TECHNICAL DATA NOTEBOOK

VOLUME 1

CAVE CREEK BELOW CAREFREE HIGHWAY FIS

FLOODPLAIN DELINEATION STUDY

FOR

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

F.C.D. Contract No. 95-30

SECTIONS 1, 2, 3, 5, 6, 7, 8

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

Registered Professional Engineer (Civil)
CERTIFICATE NO.
13248
EILEEN M.
ABBOTT
Date Signed
ARIZONA, U.S.A.

Prepared for:

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

Prepared by:

WILLDAN ASSOCIATES
1717 W. Northern Avenue, Suite 112
Phoenix, Arizona 85021
(602) 870-7600

June 23, 1997

Project No. 08855-1008

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June 23, 1997

Project No. 08855-1008

STUDY DOCUMENTATION							
INITIAL STUDY		RESTUDY	X	LOMR		OTHER	

SECTION 1: GENERAL INFORMATION

1A	COMMUNITY	Unincorporated Areas, Maricopa County City of Phoenix Town of Cave Creek
1B	COMMUNITY NUMBER	040037 Unincorporated Areas, Maricopa Co. 040051 City of Phoenix 040129 Town of Cave Creek
1C	COUNTY	Maricopa
1D	STATE	Arizona
1E	STUDY CONTRACTOR	Willdan Associates
1F	CONTACTS	Eileen M. Abbott, P.E. Dave Anderson, P.E.
	ADDRESS	1717 W. Northern Avenue, Suite 112 Phoenix, Arizona 85021
	PHONE	(602) 870-7600 (602) 870-7601 (FAX)
	SUBCONSULTANTS	Valco Surveying Corporation
		Aerial Mapping Company, Inc.
1G	TECH. REVIEWER (FEMA)	Michael Baker, Jr., Inc., Michael Conaboy
	PHONE	(609) 734-7922
1H	FEMA REGIONAL REVIEWER	
	PHONE	
1I	STATE REVIEWER	Arizona Department of Water Resources
	PHONE	(602) 542-1541
1J	LOCAL REVIEWER	Flood Control District of Maricopa County Pedro Calza Ning Mao Valerie Swick
	PHONE	(602) 506-1501
1K	RIVER OR STREAM NAME	Cave Creek
1L	REACH DESCRIPTION	North of Carefree Highway to the Cave Buttes Dam Ponding Area
IM	STUDY TYPE	Floodplain/Floodway-Delineations

STUDY DOCUMENTATION ABSTRACT (continued)

SECTION 2: MAPPING INFORMATION

2A	USGS QUAD SHEETS	Cave Creek
		Union Hills
		Wildcat Hill
		New River, SE
2B	MAPPING FOR HYDROLOGIC STUDY TYPE/SOURCE	USGS Quad maps 7.5 Minute Series (Topographic)
	SCALE	1 inch = 2,000 feet and 20' Contour Intervals
	DATE	1964 and 1965 (all were photo revised 1981)
2C	MAPPING FOR HYDRAULIC STUDY TYPE/SOURCE	2-foot contour interval mapping in digital format Aerial Mapping Company, Inc.
	SCALE	1 inch = 200 feet
	DATE	Flown - January 12, 1996

SECTION 3: HYDROLOGY

3A	MODEL OR METHOD USED (including vendor and version description)	HEC-1 version 4.0.1E dated May 1991 Dodson & Associates, Inc.
3B	STORM DURATION	24-hour
3C	HYETOGRAPH TYPE	Isopluvial Maps, Drainage Design Manual, Volume 1, Hydrology
3D	FREQUENCIES DETERMINED	100-year
3E	LIST OF GAGES USED IN FREQUENCY ANALYSIS OR CALIBRATION (Location, Years of Record, Gage Ownership)	None used
3F	RAINFALL AMOUNTS AND REFERENCE	100-year, 24-hour = 4.20 inches NOAA Atlas II
3G	UNIQUE CONDITIONS AND PROBLEMS	None Significant
3H	COORDINATION OF Q'S (Agency, date, comments)	

STUDY DOCUMENTATION ABSTRACT (continued)

SECTION 4: HYDRAULICS

4A	MODEL OR METHOD USED (including vendor and version description)	HEC-2 (Version 4.6) May 1991 U.S. Army COE
4B	REGIME	Sub-critical
4C	FREQUENCIES FOR WHICH PROFILES WERE COMPUTED	100-year, 24-hour
4D	METHOD OF FLOODWAY CALCULATION	Method 1
4E	UNIQUE CONDITIONS AND PROBLEMS	None observed

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Registered Professional Engineer (Civil)
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SECTION 1

GENERAL DOCUMENTATION AND CORRESPONDENCE

1.1 Special Problems Reports

1.1.1 To our knowledge the only special problem reported to the Flood Control District was the survey control. Apparently there were no existing control points in the vicinity. Another survey company was hired for the task, see Section 2, Mapping and Survey Information.

1.1.2 The technical review documents are attached at the end of this section.

1.2 Contact (Telephone) Reports

1.2.1 There were no significant telephone documents in the files. Nearly all correspondance was either faxed or sent by mail/courier.

1.3 Meeting Minutes or Reports

1.3.1 The meeting minutes are attached to the end of this section.

1.4 General Correspondence

1.4.1 Community

A notice letter was sent to the City of Phoenix and a response received. Both items can be found at the end of this section.

Right of Entry letters were sent to affected property owners in areas designated for survey control. All signed documents were sent to the Flood Control District. Copies were also sent to the survey subcontractor.

1.4.2 State Coordinator

No correspondence to date.

1.4.3 Other Agencies

1.4.3.1. State Land Department, Drainage and Engineering Section, requested the hydrology and hydraulics reports and floodplain delineation maps. They were sent on March 19, 1997.

1.4.4 FEMA Regional Office

No contact has been made to date.

1.4.5 FEMA Washington

No contact has been made to date.

1.4.6 FEMA Technical Consultant

Contact was made by Michael Baker, Jr., Inc., Princeton, N. J., representative requesting the ERMs on the plans and some minor changes to the HEC-2 model which have been corrected. The HEC-2 model changes requested are attached at the end of this section.

1.4.7 Copy of Public Notices

1.4.7.1 A copy of the public notice announcing the public meeting on March 7, 1996 is attached at the end of this section.
Also, a copy of the flyer announcing the public meeting on March 12, 1997 is attached at the end of this section.

1.5 Contract Documents (Scope of Work)

A copy of the Contract Scope of Work is attached at the end of this section.

ATTACHMENTS-

SECTION 1.1.2

FLOOD CONTROL DISTRICT
of
Maricopa County

Interoffice Memorandum

DATE: May 31, 1996

TO: Ning Mao

FROM: ~~Valerie Swick~~ VAS
via: Amir Motamedi

SUBJECT: Cave Creek South Hydrologic Parameters

I have reviewed the Cave Creek South Hydrologic Parameters submittal from Willdan Associates. I would like for you to set up a meeting to discuss my comments with the consultant. My comments are not complete. I will need to see a revised submittal for the final review.

Basin Boundary Map:

1. The maps should show some minor streets and the township and range locations.

2. The major elevations should be marked on the map, as well as the contour interval indicated.

3. The northern boundary does not match with the southern boundary of the Northern Cave Creek FIS, being conducted by George V. Sabol Consulting Engineers, Inc. This boundary needs to be resolved as soon as possible. I suggest a meeting between Willdan and George V. Sabol to resolved the boundary.

4. Should subbasin 1250 be 1215? The subbasin is referenced as 1215 in all the data sheets and 1250 on the maps.

Soils Map:

1. Comments 1 & 2 for the Basin Boundary map also apply for this map.

2. The soil map used should be on the map for reference.

3. Some of the Index colors do not match what is on the map. For example:
   a. Soil 1 in the index is a diagonal light green, and on the map is crisscross hatched yellow.

   b. Soil 110 is a crisscross hatched green in the index. But Soil 110 has two different colors on the map, a crisscross hatched green and a crisscross hatched orange.

   c. Soil 118 is a crisscross hatched magenta in the index and is a crisscross hatched light blue in the map.

4. The map is very busy with a lot of soil mapping area outside the basin boundary. Soils 34 and 72 are not in the basin area but are in the index because they appear on the map. The subbasin label cannot be read. I suggest cleaning up the peripheral edges of the basin boundary.

5. There is a dark line crossing Scottsdale Rd. just north of Lone Mountain Rd.

6. There needs to be a better distinction between the roads and the subbasin boundaries.

Soils Table:

1. The area digitized does not indicate the units, ie. acres, square feet, square miles.

2. Subbasin 1210. The soils map should indicate the upper soils to be Soil 61, not 63.

3. Subbasin 1515. The soils map does not indicate a soils type of 34.

4. Subbasin 3190. The soils map indicates that there is no Soil 3 in this subbasin, but there is Soil 6.

5. Subbasin 3220. The soils map indicates that there is no Soil 12 in this subbasin, but there is Soil 112.

6. Subbasin 3250. The soils map indicates that there is no Soil 110 in this subbasin, but there is Soil 112.

Land Use Map:

1. Comments 1 & 2 for the Basin Boundary map also apply for this map.

2. Why are there seven land use types and 17 colors?

3. An index should be included to show the relationship between the number, color, and land use. For example: Land Use 1 on the map represents Low Density Residential, but no where on the map or the data table is this indicated.

4. There are some subbasins north of the northern boundaries that should not be included on the map. It only makes it confusing.

Land Use Table:

1. An index relating the land use description to the map number should be included.

2. There is a Land Use 8 in Subbasin 1240. What is the land use description, and where does it fit into the table?

3. Subbasin 1215. This table includes land uses that are around the Carefree Airport, which is not part of this subbasin. The total area digitized states that the area is 370.69 acres, when it should be 68.87 acres.

4. Subbasin 3010. The land use map indicates that this subbasin has a dark blue diagonal (5) land use. Should this be Very Light Development Resident rather than Medium Density Resident as indicated in the table?

Hydrology Data Table:

1. This data needs a lot of quality control.

   a. The flow path length for the subbasin is the hydrologically most distant point. Some of the flow paths areas much as 2000 feet off, with subbasin 1240 being almost 6000 feet off in the estimate.

   b. Consistency is lacking in many of the elevations and lengths. The elevation of a subbasin outlet should be the same for the flow path low elevation and the channel routing low elevation from the upstream subbasin.

   c. The elevations should have precision with the other elevations. All the elevation should either be rounded to the 5 or 10 foot.

   d. The subbasin in all the other tables is rounded to three decimal places and in this table they are rounded to two. Why the change in significant digits?

Culvert Calculations:

1. Include pictures for all the culverts.

2. Do the calculations account for siltation of the culverts, especially Culvert #6?

3. Do the rating curves account for the full flow conditions in the culverts before the water starts to weir over the road? In most cases there is one to two feet of fill between the top of the culverts and the road. Most of the rating curves start weir flow over the road just over the depth of the culvert.

4. From the pictures, some of the culverts appear to have a fall to the culvert invert, is this accounted for in the rating curve calculations.

FLOOD CONTROL DISTRICT
of
Maricopa County

Interoffice Memorandum

DATE: August 15, 1996

TO: Ning Mao

FROM: Valerie Swick VAS

SUBJECT: CAVE CREEK SOUTH HYDROLOGIC PARAMETERS (Revised Submittal)

I have reviewed the Cave Creek South Hydrologic Parameters revised submittal from Willdan Associates.

Basin Boundary Map:

1. There are still some minor overlap areas between this study and the study to the north. Please refer to the attached map for the highlighted area.
2. The elevation 1700 (south of the basin boundary) is not on the correct contour line.
3. Another map indicating the channel routing flow paths and the subbasin flow paths would be helpful in duplicating flow lengths.

Land Use Map:

1. Subbasin 3010. The land use for medium density resident should be a diagonal green on the map.

Land Use Table:

1. Since the Boulders Resort is listed as medium density resident, the category for hotel or resort does not need to be included in the table.

Hydrology Data Table:

1. This data still needs some quality control.
   a. The flow path length for the subbasin should not be less than the upstream channel routing length. This occurs in subbasins 3050 and 3090.

b. Consistency is lacking in many of the elevations and lengths: The elevation of a subbasin outlet should be the same for the flow path low elevation and the channel routing low elevation from the upstream subbasin. This occurs in the following subbasins:

Subbasin	subbasin low elevation (actual elevation)		channel routing high (actual elevation)	
1210	2615		2630	(2615)
1215	2540	(2545)	2550	(2545)
3045	2110		2105	(2110)
3050	1985	(1975)	1975	
3000	2010		2020	(2010)
3040	1850	(1860)	1860	
3125	2100		2105	(2100)
3130	1955	(1960)	1960	
3100	1710		1700	(1710)
3120	1710		1700	(1710)
3135	1940		1945	(1940)
3160	2030		2035	(2030)
3170	1915	(1930)	1945	(1930)
3180	1740	(1750)	1750	
3210	1890		1895	(1890)
3220	1730	(1750)	1750	
1360	2130		2135	(2130)
3190	2130		2135	(2130)
3240	1885	(1875)	1880	(1875)
3250	1640	(1710?)	1675	(1710?)

c. A few of the flow path lengths do not appear to be accurate.

Subbasin	Flow Path Length (ft) from Table	Estimated Flow Path Length (ft)
3050	6400	7500
3090	8600	9600
3080	9000	10,500
3100	9200	12,000
3180	12,300	13,500
3190	8500	10,000
3240	12,000	12,500

d. Subbasin 3040: The schematic flow chart for the HEC-1 model shows the flows generated from this subbasin to be routed to at concentration point C3060 then routed to C3090. The channel routing data does not reflect this scenario. The flow length should be about 1000 ft (not 3000 ft) and the low elevation should be 1850 (not 1818).

Schematic Flow Chart for HEC-1 Model:

1. Use intermediate concentration points to complete the hydrograph for a wash before combining it with another wash. For example, subbasin 3090 should be combined with the routed C3130 before it is combined with the routed C3060. Intermediate concentration points are very useful for future hydraulic analyses.

2. There should not be routing arrows between C3090 and C3070, and Subbasin 3190 and C3190.

3. Cave Creek should not be added into the schematic until after C3100.

4. Subbasins 3510 and 3520 are missing from the schematic.

Culvert Calculations:

1. A location map for the culverts needs to be included in Section 3.

2. If a culvert falls within the subbasin and not at a concentration point, the culvert should be analyzed to determine its effect on the hydrograph. If there is very little effect, especially if the culvert is in the upper section of the subbasin, the culvert should be ignored. If the culvert causes a significant storage or backwater effect the subbasin should be subdivided and a stage storage routing be conducted through the culvert.

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

BOARD OF DIRECTORS
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Ed King
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September 10, 1996

Lee Abbott, P.E.
1717 W. Northern Ave, Suite 112
Phoenix, AZ 85021

RE: The proposed cross sections for the HEC-2 model for Cave Creek (South)

Dear Ms. Abbott:

I have completed my review of the proposed cross sections for the HEC-2 model of Cave Creek below Carefree Highway and have the following comments:

Topographic map

The following items should be shown on the map:

1) Scale for the maps
2) Fly date of the aerial map
3) North arrow (direction arrow)
4) Legend
5) Street names
6) Cover sheet with location map
7) Sheet's number and brief location map include sheet's number on every sheet
8) ERM (Elevation Reference Mark) - identify & description
9) Horizontal & Vertical Control - NGVD (National Geodetic Vertical Datum)

The cross sections for the HEC-2 model

1) Identify the center line of channel, center of mess of the cross section, which is necessary to determine the cross section location and orientation.

2) Give a number or a letter on each cross section at this stage, which will help to provide comments on the specified cross sections.

3) Show approximate right and left bank stations on each cross section.

4) The elevations of many cross sections at right side of bank are much lower than left

side of bank (up to 30 feet). These cross sections should be extended to tie into the high ground. Special attention should be given to the flat right side bank during the HEC-2 modeling.

5) Provide a few more cross sections between the longer reaches (see marked map).

6) Several skewed cross sections should be adjusted to be perpendicular to the flow line (see marked map).

7) Provide the reason or explanation regarding starting cross section (why should the study start from there? Identify the location...).

8) Add one additional cross section at the upstream side of Carefree Highway in order to complete bridge modeling in HEC-2.

9) The cross section at the upstream of the bridge should follow 1:1 contraction; the cross section at the downstream of the bridge should follow 4:1 expansion criteria. Please check and adjust accordingly.

10) There are few cross sections stopped in the middle of the channel (see sheet 1 & 5). Please extend these cross sections to tie into high ground.

Suggestion:

1) The cross sections may need be adjusted after preliminary run of HEC-2.

2) The bank stations should be determined based on "n" value and geographic data for each cross section.

3) According to the scope of work, the consultant should do quality control on each submittal before submitting to the FCD.

In addition to the above comments, a marked set of maps are attached to this letter.

Sincerely,

Ning Mao

Ning Mao, P.E.

Via: PAC EAR

FLOOD CONTROL DISTRICT
of
Maricopa County

Interoffice Memorandum

DATE: September 25, 1996

TO: Ning Mao

FROM: Valerie Swick

SUBJECT: CAVE CREEK SOUTH HYDROLOGIC PARAMETERS (Submittal dated Sept. 20, 1996)

I have reviewed the Cave Creek South Hydrologic Parameters submittal from Willdan Associates.

Flow Path Lengths Map:

1. The top and bottom elevations for the subbasin flow path lengths should be indicated on this map.

2. Subbasins 3130 and 3210 should have the lengths indicated.

3. Subbasin 3080 indicates 12,000 ft on the map and 10,500 ft in the table.

4. Subbasins 1360, 3220, 4510, and 4520 do not seem to have accurate flow path lengths.

Routing Lengths Maps:

1. The top elevation for the subbasin flow path lengths should not be on this map.

2. The routing length for Subbasin 3200 is inaccurate. The map and table read 15,000 ft, but the measured length is closer to 10,000 ft.

3. The elevation for should be added for concentration points C3140, C3060, C3070.

4. The top elevation for subbasin 4530 should be 1670, not 1650.

Hydrology Data Table:

1. Subbasin Flow Data

   a. Subbasin 3050 should have a path length of 6800 ft as indicated from the flow path lengths map.

Subbasin Flow Data (continued)

b. See Note 4 under the Flow Path Lengths Map for subbasins 3320, 1360, 4510, and 4520.

c. Low elevation for subbasin 3230 should be 1650 as indicated on the map.

2. Channel Routing Data

a. Should the routing flow length for Subbasin 3000 be precise to 10? All the other lengths are only have precision to the nearest 100.

b. The low elevation for Subbasin 3000 routing should be 2100 as indicated on the map.

c. The low elevation for routing Subbasins 3100, 3120, 3180, 3220, 3250, 4510 should be 1650 as indicated on the map, not 1640 as stated in the table.

d. The high elevation for routing Subbasins 3230 and 4520.

e. Channel routing flow lengths for subbasins 1360 and 3190 should be 10,000 ft.

Land Use Table:

1. Point #5 from Willdan's letter indicates that the symbol for hotel or resort was eliminated from the table. The Land Use Table that was submitted still has this category in the headings.

Schematic Flow Chart for HEC-1 Model:

1. More intermediate concentration points to complete the hydrograph for a wash before combining it with another wash should be used. For example, subbasin 3090 should be combined with the routed C3130 before it is combined with the routed C3060. Intermediate concentration points are very useful for future hydraulic analyses.

In the next submittal I will expect to see a HEC-1 run. A schematic for the HEC-1 should be included.

FLOOD CONTROL DISTRICT
of
Maricopa County

Interoffice Memorandum

DATE: October 24, 1996

TO: Ning Mao

FROM: Valerie Swick MS

SUBJECT: CAVE CREEK SOUTH HYDROLOGIC PARAMETERS (Submittal dated Sept. 20, 1996) - Comments on the HEC-1 Model

I have reviewed the HEC-1 output.

For all future submittals, the HEC-1 output should be accompanied with a computer disk with the HEC-1 input for that run, and the files for the DDMS program.

1. The routing data for each subbasin hydrographs should be similar to the actual wash for that subbasin. Not all the washes have 200 feet bottom widths and depths of three feet.

2. The overland *n* values are .2 or .15, which are both appear too high. The **Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona** indicates an overland *n* value of .08 with a channel *n* value of .04. The routings for each hydrograph should be looked at individually to determine the correct cross-section.

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

2801 West Durango Street · Phoenix, Arizona 85009
Telephone: (602) 506-1501
Fax: (602) 506-4601
TT: (602) 506-5897

COVER SHEET

TO: Lee Abbott

Company or Department: Willdan Eng **Fax #** 870-7601

FROM: Valerie Swick

Number of pages being sent including Cover Sheet: 2

Comments:

HYDROGRAPH FOR CAVE CREE (NORTH OF CAREFREE HIGHWAY BRIDGE)										
QI	0	0	0	0	0	1	1	1	1	1
QI	1	1	2	2	2	2	3	4	6	7
QI	8	9	10	11	12	13	14	16	18	21
QI	24	27	30	34	38	41	45	49	53	56
QI	60	64	67	71	74	77	81	84	87	91
QI	94	97	101	104	107	111	114	118	121	124
QI	128	131	134	138	141	144	147	150	153	156
QI	159	162	165	168	172	175	178	182	186	189
QI	193	197	201	206	210	214	218	223	227	231
QI	236	240	245	250	254	259	265	270	275	281
QI	287	293	300	306	313	320	327	334	342	349
QI	357	365	373	382	390	398	407	146	125	434
QI	443	452	462	472	482	492	503	514	526	538
QI	551	565	579	595	613	634	658	685	715	789
QI	945	1250	1703	2301	3026	3826	4718	5761	7289	9528
QI	13006	16648	21076	25229	28289	30497	32005	32933	33453	33696
QI	33771	33725	33591	33383	33101	32746	32309	31778	31194	30574
QI	29927	29264	28584	27876	27124	26319	25458	24549	23605	22648
QI	21707	20793	19914	19118	18269	17374	16528	15830	15258	14621
QI	13928	13149	12471	11875	11339	10810	10294	9795	9316	8852
QI	8409	8005	7696	7372	7049	6728	6422	6130	5853	5590
QI	5338	5097	4864	4643	4444	4271	4122	3989	3869	3744
QI	3612	3475	3334	3191	3048	2907	2769	2635	2506	2382
QI	2265	2154	2050	1951	1858	1771	1690	1613	1541	1474
QI	1411	1352	1297	1246	1197	1152	1109	1069	1031	995
QI	961	929	898	869	842	816	792	769	748	728
QI	709	690	673	658	641	626	612	598	586	573
QI	561	550	538	527	516	505	495	485	475	466
QI	456	447	438	430	421	413	405	398	390	383
QI	376	696	362	355	348	342	335	328	321	313

FLOOD CONTROL DISTRICT
of
Maricopa County

Interoffice Memorandum

DATE: November 14, 1996

TO: Ning Mao

FROM: Valerie Swiek VMS
via: Amir Motamed

SUBJECT: CAVE CREEK SOUTH PRELIMINARY TECHNICAL DATA NOTEBOOK FOR HYDROLOGY (Submittal dated Nov. 1, 1996)

I have reviewed the Preliminary Technical Data Notebook.

Report

1. 3.2.4 Precipitation
   The DDMS computer program that generates the precipitation values is called "PREFRE" not PREFREE.

2. 3.2.6 Rainfall Excess
   Reference should be made to the Appendix where the Green and Amp parameters can be found for each subbasin and the overall table.

HEC-1 Run

1. The routing reaches for RNORTH, R3085, R4510 and R3230 have Manning's n values for the overbank area that is considerably less that the channel Manning's n. If this is actually the case, comments cards need to be placed in the reach to explain why the lower overbank 'n' values.

2. R3220A - The routing reach length should be right justified in the forth column. The reach should be 6000 ft but the computer is reading it as 60,000 ft. This is why the attenuation is so large, 1474 cfs at 12.25 hours vs. 346 cfs at 15.50 hours.

3. The storage routing for the culverts S3220A and S3050A should have 1 as the value for the number of steps.

4. The warning messages are for two routing reaches: R4510 and R3150. Both these reaches are within Cave Creek. These cross-sections only have a depth of 3 feet in the main channel and only 5 feet of depth in the overbank area. These cross-sections are not nearly large enough to handle the flows. Check the cross-sections, especially depths with the HEC-2 cross-sections. The overbank lengths may also need to be extended.

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
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NOV 2 7 1996

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DEC 0 2 1996
WILLDAN ASSOCIATES

November 26, 1996

Lee Abbott, P.E.
1717 W. Northern Ave, Suite 112
Phoenix, AZ 85021

RE: Preliminary "n" value report of Cave Creek (South) Flood Insurance Study

Dear Ms. Abbott:

We have completed our review of the preliminary "n" value report of Cave Creek below Carefree Highway. The following are our comments:

1. This is the first flood insurance study in this area. Therefore, the title should be "Flood Insurance Study" other than "Flood Insurance Restudy".

2. **Photographs**

1). Please clarify that the left and right over banks are defined by looking down stream or upstream in each reach, since most photos are looking upstream.

2). Each reach should include a photo of the main channel, a photo of the left over bank and right over bank. The left over bank information is missing in most reaches.

3. **"n" value calculations**

The copy of "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona" by U.S. Geological Survey (USGS "n") should be used as "n" value calculation reference.

Reach 1: The "n" values, at both over banks for every cross section in Appendix 3, are smaller than calculated "n" value in Appendix 2. Please explain.

Reach 2: "nb" should be higher than 0.025 in channel B (sandy bottom), since it is actually a sandy/cobble bottom according to photo #4.

Reach 3: "n3" = 0.06 in left bank A seems too high according to photo #9.

Reach 4: "n3" = 0.08 in right bank C seems too high for "medium height brush and small trees with medium density". Please check.

Reach 5: Include a photo of the left over bank to show that "stockpiles of cobbles and boulders".

Reach 6: "n3" = 0.06 in right bank C seems too high according to photo #19 and #22.

Reach 7: "n3" = 0.08 in right bank C appears too high according to photo #23, #24 and #25.

Reach 8: Include a photo of the left over bank to show boulder/cobble bottom.

"n3" = 0.12, in left bank A and right bank C, is much too high, please see USGS "n" for reference. Also check "n3" in channel B.

The "n" values at channel B for each cross section in Appendix 3 are much smaller than the calculated results in Appendix 2. Please explain.

4. **Cross sections with "n" values**:

1). For consistency, the plot of cross section in "n" value report should have the same horizontal ordinate as in the HEC-2 model. 10,000 should be the center of the channel, not the origin.

2). Geometric data of the following cross sections in the "n" value report are different from the cross sections in the HEC-2 model. Please check this difference and provide an explanation.

Cross section: 24.525, 24.646, 24.752, 24.845, 25.099, 25.458, 25.843, 25.919, 27.265, 28.023

3). "n" value of left over bank are missing at the following cross sections: 26.695, 26.775, 27.169, 27.265.

4). Cross section 25.919: "n" value of right over bank 0.012 is different in HEC-2 model (0.12). Please check.

5). Cross section 26.921: "n" value at right over bank 0.080 is different in HEC-2 model (0.085). Please check.

6). Cross section 29.493: "n" value at right over bank 0.065 is different in HEC-2 model (0.060). Please check.

7). There are two cross section 29.735 (BM and BN). Please correct it.

We are looking forward to receiving your response, in writing, to our comments by December 10, 1996. If you have any questions please contact me at (602)506-1501.

Sincerely,

Ning Mao, P.E.

FLOOD CONTROL DISTRICT
of
Maricopa County
2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
Fax (602) 506-4601
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DEC 13 1996
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DEC 12 1996

December 12, 1996

Lee Abbott, P.E.
Willdan Associates
1717 W. Northern Ave, Suite 112
Phoenix, AZ 85021

RE: Hydrology report of Cave Creek (South) Flood Insurance Study

Dear Ms. Abbott:

We have completed our final review of the revised HEC-1 for Cave Creek South Preliminary Technical Data Notebook for Hydrology, dated December 2, 1996. The Hydrology report has been accepted by the Flood Control District of Maricopa County.

The final Hydrology report and all the related information should be included in the FEMA Submittal as part of Flood Insurance Study.

Sincerely,

Ning Mao

Ning Mao, P.E.

FLOOD CONTROL DISTRICT
of
Maricopa County
2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
Fax (602) 506-4601
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December 16, 1996

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DEC 19 1996
WILLDAN ASSOCIATES

Lee Abbott, P.E.
Willdan Associates
1717 West Northern Avenue, Suite 112
Phoenix, Arizona 85021

RE: Preliminary Floodplain Delineation of Cave Creek (South) Flood Insurance Study

Ms. Abbott:

We have completed our review of the preliminary floodplain delineation of Cave Creek below Carefree Highway. The following are our comments:

1. **HEC-2 model**

A. Cross section 24.752:

a) X3 record should be used to block the left over bank ineffective flow area.

b) The left bank station should be moved to the right side (from 8727.7 to 8895.7) to make XNCH equal 0.035.

B. Cross section 25.458:

The right bank station should be moved to the left side to make bank stations consistent with upstream and downstream cross sections.

C. Cross section 25.699:

Move the left bank station to the right (from 10808.3 to 10897.1) to have XNCH equal 0.025.

D. Cross section 29.720 (Special Bridge):

a) The bridge opening does not match channel opening. Please check stations.

b) BT record should be used in the special bridge routine to determine the length of the weir. SB.4 should be zero since there are sag roads on both sides of the bridge and the length of the weir will change with depth of flow.

E. Cross section 29.850:

Move the left bank station from 9386.0 to 9945.1, and the right bank station from

10929.0 to 10029.3, to make bank stations consistent with upstream and downstream cross sections.

F. More GR data are required at left or right over bank (should have at least one foot freeboard at both sides) for the following cross sections:

25.099, 25.519, 25.580, 25.644, 25.699, 25.750, 26.044, 26.137.

G. The horizontal ordinate at the plots of cross section in the report are confusing.

2. **Plans**

A. The legend of the plans is confusing: Floodplain Boundary, Hydraulic Base Line are the same as Corporate Limits; Ponding Limit is the same as Floodway Boundary. Please correct these problems by providing different types of lines.

B. Provide the locations of left and right bank stations on the plans.

C. Provide tick mark for river mile on hydraulic base line.

D. Use the same cross section numbering system for both HEC-2 model and plans.

E. On cross sections 25.233 and 25.750, smooth the edge point on floodway boundary.

F. Floodplain boundaries are missing at following cross sections: 25.750 - 29.850 for the left side; 29.258 - 29.601 for the right side. Please check.

G. Extend right over bank at cross section 26.044.

H. Explain the long dashed line at the left side of floodplain, from cross section 28.462 to 28.750.

I. Add Base Flood Elevations to the plan.

J. Add Section Corners, Quarter Corners and Elevation Reference Marks to the plans.

3. For other requirements on floodplain delineation, refer to the scope of work and sample plan.

Please respond, in writing, to our comments by December 24, 1996. All submittals of Hydraulic study, including "n" value report and floodplain delineation, should be received by December 31, 1996 for final review. If you have any questions, please contact me at (602) 506-1501.

Sincerely,

Ning Mao

Ning Mao, P.E.

FLOOD CONTROL DISTRICT of Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

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January 29, 1996

Lee Abbott, P.E.
Willdan Associates
1717 W. Northern Ave, Suite 112
Phoenix, AZ 85021

RE: Final "n" value report of Cave Creek (South) Flood Insurance Study

Ms. Abbott:

We have completed our review of the final "n" value report of Cave Creek below Carefree Highway. The following are our comments:

1. Water surface elevation and bank stations should be shown at each cross section in the final submittal.

2. To be consistent, Reach 1 to Reach 8 should be switched from downstream to upstream.

If you have any question, please contact me at (602)506-1501.

Sincerely,

Ning Mao

Ning Mao, P.E.

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

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February 5, 1997

Lee Abbott, P.E.
Willdan Associates
1717 W. Northern Ave., Suite 112
Phoenix, Arizona 85021

RE: Floodplain Delineation of Cave Creek Flood Insurance Study

Ms. Abbott:

We have completed our review of the floodplain delineation of Cave Creek below Carefree Highway. The following are our comments:

1. Change the title of study to "...Below Carefree Highway" instead of "...South".

2. **HEC-2 model**

A. Cross section 25.750: The station 9577.3 is not on the GR record, it should be change to 9577.4.

B. Cross section 26.044: The "n" value is missing from station 11800.0 to 12220.0. Also, 11800.0 is not on the GR record. Please check.

C. Cross section 29.720: a) Show the bridge on the cross section plot.
b) The field 4 of SB record should be zero, please refer to HEC-2 manual.

3. **Plans**

A. Take off first digital of the cross section number (e.g. change 125.010 to 25.010), to have same cross section numbering system as HEC-2 model.

B. Cross section 24.525-25.099: Include a note that clearly indicates that regulatory elevation for these cross sections is 1657.1 feet, which is because of the ponding limit of Cave Buttes Dam.

C. Cross section 25.099-25.326: Smooth out floodway boundaries for both sides.

D. Cross section 25.010, 29.493 & 29.538: Move left bank stations to the right, in order to be consistent with up and down stream bank stations.

E. Take off "Ponding Area" from sheet #3 and sheet #7, this area can be treated as ineffective area. Please also revise report accordingly.

F. Change all the "100-Yr Floodplain and Flood Boundary" to "100-Yr Floodplain and Floodway Boundary".

G. Extend the delineation and mapping to Cross section 30.200 to match the Flood Insurance Study above Carefree highway, which has been done by GVSCE. A diskettes containing digital data (ACAD files) of the first sheet of GVSCE's work maps is enclosed.

4. **Report**

A. Change "Cave Creek Bridge" to "Carefree Highway Bridge" in the report.

B. Add the water profile plots for the entire study to the report.

Besides the comments above, a set of marked plans is also attached. Please submit two copies of technical data report after this correction as soon as possible. The final submittal has to be completed by the end of February. The FEMA submittal will be sent out by the first week of March. If you have any questions, please contact me at (602)506-1501.

Sincerely,

Ning Mao

Ning Mao, P.E.

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

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Jan Brewer
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Don Stapley
Mary Rose Garrido Wilcox

March 13, 1997

Lee Abbott, P.E.
Willdan Associates
1717 W. Northern Ave, Suite 112
Phoenix, AZ 85021

RE: Floodplain Delineation of Cave Creek below Carefree Highway FIS

Ms. Abbott:

We have completed our final review of the floodplain delineation study and "n" value report for Cave Creek below Carefree highway FIS. The floodplain delineation and "n" value report have been accepted by the Flood Control District of Maricopa County. However, the Technical Data Notebook (TDN) should be included, as a part of floodplain delineation report. Please submit TDN to the District as soon as possible for review.

The final submittal of Flood Insurance Study, includes hydrology report, floodplain delineation, survey information, technical data notebooks, other related information and FEMA forms should be completed and sent out by end of March.

Sincerely,

Ning Mao

Ning Mao, P.E.

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

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Jan Brewer
Fulton Brock
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Mary Rose Garrido Wilcox

June 3, 1997

Lee Abbott, P.E.
Willdan Associates
1717 W. Northern Ave, Suite 112
Phoenix, AZ 85021

Re: Final Submittal of Cave Creek Floodplain Delineation Study below Carefree Highway FIS

Dear Ms. Abbott:

The District has completed our review of Technical Data Notebook Volume 1 ~ 5 of Cave Creek Floodplain Delineation Study and have following comments:

Volume 1:

1. Section 1 - General Information

   a. Please change the River Name from "Cave Creek Wash" to "Cave Creek".

   b. Change the Reach Description from "Carefree Highway South to Ponding Area" to "North of Carefree Highway to the Cave Buttes Dam Ponding Area".

   c. Flood Control District review comments of "Final 'n' value report of Cave Creek Flood Insurance Study" dated January 29, 1997 is missing from the Section 1.1.2, Attachments.

2. Section 3 – Hydrological Analysis

   a. Print the name of Table or Appendices at the front page (blue page), this will make it easier for the reviewer to follow.

Volume 2:

1. Section 4 – Hydraulic Analysis

a. The hydraulic jump will occur downstream of the Carefree Highway Bridge, which has been described in section 4.2.3. It is my experience that the HEC-2 model is not suitable for modeling hydraulic jumps. Different methodology should be used to calculate the water surface elevation around bridge area. A detailed hydraulic analysis of the hydraulic jump should be included in the study.

b. Please give a brief comparison between the old hydraulics model, by Harris-Toups (1978) and the new HEC-2 model, by Willdan Associates. List Harris-Toups model separately.

c. There are two Section 4.5.1 in the report. The second Section 4.5.1 should be Section 4.5.2. Please add Section 4.5.2 to the Index at beginning of the report.

d. Please add water profile plots for the entire study to the report.

e. Add the name of cross section plots to the Index.

Volume 5:

1. Floodplain Delineation Maps:

a. Please provide township and range section corner on the map, which will be used in floodplain management for scaling parcels onto map.

b. Please specify the bold line in the maps.

c. Indicate the cross section named by (CU) in the legend (sheets 7 & 8).

I am looking forward to receiving your response to our comments. If you have any question, please contact me at (602) 506-1501.

Sincerely,

Ning Mao

Ning Mao, P.E.
Project Manager

ATTACHMENTS-

SECTION 1.3.1

January 22, 1996

Reference: Cave Creek Wash (South) Flood Insurance Study
Minutes of Meeting
Wednesday, December 27, 1995

The project kick-off meeting was held in the offices of the Flood Control District of Maricopa County offices beginning at 10:00 am. In attendance were:

Tim Murphy -	FCDMC
Ning Mao -	FCDMC
Jan Farmer -	FCDMC
Hal Marron -	Willdan Associates

The following items were discussed:

- Willdan will coordinate the basin boundary limits for the adjacent hydrology studies with George Sabol & Associates.

- A copy of the Basin Boundary map will be submitted to the County. It is expected that the basin boundaries will be the same boundaries as determined by WRA in the Scottsdale Terrace Fan Study.

- The District will check on the availability of USGS digital quad map information with its GIS section.

- The legal advertisement will be published in a local Cave Creek paper. Ning will check on the name of the local publication.

- Ning Mao will supply to Willdan a copy of the standard sheet layout in digital (AutoCADD 12) format.

February 29, 1996

Reference: Cave Creek Wash (South) Flood Insurance Study
Minutes of Meeting
Wednesday, February 28, 1996

The project meeting was held in the offices of the Flood Control District of Maricopa County offices beginning at 10:00 am. In attendance were:

Ning Mao -	FCDMC
Pedro Calza -	FCDMC
Hal Marron -	Willdan Associates
David Anderson -	Willdan Associates

The following items were discussed:

- The public meeting is scheduled for March 7, 1996 from 5:00 to 7:00 pm in the Library / Media center of Desert Sun Elementary School. Willdan will place ads in paper and notify 7 property owners in study area of meeting. FCDMC will prepare the graphic displays for the meeting.

- Ad text will be submitted to Ning Mao for approval. Upon approval ads will be placed in Arizona Republic and Cave Creek paper.

- Letter of introduction will be sent to City of Phoenix, Attention Ray Acuna, regarding this project.

- Willdan will check with its surveyor on the status of the survey control.

- Minutes of meetings will be supplied by Willdan Associates.

- The project budget and schedule will be updated by next week. Carry over to next fiscal year (after June 30, 1996) should not exceed $25,000 as projected.

M E M O

Date: June 17, 1996

To: Hal Marron

From: Lee Abbott

Project: Cave Creek Wash Hydrology

Subject: Flood Control District (Maricopa County)
Meeting June 3, 1996

Items discussed:

Sabol Consultants HEC-1 run is 32,000 cfs peak runoff to the Carefree Highway Bridge.

Maps:

1. Show all mile streets, Carefree Highway, Pima Road and Stagecoach Road.
2. Show all Section numbers, township and range.
3. Identify contours at the 100 foot intervals at least.
4. Make the background on the subbasin numbers white, like the boundary map.
5. Statement: Contours at 20 foot intervals.

Culvert Data:

1. Inlet Control - O. K.
2. Use slope at 0.2 % instead of 0.5 %.
3. Add distance between top of pipe and roadway for capacity tables.
4. Renumber culverts in the study area only, consecutively.

Cave Creek Dam:

1. Standard Project Flood (SPF) elevation is O.K. to start.
2. Dam data to be submitted next time.

July 26, 1996

MEETING MINUTES

Project: Cave Creek Wash Floodplain Delineation

Location: Flood Control District of Maricopa County Conference Room

Date: July 16, 1996

Subject: Project Status

Present: Pedro Calza, Flood Control District
Ning Mao, Flood Control District
Ed Raleigh, Flood Control District
Dave Anderson, Willdan Associates
Lee Abbott, Willdan Associates
Gerard Dalziel, Willdan Associates
Dave Hunt, Willdan Associates

Discussion:

Willdan assured the District that the control datum used on Willdan's plans is the same datum as Sabol Consultants. The previous control differences have been resolved.

Willdan will send to the District a preliminary HEC-1 input and output for a review.

The cross-sections for the HEC-2 model will need to be certified in accordance with Mapping Standards.

The mapping will need to be converted to GIS format and reviewed by the District.

If there are any schedule changes a memo requesting a change order to extend the contract for 3 months would be required. However, the District agreed to wait a few weeks to evaluate the need.

A financial budget projecting monthly expenditures is required together with the projected monthly bill before the invoice is sent.

Meeting minutes of any meeting with the District is required.

Presently Willdan is working on submitting the revised data collection and maps as discussed in a previous meeting. Submittal is expected by the end of the week. (Update: submitted on July 22, 1996).

A letter from Willdan changing the Project Manager to Lee Abbott is requested by the district.

Ning Mao will contact Sabol to send the Hydrology report and HEC-1 disk to Willdan. (Update: Willdan has received the data and disk on July 18, 1996).

cc: Attendees
Susanna Struble, Willdan Associates

WILLDAN ASSOCIATES ☐ ENGINEERS & PLANNERS

Professional Consulting Services Since 1964

September 4, 1996

MEETING MINUTES

Project: Cave Creek Wash Floodplain Delineation (South)

Location: Flood Control District of Maricopa County Conference Room

Date: August 27, 1996

Subject: Project Status

Present: Ning Mao, Flood Control District
Valerie A. Swick, Flood Control District
Pedro Calza, Flood Control District (briefly)
Lee Abbott, Willdan Associates

Discussion:

Ning provided Contract Change Order No. 1 to extend our contract to December 31, 1996. Our present contract expired on August 21, 1996. Lee explained, Willdan policy is for a company officer to sign this document. It will be given to David Anderson.

The contract schedule needs to be updated and sent to Ning.

Valerie went over the items discussed in the August 15, 1996 memo concerning the Hydrologic Parameters. The items concerned the Basin Boundary Map, Land Use Map, Land Use Table, Hydrology Data Table, and Schematic Flow Chart for HEC-1 Model. All items will be corrected and resubmitted within three weeks (September 17, 1996) or less.

The Culvert Calculations were also discussed. Since most of the culverts are located in the upper reaches of the watershed area, they will have no significant affect on the floodplain delineation at the lower reach and can be ignored. Data collected for these culverts will be included in the Appendix of the report and labeled " no significant flow changes to this study and will not affect the results of the floodplain delineation".

However, those culverts in the lower reaches of the watershed must be evaluated to determine if they are causing a significant storage or backwater affect to include in the model. If they are significant, some subbasins may need to be further divided into smaller subbasins to account for the individual culvert. Only an analysis will determine these factors. This analysis will be included in the resubmittal.

The limit of the study area is the Cave Creek Dam Ponding Area.

The Carefree Bridge info is needed as soon as possible.

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The "n" values study should be sent into the Flood Control District as soon as possible.

If no other data is available for identifying the cross sections by mile, we will start at the dam with 0+00 = Mile 0, etc. (Update: FEMA, FIRM maps indicate the start of Cave Creek Wash to be at the Salt River. Since this study package is going to FEMA, we will use the established mile system used by FEMA.)

Pedro Calza approved the use of 100-year, 24-hour HEC-1 model and the use of the Flood Control District's program, Drainage Design Menu System (DDMS), for data entry. Since the North study HEC-1 model was not on the DDMS program, combining the two (2) data sets will be done by routing the hydrograph through Carefree Highway Bridge, and inserting the hydrograph at the end of subbasin 3510. Ning provided a disk to use for these tasks.

The proposed cross-sections for the HEC-2 model have been sent to the FCD for review. The cross-sections are now being prepared for the GR cards by Aerial Mapping and should be finished by August 30. (Update: Received disk on September 4.)

Respectfully submitted,

Lee Abbott

Lee Abbott
Project Manager

cc: Attendees
David Anderson, Willdan Associates
Gerard Dalziel, Willdan Associates

WILLDAN ASSOCIATES ☐ ENGINEERS & PLANNERS

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November 18, 1996

MEETING MINUTES

Project: Cave Creek Wash Floodplain Delineation

Location: Flood Control District of Maricopa County Conference Room

Date: October 24, 1996

Subject: Project Status

Present: Pedro Calza, Flood Control District
Ning Mao, Flood Control District
Ed Raleigh, Flood Control District
Valerie Swick, Flood Control District
Dave Anderson, Willdan Associates
Lee Abbott, Willdan Associates
Gerard Dalziel, Willdan Associates

Discussion:

Meeting was called by the Flood Control District to discuss Willdan's schedule and quality control. The district believes that Willdan cannot meet the present schedule with all of the remaining activities to submit.

