FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HYDROLOGIC ANALYSIS
OF
BENDER AND SAND TANK WASHES

GILA BEND, ARIZONA

Property of
Flood Control District of MC Library
Please return to
2801 W. Durango
Phoenix, AZ 85009

TECHNICAL DATA NOTEBOOK

Prepared By:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
3335 West Durango Street
Phoenix, Arizona 85009
(602) 262-1501

Hydrology Division
Watershed Management Branch

April 1991

TABLE OF CONTENTS

STUDY DOCUMENTATION ABSTRACT

Overview

Study Criteria

SECTION 1: GENERAL DOCUMENTATION AND CORRESPONDENCE

1.1 General Correspondence

1.2 Meeting Notes and Minutes

SECTION 2: MAPPING AND SURVEY INFORMATION

2.1 General

2.2 Index of Maps

2.2.1 Exhibit "A" - Drainage Watershed Map and Sheet Index for Exhibits "B" and "C" (Map Pocket)

2.3 Watershed and Hydrologic Analysis Maps

2.3.1 Exhibit "B" - Drainage Sub-Watershed, Soils, and Land Use Map (Map Pocket)

2.3.2 Exhibit "C" - Drainage Sub-Watershed Delineation, Time of Concentration Flow Paths, and Flood Routing Map (Map Pocket)

SECTION 3: HYDROLOGIC ANALYSIS

3.1 Hydrologic Method Description
Location Map
Vicinity Map

3.2 Watershed Parameter Estimation

3.2.1 Drainage Area Boundaries

3.2.2 Physical Parameters

3.2.2.1 Sub-Watershed Parameters
General
Soils
Watershed Areas
Land Use
Lag Times
S-Graphs

Table 3.2-1 Green and Ampt Loss Rate Parameters by Map Unit Number

Table 3.2-2 Summary of Green and Ampt Loss Rate Parameters by Map Unit Number

Table 3.2-3.1 Green and Ampt Loss Rate Parameters by Sub-Watershed, Bender Wash
Table 3.2-3.2 Green and Ampt Loss Rate Parameters by Sub-Watershed, Sand Tank Wash

Table 3.2-4.1 Average Slope Calculations Using Pima County Equation by Sub-Watershed, Bender Wash
Table 3.2-4.2 Average Slope Calculations Using Pima County Equation by Sub-Watershed, Sand Tank Wash

Table 3.2-5.1 Surface Retention Loss (IA) Calculations by Sub-Watershed, Bender Wash
Table 3.2-5.2 Surface Retention Loss (IA) Calculations by Sub-Watershed, Sand Tank Wash

Table 3.2-6.1 Lag Time Calculations by Sub-Watershed, Bender Wash
Table 3.2-6.2 Lag Time Calculations by Sub-Watershed, Sand Tank Wash

Table 3.2-7 Summary of Sub-Watershed Parameters, Bender and Sand Tank Washes

3.2.2.2 Reach Route Parameters
General
Field Reconnaissance
Hydraulic Computations
Channel Infiltration Losses

Table 3.2-8 Routing Parameters by Reach, Bender and Sand Tank Washes

3.2.3 Statistical Parameters

3.2.4 Precipitation

3.2.4.1 Rainfall Distribution
3.2.4.2 Precipitation Data
3.2.4.3 Areal Precipitation Reduction

Table 3.2-9 Areal Reduction of Precipitation

3.3 Special Problems and Solutions

3.3.1 Big Horn Reservoir

3.3.2 Bender and Sand Tank Washes' Flow Splits

3.3.3 Impoundment on Watershed

3.4 Final Results

3.4.1 General

3.4.2 Discussion of Results

Table 3.4-1 Log Pearson III Analysis Data

Figure 3.4-1 Plot of Log Pearson III Analysis, 100-Year Peak (cfs/mi^2) vs Drainage Area (mi^2) for Representative Washes in Maricopa County

Table 3.4-2.1 Summary Table of Peak Discharges at Concentration Points, Bender Wash

Table 3.4-2.2 Summary Table of Peak Discharges at Concentration Points, Sand Tank Wash

APPENDIX A Program MCUHP2, Bender and Sand Tank Washes 6-hour duration

APPENDIX B Program MCUHP2, Bender and Sand Tank Washes 24-hour duration

APPENDIX C HEC-1 Program, Bender and Sand Tank Washes 6-hour duration

APPENDIX D HEC-1 Program, Bender and Sand Tank Washes 24-hour duration

APPENDIX E Point rainfall precipitation calculations

STUDY DOCUMENTATION ABSTRACT

Overview

This study is known as the "Bender and Sand Tank Washes Technical Hydrology Study." The study is commissioned by the Flood Control District of Maricopa County (FCD) as an initial step in determining the base hydrology for what will be used in the evaluation of flooding in the area. The flow rates developed are anticipated to be used as starting points for a Flood Delineation Study (FDS) or for ultimately sizing flood control mitigation structures to minimize flooding damage to the Gila Bend townsite area.

Principle flows involved in this study develop from the Bender and Sand Tank Washes as a result of their tributary drainage areas which have been named Bender Wash major sub-watershed and Sand Tank Wash major sub-watershed, respectively.

The study is a detailed effort by the Hydrology Division of the FCD to depict the watershed characteristics and predict the hydrograph response using the methodologies suggested in the Hydrologic Design Manual for Maricopa County, Arizona, prepared by the FCD.

Study Criteria

Following is a brief outline of the study criteria selected for analysis of this watershed.

1. Hydrology calculations are performed for the 100-year storm.

2. Storm durations of a 6- and 24-hours were evaluated in order to determine which duration storm results in the highest magnitude peak discharge.

3. The U.S. Army Corps of Engineers HEC-1 Flood Hydrograph Package was used for hydrograph computation.

4. The Hydrologic Design Manual for Maricopa County, Arizona prepared by the Special Projects Branch, Hydrology Division, Flood Control District of Maricopa County is used as a guideline for methodology.

5. The S-graph is used for unit hydrograph development.

6. The Green and Ampt Loss Method is used for estimating precipitation losses.

7. The 24-hour duration storm uses the SCS Type II rainfall distribution. The 6-hour duration storm uses the rainfall patterns and distributions as suggested in the FCD Hydrology Manual.

8. Existing undeveloped land use conditions are used to estimate flow rates. Future land use conditions are not estimated.

State of Arizona

DEPARTMENT OF WATER RESOURCES

15 South 15th Avenue, Phoenix, AZ 85007

. Governor
. Director

LETTER OF TRANSMITTAL

To: Amir Motamedi
Flood Control District of Maricopa County
3335 West Durango
Phoenix, AZ. 85009

Date: 11-19-90

File Name: Tonto Wash

RECEIVED
NOV 20 '90

	CH ENG		P & PM
	DEP		HYDRO
	ADMIN		LMGT
	FINANCE		FILE
	C & O	1	ADM
	ENGR		

REMARKS

Attention:

Greetings:
We are sending you the following items by:

___ Drawings ___ Prints ___ Plans ___ Samples
___ Copy of Letter ___ Change Order ___ Specifications
___ Other

Copies	Date	Description
1	11-19-90	Infiltration Curves - Deadman Wash &
		Data Sheets - Channel & Overbank.

These are transmitted as checked below:

___ For approval ___ Approved as submitted ___ For instruction
___ For your use ___ Approved as noted ___ Resubmit ____ copies for approval
___ As requested ___ Returned for corrections ___ Return _____ corrected prints
___ For review & comment

Remarks The Samples show evidence of ponding - particularly the snail shells in the Channel Sample.

Copy To:

Signed:
Engineering Division/
Flood Management Section
(602) 542-1541

Think Conservation!

Office of Director 255-1554
Administration 255-1550, Water Resources and Flood Control Planning 255-1566, Dam Safety 255-1541,
Water Rights Administration 255-1581, Hydrology 255-1586.

INFILTRATION - Falling Head Permeameter

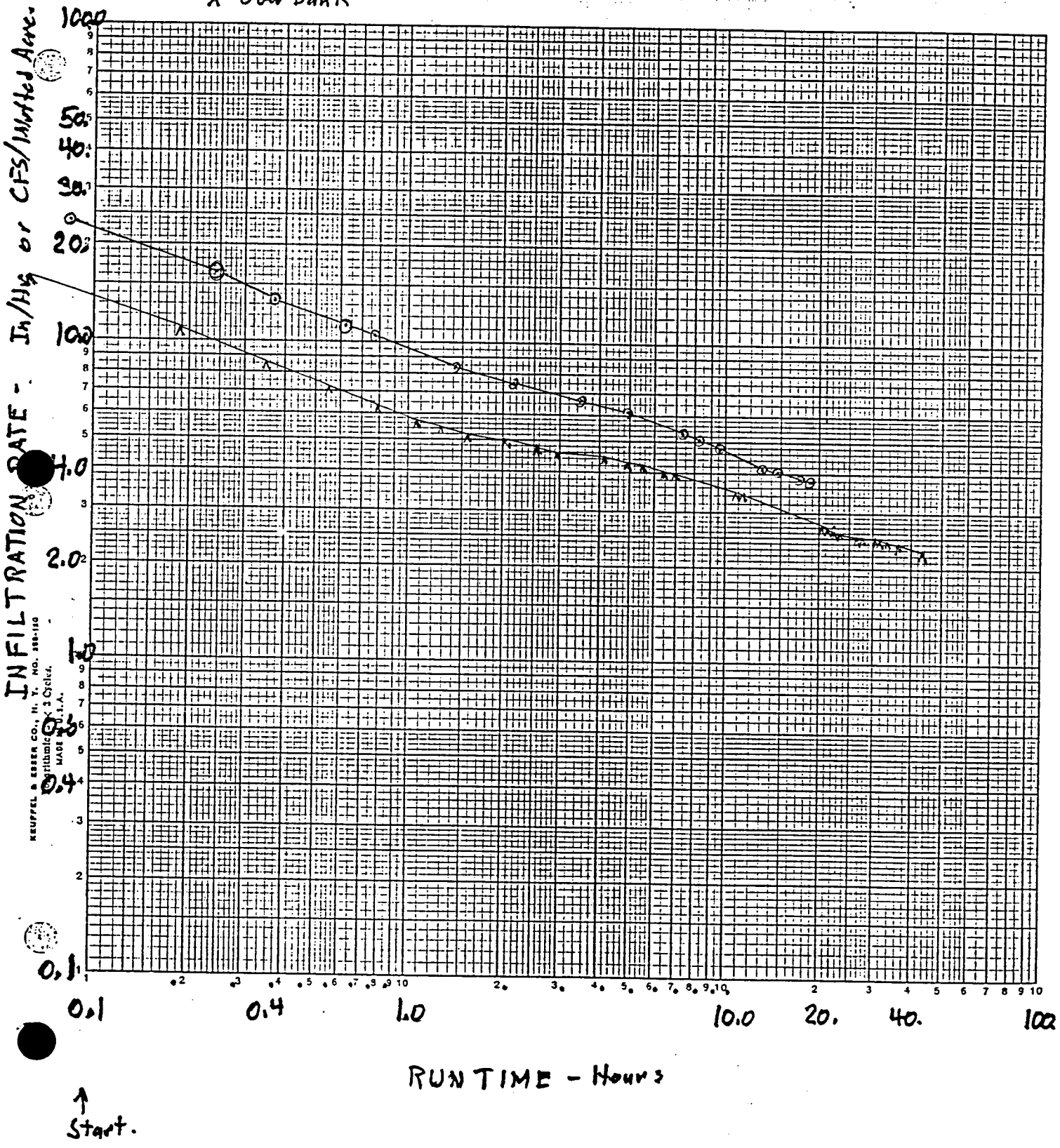
Cumulative Mean Infiltration Rate.

Sample I.D.

Deadman Wash @ I-17

⊙ Channel

∧ Overbank



↑ Start.

DEGJr.
11-14-92

INFILTRATION - Falling Head Permeameter

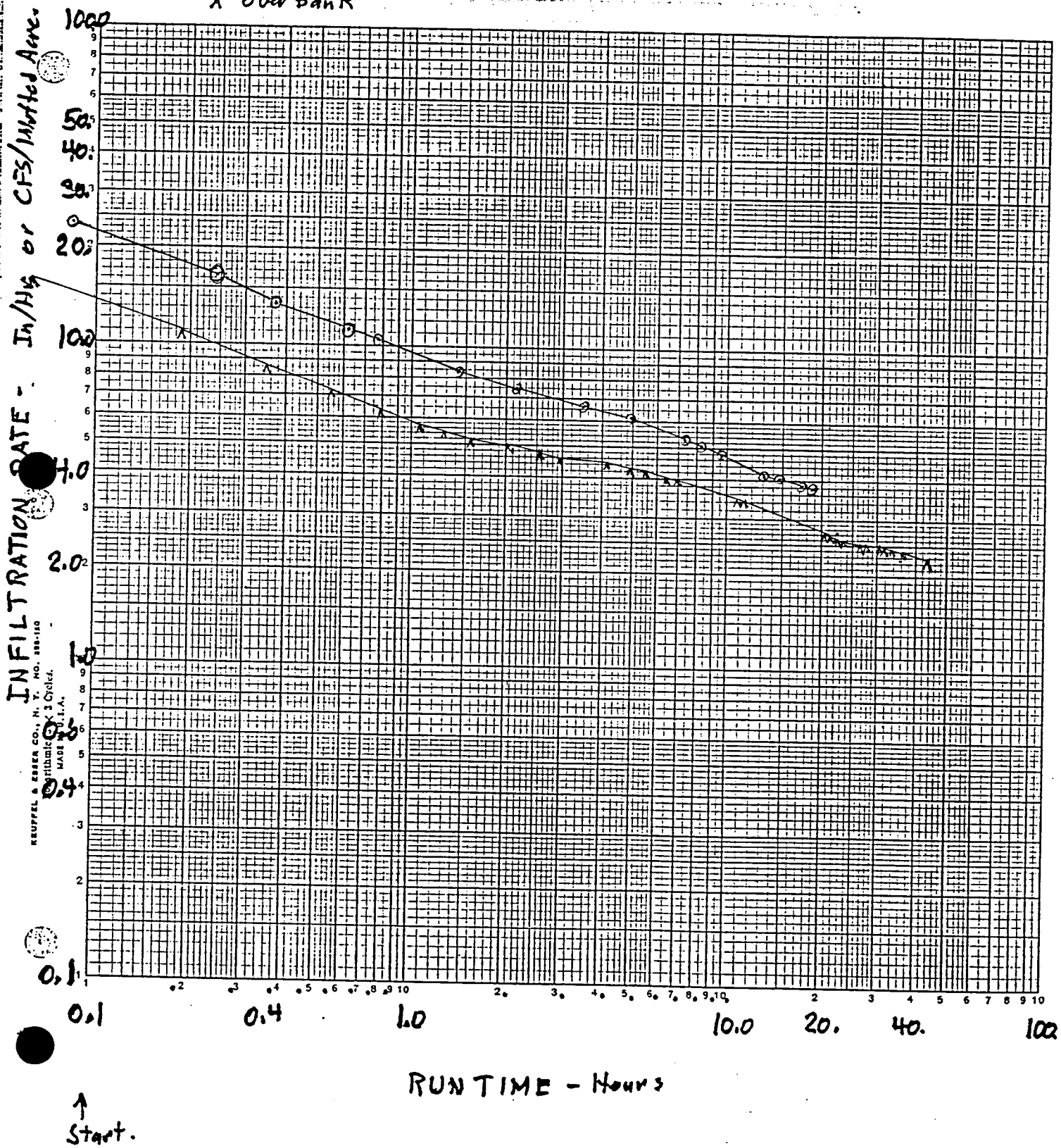
Cumulative Mean Infiltration Rate.

Sample I.D.

Deadman Wash @ I-17

⊙ Channel

^ Overbank



↑ Start.

DEGJr.

INFILTRATION TEST - Falling Head

Date: Nov. 17, 90
By: DEF

Sample: DEADMAN WASH - Overbank -

Description: Silty Fine sand with organic material

Notes:

Equipment: Plastic Cylinder OD = 1 11/16" L = 40.31"

Screening #4 very minor amount of +4 material - trace small gravel

Compaction: Rod and Vibration

Dry - Cylinder filled to 15 3/8" depth.

Temperature °F

Date	Reservoir Reading	Reservoir Cumulative	Time h m s	Elapsed Δt (h m s)	Elapsed (hrs.)	RATE (in/hr)	Notes
11-17-90	0.00		10:11:00				Initial filling of Soil Column @ 15 3/8 START
	1.0	1.0	10:14:45	0:3:45	0.0625	16.00	Wetted Face @ 9 1/4
	2.0	2.0	10:22:10	0:11:10	0.1861	10.932	Wetted Face @ 21 7/8
	3.0	3.0	10:38:00	0:21:00	0.35	8.571	" " " @ 24 1/2
	4.0	4.0	10:44:35	0:33:35	0.5597	7.146	" " " @ 27 1/8
	5.0	5.0	10:58:50	0:47:50	0.7972	6.272	" " " @ 29 9/16
	6.0	6.0	11:14:50	1:03:50	1.06389	5.640	31 7/8
Refill	0.0	6.0	11:15:30				Refill
	1.0	7.0	11:28:50	1:13:20	1.2861	5.443	
	2.25	8.25	11:46:10	1:35:10	1.5861	5.20	
	4.0	10.0	12:15:35	2:00:35	2.0097	4.976	
	6 1/8	12.125	12:43:50	2:32:50	2.5472	4.760	
	7 1/2	13.50	13:07:25	2:56:25	2.9403	4.59 ~~3.911~~	
	0.0		13:07:45				Refill
	5.0	16 ~~16.50~~	14:20:00	4:09:00	4.15	4.458 ~~3.976~~	
	8.0	21 ~~19.50~~	15:05:30	4:57:30	4.9583	4.36 ~~3.933~~	
Refill	0.0	23	15:09:00			4.244	
	2.0	~~21.50~~	15:43:15	5:32:15	5.5375	~~3.843~~	
	5.0	26 ~~24.50~~	16:40:20	6:29:20	6.4889	4.084 ~~3.776~~	
	6 3/8	27 ~~25.875~~	17:10:30	6:59:30	6.9917	3.987 ~~3.704~~	
Refill	0.0	37	17:11:10			3.428	
	9 7/16	~~35~~ 37.3125	20:52:10	10:41:10	10.6861	~~3.305~~	ΔR: 9.4375 / 3.6833 = 2.562
Refill	0.	39	20:52:30			3.439	Top of Soil 15 7/8"
	13 3/4	~~37~~ 37.0625	21:32:30	11:21:30	11.3583	~~3.263~~	Settlement 1/2"
Refill	0	54	~~21:33:10~~			2.707	
	15 3/16	~~52~~ 52.25	06:13:20	20:2:20	20.0389	~~2.607~~	
11/18/90 Refill	0	56	06:14:00			2.671	
	2 1/16	~~54~~ 54.3125	07:16:00	21:5:00	21.0833	~~2.576~~	
	4 3/16	58 ~~56~~ 56.4375	08:22:45	22:11:45	22.1958	2.633 ~~2.549~~	
	6 7/8	60 ~~58~~ 58.625	09:35:00	23:24:00	23.400	2.591 ~~2.505~~	ΔR: 2.1875 / 1.204 = 1.817
Refill	0	67	12:32:35	26:21:35	26.3597	2.542 ~~2.466~~	
	6 3/8	~~65~~ 65.00					
	9 1/8	69 ~~67~~ 67.75	13:57:30	27:46:30	27.775	2.511 ~~2.433~~	ΔR: 2.125 / 4.375 = 2.086
Refill	0	75	15:57:50			2.503	
	5 11/16	~~73~~ 73.4375	16:19:00	30:08:00	30.1333	~~2.437~~	
	7 3/8	77 ~~75~~ 75.125	17:09:20	30:58:20	30.9722	2.490 ~~2.426~~	
Refill	0.	82	17:09:50			2.468	
51°	5 3/4	~~80~~ 80.875	19:45:55	33:34:55	33:58:19	~~2.406~~ 2.406	
11/19/90	10 1/4	87 ~~85~~ 85.375	22:20:00	36:11:00	36.2833	~~2.353~~	
Refill	0.11 1/2	90 ~~88~~ 88.875	22:28:32	43:31:20	43.5222	~~2.226~~ 2.272	Terminated. END

11/12/90
S

Deadman Wash - Amir Motamedi Sampling - Nov. 6, 1990

Channel Bottom I-17 -

Coarse Sandy silty fine gravel silty Sand with hydrogenic & 3 Snail? shells.

Screened on No 4 - about 20% gravel 3/4 - #4, #16 Screen fines and non-plastic -

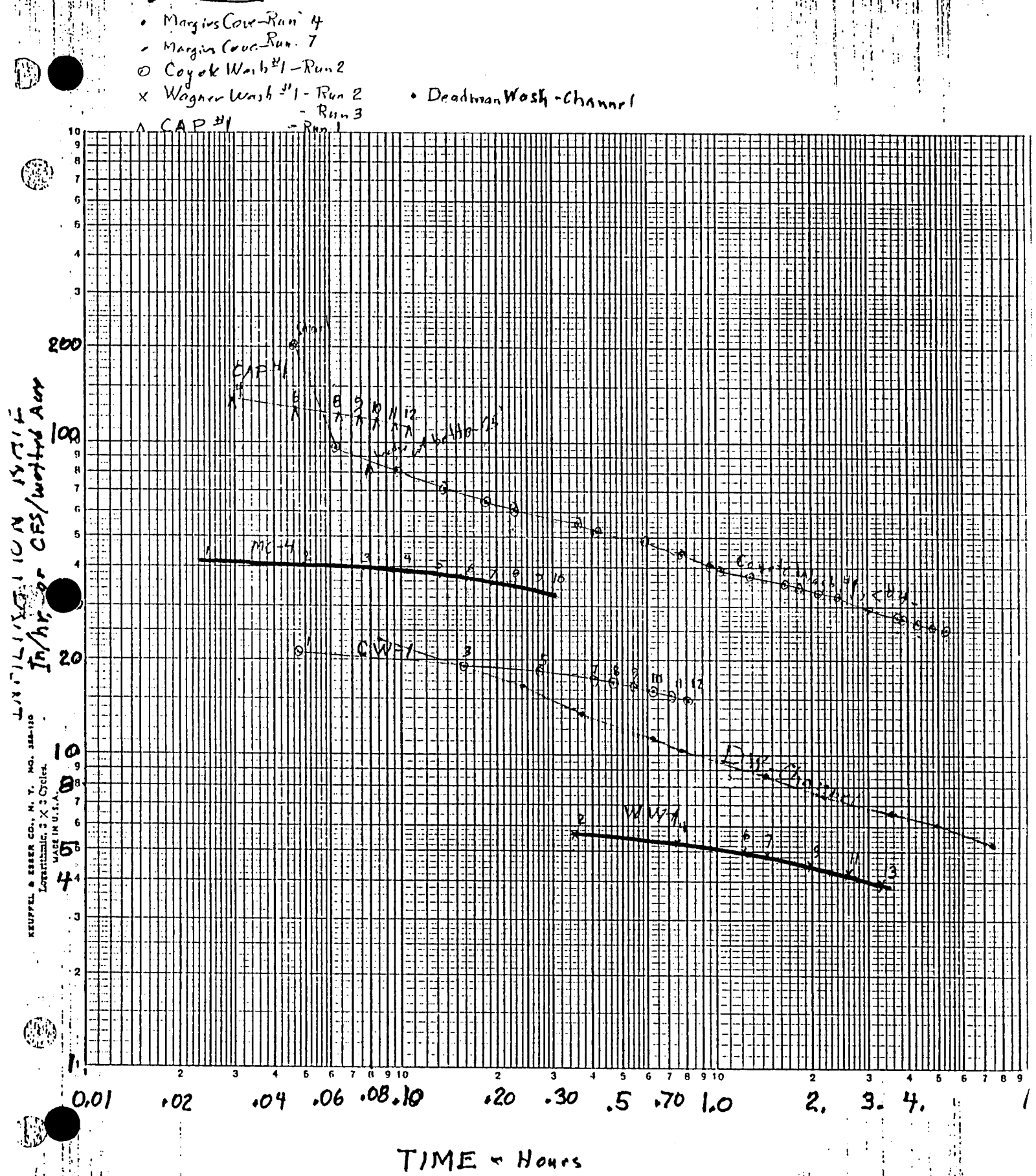
Cylinder to 13.25" dry with vibration.

	Start 11-12-90	Reservoir	ΔR. (in)	Time hms	ΔT hms	ΔT hrs	Average Rate, in/hr	
		0.00						
		0.00		15:25:35				water clear - No suspended Clay-Silt
		2.00	2.00	15:30:43	0:05:08	0.08552	23.377	water force to 22.0' 8.75"
		4.00	4.00	16:40:15	0:14:40	0.2444	16.364	29.25 16.00"
	Restart	0.00	4.00	15:41:55				
	Air: 82°	1.00	5.00	15:47:55	0:22:20	0.37222	13.433	
		3.00	7.00	16:03:00	0:37:25	0.6236	11.225	
	Restart.	4.00	8.00	16:12:15	0:46:40	0.7778	10.286	
		0.00		16:12:35				
		4.00	12.0	16:51:15	1:25:40	1.4278	8.405	
	Restart	0.00		16:51:30				
		4.25	16.25	17:35:40	2:10:05	2.1681	7.495	
	Restart	0.0		17:35:55	2:10:20			
		6.875	23.125	18:55:45	3:30:10	3.5028	6.602	
	Restart	0.0		18:56:55				
		8.0	30.125	20:23:30	4:57:35	4.9653	6.067	
	Restart.	0.0		20:23:50				
		8.11/16	38.8125	22:24:35	7:20:00	7.3333	5.293	
11/13/90		0.00		16:27:35		(8.3569) (25.9569)	(5.064) (1.61)	Refill - from empty
Restart.		3.0	3.0	41.875	17:23:00	0:55:25	0.9236	3.248
Refill		0.0		17:23:15				
		3 7/8	6.875	45.6875	18:41:40	2:14:05	(9.568) 2.2347	(4.7750) 3.076
		12.0	15.0	53.8125	22:12:35	5:45:00	5.750 (13.0833)	2.609 (4.1131)
11/14/90		0.00			16:38:00		(14.6069)	4.009
Restart		4.75	4.75	58.562	18:05:25	1:31:25	1.5236	3.12
Refill.		0			18:10:00		(17.45)	(3.81)
		8.0	12.75	66.562	21:00:00	4:22:00	4.367	2.92
Refill		0.0			21:00:15			Refill from empty.
		4.5	17.25	71.0625	22:19:55	5:41:55	(18.7819) 5.6986	(3.78) 3.03

SCS map
Unit. 98/99.
45% Pincamp B 2-6 .2-6 2-6 Gravelly Sandy loam Xt. SSCl loam NP-5 20-15 5-10 Clay 10-15 20-30 15-20 Slo Slow
35% Tremont. B 16-2. .2-6 >20 Gravelly Loam Clay loam. NP-10 10-20 NP 10-20 30-35 3-5 Slow Slow
Carrizo in drainageways

11/15 Dumped and Sampling.

INFILTRATION- Falling Head Permeameter



DEC Jr. 5-31-90

9. Normal depth routing is used to stimulate reach routing.

10. Channel infiltration losses are estimated.

SECTION 2: MAPPING AND SURVEYING INFORMATION

2.1 General

Mapping and survey data utilized for the estimating of the physical watershed characteristics are taken from the following United States Geological Survey (USGS) 7.5 minute quadrangle maps.

GILA BEND: (1973)
BOSQUE: (1973)
ESTRELLA: (1979)
CONLEY WELL: (1979)
SOUTH OF GILA BEND: (Provisional Edition 1986)
BLUE PLATEAU: (Provisional Edition 1986)
BIG HORN: (1979)
LOST HORSE PEAK: (1979)
HAT MOUNTAIN: (Provisional Edition 1986)
PLATT WELL: (Provisional Edition 1986)
KAKA NW: (Provisional Edition 1986)

The USGS maps were photo-mosaicked at actual size (1" = 2000') and combined to make Exhibits "A", Exhibits "B", and Exhibits "C". These exhibits individually reflect sub-watershed delineation, sub-watershed soils/land use, and sub-watershed time of concentration flow paths/flood routing.

Aerial photos from The Unites States Department of Agriculture (USDA) and Soil Conservation Service (SCS) were also used and proved to be beneficial in determining work locations and possible flow split conditions.

The following aerial maps used were:

ESTRELLA S.W. (1979)
ESTRELLA S.E. (1979)
ESTRELLA N.W. (1979)
ESTRELLA N.E. (1979)
GILA BEND S.W. (1979)
GILA BEND S.E. (1979)
GILA BEND N.W. (1979)
GILA BEND N.E. (1979)

2.2 Index of Maps

An Index Map is provided under Exhibit "A" and shows the limits of the watershed reflected on individual maps at scale 1" = 2000'. (Exhibit "B" and "C").

2.3 Watershed and Hydrologic Analysis Maps

Exhibit "B" and Exhibit "C" reflect at scale 1" = 2000', the sub-watershed physical and hydrologic parameters.

SECTION 3: HYDROLOGIC ANALYSIS

3.1 Hydrologic Method Description

The watershed is analyzed using a computer simulated model and the methodology set forth in Hydrologic Design Manual for Maricopa County, Arizona (Sept. 1, 1990), prepared by the Flood Control District of Maricopa County, Hydrology Division, Special Projects Branch.

The watershed is modeled for the 100-year, 6-hour and 100-year, 24-hour design storm. The temporal rainfall distribution implemented is based on the Phoenix Valley or Phoenix Mountain S-graph. Precipitation depths for the respective design storms are taken from the National Oceanic and Atmospheric Administration (NOAA) Atlas No. 2. Rainfall losses are estimated using the Green and Ampt infiltration methods.

Hydrographs are routed through the watershed using normal depth channel routing techniques. The computer model used to simulate the watershed response is the U.S. Army Corps of Engineers HEC-1 Computer Program, Version 4.0, dated August 1988, as implemented by Dodson and Associates.

The FCD MCUHP2 computer program was used to develop the unit hydrograph for each sub-watershed. The modeling was accomplished using the S-graph, Green and Ampt losses, and routing and combining of sub-basin hydrographs. The derivation of input data, assumptions and procedures used in preparation of the computer model will be discussed in the following sections.

3.2 Watershed Parameter Estimation

3.2.1 Drainage Area Boundaries

The watershed is comprised of two (2) major sub-watersheds which are identified as Bender Wash (78 square miles) and Sand Tank Wash (158 square miles). Refer to Exhibit "A" in section 2.2.1 for the watershed boundary delineation. The total tributary area making up the combined watershed is approximately 236 square miles.

The west boundary of the combined watershed is less rigidly defined as other physical boundaries present and is characterized by the distributary flow area. The west boundary is adjacent to the Quilotosa Wash watershed. The northern and eastern units of the combined watershed are fixed by the Maricopa Mountains and segments of the Interstate-8 alignment. The eastern boundary of the combined watershed is defined by natural topographic relief which divides tributary flow between a westerly and easterly drainage pattern.

The southerly boundary of the combined watershed is fixed by portions of the Sand Tank Mountains and by segments of distributary flow due to the Quilotosa Wash watershed. The combined watershed contains varied terrain consisting of steep desert mountains and flatter undeveloped desert.

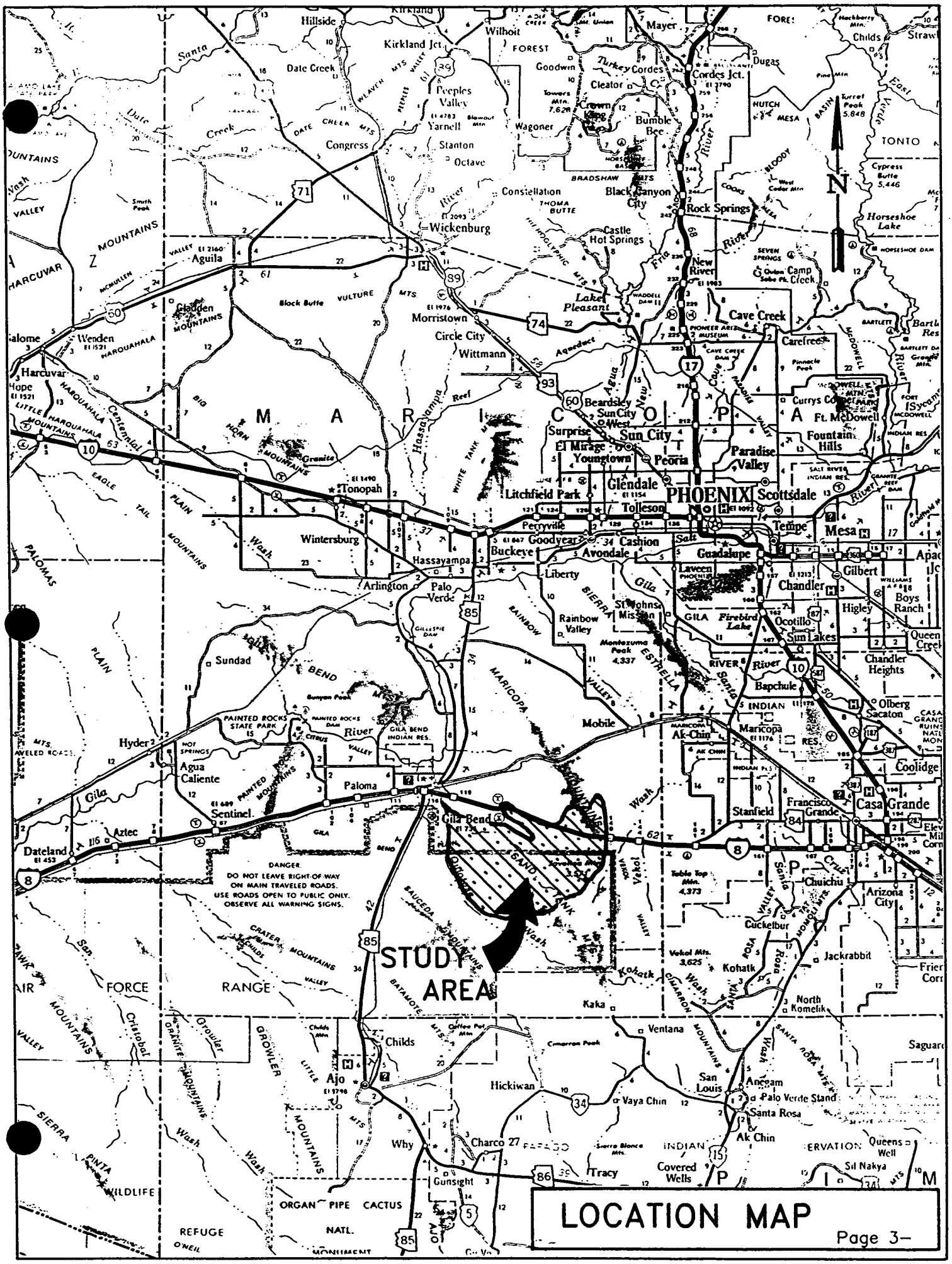
The Bender Wash major sub-watershed is broken into 23 minor sub-watersheds, while the Sand Tank Wash major sub-watershed is broken into 46 minor sub-watersheds. The "minor" sub-watersheds are referred to here after as sub-watersheds. They range from high peak mountains with many rock outcrop areas, to the valley distributary flow areas. The sub-watersheds for both, the Bender and Sand Tank Washes are virtually undeveloped with very few roads.

The Bender Wash watershed has 23 square miles of its area on the United States Air Force Military Reservation Range, while the Sand Tank watershed has 115 square miles of its area on the Range.

The two major sub-watersheds are analyzed at two separate concentration points upstream of the Bender and Sand Tank Washes' confluence. The confluence of Bender and Sand Tank Washes is immediately upstream of the Gila Bend townsite area. The two points selected for concentration each have a flow split condition at the chosen termination point. It is the intent that further development of the hydrology shall undertake a flow split analysis at these two concentration points in order to properly evaluate the hydrology at the downstream confluence. Detailed calculations and field measurements shall be performed in conjunction with a hydraulic analysis to determine the confluence location and properly account for the presence of the various physical structures in the immediate area of the confluence (i.e. Interstate-8 culverts, miscellaneous roadways, structures, etc.).

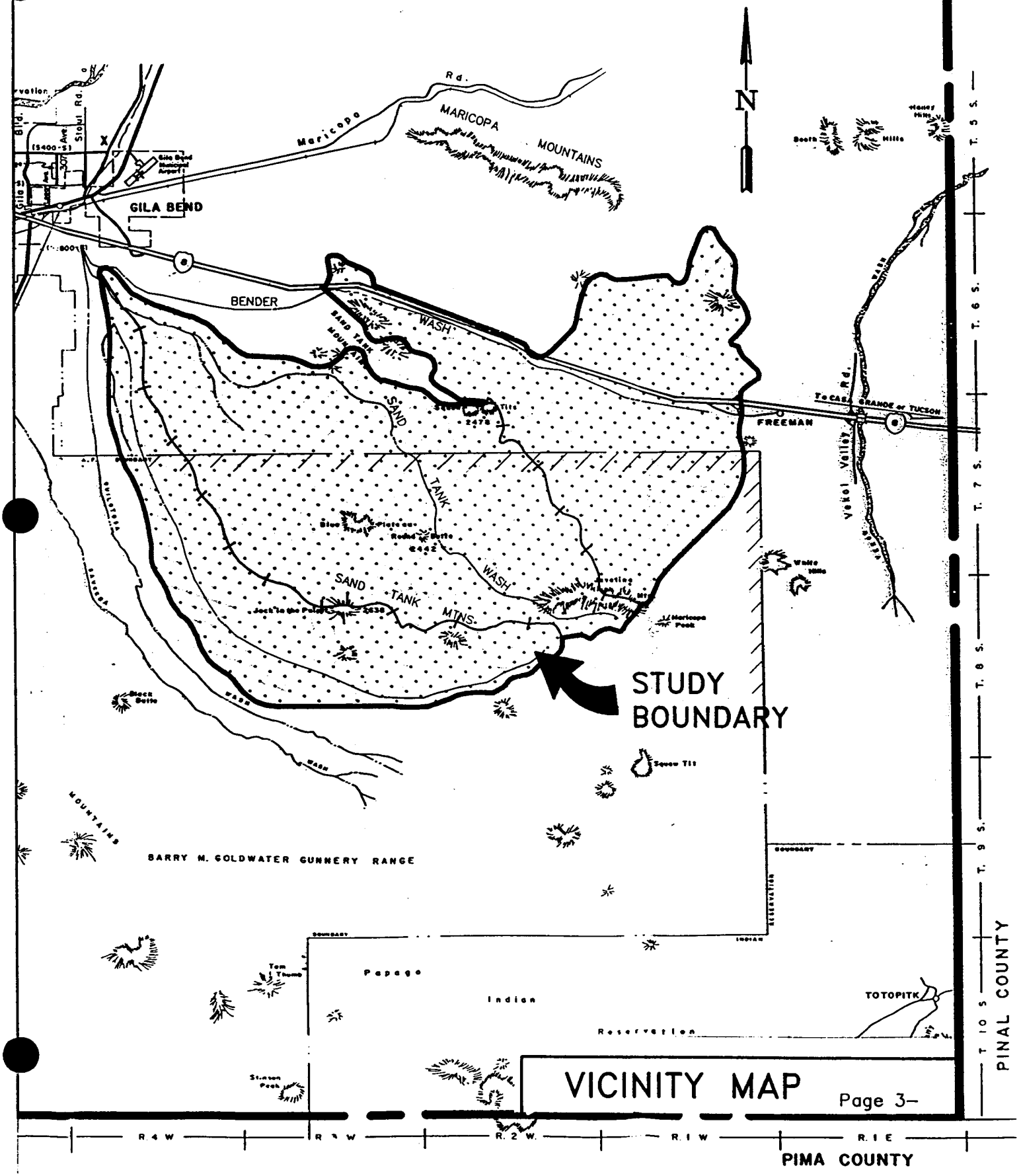
Bender Wash is largely characterized as having sub-watersheds contribute directly to it throughout its reach with minimal routing involved. These sub-watersheds have "Mountain" and "Valley" Topographic relief as dictated by the terrain of the north and northwesterly draining regions of the Sand Tank Mountains and the south and southwesterly draining regions of the Maricopa Mountains.

Sand Tank Wash is characterized as having a substantial portion of the watershed contribute to it at the chosen concentration point (upstream of the Gila Bend townsite area). The sudden contributing sub-watersheds originate from the southwest portion of the combined watershed and are characterized with distributary flow. Sub-watersheds contributing directly to the Sand Tank Wash throughout its reach have both "Mountain" and "Valley" Topographic relief as dictated by the Sand Tank Mountains and its foothill and valley regions.



LOCATION MAP

SAND TANK AND BENDER WASH PRELIMINARY HYDROLOGY STUDY



VICINITY MAP

3.2.2 Physical Parameters

General

The watershed parameters are estimated in conformance with the Hydrologic Design Manual. The procedures for estimating parameters are described in the following sections.

Soils

Soil parameters are estimated for the watershed based on the Green and Ampt infiltration equation. Soils were evaluated from the following sources:

1. "Preliminary" Soils Survey of Maricopa County, Arizona; Gila Bend - Ajo Area, prepared by the United States Department of Agriculture and the Soil Conservation Service (study not officially published for public use).

2. United States Geological Survey (USGS) 7.5 minute quadrangle maps listed in Section 2 of this report.

Restricted access within the Barry M. Goldwater Air Force Range has created significant limitations with obtaining complete soils data for the entire watershed. The study area for the "Soils Survey of Maricopa County, Arizona; Gila Bend - Ajo Area" does not encompass land within the Air Force Range. To augment the lack of valuable soils data, the USGS topographic maps (item 2 above) were used to quantify the topography into the two major categories of "Mountain" and "Valley" relief; generalized soil data, representative of the area, have been assigned for the two topographic types.

At this time the soil survey referred to in item 1 above is not officially published for public use; however, the data in its unpublished format was obtained with permission of the SCS for use in this type of analysis. The work maps and preliminary soil descriptions are on file with the Flood Control District for review on an as needed basis.

For areas of the watershed having soils survey data, the Green and Ampt precipitation loss rate parameters were estimated using methodologies suggested in the Hydrologic Design Manual. The United States Department of Agriculture (USDA) Soil classifications are obtained directly from the soils survey for the respective major and minor soils of the soil complex in question.

From Table 4.2 of the Hydrologic Design Manual, the values of Green and Ampt hydraulic conductivity at natural saturation (XKSAT) are obtained for the major and minor soils present based on the USDA soil classification.

The XKSAT values for the soil is then computed as a weighted average of the XKSAT values based on the percentage of each major and minor soils present (refer to Table 3.2-1). The result is a weighted XKSAT value for each soil present in the watershed.

The representative XKSAT value for the sub-watershed in question is an area weighted percentage of the XKSAT values for the many soils which contribute to the overall make-up of the sub-watershed.

Subsequent Green and Ampt rate variables for the sub-watershed are: wetting capillary suction (PSIF), and volumetric soil moisture deficit at the start of rainfall (DTHETA). These two parameters are constants which are based on the representative XKSAT value for the sub-watershed in question. Using the representative XKSAT value for the sub-watershed, the PSIF and DTHETA constants are interpolated between the family of Green and Ampt constants that are organized by U.S.D.A. soil classifications found in Table 4.2 of the Hydrologic Design Manual. The DTHETA value is selected for "dry" antecedent conditions of soil. Presentation of XKSAT, PSIF, and DTHETA for all sub-watersheds are found in Tables 3.2-3.1 and 3.2-3.2.

For areas of the watershed primarily within the Air Force Range and not having soils survey data, the Green and Ampt precipitation loss rate parameters were estimated by drawing general approximations of the XKSAT values based on topographic relief. The XKSAT value of 0.25 in/hr is assigned to mild and gently sloping areas which are called "Valley." The XKSAT value of 0.02 in/hr is assigned to steep, hillslope areas which are called "Mountain." The XKSAT values which are assigned by this technique are also weighted by percent area in order to obtain representative XKSAT values for the sub-watershed in question.

Rock outcrop areas within the watershed are primarily identified in the soils survey data and are presumed to account up to 50% impervious area (RTIMP) at the controlling horizon when they are present. The percentage of impervious area for the watershed is based on the extent of rock outcrop present. An estimation of 10% imperviousness by area is assumed for soils within the Air Force Range which are being broadly classified as "Mountain." The "Valley" classification is presumed to have no natural impervious area.

Watershed Areas

The areas of each sub-watershed are determined using computer digitizer. The areas for each sub-watershed are contained in Table 3.2-7.

Land Use Characteristics

Land use for the entire watershed is believed to be existing undeveloped natural desert with native vegetation in both Mountain and Valley areas. Land use in the watershed can be categorized into three (3) main types, according to Table 4.1 of the Hydrologic Design Manual: Desert Rangeland, Hillslopes, and Mountains. The topographic relief and vegetative surface conditions of the watershed are used to determine the S-graph type and initial abstraction (IA) values for each sub-watershed according to Table 4.1 of the Hydrologic Design Manual. The IA values for sub-watershed are presented in Table 3.2-7 and are computed based on an area weighted percentage of each land use condition present.

Vegetation cover is assumed to be 10% for all areas of the watershed.

Lag Times

A lag time for each sub-watershed is evaluated using the following relationship:

$$LAG = C(LL_{ca}/S^{p})^{m}$$

where LAG = basin lag time in hours.

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 = 24 Kn (from U.S. Army Corps of Engineers, [COE])
m = 0.38 (from COE)
p = 0.5
Kn = estimated mean Manning's n value for all channels in the basin.

The parameters listed above are derived from the data on Exhibit "C". The information necessary to estimate lag time is contained in tables 3.2-6.1 and 3.2-6.2.

S-Graphs

The Hydrologic Design Manual lists 2 types of S-Graphs approved for use in Maricopa County. These are the Phoenix Mountain S-Graph and Phoenix Valley S-Graph. The selection of an S-Graph for use on a particular sub-watershed is based on land use characteristics. If the sub-watershed is over 50% mountain and hillslope by area, then the Phoenix Mountain S-Graph is selected. If the sub-watershed is over 50% valley or rangeland by area, then the Phoenix Valley S-Graph is selected. The S-Graph type selected for each sub-watershed is listed in Table 3.2-7.

A separate unit hydrograph is generated for each sub-watershed by use of the computer program MCUHP2. This program was written by the Flood Control District and is furnished with the Hydrologic Design Manual. This program creates a set of UI records for direct input to HEC-1.

3.2.2.2 Reach Route Parameters

General

Routing of sub-watershed hydrographs is accomplished using the normal depth channel routing routine in HEC-1 computer model. The routing paths are shown in Exhibit "C" for each sub-watershed.

Field Reconnaissance

Extensive field reconnaissance is performed in conjunction with estimating the cross-section data for reach routing. Actual cross-sections of representative reaches are taken in the field for several washes. Table 3.2-8 presents pertinent normal depth routing data, much of which is taken from available mapping data. Several reaches shown in this table are field verified using normal survey methods. From visual observations made in the field, the typical channel cross-section geometry is found to be represented by an eight (8) point system having left and right overbank areas as well as a main channel flow section. Survey notes are on file with the Flood Control District and may be obtained upon request.

Hydraulic Computations

As part of the normal depth channel routing routine, the HEC-1 computer model computes conveyance and flow based on the channel cross-section. Manning roughness coefficients of 0.08 and 0.045 are used for overbank and main channel respectively. These values along with the typical channel cross-section are presumed to occur during the peak flow of a 24-hour duration storm. The average velocity at peak flow is checked to converge with the correct number of steps and computation interval. The computation interval of 10 minutes is chosen for this computer model.

Channel Infiltration Losses

Channel infiltration loss rates were included for each routing reach. Falling head permeameter tests performed by the Arizona Department of Water Resources staff (ADWR) on disturbed field samples of general washes in Maricopa County suggests that overbank and main channel infiltration rates are distinctly different. These tests further show that a wide range of infiltration rates can be achieved depending on the specific soil present. The infiltration rate of 5.0 inches/hour is estimated to represent the soil characteristics over the channel cross-section for all washes in this watershed.

The estimated infiltration rate is believed to be conservative since the tests by ADWR show typical channel bed infiltration rates above 40 inches/hour and overbank infiltration rates at 2 inches/hour.

3.2.3 Statistical Parameters

There has been no attempt to calibrate the HEC-1 computer model to historical precipitation and crest-stage gauge data.

3.2.4 Precipitation

3.2.4.1 Rainfall Distribution

The storm frequencies utilized in this hydrologic analysis are the 100-year, 6-hour and the 100-year, 24-hour duration storms. The rainfall distribution for the 6-hour and the 24-hour duration storm is furnished under the cover of the Hydrologic Design Manual and is provided for direct input into the HEC-1 computer model using the input loader program MCUHP-2. The rainfall distribution for the 6-hour duration storm has five (5) possible precipitation patterns. MCUHP-2 selects the appropriate pattern based on the area of the sub-watershed. The 24-hour rainfall distribution used for this study is the SCS type II pattern.

3.2.4.2 Precipitation Data

Point precipitation values used in this study are derived from the isopluvial maps and regression techniques furnished in the Hydrologic Design Manual. The point precipitation value used for the 100-year, 6-hour storm is 3.70 inches and the point precipitation value used for the 24-hour storm is 4.5 inches. Point precipitation data from the Hydrologic Design Manual is sourced from NOAA ATLAS 2, Volume VIII.

3.2.4.3 Areal Precipitation Reduction

The precipitation reduction for the 100-year, 6-hour duration storm is based on 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 reduction factors were simulated in HEC-1 through use of the JD operation card.

The precipitation reduction factors used for the 100-year, 24-hour storm were derived from information contained in NOAA Technical Memorandum NWS HYDRO-40. The precipitation values versus watershed drainage area used for the 24-hour model are contained in Table 3.2-9.

