FLOOD CONTROL DISTRICT
OF
MARICOPA COUNTY
2801 W. Durango
PHOENIX, AZ 85009

Anderson-Nelson, Inc.

VOL. 1 of 2

TOWN OF FOUNTAIN HILLS

DAM BREAK ANALYSES

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

for

Golden Eagle Park Dam
Hesperus Wash Dam
Aspen Dam
North Heights Dam
SunRidge Canyon Dam

APPENDICES

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TABLE OF CONTENTS

APPENDICES

A 100-year flood verifications from the Ftn Hills FDS report

B PMP worksheets

C Rainfall loss parameter values from the Ftn Hills FDS Future Condition report

D Clark unit hydrograph parameter values from the Ftn Hills FDS report

E Channel routing data from the Ftn Hills FDS report

F Area-capacity and spillway rating relations for the five dams

G 100-year flood results from the Ftn Hills FDS report

H HEC-1 output for Aspen Dam

I HEC-1 output for SunRidge Canyon Dam

J HEC-1 output for North Heights Dam

K HEC-1 output for Hesperus Wash Dam

L Breach Program output for Aspen Dam

M Breach Program output for North Heights Dam

N Breach Program output for SunRidge Canyon Dam

O Breach Program output for Hesperus Wash Dam

P HEC-1 output for Golden Eagle Park Dam

Q Breach Program output for Golden Eagle Park Dam (piping)

R Breach Program output for Golden Eagle Park Dam (overtopping)

S Dam Break output for Hesperus Wash Dam

T Dam Break output for Golden Eagle Park Dam

U Dam Break output for Golden Eagle Park plus Hesperus Wash Dams

V Dam Break output for Aspen Dam

W Dam Break output for North Heights Dam

X Dam Break output for SunRidge Canyon Dam

DISKETTES

HEC-1, Dam Breach, Dam Break

APPENDIX A

100-year flood verifications from the Ftn Hills FDS report

3.2.5 Gage Data

3.2.5.1 Streamflow Gaging Stations

The District, ADWR and the USGS have compiled streamflow gage data for various washes in Maricopa County and the State of Arizona. The data is summarized in a state-wide report entitled *Basin Characteristics and Streamflow Statistics in Arizona as of 1989* [6.5:27]. In addition to USGS gage data, the District also maintains a series of streamflow gages in Maricopa County. Unfortunately, none of these gages lie in or near the Fountain Hills North study area. The results from that study for representative washes in central and southern Arizona are summarized in Table G-1 and shown graphically in Figure G-1.

Modeling results for typical subbasins and key concentration points upstream of the flood control structures are summarized in Table G-2. Those modeling results are also plotted on Figure G-1 for comparison with the USGS data. Refer to Section 3.3 for a discussion of the comparison between the USGS data and the modeling results.

Table G-1

Log Pearson III Analysis Summary for Representative Washes in Central and Southern Arizona

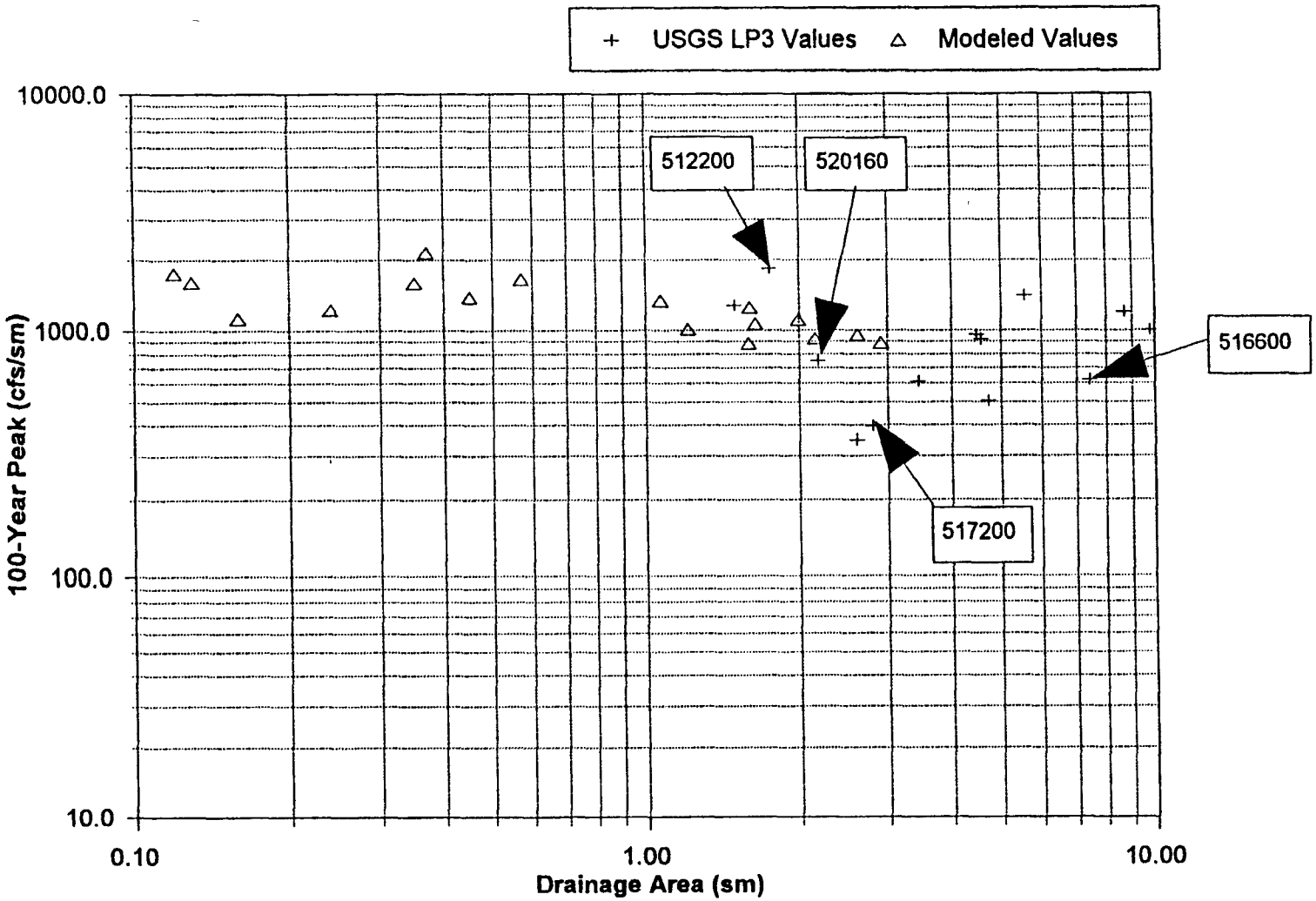
Station Number (1)	Station Name (2)	Drainage Area sm (3)	Mean Elevation feet (4)	Main Channel Slope ft/mi (5)	Record Length years (6)	Qmax cfs (7)	Log Pearson III Discharge For 100-Year Storm cfs (8)	cfs/sm (9)
*510070	West Fork Sycamore Creek Near Sunflower	4.58	5,430	260	11	1,700	4,200	917
510080	West Fork Sycamore Creek Near Sunflower	9.80	5,260	353	18	3,480	9,800	1,000
510100	East Fork Sycamore Creek Near Sunflower	4.49	5,760	370	25	1,940	4,300	958
510170	Camp Creek Near Sunflower	2.60	3,520	498	16	402	900	346
*512200	Salt River Tributary In S. Mountain Park	1.75	1,730	244	27	670	3,200	1,829
515800	Hartman Wash Near Wickenburg	5.57	2,690	72	15	2,600	7,800	1,400
*516600	Ox Wash Near Morristown	7.44	2,290	101	16	2,900	4,600	618
*517200	Centennial Wash Tributary Near Wendon	2.79	2,480	193	16	720	1,100	394
519600	Rainbow Wash Tributary Near Buckeye	3.45	950	34	16	1,430	2,100	609
520100	Military Wash Near Sentinel	8.70	674	56	16	1,530	10,400	1,195
520130	Darby Arroyo Near Ajo, AZ	4.72	1,920	71	16	1,670	2,380	504
*520160	Gibson Arroyo at Ajo, AZ	2.18	2,100	171	15	1,800	1,620	743
*520230	Crater Range Wash Near Ajo	1.49	1,280	69	16	440	1,900	1,275

* Watershed is similar to the Fountain Hills area.

Table G-2

Modeling Results at Representative Locations for the 100-year, 6-hour Storm

HEC-1 Identifier (1)	Station Name (2)	Drainage Area sm (3)	Mean Elevation feet (4)	Main Channel Slope ft/mi (5)	100-year, 6-hour Peak Discharge cfs (6)	100-year, 6-hour Peak Discharge cfs/sm (7)
204B	Subbasin in upper Caliente Wash watershed	0.13	1,699	128	208	1,600
205A	Subbasin in upper Hesperus Wash watershed	0.12	3,304	378	210	1,750
205I	Subbasin in upper Hesperus Wash watershed	0.35	2,642	326	559	1,597
207E	Subbasin in upper Ashbrook Wash watershed	0.16	2,456	315	180	1,125
207G	Subbasin in upper Ashbrook Wash watershed	0.24	2,114	198	294	1,225
209A	Subbasin in upper Cloudburst Wash watershed	0.37	3,098	367	792	2,141
C502	Un-named wash	0.45	1,741	177	622	1,382
C517	Escalante Wash d/s of McDowell Mtn. Park	1.21	1,919	185	1,227	1,014
C519	Escalante Wash at McDowell Mtn. Road	1.59	1,861	159	1,406	884
C535	Hesperus Wash at N. Town boundary	2.62	2,974	304	2,514	960
C536	Above Dam 36	2.91	2,939	299	2,580	887
C556	Ashbrook Wash at N. Town boundary	1.64	2,854	339	1,752	1,068
C560	Above Dam 6	2.15	2,774	315	1,989	925
C565	Bristol Wash at Montezuma Blvd.	0.57	2,874	332	938	1,646
C568	Bristol Wash d/s of Montezuma Blvd.	1.07	2,836	325	1,428	1,335
C578	Above Dam 11	2.00	2,417	323	2,231	1,116
C584	Above Dam 7	1.60	2,827	313	1,999	1,249



Note:

The USGS gages listed in boxes are on washes that are similiar to the Fountain Hills area.

Figure G-1

Comparison of USGS LP3 Values with Modelling Results
100-year Unit Peak Discharges vs Area

3.2.5.2 Precipitation Stations

One recording precipitation gage has been established on the study watershed by the District. Two other gages are situated about 4 and 6 miles north of Fountain Hills. These gages are located as follows:

Fountain Hills Gage: Established 9 December 1993. Located in Section 15 T3N R6E at Latitude 33°36'40" and Longitude 111°43'29". The gage is at elevation 2,280 feet.

