August 2019

PRELIMINARY HYDROLOGY STUDY

FOR

Tentative Tract 37803

City of Perris

COUNTY OF RIVERSIDE

Prepared For:

UCI Property Development, Inc.
17700 CASTLETON STREET, #128
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PRELIMINARY HYDROLOGY

STUDY

For

TRACT 37803

City of Perris

County of Riverside

August 2019

PREPARED BY: Naila A. Brown

UNDER SUPERVISION OF:

Paul R. Huddleston, Jr., R.C.E. 58020, Exp. 6/30/20 Date:

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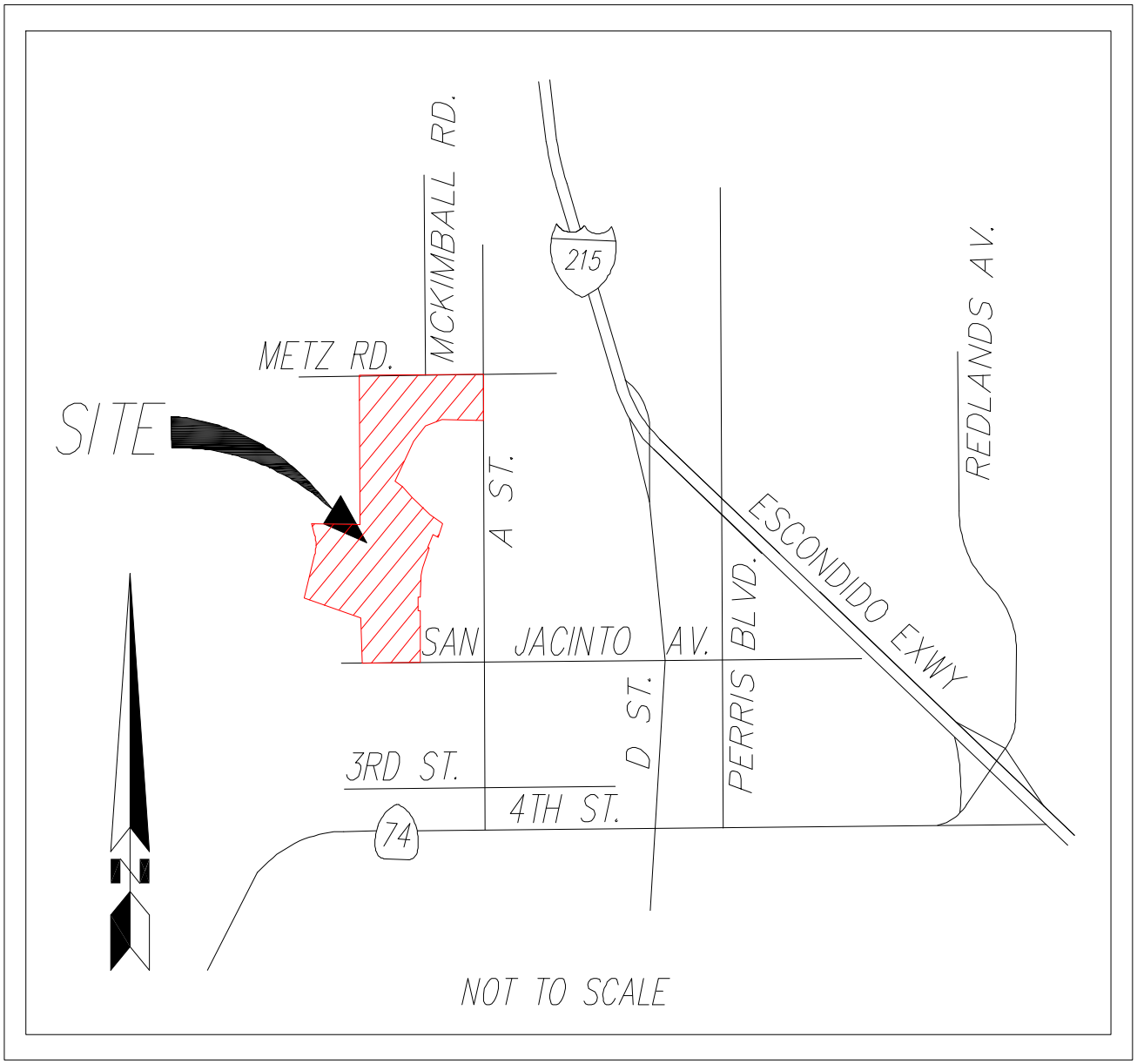
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SECTION 1
INTRODUCTION

A. PROJECT LOCATION

The project site is Tentative Tract Map 37803 in the City of Perris, County of Riverside. The site is bounded by W. San Jacinto Ave. on the south, Metz Road on the north, and "A" Street. on the East (see attached Vicinity Map for details).

Vicinity Map



B. BACKGROUND/STUDY PURPOSE

This Preliminary hydrology study has been prepared by Hunsaker and Associates, Inc for the proposed development of TTM 37803.

The project site encompasses an area of approximately 53.15 acres of onsite with approximately 52.22+/- acres of offsite. There are two drainage areas delineated for this project. Drainage area "A" and "B". The project site is tributary to the San Jacinto River before discharging to Canyon Lake and Lake Elsinore.

Existing Condition

Currently the site is undeveloped, open and drains easterly towards "A "street. The Southern portion drainage area "A" drains Northerly-easterly towards / near intersection of "A" street and Metz Road.

Drainage area "B", drains/ sheets flows at different locations around the site, with easterly direction towards "A " street. *See Exhibit "A"*

Proposed Condition

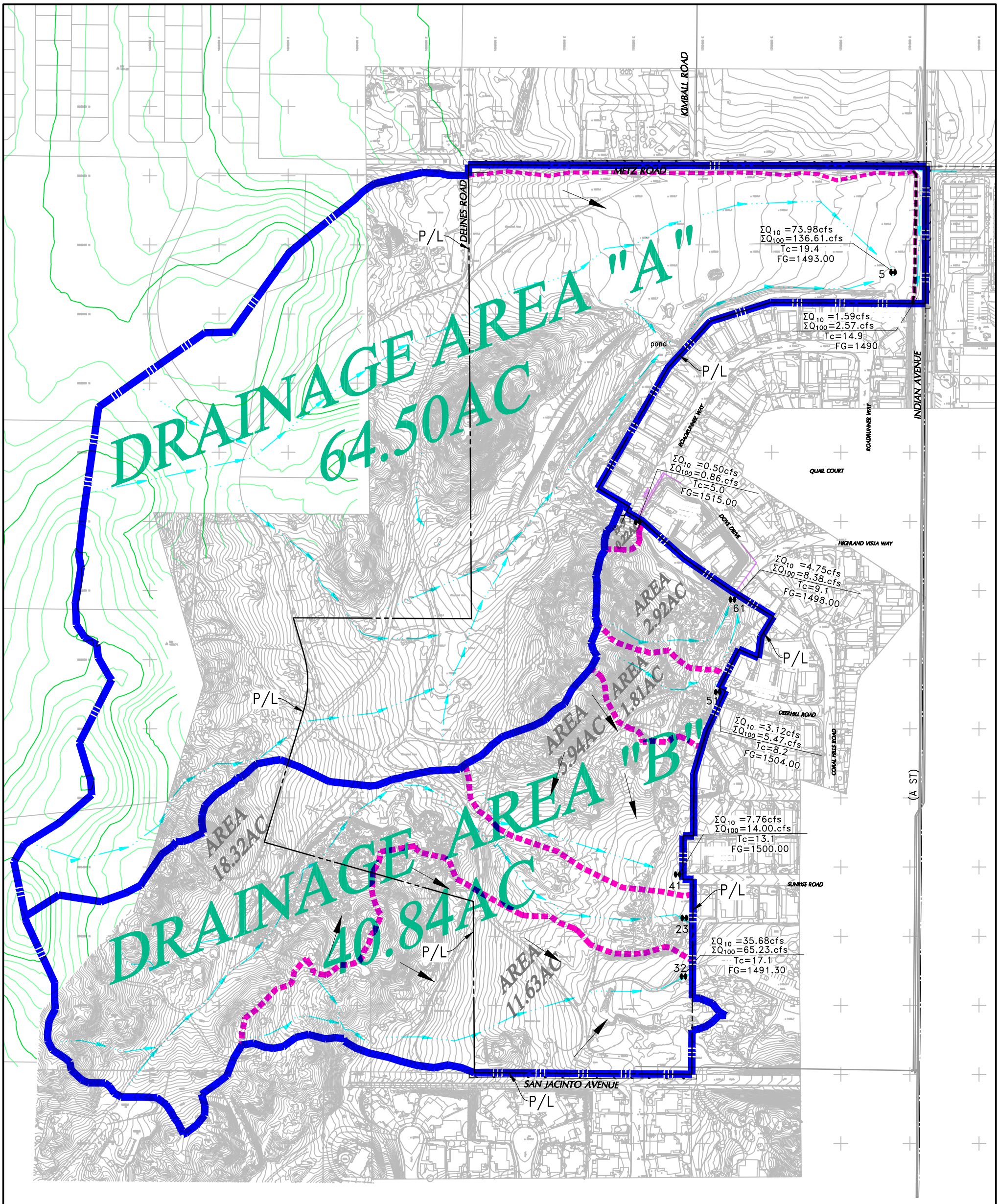
Under proposed condition the Project will be Single Family residential development, with approximately 145 single family homes.

The site consists of drainage Areas "A" & "B" that drain towards Basin 1 and 2 before discharging to the existing Metz Detention basin and existing 60" RCP storm drain at the intersection of San Jacinto Avenue and "C" Street. Both Basins are Bio retention Basins.

Exhibit "B" shows the proposed onsite drainage facilities for TTM 37803. A detailed drainage study is shown on Preliminary Hydrology Maps and Rational analysis attached in section 2.

a. Drainage area "A" and Basin 1

Drainage area "A" of approximately 63.27ac of offsite and onsite is divided into offsite area and onsite area. The offsite storm will be conveyed by proposed offsite storm drains towards Metz Road, while onsite drainage area will be conveyed by separate proposed storm drain line that drains towards and bypassing Basin 1 and connects to Proposed



LEGEND

MAJOR DRAINAGE AREA BOUNDARY	
MINOR DRAINAGE AREA BOUNDARY	
FLOW LINE	
PROPERTY LINE	P/L

SCALE: NOT TO SCALE

EXHIBIT "A"
EXISTING DRAINAGE BOUNDARY
TTM 37803, ONSITE AND OFFSITE
PERRIS, RIVERSIDE CA

PREPARED FOR:
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IRVINE, INC
INLAND EMPIRE REGION
PLANNING/ENGINEERING/SURVEYING/GOVERNMENT RELATIONS

PLOTTED BY: Naila Brown DATE: Aug. 21, 2019 11:08:00 AM FILE: H:\00648\Planning\Hydrology\Maps\Exi-Exhibit A.dwg

"Perris Valley MDP LINE P" that will discharge at Existing Metz Detention Basin ***See Exhibit "B"*** and ***Exhibit "E"*** in Reference section.

Basin 1 is sized as a water quality /Bio retention Basin. Storm from area "A" will bypass Basin 1, diverging low-flows to Basin 1 for water quality treatment. ***See Exhibit "B"***

****Per County staff at RCFC, no detention required from Basin 1, hence flows bypass Basin 1 to Existing Metz Detention Basin.***

Table 1, attached shows the Basin Volume required for water quality with some small street and slopes drainage areas that brings storm to Basin 1. The preliminary basin volume needed is +/-0.42 ac-ft and volume provided is +/- 1.58 ac-ft

b. <u>Drainage area "B" and Basin 2</u>

Drainage area "B" of offsite and onsite will drain towards Detention/ Bio retention Basin 2. The proposed Detention Basin 2 is dual purpose. In addition to providing the needed flow-through detention capacity to limit runoff during major storms, the basin will also have the additional capacity to provide storage of first-flush and nuisance water quality low-flows that will drain to underground Bio Retention media.

The outlet from Basin 2 will be through 24"RCP pipe that will drain/connect to existing 60 "RCP storm drain at intersection of "San Jacinto Ave and "C" Street.

Outflow of 15-20cfs will be added to the approximate location as shown in Exhibit "D", (EXIST.60"RCP) that shows no impact to the downstream water surface elevation.

<u>Basin Routing & Outlet Structure</u>

Storm drain facilities will be sized to intercept 100-year storm flows and route them through Detention Basin 2. Preliminary 100-year storm data and basin routing flows will be sized not to overtop detention basins but also to control the outflows and not impact the existing 60" RCP pipe at intersection of San Jacinto and C" street.

PERRIS TTM 37803 DEVELOPMENT
8/21/2019
BASIN 1

STORAGE CAPACITY CALCULATION

TABLE 1

Elevation (ft)	Contour Interval (ft)	Accumulate Depth (ft)	Area (sqft)	Area (acres)	Mean Area (acres)	Volume (ac-ft)	$Volume_{accumulat}$ (ac-ft)	$Volume_{accumulat}$ (cu-yd)
GRAVEL LAYER 1481.75			7646	0.18			0.0	0.0
SOIL MEDIA 1482.75	1.00	1.00	8369	0.19	0.18	0.07 40% VOID	0.07	118.63
BASIN BOT 1486.00	3.25	4.25	10919	0.25	0.22	0.22 30% VOID	0.29 WQ=0.42	466.89
1490.00	4.00	8.25	17135	0.39	0.32	1.29	1.58	2544.96

(See Exhibit "D" existing storm drain analysis of 60" RCP line, POC at existing 60" RCP at intersection of San Jacinto and "C" street, and Exhibit "F" for location of Proposed Perris Valley MDP Line "P")

The 100-year storm routing for Basin 2, resulted in attenuation of 100 year storms will be analyzed and incorporated during final design stage.

Table 2, attached shows the Basin Volume required for Detention during 100 year storm, which will be sized to accommodate the drainage area that contributes flows to Basin 2.
The preliminary basin volume needed per 10year 24hrs unit hydrograph is 2.80 ac-ft and volume provided is +/- 4.29 ac-ft *(See unit hydrograph study section 2 of this report)*

c. Onsite Drainage Facilities

In the proposed condition, runoff from residential units will be conveyed as sheet flows, gutter flows and area drain flows to the proposed project storm drain lines. Runoff from streets and parking areas will be conveyed as gutter flows to catch basins prior to discharging to the proposed storm drain system located around the site.

To satisfy the project requirements for Low Impact Development (LID) BMP's, and to address storm water pollutants of concern, the project proposed Detention/Water Quality Basin 1 & 2 (Bio retention) that are sized to detain some runoff required to mitigate peak flows and to retain water quality flows.

The 100-year design discharges used are based on the enclosed hydrology analysis for both existing and developed condition and are shown on hydrology maps.

PRO.PERRIS VALLEY MDP LINE P
TEMP.INLET LOCATION
FUTURE PER RCFC

PRO.PERRIS VALLEY MDP LINE P
FUTURE PER RCFC

PRO.PERRIS VALLEY MDP LINE P
FUTURE PER RCFC

ΣQ 10=29.79cfs
ΣQ100 =54.0cfs
Tc=16.0
INV=1486.0
Total Onsite flows

ΣQ10 =47.72cfs
ΣQ100=86.80.cfs
Tc=17.1
INV=1493

DIVERSION MH
STRUCTURE

BASIN 1
WATER QUALITY

DS

ΣQ10 =13.13cfs
ΣQ100=23.71.cfs
Tc=14.2
INV=1493.20

ΣQ10 =20.33cfs
ΣQ100=36.86.cfs
Tc=15.0
INV=1489.46

ΣQ10 =28.98cfs
ΣQ100=52.68.cfs
Tc=15.9
INV=1494.20

ΣQ10 =0.70cfs
ΣQ100=1.40.cfs
DRAINAGE DITCH
AREA=0.69AC

ΣQ10 =0.54cfs
ΣQ100=0.88.cfs

P/L

P/L

P/L

P/L

P/L

P/L

OFFSITE AREA TO
TTM 37803
OFFSITE PRO.STORM DRAIN

ΣQ10 =28.76cfs
ΣQ100=52.32.cfs
Tc=15.6
INV=1504.7

206

ΣQ10 =0.50cfs
ΣQ100=0.86.cfs
Tc=5.0
FG=1515.00

71

ΣQ10 =28.20cfs
ΣQ100=51.24.cfs
Tc=15.0
INV=1511.52

ΣQ10 =4.75cfs
ΣQ100=8.38.cfs
Tc=9.1
FG=1498.00

61

AREA
2.92AC

ΣQ10 =21.00cfs
ΣQ100=38.08.cfs
Tc=13.9
INV=1532.10

ΣQ10 =21.91cfs
ΣQ100=39.71.cfs
Tc=14.7
INV=1523

AREA
1.81AC

ΣQ10 =3.12cfs
ΣQ100=5.47.cfs
Tc=8.2
FG=1504.00

51

ΣQ10 =5.56cfs
ΣQ100=9.94.cfs
Tc=12.3
INV=1520.62

AREA
0.94AC

ΣQ10 =16.17cfs
ΣQ100=29.22.cfs
Tc=13.8
inv=1535

ΣQ10 =27.65cfs
ΣQ100=50.07.cfs
Tc=14.8
INV=1509

ΣQ10 =22.56cfs
ΣQ100=40.79.cfs
Tc=14.3
FS=1521

ΣQ10 =22.9Xcfs
ΣQ100=41.19cfs
Tc=14.4
INV=1520.0

ΣQ10 =1.62cfs
ΣQ100=2.84.cfs

ΣQ10 =34.35cfs
ΣQ100=62.28.cfs
Tc=15.2
INV=1501.00

OFFSITE AREA TO
TTM 37803- BASIN 2

ΣQ10 =7.73cfs
ΣQ100=13.71.cfs
Tc=10.3
INV=1501.2

ΣQ10 =45.05cfs
ΣQ100=81.47.cfs
Tc=15.3
FS=1497.00

BASIN 2
DETENTION/WQ

OS

PRO.24"RCP TO
EXIST. 60"RCP
AT "SAN JACINTO" & "C"ST

TRACT NO. 21372
M.B. 184/98-99
R-7
RESIDENTIAL

TRACT NO. 22910-1
M.B. 217/72-76
R-4
RESIDENTIAL

TRACT NO. 11501
M.B. 96/97
R-7 RESIDENTIAL

WISE & KNIGHTS
SUBDIVISION
M.B. 2/49
R-4
RESIDENTIAL

P.M. 8483
P.M. 34/98
R-7
RESIDENTIAL

P.M. 7760
P.M. 33/38
R-7
RESIDENTIAL

P.M. 8283
P.M. 174/7
R-4
RESIDENTIAL

DE LINE'S SUBDIVISION
M.B. 1/24
R-7
RESIDENTIAL

PERRIS UNION High SCHOOL DISTRICT PUBLIC FACILITIES

EGADOTA FARMS
RE-EXCLUSION MAP M.B.
18/88
PUBLIC FACILITIES

QUAIL COURT

GRAND VISTA WAY

COLUMBINE CT

SUNRISE ROAD

W SAN JACINTO AVENUE

NORTH A STREET

SOUTH A STREET

CEDAR HILLS ROAD

EX 18" PVC, C-905 WATER DR-18, 19' W C 1705 P.Z.

EX 20" WATER 1627 P.Z.

EX 20" CML&C WATER PER DWG D-13

EX 8" ACP CL150 PER D13

EX 8" VCP SEWER PER D-11847

EX 18" PVC C-905 DR-18, 3' S/CL 1705 P.Z.

LEGEND

	DRAINAGE AREA BOUNDARY
FLOW LINE	
PROPERTY LINE	P/L
EXISTING	EX.
BLUE TEXT	OFFSITE FLOWS AT CONFLUENCE POINT
	PROPOSED CATCH BASINS
	PROPOSED MDP "LINE P" STORM DRAIN
	PROPOSED STORM DRAIN– ONSITE
	PROPOSED STORM DRAIN– OFFSITE

SCALE: NOT TO SCALE

EXHIBIT "B"
PROPOSED DRAINAGE FACILITIES
TTM 37803, ONSITE AND OFFSITE AREAS
PERRIS, RIVERSIDE CA

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PERRIS TTM 37803 DEVELOPMENT
8/21/2019
BASIN 2
PRELIMINARY STORAGE CAPACITY CALCULATION

TABLE 2

Elevation (ft)	Contour Interval (ft)	Accumulate Depth (ft)	Area (sqft)	Area (acres)	Mean Area (acres)	Volume (ac-ft)	$Volume_{accumulat}$ (ac-ft)	$Volume_{accumulat}$ (cu-yd)
GRAVEL LAYER 1492.25			4793	0.11			0.0	0.0
SOIL MEDIA 1493.25	1.00	1.00	5808	0.13	0.12	0.05 40% VOID	0.05	78.53
BASIN BOTTOM 1496.50	3.25	4.25	9027	0.21	0.17	0.17 30% VOID	0.21	0.0
1500.75	4.25	8.50	17236	0.40	0.30	1.28	0.34WQ 1.50	2413.38
1506.00	5.25	13.75	29088	0.67	0.53	2.79	4.29	6917.10

DRAINAGE AREA
24.59 AC

BASIN 1
WATER QUALITY

ONSITE AREA "A" TO
WQ/BIORETENTION
BASIN # 1

B

L=2503'
Lc=1404.60'
ΔELV=132.50'

CENTROID

ONSITE&OFFSITE AREA "B" TO
TO BASIN 2
36.00AC

1629.00 EL

BASIN 2
DETENTION/WQ

LEGEND

- DRAINAGE AREA BOUNDARY TO BASIN 1 – WQ LOW FLOWS
- DRAINAGE SUBAREA BOUNDARY TO BASIN 2–DETENTION/WQ
- EL.1419.9 ELEVATION
- FLOW LINE
- B SOIL GROUP

SCALE: NOT TO SCALE

EXHIBIT "C"
UNIT HYDROGRAPH-BASIN 2
TTM 37803, ONSITE AND OFFSITE
PERRIS, RIVERSIDE CA

PREPARED FOR:
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H&A
HUNSAKER & ASSOCIATES
IRVINE, INC
INLAND EMPIRE REGION
PLANNING/ENGINEERING/SURVEYING/GOVERNMENT RELATIONS

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Table 3. Hydrology Summary Table 100-year Storm Runoff

DRAINAGE ID ONSITE AND OFFSITE	EXISTING CONDITION		PROPOSED CONDITION		Δ FLOWS (CFS)	Findings
	Area (Ac)	Q100 (cfs)	Area (Ac)	Q100 (cfs)		
AREA A	64.50	139.18	63.27	140.80	+1.62	Area Decrease Q100 Increase
AREA B	40.84	93.90	41.89	98.90	+5.00	Area increases Q100 Increases
TOTAL STUDY AREA	105.34		105.16			Area decreases -0.18ac

C. METHODOLOGY

Hydrology Analysis:

The RCFC Hydrology Manual was used to develop the hydrology parameters for the rational method. The calculations were performed using the computer program developed by CivilD.

The existing soil types is Soil B and as shown in proposed hydrology map per TR 37803 attached and used for this study. Hydrological soils map was obtained from RCFC Hydrology Manual. The ¼ acre residential lots were analyzed as 50% impervious area, which is recommended value in the Manual.

D. CONCLUSION

100-year flows discharged from the proposed project will been controlled by Basin 2, while Basin 1 is water quality basin only. The outflow from Basin 2 will be determine during final design stage.

In addition to the controlled outflow from the site (Basin 2), water quality Bio Retention Media will be sized to treat first flush flows (water quality flows) and nuisance runoff prior to discharging into Existing facilities, thus there will be no impact to downstream facilities due to the proposed project

SECTION 2

EXISTING
RATIONAL HYDROLOGY

AREA “A”

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/16/19 File:EXA.out

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

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

Program License Serial Number 6406

EXISTING HYDROLOGY STUDY, TTM 37803
CITY OF PERRIS, RIVERSIDE CA
100 YEAR STORM, ONSITE AND OFFSITE DRAINAGE AREA "A"

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

2 year, 1 hour precipitation = 0.500(In.)
100 year, 1 hour precipitation = 1.300(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5000

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

Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1645.000(Ft.)
Bottom (of initial area) elevation = 1552.000(Ft.)
Difference in elevation = 93.000(Ft.)
Slope = 0.09300 s(percent)= 9.30
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.508 min.
Rainfall intensity = 2.740(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.853
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) = 89.80
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 15.796(CFS)
Total initial stream area = 6.760(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 2.000 to Point/Station 3.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1552.000(Ft.)
End of natural channel elevation = 1517.000(Ft.)
Length of natural channel = 880.000(Ft.)
Estimated mean flow rate at midpoint of channel = 41.664(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow = 7.33(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0398
Corrected/adjusted channel slope = 0.0398
Travel time = 2.00 min. TC = 15.51 min.

Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.850
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) = 89.80
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.557(In/Hr) for a 100.0 year storm
Subarea runoff = 48.100(CFS) for 22.140(Ac.)
Total runoff = 63.896(CFS) Total area = 28.900(Ac.)

++
Process from Point/Station 3.000 to Point/Station 4.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1517.000(Ft.)
End of natural channel elevation = 1504.000(Ft.)
Length of natural channel = 740.000(Ft.)
Estimated mean flow rate at midpoint of channel = 71.966(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow = 5.70(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0176
Corrected/adjusted channel slope = 0.0176
Travel time = 2.16 min. TC = 17.67 min.

Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.846
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.395(In/Hr) for a   100.0 year storm
Subarea runoff =     14.802(CFS) for      7.300(Ac.)
Total runoff =     78.698(CFS)    Total area =      36.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1504.000(Ft.)
End of natural channel elevation =   1493.000(Ft.)
Length of natural channel  =   673.000(Ft.)
Estimated mean flow rate at midpoint of channel =     81.046(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   5.70(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0163
Corrected/adjusted channel slope =  0.0163
Travel time =    1.97 min.     TC =   19.64  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.844
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.272(In/Hr) for a   100.0 year storm
Subarea runoff =      4.141(CFS) for      2.160(Ac.)
Total runoff =     82.840(CFS)    Total area =      38.360(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     38.360(Ac.)
Runoff from this stream =     82.840(CFS)
Time of concentration =   19.64 min.
Rainfall intensity =     2.272(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station        5.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   650.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    55.000(Ft.)
Slope =    0.08462  s(percent)=       8.46
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.586 min.
Rainfall intensity =      2.958(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.856
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     11.727(CFS)
Total initial stream area =        4.630(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.200 to Point/Station        5.300
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1560.000(Ft.)
End of natural channel elevation =   1508.000(Ft.)
Length of natural channel  =  1007.000(Ft.)
Estimated mean flow rate at midpoint of channel =     28.228(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   7.48(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0516
Corrected/adjusted channel slope =  0.0516
Travel time =    2.24 min.     TC =   13.83  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.852
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.708(In/Hr) for a   100.0 year storm
Subarea runoff =     30.072(CFS) for     13.030(Ac.)
Total runoff =     41.799(CFS)    Total area =      17.660(Ac.)
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Process from Point/Station        5.300 to Point/Station        5.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1508.000(Ft.)
End of natural channel elevation =   1493.000(Ft.)
Length of natural channel  =  1015.000(Ft.)
Estimated mean flow rate at midpoint of channel =     50.663(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   4.72(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
         Normal channel slope =  0.0148
Corrected/adjusted channel slope =  0.0148
Travel time =    3.58 min.     TC =   17.41  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.847
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.413(In/Hr) for a   100.0 year storm
Subarea runoff =     15.307(CFS) for      7.490(Ac.)
Total runoff =     57.106(CFS)    Total area =      25.150(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     25.150(Ac.)
Runoff from this stream =     57.106(CFS)
Time of concentration =   17.41 min.
Rainfall intensity =     2.413(In/Hr)
Summary of stream data:

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


1       82.840     19.64           2.272
2       57.106     17.41           2.413
Largest stream flow has longer time of concentration
Qp =     82.840 + sum of
           Qb         Ia/Ib
           57.106 *    0.942 =     53.769
Qp =    136.609

Total of 2 main streams to confluence:
Flow rates before confluence point:
      82.840      57.106
Area of streams before confluence:
       38.360       25.150


Results of confluence:
Total flow rate =    136.609(CFS)
Time of concentration =    19.640 min.
Effective stream area after confluence  =     63.510(Ac.)