Table 3.2-1
Gren & Ampt Loss Rate Paramaeters
By Map Unit Number

Map Unit Number	Soil Name	Soil Series	% of Map unit components		U.S.D.A. Soil Texture (Control Horizon)	XKSAT (in/hr)	PSIF	DTHETA (dry)	DTHETA (normal)	RTIMP %	Hydrologic Soil Group
234	Growler-	Growler	50.0	Growler	e.g. fine sandy loam	0.40	4.3	0.35	0.25		B
	Wellton		32.0	Wellton	v.g. fine sandy loam	0.40	4.3	0.35	0.25		B
	complex		18.0	other	coarser textured	0.40	4.3	0.35	0.25		B
		Growler	100.0		Sandy Loam	0.40		0.35	0.25	0.00	B
263	Denure	Denure	100.0	Denure	gravelly fine sandy loam	0.40	4.3	0.35	0.25		B
		Denure	100.0		Sandy Loam	0.40		0.35	0.25	0.00	B
266	Why-	Why	50.0	Why	fine sndy loam	0.40	4.3	0.35	0.25		B
	Carrizo		23.0	Carrizo	e.g. sandy loam	0.40	4.3	0.35	0.25		A
	complex		27.0	other	more gravel & finer textured	0.40	4.3	0.35	0.25		B
		Why	100.0		Sandy Loam	0.40		0.35	0.25	0.00	B
267	Dateland-	Dateland	40.0	Dateland	fine sandy loam	0.40	4.3	0.35	0.25		B
	Denure		37.0	Denure	fine sandy loam	0.40	4.3	0.35	0.25		B
			23.0	other	coarser and/or sand	0.40	4.3	0.35	0.25		B
		Dateland	100.0		Sandy Loam	0.40		0.35	0.25	0.00	B

Map Unit Number	Soil Name	Soil Series	% of Map unit components	U.S.D.A. Soil Texture (Control Horizon)	XKSAT (in/hr)	PSIF	DTHETA (dry)	DTHETA (normal)	RTIMP %	Hydrologic Soil Group
269	Growler-	Growler	33.0 Growler	sandy loam	0.40	4.3	0.35	0.25		B
	Momoli		22.0 Momoli	sandy loam	0.40	4.3	0.35	0.25		B
	complex		45.0 other	more rock fragments	0.40	4.3	0.35	0.25		B
		Growler	100.0	Sandy Loam	0.40		0.35	0.25	0.00	B
301	Denure-	Denure	55.0 Denure	sandy loam	0.40	4.3	0.35	0.25		B
	Coolidge		25.0 Coolidge	sandy loam	0.40	4.3	0.35	0.25		B
	complex		20.0 other	more gravelly or coarser	0.40	4.3	0.35	0.25		B
		Denure	100.0	Sandy Loam	0.40		0.35	0.25	0.00	B
306	Cherioni	Cherioni	90.0 Cherioni	Sandy loam w/ harpan layer	0.02	9.4	0.20	0.10		D
			10.0 Outcrop	Rock Outcrop	---	---	---	---	50.00	-
		Cherioni	100.0	Sandy Loam w/ hardpan	0.02		0.20	0.10	5.00	D
307	Cherioni-	Cherioni	60.0 Cherioni	Sandy Loam w/hardpan layer	0.02	9.4	0.20	0.10		D
	Coolidge		25.0 Coolidge	sandy loam	0.40	4.3	0.35	0.25		B
	Complex		15.0 Outcrops	Rock Outcrop	---	---	---	---	50.00	-
		Cherioni	100.0	Sandy Loam w/ hardpan	0.13		0.24	0.14	7.50	C
310	Gunsight-	Gunsight	55.0 Gunsight	loam	0.25	3.5	0.35	0.25		B
	Ajo		35.0 Ajo	sandy clay loam	0.06	8.6	0.25	0.15		C
	complex		10.0 other	coarser textured	0.25	3.5	0.35	0.25		B
		Gunsight	100.0		0.18		0.32	0.22	0.00	B

Map Unit Number	Soil Name	Soil Series	% of Map unit components		U.S.D.A. Soil Texture (Control Horizon)	XKSAT (in/hr)	PSIF	DTHETA (dry)	DTHETA (normal)	RTIMP %	Hydrologic Soil Group
312	Gunsight-	Gunsight	50.0	Gunsight	loam	0.25	3.5	0.35	0.25		B
	Cipriano		25.0	Cipriano	sandy clay	0.02	9.4	0.20	0.10		D
	complex		25.0	other	coarser	0.25	3.5	0.35	0.25		
		Gunsight	100.0			0.19		0.31	0.21	0.00	C
313	Gunsight-	Gunsight	45.0	Gunsight	loam	0.25	3.5	0.35	0.25		B
	Rillito-		35.0	Rillito	gravelly loam/sandy loam	0.33	3.9	0.35	0.25		B
	Carrizo		15.0	Carrizo	sandy loam	0.40	4.3	0.35	0.25		A
	Complex		5.0	hardpan	sandy clay	0.02	9.4	0.20	0.10		D
		Gunsight	100.0			0.29		0.34	0.24	0.00	B
316	Pits										
317	Cipriano-	Cipriano	40.0	Cipriano	Sandy clay	0.02	9.4	0.20	0.10		D
	Hyder-		15.0	Hyder	Sandy clay	0.02	9.4	0.20	0.10		D
	Rock outcrop		15.0	Rock	-	---	---	---	---	50.00	-
	Complex		30.0	Rubble	loam	0.25	3.5	0.35	0.25		B
		Cipriano	100.0			0.10		0.25	0.15	7.50	C
321	Denure-	Denure	42.0	Denure	sandy loam	0.40	4.3	0.35	0.25		B
	Rillito-		25.0	Rillito	loam	0.25	3.5	0.35	0.25		B
	Why		16.0	Why	loam	0.25	3.5	0.35	0.25		B
	Complex		17.0	gravelly	sandy loam	0.40	4.3	0.35	0.25		A
		Gunsight	100.0			0.34		0.35	0.25	0.00	B

Map Unit Number	Soil Name	Soil Series	% of Map unit components		U.S.D.A. Soil Texture (Control Horizon)	XKSAT (in/hr)	PSIF	DTHETA (dry)	DTHETA (normal)	RTIMP %	Hydrologic Soil Group
322	Quilotosa-	Quilotosa	60.0	Quilotosa	sandy clay	0.02	9.4	0.20	0.10		D
	Rock outcrop		26.0	Rock	-	---	---	---	---	50.00	-
	Complex		14.0	finer	sandy clay loam	0.06	8.6	0.25	0.15		C
		Quilotosa	100.0			0.03		0.21	0.11	13.00	D
323	Cipriano-	Cipriano	58.0	Cipriano	sandy clay	0.02	11.5	0.20	0.10		D
	Momoli		15.0	Momoli	sandy loam	0.40	4.3	0.35	0.25		B
	complex		27.0	limy	loam	0.25	3.5	0.35	0.25		B
		Cipriano	100.0			0.14		0.26	0.16	0.00	B
324	Gunsight-	Gunsight	37.0	Gunsight	loam	0.25	3.5	0.35	0.25		B
	Chuchwalla		33.0	Chuckawalla	v.g. sandy clay loam	0.06	8.6	0.25	0.15		B
	complex		30.0	coarser	loam	0.25	3.5	0.35	0.25		A
		Gunsight	100.0			0.19		0.32	0.22	0.00	B
325	Carrizo-	Carrizo	65.0	Carrizo	gravelly sandy loam	0.40	4.3	0.35	0.25		A
	Momoli		25.0	Momoli	sandy loam	0.40	4.3	0.35	0.25		B
	complex		10.0	coarser	sandy loam	0.40	4.3	0.35	0.25		A
		Carrizo	100.0			0.40		0.35	0.25	0.00	A
326	Quilotosa-	Quilotosa	38.0	Quilotosa	sandy clay	0.02	9.4	0.20	0.10		D
	Momoli-		18.0	Momoli	sandy loam	0.40	4.3	0.35	0.25		B
	Carrizo		14.0	Carrizo	gravelly sandy loam	0.40	4.3	0.35	0.25		A
	complex		30.0	rock	-	---	---	---	---	50.00	-
		Quilotosa	100.0			0.19		0.27	0.17	15.00	B

Map Unit Number	Soil Name	Soil Series	% of Map unit components		U.S.D.A. Soil Texture (Control Horizon)	XKSAT (in/hr)	PSIF	DTHETA (dry)	DTHETA (normal)	RTIMP %	Hydrologic Soil Group
327	Momoli-	Momoli	37.0	Momoli	sandy loam	0.40	4.3	0.35	0.25		B
	Carrizo		26.0	Carrizo	gravelly sandy loam	0.40	4.3	0.20	0.10		A
	complex		37.0	other	shallow to rock (s.c.l.)	0.06	8.6	0.25	0.15		C
		Momoli	100.0			0.27		0.27	0.17	0.00	B
328	Momoli-	Momoli	41.0	Momoli	sandy loam	0.40	4.3	0.35	0.25		B
	Comobabi		15.0	Comobabi	Sandy Clay	0.02	9.4	0.20	0.10		D
	Assoc.		44.0	other	Shallow to rock (Silty C.L.)	0.04	10.8	0.30	0.15		D
		Momoli	100.0			0.18		0.31	0.18	0.00	B
329	Dateland-	Dateland	61.0	Dateland	loam	0.25	3.5	0.35	0.25		B
	Cuerda		29.0	Cuerda	sandy clay loam	0.06	8.6	0.25	0.15		C
	complex		10.0	other	coarser	0.40	3.5	0.35	0.25		
		Dateland	100.0			0.21		0.32	0.22	0.00	B
333	Carrizo-	Carrizo	47.0	benches	sandy loam	0.40	4.3	0.35	0.25		A
	Dateland		21.0	Dateland	loam	0.25	3.5	0.35	0.25		B
	Complex		18.0	Carrizo	gravelly sandy loam	0.40	4.3	0.35	0.25		A
			14.0	other	sandy loam	0.40	4.3	0.35	0.25		A
		Carrizo	100.0			0.37		0.35	0.25	0.00	A

Map Unit Number	Soil Name	Soil Series	% of Map unit components		U.S.D.A. Soil Texture (Control Horizon)	XKSAT (in/hr)	PSIF	DTHETA (dry)	DTHETA (normal)	RTIMP %	Hydrologic Soil Group
334	Gunsight-	Gunsight	44.0	Gunsight	loam	0.25	3.5	0.35	0.25		B
	Pinamt		33.0	Pinamt	v.g. sandy clay loam	0.06	8.6	0.25	0.15		B
	complex		23.0	other	coarser or hardpan (loam)	0.25	3.5	0.35	0.25		B
		Gunsight	100.0			0.19		0.32	0.22	0.00	B
335	Schenco-	Schenco	35.0	Schenco	sandy clay	0.02	9.4	0.20	0.10		D
	Laposa-		20.0	Laposa	sandy clay loam	0.06	8.6	0.25	0.15		C
	Rock outcrop		19.0	Rock	rock outcrop	---	---	---	---	50.00	-
	complex		26.0	other	deeper soils (sandy clay loam)	0.06	8.6	0.25	0.15		C
		Schenco	100.0			0.04		0.20	0.11	9.50	D
340	Ajo-	Ajo	24.0	Ajo	sandy clay loam	0.06	8.6	0.25	0.15		C
	Gunsight-		24.0	Gunsight	loam	0.25	3.5	0.35	0.25		B
	Pompeii		24.0	Pompeii	sandy clay	0.02	9.4	0.20	0.10		D
	complex		28.0	other	coarser texture (loam)	0.25	3.5	0.35	0.25		B
		Ajo	100.0			0.15		0.29	0.19	0.00	B

Table 3.2-2

Summary of Green and Ampt Loss Rate Parameters

by Map Unit Number

Hydrologic Analysis
of
Bender and Sand Tank Washes
Gila Bend, Arizona
Maricopa County

SCS Soil Map Unit	XKSAT (Unadjusted) [in/hr]	RTIMP [%]
234	0.40	0
264	0.40	0
266	0.40	0
267	0.40	0
269	0.40	0
301	0.40	0
306	0.02	5.0
307	0.11	7.5
310	0.18	0
312	0.19	0
313	0.29	0
316	-	-
317	0.09	7.5
321	0.034	0
322	0.02	13.0
323	0.14	0
324	0.19	0
325	0.40	0
326	0.14	15.0
327	0.27	0
328	0.18	0
329	0.21	0
333	0.37	0
334	0.19	0
335	0.04	9.5
340	0.15	0
* Mountain	0.02	10.0
* Valley	0.25	0

* Note: Topographic classification for areas of the watershed within the Air Force Range and not having SCS Soil Survey Data.

Table 3.2-3.1
Green & Ampt Loss Rate Parameterws
By Sub-Watershed

Bender Wash

Sub-Watershed	Map Unit	% of Area	Textural Class	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP %
1	307	11.1		0.24		0.13	7.5
	321	16.4		0.35		0.34	
	333	29.2		0.35		0.37	
	Valley	43.3		0.35		0.25	
(2.100)	Wt'd. Ave.	100.0		0.34	3.7	0.29	0.8
2	321	20.0		0.35		0.34	
	323	1.1		0.26		0.14	
	333	1.8		0.35		0.37	
	Valley	77.1		0.35		0.25	
(3.829)	Wt'd. Ave.	100.0		0.35	3.6	0.27	0.0
3	306	14.1		0.20		0.02	5.0
	307	34.7		0.24		0.13	7.5
	317	41.6		0.25		0.10	7.5
	333	9.6		0.35		0.37	
(2.103)	Wt'd. Ave.	100.0		0.25	7.0	0.13	6.4
4	Mountain	100.0		0.20		0.02	10.0
(.338)	Wt'd. Ave.	100.0		0.20	11.50	0.02	10.0
5	321	4.0		0.35		0.34	
	323	18.0		0.26		0.14	
	324	5.70		0.27		0.12	
	325	1.90		0.35		0.40	
	333	7.1		0.35		0.37	
	Valley	63.3		0.35		0.25	
(3.913)	Wt'd. Ave.	100.0		0.33	3.8	0.24	0.0

Sub-Watershed	Map Unit	% of Area	Textural Class	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP %
6	307	19.3		0.24		0.13	7.5
	313	2.8		0.34		0.29	
	317	6.4		0.25		0.10	7.5
	321	6.6		0.35		0.34	
	322	36.8		0.21		0.03	13.0
	325	1.5		0.35		0.40	
	326	2.2		0.27		0.19	15.0
	327	16.3		0.27		0.27	
	333	8.1		0.35		0.37	
(5.545)	Wt'd. Ave.	100.0		0.26	6.3	0.16	7.0
7	322	82.5		0.21		0.03	13.0
	327	17.5		0.27		0.27	
(3.783)	Wt'd. Ave.	100.0		0.22	8.3	0.07	10.7
8	313	1.5		0.34		0.29	
	321	15.6		0.35		0.34	
	322	53.0		0.21		0.03	13.0
	323	12.1		0.26		0.14	
	325	3.5		0.35		0.40	
	326	1.3		0.27		0.19	15.0
	327	13.0		0.27		0.27	
(6.767)	Wt'd. Ave.	100.0		0.25	6.8	0.14	7.1
9	Valley	8.3		0.35		0.25	
	Mountain	91.7		0.20		0.02	10.0
(.617)	Wt'd. Ave.	100.0		0.21	10.8	0.04	9.2
10	323	27.2		0.26		0.14	
	324	11.1		0.27		0.12	
	325	2.8		0.35		0.40	
	333	5.3		0.35		0.37	
	Alluvium	53.6		0.35		0.25	
(4.106)	Wt'd. Ave.	100.0		0.32	4.4	0.22	0.0
11	323	17.3		0.26		0.14	
	324	2.0		0.32		0.19	
	325	2.2		0.35		0.40	
	333	0.2		0.35		0.37	
	Valley	58.6		0.35		0.25	
	Mountain	19.7		0.20		0.02	10.0
(4.692)	Wt'd. Ave.	100.0		0.30	5.4	0.19	2.0

Sub-Watershed	Map Unit	% of Area	Textural Class	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP %
12	Mountain	100.0		0.20		0.02	10.0
(1.075)	Wt'd. Ave.	100.0		0.20	11.5	0.02	10.0
13	Mountain	100.0		0.20		0.02	10.0
(2.190)	Wt'd. Ave.	100.0		0.20	11.5	0.02	10.0
14	323	42.2		0.26		0.14	
	324	23.1		0.32		0.12	
	325	1.2		0.35		0.40	
	Valley	33.5		0.35		0.25	
(2.755)	Wt'd. Ave.	100.0		0.31	5.4	0.18	0.0
15	321	19.0		0.35		0.34	
	323	50.7		0.26		0.14	
	325	4.4		0.35		0.40	
	333	4.5		0.35		0.37	
	Valley	21.4		0.35		0.25	
(4.565)	Wt'd. Ave.	100.0		0.30	4.4	0.22	0.0
16	321	3.8		0.35		0.34	
	322	32.3		0.21		0.03	13.0
	323	38.3		0.26		0.14	
	324	0.1		0.27		0.12	
	325	14.5		0.35		0.40	
	328	11.0		0.31		0.18	
(5.225)	Wt'd. Ave.	100.0		0.27	6.6	0.15	4.2
17	317	4.4		0.25		0.10	7.5
	323	4.9		0.26		0.14	
	325	6.7		0.35		0.40	
	Valley	50.6		0.35		0.25	
	Mountain	33.4		0.20		0.02	10.0
(5.305)	Wt'd. Ave.	100.0		0.29	6.0	0.17	3.7

Sub-Watershed	Map Unit	% of Area	Textural Class	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP %
18	307	14.0		0.24		0.13	7.5
	317	10.7		0.25		0.10	7.5
	321	12.6		0.35		0.34	
	322	27.7		0.21		0.03	13.0
	323	4.2		0.26		0.14	
	Interm.	Average		0.17		0.09	5.45
	324	2.7		0.27		0.12	
	325	3.4		0.35		0.40	
	326	5.9		0.27		0.19	15.0
	340	7.6		0.29		0.15	
	Mountain	11.2		0.20		0.02	10.00
	Intermed.	Average		0.08		0.04	2.01
(2.899)	Wt'd. Ave.	100.0		0.23	7.0	0.13	7.5
19	317	5.3		0.25		0.10	7.5
	321	32.2		0.35		0.34	
	322	25.2		0.21		0.03	13.0
	323	0.9		0.26		0.14	
	324	26.8		0.27		0.12	
	325	4.9		0.35		0.40	
	328	3.9		0.31		0.18	
	340	0.8		0.29		0.15	
(4.674)	Wt'd. Ave.	100.0		0.29	5.7	0.18	3.7
20	313	5.7		0.34		0.29	
	321	10.6		0.35		0.34	
	324	55.2		0.27		0.12	
	325	28.5		0.35		0.40	
(3.194)	Wt'd. Ave.	100.0		0.31	3.6	0.23	0.0
21	317	5.1		0.25		0.10	7.5
	321	3.7		0.35		0.34	
	322	33.9		0.21		0.03	13.0
	323	9.2		0.26		0.14	
	324	11.5		0.27		0.12	
	325	4.0		0.35		0.40	
	328	9.7		0.31		0.18	
	340	22.9		0.29		0.15	
(4.766)	Wt'd. Ave.	100.0		0.26	7.1	0.12	4.8

Sub-Watershed	Map Unit	% of Area	Textural Class	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP %
22	321	26.0		0.35		0.34	
	322	15.9		0.21		0.03	13.0
	324	35.2		0.27		0.12	
	325	8.5		0.35		0.40	
	328	14.4		0.31		0.18	
(2.901)	Wt'd. Ave.	100.0		0.29	5.1	0.20	2.1
23	321	18.8		0.35		0.34	
	322	29.1		0.21		0.03	13.0
	324	7.8		0.27		0.12	
	325	28.7		0.35		0.40	
	328	15.6		0.31		0.18	
(.536)	Wt'd. Ave.	100.0		0.30	4.4	0.22	3.8

Table 3.2-3.2
Summary of Green and Ampt Loss Rate Parameters
By Map Unit Number

Sand Tank Wash

Subbasin	Map Unit	% of Area	Textural Class	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP %
101	Valley	61.4		0.35		0.25	
	Mountain	38.6		0.20		0.02	10.0
(1.125)	Wt'd. Ave.	100.0		0.29	6.3	0.16	3.9
102	Valley	0.0		0.35		0.25	
	Mountain	100.0		0.20		0.02	10.0
(1.750)	Wt'd. Ave.	100.0		0.20	11.5	0.02	10.0
103	Valley	0.0		0.35		0.25	
	Mountain	100.0		0.20		0.02	10.0
(.745)	Wt'd. Ave.	100.0		0.20	11.5	0.02	10.0
104	Valley	67.1		0.35		0.25	
	Mountain	32.9		0.20		0.02	10.0
(.997)	Wt'd. Ave.	100.0		0.30	6.0	0.17	3.3
105	Valley	1.7		0.35		0.25	
	Mountain	98.3		0.20		0.02	10.0
(.855)	Wt'd. Ave.	100.0		0.20	11.5	0.02	10.0
106	Valley	80.7		0.35		0.25	
	Mountain	19.3		0.20		0.02	10.0
(1.594)	Wt'd. Ave.	100.0		0.32	4.7	0.21	1.9
107	Valley	0.0		0.35		0.25	
	Mountain	100.0		0.20		0.02	10.0
(2.189)	Wt'd. Ave.	100.0		0.20	11.5	0.02	10.0
108	Valley	25.5		0.35		0.25	
	Mountain	74.5		0.20		0.02	10.0
(.943)	Wt'd. Ave.	100.0		0.24	8.1	0.08	7.5

Subbasin	Map Unit	% of Area	Textural Class	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP %
109	Valley	91.6		0.35		0.25	
	Mountain	8.4		0.20		0.02	10.0
(1.404)	Wt'd. Ave.	100.0		0.34	4.1	0.23	0.8
110	Valley	1.5		0.35		0.25	
	Mountain	98.5		0.20		0.02	10.0
(1.161)	Wt'd. Ave.	100.0		0.20	11.5	0.02	9.9
111	317	3.6		0.25		0.10	7.5
	Valley	0.6		0.35		0.25	
	Mountain	95.8		0.20		0.02	10.0
(1.714)	Wt'd. Ave.	100.0		0.32	6.6	0.15	9.7
112	Valley	53.2		0.35		0.25	
	Mountain	46.8		0.20		0.02	10.0
(4.33)	Wt'd. Ave.	100.0		0.28	6.8	0.14	4.7
113	Valley	81.6		0.35		0.25	
	Mountain	18.4		0.20		0.02	10.0
(3.313)	Wt'd. Ave.	100.0		0.32	4.7	0.21	1.8
114	Valley	0.0		0.35		0.25	
	Mountain	100.0		0.20		0.02	10.0
(2.315)	Wt'd. Ave.	100.0		0.20	11.5	0.02	10.0
115	Valley	81.7		0.35		0.25	
	Mountain	18.3		0.20		0.02	10.0
(2.198)	Wt'd. Ave.	100.0		0.32	4.7	0.21	1.8
116	Valley	1.3		0.35		0.25	
	Mountain	98.7		0.20		0.02	10.0
(1.659)	Wt'd. Ave.	100.0		0.20	11.5	0.02	9.9

Subbasin	Map Unit	% of Area	Textural Class	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP %
117	312	6.7		0.31		0.19	
	317	29.2		0.25		0.10	7.5
	321	3.8		0.35		0.34	
	325	11.2		0.35		0.40	
	Valley	7.8		0.35		0.25	
	Mountain	41.3		0.20		0.02	10.0
(3.513)	Wt'd. Ave.	100.0		0.26	7.0	0.13	6.3
118	307	7.4		0.24		0.13	7.5
	312	2.4		0.31		0.19	
	317	48.5		0.25		0.10	7.5
	340	20.3		0.29		0.15	
	Mountain	21.4		0.20		0.02	10.0
(2.917)	Wt'd. Ave.	100.0		0.25	7.5	0.10	6.3
119	312	48.4		0.31		0.19	
	317	30.0		0.25		0.10	7.5
	321	5.70		0.35		0.34	
	325	15.90		0.35		0.40	
(1.888)	Wt'd. Ave.	100.0		0.30	4.7	0.20	2.3
120	312	49.9		0.31		0.19	
	317	30.5		0.25		0.10	7.5
	325	10.4		0.35		0.40	
	340	9.2		0.29		0.15	
(2.667)	Wt'd. Ave.	100.0		0.29	5.7	0.18	2.3
121	306	2.8		0.20		0.02	5.0
	312	15.4		0.31		0.19	
	317	19.7		0.25		0.10	7.5
	321	2.1		0.35		0.34	
	325	3.2		0.35		0.40	
(4.898)	Mountain	56.8		0.20		0.02	10.0
	Wt'd. Ave.	100.0		0.23	8.1	0.08	7.3

Subbasin	Map Unit	% of Area	Textural Class	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP %
122	301	2.7		0.35		0.40	
	306	7.7		0.20		0.02	5.0
	312	12.2		0.31		0.19	
	317	31.6		0.25		0.10	7.5
	321	7.4		0.35		0.34	
	324	2.2		0.32		0.19	
	325	1.1		0.35		0.40	
	Mountain	35.1		0.20		0.02	10.0
(7.572)	Wt'd. Ave.	100.0		0.25	7.3	0.11	6.3
123	306	7.6		0.20		0.02	5.0
	312	39.6		0.31		0.19	
	317	19.3		0.25		0.10	7.5
	324	18.2		0.32		0.19	
	325	15.3		0.35		0.40	
(1.329)	Wt'd. Ave.	100.0		0.30	5.4	0.19	1.8
124	Valley	41.0		0.35		0.25	
	Mountain	59.0		0.20		0.02	10.0
(7.409)	Wt'd. Ave.	100.0		0.26	7.3	0.11	5.9
125	Valley	39.7		0.35		0.25	
	Mountain	60.3		0.20		0.02	10.0
(10.207)	Wt'd. Ave.	100.0		0.26	7.3	0.11	6.0
126	266	17.6		0.35		0.40	
	301	4.6		0.35		0.40	
	306	1.6		0.20		0.02	5.0
	317	7.9		0.25		0.10	7.5
	321	34.0		0.35		0.34	
	Intermed.	Average		0.22		0.21	0.67
	324	9.9		0.32		0.19	
	325	1.8		0.35		0.40	
	Valley	17.2		0.35		0.25	
	Mountain	5.4		0.20		0.02	10.0
	Intermed.	Average		0.11		0.07	0.54
(12.624)	Wt'd. Ave.	100.0		0.33	3.7	0.28	1.2

Subbasin	Map Unit	% of Area	Textural Class	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP %
127	Valley	45.3		0.35		0.25	
	Mountain	54.7		0.20		0.02	10.0
(2.467)	Wt'd. Ave.	100.0		0.27	7.1	0.12	5.5
128	Valley	49.2		0.35		0.25	
	Mountain	50.8		0.20		0.02	10.0
(5.101)	Wt'd. Ave.	100.0		0.27	7.0	0.13	5.1
129	Valley	83.6		0.35		0.25	
	Mountain	16.4		0.20		0.02	10.0
(3.731)	Wt'd. Ave.	100.0		0.33	4.7	0.21	1.6
130	234	7.7		0.35		0.40	
	263	2.2		0.35		0.40	
	266	20.6		0.35		0.40	
	269	1.2		0.35		0.40	
	301	18.1		0.35		0.40	
	321	33.7		0.35		0.34	
	329	2.6		0.32		0.21	
	Valley	13.9		0.35		0.25	
(2.651)	Wt'd. Ave.	100.0		0.35	4.0	0.35	0.0
201	Valley	50.8		0.35		0.25	
	Mountain	49.2		0.20		0.02	10.0
(5.569)	Wt'd. Ave.	100.0		0.28	6.8	0.14	4.9
202	Valley	69.4		0.35		0.25	
	Mountain	30.6		0.20		0.02	10.0
(6.771)	Wt'd. Ave.	100.0		0.30	5.7	0.18	3.1
203	Valley	34.2		0.35		0.25	
	Mountain	65.8		0.20		0.02	10.0
(2.211)	Wt'd. Ave.	100.0		0.25	7.5	0.10	6.6

Subbasin	Map Unit	% of Area	Textural Class	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP %
204	Valley	30.0		0.35		0.25	
	Mountain	70.0		0.20		0.02	10.0
(4.125)	Wt'd. Ave.	100.0		0.25	7.8	0.09	7.0
205	Valley	99.0		0.35		0.25	
	324	1.00		0.32		0.19	
(.898)	Wt'd. Ave.	100.0		0.35	3.5	0.25	0.0
206	Valley	97.6		0.35		0.25	
	324	2.4		0.32		0.19	
(4.193)	Wt'd. Ave.	100.0		0.35	3.5	0.25	0.0
207	Valley	100.0		0.35		0.25	
(5.183)	Wt'd. Ave.	100.0		0.35	3.5	0.25	ERR
208	266	1.5		0.35		0.40	
	324	97.2		0.32		0.19	
	Valley	1.3		0.35		0.25	
(.912)	Wt'd. Ave.	100.0		0.32	5.4	0.19	0.0
209	266	6.9		0.35		0.40	
	301	7.3		0.35		0.40	
	324	13.8		0.32		0.19	
	Valley	72.0		0.35		0.25	
(4.944)	Wt'd. Ave.	100.0		0.35	3.6	0.26	0.0
210	266	9.7		0.35		0.40	
	301	25.2		0.35		0.40	
	321	8.8		0.35		0.34	
	324	30.1		0.32		0.19	
	Valley	26.2		0.35		0.25	
(2.699)	Wt'd. Ave.	100.0		0.34	3.7	0.29	0.0

Subbasin	Map Unit	% of Area	Textural Class	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP %
211	Valley	100.0		0.35		0.25	
(9.638)	Wt'd. Ave.	100.0		0.35	3.5	0.25	0.0
212	Valley	100.0		0.35		0.25	
(.820)	Wt'd. Ave.	100.0		0.35	3.5	0.25	0.0
213	324	92.6		0.32		0.19	
	Valley	7.4		0.35		0.25	
(1.781)	Wt'd. Ave.	100.0		0.32	5.4	0.19	0.0
214	301	9.4		0.35		0.40	
	324	83.4		0.32		0.19	
	Valley	7.2		0.35		0.25	
1.62l	266	6.9		0.32	4.7	0.21	0.0
215	234	4.5		0.35		0.40	
	263	15.1		0.35		0.40	
	266	41.6		0.35		0.40	
	301	16.3		0.35		0.40	
	324	22.5		0.32		0.19	
(.928)	Wt'd. Ave.	100.0		0.34	4.0	0.35	0.0
216	263	5.7		0.35		0.40	
	266	4.6		0.35		0.40	
	269	5.1		0.35		0.40	
	301	31.6		0.35		0.40	
	324	53.0		0.32		0.19	
(1.085)	Wt'd. Ave.	100.0		0.33	3.7	0.29	0.0

Table 3.2-4.1
Average Slope Calculations Using Pima County Equation
By Sub-Watershed

Bender Wash

Sub-Watershed	Top Elev.	Bottom Elev.	Elevation Change (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	I ((L^3/H)^.5)	Ave. Slope (ft.mi)
1	2022	1960	62	2600	0.49	125.9	0.044	
	1960	1880	80	7750	1.47	54.5	0.199	
	1880	1793	87	11500	2.18	39.9	0.345	
				21850	4.14		0.587	49.6
2	2380	2080	300	8000	1.52	198.0	0.108	
	2080	1960	120	7500	1.42	84.5	0.155	
	1960	1777	183	19000	3.60	50.9	0.505	
				34500	6.53		0.767	72.6
3	2080	1960	120	1100	0.21	576.0	0.009	
	1960	1840	120	8000	1.52	79.2	0.170	
	1840	1777	63	10000	1.89	33.3	0.328	
				19100	3.62		0.507	50.8
4	3880	3000	880	1500	0.28	3097.6	0.005	
	3000	2560	440	2750	0.52	844.8	0.018	
	2560	2400	160	2250	0.43	375.5	0.022	
				6500	1.23		0.045	747.9
5	2420	2200	220	4500	0.85	258.1	0.053	
	2200	1840	360	19250	3.65	98.7	0.367	
	1840	1692	148	10800	2.05	72.4	0.240	
				34550	6.54		0.660	98.2
6	2955	2600	355	600	0.11	3124.0	0.002	
	2600	2200	400	3250	0.62	649.8	0.024	
	2200	1960	240	8000	1.52	158.4	0.120	
	1960	1840	120	8250	1.56	76.8	0.178	
	1840	1692	148	11250	2.13	69.5	0.256	
				31350	5.94		0.581	104.6

Table 3.2-4.1
Average Slope Calculations Using Pima County Equation
By Sub-Watershed

Bender Wash

Sub-Watershed	Top Elev.	Bottom Elev.	Elevation Change (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	I ((L^3/H)^.5)	Ave. Slope (ft.mi)
7	2840	2600	240	700	0.13	1810.3	0.003	
	2600	2320	280	1000	0.19	1478.4	0.005	
	2320	2200	120	3000	0.57	211.2	0.039	
	2200	1940	260	16500	3.13	83.2	0.343	
				21200	4.02		0.390	106.1
8	2740	2160	580	1600	0.30	1914.0	0.007	
	2160	2040	120	1400	0.27	452.6	0.012	
	2040	1920	120	6000	1.14	105.6	0.111	
	1920	1658	262	17500	3.31	79.0	0.373	
				26500	5.02		0.503	99.7
9	3520	2800	720	1750	0.33	2172.3	0.007	
	2800	2400	400	3300	0.63	640.0	0.025	
	2400	2216	184	4500	0.85	215.9	0.058	
				9550	1.81		0.090	405.5
10	2248	1960	288	11000	2.08	138.2	0.177	
	1960	1800	160	11000	2.08	76.8	0.238	
	1800	1695	105	9500	1.80	58.4	0.236	
				31500	5.97		0.650	84.1
11	3800	3200	600	2000	0.38	1584.0	0.010	
	3200	2600	600	4100	0.78	772.7	0.028	
	2600	2180	420	8000	1.52	277.2	0.091	
				14100	2.67		0.128	432.2
12	2520	2200	320	2000	0.38	844.8	0.013	
	2200	2000	200	6500	1.23	162.5	0.097	
	2000	1750	250	17000	3.22	77.6	0.365	
	1750	1658	92	7500	1.42	64.8	0.177	
				33000	6.25		0.652	92.0

Table 3.2-4.1
Average Slope Calculations Using Pima County Equation
By Sub-Watershed

Bender Wash

Sub-Watershed	Top Elev.	Bottom Elev.	Elevation Change (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	I ((L^3/H)^.5)	Ave. Slope (ft.mi)
13	3800	3200	600	1250	0.24	2534.4	0.005	
	3200	2800	400	1750	0.33	1206.9	0.010	
	2800	2600	200	1500	0.28	704.0	0.011	
	2600	2320	280	3500	0.66	422.4	0.032	
	2320	2080	240	6750	1.28	187.7	0.093	
				14750	2.79		0.151	344.5
14	2200	2076	124	600	0.11	1091.2	0.003	
	2076	2000	76	2500	0.47	160.5	0.037	
	2000	1800	200	11000	2.08	96.0	0.213	
	1800	1640	160	11000	2.08	76.8	0.238	
	1640	1608	32	4000	0.76	42.2	0.117	
				29100	5.51		0.608	82.2
15	2080	2000	80	1250	0.24	337.9	0.013	
	2000	1920	80	4000	0.76	105.6	0.074	
	1920	1800	120	6750	1.28	93.9	0.132	
	1800	1600	200	14500	2.75	72.8	0.322	
	1600	1513	87	12000	2.27	38.3	0.367	
				38500	7.29		0.908	64.5
16	3183	2600	583	750	0.14	4104.3	0.002	
	2600	2200	400	1000	0.19	2112.0	0.004	
	2200	2000	200	1050	0.20	1005.7	0.006	
	2000	1800	200	6500	1.23	162.5	0.097	
	1800	1680	120	6000	1.14	105.6	0.111	
	1680	1600	80	6000	1.14	70.4	0.135	
	1600	1513	87	11900	2.25	38.6	0.363	
				33200	6.29		0.718	76.7
17	3019	2400	619	1600	0.30	2042.7	0.007	
	2400	2280	120	1000	0.19	633.6	0.008	
	2280	2160	120	2500	0.47	253.4	0.030	
	2160	1920	240	9900	1.88	128.0	0.166	
	1920	1800	120	6000	1.14	105.6	0.111	
	1800	1620	180	15500	2.94	61.3	0.375	
				36500	6.91		0.695	98.9

Table 3.2-4.1
Average Slope Calculations Using Pima County Equation
By Sub-Watershed

Bender Wash

Sub-Watershed	Top Elev.	Bottom Elev.	Elevation Change (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	I ((L^3/H)^.5)	Ave. Slope (ft.mi)
18	2400	1880	520	700	0.13	3922.3	0.002	
	1880	1720	160	4200	0.80	201.1	0.056	
	1720	1579	141	12500	2.37	59.6	0.307	
				17400	3.30		0.365	81.5
19	2478	1800	678	1450	0.27	2468.9	0.006	
	1800	1600	200	3750	0.71	281.6	0.042	
	1600	1520	80	6400	1.21	66.0	0.149	
	1520	1440	80	7000	1.33	60.3	0.171	
	1440	1200	240	23400	4.43	54.2	0.602	
				42000	7.95		0.970	67.3
20	1578	1520	58	5250	0.99	58.3	0.130	
	1520	1400	120	13250	2.51	47.8	0.363	
	1400	1200	200	19250	3.65	54.9	0.492	
				37750	7.15		0.985	52.7
21	1840	1600	240	1400	0.27	905.1	0.009	
	1600	1520	80	2400	0.45	176.0	0.034	
	1520	1400	120	9200	1.74	68.9	0.210	
	1400	1307	93	14000	2.65	35.1	0.448	
				27000	5.11		0.701	53.3
22	1639	1340	299	1000	0.19	1578.7	0.005	
	1340	1280	60	1250	0.24	253.4	0.015	
	1280	1126	154	15750	2.98	51.6	0.415	
				18000	3.41		0.435	61.5
23	1240	1180	60	6000	1.14	52.8	0.156	
				6000	1.14		0.156	52.8

Table 3.2-4.2
Average Slope Calculations Using Pima County Equation
By Sub-Watershed

Sand Tank Wash

Sub-Watershed	Top Elev.	Bottom Elev.	Elevation Change (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	I ((L^3/H)^.5	Ave. Slope (ft/mi)
101	2080	2000	80	1200	0.23	352.0	0.012	
	2000	1960	40	2400	0.45	88.0	0.048	
	1960	1880	80	2000	0.38	211.2	0.026	
	1880	1829	51	5900	1.12	45.6	0.165	
				11500	2.18		0.252	74.7
102	3800	3400	400	750	0.14	2816.0	0.003	
	3400	2800	600	2500	0.47	1267.2	0.013	
	2800	2600	200	1250	0.24	844.8	0.008	
	2600	2360	240	3000	0.57	422.4	0.028	
	2360	2200	160	3100	0.59	272.5	0.036	
	2200	2098	102	3250	0.62	165.7	0.048	
				13850	2.62		0.135	376.7
103	3082	2800	282	500	0.09	2977.9	0.002	
	2800	2600	200	450	0.09	2346.7	0.002	
	2600	2320	280	1350	0.26	1095.1	0.008	
	2320	2160	160	1900	0.36	444.6	0.017	
	2160	1980	180	6500	1.23	146.2	0.102	
				10700	2.03		0.130	242.7
104	2400	2280	120	350	0.07	1810.3	0.002	
	2280	2120	160	3000	0.57	281.6	0.034	
	2120	2040	80	2250	0.43	187.7	0.031	
	2040	1860	180	3250	0.62	292.4	0.036	
	1860	1829	31	8250	1.56	19.8	0.351	
				17100	3.24		0.453	51.0
105	2120	2000	120	400	0.08	1584.0	0.002	
	2000	1920	80	1000	0.19	422.4	0.009	
	1920	1800	120	6000	1.14	105.6	0.111	
	1800	1728	72	4500	0.85	84.5	0.093	
				11900	2.25		0.214	110.5

Table 3.2-4.2
Average Slope Calculations Using pima County Equation
By Sub-Watershed

Sand Tank Wash

Sub-Watershed	Top Elev.	Bottom Elev.	Elevation Change (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	I ((L^3/H)^.5	Ave. Slope (ft.mi)
106	2120	2000	120	1200	0.23	528.0	0.010	
	2000	1880	120	3500	0.66	181.0	0.049	
	1880	1728	152	9500	1.80	84.5	0.196	
				14200	2.69		0.255	111.3
107	3600	3400	200	450	0.09	2346.7	0.002	
	3400	3280	120	600	0.11	1056.0	0.003	
	3280	2600	680	2750	0.52	1305.6	0.014	
	2600	2400	200	2500	0.47	422.4	0.023	
	2400	2200	200	3750	0.71	281.6	0.042	
	2200	1915	285	11000	2.08	136.8	0.178	
				21050	3.99		0.263	229.5
108	2600	2400	200	700	0.13	1508.6	0.003	
	2400	2200	200	1000	0.19	1056.0	0.006	
	2200	1960	240	7500	1.42	169.0	0.109	
	1960	1806	154	7500	1.42	108.4	0.136	
				16700	3.16		0.255	153.9
109	1945	1691	254	11100	2.10	120.8	0.191	
				11100	2.10		0.191	120.8
110	2480	2400	80	450	0.09	938.7	0.003	
	2400	2200	200	630	0.12	1676.2	0.003	
	2200	2000	200	1000	0.19	1056.0	0.006	
	2000	1880	120	1250	0.24	506.9	0.011	
	1880	1720	160	6250	1.18	135.2	0.102	
	1720	1691	29	3100	0.59	49.4	0.084	
				12680	2.40		0.207	134.1
111	2000	1685	315	2000	0.38	831.6	0.013	
	1685	1640	45	3500	0.66	67.9	0.080	
	1640	1559	81	7500	1.42	57.0	0.188	
				13000	2.46		0.282	76.4

Table 3.2-4.2
Average Slope Calculations Using Pima County Equation
By Sub-Watershed

Sand Tank Wash

Sub-Watershed	Top Elev.	Bottom Elev.	Elevation Change (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	I ((L^3/H)^.5	Ave. Slope (ft.mi)
112	3720	3400	320	900	0.17	1877.3	0.004	
	3400	3200	200	800	0.15	1320.0	0.004	
	3200	3000	200	1200	0.23	880.0	0.008	
	3000	2880	120	1000	0.19	633.6	0.008	
	2880	2135	745	24000	4.55	163.9	0.355	
				27900	5.28		0.378	195.1
113	2520	2400	120	300	0.06	2112.0	0.001	
	2400	2200	200	3500	0.66	301.7	0.038	
	2200	1840	360	14500	2.75	131.1	0.240	
	1840	1713	127	9000	1.70	74.5	0.197	
				27300	5.17		0.477	117.6
114	2575	2200	375	600	0.11	3300.0	0.002	
	2200	2000	200	500	0.09	2112.0	0.002	
	2000	1800	200	1250	0.24	844.8	0.008	
	1800	1680	120	4500	0.85	140.8	0.072	
	1680	1559	121	8750	1.66	73.0	0.194	
				15600	2.95		0.278	113.0
115	2280	2160	120	1050	0.20	603.4	0.008	
	2160	2080	80	2600	0.49	162.5	0.039	
	2080	1748	332	14000	2.65	125.2	0.237	
				17650	3.34		0.284	138.8
116	1920	1800	120	800	0.15	792.0	0.005	
	1800	1720	80	5000	0.95	84.5	0.103	
	1720	1559	161	10000	1.89	85.0	0.205	
				15800	2.99		0.314	90.9
117	2560	2480	80	750	0.14	563.2	0.006	
	2480	2000	480	2500	0.47	1013.8	0.015	
	2000	1840	160	1750	0.33	482.7	0.015	
	1840	1640	200	4000	0.76	264.0	0.047	
	1640	1333	307	9500	1.80	170.6	0.138	
				18500	3.50		0.220	252.9

Table 3.2-4.2
Average Slope Calculations Using Pima County Equation
By Sub-Watershed

Sand Tank Wash

Sub-Watershed	Top Elev.	Bottom Elev.	Elevation Change (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	I ((L^3/H)^.5	Ave. Slope (ft.mi)
118	2240	2000	240	700	0.13	1810.3	0.003	
	2000	1840	160	1200	0.23	704.0	0.009	
	1840	1720	120	4000	0.76	158.4	0.060	
	1720	1600	120	7250	1.37	87.4	0.147	
	1600	1541	59	5250	0.99	59.3	0.129	
				18400	3.48		0.348	100.4
119	2540	2280	260	450	0.09	3050.7	0.002	
	2280	2040	240	800	0.15	1584.0	0.004	
	2040	1800	240	800	0.15	1584.0	0.004	
	1800	1640	160	900	0.17	938.7	0.006	
	1640	1560	80	1700	0.32	248.5	0.020	
	1560	1440	120	6000	1.14	105.6	0.111	
	1440	1361	79	6250	1.18	66.7	0.145	
				16900	3.20		0.289	122.6
120	1433	1255	178	11500	2.18	81.7	0.241	
				11500	2.18		0.241	81.7
121	2680	2520	160	1000	0.19	844.8	0.007	
	2520	2280	240	900	0.17	1408.0	0.005	
	2280	2040	240	2500	0.47	506.9	0.021	
	2040	1680	360	7000	1.33	271.5	0.080	
	1680	1338	342	15000	2.84	120.4	0.259	
	1338	1205	133	7500	1.42	93.6	0.147	
				33900	6.42		0.518	153.5
122	2710	2600	110	850	0.16	683.3	0.006	
	2600	2400	200	450	0.09	2346.7	0.002	
	2400	2200	200	850	0.16	1242.4	0.005	
	2200	1400	800	9250	1.75	456.6	0.082	
	1400	1160	240	10000	1.89	126.7	0.168	
	1160	1097	63	7500	1.42	44.4	0.213	
				28900	5.47		0.476	132.2

Table 3.2-4.2
Average Slope Calculations Using Pima County Equation
By Sub-Watershed

Sand Tank Wash

Sub-Watershed	Top Elev.	Bottom Elev.	Elevation Change (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	I ((L^3/H)^.5	Ave. Slope (ft.mi)
123	2000	1800	200	1000	0.19	1056.0	0.006	
	1800	1380	420	1500	0.28	1478.4	0.007	
	1380	1240	140	3250	0.62	227.4	0.041	
	1240	1160	80	5250	0.99	80.5	0.111	
	1160	1058	102	9500	1.80	56.7	0.239	
				20500	3.88		0.404	92.4
124	2520	2320	200	6500	1.23	162.5	0.097	
	2320	1860	460	16500	3.13	147.2	0.258	
	1860	1720	140	12000	2.27	61.6	0.290	
	1720	1674	46	2500	0.47	97.2	0.048	
				37500	7.10		0.692	105.4
125	1880	1720	160	4900	0.93	172.4	0.071	
	1720	1240	480	29000	5.49	87.4	0.588	
	1240	1190	50	4600	0.87	57.4	0.115	
				38500	7.29		0.773	88.9
126	1361	1280	81	3600	0.68	118.8	0.063	
	1280	1200	80	5750	1.09	73.5	0.127	
	1200	1000	200	20000	3.79	52.8	0.521	
	1000	855	145	19250	3.65	39.8	0.578	
				48600	9.20		1.289	51.0
127	2065	1800	265	1100	0.21	1272.0	0.006	
	1800	1520	280	3000	0.57	492.8	0.026	
	1520	1360	160	4250	0.80	198.8	0.057	
	1360	1230	130	7500	1.42	91.5	0.148	
				15850	3.00		0.237	160.4
128	2040	1960	80	200	0.04	2112.0	0.001	
	1960	1880	80	450	0.09	938.7	0.003	
	1880	1800	80	1700	0.32	248.5	0.020	
	1800	1520	280	14500	2.75	102.0	0.272	
	1520	1343	177	14200	2.69	65.8	0.332	
				31050	5.88		0.628	87.8

Table 3.2-4.2
Average Slope Calculations Using Pima County Equation
By Sub-Watershed

Sand Tank Wash

Sub-Watershed	Top Elev.	Bottom Elev.	Elevation Change (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	I ((L^3/H)^.5	Ave. Slope (ft.mi)
129	1685	1640	45	550	0.10	432.0	0.005	
	1640	1440	200	950	0.18	1111.6	0.005	
	1440	1320	120	3400	0.64	186.4	0.047	
	1320	1115	205	19250	3.65	56.2	0.486	
				24150	4.57		0.544	70.7
130	1139	1080	59	6250	1.18	49.8	0.168	
	1080	950	130	14700	2.78	46.7	0.407	
	950	890	60	8000	1.52	39.6	0.241	
	890	807	83	14250	2.70	30.8	0.487	
				43200	8.18		1.303	39.5
201	2920	2600	320	1150	0.22	1469.2	0.006	
	2600	2520	80	1500	0.28	281.6	0.017	
	2520	2280	240	9000	1.70	140.8	0.144	
	2280	1984	296	17000	3.22	91.9	0.336	
				28650	5.43		0.502	116.8
202	2849	2600	249	350	0.07	3756.3	0.001	
	2600	2360	240	450	0.09	2816.0	0.002	
	2360	2200	160	900	0.17	938.7	0.006	
	2200	2120	80	900	0.17	469.3	0.008	
	2120	2000	120	5000	0.95	126.7	0.084	
	2000	1803	197	18400	3.48	56.5	0.463	
				26000	4.92		0.564	76.3
203	2800	2600	200	250	0.05	4224.0	0.001	
	2600	2400	200	500	0.09	2112.0	0.002	
	2400	2200	200	700	0.13	1508.6	0.003	
	2200	2000	200	3100	0.59	340.6	0.032	
	2000	1840	160	5000	0.95	169.0	0.073	
	1840	1665	175	11000	2.08	84.0	0.227	
				20550	3.89		0.338	132.5

