PRELIMINARY HYDROLOGY & HYDRAULIC STUDY

FOR

NEW GAS STATION & FOOD MART
PROJ-2019-00052
NW CORNER OF SR 58 & HIGHWAY 395,
BORON, CA 93516
A.P.N 0492-191-04

Prepared For Owner/Developer:

Mr. MARK SATER
ALRAHMAN LLC
4300 Edison Avenue
Chino, CA 91710
Ph: (909) 772-5898

Prepared By:

W&W LAND DESIGN CONSULTANTS

2335 W. Foothill Blvd., Suite #1
Upland, CA 91786
(909) 608-7118

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Project job No. 1815

TABLE OF CONTENTS

Section I Introduction

The following hydrology study has been prepared for The Development of a Gas Station and Food Mart. The site is approximately 3.91-acre drainage tributary area, and located at NW corner of SR 58 & Highway 395 in the city of Boron, County of San Bernardino, California. The general location of the site is illustrated on the Vicinity Map, included in the Appendix A of this report.

The primary objectives of this report are as follows:

1. Delineate the tributary drainage areas to proposed facilities.
2. Based on drainage patterns, ground slope, land used and soil type and using the San Bernardino County Rational Method, perform hydrologic calculations of on-site drainage facilities.
3. Based on the hydrology results and physical site requirements, design the storm drainage facilities to convey the computed design discharges.
4. Determine the 10-year and 100-year proposed condition flow rates in accordance with the San Bernardino County Hydrology Manual.

Section II Methodology

For both, the existing and proposed conditions, the peak storm discharge for the drainage sub-areas (see Hydrology Map in Appendix B of this report) were calculated using the San Bernardino County Hydrology Manual. CIVILD software was used to calculate the 10-year and 100-year storm event. The peak 100-year storm runoff is calculated to demonstrate the runoff from 100-year storm event is to size the sump catch basin and storm drainpipes. The storm drainpipe capacities calculations are calculated by using Flowmaster software.

Section III Project Description

Rational Method

The Rational Method was utilized to perform the 10-year, 100-year Storm Events hydrology analyses for the existing and proposed conditions of project site.

Soil Type	C
Land Use	Undeveloped (poor cover)
AMC	II (10 year storm event)
AMC	III (100 year storm event)

The rainfall precipitation was uniformly distributed throughout the Onsite Areas. The following table shows the values used for the associated 1-hour storm event:

Storm Event (1 Hour Duration)	Precipitation Value
10-Year	0.60 inch / hour
100-Year	1.03 inch / hour

Existing condition

The existing site is approximately 3.91 acres with existing building, concrete driveway but most of the project site is covered with dirt and considered to be a natural vacant land . In the existing condition, the site have only one subarea which will sheet flow from southeast to northwest of the subject project.

Refer to the "Existing Hydrology Map" in the Appendix F for an illustration of the existing drainage zones.

The following table illustrates the data and results for the existing 10-year and 100-year storm events. All calculations can be found in Appendix C of this report.

Drainage Area	Area (Ac.)	10 Year Peak Flow (CFS)	100 Year Peak Flow (CFS)	Time of Concentration
E-1	3.91	3.55	7.49	20.49 min
Total	3.91	3.55	7.49	-----

Proposed condition

In the proposed condition, the site is divided into six distinct drainage areas. All the subarea will drain either sheet flow or pipe travel to the designated catch basin before it discharges to the water quality Bmp on the northwest corner of the site. For the mitigation of the increased flow in the project site, water quality/ Retention (WQMP) basin will be provided to mitigate the amount of 100 year peak flow. All the Catch Basin, Drain inlet and Storm drain line are properly designed so that it will be sufficient to provide the necessary requirement of the Peak Storm water Flow.

Refer to the "Proposed Hydrology Map" in the Appendix F for an illustration of the proposed drainage zones.

The following table illustrates the data and results for the proposed 10-year and 100-year storm events. All calculations can be found in Appendix D of this report.

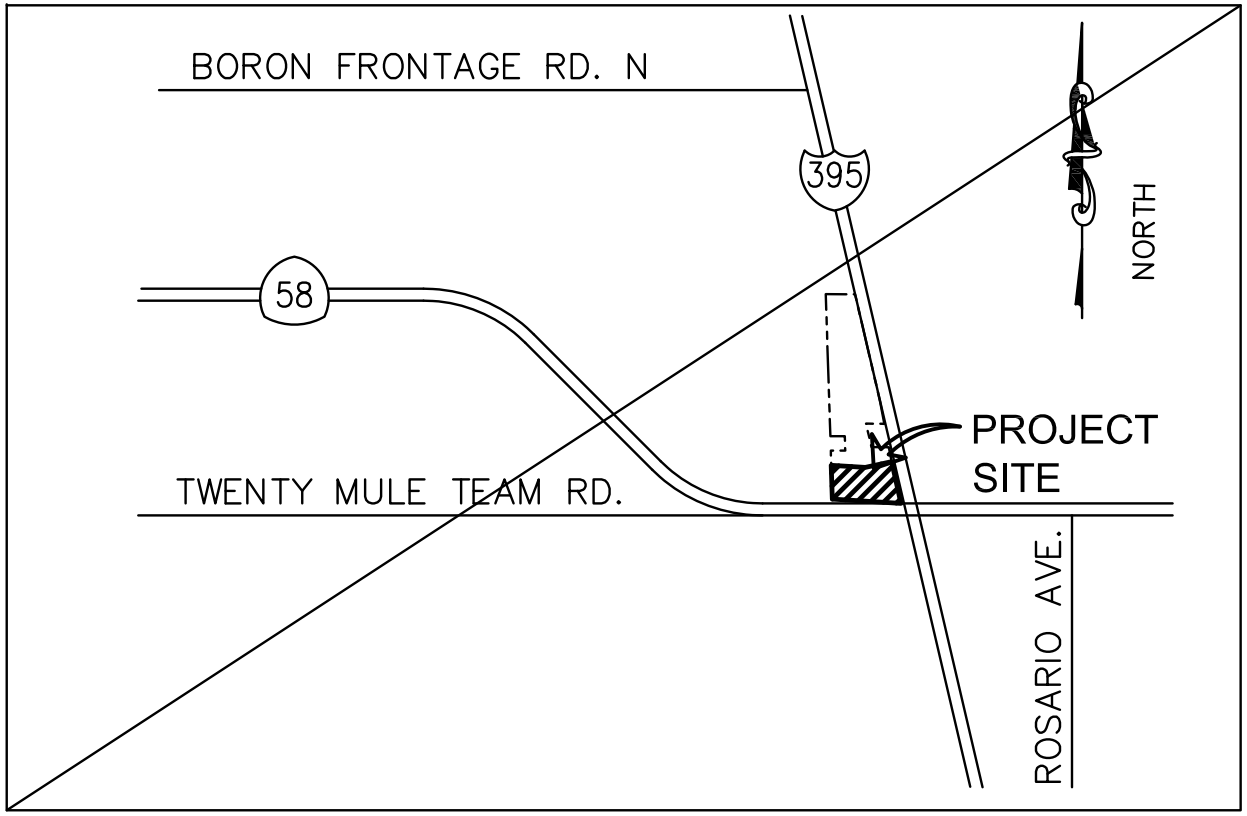
Drainage Area	Area (Ac.)	10 Year Peak Flow (CFS)	100 Year Peak Flow (CFS)	Time of Concentration
A-1	0.48	1.06	1.85	7.75 min.
A-2	0.54	1.29	2.24	6.97 min.
Confluence @ Node 13	1.02	2.28	3.98	6.97 min.
A-3	0.98	2.23	3.89	7.46 min.
A-4	0.09	0.27	0.46	5.16 min.
Confluence @ Node 20	1.07	2.44	4.26	8.21 min.
Confluence @ Node 30	2.09	4.67	8.15	7.66 min.
A-5	0.66	1.37	2.38	8.52 min.
Confluence @ Node 40	2.75	5.99	10.45	7.78 min.
A-6	1.16	2.97	5.17	6.32 min.
Confluence @ Node 200	3.91	8.56	14.94	6.32 min.
Total	3.91	8.56	14.94	-----

Section IV *Findings*

After development, more impervious surface will cover the proposed site than before. The additional runoff with existing storm water runoff will be conveyed and treated through the designated storm water quality system.
The hydrology and hydraulic analyses prepared in this report are comprehensive and evaluate the drainage impacts associated with the development of this project. The calculations within this report substantiate that the development can be constructed as shown on the proposed plans with no detrimental effect to downstream.

