Flood Control District of Maricopa County
Phoenix, Arizona
January, 2000

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES

FCD 99-14

TECHNICAL DATA NOTEBOOK

HYDROLOGY

Submitted by:

JE Fuller / Hydrology and Geomorphology, Inc.
5235 S. Kyrene Road, Suite 205
Tempe, Arizona 85283
(480) 752-2124

on behalf of:

Flood Control FCDMC of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009
(602) 506-1501

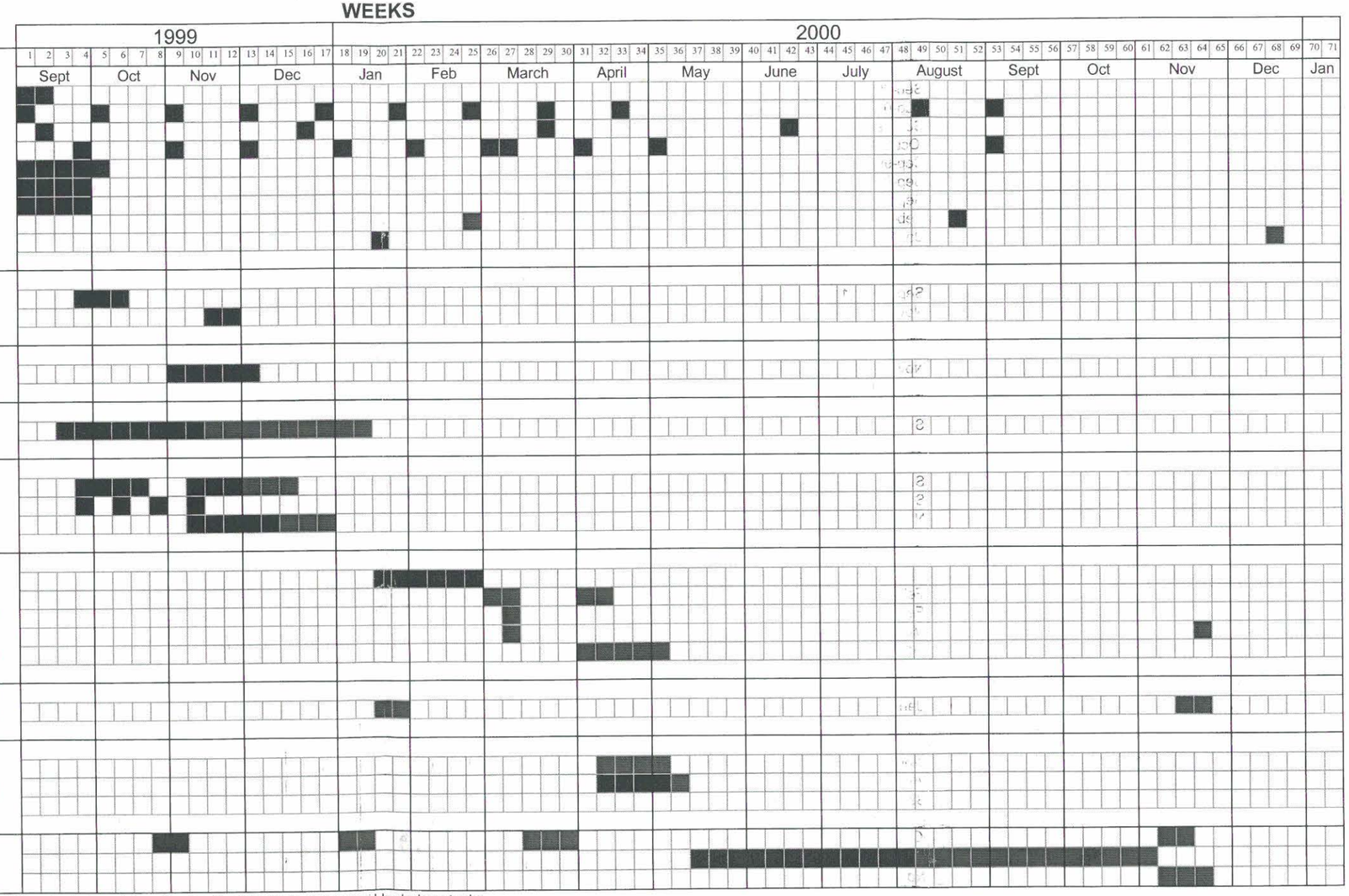
Registered Professional Engineer (Civil)
CERTIFICATE NO. 29325
BRIAN R. ISERMAN
Date Signed 1/28/00
ARIZONA, U.S.A.

Floodplain Delineation Study of Andora Hills and Galloway Washes

Project Schedule

WEEKS

CONTRACT TASK/PHASE	Start Date	End Date
TASK 1- COORDINATION		
1.1 Project Schedule	6-Sep-99	17-Sep-99
1.2 Coordination Meetings	28-Aug-00	1-Sep-00
1.3 Quarterly Billing Estimates	20-Sep-99	23-Jun-00
1.4 Monthly Progress Reports	4-Oct-99	8-Sep-00
1.5 Legal Advertising	6-Sep-99	8-Oct-99
1.6 Property Owner Notification	6-Sep-99	1-Oct-99
1.7 Public Works Coordination	6-Sep-99	1-Oct-99
1.8 Public Meetings	28-Feb-00	5-Jan-01
1.9 Performance Evaluations	24-Jan-00	22-Dec-00
TASK 2- DATA COLLECTION		
2.1 Collect & Review Data	27-Sep-99	15-Oct-99
2.2 Data Collection Report	15-Nov-99	3-Dec-99
TASK 3- TOPOGRAPHIC MAPPING	8-Nov-99	24-Dec-99
TASK 4- FIELD SURVEY	20-Sep-99	14-Jan-00
TASK 5- HYDROLOGY		
5.1-5.4 HEC-1 Modeling	27-Sep-99	17-Dec-99
5.5 Meetings/Field Trip	27-Sep-99	29-Oct-99
5.7 Hydrologic Report	8-Nov-99	31-Dec-99
TASK 6- FLOODPLAIN DELINEATION		
6.1-6.3 HEC-RAS Modeling	24-Jan-00	25-Feb-00
6.4-6.5 HEC-RAS Refinements	28-Feb-00	14-Apr-00
6.6 Identify Ponding Areas	7-Feb-00	11-Feb-00
6.7-6.8 Flood Zones & Areas	13-Mar-00	15-Sep-00
6.9 Hydraulics Report (TDN Chapter 5)	3-Apr-00	5-May-00
TASK 7- HIS DATA		
7.1 HIS Preparation	24-Jan-00	8-Dec-00
TASK 8- DELIVERABLES		
8.1 Data Submittal	17-Apr-00	5-May-00
8.2 FEMA Submittal	17-Apr-00	12-May-00
8.3 Final Submittal	4-Sep-00	22-Sep-00
DISTRICT REVIEWS	25-Oct-99	10-Nov-00
FEMA REVIEW	8-May-00	3-Nov-00
RESPOND TO FEMA COMMENTS	6-Nov-00	24-Nov-00



This schedule update reflects adjustments to survey and hydrology tasks.

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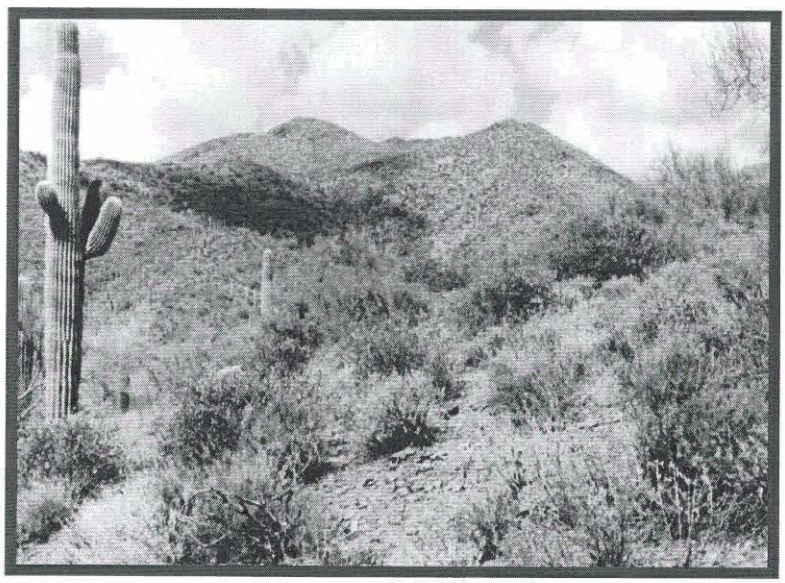
FCD 99-14

TECHNICAL DATA NOTEBOOK

HYDROLOGY



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Registered Professional Engineer (Civil)
CERTIFICATE NO.
29325
BRIAN R.
ISERMAN
Date Signed 1/21/00
ARIZONA, U.S.A.

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Registered Professional Engineer (Civil) CERTIFICATE NO. 29325 BRIAN R. ISERMAN Date Signed 1/28/00 ARIZONA, U.S.A.

Brian R. Iserman

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Registered Professional Engineer (Civil)
CERTIFICATE NO.
29325
BRIAN R.
ISERMAN
Date Signed 1/28/00
ARIZONA, U.S.A.

SECTION 4: HYDROLOGY

4.1 METHOD DESCRIPTION

Andora Hills Wash

The 100-year peak discharge values used for Andora Hills Wash were provided by the FCDMC in the Technical Data Notebook for the study titled *Cave Creek Above Carefree Highway Floodplain Delineation Study, FCD 95-28*[8]. This same study also provided a limited number of 100-year discharge values for Galloway Wash. The HEC-1 modeling performed by Sabol to obtain these earlier results was done using the methodology set forth in the *Drainage Design Manual for Maricopa County, Volume I, Hydrology*[6].

Galloway Wash

Since the FCD 95-28 study did not provide an adequate number of concentration points along Galloway Wash for the purpose of detailed hydraulic modeling, this study (FCD 99-14) includes the additional hydrologic analyses. 100-year peak discharge values for Galloway Wash at additional concentration points were determined using the US Army Corps of Engineers (COE) HEC-1 Computer Program, version 4.0.1E, dated May, 1991 in accordance with the methodology set forth in the FCDMC *Drainage Design Manual*. Concentration point locations for the Galloway Wash HEC-1 modeling were discussed and mutually agreed upon between the Flood Control District of Maricopa County (FCDMC) and JEF. Concentration points are included at the following locations:

- At the limits of this study
- At significant tributaries to Galloway Wash
- At significant road crossings.

The new Galloway Wash HEC-1 modeling was developed for existing conditions using the 100-year, 24 hour rainfall depth and the SCS Type II distribution. Additionally, a 6-hour HEC-1 model was developed using the 6-hour storm patterns published in the District's Drainage Design Manual. HEC-1 rainfall losses for the Galloway Wash watershed were estimated using the Green and Ampt infiltration equation option. The Phoenix Mountain and Desert/Rangeland S-graphs as defined in the *Drainage Design Manual, Volume I* are used in this study to generate hydrographs. The normal depth storage routing routine was used for all channel reaches in this study. Representative 8-point cross sections were obtained from previous FIS study model results and attendant topographical mapping.

The overall HEC-1 modeling study area is indicated on Figure 4.1-1 and Figure 4.1-2. The remainder of Section 4 describes data, parameters and modeling results for Galloway Wash only. See Sabol, 1997 for similar values for Andora Hills Wash. 100-year peak discharges for both washes are also presented in Sections 5 and 7 of this Technical Data Notebook (TDN).

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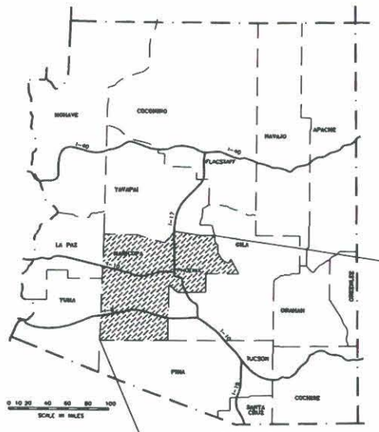

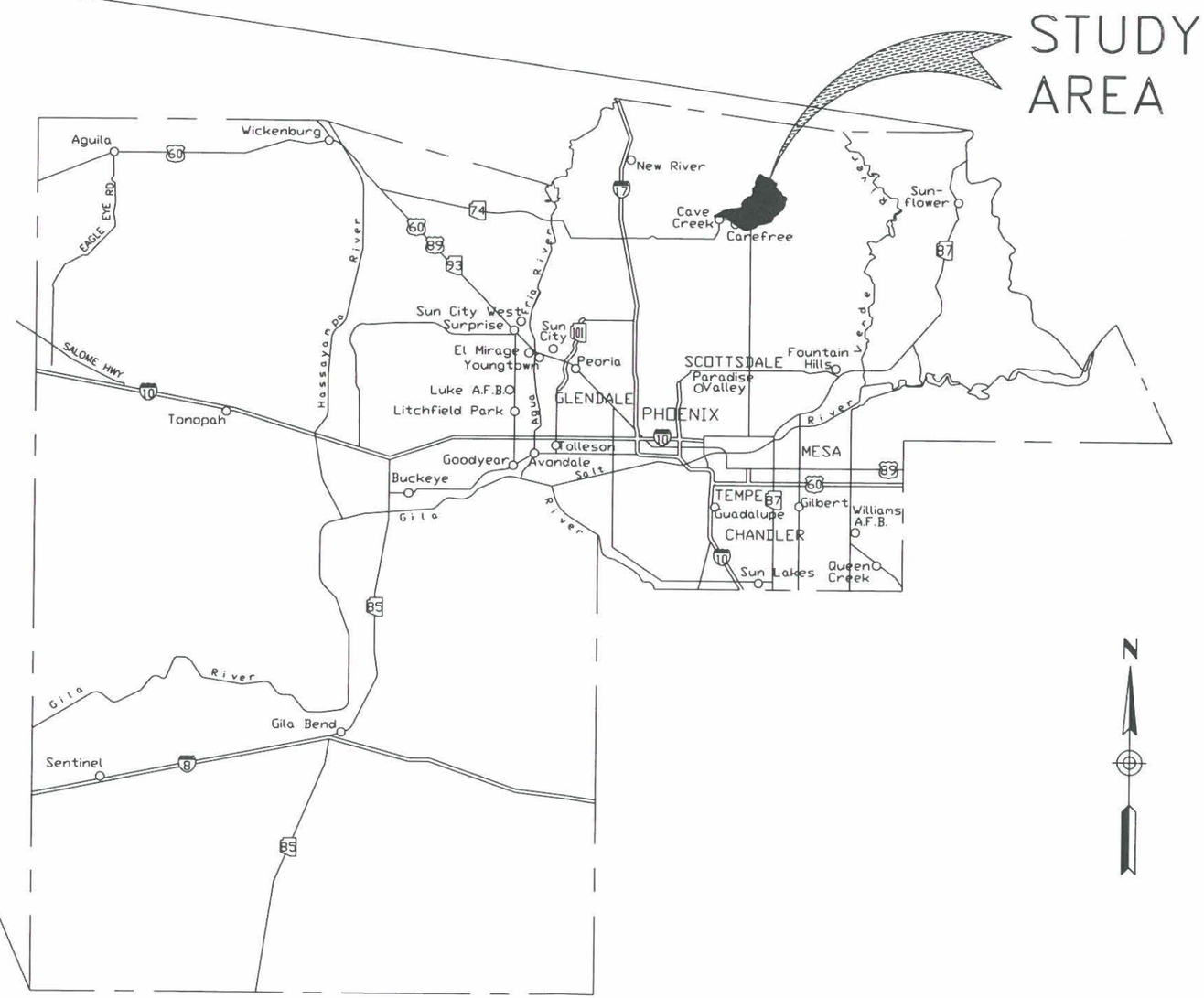

MARICOPA COUNTY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

FIGURE 4.1-1

JANUARY, 2000

LEGEND

SCALE IN MILES

10 0 10 20

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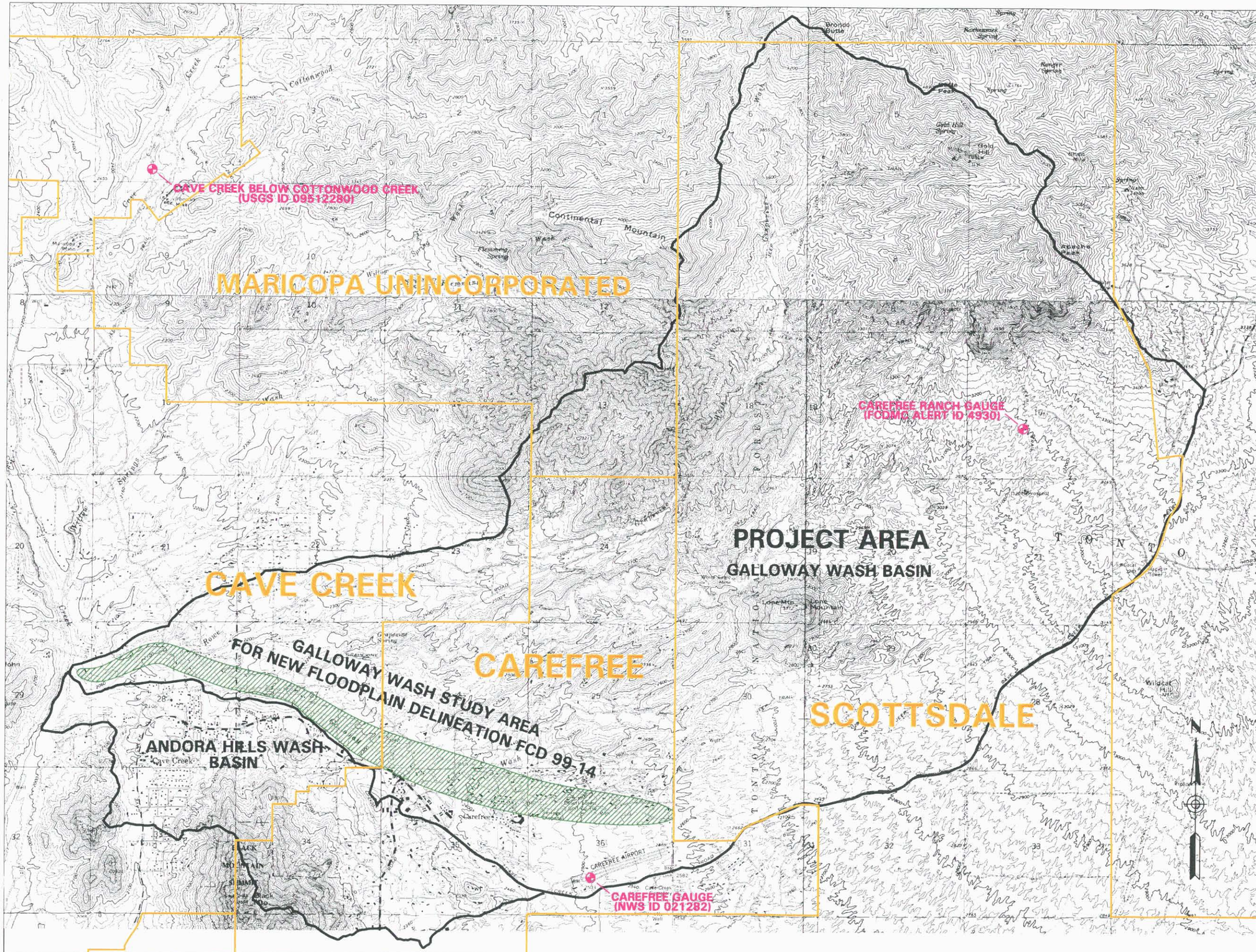

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.1-2

JANUARY, 2000

LEGEND

- PROJECT AREA BOUNDARY (HYDROLOGY)
- PROJECT AREA BOUNDARY (HYDRAULICS)
- JURISDICTIONAL BOUNDARY
- GAUGE LOCATION

Scale in Feet

2000 0 2000 4000

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4.2 PARAMETER ESTIMATION

4.2.1 Drainage Area Boundaries

The Galloway Wash study watershed is approximately 21 square miles (see Figure 4.1 and Figure 4.2). Galloway Wash is also referred to as "Rowler Wash" in a street map published by the Town of Carefree. The elevation of the watershed outlet at the Cave Creek confluence is approximately 2025 feet (NGVD 1929), and the elevation of the highest point in the watershed is approximately 4890 feet (NGVD 1929) at Butte Peak located in the northeast part of the watershed.

The study watershed is covered by the Upper Sonoran plant community and spans across multiple jurisdictions, including Maricopa County, the City of Scottsdale, and the Towns of Cave Creek and Carefree. Most of the watershed falls under the vacant land, rural and large-lot-residential land use categories.

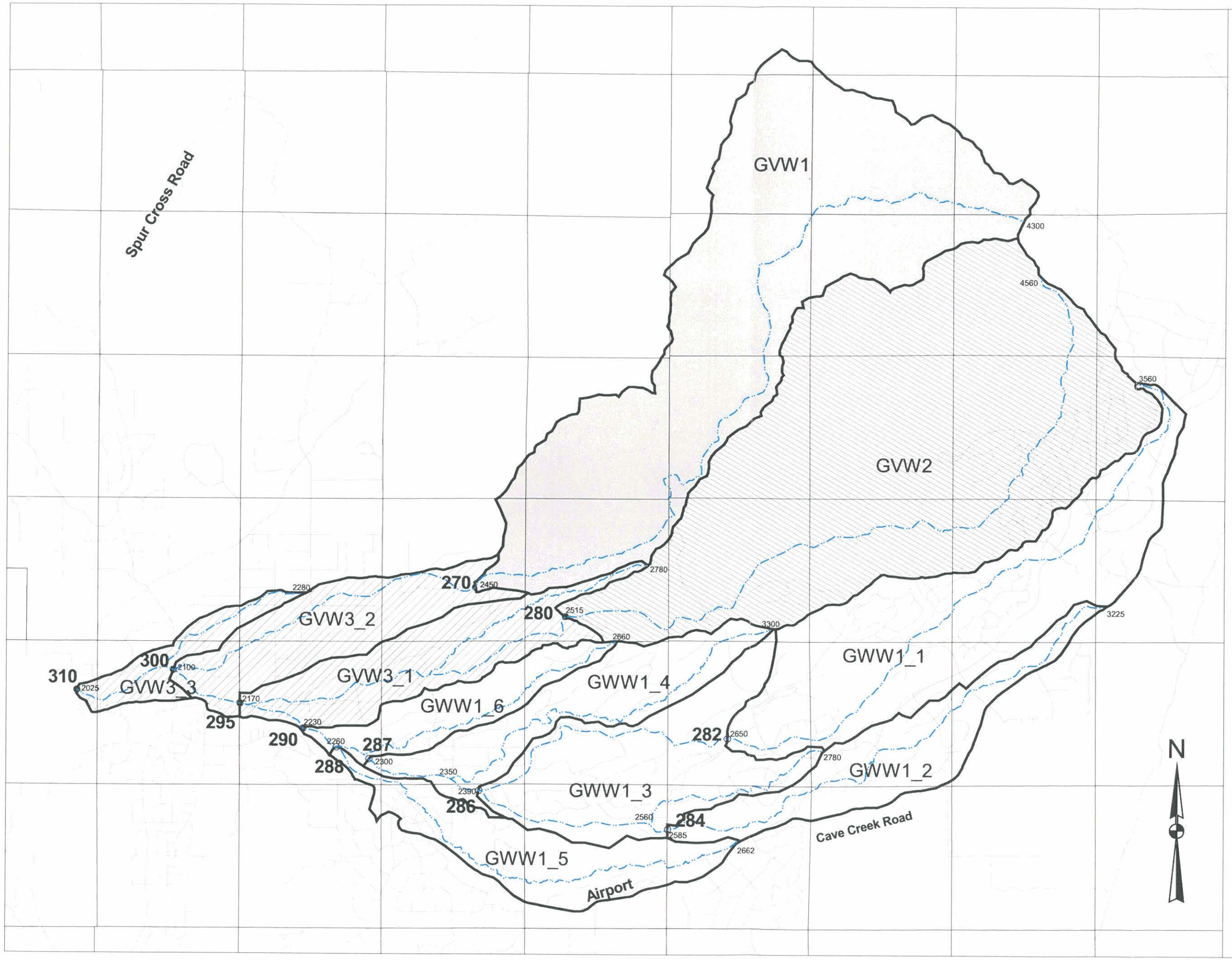
4.2.2 Watershed Work Maps

A reduced set (half size) of watershed work maps is presented in Figure 4.2.2-1, Figure 4.2.2-2, Figure 4.2.2-3, Figure 4.2.2-4, Figure 4.2.2-5, and Figure 4.2.2-6. These work maps depict subbasin boundaries and concentration points, Tc (time of concentration or lag time) flow paths and Lca (distance from the concentration point to the centroid of the watershed) flow paths, hydrograph routing paths, soils boundaries, and land-use boundaries. Full-size 24"x36" plots of these maps are contained in pockets at the back of Volume Two to this TDN.

The base map for the watershed work maps is USGS digital raster graphics (DRG) projected to Stateplane North American Datum of 1983 and tiled by FCDMC. The subbasin naming convention is an expansion of the naming convention presented in the floodplain delineation study titled *Cave Creek Above Carefree Highway Floodplain Delineation Study, FCD 95-28*[8].

Subbasin labels for subbasins draining directly to Galloway Wash are indicated by GWW1-(X), where the "X" is replaced by the actual subbasin number starting with subbasin 1 at the upstream most subbasin within the main Galloway Wash watershed. Subbasin labels for the Rowe Wash tributary to Galloway Wash are indicated by GVW1-(X), and subbasin labels for the Grapevine Wash tributary to Galloway Wash are indicated by GVW3-(X). Figure 4.2.2-1 shows the relation of the subbasins from this study with those from FCD 95-28. Table 4.2.2-1 presents a cross-reference listing of the subbasin names to the HEC-1 labels in this study area.

Concentration point identification numbers are likewise an expansion of the previous Sabol hydrology numbering scheme, which uses three-digit numbers between 270 and 310 for the Galloway Wash sub basins. Routing reaches are identified by the concentration point identification numbers attributable to each end of the routing reach. So, for example, the routing reach identification number 282286 refers to the routing reach, which begins at concentration point 282 and ends at concentration point 286. The single reservoir routing in the model is



FLOOD CONTOL DISTRICT
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FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-1
COMPARISON TO SABOL
(FCD 95-28) SUBBASINS

JANUARY, 2000

LEGEND

- Sabol Subbasin GWW1
- Sabol Subbasin GVW1
- Sabol Subbasin GVW2
- Sabol Subbasin GWW1
- 3225 Elevation
- Flow paths
- Streets
- 286 New Concentration Points
- 280 Sabol Concentration Points

SCALE

2000 0 2000 4000 Feet

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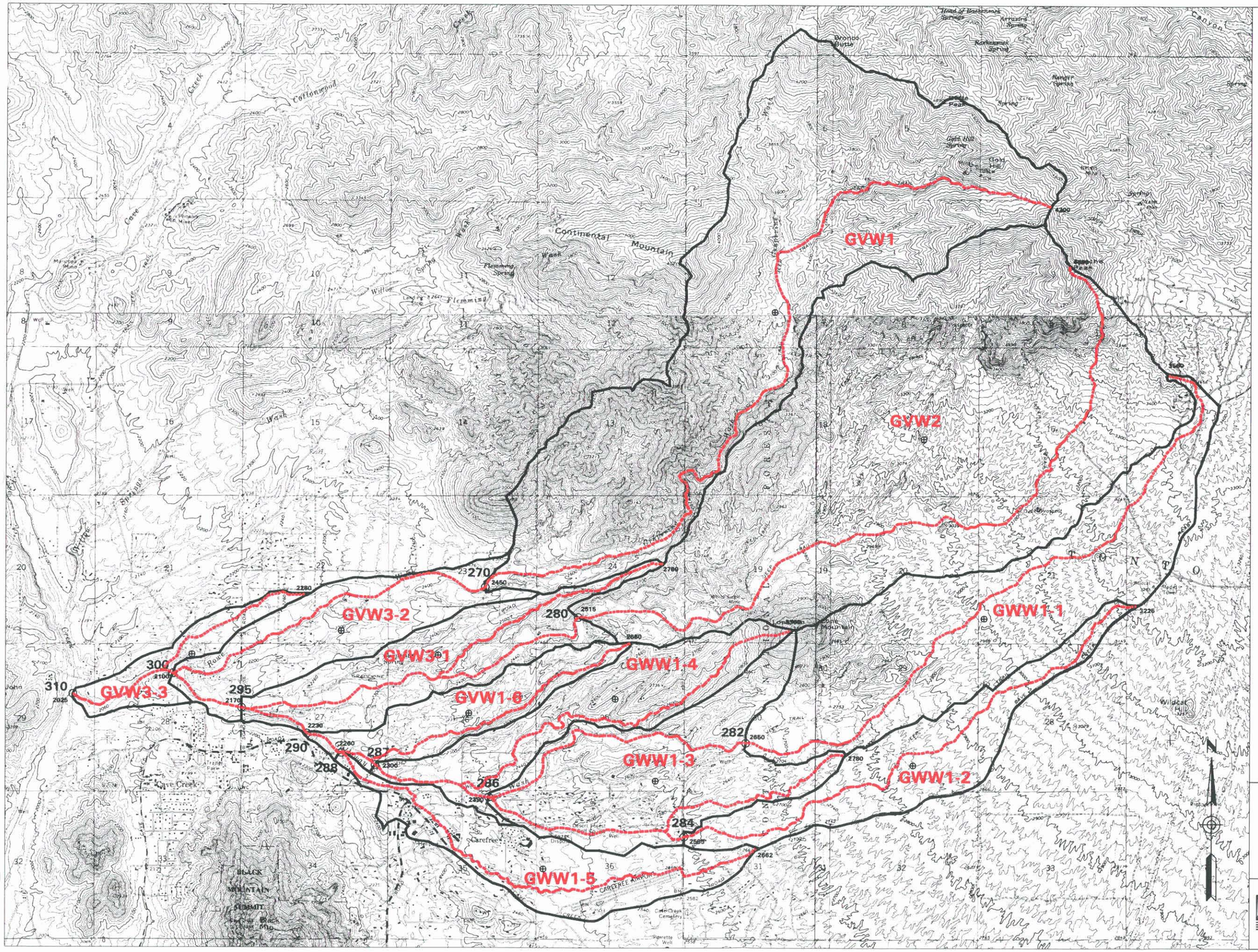

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-2
Tc FLOW PATHS

JANUARY, 2000

LEGEND

- SUBBASIN
- SUBBASIN CENTROID
- 286 / 2390 — CONCENTRATION POINT (CONCENTRATION POINT NUMBER) (ELEVATION)
- Tc FLOW PATH — 2390 (ELEVATION AT UPPER END OF FLOWPATH)

SCALE IN FEET

2000 0 2000 4000

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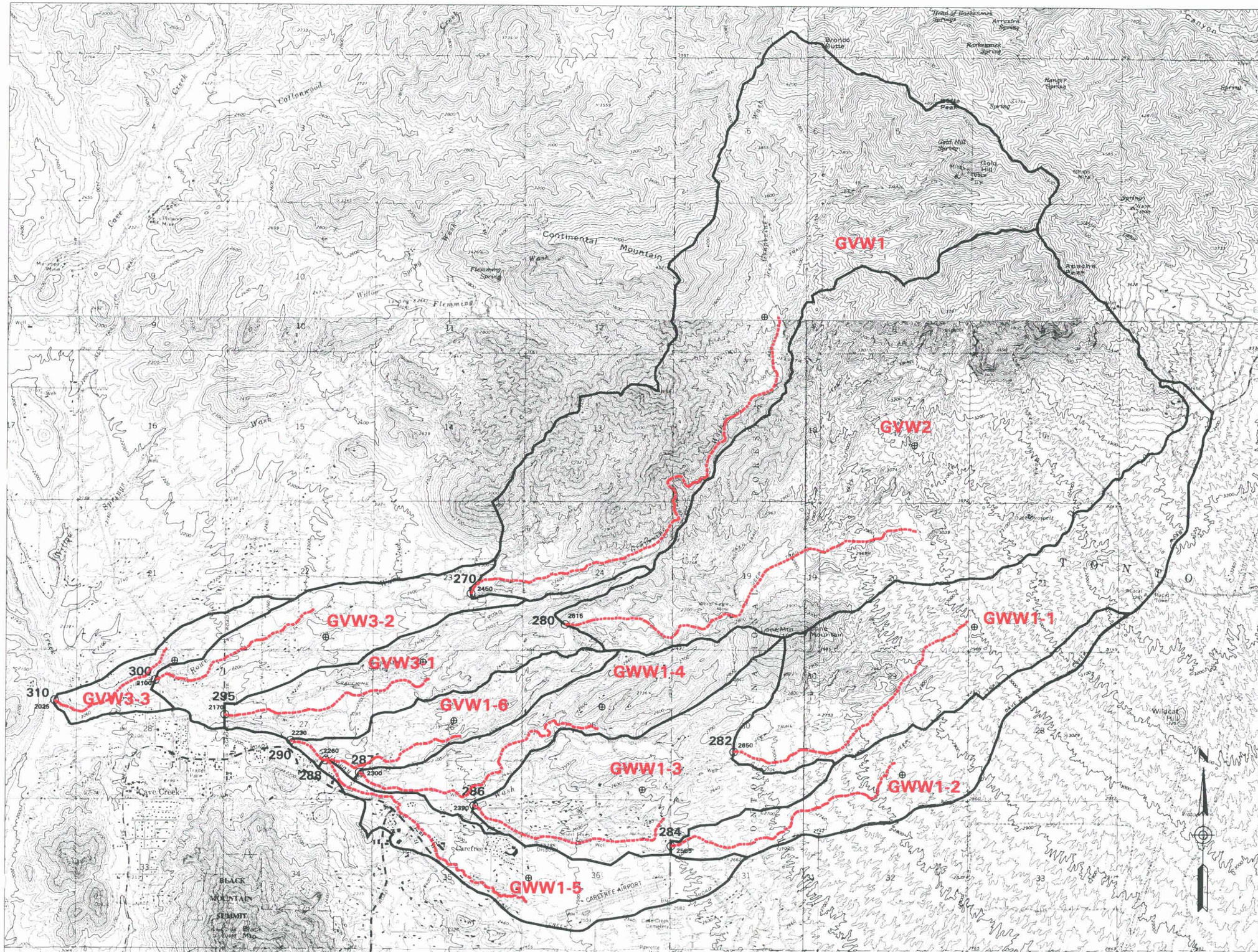