Table 3.2-4.2
Average Slope Equation Using Pima County Equation
By Sub-Watershed

Sand Tank Wash

Sub-Watershed	Top Elev.	Bottom Elev.	Elevation Change (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	I ((L^3/H)^.5	Ave. Slope (ft.mi)
204	2600	2400	200	450	0.09	2346.7	0.002	
	2400	2200	200	500	0.09	2112.0	0.002	
	2200	2000	200	1250	0.24	844.8	0.008	
	2000	1880	120	3500	0.66	181.0	0.049	
	1880	1535	345	18000	3.41	101.2	0.339	
				23700	4.49		0.400	125.9
205	1665	1465	200	14000	2.65	75.4	0.305	
				14000	2.65		0.305	75.4
206	1542	1320	222	16500	3.13	71.0	0.371	
	1320	1230	90	8000	1.52	59.4	0.197	
	1230	1007	223	24000	4.55	49.1	0.649	
				48500	9.19		1.216	57.0
207	1687	1520	167	11000	2.08	80.2	0.233	
	1520	1250	270	23000	4.36	62.0	0.553	
	1250	1007	243	26500	5.02	48.4	0.721	
				60500	11.46		1.507	57.8
208	1050	1030	20	1600	0.30	66.0	0.037	
	1030	990	40	4600	0.87	45.9	0.129	
	990	939	51	6900	1.31	39.0	0.209	
				13100	2.48		0.375	43.8
209	1649	1520	129	6000	1.14	113.5	0.107	
	1520	1280	240	18600	3.52	68.1	0.427	
	1280	1100	180	17500	3.31	54.3	0.450	
	1100	868	232	28500	5.40	43.0	0.823	
				70600	13.37		1.807	54.8

Table 3.2-4.2
Average Slope Calculations Using Pima County Equation
By Sub-Watershed

Sand Tank Wash

Sub-Watershed	Top Elev.	Bottom Elev.	Elevation Change (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	I ((L^3/H)^.5	Ave. Slope (ft.mi)
210	1210	1180	30	2400	0.45	66.0	0.056	
	1180	980	200	22000	4.17	48.0	0.601	
	980	868	112	15500	2.94	38.2	0.475	
				39900	7.56		1.133	44.5
211	1750	1520	230	14700	2.78	82.6	0.306	
	1520	1240	280	26300	4.98	56.2	0.664	
	1240	1129	111	12600	2.39	46.5	0.350	
				53600	10.15		1.321	59.1
212	1260	1150	110	10600	2.01	54.8	0.271	
	1150	1129	21	3000	0.57	37.0	0.093	
				13600	2.58		0.365	49.9
213	1170	1150	20	1600	0.30	66.0	0.037	
	1150	1090	60	6600	1.25	48.0	0.180	
	1090	1011	79	9700	1.84	43.0	0.280	
				17900	3.39		0.498	46.4
214	1068	1040	28	3000	0.57	49.3	0.081	
	1040	1010	30	3500	0.66	45.3	0.099	
	1010	907	103	14000	2.65	38.8	0.425	
				20500	3.88		0.605	41.2
215	943	930	13	1500	0.28	45.8	0.042	
	930	807	123	18000	3.41	36.1	0.568	
				19500	3.69		0.610	36.7
216	984	840	144	19000	3.60	40.0	0.569	
	840	807	33	6000	1.14	29.0	0.211	
				25000	4.73		0.780	36.9

Table 3.2-5.1
Surface Retention Loss (IA) Calculations
By Sub-Watershed

Bender Wash

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
1	Desert	0.00	0.35	0.00
	Hillslope	0.94	0.15	0.14
Area (sq.mi.)	Mt. w/veg.	0.06	0.25	0.02

2.100				0.16

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
2	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00

3.829				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
3	Desert	0.00	0.35	0.00
	Hillslope	0.55	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.45	0.25	0.11

2.103				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
4	Desert	0.00	0.35	0.00
	Hillslope	0.50	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.50	0.25	0.13

0.338				
				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
5	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00

3.913				
				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
6	Desert	0.00	0.35	0.00
	Hillslope	0.68	0.15	0.10
Area (sq.mi.)	Mt. w/veg.	0.32	0.25	0.08

5.545				
				0.18

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
7	Desert	0.00	0.35	0.00
	Hillslope	0.59	0.15	0.09
Area (sq.mi.)	Mt. w/veg.	0.41	0.25	0.10

3.783				
				0.19

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
8	Desert	0.00	0.35	0.00
	Hillslope	0.73	0.15	0.11
Area (sq.mi.)	Mt. w/veg.	0.27	0.25	0.07

6.767				
				0.18

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
9	Desert	0.00	0.35	0.00
	Hillslope	0.54	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.46	0.25	0.12

0.617				
				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
10	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00

4.107				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
11	Desert	0.00	0.35	0.00
	Hillslope	0.90	0.15	0.14
Area (sq.mi.)	Mt. w/veg.	0.10	0.25	0.03

4.692				0.16

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
12	Desert	0.00	0.35	0.00
	Hillslope	0.50	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.50	0.25	0.13

1.075				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
13	Desert	0.00	0.35	0.00
	Hillslope	0.50	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.50	0.25	0.13

2.190				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
14	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00

2.755				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
15	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00

4.565				0.15

Sub-Wataershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
16	Desert	0.00	0.35	0.00
	Hillslope	0.84	0.15	0.13
Area (sq.mi.)	Mt. w/veg.	0.16	0.25	0.04

5.225				0.17

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
17	Desert	0.00	0.35	0.00
	Hillslope	0.83	0.15	0.12
Area (sq.mi.)	Mt. w/veg.	0.17	0.25	0.04

5.305				0.17

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
18	Desert	0.00	0.35	0.00
	Hillslope	0.65	0.15	0.10
Area (sq.mi.)	Mt. w/veg.	0.35	0.25	0.09

2.899				0.19

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
19	Desert	0.00	0.35	0.00
	Hillslope	0.87	0.15	0.13
Area (sq.mi.)	Mt. w/veg.	0.13	0.25	0.03

4.674				0.16

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
20	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00

3.194				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
21	Desert	0.00	0.35	0.00
	Hillslope	0.80	0.15	0.12
Area (sq.mi.)	Mt. w/veg.	0.20	0.25	0.05

4.766				0.17

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
22	Desert	0.00	0.35	0.00
	Hillslope	0.92	0.15	0.14
Area (sq.mi.)	Mt. w/veg.	0.08	0.25	0.02

2.901				0.16

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
23	Desert	0.00	0.35	0.00
	Hillslope	0.85	0.15	0.13
Area (sq.mi.)	Mt. w/veg.	0.15	0.25	0.04

0.536				0.17

Table 3.2-5.2
Surface Retention Loss (IA) Calculations
By Sub-Watershed

Sand Tank Wash

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
101	Desert	0.00	0.35	0.00
	Hillslope	0.81	0.15	0.12
Area (sq.mi.)	Mt. w/veg.	0.19	0.25	0.05
1.125				0.17

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
102	Desert	0.00	0.35	0.00
	Hillslope	0.50	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.50	0.25	0.13
1.750				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
103	Desert	0.00	0.35	0.00
	Hillslope	0.50	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.50	0.25	0.13
0.745				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
104	Desert	0.00	0.35	0.00
	Hillslope	0.84	0.15	0.13
Area (sq.mi.)	Mt. w/veg.	0.16	0.25	0.04
0.997				0.17

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
105	Desert	0.00	0.35	0.00
	Hillslope	0.51	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.49	0.25	0.12
0.855				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
106	Desert	0.00	0.35	0.00
	Hillslope	0.90	0.15	0.14
Area (sq.mi.)	Mt. w/veg.	0.10	0.25	0.03
1.594				0.16

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
107	Desert	0.00	0.35	0.00
	Hillslope	0.50	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.50	0.25	0.13
2.189				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
108	Desert	0.00	0.35	0.00
	Hillslope	0.63	0.15	0.09
Area (sq.mi.)	Mt. w/veg.	0.37	0.25	0.09
0.943				0.19

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
109	Desert	0.00	0.35	0.00
	Hillslope	0.96	0.15	0.14
Area (sq.mi.)	Mt. w/veg.	0.04	0.25	0.01
1.404				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
110	Desert	0.00	0.35	0.00
	Hillslope	0.51	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.49	0.25	0.12
1.161				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
111	Desert	0.00	0.35	0.00
	Hillslope	0.51	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.49	0.25	0.12
1.714				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
112	Desert	0.00	0.35	0.00
	Hillslope	0.77	0.15	0.12
Area (sq.mi.)	Mt. w/veg.	0.23	0.25	0.06
4.331				0.17

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
113	Desert	0.00	0.35	0.00
	Hillslope	0.91	0.15	0.14
Area (sq.mi.)	Mt. w/veg.	0.09	0.25	0.02
3.313				0.16

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
114	Desert	0.00	0.35	0.00
	Hillslope	0.50	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.50	0.25	0.13
2.315				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
115	Desert	0.00	0.35	0.00
	Hillslope	0.91	0.15	0.14
Area (sq.mi.)	Mt. w/veg.	0.09	0.25	0.02
2.198				0.16

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
116	Desert	0.00	0.35	0.00
	Hillslope	0.51	0.15	0.08
Area (sq.mi.)	Mt. w/veg.	0.49	0.25	0.12
1.659				0.20

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
117	Desert	0.00	0.35	0.00
	Hillslope	0.65	0.15	0.10
Area (sq.mi.)	Mt. w/veg.	0.35	0.25	0.09
3.513				0.19

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
118	Desert	0.00	0.35	0.00
	Hillslope	0.61	0.15	0.09
Area (sq.mi.)	Mt. w/veg.	0.39	0.25	0.10
2.917				0.19

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
119	Desert	0.00	0.35	0.00
	Hillslope	0.78	0.15	0.12
Area (sq.mi.)	Mt. w/veg.	0.22	0.25	0.06
2.666				0.17

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
120	Desert	0.00	0.35	0.00
	Hillslope	0.89	0.15	0.13
Area (sq.mi.)	Mt. w/veg.	0.11	0.25	0.03
1.826				0.16

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
121	Desert	0.00	0.35	0.00
	Hillslope	0.60	0.15	0.09
Area (sq.mi.)	Mt. w/veg.	0.40	0.25	0.10
4.898				0.19

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
122	Desert	0.00	0.35	0.00
	Hillslope	0.79	0.15	0.12
Area (sq.mi.)	Mt. w/veg.	0.21	0.25	0.05
7.572				0.17

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
123	Desert	0.00	0.35	0.00
	Hillslope	0.87	0.15	0.13
Area (sq.mi.)	Mt. w/veg.	0.13	0.25	0.03
1.329				0.16

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
124	Desert	0.00	0.35	0.00
	Hillslope	0.70	0.15	0.11
Area (sq.mi.)	Mt. w/veg.	0.30	0.25	0.08
7.409				0.18

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
125	Desert	0.00	0.35	0.00
	Hillslope	0.70	0.15	0.11
Area (sq.mi.)	Mt. w/veg.	0.30	0.25	0.08
10.207				0.18

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
126	Desert	0.00	0.35	0.00
	Hillslope	0.93	0.15	0.14
Area (sq.mi.)	Mt. w/veg.	0.07	0.25	0.02
12.624				0.16

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
127	Desert	0.00	0.35	0.00
	Hillslope	0.73	0.15	0.11
Area (sq.mi.)	Mt. w/veg.	0.27	0.25	0.07
2.467				0.18

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
128	Desert	0.00	0.35	0.00
	Hillslope	0.75	0.15	0.11
Area (sq.mi.)	Mt. w/veg.	0.25	0.25	0.06
5.101				0.18

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
129	Desert	0.00	0.35	0.00
	Hillslope	0.92	0.15	0.14
Area (sq.mi.)	Mt. w/veg.	0.08	0.25	0.02
3.731				0.16

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
130	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
2.651				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
201	Desert	0.00	0.35	0.00
	Hillslope	0.75	0.15	0.11
Area (sq.mi.)	Mt. w/veg.	0.25	0.25	0.06
5.569				0.18

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
202	Desert	0.00	0.35	0.00
	Hillslope	0.85	0.15	0.13
Area (sq.mi.)	Mt. w/veg.	0.15	0.25	0.04
6.771				0.17

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
203	Desert	0.00	0.35	0.00
	Hillslope	0.67	0.15	0.10
Area (sq.mi.)	Mt. w/veg.	0.33	0.25	0.08
2.211				0.18

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
204	Desert	0.00	0.35	0.00
	Hillslope	0.65	0.15	0.10
Area (sq.mi.)	Mt. w/veg.	0.35	0.25	0.09
4.125				0.19

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
205	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
0.898				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
206	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
4.193				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
207	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
5.183				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
208	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
0.912				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
209	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
4.944				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
210	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
2.699				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
211	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
9.638				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
212	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
0.820				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
213	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
1.781				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
214	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
1.621				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
215	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
0.928				0.15

Sub-Watershed	Land Classification	Percentage	Surface Ret. Loss (IA)	Total S.R. Loss
216	Desert	0.00	0.35	0.00
	Hillslope	1.00	0.15	0.15
Area (sq.mi.)	Mt. w/veg.	0.00	0.25	0.00
1.085				0.15

Table 3.2-6.1
Lag Time Calculations
By Sub-Watershed

Bender Wash

Sub-Watershed	Area (sq.mi.)	Drainage Length (feet)	Drainage Length (mile)	Lca (ft)	Lca (mi)	Ave. Slope (ft/mi)	Time Lag (min)
1	2.100	21,850	4.14	8,000	1.52	49.6	68.89
2	3.829	34,500	6.53	16,000	3.03	72.6	99.19
3	2.103	19,100	3.62	10,000	1.89	50.8	70.93
4	3.913	34,550	6.54	13,000	2.46	98.2	86.60
5	0.338	6,500	1.23	3,500	0.66	747.9	18.96
6	5.545	31,350	5.94	13,500	2.56	104.6	83.66
7	3.783	21,200	4.02	11,000	2.08	106.1	66.52
8	6.767	26,500	5.02	14,000	2.65	99.7	80.30
9	0.617	9,550	1.81	5,000	0.95	405.5	28.22
10	4.107	31,500	5.97	18,500	3.50	84.1	98.47
11	1.075	14,100	2.67	6,500	1.23	432.2	35.72
12	4.693	33,000	6.25	19,500	3.69	92.0	100.52
13	2.190	14,750	2.79	8,000	1.52	344.5	41.06
14	2.755	29,100	5.51	15,000	2.84	82.2	88.61
15	4.565	38,500	7.29	17,000	3.22	64.5	108.23
16	5.142	33,200	6.29	21,000	3.98	76.7	107.27
17	5.305	36,500	6.91	20,500	3.88	98.9	105.00
18	2.899	17,400	3.30	10,000	1.89	81.5	62.58
19	4.674	42,000	7.95	21,000	3.98	67.3	120.25
20	3.277	37,750	7.15	18,500	3.50	52.7	115.28
21	4.766	27,000	5.11	14,500	2.75	53.3	92.32
22	2.901	18,000	3.41	8,750	1.66	61.5	63.56
23	0.536	6,000	1.14	3,000	0.57	52.8	28.70

Table 3.2-6.2
Lag Time Calculations
By Sub-Watershed

Sand Tank Wash

Sub-Watershed	Area (sq.mi.)	Length (feet)	Length (mile)	Lca (feet)	Lca (mi)	Slope (ft/mi)	Time Lag (min)
101	1.125	11,500	2.18	5,500	1.04	74.7	43.3
102	1.750	13,850	2.62	7,500	1.42	376.7	38.5
103	0.745	10,700	2.03	6,000	1.14	242.7	34.8
104	0.997	17,100	3.24	8,500	1.61	51.0	63.9
105	0.855	11,900	2.25	8,000	1.52	110.5	47.0
106	1.594	14,200	2.69	6,500	1.23	111.3	46.4
107	2.189	21,050	3.99	11,000	2.08	229.5	57.3
108	0.943	16,700	3.16	8,000	1.52	153.9	50.2
109	1.404	11,100	2.10	5,000	0.95	120.8	37.6
110	1.161	12,680	2.40	6,000	1.14	133.1	41.6
111	1.714	13,000	2.46	5,500	1.04	76.4	45.2
112	4.331	27,900	5.28	16,500	3.13	195.1	76.7
113	3.313	27,300	5.17	13,500	2.56	118.0	77.6
114	2.315	15,600	2.95	5,500	1.04	113.0	45.0
115	2.198	17,650	3.34	9,000	1.70	138.8	54.6
116	1.659	15,800	2.99	9,500	1.80	90.9	57.9
117	3.513	18,500	3.50	10,000	1.89	252.9	51.7
118	2.917	18,400	3.48	7,000	1.33	100.4	53.6
119	1.888	16,900	3.20	10,000	1.89	122.6	57.3
120	2.605	11,500	2.18	5,000	0.95	81.7	41.1
121	4.649	33,900	6.42	19,000	3.60	153.5	91.2
122	7.572	32,000	6.06	18,000	3.41	132.2	90.0
123	1.329	20,500	3.88	11,500	2.18	92.4	68.6

Table 3.2-6.2
Lag Time Calculations
By Sub-Watershed

Sand Tank Wash

Sub-Watershed	Area (sq.mi.)	Length (feet)	Length (feet)	Lca (feet)	Lca (mi)	Slope (ft/mi)	Time Lag (min)
124	7.409	37,500	7.10	12,000	2.27	105.40	85.5
125	10.207	38,500	7.29	18,500	3.50	88.90	105.2
126	12.624	48,600	9.20	20,000	3.79	51.00	131.5
127	2.467	15,850	3.00	6,000	1.14	160.40	43.7
128	5.101	31,050	5.88	14,000	2.65	87.80	87.4
129	3.731	24,150	4.57	10,500	1.99	70.70	74.2
130	2.651	43,200	8.18	23,000	4.36	39.50	139.2
201	5.569	28,650	5.43	17,000	3.22	116.8	86.4
202	6.771	26,000	4.92	12,000	2.27	76.3	79.1
203	2.211	20,550	3.89	12,000	2.27	132.5	65.1
204	4.125	23,700	4.49	10,500	1.99	125.9	66.0
205	0.898	14,000	2.65	7,000	1.33	75.4	51.1
206	4.193	48,500	9.19	23,000	4.36	57.0	135.7
207	5.183	60,500	11.46	28,750	5.45	57.8	160.2
208	0.912	13,100	2.48	5,750	1.09	43.8	51.2
209	4.944	70,600	13.37	34,000	6.44	54.70	183.0
210	2.699	39,900	7.56	20,000	3.79	44.50	125.2
211	9.638	53,600	10.15	30,000	5.68	59.10	154.9
212	0.820	13,600	2.58	5,500	1.04	49.90	49.8
213	1.781	17,900	3.39	8,500	1.61	46.40	66.2
214	1.621	20,500	3.88	9,500	1.80	41.30	74.3
215	0.928	19,500	3.69	10,500	1.99	36.70	77.5
216	1.085	25,000	4.73	10,000	1.89	36.90	83.5

Table 3.2-7

Summary of Sub-Watershed Parameters

Hydrologic Analysis
of
Bender and Sand Tank Washes
Gila Bend, Arizona
Maricopa County

Sub-Watershed	Area (mi^2)	IA (in)	DTHETA (in)	PSIF	XKSAT (in/hr)	RTIMP (%)	LAG (min)	S-Graph Type
1	2.10	0.16	0.31	3.7	0.28	0.8	69	Valley
2	3.83	0.15	0.35	3.6	0.27	0	99	Mountain
3	2.10	0.20	0.23	7.0	0.11	6.4	71	Mountain
4	3.91	0.15	0.20	11.5	0.02	10.0	87	Valley
5	0.34	0.17	0.33	3.8	0.24	0	19	Mountain
6	5.55	0.18	0.23	6.6	0.15	7.0	84	Valley
7	3.78	0.19	0.18	8.3	0.06	10.7	67	Mountain
8	6.77	0.18	0.23	6.8	0.14	7.1	80	Mountain
9	0.62	0.20	0.21	10.8	0.04	9.2	28	Valley
10	4.11	0.15	0.32	4.4	0.22	0	98	Mountain
11	1.08	0.16	0.30	5.4	0.19	2.0	36	Mountain
12	4.70	0.20	0.20	11.5	0.02	10.0	101	Valley
13	2.19	0.20	0.20	11.5	0.02	10.0	41	Valley
14	2.76	0.15	0.31	5.4	0.19	0	89	Mountain
15	4.37	0.15	0.30	4.4	0.22	0	108	Valley
16	5.23	0.17	0.25	6.6	0.15	4.2	107	Mountain
17	5.30	0.17	0.29	6.0	0.17	3.7	105	Mountain
18	2.90	0.19	0.23	7.1	0.12	7.5	63	Mountain
19	4.67	0.16	0.28	5.1	0.20	3.7	120	Valley
20	3.19	0.15	0.33	3.6	0.27	0	115	Valley
21	4.77	0.17	0.25	7.0	0.13	4.8	92	Mountain
22	2.90	0.16	0.30	4.4	0.22	2.1	64	Valley
23	0.54	0.17	0.29	4.4	0.23	3.8	29	Valley
101	1.13	0.17	0.29	6.3	0.16	3.9	43	Valley
102	1.75	0.20	0.20	11.5	0.02	10.0	39	Mountain
103	0.75	0.20	0.20	11.5	0.02	10.0	35	Mountain
104	1.00	0.17	0.30	6.0	0.17	3.3	64	Valley
105	0.86	0.20	0.20	11.5	0.02	10.0	47	Mountain
106	1.60	0.16	0.32	4.7	0.21	1.9	46	Valley
107	2.19	0.20	0.20	11.5	0.02	10.0	57	Mountain
108	0.94	0.19	0.24	8.1	0.08	7.5	50	Mountain
109	1.40	0.15	0.34	4.1	0.23	0.8	38	Valley
110	1.16	0.20	0.20	11.5	0.02	9.9	42	Mountain

Table 3.2-7

Sub-Watershed	Area (mi^2)	IA (in)	DTHETA (in)	PSIF	XKSAT (in/hr)	RTIMP (%)	LAG (min)	S-Graph Type
111	1.71	0.20	0.20	11.5	0.02	9.9	45	Mountain
112	4.33	0.17	0.28	6.8	0.14	4.7	77	Valley
113	3.31	0.16	0.32	4.7	0.21	1.8	78	Valley
114	2.31	0.20	0.20	11.5	0.02	10.0	45	Mountain
115	2.20	0.16	0.32	4.7	0.21	1.8	55	Valley
116	1.66	0.20	0.20	11.5	0.02	9.9	58	Mountain
117	3.51	0.19	0.25	7.1	0.12	6.3	52	Mountain
118	2.92	0.19	0.23	7.8	0.09	6.3	54	Mountain
119	1.89	0.17	0.31	4.7	0.21	1.6	57	Valley
120	2.61	0.16	0.28	5.7	0.18	2.3	41	Valley
121	4.65	0.19	0.23	8.1	0.08	7.3	91	Mountain
122	7.57	0.17	0.24	7.5	0.10	6.3	90	Valley
123	1.33	0.16	0.29	5.4	0.19	1.8	69	Valley
124	7.41	0.18	0.26	7.3	0.11	5.9	86	Mountain
125	10.21	0.18	0.26	7.3	0.11	6.0	105	Mountain
126	12.62	0.16	0.33	3.7	0.28	1.2	132	Valley
127	2.47	0.18	0.27	7.1	0.12	5.5	44	Mountain
128	5.10	0.18	0.27	7.0	0.13	5.1	87	Mountain
129	3.73	0.16	0.33	4.7	0.21	1.6	74	Valley
130	2.65	0.15	0.35	4.0	0.35	0	139	Valley
201	5.57	0.18	0.28	6.8	0.14	4.9	86	Mountain
202	6.77	0.17	0.30	5.7	0.18	3.1	79	Valley
203	2.21	0.18	0.25	7.5	0.10	6.6	65	Mountain
204	4.13	0.19	0.25	7.8	0.09	7.0	66	Mountain
205	0.90	0.15	0.35	3.5	0.25	0	51	Valley
206	4.19	0.15	0.35	3.5	0.25	0	136	Valley
207	5.18	0.15	0.35	3.5	0.25	0	160	Valley
208	0.91	0.15	0.32	5.4	0.19	0	51	Valley
209	4.94	0.15	0.35	3.6	0.26	0	183	Valley
210	2.70	0.15	0.34	3.7	0.29	0	125	Valley
211	9.64	0.15	0.35	3.5	0.25	0	155	Valley
212	0.82	0.15	0.35	3.5	0.25	0	50	Valley
213	1.78	0.15	0.32	5.4	0.19	0	66	Valley
214	1.62	0.15	0.32	4.7	0.21	0	74	Valley
215	0.93	0.15	0.34	4.0	0.35	0	78	Valley
216	1.09	0.15	0.33	3.7	0.29	0	84	Valley

Table 3.2-8.1
Routing Parameters
By Reach

Bender Wash

Route From:	Route To:	Reach Number	Length	Top Elevation	Bottom Elevation	Slope (ft/ft)	Top Width (ft)	Bottom Width (ft)	Ave. Depth (ft)	Left Slope	Right Slope	Bed Slope (ft/ft)
SUB1	A	1	3600	1793	1777	0.0044	70	60	3.0	0.010	0.010	0.004
A	B	2	7100	1777	1734	0.0061	90	80	3.0	0.010	0.010	0.006
4	CP5		36000	2400	1734	0.0185	40	30	1.5	0.020	0.020	0.019
B	C	3 *	9500	1734	1658	0.0080	122	95	5.5	0.000	0.006	0.017
7	C	3a *	20700	1940	1658	0.0136	150	119	1.3	0.000	0.003	0.017
9	C		31000	2220	1695	0.0169	40	30	1.5	0.020	0.020	0.017
11	CP12		29400	2180	1658	0.0178	40	30	1.5	0.020	0.020	0.018
C	D	5	6700	1658	1608	0.0075	100	80	3.0	0.020	0.020	0.008
13	D	4 *	28800	2080	1608	0.0164	41	30	2.3	0.018	0.086	0.023
D	E	6 *	12800	1608	1513	0.0074	72	63	2.3	0.024	0.057	0.008
E	F	7 *	30000	1513	1200	0.0104	128	110	3.1	0.000	0.007	0.010
17	CP18	8a *	3200	1620	1579	0.0128	66	40	1.9	0.000	0.017	0.010
RCP18	CP19	8	5000	1579	1200	0.0758	40	30	1.5	0.020	0.020	0.008
F	G	9 *	9200	1200	1126	0.0080	141	127	8.3	0.000	0.013	0.010
21	CP22	10	17000	1290	1126	0.0096	50	40	2.0	0.010	0.010	0.010
23	G	9	4800	1180	1074	0.0221	141	127	8.3	0.000	0.013	0.010

* indicates that a cross-section was surveyed at the location.

Table 3.2-8.2.a
Routing Parameters
By Reach

Sand Tank Wash

Route From:	Route To:	Reach Number	Length (ft)	Top Elevation	Bottom Elevation	Slope (ft/ft)	Top Width (ft)	Bottom Width (ft)	Ave. Depth (ft)	Left Slope	Right Slope	Bed Slope (ft/ft)
102	CP104	100 *	13000	2098	1800	0.023	115	71	8.8	0.001	0.008	0.006
103	CP104	100 *	10000	1980	1800	0.018	115	71	8.8	0.001	0.008	0.006
AA	BB	101 *	4500	1800	1728	0.016	74	46	2.9	0.090	0.010	0.005
BB	CC	102	4500	1728	1700	0.006	74	46	2.9	0.090	0.010	0.005
107	CP109	103 *	4800	1915	1806	0.023	41	25	4.8	0.067	0.030	0.019
108	CP109	104 *	5700	1806	1700	0.019	108	96	4.1	0.018	0.130	0.008
CC	CP111	105 *	11100	1700	1560	0.013	61	33	1.3	0.136	0.209	0.007
112	DD	106 *	15500	2135	1748	0.025	132	115	3.6	0.008	0.230	0.017
DD	CP116	110	11000	1748	1560	0.017	70	60	2.5	0.011	0.044	0.015
113	CP114	108 *	10800	1713	1560	0.014	49	31	2.0	0.000	0.018	0.005
EE	FF	111	16500	1560	1333	0.014	90	72	3.0	0.010	0.010	0.014
FF	GG	112	6200	1333	1255	0.013	90	72	3.0	0.010	0.010	0.013
118	CP119	113a	12000	1541	1361	0.015	74	50	4.8	0.067	0.030	0.015
RCP119	GG	114a	9600	1361	1255	0.011	74	50	4.8	0.067	0.030	0.150
GG	HH	113	4500	1255	1205	0.011	90	72	3.0	0.010	0.010	0.011

* indicates that the cross-section was surveyed.

Table 3.2-8.2.a
Routing Parameters
By Reach

Sand Tank Wash

Route From:	Route To:	Reach Number	Length (ft)	Top Elevation	Bottom Elevation	Slope (ft/ft)	Top Width (ft)	Bottom Width (ft)	Ave. Depth (ft)	Left Slope	Right Slope	Bed Slope (ft/ft)
HH	II	114 *	13200	1205	1058	0.011	103	79	3.8	0.110	0.092	0.004
II	JJ	116	23400	1058	855	0.009	103	79	3.8	0.110	0.092	0.009
124	CP125	117 *	30000	1674	1190	0.016	50	21	8.4	0.002	0.061	0.014
CP125	JJ	118	36000	1190	855	0.009	40	25	1.8	0.015	0.010	0.009
JJ	KK	119	9000	855	807	0.005	103	79	3.8	0.110	0.092	0.005
127	CP129	120	12000	1230	1115	0.010	40	25	1.8	0.015	0.010	0.010
128	CP129	121	20100	1343	1115	0.011	40	25	1.8	0.015	0.010	0.011
RCP129	KK	122	40000	1115	807	0.008	40	25	1.8	0.015	0.010	0.008

* indicates that the cross-section was surveyed.

Table 3.2-8.2.b
Routing Parameters
By Reach

Sand Tank Wash

Route From:	Route To:	Reach Number	Length (ft)	Top Elevation	Bottom Elevation	Slope (ft/ft)	Top Width (ft)	Bottom Width (ft)	Ave. Depth (ft)	Left Slope	Right (slope)	Bed Slope (ft/ft)
201	A1	123	15000	1984	1803	0.012	80	60	4.0	0.005	0.005	0.012
A1	B1	124	9000	1803	1665	0.015	80	60	4.0	0.005	0.005	0.015
B1	C1	125	13600	1665	1465	0.015	80	60	4.0	0.005	0.005	0.015
204	C1	126	5500	1535	1465	0.013	80	60	4.0	0.005	0.005	0.013
C1	CP206	127 *	42700	1465	1007	0.011	43	23	1.7	0.011	0.000	0.007
D1	E1	129	8800	1007	939	0.008	45	25	2.0	0.010	0.001	0.008
E1	F1	130	10000	939	868	0.007	50	30	2.0	0.011	0.001	0.007
F1	CP215	131	9800	868	807	0.006	70	60	3.0	0.011	0.001	0.006
G1	H1	132 *	14500	1129	1011	0.008	62	22	6.4	0.011	0.001	0.001
H1	J1	133	14500	1011	907	0.007	62	22	6.4	0.011	0.001	0.007
J1	CP215	134	15300	907	807	0.007	62	22	6.4	0.011	0.001	0.007

Table 3.2-9

AREAL REDUCTION PRECIPITATION DATA
100-YEAR 24-HOUR STORM

2.54 YEAR DEPTH-AREA RATIOS
ZONES A AND C - CENTRAL ARIZONA

NOAA TECHNICAL MEMORANDUM NWS HYDRO-40

WATERSHED AREA (SQ MI)	REDUCTION FACTOR	POINT PRECIPITATION (INCHES)
0.01	1.00	4.53
5.0	0.98	4.43
10.0	0.95	4.30
50.0	0.88	3.97
100.0	0.85	3.85
500.0	0.78	3.53

3.3 Special Problems and Solutions

3.3.1 Big Horn Reservoir Flow Split

The concentration point of sub-watershed 7 (within the Bender Wash Watershed) coincides with the Big Horn Reservoir. Flow immediately downstream of the reservoir appear to vary its flow path between two alternative routes. Field investigations on the ground and in flight support the routing depicted in this study. The field observations are documented by aerial photos and video tape.

3.3.2 Bender and Sand Tank Washes Flow Split

Termination of the Sand Tank Watershed and the Bender Wash Watershed occurs at points where a detailed flow split analysis is needed in order to determine the downstream flow patterns. Future hydrologic studies shall require a hydraulic analysis of the downstream reach to develop rating curves for each alternate downstream reach. A complete hydrologic analysis at the Gila Bend townsite requires a thorough hydraulic analysis and greater knowledge of the downstream floodplain topography.

3.3.3 Impoundment of Watershed

From field investigations and critique of design plans, Interstate-8 is found not to attenuate flows generating from upstream sub-watersheds. Pipe capacities are believed to be sufficient to pass peak flows from either the 6-hour duration or the 24-hour duration with minimal ponding or attenuation.

For purposes of providing conservative estimates of the hydrologic analysis, storage volume (and resulting attenuation) from the Big Horn Reservoir has been neglected. The adequacy of this dam structure is uncertain and is not relied upon as a meaningful flood retarding device. The impact of sudden dam failure is beyond the scope of this study.

3.4 Final Results

3.4.1 General

The results of this study are summarized in tables 3.4-1 through 3.4-2.2. Evaluation of HEC-1 computer model indicates that peak flow rates for the concentration points along Bender Wash and Sand Tank Wash result primarily from the 100-year, 24-hour duration storm. The 6-hour duration storm typically produces higher peak flow rates on the smaller portion of the watershed. The HEC-1 computer model output for both 6-hour and 24-hour duration storms are included in Appendices "C" and "D" of this report. Appendices "A" and "B" includes modified printouts from the loader program MCUHP2 which documents the sub-watershed input parameters for developing the respective unit hydrographs from the selected S-Graph.

3.4.2 Discussion of Results

The Flood Control District has compiled gauge data for representative washes in Maricopa County and performed a Log Pearson III statistical analysis for multiple recurrence intervals.

When comparing the results of this rainfall runoff model, it is found that 100-year peak flow rates computed by the HEC-1 computer model are within acceptable limits of the flow rates estimated by the Log Pearson III probability distribution.

Statistical analysis data for the Log Pearson III analysis is presented on Table 3.4-1. Figure 3.4-1 graphically presents this data on a log-log plot of cubic feet per second per square mile (cfs/sm) versus drainage area in square miles (sm).

Major concentration point "G" which corresponds to the catchment of the Bender Wash major sub-watershed is estimated to have a peak discharge of 9,880 cfs from a 78 square mile area. This concentration point yields a peak discharge per area of approximately 127 cfs/sm. This data point is observed to plot very close to statistical data for Tiger Wash near Aguila (USGS Station Number 517280). The Tiger Wash Watershed and Bender Wash Watershed are believed to share similar qualities in hydrologic character and basin parameters.

Major concentration point "KK", which corresponds to the catchment of the Sand Tank Wash major sub-watershed, is estimated to have a peak discharge of 22,510 cfs from a 158 square mile area. This concentration point yields a peak discharge per area of approximately 142 cfs/sm. This data point is observed to plot adjacent to the statistical data for Cave Creek near Cave Creek (USGS Station Number 512300).

Table 3.4-1

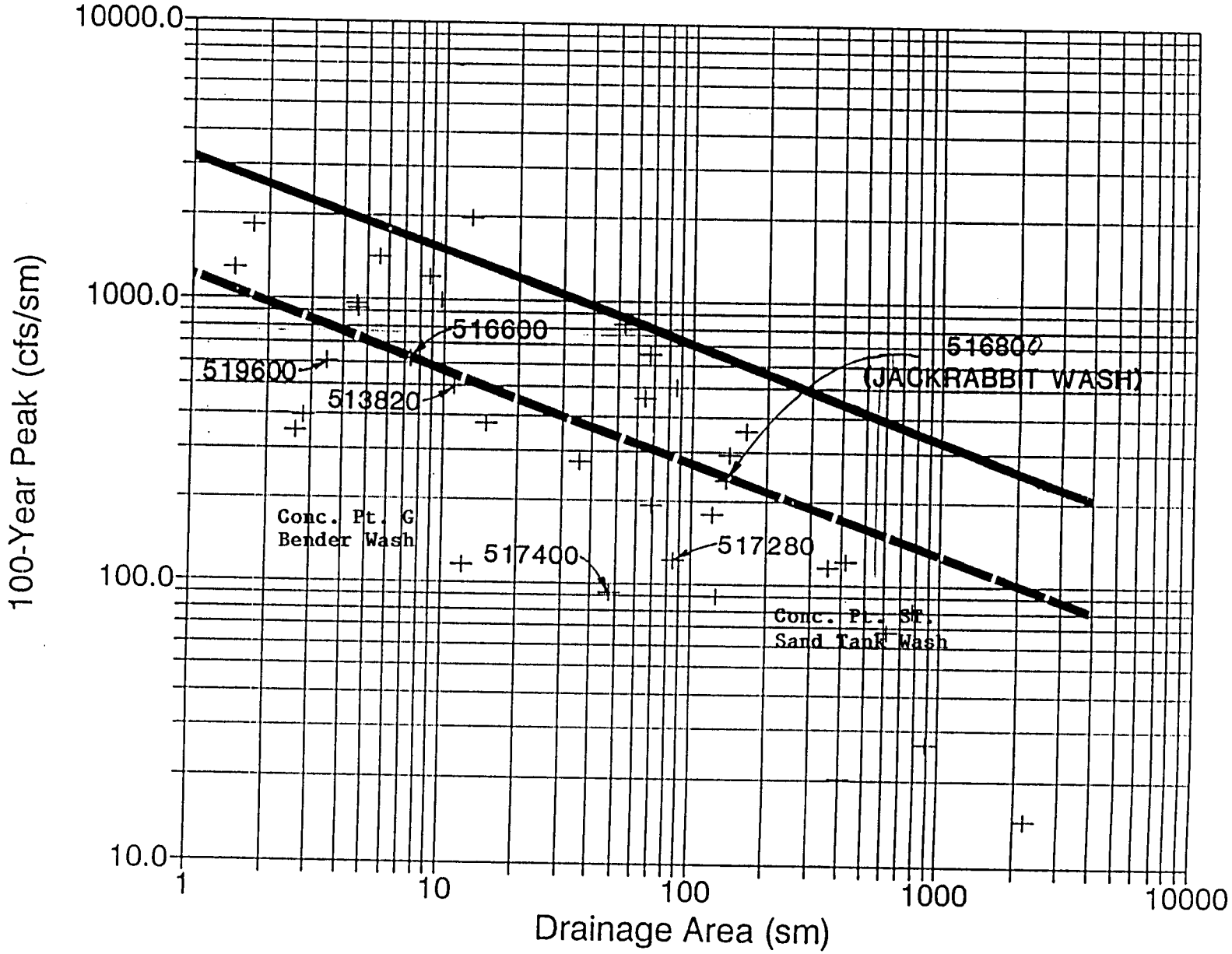
Log Pearson III Analysis Summary
Bender and Sand Tank Washes
Gila Bend, Arizona
Maricopa County

Station Number	Station Name	Drainage Area (sm)	Record Period 1		Record Period 2		Record Length (years)	Qmax (cfs)	Log Pearson III Discharge For 100-Year Storm	
			Start	End	Start	End			cfs	cfs/sm
447000	Eagle Creek Near Morenci	613.00	1945	1988			43	36,400	41,600	68
482500	Santa Cruz River Near Tucson	2,222.00	1915	1988			73	52,700	32,000	14
484000	Sabino Creek Near Tucson	35.50	1932	1988			56	7,730	9,700	273
485850	Rillito Creek Near Tucson	892.00	1915	1981			66	24,000	23,800	27
504500	Oak Creek Near Cornville	357.00	1941	1988			47	26,400	41,400	116
510070	West Fork Sycamore Creek Near Sunflower	4.58	1966	1974	1983	1986	11	1,700	4,200	917
510080	West Fork Sycamore Creek Near Sunflower	9.80	1961	1979			18	3,480	9,800	1,000
510100	East Fork Sycamore Creek Near Sunflower	4.49	1961	1986			25	1,940	4,300	958
510150	Sycamore Creek Near Sunflower	53.40	1962	1976			14	16,100	44,000	824
510170	Camp Creek Near Sunflower	2.60	1963	1979			16	402	900	346
510180	Rock Creek Near Sunflower	15.00	1963	1972			9	1,900	5,600	373
510200	Sycamore Creek Near Fort McDowell	165.00	1960	1987			27	24,200	58,800	356
512100	Indian bend Wash Near Scottsdale	142.00	1961	1984			23	21,000	41,600	293
512200	Salt River Tributary Near South Mountain Park	1.75	1961	1988			27	670	3,200	1,829
512300	Cave Creek Near Cave Creek	121.00	1958	1988			30	12,400	21,600	179
513780	New River Near Rock Springs	67.30	1962	1987			25	18,600	43,700	649
513800	New River At Rock Springs	85.70	1961	1982			21	19,500	42,900	501
513820	Deadman Wash Near New River	11.10	1960	1979			19	1,850	5,600	505
513860	Skunk Creek Phoenix	64.60	1960	1988			28	11,500	29,900	463
514200	Waterman Wash Near Buckeye	403.00	1964	1988			24	6,300	8,100	20
515500	Hassayampa River At B.D. Near Wickenburg	417.00	1946	1983			37	56,300	50,300	121
515800	Hartman Wash Near Wickenburg	5.57	1964	1979			15	2,600	7,800	1,400
516500	Hassayampa River Near Morristown	774.00	1939	1942	1964	1988	27	47,500	62,600	81
516600	Ox Wash Near Morristown	7.44	1963	1979			16	2,900	4,600	618
516800	Jackrabbit Wash Near Tonopah	137.00	1964	1979			15	6,840	32,500	237
517200	Centennial Wash Tributary Near Wendon	2.79	1963	1979			16	720	1,100	394
517280	Tiger Wash Near Aguila	85.20	1963	1979			16	4,550	10,300	121
517400	Winters Wash Near Tonopah	47.80	1962	1979			17	3,640	4,400	92
519600	Rainbow Wash Tributary Near Buckeye	3.45	1963	1979			16	1,430	2,100	609
519750	Bender Wash Near Gila Bend	68.80	1963	1979			16	2,670	13,100	190
519760	Sauceda Wash Near Gila Bend	126.00	1963	1979			16	3,150	11,300	90
519780	Windmill Wash Near Gila Bend	12.90	1964	1979			15	34,430	25,300	1,961
520100	Military Wash Near Sentinel	8.70	1963	1979			16	1,530	10,400	1,195
520200	Black Gap Wash Near Ajo	12.10	1963	1979			16	9,402	1,400	116
520230	Crater Range Wash Near Ajo	1.49	1963	1979			16	440	1,900	1,275

Taken from "Jackrabbit Wash Floodplain Delineation Study, FCD 90-05 Preliminary Technical Data Notebook Hydrology," Bk. 1 of 2, prepared by Burgess & Niple, Inc., December 22, 1990, for Flood Control District of Maricopa County.

Figure 3.4-1

Log Pearson III Analysis Summary
100-Year Peak vs Drainage Area
For Representative Maricopa County Washes
Bender and Sand Tank Washes
Gila Bend, Arizona
Maricopa County



Source: See Table 3.4-9

Table 3.4-2.1

Summary Table of Peak Discharges
at Concentration Points
Bender Wash

Gila Bend, Arizona
Maricopa County

Conc. Point	Description	Peak Discharge 6-Hour	Peak Discharge 24-Hour
A	Combines sub-watersheds 1, 2, 3		4,160
B	Pt. A routed, combines sub-watersheds 4-7		8,280
C	Pt. B routed, combines sub-watersheds 8-12		14,090
D	Pt. C routed, combines sub-watersheds 13-14		14,870
E	Pt. D routed, combines sub-watersheds 15-16		15,770
F	Pt. E routed, combines sub-watersheds 17-20		9,220
G	Pt. F routed, combines sub-watersheds 21-23		9,880

Table 3.4-2.2

Summary Table of Peak Discharges
at Concentration Points
Sand Tank Wash

Gila Bend, Arizona
Maricopa County

Conc. Point	Description	Peak Discharge 6-Hour	Peak Discharge 24-Hour
AA	Combines sub-watersheds 101-104		4,100
BB	Pt. AA routed, combines sub-watersheds 105-106		6,160
CC	Pt. BB routed, combines sub-watersheds 107-110		10,050
DD	Calculates sub-watershed 115		3,110
EE	Pts. CC & DD routed, combine sub-watersheds 111-116		2,770
FF	Pt. EE routed, combines sub-watershed 117		11,640
GG	Pt. FF routed, combines sub-watersheds 118-120		4,700
HH	Pt. GG routed, combines sub-watershed 121		15,780
II	Pt. HH routed, combines sub-watersheds 122-123		19,670
JJ	Pt. II routed, combines sub-watersheds 124-126		22,460
KK	Pt. JJ routed, combines sub-watersheds 127-130 and A1-J1		22,510

Conc. Point	Description	Peak Discharge 6-Hour	Peak Discharge 24-Hour
A1	Combines sub-watersheds 201-202		6,790
B1	Pt. A1 routed, combines sub-watershed 203		6,240
C1	Pt. B1 routed, combines sub-watersheds 204-205		8,460
D1	Pt. C1 routed, combines sub-watersheds 206-207		4,000
E1	Pt. D1 routed, combines sub-watershed 208		2,750
F1	Pt. E1 routed, combines sub-watersheds 209-210		5,190
G1	Combines sub-watersheds 211-212		3,610
H1	Pt. G1 routed, combines sub-watershed 213		2,850
I1	Pt. H1 routed, combines sub-watershed 214		2,650
J1	Pt. I1 routed, combines sub-watersheds 215-216		5,770

S graph

```
*****************************************************************************
*                                                                           *
*                              PROGRAM MCUHP2                               *
*                                                                           *
*                     THE MARICOPA COUNTY HYDROLOGY MANUAL                  *
*                                                                           *
*                                                                           *
*                   FLOOD CONTROL DISTRICT OF MARICOPA COUNTY               *
*                    3335 W. DURANGO, PHOENIX, ARIZONA 85009                *
*                                                                           *
*   Program MCUHP2, Maricopa County Unit Hydrograph Procedure2 provides the *
*   Unit-graph from the Phoenix Mountain or the Phoenix Valley S-graph.     *
*   It will also provide the rainfall pattern distribution.  Output will be *
*   presented in the form of a HEC-1 input file for immediate application.  *
*                                                                           *
*****************************************************************************
```

UNIT HYDROGRAPH FOR BASIN: 1

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	157.		
10.	103.	150.	103.		
20.	200.	160.	60.		
30.	436.	170.	31.		
40.	565.	180.	31.		
50.	701.	190.	31.		
60.	915.	200.	31.		
70.	1277.	210.	0.		
80.	1009.	220.	0.		
90.	809.				
100.	640.				
110.	504.				
120.	331.				
130.	180.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 1

Area= 2.10, Point rainfall depth= 1.0, Reduction coefficient= 1.00
Rainfall distribution is 6-hour
Phoenix Valley S-graph was selected.
Lag Time = 68.9 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

[illegible] a loss rate parameters

IA = 0.16 RTIMP = 0.8

DTHETA = 0.31

PSIF = 3.7

XKSAT = 0.28

IT HYDROGRAPH FOR BASIN: 2

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	614.	280.	100.
10.	130.	150.	544.	290.	100.
20.	130.	160.	489.	300.	73.
30.	305.	170.	422.	310.	64.
40.	522.	180.	353.	320.	64.
50.	742.	190.	317.	330.	64.
60.	886.	200.	297.	340.	61.
70.	1009.	210.	272.	350.	25.
80.	1239.	220.	215.	360.	25.
90.	1524.	230.	186.	370.	25.
100.	996.	240.	166.	380.	25.
110.	826.	250.	147.	390.	25.
120.	747.	260.	142.	400.	25.
130.	675.	270.	112.	410.	25.

UNIT HYDROGRAPH FOR BASIN: 2

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
420.	25.				
430.	25.				
440.	25.				
450.	25.				
460.	0.				
470.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 2

Area= 3.83
Rainfall distribution is 6-hour
IA= .15 DTHETA= .35 PSIF= 3.60 XKSAT= .27RTIMP= .0
Phoenix Mountain S-graph was selected
Lag Time = 99.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 3

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	238.	280.	19.
10.	100.	150.	214.	290.	19.
20.	169.	160.	166.	300.	19.
30.	395.	170.	129.	310.	19.
40.	620.	180.	115.	320.	19.
50.	758.	190.	103.	330.	0.
60.	1010.	200.	77.	340.	0.
70.	954.	210.	74.		
80.	638.	220.	49.		
90.	553.	230.	49.		
100.	481.	240.	49.		
110.	411.	250.	27.		
120.	345.	260.	19.		
130.	274.	270.	19.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 103 3

Area= 2.10 0.23
Rainfall distribution is 6-hour
IA= .20 DTHETA= .25 PSIF= 7.00 XKSAT= .13 RTIMP= 6.4
Phoenix Mountain S-graph was selected
Lag Time = 70.9 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 4

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.				
10.	175.				
20.	549.				
30.	421.				
40.	124.				
50.	28.				
60.	0.				
70.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= .99

INPUT DATA FOR SUB-BASIN: 4

Area= ~~.34~~ 3.913 0.20 11.5 6.02 10.0

Rainfall distribution is 6-hour

IA= .15 DTHETA= ~~.33~~ PSIF= ~~3.80~~ XKSAT= ~~.24~~ RTIMP= ~~.0~~

Phoenix Valley S-graph was selected.

Lag Time = ~~19.0~~ min., Hydrograph Time Step= 10min.

