PRELIMINARY DRAINAGE STUDY

FOR

ASTER APARTMENTS

Southeast Corner of Stetson Avenue and Elk Street
APN 464-270-005 and 006

Prepared By:

Blaine A. Womer Civil Engineering
41555 East Florida Avenue, Suite G
Hemet, CA 92544

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Aster Apartments

Preliminary Drainage Study

Narrative:

The Aster Apartments project is a proposed 10.0-acre, 228-unit apartment complex located at the southeast corner of Stetson Avenue and Elk Street in Hemet. The site is currently vacant. Proposed improvements include the construction of eight, 3-story apartment buildings with a clubhouse, pool, asphalt parking stalls, garages, carports and drive aisles, planters and perimeter landscaping. The property has a natural gradient to the southwest of approximately 0.7 percent. The site is surrounded by existing development and drainage facilities and is not subject to offsite flows.

The purpose of this study is to quantify the onsite generated storm water runoff for the 10-year and 100-year recurrence intervals. The study includes rational hydrology calculations for both the undeveloped and developed condition. Calculations were based on the rational method as stipulated in the Riverside County Flood Control and Water Conservation District Hydrology Manual dated 1978. Calculations were performed using CIVILCADD/CIVILDESIGN Engineering software. Onsite soils are categorized as Type 'AB' per the hydrology manual. The study also includes preliminary unit hydrograph calculations for the 100-year, 3-hour storm for use in the preliminary sizing of onsite storm water detention facilities.

The site was designed to honor the existing drainage pattern of the property. According to the Hemet Area Drainage Plan, a portion (9.4 acres) of the site is tabled to flow to the Stetson Channel. The balance of the site (5.6 acres) is tributary to Elk Street. Hydrology calculations for the 10-year and 100-year storm events for both areas are included in Appendix B of this report. The developed condition stormwater runoff flows from the apartments drain southwest to a bioretention basin located at the southwest corner of the site. Stormwater runoff from the club house area drains to a separate bioretention basin located just northwest of the project main entrance. The bioretention basins drain, via metered sub-drains, to an existing storm drain catch

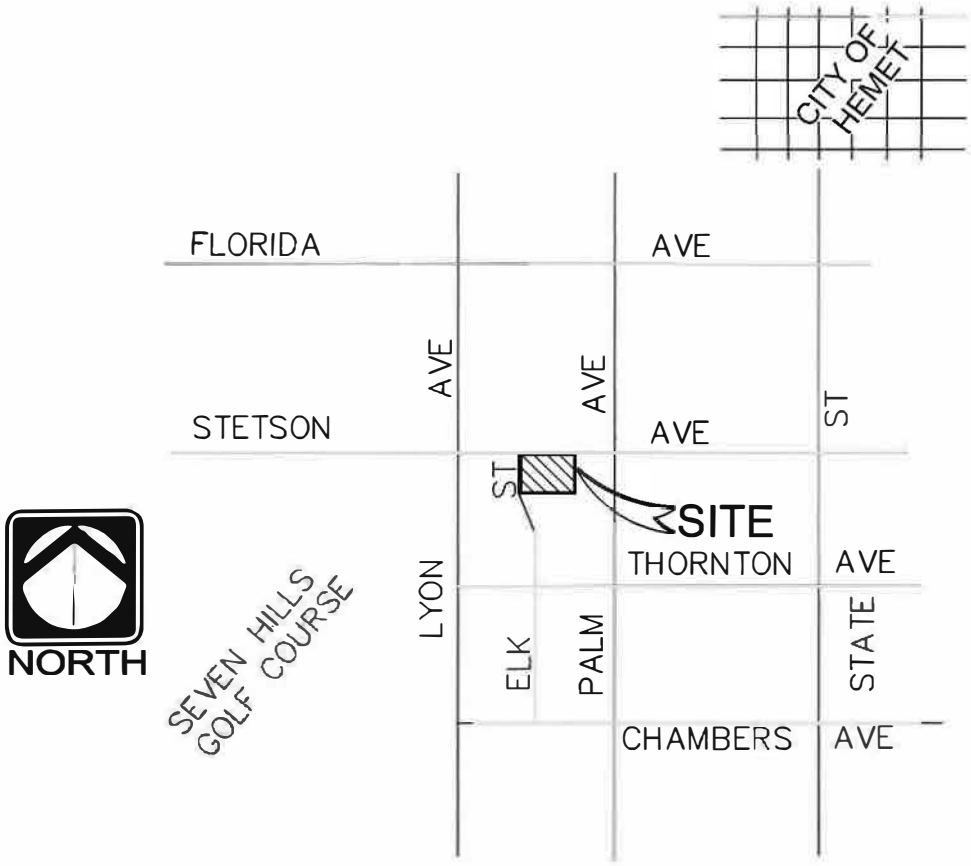
basin at the southeast corner of the intersection of Stetson Avenue and Elk Street. Flows to the catch basin will be limited in project design, through storm routing, to the peak 100-year flow rate as calculated in Appendix B. The catch basin is 7 feet wide and captures runoff from the aforementioned 5.4 acres onsite and a portion of the south half of Stetson Avenue. The catch basin discharges to the Stetson Channel via a 24-inch RCP storm drain. Preliminary storm drain lateral capacity calculations are located in Appendix E. Flows in excess of the bioretention basin metered outlet capacity surface flow through an under sidewalk drain to Elk Street which honors the natural drainage pattern of the south half of the project site.

A summary of undeveloped and developed runoff flows is as follows:

Runoff Summary

Drainage Area Designation	**Area (Ac)**	**Q_{10}(cfs)**	**Q_{100}(cfs)**
U-1	5.4	4.4	7.7
U-2	4.6	3.9	6.7
A	2.0	2.8	4.4
B	0.6	1.1	1.8
C	3.5	4.6	7.3
D	3.6	4.7	7.5

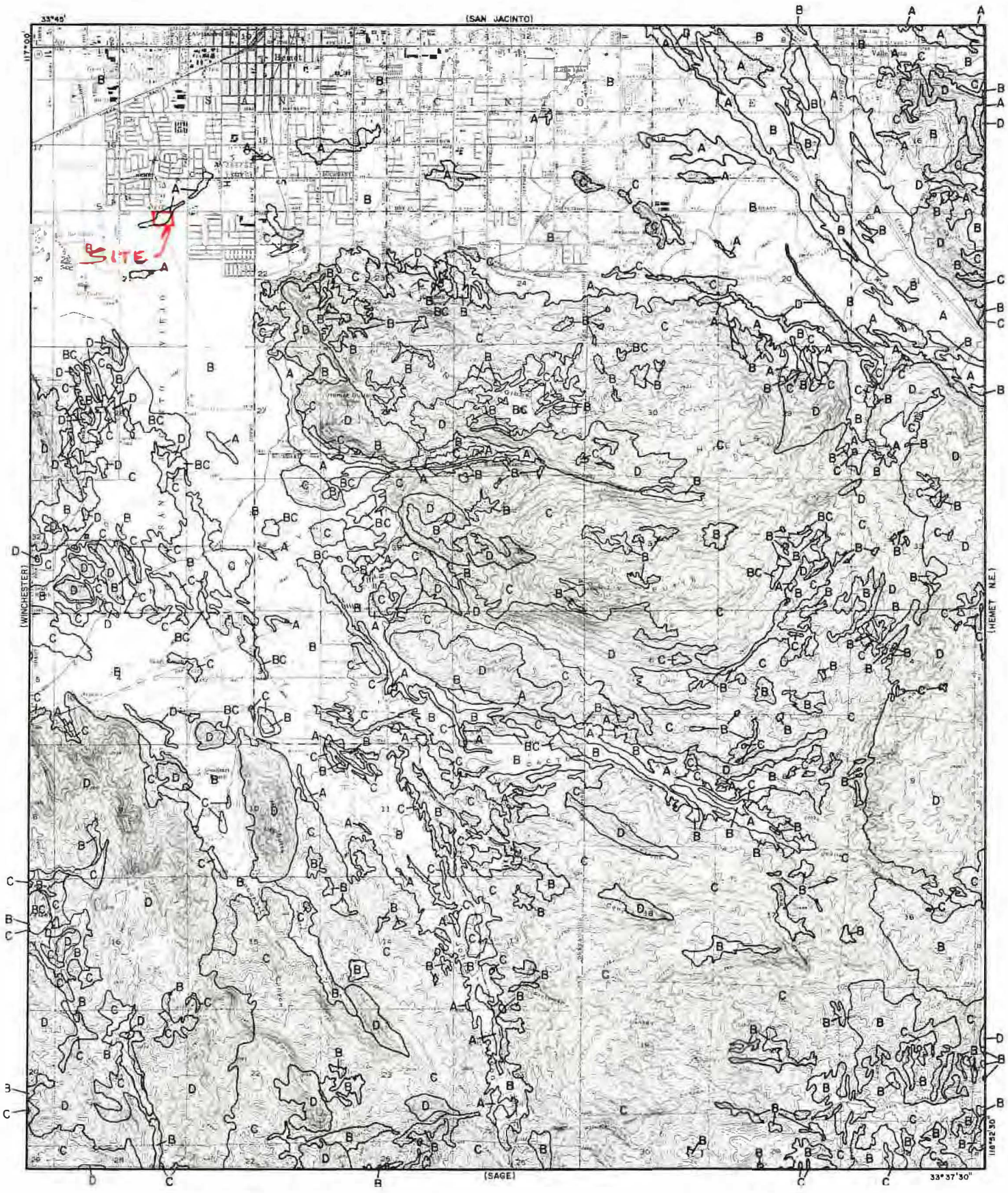
APPENDIX 'A'



VICINITY MAP

N.T.S.

SECTION 21, T.5S., R.1W., SBM



LEGEND

SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC & WCD

HYDROLOGY MANUAL

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HYDROLOGIC SOILS GROUP MAP FOR HEMET