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-3
Lca MAP

JANUARY, 2000

LEGEND

- SUBBASIN
- SUBBASIN CENTROID
- 286 / 2390 CONCENTRATION POINT
- Lca FLOW PATH

SCALE IN FEET

2000 0 2000 4000

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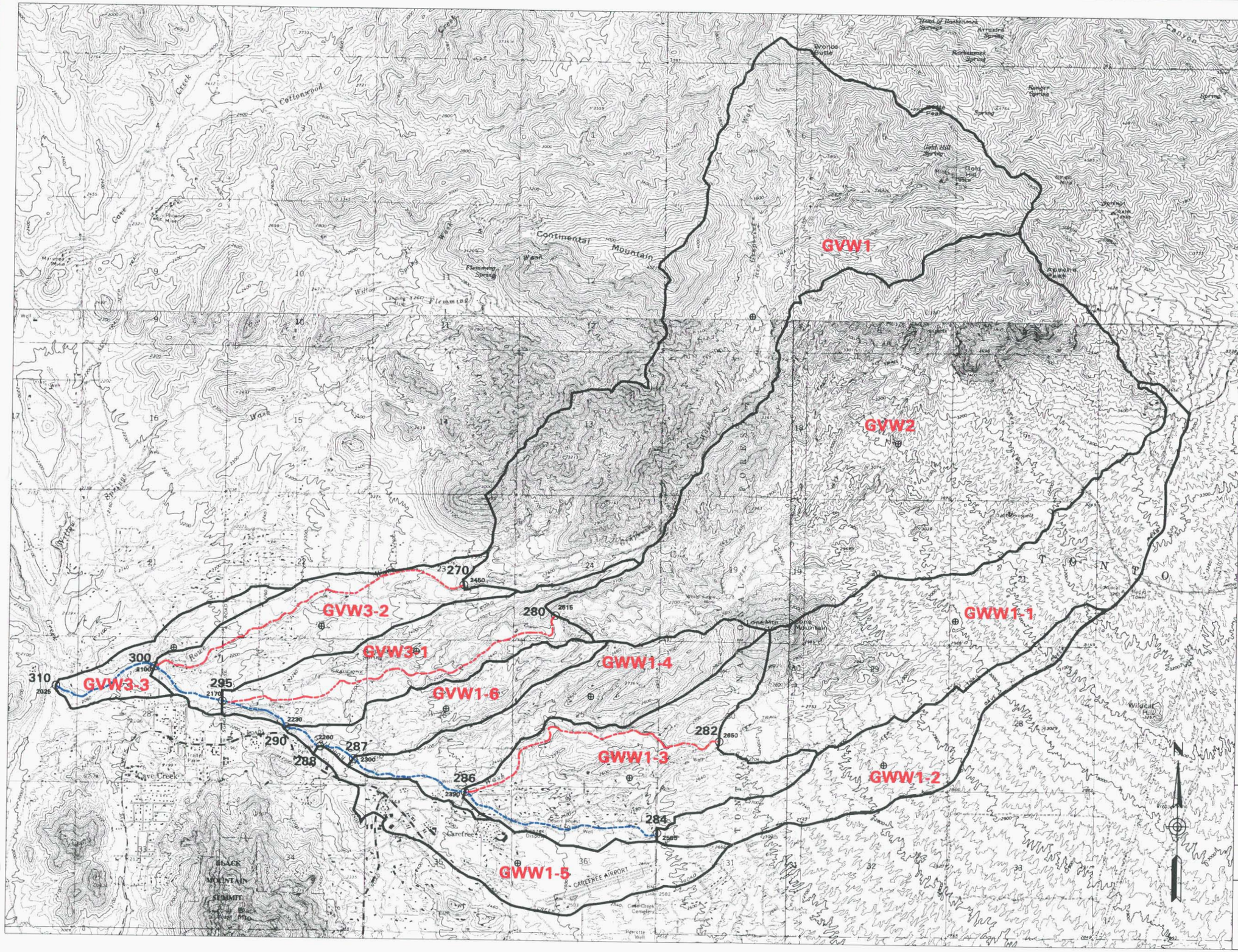

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-4
ROUTING REACHES

JANUARY, 2000

LEGEND

- SUBBASIN
- SUBBASIN CENTROID
- 286 / 2390 — CONCENTRATION POINT (CONCENTRATION POINT NUMBER) (ELEVATION)
- ROUTING REACH
- ROUTING REACH (FLOODPLAIN DELINEATION RESTUDY REACH)

SCALE IN FEET

2000 0 2000 4000

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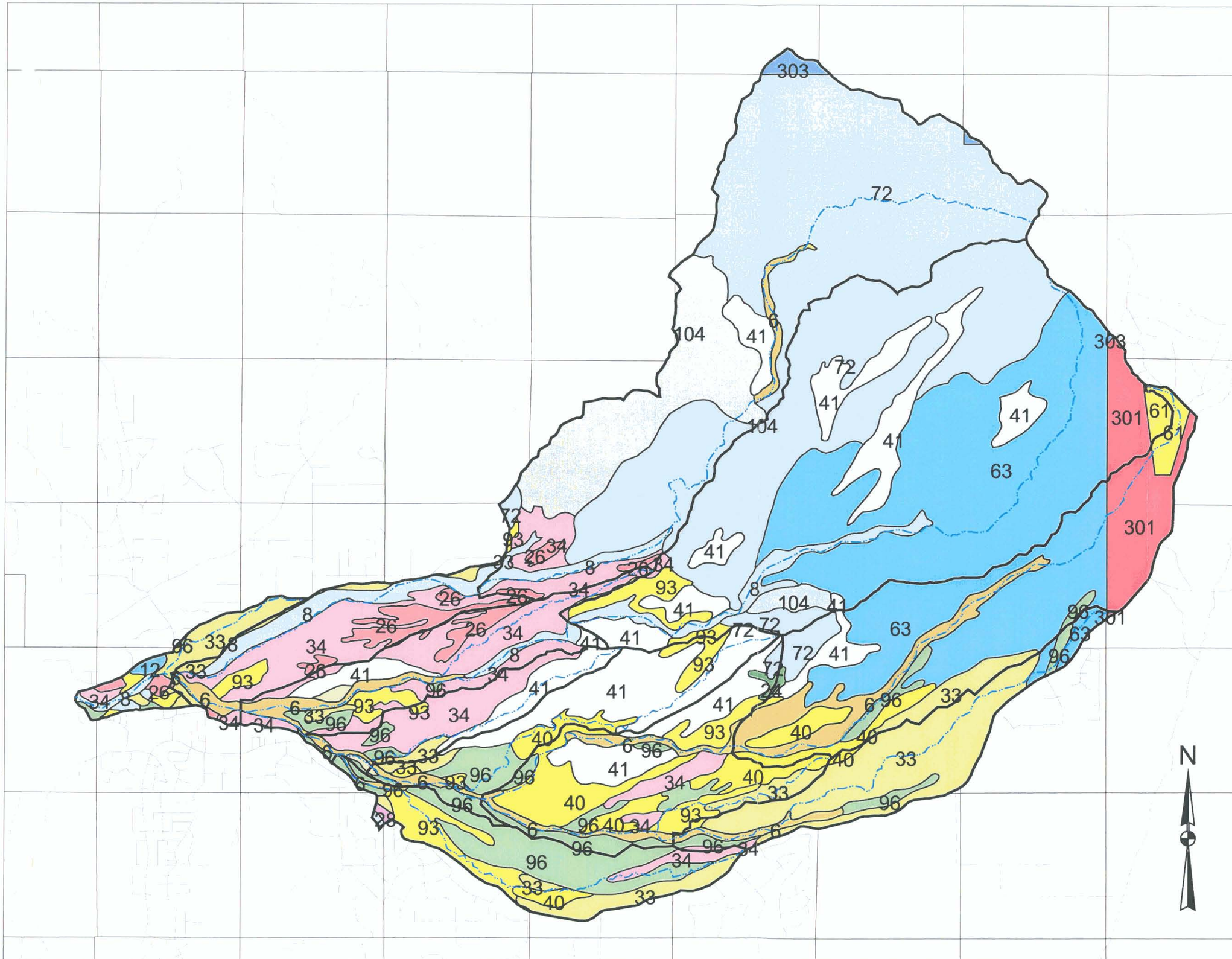

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FIGURE 4.2.2-5 SOILS MAP FOR GALLOWAY WASH

JANUARY, 2000

LEGEND

- Subbasins
- Flow paths
- 41 — Soil survey map unit
- Streets

Source: Soils data from Camp, 1986 and USFS as provided digitally by FCDMC.

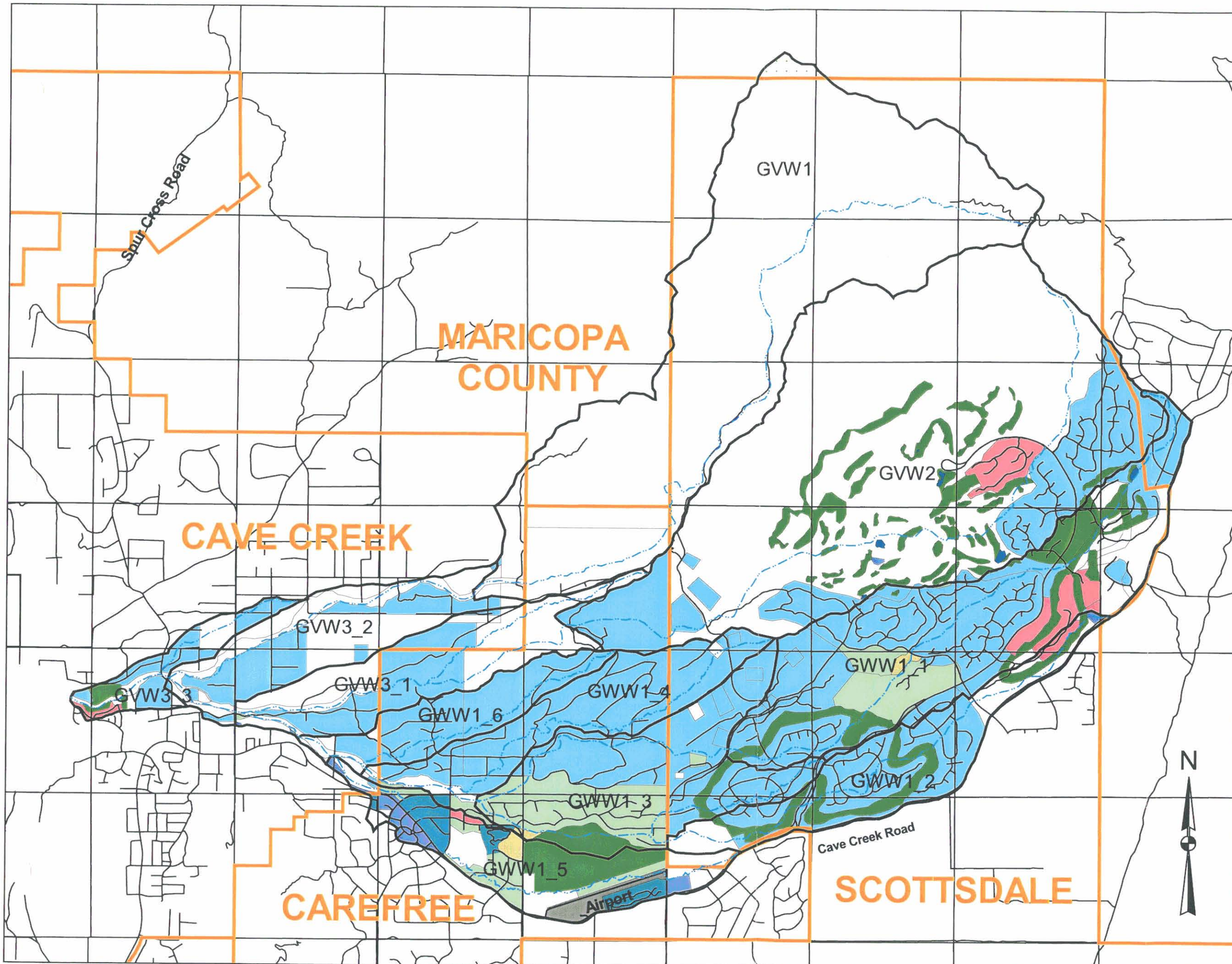

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FIGURE 4.2.2-6
LAND USE MAP
FOR GALLOWAY WASH

JANUARY, 2000

LEGEND

- Airport
- Dedicated or Non-developable Open Space
- Hotel, Motel or Resort
- Large Lot Residential (>1 and <=2 du/acre)
- Medium Density Residential (>5 and <=15 du/acre)
- Neighborhood Retail Center (<100,000 sq.ft.)
- Recreational Open Space
- Rural (1 dwelling unit per acre or less)
- Small Lot Residential (>2 and <=5 du/acre)
- Vacant
- Water
- Flow paths
- Streets
- Subbasins
- Jurisdictional Boundary

Source: Land use data modified
from MAG as provided digitally by FCDMC.

SCALE

2000 0 2000 4000 Feet

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labeled as RR282, and is located just upstream of Charles Blair McDonald Drive (CP 282) along the North Branch of Galloway Wash in subbasin GWW1-1.

Table 4.2.2-1 Subbasin IDs	
Subbasin	**HEC-1 ID**
Rowe Wash	GVW1
	GV3-2
Grapevine Wash	GVW2
	GVW3-1
North Branch Galloway Wash	GWW1-1
	GWW1-3
Galloway Wash	GWW1-2
	GWW1-3
	GWW1-4
	GWW1-5
	GWW1-6
	GVW3-3

4.2.3 Gauge Data

4.2.3.1 Precipitation Gauging:

Two precipitation gauges having published data are known to exist in the Galloway Wash Basin:

- Carefree, Arizona (NWS ID 021282)
  Operated by the National Weather Service (NWS) continuously since June 1, 1961

- Carefree Ranch (ALERT ID 4930)
  Operated by the Flood Control District of Maricopa County continuously since July 1985.

4.2.3.2 Stream Gauging:

No stream gauging records of any kind were identified for Galloway wash. The Flood Control District of Maricopa County (FCDMC) operated an automated precipitation/stream-stage sensor station on Grapevine Wash, a tributary to Galloway Wash, between 1989 and 1992. The gauge was discontinued due to poor radio telemetry communications and problems related to gauging a highly mobile sand-bed stream. No reliable data were ever collected from this station (Waters, 1999, personal communication).

The nearest stream gauge with published data is operated by the US Geological Survey (USGS) on **Cave Creek below Cottonwood Creek (ID # 09512280)**. This gauge was established June 16, 1978 and is located approximately 3.5 miles north of the Town of Cave Creek in Section 4, Township 6 North, Range 4 East, G&SRB&M The drainage area at the gauge site is

approximately 82.7 square miles, and the gauge is at an approximate elevation of 2280 feet (NGVD 1929).

The next nearest stream gauge with published data was operated by the USGS on **Cave Creek near Cave Creek (ID #09512300)** from 1968 through 1994. During this period, the USGS collected continuous data for the period beginning May 17, 1958 and ending September 30, 1967, and only recorded the annual peak discharge for the period beginning October 1968 and ending in 1994. The FCDMC took over maintenance and operation of this gauge site on May 27, 1994 by installing a continuously-recording ALERT station (station ID 4918). This gauge is located in Section 12, Township 5 North, Range 3 East, G&SRB&M at an elevation of approximately 1850 feet (NGVD 1929) and the drainage area at this gauge location is approximately 121 square miles.

4.2.4 Statistical Parameters

4.2.4.1 Precipitation Statistics:

Precipitation depth-duration-frequency statistics published by the National Oceanic and Atmospheric Administration[10] were used for this study. The NOAA Atlas 2 is currently being revised, however, the revised atlas has not been approved for use by the FCDMC or any other local agency at this time.

4.2.4.2 Discharge Statistics:

Streamflow statistics are published by the USGS for Cave Creek near Cave Creek (ID 09512300) in *Statistical Summaries of Streamflow Data and Characteristics of Drainage Basins for Selected Streamflow-Gaging Stations in Arizona Through Water Year 1996*[11]. Streamflow statistics are also published by the Flood Control District of Maricopa County in *Annual Hydrologic Data Report, Volume II Surface Water Data, Water Year 1998*[5]. Both of the above publications present the results of log-Pearson Type II analyses for these two gauging stations.

The streamflow statistics for the two gauges located on Cave Creek, which are presented in the above two publications, were not used to develop the peak discharge estimates used in this study for Galloway Wash because the Galloway Wash study area is much smaller (between 1 and 21 square miles compared to 83 and 121 square miles). However, these statistics were used as a means to verify the HEC-1 results and to maintain regional consistency.

4.2.5 Precipitation and Runoff

4.2.5.1 Historical Precipitation Records

The NWS Carefree, Arizona precipitation gauge (021282) is located at the Carefree Airport (see Figure 4.1-2), which is located inside the southern boundary of the study watershed. Monthly statistics based on over 37 years of record are presented in Table 4.2.5.1-1 below.

Table 4.2.5.1-1: Monthly Precipitation Summary for Carefree, Arizona (021282)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Precip. (in.)	1.43	1.36	1.70	0.60	0.16	0.12	1.29	1.69	1.15	1.10	1.11	1.55	13.26

The FCDMC Carefree Ranch precipitation gauge (#4930) is located approximately 5 miles northeast of the Carefree Airport in Section 16, Township 6 North, Range 4 East at an approximate elevation of 3200 feet msl. Monthly statistics based on 12 years of record through November 1999 are presented in Table 4.2.5.1-2 below.

Table 4.2.5.1-2: Monthly Precipitation Summary for Carefree Ranch (#4930)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Precip. (in.)	2.22	1.56	1.58	0.96	0.16	0.04	0.77	1.47	0.89	0.59	0.80	1.04	12.08

4.2.5.2 Historic Flooding

The distribution of annual peak flow data from the two Cave Creek gauges is presented in Table 4.2.5.2-1 (next page). The data in the tables in Section 4.2.5 show the seasonal variability of rainfall and runoff patterns in the region surrounding the study area. In general, the study area experiences two distinct precipitation seasons; summer monsoons (July-October) and winter frontal storms (December-March).

The monsoon season precipitation events tend to be relatively shorter duration but more intense than the winter storms, and are usually highly variable spatially and temporally. The winter storms tend to be relatively longer duration but less intense than the summer storms, and tend to have less spatial and temporal variability throughout the area impacted by the storm. As Table 4.2.5-3 demonstrates, significant runoff can occur as a result of storms occurring during either of the two general seasons.

In the region surrounding the study area, it is generally observed that the smaller watersheds (less than 5 square miles) tend to yield the largest peak flows as a result of the more intense, short duration storm events. Likewise, the larger basins (greater than 10 square miles) tend to yield the largest peak flows as a result of the storms having greater spatial and temporal distribution than the summer storms.

4.2.5.3 Rainfall Depth and Distribution

The storm frequencies used in the HEC-1 modeling for this project include the 100-year 24-hour storm and the 100-year 6-hour storm. The SCS Type II distribution was used for the 100-year 24-hour storm. JD records were used to define the index storm distributions for the 100-year 6-hour storm as defined in Table 2.4 and Figure 2.17 of the FCDMC's *Drainage Design Manual, Volume I*[6].

Table 4.2.5.2-1: Distribution of Annual Peak Flows (Discharge shown in cfs with date of discharge underneath)											
Cave Creek near Cave Creek (09512300), 39 years of record											
Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
3380 (10/5/95)	279 (2/28/97)	1420 (3/3/83)				610 (7/16/65)	148 (8/9/84)	332 (9/7/96)	132 (10/7/93)	856 (11/2/74)	280 (12/16/61)
13800 (1/8/93)	1260 (2/9/76)	4780 (3/1/91)				1350 (7/22/86)	170 (8/21/88)	696 (9/17/61)	1200 (10/2/81)		910 (12/27/84)
		7500 (3/2/78)				1900 (7/24/90)	364 (8/4/71)	1800 (9/6/67)	3950 (10/19/72)		6000 (12/22/65)
						3950 (7/17/72)	1390 (8/5/74)	2700 (9/5/70)	8570 (10/29/59)		6900 (12/18/78)
							1510 (8/6/63)	5680 (9/12/58)			12400 (12/19/67)
							3120 (8/2/64)				
							3590 (8/5/59)				
							4680 (8/22/92)				
Cave Creek below Cottonwood Creek (09512280), 20 years of record											
Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
173 (1/5/89)	7020 (2/19/80)	19 (3/6/81)				964 (7/16/90)	594 (8/9/84)	124 (9/11/96)		682 (11/15/93)	1470 (12/27/84)
3100 (10/5/95)		118 (3/3/87)					3460 (8/23/92)	476 (9/11/97)		746 (11/26/85)	
9200 (1/8/93)		617 (3/15/82)								840 (11/1/87)	
		709 (3/28/98)								2720 (11/30/82)	
		3900 (3/1/91)									

Average 100-year 24 hour and 100-year 6-hour point rainfall values were determined by overlaying the watershed boundary onto the precipitation isopluvial maps published in the FCDMC's *Drainage Design Manual, Volume I*[6]. Table 4.2.5.3-1 presents the resulting point rainfall values. Detailed precipitation frequency values for Galloway Wash are presented in Appendix D.1.

Table 4.2.5.3-1: Point Precipitation Values for Galloway Wash	
Storm Frequency & Duration	Point Precipitation Inches
100-year 24-hour	4.8
100-year 6-hour	3.5

4.2.5.4 Areal Precipitation Reduction

The point rainfall value for the 100-year 6-hour storm was adjusted using the depth-area reduction relationship developed by the U.S. Army Corps of Engineers for the August 19, 1954

Queen Creek, Arizona storm as depicted in Table 2.2 in the FCDMC's *Drainage Design Manual, Volume I.* The point rainfall value for the 100-year 24-hour storm was adjusted using the depth-area reduction relationship published by the National Weather Service (NWS) in HYDRO-40[14] and presented in Figure 2.1a of the *Drainage Design Manual, Volume I.*

Simulation of areal reduction of point rainfall depths within the HEC-1 models is accomplished using the JD record option. Table 4.2.5.3-1 below presents a summary of areally reduced point rainfall depths used in the HEC-1 models.

Table 4.2.5.4-1: Summary of Areal Reduction Values for Index Storms Used in JD Records

Area (square miles)	Rainfall (inches)	Temporal Distribution
100-Year 24-Hour Storm		
0.01	4.80	SCS Type II
1	4.78	SCS Type II
10	4.51	SCS Type II
20	4.37	SCS Type II
70	4.11	SCS Type II
100-Year 6-Hour Storm		
.01	3.50	Maricopa County Pattern 1
.5	3.48	Maricopa County Pattern 1
2.8	3.43	Maricopa County Pattern 2
16	3.23	Maricopa County Pattern 3
90	2.84	Maricopa County Pattern 4

4.2.5.5 Comparison to Historical Recorded Extremes

Extreme value data for the FCDMC Carefree Ranch precipitation gauge (#4930) are presented in Table 4.2.5.5-1 below. The data in the table represent the most extreme events measured at that gauge site for the period beginning July 1, 1985 and ending April, 1998. These data were downloaded from the FCDMC's Flood Warning internet web site (http://www.fcd.maricopa.gov/alert/alert.htm).

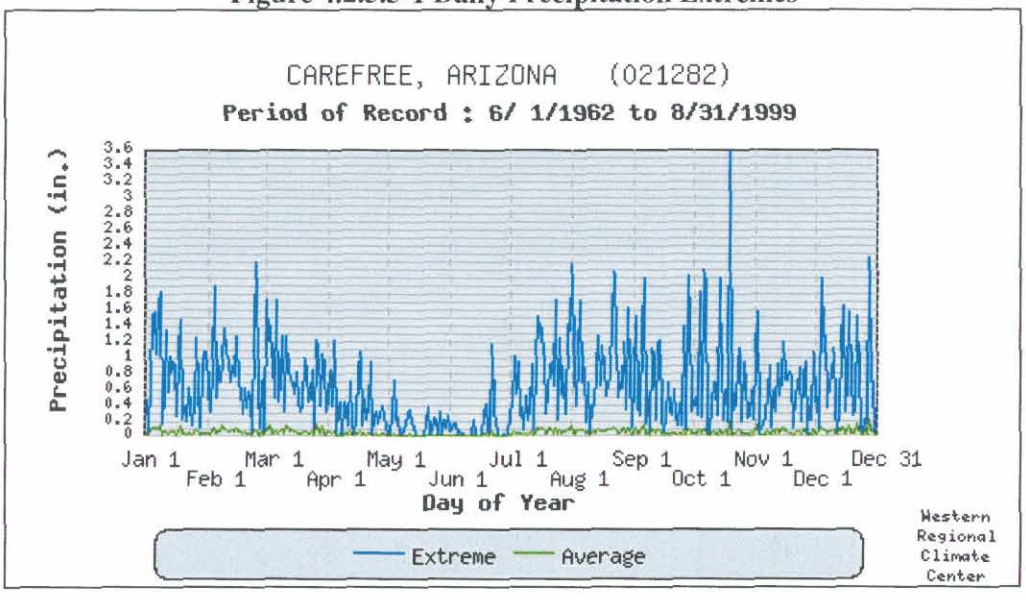
Table 4.2.5.5-1: Extreme Precipitation Events Recorded at FCDMC Carefree Ranch Gauge (4930)

Number of Events >1" / 24Hours	Number of Events >2" / 24Hours	Number of Events >3" / 24Hours	Greatest 15-Minute Depth (in)*	Greatest 1-Hour Depth (in)*	Greatest 3- Hour Depth (in)*
38	3	0	0.98"	1.61"	1.85"

* For the period beginning December 1987 and ending April 1998.

Extreme value data for the NWS Carefree precipitation gauge (021282) are presented in Figure 4.2.5.5-1 (next page). The data in this figure represent the maximum daily precipitation recorded for each day of the year between June 1, 1962 and August 31, 1999. The maximum daily precipitation recorded, according to the figure, appears to be approximately 3.6 inches and occurred at about the middle of October.

Figure 4.2.5.5-1 Daily Precipitation Extremes



This figure demonstrates that extreme precipitation events in the project area tend to occur between about the end of July and the end of October, and between the beginning of December and about the first week of March. This trend is also observed in Figures 4.2.5.5-2 and 4.2.5.5-3 (next page). These figures present graphically the probability of 2 inches and 3 inches of rain, respectively, falling during a one-day period. The figures also show the expected time of year, having a probability greater than zero, which would receive two or three inches of precipitation in one day.

The estimates of the 100-year 24-hour and the 100-year 6-hour point rainfall values (i.e., 4.8" and 3.5" respectively) are greater than any one-day event recorded at the two precipitation gauges which are located in the study area. The greatest one-day precipitation total recorded during the 36-year period of record at the NWS Carefree gauge site is 3.6 inches. At the FCDMC Carefree Ranch gauge location, three precipitation events were recorded during the approximately 13 years of record for this gauge which had 24-hour totals in excess of two inches, and no precipitation events were recorded during the period of record with 24-hour totals exceeding three inches.

Figure 4.2.5.5-2 Probability and Time of Year of 2" of Precipitation in One Day

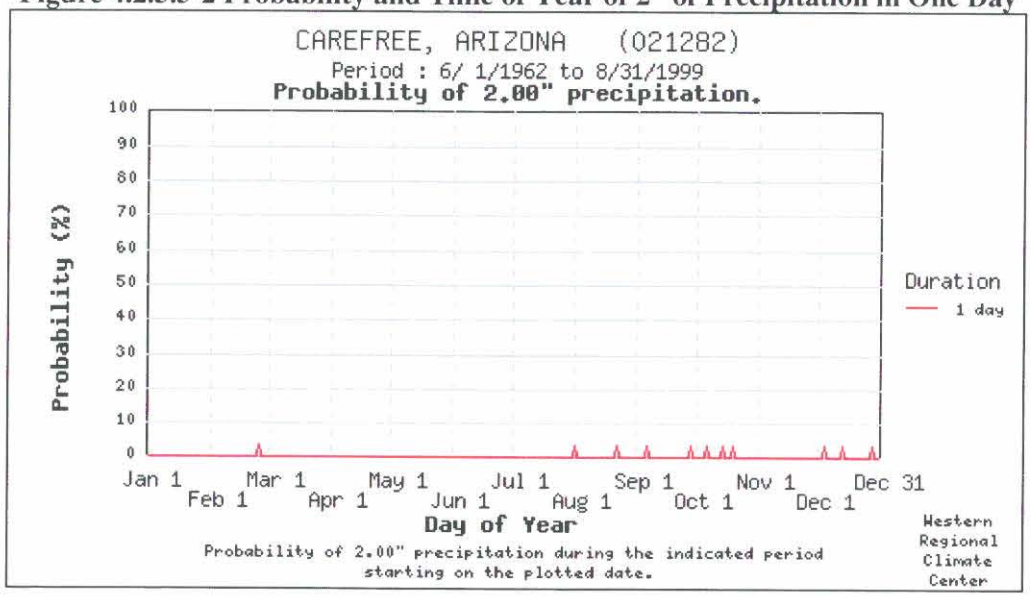
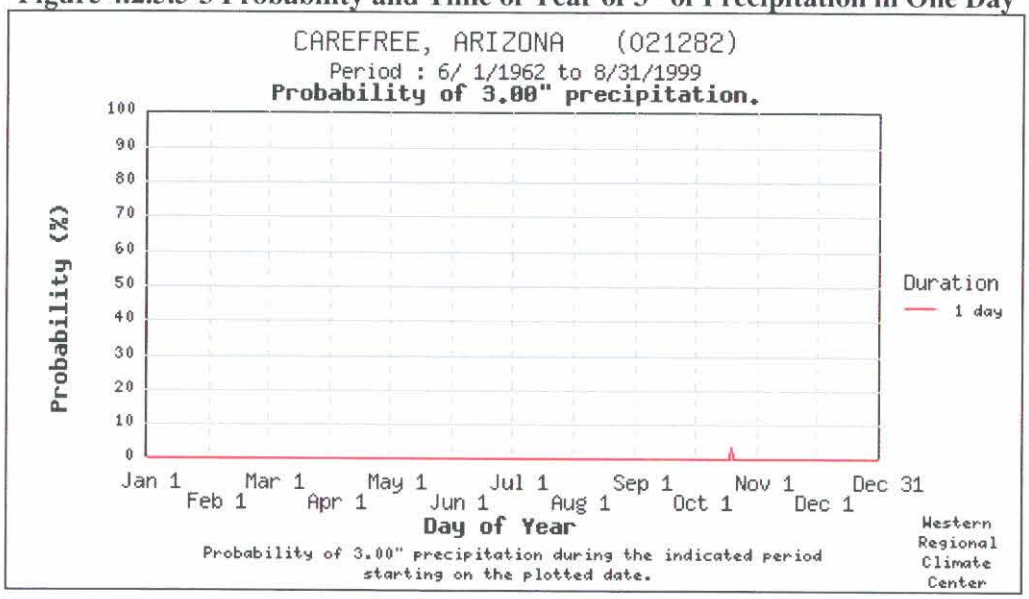


Figure 4.2.5.5-3 Probability and Time of Year of 3" of Precipitation in One Day



4.2.6 Physical Parameters

Parameters for rainfall losses, including those parameters related to soils and land use classifications, were defined using the methodologies defined in the FCDMC's *Drainage Design Manual, Volume I*[6]. The following subsections describe how these parameters were determined and present summaries of the various parameters. Detailed physical parameters for each subbasin are included in Appendix D.2.

4.2.6.1 Rainfall Losses

HEC-1 rainfall losses for the Galloway Wash watershed were estimated using the Green and Ampt infiltration equation option. Table 4.2.6-1, below, presents composite Green and Ampt loss parameters for each subbasin along with lag times for both the 100-year 24-hour and the 100-year 6-hour storms. A detailed discussion of the calculation of these parameters is included after the presentation of the summary table.

Table 4.2.6.1-1: Summary of composite Green & Ampt Rainfall Losses with Lag Times

Subbasin	Area (sq. mi.)	IA (inches)	DTHETA	PSIF (inches)	XKSAT Adjusted (in/hr)	RTIMP percent	Lag (minutes)
GWW1_1	2.552	0.19	0.25	5.3	0.26	9	48.4
GWW1_2	1.043	0.20	0.25	5.2	0.28	2	45.2
GWW1_3	1.518	0.19	0.25	5.6	0.23	5	37.8
GWW1_4	1.004	0.20	0.25	5.8	0.20	1	43.0
GWW1_5	0.983	0.16	0.23	6.2	0.19	24	41.2
GWW1_6	0.593	0.20	0.25	5.3	0.24	0	34.8
GVW1	4.905	0.20	0.17	6.8	0.13	17	71.1
GVW2	6.023	0.20	0.23	6.2	0.18	12	56.7
GVW3_1	1.043	0.20	0.25	5.2	0.26	0	42.3
GVW3_2	0.972	0.20	0.25	5.3	0.24	0	36.8
GVW3_3	0.341	0.20	0.25	6.0	0.19	2	28.2

Soils

Digital soils maps derived from the Soil Conservation Service (SCS) and the US Forest Service (USFS) were provided by the FCDMC in dxf format and as ArcView shapefiles for the project area. The digital soil map unit data are based on *Soil Survey of Aguila-Carefree, Parts of Maricopa and Pinal Counties, Arizona* (SCS 1986) and on *USFS, Tonto National Forest, General Ecosystem Survey,* 1989[13]. Figure 4.6 presents the digital soils data as provided by the FCDMC. Table 4.2.6.1-2 (next page) presents the soil units found in the study area with their corresponding natural-conditions rainfall loss characteristics.

