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RIO VERDE - NORTH FLOODPLAIN DELINEATION STUDY

FCD 93-06

TECHNICAL DATA NOTEBOOK HYDROLOGY

Prepared For:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
2801 West Durango Street
Phoenix, Arizona 85009
(602) 506-1501

Registered Professional Engineer (Civil)
CERTIFICATE NO. 10512
ASHOK C. PATEL
Date Signed 10/3/94
ARIZONA, U.S.A.

Prepared By:

Prime Consultant:

BURGESS & NIPLE, INC.
5025 East Washington Street
Phoenix, AZ 85034
(602) 244-8100

Project No. 15183

Associate Consultant:

WOOD, PATEL & ASSOCIATES, INC.
1550 East Missouri, Suite 203
Phoenix, AZ 85014
(602) 234-1344

Project No. 93031.00

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SECTION 3 - Hydrologic Analysis

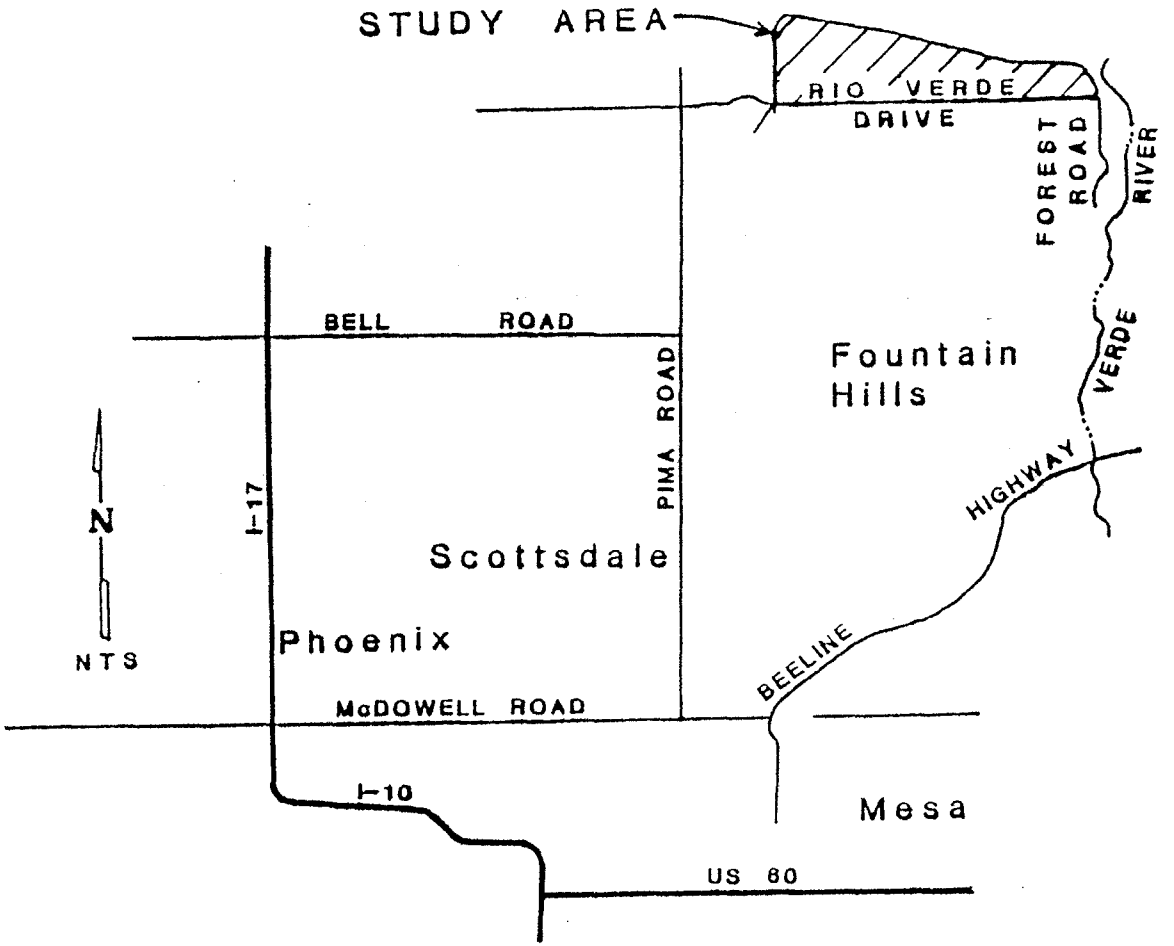
3.1 Hydrologic Method Description

The following report is a comprehensive document which contains the results and supporting computations for the hydrology portion of the Rio Verde - North Floodplain Delineation Study.

The watershed was modeled utilizing methodology set forth in the *Hydrologic Design Manual for Maricopa County, Arizona* (Design Manual), prepared by the Special Projects Branch, Hydrology Division, Flood Control District of Maricopa County, dated June 1, 1992. This manual was specified for use in the Contract Scope of Work, which is contained under Section 1.5 of this report. The watershed was modeled for the 100-year 6-hour and the 100-year 24-hour duration storms. The two durations were used in order to determine which storm results in the highest magnitude of peak discharge at various locations on the watershed.

The temporal rainfall distributions used were those suggested in the Design Manual for the 6-hour duration storm, and the SCS Type II distribution for the 24-hour storm. The Phoenix Valley S-graph was used for unit hydrograph development. Rainfall losses were estimated using the Green-Ampt infiltration equation. Hydrographs were routed through the watershed using normal depth channel routing. The watershed was modeled using the U.S. Army Corps of Engineers HEC-1 Computer Program, version 4.0.1E, dated May, 1991. The Flood Control District of Maricopa County will hereinafter be referred to as "District".

The purpose of this study is to determine peak discharges at key locations within the watershed. These peak discharges were used for the hydraulic analysis portion of this study for estimating floodplain and floodway limits for the washes designated by the District. The peak discharges and runoff volumes estimated at other locations will be used by the District for future flood studies and possibly for ultimate sizing of flood remediation structures to minimize flood damage to the area. The existing undeveloped land use conditions were used to estimate these peak flow rates. Future land use conditions were not estimated.



WOOD/PATEL ASSOCIATES Civil Engineers Hydrologists Land Surveyors (602) 234-1344	Scale ———	Design ———	LOCATION MAP
	Date JUNE, 94	Drawn ———	
	Job # 93031	Chk. ———	

3.2 Parameter Estimation

3.2.1 Drainage Area Boundaries

The study watershed is approximately 13.4 square miles in area. Refer to Exhibit "A" in Section 2.4 for the watershed boundary delineation. The study area is bounded on the north by Camp Creek and the Tonto National Forest adjacent to Bartlett Lake, on the east by the Verde River, on the south by Rio Verde Drive, and on the west by a ridge line which extends north from the McDowell Mountains. There are four major washes on the watershed, to be studied by detailed methods for floodplain delineation. Runoff from many washes within the study area commingle as a result of shallow channel depths throughout the watershed.

The south watershed boundary was compared to the northern watershed boundary delineated in the *Revised Master Drainage Plan, Tonto Verde* by Brooks, Hersey and Associates, Inc. for Rio Verde Services, Inc., May 1993. The boundaries were found to coincide. The watershed to the south is part of the Rio Verde - South Floodplain Delineation Study. Coordination of flows and watershed boundaries was maintained throughout this study with those performing the Rio Verde - South Study.

There are no culverts or bridge crossings within the watershed. All roadway crossings are dip crossings. The watershed was divided into drainage sub-basins to facilitate the modeling of the complex channel routing situation throughout the watershed. This approach allows the use of naming conventions which make it easier to follow the logic of the HEC-1 model. The sub-basins are not necessarily separate entities. Flow splits cause diversion of runoff from one major basin into another at various locations.

The watershed is rural in nature and consists entirely of desert. It is characterized by small areas of rugged mountainous terrain in portions of the western study area, and much flatter desert in the remainder of the watershed. The watershed ranges in elevation from a low of 1,500

feet at the Verde River, to a high 3,526 feet in sub-basins 10 and 130 on Granite Mountain. Typical soil types are cobbly, and gravelly and sandy loams. These soil textures correspond to SCS Hydrologic Soil Groups B and D. The watershed as a whole can therefore be characterized as having a moderately low runoff potential, even though the mountainous areas have a moderate to high runoff potential.

The target criteria for subdividing the watershed into sub-basins was to maintain sub-basin size to a maximum area of 1.5 square miles. There are a total of 21 sub-basins in the study watershed.

3.2.2 Physical Parameters

3.2.2.1 Watershed Sub-Basin Parameters

General

The watershed sub-basin parameters were estimated in conformance with the Design Manual. The procedures used for estimating the parameters are contained in the following sections.

Soils Parameters

General

Rainfall losses were estimated using the Green-Ampt infiltration equation. Soil textures were obtained from the following source:

Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona, (SCS Soil Survey), prepared by the United States Department of Agriculture, Soil Conservation Service, not dated (preliminary).

The SCS Soil Survey does not cover the portions of the watershed generally situated to the east of the Section 25/30 section line within the study area. Soil types in these areas were estimated, with the guidance of SCS personnel, by inspection of aerial photographs. While actual soil map unit numbers were assigned to various soils within the unmapped areas, it is important to note that these estimates are crude and have not been verified by "ground truth" testing. Nevertheless, the general hydrologic soil characteristics are reflected in the estimated map unit numbers, and therefore no significant effect on runoff calculations will occur.

Green-Ampt Parameters by SCS Soil Map Unit - The first step in determining rainfall loss values was to estimate Green-Ampt values for each SCS soil unit present on the watershed. This task was done using the District's Lotus spreadsheet SGRAPH.WK1. Refer to Tables S-1 and S-2. Table S-1 is an interpolation table used to determine the DTHETA and PSIF parameters given an XKSAT value. The table was derived from Table 4.2 of the Design Manual. Table S-2 is a listing of the Green-Ampt parameters for every SCS soil map unit described in the SCS Soil Survey. It is important to note that the XKSAT values listed in Table S-2 are composite values based on both major and minor soils described in the SCS Soil Survey. The values of PSIF and DTHETA in Table S-2 are obtained by looking up the composite XKSAT value in Table S-1 and returning the corresponding PSIF and DTHETA entries. The XKSAT column in Table S-2 is listed as "unadjusted" because vegetation cover density correction factors have not yet been applied. The entries for XKSAT in Table S-2 do not reflect major and minor soils with the "sand" soil texture classification. Therefore, the table values do not exceed 1.2 inches per hour. This was done since the majority of the "sand" soils lie in wash channel bottoms. Averaging in the high XKSAT value for sand (4.6-inches per hour) results in an unrealistically high XKSAT value for the map unit, which is not representative of the watershed coverage as a whole.

Green-Ampt Parameters by Sub-Basin - The XKSAT, DTHETA, and PSIF parameters were estimated for each sub-basin by calculating composite XKSAT values based on area. Composite values of XKSAT were calculated for each sub-basin using the District's spreadsheet SGRAPH.WK1 after the soil unit areas were calculated. Refer to Table S-4, a printout of the SGRAPH.WK1 spreadsheet; it shows the derivation of the Green & Ampt soil loss parameters for each sub-basin.

The soil map units present in every sub-basin, and the corresponding area and unadjusted XKSAT values, are listed in the first rows. The composite (unadjusted) XKSAT parameter was calculated by averaging the common logarithm of the XKSAT values from column four using area weighting. This was accomplished by multiplying the total area of each soil map unit in the sub-basin by the common logarithm of the associated XKSAT value. The resultant products were then totalled and the sum was divided by the total area of the sub-basin. The result is the composite log-average XKSAT parameter. The log-average XKSAT parameter was then adjusted for the effects of vegetation cover using Figure 4.3 of the Design Manual. The source of the Vegetation Cover Density values is listed in column 5 of Table S-3 and is discussed under Land Use Characteristics.

The DTHETA parameter for a dry watershed condition was read from Table S-1 using the adjusted XKSAT value calculated as described above. The value of PSIF was also read from Table S-1 based on the adjusted XKSAT value.

A summary of sub-basin Green-Ampt parameters is provided in Table S-5.

Watershed Delineation and Areas

The SCS soil map unit boundaries and sub-basin delineations shown on Exhibits "A", "B" and "C" were derived using the following process:

1. The sub-basin boundaries were determined using original copies of the USGS quadrangle maps and contact photo prints of the orthophotographs. The delineation was done using the procedures described in Section 3.2.1 Routing paths and Lag Time flow paths were derived using the same procedure.

2. Exhibits "A", "B" and "C" have been prepared using mosaicked AutoCad files of the USGS quadrangle maps, as described in Section 2.1. The graphic data prepared as described above was plotted using AutoCad onto the mylar base maps.

   The areas of soil map units present in a sub-basin, and sub-basin total areas, were calculated by use of a digital planimeter. The soil map unit areas in Table S-4 are the total area of all polygons for a particular soil map unit within a sub-basin.

Land Use Characteristics

The land use characteristics of the entire watershed fall into the natural desert classification. Surface characteristics affecting the hydrology include terrain (hillslope, mountain) and vegetative cover density. These surface characteristics were used to calculate composite values of initial abstraction (IA) and RTIMP.

The IA (initial abstraction) parameter was estimated based on terrain classification characteristics, that is, "hillslope" or "mountain". This methodology is based on the Design Manual, in which a value of 0.15 inches is recommended for hillslope terrain, and 0.25 inches for mountainous terrain. Percentages of area of each terrain type were estimated for all sub-basins by inspection of USGS topographic mapping and the aerial photographs.

Surface Class	Initial Abstraction (inches)
Hillslope	0.15
Mountain	0.25

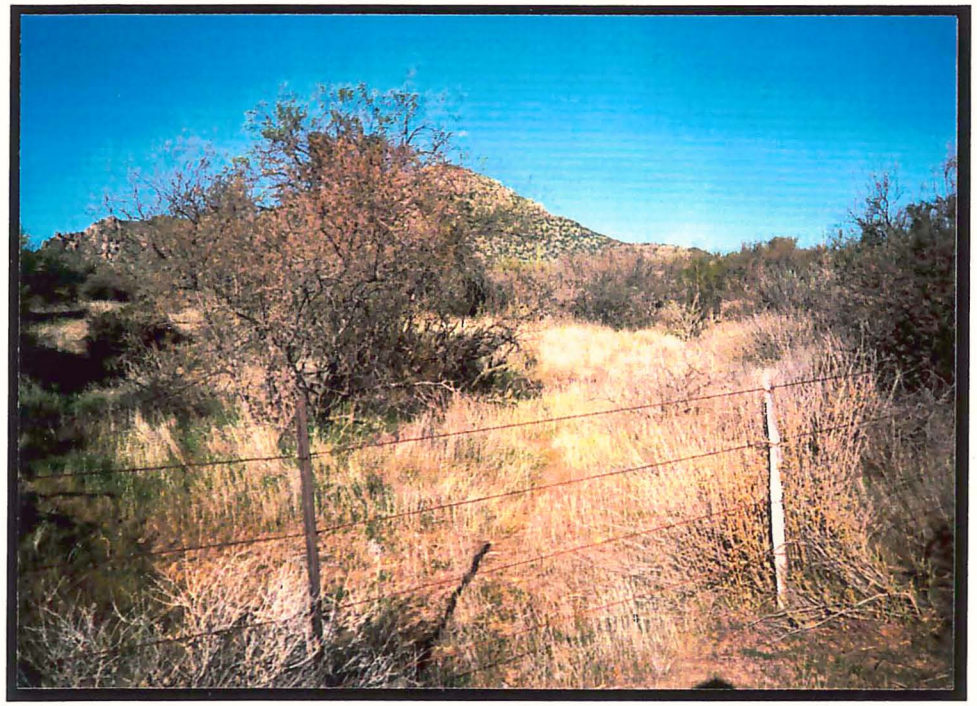
The weighting calculation was done as follows:

$$IA = \frac{[\%\ hillslope/100] \times 0.15 + [\%\ mountain/100] \times 0.25}{100}$$

Refer to Table S-3, columns 1 through 4, for a tabulation of surface terrain characteristics and weighted IA values.

The vegetation density values listed for each sub-basin in Column 5 of Table S-3 were based on observations made during the field reconnaissance. These values were correlated with a tree count (trees per unit area) on the aerial photo contact prints. Using this correlation ratio, percent vegetation cover was estimated for each sub-basin.

The following photograph is an example of an area with an estimated vegetation cover density of 25%. This value does not include the winter grasses seen in the open areas.



In general, vegetation cover estimates are based on summer conditions, when grasses are not present.

Values of RTIMP for this watershed were given a value of 0 for all sub-basins. In Table S-4, a value of 0 percent effective was used for the rock outcrop in all sub-basins, because in every sub-basin in which rock outcrop occurs, the rock outcrop is not continuous (based on field observations). In addition, rock outcrop occurs in the mountainous upper parts of the sub-basins, meaning that flow must travel over a significant length of pervious soil before reaching the sub-basin outlet.

Lag Times

A lag time for each sub-basin was evaluated using the following relationship:

$$\text{lag} = C \frac{LL_{ca}{}^{m}}{S^{p}}$$

Where, lag = basin lag time in hours, and

L	=	length of the longest watercourse in miles
L_{ca}	=	length along the watercourse to a point opposite the centroid in miles
S	=	watercourse slope in feet per mile
C	=	$24K_n$ (from U.S. Army Corps of Engineers [COE])
m	=	0.38 (from COE)
p	=	0.5
K_n	=	estimated mean Manning's value for all channels in the basin.

The parameters listed above, which are necessary to estimate lag time, were derived from Exhibit "A". The K_n value was estimated during field reconnaissance visits. The information necessary to estimate lag time is contained in Table S-3.

S-Graphs

The Design Manual lists two types of S-Graphs approved for use in Maricopa County. These are the Phoenix Mountain S-Graph and Phoenix Valley S-Graph. Per input from the District, the Phoenix Valley S-Graph was used for all sub-basins in this study. A separate S-Graph-based unit hydrograph was generated for each sub-basin by use of the computer program MCUHP2. This program was written by the Flood Control District and is furnished with the Design Manual. This program creates a set of unit hydrograph (UI) records for direct input to HEC-1.

Sample Calculation of Sub-Basin Parameters

The following is an example of the calculation procedures used in preparing the data in Tables S-3 through S-5.

Green-Ampt Parameter Calculations for Sub-Basin 5

Step 1: *Calculate the log-average value of XKSAT.* Refer to Table S-4.

Log-Avg XKSAT = where a is:
(-0.401) + (-0.253) + (-0.119) + (-0.008)
= 0.781

Log-Avg XKSAT = $10^{-0.781}$ *= 0.17 inches per hour*

Step 2: *Adjust XKSAT to reflect the effects of vegetation cover.* Refer to Table S-3.

$$Ck = \frac{25-10}{90} + 1.0 = 1.17$$

XKSAT (adjusted) = 1.17 x 0.17 = 0.198 inches per hour

Step 3: *Calculate the total percentages of Hillslope and Mountain terrain classes present in the sub-basin.* Refer to Table S-3.

Step 4: *Determine the DTHETA and PSIF parameters.* Refer to Table S-4. Use the Log-Average XKSAT value of 0.17 to look up the values for DTHETA (dry) and PSIF in Table S-1.

DTHETA (dry) = 0.39
PSIF = 5.70 inches

Step 5: *Calculate the composite value of RTIMP for the sub-basin.* Refer to Table S-4 and discussion under Land Use Characteristics.

Step 6: *Calculate the composite Initial Abstraction, IA, in inches.* Refer to Table S-4 and he discussion under Land Use Characteristics.

Step 7: *Estimate the lag time for sub-basin 5.* The lag time for sub-basin 5 is then estimated using the expression set forth under "Lag Times" in this section. The variable L was set equal to the flow path length of 2.73 miles. The variable L_{ca} was estimated to be 1.59 miles. Refer to Exhibit "A" for a depiction of the flow path limits used to estimate L and L_{ca} for sub-basin 5. The coefficient C was estimated using the expression $C = 24K_n$. K_n, the mean Manning's "n" for all channels within the sub-basin, is a composite value based on the sub-basin surface characteristics. The values used for each sub-basin were based on the following general guidelines:

Surface Characteristic	K_n
Valley	0.05
Hillslopes	0.06 - 0.07
Mountains	0.07 - 0.08

These values were estimated during the field reconnaissance, and are shown in Table S-3.

TABLE S-1

DTHETA AND PSIF INTERPOLATION TABLE USING XKSAT

(For 0.00 < XKSAT <= 1.20)

XKSAT (rounded)	DTHETA (Dry)	DTHETA (Normal)	PSIF
0.01	0.150	0.050	12.40
0.02	0.190	0.100	11.20
0.03	0.220	0.130	10.10
0.04	0.250	0.150	9.70
0.05	0.270	0.150	8.80
0.06	0.290	0.150	8.40
0.07	0.300	0.150	8.00
0.08	0.320	0.150	7.60
0.09	0.330	0.150	7.30
0.10	0.350	0.150	7.00
0.11	0.360	0.170	6.80
0.12	0.370	0.190	6.60
0.13	0.380	0.210	6.40
0.14	0.390	0.230	6.20
0.15	0.400	0.250	6.00
0.16	0.390	0.250	5.80
0.17	0.390	0.250	5.70
0.18	0.380	0.250	5.60
0.19	0.380	0.250	5.40
0.20	0.370	0.250	5.30
0.21	0.370	0.250	5.20
0.22	0.360	0.250	5.10
0.23	0.360	0.250	5.00
0.24	0.350	0.250	4.90
0.25	0.350	0.250	4.80
0.26	0.350	0.250	4.70
0.27	0.350	0.250	4.65
0.28	0.350	0.250	4.60
0.29	0.350	0.250	4.55
0.30	0.350	0.250	4.50
0.31	0.350	0.250	4.45
0.32	0.350	0.250	4.40
0.33	0.350	0.250	4.35
0.34	0.350	0.250	4.30
0.35	0.350	0.250	4.25
0.36	0.350	0.250	4.20
0.37	0.350	0.250	4.15
0.38	0.350	0.250	4.10
0.39	0.350	0.250	4.00
0.40	0.350	0.250	3.95
0.41	0.350	0.250	3.92
0.42	0.350	0.250	3.88
0.43	0.350	0.250	3.85
0.44	0.350	0.250	3.81

TABLE S-1

DTHETA AND PSIF INTERPOLATION TABLE USING XKSAT

(For 0.00 < XKSAT <= 1.20)

XKSAT (rounded)	DTHETA (Dry)	DTHETA (Normal)	PSIF
0.45	0.350	0.260	3.78
0.46	0.350	0.260	3.74
0.47	0.350	0.260	3.71
0.48	0.350	0.260	3.67
0.49	0.350	0.260	3.64
0.50	0.350	0.260	3.60
0.51	0.350	0.260	3.58
0.52	0.350	0.260	3.55
0.53	0.350	0.260	3.53
0.54	0.350	0.260	3.50
0.55	0.350	0.260	3.48
0.56	0.350	0.260	3.45
0.57	0.350	0.270	3.43
0.58	0.350	0.270	3.40
0.59	0.350	0.270	3.38
0.60	0.350	0.270	3.35
0.61	0.350	0.270	3.33
0.62	0.350	0.270	3.31
0.63	0.350	0.270	3.29
0.64	0.350	0.270	3.27
0.65	0.350	0.270	3.25
0.66	0.350	0.270	3.23
0.67	0.350	0.270	3.21
0.68	0.350	0.270	3.19
0.69	0.350	0.270	3.17
0.70	0.350	0.270	3.15
0.71	0.350	0.280	3.13
0.72	0.350	0.280	3.11
0.73	0.350	0.280	3.09
0.74	0.350	0.280	3.07
0.75	0.350	0.280	3.05
0.76	0.350	0.280	3.03
0.77	0.350	0.280	3.01
0.78	0.350	0.280	2.99
0.79	0.350	0.280	2.97
0.80	0.350	0.280	2.95
0.81	0.350	0.280	2.94
0.82	0.350	0.280	2.92
0.83	0.350	0.280	2.91
0.84	0.350	0.280	2.89
0.85	0.350	0.280	2.88
0.86	0.350	0.280	2.86
0.87	0.350	0.280	2.85
0.88	0.350	0.290	2.83

TABLE S-1

DTHETA AND PSIF INTERPOLATION TABLE USING XKSAT

(For 0.00 < XKSAT <= 1.20)

XKSAT (rounded)	DTHETA (Dry)	DTHETA (Normal)	PSIF
0.89	0.350	0.290	2.82
0.90	0.350	0.290	2.80
0.91	0.350	0.290	2.79
0.92	0.350	0.290	2.77
0.93	0.350	0.290	2.76
0.94	0.350	0.290	2.74
0.95	0.350	0.290	2.73
0.96	0.350	0.290	2.71
0.97	0.350	0.290	2.70
0.98	0.350	0.290	2.68
0.99	0.350	0.290	2.67
1.00	0.350	0.290	2.65
1.01	0.350	0.290	2.64
1.02	0.350	0.290	2.63
1.03	0.350	0.290	2.62
1.04	0.350	0.290	2.61
1.05	0.350	0.290	2.60
1.06	0.350	0.290	2.59
1.07	0.350	0.290	2.58
1.08	0.350	0.300	2.57
1.09	0.350	0.300	2.56
1.10	0.350	0.300	2.55
1.11	0.350	0.300	2.54
1.12	0.350	0.300	2.53
1.13	0.350	0.300	2.52
1.14	0.350	0.300	2.51
1.15	0.350	0.300	2.50
1.16	0.350	0.300	2.49
1.17	0.350	0.300	2.48
1.18	0.350	0.300	2.47
1.19	0.350	0.300	2.46
1.20	0.350	0.300	2.45

TABLE S-2

SUMMARY
of
GREEN-AMPT PARAMETERS BY SCS MAP UNIT

SCS Soil Map Unit	XKSAT (Unadj)	PSIF	DTHETA (Dry)	DTHETA (Normal)	% ROCK OUTCROP
45	0.03	10.10	0.22	0.13	0
46	0.03	10.10	0.22	0.13	0
47	0.11	6.80	0.36	0.17	0
48	0.06	8.40	0.29	0.15	0
49	0.06	8.40	0.29	0.15	0
50	0.26	4.70	0.35	0.25	0
51	0.24	4.90	0.35	0.25	0
52	0.16	5.80	0.39	0.25	20
53	0.02	11.20	0.19	0.10	0
54	0.29	4.55	0.35	0.25	0
55	0.27	4.65	0.35	0.25	0
56	0.27	4.65	0.35	0.25	0
57	0.06	8.40	0.29	0.15	0
58	0.34	4.30	0.35	0.25	0
59	0.34	4.30	0.35	0.25	0
60	0.26	4.70	0.35	0.25	0
61	0.15	6.00	0.40	0.25	0
62	0.15	6.00	0.40	0.25	0
63	0.14	6.20	0.39	0.23	25
64	0.14	6.20	0.39	0.23	25
65	0.19	5.40	0.38	0.25	0
66	0.23	5.00	0.36	0.25	0
67	0.01	12.40	0.15	0.05	0
68	0.63	3.29	0.35	0.27	0
69	0.63	3.29	0.35	0.27	0
70	0.36	4.20	0.35	0.25	0
71	0.36	4.20	0.35	0.25	0
72	0.09	7.30	0.33	0.15	30
73	0.09	7.30	0.33	0.15	30
74	0.08	7.60	0.32	0.15	0
75	0.23	5.00	0.36	0.25	0
76	0.23	5.00	0.36	0.25	0
77	0.05	8.80	0.27	0.15	0
78	0.05	8.80	0.27	0.15	0
79	0.02	11.20	0.19	0.10	0
80	0.08	7.60	0.32	0.15	0
81	0.08	7.60	0.32	0.15	0
82	0.04	9.70	0.25	0.15	0
83	0.04	9.70	0.25	0.15	0
84	0.05	8.80	0.27	0.15	0
85	0.04	9.70	0.25	0.15	0
86	0.05	8.80	0.27	0.15	0
87	0.04	9.70	0.25	0.15	0
88	0.02	11.20	0.19	0.10	0

TABLE S-2

SUMMARY
of
GREEN-AMPT PARAMETERS BY SCS MAP UNIT

SCS Soil Map Unit	XKSAT (Unadj)	PSIF	DTHETA (Dry)	DTHETA (Normal)	% ROCK OUTCROP
89	0.06	8.40	0.29	0.15	0
90	0.39	4.00	0.35	0.25	0
91	0.93	2.76	0.35	0.29	0
92	0.93	2.76	0.35	0.29	0
93	0.33	4.35	0.35	0.25	0
94	0.33	4.35	0.35	0.25	0
95	0.04	9.70	0.25	0.15	0
96	0.07	8.00	0.30	0.15	0
97	0.07	8.00	0.30	0.15	0
98	0.37	4.15	0.35	0.25	0
99	0.37	4.15	0.35	0.25	0
100	0.4	3.95	0.35	0.25	20
101	0.28	4.60	0.35	0.25	0
102	0.4	3.95	0.35	0.25	0
103	0.1	7.00	0.35	0.15	65
104	0.14	6.20	0.39	0.23	60
105	0.14	6.20	0.39	0.23	60
106	0.18	5.60	0.38	0.25	0
107	0.18	5.60	0.38	0.25	0
108	0.31	4.45	0.35	0.25	30
109	0.35	4.25	0.35	0.25	35
110	0.13	6.40	0.38	0.21	0
111	0.4	3.95	0.35	0.25	0
112	0.39	4.00	0.35	0.25	0
113	0.39	4.00	0.35	0.25	0
114	0.39	4.00	0.35	0.25	0
115	0.39	4.00	0.35	0.25	0
116	0.23	5.00	0.36	0.25	0
117	0.23	5.00	0.36	0.25	0
118	0.42	3.88	0.35	0.25	0
119	0.14	6.20	0.39	0.23	0
120	0.06	8.40	0.29	0.15	0
121	0.12	6.60	0.37	0.19	0
122	0.33	4.35	0.35	0.25	0
123	0.37	4.15	0.35	0.25	0
124	0.39	4.00	0.35	0.25	0
125	0.43	3.85	0.35	0.25	0

TABLE S-2

SUMMARY
of
SOIL LOSS PARAMETERS BY SCS MAP UNIT

SCS Soil Map Unit	XKSAT (Unadj)	PSIF	DTHETA (Dry)	DTHETA (Normal)	% ROCK OUTCROP
1	0.41	3.92	0.35	0.25	0
2	0.41	3.92	0.35	0.25	0
3	0.58	3.40	0.35	0.27	0
4	0.58	3.40	0.35	0.27	0
5	0.43	3.85	0.35	0.25	0
6	0.62	3.31	0.35	0.27	0
7	0.62	3.31	0.35	0.27	0
8	0.96	2.71	0.35	0.29	0
9	0.27	4.65	0.35	0.25	0
10	0.94	2.74	0.35	0.29	0
11	0.94	2.74	0.35	0.29	0
12	0.01	12.40	0.15	0.05	0
13	0.01	12.40	0.15	0.05	0
14	1.04	2.61	0.35	0.29	0
15	0.54	3.50	0.35	0.26	0
16	0.44	3.81	0.35	0.25	15
17	0.44	3.81	0.35	0.25	15
18	0.33	4.35	0.35	0.25	15
19	0.19	5.40	0.38	0.25	0
20	0.19	5.40	0.38	0.25	0
21	0.38	4.10	0.35	0.25	0
22	0.04	9.70	0.25	0.15	0
23	0.01	12.40	0.15	0.05	0
24	0.02	11.20	0.19	0.10	0
25	0.02	11.20	0.19	0.10	0
26	0.01	12.40	0.15	0.05	0
27	0.01	12.40	0.15	0.05	0
28	0.02	11.20	0.19	0.10	0
29	0.34	4.30	0.35	0.25	0
30	0.34	4.30	0.35	0.25	0
31	0.33	4.35	0.35	0.25	35
32	0.33	4.35	0.35	0.25	35
33	0.23	5.00	0.36	0.25	0
34	0.23	5.00	0.36	0.25	0
35	0.23	5.00	0.36	0.25	0
36	0.07	8.00	0.30	0.15	0
37	0.13	6.40	0.38	0.21	0
38	0.13	6.40	0.38	0.21	0
39	0.29	4.55	0.35	0.25	0
40	0.17	5.70	0.39	0.25	0
41	0.17	5.70	0.39	0.25	0
42	0.17	5.70	0.39	0.25	0
43	0.17	5.70	0.39	0.25	0
44	0.03	10.10	0.22	0.13	0