The 'n' value report was due June 3, and has not been submitted. Gerard Dalziel explained that the cross-sections were needed to evaluate the 'n' values which could not proceed without the mapping which was late (received July 11, 1996). Gerard displayed the report, exhibits and the HEC-2 model prepared to date which appeared to be a considerable effort.

Valerie Swick discussed the HEC-1 model variables. The 'n' values and the routing cross-sections need to reflect the basin conditions. Channel widths need to be justified. Valerie and Gerard will go to the field on Friday October 25 to verify the channels cross-sections.

Valerie discussed the rainfall reduction value used in the HEC-1 model as related to the North Study. Lee explained that the DDMS program, MCUHP1 option, supplied by the District, calculates that value automatically. Pedro Calza agreed.

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Willdan presented the first of 7 or 8 flood delineation maps on 200' scale.

The Preliminary Hydrology Report together with supporting data, maps, the HEC-2 model printout and on disk will be submitted no later than Friday November 1, 1996.

The Preliminary Hydraulics Report, the 'n' report and the HEC-2 model printout and on disk will be submitted November 15, 1996.

Ning Mao discussed the invoice in August had percentages which did not agree. Lee will correct and resubmit.

The billing for September will be deferred by letter to Pedro from Dave Anderson if it was sent. If not, Willdan will resubmit next month with a detailed progress report.

Dave Anderson committed the required Willdan resources to meet the submittal dates agreed upon and to perform quality control.

Respectfully submitted,

Lee Abbott

Lee Abbott
Project Manager

cc: Attendees
Susanna Struble, Willdan Associates
Dave Hunt, Willdan Associates

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ATTACHMENTS -

SECTION 1.4.1

WILLDAN ASSOCIATES ☐ ENGINEERS & PLANNERS

Professional Consulting Services Since 1964

March 5, 1996

Mr. Ray Acuna
City of Phoenix
Flood Plain Management
200 West Washington
Phoenix, Arizona 85003

Re: Flood Control District of Maricopa County
Floodplain Delineation Project
Cave Creek Wash - 100 year ponding limits of Cave Buttes Dam to Carefree Highway

Dear Mr. Acuna:

Willdan Associates is in the process of preparing the above referenced study for the FCDMC. This study will be performed in conjunction with a similar study for the northern portion of the wash. The northern study is being performed by George V. Sabol and Associates.

Our work efforts will include the examination of the hydrology in the tributary areas of our study reach, aerial mapping of the study reach, and delineation of new 100 year floodway and floodway fringe lines within our study reach. No floodplain mapping will be prepared for the tributaries to Cave Creek Wash as a part of this study.

A public open house is to be held on Thursday, March 7, 1996 to introduce both projects to interested parties. We hope that you or a member of your staff can attend. We look forward to working with the City of Phoenix on this project.

Sincerely,

Willdan Associates

Hal Marron

Hal Marron, P.E.
Division Manager

cc Ning Mao - Flood Control District of Maricopa County

1717 WEST NORTHERN AVE. • SUITE 112 • PHOENIX, ARIZONA 85021-5469 • (602) 870-7600 • (800) 643-3671 • FAX (602) 870-7601

City of Phoenix
STREET TRANSPORTATION DEPARTMENT

RECEIVED
MAR 19 1996
WILLDAN ASSOCIATES

Winner of the Carl Bertelsmann Prize
BEST RUN CITY IN THE WORLD

March 18, 1996

Mr. Hal E. Marron, P.E.
Division Manager
Willdan Associates
1717 West Northern Avenue, Suite 112
Phoenix, Arizona 85021-5469

Dear Mr. Marron:

RE: CAVE CREEK FLOODPLAIN NORTH OF THE CAVE BUTTES DAM

Thank you for the notification of the floodplain study your firm is conducting in Phoenix. It is my understanding that this study contracted by the Maricopa County Flood Control District (FCDMC) will establish a floodway and base flood elevations. This floodplain is currently a Zone A; no base flood elevations have been determined.

There has been public interest expressed in identifying a preserve along this floodplain. This area has mining activity. It would be useful to the City if you could provide a copy of the study and associated documentation that could be used to address these two issues.

If you have any questions, please call me at 262-4026.

Sincerely,

James H. Matteson, P.E.
Street Transportation Director

Raymond U. Acuña

Raymond U. Acuña, P.E.
Floodplain Manager

JHM/RUA/aff/960315c

c: Mr. Matteson
Mr. Blakley
Mr. Callow

ATTACHMENTS -

SECTION 1.4.6

Federal Emergency Management Agency

Washington, D.C. 20472

April 25, 1997

Kofi Awumah, Ph.D., P.E.
Engineering Division
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399

IN REPLY REFER TO:
Case No.: 97-09-706P
Communities: Town of Cave Creek, City of Phoenix, and Maricopa County, Arizona
Community Nos.: 040129, 040051, and 040037

316-ACK.FEX

Dear Dr. Awumah:

This responds to your request dated April 15, 1997, that the Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas, which is the effective FIRM for the above-referenced communities. Pertinent information about the request is listed below.

Identifier:	Cave Creek above and below Carefree Highway
Flooding Source:	Cave Creek
FIRM Panel(s) Affected:	04013C0795 F, 0802 F, 0805 F, 0815 G, and 1210 E

As you may know, FEMA has implemented a procedure to recover costs associated with reviewing and processing requests for modifications to published flood information and maps. However, because your request is based on a detailed hydrologic or hydraulic study conducted by a Federal, State, or local agency to replace an approximate study conducted by FEMA, no fees will be assessed for our review.

We have completed an inventory of the items you submitted. We have received the required data to begin a detailed technical review of your request. If additional data are required, we will inform you within 30 days of the date of this letter.

Please direct all questions concerning your request to our Technical Evaluation Contractor at the following address:

Michael Baker Jr., Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, Virginia 22304

Attention: Mr. Massoud Rezakhani
(703) 317-6239

When you write us about your request, you must include the case number referenced above in your letter.

If you have any questions concerning FEMA policy, or the National Flood Insurance Program in general, please contact Mr. John Magnotti of our staff in Washington, DC, either by telephone at (202) 646-3932 or by facsimile at (202) 646-4596.

Sincerely,

Frederick H. Sharrocks, Jr., Chief
Hazard Identification Branch
Mitigation Directorate

cc: Mr. Raymond U. Acuña, P.E.
Floodplain Manager
City of Phoenix Street
Transportation Department

Mr. Dennis Zwagerman
Development Services Director
Town of Cave Creek

Ms. Eileen M. Abbott, P.E.
Project Manager
Willdan Associates

George V. Sabol, Ph.D., P.E.
President
George V. Sabol Consulting Engineers, Inc.

S.O. No.

Subject: Cave Creek, AZ

Sheet No. 1 of 1

Drawing No.

Computed by MJC Checked By Date 5/22/97

Baker

Proposed Changes to William Floodway Run

① Section 25.233 (-.4 surcharge)

Change ET Card to: 9.1 8750 10400

② Section 29.012

Change ET Card to: 9.1 9940.76 10590

to eliminate -.3 Surcharge @ Sect 29.258

③ Section 29.351 and 29.387 → 9.1 9570 10303

Change ET Card to: 9.1 9695 10400

to prevent Section line from crossing fw twice

* Revise → FW in this area

④ Section 26.695

Change ET Card to: 9.1 9810.17 10920

to Remove floodway from extreme Left overbank

⑤ Section 29.850

Add ET Card: 9.1 9448.5 10043.5

This is as narrow to possible to keep Sect 30.20 unchanged

ATTACHMENTS -

SECTION 1.4.7.1

INVOICE NO. 96104

ANNOUNCEMENT OF FLOOD HAZARD STUDY AND PUBLIC MEETING

The Flood Control District of Maricopa County, under authority of the National Flood Insurance Act of 1968 (P.L. 90-448), as amended, and the Flood Disaster Protection Act of 1973 (P.L. 93-234), is funding a detailed study of flood hazard areas in the Cave Creek Wash Area, north of 100 year ponding limits of Cave Buttes Dam to the Carefree Highway. The study is being performed for the Flood Control District by Willdan Associates.

The purpose of this study is to examine and evaluate flood hazard areas which are developed or which are likely to be developed, and to determine flood elevations for those areas. These flood elevations will be used by Maricopa County to carry out floodplain management and by the Federal Emergency Management Agency to determine flood insurance rates under the National Flood Insurance Program.

This announcement is intended to notify all interested persons of the commencement of this study so that they may have an opportunity to bring any relevant facts and technical data concerning local flood hazards to the attention of the Flood Control District for consideration in the course of this study. Such information should be addressed to Ms. Ning Mao, Flood Control District of Maricopa County, 2801 W. Durango Street, Phoenix, Arizona 85009, telephone (602) 506-1501, fax (602) 506-4601. A public meeting will be held from 5:00 to 7:30 p.m. on March 7, 1996, in the library / media center of Desert Sun Elementary School, 33606 N. 60th Street. Representatives of the Flood Control District of Maricopa County and Willdan Associates will be present to inform the public of the purpose and scope of the study.

Published: Arizona Republic/Phoenix Gazette, March 7, 14, 1996.

AFFIDAVIT OF PUBLICATION

The Arizona Republic/The Phoenix Gazette

STATE OF ARIZONA
COUNTY OF MARICOPA } SS.

TOM BIANCO, being first duly sworn, upon oath deposes and says: That he is the legal advertising manager of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published at Phoenix, Arizona, by Phoenix Newspapers Inc., which also publishes The Arizona Republic and The Phoenix Gazette, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates as indicated.

The Arizona Republic
The Phoenix Gazette

MARCH 7, 14, 1996

Sworn to before me this

18TH day of

MARCH A.D. 19 96

OFFICIAL SEAL
DEBBIE WILSON
NOTARY PUBLIC-ARIZONA
MARCIOPA COUNTY
My Comm. Expires Jan. 9, 1999

Notary Public

INVOICE NO. 96104

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The Arizona Republic
The Phoenix Gazette

MARCH 7, 14, 1996

Sworn to before me this

18TH day of

MARCH A.D. 19 96

OFFICIAL SEAL
DEBBIE WILSON
NOTARY PUBLIC-ARIZONA
MARICOPA COUNTY
My Comm. Expires Jan. 9, 1999

Notary Public

FLOOD CONTROL DISTRICT of MARICOPA COUNTY 1959

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

BOARD OF DIRECTORS
Betsey Bayless
Ed King
Tom Rawles
Don Stapley
Mary Rose Garrido Wilcox

▸ *Public Meeting Announcement* ◂
Cave Creek Floodplain Delineation Study

The Flood Control District of Maricopa County invites interested people to attend a public open house meeting introducing a floodplain delineation study along Cave Creek Wash:

March 7, 1996
Thursday
5:00 - 7:30 pm

Desert Sun Elementary School (Library/Media Center)
33606 N. 60th Street
Approx. a mile east of Cave Creek Rd, south of Carefree Hwy; Turn rt at *Fine Arts Ctr & Desert Sun School* signs

Maps of the creek and study area will be displayed. Representatives from the Flood Control District and the engineering consulting firms will be available to discuss the study process and answer questions.

Floodplain delineation involves developing detailed topographic maps to determine where water goes, while incorporating the results of studying rainfall patterns to determine typical and peak amounts of runoff. The studies will be used to better manage the floodplain to reduce or prevent flood damage. Some areas may be designated for further analysis.

The Flood Control District is also currently conducting floodplain delineations for north Skunk Creek, Granite Reef Wash, Indian Bend Wash, Rio Verde, White Tanks Wash, Eastern Canal - Mesa, RWCD Canal-Mesa, RID Canal-Tolleson, Fountain Hills, and the Salt River.

Additional information may be obtained by contacting:

Sandy Walchuk, Public Involvement Coordinator,
Ning Mao, South Project Manager, or
Kofi Awumah, North Project Manager, at the Flood Control District, 506-1501

A sign language interpreter will be made available upon request with 72 hours' notice. Alternative format materials or FM or Infra-Red Listening Devices are also available upon request with 72 hours' notice. Additional reasonable accomodations will be made available to the extent possible within the time frame of the request. Please contact David A. Brozovsky, Flood Control District ADA Coordinator, at 506-1501, if any of these services are required.

OPEN HOUSE

Flood Control District of Maricopa County 2801 West Durango Street, Phoenix, AZ 85009

Public Meeting Announcement
Cave Creek Floodplain Delineation Study

OPEN HOUSE

Wednesday, March 12, 1997
Desert Sun Elementary School Cafeteria
33606 N. 60th Street
6:00pm to 7:30pm

Parking available in the NORTH parking lot

You are invited to attend an open house meeting which will present the results from the floodplain delineation study along Cave Creek Wash. Representatives from the Flood Control District and consultants will be on hand to discuss the study and answer any questions you may have.

For further information contact:
Perry Baker, Public Involvement Coordinator, or
Kofi Awumah and Ning Mao, Project Managers
Flood Control District of Maricopa County, 506-1501

A sign language interpreter will be made available upon request with 72 hours notice. Additional reasonable accommodations will be made to the extent possible. Please contact David Brozovsky, ADA Coordinator, at 506-1501 if any special services are required.

OPEN HOUSE

ATTACHMENTS-

SECTION 1.5

SCOPE OF WORK
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLOODPLAIN DELINEATION AND TOPOGRAPHIC MAPPING
FOR CAVE CREEK WASH

GENERAL

The project consists of approximately 7.5 river miles of floodplain delineations for Cave Creek Wash from 100 year ponding limits behind Cave Buttes Dam to Carefree Highway, as shown on Exhibit 1. This will require the development of the necessary topographic data and approximately 17.5 square miles of watershed hydrology. The consultant will develop the hydrology using the Corps of Engineer's HEC-1 computer model, and the floodplain and floodway delineations using primarily the HEC-1 computer model and the HEC-2 computer model if appropriate. The consultant must use sound engineering judgement in the development of the hydrologic and hydraulic models. The results of the models must be analyzed carefully and refinements made to the input parameters in order to obtain the most realistic results. All work must meet Arizona Department of Water Resources (ADWR) and Federal Emergency Management Agency (FEMA) requirements for floodplain delineations. The results of this study must be reviewed and accepted by FEMA prior to the finalization of this contract. All work under this Scope will be completed within 300 calendar days from the date of Notice to Proceed, including 60 days for District reviews.

TASK 1 - COORDINATION

1.1 The consultant will submit a project schedule showing coordination meetings and completion dates for each of the tasks in the scope within 14 days of Notice To Proceed. The consultant shall update this project schedule when appropriate.

1.2 The consultant shall participate in regular coordination meetings (at least every 4 weeks) with the District's Project Manager and in milestone coordination meetings in the development of the hydrologic and hydraulic analyses. The consultant is responsible for the minutes of any meetings. Whenever possible, coordination and milestone meetings should be combined.

1.3 The consultant will submit a quarterly estimation of the projected billing within 14 days of Notice to Proceed. Thereafter, this estimation will be updated and submitted to the District's project manager at least 10 days prior to the end of each quarter.

1.4 The consultant shall submit monthly progress reports at least 5 days before submittal of monthly invoices. The report shall be brief and should be no longer than two typed pages. At a minimum, the monthly report shall contain the following:

a. A description of the work accomplished by task during the reporting month.

b. Percent (%) completed for the month and percent (%) cumulative completed for each task.

c. A brief description of the work to be accomplished the following month.

d. A description of any problems encountered.

1.5 The consultant is responsible for placing the legal advertising at the beginning of the study, notifying the public of the study. The ad will be run in a widely circulated newspaper two times, with approximately one week between runs. The ad must also be run two times in a local newspaper that serves the area being studied. After the ad is run the consultant will supply the District with the original affidavit of publication from each of the newspapers for each day that the ad ran.

1.6 The consultant will notify all property owners and obtain any necessary Rights of Entry for the study area. The consultant will furnish the District with a list of all the property owners notified and a sample Right of Entry letter.

1.7 The consultant shall meet with officials from the Flood Control District of Maricopa County. The purpose of this meeting is to identify local flooding problems and obtain information on current and planned public works projects, channel modifications, storm-drainage systems, development, and corporate limits.

1.8 The District will plan and conduct two public meetings in conjunction with this study. The first meeting will be to inform the public of the purpose and scope of the study. The second meeting will be to inform the public and obtain public comment on the study results, and shall take place prior to the submittal of the final report to FEMA. The consultant/District will be responsible for the preparation of the graphic displays for these meetings. One representative from the consultant will attend each of the meetings. The consultant will respond to the public's comments and make revisions to the study if necessary.

1.9 Consultant/District Performance Evaluations will be performed. An informal evaluation will be performed at the completion of the hydrologic analysis. A formal evaluation will be performed at the completion of the project upon receipt of all deliverables.

TASK 2 - DATA COLLECTION

2.1 The consultant will collect and review pertinent data from the District and other outside sources. Data to be collected will include previous flood hazard reports and hydrology for the study area; existing topographic mapping; historical flooding information; as-built plans for existing structures; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions, and other pertinent information.

2.2 A written report summarizing the data collected will be submitted to the District for information purposes. A preliminary draft of this report is due within 90 days of Notice to Proceed.

TASK 3 - TOPOGRAPHIC MAPPING

3.1 An aerial survey subcontractor shall be retained by the consultant as part of this contract. The consultant shall coordinate all the aerial surveying work with the aerial surveying subcontractor to ensure that the specifications of the aerial surveying work are met. The consultant is responsible for ensuring that the topographic mapping covers the area of delineation. Quality control on surveys will be per FEMA Document 37, Flood Insurance Study Guidelines and Specifications for Study Contractors, January 1995.

3.2 Digital contour and planimetric data developed for this study shall be delivered according to the District's HIS specifications.

3.3 Prepare topographic mapping to a 2-foot contour interval, with a scale of 1 inch = 200 feet, with spot elevations and/or 1-foot contours on all section line and mid-section line roads.

3.4 Ground Control:

a. The consultant shall provide all survey control using 1983 NAD.

b. The consultant shall systematically set panel points and establish horizontal and vertical control throughout the areas to be mapped for use in compilation by the aerial survey contractor. Where readily available, surveys will tie into the State Plane Coordinate System. Field control shall be sufficient to readily allow for compilation of maps by the aerial survey contractor at the desired map scale and contour interval, and will be based on the National Geodetic Vertical Data of 1929 (NGVD). A conversion factor, including documentation of how it was derived, will be provided by the consultant to allow comparison of NGVD 29 elevations to NAVD 88 elevations and will be included in the Technical Data Notebook.

c. The horizontal and vertical control points shall be located and marked by the consultant. The controls for the aerial mapping shall be in sufficient numbers and

shall be in locations which will be compatible with the accuracy of the mapping requirements. The controls shall be of at least third order accuracy. Section corners, quarter corners, and mid-section points shall be used for control points wherever possible.

3.5 The consultant shall provide permanent non-erasable topographic mylars of the work study drawings. The drawings shall be 24" X 36" in size, with a scale of 1 inch = 200 feet and a contour interval of 2 foot for all mapping with the exception of section line roads which will have a contour interval of 1 foot. A cover sheet will be provided with the project title, date of topographic mapping, and a location map showing geographic range covered by each specific mapping sheet. Each drawing shall include the floodplain and floodway delineations and a minimum of a north arrow, scale, section corners and quarter corners, current and proposed streets and highway names, State Plane Coordinate System, major drainage features, corporate boundaries, cross section lines, channel station center line, index map, and description and elevation of elevation reference marks (ERMs). A note explaining the proper means to convert the NGVD 29 elevations to NAVD 88 elevations shall be included in "NOTES" in the map border. See Exhibit 2 for how the drawings are to be laid out. The mapping will have an accuracy such that ninety percent (90%) of all contours shall be within one-half contour of the true elevations and the remaining ten percent (10%) of the contours shall not be in error by more than one contour interval.

TASK 4 - FIELD SURVEY

4.1 Prepare topographic mapping to a 2 foot contour interval with a scale of 1 inch = 200 feet, with spot elevations or 1 foot contours on all section line and mid-section line roads, for floodplain/floodway delineation areas as identified in Task 6 or FEMA criteria, whichever is more stringent.

4.2 Ground Control for Floodplain Delineations:

4.2.1 All topographic mapping and survey work shall meet or exceed Federal Emergency Management Agency (FEMA) minimum criteria as defined in FEMA Document 37, Flood Insurance Study Guidelines and Specifications for Study Contractors, January 1995. This would include, but is not limited to: the establishment of "permanent" elevation reference marks (ERMs); field control; and verification of profiles by the ground survey profile procedure.

4.2.2 Horizontal and Vertical Control: Systematically set panel points and establish horizontal and vertical control throughout the area to be mapped for use in compilation by the aerial survey contractor. Where readily available, surveys will tie into State Plane Coordinate System 1983 NAD. Field control shall be sufficient, at least one "permanent" point per mile, such point(s) being used as Elevation Reference Marks (ERMs). Surveys will be based on National Geodetic

Vertical Datum (NGVD) 1929, per FEMA guidelines. A conversion factor, including documentation of how it was derived, will be provided by the consultant to allow comparison of NGVD 29 elevations to NAVD 88 elevations and will be included in the Technical Data Notebook. "Permanent" survey points shall consist of existing monumentation, such as brass caps or similar survey monuments. Where additional monumentation is needed, survey markers conforming to Maricopa Association of Governments (MAG) Uniform Standard Detail for Public Works Construction, detail 120-1, Type C, shall be placed 2" +/- above grade, and topped with a brass cap. Elevation Reference Marks will be labelled on available maps and described in a manner which allow them to be readily located in the field.

4.2.3 All aerial targets are to be removed following completion of the topographic mapping.

4.3 The consultant shall verify the accuracy of the mapping by the procedures called for in FEMA Document 37 or other methods approved by FEMA. This shall include the verification of cross sections used in the floodplain delineation.

4.4 Field surveys of bridges, culverts, and hydraulic structures are to be obtained by the consultant when as-built plans are not available or when changes significant to the HEC-2 modeling, such as sedimentation, have occurred since the date of as-built. This information should be reduced and compiled into an 11"x 17" (maximum size) drawing for inclusion in the final report. The information presented in the drawing should be in a format appropriate for use in the HEC-2 model. Field surveys of bridges, culverts, hydraulic structures, and routing reaches must also be obtained where necessary for proper hydrologic modeling. It may be necessary to field survey some structures since the as-built plans may not be on 1929 NGVD.

TASK 5 - HYDROLOGY

5.1 The hydrologic study of the watershed will be delivered to the District under separate cover from the hydraulic analysis. The consultant shall use the U.S. Army Corps of Engineers computer program HEC-1, 1991 Version, to develop a hydrologic model for the area. Using appropriate hydrologic judgement, sub-basins are to be identified that provide reasonable depiction of the watershed condition. The sub-basins must be as homogeneous as possible, using watershed area, watershed type (mountainous and flat lands or urban and undeveloped areas), and time of concentration as criteria. Sub-basin break-downs will be done in sufficient detail to provide peak discharges at structures, major road crossings, confluences, and at boundary lines. An appropriate time step and number of ordinates is to be selected that allows for complete calculation of the flood hydrograph without sacrificing resolution of the flood peak. All calculations, or assumptions used in developing sub-basin and routing parameters shall be documented and made a part of the appendix for

the hydrology report. Field surveys may need to be taken for HEC-1 modeling purposes.

The District has requested limited hydrology for this study area. As such, basin delineation will be prepared to yield concentration points for the watersheds at the following major roadways; Cave Creek Road, Scottsdale Road, and Pima Road. Other concentration points will be selected as deemed suitable by Willdan Associates.

5.2 Four meetings associated with four tasks, and two field trips shall be held with the Flood Control District staff at the following milestones:

a. One field trip at the start of the project to scope out the critical points of the watershed and problem areas.

b. Meeting number 1: as soon as basic data are gathered and the sub-basins have been delineated. Sample HEC-1 parameter estimations should also be presented and discussed at this meeting. A copy of the draft maps of the sub-basins must be delivered to the District at this meeting.

c. Meeting number 2: after all the parameters have been estimated. A draft copy of the parameters must be delivered to the District at least one week prior to this meeting.

d. Meeting number 3: after the preliminary HEC-1 results have been obtained and a draft report has been prepared. A copy of the draft report and the copy of the HEC-1 on a floppy disc, compatible with the Districts computer, must be delivered two weeks prior to the meeting.

e. Meeting number 4: to review comments by the District. A second field trip may be scheduled for the same day so the results obtained could be discussed.

5.3 The specific hydrologic techniques to be used in this study are:

a. Rainfall Depth: Point precipitation values will be determined using the information and procedures described in the Drainage Design Manual for Maricopa County, Arizona: Volume I - Hydrology.

Rainfall Distribution: Peak discharges and peak volumes for the 100-year 6-hour storm will be estimated using the District's Distribution(s). Peak discharges and peak volumes for the 100-year 24-hour storm will be estimated using the SCS Type II rainfall distribution.

b. Areal Reduction: The point precipitation values will be aerially reduced for critical concentration points. Areal reduction for the 6 hour rainfall duration will be applied using the curves in the Drainage Design Manual for Maricopa County, Arizona: Volume I - Hydrology. NOAA HYDRO-40 will be used with the 24 hour rainfall

reduction. Copies can be obtained from the District.

c. Rainfall Excess: The Green and Ampt methodology will be utilized for estimation of rainfall losses. The Lotus spreadsheet and procedures, provided by the District, will be used to determine composite parameter values for each sub-basin.

d. Unit Hydrograph: The Clark and S-Graph method should be used following the procedures outlined in the Drainage Design Manual for Maricopa County, Arizona: Volume I - Hydrology. The choices in methodology will be to the discretion of the consultant, with consent from the District.

e. Time of Concentration and S-Graph Lag Equation: The Papadakis method should be used with the Clark unit hydrograph, along with the MCUHP1 computer program, to determine the time of concentration. If this method results in unsuitable times of concentration, other method(s) must be used and compared for the most realistic result. The S-graph lag equation, along with the MCUHP2 computer program, should be used with the appropriate S-graph (Phoenix mountain or Phoenix Valley).

f. Channel Routing: Channel routing will be accomplished using either the Muskingum-Cunge or the Normal-Depth option of HEC-1. The choice of methodology will be at the discretion of the consultant, with consent from the District. Average cross sections will be developed utilizing available mapping and field reconnaissance data. Sufficient field cross sections will be taken to ensure that routing reaches are reasonable and representative of field conditions.

The HEC-1 routing parameters for the reaches modeled using HEC-2 will be adjusted after the HEC-2 cross sections are available. The resulting velocities and depths, for all reaches, must be assessed for realistic values.

g. Reservoir Routing: Detailed analysis of structures and ponding areas will be accomplished using the Modified Puls reservoir routing option of HEC-1. Stage versus discharge tables for hydraulic structures will be estimated using appropriate hydraulic methodology.

h. Channel Transmission Losses: Attempts should be made to estimate infiltration losses through channel bottoms based on existing field data or literature. If sufficient data is not available, the final report must acknowledge so and explain how the peaks and volumes of flow are affected by not including the transmission losses.

5.4 The District will provide appropriate references to facilitate parameter estimation.

5.5 Output of the computer model should be reviewed to see if the peak flows and volumes are realistic. Adjustments to input for obtaining the most realistic results is normal to the scope.

5.6 Every attempt must be made to recover historic stream gage data and use it to compare with the results obtained by the hydrologic model. Major differences must be discussed in the final report.

5.7 It is required that the consultant obtain the approval of the District at each of the following steps:

a. Soil maps, watershed boundary maps, and land use maps.

b. HEC-1 parameter estimation.

c. HEC-1 flow diagram and input parameters.

d. HEC-1 results.

5.8 The Hydrologic Report

5.8.1 The findings of the hydrologic study will be presented in Section 3 of the Technical Data Notebook and will be prepared in accordance with ADWR State Standards Attachment 1-90 (SSA 1-90). The report will be organized as specified by the District, following SSA 1-90 format.

5.8.2 Tables and Figures for the appendices:

a. Topographic base map(s) showing the sub-basins, routing reaches, Tc flow paths or lag flow paths, major man-made structures, and references (i.e. street names, Township, Range, Section, etc.) at a scale of 1 inch = 2000 feet.

b. Soils map(s) at the same scale as the base map.

c. Land use map(s) at the same scale as above.

d. Schematic map for the HEC-1 showing the sub-basins (area, Tc), the flow paths, the routing reaches (length, slope, friction, width, velocities, transmission losses, etc.), order of combining the hydrographs, channel, pipe or culvert dimensions (where appropriate).

e. Pertinent data on all the structures in the watershed (such as spillway elevation, rating curves, etc.).

f. One set of study maps (i.e. sub-basin boundary maps, flow path maps, soils maps, land use maps) to be folded and delivered in a binder.

Specific deviations from this hydrologic scope shall not be undertaken without the specific written concurrence from the Flood Control District.

TASK 6 - FLOODPLAIN DELINEATION

6.1 Floodplain delineations must be obtained using the U.S. Army Corps of Engineers HEC-2 Water Surface Profiles computer model, version 4.6.2, May 1991, and methodology acceptable to FEMA. This model will simulate the effects of floodplain geomorphology, flow changes, bridges, culverts, hydraulic roughness factors, effective flow limitations, split-flows, and other considerations. The consultant will prepare the study using the guidelines established in FEMA Document 37, Flood Insurance Study Guidelines and Specification for Study Contractors, January 1995, and FIA Document 12, Appeals, Revisions, and Amendments to Flood Insurance Maps, January 1990.

6.2 The delineation work shall meet requirements for floodplain and floodway delineations as prescribed by FEMA and the Arizona Department of Water Resources.

6.3 The delineation study shall be based on the final results of the hydrologic study as directed by the District.

6.4 The consultant is to make refinements to the HEC-2 model based on review of the model results by the District, ADWR, FEMA, and the Technical Evaluation Contractor. The consultant shall review the HEC-2 model results for reasonableness. Adjustments to the input parameters for obtaining the most realistic results is normal to the scope.

6.5 Floodways are to be determined using equal conveyance encroachment method 4 to start with, but only encroachment method 1 will be used in the final analysis. The floodway encroachment is to be as near the one foot maximum rise in elevation as possible.

6.6 The consultant must obtain District approval at each of the following steps:

a. Field reconnaissance report and estimation of Manning's "n" values.

b. Proposed location and alignment of the cross sections and channel centerline.

c. Floodplain (natural) delineation.

d. Floodway delineation using equal conveyance encroachment.

e. Floodway delineation using encroachment method 1.

f. Final Hydraulics Report.

6.7 Field Reconnaissance

6.7.1 The consultant will conduct a field reconnaissance of the full study reach. This will include observation of channel and floodplain conditions for estimation of Manning's "n" values; photographic documentation of floodplain characteristics;

determination of channel bank stations; observation of possible overflow areas; inspection of levees or other flood control structures; and measurement of bridge dimensions.

6.7.2 Mannings "n" values are to be determined using the methodology in the USGS report, Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona, April 1991. Copies of the report are available through the District.

6.7.3 A draft report on the field reconnaissance will be submitted to the District for review and approval prior to beginning the HEC-2 modeling. The report will present the determination of channel and overbank "n" values using captioned color photographs or color photocopies. The report will also discuss floodplain conditions affecting the delineation, describe structures and obstructions, and provide color photos or photocopies of major hydraulic structures. Photo locations, structures, and "n" values will be displayed on reduced scale mapping and included in the Final Report.

6.8 Cross Sections

6.8.1 The location and alignment of cross sections and channel centerline will be submitted for the District's review and approval prior to digitizing the cross section data. Cross section stationing will be from left to right looking downstream with the thalweg as station 10,000. Cross sections will be spaced approximately every 500 feet, unless geographic or structural constraints dictate otherwise, and will extend the full width of the area inundated by 100-year flood waters. Identification of cross sections will be in river miles, increasing upstream. The stationing will tie into the specified river mile of the existing FEMA studies. Cross section orientation may need to be altered after running of HEC-2 model to ensure that sections are perpendicular to flow per FEMA criteria.

6.8.2 All cross sections will be plotted using a pen, laser, or electrostatic plotter. The cross section plots will show water surface profiles, ineffective flow areas, "n" values, encroachments, channel stationing and other pertinent information. All plots are to be accompanied by a legend. These plots are to be available at all reviews.

6.8.3 Cross section plots are limited to one plot at the following three stages of work: (a.) a plot of digitized "GR", STCHL, STCHR, centerline (station 10,000) to be used as a check of input data and for working sections during compilation of the floodplain model; (b.) a plot of the cross section for the completed floodplain run which shows the floodplain water surface elevation, ineffective flow areas, "n" factor, and encroachments to be used as working sections for development of the floodway model; (c.) a plot of the final floodway model cross sections which will show Type 1 encroachments and encroached water surface, in addition to data

covered in items (a.) and (b.). These cross sections, generated under (c.), will be submitted as part of the Final Report.

6.9 Bridges and culverts must be modeled in compliance with HEC-2 modeling requirements for the selected routine. Where multiple bridges occur, each bridge will be modeled separately. The HEC-2 modeling results for bridges, culverts, and other hydraulic structures must be checked by using an independent method approved by the District to analyze these structures.

6.10 For floodplains identified as ponding areas, it is preferable to analyze the area by using the HEC-2 model, which will provide the District with water surface elevations. If appropriate, the consultant shall identify in the ponded floodplains a floodway. The purpose of this floodway is to allow the pond to seek a constant stage throughout the areal extent of the ponds, versus the creation of two independent ponds.

6.11 Flood zones must be determined according to FEMA criteria and clearly labelled on the final drawings.

6.12 The total area of the floodplain and floodway must be determined for each reach in square miles and acres.

6.13 The findings of the floodplain/floodway delineation study will be presented in Section 4 of the Technical Data Notebook and will be prepared in accordance with ADWR State Standards Attachment 1-90 (SSA 1-90). The report will be organized as specified by the District standards, following SSA 1-90 format.

TASK 7 - HIS DATA

7.1 Digital data will prepared in conformance with the District's HIS Data Delivery Specifications, Revision 1.1, for the following themes:

a. Drainage study boundary

b. Drainage basins

c. Land use (if not provided by the District)

d. Soil type area (if modified from that provided by the District)

e. Elevation (land)

f. Floodplain FCD Zone

g. Floodplain FCD Water Surface Elevation

7.2 Separate check plots will be produced from either Arc-Info or Arc-CAD from the digital database(s) of each theme in 7.1. The check plots will be prepared with a minimum of annotation and will serve only to verify the information in the data base. If the hydrologic and delineation maps have not derived directly from the digital data delivered to the District, then the consultant will certify that the check plots have been examined and that the check plots faithfully represent the data and maps used in the report and /or work maps.

TASK 8 - DELIVERABLES

8.1 FEMA Submittal: The consultant will submit the following items to the District for review by FEMA and any other appropriate governmental agency. All of the following products are considered deliverables for the FEMA submittal:

8.1.1 Original Affidavits of Publication

8.1.2 Two (2) complete sets of blueline topographic base maps with the floodplain/floodway delineations shown. All drawings will be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.

8.1.3 Two (2) complete copies of the Technical Data Notebook, including HEC-1 and HEC-2 input/output files on diskettes. The Technical Data Notebook will be prepared in accordance with ADWR State Standards Attachment 1-90 (SSA 1-90). The notebook will be organized as specified by the District, following SSA 1-90 format.

8.1.4 Two (2) sets of completed FEMA forms will be submitted in a notebook separate from the Final Report.

8.1.5 Three (3) sets of complete survey notes will be submitted in a notebook separate from the Final Report.

8.1.6 Two (2) copies of the current FIRM panels showing the proposed delineation.

8.2 Final Submittal: The following products are considered deliverables for the final submittal to the District after FEMA approval is issued:

8.2.1 One (1) complete set of non-erasable topographic mylars of the work study drawings. Sheets shall be 24" X 36" in size and numbered to correspond to the delineation maps.

8.2.2 One (1) complete sets of mylars and four (4) complete sets of sealed blueline topographic base maps with the floodplain/floodway delineations shown. All

drawings will be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.

8.2.3 One (1) complete set of transparent overlays of photo-mylars. Sheet size, numbering, and layout shall correspond to the delineation work maps.

8.2.4 One (1) complete set of 9" X 9" contact prints of the aerial stereo photographs sequentially numbered and catalogued.

8.2.5 Digitized topographic data and floodplain/floodway boundaries in conformance with the District's HIS Specifications.

8.2.6 Four (4) complete copies of the Technical Data Notebook including HEC-1 and HEC-2 input/output files on diskettes. The Technical Data Notebook will be prepared in accordance with ADWR State Standards Attachment 1-90 (SSA 1-90). The notebook will be organized as specified by the District, following SSA 1-90 format. This submittal of the Technical Data Notebook shall include any correspondence and/or meeting minutes with the reviewing agencies and shall reflect any revisions required by those reviewing agencies. Revisions may include, but are not limited to, modifications to the delineation maps, the HEC-1 model, the HEC-2 model, and/or the Final Report.

SECTION 2

MAPPING AND SURVEY INFORMATION

2.1 Description of Mapping

2.1.1 For the Section 3, Hydrology Analysis, Volume 1, United States Geological Service (USGS), 1"= 2000 feet maps were used. Section 4, Hydraulic Analysis, Volume 2, maps were generated by aerial photography performed by our subconsultant Aerial Mapping Company at 1"= 200 feet and a contour interval of 2'.

Survey control for the aerial photography was performed by Valco Surveying Corporation, Phoenix, Arizona, and can be found in Volume 4, Survey and Field Notes.

Additional field survey was conducted to determine the cross-sections locations and the 'n' value associated with the cross-sections. This data can be found in the Final 'n' Value Report, Volume 2. Field survey was also used for the subbasin typical cross-sections which can be found in Section 3, Hydrology Analysis, Volume 1.

2.1.2. The photogrammetric and field survey control data contained herein was completed in October 1995. This survey was based upon existing monmentation, the published values of which were acquired from the National Geodetic Survey data base.

The Horizontal datum used was the North American Datum of 1983 epic 1992. The horizontal survey was performed by 2nd Order, Class 2 terrestrial traversing techniques originating on and closing toexisting Published Control Monuments and Global Positioning System Control. Standard horizontal errors obtained from this adjustment are less than 0.02' in both Northing and Easting.

The Vertical datum used was the National Geodetic Vertical Datum of 1929. The vertical survey was performed by standard 3rd Order, Class 1 differential spirit leveling technique originating on and closing to stable Published Control Monuments. All field survey data was adjusted using a simultaneous least squares adjustment. Standard vertical errors obtained from this adjustment are 0.02'for all but two points which are 0.05'

2.2 Index of Maps

2.2.1 USGS Maps - all maps are 7.5 minute series.

Cave Creek	1965 topographic map, photo revised in 1981, reflecting the changes from a 1978 aerial photo, based on 1927 North American Datum.
New River, SE	1964 topographic map, photo revised in 1981, reflecting the changes from a 1978 aerial photo, based on 1927 North American Datum.
Union Hills	1964 topographic map, photo revised in 1981, reflecting the changes from a 1978 aerial photo, based on 1927 North American Datum.
Wildcat Hill	1965 topographic map, photo revised in 1981, reflecting the changes from a 1978 aerial photo, based on 1927 North American Datum.

All of the above maps were used for subbasin delineation, soils mapping, land use mapping, flow lengths, channel routing and FEMA-FIRM maps as presented in the Volume 5, Maps.

2.2.2 Aerial Photography Maps at 200' Scale

The aerial photography was flown on January 12, 1996 by Aerial Mapping Company. Subsequently the mapping was developed into 1" = 200 feet and 20' contour intervals. These maps were used for the floodplain delineation as developed by the HEC-2 models, and are included in the Section 4, Hydraulics Analysis, Volume 2.

2.3 Survey Field Notes

2.3.1 The only field notes generated were the typical cross-sections for the HEC-1 model. They were performed on October 25, 1996 using assumed 100.00 for vertical and 0+0 for horizontal. These notes are included in Section 3, Hydrological Analysis, Volume 1.

2.3.2 The culvert analysis is based on 00.00 vertical. Horizontal datum was not required. This analysis is included in the Section 3, Hydrological Analysis, Volume 1, in the Appendix section.

2.3.3 All other survey notes are included in Volume 4, Survey Notes.

2.4 Watershed Maps, Hydrologic Analysis Maps

As described above, USGS 2000' scale maps were used for the watershed subbasin delineation. The subbasin areas were then digitized along with the flow length and channel length for a more accurate value.

2.5 Hydraulic Analysis Maps

The mapping used for the hydraulic analysis was developed from aerial photography as described above. A representative number of cross-sections were verified in the field by Valco Surveying Corporation.

2.6 FEMA, FHBM Draft Maps

The draft floodplain delineation maps, which will be used for FEMA approval, are included in the Volume 5, Maps.

2.7 Community Maps

A community map is included on the 200' scale Flood Delineation Maps in Volume 5.

2.8 Other Maps

The Soils Map and the Land Use Map data were supplied to Willdan by the Flood Control District of Maricopa County and are included in Volume 5, Maps.

ATTACHMENTS

SECTION 2

MKE

McLaughlin Kmetty Engineers, Ltd

3501 North 16th Street Phoenix, Arizona 85016-6419 (602) 248-7702 FAX (602) 248-78

GEZA E. KMET
RONALD C McLAUGHL
HALFORD E. ERICKS
WILLIAM R. KENDA
RALPH L. TORI
TERRENCE P. KENY
RICHARD E. McLAUGHL

Date 4 Jan 96

Page 1 of 1
INCL. this page

From Frank Brown

Transmitted to Fax Number 870-7601

To Mr. Hal Marron

Company WILLOAN + ASSOC

Comments Please be advised that when we (Alcocer Land Surveyors) leveled between Valco panel HV #1 (elev 1909.56, but reported in Valco field book as elev 1927.56) and RM #127 (USGS BC on New River Road) there is a 0.47' elev difference (ALS elev 1909.09). We need to discuss vertical datum with you and FCDMC. Frank

Job # 92-404.003

FAX Copy to: ALS
GVSCE
(George Sabol or Scott Ogden)

NOTE: If this transmission is incomplete, please call (602) 248-7702

Admin\FaxForm.000

MKE

McLaughlin Kmetty Engineers, Ltd.

3501 North 16th Street Phoenix, Arizona 85016-6419 (602) 248-7702 Fax (602) 248-7851

GEZA E. KMETTY
RONALD C. McLAUGHLIN
LEO M. EISEL
HALFORD E. ERICKSON
WILLIAM R. KENDALL
RALPH L. TOREN
TERRENCE P. KENYON
RICHARD E. McLAUGHLIN

MEMORANDUM

TO: **Kofi Awumah, Flood Control District of Maricopa County**

FROM: **Frank Brown, McLaughlin Kmetty Engineers, Ltd.** Frank Richard Brown

DATE: **February 13, 1996**

RECEIVED
FEB 14 1996
WILLDAN ASSOCIATES

SUBJECT: **Cave Creek FDS**
FCD Contract No. 95-28

The purpose of this memorandum is to propose a numbering system for the brass cap Elevation Reference Marks (ERM's) for both Cave Creek Wash above Carefree Highway and Cave Creek Wash below Carefree Highway.

ERM's are proposed to be labeled per the following samples:

"CC312"

"CC061"

Where CC means Cave Creek, the next two digits refer to the Section number that the ERM is placed in, and the last digit is the actual ERM number.

This numbering system was worked out jointly between Mr. Hal Marron and me. There are no duplicate section numbers between the two study areas. I have conferred with Alcocer Land Surveyors and Aerial Mapping Company, and they see no conflict with other benchmark numbering systems in the area. This system is compatible with the HIS Arc/Info specifications, which allow for 7 characters, with any combination of alphanumeric data. This system is preferred to a sequential numbering system between the two Cave Creek projects, because there are two projects, and work is being done concurrently.

Please confer with other District/County staff as appropriate, and indicate your approval of this system. We would like to know by Friday, 16 February 1996.

c: Mr. Scott Ogden, GVSCE, Inc.
Mr. Hal Marron, Willdan & Associates

G:\P\92404003\WP\BrassCap.Mem

FLOOD CONTROL DISTRICT
of
Maricopa County
2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

RECEIVED
MAR 5 1996
WILLDAN ASSOCIATES

February 28, 1996

RECEIVED MAR 0 1 1996

Frank Brown
McLaughlin Kmetty Engineers, Inc.
3501 North 16th Street
Phoenix, Arizona 85016

Dear Frank:

SUBJECT: Cave Creek above Carefree Floodplain Delineation Study - FCD 95-28
Elevation Reference Marks Numbering Sequence

I have reviewed your proposal on the numbering sequence for the Elevation Reference Marks to be installed for the Cave Creek Wash floodplain study. After conferring with other District Staff, I have found this proposal to be acceptable.

You may therefore go ahead with the installation of the monuments.