APPENDIX A

VICINITY MAP



VICINITY MAP

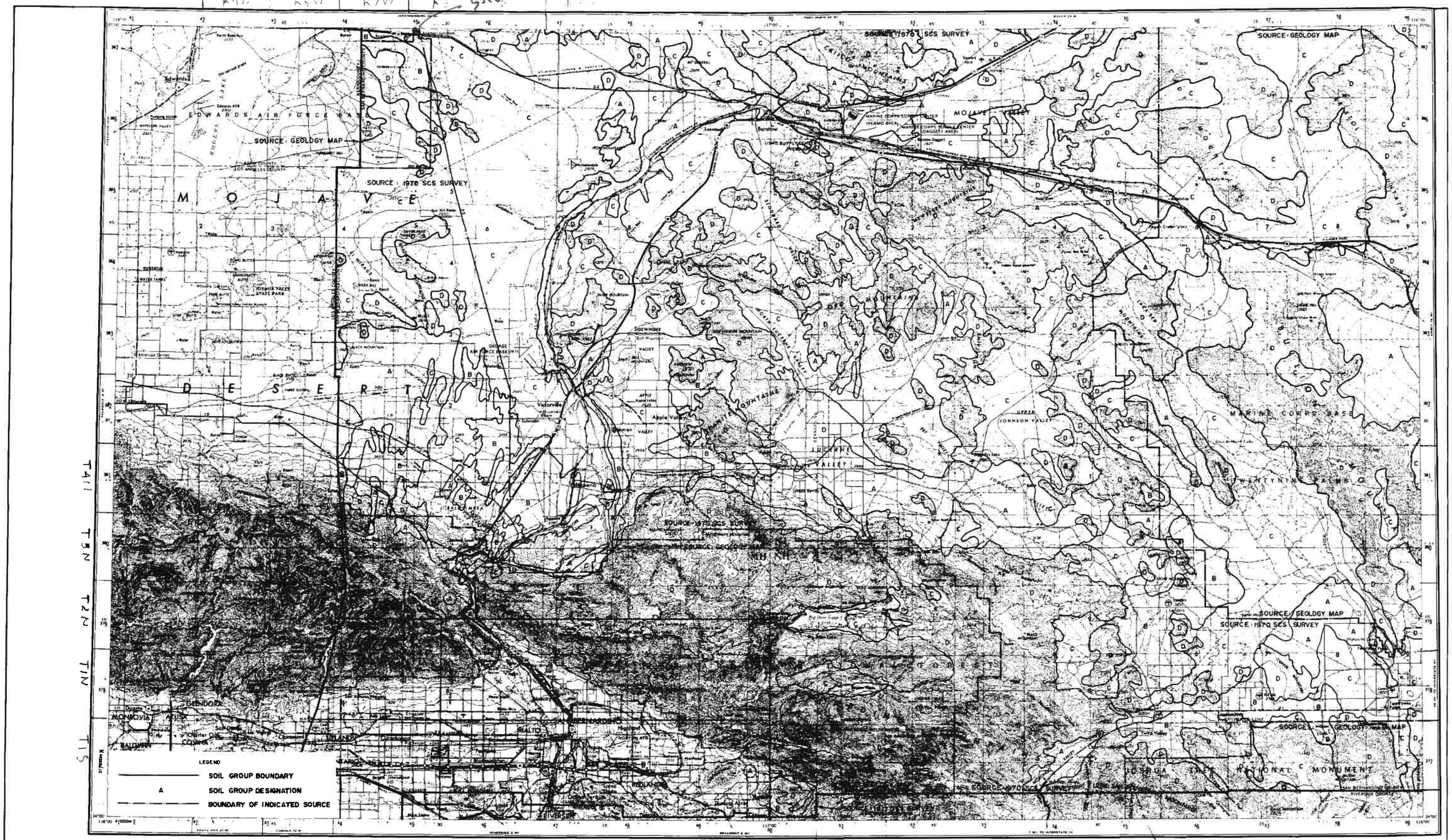
NOT TO SCALE

APPENDIX B

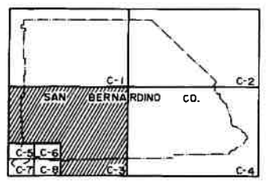
Reference

(Based on San Bernardino County Hydrology Manual):

Hydrologic Soils Group Map for Southwest - Area (C-11)
SBFCD Desert Isohyetals 10 Year 1 Hour (B-9)
SBFCD Desert Isohyetals 100 Year 1 Hour (B-10)



Soil type C



INDEX MAP

Scale 1:250,000

5 0 5 10 15 20 Statute Miles

5 0 5 10 15 20 25 30 Kilometers

5 0 5 10 15 Nautical Miles

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS
TRANSVERSE MERCATOR PROJECTION

BLACK NUMBERED LINES INDICATE THE 5000 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 11

1949 MAGNETIC DECLINATION FROM TRUE NORTH VARIES FROM 1 3/4° (200 MILS) EASTERLY FOR THE CENTER OF THE WEST HALF TO 16° (270 MILS) EASTERLY FOR THE CENTER OF THE EAST EDGE