TABLE S-3

SUB-BASIN SURFACE LOSS AND LAG TIME PARAMETERS

Sub Basin I.D.	Surface Characteristics (%)		IA (wghtd) (in)	Veg. Cover %	Sub-Basin Slope Calculations					S-Graph Lag Time					
	Hillslopes	Mountain			Top Elev.	Bottom Elev.	Length (ft)	Height (ft)	Slope (ft/ft)	Slope (ft/mi)	L (mi)	Lca (mi)	Kn	Lag (hrs)	Lag (min)
5	100	0	0.15	25	2740	2300	14,399	440	0.0306	161	2.73	1.59	0.07	1.117	67.02
10	80	20	0.17	35	3526	2300	18,000	1226	0.0681	360	3.41	1.97	0.07	1.132	67.94
20	100	0	0.15	30	2315	1895	15,622	420	0.0269	142	2.96	1.33	0.07	1.103	66.17
25	100	0	0.15	20	2480	2230	9,900	250	0.0253	133	1.88	0.95	0.07	0.826	49.58
35	100	0	0.15	30	2620	2170	16,400	450	0.0274	145	3.11	1.67	0.07	1.219	73.15
50	100	0	0.15	40	2340	2000	12,999	340	0.0262	138	2.46	0.95	0.06	0.779	46.73
60	100	0	0.15	35	2240	1840	14,800	400	0.0270	143	2.80	1.14	0.05	0.726	43.56
85	100	0	0.15	20	1990	1555	14,676	435	0.0296	157	2.78	1.39	0.07	1.075	64.50
95	100	0	0.15	30	1880	1555	10,998	325	0.0296	156	2.08	0.85	0.07	0.800	48.02
105	95	5	0.155	45	3406	2639	12,999	767	0.0590	312	2.46	1.00	0.07	0.796	47.76
110	75	25	0.175	55	2842	2610	10,961	232	0.0212	112	2.08	0.85	0.07	0.850	51.01
120	100	0	0.15	30	2850	2410	19,599	440	0.0224	119	3.71	1.23	0.07	1.209	72.54
130	100	0	0.15	40	3526	2410	24,003	1116	0.0465	245	4.55	2.58	0.07	1.504	90.24
140	100	0	0.15	45	2720	2280	15,998	440	0.0275	145	3.03	1.29	0.07	1.095	65.67
150	100	0	0.15	30	2580	2015	20,999	565	0.0269	142	3.98	1.74	0.07	1.367	82.02
160	100	0	0.15	45	2390	1905	18,501	485	0.0262	138	3.50	1.97	0.06	1.176	70.55
165	100	0	0.15	40	2380	2100	10,998	280	0.0255	134	2.08	0.87	0.07	0.830	49.82
175	100	0	0.15	50	1955	1690	9,851	265	0.0269	142	1.87	0.90	0.07	0.798	47.87
177	100	0	0.15	50	1750	1590	6,716	160	0.0238	126	1.27	0.62	0.07	0.613	36.76
178	100	0	0.15	50	1690	1590	4,716	100	0.0212	112	0.89	0.37	0.07	0.450	27.00
185	100	0	0.15	55	1660	1500	6,801	160	0.0235	124	1.29	0.60	0.07	0.609	36.56
195	100	0	0.15	30	2040	1830	7,598	210	0.0276	146	1.44	0.74	0.07	0.668	40.05
205	100	0	0.15	55	1845	1520	11,500	325	0.0283	149	2.18	1.03	0.07	0.882	52.92
215	100	0	0.15	50	1940	1730	7,102	210	0.0296	156	1.35	0.65	0.07	0.611	36.69
222	100	0	0.15	55	1765	1535	9,303	230	0.0247	131	1.76	0.69	0.07	0.717	43.02

LOSS PARAMETERS FOR SUBBASIN: 5S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
33	0.327	62.76	0.23	-0.401	0.00	0.00
96	0.114	21.88	0.07	-0.253	0.00	0.00
61	0.075	14.40	0.15	-0.119	0.00	0.00
63	0.005	0.96	0.14	-0.008	25.00	0.24
TOTAL =	0.521 SQ MI		XKSAT =	0.17	%ROCK=	0.24

DTHETA		PSIF	
Dry =	0.39	=	5.7
Normal =	0.25		
Wet =	0		

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.521	DESERT	100.00	DRY	25.00	0.00	0.00	0.15	0.150
0.521	=TOTAL AREA OK		AVERAGE =	25.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.390

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.198

IMPERVIOUS AREA: URBAN @ % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
5S	0.521	0.150	0.390	5.70	0.198	0.00	67.00

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 10S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
63	0.550	47.95	0.14	-0.409	25.00	11.99
33	0.261	22.76	0.23	-0.145	0.00	0.00
96	0.130	11.33	0.07	-0.131	0.00	0.00
61	0.111	9.68	0.15	-0.080	0.00	0.00
6	0.081	7.06	0.62	-0.015	0.00	0.00
93	0.014	1.22	0.33	-0.006	0.00	0.00

TOTAL = 1.147 SQ MI XKSAT = 0.16 %ROCK= 11.99

DTHETA

Dry = 0.39
Normal = 0.25
Wet = 0

PSIF

= 5.8

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
1.147	DESERT	100.00	DRY	35.00	0.00	0.00	0.17	0.170
1.147	=TOTAL AREA OK		AVERAGE =	35.00	TOTAL = % =	0.00 0.00	AVG. =	0.170

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.390

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.204

IMPERVIOUS AREA: URBAN @ % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00

% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
10S	1.147	0.170	0.390	5.80	0.204	0.00	67.90

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 20S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP *	% Area %R.O.
122	0.275	50.28	0.33	-0.242	0.00	0.00
96	0.189	34.54	0.07	-0.399	0.00	0.00
6	0.083	15.18	0.62	-0.032	0.00	0.00

TOTAL = 0.547 SQ MI XKSAT = 0.21 %ROCK= 0.00

DTHETA		PSIF	
Dry =	0.37	=	5.2
Normal =	0.25		
Wet =	0		

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.547	DESERT	100.00	DRY	30.00	0.00	0.00	0.15	0.150
0.547	=TOTAL AREA OK		AVERAGE =	30.00	TOTAL = % =	0.00 0.00	AVG. =	0.150

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.370

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.256

IMPERVIOUS AREA: URBAN @ 0 % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
20S	0.547	0.150	0.370	5.20	0.256	0.00	66.17

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 25S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
33	0.323	75.12	0.23	-0.479	0.00	0.00
96	0.094	21.86	0.07	-0.252	0.00	0.00
6	0.013	3.02	0.62	-0.006	0.00	0.00

TOTAL = 0.430 SQ MI XKSAT = 0.18 %ROCK= 0.00

DTHETA		PSIF	
Dry =	0.38	=	5.6
Normal =	0.25		
Wet =	0		

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.430	DESERT	100.00	DRY	20.00	0.00	0.00	0.15	0.150
0.430	=TOTAL AREA OK		AVERAGE =	20.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.380

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.200

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
25S	0.430	0.150	0.380	5.60	0.200	0.00	49.60

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 35S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
33	0.525	73.32	0.23	-0.468	0.00	0.00
96	0.114	15.92	0.07	-0.184	0.00	0.00
122	0.077	10.75	0.33	-0.052	0.00	0.00

TOTAL = 0.716 SQ MI XKSAT = 0.20 %ROCK= 0.00

DTHETA		PSIF	
Dry =	0.37	=	5.3
Normal =	0.25		
Wet =	0		

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.716	DESERT	100.00	DRY	30.00	0.00	0.00	0.15	0.150
0.716	=TOTAL AREA OK		AVERAGE =	30.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.370

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.244

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
35S	0.716	0.150	0.370	5.30	0.244	0.00	73.15

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 50S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
122	0.220	55.00	0.33	-0.265	0.00	0.00
96	0.162	40.50	0.07	-0.468	0.00	0.00
6	0.018	4.50	0.62	-0.009	0.00	0.00

TOTAL = 0.400 SQ MI XKSAT = 0.18 %ROCK= 0.00

DTHETA

Dry = 0.38
Normal = 0.25
Wet = 0

PSIF

= 5.6

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.400	DESERT	100.00	DRY	40.00	0.00	0.00	0.15	0.150

0.400 =TOTAL AREA OK AVERAGE = 40.00 TOTAL = 0.00 AVG. = 0.150
% = 0.00

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.380

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.239

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00

% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
50S	0.400	0.150	0.380	5.60	0.239	0.00	46.73

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 60S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
122	0.520	100.00	0.33	-0.481	0.00	0.00
TOTAL =	0.520 SQ MI		XKSAT =	0.33	%ROCK=	0.00

DTHETA		PSIF	
Dry =	0.35	=	4.35
Normal =	0.25		
Wet =	0		

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.520	DESERT	100.00	DRY	35.00	0.00	0.00	0.15	0.150
0.520	=TOTAL AREA OK		AVERAGE =	35.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN

DRY =	100.00 %
NORMAL =	0.00 %
WET =	0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.350

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.421

IMPERVIOUS AREA:

URBAN @	---	% effective =	0.00
ROCK OUTCROP @	0	% effective =	0.00
		% EFFECTIVE IMP. =	0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
60S	0.520	0.150	0.350	4.35	0.421	0.00	43.60

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 85S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
96	0.394	54.57	0.07	-0.630	0.00	0.00
122	0.206	28.53	0.33	-0.137	0.00	0.00
6	0.122	16.90	0.62	-0.035	0.00	0.00

TOTAL = 0.722 SQ MI XKSAT = 0.16 %ROCK= 0.00

DTHETA

Dry = 0.39
Normal = 0.25
Wet = 0

PSIF

= 5.8

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.722	DESERT	100.00	DRY	20.00	0.00	0.00	0.15	0.150

0.722 =TOTAL AREA OK AVERAGE = 20.00 TOTAL = 0.00 AVG. = 0.150
% = 0.00

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.390

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.178

IMPERVIOUS AREA: URBAN @ 0 % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
85S	0.722	0.150	0.390	5.80	0.178	0.00	64.50

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 95S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
96	0.226	100.00	0.07	-1.155	0.00	0.00

TOTAL = 0.226 SQ MI XKSAT = 0.07 %ROCK= 0.00

DTHETA		PSIF
Dry =	0.3	= 8
Normal =	0.15	
Wet =	0	

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.226	DESERT	100.00	DRY	30.00	0.00	0.00	0.15	0.150
0.226	=TOTAL AREA OK		AVERAGE =	30.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.300

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.085

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
95S	0.226	0.150	0.300	8.00	0.085	0.00	48.02

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 105S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
61	0.700	55.07	0.15	-0.454	0.00	0.00
33	0.377	29.66	0.23	-0.189	0.00	0.00
96	0.156	12.27	0.07	-0.142	0.00	0.00
63	0.038	2.99	0.14	-0.026	25.00	0.75

TOTAL = 1.271 SQ MI XKSAT = 0.15 %ROCK= 0.75

DTHETA

Dry = 0.4
Normal = 0.25
Wet = 0

PSIF

= 6

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
1.271	DESERT	100.00	DRY	45.00	0.00	0.00	0.16	0.155
1.271	=TOTAL AREA OK		AVERAGE =	45.00	TOTAL =	0.00	AVG. =	0.155
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.400

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.208

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
105S	1.271	0.155	0.400	6.00	0.208	0.00	47.76

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 110S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
61	0.278	46.57	0.15	-0.384	0.00	0.00
72	0.146	24.46	0.09	-0.256	30.00	7.34
33	0.121	20.27	0.23	-0.129	0.00	0.00
121	0.040	6.70	0.12	-0.062	0.00	0.00
96	0.012	2.01	0.07	-0.023	0.00	0.00

TOTAL = 0.597 SQ MI XKSAT = 0.14 %ROCK= 7.34

DTHETA

Dry = 0.39
Normal = 0.23
Wet = 0

PSIF

= 6.2

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.597	DESERT	100.00	DRY	55.00	0.00	0.00	0.18	0.175
0.597	=TOTAL AREA OK		AVERAGE =	55.00	TOTAL =	0.00	AVG. =	0.175
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.390

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.209

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
110S	0.597	0.175	0.390	6.20	0.209	0.00	51.01

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 120S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
33	0.900	76.79	0.23	-0.490	0.00	0.00
61	0.086	7.34	0.15	-0.060	0.00	0.00
96	0.064	5.46	0.07	-0.063	0.00	0.00
121	0.058	4.95	0.12	-0.046	0.00	0.00
72	0.034	2.90	0.09	-0.030	30.00	0.87
6	0.030	2.56	0.62	-0.005	0.00	0.00

TOTAL = 1.172 SQ MI XKSAT = 0.20 %ROCK= 0.87

DTHETA

Dry = 0.37
Normal = 0.25
Wet = 0

PSIF

= 5.3

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
1.172	DESERT	100.00	DRY	30.00	0.00	0.00	0.15	0.150
1.172	=TOTAL AREA OK		AVERAGE =	30.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.370

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.244

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
120S	1.172	0.150	0.370	5.30	0.244	0.00	72.54

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 130S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
61	0.729	50.00	0.15	-0.412	0.00	0.00
33	0.313	21.47	0.23	-0.137	0.00	0.00
96	0.237	16.26	0.07	-0.188	0.00	0.00
63	0.173	11.87	0.14	-0.101	25.00	2.97
93	0.006	0.41	0.33	-0.002	0.00	0.00

TOTAL = 1.458 SQ MI XKSAT = 0.14 %ROCK= 2.97

DTHETA

Dry = 0.39
Normal = 0.23
Wet = 0

PSIF

= 6.2

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
1.458	DESERT	100.00	DRY	40.00	0.00	0.00	0.15	0.150
1.458	=TOTAL AREA OK		AVERAGE =	40.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.390

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.186

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
130S	1.458	0.150	0.390	6.20	0.186	0.00	90.24

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 140S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
33	0.522	58.59	0.23	-0.374	0.00	0.00
96	0.220	24.69	0.07	-0.285	0.00	0.00
6	0.074	8.31	0.62	-0.017	0.00	0.00
61	0.036	4.04	0.15	-0.033	0.00	0.00
63	0.021	2.36	0.14	-0.020	25.00	0.59
93	0.018	2.02	0.33	-0.010	0.00	0.00

TOTAL = 0.891 SQ MI XKSAT = 0.18 %ROCK= 0.59

DTHETA

Dry = 0.38
Normal = 0.25
Wet = 0

PSIF

= 5.6

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.891	DESERT	100.00	DRY	45.00	0.00	0.00	0.15	0.150
0.891	=TOTAL AREA OK		AVERAGE =	45.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.380

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.249

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
140S	0.891	0.150	0.380	5.60	0.249	0.00	65.70

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 150S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
122	0.379	41.33	0.33	-0.199	0.00	0.00
33	0.275	29.99	0.23	-0.191	0.00	0.00
6	0.177	19.30	0.62	-0.040	0.00	0.00
96	0.086	9.38	0.07	-0.108	0.00	0.00

TOTAL = 0.917 SQ MI XKSAT = 0.29 %ROCK= 0.00

DTHETA

Dry = 0.35
Normal = 0.25
Wet = 0

PSIF

= 4.55

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.917	DESERT	100.00	DRY	30.00	0.00	0.00	0.15	0.150

0.917 =TOTAL AREA OK AVERAGE = 30.00 TOTAL = 0.00 AVG. = 0.150
% = 0.00

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.350

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.354

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
150S	0.917	0.150	0.350	4.55	0.354	0.00	82.02

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 160S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
122	0.333	48.12	0.33	-0.232	0.00	0.00
96	0.264	38.15	0.07	-0.441	0.00	0.00
33	0.082	11.85	0.23	-0.076	0.00	0.00
6	0.013	1.88	0.62	-0.004	0.00	0.00

TOTAL = 0.692 SQ MI XKSAT = 0.18 %ROCK= 0.00

DTHETA

Dry = 0.38
Normal = 0.25
Wet = 0

PSIF

= 5.6

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.692	DESERT	100.00	DRY	45.00	0.00	0.00	0.15	0.150
0.692	=TOTAL AREA OK		AVERAGE =	45.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.380

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.249

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
160S	0.692	0.150	0.380	5.60	0.249	0.00	70.60

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 165S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
96	0.144	54.96	0.07	-0.635	0.00	0.00
121	0.076	29.01	0.12	-0.267	0.00	0.00
33	0.042	16.03	0.23	-0.102	0.00	0.00

TOTAL = 0.262 SQ MI XKSAT = 0.10 %ROCK= 0.00

DTHETA

Dry = 0.35
Normal = 0.15
Wet = 0

PSIF

= 7

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.262	DESERT	100.00	DRY	40.00	0.00	0.00	0.15	0.150
0.262	=TOTAL AREA OK		AVERAGE =	40.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.350

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.133

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
165S	0.262	0.150	0.350	7.00	0.133	0.00	49.80

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 175S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
122	0.185	98.93	0.33	-0.476	0.00	0.00
54	0.002	1.07	0.29	-0.006	0.00	0.00

TOTAL = 0.187 SQ MI XKSAT = 0.33 %ROCK= 0.00

DTHETA		PSIF
Dry =	0.35	= 4.35
Normal =	0.25	
Wet =	0	

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.187	DESERT	100.00	DRY	50.00	0.00	0.00	0.15	0.150
0.187	=TOTAL AREA OK		AVERAGE =	50.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.350

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.475

IMPERVIOUS AREA: URBAN @ 0 % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
175S	0.187	0.150	0.350	4.35	0.475	0.00	47.87

LOSS PARAMETERS FOR SUBBASIN: 177S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
122	0.109	95.61	0.33	-0.460	0.00	0.00
54	0.005	4.39	0.29	-0.024	0.00	0.00

TOTAL = 0.114 SQ MI XKSAT = 0.33 %ROCK= 0.00

DTHETA		PSIF	
Dry =	0.35	=	4.35
Normal =	0.25		
Wet =	0		

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.114	DESERT	100.00	DRY	50.00	0.00	0.00	0.15	0.150
0.114	=TOTAL AREA OK		AVERAGE =	50.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.350

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.475

IMPERVIOUS AREA: URBAN @ 0 % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
177S	0.114	0.150	0.350	4.35	0.475	0.00	36.76

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 178S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
122	0.027	75.00	0.33	-0.361	0.00	0.00
54	0.009	25.00	0.29	-0.134	0.00	0.00

TOTAL = 0.036 SQ MI XKSAT = 0.32 %ROCK= 0.00

DTHETA		PSIF	
Dry =	0.35	=	4.4
Normal =	0.25		
Wet =	0		

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.036	DESERT	100.00	DRY	50.00	0.00	0.00	0.15	0.150
0.036	=TOTAL AREA OK		AVERAGE =	50.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.350

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.461

IMPERVIOUS AREA: URBAN @ 0 % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
178S	0.036	0.150	0.350	4.40	0.461	0.00	27.00

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 185S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
122	0.049	50.00	0.33	-0.241	0.00	0.00
115	0.044	44.90	0.39	-0.184	0.00	0.00
10	0.005	5.10	0.94	-0.001	0.00	0.00

TOTAL = 0.098 SQ MI XKSAT = 0.38 %ROCK= 0.00

DTHETA		PSIF	
Dry =	0.35	=	4.1
Normal =	0.25		
Wet =	0		

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.098	DESERT	100.00	DRY	55.00	0.00	0.00	0.15	0.150
0.098	=TOTAL AREA OK		AVERAGE =	55.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.350

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.568

IMPERVIOUS AREA: URBAN @ 0 % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
185S	0.098	0.150	0.350	4.10	0.568	0.00	36.56

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 195S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
122	0.155	100.00	0.33	-0.481	0.00	0.00

TOTAL = 0.155 SQ MI XKSAT = 0.33 %ROCK= 0.00

DTHETA

Dry = 0.35
Normal = 0.25
Wet = 0

PSIF

= 4.35

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.155	DESERT	100.00	DRY	30.00	0.00	0.00	0.15	0.150
0.155	=TOTAL AREA OK		AVERAGE =	30.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.350

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.403

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
195S	0.155	0.150	0.350	4.35	0.403	0.00	40.10

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 205S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP *	% Area %R.O.
122	0.224	72.49	0.33	-0.349	0.00	0.00
96	0.070	22.65	0.07	-0.262	0.00	0.00
115	0.015	4.85	0.39	-0.020	0.00	0.00

TOTAL = 0.309 SQ MI XKSAT = 0.23 %ROCK= 0.00

DTHETA		PSIF	
Dry =	0.36	=	5
Normal =	0.25		
Wet =	0		

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.309	DESERT	100.00	DRY	55.00	0.00	0.00	0.15	0.150
0.309	=TOTAL AREA OK		AVERAGE =	55.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.360

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.344

IMPERVIOUS AREA: URBAN @ 0 % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
205S	0.309	0.150	0.360	5.00	0.344	0.00	52.92

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 215S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
122	0.136	100.00	0.33	-0.481	0.00	0.00
TOTAL =	0.136 SQ MI		XKSAT =	0.33	%ROCK=	0.00

DTHETA		PSIF	
Dry =	0.35	=	4.35
Normal =	0.25		
Wet =	0		

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.136	DESERT	100.00	DRY	50.00	0.00	0.00	0.15	0.150
0.136	=TOTAL AREA OK		AVERAGE =	50.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.350

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.475

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
215S	0.136	0.150	0.350	4.35	0.475	0.00	36.69

SECTION 3.2.2.1: WATERSHED SOILS PARAMETERS

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

LOSS PARAMETERS FOR SUBBASIN: 222S

Soil Survey Used AGUILA

XKSAT

Map Unit	AREA SQ MI	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
122	0.163	78.37	0.33	-0.377	0.00	0.00
115	0.036	17.31	0.39	-0.071	0.00	0.00
54	0.007	3.37	0.29	-0.018	0.00	0.00
10	0.002	0.96	0.94	-0.000	0.00	0.00

TOTAL = 0.208 SQ MI XKSAT = 0.34 %ROCK= 0.00

DTHETA		PSIF	
Dry =	0.35	=	4.3
Normal =	0.25		
Wet =	0		

LAND USE

AREA SQ MI	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ MI	IA in.	Wgtd.IA in.
0.208	DESERT	100.00	DRY	55.00	0.00	0.00	0.15	0.150
0.208	=TOTAL AREA OK		AVERAGE =	55.00	TOTAL =	0.00	AVG. =	0.150
					% =	0.00		

PERCENT OF SUBBASIN DRY = 100.00 %
NORMAL = 0.00 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.350

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.508

IMPERVIOUS AREA: URBAN @ --- % effective = 0.00
ROCK OUTCROP @ 0 % effective = 0.00
% EFFECTIVE IMP. = 0.00

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	IA inches	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG min.
222S	0.208	0.150	0.350	4.30	0.508	0.00	48.02

TABLE S-4
LOSS PARAMETERS BY SUB-BASIN

TABLE S-5

SUMMARY OF SUB-BASIN PARAMETERS

Sub-Basin ID	Area (sq mi)	IA (in)	DTHETA (in)	PSIF (in)	XKSAT adj. (in/hr)	RTIMP (%)	LAG (min)
5	0.521	0.150	0.390	5.70	0.198	0.00	67.00
10	1.147	0.170	0.390	5.80	0.204	0.00	67.90
25	0.430	0.150	0.380	5.60	0.200	0.00	49.60
35	0.716	0.150	0.370	5.30	0.244	0.00	76.70
50	0.400	0.150	0.380	5.60	0.239	0.00	47.80
60	0.520	0.150	0.350	4.35	0.421	0.00	43.60
85	1.300	0.150	0.390	5.70	0.207	0.00	96.40
95	0.226	0.150	0.300	8.00	0.085	0.00	49.40
105	1.271	0.155	0.400	6.00	0.208	0.00	47.80
110	0.597	0.175	0.390	6.20	0.209	0.00	51.50
120	1.172	0.150	0.370	5.30	0.244	0.00	72.90
130	1.458	0.150	0.390	6.20	0.186	0.00	92.20
140	0.891	0.150	0.380	5.60	0.249	0.00	65.70
150	0.917	0.150	0.350	4.55	0.354	0.00	82.20
160	0.692	0.150	0.380	5.60	0.249	0.00	70.60
165	0.262	0.150	0.350	7.00	0.133	0.00	49.80
175	0.278	0.150	0.350	4.35	0.475	0.00	61.30
185	0.145	0.150	0.350	4.35	0.493	0.00	37.00
195	0.155	0.150	0.350	4.35	0.403	0.00	40.10
205	0.310	0.150	0.350	4.50	0.448	0.00	54.40
215	0.136	0.150	0.350	4.35	0.475	0.00	37.00
222	0.209	0.150	0.350	4.30	0.508	0.00	48.02

TABLE S-6

AREAS FOR CONCENTRATION POINTS DOWNSTREAM FROM FLOW DIVERSIONS

HEC-1 ID	CONTRIBUTING AREAS (a)		Total Area (sq mi)
	Flow Split Concentration Points and Corresponding Areas (sq mi)		
21C	15C - 15DV + 20S	1.670 - 1.002 + 0.550	1.218
55C	40C - 40DV + 15DV + 50S	1.150 - 0.575 + 1.002 + 0.400	1.977
57C	21C + 55C - 55DV	1.220 + 1.980 - 0.989	2.207
65C	55DV + 60S + 40DV - 61DV	0.989 + 0.520 + 0.575 - 0.403	1.681
70C	65C + 61DV - 67DV	1.681 + 0.403 - 0.282	1.802
170C	155C - 155DV + 160S + 165S - 165DV	6.310 - 3.155 + 0.690 + 0.260 - 0.182	3.923
176C	170C - 171D + 175S	3.923 - 0.785 + 0.190	3.328
180AC	176C - 176DIV + 177DR + 177S	3.328 - 1.664 + 1.808 + 0.110	3.582
180BC	176DIV + 178S	1.664 + 0.040	1.704
200C	155DV + 195S + 67DV	3.155 + 0.160 + 0.282	3.597
210C	200C - 200DV + 205S	3.597 - 1.799 + 0.310	2.108
220C	200DV + 215S	1.799 + 0.140 + 1.939	1.938

3.2.2.2 Reach Route Parameters

General

Routing of sub-basin hydrographs was done utilizing the normal depth channel option of HEC-1. The routing reach paths are shown on Exhibit "C". Channel geometry used for each routing operation is shown in Table R-2. Refer to Exhibit "C" for the HEC-1 schematic diagram in which the combination and routing logic is depicted for the HEC-1 models.

Field Reconnaissance

The field reconnaissance was done on January 12, 1994. The majority of the watershed is within the jurisdiction of the Tonto National Forest; some eastern areas of the watershed are now privately owned.

Refer to Tables R-1 and R-2. Table R-1 contains the basin physical descriptions for each routing reach. The source of the cross-section used for each reach is identified in column 3. The reach length, top and bottom elevations, and average slope are listed in columns 4 through 8.

Table R-2 contains a summary of hydraulic data for each reach. The data in columns 4 through 7 are based upon the use of the Manning's equation. This equation was applied to the cross-section deemed typical of the reach, using the slope in column 2. The cross section geometry as well as the three n values for the left and right overbanks and channel are listed in the HEC-1 input file. Hydraulic calculations were performed using the peak discharges from the 100-year, 6-hour and 24-hour duration storms. The discharge values used are listed in columns 9 and 10. These values are the average of the peak flow entering the reach and the peak flow exiting the reach, as calculated by the HEC-1 models. The resultant top width and deepest flow depth are listed in columns 4 through 7. The data in columns 11 through 16 are discussed in detail in the Hydraulic Computations section.

Cross section geometry for routing reaches was estimated based on a combination of field observation, inspection of aerial photographs, and detailed topographic mapping.

Hydraulic Computations

General

The actual cross-section used for each routing reach was determined using a combination of field observation, aerial photographs, and USGS topographic mapping. In areas covered by detailed topographic mapping, minor adjustments were made to routing parameters as necessary to reflect cross section geometry. The data necessary for the reach route computations is summarized in Table R-1. The length of each routing reach and the top and bottom elevation were determined from Exhibit "A". The calculated average slope for each reach is listed in Table R-1.

Reach Route Step Estimation

Table R-2 contains hydraulic data used to estimate the reach travel time and the number of route computation steps for input to the HEC-1 models. The velocity, travel time, and number of steps listed in columns 11 through 16 of Table R-2 were determined using the reach travel times calculated by HEC-1. The process of estimating the number of reach storage route steps was iterative, and accomplished as follows:

Step 1: An initial estimate of the number of steps (NSTEPS) for every reach was made, assuming an average velocity of 5 feet per second. The HEC-1 models were run using the assumed values.

Step 2: The travel time for every reach was calculated by subtracting the time-to-peak at the beginning of the route operation from the time-to-peak for the route operation. The summary table data from the HEC-1 runs made in Step 1 were used to determine time-to-

peak. New NSTEP estimates were made using the travel times, and then input to the HEC-1 models.

Step 3: The HEC-1 models were then run again using the new estimates for NSTEPS and transmission losses.

Step 4: Steps 2 through 4 were repeated until the NSTEP values did not change from one HEC-1 run to the next.

The iterative process described above was followed for both of the HEC-1 models. The NSTEP values normally converged within three iterations. The results of the final iteration are listed in columns 11 through 16 of Table R-2. The velocities calculated using the HEC-1 travel times were compared to values calculated using Manning's equation. The velocities based on time-to-peak differences were normally slightly higher than those calculated using Manning's equation. The number of steps calculated using the two methods vary plus or minus one time step on the average.

Main Time Interval

The computation time interval used in the HEC-1 models is based on guidelines in the HEC-1 Users Manual.

The minimum lag time for both models was 27 minutes. The main time interval for these models should lie within the range of 0.1 and 0.25 times the smallest lag time, or within the range of 2.7 to 6.75 minutes. Therefore, a value of 5 minutes was selected for the HEC-1 computation time interval.

Channel Infiltration Losses

Due to the sandy soil conditions in the washes, infiltration losses occur in the channels in this study. However, no infiltration data is available within the watershed or nearby watersheds that would enable these losses to be modeled. Therefore, infiltration and transmission losses are not taken into

account in the HEC-1 models. This results in higher peak discharges than would otherwise occur.

