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Engineering - Surveying - Land Development

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HYDROLOGY AND HYDRAULIC REPORT

For

Afton Travel Plaza
45101 Afton Canyon Road
Baker, CA, 92309

APN 542-131-54

Prepared For:

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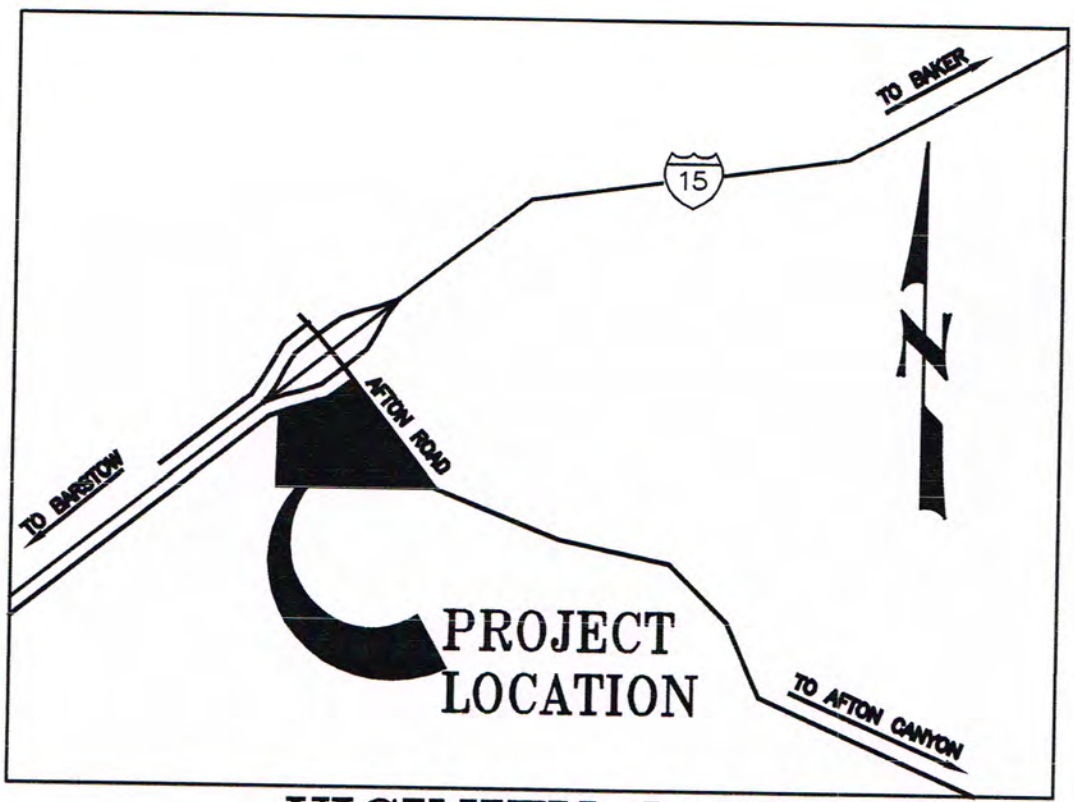
PO Box 729
Baker, CA 92309

May, 2018
Job No. 3011

TABLE OF CONTENTS



VICINITY MAP

INTRODUCTION

The purpose of this report is to document hydrology and hydraulic calculations for the construction of a Truck Stop, Automotive Repair Building and Impound Lot . The project site is 7.0 Ac and it is located at intersection of HWY 15 and Afton Road in Baker, CA.

San Bernardino County Flood Control District criteria as documented in Hydrology Design Manual dated April 1986 has been used for these calculations.

PRE-DEVELOPMENT CONDITION

The site is a vacant land and it drains from North to South. The high point at North is approximately 1780. The lowest point is 1720 located at Southwesterly corner. The land sheet flows to Southerly property line.
The existing 100 year and 10 year peak runoffs are the followings:

Rational Method
Q10= 10.07 cfs
Q100= 23.62cfs

Unit Hydrograph Method
Q100= 19.75 cfs

POST-DEVELOPMENT CONDITION

With proposed on-site improvements the run-off for post development will be conveyed to onsite infiltration basin via curb and gutter on the Southwest corner of the project. The infiltration basin is designed to capture the runoff difference between the Post and predevelopment conditions. The infiltration basin is large enough to hold the difference and eliminate the Hydromodification Concern for downstream properties.

Rational Method
Q10= 17.12 cfs
Q100= 32.94 cfs

Unit Hydrograph Method
Q100= 27.02 cfs

Unit Hydrograph construction

To construct the Unit Hydrograph we obtained the Time of Concentration, SCS Curve Number and Pervious area fraction from the Rational Method study.

Routing

We used Post development Hydrograph to rout through infiltration basin and the Peak flow leaving the infiltration basin is 13.48 cfs. It is less than Predevelopment peak flow of 19.75 cfs.

CONCLUSION

The site will drain to infiltration basin and all catch basins and curb openings are large enough to convey the 100-yr storm without flooding any building.
The infiltration basin will provide filtering and storm detention and will reduced the peak runoff leaving the property to less than predevelopment condition by retention and infiltration. The Infiltration Basin is 4 feet deep and top of outlet structure is set at 3' from bottom of basin. There is a 10 wide spillway at 3.5' above basin's bottom for any storm larger than 100-year.

SOIL

The hydrological soil group for this region of study was identified as type "A" From Hydrologic Soils Group Map for Northwest Area in San Bernardino County Hydrology Manual. The infiltration tests at the basin site shows 17.9 and 19.1 in/hr, however we utilized only 5 in/hr in our calculation.

RAIN FALL

NOAA Atlas 14, Volume 6, Version 2

10-year 1 -hour rainfall = 0.676 inch
100-year 1 -hour rainfall = 1.22inch
100-year 24 -hour rainfall = 2.72 inch

METHODOLOGY

RATIONAL METHOD

The hydrology analysis was prepared in accordance with San Bernardino County Flood Control District (SBDFC) Hydrology Manual criteria 1986. The rational method was used for determining the peak runoff for the tributary area less than 640 acres. The rational method requires that the initial sub area should be less than 10 acres and a flow path of less than 1,000 feet, and generally should be the most upstream sub area of the watershed drainage system. To compute peak discharge, San Bernardino County rational method has a basic equation:

$$Q = 0.90\ (I - Fm)\ A$$

Q = Peak discharge in cubic feet per second (cfs).
I = Average rainfall intensity in inches per hour (in/hr).
Fm = Loss rate for the watershed in inches per hour (in/hr).
A = Drainage area in acres.

SOFTWARE

CivilCADD/CivilDesign software was used for Rational Method.

Rational Method

Pre-Development

for

10 Year Storm

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-1999 Version 6.2
Rational Hydrology Study Date: 04/30/18

Sake Consulting Engineers, inc., Corona, CA - S/N 4084

********* Hydrology Study Control Information **********

10-yr storm predevelopment condition Afton Road JN 3011

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.676 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 67.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.578(In/Hr)
Initial subarea data:
Initial area flow distance = 480.000(Ft.)
Top (of initial area) elevation = 780.000(Ft.)
Bottom (of initial area) elevation = 735.000(Ft.)
Difference in elevation = 45.000(Ft.)
Slope = 0.09375 s(%)= 9.38
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.960 min.
Rainfall intensity = 2.344(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.678
Subarea runoff = **5.563(CFS)**
Total initial stream area = 3.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.578(In/Hr)

++
Process from Point/Station 2.000 to Point/Station 3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.380(Ft.), Average velocity = 3.848(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	10.00	0.00

```
      3              20.00                1.00
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =      5.563(CFS)
  '      '    flow top width =      7.605(Ft.)
  '      '     velocity=    3.848(Ft/s)
  '      '    area =      1.446(Sq.Ft)
  '      '    Froude number =     1.555

Upstream point elevation =   735.000(Ft.)
Downstream point elevation =   720.000(Ft.)
Flow length =   270.000(Ft.)
Travel time  =    1.17 min.
Time of concentration =   11.13 min.
Depth of flow =   0.380(Ft.)
Average velocity =   3.848(Ft/s)
Total irregular channel flow =     5.563(CFS)
Irregular channel normal depth above invert elev. =   0.380(Ft.)
Average velocity of channel(s) =   3.848(Ft/s)

Sub-Channel No. 1 Critical depth =      0.453(Ft.)
  '      '       '     Critical flow top width =      9.063(Ft.)
  '      '       '     Critical flow velocity=    2.710(Ft/s)
  '      '       '     Critical flow area =      2.053(Sq.Ft)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Process from Point/Station        1.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 67.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.578(In/Hr)
Time of concentration =    11.13 min.
Rainfall intensity =      2.169(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.660
Subarea runoff =      4.502(CFS) for    3.530(Ac.)
Total runoff =     10.065(CFS)
Effective area this stream =        7.03(Ac.)
Total Study Area (Main Stream No. 1) =        7.03(Ac.)
Area averaged Fm value =    0.578(In/Hr)
End of computations, Total Study Area =            7.03 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number =  67.0
```

Rational Method

Pre-Development
for

100 Year Storm

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-1999 Version 6.2
Rational Hydrology Study Date: 04/30/18

Sake Consulting Engineers, inc., Corona, CA - S/N 4084

********* Hydrology Study Control Information **********

100-yr storm predevelopment condition Afton Road JN 3011

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.676(In.)
100 Year storm 1 hour rainfall = 1.220(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.220 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 67.00
Adjusted SCS curve number for AMC 3 = 84.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.290(In/Hr)
Initial subarea data:
Initial area flow distance = 480.000(Ft.)
Top (of initial area) elevation = 780.000(Ft.)
Bottom (of initial area) elevation = 735.000(Ft.)
Difference in elevation = 45.000(Ft.)
Slope = 0.09375 s(%)= 9.38
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = **9.960 min.**
Rainfall intensity = 4.288(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff = 12.595(CFS)
Total initial stream area = 3.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.290(In/Hr)

++
Process from Point/Station 2.000 to Point/Station 3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.517(Ft.), Average velocity = 4.719(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

```
 Point number      'X' coordinate     'Y' coordinate
      1               0.00               1.00
      2              10.00               0.00
      3              20.00               1.00
 Manning's 'N' friction factor =   0.030
 -----------------------------------------------------------------
 Sub-Channel flow  =     12.595(CFS)
   '     '    flow top width =     10.332(Ft.)
   '     '     velocity=    4.720(Ft/s)
   '     '    area =      2.669(Sq.Ft)
   '     '    Froude number =     1.636

 Upstream point elevation =   735.000(Ft.)
 Downstream point elevation =   720.000(Ft.)
 Flow length =   270.000(Ft.)
 Travel time  =    0.95 min.
 Time of concentration =   10.91 min.
 Depth of flow =   0.517(Ft.)
 Average velocity =   4.719(Ft/s)
 Total irregular channel flow =    12.595(CFS)
 Irregular channel normal depth above invert elev. =   0.517(Ft.)
 Average velocity of channel(s) =   4.719(Ft/s)

 Sub-Channel No. 1 Critical depth =      0.629(Ft.)
   '     '       '     Critical flow top width =     12.578(Ft.)
   '     '       '     Critical flow velocity=    3.184(Ft/s)
   '     '       '     Critical flow area =      3.955(Sq.Ft)

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 Process from Point/Station        1.000 to Point/Station        3.000
 **** SUBAREA FLOW ADDITION ****
 ------------------------------------------------------------------------
 UNDEVELOPED (poor cover) subarea
 Decimal fraction soil group A = 1.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 0.000
 SCS curve number for soil(AMC 2)  = 67.00
 Adjusted SCS curve number for AMC 3 = 84.60
 Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.290(In/Hr)
 Time of concentration =    10.91 min.
 Rainfall intensity =      4.022(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.835
 Subarea runoff =     11.021(CFS) for    3.530(Ac.)
 Total runoff =     23.615(CFS)
 Effective area this stream =        7.03(Ac.)
 Total Study Area (Main Stream No. 1) =        7.03(Ac.)
 Area averaged Fm value =    0.290(In/Hr)
 End of computations, Total Study Area =            7.03 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.
 Note: These figures do not consider reduced effective area
 effects caused by confluences in the rational equation.

 Area averaged pervious area fraction(Ap) = 1.000
 Area averaged SCS curve number =  67.0
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Rational Method

Post-Development

for

10 Year Storm

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-1999 Version 6.2
Rational Hydrology Study Date: 05/01/18

Sake Consulting Engineers, inc., Corona, CA - S/N 4084

********* Hydrology Study Control Information **********

10-yr Storm post development condition Afton Road JN 3011

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.676 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

AGRICULTURE ROW CROPS subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 67.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.578(In/Hr)
Initial subarea data:
Initial area flow distance = 140.000(Ft.)
Top (of initial area) elevation = 780.000(Ft.)
Bottom (of initial area) elevation = 743.000(Ft.)
Difference in elevation = 37.000(Ft.)
Slope = 0.26429 s(%)= 26.43
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 4.945 min.
Rainfall intensity = 3.879(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.766
Subarea runoff = 1.664(CFS)
Total initial stream area = 0.560(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.578(In/Hr)

++
Process from Point/Station 2.000 to Point/Station 3.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 743.000(Ft.)
End of street segment elevation = 736.000(Ft.)
Length of street segment = 270.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 42.000(Ft.)
Distance from crown to crossfall grade break = 40.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020

```
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =    2.000(Ft.)
Slope from curb to property line (v/hz) =    0.025
Gutter width =    2.000(Ft.)
Gutter hike from flowline =   2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =       2.510(CFS)
Depth of flow =    0.287(Ft.), Average velocity =    3.264(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =    8.015(Ft.)
Flow velocity =    3.26(Ft/s)
Travel time =     1.38 min.      TC =     6.32  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000      Max loss rate(Fm)=      0.098(In/Hr)
Rainfall intensity =       3.266(In/Hr) for a     10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.783
Subarea runoff =       1.316(CFS) for     0.570(Ac.)
Total runoff =       2.979(CFS)
Effective area this stream =         1.13(Ac.)
Total Study Area (Main Stream No. 1) =         1.13(Ac.)
Area averaged Fm value =     0.336(In/Hr)
Street flow at end of street =       2.979(CFS)
Half street flow at end of street =       2.979(CFS)
Depth of flow =    0.300(Ft.), Average velocity =    3.388(Ft/s)
Flow width (from curb towards crown)=    8.676(Ft.)


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Process from Point/Station        3.000 to Point/Station        4.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =    736.000(Ft.)
End of street segment elevation =    733.500(Ft.)
Length of street segment  =    300.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =   42.000(Ft.)
Distance from crown to crossfall grade break  =   40.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =    1.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline =   2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
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Estimated mean flow rate at midpoint of street =      3.586(CFS)
Depth of flow =   0.367(Ft.), Average velocity =   2.282(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.019(Ft.)
Flow velocity =   2.28(Ft/s)
Travel time =    2.19 min.     TC =    8.52  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      2.652(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.782
Subarea runoff =      0.433(CFS) for    0.460(Ac.)
Total runoff =      3.412(CFS)
Effective area this stream =        1.59(Ac.)
Total Study Area (Main Stream No. 1) =        1.59(Ac.)
Area averaged Fm value =    0.267(In/Hr)
Street flow at end of street =      3.412(CFS)
Half street flow at end of street =      3.412(CFS)
Depth of flow =   0.362(Ft.), Average velocity =   2.256(Ft/s)
Flow width (from curb towards crown)=  11.774(Ft.)


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Process from Point/Station        4.000 to Point/Station        4.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.590(Ac.)
Runoff from this stream =      3.412(CFS)
Time of concentration =    8.52 min.
Rainfall intensity =     2.652(In/Hr)
Area averaged loss rate (Fm) =    0.2670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4170


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Process from Point/Station        6.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   500.000(Ft.)
Top (of initial area) elevation =   780.000(Ft.)
Bottom (of initial area) elevation =   734.600(Ft.)
Difference in elevation =    45.400(Ft.)
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```
Slope =    0.09080  s(%)=       9.08
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.900 min.
Rainfall intensity =      3.428(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.874
Subarea runoff =      6.474(CFS)
Total initial stream area =        2.160(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station        4.000 to Point/Station        4.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.160(Ac.)
Runoff from this stream =      6.474(CFS)
Time of concentration =    5.90 min.
Rainfall intensity =     3.428(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)


1         3.412       8.52              2.652
2         6.474       5.90              3.428
Qmax(1) =
         1.000 *    1.000 *     3.412) +
         0.767 *    1.000 *     6.474) + =       8.377
Qmax(2) =
         1.326 *    0.693 *     3.412) +
         1.000 *    1.000 *     6.474) + =       9.609

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.412       6.474
Maximum flow rates at confluence using above data:
        8.377        9.609
Area of streams before confluence:
        1.590        2.160
Effective area values after confluence:
        3.750        3.262
Results of confluence:
Total flow rate =      9.609(CFS)
Time of concentration =     5.900 min.
Effective stream area after confluence =      3.262(Ac.)
Stream Area average Pervious fraction(Ap) =  0.234
Stream Area average soil loss rate(Fm) =    0.170(In/Hr)
Study area (this main stream) =       3.75(Ac.)
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Process from Point/Station        4.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =    733.500(Ft.)
Downstream point/station elevation =    732.000(Ft.)
Pipe length  =    150.00(Ft.)    Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      9.609(CFS)
Nearest computed pipe diameter  =      18.00(In.)
Calculated individual pipe flow  =      9.609(CFS)
Normal flow depth in pipe =    13.55(In.)
Flow top width inside pipe =    15.53(In.)
Critical Depth =    14.36(In.)
Pipe flow velocity =       6.74(Ft/s)
Travel time through pipe =     0.37 min.
Time of concentration (TC) =      6.27 min.


