PRELIMINARY
DRAINAGE REPORT
FOR
KTM DEVELOPMENT

COUNTY OF RIVERSIDE, CALIFORNIA

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This report has been prepared by or under the direction of the following registered civil engineer who attests to the technical information contained herein.

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TABLE OF CONTENTS

I. PURPOSE AND SCOPE....1
II. PROJECT DESCRIPTION....1
III. DRAINAGE AREA OVERVIEW....1
IV. HYDROLOGY....2
V. STUDY FINDINGS....3
VI. EXISTING FACILITIES....4
VII. PROPOSED FACILITIES....5
VIII. EMERGENCY OVERFLOW AT SUMP LOCATIONS....6
IX. CONCLUSION....6
X. REFERENCES....7

FIGURES

FIGURE 1: REGIONAL VICINITY MAP
FIGURE 2: LOCAL VICINITY MAP
FIGURE 3: LAND USE MAP

APPENDICES

APPENDIX A: RATIONAL METHOD HYDROLOGY CALCULATIONS

APPENDIX A-1: AREA A OFFSITE 100-YEAR HYDROLOGY CALCULATIONS

APPENDIX A-2: AREA B OFFSITE 100-YEAR HYDROLOGY CALCULATIONS

APPENDIX A-3: AREA A ONSITE 100-YEAR HYDROLOGY CALCULATIONS (EXISTING CONDITION)

APPENDIX A-4: AREA B ONSITE 100-YEAR HYDROLOGY CALCULATIONS (EXISTING CONDITION)

APPENDIX A-5: AREA B ONSITE 100-YEAR HYDROLOGY CALCULATIONS (PROPOSED CONDITION)

APPENDIX B: NORMAL DEPTH CALCULATIONS

APPENDIX C: RCFC & WCD PLATES

APPENDIX C-1: PLATE "D 5.5": RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

APPENDIX C-2: PLATE "D 5.6": IMPERVIOUS COVER FOR DEVELOPED AREAS

APPENDIX D: NATIONAL RESOURCES CONSERVATION SERVICE WEB SOIL SURVEY

APPENDIX E: NOAA ATLAS 14 RAINFALL DATA

APPENDIX F: **OFFSITE STORM DRAIN AS-BUILTS WITHIN SKY CANYON DRIVE**

APPENDIX G: **FRENCH VALLEY AIRPORT (EAST GRADING AND DRAINAGE)**

APPENDIX H: **EXISTING 78" RCP (LINE "B") AS-BUILT**

EXHIBITS

EXHIBIT "A": **OFFSITE HYDROLOGY MAP (RATIONAL METHOD)**

EXHIBIT "B": **ONSITE HYDROLOGY MAP FOR EXISTING CONDITION (RATIONAL METHOD)**

EXHIBIT "C": **ONSITE HYDROLOGY MAP FOR PROPOSED CONDITION (RATIONAL METHOD)**

I. PURPOSE AND SCOPE

The purpose of this drainage analysis is to determine the 100-year peak flow rates emanating from the drainage area associated with the KTM Project in Riverside County, California. The study will compare the existing and proposed hydrologic conditions and determine the required on-site drainage infrastructure necessary to protect the proposed grading and site improvements from the 100-year storm event. The scope of the study includes the following:

1. Determination of points of flow concentration and drainage areas.
2. Determination of the 100-year peak storm runoff based upon the existing and proposed conditions utilizing the Civil Design Engineering Software Program Package for Riverside County, Rational Method.
3. Preparation of hydrology map.
4. Preparation of the hydrology report.

II. PROJECT DESCRIPTION

The proposed KTM project is located northeast of Hunter Road and Winchester Highway in Riverside County, California. The site is bounded on the east by Sky Canyon Drive, the south by Borel Road, the west by Winchester Road, and the north by Sparkman Way. The proposed project area is approximately 26-acres and will include a commercial development and perimeter street widening improvements will be made along Sky Canyon Drive. A right-turn lane will also be added to Winchester Road to provide site access.

III. DRAINAGE AREA OVERVIEW

Existing Condition

The project site is currently an undeveloped lot surrounded by undeveloped land along the north and south, tract housing along the west, and French Valley Airport along the east. The site is covered by bare soil and annual grass. Topographically, site elevations range from 1345 feet to 1304 feet above Mean Sea Level (MSL). The project has two drainage areas that discharge into two existing storm drain outlets located along Winchester Road. The northern portion of the site drains southwest into an existing depression where a 36" RCP is located approximately 900 feet south of Sparkman Way (see node 108 on Exhibit B). The southern portion of the site drains to the southwest corner of the site into an existing depression where a 78" RCP outlet is located (see node 226 on Exhibit B).

The northern drainage area includes off-site flows from Winchester Road, the undeveloped lot north of the project site, and a portion of French Valley Airport. The southern drainage area includes off-site flows from Winchester Road, the undeveloped lot south of the site, and four existing culverts that discharge along the east project boundary. A 66", 36", and 24" CMP discharge flows collected from the French Valley Airport into the existing natural channel located in the center of the site, and an 18" CMP discharges flows collected from a

portion of the undeveloped lot south of the project site (see nodes 202, 206, 212, and 221 on Exhibit B, respectively).

Only the western portion of the French Valley Airport runoff will be discharged onto the KTM project site. According to the "French Valley Airport East Side Storm Drain & Grading Plan," runoff generated within the eastern portion of the airport will bypass the project site. Easterly airport flows will drain in a southerly direction before discharging into the existing creek southeast of the airport. The referenced grading plan shows that the airport drainage facilities are only sized for the 10-year storm event. However, in the case of a 100-year storm event, the easterly airport flows will continue to drain southerly to an existing basin with an overflow condition that also drains to the existing creek and bypasses the KTM project site. See Appendix H for French Valley Airport easterly drainage exhibit and as-builts.

Proposed Condition

The proposed site will include paved parking and commercial buildings, which will add approximately 11-acres of impervious surface to on-site drainage areas. The site will be graded to direct runoff in a southwesterly direction, and storm drain inlets will be constructed at low points to convey on-site flows into the proposed water quality basin in the southwest corner of the site. A riser outlet will discharge overflows into the existing 78" RCP storm drain. No improvements will be made within the northern portion of the site, so the existing drainage conditions will remain.

All off-site flows will be collected via the proposed storm drain infrastructure and will bypass the project site. Off-site flows collected from the existing 36" and 24" CMP culverts along Sky Canyon Dr. will discharge into a proposed 48" RCP, which will discharge into the existing natural channel located in the center of the site. Off-site flows from the existing 66" CMP culvert along Sky Canyon Dr. will continue to discharge into the existing channel. The above 36", 24", and 66" CMP culverts will be replaced with RCP to provide sufficient capacity. All off-site runoff conveyed by the existing channel will discharge into the proposed 66" RCP bypass storm drain, which will directly discharge into the existing 78" RCP storm drain located at the southwest corner of the site. All remaining off-site flows in the southern portion of the project will be collected via storm drain and will discharge directly into the existing 72" RCP storm drain and will not comingle with on-site flows.

IV. HYDROLOGY

Methodology

The Riverside County Flood Control and Water Conservation District (RCFC&WCD) Hydrology Manual was used to develop the hydrological parameters for the 100-year storm event. The Rational Method was used to determine the peak-flow runoff for the proposed condition. Computations were performed using the Civil Design Engineering Software, RRCFC for Rational Method.

Hydrology Parameters

Hydrologic Soil Groups (HSG) were determined using the Natural Resources Conservation Service Web Soil Survey. The entire study area consists of HSG "B", "C" and "D" (see Appendix C). Precipitation values for the proposed site were obtained using NOAA Atlas 14 rainfall data, and an Antecedent Moisture Condition (AMC) 2 was used for the initial soil saturation. The proposed site land cover is classified as "Commercial Landscaping," and the existing site land cover is classified as "Grass, Annual or Perennial" per Plate D-5.5 of RCFC &WCD Hydrology Manual. Impervious values of 0% and 90% were used respectively for "Natural or Agriculture" and "Commercial, Downtown Business or Industrial" land uses per plate D-5.6 of RCFC & WCD Hydrology Manual.

V. STUDY FINDINGS

Upon development, imperviousness will be added to the southern property of the project site. However, the increased runoff generated by the development will remain within the capacity of the existing downstream storm drain facilities. The existing 78" RCP at the intersection of Winchester Road and Hunter Road will accept a 100-year peak flow of 304.0 cfs under the developed condition. The existing capacity of the 78" RCP is approximately 346.9 cfs per storm drain as-builts provided in Appendix H.

Hydrology Results Summary

NODE	AREA (AC.)	Q100 (CFS)	TC (MIN)
105	13.7	30.9	15.5
107	21.7	45.0	19.7
108	28.5	57.6	22.2
208	27.9	71.9	16.4
215	90.0	207.7	24.0
218	115.6	247.9	31.0
222	7.7	20.5	11.0
223	127.9	267.2	32.3
226	140.4	286.6	33.1

Table 5-1: Flow data summary for existing condition Rational Method.
See Exhibit "B" for hydrology map.

NODE	AREA (AC.)	Q100 (CFS)	TC (MIN)
203	2.6	6.6	16.9
204	60.0	138.9	23.6
206	1.7	5.4	9.7
208	12.9	32.4	14.1
210	29.6	76.0	16.4
211	29.6	76.0	16.6
212	92.2	212.1	24.0
213	110.6	241.6	28.6
216	2.3	6.4	14.8
217	112.9	246.0	29.3
221	117.5	254.1	29.9
223	13.1	35.4	12.0
225	2.2	6.5	10.8
227	2.2	6.5	12.4
228	4.4	12.8	12.4
230	6.2	18.6	10.6
231	10.6	28.6	10.6
232	10.6	28.6	11.0
233	17.8	48.0	11.0
234	148.4	304.0	30.1

Table 5-2: Flow data summary for proposed condition Rational Method.
See Exhibit "C" for hydrology map.

VI. EXISTING FACILITIES

Storm Drain Line "A"

Line "A" is an existing underground 36-inch RCP storm drain line designed to intercept and convey the peak 100-year storm flows from drainage Area A. No improvements will be made in the northern portion of the site; therefore, existing drainage conditions will remain.

Storm Drain Line "B1"

Line "B1" is an existing underground 24-inch CMP culvert designed to intercept and convey the peak 100-year storm flows from approximately 10.7-acres of off-site drainage area B. Under the existing condition, Line "B1" discharges directly into the existing natural channel within the center of the project site. However, under the proposed condition, Line "B1" will be replaced with RCP and discharge into the proposed Line "B6" to bypass on-site project flows.

Storm Drain Line "B2"

Line "B2" is an existing underground 36-inch CMP culvert designed to intercept and convey the peak 100-year storm flows from approximately 16.7-acres of off-site drainage area B.

Under the existing condition, Line "B2" discharges directly into the existing natural channel within the center of the project site. However, under the proposed condition, Line "B2" will be replaced with RCP and discharge into the proposed Line "B6" to bypass on-site project flows.

Storm Drain Line "B3"

Line "B3" is an existing underground 66-inch CMP culvert designed to intercept and convey the peak 100-year storm flows from approximately 57.4-acres of off-site drainage area B. Line "B3" discharges directly into the existing natural channel within the center of the project site.

Storm Drain Line "B4"

Line "B4" is an existing underground 24-inch RCP culvert designed to intercept and convey the peak 100-year storm flows generated within a 2.3-acre portion of Winchester Road. Line "B4" discharges onto the project site; however, under the proposed condition, Line "B4" will be extended 80' east and will discharge into proposed storm drain Line "B7" in order to bypass on-site project flows.

Storm Drain Line "B5"

Line "B5" is an existing underground 18-inch CMP culvert designed to intercept and convey the peak 100-year storm flows from approximately 2.1-acres of off-site drainage area B. Line "B5" discharges onto the project site; however, under the proposed condition, Line "B5" will discharge into proposed storm drain Line "B" in order to bypass on-site project flows.

Storm Drain Line "B"

Line "B" is an existing underground 78-inch RCP storm drain at the intersection of Winchester Road and Hunter Road that is designed to intercept and convey the peak 100-year storm flows from the overall drainage Area B. All proposed off-site and on-site storm drains within drainage Area B will discharge into Line "B".

VII. PROPOSED FACILITIES

Storm Drain Line "B6"

Line "B" is a proposed underground 48-inch RCP storm drain line designed to intercept and convey the peak 100-year storm flows from the existing 24" (Line "B1") and 36" (Line "B2") culverts along Sky Canyon Drive. Line "B" bypasses on-site project flows and discharges directly into the existing natural channel within the center of the site.

Storm Drain Line "B7"

Line "B7" is a proposed underground 60-inch RCP storm drain line designed to intercept and convey the off-site flows east of the project site and within Winchester Road. Line "B7" will bypass on-site flows and discharge directly into the existing 78" RCP storm drain at the southwest corner of the site.

Storm Drain Line "B8"

Line "B8" is an existing underground 18-inch CMP culvert designed to intercept and convey the peak 100-year storm flows from approximately 2.1-acres of the off-site drainage area south of the project site. Line "B8" discharges onto the project site; however, under the proposed condition, Line "B8" will discharge into proposed storm drain Line "B" in order to bypass on-site project flows. Line "B8" will also collect the remaining off-site flows south of the project site via a proposed drop inlet at the southwest corner of the project site.

Storm Drain Line "B9"

Line "B9" is a proposed underground 30-inch RCP storm drain line designed to intercept and convey the peak 100-year storm flows generated by the proposed on-site improvements. Line "B9" discharges directly into Basin "A".

Storm Drain Line "B10"

Line "B10" is a proposed RCP storm drain line designed to discharge overflows collected within the proposed water quality Basin "A". Line "B10" discharges directly into the existing 78" RCP outlet (Line "B"). Line "B10" will be sized during final engineering per basin routing calculations.

Basin "A"

Basin "A" is a proposed basin to be utilized for both water quality and hydromod requirements. The basin will also be used to convey on-site flows into the existing 78" RCP outlet located at the intersection of Winchester Road and Hunter Road. An outlet structure will be designed during final engineering to discharge 100-year flows into the existing drainage system.

VIII. EMERGENCY OVERFLOW AT SUMP LOCATIONS

Node 233 Sump Location (Proposed Condition)

An emergency overflow condition located at Node 233 within the proposed Basin "A" will result in excess flows overtopping the easterly right of way of Winchester Road. Excess runoff will flow into the proposed catch basin upstream of Borel Road within Winchester Road.

IX. CONCLUSION

Upon development, on-site storm drain infrastructure will be required to convey on-site peak 100-year flow rates and discharge them into the existing 78" RCP storm drain located at the intersection of Winchester Road and Hunter Road. All off-site flows will bypass the proposed development via the proposed storm drain infrastructure, and no on-site treatment will be required. It is concluded that implementation of the proposed storm drain facilities will provide protection of the proposed development from the 100-year storm event without adversely impacting the existing downstream drainage conditions.