TABLE R-1

REACH ROUTE PHYSICAL DATA

Reach	In Sub-Basin	Length Miles	Length Feet	Elevation (ft) Top	Elevation (ft) Bottom	Slope (ft/ft)
16	85	2.803	14800	2300	1894	0.027
31	35	0.455	2400	2230	2170	0.025
41	50	1.150	6070	2170	2000	0.028
46	50	2.111	11144	2300	2000	0.027
56	85	0.720	3800	2000	1894	0.028
58	85	1.610	8500	1894	1670	0.026
59	60	1.065	5622	2000	1840	0.028
61	60	2.327	12288	2170	1840	0.027
66	85	0.758	4000	1840	1740	0.025
67	85	1.098	5800	1900	1740	0.028
71	85	0.303	1600	1740	1690	0.031
81	85	0.663	3500	1690	1555	0.039
106	110	0.528	2786	2639	2610	0.010
116	120	1.724	9104	2610	2410	0.022
136	140	1.055	5572	2410	2280	0.023
146	150	1.998	10547	2280	2015	0.025
156	160	0.763	4030	2015	1905	0.027
166	160	1.385	7313	2100	1905	0.027
171	175	0.720	3800	1905	1800	0.028
172	175	0.795	4200	1800	1690	0.026
176A	177	0.895	4726	1690	1590	0.021
176B	178	0.886	4677	1690	1590	0.021
177	177	1.023	5400	1710	1590	0.022
181	185	0.641	3383	1590	1500	0.027
191	195	1.404	7413	2015	1830	0.025
201	205	2.158	11393	1830	1520	0.027
211	215	0.669	3532	1830	1730	0.028
221	222	1.506	7950	1730	1535	0.025

TABLE R-2

REACH ROUTE HYDRAULIC DATA

Reach	Slope (ft/ft)	Length (ft)	Section Average Top Width and Depth (a) 6-Hour Storm Width (ft)	6-Hour Storm Depth (ft)	24-Hour Storm Width (ft)	24-Hour Storm Depth (ft)	Channel Base Width (ft)	Average Discharge (cfs) (b) 6-Hour Storm	24-Hour Storm	Avg. Velocity (fps), Travel Time (hrs) and NSTEPS 6-Hour Velocity (b)	24-Hour Velocity (b)	6-Hour Time (b)	24-Hour Time (b)	6-Hour Steps	24-Hour Steps
16	0.027	14800	394	0.5	429	0.6	15	374	448	2.2	2.3	1.9	1.8	23	21
31	0.025	2400	207	0.7	207	0.8	5	332	412	4.2	3.9	0.2	0.2	2	2
41	0.028	6070	204	0.6	212	0.7	15	347	420	2.9	3.4	0.6	0.5	7	6
46	0.027	11144	367	0.7	367	0.7	10	582	688	2.5	3.4	1.3	0.9	15	11
56	0.028	3800	210	0.7	217	0.7	15	381	446	4.2	4.2	0.3	0.3	3	3
58	0.026	8500	422	0.8	422	0.8	20	732	840	2.4	2.8	1.0	0.8	12	10
59	0.028	5622	212	0.7	212	0.8	10	377	442	3.8	3.7	0.4	0.4	5	5
61	0.027	12288	247	0.5	274	0.6	15	337	406	3.2	3.1	1.1	1.1	13	13
66	0.025	4000	232	0.8	280	0.9	45	525	659	4.4	4.4	0.3	0.3	3	3
67	0.028	5800	16	1.1	16	1.2	15	65	77	6.4	6.4	0.2	0.3	3	3
71	0.031	1600	299	0.7	332	0.7	30	525	640	4.9	2.6	0.1	0.2	1	2
81	0.039	3500	445	0.8	462	0.9	60	1161	1293	3.9	2.3	0.3	0.4	3	5
106	0.010	2786	432	1.1	432	1.3	30	936	1186	2.3	3.1	0.3	0.3	4	3
116	0.022	9104	532	0.9	532	1.0	30	1153	1464	3.4	3.4	0.8	0.8	9	9
136	0.023	5572	452	1.3	452	1.5	50	1906	2443	6.2	6.2	0.3	0.3	3	3
146	0.025	10547	527	1.2	527	1.4	25	1968	2463	5.1	5.9	0.6	0.5	7	6
156	0.027	4030	332	0.9	332	1.1	30	997	1232	4.5	4.5	0.3	0.3	3	3
166	0.027	7313	16	1.1	16	1.3	15	67	79	5.0	6.0	0.4	0.3	5	4
171	0.028	3800	212	1.4	212	1.6	10	1041	1337	6.2	6.2	0.2	0.2	2	2
172	0.026	4200	212	1.2	212	1.4	10	823	1053	4.7	4.7	0.3	0.3	3	3
176A	0.021	4726	212	0.9	212	1.1	10	408	518	3.1	2.6	0.4	0.5	5	6
176B	0.021	4677	212	0.9	212	1.1	10	408	518	3.1	2.6	0.4	0.5	5	6
177	0.022	5400	147	0.5	154	0.5	10	120	128	1.8	3.0	0.8	0.5	10	6
181	0.027	3383	317	1.0	317	1.1	15	871	1109	3.8	5.5	0.3	0.2	3	2
191	0.025	7413	327	1.1	327	1.2	25	993	1273	3.6	4.1	0.6	0.5	7	6
201	0.027	11393	222	0.9	222	1.0	20	501	603	2.7	3.5	1.2	0.9	14	11
211	0.028	3532	212	0.9	212	1.0	10	512	617	2.9	3.9	0.3	0.3	4	3
221	0.025	7950	212	0.9	212	1.0	10	514	611	3.3	3.3	0.7	0.7	8	8

(a) calculated from Manning's equation

(b) based on difference in times-to-peak at each end of routing reach

3.2.3 Statistical Parameters

The statistical parameters used for this study were derived form the Design Manual. These parameters are the result of extensive study and analysis of historical record data by the Flood Control District, the State of Arizona, and consulting engineers. The parameters are based on the assumption of randomness, non-climatic variability and non-cyclic behavior or precipitation and runoff. A paper entitled *Cyclic Streamflow Test for Validity of Randomness* raises questions concerning the validity of these assumptions for frequency analysis in Arizona. The possibility that climatic patterns in Arizona may be cyclic, and that frequency analysis data used in a region may not have occurred during a rising climatic cycle, is reason for concern in the future. As more data is collected and the picture becomes clearer for Arizona, this possibility should be explored and analyzed. Refer to Section 3.3 for a discussion of how statistical analysis of historical USGS flow data was used for calibration of the HEC-1 computer models.

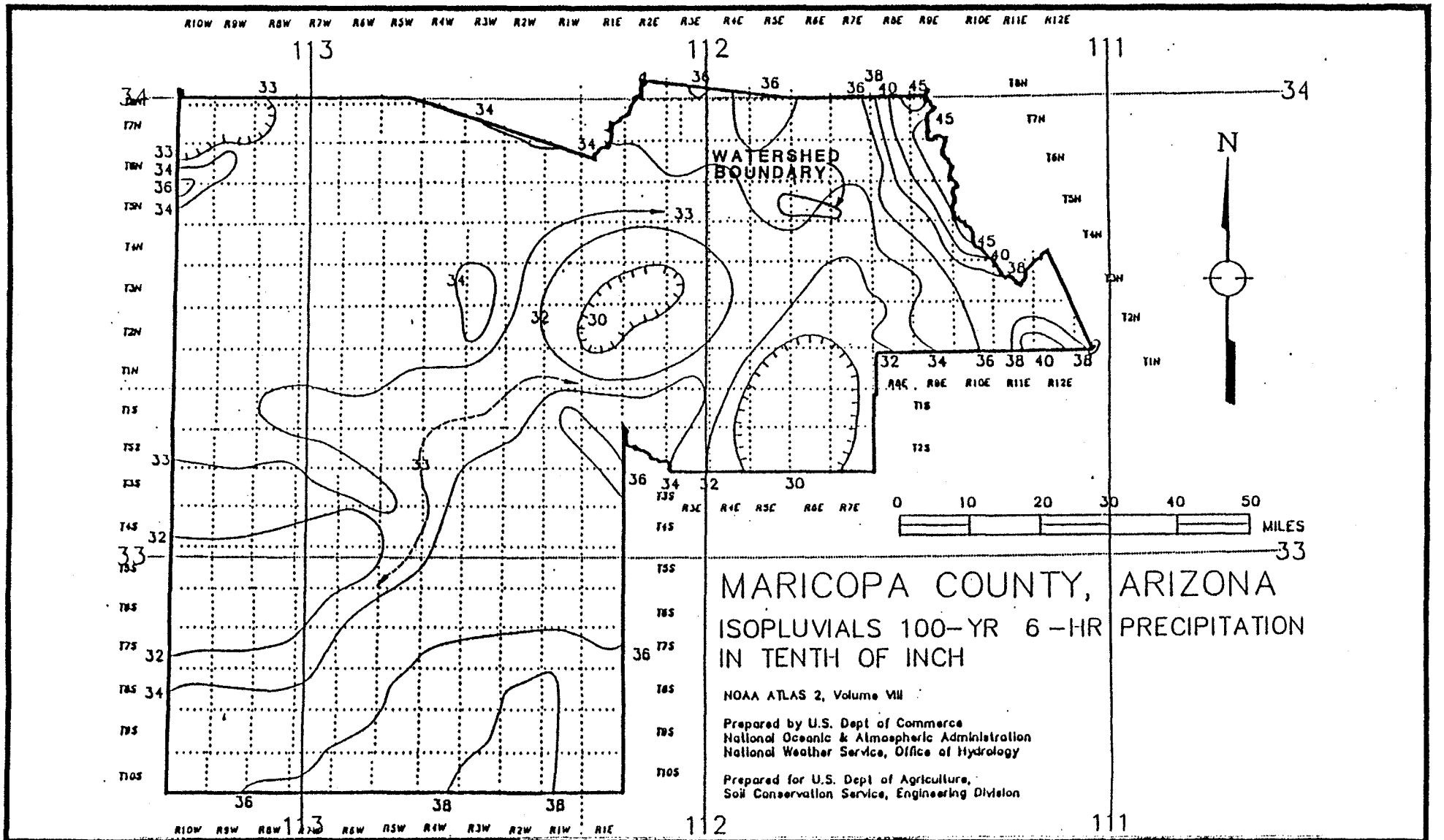
3.2.4 Precipitation

3.2.4.1 Rainfall Distributions

The storm frequencies specified for analysis in this study are the 100-year, 6-hour and the 100-year 24-hour duration storms. The rainfall distributions based on watershed area for the 6-hour duration storm were furnished by the District and are listed in the design Manual. There are a total of five precipitation patterns for the 6-hour storm. Each precipitation pattern is valid up to a certain watershed area. One precipitation pattern and its appropriate watershed area was input to the HEC-1 model using PB and PC record option. The 24-hour rainfall distribution used for this study was the SCS Type II distribution.

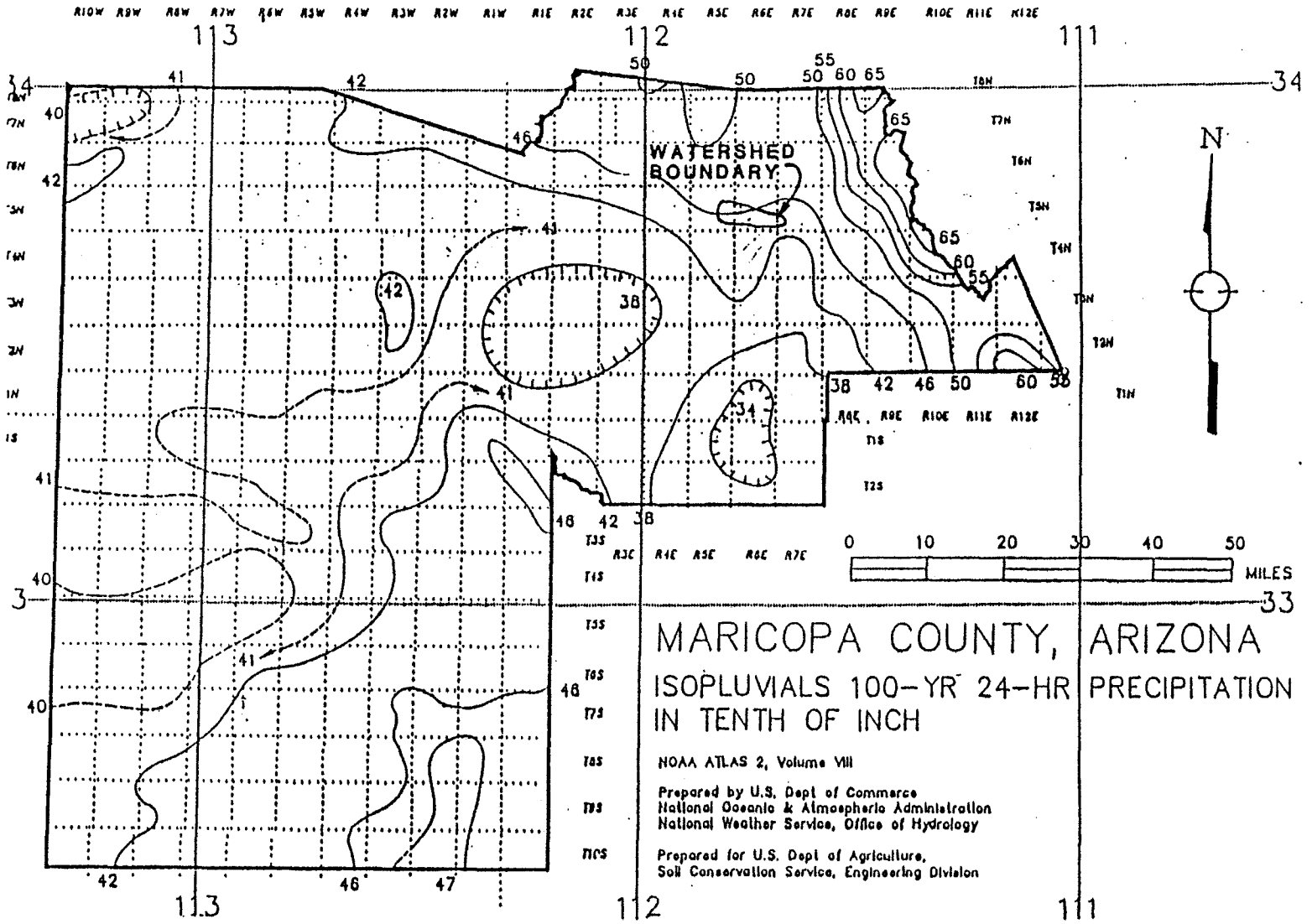
3.2.4.2 Precipitation Data

Point precipitation values used in this study were derived from the isopluvial maps in the Design Manual which, in turn, were derived using the NOAA Atlas II, Volume VIII. Refer to Figures P-1 and P-2 for a depiction of these isopluvials overlain on the



WOOD/PATEL ASSOCIATES Civil Engineers Hydrologists Land Surveyors (602) 234-1344	Scale ____	Design ____	Source: Flood Control District of Maricopa County, Drainage Design Manual for Maricopa County, Arizona, June 1, 1992.
	Date JUNE, 94	Drawn ____	
	Job # 93031	Chk. ____	

FIGURE P-1



WOOD/PATEL ASSOCIATES Civil Engineers Hydrologists Land Surveyors (602) 234-1344	Scale ___	Design ___	Source: Flood Control District of Maricopa County, Drainage Design Manual for Maricopa County, Arizona, June 1, 1992.	FIGURE P-2
	Date JUNE, 94	Drawn ___		
	Job # 93031	Chk. ___		

watershed. These figures were used to estimate an average point precipitation value for the entire watershed for both storms under consideration. The point precipitation value used for the 100-year 6-hour storm is 3.40 inches and the point precipitation value used for the 24-hour storm is 4.60 inches.

3.2.4.3 Aerial Precipitation Reduction

The precipitation reduction for the 100-year, 6-hour duration storm is based upon the depth-area curve developed for the historic storm of 1954 over the Queen Creek area, as developed by the U.S. Army Corps of Engineers in 1974. The depth-area curve is listed in the Design Manual. Depth-area reduction was simulated in HEC-1 by reducing the precipitation depth of the PC record.

The precipitation reduction factor used for the 100-year, 24-hour storm was derived from information contained in *NOAA Technical Memorandum NWS HYDRO-40*.

3.2.5 Gage Data

3.2.5.1 General

No gage data exists for this watershed or nearby washes. However, comparison of model results with a regression of other stream gage peak flow data was performed. This is discussed in the following Section 3.3, Calibration.

3.3 Calibration

3.3.1 General

In order to establish confidence in the results of computerized hydrology analyses, it is important to develop some procedure to calibrate and/or verify the computer results with measured data. Normally, the preferred approach is a two-step process, i.e., calibration followed by verification.

Calibration is the process of changing model coefficients, or other judgemental input parameters, until the model matches (with reasonable accuracy), the results from a measured event.
Verification is the process of checking a calibrated model against a data set not used in the calibration process.

As might be expected, the scarcity of measured data makes the calibration/verification process a difficult achievement. However, the absence of measured data can be overcome, to some extent, by employing several independent methodologies to calculate peak discharge values at the same concentration points used in the HEC-1 model. These independent estimates can be compared to the HEC-1 results to see if sufficient differences result that would warrant adjustments to the model input parameters. In the absence of mesured rainfall/runoff data, the verification process can only be used as a guide to ensure that the model is not producing gross inaccuracies in the calculation of peak discharge values.

Four independent calculation procedures were selected to verify the results of the HEC-1 models used for this project. These procedures are listed as follows:

1. An envelope curve of extreme floods in Arizona and the Rocky Mountain regions developed by Matthai and published by Roeske (1978).

2. A 100-year peak discharge relation developed for Arizona by Malvick (1980).

3. A 100-year peak discharge relation for Southeastern Arizona developed by Eychaner (1984).

4. A 100-year peak discharge envelope curve for Southeastern Arizona developed by Boughton and others (1987).

Table C-1 shows the HEC-1 results at selected concentration points compared to the Log-Pearson III regression by Roeske. Figure C-1 shows the 24-hour flows at the same concentration points plotted along with data from all four procedures listed above.

When interpreting the results in Table C-1 and Figure C-1, consideration must be given to the watershed characteristics. Peak discharge regression equations reflect an **average** response from all watersheds used in the regression database. Accordingly, when applied to small, homogeneous sub-basins, such as those used in this verification analysis, they may significantly over- or under- predict discharges if the test sub-basins have extremely steep or flat slopes, or have infiltration characteristics that are extremely pervious or impervious, or exhibit sheet flow characteristics. Even though the regression equations are regionalized, they do not have the capability to make good predictions for small basins that exhibit hydrologic characteristics towards the extreme ends of the spectrum.

A review of the information presented in Table C-1 and Figure C-1 indicates that the HEC-1 model is producing very realistic results. The HEC-1 flows plot somewhat lower than the curves from the four methods listed above; this is expected because several study watershed characteristics are different from those in the regression database. Specifically, the individual sub-basins in this study are smaller, more homogeneous, have flatter slopes, have sandier (more pervious) soils, and exhibit more sheet flow characteristics than the average watershed in the regression database. Furthermore, the sub-basins in this study are long and narrow, and are not characterized by incised, riverine channels typical of most washes in the regression database.

3.3.5 Summary

The models give reasonable values when compared to the four methods discussed above. No further adjustments were made to the HEC-1 models.

TABLE C-1

HEC-1 VS. LOG-PEARSON III REGRESSION ANALYSIS

UNIT HYDROGRAPH	*STORM DURATION (HRS)*	*RAINFALL DISTRIBUTION*	*SOURCE OF AREAL REDUCTION FACTOR*	*CONCENTRATION POINT*				
				100C	*190C*	*210C*	*221R*	*225C (c)*
		CUMULATIVE DRAINAGE AREA, SQ MI		4.96	4.42	2.11	1.94	13.42
FLOW IN CFS								
PHX VALLEY	6	FCDMC (a)	FCDMC (a)	1321	1036	498	522	2351
PHX VALLEY	24	SCS TYPE II	NWS HYDRO 40	1525	1286	614	629	3086
FLOW IN CSM (CFS/SQ MI)								
PHX VALLEY	6	FCDMC (a)	FCDMC (a)	266	234	236	269	175
PHX VALLEY	24	SCS TYPE II	NWS HYDRO 40	307	291	291	324	230
USGS REPORT 91-4041		*LP3 Q100 Regression (b)*		*2018*	*1896*	*1272*	*1215*	*3455*
(Roeske, 1978)		Results in cfs/sq.mi		407	429	603	627	257

(a) Developed by USCE for the 19 August 1954 Queen Creek storm

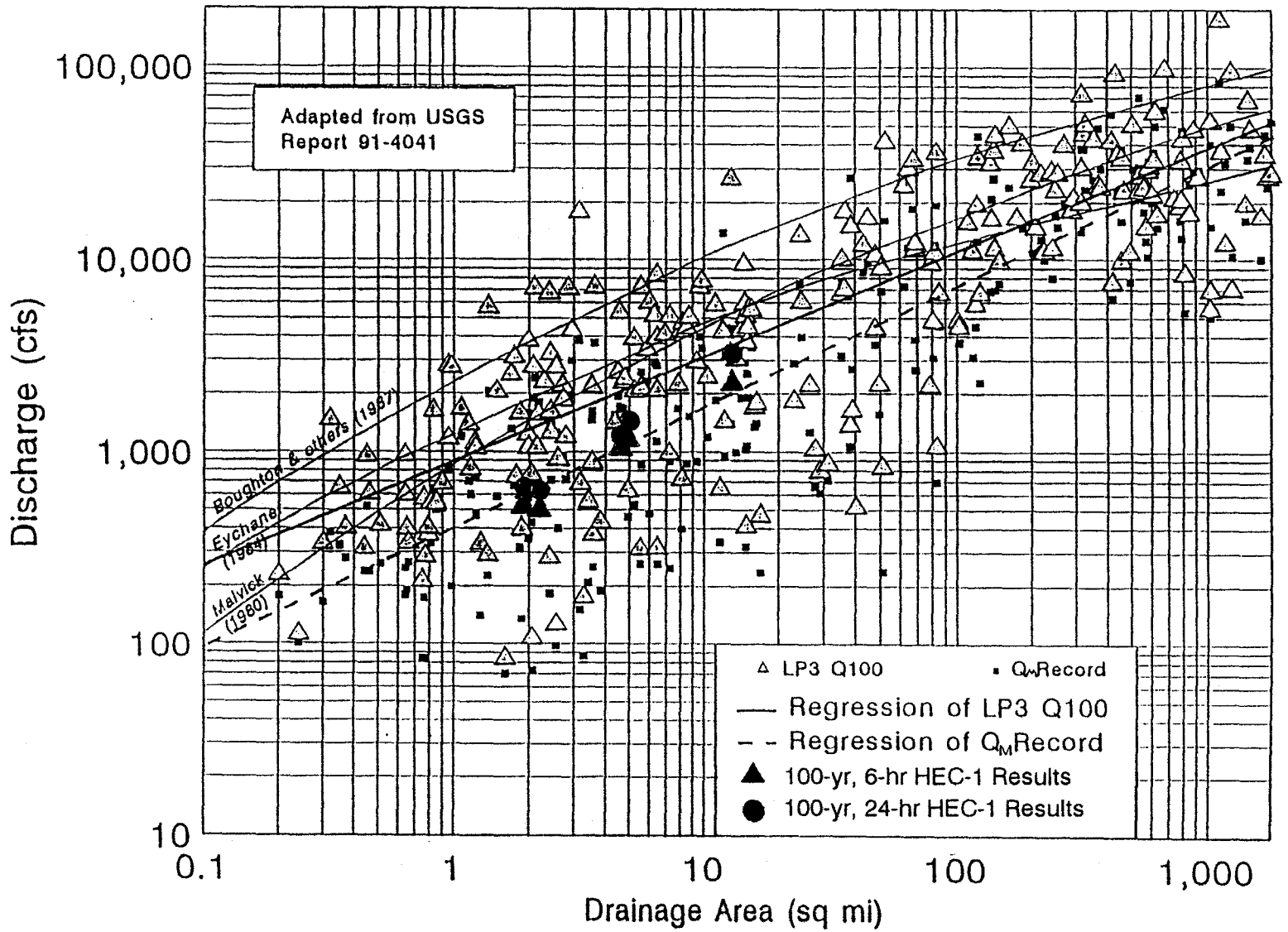
(b) Log-Pearson III regression Q(100) = 850 * (A ^ 0.54) from Fig. 10-2, ADOT Highway Drainage Design Manual: Hydrology, March, 1993.

(c) Concentration point representing the entire watershed

Wood, Patel & Associates, Inc. 01-Jul-94

FIGURE C-1

HEC-1 vs. Log-Pearson III Analysis



Adapted from: Arizona Department of Transportation, "Highway Drainage Design Manual: Hydrology," March, 1993.

3.4 Special Problems and Solutions

3.4.1 Channel Flow Splits

3.4.1.1 Discussion of Problem

The watershed is characterized throughout by numerous flow splits. Significant flow split locations were identified during the sub-basin delineation process. Significant splits are defined as those where the split causes diversion of flow into a separate watershed, and where peak discharges at downstream concentration points may be significantly affected.

Typically, these splits are caused by geologic formations which protrude in the floodplain and are less scourable than the adjacent wash bottoms. This causes a single wash approaching the protrusion to split into two or more smaller washes that either reconverge downstream, or continue to diverge into separate watersheds. The channels upstream and downstream of the splits are typically well-defined, with a depth of one or two feet, and with well-vegetated banks.

The hydraulic characteristics of these splits were modeled in HEC-1 using the hydrograph diversion operation. Diversion flow tables were estimated for each split using a combination of methods, including field observation, inspection of stereo aerial photographs and USGS topographic maps of field survey cross section data.

At most locations, field observation, along with inspection of stereo aerial photographs and topographic mapping, were used to estimate the proportion of flow split. At several locations HEC-2 was also used to estimate flow split proportions, and the following procedure was used:

Step 1: A cross section was taken through the fully developed split area from left to right (looking downstream) perpendicular to the direction of flow. The definition of "fully developed" is a location downstream of the start of the split where the left and right channels are completely formed but flow is still present in the divider area.

Step 2: The field cross section data were input into the HEC-2 computer program. Runs were made using discharge values corresponding to the estimated flow into the split. These discharge values were estimated using a preliminary HEC-1 model.

Step 3: The proportion of flow in each channel was estimated using the flow distribution option of HEC-2.

The key assumptions made as a basis for the above process are:

1. The limitations and assumptions upon which HEC-2 is based also apply to this approach.

2. Scour, which will occur as flow depths and velocities increase have the same relative effects on the conveyance capacity of both channels.

Other flow split areas, which are not significant, have been assumed to have no measurable effects on downstream concentration points. These areas have been lumped in the model by careful sub-basin delineation.

HEC-1 does not retain the total watershed area associated with a diverted hydrograph when the hydrograph is recalled and combined with another hydrograph. The total watershed area must be entered on the HC record for the downstream

combination point. There are a number of concentration points in the HEC-1 models that are affected by this requirement. The affected concentration points and the associated area calculations are listed in Table S-6 in Section 3.2.2.1.

3.4.1.4 Summary

The flow split proportions are tabulated in Table D-1. Printouts of the hydraulic calculations for splits D, E, and F follow Table D-1.

TABLE D-1

Flow Split Data

HEC-1 Identifier	Flow Split Proportion, %		Source of Data
	Left Channel	Right Channel	
15D	40	60	HEC-2
40D	50	50	HEC-2
55D	50	50	stereo aerial photo/field
61D	30	70	stereo aerial photo
67D	30	70	stereo aerial photo/field
155D	50	50	HEC-2
165D	30	70	stereo aerial photo/field
171D	80	20	HEC-2
176D	50	50	stereo aerial photo
200D	50	50	stereo aerial photo/field

==========
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Serial Number : 0010276.250

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PROJECT DESCRIPTION :

PROJECT TITLE : RIO VERDE NORTH FPDS
PROJECT NUMBER : 93031.00
DESCRIPTION : FLOW SPLIT AT CONCENTRATION POINT 15DV
ENGINEER : WOOD, PATEL & ASSOCIATES, INC.
DATE OF RUN : 6/30/1994
TIME OF RUN : 3:53 pm

T1 93031.00
T2 RIO VERDE NORTH FPDS
T3 FLOW SPLIT AT CONCENTRATION POINT 15DV

JOB PARAMETERS :

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	0.025	0	0.0	1003.0	2289.0	
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	1	0.0	0.0	0.0	0.0	0.0	-6.0	0.0	

REQUESTED CROSS-SECTION PRINTOUTS (J5) :

-10 -10

NC	0.085	0.085	0.085	0.1	0.3					
X1	1	34	247.88	289.60	0.0	0.0	0.0	1.0	0.0	
X2	0.0	0.0	0	0.0	0.0	0.0	0	0.0	0.0	15
X3	0	0.0	0.0	0.0	0.0	383.83	0.0	0.0	0.0	
GR	2290.0	0.0	2289.38	33.92	2288.59	61.01	2288.41	68.17	2288.85	72.40
[illegible]	2288.5	84.91	2289.09	120.86	2288.36	151.58	2287.77	161.77	2287.57	173.97
[illegible]	2288.1	177.80	2289.32	203.98	2288.68	224.16	2288.01	247.88	2287.75	251.41
GR	2286.8	272.22	2287.53	284.82	2288.26	289.60	2288.78	350.89	2289.11	383.83
GR	2289.0	389.79	2289.02	397.05	2288.31	419.62	2287.95	425.54	2288.05	434.76
GR	2288.4	438.92	2288.64	457.72	2289.75	482.05	2288.93	516.16	2288.17	534.36
GR	2287.6	540.04	2288.13	546.18	2288.56	583.98	2288.53	618.48		
X1	2	34	247.88	289.60	1.0	1.0	1.0	1.0	0.0	
GR	2290.0	0.0	2289.38	33.92	2288.59	61.01	2288.41	68.17	2288.85	72.40
GR	2288.5	84.91	2289.09	120.86	2288.36	151.58	2287.77	161.77	2287.57	173.97
GR	2288.1	177.80	2289.32	203.98	2288.68	224.16	2288.01	247.88	2287.75	251.41
GR	2286.8	272.22	2287.53	284.82	2288.26	289.60	2288.78	350.89	2289.11	383.83
GR	2289.0	389.79	2289.02	397.05	2288.31	419.62	2287.95	425.54	2288.05	434.76
GR	2288.4	438.92	2288.64	457.72	2289.75	482.05	2288.93	516.16	2288.17	534.36
GR	2287.6	540.04	2288.13	546.18	2288.56	583.98	2288.53	618.48		

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)	1.000
Total Discharge (cfs, Q)	1003
Computed Water Surface Elevation (ft MSL, CWSEL)	2289.43

n (ft) =	31.3	68.2	120.9	151.6	161.8	174.0
Flow (%) =	3.7	7.6	4.7	4.7	8.6	
Area (sq ft) =	18.7	35.5	21.6	13.9	21.4	
Vel (ft/s) =	1.96	2.14	2.19	3.40	4.03	
Depth (ft) =	.51	.67	.70	1.36	1.76	

Station (ft) =	174.0	204.0	247.9	289.6	350.9	383.8
Flow (%) =	6.4	8.8	38.4	14.4	2.7	
Area (sq ft) =	24.9	34.3	86.1	55.6	15.9	
Vel (ft/s) =	2.59	2.58	4.48	2.59	1.69	
Depth (ft) =	.83	.78	2.06	.91	.48	

T1 93031.00
T2 RIO VERDE NORTH FPDS
T3 FLOW SPLIT AT CONCENTRATION POINT 15DV

JOB PARAMETERS :

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	3	0	0	0.025	0	0.0	1234.0	2289.0	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	5	1	0.0	0.0	0.0	0.0	0.0	-6.0	0.0	

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)	1.000
Total Discharge (cfs, Q)	1234
Computed Water Surface Elevation (ft MSL, CWSEL)	2289.58

Station (ft) =	22.9	68.2	84.9	120.9	151.6	161.8
Flow (%) =	4.4	3.2	5.3	5.3	4.5	
Area (sq ft) =	25.0	15.3	28.2	26.3	15.4	
Vel (ft/s) =	2.17	2.58	2.33	2.47	3.61	
Depth (ft) =	.55	.92	.79	.86	1.52	

Station (ft) =	161.8	174.0	204.0	247.9	289.6	350.9
Flow (%) =	8.0	6.7	9.3	34.8	15.0	
Area (sq ft) =	23.3	29.5	41.0	92.5	65.0	
Vel (ft/s) =	4.22	2.83	2.80	4.65	2.85	
Depth (ft) =	1.91	.98	.93	2.22	1.06	

n (ft) = 350.9 383.8
Flow (%) = 3.4
Area (sq ft) = 20.9
Vel (ft/s) = 2.01
Depth (ft) = .64

SPECIAL NOTE :

An asterisk (*) to the left of the cross-section number indicates a special note is present in the SUMMARY OF WARNING AND STATUS MESSAGES section.

SUMMARY PRINTOUT TABLE 150 : RIO VERDE NORTH FPDS
FLOW SPLIT AT CONCENTRATION POINT 15DV
93031.00

Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Top of Roadway Elevation (ft MSL) ELTRD	Max. Low Chord Elevation (ft MSL) ELLC	Minimum C. S. Elevation (ft MSL) ELMIN	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	Critical W. S. Elevation (ft MSL) CRIWS	Energy Gradient Elevation (ft MSL) EG	Energy Gradient Slope * 10,000 10K*S	Channel Mean Flow Velocity (ft/s) VCH	Cross-Section Area (sq ft) AREA	Index Q (0.01 * Convey.) .01K
1.000	.00	.00	.00	2286.80	1003.00	2289.43	.00	2289.61	250.24	4.48	328.07	63.40
1.000	.00	.00	.00	2286.80	1234.00	2289.58	.00	2289.78	245.63	4.65	382.50	78.74
* [illegible]000	1.00	.00	.00	2286.80	1003.00	2289.59	.00	2289.64	69.54	2.48	603.46	120.28
* 2.000	1.00	.00	.00	2286.80	1234.00	2289.75	.00	2289.80	68.81	2.58	699.07	148.76

SUMMARY PRINTOUT TABLE 150 : RIO VERDE NORTH FPDS
FLOW SPLIT AT CONCENTRATION POINT 15DV
93031.00

Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Profile (ft) DIFWSP	W.S. Elev Diff per Section (ft) DIFWSX	W.S. Elev Diff per Know/Comp (ft) DIFKWS	Water Surface Top Width (ft) TOPWID	Channel Reach Length (ft) XLCH
1.000	1003.00	2289.43	.00	.00	.43	352.54	.00
1.000	1234.00	2289.58	.15	.00	.58	360.89	.00
* 2.000	1003.00	2289.59	.00	.16	.00	585.67	1.00
* 2.000	1234.00	2289.75	.16	.17	.00	604.66	1.00

S[illegible] OF WARNING AND STATUS MESSAGES :

Section 2, profile 1, conveyance change outside acceptable range.