McDowell Mountain Gage: Established 6 August 1990. Located in Section 16 T4N R6E at Latitude 33°43'00" and Longitude 111°44'42". The gage is at elevation 2,040 feet.

Asher Hills Gage: Established 2 August 1990. Located in Section 1 T4N R6E at Latitude 33°43'03" and Longitude 111°41'01". The gage is at elevation 1,680 feet.

3.3 Calibration

3.3.1 General

Calibration of the HEC-1 models is not possible because of the lack of available physical data. In lieu of calibration, confidence checks are performed on the modeling results. These confidence checks consist of:

1. Comparison with USGS gage data for representative watersheds;
2. Runoff volume checks using surveyed high water marks in the impoundment areas upstream of the major flood control structures (dams);
3. Comparison of modeled results with estimates using a USGS regional regression equation; and
4. Comparison of modeled results with results from previous FIS studies completed in Maricopa County.

These checks are only made using the watershed upstream of the dams. Peak discharges in washes downstream of the dams are significantly affected by those structures.

3.3.2 Comparison with USGS Gage Data

The selected USGS gage data for representative washes are summarized in Table G-1. The modeled results selected for comparison are listed in Table G-2. The data from Tables G-1 and G-2 is plotted on Figure G-1. The USGS gaged watersheds which are the most similar to the Fountain Hills area are identified on both Table G-1 and Figure G-1. The USGS data are for watersheds in the size range of about 1.5 to almost 10 square miles, and the unit peak discharges range from about 350 cfs/square mile to about 1,800 cfs/square mile. The average of the data from Table G-1 is about 900 cfs/square mile for these small watersheds. The model subbasins for comparison are generally smaller than the gaged watersheds and range in size from 0.12 square miles to 2.91 square miles. The unit peak discharges range from 884 cfs/square mile to 2,141 cfs/square mile, and the average of the data from Table G-2 is about 1,300 cfs/square mile. It is reasonable for the smaller model subbasins to produce higher unit peak discharges than the selected gaged watersheds, and this is depicted in Figure G-1. There is no reason to doubt the validity of the modeled results based on this comparison.

3.3.3 Runoff Volume Checks Using Surveyed High Water Marks

High water debris lines were noted upstream of the major flood control structures during the hydrology field reconnaissance in April 1993. The high water marks were staked in the field and later field surveyed to obtain the ponding elevation upstream of each of the five dams. The debris lines appeared to be recent; therefore, the precipitation records of the two gages described in Section 3.2.5.2 were obtained for the previous 24 months. Two convective summer storms and one general winter storm were noted. The winter storm, which occurred on 3 and 4 December 1992, was determined to be the most likely cause of the high water marks.

The two precipitation gages for which data are available, the McDowell Mountain and Asher Hills gages, lie north of the study watershed. The assumption was made that the storm had a similar distribution and total rainfall over the study watershed as recorded by the two gages. The actual precipitation distributions recorded by both gages were used as input to the HEC-1 model and a separate run was made using both rainfall distributions. The two rainfall distributions are plotted on Figure C-1.

The results of this confidence check are shown in Table C-1. The actual stage for each structure is listed in column 3. This is the average of the field surveyed elevations at each structure. The estimated peak discharge leaving the structure and the corresponding upstream stage are listed in columns 4 and 5, respectively, for rainfall input using the McDowell Mountain gage, and in columns 6 and 7, respectively, for rainfall input using the Asher Hills gage. The measured high water elevation for each dam lies within the range of stage defined by columns 5 and 7.

There is no reason to doubt the validity of the HEC-1 model based on this comparison.

Table C-1

Comparison of Modeling Results with Surveyed HighWater Marks for the Storm of 3 and 4 December 1992

			Modeled Results			
		Surveyed Stage	McDowell Mtn.		Asher Hills	
	HEC-1 ID	(high water mark)	Q_p	Stage	Q_p	Stage
(1)	(2)	(3)	(4)	(5)	(6)	(7)
4	C599	1,706.5	513	1,708.7	203	1,699.8
6	C560	1,814.6	138	1,816.1	59	1,812.1
7	C584	1,890.7	188	1,896.3	64	1,888.4
11	C578	1,791.2	204	1,792.1	76	1,783.6
36	C536	1,866.7	212	1,866.1	74	1,856.5

High water marks were observed in the outlet ends of the principal spillways of Dam 7 and Dam 11. The marks were water stains located 3.2 feet and 3.0 feet above the outlet flowline of Dams 7 and 11, respectively. The modeled outlet depths of flow (from HY-8), assuming the surveyed high water mark stage elevations at the inlet, are 2.6 feet and 3.5 feet for Dams 7 and 11, respectively. These depths are reasonably close to the measured depths and provide a measure of confidence for the culvert hydraulic models.

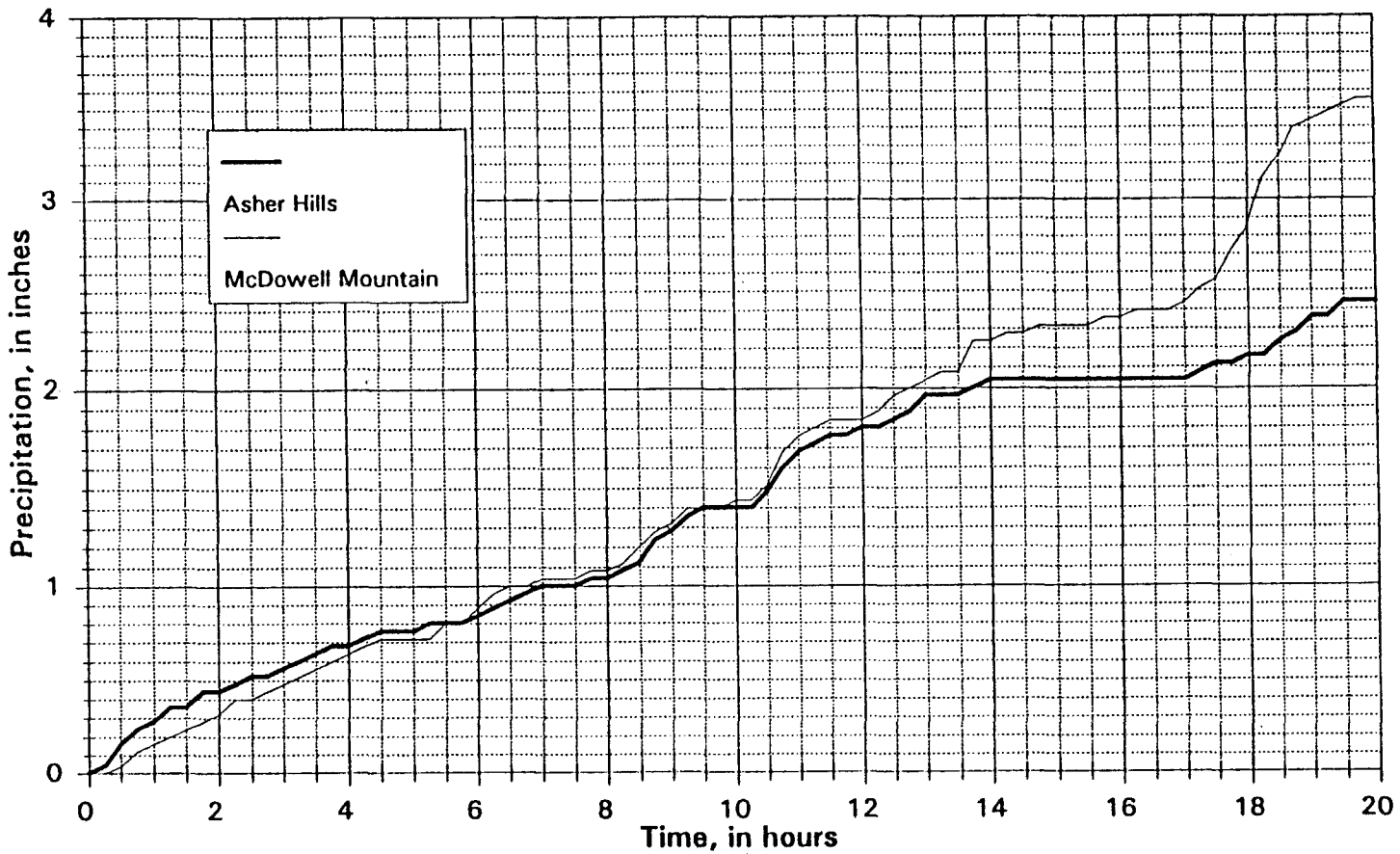


Figure C-1

Cumulative Precipitation vs Time for Storm of 3 and 4 December 1992

3.3.4 Comparison With USGS Regional Regression Equation

The Arizona Department of Transportation (ADOT) *Highway Drainage Design Manual - Hydrology* (ADOT Hydrology Manual [1]) lists preliminary USGS regional regression equations for use in Arizona. The Fountain Hills North study watershed lies in flood region 12. The regression equations for flood region 12 are listed in ADOT Table 10-6 which is included herein as Table C-2. ADOT Figure 10-20 is also included herein as Figure C-2. Figure C-2 is a scatter diagram of mean basin elevation versus drainage area for the gages upon which the regression analysis was performed.

The comparison is made using the 100-year, 6-hour modeled results for Dams 6, 7, 11 and 36. Dam 4 is not included because it is influenced by Dams 6, 7 and 11. The results of the comparison are shown in Table C-3. The modeled results are significantly lower than those estimated using the 100-year regression equation but fall within the 31 percent standard error. There is no reason to doubt the model results based on this confidence check.

Table C-2
(Ref. - ADOT Hydrology Manual Table 10-6)

Flood Magnitude-Frequency Relations for the
Central Arizona Region (R12)

Equation: Q, peak discharge, in cubic feet per second/ AREA, drainage area, in square miles; and ELEV, mean basin elevation, in feet divided by 1,000.