Using ArcView, the delineated subbasin polygons were overlaid on the digital SCS and USFS soil map unit polygons to determine the percentage of each soil map unit contained in each subwatershed. Using the FCDMC's DDMS computer program, soil texture class data were logarithmically weighted by area and related to Table 4.2 and Figure 4.3 in the *Drainage Design Manual, Volume I*[6] to determine average Green and Ampt XKSAT, PSIF and percentage of rock outcrop parameter values for bare ground. The bare ground XKSAT values were then adjusted for vegetation cover using average vegetative cover values calculated from land use data using DDMS. It was assumed that only approximately 50% of all natural rock outcrops are directly connected impervious areas. The assigned RTIMP percentages shown in Table 4.2.6.1-2 reflect this assumption.

Table 4.2.6.1-2: Natural-Conditions Rainfall Loss Characteristics for Study Area Soil Map Units			
Soil Map Unit	Bare-Ground XKSAT (in/hr)	Natural Rock Outcrop (%)	Assigned RTIMP (percent)
SCS Soil Units			
6	0.62	0	0
8	0.96	0	0
12	0.01	0	0
24	0.02	0	0
26	0.01	0	0
33	0.23	0	0
34	0.23	0	0
40	0.17	0	0
41	0.17	0	0
61	0.15	0	0
63	0.14	0	0
72	0.09	30	15
93	0.33	0	0
96	0.07	0	0
104	0.14	60	30
121	0.12	0	0
USFS Soil Units			
301	0.40	0	0
303	0.40	15	7

Land Use

Digital land use data were provided by the FCDMC for the study area in dxf format and as ArcView shapefiles. Aerial photography dated January 1999, were also provided by the FCDMC in georeferenced tiff files for the study area. The digital land use data were digitized by the Maricopa Association of Governments using existing zoning data (MAG 1995). Using ArcView, the land use polygons were overlaid onto the aerial photography and edited to reflect the actual land use observed on the 1999 aerial photography. The updated land use shapefiles were then overlaid by the subbasins to determine the percentage of each land use type in each subwatershed. The results were then were exported from ArcView to Microsoft Excel 2000, where they were sorted by subbasin and accumulated by land use type. The land use breakdowns were then input into the FCDMC's DDMS program which calculates the area-weighted averages of each land use type, and then the area-weighted average percent vegetation, RTIMP, IA, and Kn for each subbasin.

Table 4.2.6.1-3 presents the default values for DTHETA (antecedent moisture conditions), percent vegetative cover, RTIMP percent (impervious area percentage), IA (initial abstraction, or surface retention loss in inches), and Kn (estimated mean Manning's n for all channels associated with a particular land use or basin area).

Table 4.2.6.1-3: Land Use Default Values					
Land Use Type	DTHETA Condition	% Veg. Cover	RTIMP Percent	IA inches	Kn
Airport	Normal	8	85	0.07	0.02
Dedicated Open Space	Normal	35	0	0.20	0.05
Large Lot Residential	Normal	35	15	0.18	0.04
Medium Density Residential	Normal	25	30	0.15	0.03
Neighborhood Retail Center	Normal	10	80	0.07	0.02
Recreational Open Space	Normal	75	0	0.20	0.03
Hotels/Resorts	Normal	32	60	0.11	0.03
Rural	Normal	30	0	0.20	0.04
Small Lot Residential	Normal	30	25	0.15	0.04
Vacant	Normal	30	0	0.20	0.045
Water	Normal	0	100	0.00	0

4.2.6.2 Unit Hydrograph

The Phoenix Mountain and Desert/Rangeland S-graphs, defined in Table 5.3 of the *Drainage Design Manual, Volume I*[6] are used for this study. The Phoenix Mountain S-graph is used only in subbasins GVW1 and GVW2, which are located in mountainous terrain in the northeastern side of the study area. The Desert/Rangeland S-graph is used for the remaining basins, which are located in the lower portions of the study area in the foothills and more gently sloping desert terrain. Table 4.2.6.2-1 presents a summary of the parameters and lag times for each subbasin.

Table 4.2.6.2-1 MCUHP2 Lag Time Summary						
Subbasin	S-Graph Type	Kn	L miles	Lca miles	Slope ft/mile	Lag Minutes
GWW1_1	Desert/Rangeland	0.039	4.64	2.04	196.1	48.4
GWW1_2	Desert/Rangeland	0.039	3.88	1.87	164.9	45.2
GWW1_3	Desert/Rangeland	0.039	2.83	1.46	137.8	37.8
GWW1_4	Desert/Rangeland	0.040	3.64	2.11	274.7	43.0
GWW1_5	Desert/Rangeland	0.034	3.57	1.89	112.6	41.2
GWW1_6	Desert/Rangeland	0.039	2.61	1.31	164.8	34.8
GVW1	Mountain	0.045	6.19	3.56	298.9	71.1
GVW2	Mountain	0.043	5.51	2.77	371.1	56.7
GVW3_1	Desert/Rangeland	0.043	3.31	1.51	184.3	42.3
GVW3_2	Desert/Rangeland	0.043	2.42	1.26	144.6	36.8
GVW3_3	Desert/Rangeland	0.040	1.88	0.95	135.6	28.2

4.2.6.3 Routing Parameters

Channel Routing

The normal depth storage routing routine was used for all channel reaches in this study. Representative 8-point cross sections were obtained from previous FIS study model results and

attendant topographical mapping. Manning's n values assigned to the 8-point cross sections are consistent with those used in previous HEC-1 and HEC-2 modeling efforts. The NSTPS parameter (the number of steps used in the storage routing) was determined by developing a stage/discharge table for each representative 8-point cross-section and then iterating between NSTSPS and the corresponding HEC-1 discharge at the upstream end of the routing reach. Three iterations were performed in order for the HEC-1 discharge and related NSTPS to stabilize. Appendix D.3 includes routing data, a table including confidence checks, and cross-section plots.

Reservoir Routing

Reservoir routing is included in the Galloway Wash HEC-1 at an online detention basin. This detention basin (RR 282) is located on the north branch of Galloway Wash approximately one-half mile east of the Pima Road alignment at Charles Blair McDonald Drive. The outlet for the basin is 6-12'x4' concrete box culverts, with two unregulated (i.e., flow-through) cells, and four flanking cells (two on each side of the unrestricted cells) regulated by constricted weir inlets.

Each pair of flanking regulated cells shares an inlet restriction which consists of a common inlet chamber with a single 3'x2' orifice entrance which has an invert approximately two feet above the invert to the two unregulated center cells. Additionally, the flanking common inlet chambers have open tops, which permit weir flow at stages greater than approximately 11 feet above the unregulated cell inverts. The stage-storage-discharge data used in this HEC-1 were previously reported by A-N West, Inc. in *Detailed Drainage Design Report for Desert Mountain Properties Proposed Detention Basin No. S-1,* Revised March, 1996[1]. A portion of this report is included in Appendix D.4.

4.3 PROBLEMS ENCOUNTERED DURING STUDY

4.3.1 Special Problems and Solutions

No unusual or special problems were encountered during the course of this study.

4.3.2 Modeling Warning and Error Messages

The HEC-1 reported one type of warning message as follows: "routed outflow (xxxxx) is greater than maximum outflow (xxxxx) in storage-outflow table". This warning is the result of a hydrograph being generated for the index or transposition areas. For each occurrence of this warning, it is for a case in which the index area is much greater than the actual basin area at the point where the warning is generated. Therefore, this warning does not affect any of the interpolated discharges at the locations where the warning is reported in by HEC-1.

4.4 CALIBRATION

Due to a lack of rainfall and runoff data, calibration of the HEC-1 model based on physical data was not performed.

4.5 FINAL RESULTS

4.5.1 Hydrologic Analysis Results

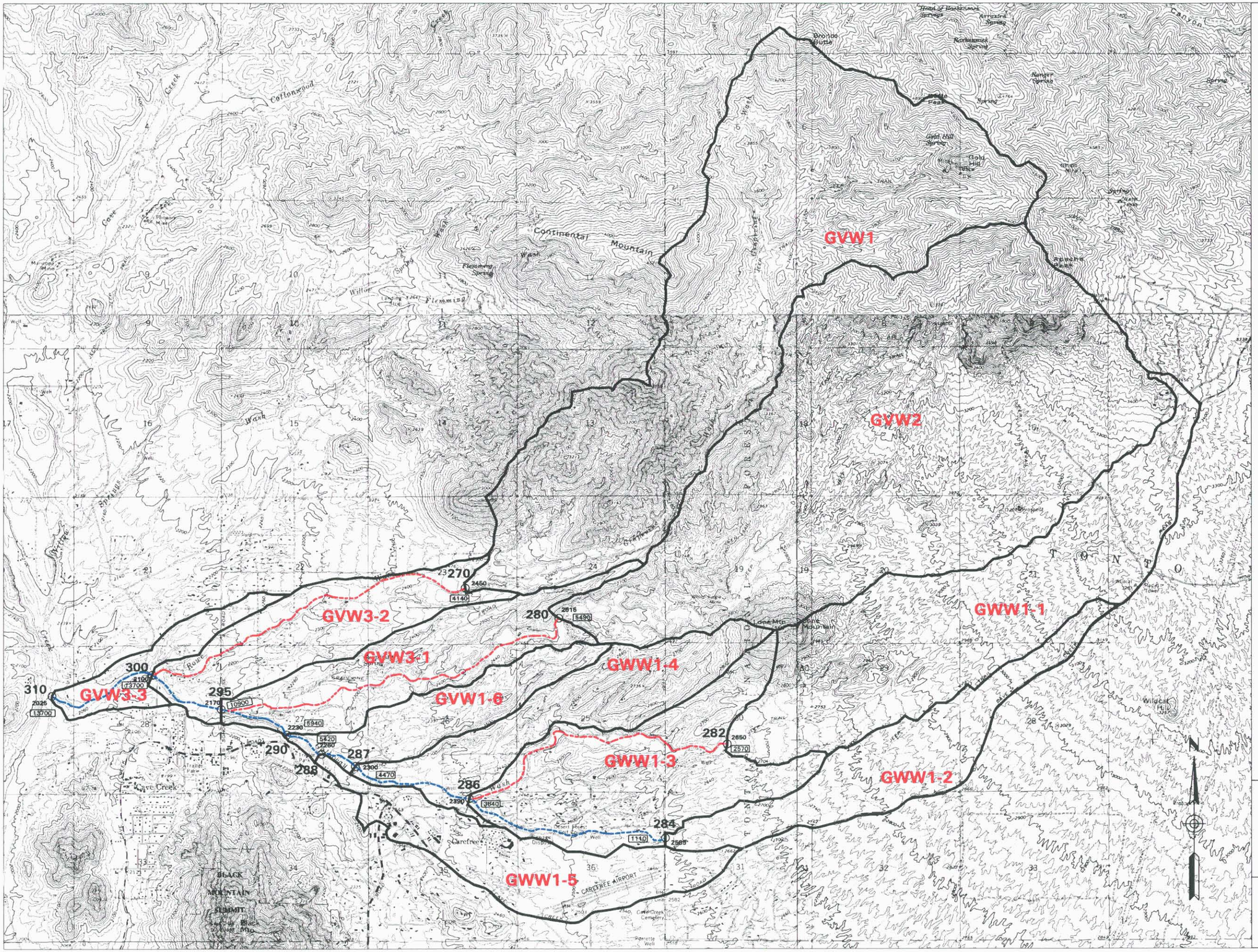
Table 4.5.1-1, Table 4.5.1-2, and Figure 4.5.1-1 present summary results of the HEC-1 modeling. Figure 4.5.1-2 presents the inflow and outflow hydrographs associated with the reservoir routing at RR282; the detention basin at Charles Blair McDonald Drive. Appendix D.6 contains the detailed HEC-1 model output. At all but one concentration point, 284, the 24-hour storm yielded greater discharge values than the 6-hour storm. In this case, the greater 6-hour discharge is the result of the small basin size; it is the smallest upland basin without a routing reach or combination of flows associated with it. Table 4.5.1-3 presents JEF's recommendations for the 100-year regulatory discharge values to be used in this study.

Table 4.5.1-1 Summary Hydrologic Analyses Results for Galloway Wash

	100-Year 24-Hour Storm		100-Year 6-Hour Storm	
Concentration Point	Peak Discharge (cfs)	Time of Peak (hours since storm began)	Peak Discharge (cfs)	Time to Peak (hours since storm began)
270	4,141	12.83	3,749	4.83
280	5,492	12.67	4,686	4.67
282	2,571	12.58	2,427	4.58
284	1,110	12.50	1,155	4.50
286	3,637	12.67	3,397	4.42
287	4,466	12.67	4,017	4.75
288	5,421	12.67	4,768	4.75
290	5,944	12.58	5,158	4.67
295	10,908	12.75	9,070	4.83
300	13,664	12.83	11,371	4.92
310	13,668	12.83	11,378	5.00

Table 4.5.1-2 Summary of Reservoir Routing at Charles Blair McDonald Drive, CP282 (100-yr 24-hr)

Peak Inflow (cfs)	Peak Outflow (cfs)	Peak Stage (feet above invert)
2571	2407	12.7



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.5.1-1
COMPUTED 100-YEAR DISCHARGES

JANUARY, 2000

LEGEND

- SUBBASIN
- 4140 — COMPUTED 100-YEAR DISCHARGE (cfs)
- 286 / 2390 — CONCENTRATION POINT (CONCENTRATION POINT NUMBER) (ELEVATION)
- ROUTING REACH
- ROUTING REACH (FLOODPLAIN DELINEATION RESTUDY REACH)

SCALE IN FEET

2000 0 2000 4000

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC

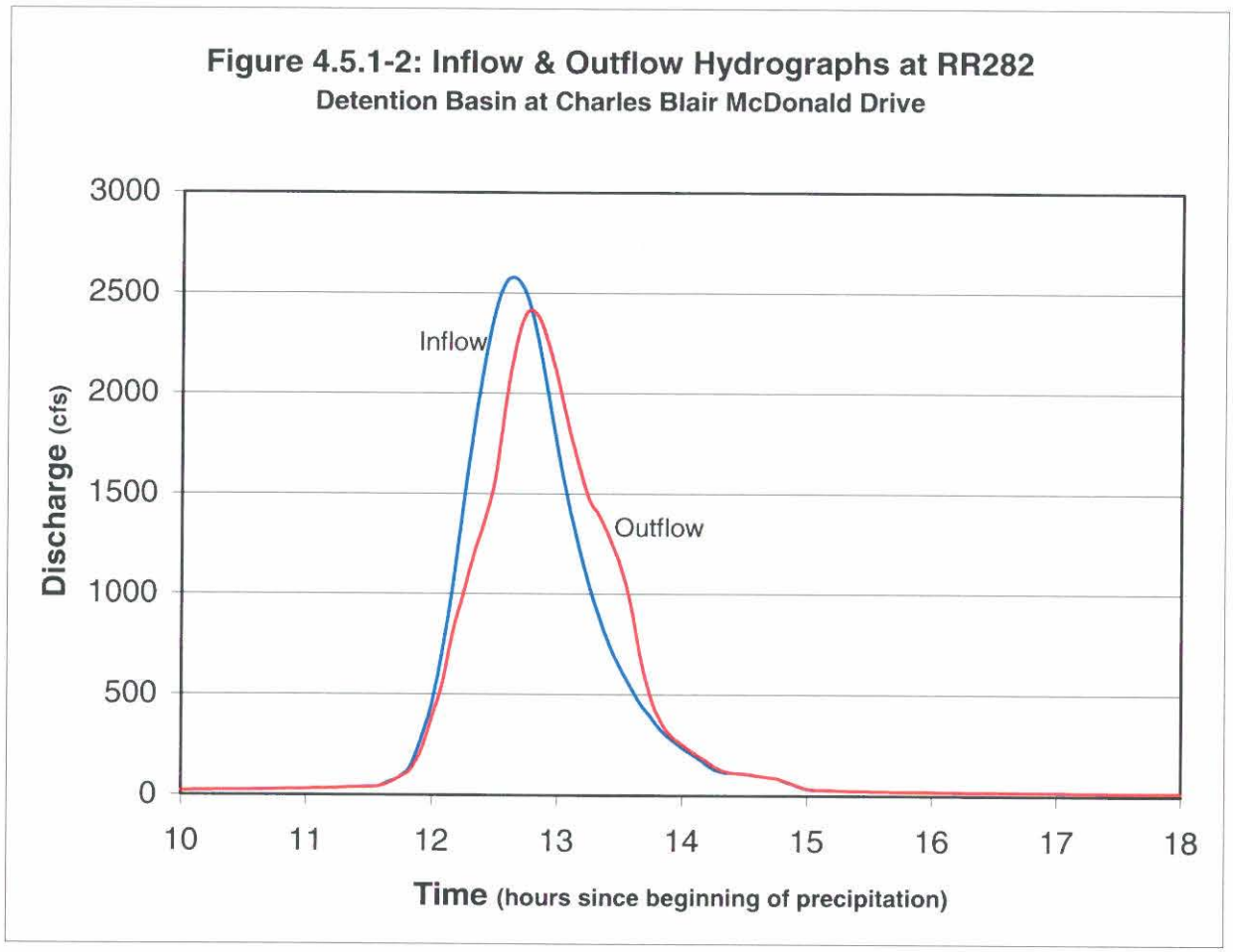


Table 4.5.1-3 Computed Discharge Values for Galloway Wash

Concentration Point	Discharge (cfs)
270	4,140
280	5,490
282	2,570
284	1,110
286	3,640
287	4,470
288	5,420
290	5,940
295	10,900
300	13,700
310	13,700

4.5.2 Verification of Results

The results of the HEC-1 model were compared to two indirect data sources:

1. USGS regional regression predictions
2. The previous FIS study for the project area.

Table 4.5.2-1 and Table 4.5.2-2, shown on the next two pages, display the results of a comparison of HEC-1 discharge values and unit discharge values throughout the study area with those discharge values and unit discharge values at the same concentration points derived from the USGS regional regression equation for the 100-year peak discharge and from the previous FIS studies conducted by Sabol in 1997[8], Cella Barr Associates (CBA) in 1989[3], and Harris-Toups Associates in 1979[9]. In general, the discharge and unit discharge values from the HEC-1 modeling agree with the USGS[12]-derived discharges and Sabol[8] discharges and unit discharges; with the JEF unit discharges derived from the 100-year 24-hour storm hovering just above and below the USGS-derived unit discharges, and just above the Sabol discharges and unit discharges.

The regulatory discharge values noted in Table 4.5.2-1 under Harris-Toups[9] and Cella Barr[3] were obtained from the HEC-2 models for those two studies. The Harris-Toups discharges at JEF concentration points 295, 300 and 310 are considerably higher than any of the other discharge estimates presented in the comparison table. Also, the Cella Barr discharge estimate at JEF concentration point 284 (Galloway Wash at Pima Road), is significantly less than the JEF HEC-1 and the USGS regression discharge estimates for that concentration point. These differences could be attributable to the use of different hydrologic models such as the Soil Conservation Service TR20 model, or by application of HEC-1 modeling using different methodology and guidelines than are now required by the FCDMC.

Table 4.5.2-1 Comparison of HEC-1 Results to USGS Regional Regression Analysis and Previous Studies								
Concentration Point	Area (sq. mi.)	Mean Basin Elevation (ft)	USGS[13] Q100 (cfs)	JEF 24hr HEC-1 Q100 (cfs)	Sabol[8] 24hr HEC-1 Q100 (cfs)	JEF 6hr HEC-1 Q100 (cfs)	Harris-Toups[9] (1979) Q100 (cfs)	CBA[3] Q100 (cfs)
270	4.905	3498	4384	4,141	3,471	3,749		
280	6.023	3179	5250	5,492	4,340	4,686		
282	2.552	3014	2971	2,571		2,427		
284	1.043	2826	1548	1,110		1,155		703*
286	5.113	2842	4954	3,637		3,397	2,350	2,466
287	6.117	2800	5618	4,466		4,017	4,375	
288	7.09	2752	6235	5,421		4,768	4,375	
290	7.693	2732	6593	5,944	6,269	5,158	6,400	
295	14.759	2894	9614	10,908	9,547	9,070	13,400	
300	20.636	3011	11493	13,664	11,828	11,371	19,040	
310	20.977	2997	11627	13,668	12,838	11,378	18,900	

*Approximately 0.3 mile below concentration point 284; actual value at concentration point 284 is 430 cfs.

Table 4.5.2-2: Unit-Discharge Comparison of HEC-1 Model Results with Results of USGS Regional Regression Analysis and Sabol[8]

Concentration Point	Area (sq. mi.)	USGS[12] unit Discharge (cfs/sq.mi.)	JEF 24-hr unit Discharge (cfs/sq.mi.)	Sabol[8] 24hr Unit Discharge (cfs/sq.mi.)	JEF 6-hr unit Discharge (cfs/sq.mi.)
270	4.905	894	833	708	812
280	6.023	872	912	721	778
282	2.552	1164	1007		951
284	1.043	1484	1064		1107
286	5.113	969	711		664
287	6.117	918	730		657
288	7.09	879	765		672
290	7.693	857	772	815	671
295	14.759	651	739	647	615
300	20.636	557	664	573	553
310	20.977	554	648	612	545

Flood-Flow –Frequency from Cave Creek Gauges

Station	Area (sq. mi.)	100-yr Peak Discharge (cfs)	Unit Discharge (cfs/sq. mi.)
Cave Creek below Cottonwood Creek (09512280)	82.7	19,700	238
Cave Creek near Cave Creek (09512300)	121	21,500	178

Data for 09512280 from FCDMC, 1998 and for 09512300 from Pope & others, 1998.

4.6 REFERENCES

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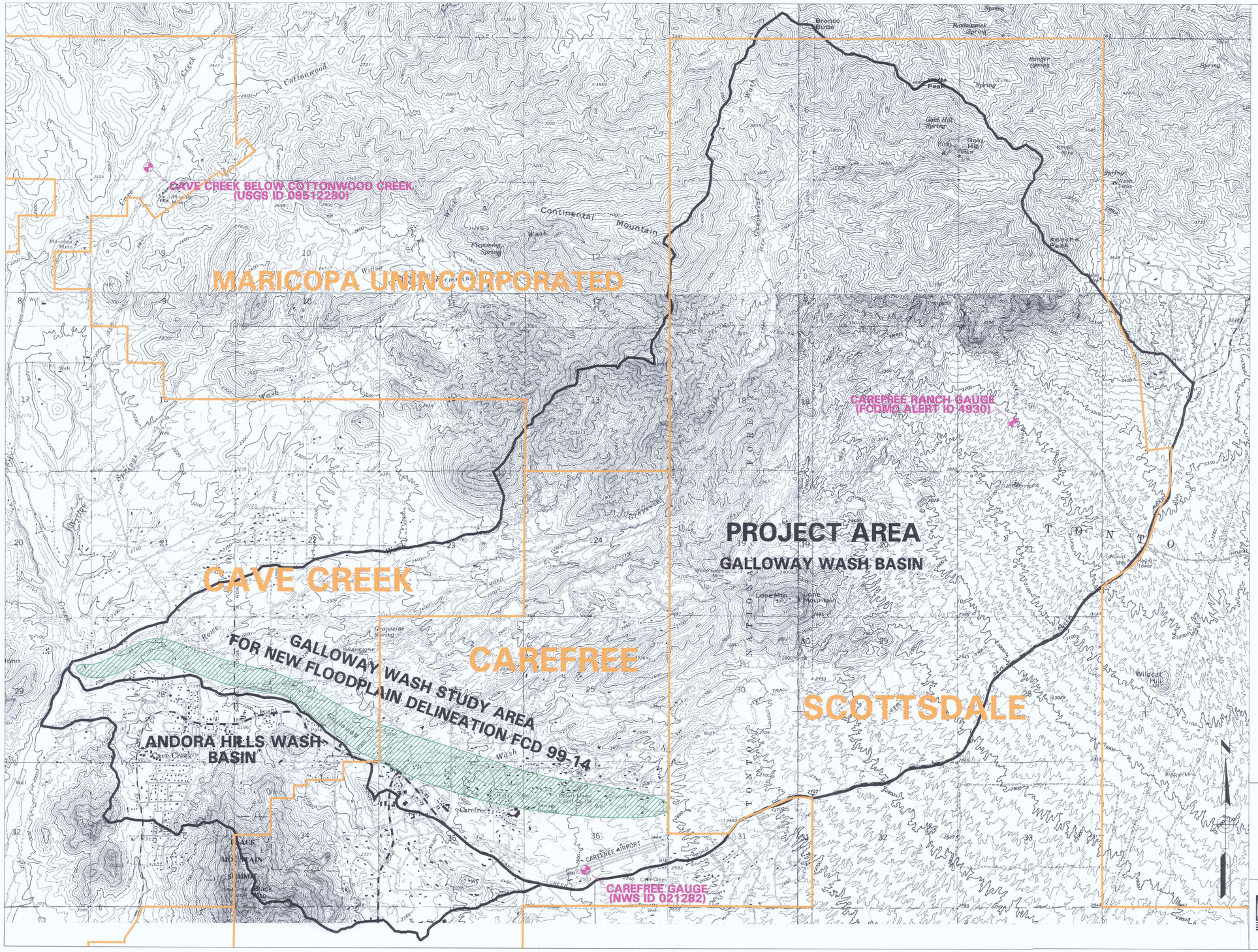
HYDROLOGY STUDY WORK MAPS

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES FCD 99-14

FIGURE 4.1-2

JANUARY, 2000



LEGEND

- PROJECT AREA BOUNDARY (HYDROLOGY)
- PROJECT AREA BOUNDARY (HYDRAULICS)
- JURISDICTIONAL BOUNDARY
- GAUGE LOCATION

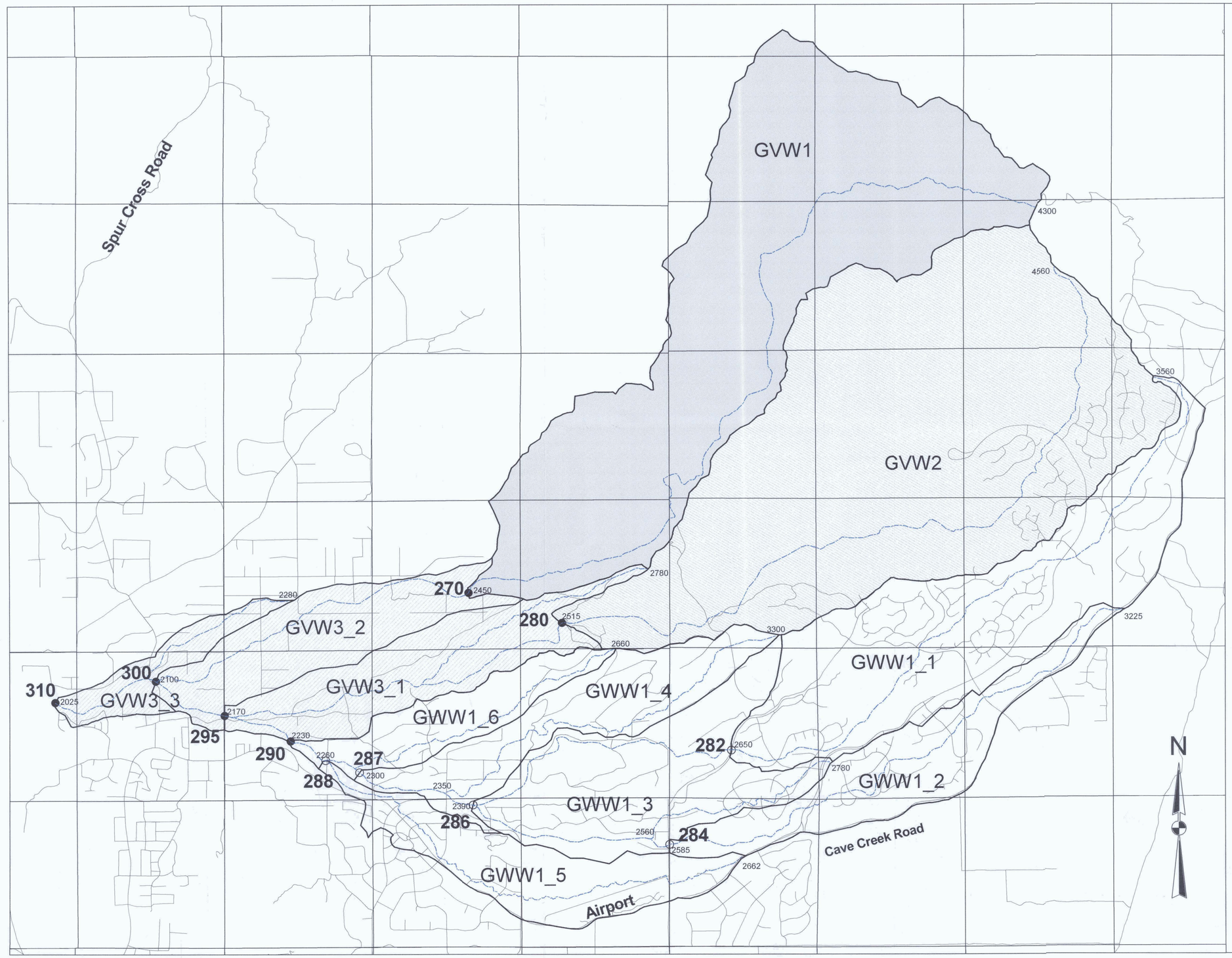
Registered Professional Engineer (Civil) CERTIFICATE NO. 29325 BRIAN R. ISERMAN Date Signed 1/12/00 ARIZONA U.S.A.

Brian R. Iserman

Scale in Feet

2000 0 2000 4000

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.



FLOOD CONTOL DISTRICT
OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-1
COMPARISON TO SABOL
(FCD 95-28) SUBBASINS

JANUARY, 2000

LEGEND

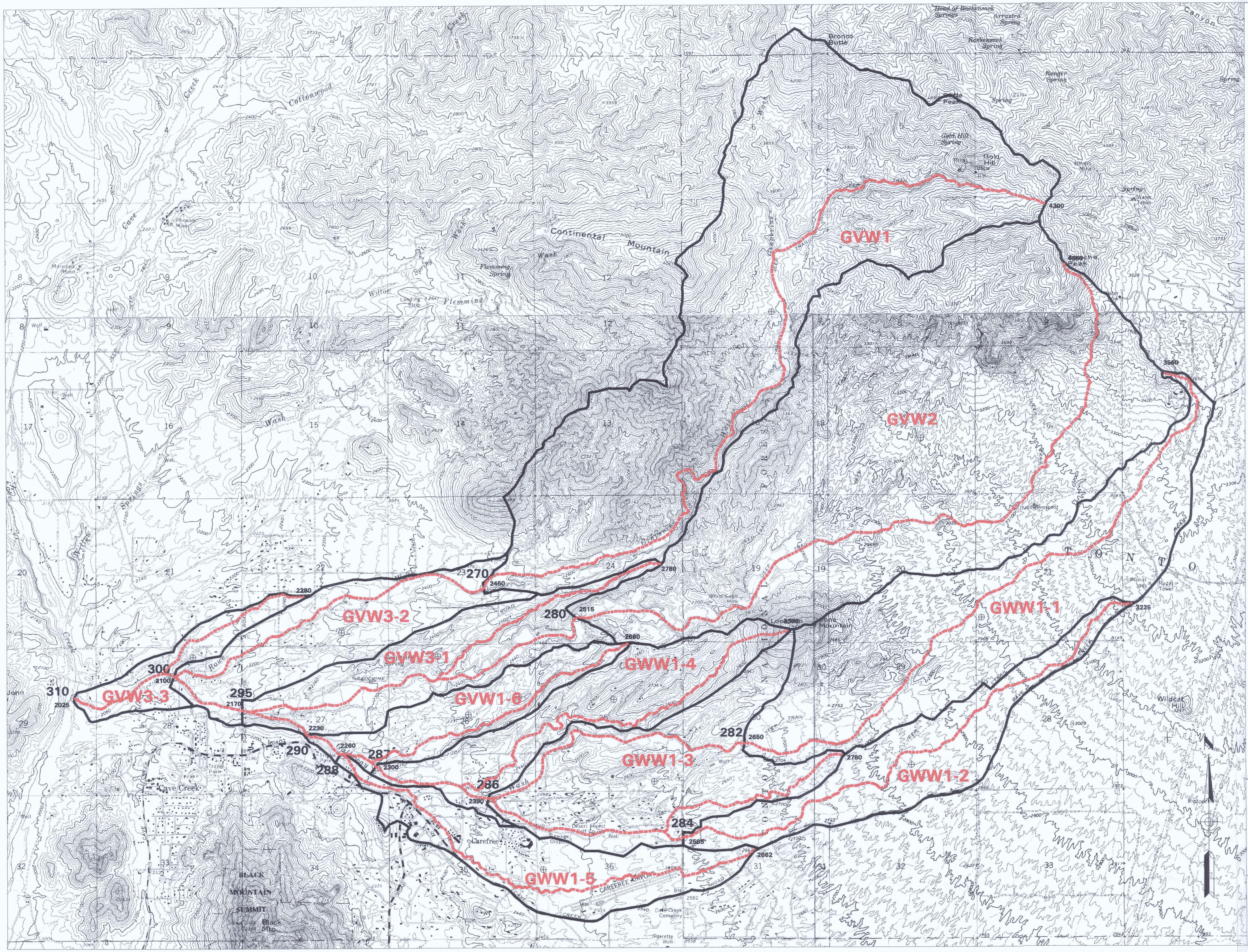
- Sabol Subbasin GWW1
- Sabol Subbasin GVW1
- Sabol Subbasin GVW2
- Sabol Subbasin GWW1
- 3225 Elevation
- Flow paths
- Streets
- 286 New Concentration Points
- 280 Sabol Concentration Points

Registered Professional Engineer (Civil)
CERTIFICATE NO. 29325
BRIAN R. ISERMAN
Date Signed 1-14-00
ARIZONA U.S.A.