BASE MAP REPRODUCED FROM U.S.G.S. "SAN BERNARDINO" TOPOGRAPHIC MAP

SCALE REDUCED BY 1/2

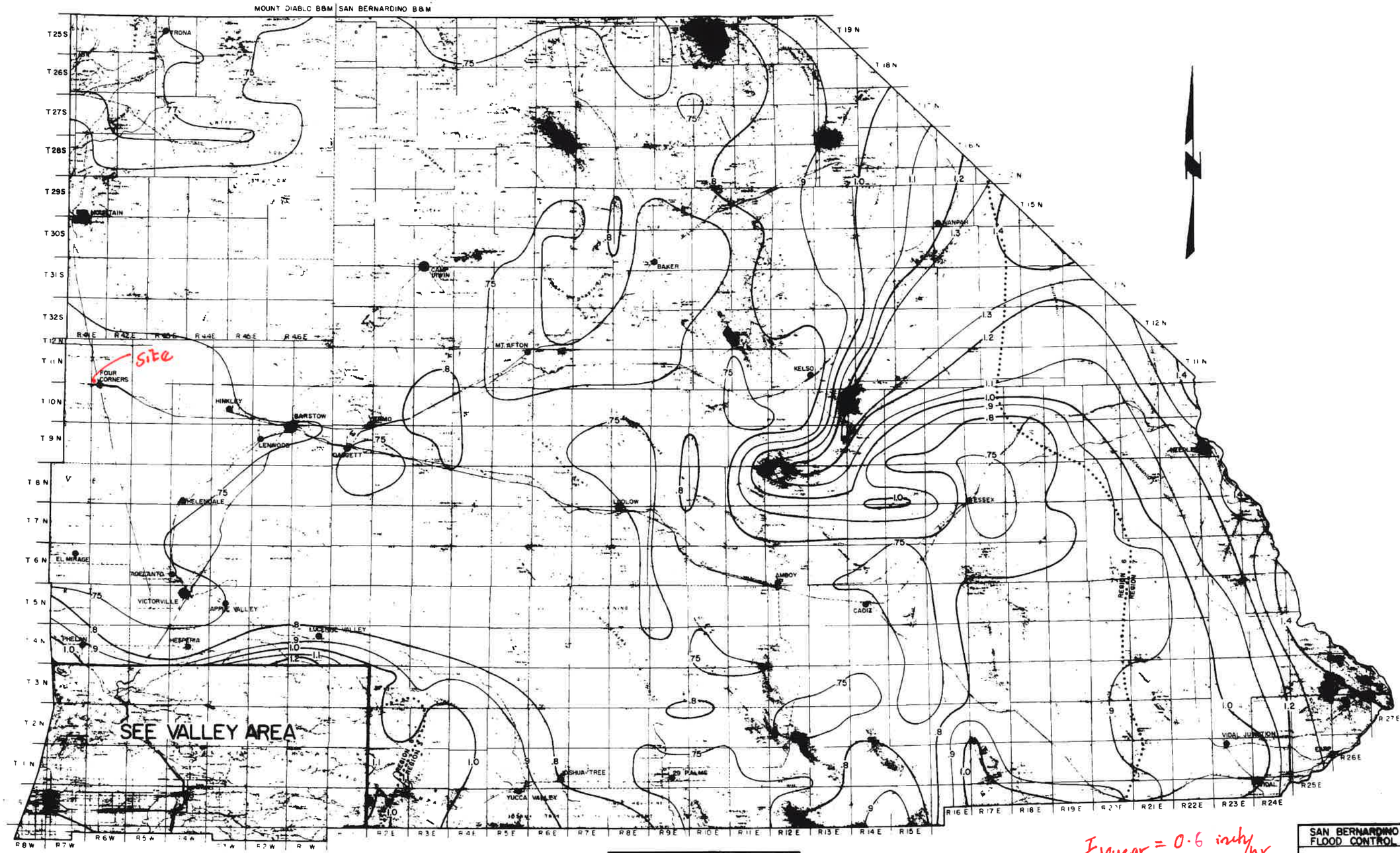
LOCATION DIAGRAM

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

HYDROLOGIC SOILS GROUP MAP FOR SOUTHCENTRAL AREA

FIGURE C-11



SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

REDUCED DRAWING

0 1 2 3

3 INCHES ON ORIGINAL

$I_{10yr,CA} = 0.6$ inch/hr

LEGEND:

3.5 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

DESERT AREA

ISOHYETALS

Y_{10} - 10 YEAR 1 HOUR

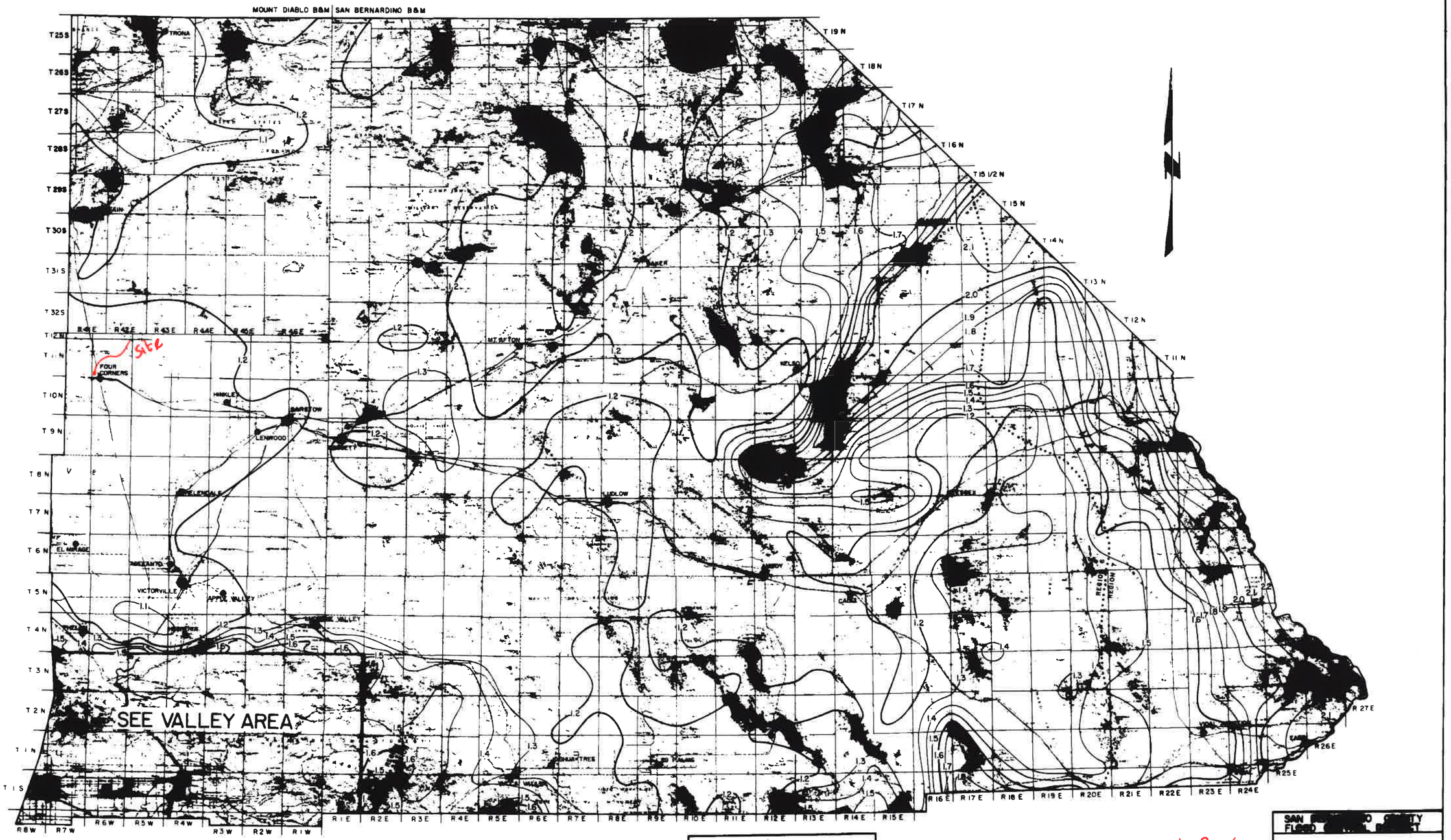
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

APPROVED BY

FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1" = 6 MI.	WRD-1	9 of 12

FIGURE B-9



SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

FIGURE B-10

APPENDIX C

Hydrology Study – Existing Conditions

10-year storm event
100-year storm event

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 03/11/20

1815 STATE ROUTE 58 NEW GAS STATION & FOOD MART
EXISTING CONDITION
10 YEAR STORM EVENT
SUBAREA E-1

Program License Serial Number 6364

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.600 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 86.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.265(In/Hr)
Initial subarea data:
Initial area flow distance = 713.000(Ft.)
Top (of initial area) elevation = 453.000(Ft.)
Bottom (of initial area) elevation = 449.000(Ft.)
Difference in elevation = 4.000(Ft.)
Slope = 0.00561 s(%)= 0.56
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 20.493 min.
Rainfall intensity = 1.273(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.713
Subarea runoff = 3.546(CFS)

Total initial stream area = 3.910(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.265(In/Hr)
End of computations, Total Study Area = 3.91 (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 = 86.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 03/11/20

1815 STATE ROUTE 58 NEW GAS STATION & FOOD MART
EXISTING CONDITION
100 YEAR STORM EVENT
SUBAREA E-1

Program License Serial Number 6364

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.030 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 3 = 97.20
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.055(In/Hr)
Initial subarea data:
Initial area flow distance = 713.000(Ft.)
Top (of initial area) elevation = 453.000(Ft.)
Bottom (of initial area) elevation = 449.000(Ft.)
Difference in elevation = 4.000(Ft.)
Slope = 0.00561 s(%)= 0.56
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 20.493 min.
Rainfall intensity = 2.185(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.877

Subarea runoff = 7.494(CFS)
Total initial stream area = 3.910(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.055(In/Hr)
End of computations, Total Study Area = 3.91 (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 = 86.0