Yours Sincerely,

Kofi Awumah

Kofi Awumah, Ph.D., P.E.
Project Manager

WILLDAN ASSOCIATES

1717 West Northern Ave, Suite 112 Phoenix, Arizona 85021 (602)870-7600

April 16, 1996

To: Valco Surveying

From: Hal Marron

Reference: Horizontal Control for Cave Creek Wash Project

We finally have a coordinate basis for the project. I will fax you the back up information tomorrow. Please adjust your traverse as quickly as possible so that we can get Aerial Mapping started.

GIS Data from Project Engineering

Name	Latitude	Longitude	North (Y) Meters	East (X) Meters	North (Y) Feet	East (X) Feet	Zone	Conver.	Scale
Union	33-39-10.90071	112-03-03.73154	294179.918	200897.266	965157.211	659111.765	AZ	0-04-28.07	.99990191
Care	33-47-57.33274	111-59-48.06744	310392.658	205950.883	1018348.615	675691.873	AZ	0-02-40.25	.99990068
RM-3	33-43-00.98079	112-02-38.35284	301267.201	301267.201	988409.452	661285.604	AZ	0-04-14.43	.99990172

Point	Northing -Y	Easting - X	Elev Ft	Latitude	Longitude	Convergence	Sc. Fact	El. Fact
Union	965109.996	459325.622	1556.739	33-39-10.76070	112-03-01.191500	0-04-26.66	0.99990189	0.99992554
Care	1018300.267	475905.264	1877.073	33-47-57.19696	111-59-45.532650	0-02-38.84	0.99990066	0.99991022
RM-3	988361.732	461499.371	1680.174	33-43-00.84290	112-02-35.812520	0-04-13.02	0.99990170	0.99991964

The top table are on 1983 NAD Datum . The bottom table is listed as NAD 27. RM-3 is the brass cap on the east end of the dam. It has the blue ring painted around it. The cap at 25+00 that I could find was marked SM-5 (settlement marker).

Aerial Mapping Company also had the following control from a previous job. Maybe these can be used as a check.

Station HV-26 X=461,601.40 Y=988,128.33 Panel El. =1713.10

This station is located on the top of a small hill at the east end of the main portion of Cave Buttes Dam. The mark is a ½ inch x 18 inch iron pipe

driven flush, with a plastic cap marked L.S. 8902

Station HV-27	X=458,894.83	Y=988,234.71	Panel El. = 1817.39

This station is located on the top of a mountain in line with west end of Cave Buttes Dam. The mark is a ½ inch x 18 inch iron pipe driven flush, with a plastic cap marked L.S. 8902

Benchmark — Top of dam east of Concrete Structure, Aluminum cap marked "CB-3 1980". Elevation 1679.52

Let me know how this information checks out, both horizontally and vertically. Let me know when I can have the control information for the mapping.

Thanks for all of your help.

Hal

CROSS-SECTION VERIFICATION

PC-Giant (c)Copyright 1990-1994

07/10/96 15:43:47.35

GPA Associates
UNO Box 1200
New Orleans, LA 70148
(504) 286-1200

95142D Willdan Engineers * Cave Creek South FCD 1:7200 07-10-96

Object Space Reference System is Rectangular (Close-Range)

Rotation angles are Photo-to-Object

Complete Triangulation process is requested

Error Propagation is not requested

Image Residuals greater than 0.008 (mm) will be listed

Triangulated Object Coordinates will be saved

Adjusted Camera Station Parameters will be saved

Images are in millimeters. Object space is in feet

O B J E C T C O N T R O L D A T A

		Position	Std. Dev.	
3010	X =	0.0000 ft	0.5000	TYPE = 3
	Y =	0.0000 ft	0.5000	
	Z =	1816.1000 ft	0.5000	
3012	X =	0.0000 ft	0.5000	TYPE = 3
	Y =	0.0000 ft	0.5000	
	Z =	1841.9000 ft	0.5000	
901	X =	0.0000 ft	0.5000	TYPE = 3
	Y =	0.0000 ft	0.5000	
	Z =	1896.2300 ft	0.5000	
904	X =	0.0000 ft	0.5000	TYPE = 3
	Y =	0.0000 ft	0.5000	
	Z =	1888.4000 ft	0.5000	
1010	X =	0.0000 ft	0.5000	TYPE = 3
	Y =	0.0000 ft	0.5000	
	Z =	1877.8300 ft	0.5000	
100	X =	476241.7430 ft	0.5000	TYPE = 0
	Y =	1019911.2810 ft	0.5000	
	Z =	1909.5600 ft	0.5000	
102	X =	476239.5270 ft	0.5000	TYPE = 0
	Y =	1020894.7740 ft	0.5000	
	Z =	1914.4800 ft	0.5000	
104	X =	476445.5960 ft	0.5000	TYPE = 4
	Y =	1018251.1000 ft	0.5000	
	Z =	1879.3600 ft	0.5000	
105	X =	478874.0990 ft	0.5000	TYPE = 0
	Y =	1018262.3540 ft	0.5000	
	Z =	1908.7300 ft	0.5000	
106	X =	474885.7370 ft	0.5000	TYPE = 0
	Y =	1018267.0050 ft	0.5000	
	Z =	1872.3600 ft	0.5000	
107	X =	478757.1580 ft	0.5000	TYPE = 0
	Y =	1022391.3940 ft	0.5000	
	Z =	1943.9600 ft	0.5000	
108	X =	484461.6780 ft	0.5000	TYPE = 0
	Y =	1025191.9270 ft	0.5000	
	Z =	1994.6900 ft	0.5000	
111	X =	481526.5500 ft	0.5000	TYPE = 0
	Y =	1020914.5400 ft	0.5000	
	Z =	1936.9200 ft	0.5000	

OBJECT CONTROL DATA

	Position	Std. Dev.	
112	X = 481535.8740 ft Y = 1023542.3000 ft Z = 1991.8600 ft	0.5000 0.5000 0.5000	TYPE = 0
113	X = 483391.8990 ft Y = 1026026.0840 ft Z = 1976.2000 ft	0.5000 0.5000 0.5000	TYPE = 0
114	X = 485005.0350 ft Y = 1027796.5950 ft Z = 2011.5300 ft	0.5000 0.5000 0.5000	TYPE = 0
116	X = 487084.8890 ft Y = 1029081.4890 ft Z = 2152.2600 ft	0.5000 0.5000 0.5000	TYPE = 0
118	X = 485767.7270 ft Y = 1029256.2160 ft Z = 2023.3800 ft	0.5000 0.5000 0.5000	TYPE = 0
119	X = 485210.8920 ft Y = 1030798.4320 ft Z = 2013.4200 ft	0.5000 0.5000 0.5000	TYPE = 0
121	X = 486801.3620 ft Y = 1034048.0430 ft Z = 2083.9500 ft	0.5000 0.5000 0.5000	TYPE = 0
122	X = 484246.6300 ft Y = 1034072.9190 ft Z = 2121.3000 ft	0.5000 0.5000 0.5000	TYPE = 0
125	X = 483050.2360 ft Y = 1035988.0020 ft Z = 2185.3100 ft	0.5000 0.5000 0.5000	TYPE = 3
127	X = 486376.8500 ft Y = 1037117.1230 ft Z = 2101.6300 ft	0.5000 0.5000 0.5000	TYPE = 0
129	X = 484570.1690 ft Y = 1039315.3010 ft Z = 2147.9000 ft	0.5000 0.5000 0.5000	TYPE = 0
131	X = 484266.6380 ft Y = 1041367.9630 ft Z = 2172.3300 ft	0.5000 0.5000 0.5000	TYPE = 0
132	X = 482562.2660 ft Y = 1043322.9140 ft Z = 2285.3400 ft	0.5000 0.5000 0.5000	TYPE = 0

O B J E C T C O N T R O L D A T A

	Position	Std. Dev.	
134	X = 485545.3880 ft Y = 1043301.1960 ft Z = 2205.4600 ft	0.5000 0.5000 0.5000	TYPE = 4
140	X = 484305.3490 ft Y = 1043310.4420 ft Z = 2203.0860 ft	0.5000 0.5000 0.5000	TYPE = 7
141	X = 476241.7430 ft Y = 1019911.2810 ft Z = 1909.5600 ft	0.5000 0.5000 0.5000	TYPE = 0
152	X = 476239.5250 ft Y = 1020894.9690 ft Z = 1814.4800 ft	0.5000 0.5000 0.5000	TYPE = 0
154	X = 476445.6380 ft Y = 1018250.7710 ft Z = 1879.3600 ft	0.5000 0.5000 0.5000	TYPE = 0
155	X = 478874.6220 ft Y = 1018262.0290 ft Z = 1908.7300 ft	0.5000 0.5000 0.5000	TYPE = 0
157	X = 478757.6520 ft Y = 1022391.8810 ft Z = 1943.9600 ft	0.5000 0.5000 0.5000	TYPE = 0
158	X = 484463.3000 ft Y = 1025192.9710 ft Z = 1994.6900 ft	0.5000 0.5000 0.5000	TYPE = 0
161	X = 481527.5900 ft Y = 1020914.7460 ft Z = 1936.9200 ft	0.5000 0.5000 0.5000	TYPE = 0
162	X = 481536.9160 ft Y = 1023543.0150 ft Z = 1991.8600 ft	0.5000 0.5000 0.5000	TYPE = 0
163	X = 483393.3090 ft Y = 1026027.2910 ft Z = 1976.2000 ft	0.5000 0.5000 0.5000	TYPE = 0
164	X = 485006.7640 ft Y = 1027798.1520 ft Z = 2011.5300 ft	0.5000 0.5000 0.5000	TYPE = 0
166	X = 487087.0280 ft Y = 1029083.3120 ft Z = 2152.2600 ft	0.5000 0.5000 0.5000	TYPE = 0

O B J E C T C O N T R O L D A T A

	Position	Std. Dev.	
168	X = 485769.6000 ft Y = 1029258.0710 ft Z = 2023.3800 ft	0.5000 0.5000 0.5000	TYPE = 0
171	X = 486803.4570 ft Y = 1034050.8380 ft Z = 2083.9500 ft	0.5000 0.5000 0.5000	TYPE = 0
172	X = 484248.2170 ft Y = 1034075.7250 ft Z = 2121.3000 ft	0.5000 0.5000 0.5000	TYPE = 0
175	X = 483051.5840 ft Y = 1035991.1770 ft Z = 2185.3100 ft	0.5000 0.5000 0.5000	TYPE = 0
177	X = 486378.8620 ft Y = 1037120.5290 ft Z = 2101.6300 ft	0.5000 0.5000 0.5000	TYPE = 0
179	X = 484571.8190 ft Y = 1039319.1430 ft Z = 2147.9000 ft	0.5000 0.5000 0.5000	TYPE = 0
181	X = 484268.2340 ft Y = 1041372.2120 ft Z = 2172.3300 ft	0.5000 0.5000 0.5000	TYPE = 0
182	X = 482563.5120 ft Y = 1043327.5430 ft Z = 2285.3400 ft	0.5000 0.5000 0.5000	TYPE = 0
184	X = 485547.2310 ft Y = 1043305.8190 ft Z = 2205.4600 ft	0.5000 0.5000 0.5000	TYPE = 0
801	X = 476241.7820 ft Y = 1019911.2630 ft Z = 1909.5600 ft	0.5000 0.5000 0.5000	TYPE = 0
802	X = 478874.0770 ft Y = 1018262.3230 ft Z = 1908.8000 ft	0.5000 0.5000 0.5000	TYPE = 0
803	X = 0.0000 ft Y = 0.0000 ft Z = 1888.4000 ft	0.5000 0.5000 0.5000	TYPE = 3
804	X = 0.0000 ft Y = 0.0000 ft Z = 1872.3600 ft	0.5000 0.5000 0.5000	TYPE = 3

OBJECT CONTROL DATA

		Position		Std. Dev.	
805	X =	0.0000	ft	0.5000	
	Y =	0.0000	ft	0.5000	TYPE = 3
	Z =	1896.2300	ft	0.5000	
806	X =	475536.1550	ft	0.5000	
	Y =	1014763.2940	ft	0.5000	TYPE = 0
	Z =	1901.2300	ft	0.5000	
807	X =	473094.7420	ft	0.5000	
	Y =	1015929.0370	ft	0.5000	TYPE = 0
	Z =	1836.9500	ft	0.5000	
808	X =	470609.3340	ft	0.5000	
	Y =	1017118.6780	ft	0.5000	TYPE = 0
	Z =	1846.2200	ft	0.5000	
809	X =	0.0000	ft	0.5000	
	Y =	0.0000	ft	0.5000	TYPE = 3
	Z =	1827.3200	ft	0.5000	
810	X =	473516.5550	ft	0.5000	
	Y =	1013779.7410	ft	0.5000	TYPE = 0
	Z =	1848.6100	ft	0.5000	
811	X =	0.0000	ft	0.5000	
	Y =	0.0000	ft	0.5000	TYPE = 3
	Z =	1802.4900	ft	0.5000	
812	X =	470332.6690	ft	0.5000	
	Y =	1009929.6750	ft	0.5000	TYPE = 0
	Z =	1797.9300	ft	0.5000	
813	X =	0.0000	ft	0.5000	
	Y =	0.0000	ft	0.5000	TYPE = 3
	Z =	1787.3300	ft	0.5000	
814	X =	465710.5200	ft	0.5000	
	Y =	1007668.3100	ft	0.5000	TYPE = 0
	Z =	1748.5500	ft	0.5000	
815	X =	0.0000	ft	0.5000	
	Y =	0.0000	ft	0.5000	TYPE = 3
	Z =	1735.3200	ft	0.5000	
816	X =	470945.9080	ft	0.5000	
	Y =	1005036.3980	ft	0.5000	TYPE = 0
	Z =	1767.7700	ft	0.5000	
817	X =	0.0000	ft	0.5000	
	Y =	0.0000	ft	0.5000	TYPE = 3
	Z =	1714.6300	ft	0.5000	

O B J E C T C O N T R O L D A T A

		Position		Std. Dev.	
818	X =	466080.7080	ft	0.5000	TYPE = 0
	Y =	1001442.6110	ft	0.5000	
	Z =	1685.8600	ft	0.5000	
819	X =	0.0000	ft	0.5000	TYPE = 3
	Y =	0.0000	ft	0.5000	
	Z =	1693.3400	ft	0.5000	
820	X =	0.0000	ft	0.5000	TYPE = 3
	Y =	0.0000	ft	0.5000	
	Z =	1651.2500	ft	0.5000	
821	X =	0.0000	ft	0.5000	TYPE = 3
	Y =	0.0000	ft	0.5000	
	Z =	1650.5500	ft	0.5000	
822	X =	465647.3790	ft	0.5000	TYPE = 0
	Y =	994450.0580	ft	0.5000	
	Z =	1656.2500	ft	0.5000	
823	X =	462949.8450	ft	0.8000	TYPE = 3
	Y =	995216.6060	ft	0.8000	
	Z =	1626.5800	ft	0.5000	
824	X =	460400.0660	ft	0.5000	TYPE = 0
	Y =	997064.4720	ft	0.5000	
	Z =	1628.4600	ft	0.5000	

E R R O R W A R N I N G S

POINTS NOT PHOTOGRAPHED

901	904	1010	100
102	105	106	107
108	111	112	113
114	116	118	119
121	122	125	127
129	131	132	134
140	141	152	154
155	157	158	161
162	163	164	166
168	171	172	175
177	179	181	182
184	806		

PASS POINTS APPEARING ON 1 PHOTO

89809 99809

C A M E R A S T A T I O N S C O R R E C T I O N S

	------- P O S I T I O N -------			--------- A T T I T U D E ------		
	X	Y	Z	Omega	Phi	Kappa
			Iteration 1			
1001	-0.0037	0.0051	0.0010 ft	0.000001	-0.000001	0.000000
1002	-0.0041	0.0040	-0.0010 ft	0.000001	0.000000	0.000000
1003	-0.0045	0.0038	-0.0021 ft	0.000001	0.000000	0.000000
1004	-0.0052	0.0050	-0.0034 ft	0.000002	0.000000	0.000000
1005	-0.0054	0.0054	-0.0034 ft	0.000002	-0.000001	0.000000
1006	-0.0094	0.0038	-0.0045 ft	0.000003	0.000000	0.000001
1007	-0.0129	0.0018	-0.0028 ft	0.000003	0.000001	0.000001
1008	-0.0209	-0.0020	0.0011 ft	0.000005	0.000003	0.000000
1009	-0.0252	-0.0074	0.0088 ft	0.000005	0.000004	0.000000
1010	-0.0366	-0.0064	0.0198 ft	0.000007	0.000005	0.000000
1011	-0.0396	0.0087	0.0321 ft	0.000009	0.000004	0.000000
2001	-0.0052	0.0033	0.0012 ft	0.000001	0.000000	0.000000
2002	-0.0054	0.0027	0.0004 ft	0.000001	0.000000	0.000000
2003	-0.0045	0.0017	-0.0001 ft	0.000001	0.000000	0.000000
2004	-0.0065	0.0028	0.0002 ft	0.000001	0.000000	0.000000
2005	-0.0064	0.0016	0.0004 ft	0.000002	0.000000	0.000000
2006	-0.0090	-0.0009	0.0011 ft	0.000002	0.000000	0.000001
2007	-0.0117	-0.0045	0.0038 ft	0.000003	0.000002	0.000001
2008	-0.0209	-0.0085	0.0123 ft	0.000004	0.000004	0.000000
2009	-0.0283	-0.0094	0.0224 ft	0.000006	0.000005	-0.000001
2010	-0.0307	-0.0053	0.0341 ft	0.000006	0.000005	-0.000001
2011	-0.0353	0.0060	0.0428 ft	0.000007	0.000003	-0.000001
3001	0.0641	0.1070	0.0840 ft	0.000007	-0.000024	0.000001
3002	0.0490	0.0963	0.0490 ft	0.000008	-0.000024	0.000001
3003	0.0184	0.0517	0.0060 ft	0.000006	-0.000012	0.000000
3004	0.0085	0.0347	-0.0218 ft	0.000005	-0.000008	0.000000

Provisional Weighted Sum of Squares = 90.3335

T R I A N G U L A T E D I M A G E P O I N T S R E S I D U A L S
(in thousandths of millimeters)

2050	1005 2 8	1004	2004	1006	2005	2006
2060	1006 3 8	1007	1005	2005	2006	2007
2070	1007 1 8	1006	1008	2006	2007	2008
2092	1009 -8 1	1010	1008	2008	2009	2010
2020	2002 9 0	2001	2003			
2044	2004 0 8	2003	2005			
2054	2005 2 8	2006	2004			

Weighted Sum of Squares (Camera) = 0.0
Weighted Sum of Squares (Object) = 4.8
Weighted Sum of Squares (Plates) = 47.0

Weighted Sum of Squares (Total) = 51.9
Degrees of Freedom..... = 220

a posteriori Variance of Unit Weight = 0.236

T R I A N G U L A T E D C A M E R A S T A T I O N S
(Photo to Object)

Ident	Position	Attitude
1001	X = 461848.1183 ft Y = 994788.7791 ft Z = 5856.1200 ft	Omega =- 01 54 22.4710 Phi = 00 18 14.2389 Kappa =- 63 10 54.9035
1002	X = 462916.5329 ft Y = 996985.9680 ft Z = 5869.7150 ft	Omega =- 00 58 19.9725 Phi = 00 59 42.4970 Kappa =- 63 42 13.5619
1003	X = 463857.9915 ft Y = 999071.5528 ft Z = 5902.0579 ft	Omega =- 01 16 09.8703 Phi = 00 31 59.8164 Kappa =- 64 12 56.5967
1004	X = 464827.3818 ft Y =1001175.0880 ft Z = 5903.3676 ft	Omega =- 00 47 59.6140 Phi =- 00 03 33.2984 Kappa =- 64 42 37.8594
1005	X = 465821.9536 ft Y =1003300.2324 ft Z = 5910.4746 ft	Omega =- 01 25 51.1114 Phi =- 00 09 06.1066 Kappa =- 64 31 15.5947
1006	X = 466844.3906 ft Y =1005427.4008 ft Z = 5917.5895 ft	Omega =- 01 42 18.5432 Phi = 00 05 36.7841 Kappa =- 64 18 55.2678
1007	X = 467886.4381 ft Y =1007559.2458 ft Z = 5900.5132 ft	Omega =- 01 40 07.4480 Phi =- 00 20 29.8488 Kappa =- 64 22 53.7804

T R I A N G U L A T E D C A M E R A S T A T I O N S
(Photo to Object)

Ident	Position	Attitude
1008	X = 468927.1781 ft Y =1009744.4250 ft Z = 5900.1271 ft	Omega =- 01 18 49.7861 Phi =- 00 09 16.1901 Kappa =- 64 31 28.2835
1009	X = 469955.7248 ft Y =1011924.4246 ft Z = 5910.7828 ft	Omega =- 01 35 26.8624 Phi = 00 16 46.5674 Kappa =- 64 34 03.1720
1010	X = 471009.5744 ft Y =1014081.7826 ft Z = 5900.5618 ft	Omega =- 01 28 54.7182 Phi = 00 00 34.7368 Kappa =- 64 37 13.9626
1011	X = 471984.1554 ft Y =1016279.2627 ft Z = 5912.4961 ft	Omega =- 00 46 14.0164 Phi = 00 01 32.4096 Kappa =- 65 30 54.3060
2001	X = 463635.4928 ft Y = 993584.5423 ft Z = 5895.5142 ft	Omega =- 00 46 10.0228 Phi = 00 36 24.6913 Kappa =- 62 56 18.6078
2002	X = 464702.5106 ft Y = 995648.8127 ft Z = 5903.8024 ft	Omega =- 01 05 12.2178 Phi = 00 09 34.2045 Kappa =- 62 37 35.2382
2003	X = 465779.0085 ft Y = 997817.6577 ft Z = 5907.6459 ft	Omega =- 01 24 44.1731 Phi = 00 04 51.5843 Kappa =- 62 52 39.1669

T R I A N G U L A T E D C A M E R A S T A T I O N S
(Photo to Object)

Ident	Position	Attitude
2004	X = 466882.1795 ft Y =1000017.3848 ft Z = 5915.8132 ft	Omega =- 01 09 44.3981 Phi = 00 16 40.7501 Kappa =- 62 57 19.4981
2005	X = 467951.4396 ft Y =1002227.3066 ft Z = 5933.1814 ft	Omega =- 01 56 18.8479 Phi = 00 13 13.6797 Kappa =- 63 10 27.7899
2006	X = 469043.8700 ft Y =1004549.9811 ft Z = 5887.6161 ft	Omega =- 00 32 52.2526 Phi =- 00 57 01.5562 Kappa =- 63 41 27.0727
2007	X = 470130.1193 ft Y =1006877.5595 ft Z = 5889.3878 ft	Omega =- 01 14 20.9519 Phi =- 00 04 37.3114 Kappa =- 63 46 05.7214
2008	X = 471298.3811 ft Y =1009079.3905 ft Z = 5918.8193 ft	Omega =- 00 57 17.1508 Phi = 00 30 20.9272 Kappa =- 63 09 24.7852
2009	X = 472369.7717 ft Y =1011288.8766 ft Z = 5923.3354 ft	Omega =- 00 56 03.4414 Phi = 00 11 10.6864 Kappa =- 63 19 50.4765
2010	X = 473406.2983 ft Y =1013476.3557 ft Z = 5939.7181 ft	Omega =- 00 40 36.0911 Phi = 00 12 05.9085 Kappa =- 63 55 02.7257

T R I A N G U L A T E D C A M E R A S T A T I O N S
(Photo to Object)

Ident	Position	Attitude
2011	X = 474420.2657 ft Y =1015686.5740 ft Z = 5931.0968 ft	Omega =- 00 42 48.6622 Phi =- 00 18 45.2850 Kappa =- 64 13 56.8440
3001	X = 472835.5701 ft Y =1014199.3940 ft Z = 5984.7500 ft	Omega =- 01 32 31.6619 Phi =- 00 06 25.9007 Kappa =- 42 36 43.6253
3002	X = 474683.6450 ft Y =1015782.6193 ft Z = 5976.0360 ft	Omega =- 01 10 31.5629 Phi = 00 05 26.9369 Kappa =- 43 08 25.5954
3003	X = 476505.3974 ft Y =1017383.6367 ft Z = 5973.1310 ft	Omega =- 00 55 46.7531 Phi =- 00 08 52.8147 Kappa =- 43 50 47.9026
3004	X = 478346.2975 ft Y =1018957.4257 ft Z = 6006.0672 ft	Omega =- 01 15 31.8869 Phi = 00 33 44.1909 Kappa =- 43 38 25.1368

T R I A N G U L A T E D O B J E C T P O I N T S

Ident		Position (feet)					
104	*4*	X =	476445.5267	Y =	1018251.2249	Z =	1876.2518
701		X =	476224.8659	Y =	1016932.1818	Z =	1878.2408
801	*0*	X =	476241.9700	Y =	1019911.2016	Z =	1909.4945
802	*0*	X =	478873.8075	Y =	1018262.3490	Z =	1908.6475
803	*3*	X =	477587.3110	Y =	1018245.8456	Z =	1888.5268
804	*3*	X =	474885.1992	Y =	1018266.8559	Z =	1872.3752
805	*3*	X =	477513.6303	Y =	1016427.6888	Z =	1896.2138
807	*0*	X =	473094.5743	Y =	1015929.1029	Z =	1836.9954
808	*0*	X =	470609.3726	Y =	1017118.5434	Z =	1846.0459
809	*3*	X =	471509.7669	Y =	1014788.4209	Z =	1827.3503
810	*0*	X =	473516.4677	Y =	1013779.9603	Z =	1848.7731
811	*3*	X =	472890.3716	Y =	1008783.7378	Z =	1802.5034
812	*0*	X =	470332.8485	Y =	1009929.6717	Z =	1798.1716
813	*3*	X =	467390.7561	Y =	1011219.8670	Z =	1787.3560
814	*0*	X =	465710.8117	Y =	1007668.2120	Z =	1748.3768
815	*3*	X =	468267.5181	Y =	1006206.7842	Z =	1735.3348
816	*0*	X =	470946.0463	Y =	1005036.2147	Z =	1767.7685
817	*3*	X =	468640.0328	Y =	1000262.0035	Z =	1714.5952
818	*0*	X =	466080.7685	Y =	1001442.5351	Z =	1685.9246
819	*3*	X =	463725.0569	Y =	1002690.0271	Z =	1693.2737
820	*3*	X =	463147.7915	Y =	997442.9961	Z =	1651.7722
821	*3*	X =	464672.1808	Y =	996839.0166	Z =	1650.6422
822	*0*	X =	465647.2692	Y =	994449.9414	Z =	1656.0524
823	*3*	X =	462949.3251	Y =	995217.0159	Z =	1626.2284
824	*0*	X =	460399.8731	Y =	997064.7090	Z =	1628.4351
1012		X =	459689.2255	Y =	995887.3304	Z =	1638.0495
1020		X =	462852.3775	Y =	997085.9071	Z =	1647.4183
1022		X =	460746.1020	Y =	998132.6096	Z =	1655.8241
1024		X =	464817.1690	Y =	996156.6183	Z =	1657.0357
1032		X =	461564.6315	Y =	1000229.4575	Z =	1675.3156
1040		X =	464785.7705	Y =	1001205.4862	Z =	1686.0930
1042		X =	462552.6632	Y =	1002228.3711	Z =	1694.8577
1044		X =	466634.0273	Y =	1000307.3564	Z =	1674.8275
1052		X =	463689.8761	Y =	1004300.4905	Z =	1713.0957
1062		X =	464607.8365	Y =	1006501.1551	Z =	1735.2227
1070		X =	467768.1525	Y =	1007571.1386	Z =	1743.7061
1072		X =	465721.0217	Y =	1008562.9296	Z =	1757.4342
1074		X =	469684.4490	Y =	1006666.9589	Z =	1756.8831
1080		X =	468841.1924	Y =	1009766.1379	Z =	1765.5324
1082		X =	466659.7581	Y =	1010808.0542	Z =	1780.5358
1084		X =	470636.0976	Y =	1008923.0289	Z =	1780.3952
1090		X =	469833.0568	Y =	1011994.1997	Z =	1792.9206
1092		X =	467768.4347	Y =	1012985.7818	Z =	1801.9738
1094		X =	471728.9785	Y =	1011094.2765	Z =	1817.4771
1100		X =	470910.7448	Y =	1014116.1734	Z =	1818.5379
1102		X =	468867.0046	Y =	1015099.1711	Z =	1820.8709
1104		X =	472854.1040	Y =	1013214.5891	Z =	1840.0364
1110		X =	471930.8114	Y =	1016320.5222	Z =	1848.3389
2010		X =	463608.3402	Y =	993728.0168	Z =	1617.2701
2012		X =	461624.4155	Y =	994850.5783	Z =	1625.3498
2014		X =	465408.5758	Y =	992719.0411	Z =	1638.7396
2020		X =	464613.5935	Y =	995715.3989	Z =	1643.5797

T R I A N G U L A T E D O B J E C T P O I N T S

Ident		Position (feet)		
2022		X = 462530.5980	Y = 996781.1489	Z = 1642.7878
2024		X = 466559.2302	Y = 994697.7460	Z = 1664.1277
2030		X = 465838.8588	Y = 998013.1794	Z = 1665.2640
2032		X = 463642.4392	Y = 999066.4886	Z = 1667.7117
2034		X = 467639.6221	Y = 996860.3635	Z = 1684.2112
2040		X = 466867.1931	Y =1000059.4469	Z = 1666.3226
2042		X = 464775.8434	Y =1001114.1092	Z = 1684.8868
2044		X = 468663.4304	Y = 999119.7240	Z = 1707.4114
2050		X = 467816.8875	Y =1002327.3654	Z = 1725.2407
2052		X = 465627.4736	Y =1003404.4555	Z = 1708.1127
2054		X = 469711.3911	Y =1001353.6641	Z = 1730.1671
2060		X = 468796.7100	Y =1004549.1730	Z = 1746.2865
2062		X = 466741.0526	Y =1005589.1816	Z = 1723.3901
2064		X = 470829.0807	Y =1003575.6193	Z = 1749.0779
2070		X = 470101.4753	Y =1006980.6420	Z = 1760.2228
2072		X = 468039.9840	Y =1008002.4210	Z = 1749.0671
2074		X = 471794.1597	Y =1006050.6726	Z = 1779.5390
2080		X = 471255.9657	Y =1009114.6511	Z = 1790.3301
2082		X = 469169.4300	Y =1010271.8749	Z = 1770.2129
2084		X = 473045.6096	Y =1008245.3977	Z = 1800.3402
2090		X = 472288.4765	Y =1011385.6423	Z = 1822.5783
2092		X = 470296.6335	Y =1012415.9475	Z = 1790.8788
2094		X = 474258.7582	Y =1010356.4735	Z = 1825.8071
2104		X = 475062.0987	Y =1012667.3567	Z = 1847.1217
2110		X = 474402.6873	Y =1015680.6657	Z = 1833.3309
2112		X = 472429.0384	Y =1016630.3904	Z = 1853.7009
2114		X = 476274.0581	Y =1014423.5549	Z = 1870.6875
3010	*3*	X = 472742.1015	Y =1014260.8034	Z = 1815.9862
3012	*3*	X = 471195.2196	Y =1015969.0692	Z = 1841.9163
3014		X = 474107.4720	Y =1012801.9256	Z = 1838.4150
3020		X = 474604.8270	Y =1015854.3277	Z = 1835.4707
3022		X = 473111.4113	Y =1017494.8129	Z = 1869.7374
3032		X = 474981.1074	Y =1018986.3306	Z = 1894.3893
3034		X = 477941.9823	Y =1015844.7316	Z = 1894.1236
3040		X = 478265.0731	Y =1019102.2607	Z = 1884.4397
3042		X = 476932.7807	Y =1020478.6425	Z = 1917.5962
3044		X = 479869.3552	Y =1017422.5254	Z = 1924.6740
12010		X = 463608.7739	Y = 993727.7936	Z = 1616.3405
12012		X = 461625.1039	Y = 994850.3271	Z = 1625.3048

C O R R E C T I O N S A P P L I E D T O O B J E C T C O N T R O L

	X =(	0.0612 ft)		X =	-0.0873 ft
3010	Y =(	0.0519 ft)	810	Y =	0.2193 ft
	Z =	-0.1138 ft		Z =	0.1631 ft
	X =(	-0.0197 ft)		X =	0.1880 ft
820	Y =(	0.0175 ft)	801	Y =	-0.0614 ft
	Z =	0.5222 ft		Z =	-0.0655 ft
	X =(	0.0052 ft)		X =(	0.0051 ft)
811	Y =(	-0.0051 ft)	821	Y =(	-0.0013 ft)
	Z =	0.0134 ft		Z =	0.0922 ft
	X =	-0.2695 ft		X =(	0.0136 ft)
802	Y =	0.0260 ft	3012	Y =(	0.0095 ft)
	Z =	-0.1525 ft		Z =	0.0163 ft
	X =	0.1795 ft		X =	-0.1098 ft
812	Y =	-0.0033 ft	822	Y =	-0.1166 ft
	Z =	0.2416 ft		Z =	-0.1976 ft
	X =(	0.0074 ft)		X =(	-0.0207 ft)
803	Y =(	0.0021 ft)	813	Y =(	0.0037 ft)
	Z =	0.1268 ft		Z =	0.0260 ft
	X =(	0.0111 ft)		X =	-0.0693 ft
823	Y =(	0.0041 ft)	104	Y =	0.1249 ft
	Z =	-0.3516 ft		Z =(	-0.0011 ft)
	X =(	-0.0001 ft)		X =	0.2917 ft
804	Y =(	0.0001 ft)	814	Y =	-0.0980 ft
	Z =	0.0152 ft		Z =	-0.1732 ft
	X =	-0.1929 ft		X =(	-0.0027 ft)
824	Y =	0.2370 ft	805	Y =(	0.0014 ft)
	Z =	-0.0249 ft		Z =	-0.0162 ft
	X =(	0.0003 ft)		X =	0.1383 ft
815	Y =(	-0.0023 ft)	816	Y =	-0.1833 ft
	Z =	0.0148 ft		Z =	-0.0015 ft
	X =	-0.1677 ft		X =(	-0.0191 ft)
807	Y =	0.0659 ft	817	Y =(	0.0112 ft)
	Z =	0.0454 ft		Z =	-0.0348 ft
	X =	0.0386 ft		X =	0.0605 ft
808	Y =	-0.1346 ft	818	Y =	-0.0759 ft
	Z =	-0.1741 ft		Z =	0.0646 ft
	X =(	-0.0026 ft)		X =(	0.0495 ft)
809	Y =(	0.0024 ft)	819	Y =(	-0.0134 ft)
	Z =	0.0303 ft		Z =	-0.0663 ft

X .... Number of Components =	12	RMS =	0.1682	feet
Y .... Number of Components =	12	RMS =	0.1321	feet
Z .... Number of Components =	25	RMS =	0.1626	feet

CAVEXS

sec1

pt num	east	north	field elev	dist	tot dist	DTM DIST	DTM ELEV	Difference
360	464777.247	996165.578	1653.190			0+00	1653.587	-0.397
374	464683.230	996226.024	1645.181	112		1+12	1645.563	-0.382
377	464589.252	996286.445	1642.917	112	223	2+23	1643.061	-0.144
372	464507.540	996338.979	1645.233	97	321	3+21	1645.074	0.159
376	464471.803	996361.956	1642.991	42	363	3+63	1643.355	-0.364
370	464361.968	996432.571	1646.194	131	494	4+94	1645.45	0.744
337	464285.222	996481.913	1635.077	91	585	5+85	1635.484	-0.407
364	464267.205	996493.497	1641.058	21	606	6+06	1640.574	0.484
371	464237.174	996512.804	1641.090	36	642	6+42	1639.966	1.124
373	464071.690	996619.198	1641.280	197	839	8+39	1641.667	-0.387
339	464062.956	996624.813	1637.755	10	849	8+49	1638.766	-1.011
340	464006.261	996661.264	1637.798	67	917	9+17	1638.248	-0.450
361	463991.885	996670.507	1640.997	17	934	9+34	1639.885	1.112
349	463879.407	996742.822	1639.445	134	1067	10+67	1640.821	-1.376
347	463869.653	996749.093	1638.434	12	1079	10+79	1639.305	-0.871
341	463858.029	996756.566	1638.133	14	1093	10+93	1638.808	-0.675
353	463852.926	996759.847	1640.516	6	1099	10+99	1639.321	1.195
359	463761.558	996818.590	1640.688	109	1207	12+07	1640.566	0.122
338	463754.838	996822.910	1637.518	8	1215	12+15	1638.62	-1.102
342	463740.283	996832.267	1638.152	17	1233	12+33	1638.739	-0.587
357	463726.581	996841.077	1640.635	16	1249	12+49	1639.908	0.727
368	463685.530	996867.470	1641.232	49	1298	12+98	1640.945	0.287
351	463509.225	996980.820	1640.449	210	1507	15+07	1639.717	0.732
378	463484.980	996996.408	1637.514	29	1536	15+36	1638.626	-1.112
379	463463.483	997010.229	1637.076	26	1562	15+62	1637.439	-0.363
355	463455.390	997015.432	1640.591	10	1571	15+71	1639.256	1.335
366	463385.488	997060.374	1641.088	83	1655	16+55	1640.992	0.096
375	463279.661	997128.413	1641.673	126	1780	17+80	1641.063	0.610
345	463266.789	997136.688	1638.348	15	1796	17+96	1638.169	0.179
344	463221.788	997165.621	1638.207	53	1849	18+49	1639.208	-1.001
907	463207.152	997175.031	1645.061	17	1867	18+67	1643.442	1.619
367	463038.635	997283.374	1649.391	200	2067	20+67	1649.582	-0.191
365	462871.280	997390.971	1649.594	199	2266	22+66	1649.624	-0.030
363	462701.098	997500.385	1650.409	202	2468	24+68	1650.312	0.097
369	462586.886	997573.815	1648.973	136	2604	26+04	1648.938	0.035
362	462409.520	997687.848	1650.692	211	2815	28+15	1651.799	-1.107
								0.599428

sec2

pt num	east	north	field elev	dist	tot dist
382	466734.021	999074.114	1687.981		
381	466622.293	999150.043	1692.171	135	
911	466485.951	999242.700	1694.370	165	300
910	466462.529	999258.618	1693.242	28	328
909	466435.154	999277.222	1667.612	33	361
513	466407.333	999296.129	1667.584	34	395
405	466393.474	999305.547	1669.670	17	412
397	466324.757	999352.247	1670.768	83	495
380	466302.511	999367.366	1668.979	27	522
410	466220.284	999423.246	1668.633	99	621
394	466212.888	999428.273	1671.477	9	630
354	466199.971	999437.051	1664.457	16	646
352	466188.517	999444.835	1664.589	14	660
343	466182.023	999449.248	1666.461	8	667
404	466145.569	999474.022	1669.805	44	711
401	466025.097	999555.894	1670.177	146	857
393	465905.588	999637.112	1672.057	144	1002
402	465884.004	999651.781	1670.163	26	1028
408	465871.974	999659.956	1668.105	15	1042
406	465811.950	999700.748	1669.627	73	1115
399	465755.670	999738.996	1670.656	68	1183
395	465701.886	999775.547	1671.193	65	1248
407	465682.589	999788.661	1667.922	23	1271
350	465606.788	999840.175	1664.673	92	1363
411	465585.306	999854.774	1669.441	26	1389
403	465558.213	999873.186	1670.039	33	1422
908	465547.341	999880.575	1667.122	13	1435
518	465538.902	999886.310	1667.184	10	1445
400	465533.058	999890.281	1670.500	7	1452
396	465335.520	1000024.527	1670.843	239	1691
398	465188.370	1000124.529	1670.683	178	1869
348	465172.173	1000135.537	1664.711	20	1888
346	465157.779	1000145.319	1664.901	17	1906
409	465140.835	1000156.834	1668.318	20	1926
906	465076.746	1000200.388	1666.943	77	2004
356	465064.462	1000208.737	1661.699	15	2019
358	465054.703	1000215.369	1661.560	12	2030
390	465033.978	1000229.454	1676.339	25	2055
387	464939.093	1000293.937	1678.820	115	2170
392	464839.444	1000361.658	1676.050	120	2291
388	464740.843	1000428.667	1677.861	119	2410
386	464578.310	1000539.123	1679.594	197	2606
389	464419.601	1000646.981	1677.369	192	2798
391	464281.298	1000740.971	1676.184	167	2966
385	464236.390	1000771.490	1679.850	54	3020
384	464155.879	1000826.204	1682.559	97	3117