X. REFERENCES

1. National Resources Conservation Service; *Web Soil Survey.* June 07 2017

2. NOAA's National Weather Service; *NOAA Atlas 14, Volume 6, Version 2.* August 29 2017.

3. Riverside County Flood Control and Water Conservation District; *Hydrology Manual*. April 1978.

FIGURE 1: REGIONAL VICINITY MAP

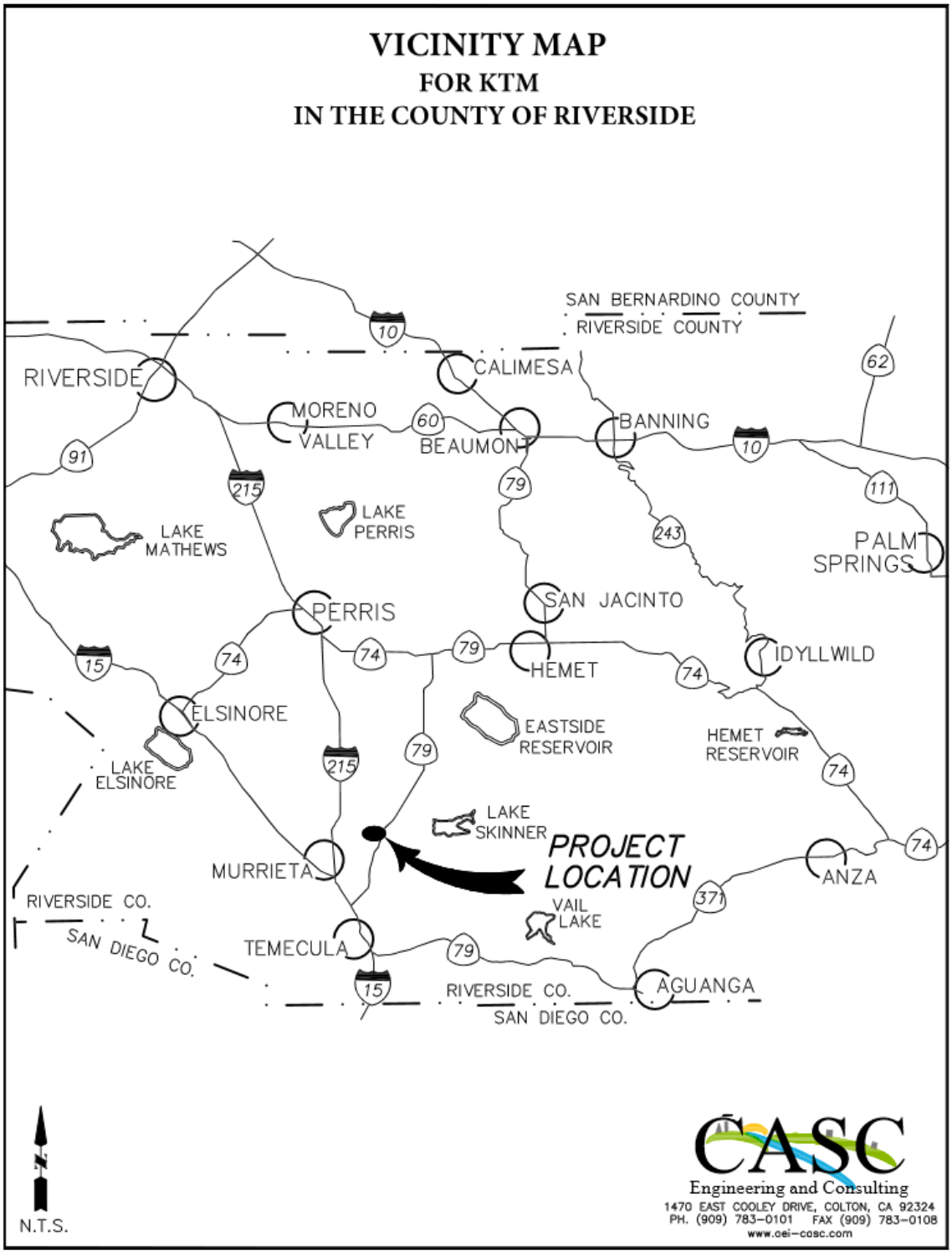
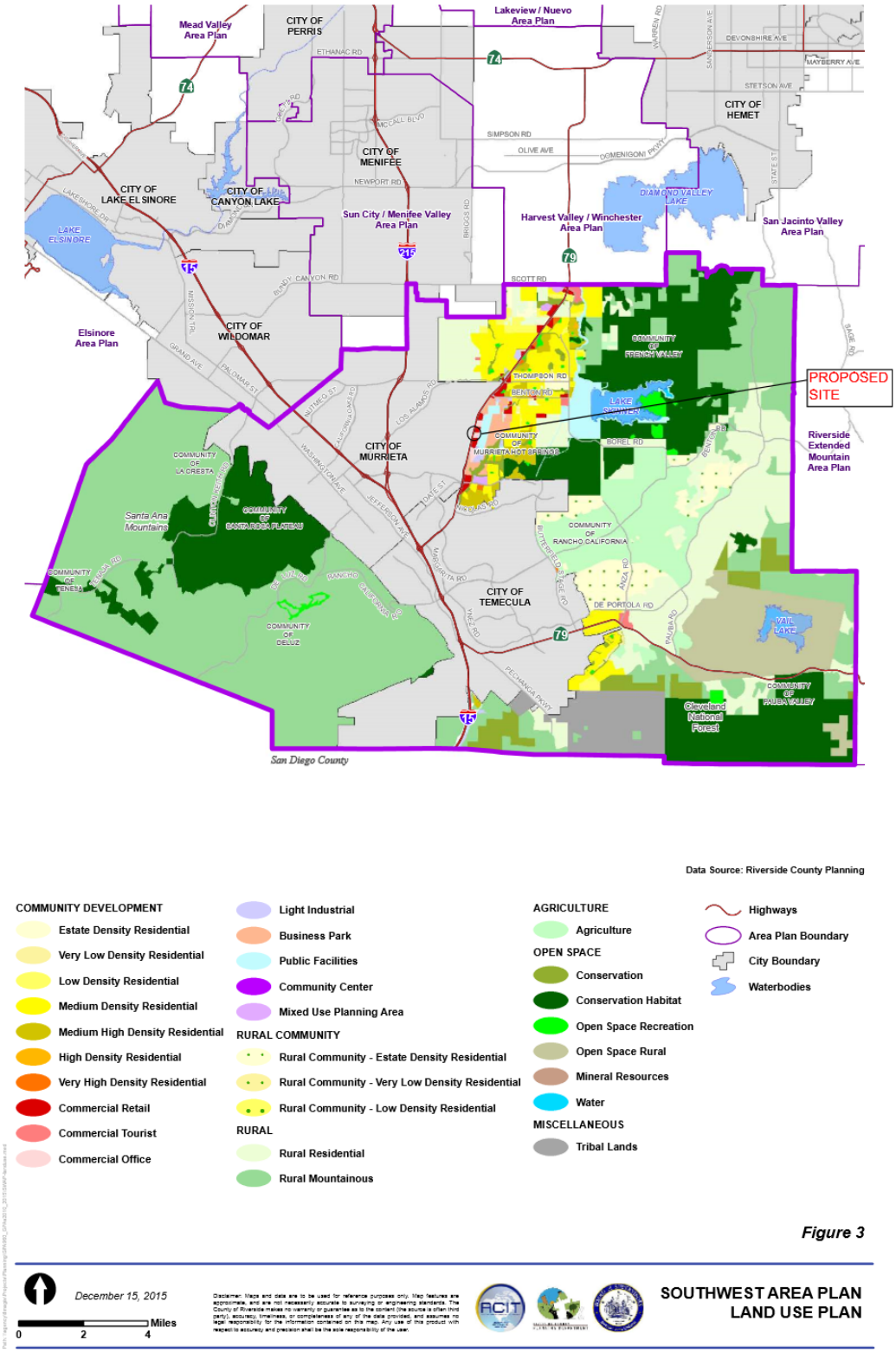


FIGURE 2: LOCAL VICINITY MAP



FIGURE 3: LAND USE MAP



APPENDIX A: RATIONAL METHOD HYDROLOGY CALCULATIONS

APPENDIX A-1: AREA A OFFSITE 100-YEAR HYDROLOGY CALCULATIONS

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 08/28/18 File:A100.out

1420-0001 KTM
OFFSITE - AREA A
100-YEAR RATIONAL METHOD
8/28/18

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

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

Program License Serial Number 6268

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

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5500

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

Initial area flow distance = 556.000(Ft.)
Top (of initial area) elevation = 1360.000(Ft.)
Bottom (of initial area) elevation = 1340.000(Ft.)
Difference in elevation = 20.000(Ft.)
Slope = 0.03597 s(percent)= 3.60
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.697 min.
Rainfall intensity = 3.195(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1 Acre Lot)
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) = 56.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Initial subarea runoff = 10.384(CFS)
Total initial stream area = 4.500(Ac.)
Pervious area fraction = 0.800

++

Process from Point/Station 101.000 to Point/Station 102.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1340.000(Ft.)
End of natural channel elevation = 1332.500(Ft.)
Length of natural channel = 416.000(Ft.)
Estimated mean flow rate at midpoint of channel = 19.383(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:

a100
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 = 0.0180
Corrected/adjusted channel slope = 0.0180
Travel time = 1.74 min. TC = 13.44 min.

Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.749
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.600
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.300
RI index for soil(AMC 2) = 63.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 2.961(In/Hr) for a 100.0 year storm
Subarea runoff = 17.306(CFS) for 7.800(Ac.)
Total runoff = 27.690(CFS) Total area = 12.300(Ac.)
End of computations, total study area = 12.30 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.800
Area averaged RI index number = 60.4

APPENDIX A-2: AREA B OFFSITE 100-YEAR HYDROLOGY CALCULATIONS

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 08/28/18 File:B100.out

1420-0001 KTM DEVELOPMENT
OFFSITE - AREA B
100-YEAR RATIONAL METHOD
8/28/18

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

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

Program License Serial Number 6268

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

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5500

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Process from Point/Station 209.000 to Point/Station 210.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 702.000(Ft.)
Top (of initial area) elevation = 1344.000(Ft.)
Bottom (of initial area) elevation = 1338.000(Ft.)
Difference in elevation = 6.000(Ft.)
Slope = 0.00855 s(percent)= 0.85
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.698 min.
Rainfall intensity = 3.356(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 62.50
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 28.141(CFS)
Total initial stream area = 9.500(Ac.)
Pervious area fraction = 0.100

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Process from Point/Station 210.000 to Point/Station 211.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1338.000(Ft.)
End of natural channel elevation = 1332.000(Ft.)
Length of natural channel = 1345.000(Ft.)
Estimated mean flow rate at midpoint of channel = 62.947(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:

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 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   2.76(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0045
Corrected/adjusted channel slope =  0.0045
Travel time =    8.11 min.     TC =   18.81  min.


 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.400
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.100
RI index for soil(AMC 2)  =  64.40
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.461(In/Hr) for a   100.0 year storm
Subarea runoff =     50.841(CFS) for     23.500(Ac.)
Total runoff =     78.982(CFS)  Total area =      33.000(Ac.)


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Process from Point/Station      211.000 to Point/Station      212.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1332.000(Ft.)
End of natural channel elevation =   1318.800(Ft.)
Length of natural channel  =  1365.000(Ft.)
Estimated mean flow rate at midpoint of channel =    108.182(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 =  0.0097
Corrected/adjusted channel slope =  0.0097
Travel time =    4.76 min.     TC =   23.57  min.


 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.400
Decimal fraction soil group D = 0.600
RI index for soil(AMC 2)  =  72.60
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.173(In/Hr) for a   100.0 year storm
Subarea runoff =     46.831(CFS) for     24.400(Ac.)
Total runoff =    125.814(CFS)  Total area =      57.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   627.000(Ft.)
Top (of initial area) elevation =  1333.000(Ft.)
Bottom (of initial area) elevation =  1329.000(Ft.)
Difference in elevation =     4.000(Ft.)
Slope =    0.00638  s(percent)=       0.64
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.841 min.
Rainfall intensity =      3.331(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
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Initial subarea runoff =     15.058(CFS)
Total initial stream area =        5.100(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of natural channel elevation =   1329.000(Ft.)
End of natural channel elevation =   1324.800(Ft.)
Length of natural channel  =   811.000(Ft.)
Estimated mean flow rate at midpoint of channel =     32.184(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 =   2.46(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0052
Corrected/adjusted channel slope =  0.0052
Travel time =    5.50 min.     TC =   16.34  min.


 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.100
RI index for soil(AMC 2)  =  69.60
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.658(In/Hr) for a   100.0 year storm
Subarea runoff =     27.255(CFS) for     11.600(Ac.)
Total runoff =     42.314(CFS)  Total area =      16.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
Initial area flow distance =   365.000(Ft.)
Top (of initial area) elevation =  1339.000(Ft.)
Bottom (of initial area) elevation =  1333.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.01644  s(percent)=       1.64
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.116 min.
Rainfall intensity =      3.461(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.838
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.950
RI index for soil(AMC 2)  =  74.70
Pervious area fraction =  0.600; Impervious fraction =  0.400
Initial subarea runoff =     10.726(CFS)
Total initial stream area =        3.700(Ac.)
Pervious area fraction = 0.600


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of natural channel elevation =   1333.000(Ft.)
End of natural channel elevation =   1323.800(Ft.)
Length of natural channel  =   762.000(Ft.)
Estimated mean flow rate at midpoint of channel =     21.598(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 =   3.36(Ft/s)
```

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope = 0.0121
Corrected/adjusted channel slope = 0.0121
Travel time =   3.78 min.   TC =   13.89 min.

 Adding area flow to channel
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.822
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.700
RI index for soil(AMC 2) = 73.20
Pervious area fraction = 0.600; Impervious fraction = 0.400
Rainfall intensity =   2.907(In/Hr) for a   100.0 year storm
Subarea runoff =   17.927(CFS) for   7.500(Ac.)
Total runoff =   28.653(CFS) Total area =   11.200(Ac.)

++
Process from Point/Station   220.000 to Point/Station   221.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =   443.000(Ft.)
Top (of initial area) elevation = 1400.000(Ft.)
Bottom (of initial area) elevation = 1344.400(Ft.)
Difference in elevation =   55.600(Ft.)
Slope =   0.12551 s(percent)=   12.55
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   9.186 min.
Rainfall intensity =   3.649(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 = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff =   6.599(CFS)
Total initial stream area =   2.100(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station   224.000 to Point/Station   225.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =   667.000(Ft.)
Top (of initial area) elevation = 1400.000(Ft.)
Bottom (of initial area) elevation = 1330.000(Ft.)
Difference in elevation =   70.000(Ft.)
Slope =   0.10495 s(percent)=   10.49
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.213 min.
Rainfall intensity =   3.270(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.857
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff =   8.126(CFS)
Total initial stream area =   2.900(Ac.)
Pervious area fraction = 1.000

++
Process from Point/Station   225.000 to Point/Station   226.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation =   1330.000(Ft.)
End of natural channel elevation =   1310.000(Ft.)
Length of natural channel =   331.000(Ft.)
Estimated mean flow rate at midpoint of channel =   16.251(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 =   6.97(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0604
Corrected/adjusted channel slope =  0.0604
Travel time =    0.79 min.     TC =   12.00  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.855
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.150(In/Hr) for a   100.0 year storm
Subarea runoff =     15.624(CFS) for      5.800(Ac.)
Total runoff =     23.750(CFS)  Total area =       8.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      226.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      8.700(Ac.)
Runoff from this stream =     23.750(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     3.150(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      226.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   995.000(Ft.)
Top (of initial area) elevation =  1400.000(Ft.)
Bottom (of initial area) elevation =   226.000(Ft.)
Difference in elevation =  1174.000(Ft.)
Slope =    1.17990  s(percent)=     117.99
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.110 min.
Rainfall intensity =      3.908(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.864
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      7.762(CFS)
Total initial stream area =        2.300(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      226.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.300(Ac.)
Runoff from this stream =      7.762(CFS)
Time of concentration =    8.11 min.
Rainfall intensity =     3.908(In/Hr)
Summary of stream data:

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


1       23.750     12.00                3.150
```

```
                                            B100
2        7.762      8.11                  3.908
Largest stream flow has longer time of concentration
Qp =     23.750 + sum of
          Qb         Ia/Ib
           7.762 *    0.806 =      6.256
Qp =     30.006

Total of 2 streams to confluence:
Flow rates before confluence point:
      23.750       7.762
Area of streams before confluence:
        8.700        2.300
Results of confluence:
Total flow rate =     30.006(CFS)
Time of concentration =    12.005 min.
Effective stream area after confluence =     11.000(Ac.)
End of computations, total study area =           98.40 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.277
Area averaged RI index number =  71.4
```

APPENDIX A-3: AREA A ONSITE 100-YEAR HYDROLOGY CALCULATIONS (EXISTING CONDITION)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 08/28/18 File:AEXIST100.out

1420-0001 KTM
ONSITE AREA A - EXISTING CONDITION
100-YEAR RATIONAL METHOD
8/28/18 AA

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

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

Program License Serial Number 6268

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

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5500

++

Process from Point/Station 100.000 to Point/Station 102.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.960(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.749
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.600
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.300
RI index for soil(AMC 2) = 63.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
User specified values are as follows:
TC = 13.44 min. Rain intensity = 2.96(In/Hr)
Total area = 12.30(Ac.) Total runoff = 27.70(CFS)

++

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

Top of natural channel elevation = 1332.500(Ft.)
End of natural channel elevation = 1325.600(Ft.)
Length of natural channel = 456.000(Ft.)
Estimated mean flow rate at midpoint of channel = 28.826(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 = 4.07(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0151
Corrected/adjusted channel slope = 0.0151

Travel time = 1.87 min. TC = 15.31 min.

Adding area flow to channel
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.817
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.400
Decimal fraction soil group D = 0.600
RI index for soil(AMC 2) = 72.60
Pervious area fraction = 0.600; Impervious fraction = 0.400
Rainfall intensity = 2.756(In/Hr) for a 100.0 year storm
Subarea runoff = 2.251(CFS) for 1.000(Ac.)
Total runoff = 29.951(CFS) Total area = 13.300(Ac.)