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Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =       3.262(Ac.)
Runoff from this stream =       9.609(CFS)
Time of concentration =     6.27 min.
Rainfall intensity =      3.285(In/Hr)
Area averaged loss rate (Fm) =     0.1695(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2344


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Process from Point/Station       10.000 to Point/Station       11.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=      0.098(In/Hr)
Initial subarea data:
Initial area flow distance =    240.000(Ft.)
Top (of initial area) elevation =    755.000(Ft.)
Bottom (of initial area) elevation =    731.450(Ft.)
Difference in elevation =     23.550(Ft.)
Slope =    0.09812  s(%)=       9.81
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =     4.331 min.
Rainfall intensity =       4.256(In/Hr) for a     10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff =       2.208(CFS)
Total initial stream area =         0.590(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =     0.098(In/Hr)
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.590(Ac.)
Runoff from this stream =      2.208(CFS)
Time of concentration =    4.33 min.
Rainfall intensity =     4.256(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station       20.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   710.000(Ft.)
Top (of initial area) elevation =   780.000(Ft.)
Bottom (of initial area) elevation =   732.700(Ft.)
Difference in elevation =    47.300(Ft.)
Slope =    0.06662  s(%)=       6.66
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.222 min.
Rainfall intensity =      2.976(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      4.144(CFS)
Total initial stream area =       1.600(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      1.600(Ac.)
Runoff from this stream =      4.144(CFS)
Time of concentration =    7.22 min.
Rainfall intensity =     2.976(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)
```

```
1        9.609       6.27              3.285
2        2.208       4.33              4.256
3        4.144       7.22              2.976
Qmax(1) =
          1.000 *     1.000 *     9.609) +
          0.766 *     1.000 *     2.208) +
          1.107 *     0.868 *     4.144) + =       15.286
Qmax(2) =
          1.312 *     0.691 *     9.609) +
          1.000 *     1.000 *     2.208) +
          1.445 *     0.600 *     4.144) + =       14.505
Qmax(3) =
          0.901 *     1.000 *     9.609) +
          0.692 *     1.000 *     2.208) +
          1.000 *     1.000 *     4.144) + =       14.327

Total of 3 streams to confluence:
Flow rates before confluence point:
       9.609       2.208       4.144
Maximum flow rates at confluence using above data:
      15.286      14.505      14.327
Area of streams before confluence:
       3.262       0.590       1.600
Effective area values after confluence:
       5.241       3.802       5.452
Results of confluence:
Total flow rate =      15.286(CFS)
Time of concentration =      6.271 min.
Effective stream area after confluence =       5.241(Ac.)
Stream Area average Pervious fraction(Ap) =  0.180
Stream Area average soil loss rate(Fm) =    0.141(In/Hr)
Study area (this main stream) =        5.45(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =     6.27 min.
Rainfall intensity =      3.285(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.870
Subarea runoff =      1.444(CFS) for    0.860(Ac.)
Total runoff =     16.730(CFS)
Effective area this stream =        6.10(Ac.)
Total Study Area (Main Stream No. 1) =        6.80(Ac.)
Area averaged Fm value =    0.238(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       5.000 to Point/Station       22.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      6.101(Ac.)
Runoff from this stream =     16.730(CFS)
Time of concentration =    6.27 min.
Rainfall intensity =     3.285(In/Hr)
Area averaged loss rate (Fm) =    0.2380(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2748


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       8.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Initial subarea data:
Initial area flow distance =   370.000(Ft.)
Top (of initial area) elevation =   755.000(Ft.)
Bottom (of initial area) elevation =   720.000(Ft.)
Difference in elevation =    35.000(Ft.)
Slope =    0.09459  s(%)=       9.46
TC = k(0.483)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.242 min.
Rainfall intensity =      2.713(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.624
Subarea runoff =      0.389(CFS)
Total initial stream area =        0.230(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.831(In/Hr)


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Process from Point/Station      22.000 to Point/Station       22.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.230(Ac.)
Runoff from this stream =      0.389(CFS)
Time of concentration =    8.24 min.
Rainfall intensity =     2.713(In/Hr)
Area averaged loss rate (Fm) =    0.8311(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8500
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)
```

```
1       16.730      6.27              3.285
2        0.389      8.24              2.713
Qmax(1) =
         1.000 *    1.000 *    16.730) +
         1.304 *    0.761 *     0.389) + =      17.116
Qmax(2) =
         0.812 *    1.000 *    16.730) +
         1.000 *    1.000 *     0.389) + =      13.978

Total of 2 streams to confluence:
Flow rates before confluence point:
      16.730       0.389
Maximum flow rates at confluence using above data:
       17.116      13.978
Area of streams before confluence:
        6.101       0.230
Effective area values after confluence:
        6.276       6.331
Results of confluence:
Total flow rate =     17.116(CFS)
Time of concentration =     6.271 min.
Effective stream area after confluence =      6.276(Ac.)
Stream Area average Pervious fraction(Ap) =  0.296
Stream Area average soil loss rate(Fm) =    0.260(In/Hr)
Study area (this main stream) =       6.33(Ac.)
End of computations, Total Study Area =            7.03 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.288
Area averaged SCS curve number =  34.8
```

Rational Method

Post-Development

for

100 Year Storm

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-1999 Version 6.2
Rational Hydrology Study Date: 05/01/18

Sake Consulting Engineers, inc., Corona, CA - S/N 4084

********* Hydrology Study Control Information **********

100-yr storm Post development condition Afton Road JN 3011

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.676(In.)
100 Year storm 1 hour rainfall = 1.220(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.220 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

AGRICULTURE ROW CROPS subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 67.00
Adjusted SCS curve number for AMC 3 = 84.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.290(In/Hr)
Initial subarea data:
Initial area flow distance = 140.000(Ft.)
Top (of initial area) elevation = 780.000(Ft.)
Bottom (of initial area) elevation = 743.000(Ft.)
Difference in elevation = 37.000(Ft.)
Slope = 0.26429 s(%)= 26.43
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 4.945 min.
Rainfall intensity = 7.000(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.863
Subarea runoff = 3.382(CFS)
Total initial stream area = 0.560(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.290(In/Hr)

++
Process from Point/Station 2.000 to Point/Station 3.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 743.000(Ft.)
End of street segment elevation = 736.000(Ft.)
Length of street segment = 270.000(Ft.)

```
Height of curb above gutter flowline =    6.0(In.)
Width of half street (curb to crown) =  42.000(Ft.)
Distance from crown to crossfall grade break =  40.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz) =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line =   2.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.103(CFS)
Depth of flow =   0.346(Ft.), Average velocity =   3.828(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.984(Ft.)
Flow velocity =   3.83(Ft/s)
Travel time =    1.18 min.     TC =    6.12  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      6.030(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.856
Subarea runoff =      2.564(CFS) for    0.570(Ac.)
Total runoff =      5.946(CFS)
Effective area this stream =        1.13(Ac.)
Total Study Area (Main Stream No. 1) =        1.13(Ac.)
Area averaged Fm value =    0.183(In/Hr)
Street flow at end of street =      5.946(CFS)
Half street flow at end of street =      5.946(CFS)
Depth of flow =   0.361(Ft.), Average velocity =   3.967(Ft/s)
Flow width (from curb towards crown)=  11.714(Ft.)


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Process from Point/Station        3.000 to Point/Station        4.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =   736.000(Ft.)
End of street segment elevation =   733.500(Ft.)
Length of street segment  =   300.000(Ft.)
Height of curb above gutter flowline =    6.0(In.)
Width of half street (curb to crown) =  42.000(Ft.)
Distance from crown to crossfall grade break =  40.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz) =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line =   1.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
```

```
 Gutter width =   2.000(Ft.)
 Gutter hike from flowline =  2.000(In.)
  Manning's N in gutter =  0.0150
  Manning's N from gutter to grade break =  0.0150
  Manning's N from grade break to crown =  0.0150
 Estimated mean flow rate at midpoint of street =      7.156(CFS)
 Depth of flow =   0.445(Ft.), Average velocity =   2.692(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width =  15.910(Ft.)
 Flow velocity =   2.69(Ft/s)
 Travel time =    1.86 min.     TC =    7.98  min.
  Adding area flow to street
 COMMERCIAL subarea type
 Decimal fraction soil group A = 1.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 0.000
 SCS curve number for soil(AMC 2)  = 32.00
 Adjusted SCS curve number for AMC 3 = 52.00
 Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
 Rainfall intensity =      5.009(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.854
 Subarea runoff =      1.003(CFS) for    0.460(Ac.)
 Total runoff =      6.949(CFS)
 Effective area this stream =        1.59(Ac.)
 Total Study Area (Main Stream No. 1) =        1.59(Ac.)
 Area averaged Fm value =    0.153(In/Hr)
 Street flow at end of street =      6.949(CFS)
 Half street flow at end of street =      6.949(CFS)
 Depth of flow =   0.441(Ft.), Average velocity =   2.673(Ft/s)
 Flow width (from curb towards crown)=  15.725(Ft.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station        4.000 to Point/Station        4.000
 **** CONFLUENCE OF MINOR STREAMS ****
 ----------------------------------------------------------------------------
 Along Main Stream number: 1 in normal stream number 1
 Stream flow area =      1.590(Ac.)
 Runoff from this stream =      6.949(CFS)
 Time of concentration =    7.98 min.
 Rainfall intensity =     5.009(In/Hr)
 Area averaged loss rate (Fm) =    0.1530(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.4170


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station        6.000 to Point/Station        7.000
 **** INITIAL AREA EVALUATION ****
 ----------------------------------------------------------------------------
 COMMERCIAL subarea type
 Decimal fraction soil group A = 1.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 0.000
 SCS curve number for soil(AMC 2)  = 32.00
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```
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =   500.000(Ft.)
Top (of initial area) elevation =   780.000(Ft.)
Bottom (of initial area) elevation =   734.600(Ft.)
Difference in elevation =    45.400(Ft.)
Slope =    0.09080  s(%)=       9.08
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.900 min.
Rainfall intensity =      6.187(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.889
Subarea runoff =     11.875(CFS)
Total initial stream area =        2.160(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


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Process from Point/Station        4.000 to Point/Station        4.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.160(Ac.)
Runoff from this stream =     11.875(CFS)
Time of concentration =    5.90 min.
Rainfall intensity =     6.187(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)


1         6.949       7.98              5.009
2        11.875       5.90              6.187
Qmax(1) =
         1.000 *     1.000 *      6.949) +
         0.807 *     1.000 *     11.875) + =       16.533
Qmax(2) =
         1.243 *     0.740 *      6.949) +
         1.000 *     1.000 *     11.875) + =       18.260

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.949       11.875
Maximum flow rates at confluence using above data:
      16.533       18.260
Area of streams before confluence:
        1.590        2.160
Effective area values after confluence:
        3.750        3.336
Results of confluence:
Total flow rate =     18.260(CFS)
Time of concentration =     5.900 min.
Effective stream area after confluence =      3.336(Ac.)
```

```
Stream Area average Pervious fraction(Ap) =  0.234
Stream Area average soil loss rate(Fm) =    0.110(In/Hr)
Study area (this main stream) =       3.75(Ac.)


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Process from Point/Station        4.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   733.500(Ft.)
Downstream point/station elevation =   732.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.260(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    18.260(CFS)
Normal flow depth in pipe =   16.34(In.)
Flow top width inside pipe =   22.38(In.)
Critical Depth =   18.47(In.)
Pipe flow velocity =      8.01(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =     6.21 min.


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Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.336(Ac.)
Runoff from this stream =     18.260(CFS)
Time of concentration =    6.21 min.
Rainfall intensity =     5.968(In/Hr)
Area averaged loss rate (Fm) =    0.1101(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2344


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Process from Point/Station       10.000 to Point/Station       11.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =   240.000(Ft.)
Top (of initial area) elevation =   755.000(Ft.)
Bottom (of initial area) elevation =   731.450(Ft.)
Difference in elevation =    23.550(Ft.)
Slope =    0.09812  s(%)=       9.81
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    4.331 min.
Rainfall intensity =      7.681(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.891
Subarea runoff =      4.037(CFS)
Total initial stream area =        0.590(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


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Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.590(Ac.)
Runoff from this stream =      4.037(CFS)
Time of concentration =    4.33 min.
Rainfall intensity =     7.681(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station        1.000 to Point/Station       20.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =   710.000(Ft.)
Top (of initial area) elevation =   780.000(Ft.)
Bottom (of initial area) elevation =   732.700(Ft.)
Difference in elevation =    47.300(Ft.)
Slope =    0.06662  s(%)=       6.66
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.222 min.
Rainfall intensity =      5.370(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.887
Subarea runoff =      7.620(CFS)
Total initial stream area =        1.600(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


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Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      1.600(Ac.)
Runoff from this stream =      7.620(CFS)
Time of concentration =    7.22 min.
Rainfall intensity =     5.370(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)              (In/Hr)


1        18.260       6.21              5.968
2         4.037       4.33              7.681
3         7.620       7.22              5.370
Qmax(1) =
          1.000 *     1.000 *    18.260) +
          0.775 *     1.000 *     4.037) +
          1.113 *     0.860 *     7.620) + =       28.682
Qmax(2) =
          1.293 *     0.697 *    18.260) +
          1.000 *     1.000 *     4.037) +
          1.437 *     0.600 *     7.620) + =       27.059
Qmax(3) =
          0.898 *     1.000 *    18.260) +
          0.696 *     1.000 *     4.037) +
          1.000 *     1.000 *     7.620) + =       26.828

Total of 3 streams to confluence:
Flow rates before confluence point:
      18.260        4.037        7.620
Maximum flow rates at confluence using above data:
       28.682       27.059       26.828
Area of streams before confluence:
        3.336        0.590        1.600
Effective area values after confluence:
        5.302        3.875        5.526
Results of confluence:
Total flow rate =      28.682(CFS)
Time of concentration =      6.212 min.
Effective stream area after confluence =       5.302(Ac.)
Stream Area average Pervious fraction(Ap) =  0.181
Stream Area average soil loss rate(Fm) =    0.098(In/Hr)
Study area (this main stream) =        5.53(Ac.)


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Process from Point/Station        21.000 to Point/Station         5.000
**** SUBAREA FLOW ADDITION ****
```

```
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.667(In/Hr)
Time of concentration =      6.21 min.
Rainfall intensity =       5.968(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.887
Subarea runoff =      3.432(CFS) for    0.860(Ac.)
Total runoff =     32.114(CFS)
Effective area this stream =        6.16(Ac.)
Total Study Area (Main Stream No. 1) =        6.80(Ac.)
Area averaged Fm value =    0.177(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       5.000 to Point/Station       22.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      6.162(Ac.)
Runoff from this stream =     32.114(CFS)
Time of concentration =    6.21 min.
Rainfall intensity =     5.968(In/Hr)
Area averaged loss rate (Fm) =    0.1771(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2745


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       8.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.667(In/Hr)
Initial subarea data:
Initial area flow distance =   370.000(Ft.)
Top (of initial area) elevation =   755.000(Ft.)
Bottom (of initial area) elevation =   720.000(Ft.)
Difference in elevation =    35.000(Ft.)
Slope =    0.09459  s(%)=       9.46
TC = k(0.483)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.242 min.
Rainfall intensity =      4.896(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.777
Subarea runoff =      0.875(CFS)
Total initial stream area =        0.230(Ac.)
Pervious area fraction = 0.850
Initial area Fm value =    0.667(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      22.000 to Point/Station       22.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.230(Ac.)
Runoff from this stream =      0.875(CFS)
Time of concentration =    8.24 min.
```

```
Rainfall intensity =     4.896(In/Hr)
Area averaged loss rate (Fm) =    0.6674(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8500
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       32.114       6.21              5.968
2        0.875       8.24              4.896
Qmax(1) =
         1.000 *    1.000 *    32.114) +
         1.253 *    0.754 *     0.875) + =      32.941
Qmax(2) =
         0.815 *    1.000 *    32.114) +
         1.000 *    1.000 *     0.875) + =      27.045