Recurrence interval in years (1)	Equation (2)	Average standard error of model in percent (3)
2	$Q = 41.1\ AREA^{0.629}$	102
5	$Q = 238\ AREA^{0.687}\ ELEV^{-0.358}$	64
10	$Q = 479\ AREA^{0.661}\ ELEV^{-0.398}$	47
25	$Q = 942\ AREA^{0.630}\ ELEV^{-0.383}$	34
50	$LOG\ Q = 7.36 - 4.17\ AREA^{-0.08} - 0.440\ LOG\ ELEV$	30
100	$LOG\ Q = 6.55 - 3.17\ AREA^{-0.11} - 0.454\ LOG\ ELEV$	31

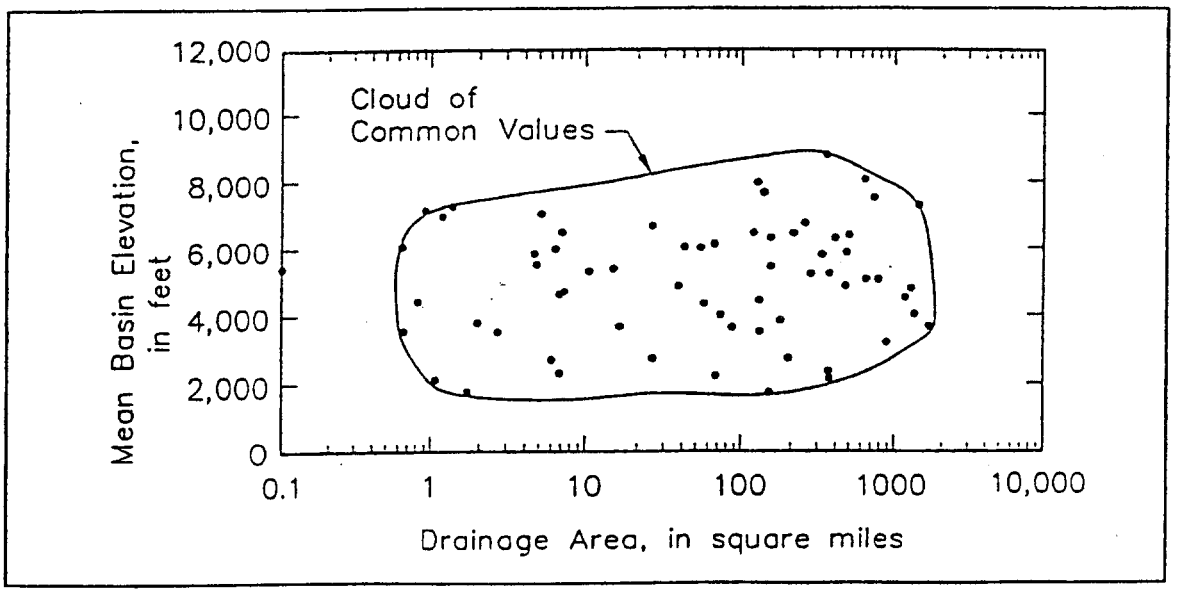


FIGURE C-2
(Ref. - ADOT Hydrology Manual Figure 10-20)

Scatter Diagram of Independent Variables for R12 Regression Equation

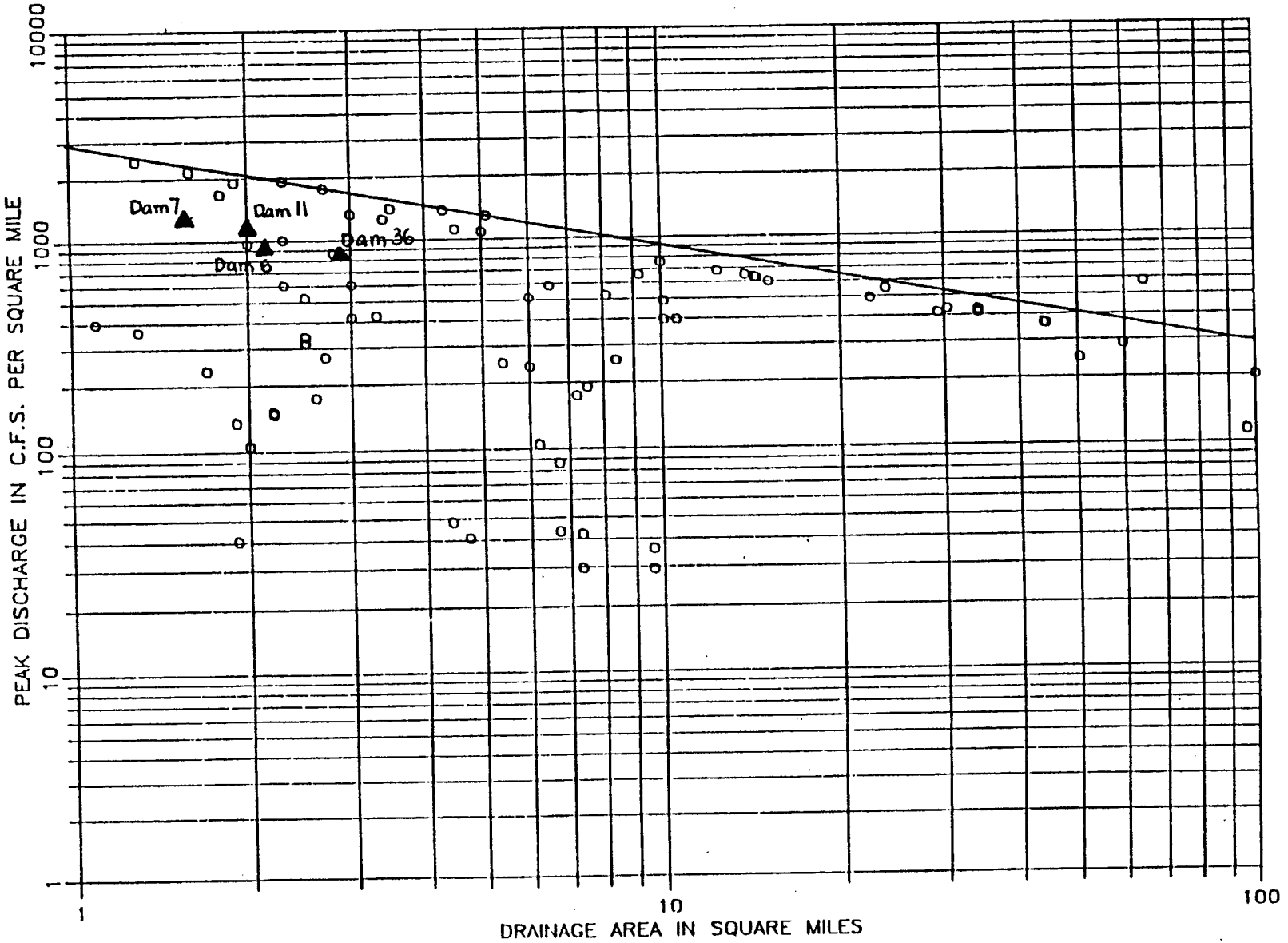
Table C-3

Comparison of Modeled Results with USGS Regional Regression Equation

Dam No.	HEC-1 ID	Drainage Area, sm	Mean Elevation	100-year Discharge,cfs	
				USGS	HEC-1 Model
(1)	(2)	(3)	(4)	(5)	(6)
6	C560	2.15	2,774	2,723	1,989
7	C584	1.60	2,827	2,162	1,999
11	C578	2.00	2,417	2,746	2,231
36	C536	2.91	2,939	3,303	2,580

3.3.5 Comparison with Previous FIS Studies in Maricopa County

The Arizona Department of Water Resources (ADWR) has adopted State Standard SS-2 [6.5:3] which includes envelope curves of FIS 100-year peak discharges for each county in the state. The curve for Maricopa County is included herein as Figure C-3. The 100-year, 6-hour peak discharges for Dams 6, 7, 11 and 36 are plotted on Figure C-3 for comparison. There is no reason to doubt the validity of the HEC-1 model based on this comparison.



Maricopa County Envelope Curve from FEMA FIS Data
SSA 2-91 ADWR

▲ - Fountain Hills HEC-1 Model

FIGURE C-3

Comparison of Modeled Results with FEMA FIS Data

APPENDIX B

PMP worksheets

DAM 6 - ASPEN DAM

Table 6.3A.--Local-storm PMP computation, Colorado River, Great Basin and California drainages. For drainage average depth PMP. Go to table 6.3B if areal variation is required.

Drainage ASPEN DAM - DAM # 6 Area 2.15 mi^2 (km^2)
Latitude 33°35' Longitude 111°45' Minimum Elevation 1810 ft (m)

Steps correspond to those in sec. 6.3A.

1. Average 1-hr 1-mi^2 (2.6-km^2) PMP for drainage [fig. 4.5]. 11.5 in. (mm)

2. a. Reduction for elevation. [No adjustment for elevations up to 5,000 feet (1,524 m): 5% decrease per 1,000 feet (305 m) above 5,000 feet (1,524 m)]. 100 %

   b. Multiply step 1 by step 2a. 11.5 in. (mm)

3. Average 6/1-hr ratio for drainage [fig. 4.7]. 1.3

	Duration (hr)									
	1/4	1/2	3/4	1	2	3	4	5	6	
4. Durational variation for 6/1-hr ratio of step 3 [table 4.4].	74	89	95	100	114	121	125	128	130	%
5. 1-mi^2 (2.6-km^2) PMP for indicated durations [step 2b X step 4].	8.5	10.2	10.9	11.5	13.1	13.9	14.4	14.7	15.0	in. (mm)
6. Areal reduction [fig. 4.9].	94	96	96	96	97	97	97	98	98	%
7. Areal reduced PMP [steps 5 X 6].	8.0	9.8	10.5	11.0	12.7	13.5	14.0	14.4	14.7	in. (mm)
8. Incremental PMP [successive subtraction in step 7].				11.0	1.7	0.8	0.5	0.4	0.3	in. (mm)
	8	1.8	0.7	0.5	} 15-min. increments					

9. Time sequence of incremental PMP according to:

Hourly increments [table 4.7].	0.4	0.8	11.0	1.7	0.5	0.3	in. (mm)
Four largest 15-min. increments [table 4.8].	8	1.8	0.7	0.5			in. (mm)

Table 6.3A.--Local-storm PMP computation, Colorado River, Great Basin and California drainages. For drainage average depth PMP. Go to table 6.3B if areal variation is required.

Drainage HESPERUS (DAM SG) Area 2.91 mi^2 (km^2)
Latitude 33°25' Longitude 111°45' Minimum Elevation 1856 ft (m)

Steps correspond to those in sec. 6.3A.

1. Average 1-hr 1-mi^2 (2.6-km^2) PMP for drainage [fig. 4.5]. 11.5 in. (mm)

2. a. Reduction for elevation. [No adjustment for elevations up to 5,000 feet (1,524 m): 5% decrease per 1,000 feet (305 m) above 5,000 feet (1,524 m)]. 100 %

   b. Multiply step 1 by step 2a. 11.5 in. (mm)

3. Average 6/1-hr ratio for drainage [fig. 4.7]. 1.3

	Duration (hr)									
	1/4	1/2	3/4	1	2	3	4	5	6	
4. Durational variation for 6/1-hr ratio of step 3 [table 4.4].	74	89	95	100	114	121	125	128	130	%
5. 1-mi^2 (2.6-km^2) PMP for indicated durations [step 2b X step 4].	8.5	10.2	10.9	11.5	13.1	13.9	14.4	14.7	15.0	in. (mm)
6. Areal reduction [fig. 4.9].	91	93	94	95	96	96	97	97	98	%
7. Areal reduced PMP [steps 5 X 6].	7.7	9.5	10.2	10.9	12.6	13.3	14.0	14.3	14.7	in. (mm)
8. Incremental PMP [successive subtraction in step 7].				10.9	1.7	0.7	0.7	0.3	0.4	in. (mm)
	7.7	1.8	0.7	0.7	} 15-min. increments					

9. Time sequence of incremental PMP according to:

Hourly increments [table 4.7].	0.4	0.7	10.9	1.7	0.7	0.3	in. (mm)
Four largest 15-min. increments [table 4.8].	7.7	1.8	0.7	0.7			in. (mm)

DAM 7 - SUNRIDGE CANYON DAM

Table 6.3A.--Local-storm PMP computation, Colorado River, Great Basin and California drainages. For drainage average depth PMP. Go to table 6.3B if areal variation is required.