++
Process from Point/Station 103.000 to Point/Station 105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1325.600(Ft.)
Downstream point/station elevation = 1325.000(Ft.)
Pipe length = 64.00(Ft.) Manning's N = 0.020
No. of pipes = 1 Required pipe flow = 29.951(CFS)
Nearest computed pipe diameter = 33.00(In.)
Calculated individual pipe flow = 29.951(CFS)
Normal flow depth in pipe = 24.47(In.)
Flow top width inside pipe = 28.90(In.)
Critical Depth = 21.84(In.)
Pipe flow velocity = 6.34(Ft/s)
Travel time through pipe = 0.17 min.
Time of concentration (TC) = 15.47 min.

++
Process from Point/Station 103.000 to Point/Station 104.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 13.300(Ac.)
Runoff from this stream = 29.951(CFS)
Time of concentration = 15.47 min.
Rainfall intensity = 2.739(In/Hr)

++
Process from Point/Station 104.000 to Point/Station 105.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 352.000(Ft.)
Top (of initial area) elevation = 1331.600(Ft.)
Bottom (of initial area) elevation = 1325.000(Ft.)
Difference in elevation = 6.600(Ft.)
Slope = 0.01875 s(percent)= 1.87
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.017 min.
Rainfall intensity = 3.687(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.852
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.256(CFS)
Total initial stream area = 0.400(Ac.)
Pervious area fraction = 0.500

++
Process from Point/Station 104.000 to Point/Station 105.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.400(Ac.)
Runoff from this stream = 1.256(CFS)
Time of concentration = 9.02 min.

```
Rainfall intensity =     3.687(In/Hr)
Summary of stream data:

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


1       29.951     15.47                 2.739
2        1.256      9.02                 3.687
Largest stream flow has longer time of concentration
Qp =     29.951 + sum of
          Qb         Ia/Ib
           1.256 *    0.743 =      0.933
Qp =     30.884

Total of 2 streams to confluence:
Flow rates before confluence point:
      29.951       1.256
Area of streams before confluence:
       13.300        0.400
Results of confluence:
Total flow rate =     30.884(CFS)
Time of concentration =    15.474 min.
Effective stream area after confluence =     13.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      107.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of natural channel elevation =   1325.000(Ft.)
End of natural channel elevation =   1324.500(Ft.)
Length of natural channel  =   331.000(Ft.)
Estimated mean flow rate at midpoint of channel =     31.560(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 =   1.32(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0015
Corrected/adjusted channel slope =  0.0015
Travel time =    4.18 min.     TC =   19.65  min.


 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.825
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.250
Decimal fraction soil group D = 0.750
RI index for soil(AMC 2)  =  73.50
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.402(In/Hr) for a   100.0 year storm
Subarea runoff =      1.189(CFS) for      0.600(Ac.)
Total runoff =     32.072(CFS)  Total area =      14.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      107.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     14.300(Ac.)
Runoff from this stream =     32.072(CFS)
Time of concentration =   19.65 min.
Rainfall intensity =     2.402(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   982.000(Ft.)
Top (of initial area) elevation =  1333.400(Ft.)
Bottom (of initial area) elevation =  1324.500(Ft.)
```

```
Difference in elevation =     8.900(Ft.)
Slope =    0.00906  s(percent)=       0.91
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   21.363 min.
Rainfall intensity =      2.294(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.250
RI index for soil(AMC 2)  =  86.75
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     14.033(CFS)
Total initial stream area =        7.400(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.400(Ac.)
Runoff from this stream =     14.033(CFS)
Time of concentration =   21.36 min.
Rainfall intensity =     2.294(In/Hr)
Summary of stream data:

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


1       32.072     19.65                2.402
2       14.033     21.36                2.294
Largest stream flow has longer or shorter time of concentration
Qp =     32.072 + sum of
          Qa          Tb/Ta
          14.033 *    0.920 =     12.910
Qp =     44.982

Total of 2 streams to confluence:
Flow rates before confluence point:
      32.072      14.033
Area of streams before confluence:
       14.300        7.400
Results of confluence:
Total flow rate =     44.982(CFS)
Time of concentration =    19.653 min.
Effective stream area after confluence =     21.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of natural channel elevation =   1324.500(Ft.)
End of natural channel elevation =   1316.000(Ft.)
Length of natural channel  =   668.000(Ft.)
Estimated mean flow rate at midpoint of channel =     52.030(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 =   4.42(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0127
Corrected/adjusted channel slope =  0.0127
Travel time =    2.52 min.     TC =   22.17  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.824
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.800
```

```
Decimal fraction soil group D = 0.200
RI index for soil(AMC 2)  =  86.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.248(In/Hr) for a   100.0 year storm
Subarea runoff =     12.599(CFS) for      6.800(Ac.)
Total runoff =     57.581(CFS)  Total area =      28.500(Ac.)
End of computations, total study area =           28.50 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.882
Area averaged RI index number =  75.5
```

APPENDIX A-4: AREA B ONSITE 100-YEAR HYDROLOGY CALCULATIONS (EXISTING CONDITION)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 08/30/18 File:BEXIST100.out

1420-0001 KTM
ONSITE AREA B - EXISTING CONDITION
100-YEAR RATIONAL METHOD
8/28/18

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

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

Program License Serial Number 6268

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

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Murrieta,Tmc,Rnch CaNorco] area used.
10 year storm 10 minute intensity = 2.360(In/Hr)
10 year storm 60 minute intensity = 0.880(In/Hr)
100 year storm 10 minute intensity = 3.480(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5500

++

Process from Point/Station 212.000 to Point/Station 212.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.172(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.400
Decimal fraction soil group D = 0.600
RI index for soil(AMC 2) = 72.60
Pervious area fraction = 0.100; Impervious fraction = 0.900
User specified values are as follows:
TC = 23.60 min. Rain intensity = 2.17(In/Hr)
Total area = 57.40(Ac.) Total runoff = 133.40(CFS)

++

Process from Point/Station 212.000 to Point/Station 215.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1316.900(Ft.)
Downstream point/station elevation = 1316.700(Ft.)
Pipe length = 133.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 133.400(CFS)
Given pipe size = 65.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
0.808(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 0.228(Ft.)
Minor friction loss = 0.781(Ft.) K-factor = 1.50
Pipe flow velocity = 5.79(Ft/s)
Travel time through pipe = 0.38 min.
Time of concentration (TC) = 23.98 min.

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      215.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     57.400(Ac.)
Runoff from this stream =    133.400(CFS)
Time of concentration =   23.98 min.
Rainfall intensity =     2.153(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      202.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
----------------------------------------------------------------------------
Rainfall intensity =      2.906(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.822
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.700
RI index for soil(AMC 2)  =  73.20
Pervious area fraction =  0.600; Impervious fraction =  0.400
User specified values are as follows:
TC =  13.90 min.  Rain intensity =       2.91(In/Hr)
Total area =        11.20(Ac.)  Total runoff =     28.00(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      208.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1323.800(Ft.)
Downstream point/station elevation =  1321.200(Ft.)
Pipe length  =   190.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.000(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    28.000(CFS)
Normal flow depth in pipe =   24.00(In.)
Flow top width inside pipe =    0.00(In.)
Critical Depth =   21.94(In.)
Pipe flow velocity =      8.42(Ft/s)
Travel time through pipe =    0.38 min.
Time of concentration (TC) =    14.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      208.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     11.200(Ac.)
Runoff from this stream =     28.000(CFS)
Time of concentration =   14.28 min.
Rainfall intensity =     2.863(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      206.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
----------------------------------------------------------------------------
Rainfall intensity =      2.662(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.100
RI index for soil(AMC 2)  =  69.60
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =  16.30 min.  Rain intensity =       2.66(In/Hr)
Total area =        16.70(Ac.)  Total runoff =     46.00(CFS)
```

++
Process from Point/Station 206.000 to Point/Station 208.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1324.800(Ft.)
Downstream point/station elevation = 1321.200(Ft.)
Pipe length = 112.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 46.000(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 46.000(CFS)
Normal flow depth in pipe = 15.49(In.)
Flow top width inside pipe = 35.65(In.)
Critical Depth = 26.52(In.)
Pipe flow velocity = 15.81(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 16.42 min.

++
Process from Point/Station 206.000 to Point/Station 208.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 16.700(Ac.)
Runoff from this stream = 46.000(CFS)
Time of concentration = 16.42 min.
Rainfall intensity = 2.652(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	28.000	14.28	2.863
2	46.000	16.42	2.652

Largest stream flow has longer time of concentration
Qp = 46.000 + sum of
Qb Ia/Ib
28.000 * 0.926 = 25.928
Qp = 71.928

Total of 2 streams to confluence:
Flow rates before confluence point:
28.000 46.000
Area of streams before confluence:
11.200 16.700
Results of confluence:
Total flow rate = 71.928(CFS)
Time of concentration = 16.418 min.
Effective stream area after confluence = 27.900(Ac.)

++
Process from Point/Station 208.000 to Point/Station 215.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1321.200(Ft.)
End of natural channel elevation = 1316.700(Ft.)
Length of natural channel = 783.000(Ft.)
Estimated mean flow rate at midpoint of channel = 75.279(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 = 3.31(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0057
Corrected/adjusted channel slope = 0.0057
Travel time = 3.95 min. TC = 20.36 min.

Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.832
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.550

```
Decimal fraction soil group D = 0.450
RI index for soil(AMC 2)  =  87.35
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.355(In/Hr) for a   100.0 year storm
Subarea runoff =      5.094(CFS) for      2.600(Ac.)
Total runoff =     77.021(CFS)  Total area =      30.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      215.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     30.500(Ac.)
Runoff from this stream =     77.021(CFS)
Time of concentration =   20.36 min.
Rainfall intensity =     2.355(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      213.000 to Point/Station      214.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   510.000(Ft.)
Top (of initial area) elevation =  1333.400(Ft.)
Bottom (of initial area) elevation =  1328.600(Ft.)
Difference in elevation =     4.800(Ft.)
Slope =    0.00941  s(percent)=       0.94
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.314 min.
Rainfall intensity =      2.661(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.837
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.700
Decimal fraction soil group D = 0.300
RI index for soil(AMC 2)  =  86.90
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.559(CFS)
Total initial stream area =        0.700(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      215.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1328.600(Ft.)
End of natural channel elevation =   1317.600(Ft.)
Length of natural channel  =   632.000(Ft.)
Estimated mean flow rate at midpoint of channel =      3.117(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 =   2.50(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0174
Corrected/adjusted channel slope =  0.0174
Travel time =    4.22 min.     TC =   20.53  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.834
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.400
Decimal fraction soil group D = 0.600
RI index for soil(AMC 2)  =  87.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.345(In/Hr) for a   100.0 year storm
Subarea runoff =      2.738(CFS) for      1.400(Ac.)
Total runoff =      4.297(CFS)  Total area =       2.100(Ac.)
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Process from Point/Station      214.000 to Point/Station      215.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      2.100(Ac.)
Runoff from this stream =      4.297(CFS)
Time of concentration =   20.53 min.
Rainfall intensity =     2.345(In/Hr)
Summary of stream data:

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


1      133.400     23.98                2.153
2       77.021     20.36                2.355
3        4.297     20.53                2.345
Largest stream flow has longer time of concentration
Qp =    133.400 + sum of
          Qb          Ia/Ib
          77.021 *    0.914 =     70.396
          Qb          Ia/Ib
           4.297 *    0.918 =      3.945
Qp =    207.741

Total of 3 main streams to confluence:
Flow rates before confluence point:
     133.400      77.021       4.297
Area of streams before confluence:
       57.400       30.500        2.100


Results of confluence:
Total flow rate =    207.741(CFS)
Time of concentration =    23.983 min.
Effective stream area after confluence  =     90.000(Ac.)


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Process from Point/Station      215.000 to Point/Station      218.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of natural channel elevation =   1316.700(Ft.)
End of natural channel elevation =   1311.600(Ft.)
Length of natural channel  =  1511.000(Ft.)
Estimated mean flow rate at midpoint of channel =    234.632(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 =   3.58(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0034
Corrected/adjusted channel slope =  0.0034
Travel time =    7.03 min.     TC =   31.02  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.800
RI index for soil(AMC 2)  =  88.40
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.869(In/Hr) for a   100.0 year storm
Subarea runoff =     35.833(CFS) for     23.300(Ac.)
Total runoff =    243.574(CFS)  Total area =     113.300(Ac.)


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Process from Point/Station      215.000 to Point/Station      218.000
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**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 113.300(Ac.)
Runoff from this stream = 243.574(CFS)
Time of concentration = 31.02 min.
Rainfall intensity = 1.869(In/Hr)

++
Process from Point/Station 216.000 to Point/Station 216.500
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 604.000(Ft.)
Top (of initial area) elevation = 1322.700(Ft.)
Bottom (of initial area) elevation = 1317.900(Ft.)
Difference in elevation = 4.800(Ft.)
Slope = 0.00795 s(percent)= 0.79
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.221 min.
Rainfall intensity = 3.441(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 = 0.000
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.800
RI index for soil(AMC 2) = 73.80
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 3.672(CFS)
Total initial stream area = 1.200(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 216.500 to Point/Station 217.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1317.900(Ft.)
End of street segment elevation = 1315.500(Ft.)
Length of street segment = 486.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 55.000(Ft.)
Distance from crown to crossfall grade break = 53.000(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 [2] side(s) of the street
Distance from curb to property line = 43.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 1.500(In.)
Manning's N in gutter = 0.0130
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 5.119(CFS)
Depth of flow = 0.320(Ft.), Average velocity = 1.748(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 11.743(Ft.)
Flow velocity = 1.75(Ft/s)
Travel time = 4.63 min. TC = 14.85 min.
Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Rainfall intensity = 2.802(In/Hr) for a 100.0 year storm
Subarea runoff = 2.736(CFS) for 1.100(Ac.)
Total runoff = 6.407(CFS) Total area = 2.300(Ac.)
Street flow at end of street = 6.407(CFS)
Half street flow at end of street = 3.204(CFS)
Depth of flow = 0.342(Ft.), Average velocity = 1.843(Ft/s)
Flow width (from curb towards crown)= 12.859(Ft.)

++

Process from Point/Station 217.000 to Point/Station 218.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1315.500(Ft.)
Downstream point/station elevation = 1311.600(Ft.)
Pipe length = 97.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.407(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 6.407(CFS)
Normal flow depth in pipe = 6.09(In.)
Flow top width inside pipe = 20.89(In.)
Critical Depth = 10.74(In.)
Pipe flow velocity = 10.21(Ft/s)
Travel time through pipe = 0.16 min.
Time of concentration (TC) = 15.01 min.

++
Process from Point/Station 217.000 to Point/Station 218.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 2.300(Ac.)
Runoff from this stream = 6.407(CFS)
Time of concentration = 15.01 min.
Rainfall intensity = 2.785(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	243.574	31.02	1.869
2	6.407	15.01	2.785

Largest stream flow has longer time of concentration
Qp = 243.574 + sum of
Qb Ia/Ib
6.407 * 0.671 = 4.299
Qp = 247.873

Total of 2 streams to confluence:
Flow rates before confluence point:
243.574 6.407
Area of streams before confluence:
113.300 2.300
Results of confluence:
Total flow rate = 247.873(CFS)
Time of concentration = 31.016 min.
Effective stream area after confluence = 115.600(Ac.)

++
Process from Point/Station 218.000 to Point/Station 223.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1311.600(Ft.)
End of natural channel elevation = 1309.400(Ft.)
Length of natural channel = 375.000(Ft.)
Estimated mean flow rate at midpoint of channel = 250.124(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 = 4.82(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0059
Corrected/adjusted channel slope = 0.0059
Travel time = 1.30 min. TC = 32.31 min.

Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.826
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000

```
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.827(In/Hr) for a   100.0 year storm
Subarea runoff =      3.168(CFS) for      2.100(Ac.)
Total runoff =    251.040(CFS)  Total area =     117.700(Ac.)


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Process from Point/Station      218.000 to Point/Station      223.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    117.700(Ac.)
Runoff from this stream =    251.040(CFS)
Time of concentration =   32.31 min.
Rainfall intensity =     1.827(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      222.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   498.000(Ft.)
Top (of initial area) elevation =  1328.800(Ft.)
Bottom (of initial area) elevation =  1312.400(Ft.)
Difference in elevation =    16.400(Ft.)
Slope =    0.03293  s(percent)=       3.29
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.579 min.
Rainfall intensity =      3.070(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.854
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      5.506(CFS)
Total initial stream area =        2.100(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      222.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.100(Ac.)
Runoff from this stream =      5.506(CFS)
Time of concentration =   12.58 min.
Rainfall intensity =     3.070(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      221.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Rainfall intensity =      3.646(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 = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
User specified values are as follows:
TC =   9.20 min.  Rain intensity =       3.65(In/Hr)
Total area =         2.10(Ac.)  Total runoff =      5.80(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      222.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1344.400(Ft.)
```

End of natural channel elevation = 1312.400(Ft.)
Length of natural channel = 621.000(Ft.)
Estimated mean flow rate at midpoint of channel = 10.633(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 = 5.76(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
Normal channel slope = 0.0515
Corrected/adjusted channel slope = 0.0515
Travel time = 1.80 min. TC = 11.00 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 = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 3.306(In/Hr) for a 100.0 year storm
Subarea runoff = 9.918(CFS) for 3.500(Ac.)
Total runoff = 15.718(CFS) Total area = 5.600(Ac.)

++
Process from Point/Station 221.000 to Point/Station 222.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 5.600(Ac.)
Runoff from this stream = 15.718(CFS)
Time of concentration = 11.00 min.
Rainfall intensity = 3.306(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.506	12.58	3.070
2	15.718	11.00	3.306

Largest stream flow has longer or shorter time of concentration
Qp = 15.718 + sum of
Qa Tb/Ta
5.506 * 0.874 = 4.814
Qp = 20.532

Total of 2 streams to confluence:
Flow rates before confluence point:
5.506 15.718
Area of streams before confluence:
2.100 5.600
Results of confluence:
Total flow rate = 20.532(CFS)
Time of concentration = 10.996 min.
Effective stream area after confluence = 7.700(Ac.)

++
Process from Point/Station 222.000 to Point/Station 223.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

Top of natural channel elevation = 1312.400(Ft.)
End of natural channel elevation = 1309.400(Ft.)
Length of natural channel = 305.000(Ft.)
Estimated mean flow rate at midpoint of channel = 23.865(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 = 3.12(Ft/s)

Correction to map slope used on extremely rugged channels with

```
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0098
Corrected/adjusted channel slope =  0.0098
Travel time =    1.63 min.     TC =   12.63  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.854
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.064(In/Hr) for a   100.0 year storm
Subarea runoff =      6.541(CFS) for      2.500(Ac.)
Total runoff =     27.073(CFS)  Total area =      10.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      223.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     10.200(Ac.)
Runoff from this stream =     27.073(CFS)
Time of concentration =   12.63 min.
Rainfall intensity =     3.064(In/Hr)
Summary of stream data:

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


1      251.040     32.31                1.827
2       27.073     12.63                3.064
Largest stream flow has longer time of concentration
Qp =    251.040 + sum of
          Qb         Ia/Ib
          27.073 *    0.596 =     16.146
Qp =    267.187

Total of 2 main streams to confluence:
Flow rates before confluence point:
     251.040      27.073
Area of streams before confluence:
      117.700       10.200


Results of confluence:
Total flow rate =    267.187(CFS)
Time of concentration =    32.314 min.
Effective stream area after confluence  =    127.900(Ac.)


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Process from Point/Station      223.000 to Point/Station      226.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1309.400(Ft.)
End of natural channel elevation =   1307.800(Ft.)
Length of natural channel  =   238.000(Ft.)
Estimated mean flow rate at midpoint of channel =    268.753(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 =   5.27(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0067
Corrected/adjusted channel slope =  0.0067
Travel time =    0.75 min.     TC =   33.07  min.


 Adding area flow to channel
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UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.825
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.804(In/Hr) for a   100.0 year storm
Subarea runoff =      2.232(CFS) for      1.500(Ac.)
Total runoff =    269.418(CFS)  Total area =     129.400(Ac.)


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Process from Point/Station      223.000 to Point/Station      226.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    129.400(Ac.)
Runoff from this stream =    269.418(CFS)
Time of concentration =   33.07 min.
Rainfall intensity =     1.804(In/Hr)


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Process from Point/Station      224.000 to Point/Station      226.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Rainfall intensity =      3.150(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.855
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  89.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       3.15(In/Hr)
Total area =        11.00(Ac.)  Total runoff =     30.00(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      224.000 to Point/Station      226.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     11.000(Ac.)
Runoff from this stream =     30.000(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     3.150(In/Hr)
Summary of stream data:

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


1      269.418     33.07                1.804
2       30.000     12.00                3.150
Largest stream flow has longer time of concentration
Qp =    269.418 + sum of
          Qb         Ia/Ib
          30.000 *    0.573 =     17.180
Qp =    286.598

Total of 2 streams to confluence:
Flow rates before confluence point:
     269.418      30.000
Area of streams before confluence:
      129.400       11.000
Results of confluence:
Total flow rate =    286.598(CFS)
Time of concentration =    33.066 min.
Effective stream area after confluence =    140.400(Ac.)
End of computations, total study area =          140.40 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.478
```

Area averaged RI index number = 78.3

APPENDIX A-5: AREA B ONSITE 100-YEAR HYDROLOGY CALCULATIONS (PROPOSED CONDITION)

APPENDIX B: NORMAL DEPTH CALCULATIONS

This existing 66" Culvert has a full flow capacity of 99.62 cfs per the following normal depth calculations. However, the culvert also has 6 feet of head available without overflowing into surrounding areas. Approximately 0.5 feet of head are needed to convey the 100-year peak flow rate of 133.4 cfs. Therefore the pressurized system is acceptable.

Existing Sky Canyon 66" CMP **CULVERT**

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.024	
Channel Slope	0.00300	ft/ft
Normal Depth	5.50	ft
Diameter	5.50	ft
Discharge	99.62	ft³/s

Results

Discharge	99.62	ft³/s
Normal Depth	5.50	ft
Flow Area	23.76	ft²
Wetted Perimeter	17.28	ft
Hydraulic Radius	1.38	ft
Top Width	0.00	ft
Critical Depth	2.76	ft
Percent Full	100.0	%
Critical Slope	0.01187	ft/ft
Velocity	4.19	ft/s
Velocity Head	0.27	ft
Specific Energy	5.77	ft
Froude Number	0.00	
Maximum Discharge	107.17	ft³/s
Discharge Full	99.62	ft³/s
Slope Full	0.00300	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Existing Sky Canyon 66" CMP **CULVERT**

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	5.50	ft
Critical Depth	2.76	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.01187	ft/ft

Sky Canyon 36" RCP Culvert

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.01790	ft/ft
Diameter	3.00	ft
Discharge	46.00	ft^3/s

Results

Normal Depth	1.67	ft
Flow Area	4.03	ft^2
Wetted Perimeter	5.04	ft
Hydraulic Radius	0.80	ft
Top Width	2.98	ft
Critical Depth	2.21	ft
Percent Full	55.5	%
Critical Slope	0.00795	ft/ft
Velocity	11.41	ft/s
Velocity Head	2.02	ft
Specific Energy	3.69	ft
Froude Number	1.73	
Maximum Discharge	83.19	ft^3/s
Discharge Full	77.33	ft^3/s
Slope Full	0.00633	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	55.53	%
Downstream Velocity	Infinity	ft/s

Sky Canyon 36" RCP Culvert

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.67	ft
Critical Depth	2.21	ft
Channel Slope	0.01790	ft/ft
Critical Slope	0.00795	ft/ft

Sky Canyon 24" RCP Culvert

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.015	
Channel Slope	0.01920	ft/ft
Diameter	2.00	ft
Discharge	28.00	ft^3/s

Results

Normal Depth	1.70	ft
Flow Area	2.85	ft^2
Wetted Perimeter	4.69	ft
Hydraulic Radius	0.61	ft
Top Width	1.43	ft
Critical Depth	1.83	ft
Percent Full	85.0	%
Critical Slope	0.01776	ft/ft
Velocity	9.83	ft/s
Velocity Head	1.50	ft
Specific Energy	3.20	ft
Froude Number	1.23	
Maximum Discharge	29.22	ft^3/s
Discharge Full	27.17	ft^3/s
Slope Full	0.02040	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	85.03	%
Downstream Velocity	Infinity	ft/s

Sky Canyon 24" RCP Culvert

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.70	ft
Critical Depth	1.83	ft
Channel Slope	0.01920	ft/ft
Critical Slope	0.01776	ft/ft

APPENDIX C: RCFC & WCD PLATES

APPENDIX C-1: PLATE “D 5.5” RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Existing → Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Proposed → Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92

RCFC & WCD
HYDROLOGY MANUAL

RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

PLATE D-5.5 (1 of 2)

APPENDIX C-2: PLATE “D 6.3” IMPERVIOUS COVER FOR DEVELOPED AREAS

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
Existing → Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. (½ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Proposed → Commercial, Downtown Business or Industrial	80 -100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area should always be made, and a review of aerial photos, where available may assist in estimating the percentage of impervious cover in developed areas.

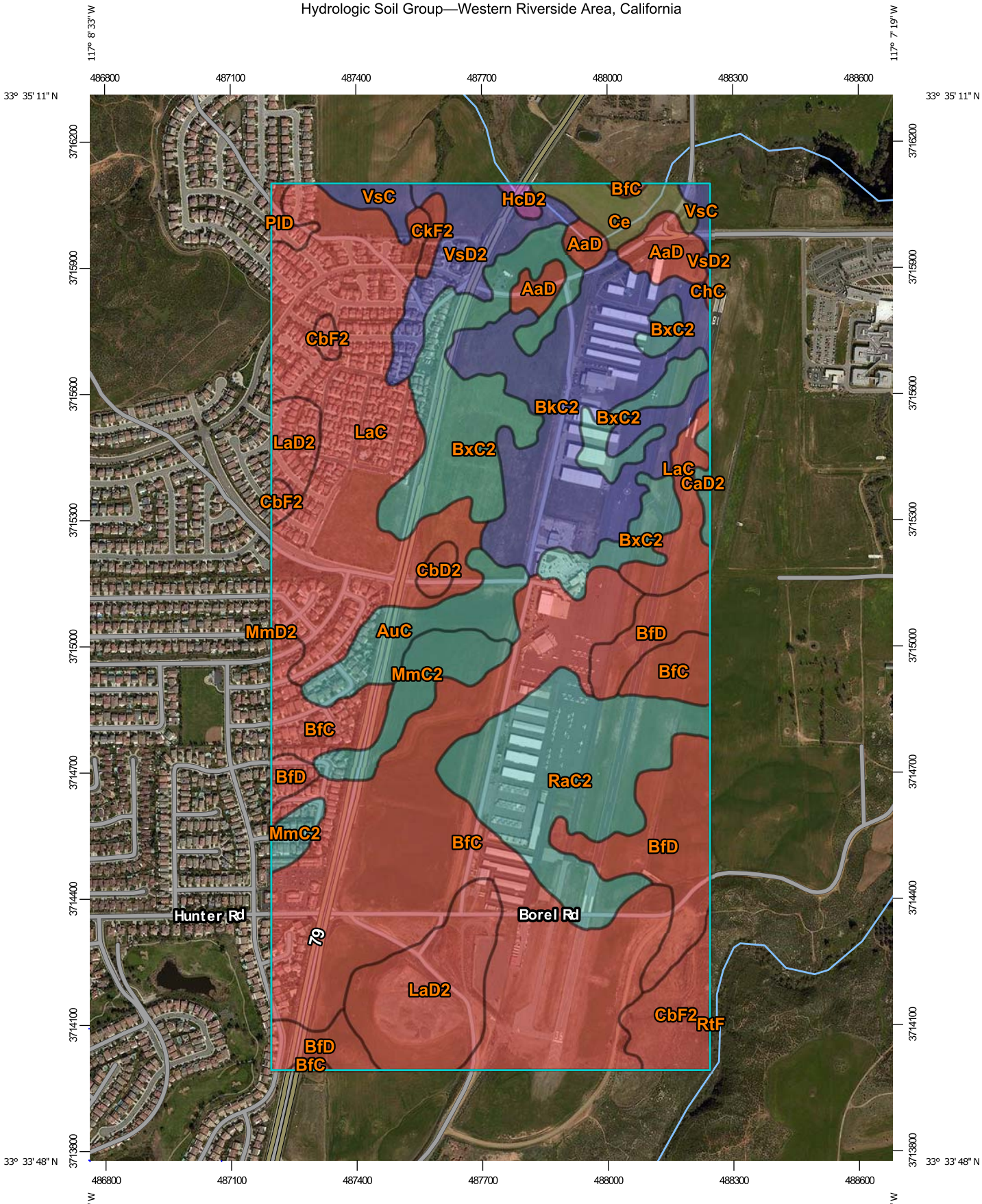
3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above.

RCFC & WCD
HYDROLOGY MANUAL

IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE E-6.3

APPENDIX D: NATIONAL RESOURCES CONSERVATION SERVICE WEB SOIL SURVEY


117° 8' 33" W
117° 7' 19" W
33° 35' 11" N
33° 33' 48" N
486800
487100
487400
487700
488000
488300
488600
3716200
3715900
3715600
3715300
3715000
3714700
3714400
3714100
3713800
VsC
HcD2
BfC
PlD
CkF2
Ce
VsC
VsD2
AaD
AaD
VsD2
AaD
ChC
BxC2
CbF2
BkC2
BxC2
LaC
LaD2
BxC2
LaC
CaD2
CbF2
BxC2
CbD2
MmD2
AuC
BfD
MmC2
BfC
BfC
BfD
RaC2
MmC2
BfC
BfD
Hunter Rd
Borel Rd
79
LaD2
CbF2
RtF
BfD
BfC
Map Scale: 1:12,400 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 150 300 600 900
Feet
0 500 1000 2000 3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 9, Sep 12, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 24, 2015—Feb 26, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Western Riverside Area, California (CA679)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
AaD	Altamont clay, 5 to 15 percent slopes	D	10.8	2.0%
AuC	Auld clay, 2 to 8 percent slopes	C	15.6	2.8%
BfC	Bosanko clay, 2 to 8 percent slopes	D	135.5	24.7%
BfD	Bosanko clay, 8 to 15 percent slopes	D	38.9	7.1%
BkC2	Buchenau silt loam, 2 to 8 percent slopes, eroded	B	58.9	10.7%
BxC2	Buren loam, deep, 2 to 8 percent slopes, eroded	C	51.9	9.5%
CaD2	Cajalco fine sandy loam, 8 to 15 percent slopes, eroded	C	1.6	0.3%
CbD2	Cajalco rocky fine sandy loam, 5 to 15 percent slopes, eroded	D	2.2	0.4%
CbF2	Cajalco rocky fine sandy loam, 15 to 50 percent slopes, eroded	D	14.0	2.5%
Ce	Chino silt loam, drained	C/D	7.7	1.4%
ChC	Cieneba sandy loam, 5 to 8 percent slopes	D	0.2	0.0%
CkF2	Cieneba rocky sandy loam, 15 to 50 percent slopes, erod ed	D	1.8	0.3%
HcD2	Hanford coarse sandy loam, 8 to 15 percent slopes, erod ed	A	1.3	0.2%
LaC	Las Posas loam, 2 to 8 percent slopes	D	89.3	16.3%
LaD2	Las Posas loam, 8 to 15 percent slopes, eroded	D	31.6	5.8%
MmC2	Monserate sandy loam, 5 to 8 percent slopes, eroded	C	15.5	2.8%
MmD2	Monserate sandy loam, 8 to 15 percent slopes, eroded	C	0.0	0.0%

Hydrologic Soil Group— Summary by Map Unit — Western Riverside Area, California (CA679)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
PlD	Placentia fine sandy loam, 5 to 15 percent slopes	D	2.0	0.4%
RaC2	Ramona sandy loam, 5 to 8 percent slopes, eroded	C	47.6	8.7%
RtF	Rockland		0.0	0.0%
VsC	Vista coarse sandy loam, 2 to 8 percent slopes	B	5.3	1.0%
VsD2	Vista coarse sandy loam, 8 to 15 percent slopes, eroded	B	16.8	3.1%
Totals for Area of Interest			**548.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX E: NOAA ATLAS 14 RAINFALL DATA

