WALDEN & ASSOCIATES

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949/660-0110 FAX: 660-0418
CIVIL ENGINEERS - PLANNERS - LAND SURVEYORS

PRELIMINARY

DRAINAGE STUDY

FOR

HKI BUSINESS PARK

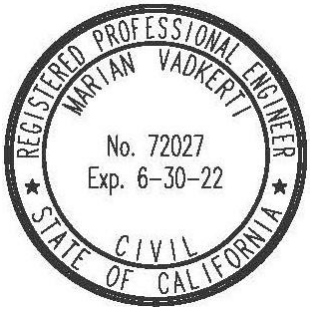
E. HARLEY KNOX BOULEVARD & INDIAN AVENUE

PERRIS, CA

MARCH 2021

PREPARED BY:

WALDEN & ASSOCIATES
2552 WHITE ROAD, SUITE B
IRVINE, CA 92614



JN: 2041-565-001

TABLE OF CONTENTS

SECTION 1

DISCUSSION

PURPOSE:

The purpose of this Preliminary Hydrology Report is to evaluate the impacts of the proposed development during the 10-year, 25-year (proposed catch basin sizing only) and 100-year storm frequencies from the HKI Business Park project along Harley Knox Boulevard. This Report abides by the most current City of Perris and Riverside County Flood Control and Water Conservation District (RCFCWCD) procedures.

PROJECT DESCRIPTION:

The project site is located along the south side of Harley Knox Boulevard between Indian Avenue and N. Perris Boulevard in the City of Perris, California. The project consists of three (3) warehouse/industrial buildings along with associated site improvements. The improvements will consist of landscaping, driveways and parking areas. There are three (3) proposed driveways for the development, one for each building along Harley Knox Boulevard. The site area is approximately 6.8 acres.

The project site is currently vacant and is located on the south side of Harley Knox Boulevard. Harley Knox Boulevard is the site's northerly boundary, a vacant lot with N. Perris Boulevard beyond is to the east, an industrial complex is to the south and Indian Avenue is the westerly boundary. Harley Knox Boulevard was improved between Indian Avenue and N. Perris Boulevard per work order P8-1167 in 2014 which included an upgraded catch basin for future development along the frontage; therefore, no existing modeling (calculations) were undertaken. Street flows were modeled along the frontage for verification and the additional flow meets the flood protection criteria (Plate A-2) for streets. The small landscape area (Subarea "D") towards Indian Avenue will provide its own treatment and no additional modeling will be required.

DESCRIPTION OF WATERSHED:

Currently, the site is a vacant lot with the topography sloping a southeasterly from north to south and then transitions to a northeasterly grade or south to north to the existing catch basin. Each building will have its own on-site drainage system maintaining similar drainage patterns while collecting its on-site surface run-off into its own drainage system that will include two grated catch basins, a biotreatment facility and associated pump station and an under-walk culvert to Harley Knox Boulevard. Each building will have emergency overflow drain protection if drainage clogging should occur.

The soil has been identified from the Hydrologic Soils Group Map, accompanying the Riverside County Flood Control Hydrology Manual (Section 2.1) as being soil group B.

METHODOLOGY:

This Hydrology Study was performed using the rational Hydrology Method Program by CivilCADD / Civil Design Engineering software based on the Riverside County Hydrology Manual dated August 1978. The calculations were done for the 10-year, 25-year (inlet sizing only) and 100-year storm frequency. The proposed inlets, pipes and all other drainage structures were sized for the 25-year storm event.

FLOODING HAZARDS:

Based on the most current Flood Insurance Rate Map (August 18, 2014) prepared by the Federal Emergency Management Agency (FEMA), the site has been determined to lie within zone X which is an area determined to be outside the 0.2% (500-year) annual chance floodplain. (See map in Appendix)

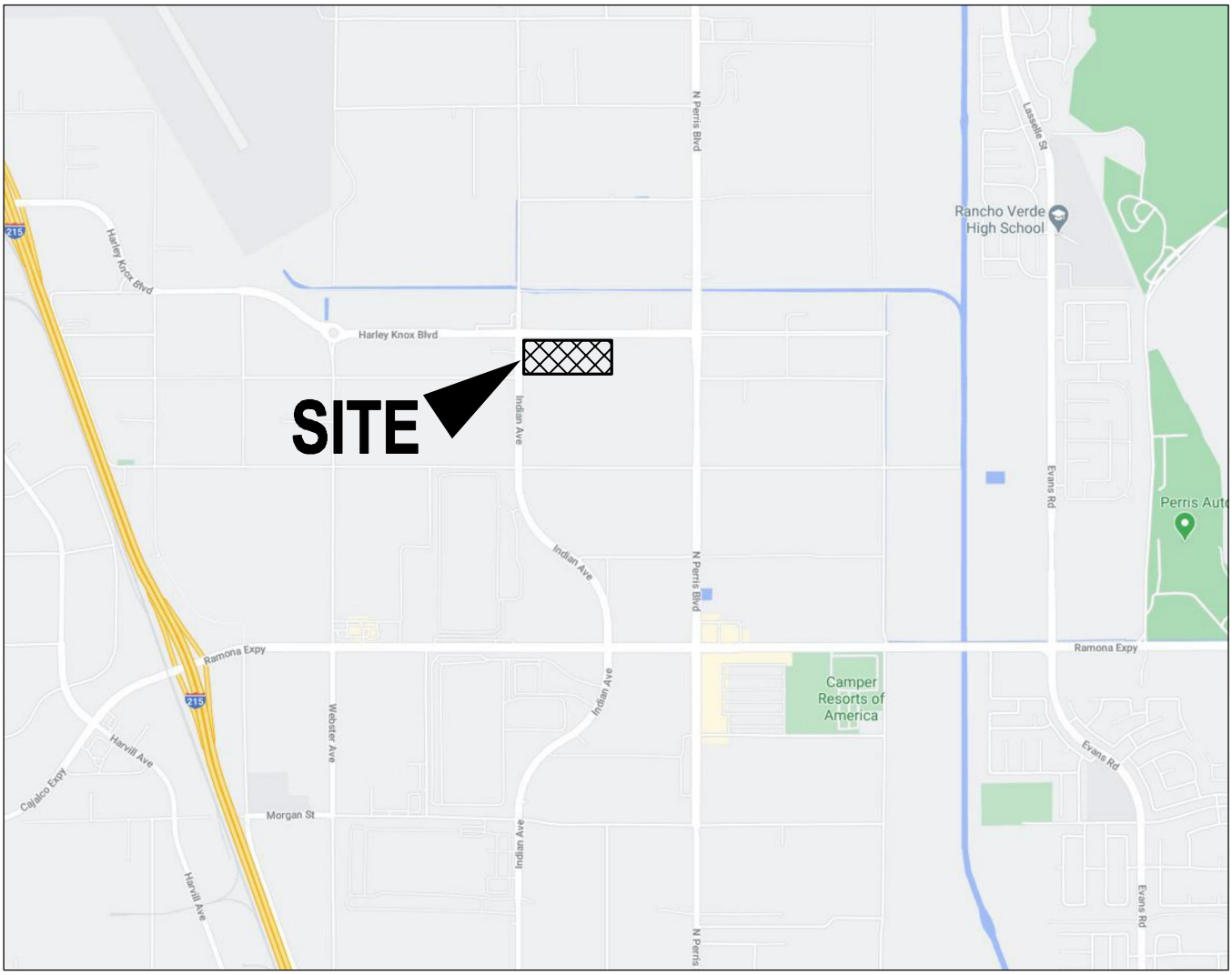
The finish floor elevation of the proposed buildings will be at least 1.0' higher than the top of the existing curb along the surrounding streets and therefore be safe from the 100-year storm.

SUMMARY:

Plans for which this report has been prepared will meet all standards of rainstorm protection as adopted by the City of Perris. Positive overflow is available throughout the development for protection of habitable areas against a 100-year storm event with all inlets clogged and there will be no adverse impact to the existing system.

SECTION 2

VICINITY MAP



N

NO SCALE

ALDEN & ASSOCIATES

CIVIL ENGINEERS - LAND SURVEYORS - PLANNERS
2552 WHITE ROAD, SUITE B• IRVINE, CA 92614-6236
(949) 660-0110 FAX: 660-0418

LOCATION MAP

HKI BUSINESS PARK
PERRIS, CA

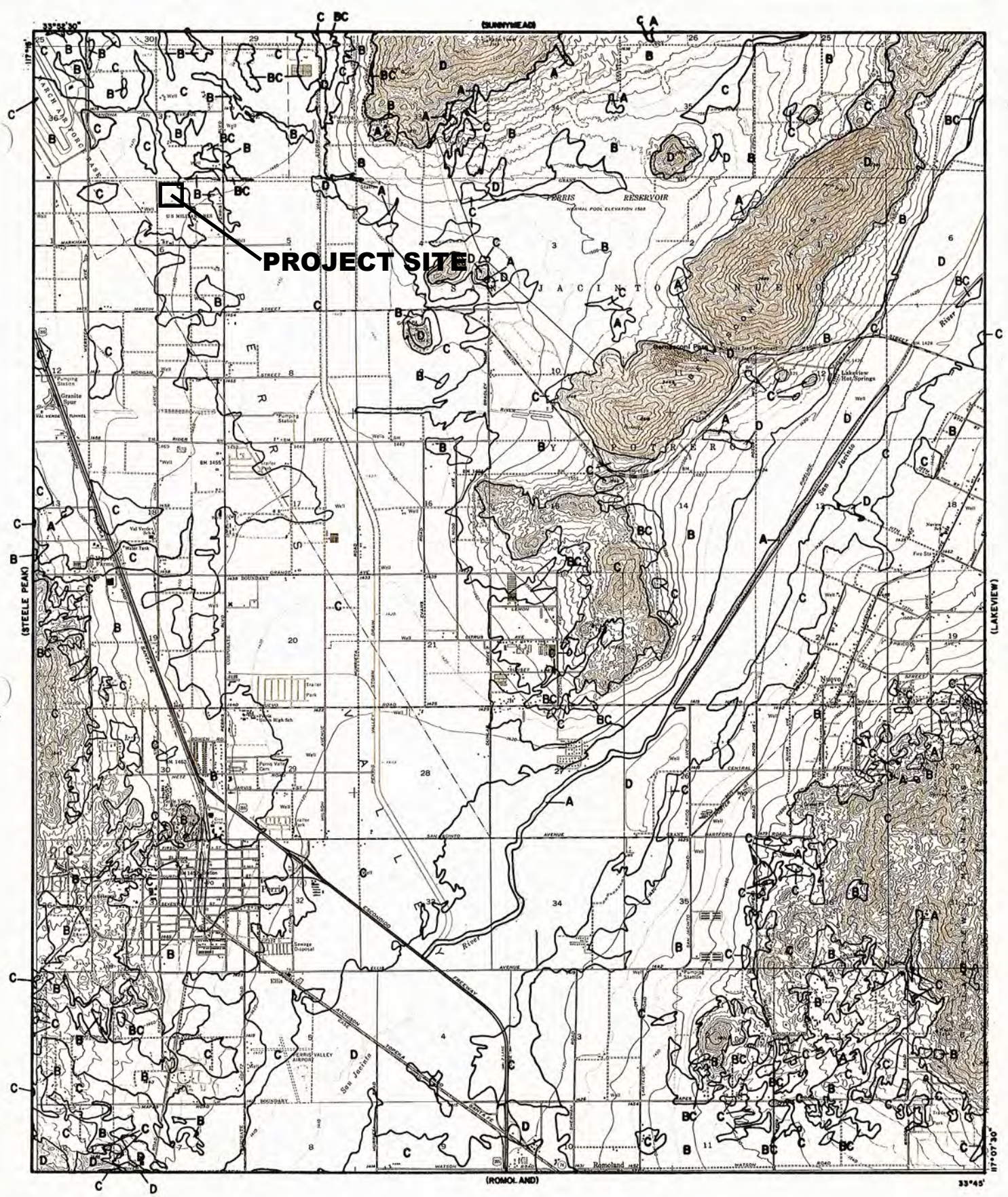
W.O. No. 2041-565-001 Date 11/2020
Engr. SK Chk'd. MV Sheet 1 of 1

SECTION 3

HYDROLOGIC CLASSIFICATION OF SOILS

PERRIS

(SOIL CLASSIFICATION = B)