APPENDIX D

Hydrology Study – Proposed Conditions

10-year storm event
100-year storm event

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 03/11/20

1815 STATE ROUTE 58 NEW GAS STATION & FOOD MART
PROPOSED CONDTION
10 YEAR STORM EVENT
SUBAREA A-1 TO A-6

Program License Serial Number 6364

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.600 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 69.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.055(In/Hr)
Initial subarea data:
Initial area flow distance = 241.000(Ft.)
Top (of initial area) elevation = 452.900(Ft.)
Bottom (of initial area) elevation = 451.600(Ft.)
Difference in elevation = 1.300(Ft.)
Slope = 0.00539 s(%)= 0.54
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.750 min.
Rainfall intensity = 2.514(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880
Subarea runoff = 1.062(CFS)

```
Total initial stream area =        0.480(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   448.000(Ft.)
Downstream point/station elevation =   446.400(Ft.)
Pipe length  =   242.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.062(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.062(CFS)
Normal flow depth in pipe =    6.04(In.)
Flow top width inside pipe =    8.46(In.)
Critical Depth =    5.68(In.)
Pipe flow velocity =      3.38(Ft/s)
Travel time through pipe =    1.19 min.
Time of concentration (TC) =     8.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.480(Ac.)
Runoff from this stream =      1.062(CFS)
Time of concentration =    8.94 min.
Rainfall intensity =     2.274(In/Hr)
Area averaged loss rate (Fm) =    0.0548(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =   185.000(Ft.)
Top (of initial area) elevation =   450.300(Ft.)
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```
Bottom (of initial area) elevation =   449.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00541  s(%)=       0.54
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.969 min.
Rainfall intensity =      2.708(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.882
Subarea runoff =      1.289(CFS)
Total initial stream area =        0.540(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.540(Ac.)
Runoff from this stream =      1.289(CFS)
Time of concentration =    6.97 min.
Rainfall intensity =     2.708(In/Hr)
Area averaged loss rate (Fm) =    0.0548(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1      1.06     0.480      8.94    0.055      2.274
2      1.29     0.540      6.97    0.055      2.708
Qmax(1) =
           1.000 *    1.000 *     1.062) +
           0.836 *    1.000 *     1.289) + =       2.141
Qmax(2) =
           1.196 *    0.779 *     1.062) +
           1.000 *    1.000 *     1.289) + =       2.279

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.062       1.289
Maximum flow rates at confluence using above data:
        2.141        2.279
Area of streams before confluence:
        0.480        0.540
Effective area values after confluence:
        1.020        0.914
Results of confluence:
Total flow rate =      2.279(CFS)
```

```
Time of concentration =     6.969 min.
Effective stream area after confluence =      0.914(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.055(In/Hr)
Study area total (this main stream) =       1.02(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       30.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   446.400(Ft.)
Downstream point/station elevation =   445.500(Ft.)
Pipe length  =   176.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.279(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.279(CFS)
Normal flow depth in pipe =    8.86(In.)
Flow top width inside pipe =   10.55(In.)
Critical Depth =    7.75(In.)
Pipe flow velocity =      3.67(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =     7.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       30.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.914(Ac.)
Runoff from this stream =      2.279(CFS)
Time of concentration =    7.77 min.
Rainfall intensity =     2.510(In/Hr)
Area averaged loss rate (Fm) =    0.0548(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       15.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
```

```
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =   299.000(Ft.)
Top (of initial area) elevation =   452.200(Ft.)
Bottom (of initial area) elevation =   449.200(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.01003  s(%)=       1.00
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.462 min.
Rainfall intensity =      2.581(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.881
Subarea runoff =      2.228(CFS)
Total initial stream area =        0.980(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   446.700(Ft.)
Downstream point/station elevation =   445.700(Ft.)
Pipe length  =   191.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.228(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.228(CFS)
Normal flow depth in pipe =    8.61(In.)
Flow top width inside pipe =   10.80(In.)
Critical Depth =    7.66(In.)
Pipe flow velocity =      3.69(Ft/s)
Travel time through pipe =    0.86 min.
Time of concentration (TC) =     8.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       20.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.980(Ac.)
Runoff from this stream =      2.228(CFS)
Time of concentration =    8.32 min.
Rainfall intensity =     2.391(In/Hr)
Area averaged loss rate (Fm) =    0.0548(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       17.000
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**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =    75.000(Ft.)
Top (of initial area) elevation =   450.500(Ft.)
Bottom (of initial area) elevation =   450.200(Ft.)
Difference in elevation =     0.300(Ft.)
Slope =    0.00400  s(%)=       0.40
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.158 min.
Rainfall intensity =      3.343(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.885
Subarea runoff =      0.266(CFS)
Total initial stream area =        0.090(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       17.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =   446.400(Ft.)
Downstream point/station elevation =   445.700(Ft.)
Pipe length  =   127.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.266(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.266(CFS)
Normal flow depth in pipe =    3.49(In.)
Flow top width inside pipe =    5.92(In.)
Critical Depth =    3.12(In.)
Pipe flow velocity =      2.25(Ft/s)
Travel time through pipe =    0.94 min.
Time of concentration (TC) =     6.10 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       17.000 to Point/Station       20.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.090(Ac.)
Runoff from this stream =      0.266(CFS)
```

```
Time of concentration =    6.10 min.
Rainfall intensity =     2.973(In/Hr)
Area averaged loss rate (Fm) =    0.0548(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1      2.23     0.980      8.32    0.055      2.391
2      0.27     0.090      6.10    0.055      2.973
Qmax(1) =
           1.000 *    1.000 *     2.228) +
           0.801 *    1.000 *     0.266) + =       2.442
Qmax(2) =
           1.249 *    0.733 *     2.228) +
           1.000 *    1.000 *     0.266) + =       2.306

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.228       0.266
Maximum flow rates at confluence using above data:
        2.442        2.306
Area of streams before confluence:
        0.980        0.090
Effective area values after confluence:
        1.070        0.808
Results of confluence:
Total flow rate =      2.442(CFS)
Time of concentration =     8.324 min.
Effective stream area after confluence =      1.070(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.055(In/Hr)
Study area total (this main stream) =       1.07(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       30.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.070(Ac.)
Runoff from this stream =      2.442(CFS)
Time of concentration =    8.32 min.
Rainfall intensity =     2.391(In/Hr)
Area averaged loss rate (Fm) =    0.0548(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:
```

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


1      2.28     0.914      7.77    0.055      2.510
2      2.44     1.070      8.32    0.055      2.391
Qmax(1) =
           1.000 *    1.000 *     2.279) +
           1.051 *    0.933 *     2.442) + =       4.673
Qmax(2) =
           0.952 *    1.000 *     2.279) +
           1.000 *    1.000 *     2.442) + =       4.611

Total of 2 main streams to confluence:
Flow rates before confluence point:
       3.279       3.442
Maximum flow rates at confluence using above data:
        4.673        4.611
Area of streams before confluence:
        0.914        1.070
Effective area values after confluence:
        1.913        1.984


Results of confluence:
Total flow rate =      4.673(CFS)
Time of concentration =     7.769 min.
Effective stream area after confluence  =      1.913(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.055(In/Hr)
Study area total =       1.98(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       40.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   445.500(Ft.)
Downstream point/station elevation =   445.300(Ft.)
Pipe length  =    38.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.673(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.673(CFS)
Normal flow depth in pipe =   12.26(In.)
Flow top width inside pipe =   11.60(In.)
Critical Depth =   10.51(In.)
Pipe flow velocity =      4.35(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     7.91 min.
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Process from Point/Station       30.000 to Point/Station       40.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.913(Ac.)
Runoff from this stream =      4.673(CFS)
Time of concentration =    7.91 min.
Rainfall intensity =     2.477(In/Hr)
Area averaged loss rate (Fm) =    0.0548(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       18.000 to Point/Station       19.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =   267.000(Ft.)
Top (of initial area) elevation =   449.900(Ft.)
Bottom (of initial area) elevation =   448.800(Ft.)
Difference in elevation =     1.100(Ft.)
Slope =    0.00412  s(%)=       0.41
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.521 min.
Rainfall intensity =      2.352(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff =      1.365(CFS)
Total initial stream area =        0.660(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       40.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   445.600(Ft.)
Downstream point/station elevation =   445.300(Ft.)
Pipe length  =    44.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.365(CFS)
```

```
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.365(CFS)
Normal flow depth in pipe =    9.00(In.)
Flow top width inside pipe =    0.00(In.)
Critical Depth =    6.46(In.)
Pipe flow velocity =      3.09(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     8.76 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       40.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.660(Ac.)
Runoff from this stream =      1.365(CFS)
Time of concentration =    8.76 min.
Rainfall intensity =     2.308(In/Hr)
Area averaged loss rate (Fm) =    0.0548(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1      4.67     1.913      7.91    0.055      2.477
2      1.36     0.660      8.76    0.055      2.308
Qmax(1) =
           1.000 *    1.000 *     4.673) +
           1.075 *    0.904 *     1.365) + =       5.999
Qmax(2) =
           0.930 *    1.000 *     4.673) +
           1.000 *    1.000 *     1.365) + =       5.711

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.673       1.365
Maximum flow rates at confluence using above data:
        5.999        5.711
Area of streams before confluence:
        1.913        0.660
Effective area values after confluence:
        2.509        2.573
Results of confluence:
Total flow rate =      5.999(CFS)
Time of concentration =     7.914 min.
Effective stream area after confluence =      2.509(Ac.)
Study area average Pervious fraction(Ap) =  0.100
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```
Study area average soil loss rate(Fm) =    0.055(In/Hr)
Study area total (this main stream) =       2.57(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station      200.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   445.300(Ft.)
Downstream point/station elevation =   445.100(Ft.)
Pipe length  =    49.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.999(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.999(CFS)
Normal flow depth in pipe =   13.27(In.)
Flow top width inside pipe =   15.85(In.)
Critical Depth =   11.35(In.)
Pipe flow velocity =      4.29(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =     8.10 min.