Drainage SUNRIDGE CANYON (DAM #7) Area 1.6 mi^2 (km^2)
Latitude 38°25' Longitude 111°45' Minimum Elevation _____ ft (m)

Steps correspond to those in sec. 6.3A.

1. Average 1-hr 1-mi^2 (2.6-km^2) PMP for drainage [fig. 4.5]. 11.5 in. (mm)

2. a. Reduction for elevation. [No adjustment for elevations up to 5,000 feet (1,524 m): 5% decrease per 1,000 feet (305 m) above 5,000 feet (1,524 m)]. 100 %

   b. Multiply step 1 by step 2a. 11.5 in. (mm)

3. Average 6/1-hr ratio for drainage [fig. 4.7]. 1.3

	Duration (hr)									
	1/4	1/2	3/4	1	2	3	4	5	6	
4. Durational variation for 6/1-hr ratio of step 3 [table 4.4].	74	89	95	100	114	121	125	128	130	%
5. 1-mi^2 (2.6-km^2) PMP for indicated durations [step 2b X step 4].	8.5	10.2	10.9	11.5	13.1	13.9	14.4	14.7	15.0	in. (mm)
6. Areal reduction [fig. 4.9].	97	98	98	99	99	99	[illegible]	100	100	%
7. Areal reduced PMP [steps 5 X 6].	8.2	10.0	10.7	11.4	13.0	13.8	[illegible]	14.7	15	in. (mm)
8. Incremental PMP [successive subtraction in step 7].				11.4	1.6	0.8	0.6	0.2	0.3	in. (mm)
	8.2	1.8	0.7	0.7	} 15-min. increments					
9. Time sequence of incremental PMP according to:										
Hourly increments [table 4.7].				0.3	0.8	11.2	1.6	0.6	0.3	in. (mm)
Four largest 15-min. increments [table 4.8].				8.2	1.8	0.7	0.7			in. (mm)

Table 6.3A.--Local-storm PMP computation, Colorado River, Great Basin and California drainages. For drainage average depth PMP. Go to table 6.3B if areal variation is required.

Drainage NORTH HEIGHTS (DAM # 11) Area 2.0 mi^2 (km^2)
Latitude 33°35' Longitude 111°45' Minimum Elevation ____ ft (m)

Steps correspond to those in sec. 6.3A.

1. Average 1-hr 1-mi^2 (2.6-km^2) PMP for drainage [fig. 4.5]. 11.5 in. (mm)

2. a. Reduction for elevation. [No adjustment for elevations up to 5,000 feet (1,524 m): 5% decrease per 1,000 feet (305 m) above 5,000 feet (1,524 m)]. 100 %

   b. Multiply step 1 by step 2a. 11.5 in. (mm)

3. Average 6/1-hr ratio for drainage [fig. 4.7]. 1.3

	Duration (hr)									
	1/4	1/2	3/4	1	2	3	4	5	6	
4. Durational variation for 6/1-hr ratio of step 3 [table 4.4].	74	89	95	100	114	121	125	128	130	%
5. 1-mi^2 (2.6-km^2) PMP for indicated durations [step 2b X step 4].	8.5	10.2	10.9	11.5	13.1	13.9	14.4	14.7	15.0	in. (mm)
6. Areal reduction [fig. 4.9].	94	96	96	97	97	97	98	98	98	%
7. Areal reduced PMP [steps 5 X 6].	8.0	9.8	10.5	11.2	12.7	13.5	14.1	14.4	14.7	in. (mm)
8. Incremental PMP [successive subtraction in step 7].				11.2	1.5	0.8	0.6	0.3	0.3	in. (mm)
	8.0	1.8	0.7	0.7	} 15-min. increments					

9. Time sequence of incremental PMP according to:

   Hourly increments [table 4.7]. 0.3 0.8 11.2 1.5 0.6 0.3 in. (mm)

   Four largest 15-min. increments [table 4.8]. 8.0 1.8 0.7 0.7 in. (mm)

Table 6.3A.--Local-storm PMP computation, Colorado River, Great Basin and California drainages. For drainage average depth PMP. Go to table 6.3B if areal variation is required.

Drainage GOLDEN EAGLE PARK (#4) Area 7.13 mi^2 (km^2)
Latitude 33° 35' Longitude 111° 45' Minimum Elevation 1706 ft (m)

Steps correspond to those in sec. 6.3A.

1. Average 1-hr 1-mi^2 (2.6-km^2) PMP for drainage [fig. 4.5]. 11.5 in. (mm)

2. a. Reduction for elevation. [No adjustment for elevations up to 5,000 feet (1,524 m): 5% decrease per 1,000 feet (305 m) above 5,000 feet (1,524 m)]. 100 %

   b. Multiply step 1 by step 2a. 11.5 in. (mm)

3. Average 6/1-hr ratio for drainage [fig. 4.7]. 1.3

	Duration (hr)									
	1/4	1/2	3/4	1	2	3	4	5	6	
4. Durational variation for 6/1-hr ratio of step 3 [table 4.4].	74	89	95	100	114	121	125	128	130	%
5. 1-mi^2 (2.6-km^2) PMP for indicated durations [step 2b X step 4].	8.5	10.2	10.9	11.5	13.1	13.9	14.4	14.7	15.0	in. (mm)
6. Areal reduction [fig. 4.9].	78	83	85	86	88	89	90	90	91	%
7. Areal reduced PMP [steps 5 X 6].	6.6	8.5	9.3	9.9	11.5	12.4	13.0	13.2	13.7	in. (mm)
8. Incremental PMP [successive subtraction in step 7].				9.9	1.6	0.9	0.6	0.2	0.5	in. (mm)
	6.6	1.9	0.8	0.6	} 15-min. increments					

9. Time sequence of incremental PMP according to:

Hourly increments [table 4.7].	0.5	0.9	9.9	1.6	0.6	0.2	in. (mm)
Four largest 15-min. increments [table 4.8].	6.6	1.9	0.8	0.6			in. (mm)

Table 6.3A.--Local-storm PMP computation, Colorado River, Great Basin and California drainages. For drainage average depth PMP. Go to table 6.3B if areal variation is required.

Drainage DRAINAGE AREA ABOVE DAM #4 Area 1.88 mi^2 (km^2)
Latitude 33°35' Longitude 111°45' Minimum Elevation 1706 ft (m)

Steps correspond to those in sec. 6.3A.

1. Average 1-hr 1-mi^2 (2.6-km^2) PMP for drainage [fig. 4.5]. 11.5 in. (mm)

2. a. Reduction for elevation. [No adjustment for elevations up to 5,000 feet (1,524 m): 5% decrease per 1,000 feet (305 m) above 5,000 feet (1,524 m)]. 100 %

   b. Multiply step 1 by step 2a. 11.5 in. (mm)

3. Average 6/1-hr ratio for drainage [fig. 4.7]. 1.8

	Duration (hr)									
	1/4	1/2	3/4	1	2	3	4	5	6	
4. Durational variation for 6/1-hr ratio of step 3 [table 4.4].	74	89	95	100	114	121	125	128	130	%
5. 1-mi^2 (2.6-km^2) PMP for indicated durations [step 2b X step 4].	8.5	10.2	10.9	11.5	13.1	13.9	14.4	14.7	15.0	in. (mm)
6. Areal reduction [fig. 4.9].	98	99	99	99	99.5	99.5	99.5	99.5	100	%
7. Areal reduced PMP [steps 5 X 6].	8.3	10.1	10.8	11.4	13.0	13.8	14.3	14.6	15.0	in. (mm)
8. Incremental PMP [successive subtraction in step 7].				11.4	1.6	0.8	0.5	0.3	0.4	in. (mm)
	8.3	1.8	0.7	0.6	} 15-min. increments					

9. Time sequence of incremental PMP according to:

Hourly increments [table 4.7].	0.4	0.8	11.4	1.6	0.5	0.3	in. (mm)
Four largest 15-min. increments [table 4.8].	8.3	1.8	0.7	0.6			in. (mm)