PLATE C-1.44

RAINFALL INTENSITY–INCHES PER HOUR

HEMET			HIGHGROVE			HOMELAND – WINCHESTER			IDYLLWILD			LAKEVIEW		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.40	5	3.02	4.37	5	2.91	4.37	5	4.91	7.28	5	2.77	4.16
6	2.58	4.00	6	2.75	3.97	6	2.65	3.97	6	4.47	6.62	6	2.53	3.79
7	2.37	3.68	7	2.54	3.67	7	2.44	3.67	7	4.13	6.11	7	2.34	3.51
8	2.21	3.43	8	2.37	3.42	8	2.28	3.42	8	3.85	5.70	8	2.19	3.29
9	2.08	3.23	9	2.23	3.22	9	2.15	3.22	9	3.62	5.36	9	2.07	3.10
10	1.96	3.05	10	2.11	3.05	10	2.03	3.05	10	3.43	5.08	10	1.96	2.94
11	1.87	2.90	11	2.01	2.90	11	1.93	2.90	11	3.26	4.83	11	1.87	2.80
12	1.78	2.77	12	1.92	2.77	12	1.85	2.77	12	3.12	4.62	12	1.79	2.68
13	1.71	2.65	13	1.84	2.66	13	1.77	2.66	13	2.99	4.43	13	1.72	2.58
14	1.64	2.55	14	1.77	2.56	14	1.71	2.56	14	2.88	4.26	14	1.66	2.48
15	1.58	2.46	15	1.71	2.47	15	1.64	2.47	15	2.78	4.11	15	1.60	2.40
16	1.53	2.38	16	1.65	2.39	16	1.59	2.39	16	2.68	3.98	16	1.55	2.32
17	1.48	2.30	17	1.60	2.31	17	1.54	2.31	17	2.60	3.85	17	1.50	2.25
18	1.44	2.23	18	1.55	2.24	18	1.50	2.24	18	2.52	3.74	18	1.46	2.19
19	1.40	2.17	19	1.51	2.18	19	1.45	2.18	19	2.45	3.64	19	1.42	2.13
20	1.36	2.11	20	1.47	2.12	20	1.42	2.12	20	2.39	3.54	20	1.39	2.08
22	1.29	2.01	22	1.40	2.02	22	1.35	2.02	22	2.27	3.37	22	1.32	1.98
24	1.24	1.92	24	1.34	1.93	24	1.29	1.93	24	2.17	3.22	24	1.26	1.90
26	1.18	1.84	26	1.28	1.85	26	1.24	1.85	26	2.09	3.09	26	1.22	1.82
28	1.14	1.77	28	1.23	1.78	28	1.19	1.78	28	2.01	2.97	28	1.17	1.76
30	1.10	1.70	30	1.19	1.72	30	1.15	1.72	30	1.94	2.87	30	1.13	1.70
32	1.06	1.65	32	1.15	1.66	32	1.11	1.66	32	1.87	2.77	32	1.10	1.64
34	1.03	1.59	34	1.12	1.61	34	1.07	1.61	34	1.81	2.69	34	1.06	1.59
36	1.00	1.55	36	1.08	1.57	36	1.04	1.57	36	1.76	2.61	36	1.03	1.55
38	.97	1.50	38	1.05	1.52	38	1.01	1.52	38	1.71	2.54	38	1.01	1.51
40	.94	1.46	40	1.02	1.48	40	.99	1.48	40	1.67	2.47	40	.98	1.47
45	.89	1.37	45	.96	1.39	45	.93	1.39	45	1.57	2.32	45	.92	1.39
50	.84	1.30	50	.91	1.32	50	.88	1.32	50	1.48	2.20	50	.88	1.31
55	.80	1.24	55	.87	1.26	55	.84	1.26	55	1.41	2.09	55	.84	1.25
60	.76	1.18	60	.83	1.20	60	.80	1.20	60	1.35	2.00	60	.80	1.20
65	.73	1.13	65	.80	1.15	65	.77	1.15	65	1.29	1.92	65	.77	1.15
70	.70	1.09	70	.77	1.11	70	.74	1.11	70	1.25	1.85	70	.74	1.11
75	.68	1.05	75	.74	1.07	75	.71	1.07	75	1.20	1.78	75	.72	1.07
80	.65	1.01	80	.71	1.03	80	.69	1.03	80	1.16	1.72	80	.69	1.04
85	.63	.98	85	.69	1.00	85	.67	1.00	85	1.13	1.67	85	.67	1.01
SLOPE = .530			SLOPE = .520			SLOPE = .520			SLOPE = .520			SLOPE = .500		

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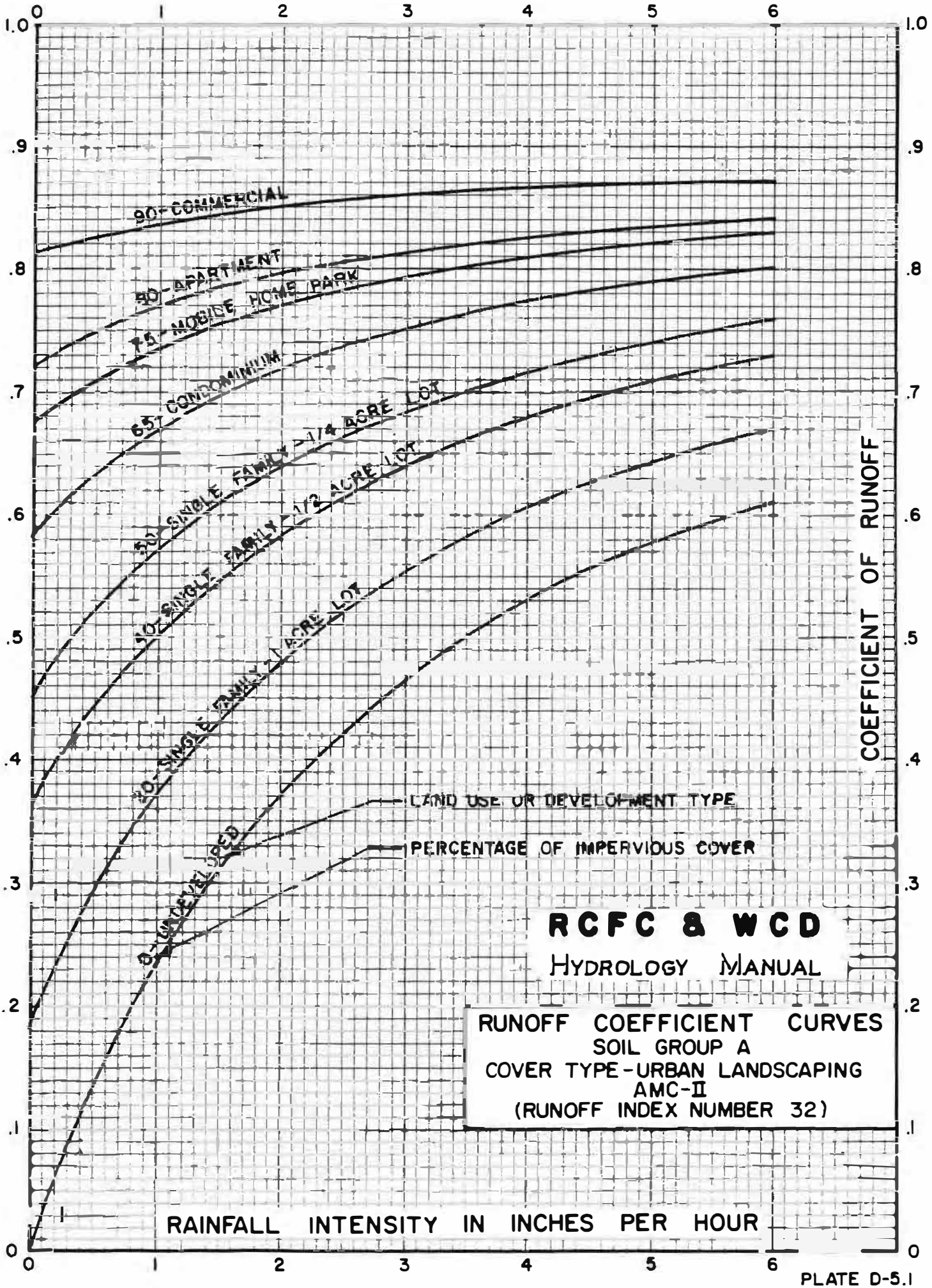
HYDROLOGY MANUAL

STANDARD INTENSITY–DURATION CURVES DATA

PLATE D-4.1 (3 of 6)



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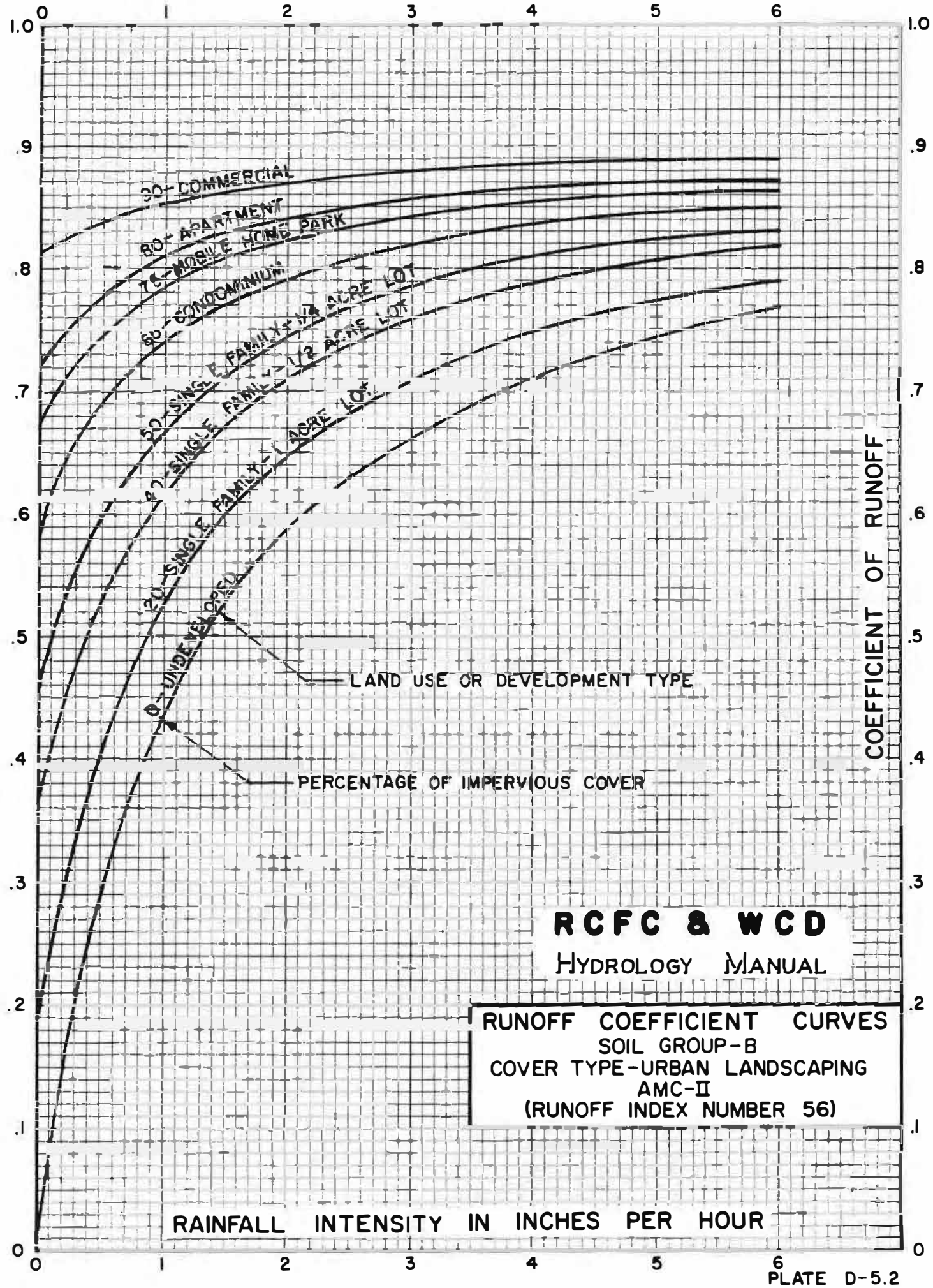
HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP A
COVER TYPE - URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 32)

PLATE D-5.1



RCFC & WCD

HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP-B
COVER TYPE-URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 56)

PLATE D-5.2

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
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 -					
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

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RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

PLATE D-5.5 (1 of 2)

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
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
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.