SCALE

2000 0 2000 4000 Feet

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-2
Tc FLOW PATHS

JANUARY, 2000

LEGEND

SUBBASIN

SUBBASIN CENTROID

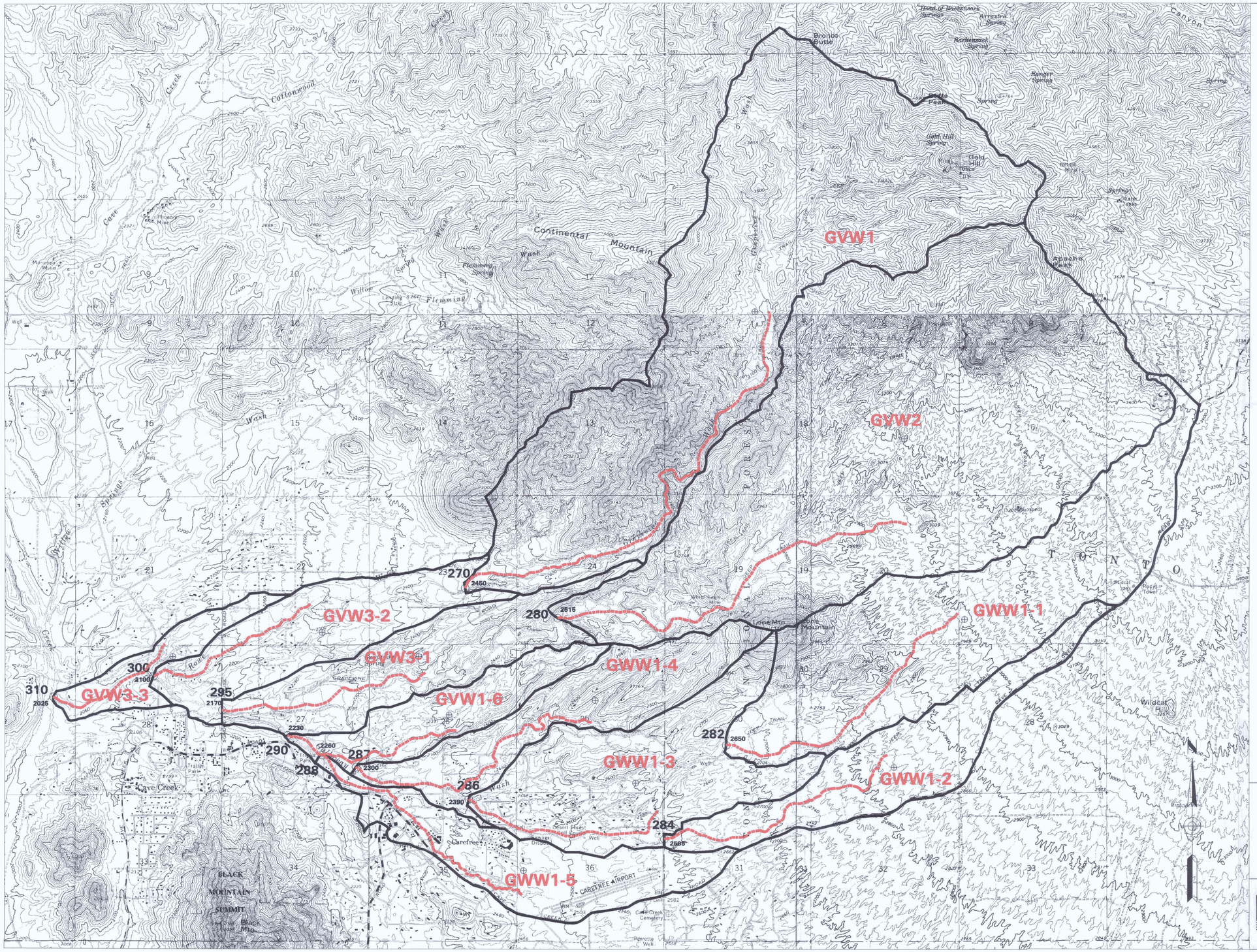
286
2390
CONCENTRATION POINT
(CONCENTRATION POINT NUMBER)
(ELEVATION)

2390
Tc FLOW PATH
(ELEVATION AT UPPER END OF FLOWPATH)

Registered Professional Engineer (Civil)
CERTIFICATE NO. 29325
BRIAN R. ISERMAN
Date Signed 1/28/00
ARIZONA, U.S.A.

SCALE IN FEET
2000 0 2000 4000

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-3
Lca MAP

JANUARY, 2000

LEGEND

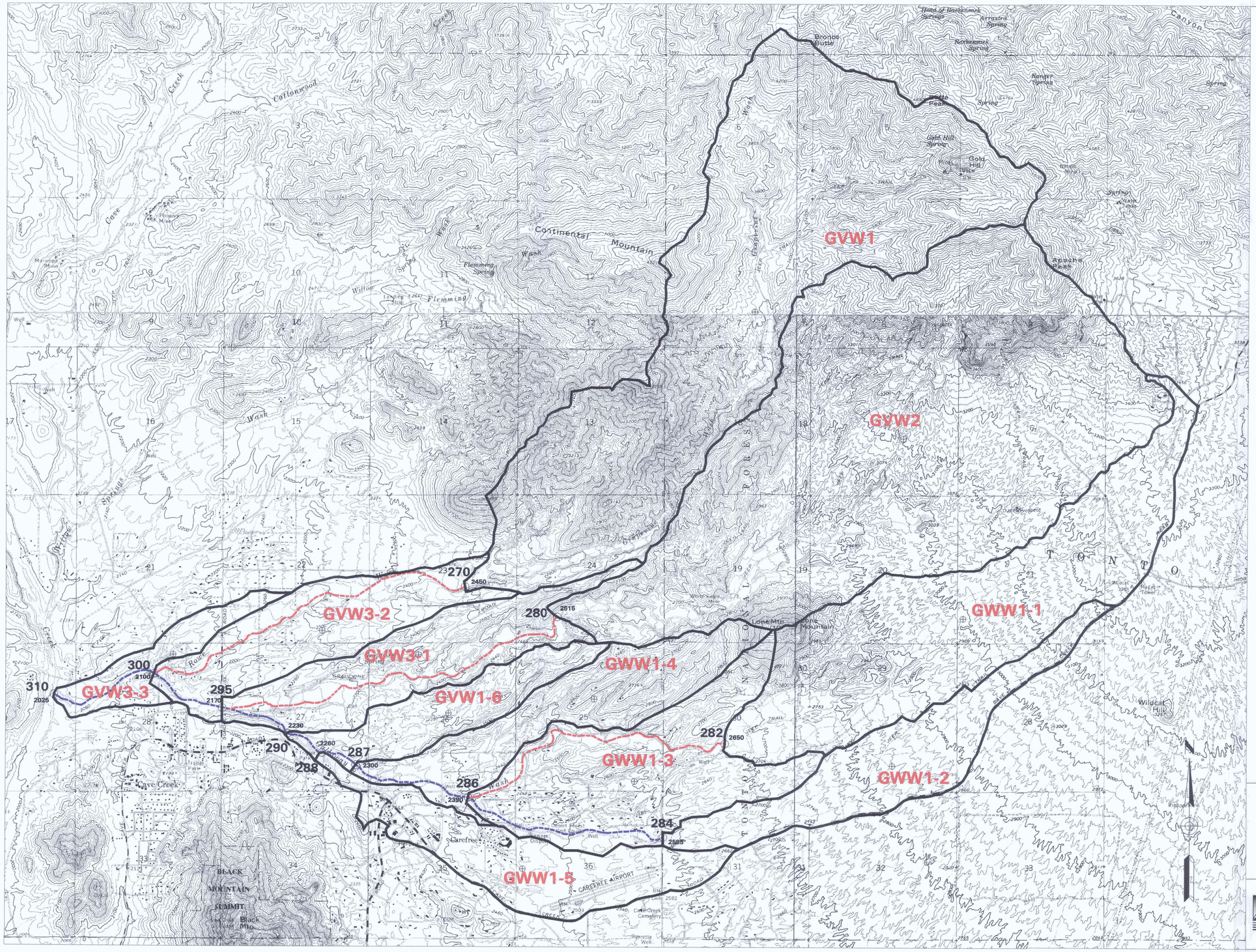
- SUBBASIN
- SUBBASIN CENTROID
- 286 / 2390 — CONCENTRATION POINT
- Lca FLOW PATH

Registered Professional Engineer (Civil) CERTIFICATE NO. 29325 BRIAN R. ISERMAN Date Signed 1-6-00 ARIZONA U.S.A.

SCALE IN FEET

2000 0 2000 4000

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-4
ROUTING REACHES

JANUARY, 2000

LEGEND

- SUBBASIN
- SUBBASIN CENTROID
- 286 / 2390 — CONCENTRATION POINT (CONCENTRATION POINT NUMBER) (ELEVATION)
- ROUTING REACH
- ROUTING REACH (FLOODPLAIN DELINEATION RESTUDY REACH)

Registered Professional Engineer (Civil) CERTIFICATE NO. 29325 BRIAN R. ISERMAN Date Signed 1-6-00 ARIZONA U.S.A.

Brian R. Iserman

SCALE IN FEET

2000 0 2000 4000

JE FULLER
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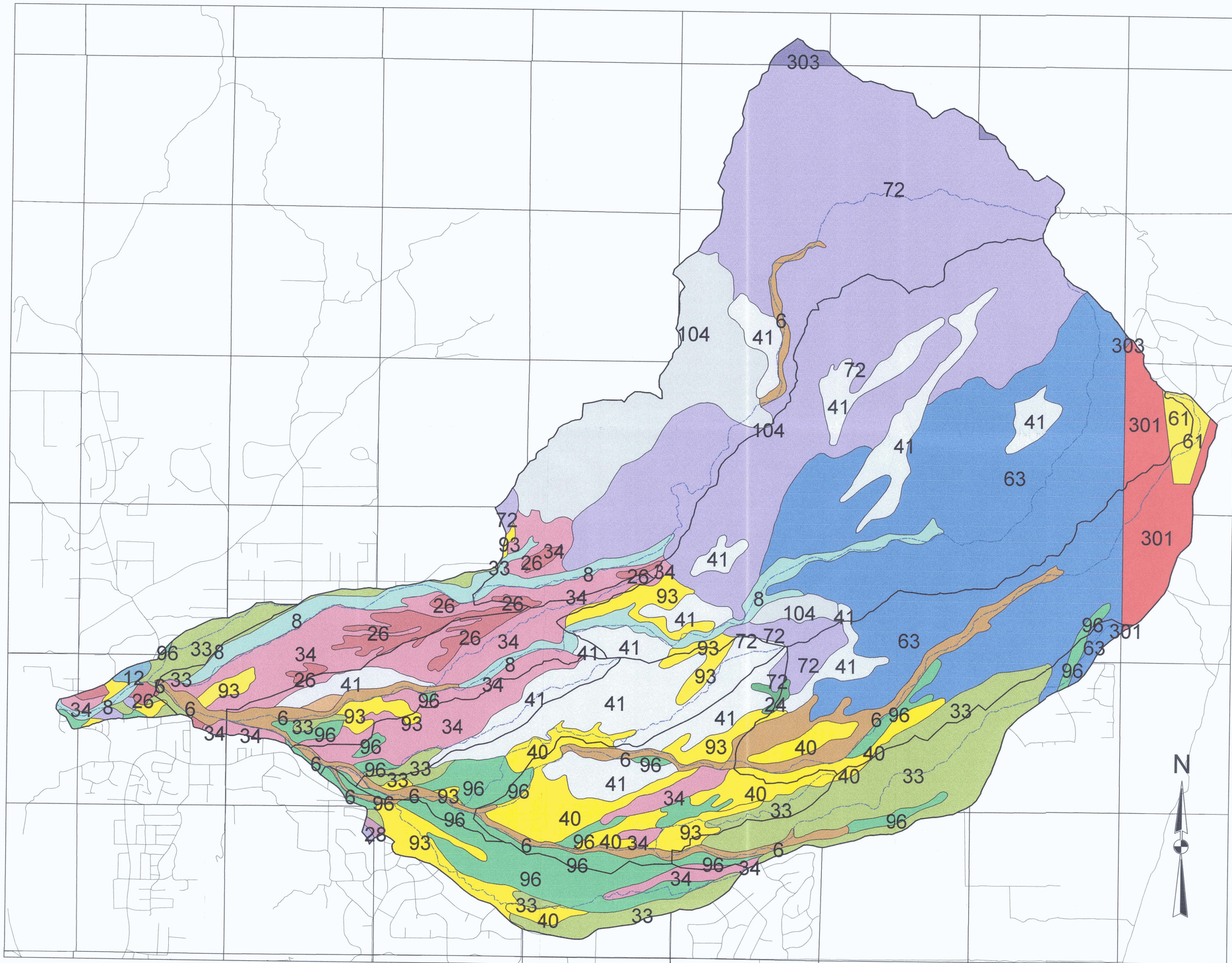


FLOOD CONTOL DISTRICT
OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-5
SOILS MAP
FOR GALLOWAY WASH

JANUARY, 2000

LEGEND

Subbasins

Flow paths

41 Soil survey map unit

Streets

Source: Soils data from Camp, 1986
and USFS as provided digitally by FCDMC.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
29925
BRIAN R.
ISERMAN
Date Signed 12-1-00
ARIZONA, U.S.A.

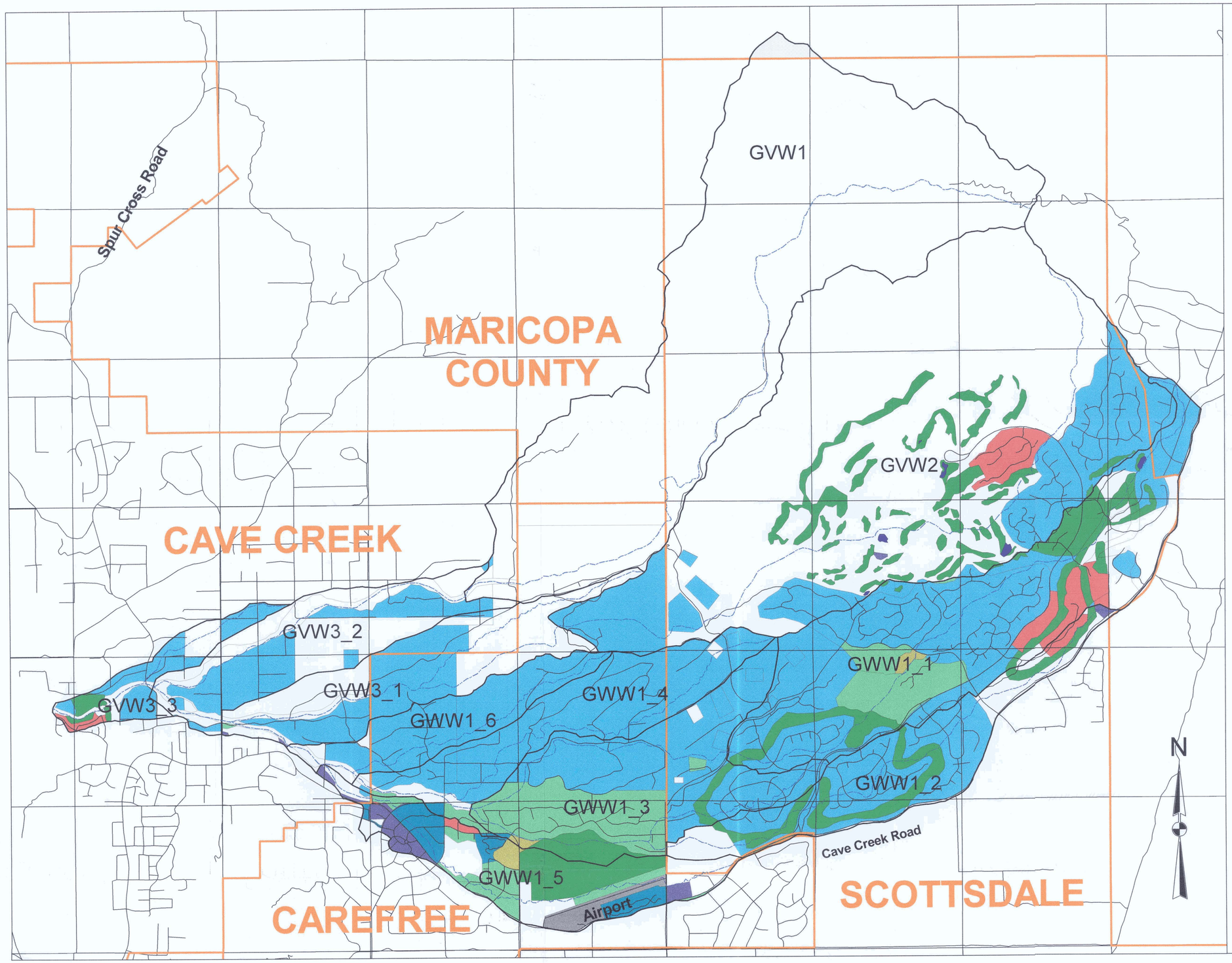
Brian R. Iserman

N

SCALE

2000 0 2000 4000 Feet

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.



FLOOD CONTOL DISTRICT
OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF
ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.2.2-6
LAND USE MAP
FOR GALLOWAY WASH

JANUARY, 2000

LEGEND

- Airport
- Dedicated or Non-developable Open Space
- Hotel, Motel or Resort
- Large Lot Residential (>1 and <=2 du/acre)
- Medium Density Residential (>5 and <=15 du/acre)
- Neighborhood Retail Center (<100,000 sq.ft.)
- Recreational Open Space
- Rural (1 dwelling unit per acre or less)
- Small Lot Residential (>2 and <=5 du/acre)
- Vacant
- Water
- Flow paths
- Streets
- Subbasins
- Jurisdictional Boundary

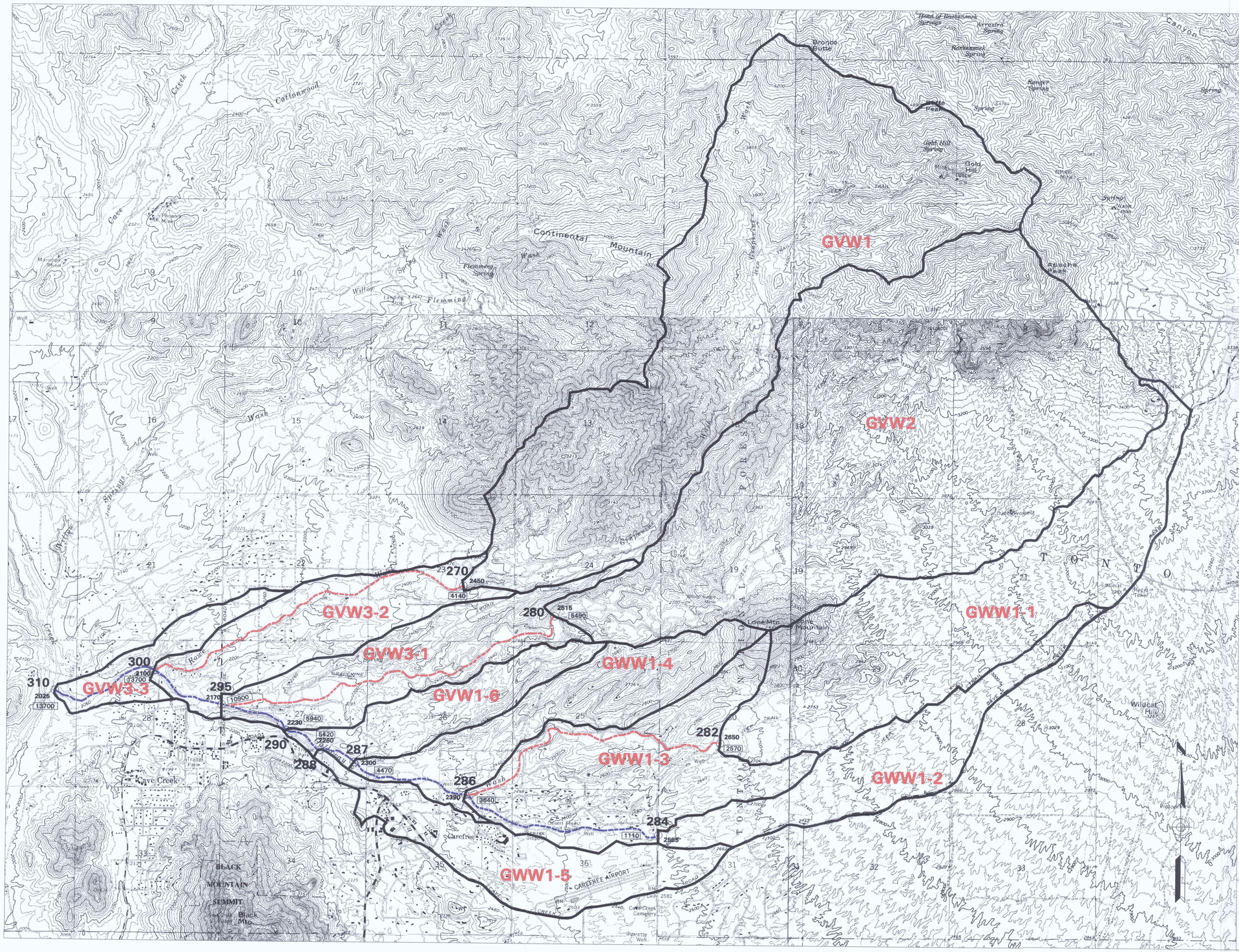
Source: Land use data modified
from MAG as provided digitally by FCDMC.

SCALE

2000 0 2000 4000 Feet

Registered Professional Engineer (Civil)
CERTIFICATE NO.
29325
BRIAN R.
ISERMAN
Date Signed 1-6-00

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14

FIGURE 4.5.1-1
COMPUTED 100-YEAR DISCHARGES

JANUARY, 2000

LEGEND

- SUBBASIN
- 4140 — COMPUTED 100-YEAR DISCHARGE (cfs)
- 286 / 2390 — CONCENTRATION POINT (CONCENTRATION POINT NUMBER) (ELEVATION)
- ROUTING REACH
- ROUTING REACH (FLOODPLAIN DELINEATION RESTUDY REACH)

Registered Professional Engineer (Civil) CERTIFICATE NO. 23325 BRIAN R. ISERMAN Date Signed 8-8-01 Arizona U.S.A.

Brian R. Iserman

SCALE IN FEET

2000 0 2000 4000

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC

APPENDIX D: HYDROLOGIC ANALYSIS SUPPORTING DOCUMENTATION

Includes:

D.1: Precipitation Data

D.2: Physical Parameter Calculations

D.3: Hydrograph Routing Data

D.4: Reservoir Routing Data

D.6: Hydrologic Calculations

Appendix D.1
Precipitation Data

*** O U T P U T D A T A ***

REVISED JUNE 1988 TO UPDATE COMPUTATION OF SHORT-DURATION VALUES

PRECIPITATION FREQUENCY VALUES FOR GALLOWAY WASH FDS, FCD NO. 99-14
PRIMARY ZONE NUMBER= 7
SHORT-DURATION ZONE NUMBER= 8

POINT VALUES

RETURN PERIOD

DURATION	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	
5-MIN	.37	.45	.51	.59	.66	.73	.88	5-MIN
10-MIN	.55	.68	.78	.91	1.01	1.11	1.35	10-MIN
15-MIN	.67	.85	.98	1.15	1.29	1.43	1.75	15-MIN
30-MIN	.89	1.14	1.31	1.56	1.75	1.94	2.37	30-MIN
1-HR	1.09	1.41	1.63	1.94	2.18	2.42	2.98	1-HR
2-HR	1.26	1.63	1.88	2.23	2.51	2.79	3.43	2-HR
3-HR	1.38	1.77	2.05	2.43	2.74	3.03	3.73	3-HR
6-HR	1.60	2.05	2.37	2.81	3.16	3.50	4.29	6-HR
12-HR	1.90	2.44	2.81	3.33	3.74	4.15	5.09	12-HR
24-HR	2.20	2.82	3.25	3.86	4.33	4.80	5.89	24-HR

* IF YOUR SITE IS IN ARIZONA OR NEW MEXICO, PLEASE CONSULT THE FOLLOWING PAPER FOR REVISED DEPTH-AREA VALUES:
  DEPTH-AREA RATIOS IN THE SEMI-ARID SOUTHWEST UNITED STATES
  NOAA TECHNICAL MEMORANDUM NWS HYDRO-40
  ZEHR AND MYERS
  AUGUST 1984

INPUT DATA

PROJECT NAME=GALLOWAY WASH FDS, FCD NO. 99-14
ZONE= 7 SHORT-DURATION ZONE= 8
LATITUDE= .00 LONGITUDE= 100.00 ELEVATION= 0
2-YR, 6-HR PCPN= 1.60 100-YR, 6-HR PCPN= 3.50
2-YR, 24-HR PCPN= 2.20 100-YR, 24-HR PCPN= 4.80

* * * * E N D O F R U N * * * *

Appendix D.2
Physical Parameter Calculations

Table D.2.1 Soils Data

BK_NM	SLTYP_	RO	SLTYP_DFN	XKSAT_	DRNBSN_UL	AREA	Area
		(%)		(in/hr)		(sq. ft)	(sq. mi.)
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GVW1	1792022	0.064
Aguila-Carefree Area,	8	0	Arizo cobbly sandy loam	0.96	GVW1	3275780	0.118
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW1	635620	0.023
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW1	331650	0.012
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW1	379147	0.014
Total	26					1346417	0.048
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GVW1	18714	0.001
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW1	3353672	0.120
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW1	2894399	0.104
Total	34					6248070	0.224
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW1	3041434	0.109
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GVW1	90232441	3.237
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GVW1	695591	0.025
Total	72					90928031	3.262
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW1	242306	0.009
Aguila-Carefree Area,	104	60	Rock outcrop-Lehmans complex, 15 to 65 perce	0.14	GVW1	28274956	1.014
USFS, Tonto National	303	15	Sandy Loam	0.40	GVW1	1535860	0.055
					Basin Total Area	136703591	4.904
Aguila-Carefree Area,	8	0	Arizo cobbly sandy loam	0.96	GVW2	6049992	0.217
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW2	3804	0.000
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW2	458436	0.016
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	6871847	0.246
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	4639471	0.166
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	2425598	0.087
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	1441246	0.052
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	2167326	0.078
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	233990	0.008
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW2	2792255	0.100
Total	41					20571732	0.738
Aguila-Carefree Area,	61	0	Gran-Wickenburg complex, 1 to 10 percent slop	0.15	GVW2	1324160	0.047
Aguila-Carefree Area,	63	25	Gran-Wickenburg-Rock outcrop complex, 1 to 7	0.14	GVW2	70209535	2.518
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GVW2	54900994	1.969
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GVW2	2241712	0.080
Total	72					57142705	2.050

Table D.2.1 Soils Data

BK_NM	SLTYP_	RO	SLTYP_DFN	XKSAT_	DRNBSN_UL	AREA	Area
		(%)		(in/hr)		(sq. ft)	(sq. mi.)
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW2	3619563	0.130
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW2	640814	0.023
Total	93					4260377	0.153
Aguila-Carefree Area,	104	60	Rock outcrop-Lehmans complex, 15 to 65 perce	0.14	GVW2	12099	0.000
Aguila-Carefree Area,	104	60	Rock outcrop-Lehmans complex, 15 to 65 perce	0.14	GVW2	2241095	0.080
Total	104					2253194	0.081
USFS, Tonto National	301	0	Sandy Loam	0.40	GVW2	5595559	0.201
USFS, Tonto National	303	15	Sandy Loam	0.40	GVW2	48756	0.002
					Basin Total Area	167918251	6.023
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GVW3_1	3155036	0.113
Aguila-Carefree Area,	8	0	Arizo cobbly sandy loam	0.96	GVW3_1	1503529	0.054
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_1	5092	0.000
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_1	1924997	0.069
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_1	6	0.000
Total	26					1930094	0.069
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GVW3_1	478051	0.017
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW3_1	10316267	0.370
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW3_1	4043885	0.145
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW3_1	707479	0.025
Total	34					15067630	0.540
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW3_1	482518	0.017
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW3_1	2857028	0.102
Total	41					3339546	0.120
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_1	174860	0.006
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_1	1684550	0.060
Total	93					1859410	0.067
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_1	130603	0.005
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_1	1092533	0.039
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_1	5258	0.000
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_1	31145	0.001
Total	96					1259538	0.045
Aguila-Carefree Area,	121	0	Tres Hermanos-Anthony complex, 1 to 5 percen	0.12	GVW3_1	485805	0.017
					Basin Total Area	29078640	1.043

Table D.2.1 Soils Data

BK_NM	SLTYP_	RO	SLTYP_DFN	XKSAT_	DRNBSN_UL	AREA	Area
		(%)		(in/hr)		(sq. ft)	(sq. mi.)
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GVW3_2	1212860	0.044
Aguila-Carefree Area,	8	0	Arizo cobbly sandy loam	0.96	GVW3_2	6024837	0.216
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_2	3631126	0.130
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_2	338020	0.012
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_2	473341	0.017
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_2	35040	0.001
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_2	113375	0.004
Total	26					4590901	0.165
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GVW3_2	2068611	0.074
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW3_2	11648370	0.418
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW3_2	316658	0.011
Total	34					11965028	0.429
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GVW3_2	1735	0.000
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_2	1206358	0.043
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_2	13595	0.000
Total	93					1219953	0.044
					Basin Total Area	27083926	0.972
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GVW3_3	17460	0.001
Aguila-Carefree Area,	8	0	Arizo cobbly sandy loam	0.96	GVW3_3	851242	0.031
Aguila-Carefree Area,	8	0	Arizo cobbly sandy loam	0.96	GVW3_3	68	0.000
Total	8					851310	0.031
Aguila-Carefree Area,	12	0	Carefree cobbly clay loam, 1 to 8 percent slopes	0.01	GVW3_3	602494	0.022
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_3	335002	0.012
Aguila-Carefree Area,	26	0	Continental cobbly clay loam, 1 to 8 percent slop	0.01	GVW3_3	479940	0.017
Total	26					814942	0.029
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GVW3_3	4761108	0.171
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GVW3_3	210897	0.008
Total	33					4972005	0.178
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GVW3_3	541229	0.019
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GVW3_3	130323	0.005
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GVW3_3	314273	0.011
Total	72					444596	0.016

Table D.2.1 Soils Data

BK_NM	SLTYP_	RO	SLTYP_DFN	XKSAT_	DRNBSN_UL	AREA	Area
		(%)		(in/hr)		(sq. ft)	(sq. mi.)
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_3	328638	0.012
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_3	377558	0.014
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GVW3_3	110775	0.004
Total	93					816970	0.029
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_3	52188	0.002
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_3	131542	0.005
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GVW3_3	260189	0.009
Total	96					443919	0.016
					Basin Total Area	9504925	0.341
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW1_1	8837149	0.317
Aguila-Carefree Area,	24	0	continental clay loam, 0 to 3 percent slopes	0.02	GWW1_1	268092	0.010
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_1	3763040	0.135
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_1	2810298	0.101
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_1	2291724	0.082
Total	40					5102022	0.183
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GWW1_1	2833801	0.102
Aguila-Carefree Area,	61	0	Gran-Wickenburg complex, 1 to 10 percent slop	0.15	GWW1_1	2301404	0.083
Aguila-Carefree Area,	63	25	Gran-Wickenburg-Rock outcrop complex, 1 to 7	0.14	GWW1_1	31986913	1.147
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GWW1_1	2686145	0.096
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_1	190252	0.007
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_1	493049	0.018
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_1	1697778	0.061
Total	96					2190827	0.079
USFS, Tonto National	301	0	Sandy Loam	0.40	GWW1_1	10952578	0.393
					Basin Total Area	71112224	2.551
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW1_2	1677688	0.060
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_2	21788404	0.782
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW1_2	381883	0.014
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_2	300476	0.011
Aguila-Carefree Area,	63	25	Gran-Wickenburg-Rock outcrop complex, 1 to 7	0.14	GWW1_2	2107092	0.076
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_2	207505	0.007
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_2	642504	0.023
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_2	1152798	0.041
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_2	770540	0.028

Table D.2.1 Soils Data

BK_NM	SLTYP_	RO	SLTYP_DFN	XKSAT_	DRNBSN_UL	AREA	Area
		(%)		(in/hr)		(sq. ft)	(sq. mi.)
Total	96					2565841	0.092
USFS, Tonto National	301	0	Sandy Loam	0.40	GWW1_2	56923	0.002
					Basin Total Area	29085812	1.043
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW1_3	1903146	0.068
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW1_3	1788943	0.064
Total	6					3692089	0.132
Aguila-Carefree Area,	24	0	continental clay loam, 0 to 3 percent slopes	0.02	GWW1_3	413839	0.015
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_3	2371930	0.085
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW1_3	2573982	0.092
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW1_3	634127	0.023
Total	34					3208109	0.115
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_3	3147887	0.113
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_3	7880278	0.283
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_3	1740375	0.062
Total	40					12768540	0.458
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GWW1_3	4625648	0.166
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GWW1_3	4770478	0.171
Total	41					9396126	0.337
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GWW1_3	517423	0.019
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_3	2410132	0.086
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_3	2125214	0.076
Total	93					4535346	0.163
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_3	313930	0.011
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_3	670151	0.024
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_3	1207647	0.043
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_3	2487434	0.089
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_3	749501	0.027
Total	96					5428662	0.195
					Basin Total Area	42332065	1.518