APPENDIX C

Rainfall loss parameter values from the Ftn Hills FDS Future Condition report

Table S-9

Summary of Future Condition Subbasin Parameters

[1] Subbasin ID	[2] Area (sm)	[3] Kb	[4] Slope (ft/mi)	[5] IA (in)	[6] DTHETA	[7] PSIF (in)	[8] XKSAT (in/hr)	[9] RTIMP (%)	[10] Time Area Curve	[11] Total Basin Area (sm)
201A	0.21655	0.07	208	0.13	0.35	5.70	0.19	7.94	HEC-1	
201B	0.08068	0.10	223	0.15	0.38	5.70	0.20	1.84	HEC-1	
201C	0.07857	0.03	206	0.09	0.26	5.70	0.18	23.84	Urban	
201D	0.07093	0.08	207	0.13	0.34	5.70	0.19	8.74	HEC-1	
201E	0.18315	0.08	178	0.13	0.34	5.60	0.23	8.39	HEC-1	0.62989
202A	0.03778	0.03	129	0.09	0.25	4.40	0.34	29.61	Urban	
202B	0.01794	0.03	322	0.09	0.25	4.55	0.31	29.03	Urban	
202C	0.00765	0.04	363	0.08	0.25	4.35	0.35	38.72	Urban	
202D	0.06258	0.03	248	0.09	0.25	5.60	0.20	28.04	Urban	
202E	0.10408	0.03	270	0.09	0.25	5.70	0.18	26.88	Urban	
202F	0.01309	0.03	337	0.08	0.25	5.60	0.20	38.05	Urban	
202G	0.01316	0.03	338	0.08	0.25	5.70	0.18	35.52	Urban	
202H	0.17938	0.03	243	0.09	0.25	5.20	0.22	26.85	Urban	
202I	0.01747	0.03	122	0.06	0.25	5.10	0.24	73.16	Urban	0.45312
203A	0.27918	0.08	229	0.14	0.37	5.70	0.20	4.62	HEC-1	
203B	0.04446	0.04	236	0.09	0.27	5.70	0.18	22.92	Urban	
203C	0.10306	0.07	258	0.12	0.33	5.70	0.20	13.59	HEC-1	
203D	0.10805	0.08	252	0.13	0.34	5.70	0.20	8.61	HEC-1	
203E	0.09335	0.03	219	0.09	0.19	6.60	0.13	25.00	Urban	
203F	0.33332	0.09	237	0.15	0.39	5.70	0.21	0.00	Natural	
203G	0.24821	0.07	215	0.13	0.34	6.00	0.18	9.21	HEC-1	
203H	0.20675	0.03	178	0.09	0.25	5.40	0.21	25.00	Urban	
203I	0.17071	0.03	161	0.09	0.25	4.80	0.27	29.11	Urban	
203J	0.03885	0.03	237	0.07	0.25	5.60	0.20	64.82	Urban	
203K	0.16019	0.03	158	0.08	0.25	5.60	0.19	44.98	Urban	1.78614
204A	0.10768	0.03	175	0.09	0.25	5.80	0.18	25.00	Urban	
204B	0.12598	0.03	128	0.09	0.25	5.80	0.18	26.66	Urban	
204C	0.07669	0.03	142	0.07	0.25	5.70	0.18	66.42	Urban	
204D	0.04409	0.03	96	0.07	0.25	5.70	0.18	53.85	Urban	
204E	0.07051	0.03	108	0.08	0.25	5.70	0.18	41.17	Urban	
204F	0.07714	0.03	135	0.08	0.15	7.00	0.11	45.00	Urban	0.50208
205A	0.11753	0.14	378	0.25	0.35	4.35	0.40	35.00	Natural	
205B	0.21124	0.14	129	0.25	0.35	4.35	0.40	35.00	Natural	
205C	0.05877	0.15	331	0.25	0.35	4.35	0.41	35.00	Natural	
205D	0.31907	0.13	361	0.25	0.35	4.35	0.40	35.00	Natural	
205E	0.21753	0.14	358	0.25	0.35	4.35	0.40	35.00	Natural	
205F	0.16126	0.14	326	0.25	0.35	4.35	0.41	35.00	Natural	
205G	0.18549	0.13	338	0.24	0.35	4.50	0.40	31.23	Natural	
205H	0.26054	0.13	325	0.24	0.35	4.50	0.39	31.55	Natural	

Table S-9

Summary of Future Condition Subbasin Parameters

[1] Subbasin ID	[2] Area (sm)	[3] Kb	[4] Slope (ft/mi)	[5] IA (in)	[6] DTHETA	[7] PSIF (in)	[8] XKSAT (in/hr)	[9] RTIMP (%)	[10] Time Area Curve	[11] Total Basin Area (sm)
205I	0.35388	0.11	326	0.20	0.37	5.20	0.28	15.18	Natural	
205J	0.36947	0.08	243	0.21	0.35	4.90	0.30	3.48	Natural	
205K	0.24538	0.10	249	0.16	0.38	5.60	0.22	1.54	Natural	
205L	0.11764	0.09	284	0.19	0.36	5.00	0.29	0.00	Natural	
205M	0.13853	0.05	230	0.15	0.31	5.40	0.22	22.35	Urban	
205N	0.15606	0.10	245	0.15	0.39	5.70	0.21	0.80	HEC-1	2.91240
206A	0.12778	0.04	256	0.12	0.28	5.30	0.23	33.34	Urban	
206B	0.09522	0.03	139	0.10	0.26	5.20	0.23	41.42	Urban	
206C	0.02378	0.04	138	0.11	0.26	4.35	0.36	28.55	Urban	
206D	0.06165	0.03	236	0.08	0.25	5.70	0.18	43.01	Urban	
206E	0.02274	0.03	175	0.09	0.25	4.30	0.36	25.75	Urban	
206F	0.15713	0.03	217	0.09	0.25	4.60	0.30	24.97	Urban	
206G	0.08946	0.03	132	0.11	0.26	5.20	0.23	29.86	Urban	
206H	0.05895	0.03	183	0.08	0.25	5.70	0.18	36.29	Urban	
206I	0.02083	0.03	286	0.08	0.25	5.70	0.18	34.78	Urban	
206J	0.05990	0.03	214	0.08	0.25	5.70	0.18	44.51	Urban	
206K	0.05577	0.03	255	0.09	0.25	5.70	0.18	25.80	Urban	
206L	0.05951	0.03	231	0.09	0.25	5.80	0.18	25.01	Urban	
206M	0.05958	0.03	166	0.08	0.25	5.20	0.23	46.18	Urban	
206N	0.15176	0.03	120	0.11	0.27	4.65	0.29	52.66	Urban	1.04406
207A	0.25609	0.13	351	0.24	0.35	4.55	0.37	29.81	Natural	
207B	0.20823	0.13	359	0.24	0.35	4.45	0.38	32.42	Natural	
207C	0.17298	0.11	297	0.19	0.37	5.30	0.26	13.69	Natural	
207D	0.19708	0.09	373	0.18	0.31	4.35	0.38	41.30	HEC-1	
207E	0.15651	0.07	315	0.15	0.29	4.35	0.38	44.41	Urban	
207F	0.12613	0.11	296	0.20	0.32	4.40	0.39	38.35	HEC-1	
207G	0.23634	0.10	198	0.17	0.37	5.60	0.23	9.10	HEC-1	
207H	0.12447	0.05	371	0.13	0.27	4.35	0.36	46.78	Urban	
207I	0.07294	0.03	320	0.09	0.25	4.40	0.35	50.00	Urban	
207J	0.09277	0.04	248	0.10	0.26	4.40	0.34	48.61	Urban	
207K	0.12955	0.05	294	0.11	0.27	5.40	0.21	37.19	Urban	
207L	0.08040	0.04	236	0.09	0.26	6.00	0.16	33.25	Urban	
207M	0.11594	0.04	295	0.11	0.28	6.00	0.17	23.09	Urban	
207N	0.04918	0.03	190	0.09	0.25	4.80	0.27	35.87	Urban	
207O	0.13051	0.04	275	0.13	0.29	5.60	0.21	23.47	Urban	2.14911
208A	0.13859	0.03	366	0.09	0.25	4.35	0.35	49.86	Urban	
208B	0.02690	0.03	325	0.09	0.25	4.35	0.35	50.00	Urban	
208C	0.06644	0.11	387	0.20	0.32	4.35	0.38	40.11	HEC-1	
208D	0.07452	0.03	327	0.09	0.25	4.35	0.35	50.00	Urban	

Table S-9

Summary of Future Condition Subbasin Parameters

[1] Subbasin ID	[2] Area (sm)	[3] Kb	[4] Slope (ft/mi)	[5] IA (in)	[6] DTHETA	[7] PSIF (in)	[8] XKSAT (in/hr)	[9] RTIMP (%)	[10] Time Area Curve	[11] Total Basin Area (sm)
208E	0.06205	0.03	306	0.09	0.25	4.35	0.35	50.00	Urban	
208F	0.06910	0.03	293	0.09	0.25	4.35	0.35	49.92	Urban	
208G	0.12941	0.04	299	0.11	0.26	4.60	0.31	54.19	Urban	
208H	0.04276	0.07	283	0.12	0.30	5.60	0.21	35.43	Urban	
208I	0.11709	0.03	363	0.09	0.25	4.35	0.35	50.00	Urban	
208J	0.08107	0.03	353	0.09	0.25	4.35	0.35	50.00	Urban	
208K	0.04756	0.03	317	0.09	0.25	4.35	0.35	54.38	Urban	
208L	0.05884	0.03	334	0.09	0.25	4.40	0.35	51.31	Urban	
208M	0.15941	0.03	321	0.09	0.25	4.40	0.34	62.04	Urban	
208N	0.04713	0.04	160	0.09	0.25	6.20	0.15	62.49	Urban	
208O	0.22988	0.03	347	0.09	0.25	4.60	0.31	48.49	Urban	
208P	0.05837	0.03	312	0.08	0.25	5.70	0.18	59.29	Urban	
208Q	0.09426	0.04	324	0.10	0.26	5.00	0.25	54.26	Urban	
208R	0.01047	0.03	327	0.08	0.23	6.20	0.15	55.16	Urban	
208S	0.06825	0.03	234	0.08	0.24	6.20	0.15	67.07	Urban	
208T	0.13175	0.03	340	0.09	0.25	5.20	0.22	44.80	Urban	
208U	0.13368	0.03	360	0.09	0.25	5.30	0.21	44.19	Urban	
208V	0.02781	0.03	319	0.09	0.21	6.40	0.15	41.15	Urban	
208W	0.05043	0.03	288	0.09	0.23	6.20	0.16	42.74	Urban	
208X	0.07543	0.05	223	0.13	0.29	5.60	0.21	39.42	Urban	2.00121
209A	0.36779	0.08	367	0.18	0.31	4.35	0.38	41.41	HEC-1	
209B	0.08313	0.03	403	0.09	0.25	4.35	0.35	50.00	Urban	
209C	0.06387	0.05	342	0.11	0.26	4.35	0.36	48.03	Urban	
209D	0.24418	0.04	354	0.11	0.26	4.35	0.36	48.63	Urban	
209E	0.14899	0.03	341	0.09	0.25	4.35	0.35	50.00	Urban	
209F	0.22574	0.09	332	0.18	0.31	4.50	0.36	40.21	HEC-1	
209G	0.20380	0.03	306	0.09	0.25	4.35	0.35	49.93	Urban	
209H	0.08348	0.07	343	0.15	0.31	5.60	0.22	26.57	Urban	
209I	0.18233	0.04	347	0.10	0.27	6.00	0.17	17.98	Urban	1.60331
210A	0.12274	0.03	233	0.09	0.25	5.00	0.24	16.65	Urban	
210B	0.10672	0.03	251	0.08	0.25	5.80	0.17	37.15	Urban	
210C	0.08171	0.03	198	0.11	0.26	4.80	0.28	22.29	Urban	
210D	0.13967	0.03	325	0.09	0.25	5.80	0.18	33.66	Urban	
210E	0.02753	0.03	151	0.09	0.17	6.80	0.12	15.00	Urban	
210F	0.09263	0.03	349	0.09	0.25	4.40	0.34	49.44	Urban	
210G	0.16152	0.03	333	0.09	0.25	5.30	0.22	39.22	Urban	
210H	0.06974	0.03	340	0.09	0.23	6.20	0.16	21.74	Urban	
210I	0.04910	0.03	250	0.09	0.15	7.60	0.09	15.00	Urban	
210J	0.10328	0.03	187	0.09	0.19	6.60	0.13	15.00	Urban	