Total of 2 streams to confluence:
Flow rates before confluence point:
      32.114       0.875
Maximum flow rates at confluence using above data:
       32.941       27.045
Area of streams before confluence:
        6.162        0.230
Effective area values after confluence:
        6.335        6.392
Results of confluence:
Total flow rate =     32.941(CFS)
Time of concentration =     6.212 min.
Effective stream area after confluence =      6.335(Ac.)
Stream Area average Pervious fraction(Ap) =  0.295
Stream Area average soil loss rate(Fm) =    0.195(In/Hr)
Study area (this main stream) =       6.39(Ac.)
End of computations, Total Study Area =            7.03 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.288
Area averaged SCS curve number =  34.8
```

Unit Hydrograph
100-yr 24-hr Storm
Predevelopment

U n i t H y d r o g r a p h A n a l y s i s

Study date 05/02/18

++

San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Sake Consulting Engineers, inc. Corona, CA - S/N 4084

100-yr 24-hr storm for Predevelopment condition JN 3011 Afton Road

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Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
7.03	1	1.22
Rainfall data for year 100		
7.03	6	1.78
Rainfall data for year 100		
7.03	24	2.72

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
67.0	84.6	7.03	1.000	0.290	1.000	0.290

Area-averaged adjusted loss rate Fm (In/Hr) = 0.290

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
7.03	1.000	67.0	84.6	1.82	0.489

Area-averaged catchment yield fraction, Y = 0.489
Area-averaged low loss fraction, Yb = 0.511
User entry of time of concentration = 0.182 (hours)
++
Watershed area = 7.03(Ac.)
Catchment Lag time = 0.146 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 57.2344
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.290(In/Hr)
Average low loss rate fraction (Yb) = 0.511 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.579(In)
Computed peak 30-minute rainfall = 0.991(In)
Specified peak 1-hour rainfall = 1.220(In)
Computed peak 3-hour rainfall = 1.538(In)
Specified peak 6-hour rainfall = 1.780(In)
Specified peak 24-hour rainfall = 2.720(In)

Rainfall depth area reduction factors:
Using a total area of 7.03(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.579(In)
30-minute factor = 1.000 Adjusted rainfall = 0.991(In)
1-hour factor = 1.000 Adjusted rainfall = 1.220(In)
3-hour factor = 1.000 Adjusted rainfall = 1.538(In)
6-hour factor = 1.000 Adjusted rainfall = 1.780(In)
24-hour factor = 1.000 Adjusted rainfall = 2.720(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 85.02 (CFS))		
1	5.081	4.320
2	38.622	28.516
3	66.254	23.492
4	78.068	10.044
5	84.961	5.861
6	89.542	3.895
7	92.631	2.626
8	94.890	1.921
9	96.533	1.396
10	97.652	0.952
11	98.325	0.572
12	98.998	0.573
13	99.588	0.501
14	100.000	0.351

Total soil rain loss = 1.03(In)
Total effective rainfall = 1.69(In)
Peak flow rate in flood hydrograph = 19.75(CFS)

++

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0000	0.01	Q				
0+10	0.0004	0.05	Q				
0+15	0.0009	0.08	Q				
0+20	0.0016	0.09	Q				
0+25	0.0023	0.10	Q				
0+30	0.0030	0.11	Q				
0+35	0.0038	0.11	Q				
0+40	0.0046	0.12	Q				
0+45	0.0054	0.12	Q				
0+50	0.0062	0.12	Q				
0+55	0.0071	0.12	Q				
1+ 0	0.0079	0.12	Q				
1+ 5	0.0088	0.12	Q				
1+10	0.0096	0.12	Q				
1+15	0.0105	0.13	Q				
1+20	0.0114	0.13	Q				
1+25	0.0122	0.13	Q				
1+30	0.0131	0.13	Q				
1+35	0.0140	0.13	Q				
1+40	0.0149	0.13	Q				
1+45	0.0157	0.13	Q				
1+50	0.0166	0.13	Q				
1+55	0.0175	0.13	Q				
2+ 0	0.0184	0.13	Q				
2+ 5	0.0193	0.13	Q				
2+10	0.0202	0.13	Q				
2+15	0.0211	0.13	Q				
2+20	0.0220	0.13	Q				
2+25	0.0229	0.13	Q				
2+30	0.0239	0.13	Q				
2+35	0.0248	0.13	QV				
2+40	0.0257	0.13	QV				
2+45	0.0266	0.13	QV				
2+50	0.0276	0.14	QV				
2+55	0.0285	0.14	QV				
3+ 0	0.0294	0.14	QV				
3+ 5	0.0304	0.14	QV				
3+10	0.0313	0.14	QV				
3+15	0.0323	0.14	QV				
3+20	0.0332	0.14	QV				
3+25	0.0342	0.14	QV				
3+30	0.0352	0.14	QV				

3+35	0.0361	0.14	QV
3+40	0.0371	0.14	QV
3+45	0.0381	0.14	QV
3+50	0.0391	0.14	QV
3+55	0.0401	0.14	QV
4+ 0	0.0411	0.14	QV
4+ 5	0.0421	0.14	QV
4+10	0.0431	0.15	QV
4+15	0.0441	0.15	QV
4+20	0.0451	0.15	QV
4+25	0.0461	0.15	QV
4+30	0.0471	0.15	QV
4+35	0.0481	0.15	QV
4+40	0.0492	0.15	QV
4+45	0.0502	0.15	Q V
4+50	0.0513	0.15	Q V
4+55	0.0523	0.15	Q V
5+ 0	0.0534	0.15	Q V
5+ 5	0.0544	0.15	Q V
5+10	0.0555	0.15	Q V
5+15	0.0566	0.16	Q V
5+20	0.0576	0.16	Q V
5+25	0.0587	0.16	Q V
5+30	0.0598	0.16	Q V
5+35	0.0609	0.16	Q V
5+40	0.0620	0.16	Q V
5+45	0.0631	0.16	Q V
5+50	0.0642	0.16	Q V
5+55	0.0653	0.16	Q V
6+ 0	0.0664	0.16	Q V
6+ 5	0.0676	0.16	Q V
6+10	0.0687	0.16	Q V
6+15	0.0699	0.17	Q V
6+20	0.0710	0.17	Q V
6+25	0.0722	0.17	Q V
6+30	0.0733	0.17	Q V
6+35	0.0745	0.17	Q V
6+40	0.0757	0.17	Q V
6+45	0.0769	0.17	Q V
6+50	0.0780	0.17	Q V
6+55	0.0792	0.17	Q V
7+ 0	0.0804	0.18	Q V
7+ 5	0.0817	0.18	Q V
7+10	0.0829	0.18	Q V
7+15	0.0841	0.18	Q V
7+20	0.0853	0.18	Q V
7+25	0.0866	0.18	Q V
7+30	0.0878	0.18	Q V
7+35	0.0891	0.18	Q V
7+40	0.0904	0.18	Q V
7+45	0.0917	0.19	Q V
7+50	0.0929	0.19	Q V
7+55	0.0942	0.19	Q V
8+ 0	0.0955	0.19	Q V
8+ 5	0.0969	0.19	Q V
8+10	0.0982	0.19	Q V
8+15	0.0995	0.19	Q V

8+20	0.1009	0.20	Q	V					
8+25	0.1022	0.20	Q	V					
8+30	0.1036	0.20	Q	V					
8+35	0.1050	0.20	Q	V					
8+40	0.1063	0.20	Q	V					
8+45	0.1077	0.20	Q	V					
8+50	0.1091	0.20	Q	V					
8+55	0.1106	0.21	Q	V					
9+ 0	0.1120	0.21	Q	V					
9+ 5	0.1134	0.21	Q	V					
9+10	0.1149	0.21	Q	V					
9+15	0.1163	0.21	Q	V					
9+20	0.1178	0.21	Q	V					
9+25	0.1193	0.22	Q	V					
9+30	0.1208	0.22	Q	V					
9+35	0.1223	0.22	Q	V					
9+40	0.1238	0.22	Q	V					
9+45	0.1254	0.22	Q	V					
9+50	0.1269	0.23	Q	V					
9+55	0.1285	0.23	Q	V					
10+ 0	0.1301	0.23	Q	V					
10+ 5	0.1317	0.23	Q	V					
10+10	0.1333	0.23	Q	V					
10+15	0.1349	0.24	Q	V					
10+20	0.1366	0.24	Q	V					
10+25	0.1382	0.24	Q	V					
10+30	0.1399	0.24	Q	V					
10+35	0.1416	0.25	Q	V					
10+40	0.1433	0.25	Q	V					
10+45	0.1450	0.25	Q	V					
10+50	0.1468	0.25	Q	V					
10+55	0.1485	0.26	Q	V					
11+ 0	0.1503	0.26	Q	V					
11+ 5	0.1521	0.26	Q	V					
11+10	0.1539	0.26	Q	V					
11+15	0.1558	0.27	Q	V					
11+20	0.1577	0.27	Q	V					
11+25	0.1595	0.27	Q	V					
11+30	0.1615	0.28	Q	V					
11+35	0.1634	0.28	Q	V					
11+40	0.1653	0.28	Q	V					
11+45	0.1673	0.29	Q	V					
11+50	0.1693	0.29	Q	V					
11+55	0.1714	0.30	Q	V					
12+ 0	0.1734	0.30	Q	V					
12+ 5	0.1755	0.30	Q	V					
12+10	0.1774	0.27	Q	V					
12+15	0.1791	0.25	Q	V					
12+20	0.1807	0.24	Q	V					
12+25	0.1824	0.24	Q	V					
12+30	0.1840	0.24	Q	V					
12+35	0.1856	0.24	Q	V					
12+40	0.1873	0.24	Q	V					
12+45	0.1889	0.24	Q	V					
12+50	0.1906	0.25	Q	V					
12+55	0.1924	0.25	Q	V					
13+ 0	0.1941	0.25	Q	V					

13+ 5	0.1959	0.26	Q V |
13+10	0.1977	0.26	Q V |
13+15	0.1996	0.27	Q V |
13+20	0.2015	0.28	Q V |
13+25	0.2034	0.28	Q V |
13+30	0.2054	0.29	Q V |
13+35	0.2074	0.30	Q V |
13+40	0.2095	0.30	Q V |
13+45	0.2117	0.31	Q V |
13+50	0.2139	0.32	Q V |
13+55	0.2162	0.33	Q V |
14+ 0	0.2185	0.34	Q V |
14+ 5	0.2209	0.35	Q V |
14+10	0.2234	0.36	Q V|
14+15	0.2259	0.37	Q V|
14+20	0.2286	0.38	Q V|
14+25	0.2313	0.40	Q V|
14+30	0.2341	0.41	Q V|
14+35	0.2371	0.43	Q V|
14+40	0.2402	0.45	Q V|
14+45	0.2434	0.47	Q V|
14+50	0.2467	0.49	Q V|
14+55	0.2503	0.51	|Q V
15+ 0	0.2540	0.54	|Q V
15+ 5	0.2579	0.57	|Q V
15+10	0.2620	0.60	|Q V
15+15	0.2664	0.64	|Q V
15+20	0.2712	0.69	|Q V
15+25	0.2764	0.76	|Q |V
15+30	0.2830	0.96	|Q |V
15+35	0.2910	1.15	| Q |V
15+40	0.3001	1.33	| Q | V
15+45	0.3106	1.52	| Q | V
15+50	0.3235	1.88	| Q | V
15+55	0.3406	2.48	| Q | V
16+ 0	0.3672	3.86	| Q | V
16+ 5	0.4214	7.86	| | Q V
16+10	**0.5574**	**19.75**	**| | | V | Q|**
16+15	0.6699	16.33	| | | V | Q |
16+20	0.7288	8.57	| | Q | V| |
16+25	0.7673	5.59	| |Q | |V |
16+30	0.7945	3.95	| Q | | V |
16+35	0.8141	2.85	| Q | | V |
16+40	0.8293	2.20	| Q | | V |
16+45	0.8411	1.72	| Q | | V |
16+50	0.8503	1.33	| Q | | V |
16+55	0.8573	1.03	| Q | | V |
17+ 0	0.8638	0.93	|Q | | V |
17+ 5	0.8693	0.81	|Q | | V |
17+10	0.8738	0.65	|Q | | V |
17+15	0.8767	0.42	Q | | V |
17+20	0.8794	0.38	Q | | V |
17+25	0.8818	0.35	Q | | V |
17+30	0.8841	0.33	Q | | V |
17+35	0.8862	0.31	Q | | V |
17+40	0.8883	0.30	Q | | V |
17+45	0.8902	0.28	Q | | V |

17+50	0.8921	0.27	Q				V
17+55	0.8938	0.26	Q				V
18+ 0	0.8955	0.25	Q				V
18+ 5	0.8972	0.24	Q				V
18+10	0.8991	0.27	Q				V
18+15	0.9010	0.29	Q				V
18+20	0.9030	0.29	Q				V
18+25	0.9050	0.29	Q				V
18+30	0.9069	0.28	Q				V
18+35	0.9088	0.28	Q				V
18+40	0.9107	0.27	Q				V
18+45	0.9126	0.27	Q				V
18+50	0.9144	0.26	Q				V
18+55	0.9162	0.26	Q				V
19+ 0	0.9179	0.25	Q				V
19+ 5	0.9197	0.25	Q				V
19+10	0.9213	0.24	Q				V
19+15	0.9230	0.24	Q				V
19+20	0.9246	0.24	Q				V
19+25	0.9262	0.23	Q				V
19+30	0.9278	0.23	Q				V
19+35	0.9293	0.22	Q				V
19+40	0.9308	0.22	Q				V
19+45	0.9323	0.21	Q				V
19+50	0.9337	0.21	Q				V
19+55	0.9352	0.21	Q				V
20+ 0	0.9366	0.20	Q				V
20+ 5	0.9380	0.20	Q				V
20+10	0.9393	0.20	Q				V
20+15	0.9407	0.20	Q				V
20+20	0.9420	0.19	Q				V
20+25	0.9433	0.19	Q				V
20+30	0.9446	0.19	Q				V
20+35	0.9459	0.18	Q				V
20+40	0.9471	0.18	Q				V
20+45	0.9484	0.18	Q				V
20+50	0.9496	0.18	Q				V
20+55	0.9508	0.18	Q				V
21+ 0	0.9520	0.17	Q				V
21+ 5	0.9532	0.17	Q				V
21+10	0.9543	0.17	Q				V
21+15	0.9555	0.17	Q				V
21+20	0.9566	0.17	Q				V
21+25	0.9578	0.16	Q				V
21+30	0.9589	0.16	Q				V
21+35	0.9600	0.16	Q				V
21+40	0.9611	0.16	Q				V
21+45	0.9621	0.16	Q				V
21+50	0.9632	0.15	Q				V
21+55	0.9643	0.15	Q				V
22+ 0	0.9653	0.15	Q				V
22+ 5	0.9663	0.15	Q				V
22+10	0.9674	0.15	Q				V
22+15	0.9684	0.15	Q				V
22+20	0.9694	0.15	Q				V
22+25	0.9704	0.14	Q				V
22+30	0.9714	0.14	Q				V

22+35	0.9723	0.14	Q	|	|	|	V|
22+40	0.9733	0.14	Q	|	|	|	V|
22+45	0.9743	0.14	Q	|	|	|	V|
22+50	0.9752	0.14	Q	|	|	|	V|
22+55	0.9762	0.14	Q	|	|	|	V|
23+ 0	0.9771	0.14	Q	|	|	|	V|
23+ 5	0.9780	0.13	Q	|	|	|	V|
23+10	0.9789	0.13	Q	|	|	|	V|
23+15	0.9799	0.13	Q	|	|	|	V|
23+20	0.9808	0.13	Q	|	|	|	V|
23+25	0.9817	0.13	Q	|	|	|	V|
23+30	0.9825	0.13	Q	|	|	|	V|
23+35	0.9834	0.13	Q	|	|	|	V|
23+40	0.9843	0.13	Q	|	|	|	V|
23+45	0.9852	0.13	Q	|	|	|	V|
23+50	0.9860	0.12	Q	|	|	|	V|
23+55	0.9869	0.12	Q	|	|	|	V|
24+ 0	0.9877	0.12	Q	|	|	|	V|
24+ 5	0.9885	0.12	Q	|	|	|	V|
24+10	0.9890	0.08	Q	|	|	|	V|
24+15	0.9893	0.04	Q	|	|	|	V|
24+20	0.9895	0.03	Q	|	|	|	V|
24+25	0.9896	0.02	Q	|	|	|	V|
24+30	0.9897	0.01	Q	|	|	|	V|
24+35	0.9898	0.01	Q	|	|	|	V|
24+40	0.9898	0.01	Q	|	|	|	V|
24+45	0.9899	0.00	Q	|	|	|	V|
24+50	0.9899	0.00	Q	|	|	|	V|
24+55	0.9899	0.00	Q	|	|	|	V|
25+ 0	0.9899	0.00	Q	|	|	|	V|
25+ 5	0.9899	0.00	Q	|	|	|	V|

Unit Hydrograph
100-yr 24-hr Storm
Post Development

U n i t H y d r o g r a p h A n a l y s i s

Study date 05/02/18

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Sake Consulting Engineers, inc. Corona, CA - S/N 4084

100-yr 24-hr Storm Post Development Condition JN 3011 Afton Road

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Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
7.03	1	1.22
Rainfall data for year 100		
7.03	6	1.78
Rainfall data for year 100		
7.03	24	2.72

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
34.8	54.8	7.03	1.000	0.750	0.288	0.216

Area-averaged adjusted loss rate Fm (In/Hr) = 0.216

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
2.02	0.288	34.8	54.8	8.25	0.045