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Process from Point/Station        6.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1522.000(Ft.)
Bottom (of initial area) elevation =  1497.000(Ft.)
Difference in elevation =    25.000(Ft.)
Slope =    0.02500  s(percent)=       2.50
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.943 min.
Rainfall intensity =      3.193(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 =      1.533(CFS)
Total initial stream area =        0.540(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station        7.000 to Point/Station        8.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1497.000(Ft.)
End of street segment elevation =  1490.000(Ft.)
Length of street segment  =   650.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  32.000(Ft.)
Distance from crown to crossfall grade break  =  30.000(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 =  0.167(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      2.082(CFS)
Depth of flow =   0.173(Ft.), Average velocity =   2.148(Ft/s)
Streetflow hydraulics at midpoint of street travel:
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Halfstreet flow width =   9.978(Ft.)
Flow velocity =   2.15(Ft/s)
Travel time =    5.04 min.     TC =   14.99  min.
 Adding area flow to street
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
Rainfall intensity =      2.601(In/Hr) for a   100.0 year storm
Subarea runoff =      1.038(CFS) for      0.450(Ac.)
Total runoff =      2.571(CFS)    Total area =       0.990(Ac.)
Street flow at end of street =      2.571(CFS)
Half street flow at end of street =      2.571(CFS)
Depth of flow =   0.189(Ft.), Average velocity =   2.266(Ft/s)
Flow width (from curb towards crown)=  10.773(Ft.)
End of computations, total study area =           64.50 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.986
Area averaged RI index number =  77.7
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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 08/16/19  File:EXA.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

------------------------------------------------------------------------
Program License Serial Number 6406
------------------------------------------------------------------------
EXISTING HYDROLOGY STUDY, TTM 37803
CITY OF PERRIS, RIVERSIDE CA
10 YEAR STORM, ONSITE AND OFFSITE DRAINAGE AREA "A"
------------------------------------------------------------------------
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

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.829(In/Hr)
Slope of intensity duration curve = 0.5000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1645.000(Ft.)
Bottom (of initial area) elevation =  1552.000(Ft.)
Difference in elevation =    93.000(Ft.)
Slope =    0.09300  s(percent)=       9.30
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.508 min.
Rainfall intensity =      1.747(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.741
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.749(CFS)
Total initial stream area =        6.760(Ac.)
Pervious area fraction = 1.000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1552.000(Ft.)
End of natural channel elevation =   1517.000(Ft.)
Length of natural channel  =   880.000(Ft.)
Estimated mean flow rate at midpoint of channel =     23.075(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   6.21(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0398
Corrected/adjusted channel slope =  0.0398
Travel time =    2.36 min.     TC =   15.87  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.730
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.612(In/Hr) for a    10.0 year storm
Subarea runoff =     26.049(CFS) for     22.140(Ac.)
Total runoff =     34.798(CFS)     Total area =      28.900(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1517.000(Ft.)
End of natural channel elevation =   1504.000(Ft.)
Length of natural channel  =   740.000(Ft.)
Estimated mean flow rate at midpoint of channel =     39.193(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   4.78(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0176
Corrected/adjusted channel slope =  0.0176
Travel time =    2.58 min.     TC =   18.45  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.719
Decimal fraction soil group A = 0.000
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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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.495(In/Hr) for a    10.0 year storm
Subarea runoff =      7.850(CFS) for      7.300(Ac.)
Total runoff =     42.648(CFS)    Total area =      36.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1504.000(Ft.)
End of natural channel elevation =   1493.000(Ft.)
Length of natural channel  =   673.000(Ft.)
Estimated mean flow rate at midpoint of channel =     43.920(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   4.77(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0163
Corrected/adjusted channel slope =  0.0163
Travel time =    2.35 min.     TC =   20.80  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.710
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.408(In/Hr) for a    10.0 year storm
Subarea runoff =      2.161(CFS) for      2.160(Ac.)
Total runoff =     44.809(CFS)    Total area =      38.360(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     38.360(Ac.)
Runoff from this stream =     44.809(CFS)
Time of concentration =   20.80 min.
Rainfall intensity =     1.408(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station        5.100 to Point/Station        5.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   650.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    55.000(Ft.)
Slope =    0.08462  s(percent)=       8.46
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.586 min.
Rainfall intensity =      1.887(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.750
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.556(CFS)
Total initial stream area =        4.630(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station        5.200 to Point/Station        5.300
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1560.000(Ft.)
End of natural channel elevation =   1508.000(Ft.)
Length of natural channel  =  1007.000(Ft.)
Estimated mean flow rate at midpoint of channel =     15.780(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   6.39(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0516
Corrected/adjusted channel slope =  0.0516
Travel time =    2.63 min.     TC =   14.21  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.737
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.704(In/Hr) for a    10.0 year storm
Subarea runoff =     16.365(CFS) for     13.030(Ac.)
Total runoff =     22.921(CFS)    Total area =      17.660(Ac.)
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Process from Point/Station        5.300 to Point/Station        5.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1508.000(Ft.)
End of natural channel elevation =   1493.000(Ft.)
Length of natural channel  =  1015.000(Ft.)
Estimated mean flow rate at midpoint of channel =     27.781(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   3.99(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0148
Corrected/adjusted channel slope =  0.0148
Travel time =    4.25 min.     TC =   18.46  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.719
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.495(In/Hr) for a    10.0 year storm
Subarea runoff =      8.052(CFS) for      7.490(Ac.)
Total runoff =     30.972(CFS)    Total area =      25.150(Ac.)


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Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     25.150(Ac.)
Runoff from this stream =     30.972(CFS)
Time of concentration =   18.46 min.
Rainfall intensity =     1.495(In/Hr)
Summary of stream data:

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


1       44.809     20.80           1.408
2       30.972     18.46           1.495
Largest stream flow has longer time of concentration
Qp =     44.809 + sum of
          Qb         Ia/Ib
          30.972 *    0.942 =     29.177
Qp =     73.986

Total of 2 main streams to confluence:
Flow rates before confluence point:
      44.809      30.972
Area of streams before confluence:
       38.360       25.150


Results of confluence:
Total flow rate =     73.986(CFS)
Time of concentration =    20.799 min.
Effective stream area after confluence  =     63.510(Ac.)


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Process from Point/Station        6.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1522.000(Ft.)
Bottom (of initial area) elevation =  1497.000(Ft.)
Difference in elevation =    25.000(Ft.)
Slope =    0.02500  s(percent)=       2.50
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.943 min.
Rainfall intensity =      2.037(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 =      0.956(CFS)
Total initial stream area =        0.540(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station        7.000 to Point/Station        8.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1497.000(Ft.)
End of street segment elevation =  1490.000(Ft.)
Length of street segment  =   650.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  32.000(Ft.)
Distance from crown to crossfall grade break  =  30.000(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 =  0.167(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 =      1.314(CFS)
Depth of flow =   0.143(Ft.), Average velocity =   1.910(Ft/s)
Streetflow hydraulics at midpoint of street travel:
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Halfstreet flow width =   8.450(Ft.)
Flow velocity =   1.91(Ft/s)
Travel time =    5.67 min.     TC =   15.62  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 =      1.625(In/Hr) for a    10.0 year storm
Subarea runoff =      0.632(CFS) for      0.450(Ac.)
Total runoff =      1.589(CFS)    Total area =       0.990(Ac.)
Street flow at end of street =      1.589(CFS)
Half street flow at end of street =      1.589(CFS)
Depth of flow =   0.155(Ft.), Average velocity =   2.005(Ft/s)
Flow width (from curb towards crown)=   9.047(Ft.)
End of computations, total study area =           64.50 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.986
Area averaged RI index number =  77.7
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AREA “B”

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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 08/16/19  File:EXB.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

------------------------------------------------------------------------
Program License Serial Number 6406
------------------------------------------------------------------------
EXISTING HYDROLOGY STUDY, TTM 37803
CITY OF PERRIS, RIVERSIDE CA
100 YEAR STORM, ONSITE AND OFFSITE DRAINAGE AREA "B"
------------------------------------------------------------------------

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

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.500


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Process from Point/Station       30.000 to Point/Station       31.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   378.000(Ft.)
Top (of initial area) elevation =  1593.800(Ft.)
Bottom (of initial area) elevation =  1544.000(Ft.)
Difference in elevation =    49.800(Ft.)
Slope =    0.13175  s(percent)=      13.17
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.537 min.
Rainfall intensity =      3.446(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.862
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      3.357(CFS)
Total initial stream area =        1.130(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1544.000(Ft.)
End of natural channel elevation =   1495.000(Ft.)
Length of natural channel  =   985.000(Ft.)
Estimated mean flow rate at midpoint of channel =     18.956(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   6.59(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0497
Corrected/adjusted channel slope =  0.0497
Travel time =    2.49 min.     TC =   11.03  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.857
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.032(In/Hr) for a   100.0 year storm
Subarea runoff =     27.290(CFS) for     10.500(Ac.)
Total runoff =     30.647(CFS)     Total area =      11.630(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     11.630(Ac.)
Runoff from this stream =     30.647(CFS)
Time of concentration =   11.03 min.
Rainfall intensity =     3.032(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   860.000(Ft.)
Top (of initial area) elevation =  1629.000(Ft.)
Bottom (of initial area) elevation =  1566.000(Ft.)
Difference in elevation =    63.000(Ft.)
Slope =    0.07326  s(percent)=       7.33
```

```
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.338 min.
Rainfall intensity =      2.757(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.853
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     20.794(CFS)
Total initial stream area =        8.840(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1566.000(Ft.)
End of natural channel elevation =   1496.000(Ft.)
Length of natural channel  =  1480.000(Ft.)
Estimated mean flow rate at midpoint of channel =     31.944(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   7.41(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0473
Corrected/adjusted channel slope =  0.0473
Travel time =    3.33 min.     TC =   16.67  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.848
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.467(In/Hr) for a   100.0 year storm
Subarea runoff =     19.827(CFS) for      9.480(Ac.)
Total runoff =     40.621(CFS)    Total area =      18.320(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       32.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1497.000(Ft.)
End of natural channel elevation =   1491.300(Ft.)
Length of natural channel  =   175.000(Ft.)
Estimated mean flow rate at midpoint of channel =     40.621(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   6.58(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0326
Corrected/adjusted channel slope =  0.0326
Travel time =    0.44 min.     TC =   17.11  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.847
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.434(In/Hr) for a   100.0 year storm
Subarea runoff =      0.000(CFS) for      0.000(Ac.)
Total runoff =     40.621(CFS)    Total area =      18.320(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     18.320(Ac.)
Runoff from this stream =     40.621(CFS)
Time of concentration =   17.11 min.
Rainfall intensity =     2.434(In/Hr)
Summary of stream data:

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


1       30.647     11.03           3.032
2       40.621     17.11           2.434
Largest stream flow has longer time of concentration
Qp =     40.621 + sum of
          Qb         Ia/Ib
          30.647 *    0.803 =     24.607
Qp =     65.228

Total of 2 main streams to confluence:
Flow rates before confluence point:
      30.647      40.621
Area of streams before confluence:
       11.630       18.320


Results of confluence:
Total flow rate =     65.228(CFS)
Time of concentration =    17.110 min.
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Effective stream area after confluence  =     29.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       41.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   721.500(Ft.)
Top (of initial area) elevation =  1538.000(Ft.)
Bottom (of initial area) elevation =  1500.000(Ft.)
Difference in elevation =    38.000(Ft.)
Slope =    0.05267  s(percent)=       5.27
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.282 min.
Rainfall intensity =      2.763(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.853
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     14.004(CFS)
Total initial stream area =        5.940(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       50.000 to Point/Station       51.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   394.000(Ft.)
Top (of initial area) elevation =  1571.000(Ft.)
Bottom (of initial area) elevation =  1504.000(Ft.)
Difference in elevation =    67.000(Ft.)
Slope =    0.17005  s(percent)=      17.01
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.248 min.
Rainfall intensity =      3.506(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
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 3)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      5.475(CFS)
Total initial stream area =        1.810(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station       60.000 to Point/Station       61.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   480.000(Ft.)
Top (of initial area) elevation =  1571.000(Ft.)
Bottom (of initial area) elevation =  1498.000(Ft.)
Difference in elevation =    73.000(Ft.)
Slope =    0.15208  s(percent)=      15.21
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.128 min.
Rainfall intensity =      3.333(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
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 3)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.379(CFS)
Total initial stream area =        2.920(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station       70.000 to Point/Station       71.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   121.000(Ft.)
Top (of initial area) elevation =  1538.000(Ft.)
Bottom (of initial area) elevation =  1515.000(Ft.)
Difference in elevation =    23.000(Ft.)
Slope =    0.19008  s(percent)=      19.01
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.030 min.
Rainfall intensity =      4.490(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.871
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.860(CFS)
Total initial stream area =        0.220(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =           40.84 (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 =  78.0
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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 08/16/19  File:EXB.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

------------------------------------------------------------------------
Program License Serial Number 6406
------------------------------------------------------------------------
EXISTING HYDROLOGY STUDY, TTM 37803
CITY OF PERRIS, RIVERSIDE CA
10 YEAR STORM, ONSITE AND OFFSITE DRAINAGE AREA "B"
------------------------------------------------------------------------
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

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.829(In/Hr)
Slope of intensity duration curve = 0.5000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   378.000(Ft.)
Top (of initial area) elevation =  1593.800(Ft.)
Bottom (of initial area) elevation =  1544.000(Ft.)
Difference in elevation =    49.800(Ft.)
Slope =    0.13175  s(percent)=      13.17
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.537 min.
Rainfall intensity =      2.198(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.769
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.909(CFS)
Total initial stream area =        1.130(Ac.)
Pervious area fraction = 1.000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1544.000(Ft.)
End of natural channel elevation =   1495.000(Ft.)
Length of natural channel  =   985.000(Ft.)
Estimated mean flow rate at midpoint of channel =     10.777(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   5.68(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0497
Corrected/adjusted channel slope =  0.0497
Travel time =    2.89 min.     TC =   11.43  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.751
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.900(In/Hr) for a    10.0 year storm
Subarea runoff =     14.987(CFS) for     10.500(Ac.)
Total runoff =     16.896(CFS)     Total area =      11.630(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     11.630(Ac.)
Runoff from this stream =     16.896(CFS)
Time of concentration =   11.43 min.
Rainfall intensity =     1.900(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   860.000(Ft.)
Top (of initial area) elevation =  1629.000(Ft.)
Bottom (of initial area) elevation =  1566.000(Ft.)
Difference in elevation =    63.000(Ft.)
Slope =    0.07326  s(percent)=       7.33
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =   13.338 min.
Rainfall intensity =      1.759(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.741
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     11.526(CFS)
Total initial stream area =        8.840(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1566.000(Ft.)
End of natural channel elevation =   1496.000(Ft.)
Length of natural channel  =  1480.000(Ft.)
Estimated mean flow rate at midpoint of channel =     17.706(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   6.31(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0473
Corrected/adjusted channel slope =  0.0473
Travel time =    3.91 min.     TC =   17.25  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.724
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.546(In/Hr) for a    10.0 year storm
Subarea runoff =     10.613(CFS) for      9.480(Ac.)
Total runoff =     22.138(CFS)     Total area =      18.320(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       32.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1497.000(Ft.)
End of natural channel elevation =   1491.300(Ft.)
Length of natural channel  =   175.000(Ft.)
Estimated mean flow rate at midpoint of channel =     22.138(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   5.56(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0326
Corrected/adjusted channel slope =  0.0326
Travel time =    0.52 min.     TC =   17.77  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.722
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.523(In/Hr) for a    10.0 year storm
Subarea runoff =      0.000(CFS) for      0.000(Ac.)
Total runoff =     22.138(CFS)     Total area =      18.320(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     18.320(Ac.)
Runoff from this stream =     22.138(CFS)
Time of concentration =   17.77 min.
Rainfall intensity =     1.523(In/Hr)
Summary of stream data:

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


1       16.896     11.43           1.900
2       22.138     17.77           1.523
Largest stream flow has longer time of concentration
Qp =     22.138 + sum of
           Qb         Ia/Ib
           16.896 *    0.802 =     13.548
Qp =     35.686

Total of 2 main streams to confluence:
Flow rates before confluence point:
      16.896      22.138
Area of streams before confluence:
       11.630       18.320


Results of confluence:
Total flow rate =     35.686(CFS)
Time of concentration =    17.774 min.
Effective stream area after confluence  =     29.950(Ac.)
```

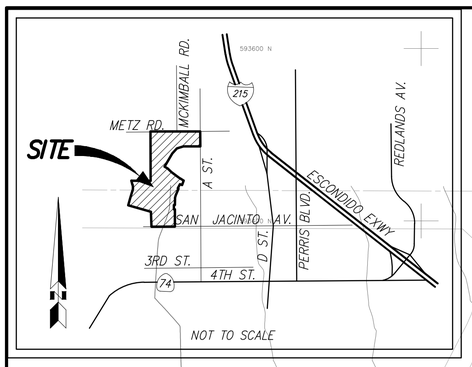
```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       41.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   721.500(Ft.)
Top (of initial area) elevation =  1538.000(Ft.)
Bottom (of initial area) elevation =  1500.000(Ft.)
Difference in elevation =    38.000(Ft.)
Slope =    0.05267  s(percent)=       5.27
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.282 min.
Rainfall intensity =      1.762(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.742
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      7.764(CFS)
Total initial stream area =        5.940(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station       50.000 to Point/Station       51.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   394.000(Ft.)
Top (of initial area) elevation =  1571.000(Ft.)
Bottom (of initial area) elevation =  1504.000(Ft.)
Difference in elevation =    67.000(Ft.)
Slope =    0.17005  s(percent)=      17.01
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.248 min.
Rainfall intensity =      2.236(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.770
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      3.118(CFS)
Total initial stream area =        1.810(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       61.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   480.000(Ft.)
Top (of initial area) elevation =  1571.000(Ft.)
Bottom (of initial area) elevation =  1498.000(Ft.)
Difference in elevation =    73.000(Ft.)
Slope =    0.15208  s(percent)=      15.21
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.128 min.
Rainfall intensity =      2.126(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.765
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.747(CFS)
Total initial stream area =        2.920(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       71.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   121.000(Ft.)
Top (of initial area) elevation =  1538.000(Ft.)
Bottom (of initial area) elevation =  1515.000(Ft.)
Difference in elevation =    23.000(Ft.)
Slope =    0.19008  s(percent)=      19.01
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.030 min.
Rainfall intensity =      2.863(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.796
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.501(CFS)
Total initial stream area =        0.220(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =           40.84 (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 =  78.0
```



VICINTY MAP

METZ ROAD

NORTH A STREET

W SAN JACINTO AVENUE

P/L

A-1 6.76

A-2 22.14

A-3 7.30

A-4 2.16

A-5 4.63

A-6 13.03

A-7 7.49

A-10 0.54

A-11 0.45

B-1 1.13

B-2 10.50

B-4 8.84

B-5 9.48

B-6 5.94

B-7 1.81

B-8 2.92

B-9 0.22

ΣQ_{10} =6.56cfs
ΣQ_{100}=11.73.cfs
Tc=11.5
FG=1560.00

ΣQ_{10} =8.75cfs
ΣQ_{100}=15.80.cfs
Tc=13.5
FG=1552

ΣQ_{10} =11.53cfs
ΣQ_{100}=20.79.cfs
Tc=13.3
FG=1566

ΣQ_{10} =1.91cfs
ΣQ_{100}=3.36.cfs
Tc=8.50
FG=1544.00

ΣQ_{10} =34.80cfs
ΣQ_{100}=63.90.cfs
Tc=15.5
FG=1517.00

ΣQ_{10} =22.92cfs
ΣQ_{100}=41.80.cfs
Tc=13.8
FG=1508.00

ΣQ_{10} =42.65cfs
ΣQ_{100}=78.70.cfs
Tc=17.6
FG=1504.00

ΣQ_{10} =0.95cfs
ΣQ_{100}=1.53.cfs
Tc=9.9
FG=1497

ΣQ_{10} =73.98cfs
ΣQ_{100}=136.61.cfs
Tc=19.4
FG=1493.00

ΣQ_{10} =1.59cfs
ΣQ_{100}=2.57.cfs
Tc=14.9
FG=1490

ΣQ_{10} =0.50cfs
ΣQ_{100}=0.86.cfs
Tc=5.0
FG=1515.00

ΣQ_{10} =4.75cfs
ΣQ_{100}=8.36.cfs
Tc=9.1
FG=1498.00

ΣQ_{10} =3.12cfs
ΣQ_{100}=5.47.cfs
Tc=8.2
FG=1504.00

ΣQ_{10} =7.76cfs
ΣQ_{100}=14.00.cfs
Tc=13.1
FG=1500.00

ΣQ_{10} =35.68cfs
ΣQ_{100}=65.23.cfs
Tc=17.1
FG=1491.30

L=650'
L=1000'
L=860'
L=378'
L=985'
L=721.50'
L=394'
L=480'

LEGEND

- DRAINAGE AREA BOUNDARY
- DRAINAGE SUBAREA BOUNDARY
- A1 / 1.07 — SUBAREA DESIGNATION / SUBAREA ACREAGE (IN ACRES)
- ● 6 / EL.1419.9 — DRAINAGE NODE DESIGNATION / DRAINAGE NODE ELEVATION
- FLOW LINE
- B — SOIL GROUP

PRELIMINARY HYDROLOGY MAP

EXISTING TTM 37803

CITY OF PERRIS, RIVERSIDE COUNTY, CA

0 50 100 200

SCALE: 1" = 100'

PREPARED FOR:
UCI PROPERTY DEVELOPMENT, INC.
17700 CASTLETON STREET, #128
CITY OF INDUSTRY, CA 91706
(626) 757-1605

HUNSAKER & ASSOCIATES
IRVINE, INC
INLAND EMPIRE REGION
PLANNING/ENGINEERING/SURVEYING/GOVERNMENT RELATIONS

W.O.: 1873-141

PLOTTED BY: Naila Brown DATE: Aug. 21, 2019 11:06:31 AM FILE: H:\00648\Planning\Hydrology\Maps\Existing Hydrology Map.dwg

SECTION 3

PROPOSED
RATIONAL HYDROLOGY

ONSITE

AREA “A”

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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 08/19/19  File:PerrisA.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

------------------------------------------------------------------------
Program License Serial Number 6406
------------------------------------------------------------------------
PROPOSED HYDROLOGY STUDY, TTM 37803
CITY OF PERRIS, RIVERSIDE CA
100 YEAR STORM, ONSITE AREA "A" TO BASIN 1
------------------------------------------------------------------------
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

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   630.000(Ft.)
Top (of initial area) elevation =  1541.800(Ft.)
Bottom (of initial area) elevation =  1534.000(Ft.)
Difference in elevation =     7.800(Ft.)
Slope =    0.01238  s(percent)=       1.24
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.367 min.
Rainfall intensity =      2.863(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.839
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 =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      5.910(CFS)
Total initial stream area =        2.460(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1528.000(Ft.)
Downstream point/station elevation =  1520.620(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.910(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     5.910(CFS)
Normal flow depth in pipe =    5.65(In.)
Flow top width inside pipe =    8.70(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.21(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    12.39 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.839
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    12.39 min.
Rainfall intensity =      2.861(In/Hr) for a   100.0 year storm
Subarea runoff =      4.032(CFS) for      1.680(Ac.)
Total runoff =      9.942(CFS)    Total area =       4.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1520.620(Ft.)
Downstream point/station elevation =  1493.200(Ft.)
Pipe length  =  1070.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.942(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     9.942(CFS)
Normal flow depth in pipe =   11.81(In.)
Flow top width inside pipe =   12.27(In.)
Critical Depth =   14.19(In.)
Pipe flow velocity =      9.60(Ft/s)
Travel time through pipe =    1.86 min.
Time of concentration (TC) =    14.25 min.
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.835
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    14.25 min.
Rainfall intensity =      2.668(In/Hr) for a   100.0 year storm
Subarea runoff =      7.062(CFS) for      3.170(Ac.)
Total runoff =     17.004(CFS)    Total area =       7.310(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.835
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    14.25 min.
Rainfall intensity =      2.668(In/Hr) for a   100.0 year storm
Subarea runoff =      6.706(CFS) for      3.010(Ac.)
Total runoff =     23.710(CFS)    Total area =      10.320(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1493.200(Ft.)
Downstream point/station elevation =  1489.460(Ft.)
Pipe length  =   374.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.710(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    23.710(CFS)
Normal flow depth in pipe =   20.91(In.)
Flow top width inside pipe =   16.08(In.)
Critical Depth =   20.72(In.)
Pipe flow velocity =      8.16(Ft/s)
Travel time through pipe =    0.76 min.
Time of concentration (TC) =    15.01 min.


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Process from Point/Station        5.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.834
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    15.01 min.
Rainfall intensity =      2.599(In/Hr) for a   100.0 year storm
Subarea runoff =      6.760(CFS) for      3.120(Ac.)
Total runoff =     30.469(CFS)    Total area =      13.440(Ac.)


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Process from Point/Station        5.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.834
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    15.01 min.
Rainfall intensity =      2.599(In/Hr) for a   100.0 year storm
Subarea runoff =      6.392(CFS) for      2.950(Ac.)
Total runoff =     36.861(CFS)    Total area =      16.390(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        6.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1489.460(Ft.)
Downstream point/station elevation =  1486.500(Ft.)
Pipe length  =   527.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    36.861(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    36.861(CFS)
Normal flow depth in pipe =   25.17(In.)
Flow top width inside pipe =   28.07(In.)
Critical Depth =   24.26(In.)
Pipe flow velocity =      7.58(Ft/s)
Travel time through pipe =    1.16 min.
Time of concentration (TC) =    16.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        6.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.832
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 =  0.500; Impervious fraction =  0.500
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Time of concentration =    16.17 min.
Rainfall intensity =      2.504(In/Hr) for a   100.0 year storm
Subarea runoff =     10.182(CFS) for      4.890(Ac.)
Total runoff =     47.043(CFS)    Total area =      21.280(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        7.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1486.500(Ft.)
Downstream point/station elevation =  1480.500(Ft.)
Pipe length  =   270.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    47.043(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    47.043(CFS)
Normal flow depth in pipe =   22.64(In.)
Flow top width inside pipe =   19.87(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.22(Ft/s)
Travel time through pipe =    0.34 min.
Time of concentration (TC) =    16.51 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.786
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)  =  78.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    16.51 min.
Rainfall intensity =      2.478(In/Hr) for a   100.0 year storm
Subarea runoff =      1.227(CFS) for      0.630(Ac.)
Total runoff =     48.270(CFS)    Total area =      21.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.819
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
Time of concentration =    16.51 min.
Rainfall intensity =      2.478(In/Hr) for a   100.0 year storm
Subarea runoff =      1.400(CFS) for      0.690(Ac.)
Total runoff =     49.670(CFS)    Total area =      22.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.886
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 =    16.51 min.
Rainfall intensity =      2.478(In/Hr) for a   100.0 year storm
Subarea runoff =      3.492(CFS) for      1.590(Ac.)
Total runoff =     53.162(CFS)    Total area =      24.190(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.886
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 =    16.51 min.
Rainfall intensity =      2.478(In/Hr) for a   100.0 year storm
Subarea runoff =      0.878(CFS) for      0.400(Ac.)
Total runoff =     54.040(CFS)    Total area =      24.590(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1486.000(Ft.)
Downstream point/station elevation =  1480.000(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    54.040(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    54.040(CFS)
Normal flow depth in pipe =   19.17(In.)
Flow top width inside pipe =   19.24(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.10(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    16.60 min.
End of computations, total study area =           24.59 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.494
Area averaged RI index number =  56.5
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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 08/19/19  File:PerrisA.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

------------------------------------------------------------------------
Program License Serial Number 6406

------------------------------------------------------------------------
PROPOSED HYDROLOGY STUDY, TTM 37803
CITY OF PERRIS, RIVERSIDE CA
10 YEAR STORM, ONSITE AREA "A" TO BASIN 1
------------------------------------------------------------------------
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

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.829(In/Hr)
Slope of intensity duration curve = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   630.000(Ft.)
Top (of initial area) elevation =  1541.800(Ft.)
Bottom (of initial area) elevation =  1534.000(Ft.)
Difference in elevation =     7.800(Ft.)
Slope =    0.01238  s(percent)=       1.24
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.367 min.
Rainfall intensity =      1.826(In/Hr) for a    10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.736
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 =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      3.306(CFS)
Total initial stream area =        2.460(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1528.000(Ft.)
Downstream point/station elevation =  1520.620(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.306(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.306(CFS)
Normal flow depth in pipe =    3.98(In.)
Flow top width inside pipe =    8.94(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.57(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    12.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.736
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    12.40 min.
Rainfall intensity =      1.824(In/Hr) for a    10.0 year storm
Subarea runoff =      2.255(CFS) for      1.680(Ac.)
Total runoff =      5.562(CFS)    Total area =       4.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1520.620(Ft.)
Downstream point/station elevation =  1493.200(Ft.)
Pipe length  =  1070.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.562(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.562(CFS)
Normal flow depth in pipe =    9.59(In.)
Flow top width inside pipe =    9.62(In.)
Critical Depth =   11.30(In.)
Pipe flow velocity =      8.28(Ft/s)
Travel time through pipe =    2.15 min.
Time of concentration (TC) =    14.55 min.
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Process from Point/Station        4.000 to Point/Station        4.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.727
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    14.55 min.
Rainfall intensity =      1.684(In/Hr) for a    10.0 year storm
Subarea runoff =      3.882(CFS) for      3.170(Ac.)
Total runoff =      9.444(CFS)    Total area =       7.310(Ac.)


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Process from Point/Station        4.000 to Point/Station        4.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.727
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    14.55 min.
Rainfall intensity =      1.684(In/Hr) for a    10.0 year storm
Subarea runoff =      3.686(CFS) for      3.010(Ac.)
Total runoff =     13.130(CFS)    Total area =      10.320(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1493.200(Ft.)
Downstream point/station elevation =  1489.460(Ft.)
Pipe length  =   374.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.130(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    13.130(CFS)
Normal flow depth in pipe =   14.58(In.)
Flow top width inside pipe =   19.35(In.)
Critical Depth =   16.19(In.)
Pipe flow velocity =      7.36(Ft/s)
Travel time through pipe =    0.85 min.
Time of concentration (TC) =    15.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.724
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    15.40 min.
Rainfall intensity =      1.637(In/Hr) for a    10.0 year storm
Subarea runoff =      3.699(CFS) for      3.120(Ac.)
Total runoff =     16.830(CFS)    Total area =      13.440(Ac.)


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Process from Point/Station        5.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.724
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    15.40 min.
Rainfall intensity =      1.637(In/Hr) for a    10.0 year storm
Subarea runoff =      3.498(CFS) for      2.950(Ac.)
Total runoff =     20.327(CFS)    Total area =      16.390(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        6.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1489.460(Ft.)
Downstream point/station elevation =  1486.500(Ft.)
Pipe length  =   527.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.327(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    20.327(CFS)
Normal flow depth in pipe =   19.59(In.)
Flow top width inside pipe =   24.09(In.)
Critical Depth =   18.92(In.)
Pipe flow velocity =      6.58(Ft/s)
Travel time through pipe =    1.33 min.
Time of concentration (TC) =    16.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        6.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.720
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 =  0.500; Impervious fraction =  0.500
```

```
Time of concentration =    16.73 min.
Rainfall intensity =      1.570(In/Hr) for a    10.0 year storm
Subarea runoff =      5.527(CFS) for      4.890(Ac.)
Total runoff =     25.855(CFS)    Total area =      21.280(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        7.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1486.500(Ft.)
Downstream point/station elevation =  1480.500(Ft.)
Pipe length  =   270.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.855(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    25.855(CFS)
Normal flow depth in pipe =   15.75(In.)
Flow top width inside pipe =   22.80(In.)
Critical Depth =   21.39(In.)
Pipe flow velocity =     11.83(Ft/s)
Travel time through pipe =    0.38 min.
Time of concentration (TC) =    17.11 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.581
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)  =  61.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    17.11 min.
Rainfall intensity =      1.553(In/Hr) for a    10.0 year storm
Subarea runoff =      0.568(CFS) for      0.630(Ac.)
Total runoff =     26.423(CFS)    Total area =      21.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (fair cover) subarea
Runoff Coefficient = 0.649
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
Time of concentration =    17.11 min.
Rainfall intensity =      1.553(In/Hr) for a    10.0 year storm
Subarea runoff =      0.696(CFS) for      0.690(Ac.)
Total runoff =     27.119(CFS)    Total area =      22.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.864
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 =    17.11 min.
Rainfall intensity =      1.553(In/Hr) for a    10.0 year storm
Subarea runoff =      2.132(CFS) for      1.590(Ac.)
Total runoff =     29.251(CFS)    Total area =      24.190(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        7.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.864
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 =    17.11 min.
Rainfall intensity =      1.553(In/Hr) for a    10.0 year storm
Subarea runoff =      0.536(CFS) for      0.400(Ac.)
Total runoff =     29.787(CFS)    Total area =      24.590(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1486.000(Ft.)
Downstream point/station elevation =  1480.000(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.787(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    29.787(CFS)
Normal flow depth in pipe =   13.78(In.)
Flow top width inside pipe =   19.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.79(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    17.20 min.
End of computations, total study area =           24.59 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.494
Area averaged RI index number =  56.5
```