NOAA Atlas 14, Volume 6, Version 2
Location name: Murrieta, California, USA*
Latitude: 33.5718°, Longitude: -117.1342°
Elevation: 1321.16 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.104** (0.087-0.125)	**0.139** (0.117-0.168)	**0.188** (0.157-0.227)	**0.229** (0.190-0.279)	**0.288** (0.230-0.363)	**0.335** (0.262-0.432)	**0.384** (0.293-0.509)	**0.437** (0.323-0.597)	**0.512** (0.362-0.730)	**0.572** (0.390-0.846)
10-min	**0.149** (0.125-0.179)	**0.199** (0.167-0.240)	**0.269** (0.225-0.325)	**0.328** (0.272-0.400)	**0.412** (0.330-0.521)	**0.480** (0.375-0.620)	**0.551** (0.419-0.730)	**0.626** (0.463-0.855)	**0.733** (0.519-1.05)	**0.820** (0.559-1.21)
15-min	**0.180** (0.151-0.216)	**0.241** (0.202-0.291)	**0.326** (0.272-0.394)	**0.397** (0.329-0.484)	**0.498** (0.398-0.630)	**0.580** (0.453-0.749)	**0.666** (0.507-0.883)	**0.757** (0.560-1.03)	**0.887** (0.628-1.27)	**0.991** (0.677-1.47)
30-min	**0.279** (0.234-0.336)	**0.375** (0.314-0.452)	**0.506** (0.423-0.612)	**0.617** (0.511-0.753)	**0.775** (0.620-0.979)	**0.902** (0.705-1.17)	**1.03** (0.789-1.37)	**1.18** (0.871-1.61)	**1.38** (0.976-1.97)	**1.54** (1.05-2.28)
60-min	**0.425** (0.357-0.512)	**0.570** (0.478-0.687)	**0.770** (0.643-0.930)	**0.938** (0.777-1.14)	**1.18** (0.942-1.49)	**1.37** (1.07-1.77)	**1.57** (1.20-2.09)	**1.79** (1.33-2.45)	**2.10** (1.48-2.99)	**2.34** (1.60-3.47)
2-hr	**0.619** (0.519-0.745)	**0.818** (0.685-0.986)	**1.09** (0.908-1.31)	**1.31** (1.09-1.60)	**1.62** (1.30-2.05)	**1.87** (1.46-2.41)	**2.12** (1.62-2.81)	**2.39** (1.77-3.26)	**2.76** (1.95-3.94)	**3.05** (2.08-4.52)
3-hr	**0.761** (0.639-0.917)	**1.00** (0.840-1.21)	**1.32** (1.11-1.60)	**1.59** (1.32-1.94)	**1.96** (1.56-2.47)	**2.25** (1.76-2.90)	**2.54** (1.94-3.37)	**2.85** (2.11-3.90)	**3.28** (2.32-4.68)	**3.61** (2.47-5.35)
6-hr	**1.08** (0.910-1.31)	**1.42** (1.19-1.71)	**1.87** (1.56-2.26)	**2.24** (1.85-2.73)	**2.74** (2.19-3.46)	**3.13** (2.45-4.05)	**3.53** (2.69-4.68)	**3.95** (2.92-5.39)	**4.51** (3.19-6.44)	**4.95** (3.38-7.33)
12-hr	**1.44** (1.21-1.73)	**1.89** (1.59-2.28)	**2.50** (2.09-3.02)	**2.99** (2.48-3.64)	**3.66** (2.93-4.63)	**4.18** (3.27-5.40)	**4.71** (3.59-6.24)	**5.25** (3.88-7.17)	**5.99** (4.24-8.55)	**6.57** (4.48-9.72)
24-hr	**1.86** (1.65-2.15)	**2.49** (2.19-2.87)	**3.31** (2.91-3.84)	**3.98** (3.48-4.65)	**4.91** (4.15-5.92)	**5.62** (4.66-6.91)	**6.35** (5.14-7.99)	**7.10** (5.60-9.19)	**8.13** (6.16-10.9)	**8.93** (6.55-12.4)
2-day	**2.21** (1.95-2.55)	**3.02** (2.67-3.49)	**4.11** (3.62-4.76)	**5.01** (4.38-5.86)	**6.28** (5.31-7.57)	**7.27** (6.03-8.95)	**8.31** (6.73-10.5)	**9.40** (7.41-12.2)	**10.9** (8.27-14.7)	**12.1** (8.89-16.9)
3-day	**2.33** (2.06-2.69)	**3.24** (2.86-3.74)	**4.47** (3.94-5.18)	**5.52** (4.82-6.44)	**6.99** (5.92-8.43)	**8.18** (6.79-10.1)	**9.43** (7.64-11.9)	**10.8** (8.49-13.9)	**12.7** (9.60-17.1)	**14.2** (10.4-19.8)
4-day	**2.52** (2.22-2.91)	**3.52** (3.11-4.07)	**4.91** (4.33-5.69)	**6.09** (5.32-7.12)	**7.78** (6.59-9.38)	**9.15** (7.59-11.3)	**10.6** (8.59-13.4)	**12.2** (9.60-15.7)	**14.4** (10.9-19.4)	**16.3** (11.9-22.6)
7-day	**2.89** (2.55-3.33)	**4.08** (3.60-4.72)	**5.74** (5.06-6.66)	**7.17** (6.26-8.37)	**9.22** (7.80-11.1)	**10.9** (9.04-13.4)	**12.7** (10.3-16.0)	**14.6** (11.5-18.9)	**17.4** (13.2-23.5)	**19.7** (14.5-27.5)
10-day	**3.10** (2.74-3.58)	**4.41** (3.89-5.09)	**6.23** (5.49-7.22)	**7.81** (6.82-9.12)	**10.1** (8.53-12.2)	**11.9** (9.91-14.7)	**14.0** (11.3-17.6)	**16.1** (12.7-20.9)	**19.3** (14.6-26.0)	**21.9** (16.1-30.5)
20-day	**3.77** (3.33-4.35)	**5.44** (4.80-6.29)	**7.79** (6.86-9.03)	**9.84** (8.60-11.5)	**12.8** (10.9-15.5)	**15.3** (12.7-18.9)	**18.0** (14.6-22.7)	**21.0** (16.5-27.1)	**25.3** (19.1-34.0)	**28.8** (21.2-40.1)
30-day	**4.45** (3.94-5.14)	**6.45** (5.69-7.45)	**9.28** (8.17-10.8)	**11.8** (10.3-13.7)	**15.4** (13.1-18.6)	**18.5** (15.3-22.7)	**21.8** (17.7-27.4)	**25.4** (20.1-32.9)	**30.8** (23.3-41.5)	**35.3** (25.9-49.1)
45-day	**5.24** (4.63-6.05)	**7.56** (6.67-8.73)	**10.9** (9.58-12.6)	**13.8** (12.1-16.1)	**18.2** (15.4-21.9)	**21.8** (18.1-26.8)	**25.8** (20.9-32.5)	**30.2** (23.8-39.1)	**36.7** (27.8-49.4)	**42.2** (30.9-58.7)
60-day	**6.07** (5.37-7.01)	**8.70** (7.68-10.1)	**12.5** (11.0-14.5)	**15.8** (13.8-18.5)	**20.8** (17.6-25.1)	**25.0** (20.7-30.8)	**29.6** (24.0-37.3)	**34.7** (27.4-44.9)	**42.3** (32.0-56.9)	**48.7** (35.7-67.7)

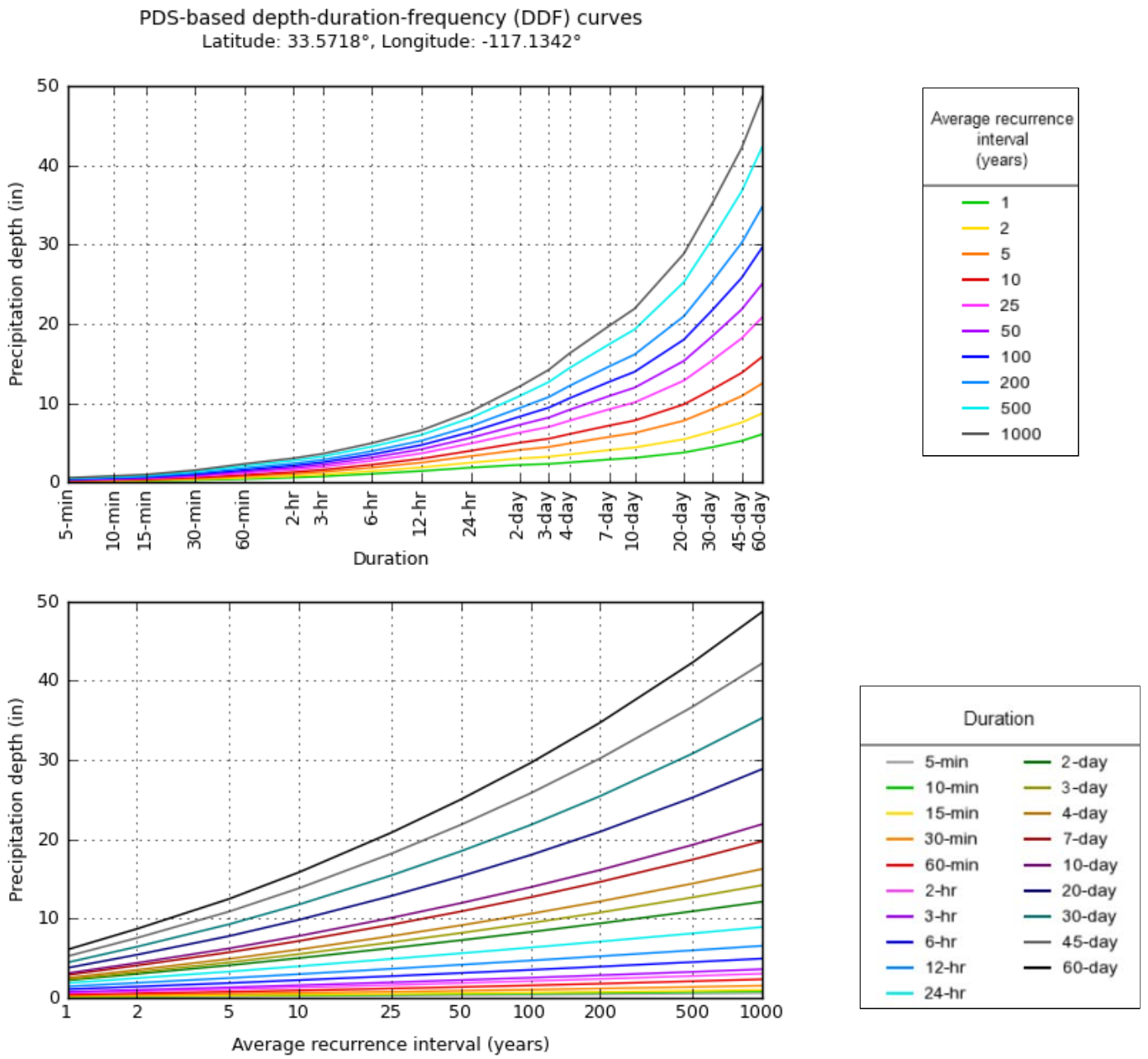
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



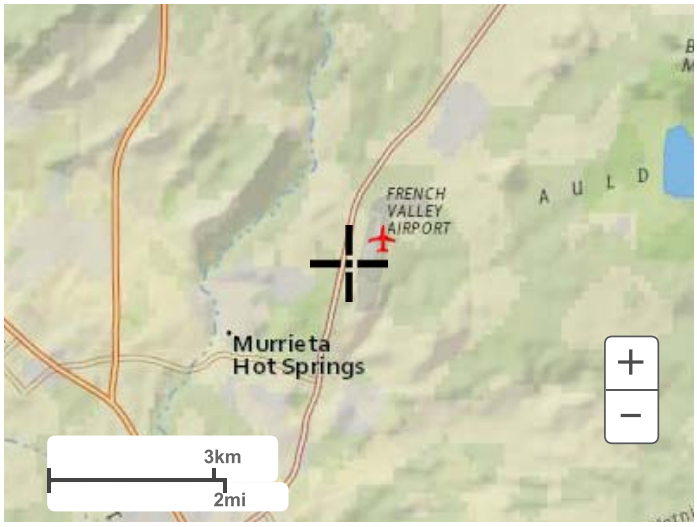
NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Mon Sep 25 22:12:04 2017

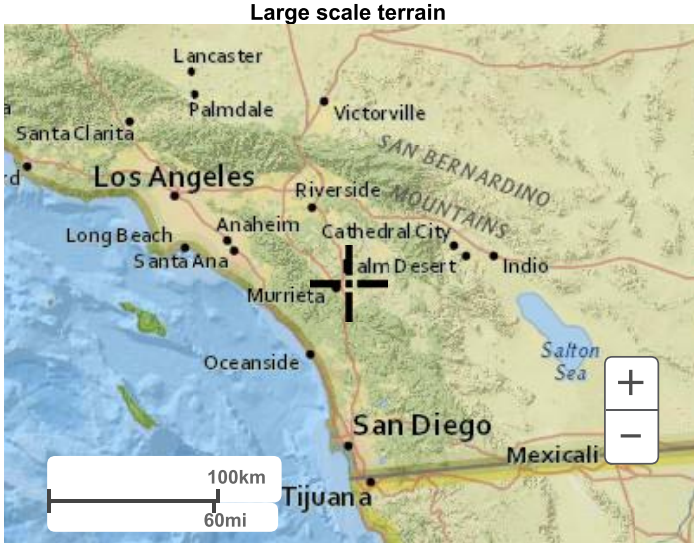
Back to Top

Maps & aerials

Small scale terrain



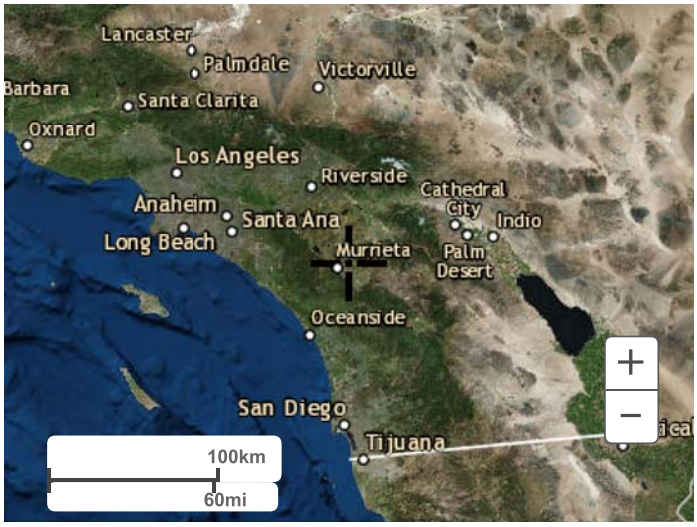
Large scale terrain



Large scale map



Large scale aerial

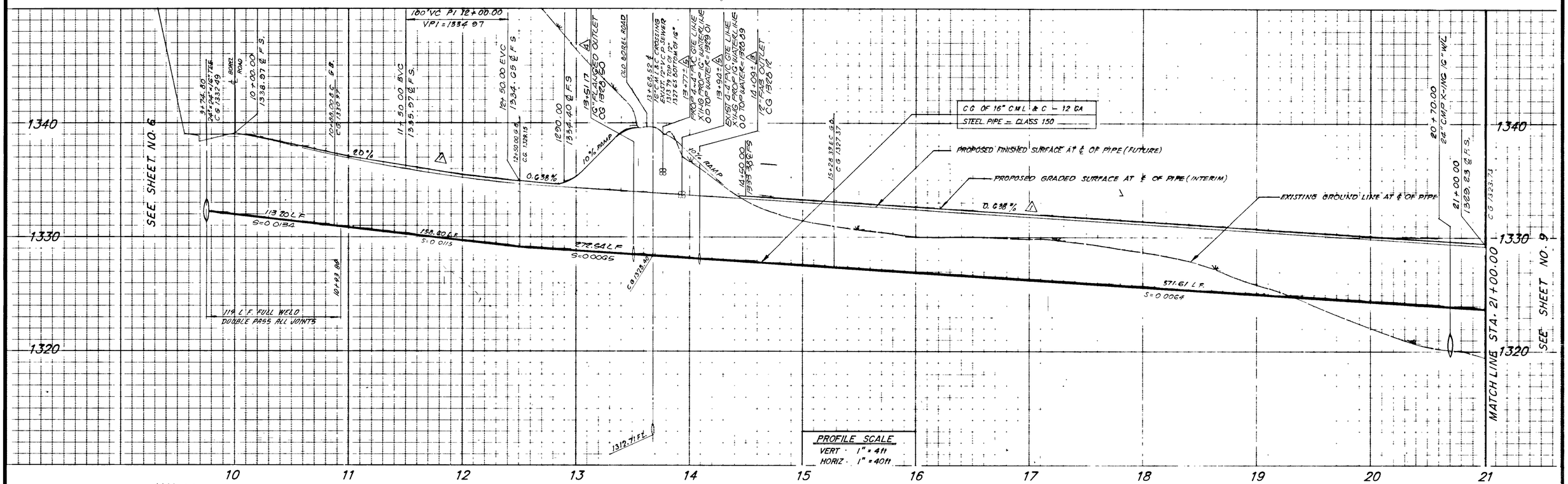


Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX F: OFFSITE STORM DRAIN AS-BUILTS WITHIN SKY CANYON DRIVE



WATER APPROVED BY
EASTERN MUNICIPAL WATER DISTRICT
Victor J. Banuelos 9/3/91
CIVIL ENGINEER OF SUBDIVISIONS DATE

	INITIAL	DATE
PROJ. ENG.	BR	7/8/91
PLANNING		
WATER OPER.		