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

N

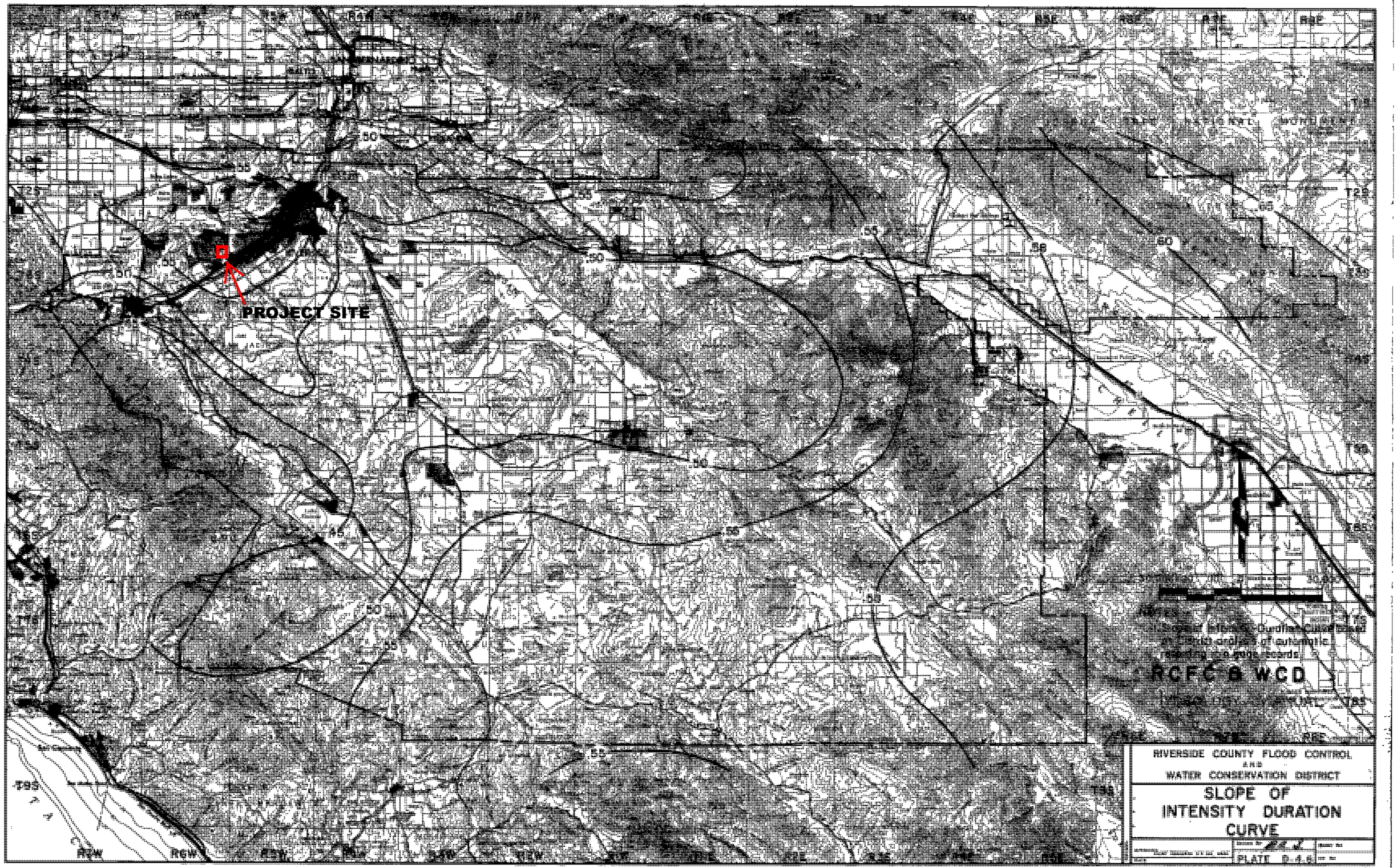
0 FEET 5000

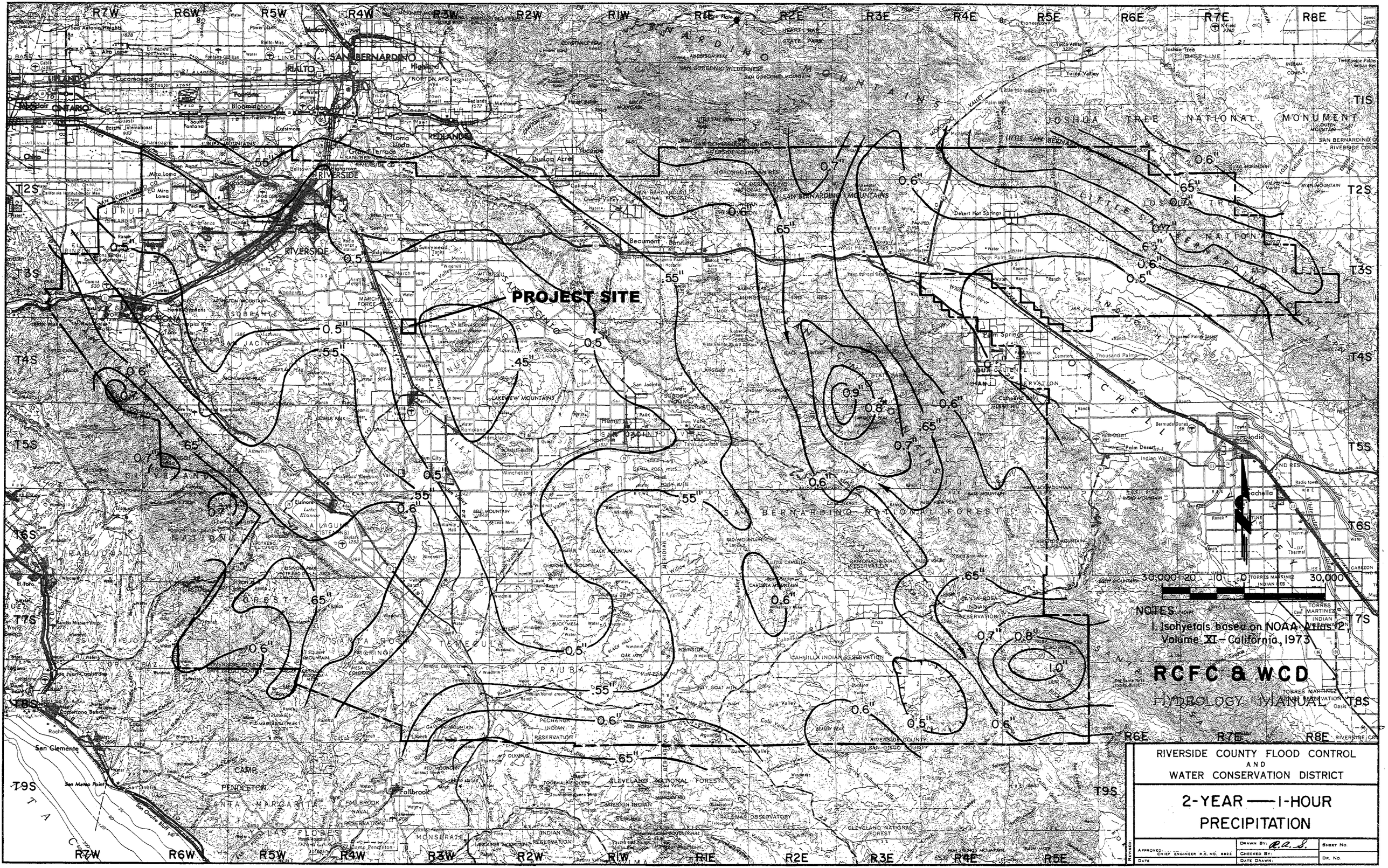
HYDROLOGIC SOILS GROUP MAP FOR PERRIS

PLATE C-1.30

SECTION 4

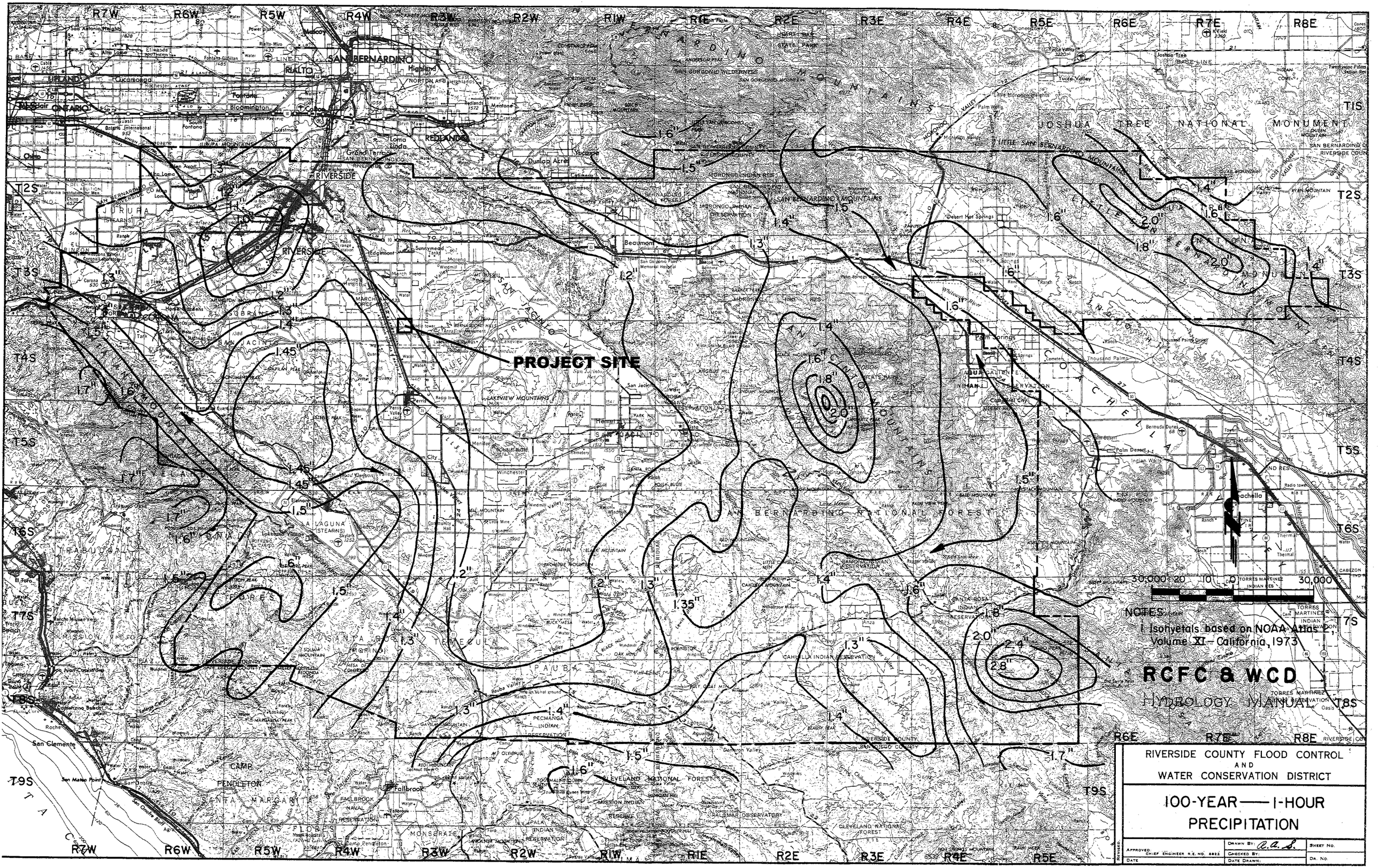
PRECIPITATION MAPS AND INTENSITY DURATION CURVES

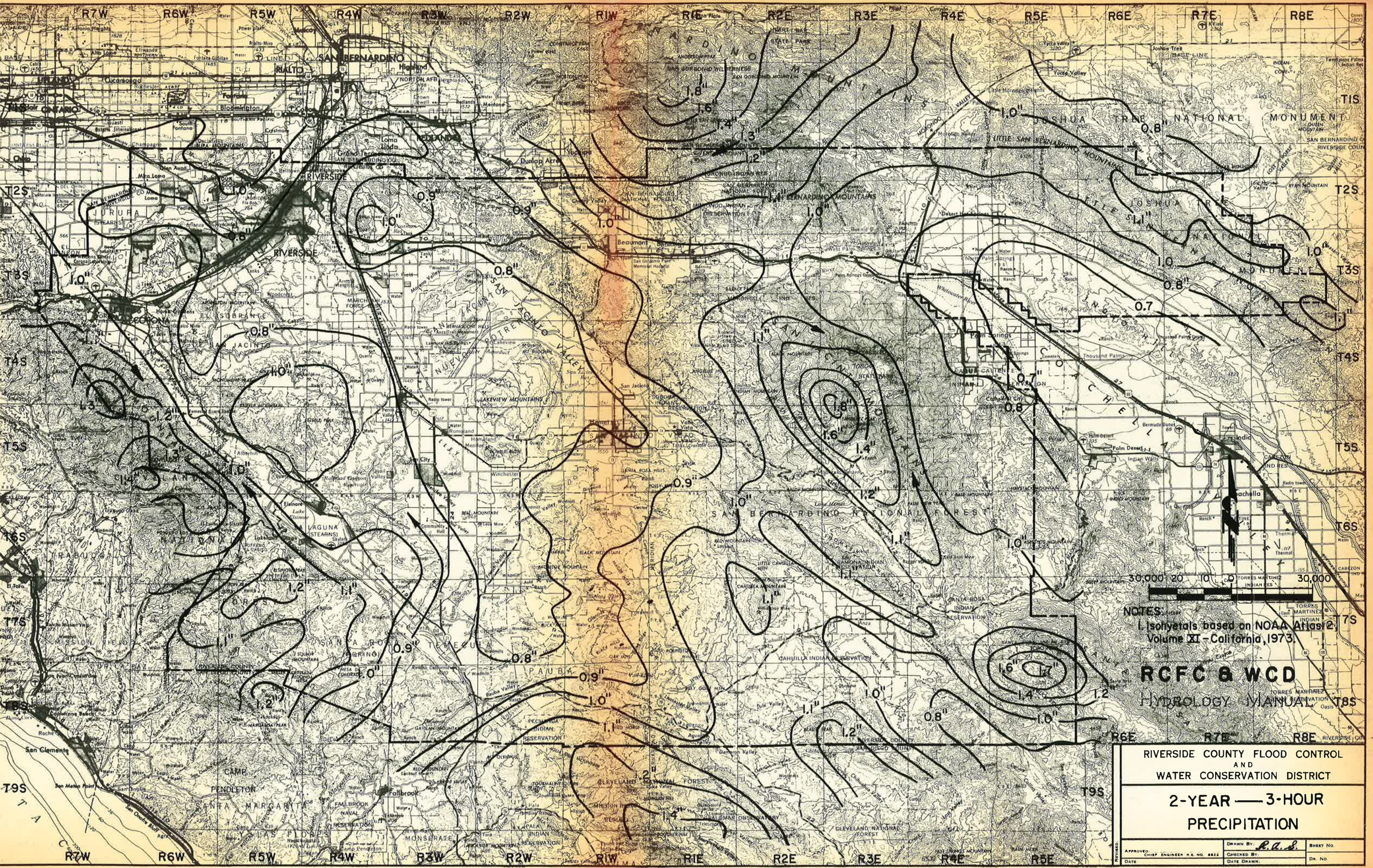

PROJECT SITE
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
SLOPE OF
INTENSITY DURATION
CURVE
PLATE D-4.6
RCFC & WCD