Table D.2.1 Soils Data

BK_NM	SLTYP_	RO	SLTYP_DFN	XKSAT_	DRNBSN_UL	AREA	Area
		(%)		(in/hr)		(sq. ft)	(sq. mi.)
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW1_4	1095853	0.039
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_4	950734	0.034
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_4	2343404	0.084
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GWW1_4	16115109	0.578
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GWW1_4	34080	0.001
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_4	1775179	0.064
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_4	282443	0.010
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_4	271762	0.010
Total	93					2329385	0.084
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_4	3628729	0.130
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_4	188703	0.007
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_4	1224340	0.044
Total	96					5041772	0.181
Aguila-Carefree Area,	121	0	Tres Hermanos-Anthony complex, 1 to 5 percen	0.12	GWW1_4	66527	0.002
					Basin Total Area	27976863	1.004
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW1_5	400209	0.014
Aguila-Carefree Area,	28	0	Continental-Ohaco complex	0.02	GWW1_5	265163	0.010
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_5	4480490	0.161
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_5	216019	0.008
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_5	521963	0.019
Total	33					5218472	0.187
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW1_5	1770053	0.063
Aguila-Carefree Area,	40	0	Eba-Pinaleno complex, 3 to 20 percent slopes	0.17	GWW1_5	1228426	0.044
Aguila-Carefree Area,	72	30	Lehmans-Rock outcrop complex, 8 to 65 percen	0.09	GWW1_5	134174	0.005
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_5	5360280	0.192
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_5	534413	0.019
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_5	253923	0.009
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_5	12239379	0.439
Total	96					13027716	0.467
					Basin Total Area	27404493	0.983

Table D.2.1 Soils Data

BK_NM	SLTYP_	RO	SLTYP_DFN	XKSAT_	DRNBSN_UL	AREA	Area
		(%)		(in/hr)		(sq. ft)	(sq. mi.)
Aguila-Carefree Area,	6	0	Anthony-Arizo complex	0.62	GWW1_6	532234	0.019
Aguila-Carefree Area,	33	0	Eba very gravelly loam, 1 to 8 percent slopes	0.23	GWW1_6	940818	0.034
Aguila-Carefree Area,	34	0	Eba very gravelly loam, 8 to 20 percent slopes	0.23	GWW1_6	8537647	0.306
Aguila-Carefree Area,	41	0	Eba-Pinaleno complex, 20 to 40 percent slopes	0.17	GWW1_6	4867931	0.175
Aguila-Carefree Area,	93	0	Nickel-Cave complex, 8 to 30 percent slopes	0.33	GWW1_6	191531	0.007
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_6	447400	0.016
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_6	216713	0.008
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_6	468074	0.017
Aguila-Carefree Area,	96	0	Pinaleno-Tres Hermanos complex, 1 to 10 perce	0.07	GWW1_6	105162	0.004
Total	96					1237349	0.044
Aguila-Carefree Area,	121	0	Tres Hermanos-Anthony complex, 1 to 5 percen	0.12	GWW1_6	213760	0.008
					Basin Total Area	16521268	0.593
					Galloway Wash Total Basin Area	584740772	20.975

Table D.S.2 Land Use Data

LDUSE_DFN	Area (sq. ft.)	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Dedicated or Non-developable Open Space	1341475	GVW1	0.048	
Rural (1 dwelling unit per acre or less)	47020	GVW1	0.002	
Vacant	135315096	GVW1	4.854	
Total (square feet)	136703591		4.904	
Total (square miles)	5			GVW1
Rural (1 dwelling unit per acre or less)	15001271	GWW1_6	0.538	
Vacant	**220480**	**GWW1_6**	**0.008**	
Vacant	**264851**	**GWW1_6**	**0.010**	
Vacant	**388618**	**GWW1_6**	**0.014**	
Vacant	**646048**	**GWW1_6**	**0.023**	**0.055**
Total (square feet)	16521268		0.593	
Total (square miles)	1			GVW1_6
Neighborhood Retail Center (<100,000 sq.ft.)	88806	GVW2	0.003	
Recreational Open Space	**19**	**GVW2**	**0.000**	
Recreational Open Space	**14003**	**GVW2**	**0.001**	
Recreational Open Space	**31621**	**GVW2**	**0.001**	
Recreational Open Space	**34247**	**GVW2**	**0.001**	
Recreational Open Space	**37149**	**GVW2**	**0.001**	
Recreational Open Space	**42884**	**GVW2**	**0.002**	
Recreational Open Space	**57812**	**GVW2**	**0.002**	
Recreational Open Space	**60521**	**GVW2**	**0.002**	
Recreational Open Space	**63343**	**GVW2**	**0.002**	
Recreational Open Space	**65537**	**GVW2**	**0.002**	
Recreational Open Space	**66209**	**GVW2**	**0.002**	
Recreational Open Space	**68210**	**GVW2**	**0.002**	
Recreational Open Space	**81225**	**GVW2**	**0.003**	
Recreational Open Space	**81608**	**GVW2**	**0.003**	
Recreational Open Space	**85824**	**GVW2**	**0.003**	
Recreational Open Space	**91110**	**GVW2**	**0.003**	
Recreational Open Space	**106624**	**GVW2**	**0.004**	
Recreational Open Space	**111555**	**GVW2**	**0.004**	
Recreational Open Space	**113372**	**GVW2**	**0.004**	
Recreational Open Space	**113526**	**GVW2**	**0.004**	
Recreational Open Space	**116046**	**GVW2**	**0.004**	
Recreational Open Space	**145494**	**GVW2**	**0.005**	
Recreational Open Space	**153453**	**GVW2**	**0.006**	
Recreational Open Space	**153521**	**GVW2**	**0.006**	
Recreational Open Space	**157016**	**GVW2**	**0.006**	
Recreational Open Space	**162629**	**GVW2**	**0.006**	
Recreational Open Space	**188139**	**GVW2**	**0.007**	
Recreational Open Space	**213727**	**GVW2**	**0.008**	
Recreational Open Space	**217255**	**GVW2**	**0.008**	
Recreational Open Space	**225502**	**GVW2**	**0.008**	
Recreational Open Space	**230023**	**GVW2**	**0.008**	
Recreational Open Space	**246045**	**GVW2**	**0.009**	
Recreational Open Space	**265459**	**GVW2**	**0.010**	
Recreational Open Space	**269783**	**GVW2**	**0.010**	
Recreational Open Space	**271406**	**GVW2**	**0.010**	
Recreational Open Space	**315032**	**GVW2**	**0.011**	
Recreational Open Space	**336707**	**GVW2**	**0.012**	
Recreational Open Space	**339067**	**GVW2**	**0.012**	
Recreational Open Space	**347411**	**GVW2**	**0.012**	
Recreational Open Space	**378117**	**GVW2**	**0.014**	
Recreational Open Space	**484019**	**GVW2**	**0.017**	
Recreational Open Space	**547826**	**GVW2**	**0.020**	
Recreational Open Space	**817234**	**GVW2**	**0.029**	

Table D.S.2 Land Use Data				
LDUSE_DFN	Area (sq. ft.)	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Recreational Open Space	**1156461**	**GVW2**	**0.041**	
Recreational Open Space	**3545348**	**GVW2**	**0.127**	**0.452**
Rural (1 dwelling unit per acre or less)	**216792**	**GVW2**	**0.008**	
Rural (1 dwelling unit per acre or less)	**683438**	**GVW2**	**0.025**	
Rural (1 dwelling unit per acre or less)	**1207137**	**GVW2**	**0.043**	
Rural (1 dwelling unit per acre or less)	**12345258**	**GVW2**	**0.443**	
Rural (1 dwelling unit per acre or less)	**18043521**	**GVW2**	**0.647**	**1.166**
Small Lot Residential (>2 and <=5 du/acre)	3364665	GVW2	0.121	
Vacant	**141**	**GVW2**	**0.000**	
Vacant	**119059483**	**GVW2**	**4.271**	**4.271**
Water	**7646**	**GVW2**	**0.000**	
Water	**20448**	**GVW2**	**0.001**	
Water	**74903**	**GVW2**	**0.003**	
Water	**79536**	**GVW2**	**0.003**	
Water	**117295**	**GVW2**	**0.004**	**0.011**
Total (square feet)	167918191		6.023	
Total (square miles)	6			GVW2
Large Lot Residential (>1 and <=2 du/acre)	**10965**	**GVW3_1**	**0.000**	
Large Lot Residential (>1 and <=2 du/acre)	**73563**	**GVW3_1**	**0.003**	**0.003**
Neighborhood Retail Center (<100,000 sq.ft.)	**26542**	**GVW3_1**	**0.001**	
Neighborhood Retail Center (<100,000 sq.ft.)	**31036**	**GVW3_1**	**0.001**	**0.002**
Rural (1 dwelling unit per acre or less)	**237366**	**GVW3_1**	**0.009**	
Rural (1 dwelling unit per acre or less)	**11872340**	**GVW3_1**	**0.426**	**0.434**
Vacant	16826393	GVW3_1	0.604	
Total (square feet)	29078206		1.043	
Total (square miles)	1			GVW3_1
Rural (1 dwelling unit per acre or less)	**4857**	**GVW3_2**	**0.000**	
Rural (1 dwelling unit per acre or less)	**8099**	**GVW3_2**	**0.000**	
Rural (1 dwelling unit per acre or less)	**12621**	**GVW3_2**	**0.000**	
Rural (1 dwelling unit per acre or less)	**54246**	**GVW3_2**	**0.002**	
Rural (1 dwelling unit per acre or less)	**64684**	**GVW3_2**	**0.002**	
Rural (1 dwelling unit per acre or less)	**174954**	**GVW3_2**	**0.006**	
Rural (1 dwelling unit per acre or less)	**288805**	**GVW3_2**	**0.010**	
Rural (1 dwelling unit per acre or less)	**337509**	**GVW3_2**	**0.012**	
Rural (1 dwelling unit per acre or less)	**3671713**	**GVW3_2**	**0.132**	
Rural (1 dwelling unit per acre or less)	**6567229**	**GVW3_2**	**0.236**	**0.401**
Vacant	**78640**	**GVW3_2**	**0.003**	
Vacant	**15820503**	**GVW3_2**	**0.567**	**0.570**
Total (square feet)	27083859		0.971	
Total (square miles)	1			GVW3_2
Recreational Open Space	**111432**	**GVW3_3**	**0.004**	
Recreational Open Space	**162403**	**GVW3_3**	**0.006**	
Recreational Open Space	**637201**	**GVW3_3**	**0.023**	**0.033**
Rural (1 dwelling unit per acre or less)	**239325**	**GVW3_3**	**0.009**	
Rural (1 dwelling unit per acre or less)	**1293513**	**GVW3_3**	**0.046**	
Rural (1 dwelling unit per acre or less)	**1373837**	**GVW3_3**	**0.049**	
Rural (1 dwelling unit per acre or less)	**2565716**	**GVW3_3**	**0.092**	**0.196**
Small Lot Residential (>2 and <=5 du/acre)	502105	GVW3_3	0.018	
Vacant	2619393	GVW3_3	0.094	
Total (square feet)	9504924		0.341	
Total (square miles)	0			GVW3_3
Dedicated or Non-developable Open Space	**123492**	**GWW1_1**	**0.004**	
Dedicated or Non-developable Open Space	**177515**	**GWW1_1**	**0.006**	**0.011**
Hotel, Motel or Resort	414438	GWW1_1	0.015	
Large Lot Residential (>1 and <=2 du/acre)	**12**	**GWW1_1**	**0.000**	
Large Lot Residential (>1 and <=2 du/acre)	**6638**	**GWW1_1**	**0.000**	

Table D.S.2 Land Use Data

LDUSE_DFN	Area (sq. ft.)	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Large Lot Residential (>1 and <=2 du/acre)	**72779**	**GWW1_1**	**0.003**	
Large Lot Residential (>1 and <=2 du/acre)	**7765932**	**GWW1_1**	**0.279**	**0.281**
Recreational Open Space	**28941**	**GWW1_1**	**0.001**	
Recreational Open Space	**29622**	**GWW1_1**	**0.001**	
Recreational Open Space	**39003**	**GWW1_1**	**0.001**	
Recreational Open Space	**73908**	**GWW1_1**	**0.003**	
Recreational Open Space	**76596**	**GWW1_1**	**0.003**	
Recreational Open Space	**404266**	**GWW1_1**	**0.015**	
Recreational Open Space	**2969063**	**GWW1_1**	**0.107**	
Recreational Open Space	**6384582**	**GWW1_1**	**0.229**	**0.359**
Rural (1 dwelling unit per acre or less)	**0**	**GWW1_1**	**0.000**	
Rural (1 dwelling unit per acre or less)	**0**	**GWW1_1**	**0.000**	
Rural (1 dwelling unit per acre or less)	**1**	**GWW1_1**	**0.000**	
Rural (1 dwelling unit per acre or less)	**7**	**GWW1_1**	**0.000**	
Rural (1 dwelling unit per acre or less)	**9**	**GWW1_1**	**0.000**	
Rural (1 dwelling unit per acre or less)	**21008**	**GWW1_1**	**0.001**	
Rural (1 dwelling unit per acre or less)	**648373**	**GWW1_1**	**0.023**	
Rural (1 dwelling unit per acre or less)	**4827134**	**GWW1_1**	**0.173**	
Rural (1 dwelling unit per acre or less)	**5036987**	**GWW1_1**	**0.181**	
Rural (1 dwelling unit per acre or less)	**31529070**	**GWW1_1**	**1.131**	**1.509**
Small Lot Residential (>2 and <=5 du/acre)	**903266**	**GWW1_1**	**0.032**	
Small Lot Residential (>2 and <=5 du/acre)	**1127022**	**GWW1_1**	**0.040**	
Small Lot Residential (>2 and <=5 du/acre)	**1414377**	**GWW1_1**	**0.051**	**0.124**
Vacant	**301757**	**GWW1_1**	**0.011**	
Vacant	**320102**	**GWW1_1**	**0.011**	
Vacant	**714388**	**GWW1_1**	**0.026**	
Vacant	**5626242**	**GWW1_1**	**0.202**	**0.250**
Water	75693	GWW1_1	0.003	
Total (square feet)	71112224		2.551	
Total (square miles)	3			GWW1_1
Dedicated or Non-developable Open Space	184045	GWW1_2	0.007	
Large Lot Residential (>1 and <=2 du/acre)	205309	GWW1_2	0.007	
Neighborhood Retail Center (<100,000 sq.ft.)	187831	GWW1_2	0.007	
Recreational Open Space	**5**	**GWW1_2**	**0.000**	
Recreational Open Space	**1163049**	**GWW1_2**	**0.042**	
Recreational Open Space	**4827823**	**GWW1_2**	**0.173**	**0.215**
Rural (1 dwelling unit per acre or less)	**1**	**GWW1_2**	**0.000**	
Rural (1 dwelling unit per acre or less)	**57**	**GWW1_2**	**0.000**	
Rural (1 dwelling unit per acre or less)	**6631070**	**GWW1_2**	**0.238**	
Rural (1 dwelling unit per acre or less)	**9775796**	**GWW1_2**	**0.351**	**0.589**
Small Lot Residential (>2 and <=5 du/acre)	695912	GWW1_2	0.025	
Vacant	**59**	**GWW1_2**	**0.000**	
Vacant	**247**	**GWW1_2**	**0.000**	
Vacant	**21369**	**GWW1_2**	**0.001**	
Vacant	**28410**	**GWW1_2**	**0.001**	
Vacant	**101624**	**GWW1_2**	**0.004**	
Vacant	**182522**	**GWW1_2**	**0.007**	
Vacant	**271986**	**GWW1_2**	**0.010**	
Vacant	**2260369**	**GWW1_2**	**0.081**	
Vacant	**2546429**	**GWW1_2**	**0.091**	**0.194**
Total (square feet)	29083915		1.043	
Total (square miles)	1			GWW1_2
Hotel, Motel or Resort	251812	GWW1_3	0.009	
Large Lot Residential (>1 and <=2 du/acre)	**251666**	**GWW1_3**	**0.009**	
Large Lot Residential (>1 and <=2 du/acre)	**12334432**	**GWW1_3**	**0.442**	**0.451**
Medium Density Residential (>5 and <=15 du/acre)	68763	GWW1_3	0.002	

Table D.S.2 Land Use Data

LDUSE_DFN	Area (sq. ft.)	DRNBSN_UL	Area (sq. mi.)	Cumulative Area (sq.mi.)
Recreational Open Space	**903892**	**GWW1_3**	**0.032**	
Recreational Open Space	**2617881**	**GWW1_3**	**0.094**	**0.126**
Rural (1 dwelling unit per acre or less)	**5061118**	**GWW1_3**	**0.182**	
Rural (1 dwelling unit per acre or less)	**20548021**	**GWW1_3**	**0.737**	**0.919**
Vacant	**67450**	**GWW1_3**	**0.002**	
Vacant	**227031**	**GWW1_3**	**0.008**	**0.011**
Total (square feet)	42332065		1.518	
Total (square miles)	2			GWW1_3
Large Lot Residential (>1 and <=2 du/acre)	**120762**	**GWW1_4**	**0.004**	
Large Lot Residential (>1 and <=2 du/acre)	**592483**	**GWW1_4**	**0.021**	**0.026**
Medium Density Residential (>5 and <=15 du/acre)	**56166**	**GWW1_4**	**0.002**	
Medium Density Residential (>5 and <=15 du/acre)	**246894**	**GWW1_4**	**0.009**	**0.011**
Rural (1 dwelling unit per acre or less)	**0**	**GWW1_4**	**0.000**	
Rural (1 dwelling unit per acre or less)	**62184**	**GWW1_4**	**0.002**	
Rural (1 dwelling unit per acre or less)	**25176154**	**GWW1_4**	**0.903**	**0.905**
Vacant	**1**	**GWW1_4**	**0.000**	
Vacant	**210288**	**GWW1_4**	**0.008**	
Vacant	**1511933**	**GWW1_4**	**0.054**	**0.062**
Total (square feet)	27976864		1.004	
Total (square miles)	1			GWW1_4
Airport	2233333	GWW1_5	0.080	
Hotel, Motel or Resort	717585	GWW1_5	0.026	
Large Lot Residential (>1 and <=2 du/acre)	**3735**	**GWW1_5**	**0.000**	
Large Lot Residential (>1 and <=2 du/acre)	**176897**	**GWW1_5**	**0.006**	
Large Lot Residential (>1 and <=2 du/acre)	**366999**	**GWW1_5**	**0.013**	
Large Lot Residential (>1 and <=2 du/acre)	**469701**	**GWW1_5**	**0.017**	
Large Lot Residential (>1 and <=2 du/acre)	**1033898**	**GWW1_5**	**0.037**	
Large Lot Residential (>1 and <=2 du/acre)	**2645161**	**GWW1_5**	**0.095**	**0.168**
Medium Density Residential (>5 and <=15 du/acre)	**168177**	**GWW1_5**	**0.006**	
Medium Density Residential (>5 and <=15 du/acre)	**698470**	**GWW1_5**	**0.025**	
Medium Density Residential (>5 and <=15 du/acre)	**1476061**	**GWW1_5**	**0.053**	
Medium Density Residential (>5 and <=15 du/acre)	**2183540**	**GWW1_5**	**0.078**	**0.162**
Neighborhood Retail Center (<100,000 sq.ft.)	**125175**	**GWW1_5**	**0.004**	
Neighborhood Retail Center (<100,000 sq.ft.)	**174832**	**GWW1_5**	**0.006**	
Neighborhood Retail Center (<100,000 sq.ft.)	**507953**	**GWW1_5**	**0.018**	
Neighborhood Retail Center (<100,000 sq.ft.)	**1698829**	**GWW1_5**	**0.061**	**0.090**
Recreational Open Space	5688704	GWW1_5	0.204	
Rural (1 dwelling unit per acre or less)	63854	GWW1_5	0.002	
Small Lot Residential (>2 and <=5 du/acre)	**27964**	**GWW1_5**	**0.001**	
Small Lot Residential (>2 and <=5 du/acre)	**357534**	**GWW1_5**	**0.013**	**0.014**
Vacant	**12008**	**GWW1_5**	**0.000**	
Vacant	**58258**	**GWW1_5**	**0.002**	
Vacant	**87765**	**GWW1_5**	**0.003**	
Vacant	**324280**	**GWW1_5**	**0.012**	
Vacant	**629655**	**GWW1_5**	**0.023**	
Vacant	**1547423**	**GWW1_5**	**0.056**	
Vacant	**1639239**	**GWW1_5**	**0.059**	
Vacant	**2284887**	**GWW1_5**	**0.082**	**0.236**
Total (square feet)	27401917		0.983	
Total (square miles)	1			GWW1_5

LOSS PARAMETERS FOR SUBBASIN: GVW1

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.064	1.3	0.62	0
A_8	0.118	2.4	0.96	0
A_26	0.048	1.0	0.01	0
A_33	0.001	0.0	0.23	0
A_34	0.224	4.6	0.23	0
A_41	0.109	2.2	0.17	0
A_72	3.262	66.5	0.09	30
A_93	0.009	0.2	0.33	0
A_104	1.014	20.7	0.14	60
T_303	0.055	1.1	0.40	15

TOTAL = 4.904 Sq.Miles XKSAT = 0.11 %Rock = 33

DTHETA

Dry = 0.36 PSIF = 6.80
Normal = 0.17
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
0.048	DedOpSpc	1.0	NORMAL	35	0	0.20	0.05	Hi	0.11
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.002	Rural	0.0	NORMAL	30	0	0.20	0.04	Low	0.08
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
4.854	Vacant	99.0	NORMAL	30	0	0.20	0.05	Hi	0.06
	Water		NORMAL	0	10	0.00	0.00	Min	

4.904 = Total Area Avg. = 30 0% 0.200

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.17

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.13

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 50 % effective = 33

% EFFECTIVE IMP. = 17

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW1	4.904	6.19	3.56	0.05	298.9	0.20	0.17	6.80	0.13	17	71

LOSS PARAMETERS FOR SUBBASIN: GVW2

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_8	0.217	3.6	0.96	0
A_26	0.000	0.0	0.01	0
A_34	0.016	0.3	0.23	0
A_41	0.738	12.2	0.17	0
A_61	0.047	0.8	0.15	0
A_63	2.518	41.8	0.14	25
A_72	2.050	34.0	0.09	30
A_93	0.153	2.5	0.33	0
A_104	0.081	1.3	0.14	60
T_301	0.201	3.3	0.40	0
T_303	0.002	0.0	0.40	15

TOTAL = 6.023 Sq.Miles XKSAT = 0.14 %Rock = 21

DTHETA

Dry = 0.39 PSIF = 6.20
Normal = 0.23
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
0.003	NRC	0.0	NORMAL	10	80	0.07	0.02	Min	0.04
0.452	RecOpSc	7.5	NORMAL	75	0	0.20	0.03	Low	0.05
	Resort		NORMAL	32	60	0.11	0.03	Low	
1.166	Rural	19.4	NORMAL	30	0	0.20	0.04	Low	0.04
0.121	SmLotRes	2.0	NORMAL	30	25	0.15	0.04	Low	0.05
4.270	Vacant	70.9	NORMAL	30	0	0.20	0.05	Hi	0.06
0.011	Water	0.2	NORMAL	0	10	0.00	0.00	Min	0.03

6.023 = Total Area Avg. = 33 1% 0.200

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.23

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.18

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 50 % effective = 21

% EFFECTIVE IMP. = 12

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW2	6.023	5.51	2.77	0.04	371.1	0.20	0.23	6.20	0.18	12	57

LOSS PARAMETERS FOR SUBBASIN: GVW3_1

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.113	10.8	0.62	0
A_8	0.054	5.2	0.96	0
A_26	0.069	6.6	0.01	0
A_33	0.017	1.6	0.23	0
A_34	0.541	51.9	0.23	0
A_41	0.120	11.5	0.17	0
A_93	0.067	6.4	0.33	0
A_96	0.045	4.3	0.07	0
A_121	0.017	1.6	0.12	0

TOTAL = 1.043 Sq.Miles XKSAT = 0.21 %Rock = 0

DTHETA

Dry = 0.37 PSIF = 5.20
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.003	LgLotRes	0.3	NORMAL	35	15	0.18	0.04	Low	0.08
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
0.002	NRC	0.2	NORMAL	10	80	0.07	0.02	Min	0.04
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.434	Rural	41.6	NORMAL	30	0	0.20	0.04	Low	0.05
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.604	Vacant	57.9	NORMAL	30	0	0.20	0.05	Hi	0.09
	Water		NORMAL	0	10	0.00	0.00	Min	
1.043 = Total Area			Avg. =	30	0%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.26

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW3_1	1.043	3.31	1.51	0.04	184.3	0.20	0.25	5.20	0.26	0	42

LOSS PARAMETERS FOR SUBBASIN: GVW3_2

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.044	4.5	0.62	0
A_8	0.216	22.2	0.96	0
A_26	0.165	17.0	0.01	0
A_33	0.074	7.6	0.23	0
A_34	0.429	44.1	0.23	0
A_41	0.000	0.0	0.17	0
A_93	0.044	4.5	0.33	0

TOTAL = 0.972 Sq.Miles XKSAT = 0.20 %Rock = 0

DTHETA

Dry = 0.37 PSIF = 5.30
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.401	Rural	41.3	NORMAL	30	0	0.20	0.04	Low	0.05
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.571	Vacant	58.7	NORMAL	30	0	0.20	0.05	Hi	0.09
	Water		NORMAL	0	10	0.00	0.00	Min	
0.972 = Total Area			Avg. =	30	0%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.24

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW3_2	0.972	2.42	1.26	0.04	144.6	0.20	0.25	5.30	0.24	0	37

LOSS PARAMETERS FOR SUBBASIN: GVW3_3

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.001	0.3	0.62	0
A_8	0.031	9.1	0.96	0
A_12	0.022	6.5	0.01	0
A_26	0.029	8.5	0.01	0
A_33	0.178	52.2	0.23	0
A_34	0.019	5.6	0.23	0
A_72	0.016	4.7	0.09	30
A_93	0.029	8.5	0.33	0
A_96	0.016	4.7	0.07	0

TOTAL = 0.341 Sq.Miles XKSAT = 0.15 %Rock = 1

DTHETA

Dry = 0.40 PSIF = 6.00
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.033	RecOpSc	9.7	NORMAL	75	0	0.20	0.03	Low	0.06
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.196	Rural	57.5	NORMAL	30	0	0.20	0.04	Low	0.05
0.018	SmLotRes	5.3	NORMAL	30	25	0.15	0.04	Low	0.07
0.094	Vacant	27.6	NORMAL	30	0	0.20	0.05	Hi	0.11
	Water		NORMAL	0	10	0.00	0.00	Min	

0.341 = Total Area Avg. = 34 1% 0.200

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.19

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 50 % effective = 1
% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW3_3	0.341	1.88	0.95	0.04	135.6	0.20	0.25	6.00	0.19	2	28

LOSS PARAMETERS FOR SUBBASIN: GWW1_1

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.317	12.4	0.62	0
A_24	0.010	0.4	0.02	0
A_33	0.135	5.3	0.23	0
A_40	0.183	7.2	0.17	0
A_41	0.102	4.0	0.17	0
A_61	0.083	3.3	0.15	0
A_63	1.146	44.9	0.14	25
A_72	0.096	3.8	0.09	30
A_93	0.007	0.3	0.33	0
A_96	0.079	3.1	0.07	0
T_301	0.393	15.4	0.40	0

TOTAL = 4.904 Sq.Miles XKSAT = 0.11 %Rock = 33

DTHETA

Dry = 0.36 PSIF = 6.80
Normal = 0.17
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
0.011	DedOpSpc	0.4	NORMAL	35	0	0.20	0.05	Hi	0.13
0.281	LgLotRes	11.0	NORMAL	35	15	0.18	0.04	Low	0.05
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.359	RecOpSc	14.1	NORMAL	75	0	0.20	0.03	Low	0.05
0.015	Resort	0.6	NORMAL	32	60	0.11	0.03	Low	0.07
1.508	Rural	59.1	NORMAL	30	0	0.20	0.04	Low	0.04
0.124	SmLotRes	4.9	NORMAL	30	25	0.15	0.04	Low	0.05
0.250	Vacant	9.8	NORMAL	30	0	0.20	0.05	Hi	0.09
0.003	Water	0.1	NORMAL	0	10	0.00	0.00	Min	0.04

4.904 = Total Area Avg. = 30 0% 0.200

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.17

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.13

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 50 % effective = 33
% EFFECTIVE IMP. = 17

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_1	2.552	4.64	2.04	0.04	196.1	0.19	0.25	5.30	0.26	9	48

LOSS PARAMETERS FOR SUBBASIN: GWW1_2

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.060	5.8	0.62	0
A_33	0.781	74.9	0.23	0
A_34	0.014	1.3	0.23	0
A_40	0.011	1.1	0.17	0
A_63	0.076	7.3	0.14	25
A_93	0.007	0.7	0.33	0
A_96	0.092	8.8	0.07	0
T_301	0.002	0.2	0.40	0

TOTAL = 1.043 Sq.Miles XKSAT = 0.21 %Rock = 2

DTHETA

Dry = 0.37 PSIF = 5.20
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
0.007	DedOpSpc	0.7	NORMAL	35	0	0.20	0.05	Hi	0.13
0.007	LgLotRes	0.7	NORMAL	35	15	0.18	0.04	Low	0.07
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
0.007	NRC	0.7	NORMAL	10	80	0.07	0.02	Min	0.04
0.215	RecOpSc	20.6	NORMAL	75	0	0.20	0.03	Low	0.05
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.588	Rural	56.4	NORMAL	30	0	0.20	0.04	Low	0.04
0.025	SmLotRes	2.4	NORMAL	30	25	0.15	0.04	Low	0.06
0.194	Vacant	18.6	NORMAL	30	0	0.20	0.05	Hi	0.10
	Water		NORMAL	0	10	0.00	0.00	Min	
1.043 = Total Area			Avg. =	39	1%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.28

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 50 % effective = 2
% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_2	1.043	3.88	1.87	0.04	164.9	0.20	0.25	5.20	0.28	2	45

LOSS PARAMETERS FOR SUBBASIN: GWW1_3

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.132	8.7	0.62	0
A_24	0.015	1.0	0.02	0
A_33	0.085	5.6	0.23	0
A_34	0.115	7.6	0.23	0
A_40	0.457	30.1	0.17	0
A_41	0.337	22.2	0.17	0
A_72	0.019	1.3	0.09	30
A_93	0.163	10.7	0.33	0
A_96	0.195	12.9	0.07	0

TOTAL = 1.518 Sq.Miles XKSAT = 0.18 %Rock = 0

DTHETA

Dry = 0.38 PSIF = 5.60
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.451	LgLotRes	29.7	NORMAL	35	15	0.18	0.04	Low	0.05
0.002	MedDRes	0.1	NORMAL	25	30	0.15	0.03	Low	0.08
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.126	RecOpSc	8.3	NORMAL	75	0	0.20	0.03	Low	0.05
0.009	Resort	0.6	NORMAL	32	60	0.11	0.03	Low	0.07
0.919	Rural	60.5	NORMAL	30	0	0.20	0.04	Low	0.04
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.011	Vacant	0.7	NORMAL	30	0	0.20	0.05	Hi	0.13
	Water		NORMAL	0	10	0.00	0.00	Min	
1.518 = Total Area			Avg. =	35	5%	0.190			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.23

IMPERVIOUS AREA: URBAN @ 100 % effective = 5
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 5

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_3	1.518	2.83	1.46	0.04	137.8	0.19	0.25	5.60	0.23	5	38

LOSS PARAMETERS FOR SUBBASIN: GWW1_4

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.039	3.9	0.62	0
A_33	0.034	3.4	0.23	0
A_40	0.084	8.4	0.17	0
A_41	0.579	57.7	0.17	0
A_72	0.001	0.1	0.09	30
A_93	0.084	8.4	0.33	0
A_96	0.181	18.0	0.07	0
A_121	0.002	0.2	0.12	0

TOTAL = 1.004 Sq.Miles XKSAT = 0.16 %Rock = 0

DTHETA

Dry = 0.39 PSIF = 5.80
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.026	LgLotRes	2.6	NORMAL	35	15	0.18	0.04	Low	0.06
0.011	MedDRes	1.1	NORMAL	25	30	0.15	0.03	Low	0.07
	NRC		NORMAL	10	80	0.07	0.02	Min	
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.905	Rural	90.1	NORMAL	30	0	0.20	0.04	Low	0.04
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.062	Vacant	6.2	NORMAL	30	0	0.20	0.05	Hi	0.11
	Water		NORMAL	0	10	0.00	0.00	Min	

1.004 = Total Area Avg. = 30 1% 0.200

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.20

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 50 % effective = 0

% EFFECTIVE IMP. = 1

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_4	1.004	3.64	2.11	0.04	274.7	0.20	0.25	5.80	0.20	1	43

LOSS PARAMETERS FOR SUBBASIN: GWW1_5

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.014	1.4	0.62	0
A_28	0.010	1.0	0.02	0
A_33	0.187	19.0	0.23	0
A_34	0.063	6.4	0.23	0
A_40	0.044	4.5	0.17	0
A_72	0.005	0.5	0.09	30
A_93	0.192	19.5	0.33	0
A_96	0.468	47.6	0.07	0

TOTAL = 0.983 Sq.Miles XKSAT = 0.14 %Rock = 0

DTHETA

Dry = 0.39 PSIF = 6.20
Normal = 0.23
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.080	Airport	8.1	NORMAL	8	85	0.07	0.02	Min	0.03
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.168	LgLotRes	17.1	NORMAL	35	15	0.18	0.04	Low	0.05
0.162	MedDRes	16.5	NORMAL	25	30	0.15	0.03	Low	0.05
0.090	NRC	9.2	NORMAL	10	80	0.07	0.02	Min	0.03
0.204	RecOpSc	20.8	NORMAL	75	0	0.20	0.03	Low	0.05
0.026	Resort	2.6	NORMAL	32	60	0.11	0.03	Low	0.06
0.002	Rural	0.2	NORMAL	30	0	0.20	0.04	Low	0.08
0.014	SmLotRes	1.4	NORMAL	30	25	0.15	0.04	Low	0.07
0.237	Vacant	24.1	NORMAL	30	0	0.20	0.05	Hi	0.10
	Water		NORMAL	0	10	0.00	0.00	Min	