66.6 HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 5

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	575.	280.	74.
10.	152.	150.	487.	290.	74.
20.	154.	160.	394.	300.	57.
30.	483.	170.	362.	310.	29.
40.	740.	180.	331.	320.	29.
50.	983.	190.	274.	330.	29.
60.	1154.	200.	226.	340.	29.
70.	1431.	210.	194.	350.	29.
80.	1718.	220.	170.	360.	29.
90.	1107.	230.	164.	370.	29.
100.	923.	240.	117.	380.	29.
110.	831.	250.	117.	390.	29.
120.	738.	260.	98.	400.	29.
130.	653.	270.	74.	410.	0.

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

0.338 INPUT DATA FOR SUB-BASIN: 5

Area= ~~3.91~~

Rainfall distribution is 6-hour 3.8

.17 DTHETA= .28 PSIF= ~~6.30~~ XKSAT= ~~.16~~ RTIMP= ~~3.8~~ 0.0

Phoenix Mountain S-graph was selected

Lag Time = ~~86.6~~ min., Hydrograph Time Step= 10min.

19.0 HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 6

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	884.		
10.	223.	150.	524.		
20.	262.	160.	384.		
30.	793.	170.	335.		
40.	1080.	180.	223.		
50.	1282.	190.	178.		
60.	1530.	200.	68.		
70.	1882.	210.	68.		
80.	2654.	220.	68.		
90.	2556.	230.	68.		
100.	2021.	240.	68.		
110.	1705.	250.	0.		
120.	1397.	260.	0.		
130.	1148.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 6

Area= 5.55 ✓ (23) (6.0) (.15)
Rainfall distribution is 6-hour
[illegible] .18 DTHETA= ~~.26~~ PSIF= ~~6.30~~ XKSAT= ~~.16~~ RTIMP= 7.0
[illegible]enix Valley S-graph was selected.
Lag Time = ~~83.7~~ (104.6) min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 7

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	415.	280.	37.
10.	191.	150.	323.	290.	37.
20.	360.	160.	247.	300.	37.
30.	847.	170.	218.	310.	0.
40.	1250.	180.	186.	320.	0.
50.	1546.	190.	147.		
60.	2143.	200.	127.		
70.	1428.	210.	94.		
80.	1132.	220.	94.		
90.	977.	230.	79.		
100.	838.	240.	37.		
110.	707.	250.	37.		
120.	551.	260.	37.		
130.	463.	270.	37.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 7

Area= 3.78 ✓ 0.18

Rainfall distribution is 6-hour

.19 ✓ DTHETA= .22 PSIF= 8.30 ✓ XKSAT= ~~.07~~ 0.0 RTIMP= 10.7 ✓

Phoenix Mountain S-graph was selected

Lag Time = 66.5 ✓ min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 8

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	893.	280.	93.
10.	284.	150.	727.	290.	54.
20.	365.	160.	667.	300.	54.
30.	961.	170.	602.	310.	54.
40.	1536.	180.	469.	320.	54.
50.	1953.	190.	378.	330.	54.
60.	2307.	200.	341.	340.	54.
70.	3172.	210.	311.	350.	54.
80.	2461.	220.	244.	360.	54.
90.	1805.	230.	218.	370.	54.
100.	1595.	240.	193.	380.	0.
110.	1408.	250.	139.	390.	0.
120.	1233.	260.	139.		
130.	1075.	270.	139.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 8

Area= 6.77 (0.23)
Rainfall distribution is 6-hour
.18 DTHETA= .25 PSIF= 6.80 XKSAT= .14RTIMP= 7.1
enix Mountain S-graph was selected
Lag Time = 80.3 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 9

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.				
10.	139.				
20.	423.				
30.	776.				
40.	576.				
50.	297.				
60.	107.				
70.	38.				
80.	23.				
90.	0.				
100.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 9

Area= .62
Rainfall distribution is 6-hour 10.8
IA= .20 DTHETA= .21 PSIF= ~~****~~ XKSAT= .04 RTIMP= 9.2
Phoenix Valley S-graph was selected.
Lag Time = 28.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 10

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	656.	280.	108.
10.	140.	150.	582.	290.	108.
20.	140.	160.	519.	300.	71.
30.	334.	170.	450.	310.	69.
40.	570.	180.	370.	320.	69.
50.	810.	190.	340.	330.	69.
60.	963.	200.	317.	340.	55.
70.	1096.	210.	286.	350.	27.
80.	1360.	220.	231.	360.	27.
90.	1629.	230.	192.	370.	27.
100.	1054.	240.	179.	380.	27.
110.	883.	250.	154.	390.	27.
120.	802.	260.	154.	400.	27.
130.	722.	270.	112.	410.	27.

UNIT HYDROGRAPH FOR BASIN: 10

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
420.	27.				
430.	27.				
440.	27.				
450.	27.				
460.	0.				
470.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 10

Area= 4.11
Rainfall distribution is 6-hour
IA= .15 DTHETA= .32 PSIF= 4.40 XKSAT= .22 RTIMP= .0
Phoenix Mountain S-graph was selected
Lag Time = 98.5 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 11

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	19.		
10.	135.	150.	19.		
20.	511.	160.	19.		
30.	887.	170.	0.		
40.	823.	180.	0.		
50.	529.				
60.	389.				
70.	263.				
80.	196.				
90.	127.				
100.	93.				
110.	65.				
120.	50.				
130.	26.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 11

Area= 1.08
Rainfall distribution is 6-hour
.16 DTHETA= .30 PSIF= 5.40 XKSAT= .19RTIMP= 2.0
enix Mountain S-graph was selected
Lag Time = 35.7 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 12

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	1033.	280.	48.
10.	157.	150.	884.	290.	48.
20.	157.	160.	752.	300.	48.
30.	404.	170.	554.	310.	0.
40.	647.	180.	356.	320.	0.
50.	793.	190.	273.		
60.	915.	200.	258.		
70.	1058.	210.	174.		
80.	1238.	220.	157.		
90.	1629.	230.	100.		
100.	1989.	240.	48.		
110.	1678.	250.	48.		
120.	1403.	260.	48.		
130.	1223.	270.	48.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 12

Area= 4.69

Rainfall distribution is 6-hour 11.5

= .20 DTHETA= .20 PSIF= **** XKSAT= .02RTIMP= 10.0

enix Valley S-graph was selected.

Lag Time = 100.5 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 13

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	0.		
10.	202.				
20.	764.				
30.	1151.				
40.	1888.				
50.	1770.				
60.	1201.				
70.	758.				
80.	335.				
90.	207.				
100.	78.				
110.	55.				
120.	55.				
130.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 13

Area= 2.19

Rainfall distribution is 6-hour 11.5

.20 DTHETA= .20 PSIF= **** XKSAT= .02RTIMP= 10.0

enix Valley S-graph was selected.

Lag Time = 41.1 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 14

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	413.	280.	51.
10.	105.	150.	351.	290.	51.
20.	105.	160.	292.	300.	51.
30.	319.	170.	257.	310.	30.
40.	493.	180.	237.	320.	20.
50.	662.	190.	209.	330.	20.
60.	782.	200.	172.	340.	20.
70.	939.	210.	135.	350.	20.
80.	1220.	220.	127.	360.	20.
90.	808.	230.	115.	370.	20.
100.	654.	240.	97.	380.	20.
110.	588.	250.	80.	390.	20.
120.	523.	260.	80.	400.	20.
130.	468.	270.	55.	410.	0.

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 14

Area= 2.76 31

Rainfall distribution is 6-hour 5.4

TA= .15 DTHETA= .29 PSIF= 5.70 XKSAT= .18 RTIMP= .0 0.19

Phenix Mountain S-graph was selected

Lag Time = 88.6 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 15

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	1099.	280.	44.
10.	142.	150.	939.	290.	44.
20.	142.	160.	811.	300.	44.
30.	308.	170.	694.	310.	44.
40.	536.	180.	564.	320.	44.
50.	680.	190.	375.	330.	0.
60.	787.	200.	251.	340.	0.
70.	886.	210.	237.		
80.	1033.	220.	207.		
90.	1211.	230.	142.		
100.	1598.	240.	142.		
110.	1802.	250.	63.		
120.	1460.	260.	44.		
130.	1245.	270.	44.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 15

Area= 4.57
Rainfall distribution is 6-hour
.15 DTHETA= .30 PSIF= 4.40 XKSAT= .22RTIMP= .0
enix Valley S-graph was selected.
Lag Time = 108.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 16

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	838.	280.	177.
10.	161.	150.	768.	290.	146.
20.	161.	160.	690.	300.	124.
30.	323.	170.	631.	310.	124.
40.	572.	180.	543.	320.	108.
50.	837.	190.	468.	330.	79.
60.	1029.	200.	410.	340.	79.
70.	1184.	210.	383.	350.	79.
80.	1336.	220.	356.	360.	79.
90.	1710.	230.	319.	370.	64.
100.	1762.	240.	265.	380.	31.
110.	1177.	250.	221.	390.	31.
120.	1005.	260.	206.	400.	31.
130.	923.	270.	182.	410.	31.

UNIT HYDROGRAPH FOR BASIN: 16

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
420.	31.				
430.	31.				
440.	31.				
450.	31.				
460.	31.				
470.	31.				
480.	31.				
490.	31.				
500.	0.				
510.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 16

Area= ~~5.14~~ 5.23 0.25
Rainfall distribution is 6-hour
IA= .17 DTHETA= .27 PSIF= 6.60 XKSAT= .15RTIMP= 4.2
Phoenix Mountain S-graph was selected
Lag Time = 107.3 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 17

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	859.	280.	177.
10.	170.	150.	787.	290.	130.
20.	170.	160.	703.	300.	130.
30.	357.	170.	631.	310.	129.
40.	626.	180.	550.	320.	83.
50.	907.	190.	462.	330.	83.
60.	1101.	200.	419.	340.	83.
70.	1269.	210.	393.	350.	83.
80.	1459.	220.	359.	360.	79.
90.	1896.	230.	299.	370.	33.
100.	1692.	240.	263.	380.	33.
110.	1191.	250.	217.	390.	33.
120.	1033.	260.	206.	400.	33.
130.	950.	270.	186.	410.	33.

UNIT HYDROGRAPH FOR BASIN: 17

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
420.	33.				
430.	33.				
440.	33.				
450.	33.				
460.	33.				
470.	33.				
480.	33.				
490.	0.				
500.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 17

Area= 5.30 ✓
Rainfall distribution is 6-hour
IA= .17 ✓ DTHETA= .29 ✓ PSIF= 6.00 ✓ XKSAT= .17 ✓ RTIMP= ~~3.3~~ 3.7
Phoenix Mountain S-graph was selected
Lag Time = 105.0 ✓ min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 18

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	275.	280.	30.
10.	156.	150.	207.	290.	0.
20.	329.	160.	178.	300.	0.
30.	752.	170.	149.		
40.	1069.	180.	120.		
50.	1371.	190.	96.		
60.	1642.	200.	76.		
70.	1028.	210.	76.		
80.	863.	220.	49.		
90.	735.	230.	30.		
100.	619.	240.	30.		
110.	490.	250.	30.		
120.	392.	260.	30.		
130.	345.	270.	30.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 18

Area= 2.90 ✓ 0.23

Rainfall distribution is 6-hour 7.1

N= .19 ✓ DTHETA= ~~.25~~ PSIF= ~~7.00~~ XKSAT= ~~.13~~ 0.12 RTIMP= 7.5

Phoenix Mountain S-graph was selected

Lag Time = 62.6 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 19

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	1207.	280.	40.
10.	131.	150.	1071.	290.	40.
20.	131.	160.	946.	300.	40.
30.	201.	170.	823.	310.	40.
40.	458.	180.	719.	320.	40.
50.	572.	190.	626.	330.	40.
60.	670.	200.	510.	340.	40.
70.	753.	210.	358.	350.	40.
80.	849.	220.	232.	360.	0.
90.	971.	230.	222.	370.	0.
100.	1128.	240.	215.		
110.	1451.	250.	141.		
120.	1695.	260.	131.		
130.	1410.	270.	121.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 19

Area= 4.67 ✓ 10.28

Rainfall distribution is 6-hour 5.1

.16 ✓ DTHETA= .29 PSIF= ~~5.70~~ XKSAT= ~~.18~~ 0.20 RTIMP= 3.7

Phoenix Valley S-graph was selected.

Lag Time = 120.3 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 20

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	821.	280.	29.
10.	96.	150.	729.	290.	29.
20.	96.	160.	627.	300.	29.
30.	172.	170.	548.	310.	29.
40.	343.	180.	472.	320.	29.
50.	437.	190.	396.	330.	29.
60.	506.	200.	283.	340.	29.
70.	568.	210.	171.	350.	0.
80.	648.	220.	163.	360.	0.
90.	742.	230.	157.		
100.	909.	240.	103.		
110.	1190.	250.	96.		
120.	1146.	260.	81.		
130.	942.	270.	29.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 20

Area= ~~3.28~~ 3.19
Rainfall distribution is 6-hour 3.6
= .15 DTHETA= .31 0.33 PSIF= 4.10 XKSAT= .23 0.27 RTIMP= .0
Phoenix Valley S-graph was selected.
Lag Time = 115.3 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 21

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	729.	280.	96.
10.	174.	150.	646.	290.	85.
20.	174.	160.	553.	300.	85.
30.	483.	170.	451.	310.	85.
40.	769.	180.	416.	320.	63.
50.	1067.	190.	384.	330.	33.
60.	1257.	200.	330.	340.	33.
70.	1462.	210.	277.	350.	33.
80.	1964.	220.	222.	360.	33.
90.	1587.	230.	207.	370.	33.
100.	1156.	240.	190.	380.	33.
110.	1019.	250.	160.	390.	33.
120.	914.	260.	133.	400.	33.
130.	827.	270.	133.	410.	33.

UNIT HYDROGRAPH FOR BASIN: 21

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
420.	33.				
430.	0.				
440.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 21

Area= 4.77 ✓ 0.25 7.0 0.13
Rainfall distribution is 6-hour
IA= .17 ✓ DTHETA= .26 PSIF= 7.10 XKSAT= .12 RTIMP= 4.8
Phoenix Mountain S-graph was selected
Lag Time = 92.3 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 22

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	154.		
10.	154.	150.	70.		
20.	351.	160.	47.		
30.	697.	170.	47.		
40.	899.	180.	47.		
50.	1141.	190.	0.		
60.	1674.	200.	0.		
70.	1743.				
80.	1307.				
90.	1027.				
100.	791.				
110.	536.				
120.	275.				
130.	228.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 22

Area= 2.90 .30 4.4 0.22
Rainfall distribution is 6-hour
= .16 DTHETA= .29 PSIF= 5.10 XKSAT= .20 RTIMP= 2.1
Phoenix Valley S-graph was selected.
Lag Time = 63.6 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

UNIT HYDROGRAPH FOR BASIN: 23

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	39.		
10.	26.	150.	26.		
20.	52.	160.	14.		
30.	112.	170.	8.		
40.	145.	180.	8.		
50.	180.	190.	8.		
60.	237.	200.	8.		
70.	327.	210.	0.		
80.	256.	220.	0.		
90.	206.				
100.	163.				
110.	127.				
120.	82.				
130.	46.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 23

Area= .54 0.29
Rainfall distribution is 6-hour
= .17 DTHETA= .30 PSIF= 4.40 XKSAT= .22 0.23 RTIMP= 3.8
Phoenix Valley S-graph was selected.
Lag Time = 68.6 28.7 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: BS6OUT

Stop - Program terminated.

```
*************************************************************************
*                                                                       *
*                          PROGRAM MCUHP2                               *
*                                                                       *
*                   THE MARICOPA COUNTY HYDROLOGY MANUAL                *
*                                                                       *
*                                                                       *
*                 FLOOD CONTROL DISTRICT OF MARICOPA COUNTY             *
*                  3335 W. DURANGO, PHOENIX, ARIZONA 85009              *
*                                                                       *
*   Program MCUHP2, Maricopa County Unit Hydrograph Procedure2 provides the *
*   Unit-graph from the Phoenix Mountain or the Phoenix Valley S-graph. *
*   It will also provide the rainfall pattern distribution.  Output will be *
*   presented in the form of a HEC-1 input file for immediate application. *
*                                                                       *
*************************************************************************
```

UNIT HYDROGRAPH FOR BASIN: 101

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	0.		
10.	88.				
20.	357.				
30.	535.				
40.	824.				
50.	963.				
60.	651.				
70.	446.				
80.	219.				
90.	127.				
100.	68.				
110.	27.				
120.	27.				
130.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= .99

INPUT DATA FOR SUB-BASIN: 101

Area= 1.13, Point rainfall depth= 4.5, Reduction coefficient= 1.00
Rainfall distribution is 24-hour, SCS Type II
IA= .17 DTHETA= .29 PSIF= 6.30 XKSAT= .16RTIMP= 3.9
Phoenix Valley S-graph was selected.
Lag Time = 43.3 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

--- ENTER

UNIT HYDROGRAPH FOR BASIN: 102

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	37.		
10.	186.	150.	29.		
20.	708.	160.	29.		
30.	1205.	170.	29.		
40.	1443.	180.	0.		
50.	870.	190.	0.		
60.	671.				
70.	476.				
80.	352.				
90.	246.				
100.	179.				
110.	128.				
120.	90.				
130.	75.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 102

Area= 1.75 11.5
Rainfall distribution is 24-hour, SCS Type II
[illegible] .20 DTHETA= .20 PSIF= **** XKSAT= .02RTIMP= 10.0
[illegible]enix Mountain S-graph was selected
Lag Time = 38.5 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 103

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	14.		
10.	99.	150.	14.		
20.	375.	160.	14.		
30.	660.	170.	0.		
40.	543.	180.	0.		
50.	364.				
60.	264.				
70.	178.				
80.	127.				
90.	85.				
100.	61.				
110.	41.				
120.	33.				
130.	14.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 103

Area= .75

Rainfall distribution is 24-hour, SCS Type II

.20 DTHETA= .20 PSIF= **** XKSAT= .02RTIMP= 10.0

nix Mountain S-graph was selected

Lag Time = 34.8 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 104

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	53.		
10.	53.	150.	27.		
20.	119.	160.	16.		
30.	237.	170.	16.		
40.	306.	180.	16.		
50.	388.	190.	16.		
60.	564.	200.	0.		
70.	603.	210.	0.		
80.	451.				
90.	355.				
100.	274.				
110.	188.				
120.	98.				
130.	80.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 104

Area= 1.00
Rainfall distribution is 24-hour, SCS Type II
.17 DTHETA= .30 PSIF= 6.00 XKSAT= .17RTIMP= 3.3
nix Valley S-graph was selected.
Lag Time = 63.9 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 105

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	45.		
10.	62.	150.	30.		
20.	216.	160.	30.		
30.	411.	170.	13.		
40.	590.	180.	12.		
50.	527.	190.	12.		
60.	354.	200.	12.		
70.	286.	210.	12.		
80.	223.	220.	0.		
90.	163.	230.	0.		
100.	135.				
110.	94.				
120.	74.				
130.	57.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 105

Area= .87

11.5

Rainfall distribution is 24-hour, SCS Type II

IA= .20 DTHETA= .20 PSIF= **** XKSAT= .02RTIMP= 10.0

Phoenix Mountain S-graph was selected

Lag Time = 47.0 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 106

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	0.		
10.	116.	150.	0.		
20.	433.				
30.	666.				
40.	951.				
50.	1368.				
60.	979.				
70.	696.				
80.	450.				
90.	207.				
100.	139.				
110.	66.				
120.	35.				
130.	35.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 106

Area= 1.59
Rainfall distribution is 24-hour, SCS Type II
IA= .16 DTHETA= .32 PSIF= 4.70 XKSAT= .21RTIMP= 1.9
Phoenix Valley S-graph was selected.
Time = 46.4 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 107

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	164.	280.	0.
10.	129.	150.	141.		
20.	321.	160.	106.		
30.	688.	170.	95.		
40.	946.	180.	63.		
50.	1346.	190.	63.		
60.	1040.	200.	47.		
70.	756.	210.	25.		
80.	637.	220.	25.		
90.	530.	230.	25.		
100.	420.	240.	25.		
110.	324.	250.	25.		
120.	283.	260.	25.		
130.	217.	270.	0.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 107

Area= 2.19 11.5

Rainfall distribution is 24-hour, SCS Type II

IA= .20 DTHETA= .20 PSIF= **** XKSAT= .02RTIMP= 10.0

Phoenix Mountain S-graph was selected

Lag Time = 57.3 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 108

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	55.		
10.	63.	150.	45.		
20.	197.	160.	31.		
30.	391.	170.	31.		
40.	537.	180.	15.		
50.	628.	190.	12.		
60.	389.	200.	12.		
70.	318.	210.	12.		
80.	258.	220.	12.		
90.	193.	230.	12.		
100.	152.	240.	0.		
110.	123.	250.	0.		
120.	89.				
130.	72.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 108

Area= .94

Rainfall distribution is 24-hour, SCS Type II

IA= .19 DTHETA= .24 PSIF= 8.10 XKSAT= .08RTIMP= 7.5

Phoenix Mountain S-graph was selected

Lag Time = 50.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 109

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.				
10.	165.				
20.	572.				
30.	877.				
40.	1434.				
50.	1047.				
60.	688.				
70.	323.				
80.	170.				
90.	74.				
100.	39.				
110.	39.				
120.	0.				
130.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 109

Area= 1.40
Rainfall distribution is 24-hour, SCS Type II
.15 DTHETA= .34 PSIF= 4.10 XKSAT= .23RTIMP= .8
Phoenix Valley S-graph was selected.
Lag Time = 37.6 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 110

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	45.		
10.	95.	150.	33.		
20.	377.	160.	18.		
30.	653.	170.	18.		
40.	946.	180.	18.		
50.	597.	190.	18.		
60.	464.	200.	0.		
70.	359.	210.	0.		
80.	255.				
90.	204.				
100.	140.				
110.	107.				
120.	79.				
130.	59.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 110

Area= 1.16 11.5
Rainfall distribution is 24-hour, SCS Type II
.20 DTHETA= .20 PSIF= **** XKSAT= .02RTIMP= 9.9
Phoenix Mountain S-graph was selected
Lag Time = 42.6 min., Hydrograph Time Step= 10min.

41.7 HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 111

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	76.		
10.	130.	150.	64.		
20.	488.	160.	43.		
30.	885.	170.	25.		
40.	1322.	180.	25.		
50.	963.	190.	25.		
60.	708.	200.	25.		
70.	565.	210.	0.		
80.	424.	220.	0.		
90.	317.				
100.	250.				
110.	177.				
120.	143.				
130.	100.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

1.71 INPUT DATA FOR SUB-BASIN: 111

Area= 1.75 0.20 1.5 0.02 9.9
Rainfall distribution is 24-hour, SCS Type II
IA= .20 DTHETA= .32 PSIF= 6.60 XKSAT= .15 RTIMP= 9.7
Phoenix Mountain S-graph was selected
Time = 45.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 112

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	403.		
10.	190.	150.	320.		
20.	293.	160.	237.		
30.	732.	170.	190.		
40.	973.	180.	78.		
50.	1165.	190.	58.		
60.	1433.	200.	58.		
70.	1953.	210.	58.		
80.	2348.	220.	58.		
90.	1800.	230.	0.		
100.	1489.	240.	0.		
110.	1201.				
120.	970.				
130.	710.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 112

Area= 4.33

Rainfall distribution is 24-hour, SCS Type II

[illegible].17 DTHETA= .28 PSIF= 6.80 XKSAT= .14 RTIMP= 4.7

[illegible]nix Valley S-graph was selected.

Lag Time = 76.7 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 113

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	620.	280.	0.
10.	125.	150.	475.		
20.	125.	160.	288.		
30.	418.	170.	216.		
40.	568.	180.	197.		
50.	688.	190.	125.		
60.	802.	200.	120.		
70.	958.	210.	38.		
80.	1274.	220.	38.		
90.	1571.	230.	38.		
100.	1281.	240.	38.		
110.	1065.	250.	38.		
120.	905.	260.	38.		
130.	753.	270.	0.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 113

Area= 3.31

Rainfall distribution is 24-hour, SCS Type II

.16 DTHETA= .32 PSIF= 4.70 XKSAT= .21RTIMP= 1.8

enix Valley S-graph was selected.

Lag Time = 89.2 min., Hydrograph Time Step= 10min.

77.6

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 114

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	98.		
10.	173.	150.	85.		
20.	653.	160.	53.		
30.	1180.	170.	33.		
40.	1765.	180.	33.		
50.	1262.	190.	33.		
60.	936.	200.	33.		
70.	746.	210.	0.		
80.	556.	220.	0.		
90.	419.				
100.	328.				
110.	231.				
120.	185.				
130.	133.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 114

Area= 2.32 ✓ 11.5

Rainfall distribution is 24-hour, SCS Type II

= .20 DTHETA= .20 PSIF= **** XKSAT= .02RTIMP= 10.0

Phoenix Mountain S-graph was selected

Lag Time = 45.0 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 115

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	42.		
10.	136.	150.	42.		
20.	397.	160.	42.		
30.	696.	170.	0.		
40.	908.	180.	0.		
50.	1312.				
60.	1578.				
70.	1137.				
80.	853.				
90.	620.				
100.	317.				
110.	222.				
120.	136.				
130.	61.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 115

Area= 2.20

Rainfall distribution is 24-hour, SCS Type II

IA= .16 DTHETA= .32 PSIF= 4.70 XKSAT= .21RTIMP= 1.8

Phoenix Valley S-graph was selected.

Time = 54.6 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 116

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	124.	280.	0.
10.	94.	150.	106.		
20.	231.	160.	83.		
30.	499.	170.	72.		
40.	688.	180.	48.		
50.	969.	190.	46.		
60.	795.	200.	41.		
70.	561.	210.	18.		
80.	474.	220.	18.		
90.	395.	230.	18.		
100.	319.	240.	18.		
110.	241.	250.	18.		
120.	211.	260.	18.		
130.	167.	270.	0.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 116

Area= ~~1.62~~ 1.66 → 11.5
Rainfall distribution is 24-hour, SCS Type II
.20 DTHETA= .20 PSIF= **** XKSAT= .02RTIMP= 9.9
nix Mountain S-graph was selected
Lag Time = 57.9 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 117

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	228.		
10.	229.	150.	175.		
20.	679.	160.	128.		
30.	1373.	170.	112.		
40.	1867.	180.	90.		
50.	2373.	190.	44.		
60.	1460.	200.	44.		
70.	1194.	210.	44.		
80.	978.	220.	44.		
90.	765.	230.	44.		
100.	573.	240.	0.		
110.	493.	250.	0.		
120.	349.				
130.	276.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 117

Area= 3.51 ✓ 0.25 7.10 0.12
Rainfall distribution is 24-hour, SCS Type II
[illegible] .19✓ DTHETA= .26 PSIF= ~~7.00~~ XKSAT= .13 RTIMP= 6.3✓
Phoenix Mountain S-graph was selected
Lag Time = 51.7 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 118

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	203.		
10.	183.	150.	153.		
20.	509.	160.	131.		
30.	1060.	170.	90.		
40.	1432.	180.	90.		
50.	1970.	190.	53.		
60.	1237.	200.	35.		
70.	999.	210.	35.		
80.	827.	220.	35.		
90.	666.	230.	35.		
100.	498.	240.	35.		
110.	419.	250.	0.		
120.	331.	260.	0.		
130.	242.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 118

Area= 2.92 0.25 7.80 0.09

Rainfall distribution is 24-hour, SCS Type II

.19 DTHETA= .25 PSIF= 7.50 XKSAT= .10RTIMP= 6.3

nix Mountain S-graph was selected

Lag Time = 53.6 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 119

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	34.		
10.	111.	150.	34.		
20.	301.	160.	34.		
30.	549.	170.	34.		
40.	709.	180.	0.		
50.	967.	190.	0.		
60.	1352.				
70.	1011.				
80.	776.				
90.	583.				
100.	377.				
110.	192.				
120.	146.				
130.	96.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 119

Area= 1.89 0.31 4.7 0.21 1.6
Rainfall distribution is 24-hour, SCS Type II
.17 DTHETA= .28 PSIF= 6.60 XKSAT= .15RTIMP= 3.2
Phoenix Valley S-graph was selected.
Lag Time = 57.3 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 120

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	0.		
10.	240.				
20.	908.				
30.	1367.				
40.	2240.				
50.	2108.				
60.	1431.				
70.	904.				
80.	400.				
90.	247.				
100.	94.				
110.	65.				
120.	65.				
130.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 120

Area= 2.61 0.28 5.7 0.18

Rainfall distribution is 24-hour, SCS Type II 2.3

.16 DTHETA= ~~.31~~ PSIF= ~~4.40~~ XKSAT= ~~.22~~ RTIMP= ~~1.6~~

nix Valley S-graph was selected.

Lag Time = 41.1 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 121

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	706.	280.	84.
10.	172.	150.	622.	290.	84.
20.	172.	160.	520.	300.	84.
30.	490.	170.	439.	310.	84.
40.	774.	180.	405.	320.	43.
50.	1064.	190.	371.	330.	33.
60.	1252.	200.	308.	340.	33.
70.	1470.	210.	258.	350.	33.
80.	1972.	220.	219.	360.	33.
90.	1487.	230.	196.	370.	33.
100.	1119.	240.	188.	380.	33.
110.	993.	250.	141.	390.	33.
120.	891.	260.	132.	400.	33.
130.	801.	270.	127.	410.	33.

UNIT HYDROGRAPH FOR BASIN: 121

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
420.	33.				
430.	0.				
440.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 121

Area= 4.65

Rainfall distribution is 24-hour, SCS Type II

IA= .19 DTHETA= .23 PSIF= 8.30 XKSAT= .07RTIMP= 7.3

Phoenix Mountain S-graph was selected

Lag Time = 91.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 122

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	1157.		
10.	254.	150.	808.		
20.	260.	160.	454.		
30.	890.	170.	421.		
40.	1184.	180.	311.		
50.	1425.	190.	254.		
60.	1681.	200.	138.		
70.	2025.	210.	78.		
80.	2766.	220.	78.		
90.	3132.	230.	78.		
100.	2441.	240.	78.		
110.	2059.	250.	78.		
120.	1707.	260.	0.		
130.	1420.	270.	0.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

7.57 INPUT DATA FOR SUB-BASIN: 122

Area= ~~6.52~~ 2.4 7.5 0.10

Rainfall distribution is 24-hour, SCS Type II

.17 DTHETA= .25 PSIF= ~~7.30~~ XKSAT= .11 RTIMP= 3.9

Phoenix Valley S-graph was selected.

Lag Time = ~~86.5~~ 90.0 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 123

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	195.		
10.	131.	150.	131.		
20.	257.	160.	71.		
30.	557.	170.	40.		
40.	722.	180.	40.		
50.	895.	190.	40.		
60.	1178.	200.	40.		
70.	1622.	210.	0.		
80.	1272.	220.	0.		
90.	1021.				
100.	807.				
110.	631.				
120.	407.				
130.	228.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

1.33 INPUT DATA FOR SUB-BASIN: 123

Area= ~~2.66~~ .29
Rainfall distribution is 24-hour, SCS Type II
A= .16 DTHETA= .30 PSIF= 5.40 XKSAT= .19RTIMP= ~~.2~~ 0.18
Phoenix Valley S-graph was selected.
Lag Time = 68.6 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 124

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	1072.	280.	143.
10.	291.	150.	891.	290.	143.
20.	310.	160.	743.	300.	77.
30.	935.	170.	684.	310.	56.
40.	1447.	180.	621.	320.	56.
50.	1902.	190.	495.	330.	56.
60.	2232.	200.	407.	340.	56.
70.	2817.	210.	365.	350.	56.
80.	3198.	220.	319.	360.	56.
90.	2063.	230.	286.	370.	56.
100.	1746.	240.	223.	380.	56.
110.	1564.	250.	223.	390.	56.
120.	1396.	260.	161.	400.	0.
130.	1225.	270.	143.	410.	0.

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 124

Area= 7.40
Rainfall distribution is 24-hour, SCS Type II
.18 DTHETA= .26 PSIF= 7.30 XKSAT= .11RTIMP= 5.9
nix Mountain S-graph was selected
Lag Time = 85.5 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 125

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	1655.	280.	345.
10.	327.	150.	1518.	290.	251.
20.	327.	160.	1354.	300.	251.
30.	683.	170.	1220.	310.	251.
40.	1198.	180.	1060.	320.	163.
50.	1739.	190.	893.	330.	160.
60.	2113.	200.	807.	340.	160.
70.	2435.	210.	756.	350.	160.
80.	2796.	220.	694.	360.	158.
90.	3623.	230.	581.	370.	63.
100.	3286.	240.	510.	380.	63.
110.	2297.	250.	418.	390.	63.
120.	1990.	260.	398.	400.	63.
130.	1832.	270.	358.	410.	63.

UNIT HYDROGRAPH FOR BASIN: 125

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
420.	63.				
430.	63.				
440.	63.				
450.	63.				
460.	63.				
470.	63.				
480.	63.				
490.	0.				
500.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 125

Area= 10.22
Rainfall distribution is 24-hour, SCS Type II
IA= .18 DTHETA= .26 PSIF= 7.30 XKSAT= .11 RTIMP= 6.0
Phoenix Mountain S-graph was selected
Lag Time = 105.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 126

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	3581.	280.	322.
10.	322.	150.	3070.	290.	322.
20.	322.	160.	2737.	300.	189.
30.	322.	170.	2468.	310.	99.
40.	1051.	180.	2162.	320.	99.
50.	1302.	190.	1925.	330.	99.
60.	1541.	200.	1677.	340.	99.
70.	1759.	210.	1511.	350.	99.
80.	1929.	220.	1167.	360.	99.
90.	2161.	230.	866.	370.	99.
100.	2454.	240.	571.	380.	99.
110.	2843.	250.	552.	390.	99.
120.	3582.	260.	530.	400.	0.
130.	4207.	270.	401.	410.	0.

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 126

Area= ~~12.59~~ 12.62
Rainfall distribution is 24-hour, SCS Type II
= .16 DTHETA= .33 PSIF= 3.70 XKSAT= .28RTIMP= 1.2
Phoenix Valley S-graph was selected.
Lag Time = 131.5 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 127

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.				
10.	1253.				
20.	3726.				
30.	2174.				
40.	1171.				
50.	602.				
60.	310.				
70.	159.				
80.	82.				
90.	0.				
100.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= .99

INPUT DATA FOR SUB-BASIN: 127

Area= 2.47 ✓ 7.1 0.12 15.5
Rainfall distribution is 24-hour, SCS Type II
IA= .18 ✓ DTHETA= .27 ✓ PSIF= ~~7.00~~ XKSAT= ~~.13~~RTIMP= 5.1
Phoenix Mountain S-graph was selected
Lag Time = ~~19.3~~ 43.8 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 128

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	758.	280.	96.
10.	197.	150.	640.	290.	96.
20.	197.	160.	525.	300.	90.
30.	616.	170.	472.	310.	38.
40.	943.	180.	434.	320.	38.
50.	1259.	190.	369.	330.	38.
60.	1482.	200.	305.	340.	38.
70.	1814.	210.	251.	350.	38.
80.	2259.	220.	227.	360.	38.
90.	1455.	230.	215.	370.	38.
100.	1206.	240.	161.	380.	38.
110.	1084.	250.	151.	390.	38.
120.	967.	260.	139.	400.	38.
130.	856.	270.	96.	410.	0.

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 128

Area= 5.10
Rainfall distribution is 24-hour, SCS Type II
= .18 DTHETA= .27 PSIF= 7.00 XKSAT= .13RTIMP= 5.1
nix Mountain S-graph was selected
Lag Time = 87.4 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 129

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	296.		
10.	169.	150.	266.		
20.	283.	160.	169.		
30.	671.	170.	121.		
40.	886.	180.	52.		
50.	1072.	190.	52.		
60.	1330.	200.	52.		
70.	1902.	210.	52.		
80.	1968.	220.	52.		
90.	1511.	230.	0.		
100.	1241.	240.	0.		
110.	993.				
120.	789.				
130.	511.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 129

Area= 3.73
Rainfall distribution is 24-hour, SCS Type II
.16 DTHETA= .33 PSIF= 4.70 XKSAT= .21RTIMP= 1.6
Phenix Valley S-graph was selected.
Lag Time = 74.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 130

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	821.	280.	102.
10.	64.	150.	687.	290.	64.
20.	64.	160.	600.	300.	64.
30.	64.	170.	539.	310.	64.
40.	181.	180.	489.	320.	25.
50.	240.	190.	431.	330.	20.
60.	300.	200.	386.	340.	20.
70.	333.	210.	341.	350.	20.
80.	368.	220.	305.	360.	20.
90.	406.	230.	256.	370.	20.
100.	459.	240.	188.	380.	20.
110.	510.	250.	125.	390.	20.
120.	613.	260.	113.	400.	20.
130.	768.	270.	105.	410.	20.

UNIT HYDROGRAPH FOR BASIN: 130

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
420.	0.				
430.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 130

Area= 2.65

Rainfall distribution is 24-hour, SCS Type II

IA= .15 DTHETA= .35 PSIF= ~~4.10~~ 4.0 XKSAT= .35RTIMP= .0

Phoenix Valley S-graph was selected.

Lag Time = 139.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 201

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	816.	280.	106.
10.	217.	150.	689.	290.	106.
20.	222.	160.	560.	300.	77.
30.	691.	170.	515.	310.	42.
40.	1060.	180.	470.	320.	42.
50.	1404.	190.	387.	330.	42.
60.	1649.	200.	319.	340.	42.
70.	2051.	210.	277.	350.	42.
80.	2439.	220.	241.	360.	42.
90.	1572.	230.	230.	370.	42.
100.	1314.	240.	166.	380.	42.
110.	1183.	250.	166.	390.	42.
120.	1050.	260.	136.	400.	0.
130.	928.	270.	106.	410.	0.

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 201

Area= 5.57

Rainfall distribution is 24-hour, SCS Type II

.18 DTHETA= .28 PSIF= 6.80 XKSAT= .14RTIMP= 4.9

enix Mountain S-graph was selected

Lag Time = 86.4 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 202

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	770.		
10.	288.	150.	501.		
20.	407.	160.	449.		
30.	1080.	170.	288.		
40.	1444.	180.	226.		
50.	1727.	190.	88.		
60.	2098.	200.	88.		
70.	2773.	210.	88.		
80.	3591.	220.	88.		
90.	2904.	230.	88.		
100.	2377.	240.	0.		
110.	1950.	250.	0.		
120.	1586.				
130.	1262.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 202

Area= 6.77
Rainfall distribution is 24-hour, SCS Type II
.17 DTHETA= .30 PSIF= 5.70 XKSAT= .18RTIMP= 3.1 .3
enix Valley S-graph was selected.
Lag Time = 79.1 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 203

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	231.	280.	22.
10.	114.	150.	176.	290.	22.
20.	222.	160.	144.	300.	22.
30.	523.	170.	125.	310.	0.
40.	761.	180.	97.	320.	0.
50.	948.	190.	88.		
60.	1269.	200.	62.		
70.	809.	210.	56.		
80.	661.	220.	56.		
90.	567.	230.	31.		
100.	484.	240.	22.		
110.	400.	250.	22.		
120.	312.	260.	22.		
130.	270.	270.	22.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 203

Area= 2.21 (0.10)
Rainfall distribution is 24-hour, SCS Type II
.18 DTHETA= .25 PSIF= 7.50 XKSAT= .11RTIMP= 6.6
enix Mountain S-graph was selected
Lag Time = 65.1 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 204

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	451.	280.	40.
10.	210.	150.	339.	290.	40.
20.	401.	160.	269.	300.	40.
30.	943.	170.	234.	310.	0.
40.	1384.	180.	195.	320.	0.
50.	1715.	190.	161.		
60.	2362.	200.	130.		
70.	1527.	210.	103.		
80.	1233.	220.	103.		
90.	1064.	230.	76.		
100.	909.	240.	40.		
110.	761.	250.	40.		
120.	596.	260.	40.		
130.	503.	270.	40.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 204

Area= 4.13
Rainfall distribution is 24-hour, SCS Type II
.19 DTHETA= .25 PSIF= 7.80 XKSAT= .09RTIMP= 7.0
enix Mountain S-graph was selected
Lag Time = 66.0 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 205

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	18.		
10.	59.	150.	18.		
20.	193.	160.	0.		
30.	317.	170.	0.		
40.	424.				
50.	666.				
60.	600.				
70.	439.				
80.	319.				
90.	195.				
100.	101.				
110.	69.				
120.	36.				
130.	18.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 205

Area= .90

Rainfall distribution is 24-hour, SCS Type II

= .15 DTHETA= .35 PSIF= 3.50 XKSAT= .25RTIMP= .0

enix Valley S-graph was selected.

Lag Time = 51.1 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 206

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	1250.	280.	119.
10.	104.	150.	1056.	290.	104.
20.	104.	160.	929.	300.	104.
30.	104.	170.	841.	310.	57.
40.	313.	180.	751.	320.	32.
50.	404.	190.	661.	330.	32.
60.	492.	200.	591.	340.	32.
70.	553.	210.	520.	350.	32.
80.	608.	220.	451.	360.	32.
90.	676.	230.	346.	370.	32.
100.	765.	240.	248.	380.	32.
110.	860.	250.	184.	390.	32.
120.	1084.	260.	175.	400.	32.
130.	1306.	270.	171.	410.	0.

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 206

Area= 4.19
Rainfall distribution is 24-hour, SCS Type II
= .15 DTHETA= .35 PSIF= 3.50 XKSAT= .25RTIMP= .0
enix Valley S-graph was selected.
Lag Time = 135.7 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 207

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	1094.	280.	290.
10.	109.	150.	1335.	290.	193.
20.	109.	160.	1406.	300.	191.
30.	109.	170.	1197.	310.	179.
40.	187.	180.	1054.	320.	179.
50.	369.	190.	956.	330.	118.
60.	437.	200.	878.	340.	109.
70.	515.	210.	802.	350.	109.
80.	567.	220.	716.	360.	95.
90.	621.	230.	651.	370.	33.
100.	671.	240.	587.	380.	33.
110.	741.	250.	526.	390.	33.
120.	824.	260.	465.	400.	33.

130. 913. 270. 368. 410. 33.

UNIT HYDROGRAPH FOR BASIN: 207

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
420.	33.				
430.	33.				
440.	33.				
450.	33.				
460.	33.				
470.	33.				
480.	0.				
490.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 207

Area= 5.18

Rainfall distribution is 24-hour, SCS Type II

IA= .15 DTHETA= .35 PSIF= 3.50 XKSAT= .25 RTIMP= .0

Phoenix Valley S-graph was selected.

Lag Time = 160.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 208

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	18.		
10.	60.	150.	18.		
20.	195.	160.	0.		
30.	321.	170.	0.		
40.	429.				
50.	672.				
60.	611.				
70.	447.				
80.	325.				
90.	200.				
100.	103.				
110.	70.				
120.	37.				
130.	18.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 208

Area= .91

Rainfall distribution is 24-hour, SCS Type II

[illegible]= .15 DTHETA= .32 PSIF= 5.40 XKSAT= .19RTIMP= .0

[illegible]nix Valley S-graph was selected.

Lag Time = 51.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 209

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	781.	280.	430.
10.	95.	150.	925.	290.	359.
20.	95.	160.	1102.	300.	274.
30.	95.	170.	1260.	310.	203.
40.	95.	180.	1122.	320.	169.
50.	309.	190.	985.	330.	164.
60.	353.	200.	885.	340.	157.
70.	417.	210.	813.	350.	157.
80.	462.	220.	756.	360.	98.
90.	516.	230.	691.	370.	95.
100.	550.	240.	624.	380.	95.
110.	596.	250.	570.	390.	95.
120.	651.	260.	519.	400.	33.
130.	719.	270.	472.	410.	29.

UNIT HYDROGRAPH FOR BASIN: 209

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
420.	29.				
430.	29.				
440.	29.				
450.	29.				
460.	29.				
470.	29.				
480.	29.				
490.	29.				
500.	29.				
510.	29.				
520.	29.				
530.	0.				
540.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 209

Area= 4.94
Rainfall distribution is 24-hour, SCS Type II
IA= .15 DTHETA= .35 PSIF= 3.60 XKSAT= .26RTIMP= .0
Phoenix Valley S-graph was selected.
Lag Time = 174.7 min., Hydrograph Time Step= 10min.

103.0

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 210

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	2579.	280.	258.
10.	259.	150.	2263.	290.	79.
20.	259.	160.	2039.	300.	79.
30.	331.	170.	1773.	310.	79.
40.	886.	180.	1567.	320.	79.
50.	1091.	190.	1364.	330.	79.
60.	1291.	200.	1216.	340.	79.
70.	1453.	210.	927.	350.	79.
80.	1615.	220.	669.	360.	79.
90.	1841.	230.	459.	370.	79.
100.	2078.	240.	438.	380.	0.
110.	2603.	250.	426.	390.	0.
120.	3259.	260.	278.		
130.	3090.	270.	259.		

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

2.70 INPUT DATA FOR SUB-BASIN: 210

Area= ~~9.64~~

Rainfall distribution is 24-hour, SCS Type II

[illegible]= .15 DTHETA= .34 PSIF= 3.70 XKSAT= .29RTIMP= .0

[illegible]nix Valley S-graph was selected.

Lag Time = 125.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 211

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	2332.	280.	371.
10.	209.	150.	2717.	290.	368.
20.	209.	160.	2476.	300.	344.
30.	209.	170.	2137.	310.	344.
40.	419.	180.	1911.	320.	219.
50.	729.	190.	1737.	330.	209.
60.	871.	200.	1597.	340.	209.
70.	1004.	210.	1421.	350.	157.
80.	1127.	220.	1286.	360.	64.
90.	1214.	230.	1154.	370.	64.
100.	1335.	240.	1037.	380.	64.
110.	1488.	250.	919.	390.	64.
120.	1626.	260.	733.	400.	64.
130.	1898.	270.	577.	410.	64.

UNIT HYDROGRAPH FOR BASIN: 211

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
420.	64.				
430.	64.				
440.	64.				
450.	64.				
460.	64.				
470.	0.				
480.	0.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 211

Area= 9.64
Rainfall distribution is 24-hour, SCS Type II
IA= .15 DTHETA= .35 PSIF= 3.50 XKSAT= .25RTIMP= .0
Phoenix Valley S-graph was selected.
Lag Time = 154.9 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

212

UNIT HYDROGRAPH FOR BASIN: ~~121~~

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	17.		
10.	55.	150.	0.		
20.	188.	160.	0.		
30.	303.				
40.	409.				
50.	645.				
60.	533.				
70.	391.				
80.	281.				
90.	151.				
100.	93.				
110.	55.				
120.	22.				
130.	17.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 121

Area= .82

Rainfall distribution is 24-hour, SCS Type II

[illegible]= .15 DTHETA= .35 PSIF= 3.50 XKSAT= .25RTIMP= .0

[illegible]nix Valley S-graph was selected.

Lag Time = 49.8 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 213

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	107.		
10.	91.	150.	78.		
20.	190.	160.	28.		
30.	398.	170.	28.		
40.	515.	180.	28.		
50.	643.	190.	28.		
60.	891.	200.	0.		
70.	1099.	210.	0.		
80.	825.				
90.	660.				
100.	515.				
110.	390.				
120.	210.				
130.	153.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 213

Area= 1.78

Rainfall distribution is 24-hour, SCS Type II

D= .15 DTHETA= .32 PSIF= 5.40 XKSAT= .19 RTIMP= .0

Phoenix Valley S-graph was selected.

Lag Time = 66.2 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 214

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	129.		
10.	73.	150.	120.		
20.	120.	160.	73.		
30.	287.	170.	59.		
40.	380.	180.	22.		
50.	458.	190.	22.		
60.	566.	200.	22.		
70.	803.	210.	22.		
80.	864.	220.	22.		
90.	660.	230.	0.		
100.	544.	240.	0.		
110.	436.				
120.	349.				
130.	236.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 214

Area= 1.62 0.34 4.7 0.21

Rainfall distribution is 24-hour, SCS Type II

.15 DTHETA= .35 PSIF= 4.30 XKSAT= .40 RTIMP= .0

Phenix Valley S-graph was selected.

Lag Time = 74.8 min., Hydrograph Time Step= 10min.

74.3 HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 215

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	92.		
10.	40.	150.	69.		
20.	60.	160.	54.		
30.	154.	170.	40.		
40.	205.	180.	22.		
50.	245.	190.	12.		
60.	299.	200.	12.		
70.	407.	210.	12.		
80.	500.	220.	12.		
90.	390.	230.	12.		
100.	321.	240.	0.		
110.	261.	250.	0.		
120.	211.				
130.	160.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 215

Area= .93
Rainfall distribution is 24-hour, SCS Type II
.15 DTHETA= .34 PSIF= 4.00 XKSAT= .35RTIMP= .0
Phoenix Valley S-graph was selected.
Lag Time = 77.5 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

UNIT HYDROGRAPH FOR BASIN: 216

TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)	TIME (min.)	DISCHARGE (cfs)
0.	0.	140.	171.		
10.	44.	150.	101.		
20.	52.	160.	75.		
30.	156.	170.	65.		
40.	212.	180.	44.		
50.	252.	190.	34.		
60.	301.	200.	13.		
70.	370.	210.	13.		
80.	522.	220.	13.		
90.	499.	230.	13.		
100.	395.	240.	13.		
110.	333.	250.	0.		
120.	273.	260.	0.		
130.	224.				

VOLUME OF CALCULATED HYDROGRAPH (Inches)= 1.00

INPUT DATA FOR SUB-BASIN: 216

Area= 1.09
Rainfall distribution is 24-hour, SCS Type II
.15 DTHETA= .33 PSIF= 3.70 XKSAT= .29RTIMP= .0
Phoenix Valley S-graph was selected.
Lag Time = 83.5 min., Hydrograph Time Step= 10min.