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Process from Point/Station       40.000 to Point/Station      200.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.509(Ac.)
Runoff from this stream =      5.999(CFS)
Time of concentration =    8.10 min.
Rainfall intensity =     2.436(In/Hr)
Area averaged loss rate (Fm) =    0.0548(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station      200.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.055(In/Hr)
Initial subarea data:
Initial area flow distance =   276.000(Ft.)
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```
Top (of initial area) elevation =   450.500(Ft.)
Bottom (of initial area) elevation =   445.100(Ft.)
Difference in elevation =     5.400(Ft.)
Slope =    0.01957  s(%)=       1.96
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.323 min.
Rainfall intensity =      2.899(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.883
Subarea runoff =      2.969(CFS)
Total initial stream area =        1.160(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.055(In/Hr)


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Process from Point/Station       21.000 to Point/Station      200.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.160(Ac.)
Runoff from this stream =      2.969(CFS)
Time of concentration =    6.32 min.
Rainfall intensity =     2.899(In/Hr)
Area averaged loss rate (Fm) =    0.0548(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1      6.00     2.509      8.10    0.055      2.436
2      2.97     1.160      6.32    0.055      2.899
Qmax(1) =
           1.000 *    1.000 *     5.999) +
           0.837 *    1.000 *     2.969) + =       8.486
Qmax(2) =
           1.194 *    0.780 *     5.999) +
           1.000 *    1.000 *     2.969) + =       8.558