	INITIAL	DATE
SEWER OPER.		
CONSTRUCTION		
DESIGN		

APPROVED BY
RIVERSIDE COUNTY, CALIF. FOR TRANSPORTATION DEPARTMENT
DATE 2/28/92

1	REVISED GRADING	KJB 4/1/92
2	ADD EXIST. FAA FENCE	KJB 4/1/92
3	ADD OUTLET @ STA 14+09±	MB 6/4/92
4	ADD CATHODIC TEST STATION	MB 11/17/92
5	CHANGED 16"BFV TO 16"RGGV	MB 11/17/92
6	SHOW GTE LINE X'ING WAT. REF'D. IW.P.	MB 11/26/96

SUBMITTED BY
REGISTERED C.E. NO. 30927
EXP 3/31/92
DATE 5-6-91

RANPAC
ENGINEERING CORPORATION
27447 ENTERPRISE CIRCLE WEST
TEMECULA, CALIFORNIA 92390
TELEPHONE (714) 676-7000

COUNTY OF RIVERSIDE
ASSESSMENT DISTRICT NO. 161
WATER PLANS
IN SKY CANYON DRIVE

SA	43
W.O.	91-458
C.O.	50159
COORD.	31-K
SHT.	8 of 13
D-	13690

DRAWN BY D.T. HATMAN
CHECKED BY C.D. MAYK
DESIGNED BY K.J. SOUEZ

RIVERSIDE BLUEPRINT RIVERSIDE CALIF

2/25/91
135-08
49A-91.DWG

MATCH LINE STA 21+00.00 — SEE SHEET NO. 8

SEE SHEET NO. 10 — MATCH LINE STA. 32+00.00

21+00.00 C.G. 1323.13

21+00.00 1320.83 E.F.S.

21+45± 18" FAB OUTLET C.G. 1323.44

22+12.00 36" C.M.P. CROSSING 16" W/L 1321.3 TOP OF C.M.P. 1320.34 BOTTOM OF W/L

CG OF 16" C.M.L. & C. – 12 GA STEEL PIPE – CLASS 150

FUTURE FINISHED SURFACE AT STREET ℄

PROPOSED GRADED SURFACE AT ℄ OF PIPE (INTERIM) 0.638 %

EXISTING GROUND LINE AT ℄ OF PIPE

240 25 L.F.

S=0.0064

1318.3 FL 36" CMP

22+33.00

24+91.00

27+92.00

230 L.F. FULL WELD DOUBLE PASS ALL JOINTS

230 L.F. FULL WELD DOUBLE PASS ALL JOINTS

28+82 ± 12" FAB OUTLET CG 1318.74

29+40.25 45° BEND C.G. 1318.37

29+50.00 16" W/L CROSSING 66" C.M.P. 1314.0 BOTTOM OF C.M.P. 1311.79 TOP OF W/L

29+58.75 45° BEND C.G. 1318.25 1" AVAR VALVE B598

29+75.00 S.A. C.G. 1318.13

29+75.00 B.V.C. 1323.04 E.F.S.

200' V.C. P.I. STA. 30+75.00 VPI = 1323.00 G_1 = 0.638% G_2 = 0.800%

30+75.00 S.A. C.G. 1317.88

31+75.00 E.V.C. 1325.80 E.F.S.

31+75.00 S.A. C.G. 1318.30

32+00.00 1324.00 E.F.S.

32+00.00 C.G. 1318.30

0.800%

16 25 L.F.

S=0.0028

100 DOL.F.

S=0.0044

100 DOL.F.

25 DOL.F.

S=0.0080

S=0.0064

S=0.1112

S=0.1024

S=0.0064

10 25 L.F.

10 25 L.F.

1313.73 BOT 66" C.M.P.

29+51.50 25° BEND C.G. 1311.05

29+41.50 45° BEND C.G. 1311.08

S=0.0064

29+12.00

75 L.F. FULL WELD DOUBLE PASS ALL JOINTS

29+87.00

PROFILE SCALE
VERT 1" = 4 ft
HORIZ : 1" = 40 ft

21 22 23 24 25 26 27 28 29 30 31 32

1330 1320 1310

GRADE TO DRAIN

15'X10'X14" THK. RIP. RIPRAP W/ MARIFI 700 FILTER FABRIC & 6" THK x 3/4" GRAVEL BLANKET

15'X10'X14" THK RIP. RIPRAP WITH MIRAFI 700 FILTER FABRIC & 6" THK x 3/4" GRAVEL BLANKET GRADE TO DRAIN

180 LF ~ 36" CMP (12 GA) S=0.0182 Q=28 CFS

STA 24+91.00 16" F x F RGGV

22+12.00 36" S.D. X'ING. 16" W/L 1322.34 O.B.P. ELEV. 16" W/L 1321.30 O.T.P. ELEV. 36" S/D

16" C.M.L. & C. CLASS 150 21' WEST OF C/L

27+00.00 2 WIRE ~ CATHODIC TEST STATION PER B-582

28+87± 12" FAB OUTLET 12" F x F RGGV 12" BLIND FLANGE (W'LY)

2% FILL SLOPE

28+00 LOCATOR BOX

80'X15'X2.7' THK ½ TON RIPRAP WITH MIRAFI 700 FILTER FABRIC & 6" x 3/4" GRAVEL BLANKET

123 L.F. OF 66" C.M.P. (12 GA) Q=133.4 c.f.s. S=0.0030 V=6.13 f.p.s.

29+58.75 1" AVAR VALVE PER B598

SKY CANYON DRIVE

N 12°56'33" E

2:1

0.5%

TEMP BARRICADE CO STD NO 810

DAYLIGHT FILL

AREA UNDER CONST

(EXIST. 42" S.D.)

EXIST. 24" CMP

112.00 L.F. OF 30" CMP (12 GA) Q=40.0 CFS ~ S=0.0179 V=7.3 FPS

21+45± 12" FAB OUTLET 12" F x F RGGV 12" BLIND FLANGE (W'LY)

REMOVE & RELOCATE EXIST 6' FAA CHAIN LINK FENCE TO PROPOSED INTERIM GRADE

ASPH

15'X10'X1.6' THK FACING RIPRAP W/ MIR. 700 FILTER FABRIC & 6" THK x 3/4" GRAVEL BLANKET

29+90 66" CMP X'ING 16" W/L 1311.79 OTP ELEV 16" W/L 1313.70 OBP ELEV. 66" CMP

0' 40' 80' 120' 180'

SCALE 1" = 40'

E.M.W.D. INSPECTOR: GARY GRAHAM

ID # U-26

WATER APPROVED BY EASTERN MUNICIPAL WATER DISTRICT
Victor J. Bauer 7/19/91
CIVIL ENGINEER OF SUBDIVISIONS

	INITIAL	DATE		INITIAL	DATE
PROJ. ENG.	BR	7/18/91	SEWER OPER.		
PLANNING			CONSTRUCTION		
WATER OPER.			DESIGN		

APPROVED BY
RIVERSIDE COUNTY, CALIF. FOR TRANSPORTATION DEPARTMENT
DATE 2-5-91

REVISIONS
1 REVISED GRADING V.H.R. 11/8/94
2 ADD EXIST FAA FENCE V.H.R. 6/11/96
3 ADD OUTLET @ STA 21+45 & 28+82 V.H.R. 8/12/96
4 ADD CATHODIC TEST STATION W.J.S. 11/7/96
5 CHANGED 16" BAV TO 16" RGGV V.H.R. 11/7/96
6 REV. STORM DRAIN, ADD NOTE V.H.R. 12/2/96
7 AS CONSTRUCTED, C.O. 80158 (CE 11-13-96) C.H.S. 1/10/96
GKB 12-20-96

SUBMITTED BY
EXP 3/31/92
DATE 5-6-91

RANPAC ENGINEERING CORPORATION
27447 ENTERPRISE CIRCLE WEST
TEMECULA, CALIFORNIA 92390
TELEPHONE (714) 676-7000

COUNTY OF RIVERSIDE
ASSESSMENT DISTRICT NO. 161
WATER PLANS
IN SKY CANYON DRIVE

SA	43
WO	91-458
CO	50159
COORD	31-K
SHT	9 of 13
D-	13691

DESIGNED BY K. L. SCHULZ
DRAWN BY D. K. HAYMAN
CHECKED BY C. D. HAYMAN

7/25/91 1:35-08 50A-91.DWG

RIVERSIDE BLUEPRINT RIVERSIDE CALIF

APPENDIX G: FRENCH VALLEY AIRPORT (EAST GRADING AND DRAINAGE)

PROJECT SITE

Hwy 79

Sparkman Way

Hunter Rd

FRENCH VALLEY AIRPORT

N

CULVERT

DISCH. PT.

CULVERT

DISCHARGE PT.

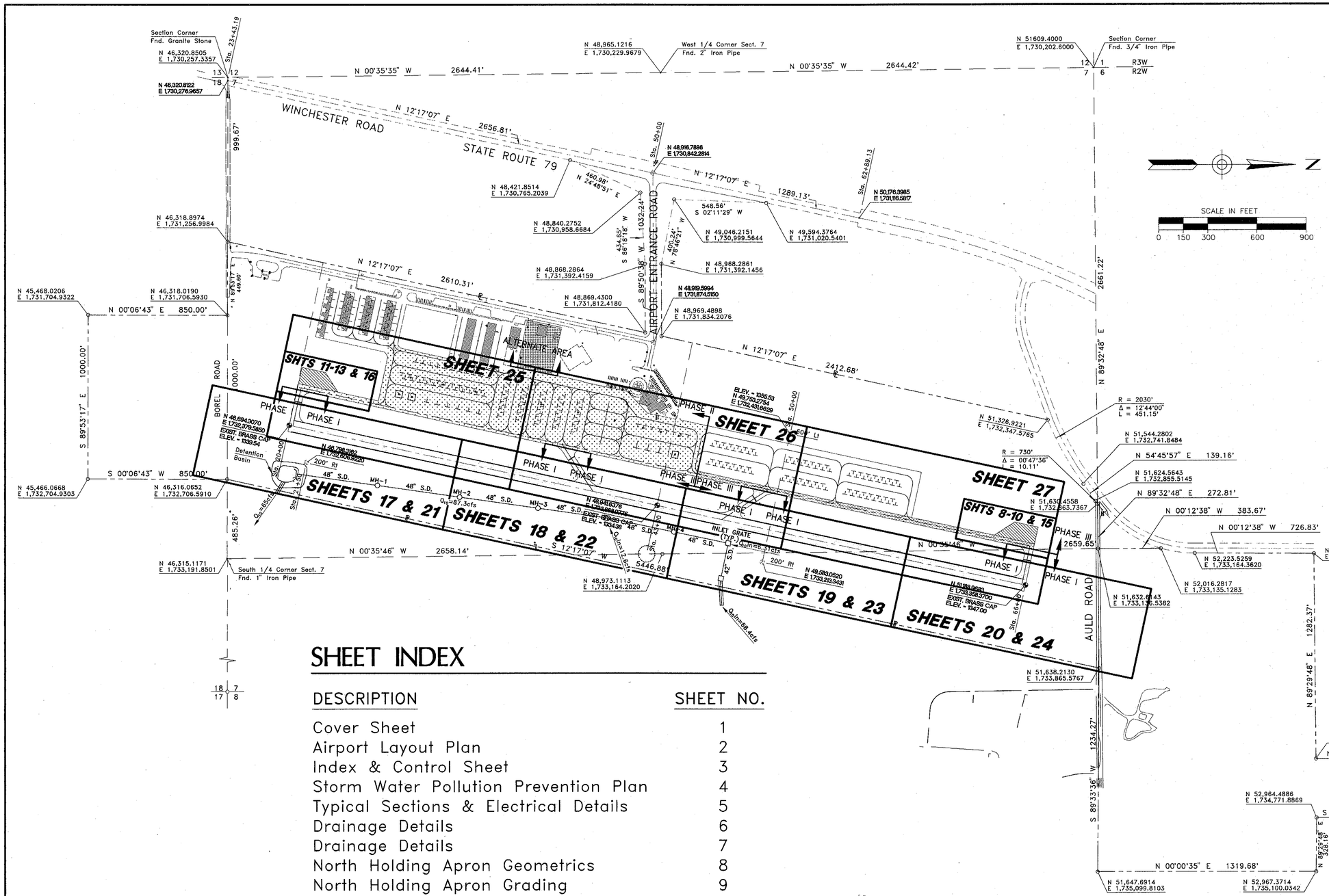
DISCHARGE PT.

INLET

INLET

EX. CHANNEL

EX. BASIN



LEGEND

- PRIMARY HORIZONTAL & VERTICAL CONTROL POINTS (1/2" REBAR WITH PLASTIC CAP SET BY ENGINEER)
- PRIMARY HORIZONTAL & VERTICAL CONTROL POINTS (BRASS CAP)
- PROPERTY CORNERS (TYP.)
- CENTERLINE
- PROPERTY LINE
- SECTION LINE
- RIGHT-OF-WAY
- PHASE 1 SEALCOATING
- PHASE 2 SEALCOATING
- PHASE 3 SEALCOATING
- ALTERNATE SEALCOATING

N

SCALE IN FEET

0 150 300 600 900

SHEET INDEX

DESCRIPTION	SHEET NO.
Cover Sheet	1
Airport Layout Plan	2
Index & Control Sheet	3
Storm Water Pollution Prevention Plan	4
Typical Sections & Electrical Details	5
Drainage Details	6
Drainage Details	7
North Holding Apron Geometrics	8
North Holding Apron Grading	9
North Holding Apron Electrical Geometrics	10
South Holding Apron Geometrics	11
South Holding Apron Grading	12
South Holding Apron Electrical Geometrics	13
Holding Apron Electrical Details	14
North Holding Apron Electrical Plan	15
South Holding Apron Electrical Plan	16
East Side Storm Drain Plan & Profile	17-20
East Side Grading	21-24
Sealcoating & Marking Plans	25-27
Cross-Sections	28-33

BENCH MARK

RIVERSIDE COUNTY DATUM
T-42-81 3-1/2" B.C. U.S.G.S.
N.W. CORN. OF BENTON & BRIGGS RD.
17' N. OF BENTON & 15' W. OF BRIGGS ℄
ELEV. = 1335.24

COUNTY OF RIVERSIDE - FRENCH VALLEY AIRPORT
EAST SIDE STORM DRAIN & GRADING

Z & H Engineering, Inc.
717 WEST DUNLAP AVENUE
PHOENIX, ARIZONA 85021
PHONE (602) 997-7536

REGISTERED PROFESSIONAL ENGINEER
MARTIN H. ROSNESS
No. C 041309
EXP. 3-31-99
CIVIL
STATE OF CALIFORNIA

INDEX & CONTROL SHEET

FILE: L:\RIVERSID\96074\FRO3.DWG		NAME	DATE
DESIGN BY:		MHR	04-96
DRAWN BY:		KJH	04-96
CHECKED BY:		MHR	09-97
PROJECT NO.: 96074	SCALE: 1"= 300'		