Table S-9

Summary of Future Condition Subbasin Parameters

[1] Subbasin ID	[2] Area (sm)	[3] Kb	[4] Slope (ft/mi)	[5] IA (in)	[6] DTHETA	[7] PSIF (in)	[8] XKSAT (in/hr)	[9] RTIMP (%)	[10] Time Area Curve	[11] Total Basin Area (sm)
210K	0.07706	0.03	207	0.09	0.19	6.60	0.13	15.00	Urban	
210L	0.13741	0.03	251	0.09	0.25	5.20	0.23	15.90	Urban	
210M	0.16239	0.03	232	0.09	0.25	5.80	0.17	15.02	Urban	
210N	0.04852	0.03	178	0.09	0.25	4.10	0.40	16.38	Urban	1.38000
211A	0.14294	0.03	248	0.09	0.25	5.70	0.18	23.09	Urban	
211B	0.10855	0.03	244	0.09	0.25	5.80	0.18	20.22	Urban	
211C	0.04277	0.03	154	0.08	0.25	5.70	0.18	44.48	Urban	
211D	0.07054	0.03	115	0.08	0.25	3.85	0.46	37.42	Urban	
211E	0.15557	0.03	118	0.08	0.25	5.10	0.24	42.21	Urban	
211F	0.11280	0.03	134	0.08	0.25	4.30	0.36	62.81	Urban	
211G	0.00759	0.04	190	0.06	0.25	5.70	0.18	90.00	Urban	
211H	0.07345	0.03	289	0.09	0.25	6.00	0.16	17.93	Urban	
211I	0.04077	0.03	257	0.08	0.25	5.70	0.18	45.00	Urban	
211J	0.01480	0.03	166	0.08	0.23	6.20	0.16	39.19	Urban	
211K	0.10197	0.03	157	0.13	0.27	6.00	0.16	31.48	Urban	
211L	0.09575	0.03	181	0.11	0.26	4.35	0.36	42.40	Urban	
211M	0.08133	0.03	266	0.07	0.25	5.70	0.18	50.05	Urban	
211N	0.02038	0.03	235	0.07	0.25	5.70	0.18	56.58	Urban	
211O	0.04119	0.03	257	0.08	0.25	5.70	0.18	45.31	Urban	
211P	0.03347	0.03	192	0.08	0.15	7.00	0.11	45.00	Urban	
211Q	0.02107	0.03	295	0.08	0.25	5.70	0.18	30.04	Urban	
211R	0.08438	0.03	271	0.08	0.25	5.70	0.18	37.77	Urban	
211S	0.05041	0.07	272	0.11	0.31	5.70	0.19	30.06	Urban	
211T	0.06637	0.03	250	0.07	0.25	5.70	0.18	64.25	Urban	
211U	0.02744	0.03	214	0.07	0.25	5.70	0.18	65.99	Urban	
211V	0.00490	0.04	212	0.06	0.25	5.80	0.18	90.00	Urban	
211W	0.02969	0.03	173	0.06	0.25	5.70	0.18	73.65	Urban	
211X	0.21393	0.03	111	0.10	0.26	4.90	0.26	56.64	Urban	
211Y	0.08928	0.04	147	0.09	0.21	6.60	0.13	50.06	Urban	
211Z	0.08254	0.04	147	0.14	0.27	4.50	0.34	34.43	Urban	
211AA	0.03399	0.03	85	0.08	0.19	6.60	0.13	39.38	Urban	
211AB	0.03974	0.03	321	0.07	0.17	6.80	0.12	54.72	Urban	
211AC	0.02745	0.03	82	0.08	0.15	8.40	0.07	44.76	Urban	
211AD	0.04132	0.03	280	0.08	0.15	8.00	0.08	46.16	Urban	
211AE	0.03443	0.04	153	0.12	0.24	6.40	0.15	38.15	Urban	
211AF	0.05270	0.03	292	0.07	0.25	5.80	0.17	52.43	Urban	2.04349

Total Watershed Are **16.50481**
(excluding non-contributing area)

APPENDIX D

Clark unit hydrograph parameter values from the Ftn Hills FDS report

Table S-7

Future Condition Subbasin Time of Concentration Parameters

[1] Subbasin ID	[2] Drainage Area (sm)	[3] Elevation Top	[4] Elevation Bottom	[5] Flow Path (miles)	[6] Slope (ft/mi)	[7] Adjust. Slope (ft/mi)	[8] Valley Area (%)	[9] Hillslope Area (%)	[10] Mountain Area (%)	[11] Urban Area %	[12] Weighted Kb Equation Parameters m	[13] Weighted Kb Equation Parameters b	[14] Kb
201A	0.21655	1903.0	1639.0	1.269	208	208	0.0%	68.2%	0.0%	31.8%	-0.01905	0.12	0.07
201B	0.08068	1791.0	1639.0	0.680	223	223	0.0%	92.7%	0.0%	7.3%	-0.02362	0.14	0.10
201C	0.07857	1717.0	1578.0	0.674	206	206	0.0%	4.6%	0.0%	95.4%	-0.00712	0.05	0.03
201D	0.07093	1764.0	1578.0	0.898	207	207	0.0%	65.0%	0.0%	35.0%	-0.01844	0.11	0.08
201E	0.18315	1754.0	1533.0	1.245	178	178	0.0%	69.9%	0.0%	30.1%	-0.01936	0.12	0.08
202A	0.03778	1590.0	1537.2	0.409	129	129	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
202B	0.01794	1764.0	1536.0	0.364	627	322	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
202C	0.00765	1764.0	1529.0	0.192	1227	363	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.04
202D	0.06258	1740.0	1525.0	0.800	269	248	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
202E	0.10408	1757.0	1523.6	0.732	319	270	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
202F	0.01309	1678.0	1526.0	0.188	809	337	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
202G	0.01316	1676.0	1534.4	0.175	811	338	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
202H	0.17938	1759.0	1534.5	0.861	261	243	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
202I	0.01747	1556.0	1526.0	0.247	122	122	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
203A	0.27918	2159.0	1791.7	1.569	234	229	0.0%	83.7%	0.0%	16.3%	-0.02194	0.13	0.08
203B	0.04446	1853.0	1734.0	0.484	246	236	0.0%	10.8%	0.0%	89.2%	-0.00828	0.05	0.04
203C	0.10306	2020.0	1734.0	0.988	290	258	0.0%	57.8%	0.0%	42.2%	-0.01710	0.10	0.07
203D	0.10805	2012.0	1728.0	1.025	277	252	0.0%	65.5%	0.0%	34.5%	-0.01854	0.11	0.08
203E	0.09335	1806.0	1666.0	0.640	219	219	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
203F	0.33332	2171.0	1809.0	1.460	248	237	0.0%	100.0%	0.0%	0.0%	-0.02500	0.15	0.09
203G	0.24821	1972.0	1666.0	1.424	215	215	0.0%	63.1%	0.0%	36.9%	-0.01809	0.11	0.07
203H	0.20675	1774.0	1590.0	1.035	178	178	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
203I	0.17071	1764.0	1551.0	1.323	161	161	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
203J	0.03885	1710.0	1578.0	0.533	248	237	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
203K	0.16019	1654.0	1515.0	0.878	158	158	0.0%	3.4%	0.0%	96.6%	-0.00689	0.04	0.03
204A	0.10768	1834.0	1714.0	0.687	175	175	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
204B	0.12598	1749.0	1649.6	0.775	128	128	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
204C	0.07669	1676.0	1619.0	0.400	142	142	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
204D	0.04409	1630.0	1597.0	0.345	96	96	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
204E	0.07051	1620.0	1565.0	0.508	108	108	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03

Table S-7

Future Condition Subbasin Time of Concentration Parameters

[1] Subbasin ID	[2] Drainage Area (sm)	[3] Elevation Top	[4] Elevation Bottom	[5] Flow Path (miles)	[6] Slope (ft/mi)	[7] Adjust. Slope (ft/mi)	[8] Valley Area (%)	[9] Hillslope Area (%)	[10] Mountain Area (%)	[11] Urban Area %	[12] Weighted Kb Equation Parameters m	[13] Weighted Kb Equation Parameters b	[14] Kb
204F	0.07714	1593.0	1526.1	0.495	135	135	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
205A	0.11753	3985.0	2622.0	0.870	1567	378	0.0%	0.0%	100.0%	0.0%	-0.03000	0.20	0.14
205B	0.21124	2720.0	2622.0	0.759	129	129	0.0%	0.0%	100.0%	0.0%	-0.03000	0.20	0.14
205C	0.05877	2890.0	2438.0	0.618	731	331	0.0%	0.0%	100.0%	0.0%	-0.03000	0.20	0.15
205D	0.31907	3690.0	2480.0	1.020	1186	361	0.0%	0.0%	100.0%	0.0%	-0.03000	0.20	0.13
205E	0.21753	4025.0	2480.0	1.357	1138	358	0.0%	0.0%	100.0%	0.0%	-0.03000	0.20	0.14
205F	0.16126	2865.0	2340.0	0.786	668	326	0.0%	0.0%	100.0%	0.0%	-0.03000	0.20	0.14
205G	0.18549	2940.0	2183.0	0.924	819	338	0.0%	10.8%	89.2%	0.0%	-0.02946	0.19	0.13
205H	0.26054	3145.0	2183.0	1.464	657	325	0.0%	9.9%	90.1%	0.0%	-0.02951	0.20	0.13
205I	0.35388	3145.0	2139.0	1.487	676	326	1.3%	55.3%	43.4%	0.0%	-0.02702	0.17	0.11
205J	0.36947	2391.0	1967.0	1.633	260	243	24.6%	65.5%	9.9%	0.0%	-0.02273	0.14	0.08
205K	0.24538	2449.0	1967.0	1.772	272	249	2.8%	92.7%	4.4%	0.0%	-0.02490	0.15	0.10
205L	0.11764	2169.0	1922.0	0.701	352	284	20.7%	79.3%	0.0%	0.0%	-0.02267	0.14	0.09
205M	0.13853	2049.0	1851.9	0.839	235	230	18.0%	26.3%	0.0%	55.6%	-0.01254	0.08	0.05
205N	0.15606	2163.0	1851.9	1.183	263	245	1.1%	97.1%	0.0%	1.8%	-0.02454	0.15	0.10
206A	0.12778	2002.0	1821.0	0.631	287	256	13.7%	9.6%	0.0%	76.7%	-0.00908	0.06	0.04
206B	0.09522	1855.0	1775.8	0.570	139	139	7.5%	0.0%	0.0%	92.5%	-0.00681	0.04	0.03
206C	0.02378	1789.0	1730.0	0.427	138	138	7.8%	0.0%	0.0%	92.2%	-0.00684	0.04	0.04
206D	0.06165	1909.0	1778.0	0.531	247	236	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
206E	0.02274	1790.0	1730.0	0.343	175	175	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
206F	0.15713	1856.0	1644.0	0.975	217	217	2.0%	0.0%	0.0%	98.0%	-0.00640	0.04	0.03
206G	0.08946	1733.0	1608.0	0.950	132	132	10.3%	0.0%	0.0%	89.7%	-0.00703	0.04	0.03
206H	0.05895	1813.0	1718.5	0.515	183	183	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
206I	0.02083	1797.0	1714.0	0.232	357	286	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
206J	0.05990	1755.0	1647.5	0.502	214	214	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
206K	0.05577	1876.0	1702.0	0.615	283	255	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
206L	0.05951	1802.0	1672.0	0.546	238	231	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
206M	0.05958	1685.0	1608.0	0.465	166	166	2.9%	0.0%	0.0%	97.1%	-0.00647	0.04	0.03
206N	0.15176	1644.0	1552.0	0.767	120	120	16.2%	0.0%	0.0%	83.8%	-0.00746	0.05	0.03
207A	0.25609	3615.0	2237.0	1.356	1016	351	0.0%	14.8%	85.2%	0.0%	-0.02926	0.19	0.13