0.983 = Total Area Avg. = 42 24% 0.160

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.23

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.19

IMPERVIOUS AREA: URBAN @ 100 % effective = 24
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 24

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_5	0.983	3.57	1.89	0.03	112.6	0.16	0.23	6.20	0.19	24	41

LOSS PARAMETERS FOR SUBBASIN: GWW1_6

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.019	3.2	0.62	0
A_33	0.034	5.7	0.23	0
A_34	0.306	51.6	0.23	0
A_41	0.175	29.5	0.17	0
A_93	0.007	1.2	0.33	0
A_96	0.044	7.4	0.07	0
A_121	0.008	1.3	0.12	0

TOTAL = 0.593 Sq.Miles XKSAT = 0.20 %Rock = 0

DTHETA

Dry = 0.37 PSIF = 5.30
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.538	Rural	90.9	NORMAL	30	0	0.20	0.04	Low	0.05
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.054	Vacant	9.1	NORMAL	30	0	0.20	0.05	Hi	0.11
	Water		NORMAL	0	10	0.00	0.00	Min	
0.593 = Total Area			Avg. =	30	0%	0.20			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.24

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_6	0.593	2.61	1.31	0.04	164.8	0.20	0.25	5.30	0.24	0	34

Appendix D.3
Hydrograph Routing Data

Galloway Wash FDS - 100-Year 24-Hour HEC-1
Normal Depth Channel Routing Blocks

```
Storage Routing through SUBBASIN : 282286
=========================================

Parameters Used:
   NSTPS        5  Number of subreaches
    ITYP     FLOW  Type of Initial Condition
  RSVRIC    -1.00  Initial Condition
       X     0.00  Working R and D coefficient

Normal Depth Data
=================
62 RC          NORMAL DEPTH CHANNEL
                     ANL       0.055  LEFT OVERBANK N-VALUE
                    ANCH       0.045  MAIN CHANNEL N-VALUE
                     ANR       0.055  RIGHT OVERBANK N-VALUE
                   RLNTH      11240.  REACH LENGTH
                     SEL      0.0231  ENERGY SLOPE
                   ELMAX         0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                        --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
64 RY        ELEVATION    100.00    100.00     96.50     95.00     95.00     96.50    100.00    100.00
63 RX        DISTANCE       0.00      0.00    102.00    105.00    145.00    148.00    250.00    250.00

                                                   ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      2.75      5.58      8.47     11.44     14.47     17.63     21.58     26.58      32.6
          OUTFLOW       0.00     21.81     69.42    136.86    221.76    322.76    441.09    583.51    751.83     950.7
        ELEVATION      95.00     95.26     95.53     95.79     96.05     96.32     96.58     96.84     97.11      97.3

          STORAGE      39.70     47.83     56.99     67.20     78.45     90.74    104.07    118.44    133.85     150.3
          OUTFLOW    1184.18   1455.79   1768.95   2126.81   2532.42   2988.69   3498.45   4064.42   4689.26    5375.5
        ELEVATION      97.63     97.89     98.16     98.42     98.68     98.95     99.21     99.47     99.74      100.0
```

Galloway Wash FDS - 100-Year 24-Hour HEC-1
Normal Depth Channel Routing Blocks

```
Storage Routing through SUBBASIN : 284286
=========================================

Parameters Used:
   NSTPS        3  Number of subreaches
    ITYP     FLOW  Type of Initial Condition
  RSVRIC    -1.00  Initial Condition
       X     0.00  Working R and D coefficient

Normal Depth Data
=================
82 RC          NORMAL DEPTH CHANNEL
                     ANL       0.050  LEFT OVERBANK N-VALUE
                    ANCH       0.045  MAIN CHANNEL N-VALUE
                     ANR       0.050  RIGHT OVERBANK N-VALUE
                   RLNTH       7590.  REACH LENGTH
                     SEL      0.0257  ENERGY SLOPE
                   ELMAX         0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                        --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
84 RY        ELEVATION   100.00    100.00     96.00     95.00     95.00     96.00    100.00    100.00
83 RX        DISTANCE      0.00      0.00     40.00     42.00     97.00     99.00    139.00    139.00

                                                  ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      2.55      5.14      7.78     10.48     13.35     16.47     19.82     23.42      27.2
          OUTFLOW       0.00     31.61    100.53    198.01    321.32    472.63    650.26    855.03   1087.72    1349.0
        ELEVATION      95.00     95.26     95.53     95.79     96.05     96.32     96.58     96.84     97.11      97.3

          STORAGE      31.34     35.67     40.23     45.03     50.08     55.37     60.90     66.67     72.68      78.9
          OUTFLOW    1639.89   1960.93   2312.99   2696.88   3113.36   3563.25   4047.33   4566.38   5121.20     5712.5
        ELEVATION      97.63     97.89     98.16     98.42     98.68     98.95     99.21     99.47     99.74      100.0
```

Galloway Wash FDS - 100-Year 24-Hour HEC-1
Normal Depth Channel Routing Blocks

```
Storage Routing through SUBBASIN : 286287
=========================================

Parameters Used:
   NSTPS        2  Number of subreaches
    ITYP    FLOW  Type of Initial Condition
  RSVRIC    -1.00  Initial Condition
       X     0.00  Working R and D coefficient

   Normal Depth Data
=================
104 RC          NORMAL DEPTH CHANNEL
                       ANL       0.050  LEFT OVERBANK N-VALUE
                      ANCH       0.045  MAIN CHANNEL N-VALUE
                       ANR       0.050  RIGHT OVERBANK N-VALUE
                     RLNTH       4410.  REACH LENGTH
                       SEL      0.0204  ENERGY SLOPE
                     ELMAX         0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                        --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
106 RY        ELEVATION   100.00    100.00     97.00     95.00     95.00     97.00    100.00    100.00
105 RX        DISTANCE      0.00      0.00     90.00     92.00    157.00    159.00    249.00    249.00

                                                  ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      1.74      3.49      5.26      7.04      8.83     10.64     12.47     14.34      16.5
          OUTFLOW       0.00     33.19    105.29    206.81    333.81    483.88    655.32    846.84   1060.45    1302.6
        ELEVATION      95.00     95.26     95.53     95.79     96.05     96.32     96.58     96.84     97.11      97.3

          STORAGE      19.19     22.25     25.73     29.63     33.95     38.69     43.85     49.43     55.44      61.8
          OUTFLOW    1576.05   1885.70   2235.75   2630.03   3072.07   3565.22   4112.67   4717.49   5382.63    6110.9
        ELEVATION      97.63     97.89     98.16     98.42     98.68     98.95     99.21     99.47     99.74      100.0
```

Galloway Wash FDS - 100-Year 24-Hour HEC-1
Normal Depth Channel Routing Blocks

```
Storage Routing through SUBBASIN : 287288
=========================================

Parameters Used:
   NSTPS        1  Number of subreaches
    ITYP     FLOW  Type of Initial Condition
  RSVRIC    -1.00  Initial Condition
       X     0.00  Working R and D coefficient

Normal Depth Data
=================
127 RC          NORMAL DEPTH CHANNEL
                       ANL       0.050  LEFT OVERBANK N-VALUE
                      ANCH       0.040  MAIN CHANNEL N-VALUE
                       ANR       0.050  RIGHT OVERBANK N-VALUE
                     RLNTH       1370.  REACH LENGTH
                       SEL      0.0292  ENERGY SLOPE
                     ELMAX         0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                        --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
129 RY        ELEVATION   100.00    100.00     95.00     93.50     93.50     95.00    100.00    100.00
128 RX        DISTANCE      0.00      0.00    125.00    127.00    227.00    229.00    354.00    354.00

                                                  ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      1.08      2.17      3.27      4.38      5.54      6.86      8.37     10.06      11.9
          OUTFLOW       0.00    106.52    338.20    664.83   1074.03   1565.53   2146.33   2822.69   3601.90    4490.4
        ELEVATION      93.50     93.84     94.18     94.53     94.87     95.21     95.55     95.89     96.24      96.5

          STORAGE      14.00     16.24     18.67     21.28     24.08     27.06     30.22     33.57     37.11      40.8
          OUTFLOW    5494.55   6619.97   7872.37   9257.24  10779.94  12445.69  14259.62  16226.76  18352.06   20640.3
        ELEVATION      96.92     97.26     97.61     97.95     98.29     98.63     98.97     99.32     99.66      100.0

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN      338. TO    20640.
                THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
                THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)
```

Galloway Wash FDS - 100-Year 24-Hour HEC-1
Normal Depth Channel Routing Blocks

```
Storage Routing through SUBBASIN : 290295
=========================================

Parameters Used:
   NSTPS        1  Number of subreaches
    ITYP     FLOW  Type of Initial Condition
  RSVRIC    -1.00  Initial Condition
       X     0.00  Working R and D coefficient

Normal Depth Data
=================
165 RC          NORMAL DEPTH CHANNEL
                       ANL       0.050  LEFT OVERBANK N-VALUE
                      ANCH       0.035  MAIN CHANNEL N-VALUE
                       ANR       0.050  RIGHT OVERBANK N-VALUE
                     RLNTH       2620.  REACH LENGTH
                       SEL      0.0229  ENERGY SLOPE
                     ELMAX         0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
167 RY        ELEVATION   100.00    100.00     92.00     90.00     90.00     92.00    100.00    100.00
166 RX        DISTANCE      0.00      0.00     80.00     82.00    162.00    164.00    244.00    244.00

                                                  ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      2.55      5.13      7.75     10.40     13.29     16.52     20.08     23.97      28.2
          OUTFLOW       0.00    176.58    559.93   1099.40   1778.11   2607.28   3581.74   4707.24   5988.98    7432.0
        ELEVATION      90.00     90.53     91.05     91.58     92.11     92.63     93.16     93.68     94.21      94.7

          STORAGE      32.76     37.65     42.87     48.43     54.32     60.55     67.10     73.99     81.22      88.7
          OUTFLOW    9041.59  10822.59  12780.13  14919.24  17244.92  19762.13  22475.83  25390.91  28512.23   31844.6
        ELEVATION      95.26     95.79     96.32     96.84     97.37     97.89     98.42     98.95     99.47     100.0

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN     2607. TO    31845.
                THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
                THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)
```

```
Storage Routing through SUBBASIN : 280295
=========================================

Parameters Used:
   NSTPS        5  Number of subreaches
    ITYP     FLOW  Type of Initial Condition
  RSVRIC    -1.00  Initial Condition
       X     0.00  Working R and D coefficient

Normal Depth Data
=================
191 RC          NORMAL DEPTH CHANNEL
                       ANL       0.080  LEFT OVERBANK N-VALUE
                      ANCH       0.050  MAIN CHANNEL N-VALUE
                       ANR       0.070  RIGHT OVERBANK N-VALUE
                     RLNTH      13560.  REACH LENGTH
                       SEL      0.0254  ENERGY SLOPE
                     ELMAX         0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                         --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
193 RY        ELEVATION    110.00    100.00     90.00     90.00     90.00     90.00    100.00    110.00
192 RX        DISTANCE    1000.00   1020.00   1040.00   1040.10   1202.90   1203.00   1223.00   1243.00

                                                   ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00     54.10    109.58    166.44    224.68    284.31    345.31    407.69    471.45     536.5
          OUTFLOW       0.00    847.50   2704.20   5341.87   8671.27  12640.00  17212.86  22364.43  28075.49   34331.0
        ELEVATION      90.00     91.05     92.11     93.16     94.21     95.26     96.32     97.37     98.42      99.4

          STORAGE     603.10    671.00    740.28    810.94    882.98    956.39   1031.19   1107.37   1184.93    1263.8
          OUTFLOW   41119.33  48430.59  56257.00  64592.11  73430.55  82767.92  92600.55 102925.40 113740.00  125042.4
        ELEVATION     100.53    101.58    102.63    103.68    104.74    105.79    106.84    107.89    108.95      110.0

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN     8671. TO   125042.
                THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
                THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)
```

Galloway Wash FDS - 100-Year 24-Hour HEC-1
Normal Depth Channel Routing Blocks

```
Storage Routing through SUBBASIN : 295300
=========================================

Parameters Used:
   NSTPS        1  Number of subreaches
    ITYP     FLOW  Type of Initial Condition
  RSVRIC    -1.00  Initial Condition
       X     0.00  Working R and D coefficient

Normal Depth Data
=================
219 RC          NORMAL DEPTH CHANNEL
                       ANL       0.050  LEFT OVERBANK N-VALUE
                      ANCH       0.035  MAIN CHANNEL N-VALUE
                       ANR       0.050  RIGHT OVERBANK N-VALUE
                     RLNTH       2895.  REACH LENGTH
                       SEL      0.0242  ENERGY SLOPE
                     ELMAX         0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                        --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
221 RY        ELEVATION   100.00    100.00     95.00     91.00     91.00     95.00    100.00    100.00
220 RX        DISTANCE      0.00      0.00     60.00     64.00    139.00    143.00    203.00    203.00

                                                  ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      2.38      4.78      7.22      9.68     12.18     14.70     17.26     19.84      22.5
          OUTFLOW       0.00    142.78    452.77    889.02   1434.66   2079.33   2815.79   3638.61   4543.51    5557.8
        ELEVATION      91.00     91.47     91.95     92.42     92.89     93.37     93.84     94.32     94.79      95.2

          STORAGE      25.50     28.85     32.55     36.62     41.04     45.82     50.96     56.46     62.31      68.5
          OUTFLOW    6691.46   7933.89   9293.81  10778.71  12395.42  14150.32  16049.51  18098.82  20303.89   22670.2
        ELEVATION      95.74     96.21     96.68     97.16     97.63     98.11     98.58     99.05     99.53      100.0

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN     2079. TO    22670.
                THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
                THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)
```

```
Storage Routing through SUBBASIN : 270300
=========================================

Parameters Used:
   NSTPS        8  Number of subreaches
    ITYP     FLOW  Type of Initial Condition
  RSVRIC    -1.00  Initial Condition
       X     0.00  Working R and D coefficient

Normal Depth Data
=================
246 RC          NORMAL DEPTH CHANNEL
                       ANL       0.100  LEFT OVERBANK N-VALUE
                      ANCH       0.030  MAIN CHANNEL N-VALUE
                       ANR       0.100  RIGHT OVERBANK N-VALUE
                     RLNTH      12750.  REACH LENGTH
                       SEL      0.0275  ENERGY SLOPE
                     ELMAX         0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                         --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
248 RY        ELEVATION    104.00     94.00     93.00     90.00     90.00     93.00     94.00    104.00
247 RX        DISTANCE    1000.00   1015.00   1095.00   1095.50   1128.50   1129.00   1209.00   1224.00

                                                   ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      7.14     14.34     21.59     28.89     47.19     86.77    129.12    171.95     215.2
          OUTFLOW       0.00    159.61    495.66    954.04   1510.56   2243.41   3332.27   4787.38   6534.44    8546.1
        ELEVATION      90.00     90.74     91.47     92.21     92.95     93.68     94.42     95.16     95.89      96.6

          STORAGE     259.04    303.29    348.03    393.24    438.93    485.09    531.74    578.86    626.45     674.5
          OUTFLOW   10804.41  13295.89  16010.20  18938.96  22075.20  25413.05  28947.43  32674.00  36588.91   40688.7
        ELEVATION      97.37     98.11     98.84     99.58    100.32    101.05    101.79    102.53    103.26     104.0

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN      160. TO    40689.
                THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
                THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)
```

Galloway Wash FDS - 100-Year 24-Hour HEC-1
Normal Depth Channel Routing Blocks

```
Storage Routing through SUBBASIN : 300310
=========================================

Parameters Used:
   NSTPS        1  Number of subreaches
    ITYP     FLOW  Type of Initial Condition
  RSVRIC    -1.00  Initial Condition
       X     0.00  Working R and D coefficient

Normal Depth Data
=================
273 RC          NORMAL DEPTH CHANNEL
                       ANL       0.085  LEFT OVERBANK N-VALUE
                      ANCH       0.040  MAIN CHANNEL N-VALUE
                       ANR       0.085  RIGHT OVERBANK N-VALUE
                     RLNTH       4080.  REACH LENGTH
                       SEL      0.0184  ENERGY SLOPE
                     ELMAX         0.0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                         --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
275 RY        ELEVATION   100.00    100.00     93.00     90.00     90.00     93.00    100.00    100.00
274 RX        DISTANCE      0.00      0.00    105.00    114.00    149.00    158.00    263.00    263.00

                                                  ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       0.00      1.80      3.76      5.88      8.15     10.57     13.18     16.42     20.43      25.2
          OUTFLOW       0.00     61.47    198.08    395.74    650.40    960.63   1341.46   1822.52   2380.24    3021.9
        ELEVATION      90.00     90.53     91.05     91.58     92.11     92.63     93.16     93.68     94.21      94.7

          STORAGE      30.79     37.14     44.27     52.18     60.86     70.32     80.56     91.58    103.38     115.9
          OUTFLOW    3753.79   4581.70   5511.09   6547.19   7695.05   8959.56  10345.51  11857.56  13500.26   15278.1
        ELEVATION      95.26     95.79     96.32     96.84     97.37     97.89     98.42     98.95     99.47      100.0

WARNING --- ROUTED OUTFLOW (  15346.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  15314.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE
```

Galloway Wash FDS NSTEPS Check
100-Year 24-Hour and 6-Hour Discharges

24-hour, 100-year

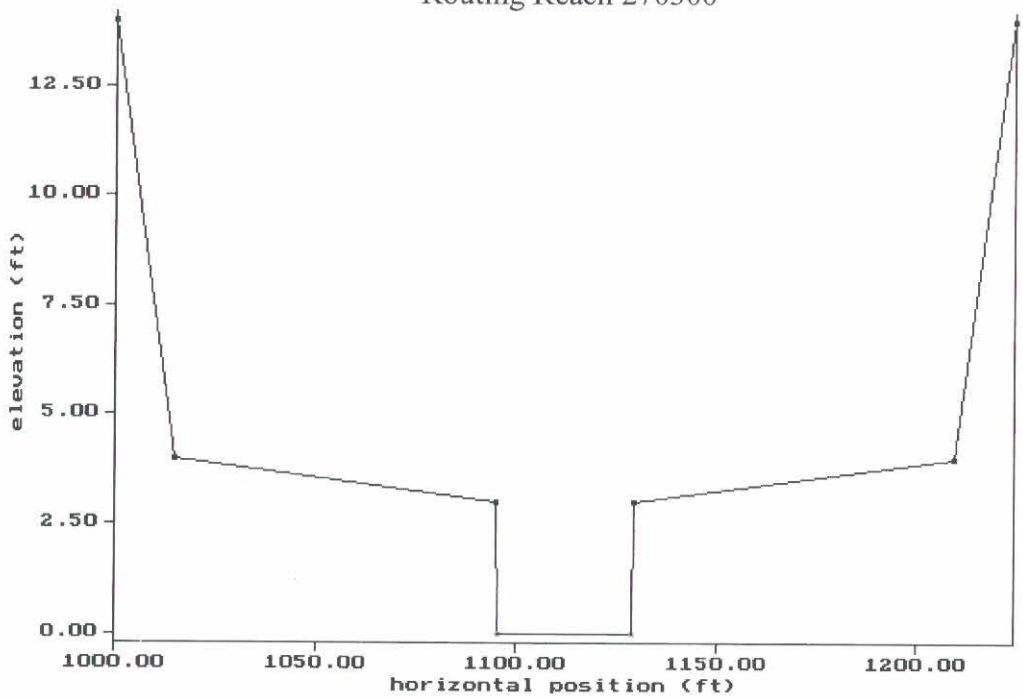
Routing Reach	HEC-1 Q100 new	Reach Length (ft)	HEC-1 Route Time (hour)	HEC-1 Velocity (fps)	Manning Velocity (fps)	NSTEPS
270-300	4140	12750	0.33	10.7	5.4	8
280-295	5492	13560	0.25	15.1	10	5
282-286	2571	11240	0.41	7.6	7.2	5
284-286	1110	7590	0.17	12.4	7.8	3
286-287	3637	4410	0.16	7.7	8.6	2
287-288	4466	1370	0	-	10.8	1
290-295	5944	2620	0.09	8.1	14	1
295-300	10908	2895	0	-	18	1
300-310	13664	4080	0.09	12.6	9.3	1

6-hour, 100-year

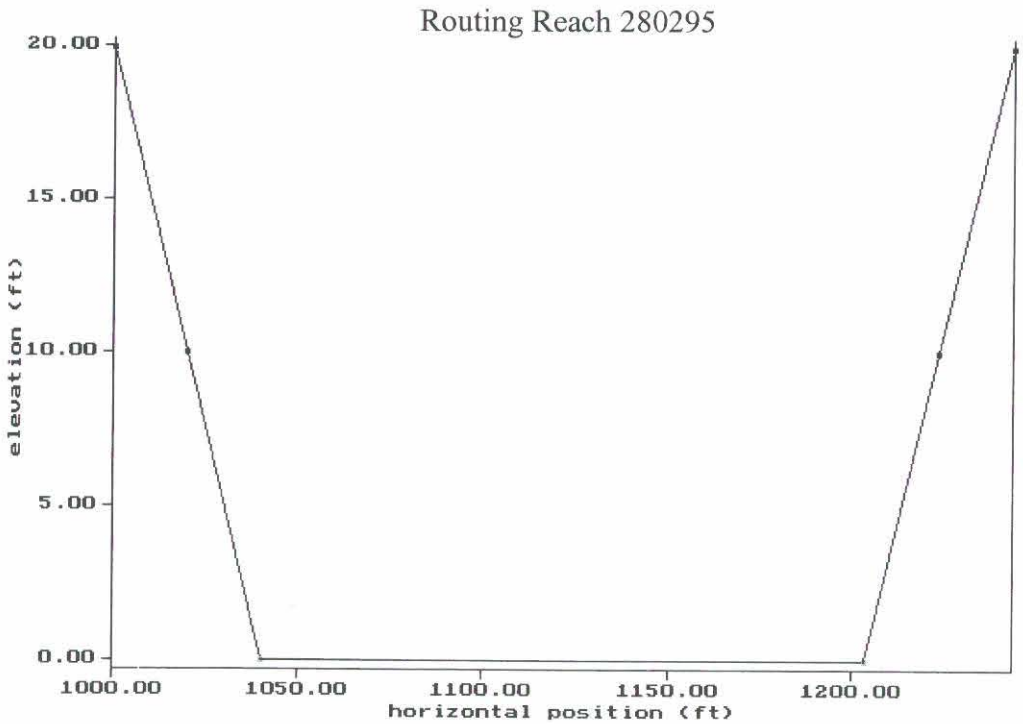
Routing Reach	HEC-1 Q100 new	Reach Length (ft)	HEC-1 Route Time (hour)	HEC-1 Velocity (fps)	Manning Velocity (fps)	NSTEPS
270-300	3749	12750	0.33	10.7	5.3	8
280-295	4686	13560	0.25	15.1	9.4	5
282-286	2427	11240	0.33	9.5	7.1	5
284-286	1155	7590	0.17	12.4	7.8	3
286-287	3397	4410	0.17	7.2	8.5	2
287-288	4017	1370	0	-	10.6	1
290-295	5158	2620	0.08	9.1	13.6	1
295-300	9070	2895	0	-	17.7	1
300-310	11371	4080	0.08	14.2	9	2

Galloway Wash FDS Normal Depth Routing
8-Point Cross Sections

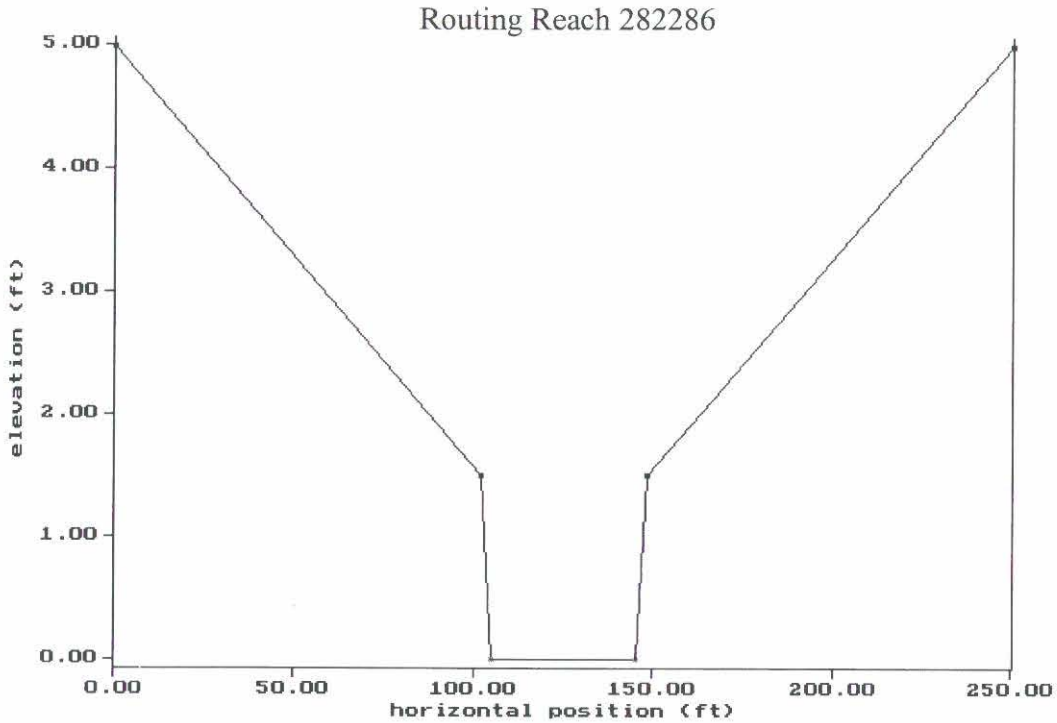
Routing Reach 270300

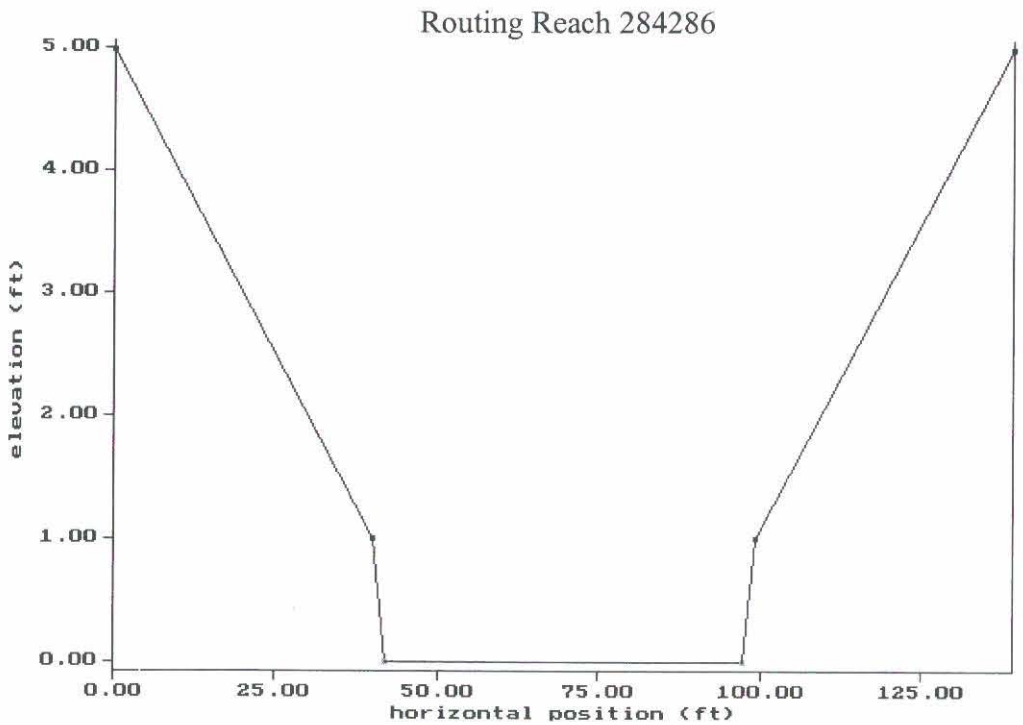


Routing Reach 280295



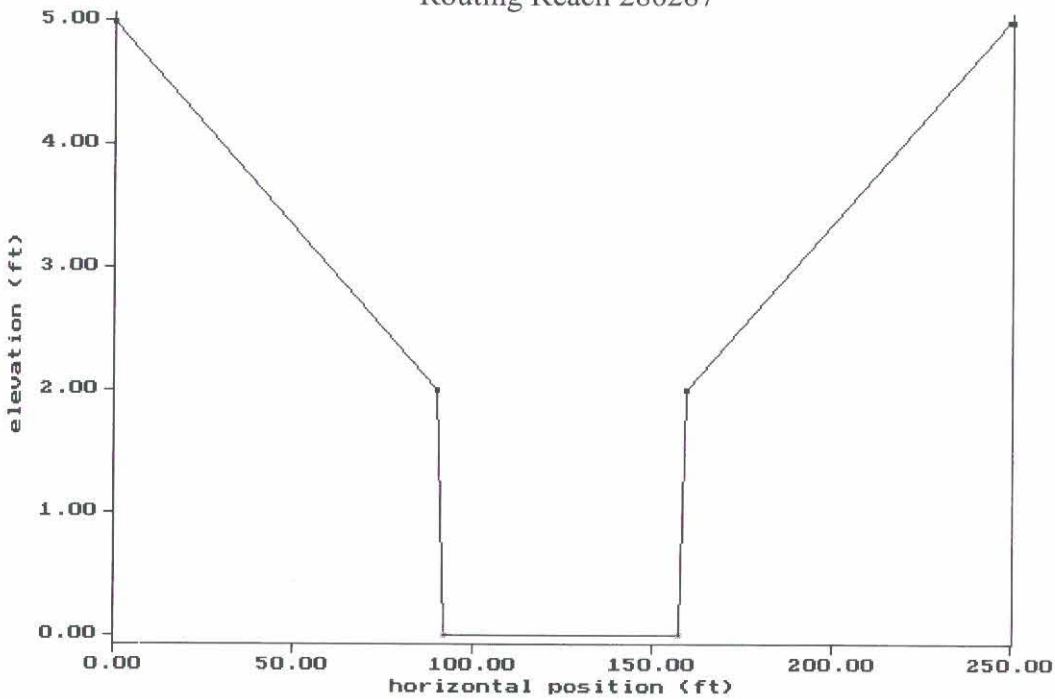
Galloway Wash FDS Normal Depth Routing
8-Point Cross Sections