SHEET 3 OF 33

09-16-97 KJH

N

HORIZONTAL SCALE IN FEET

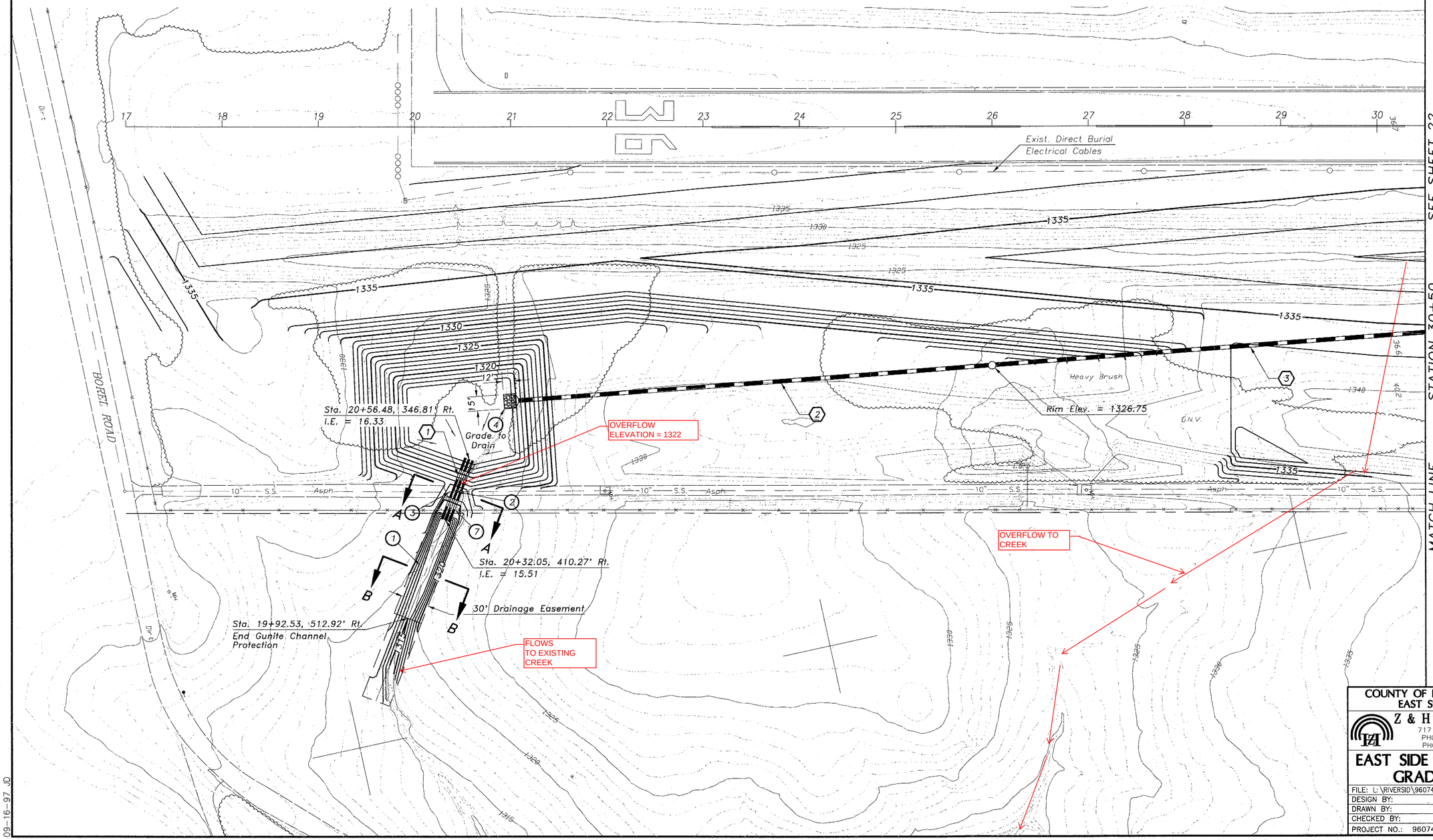
0 25 50 100 150

PIPE CULVERTS

NO.	NUMBER, SIZE & TYPE	LENGTH	PROFILE SHT NO.
1	3-24" RGRCP	68'	17
2	1-48" RGRCP	493'	17
3	1-48" RGRCP	501'	17-18

CONSTRUCTION NOTES

1. Construct Concrete Lined Outlet Channel. (1/5)
2. Construct Concrete Lined Outlet Scupper. Connect to, and construct continuously with Concrete Lined Outlet Channel. (2/5)
3. Existing 10" VCP Sanitary Sewer. Pothole to field verify exact location. Protect during construction.
4. Install 48" Conc. End Section & Riprap Outlet Protection. Sta. 21+08, 286' Rt. (4/6)
7. Remove & replace 50 L.F. of existing Chain Link Fence.



09-16-97 JD

COUNTY OF RIVERSIDE - FRENCH VALLEY AIRPORT
EAST SIDE STORM DRAIN & GRADING

Z & H Engineering, Inc.
717 WEST DUNLAP AVENUE
PHOENIX, ARIZONA 85021
PHONE (602) 997-7536

REGISTERED PROFESSIONAL ENGINEER
MARVIN H. ROSNESS
No. C 041309
EXP. 3-31-99
CIVIL
STATE OF CALIFORNIA

EAST SIDE STORM DRAIN GRADING PLAN

FILE: L:\RIVERSID\96074\FR21.DWG	NAME	DATE
DESIGN BY:	MHR	04-96
DRAWN BY:	KJH	04-96
CHECKED BY:	MHR	04-96
PROJECT NO.: 96074	SCALE: 1"= 50'	

SHEET 21 OF 33

APPENDIX H: EXISTING 78" RCP (LINE "B") AS-BUILT

N

PROPOSED EASEMENT TO R.C.T.D.
FOR STORM DRAIN PURPOSES

STREET SIGN
(TYPICAL)

TR
24159

HUNTER

ROAD

GOLF
COURSE

Q_{10} =4.9 cfs
Q_{100}=7.3 cfs

Q_{10} =7.6 cfs
Q_{100}=11.4 cfs

EXIST. SD
Q_{100}=316.8 cfs

STREET TREES
(TYPICAL)

STREET SIGN
(TYPICAL)

STREET LIGHT
(TYPICAL)

STREET TREES
(TYPICAL)

CLUB

COUNTRY

AUGUSTA DRIVE

Sheet 6

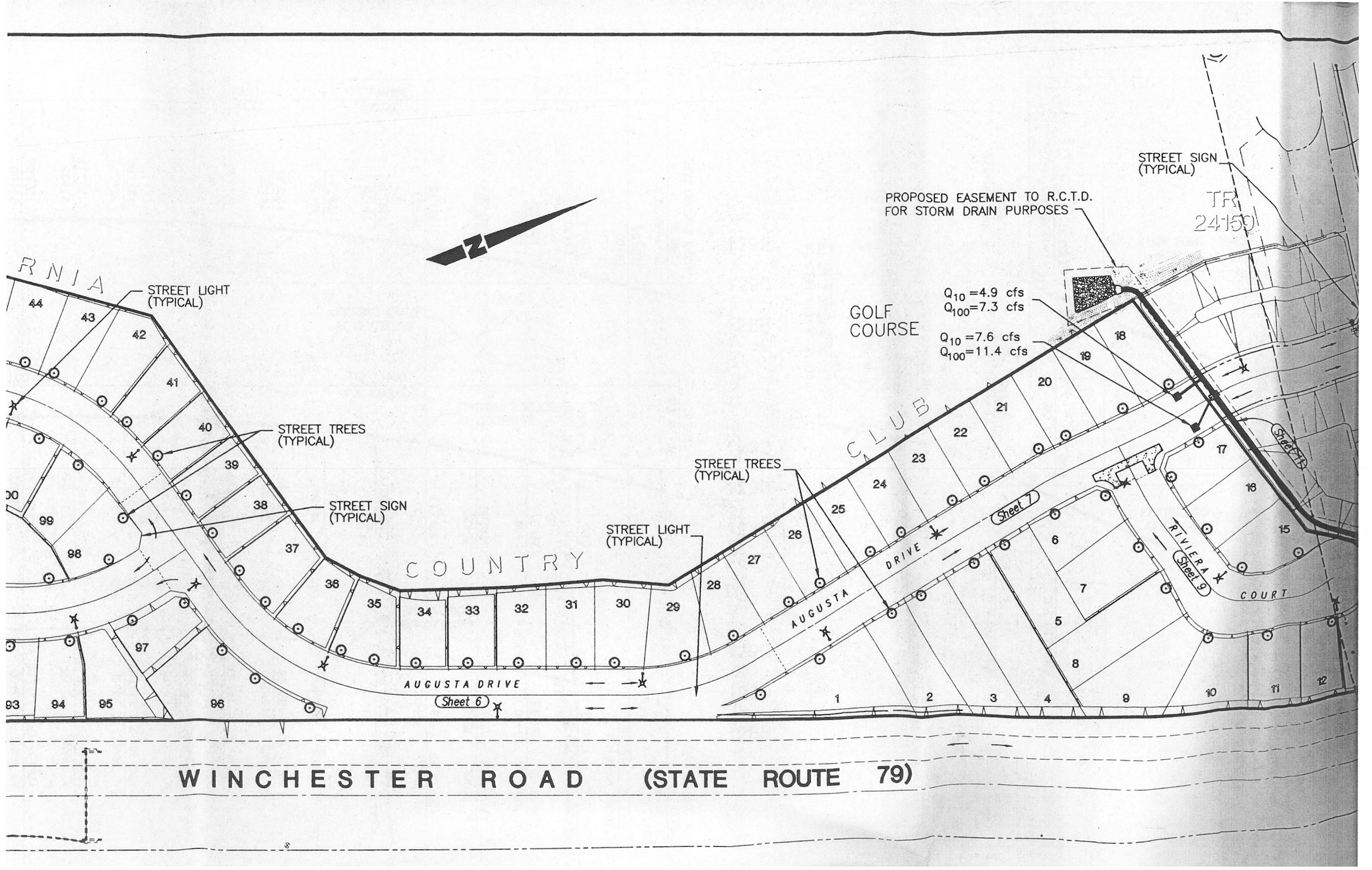
Sheet 7

Sheet 11

Sheet 9

RIVIERA COURT

HESTER ROAD (STATE ROUTE 79)


RNIA
STREET LIGHT (TYPICAL)
STREET TREES (TYPICAL)
STREET SIGN (TYPICAL)
STREET LIGHT (TYPICAL)
STREET TREES (TYPICAL)
PROPOSED EASEMENT TO R.C.T.D. FOR STORM DRAIN PURPOSES
STREET SIGN (TYPICAL)
TR 24159
GOLF COURSE
CLUB
Q_{10} =4.9 cfs
Q_{100}=7.3 cfs
Q_{10} =7.6 cfs
Q_{100}=11.4 cfs
COUNTRY
AUGUSTA DRIVE
Sheet 6
AUGUSTA DRIVE
Sheet 7
RIVIERA
Sheet 9
COURT
WINCHESTER ROAD (STATE ROUTE 79)

(1)	34°18'27"	90.00'	53.8
(2)	57°48'38"	27.51'	27.7

TRACT

HUNTER RO

AUGUSTA DRIVE

60'
20'
20'
13'
6'
36'
Cut
Fill

36+89.28 ℄ AUGUSTA DR.
54+26.89 ℄ HUNTER DRIVE

24159

(2) 6+46.63 LINE "A"
= 10+00.00 LINE "A-1"
℄ M.H. NO. 2

(1E) 6+30.00 BEGIN RCP
6+70.00 END RCP

5+01.01 EC

PROPOSED EASEMENT TO R.C.T.D.
FOR STORM DRAIN PURPOSES

6+35.55
78" S.D. X'ING 8" WTR.

6+48.65 LINE "A"
= 34+27.96 AUGUSTA DRIVE

6+56.55
78" S.D. X'ING 8" SWR.

6+78.92 (12)

LINE "A" (4)
TO BE MAINTAINED BY RCTD

8+78.44 EC

N 31°39'34" E

(4)

(3) 4+73.25 BC
BEGIN C.I.P.P.

(5) 6+22.02 LINE "A"
= 10+00.00 LINE "A-2"
J.S. No.4

(12) 6+18.43

8+24.55 BC (1)

4+65.00
BEGIN METAL FLARED END SECTION

N 65°58'1" E

REMOVE INTERFERING PORTIONS OF CONCRETE SWALES (9)

(1D) LINE "A-2"
N 23°46'57" W
31.69'

LINE "A-1" (1C)
N 54°12'25" W
40.11'

26'
17'
9'
Cut
Fill
R/W

10+34.94
END OF PIPE

10+43.36
END OF PIPE

4+15.00
BEGIN RIP RAP

(13)

(6A) 33+88.57 ST. STA
℄ C.B. NO. 2
W=6.0', V=4.5'

33+88.57 ST. STA. (6D)
℄ C.B. NO. 1
W=9', V=4.5'

RIVERA COURT

TRACT 27348

ASL Consulting Engineers

ARCADIA	(818) 447-4494
CAMARILLO	(805) 388-2344
IRVINE	(714) 727-7099
PALM SPRINGS	(619) 320-4220
SAN BERNARDINO	(909) 381-3666
SAN DIEGO	(619) 673-5505

RECOMMENDED FOR APPROVAL
ECLIS ENGINEERING
DATE 7-22-98

THE PRIVATE ENGINEER SIGNING THESE
FOR ASSURING THE ACCURACY AND ACC
DESIGN HEREON. IN THE EVENT OF DIS
AFTER COUNTY APPROVAL OR DURING C
PRIVATE ENGINEER SHALL BE RESPONSIE
ACCEPTABLE SOLUTION AND REVISING TH

8+24.5
1297.4
8+7
129
9+0
129
1298
1290
1290
HYDRAULIC DATA
Q100=346.9 CFS
VMAX=10.4 FPS
9+97.66
CONSTRUCT 318.74 L.F. 78" CIPP
LINE "A"
(TO BE MAINTAINED BY RCTD)
8+00
9+00
10+00

CURVE DATA						
NO.	DELTA	RADIUS	LENGTH	TANGENT	B.C.	E.C.
(1)	34°18'27"	90.00'	53.89'	27.78'	8+24.91	8+78.80
(2)	57°48'38"	27.51'	27.76'	15.19'	4+73.25	5+01.01

HUNTER ROAD
AUGUSTA DRIVE
60'
20'
20'
13'
6'
3%
Cut
Fill
36+89.28 ℄ AUGUSTA DR.
54+26.89 ℄ HUNTER DRIVE
24159
6+48.65 LINE "A"
= 34+27.96 AUGUSTA DRIVE
6+56.55
78" S.D. X'ING 8" SWR.
6+78.92
12
LINE "A"
TO BE MAINTAINED BY RCTD
4
8+78.44 EC
8+24.55 BC
1
N 31°39'34" E
7
8
9
7
10+00.00
JOIN EXISTING 78" STORM DRAIN
2

METAL FLARED END
PER CALTRANS STD
(USE METAL FLARE
CONNECTION TO R
TOP OF SLOPE BEYOND
PER PLAN
2:1 SLOPE BEYOND
S.S.=2:1
METAL FLARED END SKIRT
TOP OF RIP-RAP AT SLOPE
4+15.00
2'
3.5'
18"
1296.34 FL
1296.40 FL
5'
S=0.
PROPOS
78" STO
12"
#4 BAR, 24" LONG HOOK END, 3 REQUIRED
1/2 TON RIP-RAP, 3.5' THICK W/ 18" THICK NO.1 BACKING AND ROCK PROTECTION FABRIC(WOVEN) PER CALTRANS SPECS.
4+65.00
CONC. CUT-OFF WALL
4+72.25
STA 4+73.25 BEG. 78" STORM DRAIN

SECTION A-A

CONSTRUCTION NOTI
(1C) CONSTRUCT 24" RCP, CLASS IV
(1D) CONSTRUCT 18" RCP, CLASS IV
(1E) CONSTRUCT 78" RCP, 1000-D

1310

1300

1290

4+15.00
BEGIN RIP RAP

4+65.00
BEGIN METAL FLARED END SECTION

F.S. ℄ PIPE

8" WATER
1294.17 FL

6+46.63
C M.H. NO. 2
T.O.R. = 1305.9

8" SEWER
1294.94 FL

EXIST. GROUND ℄ PIPE

F.S. ℄ PIPE

HGL

1303.45

1305
W.S.

S=0.0030

1301.67

(1296.4)

1296.34

1297.3 WS
(1296.0 FL)

S=0.0030

S=0.0030

S=0.008

9

6+22.02
℄ J.S. NO.4
18" RCP
1299.48 FL

1296.92 FL

1296.93 FL

6+46.63
24" RCP
1299.34 FL

8+24.55 BC
1297.46 FL

8+78.44 EC
1297.62 FL

9+00.00 GB
1297.69 FL

4+73.25
END TRANSITION
BEGIN PIPE

5+01.01 EC
1296.48 FL

HYDRAULIC DATA
Q100=354.5 CFS
VMAX=10.8 FPS

HYDRAULIC DATA
Q100=359.3 CFS
VMAX=12.3 FPS

6+18.43 BEG RCP
1296.84 FL

6+44.30

6+48.96

6+78.92 END RCP
1297.02 FL

HYDRAULIC DATA
Q100=346.9 CFS
VMAX=10.4 FPS

CONSTRUCT 145.18 L.F. 78" CIPP

CONSTRUCT 318.74 L.F. 78" CIPP

25.87 L.F.
78"RCP
1000-D

29.96 L.F.
78"RCP
1000-D

12

12

LINE "A"