APPROVED: CHIEF ENGINEER R.E. NO. 8822	DRAWN BY: A.A.S.	SHEET NO.	
DATE	CHECKED BY:	DR. NO.	
	DATE DRAWN:		

PLATE D-4.3


PROJECT SITE
1.6"
1.5"
1.4"
1.3"
1.2"
1.45"
1.7"
1.35"
1.8"
2.0"
2.4"
2.8"
NOTES:
1. Isohyetals based on NOAA Atlas 2,
Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR — 1-HOUR
PRECIPITATION
APPROVED CHIEF ENGINEER R.E. NO. 6822
DATE
DRAWN BY: A.A.S.
CHECKED BY:
DATE DRAWN:
SHEET NO.
DR. NO.
REVISED
PLATE D-4.4


R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
SAN BERNARDINO
RIVERSIDE
RIALTO
Ontario
Pomona
Corona
Riverside
Beaumont
Banning
Hemet
San Jacinto
Perris
Lake Elsinore
Temecula
Murrieta
Palm Springs
Indio
Coachella
San Clemente
Fallbrook
SAN BERNARDINO MOUNTAINS
SAN JACINTO MOUNTAINS
SAN JACINTO VALLEY
SANTA ROSA MTNS
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO NATIONAL FOREST
CLEVELAND NATIONAL FOREST
1.8"
1.6"
1.4"
1.3"
1.2"
1.1"
1.0"
0.9"
0.8"
0.7"
30,000 20 10 0 30,000
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 3-HOUR PRECIPITATION
APPROVED CHIEF ENGINEER R.E. NO. 8822
DATE
DRAWN BY: R.A.S.
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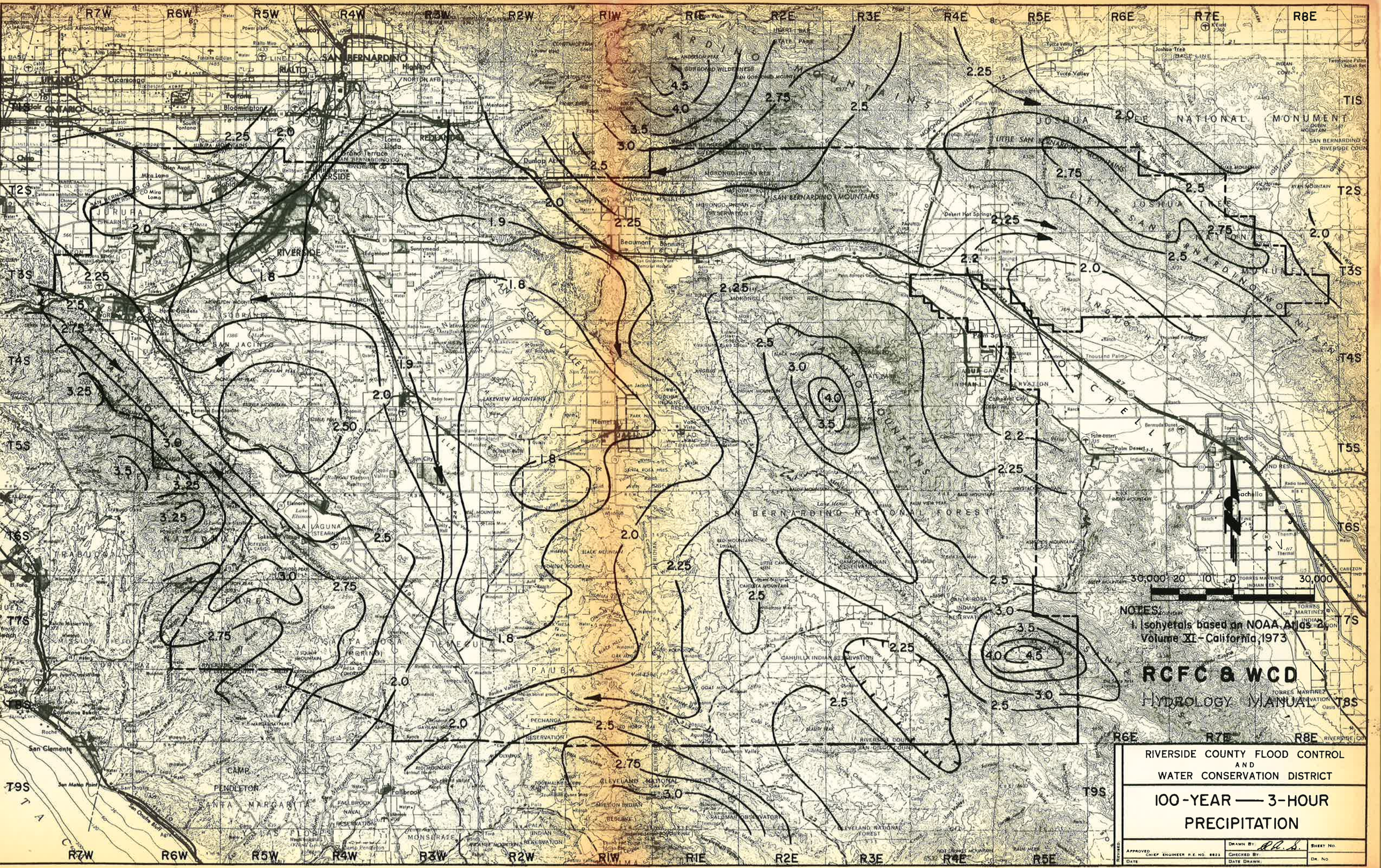
DATE DRAWN:
SHEET NO.
DR. NO.
REVISED

PLATE E-5.1



NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

100 - YEAR — 3 - HOUR
PRECIPITATION

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DATE	CHECKED BY:	DR. NO.
	DATE DRAWN:	

REVISED

PLATE E-5.2

NOTES:
1. Isohyetals from NOAA Atlas 2 Volume XI - California, 1973

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

2-YEAR — 6-HOUR PRECIPITATION

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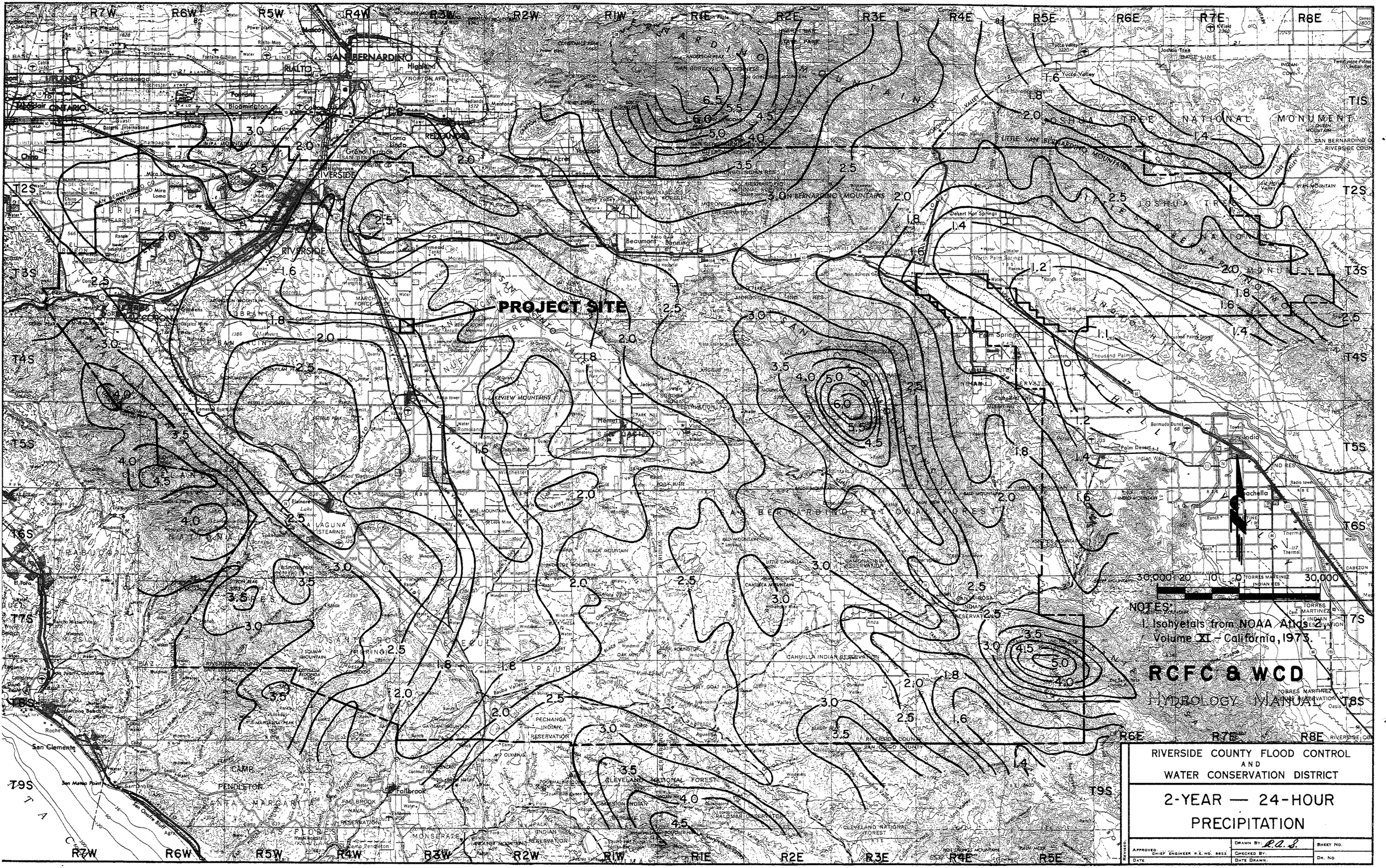
DATE	CHECKED BY	DR. NO.
	DATE DRAWN	
REVISED		

PLATE E-5.3


NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
100-YEAR — 6-HOUR PRECIPITATION
PLATE E-5.4



NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI – California, 1973.

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

2-YEAR — 24-HOUR PRECIPITATION

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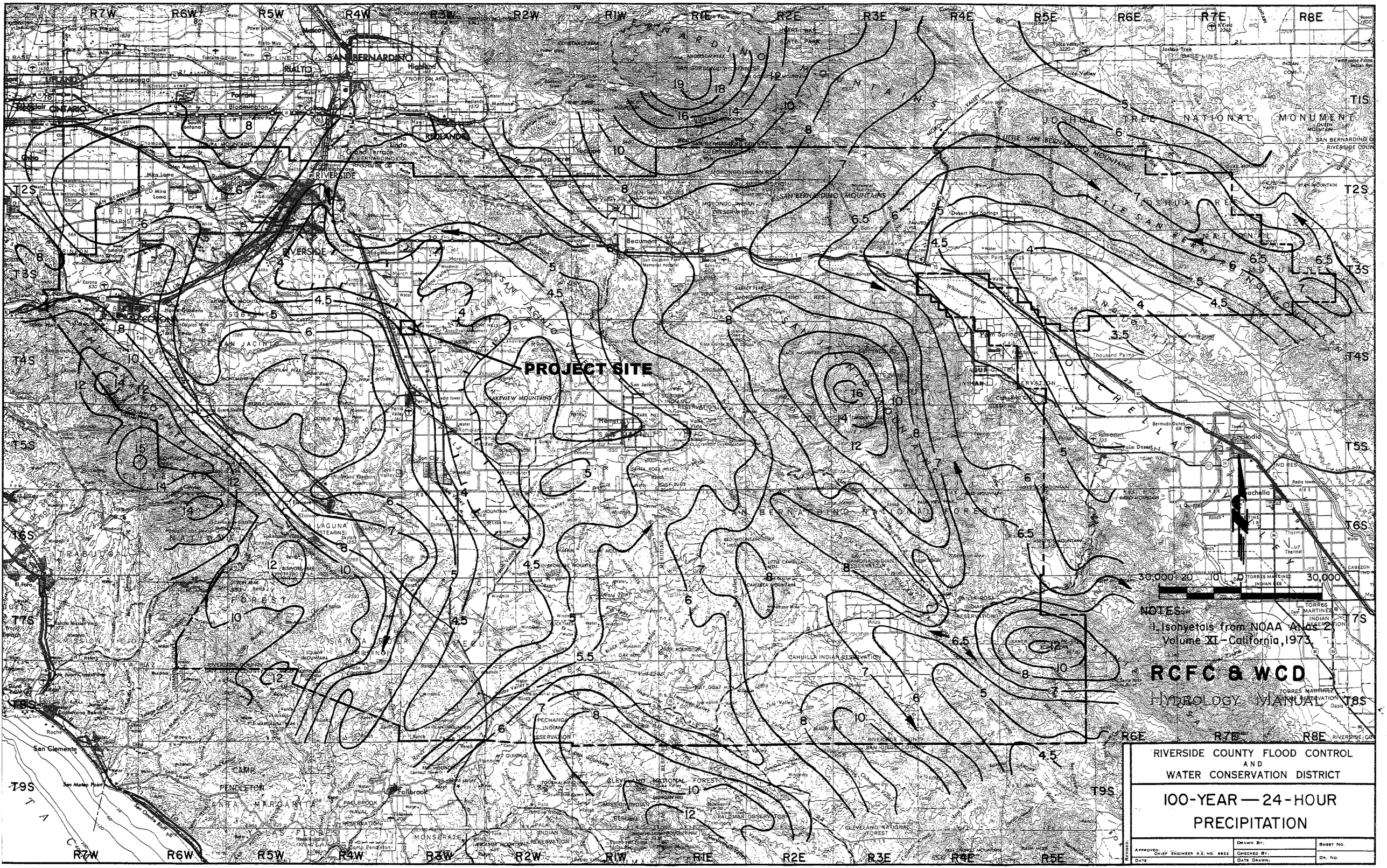
DATE	CHECKED BY:	DR. NO.
	DATE DRAWN:	
REVISED:		

PLATE E-5.5



NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973.