Total of 2 main streams to confluence:
Flow rates before confluence point:
       6.999       3.969
Maximum flow rates at confluence using above data:
        8.486        8.558
Area of streams before confluence:
        2.509        1.160
Effective area values after confluence:
        3.669        3.118
```

Results of confluence:
Total flow rate = 8.558(CFS)
Time of concentration = 6.323 min.
Effective stream area after confluence = 3.118(Ac.)
Study area average Pervious fraction(Ap) = 0.100
Study area average soil loss rate(Fm) = 0.055(In/Hr)
Study area total = 3.67(Ac.)
End of computations, Total Study Area = 3.91 (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) = 0.100
Area averaged SCS curve number = 69.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 03/11/20

1815 STATE ROUTE 58 NEW GAS STATION & FOOD MART
PROPOSED CONDTION
100 YEAR STORM EVENT
SUBAREA A-1 TO A-6

Program License Serial Number 6364

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.030 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

++

Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.026(In/Hr)
Initial subarea data:
Initial area flow distance = 241.000(Ft.)
Top (of initial area) elevation = 452.900(Ft.)
Bottom (of initial area) elevation = 451.600(Ft.)
Difference in elevation = 1.300(Ft.)
Slope = 0.00539 s(%)= 0.54
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.750 min.
Rainfall intensity = 4.316(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.895

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Subarea runoff =      1.853(CFS)
Total initial stream area =        0.480(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.026(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   448.000(Ft.)
Downstream point/station elevation =   446.400(Ft.)
Pipe length  =   242.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.853(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.853(CFS)
Normal flow depth in pipe =    6.97(In.)
Flow top width inside pipe =   11.84(In.)
Critical Depth =    6.96(In.)
Pipe flow velocity =      3.91(Ft/s)
Travel time through pipe =    1.03 min.
Time of concentration (TC) =     8.78 min.


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Process from Point/Station       11.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.480(Ac.)
Runoff from this stream =      1.853(CFS)
Time of concentration =    8.78 min.
Rainfall intensity =     3.954(In/Hr)
Area averaged loss rate (Fm) =    0.0262(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station       12.000 to Point/Station       13.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.026(In/Hr)
Initial subarea data:
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Initial area flow distance =   185.000(Ft.)
Top (of initial area) elevation =   450.300(Ft.)
Bottom (of initial area) elevation =   449.300(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00541  s(%)=       0.54
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.969 min.
Rainfall intensity =      4.649(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.895
Subarea runoff =      2.246(CFS)
Total initial stream area =        0.540(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.026(In/Hr)


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Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.540(Ac.)
Runoff from this stream =      2.246(CFS)
Time of concentration =    6.97 min.
Rainfall intensity =     4.649(In/Hr)
Area averaged loss rate (Fm) =    0.0262(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1      1.85     0.480      8.78    0.026      3.954
2      2.25     0.540      6.97    0.026      4.649
Qmax(1) =
           1.000 *    1.000 *     1.853) +
           0.850 *    1.000 *     2.246) + =       3.762
Qmax(2) =
           1.177 *    0.794 *     1.853) +
           1.000 *    1.000 *     2.246) + =       3.977

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.853       2.246
Maximum flow rates at confluence using above data:
        3.762        3.977
Area of streams before confluence:
        0.480        0.540
Effective area values after confluence:
        1.020        0.921
```

```
Results of confluence:
Total flow rate =      3.977(CFS)
Time of concentration =     6.969 min.
Effective stream area after confluence =      0.921(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.026(In/Hr)
Study area total (this main stream) =       1.02(Ac.)


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Process from Point/Station       13.000 to Point/Station       30.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   446.400(Ft.)
Downstream point/station elevation =   445.500(Ft.)
Pipe length  =   176.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.977(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     3.977(CFS)
Normal flow depth in pipe =   10.73(In.)
Flow top width inside pipe =   13.53(In.)
Critical Depth =    9.68(In.)
Pipe flow velocity =      4.23(Ft/s)
Travel time through pipe =    0.69 min.
Time of concentration (TC) =     7.66 min.


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Process from Point/Station       13.000 to Point/Station       30.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.921(Ac.)
Runoff from this stream =      3.977(CFS)
Time of concentration =    7.66 min.
Rainfall intensity =     4.350(In/Hr)
Area averaged loss rate (Fm) =    0.0262(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       15.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
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Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.026(In/Hr)
Initial subarea data:
Initial area flow distance =   299.000(Ft.)
Top (of initial area) elevation =   452.200(Ft.)
Bottom (of initial area) elevation =   449.200(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.01003  s(%)=       1.00
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.462 min.
Rainfall intensity =      4.431(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.895
Subarea runoff =      3.885(CFS)
Total initial stream area =        0.980(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.026(In/Hr)


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Process from Point/Station       15.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   446.700(Ft.)
Downstream point/station elevation =   445.700(Ft.)
Pipe length  =   191.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.885(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     3.885(CFS)
Normal flow depth in pipe =   10.44(In.)
Flow top width inside pipe =   13.80(In.)
Critical Depth =    9.56(In.)
Pipe flow velocity =      4.26(Ft/s)
Travel time through pipe =    0.75 min.
Time of concentration (TC) =     8.21 min.


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Process from Point/Station       15.000 to Point/Station       20.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.980(Ac.)
Runoff from this stream =      3.885(CFS)
Time of concentration =    8.21 min.
Rainfall intensity =     4.145(In/Hr)
Area averaged loss rate (Fm) =    0.0262(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
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Process from Point/Station       16.000 to Point/Station       17.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.026(In/Hr)
Initial subarea data:
Initial area flow distance =    75.000(Ft.)
Top (of initial area) elevation =   450.500(Ft.)
Bottom (of initial area) elevation =   450.200(Ft.)
Difference in elevation =     0.300(Ft.)
Slope =    0.00400  s(%)=       0.40
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.158 min.
Rainfall intensity =      5.739(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.896
Subarea runoff =      0.463(CFS)
Total initial stream area =        0.090(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.026(In/Hr)


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Process from Point/Station       17.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =   446.400(Ft.)
Downstream point/station elevation =   445.700(Ft.)
Pipe length  =   127.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.463(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.463(CFS)
Normal flow depth in pipe =    3.83(In.)
Flow top width inside pipe =    8.90(In.)
Critical Depth =    3.68(In.)
Pipe flow velocity =      2.59(Ft/s)
Travel time through pipe =    0.82 min.
Time of concentration (TC) =     5.98 min.


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Process from Point/Station       17.000 to Point/Station       20.000
**** CONFLUENCE OF MINOR STREAMS ****
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Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.090(Ac.)
Runoff from this stream =      0.463(CFS)
Time of concentration =    5.98 min.
Rainfall intensity =     5.176(In/Hr)
Area averaged loss rate (Fm) =    0.0262(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1      3.89     0.980      8.21    0.026      4.145
2      0.46     0.090      5.98    0.026      5.176
Qmax(1) =
           1.000 *    1.000 *     3.885) +
           0.800 *    1.000 *     0.463) + =       4.256
Qmax(2) =
           1.250 *    0.728 *     3.885) +
           1.000 *    1.000 *     0.463) + =       4.000

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.885       0.463
Maximum flow rates at confluence using above data:
        4.256        4.000
Area of streams before confluence:
        0.980        0.090
Effective area values after confluence:
        1.070        0.803
Results of confluence:
Total flow rate =      4.256(CFS)
Time of concentration =     8.209 min.
Effective stream area after confluence =      1.070(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.026(In/Hr)
Study area total (this main stream) =       1.07(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       30.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.070(Ac.)
Runoff from this stream =      4.256(CFS)
Time of concentration =    8.21 min.
```

```
Rainfall intensity =     4.145(In/Hr)
Area averaged loss rate (Fm) =    0.0262(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1      3.98     0.921      7.66    0.026      4.350
2      4.26     1.070      8.21    0.026      4.145
Qmax(1) =
           1.000 *    1.000 *     3.977) +
           1.050 *    0.933 *     4.256) + =       8.147
Qmax(2) =
           0.953 *    1.000 *     3.977) +
           1.000 *    1.000 *     4.256) + =       8.044

Total of 2 main streams to confluence:
Flow rates before confluence point:
       4.977       5.256
Maximum flow rates at confluence using above data:
        8.147        8.044
Area of streams before confluence:
        0.921        1.070
Effective area values after confluence:
        1.920        1.991


Results of confluence:
Total flow rate =      8.147(CFS)
Time of concentration =     7.662 min.
Effective stream area after confluence  =      1.920(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.026(In/Hr)
Study area total =       1.99(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       40.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   445.500(Ft.)
Downstream point/station elevation =   445.300(Ft.)
Pipe length  =    38.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.147(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     8.147(CFS)
Normal flow depth in pipe =   13.05(In.)
Flow top width inside pipe =   20.37(In.)
```

```
Critical Depth =   12.71(In.)
Pipe flow velocity =      5.18(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =     7.78 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       40.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.920(Ac.)
Runoff from this stream =      8.147(CFS)
Time of concentration =    7.78 min.
Rainfall intensity =     4.302(In/Hr)
Area averaged loss rate (Fm) =    0.0262(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       18.000 to Point/Station       19.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.026(In/Hr)
Initial subarea data:
Initial area flow distance =   267.000(Ft.)
Top (of initial area) elevation =   449.900(Ft.)
Bottom (of initial area) elevation =   448.800(Ft.)
Difference in elevation =     1.100(Ft.)
Slope =    0.00412  s(%)=       0.41
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.521 min.
Rainfall intensity =      4.038(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.894
Subarea runoff =      2.383(CFS)
Total initial stream area =        0.660(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.026(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       40.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =   445.600(Ft.)
Downstream point/station elevation =   445.300(Ft.)
Pipe length  =    44.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.383(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.383(CFS)
Normal flow depth in pipe =    8.19(In.)
Flow top width inside pipe =   11.17(In.)
Critical Depth =    7.93(In.)
Pipe flow velocity =      4.17(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     8.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       40.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.660(Ac.)
Runoff from this stream =      2.383(CFS)
Time of concentration =    8.70 min.
Rainfall intensity =     3.981(In/Hr)
Area averaged loss rate (Fm) =    0.0262(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1      8.15     1.920      7.78    0.026      4.302
2      2.38     0.660      8.70    0.026      3.981
Qmax(1) =
           1.000 *    1.000 *     8.147) +
           1.081 *    0.895 *     2.383) + =      10.453
Qmax(2) =
           0.925 *    1.000 *     8.147) +
           1.000 *    1.000 *     2.383) + =       9.918

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.147       2.383
Maximum flow rates at confluence using above data:
       10.453        9.918
Area of streams before confluence:
        1.920        0.660
Effective area values after confluence:
        2.510        2.580
```

```
Results of confluence:
Total flow rate =     10.453(CFS)
Time of concentration =     7.784 min.
Effective stream area after confluence =      2.510(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.026(In/Hr)
Study area total (this main stream) =       2.58(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station      200.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   445.300(Ft.)
Downstream point/station elevation =   445.100(Ft.)
Pipe length  =    49.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.453(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    10.453(CFS)
Normal flow depth in pipe =   15.12(In.)
Flow top width inside pipe =   23.18(In.)
Critical Depth =   13.89(In.)
Pipe flow velocity =      5.01(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     7.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station      200.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.510(Ac.)
Runoff from this stream =     10.453(CFS)
Time of concentration =    7.95 min.
Rainfall intensity =     4.240(In/Hr)
Area averaged loss rate (Fm) =    0.0262(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station      200.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
```

```
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.026(In/Hr)
Initial subarea data:
Initial area flow distance =   276.000(Ft.)
Top (of initial area) elevation =   450.500(Ft.)
Bottom (of initial area) elevation =   445.100(Ft.)
Difference in elevation =     5.400(Ft.)
Slope =    0.01957  s(%)=       1.96
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.323 min.
Rainfall intensity =      4.976(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.895
Subarea runoff =      5.168(CFS)
Total initial stream area =        1.160(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.026(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station      200.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.160(Ac.)
Runoff from this stream =      5.168(CFS)
Time of concentration =    6.32 min.
Rainfall intensity =     4.976(In/Hr)
Area averaged loss rate (Fm) =    0.0262(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1     10.45     2.510      7.95    0.026      4.240
2      5.17     1.160      6.32    0.026      4.976
Qmax(1) =
           1.000 *    1.000 *    10.453) +
           0.851 *    1.000 *     5.168) + =      14.853
Qmax(2) =
           1.175 *    0.796 *    10.453) +
           1.000 *    1.000 *     5.168) + =      14.937

Total of 2 main streams to confluence:
Flow rates before confluence point:
      11.453       6.168
```

Maximum flow rates at confluence using above data:
14.853 14.937
Area of streams before confluence:
2.510 1.160
Effective area values after confluence:
3.670 3.157

Results of confluence:
Total flow rate = 14.937(CFS)
Time of concentration = 6.323 min.
Effective stream area after confluence = 3.157(Ac.)
Study area average Pervious fraction(Ap) = 0.100
Study area average soil loss rate(Fm) = 0.026(In/Hr)
Study area total = 3.67(Ac.)
End of computations, Total Study Area = 3.91 (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) = 0.100
Area averaged SCS curve number = 69.0

APPENDIX E

Hydraulic Calculations
Catch Basin Capacity Calculations
Storm Drain Line A Capacity Calculations

1815 BORON NEW GAS STATION
SUMP CONDITION

Grated Inlet (Weir Condition) at Sump							
Catch Basin #	**Perimeter (Feet)**	**Allowed Depth (Inches)**	**% Opening of Grate**	**Full Capacity (cfs)**	**Half-Clogged Capacity (cfs)**	**Design Q-100 (cfs)**	**Safety Factor**
CB #1	10	4	0.75	4.33	2.17	1.85	1.2
CB #2	10	6	0.75	7.95	3.98	3.98	1.0
CB #3	10	6	0.75	7.95	3.98	3.89	1.0
CB #4	10	2	0.75	1.53	0.77	0.46	1.7
CB #5	10	5	0.75	6.05	3.03	2.38	1.3

USE WEIR FORMULA

$$Q = cb\sqrt{2g}H^{3/2}$$

(C=0.373, RECTANGULAR SHAPE)

Storm Drain Line A-1
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\1815.fm2
Worksheet	Storm Drain Capacity
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.005000	ft/ft
Depth	0.83	ft
Diameter	10.00	in

Results		
Discharge	2.30	cfs
Flow Area	0.55	ft²
Wetted Perimeter	2.51	ft
Top Width	0.11	ft
Critical Depth	0.68	ft
Percent Full	99.60	
Critical Slope	0.005362	ft/ft
Velocity	4.22	ft/s
Velocity Head	0.28	ft
Specific Energy	1.11	ft
Froude Number	0.33	
Maximum Discharge	2.41	cfs
Full Flow Capacity	2.24	cfs
Full Flow Slope	0.005274	ft/ft
Flow is subcritical.		