(TO BE MAINTAINED BY RCTD)

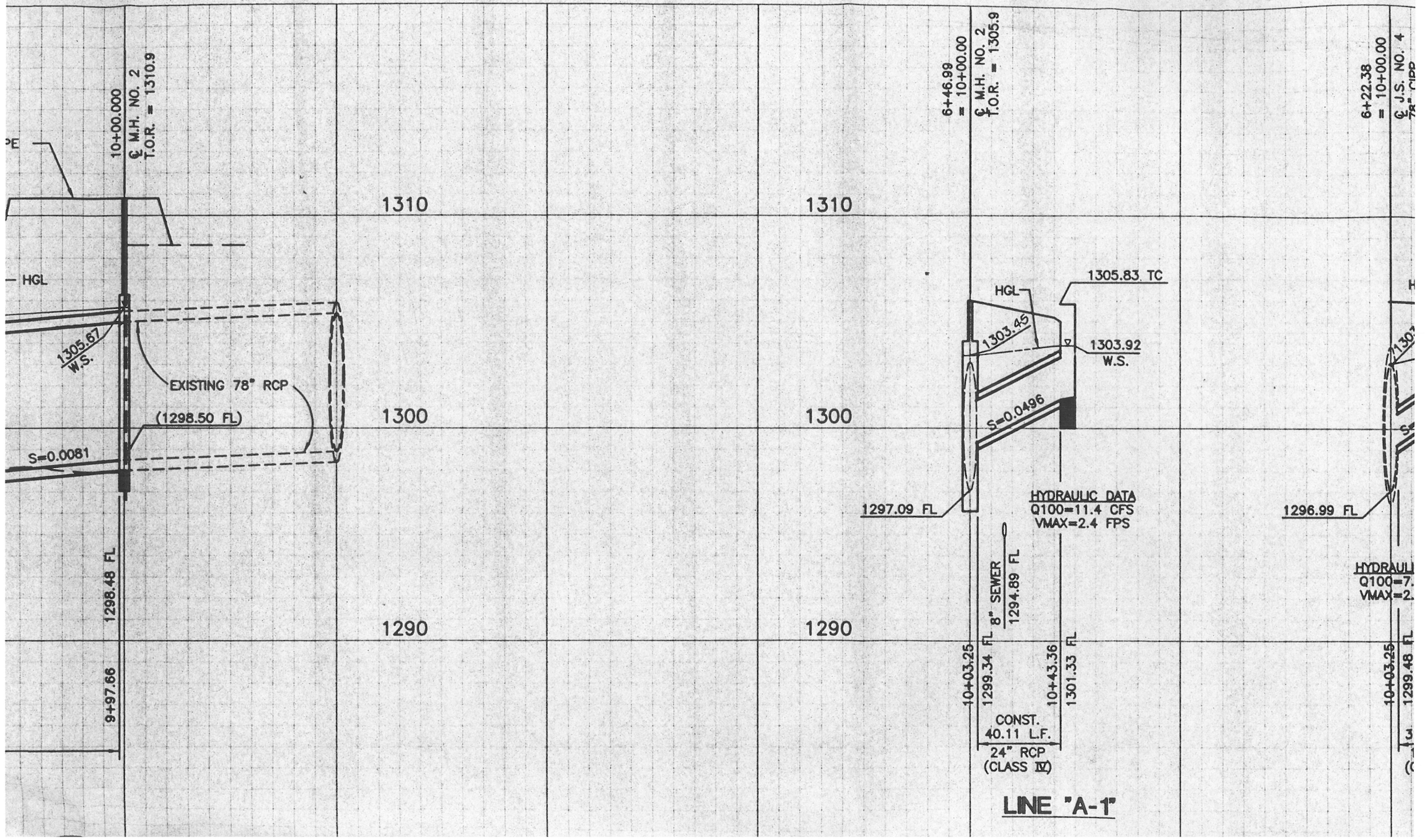

10+00.000
℄ M.H. NO. 2
T.O.R. = 1310.9
6+46.99
= 10+00.00
℄ M.H. NO. 2
T.O.R. = 1305.9
6+22.38
= 10+00.00
℄ J.S. NO. 4
1310
1310
1300
1300
1290
1290
HGL
1305.67
W.S.
EXISTING 78" RCP
(1298.50 FL)
S=0.0081
1298.48 FL
9+97.66
1305.83 TC
HGL
1303.45
1303.92
W.S.
S=0.0496
1297.09 FL
HYDRAULIC DATA
Q100=11.4 CFS
VMAX=2.4 FPS
8" SEWER
1294.89 FL
10+03.25
1299.34 FL
10+43.36
1301.33 FL
CONST.
40.11 L.F.
24" RCP
(CLASS IV)
1296.99 FL
10+03.25
1299.48 FL
LINE "A-1"

EXHIBIT “A”: OFFSITE HYDROLOGY MAP (RATIONAL METHOD)

LEGEND

XXX / XX.X — NODE/CONCENTRATION POINT / ELEVATION	FLOW PATH
XX / X.X — SUBAREA / ACRES	WATERSHED BOUNDARY
L=XXX' — MAIN FLOW PATH	PROJECT BOUNDARY
"C" / "D" — HYDROLOGIC SOIL GROUP BOUNDARY	PIPE FLOW PATH

B7 9.5 — L=702' — 209 1344.0 — 210 1338.0 — B8 23.5 — 100 1360 — L=556' — A1 4.5 — A2 7.8 — L=416' — 101 1340 — 102 1332.5 — L=1,345' — 211 1332.0 — B9 24.4 — L=1,365' — 212 *1316.9 1318.8 Q_{100}=133.4 CFS TC = 23.6 MIN EXIST. 66" CMP — 204 1333.0 — B4 5.1 — L=627' — 205 1329.0 — L=811' — 206 1324.8 Q_{100}=46.0 CFS TC = 16.3 MIN EXIST. 36" CMP — B5 11.6 — L=762' — 202 1323.8 Q_{100}=28.0 CFS TC = 13.9 MIN EXIST. 24" CMP — 201 1333.0 — B2 7.5 — B1 3.7 — L=365' — 200 1339.0 — 226 1310.0 — L=331' — L=995' — B22 5.8 — 225 1330 — L=667' — B21 2.9 — B22 2.3 — L=447' — B17 2.1 — 221 1344.4 Q_{100}=5.8 CFS TC = 9.2 MIN EXIST. 18" CMP — 220 1400 — 224 1400 — 79

"A" "B" "C" "D"

BA DR

FLOW DATA

NODE	AREA (AC.)	Q100 (CFS)	TC (MIN)
102	12.3	27.7	13.4
226	11.0	30.0	12.0

N

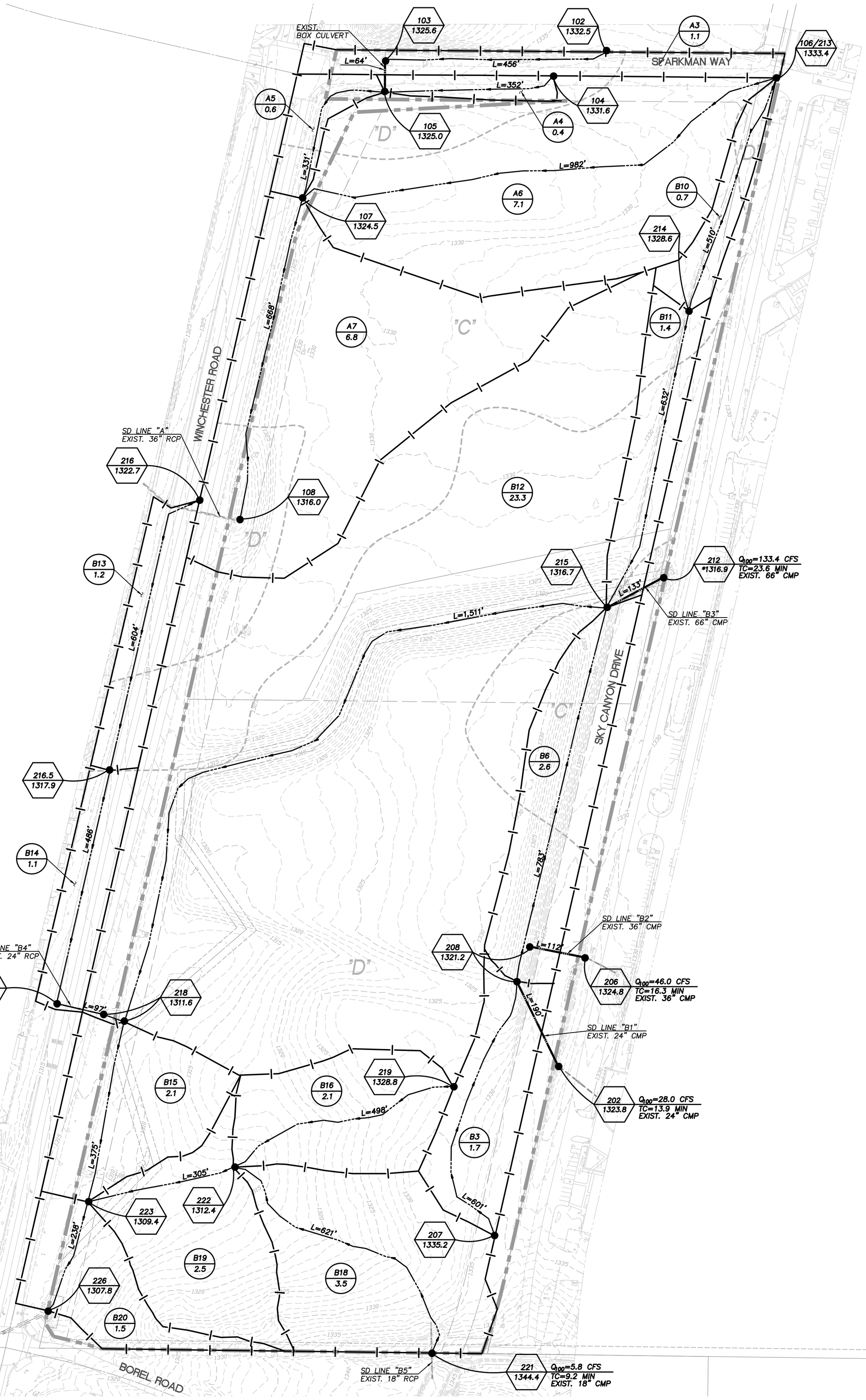
GRAPHIC SCALE
150 0 75 150 300
1" = 150'

EXHIBIT "A"
KTM
HYDROLOGY MAP FOR
OFFSITE - EXISTING CONDITION

CASC
Engineering and Consulting
1470 EAST COOLEY DRIVE, COLTON, CA 92324
PH. (909) 783-0101 FAX (909) 783-0108
www.cascinc.com

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EXHIBIT "B": ONSITE HYDROLOGY MAP FOR EXISTING CONDITION (RATIONAL METHOD)



LEGEND

- XXX / XX.X — NODE/CONCENTRATION POINT / ELEVATION
- XX / X.X — SUBAREA / ACRES
- L=XXX' — MAIN FLOW PATH
- "C" / "D" — HYDROLOGIC SOIL GROUP BOUNDARY
- FLOW PATH
- WATERSHED BOUNDARY
- PROJECT BOUNDARY
- PIPE FLOW PATH

FLOW DATA

NODE	AREA (AC.)	Q100 (CFS)	TC (MIN)
105	13.7	30.9	15.5
107	21.7	45.0	19.7
108	28.5	57.6	22.2
208	27.9	71.9	16.4
215	90.0	207.7	24.0
218	115.6	247.9	31.0
222	7.7	20.5	11.0
223	127.9	267.2	32.3
226	140.4	286.6	33.1

N

GRAPHIC SCALE
100 0 50 100 200
1" = 100'

EXHIBIT "B"
KTM
HYDROLOGY MAP FOR
ONSITE - EXISTING CONDITION

CASC
Engineering and Consulting
1470 EAST COOLEY DRIVE, COLTON, CA 92324
PH. (909) 783-0101 FAX (909) 783-0108
www.cascinc.com

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EXHIBIT "C": ONSITE HYDROLOGY MAP FOR PROPOSED CONDITION (RATIONAL METHOD)

SPARKMAN WAY

WINCHESTER ROAD

SKY CANYON DRIVE

HUNTER ROAD

BOREL ROAD

"C"

"D"

200
1333.38

B1
0.8

L=489'

201
1330.70

B2
1.0

L=594'

214
1322.7

218
1321.8

B8
1.2

B10
1.1

L=604'

L=545'

215
1317.9

213
*1313.6

219
1317.8

B9
1.1

L=486'

B11
3.5

L=966'

216
1315.5

L=178'

217
*1309.1

SD LINE "B4"
EXIST. 24" RCP

225
*1316.6
1321.6

228
*1315.6

B12
2.2

L=787'

B14
6.2

L=735'

230
*1315.1
1321.1

SD LINE "B7"
60" RCP

231
*1313.1

B15
7.2

SD LINE "B9"
30" RCP

232
*1309.7

220
*1307.0
1310.6

221
*1304.6

BASIN "A"

SD LINE "B10"
30" RCP

233
*1305.1
1309.1

234
1303.7

SD LINE "B"
EXIST. 78" RCP

Q_{100}=30.0 CFS
TC = 12.0 MIN
*NODE 226 ON
OFFSITE HYD.
MAP (EXHIBIT A)

223
*1305.0
1314.0

PROP DROP
INLET

B7
18.4

SD LINE "B3"
EXIST. 66" CMP

212
*1316.7

204
*1316.9

Q_{100}=133.4 CFS
TC=23.6 MIN
EXIST. 66" CMP
*NODE 212 ON OFFSITE HYD. MAP
(EXHIBIT A)

203
1327.50

B3
0.8

L=971'

L=622'

L=523'

B6
2.6

202
1330.25

B5
0.7

224
1329.5

211
*1320.0

210
*1320.5

L=327'

SD LINE "B2"
EXIST. 36" CMP
(REPLACE WITH RCP)

209
*1321.0

Q_{100}=46.0 CFS
TC=16.3 MIN
EXIST. 36" CMP

B13
2.2

229
1328.3

227
*1320.3
1325.4

206
*1321.5
1326.0

208
*1321.0

SD LINE "B6"
48" RCP

SD LINE "B1"
EXIST. 24" CMP
(REPLACE WITH RCP)

207
*1322.2

Q_{100}=28.0 CFS
TC=13.9 MIN
EXIST. 24" CMP

L=706'

L=786'

226
1331.2

B4
1.0

205
1340.00

SD LINE "B8"
18" RCP

SD LINE "B5"
EXIST. 18" CMP

222
*1336.1
1341.0

Q_{100}=5.8 CFS
TC = 9.2 MIN
*NODE 221 ON OFFSITE HYD. MAP (EXHIBIT A)

FLOW DATA

NODE	AREA (AC.)	Q100 (CFS)	TC (MIN)
203	2.6	6.6	16.9
204	60.0	138.9	23.6
206	1.7	5.4	9.7
208	12.9	32.4	14.1
210	29.6	76.0	16.4
211	29.6	76.0	16.6
212	92.2	212.1	24.0
213	110.6	241.6	28.6
216	2.3	6.4	14.8
217	112.9	246.0	29.3
221	117.5	254.1	29.9
223	13.1	35.4	12.0
225	2.2	6.5	10.8
227	2.2	6.5	12.4
228	4.4	12.8	12.4
230	6.2	18.6	10.6
231	10.6	28.6	10.6
232	10.6	28.6	11.0
233	17.8	48.0	11.0
234	148.4	304.0	30.1

LEGEND

XXX / XX.X — NODE/CONCENTRATION POINT / ELEVATION

XX / X.X — SUBAREA / ACRES

L=XXX' — MAIN FLOW PATH

*1308.0 — PIPE INVERT

"C" / "D" — HYDROLOGIC SOIL GROUP BOUNDARY

FLOW PATH

WATERSHED BOUNDARY

PROJECT BOUNDARY

PIPE FLOW PATH

N

GRAPHIC SCALE
100 0 50 100 200
1" = 100'

EXHIBIT "C"
HYDROLOGY MAP FOR ONSITE - PROPOSED CONDITION KTM

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