OFFSITE

AREA “A”

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 08/15/19  File:OFFA.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

------------------------------------------------------------------------

Program License Serial Number 6406
------------------------------------------------------------------------
PROPOSED HYDROLOGY STUDY, TTM 37803
CITY OF PERRIS, RIVERSIDE,CA
100 YEAR STORM, OFFSITE TO FUTURE PERRIS VALLEY MDP LINE P
DRAINAGE AREA "A"
------------------------------------------------------------------------

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

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1645.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =    95.000(Ft.)
Slope =    0.09500  s(percent)=       9.50
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.450 min.
Rainfall intensity =      2.746(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.853
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     15.832(CFS)
Total initial stream area =        6.760(Ac.)
Pervious area fraction = 1.000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1550.000(Ft.)
End of natural channel elevation =   1543.000(Ft.)
Length of natural channel  =   160.000(Ft.)
Estimated mean flow rate at midpoint of channel =     17.225(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   6.02(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0437
Corrected/adjusted channel slope =  0.0437
Travel time =    0.44 min.     TC =   13.89  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.852
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.702(In/Hr) for a   100.0 year storm
Subarea runoff =      2.740(CFS) for      1.190(Ac.)
Total runoff =     18.571(CFS)     Total area =       7.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1543.000(Ft.)
Downstream point/station elevation =  1532.100(Ft.)
Pipe length  =    92.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.571(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    18.571(CFS)
Normal flow depth in pipe =   10.48(In.)
Flow top width inside pipe =   13.77(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.28(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    13.97 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.852
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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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    13.97 min.
Rainfall intensity =      2.694(In/Hr) for a   100.0 year storm
Subarea runoff =     19.514(CFS) for      8.500(Ac.)
Total runoff =     38.086(CFS)    Total area =      16.450(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1532.100(Ft.)
Downstream point/station elevation =  1523.000(Ft.)
Pipe length  =   565.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    38.086(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    38.086(CFS)
Normal flow depth in pipe =   21.42(In.)
Flow top width inside pipe =   21.86(In.)
Critical Depth =   24.79(In.)
Pipe flow velocity =     11.26(Ft/s)
Travel time through pipe =    0.84 min.
Time of concentration (TC) =    14.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      204.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.851
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    14.80 min.
Rainfall intensity =      2.617(In/Hr) for a   100.0 year storm
Subarea runoff =      1.625(CFS) for      0.730(Ac.)
Total runoff =     39.711(CFS)    Total area =      17.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1523.000(Ft.)
Downstream point/station elevation =  1511.520(Ft.)
Pipe length  =   240.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    39.711(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    39.711(CFS)
Normal flow depth in pipe =   16.27(In.)
Flow top width inside pipe =   22.43(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.50(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    15.03 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      205.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.850
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    15.03 min.
Rainfall intensity =      2.597(In/Hr) for a   100.0 year storm
Subarea runoff =      0.663(CFS) for      0.300(Ac.)
Total runoff =     40.374(CFS)    Total area =      17.480(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      205.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.850
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    15.03 min.
Rainfall intensity =      2.597(In/Hr) for a   100.0 year storm
Subarea runoff =     10.866(CFS) for      4.920(Ac.)
Total runoff =     51.240(CFS)    Total area =      22.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1511.520(Ft.)
Downstream point/station elevation =  1504.700(Ft.)
Pipe length  =   450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    51.240(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    51.240(CFS)
Normal flow depth in pipe =   25.03(In.)
Flow top width inside pipe =   22.30(In.)
Critical Depth =   27.77(In.)
Pipe flow velocity =     11.72(Ft/s)
Travel time through pipe =    0.64 min.
Time of concentration (TC) =    15.67 min.
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      206.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.849
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    15.67 min.
Rainfall intensity =      2.544(In/Hr) for a   100.0 year storm
Subarea runoff =      1.037(CFS) for      0.480(Ac.)
Total runoff =     52.277(CFS)    Total area =      22.880(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      207.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1504.700(Ft.)
Downstream point/station elevation =  1494.200(Ft.)
Pipe length  =   258.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    52.277(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    52.277(CFS)
Normal flow depth in pipe =   18.89(In.)
Flow top width inside pipe =   24.75(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.59(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =    15.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      207.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.849
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    15.92 min.
Rainfall intensity =      2.524(In/Hr) for a   100.0 year storm
Subarea runoff =      0.407(CFS) for      0.190(Ac.)
Total runoff =     52.684(CFS)    Total area =      23.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      208.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1494.200(Ft.)
Downstream point/station elevation =  1493.000(Ft.)
Pipe length  =   430.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    52.684(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    52.684(CFS)
Normal flow depth in pipe =   34.13(In.)
Flow top width inside pipe =   32.79(In.)
Critical Depth =   27.27(In.)
Pipe flow velocity =      6.30(Ft/s)
Travel time through pipe =    1.14 min.
Time of concentration (TC) =    17.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      208.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     23.070(Ac.)
Runoff from this stream =     52.684(CFS)
Time of concentration =   17.06 min.
Rainfall intensity =     2.438(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.100 to Point/Station      208.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   650.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    55.000(Ft.)
Slope =    0.08462  s(percent)=       8.46
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.586 min.
Rainfall intensity =      2.958(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.856
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     11.727(CFS)
Total initial stream area =        4.630(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.200 to Point/Station      208.300
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1560.000(Ft.)
End of natural channel elevation =   1516.000(Ft.)
Length of natural channel  =   830.000(Ft.)
Estimated mean flow rate at midpoint of channel =     25.632(CFS)
```

```
Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   7.38(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0530
Corrected/adjusted channel slope =  0.0530
Travel time =    1.87 min.     TC =   13.46  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.853
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.745(In/Hr) for a   100.0 year storm
Subarea runoff =     25.704(CFS) for     10.980(Ac.)
Total runoff =     37.431(CFS)    Total area =      15.610(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.300 to Point/Station      208.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1516.000(Ft.)
Downstream point/station elevation =  1493.000(Ft.)
Pipe length  =   650.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.431(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    37.431(CFS)
Normal flow depth in pipe =   17.46(In.)
Flow top width inside pipe =   21.37(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.28(Ft/s)
Travel time through pipe =    0.71 min.
Time of concentration (TC) =    14.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      208.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     15.610(Ac.)
Runoff from this stream =     37.431(CFS)
Time of concentration =   14.17 min.
Rainfall intensity =     2.675(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)
1       52.684     17.06           2.438
2       37.431     14.17           2.675
Largest stream flow has longer time of concentration
Qp =     52.684 + sum of
          Qb         Ia/Ib
          37.431 *    0.911 =     34.117
Qp =     86.802

Total of 2 main streams to confluence:
Flow rates before confluence point:
      52.684      37.431
Area of streams before confluence:
       23.070       15.610


Results of confluence:
Total flow rate =     86.802(CFS)
Time of concentration =    17.056 min.
Effective stream area after confluence  =     38.680(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      209.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1493.000(Ft.)
Downstream point/station elevation =  1492.390(Ft.)
Pipe length  =   205.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    86.802(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =    86.802(CFS)
Normal flow depth in pipe =   39.38(In.)
Flow top width inside pipe =   42.79(In.)
Critical Depth =   33.35(In.)
Pipe flow velocity =      7.38(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =    17.52 min.
End of computations, total study area =           38.68 (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 =  78.0
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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 08/15/19  File:OFFA.out
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 *********   Hydrology Study Control Information **********

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

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Program License Serial Number 6406
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PROPOSED HYDROLOGY STUDY, TTM 37803
CITY OF PERRIS, RIVERSIDE,CA
10 YEAR STORM, OFFSITE TO FUTURE PERRIS VALLEY MDP LINE P
DRAINAGE AREA "A"
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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

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.829(In/Hr)
Slope of intensity duration curve = 0.5000

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Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1645.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =    95.000(Ft.)
Slope =    0.09500  s(percent)=       9.50
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.450 min.
Rainfall intensity =      1.751(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.741
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.771(CFS)
Total initial stream area =        6.760(Ac.)
Pervious area fraction = 1.000

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Process from Point/Station      201.000 to Point/Station      202.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1550.000(Ft.)
End of natural channel elevation =   1543.000(Ft.)
Length of natural channel  =   160.000(Ft.)
Estimated mean flow rate at midpoint of channel =      9.543(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   5.17(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0437
Corrected/adjusted channel slope =  0.0437
Travel time =    0.52 min.     TC =   13.97  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.738
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.719(In/Hr) for a    10.0 year storm
Subarea runoff =      1.510(CFS) for      1.190(Ac.)
Total runoff =     10.281(CFS)     Total area =       7.950(Ac.)


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Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1543.000(Ft.)
Downstream point/station elevation =  1532.100(Ft.)
Pipe length  =    92.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.281(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =    10.281(CFS)
Normal flow depth in pipe =    8.41(In.)
Flow top width inside pipe =   10.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.49(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    14.05 min.
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Process from Point/Station 203.000 to Point/Station 203.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.738
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) = 78.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 14.05 min.
Rainfall intensity = 1.713(In/Hr) for a 10.0 year storm
Subarea runoff = 10.747(CFS) for 8.500(Ac.)
Total runoff = 21.027(CFS) Total area = 16.450(Ac.)

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Process from Point/Station 203.000 to Point/Station 204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1532.100(Ft.)
Downstream point/station elevation = 1523.000(Ft.)
Pipe length = 565.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 21.027(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 21.027(CFS)
Normal flow depth in pipe = 15.26(In.)
Flow top width inside pipe = 23.10(In.)
Critical Depth = 19.71(In.)
Pipe flow velocity = 9.98(Ft/s)
Travel time through pipe = 0.94 min.
Time of concentration (TC) = 15.00 min.

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Process from Point/Station 204.000 to Point/Station 204.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.734
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) = 78.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 15.00 min.
Rainfall intensity = 1.658(In/Hr) for a 10.0 year storm
Subarea runoff = 0.888(CFS) for 0.730(Ac.)
Total runoff = 21.915(CFS) Total area = 17.180(Ac.)

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Process from Point/Station 204.000 to Point/Station 205.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1523.000(Ft.)
Downstream point/station elevation = 1511.520(Ft.)
Pipe length = 240.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 21.915(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 21.915(CFS)
Normal flow depth in pipe = 14.06(In.)
Flow top width inside pipe = 14.88(In.)
Critical depth could not be calculated.
Pipe flow velocity = 14.80(Ft/s)
Travel time through pipe = 0.27 min.
Time of concentration (TC) = 15.27 min.

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Process from Point/Station 205.000 to Point/Station 205.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.732
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) = 78.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 15.27 min.
Rainfall intensity = 1.644(In/Hr) for a 10.0 year storm
Subarea runoff = 0.361(CFS) for 0.300(Ac.)
Total runoff = 22.277(CFS) Total area = 17.480(Ac.)

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Process from Point/Station 205.000 to Point/Station 205.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.732
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) = 78.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 15.27 min.
Rainfall intensity = 1.644(In/Hr) for a 10.0 year storm
Subarea runoff = 5.923(CFS) for 4.920(Ac.)
Total runoff = 28.199(CFS) Total area = 22.400(Ac.)

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Process from Point/Station 205.000 to Point/Station 206.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1511.520(Ft.)
Downstream point/station elevation = 1504.700(Ft.)
Pipe length = 450.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 28.199(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 28.199(CFS)

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Normal flow depth in pipe =   19.97(In.)
Flow top width inside pipe =   17.94(In.)
Critical Depth =   21.99(In.)
Pipe flow velocity =     10.10(Ft/s)
Travel time through pipe =    0.74 min.
Time of concentration (TC) =    16.01 min.


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Process from Point/Station      206.000 to Point/Station      206.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.729
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    16.01 min.
Rainfall intensity =      1.605(In/Hr) for a    10.0 year storm
Subarea runoff =      0.562(CFS) for      0.480(Ac.)
Total runoff =     28.761(CFS)    Total area =      22.880(Ac.)


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Process from Point/Station      206.000 to Point/Station      207.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1504.700(Ft.)
Downstream point/station elevation =  1494.200(Ft.)
Pipe length  =   258.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.761(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    28.761(CFS)
Normal flow depth in pipe =   15.56(In.)
Flow top width inside pipe =   18.40(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.04(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =    16.30 min.


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Process from Point/Station      207.000 to Point/Station      207.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.728
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    16.30 min.
Rainfall intensity =      1.591(In/Hr) for a    10.0 year storm
Subarea runoff =      0.220(CFS) for      0.190(Ac.)
Total runoff =     28.981(CFS)    Total area =      23.070(Ac.)


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Process from Point/Station      207.000 to Point/Station      208.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1494.200(Ft.)
Downstream point/station elevation =  1493.000(Ft.)
Pipe length  =   430.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.981(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    28.981(CFS)
Normal flow depth in pipe =   28.31(In.)
Flow top width inside pipe =   23.04(In.)
Critical Depth =   21.48(In.)
Pipe flow velocity =      5.34(Ft/s)
Travel time through pipe =    1.34 min.
Time of concentration (TC) =    17.64 min.


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Process from Point/Station      208.000 to Point/Station      208.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     23.070(Ac.)
Runoff from this stream =     28.981(CFS)
Time of concentration =   17.64 min.
Rainfall intensity =     1.529(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      208.100 to Point/Station      208.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   650.000(Ft.)
Top (of initial area) elevation =  1615.000(Ft.)
Bottom (of initial area) elevation =  1560.000(Ft.)
Difference in elevation =    55.000(Ft.)
Slope =    0.08462  s(percent)=       8.46
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.586 min.
Rainfall intensity =      1.887(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.750
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.556(CFS)
Total initial stream area =        4.630(Ac.)
Pervious area fraction = 1.000
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Process from Point/Station      208.200 to Point/Station      208.300
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1560.000(Ft.)
End of natural channel elevation =   1516.000(Ft.)
Length of natural channel  =   830.000(Ft.)
Estimated mean flow rate at midpoint of channel =     14.329(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   6.31(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
         Normal channel slope =  0.0530
Corrected/adjusted channel slope =  0.0530
Travel time =    2.19 min.     TC =   13.78  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.739
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.730(In/Hr) for a    10.0 year storm
Subarea runoff =     14.046(CFS) for     10.980(Ac.)
Total runoff =     20.601(CFS)     Total area =      15.610(Ac.)


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Process from Point/Station      208.300 to Point/Station      208.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1516.000(Ft.)
Downstream point/station elevation =  1493.000(Ft.)
Pipe length  =   650.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.601(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    20.601(CFS)
Normal flow depth in pipe =   12.84(In.)
Flow top width inside pipe =   20.47(In.)
Critical Depth =   19.34(In.)
Pipe flow velocity =     13.37(Ft/s)
Travel time through pipe =    0.81 min.
Time of concentration (TC) =    14.59 min.
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Process from Point/Station      208.000 to Point/Station      208.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     15.610(Ac.)
Runoff from this stream =     20.601(CFS)
Time of concentration =   14.59 min.
Rainfall intensity =     1.682(In/Hr)
Summary of stream data:

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


1       28.981     17.64           1.529
2       20.601     14.59           1.682
Largest stream flow has longer time of concentration
Qp =     28.981 + sum of
           Qb         Ia/Ib
           20.601 *    0.909 =     18.736
Qp =     47.717

Total of 2 main streams to confluence:
Flow rates before confluence point:
      28.981      20.601
Area of streams before confluence:
       23.070       15.610


Results of confluence:
Total flow rate =     47.717(CFS)
Time of concentration =    17.637 min.
Effective stream area after confluence  =     38.680(Ac.)


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Process from Point/Station      208.000 to Point/Station      209.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1493.000(Ft.)
Downstream point/station elevation =  1492.390(Ft.)
Pipe length  =   205.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    47.717(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    47.717(CFS)
Normal flow depth in pipe =   34.69(In.)
Flow top width inside pipe =   24.46(In.)
Critical Depth =   26.45(In.)
Pipe flow velocity =      6.13(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =    18.20 min.
End of computations, total study area =           38.68 (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 =  78.0
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AREA “B”

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/16/19 File:PerrisB.out

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

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

Program License Serial Number 6406

PROPOSED HYDROLOGY STUDY, TTM 37803
CITY OF PERRIS, RIVERSIDE,CA
100 YEAR STORM, ONSITE AND OFFSITE TO BASIN 2, DRAINAGE AREA "B"

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

2 year, 1 hour precipitation = 0.500(In.)
100 year, 1 hour precipitation = 1.300(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5000

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Process from Point/Station 100.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 860.000(Ft.)
Top (of initial area) elevation = 1629.000(Ft.)
Bottom (of initial area) elevation = 1566.000(Ft.)
Difference in elevation = 63.000(Ft.)
Slope = 0.07326 s(percent)= 7.33
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.338 min.
Rainfall intensity = 2.757(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.853
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) = 89.80
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 20.794(CFS)
Total initial stream area = 8.840(Ac.)
Pervious area fraction = 1.000

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Process from Point/Station 102.000 to Point/Station 103.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1566.000(Ft.)
End of natural channel elevation = 1558.000(Ft.)
Length of natural channel = 163.000(Ft.)
Estimated mean flow rate at midpoint of channel = 23.817(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow = 6.96(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0491
Corrected/adjusted channel slope = 0.0491
Travel time = 0.39 min. TC = 13.73 min.

Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.852
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) = 89.80
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.718(In/Hr) for a 100.0 year storm
Subarea runoff = 5.954(CFS) for 2.570(Ac.)
Total runoff = 26.748(CFS) Total area = 11.410(Ac.)

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Process from Point/Station 103.000 to Point/Station 104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1558.000(Ft.)
Downstream point/station elevation = 1535.000(Ft.)
Pipe length = 147.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 26.748(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 26.748(CFS)
Normal flow depth in pipe = 10.50(In.)
Flow top width inside pipe = 17.75(In.)
Critical depth could not be calculated.
Pipe flow velocity = 24.97(Ft/s)
Travel time through pipe = 0.10 min.
Time of concentration (TC) = 13.83 min.

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Process from Point/Station      104.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.852
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    13.83 min.
Rainfall intensity =      2.708(In/Hr) for a   100.0 year storm
Subarea runoff =      2.470(CFS) for      1.070(Ac.)
Total runoff =     29.218(CFS)    Total area =      12.480(Ac.)


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Process from Point/Station      104.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1535.000(Ft.)
Downstream point/station elevation =  1521.000(Ft.)
Pipe length  =   460.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.218(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    29.218(CFS)
Normal flow depth in pipe =   15.38(In.)
Flow top width inside pipe =   23.03(In.)
Critical Depth =   22.20(In.)
Pipe flow velocity =     13.75(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =    14.38 min.


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Process from Point/Station       22.000 to Point/Station       22.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.835
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    14.38 min.
Rainfall intensity =      2.655(In/Hr) for a   100.0 year storm
Subarea runoff =      6.761(CFS) for      3.050(Ac.)
Total runoff =     35.979(CFS)    Total area =      15.530(Ac.)