DTM DIST	DTM ELEV	Difference
0+00	1688.058	-0.077
1+35	1692.398	-0.227
3+00	1694.544	-0.174
3+28	1692.445	0.797
3+61	1669.624	-2.012
3+95	1669.088	-1.504
4+12	1670.305	-0.635
4+95	1670.391	0.377
5+22	1669.508	-0.529
6+21	1668.943	-0.310
6+30	1671.897	-0.420
6+46	1665.255	-0.798
6+60	1665.163	-0.574
6+67	1666.248	0.213
7+11	1668.392	1.413
8+57	1670.97	-0.793
10+02	1672.065	-0.008
10+28	1670.057	0.106
10+42	1668.727	-0.622
11+15	1670.116	-0.489
11+83	1671.942	-1.286
12+48	1671.201	-0.008
12+71	1668.967	-1.045
13+63	1664.702	-0.029
13+89	1669.418	0.023
14+22	1670.013	0.026
14+35	1668.193	-1.071
14+45	1667.536	-0.352
14+52	1668.647	1.853
16+91	1671.297	-0.454
18+69	1670.818	-0.135
18+88	1665.983	-1.272
19+06	1665.3	-0.399
19+26	1668.604	-0.286
20+04	1667.762	-0.819
20+19	1661.868	-0.169
20+30	1662.319	-0.759
20+55	1675.778	0.561
21+70	1679.142	-0.322
22+91	1675.821	0.229
24+10	1678.152	-0.291
26+06	1679.724	-0.130
27+98	1677.568	-0.199
29+66	1676.188	-0.004
30+20	1679.596	0.254
31+17	1682.537	0.022
		0.457609

sec3

pt num	east	north	field elev	dist	tot dist	DTM DIST	DTM ELEV	Difference
440	467976.092	1003899.685	1739.896			0+00	1740.004	-0.108
916	467826.394	1003903.529	1737.830	150	150	1+50	1737.713	0.117
915	467730.741	1003905.986	1736.139	96	245	2+45	1736.239	-0.100
412	467690.957	1003907.007	1735.546	40	285	2+85	1735.999	-0.453
413	467651.584	1003908.019	1734.360	39	325	3+25	1734.369	-0.009
418	467581.313	1003909.823	1727.921	70	395	3+95	1727.599	0.322
912	467535.956	1003910.988	1700.377	45	440	4+40	1700.827	-0.450
438	467415.525	1003914.081	1701.519	120	561	5+61	1701.653	-0.134
913	467337.505	1003916.084	1700.661	78	639	6+39	1700.585	0.076
437	467210.789	1003919.339	1701.560	127	766	7+66	1701.593	-0.033
515	467081.145	1003922.668	1698.545	130	895	8+95	1699.773	-1.228
432	467066.713	1003923.039	1706.265	14	910	9+10	1706.047	0.218
431	467047.777	1003923.525	1706.761	19	929	9+29	1707.205	-0.444
421	467040.442	1003923.713	1712.684	7	936	9+36	1712.241	0.443
423	467032.591	1003923.915	1711.229	8	944	9+44	1711.635	-0.406
424	466880.678	1003927.816	1710.675	152	1096	10+96	1710.638	0.037
428	466731.944	1003931.636	1707.960	149	1245	12+45	1709.617	-1.657
419	466719.356	1003931.959	1716.024	13	1257	12+57	1714.1	1.924
516	466681.124	1003932.941	1708.328	38	1295	12+95	1709.19	-0.862
430	466638.956	1003934.024	1707.016	42	1338	13+38	1706.137	0.879
435	466622.412	1003934.449	1704.585	17	1354	13+54	1704.672	-0.087
517	466514.915	1003937.209	1709.428	108	1462	14+62	1709.102	0.326
426	466337.747	1003941.759	1708.988	177	1639	16+39	1708.741	0.247
436	466286.690	1003943.070	1702.574	51	1690	16+90	1702.683	-0.109
433	466256.850	1003943.837	1705.009	30	1720	17+20	1704.009	1.000
425	466241.248	1003944.237	1700.723	16	1735	17+35	1700.801	-0.078
439	466229.146	1003944.548	1700.969	12	1748	17+48	1700.727	0.242
434	466203.849	1003945.198	1704.733	25	1773	17+73	1703.028	1.705
427	466139.496	1003946.851	1708.222	64	1837	18+37	1707.863	0.359
429	466028.423	1003949.703	1707.861	111	1948	19+48	1707.524	0.337
422	465916.987	1003952.565	1712.328	111	2060	20+60	1712.307	0.021
420	465731.419	1003957.330	1713.837	186	2245	22+45	1713.683	0.154
								0.481123

sec4

pt num	east	north	field elev	dist	tot dist	DTM DIST	DTM ELEV	Difference	
460	469158.626	1007310.531	1767.660			0+00	1767.836	-0.176	
459	469110.807	1007326.266	1766.031	50	50	0+50	1765.776	0.255	
449	468948.241	1007379.759	1745.669	171	221	2+21	1746.065	-0.396	
447	468790.080	1007431.802	1744.795	167	388	3+88	1745.064	-0.269	
442	468764.031	1007440.373	1740.422	27	415	4+15	1740.653	-0.231	
919	468743.132	1007447.250	1740.137	22	437	4+37	1740.387	-0.250	
918	468722.340	1007454.092	1748.049	22	459	4+59	1746.145		1.904
451	468637.039	1007482.160	1747.458	90	549	5+49	1747.639	-0.181	
457	468618.441	1007488.280	1755.142	20	569	5+69	1754.468	0.674	
453	468604.709	1007492.798	1748.405	14	583	5+83	1748.77	-0.365	
455	468490.360	1007530.425	1750.750	120	704	7+04	1751.48	-0.730	
458	468473.105	1007536.103	1761.532	18	722	7+22	1759.037		2.495
448	468392.538	1007562.614	1744.800	85	806	8+06	1744.408	0.392	
456	468347.470	1007577.443	1752.306	47	854	8+54	1750.791	1.515	
415	468314.564	1007588.271	1734.065	35	889	8+89	1735.287	-1.222	
417	468042.326	1007677.851	1731.765	287	1175	11+75	1732.553	-0.788	
416	467878.295	1007731.826	1733.950	173	1348	13+48	1734.325	-0.375	
446	467830.587	1007747.524	1744.658	50	1398	13+98	1744.528	0.130	
443	467707.890	1007787.898	1741.439	129	1527	15+27	1741.773	-0.334	
444	467666.118	1007801.643	1743.992	44	1571	15+71	1743.733	0.259	
445	467541.095	1007842.782	1744.389	132	1703	17+03	1744.085	0.304	
441	467356.274	1007903.598	1740.286	195	1897	18+97	1740.397	-0.111	
414	467334.583	1007910.735	1734.118	23	1920	19+20	1735.295	-1.177	
914	467326.219	1007913.488	1734.525	9	1929	19+29	1735.767	-1.242	
50	467318.492	1007916.030	1737.574	8	1937	19+37	1737.435	0.139	
917	467269.759	1007932.066	1738.646	51	1988	19+88	1739.665	-1.019	
450	467250.668	1007938.347	1746.494	20	2009	20+09	1745.731	0.763	
452	467071.022	1007997.460	1747.990	189	2198	21+98	1747.866	0.124	
454	466892.496	1008056.205	1750.198	188	2386	23+86	1750.086	0.112	
								0.405369	

sec5

pt num	east	north	field elev	dist	tot dist	DTM DIST	DTM ELEV	Difference	
486	471304.922	1011330.460	1815.388			0+00	1815.136	0.252	
925	471201.695	1011380.962	1814.578	115	115	1+15	1814.169	0.409	
485	471089.961	1011435.625	1809.839	124	239	2+39	1803.914		5.925
466	471072.183	1011444.323	1783.090	20	259	2+59	1784.741	-1.651	
462	471026.550	1011466.648	1781.931	51	310	3+10	1782.715	-0.784	
481	471013.966	1011472.804	1786.384	14	324	3+24	1785.642	0.742	
467	470811.494	1011571.859	1785.762	225	549	5+49	1785.556	0.206	
464	470800.255	1011577.358	1782.796	13	562	5+62	1784.142	-1.346	
463	470736.566	1011608.516	1782.421	71	633	6+33	1782.514	-0.093	
461	470679.882	1011636.248	1781.820	63	696	6+96	1784.037	-2.217	
468	470669.388	1011641.382	1790.395	12	708	7+08	1790.187	0.208	
474	470503.830	1011722.377	1793.256	184	892	8+92	1793.074	0.182	
469	470338.087	1011803.464	1791.031	185	1076	10+76	1790.768	0.263	
482	470090.459	1011924.611	1787.469	276	1352	13+52	1787.036	0.433	
920	470060.433	1011939.300	1782.821	33	1385	13+85	1782.93	-0.109	
921	470053.428	1011942.727	1783.035	8	1393	13+93	1783.793	-0.758	
483	470005.462	1011966.194	1787.949	53	1447	14+47	1788.002	-0.053	
473	469818.891	1012057.469	1793.208	208	1654	16+54	1793.044	0.164	
472	469660.515	1012134.951	1792.310	176	1831	18+31	1792.299	0.011	
471	469494.597	1012216.123	1792.296	185	2015	20+15	1792.379	-0.083	
470	469315.917	1012303.539	1792.076	199	2214	22+14	1792.238	-0.162	
475	469148.761	1012385.316	1794.256	186	2400	24+00	1794.048	0.208	
476	468981.083	1012467.349	1797.834	187	2587	25+87	1797.894	-0.060	
477	468807.282	1012552.377	1800.163	193	2781	27+81	1799.867	0.296	
479	468681.544	1012613.892	1803.057	140	2920	29+20	1802.857	0.200	
480	468571.058	1012667.945	1804.470	123	3043	30+43	1804.17	0.300	
								0.486419	

sec6

pt num	east	north	field elev	dist	tot dist	DTM DIST	DTM ELEV	Difference	
636	473007.579	1012686.212	1837.290			0+00	1837.99	-0.700	
602	472888.393	1012846.819	1838.530	200	200	2+00	1838.933	-0.403	
601	472769.206	1013007.426	1837.920	200	400	4+00	1838.674	-0.754	
600	472650.020	1013168.033	1837.340	200	600	6+00	1837.726	-0.386	
499	472564.325	1013283.509	1833.120	144	744	7+44	1833.486	-0.366	
498	472562.003	1013286.638	1832.149	4	748	7+48	1833.224	-1.075	
490	472558.051	1013291.962	1818.107	7	754	7+54	1827.656		-9.549
488	472551.555	1013300.717	1817.906	11	765	7+65	1818.539	-0.633	
478	472538.329	1013318.539	1800.657	22	787	7+87	1801.572	-0.915	
923	472480.581	1013396.356	1800.306	97	884	8+84	1801.212	-0.906	
484	472458.231	1013426.472	1808.988	38	922	9+22	1809.437	-0.449	
922	472341.732	1013583.459	1810.988	195	1117	11+17	1811.366	-0.378	
809	472272.298	1013677.023	1809.214	117	1234	12+34	1810.478	-1.264	
924	472063.117	1013958.900	1813.268	351	1585	15+85	1813.055	0.213	
487	472014.422	1014024.518	1817.037	82	1667	16+67	1816.311	0.726	
489	471869.906	1014219.257	1817.947	243	1909	19+09	1817.664	0.283	
927	471654.600	1014509.387	1816.245	361	2270	22+70	1816.501	-0.256	
491	471555.572	1014642.830	1819.413	166	2437	24+37	1819.021	0.392	
492	471511.792	1014701.825	1824.826	73	2510	25+10	1824.236	0.590	
494	471509.767	1014788.421	1830.400	87	2597	25+97	1826.931		3.469
493	471389.684	1014866.369	1828.706	143	2740	27+40	1828.379	0.327	
495	471275.505	1015020.228	1830.400	192	2931	29+31	1830.062	0.338	
								0.343444	

sec7

pt num	east	north	field elev	dist	tot dist	DTM DIST	DTM ELEV	Difference	
616	475992.764	1016048.527	1881.014			0+00	1881.049	-0.035	
615	475793.328	1016246.335	1879.459	281	281	2+81	1879.56	-0.101	
532	475631.460	1016406.882	1871.443	228	509	5+09	1871.676	-0.233	
608	475602.878	1016435.232	1842.250	40	549	5+49	1848.189		-5.939
612	475575.486	1016462.399	1845.250	39	588	5+88	1844.978	0.272	
611	475558.300	1016479.446	1844.377	24	612	6+12	1844.374	0.003	
605	475542.015	1016495.598	1839.958	23	635	6+35	1840.289	-0.331	
606	475493.309	1016543.906	1840.286	69	703	7+03	1840.751	-0.465	
607	475412.794	1016623.763	1840.682	113	817	8+17	1842.024	-1.342	
634	475395.026	1016641.387	1847.558	25	842	8+42	1847.94	-0.382	
52	475364.427	1016671.736	1848.030	43	885	8+85	1847.115	0.915	
609	475351.936	1016684.125	1844.041	18	903	9+03	1844.452	-0.411	
610	475302.305	1016733.351	1844.234	70	972	9+72	1844.159	0.075	
604	475265.026	1016770.326	1839.362	53	1025	10+25	1840.146	-0.784	
603	475197.139	1016837.658	1838.705	96	1121	11+21	1839.156	-0.451	
926	475186.776	1016847.937	1843.790	15	1135	11+35	1842.24	1.550	
928	475046.347	1016987.220	1845.980	198	1333	13+33	1846.316	-0.336	
667	475031.795	1017001.653	1851.060	20	1353	13+53	1849.996	1.064	
51	474900.672	1017131.706	1849.039	185	1538	15+38	1849.26	-0.221	
647	474872.596	1017159.553	1857.520	40	1578	15+78	1857.796	-0.276	
651	474754.840	1017276.348	1858.280	166	1744	17+44	1858.234	0.046	
666	474634.184	1017396.019	1858.328	170	1913	19+13	1858.239	0.089	
649	474503.296	1017525.839	1855.703	184	2098	20+98	1856.039	-0.336	
668	474394.561	1017633.686	1855.075	153	2251	22+51	1855.181	-0.106	
648	474259.691	1017767.456	1855.499	190	2441	24+41	1855.802	-0.303	
650	474210.920	1017815.828	1862.598	69	2510	25+10	1862.281	0.317	
526	474120.516	1017905.495	1876.666	127	2637	26+37	1876.617	0.049	
614	474052.572	1017972.884	1878.230	96	2733	27+33	1878.382	-0.152	
								0.316816	

TECHNICAL DATA NOTEBOOK

VOLUME 1

CAVE CREEK BELOW CAREFREE HIGHWAY FIS

FLOODPLAIN DELINEATION STUDY

FOR

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

F.C.D. Contract No. 95-30

SECTION 3

HYDROLOGY

Registered Professional Engineer (Civil)
CERTIFICATE NO.
13248
EILEEN M.
ABBOTT
Date Signed 6/23/97
ARIZONA, U.S.A.

Eileen M. Abbott

Prepared for:

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

Prepared by:

WILLDAN ASSOCIATES
1717 W. Northern Avenue, Suite 112
Phoenix, Arizona 85021
(602) 870-7600

June 23, 1997

Project No. 08855-1008

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3.3 HEC-1 Hydrologic Data

Registered Professional Engineer (Civil)
CERTIFICATE NO.
13248
EILEEN M.
ABBOTT
Date Signed 4/23/97
ARIZONA, U.S.A.

APPENDICES

HEC-1 Model, Input and Output

DDMS Subbasin Report

DDMS MCUHP1 Report

Culverts

Field Notes

ASSOCIATED MAPS

ARE IN

VOLUME 5

Carefree Highway Bridge Plans

Basin Boundary Map

Land Use Map

Soils Map

Flow Path Map

Routing Map

Culverts Map

FEMA-FIRM Map

SECTION 3: HYDROLOGIC ANALYSIS

3.1 Hydrologic Method Description

The hydrologic model was performed using the Drainage Design Manual for Maricopa County, Arizona, Volume 1, Hydrology, June 1, 1992, Revised January 1, 1995 Edition as published by the Flood Control District of Maricopa County, (FCDMC) Arizona along with the accompanying Drainage Design Menu System (DDMS) computer program. The DDMS program provides a vehicle to input values for precipitation and watershed subbasin features. This information is setup in data set format for easy entry to the HEC-1 model computer program. The HEC-1, Flood Hydrograph Package, Version 4.0.1E, May 1991, computer program as developed by the U. S. Army Corps of Engineers (COE) and provided by Dodson and Associates, Inc. was used to compute the final results.

The study area is located south of Carefree Highway to the ponding area of the Cave Buttes Dam and is identified as the Cave Creek Wash (South) Study

3.2 Parameter Estimation

3.2.1 Drainage Area Boundaries

The entire drainage area for this study covers approximately 18 square miles as shown in the Subbasin Boundary Map. The boundaries are roughly Cave Creek Wash to the west, Carefree Highway on the north, south of Cave Creek Road to the northeast, and Cave Buttes Dam ponding area to the south.

There are 41 subbasins within the study boundary. A former study of this drainage area, Paradise Valley Fan Terrace, Concept Drainage Study, was prepared by Water Resources Associates, Inc., March 1990, herein referred to as the WRA 1990 Study. This study included a much larger area south of Carefree Highway. The HEC-1 model in the WRA 1990 Study was developed using the Kinematic Wave method, while this study is using the Clark Unit Hydrograph method. For comparison the subbasin identities used in the 1990 report have been repeated in the Cave Creek Wash (South) study.

The study area north of Carefree Highway prepared by George V. Sabol Consulting Engineers, Inc. which covers 124.38 square miles was included in the development of the HEC-1 model by importing the final hydrograph into the model.

3.2.2 Physical Parameters

3.2.2.1 Soil Parameters

The data for the Soils Map was supplied on disk by the FCDMC. The area for each of the soil units was digitized by computer. The results were tabulated and entered into the Subbasin Preparation section of the DDMS system. All of the soils in this study are within the Aquila-Carefree Soil Survey. Table 3.1 shows the results of these tasks.

3.2.2.2 Land Use

The data for the Land Use Map was also supplied on disk by the FCDMC. The various land use areas within the subbasins were digitized by computer. The results were tabulated and entered into the Subbasin Preparation program. The tabulated data is shown in Table 3.2.

3.2.2.3 Culverts

There are 25 culverts in the entire watershed area. They were all analyzed using the hydraulics program associated with the U.S. Department of Transportation, Federal Highway Administration, Hydraulic Design of Highway Culverts. However only two were believed to impact the model. They were #5 and #6 which are included in the model. The entire culvert analysis can be found in the appendix.

3.2.2.4 Digitization

The areas of the subbasins, flow path lengths and routing lengths were digitized to provide more accurate values. Lengths were rounded to the nearest hundred. Slopes were calculated to the nearest tenth, however the model automatically gave a different number in some cases. These differences can be found in Table 3.3 along with all of the other pertinent data for subbasins and channels.

3.2.2.5 "n" Values

The "n" values were developed from field observations. These values may change as a result of the "n" value report provided under separate cover.

3.2.3 Statistical Parameters

Statistical parameters for the 100-year storm, 24 hour duration have been well established by historical data and provided in the Drainage Design Manual.

3.2.4 Precipitation

The DDMS computer program PREFRE was used to generate the applicable precipitation values based on the isopluvial maps provided in the Hydrology Design Manual. These values were then used in the model. The following are those values:

Frequency	6-Hour	24-Hour
2-year	1.4	3.4
100-year	1.8	4.2

The PREFRE program then used this input to create a data set of cumulative precipitation time series values which were used for the entire model.

3.2.5 Rainfall Distribution

Peak discharges and peak volumes for the 100-year, 24-hour storm were estimated using the SCS Type II rainfall distribution as provided in the DDMS program.

3.2.6 Areal Reduction

The areal reduction for this model was performed as part of the DDMS program.

3.2.7 Rainfall Excess

The Green and Amp methodology was used for the estimation of rainfall losses. Green and Amp parameters can be found for each subbasin and the overall table in the Appendices, DDMS Subbasin Report and DDMS MCUHP1 Report.

3.2.8 Unit Hydrograph

The Clark unit hydrograph was used for this model.

3.2.9 Time of Concentration

The Clark unit hydrograph along with MCUHP1 computer program was used to determine the time of concentration.

3.2.10 Channel Routing

Channel routing was accomplished using the Normal-Depth option of HEC-1. Average cross-sections were developed using field reconnaissance. Field notes are included in the appendix.

3.2.11 Culvert Routing

The Modified Puls method was used to route flow thru culverts.

3.2.12 Subbasin Preparation

The DDMS program contains a sub-routine for the soils and land use entries for each subbasin. These variables were entered and are tabulated in Table 3.1 Soils and Table 3.2 Land Use.

3.2.13 MCUHP1

The MCUHP1 routine allows the subbasin area, length, high and low elevations to be entered into the program. The program then includes all of the data and runs a complete analysis of each subbasin for entry into a HEC-1 format.

3.3 Special Problems and Solutions

The WRA 1990 Study routed this entire watershed to the Cave Buttes ponding area. Originally this model was prepared the same way. However, when the 200' scale maps arrived it was quite clear that the routing was entirely different from the WRA model. The model was changed to agree with the 200' scale maps.

FIGURE 1 -

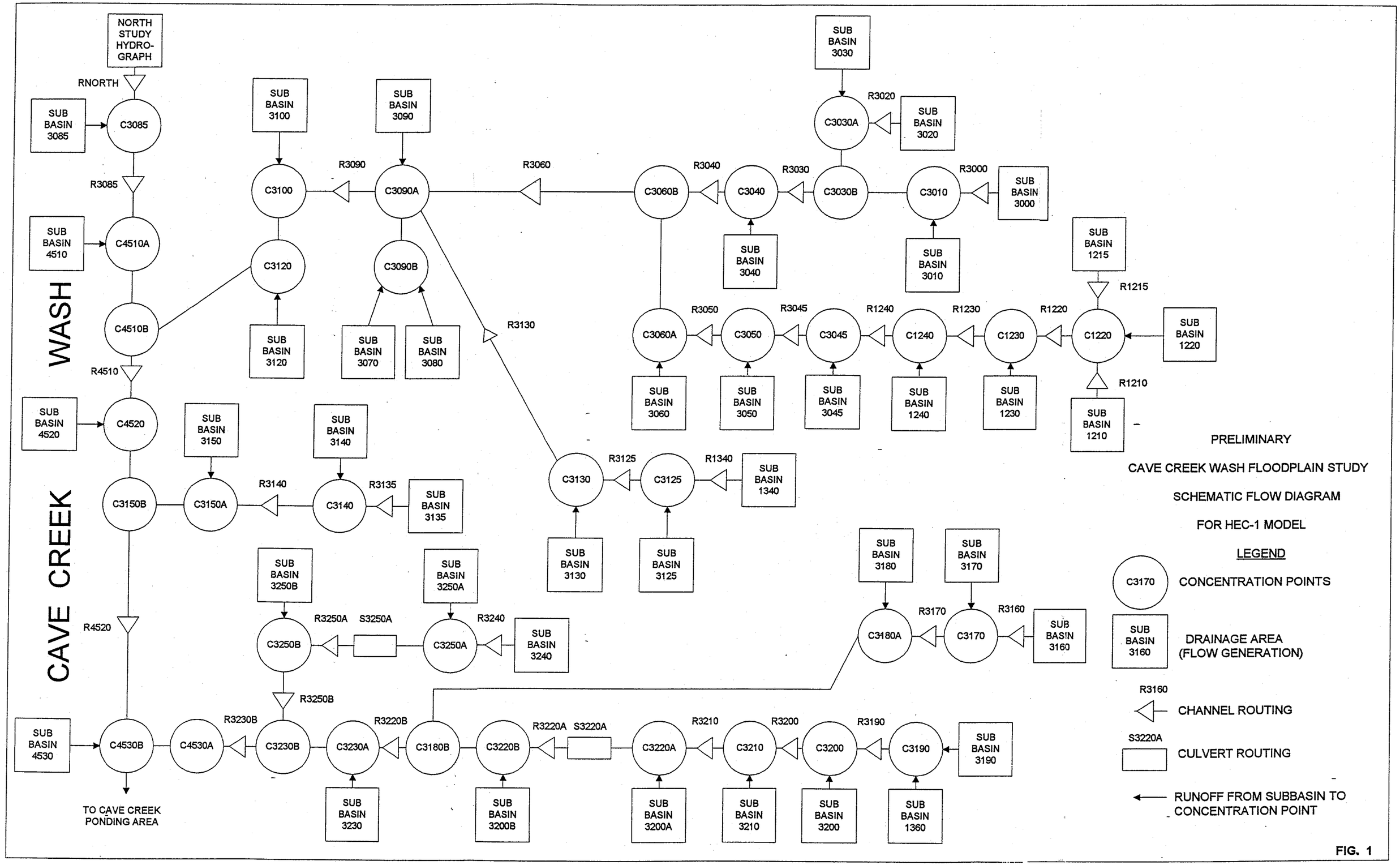

FIG. 1

11/04/96, REV. 12/03/96

TABLE 3.1 -

CAVE CREEK WASH
FLOODPLAIN DELINEATION SOILS

TABLE 3.1

AQUILA - CAREFREE
SOILS MAP

Subbasin Number	SOIL MAP NUMBER 1	3	6	12	33	44	61	63	77	93	96	98	110	112	118	Area Digitized on Land Use Map
	AREA (ACRES)															
1210			15.97		591.60			147.26			60.33					815.16
1215			0.41		138.81											139.22
1220			59.26		336.76		3.81			30.05	24.18					454.06
1230			55.02		120.99		201.40	12.08		9.62	2.67					401.78
1240			26.51		121.36		50.18	9.03			47.23					254.31
1340			4.53		376.00		508.09	34.80			79.56					1002.98
1360					335.25		12.01	87.00			5.52					439.78
3000			7.35		103.68						135.09					246.12
3010					22.09	3.57					78.68					104.34
3020			0.39		162.32						35.62					198.33
3030					119.42						23.37					142.79
3040					22.71	27.48					26.00					76.19
3045			15.01		94.36						47.57					156.94
3050					144.43							71.22				215.65
3060					74.24	9.23					1.14	162.18				246.79
3070				27.16		70.79					51.76		20.20	14.30		184.21
3080		5.68		267.58							22.77	2.00	30.74	43.80		372.57
3085		41.04										11.02				52.06
3090				12.20		63.84						200.42	0.89			277.35
3100		108.91		96.82		0.19							159.71			365.63
3120		13.51		36.33		197.82						33.49	120.13			401.28
3125			19.24		224.71						49.12					293.07
3130					45.72							89.24				134.96
3135					19.13							14.24				33.37
3140				36.24		32.41						212.64				281.29
3150		125.02		96.27									147.01			368.30
3160					174.50						58.09	32.05				264.64
3170			20.17		87.47	6.25					2.55	142.26				258.70
3180				22.86		141.21						62.99	11.87		33.40	272.33
3190			51.69		156.74			10.89			85.50					304.82
3200			68.50		42.31	1.70					255.84	50.66				419.01
3210												66.07				66.07
3220A						2.23						132.97			19.30	154.50
3220B	6.67													12.38	232.33	251.38
3230	40.67	63.23		21.63									79.93	22.83		228.29
3240												47.96				47.96
3250A												48.90			4.22	53.12
3250B				11.95										62.30	128.75	203.00

TABLE 3.1

	SOIL MAP NUMBER															Area Digitized on
Subbasin	1	3	6	12	33	44	61	63	77	93	96	98	110	112	118	Land Use Map
Number	AREA (ACRES)															
4510		270.56		341.94		314.03			39.75			13.74				980.02
4520		166.26		30.42		227.05										423.73
4530		35.31														35.31

TABLE 3.2 -

TABLE 3.2
CAVE CREEK WASH SUBBASIN AREAS — LAND USE

	DRAINAGE DESIGN MENU SYSTEM (DDMS) LAND USE SELECTIONS												
	LOW DENSITY RESIDENT (L.D.R.)	MEDIUM DENSITY RESIDENT (M.D.R.)	VERY LIGHT DEVELOP. RESIDENT (V.L.D.R.)	MULTI-FAMILY RESIDENT (M.F.R.)		COMMERCIAL		INDUS-TRIAL	PARK		DESERT	OPEN	
	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY LAND USE MAP SELECTIONS												
	LOW DENSITY RESIDENT	MEDIUM DENSITY RESIDENT	DEVELOP. RESIDENT	INST. SCHOOL	RELIGIOUS INST.	LOW INTENSITY COMM.	MED. INTENSITY COMM.	GEN. INDUST.	PARK	GOLF COURSE	VACANT	UNDEV. FOREST	TOTAL AREA DIGITIZED
Subbasin	1	2	5	16	22	6	7	14	27	28	31	41	
Number	A R E A (Acres)												
1210	224.65									17.20	556.69	16.62	815.16
1215	128.06										11.16		139.22
1220	4.43		1.35								448.28		454.06
1230		54.36	3.99							37.49	305.94		401.78
1240		68.90				5.63				12.72	167.06		254.31
1340	21.69	15.26	117.75								848.28		1002.98
1360	11.33					13.94					414.51		439.78
3000	46.95										199.17		246.12
3010	55.08	4.82									44.44		104.34
3020	64.39			6.71					27.04		100.19		198.33
3030	88.36										54.43		142.79
3040											76.19		76.19
3045											156.94		156.94
3050	10.44			15.52					15.61		174.08		215.65
3060	39.79			5.50							201.50		246.79
3070											184.21		184.21
3080											372.57		372.57
3085											52.06		52.06
3090	51.03				9.08						217.24		277.35
3100								3.52			362.11		365.63
3120	41.78				0.36			10.37			348.77		401.28
3125	5.77	6.28									281.02		293.07
3130	0.21			7.18							127.57		134.96
3135											33.37		33.37
3140	25.12					17.24					238.93		281.29
3150								3.32			364.98		368.30
3160	9.95										254.69		264.64

CAVE CREEK WASH SUBBASIN AREAS

TABLE 3.2
LAND USE

	DRAINAGE DESIGN MENU SYSTEM (DDMS) LAND USE SELECTIONS												
	LOW DENSITY RESIDENT (L.D.R.)	MEDIUM DENSITY RESIDENT (M.D.R.)	VERY LIGHT DEVELOP. RESIDENT (V.L.D.R.)	MULTI-FAMILY RESIDENT (M.F.R.)		COMMERCIAL		INDUS-TRIAL	PARK		DESERT	OPEN	
	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY LAND USE MAP SELECTIONS												
	LOW DENSITY RESIDENT	MEDIUM DENSITY RESIDENT	DEVELOP. RESIDENT	INST. SCHOOL	RELIGIOUS INST.	LOW INTENSITY COMM.	MED. INTENSITY COMM.	GEN. INDUST.	PARK	GOLF COURSE	VACANT	UNDEV. FOREST	TOTAL AREA DIGITIZED
Subbasin	1	2	5	16	22	6	7	14	27	28	31	41	
Number	A R E A (Acres)												
3170	107.06										151.64		258.70
3180	35.40					29.21					207.72		272.33
3190	22.14										282.68		304.82
3200	51.66						7.07				360.28		419.01
3210	8.54										57.53		66.07
3220A		6.08	15.75								132.67		154.50
3220B		1.84									249.54		251.38
3230											228.29		228.29
3240	12.31		5.13							3.16	27.36		47.96
3250A		7.73	22.05								23.34		53.12
3250B		1.84									201.16		203.00
4510								3.24			976.78		980.02
4520											423.73		423.73
4530											35.31		35.31

TABLE 3.3

TABLE 3.3

CAVE CREEK SUBBASIN — HEC-1 HYDROLOGIC DATA — JN.08855-1005

SUB BASIN FLOW DATA									CHANNEL ROUTING DATA					
SUB BASIN #	BASIN AREA acres	BASIN AREA sq. mi	FLOW PATH LENGTH ft.	FLOW PATH LENGTH miles	HIGH ELEV. ft.	LOW ELEV. ft.	SUBBASIN SLOPE ft/mi	MODEL SLOPE ft/mi	ROUTING ID	ROUTING SUBBASIN #	ROUTING LENGTH ft.	HIGH ELEV. ft.	LOW ELEV. ft.	CHANNEL SLOPE ft./ft.
NORTH									RNORTH	3085	2800	1856*	1835*	0.0075
3085	52.06	0.081	3500	0.66	1910*	1835*	113.1	114.0	R 3085	4510	14500	1835*	1710	0.0086
1210	815.16	1.274	19300	3.66	3225	2615	166.9	167.0	R 1210	1220	9600	2615	2410	0.0214
1215	139.22	0.218	7800	1.48	2740	2545	132.0	132.0	R 1215	1220	6400	2545	2410	0.0211
1220	454.06	0.709	9600	1.82	2660	2410	137.5	137.0	R 1220	1230	5900	2410	2275	0.0229
1230	401.78	0.628	12600	2.39	2560	2275	119.4	119.0	R 1230	1240	4400	2275	2195	0.0182
1240	254.31	0.397	9400	1.78	2390	2195	109.5	110.0	R 1240	3045	4400	2195	2110	0.0193
3045	156.94	0.245	6900	1.31	2245	2110	103.3	103.0	R 3045	3050	6800	2110	1980	0.0191
3050	215.65	0.337	6700	1.27	2115	1980	106.4	106.0	R 3050	3060	7800	1980	1850	0.0167
3060	246.79	0.386	8800	1.67	1995	1850	87.0	87.0	R 3060	3090	2800	1850	1815	0.0125
3000	246.12	0.385	10500	1.99	2240	2015	113.1	116.0	R 3000	3010	6500	2010	1905	0.0162
3010	104.34	0.163	7200	1.36	2025	1905	88.0	88.0	R3030	3040	3100	1905	1860	0.0145
3020	198.33	0.310	8600	1.63	2175	2000	107.4	107.0	R 3020	3030	5700	2000	1905	0.0167
3030	142.79	0.223	6100	1.16	2010	1905	90.9	91.0	R 3030	3040	3100	1905	1860	0.0145
3040	76.19	0.119	5400	1.02	1940	1860	78.2	78.0	R 3040	3060	900	1860	1850	0.0111
1340	1002.98	1.567	21100	4.00	2755	2295	115.1	115.0	R 1340	3125	9300	2295	2110	0.0199
3125	293.07	0.458	10500	1.99	2325	2110	108.1	108.0	R 3125	3130	7500	2110	1965	0.0193
3130	134.96	0.211	7900	1.50	2110	1965	96.9	97.0	R 3130	3090	9300	1965	1815	0.0161
3090	277.35	0.433	9700	1.84	1970	1815	84.4	84.0	R 3090	3100	9500	1815	1710	0.0111
3080	372.57	0.582	10300	1.95	1945	1815	66.6	67.0	R 3090	3100	9500	1815	1710	0.0111
3070	184.21	0.288	13200	2.50	2005	1815	76.0	76.0	R 3090	3100	9500	1815	1710	0.0111
3100	365.63	0.571	12300	2.33	1845	1710	58.0	58.0	R 4510	4520	9000	1710	1650	0.0067
3120	401.28	0.627	13600	2.58	1900	1710	73.8	74.0	R 4510	4520	9000	1710	1650	0.0067
3135	33.37	0.052	3000	0.57	2000	1950	88.0	88.0	R 3135	3140	11600	1950	1775	0.0151
3140	281.29	0.440	11900	2.25	1950	1775	77.6	78.0	R 3140	3150	13000	1775	1650	0.0096
3150	368.30	0.575	13300	2.52	1775	1650	49.6	50.0	R 3150	4530	2000	1650	1635	0.0075

Above Data From 2000 Scale Map Unless Otherwise Noted

* = From 200 Ft. Scale Drawing

Updated: 11/1/96, 2:06 PM

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TABLE 3.3

CAVE CREEK SUBBASIN — HEC-1 HYDROLOGIC DATA — JN.08855-1005

SUB BASIN FLOW DATA									CHANNEL ROUTING DATA					
SUB BASIN #	BASIN AREA acres	BASIN AREA sq. mi	FLOW PATH LENGTH ft.	FLOW PATH LENGTH miles	HIGH ELEV. ft.	LOW ELEV. ft.	SUBBASIN SLOPE ft/mi	MODEL SLOPE ft/mi	ROUTING ID	ROUTING SUBBASIN #	ROUTING LENGTH ft.	HIGH ELEV. ft.	LOW ELEV. ft.	CHANNEL SLOPE ft./ft.
3160	264.64	0.414	9800	1.86	2235	2030	110.4	110.0	R 3160	3170	6300	2030	1930	0.0159
3170	258.70	0.404	6600	1.25	2030	1930	80.0	80.0	R 3170	3180	12200	1930	1750	0.0148
3180	272.33	0.426	13800	2.61	1945	1750	74.6	75.0	R 3220B	3230	10100	1750	1650	0.0099
1360	439.78	0.687	10900	2.06	2640	2130	247.0	239.0	R 3190	3200	10400	2130	1935	0.0188
3190	304.82	0.476	9900	1.88	2560	2130	229.3	225.4	R 3190	3200	10400	2130	1935	0.0188
3200	419.01	0.655	10500	1.99	2130	1935	98.1	98.0	R 3200	3210	2300	1935	1900	0.0152
3210	66.07	0.103	2200	0.42	1935	1900	84.0	83.0	R 3210	3220A	3900	1900	1830	0.0179
									S 3220A	CULVERTS				
3220A	154.50	0.241	5100	0.97	1915	1830	88.0	88.0	R 3220A	3220B	6000	1830	1750	0.0133
3220B	251.38	0.393	6800	1.29	1840	1750	69.9	101.0	R 3220B	3230	10100	1750	1650	0.0099
3240	47.96	0.075	3900	0.74	1935	1880	74.5	74.0	R 3240	3250A	3000	1880	1825	0.0183
3250A	53.12	0.083	3600	0.68	1890	1825	95.3	96.0	R 3250A	3250B	9300	1825	1710	0.0124
									S 3250A	CULVERTS				
3250B	203.00	0.317	9500	1.80	1830	1710	66.7	67.0	R 3250B	3230	5800	1710	1650	0.0103
3230	228.29	0.357	10200	1.93	1765	1650	59.5	60.0	R 3230	4530	1100	1650	1635	0.0136
4510	980.02	1.531	17600	3.33	1870	1710	48.0	49.0	R 4510	4520	9000	1710	1650	0.0067
4520	423.73	0.662	11400	2.16	1710	1650	27.8	28.0	R 3150	4530	2000	1650	1635	0.0075
4530	35.31	0.055	3400	0.64	1670	1635	54.4	55.0	N / A	N/A	N / A	N/A	N/A	N/A

Above Data From 2000 Scale Map Unless Otherwise Noted

* = From 200 Ft. Scale Drawing

Updated: 11/1/96, 2:06 PM

c:\cavcreek\hydrodat.xls

APPENDICES -

HEC-1 MODEL -

INPUT AND OUTPUT

```
1****************************************
****************************************
 *                                      *
*
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*
 *              MAY   1991              *
*
 *           VERSION 4.0.1E             *
*
 *                                      *
*
 *  RUN DATE  12/03/96  TIME  09:47:52  *
*
 *                                      *
*
 ****************************************
****************************************
```

```
*                                      *
*   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

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

  1           ID   Analysis as of October 29, 1996  FILE:  CC1-24RT.DAT
  2           ID   Revised November 29, 1996 per FCD review
  3           ID   100-Year Storm, 24-Hour Duration, SCS Type II Rainfall
  4           ID   Green-Ampt Loss Rate
  5           ID   Clark Unit Hydrograph
  6           ID   Normal-Depth Option for Channel Routing
  7           ID   Modified Puls Option for Reservoir Routing
  8           ID   Includes Culvert Data
  9           ID   Includes Cave Creek (North) Study Hydrograph
 10           ID   Preliminary Model
 11           ID   Single Run, Existing Conditions
 12           ID   Extended routing cross-sections in Cave Creek Wash
 13           ID   DDM MCUHP1 CAVE CREEK WASH FLOODPLAIN DELINEATION
              *DIAGRAM
              *
 14           IT       5                    300
 15           IO       5
              *
              * DDM   ***** Preserved *****

 16           KK   NORTH
 17           KM   HYDROGRAPH FROM THE STUDY NORTH OF CAREFREE HIGHWAY
 18           KM   BY SABOL CONSULTING ENGINEERS
 19           BA  124.38       7
 20           IN       5
 21           QI       0       0       0       0       0       1       1       1       1       1
 22           QI       1       1       2       2       2       2       3       4       6       7
 23           QI       8       9      10      11      12      13      14      16      18      21
 24           QI      24      27      30      34      38      41      45      49      53      56
 25           QI      60      64      67      71      74      77      81      84      87      91
 26           QI      94      97     101     104     107     111     114     118     121     124
 27           QI     128     131     134     138     141     144     147     150     153     156
 28           QI     159     162     165     168     172     175     178     182     186     189
 29           QI     193     197     201     206     210     214     218     223     227     231
 30           QI     236     240     245     250     254     259     265     270     275     281
 31           QI     287     293     300     306     313     320     327     334     342     349
 32           QI     357     365     373     382     390     398     407     146     125     434
 33           QI     443     452     462     372     482     492     503     514     526     538
 34           QI     551     565     579     595     613     634     658     685     715     789
 35           QI     945    1250    1703    2301    3046    3846    4718    5761    7289    9528
 36           QI   13006   16648   21076   25229   28289   30497   32005   32933   33453   33696
 37           QI   33771   33725   33591   33383   33101   32746   32309   31778   31194   30574
 38           QI   29927   29264   28584   27876   27124   26319   25458   24549   23605   22648
 39           QI   21707   20793   19914   19118   18269   17374   16528   15830   15258   14621
 40           QI   13928   13149   12471   11875   11339   10810   10294    9795    9316    8852
 41           QI    8409    8005    7696    7372    7049    6728    6422    6130    5853    5590
 42           QI    5338    5097    4864    4643    4444    4271    4122    3869    3989    3744
 43           QI    3612    3475    3334    3191    3048    2907    2769    2635    2506    2382
 44           QI    2265    2154    2050    1951    1858    1771    1690    1613    1541    1474
 45           QI    1411    1352    1297    1246    1197    1152    1109    1069    1031     995
 46           QI     961     929     898     869     842     816     792     769     748     728
 47           QI     709     690     673     658     641     626     612     598     586     573
 48           QI     561     550     538     527     516     505     495     485     475     466
 49           QI     456     447     438     430     421     413     405     398     390     383
 50           QI     376     696     362     355     348     342     335     328     321     313
              *
              *
              * DDM   ***** Preserved *****
```

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

 51           KK  RNORTH
 52           KM   ROUTE NORTH TO C3085
 53           KM   THRU CAVE CREEK WASH
 54           RS       1    FLOW      -1
 55           RC    0.08   0.045    0.15    2800  0.0075
 56           RX       0      40     140     360     400     410     610     720
 57           RY     100      85      85      84      84      90      90      91
              *
              *
              * DDM   ***** Updated *****

 58           KK    3085
 59           KM   SUB-BASIN 3085
 60           KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 61           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 62           KM     L =  .66  Kb = .029  Adj. Slope =  114.0
 63           BA    .081
 64           IN      15
 65           KM   RAINFALL DEPTH OF 4.20 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
 66           PB   3.847
 67           KM   THE FOLLOWING PC RECORD USED A 24-HR SCS TYPE II STORM
 68           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 69           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 70           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 71           PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
 72           PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
 73           PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
 74           PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
 75           PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
 76           PC    .953    .956    .959    .962    .965    .968   -.971    .974    .977    .980
 77           PC    .983    .986    .989    .992    .995    .998   1.000
 78           LG    .100    .350   3.530    .530    .000
 79           UC    .208    .195
 80           UA       0       3       5       8      12      20      43      75      90      96
 81           UA     100
              *
              * DDM   ***** Preserved *****

 82           KK   C3085
 83           KM   COMBINE SUB 3085 & RNORTH
 84           HC       2
              *
              * DDM   ***** Preserved *****

 85           KK   R3085
 86           KM   ROUTE C3085 TO C4510A
 87           KM   THRU CAVE CREEK WASH
 88           RS       7    FLOW      -1
 89           RC   0.080   0.045   0.150   14500  0.0086
 90           RX       0      50     750     850     900     905     910     915
 91           RY     102     101      91      89    89.5      98     100     101
              *
              * DDM   ***** Updated *****
```

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

 92           KK    4510
 93           KM   SUB-BASIN 4510
 94           KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 95           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 96           KM     L = 3.24  Kb = .039  Adj. Slope =   49.0
 97           BA   1.531
 98           LG    .350    .270   8.800    .060    .000
 99           UC    .900    .661
100           UA       0       3       5       8      12      20      43      75      90      96
101           UA     100
              *
              * DDM   ***** Preserved *****

102           KK  C4510A
103           KM   COMBINE SUB BASIN 4510 & R3085
104           HC       2
              *
              * DDM   ***** Updated *****

105           KK    1210
106           KM   SUB-BASIN 1210
107           KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
108           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
109           KM     L = 3.66  Kb = .041  Adj. Slope =  167.0
110           BA   1.274
111           LG    .330    .330   5.300    .250   9.000
112           UC    .642    .556
113           UA       0       3       5       8      12      20      43      75      90      96
114           UA     100
              *
              * DDM   ***** Preserved *****

115           KK   R1210
116           KM   ROUTE SUB 1215 TO C1220
117           RS       6    FLOW      -1
118           RC    0.08    0.04    0.08    9600  0.0214
119           RX       0     100     200     245     278     347     447     547
120           RY     100      99      98      93      93      98      99     100
              *
              * DDM   ***** Updated *****

121           KK    1215
122           KM   SUB-BASIN 1215
123           KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
124           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
125           KM     L = 1.48  Kb = .051  Adj. Slope =  132.0
126           BA    .218
127           LG    .300    .260   5.000    .330  14.000
128           UC    .438    .482
129           UA       0       3       5       8      12      20      43      75      90      96
130           UA     100
              *
              * DDM   ***** Preserved *****
```

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

 131          KK   R1215
 132          KM   ROUTE SUB 1215 TO C1220
 133          RS       3    FLOW      -1
 134          RC    0.08    0.04    0.08    6400  0.0211
 135          RX       0     100     200     245     278     347     447     547
 136          RY     100      99      98      93      93      98      99     100
              *
              * DDM   ***** Updated *****

 137          KK    1220
 138          KM   SUB-BASIN 1220
 139          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 140          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 141          KM     L = 1.82  Kb = .043  Adj. Slope =  137.0
 142          BA    .709
 143          LG    .350    .350   4.800    .290    .000
 144          UC    .450    .300
 145          UA       0       3       5       8      12      20      43      75      90      96
 146          UA     100
              *
              * DDM   ***** Preserved *****

 147          KK   C1220
 148          KM   COMBINE SUB 1220, R1210 & R1215
 149          HC       3
              *
              * DDM   ***** Preserved *****

 150          KK   R1220
 151          KM   ROUTE C1220 TO C1230
 152          RS       3    FLOW      -1
 153          RC    0.08    0.03    0.08    5900  0.0229
 154          RX       0     100     200     206     238     242     342     442
 155          RY     100      99      98    96.5    96.5      98      99     100
              *
              * DDM   ***** Updated *****

 156          KK    1230
 157          KM   SUB-BASIN 1230
 158          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 159          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 160          KM     L = 2.39  Kb = .048  Adj. Slope =  119.0
 161          BA    .628
 162          LG    .320    .340   5.200    .270   5.000
 163          UC    .629    .579
 164          UA       0       3       5       8      12      20      43      75      90      96
 165          UA     100
              *
              * DDM   ***** Preserved *****
```

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

 166          KK   C1230
 167          KM   COMBINE SUB 1230 & R1220
 168          HC       2
              *
              * DDM   ***** Preserved *****

 169          KK   R1230
 170          KM   ROUTE C1230 TO C1240
 171          RS       2    FLOW      -1
 172          RC    0.10   0.050    0.10    4400  0.0182
 173          RX       0     100     200     216     230     238     338     438
 174          RY     100      99      98      94      94    98.4    99.4   100.4
              *
              * DDM   ***** Updated *****

 175          KK    1240
 176          KM   SUB-BASIN 1240
 177          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 178          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 179          KM     L = 1.78  Kb = .049  Adj. Slope =  110.0
 180          BA    .397
 181          LG    .310    .340   5.600    .230  11.000
 182          UC    .512    .473
 183          UA       0       3       5       8      12      20      43      75      90      96
 184          UA     100
              *
              * DDM   ***** Preserved *****

 185          KK   C1240
 186          KM   COMBINE SUB 1240 & R1230
 187          HC       2
              *
              * DDM   ***** Preserved *****

 188          KK   R1240
 189          KM   ROUTE C1240 TO C3045
 190          RS       2    FLOW      -1
 191          RC    0.06   0.030    0.06    4400  0.0193
 192          RX       0     100     200     219     250     257     357     457
 193          RY     100      99      98      97      97    98.7    99.7   100.7
              *
              * DDM   ***** Updated *****

 194          KK    3045
 195          KM   SUB-BASIN 3045
 196          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 197          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 198          KM     L = 1.31  Kb = .050  Adj. Slope =  103.0
 199          BA    .245
 200          LG    .350    .380   5.600    .210    .000
 201          UC    .442    .413
 202          UA       0       3       5       8      12      20      43      75      90      96
 203          UA     100
              *
              * DDM   ***** Preserved *****
```