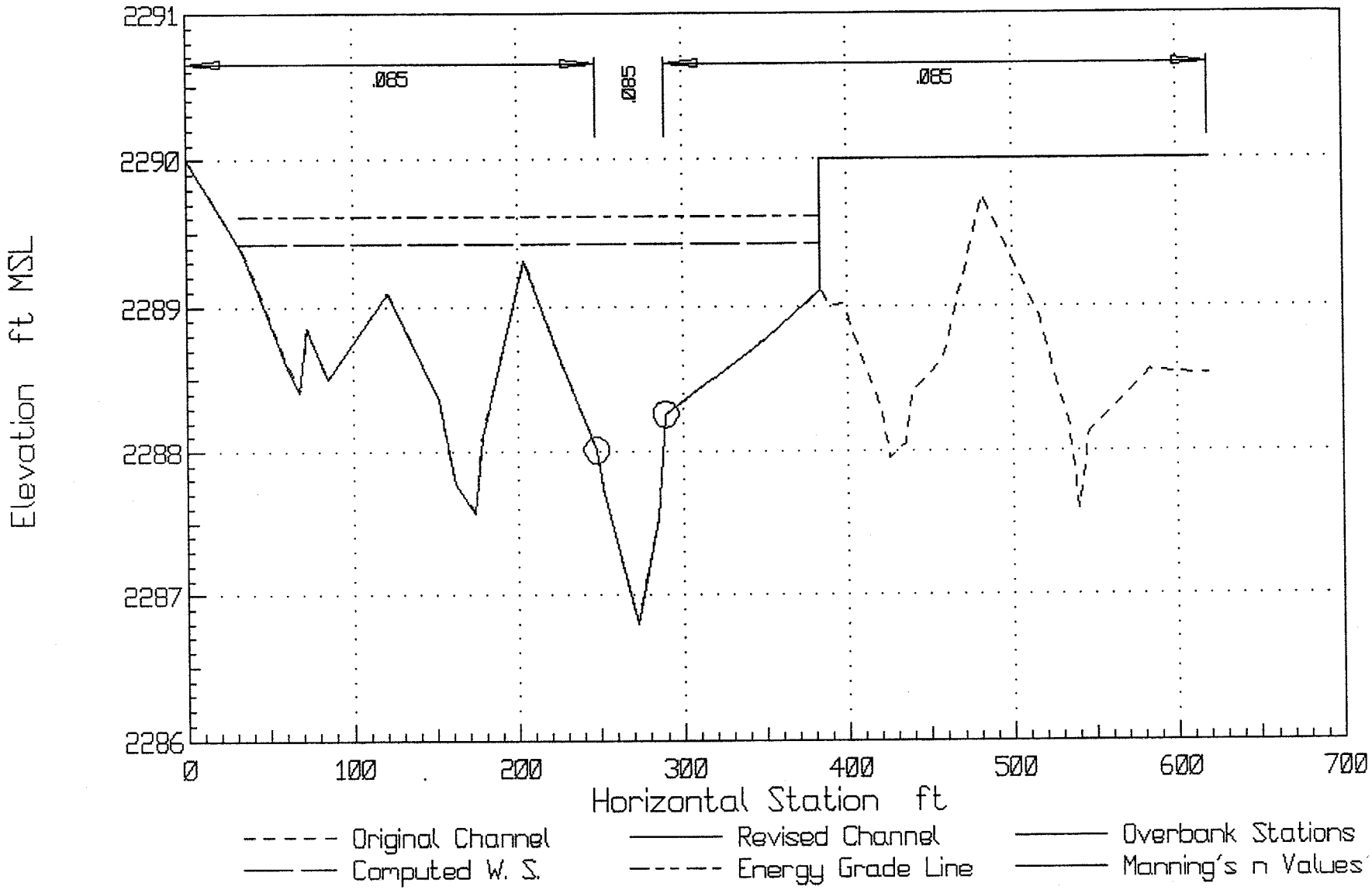
Section 2, profile 2, conveyance change outside acceptable range.

2 Warning and status message(s) generated

END OF OUTPUT

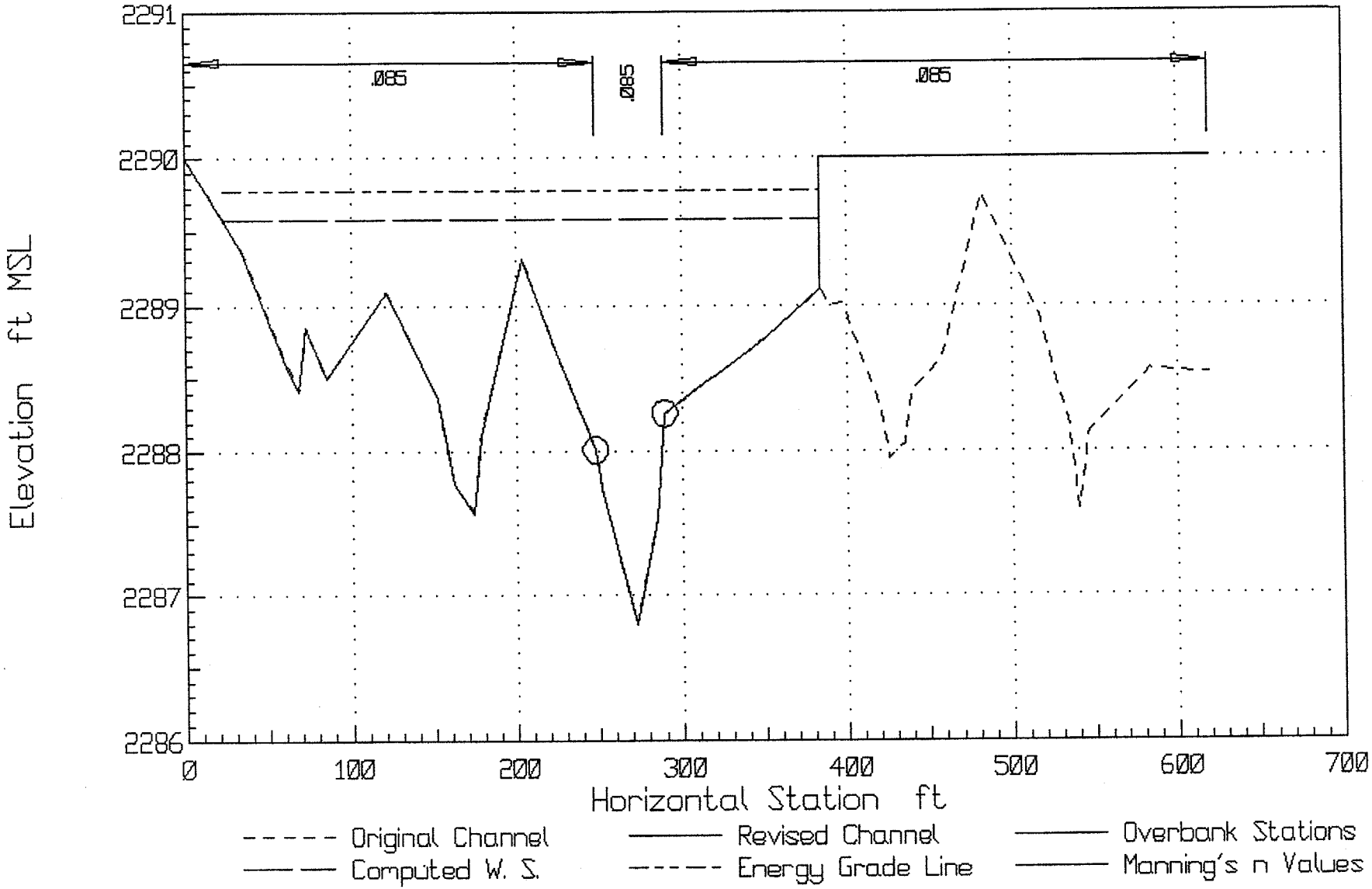
Cross-Section Plot 1 ft

WS Elev: 2289.42 ft EGL Elev: 2289.61 ft Flow: 1003 cfs



Cross-Section Plot 1 ft

WS Elev: 2289.58 ft EGL Elev: 2289.77 ft Flow: 1234 cfs



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==========

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PROJECT DESCRIPTION :

PROJECT TITLE : RIO VERDE NORTH FPDS
PROJECT NUMBER : 93031.00
DESCRIPTION : FLOW SPLIT AT CONCENTRATION POINT 40DV
ENGINEER : WOOD, PATEL & ASSOCIATES, INC.
DATE OF RUN : 6/30/1994
TIME OF RUN : 3:47 pm

T 93031.00
T2 RIO VERDE NORTH FPDS
T3 FLOW SPLIT AT CONCENTRATION POINT 40DV

JOB PARAMETERS :

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	0.0121	0	0.0	622.0	2159.5	
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	1	0.0	0.0	0.0	0.0	0.0	-6.0	0.0	

REQUESTED CROSS-SECTION PRINTOUTS (J5) :

-10 -10

NC	0.085	0.085	0.085	0.1	0.3					
X1	1	17	169.06	190.36	0.0	0.0	0.0	1.0	0.0	
X2	0.0	0.0	0	0.0	0.0	0.0	0	0.0	0.0	15
GR	2160.0	0.0	2159.27	15.62	2159.69	40.48	2158.54	46.11	2158.41	50.23
GR	2158.5	53.67	2159.56	58.82	2159.12	111.52	2159.95	118.32	2159.50	143.58
[illegible]	159.4	169.06	2159.22	176.06	2158.56	178.78	2158.61	181.64	2158.54	185.34
[illegible]	59.4	190.36	2159.53	206.10						
X1	2	17	169.06	190.36	1.0	1.0	1.0	1.0	0.0	
GR	2160.0	0.0	2159.27	15.62	2159.69	40.48	2158.54	46.11	2158.41	50.23
GR	2158.5	53.67	2159.56	58.82	2159.12	111.52	2159.95	118.32	2159.50	143.58
GR	2159.4	169.06	2159.22	176.06	2158.56	178.78	2158.61	181.64	2158.54	185.34
GR	2159.4	190.36	2159.53	206.10						

FLOW DISTRIBUTION :

Cross-Section Number (SECNO) 1.000
Total Discharge (cfs, Q) 622
Computed Water Surface Elevation (ft MSL, CWSEL) 2160.67

Station (ft) =	.0	15.6	40.5	46.1	50.2	53.7
Flow (%) =	4.9	10.2	3.6	4.7	4.0	
Area (sq ft) =	16.2	29.6	8.8	9.0	7.6	
Vel (ft/s) =	1.90	2.15	2.53	3.23	3.25	
Depth (ft) =	1.04	1.19	1.56	2.20	2.22	

on (ft) =	53.7	58.8	111.5	143.6	169.1	190.4
Flow (%) =	3.6	26.1	9.6	10.9	16.1	
Area (sq ft) =	8.5	70.1	31.6	31.1	36.6	
Vel (ft/s) =	2.62	2.31	1.90	2.18	2.73	
Depth (ft) =	1.64	1.33	.99	1.22	1.72	

Station (ft) =	190.4	206.1
Flow (%) =	6.3	
Area (sq ft) =	19.0	
Vel (ft/s) =	2.07	
Depth (ft) =	1.21	

T1 93031.00
T2 RIO VERDE NORTH FPDS
T3 FLOW SPLIT AT CONCENTRATION POINT 40DV

JOB PARAMETERS :

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	3	0	0	0.0121	0	0.0	781.0	2159.5	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	5	1	0.0	0.0	0.0	0.0	0.0	-6.0	0.0	

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)	1.000
Total Discharge (cfs, Q)	781
Computed Water Surface Elevation (ft MSL, CWSEL)	2160.86

Station (ft) =	.0	15.6	40.5	46.1	50.2	53.7
Flow (%) =	5.2	10.5	3.5	4.3	3.7	
Area (sq ft) =	19.2	34.4	9.8	9.8	8.3	
Vel (ft/s) =	2.12	2.38	2.75	3.43	3.45	
Depth (ft) =	1.23	1.38	1.75	2.39	2.41	

Station (ft) =	53.7	58.8	111.5	143.6	169.1	190.4
Flow (%) =	3.4	26.1	10.4	11.2	15.3	
Area (sq ft) =	9.4	80.3	37.8	36.0	40.7	
Vel (ft/s) =	2.83	2.54	2.14	2.42	2.94	
Depth (ft) =	1.83	1.52	1.18	1.41	1.91	

on (ft) = 190.4 206.1
Flow (%) = 6.4
Area (sq ft) = 22.0
Vel (ft/s) = 2.27
Depth (ft) = 1.40

SPECIAL NOTE :

An asterisk (*) to the left of the cross-section number indicates a special note is present in the SUMMARY OF WARNING AND STATUS MESSAGES section.

SUMMARY PRINTOUT TABLE 150 : RIO VERDE NORTH FPDS
FLOW SPLIT AT CONCENTRATION POINT 40DV
93031.00

Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Top of Roadway Elevation (ft MSL) ELTRD	Max. Low Chord Elevation (ft MSL) ELLC	Minimum C. S. Elevation (ft MSL) ELMIN	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	Critical W. S. Elevation (ft MSL) CRIWS	Energy Gradient Elevation (ft MSL) EG	Energy Gradient Slope * 10,000 10K*S	Channel Mean Flow Velocity (ft/s) VCH	Cross-Section Area (sq ft) AREA	Index Q (0.01 * Convey.) .01K
1.000	.00	.00	.00	2158.41	622.00	2160.67	.00	2160.76	119.46	2.73	268.19	56.91
1.000	.00	.00	.00	2158.41	781.00	2160.86	.00	2160.97	120.38	2.94	307.99	71.18
[illegible]000	1.00	.00	.00	2158.41	622.00	2160.68	.00	2160.77	115.99	2.70	270.66	57.75
2.000	1.00	.00	.00	2158.41	781.00	2160.88	.00	2160.98	117.31	2.92	310.46	72.11

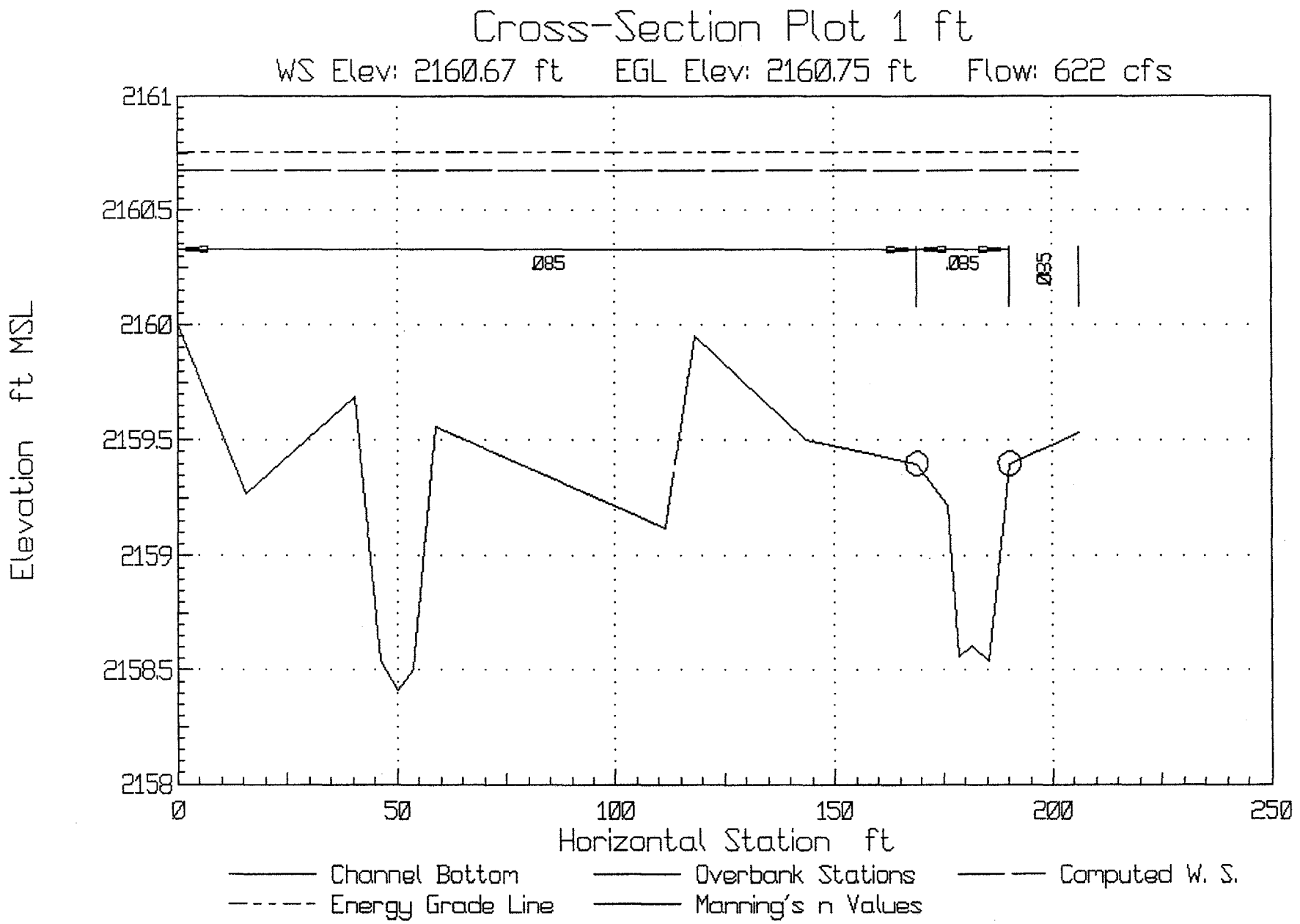
SUMMARY PRINTOUT TABLE 150 : RIO VERDE NORTH FPDS
FLOW SPLIT AT CONCENTRATION POINT 40DV
93031.00

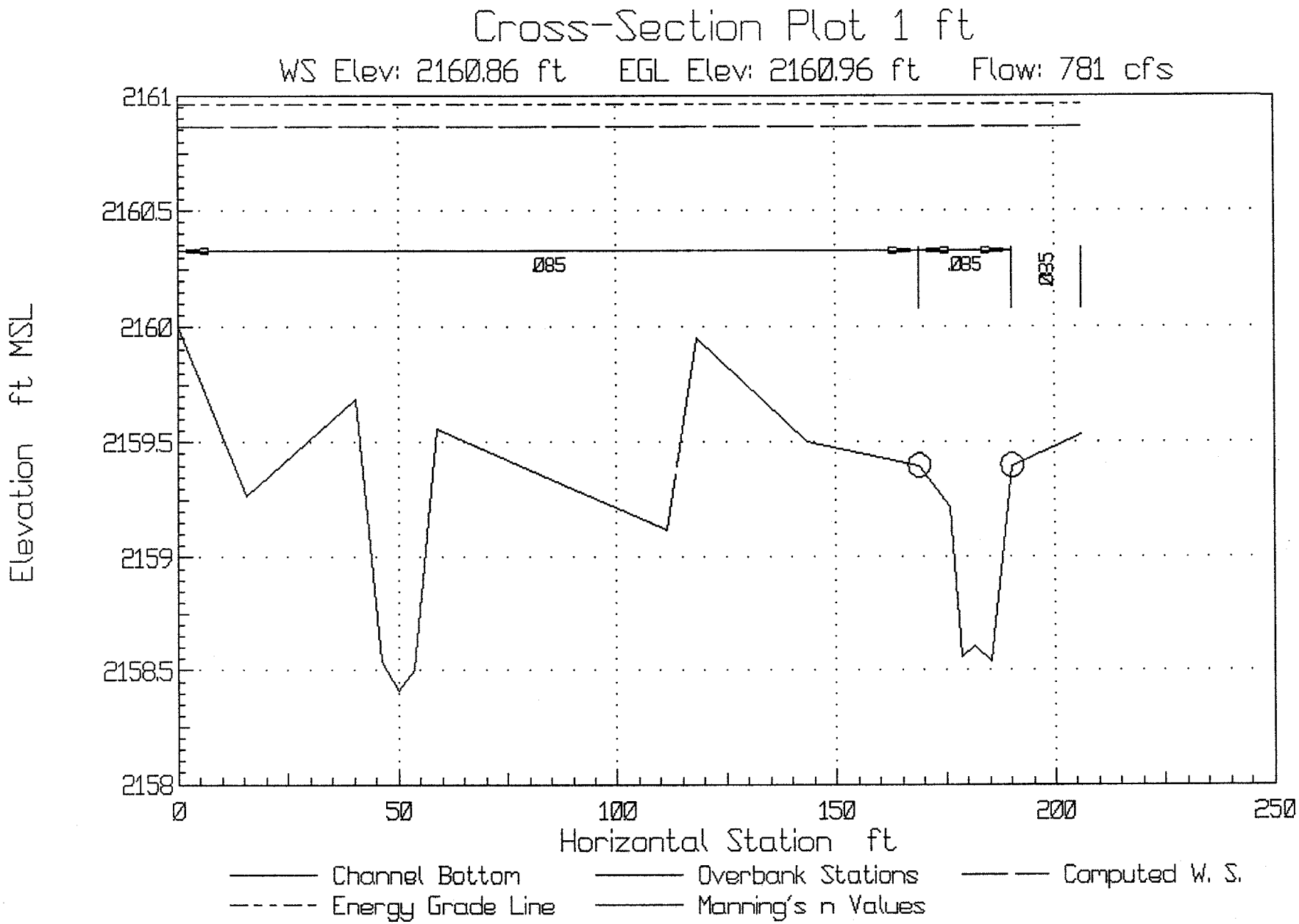
Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Profile (ft) DIFWSP	W.S. Elev Diff per Section (ft) DIFWSX	W.S. Elev Diff per Know/Comp (ft) DIFKWS	Water Surface Top Width (ft) TOPWID	Channel Reach Length (ft) XLCH
1.000	622.00	2160.67	.00	.00	1.17	206.10	.00
1.000	781.00	2160.86	.19	.00	1.36	206.10	.00
2.000	622.00	2160.68	.00	.01	.00	206.10	1.00
2.000	781.00	2160.88	.19	.01	.00	206.10	1.00

SUMMARY OF WARNING AND STATUS MESSAGES :

No warning messages generated

END OF OUTPUT


Cross-Section Plot 1 ft
WS Elev: 2160.67 ft
EGL Elev: 2160.75 ft
Flow: 622 cfs
Elevation ft MSL
2161
2160.5
2160
2159.5
2159
2158.5
2158
0
50
100
150
200
250
Horizontal Station ft
.085
.085
.035
Channel Bottom
Energy Grade Line
Overbank Stations
Manning's n Values
Computed W. S.


Cross-Section Plot 1 ft
WS Elev: 2160.86 ft
EGL Elev: 2160.96 ft
Flow: 781 cfs
Elevation ft MSL
2161
2160.5
2160
2159.5
2159
2158.5
2158
0
50
100
150
200
250
Horizontal Station ft
.085
.085
.035
Channel Bottom
Energy Grade Line
Overbank Stations
Manning's n Values
Computed W. S.

==========
B O S S H E C - 2 (tm)
==========

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Version : 3.10
Serial Number : 0010276.250

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PROGRAM ORIGIN :

Boss Hec-2 (tm) is an enhanced version of the U.S. Army Corps of Engineers Hydrologic Engineering Center HEC-2 program for water-surface profile computations. Program based upon the September 1990 version, updated on August 1991.

DISCLAIMER :

Hec-2 (tm) is a complex program which requires engineering expertise to use correctly. Boss Corporation assumes absolutely no responsibility for the correct use of this program. All results obtained should be carefully examined by an experienced professional engineer to determine if they are reasonable and accurate.

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PROJECT DESCRIPTION :

PROJECT TITLE : RIO VERDE NORTH FPDS
PROJECT NUMBER : 93031.00
DESCRIPTION : FLOW SPLIT AT CONCENTRATION POINT 155DV
ENGINEER : WOOD, PATEL & ASSOCIATES, INC.
DATE OF RUN : 6/30/1994
TIME OF RUN : 3:45 pm

T 93031.00
T RIO VERDE NORTH FPDS
T3 FLOW SPLIT AT CONCENTRATION POINT 155DV

JOB PARAMETERS :

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	0.0286	0	0.0	1945.0	2001.0	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	1	0.0	0.0	0.0	0.0	0.0	-6.0	0.0	

REQUESTED CROSS-SECTION PRINTOUTS (J5) :

-10 -10

NC	0.085	0.085	0.085	0.1	0.3					
X1	1	34	318.81	354.19	0.0	0.0	0.0	1.0	0.0	
X2	0.0	0.0	0	0.0	0.0	0.0	0	0.0	0.0	15
GR	2000.0	0.0	1999.87	7.30	1998.44	10.60	1998.58	29.33	1998.93	50.29
GR	2000.3	56.89	1998.43	65.15	1998.34	74.77	2000.50	82.21	2000.49	91.23
GR	2001.3	105.52	2001.18	133.03	2001.79	144.24	2001.80	183.28	2002.22	228.66
GR	2002.2	252.74	2003.10	263.17	2000.25	273.28	2000.14	282.40	2001.32	287.54
GR	2001.0	318.81	1998.26	329.14	1998.33	336.21	1998.14	343.90	2001.30	354.19
GR	2001.0	359.62	1999.94	362.83	2001.08	367.98	2000.82	376.69	1999.50	384.82
GR	1998.4	396.62	1998.79	409.57	2001.43	417.83	2001.72	430.56		

X1	2	34	318.81	354.19	1.0	1.0	1.0	1.0	0.0	
GR	2000.0	0.0	1999.87	7.30	1998.44	10.60	1998.58	29.33	1998.93	50.29
GR	2000.3	56.89	1998.43	65.15	1998.34	74.77	2000.50	82.21	2000.49	91.23
GR	2001.3	105.52	2001.18	133.03	2001.79	144.24	2001.80	183.28	2002.22	228.66
GR	2002.2	252.74	2003.10	263.17	2000.25	273.28	2000.14	282.40	2001.32	287.54
GR	2001.0	318.81	1998.26	329.14	1998.33	336.21	1998.14	343.90	2001.30	354.19
GR	2001.0	359.62	1999.94	362.83	2001.08	367.98	2000.82	376.69	1999.50	384.82
GR	1998.4	396.62	1998.79	409.57	2001.43	417.83	2001.72	430.56		

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)	1.000
Total Discharge (cfs, Q)	1945
Computed Water Surface Elevation (ft MSL, CWSEL)	2001.33

n (ft) =	.0	10.6	29.3	50.3	65.2	74.8
Flow (%) =	3.4	16.0	15.4	6.2	8.8	
Area (sq ft) =	17.3	52.8	53.9	27.5	28.3	
Vel (ft/s) =	3.86	5.88	5.54	4.39	6.06	
Depth (ft) =	1.64	2.82	2.57	1.85	2.94	

Station (ft) =	74.8	82.2	282.4	318.8	354.2	396.6
Flow (%) =	3.2	3.5	.6	20.3	10.4	
Area (sq ft) =	14.2	28.7	8.3	79.3	48.8	
Vel (ft/s) =	4.42	2.39	1.33	4.97	4.13	
Depth (ft) =	1.91	.14	.23	2.24	1.15	

Station (ft) =	396.6	409.6	417.5
Flow (%) =	10.5	1.7	
Area (sq ft) =	35.4	10.1	
Vel (ft/s) =	5.76	3.35	
Depth (ft) =	2.73	1.27	

T1 93031.00
T2 RIO VERDE NORTH FPDS
T3 FLOW SPLIT AT CONCENTRATION POINT 155DV

JOB PARAMETERS :

ECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
0	3	0	0	0.0286	0	0.0	2543.0	2001.0	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	15	1	0.0	0.0	0.0	0.0	0.0	-6.0	0.0	

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)	1.000
Total Discharge (cfs, Q)	2543
Computed Water Surface Elevation (ft MSL, CWSEL)	2001.67

Station (ft) =	.0	10.6	29.3	50.3	65.2	74.8
Flow (%) =	3.5	14.7	14.4	6.3	8.1	
Area (sq ft) =	20.9	59.1	61.0	32.5	31.6	
Vel (ft/s) =	4.27	6.34	6.01	4.90	6.51	
Depth (ft) =	1.97	3.16	2.91	2.19	3.28	

on (ft) =	74.8	82.2	133.0	318.8	354.2	384.8
Flow (%) =	3.2	3.2	4.1	19.6	3.9	
Area (sq ft) =	16.7	33.3	39.8	91.3	31.1	
Vel (ft/s) =	4.92	2.45	2.63	5.46	3.17	
Depth (ft) =	2.25	.66	.21	2.58	1.02	

Station (ft) =	384.8	396.6	409.6	428.2
Flow (%) =	7.2	9.7	2.0	
Area (sq ft) =	32.1	39.8	14.1	
Vel (ft/s) =	5.72	6.23	3.56	
Depth (ft) =	2.72	3.07	.76	

SPECIAL NOTE :

An asterisk (*) to the left of the cross-section number indicates a special note is present in the SUMMARY OF WARNING AND STATUS MESSAGES section.