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HYDROLOGY MANUAL

IMPERVIOUS COVER FOR DEVELOPED AREAS

APPENDIX 'B'

```
            Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
      Rational Hydrology Study        Date: 05/03/24  File:ASTERAREAU110YR.out
------------------------------------------------------------------------
ASTER APARTMENTS
PRELIMINARY HYDROLOGY
AREA U-1
10-YEAR STORM
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 4061

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [ Hemet ] area used.
10 year storm 10 minute intensity =  1.960(In/Hr)
10 year storm 60 minute intensity =  0.760(In/Hr)
100 year storm 10 minute intensity =  3.050(In/Hr)
100 year storm 60 minute intensity =  1.180(In/Hr)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.760(In/Hr)
Slope of intensity duration curve = 0.5300




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

Initial area flow distance =   940.000(Ft.)
Top (of initial area) elevation =    67.000(Ft.)
Bottom (of initial area) elevation =    60.900(Ft.)
Difference in elevation =     6.100(Ft.)
Slope =    0.00649  s(percent)=       0.65
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   22.443 min.
Rainfall intensity =      1.280(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.645
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
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```
RI index for soil(AMC 2)  =  72.50
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.458(CFS)
Total initial stream area =        5.400(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =           5.40 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  72.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 05/03/24 File:ASTERAPTSAREAU1100YR.out

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ASTER APARTMENTS
PRELIMINARY HYDROLOGY
AREA U-1
100-YEAR STORM

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

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

Program License Serial Number 4061

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 [Hemet] area used.
10 year storm 10 minute intensity = 1.960(In/Hr)
10 year storm 60 minute intensity = 0.760(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.180(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.180(In/Hr)
Slope of intensity duration curve = 0.5300

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

Initial area flow distance = 940.000(Ft.)
Top (of initial area) elevation = 67.000(Ft.)
Bottom (of initial area) elevation = 60.900(Ft.)
Difference in elevation = 6.100(Ft.)
Slope = 0.00649 s(percent)= 0.65
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 22.443 min.
Rainfall intensity = 1.987(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.717
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 72.50
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 7.698(CFS)
Total initial stream area = 5.400(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 5.40 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 72.5

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 05/03/24 File:ASTERAREAU210YR.out

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ASTER APARTMENTS
PRELIMINARY HYDROLOGY
AREA U-2
10-YEAR STORM

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

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

Program License Serial Number 4061

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [Hemet] area used.
10 year storm 10 minute intensity = 1.960(In/Hr)
10 year storm 60 minute intensity = 0.760(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.180(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.760(In/Hr)
Slope of intensity duration curve = 0.5300

++
Process from Point/Station 3.000 to Point/Station 4.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 905.000(Ft.)
Top (of initial area) elevation = 66.200(Ft.)
Bottom (of initial area) elevation = 60.000(Ft.)
Difference in elevation = 6.200(Ft.)
Slope = 0.00685 s(percent)= 0.69
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 21.867 min.
Rainfall intensity = 1.298(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.648
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000

```
RI index for soil(AMC 2)  =  72.50
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      3.866(CFS)
Total initial stream area =       4.600(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =            4.60 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  72.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 05/03/24 File:ASTERAREAU1100YR.out

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ASTER APARTMENTS
PRELIMINARY HYDROLOGY
AREA U-2
100-YEAR STORM

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

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

Program License Serial Number 4061

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 [Hemet] area used.
10 year storm 10 minute intensity = 1.960(In/Hr)
10 year storm 60 minute intensity = 0.760(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.180(In/Hr)

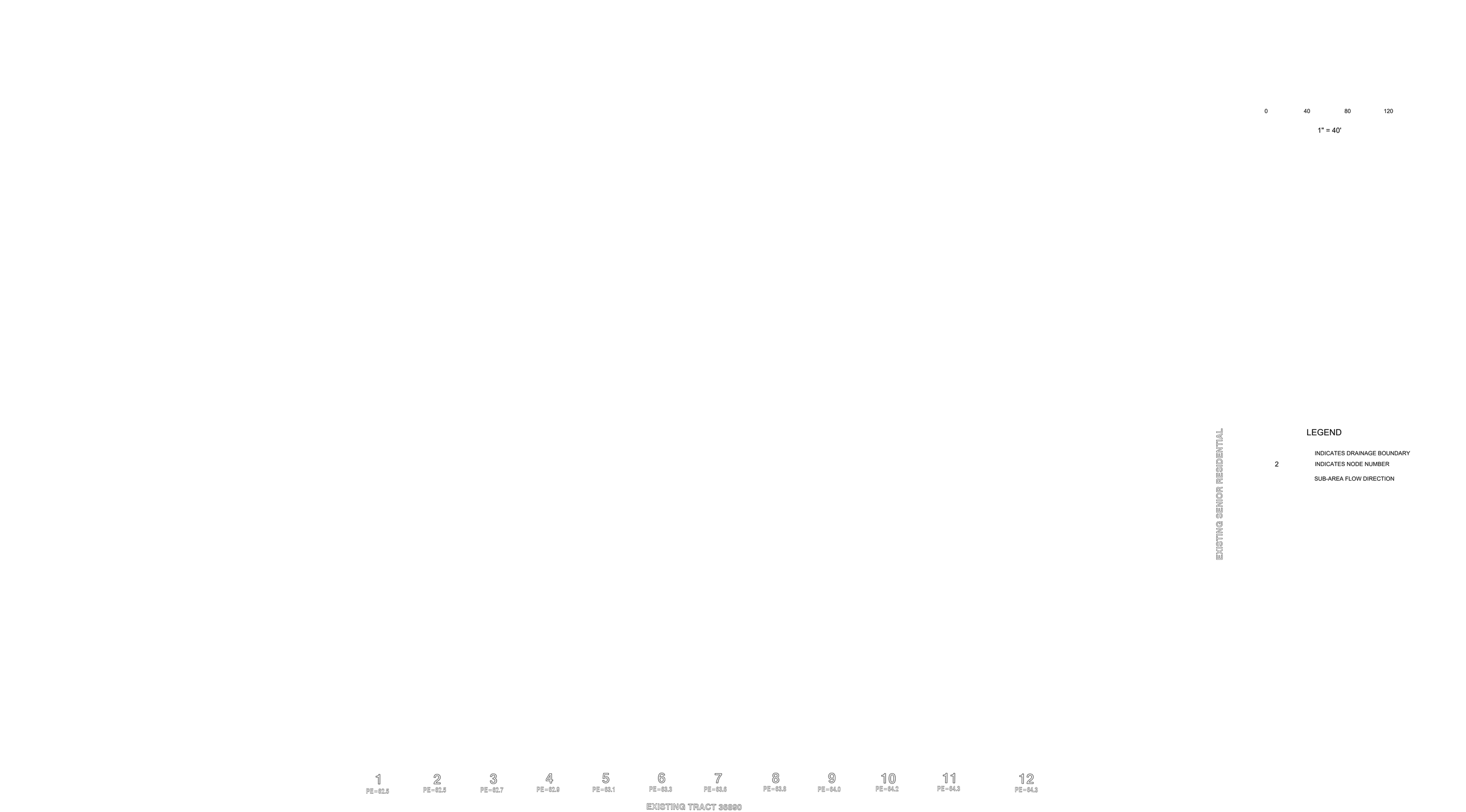
Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.180(In/Hr)
Slope of intensity duration curve = 0.5300

++
Process from Point/Station 3.000 to Point/Station 4.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 905.000(Ft.)
Top (of initial area) elevation = 66.200(Ft.)
Bottom (of initial area) elevation = 60.000(Ft.)
Difference in elevation = 6.200(Ft.)
Slope = 0.00685 s(percent)= 0.69
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 21.867 min.
Rainfall intensity = 2.015(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.719
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000

```
RI index for soil(AMC 2)  =  72.50
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.667(CFS)
Total initial stream area =        4.600(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =            4.60 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  72.5
```



REVISIONS:

NO: DATE: BY:

APPROVED:

DESIGNED BY:

DRAWN BY:

CHECKED BY:

B A W

Hemet, CA. 92544, 41555 E Florida Ave., Suite G, Phone (951)658-1727 Fax (951)658-9347
Park City, UT 84098, 5133 Cove Canyon Dr. #302, Phone/Fax (435)615-1489

W.D.

PREPARED UNDER THE SUPERVISION OF:

DATE:

SCALE: BENCHMARK:

DATE:

City of Hemet

PUBLIC WORKS DEPARTMENT

ENGINEERING DIVISION

510 E. Florida Ave.
HEMET, CA 92543
(951) 765-2360

City of Hemet

1

EXISTING CONDITIONS
RATIONAL HYDROLOGY EXHIBIT
ASTER APARTMENTS

OF 1 SHEETS

FILE NO.

W.O. F.N.

APPENDIX 'C'

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 02/01/24 File:ASTERAPTSAREAA10YRDEV.out

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ASTER APARTMENTS
PRELIMINARY HYDROLOGY
AREA A, 10 YEAR STORM
DEVELOPED CONDITION

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

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

Program License Serial Number 4061

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

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

2 year, 1 hour precipitation = 0.489(In.)
100 year, 1 hour precipitation = 1.590(In.)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.942(In/Hr)
Slope of intensity duration curve = 0.5300

++

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

Initial area flow distance = 830.000(Ft.)
Top (of initial area) elevation = 66.900(Ft.)
Bottom (of initial area) elevation = 60.500(Ft.)
Difference in elevation = 6.400(Ft.)
Slope = 0.00771 s(percent)= 0.77
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.572 min.
Rainfall intensity = 2.157(In/Hr) for a 10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.807
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 36.80
Pervious area fraction = 0.200; Impervious fraction = 0.800
Initial subarea runoff = 3.482(CFS)
Total initial stream area = 2.000(Ac.)

Pervious area fraction = 0.200
End of computations, total study area = 2.00 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.200
Area averaged RI index number = 36.8

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 02/01/24 File:ASTERAPTSAREAA100YRDEV.out

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ASTER APARTMENTS
PRELIMINARY HYDROLOGY
AREA A, 100 YEAR STORM
DEVELOPED CONDITION

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

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

Program License Serial Number 4061

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

2 year, 1 hour precipitation = 0.489(In.)
100 year, 1 hour precipitation = 1.590(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.590(In/Hr)
Slope of intensity duration curve = 0.5300

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

Initial area flow distance = 830.000(Ft.)
Top (of initial area) elevation = 66.900(Ft.)
Bottom (of initial area) elevation = 60.500(Ft.)
Difference in elevation = 6.400(Ft.)
Slope = 0.00771 s(percent)= 0.77
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.572 min.
Rainfall intensity = 3.640(In/Hr) for a 100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.830
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 36.80
Pervious area fraction = 0.200; Impervious fraction = 0.800
Initial subarea runoff = 6.046(CFS)
Total initial stream area = 2.000(Ac.)

Pervious area fraction = 0.200
End of computations, total study area = 2.00 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.200
Area averaged RI index number = 36.8

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 02/01/24 File:ASTERAPTSAREAB10YRDEV.out

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ASTER APARTMENTS
PRELIMINARY HYDROLOGY
AREA B, 10 YEAR STORM
DEVELOPED CONDITION

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

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

Program License Serial Number 4061

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

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

2 year, 1 hour precipitation = 0.489(In.)
100 year, 1 hour precipitation = 1.590(In.)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.942(In/Hr)
Slope of intensity duration curve = 0.5300

++

Process from Point/Station 3.000 to Point/Station 4.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 280.000(Ft.)
Top (of initial area) elevation = 62.800(Ft.)
Bottom (of initial area) elevation = 59.800(Ft.)
Difference in elevation = 3.000(Ft.)
Slope = 0.01071 s(percent)= 1.07
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.622 min.
Rainfall intensity = 2.812(In/Hr) for a 10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.819
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 36.80
Pervious area fraction = 0.200; Impervious fraction = 0.800
Initial subarea runoff = 1.382(CFS)
Total initial stream area = 0.600(Ac.)

Pervious area fraction = 0.200
End of computations, total study area = 0.60 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.200
Area averaged RI index number = 36.8

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 02/01/24 File:ASTERAPTSAREAB100YRDEV.out

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ASTER APARTMENTS
PRELIMINARY HYDROLOGY
AREA B, 100 YEAR
DEVELOPED CONDITION

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

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

Program License Serial Number 4061

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

2 year, 1 hour precipitation = 0.489(In.)
100 year, 1 hour precipitation = 1.590(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.590(In/Hr)
Slope of intensity duration curve = 0.5300

++
Process from Point/Station 3.000 to Point/Station 4.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 280.000(Ft.)
Top (of initial area) elevation = 62.800(Ft.)
Bottom (of initial area) elevation = 59.800(Ft.)
Difference in elevation = 3.000(Ft.)
Slope = 0.01071 s(percent)= 1.07
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.622 min.
Rainfall intensity = 4.746(In/Hr) for a 100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.841
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 36.80
Pervious area fraction = 0.200; Impervious fraction = 0.800
Initial subarea runoff = 2.396(CFS)
Total initial stream area = 0.600(Ac.)