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Process from Point/Station       22.000 to Point/Station       22.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.835
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    14.38 min.
Rainfall intensity =      2.655(In/Hr) for a   100.0 year storm
Subarea runoff =      4.810(CFS) for      2.170(Ac.)
Total runoff =     40.789(CFS)    Total area =      17.700(Ac.)


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Process from Point/Station       22.000 to Point/Station       22.100
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1521.000(Ft.)
Downstream point/station elevation =  1520.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    40.789(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    40.789(CFS)
Normal flow depth in pipe =   20.63(In.)
Flow top width inside pipe =   22.93(In.)
Critical Depth =   25.21(In.)
Pipe flow velocity =     12.51(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    14.45 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.100 to Point/Station       22.100
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.851
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    14.45 min.
Rainfall intensity =      2.649(In/Hr) for a   100.0 year storm
Subarea runoff =      0.406(CFS) for      0.180(Ac.)
Total runoff =     41.195(CFS)    Total area =      17.880(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.100 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1520.000(Ft.)
Downstream point/station elevation =  1509.000(Ft.)
Pipe length  =   332.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    41.195(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    41.195(CFS)
Normal flow depth in pipe =   19.69(In.)
Flow top width inside pipe =   18.43(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.94(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    14.82 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       23.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.834
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    14.82 min.
Rainfall intensity =      2.616(In/Hr) for a   100.0 year storm
Subarea runoff =      3.272(CFS) for      1.500(Ac.)
Total runoff =     44.467(CFS)    Total area =      19.380(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       23.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.851
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    14.82 min.
Rainfall intensity =      2.616(In/Hr) for a   100.0 year storm
Subarea runoff =      3.004(CFS) for      1.350(Ac.)
Total runoff =     47.471(CFS)    Total area =      20.730(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       23.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.834
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    14.82 min.
Rainfall intensity =      2.616(In/Hr) for a   100.0 year storm
Subarea runoff =      2.596(CFS) for      1.190(Ac.)
Total runoff =     50.067(CFS)    Total area =      21.920(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1509.000(Ft.)
Downstream point/station elevation =  1501.000(Ft.)
Pipe length  =   370.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    50.067(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    50.067(CFS)
Normal flow depth in pipe =   20.86(In.)
Flow top width inside pipe =   27.62(In.)
Critical Depth =   27.59(In.)
Pipe flow velocity =     13.74(Ft/s)
Travel time through pipe =    0.45 min.
Time of concentration (TC) =    15.27 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       24.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.833
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    15.27 min.
Rainfall intensity =      2.577(In/Hr) for a   100.0 year storm
Subarea runoff =      9.512(CFS) for      4.430(Ac.)
Total runoff =     59.579(CFS)    Total area =      26.350(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       24.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.833
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 =  0.500; Impervious fraction =  0.500
```

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Time of concentration =    15.27 min.
Rainfall intensity =      2.577(In/Hr) for a   100.0 year storm
Subarea runoff =      2.705(CFS) for      1.260(Ac.)
Total runoff =     62.284(CFS)    Total area =      27.610(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1501.000(Ft.)
Downstream point/station elevation =  1497.000(Ft.)
Pipe length  =   110.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    62.284(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    62.284(CFS)
Normal flow depth in pipe =   23.81(In.)
Flow top width inside pipe =   17.42(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.79(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    15.38 min.


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Process from Point/Station       26.000 to Point/Station       26.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.790
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)  =  78.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    15.38 min.
Rainfall intensity =      2.568(In/Hr) for a   100.0 year storm
Subarea runoff =      2.170(CFS) for      1.070(Ac.)
Total runoff =     64.454(CFS)    Total area =      28.680(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       26.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     28.680(Ac.)
Runoff from this stream =     64.454(CFS)
Time of concentration =   15.38 min.
Rainfall intensity =     2.568(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.100 to Point/Station       26.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   488.000(Ft.)
Top (of initial area) elevation =  1579.000(Ft.)
Bottom (of initial area) elevation =  1523.000(Ft.)
Difference in elevation =    56.000(Ft.)
Slope =    0.11475  s(percent)=      11.48
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.721 min.
Rainfall intensity =      3.230(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.860
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.385(CFS)
Total initial stream area =        3.740(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.200 to Point/Station       26.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1523.000(Ft.)
Downstream point/station elevation =  1501.200(Ft.)
Pipe length  =   465.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.385(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    10.385(CFS)
Normal flow depth in pipe =    9.62(In.)
Flow top width inside pipe =   14.39(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.48(Ft/s)
Travel time through pipe =    0.62 min.
Time of concentration (TC) =    10.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.300 to Point/Station       26.300
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.844
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    10.34 min.
Rainfall intensity =      3.131(In/Hr) for a   100.0 year storm
Subarea runoff =      3.328(CFS) for      1.260(Ac.)
Total runoff =     13.713(CFS)    Total area =       5.000(Ac.)
```

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Process from Point/Station       26.300 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1501.200(Ft.)
Downstream point/station elevation =  1497.000(Ft.)
Pipe length  =   115.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.713(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    13.713(CFS)
Normal flow depth in pipe =   10.92(In.)
Flow top width inside pipe =   17.58(In.)
Critical Depth =   16.48(In.)
Pipe flow velocity =     12.23(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =    10.50 min.


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Process from Point/Station       26.000 to Point/Station       26.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.000(Ac.)
Runoff from this stream =     13.713(CFS)
Time of concentration =   10.50 min.
Rainfall intensity =     3.108(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.400 to Point/Station       26.500
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   710.000(Ft.)
Top (of initial area) elevation =  1596.800(Ft.)
Bottom (of initial area) elevation =  1523.000(Ft.)
Difference in elevation =    73.800(Ft.)
Slope =    0.10394  s(percent)=      10.39
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.519 min.
Rainfall intensity =      2.967(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.856
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)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      3.506(CFS)
Total initial stream area =        1.380(Ac.)
Pervious area fraction = 1.000
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Process from Point/Station       26.500 to Point/Station       26.600
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1523.000(Ft.)
End of street segment elevation =  1503.000(Ft.)
Length of street segment  =   600.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  32.000(Ft.)
Distance from crown to crossfall grade break  =  30.000(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  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  0.167(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 =      4.763(CFS)
Depth of flow =   0.193(Ft.), Average velocity =   4.039(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.979(Ft.)
Flow velocity =   4.04(Ft/s)
Travel time =    2.48 min.     TC =   13.99  min.
 Adding area flow to street
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
Rainfall intensity =      2.692(In/Hr) for a   100.0 year storm
Subarea runoff =      2.436(CFS) for      1.020(Ac.)
Total runoff =      5.942(CFS)     Total area =       2.400(Ac.)
Street flow at end of street =      5.942(CFS)
Half street flow at end of street =      5.942(CFS)
Depth of flow =   0.212(Ft.), Average velocity =   4.272(Ft/s)
Flow width (from curb towards crown)=  11.904(Ft.)


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Process from Point/Station       26.600 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1498.000(Ft.)
Downstream point/station elevation =  1497.000(Ft.)
Pipe length  =    53.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.942(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.942(CFS)
Normal flow depth in pipe =    8.98(In.)
Flow top width inside pipe =   14.71(In.)
Critical Depth =   11.82(In.)
Pipe flow velocity =      7.75(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    14.11 min.
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       26.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      2.400(Ac.)
Runoff from this stream =      5.942(CFS)
Time of concentration =   14.11 min.
Rainfall intensity =     2.681(In/Hr)
Summary of stream data:

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


1       64.454     15.38           2.568
2       13.713     10.50           3.108
3        5.942     14.11           2.681
Largest stream flow has longer time of concentration
Qp =     64.454 + sum of
           Qb         Ia/Ib
           13.713 *    0.826 =     11.330
           Qb         Ia/Ib
            5.942 *    0.958 =      5.691
Qp =     81.474

Total of 3 main streams to confluence:
Flow rates before confluence point:
      64.454      13.713       5.942
Area of streams before confluence:
       28.680        5.000        2.400


Results of confluence:
Total flow rate =     81.474(CFS)
Time of concentration =    15.379 min.
Effective stream area after confluence  =     36.080(Ac.)
End of computations, total study area =           36.08 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.769
Area averaged RI index number =  67.8
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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/16/19 File:PerrisB.out

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

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

Program License Serial Number 6406

PROPOSED HYDROLOGY STUDY, TTM 37803
CITY OF PERRIS, RIVERSIDE,CA
10 YEAR STORM, ONSITE AND OFFSITE TO BASIN 2, DRAINAGE AREA "B"

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

2 year, 1 hour precipitation = 0.500(In.)
100 year, 1 hour precipitation = 1.300(In.)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.829(In/Hr)
Slope of intensity duration curve = 0.5000

++
Process from Point/Station 100.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 860.000(Ft.)
Top (of initial area) elevation = 1629.000(Ft.)
Bottom (of initial area) elevation = 1566.000(Ft.)
Difference in elevation = 63.000(Ft.)
Slope = 0.07326 s(percent)= 7.33
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.338 min.
Rainfall intensity = 1.759(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.741
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) = 78.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 11.526(CFS)
Total initial stream area = 8.840(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station 102.000 to Point/Station 103.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1566.000(Ft.)
End of natural channel elevation = 1558.000(Ft.)
Length of natural channel = 163.000(Ft.)
Estimated mean flow rate at midpoint of channel = 13.201(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow = 5.95(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0491
Corrected/adjusted channel slope = 0.0491
Travel time = 0.46 min. TC = 13.80 min.

Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.739
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) = 78.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.729(In/Hr) for a 10.0 year storm
Subarea runoff = 3.285(CFS) for 2.570(Ac.)
Total runoff = 14.811(CFS) Total area = 11.410(Ac.)

++
Process from Point/Station 103.000 to Point/Station 104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1558.000(Ft.)
Downstream point/station elevation = 1535.000(Ft.)
Pipe length = 147.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 14.811(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 14.811(CFS)
Normal flow depth in pipe = 8.20(In.)
Flow top width inside pipe = 14.94(In.)
Critical depth could not be calculated.
Pipe flow velocity = 21.59(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 13.91 min.

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Process from Point/Station      104.000 to Point/Station      104.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.739
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    13.91 min.
Rainfall intensity =      1.722(In/Hr) for a    10.0 year storm
Subarea runoff =      1.361(CFS) for      1.070(Ac.)
Total runoff =     16.172(CFS)    Total area =      12.480(Ac.)


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Process from Point/Station      104.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1535.000(Ft.)
Downstream point/station elevation =  1521.000(Ft.)
Pipe length  =   460.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.172(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    16.172(CFS)
Normal flow depth in pipe =   13.13(In.)
Flow top width inside pipe =   16.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.70(Ft/s)
Travel time through pipe =    0.66 min.
Time of concentration (TC) =    14.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       22.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.727
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    14.56 min.
Rainfall intensity =      1.683(In/Hr) for a    10.0 year storm
Subarea runoff =      3.733(CFS) for      3.050(Ac.)
Total runoff =     19.905(CFS)    Total area =      15.530(Ac.)


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Process from Point/Station       22.000 to Point/Station       22.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.727
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    14.56 min.
Rainfall intensity =      1.683(In/Hr) for a    10.0 year storm
Subarea runoff =      2.656(CFS) for      2.170(Ac.)
Total runoff =     22.561(CFS)    Total area =      17.700(Ac.)


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Process from Point/Station       22.000 to Point/Station       22.100
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1521.000(Ft.)
Downstream point/station elevation =  1520.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.561(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    22.561(CFS)
Normal flow depth in pipe =   17.34(In.)
Flow top width inside pipe =   15.93(In.)
Critical Depth =   19.77(In.)
Pipe flow velocity =     10.62(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    14.64 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.100 to Point/Station       22.100
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.735
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    14.64 min.
Rainfall intensity =      1.678(In/Hr) for a    10.0 year storm
Subarea runoff =      0.222(CFS) for      0.180(Ac.)
Total runoff =     22.784(CFS)    Total area =      17.880(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.100 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1520.000(Ft.)
Downstream point/station elevation =  1509.000(Ft.)
Pipe length  =   332.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.784(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    22.784(CFS)
Normal flow depth in pipe =   14.09(In.)
Flow top width inside pipe =   19.74(In.)
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Critical Depth =   19.82(In.)
Pipe flow velocity =     13.29(Ft/s)
Travel time through pipe =    0.42 min.
Time of concentration (TC) =    15.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       23.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.726
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    15.06 min.
Rainfall intensity =      1.655(In/Hr) for a    10.0 year storm
Subarea runoff =      1.801(CFS) for      1.500(Ac.)
Total runoff =     24.585(CFS)    Total area =      19.380(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       23.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.733
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    15.06 min.
Rainfall intensity =      1.655(In/Hr) for a    10.0 year storm
Subarea runoff =      1.639(CFS) for      1.350(Ac.)
Total runoff =     26.223(CFS)    Total area =      20.730(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       23.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.726
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    15.06 min.
Rainfall intensity =      1.655(In/Hr) for a    10.0 year storm
Subarea runoff =      1.429(CFS) for      1.190(Ac.)
Total runoff =     27.652(CFS)    Total area =      21.920(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1509.000(Ft.)
Downstream point/station elevation =  1501.000(Ft.)
Pipe length  =   370.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    27.652(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    27.652(CFS)
Normal flow depth in pipe =   16.71(In.)
Flow top width inside pipe =   22.07(In.)
Critical Depth =   21.84(In.)
Pipe flow velocity =     11.84(Ft/s)
Travel time through pipe =    0.52 min.
Time of concentration (TC) =    15.58 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       24.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.724
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    15.58 min.
Rainfall intensity =      1.627(In/Hr) for a    10.0 year storm
Subarea runoff =      5.217(CFS) for      4.430(Ac.)
Total runoff =     32.869(CFS)    Total area =      26.350(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       24.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.724
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    15.58 min.
Rainfall intensity =      1.627(In/Hr) for a    10.0 year storm
Subarea runoff =      1.484(CFS) for      1.260(Ac.)
Total runoff =     34.353(CFS)    Total area =      27.610(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1501.000(Ft.)
Downstream point/station elevation =  1497.000(Ft.)
```

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Pipe length  =   110.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.353(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    34.353(CFS)
Normal flow depth in pipe =   16.17(In.)
Flow top width inside pipe =   22.50(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.24(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    15.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       26.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.590
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)  =  61.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    15.70 min.
Rainfall intensity =      1.621(In/Hr) for a    10.0 year storm
Subarea runoff =      1.023(CFS) for      1.070(Ac.)
Total runoff =     35.376(CFS)    Total area =      28.680(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       26.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     28.680(Ac.)
Runoff from this stream =     35.376(CFS)
Time of concentration =   15.70 min.
Rainfall intensity =     1.621(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.100 to Point/Station       26.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   488.000(Ft.)
Top (of initial area) elevation =  1579.000(Ft.)
Bottom (of initial area) elevation =  1523.000(Ft.)
Difference in elevation =    56.000(Ft.)
Slope =    0.11475  s(percent)=      11.48
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.721 min.
Rainfall intensity =      2.060(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.761
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      5.863(CFS)
Total initial stream area =        3.740(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.200 to Point/Station       26.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1523.000(Ft.)
Downstream point/station elevation =  1501.200(Ft.)
Pipe length  =   465.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.863(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.863(CFS)
Normal flow depth in pipe =    7.83(In.)
Flow top width inside pipe =   11.43(In.)
Critical depth could not be calculated.
Pipe flow velocity =     10.81(Ft/s)
Travel time through pipe =    0.72 min.
Time of concentration (TC) =    10.44 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.300 to Point/Station       26.300
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.745
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 =  0.500; Impervious fraction =  0.500
Time of concentration =    10.44 min.
Rainfall intensity =      1.988(In/Hr) for a    10.0 year storm
Subarea runoff =      1.865(CFS) for      1.260(Ac.)
Total runoff =      7.729(CFS)    Total area =       5.000(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.300 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1501.200(Ft.)
Downstream point/station elevation =  1497.000(Ft.)
Pipe length  =   115.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.729(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.729(CFS)
Normal flow depth in pipe =    8.60(In.)
Flow top width inside pipe =   14.84(In.)
Critical Depth =   13.22(In.)
Pipe flow velocity =     10.62(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    10.62 min.
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       26.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.000(Ac.)
Runoff from this stream =      7.729(CFS)
Time of concentration =   10.62 min.
Rainfall intensity =     1.971(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.400 to Point/Station       26.500
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   710.000(Ft.)
Top (of initial area) elevation =  1596.800(Ft.)
Bottom (of initial area) elevation =  1523.000(Ft.)
Difference in elevation =    73.800(Ft.)
Slope =    0.10394  s(percent)=      10.39
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.519 min.
Rainfall intensity =      1.892(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.751
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.961(CFS)
Total initial stream area =        1.380(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.500 to Point/Station       26.600
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1523.000(Ft.)
End of street segment elevation =  1503.000(Ft.)
Length of street segment  =   600.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  32.000(Ft.)
Distance from crown to crossfall grade break  =  30.000(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  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  0.167(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      2.685(CFS)
Depth of flow =   0.152(Ft.), Average velocity =   3.491(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.918(Ft.)
Flow velocity =   3.49(Ft/s)
Travel time =    2.86 min.     TC =   14.38  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.866
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 =      1.693(In/Hr) for a    10.0 year storm
Subarea runoff =      1.495(CFS) for      1.020(Ac.)
Total runoff =      3.456(CFS)    Total area =       2.400(Ac.)
Street flow at end of street =      3.456(CFS)
Half street flow at end of street =      3.456(CFS)
Depth of flow =   0.169(Ft.), Average velocity =   3.723(Ft/s)
Flow width (from curb towards crown)=   9.769(Ft.)


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Process from Point/Station       26.600 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1498.000(Ft.)
Downstream point/station elevation =  1497.000(Ft.)
Pipe length  =    53.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.456(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.456(CFS)
Normal flow depth in pipe =    7.44(In.)
Flow top width inside pipe =   11.65(In.)
Critical Depth =    9.53(In.)
Pipe flow velocity =      6.75(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    14.51 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       26.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      2.400(Ac.)
Runoff from this stream =      3.456(CFS)
Time of concentration =   14.51 min.
Rainfall intensity =     1.686(In/Hr)
Summary of stream data:

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


1       35.376     15.70           1.621
2        7.729     10.62           1.971
```

```
3        3.456     14.51           1.686
Largest stream flow has longer time of concentration
Qp =     35.376 + sum of
           Qb          Ia/Ib
            7.729 *    0.822 =      6.356
           Qb          Ia/Ib
            3.456 *    0.962 =      3.323
Qp =     45.055

Total of 3 main streams to confluence:
Flow rates before confluence point:
      35.376       7.729       3.456
Area of streams before confluence:
       28.680        5.000        2.400


Results of confluence:
Total flow rate =     45.055(CFS)
Time of concentration =    15.700 min.
Effective stream area after confluence  =     36.080(Ac.)
End of computations, total study area =           36.08 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.769
Area averaged RI index number =  67.8
```

10YEAR- 24HR UNIT HYDROGRAPH

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

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Study date 08/19/19 File: BASIN22410.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978
Program License Serial Number 6406

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used
English Units used in output format

UNIT HYDROGRAPH STUDY, 10 YEAR STORM, 24HRS
TTM 37803 **CITY OF PERRIS, CA**
BASIN 2

Drainage Area = 36.00(Ac.) = 0.056 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 36.00(Ac.) = 0.056 Sq. Mi.
Length along longest watercourse = 2503.00(Ft.)
Length along longest watercourse measured to centroid = 1404.60(Ft.)
Length along longest watercourse = 0.474 Mi.
Length along longest watercourse measured to centroid = 0.266 Mi.
Difference in elevation = 132.50(Ft.)
Slope along watercourse = 279.5046 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.075 Hr.
Lag time = 4.50 Min.
25% of lag time = 1.12 Min.
40% of lag time = 1.80 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
36.00	2.00	72.00

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
36.00	5.00	180.00

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 3.234(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 3.234(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
36.000	67.80	0.230

Total Area Entered = 36.00(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
67.8	67.8	0.386	0.230	0.306	1.000	0.306
					Sum (F) =	0.306

Area averaged mean soil loss (F) (In/Hr) = 0.306
Minimum soil loss rate ((In/Hr)) = 0.153
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.716

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	111.201	22.599	8.199
2	0.167	222.402	48.844	17.721
3	0.250	333.603	14.171	5.141
4	0.333	444.803	6.483	2.352
5	0.417	556.004	3.601	1.307
6	0.500	667.205	2.224	0.807
7	0.583	778.406	1.306	0.474
8	0.667	889.607	0.772	0.280
			Sum = 100.000	Sum= 36.281

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.026	(0.542)	0.019	0.007
2	0.17	0.07	0.026	(0.540)	0.019	0.007
3	0.25	0.07	0.026	(0.538)	0.019	0.007
4	0.33	0.10	0.039	(0.536)	0.028	0.011
5	0.42	0.10	0.039	(0.534)	0.028	0.011
6	0.50	0.10	0.039	(0.532)	0.028	0.011
7	0.58	0.10	0.039	(0.530)	0.028	0.011
8	0.67	0.10	0.039	(0.528)	0.028	0.011
9	0.75	0.10	0.039	(0.526)	0.028	0.011
10	0.83	0.13	0.052	(0.524)	0.037	0.015
11	0.92	0.13	0.052	(0.522)	0.037	0.015
12	1.00	0.13	0.052	(0.519)	0.037	0.015
13	1.08	0.10	0.039	(0.517)	0.028	0.011
14	1.17	0.10	0.039	(0.515)	0.028	0.011
15	1.25	0.10	0.039	(0.513)	0.028	0.011
16	1.33	0.10	0.039	(0.511)	0.028	0.011
17	1.42	0.10	0.039	(0.509)	0.028	0.011
18	1.50	0.10	0.039	(0.507)	0.028	0.011
19	1.58	0.10	0.039	(0.505)	0.028	0.011

19	1.58	0.10	0.039	(0.505)	0.028	0.011
20	1.67	0.10	0.039	(0.503)	0.028	0.011
21	1.75	0.10	0.039	(0.501)	0.028	0.011
22	1.83	0.13	0.052	(0.499)	0.037	0.015
23	1.92	0.13	0.052	(0.497)	0.037	0.015
24	2.00	0.13	0.052	(0.495)	0.037	0.015
25	2.08	0.13	0.052	(0.493)	0.037	0.015
26	2.17	0.13	0.052	(0.491)	0.037	0.015
27	2.25	0.13	0.052	(0.489)	0.037	0.015
28	2.33	0.13	0.052	(0.487)	0.037	0.015
29	2.42	0.13	0.052	(0.485)	0.037	0.015
30	2.50	0.13	0.052	(0.483)	0.037	0.015
31	2.58	0.17	0.065	(0.481)	0.046	0.018
32	2.67	0.17	0.065	(0.479)	0.046	0.018
33	2.75	0.17	0.065	(0.477)	0.046	0.018
34	2.83	0.17	0.065	(0.475)	0.046	0.018
35	2.92	0.17	0.065	(0.473)	0.046	0.018
36	3.00	0.17	0.065	(0.471)	0.046	0.018
37	3.08	0.17	0.065	(0.469)	0.046	0.018
38	3.17	0.17	0.065	(0.467)	0.046	0.018
39	3.25	0.17	0.065	(0.465)	0.046	0.018
40	3.33	0.17	0.065	(0.464)	0.046	0.018
41	3.42	0.17	0.065	(0.462)	0.046	0.018
42	3.50	0.17	0.065	(0.460)	0.046	0.018
43	3.58	0.17	0.065	(0.458)	0.046	0.018
44	3.67	0.17	0.065	(0.456)	0.046	0.018
45	3.75	0.17	0.065	(0.454)	0.046	0.018
46	3.83	0.20	0.078	(0.452)	0.056	0.022
47	3.92	0.20	0.078	(0.450)	0.056	0.022
48	4.00	0.20	0.078	(0.448)	0.056	0.022
49	4.08	0.20	0.078	(0.446)	0.056	0.022
50	4.17	0.20	0.078	(0.444)	0.056	0.022
51	4.25	0.20	0.078	(0.442)	0.056	0.022
52	4.33	0.23	0.091	(0.441)	0.065	0.026
53	4.42	0.23	0.091	(0.439)	0.065	0.026
54	4.50	0.23	0.091	(0.437)	0.065	0.026
55	4.58	0.23	0.091	(0.435)	0.065	0.026
56	4.67	0.23	0.091	(0.433)	0.065	0.026
57	4.75	0.23	0.091	(0.431)	0.065	0.026
58	4.83	0.27	0.103	(0.429)	0.074	0.029
59	4.92	0.27	0.103	(0.428)	0.074	0.029
60	5.00	0.27	0.103	(0.426)	0.074	0.029
61	5.08	0.20	0.078	(0.424)	0.056	0.022
62	5.17	0.20	0.078	(0.422)	0.056	0.022
63	5.25	0.20	0.078	(0.420)	0.056	0.022
64	5.33	0.23	0.091	(0.418)	0.065	0.026
65	5.42	0.23	0.091	(0.416)	0.065	0.026
66	5.50	0.23	0.091	(0.415)	0.065	0.026
67	5.58	0.27	0.103	(0.413)	0.074	0.029
68	5.67	0.27	0.103	(0.411)	0.074	0.029
69	5.75	0.27	0.103	(0.409)	0.074	0.029
70	5.83	0.27	0.103	(0.407)	0.074	0.029
71	5.92	0.27	0.103	(0.406)	0.074	0.029
72	6.00	0.27	0.103	(0.404)	0.074	0.029
73	6.08	0.30	0.116	(0.402)	0.083	0.033
74	6.17	0.30	0.116	(0.400)	0.083	0.033
75	6.25	0.30	0.116	(0.398)	0.083	0.033
76	6.33	0.30	0.116	(0.397)	0.083	0.033
77	6.42	0.30	0.116	(0.395)	0.083	0.033
78	6.50	0.30	0.116	(0.393)	0.083	0.033
79	6.58	0.33	0.129	(0.391)	0.093	0.037
80	6.67	0.33	0.129	(0.390)	0.093	0.037
81	6.75	0.33	0.129	(0.388)	0.093	0.037
82	6.83	0.33	0.129	(0.386)	0.093	0.037
83	6.92	0.33	0.129	(0.384)	0.093	0.037
84	7.00	0.33	0.129	(0.383)	0.093	0.037
85	7.08	0.33	0.129	(0.381)	0.093	0.037
86	7.17	0.33	0.129	(0.379)	0.093	0.037
87	7.25	0.33	0.129	(0.377)	0.093	0.037
88	7.33	0.37	0.142	(0.376)	0.102	0.040
89	7.42	0.37	0.142	(0.374)	0.102	0.040
90	7.50	0.37	0.142	(0.372)	0.102	0.040
91	7.58	0.40	0.155	(0.371)	0.111	0.044
92	7.67	0.40	0.155	(0.369)	0.111	0.044
93	7.75	0.40	0.155	(0.367)	0.111	0.044
94	7.83	0.43	0.168	(0.365)	0.120	0.048
95	7.92	0.43	0.168	(0.364)	0.120	0.048
96	8.00	0.43	0.168	(0.362)	0.120	0.048
97	8.08	0.50	0.194	(0.360)	0.139	0.055
98	8.17	0.50	0.194	(0.359)	0.139	0.055
99	8.25	0.50	0.194	(0.357)	0.139	0.055
100	8.33	0.50	0.194	(0.355)	0.139	0.055
101	8.42	0.50	0.194	(0.354)	0.139	0.055
102	8.50	0.50	0.194	(0.352)	0.139	0.055
103	8.58	0.53	0.207	(0.350)	0.148	0.059
104	8.67	0.53	0.207	(0.349)	0.148	0.059
105	8.75	0.53	0.207	(0.347)	0.148	0.059
106	8.83	0.57	0.220	(0.345)	0.157	0.062
107	8.92	0.57	0.220	(0.344)	0.157	0.062
108	9.00	0.57	0.220	(0.342)	0.157	0.062
109	9.08	0.63	0.246	(0.341)	0.176	0.070
110	9.17	0.63	0.246	(0.339)	0.176	0.070
111	9.25	0.63	0.246	(0.337)	0.176	0.070
112	9.33	0.67	0.259	(0.336)	0.185	0.073
113	9.42	0.67	0.259	(0.334)	0.185	0.073
114	9.50	0.67	0.259	(0.333)	0.185	0.073
115	9.58	0.70	0.272	(0.331)	0.195	0.077
116	9.67	0.70	0.272	(0.329)	0.195	0.077
117	9.75	0.70	0.272	(0.328)	0.195	0.077
118	9.83	0.73	0.285	(0.326)	0.204	0.081
119	9.92	0.73	0.285	(0.325)	0.204	0.081
120	10.00	0.73	0.285	(0.323)	0.204	0.081
121	10.08	0.50	0.194	(0.321)	0.139	0.055
122	10.17	0.50	0.194	(0.320)	0.139	0.055
123	10.25	0.50	0.194	(0.318)	0.139	0.055
124	10.33	0.50	0.194	(0.317)	0.139	0.055
125	10.42	0.50	0.194	(0.315)	0.139	0.055
126	10.50	0.50	0.194	(0.314)	0.139	0.055
127	10.58	0.67	0.259	(0.312)	0.185	0.073
128	10.67	0.67	0.259	(0.311)	0.185	0.073
129	10.75	0.67	0.259	(0.309)	0.185	0.073
130	10.83	0.67	0.259	(0.308)	0.185	0.073
131	10.92	0.67	0.259	(0.306)	0.185	0.073
132	11.00	0.67	0.259	(0.305)	0.185	0.073
133	11.08	0.63	0.246	(0.303)	0.176	0.070
134	11.17	0.63	0.246	(0.302)	0.176	0.070
135	11.25	0.63	0.246	(0.300)	0.176	0.070
136	11.33	0.63	0.246	(0.299)	0.176	0.070
137	11.42	0.63	0.246	(0.297)	0.176	0.070
138	11.50	0.63	0.246	(0.296)	0.176	0.070