Storm Drain Line A-2
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\1815.fm2
Worksheet	Storm Drain Capacity
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.005000	ft/ft
Depth	1.25	ft
Diameter	15.00	in

Results		
Discharge	6.60	cfs
Flow Area	1.23	ft²
Wetted Perimeter	3.93	ft
Top Width	0.33e-7	ft
Critical Depth	1.03	ft
Percent Full	100.00	
Critical Slope	0.004921	ft/ft
Velocity	5.38	ft/s
Velocity Head	0.45	ft
Specific Energy	1.70	ft
Froude Number	0.16e-3	
Maximum Discharge	7.10	cfs
Full Flow Capacity	6.60	cfs
Full Flow Slope	0.005000	ft/ft
Flow is subcritical.		

Storm Drain Line A-3
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\1815.fm2
Worksheet	Storm Drain Capacity
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.005000	ft/ft
Depth	1.25	ft
Diameter	15.00	in

Results		
Discharge	6.60	cfs
Flow Area	1.23	ft²
Wetted Perimeter	3.93	ft
Top Width	0.33e-7	ft
Critical Depth	1.03	ft
Percent Full	100.00	
Critical Slope	0.004921	ft/ft
Velocity	5.38	ft/s
Velocity Head	0.45	ft
Specific Energy	1.70	ft
Froude Number	0.16e-3	
Maximum Discharge	7.10	cfs
Full Flow Capacity	6.60	cfs
Full Flow Slope	0.005000	ft/ft
Flow is subcritical.		

Storm Drain Line A-4
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\1815.fm2
Worksheet	Storm Drain Capacity
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.005000	ft/ft
Depth	0.67	ft
Diameter	8.00	in

Results		
Discharge	1.23	cfs
Flow Area	0.35	ft²
Wetted Perimeter	2.09	ft
Top Width	0.00	ft
Critical Depth	0.53	ft
Percent Full	100.00	
Critical Slope	0.005383	ft/ft
Velocity	3.54	ft/s
Velocity Head	0.19	ft
Specific Energy	FULL	ft
Froude Number	FULL	
Maximum Discharge	1.33	cfs
Full Flow Capacity	1.23	cfs
Full Flow Slope	0.005000	ft/ft

Storm Drain Line A-5
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\1815.fm2
Worksheet	Storm Drain Capacity
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.005000	ft/ft
Depth	1.25	ft
Diameter	15.00	in

Results		
Discharge	6.60	cfs
Flow Area	1.23	ft²
Wetted Perimeter	3.93	ft
Top Width	0.33e-7	ft
Critical Depth	1.03	ft
Percent Full	100.00	
Critical Slope	0.004921	ft/ft
Velocity	5.38	ft/s
Velocity Head	0.45	ft
Specific Energy	1.70	ft
Froude Number	0.16e-3	
Maximum Discharge	7.10	cfs
Full Flow Capacity	6.60	cfs
Full Flow Slope	0.005000	ft/ft
Flow is subcritical.		

Storm Drain Line A-6
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\1815.fm2
Worksheet	Storm Drain Capacity
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.005000	ft/ft
Depth	1.50	ft
Diameter	18.00	in

Results		
Discharge	10.73	cfs
Flow Area	1.77	ft²
Wetted Perimeter	4.71	ft
Top Width	0.37e-7	ft
Critical Depth	1.26	ft
Percent Full	100.00	
Critical Slope	0.004814	ft/ft
Velocity	6.07	ft/s
Velocity Head	0.57	ft
Specific Energy	2.07	ft
Froude Number	0.15e-3	
Maximum Discharge	11.54	cfs
Full Flow Capacity	10.73	cfs
Full Flow Slope	0.005000	ft/ft
Flow is subcritical.		

Storm Drain Line A-7
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\1815.fm2
Worksheet	Storm Drain Capacity
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.005000	ft/ft
Depth	1.00	ft
Diameter	12.00	in

Results		
Discharge	3.64	cfs
Flow Area	0.79	ft²
Wetted Perimeter	3.14	ft
Top Width	0.00	ft
Critical Depth	0.81	ft
Percent Full	100.00	
Critical Slope	0.005067	ft/ft
Velocity	4.63	ft/s
Velocity Head	0.33	ft
Specific Energy	FULL	ft
Froude Number	FULL	
Maximum Discharge	3.91	cfs
Full Flow Capacity	3.64	cfs
Full Flow Slope	0.005000	ft/ft

Storm Drain Line A-8
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\1815.fm2
Worksheet	Storm Drain Capacity
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.005000	ft/ft
Depth	1.50	ft
Diameter	18.00	in

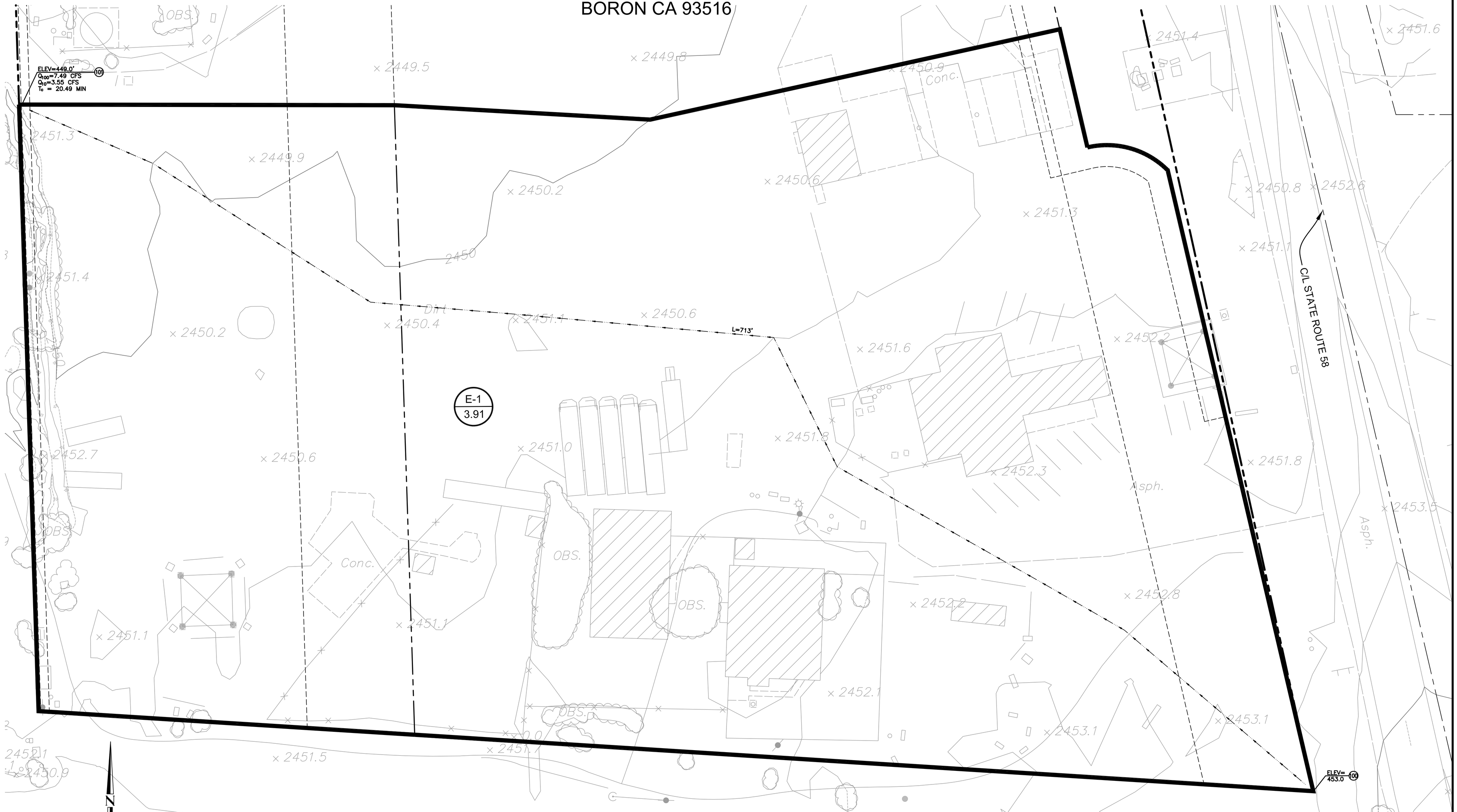
Results		
Discharge	10.73	cfs
Flow Area	1.77	ft²
Wetted Perimeter	4.71	ft
Top Width	0.37e-7	ft
Critical Depth	1.26	ft
Percent Full	100.00	
Critical Slope	0.004814	ft/ft
Velocity	6.07	ft/s
Velocity Head	0.57	ft
Specific Energy	2.07	ft
Froude Number	0.15e-3	
Maximum Discharge	11.54	cfs
Full Flow Capacity	10.73	cfs
Full Flow Slope	0.005000	ft/ft
Flow is subcritical.		