Pervious area fraction = 0.200
End of computations, total study area = 0.60 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.200
Area averaged RI index number = 36.8

```
            Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
      Rational Hydrology Study        Date: 02/01/24  File:ASTERAPTSAREAC10YRDEV.out
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ASTER APARTMENTS
PRELIMINARY HYDROLOGY
AREA C, 10 YEAR STORM
DEVELOPED CONDITION
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 4061

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

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

2 year, 1 hour precipitation =  0.489(In.)
100 year, 1 hour precipitation =  1.590(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.942(In/Hr)
Slope of intensity duration curve = 0.5300




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        6.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =   890.000(Ft.)
Top (of initial area) elevation =    64.700(Ft.)
Bottom (of initial area) elevation =    60.000(Ft.)
Difference in elevation =     4.700(Ft.)
Slope =    0.00528  s(percent)=       0.53
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.945 min.
Rainfall intensity =      2.041(In/Hr) for a    10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.805
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  36.80
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      5.750(CFS)
Total initial stream area =        3.500(Ac.)
```

Pervious area fraction = 0.200
End of computations, total study area = 3.50 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.200
Area averaged RI index number = 36.8

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 02/01/24 File:ASTERAPTSAREAC100YRDEV.out

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ASTER APARTMENTS
PRELIMINARY HYDROLOGY
AREA C, 100 YEAR STORM
DEVELOPED CONDITION

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

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

Program License Serial Number 4061

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

2 year, 1 hour precipitation = 0.489(In.)
100 year, 1 hour precipitation = 1.590(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.590(In/Hr)
Slope of intensity duration curve = 0.5300

++

Process from Point/Station 5.000 to Point/Station 6.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 890.000(Ft.)
Top (of initial area) elevation = 64.700(Ft.)
Bottom (of initial area) elevation = 60.000(Ft.)
Difference in elevation = 4.700(Ft.)
Slope = 0.00528 s(percent)= 0.53
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.945 min.
Rainfall intensity = 3.446(In/Hr) for a 100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.828
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 36.80
Pervious area fraction = 0.200; Impervious fraction = 0.800
Initial subarea runoff = 9.987(CFS)
Total Initial stream area = 3.500(Ac.)

Pervious area fraction = 0.200
End of computations, total study area = 3.50 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.200
Area averaged RI index number = 36.8

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 02/01/24 File:ASTERAPTSAREAD10YRDEV.out

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ASTER APARTMENTS
PRELIMINARY HYDROLOGY
AREA D, 10 YEAR STORM
DEVELOPED CONDITION

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

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

Program License Serial Number 4061

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

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

2 year, 1 hour precipitation = 0.489(In.)
100 year, 1 hour precipitation = 1.590(In.)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.942(In/Hr)
Slope of intensity duration curve = 0.5300

++

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

Initial area flow distance = 950.000(Ft.)
Top (of initial area) elevation = 66.000(Ft.)
Bottom (of initial area) elevation = 60.200(Ft.)
Difference in elevation = 5.800(Ft.)
Slope = 0.00611 s(percent)= 0.61
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.904 min.
Rainfall intensity = 2.044(In/Hr) for a 10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.805
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 36.80
Pervious area fraction = 0.200; Impervious fraction = 0.800
Initial subarea runoff = 5.924(CFS)
Total initial stream area = 3.600(Ac.)

Pervious area fraction = 0.200
End of computations, total study area = 3.60 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.200
Area averaged RI index number = 36.8

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 02/01/24 File:ASTERAPTSAREAD100YRDEV.out

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ASTER APARTMENTS
PRELIMINARY HYDROLOGY
AREA D, 100 YEAR STORM
DEVELOPED CONDITION

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

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

Program License Serial Number 4061

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

2 year, 1 hour precipitation = 0.489(In.)
100 year, 1 hour precipitation = 1.590(In.)

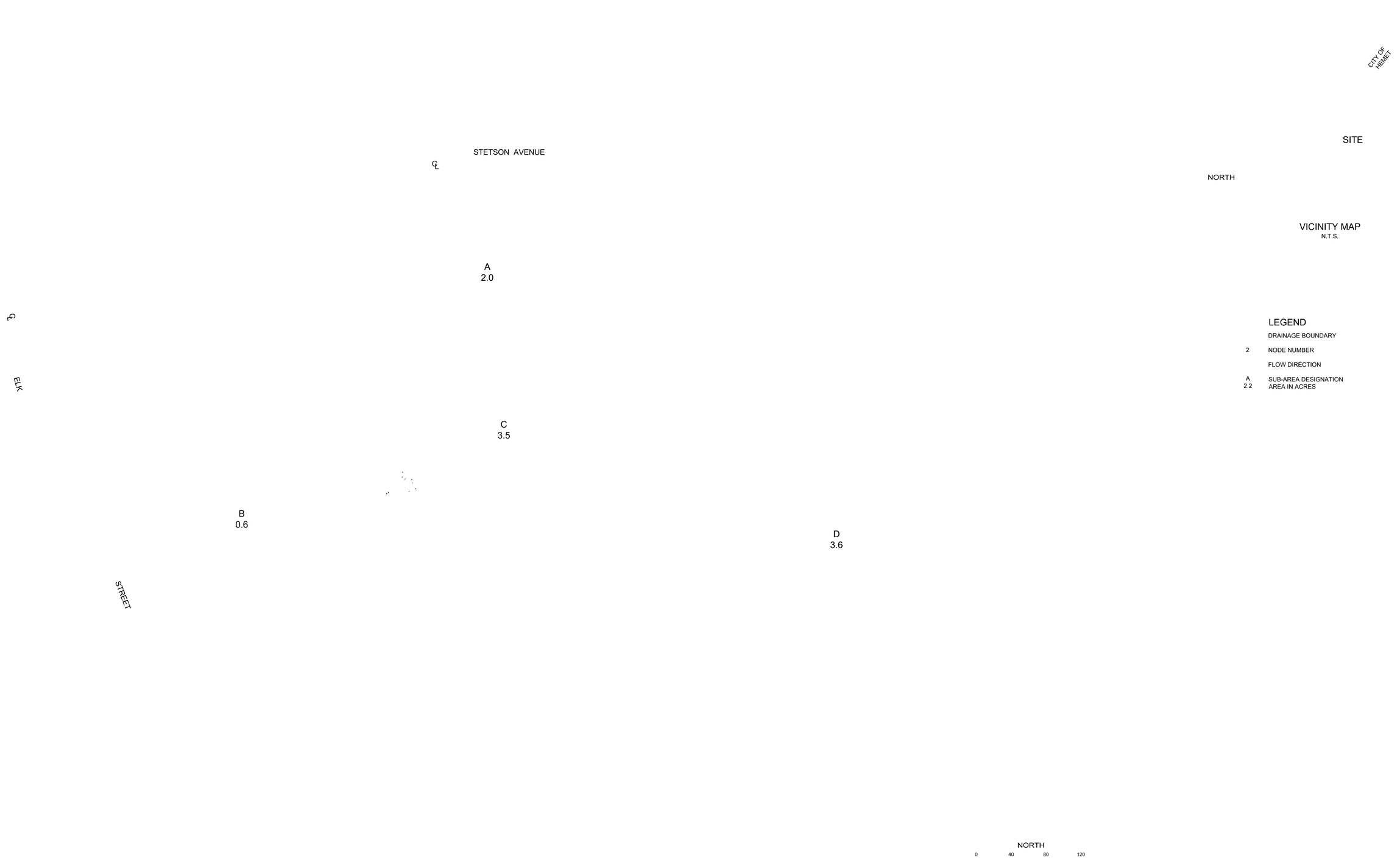
Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.590(In/Hr)
Slope of intensity duration curve = 0.5300

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

Initial area flow distance = 950.000(Ft.)
Top (of initial area) elevation = 66.000(Ft.)
Bottom (of initial area) elevation = 60.200(Ft.)
Difference in elevation = 5.800(Ft.)
Slope = 0.00611 s(percent)= 0.61
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.904 min.
Rainfall intensity = 3.451(In/Hr) for a 100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.828
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 36.80
Pervious area fraction = 0.200; Impervious fraction = 0.800
Initial subarea runoff = 10.289(CFS)
Total initial stream area = 3.600(Ac.)

Pervious area fraction = 0.200
End of computations, total study area = 3.60 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.200
Area averaged RI index number = 36.8



REVISIONS:

NO: DATE: BY: APPROVED:

DESIGNED BY: DRAWN BY: CHECKED BY:

BLAINE A. WOMER
CIVIL ENGINEERING

Hemet, CA. 92544, 41555 E Florida Ave., Suite G, Phone (951)658-1727 Fax (951)658-9347
Park City, UT 84098, 5133 Cove Canyon Dr, #302
Boise, ID. 83706, 4355 W Emerald Street, St. 145, Phone (208)593-7555

W.D.

PREPARED UNDER THE SUPERVISION OF:

DATE:

SCALE: BENCHMARK:

DATE:

APPROVED BY:

, CITY OF HEMET

DATE:

City of Hemet
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION
510 E. Florida Ave.
HEMET, CA 92543
(951) 765-2360

City of Hemet

ASTER APARTMENTS
RATIONAL HYDROLOGY EXHIBIT
DEVELOPED CONDITION

1

OF 1 SHEETS

FILE NO.

EA E

APPENDIX 'D'

PRELIMINARY BASIN SIZING:

PER COM DRAINAGE CRITERIA, THE PROJECT MUST RETAIN THE RUNOFF VOLUME FROM A 100-YEAR, 3 HOUR STORM.

PER. THE DEVELOPED COND. HYDROGRAPH
VOL = 49,630 CF

ON-SITE CAPACITY:

BIORETENTION BASIN SURFACE STORAGE = 14,570 CF
MEDIA/GRAVEL STORAGE = 13,933 SF * 1.49' = 20,760 CF

TOTAL BASIN STORAGE = 35,330 CF

BALANCE OF REQ'D VOLUME TO BE STORED IN CONTECH CHAMBERS

CHAMBER STORAGE REQ'D = 49,630 CF - 35,330 CF
= 14,300 CF

LENGTH OF CHAMBER REQ'D = 14,300 CF / 9.9 CF/ FT OF CHAMBER

L_R = 1444 LF

$L_{PROVIDED\ ON\ PLAN}$ = 1605 LF
3 ROWS OF CHAMBERS 535 LF

Bioretention Facility - Design Procedure	BMP ID BRB NO. 1	Legend:	Required Entries / Calculated Cells
Company Name:	WOMER ENGINEERING	Date:	2/14/2023
Designed by:	BAW	County/City Case No.:	STER APTS

Design Volume

Enter the area tributary to this feature	A_T=	6.7	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	13,119	ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	2.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	53.5	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.49	ft
Minimum Surface Area, A_m $A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$	A_M =	8,823	ft^2
Proposed Surface Area	A=	10,777	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation: Natural Grasses

Notes:

Bioretention Facility - Design Procedure	BMP ID BRB NO. 2	Legend:	Required Entries / Calculated Cells

Company Name: WOMER ENGINEERING Date: 2/14/2023

Designed by: BAW County/City Case No.: ASTER APTS

Design Volume

Enter the area tributary to this feature	A_T=	0.82	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	1,169	ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	2.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	53.5	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.49	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	787	ft^2
Proposed Surface Area	A=	790	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation: Natural Grasses

Notes:

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

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Study date 07/14/22 File: ASTERAPTS1003HRUNDEV3100.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 4061

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

English Units used in output format

ASTER APARTMENTS
PRELIMINARY BASIN SIZING
100 YEAR, 3 HOUR STORM
UNDEVELOPED CONDITION

Drainage Area = 10.00(Ac.) = 0.016 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 10.00(Ac.) = 0.016 Sq. Mi.
Length along longest watercourse = 940.00(Ft.)
Length along longest watercourse measured to centroid = 450.00(Ft.)
Length along longest watercourse = 0.178 Mi.
Length along longest watercourse measured to centroid = 0.085 Mi.
Difference in elevation = 7.00(Ft.)
Slope along watercourse = 39.3191 Ft./Mi.
Average Manning's 'N' = 0.025
Lag time = 0.061 Hr.
Lag time = 3.65 Min.
25% of lag time = 0.91 Min.
40% of lag time = 1.46 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
10.00	0.80	8.00

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
10.00	1.80	18.00

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)

Area Averaged 100-Year Rainfall = 1.800(In)

Point rain (area averaged) = 1.800(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.800(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
10.000	70.00	0.000

Total Area Entered = 10.00(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
70.0	70.0	0.362	0.000	0.362	1.000	0.362
					Sum (F) =	0.362

Area averaged mean soil loss (F) (In/Hr) = 0.362
Minimum soil loss rate ((In/Hr)) = 0.181
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