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

 204          KK   C3045
 205          KM   COMBINE SUB 3045 & R1240
 206          HC       2
              *
              * DDM   ***** Preserved *****

 207          KK   R3045
 208          KM   ROUTE C3045 TO C3050
 209          RS       4    FLOW      -1
 210          RC    0.08   0.035    0.08    6800  0.0191
 211          RX       0     100     200     212     242     254     354     454
 212          RY     100      99      98      96      96      98      99     100
              *
              * DDM   ***** Updated *****

 213          KK    3050
 214          KM   SUB-BASIN 3050
 215          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 216          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 217          KM     L = 1.27  Kb = .051  Adj. Slope =  106.0
 218          BA    .337
 219          LG    .330    .330   4.650    .340   4.000
 220          UC    .446    .340
 221          UA       0       3       5       8      12      20      43      75      90      96
 222          UA     100
              *
              * DDM   ***** Preserved *****

 223          KK   C3050
 224          KM   COMBINE SUB 3050 & R3045
 225          HC       2
              *
              * DDM   ***** Preserved *****

 226          KK   R3050
 227          KM   ROUTE C3050 TO C3060
 228          RS       4    FLOW      -1
 229          RC   0.055   0.040   0.055    7800  0.0167
 230          RX       0     100     200     207     217     225     325     425
 231          RY     100      99      98      96      95      98      99     100
              *
              * DDM   ***** Updated *****

 232          KK    3060
 233          KM   SUB-BASIN 3060
 234          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 235          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 236          KM     L = 1.67  Kb = .047  Adj. Slope =   87.0
 237          BA    .386
 238          LG    .340    .330   4.550    .350   3.000
 239          UC    .563    .507
 240          UA       0       3       5       8      12      20      43      75      90      96
 241          UA     100
              *
              * DDM   ***** Preserved *****
```

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

 242          KK  C3060A
 243          KM   COMBINE SUB 3060 & R3050
 244          HC       2
              *
              * DDM   ***** Updated *****

 245          KK    3000
 246          KM   SUB-BASIN 3000
 247          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 248          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 249          KM     L = 1.99  Kb = .047  Adj. Slope =  116.0
 250          BA    .385
 251          LG    .340    .340   6.600    .150   3.000
 252          UC    .517    .531
 253          UA       0       3       5       8      12      20      43      75      90      96
 254          UA     100
              *
              * DDM   ***** Preserved *****

 255          KK   R3000
 256          KM   ROUTE SUB 3000 TO C3010
 257          RS       3    FLOW      -1
 258          RC    0.09   0.050    0.09    6500  0.0162
 259          RX       0     100     200     203     213     216     316     416
 260          RY     100      99      98      97      97      98      99     100
              *
              * DDM   ***** Updated *****

 261          KK    3010
 262          KM   SUB-BASIN 3010
 263          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 264          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 265          KM     L = 1.36  Kb = .052  Adj. Slope =   88.0
 266          BA    .163
 267          LG    .320    .230   7.300    .120   9.000
 268          UC    .467    .571
 269          UA       0       3       5       8      12      20      43      75      90      96
 270          UA     100
              *
              * DDM   ***** Preserved *****

 271          KK   C3010
 272          KM   COMBINE SUB 3010 & R3000
 273          HC       2
              *
              * DDM   ***** Updated *****

 274          KK    3020
 275          KM   SUB-BASIN 3020
 276          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 277          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 278          KM     L = 1.63  Kb = .055  Adj. Slope =  107.0
 279          BA    .310
 280          LG    .310    .310   5.400    .260   6.000
```

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

 281          UC    .538    .535
 282          UA       0       3       5       8      12      20      43      75      90      96
 283          UA     100
              *
              * DDM   ***** Preserved *****

 284          KK   R3020
 285          KM   ROUTE C3020 TO C3030
 286          RS       3    FLOW      -1
 287          RC    0.09   0.050    0.09    5700  0.0167
 288          RX       0     100     200     203     213     216     316     416
 289          RY     100      99      98      97      97      98      99     100
              *
              * DDM   ***** Updated *****

 290          KK    3030
 291          KM   SUB-BASIN 3030
 292          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 293          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 294          KM     L = 1.16  Kb = .050  Adj. Slope =   91.0
 295          BA    .223
 296          LG    .320    .300   5.400    .250   9.000
 297          UC    .425    .379
 298          UA       0       3       5       8      12      20      43      75      90      96
 299          UA     100
              *
              * DDM   ***** Preserved *****

 300          KK  C3030A
 301          KM   COMBINE SUB 3030 & R3020
 302          HC       2
              *
              * DDM   ***** Preserved *****

 303          KK  C3030B
 304          KM   COMBINE C3030A & C3010
 305          HC       2
              *
              * DDM   ***** Preserved *****

 306          KK   R3030
 307          KM   ROUTE C3030B TO C3040
 308          RS       2    FLOW      -1
 309          RC    0.08    0.04    0.08    3100  0.0145
 310          RX       0     100     200     210     216     222     322     422
 311          RY     100      99      98      95      95      96      99     100
              *
              * DDM   ***** Updated *****

 312          KK    3040
 313          KM   SUB-BASIN 3040
 314          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 315          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 316          KM     L = 1.02  Kb = .054  Adj. Slope =   78.0
 317          BA    .119
```

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

 318          LG    .350    .300   8.000    .080    .000
 319          UC    .421    .484
 320          UA       0       3       5       8      12      20      43      75      90      96
 321          UA     100
              *
              * DDM   ***** Preserved *****

 322          KK   C3040
 323          KM   COMBINE SUB 3040 & R3030
 324          HC       2
              *
              * DDM   ***** Preserved *****

 325          KK   R3040
 326          KM   ROUTE C3040 TO C3060B
 327          RS       1    FLOW      -1
 328          RC    0.07    0.04    0.07     900  0.0111
 329          RX       0     100     200     210     229     232     332     436
 330          RY     100      99      98      96      96      97      99     100
              *
              * DDM   ***** Preserved *****

 331          KK  C3060B
 332          KM   COMBINE C3060A & R3040
 333          HC       2
              *
              * DDM   ***** Preserved *****

 334          KK   R3060
 335          KM   ROUTE C3060B TO C3090
 336          RS       2    FLOW      -1
 337          RC    0.07   0.045    0.07    2800  0.0125
 338          RX       0     100     200     205     242     246     346     446
 339          RY     100      99      98    96.5    96.5    98.5    99.5   100.5
              *
              * DDM   ***** Updated *****

 340          KK    1340
 341          KM   SUB-BASIN 1340
 342          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 343          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 344          KM     L = 4.00  Kb = .039  Adj. Slope =  115.0
 345          BA   1.567
 346          LG    .340    .370   5.700    .200   2.000
 347          UC    .792    .670
 348          UA       0       3       5       8      12      20      43      75      90      96
 349          UA     100
              *
              * DDM   ***** Preserved *****
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 350          KK   R1340
 351          KM   ROUTE SUB 1340 TO C3125
 352          RS       5    FLOW      -1
 353          RC    0.06   0.040    0.06    9300  0.0199
 354          RX       0     100     200     202     235     265     365     465
 355          RY     100      99      98    96.0    96.0    98.5    99.5   100.5
              *
              * DDM   ***** Updated *****

 356          KK    3125
 357          KM   SUB-BASIN 3125
 358          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 359          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 360          KM     L = 1.99  Kb = .046  Adj. Slope =  108.0
 361          BA    .458
 362          LG    .350    .370   5.300    .240   1.000
 363          UC    .550    .516
 364          UA       0       3       5       8      12      20      43      75      90      96
 365          UA     100
              *
              * DDM   ***** Preserved *****

 366          KK   C3125
 367          KM   COMBINE SUB 3125 & R1340
 368          HC       2
              *
              * DDM   ***** Preserved *****

 369          KK   R3125
 370          KM   ROUTE C3125 TO C3130
 371          RS       4    FLOW      -1
 372          RC   0.060   0.045   0.060    7500  0.0193
 373          RX       0     100     200     210     236     246     346     446
 374          RY     100      99      98      97      97      98      99     100
              *
              * DDM   ***** Updated *****

 375          KK    3130
 376          KM   SUB-BASIN 3130
 377          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 378          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 379          KM     L = 1.50  Kb = .051  Adj. Slope =   97.0
 380          BA    .211
 381          LG    .340    .340   4.450    .370   2.000
 382          UC    .529    .613
 383          UA       0       3       5       8      12      20      43      75      90      96
 384          UA     100
              *
              * DDM   ***** Preserved *****
```

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

 385          KK   C3130
 386          KM   COMBINE SUB 3130 & R3125
 387          HC       2
              *
              * DDM   ***** Preserved *****

 388          KK   R3130
 389          KM   ROUTE C3130 TO C3090
 390          RS       5    FLOW      -1
 391          RC   0.055   0.040   0.055    9300  0.0161
 392          RX       0     100     200     207     217     225     325     425
 393          RY     100      99      98      95      95      98      99     100
              *
              * DDM   ***** Updated *****

 394          KK    3090
 395          KM   SUB-BASIN 3090
 396          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 397          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 398          KM     L = 1.84  Kb = .046  Adj. Slope =   84.0
 399          BA    .433
 400          LG    .340    .350   5.600    .220   4.000
 401          UC    .575    .525
 402          UA       0       3       5       8      12      20      43      75      90      96
 403          UA     100
              *
              * DDM   ***** Preserved *****

 404          KK  C3090A
 405          KM   COMBINE SUB 3090, R3130 & R3060
 406          HC       3
              *
              * DDM   ***** Updated *****

 407          KK    3070
 408          KM   SUB-BASIN 3070
 409          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 410          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 411          KM     L = 2.50  Kb = .049  Adj. Slope =   76.0
 412          BA    .288
 413          LG    .350    .270   8.800    .060    .000
 414          UC    .721   1.089
 415          UA       0       3       5       8      12      20      43      75      90      96
 416          UA     100
              *
              * DDM   ***** Updated *****

 417          KK    3080
 418          KM   SUB-BASIN 3080
 419          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 420          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 421          KM     L = 1.95  Kb = .045  Adj. Slope =   67.0
 422          BA    .582
 423          LG    .350    .190  11.200    .020    .000
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 424          UC    .579    .469
 425          UA       0       3       5       8      12      20      43      75      90      96
 426          UA     100
              *
              * DDM   ***** Preserved *****

 427          KK  C3090B
 428          KM   COMBINE SUB 3080, SUB 3070 & C3090A
 429          HC       3
              *
              * DDM   ***** Preserved *****

 430          KK   R3090
 431          KM   ROUTE C3090B TO C3100
 432          RS       5    FLOW      -1
 433          RC    0.05   0.040    0.05    9500  0.0111
 434          RX       0     100     200     245     278     300     400     500
 435          RY     100      99      98    95.5    95.5   100.5   101.5   102.5
              *
              *
              * DDM   ***** Updated *****

 436          KK    3100
 437          KM   SUB-BASIN 3100
 438          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 439          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 440          KM     L = 2.33  Kb = .045  Adj. Slope =   58.0
 441          BA    .571
 442          LG    .350    .350   7.000    .120   1.000
 443          UC    .767    .746
 444          UA       0       3       5       8      12      20  -  43      75      90      96
 445          UA     100
              *
              * DDM   ***** Preserved *****

 446          KK   C3100
 447          KM   COMBINE SUB 3100 & R3090
 448          HC       2
              *
              * DDM   ***** Updated *****

 449          KK    3120
 450          KM   SUB-BASIN 3120
 451          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 452          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 453          KM     L = 2.58  Kb = .044  Adj. Slope =   74.0
 454          BA    .627
 455          LG    .340    .270   8.400    .070   3.000
 456          UC    .692    .684
 457          UA       0       3       5       8      12      20      43      75      90      96
 458          UA     100
              *
              * DDM   ***** Preserved *****
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 459          KK   C3120
 460          KM   COMBINE SUB 3120 & C3100
 461          HC       2
              *
              * DDM   ***** Preserved *****

 462          KK  C4510B
 463          KM   COMBINE C4510A & C3120
 464          HC       2
              *
              * DDM   ***** Preserved *****

 465          KK   R4510
 466          KM   ROUTE C4510B TO C4520
 467          KM   THRU CAVE CREEK WASH
 468          RS       5    FLOW      -1
 469          RC    0.08   0.045    0.15    9000  0.0067
 470          RX       0      50    1000    1030    1080    1082    1200    1300
 471          RY     100      94      93      90    89.0     97.     100     102
              *
              * DDM   ***** Updated *****

 472          KK    4520
 473          KM   SUB-BASIN 4520
 474          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 475          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 476          KM     L = 2.16  Kb = .044  Adj. Slope =   28.0
 477          BA    .662
 478          LG    .350    .330   7.300    .110    .000
 479          UC   1.004    .871
 480          UA       0       3       5       8      12      20      43      75      90      96
 481          UA     100
              *
              * DDM   ***** Preserved *****

 482          KK   C4520
 483          KM   COMBINE SUB 4520 & R4510
 484          HC       2
              *
              * DDM   ***** Updated *****

 485          KK    3135
 486          KM   SUB-BASIN 3135
 487          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 488          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 489          KM     L =  .57  Kb = .059  Adj. Slope =   88.0
 490          BA    .052
 491          LG    .350    .350   4.600    .330    .000
 492          UC    .317    .355
 493          UA       0       3       5       8      12      20      43      75      90      96
 494          UA     100
              *
              * DDM   ***** Preserved *****
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 495          KK   R3135
 496          KM   ROUTE SUB 3135 TO C3140
 497          RS       6    FLOW      -1
 498          RC   0.055   0.040   0.055   11600  0.0151
 499          RX       0     100     200     207     217     225     325     425
 500          RY     100      99      98      95      95      98      99     100
              *
              * DDM   ***** Updated *****

 501          KK    3140
 502          KM   SUB-BASIN 3140
 503          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 504          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 505          KM     L = 2.25  Kb = .044  Adj. Slope =   78.0
 506          BA    .440
 507          LG    .330    .370   5.700    .200   6.000
 508          UC    .667    .721
 509          UA       0       3       5       8      12      20      43      75      90      96
 510          UA     100
              *
              * DDM   ***** Preserved *****

 511          KK   C3140
 512          KM   COMBINE SUB 3140 & R3135
 513          HC       2
              *
              * DDM   ***** Preserved *****

 514          KK   R3140
 515          KM   ROUTE C3140 TO C3150A
 516          RS       7    FLOW      -1
 517          RC   0.055   0.045   0.055   13000  0.0096
 518          RX       0     100     200     210     235     244     344     444
 519          RY     100      99      98      95      96      98      99     100
              *
              * DDM   ***** Updated *****

 520          KK    3150
 521          KM   SUB-BASIN 3150
 522          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 523          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 524          KM     L = 2.52  Kb = .045  Adj. Slope =   50.0
 525          BA    .575
 526          LG    .350    .360   6.800    .130    .000
 527          UC    .887    .931
 528          UA       0       3       5       8      12      20      43      75      90      96
 529          UA     100
              *
              * DDM   ***** Preserved *****
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 530          KK  C3150A
 531          KM   COMBINE SUB 3150 & R3140
 532          HC       2
              *
              *
              * DDM   ***** Preserved *****

 533          KK  C3150B
 534          KM   COMBINE C3150A & C4520
 535          HC       2
              *
              * DDM   ***** Preserved *****

 536          KK   R4520
 537          KM   ROUTE C3150B TO C4530
 538          KM   THRU CAVE CREEK WASH
 539          RS       1    FLOW      -1
 540          RC    0.08   0.040    0.08    2000  0.0075
 541          RX       0      40     230     270     340     490     620     900
 542          RY     100      95      94      87      88      98      97   100.0
              *
              * DDM   ***** Updated *****

 543          KK    3160
 544          KM   SUB-BASIN 3160
 545          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 546          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 547          KM     L = 1.86  Kb = .047  Adj. Slope =  110.0
 548          BA    .414
 549          LG    .350    .370   5.400    .220   1.000          -
 550          UC    .521    .487
 551          UA       0       3       5       8      12      20      43      75      90      96
 552          UA     100
              *
              * DDM   ***** Preserved *****

 553          KK   R3160
 554          KM   ROUTE SUB 3160 TO C3170
 555          RS       4    FLOW      -1
 556          RC   0.055   0.045   0.055    6300  0.0159
 557          RX       0     100     200     214     223     227     327     427
 558          RY     100      99      98      95      95      98      99     100
              *
              * DDM   ***** Updated *****

 559          KK    3170
 560          KM   SUB-BASIN 3170
 561          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 562          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 563          KM     L = 1.25  Kb = .047  Adj. Slope =   80.0
 564          BA    .404
 565          LG    .330    .310   4.500    .380   6.000
 566          UC    .471    .321
 567          UA       0       3       5       8      12      20      43      75      90      96
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 568          UA     100
              *
              * DDM   ***** Preserved *****

 569          KK   C3170
 570          KM   COMBINE SUB 3170 & R3160
 571          HC       2
              *
              * DDM   ***** Preserved *****

 572          KK   R3170
 573          KM   ROUTE C3170 TO C3180A
 574          RS       7    FLOW      -1
 575          RC    0.05   0.040    0.05   12200  0.0148
 576          RX       0     100     200     207     217     225     325     425
 577          RY     100      99      98      96      95      98      99     100
              *
              * DDM   ***** Updated *****

 578          KK    3180
 579          KM   SUB-BASIN 3180
 580          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 581          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 582          KM     L = 2.61  Kb = .044  Adj. Slope =   75.0
 583          BA    .426
 584          LG    .320    .260   8.000    .080  11.000
 585          UC    .692    .861
 586          UA       0       3       5       8      12      20      43      75      90      96
 587          UA     100
              *
              * DDM   ***** Preserved *****

 588          KK  C3180A
 589          KM   COMBINE SUB 3180 & R3170
 590          HC       2
              *
              * DDM   ***** Updated *****

 591          KK    1360
 592          KM   SUB-BASIN 1360
 593          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 594          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 595          KM     L = 2.06  Kb = .043  Adj. Slope =  239.0
 596          BA    .687
 597          LG    .340    .360   5.300    .240   8.000
 598          UC    .379    .278
 599          UA       0       3       5       8      12      20      43      75      90      96
 600          UA     100
              *
              * DDM   ***** Updated *****
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 601          KK    3190
 602          KM   SUB-BASIN 3190
 603          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 604          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 605          KM     L = 1.88  Kb = .046  Adj. Slope =  225.4
 606          BA    .476
 607          LG    .350    .370   5.400    .230   2.000
 608          UC    .387    .327
 609          UA       0       3       5       8      12      20      43      75      90      96
 610          UA     100
              *
              * DDM   ***** Preserved *****

 611          KK   C3190
 612          KM   COMBINE SUB 3190 & SUB 1360
 613          HC       2
              *
              * DDM   ***** Preserved *****

 614          KK   R3190
 615          KM   ROUTE C3190 TO C3200
 616          RS       6    FLOW      -1
 617          RC    0.05   0.040    0.05   10400  0.0188
 618          RX       0     100     200     245     278     300     400     500
 619          RY     100      99      98    96.5    96.5   100.5   101.5   102.5
              *
              * DDM   ***** Updated *****

 620          KK    3200
 621          KM   SUB-BASIN 3200
 622          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 623          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 624          KM     L = 1.99  Kb = .043  Adj. Slope =   98.0
 625          BA    .655
 626          LG    .340    .370   6.200    .170   3.000
 627          UC    .529    .403
 628          UA       0       3       5       8      12      20      43      75      90      96
 629          UA     100
              *
              * DDM   ***** Preserved *****

 630          KK   C3200
 631          KM   COMBINE SUB 3200 & R3190
 632          HC       2
              *
              * DDM   ***** Preserved *****

 633          KK   R3200
 634          KM   ROUTE C3200 TO C3210
 635          RS       1    FLOW      -1
 636          RC    0.05   0.035    0.05    2300  0.0152
 637          RX       0     100     200     207     235     246     346     446
 638          RY     100      99      98      95      95      98      99     100
              *
              * DDM   ***** Updated *****
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 639          KK    3210
 640          KM   SUB-BASIN 3210
 641          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 642          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 643          KM     L =  .42  Kb = .055  Adj. Slope =   83.0
 644          BA    .103
 645          LG    .340    .340   4.150    .440   2.000
 646          UC    .254    .148
 647          UA       0       3       5       8      12      20      43      75      90      96
 648          UA     100
              *
              * DDM   ***** Preserved *****

 649          KK   C3210
 650          KM   COMBINE SUB BASIN 3210 & R3200
 651          HC       2
              *
              * DDM   ***** Preserved *****

 652          KK   R3210
 653          KM   ROUTE C3210 TO C3220A
 654          RS       2    FLOW      -1
 655          RC    0.05   0.035    0.05    3900  0.0179
 656          RX       0     100     200     207     235     246     346     446
 657          RY     100      99      98      97      97      98      99     100
              *
              * DDM   ***** Updated *****

 658          KK   3220A
 659          KM   SUB-BASIN 3220A
 660          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 661          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 662          KM     L =  .97  Kb = .050  Adj. Slope =   88.0
 663          BA    .241
 664          LG    .340    .340   4.200    .420   2.000
 665          UC    .408    .301
 666          UA       0       3       5       8      12      20      43      75      90      96
 667          UA     100
              *
              * DDM   ***** Preserved *****

 668          KK  C3220A
 669          KM   COMBINE SUB 3220A & R3210
 670          HC       2
              *
              * DDM   ***** Preserved *****

 671          KK  S3220A
 672          KM   ROUTE C3220A TO C3220B (CULVERT # 5)
 673          RS       1    FLOW      -1
 674          SV       0 0.00172 0.00689 0.01550 0.02750 0.05170 0.08260 0.09524 0.10579 0.14987
 675          SV  .12050 0.12050 0.12050 0.12050
 676          SQ       0      36     102     189     290     531     819     819     819     819
 677          SQ     877    1017    1213    1732
              *
              * DDM   ***** Preserved *****
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 678          KK  R3220A
 679          KM   ROUTE S3220A TO C3220B
 680          RS       3    FLOW      -1
 681          RC    0.05   0.035    0.05   6000.  0.0133
 682          RX       0     100     200     207     235     246     346     446
 683          RY     100      99      98      97      97      98      99     100
              *
              * DDM   ***** Updated *****

 684          KK   3220B
 685          KM   SUB-BASIN 3220B
 686          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 687          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 688          KM     L = 1.29  Kb = .047  Adj. Slope =  101.0
 689          BA    .393
 690          LG    .350    .350   3.880    .490    .000
 691          UC    .463    .328
 692          UA       0       3       5       8      12      20      43      75      90      96
 693          UA     100
              *
              * DDM   ***** Preserved *****

 694          KK  C3220B
 695          KM   COMBINE SUB 3220B & R3220A
 696          HC       2
              *
              * DDM   ***** Preserved *****

 697          KK  C3180B
 698          KM   COMBINE C3180A & C3220B
 699          HC       2
              *
              * DDM   ***** Preserved *****

 700          KK  R3220B
 701          KM   ROUTE C3180B TO C3230A
 702          RS       5    FLOW      -1
 703          RC   0.055   0.045   0.055   10100  0.0099
 704          RX       0     100     200     210     235     244     344     444
 705          RY     100      99      98      96      96      98      99     100
              *
              * DDM   ***** Updated *****

 706          KK    3230
 707          KM   SUB-BASIN 3230
 708          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 709          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 710          KM     L = 1.93  Kb = .048  Adj. Slope =   60.0
 711          BA    .357
 712          LG    .350    .370   5.200    .240    .000
 713          UC    .746    .813
 714          UA       0       3       5       8      12      20      43      75      90      96
 715          UA     100
              *
              * DDM   ***** Preserved *****
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 716          KK  C3230A
 717          KM   COMBINE SUB 3230 & R3180
 718          HC       2
              *
              * DDM   ***** Updated *****

 719          KK    3240
 720          KM   SUB-BASIN 3240
 721          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 722          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 723          KM     L =  .74  Kb = .061  Adj. Slope =   74.0
 724          BA    .075
 725          LG    .320    .310   4.150    .480   4.000
 726          UC    .425    .492
 727          UA       0       3       5       8      12      20      43      75      90      96
 728          UA     100
              *
              *
              * DDM   ***** Preserved *****

 729          KK   R3240
 730          KM   ROUTE C3240 TO S3250A
 731          RS       2    FLOW      -1
 732          RC    0.06   0.040    0.06    3000  0.0183
 733          RX       0     100     200     207     224     231     331     431
 734          RY     100      99      98      97      97      98      99     100
              *
              * DDM   ***** Updated *****

 735          KK   3250A
 736          KM   SUB-BASIN 3250A
 737          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 738          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 739          KM     L =  .68  Kb = .056  Adj. Slope =   96.0
 740          BA    .083
 741          LG    .310    .290   4.150    .450   6.000
 742          UC    .333    .332
 743          UA       0       3       5       8      12      20      43      75      90      96
 744          UA     100
              *
              * DDM   ***** Preserved *****

 745          KK  C3250A
 746          KM   COMBINE SUB 3250A & R3240
 747          HC       2
              *
              * DDM   ***** Preserved *****

 748          KK  S3050A
 749          KM   ROUTE C3250A THRU CULVERTS
 750          RS       1    FLOW      -1
 751          SV       0       0 0.00100 0.00689 0.01550 0.02750 0.08260 0.12050 0.15030
 752          SQ       0      15      42      76     117     212     325     325     325
              *
              * DDM   ***** Preserved *****
```

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

 753          KK  R3250A
 754          KM   ROUTE S3250A TO C3250B
 755          RS       3    FLOW      -1
 756          RC    0.06   0.040    0.06    9300  0.0124
 757          RX       0     100     200     207     224     231     331     431
 758          RY     100      99      98      97      97      98      99     100
              *
              * DDM   ***** Updated *****

 759          KK   3250B
 760          KM   SUB-BASIN 3250B
 761          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 762          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 763          KM     L = 1.80  Kb = .048  Adj. Slope =   67.0
 764          BA    .317
 765          LG    .350    .350   4.350    .380    .000
 766          UC    .712    .782
 767          UA       0       3       5       8      12      20      43      75      90      96
 768          UA     100
              *
              * DDM   ***** Preserved *****

 769          KK  C3250B
 770          KM   COMBINE SUB 3250B & R3250A
 771          HC       2
              *
              * DDM   ***** Preserved *****

 772          KK  R3250B
 773          KM   ROUTE C3250B TO C3230B
 774          RS       3    FLOW      -1
 775          RC    0.06   0.040    0.06    5800  0.0103
 776          RX       0     100     200     207     224     231     331     431
 777          RY     100      99      98      97      97      98      99     100
              *
              * DDM   ***** Preserved *****

 778          KK  C3230B
 779          KM   COMBINE R3250B & C3230A
 780          KM   TOTAL EAST SIDE CAVE CREEK WASH FLOWS
 781          HC       2
              *
              * DDM   ***** Preserved *****

 782          KK   R3230
 783          KM   ROUTE C3230B TO C4530
 784          KM   THRU CAVE CREEK WASH
 785          RS       1    FLOW      -1
 786          RC    0.08   0.035    0.06    1100  0.0136
 787          RX       0     100     200     210     260     280     300     350
 788          RY     100      99      98      97      97      98      99     100
              *
              * DDM   ***** Updated *****
```

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

 789          KK    4530
 790          KM   SUB-BASIN 4530
 791          KM   24-HOUR SCS TYPE II RAINFALL WAS USED TO FIND TC & R FOR THIS BASIN
 792          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF  .916
 793          KM     L =  .64  Kb = .059  Adj. Slope =   55.0
 794          BA    .055
 795          LG    .350    .350   3.400    .680    .000
 796          UC    .467    .580
 797          UA       0       3       5       8      12      20      43      75      90      96
 798          UA     100
              *
              * DDM   ***** Preserved *****

 799          KK  C4530A
 800          KM   COMBINE SUB 4530 & R3150
 801          KM   TOTAL WEST SIDE CAVE CREEK WASH FLOWS
 802          HC       2
              *
              *
              * DDM   ***** Preserved *****

 803          KK  C4530B
 804          KM   COMBINE C4530A & C3230B
 805          KM   TOTAL CAVE CREEK WASH FLOWS TO CAVE CREEK DAM PONDING AREA
 806          HC       2
 807          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   16      NORTH
               V
               V
   51     RNORTH
               .
               .
   58          .        3085
               .           .
               .           .
   82      C3085............
               V
               V
   85      R3085
               .
               .
   92          .        4510
               .           .
               .           .
  102     C4510A............
               .
               .
  105          .        1210
               .           V
               .           V
  115          .       R1210
               .           .
               .           .
  121          .           .        1215
               .           .           V
               .           .           V
  131          .           .       R1215
               .           .           .
               .           .           .
  137          .           .           .        1220
               .           .           .           .
               .           .           .           .
  147          .       C1220.......................
               .           V
               .           V
  150          .       R1220
               .           .
               .           .
  156          .           .        1230
               .           .           .
               .           .           .
  166          .       C1230............
               .           V
               .           V
  169          .       R1230
               .           .
               .           .
  175          .           .        1240
               .           .           .
               .           .           .
  185          .       C1240............
               .           V
               .           V
  188          .       R1240
               .           .
               .           .
  194          .           .        3045
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                .          .
                .          .
204             .     C3045.............
                .        V
                .        V
207             .     R3045
                .        .
                .        .
213             .        .        3050
                .        .          .
                .        .          .
223             .     C3050.............
                .        V
                .        V
226             .     R3050
                .        .
                .        .
232             .        .        3060
                .        .          .
                .        .          .
242             .    C3060A.............
                .        .
                .        .
245             .        .        3000
                .        .          V
                .        .          V
255             .        .       R3000
                .        .          .
                .        .          .
261             .        .          .        3010
                .        .          .          .
                .        .          .          .
271             .        .       C3010.............
                .        .          .
                .        .          .
274             .        .          .        3020
                .        .          .          V
                .        .          .          V
284             .        .          .       R3020
                .        .          .          .
                .        .          .          .
290             .        .          .          .        3030
                .        .          .          .          .
                .        .          .          .          .
300             .        .          .     C3030A.............
                .        .          .          .
                .        .          .          .
303             .        .       C3030B.............
                .        .          V
                .        .          V
306             .        .       R3030
                .        .          .
                .        .          .
312             .        .          .        3040
                .        .          .          .
                .        .          .          .
322             .        .       C3040.............
                .        .          V
                .        .          V
325             .        .       R3040
                .        .          .
                .        .          .
331             .    C3060B.............
                .        V
                .        V
334             .     R3060
                .        .
                .        .
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340          .           .        1340
             .           .           V
             .           .           V
350          .           .       R1340
             .           .           .
             .           .           .
356          .           .           .        3125
             .           .           .           .
             .           .           .           .
366          .           .       C3125............
             .           .           V
             .           .           V
369          .           .       R3125
             .           .           .
             .           .           .
375          .           .           .        3130
             .           .           .           .
             .           .           .           .
385          .           .       C3130............
             .           .           V
             .           .           V
388          .           .       R3130
             .           .           .
             .           .           .
394          .           .           .        3090
             .           .           .           .
             .           .           .           .
404          .       C3090A......................
             .           .
             .           .
407          .           .        3070
             .           .           .
             .           .           .
417          .           .           .        3080
             .           .           .           .
             .           .           .           .
427          .       C3090B......................
             .           V
             .           V
430          .       R3090
             .           .
             .           .
436          .           .        3100
             .           .           .
             .           .           .
446          .       C3100............
             .           .
             .           .
449          .           .        3120
             .           .           .
             .           .           .
459          .       C3120............
             .           .
             .           .
462      C4510B............
             V
             V
465      R4510
             .
             .
472          .        4520
             .           .
             .           .
482      C4520............
             .
             .
485          .        3135
             .           V
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                .          V
495             .       R3135
                .          .
                .          .
501             .          .        3140
                .          .          .
                .          .          .
511             .       C3140............
                .          V
                .          V
514             .       R3140
                .          .
                .          .
520             .          .        3150
                .          .          .
                .          .          .
530             .      C3150A...........
                .          .
                .          .
533     C3150B...........
            V
            V
536     R4520
            .
            .
543             .        3160
                .          V
                .          V
553             .       R3160
                .          .
                .          .
559             .          .        3170
                .          .          .
                .          .          .
569             .       C3170............
                .          V
                .          V
572             .       R3170
                .          .
                .          .
578             .          .        3180
                .          .          .
                .          .          .
588             .      C3180A...........
                .          .
                .          .
591             .          .        1360
                .          .          .
                .          .          .
601             .          .          .        3190
                .          .          .          .
                .          .          .          .
611             .          .      C3190............
                .          .          V
                .          .          V
614             .          .      R3190
                .          .          .
                .          .          .
620             .          .          .        3200
                .          .          .          .
                .          .          .          .
630             .          .      C3200............
                .          .          V
                .          .          V
633             .          .      R3200
                .          .          .
                .          .          .
639             .          .          .        3210
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                .         .         .         .
                .         .         .         .
649             .         .      C3210.........
                .         .         V
                .         .         V
652             .         .      R3210
                .         .         .
                .         .         .
658             .         .         .      3220A
                .         .         .         .
                .         .         .         .
668             .         .     C3220A.........
                .         .         V
                .         .         V
671             .         .     S3220A
                .         .         V
                .         .         V
678             .         .     R3220A
                .         .         .
                .         .         .
684             .         .         .      3220B
                .         .         .         .
                .         .         .         .
694             .         .     C3220B.........
                .         .         .
                .         .         .
697             .      C3180B.......
                .         V
                .         V
700             .      R3220B
                .         .
                .         .
706             .         .      3230
                .         .         .
                .         .         .
716             .      C3230A.......
                .         .
                .         .
719             .         .      3240
                .         .         V
                .         .         V
729             .         .     R3240
                .         .         .
                .         .         .
735             .         .         .      3250A
                .         .         .         .
                .         .         .         .
745             .         .     C3250A.........
                .         .         V
                .         .         V
748             .         .     S3050A
                .         .         V
                .         .         V
753             .         .     R3250A
                .         .         .
                .         .         .
759             .         .         .      3250B
                .         .         .         .
                .         .         .         .
769             .         .     C3250B.........
                .         .         V
                .         .         V
772             .         .     R3250B
                .         .         .
                .         .         .
778             .      C3230B.......
                .         V
                .         V
```

```
782          .       R3230
             .          .
             .          .
789          .          .        4530
             .          .          .
             .          .          .
799          .      C4530A............
             .          .
             .          .
803      C4530B............
```

(***) 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  12/03/96  TIME  09:47:52  *                                        *          (916) 551-1748
*
 *                                      *                                        *
*
 ****************************************
****************************************
```

Analysis as of October 29, 1996 FILE: CC1-24RT.DAT
Revised November 29, 1996 per FCD review
100-Year Storm, 24-Hour Duration, SCS Type II Rainfall
Green-Ampt Loss Rate
Clark Unit Hydrograph
Normal-Depth Option for Channel Routing
Modified Puls Option for Reservoir Routing
Includes Culvert Data
Includes Cave Creek (North) Study Hydrograph
Preliminary Model
Single Run, Existing Conditions
Extended routing cross-sections in Cave Creek Wash -
DDM MCUHP1 CAVE CREEK WASH FLOODPLAIN DELINEATION

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

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

                 COMPUTATION INTERVAL    0.08 HOURS
                      TOTAL TIME BASE   24.92 HOURS

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

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	NORTH	33771.	13.33	17816.	4928.	4747.	124.38		
ROUTED TO	RNORTH	33712.	13.42	17803.	4923.	4742.	124.38	92.95	13.42
HYDROGRAPH AT	3085	113.	12.08	8.	2.	2.	0.08		
2 COMBINED AT	C3085	33712.	13.42	17806.	4925.	4744.	124.46		
ROUTED TO	R3085	33448.	13.92	17751.	4904.	4723.	124.46	99.73	13.92
HYDROGRAPH AT	4510	1280.	12.67	264.	66.	64.	1.53		
2 COMBINED AT	C4510A	33734.	13.92	17925.	4970.	4787.	125.99		
HYDROGRAPH AT	1210	1043.	12.42	172.	46.	45.	1.27		
ROUTED TO	R1210	958.	12.75	172.	46.	45.	1.27	95.24	12.75
HYDROGRAPH AT	1215	203.	12.33	31.	9.	8.	0.22		
ROUTED TO	R1215	162.	12.58	31.	9.	8.	0.22	93.86	12.58
HYDROGRAPH AT	1220	803.	12.25	80.	20.	19.	0.71		
3 COMBINED AT	C1220	1354.	12.67	283.	75.	72.	2.20		
ROUTED TO	R1220	1241.	12.92	283.	75.	72.	2.20	98.83	12.92
HYDROGRAPH AT	1230	485.	12.42	78.	21.	20.	0.63		
2 COMBINED AT	C1230	1488.	12.83	361.	95.	92.	2.83		
ROUTED TO	R1230	1428.	13.08	361.	95.	92.	2.83	99.04	13.08
HYDROGRAPH AT	1240	381.	12.33	56.	15.	15.	0.40		

+	2 COMBINED AT	C1240	1535.	13.00	416.	110.	106.	3.23		
+	ROUTED TO	R1240	1518.	13.17	416.	110.	106.	3.23	99.30	13.17
+	HYDROGRAPH AT	3045	242.	12.25	30.	7.	7.	0.25		
+	2 COMBINED AT	C3045	1553.	13.08	445.	118.	113.	3.47		
+	ROUTED TO	R3045	1532.	13.42	445.	117.	113.	3.47	98.89	13.42
+	HYDROGRAPH AT	3050	353.	12.25	39.	10.	10.	0.34		
+	2 COMBINED AT	C3050	1550.	13.42	484.	128.	123.	3.81		
+	ROUTED TO	R3050	1507.	13.83	484.	127.	123.	3.81	99.51	13.83
+	HYDROGRAPH AT	3060	307.	12.42	44.	11.	11.	0.39		
+	2 COMBINED AT	C3060A	1531.	13.75	527.	139.	134.	4.19		
+	HYDROGRAPH AT	3000	355.	12.33	53.	14.	13.	0.38		
+	ROUTED TO	R3000	199.	13.17	53.	14.	13.	0.38	98.78	13.17
+	HYDROGRAPH AT	3010	158.	12.33	27.	7.	7.	0.16		
+	2 COMBINED AT	C3010	255.	13.00	80.	21.	20.	0.55		
+	HYDROGRAPH AT	3020	262.	12.33	40.	11.	10.	0.31		
+	ROUTED TO	R3020	158.	13.08	40.	11.	10.	0.31	98.65	13.08
+	HYDROGRAPH AT	3030	246.	12.25	31.	8.	8.	0.22		
+	2 COMBINED AT	C3030A	292.	12.33	71.	19.	18.	0.53		
+	2 COMBINED AT	C3030B	507.	12.33	151.	40.	38.	1.08		
+	ROUTED TO	R3030	466.	12.58	151.	40.	38.	1.08	97.90	12.58
+	HYDROGRAPH AT	3040	127.	12.25	19.	5.	5.	0.12		

+	2 COMBINED AT	C3040	554.	12.50	170.	44.	43.	1.20		
+	ROUTED TO	R3040	547.	12.58	170.	44.	43.	1.20	98.48	12.58
+	2 COMBINED AT	C3060B	1900.	13.67	696.	183.	176.	5.39		
+	ROUTED TO	R3060	1885.	13.83	696.	183.	176.	5.39	99.95	13.83
+	HYDROGRAPH AT	1340	1092.	12.58	199.	51.	49.	1.57		
+	ROUTED TO	R1340	985.	12.92	199.	51.	49.	1.57	98.47	12.92
+	HYDROGRAPH AT	3125	379.	12.42	55.	14.	13.	0.46		
+	2 COMBINED AT	C3125	1142.	12.83	254.	65.	62.	2.03		
+	ROUTED TO	R3125	1011.	13.33	253.	64.	62.	2.03	99.20	13.33
+	HYDROGRAPH AT	3130	146.	12.33	23.	6.	6.	0.21		
+	2 COMBINED AT	C3130	1045.	13.33	276.	70.	68.	2.24		
+	ROUTED TO	R3130	927.	13.92	275.	70.	68.	2.24	98.95	13.92
+	HYDROGRAPH AT	3090	371.	12.42	56.	14.	14.	0.43		
+	3 COMBINED AT	C3090A	2834.	13.83	1025.	268.	258.	8.06		
+	HYDROGRAPH AT	3070	178.	12.58	49.	12.	12.	0.29		
+	HYDROGRAPH AT	3080	694.	12.42	134.	34.	33.	0.58		
+	3 COMBINED AT	C3090B	3003.	13.83	1204.	314.	303.	8.93		
+	ROUTED TO	R3090	2953.	14.17	1203.	313.	302.	8.93	99.64	14.17
+	HYDROGRAPH AT	3100	407.	12.58	81.	20.	20.	0.57		
+	2 COMBINED AT	C3100	3009.	14.17	1283.	334.	321.	9.50		
+	HYDROGRAPH AT	3120	533.	12.50	107.	27.	26.	0.63		

+	2 COMBINED AT	C3120	3081.	14.08	1389.	361.	348.	10.13		
+	2 COMBINED AT	C4510B	36762.	13.92	19227.	5331.	5135.	136.12		
+	ROUTED TO	R4510	36544.	14.25	19069.	5319.	5123.	136.12		
+									99.40	14.25
+	HYDROGRAPH AT	4520	415.	12.75	96.	24.	23.	0.66		
+	2 COMBINED AT	C4520	36631.	14.25	19112.	5342.	5146.	136.79		
+	HYDROGRAPH AT	3135	54.	12.17	6.	1.	1.	0.05		
+	ROUTED TO	R3135	29.	13.00	6.	1.	1.	0.05		
+									95.73	13.00
+	HYDROGRAPH AT	3140	308.	12.50	59.	16.	15.	0.44		
+	2 COMBINED AT	C3140	311.	12.50	65.	17.	16.	0.49		
+	ROUTED TO	R3140	250.	13.25	64.	17.	16.	0.49		
+									97.33	13.25
+	HYDROGRAPH AT	3150	338.	12.67	79.	20.	19.	0.57		
+	2 COMBINED AT	C3150A	472.	13.08	143.	37.	35.	1.07		
+	2 COMBINED AT	C3150B	36806.	14.25	19200.	5379.	5181.	137.85		
+	ROUTED TO	R4520	36752.	14.33	19195.	5376.	5178.	137.85		
+									99.74	14.33
+	HYDROGRAPH AT	3160	372.	12.33	51.	13.	12.	0.41		
+	ROUTED TO	R3160	335.	12.58	51.	13.	12.	0.41		
+									97.94	12.58
+	HYDROGRAPH AT	3170	428.	12.33	48.	13.	12.	0.40		
+	2 COMBINED AT	C3170	613.	12.42	98.	25.	25.	0.82		
+	ROUTED TO	R3170	475.	13.17	98.	25.	24.	0.82		
+									98.51	13.17
+	HYDROGRAPH AT	3180	314.	12.50	76.	20.	20.	0.43		
+	2 COMBINED AT	C3180A	668.	13.08	174.	46.	44.	1.24		

+	HYDROGRAPH AT	1360	878.	12.25	91.	24.	24.	0.69	
+	HYDROGRAPH AT	3190	552.	12.25	58.	15.	14.	0.48	
+	2 COMBINED AT	C3190	1430.	12.25	149.	39.	38.	1.16	
+	ROUTED TO	R3190	1111.	12.58	149.	39.	38.	1.16	
+									98.67 12.58
+	HYDROGRAPH AT	3200	688.	12.33	87.	22.	22.	0.65	
+	2 COMBINED AT	C3200	1582.	12.58	237.	62.	59.	1.82	
+	ROUTED TO	R3200	1524.	12.67	236.	62.	59.	1.82	
+									98.56 12.67
+	HYDROGRAPH AT	3210	154.	12.08	11.	3.	3.	0.10	
+	2 COMBINED AT	C3210	1531.	12.67	247.	64.	62.	1.92	
+	ROUTED TO	R3210	1427.	12.83	247.	64.	62.	1.92	
+									99.31 12.83
+	HYDROGRAPH AT	3220A	260.	12.25	25.	7.	6.	0.24	
+	2 COMBINED AT	C3220A	1474.	12.83	272.	71.	68.	2.16	
+	ROUTED TO	S3220A	1474.	12.83	272.	71.	68.	2.16	
+	ROUTED TO	R3220A	1306.	13.17	272.	71.	68.	2.16	
+									99.36 13.17
+	HYDROGRAPH AT	3220B	365.	12.33	37.	9.	9.	0.39	
+	2 COMBINED AT	C3220B	1342.	13.08	310.	80.	77.	2.55	
+	2 COMBINED AT	C3180B	2009.	13.08	484.	126.	121.	3.80	
+	ROUTED TO	R3220B	1743.	13.75	483.	125.	121.	3.80	
+									99.70 13.75
+	HYDROGRAPH AT	3230	210.	12.50	42.	11.	10.	0.36	
+	2 COMBINED AT	C3230A	1796.	13.75	524.	136.	131.	4.16	
+	HYDROGRAPH AT	3240	58.	12.33	8.	2.	2.	0.08	