SUMMARY PRINTOUT TABLE 150 : RIO VERDE NORTH FPDS
FLOW SPLIT AT CONCENTRATION POINT 155DV
93031.00

Cross-Section Number	Channel Reach Length (ft) XLCH	Top of Roadway Elevation (ft MSL) ELTRD	Max. Low Chord Elevation (ft MSL) ELLC	Minimum C. S. Elevation (ft MSL) ELMIN	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	Critical W. S. Elevation (ft MSL) CRIWS	Energy Gradient Elevation (ft MSL) EG	Energy Gradient Slope * 10,000 10K*S	Channel Mean Flow Velocity (ft/s) VCH	Cross-Section Area (sq ft) AREA	Index Q (0.01 * Convey.) .01K
1.000	.00	.00	.00	1998.14	1945.00	2001.33	.00	2001.69	284.48	4.97	404.83	115.32
1.000	.00	.00	.00	1998.14	2543.00	2001.67	.00	2002.06	284.28	5.46	503.33	150.83
2.000	1.00	.00	.00	1998.14	1945.00	2001.39	.00	2001.72	259.37	4.83	420.91	120.77
2.000	1.00	.00	.00	1998.14	2543.00	2001.72	.00	2002.09	261.95	5.31	519.76	157.12

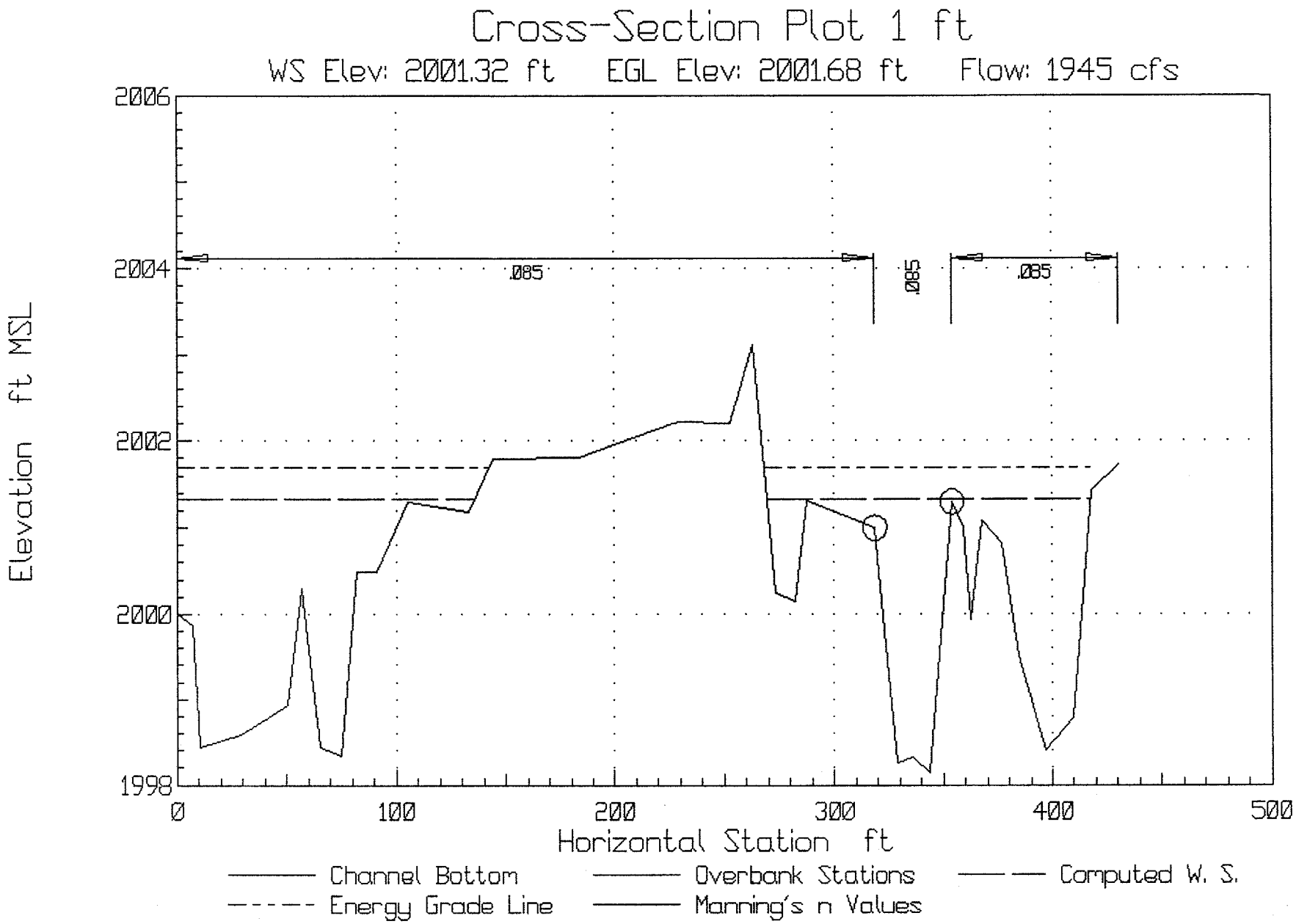
SU PRINTOUT TABLE 150 : RIO VERDE NORTH FPDS
---------- FLOW SPLIT AT CONCENTRATION POINT 155DV
93031.00

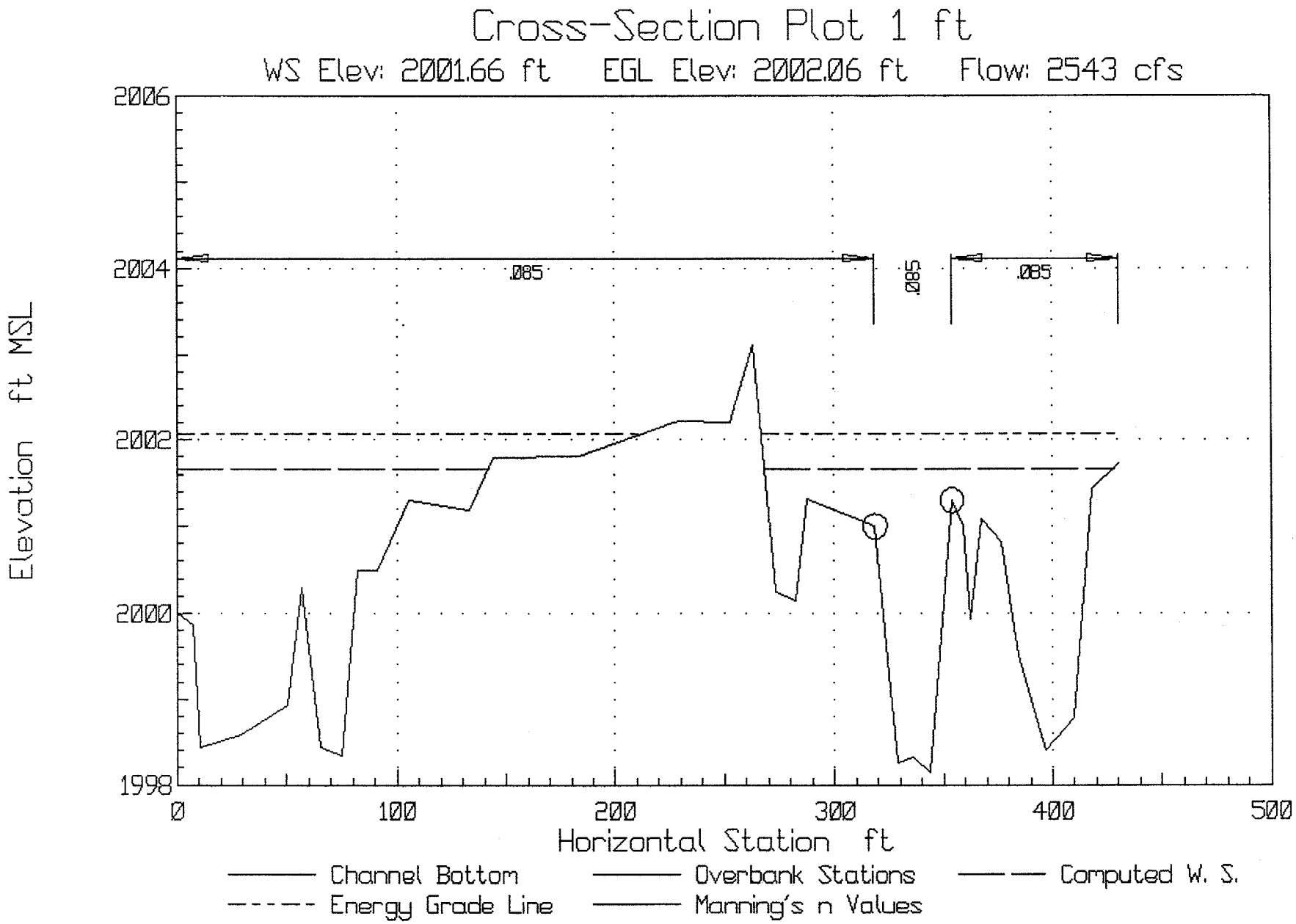
Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Profile (ft) DIFWSP	W.S. Elev Diff per Section (ft) DIFWSX	W.S. Elev Diff per Know/Comp (ft) DIFKWS	Water Surface Top Width (ft) TOPWID	Channel Reach Length (ft) XLCH
1.000	1945.00	2001.33	.00	.00	.33	283.82	.00
1.000	2543.00	2001.67	.34	.00	.67	301.93	.00
2.000	1945.00	2001.39	.00	.06	.00	285.23	1.00
2.000	2543.00	2001.72	.34	.05	.00	305.46	1.00

SUMMARY OF WARNING AND STATUS MESSAGES :

No warning messages generated

END OF OUTPUT


Cross-Section Plot 1 ft
WS Elev: 2001.32 ft
EGL Elev: 2001.68 ft
Flow: 1945 cfs
2006
2004
2002
2000
1998
Elevation ft MSL
.085
.085
.085
0
100
200
300
400
500
Horizontal Station ft
Channel Bottom
Energy Grade Line
Overbank Stations
Manning's n Values
Computed W. S.


Cross-Section Plot 1 ft
WS Elev: 2001.66 ft
EGL Elev: 2002.06 ft
Flow: 2543 cfs
2006
2004
2002
2000
1998
Elevation ft MSL
.085
.085
.085
0
100
200
300
400
500
Horizontal Station ft
Channel Bottom
Energy Grade Line
Overbank Stations
Manning's n Values
Computed W. S.

3.4.6 HEC-1 Warnings and Errors

3.4.6.1 General

No warnings were encountered in the HEC-1 output.

3.5 FINAL RESULTS

3.5.1 General

The results of this study are summarized in Tables F-1 through F-3. Evaluation of the results indicate that peak flow rates for the major concentration points on all major washes result from the 100-year, 24-hour duration storm. The 6-hour duration storm typically produced higher peaks on the smaller portions of the watershed. Therefore, care must be taken in selecting a peak discharge at any particular point of interest.

The HEC-1 output files for both the 6-hour and 24-hour storms are included in Section 3.5.6.

3.5.2 Discussion of Results

3.5.2.1 General

The final results are summarized in Table F-1, which contains a summary of peak discharges at key locations on the watershed. Tables F-2 and F-3 contain flow summaries at all locations for the 100-year 6-hour and 100-year 24-hour storms respectively.

3.5.2.2 Comparison of Results with Previous Studies

There are no existing drainage studies of record in this watershed with which to compare the HEC-1 model results. However, comparison of flows with regression analyses of streamflows throughout the state of Arizona were used to select the most appropriate unit hydrograph method and to measure the reasonableness of the HEC-1 models.

3.5.2.3 Applicability of the Hydrologic Models for Other Uses

The HEC-1 models have been developed for the 100-year, 6-hour and the 100-year, 24-hour storms. No other frequencies have been modeled. The specific purpose in preparing these models was for floodplain delineation and flood insurance purposes. The key assumptions upon which this study is based were made with these purposes in mind. Therefore, if theses

models are used for other purposes, such as for design of drainage improvements or new developments, the following points should be considered:

1. The lag times and routing parameters may not be appropriate for other storm frequencies.

2. The flow splits that were modeled as an existing condition may need to be re-evaluated or different assumptions made as to the percentage of flow in the branches downstream of the split. This could particularly be true for a design situation.

3.5.2.4 Summary of HEC-1 Nomenclature

The HEC-1 identifier is the name used on the exhibit maps and the HEC-1 input files to pinpoint the type of HEC-1 operation and the location on the watershed. The following is a description of the nomenclature used throughout all tables in the report and in the HEC-1 computer models. Note that on Exhibit "C", a symbol is used to describe the identifier instead of a letter.

HEC-1 COMPUTER MODEL NOMENCLATURE	
HEC-1 Identifier	**Description**
5S	Hydrograph identifier for sub-basin 5.
16R	Hydrograph identifier for normal depth channel routing operation 6.
21C	Hydrograph identifier for concentration point 21.
40DV	The hydrograph at concentration point 40 was split using the HEC-1 diversion operation. This defines the hydrograph diverted from the main channel.
40DR	The diverted hydrograph for the operation at concentration point 40 has been recalled using the divert return operation.

SECTION 3.5.3: FINAL RESULTS

TABLE F-1

Summary of Peak Discharges at Key Locations on the Watershed

HEC-1 Identifier	Peak Discharge (cfs)		Area (sq mi)
	6-hour	24-hour	
57C	770	856	2.21
65C	530	691	1.68
70C	527	660	1.80
80C	1164	1278	4.01
90C	1189	1347	4.73
100C	1334	1525	4.96
170C	1047	1347	3.92
176C	825	1048	3.33
180AC	487	619	3.58
180BC	417	520	1.70
180C	875	1116	5.29
190C	867	1102	5.39
200C	1030	1302	3.60
210C	498	610	2.11
220C	523	651	1.94

TABLE F-2

100-YEAR 6-HOUR HEC-1 RESULTS

HEC-1 ID	Peak Discharge (cfs)	Time to Peak (hrs)	Drainage Area (sq mi)	Discharge (cfs/mi^2)
5S	337	4.92	0.52	648
10S	719	4.92	1.15	625
15C	1041	4.92	1.67	623
15DV	625	4.92	1.67	374
15D	416	4.92	1.67	249
16R	332	6.83	1.67	199
20S	333	4.92	0.55	605
21C	481	5.00	1.22	394
25S	343	4.67	0.43	798
31R	321	4.92	0.43	747
35S	414	5.00	0.72	575
40C	719	5.00	1.15	625
40DV	359	5.00	1.15	312
40D	359	5.00	1.15	312
41R	335	5.50	1.15	291
46DR	625	4.92	1.67	374
46R	538	6.17	1.67	322
50S	307	4.67	0.40	768
55C	771	5.92	1.98	389
55DV	385	5.92	1.98	194
55D	385	5.92	1.98	194
56R	376	6.17	1.98	190
57C	770	5.00	2.21	348
58R	693	6.08	2.21	314
59DR	385	5.92	1.98	194
59R	368	6.33	1.98	186
60S	346	4.58	0.52	665
61DR	359	5.00	1.15	312
61R	315	6.00	1.15	274
61DV	221	6.00	1.15	192
61D	95	6.00	1.15	83
65C	530	4.67	1.68	315
66R	519	4.92	1.68	309
67DR	221	6.00	1.15	192
67DV	155	6.00	1.15	135
67D	66	6.00	1.15	57
67R	63	6.17	1.15	55
70C	527	5.08	1.80	293
71R	523	5.17	1.80	291
80C	1164	6.25	4.01	290
81R	1157	6.42	4.01	289
85S	497	4.92	0.72	690
90C	1189	6.33	4.73	251
95S	221	4.67	0.23	961
100C	1334	4.92	4.96	269
105S	972	4.67	1.27	765
106R	900	5.00	1.27	709
110S	440	4.67	0.60	733
115C	1262	4.92	1.87	675
116R	1044	5.75	1.87	558
120S	679	5.00	1.17	580
125C	1359	5.67	3.04	447
130S	741	5.33	1.46	508
135C	1938	5.58	4.50	431
136R	1873	5.92	4.50	416
140S	533	4.92	0.89	599
145C	1995	5.75	5.39	370
146R	1941	6.33	5.39	360
150S	426	5.17	0.92	463
155C	2017	6.25	6.31	320
155DV	1009	6.25	6.31	160
155D	1009	6.25	6.31	160
156R	985	6.58	6.31	156
160S	394	5.00	0.69	571
165S	232	4.67	0.26	892
165DV	162	4.67	0.26	623
165D	69	4.67	0.26	265
166R	64	5.08	0.26	246
170C	1047	6.58	3.92	267
171R	1034	6.75	3.92	264
171DV	207	6.75	3.92	53
171D	827	6.75	3.92	211
172R	819	7.00	3.92	209
175S	108	4.67	0.19	568
176C	825	7.00	3.33	248
176DV	413	7.00	3.33	124
176D	413	7.00	3.33	124
176AR	405	7.42	3.33	122
177DR	123	5.25	1.81	68
177R	116	6.08	1.81	64
177S	78	4.50	0.11	709
180AC	487	7.42	3.58	136
176DR	413	7.00	3.33	124
176BR	405	7.42	3.33	122
178S	29	4.33	0.04	725
180BC	417	7.42	1.70	245
180C	875	7.42	5.29	165
181R	867	7.67	5.29	164
185S	59	4.42	0.10	590
190C	867	7.67	5.39	161
191DR	1009	6.25	6.31	160
191R	976	6.83	6.31	155
195S	112	4.50	0.16	700
200DR	155	6.00	1.15	135
200C	1030	6.83	3.60	286
200DV	515	6.83	3.60	143
200D	515	6.83	3.60	143
201R	486	8.00	3.60	135
205S	194	4.75	0.31	626
210C	498	7.92	2.11	236
211DR	515	6.83	3.60	143
211R	508	7.08	3.60	141
215S	93	4.50	0.14	664
220C	523	7.08	1.94	270
221R	504	7.75	1.94	260
222S	113	4.67	0.21	538
223C	504	7.75	2.15	234
225C	2213	7.67	14.60	152

TABLE F-3

100-YEAR 24-HOUR HEC-1 RESULTS

HEC-1 ID	Peak Discharge (cfs)	Time to Peak (hrs)	Drainage Area (sq mi)	Discharge (cfs/mi^2)
5S	409	12.83	0.52	787
10S	880	12.92	1.15	765
15C	1276	12.92	1.67	764
15DV	766	12.92	1.67	459
15D	510	12.92	1.67	305
16R	368	14.92	1.67	220
20S	413	12.83	0.55	751
21C	526	12.92	1.22	431
25S	425	12.58	0.43	988
31R	416	12.67	0.43	967
35S	508	13.00	0.72	706
40C	876	12.83	1.15	762
40DV	438	12.83	1.15	381
40D	438	12.83	1.15	381
41R	392	13.33	1.15	341
46DR	766	12.92	1.67	459
46R	619	13.83	1.67	371
50S	393	12.50	0.40	983
55C	902	13.75	1.98	456
55DV	451	13.75	1.98	228
55D	451	13.75	1.98	228
56R	429	14.00	1.98	217
57C	856	12.92	2.21	387
58R	752	13.83	2.21	340
59DR	451	13.75	1.98	228
59R	421	14.17	1.98	213
60S	482	12.50	0.52	927
61DR	438	12.83	1.15	381
61R	354	13.83	1.15	308
61DV	248	13.83	1.15	216
61D	106	13.83	1.15	92
65C	691	12.58	1.68	411
66R	654	12.92	1.68	389
67DR	248	13.83	1.15	216
67DV	173	13.83	1.15	150
67D	74	13.83	1.15	64
67R	73	14.08	1.15	63
70C	660	12.92	1.80	367
71R	643	13.08	1.80	357
80C	1278	13.83	4.01	319
81R	1261	14.33	4.01	314
85S	597	12.83	0.72	829
90C	1347	12.92	4.73	285
95S	259	12.58	0.23	1126
100C	1525	12.83	4.96	307
105S	1234	12.58	1.27	972
106R	1165	12.83	1.27	917
110S	557	12.58	0.60	928
115C	1656	12.75	1.87	886
116R	1358	13.58	1.87	726
120S	835	12.92	1.17	714
125C	1799	13.50	3.04	592
130S	896	13.25	1.46	614
135C	2560	13.42	4.50	569
136R	2457	13.67	4.50	546
140S	671	12.83	0.89	754
145C	2615	13.67	5.39	485
146R	2505	14.25	5.39	465
150S	549	13.08	0.92	597
155C	2595	14.17	6.31	411
155DV	1297	14.17	6.31	206
155D	1297	14.17	6.31	206
156R	1277	14.42	6.31	202
160S	494	12.92	0.69	716
165S	276	12.58	0.26	1062
165DV	193	12.58	0.26	742
165D	83	12.58	0.26	319
166R	77	12.92	0.26	296
170C	1347	14.33	3.92	344
171R	1327	14.50	3.92	339
171DV	265	14.50	3.92	68
171D	1062	14.50	3.92	271
172R	1043	14.75	3.92	266
175S	156	12.58	0.19	821
176C	1048	14.75	3.33	315
176DV	524	14.75	3.33	157
176D	524	14.75	3.33	157
176AR	511	15.25	3.33	153
177DR	131	13.50	1.81	72
177R	125	14.00	1.81	69
177S	115	12.33	0.11	1045
180AC	619	15.25	3.58	173
176DR	524	14.75	3.33	157
176BR	511	15.25	3.33	153
178S	45	12.17	0.04	1125
180BC	520	15.25	1.70	306
180C	1116	15.25	5.29	211
181R	1102	15.42	5.29	208
185S	93	12.33	0.10	930
190C	1102	15.42	5.39	204
191DR	1297	14.17	6.31	206
191R	1248	14.67	6.31	198
195S	156	12.42	0.16	975
200DR	173	13.83	1.15	150
200C	1302	14.67	3.60	362
200DV	651	14.67	3.60	181
200D	651	14.67	3.60	181
201R	602	15.58	3.60	167
205S	257	12.67	0.31	829
210C	610	15.58	2.11	289
211DR	651	14.67	3.60	181
211R	640	14.92	3.60	178
215S	137	12.33	0.14	979
220C	651	14.92	1.94	336
221R	628	15.50	1.94	324
222S	170	12.58	0.21	810
223C	627	15.50	2.15	292
225C	2930	15.42	14.60	201