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

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	137.036	29.906	3.014
2	0.167	274.072	47.894	4.827
3	0.250	411.108	12.003	1.210
4	0.333	548.144	5.308	0.535
5	0.417	685.180	2.866	0.289
6	0.500	822.216	2.024	0.204
			Sum = 100.000	Sum= 10.078

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

Unit Time	(Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max		Low	Effective (In/Hr)
1	0.08	1.30	0.281	(0.362)		0.253	0.028
2	0.17	1.30	0.281	(0.362)		0.253	0.028
3	0.25	1.10	0.238	(0.362)		0.214	0.024
4	0.33	1.50	0.324	(0.362)		0.292	0.032
5	0.42	1.50	0.324	(0.362)		0.292	0.032
6	0.50	1.80	0.389	(0.362)		0.350	0.039
7	0.58	1.50	0.324	(0.362)		0.292	0.032
8	0.67	1.80	0.389	(0.362)		0.350	0.039
9	0.75	1.80	0.389	(0.362)		0.350	0.039
10	0.83	1.50	0.324	(0.362)		0.292	0.032
11	0.92	1.60	0.346	(0.362)		0.311	0.035
12	1.00	1.80	0.389	(0.362)		0.350	0.039
13	1.08	2.20	0.475	0.362	(	0.428)	0.113
14	1.17	2.20	0.475	0.362	(	0.428)	0.113
	1.25	2.20	0.475	0.362	(	0.428)	0.113
	1.33	2.00	0.432	0.362	(	0.389)	0.070

17	1.42	2.60	0.562	0.362	(	0.505)	0.200
	1.50	2.70	0.583	0.362	(	0.525)	0.221
	1.58	2.40	0.518	0.362	(	0.467)	0.156
	1.67	2.70	0.583	0.362	(	0.525)	0.221
21	1.75	3.30	0.713	0.362	(	0.641)	0.351
22	1.83	3.10	0.670	0.362	(	0.603)	0.308
23	1.92	2.90	0.626	0.362	(	0.564)	0.264
24	2.00	3.00	0.648	0.362	(	0.583)	0.286
25	2.08	3.10	0.670	0.362	(	0.603)	0.308
26	2.17	4.20	0.907	0.362	(	0.816)	0.545
27	2.25	5.00	1.080	0.362	(	0.972)	0.718
28	2.33	3.50	0.756	0.362	(	0.680)	0.394
29	2.42	6.80	1.469	0.362	(	1.322)	1.107
30	2.50	7.30	1.577	0.362	(	1.419)	1.215
31	2.58	8.20	1.771	0.362	(	1.594)	1.409
32	2.67	5.90	1.274	0.362	(	1.147)	0.912
33	2.75	2.00	0.432	0.362	(	0.389)	0.070
34	2.83	1.80	0.389	(0.362)		0.350	0.039
35	2.92	1.80	0.389	(0.362)		0.350	0.039
36	3.00	0.60	0.130	(0.362)		0.117	0.013

(Loss Rate Not Used)

Sum = 100.0 Sum = 9.6

Flood volume = Effective rainfall 0.80(In)
times area 10.0(Ac.)/[(In)/(Ft.)] = 0.7(Ac.Ft)

Total soil loss = 1.00(In)

Total soil loss = 0.834(Ac.Ft)

Total rainfall = 1.80(In)

Flood volume = 28992.7 Cubic Feet

Total soil loss = 36344.4 Cubic Feet

Peak flow rate of this hydrograph = 11.985(CFS)

++

3 - H O U R S T O R M

R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0006	0.08	Q				
0+10	0.0021	0.22	Q				
0+15	0.0038	0.24	Q				
0+20	0.0056	0.26	Q				
0+25	0.0077	0.31	Q				
0+30	0.0100	0.34	Q				
0+35	0.0125	0.35	Q				
0+40	0.0149	0.35	Q				
0+45	0.0175	0.38	QV				
0+50	0.0200	0.37	QV				
0+55	0.0224	0.35	QV				
1+ 0	0.0249	0.36	QV				
1+ 5	0.0291	0.61	|Q				
1+10	0.0358	0.97	|QV				
1+15	0.0431	1.06	| Q				
1+20	0.0498	0.97	|QV				
1+25	0.0579	1.18	| QV				
1+30	0.0705	1.83	| QV				
+35	0.0834	1.87	| Q V				
+40	0.0961	1.84	| Q V				

```
    1+45       0.1134       2.51  |    QV    |          |          |          |
    1+50       0.1346       3.08  |     Q V  |          |          |          |
    1+55       0.1546       2.92  |    Q   V |          |          |          |
    2+ 0       0.1739       2.79  |    Q     V          |          |          |
    2+ 5       0.1941       2.94  |    Q     |V         |          |          |
    2+10       0.2201       3.78  |      Q   |  V       |          |          |
    2+15       0.2578       5.46  |          Q     V     |          |          |
    2+20       0.2964       5.62  |          |Q      V   |          |          |
    2+25       0.3415       6.55  |          |  Q       V          |          |
    2+30       0.4110      10.09  |          |          Q   V      |          |
    2+35       0.4936      11.98  |          |          |  Q      V|          |
    2+40       0.5754      11.88  |          |          |  Q       |   V      |
    2+45       0.6261       7.37  |          |    Q     |          |      V   |
    2+50       0.6461       2.89  |    Q     |          |          |       V  |
    2+55       0.6566       1.53  |  Q       |          |          |         V|
    3+ 0       0.6626       0.86  |Q         |          |          |         V|
    3+ 5       0.6649       0.34  Q          |          |          |         V|
    3+10       0.6653       0.06  Q          |          |          |         V|
    3+15       0.6655       0.03  Q          |          |          |         V|
    3+20       0.6656       0.01  Q          |          |          |         V|
    3+25       0.6656       0.00  Q          |          |          |          V
-------------------------------------------------------------------------------
```

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

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1
Study date 02/16/23 File: ASTERAPTS100YR3HRDEV3100.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 4061

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

English Units used in output format

ASTER APARTMENTS
PRELIMINARY BASING HYDROLOGY
100 YEAR, 3 HOUR STORM
DEVELOPED CONDITION

Drainage Area = 9.70(Ac.) = 0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.70(Ac.) = 0.015 Sq. Mi.
Length along longest watercourse = 1000.00(Ft.)
Length along longest watercourse measured to centroid = 240.00(Ft.)
Length along longest watercourse = 0.189 Mi.
Length along longest watercourse measured to centroid = 0.045 Mi.
Difference in elevation = 6.00(Ft.)
Slope along watercourse = 31.6800 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.031 Hr.
Lag time = 1.84 Min.
25% of lag time = 0.46 Min.
40% of lag time = 0.74 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.70	0.80	7.76

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.70	1.80	17.46

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)

Area Averaged 100-Year Rainfall = 1.800(In)

Point rain (area averaged) = 1.800(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.800(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.700	37.00	0.800

Total Area Entered = 9.70(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
37.0	37.0	0.697	0.800	0.195	1.000	0.195
					Sum (F) =	0.195

Area averaged mean soil loss (F) (In/Hr) = 0.195
Minimum soil loss rate ((In/Hr)) = 0.098
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.260

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

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %		Unit Hydrograph (CFS)
1	0.083	271.886	53.598		5.240
2	0.167	543.772	38.732		3.786
3	0.250	815.658	7.669		0.750
			Sum = 100.000	Sum=	9.776

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.281	(0.195)	0.073	0.208
2	0.17	1.30	0.281	(0.195)	0.073	0.208
3	0.25	1.10	0.238	(0.195)	0.062	0.176
4	0.33	1.50	0.324	(0.195)	0.084	0.240
5	0.42	1.50	0.324	(0.195)	0.084	0.240
6	0.50	1.80	0.389	(0.195)	0.101	0.288
7	0.58	1.50	0.324	(0.195)	0.084	0.240
8	0.67	1.80	0.389	(0.195)	0.101	0.288
9	0.75	1.80	0.389	(0.195)	0.101	0.288
10	0.83	1.50	0.324	(0.195)	0.084	0.240
11	0.92	1.60	0.346	(0.195)	0.090	0.256
12	1.00	1.80	0.389	(0.195)	0.101	0.288
13	1.08	2.20	0.475	(0.195)	0.124	0.352
14	1.17	2.20	0.475	(0.195)	0.124	0.352
15	1.25	2.20	0.475	(0.195)	0.124	0.352
16	1.33	2.00	0.432	(0.195)	0.112	0.320
17	1.42	2.60	0.562	(0.195)	0.146	0.416
	1.50	2.70	0.583	(0.195)	0.152	0.432
	1.58	2.40	0.518	(0.195)	0.135	0.384

20	1.67	2.70	0.583	(	0.195)	0.152	0.432
	1.75	3.30	0.713	(	0.195)	0.185	0.527
	1.83	3.10	0.670	(	0.195)	0.174	0.495
	1.92	2.90	0.626	(	0.195)	0.163	0.464
24	2.00	3.00	0.648	(	0.195)	0.168	0.479
25	2.08	3.10	0.670	(	0.195)	0.174	0.495
26	2.17	4.20	0.907		0.195	(0.236)	0.712
27	2.25	5.00	1.080		0.195	(0.281)	0.885
28	2.33	3.50	0.756		0.195	(0.197)	0.561
29	2.42	6.80	1.469		0.195	(0.382)	1.274
30	2.50	7.30	1.577		0.195	(0.410)	1.382
31	2.58	8.20	1.771		0.195	(0.460)	1.576
32	2.67	5.90	1.274		0.195	(0.331)	1.079
33	2.75	2.00	0.432	(	0.195)	0.112	0.320
34	2.83	1.80	0.389	(	0.195)	0.101	0.288
35	2.92	1.80	0.389	(	0.195)	0.101	0.288
36	3.00	0.60	0.130	(	0.195)	0.034	0.096

(Loss Rate Not Used)

Sum = 100.0 Sum = 16.9

Flood volume = Effective rainfall 1.41(In)
times area 9.7(Ac.)/[(In)/(Ft.)] = 1.1(Ac.Ft)
Total soil loss = 0.39(In)
Total soil loss = 0.316(Ac.Ft)
Total rainfall = 1.80(In)
Flood volume = 49630.0 Cubic Feet
Total soil loss = 13747.1 Cubic Feet

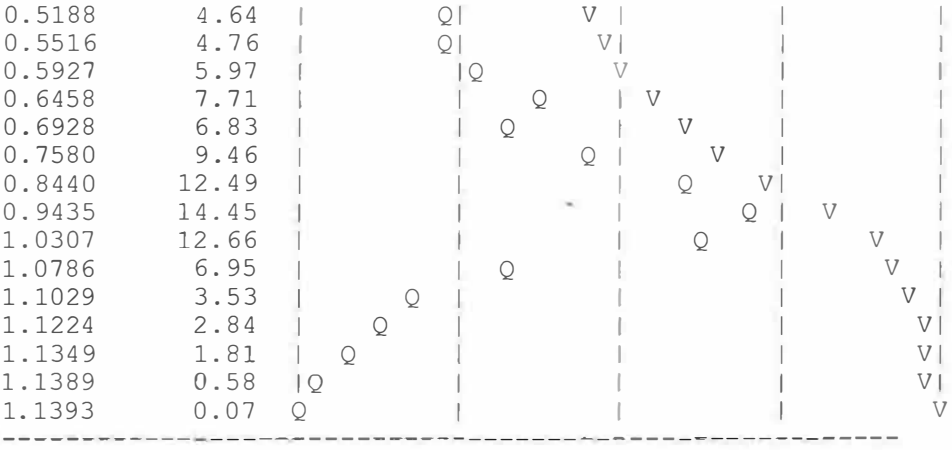
Peak flow rate of this hydrograph = 14.451(CFS)