+	ROUTED TO R3240	51.	12.50	8.	2.	2.	0.08		
+								97.68	12.50
+	HYDROGRAPH AT 3250A	88.	12.25	10.	3.	2.	0.08		
+	2 COMBINED AT C3250A	112.	12.25	18.	5.	4.	0.16		
+	ROUTED TO S3050A	112.	12.25	18.	5.	4.	0.16		
+	ROUTED TO R3250A	73.	12.92	17.	5.	4.	0.16		
+								97.93	12.92
+	HYDROGRAPH AT 3250B	175.	12.50	33.	8.	8.	0.32		
+	2 COMBINED AT C3250B	212.	12.58	50.	13.	12.	0.47		
+	ROUTED TO R3250B	176.	13.25	50.	13.	12.	0.47		
+								98.43	13.25
+	2 COMBINED AT C3230B	1937.	13.67	574.	149.	143.	4.63		
+	ROUTED TO R3230	1934.	13.75	574.	149.	143.	4.63		
+								99.54	13.75
+	HYDROGRAPH AT 4530	32.	12.33	4.	1.	1.	0.05		
+	2 COMBINED AT C4530A	1937.	13.75	579.	150.	144.	4.69		
+	2 COMBINED AT C4530B	38173.	14.25	19671.	5526.	5322.	142.54		

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

DDMS SUBBASIN REPORT

LOSS PARAMETERS FOR SUBBASIN: 3130

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
33	45.720	33.9	0.23	0
98	89.240	66.1	0.37	0

TOTAL = 134.960 Acres XKSAT = 0.31 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.45
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
127.570	Desert	94.5	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	- 0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
0.210	L.D.R.	0.2	NORMAL	50	15	0.30	0.05	Low	0.09
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
7.180	M.F.R.	5.3	NORMAL	50	45	0.25	0.05	Low	0.07
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

134.96 = Total Area Avg. = 26 2% 0.340

PERCENT OF SUBBASIN DRY = 94.0 %
NORMAL = 6.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.34

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.37

IMPERVIOUS AREA: URBAN @ 100 % effective = 2
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3130	0.211	1.500	0.051	97.0	0.34	0.34	4.45	0.37	2

LOSS PARAMETERS FOR SUBBASIN: 3090

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
12	12.200	4.4	0.01	0
44	63.840	23.0	0.03	0
98	200.420	72.3	0.37	0
110	0.890	0.3	0.13	0

TOTAL = 277.350 Acres XKSAT = 0.18 %Rock = 0

DTHETA

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

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
217.240	Desert	78.3	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
51.030	L.D.R.	18.4	NORMAL	50	15	0.30	0.05	Low	0.06
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
9.080	M.F.R.	3.3	NORMAL	50	45	0.25	0.05	Low	0.07
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

277.35 = Total Area Avg. = 30 4% 0.340

PERCENT OF SUBBASIN DRY = 78.0 %
NORMAL = 22.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.22

IMPERVIOUS AREA: URBAN @ 100 % effective = 4
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 4

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area	Length	Kb	Slope	IA	DTHETA	PSIF	XKSAT	RTIMP

	sq.mi.	mi.		ft/mi	in.			adj.	%
3090	0.433	1.840	0.046	84.0	0.34	0.35	5.60	0.22	4

LOSS PARAMETERS FOR SUBBASIN: 3080

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
3	5.680	1.5	0.58	0
12	267.580	71.8	0.01	0
96	22.770	6.1	0.07	0
98	2.000	0.5	0.37	0
110	30.740	8.3	0.13	0
112	43.800	11.8	0.39	0

TOTAL = 372.570 Acres XKSAT = 0.02 %Rock = 0

DTHETA

Dry = 0.19 PSIF = 11.20
Normal = 0.10
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	-Kn	Kb Type	Kb
372.570	Desert	100.	DRY	25	0	0.35	0.03	Low	0.04
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

372.57 = Total Area Avg. = 25 0% 0.350

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

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.19

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.02

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

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
3080	0.582	1.950	0.045	67.0	0.35	0.19	11.20	0.02	0

LOSS PARAMETERS FOR SUBBASIN: 3070

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
12	27.160	14.7	0.01	0
44	70.790	38.4	0.03	0
96	51.760	28.1	0.07	0
110	20.200	11.0	0.13	0
112	14.300	7.8	0.39	0

TOTAL = 184.210 Acres XKSAT = 0.05 %Rock = 0

DTHETA

Dry = 0.27 PSIF = 8.80
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn -	Kb Type	Kb
184.210	Desert	100.	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

184.21 = Total Area Avg. = 25 0% 0.350

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

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.27

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.06

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

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
3070	0.288	2.500	0.049	76.0	0.35	0.27	8.80	0.06	0

LOSS PARAMETERS FOR SUBBASIN: 3100

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
3	108.910	29.8	0.58	0
12	96.820	26.5	0.01	0
44	0.190	0.1	0.03	0
110	159.710	43.7	0.13	0

TOTAL = 365.630 Acres XKSAT = 0.10 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 7.00
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
362.110	Desert	99.0	DRY	25	0	0.35	0.03	Low	0.04
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
3.520	Ind	1.0	NORMAL	60	55	0.15	0.03	Min	0.04
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

365.63 = Total Area Avg. = 25 1% 0.350

PERCENT OF SUBBASIN DRY = 99.0 %
NORMAL = 1.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.12

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

% EFFECTIVE IMP. = 1

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area	Length	Kb	Slope	IA	DTHETA	PSIF	XKSAT	RTIMP

	sq.mi.	mi.		ft/mi	in.			adj.	%
3100	0.571	2.330	0.045	58.0	0.35	0.35	7.00	0.12	1

LOSS PARAMETERS FOR SUBBASIN: 3120

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
3	13.510	3.4	0.58	0
12	36.330	9.1	0.01	0
44	197.820	49.3	0.03	0
98	33.490	8.3	0.37	0
110	120.130	29.9	0.13	0

TOTAL = 401.280 Acres XKSAT = 0.06 %Rock = 0

DTHETA

Dry = 0.29 PSIF = 8.40
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn -	Kb Type	Kb
348.770	Desert	86.9	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
41.780	L.D.R.	10.4	NORMAL	50	15	0.30	0.05	Low	0.06
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
0.360	M.F.R.	0.1	NORMAL	50	45	0.25	0.05	Low	0.09
10.370	Ind	2.6	NORMAL	60	55	0.15	0.03	Min	0.03
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

401.28 = Total Area Avg. = 28 3% 0.340

PERCENT OF SUBBASIN DRY = 87.0 %
NORMAL = 13.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.27

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.07

IMPERVIOUS AREA: URBAN @ 100 % effective = 3
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 3

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
3120	0.627	2.580	0.044	74.0	0.34	0.27	8.40	0.07	3

LOSS PARAMETERS FOR SUBBASIN: 3135

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
33	19.130	57.3	0.23	0
98	14.240	42.7	0.37	0

TOTAL = 33.370 Acres XKSAT = 0.28 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.60
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
33.370	Desert	100.	DRY	25	0	0.35	0.03	Low	0.06
	OPEN		DRY	10	0	0.10	-0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

33.370 = Total Area Avg. = 25 0% 0.350

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

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.33

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

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3135	0.052	0.570	0.059	88.0	0.35	0.35	4.60	0.33	0

LOSS PARAMETERS FOR SUBBASIN: 3140

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
12	36.240	12.9	0.01	0
44	32.410	11.5	0.03	0
98	212.640	75.6	0.37	0

TOTAL = 281.290 Acres XKSAT = 0.17 %Rock = 0

DTHETA

Dry = 0.39 PSIF = 5.70
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
238.930	Desert	84.9	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
25.120	L.D.R.	8.9	NORMAL	50	15	0.30	0.05	Low	0.06
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
17.240	Comm	6.1	NORMAL	75	80	0.10	0.02	Min	0.03
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

281.29 = Total Area Avg. = 28 6% 0.330

PERCENT OF SUBBASIN DRY = 85.0 %
NORMAL = 15.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.37

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.20

IMPERVIOUS AREA: URBAN @ 100 % effective = 6
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 6

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3140	0.440	2.250	0.044	78.0	0.33	0.37	5.70	0.20	6

LOSS PARAMETERS FOR SUBBASIN: 3150

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
3	125.020	33.9	0.58	0
12	96.270	26.1	0.01	0
110	147.010	39.9	0.13	0

TOTAL = 368.300 Acres XKSAT = 0.11 %Rock = 0

DTHETA

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

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
364.980	Desert	99.1	DRY	25	0	0.35	0.03	Low	0.04
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
3.320	Ind	0.9	NORMAL	60	55	0.15	0.03	Min	0.04
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

368.30 = Total Area Avg. = 25 0% 0.350

PERCENT OF SUBBASIN DRY = 99.0 %
NORMAL = 1.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.36

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.13

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

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3150	0.575	2.520	0.045	50.0	0.35	0.36	6.80	0.13	0

LOSS PARAMETERS FOR SUBBASIN: 3160

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
33	174.500	65.9	0.23	0
96	58.090	22.0	0.07	0
98	32.050	12.1	0.37	0

TOTAL = 264.640 Acres XKSAT = 0.19 %Rock = 0

DTHETA

Dry = 0.38 PSIF = 5.40
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
254.690	Desert	96.2	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
9.950	L.D.R.	3.8	NORMAL	50	15	0.30	0.05	Low	0.07
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

264.64 = Total Area Avg. = 26 1% 0.350

PERCENT OF SUBBASIN DRY = 96.0 %
NORMAL = 4.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.37

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.22

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

% EFFECTIVE IMP. = 1

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3160	0.414	1.860	0.047	110.0	0.35	0.37	5.40	0.22	1

LOSS PARAMETERS FOR SUBBASIN: 3170

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	20.170	7.8	0.62	0
33	87.470	33.8	0.23	0
44	6.250	2.4	0.03	0
96	2.550	1.0	0.07	0
98	142.260	55.0	0.37	0

TOTAL = 258.700 Acres XKSAT = 0.30 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.50
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
151.640	Desert	58.6	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
107.060	L.D.R.	41.4	NORMAL	50	15	0.30	0.05	Low	0.05
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

258.70 = Total Area Avg. = 34 6% 0.330

PERCENT OF SUBBASIN DRY = 59.0 %
NORMAL = 41.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.31

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.38

IMPERVIOUS AREA: URBAN @ 100 % effective = 6
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 6

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
3170	0.404	1.250	0.047	80.0	0.33	0.31	4.50	0.38	6

LOSS PARAMETERS FOR SUBBASIN: 3180

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
12	22.860	8.4	0.01	0
44	141.210	51.9	0.03	0
98	62.990	23.1	0.37	0
110	11.870	4.4	0.13	0
118	33.400	12.3	0.42	0

TOTAL = 272.330 Acres XKSAT = 0.07 %Rock = 0

DTHETA

Dry = 0.30 PSIF = 8.00
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
207.720	Desert	76.3	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
35.400	L.D.R.	13.0	NORMAL	50	15	0.30	0.05	Low	0.06
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
29.210	Comm	10.7	NORMAL	75	80	0.10	0.02	Min	0.03
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

272.33 = Total Area Avg. = 29 11% 0.320

PERCENT OF SUBBASIN DRY = 76.0 %
NORMAL = 24.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.26

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.08

IMPERVIOUS AREA: URBAN @ 100 % effective = 11
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 11

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
3180	0.426	2.610	0.044	75.0	0.32	0.26	8.00	0.08	11

LOSS PARAMETERS FOR SUBBASIN: 1360

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
33	335.250	76.2	0.23	0
61	12.010	2.7	0.15	0
63	87.000	19.8	0.14	25
96	5.520	1.3	0.07	0

TOTAL = 439.780 Acres XKSAT = 0.20 %Rock = 5

DTHETA

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

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
414.510	Desert	94.3	DRY	25	0	0.35	0.03	Low	0.04
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
11.330	L.D.R.	2.6	NORMAL	50	15	0.30	0.05	Low	0.07
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
13.940	Comm	3.2	NORMAL	75	80	0.10	0.02	Min	0.03
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

439.78 = Total Area Avg. = 26 3% 0.340

PERCENT OF SUBBASIN DRY = 94.0 %
NORMAL = 6.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.36

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.24

IMPERVIOUS AREA: URBAN @ 100 % effective = 3
ROCK OUTCROP @ 100 % effective = 5

% EFFECTIVE IMP. = 8

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area	Length	Kb	Slope	IA	DTHETA	PSIF	XKSAT	RTIMP

	sq.mi.	mi.		ft/mi	in.			adj.	%
1360	0.687	2.060	0.043	239.0	0.34	0.36	5.30	0.24	8

LOSS PARAMETERS FOR SUBBASIN: 3190

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	51.690	17.0	0.62	0
33	156.740	51.4	0.23	0
63	10.890	3.6	0.14	25
96	85.500	28.0	0.07	0

TOTAL = 304.820 Acres XKSAT = 0.19 %Rock = 1

DTHETA

Dry = 0.38 PSIF = 5.40
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
282.680	Desert	92.7	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
22.140	L.D.R.	7.3	NORMAL	50	15	0.30	0.05	Low	0.06
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

304.82 = Total Area Avg. = 27 1% 0.350

PERCENT OF SUBBASIN DRY = 93.0 %
NORMAL = 7.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.37

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.23

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

% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area	Length	Kb	Slope	IA	DTHETA	PSIF	XKSAT	RTIMP

	sq.mi.	mi.		ft/mi	in.			adj.	%
3190	0.476	1.880	0.046	225.4	0.35	0.37	5.40	0.23	2

LOSS PARAMETERS FOR SUBBASIN: 3200

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	68.500	16.3	0.62	0
33	42.310	10.1	0.23	0
44	1.700	0.4	0.03	0
96	255.840	61.1	0.07	0
98	50.660	12.1	0.37	0

TOTAL = 419.010 Acres XKSAT = 0.14 %Rock = 0

DTHETA

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

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
360.280	Desert	86.0	DRY	25	0	0.35	0.03	Low	0.04
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
51.660	L.D.R.	12.3	NORMAL	50	15	0.30	0.05	Low	0.06
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
7.070	Comm	1.7	NORMAL	75	80	0.10	0.02	Min	0.03
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

419.01 = Total Area Avg. = 28 3% 0.340

PERCENT OF SUBBASIN DRY = 86.0 %
NORMAL = 14.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.37

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.17

IMPERVIOUS AREA: URBAN @ 100 % effective = 3
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 3

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
3200	0.655	1.990	0.043	98.0	0.34	0.37	6.20	0.17	3

LOSS PARAMETERS FOR SUBBASIN: 3220A

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
98	132.970	86.1	0.37	0
44	2.230	1.4	0.03	0
118	19.300	12.5	0.42	0

TOTAL = 154.500 Acres XKSAT = 0.36 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.20
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
132.670	Desert	85.9	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
15.750	V.L.D.R	10.2	NORMAL	30	5	0.30	0.05	Low	0.06
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
6.080	M.D.R.	3.9	NORMAL	50	30	0.25	0.05	Low	0.07
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

154.50 = Total Area Avg. = 26 2% 0.340

PERCENT OF SUBBASIN DRY = 86.0 %
NORMAL = 14.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.34

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.42

IMPERVIOUS AREA: URBAN @ 100 % effective = 2
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3220A	0.241	0.970	0.050	88.0	0.34	0.34	4.20	0.42	2

LOSS PARAMETERS FOR SUBBASIN: 3210

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
98	66.070	100.	0.37	0

TOTAL = 66.070 Acres XKSAT = 0.37 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.15
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
57.530	Desert	87.1	DRY	25	0	0.35	0.03	Low	0.06
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
8.540	L.D.R.	12.9	NORMAL	50	15	0.30	0.05	Low	0.07
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

66.070 = Total Area Avg. = 28 2% 0.340

PERCENT OF SUBBASIN DRY = 87.0 %
NORMAL = 13.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.34

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.44

IMPERVIOUS AREA: URBAN @ 100 % effective = 2
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
3210	0.103	0.420	0.055	83.0	0.34	0.34	4.15	0.44	2

LOSS PARAMETERS FOR SUBBASIN: 3220B

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
1	6.670	2.7	0.41	0
112	12.380	4.9	0.39	0
118	232.330	92.4	0.42	0

TOTAL = 251.380 Acres XKSAT = 0.42 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 3.88
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
249.540	Desert	99.3	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
1.840	M.D.R.	0.7	NORMAL	50	30	0.25	0.05	Low	0.08
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

251.38 = Total Area Avg. = 25 0% 0.350

PERCENT OF SUBBASIN DRY = 99.0 %
NORMAL = 1.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.49

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

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3220B	0.393	1.290	0.047	101.0	0.35	0.35	3.88	0.49	0

LOSS PARAMETERS FOR SUBBASIN: 3230

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
1	40.670	17.8	0.41	0
3	63.230	27.7	0.58	0
12	21.630	9.5	0.01	0
110	79.930	35.0	0.13	0
112	22.830	10.0	0.39	0

TOTAL = 228.290 Acres XKSAT = 0.21 %Rock = 0

DTHETA

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

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn -	Kb Type	Kb
228.290	Desert	100.	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

228.29 = Total Area Avg. = 25 0% 0.350

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

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.37

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.24

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

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
3230	0.357	1.930	0.048	60.0	0.35	0.37	5.20	0.24	0

LOSS PARAMETERS FOR SUBBASIN: 3240

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
98	47.960	100.	0.37	0

TOTAL = 47.960 Acres XKSAT = 0.37 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.15
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
27.360	Desert	57.0	DRY	25	0	0.35	0.03	Low	0.06
	OPEN		DRY	10	0	0.10	0.02	Min	
5.130	V.L.D.R	10.7	NORMAL	30	5	0.30	0.05	Low	0.07
12.310	L.D.R.	25.7	NORMAL	50	15	0.30	0.05	Low	0.07
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
3.160	Park	6.6	NORMAL	90	0	0.20	0.10	Hi	0.14
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

47.960 = Total Area Avg. = 36 4% 0.320

PERCENT OF SUBBASIN DRY = 57.0 %
NORMAL = 43.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.31

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.48

IMPERVIOUS AREA: URBAN @ 100 % effective = 4
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 4

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
3240	0.075	0.740	0.061	74.0	0.32	0.31	4.15	0.48	4

LOSS PARAMETERS FOR SUBBASIN: 3250B

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
12	11.950	5.9	0.01	0
112	62.300	30.7	0.39	0
118	128.750	63.4	0.42	0

TOTAL = 203.000 Acres XKSAT = 0.33 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.35
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
201.160	Desert	99.1	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
1.840	M.D.R.	0.9	NORMAL	50	30	0.25	0.05	Low	0.08
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

203.00 = Total Area Avg. = 25 0% 0.350

PERCENT OF SUBBASIN DRY = 99.0 %
NORMAL = 1.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.38

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

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3250B	0.317	1.800	0.048	67.0	0.35	0.35	4.35	0.38	0

LOSS PARAMETERS FOR SUBBASIN: 3250A

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
98	48.900	92.1	0.37	0
118	4.220	7.9	0.42	0

TOTAL = 53.120 Acres XKSAT = 0.37 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.15
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
23.340	Desert	43.9	DRY	25	0	0.35	0.03	Low	0.06
	OPEN		DRY	10	0	0.10	0.02	Min	
22.050	V.L.D.R	41.5	NORMAL	30	5	0.30	0.05	Low	0.06
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
7.730	M.D.R.	14.6	NORMAL	50	30	0.25	0.05	Low	0.07
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

53.120 = Total Area Avg. = 30 6% 0.310

PERCENT OF SUBBASIN DRY = 44.0 %
NORMAL = 56.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.29

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.45

IMPERVIOUS AREA: URBAN @ 100 % effective = 6
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 6

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3250A	0.083	0.680	0.056	96.0	0.31	0.29	4.15	0.45	6

LOSS PARAMETERS FOR SUBBASIN: 4510

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
3	270.560	27.6	0.58	0
12	341.940	34.9	0.01	0
44	314.030	32.0	0.03	0
77	39.750	4.1	0.05	0
98	13.740	1.4	0.37	0

TOTAL = 980.020 Acres XKSAT = 0.05 %Rock = 0

DTHETA

Dry = 0.27 PSIF = 8.80
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn -	Kb Type	Kb
976.780	Desert	99.7	DRY	25	0	0.35	0.03	Low	0.04
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
3.240	Ind	0.3	NORMAL	60	55	0.15	0.03	Min	0.04
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

980.02 = Total Area Avg. = 25 0% 0.350

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

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.27

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.06

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

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
4510	1.531	3.240	0.039	49.0	0.35	0.27	8.80	0.06	0

LOSS PARAMETERS FOR SUBBASIN: 4520

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
3	166.260	39.2	0.58	0
12	30.420	7.2	0.01	0
44	227.050	53.6	0.03	0

TOTAL = 423.730 Acres XKSAT = 0.09 %Rock = 0

DTHETA

Dry = 0.33 PSIF = 7.30
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
423.730	Desert	100.	DRY	25	0	0.35	0.03	Low	0.04
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

423.73 = Total Area Avg. = 25 0% 0.350

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

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.33

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.11

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

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

4520	0.662	2.160	0.044	28.0	0.35	0.33	7.30	0.11	0

LOSS PARAMETERS FOR SUBBASIN: 4530

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
3	35.310	100.	0.58	0

TOTAL = 35.310 Acres XKSAT = 0.58 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 3.40
Normal = 0.27
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
35.310	Desert	100.	DRY	25	0	0.35	0.03	Low	0.06
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

35.310 = Total Area Avg. = 25 0% 0.350

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

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.68

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

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
4530	0.055	0.640	0.059	55.0	0.35	0.35	3.40	0.68	0

LOSS PARAMETERS FOR SUBBASIN: 3085

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
98	11.020	21.2	0.37	0
3	41.040	78.8	0.58	0

TOTAL = 52.060 Acres XKSAT = 0.53 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 3.53
Normal = 0.26
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert		DRY	25	0	0.35	0.03	Low	
52.060	OPEN	100.	DRY	10	0	0.10	0.02	Min	0.03
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

52.060 = Total Area Avg. = 10 0% 0.100

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

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.53

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

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3085	0.081	0.660	0.029	114.0	0.10	0.35	3.53	0.53	0

LOSS PARAMETERS FOR SUBBASIN: 1210

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	15.970	2.0	0.62	0
33	591.600	72.6	0.23	0
63	147.260	18.1	0.14	25
96	60.330	7.4	0.07	0

TOTAL = 815.160 Acres XKSAT = 0.20 %Rock = 5

DTHETA

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

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
556.690	Desert	68.3	DRY	25	0	0.35	0.03	Low	0.04
16.620	OPEN	2.0	DRY	10	0	0.10	0.02	Min	0.03
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
224.650	L.D.R.	27.6	NORMAL	50	15	0.30	0.05	Low	0.05
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
17.200	Park	2.1	NORMAL	90	0	0.20	0.10	Hi	0.12
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

815.16 = Total Area Avg. = 32 4% 0.330

PERCENT OF SUBBASIN DRY = 70.0 %
NORMAL = 30.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.33

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.25

IMPERVIOUS AREA: URBAN @ 100 % effective = 4
ROCK OUTCROP @ 100 % effective = 5

% EFFECTIVE IMP. = 9

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area	Length	Kb	Slope	IA	DTHETA	PSIF	XKSAT	RTIMP

	sq.mi.	mi.		ft/mi	in.			adj.	%
1210	1.274	3.660	0.041	167.0	0.33	0.33	5.30	0.25	9

LOSS PARAMETERS FOR SUBBASIN: 1215

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	0.410	0.3	0.62	0
33	138.810	99.7	0.23	0

TOTAL = 139.220 Acres XKSAT = 0.23 %Rock = 0

DTHETA

Dry = 0.36 PSIF = 5.00
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
11.160	Desert	8.0	DRY	25	0	0.35	0.03	Low	0.07
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
128.060	L.D.R.	92.0	NORMAL	50	15	0.30	0.05	Low	0.05
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

139.22 = Total Area Avg. = 48 14% 0.300

PERCENT OF SUBBASIN DRY = 8.0 %
NORMAL = 92.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.26

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.33

IMPERVIOUS AREA: URBAN @ 100 % effective = 14
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 14

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

1215	0.218	1.480	0.051	132.0	0.30	0.26	5.00	0.33	14

LOSS PARAMETERS FOR SUBBASIN: 1220

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	59.260	13.1	0.62	0
33	336.760	74.2	0.23	0
61	3.810	0.8	0.15	0
93	30.050	6.6	0.33	0
96	24.180	5.3	0.07	0

TOTAL = 454.060 Acres XKSAT = 0.25 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.80
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn -	Kb Type	Kb
448.280	Desert	98.7	DRY	25	0	0.35	0.03	Low	0.04
	OPEN		DRY	10	0	0.10	0.02	Min	
1.350	V.L.D.R	0.3	NORMAL	30	5	0.30	0.05	Low	0.08
4.430	L.D.R.	1.0	NORMAL	50	15	0.30	0.05	Low	0.07
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

454.06 = Total Area Avg. = 25 0% 0.350

PERCENT OF SUBBASIN DRY = 99.0 %
NORMAL = 1.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.29

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

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
1220	0.709	1.820	0.043	137.0	0.35	0.35	4.80	0.29	0

LOSS PARAMETERS FOR SUBBASIN: 1230

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	55.020	13.7	0.62	0
33	120.990	30.1	0.23	0
61	201.400	50.1	0.15	0
63	12.080	3.0	0.14	25
93	9.620	2.4	0.33	0
96	2.670	0.7	0.07	0

TOTAL = 401.780 Acres XKSAT = 0.21 %Rock = 1

DTHETA

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

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	-Kn	Kb Type	Kb
305.940	Desert	76.1	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
3.990	V.L.D.R	1.0	NORMAL	30	5	0.30	0.05	Low	0.07
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
54.360	M.D.R.	13.5	NORMAL	50	30	0.25	0.05	Low	0.06
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
37.490	Park	9.3	NORMAL	90	0	0.20	0.10	Hi	0.11
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

401.78 = Total Area Avg. = 34 4% 0.320

PERCENT OF SUBBASIN DRY = 76.0 %
NORMAL = 24.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.34

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.27

IMPERVIOUS AREA: URBAN @ 100 % effective = 4
ROCK OUTCROP @ 100 % effective = 1

% EFFECTIVE IMP. = 5

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
1230	0.628	2.390	0.048	119.0	0.32	0.34	5.20	0.27	5

LOSS PARAMETERS FOR SUBBASIN: 1240

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	26.510	10.4	0.62	0
33	121.360	47.7	0.23	0
61	50.180	19.7	0.15	0
63	9.030	3.6	0.14	25
96	47.230	18.6	0.07	0

TOTAL = 254.310 Acres XKSAT = 0.18 %Rock = 1

DTHETA

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

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn -	Kb Type	Kb
167.060	Desert	65.7	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
68.900	M.D.R.	27.1	NORMAL	50	30	0.25	0.05	Low	0.05
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
5.630	Comm	2.2	NORMAL	75	80	0.10	0.02	Min	0.04
12.720	Park	5.0	NORMAL	90	0	0.20	0.10	Hi	0.12
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

254.31 = Total Area Avg. = 34 10% 0.310

PERCENT OF SUBBASIN DRY = 66.0 %
NORMAL = 34.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.34

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.23

IMPERVIOUS AREA: URBAN @ 100 % effective = 10
ROCK OUTCROP @ 100 % effective = 1

% EFFECTIVE IMP. = 11

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
1240	0.397	1.780	0.049	110.0	0.31	0.34	5.60	0.23	11

LOSS PARAMETERS FOR SUBBASIN: 3000

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	7.350	3.0	0.62	0
33	103.680	42.1	0.23	0
96	135.090	54.9	0.07	0

TOTAL = 246.120 Acres XKSAT = 0.12 %Rock = 0

DTHETA

Dry = 0.37 PSIF = 6.60
Normal = 0.19
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
199.170	Desert	80.9	DRY	25	0	0.35	- 0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
46.950	L.D.R.	19.1	NORMAL	50	15	0.30	0.05	Low	0.06
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

246.12 = Total Area Avg. = 29 3% 0.340

PERCENT OF SUBBASIN DRY = 81.0 %
NORMAL = 19.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.34

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.15

IMPERVIOUS AREA: URBAN @ 100 % effective = 3
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 3

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3000	0.385	1.990	0.047	116.0	0.34	0.34	6.60	0.15	3

LOSS PARAMETERS FOR SUBBASIN: 3010

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
33	22.090	21.2	0.23	0
44	3.570	3.4	0.03	0
96	78.680	75.4	0.07	0

TOTAL = 104.340 Acres XKSAT = 0.09 %Rock = 0

DTHETA

Dry = 0.33 PSIF = 7.30
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
44.440	Desert	42.6	DRY	25	0	0.35	0.03	Low	0.06
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
55.080	L.D.R.	52.8	NORMAL	50	15	0.30	0.05	Low	0.06
4.820	M.D.R.	4.6	NORMAL	50	30	0.25	0.05	Low	0.07
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

104.34 = Total Area Avg. = 38 9% 0.320

PERCENT OF SUBBASIN DRY = 43.0 %
NORMAL = 57.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.23

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.12

IMPERVIOUS AREA: URBAN @ 100 % effective = 9
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 9

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3010	0.163	1.360	0.052	88.0	0.32	0.23	7.30	0.12	9

LOSS PARAMETERS FOR SUBBASIN: 3020

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	0.390	0.2	0.62	0
33	162.320	81.8	0.23	0
96	35.620	18.0	0.07	0

TOTAL = 198.330 Acres XKSAT = 0.19 %Rock = 0

DTHETA

Dry = 0.38 PSIF = 5.40
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
100.190	Desert	50.5	DRY	25	0	0.35	- 0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
64.390	L.D.R.	32.5	NORMAL	50	15	0.30	0.05	Low	0.06
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
6.710	M.F.R.	3.4	NORMAL	50	45	0.25	0.05	Low	0.07
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
27.040	Park	13.6	NORMAL	90	0	0.20	0.10	Hi	0.11
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

198.33 = Total Area Avg. = 42 6% 0.310

PERCENT OF SUBBASIN DRY = 50.0 %
NORMAL = 50.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.31

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.26

IMPERVIOUS AREA: URBAN @ 100 % effective = 6
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 6

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3020	0.310	1.630	0.055	107.0	0.31	0.31	5.40	0.26	6

LOSS PARAMETERS FOR SUBBASIN: 3030

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
33	119.420	83.6	0.23	0
96	23.370	16.4	0.07	0

TOTAL = 142.790 Acres XKSAT = 0.19 %Rock = 0

DTHETA

Dry = 0.38 PSIF = 5.40
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
54.430	Desert	38.1	DRY	25	0	0.35	0.03	Low	0.06
	OPEN		DRY	10	0	0.10	- 0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
88.360	L.D.R.	61.9	NORMAL	50	15	0.30	0.05	Low	0.05
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

142.79 = Total Area Avg. = 39 9% 0.320

PERCENT OF SUBBASIN DRY = 38.0 %
NORMAL = 62.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.30

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.25

IMPERVIOUS AREA: URBAN @ 100 % effective = 9
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 9

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3030	0.223	1.160	0.050	91.0	0.32	0.30	5.40	0.25	9

LOSS PARAMETERS FOR SUBBASIN: 3040

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
33	22.710	29.8	0.23	0
44	27.480	36.1	0.03	0
96	26.000	34.1	0.07	0

TOTAL = 76.190 Acres XKSAT = 0.07 %Rock = 0

DTHETA

Dry = 0.30 PSIF = 8.00
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
76.190	Desert	100.	DRY	25	0	0.35	- 0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

76.190 = Total Area Avg. = 25 0% 0.350

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

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.30

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.08

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

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3040	0.119	1.020	0.054	78.0	0.35	0.30	8.00	0.08	0

LOSS PARAMETERS FOR SUBBASIN: 3045

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	15.010	9.6	0.62	0
33	94.360	60.1	0.23	0
96	47.570	30.3	0.07	0

TOTAL = 156.940 Acres XKSAT = 0.18 %Rock = 0

DTHETA

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

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
156.940	Desert	100.	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
	L.D.R.		NORMAL	50	15	0.30	0.05	Low	
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

156.94 = Total Area Avg. = 25 0% 0.350

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

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.38

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.21

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

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3045	0.245	1.310	0.050	103.0	0.35	0.38	5.60	0.21	0

LOSS PARAMETERS FOR SUBBASIN: 3050

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
33	144.430	67.0	0.23	0
98	71.220	33.0	0.37	0

TOTAL = 215.650 Acres XKSAT = 0.27 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.65
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
174.080	Desert	80.7	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
10.440	L.D.R.	4.8	NORMAL	50	15	0.30	0.05	Low	0.07
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
15.520	M.F.R.	7.2	NORMAL	50	45	0.25	0.05	Low	0.06
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
15.610	Park	7.2	NORMAL	90	0	0.20	0.10	Hi	0.12
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

215.65 = Total Area Avg. = 32 4% 0.330

PERCENT OF SUBBASIN DRY = 81.0 %
NORMAL = 19.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.33

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.34

IMPERVIOUS AREA: URBAN @ 100 % effective = 4
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 4

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3050	0.337	1.270	0.051	106.0	0.33	0.33	4.65	0.34	4

LOSS PARAMETERS FOR SUBBASIN: 3060

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
33	74.240	30.1	0.23	0
44	9.230	3.7	0.03	0
96	1.140	0.5	0.07	0
98	162.180	65.7	0.37	0

TOTAL = 246.790 Acres XKSAT = 0.29 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.55
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
201.500	Desert	81.6	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
39.790	L.D.R.	16.1	NORMAL	50	15	0.30	0.05	Low	0.06
	M.D.R.		NORMAL	50	30	0.25	0.05	Low	
5.500	M.F.R.	2.2	NORMAL	50	45	0.25	0.05	Low	0.07
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

246.79 = Total Area Avg. = 29 3% 0.340

PERCENT OF SUBBASIN DRY = 82.0 %
NORMAL = 18.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.33

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.35

IMPERVIOUS AREA: URBAN @ 100 % effective = 3
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 3

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area	Length	Kb	Slope	IA	DTHETA	PSIF	XKSAT	RTIMP

	sq.mi.	mi.		ft/mi	in.			adj.	%
3060	0.386	1.670	0.047	87.0	0.34	0.33	4.55	0.35	3

LOSS PARAMETERS FOR SUBBASIN: 1340

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	4.530	0.5	0.62	0
33	376.000	37.5	0.23	0
61	508.090	50.7	0.15	0
63	34.800	3.5	0.14	25
96	79.560	7.9	0.07	0

TOTAL = 1002.980 Acres XKSAT = 0.17 %Rock = 1

DTHETA

Dry = 0.39 PSIF = 5.70
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn -	Kb Type	Kb
848.280	Desert	84.6	DRY	25	0	0.35	0.03	Low	0.04
	OPEN		DRY	10	0	0.10	0.02	Min	
117.750	V.L.D.R	11.7	NORMAL	30	5	0.30	0.05	Low	0.05
21.690	L.D.R.	2.2	NORMAL	50	15	0.30	0.05	Low	0.06
15.260	M.D.R.	1.5	NORMAL	50	30	0.25	0.05	Low	0.06
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

1002.9 = Total Area Avg. = 26 1% 0.340

PERCENT OF SUBBASIN DRY = 85.0 %
NORMAL = 15.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.37

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.20

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

% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %
1340	1.567	4.000	0.039	115.0	0.34	0.37	5.70	0.20	2

LOSS PARAMETERS FOR SUBBASIN: 3125

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	19.240	6.6	0.62	0
33	224.710	76.7	0.23	0
96	49.120	16.8	0.07	0

TOTAL = 293.070 Acres XKSAT = 0.20 %Rock = 0

DTHETA

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

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
281.020	Desert	95.9	DRY	25	0	0.35	0.03	Low	0.05
	OPEN		DRY	10	0	0.10	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.05	Low	
5.770	L.D.R.	2.0	NORMAL	50	15	0.30	0.05	Low	0.07
6.280	M.D.R.	2.1	NORMAL	50	30	0.25	0.05	Low	0.07
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

293.07 = Total Area Avg. = 26 1% 0.350

PERCENT OF SUBBASIN DRY = 96.0 %
NORMAL = 4.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.37

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.24

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

% EFFECTIVE IMP. = 1

INPUT VALUES FOR MCUHP1 PROGRAM

SUBBASIN	Area sq.mi.	Length mi.	Kb	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %

3125	0.458	1.990	0.046	108.0	0.35	0.37	5.30	0.24	1

DDMS MCUHP1 REPORT

Summary of MCUHP1 Input Parameters

Input File: CC1-24RT.M1I
Output File: CC1-24RT.M1O

SUBBASIN	AREA sq.miles	IA ins.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Tc	R
3085	0.081	0.100	0.350	3.53	0.530	0.0	0.21	0.19
1210	1.274	0.330	0.330	5.30	0.250	9.0	0.64	0.56
1215	0.218	0.300	0.260	5.00	0.330	14.0	0.44	0.48
1220	0.709	0.350	0.350	4.80	0.290	0.0	0.45	0.30
1230	0.628	0.320	0.340	5.20	0.270	5.0	0.63	0.58
1240	0.397	0.310	0.340	5.60	0.230	11.0	0.51	0.47
3045	0.245	0.350	0.380	5.60	0.210	0.0	0.44	0.41
3050	0.337	0.330	0.330	4.65	0.340	4.0	0.45	0.34
3060	0.386	0.340	0.330	4.55	0.350	3.0	0.56	0.51
3000	0.385	0.340	0.340	6.60	0.150	3.0	0.52	0.53
3010	0.163	0.320	0.230	7.30	0.120	9.0	0.47	0.57
3020	0.310	0.310	0.310	5.40	0.260	6.0	0.54	0.54
3030	0.223	0.320	0.300	5.40	0.250	9.0	0.43	0.38
3040	0.119	0.350	0.300	8.00	0.080	0.0	0.42	0.48
1340	1.567	0.340	0.370	5.70	0.200	2.0	0.79	0.67
3125	0.458	0.350	0.370	5.30	0.240	1.0	0.55	0.52
3130	0.211	0.340	0.340	4.45	0.370	2.0	0.53	0.61
3090	0.433	0.340	0.350	5.60	0.220	4.0	0.57	0.52
3080	0.582	0.350	0.190	11.20	0.020	0.0	0.58	0.47
3070	0.288	0.350	0.270	8.80	0.060	0.0	0.72	1.09
3100	0.571	0.350	0.350	7.00	0.120	1.0	0.77	0.75
3120	0.627	0.340	0.270	8.40	0.070	3.0	0.69	0.68
3135	0.052	0.350	0.350	4.60	0.330	0.0	0.32	0.35
3140	0.440	0.330	0.370	5.70	0.200	6.0	0.67	0.72
3150	0.575	0.350	0.360	6.80	0.130	0.0	0.89	0.93
3160	0.414	0.350	0.370	5.40	0.220	1.0	0.52	0.49
3170	0.404	0.330	0.310	4.50	0.380	6.0	0.47	0.32
3180	0.426	0.320	0.260	8.00	0.080	11.0	0.69	0.86
3210	0.103	0.340	0.340	4.15	0.440	2.0	0.25	0.15
3220A	0.241	0.340	0.340	4.20	0.420	2.0	0.41	0.30
3220B	0.393	0.350	0.350	3.88	0.490	0.0	0.46	0.33
1360	0.687	0.340	0.360	5.30	0.240	8.0	0.38	0.28
3190	0.476	0.350	0.370	5.40	0.230	2.0	0.39	0.33
3200	0.655	0.340	0.370	6.20	0.170	3.0	0.53	0.40
3240	0.075	0.320	0.310	4.15	0.480	4.0	0.43	0.49
3250A	0.083	0.310	0.290	4.15	0.450	6.0	0.33	0.33
3250B	0.317	0.350	0.350	4.35	0.380	0.0	0.71	0.78
3230	0.357	0.350	0.370	5.20	0.240	0.0	0.75	0.81
4510	1.531	0.350	0.270	8.80	0.060	0.0	0.90	0.66
4520	0.662	0.350	0.330	7.30	0.110	0.0	1.00	0.87
4530	0.055	0.350	0.350	3.40	0.680	0.0	0.47	0.58

CAVE CREEK WASH FLOODPLAIN STUDY
SUMMARY CULVERT LIST

CULVERT NO.	SUBBASIN NO.	SIZE FT.	NO. OF BARRELS	MAT'L	CONTROL ASSUMED
1	3240	10 x 4	2	RCB	Inlet
2	3210	8 x 3	3	RCB	Inlet
3	3220	6 x 3	1	RCB	Inlet
4	3050	4	4	CMP	Inlet
5	3220	12 x 4	3	RCB	Inlet
6	3250	8 x 4	2	RCB	Inlet
7	3240	8 x 4	2	RCB	Inlet
8	1220	8 x 4	2	RCB	Inlet
9	3125	6 x 3	5	RCB	Inlet
10	1360	6 x 3	1	RCB	Inlet
11	3190	3	1	RCP	Inlet
12	3190	3	2	RCP	Inlet
13	3190	8 x 3	4	RCB	Inlet
14	3125	8 x 3	4	RCB	Inlet
15	1240	3	2	RCP	Inlet
16	1240	10 x 3	1	RCB	Inlet
17	1240	10 x 4	4	RCB	Inlet
18	1240	16 inch	1	RCP	Inlet
19	1240	16 inch	1	RCP	Inlet
20	1220	30 inch	2	CMP	Inlet
21	1340	30 inch	2	RCP	Inlet
22	1340	30 inch	1	RCP	Inlet
23	1220	3	1	RCP	Inlet
24	1210	27 inch	1	CMP	Inlet
25	1230	2	1	CMP	Inlet

7-19-96 ema/ccwculvr.wk4

CULVERT #1

CULVERTS -

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
DUAL 10X4 RCB'S
BASIN 3240
CULVERT #1

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	10.00
Culvert Rise (Height of Opening) (feet).....	4.00
FHWA Chart Number (8,9,10,11,12 or 13).....	8
Scale Number on Chart (Type of Culvert Entrance).....	3
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0170

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
9.0	0.00	0.49	0.45	0.18	0.29	0.18	5.03
26.0	0.00	1.00	0.61	0.34	0.59	0.34	7.59
48.0	0.00	1.51	0.79	0.50	0.89	0.50	9.58
73.0	0.00	2.00	0.98	0.65	1.18	0.65	11.19
133.0	0.00	3.00	1.48	0.95	1.76	0.95	13.94
203.0	0.00	4.00	2.17	1.25	2.34	1.25	16.18

==========

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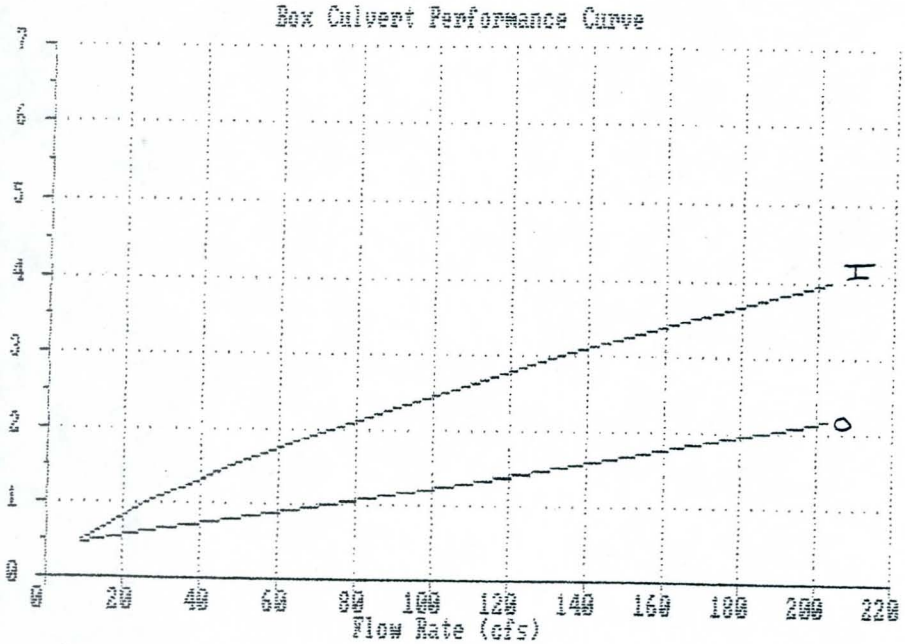
Box Culvert Performance Curve
0
20
40
60
80
100
120
140
160
180
200
220
Flow Rate (cfs)
H
O

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 1
Culvert Type: RCB
Culvert Size: 10x4
Quantity: 2
Sub-basin #: 3240