5.01	0.712	98.0	98.0	0.20	0.915

Area-averaged catchment yield fraction, Y = 0.665
Area-averaged low loss fraction, Yb = 0.335
User entry of time of concentration = 0.103 (hours)
++
Watershed area = 7.03(Ac.)
Catchment Lag time = 0.082 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 101.1327
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.216(In/Hr)
Average low loss rate fraction (Yb) = 0.335 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.579(In)
Computed peak 30-minute rainfall = 0.991(In)
Specified peak 1-hour rainfall = 1.220(In)
Computed peak 3-hour rainfall = 1.538(In)
Specified peak 6-hour rainfall = 1.780(In)
Specified peak 24-hour rainfall = 2.720(In)

Rainfall depth area reduction factors:
Using a total area of 7.03(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.579(In)
30-minute factor = 1.000 Adjusted rainfall = 0.991(In)
1-hour factor = 1.000 Adjusted rainfall = 1.220(In)
3-hour factor = 1.000 Adjusted rainfall = 1.538(In)
6-hour factor = 1.000 Adjusted rainfall = 1.780(In)
24-hour factor = 1.000 Adjusted rainfall = 2.720(In)

U n i t H y d r o g r a p h
++

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 85.02 (CFS))		
1	17.608	14.970
2	67.610	42.512
3	84.310	14.198
4	91.677	6.263
5	95.649	3.377
6	97.785	1.816
7	98.987	1.022
8	100.000	0.862

Total soil rain loss = 0.69(In)
Total effective rainfall = 2.03(In)

Peak flow rate in flood hydrograph = 27.02(CFS)

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0002	0.03	Q				
0+10	0.0010	0.11	Q				
0+15	0.0019	0.14	Q				
0+20	0.0030	0.15	Q				
0+25	0.0040	0.16	Q				
0+30	0.0052	0.16	Q				
0+35	0.0063	0.16	Q				
0+40	0.0074	0.17	Q				
0+45	0.0086	0.17	Q				
0+50	0.0097	0.17	Q				
0+55	0.0109	0.17	Q				
1+ 0	0.0121	0.17	Q				
1+ 5	0.0132	0.17	Q				
1+10	0.0144	0.17	Q				
1+15	0.0156	0.17	Q				
1+20	0.0168	0.17	Q				
1+25	0.0180	0.17	Q				
1+30	0.0192	0.17	Q				
1+35	0.0204	0.17	Q				
1+40	0.0216	0.17	Q				
1+45	0.0228	0.18	Q				
1+50	0.0240	0.18	Q				
1+55	0.0252	0.18	Q				
2+ 0	0.0264	0.18	Q				
2+ 5	0.0276	0.18	Q				
2+10	0.0289	0.18	Q				
2+15	0.0301	0.18	QV				
2+20	0.0314	0.18	QV				
2+25	0.0326	0.18	QV				
2+30	0.0339	0.18	QV				
2+35	0.0351	0.18	QV				
2+40	0.0364	0.18	QV				
2+45	0.0376	0.18	QV				
2+50	0.0389	0.19	QV				
2+55	0.0402	0.19	QV				
3+ 0	0.0415	0.19	QV				
3+ 5	0.0428	0.19	QV				
3+10	0.0441	0.19	QV				
3+15	0.0454	0.19	QV				
3+20	0.0467	0.19	QV				
3+25	0.0480	0.19	QV				
3+30	0.0493	0.19	QV				
3+35	0.0506	0.19	QV				
3+40	0.0520	0.19	QV				
3+45	0.0533	0.19	QV				
3+50	0.0547	0.20	QV				

3+55	0.0560	0.20	QV				
4+ 0	0.0574	0.20	QV				
4+ 5	0.0587	0.20	QV				
4+10	0.0601	0.20	Q V				
4+15	0.0615	0.20	Q V				
4+20	0.0629	0.20	Q V				
4+25	0.0643	0.20	Q V				
4+30	0.0657	0.20	Q V				
4+35	0.0671	0.20	Q V				
4+40	0.0685	0.21	Q V				
4+45	0.0699	0.21	Q V				
4+50	0.0713	0.21	Q V				
4+55	0.0728	0.21	Q V				
5+ 0	0.0742	0.21	Q V				
5+ 5	0.0756	0.21	Q V				
5+10	0.0771	0.21	Q V				
5+15	0.0786	0.21	Q V				
5+20	0.0800	0.21	Q V				
5+25	0.0815	0.21	Q V				
5+30	0.0830	0.22	Q V				
5+35	0.0845	0.22	Q V				
5+40	0.0860	0.22	Q V				
5+45	0.0875	0.22	Q V				
5+50	0.0890	0.22	Q V				
5+55	0.0906	0.22	Q V				
6+ 0	0.0921	0.22	Q V				
6+ 5	0.0936	0.22	Q V				
6+10	0.0952	0.23	Q V				
6+15	0.0968	0.23	Q V				
6+20	0.0983	0.23	Q V				
6+25	0.0999	0.23	Q V				
6+30	0.1015	0.23	Q V				
6+35	0.1031	0.23	Q V				
6+40	0.1047	0.23	Q V				
6+45	0.1064	0.24	Q V				
6+50	0.1080	0.24	Q V				
6+55	0.1096	0.24	Q V				
7+ 0	0.1113	0.24	Q V				
7+ 5	0.1129	0.24	Q V				
7+10	0.1146	0.24	Q V				
7+15	0.1163	0.24	Q V				
7+20	0.1180	0.25	Q V				
7+25	0.1197	0.25	Q V				
7+30	0.1214	0.25	Q V				
7+35	0.1231	0.25	Q V				
7+40	0.1249	0.25	Q V				
7+45	0.1266	0.25	Q V				
7+50	0.1284	0.26	Q V				
7+55	0.1302	0.26	Q V				
8+ 0	0.1320	0.26	Q V				
8+ 5	0.1338	0.26	Q V				
8+10	0.1356	0.26	Q V				
8+15	0.1374	0.27	Q V				
8+20	0.1393	0.27	Q V				
8+25	0.1411	0.27	Q V				
8+30	0.1430	0.27	Q V				
8+35	0.1449	0.27	Q V				

8+40	0.1468	0.28	Q	V					
8+45	0.1487	0.28	Q	V					
8+50	0.1506	0.28	Q	V					
8+55	0.1525	0.28	Q	V					
9+ 0	0.1545	0.28	Q	V					
9+ 5	0.1565	0.29	Q	V					
9+10	0.1585	0.29	Q	V					
9+15	0.1605	0.29	Q	V					
9+20	0.1625	0.29	Q	V					
9+25	0.1645	0.30	Q	V					
9+30	0.1666	0.30	Q	V					
9+35	0.1687	0.30	Q	V					
9+40	0.1708	0.30	Q	V					
9+45	0.1729	0.31	Q	V					
9+50	0.1750	0.31	Q	V					
9+55	0.1772	0.31	Q	V					
10+ 0	0.1794	0.32	Q	V					
10+ 5	0.1815	0.32	Q	V					
10+10	0.1838	0.32	Q	V					
10+15	0.1860	0.32	Q	V					
10+20	0.1883	0.33	Q	V					
10+25	0.1905	0.33	Q	V					
10+30	0.1928	0.33	Q	V					
10+35	0.1952	0.34	Q	V					
10+40	0.1975	0.34	Q	V					
10+45	0.1999	0.35	Q	V					
10+50	0.2023	0.35	Q	V					
10+55	0.2047	0.35	Q	V					
11+ 0	0.2072	0.36	Q	V					
11+ 5	0.2097	0.36	Q	V					
11+10	0.2122	0.37	Q	V					
11+15	0.2147	0.37	Q	V					
11+20	0.2173	0.37	Q	V					
11+25	0.2199	0.38	Q	V					
11+30	0.2225	0.38	Q	V					
11+35	0.2252	0.39	Q	V					
11+40	0.2279	0.39	Q	V					
11+45	0.2307	0.40	Q	V					
11+50	0.2334	0.40	Q	V					
11+55	0.2362	0.41	Q	V					
12+ 0	0.2391	0.41	Q	V					
12+ 5	0.2418	0.40	Q	V					
12+10	0.2441	0.34	Q	V					
12+15	0.2463	0.32	Q	V					
12+20	0.2485	0.31	Q	V					
12+25	0.2507	0.31	Q	V					
12+30	0.2528	0.32	Q	V					
12+35	0.2550	0.32	Q	V					
12+40	0.2573	0.33	Q	V					
12+45	0.2596	0.33	Q	V					
12+50	0.2619	0.34	Q	V					
12+55	0.2643	0.35	Q	V					
13+ 0	0.2667	0.35	Q	V					
13+ 5	0.2692	0.36	Q	V					
13+10	0.2717	0.37	Q	V					
13+15	0.2743	0.38	Q	V					
13+20	0.2770	0.38	Q	V					

13+25	0.2797	0.39	Q V|
13+30	0.2824	0.40	Q V|
13+35	0.2853	0.41	Q V|
13+40	0.2882	0.42	Q V|
13+45	0.2912	0.44	Q V|
13+50	0.2943	0.45	Q V|
13+55	0.2975	0.46	Q V|
14+ 0	0.3007	0.47	Q V
14+ 5	0.3041	0.49	Q V
14+10	0.3076	0.51	Q V
14+15	0.3112	0.52	Q V
14+20	0.3149	0.54	Q V
14+25	0.3188	0.56	Q V
14+30	0.3228	0.58	Q V
14+35	0.3270	0.61	Q V
14+40	0.3313	0.63	Q |V
14+45	0.3359	0.66	Q |V
14+50	0.3407	0.70	Q |V
14+55	0.3457	0.73	Q |V
15+ 0	0.3510	0.77	|Q |V
15+ 5	0.3567	0.82	|Q |V
15+10	0.3627	0.87	|Q | V
15+15	0.3691	0.93	|Q | V
15+20	0.3760	1.01	|Q | V
15+25	0.3841	1.18	|Q | V
15+30	0.3949	1.56	| Q | V
15+35	0.4072	1.79	| Q | V
15+40	0.4213	2.05	| Q | V
15+45	0.4375	2.35	| Q | V
15+50	0.4570	2.83	| Q | V
15+55	0.4829	3.76	| Q | V
16+ 0	0.5235	5.90	| Q | V
16+ 5	0.6258	14.85	| | Q|V
16+10	**0.8118**	**27.02**	**| | | V | Q |**
16+15	0.8935	11.86	| | Q | V |
16+20	0.9388	6.57	| Q | | |V |
16+25	0.9678	4.22	| Q | | | V |
16+30	0.9863	2.68	| Q | | | V |
16+35	0.9992	1.87	| Q | | | V |
16+40	1.0095	1.49	|Q | | | V |
16+45	1.0156	0.89	|Q | | | V |
16+50	1.0209	0.76	|Q | | | V |
16+55	1.0255	0.68	Q | | | V |
17+ 0	1.0298	0.61	Q | | | V |
17+ 5	1.0337	0.57	Q | | | V |
17+10	1.0373	0.53	Q | | | V |
17+15	1.0407	0.49	Q | | | V |
17+20	1.0438	0.46	Q | | | V |
17+25	1.0469	0.44	Q | | | V |
17+30	1.0497	0.41	Q | | | V |
17+35	1.0524	0.39	Q | | | V |
17+40	1.0550	0.38	Q | | | V |
17+45	1.0575	0.36	Q | | | V |
17+50	1.0599	0.35	Q | | | V |
17+55	1.0622	0.33	Q | | | V |
18+ 0	1.0644	0.32	Q | | | V |
18+ 5	1.0667	0.33	Q | | | V |

18+10	1.0693	0.39	Q			V	
18+15	1.0721	0.40	Q			V	
18+20	1.0748	0.40	Q			V	
18+25	1.0775	0.39	Q			V	
18+30	1.0801	0.38	Q			V	
18+35	1.0827	0.38	Q			V	
18+40	1.0853	0.37	Q			V	
18+45	1.0878	0.36	Q			V	
18+50	1.0902	0.35	Q			V	
18+55	1.0926	0.35	Q			V	
19+ 0	1.0949	0.34	Q			V	
19+ 5	1.0972	0.33	Q			V	
19+10	1.0994	0.32	Q			V	
19+15	1.1016	0.32	Q			V	
19+20	1.1037	0.31	Q			V	
19+25	1.1059	0.31	Q			V	
19+30	1.1079	0.30	Q			V	
19+35	1.1100	0.30	Q			V	
19+40	1.1120	0.29	Q			V	
19+45	1.1140	0.29	Q			V	
19+50	1.1159	0.28	Q			V	
19+55	1.1178	0.28	Q			V	
20+ 0	1.1197	0.27	Q			V	
20+ 5	1.1216	0.27	Q			V	
20+10	1.1234	0.27	Q			V	
20+15	1.1252	0.26	Q			V	
20+20	1.1270	0.26	Q			V	
20+25	1.1287	0.25	Q			V	
20+30	1.1304	0.25	Q			V	
20+35	1.1321	0.25	Q			V	
20+40	1.1338	0.24	Q			V	
20+45	1.1355	0.24	Q			V	
20+50	1.1371	0.24	Q			V	
20+55	1.1388	0.24	Q			V	
21+ 0	1.1404	0.23	Q			V	
21+ 5	1.1419	0.23	Q			V	
21+10	1.1435	0.23	Q			V	
21+15	1.1450	0.22	Q			V	
21+20	1.1466	0.22	Q			V	
21+25	1.1481	0.22	Q			V	
21+30	1.1496	0.22	Q			V	
21+35	1.1511	0.21	Q			V	
21+40	1.1525	0.21	Q			V	
21+45	1.1540	0.21	Q			V	
21+50	1.1554	0.21	Q			V	
21+55	1.1568	0.21	Q			V	
22+ 0	1.1582	0.20	Q			V	
22+ 5	1.1596	0.20	Q			V	
22+10	1.1610	0.20	Q			V	
22+15	1.1624	0.20	Q			V	
22+20	1.1637	0.20	Q			V	
22+25	1.1650	0.19	Q			V	
22+30	1.1664	0.19	Q			V	
22+35	1.1677	0.19	Q			V	
22+40	1.1690	0.19	Q			V	
22+45	1.1703	0.19	Q			V	
22+50	1.1716	0.19	Q			V	

22+55	1.1728	0.18	Q	|	|	|	V|
23+ 0	1.1741	0.18	Q	|	|	|	V|
23+ 5	1.1753	0.18	Q	|	|	|	V|
23+10	1.1766	0.18	Q	|	|	|	V|
23+15	1.1778	0.18	Q	|	|	|	V|
23+20	1.1790	0.18	Q	|	|	|	V|
23+25	1.1802	0.18	Q	|	|	|	V|
23+30	1.1814	0.17	Q	|	|	|	V|
23+35	1.1826	0.17	Q	|	|	|	V|
23+40	1.1838	0.17	Q	|	|	|	V|
23+45	1.1850	0.17	Q	|	|	|	V|
23+50	1.1861	0.17	Q	|	|	|	V|
23+55	1.1873	0.17	Q	|	|	|	V|
24+ 0	1.1884	0.17	Q	|	|	|	V|
24+ 5	1.1893	0.14	Q	|	|	|	V|
24+10	1.1897	0.05	Q	|	|	|	V|
24+15	1.1899	0.03	Q	|	|	|	V|
24+20	1.1900	0.01	Q	|	|	|	V|
24+25	1.1900	0.01	Q	|	|	|	V|
24+30	1.1901	0.00	Q	|	|	|	V|
24+35	1.1901	0.00	Q	|	|	|	V

Routing 100-yr 24-hr Post Development Storm through Infiltration Basin

FLOOD HYDROGRAPH ROUTING PROGRAM
Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 1998
Study date: 05/02/18

Routing 100-yr 24-hr Storm through Infiltration Basin JN 3011 AFTON ROAD

********** HYDROGRAPH INFORMATION **********

From study/file name: 100P.rte

**********HYDROGRAPH DATA**********

Number of intervals = 295
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 27.021 (CFS)
Total volume = 1.190 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

****

++++++++++

Process from Point/Station 1.000 to Point/Station 2.000
**** RETARDING BASIN ROUTING ****

User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 295
Hydrograph time unit = 5.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
1.000	0.111	0.480	0.109	0.113
2.000	0.256	0.481	0.254	0.258
3.000	0.436	13.480	0.390	0.482
3.500	0.541	38.482	0.408	0.674

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	6.8	13.51	20.27	27.02	Depth (Ft.)
0.083	0.03	0.00	0.000	O	|	|	|	|	0.00

0.167	0.11	0.00	0.001	O	|	|	|	0.01
0.250	0.14	0.01	0.001	O	|	|	|	0.01
0.333	0.15	0.01	0.002	O	|	|	|	0.02
0.417	0.16	0.01	0.003	O	|	|	|	0.03
0.500	0.16	0.02	0.004	O	|	|	|	0.04
0.583	0.16	0.02	0.005	O	|	|	|	0.05
0.667	0.17	0.03	0.006	O	|	|	|	0.06
0.750	0.17	0.03	0.007	O	|	|	|	0.06
0.833	0.17	0.04	0.008	O	|	|	|	0.07
0.917	0.17	0.04	0.009	O	|	|	|	0.08
1.000	0.17	0.04	0.010	O	|	|	|	0.09
1.083	0.17	0.05	0.011	O	|	|	|	0.10
1.167	0.17	0.05	0.012	O	|	|	|	0.10
1.250	0.17	0.05	0.012	O	|	|	|	0.11
1.333	0.17	0.06	0.013	O	|	|	|	0.12
1.417	0.17	0.06	0.014	O	|	|	|	0.13
1.500	0.17	0.06	0.015	O	|	|	|	0.13
1.583	0.17	0.07	0.016	O	|	|	|	0.14
1.667	0.17	0.07	0.016	O	|	|	|	0.15
1.750	0.18	0.07	0.017	O	|	|	|	0.15
1.833	0.18	0.08	0.018	O	|	|	|	0.16
1.917	0.18	0.08	0.018	O	|	|	|	0.17
2.000	0.18	0.08	0.019	O	|	|	|	0.17
2.083	0.18	0.08	0.020	O	|	|	|	0.18
2.167	0.18	0.09	0.020	O	|	|	|	0.18
2.250	0.18	0.09	0.021	O	|	|	|	0.19
2.333	0.18	0.09	0.022	O	|	|	|	0.19
2.417	0.18	0.10	0.022	O	|	|	|	0.20
2.500	0.18	0.10	0.023	O	|	|	|	0.20
2.583	0.18	0.10	0.023	O	|	|	|	0.21
2.667	0.18	0.10	0.024	O	|	|	|	0.21