HEC-1 INPUT IS STORED IN FILE: STSOUT

Stop - Program terminated.

```
#0000801***************************************** ****************************************
 *                                              *                                          * *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)          *                                          *   U.S. ARMY CORPS OF ENGINEERS *
 *            SEPTEMBER 1990                    *                                          *   HYDROLOGIC ENGINEERING CENTER *
 *             VERSION 4.0                      *                                          *         609 SECOND STREET *
 *                                              *                                          *      DAVIS, CALIFORNIA 95616 *
 *  RUN DATE  08/21/1991  TIME  11:10:47        *                                          *          (916) 756-1104 *
 *                                              *                                          * *
 ***************************************** ****************************************
```

```
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      BENDER WASH HYDROLOGY FOR FLOOD INSURANCE STUDY
  2           ID      SOUTHEAST OF GILA BEND, MARICOPA COUNTY, ARIZONA
  3           ID      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  4           ID      RICE & GRANILLO   NOV., 1990/REV. APRIL, 1991
  5           ID
  6           ID      GREEN & AMPT LOSS RATE METHOD
  7           ID      S-GRAPH UNIT HYDROGRAPH METHOD
  8           ID      NORMAL DEPTH ROUTING
  9           ID
 10           ID      100-YEAR, 6-HOUR STORM
 11           ID
 12           ID       MAIN CHANNEL ROUTING - MANNINGS N : OVERBANKS - .08, CHANNEL - .035
 13           ID                            - LOSSES : 10 IN/HR
 14           ID
 15           ID       TRIBUTARY ROUTINGS   - MANNINGS N : OVERBANKS - .08, CHANNEL - .045
 16           ID                            - LOSSES : 5 IN/HR
 17           ID
 18           ID       INPUT FILE NAME      - BS6.DAT
 19           ID
              *DIAGRAM
 20           IT      10                     300
 21           IO       5
 22           IN      15
 23           JD    3.70     .01
 24           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 25           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 26           PC   0.962   0.972   0.983   0.991   1.000
 27           JD    3.67     0.5
 28           JD    3.61     2.8
 29           PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 30           PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
 31           PC   0.950   0.963   0.975   0.988   1.000
 32           JD    3.41    15.8
 33           PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
 34           PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
 35           PC   0.946   0.960   0.973   0.987   1.000
 36           JD    3.00    90.0
 37           PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
 38           PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
 39           PC   0.927   0.945   0.964   0.982   1.000
 40           JD    2.11   500.0
 41           PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
 42           PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
 43           PC   0.907   0.930   0.954   0.977   1.000
```

```
                *

 44             KK    SUB1
 45             KM   SUB-BASIN 1
 46             BA    2.10
 47             LG     .16     .34    3.70     .29     .80
 48             UI    103.    200.    436.    565.    701.    915.   1277.   1009.    809.    640.
 49             UI    504.    331.    180.    157.    103.     60.     31.     31.     31.     31.
 50             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 51             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *
1                                          HEC-1 INPUT                                          PAGE  2

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

 52             KK      R1
 53             KM      ROUTE SUB1 TO A
 54             RS       1    FLOW      -1
 55             RC     .08    .035     .08    3600    .004
 56             RX       0     100     200     205     265     270     370     470
 57             RY     4.0     3.0       2       0       0       2     3.0     4.0
 58             RL       0       0      10       0
                *

 59             KK    SUB2
 60             KM   SUB-BASIN 2
 61             BA    3.83
 62             LG     .15     .35    3.60     .27     .00
 63             UI    130.    130.    305.    522.    742.    886.   1009.   1239.   1524.    996.
 64             UI    826.    747.    675.    614.    544.    489.    422.    353.    317.    297.
 65             UI    272.    215.    186.    166.    147.    142.    112.    100.    100.     73.
 66             UI     64.     64.     64.     61.     25.     25.     25.     25.     25.     25.
 67             UI     25.     25.     25.     25.     25.      0.      0.      0.      0.      0.
 68             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *

 69             KK    SUB3
 70             KM   SUB-BASIN 3
 71             BA    2.10
 72             LG     .20     .25    7.00     .13    6.40
 73             UI    100.    169.    395.    620.    758.   1010.    954.    638.    553.    481.
 74             UI    411.    345.    274.    238.    214.    166.    129.    115.    103.     77.
 75             UI     74.     49.     49.     49.     27.     19.     19.     19.     19.     19.
 76             UI     19.     19.      0.      0.      0.      0.      0.      0.      0.      0.
 77             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *

 78             KK       A
 79             KM
 80             HC       3
                *

 81             KK      RA
 82             KM      ROUTE A TO B
 83             RS       1    FLOW      -1
 84             RC     .08    .035     .08    7100    .006
 85             RX       0     200     400     405     465     470     670     870
 86             RY       6       4       2       0       0       2       4       6
 87             RL       0       0      10       0
                *

 88             KK    SUB4
 89             KM   SUB-BASIN 4
 90             BA     .34
 91             LG     .15     .33    3.80     .24     .00
 92             UI     175     549     421     124      28       0       0       0       0       0
 93             UI       0       0       0       0       0       0       0       0       0       0
                *
1                                          HEC-1 INPUT                                          PAGE  3

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

 94             KK      R4
 95             KM      ROUTE SUB4 TO B
 96             RS       1    FLOW      -1
 97             RC     .08    .045     .08   36000    .019
 98             RX       0      50     100     105     135     140     190     240
 99             RY     3.5     2.5     1.5       0       0     1.5     2.5     3.5
100             RL       0       0       5       0
                *
```

```
101          KK    SUB5
102          KM   SUB-BASIN 5
103          BA    3.91
104          LG     .17     .28    6.30     .16    3.80
105          UI    152.    154.    483.    740.    983.   1154.   1431.   1718.   1107.    923.
106          UI    831.    738.    653.    575.    487.    394.    362.    331.    274.    226.
107          UI    194.    170.    164.    117.    117.     98.     74.     74.     74.     57.
108          UI     29.     29.     29.     29.     29.     29.     29.     29.     29.     29.
109          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
110          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

111          KK     CP5
112          KM
113          HC       2
             *

114          KK    SUB6
115          KM   SUB-BASIN 6
116          BA    5.55
117          LG     .18     .26    6.30     .16    7.00
118          UI    223.    262.    793.   1080.   1282.   1530.   1882.   2654.   2556.   2021.
119          UI   1705.   1397.   1148.    884.    524.    384.    335.    223.    178.     68.
120          UI     68.     68.     68.     68.      0.      0.      0.      0.      0.      0.
121          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

122          KK       B
123          KM
124          HC       3
             *

125          KK      RB
126          KM      ROUTE B TO C
127          RS       1    FLOW      -1
128          RC     .08    .035     .08    9500    .008
129          RX       0     200     400     412     507     522     722     922
130          RY     6.4     6.2     6.1       0     2.3     5.0     6.2     7.4
131          RL       0       0      10       0
             *
```



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

132          KK    SUB7
133          KM   SUB-BASIN 7
134          BA    3.78
135          LG     .19     .22    8.30     .07   10.70
136          UI    191.    360.    847.   1250.   1546.   2143.   1428.   1132.    977.    838.
137          UI    707.    551.    463.    415.    323.    247.    218.    186.    147.    127.
138          UI     94.     94.     79.     37.     37.     37.     37.     37.     37.     37.
139          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
140          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

141          KK      R7
142          KM      ROUTE SUB7 TO CPC
143          RS       1    FLOW      -1
144          RC     .08    .045     .08   20700   .0136
145          RX       0     200     400     416     535     550     750     950
146          RY     2.1     1.9     1.7       0       0     1.0     1.6     2.2
147          RL       0       0       5       0
             *

148          KK    SUB8
149          KM   SUB-BASIN 8
150          BA    6.77
151          LG     .18     .25    6.80     .14    7.10
152          UI    284.    365.    961.   1536.   1953.   2307.   3172.   2461.   1805.   1595.
153          UI   1408.   1233.   1075.    893.    727.    667.    602.    469.    378.    341.
154          UI    311.    244.    218.    193.    139.    139.    139.     93.     54.     54.
155          UI     54.     54.     54.     54.     54.     54.     54.      0.      0.      0.
156          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

157          KK     CP8
158          KM
159          HC       2
             *
```

```
160        KK    SUB9
161        KM   SUB-BASIN 9
162        BA     .62
163        LG     .20     .21   10.80     .04    9.20
164        UI     139     423     776     576     297     107      38      23       0       0
165        UI       0       0       0       0       0       0       0       0       0       0
           *

166        KK      R9
167        KM      ROUTE SUB9 TO CP10
168        RS       1    FLOW      -1
169        RC     .08    .045     .08   31000    .017
170        RX       0      50     100     106     136     142     192     242
171        RY     3.5     2.5     1.5       0       0     1.5     2.5     3.5
172        RL       0       0       5       0
           *
```



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

173        KK   SUB10
174        KM   SUB-BASIN 10
175        BA    4.11
176        LG     .15     .32    4.40     .22     .00
177        UI    140.    140.    334.    570.    810.    963.   1096.   1360.   1629.   1054.
178        UI    883.    802.    722.    656.    582.    519.    450.    370.    340.    317.
179        UI    286.    231.    192.    179.    154.    154.    112.    108.    108.     71.
180        UI     69.     69.     69.     55.     27.     27.     27.     27.     27.     27.
181        UI     27.     27.     27.     27.     27.      0.      0.      0.      0.      0.
182        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
           *

183        KK    CP10
184        KM
185        HC       2
           *

186        KK   RCP10
187        KM      ROUTE CP10 TO C
188        RS       1    FLOW      -1
189        RC     .08    .045     .08   29400    .018
190        RX       0      50     100     106     136     142     192     242
191        RY     3.5     2.5     1.5       0       0     1.5     2.5     3.5
192        RL       0       0       5       0
           *

193        KK   SUB11
194        KM   SUB-BASIN 11
195        BA    1.08
196        LG     .16     .30    5.40     .19    2.00
197        UI    135.    511.    887.    823.    529.    389.    263.    196.    127.     93.
198        UI     65.     50.     26.     19.     19.     19.      0.      0.      0.      0.
199        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
           *

200        KK     R11
201        KM      ROUTE SUB11 TO CP12
202        RS       1    FLOW      -1
203        RC     .08    .045     .08   29400    .018
204        RX       0      50     100     106     136     142     192     242
205        RY     3.5     2.5     1.5       0       0     1.5     2.5     3.5
206        RL       0       0       5       0
           *

207        KK   SUB12
208        KM   SUB-BASIN 12
209        BA    4.69
210        LG     .20     .20   11.50     .02   10.00
211        UI    157.    157.    404.    647.    793.    915.   1058.   1238.   1629.   1989.
212        UI   1678.   1403.   1223.   1033.    884.    752.    554.    356.    273.    258.
213        UI    174.    157.    100.     48.     48.     48.     48.     48.     48.     48.
214        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
215        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
           *
```



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

216        KK    CP12
217        KM
```

```
218          HC       2
             *

219          KK       C
220          KM
221          HC       4
             *

222          KK      RC
223          KM      ROUTE C TO D
224          RS       1    FLOW      -1
225          RC     .08    .035     .08    6700    .008
226          RX       0     400     800     810     890     900    1300    1700
227          RY      19      11       3       0       0       3      11      19
228          RL       0       0      10       0
             *

229          KK   SUB13
230          KM   SUB-BASIN 13
231          BA    2.19
232          LG     .20     .20   11.50     .02   10.00
233          UI     202     764    1151    1888    1770    1201     758     335     207      78
234          UI      55      55       0       0       0       0       0       0       0       0
             *

235          KK     R13
236          KM     ROUTE SUB13 TO D
237          RS       1    FLOW      -1
238          RC     .08    .045     .08   28800   .0164
239          RX       0      50     100     107     137     141     191     241
240          RY     4.4     3.5     2.6     1.6       0     2.1     6.4    10.7
241          RL       0       0       5       0
             *

242          KK   SUB14
243          KM   SUB-BASIN 14
244          BA    2.76
245          LG     .15     .29    5.70     .18     .00
246          UI    105.    105.    319.    493.    662.    782.    939.   1220.    808.    654.
247          UI    588.    523.    468.    413.    351.    292.    257.    237.    209.    172.
248          UI    135.    127.    115.     97.     80.     80.     55.     51.     51.     51.
249          UI     30.     20.     20.     20.     20.     20.     20.     20.     20.     20.
250          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
251          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

252          KK    CP14
253          KM
254          HC       2
             *
```



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

255          KK       D
256          KM
257          HC       2
             *

258          KK      RD
259          KM      ROUTE D TO E
260          RS       1    FLOW      -1
261          RC     .08    .035     .08   12800    .008
262          RX       0     400     800     801     864     872    1272    1672
263          RY    21.3    11.7     2.1       0     1.3     2.5    25.3    48.1
264          RL       0       0      10       0
             *

265          KK   SUB15
266          KM   SUB-BASIN 15
267          BA    4.57
268          LG     .15     .30    4.40     .22     .00
269          UI    142.    142.    308.    536.    680.    787.    886.   1033.   1211.   1598.
270          UI   1802.   1460.   1245.   1099.    939.    811.    694.    564.    375.    251.
271          UI    237.    207.    142.    142.     63.     44.     44.     44.     44.     44.
272          UI     44.     44.      0.      0.      0.      0.      0.      0.      0.      0.
273          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

274          KK   SUB16
275          KM   SUB-BASIN 16
```

```
276          BA    5.14
277          LG     .17     .27    6.60     .15    4.20
278          UI    161.    161.    323.    572.    837.   1029.   1184.   1336.   1710.   1762.
279          UI   1177.   1005.    923.    838.    768.    690.    631.    543.    468.    410.
280          UI    383.    356.    319.    265.    221.    206.    182.    177.    146.    124.
281          UI    124.    108.     79.     79.     79.     79.     64.     31.     31.     31.
282          UI     31.     31.     31.     31.     31.     31.     31.     31.     31.      0.
283          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
284          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

285          KK       E
286          KM
287          HC       3
             *

288          KK      RE
289          KM      ROUTE E TO F
290          RS       1    FLOW      -1
291          RC     .08    .035     .08   30000     .01
292          RX       0     400     800     810     920     928    1328    1528
293          RY     2.8     2.4     2.2       0     2.8     4.1     6.9     9.7
294          RL       0       0      10       0
             *
```



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

295          KK   SUB17
296          KM   SUB-BASIN 17
297          BA    5.30
298          LG     .17     .29    6.00     .17    3.30
299          UI    170.    170.    357.    626.    907.   1101.   1269.   1459.   1896.   1692.
300          UI   1191.   1033.    950.    859.    787.    703.    631.    550.    462.    419.
301          UI    393.    359.    299.    263.    217.    206.    186.    177.    130.    130.
302          UI    129.     83.     83.     83.     83.     79.     33.     33.     33.     33.
303          UI     33.     33.     33.     33.     33.     33.     33.     33.      0.      0.
304          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

305          KK     R17
306          KM      ROUTE SUB17 TO CP18
307          RS       1    FLOW      -1
308          RC     .08    .045     .08    3200    .013
309          RX       0      50     100     114     154     166     216     266
310          RY     1.7     1.6     1.5       0     2.1     2.3     3.2     4.1
311          RL       0       0       5       0
             *

312          KK   SUB18
313          KM   SUB-BASIN 18
314          BA    2.90
315          LG     .19     .25    7.00     .13    7.50
316          UI    156.    329.    752.   1069.   1371.   1642.   1028.    863.    735.    619.
317          UI    490.    392.    345.    275.    207.    178.    149.    120.     96.     76.
318          UI     76.     49.     30.     30.     30.     30.     30.     30.      0.      0.
319          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

320          KK    CP18
321          KM
322          HC       2
             *

323          KK   RCP18
324          KM      ROUTE CP18 TO F
325          RS       1    FLOW      -1
326          RC     .08    .045     .08    5000    .008
327          RX       0     200     400     406     436     442     642     842
328          RY     5.5     3.5     1.5       0       0     1.5     3.5     5.5
329          RL       0       0       5       0
             *

330          KK   SUB19
331          KM   SUB-BASIN 19
332          BA    4.67
333          LG     .16     .29    5.70     .18    3.70
334          UI    131.    131.    201.    458.    572.    670.    753.    849.    971.   1128.
335          UI   1451.   1695.   1410.   1207.   1071.    946.    823.    719.    626.    510.
336          UI    358.    232.    222.    215.    141.    131.    121.     40.     40.     40.
337          UI     40.     40.     40.     40.     40.      0.      0.      0.      0.      0.
```

```
338          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
1                                          HEC-1 INPUT                                          PAGE  9

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


339          KK    CP19
340          KM
341          HC       2
             *

342          KK   SUB20
343          KM   SUB-BASIN 20
344          BA    3.28
345          LG     .15     .31    4.10     .23     .00
346          UI     96.     96.    172.    343.    437.    506.    568.    648.    742.    909.
347          UI   1190.   1146.    942.    821.    729.    627.    548.    472.    396.    283.
348          UI    171.    163.    157.    103.     96.     81.     29.     29.     29.     29.
349          UI     29.     29.     29.     29.      0.      0.      0.      0.      0.      0.
350          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

351          KK    CP21
352          KM
353          HC       2
             *

354          KK       F
355          KM
356          HC       2
             *

357          KK      RF
358          KM      ROUTE F TO G
359          RS       1    FLOW      -1
360          RC     .08    .035     .08    9200    .008
361          RX       0      50     100     101     228     241     291     341
362          RY     6.6     6.5     6.4       0     4.7    10.3    11.0    11.6
363          RL       0       0      10       0
             *

364          KK   SUB21
365          KM   SUB-BASIN 21
366          BA    4.77
367          LG     .17     .26    7.10     .12    4.80
368          UI    174.    174.    483.    769.   1067.   1257.   1462.   1964.   1587.   1156.
369          UI   1019.    914.    827.    729.    646.    553.    451.    416.    384.    330.
370          UI    277.    222.    207.    190.    160.    133.    133.     96.     85.     85.
371          UI     85.     63.     33.     33.     33.     33.     33.     33.     33.     33.
372          UI     33.     33.      0.      0.      0.      0.      0.      0.      0.      0.
373          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

374          KK     R21
375          KM      ROUTE SUB21 TO CP22
376          RS       1    FLOW      -1
377          RC     .08    .045     .08   17000   .0096
378          RX       0     200     400     405     445     450     650     850
379          RY       6       4     2.0       0       0     2.0       4       6
380          RL       0       0       5       0
             *
1                                          HEC-1 INPUT                                          PAGE 10

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


381          KK   SUB22
382          KM   SUB-BASIN 22
383          BA    2.90
384          LG     .16     .29    5.10     .20    2.10
385          UI    154.    351.    697.    899.   1141.   1674.   1743.   1307.   1027.    791.
386          UI    536.    275.    228.    154.     70.     47.     47.     47.      0.      0.
387          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

388          KK    CP22
389          KM
390          HC       2
             *

391          KK   SUB23
```

```
392          KM   SUB-BASIN 23
393          BA     .54
394          LG     .17     .30    4.40     .22    3.80
395          UI      26      52     112     145     180     237     327     256     206     163
396          UI     127      82      46      39      26      14       8       8       8       8
397          UI       0       0       0       0       0       0       0       0       0       0
             *

398          KK     R23
399          KM     ROUTE SUB23 TO G
400          RS       1    FLOW      -1
401          RC     .08    .045     .08    4800    .008
402          RX       0      50     100     101     228     241     291     341
403          RY     6.6     6.5     6.4       0     4.7    10.3    11.0    11.6
404          RL       0       0       5       0
             *

405          KK       G
406          KM
407          HC       3
408          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

   NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    44       SUB1
                V
                V
    52          R1
                 .
                 .
    59           .        SUB2
                 .           .
                 .           .
    69           .           .        SUB3
                 .           .           .
                 .           .           .
    78           A.......................
                 V
                 V
    81          RA
                 .
                 .
    88           .        SUB4
                 .           V
                 .           V
    94           .          R4
                 .           .
                 .           .
   101           .           .        SUB5
                 .           .           .
                 .           .           .
   111           .         CP5............
                 .           .
                 .           .
   114           .           .        SUB6
                 .           .           .
                 .           .           .
   122           B.......................
                 V
                 V
   125          RB
                 .
                 .
   132           .        SUB7
                 .           V
                 .           V
   141           .          R7
                 .           .
                 .           .
   148           .           .        SUB8
                 .           .           .
                 .           .           .
   157           .         CP8............
                 .           .
                 .           .
   160           .           .        SUB9
                 .           .           V
                 .           .           V
```

```
166          .           .          R9
             .           .           .
             .           .           .
173          .           .           .      SUB10
             .           .           .          .
             .           .           .          .
183          .           .        CP10............
             .           .          V
             .           .          V
186          .           .       RCP10
             .           .           .
             .           .           .
193          .           .           .      SUB11
             .           .           .          V
             .           .           .          V
200          .           .           .       R11
             .           .           .          .
             .           .           .          .
207          .           .           .          .       SUB12
             .           .           .          .          .
             .           .           .          .          .
216          .           .           .      CP12............
             .           .           .          .
             .           .           .          .
219          C.................................
             V
             V
222         RC
             .
             .
229          .       SUB13
             .           V
             .           V
235          .         R13
             .           .
             .           .
242          .           .       SUB14
             .           .           .
             .           .           .
252          .        CP14............
             .           .
             .           .
255          D............
             V
             V
258         RD
             .
             .
265          .       SUB15
             .           .
             .           .
274          .           .       SUB16
             .           .           .
             .           .           .
285          E......................
             V
             V
288         RE
             .
             .
295          .       SUB17
             .           V
             .           V
305          .         R17
             .           .
             .           .
312          .           .       SUB18
             .           .           .
             .           .           .
320          .        CP18............
             .           V
             .           V
323          .       RCP18
             .           .
             .           .
330          .           .       SUB19
             .           .           .
             .           .           .
339          .        CP19............
             .           .
             .           .
342          .           .       SUB20
```

```
                .          .          .
                .          .          .
  351           .       CP21...........
                .          .
                .          .
  354           F...........
                V
                V
  357          RF
                .
                .
  364           .      SUB21
                .          V
                .          V
  374           .        R21
                .          .
                .          .
  381           .          .      SUB22
                .          .          .
                .          .          .
  388           .       CP22...........
                .          .
                .          .
  391           .          .      SUB23
                .          .          V
                .          .          V
  398           .          .        R23
                .          .          .
                .          .          .
  405           G......................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1**************************************** ****************************************
 *                                       *                                      * *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                      *    U.S. ARMY CORPS OF ENGINEERS *
 *            SEPTEMBER 1990             *                                      *    HYDROLOGIC ENGINEERING CENTER *
 *             VERSION 4.0               *                                      *          609 SECOND STREET *
 *                                       *                                      *       DAVIS, CALIFORNIA 95616 *
 *  RUN DATE  08/21/1991  TIME  11:10:47 *                                      *          (916) 756-1104 *
 *                                       *                                      * *
****************************************** ****************************************
```

BENDER WASH HYDROLOGY FOR FLOOD INSURANCE STUDY
SOUTHEAST OF GILA BEND, MARICOPA COUNTY, ARIZONA
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
RICE & GRANILLO NOV., 1990/REV. APRIL, 1991

GREEN & AMPT LOSS RATE METHOD
S-GRAPH UNIT HYDROGRAPH METHOD
NORMAL DEPTH ROUTING

100-YEAR, 6-HOUR STORM

MAIN CHANNEL ROUTING - MANNINGS N : OVERBANKS - .08, CHANNEL - .035
- LOSSES : 10 IN/HR

TRIBUTARY ROUTINGS - MANNINGS N : OVERBANKS - .08, CHANNEL - .045
- LOSSES : 5 IN/HR

INPUT FILE NAME - BS6.DAT

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

    IT        HYDROGRAPH TIME DATA
                     NMIN         10  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1    0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      3    0  ENDING DATE
                   NDTIME       0150  ENDING TIME
                    ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL     .17 HOURS
                   TOTAL TIME BASE   49.83 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

 23 JD        INDEX STORM NO. 1
                    STRM        3.70  PRECIPITATION DEPTH
                    TRDA         .01  TRANSPOSITION DRAINAGE AREA

 24 PI          PRECIPITATION PATTERN
                  .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                  .01       .01       .01       .01       .01       .01       .01       .01       .01       .03
                  .05       .11       .21       .30       .05       .03       .01       .01       .01       .01
                  .01       .01       .01       .01       .01       .01

 27 JD        INDEX STORM NO. 2
                    STRM        3.67  PRECIPITATION DEPTH
                    TRDA         .50  TRANSPOSITION DRAINAGE AREA

  0 PI          PRECIPITATION PATTERN
                  .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                  .01       .01       .01       .01       .01       .01       .01       .01       .01       .03
                  .05       .11       .21       .30       .05       .03       .01       .01       .01       .01
                  .01       .01       .01       .01       .01       .01

 28 JD        INDEX STORM NO. 3
                    STRM        3.61  PRECIPITATION DEPTH
                    TRDA        2.80  TRANSPOSITION DRAINAGE AREA

 29 PI          PRECIPITATION PATTERN
                  .01       .01       .00       .01       .01       .01       .01       .01       .01       .01
                  .01       .01       .01       .01       .01       .01       .01       .01       .03       .04
                  .06       .13       .15       .16       .10       .07       .04       .03       .02       .01
                  .01       .01       .01       .01       .01       .01

 2 JD         INDEX STORM NO. 4
                    STRM        3.41  PRECIPITATION DEPTH
                    TRDA       15.80  TRANSPOSITION DRAINAGE AREA

 33 PI          PRECIPITATION PATTERN
                  .01       .01       .00       .01       .01       .01       .01       .01       .01       .01
                  .01       .01       .01       .01       .01       .01       .01       .02       .03       .04
                  .05       .11       .12       .13       .08       .07       .05       .03       .03       .02
                  .01       .01       .01       .01       .01       .01

 36 JD        INDEX STORM NO. 5
                    STRM        3.00  PRECIPITATION DEPTH
                    TRDA       90.00  TRANSPOSITION DRAINAGE AREA

 37 PI          PRECIPITATION PATTERN
                  .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                  .01       .01       .01       .01       .01       .01       .02       .02       .03       .04
                  .06       .09       .10       .11       .08       .06       .05       .03       .03       .03
                  .01       .01       .01       .01       .01       .01

 40 JD        INDEX STORM NO. 6
                    STRM        2.11  PRECIPITATION DEPTH
                    TRDA      500.00  TRANSPOSITION DRAINAGE AREA

 41 PI          PRECIPITATION PATTERN
                  .02       .01       .01       .01       .01       .01       .01       .01       .01       .01
                  .01       .01       .02       .02       .02       .02       .02       .02       .03       .05
                  .06       .07       .07       .07       .07       .06       .05       .03       .03       .03
                  .02       .02       .02       .02       .02       .02

WARNING --- ROUTED OUTFLOW (   2769.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3214.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE

NING --- ROUTED OUTFLOW (   3554.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3501.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3032.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   2737.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE
```

```
WARNING --- ROUTED OUTFLOW (   3178.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3515.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3464.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   2999.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   2737.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   2936.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   2907.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   2691.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE
1
```

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	SUB1	1799.	5.00	407.	102.	49.	2.10		
+	ROUTED TO	R1	1450.	5.17	362.	91.	44.	2.10		
+	HYDROGRAPH AT	SUB2	2006.	5.17	701.	179.	86.	3.83		
+	HYDROGRAPH AT	SUB3	1754.	4.83	499.	126.	61.	2.10		
+	3 COMBINED AT	A	4283.	5.17	1391.	353.	170.	8.03		
	ROUTED TO	RA	3236.	5.50	1209.	302.	146.	8.03		
+	HYDROGRAPH AT	SUB4	887.	4.17	77.	19.	9.	.34		
+	ROUTED TO	R4	32.	4.50	2.	1.	0.	.34		
+	HYDROGRAPH AT	SUB5	2506.	5.00	826.	210.	101.	3.91		
+	2 COMBINED AT	CP5	2481.	5.00	819.	209.	100.	4.25		
+	HYDROGRAPH AT	SUB6	4159.	5.17	1189.	299.	144.	5.55		
+	3 COMBINED AT	B	8116.	5.17	2825.	714.	344.	17.83		
+	ROUTED TO	RB	6767.	5.67	2642.	663.	319.	17.83		
+	HYDROGRAPH AT	SUB7	3355.	4.83	993.	251.	121.	3.78		
+	ROUTED TO	R7	1211.	5.67	558.	139.	67.	3.78		
+	HYDROGRAPH AT	SUB8	4471.	5.00	1455.	371.	178.	6.77		
+	2 COMBINED AT	CP8	5151.	5.00	1904.	483.	233.	10.55		
+	HYDROGRAPH AT	SUB9	1404.	4.33	179.	45.	22.	.62		
+	ROUTED TO	R9	310.	4.67	72.	18.	9.	.62		
	HYDROGRAPH AT									

+	SUB10	2245.	5.17	789.	201.	97.	4.11
2 COMBINED AT +	CP10	2440.	5.17	838.	214.	103.	4.73
ROUTED TO	RCP10	1058.	6.00	592.	150.	72.	4.73
HYDROGRAPH AT +	SUB11	1467.	4.33	241.	60.	29.	1.08
ROUTED TO +	R11	408.	5.00	123.	31.	15.	1.08
HYDROGRAPH AT +	SUB12	3951.	5.50	1400.	353.	170.	4.69
2 COMBINED AT +	CP12	4175.	5.50	1483.	374.	180.	5.77
4 COMBINED AT +	C	13449.	5.50	5461.	1384.	667.	38.88
ROUTED TO +	RC	12660.	5.67	5237.	1315.	633.	38.88
HYDROGRAPH AT +	SUB13	3428.	4.50	676.	169.	82.	2.19
ROUTED TO +	R13	1438.	5.00	539.	135.	65.	2.19
HYDROGRAPH AT +	SUB14	1751.	5.00	575.	145.	70.	2.76
2 COMBINED AT +	CP14	2964.	5.00	1060.	267.	129.	4.95
2 COMBINED AT	D	14133.	5.67	5932.	1490.	718.	43.83
ROUTED TO +	RD	12277.	6.17	5500.	1382.	666.	43.83
HYDROGRAPH AT +	SUB15	2653.	5.67	897.	224.	108.	4.57
HYDROGRAPH AT +	SUB16	2775.	5.33	1061.	275.	132.	5.14
3 COMBINED AT +	E	14697.	6.00	6634.	1676.	807.	53.54
ROUTED TO +	RE	5957.	7.17	3013.	789.	380.	53.54
HYDROGRAPH AT +	SUB17	2796.	5.33	1051.	271.	131.	5.30
ROUTED TO +	R17	2674.	5.33	1017.	262.	126.	5.30
HYDROGRAPH AT +	SUB18	2505.	4.67	684.	172.	83.	2.90
2 COMBINED AT +	CP18	4078.	5.17	1590.	409.	197.	8.20
ROUTED TO +	RCP18	3545.	5.50	1504.	384.	185.	8.20
HYDROGRAPH AT +	SUB19	2597.	5.83	957.	241.	116.	4.67
2 COMBINED AT +	CP19	5584.	5.67	2293.	584.	281.	12.87
HYDROGRAPH AT +	SUB20	1893.	5.67	660.	165.	80.	3.28
2 COMBINED AT +	CP21	6946.	5.67	2781.	706.	340.	16.15

	2 COMBINED AT						
+	F	8154.	6.67	4702.	1249.	602.	69.69
	ROUTED TO						
	RF	7834.	6.83	4499.	1185.	571.	69.69
	HYDROGRAPH AT						
+	SUB21	3015.	5.17	1062.	271.	131.	4.77
	ROUTED TO						
+	R21	1547.	6.00	868.	220.	106.	4.77
	HYDROGRAPH AT						
+	SUB22	2705.	4.83	610.	153.	74.	2.90
	2 COMBINED AT						
+	CP22	3260.	5.00	1368.	348.	168.	7.67
	HYDROGRAPH AT						
+	SUB23	599.	5.00	126.	32.	15.	.54
	ROUTED TO						
+	R23	491.	5.17	115.	29.	14.	.54
	3 COMBINED AT						
+	G	8568.	6.67	5278.	1394.	671.	77.90

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

```
#0000801**************************************** ****************************************
 *                                   *                                                  * *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                              *    U.S. ARMY CORPS OF ENGINEERS *
 *            SEPTEMBER 1990             *                                              *    HYDROLOGIC ENGINEERING CENTER *
 *             VERSION 4.0               *                                              *          609 SECOND STREET *
 *                                       *                                              *       DAVIS, CALIFORNIA 95616 *
 *  RUN DATE  08/21/1991  TIME  11:48:05 *                                              *           (916) 756-1104 *
 *                                       *                                              * *
 **************************************** ****************************************
```

```
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

1 HEC-1 INPUT PAGE 1

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

  1           ID      SAND TANK WASH HYDROLOGY FOR FLOOD INSURANCE STUDY
  2           ID      SOUTHEAST OF GILA BEND, MARICOPA COUNTY, ARIZONA
  3           ID      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  4           ID      RICE & GRANILLO   NOV.,1991/APRIL, 1991
  5           ID
  6           ID      GREEN & AMPT LOSS RATE METHOD
  7           ID      S-GRAPH UNIT HYDROGRAPH
  8           ID      NORMAL DEPTH ROUTING
  9           ID
 10           ID      100 YR, 6 HOUR STORM
 11           ID
 12           ID      MAIN CHANNEL ROUTING - MANNINGS N: OVERBANKS - .08, CHANNEL - .035
 13           ID                           - LOSSES : 10 IN/HR
 14           ID
 15           ID      TRIBUTARY ROUTING    - MANNINGS N: OVERBANKS - .08, CHANNEL - .045
 16           ID                           - LOSSES : 5 IN/HR
 17           ID
 18           ID      INPUT DATA FILE      - STS6.DAT
 19           ID
              *DIAGRAM
 20           IT      10                     300
 21           IO       5
 22           IN      15
 23           JD    3.70     .01
 24           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 25           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 26           PC   0.962   0.972   0.983   0.991   1.000
 27           JD    3.67     0.5
 28           JD    3.61     2.8
 29           PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 30           PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
 31           PC   0.950   0.963   0.975   0.988   1.000
 32           JD    3.41    15.8
 33           PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
 34           PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
 35           PC   0.946   0.960   0.973   0.987   1.000
 36           JD    3.00      90
 37           PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
 38           PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
 39           PC   0.927   0.945   0.964   0.982   1.000
 40           JD    2.11     500
 41           PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
 42           PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
 43           PC   0.907   0.930   0.954   0.977   1.000
```

```
                *

 44             KK  SUB101
 45             KM   SUB-BASIN 101
 46             BA    1.13
 47             LG     .17     .29    6.30     .16    3.90
 48             UI     88.    357.    535.    824.    963.    651.    446.    219.    127.     68.
 49             UI     27.     27.      0.      0.      0.      0.      0.      0.      0.      0.
 50             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *
1                                          HEC-1 INPUT                                          PAGE  2

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

 51             KK  SUB102
 52             KM   SUB-BASIN 102
 53             BA    1.75
 54             LG     .20     .20   11.50     .02   10.00
 55             UI     186     708    1205    1443     870     671     476     352     246     179
 56             UI     128      90      75      37      29      29      29       0       0       0
                *

 57             KK    R102
 58             KM     ROUTE SUB102 TO AA
 59             RS       1    FLOW      -1
 60             RC     .08    .045     .08   13000    .023
 61             RX       0      50     100     122     193     215     265     315
 62             RY    10.1     9.9     9.7     1.6       0     7.8     8.2     8.6
 63             RL       0       0       5       0
                *

 64             KK  SUB103
 65             KM   SUB-BASIN 103
 66             BA     .75
 67             LG     .20     .20   11.50     .02   10.00
 68             UI      99     375     660     543     364     264     178     127      85      61
 69             UI      41      33      14      14      14      14       0       0       0       0
                *

 70             KK    R103
 71             KM     ROUTE SUB103 TO AA
 72             RS       1    FLOW      -1
 73             RC     .08    .045     .08   10000    .018
 74             RX       0      50     100     122     193     215     265     315
 75             RY    10.1     9.9     9.7     1.6       0     7.8     8.2     8.6
 76             RL       0       0       5       0
                *

 77             KK  SUB104
 78             KM   SUB-BASIN 104
 79             BA    1.00
 80             LG     .17     .30    6.00     .17    3.30
 81             UI     53.    119.    237.    306.    388.    564.    603.    451.    355.    274.
 82             UI    188.     98.     80.     53.     27.     16.     16.     16.     16.      0.
 83             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 84             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *

 85             KK   CP104
 86             KM
 87             HC       3
                *
1                                          HEC-1 INPUT                                          PAGE  3

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

 88             KK      AA
 89             KM
 90             HC       2
                *

 91             KK     RAA
 92             KM     ROUTE AA TO BB
 93             RS       1    FLOW      -1
 94             RC     .08    .045     .08    4500    .016
 95             RX       0      50     100     121     167     174     224     274
 96             RY    13.0     8.5     4.0       0      .5     1.8     2.3     2.8
 97             RL       0       0       5       0
                *
```

```
 98          KK  SUB105
 99          KM   SUB-BASIN 105
100          BA     .87
101          LG     .20     .20   11.50     .02   10.00
102          UI     62.    216.    411.    590.    527.    354.    286.    223.    163.    135.
103          UI     94.     74.     57.     45.     30.     30.     13.     12.     12.     12.
104          UI     12.      0.      0.      0.      0.      0.      0.      0.      0.      0.
105          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

106          KK  SUB106
107          KM   SUB-BASIN 106
108          BA    1.59
109          LG     .16     .32    4.70     .21    1.90
110          UI    116.    433.    666.    951.   1368.    979.    696.    450.    207.    139.
111          UI     66.     35.     35.      0.      0.      0.      0.      0.      0.      0.
112          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

113          KK      BB
114          KM
115          HC       3
             *

116          KK     RBB
117          KM     ROUTE BB TO CC
118          RS       1    FLOW      -1
119          RC     .08    .045     .08    4500    .006
120          RX       0      50     100     121     167     174     224     274
121          RY    13.0     8.5     4.0       0      .5     1.8     2.3     2.8
122          RL       0       0       5       0
             *

123          KK  SUB107
124          KM   SUB-BASIN 107
125          BA    2.19
126          LG     .20     .20   11.50     .02   10.00
127          UI    129.    321.    688.    946.   1346.   1040.    756.    637.    530.    420.
128          UI    324.    283.    217.    164.    141.    106.     95.     63.     63.     47.
129          UI     25.     25.     25.     25.     25.     25.      0.      0.      0.      0.
```



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

130          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

131          KK    R107
132          KM     ROUTE SUB107 TO CC
133          RS       1    FLOW      -1
134          RC     .08    .045     .08    4800    .023
135          RX       0      59      85      96     121     126     166     206
136          RY    12.9    11.2     7.2       0     1.1     2.5     3.8     5.2
137          RL       0       0       5       0
             *

138          KK  SUB108
139          KM   SUB-BASIN 108
140          BA     .94
141          LG     .19     .24    8.10     .08    7.50
142          UI     63.    197.    391.    537.    628.    389.    318.    258.    193.    152.
143          UI    123.     89.     72.     55.     45.     31.     31.     15.     12.     12.
144          UI     12.     12.     12.      0.      0.      0.      0.      0.      0.      0.
145          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

146          KK    R108
147          KM     ROUTE SUB108 TO CC
148          RS       1    FLOW      -1
149          RC     .08    .045     .08    5700    .019
150          RX       0      50     100     104     200     208     258     308
151          RY     6.4     5.5     4.6       0      .6     3.6    11.4    17.9
152          RL       0       0       5       0
             *

153          KK  SUB109
154          KM   SUB-BASIN 109
155          BA    1.40
156          LG     .15     .34    4.10     .23     .80
157          UI     165     572     877    1434    1047     688     323     170      74      39
158          UI      39       0       0       0       0       0       0       0       0       0
             *
```

```
159          KK   CP109
160          KM
161          HC       3
             *

162          KK  SUB110
163          KM   SUB-BASIN 110
164          BA    1.16
165          LG     .20     .20   11.50     .02    9.90
166          UI     95.    377.    653.    946.    597.    464.    359.    255.    204.    140.
167          UI    107.     79.     59.     45.     33.     18.     18.     18.     18.      0.
168          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
169          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
1                                          HEC-1 INPUT                                          PAGE  5

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

170          KK      CC
171          KM
172          HC       3
             *

173          KK     RCC
174          KM     ROUTE CC TO EE
175          RS       1    FLOW      -1
176          RC     .08    .045     .08   11100    .013
177          RX       0      50     100     123     156     161     211     261
178          RY      15     8.2     1.4      .8       0     1.3    11.8    22.2
179          RL       0       0       5       0
             *

180          KK     111
181          KM   SUB-BASIN 111
182          BA    1.75
183          LG     .20     .32    6.60     .15    9.70
184          UI    130.    488.    885.   1322.    963.    708.    565.    424.    317.    250.
185          UI    177.    143.    100.     76.     64.     43.     25.     25.     25.     25.
186          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
187          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

188          KK   CP111
189          KM
190          HC       2
             *

191          KK  SUB112
192          KM   SUB-BASIN 112
193          BA    4.33
194          LG     .17     .28    6.80     .14    4.70
195          UI    190.    293.    732.    973.   1165.   1433.   1953.   2348.   1800.   1489.
196          UI   1201.    970.    710.    403.    320.    237.    190.     78.     58.     58.
197          UI     58.     58.      0.      0.      0.      0.      0.      0.      0.      0.
198          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

199          KK    R112
200          KM     ROUTE SUB112 TO DD
201          RS       1    FLOW      -1
202          RC     .08    .035     .08   15500    .025
203          RX       0      50     100     104     219     232     282     332
204          RY     2.7     2.3     1.9       0     2.4     5.4    16.9    28.4
205          RL       0       0      10       0
             *

206          KK  SUB115
207          KM   SUB-BASIN 115
208          BA    2.20
209          LG     .16     .32    4.70     .21    1.80
210          UI    136.    397.    696.    908.   1312.   1578.   1137.    853.    620.    317.
211          UI    222.    136.     61.     42.     42.     42.      0.      0.      0.      0.
1                                          HEC-1 INPUT                                          PAGE  6

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

212          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

213          KK      DD
```

```
214          KM
215          HC       2
             *

216          KK     RDD
217          KM     ROUTE DD TO EE
218          RS       1    FLOW      -1
219          RC     .08    .035     .08   11000    .017
220          RX       0      50     100     105     165     170     220     280
221          RY     3.6     3.0     2.5       0       0     2.5     4.7     6.9
222          RL       0       0      10       0
             *

223          KK  SUB116
224          KM   SUB-BASIN 116
225          BA    1.62
226          LG     .20     .20   11.50     .02    9.90
227          UI     94.    231.    499.    688.    969.    795.    561.    474.    395.    319.
228          UI    241.    211.    167.    124.    106.     83.     72.     48.     46.     41.
229          UI     18.     18.     18.     18.     18.     18.      0.      0.      0.      0.
230          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

231          KK   CP116
232          KM
233          HC       2
             *

234          KK  SUB113
235          KM   SUB-BASIN 113
236          BA    3.31
237          LG     .16     .32    4.70     .21    1.80
238          UI    125.    125.    418.    568.    688.    802.    958.   1274.   1571.   1281.
239          UI   1065.    905.    753.    620.    475.    288.    216.    197.    125.    120.
240          UI     38.     38.     38.     38.     38.     38.      0.      0.      0.      0.
241          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

242          KK    R113
243          KM     ROUTE SUB113 TO EE
244          RS       1    FLOW      -1
245          RC     .08    .035     .08   10800    .017
246          RX       0       5     144     151     182     193     293     320
247          RY    11.7     1.7     1.7      .5       0     2.3     4.1    17.6
248          RL       0       0      10       0
             *
```



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

249          KK  SUB114
250          KM   SUB-BASIN 114
251          BA    2.32
252          LG     .20     .20   11.50     .02   10.00
253          UI    173.    653.   1180.   1765.   1262.    936.    746.    556.    419.    328.
254          UI    231.    185.    133.     98.     85.     53.     33.     33.     33.     33.
255          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
256          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

257          KK   CP114
258          KM
259          HC       2
             *

260          KK      EE
261          KM
262          HC       3
             *

263          KK     REE
264          KM     ROUTE EE TO FF
265          RS       1    FLOW      -1
266          RC     .08    .035     .08   16500    .014
267          RX       0     400     800     809     881     890    1290    1690
268          RY      11       7     3.0       0       0     3.0       7      11
269          RL       0       0      10       0
             *

270          KK  SUB117
271          KM   SUB-BASIN 117
```

```
272          BA    3.51
273          LG     .19     .26    7.00     .13    6.30
274          UI    229.    679.   1373.   1867.   2373.   1460.   1194.    978.    765.    573.
275          UI    493.    349.    276.    228.    175.    128.    112.     90.     44.     44.
276          UI     44.     44.     44.      0.      0.      0.      0.      0.      0.      0.
277          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

278          KK      FF
279          KM
280          HC       2
             *

281          KK     RFF
282          KM     ROUTE FF TO GG
283          RS       1    FLOW      -1
284          RC     .08    .035     .08    6200    .013
285          RX       0     400     800     809     881     890    1290    1690
286          RY      11       7     3.0       0       0     3.0       7      11
287          RL       0       0      10       0
             *
1                                          HEC-1 INPUT                                          PAGE  8

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

288          KK  SUB118
289          KM   SUB-BASIN 118
290          BA    2.92
291          LG     .19     .25    7.50     .10    6.30
292          UI    183.    509.   1060.   1432.   1970.   1237.    999.    827.    666.    498.
293          UI    419.    331.    242.    203.    153.    131.     90.     90.     53.     35.
294          UI     35.     35.     35.     35.      0.      0.      0.      0.      0.      0.
295          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

296          KK    R118
297          KM     ROUTE SUB118 TO CP119
298          RS       1    FLOW      -1
299          RC     .08    .045     .08   12000    .015
300          RX       0      50     100     112     162     174     224     274
301          RY    11.5     8.2     4.8       0       0     4.8     6.3     7.8
302          RL       0       0       5       0
             *

303          KK  SUB119
304          KM   SUB-BASIN 119
305          BA    1.89
306          LG     .17     .28    6.60     .15    3.20
307          UI    111.    301.    549.    709.    967.   1352.   1011.    776.    583.    377.
308          UI    192.    146.     96.     34.     34.     34.     34.      0.      0.      0.
309          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

310          KK   CP119
311          KM
312          HC       2
             *

313          KK  RCP119
314          KM     ROUTE CP119 TO GG
315          RS       1    FLOW      -1
316          RC     .08    .045     .08   12000    .015
317          RX       0      50     100     112     162     174     224     274
318          RY    11.5     8.2     4.8       0       0     4.8     6.3     7.8
319          RL       0       0       5       0
             *

320          KK  SUB120
321          KM   SUB-BASIN 120
322          BA    2.61
323          LG     .16     .31    4.40     .22    1.60
324          UI    240.    908.   1367.   2240.   2108.   1431.    904.    400.    247.     94.
325          UI     65.     65.      0.      0.      0.      0.      0.      0.      0.      0.
326          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
1                                          HEC-1 INPUT                                          PAGE  9

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

327          KK      GG
```

```
328          KM
329          HC       2
             *

330          KK     RGG
331          KM     ROUTE GG TO HH
332          RS       1    FLOW      -1
333          RC     .08    .035     .08    4500    .011
334          RX       0     200     400     409     481     490     690     890
335          RY       7       5     3.0       0       0     3.0       5       7
336          RL       0       0      10       0
             *

337          KK  SUB121
338          KM   SUB-BASIN 121
339          BA    4.65
340          LG     .19     .23    8.30     .07    7.30
341          UI    172.    172.    490.    774.   1064.   1252.   1470.   1972.   1487.   1119.
342          UI    993.    891.    801.    706.    622.    520.    439.    405.    371.    308.
343          UI    258.    219.    196.    188.    141.    132.    127.     84.     84.     84.
344          UI     84.     43.     33.     33.     33.     33.     33.     33.     33.     33.
345          UI     33.     33.      0.      0.      0.      0.      0.      0.      0.      0.
346          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

347          KK      HH
348          KM
349          HC       3
             *

350          KK     RHH
351          KM      ROUTE HH TO II
352          RS       1    FLOW      -1
353          RC     .08    .035     .08   13200    .011
354          RX       0      50     100     113     192     203     253     303
355          RY    16.6    11.1     5.6     2.2       0     3.5     8.1    12.7
356          RL       0       0      10       0
             *

357          KK  SUB123
358          KM   SUB-BASIN 123
359          BA    2.66
360          LG     .16     .30    5.40     .19     .18
361          UI    131.    257.    557.    722.    895.   1178.   1622.   1272.   1021.    807.
362          UI    631.    407.    228.    195.    131.     71.     40.     40.     40.     40.
363          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
364          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
```



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

365          KK   CP123
366          KM
367          HC       2
             *

368          KK  SUB122
369          KM   SUB-BASIN 122
370          BA    6.52
371          LG     .17     .25    7.30     .11    3.90
372          UI    254.    260.    890.   1184.   1425.   1681.   2025.   2766.   3132.   2441.
373          UI   2059.   1707.   1420.   1157.    808.    454.    421.    311.    254.    138.
374          UI     78.     78.     78.     78.     78.      0.      0.      0.      0.      0.
375          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

376          KK      II
377          KM
378          HC       2
             *

379          KK     RII
380          KM     ROUTE II TO JJ
381          RS       1    FLOW      -1
382          RC     .08    .035     .08   23400    .009
383          RX       0      50     100     113     192     203     253     303
384          RY    16.6    11.1     5.6     2.2       0     3.5     8.1    12.7
385          RL       0       0      10       0
             *
```