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Are (acre ft
0.00	0	0	0	0.00	0.00000
0.50	18	0	18	0.00	0.00172
1.00	52	0	52	0.00	0.00689
1.50	96	0	96	0.00	0.01550
2.00	146	0	146	0.00	0.02750
3.00	266	0	266	0.00	0.05170
4.00	406	0	406	0.00	0.08260
5.00	406	0	406	0.00	0.12050
5.50	406	0	406	0.00	0.18029
6.00	406	58	464	0.50	0.18029
6.50	406	165	571	1.00	0.18029
7.00	406	303	709	1.50	0.18029
8.00	406	652	1058	2.50	0.18029

CULVERT #2

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
TRIPLE 8X3 RCB'S
BASIN 3210
CULVERT #2

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	8.00
Culvert Rise (Height of Opening) (feet).....	3.00
FHWA Chart Number (8,9,10,11,12 or 13).....	8
Scale Number on Chart (Type of Culvert Entrance).....	3
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
7.5	0.00	0.50	0.45	0.20	0.30	0.20	4.57
21.0	0.00	1.01	0.62	0.39	0.60	0.39	6.79
38.0	0.00	1.50	0.82	0.56	0.89	0.56	8.47
58.0	0.00	2.00	1.06	0.73	1.18	0.73	9.87
105.5	0.00	3.00	1.74	1.08	1.75	1.08	12.20

==========

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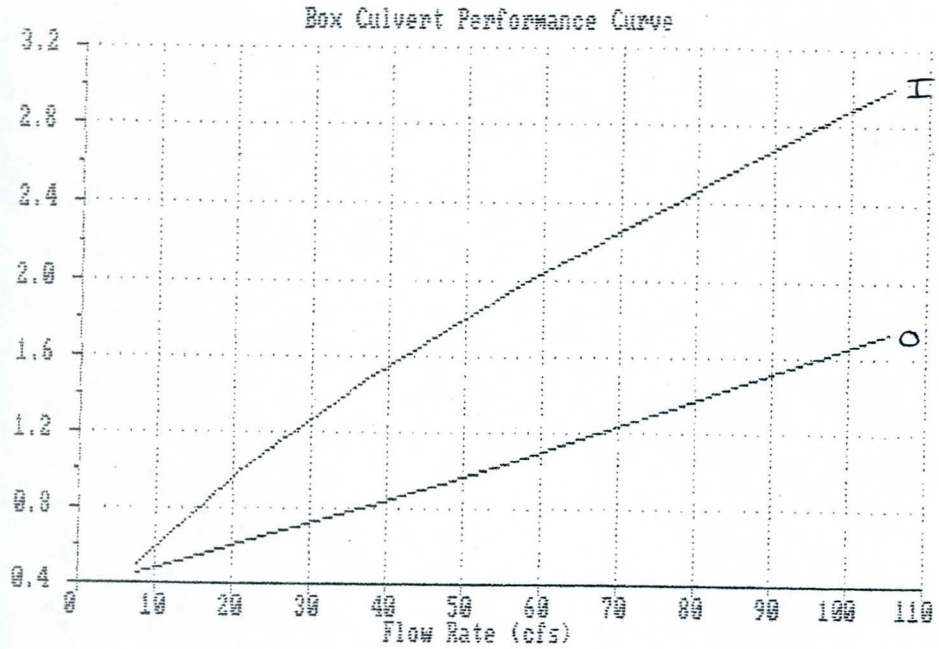
Box Culvert Performance Curve
Headwater (ft)
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0
10
20
30
40
50
60
70
80
90
100
110
Flow Rate (cfs)
H
O

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 2
Culvert Type: RCB
Culvert Size: 8x3
Quantity: 3
Sub-basin #: 3210

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	23	0	23	0.00	0.00541
1.00	63	0	63	0.00	0.01802
1.50	114	0	114	0.00	0.03784
2.00	174	0	174	0.00	0.06488
3.00	317	0	317	0.00	0.11894
4.00	317	0	317	0.00	0.18742
4.50	317	0	317	0.00	0.24328
5.00	317	70	387	0.50	0.30636
5.50	317	198	515	1.00	0.30636
6.00	317	364	680	1.50	0.30636
6.50	317	560	877	2.00	0.30636
7.00	317	783	1099	2.50	0.30636

=

CULVERT #3

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
SINGLE 6X3 RCB
BASIN 3220
CULVERT #3

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	6.00
Culvert Rise (Height of Opening) (feet).....	3.00
FHWA Chart Number (8,9,10,11,12 or 13).....	8
Scale Number on Chart (Type of Culvert Entrance).....	3
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
5.6	0.00	0.50	0.45	0.21	0.30	0.21	4.54
15.5	0.00	1.00	0.62	0.39	0.59	0.39	6.67
28.5	0.00	1.50	0.82	0.57	0.89	0.57	8.32
43.5	0.00	2.00	1.06	0.75	1.18	0.75	9.66
79.0	0.00	3.00	1.75	1.11	1.75	1.11	11.82

==========

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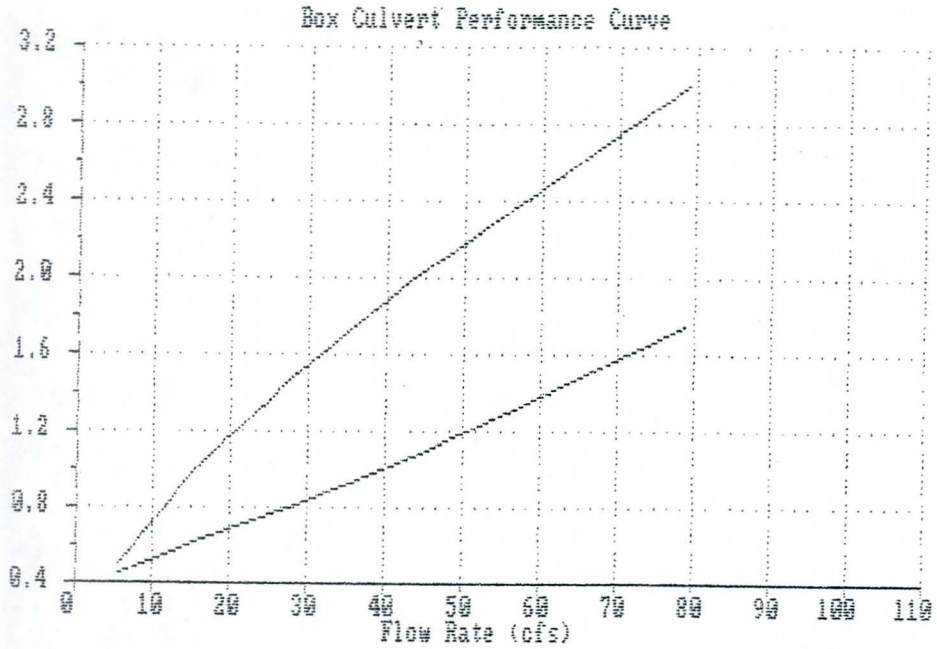
Box Culvert Performance Curve
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0
10
20
30
40
50
60
70
80
90
100
110
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 3
Culvert Type: RCB
Culvert Size: 6x3
Quantity: 1
Sub-basin #: 3220

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Are (acre ft
0.00	0	0	0	0.00	0.00000
0.50	6	0	6	0.00	0.00172
1.00	16	0	16	0.00	0.00689
1.50	29	0	29	0.00	0.01550
2.00	44	0	44	0.00	0.02750
3.00	79	0	79	0.00	0.05170
4.00	79	0	79	0.00	0.07527
4.50	79	0	79	0.00	0.09157
5.00	79	53	132	0.50	0.09157
5.50	79	165	244	1.00	0.09157
6.00	79	303	382	1.50	0.09157
6.50	79	653	732	2.00	0.09157
7.00	79	978	1057	2.50	0.09157
7.50	79	1372	1451	3.00	0.09157

CULVERT #4

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
QUAD 48-INCH CMP'S PROJECTING
BASIN 3050
CULVERT #4

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	4.00
FHWA Chart Number (1,2 or 3).....	2
Scale Number on Chart (Type of Culvert Entrance).....	3
Manning's Roughness Coefficient (n-value).....	0.0240
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0170

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
1.7	0.00	0.50	0.49	0.36	0.37	0.36	3.04
6.3	0.00	1.00	0.68	0.68	0.73	0.68	4.47
13.4	0.00	1.50	0.89	0.98	1.07	0.98	5.60
22.0	0.00	2.00	1.14	1.26	1.38	1.26	6.50
42.4	0.00	3.00	1.83	1.80	1.95	1.80	7.71
64.5	0.00	4.00	2.81	2.31	2.42	2.31	8.56

==========

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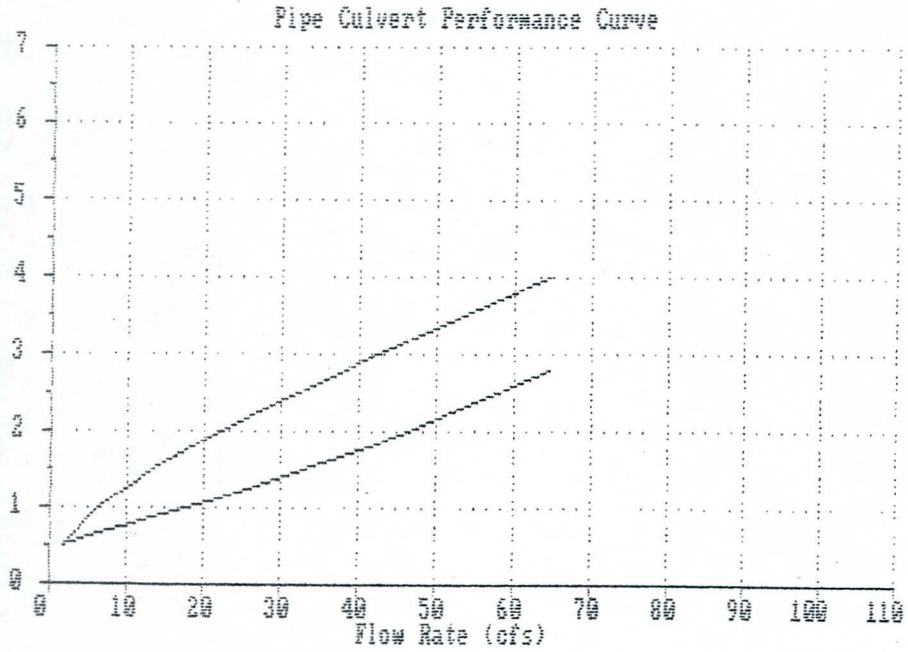
Pipe Culvert Performance Curve
0
10
20
30
40
50
60
70
80
90
100
110
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 4
Culvert Type: CMP
Culvert Size: 48-inch
Quantity: 4
Sub-basin #: 3050

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	7	0	7	0.00	0.01837
1.00	25	0	25	0.00	0.04591
1.50	54	0	54	0.00	0.08264
2.00	88	0	88	0.00	0.14692
3.00	170	0	170	0.00	0.18264
4.00	258	0	258	0.00	0.26897
4.50	258	0	258	0.00	0.31587
5.00	258	0	258	0.00	0.36419
5.50	258	117	375	0.50	0.49587
6.00	258	578	836	1.00	0.49587
6.50	258	1212	1470	1.50	0.49587
7.00	258	2100	2358	2.00	0.49587

CULVERT #5

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26. 1996
TRIPLE 12X4 RCB'S
BASIN 3220
CULVERT #5

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	12.00
Culvert Rise (Height of Opening) (feet).....	4.00
FHWA Chart Number (8,9,10,11,12 or 13).....	11
Scale Number on Chart (Type of Culvert Entrance).....	4
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0170

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
12.0	0.00	0.50	0.46	0.19	0.31	0.19	5.25
34.0	0.00	1.00	0.63	0.36	0.63	0.36	7.88
63.0	0.00	1.50	0.82	0.53	0.95	0.53	9.97
96.5	0.00	2.00	1.04	0.69	1.26	0.69	11.70
177.0	0.00	3.00	1.61	1.01	1.89	1.01	14.64
273.0	0.00	4.00	2.44	1.33	2.52	1.33	17.10

==========

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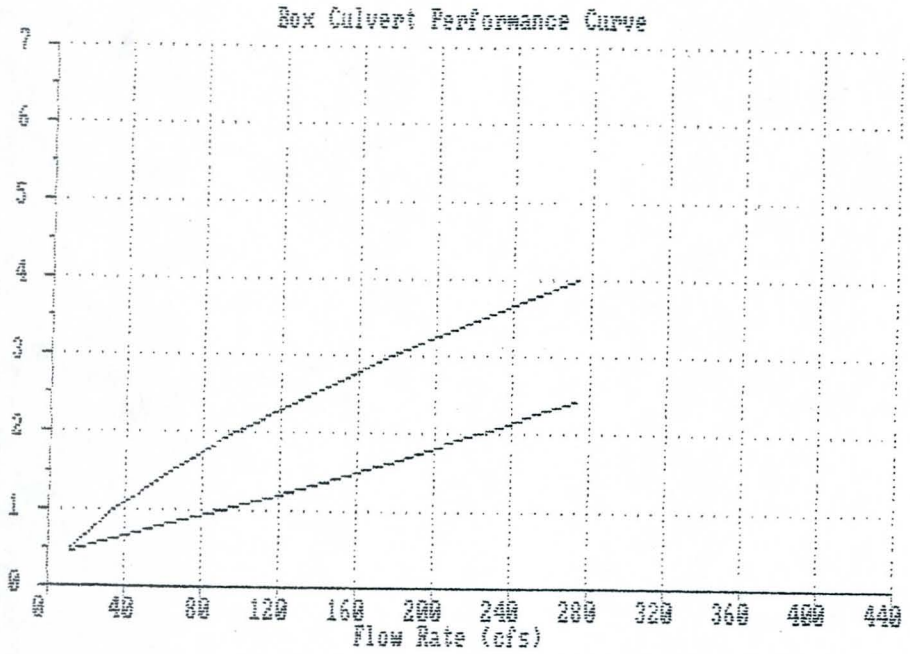
Box Culvert Performance Curve
0
1
2
3
4
5
6
7
0
40
80
120
160
200
240
280
320
360
400
440
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 5
Culvert Type: RCB
Culvert Size: 12x4
Quantity: 3
Sub-basin #: 3220

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Are (acre ft
0.00	0	0	0	0.00	0.00000
0.50	36	0	36	0.00	0.00172
1.00	102	0	102	0.00	0.00689
1.50	189	0	189	0.00	0.01550
2.00	290	0	290	0.00	0.02750
3.00	531	0	531	0.00	0.05170
4.00	819	0	819	0.00	0.08260
4.50	819	0	819	0.00	0.09524
5.00	819	0	819	0.00	0.10579
5.50	819	0	819	0.00	0.14987
6.00	819	58	877	0.50	0.12050
6.50	819	198	1017	1.00	0.12050
7.00	819	394	1213	1.50	0.12050
8.00	819	913	1732	2.50	0.12050

CULVERT #6

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
DUAL 8X4 RCB'S
BASIN 3250
CULVERT #6

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	8.00
Culvert Rise (Height of Opening) (feet).....	4.00
FHWA Chart Number (8,9,10,11,12 or 13).....	8
Scale Number on Chart (Type of Culvert Entrance).....	3
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0170

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
7.5	0.00	0.50	0.45	0.18	0.30	0.18	5.09
21.0	0.00	1.00	0.61	0.35	0.60	0.35	7.56
38.0	0.00	1.50	0.78	0.50	0.89	0.50	9.44
58.5	0.00	2.00	0.98	0.66	1.18	0.66	11.07
106.0	0.00	3.00	1.48	0.97	1.76	0.97	13.68
162.5	0.00	4.00	2.18	1.28	2.34	1.28	15.84

==========

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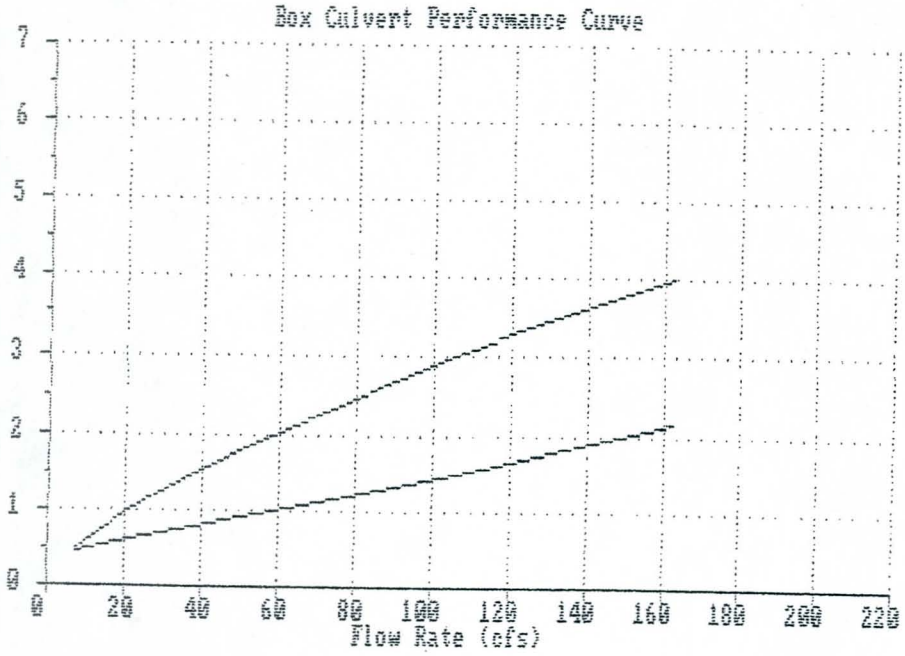
Box Culvert Performance Curve
Headwater (feet)
0
1
2
3
4
5
6
7
0
20
40
60
80
100
120
140
160
180
200
220
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 6
Culvert Type: RCB
Culvert Size: 8x4
Quantity: 2
Sub-basin #: 3250

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Are (acre ft
0.00	0	0	0	0.00	0.00000
0.50	15	0	15	0.00	0.00100
1.00	42	0	42	0.00	0.00689
1.50	76	0	76	0.00	0.01550
2.00	117	0	117	0.00	0.02750
3.00	212	0	212	0.00	0.08260
4.00	325	0	325	0.00	0.12050
4.50	325	0	325	0.00	0.15030
5.00	325	0	325	0.00	0.17589
5.50	325	0	325	0.00	0.19125
6.00	325	158	483	0.50	0.19125
6.50	325	660	985	1.00	0.19125
7.00	325	1364	1689	1.50	0.19125
7.50	325	2147	2472	2.00	0.19125

CULVERT #7

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
DUAL 8X4 RCB'S W/ CHANNEL
BASIN 3240
CULVERT #7

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	8.00
Culvert Rise (Height of Opening) (feet).....	4.00
FHWA Chart Number (8,9,10,11,12 or 13).....	8
Scale Number on Chart (Type of Culvert Entrance).....	3
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0170

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
7.5	0.00	0.50	0.45	0.18	0.30	0.18	5.09
21.0	0.00	1.00	0.61	0.35	0.60	0.35	7.56
38.0	0.00	1.50	0.78	0.50	0.89	0.50	9.44
58.5	0.00	2.00	0.98	0.66	1.18	0.66	11.07
106.0	0.00	3.00	1.48	0.97	1.76	0.97	13.68
162.5	0.00	4.00	2.18	1.28	2.34	1.28	15.84

==========

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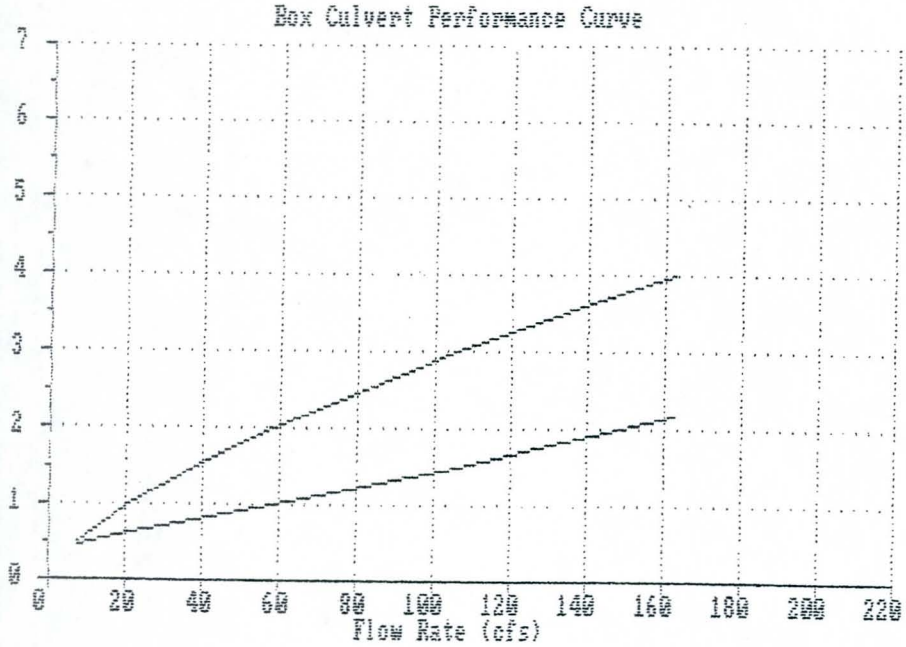
Box Culvert Performance Curve
0
1
2
3
4
5
6
7
0
20
40
60
80
100
120
140
160
180
200
220
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 7
Culvert Type: RCB
Culvert Size: 8x4
Quantity: 2
Sub-basin #: 3240

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Are (acre ft
0.00	0	0	0	0.00	0.00000
0.50	15	0	15	0.00	0.00459
1.00	42	0	42	0.00	0.00918
1.50	76	0	76	0.00	0.02066
2.00	117	0	117	0.00	0.04591
3.00	212	0	212	0.00	0.08260
4.00	325	0	325	0.00	0.09157
4.50	325	0	325	0.00	0.09875
5.00	325	0	325	0.00	0.11862
5.50	325	0	325	0.00	0.13777
6.00	325	105	430	0.50	0.13777
6.50	325	446	771	1.00	0.13777
7.00	325	1061	1386	1.50	0.13777
7.50	325	1867	2192	2.00	0.13777

CULVERT #8

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
DUAL 8X4 RCB'S
BASIN 1220
CULVERT #8

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	8.00
Culvert Rise (Height of Opening) (feet).....	4.00
FHWA Chart Number (8,9,10,11,12 or 13).....	8
Scale Number on Chart (Type of Culvert Entrance).....	3
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0170

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
7.5	0.00	0.50	0.45	0.18	0.30	0.18	5.09
21.0	0.00	1.00	0.61	0.35	0.60	0.35	7.56
38.0	0.00	1.50	0.78	0.50	0.89	0.50	9.44
58.5	0.00	2.00	0.98	0.66	1.18	0.66	11.07
106.0	0.00	3.00	1.48	0.97	1.76	0.97	13.68
162.5	0.00	4.00	2.18	1.28	2.34	1.28	15.84

==========

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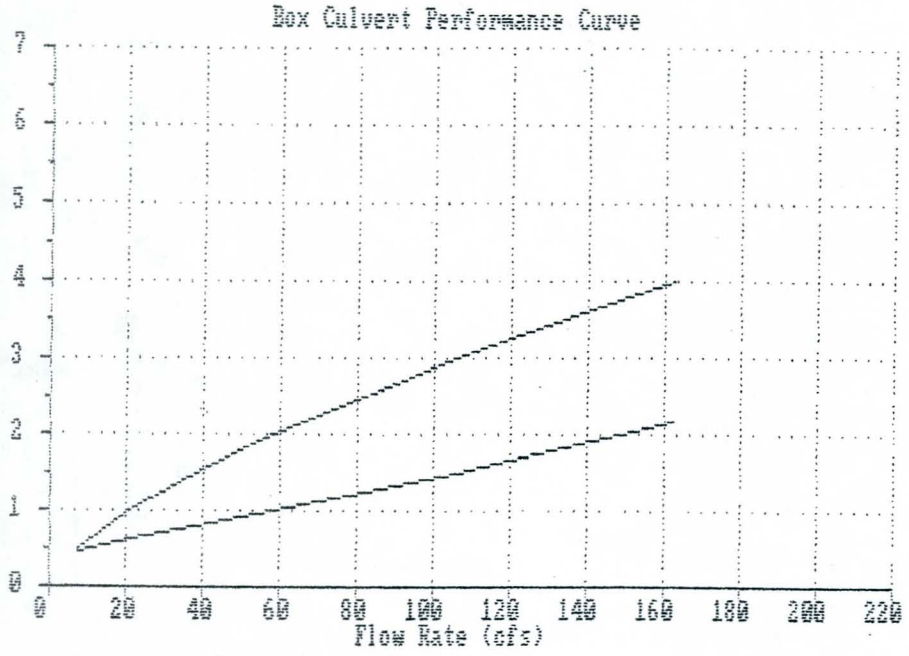
Box Culvert Performance Curve
0
20
40
60
80
100
120
140
160
180
200
220
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 8
Culvert Type: RCB
Culvert Size: 8x4
Quantity: 2
Sub-basin #: 1220

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Are (acre ft
0.00	0	0	0	0.00	0.00000
0.50	15	0	15	0.00	0.02296
1.00	42	0	42	0.00	0.14348
1.50	76	0	76	0.00	0.21522
2.00	117	0	117	0.00	0.38976
3.00	212	0	212	0.00	0.40054
4.00	325	0	325	0.00	0.43716
4.50	325	0	325	0.00	0.45769
5.00	325	0	325	0.00	0.51897
5.50	325	0	325	0.00	0.52879
6.00	325	58	383	0.50	0.68871
6.50	325	330	655	1.00	0.68871
7.00	325	909	1234	1.50	0.68871
7.50	325	1633	1958	2.00	0.68871

CULVERT #9

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
FIVE 5X3 RCB'S @45 SKEW
BASIN 3125
CULVERT #9

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	6.00
Culvert Rise (Height of Opening) (feet).....	3.00
FHWA Chart Number (8,9,10,11,12 or 13).....	8
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
6.3	0.00	0.50	0.47	0.22	0.32	0.22	4.75
17.3	0.00	1.00	0.65	0.42	0.64	0.42	6.94
31.5	0.00	1.50	0.87	0.61	0.95	0.61	8.62
47.8	0.00	2.00	1.14	0.80	1.25	0.80	9.98
86.0	0.00	3.00	1.91	1.18	1.85	1.18	12.15

==========

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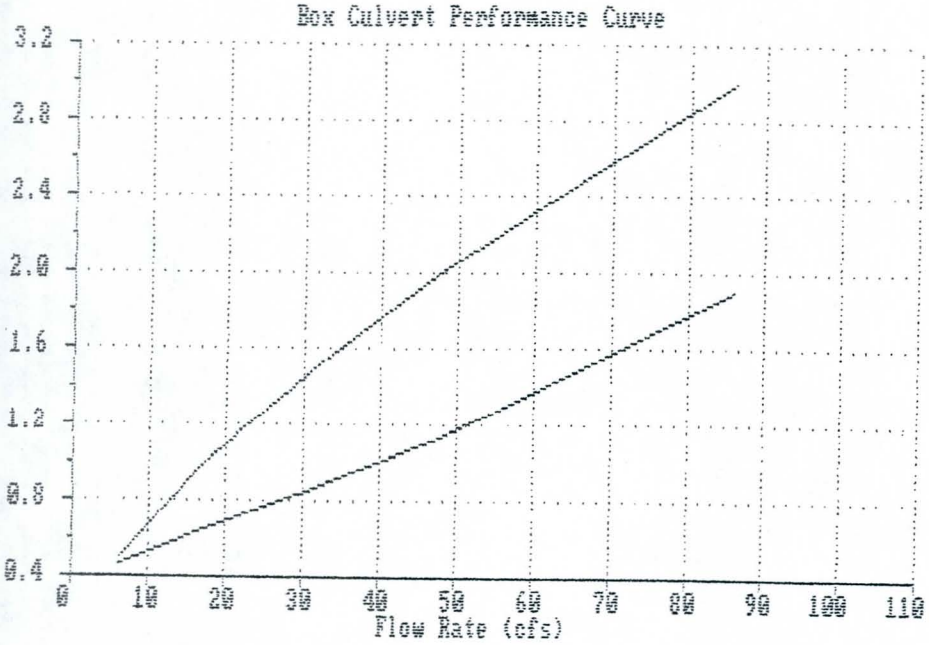
Box Culvert Performance Curve
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0
10
20
30
40
50
60
70
80
90
100
110
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 9
Culvert Type: RCB
Culvert Size: 6x3
Quantity: 5
Sub-basin #: 3125

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	32	0	32	0.00	0.02296
1.00	87	0	87	0.00	0.14348
1.50	158	0	158	0.00	0.21522
2.00	239	0	239	0.00	0.38976
3.00	430	0	430	0.00	0.42059
4.00	430	0	430	0.00	0.49751
4.50	430	0	430	0.00	0.59005
5.00	430	58	488	0.50	0.68871
5.50	430	248	678	1.00	0.68871
6.00	430	606	1036	1.50	0.68871
6.50	430	1260	1690	2.00	0.68871
7.00	430	2283	2713	2.50	0.68871
7.50	430	3858	4288	3.00	0.68871

CULVERT #10

LOOKING WEST

LOOKING SOUTH

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
SINGLE 6X3 RCB W/DROP STRUCTURE
BASIN 1360
CULVERT #10

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	6.00
Culvert Rise (Height of Opening) (feet).....	3.00
FHWA Chart Number (8,9,10,11,12 or 13).....	12
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
6.0	0.00	0.50	0.46	0.21	0.31	0.21	4.66
17.2	0.00	1.00	0.64	0.41	0.63	0.41	6.93
31.5	0.00	1.50	0.87	0.61	0.95	0.61	8.62
48.5	0.00	2.00	1.15	0.81	1.27	0.81	10.03
89.0	0.00	3.00	1.98	1.21	1.90	1.21	12.29

==========

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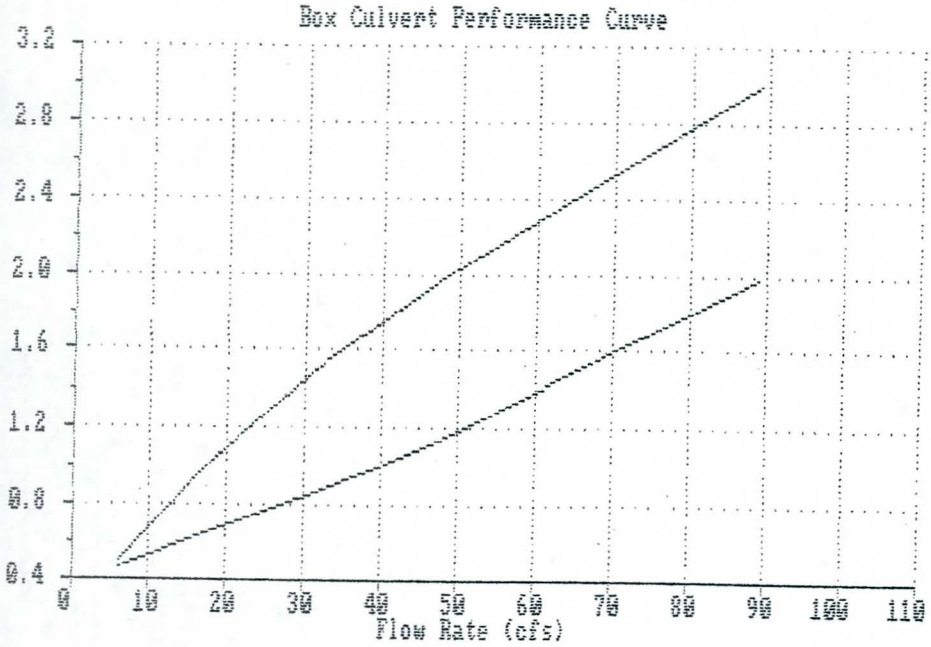
Box Culvert Performance Curve
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0
10
20
30
40
50
60
70
80
90
100
110
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 10
Culvert Type: RCB
Culvert Size: 6x3
Quantity: 1
Sub-basin #: 1360

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Are (acre ft
0.00	0	0	0	0.00	0.00000
0.50	6	0	6	0.00	0.00172
1.00	17	0	17	0.00	0.00689
1.50	32	0	32	0.00	0.01550
2.00	49	0	49	0.00	0.02750
3.00	89	0	89	0.00	0.03189
4.00	89	0	89	0.00	0.03906
4.50	89	0	89	0.00	0.05170
5.00	89	53	142	0.50	0.05170
5.50	89	165	254	1.00	0.05170
6.00	89	303	392	1.50	0.05170
6.50	89	653	742	2.00	0.05170
7.00	89	978	1067	2.50	0.05170
7.50	89	1372	1461	3.00	0.05170

CULVERT #11

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
SINGLE 36-INCH RCP W/DROP STRUCTURE
BASIN 3190
CULVERT #11

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	3.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
1.5	0.00	0.51	0.49	0.30	0.38	0.30	4.13
5.5	0.00	1.00	0.69	0.56	0.74	0.56	6.08
11.5	0.00	1.50	0.93	0.80	1.08	0.80	7.54
18.9	0.00	2.00	1.24	1.04	1.39	1.04	8.67
35.1	0.00	3.00	2.11	1.47	1.93	1.47	10.18

==========

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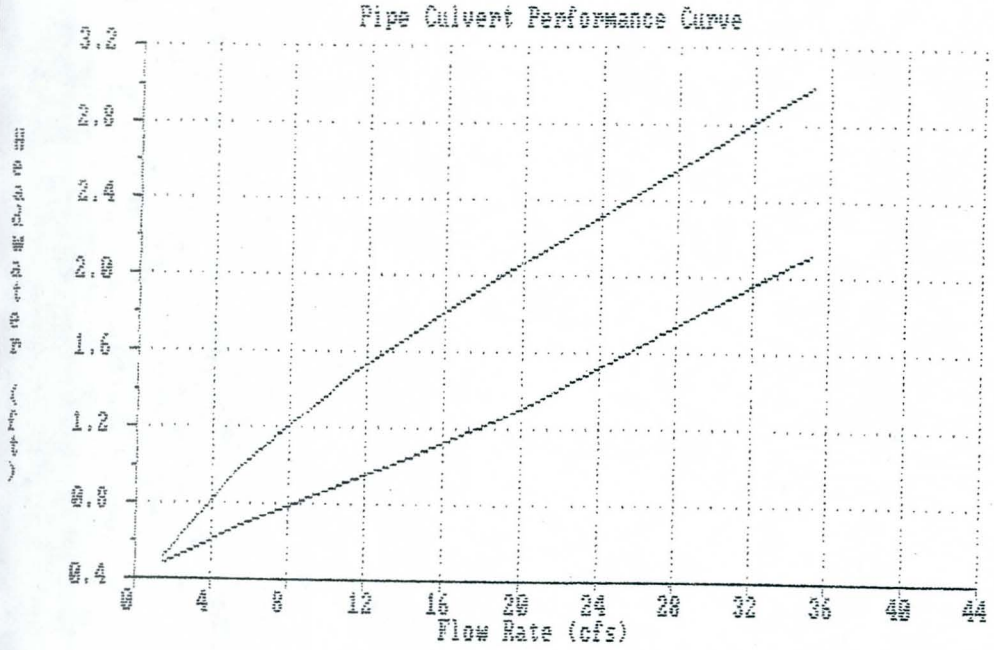
Pipe Culvert Performance Curve
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0
4
8
12
16
20
24
28
32
36
40
44
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 11
Culvert Type: RCP
Culvert Size: 36 inch
Quantity: 1
Sub-basin #: 3190

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	2	0	2	0.00	0.00046
1.00	6	0	6	0.00	0.00115
1.50	12	0	12	0.00	0.00861
2.00	19	0	19	0.00	0.09587
3.00	35	0	35	0.00	0.13047
4.00	35	0	35	0.00	0.19564
4.50	35	0	35	0.00	0.22957
5.00	35	53	88	0.50	0.22957
5.50	35	165	200	1.00	0.22957
6.00	35	394	429	1.50	0.22957
6.50	35	700	735	2.00	0.22957
7.00	35	1304	1340	2.50	0.22957
7.50	35	2143	2179	3.00	0.22957

CULVERT #12

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
DUAL 36-INCH RCP'S W/DROP STRUCTURE
BASIN 3190
CULVERT #12

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	3.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
1.5	0.00	0.51	0.49	0.30	0.38	0.30	4.13
5.5	0.00	1.00	0.69	0.56	0.74	0.56	6.08
11.5	0.00	1.50	0.93	0.80	1.08	0.80	7.54
18.9	0.00	2.00	1.24	1.04	1.39	1.04	8.67
35.1	0.00	3.00	2.11	1.47	1.93	1.47	10.18

==========

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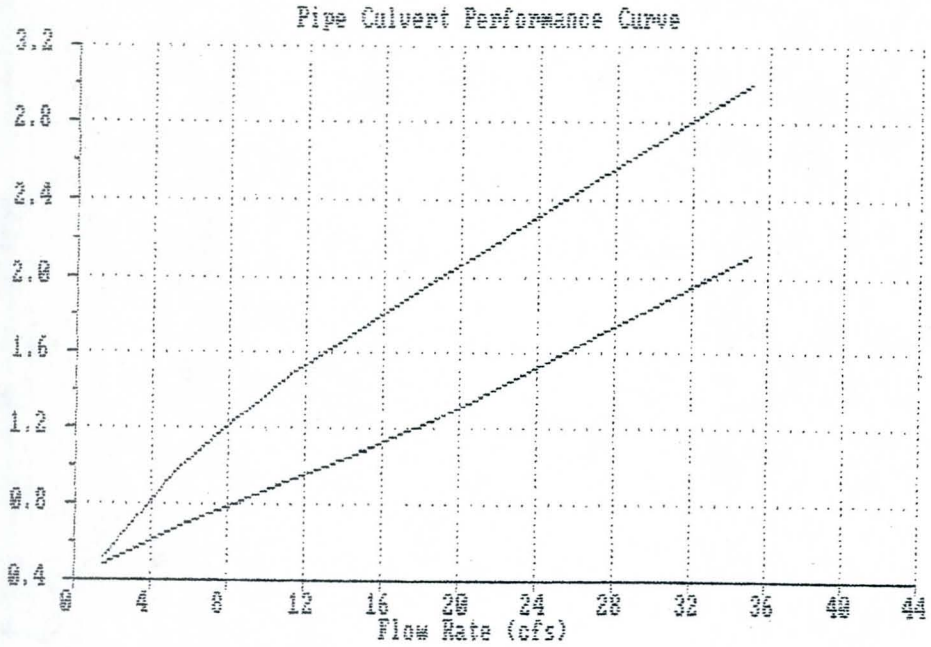
Pipe Culvert Performance Curve
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0
4
8
12
16
20
24
28
32
36
40
44
Flow Rate (cfs)

CAVE CREEK HYDROLOGY – CULVERT ANALYSIS

Culvert # 12
Culvert Type: RCP
Culvert Size: 36 inch
Quantity: 2
Sub-basin #: 3190

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	3	0	3	0.00	0.00075
1.00	11	0	11	0.00	0.00149
1.50	23	0	23	0.00	0.00238
2.00	38	0	38	0.00	0.05165
3.00	70	0	70	0.00	0.06425
4.00	70	0	70	0.00	0.07106
4.50	70	0	70	0.00	0.07985
5.00	70	53	123	0.50	0.08609
5.50	70	165	235	1.00	0.08609
6.00	70	394	464	1.50	0.08609
6.50	70	700	770	2.00	0.08609
7.00	70	1304	1375	2.50	0.08609
7.50	70	2143	2214	3.00	0.08609

CULVERT #13

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
QUAD 8X3 RCB'S W/DROP STRUCTURE
BASIN 3190
CULVERT #13

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	8.00
Culvert Rise (Height of Opening) (feet).....	3.00
FHWA Chart Number (8,9,10,11,12 or 13).....	11
Scale Number on Chart (Type of Culvert Entrance).....	2
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
7.2	0.00	0.50	0.45	0.20	0.29	0.20	4.50
20.6	0.00	1.00	0.62	0.38	0.59	0.38	6.74
37.6	0.00	1.50	0.81	0.56	0.88	0.56	8.44
58.0	0.00	2.00	1.06	0.73	1.18	0.73	9.87
107.0	0.00	3.00	1.76	1.09	1.77	1.09	12.25
159.6	0.00	4.00	2.74	1.42	2.31	1.42	14.02

==========

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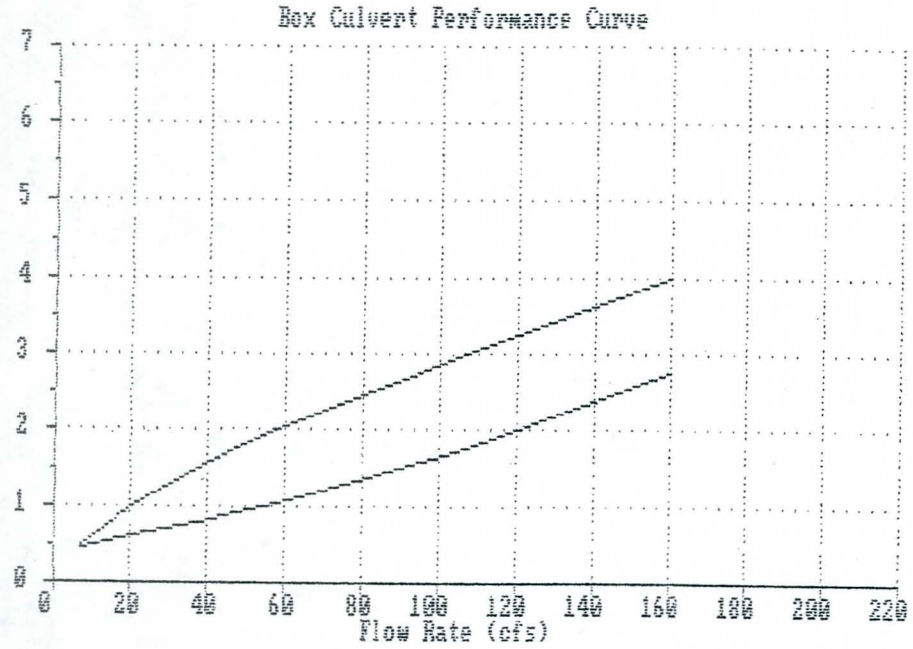
Box Culvert Performance Curve
0
1
2
3
4
5
6
7
0
20
40
60
80
100
120
140
160
180
200
220
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert #13
Culvert Type: RCB
Culvert Size: 8x3
Quantity: 4
Sub-basin #: 3190

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	29	0	29	0.00	0.00016
1.00	82	0	82	0.00	0.00054
1.50	150	0	150	0.00	0.00095
2.00	232	0	232	0.00	0.00541
3.00	428	0	428	0.00	0.02189
4.00	638	0	638	0.00	0.02901
4.50	638	0	638	0.00	0.03565
5.00	638	58	697	0.50	0.03565
5.50	638	248	886	1.00	0.03565
6.00	638	606	1245	1.50	0.03565
6.50	638	1400	2038	2.00	0.03565
7.00	638	2609	3247	2.50	0.03565
7.50	638	3858	4497	3.00	0.03565

CULVERT #14

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
QUAD 8X3 RCB'S W/DROP STRUCTURE
BASIN 3125
CULVERT #14

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	8.00
Culvert Rise (Height of Opening) (feet).....	3.00
FHWA Chart Number (8,9,10,11,12 or 13).....	11
Scale Number on Chart (Type of Culvert Entrance).....	2
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot.....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
7.2	0.00	0.50	0.45	0.20	0.29	0.20	4.50
20.6	0.00	1.00	0.62	0.38	0.59	0.38	6.74
37.6	0.00	1.50	0.81	0.56	0.88	0.56	8.44
58.0	0.00	2.00	1.06	0.73	1.18	0.73	9.87
107.0	0.00	3.00	1.76	1.09	1.77	1.09	12.25
159.6	0.00	4.00	2.74	1.42	2.31	1.42	14.02

==========

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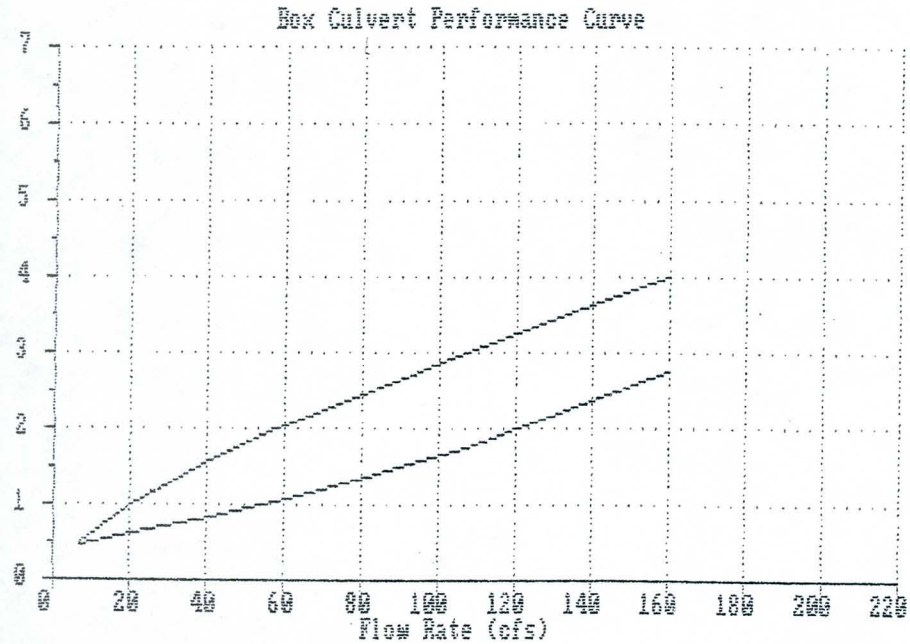
Box Culvert Performance Curve
0
1
2
3
4
5
6
7
0
20
40
60
80
100
120
140
160
180
200
220
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 14
Culvert Type: RCB
Culvert Size: 8x3
Quantity: 4
Sub-basin #: 3125