++

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

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0 5.0 10.0 15.0 20.0
0+ 5	0.0075	1.09	V Q
0+10	0.0204	1.88	V Q
0+15	0.0333	1.86	V Q
0+20	0.0476	2.08	V Q
0+25	0.0634	2.30	V Q
0+30	0.0813	2.60	V Q
0+35	0.0987	2.53	V Q
0+40	0.1168	2.63	VQ
0+45	0.1359	2.78	VQ
0+50	0.1536	2.56	Q
0+55	0.1706	2.46	QV
1+ 0	0.1889	2.66	QV
1+ 5	0.2104	3.13	QV
1+10	0.2337	3.39	Q V
1+15	0.2574	3.44	Q V
1+20	0.2800	3.27	Q V
1+25	0.3051	3.65	Q V
1+30	0.3332	4.08	Q V
1+35	0.3605	3.96	Q V
1+40	0.3883	4.04	Q V
1+45	0.4206	4.69	Q V
+50	0.4544	4.92	Q V
+55	0.4868	4.70	Q V

2+ 0	0.5188	4.64	
2+ 5	0.5516	4.76	
+10	0.5927	5.97	
2+15	0.6458	7.71	
2+20	0.6928	6.83	
2+25	0.7580	9.46	
2+30	0.8440	12.49	
2+35	0.9435	14.45	
2+40	1.0307	12.66	
2+45	1.0786	6.95	
2+50	1.1029	3.53	
2+55	1.1224	2.84	
3+ 0	1.1349	1.81	
3+ 5	1.1389	0.58	
3+10	1.1393	0.07	

NORTH

0 40 80 120

1" = 40'

LEGEND

INDICATES DRAINAGE BOUNDARY

INDICATES FLOW DIRECTION

INDICATES CENTROID OF PROPERTY

EXISTING SENIOR RESIDENTIAL

1 PE=62.5 | 2 PE=62.5 | 3 PE=62.7 | 4 PE=62.9 | 5 PE=63.1 | 6 PE=63.3 | 7 PE=63.6 | 8 PE=63.8 | 9 PE=64.0 | 10 PE=64.2 | 11 PE=64.3 | 12 PE=64.3

EXISTING TRACT 36890

REVISIONS:

NO: DATE: BY: APPROVED:

DESIGNED BY: DRAWN BY: CHECKED BY:

BAW
Hemet, CA. 92544, 41555 E Florida Ave., Suite G, Phone (951)658-1727 Fax (951)658-9347
Park City, UT 84098, 5133 Cove Canyon Dr. #302. Phone/Fax (435)615-1489

W.D.

PREPARED UNDER THE SUPERVISION OF:

DATE:

SCALE: BENCHMARK:

DATE:

City of Hemet
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION
510 E. Florida Ave.
HEMET, CA 92543
(951) 765-2360

City of Hemet

EXISTING CONDITION
UNIT HYDROGRAPH EXHIBIT
ASTER APARTMENTS

W.O. F.N.

1

OF 1 SHEETS

FILE NO.

CITY OF HEMET

STETSON AVENUE

SITE

NORTH

VICINITY MAP
N.T.S.

ELK

STREET

AREA= 9.7AC

LEGEND

DRAINAGE BOUNDARY

FLOW PATH

CENTROID OF PROPERTY

NORTH

0 40 80 120

1" = 40'

REVISIONS:

NO: DATE: BY: APPROVED:

DESIGNED BY: DRAWN BY: CHECKED BY: W.D.

BLAINE A. WOMER
CIVIL ENGINEERING
Hemet, CA. 92544, 41555 E Florida Ave., Suite G, Phone (951)658-1727 Fax (951)658-9347
Park City, UT 84098, 5133 Cove Canyon Dr. #302
Boise, ID, 83706, 4355 W Emerald Street, St. 145, Phone (208)593-7555

PREPARED UNDER THE SUPERVISION OF:

DATE:

SCALE: BENCHMARK:

DATE:

APPROVED BY:

, CITY OF HEMET

DATE:

City of Hemet
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION
510 E. Florida Ave.
HEMET, CA 92543
(951) 765-2360

City of Hemet

DEVELOPED CONDITION
UNIT HYDROGRAPH EXHIBIT
ASTER APARTMENTS

EA E

1

OF 1 SHEETS

FILE NO.

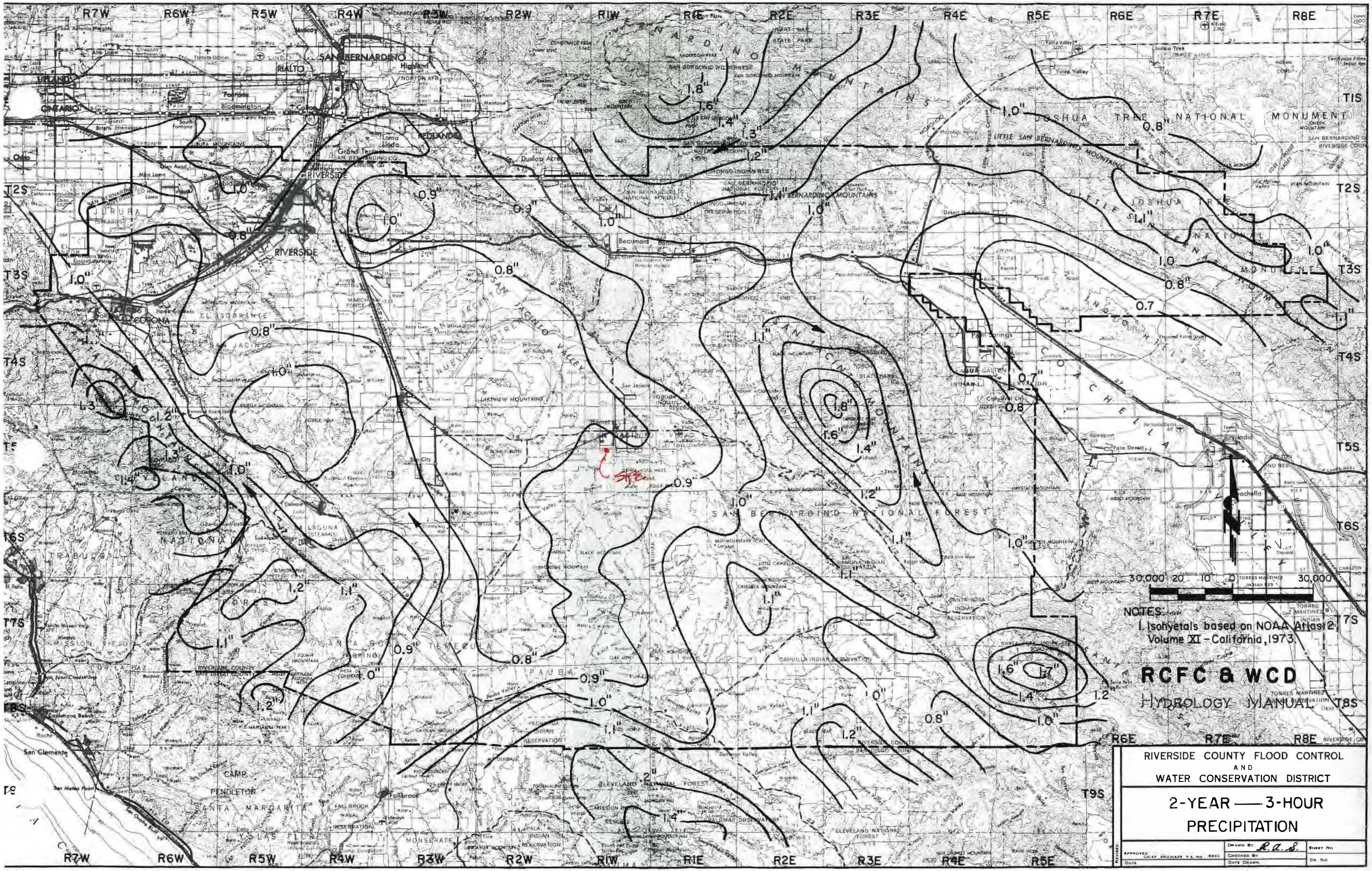

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
2-YEAR — 3-HOUR
PRECIPITATION
RCFC & WCD
HYDROLOGY MANUAL
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973.
30,000 20 10 0 30,000
Drawn By R.A.S.
Checked By
Date Drawn
Approved
Chief Engineer R.E. No.
Date
Revised
Sheet No
Dr. No
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
SAN BERNARDINO
RIVERSIDE
CORONA
SAN JACINTO MOUNTAINS
SAN BERNARDINO NATIONAL FOREST
CLEVELAND NATIONAL FOREST
JOSHUA TREE NATIONAL MONUMENT
COACHELLA VALLEY
TEMECULA
CAMP PENDLETON

PLATE E-5.1

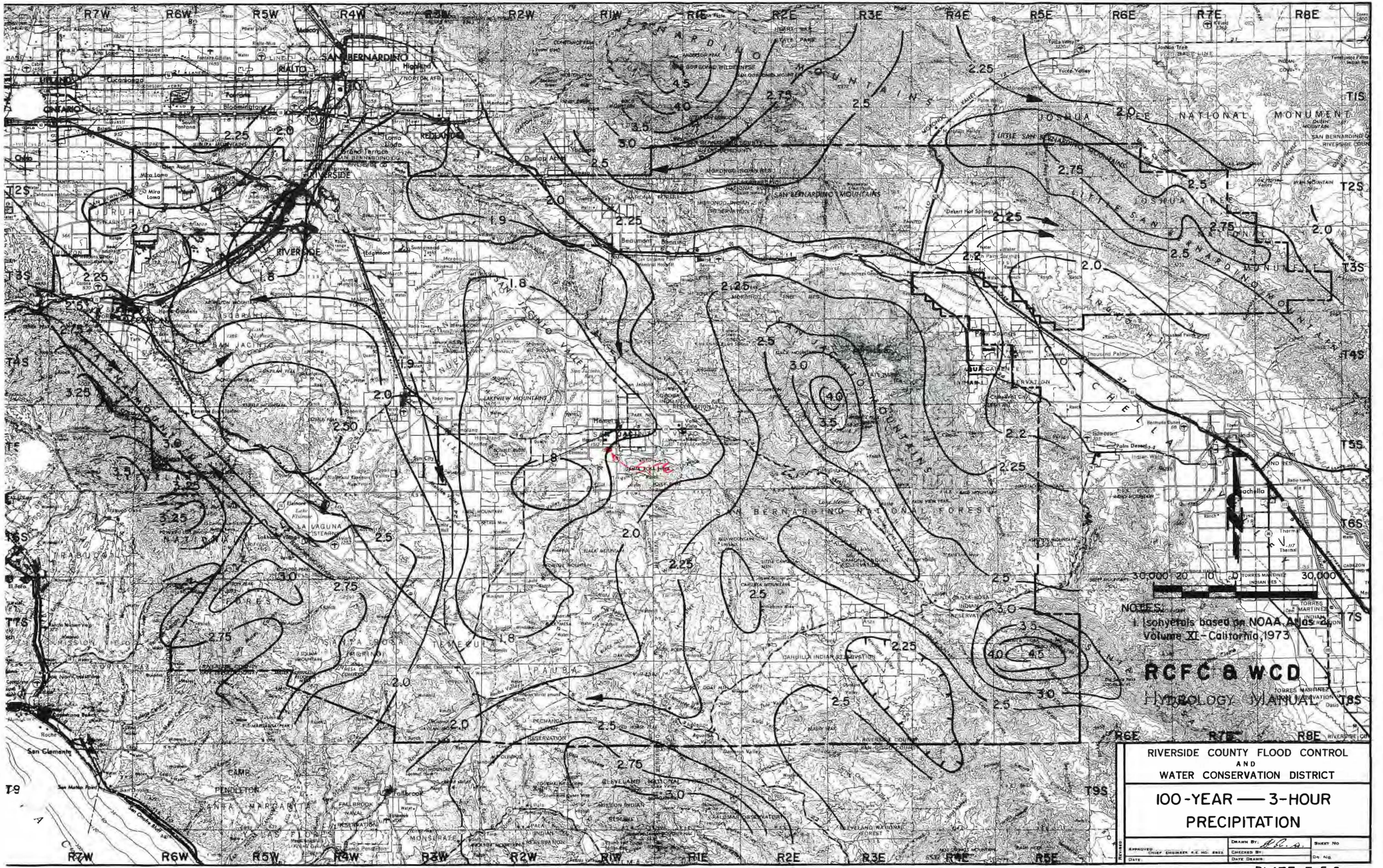

NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
100-YEAR — 3-HOUR PRECIPITATION
SAN BERNARDINO MOUNTAINS
SAN JACINTO MOUNTAINS
SAN BERNARDINO NATIONAL FOREST
JOSHUA TREE NATIONAL MONUMENT
PALM SPRINGS
RIVERSIDE
SAN BERNARDINO
ONTARIO
CORONA
PERRIS
TEMECULA
MURRIETA
FALLBROOK
SAN CLEMENTE
CAMP PENDLETON
R7W R6W R5W R4W R3W R2W R1W R1E R2E R3E R4E R5E R6E R7E R8E
T9S T8S T7S T6S T5S T4S T3S T2S T1S 7S