```
386          KK  SUB124
387          KM   SUB-BASIN 124
388          BA    7.40
389          LG     .18     .26    7.30     .11    5.90
390          UI    291.    310.    935.   1447.   1902.   2232.   2817.   3198.   2063.   1746.
391          UI   1564.   1396.   1225.   1072.    891.    743.    684.    621.    495.    407.
392          UI    365.    319.    286.    223.    223.    161.    143.    143.    143.     77.
393          UI     56.     56.     56.     56.     56.     56.     56.     56.     56.      0.
394          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
395          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

396          KK    R124
397          KM     ROUTE SUB124 TO CP125
398          RS       1    FLOW      -1
399          RC     .08    .035     .08   30000    .016
400          RX       0      50     100     114     138     150     200     250
401          RY     9.3     9.2     9.1       0      .5     7.6    10.7    13.7
402          RL       0       0       5       0
             *
1                                          HEC-1 INPUT                                          PAGE 11

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

403          KK  SUB125
404          KM   SUB-BASIN 125
405          BA   10.22
406          LG     .18     .26    7.30     .11    6.00
407          UI    327.    327.    683.   1198.   1739.   2113.   2435.   2796.   3623.   3286.
408          UI   2297.   1990.   1832.   1655.   1518.   1354.   1220.   1060.    893.    807.
409          UI    756.    694.    581.    510.    418.    398.    358.    345.    251.    251.
410          UI    251.    163.    160.    160.    160.    158.     63.     63.     63.     63.
411          UI     63.     63.     63.     63.     63.     63.     63.     63.      0.      0.
412          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

413          KK   CP125
414          KM
415          HC       2
             *

416          KK  RCP125
417          KM     ROUTE CP125 TO JJ
418          RS       1    FLOW      -1
419          RC     .08    .045     .08   36000    .009
420          RX       0     200     400     408     433     440     640     840
421          RY     7.8     4.8     1.8       0       0     1.8     3.8     5.8
422          RL       0       0       5       0
             *

423          KK  SUB126
424          KM   SUB-BASIN 126
425          BA   12.59
426          LG     .16     .33    3.70     .28    1.20
427          UI    322.    322.    322.   1051.   1302.   1541.   1759.   1929.   2161.   2454.
428          UI   2843.   3582.   4207.   3581.   3070.   2737.   2468.   2162.   1925.   1677.
429          UI   1511.   1167.    866.    571.    552.    530.    401.    322.    322.    189.
430          UI     99.     99.     99.     99.     99.     99.     99.     99.     99.      0.
431          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
432          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

433          KK      JJ
434          KM
435          HC       3
             *

436          KK     RJJ
437          KM    ROUTE JJ TO KK
438          RS       1    FLOW      -1
439          RC     .08    .035     .08    9000    .005
440          RX       0      50     100     113     192     203     253     303
441          RY    16.6    11.1     5.6     2.2       0     3.5     8.1    12.7
442          RL       0       0      10       0
             *
1                                          HEC-1 INPUT                                          PAGE 12

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

443          KK  SUB127
```

```
444          KM   SUB-BASIN 127
445          BA    2.47
446          LG     .18     .27    7.00     .13    5.10
447          UI   1253.   3726.   2174.   1171.    602.    310.    159.     82.      0.      0.
448          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

449          KK    R127
450          KM     ROUTE SUB127 TO CP129
451          RS       1    FLOW      -1
452          RC     .08    .045     .08   12000     .01
453          RX       0     200     400     408     433     440     640     840
454          RY     7.8     4.8     1.8       0       0     1.8     3.8     5.8
455          RL       0       0       5       0
             *

456          KK  SUB128
457          KM   SUB-BASIN 128
458          BA    5.10
459          LG     .18     .27    7.00     .13    5.10
460          UI    197.    197.    616.    943.   1259.   1482.   1814.   2259.   1455.   1206.
461          UI   1084.    967.    856.    758.    640.    525.    472.    434.    369.    305.
462          UI    251.    227.    215.    161.    151.    139.     96.     96.     96.     90.
463          UI     38.     38.     38.     38.     38.     38.     38.     38.     38.     38.
464          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
465          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

466          KK    R128
467          KM     ROUTE SUB128 TO CP129
468          RS       1    FLOW      -1
469          RC     .08    .045     .08   20100    .011
470          RX       0     200     400     408     433     440     640     840
471          RY     7.8     4.8     1.8       0       0     1.8     3.8     5.8
472          RL       0       0       5       0
             *

473          KK  SUB129
474          KM   SUB-BASIN 129
475          BA    3.73
476          LG     .16     .33    4.70     .21    1.60
477          UI    169.    283.    671.    886.   1072.   1330.   1902.   1968.   1511.   1241.
478          UI    993.    789.    511.    296.    266.    169.    121.     52.     52.     52.
479          UI     52.     52.      0.      0.      0.      0.      0.      0.      0.      0.
480          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

481          KK   CP129
482          KM
483          HC       3
             *
```



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

484          KK  RCP129
485          KM     ROUTE CP129 TO KK
486          RS       1    FLOW      -1
487          RC     .08    .035     .08   40000    .008
488          RX       0     200     400     408     433     440     640     840
489          RY     7.8     4.8     1.8       0       0     1.8     3.8     5.8
490          RL       0       0      10       0
             *

491          KK  SUB130
492          KM   SUB-BASIN 130
493          BA    2.65
494          LG     .15     .35    4.10     .35     .00
495          UI     64.     64.     64.    181.    240.    300.    333.    368.    406.    459.
496          UI    510.    613.    768.    821.    687.    600.    539.    489.    431.    386.
497          UI    341.    305.    256.    188.    125.    113.    105.    102.     64.     64.
498          UI     64.     25.     20.     20.     20.     20.     20.     20.     20.     20.
499          UI     20.      0.      0.      0.      0.      0.      0.      0.      0.      0.
500          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

501          KK      KK
502          KM      (MAIN SAND TANK WASH)
503          HC       3
             *
             *
```

```
                *

504             KK  SUB201
505             KM   SUB-BASIN 201
506             BA    5.57
507             LG     .18     .28    6.80     .14    4.90
508             UI    217.    222.    691.   1060.   1404.   1649.   2051.   2439.   1572.   1314.
509             UI   1183.   1050.    928.    816.    689.    560.    515.    470.    387.    319.
510             UI    277.    241.    230.    166.    166.    136.    106.    106.    106.     77.
511             UI     42.     42.     42.     42.     42.     42.     42.     42.     42.      0.
512             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
513             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *

514             KK    R201
515             KM     ROUTE SUB201 TO A1
516             RS       1    FLOW      -1
517             RC     .08    .045     .08   15000    .012
518             RX       0      50     100     110     170     180     230     280
519             RY     4.5     4.3     4.0       0       0     4.0     4.3     4.5
520             RL       0       0       5       0
                *
```



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

521             KK  SUB202
522             KM   SUB-BASIN 202
523             BA    6.77
524             LG     .17     .30    5.70     .18     .30
525             UI    288.    407.   1080.   1444.   1727.   2098.   2773.   3591.   2904.   2377.
526             UI   1950.   1586.   1262.    770.    501.    449.    288.    226.     88.     88.
527             UI     88.     88.     88.      0.      0.      0.      0.      0.      0.      0.
528             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *

529             KK      A1
530             KM
531             HC       2
                *

532             KK     RA1
533             KM     ROUTE A1 TO B1
534             RS       1    FLOW      -1
535             RC     .08    .045     .08    9000    .015
536             RX       0     200     400     410     470     480     680     880
537             RY       6       5     4.0       0       0     4.0       5       6
538             RL       0       0       5       0
                *

539             KK  SUB203
540             KM   SUB-BASIN 203
541             BA    2.21
542             LG     .18     .25    7.50     .11    6.60
543             UI    114.    222.    523.    761.    948.   1269.    809.    661.    567.    484.
544             UI    400.    312.    270.    231.    176.    144.    125.     97.     88.     62.
545             UI     56.     56.     31.     22.     22.     22.     22.     22.     22.     22.
546             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
547             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *

548             KK    R203
549             KM     ROUTE SUB203 TO C1
550             RS       1    FLOW      -1
551             RC     .08    .045     .08   13600    .015
552             RX       0      50     100     110     170     180     230     280
553             RY     4.5     4.3     4.0       0       0     4.0     4.3     4.5
554             RL       0       0       5       0
                *

555             KK      B1
556             KM
557             HC       2
                *
```



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

558             KK  SUB204
559             KM   SUB-BASIN 204
```

```
560          BA    4.13
561          LG     .19     .25    7.80     .09    7.00
562          UI    210.    401.    943.   1384.   1715.   2362.   1527.   1233.   1064.    909.
563          UI    761.    596.    503.    451.    339.    269.    234.    195.    161.    130.
564          UI    103.    103.     76.     40.     40.     40.     40.     40.     40.     40.
565          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
566          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

567          KK    R204
568          KM     ROUTE SUB204 TO C1
569          RS       1    FLOW      -1
570          RC     .08    .045     .08    5500    .013
571          RX       0      50     100     110     170     180     230     280
572          RY     4.5     4.3     4.0       0       0     4.0     4.3     4.5
573          RL       0       0       5       0
             *

574          KK  SUB205
575          KM   SUB-BASIN 205
576          BA     .90
577          LG     .15     .35    3.50     .25     .00
578          UI     59.    193.    317.    424.    666.    600.    439.    319.    195.    101.
579          UI     69.     36.     18.     18.     18.      0.      0.      0.      0.      0.
580          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

581          KK      C1
582          KM
583          HC       3
             *

584          KK     RC1
585          KM     ROUTE C1 TO D1
586          RS       1    FLOW      -1
587          RC     .08    .045     .08   42700    .011
588          RX       0     400     800     804     827     843    1243    1643
589          RY    10.3     5.9     1.5       0      .3     1.9     2.3     2.7
590          RL       0       0       5       0
             *

591          KK  SUB206
592          KM   SUB-BASIN 206
593          BA    4.19
594          LG     .15     .35    3.50     .25     .00
595          UI    104.    104.    104.    313.    404.    492.    553.    608.    676.    765.
596          UI    860.   1084.   1306.   1250.   1056.    929.    841.    751.    661.    591.
597          UI    520.    451.    346.    248.    184.    175.    171.    119.    104.    104.
598          UI     57.     32.     32.     32.     32.     32.     32.     32.     32.     32.
599          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
600          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
```



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

601          KK   CP206
602          KM
603          HC       2
             *

604          KK  SUB207
605          KM   SUB-BASIN 207
606          BA    5.18
607          LG     .15     .35    3.50     .25     .00
608          UI    109.    109.    109.    187.    369.    437.    515.    567.    621.    671.
609          UI    741.    824.    913.   1094.   1335.   1406.   1197.   1054.    956.    878.
610          UI    802.    716.    651.    587.    526.    465.    368.    290.    193.    191.
611          UI    179.    179.    118.    109.    109.     95.     33.     33.     33.     33.
612          UI     33.     33.     33.     33.     33.     33.     33.      0.      0.      0.
613          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

614          KK      D1
615          KM
616          HC       2
             *

617          KK     RD1
618          KM     ROUTE D1 TO E1
619          RS       1    FLOW      -1
```

```
620          RC     .08    .045     .08    8800    .008
621          RX       0     400     800     810     835     845    1245    1645
622          RY    10.8     6.4     2.0       0       0     2.0     2.4     2.8
623          RL       0       0       5       0
             *

624          KK  SUB208
625          KM   SUB-BASIN 208
626          BA     .91
627          LG     .15     .32    5.40     .19     .00
628          UI     60.    195.    321.    429.    672.    611.    447.    325.    200.    103.
629          UI     70.     37.     18.     18.     18.      0.      0.      0.      0.      0.
630          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

631          KK      E1
632          KM
633          HC       2
             *

634          KK     RE1
635          KM     ROUTE E1 TO F1
636          RS       1    FLOW      -1
637          RC     .08    .045     .08   10000    .007
638          RX       0     400     400     410     440     450     850    1250
639          RY    10.8     6.4     2.0       0       0     2.0     2.4     2.8
640          RL       0       0       5       0
             *
```



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

641          KK  SUB209
642          KM   SUB-BASIN 209
643          BA    4.94
644          LG     .15     .35    3.60     .26     .00
645          UI     95.     95.     95.     95.    309.    353.    417.    462.    516.    550.
646          UI    596.    651.    719.    781.    925.   1102.   1260.   1122.    985.    885.
647          UI    813.    756.    691.    624.    570.    519.    472.    430.    359.    274.
648          UI    203.    169.    164.    157.    157.     98.     95.     95.     95.     33.
649          UI     29.     29.     29.     29.     29.     29.     29.     29.     29.     29.
650          UI     29.     29.      0.      0.      0.      0.      0.      0.      0.      0.
651          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

652          KK  SUB210
653          KM   SUB-BASIN 210
654          BA    9.64
655          LG     .15     .34    3.70     .29     .00
656          UI    259.    259.    331.    886.   1091.   1291.   1453.   1615.   1841.   2078.
657          UI   2603.   3259.   3090.   2579.   2263.   2039.   1773.   1567.   1364.   1216.
658          UI    927.    669.    459.    438.    426.    278.    259.    258.     79.     79.
659          UI     79.     79.     79.     79.     79.     79.     79.      0.      0.      0.
660          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

661          KK      F1
662          KM
663          HC       3
             *

664          KK     RF1
665          KM     ROUTE F1 TO J1
666          RS       1    FLOW      -1
667          RC     .08    .045     .08    9800    .006
668          RX       0     400     800     805     860     870    1270    1670
669          RY    11.8     7.4     3.0       0       0     3.0     3.4     3.8
670          RL       0       0       5       0
             *

671          KK  SUB211
672          KM   SUB-BASIN 211
673          BA    9.64
674          LG     .15     .35    3.50     .25     .00
675          UI    209.    209.    209.    419.    729.    871.   1004.   1127.   1214.   1335.
676          UI   1488.   1626.   1898.   2332.   2717.   2476.   2137.   1911.   1737.   1597.
677          UI   1421.   1286.   1154.   1037.    919.    733.    577.    371.    368.    344.
678          UI    344.    219.    209.    209.    157.     64.     64.     64.     64.     64.
679          UI     64.     64.     64.     64.     64.     64.      0.      0.      0.      0.
680          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
```

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

 681          KK  SUB212
 682          KM   SUB-BASIN 212
 683          BA     .82
 684          LG     .15     .35    3.50     .25     .00
 685          UI     55.    188.    303.    409.    645.    533.    391.    281.    151.     93.
 686          UI     55.     22.     17.     17.      0.      0.      0.      0.      0.      0.
 687          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

 688          KK      G1
 689          KM
 690          HC       2
              *

 691          KK     RG1
 692          KM     ROUTE G1 TO H1
 693          RS       1    FLOW      -1
 694          RC     .08    .045     .08   14500    .008
 695          RX       0      50     100     123     145     162     212     262
 696          RY     7.8     7.2     6.7       0       0     6.0     6.1     6.2
 697          RL       0       0       5       0
              *

 698          KK  SUB213
 699          KM   SUB-BASIN 213
 700          BA    1.78
 701          LG     .15     .32    5.40     .19     .00
 702          UI     91.    190.    398.    515.    643.    891.   1099.    825.    660.    515.
 703          UI    390.    210.    153.    107.     78.     28.     28.     28.     28.      0.
 704          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 705          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

 706          KK      H1
 707          KM
 708          HC       2
              *

 709          KK     RH1
 710          KM     ROUTE H1 TO I1
 711          RS       1    FLOW      -1
 712          RC     .08    .045     .08   14500    .007
 713          RX       0      50     100     123     145     162     212     262
 714          RY     7.8     7.2     6.7       0       0     6.0     6.1     6.2
 715          RL       0       0       5       0
              *

 716          KK  SUB214
 717          KM   SUB-BASIN 214
 718          BA    1.62
 719          LG     .15     .35    4.30     .40     .00
 720          UI     73.    120.    287.    380.    458.    566.    803.    864.    660.    544.
 721          UI    436.    349.    236.    129.    120.     73.     59.     22.     22.     22.
 722          UI     22.     22.      0.      0.      0.      0.      0.      0.      0.      0.
```



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

 723          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

 724          KK      I1
 725          KM
 726          HC       2
              *

 727          KK     RI1
 728          KM     ROUTE I1 TO J1
 729          RS       1    FLOW      -1
 730          RC     .08    .045     .08   15300    .007
 731          RX       0      50     100     123     145     162     212     262
 732          RY     7.8     7.2     6.7       0       0     6.0     6.1     6.2
 733          RL       0       0       5       0
              *

 734          KK  SUB215
 735          KM   SUB-BASIN 215
```

```
736          BA     .93
737          LG     .15     .34    4.00     .35     .00
738          UI     40.     60.    154.    205.    245.    299.    407.    500.    390.    321.
739          UI    261.    211.    160.     92.     69.     54.     40.     22.     12.     12.
740          UI     12.     12.     12.      0.      0.      0.      0.      0.      0.      0.
741          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

742          KK   CP215
743          KM
744          HC       3
             *

745          KK  SUB216
746          KM   SUB-BASIN 216
747          BA    1.09
748          LG     .15     .33    3.70     .29     .00
749          UI     44.     52.    156.    212.    252.    301.    370.    522.    499.    395.
750          UI    333.    273.    224.    171.    101.     75.     65.     44.     34.     13.
751          UI     13.     13.     13.     13.      0.      0.      0.      0.      0.      0.
752          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

753          KK      J1
754          KM
755          HC       2
             *

756          KK      ST
757          KM
758          HC       2
759          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

  NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 44       SUB101
            .
            .
 51         .      SUB102
            .          V
            .          V
 57         .        R102
            .          .
            .          .
 64         .          .      SUB103
            .          .          V
            .          .          V
 70         .          .        R103
            .          .          .
            .          .          .
 77         .          .          .      SUB104
            .          .          .          .
            .          .          .          .
 85         .       CP104.......................
            .          .
            .          .
 88       AA............
           V
           V
 91      RAA
            .
            .
 98         .      SUB105
            .          .
            .          .
106         .          .      SUB106
            .          .          .
            .          .          .
113       BB........................
           V
           V
116      RBB
            .
            .
123         .      SUB107
            .          V
            .          V
131         .        R107
```

```
138          .           .      SUB108
             .           .          V
             .           .          V
146          .           .       R108
             .           .          .
             .           .          .
153          .           .          .      SUB109
             .           .          .          .
             .           .          .          .
159          .      CP109.......................
             .           .
             .           .
162          .           .      SUB110
             .           .          .
             .           .          .
170        CC........................
            V
            V
173       RCC
             .
             .
180          .         111
             .           .
             .           .
188    CP111............
             .
             .
191          .      SUB112
             .           V
             .           V
199          .       R112
             .           .
             .           .
206          .           .      SUB115
             .           .          .
             .           .          .
213          .          DD............
             .           V
             .           V
216          .         RDD
             .           .
             .           .
223          .           .      SUB116
             .           .          .
             .           .          .
231          .      CP116............
             .           .
             .           .
234          .           .      SUB113
             .           .          V
             .           .          V
242          .           .       R113
             .           .          .
             .           .          .
249          .           .          .      SUB114
             .           .          .          .
             .           .          .          .
257          .           .      CP114............
             .           .          .
             .           .          .
260        EE........................
            V
            V
263       REE
             .
             .
270          .      SUB117
             .           .
             .           .
278        FF............
            V
            V
281       RFF
             .
             .
288          .      SUB118
             .           V
             .           V
296          .       R118
             .           .
```

```
303                 .           .      SUB119
                    .           .           .
                    .           .           .
310                 .       CP119.............
                    .           V
                    .           V
313                 .      RCP119
                    .           .
                    .           .
320                 .           .      SUB120
                    .           .           .
                    .           .           .
327                 .          GG.............
                    .           V
                    .           V
330                 .         RGG
                    .           .
                    .           .
337                 .           .      SUB121
                    .           .           .
                    .           .           .
347               HH........................
                   V
                   V
350              RHH
                    .
                    .
357                 .      SUB123
                    .           .
                    .           .
365          CP123............
                    .
                    .
368                 .      SUB122
                    .           .
                    .           .
376               II............
                   V
                   V
379              RII
                    .
                    .
386                 .      SUB124
                    .           V
                    .           V
396                 .       R124
                    .           .
                    .           .
403                 .           .      SUB125
                    .           .           .
                    .           .           .
413                 .       CP125.............
                    .           V
                    .           V
416                 .      RCP125
                    .           .
                    .           .
423                 .           .      SUB126
                    .           .           .
                    .           .           .
433               JJ........................
                   V
                   V
436              RJJ
                    .
                    .
443                 .      SUB127
                    .           V
                    .           V
449                 .       R127
                    .           .
                    .           .
456                 .           .      SUB128
                    .           .           V
                    .           .           V
466                 .           .       R128
                    .           .           .
                    .           .           .
473                 .           .           .      SUB129
                    .           .           .           .
                    .           .           .           .
```

```
481          .      CP129.......................
             .         V
             .         V
484          .     RCP129
             .         .
             .         .
491          .         .      SUB130
             .         .          .
             .         .          .
501        KK.......................
             .
             .
504          .     SUB201
             .         V
             .         V
514          .      R201
             .         .
             .         .
521          .         .      SUB202
             .         .          .
             .         .          .
529          .        A1............
             .         V
             .         V
532          .       RA1
             .         .
             .         .
539          .         .      SUB203
             .         .          V
             .         .          V
548          .         .       R203
             .         .          .
             .         .          .
555          .        B1............
             .         .
             .         .
558          .         .      SUB204
             .         .          V
             .         .          V
567          .         .       R204
             .         .          .
             .         .          .
574          .         .          .      SUB205
             .         .          .          .
             .         .          .          .
581          .        C1........................
             .         V
             .         V
584          .       RC1
             .         .
             .         .
591          .         .      SUB206
             .         .          .
             .         .          .
601          .     CP206............
             .         .
             .         .
604          .         .      SUB207
             .         .          .
             .         .          .
614          .        D1............
             .         V
             .         V
617          .       RD1
             .         .
             .         .
624          .         .      SUB208
             .         .          .
             .         .          .
631          .        E1............
             .         V
             .         V
634          .       RE1
             .         .
             .         .
641          .         .      SUB209
             .         .          .
             .         .          .
652          .         .          .      SUB210
             .         .          .          .
             .         .          .          .
661          .        F1........................
```

```
                .          V
                .          V
   664          .        RF1
                .          .
                .          .
   671          .          .      SUB211
                .          .          .
                .          .          .
   681          .          .          .      SUB212
                .          .          .          .
                .          .          .          .
   688          .          .         G1............
                .          .          V
                .          .          V
   691          .          .        RG1
                .          .          .
                .          .          .
   698          .          .          .      SUB213
                .          .          .          .
                .          .          .          .
   706          .          .         H1............
                .          .          V
                .          .          V
   709          .          .        RH1
                .          .          .
                .          .          .
   716          .          .          .      SUB214
                .          .          .          .
                .          .          .          .
   724          .          .         I1............
                .          .          V
                .          .          V
   727          .          .        RI1
                .          .          .
                .          .          .
   734          .          .          .      SUB215
                .          .          .          .
                .          .          .          .
   742          .       CP215........................
                .          .
                .          .
   745          .          .      SUB216
                .          .          .
                .          .          .
   753          .         J1............
                .          .
                .          .
   756        ST............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*************************************** ***************************************
*                                     *                                       * *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1) *                                       *   U.S. ARMY CORPS OF ENGINEERS *
*            SEPTEMBER 1990           *                                       *   HYDROLOGIC ENGINEERING CENTER *
*             VERSION 4.0             *                                       *         609 SECOND STREET *
*                                     *                                       *      DAVIS, CALIFORNIA 95616 *
*  RUN DATE  08/21/1991  TIME  11:48:05 *                                     *         (916) 756-1104 *
*                                     *                                       * *
*************************************** ***************************************
```

SAND TANK WASH HYDROLOGY FOR FLOOD INSURANCE STUDY
SOUTHEAST OF GILA BEND, MARICOPA COUNTY, ARIZONA
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
RICE & GRANILLO NOV.,1991/APRIL, 1991

GREEN & AMPT LOSS RATE METHOD
S-GRAPH UNIT HYDROGRAPH
NORMAL DEPTH ROUTING

100 YR, 6 HOUR STORM

MAIN CHANNEL ROUTING - MANNINGS N: OVERBANKS - .08, CHANNEL - .035
- LOSSES : 10 IN/HR

TRIBUTARY ROUTING - MANNINGS N: OVERBANKS - .08, CHANNEL - .045
- LOSSES : 5 IN/HR

INPUT DATA FILE - STS6.DAT

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

   IT        HYDROGRAPH TIME DATA
                   NMIN         10  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1    0  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      3    0  ENDING DATE
                 NDTIME       0150  ENDING TIME
                  ICENT         19  CENTURY MARK

            COMPUTATION INTERVAL     .17 HOURS
                 TOTAL TIME BASE   49.83 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

23 JD        INDEX STORM NO. 1
                  STRM        3.70  PRECIPITATION DEPTH
                  TRDA         .01  TRANSPOSITION DRAINAGE AREA

24 PI          PRECIPITATION PATTERN
                 .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                 .01       .01       .01       .01       .01       .01       .01       .01       .01       .03
                 .05       .11       .21       .30       .05       .03       .01       .01       .01       .01
                 .01       .01       .01       .01       .01       .01

27 JD        INDEX STORM NO. 2
                  STRM        3.67  PRECIPITATION DEPTH
                  TRDA         .50  TRANSPOSITION DRAINAGE AREA

 0 PI          PRECIPITATION PATTERN
                 .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                 .01       .01       .01       .01       .01       .01       .01       .01       .01       .03
                 .05       .11       .21       .30       .05       .03       .01       .01       .01       .01
                 .01       .01       .01       .01       .01       .01

28 JD        INDEX STORM NO. 3
                  STRM        3.61  PRECIPITATION DEPTH
                  TRDA        2.80  TRANSPOSITION DRAINAGE AREA

29 PI          PRECIPITATION PATTERN
                 .01       .01       .00       .01       .01       .01       .01       .01       .01       .01
                 .01       .01       .01       .01       .01       .01       .01       .01       .03       .04
                 .06       .13       .15       .16       .10       .07       .04       .03       .02       .01
                 .01       .01       .01       .01       .01       .01

32 JD        INDEX STORM NO. 4
                  STRM        3.41  PRECIPITATION DEPTH
                  TRDA       15.80  TRANSPOSITION DRAINAGE AREA

33 PI          PRECIPITATION PATTERN
                 .01       .01       .00       .01       .01       .01       .01       .01       .01       .01
                 .01       .01       .01       .01       .01       .01       .01       .02       .03       .04
                 .05       .11       .12       .13       .08       .07       .05       .03       .03       .02
                 .01       .01       .01       .01       .01       .01

36 JD        INDEX STORM NO. 5
                  STRM        3.00  PRECIPITATION DEPTH
                  TRDA       90.00  TRANSPOSITION DRAINAGE AREA

37 PI          PRECIPITATION PATTERN
                 .01       .01       .01       .01       .01       .01       .01       .01       .01       .01
                 .01       .01       .01       .01       .01       .01       .02       .02       .03       .04
                 .06       .09       .10       .11       .08       .06       .05       .03       .03       .03
                 .01       .01       .01       .01       .01       .01

40 JD        INDEX STORM NO. 6
                  STRM        2.11  PRECIPITATION DEPTH
                  TRDA      500.00  TRANSPOSITION DRAINAGE AREA
```

```
41 PI            PRECIPITATION PATTERN
                    .02      .01      .01      .01      .01      .01      .01      .01      .01      .01
                    .01      .01      .02      .02      .02      .02      .02      .02      .03      .05
                    .06      .07      .07      .07      .07      .06      .05      .03      .03      .03
                    .02      .02      .02      .02      .02      .02

NING --- ROUTED OUTFLOW (  36401.) IS GREATER THAN MAXIMUM OUTFLOW (  35242.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  37466.) IS GREATER THAN MAXIMUM OUTFLOW (  35242.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  36923.) IS GREATER THAN MAXIMUM OUTFLOW (  35242.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  35956.) IS GREATER THAN MAXIMUM OUTFLOW (  35242.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  37016.) IS GREATER THAN MAXIMUM OUTFLOW (  35242.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  36482.) IS GREATER THAN MAXIMUM OUTFLOW (  35242.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3005.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3335.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3462.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3399.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3261.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3085.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   2982.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3308.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3432.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3368.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3230.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

ING --- ROUTED OUTFLOW (   3055.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3023.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3031.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   2959.) IS GREATER THAN MAXIMUM OUTFLOW (   2922.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   7470.) IS GREATER THAN MAXIMUM OUTFLOW (   7314.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   7742.) IS GREATER THAN MAXIMUM OUTFLOW (   7314.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   7666.) IS GREATER THAN MAXIMUM OUTFLOW (   7314.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   7344.) IS GREATER THAN MAXIMUM OUTFLOW (   7314.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   7395.) IS GREATER THAN MAXIMUM OUTFLOW (   7314.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   7663.) IS GREATER THAN MAXIMUM OUTFLOW (   7314.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   7587.) IS GREATER THAN MAXIMUM OUTFLOW (   7314.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3551.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   4011.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3992.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3574.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3108.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3519.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE

ING --- ROUTED OUTFLOW (   3974.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3953.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3538.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (   3077.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE
```

```
WARNING --- ROUTED OUTFLOW (   3045.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3322.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3382.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3227.) IS GREATER THAN MAXIMUM OUTFLOW (   3041.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3966.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   4217.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   4301.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   4261.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   4145.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3981.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3782.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3921.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   4169.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   4253.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   4213.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   4098.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3936.) IS GREATER THAN MAXIMUM OUTFLOW (   3773.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3635.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3748.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3821.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3847.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3829.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3773.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3683.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3565.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3594.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3706.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3778.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3803.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3785.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3730.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3641.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3540.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3570.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3578.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3562.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3530.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   3537.) IS GREATER THAN MAXIMUM OUTFLOW (   3529.) IN STORAGE-OUTFLOW TABLE
```

1

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	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE

				6-HOUR	24-HOUR	72-HOUR	
+ HYDROGRAPH AT	SUB101	1586.	4.50	259.	65.	31.	1.13
HYDROGRAPH AT	SUB102	2494.	4.33	540.	136.	65.	1.75
+ ROUTED TO	R102	2034.	4.67	482.	120.	58.	1.75
+ HYDROGRAPH AT	SUB103	1311.	4.33	233.	59.	28.	.75
+ ROUTED TO	R103	917.	4.67	198.	50.	24.	.75
+ HYDROGRAPH AT	SUB104	1088.	4.83	229.	57.	28.	1.00
+ 3 COMBINED AT	CP104	3487.	4.67	872.	218.	105.	3.50
+ 2 COMBINED AT	AA	4608.	4.67	1089.	273.	131.	4.63
+ ROUTED TO	RAA	4407.	4.83	1058.	265.	127.	4.63
+ HYDROGRAPH AT	SUB105	1241.	4.50	271.	68.	33.	.87
+ HYDROGRAPH AT	SUB106	1984.	4.67	342.	86.	41.	1.59
+ 3 COMBINED AT	BB	6508.	4.67	1573.	394.	190.	7.09
ROUTED TO	RBB	6144.	4.83	1531.	383.	184.	7.09
+ HYDROGRAPH AT	SUB107	2455.	4.67	673.	170.	82.	2.19
+ ROUTED TO	R107	2312.	4.83	659.	165.	80.	2.19
+ HYDROGRAPH AT	SUB108	1161.	4.50	251.	63.	30.	.94
+ ROUTED TO	R108	1016.	4.67	215.	54.	26.	.94
+ HYDROGRAPH AT	SUB109	2038.	4.50	299.	75.	36.	1.40
+ 3 COMBINED AT	CP109	4302.	4.67	1107.	278.	134.	4.53
+ HYDROGRAPH AT	SUB110	1687.	4.50	360.	90.	44.	1.16
+ 3 COMBINED AT	CC	10206.	4.83	2801.	703.	338.	12.78
+ ROUTED TO	RCC	9376.	5.00	2716.	680.	327.	12.78
+ HYDROGRAPH AT	111	1948.	4.50	403.	101.	49.	1.75
+ 2 COMBINED AT	CP111	10191.	5.00	3018.	757.	365.	14.53
+ HYDROGRAPH AT	SUB112	3528.	5.17	945.	237.	114.	4.33
+ ROUTED TO	R112	2641.	5.50	747.	187.	90.	4.33
+ HYDROGRAPH AT	SUB115	2310.	4.67	463.	116.	56.	2.20

	2 COMBINED AT						
+		DD	3606.	5.17	1130.	283.	136.	6.53
	ROUTED TO						
		RDD	3115.	5.33	985.	246.	119.	6.53
	HYDROGRAPH AT						
+		SUB116	1879.	4.67	500.	126.	61.	1.62
	2 COMBINED AT						
+		CP116	4071.	5.17	1427.	358.	172.	8.15
	HYDROGRAPH AT						
+		SUB113	2331.	5.33	673.	169.	81.	3.31
	ROUTED TO						
+		R113	1671.	5.67	534.	134.	64.	3.31
	HYDROGRAPH AT						
+		SUB114	2956.	4.50	711.	179.	86.	2.32
	2 COMBINED AT						
+		CP114	2992.	4.50	1182.	297.	143.	5.63
	3 COMBINED AT						
+		EE	14658.	5.00	4938.	1242.	598.	28.31
	ROUTED TO						
+		REE	10727.	5.50	4397.	1099.	529.	28.31
	HYDROGRAPH AT						
+		SUB117	3293.	4.67	806.	202.	98.	3.51
	2 COMBINED AT						
+		FF	11608.	5.50	4937.	1237.	596.	31.82
	ROUTED TO						
+		RFF	10891.	5.67	4733.	1183.	570.	31.82
	HYDROGRAPH AT						
+		SUB118	2866.	4.67	717.	180.	87.	2.92
	ROUTED TO						
+		R118	2475.	4.83	642.	160.	77.	2.92
	HYDROGRAPH AT						
+		SUB119	2080.	4.83	428.	107.	52.	1.89
	2 COMBINED AT						
+		CP119	4157.	4.83	1014.	254.	122.	4.81
	ROUTED TO						
+		RCP119	3647.	5.00	937.	234.	113.	4.81
	HYDROGRAPH AT						
+		SUB120	3214.	4.50	544.	136.	65.	2.61
	2 COMBINED AT						
+		GG	5181.	4.83	1384.	346.	167.	7.42
	ROUTED TO						
+		RGG	4770.	5.00	1306.	327.	157.	7.42
	HYDROGRAPH AT						
+		SUB121	3235.	5.17	1162.	298.	143.	4.65
	3 COMBINED AT						
+		HH	14959.	5.33	6368.	1600.	770.	43.89
	ROUTED TO						
+		RHH	14278.	5.67	6109.	1530.	737.	43.89
	HYDROGRAPH AT						
		SUB123	2364.	5.00	555.	139.	67.	2.66
	2 COMBINED AT						
+		CP123	15029.	5.50	6406.	1605.	773.	46.55
	HYDROGRAPH AT						
+		SUB122	4913.	5.17	1467.	368.	177.	6.52

	2 COMBINED AT						
+		II	17980.	5.50	7351.	1846.	889.	53.07
	ROUTED TO						
+		RII	15664.	5.83	6792.	1703.	820.	53.07
	HYDROGRAPH AT						
+		SUB124	4777.	5.00	1631.	416.	200.	7.40
	ROUTED TO						
+		R124	3922.	5.33	1504.	380.	183.	7.40
	HYDROGRAPH AT						
+		SUB125	5496.	5.33	2157.	560.	269.	10.22
	2 COMBINED AT						
+		CP125	8611.	5.33	3415.	879.	423.	17.62
	ROUTED TO						
+		RCP125	2858.	6.83	1987.	606.	292.	17.62
	HYDROGRAPH AT						
+		SUB126	5118.	6.00	1994.	504.	243.	12.59
	3 COMBINED AT						
+		JJ	19119.	6.00	8813.	2315.	1115.	83.28
	ROUTED TO						
+		RJJ	18404.	6.17	8558.	2232.	1075.	83.28
	HYDROGRAPH AT						
+		SUB127	3962.	4.17	572.	143.	69.	2.47
	ROUTED TO						
+		R127	1685.	4.67	489.	122.	59.	2.47
	HYDROGRAPH AT						
+		SUB128	3266.	5.00	1106.	282.	136.	5.10
	ROUTED TO						
+		R128	1473.	6.00	854.	221.	106.	5.10
	HYDROGRAPH AT						
+		SUB129	2950.	5.00	744.	186.	90.	3.73
	3 COMBINED AT						
+		CP129	4595.	5.00	1844.	475.	229.	11.30
	ROUTED TO						
+		RCP129	663.	6.50	457.	130.	62.	11.30
	HYDROGRAPH AT						
+		SUB130	1123.	6.00	442.	112.	54.	2.65
	3 COMBINED AT						
+		KK	18398.	6.17	8605.	2247.	1082.	97.23
	HYDROGRAPH AT						
+		SUB201	3496.	5.00	1171.	298.	143.	5.57
	ROUTED TO						
+		R201	2725.	5.50	1033.	259.	125.	5.57
	HYDROGRAPH AT						
+		SUB202	4828.	5.17	1289.	322.	155.	6.77
	2 COMBINED AT						
+		A1	6877.	5.17	2152.	539.	260.	12.34
	ROUTED TO						
+		RA1	5587.	5.67	2051.	513.	247.	12.34
	HYDROGRAPH AT						
+		SUB203	1964.	4.83	541.	136.	66.	2.21
	ROUTED TO						
+		R203	1544.	5.00	440.	110.	53.	2.21
	2 COMBINED AT						
+		B1	6501.	5.50	2381.	595.	287.	14.55
	HYDROGRAPH AT						

+	SUB204	3470.	4.83	1005.	253.	122.	4.13
ROUTED TO							
+	R204	3201.	5.00	961.	240.	116.	4.13
HYDROGRAPH AT							
	SUB205	1147.	4.67	196.	49.	24.	.90
3 COMBINED AT							
+	C1	8682.	5.33	3239.	811.	390.	19.58
ROUTED TO							
+	RC1	1222.	6.83	697.	209.	101.	19.58
HYDROGRAPH AT							
+	SUB206	2015.	6.00	796.	201.	97.	4.19
2 COMBINED AT							
+	CP206	2392.	6.33	1236.	354.	170.	23.77
HYDROGRAPH AT							
+	SUB207	2110.	6.33	946.	242.	117.	5.18
2 COMBINED AT							
+	D1	3861.	6.33	1891.	521.	251.	28.95
ROUTED TO							
+	RD1	2742.	7.17	1534.	438.	211.	28.95
HYDROGRAPH AT							
+	SUB208	1173.	4.67	202.	50.	24.	.91
2 COMBINED AT							
+	E1	2740.	7.17	1610.	472.	227.	29.86
ROUTED TO							
+	RE1	1886.	8.00	1220.	377.	182.	29.86
HYDROGRAPH AT							
+	SUB209	1852.	6.67	877.	227.	110.	4.94
HYDROGRAPH AT							
+	SUB210	4127.	5.83	1531.	385.	185.	9.64
3 COMBINED AT							
+	F1	4364.	6.00	2681.	770.	371.	44.44
ROUTED TO							
+	RF1	3259.	7.17	2304.	687.	331.	44.44
HYDROGRAPH AT							
+	SUB211	3722.	6.33	1637.	418.	201.	9.64
HYDROGRAPH AT							
+	SUB212	1086.	4.67	179.	45.	22.	.82
2 COMBINED AT							
+	G1	3722.	6.33	1772.	453.	218.	10.46
ROUTED TO							
+	RG1	3031.	6.83	1650.	422.	203.	10.46
HYDROGRAPH AT							
+	SUB213	1682.	5.00	376.	94.	45.	1.78
2 COMBINED AT							
+	H1	3031.	6.67	1918.	493.	237.	12.24
ROUTED TO							
+	RH1	2712.	7.17	1789.	462.	222.	12.24
HYDROGRAPH AT							
+	SUB214	1159.	5.00	269.	67.	32.	1.62
2 COMBINED AT							
+	I1	2712.	7.17	1946.	505.	243.	13.86
ROUTED TO							
+	RI1	2483.	7.67	1798.	470.	226.	13.86
HYDROGRAPH AT							
+	SUB215	755.	5.17	177.	44.	21.	.93

	3 COMBINED AT							
+		CP215	4851.	7.17	3444.	980.	472.	59.23
	HYDROGRAPH AT							
		SUB216	890.	5.17	222.	56.	27.	1.09
	2 COMBINED AT							
+		J1	4851.	7.17	3517.	1005.	484.	60.32
	2 COMBINED AT							
+		ST	18361.	6.33	9523.	2537.	1222.	157.55

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

```
1**************************************** ****************************************
 *                                      *                                        * *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                        *   U.S. ARMY CORPS OF ENGINEERS *
 *          SEPTEMBER 1990              *                                        *   HYDROLOGIC ENGINEERING CENTER *
 *           VERSION 4.0                *                                        *         609 SECOND STREET *
 *                                      *                                        *      DAVIS, CALIFORNIA 95616 *
 *  RUN DATE  08/21/1991  TIME  10:43:40 *                                        *          (916) 756-1104 *
 *                                      *                                        * *
 **************************************** ****************************************
```

```
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

1 HEC-1 INPUT PAGE 1

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

  1           ID      BENDER WASH HYDROLOGY FOR FLOOD INSURANCE STUDY
  2           ID      SOUTHEAST OF GILA BEND, MARICOPA COUNTY, ARIZONA
  3           ID      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  4           ID      RICE & GRANILLO   NOV., 1990/REV. APRIL, 1991
  5           ID
  6           ID      GREEN & AMPT LOSS RATE METHOD
  7           ID      S-GRAPH UNIT HYDROGRAPH METHOD
  8           ID      NORMAL DEPTH ROUTING
  9           ID
 10           ID      100-YEAR, 24-HOUR STORM
 11           ID
 12           ID       MAIN CHANNEL ROUTING - MANNINGS N : OVERBANKS - .08, CHANNEL - .035
 13           ID                            - LOSSES : 10 IN/HR
 14           ID
 15           ID       TRIBUTARY ROUTINGS   - MANNINGS N : OVERBANKS - .08, CHANNEL - .045
 16           ID                            - LOSSES : 5 IN/HR
 17           ID
 18           ID       INPUT FILE NAME      - BS24.DAT
 19           ID
              *DIAGRAM
 20           IT      10                     300
 21           IO       5
 22           IN      15
 23           JD    4.53     .01
 24           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
 25           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
 26           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 27           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.173
 28           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.487   0.663   0.707
 29           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 30           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 31           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
 32           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
 33           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
 34           JD    4.30      10
 35           JD    4.00      50
 36           JD    3.90      80
              *

 37           KK    SUB1
 38           KM   SUB-BASIN 1
 39           BA    2.10
```

```
 40        LG     .16     .34    3.70     .29     .80
 41        UI    103.    200.    436.    565.    701.    915.   1277.   1009.    809.    640.
 42        UI    504.    331.    180.    157.    103.     60.     31.     31.     31.     31.
 43        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 44        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
           *

 45        KK      R1
 46        KM      ROUTE SUB1 TO A
 47        RS       1    FLOW      -1
 48        RC     .08    .035     .08    3600    .004
 49        RX       0     100     200     205     265     270     370     470
 50        RY     4.0     3.0       2       0       0       2     3.0     4.0
```



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

 51        RL       0       0      10       0
           *

 52        KK    SUB2
 53        KM   SUB-BASIN 2
 54        BA    3.83
 55        LG     .15     .35    3.60     .27     .00
 56        UI    130.    130.    305.    522.    742.    886.   1009.   1239.   1524.    996.
 57        UI    826.    747.    675.    614.    544.    489.    422.    353.    317.    297.
 58        UI    272.    215.    186.    166.    147.    142.    112.    100.    100.     73.
 59        UI     64.     64.     64.     61.     25.     25.     25.     25.     25.     25.
 60        UI     25.     25.     25.     25.     25.      0.      0.      0.      0.      0.
 61        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
           *

 62        KK    SUB3
 63        KM   SUB-BASIN 103
 64        BA    2.10
 65        LG     .20     .25    7.00     .13    6.40
 66        UI    100.    169.    395.    620.    758.   1010.    954.    638.    553.    481.
 67        UI    411.    345.    274.    238.    214.    166.    129.    115.    103.     77.
 68        UI     74.     49.     49.     49.     27.     19.     19.     19.     19.     19.
 69        UI     19.     19.      0.      0.      0.      0.      0.      0.      0.      0.
 70        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
           *

 71        KK       A
 72        KM
 73        HC       3
           *

 74        KK      RA
 75        KM      ROUTE A TO B
 76        RS       1    FLOW      -1
 77        RC     .08    .035     .08    7100    .006
 78        RX       0     200     400     405     465     470     670     870
 79        RY       6       4       2       0       0       2       4       6
 80        RL       0       0      10       0
           *

 81        KK    SUB4
 82        KM   SUB-BASIN 4
 83        BA     .34
 84        LG     .15     .33    3.80     .24     .00
 85        UI     175     549     421     124      28       0       0       0       0       0
 86        UI       0       0       0       0       0       0       0       0       0       0
           *

 87        KK      R4
 88        KM      ROUTE SUB4 TO B
 89        RS       1    FLOW      -1
 90        RC     .08    .045     .08   36000    .019
 91        RX       0      50     100     105     135     140     190     240
 92        RY     3.5     2.5     1.5       0       0     1.5     2.5     3.5
 93        RL       0       0       5       0
           *
```



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

 94        KK    SUB5
 95        KM   SUB-BASIN 5
```

```
 96          BA    3.91
 97          LG     .17     .28    6.30     .16    3.80
 98          UI    152.    154.    483.    740.    983.   1154.   1431.   1718.   1107.    923.
 99          UI    831.    738.    653.    575.    487.    394.    362.    331.    274.    226.
100          UI    194.    170.    164.    117.    117.     98.     74.     74.     74.     57.
101          UI     29.     29.     29.     29.     29.     29.     29.     29.     29.     29.
102          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
103          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

104          KK     CP5
105          KM
106          HC       2
             *

107          KK    SUB6
108          KM   SUB-BASIN 6
109          BA    5.55
110          LG     .18     .26    6.30     .16    7.00
111          UI    223.    262.    793.   1080.   1282.   1530.   1882.   2654.   2556.   2021.
112          UI   1705.   1397.   1148.    884.    524.    384.    335.    223.    178.     68.
113          UI     68.     68.     68.     68.      0.      0.      0.      0.      0.      0.
114          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

115          KK       B
116          KM
117          HC       3
             *

118          KK      RB
119          KM      ROUTE B TO C
120          RS       1    FLOW      -1
121          RC     .08    .035     .08    9500    .008
122          RX       0     200     400     412     507     522     722     922
123          RY     6.4     6.2     6.1       0     2.3     5.0     6.2     7.4
124          RL       0       0      10       0
             *

125          KK    SUB7
126          KM   SUB-BASIN 7
127          BA    3.78
128          LG     .19     .22    8.30     .07   10.70
129          UI    191.    360.    847.   1250.   1546.   2143.   1428.   1132.    977.    838.
130          UI    707.    551.    463.    415.    323.    247.    218.    186.    147.    127.
131          UI     94.     94.     79.     37.     37.     37.     37.     37.     37.     37.
132          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
133          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
```



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

134          KK      R7
135          KM      ROUTE SUB7 TO CPC
136          RS       1    FLOW      -1
137          RC     .08    .045     .08   20700   .0136
138          RX       0     200     400     416     535     550     750     950
139          RY     2.1     1.9     1.7       0       0     1.0     1.6     2.2
140          RL       0       0       5       0
             *

141          KK    SUB8
142          KM   SUB-BASIN 8
143          BA    6.77
144          LG     .18     .25    6.80     .14    7.10
145          UI    284.    365.    961.   1536.   1953.   2307.   3172.   2461.   1805.   1595.
146          UI   1408.   1233.   1075.    893.    727.    667.    602.    469.    378.    341.
147          UI    311.    244.    218.    193.    139.    139.    139.     93.     54.     54.
148          UI     54.     54.     54.     54.     54.     54.     54.      0.      0.      0.
149          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

150          KK     CP8
151          KM
152          HC       2
             *

153          KK    SUB9
```

```
154          KM   SUB-BASIN 9
155          BA     .62
156          LG     .20      .21    10.80     .04    9.20
157          UI     139      423      776     576     297     107      38      23       0       0
158          UI       0        0        0       0       0       0       0       0       0       0
             *

159          KK      R9
160          KM      ROUTE SUB9 TO CP10
161          RS       1    FLOW      -1
162          RC     .08     .045     .08   31000    .017
163          RX       0       50     100     106     136     142     192     242
164          RY     3.5      2.5     1.5       0       0     1.5     2.5     3.5
165          RL       0        0       5       0
             *

166          KK   SUB10
167          KM   SUB-BASIN 10
168          BA    4.11
169          LG     .15      .32    4.40     .22     .00
170          UI    140.     140.    334.    570.    810.    963.   1096.   1360.   1629.   1054.
171          UI    883.     802.    722.    656.    582.    519.    450.    370.    340.    317.
172          UI    286.     231.    192.    179.    154.    154.    112.    108.    108.     71.
173          UI     69.      69.     69.     55.     27.     27.     27.     27.     27.     27.
174          UI     27.      27.     27.     27.     27.      0.      0.      0.      0.      0.
175          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
```



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

176          KK    CP10
177          KM
178          HC       2
             *

179          KK   RCP10
180          KM      ROUTE CP10 TO C
181          RS       1    FLOW      -1
182          RC     .08     .045     .08   29400    .018
183          RX       0       50     100     106     136     142     192     242
184          RY     3.5      2.5     1.5       0       0     1.5     2.5     3.5
185          RL       0        0       5       0
             *

186          KK   SUB11
187          KM   SUB-BASIN 11
188          BA    1.08
189          LG     .16      .30    5.40     .19    2.00
190          UI    135.     511.    887.    823.    529.    389.    263.    196.    127.     93.
191          UI     65.      50.     26.     19.     19.     19.      0.      0.      0.      0.
192          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