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	29	0	29	0.00	0.00068
1.00	82	0	82	0.00	0.00216
1.50	150	0	150	0.00	0.00332
2.00	232	0	232	0.00	0.01468
3.00	428	0	428	0.00	0.02541
4.00	638	0	638	0.00	0.09057
4.50	638	0	638	0.00	0.18596
5.00	638	93	732	0.50	0.18596
5.50	638	396	1034	1.00	0.18596
6.00	638	818	1457	1.50	0.18596
6.50	638	1400	2038	2.00	0.18596
7.00	638	2609	3247	2.50	0.18596
7.50	638	4287	4925	3.00	0.18596

CULVERT #15

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
DUAL 36-INCH RCP'S W/DROP STRUCTURE
BASIN 1240
CULVERT #15

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	3.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
1.4	0.00	0.49	0.49	0.29	0.37	0.29	4.04
5.5	0.00	1.00	0.69	0.56	0.74	0.56	6.08
11.5	0.00	1.50	0.93	0.80	1.08	0.80	7.54
18.9	0.00	2.00	1.24	1.04	1.39	1.04	8.67
35.1	0.00	3.00	2.11	1.47	1.93	1.47	10.18

==========

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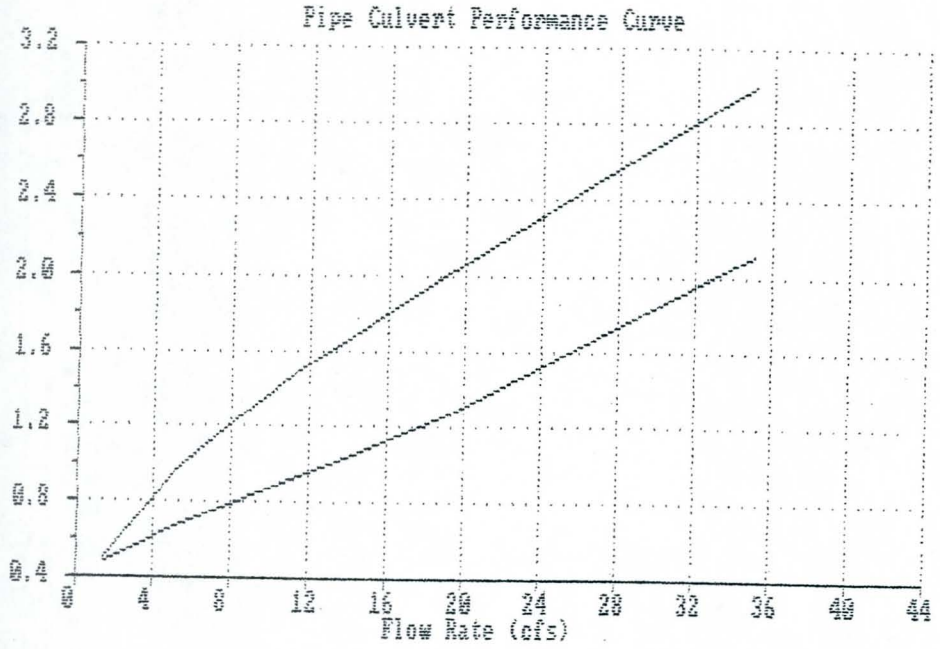
Pipe Culvert Performance Curve
Headwater (ft)
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0
4
8
12
16
20
24
28
32
36
40
44
Flow Rate (cfs)

CAVE CREEK HYDROLOGY – CULVERT ANALYSIS

Culvert # 15
Culvert Type: RCP
Culvert Size: 36 inch
Quantity: 2
Sub-basin #: 1240

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	3	0	3	0.00	0.00075
1.00	11	0	11	0.00	0.00149
1.50	23	0	23	0.00	0.00238
2.00	38	0	38	0.00	0.05165
3.00	70	0	70	0.00	0.05926
4.00	70	0	70	0.00	0.07208
4.50	70	0	70	0.00	0.08609
5.00	70	53	123	0.50	0.08609
5.50	70	165	235	1.00	0.08609
6.00	70	394	464	1.50	0.08609
6.50	70	700	770	2.00	0.08609
7.00	70	1304	1375	2.50	0.08609
7.50	70	2143	2214	3.00	0.08609

CULVERT #16

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
SINGLE 10X3 RCB W/DROP STRUCTURE
BASIN 1240
CULVERT #16

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	10.00
Culvert Rise (Height of Opening) (feet).....	3.00
FHWA Chart Number (8,9,10,11,12 or 13).....	13
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
10.0	0.00	0.50	0.46	0.21	0.31	0.21	4.71
28.5	0.00	1.00	0.64	0.40	0.63	0.40	7.05
52.5	0.00	1.50	0.86	0.59	0.95	0.59	8.88
81.0	0.00	2.00	1.14	0.78	1.27	0.78	10.43
148.0	0.00	3.00	1.94	1.14	1.89	1.14	12.94

==========

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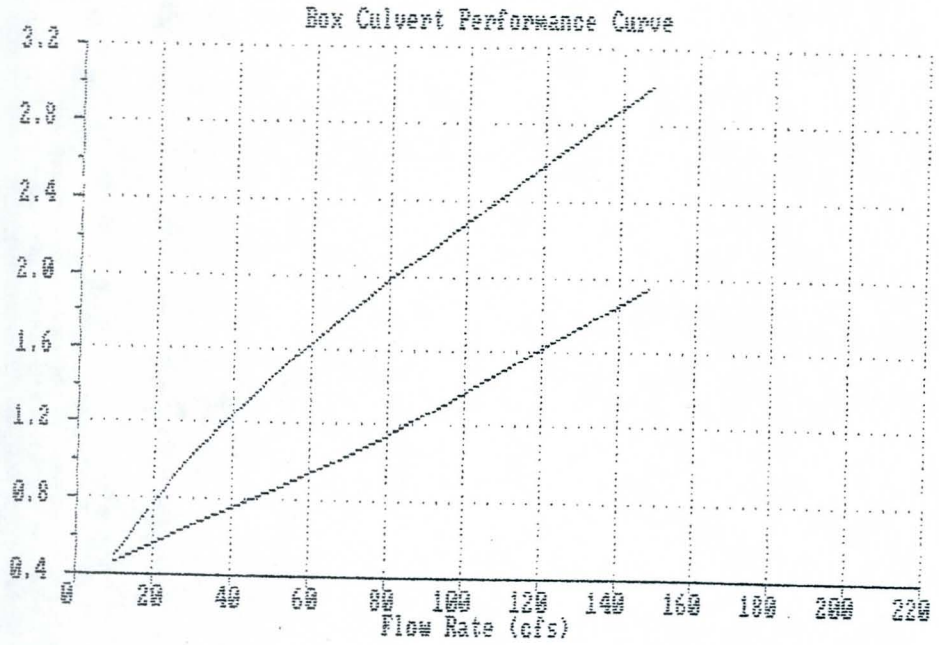
Box Culvert Performance Curve
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0
20
40
60
80
100
120
140
160
180
200
220
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 16
Culvert Type: RCB
Culvert Size: 10x3
Quantity: 1
Sub-basin #: 1240

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	10	0	10	0.00	0.00018
1.00	29	0	29	0.00	0.00057
1.50	53	0	53	0.00	0.00087
2.00	81	0	81	0.00	0.00386
3.00	148	0	148	0.00	0.00599
4.00	148	0	148	0.00	0.03126
4.50	148	0	148	0.00	0.04894
5.00	148	53	201	0.50	0.04894
5.50	148	165	313	1.00	0.04894
6.00	148	394	542	1.50	0.04894
6.50	148	700	848	2.00	0.04894
7.00	148	1304	1452	2.50	0.04894
7.50	148	2143	2291	3.00	0.04894
8.00	148	3241	3389	3.50	0.04894
8.50	148	4620	4768	4.00	0.04894
9.00	148	6300	6448	4.50	0.04894
9.50	148	8301	8449	5.00	0.04894
10.00	148	10641	10789	5.50	0.04894

CULVERT #17

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
QUAD 10X4 RCB'S
BASIN 1240
CULVERT #17

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Span (Width of Opening) (feet).....	10.00
Culvert Rise (Height of Opening) (feet).....	4.00
FHWA Chart Number (8,9,10,11,12 or 13).....	13
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0170

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
10.0	0.00	0.50	0.46	0.19	0.31	0.19	5.24
28.5	0.00	1.00	0.63	0.36	0.63	0.36	7.86
52.5	0.00	1.50	0.82	0.53	0.95	0.53	9.90
81.0	0.00	2.00	1.05	0.70	1.27	0.70	11.63
148.0	0.00	3.00	1.62	1.02	1.89	1.02	14.48
228.0	0.00	4.00	2.45	1.35	2.53	1.35	16.84

==========

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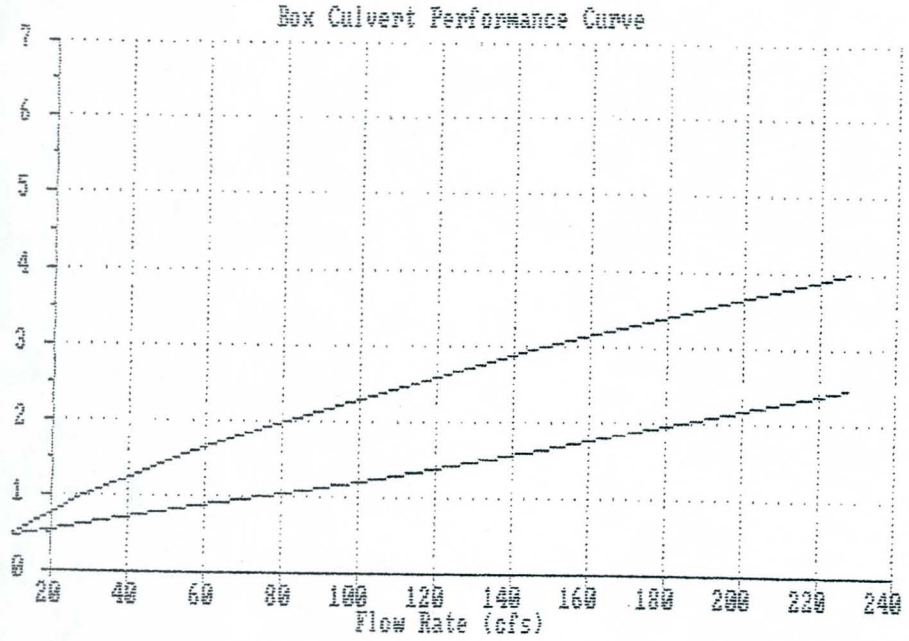
Box Culvert Performance Curve
0
1
2
3
4
5
6
7
20
40
60
80
100
120
140
160
180
200
220
240
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 17
Culvert Type: RCB
Culvert Size: 10x4
Quantity: 4
Sub-basin #: 1240

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	40	0	40	0.00	0.00018
1.00	114	0	114	0.00	0.00057
1.50	210	0	210	0.00	0.00087
2.00	324	0	324	0.00	0.00386
3.00	592	0	592	0.00	0.04894
4.00	912	0	912	0.00	0.06502
4.50	912	0	912	0.00	0.07691
5.00	912	0	912	0.00	0.08753
5.50	912	0	912	0.00	0.09245
6.00	912	88	1000	0.50	0.09245
6.50	912	396	1308	1.00	0.09245
7.00	912	909	1821	1.50	0.09245
7.50	912	1633	2545	2.00	0.09245
8.00	912	2609	3521	2.50	0.09245
8.50	912	3858	4770	3.00	0.09245
9.00	912	5402	6314	3.50	0.09245
9.50	912	6600	7512	4.00	0.09245
10.00	912	7875	8787	4.50	0.09245

CULVERT #18

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
SINGLE 16-INCH RCP
BASIN 1240
CULVERT #18

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	1.33
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0040

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
0.9	0.00	0.50	0.47	0.39	0.37	0.39	2.66
3.0	0.00	1.00	0.87	0.76	0.68	0.76	3.66
4.6	0.00	1.33	1.31	1.06	0.85	1.06	3.88

==========

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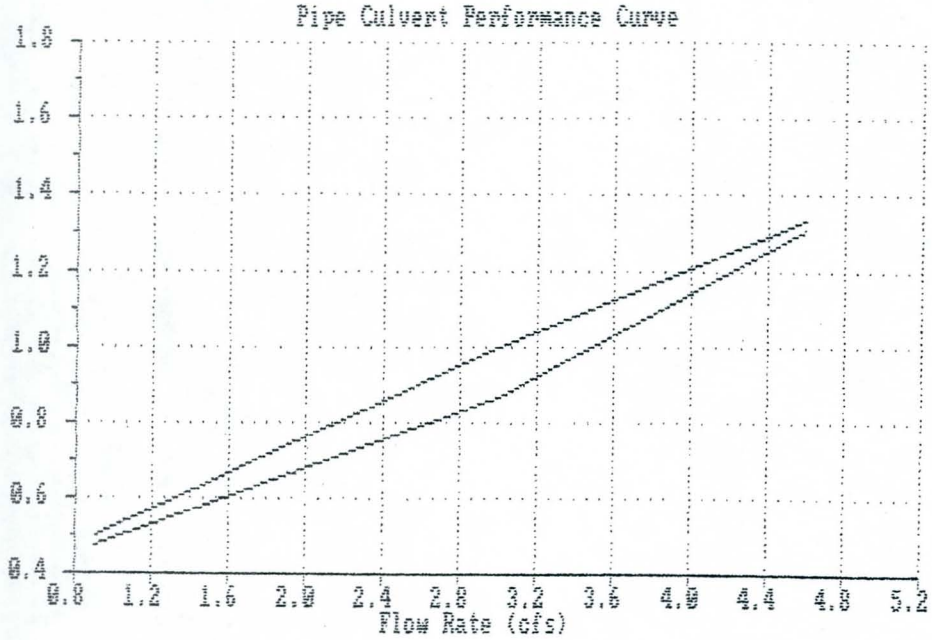
Pipe Culvert Performance Curve
Headwater (ft)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
4.0
4.4
4.8
5.2
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 18
Culvert Type: RCP
Culvert Size: 16-inch
Quantity: 1
Sub-basin #: 1240

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	1	0	1	0.00	0.00148
1.00	3	0	3	0.00	0.00459
1.33	5	0	5	0.00	0.00982
1.50	5	0	5	0.00	0.01897
2.00	5	0	5	0.00	0.02005
2.50	5	0	5	0.00	0.02296
3.00	5	58	63	0.50	0.02296
4.00	5	394	399	1.50	0.02296
5.00	5	978	983	2.50	0.02296
6.00	5	2161	2165	3.50	0.02296

CULVERT #19

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
SINGLE 16-INCH RCP
BASIN 1240
CULVERT #19

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	1.33
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0040

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
0.9	0.00	0.50	0.47	0.39	0.37	0.39	2.66
3.0	0.00	1.00	0.87	0.76	0.68	0.76	3.66
4.6	0.00	1.33	1.31	1.06	0.85	1.06	3.88

==========

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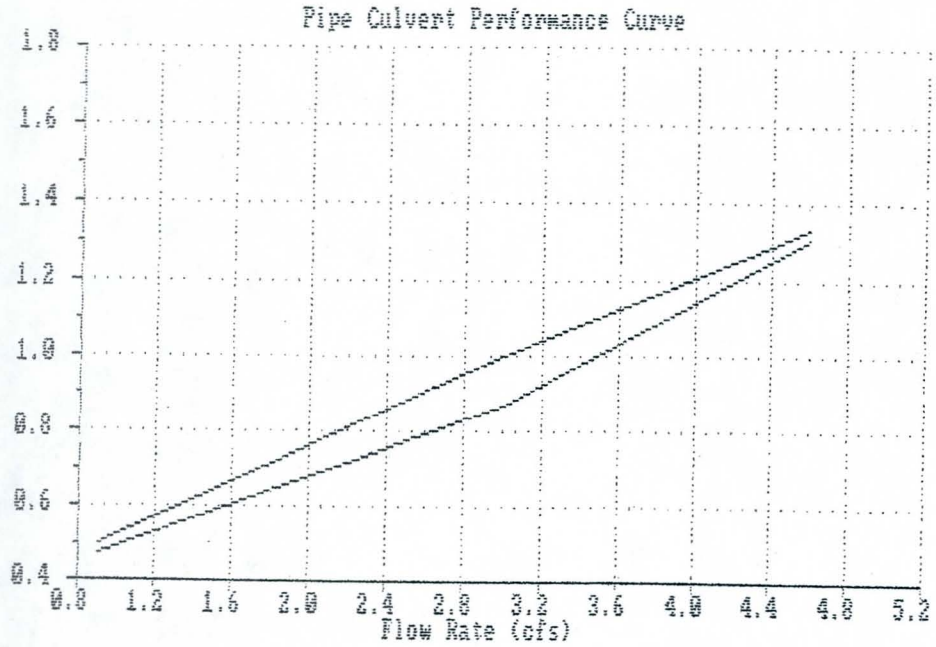
Pipe Culvert Performance Curve
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.0
1.2
1.6
2.0
2.4
2.8
3.2
3.6
4.0
4.4
4.8
5.2
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 19
Culvert Type: RCP
Culvert Size: 16-inch
Quantity: 1
Sub-basin #: 1240

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	1	0	1	0.00	0.00148
1.00	3	0	3	0.00	0.00459
1.33	5	0	5	0.00	0.00982
1.50	5	0	5	0.00	0.01897
2.00	5	0	5	0.00	0.02005
2.50	5	0	5	0.00	0.02296
3.00	5	58	63	0.50	0.02296
4.00	5	394	399	1.50	0.02296
5.00	5	978	983	2.50	0.02296
6.00	5	2161	2165	3.50	0.02296

CULVERT #20

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
DUAL 30-INCH CMP
BASIN 1220
CULVERT #20

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.50
FHWA Chart Number (1,2 or 3).....	2
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0240
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
1.3	0.00	0.50	0.24	0.39	0.37	0.39	2.63
4.9	0.00	1.00	0.49	0.76	0.73	0.76	3.88
10.1	0.00	1.50	0.89	1.12	1.06	1.12	4.75
16.3	0.00	2.00	1.52	1.50	1.36	1.50	5.31
22.8	0.00	2.50	2.41	1.92	1.62	1.92	5.63

==========

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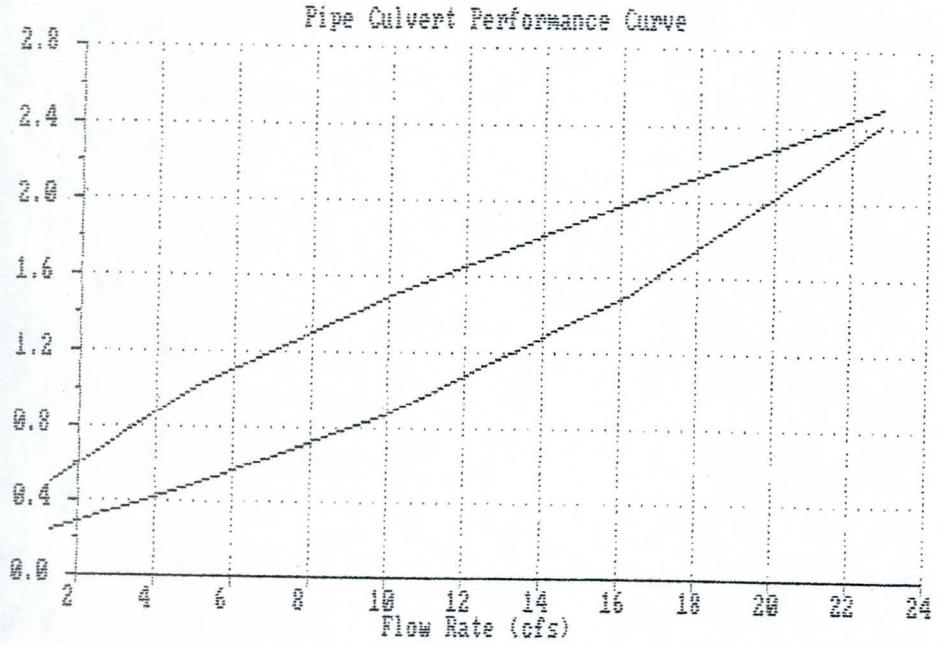
Pipe Culvert Performance Curve
Headwater (feet)
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
2
4
6
8
10
12
14
16
18
20
22
24
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 20
Culvert Type: RCP
Culvert Size: 30-inch
Quantity: 2
Sub-basin #: 1220

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	3	0	3	0.00	0.00172
1.00	10	0	10	0.00	0.00574
1.25	20	0	20	0.00	0.04649
1.50	33	0	33	0.00	0.00103
2.00	46	0	46	0.00	0.02296
2.25	46	0	46	0.00	0.03099
2.50	46	0	46	0.00	0.04279
3.00	46	0	46	0.00	0.05136
3.50	46	0	46	0.00	0.05988
4.00	46	0	46	0.00	0.06026
4.50	46	88	133	0.50	0.06026
5.00	46	330	376	1.00	0.06026
6.00	46	1167	1212	2.00	0.06026

CULVERT #21

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
DUAL 30-INCH CMP
BASIN 1340
CULVERT #21

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0100

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
1.3	0.00	0.50	0.44	0.30	0.37	0.30	3.82
4.9	0.00	1.00	0.65	0.58	0.73	0.58	5.64
10.0	0.00	1.50	0.93	0.84	1.06	0.84	6.90
16.0	0.00	2.00	1.32	1.09	1.35	1.09	7.79
22.2	0.00	2.50	1.82	1.31	1.60	1.31	8.53

==========

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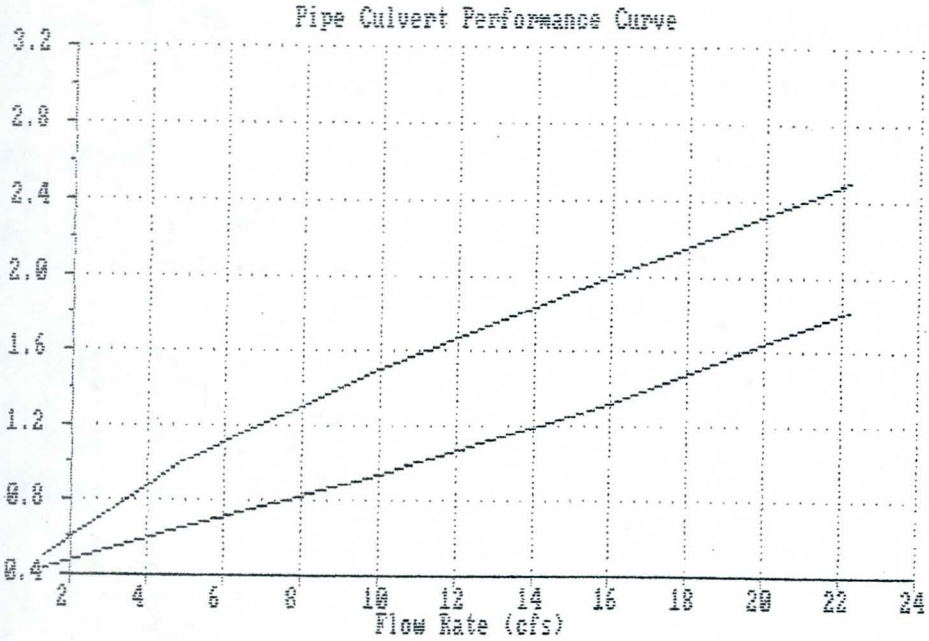
Pipe Culvert Performance Curve
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
2
4
6
8
10
12
14
16
18
20
22
24
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 21
Culvert Type: RCP
Culvert Size: 30-inch
Quantity: 2
Sub-basin #: 1340

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	3	0	3	0.00	0.00172
1.00	10	0	10	0.00	0.00574
1.50	20	0	20	0.00	0.00103
2.00	32	0	32	0.00	0.02296
2.50	44	0	44	0.00	0.03099
3.00	44	0	44	0.00	0.04988
3.50	44	0	44	0.00	0.05421
4.00	44	0	44	0.00	0.06026
5.00	44	76	120	0.50	0.06026
5.50	44	248	292	1.00	0.06026
6.00	44	606	651	1.50	0.06026
7.00	44	1631	1675	2.50	0.06026

CULVERT #22

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
SINGLE 30-INCH RCP
BASIN 1340
CULVERT #22

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0100

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
1.3	0.00	0.50	0.44	0.30	0.37	0.30	3.82
4.9	0.00	1.00	0.65	0.58	0.73	0.58	5.64
10.0	0.00	1.50	0.93	0.84	1.06	0.84	6.90
16.0	0.00	2.00	1.32	1.09	1.35	1.09	7.79
22.2	0.00	2.50	1.82	1.31	1.60	1.31	8.53

==========

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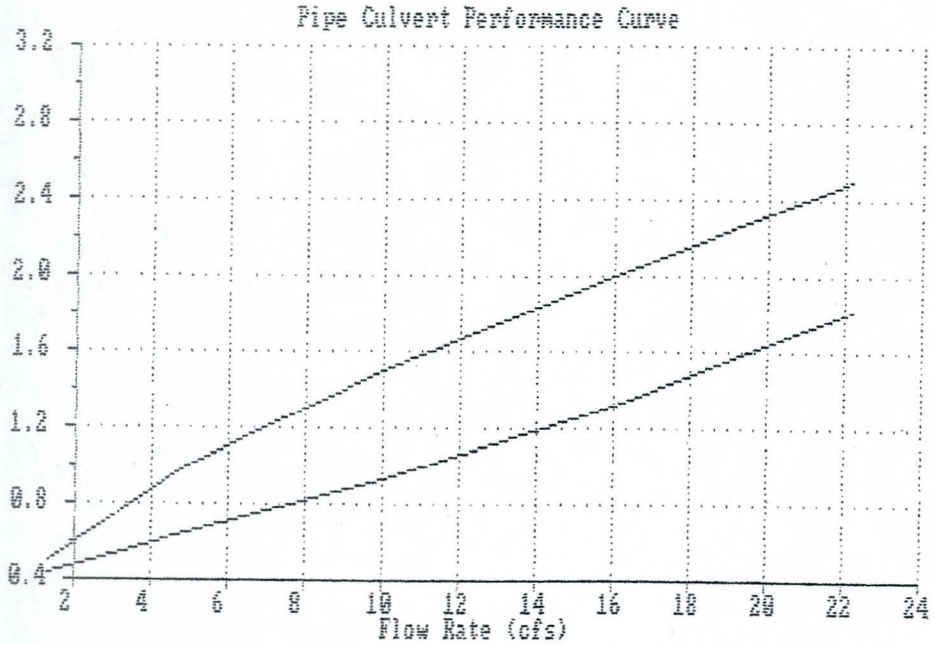
Pipe Culvert Performance Curve
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
2
4
6
8
10
12
14
16
18
20
22
24
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 22
Culvert Type: RCP
Culvert Size: 30-inch
Quantity: 1
Sub-basin #: 1340

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	1	0	1	0.00	0.00172
1.00	5	0	5	0.00	0.00574
1.50	10	0	10	0.00	0.00103
2.00	16	0	16	0.00	0.02296
2.50	22	0	22	0.00	0.03099
3.00	22	0	22	0.00	0.04988
3.50	22	0	22	0.00	0.05421
4.00	22	0	22	0.00	0.06026
4.50	22	58	81	0.50	0.06026
5.00	22	215	237	1.00	0.06026
5.50	22	455	477	1.50	0.06026
6.00	22	933	956	2.00	0.06026
7.00	22	2143	2166	3.00	0.06026

CULVERT #23

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
SINGLE 36-INCH RCP
BASIN 1220
CULVERT #23

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	3.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
1.4	0.00	0.50	0.49	0.29	0.37	0.29	4.09
5.5	0.00	1.00	0.69	0.56	0.74	0.56	6.08
11.3	0.00	1.48	0.92	0.80	1.07	0.80	7.50
18.9	0.00	2.00	1.24	1.04	1.39	1.04	8.67
26.9	0.00	2.50	1.64	1.26	1.68	1.26	9.52
35.1	0.00	3.00	2.11	1.47	1.93	1.47	10.18

==========

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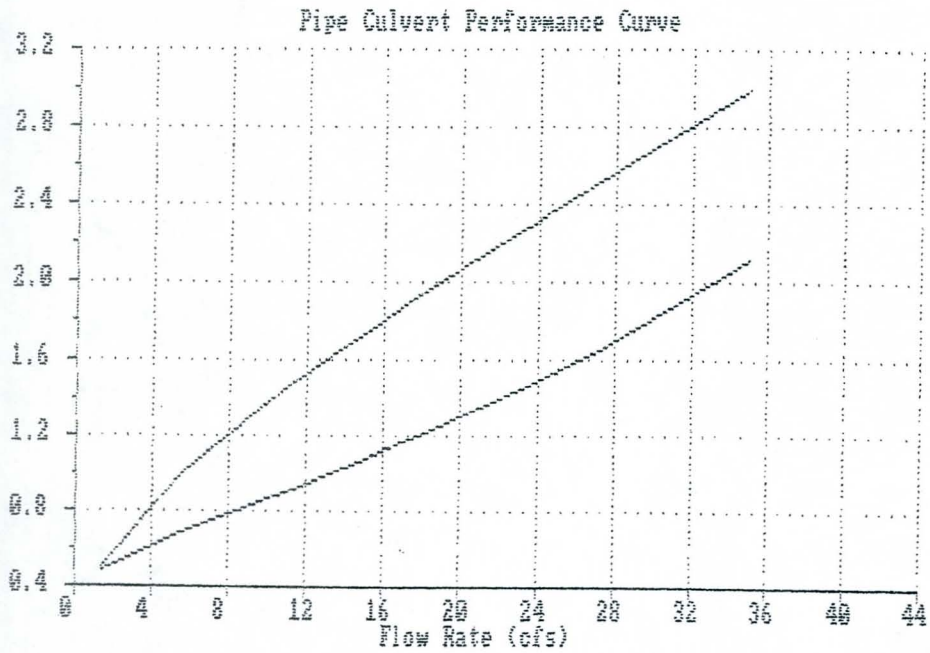
Pipe Culvert Performance Curve
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0
4
8
12
16
20
24
28
32
36
40
44
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 23
Culvert Type: RCP
Culvert Size: 36 inch
Quantity: 1
Sub-basin #: 1220

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	1	0	1	0.00	0.00046
1.00	6	0	6	0.00	0.00115
1.50	12	0	12	0.00	0.00861
2.00	19	0	19	0.00	0.09587
2.50	27	0	27	0.00	0.09587
3.00	35	0	35	0.00	0.14299
4.00	35	0	35	0.00	0.18632
4.50	35	0	35	0.00	0.22957
5.00	35	53	88	0.50	0.22957
5.50	35	165	200	1.00	0.22957
6.00	35	394	429	1.50	0.22957
6.50	35	700	735	2.00	0.22957
7.00	35	1304	1340	2.50	0.22957
7.50	35	2143	2179	3.00	0.22957

CULVERT #24

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
SINGLE 27-INCH CMP
BASIN 1210
CULVERT #24

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.25
FHWA Chart Number (1,2 or 3).....	2
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0240
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
1.3	0.00	0.51	0.12	0.41	0.38	0.41	2.67
4.6	0.00	1.00	0.40	0.77	0.73	0.77	3.84
9.3	0.00	1.50	0.88	1.13	1.05	1.13	4.63
14.7	0.00	2.00	1.67	1.52	1.33	1.52	5.14
17.5	0.00	2.25	2.19	1.76	1.46	1.76	5.26

==========

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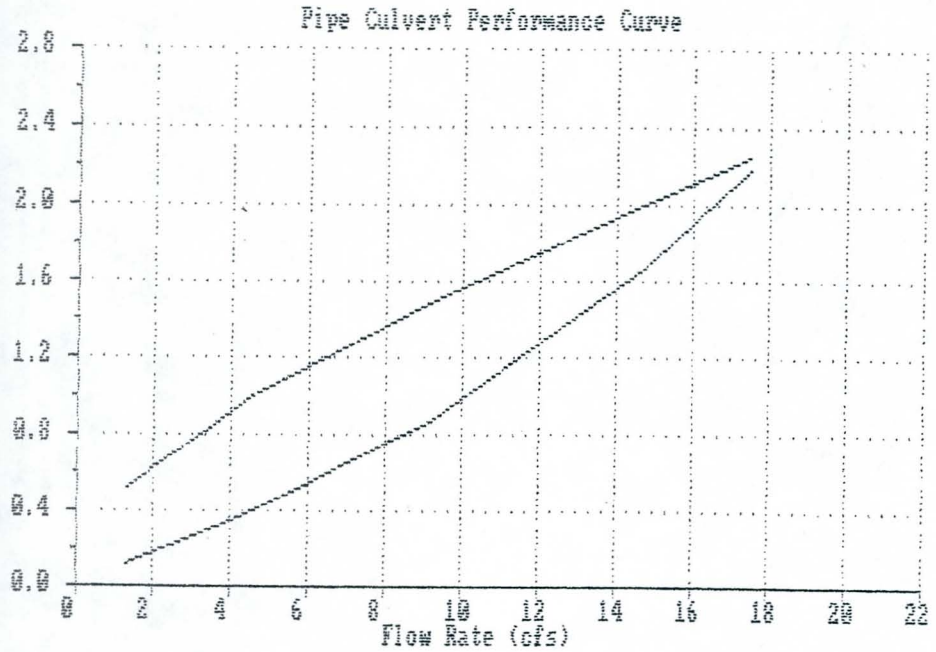
Pipe Culvert Performance Curve
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
0
2
4
6
8
10
12
14
16
18
20
22
Flow Rate (cfs)

CAVE CREEK HYDROLOGY – CULVERT ANALYSIS

Culvert # 24
Culvert Type: CMP
Culvert Size: 27-inch
Quantity: 1
Sub-basin #: 1210

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	1	0	1	0.00	0.00172
1.00	5	0	5	0.00	0.00574
1.50	9	0	9	0.00	0.00103
2.00	15	0	15	0.00	0.03099
2.25	18	0	18	0.00	0.03880
2.50	18	0	18	0.00	0.04521
3.00	18	0	18	0.00	0.05724
3.50	18	0	18	0.00	0.06026
4.00	18	58	76	0.50	0.06026
4.50	18	248	265	1.00	0.06026
5.00	18	576	593	1.50	0.06026

CULVERT #25

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

June 26, 1996
SINGLE 24-INCH CMP
BASIN 1230
CULVERT #25

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.00
FHWA Chart Number (1,2 or 3).....	2
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0240
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	100.0
Culvert Slope (feet per foot).....	0.0120

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
1.1	0.00	0.49	-0.01	0.39	0.36	0.39	2.58
4.2	0.00	1.00	0.32	0.77	0.72	0.77	3.78
8.4	0.00	1.50	0.95	1.15	1.03	1.15	4.51
13.0	0.00	2.00	1.97	1.58	1.30	1.58	4.88

==========

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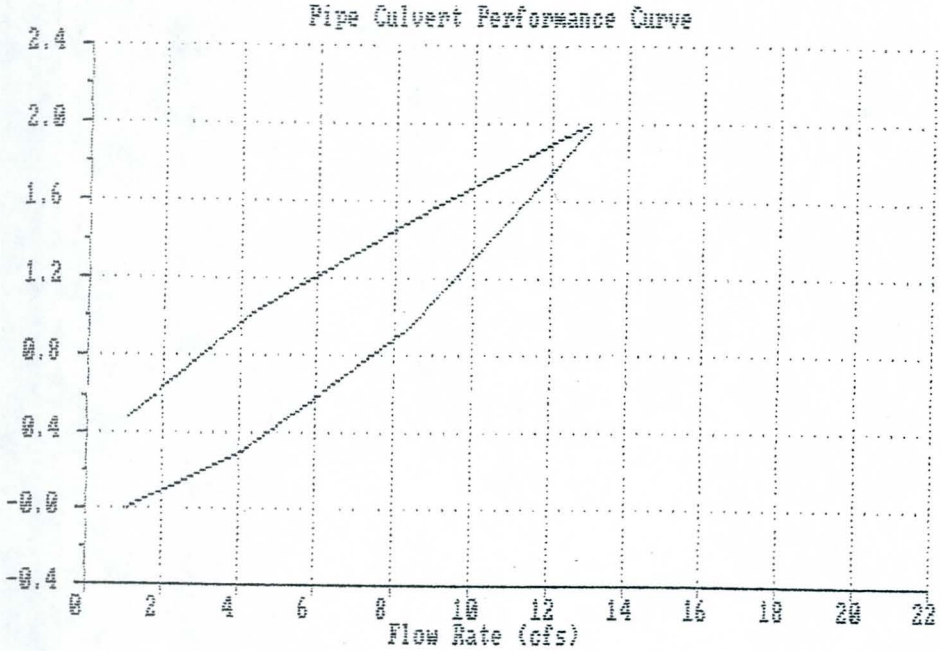
Pipe Culvert Performance Curve
2.4
2.0
1.6
1.2
0.8
0.4
-0.0
-0.4
0
2
4
6
8
10
12
14
16
18
20
22
Flow Rate (cfs)

CAVE CREEK HYDROLOGY -- CULVERT ANALYSIS

Culvert # 25
Culvert Type: CMP
Culvert Size: 24-inch
Quantity: 1
Sub-basin #: 1230

Elevation (ft)	Qpipe (cfs)	Qweir (cfs)	Qtotal (cfs)	Weir elev. (ft)	Storage Area (acre ft)
0.00	0	0	0	0.00	0.00000
0.50	1	0	1	0.00	0.00172
1.00	4	0	4	0.00	0.00574
1.50	8	0	8	0.00	0.00103
2.00	13	0	13	0.00	0.03099
2.50	13	0	13	0.00	0.03880
3.00	13	0	13	0.00	0.04521
3.50	13	0	13	0.00	0.06026
4.00	13	76	89	0.50	0.06026
5.00	13	455	468	1.50	0.06026
6.00	13	1304	1317	2.50	0.06026
7.00	13	2701	2714	3.50	0.06026

FIELD NOTES -

CROSS SECTION TABULATION FOR CAVE CREEK ROUTING

REACH IDENT.								
	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	0	100	100	99	200	98	245	93
R 1210 & R 1215	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	278	93	347	98	447	99	547	100

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.08	0.04	0.08

REACH IDENT.								
	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	0	100	100	99	200	98	216	94
R 1230	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	230	94	238	96.4	338	99.4	438	100.4

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.1	0.05	0.1

Elevs [illegible]

REACH IDENT.								
	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	0	100	100	99	200	98	206	96.5
R 1220	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	236	96.5	242	98	342	99	442	100

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.08	0.03	0.08

REACH IDENT.								
	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	0	100	100	99	200	98	202	93.5
R ~~3140~~ 13	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	235	93.5	265	98.5	365	99.5	465	100.5

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.06	0.04	0.06

REACH IDENT.

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
0	100	100	99	200	98	219	97

R 1240

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
250	97	257	98.7	357	99.7	457	100.7

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.06	0.03	0.06

Elev. for closed

REACH IDENT.

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
0	100	100	99	200	98	212	94

R 3045

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
242	94	254	98	354	99	454	100

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.08	0.035	0.08

Wrong

REACH IDENT.

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
0	100	100	99	200	98	210	97

R 3125

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
236	97	246	98	346	99	446	100

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.065	0.055	0.065

REACH IDENT.

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
0	100	100	99	200	98	205	96.5

R 3060

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
242	96.5	246	98.5	346	99.5	446	100.5

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.07	0.045	0.07

REACH IDENT.

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
0	100	100	99	200	98	210	95

R 3030

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
216	95	222	96	322	99	422	100

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.06	0.04	0.06

REACH IDENT.

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
0	100	100	99	200	98	203	97

R 3000

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
213	97	216	98	316	99	416	100

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.09	0.05	0.09

REACH IDENT.

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
0	100	100	99	200	98	205	95.5

R 3125

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
228	95.5	232	98	332	99	432	100

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.06	0.045	0.06

REACH IDENT.

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
0	100	100	99	200	98	214	95

R 3160

STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
223	95	227	98	327	99	427	100

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.055	0.045	0.055

REACH IDENT.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	0	100	100	99	200	98	207	97
R 3190	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	235	97	246	98	346	99	446	100

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.05	0.035	0.05

REACH IDENT.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	0	100	100	99	200	98	207	96
R 3135	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	217	95	225	98	325	99	425	100

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.055	0.04	0.055

REACH IDENT.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	0	100	100	99	200	98	245	95.5
R 3090	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	278	95.5	300	100.5	400	101.5	500	102.5

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.05	0.04	0.05

REACH IDENT.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	0	100	100	99	200	98	210	96
R 3140	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	235	96	244	98	344	99	444	100

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.055	0.045	0.055

REACH IDENT.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	0	100	100	99	200	98	207	97
R 3240	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.	STA.	ELEV.
	224	97	231	98	331	99	431	100

N - LEFT BANK	N - CHANNEL	N - RIGHT BANK
0.06	0.04	0.06

END

SECTION 3, HYDROLOGY

FOR

SECTION 4, HYDRAULICS

SEE VOLUME 2_

SECTION 5

EROSION AND SEDIMENT TRANSPORT ANALYSIS

NOT REQUIRED UNDER THIS CONTRACT

SECTION 6

REFERENCE MATERIAL

6.1 Other published flood studies.

6.1.1 See items 1, 8, 17, and 18 listed in the Bibliography.

6.2 Previous FEMA studies.

6.2.1 Harris-Toups prepared a 1978 study. Only 15 cross-sections were within the present study area. A revised HEC-2 model for the 1978 model was prepared.

6.3 Other applicable studies

6.3.1 None

6.4 Published/Unpublished historical flood information

6.4.1 None

6.5 Referenced technical papers/documents pertaining to methodology used in study

6.5.1 See items 6, 7, 9 and 10 listed in the Bibliography

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SECTION 7

CROSS-REFERENCING AND LABELING INFORMATION

7.1 Other studies impacted

7.1.1 There will be an update to the Federal Emergency Management Agency, Flood Insurance Study, 1995 Maricopa County, Arizona, and Incorporated Areas, Volume 1. Changes are listed in Section 8.

7.2 Key to cross-section labeling

7.2.1 Cross-section labeling are the same cross-section that appears on the floodplain delineation maps.

SECTION 8

DRAFT FIS REPORT - REVISED TEXT

Insert 1, Volume 1 of 12, Section 1.2, insert after paragraph 13

Revised hydrologic and hydraulic analyses for Cave Creek, Cave Buttes Dam Ponding Area to Carefree Highway, were performed by Willdan Associates, for the Flood Control District of Maricopa County, completed in March 1997.

Insert 2, Volume 1 of 12, Page 5, Table 1, Detailed-Study Sources, insert after Cave Creek Wash

Flooding Source	Limits of Study
Cave Creek Wash	From Cave Buttes Dam Ponding Area to Below Carefree Highway

Insert 3, Volume 1 of 12, Page 52, Table 3, Summary of Discharges, insert and revise after 5th item:

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-year	50-year	100-year	500-year
Cave Creek Wash (continued)					
.....					
.....					
.....					
.....					
Above Deer Valley Road	4.50	1,300	3,500	5,000	10,000
Above Cave Buttes Dam Ponding Area	**142.54**	---	---	**38,200**	---
Below Carefree Highway	**124.38**	20,600	32,975	**33,712**	52,000

Note: Bold line is a new line.

Insert 4, Volume 1 of 12, Section 3.2, insert after paragraph 8:

Cross-sections for Cave Creek Wash, from the Cave Buttes Dam Ponding Area to Below Carefree Highway, were developed from aerial topography flown on January 12, 1996 by Aerial Mapping Company, Inc. Digital maps were provided at a scale of 1"=200', with a contour interval of 2 feet. Cross-sections were taken from the field by Valco Surveying Corporation. Aerial Mapping Company, Inc. performed the computer verification of each

selected cross-section.

Insert 5, Volume 1 of 12, Table 4, Page 72, insert after Cave Creek Wash:

Flooding Source	Channel	Overbanks
Cave Creek Wash	0.015 - 0.065	0.035 - 0.065
Cave Creek Wash, Below Carefree Highway	**0.022 - 0.080**	**0.022 - 0.120**