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT	
100-YEAR — 24-HOUR PRECIPITATION	
APPROVED: CHIEF ENGINEER R.E. NO. 8822	DRAWN BY:
DATE	CHECKED BY:
REVISED:	DATE DRAWN:
	SHEET NO.
	DR. NO.

PLATE E-5.6

SECTION 5.1

HYDROLOGY

FREQUENCY: **PROPOSED 10-YEAR**
SOIL CLASS: **B**

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 03/17/21 File:204110a.out

HKI BUSINESS PARK
SUBAREA "A"
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.780(In/Hr)
Slope of intensity duration curve = 0.4900

++

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

Initial area flow distance = 510.000(Ft.)
Top (of initial area) elevation = 1468.200(Ft.)
Bottom (of initial area) elevation = 1461.960(Ft.)
Difference in elevation = 6.240(Ft.)
Slope = 0.01224 s(percent)= 1.22
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.762 min.
Rainfall intensity = 2.002(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900

```
Initial subarea runoff =      2.819(CFS)
Total initial stream area =        1.620(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        2.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
COMMERCIAL subarea type
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     8.76 min.
Rainfall intensity =      2.002(In/Hr) for a    10.0 year storm
Subarea runoff =      1.027(CFS) for      0.590(Ac.)
Total runoff =      3.846(CFS)      Total area =       2.210(Ac.)
End of computations, total study area =            2.21 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 03/17/21 File:204110B.out

HKI BUSINESS PARK
SUBAREA "B"
2041-565-001

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

English (in-lb) Units used in input data file

----------19----------

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.780(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 4.000 to Point/Station 5.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 494.000(Ft.)
Top (of initial area) elevation = 1465.900(Ft.)
Bottom (of initial area) elevation = 1460.850(Ft.)
Difference in elevation = 5.050(Ft.)
Slope = 0.01022 s(percent)= 1.02
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.968 min.
Rainfall intensity = 1.980(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900

```
Initial subarea runoff =      2.580(CFS)
Total initial stream area =        1.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     8.97 min.
Rainfall intensity =      1.980(In/Hr) for a    10.0 year storm
Subarea runoff =      1.015(CFS) for      0.590(Ac.)
Total runoff =      3.595(CFS)      Total area =       2.090(Ac.)
End of computations, total study area =            2.09 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 03/17/21 File:204110C.out

HKI BUSINESS PARK
SUBAREA "C"
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.780(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 7.000 to Point/Station 8.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 535.000(Ft.)
Top (of initial area) elevation = 1464.400(Ft.)
Bottom (of initial area) elevation = 1459.430(Ft.)
Difference in elevation = 4.970(Ft.)
Slope = 0.00929 s(percent)= 0.93
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.438 min.
Rainfall intensity = 1.931(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.868
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900

```
Initial subarea runoff =      2.884(CFS)
Total initial stream area =        1.720(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        8.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.868
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     9.44 min.
Rainfall intensity =      1.931(In/Hr) for a    10.0 year storm
Subarea runoff =      0.989(CFS) for      0.590(Ac.)
Total runoff =      3.873(CFS)      Total area =       2.310(Ac.)
End of computations, total study area =            2.31 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 11/19/20 File:204110D.out

HKI BUSINESS PARK
LANDSCAPE RUN OFF TOWARDS INDIAN AVENUE
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 1

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.780(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 9.000 to Point/Station 10.000
**** INITIAL AREA EVALUATION **** **SUBAREA D**

Initial area flow distance = 25.000(Ft.)
Top (of initial area) elevation = 1464.000(Ft.)
Bottom (of initial area) elevation = 1463.500(Ft.)
Difference in elevation = 0.500(Ft.)
Slope = 0.02000 s(percent)= 2.00
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.626 min.
Rainfall intensity = 2.488(In/Hr) for a 10.0 year storm
UNDEVELOPED (fair cover) subarea

```
Runoff Coefficient = 0.584
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  49.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.160(CFS)
Total initial stream area =        0.110(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =            0.11 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  69.0
```

SECTION 5.2

HYDROLOGY

FREQUENCY: **PROPOSED 25-YEAR**
SOIL CLASS: **B**

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 03/17/21 File:204125a.out

HKI BUSINESS PARK
SUBAREA "A"
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 25.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 25.0
Calculated rainfall intensity data:
1 hour intensity = 0.915(In/Hr)
Slope of intensity duration curve = 0.4900

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

Initial area flow distance = 510.000(Ft.)
Top (of initial area) elevation = 1468.200(Ft.)
Bottom (of initial area) elevation = 1461.960(Ft.)
Difference in elevation = 6.240(Ft.)
Slope = 0.01224 s(percent)= 1.22
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.762 min.
Rainfall intensity = 2.349(In/Hr) for a 25.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900

```
Initial subarea runoff =      3.320(CFS)
Total initial stream area =        1.620(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        2.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     8.76 min.
Rainfall intensity =      2.349(In/Hr) for a    25.0 year storm
Subarea runoff =      1.209(CFS) for      0.590(Ac.)
Total runoff =      4.529(CFS)      Total area =       2.210(Ac.)
End of computations, total study area =            2.21 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 03/17/21 File:204125B.out

1
SUBAREA "B"
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 25.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 25.0
Calculated rainfall intensity data:
1 hour intensity = 0.915(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 4.000 to Point/Station 5.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 494.000(Ft.)
Top (of initial area) elevation = 1465.900(Ft.)
Bottom (of initial area) elevation = 1460.850(Ft.)
Difference in elevation = 5.050(Ft.)
Slope = 0.01022 s(percent)= 1.02
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.968 min.
Rainfall intensity = 2.323(In/Hr) for a 25.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900

```
Initial subarea runoff =      3.038(CFS)
Total initial stream area =        1.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     8.97 min.
Rainfall intensity =      2.323(In/Hr) for a    25.0 year storm
Subarea runoff =      1.195(CFS) for      0.590(Ac.)
Total runoff =      4.234(CFS)      Total area =       2.090(Ac.)
End of computations, total study area =            2.09 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 03/17/21 File:204125C.out

HKI BUSINESS PARK
SUBAREA "C"
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 25.00 Antecedent Moisture Condition = 1

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 25.0
Calculated rainfall intensity data:
1 hour intensity = 0.915(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 7.000 to Point/Station 8.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 535.000(Ft.)
Top (of initial area) elevation = 1464.400(Ft.)
Bottom (of initial area) elevation = 1459.430(Ft.)
Difference in elevation = 4.970(Ft.)
Slope = 0.00929 s(percent)= 0.93
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.438 min.
Rainfall intensity = 2.266(In/Hr) for a 25.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.854
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1) = 36.00
Pervious area fraction = 0.100; Impervious fraction = 0.900

```
Initial subarea runoff =      3.328(CFS)
Total initial stream area =        1.720(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        8.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.854
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     9.44 min.
Rainfall intensity =      2.266(In/Hr) for a    25.0 year storm
Subarea runoff =      1.141(CFS) for      0.590(Ac.)
Total runoff =      4.469(CFS)      Total area =       2.310(Ac.)
End of computations, total study area =            2.31 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 11/19/20 File:204125D.out

HKI BUSINESS PARK
LANDSCAPE AREA ALONG INDIAN AVENUE
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 25.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 25.0
Calculated rainfall intensity data:
1 hour intensity = 0.915(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 9.000 to Point/Station 10.000
**** INITIAL AREA EVALUATION ****SUBAREA D

Initial area flow distance = 25.000(Ft.)
Top (of initial area) elevation = 1464.000(Ft.)
Bottom (of initial area) elevation = 1463.500(Ft.)
Difference in elevation = 0.500(Ft.)
Slope = 0.02000 s(percent)= 2.00
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.626 min.
Rainfall intensity = 2.919(In/Hr) for a 25.0 year storm
UNDEVELOPED (fair cover) subarea

Runoff Coefficient = 0.747
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 0.240(CFS)
Total initial stream area = 0.110(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 0.11 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 69.0

SECTION 5.3

HYDROLOGY

FREQUENCY:	**PROPOSED 100-YEAR**
SOIL CLASS:	**B**

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 03/17/21 File:2041100a.out

SUBAREA "A"
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 3

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

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

Initial area flow distance = 510.000(Ft.)
Top (of initial area) elevation = 1468.200(Ft.)
Bottom (of initial area) elevation = 1461.960(Ft.)
Difference in elevation = 6.240(Ft.)
Slope = 0.01224 s(percent)= 1.22
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.762 min.
Rainfall intensity = 2.875(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3) = 74.80
Pervious area fraction = 0.100; Impervious fraction = 0.900

```
Initial subarea runoff =      4.135(CFS)
Total initial stream area =        1.620(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        2.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     8.76 min.
Rainfall intensity =      2.875(In/Hr) for a   100.0 year storm
Subarea runoff =      1.506(CFS) for      0.590(Ac.)
Total runoff =      5.641(CFS)      Total area =       2.210(Ac.)
End of computations, total study area =            2.21 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 03/17/21 File:2041100B.out

1
SUBAREA "B"
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 3

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 4.000 to Point/Station 5.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 494.000(Ft.)
Top (of initial area) elevation = 1465.900(Ft.)
Bottom (of initial area) elevation = 1460.850(Ft.)
Difference in elevation = 5.050(Ft.)
Slope = 0.01022 s(percent)= 1.02
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.968 min.
Rainfall intensity = 2.842(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3) = 74.80
Pervious area fraction = 0.100; Impervious fraction = 0.900

```
Initial subarea runoff =      3.785(CFS)
Total initial stream area =        1.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     8.97 min.
Rainfall intensity =      2.842(In/Hr) for a   100.0 year storm
Subarea runoff =      1.489(CFS) for      0.590(Ac.)
Total runoff =      5.274(CFS)      Total area =       2.090(Ac.)
End of computations, total study area =            2.09 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 03/17/21 File:2041100C.out

HKI BUSINESS PARK
SUBAREA "C"
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 3

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 7.000 to Point/Station 8.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 535.000(Ft.)
Top (of initial area) elevation = 1464.400(Ft.)
Bottom (of initial area) elevation = 1459.430(Ft.)
Difference in elevation = 4.970(Ft.)
Slope = 0.00929 s(percent)= 0.93
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.438 min.
Rainfall intensity = 2.772(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3) = 74.80
Pervious area fraction = 0.100; Impervious fraction = 0.900

```
Initial subarea runoff =      4.232(CFS)
Total initial stream area =        1.720(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        8.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     9.44 min.
Rainfall intensity =      2.772(In/Hr) for a   100.0 year storm
Subarea runoff =      1.452(CFS) for      0.590(Ac.)
Total runoff =      5.683(CFS)      Total area =       2.310(Ac.)
End of computations, total study area =            2.31 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 11/19/20 File:2041100D.out

HKI BUSINESS PARK
LANDSCAPE AREA ALONG INDIAN AVENUE
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 3

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 9.000 to Point/Station 10.000
**** INITIAL AREA EVALUATION **** **SUBAREA D**

Initial area flow distance = 25.000(Ft.)
Top (of initial area) elevation = 1464.000(Ft.)
Bottom (of initial area) elevation = 1463.500(Ft.)
Difference in elevation = 0.500(Ft.)
Slope = 0.02000 s(percent)= 2.00
TC = k(0.710)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.626 min.
Rainfall intensity = 3.572(In/Hr) for a 100.0 year storm
UNDEVELOPED (fair cover) subarea

Runoff Coefficient = 0.842
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3) = 84.40
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 0.331(CFS)
Total initial stream area = 0.110(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 0.11 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 69.0

SECTION 5.4

HYDROLOGY

EXISTING STREET W/ PROPOSED FLOW – 10, 25 100-YEAR

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 03/17/21 File:2041ST10.out

HKI BUSINESS PARK
HARLEY KNOX BOULEVARD FRONTAGE
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.780(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 3.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 331.000(Ft.)
Top (of initial area) elevation = 1463.210(Ft.)
Bottom (of initial area) elevation = 1461.520(Ft.)
Difference in elevation = 1.690(Ft.)
Slope = 0.00511 s(percent)= 0.51
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.779 min.
Rainfall intensity = 2.000(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900

```
Initial subarea runoff =      0.626(CFS)
Total initial stream area =        0.360(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.360(Ac.)
Runoff from this stream =      0.626(CFS)
Time of concentration =    8.78 min.
Rainfall intensity =     2.000(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Rainfall intensity =      2.002(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =   8.76 min.  Rain intensity =       2.00(In/Hr)
Total area =         2.21(Ac.)  Total runoff =      3.85(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.210(Ac.)
Runoff from this stream =      3.846(CFS)
Time of concentration =    8.76 min.
Rainfall intensity =     2.002(In/Hr)
Summary of stream data:

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


1        0.626      8.78                2.000
2        3.846      8.76                2.002
Largest stream flow has longer or shorter time of concentration
Qp =      3.846 + sum of
        Qa          Tb/Ta
         0.626 *    0.998 =      0.624
Qp =      4.470

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.626       3.846
Area of streams before confluence:
        0.360        2.210
Results of confluence:
```

```
Total flow rate =      4.470(CFS)
Time of concentration =     8.760 min.
Effective stream area after confluence =      2.570(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        6.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1461.520(Ft.)
End of street segment elevation =  1460.350(Ft.)
Length of street segment  =   393.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  40.000(Ft.)
Distance from crown to crossfall grade break  =  28.000(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  =  17.000(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 =      4.916(CFS)
Depth of flow =   0.463(Ft.), Average velocity =   1.664(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.814(Ft.)
Flow velocity =   1.66(Ft/s)
Travel time =    3.94 min.     TC =   12.70  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.670(In/Hr) for a    10.0 year storm
Subarea runoff =      0.809(CFS) for      0.560(Ac.)
Total runoff =      5.280(CFS)      Total area =       3.130(Ac.)
Street flow at end of street =      5.280(CFS)
Half street flow at end of street =      5.280(CFS)
Depth of flow =   0.473(Ft.), Average velocity =   1.694(Ft/s)
Flow width (from curb towards crown)=  17.294(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.130(Ac.)
Runoff from this stream =      5.280(CFS)
Time of concentration =   12.70 min.
Rainfall intensity =     1.670(In/Hr)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Process from Point/Station        6.000 to Point/Station        6.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
```

```
Rainfall intensity =      1.979(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =   8.97 min.  Rain intensity =       1.98(In/Hr)
Total area =         2.09(Ac.)  Total runoff =      3.60(CFS)


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Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.090(Ac.)
Runoff from this stream =      3.595(CFS)
Time of concentration =    8.97 min.
Rainfall intensity =     1.979(In/Hr)
Summary of stream data:

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


1        5.280     12.70                1.670
2        3.595      8.97                1.979
Largest stream flow has longer time of concentration
Qp =      5.280 + sum of
        Qb         Ia/Ib
         3.595 *    0.843 =      3.032
Qp =      8.312

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.280       3.595
Area of streams before confluence:
        3.130        2.090
Results of confluence:
Total flow rate =      8.312(CFS)
Time of concentration =    12.695 min.
Effective stream area after confluence =      5.220(Ac.)


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Process from Point/Station        6.000 to Point/Station        9.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1460.350(Ft.)
End of street segment elevation =  1459.110(Ft.)
Length of street segment  =   331.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  40.000(Ft.)
Distance from crown to crossfall grade break  =  28.000(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  =  17.000(Ft.)
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```
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 =      8.690(CFS)
Depth of flow =   0.529(Ft.), Average velocity =   2.086(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.095(Ft.)
Flow velocity =   2.09(Ft/s)
Travel time =    2.64 min.     TC =   15.34  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.863
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.522(In/Hr) for a    10.0 year storm
Subarea runoff =      0.683(CFS) for      0.520(Ac.)
Total runoff =      8.995(CFS)      Total area =       5.740(Ac.)
Street flow at end of street =      8.995(CFS)
Half street flow at end of street =      8.995(CFS)
Depth of flow =   0.534(Ft.), Average velocity =   2.104(Ft/s)
Flow width (from curb towards crown)=  20.367(Ft.)


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Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.740(Ac.)
Runoff from this stream =      8.995(CFS)
Time of concentration =   15.34 min.
Rainfall intensity =     1.522(In/Hr)


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Process from Point/Station        9.000 to Point/Station        9.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Rainfall intensity =      1.930(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.868
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =   9.44 min.  Rain intensity =       1.93(In/Hr)
Total area =         2.31(Ac.)  Total runoff =      3.87(CFS)


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Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
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Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.310(Ac.)
Runoff from this stream =      3.873(CFS)
Time of concentration =    9.44 min.
Rainfall intensity =     1.930(In/Hr)
Summary of stream data:

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


1        8.995     15.34                 1.522
2        3.873      9.44                 1.930
Largest stream flow has longer time of concentration
Qp =      8.995 + sum of
        Qb         Ia/Ib
         3.873 *    0.788 =      3.053
Qp =     12.048

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.995       3.873
Area of streams before confluence:
        5.740        2.310
Results of confluence:
Total flow rate =     12.048(CFS)
Time of concentration =    15.339 min.
Effective stream area after confluence =      8.050(Ac.)


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Process from Point/Station        9.000 to Point/Station       21.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1459.110(Ft.)
End of street segment elevation =  1458.230(Ft.)
Length of street segment  =   430.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  40.000(Ft.)
Distance from crown to crossfall grade break  =  28.000(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  =  17.000(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 =     12.337(CFS)
Depth of flow =   0.644(Ft.), Average velocity =   1.811(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  25.854(Ft.)
Flow velocity =   1.81(Ft/s)
Travel time =    3.96 min.     TC =   19.30  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.872
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
```

```
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.360(In/Hr) for a    10.0 year storm
Subarea runoff =      0.510(CFS) for      0.430(Ac.)
Total runoff =     12.558(CFS)      Total area =       8.480(Ac.)
Street flow at end of street =     12.558(CFS)
Half street flow at end of street =     12.558(CFS)
Depth of flow =   0.647(Ft.), Average velocity =   1.819(Ft/s)
Flow width (from curb towards crown)=  26.031(Ft.)


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Process from Point/Station       21.000 to Point/Station       21.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    19.30 min.
Rainfall intensity =      1.360(In/Hr) for a    10.0 year storm
Subarea runoff =      0.925(CFS) for      0.790(Ac.)
Total runoff =     13.483(CFS)      Total area =       9.270(Ac.)
End of computations, total study area =            9.27 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.6
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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 03/17/21 File:2041ST25.out

HKI BUSINESS PARK
HARLEY KNOX BOULEVARD FRONTAGE
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 25.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 25.0
Calculated rainfall intensity data:
1 hour intensity = 0.915(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 3.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 331.000(Ft.)
Top (of initial area) elevation = 1463.210(Ft.)
Bottom (of initial area) elevation = 1461.520(Ft.)
Difference in elevation = 1.690(Ft.)
Slope = 0.00511 s(percent)= 0.51
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.779 min.
Rainfall intensity = 2.347(In/Hr) for a 25.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900

```
Initial subarea runoff =      0.737(CFS)
Total initial stream area =        0.360(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.360(Ac.)
Runoff from this stream =      0.737(CFS)
Time of concentration =    8.78 min.
Rainfall intensity =     2.347(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Rainfall intensity =      2.350(In/Hr) for a    25.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =   8.76 min.  Rain intensity =       2.35(In/Hr)
Total area =         2.21(Ac.)  Total runoff =      4.53(CFS)


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Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.210(Ac.)
Runoff from this stream =      4.529(CFS)
Time of concentration =    8.76 min.
Rainfall intensity =     2.350(In/Hr)
Summary of stream data:

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


1        0.737      8.78                2.347
2        4.529      8.76                2.350
Largest stream flow has longer or shorter time of concentration
Qp =      4.529 + sum of
        Qa          Tb/Ta
         0.737 *    0.998 =      0.735
Qp =      5.264

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.737       4.529
Area of streams before confluence:
        0.360        2.210
Results of confluence:
```

```
Total flow rate =      5.264(CFS)
Time of concentration =     8.760 min.
Effective stream area after confluence =      2.570(Ac.)


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Process from Point/Station        3.000 to Point/Station        6.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1461.520(Ft.)
End of street segment elevation =  1460.350(Ft.)
Length of street segment  =   393.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  40.000(Ft.)
Distance from crown to crossfall grade break  =  28.000(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  =  17.000(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 =      5.775(CFS)
Depth of flow =   0.485(Ft.), Average velocity =   1.731(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.915(Ft.)
Flow velocity =   1.73(Ft/s)
Travel time =    3.78 min.     TC =   12.54  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.879
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
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.971(In/Hr) for a    25.0 year storm
Subarea runoff =      0.935(CFS) for      0.540(Ac.)
Total runoff =      6.200(CFS)      Total area =       3.110(Ac.)
Street flow at end of street =      6.200(CFS)
Half street flow at end of street =      6.200(CFS)
Depth of flow =   0.495(Ft.), Average velocity =   1.761(Ft/s)
Flow width (from curb towards crown)=  18.422(Ft.)


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Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.110(Ac.)
Runoff from this stream =      6.200(CFS)
Time of concentration =   12.54 min.
Rainfall intensity =     1.971(In/Hr)


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Process from Point/Station        6.000 to Point/Station        6.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
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```
Rainfall intensity =      2.323(In/Hr) for a    25.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =   8.97 min.  Rain intensity =       2.32(In/Hr)
Total area =         2.09(Ac.)  Total runoff =      4.23(CFS)


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Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.090(Ac.)
Runoff from this stream =      4.234(CFS)
Time of concentration =    8.97 min.
Rainfall intensity =     2.323(In/Hr)
Summary of stream data:

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


1        6.200     12.54                1.971
2        4.234      8.97                2.323
Largest stream flow has longer time of concentration
Qp =      6.200 + sum of
        Qb         Ia/Ib
         4.234 *    0.848 =      3.592
Qp =      9.792

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.200       4.234
Area of streams before confluence:
        3.110        2.090
Results of confluence:
Total flow rate =      9.792(CFS)
Time of concentration =    12.544 min.
Effective stream area after confluence =      5.200(Ac.)


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Process from Point/Station        6.000 to Point/Station        9.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1460.350(Ft.)
End of street segment elevation =  1459.110(Ft.)
Length of street segment  =   331.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  40.000(Ft.)
Distance from crown to crossfall grade break  =  28.000(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  =  17.000(Ft.)
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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 =     10.243(CFS)
Depth of flow =   0.555(Ft.), Average velocity =   2.172(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  21.420(Ft.)
Flow velocity =   2.17(Ft/s)
Travel time =    2.54 min.     TC =   15.08  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.878
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
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.800(In/Hr) for a    25.0 year storm
Subarea runoff =      0.822(CFS) for      0.520(Ac.)
Total runoff =     10.614(CFS)      Total area =       5.720(Ac.)
Street flow at end of street =     10.614(CFS)
Half street flow at end of street =     10.614(CFS)
Depth of flow =   0.561(Ft.), Average velocity =   2.192(Ft/s)
Flow width (from curb towards crown)=  21.717(Ft.)


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Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MINOR STREAMS ****
_______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.720(Ac.)
Runoff from this stream =     10.614(CFS)
Time of concentration =   15.08 min.
Rainfall intensity =     1.800(In/Hr)


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Process from Point/Station        9.000 to Point/Station        9.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
_______________________________________________________________________________
Rainfall intensity =      2.265(In/Hr) for a    25.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =   9.44 min.  Rain intensity =       2.27(In/Hr)
Total area =         2.31(Ac.)  Total runoff =      4.47(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MINOR STREAMS ****
_______________________________________________________________________________
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Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.310(Ac.)
Runoff from this stream =      4.469(CFS)
Time of concentration =    9.44 min.
Rainfall intensity =     2.265(In/Hr)
Summary of stream data:

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


1       10.614     15.08                 1.800
2        4.469      9.44                 2.265
Largest stream flow has longer time of concentration
Qp =     10.614 + sum of
        Qb         Ia/Ib
         4.469 *    0.795 =      3.552
Qp =     14.166

Total of 2 streams to confluence:
Flow rates before confluence point:
      10.614       4.469
Area of streams before confluence:
        5.720        2.310
Results of confluence:
Total flow rate =     14.166(CFS)
Time of concentration =    15.083 min.
Effective stream area after confluence =      8.030(Ac.)


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Process from Point/Station        9.000 to Point/Station       21.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1459.110(Ft.)
End of street segment elevation =  1458.230(Ft.)
Length of street segment  =   430.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  40.000(Ft.)
Distance from crown to crossfall grade break  =  28.000(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  =  17.000(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 =     14.483(CFS)
Depth of flow =   0.679(Ft.), Average velocity =   1.864(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    0.64(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  27.636(Ft.)
Flow velocity =   1.86(Ft/s)
Travel time =    3.84 min.     TC =   18.93  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.876
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
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.611(In/Hr) for a    25.0 year storm
Subarea runoff =      0.564(CFS) for      0.400(Ac.)
Total runoff =     14.730(CFS)      Total area =       8.430(Ac.)
Street flow at end of street =     14.730(CFS)
Half street flow at end of street =     14.730(CFS)
Depth of flow =   0.684(Ft.), Average velocity =   1.866(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    0.86(Ft.)
Flow width (from curb towards crown)=  27.860(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       21.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    18.93 min.
Rainfall intensity =      1.611(In/Hr) for a    25.0 year storm
Subarea runoff =      1.100(CFS) for      0.790(Ac.)
Total runoff =     15.830(CFS)      Total area =       9.220(Ac.)
End of computations, total study area =            9.22 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  58.1
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version 8.0
Rational Hydrology Study Date: 03/17/21 File:2041ST100.out

HKI BUSINESS PARK
HARLEY KNOX BOULEVARD FRONTAGE
2041-565-001

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

English (in-lb) Units used in input data file

Program License Serial Number 6293

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 3

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 3.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 331.000(Ft.)
Top (of initial area) elevation = 1463.210(Ft.)
Bottom (of initial area) elevation = 1461.520(Ft.)
Difference in elevation = 1.690(Ft.)
Slope = 0.00511 s(percent)= 0.51
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.779 min.
Rainfall intensity = 2.872(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000

```
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.918(CFS)
Total initial stream area =        0.360(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.360(Ac.)
Runoff from this stream =      0.918(CFS)
Time of concentration =    8.78 min.
Rainfall intensity =     2.872(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Rainfall intensity =      2.875(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =   8.76 min.  Rain intensity =       2.88(In/Hr)
Total area =         2.21(Ac.)  Total runoff =      5.64(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.210(Ac.)
Runoff from this stream =      5.641(CFS)
Time of concentration =    8.76 min.
Rainfall intensity =     2.875(In/Hr)
Summary of stream data:

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


1        0.918      8.78                 2.872
2        5.641      8.76                 2.875
Largest stream flow has longer or shorter time of concentration
Qp =      5.641 + sum of
        Qa          Tb/Ta
         0.918 *    0.998 =      0.916
Qp =      6.557
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
       0.918       5.641
Area of streams before confluence:
        0.360        2.210
Results of confluence:
Total flow rate =      6.557(CFS)
Time of concentration =     8.760 min.
Effective stream area after confluence =      2.570(Ac.)