193          KK     R11
194          KM      ROUTE SUB11 TO CP12
195          RS       1    FLOW      -1
196          RC     .08     .045     .08   29400    .018
197          RX       0       50     100     106     136     142     192     242
198          RY     3.5      2.5     1.5       0       0     1.5     2.5     3.5
199          RL       0        0       5       0
             *

200          KK   SUB12
201          KM   SUB-BASIN 12
202          BA    4.69
203          LG     .20      .20   11.50     .02   10.00
204          UI    157.     157.    404.    647.    793.    915.   1058.   1238.   1629.   1989.
205          UI   1678.    1403.   1223.   1033.    884.    752.    554.    356.    273.    258.
206          UI    174.     157.    100.     48.     48.     48.     48.     48.     48.     48.
207          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
208          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

209          KK    CP12
210          KM
211          HC       2
             *
```

```
212          KK       C
213          KM
214          HC       4
             *
1                                    HEC-1 INPUT                                                    PAGE  6

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

215          KK      RC
216          KM      ROUTE C TO D
217          RS       1    FLOW      -1
218          RC     .08    .035     .08    6700    .008
219          RX       0     400     800     810     890     900    1300    1700
220          RY      19      11       3       0       0       3      11      19
221          RL       0       0      10       0
             *

222          KK   SUB13
223          KM   SUB-BASIN 13
224          BA    2.19
225          LG     .20     .20   11.50     .02   10.00
226          UI     202     764    1151    1888    1770    1201     758     335     207      78
227          UI      55      55       0       0       0       0       0       0       0       0
             *

228          KK     R13
229          KM     ROUTE SUB13 TO D
230          RS       1    FLOW      -1
231          RC     .08    .045     .08   28800   .0164
232          RX       0      50     100     107     137     141     191     241
233          RY     4.4     3.5     2.6     1.6       0     2.1     6.4    10.7
234          RL       0       0       5       0
             *

235          KK   SUB14
236          KM   SUB-BASIN 14
237          BA    2.76
238          LG     .15     .29    5.70     .18     .00
239          UI    105.    105.    319.    493.    662.    782.    939.   1220.    808.    654.
240          UI    588.    523.    468.    413.    351.    292.    257.    237.    209.    172.
241          UI    135.    127.    115.     97.     80.     80.     55.     51.     51.     51.
242          UI     30.     20.     20.     20.     20.     20.     20.     20.     20.     20.
243          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
244          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

245          KK    CP14
246          KM
247          HC       2
             *

248          KK       D
249          KM
250          HC       2
             *

251          KK      RD
252          KM      ROUTE D TO E
253          RS       1    FLOW      -1
254          RC     .08    .035     .08   12800    .008
255          RX       0     400     800     801     864     872    1272    1672
256          RY    21.3    11.7     2.1       0     1.3     2.5    25.3    48.1
1                                    HEC-1 INPUT                                                    PAGE  7

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

257          RL       0       0      10       0
             *

258          KK   SUB15
259          KM   SUB-BASIN 15
260          BA    4.57
261          LG     .15     .30    4.40     .22     .00
262          UI    142.    142.    308.    536.    680.    787.    886.   1033.   1211.   1598.
263          UI   1802.   1460.   1245.   1099.    939.    811.    694.    564.    375.    251.
264          UI    237.    207.    142.    142.     63.     44.     44.     44.     44.     44.
265          UI     44.     44.      0.      0.      0.      0.      0.      0.      0.      0.
266          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
```

```
267          KK   SUB16
268          KM   SUB-BASIN 16
269          BA    5.14
270          LG     .17     .27    6.60     .15    4.20
271          UI    161.    161.    323.    572.    837.   1029.   1184.   1336.   1710.   1762.
272          UI   1177.   1005.    923.    838.    768.    690.    631.    543.    468.    410.
273          UI    383.    356.    319.    265.    221.    206.    182.    177.    146.    124.
274          UI    124.    108.     79.     79.     79.     79.     64.     31.     31.     31.
275          UI     31.     31.     31.     31.     31.     31.     31.     31.     31.      0.
276          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
277          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

278          KK       E
279          KM
280          HC       3
             *

281          KK      RE
282          KM      ROUTE E TO F
283          RS       1    FLOW      -1
284          RC     .08    .035     .08   30000     .01
285          RX       0     400     800     810     920     928    1328    1528
286          RY     2.8     2.4     2.2       0     2.8     4.1     6.9     9.7
287          RL       0       0      10       0
             *

288          KK   SUB17
289          KM   SUB-BASIN 17
290          BA    5.30
291          LG     .17     .29    6.00     .17    3.30
292          UI    170.    170.    357.    626.    907.   1101.   1269.   1459.   1896.   1692.
293          UI   1191.   1033.    950.    859.    787.    703.    631.    550.    462.    419.
294          UI    393.    359.    299.    263.    217.    206.    186.    177.    130.    130.
295          UI    129.     83.     83.     83.     83.     79.     33.     33.     33.     33.
296          UI     33.     33.     33.     33.     33.     33.     33.     33.      0.      0.
297          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
```



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

298          KK     R17
299          KM      ROUTE SUB17 TO CP18
300          RS       1    FLOW      -1
301          RC     .08    .045     .08    3200    .013
302          RX       0      50     100     114     154     166     216     266
303          RY     1.7     1.6     1.5       0     2.1     2.3     3.2     4.1
304          RL       0       0       5       0
             *

305          KK   SUB18
306          KM   SUB-BASIN 18
307          BA    2.90
308          LG     .19     .25    7.00     .13    7.50
309          UI    156.    329.    752.   1069.   1371.   1642.   1028.    863.    735.    619.
310          UI    490.    392.    345.    275.    207.    178.    149.    120.     96.     76.
311          UI     76.     49.     30.     30.     30.     30.     30.     30.      0.      0.
312          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

313          KK    CP18
314          KM
315          HC       2
             *

316          KK   RCP18
317          KM      ROUTE CP18 TO F
318          RS       1    FLOW      -1
319          RC     .08    .045     .08    5000    .008
320          RX       0     200     400     406     436     442     642     842
321          RY     5.5     3.5     1.5       0       0     1.5     3.5     5.5
322          RL       0       0       5       0
             *

323          KK   SUB19
324          KM   SUB-BASIN 19
325          BA    4.67
```

```
326          LG     .16     .29    5.70     .18    3.70
327          UI    131.    131.    201.    458.    572.    670.    753.    849.    971.   1128.
328          UI   1451.   1695.   1410.   1207.   1071.    946.    823.    719.    626.    510.
329          UI    358.    232.    222.    215.    141.    131.    121.     40.     40.     40.
330          UI     40.     40.     40.     40.     40.      0.      0.      0.      0.      0.
331          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

332          KK    CP19
333          KM
334          HC       2
             *
1                                          HEC-1 INPUT                                          PAGE  9

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

335          KK   SUB20
336          KM   SUB-BASIN 20
337          BA    3.28
338          LG     .15     .31    4.10     .23     .00
339          UI     96.     96.    172.    343.    437.    506.    568.    648.    742.    909.
340          UI   1190.   1146.    942.    821.    729.    627.    548.    472.    396.    283.
341          UI    171.    163.    157.    103.     96.     81.     29.     29.     29.     29.
342          UI     29.     29.     29.     29.      0.      0.      0.      0.      0.      0.
343          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

344          KK    CP21
345          KM
346          HC       2
             *

347          KK       F
348          KM
349          HC       2
             *

350          KK      RF
351          KM      ROUTE F TO G
352          RS       1    FLOW      -1
353          RC     .08    .035     .08    9200    .008
354          RX       0      50     100     101     228     241     291     341
355          RY     6.6     6.5     6.4       0     4.7    10.3    11.0    11.6
356          RL       0       0      10       0
             *

357          KK   SUB21
358          KM   SUB-BASIN 21
359          BA    4.77
360          LG     .17     .26    7.10     .12    4.80
361          UI    174.    174.    483.    769.   1067.   1257.   1462.   1964.   1587.   1156.
362          UI   1019.    914.    827.    729.    646.    553.    451.    416.    384.    330.
363          UI    277.    222.    207.    190.    160.    133.    133.     96.     85.     85.
364          UI     85.     63.     33.     33.     33.     33.     33.     33.     33.     33.
365          UI     33.     33.      0.      0.      0.      0.      0.      0.      0.      0.
366          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

367          KK     R21
368          KM      ROUTE SUB21 TO CP22
369          RS       1    FLOW      -1
370          RC     .08    .045     .08   17000   .0096
371          RX       0     200     400     405     445     450     650     850
372          RY       6       4     2.0       0       0     2.0       4       6
373          RL       0       0       5       0
             *
1                                          HEC-1 INPUT                                          PAGE 10

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

374          KK   SUB22
375          KM   SUB-BASIN 22
376          BA    2.90
377          LG     .16     .29    5.10     .20    2.10
378          UI    154.    351.    697.    899.   1141.   1674.   1743.   1307.   1027.    791.
379          UI    536.    275.    228.    154.     70.     47.     47.     47.      0.      0.
380          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
```

```
381          KK    CP22
382          KM
383          HC       2
             *

384          KK   SUB23
385          KM   SUB-BASIN 23
386          BA     .54
387          LG     .17     .30    4.40     .22    3.80
388          UI      26      52     112     145     180     237     327     256     206     163
389          UI     127      82      46      39      26      14       8       8       8       8
390          UI       0       0       0       0       0       0       0       0       0       0
             *

391          KK     R23
392          KM      ROUTE SUB23 TO G
393          RS       1    FLOW      -1
394          RC     .08    .045     .08    4800    .008
395          RX       0      50     100     101     228     241     291     341
396          RY     6.6     6.5     6.4       0     4.7    10.3    11.0    11.6
397          RL       0       0       5       0
             *

398          KK       G
399          KM
400          HC       3
401          ZZ
```

1

```
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    37        SUB1
                V
                V
    45          R1
                .
                .
    52          .        SUB2
                .           .
                .           .
    62          .           .        SUB3
                .           .           .
                .           .           .
    71          A.......................
                V
                V
    74          RA
                .
                .
    81          .        SUB4
                .           V
                .           V
    87          .          R4
                .           .
                .           .
    94          .           .        SUB5
                .           .           .
                .           .           .
   104          .         CP5............
                .           .
                .           .
   107          .           .        SUB6
                .           .           .
                .           .           .
   115          B.......................
                V
                V
   118          RB
                .
                .
   125          .        SUB7
                .           V
                .           V
   134          .          R7
                .           .
                .           .
```

```
141          .           .        SUB8
             .           .           .
             .           .           .
150          .         CP8............
             .           .
             .           .
153          .           .        SUB9
             .           .           V
             .           .           V
159          .           .          R9
             .           .           .
             .           .           .
166          .           .           .       SUB10
             .           .           .           .
             .           .           .           .
176          .           .        CP10............
             .           .           V
             .           .           V
179          .           .       RCP10
             .           .           .
             .           .           .
186          .           .           .       SUB11
             .           .           .           V
             .           .           .           V
193          .           .           .         R11
             .           .           .           .
             .           .           .           .
200          .           .           .           .       SUB12
             .           .           .           .           .
             .           .           .           .           .
209          .           .           .        CP12............
             .           .           .           .
             .           .           .           .
212         C..................................
            V
            V
215        RC
            .
            .
222         .       SUB13
            .           V
            .           V
228         .         R13
            .           .
            .           .
235         .           .       SUB14
            .           .           .
            .           .           .
245         .        CP14............
            .           .
            .           .
248        D............
            V
            V
251        RD
            .
            .
258         .       SUB15
            .           .
            .           .
267         .           .       SUB16
            .           .           .
            .           .           .
278        E........................
            V
            V
281        RE
            .
            .
288         .       SUB17
            .           V
            .           V
298         .         R17
            .           .
            .           .
305         .           .       SUB18
            .           .           .
            .           .           .
313         .        CP18............
            .           V
```

```
                .          V
  316           .       RCP18
                .          .
                .          .
  323           .          .       SUB19
                .          .          .
                .          .          .
  332           .       CP19............
                .          .
                .          .
  335           .          .       SUB20
                .          .          .
                .          .          .
  344           .       CP21............
                .          .
                .          .
  347          F............
               V
               V
  350         RF
                .
                .
  357           .       SUB21
                .          V
                .          V
  367           .        R21
                .          .
                .          .
  374           .          .       SUB22
                .          .          .
                .          .          .
  381           .       CP22............
                .          .
                .          .
  384           .          .       SUB23
                .          .          V
                .          .          V
  391           .          .        R23
                .          .          .
                .          .          .
  398          G........................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************** ****************************************
 *                                         *                                      * *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)     *                                      *    U.S. ARMY CORPS OF ENGINEERS *
 *            SEPTEMBER 1990               *                                      *    HYDROLOGIC ENGINEERING CENTER *
 *             VERSION 4.0                 *                                      *          609 SECOND STREET *
 *                                         *                                      *       DAVIS, CALIFORNIA 95616 *
 *  RUN DATE  08/21/1991  TIME  10:43:40   *                                      *           (916) 756-1104 *
 *                                         *                                      * *
 ****************************************** ****************************************
```

BENDER WASH HYDROLOGY FOR FLOOD INSURANCE STUDY
SOUTHEAST OF GILA BEND, MARICOPA COUNTY, ARIZONA
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
RICE & GRANILLO NOV., 1990/REV. APRIL, 1991

GREEN & AMPT LOSS RATE METHOD
S-GRAPH UNIT HYDROGRAPH METHOD
NORMAL DEPTH ROUTING

100-YEAR, 24-HOUR STORM

MAIN CHANNEL ROUTING - MANNINGS N : OVERBANKS - .08, CHANNEL - .035
- LOSSES : 10 IN/HR

TRIBUTARY ROUTINGS - MANNINGS N : OVERBANKS - .08, CHANNEL - .045
- LOSSES : 5 IN/HR

INPUT FILE NAME - BS24.DAT

```
  21 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
```

```
                QSCAL          0.  HYDROGRAPH PLOT SCALE

IT          HYDROGRAPH TIME DATA
                 NMIN          10  MINUTES IN COMPUTATION INTERVAL
                IDATE      1    0  STARTING DATE
                ITIME        0000  STARTING TIME
                   NQ         300  NUMBER OF HYDROGRAPH ORDINATES
               NDDATE      3    0  ENDING DATE
               NDTIME        0150  ENDING TIME
               ICENT           19  CENTURY MARK

          COMPUTATION INTERVAL     .17 HOURS
               TOTAL TIME BASE   49.83 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

23 JD       INDEX STORM NO. 1
                 STRM        4.53  PRECIPITATION DEPTH
                 TRDA         .01  TRANSPOSITION DRAINAGE AREA

24 PI        PRECIPITATION PATTERN
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .01    .01    .01    .01    .01    .01
             .01    .01    .01    .01    .01    .01    .01    .02    .02    .14
             .13    .12    .03    .02    .02    .02    .01    .01    .01    .01
             .01    .01    .01    .01    .01    .01    .01    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00

34 JD       INDEX STORM NO. 2
                 STRM        4.30  PRECIPITATION DEPTH
                 TRDA       10.00  TRANSPOSITION DRAINAGE AREA

 0 PI        PRECIPITATION PATTERN
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .01    .01    .01    .01    .01    .01
             .01    .01    .01    .01    .01    .01    .01    .02    .02    .14
             .13    .12    .03    .02    .02    .02    .01    .01    .01    .01
             .01    .01    .01    .01    .01    .01    .01    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00

35 JD       INDEX STORM NO. 3
                 STRM        4.00  PRECIPITATION DEPTH
                 TRDA       50.00  TRANSPOSITION DRAINAGE AREA

 0 PI        PRECIPITATION PATTERN
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
             .00    .00    .00    .00    .01    .01    .01    .01    .01    .01
             .01    .01    .01    .01    .01    .01    .01    .02    .02    .14
             .13    .12    .03    .02    .02    .02    .01    .01    .01    .01
             .01    .01    .01    .01    .01    .01    .01    .00    .00    .00
             .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
```

```
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00

56 JD        INDEX STORM NO. 4
                STRM        3.90  PRECIPITATION DEPTH
                TRDA       80.00  TRANSPOSITION DRAINAGE AREA

  0 PI        PRECIPITATION PATTERN
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .01      .01      .01      .01      .01      .01
                .01      .01      .01      .01      .01      .01      .01      .02      .02      .14
                .13      .12      .03      .02      .02      .02      .01      .01      .01      .01
                .01      .01      .01      .01      .01      .01      .01      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00

 WARNING --- ROUTED OUTFLOW (   2652.) IS GREATER THAN MAXIMUM OUTFLOW (   2627.) IN STORAGE-OUTFLOW TABLE
1
```

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	SUB1	1493.	12.83	321.	81.	39.	2.10		
+	ROUTED TO	R1	1195.	13.17	281.	70.	34.	2.10		
+	HYDROGRAPH AT	SUB2	1795.	13.00	579.	147.	71.	3.83		
+	HYDROGRAPH AT	SUB3	1468.	12.67	402.	105.	51.	2.10		
+	3 COMBINED AT	A	4157.	13.00	1246.	319.	154.	8.03		
+	ROUTED TO	RA	3005.	13.33	1074.	269.	129.	8.03		
+	HYDROGRAPH AT	SUB4	557.	12.00	55.	14.	7.	.34		
+	ROUTED TO	R4	0.	.17	0.	0.	0.	.34		
+	HYDROGRAPH AT	SUB5	2231.	12.83	681.	177.	85.	3.91		
+	2 COMBINED AT	CP5	2229.	12.83	680.	177.	85.	4.25		
+	HYDROGRAPH AT	SUB6	3791.	13.17	1009.	265.	128.	5.55		
+	3 COMBINED AT	B	8283.	13.17	2642.	680.	328.	17.83		
	ROUTED TO	RB	6673.	13.50	2466.	619.	298.	17.83		
+	HYDROGRAPH AT	SUB7	2998.	12.67	860.	229.	110.	3.78		
	ROUTED TO									

+	R7	1037.	13.50	462.	116.	56.	3.78
HYDROGRAPH AT +	SUB8	4243.	12.83	1261.	334.	161.	6.77
2 COMBINED AT	CP8	5002.	12.83	1705.	444.	214.	10.55
HYDROGRAPH AT +	SUB9	993.	12.17	156.	41.	20.	.62
ROUTED TO +	R9	220.	12.67	50.	13.	6.	.62
HYDROGRAPH AT +	SUB10	2015.	13.00	650.	165.	80.	4.11
2 COMBINED AT +	CP10	2206.	13.00	697.	177.	85.	4.73
ROUTED TO +	RCP10	872.	14.00	476.	119.	58.	4.73
HYDROGRAPH AT +	SUB11	1100.	12.33	182.	46.	22.	1.08
ROUTED TO +	R11	297.	12.83	79.	20.	10.	1.08
HYDROGRAPH AT +	SUB12	3535.	13.33	1303.	356.	172.	4.69
2 COMBINED AT +	CP12	3779.	13.33	1377.	374.	181.	5.77
4 COMBINED AT +	C	14091.	13.33	5556.	1437.	692.	38.88
ROUTED TO	RC	13195.	13.50	5331.	1342.	646.	38.88
HYDROGRAPH AT +	SUB13	2888.	12.50	616.	167.	81.	2.19
ROUTED TO +	R13	1184.	13.00	485.	125.	60.	2.19
HYDROGRAPH AT +	SUB14	1497.	13.00	455.	115.	55.	2.76
2 COMBINED AT +	CP14	2663.	13.00	933.	238.	115.	4.95
2 COMBINED AT +	D	14872.	13.50	6123.	1544.	744.	43.83
ROUTED TO +	RD	12888.	14.00	5682.	1432.	689.	43.83
HYDROGRAPH AT +	SUB15	2392.	13.50	741.	185.	89.	4.57
HYDROGRAPH AT +	SUB16	2542.	13.17	896.	237.	114.	5.14
3 COMBINED AT +	E	15774.	13.67	7027.	1784.	859.	53.54
ROUTED TO +	RE	6489.	15.00	3292.	861.	415.	53.54
HYDROGRAPH AT +	SUB17	2589.	13.17	891.	234.	113.	5.30
ROUTED TO +	R17	2437.	13.33	860.	225.	108.	5.30
HYDROGRAPH AT +	SUB18	2179.	12.50	558.	147.	71.	2.90

	2 COMBINED AT						
+		CP18	3668.	13.17	1401.	368.	178.	8.20
	ROUTED TO						
+		RCP18	3186.	13.50	1322.	340.	164.	8.20
	HYDROGRAPH AT						
+		SUB19	2325.	13.67	801.	206.	99.	4.67
	2 COMBINED AT						
+		CP19	5283.	13.67	2077.	535.	258.	12.87
	HYDROGRAPH AT						
+		SUB20	1610.	13.67	530.	132.	64.	3.28
	2 COMBINED AT						
+		CP21	6752.	13.67	2554.	654.	315.	16.15
	2 COMBINED AT						
+		F	9215.	14.50	5345.	1421.	684.	69.69
	ROUTED TO						
+		RF	8902.	14.67	5126.	1352.	651.	69.69
	HYDROGRAPH AT						
+		SUB21	2746.	13.00	895.	235.	113.	4.77
	ROUTED TO						
+		R21	1307.	13.83	725.	183.	88.	4.77
	HYDROGRAPH AT						
+		SUB22	2352.	12.83	486.	124.	60.	2.90
	2 COMBINED AT						
+		CP22	3087.	12.83	1193.	304.	147.	7.67
	HYDROGRAPH AT						
+		SUB23	416.	12.83	92.	24.	11.	.54
	ROUTED TO						
		R23	337.	13.17	82.	21.	10.	.54
	3 COMBINED AT						
+		G	9878.	14.50	6094.	1612.	776.	77.90

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

```
1**************************************** ****************************************
 *                                      *                                        * *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                        *   U.S. ARMY CORPS OF ENGINEERS *
 *           SEPTEMBER 1990             *                                        *   HYDROLOGIC ENGINEERING CENTER *
 *            VERSION 4.0               *                                        *         609 SECOND STREET *
 *                                      *                                        *      DAVIS, CALIFORNIA 95616 *
 *  RUN DATE  08/21/1991  TIME  11:33:00 *                                        *          (916) 756-1104 *
 *                                      *                                        * *
 **************************************** ****************************************
```

```
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

1 HEC-1 INPUT PAGE 1

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

  1           ID      SAND TANK WASH HYDROLOGY FOR FLOOD INSURANCE STUDY
  2           ID      SOUTHEAST OF GILA BEND, MARICOPA COUNTY, ARIZONA
  3           ID      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  4           ID      RICE & GRANILLO   NOV., 1990/REV. APRIL, 1991
  5           ID
  6           ID      GREEN & AMPT LOSS RATE METHOD
  7           ID      S-GRAPH UNIT HYDROGRAPH
  8           ID      NORMAL DEPTH ROUTING
  9           ID
 10           ID      100 YR, 24 HOUR STORM
 11           ID
 12           ID      MAIN CHANNEL ROUTING - MANNINGS N: OVERBANKS - .08, CHANNEL - .035
 13           ID                           - LOSSES : 10 IN/HR
 14           ID
 15           ID      TRIBUTARY ROUTING    - MANNINGS N: OVERBANKS - .08, CHANNEL - .045
 16           ID                           - LOSSES : 5 IN/HR
 17           ID
 18           ID      INPUT DATA FILE      - STS24.DAT
 19           ID
              *DIAGRAM
 20           IT      10                     300
 21           IO       5
 22           IN      15
 23           JD    4.53     .01
 24           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
 25           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
 26           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 27           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.173
 28           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.487   0.663   0.707
 29           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 30           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 31           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
 32           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
 33           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
 34           JD    4.30      10
 35           JD    4.00      50
 36           JD    3.85     100
 37           JD    3.76     150
              *

 38           KK  SUB101
 39           KM   SUB-BASIN 101
```

```
 40          BA    1.13
 41          LG     .17     .29    6.30     .16    3.90
 42          UI     88.    357.    535.    824.    963.    651.    446.    219.    127.     68.
 43          UI     27.     27.      0.      0.      0.      0.      0.      0.      0.      0.
 44          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

 45          KK  SUB102
 46          KM   SUB-BASIN 102
 47          BA    1.75
 48          LG     .20     .20   11.50     .02   10.00
 49          UI     186     708    1205    1443     870     671     476     352     246     179
 50          UI     128      90      75      37      29      29      29       0       0       0
             *
```



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

 51          KK    R102
 52          KM     ROUTE SUB102 TO AA
 53          RS       1    FLOW      -1
 54          RC     .08    .045     .08   13000    .023
 55          RX       0      50     100     122     193     215     265     315
 56          RY    10.1     9.9     9.7     1.6       0     7.8     8.2     8.6
 57          RL       0       0       5       0
             *

 58          KK  SUB103
 59          KM   SUB-BASIN 103
 60          BA     .75
 61          LG     .20     .20   11.50     .02   10.00
 62          UI      99     375     660     543     364     264     178     127      85      61
 63          UI      41      33      14      14      14      14       0       0       0       0
             *

 64          KK    R103
 65          KM     ROUTE SUB103 TO AA
 66          RS       1    FLOW      -1
 67          RC     .08    .045     .08   10000    .018
 68          RX       0      50     100     122     193     215     265     315
 69          RY    10.1     9.9     9.7     1.6       0     7.8     8.2     8.6
 70          RL       0       0       5       0
             *

 71          KK  SUB104
 72          KM   SUB-BASIN 104
 73          BA    1.00
 74          LG     .17     .30    6.00     .17    3.30
 75          UI     53.    119.    237.    306.    388.    564.    603.    451.    355.    274.
 76          UI    188.     98.     80.     53.     27.     16.     16.     16.     16.      0.
 77          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 78          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

 79          KK   CP104
 80          KM
 81          HC       3
             *

 82          KK      AA
 83          KM
 84          HC       2
             *

 85          KK     RAA
 86          KM     ROUTE AA TO BB
 87          RS       1    FLOW      -1
 88          RC     .08    .045     .08    4500    .016
 89          RX       0      50     100     121     167     174     224     274
 90          RY    13.0     8.5     4.0       0      .5     1.8     2.3     2.8
 91          RL       0       0       5       0
             *
```



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

 92          KK  SUB105
 93          KM   SUB-BASIN 105
```

```
 94          BA     .87
 95          LG     .20     .20   11.50     .02   10.00
 96          UI     62.    216.    411.    590.    527.    354.    286.    223.    163.    135.
 97          UI     94.     74.     57.     45.     30.     30.     13.     12.     12.     12.
 98          UI     12.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 99          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

100          KK  SUB106
101          KM   SUB-BASIN 106
102          BA    1.59
103          LG     .16     .32    4.70     .21    1.90
104          UI    116.    433.    666.    951.   1368.    979.    696.    450.    207.    139.
105          UI     66.     35.     35.      0.      0.      0.      0.      0.      0.      0.
106          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

107          KK      BB
108          KM
109          HC       3
             *

110          KK     RBB
111          KM     ROUTE BB TO CC
112          RS       1    FLOW      -1
113          RC     .08    .045     .08    4500    .006
114          RX       0      50     100     121     167     174     224     274
115          RY    13.0     8.5     4.0       0      .5     1.8     2.3     2.8
116          RL       0       0       5       0
             *

117          KK  SUB107
118          KM   SUB-BASIN 107
119          BA    2.19
120          LG     .20     .20   11.50     .02   10.00
121          UI    129.    321.    688.    946.   1346.   1040.    756.    637.    530.    420.
122          UI    324.    283.    217.    164.    141.    106.     95.     63.     63.     47.
123          UI     25.     25.     25.     25.     25.     25.      0.      0.      0.      0.
124          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

125          KK    R107
126          KM     ROUTE SUB107 TO CC
127          RS       1    FLOW      -1
128          RC     .08    .045     .08    4800    .023
129          RX       0      59      85      96     121     126     166     206
130          RY    12.9    11.2     7.2       0     1.1     2.5     3.8     5.2
131          RL       0       0       5       0
             *
```



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

132          KK  SUB108
133          KM   SUB-BASIN 108
134          BA     .94
135          LG     .19     .24    8.10     .08    7.50
136          UI     63.    197.    391.    537.    628.    389.    318.    258.    193.    152.
137          UI    123.     89.     72.     55.     45.     31.     31.     15.     12.     12.
138          UI     12.     12.     12.      0.      0.      0.      0.      0.      0.      0.
139          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

140          KK    R108
141          KM     ROUTE SUB108 TO CC
142          RS       1    FLOW      -1
143          RC     .08    .045     .08    5700    .019
144          RX       0      50     100     104     200     208     258     308
145          RY     6.4     5.5     4.6       0      .6     3.6    11.4    17.9
146          RL       0       0       5       0
             *

147          KK  SUB109
148          KM   SUB-BASIN 109
149          BA    1.40
150          LG     .15     .34    4.10     .23     .80
151          UI     165     572     877    1434    1047     688     323     170      74      39
152          UI      39       0       0       0       0       0       0       0       0       0
             *
```

```
153          KK   CP109
154          KM
155          HC       3
             *

156          KK  SUB110
157          KM   SUB-BASIN 110
158          BA    1.16
159          LG     .20     .20   11.50     .02    9.90
160          UI     95.    377.    653.    946.    597.    464.    359.    255.    204.    140.
161          UI    107.     79.     59.     45.     33.     18.     18.     18.     18.      0.
162          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
163          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

164          KK      CC
165          KM
166          HC       3
             *

167          KK     RCC
168          KM     ROUTE CC TO EE
169          RS       1    FLOW      -1
170          RC     .08    .045     .08   11100    .013
171          RX       0      50     100     123     156     161     211     261
172          RY      15     8.2     1.4      .8       0     1.3    11.8    22.2
173          RL       0       0       5       0
             *
```



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

174          KK     111
175          KM   SUB-BASIN 111
176          BA    1.75
177          LG     .20     .32    6.60     .15    9.70
178          UI    130.    488.    885.   1322.    963.    708.    565.    424.    317.    250.
179          UI    177.    143.    100.     76.     64.     43.     25.     25.     25.     25.
180          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
181          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

182          KK   CP111
183          KM
184          HC       2
             *

185          KK  SUB112
186          KM   SUB-BASIN 112
187          BA    4.33
188          LG     .17     .28    6.80     .14    4.70
189          UI    190.    293.    732.    973.   1165.   1433.   1953.   2348.   1800.   1489.
190          UI   1201.    970.    710.    403.    320.    237.    190.     78.     58.     58.
191          UI     58.     58.      0.      0.      0.      0.      0.      0.      0.      0.
192          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

193          KK    R112
194          KM     ROUTE SUB112 TO DD
195          RS       1    FLOW      -1
196          RC     .08    .035     .08   15500    .025
197          RX       0      50     100     104     219     232     282     332
198          RY     2.7     2.3     1.9       0     2.4     5.4    16.9    28.4
199          RL       0       0      10       0
             *

200          KK  SUB115
201          KM   SUB-BASIN 115
202          BA    2.20
203          LG     .16     .32    4.70     .21    1.80
204          UI    136.    397.    696.    908.   1312.   1578.   1137.    853.    620.    317.
205          UI    222.    136.     61.     42.     42.     42.      0.      0.      0.      0.
206          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

207          KK      DD
208          KM
209          HC       2
```

```
                *

210             KK     RDD
211             KM     ROUTE DD TO EE
212             RS       1    FLOW      -1
213             RC     .08    .035     .08   11000    .017
214             RX       0      50     100     105     165     170     220     280
215             RY     3.6     3.0     2.5       0       0     2.5     4.7     6.9
```



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

216             RL       0       0      10       0
                *

217             KK  SUB116
218             KM   SUB-BASIN 116
219             BA    1.62
220             LG     .20     .20   11.50     .02    9.90
221             UI     94.    231.    499.    688.    969.    795.    561.    474.    395.    319.
222             UI    241.    211.    167.    124.    106.     83.     72.     48.     46.     41.
223             UI     18.     18.     18.     18.     18.     18.      0.      0.      0.      0.
224             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *

225             KK   CP116
226             KM
227             HC       2
                *

228             KK  SUB113
229             KM   SUB-BASIN 113
230             BA    3.31
231             LG     .16     .32    4.70     .21    1.80
232             UI    125.    125.    418.    568.    688.    802.    958.   1274.   1571.   1281.
233             UI   1065.    905.    753.    620.    475.    288.    216.    197.    125.    120.
234             UI     38.     38.     38.     38.     38.     38.      0.      0.      0.      0.
235             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *

236             KK    R113
237             KM     ROUTE SUB113 TO EE
238             RS       1    FLOW      -1
239             RC     .08    .035     .08   10800    .017
240             RX       0       5     144     151     182     193     293     320
241             RY    11.7     1.7     1.7      .5       0     2.3     4.1    17.6
242             RL       0       0      10       0
                *

243             KK  SUB114
244             KM   SUB-BASIN 114
245             BA    2.32
246             LG     .20     .20   11.50     .02   10.00
247             UI    173.    653.   1180.   1765.   1262.    936.    746.    556.    419.    328.
248             UI    231.    185.    133.     98.     85.     53.     33.     33.     33.     33.
249             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
250             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *

251             KK   CP114
252             KM
253             HC       2
                *
```



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

254             KK      EE
255             KM
256             HC       3
                *

257             KK     REE
258             KM     ROUTE EE TO FF
259             RS       1    FLOW      -1
260             RC     .08    .035     .08   16500    .014
261             RX       0     400     800     809     881     890    1290    1690
262             RY      11       7     3.0       0       0     3.0       7      11
263             RL       0       0      10       0
```

```
            *

264         KK  SUB117
265         KM   SUB-BASIN 117
266         BA    3.51
267         LG     .19     .26    7.00     .13    6.30
268         UI    229.    679.   1373.   1867.   2373.   1460.   1194.    978.    765.    573.
269         UI    493.    349.    276.    228.    175.    128.    112.     90.     44.     44.
270         UI     44.     44.     44.      0.      0.      0.      0.      0.      0.      0.
271         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            *

272         KK      FF
273         KM
274         HC       2
            *

275         KK     RFF
276         KM     ROUTE FF TO GG
277         RS       1    FLOW      -1
278         RC     .08    .035     .08    6200    .013
279         RX       0     400     800     809     881     890    1290    1690
280         RY      11       7     3.0       0       0     3.0       7      11
281         RL       0       0      10       0
            *

282         KK  SUB118
283         KM   SUB-BASIN 118
284         BA    2.92
285         LG     .19     .25    7.50     .10    6.30
286         UI    183.    509.   1060.   1432.   1970.   1237.    999.    827.    666.    498.
287         UI    419.    331.    242.    203.    153.    131.     90.     90.     53.     35.
288         UI     35.     35.     35.     35.      0.      0.      0.      0.      0.      0.
289         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            *

290         KK    R118
291         KM     ROUTE SUB118 TO CP119
292         RS       1    FLOW      -1
293         RC     .08    .045     .08   12000    .015
294         RX       0      50     100     112     162     174     224     274
295         RY    11.5     8.2     4.8       0       0     4.8     6.3     7.8
```



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

296         RL       0       0       5       0
            *

297         KK  SUB119
298         KM   SUB-BASIN 119
299         BA    1.89
300         LG     .17     .28    6.60     .15    3.20
301         UI    111.    301.    549.    709.    967.   1352.   1011.    776.    583.    377.
302         UI    192.    146.     96.     34.     34.     34.     34.      0.      0.      0.
303         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            *

304         KK   CP119
305         KM
306         HC       2
            *

307         KK  RCP119
308         KM     ROUTE CP119 TO GG
309         RS       1    FLOW      -1
310         RC     .08    .045     .08   12000    .015
311         RX       0      50     100     112     162     174     224     274
312         RY    11.5     8.2     4.8       0       0     4.8     6.3     7.8
313         RL       0       0       5       0
            *

314         KK  SUB120
315         KM   SUB-BASIN 120
316         BA    2.61
317         LG     .16     .31    4.40     .22    1.60
318         UI    240.    908.   1367.   2240.   2108.   1431.    904.    400.    247.     94.
319         UI     65.     65.      0.      0.      0.      0.      0.      0.      0.      0.
320         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            *
```

```
321          KK      GG
322          KM
323          HC       2
             *

324          KK     RGG
325          KM     ROUTE GG TO HH
326          RS       1    FLOW      -1
327          RC     .08    .035     .08    4500    .011
328          RX       0     200     400     409     481     490     690     890
329          RY       7       5     3.0       0       0     3.0       5       7
330          RL       0       0      10       0
             *

331          KK  SUB121
332          KM   SUB-BASIN 121
333          BA    4.65
334          LG     .19     .23    8.30     .07    7.30
335          UI    172.    172.    490.    774.   1064.   1252.   1470.   1972.   1487.   1119.
336          UI    993.    891.    801.    706.    622.    520.    439.    405.    371.    308.
1                                          HEC-1 INPUT                                          PAGE  9

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

337          UI    258.    219.    196.    188.    141.    132.    127.     84.     84.     84.
338          UI     84.     43.     33.     33.     33.     33.     33.     33.     33.     33.
339          UI     33.     33.      0.      0.      0.      0.      0.      0.      0.      0.
340          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

341          KK      HH
342          KM
343          HC       3
             *

344          KK     RHH
345          KM      ROUTE HH TO II
346          RS       1    FLOW      -1
347          RC     .08    .035     .08   13200    .011
348          RX       0      50     100     113     192     203     253     303
349          RY    16.6    11.1     5.6     2.2       0     3.5     8.1    12.7
350          RL       0       0      10       0
             *

351          KK  SUB123
352          KM   SUB-BASIN 123
353          BA    2.66
354          LG     .16     .30    5.40     .19     .18
355          UI    131.    257.    557.    722.    895.   1178.   1622.   1272.   1021.    807.
356          UI    631.    407.    228.    195.    131.     71.     40.     40.     40.     40.
357          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
358          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

359          KK   CP123
360          KM
361          HC       2
             *

362          KK  SUB122
363          KM   SUB-BASIN 122
364          BA    6.52
365          LG     .17     .25    7.30     .11    3.90
366          UI    254.    260.    890.   1184.   1425.   1681.   2025.   2766.   3132.   2441.
367          UI   2059.   1707.   1420.   1157.    808.    454.    421.    311.    254.    138.
368          UI     78.     78.     78.     78.     78.      0.      0.      0.      0.      0.
369          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

370          KK      II
371          KM
372          HC       2
             *
                                           HEC-1 INPUT                                          PAGE 10

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

373          KK     RII
```

```
374          KM     ROUTE II TO JJ
375          RS       1    FLOW      -1
376          RC     .08    .035     .08   23400    .009
377          RX       0      50     100     113     192     203     253     303
378          RY    16.6    11.1     5.6     2.2       0     3.5     8.1    12.7
379          RL       0       0      10       0
             *

380          KK  SUB124
381          KM   SUB-BASIN 124
382          BA    7.40
383          LG     .18     .26    7.30     .11    5.90
384          UI    291.    310.    935.   1447.   1902.   2232.   2817.   3198.   2063.   1746.
385          UI   1564.   1396.   1225.   1072.    891.    743.    684.    621.    495.    407.
386          UI    365.    319.    286.    223.    223.    161.    143.    143.    143.     77.
387          UI     56.     56.     56.     56.     56.     56.     56.     56.     56.      0.
388          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
389          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

390          KK    R124
391          KM     ROUTE SUB124 TO CP125
392          RS       1    FLOW      -1
393          RC     .08    .035     .08   30000    .016
394          RX       0      50     100     114     138     150     200     250
395          RY     9.3     9.2     9.1       0      .5     7.6    10.7    13.7
396          RL       0       0       5       0
             *

397          KK  SUB125
398          KM   SUB-BASIN 125
399          BA   10.22
400          LG     .18     .26    7.30     .11    6.00
401          UI    327.    327.    683.   1198.   1739.   2113.   2435.   2796.   3623.   3286.
402          UI   2297.   1990.   1832.   1655.   1518.   1354.   1220.   1060.    893.    807.
403          UI    756.    694.    581.    510.    418.    398.    358.    345.    251.    251.
404          UI    251.    163.    160.    160.    160.    158.     63.     63.     63.     63.
405          UI     63.     63.     63.     63.     63.     63.     63.     63.      0.      0.
406          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

407          KK   CP125
408          KM
409          HC       2
             *

410          KK  RCP125
411          KM     ROUTE CP125 TO JJ
412          RS       1    FLOW      -1
413          RC     .08    .045     .08   36000    .009
414          RX       0     200     400     408     433     440     640     840
415          RY     7.8     4.8     1.8       0       0     1.8     3.8     5.8
416          RL       0       0       5       0
             *
```



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

417          KK  SUB126
418          KM   SUB-BASIN 126
419          BA   12.59
420          LG     .16     .33    3.70     .28    1.20
421          UI    322.    322.    322.   1051.   1302.   1541.   1759.   1929.   2161.   2454.
422          UI   2843.   3582.   4207.   3581.   3070.   2737.   2468.   2162.   1925.   1677.
423          UI   1511.   1167.    866.    571.    552.    530.    401.    322.    322.    189.
424          UI     99.     99.     99.     99.     99.     99.     99.     99.     99.      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     JJ
428          KM
429          HC       3
             *

430          KK     RJJ
431          KM    ROUTE JJ TO KK
432          RS       1    FLOW      -1
433          RC     .08    .035     .08    9000    .005
```

```
434          RX       0      50     100     113     192     203     253     303
435          RY    16.6    11.1     5.6     2.2       0     3.5     8.1    12.7
436          RL       0       0      10       0
             *

437          KK  SUB127
438          KM   SUB-BASIN 127
439          BA    2.47
440          LG     .18     .27    7.00     .13    5.10
441          UI   1253.   3726.   2174.   1171.    602.    310.    159.     82.      0.      0.
442          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

443          KK    R127
444          KM     ROUTE SUB127 TO CP129
445          RS       1    FLOW      -1
446          RC     .08    .045     .08   12000     .01
447          RX       0     200     400     408     433     440     640     840
448          RY     7.8     4.8     1.8       0       0     1.8     3.8     5.8
449          RL       0       0       5       0
             *

450          KK  SUB128
451          KM   SUB-BASIN 128
452          BA    5.10
453          LG     .18     .27    7.00     .13    5.10
454          UI    197.    197.    616.    943.   1259.   1482.   1814.   2259.   1455.   1206.
455          UI   1084.    967.    856.    758.    640.    525.    472.    434.    369.    305.
456          UI    251.    227.    215.    161.    151.    139.     96.     96.     96.     90.
457          UI     38.     38.     38.     38.     38.     38.     38.     38.     38.     38.
458          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
459          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
```



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

460          KK    R128
461          KM     ROUTE SUB128 TO CP129
462          RS       1    FLOW      -1
463          RC     .08    .045     .08   20100    .011
464          RX       0     200     400     408     433     440     640     840
465          RY     7.8     4.8     1.8       0       0     1.8     3.8     5.8
466          RL       0       0       5       0
             *

467          KK  SUB129
468          KM   SUB-BASIN 129
469          BA    3.73
470          LG     .16     .33    4.70     .21    1.60
471          UI    169.    283.    671.    886.   1072.   1330.   1902.   1968.   1511.   1241.
472          UI    993.    789.    511.    296.    266.    169.    121.     52.     52.     52.
473          UI     52.     52.      0.      0.      0.      0.      0.      0.      0.      0.
474          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

475          KK   CP129
476          KM
477          HC       3
             *

478          KK  RCP129
479          KM     ROUTE CP129 TO KK
480          RS       1    FLOW      -1
481          RC     .08    .035     .08   40000    .008
482          RX       0     200     400     408     433     440     640     840
483          RY     7.8     4.8     1.8       0       0     1.8     3.8     5.8
484          RL       0       0      10       0
             *

485          KK  SUB130
486          KM   SUB-BASIN 130
487          BA    2.65
488          LG     .15     .35    4.10     .35     .00
489          UI     64.     64.     64.    181.    240.    300.    333.    368.    406.    459.
490          UI    510.    613.    768.    821.    687.    600.    539.    489.    431.    386.
491          UI    341.    305.    256.    188.    125.    113.    105.    102.     64.     64.
492          UI     64.     25.     20.     20.     20.     20.     20.     20.     20.     20.
493          UI     20.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```

```
494          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

495          KK      KK
496          KM      (MAIN SAND TANK WASH)
497          HC       3
             *
             *
             *
```



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

498          KK  SUB201
499          KM   SUB-BASIN 201
500          BA    5.57
501          LG     .18     .28    6.80     .14    4.90
502          UI    217.    222.    691.   1060.   1404.   1649.   2051.   2439.   1572.   1314.
503          UI   1183.   1050.    928.    816.    689.    560.    515.    470.    387.    319.
504          UI    277.    241.    230.    166.    166.    136.    106.    106.    106.     77.
505          UI     42.     42.     42.     42.     42.     42.     42.     42.     42.      0.
506          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
507          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

508          KK    R201
509          KM     ROUTE SUB201 TO A1
510          RS       1    FLOW      -1
511          RC     .08    .045     .08   15000    .012
512          RX       0      50     100     110     170     180     230     280
513          RY     4.5     4.3     4.0       0       0     4.0     4.3     4.5
514          RL       0       0       5       0
             *

515          KK  SUB202
516          KM   SUB-BASIN 202
517          BA    6.77
518          LG     .17     .30    5.70     .18     .30
519          UI    288.    407.   1080.   1444.   1727.   2098.   2773.   3591.   2904.   2377.
520          UI   1950.   1586.   1262.    770.    501.    449.    288.    226.     88.     88.
521          UI     88.     88.     88.      0.      0.      0.      0.      0.      0.      0.
522          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

523          KK      A1
524          KM
525          HC       2
             *

526          KK     RA1
527          KM     ROUTE A1 TO B1
528          RS       1    FLOW      -1
529          RC     .08    .045     .08    9000    .015
530          RX       0     200     400     410     470     480     680     880
531          RY       6       5     4.0       0       0     4.0       5       6
532          RL       0       0       5       0
             *

533          KK  SUB203
534          KM   SUB-BASIN 203
535          BA    2.21
536          LG     .18     .25    7.50     .11    6.60
537          UI    114.    222.    523.    761.    948.   1269.    809.    661.    567.    484.
538          UI    400.    312.    270.    231.    176.    144.    125.     97.     88.     62.
539          UI     56.     56.     31.     22.     22.     22.     22.     22.     22.     22.
540          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
541          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
```



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

542          KK    R203
543          KM     ROUTE SUB203 TO C1
544          RS       1    FLOW      -1
545          RC     .08    .045     .08   13600    .015
546          RX       0      50     100     110     170     180     230     280
547          RY     4.5     4.3     4.0       0       0     4.0     4.3     4.5
```

```
548          RL       0       0       5       0
             *

549          KK      B1
550          KM
551          HC       2
             *

552          KK  SUB204
553          KM   SUB-BASIN 204
554          BA    4.13
555          LG     .19     .25    7.80     .09    7.00
556          UI    210.    401.    943.   1384.   1715.   2362.   1527.   1233.   1064.    909.
557          UI    761.    596.    503.    451.    339.    269.    234.    195.    161.    130.
558          UI    103.    103.     76.     40.     40.     40.     40.     40.     40.     40.
559          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
560          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

561          KK    R204
562          KM     ROUTE SUB204 TO C1
563          RS       1    FLOW      -1
564          RC     .08    .045     .08    5500    .013
565          RX       0      50     100     110     170     180     230     280
566          RY     4.5     4.3     4.0       0       0     4.0     4.3     4.5
567          RL       0       0       5       0
             *

568          KK  SUB205
569          KM   SUB-BASIN 205
570          BA     .90
571          LG     .15     .35    3.50     .25     .00
572          UI     59.    193.    317.    424.    666.    600.    439.    319.    195.    101.
573          UI     69.     36.     18.     18.     18.      0.      0.      0.      0.      0.
574          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

575          KK      C1
576          KM
577          HC       3
             *

578          KK     RC1
579          KM     ROUTE C1 TO D1
580          RS       1    FLOW      -1
581          RC     .08    .045     .08   42700    .011
582          RX       0     400     800     804     827     843    1243    1643
583          RY    10.3     5.9     1.5       0      .3     1.9     2.3     2.7
```



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

584          RL       0       0       5       0
             *

585          KK  SUB206
586          KM   SUB-BASIN 206
587          BA    4.19
588          LG     .15     .35    3.50     .25     .00
589          UI    104.    104.    104.    313.    404.    492.    553.    608.    676.    765.
590          UI    860.   1084.   1306.   1250.   1056.    929.    841.    751.    661.    591.
591          UI    520.    451.    346.    248.    184.    175.    171.    119.    104.    104.
592          UI     57.     32.     32.     32.     32.     32.     32.     32.     32.     32.
593          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
594          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

595          KK   CP206
596          KM
597          HC       2
             *

598          KK  SUB207
599          KM   SUB-BASIN 207
600          BA    5.18
601          LG     .15     .35    3.50     .25     .00
602          UI    109.    109.    109.    187.    369.    437.    515.    567.    621.    671.
603          UI    741.    824.    913.   1094.   1335.   1406.   1197.   1054.    956.    878.
604          UI    802.    716.    651.    587.    526.    465.    368.    290.    193.    191.
605          UI    179.    179.    118.    109.    109.     95.     33.     33.     33.     33.
```

```
606          UI     33.     33.     33.     33.     33.     33.     33.      0.      0.      0.
607          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

608          KK      D1
609          KM
610          HC       2
             *

611          KK     RD1
612          KM     ROUTE D1 TO E1
613          RS       1    FLOW      -1
614          RC     .08    .045     .08    8800    .008
615          RX       0     400     800     810     835     845    1245    1645
616          RY    10.8     6.4     2.0       0       0     2.0     2.4     2.8
617          RL       0       0       5       0
             *