2.750	0.18	0.11	0.024	O	|	|	|	0.22
2.833	0.19	0.11	0.025	O	|	|	|	0.22
2.917	0.19	0.11	0.025	O	|	|	|	0.23
3.000	0.19	0.11	0.026	O	|	|	|	0.23
3.083	0.19	0.11	0.026	O	|	|	|	0.24
3.167	0.19	0.12	0.027	O	|	|	|	0.24
3.250	0.19	0.12	0.027	O	|	|	|	0.25
3.333	0.19	0.12	0.028	O	|	|	|	0.25
3.417	0.19	0.12	0.028	O	|	|	|	0.26
3.500	0.19	0.12	0.029	O	|	|	|	0.26
3.583	0.19	0.13	0.029	O	|	|	|	0.26
3.667	0.19	0.13	0.030	O	|	|	|	0.27
3.750	0.19	0.13	0.030	O	|	|	|	0.27
3.833	0.20	0.13	0.031	O	|	|	|	0.28
3.917	0.20	0.13	0.031	O	|	|	|	0.28
4.000	0.20	0.14	0.031	O	|	|	|	0.28
4.083	0.20	0.14	0.032	O	|	|	|	0.29
4.167	0.20	0.14	0.032	O	|	|	|	0.29
4.250	0.20	0.14	0.033	O	|	|	|	0.29
4.333	0.20	0.14	0.033	O	|	|	|	0.30
4.417	0.20	0.14	0.034	O	|	|	|	0.30
4.500	0.20	0.15	0.034	O	|	|	|	0.31
4.583	0.20	0.15	0.034	O	|	|	|	0.31
4.667	0.21	0.15	0.035	O	|	|	|	0.31
4.750	0.21	0.15	0.035	O	|	|	|	0.32
4.833	0.21	0.15	0.035	O	|	|	|	0.32

4.917	0.21	0.15	0.036	O				0.32
5.000	0.21	0.16	0.036	O				0.33
5.083	0.21	0.16	0.037	O				0.33
5.167	0.21	0.16	0.037	O				0.33
5.250	0.21	0.16	0.037	O				0.34
5.333	0.21	0.16	0.038	O				0.34
5.417	0.21	0.16	0.038	O				0.34
5.500	0.22	0.17	0.038	O				0.35
5.583	0.22	0.17	0.039	O				0.35
5.667	0.22	0.17	0.039	O				0.35
5.750	0.22	0.17	0.039	O				0.35
5.833	0.22	0.17	0.040	O				0.36
5.917	0.22	0.17	0.040	O				0.36
6.000	0.22	0.17	0.040	O				0.36
6.083	0.22	0.18	0.041	O				0.37
6.167	0.23	0.18	0.041	O				0.37
6.250	0.23	0.18	0.041	O				0.37
6.333	0.23	0.18	0.042	O				0.38
6.417	0.23	0.18	0.042	O				0.38
6.500	0.23	0.18	0.042	O				0.38
6.583	0.23	0.18	0.043	O				0.38
6.667	0.23	0.19	0.043	O				0.39
6.750	0.24	0.19	0.043	O				0.39
6.833	0.24	0.19	0.044	O				0.39
6.917	0.24	0.19	0.044	O				0.40
7.000	0.24	0.19	0.044	O				0.40
7.083	0.24	0.19	0.045	O				0.40
7.167	0.24	0.19	0.045	O				0.41
7.250	0.24	0.20	0.045	O				0.41
7.333	0.25	0.20	0.046	O				0.41
7.417	0.25	0.20	0.046	O				0.41
7.500	0.25	0.20	0.046	O				0.42
7.583	0.25	0.20	0.047	O				0.42
7.667	0.25	0.20	0.047	O				0.42
7.750	0.25	0.20	0.047	O				0.43
7.833	0.26	0.21	0.048	O				0.43
7.917	0.26	0.21	0.048	O				0.43
8.000	0.26	0.21	0.048	O				0.44
8.083	0.26	0.21	0.049	O				0.44
8.167	0.26	0.21	0.049	O				0.44
8.250	0.27	0.21	0.049	O				0.45
8.333	0.27	0.22	0.050	O				0.45
8.417	0.27	0.22	0.050	O				0.45
8.500	0.27	0.22	0.051	O				0.46
8.583	0.27	0.22	0.051	O				0.46
8.667	0.28	0.22	0.051	O				0.46
8.750	0.28	0.22	0.052	O				0.47
8.833	0.28	0.22	0.052	O				0.47
8.917	0.28	0.23	0.052	O				0.47
9.000	0.28	0.23	0.053	O				0.48
9.083	0.29	0.23	0.053	O				0.48
9.167	0.29	0.23	0.054	O				0.48
9.250	0.29	0.23	0.054	O				0.49
9.333	0.29	0.24	0.054	O				0.49
9.417	0.30	0.24	0.055	O				0.49
9.500	0.30	0.24	0.055	O				0.50
9.583	0.30	0.24	0.056	O				0.50

9.667	0.30	0.24	0.056	O	|	|	|	|	0.50
9.750	0.31	0.24	0.056	O	|	|	|	|	0.51
9.833	0.31	0.25	0.057	O	|	|	|	|	0.51
9.917	0.31	0.25	0.057	O	|	|	|	|	0.52
10.000	0.32	0.25	0.058	O	|	|	|	|	0.52
10.083	0.32	0.25	0.058	O	|	|	|	|	0.52
10.167	0.32	0.25	0.059	O	|	|	|	|	0.53
10.250	0.32	0.26	0.059	O	|	|	|	|	0.53
10.333	0.33	0.26	0.060	O	|	|	|	|	0.54
10.417	0.33	0.26	0.060	O	|	|	|	|	0.54
10.500	0.33	0.26	0.061	O	|	|	|	|	0.55
10.583	0.34	0.26	0.061	O	|	|	|	|	0.55
10.667	0.34	0.27	0.062	O	|	|	|	|	0.56
10.750	0.35	0.27	0.062	O	|	|	|	|	0.56
10.833	0.35	0.27	0.063	O	|	|	|	|	0.56
10.917	0.35	0.27	0.063	O	|	|	|	|	0.57
11.000	0.36	0.28	0.064	O	|	|	|	|	0.57
11.083	0.36	0.28	0.064	O	|	|	|	|	0.58
11.167	0.37	0.28	0.065	O	|	|	|	|	0.58
11.250	0.37	0.28	0.066	O	|	|	|	|	0.59
11.333	0.37	0.29	0.066	O	|	|	|	|	0.60
11.417	0.38	0.29	0.067	O	|	|	|	|	0.60
11.500	0.38	0.29	0.067	O	|	|	|	|	0.61
11.583	0.39	0.29	0.068	O	|	|	|	|	0.61
11.667	0.39	0.30	0.069	O	|	|	|	|	0.62
11.750	0.40	0.30	0.069	O	|	|	|	|	0.62
11.833	0.40	0.30	0.070	O	|	|	|	|	0.63
11.917	0.41	0.31	0.071	O	|	|	|	|	0.64
12.000	0.41	0.31	0.071	O	|	|	|	|	0.64
12.083	0.40	0.31	0.072	O	|	|	|	|	0.65
12.167	0.34	0.31	0.072	O	|	|	|	|	0.65
12.250	0.32	0.31	0.073	O	|	|	|	|	0.65
12.333	0.31	0.31	0.073	O	|	|	|	|	0.65
12.417	0.31	0.31	0.073	O	|	|	|	|	0.65
12.500	0.32	0.31	0.073	O	|	|	|	|	0.65
12.583	0.32	0.31	0.073	O	|	|	|	|	0.65
12.667	0.33	0.31	0.073	O	|	|	|	|	0.65
12.750	0.33	0.31	0.073	O	|	|	|	|	0.66
12.833	0.34	0.32	0.073	O	|	|	|	|	0.66
12.917	0.35	0.32	0.073	O	|	|	|	|	0.66
13.000	0.35	0.32	0.073	O	|	|	|	|	0.66
13.083	0.36	0.32	0.074	O	|	|	|	|	0.66
13.167	0.37	0.32	0.074	O	|	|	|	|	0.67
13.250	0.38	0.32	0.074	O	|	|	|	|	0.67
13.333	0.38	0.32	0.075	O	|	|	|	|	0.67
13.417	0.39	0.32	0.075	O	|	|	|	|	0.68
13.500	0.40	0.33	0.076	O	|	|	|	|	0.68
13.583	0.41	0.33	0.076	O	|	|	|	|	0.69
13.667	0.42	0.33	0.077	O	|	|	|	|	0.69
13.750	0.44	0.33	0.077	O	|	|	|	|	0.70
13.833	0.45	0.34	0.078	O	|	|	|	|	0.70
13.917	0.46	0.34	0.079	O	|	|	|	|	0.71
14.000	0.47	0.34	0.080	O	|	|	|	|	0.72
14.083	0.49	0.35	0.081	O	|	|	|	|	0.73
14.167	0.51	0.35	0.082	O	|	|	|	|	0.74
14.250	0.52	0.36	0.083	O	|	|	|	|	0.75
14.333	0.54	0.36	0.084	O	|	|	|	|	0.76

14.417	0.56	0.37	0.085	O					0.77
14.500	0.58	0.37	0.087	O					0.78
14.583	0.61	0.38	0.088	O					0.79
14.667	0.63	0.39	0.090	O					0.81
14.750	0.66	0.40	0.092	O					0.82
14.833	0.70	0.40	0.093	O					0.84
14.917	0.73	0.41	0.096	O					0.86
15.000	0.77	0.42	0.098	O					0.88
15.083	0.82	0.43	0.100	O					0.90
15.167	0.87	0.45	0.103	OI					0.93
15.250	0.93	0.46	0.106	OI					0.96
15.333	1.01	0.47	0.110	OI					0.99
15.417	1.18	0.48	0.114	OI					1.02
15.500	1.56	0.48	0.120	OI					1.06
15.583	1.79	0.48	0.128	O I					1.12
15.667	2.05	0.48	0.138	O I					1.19
15.750	2.35	0.48	0.150	O I					1.27
15.833	2.83	0.48	0.165	O I					1.37
15.917	3.76	0.48	0.184	O I					1.50
16.000	5.90	0.48	0.214	O I					1.71
16.083	14.85	1.98	0.277	O			I		2.12
16.167	27.02	9.53	0.381		O			I	2.70
16.250	**11.86**	**13.48**	**0.436**		**IO**				**3.00**
16.333	6.57	11.78	0.412		I	O			2.87
16.417	4.22	9.24	0.377		I	O			2.67
16.500	2.68	6.93	0.345		I O				2.50
16.583	1.87	5.08	0.320		I O				2.35
16.667	1.49	3.72	0.301	I O					2.25
16.750	0.89	2.72	0.287	I O					2.17
16.833	0.76	1.96	0.277	I O					2.11
16.917	0.68	1.47	0.270	IO					2.08
17.000	0.61	1.14	0.265	IO					2.05
17.083	0.57	0.92	0.262	IO					2.03
17.167	0.53	0.77	0.260	O					2.02
17.250	0.49	0.67	0.259	O					2.01
17.333	0.46	0.59	0.258	O					2.01
17.417	0.44	0.53	0.257	O					2.00
17.500	0.41	0.49	0.256	O					2.00
17.583	0.39	0.48	0.256	O					2.00
17.667	0.38	0.48	0.255	O					1.99
17.750	0.36	0.48	0.254	O					1.99
17.833	0.35	0.48	0.253	O					1.98
17.917	0.33	0.48	0.252	O					1.97
18.000	0.32	0.48	0.251	O					1.97
18.083	0.33	0.48	0.250	O					1.96
18.167	0.39	0.48	0.249	O					1.95
18.250	0.40	0.48	0.249	O					1.95
18.333	0.40	0.48	0.248	O					1.95
18.417	0.39	0.48	0.248	O					1.94
18.500	0.38	0.48	0.247	O					1.94
18.583	0.38	0.48	0.246	O					1.93
18.667	0.37	0.48	0.245	O					1.93
18.750	0.36	0.48	0.245	O					1.92
18.833	0.35	0.48	0.244	O					1.92
18.917	0.35	0.48	0.243	O					1.91
19.000	0.34	0.48	0.242	O					1.90
19.083	0.33	0.48	0.241	O					1.90

19.167	0.32	0.48	0.240	O	|	|	|	|	1.89
19.250	0.32	0.48	0.239	O	|	|	|	|	1.88
19.333	0.31	0.48	0.238	O	|	|	|	|	1.87
19.417	0.31	0.48	0.236	O	|	|	|	|	1.87
19.500	0.30	0.48	0.235	O	|	|	|	|	1.86
19.583	0.30	0.48	0.234	O	|	|	|	|	1.85
19.667	0.29	0.48	0.233	O	|	|	|	|	1.84
19.750	0.29	0.48	0.231	O	|	|	|	|	1.83
19.833	0.28	0.48	0.230	O	|	|	|	|	1.82
19.917	0.28	0.48	0.229	O	|	|	|	|	1.81
20.000	0.27	0.48	0.227	O	|	|	|	|	1.80
20.083	0.27	0.48	0.226	O	|	|	|	|	1.79
20.167	0.27	0.48	0.224	O	|	|	|	|	1.78
20.250	0.26	0.48	0.223	O	|	|	|	|	1.77
20.333	0.26	0.48	0.221	O	|	|	|	|	1.76
20.417	0.25	0.48	0.220	O	|	|	|	|	1.75
20.500	0.25	0.48	0.218	O	|	|	|	|	1.74
20.583	0.25	0.48	0.217	O	|	|	|	|	1.73
20.667	0.24	0.48	0.215	O	|	|	|	|	1.72
20.750	0.24	0.48	0.213	O	|	|	|	|	1.71
20.833	0.24	0.48	0.212	O	|	|	|	|	1.69
20.917	0.24	0.48	0.210	O	|	|	|	|	1.68
21.000	0.23	0.48	0.208	O	|	|	|	|	1.67
21.083	0.23	0.48	0.207	O	|	|	|	|	1.66
21.167	0.23	0.48	0.205	O	|	|	|	|	1.65
21.250	0.22	0.48	0.203	O	|	|	|	|	1.63
21.333	0.22	0.48	0.201	O	|	|	|	|	1.62
21.417	0.22	0.48	0.200	O	|	|	|	|	1.61
21.500	0.22	0.48	0.198	O	|	|	|	|	1.60
21.583	0.21	0.48	0.196	O	|	|	|	|	1.59
21.667	0.21	0.48	0.194	O	|	|	|	|	1.57
21.750	0.21	0.48	0.192	O	|	|	|	|	1.56
21.833	0.21	0.48	0.190	O	|	|	|	|	1.55
21.917	0.21	0.48	0.188	O	|	|	|	|	1.53
22.000	0.20	0.48	0.187	O	|	|	|	|	1.52
22.083	0.20	0.48	0.185	O	|	|	|	|	1.51
22.167	0.20	0.48	0.183	O	|	|	|	|	1.49
22.250	0.20	0.48	0.181	O	|	|	|	|	1.48
22.333	0.20	0.48	0.179	O	|	|	|	|	1.47
22.417	0.19	0.48	0.177	O	|	|	|	|	1.45
22.500	0.19	0.48	0.175	O	|	|	|	|	1.44
22.583	0.19	0.48	0.173	O	|	|	|	|	1.43
22.667	0.19	0.48	0.171	O	|	|	|	|	1.41
22.750	0.19	0.48	0.169	O	|	|	|	|	1.40
22.833	0.19	0.48	0.167	O	|	|	|	|	1.39
22.917	0.18	0.48	0.165	O	|	|	|	|	1.37
23.000	0.18	0.48	0.163	O	|	|	|	|	1.36
23.083	0.18	0.48	0.161	O	|	|	|	|	1.34
23.167	0.18	0.48	0.159	O	|	|	|	|	1.33
23.250	0.18	0.48	0.157	O	|	|	|	|	1.31
23.333	0.18	0.48	0.154	O	|	|	|	|	1.30
23.417	0.18	0.48	0.152	O	|	|	|	|	1.29
23.500	0.17	0.48	0.150	O	|	|	|	|	1.27
23.583	0.17	0.48	0.148	O	|	|	|	|	1.26
23.667	0.17	0.48	0.146	O	|	|	|	|	1.24
23.750	0.17	0.48	0.144	O	|	|	|	|	1.23
23.833	0.17	0.48	0.142	O	|	|	|	|	1.21

23.917	0.17	0.48	0.140	O	|	|	|	|	1.20
24.000	0.17	0.48	0.137	O	|	|	|	|	1.18
24.083	0.14	0.48	0.135	O	|	|	|	|	1.17
24.167	0.05	0.48	0.133	O	|	|	|	|	1.15
24.250	0.03	0.48	0.130	O	|	|	|	|	1.13
24.333	0.01	0.48	0.126	O	|	|	|	|	1.11
24.417	0.01	0.48	0.123	O	|	|	|	|	1.08
24.500	0.00	0.48	0.120	O	|	|	|	|	1.06
24.583	0.00	0.48	0.117	O	|	|	|	|	1.04
24.667	0.00	0.48	0.113	O	|	|	|	|	1.02
24.750	0.00	0.48	0.110	O	|	|	|	|	0.99
24.833	0.00	0.46	0.107	O	|	|	|	|	0.96
24.917	0.00	0.45	0.104	O	|	|	|	|	0.93
25.000	0.00	0.43	0.101	O	|	|	|	|	0.91
25.083	0.00	0.42	0.098	O	|	|	|	|	0.88
25.167	0.00	0.41	0.095	O	|	|	|	|	0.85
25.250	0.00	0.40	0.092	O	|	|	|	|	0.83
25.333	0.00	0.39	0.089	O	|	|	|	|	0.80
25.417	0.00	0.37	0.087	O	|	|	|	|	0.78
25.500	0.00	0.36	0.084	O	|	|	|	|	0.76
25.583	0.00	0.35	0.082	O	|	|	|	|	0.74
25.667	0.00	0.34	0.079	O	|	|	|	|	0.71
25.750	0.00	0.33	0.077	O	|	|	|	|	0.69
25.833	0.00	0.32	0.075	O	|	|	|	|	0.67
25.917	0.00	0.31	0.072	O	|	|	|	|	0.65
26.000	0.00	0.30	0.070	O	|	|	|	|	0.63
26.083	0.00	0.30	0.068	O	|	|	|	|	0.62
26.167	0.00	0.29	0.066	O	|	|	|	|	0.60
26.250	0.00	0.28	0.064	O	|	|	|	|	0.58
26.333	0.00	0.27	0.062	O	|	|	|	|	0.56
26.417	0.00	0.26	0.061	O	|	|	|	|	0.55
26.500	0.00	0.25	0.059	O	|	|	|	|	0.53
26.583	0.00	0.25	0.057	O	|	|	|	|	0.51
26.667	0.00	0.24	0.055	O	|	|	|	|	0.50
26.750	0.00	0.23	0.054	O	|	|	|	|	0.48
26.833	0.00	0.23	0.052	O	|	|	|	|	0.47
26.917	0.00	0.22	0.051	O	|	|	|	|	0.46
27.000	0.00	0.21	0.049	O	|	|	|	|	0.44
27.083	0.00	0.21	0.048	O	|	|	|	|	0.43
27.167	0.00	0.20	0.046	O	|	|	|	|	0.42
27.250	0.00	0.19	0.045	O	|	|	|	|	0.41
27.333	0.00	0.19	0.044	O	|	|	|	|	0.39
27.417	0.00	0.18	0.042	O	|	|	|	|	0.38
27.500	0.00	0.18	0.041	O	|	|	|	|	0.37
27.583	0.00	0.17	0.040	O	|	|	|	|	0.36
27.667	0.00	0.17	0.039	O	|	|	|	|	0.35
27.750	0.00	0.16	0.038	O	|	|	|	|	0.34
27.833	0.00	0.16	0.037	O	|	|	|	|	0.33
27.917	0.00	0.15	0.035	O	|	|	|	|	0.32
28.000	0.00	0.15	0.034	O	|	|	|	|	0.31
28.083	0.00	0.14	0.033	O	|	|	|	|	0.30
28.167	0.00	0.14	0.032	O	|	|	|	|	0.29
28.250	0.00	0.14	0.031	O	|	|	|	|	0.28
28.333	0.00	0.13	0.031	O	|	|	|	|	0.28
28.417	0.00	0.13	0.030	O	|	|	|	|	0.27
28.500	0.00	0.12	0.029	O	|	|	|	|	0.26
28.583	0.00	0.12	0.028	O	|	|	|	|	0.25