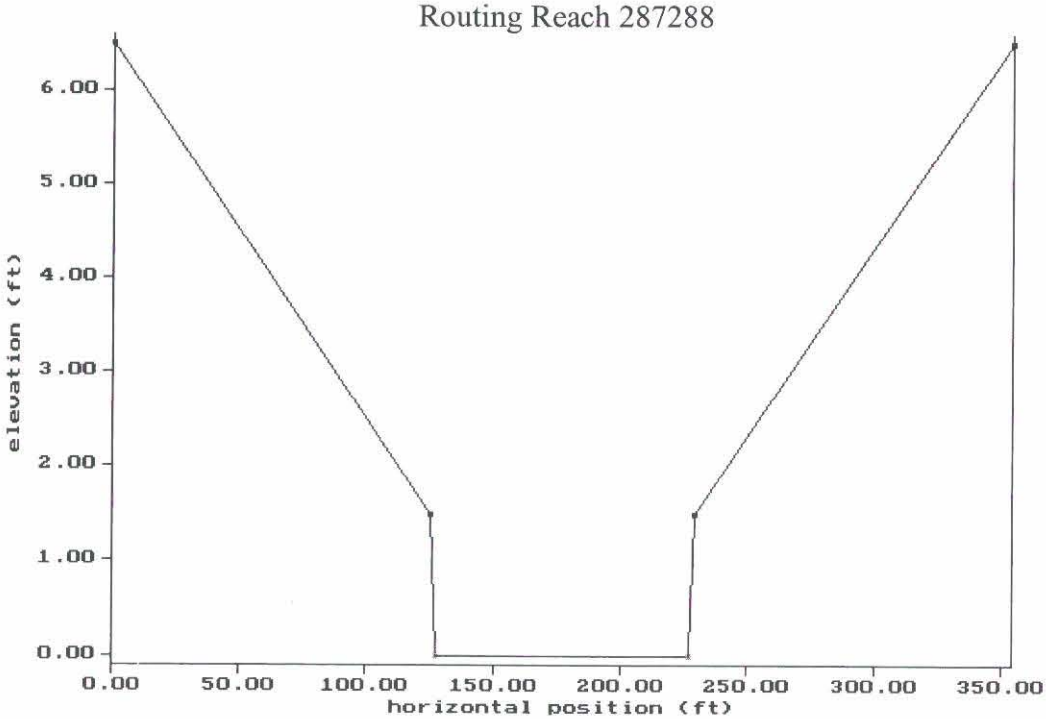


Galloway Wash FDS Normal Depth Routing
8-Point Cross Sections

Routing Reach 286287

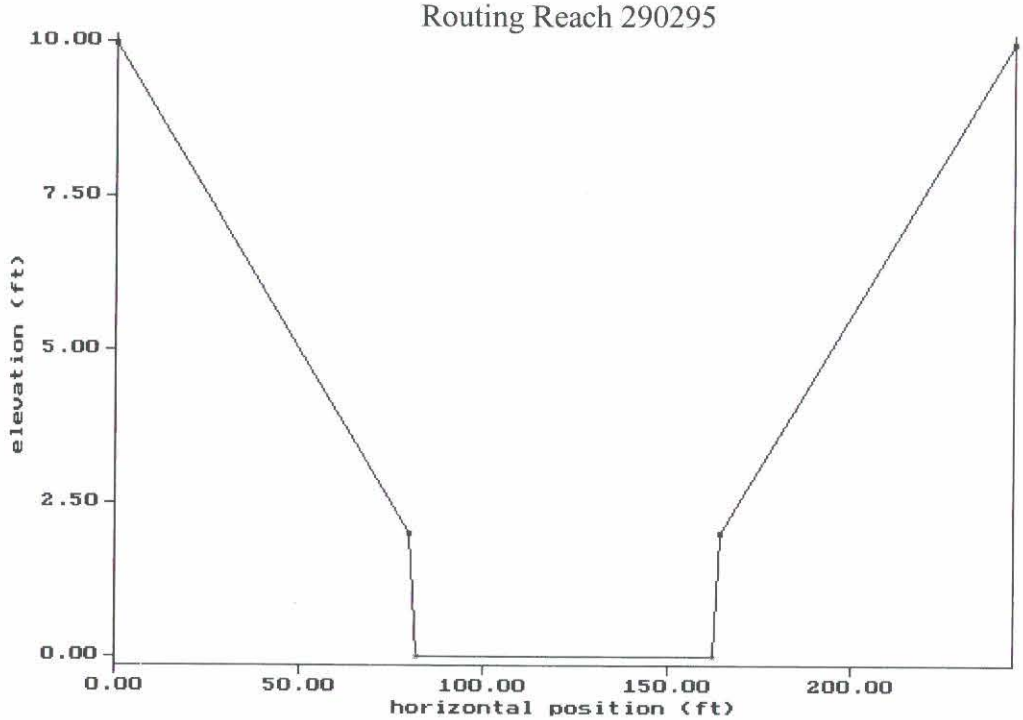


Routing Reach 287288

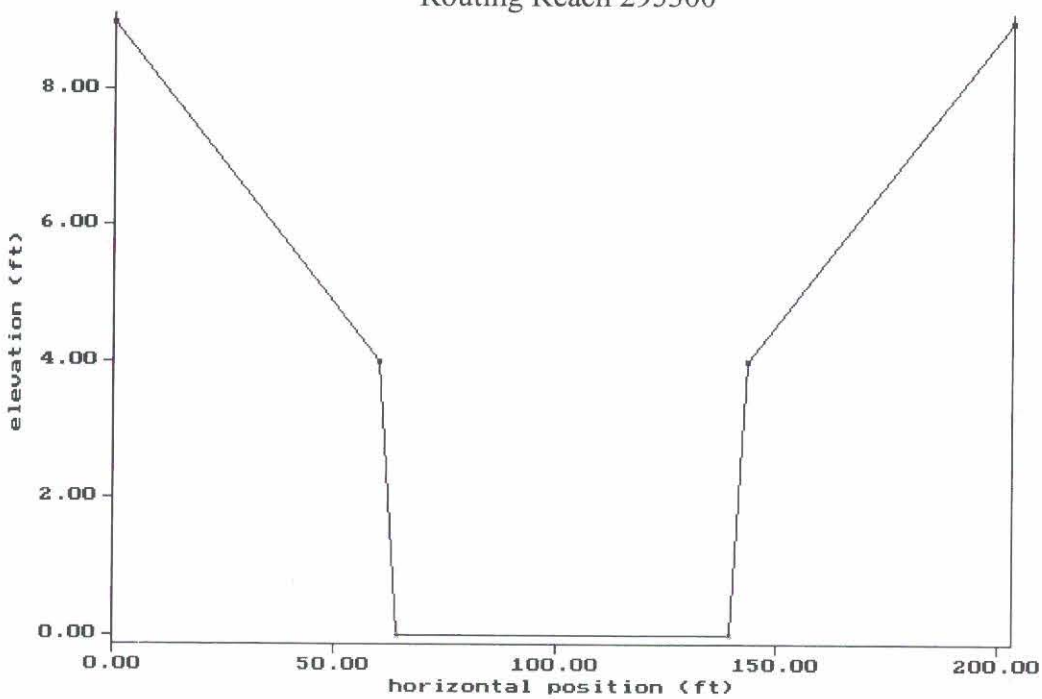


Galloway Wash FDS Normal Depth Routing
8-Point Cross Sections

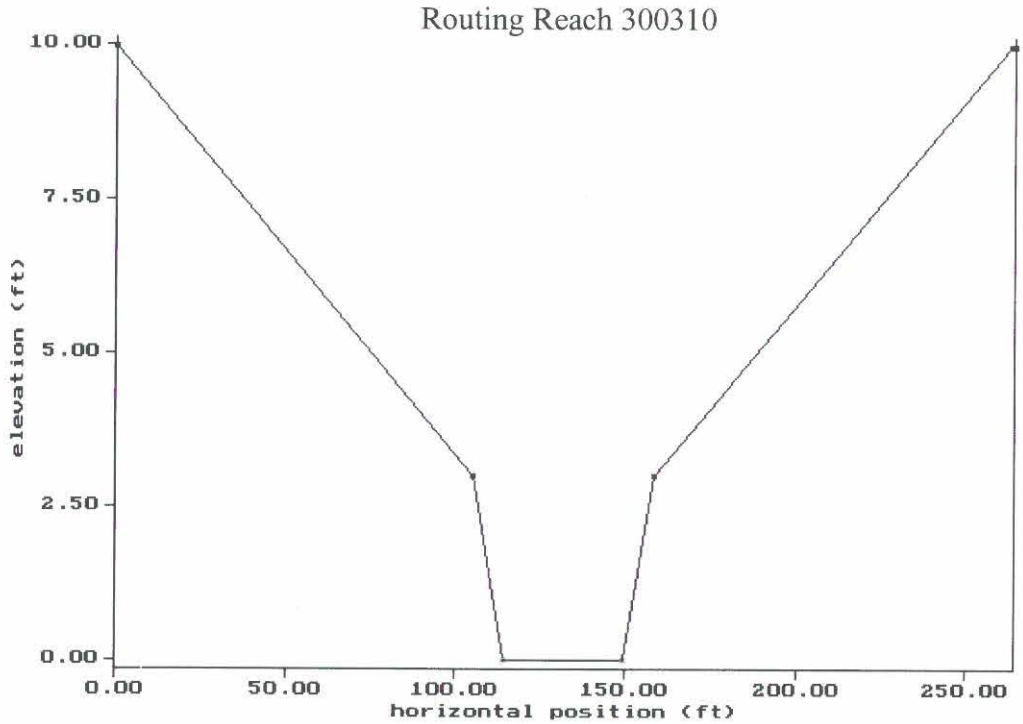
Routing Reach 290295



Routing Reach 295300



Galloway Wash FDS Normal Depth Routing
8-Point Cross Sections



Appendix D.4
Reservoir Routing Data

DETAILED DRAINAGE DESIGN REPORT
FOR
DESERT MOUNTAIN PROPERTIES
PROPOSED DETENTION BASIN NO. S-1

JULY, 1995
REVISED: MARCH, 1996

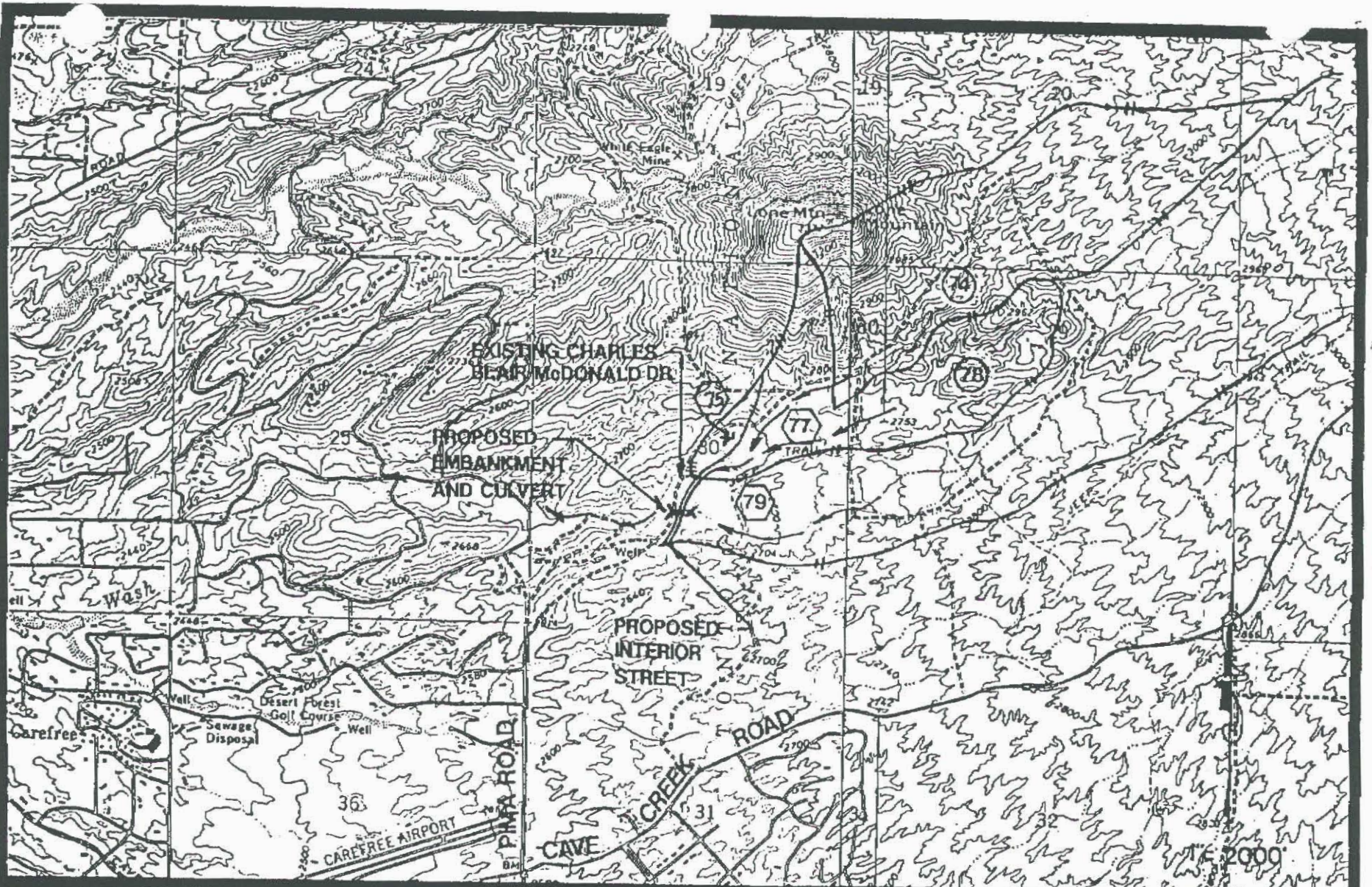
PREPARED FOR:
DESERT MOUNTAIN PROPERTIES
6263 NORTH SCOTTSDALE ROAD
SCOTTSDALE ARIZONA 85250

A-N WEST NO. 4628-55

Registered Professional Engineer (Civil)
CERTIFICATE NO.
15290
GREGORY A.
SCHUELKE
Date Signed 3/11/96
ARIZONA, U.S.A.

A-N WEST INC.
Consulting Engineers
7600 North 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 861-2200

10/20/1999 15:30 6029431989 A-N WEST, INC. PAGE 02



EXPLANATION

79 COMBINE HYROGRAPHS (HEC-1 I.D.No.)

74 COMPUTE HYROGRAPH (HEC-1 I.D.No.)

SUBAREA DRAINAGE BOUNDARY

FLOW DIRECTION

NO. 4628-55

A-N WEST INC.
Consulting Engineers

DESERT MOUNTAIN PROPERTIES
PROPOSED DETENTION BASIN No. S-1
IN SECTION 30, T6N, R5E
VICINITY MAP

FIGURE 2

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

 138          KK  RO79.1
 139          KM        ROUTE CO79 THROUGH PROP. DET. BASIN NO.S-1 AT CHARLES BLAIR MCDONALD DR.
 140          KM        BASIN OUTLET INVOLVES 6-12'X 4' RCB'S WITH 2 BARRELS FLOW-THRU AND
 141          KM        4 BARRELS RECEIVING FLOW FROM FRONT, BACK AND SIDE WEIR
 142          KO       3       2
 143          RS       1    STOR       0
 144          SV       0    .097   0.992   3.428   7.831  14.433  18.672  23.649  29.425  36.060
 145          SV    43.2
 146          SQ       0     110     433     875    1157    1380    1489    1838    2386    3399
 147          SQ    4778
 148          SE  2656.5    2658    2660    2662    2664    2666    2667    2668    2669    2670
 149          SE    2671

 150          KK   SUB75
 151          KM        COMPUTE HYDROGRAPH FOR SMALL D.A. CONTRIBUTING FROM NORTH BETWEEN
 152          KM        C.B.M.DR. AND INTERIOR STR.(EMBANKMENT).
 153          BA    0.02
 154          LS       0    80.2      10
 155          UK     100     .05     .25     100
 156          RK    1600    .055    .045     1.0    TRAP      10      10

 157          KK    CO81
 158          KM        COMBINE SUB75 AND RO79.1
 159          HC       2
 160          ZZ
```

B-48

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

              *DIAGRAM
  1           ID       DEVELOPED CONDITION HYDROLOGY     BY:A-N WEST,INC.PHX.AZ.  FILE:S1DMTNDV
  2           ID       DESERT MOUNTAIN DEVELOPMENT S-1 DETENTION BASIN     BY:A-N WEST,INC
  3           ID       100-YEAR 6-HOUR STORM                    DATE:4\10\92   REV.2/22/96
  4           ID       INCLUDES PROPOSED S-1 DET. BASIN AT CHARLES BLAIR MCDONALD DR.
  5           IT     3                    300
  6           IO     5

  7           KK   SUB50
  8           KM        COMPUTE HYDROGRAPH
  9           KM    *******
 10           KM       THE FOLLOWING VALUES ARE ENTERED ON THE PH RECORD FOR THE RESPECTIVE
 11           KM       2, 10, 25, 50, 100, YR. STORMS.
 12           KM    ****CAUTION*** THE VALUES IN ( ) ARE TO BE USED FOR 24-HR.STORMS ONLY,IN
 13           KM                    FIELDS 9 AND 10 RESPECTIVELY OF PH RECORD.
 14           KM    ****CAUTION*** ALSO A 5 MINUTE TIME ORDINATE (FIELD 1 OF IT RECORD) SHALL
 15           KM                   BE USED FOR 24 - HR STORMS  AND A 3 MINUTE ORDINATE FOR
 16           KM                   6- HOUR STORMS.
 17           KM   2:50   2.419   0.37   0.68   1.09   1.27   1.39   1.62   (1.94) (2.25)
 18           KM  10:10   2.419   0.52   1.01   1.68   1.93   2.10   2.42   (2.85) (3.27)
 19           KM  25:     2.419   0.62   1.20   2.01   2.31   2.51   2.88   (3.38) (3.87)
 20           KM     ***
 21           KM  50:     2.419   0.69   1.34   2.27   2.60   2.82   3.24   (3.79) (4.34)
 22           KM 100:     2.419   0.76   1.49   2.53   2.89   3.14   3.60   (4.20) (4.80)
 23           BA  0.450
 24           PH          2.419   0.76   1.49   2.53   2.89   3.14   3.60
 25           LS     0    85.8     10     Curve No. Method.
 26           UK   100     .05    .25    100
 27           RK  2200   0.040   .045   .075   TRAP     10     10
 28           RK  4000    .033   .045    1.0   TRAP     25     10

 29           KK   RO51
 30           KM       ROUTE SUB50 TO CO51
 31           RS     1    FLOW     -1
 32           RC   .05    .035    .05   1500   .035
 33           RX     0       5     80     85    115    120    195    200
 34           RY     4       2    1.5      0      0    1.5      2      4

 35           KK   SUB54
 36           KM       COMPUTE HYDROGRAPH
 37           BA  0.177
 38           LS     0      86     10
 39           UK   100     .05    .25    100
 40           RK  1700    .032   .045   .035   TRAP     10     10
 41           RK  2900    .037   .045    1.0   TRAP     15     10

 42           KK   CO51
 43           KM       COMBINE SUB 50 AND SUB 54
 44           HC     2
```

Appendix D.6
Hydrologic Calculations

```
1*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991           *
*           VERSION 4.0.1E          *
*                                   *
* RUN DATE  12/30/99  TIME  14:07:18 *
*                                   *
*************************************
```

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

```
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         FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
   2           ID         FCD 99-14
   3           ID         BY JE FULLER/HYDROLOGY & GEOMORPHOLOGY, INC.
   4           ID         FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
   5           ID         DECEMBER 1999     FILENAME: GWM224.DAT
   6           ID    ******************************************************************
   7           ID         100 YEAR ANALYSIS 24-HOUR STORM USING JD RECORDS
   8           ID         MCUHP2 USED FOR UNIT HYDROGRAPHS
   9           ID   *******************************************************************
  10           ID     PRELIMINARY
  11           ID   DDM MCUHP2 GALLOWAY WASH FLOODPLAIN DELINEATION STUDY, FCD NO. 99-14
               *DIAGRAM
  12           IT       5 01DEC99    0005     400
  13           IO       5
  14           IN      15
  15           JD    4.80    0.01
  16           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
  17           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
  18           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
  19           PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
  20           PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
  21           PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
  22           PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
  23           PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
  24           PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
  25           PC    .983    .986    .989    .992    .995    .998   1.000
  26           JD    4.78       1
  27           JD    4.51   10.00
  28           JD    4.37   20.00
  29           JD    4.11   70.00
               *
               * DDM   ***** Updated *****

  30           KK  GWW1_1
  31           KM   BASIN GWW1_1
  32           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  33           KM    L=      4.6  Lca=      2.0   S=  196.1  Kn= .039  LAG=  48.4
  34           KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
  35           BA    2.55
  36           LG     .19     .25    5.30     .26    9.00
  37           UI    178.    178.    435.    760.   1042.   1288.   1519.   1641.   1701.   1658.
  38           UI   1545.   1299.   1089.    907.    762.    641.    524.    438.    363.    312.
  39           UI    272.    196.    188.    134.    122.    122.     78.     43.     43.     43.
  40           UI     43.     43.     43.     43.     43.      0.      0.      0.      0.      0.
  41           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
               *
               * DDM   ***** Preserved *****
```

```
 42          KK   RR282
 43          KM    STORAGE ROUTING AT CHARLES BLAIR MCDONALD DRIVE
 44          KM    FROM A-N WEST, INC., DETAILED DRAINAGE DESIGN REPORT FOR DESERT MOUNTAIN
 45          KM    PROPERTIES, PROPOSED DETENTION BASIN NO. S-1, JULY, 1995, REVISED MARCH 1996
 46          KM    Culvert is 6-12'x4' CBC with 2 unregulated boxes and 4 which are regulated
 47          KM    by 2-3'x2' orifices and front, and side weir inlets.  The orifice entrance
 48          KM    inverts are 2' above the invert of the 2 unregulated culverts.  The weir
1                                          HEC-1 INPUT                                          PAGE  2

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

 49          KM    inlet invert is approximately 11' above the invert of the 4 regulated
 50          KM    culvert openings.
 51          RS       1    STOR      -1
 52          SV       0    .097   0.992   3.428   7.831  14.433  18.672  23.649  29.425  36.060
 53          SV    43.2
 54          SQ       0     110     433     875    1157    1380    1489    1838    2386    3399
 55          SQ    4778
 56          SE  2656.5    2658    2660    2662    2664    2666    2667    2668    2669    2670
 57          SE    2671
             *
             * DDM    ***** Preserved *****

 58          KK  282286
 59          KM    ROUTING REACH FROM CP 282 TO 286 THROUGH SUBBASIN GWW1_3
 60          KM    SLOPE = (2650-2390)/11240
 61          RS       5    FLOW      -1
 62          RC   0.055   0.045   0.055   11240  0.0231
 63          RX       0       0     102     105     145     148     250     250
 64          RY     100     100    96.5      95      95    96.5     100     100
 65          RL                    0.70      95
             *
             * DDM    ***** Updated *****

 66          KK  GWW1_2
 67          KM   BASIN GWW1_2
 68          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 69          KM    L=      3.9  Lca=      1.9   S=  164.9  Kn= .039  LAG=  45.2
 70          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 71          BA    1.04
 72          LG     .20     .25    5.20     .28    2.00
 73          UI     78.     78.    228.    361.    493.    604.    690.    740.    739.    694.
 74          UI    597.    496.    405.    336.    278.    227.    186.    153.    128.    108.
 75          UI     82.     72.     53.     53.     43.     19.     19.     19.     19.     19.
 76          UI     19.     19.     19.      0.      0.      0.      0.      0.      0.      0.
 77          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM    ***** Preserved *****

 78          KK  284286
 79          KM    ROUTING REACH FROM CP 284 TO 286 THROUGH SUBBASIN GWW1_3
 80          KM    SLOPE = (2585-2390)/7590
 81          RS       3    FLOW      -1
 82          RC    0.05   0.045    0.05    7590  0.0257
 83          RX       0       0      40      42      97      99     139     139
 84          RY     100     100      96      95      95      96     100     100
 85          RL                    0.70      95
             *
             * DDM    ***** Updated *****

 86          KK  GWW1_3
 87          KM   BASIN GWW1_3
 88          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 89          KM    L=      2.8  Lca=      1.5   S=  137.8  Kn= .039  LAG=  37.8
 90          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 91          BA    1.52
1                                          HEC-1 INPUT                                          PAGE  3

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

 92          LG     .19     .25    5.60     .23    5.00
 93          UI    135.    201.    505.    785.   1033.   1207.   1296.   1254.   1111.    881.
 94          UI    699.    559.    442.    346.    275.    223.    174.    143.     98.     93.
 95          UI     72.     33.     33.     33.     33.     33.     33.      0.      0.      0.
 96          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM    ***** Preserved *****

 97          KK   CP286
 98          KM     COMBINE ROUTED FLOW FROM GWW1_1 AND GWW1_2 WITH RUNOFF FROM SUBBASIN GWW1_3
 99          HC       3
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                *
                * DDM   ***** Preserved *****

 100            KK  286287
 101            KM    ROUTING REACH FROM CP 286 TO 287 THROUGH SUBBASIN GWW1_4
 102            KM    SLOPE = (2390-2300)/4410
 103            RS       2    FLOW      -1
 104            RC    0.05   0.045    0.05    4410  0.0204
 105            RX       0       0      90      92     157     159     249     249
 106            RY     100     100      97      95      95      97     100     100
 107            RL                    0.70      95
                *
                * DDM   ***** Updated *****

 108            KK  GWW1_4
 109            KM   BASIN GWW1_4
 110            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 111            KM    L=       3.6  Lca=       2.1   S=  274.7  Kn= .040  LAG=  43.0
 112            KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 113            BA    1.00
 114            LG     .20     .25    5.80     .20    1.00
 115            UI     79.     82.    253.    389.    523.    646.    717.    753.    730.    668.
 116            UI    544.    443.    365.    298.    241.    196.    159.    133.    111.     83.
 117            UI     72.     54.     54.     36.     19.     19.     19.     19.     19.     19.
 118            UI     19.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 119            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *
                * DDM   ***** Preserved *****

 120            KK   CP287
 121            KM    COMBINE ROUTED FLOW FROM CP286 WITH RUNOFF FROM SUBBASIN GWW1_4
 122            HC       2
                *
                * DDM   ***** Preserved *****

 123            KK  287288
 124            KM    ROUTING REACH FROM CP 287 TO 288 THROUGH SUBBASIN GWW1_6
 125            KM    SLOPE = (2300-2260)/1370
 126            RS       1    FLOW      -1
 127            RC    0.05    0.04    0.05    1370  0.0292
 128            RX       0       0     125     127     227     229     354     354
 129            RY     100     100      95    93.5    93.5      95     100     100
 130            RL                    0.70    93.5
                *
                * DDM   ***** Updated *****
1                                   HEC-1 INPUT                                          PAGE  4

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

 131            KK  GWW1_5
 132            KM   BASIN GWW1_5
 133            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 134            KM    L=       3.6  Lca=       1.9   S=  112.6  Kn= .034  LAG=  41.2
 135            KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 136            BA     .98
 137            LG     .16     .23    6.20     .19   24.00
 138            UI     80.     96.    268.    423.    556.    685.    749.    770.    727.    626.
 139            UI    511.    410.    335.    268.    219.    171.    144.    121.     85.     77.
 140            UI     55.     55.     38.     20.     20.     20.     20.     20.     20.     20.
 141            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 142            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *
                * DDM   ***** Preserved *****

 143            KK   CP288
 144            KM     COMBINE ROUTED FLOW FROM CP287 WITH RUNOFF FROM SUBBASIN GWW1_5
 145            HC       2
                *
                * DDM   ***** Updated *****

 146            KK  GWW1_6
 147            KM   BASIN GWW1_6
 148            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 149            KM    L=       2.6  Lca=       1.3   S=  164.8  Kn= .040  LAG=  34.8
 150            KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 151            BA     .59
 152            LG     .20     .25    5.30     .24     .00
 153            UI     57.    100.    240.    366.    473.    534.    545.    500.    398.    309.
 154            UI    243.    188.    144.    114.     90.     65.     54.     39.     39.     14.
 155            UI     14.     14.     14.     14.     14.      0.      0.      0.      0.      0.
```

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156          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM   ***** Preserved *****

157          KK   CP290
158          KM     COMBINE RUNOFF FROM SUBBASIN GWW1_6 WITH ROUTED FLOW FROM CP288
159          HC       2
160          ZW      C=FLOW
             *
             * DDM   ***** Preserved *****

161          KK  290295
162          KM    ROUTING REACH FROM CP290 TO CP295 THROUGH SUBBASIN GWW3_1
163          KM    SLOPE = (2230-2170)/2620
164          RS       1    FLOW      -1
165          RC    0.05   0.035    0.05    2620  0.0229
166          RX       0       0      80      82     162     164     244     244
167          RY     100     100      92      90      90      92     100     100
168          RL                    0.70      90
             *
             * DDM   ***** Updated *****
1                                    HEC-1 INPUT                                                    PAGE  5

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

169          KK    GVW2
170          KM   BASIN GVW2
171          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
172          KM    L=      5.5  Lca=      2.8   S=  371.1  Kn= .043  LAG=  56.7
173          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
174          BA    6.02
175          LG     .20     .23    6.20     .18   12.00
176          UI    358.    358.    620.   1194.   1689.   2184.   2513.   2794.   3334.   4259.
177          UI   3145.   2434.   2157.   1998.   1821.   1680.   1506.   1395.   1202.   1046.
178          UI    917.    857.    807.    748.    594.    539.    457.    435.    392.    392.
179          UI    280.    274.    274.    220.    175.    175.    175.    175.    152.     69.
180          UI     69.     69.     69.     69.     69.     69.     69.     69.     69.     69.
181          UI     69.     69.      0.      0.      0.      0.      0.      0.      0.      0.
182          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
183          ZW     C=FLOW
             *
             * KK280295
             * KM      REACH EXTENDS FROM X-SECT.    320.000 TO X-SECT.   2460.000
             * RS     4    FLOW      -1
             * SV     0     171     227     254     299
             * SQ     0    4265    6389    7470    9393
             * DDM   ***** Preserved *****

184          KK  280295
185          KM    Normal depth channel route from CP280 to CP295 through subbasin GVW3_1
186          KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
187          KM               Hydrology Field Reconnaissance, page 12
188          KM               slope and length revised by JEF
189          KM    SLOPE = (2515-2170)/13560
190          RS       5    FLOW      -1
191          RC   0.080   0.050   0.070   13560  0.0254
192          RX  1000.0  1020.0  1040.0  1040.1  1202.9  1203.0  1223.0  1243.0
193          RY   110.0   100.0    90.0    90.0    90.0    90.0   100.0   110.0
194          RL                    0.80    90.0
             *
             * DDM   ***** Updated *****

195          KK  GVW3_1
196          KM   BASIN GVW3_1
197          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
198          KM    L=      3.3  Lca=      1.5   S=  184.3  Kn= .043  LAG=  42.3
199          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
200          BA    1.04
201          LG     .20     .25    5.20     .26     .00
202          UI     83.     91.    271.    421.    558.    695.    764.    796.    765.    683.
203          UI    556.    453.    368.    301.    242.    196.    160.    132.    105.     88.
204          UI     65.     57.     57.     24.     20.     20.     20.     20.     20.     20.
205          UI     20.      0.      0.      0.      0.      0.      0.      0.      0.      0.
206          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM   ***** Preserved *****
1                                    HEC-1 INPUT                                                    PAGE  6

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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```
 207          KK   CP295
 208          KM    COMBINE SUBBASIN RUNOFF FROM GVW3_1 WITH ROUTED FLOWS FROM
 209          KM    CP280 AND CP290
 210          HC       3
              *
              * DDM    ***** Preserved *****

 211          KK  295300
 212          KM   Normal depth channel route from CP295 to CP300 through subbasin GWW3_2
 213          KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
 214          KM               Hydrology Field Reconnaissance, page 10
 215          KM               Elevations were adjusted up 0.3' from field book
 216          KM               slope and length revised by JEF
 217          KM    SLOPE = (2170-2100)/2895
 218          RS       1    FLOW      -1
 219          RC   0.050   0.035   0.050    2895  0.0242
 220          RX       0       0      60      64     139     143     203     203
 221          RY     100     100      95      91      91      95     100     100
 222          RL                    0.60      91
              * DDM    ***** Updated *****

 223          KK    GVW1
 224          KM   BASIN GVW1
 225          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 226          KM    L=       6.2  Lca=       3.6   S=  298.9  Kn= .045  LAG=  71.1
 227          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 228          BA    4.90
 229          LG     .20      .17    6.80     .13   17.00
 230          UI    232.     232.    232.    550.    799.   1029.   1368.   1513.   1688.   1830.
 231          UI   2103.    2570.   2677.   1797.   1567.   1414.   1338.   1241.   1155.   1088.
 232          UI    997.     924.    851.    762.    677.    606.    568.    540.    514.    486.
 233          UI    397.     382.    308.    297.    284.    254.    254.    230.    178.    178.
 234          UI    178.     175.    114.    114.    114.    114.    114.    114.     88.     45.
 235          UI     45.      45.     45.     45.     45.     45.     45.     45.     45.     45.
 236          UI     45.      45.     45.     45.     45.      0.      0.      0.      0.      0.
 237          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
 238          ZW     C=FLOW
              *
              * DDM    ***** Preserved *****

 239          KK  270300
 240          KM     Normal depth channel route from CP270 to CP300 through subbasin GVW3_2
 241          KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
 242          KM               Hydrology Field Reconnaissance, page 13
 243          KM               slope and length revised by JEF
 244          KM    SLOPE = (2450-2100)/12750
 245          RS       8    FLOW      -1
 246          RC   0.100   0.030   0.100   12750  0.0275
 247          RX  1000.0  1015.0  1095.0  1095.5  1128.5  1129.0  1209.0  1224.0
 248          RY   104.0    94.0    93.0    90.0    90.0    93.0    94.0   104.0
 249          RL                    0.95    90.0
 250          ZW       C=FLOW
              * DDM    ***** Updated *****
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```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 251          KK  GVW3_2
 252          KM   BASIN GVW3_2
 253          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 254          KM    L=       2.4  Lca=       1.3   S=  144.6  Kn= .043  LAG=  36.8
 255          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 256          BA     .97
 257          LG     .20      .25    5.30     .24     .00
 258          UI     89.     140.    344.    535.    695.    808.    852.    813.    691.    548.
 259          UI    431.     342.    267.    211.    167.    136.     96.     82.     61.     61.
 260          UI     26.      22.     22.     22.     22.     22.     22.      0.      0.      0.
 261          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
              *
              * DDM    ***** Preserved *****

 262          KK   CP300
 263          KM    COMBINE SUBBASIN RUNOFF FROM GVW3_2 WITH ROUTED FLOWS FROM
 264          KM    CP295 AND CP270
 265          HC       3
              *
              * DDM    ***** Preserved *****

 266          KK  300310
```

```
267          KM    Normal depth channel route from CP300 to CP310.
268          KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
269          KM               Hydrology Field Reconnaissance, page 9
270          KM               slope and length revised by JEF
271          KM    SLOPE = (2100-2025)/4080
272          RS       2    FLOW      -1
273          RC   0.085   0.040   0.085    4080  0.0184
274          RX       0       0     105     114     149     158     263     263
275          RY     100     100      93    90.0    90.0      93     100     100
276          RL                    0.95    90.0
             *
             * DDM    ***** Updated *****

277          KK  GVW3_3
278          KM   BASIN GVW3_3
279          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
280          KM    L=       1.9  Lca=        .9   S=  135.6  Kn= .040  LAG=  28.2
281          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
282          BA     .34
283          LG     .20     .25    6.00     .19    2.00
284          UI     41.    105.    224.    324.    380.    380.    319.    234.    172.    126.
285          UI     91.     69.     49.     36.     28.     17.     10.     10.     10.     10.
286          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
287          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM    ***** Preserved *****
```



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

288          KK   CP310
289          KM    COMBINE SUBBASIN RUNOFF FROM GVW3_3 WITH ROUTED FLOWS FROM CP300
290          KM     TOTAL FLOW IN GALLOWAY WASH AT ITS CONFLUENCE WITH CAVE CREEK
291          HC       2
292          ZW      C=FLOW
             *
293          ZZ
```

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

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

   30      GWW1_1
                V
                V
   42       RR282
                V
                V
   58      282286
                .
                .
   66           .      GWW1_2
                .           V
                .           V
   78           .      284286
                .           .
                .           .
   86           .           .      GWW1_3
                .           .           .
                .           .           .
   97       CP286.......................
                V
                V
  100      286287
                .
                .
  108           .      GWW1_4
                .           .
                .           .
  120       CP287............
                V
                V
  123      287288
                .
                .
  131           .      GWW1_5
                .           .
                .           .
  143       CP288............
                .
                .
  146           .      GWW1_6
                .           .
                .           .
  157       CP290............
                V
                V
  161      290295
                .
                .
  169           .        GVW2
                .           V
                .           V
  184           .      280295
                .           .
                .           .
  195           .           .      GVW3_1
                .           .           .
                .           .           .
  207       CP295.......................
                V
                V
  211      295300
                .
                .
  223           .        GVW1
                .           V
                .           V
  239           .      270300
                .           .
                .           .
  251           .           .      GVW3_2
                .           .           .
                .           .           .
  262       CP300.......................
                V
                V
  266      300310
                .
                .
  277           .      GVW3_3
                .           .
                .           .
  288       CP310............