SECTION 3.5.6

100-YEAR 6-HOUR STORM HEC-1 OUTPUT

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*            VERSION 4.0.1E            *
*                                      *
*          DATE  09/27/94  TIME  15:12:41  *
*                                      *
****************************************
```

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****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 551-1748              *
*                                      *
****************************************
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X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID   RIO VERDE - NORTH
  2           ID   FLOODPLAIN DELINEATION STUDY
  3           ID   PHOENIX VALLEY S-GRAPH UNIT HYDROGRAPH
  4           ID   ***************************
  5           ID   *** FILE = RIO6HR.DAT   ***
  6           ID   ***************************
  7           ID   6-HOUR, 100-YEAR STORM
  8           ID   FCDMC RAINFALL DISTRIBUTION BASED ON QUEEN CREEK STORM OF AUGUST, 1954
  9           ID   GREEN-AMPT RAINFALL LOSSES
 10           ID   NORMAL DEPTH CHANNEL ROUTING
 11           IT       5                    300
 12           IO       5
 13           IN      15
 14           JD    3.40     .01
              * THE FOLLOWING PC RECORD USED A 6-HOUR RAINFALL WITH PATTERN NO. 2.90
 15           PC    .000    .014    .020    .030    .047    .061    .074    .087    .101    .115
 16           PC    .130    .147    .170    .216    .299    .470    .672    .800    .871    .914
 17           PC    .946    .960    .973    .987   1.000
 18           JD    3.36       1
 19           JD    3.26       5
 20           JD    3.20      10
 21           JD    3.09      20
              *DIAGRAM

 22           KK      5S
 23           KM   SUB-BASIN 5
 24           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 25           KM    L=      2.7  Lca=      1.6   S=  161.3  Kn= .070  LAG=  67.0
 26           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 27           BA     .52
 28           LG     .15     .39    5.70     .20       0
 29           UI     26.     26.     26.     81.    104.    124.    141.    154.    172.    195.
 30           UI    222.    283.    334.    305.    259.    229.    208.    184.    162.    144.
 31           UI    127.    108.     80.     54.     46.     43.     41.     26.     26.     25.
 32           UI      8.      8.      8.      8.      8.      8.      8.      8.      8.      8.
 33           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 34           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 35           KK     10S
 36           KM   SUB-BASIN 10
 37           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 38           KM    L=      3.4  Lca=      2.0   S=  359.5  Kn= .070  LAG=  67.9
 39           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 40           BA    1.15
 41           LG     .17     .39    5.80     .20       0
 42           UI     57.     57.     57.    171.    221.    269.    302.    332.    369.    418.
 43           UI    469.    591.    714.    685.    578.    509.    460.    411.    362.    324.
 44           UI    285.    247.    190.    137.    101.     96.     93.     66.     57.     57.
 45           UI     32.     17.     17.     17.     17.     17.     17.     17.     17.     17.
 46           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 47           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48          KK     15C
  49          KM   COMBINE 5S AND 10S
  50          HC       2

  51          KK     15D
  52          KM   DIVERT 60 % OF FLOW FROM 15C TO SOUTH CHANNEL
  53          DT    15DV
  54          DI       0   10000
  55          DQ       0    6000

  56          KK     16R
  57          KM   ROUTE FLOW FROM 15C TO 80C
  58          RS      23    FLOW      -1
  59          RC     .09     .07     .09   14800    .027
  60          RX       0       1     226     227     242     243     468     469
  61          RY     105     100      99      97      97      99     100     105

  62          KK     20S
  63          KM   SUB-BASIN 20
  64          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  65          KM    L=      3.0  Lca=      1.3   S=  142.0  Kn= .070  LAG=  66.2
  66          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
  67          BA     .55
  68          LG     .15     .37    5.20     .26     .00
  69          UI     28.     28.     28.     90.    112.    133.    152.    167.    186.    211.
  70          UI    243.    308.    364.    315.    270.    240.    217.    190.    169.    149.
  71          UI    133.    108.     80.     50.     48.     46.     38.     28.     28.     20.
  72          UI      9.      9.      9.      9.      9.      9.      9.      9.      9.      0.
  73          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
  74          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

  75          KK     21C
  76          KM   COMBINE 16R AND 20S
  77          HC       2   1.218

  78          KK     25S
  79          KM   SUB-BASIN 25
  80          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  81          KM    L=      1.9  Lca=      1.0   S=  133.3  Kn= .070  LAG=  49.6
  82          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
  83          BA     .43
  84          LG     .15     .38    5.60     .20       0
  85          UI     29.     29.     78.    121.    149.    171.    199.    234.    309.    372.
  86          UI    303.    254.    222.    186.    158.    133.     96.     59.     50.     46.
  87          UI     29.     29.     13.      9.      9.      9.      9.      9.      9.      0.
  88          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
  89          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

  90          KK     31R
  91          KM   ROUTE FLOW FROM 30C TO 40C
  92          RS       2    FLOW      -1
  93          RC     .09     .07     .09    2400    .025
  94          RX       0       1     101     102     107     108     208     209
  95          RY     105     100      99      97      97      99     100     105
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 96           KK     35S
 97           KM   SUB-BASIN 35
 98           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 99           KM    L=       3.1  Lca=       1.7   S=  145.0  Kn= .070  LAG=  73.2
100           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
101           BA     .72
102           LG     .15      .37     5.30      .24        0
103           UI     33.      33.      33.      81.     119.     145.     166.     183.     200.     222.
104           UI    249.     280.     354.     413.     400.     340.     301.     273.     249.     220.
105           UI    198.     176.     158.     135.     102.      73.      58.      55.      54.      40.
106           UI     33.      33.      26.      10.      10.      10.      10.      10.      10.      10.
107           UI     10.      10.      10.       0.       0.       0.       0.       0.       0.       0.
108           UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

109           KK     40C
110           KM   COMBINE 31R AND 35S
111           HC       2

112           KK     40D
113           KM   DIVERT 50 % OF FLOW FROM 40C TO SOUTH CHANNEL
114           DT    40DV
115           DI       0   10000
116           DQ       0    5000

117           KK     41R
118           KM   ROUTE REMAINING FLOW FROM 40C TO 55C
119           RS       7    FLOW      -1
120           RC    .070    .050    .070    6070    .028
121           RX       0       1     101     102     112     113     213     214
122           RY     105     100      99      97      97      99     100     105

123           KK    46DR
124           KM   RETRIEVE FLOW DIVERTED FROM 15C
125           DR    15DV

126           KK     46R
127           KM   ROUTE REMAINING FLOW FROM 15C TO 55C
128           RS      15    FLOW      -1
129           RC     .08     .07     .08   11144    .027
130           RX       0       1     176     177     192     193     368     369
131           RY     105     100      99      97      97      99     100     105

132           KK     50S
133           KM   SUB-BASIN 50
134           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
135           KM    L=       2.5  Lca=       .9   S=  138.0  Kn= .060  LAG=  46.7
136           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
137           BA     .40
138           LG     .15      .38     5.60      .24        0
139           UI     29.      29.      88.     126.     153.     177.     210.     258.     355.     329.
140           UI    266.     229.     191.     162.     135.      96.      58.      49.      43.      29.
141           UI     27.       9.       9.       9.       9.       9.       9.       0.       0.       0.
142           UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 143          KK     55C
 144          KM   COMBINE 41R, 46S, AND 50S
 145          HC       3   1.977

 146          KK     55D
 147          KM   DIVERT 50 % OF FLOW FROM 55C TO SOUTH CHANNEL
 148          DT    55DV
 149          DI       0   10000
 150          DQ       0    5000

 151          KK     56R
 152          KM   ROUTE FLOW FROM 55C TO 57C
 153          RS       3    FLOW      -1
 154          RC     .08     .05     .08    3800    .028
 155          RX       0       1     101     102     117     118     218     219
 156          RY     105     100      99      97      97      99     100     105

 157          KK     57C
 158          KM   COMBINE 16R AND 56R
 159          HC       2   2.207

 160          KK     58R
 161          KM   ROUTE FLOW FROM 57C TO 80C
 162          RS      12    FLOW      -1
 163          RC     .09     .07     .09    8500    .026
 164          RX       0       1     201     202     222     223     423     424
 165          RY     105     100      99      97      97      99     100     105

 166          KK    59DR
 167          KM    RETRIEVE DIVERTED FLOW FROM 55D
 168          DR    55DV

 169          KK     59R
 170          KM   ROUTE DIVERTED FLOW FROM 55D TO 65C
 171          RS       5    FLOW      -1
 172          RC     .08     .05     .08    5622    .029
 173          RX       0       1     101     102     112     113     213     214
 174          RY     105     100      99      97      97      99     100     105

 175          KK     60S
 176          KM   SUB-BASIN 60
 177          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 178          KM    L=       2.8  Lca=       1.1   S=  142.9  Kn= .050  LAG=  43.6
 179          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 180          BA     .52
 181          LG     .15     .35    4.35     .42       0
 182          UI     40.     40.    140.    186.    225.    263.    317.    429.    501.    393.
 183          UI    330.    276.    229.    189.    132.     77.     67.     53.     40.     26.
 184          UI     12.     12.     12.     12.     12.     12.      0.      0.      0.      0.
 185          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 186          KK    61DR
 187          KM   RETRIEVE DIVERTED FLOW FROM 40C
 188          DR    40DV

 189          KK     61R
 190          KM   ROUTE DIVERTED FLOW FROM 40C TO 61D
 191          RS      13    FLOW      -1
 192          RC    .070    .050    .070   12288    .027
 193          RX       0       1     151     152     167     168     318     319
 194          RY     105     100      99      97      97      99     100     105

 195          KK     61D
 196          KM   DIVERT 70 % OF FLOW FROM 61R TO SOUTH CHANNEL
 197          DT    61DV
 198          DI       0   10000
 199          DQ       0    7000

 200          KK     65C
 201          KM   COMBINE 61D, 59R AND 60S
 202          HC       3   1.681

 203          KK     66R
 204          KM   ROUTE FLOW FROM 65C TO 200C
 205          RS       3    FLOW      -1
 206          RC     .09     .07     .09    4000    .025
 207          RX       0       1     126     127     172     173     298     299
 208          RY     105     100      99      97      97      99     100     105

 209          KK    67DR
 210          KM   RETRIEVE DIVERTED FLOW FROM 61D
 211          DR    61DV

 212          KK     67D
 213          KM   DIVERT 70 % OF FLOW FROM 67DR TO SOUTH CHANNEL
 214          DT    67DV
 215          DI       0   10000
 216          DQ       0    7000

 217          KK     67R
 218          KM   ROUTE REMAINING FLOW FROM 67D TO 70C
 219          RS       2    FLOW      -1
 220          RC     .09     .07     .09    5800    .028
 221          RX       0       1     126     127     142     143     268     269
 222          RY     105     100      99      97      97      99     100     105

 223          KK     70C
 224          KM   COMBINE 66R AND 67R
 225          HC       2   1.802
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 226          KK     71R
 227          KM   ROUTE FLOW FROM 70C TO 80C
 228          RS       1    FLOW      -1
 229          RC     .09     .07     .09    1600    .031
 230          RX       0       1     151     152     182     183     333     334
 231          RY     105     100      99      97      97      99     100     105

 232          KK     80C
 233          KM   COMBINE 58R AND 71R
 234          HC       2   4.008

 235          KK     81R
 236          KM   ROUTE FLOW FROM 80C TO 90C
 237          RS       3    FLOW      -1
 238          RC     .09     .07     .09    3500    .039
 239          RX       0       1     201     202     262     263     463     464
 240          RY     105     100      99      97      97      99     100     105

 241          KK     85S
 242          KM   SUB-BASIN 85
 243          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 244          KM    L=       2.8  Lca=       1.4   S=  157.0  Kn= .070  LAG=  64.5
 245          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 246          BA     .72
 247          LG     .15     .39    5.80     .18     .00
 248          UI     38.     38.     41.    127.    155.    183.    207.    229.    259.    291.
 249          UI    348.    442.    483.    400.    346.    310.    277.    242.    215.    188.
 250          UI    161.    121.     83.     67.     62.     59.     38.     38.     34.     12.
 251          UI     12.     12.     12.     12.     12.     12.     12.     12.      0.      0.
 252          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 253          KK     90C
 254          KM   COMBINE 81R AND 85S
 255          HC       2

 256          KK     95S
 257          KM   SUB-BASIN 95
 258          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 259          KM    L=       2.1  Lca=        .9   S=  156.0  Kn= .070  LAG=  48.0
 260          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 261          BA     .23
 262          LG     .15     .30    8.00     .09       0
 263          UI     16.     16.     46.     68.     83.     95.    112.    134.    183.    194.
 264          UI    154.    131.    112.     95.     79.     63.     40.     28.     26.     19.
 265          UI     16.     10.      5.      5.      5.      5.      5.      5.      0.      0.
 266          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 267          KK    100C
 268          KM   COMBINE 90C AND 95S
 269          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 270          KK   105S
 271          KM  SUB-BASIN 105
 272          KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 273          KM   L=      2.5  Lca=      1.0   S=  312.0  Kn= .070  LAG=  47.8
 274          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 275          BA   1.27
 276          LG    .16     .40    6.00     .21       0
 277          UI    90.     90.    261.    384.    470.    541.    638.    767.   1047.   1081.
 278          UI   860.    736.    626.    529.    442.    345.    216.    157.    147.     99.
 279          UI    90.     50.     27.     27.     27.     27.     27.     27.      0.      0.
 280          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 281          KK   106R
 282          KM  ROUTE FLOW FROM SUB-BASIN 105S TO 115C
 283          RS      4    FLOW      -1
 284          RC    .09     .07     .09    2786    .010
 285          RX      0       1     201     202     232     233     433     434
 286          RY    105     100      99      97      97      99     100     105

 287          KK   110S
 288          KM  SUB-BASIN 110
 289          KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 290          KM   L=      2.1  Lca=       .9   S=  112.0  Kn= .070  LAG=  51.0
 291          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 292          BA    .60
 293          LG    .17     .39    6.20     .21       0
 294          UI    39.     39.     98.    160.    197.    227.    260.    305.    391.    498.
 295          UI   435.    361.    315.    268.    229.    194.    156.    101.     70.     65.
 296          UI    51.     39.     34.     12.     12.     12.     12.     12.     12.     12.
 297          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 298          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 299          KK   115C
 300          KM  COMBINE 106R AND 110S
 301          KM  BLACK HILL TANK ASSUMED TO NOT REMAIN IN PLACE PER FEMA REQUIREMENTS
 302          HC      2

 303          KK   116R
 304          KM  ROUTE FLOW FROM 115RET TO 125C
 305          RS      9    FLOW      -1
 306          RC    .09     .07     .09    9104    .022
 307          RX      0       1     251     252     282     283     533     534
 308          RY    105     100      99      97      97      99     100     105

 309          KK   120S
 310          KM  SUB-BASIN 120
 311          KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 312          KM   L=      3.7  Lca=      1.2   S=  119.0  Kn= .070  LAG=  72.5
 313          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 314          BA   1.17
 315          LG    .15     .37    5.30     .24       0
 316          UI    54.     54.     54.    137.    198.    242.    275.    304.    332.    371.
 317          UI   414.    469.    596.    694.    645.    552.    490.    445.    404.    356.
 318          UI   321.    283.    257.    215.    158.    107.     96.     90.     89.     58.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 319          UI     54.     54.     33.     17.     17.     17.     17.     17.     17.     17.
 320          UI     17.     17.     17.      0.      0.      0.      0.      0.      0.      0.
 321          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 322          KK    125C
 323          KM   COMBINE 116R AND 120S
 324          HC       2

 325          KK    130S
 326          KM   SUB-BASIN 130
 327          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 328          KM    L=       4.6  Lca=       2.6   S=  245.0  Kn= .070  LAG=  90.2
 329          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 330          BA    1.46
 331          LG     .15     .39    6.20     .19       0
 332          UI     54.     54.     54.     54.    160.    196.    229.    260.    285.    309.
 333          UI    330.    360.    396.    425.    486.    593.    667.    700.    604.    540.
 334          UI    490.    453.    424.    382.    349.    322.    292.    266.    242.    203.
 335          UI    156.    116.     96.     94.     89.     89.     62.     54.     54.     54.
 336          UI     30.     17.     17.     17.     17.     17.     17.     17.     17.     17.
 337          UI     17.     17.     17.      0.      0.      0.      0.      0.      0.      0.
 338          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 339          KK    135C
 340          KM   COMBINE 125C AND 130S
 341          HC       2

 342          KK    136R
 343          KM   ROUTE FLOW FROM 135C TO 145C
 344          RS       3    FLOW      -1
 345          RC     .09     .07     .09    5572    .023
 346          RX       0       1     201     202     252     253     453     454
 347          RY     105     100      99      97      97      99     100     105

 348          KK    140S
 349          KM   SUB-BASIN 140
 350          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 351          KM    L=       3.0  Lca=       1.3   S=  145.2  Kn= .070  LAG=  65.7
 352          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 353          BA     .89
 354          LG     .15     .38    5.60     .25       0
 355          UI     46.     46.     46.    149.    184.    218.    249.    273.    306.    348.
 356          UI    403.    508.    595.    506.    434.    387.    349.    306.    272.    237.
 357          UI    213.    165.    122.     81.     78.     75.     56.     46.     46.     26.
 358          UI     14.     14.     14.     14.     14.     14.     14.     14.     14.      0.
 359          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 360          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 361          KK    145C
 362          KM   COMBINE 136R AND 140S
 363          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 364          KK    146R
 365          KM   ROUTE FLOW FROM 145C TO 155C
 366          RS       7    FLOW      -1
 367          RC     .09     .07     .09   10547    .025
 368          RX       0       1     251     252     277     278     528     529
 369          RY     105     100      99      97      97      99     100     105

 370          KK    150S
 371          KM   SUB-BASIN 150
 372          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 373          KM    L=      4.0  Lca=      1.7   S=  142.0  Kn= .070  LAG=  82.0
 374          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 375          BA     .92
 376          LG     .15     .35    4.55     .35       0
 377          UI     38.     38.     38.     57.    125.    147.    176.    193.    211.    228.
 378          UI    250.    278.    303.    356.    431.    497.    439.    382.    344.    315.
 379          UI    291.    262.    235.    216.    192.    177.    150.    114.     86.     67.
 380          UI     65.     62.     60.     38.     38.     38.     29.     12.     12.     12.
 381          UI     12.     12.     12.     12.     12.     12.     12.     12.      0.      0.
 382          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 383          KK    155C
 384          KM   COMBINE 146R AND 150S
 385          HC       2

 386          KK    155D
 387          KM   DIVERT 50 % OF FLOW FROM 155C TO NORTH CHANNEL
 388          DT   155DV
 389          DI       0   10000
 390          DQ       0    5000

 391          KK    156R
 392          KM   ROUTE REMAINING FLOW FROM 155C TO 170C
 393          RS       3    FLOW      -1
 394          RC     .08     .05     .08    4030    .027
 395          RX       0       1     151     152     182     183     333     334
 396          RY     105     100      99      97      97      99     100     105

 397          KK    160S
 398          KM   SUB-BASIN 160
 399          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 400          KM    L=      3.5  Lca=      2.0   S=  137.6  Kn= .060  LAG=  70.6
 401          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 402          BA     .69
 403          LG     .15     .38    5.60     .25       0
 404          UI     33.     33.     33.     90.    122.    152.    170.    188.    207.    232.
 405          UI    257.    305.    380.    430.    366.    317.    283.    260.    229.    204.
 406          UI    182.    162.    140.    107.     77.     58.     56.     54.     40.     33.
 407          UI     33.     23.     10.     10.     10.     10.     10.     10.     10.     10.
 408          UI     10.     10.      0.      0.      0.      0.      0.      0.      0.      0.
 409          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 410          KK    165S
 411          KM   SUB-BASIN 165
 412          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 413          KM    L=       2.1  Lca=        .9   S=  134.4  Kn= .070  LAG=  49.8
 414          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 415          BA     .26
 416          LG     .15      .35     7.00      .13       0
 417          UI     18.      18.      47.      74.      90.     104.     120.     141.     187.     225.
 418          UI    185.     156.     136.     114.      97.      82.      59.      37.      30.      29.
 419          UI     18.      18.       9.       5.       5.       5.       5.       5.       5.       0.
 420          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
 421          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

 422          KK    165D
 423          KM   DIVERT 70 % OF FLOW FROM 165S TO SOUTH ALONG OLD DIRT ROAD
 424          DT   165DV
 425          DI       0   10000
 426          DQ       0    7000

 427          KK    166R
 428          KM   ROUTE FLOW FROM 165S TO 170C
 429          RS       5    FLOW      -1
 430          RC     .09      .07      .09     7313     .027
 431          RX       0        1      101      102      117      118      218      219
 432          RY     105      100       99       97       97       99      100      105

 433          KK    170C
 434          KM   COMBINE 156R, 160S, 166R
 435          HC       3    3.923

 436          KK    171R
 437          KM   ROUTE FLOW FROM 170C TO 171D
 438          RS       2    FLOW      -1
 439          RC     .09      .07      .09     3800     .028
 440          RX       0        1      101      102      112      113      213      214
 441          RY     105      100       99       97       97       99      100      105

 442          KK    171D
 443          KM   DIVERT 20 % OF FLOW FROM 171R TO SOUTH, OUT OF WATERSHED
 444          KM   THIS DIVERT QUANTITY WAS DETERMINED BY HEC-2 MODEL DURING FLOODPLAIN
 445          KM   DELINEATION PORTION OF STUDY
 446          DT   171DV
 447          DI       0    2000
 448          DQ       0     400

 449          KK    172R
 450          KM   ROUTE FLOW FROM 171D TO 176C
 451          RS       3    FLOW      -1
 452          RC     .09      .07      .09     4200     .026
 453          RX       0        1      101      102      112      113      213      214
 454          RY     105      100       99       97       97       99      100      105
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

455           KK    175S
456           KM   SUB-BASIN 175
457           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
458           KM    L=       1.9  Lca=       .9   S=  142.0  Kn= .070  LAG=  47.9
459           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
460           BA     .19
461           LG     .15     .35    4.35     .47     .00
462           UI     13.     13.     38.     56.     69.     79.     93.    112.    153.    160.
463           UI    127.    108.     92.     78.     65.     51.     32.     23.     22.     15.
464           UI     13.      8.      4.      4.      4.      4.      4.      4.      0.      0.
465           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

466           KK    176C
467           KM   COMBINE 172R AND 175S
468           HC       2  3.3284

469           KK    176D
470           KM   DIVERT 50 PERCENT OF FLOW TO 180BC
471           DT   176DV
472           DI       0    5000
473           DQ       0    2500

474           KK   176AR
475           KM   ROUTE 176D TO 180AC
476           RS       5    FLOW      -1
477           RC      .1     .07      .1    4726   .0212
478           RX       0       1     101     102     112     113     213     214
479           RY     105     100      99      97      97      99     100     105

480           KK   177DR
481           KM   RETRIEVE HYDROGRAPH FROM RIO VERDE SOUTH WATERSHED
482           KM   DATA PROVIDED BY GEORGE V. SABOL CONSULTING ENGINEERS, INC.
483           BA   1.808
484           QI       0       0       0       0       0       0       0       0       0       0
485           QI       0       0       0       0       0      12      38      98      90      68
486           QI      98     123     122     107      93      90      90      90      87      80
487           QI      71      61      51      39      29      22      14       7       3       2
488           QI       2       1       1       1       1       1       0       0       0       0

489           KK    177R
490           KM   ROUTE FLOW FROM 177DR TO 180AC
491           RS      10    FLOW      -1
492           RC      .1     .07      .1    5400   0.022
493           RX       0       1     101     102     112     113     213     214
494           RY     105     100      99      97      97      99     100     105

495           KK    177S
496           KM   SUB-BASIN 177
497           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
498           KM    L=       1.3  Lca=       .6   S=  126.0  Kn= .070  LAG=  36.8
499           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
500           BA     .11
501           LG     .15     .35    4.35     .47     .00
502           UI     10.     18.     42.     55.     67.     83.    120.    119.     92.     75.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 503          UI     60.     47.     29.     18.     15.     10.      6.      3.      3.      3.
 504          UI      3.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 505          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 506          KK   180AC
 507          KM   COMBINE 176AR, 177R, AND 177S
 508          HC       3  3.5822

 509          KK   176DR
 510          KM   RETRIEVE DIVERTED HYDROGRAPH FROM FROM 176C
 511          DR   176DV

 512          KK   176BR
 513          KM   ROUTE 176DR TO 180BC
 514          RS       5    FLOW      -1
 515          RC      .1     .07      .1    4677   .0212
 516          RX       0       1     101     102     112     113     213     214
 517          RY     105     100      99      97      97      99     100     105

 518          KK    178S
 519          KM   SUB-BASIN 178
 520          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 521          KM    L=        .9  Lca=        .4   S=  112.0  Kn= .070  LAG=  27.0
 522          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 523          BA     .04
 524          LG     .15     .35    4.40     .46     .00
 525          UI      4.     13.     23.     30.     45.     51.     37.     28.     20.     10.
 526          UI      7.      4.      2.      1.      1.      1.      0.      0.      0.      0.
 527          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 528          KK   180BC
 529          KM   COMBINE 176BR AND 178S
 530          HC       2  1.7042

 531          KK    180C
 532          KM   COMBINE 180AC AND 180BC
 533          HC       2

 534          KK    181R
 535          KM   ROUTE FLOW FROM 180C TO 190C
 536          RS       3    FLOW      -1
 537          RC     .09     .07     .09    3383    .027
 538          RX       0       1     151     152     167     168     318     319
 539          RY     105     100      99      97      97      99     100     105

 540          KK    185S
 541          KM   SUB-BASIN 185
 542          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 543          KM    L=       1.3  Lca=        .6   S=  124.0  Kn= .070  LAG=  36.6
 544          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 545          BA     .10
 546          LG     .15     .35    4.10     .57     .00
 547          UI      9.     16.     36.     48.     58.     73.    105.    101.     79.     64.
 548          UI     51.     40.     24.     16.     13.      9.      5.      3.      3.      3.
 549          UI      3.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 550          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 551          KK    190C
 552          KM    COMBINE 181R AND 185S
 553          HC       2

 554          KK    191DR
 555          KM    RETRIEVE DIVERTED FLOW FROM 155C
 556          DR    155DV

 557          KK    191R
 558          KM    ROUTE FLOW FROM 191DR TO 200C
 559          RS       7    FLOW      -1
 560          RC     .09     .07     .09    7413    .025
 561          RX       0       1     151     152     177     178     328     329
 562          RY     105     100      99      97      97      99     100     105

 563          KK    195S
 564          KM    SUB-BASIN 195
 565          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 566          KM     L=       1.4  Lca=       .7   S=  145.8  Kn= .070  LAG=  40.1
 567          KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 568          BA     .16
 569          LG     .15     .35    4.35     .40       0
 570          UI     13.     18.     48.     65.     77.     93.    119.    164.    135.    110.
 571          UI     91.     74.     59.     40.     23.     21.     14.     12.      4.      4.
 572          UI      4.      4.      4.      0.      0.      0.      0.      0.      0.      0.
 573          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 574          KK    200DR
 575          KM    RETRIEVE DIVERTED FLOW FROM 67D
 576          DR     67DV

 577          KK     200C
 578          KM    COMBINE 191R, 195S, AND 200DR
 579          HC       3   3.597

 580          KK     200D
 581          KM    DIVERT 50 % OF FLOW FROM 200C TO 220C
 582          DT    200DV
 583          DI       0   10000
 584          DQ       0    5000

 585          KK     201R
 586          KM    ROUTE REMAINING FLOW FROM 200C TO 210C
 587          RS      14    FLOW      -1
 588          RC     .09     .07     .09   11393    .027
 589          RX       0       1     101     102     122     123     223     224
 590          RY     105     100      99      97      97      99     100     105
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 591          KK   205S
 592          KM  SUB-BASIN 205
 593          KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 594          KM   L=      2.2  Lca=      1.0   S=  149.0  Kn= .070  LAG=  52.9
 595          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 596          BA    .31
 597          LG    .15     .36    5.00     .34     .00
 598          UI    20.     20.     45.     76.     96.    110.    125.    146.    176.    235.
 599          UI   239.    193.    166.    145.    124.    106.     91.     66.     43.     34.
 600          UI    32.     23.     20.     15.      6.      6.      6.      6.      6.      6.
 601          UI     6.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 602          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 603          KK   210C
 604          KM  COMBINE 201R AND 205S
 605          HC      2   2.108

 606          KK  211DR
 607          KM  RETRIEVE DIVERTED FLOW FROM 200C
 608          DR  200DV

 609          KK   211R
 610          KM  ROUTE FLOW FROM 200DV TO 220C
 611          RS      4    FLOW      -1
 612          RC    .09     .07     .09    3532    .028
 613          RX      0       1     101     102     112     113     213     214
 614          RY    105     100      99      97      97      99     100     105

 615          KK   215S
 616          KM  SUB-BASIN 215
 617          KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 618          KM   L=      1.4  Lca=       .6   S=  156.0  Kn= .070  LAG=  36.7
 619          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 620          BA    .14
 621          LG    .15     .35    4.35     .47       0
 622          UI    12.     21.     50.     66.     80.    100.    144.    141.    109.     89.
 623          UI    72.     56.     34.     22.     18.     12.      7.      4.      4.      4.
 624          UI     4.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 625          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 626          KK   220C
 627          KM  COMBINE 211R AND 215S
 628          HC      2   1.938

 629          KK   221R
 630          KM  ROUTE FLOW FROM 220C TO VERDE RIVER
 631          RS      8    FLOW      -1
 632          RC    .09     .07     .09    7950    .025
 633          RX      0       1     101     102     112     113     213     214
 634          RY    105     100      99      97      97      99     100     105
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 635          KK    222S
 636          KM   SUB-BASIN 222
 637          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 638          KM    L=       1.8  Lca=       .7   S=  131.0  Kn= .070  LAG=  48.0
 639          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 640          BA     .21
 641          LG     .15     .35    4.30     .51     .00
 642          UI     15.     15.     42.     62.     76.     88.    103.    123.    168.    178.
 643          UI    141.    121.    103.     87.     73.     58.     37.     26.     24.     17.
 644          UI     15.      9.      4.      4.      4.      4.      4.      4.      0.      0.
 645          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 646          KK    223C
 647          KM   COMBINE 221R AND 222S
 648          HC      2

 649          KK    225C
 650          KM   DUMMY COMBINE OPERATION OF HYDROGRAPHS 100C, 190C, 210C, AND 223C
 651          HC      4
 652          ZZ
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SCHEMATIC DIAGRAM OF STREAM NETWORK

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INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

           (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 22          5S
              .
              .
 35           .          10S
              .            .
              .            .
 48        15C............
              .
              .
 53           .------->    15DV
 51        15D
            V
            V
 56        16R
              .
              .
 62           .          20S
              .            .
              .            .
 75        21C............
              .
              .
              .          25S
              .            V
              .            V
 90           .          31R
              .            .
              .            .
 96           .            .         35S
              .            .           .
              .            .           .
109           .          40C............
              .            .
              .            .
114           .            .------->    40DV
112           .          40D
              .            V
              .            V
117           .          41R
              .            .
              .            .
125           .            .           .<-------    15DV
123           .            .        46DR
              .            .           V
              .            .           V
126           .            .         46R
              .            .           .
              .            .           .
              .            .           .         50S
              .            .           .           .
              .            .           .           .
143           .          55C.......................
              .            .
```

```
        .          .
148     .          .-------->    55DV
146     .        55D
        .          V
        .          V
        .        56R
        .          .
        .          .
157   57C............
        V
        V
160   58R
        .
        .
168     .          .<--------    55DV
166     .       59DR
        .          V
        .          V
169     .        59R
        .          .
        .          .
175     .          .        60S
        .          .          .
        .          .          .
188     .          .          .          .<--------    40DV
186     .          .          .       61DR
        .          .          .          V
        .          .          .          V
189     .          .          .        61R
        .          .          .          .
        .          .          .          .
197     .          .          .          .-------->    61DV
195     .          .          .        61D
        .          .          .          .
        .          .          .          .
200     .        65C......................
        .          V
        .          V
203     .        66R
        .          .
        .          .
211     .          .          .<--------    61DV
209     .          .       67DR
        .          .          .
        .          .          .
214     .          .          .-------->    67DV
212     .          .        67D
        .          .          V
        .          .          V
217     .          .        67R
        .          .          .
        .          .          .
223     .        70C............
        .          V
        .          V
        .        71R
        .          .
        .          .
232   80C............
        V
```

```
                V
235            81R
                .
                .
                .          85S
                .            .
                .            .
253            90C............
                .
                .
256             .          95S
                .            .
                .            .
267           100C............
                .
                .
270             .         105S
                .            V
                .            V
281             .         106R
                .            .
                .            .
287             .            .         110S
                .            .           .
                .            .           .
299             .         115C............
                .            V
                .            V
[illegible]     .         116R
                .            .
                .            .
309             .            .         120S
                .            .           .
                .            .           .
322             .         125C............
                .            .
                .            .
325             .            .         130S
                .            .           .
                .            .           .
339             .         135C............
                .            V
                .            V
342             .         136R
                .            .
                .            .
348             .            .         140S
                .            .           .
                .            .           .
361             .         145C............
                .            V
                .            V
364             .         146R
                .            .
                .            .
                .            .         150S
                .            .           .
                .            .           .
383             .         155C............
                .            .
```

```
.          .
388        .          .-------->   155DV
386        .       155D
           .          V
           .          V
           .       156R
           .          .
           .          .
397        .          .        160S
           .          .           .
           .          .           .
410        .          .           .        165S
           .          .           .           .
           .          .           .           .
424        .          .           .           .-------->   165DV
422        .          .           .        165D
           .          .           .           V
           .          .           .           V
427        .          .           .        166R
           .          .           .           .
           .          .           .           .
433        .       170C.......................
           .          V
           .          V
436        .       171R
           .          .
           .          .
446        .          .-------->   171DV
442        .       171D
           .          V
           .          V
449        .       172R
           .          .
           .          .
455        .          .        175S
           .          .           .
           .          .           .
466        .       176C............
           .          .
           .          .
471        .          .-------->   176DV
469        .       176D
           .          V
           .          V
474        .      176AR
           .          .
           .          .
480        .          .       177DR
           .          .           V
           .          .           V
489        .          .        177R
           .          .           .
           .          .           .
495        .          .           .        177S
           .          .           .           .
           .          .           .           .
           .      180AC........................
           .          .
           .          .
511        .          .           .<-------   176DV
```

```
509          .          .       176DR
             .          .           V
             .          .           V
512          .          .       176BR
             .          .           .
             .          .           .
             .          .           .        178S
             .          .           .           .
             .          .           .           .
528          .          .       180BC............
             .          .           .
             .          .           .
531          .       180C............
             .          V
             .          V
534          .       181R
             .          .
             .          .
540          .          .        185S
             .          .           .
             .          .           .
551          .       190C............
             .          .
             .          .
556          .          .           .<-------   155DV
554          .          .       191DR
             .          .           V
             .          .           V
557          .          .        191R
             .          .           .
             .          .           .
563          .          .           .        195S
             .          .           .           .
             .          .           .           .
576          .          .           .           .           .<-------    67DV
574          .          .           .           .       200DR
             .          .           .           .           .
             .          .           .           .           .
577          .          .        200C......................
             .          .           .
             .          .           .
582          .          .           .------->   200DV
580          .          .        200D
             .          .           V
             .          .           V
585          .          .        201R
             .          .           .
             .          .           .
591          .          .           .        205S
             .          .           .           .
             .          .           .           .
603          .          .        210C............
             .          .           .
             .          .           .
608          .          .           .           .<-------   200DV
             .          .           .       211DR
             .          .           .           V
             .          .           .           V
609          .          .           .        211R
             .          .           .           .
```

```
                .         .         .         .
615             .         .         .         .        215S
                .         .         .         .          .
                .         .         .         .          .
                .         .         .   220C............
                .         .         .      V
                .         .         .      V
629             .         .         .   221R
                .         .         .      .
                .         .         .      .
635             .         .         .      .        222S
                .         .         .      .          .
                .         .         .      .          .
646             .         .         .   223C............
                .         .         .      .
                .         .         .      .
649         225C.................................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*          DATE  09/27/94  TIME  15:12:41  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 551-1748             *
*                                      *
****************************************
```

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                    RIO VERDE - NORTH
                    FLOODPLAIN DELINEATION STUDY
                    PHOENIX VALLEY S-GRAPH UNIT HYDROGRAPH
                    ***************************
                    *** FILE = RIO6HR.DAT   ***
                    ***************************
                    6-HOUR, 100-YEAR STORM
                    FCDMC RAINFALL DISTRIBUTION BASED ON QUEEN CREEK STORM OF AUGUST, 1954
                    GREEN-AMPT RAINFALL LOSSES
                    NORMAL DEPTH CHANNEL ROUTING

12 IO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE     1    0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     2    0  ENDING DATE
                    NDTIME       0055  ENDING TIME
                     ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL    0.08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT

14 JD          INDEX STORM NO. 1
                     STRM        3.40  PRECIPITATION DEPTH
                     TRDA        0.01  TRANSPOSITION DRAINAGE AREA