```
28.667    0.00     0.12      0.027  O       |       |       |       |      0.24
28.750    0.00     0.11      0.026  O       |       |       |       |      0.24
28.833    0.00     0.11      0.026  O       |       |       |       |      0.23
28.917    0.00     0.11      0.025  O       |       |       |       |      0.22
29.000    0.00     0.10      0.024  O       |       |       |       |      0.22
29.083    0.00     0.10      0.023  O       |       |       |       |      0.21
29.167    0.00     0.10      0.023  O       |       |       |       |      0.20

 Remaining water in basin =    0.02 (Ac.Ft)

 ****************************HYDROGRAPH DATA****************************
           Number of intervals =   350
           Time interval =    5.0 (Min.)
           Maximum/Peak flow rate =       13.479 (CFS)
           Total volume =       1.168 (Ac.Ft)
      Status of hydrographs being held in storage
                 Stream 1  Stream 2  Stream 3  Stream 4  Stream 5
      Peak (CFS)      0.000     0.000     0.000     0.000     0.000
      Vol (Ac.Ft)     0.000     0.000     0.000     0.000     0.000
 ************************************************************************

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Calculations:

Grate Inlets, Curb Opening Plus Infiltration Basin Depth, Volume & Discharge

Summery of Grate Inlets & Curb Openings

With Head = 0.5'
25% Glogging

24"x24" Grate			
	Perimeter	Discharge cfs	With 25% Clogged
Open 4 sides	8	8.5	6.5

With Head = 0.5'

36"x36" Grate			
	Perimeter	Discharge cfs	With 25% Clogged
Open 2 sides	6	6	4.5

With Head = 1.0'

48" CMP Drop inlet			
	Perimeter	Discharge cfs	No Clogging
Open all sides	12.56	38	38.0

Catch Basin #	Q10	Q100	Grate Size
1	6.5	11.9	24"x24" Grate
2	3.4	6.9	36"x36" Grate
3		12.94	6.5' Curb Opening
4		7.62	4' Curb Opening
5		32.11	48" CMP inlet

Catch Basin #1 and 2 are designed for 10-yr storm. Any over flow will be picked up by curb opening #3
DIFFERENCE BETWEEN 100 AND 10-YR FROM C.B. # 1 AND #2 WILL GO TO C.B. # 3
C.B. #3 IS DESIGNED FOR 4.04+(11.9-6.5+6.9-3.4)= 12.94 CFS

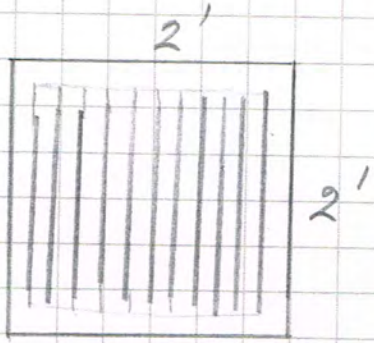
SAKE ENGINEERS, INC.
400 S. RAMONA AVE. STE 202
CORONA, CA 92879
(951) 279-4041
FAX (951) 279-2830
SAKE@SAKEENGINEERS.COM

JOB 3011
SHEET NO. 1 OF
CALCULATED BY DATE
CHECKED BY DATE
SCALE

INLET Capacity calc.

for Grate inlet 24"x24"

open All Sides $P = 4 \times 2 = 8'$

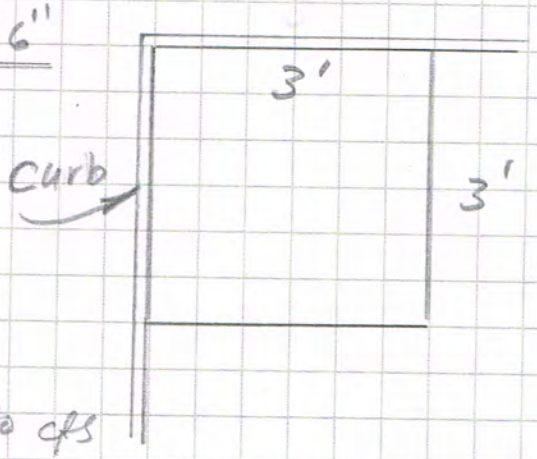


$H = 0.5'$
from graph
$P = 8' \Longrightarrow Q = 8.5$ cfs

25% clogging $Q = 6.5$ cfs

2 Sides are open 36"x36"

$P = 3' + 3' = 6'$
$H = 0.5'$
$Q = 6.0$ cfs
25% clogging $6 \times 0.75 = 4.50$ cfs



C.B.#2 $Q_1 = 3.40$ cfs < 4.50 O.K.

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JOB 3011
SHEET NO. 2 OF
CALCULATED BY DATE
CHECKED BY DATE
SCALE

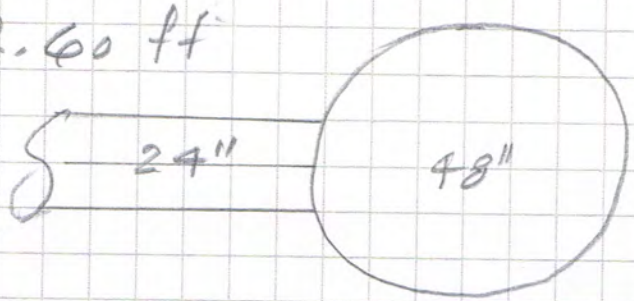
48" Drop INLET CMP

outflow from Basin

$P = 4 \times 3.14 = 12.60$ ft

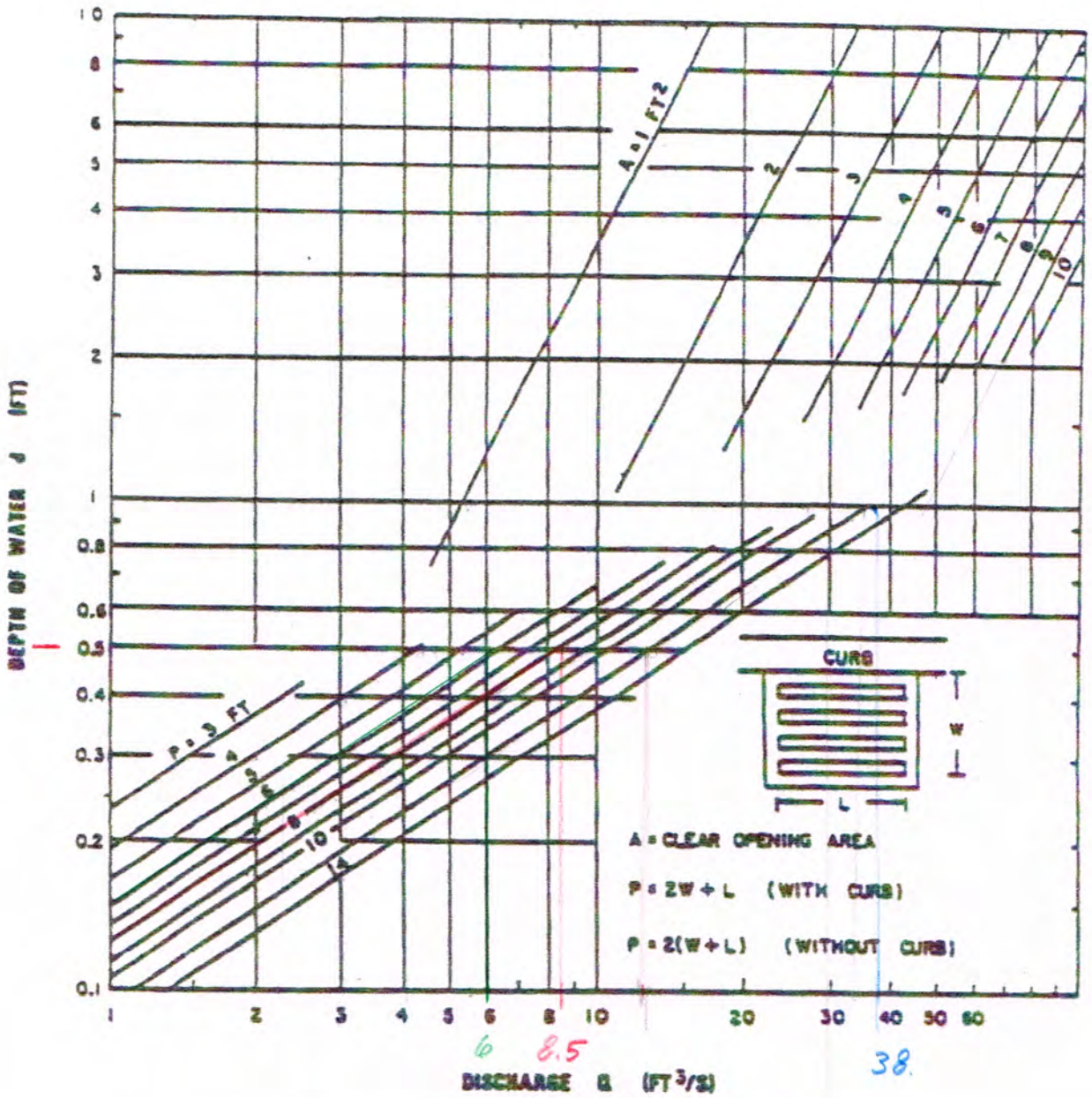
$H = 1.0'$

From graph



$P = 12.6$ and $H = 1.0'$

$Q = 38.0$ cfs $>$ 32.11 cfs



GRATE INLET CAPACITY IN SUMP CONDITIONS

(Table assumes no clogging.)

orange county

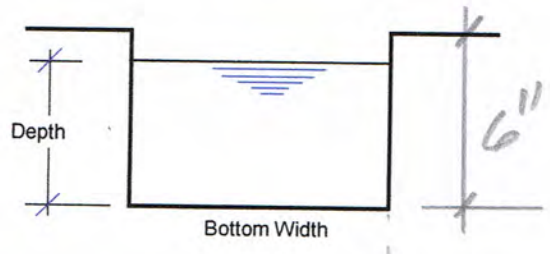
Figure 5-18

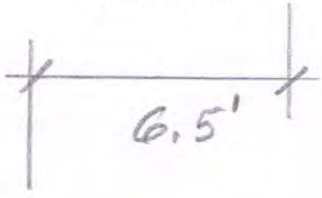
SAKE ENGINEERS
400 S. Ramona Ave #202
Corona, California
Tel: (951) 279-4041 Fax: (951) 279-2830

Project: JN
Designed by: J. Kanani
Date: May 2, 2018

Input:

Discharge Rate Q = 100	12.94 cfs
Roughness Coef. n =	0.035
Slope =	0.5 ft/ft
Bottom With =	6.5 ft
Side Slope 1 =	0
Side Slope 2 =	0



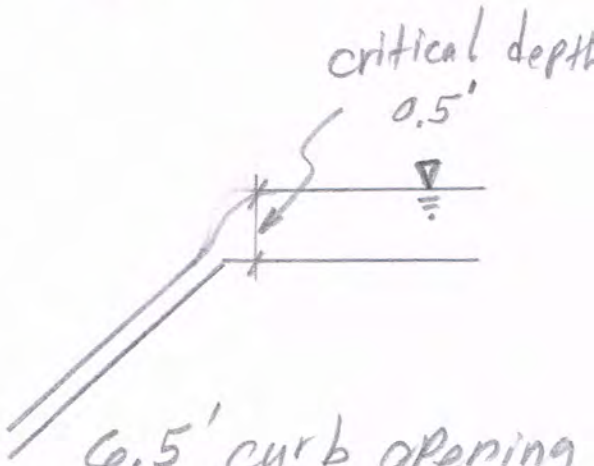


Output for Normal

Depth =	0.21 ft
Velocity =	9.48 ft/s
Area =	1.37 sf
Wetted Perimeter =	6.92 ft
Hydraulic Radius =	0.20 ft
V2 / 2g =	1.40 ft
T =	6.50 ft
Froude No. =	3.65 Super Critical flow
Momentum =	237.72 lb
Pressure+Momentum=	246.66 lb
Spec. E =	1.61 ft

Output for Critical

Depth =	0.50 ft ←
Velocity =	4.00 ft/s
Area =	3.24 sf
Wetted Perimeter =	7.50 ft
Hydraulic Radius =	0.43 ft
V2 / 2g =	0.25 ft
T =	6.50 ft
Froude No. =	1.00
Critical Slope =	0.0272 ft/ft



C.O. #3

Const. Note (10)

SAKE ENGINEERS
400 S. Ramona Ave #202
Corona, California
Tel: (951) 279-4041 Fax: (951) 279-2830

Project: JN
Designed by: J. Kanani
Date: May 1, 2018

Input:

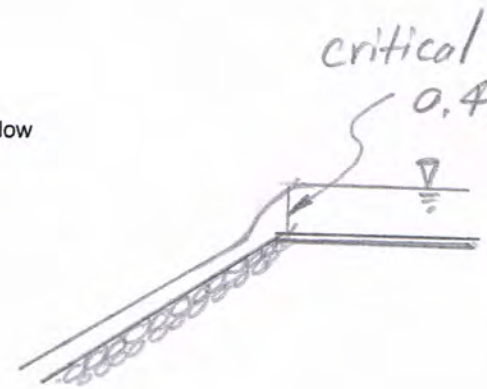
Discharge Rate Q = 100	7.62 cfs
Roughness Coef. n =	0.035
Slope =	0.5 ft/ft
Bottom With =	4 ft
Side Slope 1 =	0
Side Slope 2 =	0

Output for Normal

Depth =	0.20 ft
Velocity =	9.52 ft/s
Area =	0.80 sf
Wetted Perimeter =	4.40 ft
Hydraulic Radius =	0.18 ft
V2 / 2g =	1.41 ft
T =	4.00 ft
Froude No. =	3.75 Super Critical flow
Momentum =	140.65 lb
Pressure+Momentum=	145.64 lb
Spec. E =	1.61 ft

Output for Critical

Depth =	0.48 ft
Velocity =	3.94 ft/s
Area =	1.94 sf
Wetted Perimeter =	4.97 ft
Hydraulic Radius =	0.39 ft
V2 / 2g =	0.24 ft
T =	4.00 ft
Froude No. =	1.00
Critical Slope =	0.0302 ft/ft



4' curb opening in 6" curb

C.O. #4

Const. Note (10)

Infiltration Basin Depth, Volume and Discharge

used by Routing Software

Depth	ELEVATION	AREA	VOLUME	TOTAL Volume	AC-ft	Q Infiltration	Q out	Q total cfs
0	721	4166	0	0	0.000	0.482	0	0.482
1	722	5531	4848.5	4,849	0.111	0.482	0	0.482
2	723	7033	6282	11,131	0.256	0.482	0	0.482
3	724	8690	7861.5	18,992	0.436	0.482	13	13.482
3.5	724.5	9582	4568	23,560	0.541	0.482	38	38.482

Soil Type "A"
Infiltration per soils test are 17.9 and 19.1 in/hr
We use only 5 in/hr in our calculation

Infiltration will need to be verified for final drainage study for 72 hour drawdown time.