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
1*************************************                    *************************************
*                                   *                    *                                   *
*  FLOOD HYDROGRAPH PACKAGE (HEC-1) *                    *   U.S. ARMY CORPS OF ENGINEERS    *
*            MAY  1991              *                    *   HYDROLOGIC ENGINEERING CENTER   *
*          VERSION 4.0.1E           *                    *         609 SECOND STREET         *
*                                   *                    *      DAVIS, CALIFORNIA 95616      *
* RUN DATE 12/30/99  TIME 14:07:18  *                    *          (916) 551-1748           *
*                                   *                    *                                   *
*************************************                    *************************************
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FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
FCD 99-14
BY JE FULLER/HYDROLOGY & GEOMORPHOLOGY, INC.
FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DECEMBER 1999 FILENAME: GWM224.DAT

****

100 YEAR ANALYSIS 24-HOUR STORM USING JD RECORDS
MCUHP2 USED FOR UNIT HYDROGRAPHS

****

PRELIMINARY
DDM MCUHP2 GALLOWAY WASH FLOODPLAIN DELINEATION STUDY, FCD NO. 99-14

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

   IT          HYDROGRAPH TIME DATA
                      NMIN          5  MINUTES IN COMPUTATION INTERVAL
                     IDATE     1DEC99  STARTING DATE
                     ITIME       0005  STARTING TIME
                        NQ        400  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     2DEC99  ENDING DATE
                    NDTIME       0920  ENDING TIME
                     ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL    0.08 HOURS
                     TOTAL TIME BASE   33.25 HOURS

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

15 JD          INDEX STORM NO. 1
                      STRM       4.80  PRECIPITATION DEPTH
                      TRDA       0.01  TRANSPOSITION DRAINAGE AREA

16 PI            PRECIPITATION PATTERN
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                   0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                   0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                   0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

26 JD        INDEX STORM NO. 2
                STRM        4.78  PRECIPITATION DEPTH
                TRDA        1.00  TRANSPOSITION DRAINAGE AREA

 0 PI         PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

27 JD        INDEX STORM NO. 3
                STRM        4.51  PRECIPITATION DEPTH
                TRDA       10.00  TRANSPOSITION DRAINAGE AREA

 0 PI         PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

28 JD        INDEX STORM NO. 4
                STRM        4.37  PRECIPITATION DEPTH
                TRDA       20.00  TRANSPOSITION DRAINAGE AREA

 0 PI         PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
 29 JD        INDEX STORM NO. 5
                  STRM        4.11  PRECIPITATION DEPTH
                  TRDA       70.00  TRANSPOSITION DRAINAGE AREA

  0 PI          PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
   -----DSS---ZOPEN:  Existing File Opened,  File: GWM224.DSS
                      Unit:  71;  DSS Version: 6-FT
-----DSS---ZWRITE Unit  71; Vers.   18:  //CP290/FLOW/01DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.   18:  //CP290/FLOW/02DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.   18:  //GVW2/FLOW/01DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.   18:  //GVW2/FLOW/02DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.   18:  //GVW1/FLOW/01DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.   18:  //GVW1/FLOW/02DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.   18:  //270300/FLOW/01DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.   18:  //270300/FLOW/02DEC1999/5MIN//

WARNING --- ROUTED OUTFLOW (  15416.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  15476.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  15304.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  15437.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE
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WARNING --- ROUTED OUTFLOW (  15385.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  15329.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  15383.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  15348.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  15293.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE
-----DSS---ZWRITE Unit  71; Vers.   18:  //CP310/FLOW/01DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.   18:  //CP310/FLOW/02DEC1999/5MIN//
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OF STAGE +	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME MAX
+	HYDROGRAPH AT	GWW1_1	2571.	12.58	481.	129.	93.	2.55		
+	ROUTED TO	RR282	2407.	12.67	481.	129.	93.	2.55		
+	ROUTED TO	282286	2192.	13.08	472.	121.	87.	2.55		
+	HYDROGRAPH AT	GWW1_2	1110.	12.50	186.	47.	34.	1.04		
+	ROUTED TO	284286	1051.	12.67	180.	45.	32.	1.04		
+	HYDROGRAPH AT	GWW1_3	1916.	12.42	287.	75.	54.	1.52		
+	3 COMBINED AT	CP286	3637.	12.67	904.	232.	167.	5.11		
+	ROUTED TO	286287	3614.	12.83	899.	227.	164.	5.11		
+	HYDROGRAPH AT	GWW1_4	1170.	12.50	192.	48.	35.	1.00		
+	2 COMBINED AT	CP287	4466.	12.67	1072.	271.	196.	6.11		
+	ROUTED TO	287288	4449.	12.67	1070.	269.	195.	6.11		
+	HYDROGRAPH AT	GWW1_5	1258.	12.42	231.	67.	48.	0.98		
+	2 COMBINED AT	CP288	5421.	12.67	1279.	330.	239.	7.09		
+	HYDROGRAPH AT	GWW1_6	794.	12.33	108.	27.	19.	0.59		
+	2 COMBINED AT	CP290	5944.	12.58	1375.	355.	256.	7.68		
+	ROUTED TO	290295	5902.	12.67	1371.	351.	253.	7.68		
+	HYDROGRAPH AT	GVW2	5492.	12.67	1225.	332.	240.	6.02		
+	ROUTED TO	280295	5107.	12.92	1183.	298.	215.	6.02		
+	HYDROGRAPH AT	GVW3_1	1178.	12.50	186.	46.	34.	1.04		
+	3 COMBINED AT	CP295	10908.	12.75	2621.	665.	480.	14.74		
+	ROUTED TO	295300	10847.	12.75	2618.	662.	478.	14.74		
+	HYDROGRAPH AT	GVW1	4141.	12.83	1148.	318.	230.	4.90		
+	ROUTED TO	270300	3846.	13.17	1136.	308.	223.	4.90		
+	HYDROGRAPH AT	GVW3_2	1248.	12.42	177.	44.	32.	0.97		

```
        3 COMBINED AT
+                       CP300     13664.   12.83        3772.        973.        703.      20.61

        ROUTED TO
+                      300310     13596.   12.92        3766.        969.        700.      20.61

        HYDROGRAPH AT
+                      GVW3_3       551.   12.25          67.         17.         12.       0.34

        2 COMBINED AT
+                       CP310     13668.   12.92        3819.        983.        710.      20.95


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


    -----DSS---ZCLOSE Unit:  71,   File: GWM224.DSS
              Pointer Utilization:  0.25
              Number of Records:     20
              File Size:     45.8  Kbytes
              Percent Inactive:   0.0
```

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY  1991               *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/30/99  TIME  14:04:29  *
*                                      *
****************************************
```

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

```
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         FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
    2          ID         FCD 99-14
    3          ID         BY JE FULLER/HYDROLOGY & GEOMORPHOLOGY, INC.
    4          ID         FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
    5          ID         DECEMBER 1999     FILENAME: GWM26.DAT
    6          ID    ****************************************************************
    7          ID         100 YEAR ANALYSIS 6-HOUR STORM USING JD RECORDS
    8          ID         MCUHP2 USED FOR UNIT HYDROGRAPHS
    9          ID   ******************************************************************
   10          ID     PRELIMINARY
   11          ID   DDM MCUHP2 GALLOWAY WASH FLOODPLAIN DELINEATION STUDY, FCD NO. 99-14
               *DIAGRAM
   12          IT       5 01DEC99    0005     400
   13          IO       5
   14          IN      15
   15          JD    3.50    0.01
   16          PC    .000    .008    .016    .025    .033    .041    .050    .058    .066    .074
   17          PC    .087    .099    .118    .138    .216    .377    .834    .911    .931    .950
   18          PC    .962    .972    .983    .991   1.000
   19          JD    3.48    0.50
   20          JD    3.43    2.80
   21          PC    .000    .009    .016    .025    .034    .042    .051    .059    .067    .076
   22          PC    .087    .100    .120    .163    .252    .451    .694    .837    .900    .938
   23          PC    .950    .963    .975    .988   1.000
   24          JD    3.23    16.0
   25          PC    .000    .015    .020    .030    .048    .063    .076    .090    .105    .119
   26          PC    .135    .152    .175    .222    .304    .472    .670    .796    .868    .912
   27          PC    .946    .960    .973    .987   1.000
   28          JD    2.84    90.0
   29          PC    .000    .021    .035    .051    .071    .087    .105    .125    .143    .160
   30          PC    .179    .201    .232    .281    .364    .500    .658    .773    .841    .888
   31          PC    .927    .945    .964    .982   1.000
               *
               * DDM   ***** Updated *****

   32          KK  GWW1_1
   33          KM   BASIN GWW1_1
   34          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
   35          KM    L=      4.6  Lca=      2.0   S=  196.1  Kn= .039  LAG=  48.4
   36          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
   37          BA    2.55
   38          LG     .19     .25    5.30     .26    9.00
   39          UI    178.    178.    435.    760.   1042.   1288.   1519.   1641.   1701.   1658.
   40          UI   1545.   1299.   1089.    907.    762.    641.    524.    438.    363.    312.
   41          UI    272.    196.    188.    134.    122.    122.     78.     43.     43.     43.
   42          UI     43.     43.     43.     43.     43.      0.      0.      0.      0.      0.
   43          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
               *
```

```
                 * DDM    ***** Preserved *****
1                                    HEC-1 INPUT                                                    PAGE  2

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

  44             KK   RR282
  45             KM    STORAGE ROUTING AT CHARLES BLAIR MCDONALD DRIVE
  46             KM    FROM A-N WEST, INC., DETAILED DRAINAGE DESIGN REPORT FOR DESERT MOUNTAIN
  47             KM    PROPERTIES, PROPOSED DETENTION BASIN NO. S-1, JULY, 1995, REVISED MARCH 1996
  48             KM    Culvert is 6-12'x4' CBC with 2 unregulated boxes and 4 which are regulated
  49             KM    by 2-3'x2' orifices and front, and side weir inlets.  The orifice entrance
  50             KM    inverts are 2' above the invert of the 2 unregulated culverts.  The weir
  51             KM    inlet invert is approximately 11' above the invert of the 4 regulated
  52             KM    culvert openings.
  53             RS       1    STOR      -1
  54             SV       0    .097   0.992   3.428   7.831  14.433  18.672  23.649  29.425  36.060
  55             SV    43.2
  56             SQ       0     110     433     875    1157    1380    1489    1838    2386    3399
  57             SQ    4778
  58             SE  2656.5    2658    2660    2662    2664    2666    2667    2668    2669    2670
  59             SE    2671
                 *
                 * DDM    ***** Preserved *****

  60             KK  282286
  61             KM    ROUTING REACH FROM CP 282 TO 286 THROUGH SUBBASIN GWW1_3
  62             KM    SLOPE = (2650-2390)/11240
  63             RS       5    FLOW      -1
  64             RC   0.055   0.045   0.055   11240  0.0231
  65             RX       0       0     102     105     145     148     250     250
  66             RY     100     100    96.5      95      95    96.5     100     100
  67             RL                    0.70      95
                 *
                 * DDM    ***** Updated *****

  68             KK  GWW1_2
  69             KM   BASIN GWW1_2
  70             KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  71             KM    L=      3.9  Lca=      1.9   S=  164.9  Kn= .039  LAG=  45.2
  72             KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
  73             BA    1.04
  74             LG     .20     .25    5.20     .28    2.00
  75             UI     78.     78.    228.    361.    493.    604.    690.    740.    739.    694.
  76             UI    597.    496.    405.    336.    278.    227.    186.    153.    128.    108.
  77             UI     82.     72.     53.     53.     43.     19.     19.     19.     19.     19.
  78             UI     19.     19.     19.      0.      0.      0.      0.      0.      0.      0.
  79             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                 *
                 * DDM    ***** Preserved *****

  80             KK  284286
  81             KM    ROUTING REACH FROM CP 284 TO 286 THROUGH SUBBASIN GWW1_3
  82             KM    SLOPE = (2585-2390)/7590
  83             RS       3    FLOW      -1
  84             RC    0.05   0.045    0.05    7590  0.0257
  85             RX       0       0      40      42      97      99     139     139
  86             RY     100     100      96      95      95      96     100     100
  87             RL                    0.70      95
                 *
                 * DDM    ***** Updated *****
1                                    HEC-1 INPUT                                                    PAGE  3

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

  88             KK  GWW1_3
  89             KM   BASIN GWW1_3
  90             KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  91             KM    L=      2.8  Lca=      1.5   S=  137.8  Kn= .039  LAG=  37.8
  92             KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
  93             BA    1.52
  94             LG     .19     .25    5.60     .23    5.00
  95             UI    135.    201.    505.    785.   1033.   1207.   1296.   1254.   1111.    881.
  96             UI    699.    559.    442.    346.    275.    223.    174.    143.     98.     93.
  97             UI     72.     33.     33.     33.     33.     33.     33.      0.      0.      0.
  98             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                 *
                 * DDM    ***** Preserved *****

  99             KK   CP286
```

```
 100          KM     COMBINE ROUTED FLOW FROM GWW1_1 AND GWW1_2 WITH RUNOFF FROM SUBBASIN GWW1_3
 101          HC       3
              *
              * DDM   ***** Preserved *****

 102          KK  286287
 103          KM    ROUTING REACH FROM CP 286 TO 287 THROUGH SUBBASIN GWW1_4
 104          KM    SLOPE = (2390-2300)/4410
 105          RS       2    FLOW      -1
 106          RC    0.05   0.045    0.05    4410  0.0204
 107          RX       0       0      90      92     157     159     249     249
 108          RY     100     100      97      95      95      97     100     100
 109          RL                    0.70      95
              *
              * DDM   ***** Updated *****

 110          KK  GWW1_4
 111          KM   BASIN GWW1_4
 112          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 113          KM    L=       3.6  Lca=       2.1   S=  274.7  Kn= .040  LAG=  43.0
 114          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 115          BA    1.00
 116          LG     .20     .25    5.80     .20    1.00
 117          UI     79.     82.    253.    389.    523.    646.    717.    753.    730.    668.
 118          UI    544.    443.    365.    298.    241.    196.    159.    133.    111.     83.
 119          UI     72.     54.     54.     36.     19.     19.     19.     19.     19.     19.
 120          UI     19.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 121          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *
              * DDM   ***** Preserved *****

 122          KK   CP287
 123          KM    COMBINE ROUTED FLOW FROM CP286 WITH RUNOFF FROM SUBBASIN GWW1_4
 124          HC       2
              *
              * DDM   ***** Preserved *****
```



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

 125          KK  287288
 126          KM    ROUTING REACH FROM CP 287 TO 288 THROUGH SUBBASIN GWW1_6
 127          KM    SLOPE = (2300-2260)/1370
 128          RS       1    FLOW      -1
 129          RC    0.05    0.04    0.05    1370  0.0292
 130          RX       0       0     125     127     227     229     354     354
 131          RY     100     100      95    93.5    93.5      95     100     100
 132          RL                    0.70    93.5
              *
              * DDM   ***** Updated *****

 133          KK  GWW1_5
 134          KM   BASIN GWW1_5
 135          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 136          KM    L=       3.6  Lca=       1.9   S=  112.6  Kn= .034  LAG=  41.2
 137          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 138          BA     .98
 139          LG     .16     .23    6.20     .19   24.00
 140          UI     80.     96.    268.    423.    556.    685.    749.    770.    727.    626.
 141          UI    511.    410.    335.    268.    219.    171.    144.    121.     85.     77.
 142          UI     55.     55.     38.     20.     20.     20.     20.     20.     20.     20.
 143          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 144          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *
              * DDM   ***** Preserved *****

 145          KK   CP288
 146          KM     COMBINE ROUTED FLOW FROM CP287 WITH RUNOFF FROM SUBBASIN GWW1_5
 147          HC       2
              *
              * DDM   ***** Updated *****

 148          KK  GWW1_6
 149          KM   BASIN GWW1_6
 150          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 151          KM    L=       2.6  Lca=       1.3   S=  164.8  Kn= .040  LAG=  34.8
 152          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 153          BA     .59
 154          LG     .20     .25    5.30     .24     .00
 155          UI     57.    100.    240.    366.    473.    534.    545.    500.    398.    309.
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 156          UI    243.    188.    144.    114.     90.     65.     54.     39.     39.     14.
 157          UI     14.     14.     14.     14.     14.      0.      0.      0.      0.      0.
 158          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *
              * DDM   ***** Preserved *****

 159          KK   CP290
 160          KM     COMBINE RUNOFF FROM SUBBASIN GWW1_6 WITH ROUTED FLOW FROM CP288
 161          HC       2
 162          ZW      C=FLOW
              *
              * DDM   ***** Preserved *****
1                                          HEC-1 INPUT                                          PAGE  5

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


 163          KK  290295
 164          KM    ROUTING REACH FROM CP290 TO CP295 THROUGH SUBBASIN GWW3_1
 165          KM    SLOPE = (2230-2170)/2620
 166          RS       1    FLOW      -1
 167          RC    0.05   0.035    0.05    2620  0.0229
 168          RX       0       0      80      82     162     164     244     244
 169          RY     100     100      92      90      90      92     100     100
 170          RL                    0.70      90
              *
              * DDM   ***** Updated *****

 171          KK    GVW2
 172          KM   BASIN GVW2
 173          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 174          KM    L=       5.5  Lca=       2.8   S=  371.1  Kn= .043  LAG=  56.7
 175          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 176          BA    6.02
 177          LG     .20     .23    6.20     .18   12.00
 178          UI    358.    358.    620.   1194.   1689.   2184.   2513.   2794.   3334.   4259.
 179          UI   3145.   2434.   2157.   1998.   1821.   1680.   1506.   1395.   1202.   1046.
 180          UI    917.    857.    807.    748.    594.    539.    457.    435.    392.    392.
 181          UI    280.    274.    274.    220.    175.    175.    175.    175.    152.     69.
 182          UI     69.     69.     69.     69.     69.     69.     69.     69.     69.     69.
 183          UI     69.     69.      0.      0.      0.      0.      0.      0.      0.      0.
 184          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 185          ZW     C=FLOW
              *
              * KK280295
              * KM      REACH EXTENDS FROM X-SECT.    320.000 TO X-SECT.   2460.000
              * RS     4    FLOW      -1
              * SV     0     171     227     254     299
              * SQ     0    4265    6389    7470    9393
              * DDM   ***** Preserved *****

 186          KK  280295
 187          KM    Normal depth channel route from CP280 to CP295 through subbasin GVW3_1
 188          KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
 189          KM               Hydrology Field Reconnaissance, page 12
 190          KM               slope and length revised by JEF
 191          KM    SLOPE = (2515-2170)/13560
 192          RS       5    FLOW      -1
 193          RC   0.080   0.050   0.070   13560  0.0254
 194          RX  1000.0  1020.0  1040.0  1040.1  1202.9  1203.0  1223.0  1243.0
 195          RY   110.0   100.0    90.0    90.0    90.0    90.0   100.0   110.0
 196          RL                    0.80    90.0
              *
              * DDM   ***** Updated *****

 197          KK  GVW3_1
 198          KM   BASIN GVW3_1
 199          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 200          KM    L=       3.3  Lca=       1.5   S=  184.3  Kn= .043  LAG=  42.3
 201          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 202          BA    1.04
1                                          HEC-1 INPUT                                          PAGE  6

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

 203          LG     .20     .25    5.20     .26     .00
 204          UI     83.     91.    271.    421.    558.    695.    764.    796.    765.    683.
 205          UI    556.    453.    368.    301.    242.    196.    160.    132.    105.     88.
 206          UI     65.     57.     57.     24.     20.     20.     20.     20.     20.     20.
 207          UI     20.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 208          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```

```
                *
                * DDM    ***** Preserved *****

 209            KK   CP295
 210            KM    COMBINE SUBBASIN RUNOFF FROM GVW3_1 WITH ROUTED FLOWS FROM
 211            KM    CP280 AND CP290
 212            HC       3
                *
                * DDM    ***** Preserved *****

 213            KK  295300
 214            KM   Normal depth channel route from CP295 to CP300 through subbasin GWW3_2
 215            KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
 216            KM               Hydrology Field Reconnaissance, page 10
 217            KM               Elevations were adjusted up 0.3' from field book
 218            KM               slope and length revised by JEF
 219            KM    SLOPE = (2170-2100)/2895
 220            RS       1    FLOW      -1
 221            RC   0.050   0.035   0.050    2895  0.0242
 222            RX       0       0      60      64     139     143     203     203
 223            RY     100     100      95      91      91      95     100     100
 224            RL                    0.60      91
                * DDM    ***** Updated *****

 225            KK    GVW1
 226            KM   BASIN GVW1
 227            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 228            KM    L=      6.2  Lca=      3.6   S=  298.9  Kn= .045  LAG=  71.1
 229            KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 230            BA    4.90
 231            LG     .20     .17    6.80     .13   17.00
 232            UI    232.    232.    232.    550.    799.   1029.   1368.   1513.   1688.   1830.
 233            UI   2103.   2570.   2677.   1797.   1567.   1414.   1338.   1241.   1155.   1088.
 234            UI    997.    924.    851.    762.    677.    606.    568.    540.    514.    486.
 235            UI    397.    382.    308.    297.    284.    254.    254.    230.    178.    178.
 236            UI    178.    175.    114.    114.    114.    114.    114.    114.     88.     45.
 237            UI     45.     45.     45.     45.     45.     45.     45.     45.     45.     45.
 238            UI     45.     45.     45.     45.     45.      0.      0.      0.      0.      0.
 239            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 240            ZW     C=FLOW
                *
                * DDM    ***** Preserved *****

 241            KK  270300
 242            KM     Normal depth channel route from CP270 to CP300 through subbasin GVW3_2
 243            KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
 244            KM               Hydrology Field Reconnaissance, page 13
 245            KM               slope and length revised by JEF
 246            KM    SLOPE = (2450-2100)/12750
1                                          HEC-1 INPUT                                                    PAGE  7

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

 247            RS       8    FLOW      -1
 248            RC   0.100   0.030   0.100   12750  0.0275
 249            RX  1000.0  1015.0  1095.0  1095.5  1128.5  1129.0  1209.0  1224.0
 250            RY   104.0    94.0    93.0    90.0    90.0    93.0    94.0   104.0
 251            RL                   0.95    90.0
 252            ZW       C=FLOW
                * DDM    ***** Updated *****

 253            KK  GVW3_2
 254            KM   BASIN GVW3_2
 255            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 256            KM    L=      2.4  Lca=      1.3   S=  144.6  Kn= .043  LAG=  36.8
 257            KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 258            BA     .97
 259            LG     .20     .25    5.30     .24     .00
 260            UI     89.    140.    344.    535.    695.    808.    852.    813.    691.    548.
 261            UI    431.    342.    267.    211.    167.    136.     96.     82.     61.     61.
 262            UI     26.     22.     22.     22.     22.     22.     22.      0.      0.      0.
 263            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *
                * DDM    ***** Preserved *****

 264            KK   CP300
 265            KM    COMBINE SUBBASIN RUNOFF FROM GVW3_2 WITH ROUTED FLOWS FROM
 266            KM    CP295 AND CP270
 267            HC       3
                *
                * DDM    ***** Preserved *****
```

```
268          KK  300310
269          KM    Normal depth channel route from CP300 to CP310.
270          KM      Source:  modified from GVSCE (1997) HEC-1 for FCD 95-28
271          KM               Hydrology Field Reconnaissance, page 9
272          KM               slope and length revised by JEF
273          KM    SLOPE = (2100-2025)/4080
274          RS       2    FLOW      -1
275          RC   0.085   0.040   0.085    4080  0.0184
276          RX       0       0     105     114     149     158     263     263
277          RY     100     100      93    90.0    90.0      93     100     100
278          RL                    0.95    90.0
             *
             * DDM   ***** Updated *****

279          KK  GVW3_3
280          KM   BASIN GVW3_3
281          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
282          KM    L=       1.9  Lca=        .9   S=  135.6  Kn= .040  LAG=  28.2
283          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
284          BA     .34
285          LG     .20      .25    6.00     .19    2.00
286          UI     41.     105.    224.    324.    380.    380.    319.    234.    172.    126.
287          UI     91.      69.     49.     36.     28.     17.     10.     10.     10.     10.
288          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
289          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM   ***** Preserved *****
```



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

290          KK   CP310
291          KM    COMBINE SUBBASIN RUNOFF FROM GVW3_3 WITH ROUTED FLOWS FROM CP300
292          KM     TOTAL FLOW IN GALLOWAY WASH AT ITS CONFLUENCE WITH CAVE CREEK
293          HC       2
294          ZW      C=FLOW
             *
295          ZZ
```

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

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

   32     GWW1_1
               V
               V
   44      RR282
               V
               V
   60     282286
               .
               .
   68           .      GWW1_2
                .           V
                .           V
   80           .      284286
                .           .
                .           .
   88           .           .      GWW1_3
                .           .           .
                .           .           .
   99      CP286.......................
               V
               V
  102     286287
               .
               .
  110           .      GWW1_4
                .           .
                .           .
  122      CP287............
               V
               V
  125     287288
               .
               .
  133           .      GWW1_5
                .           .
                .           .
  145      CP288............
               .
               .
  148           .      GWW1_6
                .           .
                .           .
  159      CP290............
               V
               V
  163     290295
               .
               .
  171           .        GVW2
                .           V
                .           V
  186           .      280295
                .           .
                .           .
  197           .           .      GVW3_1
                .           .           .
                .           .           .
  209      CP295.......................
               V
               V
  213     295300
               .
               .
  225           .        GVW1
                .           V
                .           V
  241           .      270300
                .           .
                .           .
  253           .           .      GVW3_2
                .           .           .
                .           .           .
  264      CP300.......................
               V
               V
  268     300310
               .
               .
  279           .      GVW3_3
                .           .
                .           .
  290      CP310............
(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY  1991               *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/30/99  TIME  14:04:29  *
*                                      *
****************************************
```

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

```
                    FLOODPLAIN DELINEATION STUDY OF ANDORA HILLS & GALLOWAY WASHES
                    FCD 99-14
                    BY JE FULLER/HYDROLOGY & GEOMORPHOLOGY, INC.
                    FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
                    DECEMBER 1999     FILENAME: GWM26.DAT
                 ******************************************************************
                    100 YEAR ANALYSIS 6-HOUR STORM USING JD RECORDS
                    MCUHP2 USED FOR UNIT HYDROGRAPHS
                 ******************************************************************
                  PRELIMINARY
                 DDM MCUHP2 GALLOWAY WASH FLOODPLAIN DELINEATION STUDY, FCD NO. 99-14

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

    IT        HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE     1DEC99  STARTING DATE
                    ITIME       0005  STARTING TIME
                       NQ        400  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE     2DEC99  ENDING DATE
                  NDTIME       0920  ENDING TIME
                   ICENT         19  CENTURY MARK

               COMPUTATION INTERVAL    0.08 HOURS
                    TOTAL TIME BASE   33.25 HOURS

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

 15 JD         INDEX STORM NO. 1
                     STRM        3.50  PRECIPITATION DEPTH
                     TRDA        0.01  TRANSPOSITION DRAINAGE AREA

 16 PI           PRECIPITATION PATTERN
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                   0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
                   0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00

 19 JD         INDEX STORM NO. 2
                     STRM        3.48  PRECIPITATION DEPTH
                     TRDA        0.50  TRANSPOSITION DRAINAGE AREA

  0 PI           PRECIPITATION PATTERN
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                   0.03      0.03      0.05      0.05      0.05      0.15      0.15      0.15      0.03      0.03
                   0.03      0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00
                   0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                   0.00      0.00

 20 JD         INDEX STORM NO. 3
                     STRM        3.43  PRECIPITATION DEPTH
                     TRDA        2.80  TRANSPOSITION DRAINAGE AREA
```

```
 21 PI            PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.01      0.01      0.01      0.01      0.01      0.01      0.03
                    0.03      0.03      0.07      0.07      0.07      0.08      0.08      0.08      0.05      0.05
                    0.05      0.02      0.02      0.02      0.01      0.01      0.01      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00

 24 JD          INDEX STORM NO. 4
                      STRM        3.23  PRECIPITATION DEPTH
                      TRDA       16.00  TRANSPOSITION DRAINAGE AREA

 25 PI            PRECIPITATION PATTERN
                    0.01      0.01      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01
                    0.01      0.01      0.00      0.01      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.01      0.00      0.00      0.00      0.00      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                    0.03      0.03      0.06      0.06      0.06      0.07      0.07      0.07      0.04      0.04
                    0.04      0.02      0.02      0.02      0.01      0.01      0.01      0.01      0.01      0.01
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00

 28 JD          INDEX STORM NO. 5
                      STRM        2.84  PRECIPITATION DEPTH
                      TRDA       90.00  TRANSPOSITION DRAINAGE AREA

 29 PI            PRECIPITATION PATTERN
                    0.01      0.01      0.01      0.00      0.00      0.00      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.03
                    0.03      0.03      0.05      0.05      0.05      0.05      0.05      0.05      0.04      0.04
                    0.04      0.02      0.02      0.02      0.02      0.02      0.02      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01
                    0.01      0.01
  -----DSS---ZOPEN:  Existing File Opened,  File: GWM26.DSS
                     Unit:  71;  DSS Version: 6-FT
-----DSS---ZWRITE Unit  71; Vers.    3:  //CP290/FLOW/01DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    3:  //CP290/FLOW/02DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    3:  //GVW2/FLOW/01DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    3:  //GVW2/FLOW/02DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    3:  //GVW1/FLOW/01DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    3:  //GVW1/FLOW/02DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    3:  //270300/FLOW/01DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    3:  //270300/FLOW/02DEC1999/5MIN//

WARNING --- ROUTED OUTFLOW (  16800.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  17703.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  18186.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  18295.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  17963.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  17242.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  16323.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  16008.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  17229.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  17929.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  18230.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  18124.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  17604.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  16788.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  15802.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  16660.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE
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WARNING --- ROUTED OUTFLOW (  17557.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  18034.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  18144.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  17819.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  17110.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  16203.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  15867.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  17086.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  17780.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  18079.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  17977.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  17465.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  16661.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (  15687.) IS GREATER THAN MAXIMUM OUTFLOW (  15278.) IN STORAGE-OUTFLOW TABLE
-----DSS---ZWRITE Unit  71; Vers.    3:  //CP310/FLOW/01DEC1999/5MIN//
-----DSS---ZWRITE Unit  71; Vers.    3:  //CP310/FLOW/02DEC1999/5MIN//
```

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

OF STAGE	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME MAX
+	HYDROGRAPH AT	GWW1_1	2427.	4.58	498.	125.	90.	2.55		
+	ROUTED TO	RR282	2287.	4.75	498.	125.	90.	2.55		
+	ROUTED TO	282286	2124.	5.08	488.	122.	88.	2.55		
+	HYDROGRAPH AT	GWW1_2	1155.	4.50	201.	50.	36.	1.04		
+	ROUTED TO	284286	1098.	4.67	195.	49.	35.	1.04		
+	HYDROGRAPH AT	GWW1_3	1876.	4.42	307.	77.	55.	1.52		
+	3 COMBINED AT	CP286	3397.	4.75	889.	223.	161.	5.11		
+	ROUTED TO	286287	3374.	4.92	883.	221.	160.	5.11		
+	HYDROGRAPH AT	GWW1_4	1229.	4.50	209.	52.	38.	1.00		
+	2 COMBINED AT	CP287	4017.	4.75	1042.	261.	188.	6.11		
+	ROUTED TO	287288	4005.	4.75	1040.	260.	188.	6.11		
+	HYDROGRAPH AT	GWW1_5	1345.	4.42	246.	62.	45.	0.98		
+	2 COMBINED AT	CP288	4768.	4.75	1231.	310.	224.	7.09		
+	HYDROGRAPH AT	GWW1_6	899.	4.33	123.	31.	22.	0.59		
+	2 COMBINED AT	CP290	5158.	4.67	1315.	331.	239.	7.68		
+	ROUTED TO	290295	5128.	4.75	1311.	329.	238.	7.68		
+	HYDROGRAPH AT	GVW2	4686.	4.67	1222.	309.	223.	6.02		
+	ROUTED TO	280295	4503.	4.92	1179.	295.	213.	6.02		
+	HYDROGRAPH AT	GVW3_1	1227.	4.50	202.	51.	36.	1.04		
+	3 COMBINED AT	CP295	9070.	4.83	2423.	609.	439.	14.74		
+	ROUTED TO	295300	9063.	4.83	2419.	607.	438.	14.74		
+	HYDROGRAPH AT	GVW1	3749.	4.83	1153.	295.	213.	4.90		
+	ROUTED TO	270300	3595.	5.25	1142.	290.	210.	4.90		
+	HYDROGRAPH AT	GVW3_2	1303.	4.42	194.	48.	35.	0.97		

```
        3 COMBINED AT
+                       CP300     11371.    4.92       3419.       864.       623.      20.61

        ROUTED TO
+                      300310     11318.    5.00       3413.       862.       622.      20.61

        HYDROGRAPH AT
+                      GVW3_3       643.    4.25         75.        19.        14.       0.34

        2 COMBINED AT
+                       CP310     11378.    5.00       3456.       872.       630.      20.95


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


-----DSS---ZCLOSE Unit:  71,   File: GWM26.DSS
           Pointer Utilization:  0.25
           Number of Records:     20
           File Size:     45.8  Kbytes
           Percent Inactive:   0.0
```