Table S-7

Future Condition Subbasin Time of Concentration Parameters

[1] Subbasin ID	[2] Drainage Area (sm)	[3] Elevation Top	[4] Elevation Bottom	[5] Flow Path (miles)	[6] Slope (ft/mi)	[7] Adjust. Slope (ft/mi)	[8] Valley Area (%)	[9] Hillslope Area (%)	[10] Mountain Area (%)	[11] Urban Area %	[12] Weighted Kb Equation Parameters m	[13] Weighted Kb Equation Parameters b	[14] Kb
207B	0.20823	3750.0	2237.0	1.312	1154	359	0.0%	7.4%	92.6%	0.0%	-0.02963	0.20	0.13
207C	0.17298	2454.0	2074.0	0.974	390	297	0.0%	60.9%	39.1%	0.0%	-0.02696	0.17	0.11
207D	0.19708	3800.0	2307.0	1.036	1440	373	0.0%	0.0%	58.0%	42.0%	-0.02002	0.13	0.09
207E	0.15651	2837.0	2074.0	1.366	559	315	0.0%	0.0%	37.3%	62.7%	-0.01510	0.10	0.07
207F	0.12613	2355.0	2029.0	0.794	411	296	0.0%	0.0%	68.8%	31.2%	-0.02259	0.15	0.11
207G	0.23634	2259.0	1968.0	1.467	198	198	0.0%	70.8%	23.4%	5.8%	-0.02508	0.16	0.10
207H	0.12447	3740.0	2291.0	1.044	1388	371	0.0%	0.0%	21.5%	78.5%	-0.01134	0.07	0.05
207I	0.07294	2619.0	2129.0	0.810	605	320	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
207J	0.09277	2161.0	1968.0	0.714	270	248	0.0%	0.0%	5.3%	94.7%	-0.00752	0.05	0.04
207K	0.12955	2253.0	1908.2	0.859	402	294	0.0%	0.0%	16.4%	83.6%	-0.01015	0.07	0.05
207L	0.08040	2073.0	1908.2	0.667	247	236	0.0%	8.2%	0.0%	91.8%	-0.00779	0.05	0.04
207M	0.11594	2087.0	1844.0	0.636	382	295	3.0%	19.5%	0.0%	77.5%	-0.01013	0.06	0.04
207N	0.04918	1939.0	1857.0	0.431	190	190	2.9%	0.0%	0.0%	97.1%	-0.00647	0.04	0.03
207O	0.13051	2020.0	1807.2	0.643	331	275	14.6%	12.8%	0.0%	72.6%	-0.00975	0.06	0.04
208A	0.13859	3234.0	2425.0	0.626	1292	366	0.0%	0.0%	0.9%	99.1%	-0.00647	0.04	0.03
208B	0.02690	2551.0	2225.0	0.491	663	325	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
208C	0.06644	3800.0	2639.0	0.639	1816	387	0.0%	0.0%	66.0%	34.0%	-0.02191	0.15	0.11
208D	0.07452	2756.0	2225.0	0.772	688	327	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
208E	0.06205	2390.0	2076.0	0.644	488	306	0.0%	0.0%	1.1%	98.9%	-0.00650	0.04	0.03
208F	0.06910	2296.0	2076.0	0.582	378	293	0.0%	0.0%	1.4%	98.6%	-0.00658	0.04	0.03
208G	0.12941	2253.0	1947.0	0.772	396	299	0.0%	0.0%	13.9%	86.1%	-0.00955	0.06	0.04
208H	0.04276	2094.0	1872.0	0.632	351	283	0.0%	19.5%	17.8%	62.7%	-0.01413	0.09	0.07
208I	0.11709	3088.0	2074.0	0.823	1231	363	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
208J	0.08107	3088.0	2074.0	0.974	1041	353	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
208K	0.04756	2265.0	2014.0	0.431	582	317	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
208L	0.05884	2517.0	2014.0	0.655	769	334	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
208M	0.15941	2509.0	1872.0	1.031	618	321	0.0%	0.0%	0.2%	99.8%	-0.00629	0.04	0.03
208N	0.04713	1899.0	1805.0	0.589	160	160	0.0%	12.7%	0.6%	86.7%	-0.00877	0.05	0.04
208O	0.22988	3056.0	1939.0	1.174	952	347	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
208P	0.05837	2122.0	1870.4	0.471	535	312	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03

Table S-7

Future Condition Subbasin Time of Concentration Parameters

[1] Subbasin ID	[2] Drainage Area (sm)	[3] Elevation Top	[4] Elevation Bottom	[5] Flow Path (miles)	[6] Slope (ft/mi)	[7] Adjust. Slope (ft/mi)	[8] Valley Area (%)	[9] Hillslope Area (%)	[10] Mountain Area (%)	[11] Urban Area %	[12] Weighted Kb Equation Parameters m	[13] Weighted Kb Equation Parameters b	[14] Kb
208Q	0.09426	2402.0	1870.4	0.823	646	324	0.0%	0.0%	9.0%	91.0%	-0.00840	0.05	0.04
208R	0.01047	2089.0	1926.0	0.238	686	327	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
208S	0.06825	1943.0	1805.0	0.568	243	234	0.0%	6.5%	0.0%	93.5%	-0.00747	0.05	0.03
208T	0.13175	2612.0	1947.0	0.787	845	340	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
208U	0.13368	2536.0	1947.0	0.507	1162	360	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
208V	0.02781	2130.0	1917.0	0.354	601	319	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
208W	0.05043	1991.0	1818.0	0.475	364	288	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
208X	0.07543	1870.0	1777.1	0.417	223	223	12.6%	19.4%	0.0%	68.0%	-0.01084	0.07	0.05
209A	0.36779	3770.0	2426.0	1.028	1308	367	0.0%	0.0%	57.3%	42.7%	-0.01985	0.13	0.08
209B	0.08313	3999.0	2321.0	0.716	2345	403	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
209C	0.06387	2951.0	2321.0	0.723	871	342	0.0%	0.0%	13.2%	86.8%	-0.00938	0.06	0.05
209D	0.24418	3065.0	2218.0	0.800	1059	354	0.0%	0.0%	9.1%	90.9%	-0.00841	0.05	0.04
209E	0.14899	3094.0	2218.0	1.018	861	341	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
209F	0.22574	2921.0	2034.0	1.191	745	332	0.0%	0.0%	55.3%	44.7%	-0.01938	0.13	0.09
209G	0.20380	2545.0	2034.0	1.050	487	306	0.0%	0.0%	0.5%	99.5%	-0.00637	0.04	0.03
209H	0.08348	2470.0	1994.0	0.542	878	343	0.0%	17.7%	26.9%	55.4%	-0.01596	0.10	0.07
209I	0.18233	2536.0	1883.5	0.691	945	347	0.0%	12.9%	2.4%	84.7%	-0.00923	0.06	0.04
210A	0.12274	1874.0	1722.0	0.631	241	233	0.8%	0.0%	0.0%	99.2%	-0.00631	0.04	0.03
210B	0.10672	2062.0	1805.6	0.930	276	251	0.0%	0.5%	0.0%	99.5%	-0.00634	0.04	0.03
210C	0.08171	1854.0	1728.0	0.637	198	198	5.8%	0.0%	0.0%	94.2%	-0.00669	0.04	0.03
210D	0.13967	2390.0	1836.0	0.832	666	325	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
210E	0.02753	1849.0	1798.0	0.339	151	151	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
210F	0.09263	2529.0	1872.0	0.668	983	349	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
210G	0.16152	2529.0	1798.0	0.969	755	333	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
210H	0.06974	2351.0	1875.0	0.565	842	340	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
210I	0.04910	1944.0	1770.0	0.634	275	250	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
210J	0.10328	1856.0	1728.0	0.684	187	187	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
210K	0.07706	1804.0	1716.0	0.425	207	207	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
210L	0.13741	2013.0	1787.0	0.820	276	251	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
210M	0.16239	1961.0	1716.0	1.022	240	232	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03

Table S-7

Future Condition Subbasin Time of Concentration Parameters

[1] Subbasin ID	[2] Drainage Area (sm)	[3] Elevation Top	[4] Elevation Bottom	[5] Flow Path (miles)	[6] Slope (ft/mi)	[7] Adjust. Slope (ft/mi)	[8] Valley Area (%)	[9] Hillslope Area (%)	[10] Mountain Area (%)	[11] Urban Area %	[12] Weighted Kb Equation Parameters m	[13] Weighted Kb Equation Parameters b	[14] Kb
210N	0.04852	1749.0	1693.9	0.309	178	178	0.3%	0.0%	0.0%	99.7%	-0.00627	0.04	0.03
211A	0.14294	1972.0	1751.0	0.820	269	248	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211B	0.10855	1870.0	1708.7	0.618	261	244	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211C	0.04277	1757.0	1683.0	0.479	154	154	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211D	0.07054	1762.0	1683.0	0.686	115	115	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211E	0.15557	1700.0	1628.0	0.609	118	118	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211F	0.11280	1675.0	1572.0	0.770	134	134	3.4%	0.0%	0.0%	96.6%	-0.00650	0.04	0.03
211G	0.00759	1982.0	1897.0	0.448	190	190	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.04
211H	0.07345	1912.0	1728.0	0.501	368	289	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211I	0.04077	1898.0	1717.0	0.626	289	257	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211J	0.01480	1728.0	1686.6	0.249	166	166	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211K	0.10197	1731.0	1672.0	0.376	157	157	16.4%	0.0%	0.0%	83.6%	-0.00748	0.05	0.03
211L	0.09575	1719.0	1627.0	0.508	181	181	14.4%	0.0%	0.0%	85.6%	-0.00733	0.05	0.03
211M	0.08133	1874.0	1707.0	0.541	308	266	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211N	0.02038	1748.0	1684.0	0.261	245	235	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211O	0.04119	1800.0	1693.4	0.371	288	257	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211P	0.03347	1718.0	1659.0	0.307	192	192	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211Q	0.02107	1964.0	1860.0	0.255	408	295	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211R	0.08438	1981.0	1797.5	0.572	321	271	0.0%	0.1%	0.0%	99.9%	-0.00627	0.04	0.03
211S	0.05041	1875.0	1731.5	0.445	323	272	0.0%	42.6%	0.0%	57.4%	-0.01425	0.09	0.07
211T	0.06637	1813.0	1679.1	0.488	274	250	0.0%	1.9%	0.0%	98.1%	-0.00660	0.04	0.03
211U	0.02744	2023.0	1845.0	0.831	214	214	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211V	0.00490	1847.0	1800.0	0.222	212	212	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.04
211W	0.02969	1713.0	1663.0	0.289	173	173	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211X	0.21393	1675.0	1572.0	0.929	111	111	12.7%	0.0%	0.0%	87.3%	-0.00721	0.05	0.03
211Y	0.08928	1641.0	1552.0	0.606	147	147	5.2%	6.3%	0.0%	88.5%	-0.00782	0.05	0.04
211Z	0.08254	1592.0	1517.0	0.509	147	147	23.5%	0.0%	0.0%	76.5%	-0.00801	0.05	0.04
211AA	0.03399	1592.0	1551.0	0.480	85	85	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211AB	0.03974	1721.0	1540.0	0.293	617	321	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211AC	0.02745	1557.0	1532.0	0.306	82	82	0.0%	0.5%	0.0%	99.5%	-0.00635	0.04	0.03