4166 x 5 /12/3600 = 0.482 cfs

Out Let Structure is 48" CMP
for 0.5' head Q out = 13 cfs
for 1' head Q out = 38 cfs

P=4 x Pi =12.57'
using attached graph for grate inlet in sump

EXHIBITS:

Rainfall Data

Soil Map

Hydrology Map for Pre and post Developed Conditions

NOAA Atlas 14, Volume 6, Version 2
Location name: Ludlow, California, USA*
Latitude: 35.0687°, Longitude: -116.4115°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

AFTON Road

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

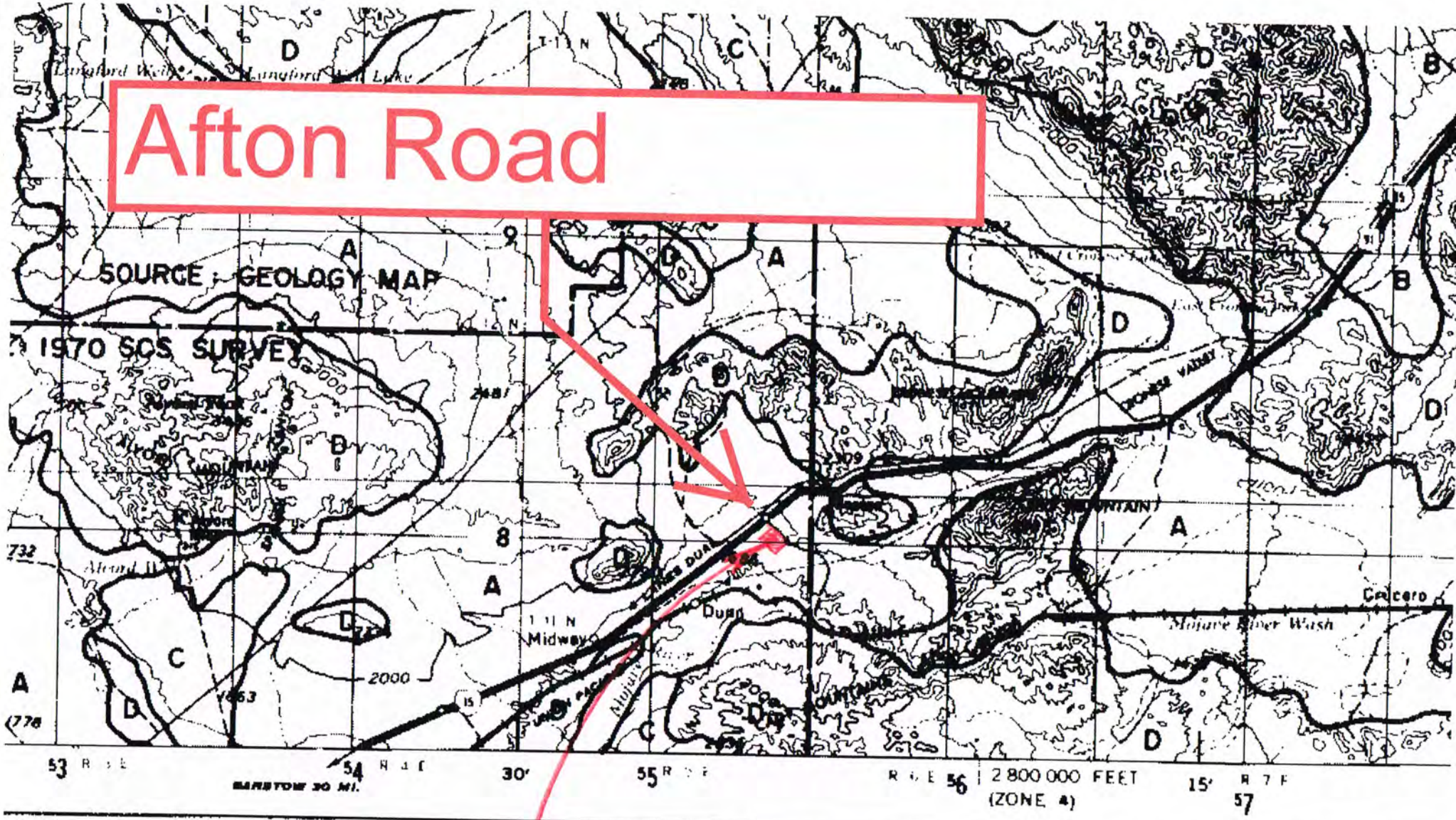
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.073 (0.060-0.090)	0.112 (0.092-0.139)	0.166 (0.135-0.206)	0.211 (0.171-0.264)	0.275 (0.215-0.354)	0.326 (0.250-0.428)	0.379 (0.285-0.510)	0.436 (0.319-0.603)	0.516 (0.363-0.742)	0.581 (0.395-0.862)
10-min	0.105 (0.086-0.130)	0.161 (0.132-0.199)	0.238 (0.194-0.295)	0.303 (0.245-0.378)	0.394 (0.309-0.508)	0.467 (0.359-0.614)	0.544 (0.408-0.731)	0.625 (0.457-0.864)	0.740 (0.520-1.06)	0.832 (0.566-1.24)
15-min	0.127 (0.104-0.157)	0.195 (0.159-0.241)	0.288 (0.234-0.357)	0.366 (0.296-0.457)	0.476 (0.373-0.614)	0.565 (0.434-0.743)	0.658 (0.494-0.885)	0.756 (0.553-1.04)	0.895 (0.629-1.29)	1.01 (0.685-1.49)
30-min	0.174 (0.142-0.215)	0.267 (0.218-0.330)	0.394 (0.321-0.489)	0.501 (0.405-0.626)	0.653 (0.511-0.841)	0.774 (0.594-1.02)	0.901 (0.676-1.21)	1.04 (0.757-1.43)	1.23 (0.862-1.76)	1.38 (0.938-2.05)
60-min	0.234 (0.192-0.289)	0.360 (0.294-0.445)	0.532 (0.433-0.659)	0.676 (0.546-0.845)	0.880 (0.690-1.14)	1.04 (0.801-1.37)	1.22 (0.912-1.63)	1.40 (1.02-1.93)	1.65 (1.16-2.38)	1.86 (1.26-2.76)
2-hr	0.317 (0.260-0.392)	0.454 (0.371-0.561)	0.642 (0.523-0.796)	0.801 (0.648-1.00)	1.03 (0.805-1.33)	1.21 (0.930-1.59)	1.40 (1.05-1.89)	1.61 (1.18-2.22)	1.89 (1.33-2.72)	2.13 (1.45-3.16)
3-hr	0.368 (0.301-0.455)	0.514 (0.420-0.635)	0.715 (0.582-0.886)	0.886 (0.716-1.11)	1.13 (0.885-1.46)	1.33 (1.02-1.74)	1.53 (1.15-2.06)	1.76 (1.28-2.42)	2.07 (1.45-2.97)	2.32 (1.58-3.44)
6-hr	0.457 (0.373-0.564)	0.622 (0.508-0.769)	0.850 (0.693-1.05)	1.05 (0.845-1.31)	1.32 (1.04-1.71)	1.55 (1.19-2.03)	1.78 (1.34-2.40)	2.04 (1.49-2.82)	2.40 (1.69-3.44)	2.69 (1.83-3.99)
12-hr	0.536 (0.438-0.662)	0.732 (0.598-0.906)	1.00 (0.817-1.24)	1.23 (0.995-1.54)	1.56 (1.22-2.01)	1.82 (1.40-2.39)	2.09 (1.57-2.81)	2.38 (1.74-3.29)	2.79 (1.96-4.01)	3.12 (2.13-4.64)
24-hr	0.686 (0.607-0.791)	0.951 (0.840-1.10)	1.31 (1.16-1.52)	1.61 (1.41-1.88)	2.03 (1.72-2.45)	2.37 (1.97-2.91)	2.72 (2.21-3.42)	3.09 (2.44-3.99)	3.60 (2.74-4.84)	4.01 (2.95-5.57)
2-day	0.811 (0.717-0.935)	1.13 (0.997-1.30)	1.56 (1.37-1.80)	1.91 (1.67-2.23)	2.40 (2.04-2.89)	2.79 (2.32-3.43)	3.19 (2.59-4.01)	3.62 (2.86-4.67)	4.20 (3.19-5.65)	4.67 (3.43-6.48)
3-day	0.868 (0.768-1.00)	1.21 (1.07-1.40)	1.67 (1.47-1.93)	2.05 (1.80-2.39)	2.58 (2.18-3.10)	2.99 (2.48-3.67)	3.41 (2.77-4.29)	3.86 (3.05-4.98)	4.48 (3.40-6.01)	4.97 (3.65-6.89)
4-day	0.910 (0.806-1.05)	1.27 (1.12-1.47)	1.76 (1.55-2.03)	2.15 (1.88-2.51)	2.70 (2.29-3.25)	3.13 (2.60-3.84)	3.57 (2.90-4.48)	4.03 (3.18-5.20)	4.66 (3.54-6.26)	5.16 (3.79-7.16)
7-day	0.973 (0.861-1.12)	1.36 (1.20-1.57)	1.88 (1.65-2.17)	2.30 (2.01-2.68)	2.87 (2.43-3.45)	3.31 (2.75-4.06)	3.76 (3.05-4.72)	4.22 (3.34-5.45)	4.86 (3.69-6.52)	5.35 (3.93-7.42)
10-day	1.02 (0.906-1.18)	1.44 (1.27-1.66)	1.98 (1.75-2.29)	2.43 (2.12-2.83)	3.03 (2.57-3.65)	3.49 (2.90-4.29)	3.96 (3.21-4.97)	4.44 (3.51-5.73)	5.09 (3.87-6.83)	5.59 (4.11-7.75)
20-day	1.15 (1.02-1.33)	1.63 (1.44-1.88)	2.26 (2.00-2.62)	2.78 (2.43-3.25)	3.49 (2.96-4.20)	4.03 (3.35-4.95)	4.58 (3.72-5.76)	5.14 (4.07-6.64)	5.89 (4.48-7.91)	6.46 (4.75-8.97)
30-day	1.27 (1.12-1.46)	1.81 (1.60-2.09)	2.53 (2.23-2.93)	3.13 (2.74-3.65)	3.95 (3.35-4.75)	4.58 (3.81-5.62)	5.22 (4.24-6.56)	5.87 (4.64-7.58)	6.74 (5.12-9.05)	7.39 (5.44-10.3)
45-day	1.42 (1.26-1.64)	2.04 (1.80-2.35)	2.87 (2.53-3.32)	3.56 (3.12-4.16)	4.53 (3.84-5.45)	5.29 (4.39-6.49)	6.05 (4.91-7.61)	6.83 (5.40-8.82)	7.88 (5.99-10.6)	8.68 (6.38-12.0)
60-day	1.55 (1.37-1.79)	2.22 (1.96-2.56)	3.14 (2.77-3.63)	3.91 (3.42-4.56)	4.99 (4.23-6.01)	5.84 (4.85-7.18)	6.72 (5.45-8.45)	7.61 (6.02-9.82)	8.82 (6.70-11.8)	9.74 (7.16-13.5)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

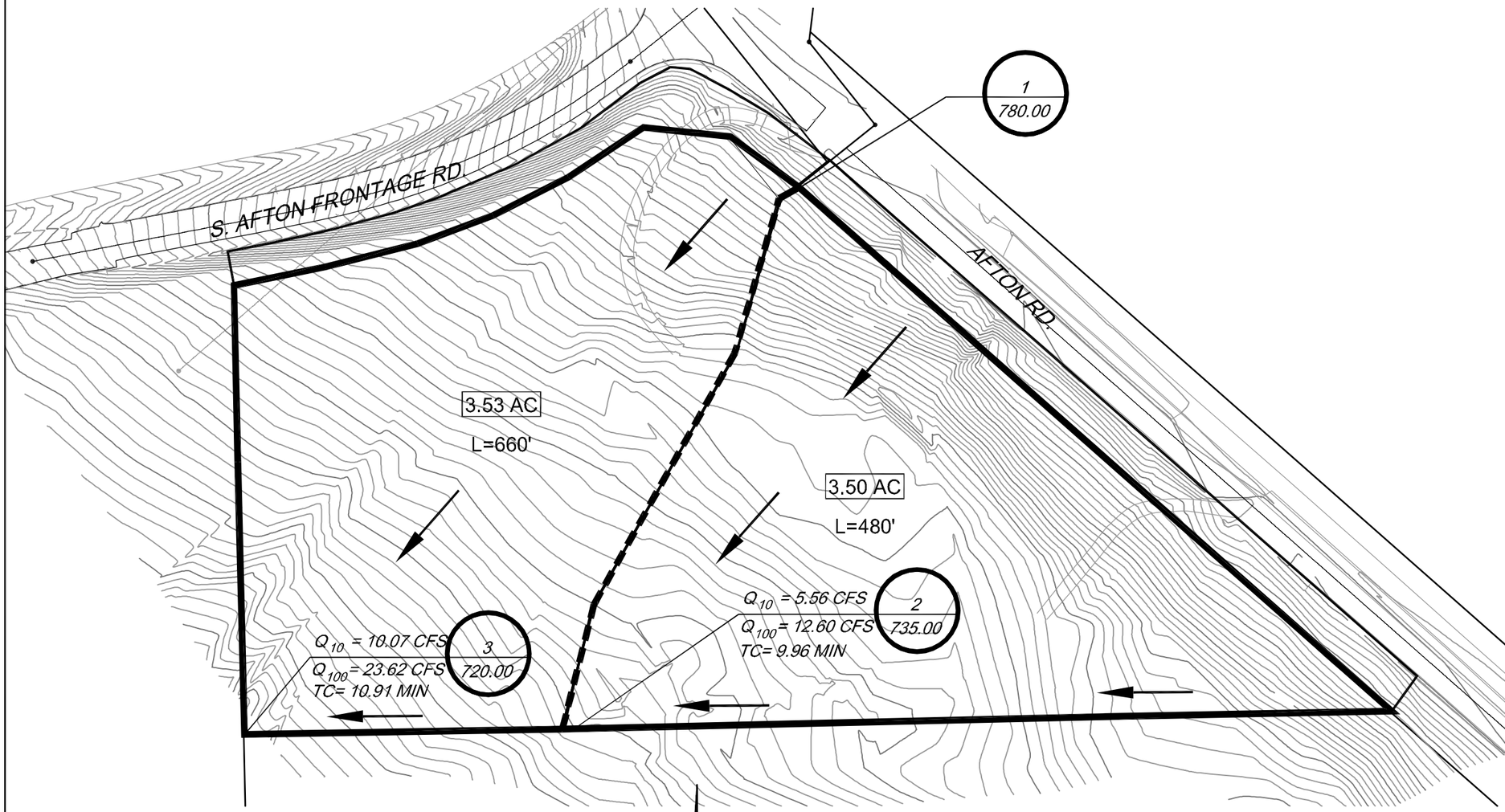
Back to Top


Afton Road
SOURCE: GEOLOGY MAP
1970 SCS SURVEY
Midway
Dunn
Calcero
Mojave River Wash
2000
2 800 000 FEET
(ZONE 4)
BARSTOW 30 MI.
Location
Soil type "A"

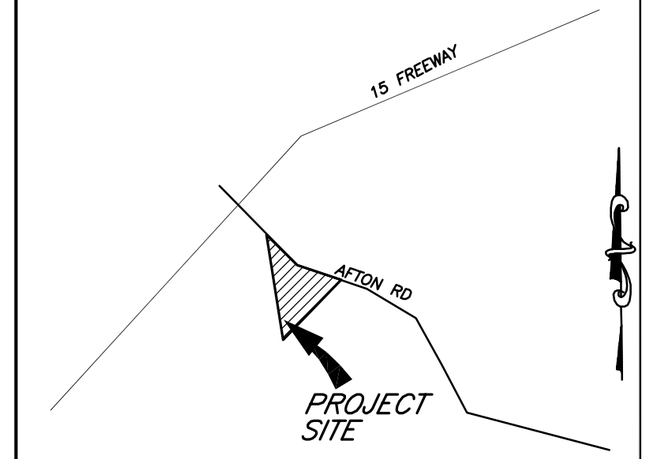
PRE DEVELOPMENT HYDROLOGY MAP

FOR

APN 0542-131-54



SOILS TYPE "A"



VICINITY MAP

N.T.S.

OWNER/DEVELOPER:

RAVINDR GREWAL
HAPPY HIGHWAY INC.
PO BOX 729
BAKER, CA 92309
(760) 733–1048 PH.

ENGINEER:

SAKE ENGINEERS, INC.
400 S. RAMONA AVE. STE. 202
CORONA, CA 92879
(951) 279–4041 PH.

ASSESSORS PARCEL NO.:

0542–131–54

LEGEND

DRAINAGE SUB-BOUNDARY

DRAINAGE BOUNDRY

13 / 1460 — NODE / ELEV.