618          KK   SUB208
619          KM    SUB-BASIN 208
620          BA     .91
621          LG     .15     .32    5.40     .19     .00
622          UI     60.    195.    321.    429.    672.    611.    447.    325.    200.    103.
623          UI     70.     37.     18.     18.     18.      0.      0.      0.      0.      0.
624          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
```



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

625          KK      E1
626          KM
627          HC       2
             *

628          KK     RE1
629          KM     ROUTE E1 TO F1
630          RS       1    FLOW      -1
631          RC     .08    .045     .08   10000    .007
632          RX       0     400     400     410     440     450     850    1250
633          RY    10.8     6.4     2.0       0       0     2.0     2.4     2.8
634          RL       0       0       5       0
             *

635          KK   SUB209
636          KM    SUB-BASIN 209
637          BA    4.94
638          LG     .15     .35    3.60     .26     .00
639          UI     95.     95.     95.     95.    309.    353.    417.    462.    516.    550.
640          UI    596.    651.    719.    781.    925.   1102.   1260.   1122.    985.    885.
641          UI    813.    756.    691.    624.    570.    519.    472.    430.    359.    274.
642          UI    203.    169.    164.    157.    157.     98.     95.     95.     95.     33.
643          UI     29.     29.     29.     29.     29.     29.     29.     29.     29.     29.
644          UI     29.     29.      0.      0.      0.      0.      0.      0.      0.      0.
645          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

646          KK   SUB210
647          KM    SUB-BASIN 210
648          BA    9.64
649          LG     .15     .34    3.70     .29     .00
650          UI    259.    259.    331.    886.   1091.   1291.   1453.   1615.   1841.   2078.
651          UI   2603.   3259.   3090.   2579.   2263.   2039.   1773.   1567.   1364.   1216.
652          UI    927.    669.    459.    438.    426.    278.    259.    258.     79.     79.
653          UI     79.     79.     79.     79.     79.     79.     79.      0.      0.      0.
654          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

655          KK      F1
656          KM
657          HC       3
             *

658          KK     RF1
659          KM     ROUTE F1 TO J1
660          RS       1    FLOW      -1
661          RC     .08    .045     .08    9800    .006
662          RX       0     400     800     805     860     870    1270    1670
663          RY    11.8     7.4     3.0       0       0     3.0     3.4     3.8
```

```
664          RL       0       0       5       0
             *
```



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

665          KK  SUB211
666          KM   SUB-BASIN 211
667          BA    9.64
668          LG     .15     .35    3.50     .25     .00
669          UI    209.    209.    209.    419.    729.    871.   1004.   1127.   1214.   1335.
670          UI   1488.   1626.   1898.   2332.   2717.   2476.   2137.   1911.   1737.   1597.
671          UI   1421.   1286.   1154.   1037.    919.    733.    577.    371.    368.    344.
672          UI    344.    219.    209.    209.    157.     64.     64.     64.     64.     64.
673          UI     64.     64.     64.     64.     64.     64.      0.      0.      0.      0.
674          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

675          KK  SUB212
676          KM   SUB-BASIN 212
677          BA     .82
678          LG     .15     .35    3.50     .25     .00
679          UI     55.    188.    303.    409.    645.    533.    391.    281.    151.     93.
680          UI     55.     22.     17.     17.      0.      0.      0.      0.      0.      0.
681          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

682          KK      G1
683          KM
684          HC       2
             *

685          KK     RG1
686          KM     ROUTE G1 TO H1
687          RS       1    FLOW      -1
688          RC     .08    .045     .08   14500    .008
689          RX       0      50     100     123     145     162     212     262
690          RY     7.8     7.2     6.7       0       0     6.0     6.1     6.2
691          RL       0       0       5       0
             *

692          KK  SUB213
693          KM   SUB-BASIN 213
694          BA    1.78
695          LG     .15     .32    5.40     .19     .00
696          UI     91.    190.    398.    515.    643.    891.   1099.    825.    660.    515.
697          UI    390.    210.    153.    107.     78.     28.     28.     28.     28.      0.
698          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
699          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

700          KK      H1
701          KM
702          HC       2
             *
```



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

703          KK     RH1
704          KM     ROUTE H1 TO I1
705          RS       1    FLOW      -1
706          RC     .08    .045     .08   14500    .007
707          RX       0      50     100     123     145     162     212     262
708          RY     7.8     7.2     6.7       0       0     6.0     6.1     6.2
709          RL       0       0       5       0
             *

710          KK  SUB214
711          KM   SUB-BASIN 214
712          BA    1.62
713          LG     .15     .35    4.30     .40     .00
714          UI     73.    120.    287.    380.    458.    566.    803.    864.    660.    544.
715          UI    436.    349.    236.    129.    120.     73.     59.     22.     22.     22.
716          UI     22.     22.      0.      0.      0.      0.      0.      0.      0.      0.
717          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
```

```
718          KK      I1
719          KM
720          HC       2
             *

721          KK     RI1
722          KM     ROUTE I1 TO J1
723          RS       1    FLOW      -1
724          RC     .08    .045     .08   15300    .007
725          RX       0      50     100     123     145     162     212     262
726          RY     7.8     7.2     6.7       0       0     6.0     6.1     6.2
727          RL       0       0       5       0
             *

728          KK  SUB215
729          KM   SUB-BASIN 215
730          BA     .93
731          LG     .15     .34    4.00     .35     .00
732          UI     40.     60.    154.    205.    245.    299.    407.    500.    390.    321.
733          UI    261.    211.    160.     92.     69.     54.     40.     22.     12.     12.
734          UI     12.     12.     12.      0.      0.      0.      0.      0.      0.      0.
735          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

736          KK   CP215
737          KM
738          HC       3
             *

739          KK  SUB216
740          KM   SUB-BASIN 216
741          BA    1.09
742          LG     .15     .33    3.70     .29     .00
743          UI     44.     52.    156.    212.    252.    301.    370.    522.    499.    395.
744          UI    333.    273.    224.    171.    101.     75.     65.     44.     34.     13.
```



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

745          UI     13.     13.     13.     13.      0.      0.      0.      0.      0.      0.
746          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

747          KK      J1
748          KM
749          HC       2
             *

750          KK      ST
751          KM
752          HC       2
753          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

  NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   38     SUB101
            .
            .
   45       .       SUB102
            .           V
            .           V
   51       .         R102
            .           .
            .           .
   58       .           .      SUB103
            .           .          V
            .           .          V
   64       .           .        R103
            .           .          .
            .           .          .
   71       .           .          .      SUB104
            .           .          .          .
            .           .          .          .
   79       .       CP104.......................
            .           .
            .           .
```

```
 82        AA............
            V
            V
 85       RAA
            .
            .
 92         .      SUB105
            .          .
            .          .
100         .          .      SUB106
            .          .          .
            .          .          .
107        BB.......................
            V
            V
110       RBB
            .
            .
117         .      SUB107
            .          V
            .          V
125         .       R107
            .          .
            .          .
132         .          .      SUB108
            .          .          V
            .          .          V
140         .          .       R108
            .          .          .
            .          .          .
147         .          .          .      SUB109
            .          .          .          .
            .          .          .          .
153         .      CP109........................
            .          .
            .          .
156         .          .      SUB110
            .          .          .
            .          .          .
164        CC.......................
            V
            V
167       RCC
            .
            .
174         .        111
            .          .
            .          .
182    CP111............
            .
            .
185         .      SUB112
            .          V
            .          V
193         .       R112
            .          .
            .          .
200         .          .      SUB115
            .          .          .
            .          .          .
207         .         DD............
            .          V
            .          V
210         .        RDD
            .          .
            .          .
217         .          .      SUB116
            .          .          .
            .          .          .
225         .      CP116............
            .          .
            .          .
228         .          .      SUB113
            .          .          V
            .          .          V
236         .          .       R113
            .          .          .
            .          .          .
243         .          .          .      SUB114
            .          .          .          .
```

```
251          .           .           .           .
             .           .       CP114............
             .           .           .
             .           .           .
254         EE........................
             V
             V
257        REE
             .
             .
264          .       SUB117
             .           .
             .           .
272         FF............
             V
             V
275        RFF
             .
             .
282          .       SUB118
             .           V
             .           V
290          .        R118
             .           .
             .           .
297          .           .       SUB119
             .           .           .
             .           .           .
304          .       CP119............
             .           V
             .           V
307          .       RCP119
             .           .
             .           .
314          .           .       SUB120
             .           .           .
             .           .           .
321          .          GG............
             .           V
             .           V
324          .         RGG
             .           .
             .           .
331          .           .       SUB121
             .           .           .
             .           .           .
341         HH........................
             V
             V
344        RHH
             .
             .
351          .       SUB123
             .           .
             .           .
359      CP123............
             .
             .
362          .       SUB122
             .           .
             .           .
370         II............
             V
             V
373        RII
             .
             .
380          .       SUB124
             .           V
             .           V
390          .        R124
             .           .
             .           .
397          .           .       SUB125
             .           .           .
             .           .           .
407          .       CP125............
             .           V
             .           V
410          .       RCP125
```

```
                .          .
                .          .
417             .          .      SUB126
                .          .          .
                .          .          .
427           JJ.......................
               V
               V
430          RJJ
                .
                .
437             .     SUB127
                .          V
                .          V
443             .       R127
                .          .
                .          .
450             .          .      SUB128
                .          .          V
                .          .          V
460             .          .       R128
                .          .          .
                .          .          .
467             .          .          .      SUB129
                .          .          .          .
                .          .          .          .
475             .     CP129.......................
                .          V
                .          V
478             .    RCP129
                .          .
                .          .
485             .          .      SUB130
                .          .          .
                .          .          .
495           KK.......................
                .
                .
498             .     SUB201
                .          V
                .          V
508             .       R201
                .          .
                .          .
515             .          .      SUB202
                .          .          .
                .          .          .
523             .         A1............
                .          V
                .          V
526             .        RA1
                .          .
                .          .
533             .          .      SUB203
                .          .          V
                .          .          V
542             .          .       R203
                .          .          .
                .          .          .
549             .         B1............
                .          .
                .          .
552             .          .      SUB204
                .          .          V
                .          .          V
561             .          .       R204
                .          .          .
                .          .          .
568             .          .          .      SUB205
                .          .          .          .
                .          .          .          .
575             .         C1.......................
                .          V
                .          V
578             .        RC1
                .          .
                .          .
585             .          .      SUB206
                .          .          .
                .          .          .
```

```
595          .       CP206............
             .          .
             .          .
598          .          .      SUB207
             .          .          .
             .          .          .
608          .         D1............
             .         V
             .         V
611          .        RD1
             .          .
             .          .
618          .          .      SUB208
             .          .          .
             .          .          .
625          .         E1............
             .         V
             .         V
628          .        RE1
             .          .
             .          .
635          .          .      SUB209
             .          .          .
             .          .          .
646          .          .          .      SUB210
             .          .          .          .
             .          .          .          .
655          .         F1........................
             .         V
             .         V
658          .        RF1
             .          .
             .          .
665          .          .      SUB211
             .          .          .
             .          .          .
675          .          .          .      SUB212
             .          .          .          .
             .          .          .          .
682          .          .         G1............
             .          .         V
             .          .         V
685          .          .        RG1
             .          .          .
             .          .          .
692          .          .          .      SUB213
             .          .          .          .
             .          .          .          .
700          .          .         H1............
             .          .         V
             .          .         V
703          .          .        RH1
             .          .          .
             .          .          .
710          .          .          .      SUB214
             .          .          .          .
             .          .          .          .
718          .          .         I1............
             .          .         V
             .          .         V
721          .          .        RI1
             .          .          .
             .          .          .
728          .          .          .      SUB215
             .          .          .          .
             .          .          .          .
736          .       CP215........................
             .          .
             .          .
739          .          .      SUB216
             .          .          .
             .          .          .
747          .         J1............
             .          .
             .          .
750          .       ST............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1************************************** ***************************************
 *                                    *                                     * *
```

```
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                          *    U.S. ARMY CORPS OF ENGINEERS *
*            SEPTEMBER 1990             *                                          *    HYDROLOGIC ENGINEERING CENTER *
*             VERSION 4.0               *                                          *          609 SECOND STREET *
*                                       *                                          *       DAVIS, CALIFORNIA 95616 *
*  RUN DATE  08/21/1991  TIME  11:33:00 *                                          *           (916) 756-1104 *
                                        *                                          * *
***************************************** ******************************************
```

```
                    SAND TANK WASH HYDROLOGY FOR FLOOD INSURANCE STUDY
                    SOUTHEAST OF GILA BEND, MARICOPA COUNTY, ARIZONA
                    FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
                    RICE & GRANILLO   NOV., 1990/REV. APRIL, 1991

                    GREEN & AMPT LOSS RATE METHOD
                    S-GRAPH UNIT HYDROGRAPH
                    NORMAL DEPTH ROUTING

                    100 YR, 24 HOUR STORM

                    MAIN CHANNEL ROUTING - MANNINGS N: OVERBANKS - .08, CHANNEL - .035
                                         - LOSSES : 10 IN/HR

                    TRIBUTARY ROUTING    - MANNINGS N: OVERBANKS - .08, CHANNEL - .045
                                         - LOSSES : 5 IN/HR

                    INPUT DATA FILE      - STS24.DAT

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

   IT          HYDROGRAPH TIME DATA
                      NMIN         10  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      3    0  ENDING DATE
                    NDTIME       0150  ENDING TIME
                     ICENT         19  CENTURY MARK

               COMPUTATION INTERVAL     .17 HOURS
                    TOTAL TIME BASE   49.83 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

23 JD          INDEX STORM NO. 1
                      STRM       4.53  PRECIPITATION DEPTH
                      TRDA        .01  TRANSPOSITION DRAINAGE AREA

24 PI            PRECIPITATION PATTERN
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .01       .01       .01       .01       .01       .01
                    .01       .01       .01       .01       .01       .01       .01       .02       .02       .14
                    .13       .12       .03       .02       .02       .02       .01       .01       .01       .01
                    .01       .01       .01       .01       .01       .01       .01       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                    .00       .00       .00       .00

34 JD          INDEX STORM NO. 2
```

```
                STRM        4.30  PRECIPITATION DEPTH
                TRDA       10.00  TRANSPOSITION DRAINAGE AREA

 0 PI         PRECIPITATION PATTERN
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .01        .01        .01        .01        .01        .01
                .01        .01        .01        .01        .01        .01        .01        .02        .02        .14
                .13        .12        .03        .02        .02        .02        .01        .01        .01        .01
                .01        .01        .01        .01        .01        .01        .01        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00

35 JD        INDEX STORM NO. 3
                STRM        4.00  PRECIPITATION DEPTH
                TRDA       50.00  TRANSPOSITION DRAINAGE AREA

 0 PI         PRECIPITATION PATTERN
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .01        .01        .01        .01        .01        .01
                .01        .01        .01        .01        .01        .01        .01        .02        .02        .14
                .13        .12        .03        .02        .02        .02        .01        .01        .01        .01
                .01        .01        .01        .01        .01        .01        .01        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00

36 JD        INDEX STORM NO. 4
                STRM        3.85  PRECIPITATION DEPTH
                TRDA      100.00  TRANSPOSITION DRAINAGE AREA

 0 PI         PRECIPITATION PATTERN
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .01        .01        .01        .01        .01        .01
                .01        .01        .01        .01        .01        .01        .01        .02        .02        .14
                .13        .12        .03        .02        .02        .02        .01        .01        .01        .01
                .01        .01        .01        .01        .01        .01        .01        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00

37 JD        INDEX STORM NO. 5
                STRM        3.76  PRECIPITATION DEPTH
                TRDA      150.00  TRANSPOSITION DRAINAGE AREA

 0 PI         PRECIPITATION PATTERN
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .01        .01        .01        .01        .01        .01
                .01        .01        .01        .01        .01        .01        .01        .02        .02        .14
                .13        .12        .03        .02        .02        .02        .01        .01        .01        .01
                .01        .01        .01        .01        .01        .01        .01        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
                .00        .00        .00        .00        .00        .00        .00        .00        .00        .00
```

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00						

WARNING --- ROUTED OUTFLOW (3092.) IS GREATER THAN MAXIMUM OUTFLOW (3041.) IN STORAGE-OUTFLOW TABLE

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	SUB101	1240.	12.50	199.	51.	25.	1.13		
+	HYDROGRAPH AT	SUB102	2092.	12.33	492.	134.	64.	1.75		
+	ROUTED TO	R102	1596.	12.50	429.	109.	53.	1.75		
+	HYDROGRAPH AT	SUB103	933.	12.17	212.	58.	28.	.75		
+	ROUTED TO	R103	671.	12.50	174.	44.	21.	.75		
+	HYDROGRAPH AT	SUB104	826.	12.83	174.	45.	22.	1.00		
+	3 COMBINED AT	CP104	3010.	12.67	768.	196.	94.	3.50		
+	2 COMBINED AT	AA	4097.	12.50	961.	245.	118.	4.63		
+	ROUTED TO	RAA	3921.	12.67	929.	234.	113.	4.63		
+	HYDROGRAPH AT	SUB105	931.	12.33	246.	67.	32.	.87		
+	HYDROGRAPH AT	SUB106	1622.	12.50	264.	67.	32.	1.59		
+	3 COMBINED AT	BB	6155.	12.67	1423.	364.	175.	7.09		
+	ROUTED TO	RBB	5698.	12.83	1382.	348.	168.	7.09		
+	HYDROGRAPH AT	SUB107	2071.	12.50	613.	167.	81.	2.19		
+	ROUTED TO	R107	1954.	12.67	598.	160.	77.	2.19		
+	HYDROGRAPH AT	SUB108	881.	12.50	206.	54.	26.	.94		
+	ROUTED TO	R108	747.	12.67	169.	42.	20.	.94		
+	HYDROGRAPH AT	SUB109	1623.	12.33	228.	57.	28.	1.40		
+	3 COMBINED AT	CP109	3980.	12.50	985.	257.	124.	4.53		
+	HYDROGRAPH AT	SUB110	1320.	12.33	328.	89.	43.	1.16		
+	3 COMBINED AT	CC	10050.	12.67	2631.	678.	326.	12.78		
+	ROUTED TO	RCC	8973.	12.83	2546.	646.	311.	12.78		
	HYDROGRAPH AT									

+	111	1605.	12.33	322.	86.	42.	1.75
2 COMBINED AT +	CP111	9836.	12.83	2833.	723.	348.	14.53
HYDROGRAPH AT	SUB112	3204.	13.00	786.	203.	98.	4.33
ROUTED TO +	R112	2211.	13.33	603.	151.	73.	4.33
HYDROGRAPH AT +	SUB115	1980.	12.67	364.	92.	44.	2.20
2 COMBINED AT +	DD	3108.	12.83	959.	241.	116.	6.53
ROUTED TO +	RDD	2680.	13.33	823.	206.	99.	6.53
HYDROGRAPH AT +	SUB116	1530.	12.50	456.	124.	60.	1.62
2 COMBINED AT +	CP116	3626.	13.00	1269.	327.	158.	8.15
HYDROGRAPH AT +	SUB113	2038.	13.17	545.	138.	67.	3.31
ROUTED TO +	R113	1343.	13.50	421.	105.	51.	3.31
HYDROGRAPH AT +	SUB114	2528.	12.33	649.	177.	85.	2.32
2 COMBINED AT +	CP114	2771.	12.50	1061.	279.	135.	5.63
3 COMBINED AT	EE	14974.	12.83	4867.	1253.	604.	28.31
ROUTED TO +	REE	10681.	13.50	4329.	1083.	521.	28.31
HYDROGRAPH AT +	SUB117	2995.	12.50	664.	173.	84.	3.51
2 COMBINED AT +	FF	11640.	13.33	4899.	1233.	594.	31.82
ROUTED TO +	RFF	10871.	13.50	4692.	1173.	565.	31.82
HYDROGRAPH AT +	SUB118	2533.	12.50	591.	154.	74.	2.92
ROUTED TO +	R118	2038.	12.83	517.	129.	62.	2.92
HYDROGRAPH AT +	SUB119	1721.	12.67	337.	86.	42.	1.89
2 COMBINED AT +	CP119	3724.	12.67	847.	214.	103.	4.81
ROUTED TO +	RCP119	3207.	13.00	773.	193.	93.	4.81
HYDROGRAPH AT +	SUB120	2811.	12.50	430.	109.	52.	2.61
2 COMBINED AT +	GG	4702.	12.67	1194.	300.	144.	7.42
ROUTED TO +	RGG	4289.	12.83	1120.	280.	135.	7.42
HYDROGRAPH AT +	SUB121	2940.	13.00	1015.	270.	130.	4.65

	3 COMBINED AT						
+		HH	15776.	13.17	6494.	1638.	789.	43.89
	ROUTED TO						
+		RHH	14889.	13.50	6230.	1561.	752.	43.89
	HYDROGRAPH AT						
+		SUB123	2025.	12.83	439.	110.	53.	2.66
	2 COMBINED AT						
+		CP123	15945.	13.33	6588.	1652.	796.	46.55
	HYDROGRAPH AT						
+		SUB122	4610.	13.17	1262.	324.	156.	6.52
	2 COMBINED AT						
+		II	19668.	13.33	7637.	1923.	926.	53.07
	ROUTED TO						
+		RII	16754.	13.67	7068.	1774.	854.	53.07
	HYDROGRAPH AT						
+		SUB124	4540.	12.83	1426.	375.	181.	7.40
	ROUTED TO						
+		R124	3501.	13.33	1305.	330.	159.	7.40
	HYDROGRAPH AT						
+		SUB125	5391.	13.17	1932.	516.	249.	10.22
	2 COMBINED AT						
+		CP125	8558.	13.17	3112.	815.	393.	17.62
	ROUTED TO						
+		RCP125	2545.	14.67	1789.	550.	265.	17.62
	HYDROGRAPH AT						
+		SUB126	5236.	13.83	1887.	481.	232.	12.59
	3 COMBINED AT						
+		JJ	22463.	13.83	9895.	2601.	1253.	83.28
	ROUTED TO						
+		RJJ	21564.	14.00	9630.	2513.	1210.	83.28
	HYDROGRAPH AT						
+		SUB127	3603.	12.00	459.	119.	57.	2.47
	ROUTED TO						
+		R127	1391.	12.50	388.	97.	47.	2.47
	HYDROGRAPH AT						
+		SUB128	2977.	12.83	937.	246.	119.	5.10
	ROUTED TO						
+		R128	1232.	13.83	720.	186.	89.	5.10
	HYDROGRAPH AT						
+		SUB129	2631.	13.00	610.	155.	74.	3.73
	3 COMBINED AT						
+		CP129	4477.	13.00	1666.	429.	206.	11.30
	ROUTED TO						
+		RCP129	568.	14.33	392.	110.	53.	11.30
	HYDROGRAPH AT						
+		SUB130	974.	14.00	363.	92.	44.	2.65
	3 COMBINED AT						
+		KK	22507.	14.00	10084.	2637.	1270.	97.23
	HYDROGRAPH AT						
+		SUB201	3236.	12.83	998.	261.	126.	5.57
	ROUTED TO						
+		R201	2489.	13.17	867.	217.	104.	5.57
	HYDROGRAPH AT						
+		SUB202	4592.	13.00	1113.	279.	134.	6.77

	2 COMBINED AT						
+	A1	6788.	13.00	1938.	486.	234.	12.34
	ROUTED TO						
	RA1	5349.	13.50	1842.	461.	222.	12.34
	HYDROGRAPH AT						
+	SUB203	1663.	12.67	440.	115.	55.	2.21
	ROUTED TO						
+	R203	1217.	13.00	342.	85.	41.	2.21
	2 COMBINED AT						
+	B1	6243.	13.33	2146.	537.	258.	14.55
	HYDROGRAPH AT						
+	SUB204	3141.	12.67	854.	223.	108.	4.13
	ROUTED TO						
+	R204	2893.	12.83	811.	203.	98.	4.13
	HYDROGRAPH AT						
+	SUB205	826.	12.67	144.	36.	17.	.90
	3 COMBINED AT						
+	C1	8460.	13.17	3002.	751.	362.	19.58
	ROUTED TO						
+	RC1	1014.	14.67	590.	179.	86.	19.58
	HYDROGRAPH AT						
+	SUB206	1761.	13.83	657.	166.	80.	4.19
	2 COMBINED AT						
+	CP206	2391.	14.00	1157.	330.	159.	23.77
	HYDROGRAPH AT						
+	SUB207	1900.	14.33	800.	204.	98.	5.18
	2 COMBINED AT						
+	D1	4002.	14.17	1868.	512.	247.	28.95
	ROUTED TO						
+	RD1	2745.	14.83	1510.	429.	207.	28.95
	HYDROGRAPH AT						
+	SUB208	856.	12.67	151.	38.	18.	.91
	2 COMBINED AT						
+	E1	2745.	14.83	1592.	464.	223.	29.86
	ROUTED TO						
+	RE1	1830.	15.83	1201.	371.	179.	29.86
	HYDROGRAPH AT						
+	SUB209	1660.	14.50	742.	192.	93.	4.94
	HYDROGRAPH AT						
+	SUB210	4112.	13.67	1431.	359.	173.	9.64
	3 COMBINED AT						
+	F1	5187.	13.83	2995.	852.	410.	44.44
	ROUTED TO						
+	RF1	3781.	15.00	2566.	762.	367.	44.44
	HYDROGRAPH AT						
+	SUB211	3608.	14.17	1482.	378.	182.	9.64
	HYDROGRAPH AT						
+	SUB212	774.	12.50	132.	33.	16.	.82
	2 COMBINED AT						
	G1	3608.	14.17	1605.	409.	197.	10.46
	ROUTED TO						
+	RG1	2832.	14.67	1501.	383.	185.	10.46
	HYDROGRAPH AT						

+	SUB213	1392.	12.83	292.	73.	35.	1.78
2 COMBINED AT							
+	H1	2849.	14.67	1756.	450.	217.	12.24
ROUTED TO							
	RH1	2524.	15.00	1641.	422.	203.	12.24
HYDROGRAPH AT							
+	SUB214	946.	13.00	213.	53.	26.	1.62
2 COMBINED AT							
+	I1	2650.	13.17	1813.	470.	226.	13.86
ROUTED TO							
+	RI1	2334.	15.50	1687.	439.	212.	13.86
HYDROGRAPH AT							
+	SUB215	567.	13.00	132.	33.	16.	.93
3 COMBINED AT							
+	CP215	5759.	15.00	4087.	1163.	560.	59.23
HYDROGRAPH AT							
+	SUB216	663.	13.17	166.	42.	20.	1.09
2 COMBINED AT							
+	J1	5774.	15.00	4193.	1196.	576.	60.32
2 COMBINED AT							
+	ST	26182.	14.00	13418.	3592.	1730.	157.55

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

ADDENDUM to "HYDROLOGIC DESIGN FOR HIGHWAY DRAINAGE IN ARIZONA" April 1975

Steps to be used to determine precipitation values for various durations and return periods.

STEP 1. From the precipitation maps in the manual "Hydrologic Design for Highway Drainage in Arizona", determine the precipitation values for the 6 and 24 hour duration storms for return periods of 2, 5, 10, 25, 50 and 100 years. Tabulate these values in Table 1 in the column headed 'Map Values'

TABLE 1

Benden Wash

Return Period (Years)	Precipitation Values (inches)			
	6 hour duration		24 hour duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.32	1.35	1.53	1.55
5	1.87	1.90	2.24	2.30
10	2.39	2.30	2.75	2.75
25	2.77	2.75	3.47	3.4
50	3.2	3.20	3.90	3.95
100	3.63	3.63	4.52	4.52

NOTE: There is a possibility of making an error while reading the maps because, (1) a site is not easy to locate precisely on a series of 12 maps, (2) there may be some slight registration differences in printing, and (3) precise interpolation between isolines is difficult. In order to minimize any errors in reading the maps, these values should be plotted on the diagram "Precipitation Depth versus Return Period" Fig. 1.

1 hour ppt $\Rightarrow$ $Y_{100} = .494 + .755\,(3.63^2/4.52) = 1.09$

2 hour $\Rightarrow$ $.341\,(6\text{ hr}) + .659\,(1\text{ hr})$

$= .341\,(3.63) + .659\,(1.09)$

$= 1.96$

Project No. Bender Wash Station _____

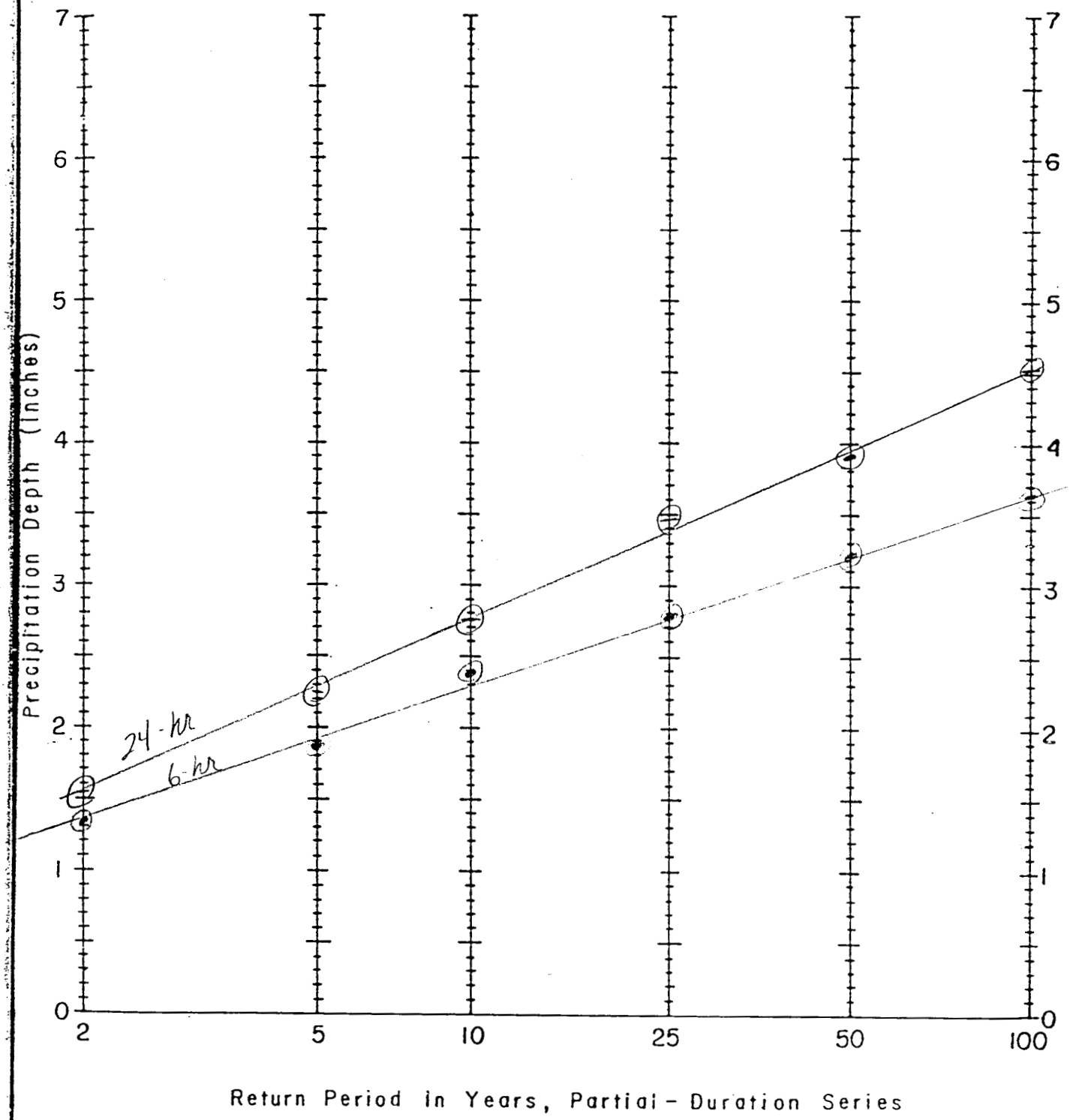


Figure 1 Precipitation Depth Versus Return Period for Partial-Duration Series

Bender Wash – 6 hr duration

	ppt	area	%	total
2 yr - 6 hr	1.2	2	.08	.10
	1.3	18	.69	.90
	1.4	6	.23	.32
				1.32
5 yr	1.8	6	.23	.41
	1.9	20	.77	1.46
				1.87
10-yr	2.2	6	.23	.62
	2.3	20	.77	1.77
				2.39
25-yr	2.7	7	.27	.73
	2.8	19	.73	2.04
				2.77
50 yr.	3.2	26		3.2
100-yr	3.6	22	.85	3.06
	3.8	4	.15	.57
				3.63

Bender Wash

26

	PPt Value	area	%	total
2 yr. -24	1.4	8	.31	.43
	1.6	18	.69	1.10
				1.53
5 yr. -24	2.1	3	.12	.25
	2.2	8	.31	.68
	2.3	15	.57	1.31
				2.24
10 yr	2.6	2	.08	.21
	2.7	10	.38	1.03
	2.8	14	.54	1.51
				2.75
25 yr	3.2	2	.08	.26
	3.4	14	.54	1.84
	3.6	10	.38	1.37
				3.47
50 yr.	3.8	5	.19	.72
	4.0	16	.62	2.48
	4.2	5	.19	.80
				3.90
100 yr.	4.2	6	.23	.97
	4.6	18	.69	3.17
	4.7	2	.08	.38
				4.57

Bender Wash - 6 hr

Sub	tot area	ppt	area	ratio	total
1		3.6		1.0	3.6
2	1704	3.6	862	.51	1.84
		3.8	842	.49	1.86
					3.70
3		3.6		1.0	3.6
4	1925	3.6	1157	.60	2.16
		3.8	768	.40	1.52
					3.68
5		3.6		1.0	3.6
6A		3.6		1.0	3.6
6B		3.6		1.0	3.6
7	2290	3.6	1582	.69	2.48
		3.8	708	.31	1.18
					3.66
8	4796	3.6	3364	.70	2.52
		3.8	1432	.30	1.14
					3.66

Bender Wash - 6m (cont)

Sub	tot area	ppt	area	ratio	tot.
9A		3.8		1.0	3.8
9B		3.6		1.0	3.6
10		3.6		1.0	3.6
11		3.6		1.0	3.6
12A	2375	3.6	1710	.72	2.59
		3.8	665	.28	.06
					3.65
12B		3.6		1.0	3.6
12C		3.6		1.0	3.6
13		3.6			3.6
14		3.6		1.0	3.6
15		3.6			3.6
16		3.6			3.6
17A		3.6			3.6
~~17B~~		~~3.6~~			~~3.6~~

Bender Wash - 6 m (con't)

sub	tot area	ppt	area	ratio	total
~~18~~		~~3.6~~			~~3.6~~
~~19~~		~~3.6~~			~~3.6~~
~~20~~ 18		3.6			3.6
~~21~~ 19		3.6			3.6
~~22~~ 20	658	3.4	54	.08	.27
		3.6	604	.92	3.31
					3.58
~~23~~ 21	2.09 mi.²	3.4	.12	.06	.20
		3.6	1.97	.94	3.38
					3.58

Bender Wash - 24 hr. storm

Sub	total area	ppt	area	%	total
1		4.6		1.00	4.6
2	1704	4.6	1404	.82	3.77
		4.7	300	.18	.85
					4.62
3		4.6			4.6
4	1925	4.6	1425	.74	3.40
		4.7	500	.26	1.22
					4.63
5		4.6			4.6
6A					4.6
6B					4.6
7	2290	4.6	1838	.80	3.68
		4.7	452	.20	.94
					4.62
8	4796	4.6	3799	.79	3.63
		4.7	997	.21	.99
					4.62

Bender Wash

	tot area	ppt	area	%	tot.
9A					4.7
9B					4.6
10					4.6
11					4.6
12A	2375	4.6	1844	.78	3.59
		4.7	531	.22	1.03
					4.62
3					4.6
12C	2081	4.5	577	.28	1.26
		4.6	1504	.72	3.31
					4.57
13					4.6
14	991	4.5	576	.58	2.61
		4.6	415	.42	1.93
					4.54
15					4.5

	tot area	pt	area	%	total
16					4.5
17 A					4.6
~~17 B~~	~~2530~~	~~4.5~~	~~713~~	~~.28~~	~~1.26~~
		~~4.6~~	~~1817~~	~~.72~~	~~3.31~~
					~~4.57~~
18					4.5
19	1593	4.3	64	.04	.17
		4.4	1162	.73	3.21
		4.5	367	.23	1.04
					~~4.42~~
~~20~~ 18	891	4.3	159	.18	.77
		4.4	450	.51	2.24
		4.5	282	.31	1.40
					4.41
~~21~~ 19	596	4.3	210	.35	1.51
		4.4	324	.54	2.38
		4.5	62	.11	.50
					4.39
22 20	658	4.2	235	.36	1.51
		4.3	423	.64	2.75
					4.26

.88 2.84 5.9 4.31

.20 .66 1.4

.41 1.39 2.9

4.4 4.3 4.2

2.09

~~22~~ 21

ADDENDUM to "HYDROLOGIC DESIGN FOR HIGHWAY DRAINAGE IN ARIZONA" April 1975

Steps to be used to determine precipitation values for various durations and return periods.

STEP 1. From the precipitation maps in the manual "Hydrologic Design for Highway Drainage in Arizona", determine the precipitation values for the 6 and 24 hour duration storms for return periods of 2, 5, 10, 25, 50 and 100 years. Tabulate these values in Table 1 in the column headed 'Map Values'

TABLE 1

Sand Tank Wash

Return Period (Years)	Precipitation Values (inches)			
	6 hour duration		24 hour duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.34	1.25	1.56	1.56
5	1.86	1.86	2.25	2.28
10	2.29	2.25	2.76	2.75
25	2.80	2.75	3.33	3.36
50	3.20	3.20	4.03	3.92
100	3.70	3.70	4.51	4.51

NOTE: There is a possibility of making an error while reading the maps because, (1) a site is not easy to locate precisely on a series of 12 maps, (2) there may be some slight registration differences in printing, and (3) precise interpolation between isolines is difficult. In order to minimize any errors in reading the maps, these values should be plotted on the diagram "Precipitation Depth versus Return Period" Fig. 1.

Project No. Sand Tank Wash Station _____

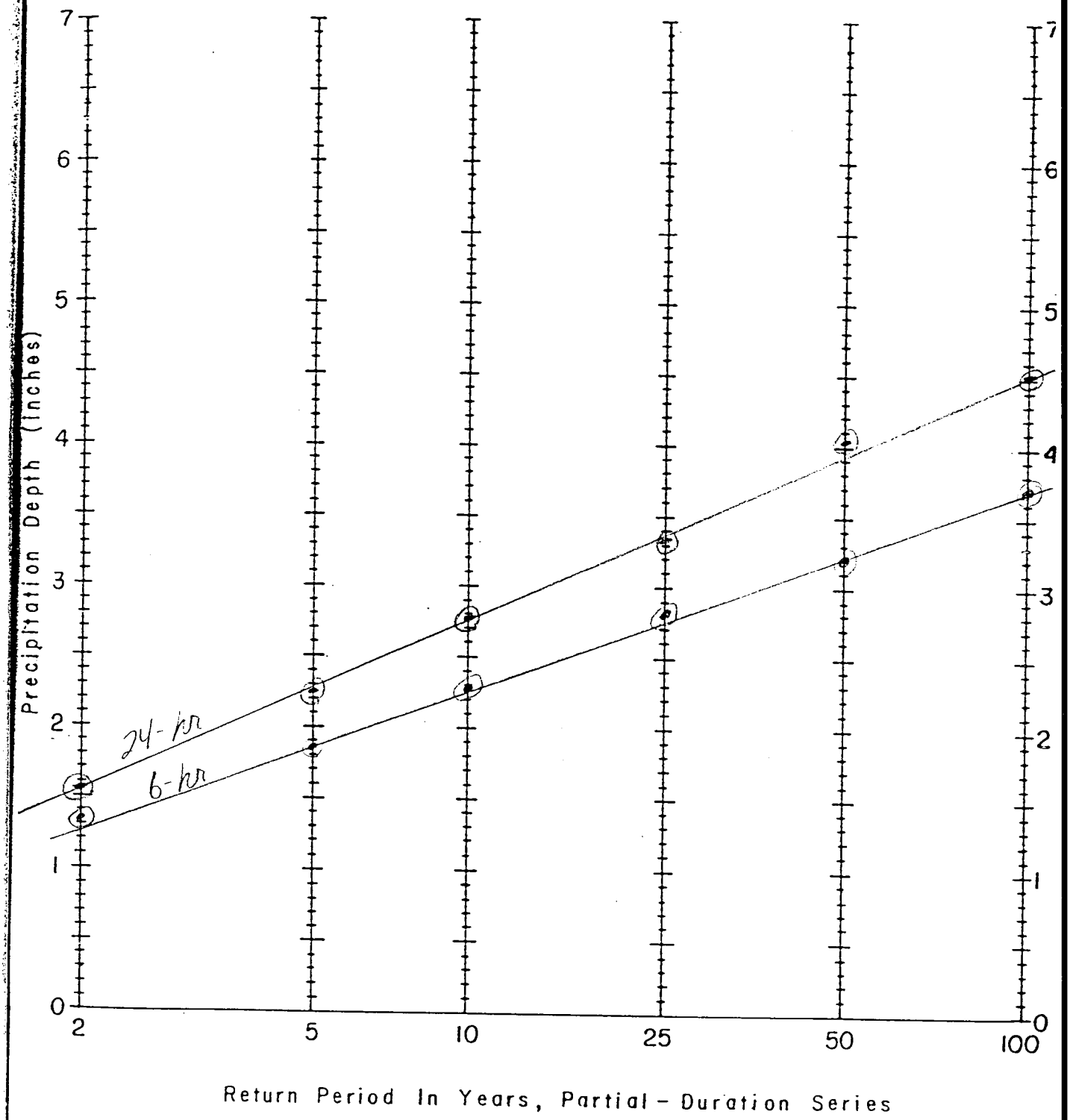


Figure 1 Precipitation Depth Versus Return Period for Partial-Duration Series

Sand Tank

	PPT Value	area	%	total
2 yr. 24hr	1.4	7	.18	.25
	1.6	32	.82	1.31
				1.56
5 yr. 24	2.1	2	.05	.11
	2.2	16	.41	.90
	2.3	21	.54	1.24
				2.25
10 yr	2.6	2	.05	.13
	2.7	13	.33	.89
	2.8	24	.62	1.74
				2.76
25 yr.	3.2	2	.05	.03
	3.4	23	.59	2.01
	3.6	14	.36	1.30
				3.33
50 yr.	3.8	6	.15	.57
	4.0	21	.54	2.16
	4.2	12	.31	1.30
				4.03
100 yr.	4.2	10	.26	1.09
	4.6	21	.54	2.48
	4.7	8	.20	.94
				4.51

Sand Tank - 6 hr duration

	PPT value	area	%	total
(3				
2 yr -	1.2	2	.05	.06
	1.3	19	.49	.64
	1.4	18	.46	.64
				1.34
5 yr.	1.8	13	.33	.59
	1.9	26	.67	1.27
				1.86
10 yr	2.2	6	.15	.33
	2.3	33	.85	1.96
				2.29
25-yr	2.7	3	.08	.22
	2.8	36	.92	2.58
				2.80
50 yr.	3.2	39		3.2
100 yr	3.6	20	.51	1.84
	3.8	19	.49	1.86
				3.70

Sand Tank - 24 hr

Sob	tot area	pct	area	ratio	tot.
101		4.6		1.0	4.6
102A		4.7		1.0	4.7
102B		4.7		1.0	4.7
102C	453	4.6	295	.65	2.99
		4.7	158	.35	1.65
					4.64
3		4.6			4.6
104		4.6			4.6
105A	984	4.6	124	.13	.60
		4.7	860	.87	4.09
					4.69
105B	418	4.6	264	.63	2.90
		4.7	154	.37	1.74
					4.64
105C		4.6			4.6
106		4.6			4.6

Sand Tank Wash - 24 hr (cont)

Sub	tot area	ppt	area	ratio	Total
107		4.6		1.0	4.6
108A		4.7		1.0	4.7
108B	1455	4.6	1167	.80	3.68
		4.7	288	.20	.94
					4.62
108C		4.6		1.0	4.6
109A	982	4.6	824	.84	3.86
		4.7	158	.16	.75
					4.61
109B		4.6		1.0	4.6
110		4.6		1.0	4.6
111A		4.6		1.0	4.6
111B		4.6		1.0	4.6
111C		4.6		1.0	4.6
112		4.6		1.0	4.6

Sand Tank Wash → 24 hr (con't)

[illegible]b	tot area	ppt	area	ratio	total
113A	2915	4.5	1498	.51	2.30
		4.6	1417	.49	2.25
					4.55
113B	1176	4.5	889	.76	3.42
		4.6	287	.24	1.10
					4.52
114A		4.6		1.0	4.6
B	4564	4.5	936	.21	.95
		4.6	3628	.79	3.63
					4.58
114C	5606	4.3	746	.14	.60
		4.4	3100	.55	2.42
		4.5	1760	.31	1.40
					4.42
115	1109	4.5	751	.68	3.06
		4.6	358	.32	1.47
					4.53
116A	2277	4.5	435	.19	.86
		4.6	1842	.81	3.73
					4.59

Sub	tot area	ppt	area	ratio	tot.
116B	1684	4.4	174	.10	.44
		4.5	1510	.90	4.05
					4.49
116C	1264	4.2	75	.06	.25
		4.3	617	.49	2.11
		4.4	572	.45	1.98
					4.34
117(B-17B)	2530	4.5	713	.28	1.26
		4.6	1817	.72	3.31
					4.57
118(B-1B)		4.5		1.0	4.5
119	1593	4.3	64	.04	.17
		4.4	1162	.73	3.21
		4.5	367	.23	1.04
					4.42
120					4.2
121					4.2

Sand Tank Wash - 6 hr. storm

Sub	total area	ppt	area	%	total
101		3.6	1	100	3.6
102A		3.8		1.0	3.8
102B		3.8		1.0	3.8
102C	453	3.6	138	.30	1.08
		3.8	315	.70	2.66
					3.74
3		3.6			3.6
104	742	3.6	450	.61	2.20
		3.8	292	.39	1.48
					3.68
105A		3.8			3.8
105B		3.8			3.8
105C	628	3.6	469	.75	2.70
		3.8	159	.25	.95
					3.65
106		3.6			3.6

Sand Tank Wash - 6 hr (con't)

Sub	tot area	ppt	area	ratio	total
107		3.6		1.0	3.6
108A		3.8			3.8
108B		3.8			3.8
108C		3.6			3.6
109A		3.8			3.8
109B	700	3.6	620	.89	3.20
		3.8	80	.11	.42
					3.62
110		3.6			3.6
111A		3.6			3.6
111B		3.6			3.6
111C		3.6			3.6
112		3.6			3.6
113A		3.6			3.6

Sand Tank Wash → 6 hr (con't)

Lab	tot area	ppt	area	ratio	tot.
113B		3.6		1.0	3.6
114A		3.8		1.0	3.8
114B	4564	3.6	4164	.91	3.28
		3.8	400	.09	.34
					3.62
114C		3.6			3.6
115		3.6			3.6
116A	2277	3.6	835	.37	1.33
		3.8	1442	.63	2.39
					3.72
116B		3.6			3.6
116C		3.6			3.6
117 (B-17B)		3.6			3.6
118 (B-18)		3.6			3.6
119 (B-19)		3.6			3.6

ADDENDUM to "HYDROLOGIC DESIGN FOR HIGHWAY DRAINAGE IN ARIZONA" April 1975

Steps to be used to determine precipitation values for various durations and return periods.

STEP 1. From the precipitation maps in the manual "Hydrologic Design for Highway Drainage in Arizona", determine the precipitation values for the 6 and 24 hour duration storms for return periods of 2, 5, 10, 25, 50 and 100 years. Tabulate these values in Table 1 in the column headed 'Map Values'

TABLE 1

Gila Bend Washes

Return Period (Years)	Precipitation Values (inches)			
	6 hour duration		24 hour duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2	1.33	1.33	1.55	1.55
5	1.87	1.90	2.24	2.30
10	2.27	2.30	2.75	2.80
25	2.79	2.79	3.46	3.40
50	3.20	3.21	4.03	4.00
100	3.67	3.67	4.53	4.53

NOTE: There is a possibility of making an error while reading the maps because, (1) a site is not easy to locate precisely on a series of 12 maps, (2) there may be some slight registration differences in printing, and (3) precise interpolation between isolines is difficult. In order to minimize any errors in reading the maps, these values should be plotted on the diagram "Precipitation Depth versus Return Period" Fig. 1.

	PPt Value	area	%	total
2yr-24hr	1.4	16	.25	.35
	1.6	49	.75	1.20
				1.55
5yr-24hr	2.1	8	.12	.25
	2.2	28	.43	.95
	2.3	29	.45	1.04
				2.24
10yr-24hr	2.6	5	.08	.21
	2.7	22	.34	.92
	2.8	38	.58	1.62
				2.75
25yr-24hr	3.2	3	.05	.16
	3.4	38	.58	1.97
	3.6	24	.37	1.33
				3.46
50yr-24hr	3.8	8	.12	.46
	4.0	41	.63	2.52
	4.2	16	.25	1.05
				4.03
100yr-24hr	4.2	14	.22	.92
	4.6	42	.65	2.99
	4.7	9	.13	.61
				4.53

	total area	ppt	area	%	total
2-yr-bhr	65	1.2	3	.05	.06
		1.3	38	.58	.75
		1.4	24	.37	.52
			65		1.33
5-yr-bhr		1.8	18	.28	.50
		1.9	47	.72	1.37
					1.87
11 yr-bhr		2.2	14	.22	.48
		2.3	51	.78	1.79
					2.27
25yr-bhr		2.7	10	.15	.41
		2.8	55	.85	2.38
					2.79
50-yr-bhr		3.2	65		3.2
100-yr-bhr		3.6	44	.68	2.45
		3.8	21	.32	1.22
					3.67