PLATE E-5.2

APPENDIX 'E'

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 05/03/24 File:STETSONCBFLOW10YR.out

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ASTER APARTMENTS
PELIMINARY HYDROLOGY
STETSON AVE TRIBUTARY FLOW TO EXIST. CB
10-YEAR STORM

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

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

Program License Serial Number 4061

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [Hemet] area used.
10 year storm 10 minute intensity = 1.960(In/Hr)
10 year storm 60 minute intensity = 0.760(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.180(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.760(In/Hr)
Slope of intensity duration curve = 0.5300

++

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

Initial area flow distance = 780.000(Ft.)
Top (of initial area) elevation = 67.200(Ft.)
Bottom (of initial area) elevation = 64.000(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.00410 s(percent)= 0.41
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.923 min.
Rainfall intensity = 1.715(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.855
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000

```
RI index for soil(AMC 2)  =  44.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.173(CFS)
Total initial stream area =        0.800(Ac.)
Pervious area fraction = 0.100


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

Top of street segment elevation =    64.000(Ft.)
End of street segment elevation =    60.000(Ft.)
Length of street segment  =   550.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  32.000(Ft.)
Distance from crown to crossfall grade break  =  30.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      1.509(CFS)
Depth of flow =   0.297(Ft.), Average velocity =   1.777(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.502(Ft.)
Flow velocity =   1.78(Ft/s)
Travel time =   5.16 min.     TC =   18.08  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.851
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  44.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.435(In/Hr) for a    10.0 year storm
Subarea runoff =      0.611(CFS) for      0.500(Ac.)
Total runoff =      1.784(CFS)      Total area =       1.300(Ac.)
Street flow at end of street =      1.784(CFS)
Half street flow at end of street =      1.784(CFS)
Depth of flow =   0.310(Ft.), Average velocity =   1.844(Ft/s)
Flow width (from curb towards crown)=   9.170(Ft.)
End of computations, total study area =           1.30 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  44.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 05/03/24 File:STETSONCBFLOW100YR.out

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ASTER APARTMENTS
PRELIMINARY HYDROLOGY
STETSON AVE TRIBUTARY FLOW TO EXIST. CB
100-YEAR STORM

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

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

Program License Serial Number 4061

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 [Hemet] area used.
10 year storm 10 minute intensity = 1.960(In/Hr)
10 year storm 60 minute intensity = 0.760(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.180(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.180(In/Hr)
Slope of intensity duration curve = 0.5300

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

Initial area flow distance = 780.000(Ft.)
Top (of initial area) elevation = 67.200(Ft.)
Bottom (of initial area) elevation = 64.000(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.00410 s(percent)= 0.41
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.923 min.
Rainfall intensity = 2.662(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000

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RI index for soil(AMC 2)  =  44.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.842(CFS)
Total initial stream area =       0.800(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station        2.000 to Point/Station        3.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =    64.000(Ft.)
End of street segment elevation =    60.000(Ft.)
Length of street segment  =   550.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  32.000(Ft.)
Distance from crown to crossfall grade break  =  30.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      2.374(CFS)
Depth of flow =   0.334(Ft.), Average velocity =   1.968(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.392(Ft.)