APPENDIX F

Existing Hydrology Map
Proposed Hydrology Map

EXISTING HYDROLOGY MAP

NEW GAS STATION AND FOOD MART
NW CORNER OF SR 58 & HIGHWAY 395
BORON CA 93516



GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = ft. 20

LEGEND

	DRAINAGE AREA BOUNDARY
100	NODE NUMBER
Q_{100}	100 YEAR STORM EVENT
Q_{10}	10 YEAR STORM EVENT
Tc	TIME OF CONCENTRATION
E-1 / 3.91	DRAINAGE AREA NUMBER / DRAINAGE AREA ACREAGE

SEAL-DESIGN ENGINEER

REGISTERED PROFESSIONAL ENGINEER — NE TOONG LIN — No. 66242 Exp. 06-30-20 — CIVIL — STATE OF CALIFORNIA

W&W Land Design Consultants, Inc
Civil Engineering • Subdivision • Land Planning
2335 W. FOOTHILL BLVD., SUITE 1, UPLAND, CA 91786
TEL: (909) 608-7118 • FAX: (909) 946-1137

CITY OF BORON
NEW GAS STATION AND FOOD MART
EXISTING HYDROLOGY MAP

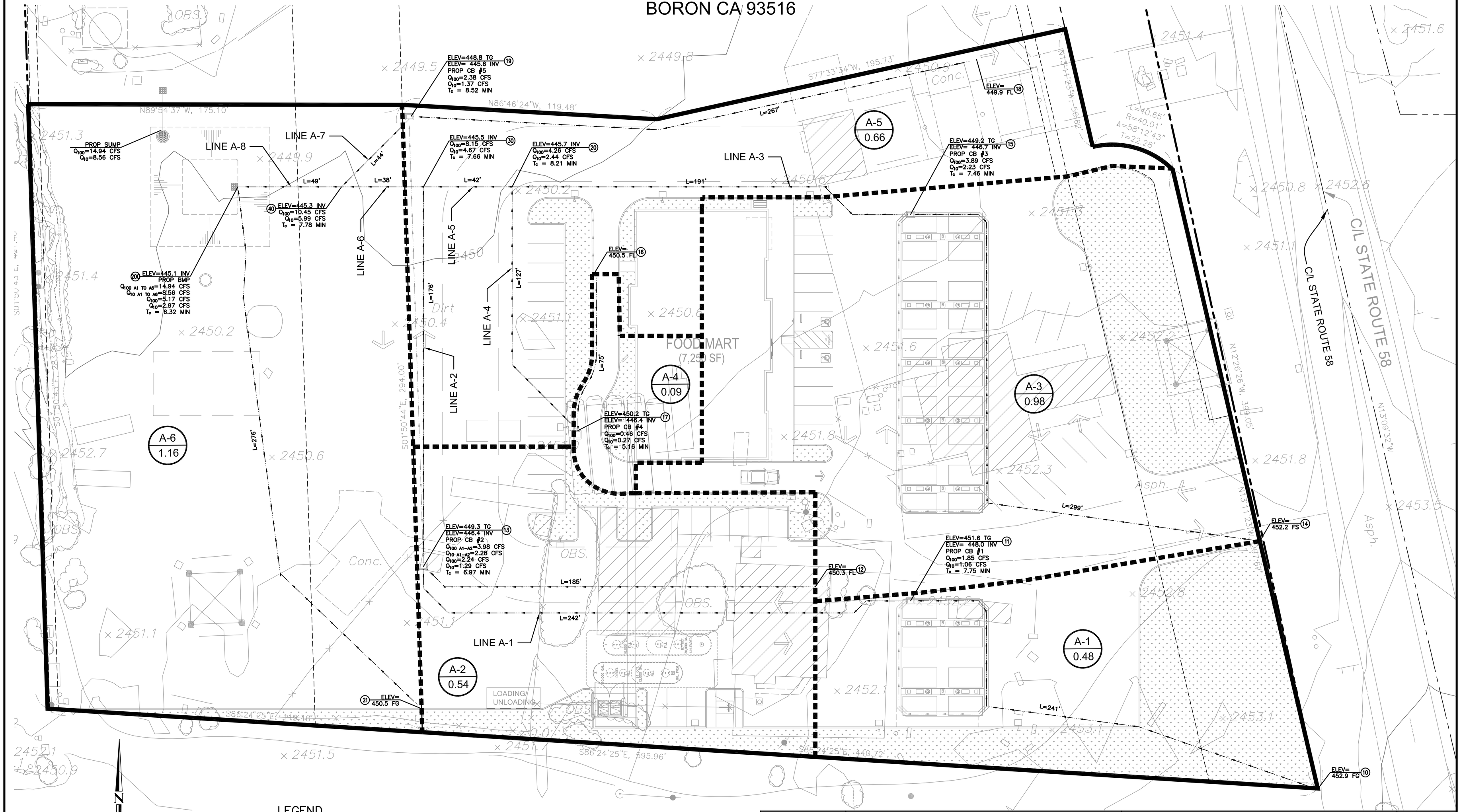
1 OF 2 SHEETS

FOR: MARK SATER

PROJ-2019-00052

PROPOSED HYDROLOGY MAP

NEW GAS STATION AND FOOD MART
NW CORNER OF SR 58 & HIGHWAY 395
BORON CA 93516



GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = ft. 20

LEGEND

- DRAINAGE AREA BOUNDARY
- DRAINAGE SUBAREA BOUNDARY
- (10) NODE NUMBER
- Q_{100} 100 YEAR STORM EVENT
- Q_{10} 10 YEAR STORM EVENT
- Tc TIME OF CONCENTRATION
- A–1 / 0.48 DRAINAGE AREA NUMBER / DRAINAGE AREA ACREAGE

SEAL-DESIGN ENGINEER

REGISTERED PROFESSIONAL ENGINEER
WEIDONG LIU
No. 66222
Exp. 06-30-20
CIVIL
STATE OF CALIFORNIA

W&W Land Design Consultants, Inc
Civil Engineering • Subdivision • Land Planning
2335 W. FOOTHILL BLVD., SUITE 1, UPLAND, CA 91786
TEL: (909) 608-7118 • FAX: (909) 946-1137

CITY OF BORON
NEW GAS STATION AND FOOD MART
PROPOSED HYDROLOGY MAP

2 OF 2 SHEETS

FOR: MARK SATER

PROJ-2019-00052