139	11.58	0.57	0.220	(0.294)	0.157	0.062
140	11.67	0.57	0.220	(0.293)	0.157	0.062
141	11.75	0.57	0.220	(0.291)	0.157	0.062
142	11.83	0.60	0.233	(0.290)	0.167	0.066
143	11.92	0.60	0.233	(0.288)	0.167	0.066
144	12.00	0.60	0.233	(0.287)	0.167	0.066
145	12.08	0.83	0.323	(0.286)	0.232	0.092
146	12.17	0.83	0.323	(0.284)	0.232	0.092
147	12.25	0.83	0.323	(0.283)	0.232	0.092
148	12.33	0.87	0.336	(0.281)	0.241	0.096
149	12.42	0.87	0.336	(0.280)	0.241	0.096
150	12.50	0.87	0.336	(0.278)	0.241	0.096
151	12.58	0.93	0.362	(0.277)	0.259	0.103
152	12.67	0.93	0.362	(0.276)	0.259	0.103
153	12.75	0.93	0.362	(0.274)	0.259	0.103
154	12.83	0.97	0.375	(0.273)	0.269	0.107
155	12.92	0.97	0.375	(0.272)	0.269	0.107
156	13.00	0.97	0.375	(0.270)	0.269	0.107
157	13.08	1.13	0.440	0.269	(0.315)	0.171
158	13.17	1.13	0.440	0.267	(0.315)	0.172
159	13.25	1.13	0.440	0.266	(0.315)	0.174
160	13.33	1.13	0.440	0.265	(0.315)	0.175
161	13.42	1.13	0.440	0.263	(0.315)	0.176
162	13.50	1.13	0.440	0.262	(0.315)	0.178
163	13.58	0.77	0.298	(0.261)	0.213	0.084
164	13.67	0.77	0.298	(0.259)	0.213	0.084
165	13.75	0.77	0.298	(0.258)	0.213	0.084
166	13.83	0.77	0.298	(0.257)	0.213	0.084
167	13.92	0.77	0.298	(0.255)	0.213	0.084
168	14.00	0.77	0.298	(0.254)	0.213	0.084
169	14.08	0.90	0.349	(0.253)	0.250	0.099
170	14.17	0.90	0.349	(0.252)	0.250	0.099
171	14.25	0.90	0.349	(0.250)	0.250	0.099
172	14.33	0.87	0.336	(0.249)	0.241	0.096
173	14.42	0.87	0.336	(0.248)	0.241	0.096
174	14.50	0.87	0.336	(0.246)	0.241	0.096
175	14.58	0.87	0.336	(0.245)	0.241	0.096
176	14.67	0.87	0.336	(0.244)	0.241	0.096
177	14.75	0.87	0.336	(0.243)	0.241	0.096
178	14.83	0.83	0.323	(0.241)	0.232	0.092
179	14.92	0.83	0.323	(0.240)	0.232	0.092
180	15.00	0.83	0.323	(0.239)	0.232	0.092
181	15.08	0.80	0.310	(0.238)	0.222	0.088
182	15.17	0.80	0.310	(0.236)	0.222	0.088
183	15.25	0.80	0.310	(0.235)	0.222	0.088
184	15.33	0.77	0.298	(0.234)	0.213	0.084
185	15.42	0.77	0.298	(0.233)	0.213	0.084
186	15.50	0.77	0.298	(0.232)	0.213	0.084
187	15.58	0.63	0.246	(0.230)	0.176	0.070
188	15.67	0.63	0.246	(0.229)	0.176	0.070
189	15.75	0.63	0.246	(0.228)	0.176	0.070
190	15.83	0.63	0.246	(0.227)	0.176	0.070
191	15.92	0.63	0.246	(0.226)	0.176	0.070
192	16.00	0.63	0.246	(0.225)	0.176	0.070
193	16.08	0.13	0.052	(0.223)	0.037	0.015
194	16.17	0.13	0.052	(0.222)	0.037	0.015
195	16.25	0.13	0.052	(0.221)	0.037	0.015
196	16.33	0.13	0.052	(0.220)	0.037	0.015
197	16.42	0.13	0.052	(0.219)	0.037	0.015
198	16.50	0.13	0.052	(0.218)	0.037	0.015
199	16.58	0.10	0.039	(0.217)	0.028	0.011
200	16.67	0.10	0.039	(0.216)	0.028	0.011
201	16.75	0.10	0.039	(0.215)	0.028	0.011
202	16.83	0.10	0.039	(0.213)	0.028	0.011
203	16.92	0.10	0.039	(0.212)	0.028	0.011
204	17.00	0.10	0.039	(0.211)	0.028	0.011
205	17.08	0.17	0.065	(0.210)	0.046	0.018
206	17.17	0.17	0.065	(0.209)	0.046	0.018
207	17.25	0.17	0.065	(0.208)	0.046	0.018
208	17.33	0.17	0.065	(0.207)	0.046	0.018
209	17.42	0.17	0.065	(0.206)	0.046	0.018
210	17.50	0.17	0.065	(0.205)	0.046	0.018
211	17.58	0.17	0.065	(0.204)	0.046	0.018
212	17.67	0.17	0.065	(0.203)	0.046	0.018
213	17.75	0.17	0.065	(0.202)	0.046	0.018
214	17.83	0.13	0.052	(0.201)	0.037	0.015
215	17.92	0.13	0.052	(0.200)	0.037	0.015
216	18.00	0.13	0.052	(0.199)	0.037	0.015
217	18.08	0.13	0.052	(0.198)	0.037	0.015
218	18.17	0.13	0.052	(0.197)	0.037	0.015
219	18.25	0.13	0.052	(0.196)	0.037	0.015
220	18.33	0.13	0.052	(0.195)	0.037	0.015
221	18.42	0.13	0.052	(0.194)	0.037	0.015
222	18.50	0.13	0.052	(0.193)	0.037	0.015
223	18.58	0.10	0.039	(0.192)	0.028	0.011
224	18.67	0.10	0.039	(0.191)	0.028	0.011
225	18.75	0.10	0.039	(0.190)	0.028	0.011
226	18.83	0.07	0.026	(0.190)	0.019	0.007
227	18.92	0.07	0.026	(0.189)	0.019	0.007
228	19.00	0.07	0.026	(0.188)	0.019	0.007
229	19.08	0.10	0.039	(0.187)	0.028	0.011
230	19.17	0.10	0.039	(0.186)	0.028	0.011
231	19.25	0.10	0.039	(0.185)	0.028	0.011
232	19.33	0.13	0.052	(0.184)	0.037	0.015
233	19.42	0.13	0.052	(0.183)	0.037	0.015
234	19.50	0.13	0.052	(0.183)	0.037	0.015
235	19.58	0.10	0.039	(0.182)	0.028	0.011
236	19.67	0.10	0.039	(0.181)	0.028	0.011
237	19.75	0.10	0.039	(0.180)	0.028	0.011
238	19.83	0.07	0.026	(0.179)	0.019	0.007
239	19.92	0.07	0.026	(0.178)	0.019	0.007
240	20.00	0.07	0.026	(0.178)	0.019	0.007
241	20.08	0.10	0.039	(0.177)	0.028	0.011
242	20.17	0.10	0.039	(0.176)	0.028	0.011
243	20.25	0.10	0.039	(0.175)	0.028	0.011
244	20.33	0.10	0.039	(0.175)	0.028	0.011
245	20.42	0.10	0.039	(0.174)	0.028	0.011
246	20.50	0.10	0.039	(0.173)	0.028	0.011
247	20.58	0.10	0.039	(0.172)	0.028	0.011
248	20.67	0.10	0.039	(0.172)	0.028	0.011
249	20.75	0.10	0.039	(0.171)	0.028	0.011
250	20.83	0.07	0.026	(0.170)	0.019	0.007
251	20.92	0.07	0.026	(0.170)	0.019	0.007
252	21.00	0.07	0.026	(0.169)	0.019	0.007
253	21.08	0.10	0.039	(0.168)	0.028	0.011
254	21.17	0.10	0.039	(0.168)	0.028	0.011
255	21.25	0.10	0.039	(0.167)	0.028	0.011
256	21.33	0.07	0.026	(0.166)	0.019	0.007
257	21.42	0.07	0.026	(0.166)	0.019	0.007
258	21.50	0.07	0.026	(0.165)	0.019	0.007

259	21.58	0.10	0.039	(0.164)	0.028	0.011
260	21.67	0.10	0.039	(0.164)	0.028	0.011
261	21.75	0.10	0.039	(0.163)	0.028	0.011
262	21.83	0.07	0.026	(0.163)	0.019	0.007
263	21.92	0.07	0.026	(0.162)	0.019	0.007
264	22.00	0.07	0.026	(0.162)	0.019	0.007
265	22.08	0.10	0.039	(0.161)	0.028	0.011
266	22.17	0.10	0.039	(0.160)	0.028	0.011
267	22.25	0.10	0.039	(0.160)	0.028	0.011
268	22.33	0.07	0.026	(0.159)	0.019	0.007
269	22.42	0.07	0.026	(0.159)	0.019	0.007
270	22.50	0.07	0.026	(0.158)	0.019	0.007
271	22.58	0.07	0.026	(0.158)	0.019	0.007
272	22.67	0.07	0.026	(0.158)	0.019	0.007
273	22.75	0.07	0.026	(0.157)	0.019	0.007
274	22.83	0.07	0.026	(0.157)	0.019	0.007
275	22.92	0.07	0.026	(0.156)	0.019	0.007
276	23.00	0.07	0.026	(0.156)	0.019	0.007
277	23.08	0.07	0.026	(0.156)	0.019	0.007
278	23.17	0.07	0.026	(0.155)	0.019	0.007
279	23.25	0.07	0.026	(0.155)	0.019	0.007
280	23.33	0.07	0.026	(0.155)	0.019	0.007
281	23.42	0.07	0.026	(0.154)	0.019	0.007
282	23.50	0.07	0.026	(0.154)	0.019	0.007
283	23.58	0.07	0.026	(0.154)	0.019	0.007
284	23.67	0.07	0.026	(0.154)	0.019	0.007
285	23.75	0.07	0.026	(0.153)	0.019	0.007
286	23.83	0.07	0.026	(0.153)	0.019	0.007
287	23.92	0.07	0.026	(0.153)	0.019	0.007
288	24.00	0.07	0.026	(0.153)	0.019	0.007

(Loss Rate Not Used)

Sum = 100.0 Sum = 11.3

Flood volume = Effective rainfall 0.94(In)
times area 36.0(Ac.)/[(In)/(Ft.)] = 2.8(Ac.Ft)
Total soil loss = 2.29(In)
Total soil loss = 6.872(Ac.Ft)
Total rainfall = 3.23(In)
Flood volume = 123260.0 Cubic Feet
Total soil loss = 299358.7 Cubic Feet

Peak flow rate of this hydrograph = 6.339(CFS)

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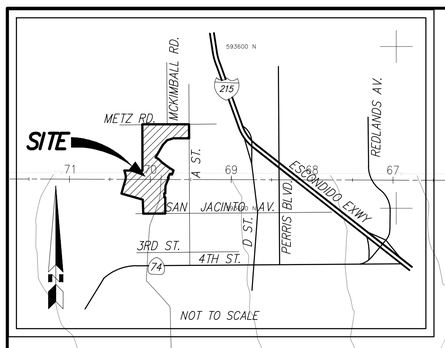
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0004	0.06	Q				
0+10	0.0017	0.19	Q				
0+15	0.0033	0.23	Q				
0+20	0.0052	0.28	VQ				
0+25	0.0076	0.35	VQ				
0+30	0.0102	0.38	VQ				
0+35	0.0128	0.39	VQ				
0+40	0.0156	0.39	VQ				
0+45	0.0183	0.40	VQ				
0+50	0.0213	0.43	VQ				
0+55	0.0247	0.50	VQ				
1+ 0	0.0282	0.51	V Q				
1+ 5	0.0316	0.49	VQ				
1+10	0.0346	0.43	VQ				
1+15	0.0374	0.42	VQ				
1+20	0.0403	0.41	VQ				
1+25	0.0431	0.41	VQ				
1+30	0.0458	0.40	VQ				
1+35	0.0486	0.40	VQ				
1+40	0.0514	0.40	VQ				
1+45	0.0541	0.40	VQ				
1+50	0.0571	0.43	VQ				
1+55	0.0605	0.50	VQ				
2+ 0	0.0640	0.51	V Q				
2+ 5	0.0676	0.52	V Q				
2+10	0.0713	0.53	|VQ				
2+15	0.0749	0.53	|VQ				
2+20	0.0786	0.53	|VQ				
2+25	0.0822	0.53	|VQ				
2+30	0.0859	0.53	|VQ				
2+35	0.0898	0.56	|VQ				
2+40	0.0941	0.63	|VQ				
2+45	0.0986	0.65	|VQ				
2+50	0.1031	0.66	|VQ				
2+55	0.1077	0.66	|VQ				
3+ 0	0.1122	0.66	|VQ				
3+ 5	0.1168	0.67	|VQ				
3+10	0.1214	0.67	|VQ				
3+15	0.1260	0.67	|VQ				
3+20	0.1306	0.67	|VQ				
3+25	0.1352	0.67	|VQ				
3+30	0.1398	0.67	|VQ				
3+35	0.1444	0.67	| Q				
3+40	0.1490	0.67	| Q				
3+45	0.1536	0.67	| Q				
3+50	0.1584	0.70	| Q				
3+55	0.1636	0.76	| VQ				
4+ 0	0.1690	0.78	| VQ				
4+ 5	0.1744	0.79	| VQ				
4+10	0.1799	0.79	| VQ				
4+15	0.1854	0.80	| VQ				
4+20	0.1911	0.83	| VQ				
4+25	0.1973	0.90	| VQ				
4+30	0.2035	0.91	| VQ				
4+35	0.2099	0.92	| VQ				
4+40	0.2163	0.93	| Q				
4+45	0.2227	0.93	| Q				
4+50	0.2293	0.96	| Q				
4+55	0.2364	1.03	| VQ				
5+ 0	0.2436	1.05	| VQ				
5+ 5	0.2505	1.00	| Q				
5+10	0.2565	0.87	| Q				
5+15	0.2622	0.84	| Q				
5+20	0.2681	0.85	| Q				
5+25	0.2743	0.91	| Q				
5+30	0.2807	0.92	| Q				
5+35	0.2873	0.95	| QV				
5+40	0.2943	1.02	| Q				
5+45	0.3015	1.04	| Q				

5+50	0.3088	1.06	|	Q	|	|	|	|		10+50	1.0958	2.61	|	Q	V	|	|	|
5+55	0.3161	1.06	|	Q	|	|	|	|		10+55	1.1140	2.64	|	Q	V	|	|	|
6+ 0	0.3234	1.06	|	Q	|	|	|	|		11+ 0	1.1323	2.65	|	Q	V	|	|	|
6+ 5	0.3309	1.10	|	Q	|	|	|	|		11+ 5	1.1504	2.63	|	Q	V	|	|	|
6+10	0.3389	1.16	|	Q	|	|	|	|		11+10	1.1681	2.57	|	Q	V	|	|	|
6+15	0.3471	1.18	|	Q	|	|	|	|		11+15	1.1857	2.55	|	Q	V	|	|	|
6+20	0.3553	1.19	|	QV	|	|	|	|		11+20	1.2032	2.54	|	Q	V	|	|	|
6+25	0.3635	1.19	|	QV	|	|	|	|		11+25	1.2207	2.54	|	Q	V	|	|	|
6+30	0.3717	1.20	|	QV	|	|	|	|		11+30	1.2382	2.54	|	Q	V	|	|	|
6+35	0.3802	1.23	|	QV	|	|	|	|		11+35	1.2552	2.48	|	Q|	V	|	|	|
6+40	0.3891	1.30	|	Q	|	|	|	|		11+40	1.2714	2.34	|	Q|	V	|	|	|
6+45	0.3982	1.31	|	Q	|	|	|	|		11+45	1.2873	2.31	|	Q|	V	|	|	|
6+50	0.4073	1.32	|	Q	|	|	|	|		11+50	1.3032	2.32	|	Q|	V	|	|	|
6+55	0.4164	1.33	|	Q	|	|	|	|		11+55	1.3196	2.37	|	Q|	V	|	|	|
7+ 0	0.4256	1.33	|	QV	|	|	|	|		12+ 0	1.3360	2.39	|	Q|	V	|	|	|
7+ 5	0.4348	1.33	|	QV	|	|	|	|		12+ 5	1.3539	2.60	|	Q	V|	|	|	|
7+10	0.4440	1.33	|	QV	|	|	|	|		12+10	1.3750	3.06	|	| Q	V|	|	|	|
7+15	0.4531	1.33	|	QV	|	|	|	|		12+15	1.3970	3.20	|	| Q	V|	|	|	|
7+20	0.4625	1.36	|	QV	|	|	|	|		12+20	1.4196	3.29	|	| Q	V	|	|	|
7+25	0.4724	1.43	|	QV	|	|	|	|		12+25	1.4430	3.39	|	| Q	V	|	|	|
7+30	0.4823	1.45	|	QV	|	|	|	|		12+30	1.4666	3.43	|	| Q	V	|	|	|
7+35	0.4926	1.49	|	QV	|	|	|	|		12+35	1.4908	3.51	|	| Q	|V	|	|	|
7+40	0.5033	1.56	|	QV	|	|	|	|		12+40	1.5159	3.65	|	| Q	|V	|	|	|
7+45	0.5142	1.58	|	QV	|	|	|	|		12+45	1.5413	3.69	|	| Q	|V	|	|	|
7+50	0.5253	1.62	|	QV	|	|	|	|		12+50	1.5671	3.74	|	| Q	| V	|	|	|
7+55	0.5369	1.69	|	QV	|	|	|	|		12+55	1.5934	3.82	|	| Q	| V	|	|	|
8+ 0	0.5487	1.71	|	QV	|	|	|	|		13+ 0	1.6199	3.84	|	| Q	| V	|	|	|
8+ 5	0.5610	1.78	|	Q	|	|	|	|		13+ 5	1.6500	4.38	|	|	Q | V	|	|	|
8+10	0.5742	1.92	|	QV	|	|	|	|		13+10	1.6882	5.54	|	|	| QV	|	|	|
8+15	0.5877	1.96	|	QV	|	|	|	|		13+15	1.7289	5.91	|	|	| QV	|	|	|
8+20	0.6013	1.98	|	QV	|	|	|	|		13+20	1.7710	6.11	|	|	| QV	|	|	|
8+25	0.6150	1.99	|	QV	|	|	|	|		13+25	1.8139	6.24	|	|	| QV	|	|	|
8+30	0.6288	1.99	|	QV	|	|	|	|		13+30	1.8576	6.34	|	|	| QV	|	|	|
8+35	0.6427	2.03	|	QV|	|	|	|		13+35	1.8965	5.65	|	|	| Q V	|	|	|
8+40	0.6572	2.10	|	QV|	|	|	|		13+40	1.9242	4.03	|	| Q	| V	|	|	|
8+45	0.6717	2.11	|	QV|	|	|	|		13+45	1.9487	3.55	|	| Q	| V	|	|	|
8+50	0.6866	2.15	|	QV|	|	|	|		13+50	1.9717	3.33	|	| Q	| V	|	|	|
8+55	0.7019	2.22	|	QV|	|	|	|		13+55	1.9938	3.21	|	| Q	| V	|	|	|
9+ 0	0.7173	2.24	|	Q V	|	|	|		14+ 0	2.0154	3.14	|	| Q	| V	|	|	|
9+ 5	0.7333	2.32	|	QV	|	|	|		14+ 5	2.0376	3.21	|	| Q	| V	|	|	|
9+10	0.7501	2.45	|	QV	|	|	|		14+10	2.0613	3.45	|	| Q	| V|	|	|	|
9+15	0.7673	2.49	|	QV	|	|	|		14+15	2.0856	3.52	|	| Q	| V|	|	|	|
9+20	0.7848	2.54	|	QV	|	|	|		14+20	2.1099	3.53	|	| Q	| V|	|	|	|
9+25	0.8028	2.62	|	QV	|	|	|		14+25	2.1338	3.48	|	| Q	| V	|	|	|
9+30	0.8210	2.64	|	QV	|	|	|		14+30	2.1578	3.48	|	| Q	| V	|	|	|
9+35	0.8395	2.68	|	QV	|	|	|		14+35	2.1817	3.47	|	| Q	| V	|	|	|
9+40	0.8585	2.76	|	|QV	|	|	|		14+40	2.2056	3.47	|	| Q	| |V	|	|	|
9+45	0.8776	2.78	|	|QV	|	|	|		14+45	2.2295	3.47	|	| Q	| |V	|	|	|
9+50	0.8971	2.82	|	|QV	|	|	|		14+50	2.2532	3.44	|	| Q	| |V	|	|	|
9+55	0.9170	2.89	|	|QV	|	|	|		14+55	2.2764	3.37	|	| Q	| | V	|	|	|
10+ 0	0.9370	2.91	|	|Q V	|	|	|		15+ 0	2.2995	3.35	|	| Q	| | V	|	|	|
10+ 5	0.9557	2.71	|	Q V	|	|	|		15+ 5	2.3224	3.31	|	| Q	| | V	|	|	|
10+10	0.9713	2.26	|	Q| V	|	|	|		15+10	2.3447	3.24	|	| Q	| |	| V	|	|
10+15	0.9860	2.13	|	Q | V	|	|	|		15+15	2.3669	3.22	|	| Q	| |	| V	|	|
10+20	1.0003	2.07	|	Q | V	|	|	|		15+20	2.3888	3.18	|	| Q	| |	| V	|	|
10+25	1.0143	2.04	|	Q | V	|	|	|		15+25	2.4102	3.11	|	| Q	| |	| V	|	|
10+30	1.0282	2.02	|	Q | V	|	|	|		15+30	2.4315	3.09	|	| Q	| |	| V	|	|
10+35	1.0431	2.16	|	Q | V	|	|	|		15+35	2.4519	2.96	|	|Q	| |	| V	|	|
10+40	1.0601	2.48	|	Q| V	|	|	|		15+40	2.4705	2.69	|	Q	| |	| V	|	|
10+45	1.0778	2.57	|	Q V	|	|	|		15+45	2.4885	2.61	|	Q	| |	| V	|	|