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Process from Point/Station        3.000 to Point/Station        6.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1461.520(Ft.)
End of street segment elevation =  1460.350(Ft.)
Length of street segment  =   393.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  40.000(Ft.)
Distance from crown to crossfall grade break  =  28.000(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  =  17.000(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 =      7.168(CFS)
Depth of flow =   0.517(Ft.), Average velocity =   1.825(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.497(Ft.)
Flow velocity =   1.82(Ft/s)
Travel time =    3.59 min.     TC =   12.35  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.892
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
RI index for soil(AMC 3)  =  84.40
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.430(In/Hr) for a   100.0 year storm
Subarea runoff =      1.170(CFS) for      0.540(Ac.)
Total runoff =      7.727(CFS)    Total area =       3.110(Ac.)
Street flow at end of street =      7.727(CFS)
Half street flow at end of street =      7.727(CFS)
Depth of flow =   0.528(Ft.), Average velocity =   1.859(Ft/s)
Flow width (from curb towards crown)=  20.076(Ft.)


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Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
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Stream flow area =      3.110(Ac.)
Runoff from this stream =      7.727(CFS)
Time of concentration =   12.35 min.
Rainfall intensity =     2.430(In/Hr)


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Process from Point/Station        6.000 to Point/Station        6.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Rainfall intensity =      2.842(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =   8.97 min.  Rain intensity =       2.84(In/Hr)
Total area =         2.09(Ac.)  Total runoff =      5.27(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.090(Ac.)
Runoff from this stream =      5.274(CFS)
Time of concentration =    8.97 min.
Rainfall intensity =     2.842(In/Hr)
Summary of stream data:

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


1        7.727     12.35                2.430
2        5.274      8.97                2.842
Largest stream flow has longer time of concentration
Qp =      7.727 + sum of
        Qb         Ia/Ib
         5.274 *    0.855 =      4.509
Qp =     12.236

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.727       5.274
Area of streams before confluence:
        3.110        2.090
Results of confluence:
Total flow rate =     12.236(CFS)
Time of concentration =    12.349 min.
Effective stream area after confluence =      5.200(Ac.)


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Process from Point/Station        6.000 to Point/Station        9.000
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**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________
Top of street segment elevation =  1460.350(Ft.)
End of street segment elevation =  1459.110(Ft.)
Length of street segment  =   331.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  40.000(Ft.)
Distance from crown to crossfall grade break  =  28.000(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  =  17.000(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 =     12.800(CFS)
Depth of flow =   0.594(Ft.), Average velocity =   2.295(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  23.347(Ft.)
Flow velocity =   2.30(Ft/s)
Travel time =    2.40 min.     TC =   14.75  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.891
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
RI index for soil(AMC 3)  =  84.40
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.227(In/Hr) for a   100.0 year storm
Subarea runoff =      1.032(CFS) for      0.520(Ac.)
Total runoff =     13.268(CFS)    Total area =       5.720(Ac.)
Street flow at end of street =     13.268(CFS)
Half street flow at end of street =     13.268(CFS)
Depth of flow =   0.600(Ft.), Average velocity =   2.315(Ft/s)
Flow width (from curb towards crown)=  23.672(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.720(Ac.)
Runoff from this stream =     13.268(CFS)
Time of concentration =   14.75 min.
Rainfall intensity =     2.227(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station        9.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
_____________________________________________________________________
Rainfall intensity =      2.772(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =   9.44 min.  Rain intensity =       2.77(In/Hr)
Total area =         2.31(Ac.)  Total runoff =      5.68(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.310(Ac.)
Runoff from this stream =      5.683(CFS)
Time of concentration =    9.44 min.
Rainfall intensity =     2.772(In/Hr)
Summary of stream data:

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


1       13.268     14.75                 2.227
2        5.683      9.44                 2.772
Largest stream flow has longer time of concentration
Qp =     13.268 + sum of
        Qb         Ia/Ib
         5.683 *    0.803 =      4.566
Qp =     17.835