                 PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01
                    0.01      0.01      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00
                    0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
```

0.03	0.03	0.06	0.06	0.06	0.07	0.07	0.07	0.04	0.04
0.04	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00								

INDEX STORM NO. 2

STRM 3.36 PRECIPITATION DEPTH

TRDA 1.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03
0.03	0.03	0.06	0.06	0.06	0.07	0.07	0.07	0.04	0.04
0.04	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00								

19 JD INDEX STORM NO. 3

STRM 3.26 PRECIPITATION DEPTH

TRDA 5.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03
0.03	0.03	0.06	0.06	0.06	0.07	0.07	0.07	0.04	0.04
0.04	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00								

20 JD INDEX STORM NO. 4

STRM 3.20 PRECIPITATION DEPTH

TRDA 10.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03
0.03	0.03	0.06	0.06	0.06	0.07	0.07	0.07	0.04	0.04
0.04	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00								

21 JD INDEX STORM NO. 5

STRM 3.09 PRECIPITATION DEPTH

TRDA 20.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03
0.03	0.03	0.06	0.06	0.06	0.07	0.07	0.07	0.04	0.04
0.04	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00								

WARNING EXCESS AT PONDING LESS THAN ZERO FOR PERIOD. EXCESS SET TO ZERO

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	5S	337.	4.92	78.	20.	19.	0.52		
HYDROGRAPH AT	10S	719.	4.92	169.	42.	41.	1.15		
2 COMBINED AT	15C	1041.	4.92	243.	61.	59.	1.67		
DIVERSION TO	15DV	625.	4.92	146.	36.	35.	1.67		
HYDROGRAPH AT	15D	416.	4.92	97.	24.	23.	1.67		
ROUTED TO	16R	332.	6.83	97.	24.	23.	1.67		
HYDROGRAPH AT	20S	333.	4.92	75.	19.	18.	0.55		
2 COMBINED AT	21C	481.	5.00	172.	43.	42.	1.22		
HYDROGRAPH AT	25S	343.	4.67	66.	16.	16.	0.43		
ROUTED TO	31R	321.	4.92	66.	16.	16.	0.43		
HYDROGRAPH AT	35S	414.	5.00	102.	25.	24.	0.72		
2 COMBINED AT	40C	719.	5.00	166.	41.	40.	1.15		
DIVERSION TO	40DV	359.	5.00	83.	21.	20.	1.15		
HYDROGRAPH AT	40D	359.	5.00	83.	21.	20.	1.15		
ROUTED TO	41R	335.	5.50	83.	21.	20.	1.15		
HYDROGRAPH AT	46DR	625.	4.92	146.	36.	35.	1.67		
ROUTED TO	46R	538.	6.17	146.	36.	35.	1.67		
HYDROGRAPH AT	50S	307.	4.67	55.	14.	13.	0.40		
3 COMBINED AT	55C	771.	5.92	280.	70.	67.	1.98		
DIVERSION TO	55DV	385.	5.92	140.	35.	34.	1.98		
HYDROGRAPH AT	55D	385.	5.92	140.	35.	34.	1.98		
ROUTED TO	56R	376.	6.17	140.	35.	34.	1.98		
2 COMBINED AT	57C	770.	5.00	308.	77.	74.	2.21		
ROUTED TO	58R	693.	6.08	307.	77.	74.	2.21		
HYDROGRAPH AT	59DR	385.	5.92	140.	35.	34.	1.98		
ROUTED TO	59R	368.	6.33	140.	35.	34.	1.98		

HYDROGRAPH AT	60S	346.	4.58	56.	14.	14.	0.52
HYDROGRAPH AT	61DR	359.	5.00	83.	21.	20.	1.15
ROUTED TO	61R	315.	6.00	83.	21.	20.	1.15
DIVERSION TO	61DV	221.	6.00	58.	15.	14.	1.15
HYDROGRAPH AT	61D	95.	6.00	25.	6.	6.	1.15
3 COMBINED AT	65C	530.	4.67	220.	55.	53.	1.68
ROUTED TO	66R	519.	4.92	220.	55.	53.	1.68
HYDROGRAPH AT	67DR	221.	6.00	58.	15.	14.	1.15
DIVERSION TO	67DV	155.	6.00	41.	10.	10.	1.15
HYDROGRAPH AT	67D	66.	6.00	17.	4.	4.	1.15
ROUTED TO	67R	63.	6.17	17.	4.	4.	1.15
2 COMBINED AT	70C	527.	5.08	236.	59.	57.	1.80
ROUTED TO	71R	523.	5.17	236.	59.	57.	1.80
2 COMBINED AT	80C	1164.	6.25	528.	133.	128.	4.01
ROUTED TO	81R	1157.	6.42	528.	133.	128.	4.01
HYDROGRAPH AT	85S	497.	4.92	114.	28.	27.	0.72
2 COMBINED AT	90C	1189.	6.33	628.	159.	153.	4.73
HYDROGRAPH AT	95S	221.	4.67	46.	11.	11.	0.23
2 COMBINED AT	100C	1334.	4.92	670.	169.	163.	4.96
HYDROGRAPH AT	105S	972.	4.67	178.	44.	43.	1.27
ROUTED TO	106R	900.	5.00	178.	44.	43.	1.27
HYDROGRAPH AT	110S	440.	4.67	84.	21.	20.	0.60
2 COMBINED AT	115C	1262.	4.92	257.	64.	62.	1.87
ROUTED TO	116R	1044.	5.75	257.	64.	62.	1.87
HYDROGRAPH AT	120S	679.	5.00	165.	41.	40.	1.17
2 COMBINED AT	125C	1359.	5.67	411.	103.	99.	3.04
HYDROGRAPH AT	130S	741.	5.33	215.	54.	52.	1.46
2 COMBINED AT	135C	1938.	5.58	611.	153.	147.	4.50
ROUTED TO	136R	1873.	5.92	610.	153.	147.	4.50
HYDROGRAPH AT	140S	533.	4.92	119.	30.	29.	0.89

2 COMBINED AT	145C	1995.	5.75	716.	179.	173.	5.39
ROUTED TO	146R	1941.	6.33	714.	179.	173.	5.39
HYDROGRAPH AT	150S	426.	5.17	111.	28.	27.	0.92
2 COMBINED AT	155C	2017.	6.25	808.	203.	196.	6.31
DIVERSION TO	155DV	1009.	6.25	404.	102.	98.	6.31
HYDROGRAPH AT	155D	1009.	6.25	404.	102.	98.	6.31
ROUTED TO	156R	985.	6.58	404.	102.	98.	6.31
HYDROGRAPH AT	160S	394.	5.00	93.	23.	22.	0.69
HYDROGRAPH AT	165S	232.	4.67	47.	12.	11.	0.26
DIVERSION TO	165DV	162.	4.67	33.	8.	8.	0.26
HYDROGRAPH AT	165D	69.	4.67	14.	3.	3.	0.26
ROUTED TO	166R	64.	5.08	14.	3.	3.	0.26
3 COMBINED AT	170C	1047.	6.58	513.	129.	125.	3.92
ROUTED TO	171R	1034.	6.75	512.	129.	125.	3.92
DIVERSION TO	171DV	207.	6.75	102.	26.	25.	3.92
HYDROGRAPH AT	171D	827.	6.75	410.	103.	100.	3.92
ROUTED TO	172R	819.	7.00	409.	103.	100.	3.92
HYDROGRAPH AT	175S	108.	4.67	19.	5.	4.	0.19
2 COMBINED AT	176C	825.	7.00	428.	108.	104.	3.33
DIVERSION TO	176DV	413.	7.00	214.	54.	52.	3.33
HYDROGRAPH AT	176D	413.	7.00	214.	54.	52.	3.33
ROUTED TO	176AR	405.	7.42	214.	54.	52.	3.33
HYDROGRAPH AT	177DR	123.	5.25	66.	17.	17.	1.81
ROUTED TO	177R	116.	6.08	66.	17.	16.	1.81
HYDROGRAPH AT	177S	78.	4.50	11.	3.	3.	0.11
3 COMBINED AT	180AC	487.	7.42	287.	74.	71.	3.58
HYDROGRAPH AT	176DR	413.	7.00	214.	54.	52.	3.33
ROUTED TO	176BR	405.	7.42	214.	54.	52.	3.33
HYDROGRAPH AT	178S	29.	4.33	4.	1.	1.	0.04
2 COMBINED AT	180BC	417.	7.42	222.	57.	54.	1.70

2 COMBINED AT	180C	875.	7.42	495.	127.	122.	5.29
ROUTED TO	181R	867.	7.67	495.	127.	122.	5.29
HYDROGRAPH AT	185S	59.	4.42	8.	2.	2.	0.10
2 COMBINED AT	190C	867.	7.67	501.	129.	124.	5.39
HYDROGRAPH AT	191DR	1009.	6.25	404.	102.	98.	6.31
ROUTED TO	191R	976.	6.83	403.	102.	98.	6.31
HYDROGRAPH AT	195S	112.	4.50	18.	4.	4.	0.16
HYDROGRAPH AT	200DR	155.	6.00	41.	10.	10.	1.15
3 COMBINED AT	200C	1030.	6.83	467.	118.	114.	3.60
DIVERSION TO	200DV	515.	6.83	233.	59.	57.	3.60
HYDROGRAPH AT	200D	515.	6.83	233.	59.	57.	3.60
ROUTED TO	201R	486.	8.00	232.	59.	57.	3.60
HYDROGRAPH AT	205S	194.	4.75	37.	9.	9.	0.31
2 COMBINED AT	210C	498.	7.92	269.	69.	67.	2.11
HYDROGRAPH AT	211DR	515.	6.83	233.	59.	57.	3.60
ROUTED TO	211R	508.	7.08	233.	59.	57.	3.60
HYDROGRAPH AT	215S	93.	4.50	13.	3.	3.	0.14
2 COMBINED AT	220C	523.	7.08	251.	64.	61.	1.94
ROUTED TO	221R	504.	7.75	250.	64.	61.	1.94
HYDROGRAPH AT	222S	113.	4.67	19.	5.	5.	0.21
2 COMBINED AT	223C	504.	7.75	266.	68.	66.	2.15
4 COMBINED AT	225C	2213.	7.67	1559.	400.	385.	14.60

*** NORMAL END OF HEC-1 ***

SECTION 3.5.6

100-YEAR 24-HOUR STORM HEC-1 OUTPUT

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****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*          DATE  09/27/94  TIME  15:10:14  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 551-1748             *
*                                      *
****************************************
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X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID   RIO VERDE - NORTH
  2           ID   FLOODPLAIN DELINEATION STUDY
  3           ID   PHOENIX VALLEY S-GRAPH UNIT HYDROGRAPH
  4           ID   ***************************
  5           ID   *** FILE = RIO24HR.DAT  ***
  6           ID   ***************************
  7           ID   24-HOUR, 100-YEAR STORM
  8           ID   SCS TYPE II RAINFALL DISTRIBUTION
  9           ID   NWS HYDRO-40 (AUGUST 1984) AREAL REDUCTION COEFFICIENT
 10           ID   GREEN-AMPT RAINFALL LOSSES
 11           ID   NORMAL DEPTH CHANNEL ROUTING
 12           IT       5                    300
 13           IO       5
 14           IN      30
 15           JD     4.6     .01
              * THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL
 16           PC    .000    .005    .011    .016    .022    .028    .035    .041    .048    .056
 17           PC    .063    .071    .080    .089    .098    .109    .120    .133    .147    .163
 18           PC    .181    .204    .235    .283    .663    .735    .772    .799    .820    .838
 19           PC    .854    .868    .880    .891    .902    .912    .921    .929    .937    .945
 20           PC    .952    .959    .965    .972    .978    .984    .989    .995   1.000
 21           JD    4.55       1
 22           JD    4.45       5
 23           JD    4.36      10
 24           JD    4.23      20
              *DIAGRAM

 25           KK      5S
 26           KM   SUB-BASIN 5
 27           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 28           KM    L=       2.7  Lca=       1.6   S=  161.3  Kn= .070  LAG=  67.0
 29           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 30           BA     .52
 31           LG     .15     .39    5.70     .20       0
 32           UI     26.     26.     26.     81.    104.    124.    141.    154.    172.    195.
 33           UI    222.    283.    334.    305.    259.    229.    208.    184.    162.    144.
 34           UI    127.    108.     80.     54.     46.     43.     41.     26.     26.     25.
 35           UI      8.      8.      8.      8.      8.      8.      8.      8.      8.      8.
 36           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 37           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 38           KK     10S
 39           KM   SUB-BASIN 10
 40           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 41           KM    L=       3.4  Lca=       2.0   S=  359.5  Kn= .070  LAG=  67.9
 42           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 43           BA    1.15
 44           LG     .17     .39    5.80     .20       0
 45           UI     57.     57.     57.    171.    221.    269.    302.    332.    369.    418.
 46           UI    469.    591.    714.    685.    578.    509.    460.    411.    362.    324.
 47           UI    285.    247.    190.    137.    101.     96.     93.     66.     57.     57.
 48           UI     32.     17.     17.     17.     17.     17.     17.     17.     17.     17.
 49           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 50           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  51          KK     15C
  52          KM   COMBINE 5S AND 10S
  53          HC       2

  54          KK     15D
  55          KM   DIVERT 60 % OF FLOW FROM 15C TO SOUTH CHANNEL
  56          DT    15DV
  57          DI       0   10000
  58          DQ       0    6000

  59          KK     16R
  60          KM   ROUTE FLOW FROM 15C TO 80C
  61          RS      21    FLOW      -1
  62          RC     .09     .07     .09   14800    .021
  63          RX       0       1     226     227     242     243     468     469
  64          RY     105     100      99      97      97      99     100     105

  65          KK     20S
  66          KM   SUB-BASIN 20
  67          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  68          KM    L=      3.0  Lca=      1.3   S=  142.0  Kn= .070  LAG=  66.2
  69          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
  70          BA     .55
  71          LG     .15     .37    5.20     .26     .00
  72          UI     28.     28.     28.     89.    112.    133.    151.    166.    185.    210.
  73          UI    241.    306.    362.    313.    269.    238.    216.    189.    168.    148.
  74          UI    132.    107.     79.     49.     48.     46.     38.     28.     28.     20.
  75          UI      9.      9.      9.      9.      9.      9.      9.      9.      9.      0.
  76          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
  77          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

  78          KK     21C
  79          KM   COMBINE 16R AND 20S
  80          HC       2   1.218

  81          KK     25S
  82          KM   SUB-BASIN 25
  83          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  84          KM    L=      1.9  Lca=      1.0   S=  133.3  Kn= .070  LAG=  49.6
  85          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
  86          BA     .43
  87          LG     .15     .38    5.60     .20       0
  88          UI     29.     29.     78.    121.    149.    171.    199.    234.    309.    372.
  89          UI    303.    254.    222.    186.    158.    133.     96.     59.     50.     46.
  90          UI     29.     29.     13.      9.      9.      9.      9.      9.      9.      0.
  91          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
  92          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

  93          KK     31R
  94          KM   ROUTE FLOW FROM 30C TO 40C
  95          RS       2    FLOW      -1
  96          RC     .09     .07     .09    1493    .030
  97          RX       0       1     101     102     107     108     208     209
  98          RY     105     100      99      97      97      99     100     105
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 99           KK     35S
100           KM   SUB-BASIN 35
101           KM   BASIN 35S
102           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
103           KM    L=       3.1  Lca=       1.7   S=  145.0  Kn= .070  LAG=  73.2
104           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
105           BA     .72
106           LG     .15      .37     5.30      .24        0
107           UI     33.      33.      33.      81.     119.     145.     166.     183.     200.     222.
108           UI    249.     280.     354.     413.     400.     340.     301.     273.     249.     220.
109           UI    198.     176.     158.     135.     102.      73.      58.      55.      54.      40.
110           UI     33.      33.      26.      10.      10.      10.      10.      10.      10.      10.
111           UI     10.      10.      10.       0.       0.       0.       0.       0.       0.       0.
112           UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

113           KK     40C
114           KM   COMBINE 31R AND 35S
115           HC       2

116           KK     40D
117           KM   DIVERT 50 % OF FLOW FROM 40C TO SOUTH CHANNEL
118           DT    40DV
119           DI       0   10000
120           DQ       0    5000

121           KK     41R
122           KM   ROUTE REMAINING FLOW FROM 40C TO 55C
123           RS       5    FLOW      -1
124           RC     .07      .05      .07    6070     .028
125           RX       0        1      101     102      112      113      213      214
126           RY     105      100       99      97       97       99      100      105

127           KK    46DR
128           KM   RETRIEVE FLOW DIVERTED FROM 15C
129           DR    15DV

130           KK     46R
131           KM   ROUTE REMAINING FLOW FROM 15C TO 55C
132           RS      12    FLOW      -1
133           RC     .08      .07      .08   11144     .027
134           RX       0        1      176     177      192      193      368      369
135           RY     105      100       99      97       97       99      100      105

136           KK     50S
137           KM   SUB-BASIN 50
138           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
139           KM    L=       2.5  Lca=        .9   S=  138.0  Kn= .060  LAG=  46.7
140           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
141           BA     .40
142           LG     .15      .38     5.60      .24        0
143           UI     29.      29.      88.     126.     153.     177.     210.     258.     355.     329.
144           UI    266.     229.     191.     162.     135.      96.      58.      49.      43.      29.
145           UI     27.       9.       9.       9.       9.       9.       9.       0.       0.       0.
146           UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 147          KK     55C
 148          KM   COMBINE 41R, 46S, AND 50S
 149          HC       3   1.977

 150          KK     55D
 151          KM   DIVERT 50 % OF FLOW FROM 55C TO SOUTH CHANNEL
 152          DT    55DV
 153          DI       0   10000
 154          DQ       0    5000

 155          KK     56R
 156          KM   ROUTE FLOW FROM 55C TO 57C
 157          RS       2    FLOW      -1
 158          RC     .08     .05     .08    3800    .028
 159          RX       0       1     101     102     117     118     218     219
 160          RY     105     100      99      97      97      99     100     105

 161          KK     57C
 162          KM   COMBINE 16R AND 56R
 163          HC       2   2.207

 164          KK     58R
 165          KM   ROUTE FLOW FROM 57C TO 80C
 166          RS       9    FLOW      -1
 167          RC     .09     .07     .09    8500    .026
 168          RX       0       1     201     202     222     223     423     424
 169          RY     105     100      99      97      97      99     100     105

 170          KK    59DR
 171          KM    RETRIEVE DIVERTED FLOW FROM 55D
 172          DR    55DV

 173          KK     59R
 174          KM   ROUTE DIVERTED FLOW FROM 55D TO 65C
 175          RS       4    FLOW      -1
 176          RC     .08     .05     .08    5622    .029
 177          RX       0       1     101     102     112     113     213     214
 178          RY     105     100      99      97      97      99     100     105

 179          KK     60S
 180          KM   SUB-BASIN 60
 181          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 182          KM    L=      2.8  Lca=      1.1   S=  142.9  Kn= .050  LAG=  43.6
 183          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 184          BA     .52
 185          LG     .15     .35    4.35     .42       0
 186          UI     40.     40.    140.    186.    225.    263.    317.    429.    501.    393.
 187          UI    330.    276.    229.    189.    132.     77.     67.     53.     40.     26.
 188          UI     12.     12.     12.     12.     12.     12.      0.      0.      0.      0.
 189          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 190          KK    61DR
 191          KM   RETRIEVE DIVERTED FLOW FROM 40C
 192          DR    40DV

 193          KK     61R
 194          KM   ROUTE DIVERTED FLOW FROM 40C TO 61D
 195          RS       8    FLOW      -1
 196          RC     .07     .05     .07   12288    .027
 197          RX       0       1     151     152     167     168     318     319
 198          RY     105     100      99      97      97      99     100     105

 199          KK     61D
 200          KM   DIVERT 70 % OF FLOW FROM 61R TO SOUTH CHANNEL
 201          DT    61DV
 202          DI       0   10000
 203          DQ       0    7000

 204          KK     65C
 205          KM   COMBINE 61D, 59R AND 60S
 206          HC       3   1.681

 207          KK     66R
 208          KM   ROUTE FLOW FROM 65C TO 200C
 209          RS       5    FLOW      -1
 210          RC     .09     .07     .09    5000    .026
 211          RX       0       1     126     127     172     173     298     299
 212          RY     105     100      99      97      97      99     100     105

 213          KK    67DR
 214          KM   RETRIEVE DIVERTED FLOW FROM 61D
 215          DR    61DV

 216          KK     67D
 217          KM   DIVERT 70 % OF FLOW FROM 67DR TO SOUTH CHANNEL
 218          DT    67DV
 219          DI       0   10000
 220          DQ       0    7000

 221          KK     67R
 222          KM   ROUTE REMAINING FLOW FROM 67D TO 70C
 223          RS       5    FLOW      -1
 224          RC     .09     .07     .09    5800    .025
 225          RX       0       1     126     127     142     143     268     269
 226          RY     105     100      99      97      97      99     100     105

 227          KK     70C
 228          KM   COMBINE 66R AND 67R
 229          HC       2   1.802
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  230         KK     71R
  231         KM   ROUTE FLOW FROM 70C TO 80C
  232         RS       1    FLOW      -1
  233         RC     .09     .07     .09    1600    .025
  234         RX       0       1     151     152     182     183     333     334
  235         RY     105     100      99      97      97      99     100     105

  236         KK     80C
  237         KM   COMBINE 58R AND 71R
  238         HC       2   4.008

  239         KK     81R
  240         KM   ROUTE FLOW FROM 80C TO 90C
  241         RS       2    FLOW      -1
  242         RC     .09     .07     .09    3500    .031
  243         RX       0       1     201     202     262     263     463     464
  244         RY     105     100      99      97      97      99     100     105

  245         KK     85S
  246         KM   SUB-BASIN 85
  247         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  248         KM    L=       2.8  Lca=       1.4   S=  157.0  Kn= .070  LAG=  64.5
  249         KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
  250         BA     .72
  251         LG     .15     .39    5.80     .18     .00
  252         UI     38.     38.     41.    127.    155.    183.    207.    229.    259.    291.
  253         UI    348.    442.    483.    400.    346.    310.    277.    242.    215.    188.
  254         UI    161.    121.     83.     67.     62.     59.     38.     38.     34.     12.
  255         UI     12.     12.     12.     12.     12.     12.     12.     12.      0.      0.
  256         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

  257         KK     90C
  258         KM   COMBINE 81R AND 85S
  259         HC       2

  260         KK     95S
  261         KM   SUB-BASIN 95
  262         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  263         KM    L=       2.1  Lca=        .9   S=  156.0  Kn= .070  LAG=  48.0
  264         KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
  265         BA     .23
  266         LG     .15     .30    8.00     .09       0
  267         UI     16.     16.     46.     68.     83.     95.    112.    134.    183.    194.
  268         UI    154.    131.    112.     95.     79.     63.     40.     28.     26.     19.
  269         UI     16.     10.      5.      5.      5.      5.      5.      5.      0.      0.
  270         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

  271         KK    100C
  272         KM   COMBINE 90C AND 95S
  273         HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 274          KK   105S
 275          KM  SUB-BASIN 105
 276          KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 277          KM   L=      2.5  Lca=      1.0   S=  311.4  Kn= .070  LAG=  47.8
 278          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 279          BA   1.27
 280          LG    .16     .40    6.00     .21       0
 281          UI    90.     90.    260.    384.    469.    540.    637.    765.   1044.   1082.
 282          UI   861.    736.    626.    530.    442.    346.    217.    157.    147.    100.
 283          UI    90.     51.     27.     27.     27.     27.     27.     27.      0.      0.
 284          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 285          KK   106R
 286          KM  ROUTE FLOW FROM SUB-BASIN 105S TO 115C
 287          RS      4    FLOW      -1
 288          RC    .09     .07     .09    2786    .013
 289          RX      0       1     201     202     232     233     433     434
 290          RY    105     100      99      97      97      99     100     105

 291          KK   110S
 292          KM  SUB-BASIN 110
 293          KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 294          KM   L=      2.1  Lca=       .9   S=  112.0  Kn= .070  LAG=  51.0
 295          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 296          BA    .60
 297          LG    .17     .39    6.20     .21       0
 298          UI    39.     39.     98.    160.    197.    227.    260.    305.    391.    498.
 299          UI   435.    361.    315.    268.    229.    194.    156.    101.     70.     65.
 300          UI    51.     39.     34.     12.     12.     12.     12.     12.     12.     12.
 301          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 302          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 303          KK   115C
 304          KM  COMBINE 106R AND 110S
 305          KM  BLACK HILL TANK ASSUMED TO NOT REMAIN IN PLACE PER FEMA REQUIREMENTS
 306          HC      2

 307          KK   116R
 308          KM  ROUTE FLOW FROM 115RET TO 125C
 309          RS     10    FLOW      -1
 310          RC    .09     .07     .09    9104    .021
 311          RX      0       1     251     252     282     283     533     534
 312          RY    105     100      99      97      97      99     100     105

 313          KK   120S
 314          KM  SUB-BASIN 120
 315          KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 316          KM   L=      3.7  Lca=      1.2   S=  119.0  Kn= .070  LAG=  72.5
 317          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 318          BA   1.17
 319          LG    .15     .37    5.30     .24       0
 320          UI    54.     54.     54.    137.    198.    242.    275.    304.    332.    371.
 321          UI   414.    469.    596.    694.    645.    552.    490.    445.    404.    356.
 322          UI   321.    283.    257.    215.    158.    107.     96.     90.     89.     58.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 323          UI     54.     54.     33.     17.     17.     17.     17.     17.     17.     17.
 324          UI     17.     17.     17.      0.      0.      0.      0.      0.      0.      0.
 325          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 326          KK    125C
 327          KM   COMBINE 116R AND 120S
 328          HC       2

 329          KK    130S
 330          KM   SUB-BASIN 130
 331          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 332          KM    L=       4.6  Lca=       2.6   S=  245.0  Kn= .070  LAG=  90.2
 333          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 334          BA    1.46
 335          LG     .15     .39    6.20     .19       0
 336          UI     54.     54.     54.     54.    160.    196.    229.    260.    285.    309.
 337          UI    330.    360.    396.    425.    486.    593.    667.    700.    604.    540.
 338          UI    490.    453.    424.    382.    349.    322.    292.    266.    242.    203.
 339          UI    156.    116.     96.     94.     89.     89.     62.     54.     54.     54.
 340          UI     30.     17.     17.     17.     17.     17.     17.     17.     17.     17.
 341          UI     17.     17.     17.      0.      0.      0.      0.      0.      0.      0.
 342          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 343          KK    135C
 344          KM   COMBINE 125C AND 130S
 345          HC       2

 346          KK    136R
 347          KM   ROUTE FLOW FROM 135C TO 145C
 348          RS       5    FLOW      -1
 349          RC     .09     .07     .09    5572    .023
 350          RX       0       1     201     202     252     253     453     454
 351          RY     105     100      99      97      97      99     100     105

 352          KK    140S
 353          KM   SUB-BASIN 140
 354          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 355          KM    L=       3.0  Lca=       1.3   S=  145.2  Kn= .070  LAG=  65.7
 356          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 357          BA     .89
 358          LG     .15     .38    5.60     .25       0
 359          UI     46.     46.     46.    149.    184.    218.    249.    273.    306.    348.
 360          UI    403.    508.    595.    506.    434.    387.    349.    306.    272.    237.
 361          UI    213.    165.    122.     81.     78.     75.     56.     46.     46.     26.
 362          UI     14.     14.     14.     14.     14.     14.     14.     14.     14.      0.
 363          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 364          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 365          KK    145C
 366          KM   COMBINE 136R AND 140S
 367          HC       2
```

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

368           KK    146R
369           KM   ROUTE FLOW FROM 145C TO 155C
370           RS      10     FLOW      -1
371           RC     .09      .07      .09    10547     .025
372           RX       0        1      251      252      277      278      528      529
373           RY     105      100       99       97       97       99      100      105

374           KK    150S
375           KM   SUB-BASIN 150
376           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
377           KM    L=       4.0  Lca=       1.7   S=  142.0  Kn= .070  LAG=  82.0
378           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
379           BA     .92
380           LG     .15      .35     4.55      .35        0
381           UI     38.      38.      38.      57.     125.     147.     176.     193.     211.     228.
382           UI    250.     278.     303.     356.     431.     497.     439.     382.     344.     315.
383           UI    291.     262.     235.     216.     192.     177.     150.     114.      86.      67.
384           UI     65.      62.      60.      38.      38.      38.      29.      12.      12.      12.
385           UI     12.      12.      12.      12.      12.      12.      12.      12.       0.       0.
386           UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

387           KK    155C
388           KM   COMBINE 146R AND 150S
389           HC       2

390           KK    155D
391           KM   DIVERT 50 % OF FLOW FROM 155C TO NORTH CHANNEL
392           DT   155DV
393           DI       0   10000
394           DQ       0    5000

395           KK    156R
396           KM   ROUTE REMAINING FLOW FROM 155C TO 170C
397           RS       3     FLOW      -1
398           RC     .08      .05      .08     4030     .027
399           RX       0        1      151      152      182      183      333      334
400           RY     105      100       99       97       97       99      100      105

401           KK    160S
402           KM   SUB-BASIN 160
403           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
404           KM    L=       3.5  Lca=       2.0   S=  137.6  Kn= .060  LAG=  70.6
405           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
406           BA     .69
407           LG     .15      .38     5.60      .25        0
408           UI     33.      33.      33.      90.     122.     152.     170.     188.     207.     232.
409           UI    257.     305.     380.     430.     366.     317.     283.     260.     229.     204.
410           UI    182.     162.     140.     107.      77.      58.      56.      54.      40.      33.
411           UI     33.      23.      10.      10.      10.      10.      10.      10.      10.      10.
412           UI     10.      10.       0.       0.       0.       0.       0.       0.       0.       0.
413           UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
```

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 414          KK   165S
 415          KM  SUB-BASIN 165
 416          KM  BASIN 165S
 417          KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 418          KM   L=      2.1  Lca=       .9   S=  134.4  Kn= .070  LAG=  49.8
 419          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 420          BA    .26
 421          LG    .15     .35    7.00     .13       0
 422          UI    18.     18.     47.     74.     90.    104.    120.    141.    187.    225.
 423          UI   185.    156.    136.    114.     97.     82.     59.     37.     30.     29.
 424          UI    18.     18.      9.      5.      5.      5.      5.      5.      5.      0.
 425          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 426          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 427          KK   165D
 428          KM  DIVERT 70 % OF FLOW FROM 165C TO SOUTH ALONG OLD DIRT ROAD
 429          DT  165DV
 430          DI      0   10000
 431          DQ      0    7000

 432          KK   166R
 433          KM  ROUTE FLOW FROM 165S TO 170C
 434          RS      6    FLOW      -1
 435          RC    .09     .07     .09    7313    .027
 436          RX      0       1     101     102     117     118     218     219
 437          RY    105     100      99      97      97      99     100     105

 438          KK   170C
 439          KM  COMBINE 156R, 160S, 166R
 440          HC      3   3.923

 441          KK   171R
 442          KM  ROUTE FLOW FROM 170C TO 171D
 443          RS      2    FLOW      -1
 444          RC    .09     .07     .09    3800    .028
 445          RX      0       1     101     102     112     113     213     214
 446          RY    105     100      99      97      97      99     100     105

 447          KK   171D
 448          KM  DIVERT 20 % OF FLOW FROM 171R TO SOUTH, OUT OF WATERSHED
 449          KM  THIS DIVERT QUANTITY WAS DETERMINED BY HEC-2 MODEL DURING FLOODPLAIN
 450          KM  DELINEATION PORTION OF STUDY
 451          DT  171DV
 452          DI      0    4000
 453          DQ      0     800

 454          KK   172R
 455          KM  ROUTE FLOW FROM 171D TO 176C
 456          RS      3    FLOW      -1
 457          RC    .09     .07     .09    4200    .026
 458          RX      0       1     101     102     112     113     213     214
 459          RY    105     100      99      97      97      99     100     105
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  460         KK   175S
  461         KM  SUB-BASIN 175
  462         KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  463         KM   L=      1.9  Lca=       .9   S=  142.0  Kn= .070  LAG=  47.9
  464         KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
  465         BA    .19
  466         LG    .15     .35    4.35     .47     .00
  467         UI    13.     13.     38.     56.     69.     79.     93.    112.    153.    160.
  468         UI   127.    108.     92.     78.     65.     51.     32.     23.     22.     15.
  469         UI    13.      8.      4.      4.      4.      4.      4.      4.      0.      0.
  470         UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

  471         KK   176C
  472         KM  COMBINE 171R AND 175S
  473         HC      2  3.3284

  474         KK   176D
  475         KM  DIVERT 50 PERCENT OF FLOW TO 180BC
  476         DT  176DV
  477         DI      0    5000
  478         DQ      0    2500

  479         KK  176AR
  480         KM  ROUTE 176D TO 180AC
  481         RS      6    FLOW      -1
  482         RC     .1     .07      .1    4726   .0212
  483         RX      0       1     101     102     112     113     213     214
  484         RY    105     100      99      97      97      99     100     105

  485         KK  177DR
  486         KM  RETRIEVE HYDROGRAPH FROM RIO VERDE SOUTH WATERSHED
  487         KM  DATA PROVIDED BY GEORGE V. SABOL CONSULTING ENGINEERS, INC.
  488         BA  1.808
  489         QI      0       0       0       0       0       0       0       0       0       0
  490         QI      0       0       0       0       0       0       0       0       0       0
  491         QI      0       0       0       0      88      87     128     131     100     116
  492         QI    100      75      50      26      10       2       2       1       1       0

  493         KK   177R
  494         KM  ROUTE FLOW FROM 177DR TO 180AC
  495         RS      6    FLOW      -1
  496         RC     .1     .07      .1    5400   0.022
  497         RX      0       1     101     102     112     113     213     214
  498         RY    105     100      99      97      97      99     100     105

  499         KK   177S
  500         KM  SUB-BASIN 177
  501         KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  502         KM   L=      1.3  Lca=       .6   S=  126.0  Kn= .070  LAG=  36.8
  503         KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
  504         BA    .11
  505         LG    .15     .35    4.35     .47     .00
  506         UI    10.     18.     42.     55.     67.     83.    120.    119.     92.     75.
  507         UI    60.     47.     29.     18.     15.     10.      6.      3.      3.      3.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 508          UI      3.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 509          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 510          KK  180AC
 511          KM  COMBINE 176AR, 177R, AND 177S
 512          HC      3  3.5822

 513          KK  176DR
 514          KM  RETRIEVE DIVERTED FLOW FROM 176C
 515          DR  176DV

 516          KK  176BR
 517          KM  ROUTE 176DR TO 180BC
 518          RS      6    FLOW      -1
 519          RC     .1     .07      .1    4677   .0212
 520          RX      0       1     101     102     112     113     213     214
 521          RY    105     100      99      97      97      99     100     105

 522          KK   178S
 523          KM  SUB-BASIN 178
 524          KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 525          KM   L=       .9  Lca=       .4   S=  112.0  Kn= .070  LAG=  27.0
 526          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 527          BA    .04
 528          LG    .15     .35    4.40     .46     .00
 529          UI     4.     13.     23.     30.     45.     51.     37.     28.     20.     10.
 530          UI     7.      4.      2.      1.      1.      1.      0.      0.      0.      0.
 531          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 532          KK  180BC
 533          KM  COMBINE 176BR AND 178S
 534          HC      2  1.7042

 535          KK   180C
 536          KM  COMBINE 180AC AND 180BC
 537          HC      2

 538          KK   181R
 539          KM  ROUTE FLOW FROM 180C TO 190C
 540          RS      2    FLOW      -1
 541          RC    .09     .07     .09    3383   .0235
 542          RX      0       1     151     152     167     168     318     319
 543          RY    105     100      99      97      97      99     100     105

 544          KK   185S
 545          KM  SUB-BASIN 185
 546          KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 547          KM   L=      1.3  Lca=       .6   S=  124.0  Kn= .070  LAG=  36.6
 548          KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 549          BA    .10
 550          LG    .15     .35    4.10     .57     .00
 551          UI     9.     16.     36.     48.     58.     73.    105.    101.     79.     64.
 552          UI    51.     40.     24.     16.     13.      9.      5.      3.      3.      3.
 553          UI     3.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 554          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 555          KK   190C
 556          KM   COMBINE 181R AND 185S
 557          HC      2

 558          KK   191DR
 559          KM   RETRIEVE DIVERTED FLOW FROM 155C
 560          DR   155DV

 561          KK   191R
 562          KM   ROUTE FLOW FROM 191DR TO 200C
 563          RS      6    FLOW      -1
 564          RC    .09     .07     .09    7413    .025
 565          RX      0       1     151     152     177     178     328     329
 566          RY    105     100      99      97      97      99     100     105

 567          KK   195S
 568          KM   SUB-BASIN 195
 569          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 570          KM    L=      1.4  Lca=       .7   S=  145.8  Kn= .070  LAG=  40.1
 571          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 572          BA    .16
 573          LG    .15     .35    4.35     .40       0
 574          UI    13.     18.     48.     65.     77.     93.    119.    164.    135.    110.
 575          UI    91.     74.     59.     40.     23.     21.     14.     12.      4.      4.
 576          UI     4.      4.      4.      0.      0.      0.      0.      0.      0.      0.
 577          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 578          KK   200DR
 579          KM   RETRIEVE DIVERTED FLOW FROM 67D
 580          DR   67DV

 581          KK   200C
 582          KM   COMBINE 191R, 195S, AND 200DR
 583          HC      3   3.597

 584          KK   200D
 585          KM   DIVERT 50 % OF FLOW FROM 200C TO 220C
 586          DT   200DV
 587          DI      0   10000
 588          DQ      0    5000

 589          KK   201R
 590          KM   ROUTE REMAINING FLOW FROM 200C TO 210C
 591          RS     10    FLOW      -1
 592          RC    .09     .07     .09   11393    .027
 593          RX      0       1     101     102     122     123     223     224
 594          RY    105     100      99      97      97      99     100     105

 595          KK   205S
 596          KM   SUB-BASIN 205
 597          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 598          KM    L=      2.2  Lca=      1.0   S=  149.0  Kn= .070  LAG=  52.9
 599          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 600          BA    .31
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 601          LG     .15     .36    5.00     .34     .00
 602          UI     20.     20.     45.     76.     96.    110.    125.    146.    176.    235.
 603          UI    239.    193.    166.    145.    124.    106.     91.     66.     43.     34.
 604          UI     32.     23.     20.     15.      6.      6.      6.      6.      6.      6.
 605          UI      6.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 606          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 607          KK    210C
 608          KM   COMBINE 201R AND 205S
 609          HC       2   2.108

 610          KK   211DR
 611          KM   RETRIEVE DIVERTED FLOW FROM 200C
 612          DR   200DV

 613          KK    211R
 614          KM   ROUTE FLOW FROM 200DV TO 220C
 615          RS       4    FLOW      -1
 616          RC     .09     .07     .09    3532    .028
 617          RX       0       1     101     102     112     113     213     214
 618          RY     105     100      99      97      97      99     100     105

 619          KK    215S
 620          KM   SUB-BASIN 215
 621          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 622          KM    L=       1.4  Lca=       .6   S=  156.0  Kn= .070  LAG=  36.7
 623          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 624          BA     .14
 625          LG     .15     .35    4.35     .47       0
 626          UI     12.     21.     50.     66.     80.    100.    144.    141.    109.     89.
 627          UI     72.     56.     34.     22.     18.     12.      7.      4.      4.      4.
 628          UI      4.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 629          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 630          KK    220C
 631          KM   COMBINE 211R AND 215S
 632          HC       2   1.938

 633          KK    221R
 634          KM   ROUTE FLOW FROM 220C TO VERDE RIVER
 635          RS       9    FLOW      -1
 636          RC     .09     .07     .09    7950    .026
 637          RX       0       1     101     102     112     113     213     214
 638          RY     105     100      99      97      97      99     100     105

 639          KK    222S
 640          KM   SUB-BASIN 222
 641          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 642          KM    L=       1.8  Lca=       .7   S=  131.0  Kn= .070  LAG=  48.0
 643          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 644          BA     .21
 645          LG     .15     .35    4.30     .51     .00
 646          UI     15.     15.     42.     63.     77.     88.    104.    125.    170.    180.
 647          UI    143.    122.    104.     88.     73.     59.     37.     26.     24.     17.
 648          UI     15.      9.      5.      5.      5.      5.      5.      5.      0.      0.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 649          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 650          KK    223C
 651          KM   COMBINE 221R AND 222S
 652          HC       2

 653          KK    225C
 654          KM   DUMMY COMBINE OF HYDROGRAPHS 100C, 190C, 210C, AND 223C
 655          HC       4
 656          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

          (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 25          5S
              .
              .
 38           .          10S
              .            .
              .            .
 51         15C............
              .
              .
 56           .------->    15DV
 54         15D
             V
             V
 59         16R
              .
              .
 65           .          20S
              .            .
              .            .
 78         21C............
              .
              .
              .          25S
              .            V
              .            V
 93           .          31R
              .            .
              .            .
 99           .            .          35S
              .            .            .
              .            .            .
113           .          40C............
              .            .
              .            .
118           .            .------->    40DV
116           .          40D
              .            V
              .            V
121           .          41R
              .            .
              .            .
129           .            .            .<-------    15DV
127           .            .        46DR
              .            .           V
              .            .           V
130           .            .         46R
              .            .           .
              .            .           .
              .            .           .          50S
              .            .           .            .
              .            .           .            .
147           .          55C.......................
              .            .
```

```
        .          .
152     .          .------->    55DV
150     .        55D
        .          V
        .          V
        .        56R
        .          .
        .          .
161   57C............
        V
        V
164   58R
        .
        .
172     .          .<-------    55DV
170     .       59DR
        .          V
        .          V
173     .        59R
        .          .
        .          .
179     .          .        60S
        .          .          .
        .          .          .
192     .          .          .          .<-------    40DV
190     .          .          .       61DR
        .          .          .          V
        .          .          .          V
193     .          .          .        61R
        .          .          .          .
        .          .          .          .
201     .          .          .          .------->    61DV
199     .          .          .        61D
        .          .          .          .
        .          .          .          .
204     .        65C......................
        .          V
        .          V
207     .        66R
        .          .
        .          .
215     .          .          .<-------    61DV
213     .          .       67DR
        .          .          .
        .          .          .
218     .          .          .------->    67DV
216     .          .        67D
        .          .          V
        .          .          V
221     .          .        67R
        .          .          .
        .          .          .
227     .        70C............
        .          V
        .          V
        .        71R
        .          .
        .          .
236   80C............
        V
```

```
                V
239            81R
                .
                .
                .          85S
                .            .
                .            .
257            90C............
                .
                .
260             .          95S
                .            .
                .            .
271           100C............
                .
                .
274             .         105S
                .            V
                .            V
285             .         106R
                .            .
                .            .
291             .            .         110S
                .            .            .
                .            .            .
303             .         115C............
                .            V
                .            V
307             .         116R
                .            .
                .            .
313             .            .         120S
                .            .            .
                .            .            .
326             .         125C............
                .            .
                .            .
329             .            .         130S
                .            .            .
                .            .            .
343             .         135C............
                .            V
                .            V
346             .         136R
                .            .
                .            .
352             .            .         140S
                .            .            .
                .            .            .
365             .         145C............
                .            V
                .            V
368             .         146R
                .            .
                .            .
                .            .         150S
                .            .            .
                .            .            .
387             .         155C............
                .            .
```

```
.          .
392        .          .-------->   155DV
390        .       155D
           .          V
           .          V
           .       156R
           .          .
           .          .
401        .          .        160S
           .          .           .
           .          .           .
414        .          .           .        165S
           .          .           .           .
           .          .           .           .
429        .          .           .           .-------->   165DV
427        .          .           .        165D
           .          .           .           V
           .          .           .           V
432        .          .           .        166R
           .          .           .           .
           .          .           .           .
438        .       170C.......................
           .          V
           .          V
441        .       171R
           .          .
           .          .
451        .          .-------->   171DV
447        .       171D
           .          V
           .          V
454        .       172R
           .          .
           .          .
460        .          .        175S
           .          .           .
           .          .           .
471        .       176C............
           .          .
           .          .
476        .          .-------->   176DV
474        .       176D
           .          V
           .          V
479        .      176AR
           .          .
           .          .
485        .          .       177DR
           .          .           V
           .          .           V
493        .          .        177R
           .          .           .
           .          .           .
499        .          .           .        177S
           .          .           .           .
           .          .           .           .
           .      180AC.......................
           .          .
           .          .
515        .          .           .<-------   176DV
```

```
513          .          .       176DR
             .          .          V
             .          .          V
576          .          .       176BR
             .          .          .
             .          .          .
             .          .          .        178S
             .          .          .           .
             .          .          .           .
532          .          .       180BC............
             .          .          .
             .          .          .
535          .       180C............
             .          V
             .          V
538          .       181R
             .          .
             .          .
544          .          .        185S
             .          .          .
             .          .          .
555          .       190C............
             .          .
             .          .
560          .          .          .<-------   155DV
558          .          .       191DR
             .          .          V
             .          .          V
561          .          .        191R
             .          .          .
             .          .          .
567          .          .          .        195S
             .          .          .           .
             .          .          .           .
580          .          .          .           .           .<-------    67DV
578          .          .          .           .       200DR
             .          .          .           .           .
             .          .          .           .           .
581          .          .        200C......................
             .          .          .
             .          .          .
586          .          .          .------->   200DV
584          .          .        200D
             .          .          V
             .          .          V
589          .          .        201R
             .          .          .
             .          .          .
595          .          .          .        205S
             .          .          .           .
             .          .          .           .
607          .          .        210C............
             .          .          .
             .          .          .
612          .          .          .           .<-------   200DV
             .          .          .       211DR
             .          .          .           V
             .          .          .           V
613          .          .          .        211R
             .          .          .           .
```

```
                .         .         .         .
619             .         .         .         .        215S
                .         .         .         .          .
                .         .         .         .          .
                .         .         .      220C............
                .         .         .         V
                .         .         .         V
633             .         .         .      221R
                .         .         .         .
                .         .         .         .
639             .         .         .         .        222S
                .         .         .         .          .
                .         .         .         .          .
650             .         .         .      223C............
                .         .         .         .
                .         .         .         .
653          225C.................................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
           VERSION 4.0.1E              *
*                                      *
*          DATE  09/27/94  TIME  15:10:14  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 551-1748              *
*                                      *
****************************************
```