15+50	2.5062	2.58		Q		V	
15+55	2.5238	2.56		Q		V	
16+ 0	2.5413	2.55		Q		V	
16+ 5	2.5557	2.09		Q		V	
16+10	2.5634	1.11	Q			V	
16+15	2.5691	0.82	Q			V	
16+20	2.5738	0.69	Q			V	
16+25	2.5781	0.62	Q			V	
16+30	2.5821	0.58	Q			V	
16+35	2.5857	0.52	Q			V	
16+40	2.5887	0.44	Q			V	
16+45	2.5916	0.42	Q			V	
16+50	2.5944	0.41	Q			V	
16+55	2.5972	0.41	Q			V	
17+ 0	2.6000	0.40	Q			V	
17+ 5	2.6031	0.46	Q			V	
17+10	2.6072	0.59	Q			V	
17+15	2.6115	0.63	Q			V	
17+20	2.6160	0.65	Q			V	
17+25	2.6205	0.66	Q			V	
17+30	2.6250	0.66	Q			V	
17+35	2.6296	0.66	Q			V	
17+40	2.6342	0.67	Q			V	
17+45	2.6388	0.67	Q			V	
17+50	2.6432	0.64	Q			V	
17+55	2.6471	0.57	Q			V	
18+ 0	2.6509	0.55	Q			V	
18+ 5	2.6547	0.54	Q			V	
18+10	2.6584	0.54	Q			V	
18+15	2.6621	0.54	Q			V	
18+20	2.6658	0.53	Q			V	
18+25	2.6694	0.53	Q			V	
18+30	2.6731	0.53	Q			V	
18+35	2.6766	0.50	Q			V	
18+40	2.6796	0.44	Q			V	
18+45	2.6825	0.42	Q			V	
18+50	2.6851	0.38	Q			V	
18+55	2.6873	0.31	Q			V	
19+ 0	2.6892	0.29	Q			V	
19+ 5	2.6914	0.31	Q			V	
19+10	2.6939	0.37	Q			V	
19+15	2.6965	0.38	Q			V	
19+20	2.6994	0.42	Q			V	
19+25	2.7028	0.49	Q			V	
19+30	2.7063	0.51	Q			V	
19+35	2.7097	0.49	Q			V	
19+40	2.7127	0.43	Q			V	
19+45	2.7156	0.42	Q			V	
19+50	2.7182	0.38	Q			V	
19+55	2.7203	0.31	Q			V	
20+ 0	2.7223	0.29	Q			V	
20+ 5	2.7244	0.31	Q			V	
20+10	2.7270	0.37	Q			V	
20+15	2.7296	0.38	Q			V	
20+20	2.7323	0.39	Q			V	
20+25	2.7350	0.39	Q			V	
20+30	2.7377	0.40	Q			V	
20+35	2.7405	0.40	Q			V	
20+40	2.7432	0.40	Q			V	
20+45	2.7460	0.40	Q			V	
20+50	2.7486	0.37	Q			V	
20+55	2.7507	0.31	Q			V	
21+ 0	2.7526	0.29	Q			V	
21+ 5	2.7547	0.31	Q			V	
21+10	2.7573	0.37	Q			V	
21+15	2.7599	0.38	Q			V	
21+20	2.7624	0.36	Q			V	
21+25	2.7645	0.30	Q			V	
21+30	2.7664	0.28	Q			V	
21+35	2.7685	0.31	Q			V	
21+40	2.7710	0.37	Q			V	
21+45	2.7737	0.38	Q			V	
21+50	2.7762	0.36	Q			V	
21+55	2.7782	0.30	Q			V	
22+ 0	2.7802	0.28	Q			V	
22+ 5	2.7823	0.31	Q			V	
22+10	2.7848	0.37	Q			V	
22+15	2.7875	0.38	Q			V	
22+20	2.7899	0.36	Q			V	
22+25	2.7920	0.30	Q			V	
22+30	2.7940	0.28	Q			V	
22+35	2.7959	0.28	Q			V	
22+40	2.7977	0.27	Q			V	
22+45	2.7996	0.27	Q			V	
22+50	2.8014	0.27	Q			V	
22+55	2.8033	0.27	Q			V	
23+ 0	2.8051	0.27	Q			V	
23+ 5	2.8070	0.27	Q			V	
23+10	2.8088	0.27	Q			V	
23+15	2.8106	0.27	Q			V	
23+20	2.8125	0.27	Q			V	
23+25	2.8143	0.27	Q			V	
23+30	2.8161	0.27	Q			V	
23+35	2.8180	0.27	Q			V	
23+40	2.8198	0.27	Q			V	
23+45	2.8216	0.27	Q			V	
23+50	2.8235	0.27	Q			V	
23+55	2.8253	0.27	Q			V	
24+ 0	2.8272	0.27	Q			V	
24+ 5	2.8286	0.21	Q			V	
24+10	2.8291	0.08	Q			V	
24+15	2.8294	0.04	Q			V	
24+20	2.8295	0.02	Q			V	
24+25	2.8296	0.01	Q			V	
24+30	2.8296	0.01	Q			V	
24+35	2.8297	0.00	Q			V	



VICINITY MAP

PRELIMINARY HYDROLOGY MAP
PROPOSED TTM 37803
CITY OF PERRIS, RIVERSIDE COUNTY, CA

SCALE: 1" = 100'

PREPARED FOR:
UCI PROPERTY DEVELOPMENT, INC.
17700 CASTLETON STREET, #128
CITY OF INDUSTRY, CA 91706
(626) 757-1605

HUNSAKER & ASSOCIATES
IRVINE, INC
INLAND EMPIRE REGION
PLANNING/ENGINEERING/SURVEYING/GOVERNMENT RELATIONS

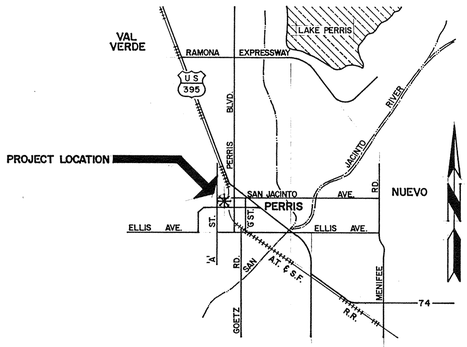
W.O.: 1873-141

PLOTTED BY: Naila Brown DATE: Aug. 21, 2019 11:02:52 AM FILE: H:\00648\Planning\Hydrology\Maps\Preliminary Hydro Map.dwg

SECTION 4

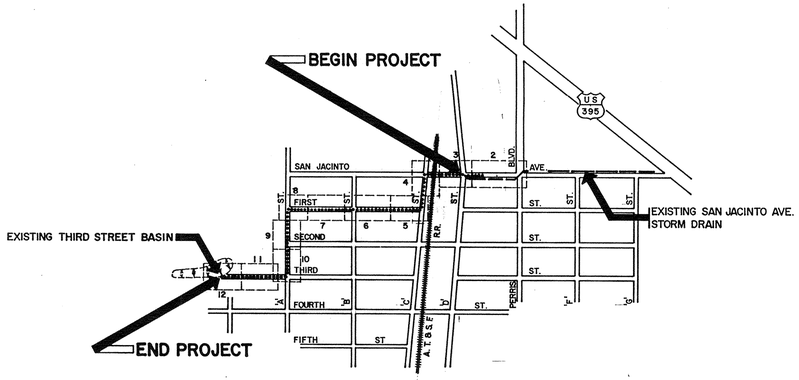
REFERENCE

RIVERSIDE COUNTY FLOOD CONTROL
and
WATER CONSERVATION DISTRICT

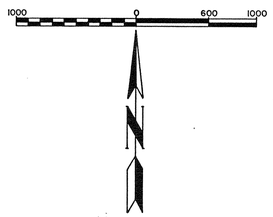


VICINITY MAP

NO SCALE



LOCATION MAP



GENERAL NOTES

1. STANDARD DRAWINGS CALLED FOR ON THE PLAN & PROFILE SHALL CONFORM TO RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT STANDARD DRAWINGS LISTED ON THIS SHEET.
2. TIES TO CATCH BASINS ARE FROM THE CURB RETURN TO THE CENTERLINE OF THE BASIN UNLESS OTHERWISE SHOWN.
3. PAVEMENT REPLACEMENT SHALL BE 2-1/2" OF ASPHALTIC CONCRETE AND 6" OF CLASS 3 BASE, UNLESS OTHERWISE NOTED.
4. CURB AND GUTTER SHALL BE REPLACED PER RIVERSIDE COUNTY FLOOD CONTROL STANDARD DRAWING Nº M 813.
5. JUNCTION STRUCTURE Nº 4 (PIPE) OR JUNCTION STRUCTURE Nº 3 (BOX) SHALL BE CONSTRUCTED FOR JUNCTIONS NOT OTHERWISE SPECIFIED ON THE PLAN AND PROFILE.
6. ALL OPENINGS RESULTING FROM CUTTING OR PARTIAL REMOVAL OF EXISTING CULVERTS, PIPES OR SIMILAR STRUCTURES TO BE ABANDONED SHALL BE SEALED WITH 6" OF CLASS "B" CONCRETE, NOTED ON THE DRAWINGS AS "PLUG."
7. ALL RESURFACING, CURBS, GUTTERS, SIDEWALK, DRIVEWAYS AND OTHER EXISTING IMPROVEMENTS TO BE RECONSTRUCTED SHALL BE CONSTRUCTED AT THE SAME ELEVATION AND LOCATION AS THE EXISTING IMPROVEMENTS, UNLESS OTHERWISE NOTED.

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R.C.F.C. STANDARD DRAWINGS

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• KRIEGER & STEWART •
INCORPORATED
ENGINEERING CONSULTANTS
RIVERSIDE, CALIFORNIA (714) 684-6900

APPROVED BY Mark E. Krieger
REGISTERED ENGINEER Nº 22020 DATE 5/19/80

REFERENCE	DESCRIPTION	APPROVED	DATE

REVISIONS
AS BUILT

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

PERRIS THIRD STREET BASIN OUTLET DRAIN

TITLE SHEET

PROJECT NO. 4-0-270

Approved: Kenneth L. Schwade
Chief Engineer R.E. No. 12400
Date: 8-26-80

Designed: M.E.M.
Drawn: W.E. & J.V.
Checked: M.E.M.
Date Drawn: 2-80

Sheet No. 1 of 37
Dwg. No. 4-271

S=C1182

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES CROSSING OR PARALLELING THE STORM DRAIN, UNLESS OTHERWISE NOTED.

NOTE: CONTRACTOR SHALL VERIFY EXACT ELEVATION OF SS6 BEFORE LAYING ANY 60" PIPE.

EXISTING SURFACE OVER ℄ S.D.

H.G.L.

℄ "D" STREET

℄ RAILROAD

EXISTING 18" S.D.

T.V.

3.2'

2.7'

SS 6

① W4

EXISTING 24" SD

S=0.00777

S=0.002

1435.77

436.55 GRADE CHANGE

1437.35

STA. 10+00

STA. 12+41

STA. 12+81

STA. 13+21

MATCH LINE

341'-60" R.C.P., 1000D

80'-60" R.C.P., 3000D ASTM C76 WALL C

79'-60" R.C.P., 1000D

STA. 9+00

STA. 14+00

1445

1440

1435

1430

PROFILE

HYDRAULIC DATA
Q=139 c.f.s.
V=7.1 f.p.s.

MATCH LINE

"D" STREET

SD 24

C.B.

SD 6 (STEEL)

SD 18

GRATE

STA. 10+00 PT. ①

W4

STOP SIGN

BUSH

BUSHES

SS 6

℄ RAILROAD

BOX CULVERT

CONCRETE CHANNEL

SIGN

T.V.

BH-1

N89°37'57"W

SS 8

W10

G3

STOP SIGN

SAN JACINTO AVENUE

SANTA FE R.R.

STA. 9+00

STA. 14+00

PLAN

20' 0 20'

① W4 TO BE RELOCATED BY OTHERS PRIOR TO CONSTRUCTION.

℄ SAN JACINTO AVENUE

R/W 40' 20' 20' 40' R/W

C&G C&G

G3 W10 T.V. SD 18

60" RCP 12'

SECTION AT STATION 12+00

10 0 10

BENCH MARK
TOP OF 2" BRASS DISK AT ℄ INTERSECTION "D" ST. & SAN JACINTO AVE. STA 10+00
ELEV. 1444.28

REFERENCE	DESCRIPTION	APPROVED	DATE
	No Change		

REVISIONS
AS BUILT

• KRIEGER & STEWART •
INCORPORATED
ENGINEERING CONSULTANTS
RIVERSIDE, CALIFORNIA (714) 684-6900

APPROVED BY Mark E. Mesecum
REGISTERED ENGINEER NO 22020 DATE 6/19/80

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

PERRIS THIRD STREET BASIN OUTLET DRAIN

STA. 9+00 TO STA. 14+00

PROJECT NO. 4-0-270

Approved: Chief Engineer R.E.No.12400

Date: 8-26-80

Designed: M.E.M.
Drawn: J.B./R.K./J.V.
Checked: M.E.M.
Date Drawn: 2/80

Sheet No. 3 of 37
Dwg. No. 4-271

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES CROSSING OR PARALLELING THE STORM DRAIN, UNLESS OTHERWISE NOTED

+/- LOCATION OF PRO.24"RCP FROM TTM 37803

MANHOLE NO.4 STA. 14+28.59 1½ x 2.6 C2

H.G.L.

2.6'

W8

EXISTING SURFACE OVER ℄ S.D.

EXISTING 8" SS

18" INLET (E) ℄ STA. 14+82.03

18" INLET (W) ℄ STA 15+25.63

S=0.002

18" INLET (E) ℄ STA.17+24.38

24" INLET (W) ℄ STA.17+47.24

1437.35

1437.42

30" INLET (S) ℄ STA. 14+28.59

1437.40

1438.11

24"-60" RCP 1000D

347'-60" R.C.P., 1000D

STA. 14+00 MATCHLINE

STA. 14+24.91

STA. 14+32.91

STA. 17+80 MATCHLINE

HYDRAULIC DATA
Q = 112 c.f.s.
V = 5.7 f.p.s.

HYDRAULIC DATA
Q = 82 c.f.s.
V = 4.2 f.p.s.

PROFILE

STA. 14+82.03 ℄ 60" R.C.P. = STA. 0+00 CONNECTOR PIPE

W8 T.V. 1443.93 10'-18" R.C.P. 1442.5 0+10 JOIN WITH CONCRETE COLLAR 1440.30 EL. "S"

CONNECTOR PIPE PROFILE

STA 14+82.03

STA. 14+28.59 ℄ 60" R.C.P. = STA. 0+00 CONNECTOR PIPE

EX. CONC. CHANNEL

T.V. ⑨ 8'-30" R.C.P. 1442.17 1440.0 EL. "R" 1439.2 EL. "S"

CONNECTOR PIPE PROFILE

STA. 14+28.59

MATCH LINE

STA. 14+00

STOP SIGN

G3 W10 N89°37'57"W 12' TV

② MANHOLE NO. 4 STA. 14+28.59

B.C. P.F.H. 12' ③ TV W8(PVC) 15 16 17 70° ⑤

W2 8" 12' E.C. 9.03' 12.0' PT ② S04°56'52"W SS8 SS SS SS SS

51' ④ M.B.(3) ℄ M.B. ⑥

℄ STA. 17+38.00 ℄ STA. 17+66.97 STA. 17+80

AVENUE

CONCRETE CHANNEL

"C" STREET

SAN JACINTO

W4 G3

40' 40' 20' 20' 12'

PLAN

20' 0 20'

℄ CURVE DATA
Δ=85°25'10"
R=22.50'
L=33.54'
T=20.77'
BC=14+32.91
EC=14+66.45

R/W 30' 20' ℄ "C" STREET 20' 30' R/W C&G SS 8 W8 TV 60" RCP 9'

SECTION AT STA. 17+00

10' 0 10'

① C.B. NO.1, W=10', V=6', 8'-30" R.C.P., 1400D CONSTRUCT CATCH BASIN ON CHORD. NO LOCAL DEPRESSION REQ'D. MATCH CATCH BASIN OPENING TO EXISTING GUTTER FLOWLINE. OPENING HEIGHT VARIES. CENTER BASIN ON EX. OPENING THROUGH CURB. SEE PROFILE THIS SHEET.

② M.H.NO. 4, STA. 14+28.59, A=70°, B=30°, C=5.6', D_1=60", D_2=60" EL. "R"=1440.0, EL. "S"=1439.2

③ C.B. NO.1, W=7', V=4.0', 10'-18" R.C.P., CL. IV. (STA. 14+82.03) SEE PROFILE THIS SHEET.

④ C.B. NO.1, W=7', V=4.0', 27'-18" R.C.P., CL. IV. GRADE SLOPE AS REQUIRED BEHIND CATCH BASIN. CONNECTOR PIPE PROFILE, SHEET 13 (STA. 15+25.63).

⑤ C.B. NO.1, W=21', V=4.0', 11'-18" R.C.P., CL. IV CONNECTOR PIPE PROFILE, SHEET 13 (STA. 17+24.38).

⑥ C.B. NO.1, W=21', V=4.0', 31'-24" R.C.P., CL. III CONNECTOR PIPE PROFILE, SHEET 13 (STA. 17+47.24).

⑦ REMOVE & REPLACE INTERFERING PORTIONS OF CURB & GUTTER, SPANDREL & CROSS GUTTER.

⑧ REMOVE INTERFERING PORTIONS OF EX. CONC. CHANNEL.

⑨ T.V. CABLE TO BE RELOCATED BY OTHERS PRIOR TO CONSTRUCTION.

+/- LOCATION OF PRO.24"RCP FROM TTM 37803

BENCH MARK
TOP OF 2" O.D.I.P. WITH ALUMINUM DISK STAMPED "STATE OF CALIF. FORESTRY" AT ℄ INTERSECTION "C" ST. & SAN JACINTO AVE.
ELEV. 1447.28

REFERENCE	DESCRIPTION	APPROVED	DATE
C2	Station Changed	GBS	4/2/81

REVISIONS
AS BUILT

• KRIEGER & STEWART •
INCORPORATED
ENGINEERING CONSULTANTS
RIVERSIDE, CALIFORNIA (714) 684-6900

APPROVED BY Mark E. Krieger
REGISTERED ENGINEER No 22020 DATE 5/9/80

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

PERRIS THIRD STREET BASIN OUTLET DRAIN

STA. 14+00 TO STA. 17+80

PROJECT NO. 4-0-270

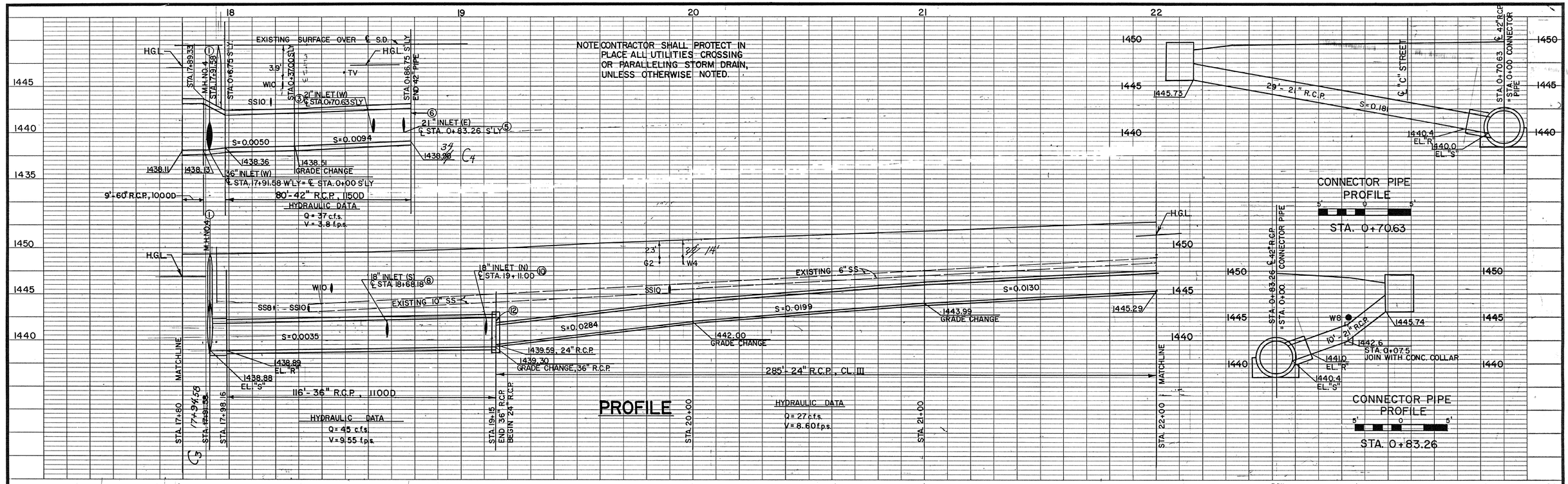
Approved: Kenneth L. Ford
Chief Engineer R.E.No.12400
Date: 5-12-80

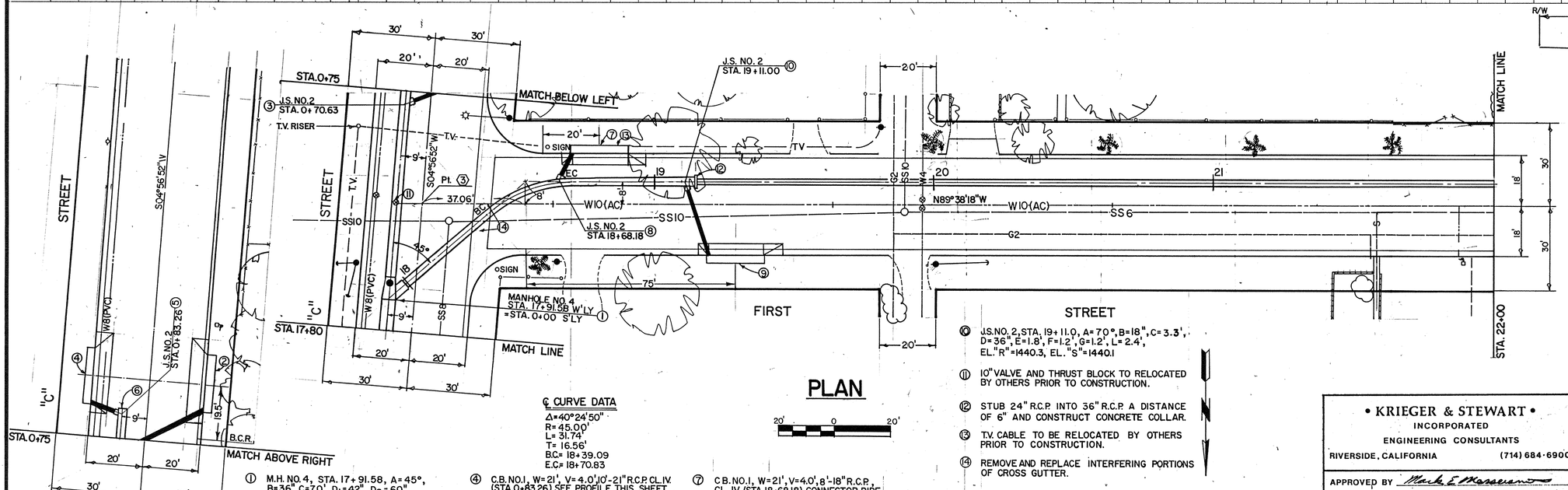
Designed: M.E.M.
Drawn: J.B./R.K./J.V.
Checked: M.E.M.
Date Drawn: 2/80

Sheet No. 4 of 37
Dwg. No. 4-271

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES CROSSING OR PARALLELING STORM DRAIN, UNLESS OTHERWISE NOTED.

PROFILE





PLAN

℄ CURVE DATA
Δ=40°24'50"
R=45.00'
L=31.74'
T=16.56'
B.C.=18+39.09
E.C.=18+70.83

① M.H. NO. 4, STA. 17+91.58, A=45°, B=36", C=7.0', D_1=42", D_2=60", EL."R"=1438.89, EL. "S"=1438.88

② C.B. NO. I, W=21', V=4.0', 29'-21" R.C.P. CL. IV (STA. 0+70.63) SEE PROFILE, THIS SHEET.

③ J.S. NO. 2, STA. 0+70.63, A=60°, B=21", C=4.2', D=42", E=2.7', F=1.6', G=1.6', L=3.0' EL."R"=1440.4, EL."S"=1440.0

④ C.B. NO. I, W=21', V=4.0', 10'-21" R.C.P. CL. IV (STA. 0+83.26) SEE PROFILE THIS SHEET.

⑤ J.S. NO. 2, STA. 0+83.26, A=70°, B=21", C=3.7', D=42", E=2.1', F=1.3', G=1.6', L=2.7', EL."R"=1441.0, EL."S"=1440.4

⑥ CONCRETE BULKHEAD STD. DWG. NO. M816, STA. 0+86.75

⑦ C.B. NO. I, W=21', V=4.0', 8'-18" R.C.P., CL. IV (STA. 18+68.18) CONNECTOR PIPE PROFILE SHEET NO. 13.

⑧ J.S. NO. 2, STA. 18+68.18, A=70°, B=18", C=3.3', D=36", E=1.8', F=0.6', G=1.5', L=2.4', EL."R"=1441.5, EL."S"=1441.0

⑨ C.B. NO. I, W=21', V=4.0', 26'-18" R.C.P., CL. IV. (STA. 19+11.00) CONNECTOR PIPE PROFILE SHEET NO. 13

⑩ J.S. NO. 2, STA. 19+11.0, A=70°, B=18", C=3.3', D=36", E=1.8', F=1.2', G=1.2', L=2.4', EL."R"=1440.3, EL."S"=1440.1

⑪ 10" VALVE AND THRUST BLOCK TO RELOCATED BY OTHERS PRIOR TO CONSTRUCTION.

⑫ STUB 24" R.C.P. INTO 36" R.C.P. A DISTANCE OF 6" AND CONSTRUCT CONCRETE COLLAR.

⑬ T.V. CABLE TO BE RELOCATED BY OTHERS PRIOR TO CONSTRUCTION.

⑭ REMOVE AND REPLACE INTERFERING PORTIONS OF CROSS GUTTER.

BENCH MARK
TOP OF 1 1/4" O.D.I.P. TAGGED L.S. 4055 AT ℄ INTERSECTION "C" ST. & FIRST ST.