Total of 2 streams to confluence:
Flow rates before confluence point:
      13.268       5.683
Area of streams before confluence:
        5.720        2.310
Results of confluence:
Total flow rate =     17.835(CFS)
Time of concentration =    14.753 min.
Effective stream area after confluence =      8.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       21.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1459.110(Ft.)
End of street segment elevation =  1458.230(Ft.)
Length of street segment  =   430.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  40.000(Ft.)
Distance from crown to crossfall grade break  =  28.000(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  =  17.000(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 =     18.234(CFS)
Depth of flow =   0.738(Ft.), Average velocity =   1.898(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    3.58(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  30.577(Ft.)
Flow velocity =   1.90(Ft/s)
Travel time =    3.77 min.     TC =   18.53  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.890
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
RI index for soil(AMC 3)  =  84.40
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.992(In/Hr) for a   100.0 year storm
Subarea runoff =      0.709(CFS) for      0.400(Ac.)
Total runoff =     18.544(CFS)    Total area =       8.430(Ac.)
Street flow at end of street =     18.544(CFS)
Half street flow at end of street =     18.544(CFS)
Depth of flow =   0.742(Ft.), Average velocity =   1.902(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    3.79(Ft.)
Flow width (from curb towards crown)=  30.787(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       21.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    18.53 min.
Rainfall intensity =      1.992(In/Hr) for a   100.0 year storm
Subarea runoff =      1.390(CFS) for      0.790(Ac.)
Total runoff =     19.934(CFS)    Total area =       9.220(Ac.)
End of computations, total study area =            9.22 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  58.1
```

SECTION 6.1

HYDRAULIC CALCULATIONS

INLET SIZING (25-YEAR)

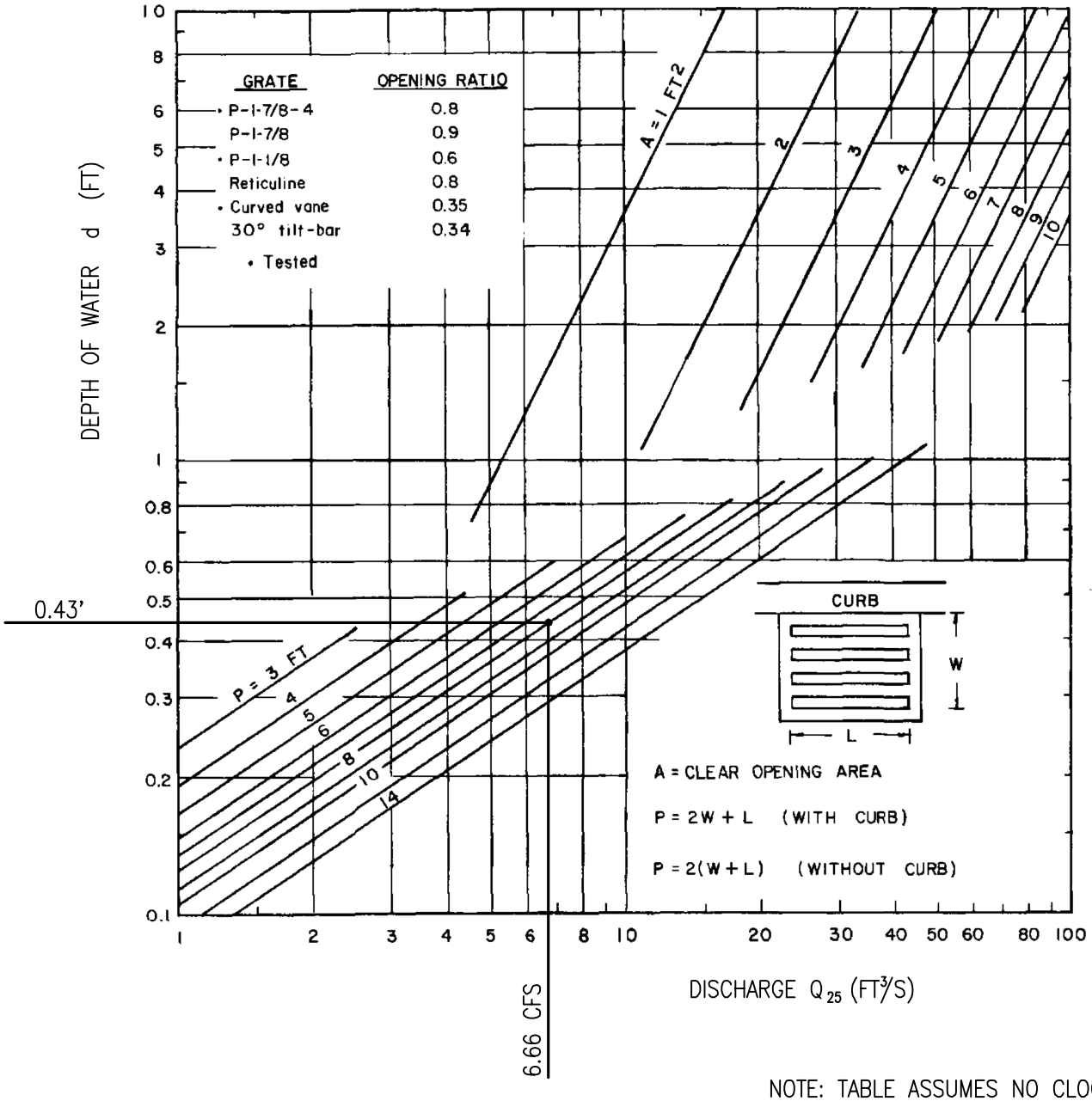
2-24"X24" GRATED INLET FOR AREA A-1, B-1 AND C-1

Q_{25} = 3.24 CFS (A-1), 3.00 (B-1) AND 3.33 (C-1)

P = 2*(2W+L) = 8'

Q X 2 = 3.33 CFS X 2 = 6.66 CFS (CLOGGING ASSUMPTION)

RESULT: 0.43' WHICH IS LESS THAN TOP OF CURB, THEREFORE OK



NOTE: TABLE ASSUMES NO CLOGGING

WALDEN & ASSOCIATES

2552 WHITE RD., SUITE B, IRVINE, CA 92614

(949) 660-0110 FAX: 660-0418

GRATE INLET CAPACITY IN SUMP CONDITION

SOURCE: U.S. DEPARTMENT OF TRANSPORTATION, HEC-22, CHART 9B

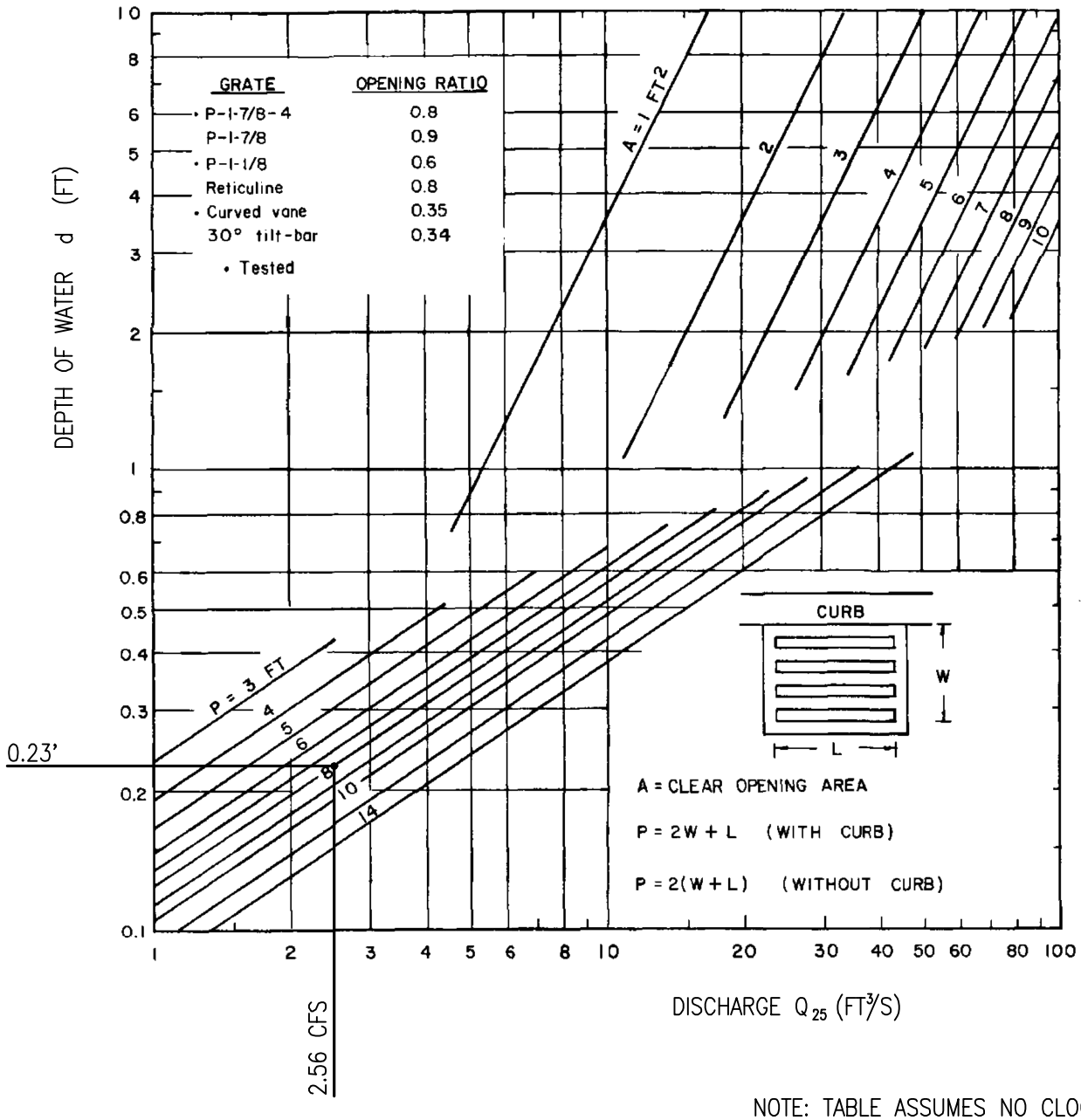
24"X24" GRATED INLET FOR AREA A-2 AND B-2

Q_{25} = 1.25 CFS (A-2) AND 1.28 CFS (B-2)

P = 2*(W+L) = 8'

Q X 2 = 1.28 CFS X 2 = 2.56 CFS (CLOGGING ASSUMPTION)

RESULT: 0.23' WHICH IS LESS THAN TOP OF RIDGE AND BELOW FINISH FLOOR, THEREFORE OK



NOTE: TABLE ASSUMES NO CLOGGING

WALDEN & ASSOCIATES

2552 WHITE RD., SUITE B, IRVINE, CA 92614

(949) 660-0110 FAX: 660-0418

GRATE INLET CAPACITY IN SUMP CONDITION

SOURCE: U.S. DEPARTMENT OF TRANSPORTATION, HEC-22, CHART 9B

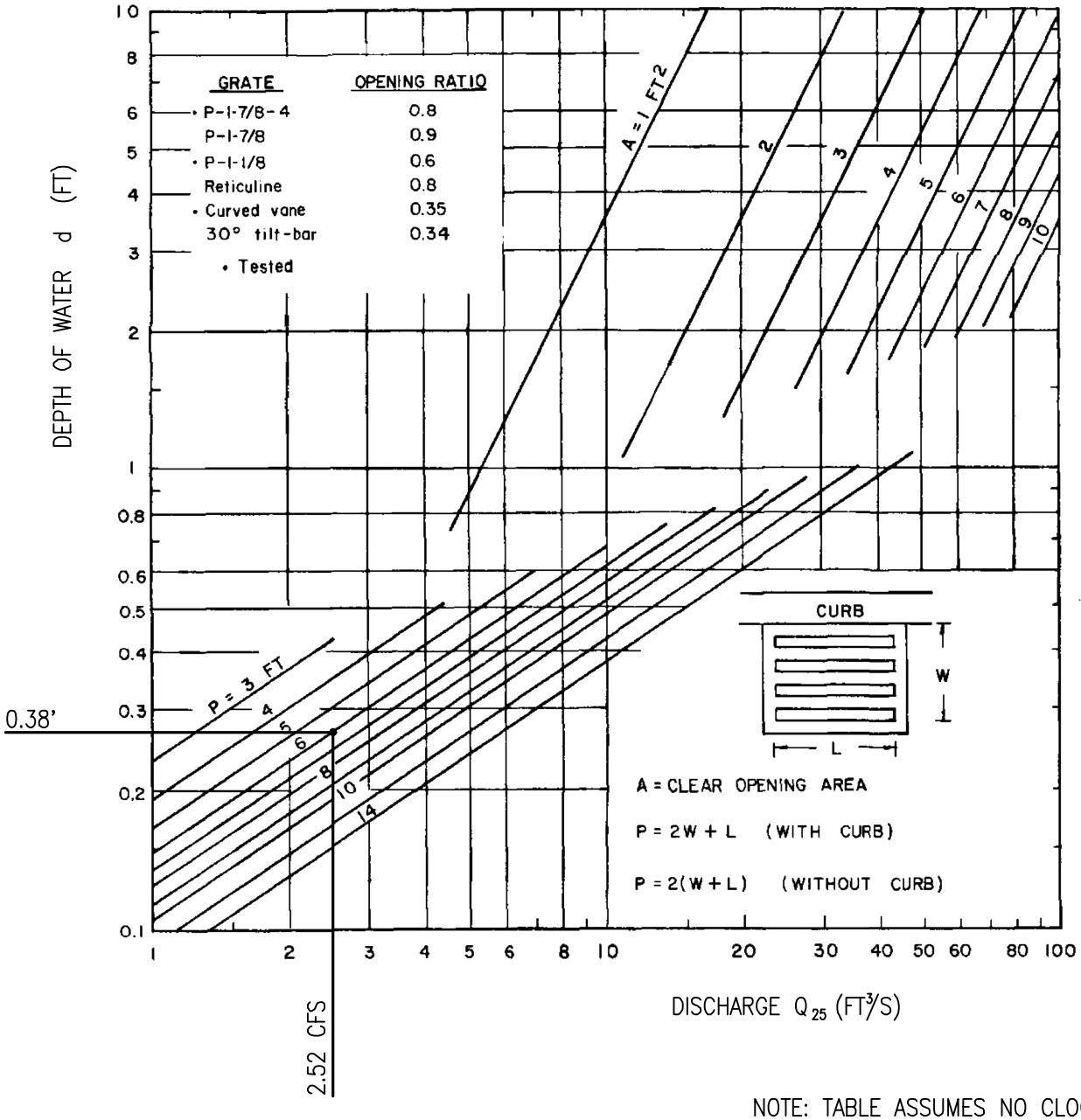
24"X24" GRATED INLET FOR AREA C-2

Q_{25} = 1.26

P = 2W+L = 6'

Q X 2 = 1.28 CFS X 2 = 2.52 CFS (CLOGGING ASSUMPTION)

RESULT: 0.38 WHICH IS LESS THAN TOP OF RIDGE AND BELOW FINISH FLOOR, THEREFORE OK



NOTE: TABLE ASSUMES NO CLOGGING

WALDEN & ASSOCIATES

2552 WHITE RD., SUITE B, IRVINE, CA 92614

(949) 660-0110 FAX: 660-0418

GRATE INLET CAPACITY IN SUMP CONDITION

SOURCE: U.S. DEPARTMENT OF TRANSPORTATION, HEC-22, CHART 9B

SECTION 6.2

HYDRAULIC CALCULATIONS

CULVERT SIZING (25-YEAR)

Cross Section for Culvert for area A

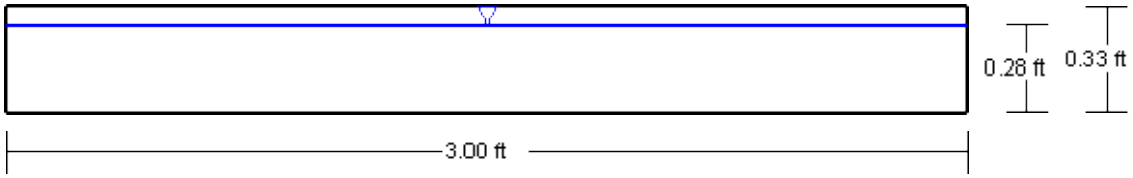
Project Description

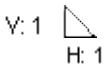
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.02000	ft/ft
Normal Depth	0.28	ft
Height	0.33	ft
Bottom Width	3.00	ft
Discharge	4.49	ft³/s

Cross Section Image





Worksheet for Cross Section for Culvert for area A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.02000	ft/ft
Height	0.33	ft
Bottom Width	3.00	ft
Discharge	4.49	ft³/s

Results

Normal Depth	0.28	ft
Flow Area	0.84	ft²
Wetted Perimeter	3.56	ft
Hydraulic Radius	0.24	ft
Top Width	3.00	ft
Critical Depth	0.41	ft
Percent Full	84.8	%
Critical Slope	0.00609	ft/ft
Velocity	5.35	ft/s
Velocity Head	0.44	ft
Specific Energy	0.72	ft
Froude Number	1.78	
Discharge Full	3.89	ft³/s
Slope Full	0.01503	ft/ft
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	84.80	%
Downstream Velocity	Infinity	ft/s

Worksheet for Cross Section for Culvert for area A