AC — DRAINAGE AREA IN ACERS

REGISTERED PROFESSIONAL ENGINEER
SAM AKBARPOUR
C053038
Exp. 6/30/19
CIVIL
STATE OF CALIFORNIA

SAKE ENGINEERS, INC.
www.sakengineers.com
ENGINEERING ● SURVEYING ● LAND DEVELOPMENT
400 S. RAMONA AVE., STE. 202
CORONA, CALIFORNIA 92879
(951) 279–4041 FAX: (951) 279–2830

COUNTY OF SAN BERNARDINO
PRE DEVELOPMENT
HYDROLOGY MAP
FOR
APN 0542-131-54

DWG. NO. XX-XXXX

Sh 1 of 1

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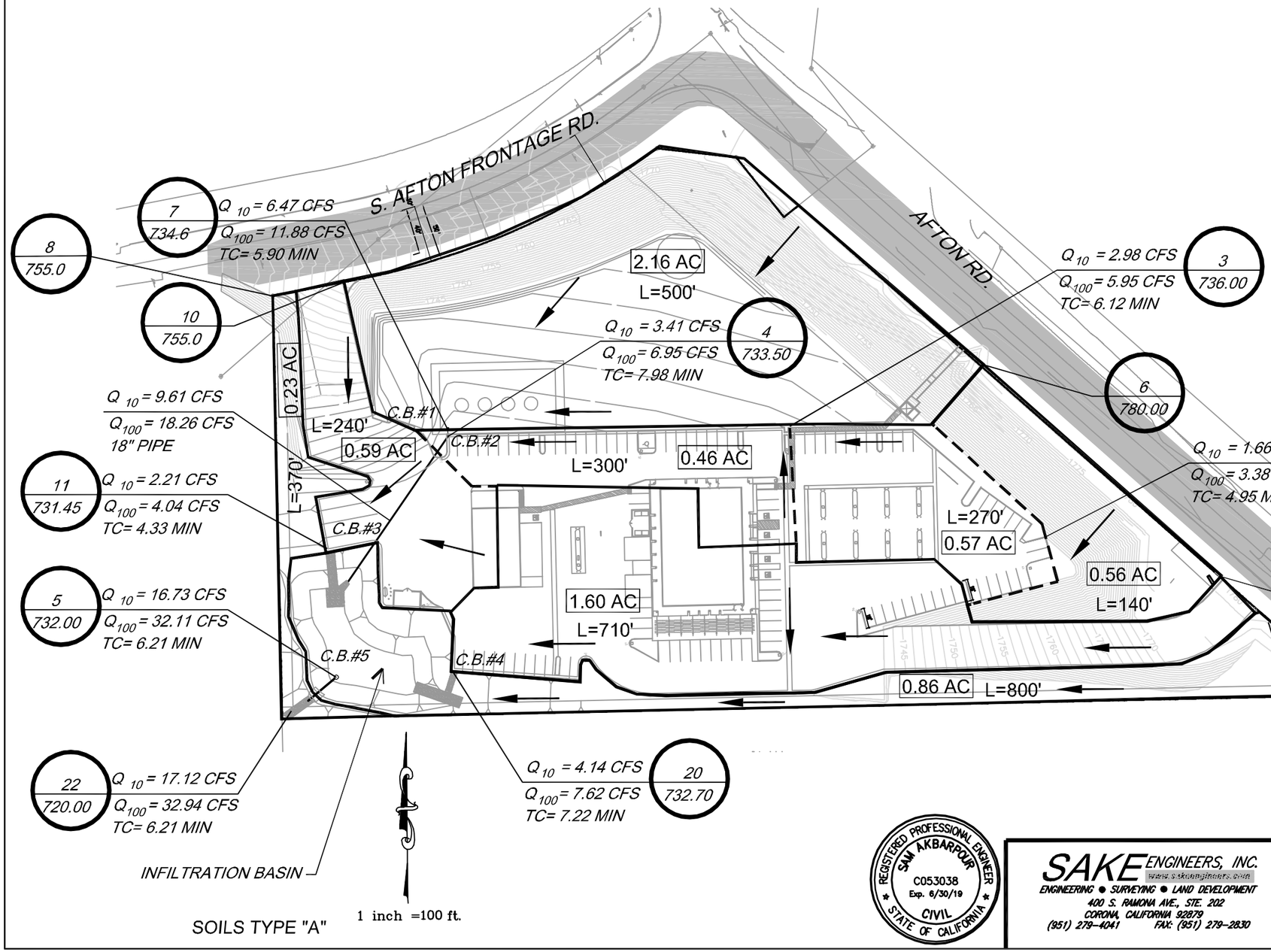
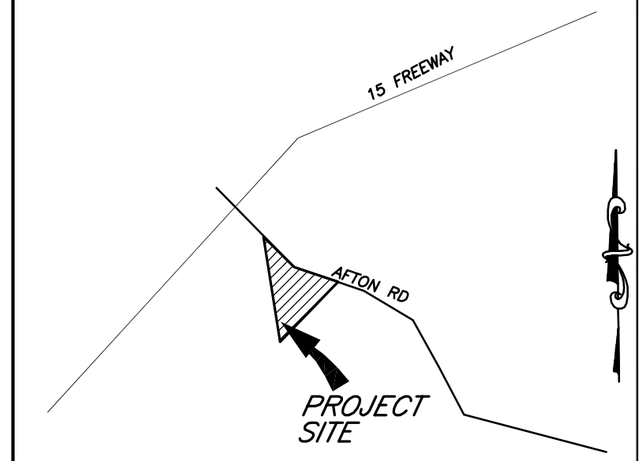
POST DEVELOPMENT HYDROLOGY MAP

FOR

APN 0542-131-54





VICINITY MAP

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COUNTY OF SAN BERNARDINO

POST DEVELOPMENT HYDROLOGY MAP

FOR

APN 0542-131-54

DWG. NO.

Sh 1 of 1

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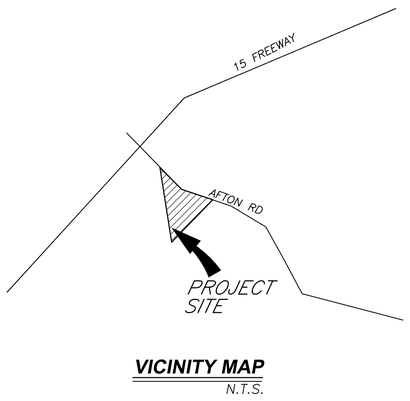
OFFICIAL USE ONLY

IN THE UNINCORPORATED TERRITORY OF SAN BERNARDINO COUNTY, STATE OF CALIFORNIA

PLOT PLAN

OF A PORTION OF PARCEL 3 OF PARCEL MAP NO. 11970 AS SHOWN BY MAP RECORDED IN BOOK 139 PAGES 56 AND 57 OF PARCEL MAPS RECORDS OF SAN BERNARDINO COUNTY.

SAKE ENGINEERS, INC. JANUARY 2018



VICINITY MAP
N.T.S.

DISTRICT : BARSTOW

EASEMENTS:
NO EASEMENT EXISTS ON THE PROPERTY

DRAINAGE
PER GRADING PLANS

GRADING
PER GRADING PLANS

LAND USE DISTRICT
RC

PROTECTED TREES
NONE TO BE REMOVED OR EXISTING ON SITE

PROJECT DATA

APN : 542-131-54
ZONE : RC

APPLICATION TYPE : GENERAL PLAN AMENDMENT TO REZONE 7 ACRES OF 60.41 ACRE PARCEL FROM RESOURCE CONVERSATION (RC) TO RURAL COMMERCIAL (CR) AND CONDITIONAL USE PERMIT TO ALLOW DEVELOPMENT OF A MINI TRUCK STOP AND IMPOUND LOT
THE PROJECT INCLUDES (1) MARKET & RESTAURANT BUILDING (2) AUTO REPAIR SHOP SERVICE BAY WITH TOW SERVICE, (3) CANOPIES AND A VEHICLE IMPOUND LOT
THE PROJECT ALSO INCLUDES NEW WATER WELL WITH TANK & SEPTIC TANK SYSTEM

LOT COVERAGE

GROSS LAND AREA	304,909	SQ. FT.
DEVLOPED LAND AREA	250,177	SQ. FT.
UNDEVLOPED LAND AREA (IMPOUND LOT)	54,732	SQ. FT.
PROPOSED MARKET/RESTAURANT BUILDING (A)	7,300	SQ. FT.
PROPOSED AUTO FUELING CANOPY: (B)	6,912	SQ. FT.
PROPOSED TRUCK CANOPY : (C)	480	SQ. FT.
AUTO SERVICE W/ TOWING OFFICE & DRIVE THROUGH (D)	3,570	SQ. FT.
TOTAL	18,262	SQ. FT.
TOTAL LOT COVERAGE :	18,262 SQ. FT. (BASED UPON GROSS SITE)	
PROPOSED OPEN TRELLIS PATIO:	1500	SQ. FT.
F. A. R.(BASED UPON GROSS SITE)		(5.99%)
MARKET/RESTAURANT BUILDING (A)	7,300	SQ. FT.
AUTO REPAIR/ TOWING OFFICE BUILDING (D)	3,570	SQ. FT.
TOTAL GROSS FLOOR AREA	10,870	SQ. FT.
FLOOR AREA RATIO	0.036 (10870/304909)	

PARKING ANALYSIS

			PARKING REQUIRED
(D)	AUTO REPAIR -(2 BAYS, 3 EMPLOYEES, 0 VEHICLE :		9
	OFFICE - 1/200	150 SQ. FT.	1
(A)	RETAIL, LOUNGE, OFFICE, KITCHEN, STORAGE ETC. - 1/200	3000 SQ. FT.	15
	RESTAURANT (FAST FOOD) SEATING : 1/3 SEAT	75 SEATS	25
	TOTAL REQUIRED FOR PROJECT		50
	TOTAL PARKING PROVIDED :	STANDARD	87
		ACCESSIBLE - VAN	1
		ACCESSIBLE-STANDARD	4
		STANDARD-CLEAN AIR VEHILCES "CAV"	11 (8 WITH EV CHARGING)
		TOTAL	103
	TRUCK PARKING PROVIDED :		4

LOADING ZONE

REQUIRED : 2
PROVIDED : 2 (20'-0" X 20'-0")

SITE LIGHTING

DOWNWARD FACING LIGHT FIXTURES ON 14'-0" POLE

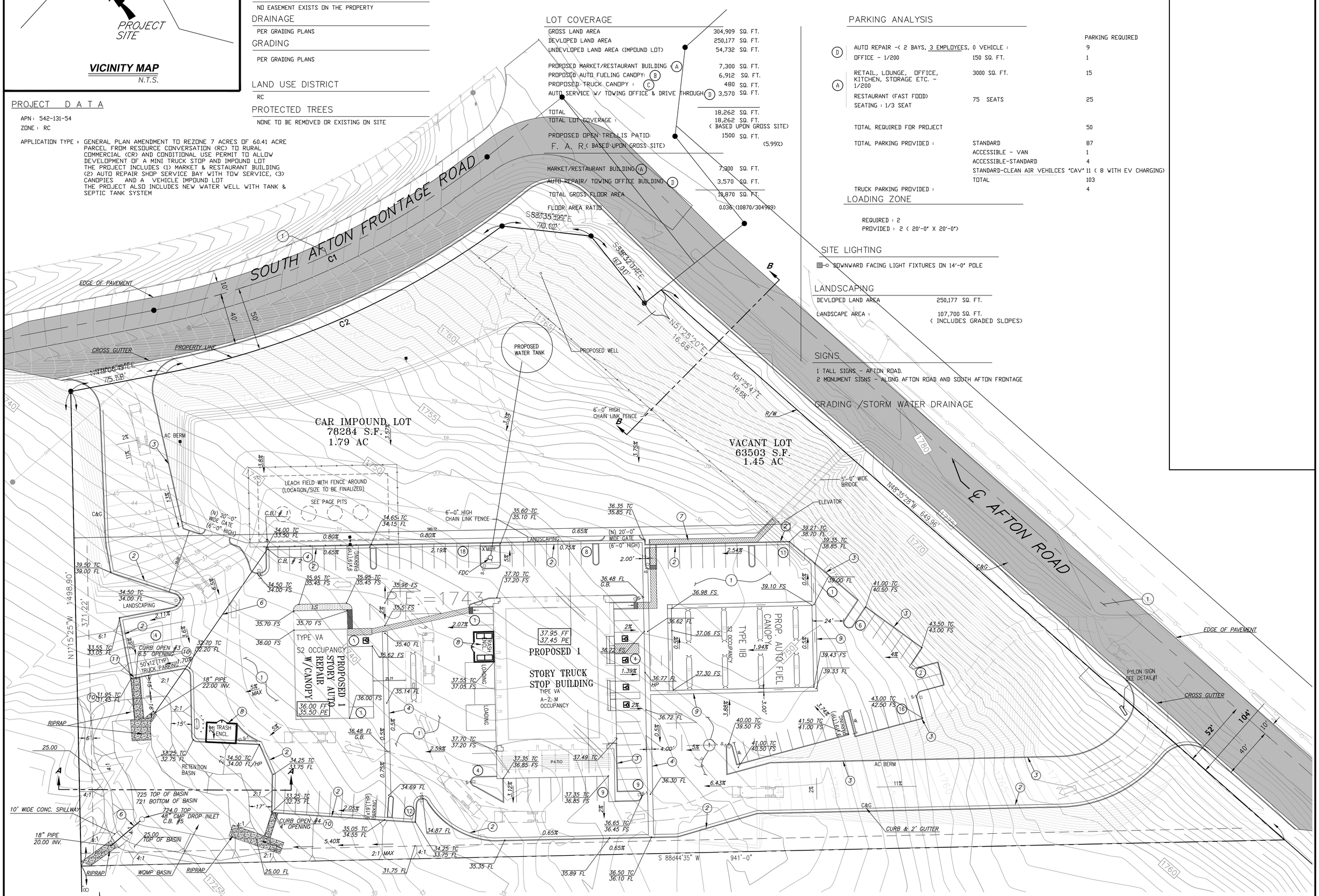
LANDSCAPING

DEVLOPED LAND AREA	250,177	SQ. FT.
LANDSCAPE AREA :	107,700 SQ. FT. (INCLUDES GRADED SLOPES)	

SIGNS

1 TALL SIGNS - AFTON ROAD.
2 MONUMENT SIGNS - ALONG AFTON ROAD AND SOUTH AFTON FRONTAGE

GRADING /STORM WATER DRAINAGE



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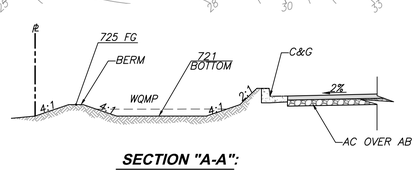
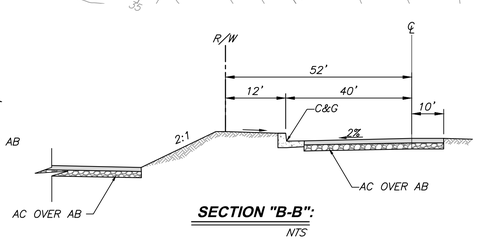
SCALE: 1"=30'



SECTION "A-A":
NTS



SECTION "B-B":
NTS

CONSTRUCTION NOTES: QUANTITIES

1. CONST. AC OVER AB
2. CONST. 6" CURB & GUTTER
3. CONST. 6" CURB
4. CONST. 4' WIDE CONC. SWALE
5. CONST. GRATE INLET
6. CONST. PVC DRAIN PIPE
7. CONST. A.D.A. RAMP
8. CONST. TRASH ENCLOSURE
9. CONST. 3' WIDE CONC. SWALE
10. CONST. CURB OPENING LENGTH PER PLAN HEREON
11. CONST. 4" DIA. STEEL POST FILLED WITH CONCRETE 2' TALL

LEGEND

- FLOW LINE
- PROPERTY LINE
- CENTER LINE
- EXISTING WATER LINE
- EXISTING SANITARY SEWER LINE
- PROPOSED SLOPE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- RET. WALL
- NEW ASPHALT CONCRETE
- (600.00 ___) EXISTING ELEVATION

G.B.	=	GRADE BREAK
H.P.	=	HIGH POINT
FS	=	FINISHED SURFACE
SD	=	STORM DRAIN
FL	=	FLOW LINE
TC	=	TOP OF CURB
W.I.	=	WROUGHT IRON
C.L.	=	CHAIN LINK
P.I.P.	=	PROTECT IN PLACE
TW	=	TOP OF WALL
TF	=	TOP OF FOOTING
℄	=	CENTERLINE

VOLUME

BASIN CAPACITY = 12,495 CF
DVC = 9,776 CF
2-YR 24-HR POST-DEVELOPMENT VOLUME = 4,929

LAND USE

PROPOSED
1. MARKET/RESTAURANT & AUTO FUELING CANOPY (A) (B)
2. TRUCK FUELING CANOPY (C)
3. AUTO REPAIR W/ TOWING OFFICE & DRIVE THROUGH (D)
4. OPEN TRELLIS PATIO
5. PROPANE TANK FOR GAS SUPPLY
6. 100 FT. HIGH FLAG POLE
7. WATER WELL & WATER SORAGE TANK
8. SEPTIC TANK SYSTEM

BUILDING INFORMATION

AUTO REPAIR / TOWING : TYPE III B , - 1 STORY
PROP. RETAIL & RESTAURANT : TYPE V - B, , 1 STORY, SPRINKLERS
PROP. TRUCK FUELING CANOPY : TYPE III - B, , 1 STORY
PROP. AUTO FUELING CANOPY : TYPE III - B, , 1 STORY

HOURS OF OPERATION (7 DAYS A WEEK)

PROPOSED AUTO REPAIR : 9 AM TO 10 P.M.
TOWING : 24 HOURS
PROPOSED TRUCK AND AUTO FUELING : 24 HOURS
PROPOSED RESTAURANTS : 24 HOURS
PROPOSED MARKET : 24 HOURS

EMPLOYEES

AUTO REPAIR : 2
TOWING : 3 (1 OFFICE + 2 DRIVERS)
PROPOSED MARKET : 1
PROPOSED RESTAURANTS : 4

OWNER

JESSE R MCROBERTS & EVELYN F MCROBERTS.
1774 SAGEBRUSH DR
SHERIDAN WY 82801

APPLICANT

RAVINDER GREWAL (HAPPY HIGHWAY INC.)
72363 BAKER BLVD.
BAKER, CA 92309
PHONE : 760-733-4505 (CONTACT : NONE)

ARCHITECT

N. G. PATEL ARCHITECTS INC.
6220 GOSHEN STREET
SIMI VALLEY, CA 93063
PHONE : 805-522-7159
E-MAIL : ngpatelarchitects@sbcglobal.net

UTILITIES

ELECTRICITY	SOUTHERN CALIFORNIA EDISON 30553 RIMROCK ROAD BARSTOW, CA 92311 800-655-4555
WATER :	PRIVATE NO PUBLIC WATER SUPPLY
SEWER :	NONE NO PUBLIC SEWER
GAS :	INDEPENDENT PROPANE SUPPLIER
TELEPHONE :	AT & T
CABLE TV	800-310-2355

PREPARED UNDER THE DIRECTION OF:

REGISTERED PROFESSIONAL ENGINEER SAM AKBARPOUR C053038 Exp. 6/30/19 CIVIL STATE OF CALIFORNIA

SAM AKBARPOUR P.E. RCE. 053038

REVISIONS	DATE	BY

PLOT PLAN
COUNTY OF SAN BERNARDINO

SCALE	1" = 30'
DATE	1-23-2018
DRAWN:	J.A.C.
DESIGNED:	SA
CHECKED:	SA
PLN CK REF:	

SAKE ENGINEERS, INC.
ENGINEERING ● SURVEYING ● LAND DEVELOPMENT
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CORONA, CALIFORNIA 92879
(951) 279-4041 FAX (951) 279-2830

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