ELEV. 1449.74

REFERENCE	DESCRIPTION	APPROVED	DATE
C4	Elevation Changed	JBS	4/3/81
C3	M.H. No 4 Sta. Changed	JBS	4/3/81

REVISIONS
AS BUILT

• KRIEGER & STEWART •
INCORPORATED
ENGINEERING CONSULTANTS
RIVERSIDE, CALIFORNIA (714) 684-6900

APPROVED BY Mark E. Krieger
REGISTERED ENGINEER Nº 22020 DATE 8/19/80

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

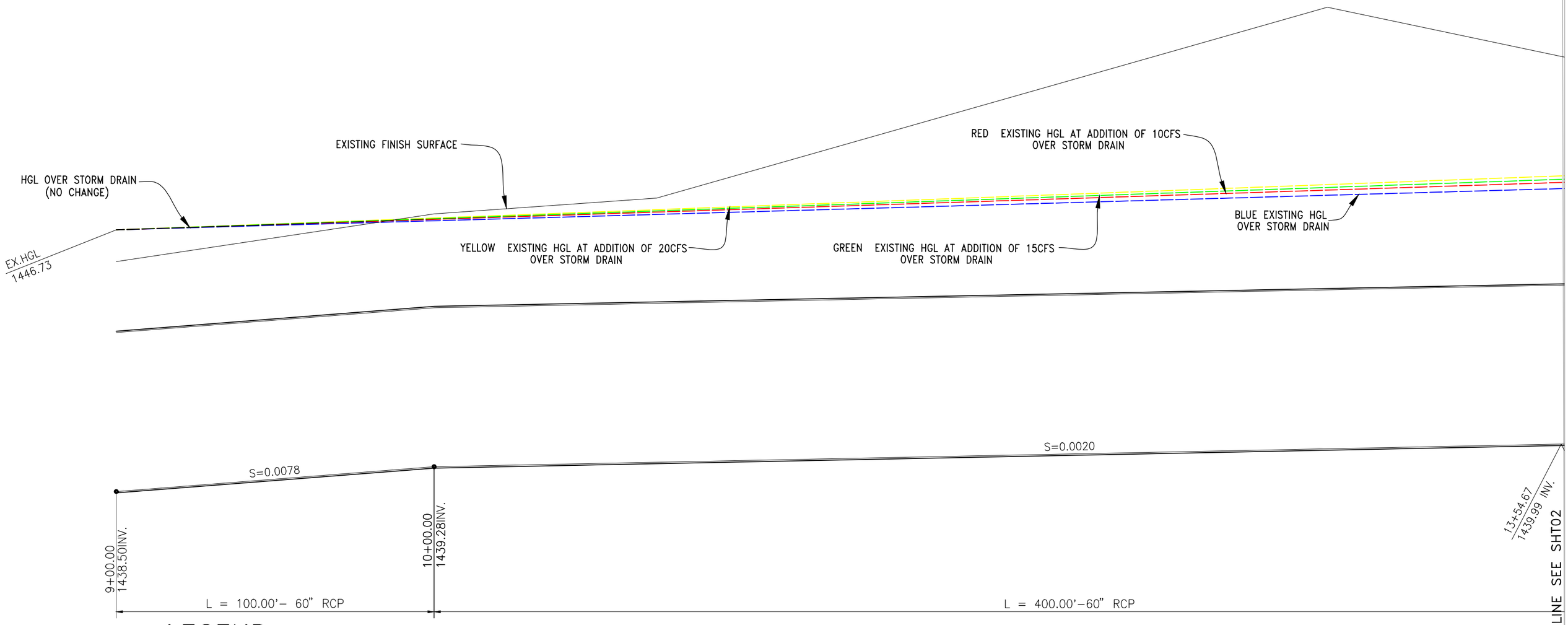
PERRIS THIRD STREET BASIN OUTLET DRAIN

STA. 17+80 TO STA. 22+00

PROJECT NO. 4-0-270

Approved: Kenneth L. Ford, Chief Engineer R.E. No. 12400
Date: 8-26-80

Designed: MEM	Sheet No. 5 of 37
Drawn: JLB	
Checked: MEM	Dwg. No. 4-271
Date Drawn: 2/80	



LEGEND

- HGL AT ADDITION OF 20CFS TO EXISTING FOWS
- HGL AT ADDITION OF 15CFS TO EXISTING FLOWS
- HGL AT ADDITION OF 10CFS TO EXISTING FLOWS
- EXISTING HGL AT EXISTING FLOWS

SCALE: NOT TO SCALE

EXHIBIT "D"
PERRIS THIRD STREET BASIN
OUTLET DRAIN– EXI. 60" RCP
SHT 1 OF 2 SEE REFERENCE SECTION
FOR AS BUILD PLANS

EXISTING FINISH SURFACE

EXISTING FINISH SURFACE

YELLOW EXISTING HGL AT ADDITION OF 20CFS OVER STORM DRAIN

RED EXISTING HGL AT ADDITION OF 10CFS OVER STORM DRAIN

GREEN EXISTING HGL AT ADDITION OF 15CFS OVER STORM DRAIN

BLUE EXISTING HGL OVER STORM DRAIN

No. Desc.
STA 14+28.91
ELEV 1442.14

24" RCP- TTM 37803
STA 14+50.00
ELEV 1441.00

18" RCP EX
STA 14+82.03
ELEV 1441.50

18" RCP EX
STA 15+25.63
ELEV 1442.33

17+24.38
1443.72

24" RCP
STA 17+47.24
ELEV 1442.22

S=0.0020

13+54.67
1439.99 INV.

14+00.00
1440.08 INV

14+00.00
1440.08 INV

14+24.91
1440.13INV.

14+32.91
1440.15INV.

14+50.00
1440.18INV.

EC=14+66.45
1440.22INV.

14+82.03
1440.25INV.

15+25.63
1440.33INV.

17+24.38
1440.73

17+47.24
1440.77INV.

17+80.00
1440.84INV.

MATCH LINE SEE SHT01

L = 24.91'-60"RCP

L = 347.09'-60" RCP

LEGEND

- HGL AT ADDITION OF 20CFS TO EXISTING FOWS
- HGL AT ADDITION OF 15CFS TO EXISTING FLOWS
- HGL AT ADDITION OF 10CFS TO EXISTING FLOWS
- EXISTING HGL AT EXISTING FLOWS

SCALE: NOT TO SCALE

EXHIBIT "D"
PERRIS THIRD STREET BASIN
OUTLET DRAIN- EXI. 60" RCP
SHT 2 OF 2 SEE REFERENCE SECTION
FOR AS BUILD PLANS

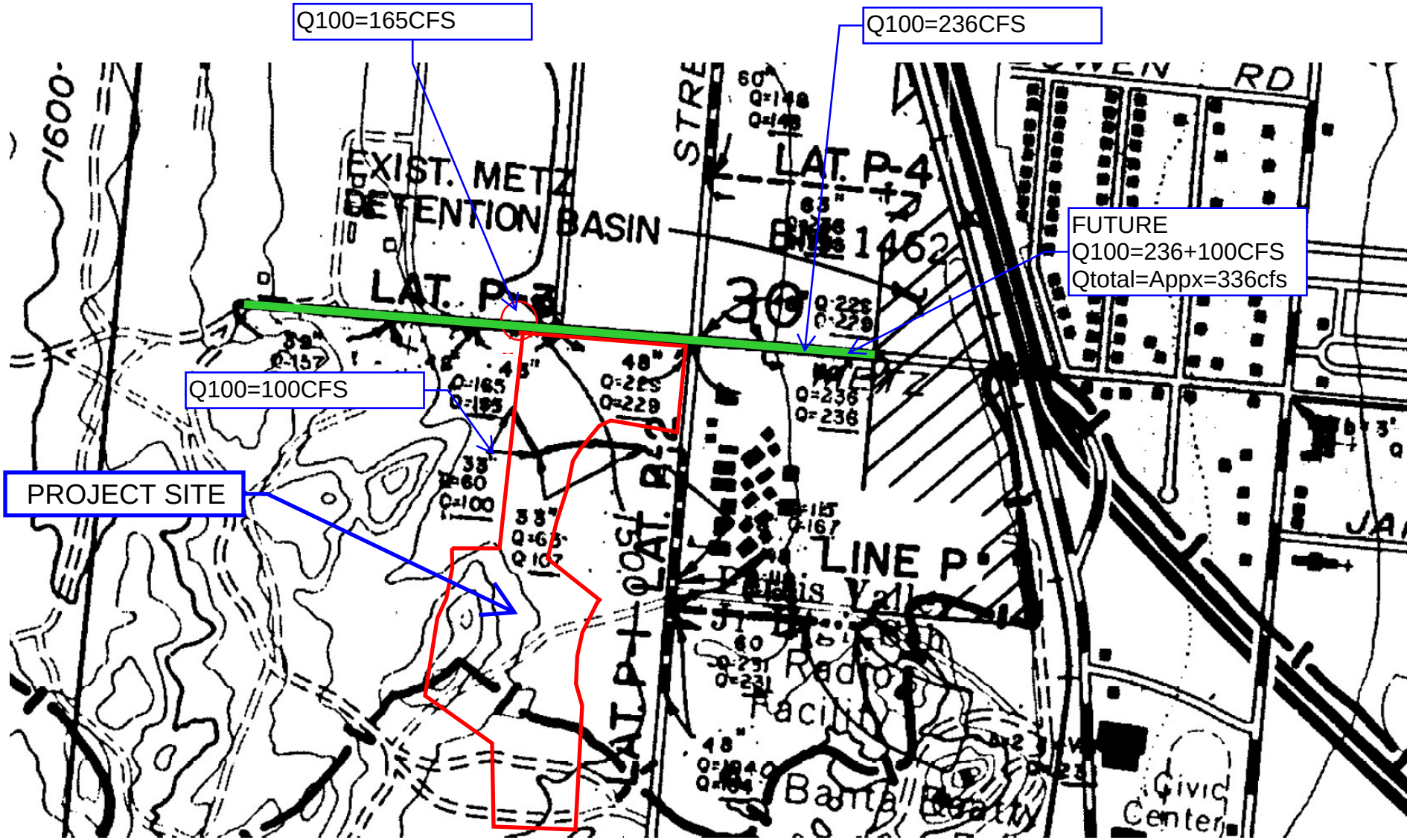


EXHIBIT "E"
PROPOSED Q100 FLOWS FOR
FUTURE PERRIS VALLEY
MDP LINE P

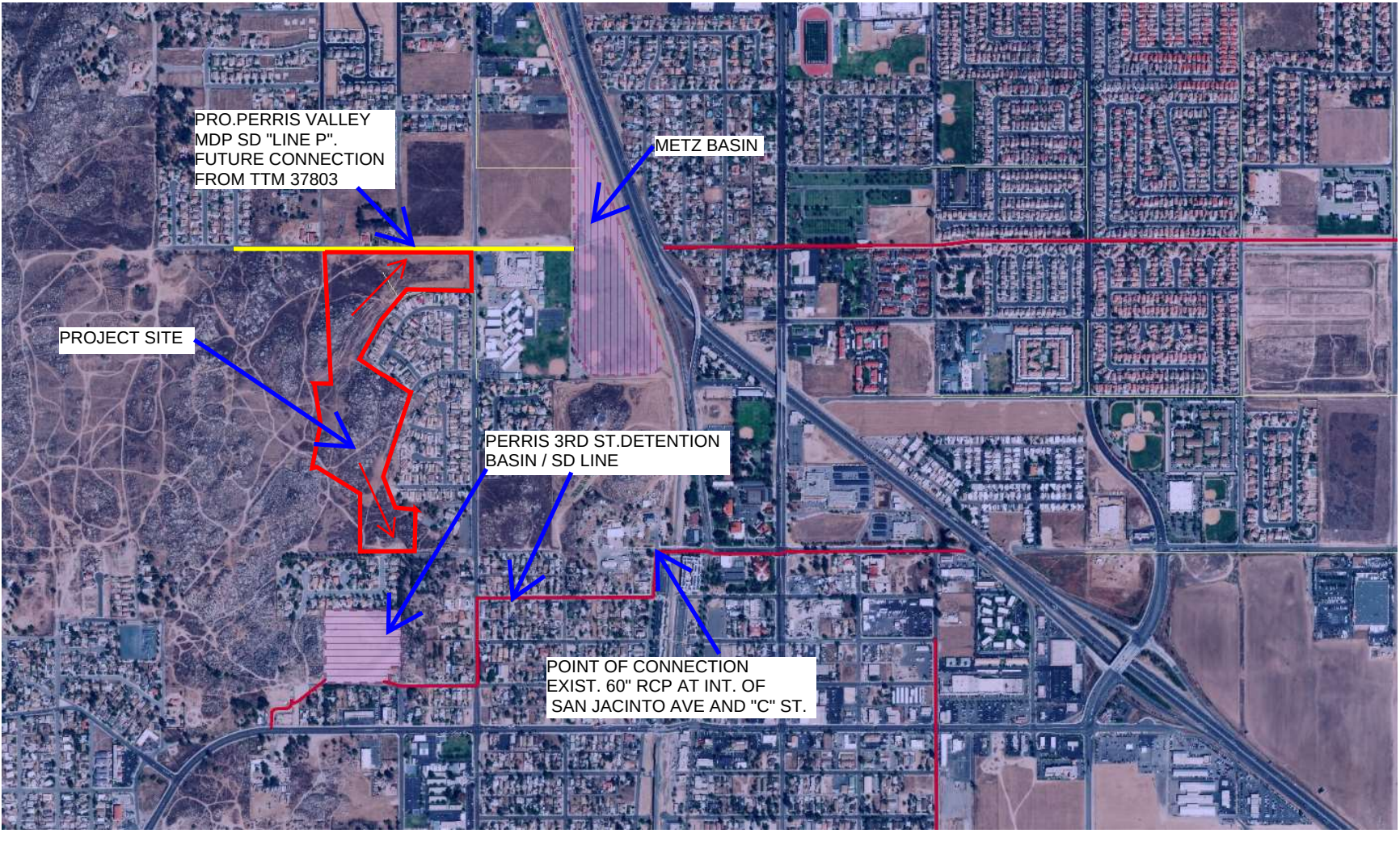
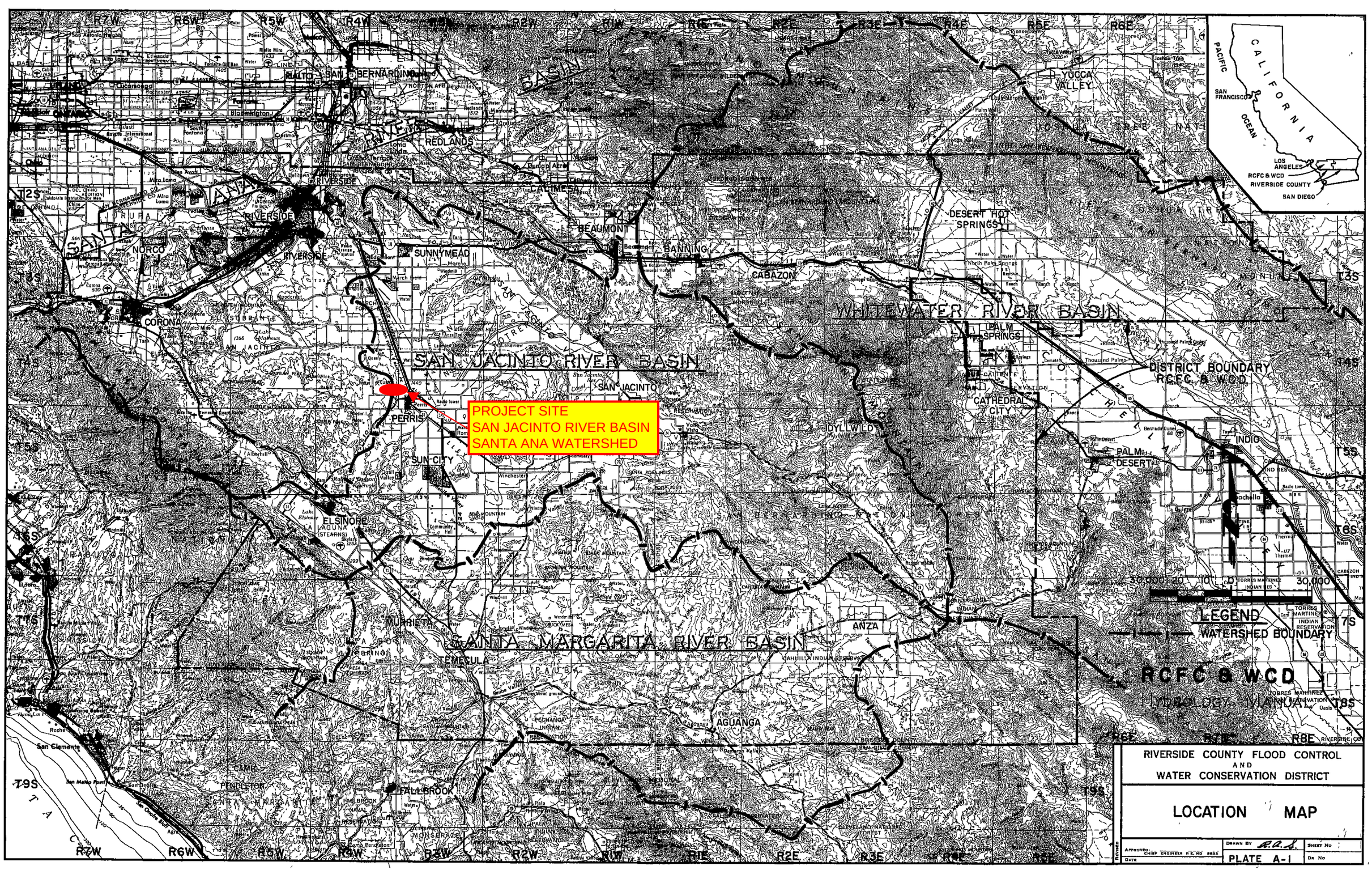
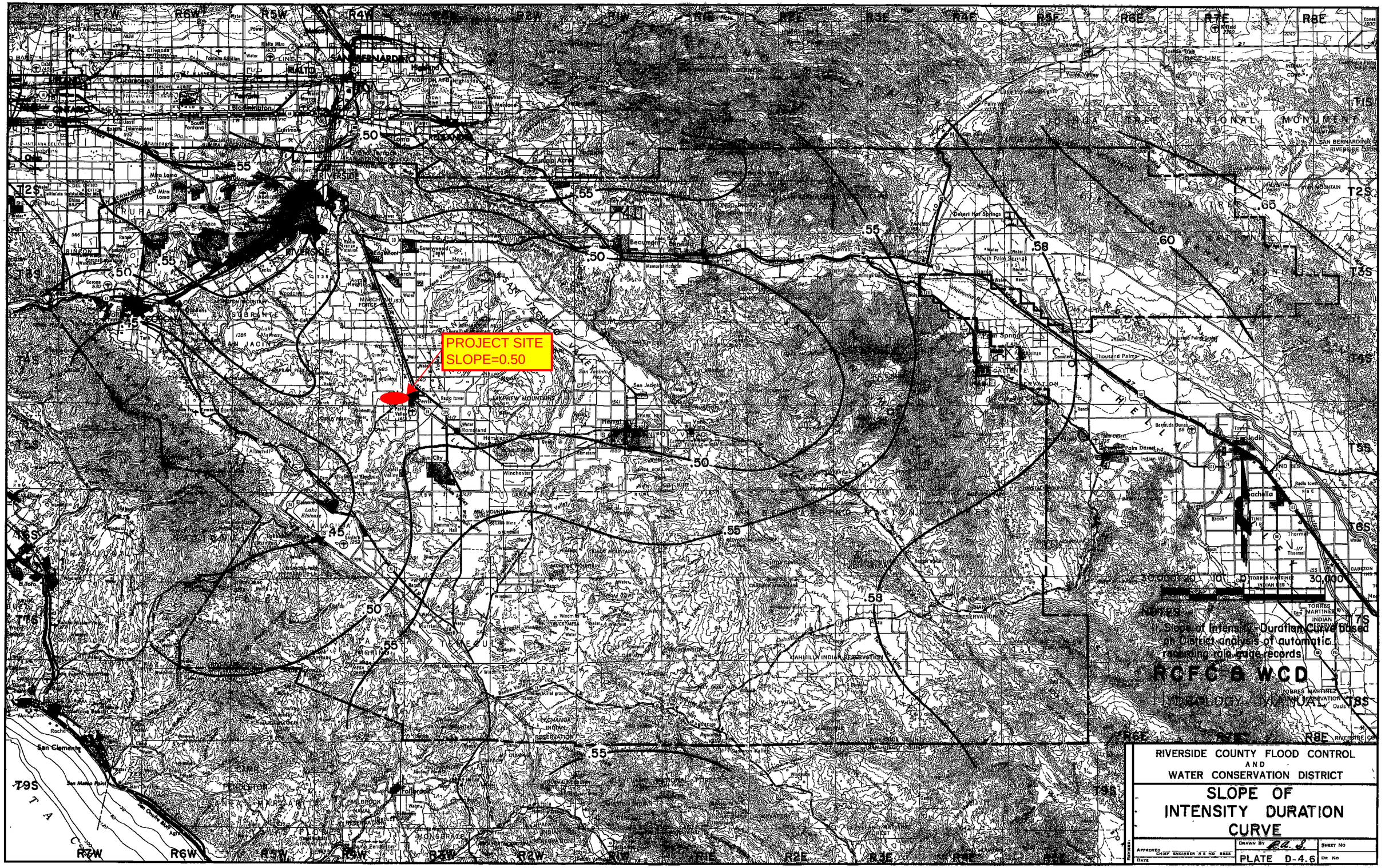
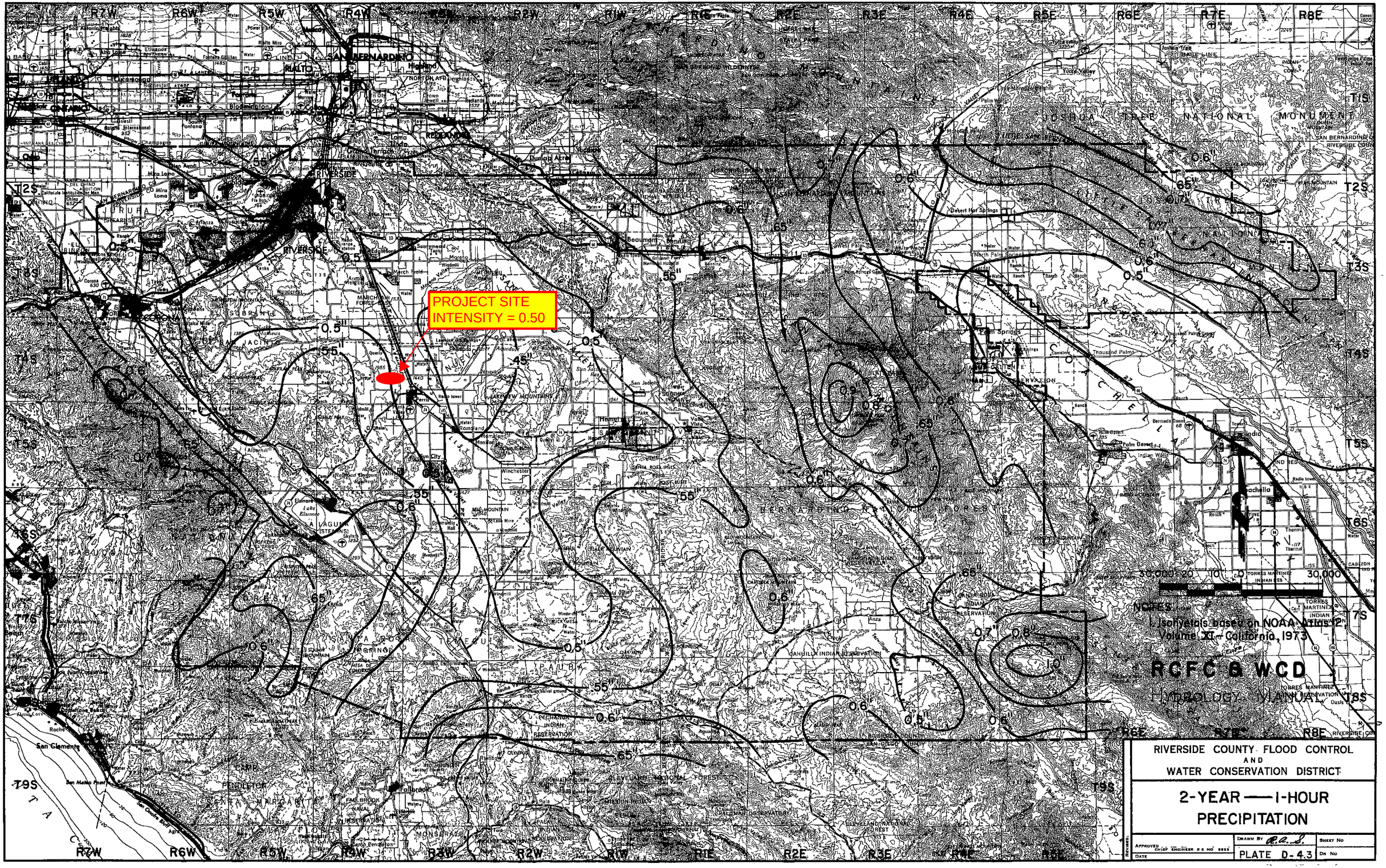
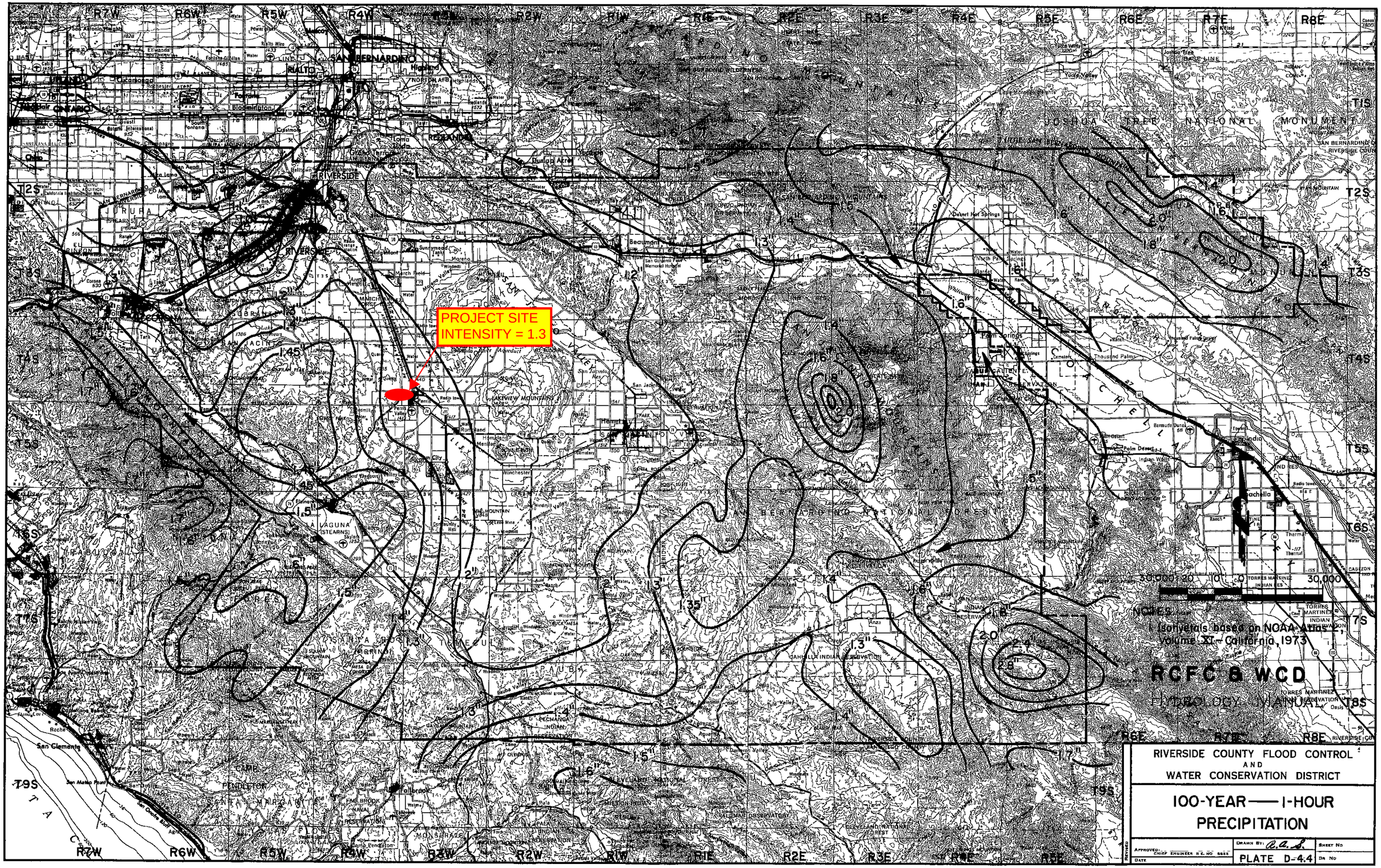