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.28	ft
Critical Depth	0.41	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00609	ft/ft

Cross Section for Culvert for area B

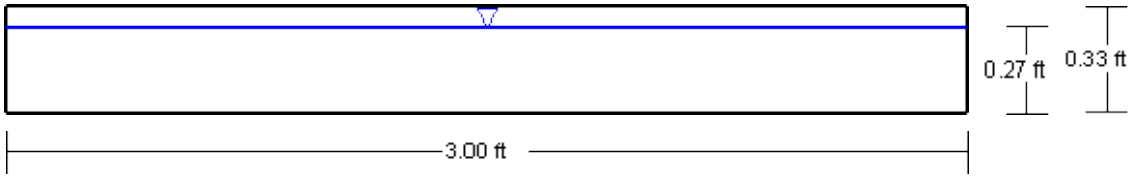
Project Description

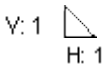
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.02000	ft/ft
Normal Depth	0.27	ft
Height	0.33	ft
Bottom Width	3.00	ft
Discharge	4.27	ft³/s

Cross Section Image





Worksheet for Cross Section for Culvert for area B

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.02000	ft/ft
Height	0.33	ft
Bottom Width	3.00	ft
Discharge	4.27	ft³/s

Results

Normal Depth	0.27	ft
Flow Area	0.81	ft²
Wetted Perimeter	3.54	ft
Hydraulic Radius	0.23	ft
Top Width	3.00	ft
Critical Depth	0.40	ft
Percent Full	82.2	%
Critical Slope	0.00610	ft/ft
Velocity	5.25	ft/s
Velocity Head	0.43	ft
Specific Energy	0.70	ft
Froude Number	1.78	
Discharge Full	3.89	ft³/s
Slope Full	0.01658	ft/ft
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	82.18	%
Downstream Velocity	Infinity	ft/s

Worksheet for Cross Section for Culvert for area B

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.27	ft
Critical Depth	0.40	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00610	ft/ft

Cross Section for Culvert for area C

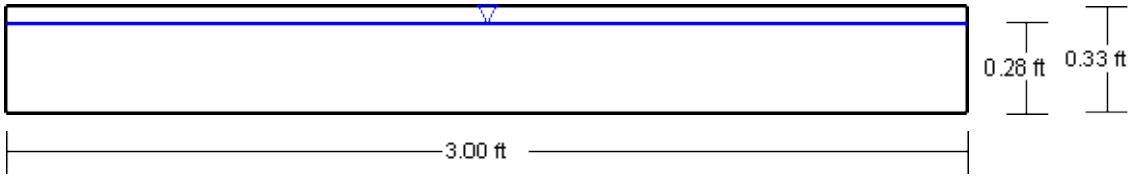
Project Description

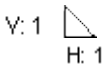
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.02000	ft/ft
Normal Depth	0.28	ft
Height	0.33	ft
Bottom Width	3.00	ft
Discharge	4.59	ft³/s

Cross Section Image





Worksheet for Cross Section for Culvert for area C

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.02000	ft/ft
Height	0.33	ft
Bottom Width	3.00	ft
Discharge	4.59	ft³/s

Results

Normal Depth	0.28	ft
Flow Area	0.85	ft²
Wetted Perimeter	3.57	ft
Hydraulic Radius	0.24	ft
Top Width	3.00	ft
Critical Depth	0.42	ft
Percent Full	86.0	%
Critical Slope	0.00609	ft/ft
Velocity	5.39	ft/s
Velocity Head	0.45	ft
Specific Energy	0.73	ft
Froude Number	1.78	
Discharge Full	3.89	ft³/s
Slope Full	0.01440	ft/ft
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	85.97	%
Downstream Velocity	Infinity	ft/s

Worksheet for Cross Section for Culvert for area C

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.28	ft
Critical Depth	0.42	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00609	ft/ft

SECTION 8.1

APPENDIX

(FEMA)

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

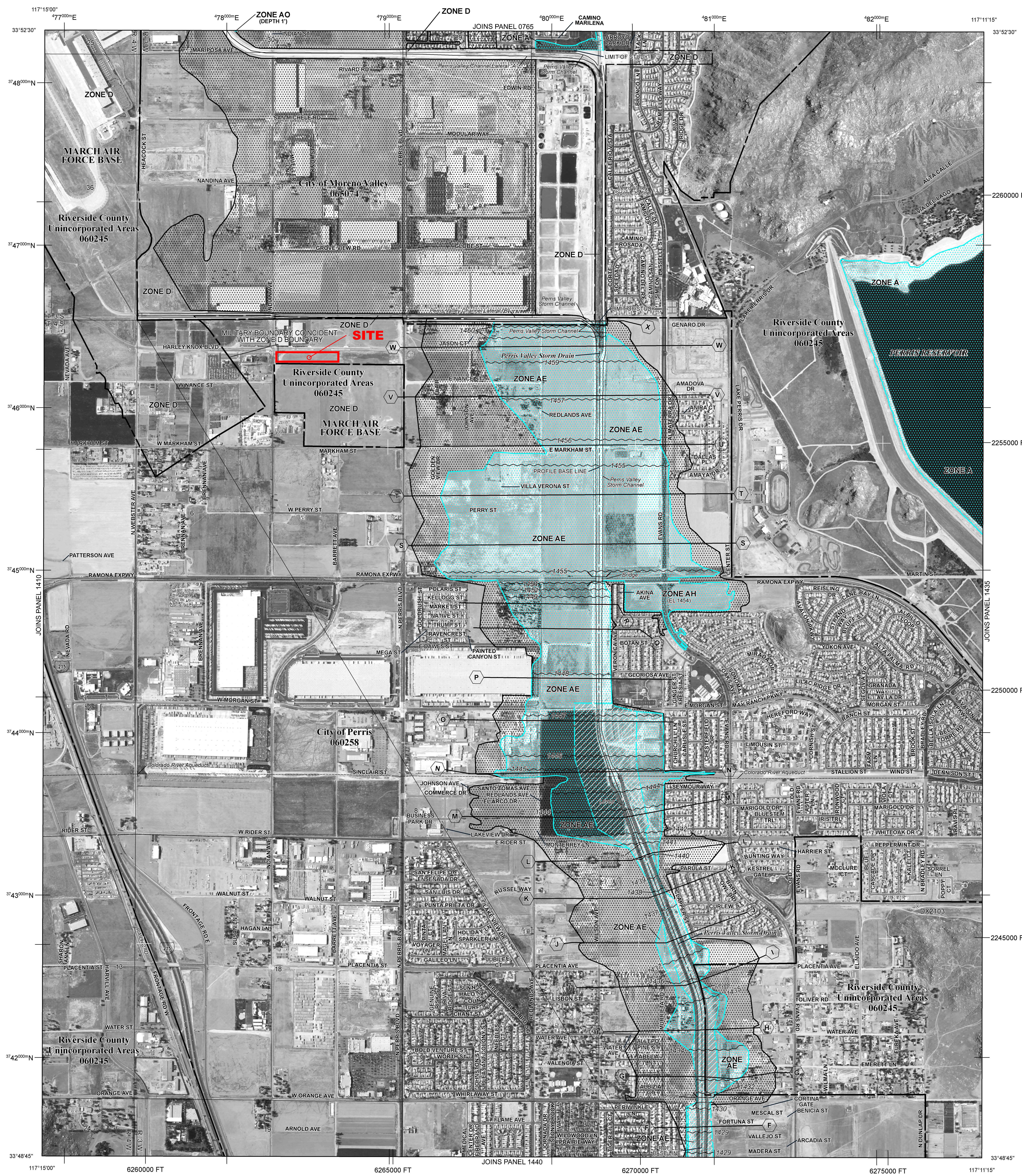
Base map information shown on this FIRM was derived from multiple sources including the Riverside County, CA effective database, and the National Geodetic Survey. Base map imagery for Riverside County, CA is a mosaic of the NAIP 2009 images, 1 meter resolution.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 - - - 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000mE	1000-meter Universal Transverse Mercator grid ticks, zone 11
6000000 FT	5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories List on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
August 18, 2014: for a description of revisions, see Notice to Users page in the Flood Insurance Study report.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 500 1,000 1,500 2,000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1430H

FIRM

FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 1430 OF 3805

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MORENO VALLEY, CITY OF	065074	1430	H
PERRIS, CITY OF	060258	1430	H
RIVERSIDE COUNTY UNINCORPORATED AREAS	060245	1430	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 06065C1430H

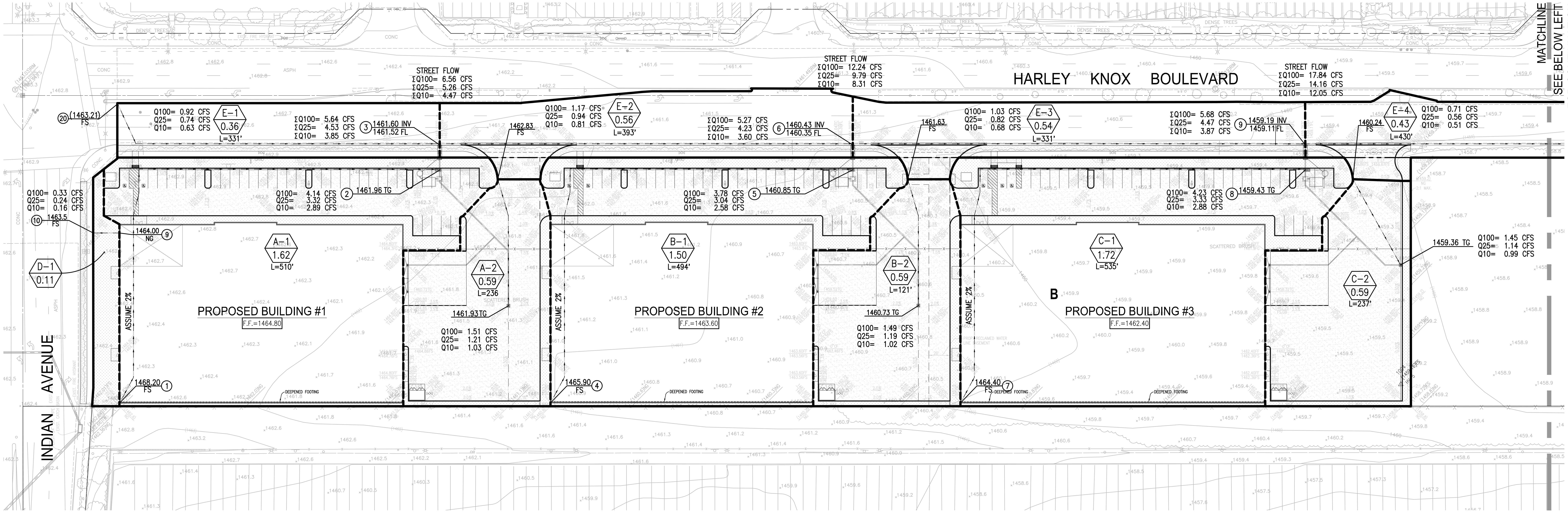
MAP REVISED AUGUST 18, 2014

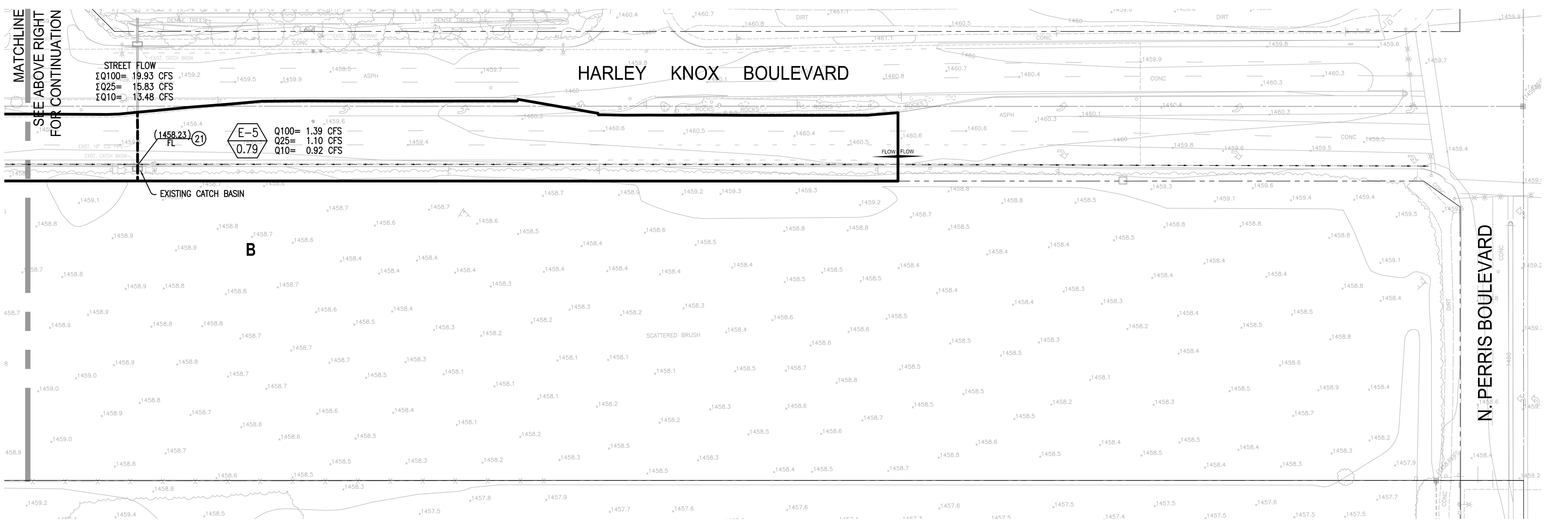
Federal Emergency Management Agency

SECTION 8.2

APPENDIX

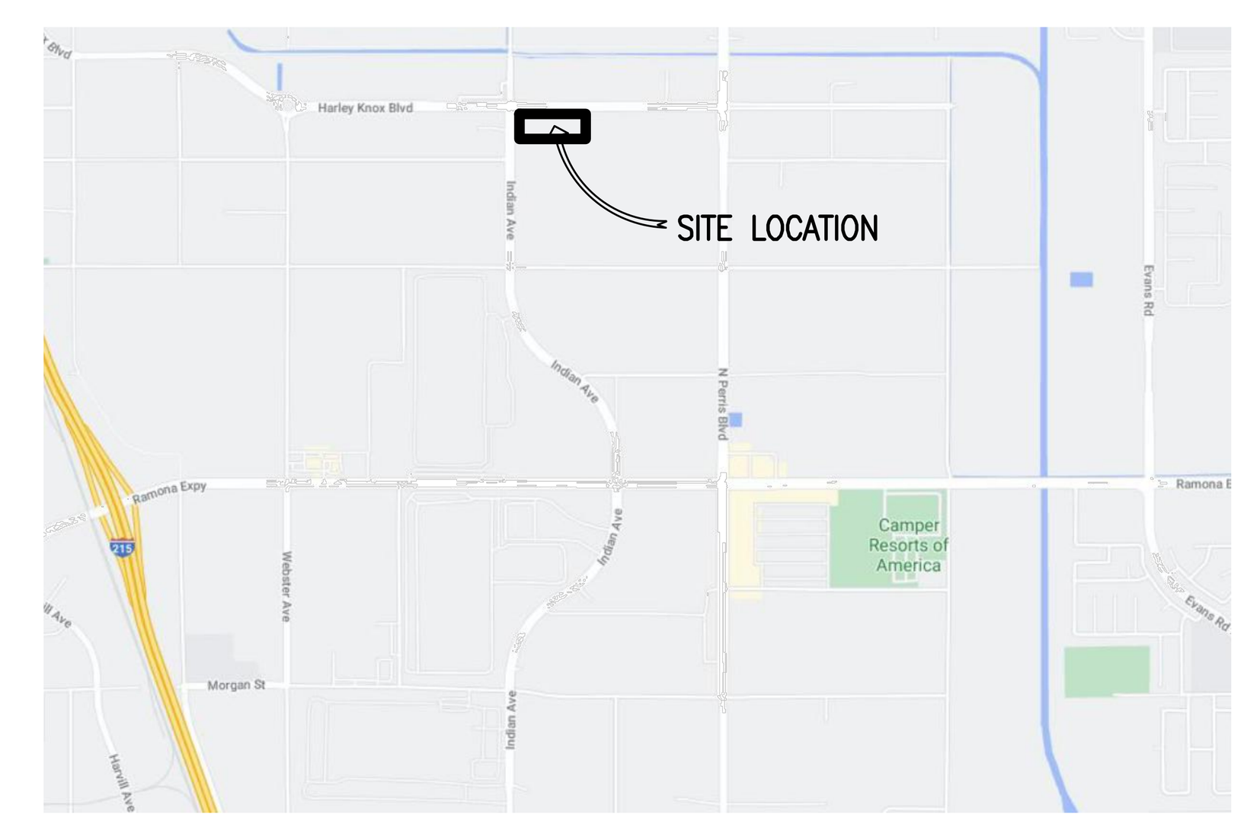
(DRAINAGE MAP)





LEGEND:

A-1 / 1.16	INDICATES TRIBUTARY SUBAREA DESIGNATION INDICATES TRIBUTARY SUBAREA, ACRES
221'	INDICATES TRIBUTARY LENGTH
B	INDICATES HYDROLOGIC SOILS GROUP
1	INDICATES HYDROLOGY STUDY NODE NUMBER
	INDICATES DRAINAGE AREA BOUNDARY INDICATES TRIBUTARY SUBAREA BOUNDARY
Q_{YEAR} =	INDICATES YEAR STORM FREQUENCY FLOW RATE, (cfs)
42.5 / 39.5	INDICATES FS/TG ELEVATION, (ft) INDICATES INV ELEVATION, (ft)
→	INDICATES FLOW DIRECTION
	INDICATES PROPOSED STORM DRAIN SYSTEM



LOCATION MAP
NO SCALE

N

SCALE IN FEET
1 inch = 40 ft.

ALDEN & ASSOCIATES
CIVIL ENGINEERS
LAND SURVEYORS
PLANNERS
2552 WHITE ROAD, SUITE B, IRVINE, CA 92614
(949) 660-0110 FAX: 660-0418

PRELIMINARY HYDROLOGY

FOR

HKI BUSINESS PARK

E. HARLEY KNOX BOULEVARD & INDIAN AVENUE

PERRIS, CALIFORNIA

JOB NUMBER	2041-565-001
DATE:	3/17/2021
DRAWN:	SK
CHECKED:	MV
SHEET	1 OF 1