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RIO VERDE - NORTH
FLOODPLAIN DELINEATION STUDY
PHOENIX VALLEY S-GRAPH UNIT HYDROGRAPH
***************************
*** FILE = RIO24HR.DAT  ***
***************************
24-HOUR, 100-YEAR STORM
SCS TYPE II RAINFALL DISTRIBUTION
NWS HYDRO-40 (AUGUST 1984) AREAL REDUCTION COEFFICIENT
GREEN-AMPT RAINFALL LOSSES
NORMAL DEPTH CHANNEL ROUTING

13 IO        OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          0  PLOT CONTROL
                 QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT        HYDROGRAPH TIME DATA
                  NMIN          5  MINUTES IN COMPUTATION INTERVAL
                 IDATE      1   0  STARTING DATE
                 ITIME       0000  STARTING TIME
                    NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                NDDATE      2   0  ENDING DATE
                NDTIME       0055  ENDING TIME
                 ICENT         19  CENTURY MARK

            COMPUTATION INTERVAL    0.08 HOURS
                 TOTAL TIME BASE   24.92 HOURS

      ENGLISH UNITS
           DRAINAGE AREA          SQUARE MILES
           PRECIPITATION DEPTH    INCHES
           LENGTH, ELEVATION      FEET
           FLOW                   CUBIC FEET PER SECOND
           STORAGE VOLUME         ACRE-FEET
           SURFACE AREA           ACRES
           TEMPERATURE            DEGREES FAHRENHEIT

15 JD        INDEX STORM NO. 1
                 STRM        4.60  PRECIPITATION DEPTH
                 TRDA        0.01  TRANSPOSITION DRAINAGE AREA

          I    PRECIPITATION PATTERN
               0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
               0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
               0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
```

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.06
0.06	0.06	0.06	0.06	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

21 JD INDEX STORM NO. 2

STRM 4.55 PRECIPITATION DEPTH

TRDA 1.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.06
0.06	0.06	0.06	0.06	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

22 JD INDEX STORM NO. 3

STRM 4.45 PRECIPITATION DEPTH

TRDA 5.00 TRANSPOSITION DRAINAGE AREA

PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.06
0.06	0.06	0.06	0.06	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

23 JD INDEX STORM NO. 4

STRM 4.36 PRECIPITATION DEPTH

TRDA 10.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.06
0.06	0.06	0.06	0.06	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00						

24 JD INDEX STORM NO. 5

STRM 4.23 PRECIPITATION DEPTH

TRDA 20.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.06
0.06	0.06	0.06	0.06	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00						

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	5S	409.	12.83	86.	22.	21.	0.52		
HYDROGRAPH AT	10S	880.	12.92	188.	47.	45.	1.15		
2 COMBINED AT	15C	1276.	12.92	271.	68.	65.	1.67		
DIVERSION TO	15DV	766.	12.92	163.	41.	39.	1.67		
HYDROGRAPH AT	15D	510.	12.92	109.	27.	26.	1.67		
ROUTED TO	16R	368.	14.92	109.	27.	26.	1.67		
HYDROGRAPH AT	20S	413.	12.83	85.	21.	21.	0.55		
2 COMBINED AT	21C	526.	12.92	194.	49.	47.	1.22		
HYDROGRAPH AT	25S	425.	12.58	72.	18.	17.	0.43		
ROUTED TO	31R	416.	12.67	72.	18.	17.	0.43		
HYDROGRAPH AT	35S	508.	13.00	114.	29.	28.	0.72		
2 COMBINED AT	40C	876.	12.83	185.	46.	45.	1.15		
DIVERSION TO	40DV	438.	12.83	93.	23.	22.	1.15		
HYDROGRAPH AT	40D	438.	12.83	93.	23.	22.	1.15		
ROUTED TO	41R	392.	13.33	93.	23.	22.	1.15		
HYDROGRAPH AT	46DR	766.	12.92	163.	41.	39.	1.67		
ROUTED TO	46R	619.	13.83	163.	41.	39.	1.67		
HYDROGRAPH AT	50S	393.	12.50	63.	16.	15.	0.40		
3 COMBINED AT	55C	902.	13.75	315.	79.	76.	1.98		
DIVERSION TO	55DV	451.	13.75	158.	39.	38.	1.98		
HYDROGRAPH AT	55D	451.	13.75	158.	39.	38.	1.98		
ROUTED TO	56R	429.	14.00	158.	39.	38.	1.98		
2 COMBINED AT	57C	856.	12.92	348.	87.	84.	2.21		
ROUTED TO	58R	752.	13.83	347.	87.	84.	2.21		
HYDROGRAPH AT	59DR	451.	13.75	158.	39.	38.	1.98		
ROUTED TO	59R	421.	14.17	158.	39.	38.	1.98		

HYDROGRAPH AT	60S	482.	12.50	72.	18.	17.	0.52
HYDROGRAPH AT	61DR	438.	12.83	93.	23.	22.	1.15
ROUTED TO	61R	354.	13.83	93.	23.	22.	1.15
DIVERSION TO	61DV	248.	13.83	65.	16.	16.	1.15
HYDROGRAPH AT	61D	106.	13.83	28.	7.	7.	1.15
3 COMBINED AT	65C	691.	12.58	257.	64.	62.	1.68
ROUTED TO	66R	654.	12.92	256.	64.	62.	1.68
HYDROGRAPH AT	67DR	248.	13.83	65.	16.	16.	1.15
DIVERSION TO	67DV	173.	13.83	45.	11.	11.	1.15
HYDROGRAPH AT	67D	74.	13.83	19.	5.	5.	1.15
ROUTED TO	67R	73.	14.08	19.	5.	5.	1.15
2 COMBINED AT	70C	660.	12.92	275.	69.	66.	1.80
ROUTED TO	71R	643.	13.08	275.	69.	66.	1.80
2 COMBINED AT	80C	1278.	13.83	613.	154.	148.	4.01
ROUTED TO	81R	1261.	14.33	612.	154.	148.	4.01
HYDROGRAPH AT	85S	597.	12.83	123.	31.	30.	0.72
2 COMBINED AT	90C	1347.	12.92	725.	183.	176.	4.73
HYDROGRAPH AT	95S	259.	12.58	47.	12.	11.	0.23
2 COMBINED AT	100C	1525.	12.83	769.	194.	187.	4.96
HYDROGRAPH AT	105S	1234.	12.58	202.	51.	49.	1.27
ROUTED TO	106R	1165.	12.83	202.	51.	49.	1.27
HYDROGRAPH AT	110S	557.	12.58	95.	24.	23.	0.60
2 COMBINED AT	115C	1656.	12.75	294.	74.	71.	1.87
ROUTED TO	116R	1358.	13.58	294.	74.	71.	1.87
HYDROGRAPH AT	120S	835.	12.92	186.	47.	45.	1.17
2 COMBINED AT	125C	1799.	13.50	473.	118.	114.	3.04
HYDROGRAPH AT	130S	896.	13.25	239.	60.	57.	1.46
2 COMBINED AT	135C	2560.	13.42	702.	176.	169.	4.50
ROUTED TO	136R	2457.	13.67	702.	176.	169.	4.50
HYDROGRAPH AT	140S	671.	12.83	138.	34.	33.	0.89

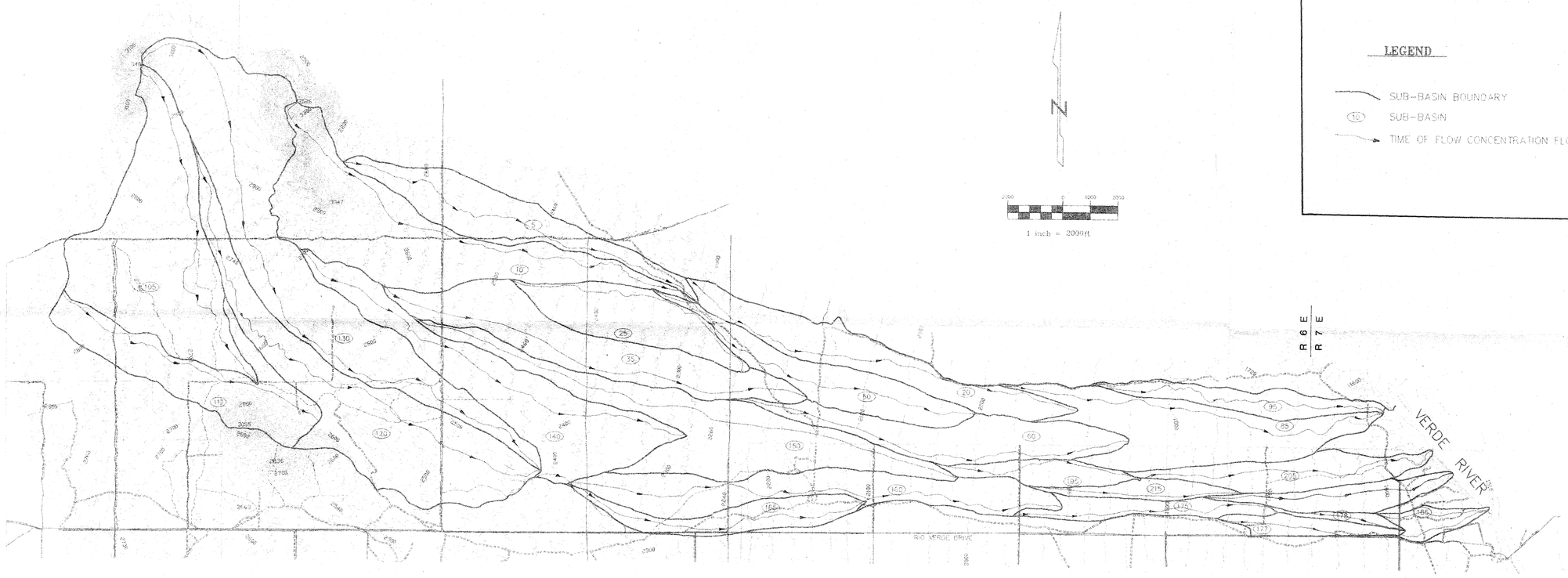
2 COMBINED AT	145C	2615.	13.67	830.	208.	200.	5.39
ROUTED TO	146R	2505.	14.25	828.	208.	200.	5.39
HYDROGRAPH AT	150S	549.	13.08	133.	33.	32.	0.92
2 COMBINED AT	155C	2595.	14.17	946.	238.	229.	6.31
DIVERSION TO	155DV	1297.	14.17	473.	119.	115.	6.31
HYDROGRAPH AT	155D	1297.	14.17	473.	119.	115.	6.31
ROUTED TO	156R	1277.	14.42	473.	119.	115.	6.31
HYDROGRAPH AT	160S	494.	12.92	107.	27.	26.	0.69
HYDROGRAPH AT	165S	276.	12.58	48.	12.	12.	0.26
DIVERSION TO	165DV	193.	12.58	33.	8.	8.	0.26
HYDROGRAPH AT	165D	83.	12.58	14.	4.	3.	0.26
ROUTED TO	166R	77.	12.92	14.	4.	3.	0.26
3 COMBINED AT	170C	1347.	14.33	597.	150.	145.	3.92
ROUTED TO	171R	1327.	14.50	596.	150.	145.	3.92
DIVERSION TO	171DV	265.	14.50	119.	30.	29.	3.92
HYDROGRAPH AT	171D	1062.	14.50	477.	120.	116.	3.92
ROUTED TO	172R	1043.	14.75	477.	120.	116.	3.92
HYDROGRAPH AT	175S	156.	12.58	25.	6.	6.	0.19
2 COMBINED AT	176C	1048.	14.75	501.	127.	122.	3.33
DIVERSION TO	176DV	524.	14.75	251.	63.	61.	3.33
HYDROGRAPH AT	176D	524.	14.75	251.	63.	61.	3.33
ROUTED TO	176AR	511.	15.25	250.	63.	61.	3.33
HYDROGRAPH AT	177DR	131.	13.50	76.	19.	19.	1.81
ROUTED TO	177R	125.	14.00	76.	19.	19.	1.81
HYDROGRAPH AT	177S	115.	12.33	15.	4.	4.	0.11
3 COMBINED AT	180AC	619.	15.25	338.	86.	83.	3.58
HYDROGRAPH AT	176DR	524.	14.75	251.	63.	61.	3.33
ROUTED TO	176BR	511.	15.25	250.	63.	61.	3.33
HYDROGRAPH AT	178S	45.	12.17	5.	1.	1.	0.04
2 COMBINED AT	180BC	520.	15.25	257.	65.	63.	1.70

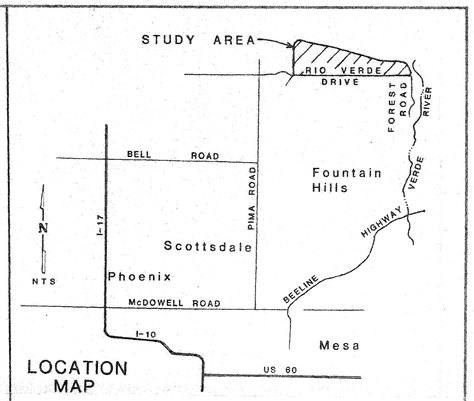
2 COMBINED AT	180C	1116.	15.25	587.	149.	144.	5.29
ROUTED TO	181R	1102.	15.42	585.	149.	144.	5.29
HYDROGRAPH AT	185S	93.	12.33	12.	3.	3.	0.10
2 COMBINED AT	190C	1102.	15.42	595.	152.	147.	5.39
HYDROGRAPH AT	191DR	1297.	14.17	473.	119.	115.	6.31
ROUTED TO	191R	1248.	14.67	472.	119.	115.	6.31
HYDROGRAPH AT	195S	156.	12.42	22.	5.	5.	0.16
HYDROGRAPH AT	200DR	173.	13.83	45.	11.	11.	1.15
3 COMBINED AT	200C	1302.	14.67	544.	137.	132.	3.60
DIVERSION TO	200DV	651.	14.67	272.	69.	66.	3.60
HYDROGRAPH AT	200D	651.	14.67	272.	69.	66.	3.60
ROUTED TO	201R	602.	15.58	270.	69.	66.	3.60
HYDROGRAPH AT	205S	257.	12.67	44.	11.	11.	0.31
2 COMBINED AT	210C	610.	15.58	314.	80.	77.	2.11
HYDROGRAPH AT	211DR	651.	14.67	272.	69.	66.	3.60
ROUTED TO	211R	640.	14.92	272.	69.	66.	3.60
HYDROGRAPH AT	215S	137.	12.33	18.	5.	4.	0.14
2 COMBINED AT	220C	651.	14.92	292.	74.	71.	1.94
ROUTED TO	221R	628.	15.50	291.	74.	71.	1.94
HYDROGRAPH AT	222S	170.	12.58	27.	7.	7.	0.21
2 COMBINED AT	223C	627.	15.50	316.	81.	78.	2.15
4 COMBINED AT	225C	2930.	15.42	1868.	477.	459.	14.60

*** NORMAL END OF HEC-1 ***

SECTION 3.6

HEC-1 INPUT/OUTPUT ON DISKETTES





LEGEND

- SUB-BASIN BOUNDARY
- (10) SUB-BASIN
- TIME OF FLOW CONCENTRATION FLOW PATH

REVISED 9/28/94

WOOD, PATEL & ASSOC., INC. 1550 EAST MISSOURI, SUITE 203 PHOENIX, ARIZONA (602)234-1344		
DESIGN	BY AJR	DATE 6-22-94
DESIGN CHK.	ACP	6-22-94
PLANS	JWC	6-22-94
PLANS CHK.	AJR	6-22-94
SUBMITTED BY:		DATE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RIO VERDE – NORTH F.P.D.S.

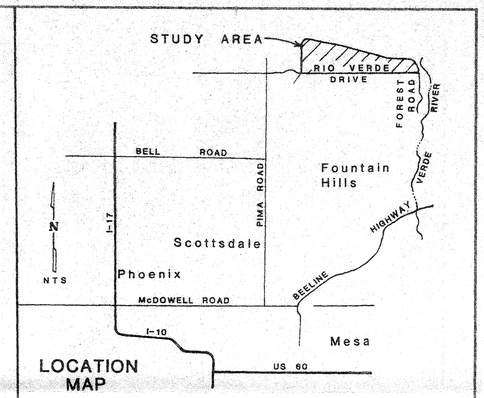
SUB-BASIN DELINEATION AND FLOW PATH MAP

RECOMMENDED BY: DATE

APPROVED BY: DATE

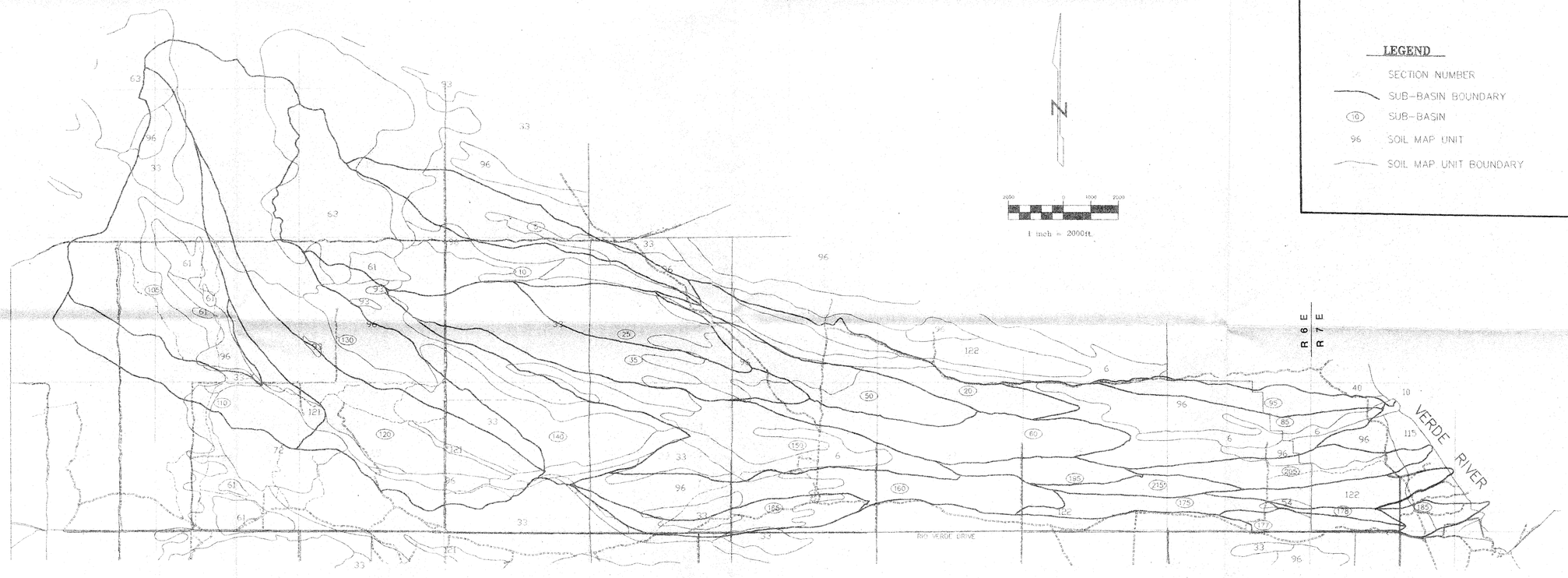
CHIEF ENGINEER AND GENERAL MANAGER

EXHIBIT A



LEGEND

- SECTION NUMBER
- SUB-BASIN BOUNDARY
- (10) SUB-BASIN
- 96 SOIL MAP UNIT
- SOIL MAP UNIT BOUNDARY



T 5 N
T 4 N

REVISED 9/28/94

WOOD, PATEL & ASSOC., INC. 1550 EAST MISSOURI, SUITE 203 PHOENIX, ARIZONA (602)234-1344		
DESIGN	BY: AJR	DATE: 6-22-94
DESIGN CHK.	ACP	6-22-94
PLANS	JWC	6-22-94
PLANS CHK.	AJR	6-22-94
SUBMITTED BY:		DATE:

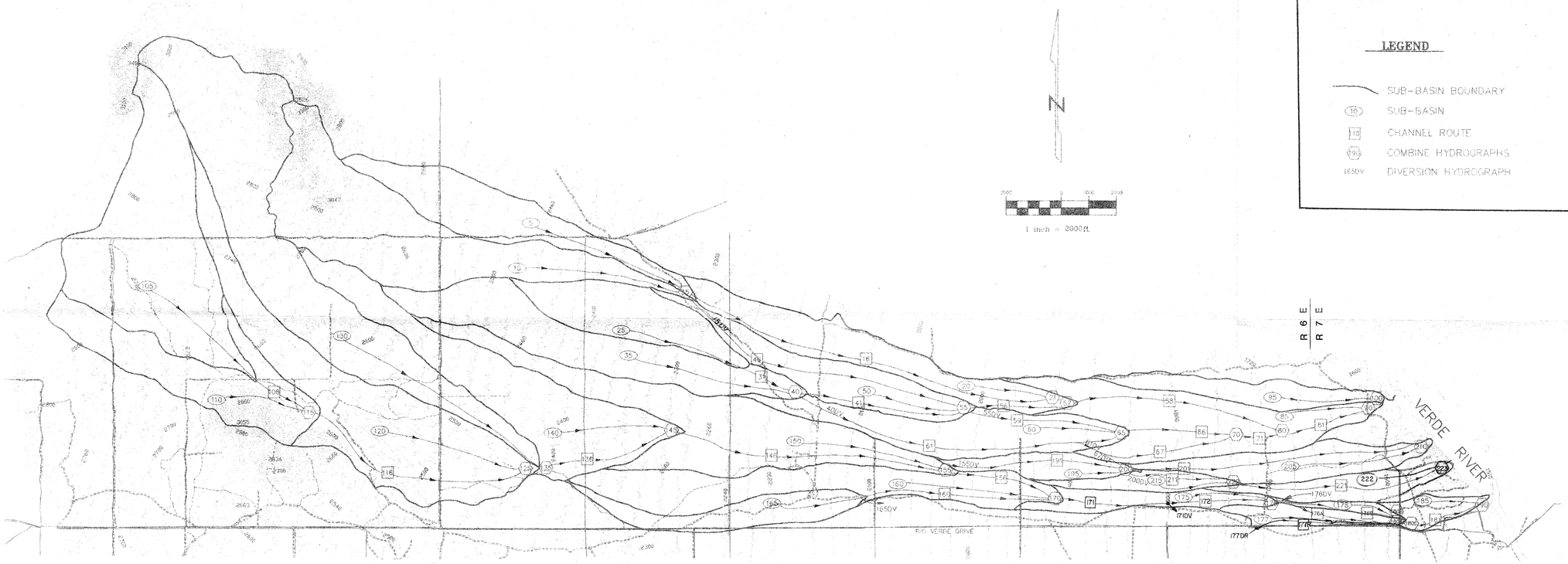
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

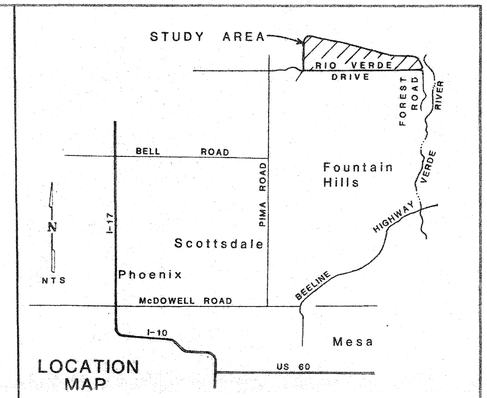
RIO VERDE – NORTH F.P.D.S.

SOIL MAP UNIT DATA

RECOMMENDED BY: DATE:
APPROVED BY: DATE:
CHIEF ENGINEER AND GENERAL MANAGER

EXHIBIT B





LEGEND

- SUB-BASIN BOUNDARY
- (10) SUB-BASIN
- [16] CHANNEL ROUTE
- (99) COMBINE HYDROGRAPHS
- 1650V DIVERSION HYDROGRAPH

REVISED 9/28/94

WOOD, PATEL & ASSOC., INC. 1550 EAST MISSOURI, SUITE 203 PHOENIX, ARIZONA (602)234-1344		
DESIGN	BY AJR	DATE 6-22-94
DESIGN CHK.	ACP	6-22-94
PLANS	JWC	6-22-94
PLANS CHK.	AJR	6-22-94
SUBMITTED BY:		DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RIO VERDE – NORTH F.P.D.S.

HEC-1 SCHEMATIC DIAGRAM

RECOMMENDED BY: DATE:

APPROVED BY: DATE:

CHIEF ENGINEER AND GENERAL MANAGER

EXHIBIT C

August 14th, 1995

Pedro Calza

Subject: Rio Verde North & South ELV ARC/INFO Data Submittal

The ELV coverage was the only coverage delivered at this time. The ELV coverage is not acceptable at this time due to the following reasons:

1) Based on an evaluation of the number of records corresponding to the ELV_AID ITEM in the ELV.AAT and the ELV.AATEXP files, I believe the number of records in the ELV.AATEXP should be equal to the frequency of unique ELV_AID numbers found in the ELV.AAT file. The number of unique ELV_AID numbers is 3043, and the number of records in the ELV.AATEXP file is 3924. Therefore, the number of records in the ELV.AATEXP file should be reduced by 881.

Eric Marc Feldman
Decision Support Analyst II

Eric M Feldman

CC: Marta Dent