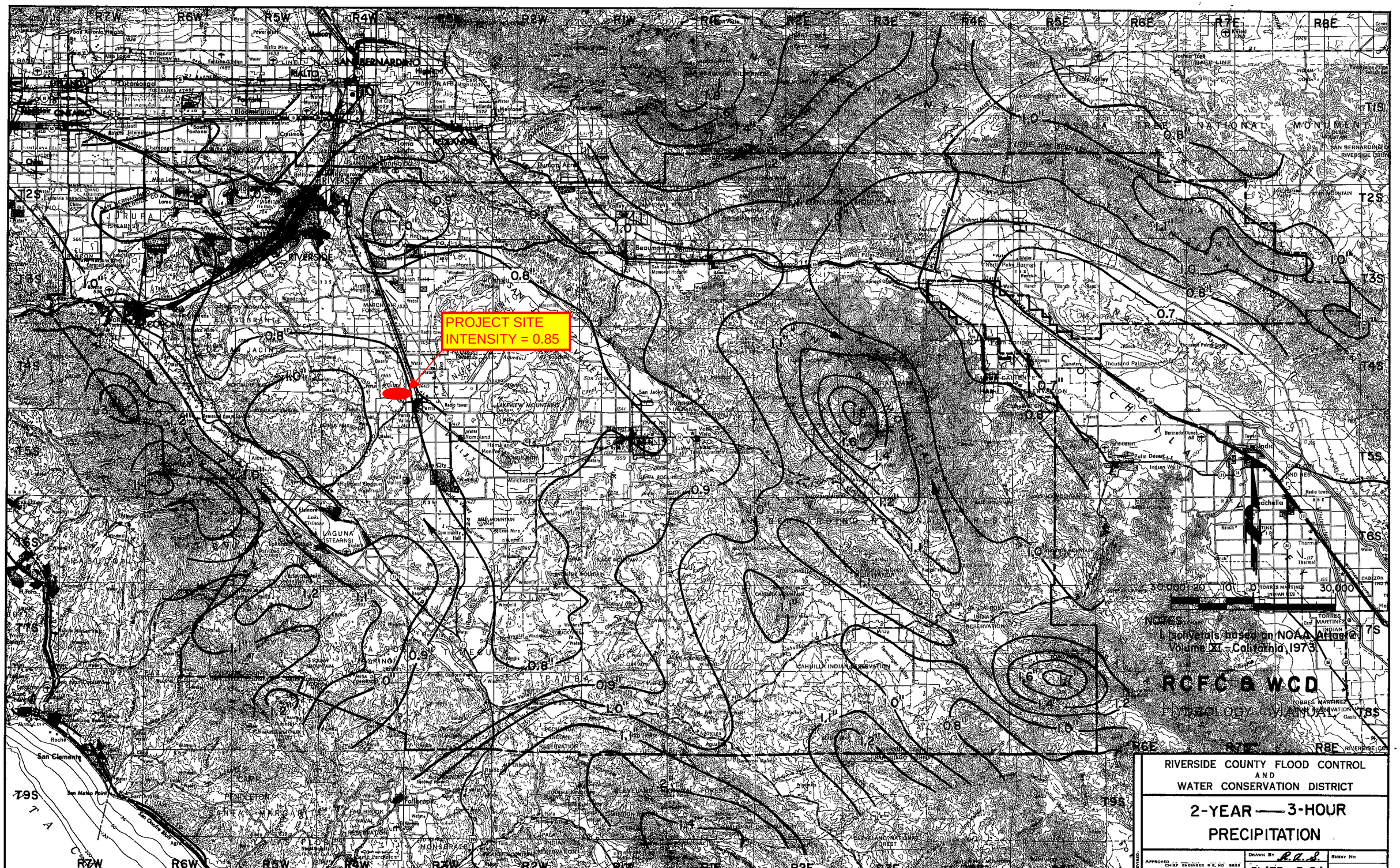
EXHIBIT "F"
PROPOSED AND AS BUILT
RCFC STORM DRAIN
FACILITIES

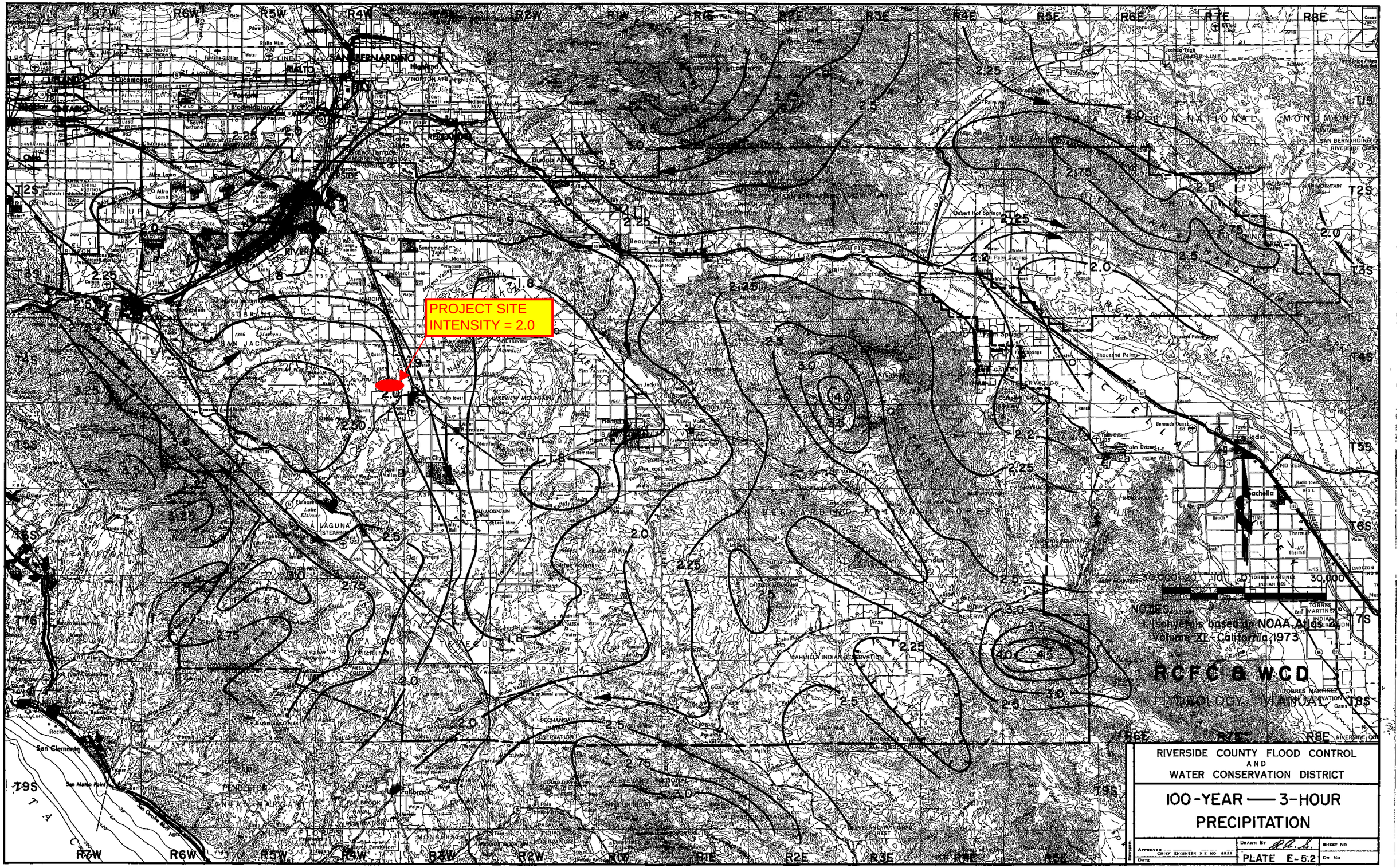

PROJECT SITE
SAN JACINTO RIVER BASIN
SANTA ANA WATERSHED
SAN JACINTO RIVER BASIN
SANTA MARGARITA RIVER BASIN
WHITEWATER RIVER BASIN
SANTA ANA RIVER BASIN
RIVERSIDE
CORONA
NORCO
SUNNYMEAD
RIALTO
SAN BERNARDINO
REDLANDS
LOMA LINDA
CRAFTON
CALIMESA
BEAUMONT
BANNING
CABAZON
DESERT HOT SPRINGS
YUCCA VALLEY
PALM SPRINGS
CATHEDRAL CITY
DYLLWILD
INDIO
PALM DESERT
PERRIS
SUN CITY
ELSINORE
LAGUNA
MURRIETA
TEMECULA
ANZA
AGUANGA
FALLBROOK
SAN CLEMENTE
CAMP PENDLETON
PECHANGA INDIAN RESERVATION
SAN JACINTO
DISTRICT BOUNDARY
RCFC & WCD
CALIFORNIA
PACIFIC OCEAN
SAN FRANCISCO
LOS ANGELES
RCFC & WCD
RIVERSIDE COUNTY
SAN DIEGO
LEGEND
WATERSHED BOUNDARY
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
LOCATION MAP
HYDROLOGY MANUAL
PLATE A-1
DRAWN BY R.A.S.
APPROVED
DATE
SHEET NO
DR NO

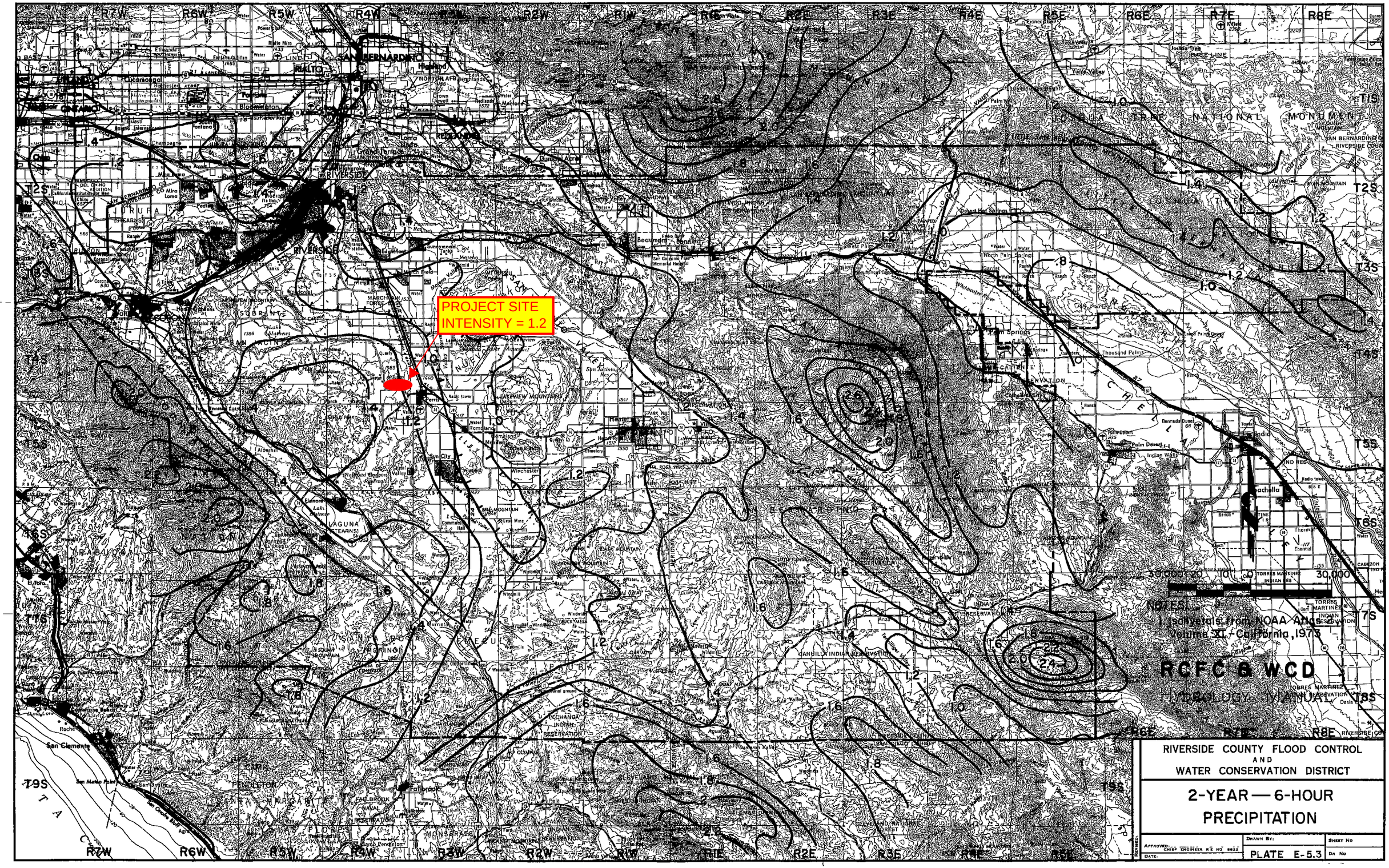

PROJECT SITE
SLOPE=0.50
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
SLOPE OF
INTENSITY DURATION
CURVE
PLATE D-4.6
Notes
1. Slope of Intensity-Duration Curve based on District analysis of automatic recording rain gage records
RCFC & WCD
HYDROLOGY MANUAL

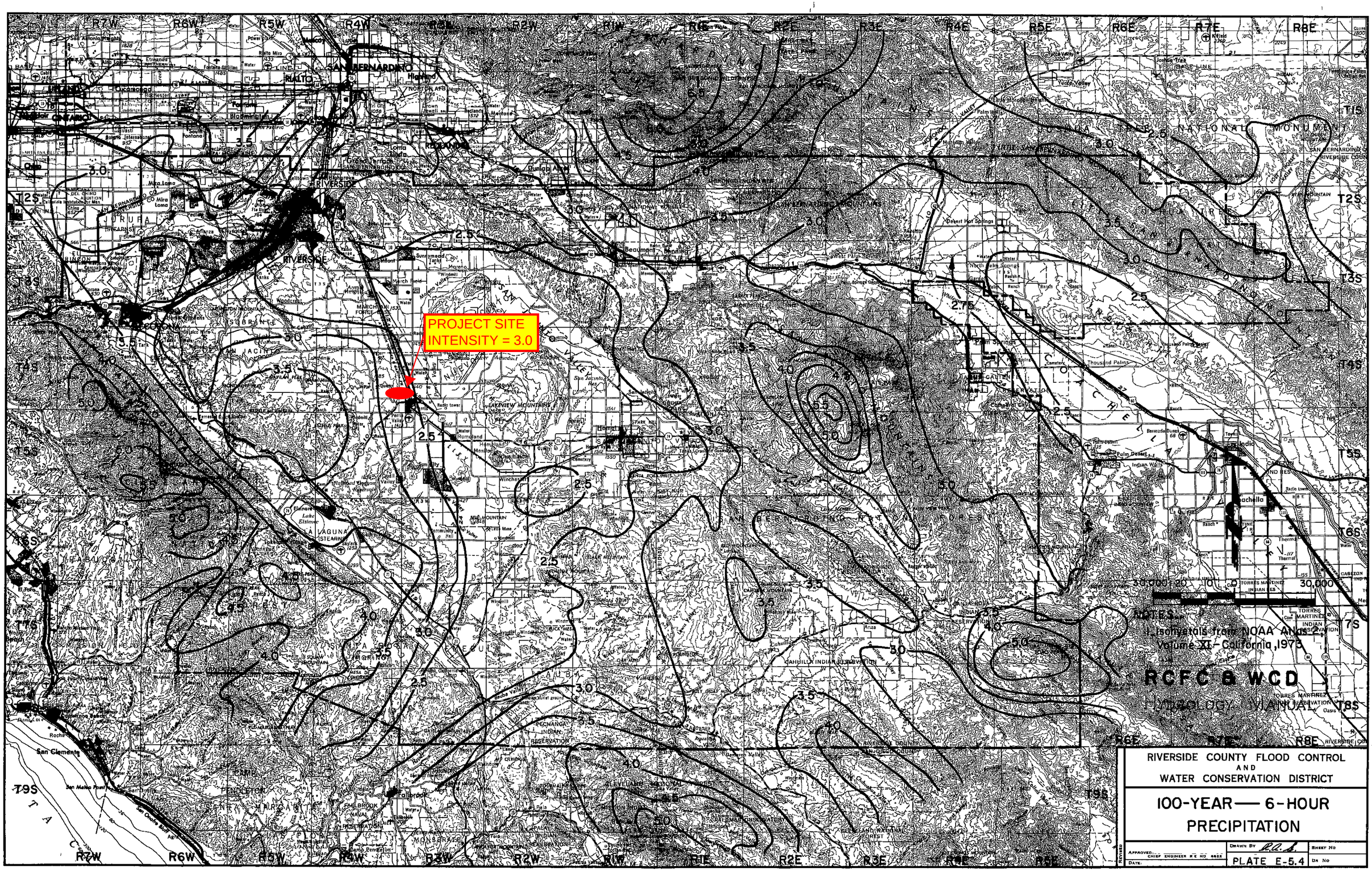

PROJECT SITE
INTENSITY = 0.50
NOTES
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION
PLATE D-4.3


PROJECT SITE
INTENSITY = 1.3
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
DRAWN BY: A.A.S.
PLATE D-4.4


PROJECT SITE
INTENSITY = 0.85
SAN BERNARDINO
RIVERSIDE
RIALTO
NORTON AFB
MARCH FIELD
Beaumont
Banning
Palm Springs
Thousand Palms
Indio
Coachella
Winchester
Hemet
San Jacinto
Temecula
Fallbrook
Oceanside
San Clemente
Camp Pendleton
SAN JACINTO MOUNTAINS
SANTA ROSA MOUNTAINS
LAKEVIEW MOUNTAINS
SAN JACINTO WILDERNESS
CAHUILLA INDIAN RESERVATION
AGUA CALIENTE INDIAN RESERVATION
SAN JACINTO NATIONAL MONUMENT
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
DRAWN BY R.A.S.
SHEET NO
APPROVED CHIEF ENGINEER R.E. NO 6822
DATE
PLATE E-5.1
DR NO
REVISED


PROJECT SITE
INTENSITY = 2.0
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
PLATE E-5.2


PROJECT SITE
INTENSITY = 1.2
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
DRAWN BY:
SHEET NO
APPROVED CHIEF ENGINEER R.E. NO. 6822
PLATE E-5.3
DATE:
DR NO



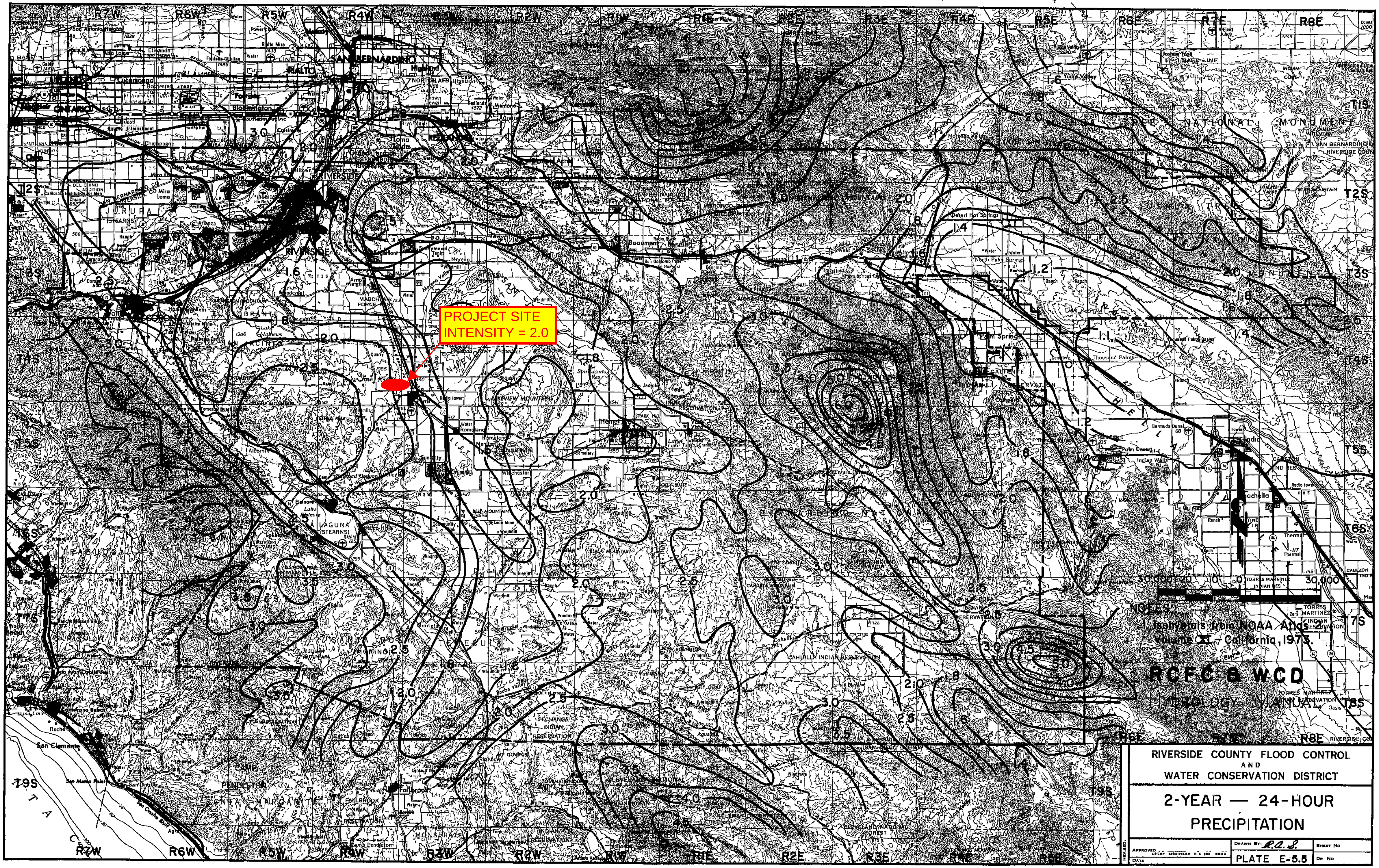
Isohyetals from NOAA Atlas 2, Volume XI - California, 1973

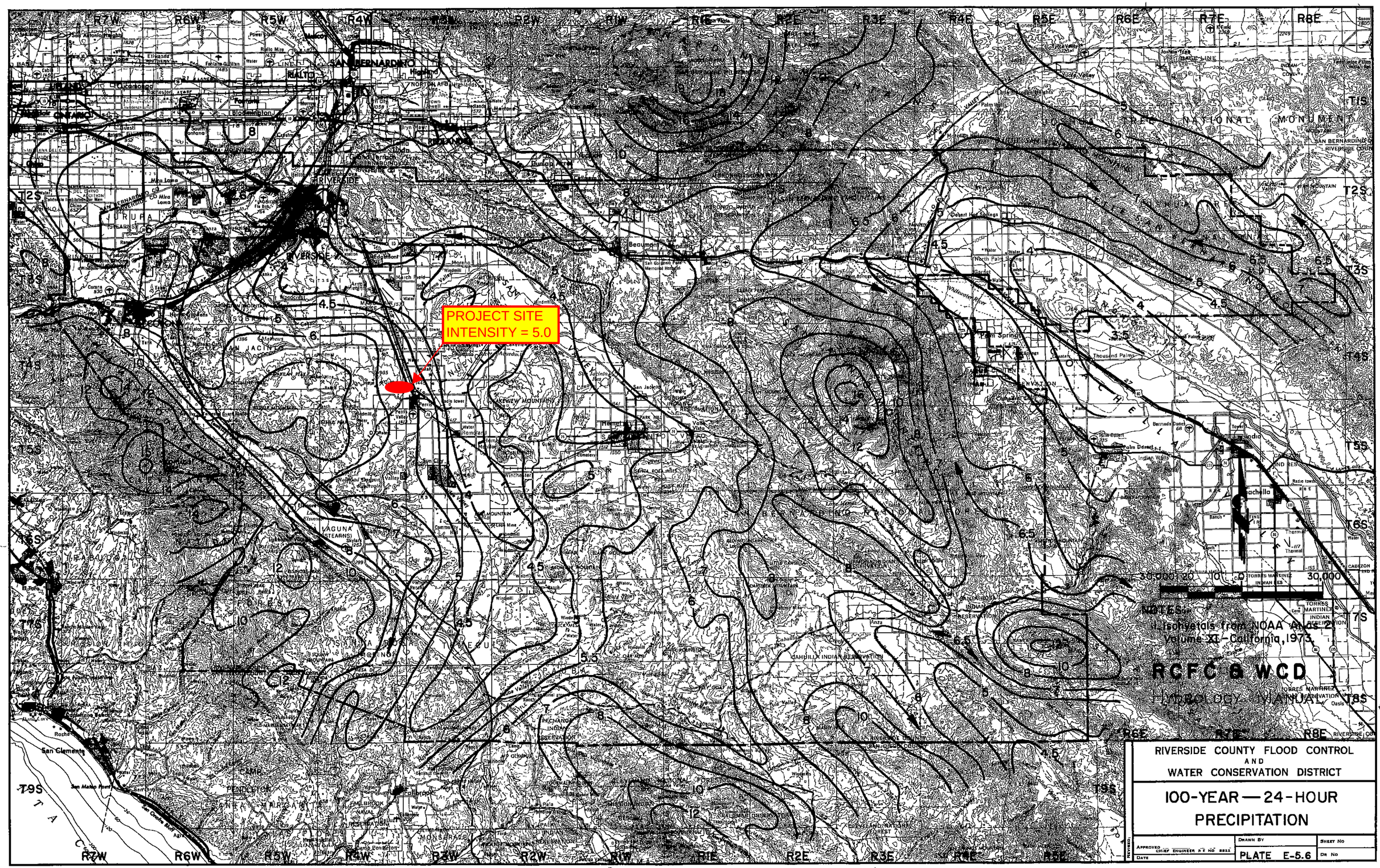
RCFC & WCD HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

100-YEAR — 6-HOUR PRECIPITATION

APPROVED: CHIEF ENGINEER R.C.E. NO. 6822	DRAWN BY R.C.E.	SHEET NO
DATE:	PLATE E-5.4	DR NO
REVISED		


PROJECT SITE
INTENSITY = 2.0
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
PLATE E-5.5


PROJECT SITE
INTENSITY = 5.0
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.C.F.C. & W.C.D.
DATE
DRAWN BY
PLATE E-5.6
SHEET NO
DR NO
REVISED

August 2019

HYDROLOGY STUDY

TTM 37803

City of Perris

County of Riverside

HUNSAKER & ASSOCIATES IRVINE, INC.