Flow velocity =   1.97(Ft/s)
Travel time =    4.66 min.     TC =   17.58  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  44.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.262(In/Hr) for a   100.0 year storm
Subarea runoff =      0.974(CFS) for      0.500(Ac.)
Total runoff =      2.816(CFS)      Total area =       1.300(Ac.)
Street flow at end of street =      2.816(CFS)
Half street flow at end of street =      2.816(CFS)
Depth of flow =   0.350(Ft.), Average velocity =   2.047(Ft/s)
Flow width (from curb towards crown)=  11.177(Ft.)
End of computations, total study area =            1.30 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  44.0
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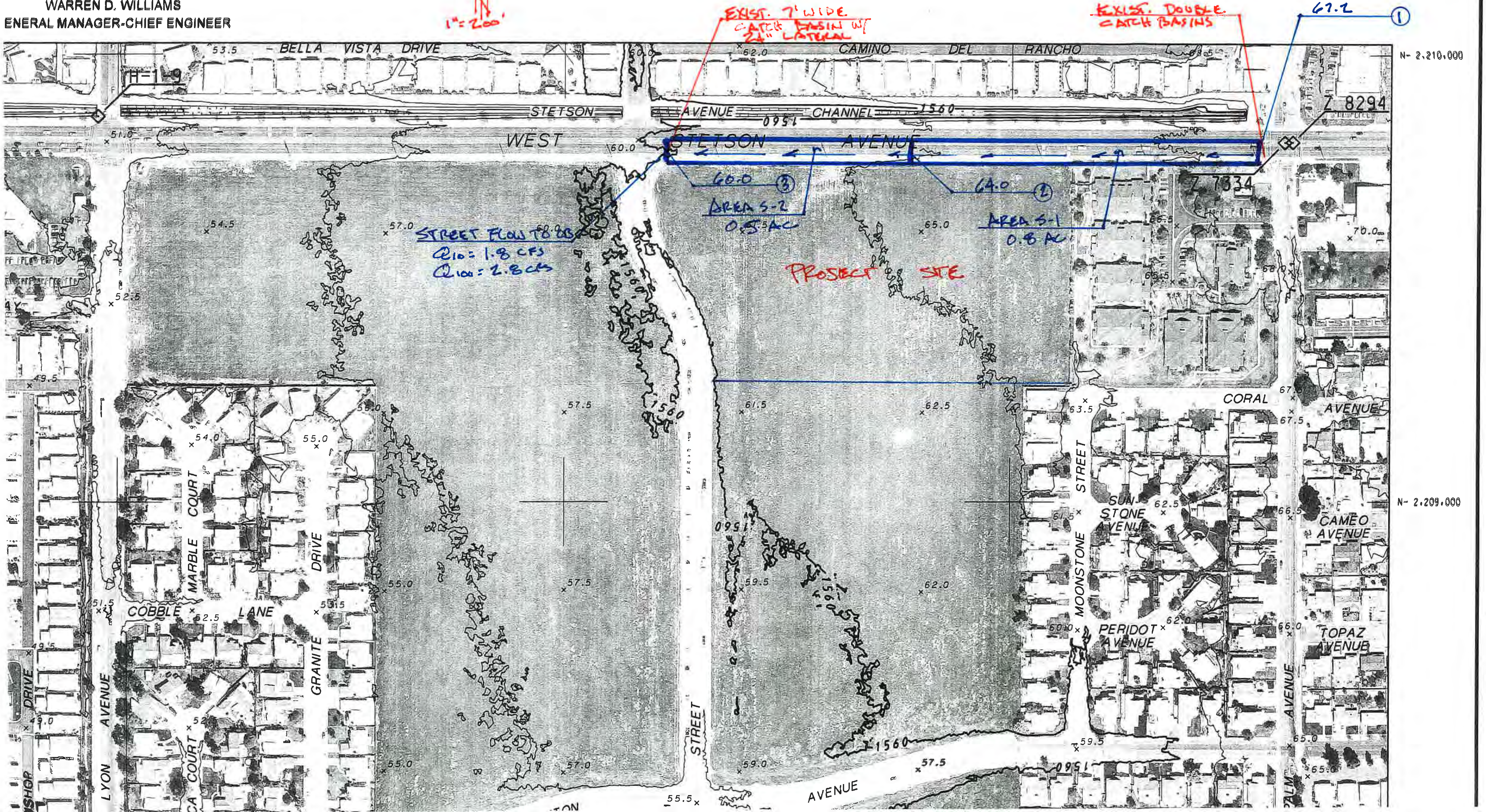
COUNTY FLOOD CONTROL AND CONSERVATION DISTRICT

RIVERSIDE, CALIFORNIA

WARREN D. WILLIAMS
GENERAL MANAGER-CHIEF ENGINEER



PRELIMINARY HYDRAULIC CALCULATIONS:

STETSON RCP LATERAL -

PER SHEET 10 OF THE STETSON AVE CHANNEL STAGE II (ATTACHED), THE HGL AT THE 24" STETSON LATERAL (STA 109+60) IS 1556. AT CONVERSION TO NAVD 88 FOR CURRENT TOPO, HGL = 1558.9.

TOTAL FLOW IN LATERAL = STETSON FLOW + MDP AREA SITE FLOW = 2.8 cfs + 7.7 cfs = 10.5 cfs

FOR 24" RCP:

$d = 24"$
$A = 3.14\ ft^2$
$R_h = 0.50$
$n = 0.013$
$V @ 10.5\ cfs = 3.34\ fps$

CALCULATE APPROX HGL AT C.B:

- EXIT LOSS = $h_{LE} = V^2/2g = (3.34)^2/2g = 0.17'$

- FRICTION LOSS = $h_{Lf} = \left(\frac{nV}{1.49 R_h^{2/3}}\right)^2 * L$

$= \left(\frac{.013(3.34)}{1.49(.5)^{2/3}}\right)^2 * 90'$

$= 0.19'$

- ENT. LOSS = $h_{L\,ENT} = 0.5\, V^2/2g$

$= 0.5(3.34)^2/2g = 0.09'$

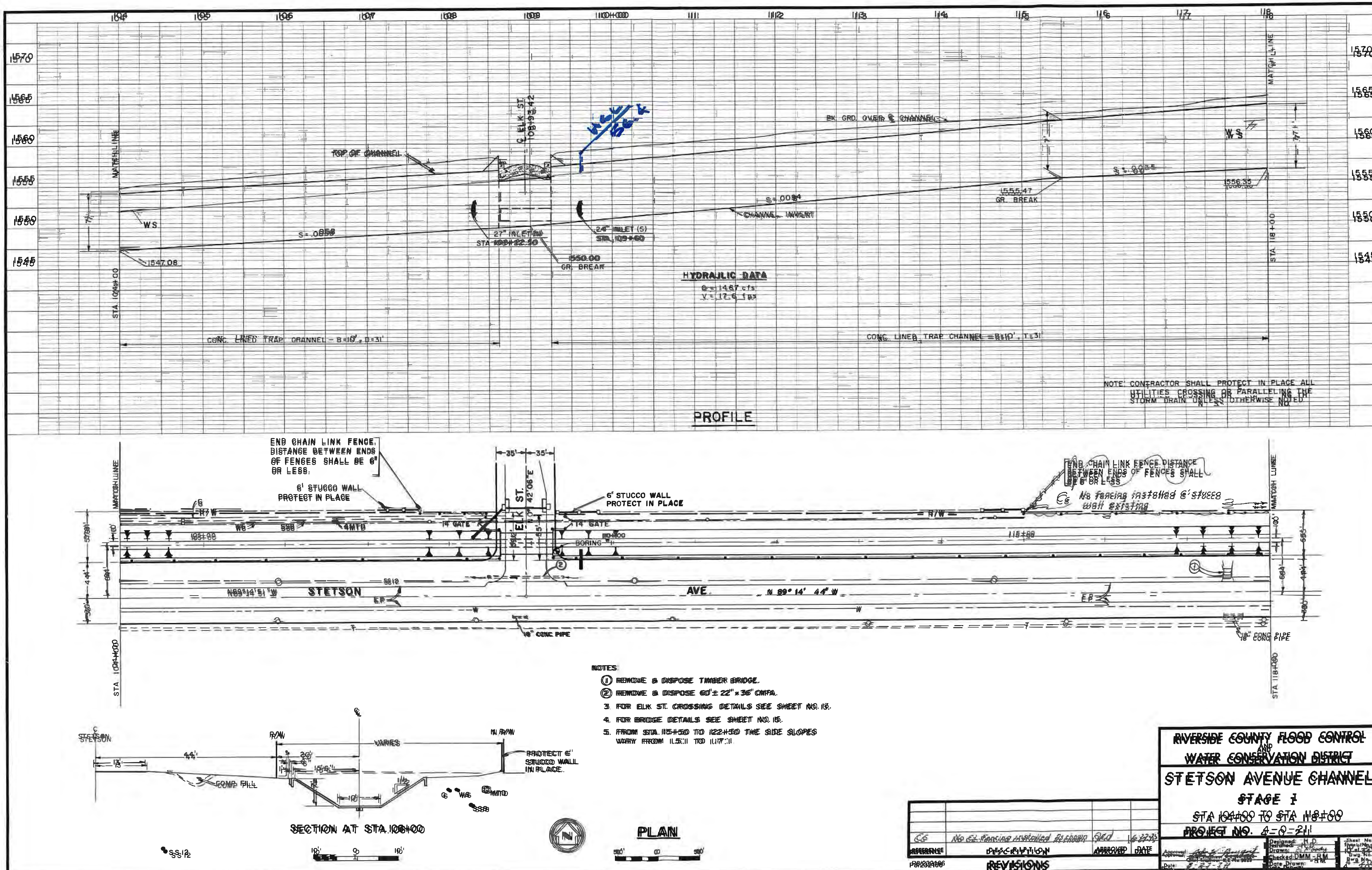
HGL ELEV INSIDE CB = 58.9 + 0.17' + 0.19' + 0.09'

= 59.4

PER RECENT FIELD SURVEY, THE FL ELEV AT THE CB IS 59.64

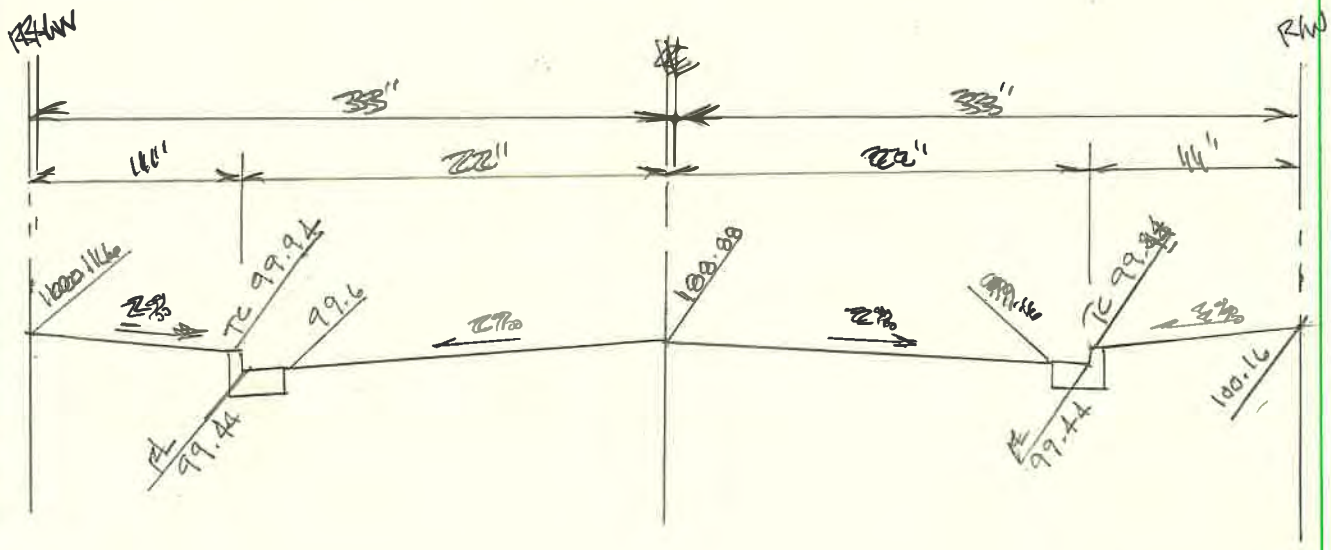
∴ HGL IS BELOW FL, SO TAILWATER CAN BE ENTERED OUT TO THE STETSON LATERAL FROM THE DEVELOPED ASTER APTS. PROJECT.

PER HYDROLOGY CALCULATIONS FOR STETSON AVE, DEPTH OF FLOW IN THE STREET IS 0.4' FOR THE 100-YR CONDITION. WITH 8" CURB, THE FLOW IS CONTAINED WITHIN THE CURB. ALL FF'S, AS SHOWN ON THE CONCEPTUAL GRADING PLAN, ARE A MINIMUM OF 1.3 FEET HIGHER THAN THE STETSON AVE TOP OF CURB. THEREFORE, LOCALIZED FLOODING IS NOT A CONCERN.



PROFILE
TOP OF CHANNEL
EX. GRD. OVER ℄ CHANNEL
CHANNEL INVERT
W.S.
S = .0059
S = .0084
S = .0085
1547.08
1550.00 GR. BREAK
1555.47 GR. BREAK
1556.35
27" INLET (1) STA 108+22.50
24" INLET (5) STA 109+60
℄ ELK ST. 108+93.42
HYDRAULIC DATA
Q = 1467 cfs
V = 12.6 fps
CONC. LINED TRAP. CHANNEL - B=10', D=3'
CONC. LINED TRAP. CHANNEL = B=10', T=3'
STA 104+00
STA 118+00
MATCH LINE
NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES CROSSING OR PARALLELING THE STORM DRAIN UNLESS OTHERWISE NOTED.
END CHAIN LINK FENCE. DISTANCE BETWEEN ENDS OF FENCES SHALL BE 6" OR LESS.
6' STUCCO WALL PROTECT IN PLACE
14' GATE
ELK ST.
N 0° 42' 06" E
BORING
STETSON
AVE.
N 89° 14' 44" W
N89°14'51"W
18" CONC PIPE
END CHAIN LINK FENCE DISTANCE BETWEEN ENDS OF FENCES SHALL BE 6" OR LESS
No fencing installed 6' stucco wall existing
NOTES:
1. REMOVE & DISPOSE TIMBER BRIDGE.
2. REMOVE & DISPOSE 60' ± 22" x 36" CMPA.
3. FOR ELK ST. CROSSING DETAILS SEE SHEET NO. 13.
4. FOR BRIDGE DETAILS SEE SHEET NO. 15.
5. FROM STA. 115+50 TO 122+50 THE SIDE SLOPES VARY FROM 1.5:1 TO 1.7:1
℄ STETSON
R/W
VARIES
N R/W
PROTECT 6' STUCCO WALL IN PLACE.
COMP. FILL
SECTION AT STA. 108+00
PLAN
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
STETSON AVENUE CHANNEL
STAGE I
STA 104+00 TO STA 118+00
PROJECT NO. 4-0-211
No CL fencing installed As shown
REFERENCE
DESCRIPTION
APPROVED
DATE
REVISIONS
AS BUILT
Designed: H.D.
Checked: DMM - RM

HELM STREET CAPACITY CALCULATIONS:



FLOW AREA TO R/W:

$A = 2(0.16' * 2' * 0.5) + 2(0.16' * 29') + 2(0.4' * 2') + 2(0.4' * 20' * 0.5) + 2(3' * 0.06' * 0.5) = 19.38 \text{ FT}^2$

$$Q_{CAP} = \frac{1.49}{n} A R_H^{2/3} S^{1/2}$$

$$Q_{CAP} = \frac{1.49}{.015} (19.38)(.58)^{2/3}(.0035)^{1/2}$$

$Q_{CAP} = 79.2$ CFS

n = 0.015
A = 19.38 FT²
$R_H = 19.38/33.5'$
= 0.58
S = 0.0035

Q_{100} UN-ATTENUATED FLOWS FROM THE PROJECT = 22.7 CFS

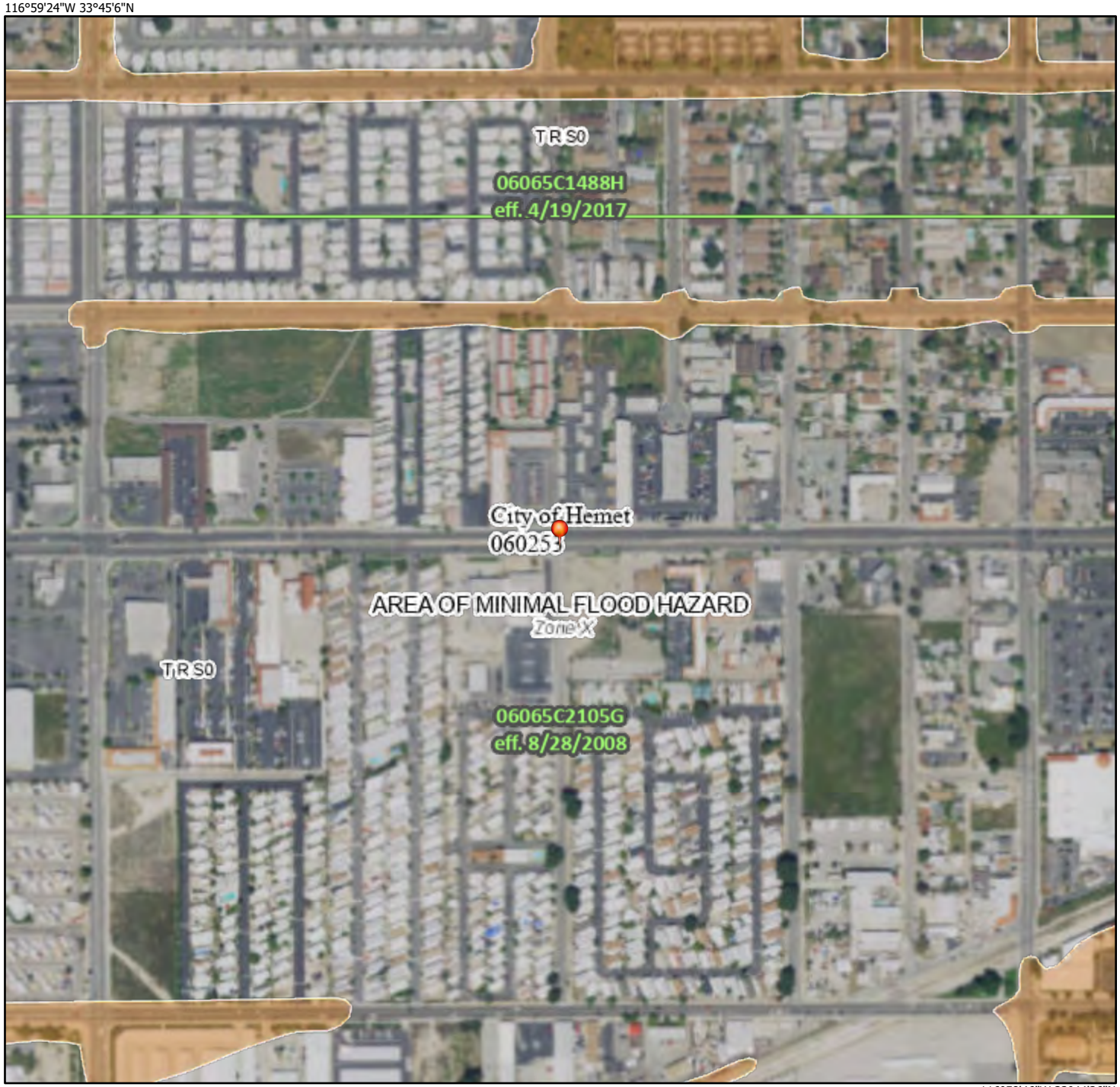
∴ STREET CAPACITY IS ADEQUATE.

APPENDIX 'F'

National Flood Hazard Layer FIRMette

FEMA

116°59'24"W 33°45'6"N



Feet

0 250 500 1,000 1,500 2,000

1:6,000

116°58'46"W 33°44'36"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

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