Table S-7

Future Condition Subbasin Time of Concentration Parameters

[1] Subbasin ID	[2] Drainage Area (sm)	[3] Elevation Top	[4] Elevation Bottom	[5] Flow Path (miles)	[6] Slope (ft/mi)	[7] Adjust. Slope (ft/mi)	[8] Valley Area (%)	[9] Hillslope Area (%)	[10] Mountain Area (%)	[11] Urban Area %	[12] Weighted Kb Equation Parameters m	[13] Weighted Kb Equation Parameters b	[14] Kb
211AD	0.04132	1684.0	1517.0	0.489	341	280	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03
211AE	0.03443	1552.0	1504.0	0.313	153	153	15.2%	0.0%	0.0%	84.8%	-0.00739	0.05	0.04
211AF	0.05270	1666.0	1542.0	0.332	373	292	0.0%	0.0%	0.0%	100.0%	-0.00625	0.04	0.03

Note: The composite m and b values listed are based on the following:

	m	b
Urban:	-0.00625	0.04
Valley (desert rangeland):	-0.01375	0.08
Hillslope	-0.02500	0.15
Mountain	-0.03000	0.20

Table S-10

Summary of Clark Unit Hydrograph Parameters
100-year and 10-year Future Condition Tc and R values

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	Tc				R			
Subbasin	100-year		10-year		100-year		10-year	
ID	6-hour (hours)	24-hour (hours)	6-hour (hours)	24-hour (hours)	6-hour (hours)	24-hour (hours)	6-hour (hours)	24-hour (hours)
201A	0.354	0.400	0.471	0.483	0.338	0.387	0.464	0.478
201B	0.292	0.350	0.392	0.425	0.291	0.356	0.403	0.441
201C	0.150	0.183	0.179	0.217	0.140	0.175	0.171	0.211
201D	0.304	0.363	0.404	0.433	0.409	0.497	0.561	0.606
201E	0.413	0.450	0.575	0.579	0.434	0.478	0.628	0.633
202A	0.138	0.171	0.163	0.200	0.129	0.165	0.156	0.196
202B	0.096	0.121	0.117	0.142	0.121	0.156	0.150	0.186
202C	0.083	0.096	0.092	0.113	0.101	0.118	0.112	0.141
202D	0.154	0.192	0.183	0.225	0.189	0.240	0.229	0.287
202E	0.142	0.175	0.171	0.208	0.120	0.151	0.147	0.184
202F	0.083	0.083	0.083	0.096	0.073	0.073	0.073	0.085
202G	0.083	0.083	0.083	0.092	0.069	0.069	0.069	0.076
202H	0.163	0.200	0.192	0.233	0.116	0.146	0.140	0.174
202I	0.104	0.129	0.125	0.150	0.099	0.125	0.121	0.148
203A	0.433	0.467	0.613	0.613	0.434	0.471	0.637	0.637
203B	0.142	0.175	0.167	0.204	0.140	0.176	0.167	0.209
203C	0.271	0.329	0.350	0.396	0.314	0.390	0.417	0.478
203D	0.308	0.363	0.408	0.438	0.363	0.435	0.496	0.536
203E	0.142	0.175	0.167	0.204	0.114	0.145	0.137	0.171
203F	0.450	0.479	0.658	0.650	0.386	0.414	0.589	0.581
203G	0.375	0.421	0.504	0.508	0.366	0.416	0.508	0.513
203H	0.196	0.242	0.233	0.283	0.153	0.193	0.186	0.230
203I	0.229	0.283	0.279	0.333	0.247	0.313	0.308	0.375
203J	0.125	0.154	0.150	0.179	0.142	0.179	0.173	0.211
203K	0.183	0.225	0.217	0.267	0.144	0.181	0.173	0.218
204A	0.158	0.196	0.188	0.229	0.126	0.160	0.152	0.190
204B	0.188	0.229	0.221	0.271	0.153	0.192	0.184	0.231
204C	0.129	0.158	0.150	0.179	0.079	0.099	0.094	0.114
204D	0.133	0.167	0.158	0.192	0.100	0.128	0.121	0.150
204E	0.158	0.196	0.188	0.225	0.126	0.160	0.152	0.186
204F	0.146	0.175	0.171	0.204	0.107	0.131	0.128	0.156
205A	0.350	0.400	0.471	0.492	0.350	0.406	0.486	0.510
205B	0.508	0.538	0.696	0.729	0.340	0.361	0.481	0.507
205C	0.308	0.367	0.417	0.446	0.343	0.416	0.479	0.517
205D	0.379	0.425	0.513	0.529	0.246	0.279	0.343	0.356
205E	0.488	0.517	0.671	0.700	0.508	0.541	0.723	0.758
205F	0.350	0.400	0.471	0.492	0.269	0.312	0.374	0.393
205G	0.367	0.417	0.500	0.517	0.298	0.343	0.420	0.436
205H	0.513	0.542	0.713	0.742	0.514	0.547	0.742	0.775
205I	0.458	0.488	0.658	0.667	0.386	0.414	0.578	0.586
205J	0.450	0.479	0.667	0.667	0.398	0.427	0.616	0.616
205K	0.546	0.579	0.817	0.808	0.665	0.710	1.040	1.028
205L	0.254	0.317	0.346	0.396	0.206	0.263	0.290	0.337

Table S-10

Summary of Clark Unit Hydrograph Parameters
100-year and 10-year Future Condition Tc and R values

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	Tc				R			
Subbasin	100-year		10-year		100-year		10-year	
ID	6-hour (hours)	24-hour (hours)	6-hour (hours)	24-hour (hours)	6-hour (hours)	24-hour (hours)	6-hour (hours)	24-hour (hours)
205M	0.213	0.263	0.258	0.313	0.178	0.225	0.221	0.273
205N	0.413	0.450	0.592	0.588	0.457	0.503	0.681	0.676
206A	0.158	0.196	0.188	0.229	0.107	0.135	0.129	0.161
206B	0.154	0.192	0.183	0.225	0.113	0.144	0.137	0.172
206C	0.158	0.196	0.192	0.238	0.204	0.258	0.252	0.320
206D	0.125	0.154	0.150	0.183	0.109	0.137	0.133	0.166
206E	0.113	0.142	0.138	0.171	0.120	0.155	0.150	0.191
206F	0.179	0.221	0.213	0.263	0.154	0.195	0.187	0.236
206G	0.204	0.254	0.246	0.300	0.241	0.307	0.296	0.369
206H	0.138	0.167	0.158	0.196	0.121	0.150	0.141	0.179
206I	0.083	0.096	0.092	0.113	0.066	0.077	0.074	0.092
206K	0.125	0.154	0.150	0.183	0.105	0.133	0.129	0.161
206L	0.133	0.167	0.158	0.196	0.139	0.178	0.168	0.213
206J	0.129	0.158	0.154	0.188	0.117	0.147	0.143	0.178
206M	0.133	0.163	0.158	0.192	0.107	0.133	0.129	0.160
206N	0.188	0.233	0.225	0.271	0.137	0.174	0.167	0.206
207A	0.467	0.496	0.650	0.675	0.440	0.471	0.636	0.663
207B	0.450	0.483	0.621	0.646	0.463	0.502	0.662	0.692
207C	0.354	0.404	0.492	0.496	0.311	0.360	0.448	0.452
207D	0.288	0.346	0.371	0.413	0.241	0.296	0.319	0.359
207E	0.308	0.363	0.400	0.433	0.370	0.443	0.494	0.540
207F	0.304	0.363	0.400	0.438	0.267	0.325	0.362	0.400
207G	0.521	0.554	0.763	0.767	0.555	0.594	0.847	0.852
207H	0.204	0.250	0.242	0.296	0.215	0.270	0.260	0.325
207I	0.142	0.175	0.171	0.208	0.159	0.201	0.196	0.244
207J	0.171	0.208	0.200	0.246	0.154	0.192	0.184	0.231
207K	0.196	0.242	0.233	0.288	0.172	0.217	0.209	0.263
207L	0.167	0.204	0.196	0.238	0.154	0.193	0.184	0.228
207M	0.150	0.188	0.179	0.221	0.107	0.137	0.130	0.165
207O	0.125	0.150	0.146	0.179	0.104	0.128	0.124	0.156
207N	0.158	0.192	0.188	0.229	0.107	0.133	0.129	0.162
210A	0.121	0.150	0.142	0.175	0.075	0.096	0.090	0.113
208A	0.113	0.138	0.133	0.163	0.146	0.182	0.176	0.219
208B	0.238	0.296	0.300	0.354	0.246	0.314	0.319	0.383
208C	0.138	0.171	0.167	0.200	0.146	0.186	0.181	0.221
208D	0.129	0.158	0.154	0.188	0.131	0.164	0.159	0.198
208E	0.125	0.154	0.150	0.179	0.109	0.138	0.134	0.163
208F	0.167	0.204	0.196	0.238	0.132	0.165	0.158	0.196
208G	0.204	0.254	0.246	0.300	0.265	0.338	0.326	0.406
208H	0.138	0.171	0.167	0.200	0.119	0.151	0.147	0.180
208I	0.154	0.188	0.179	0.221	0.190	0.237	0.225	0.284
208J	0.104	0.129	0.125	0.150	0.087	0.110	0.106	0.130
208K	0.125	0.158	0.150	0.183	0.132	0.171	0.161	0.202

Table S-10

Summary of Clark Unit Hydrograph Parameters
100-year and 10-year Future Condition Tc and R values

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	Tc				R			
Subbasin	100-year		10-year		100-year		10-year	
ID	6-hour (hours)	24-hour (hours)	6-hour (hours)	24-hour (hours)	6-hour (hours)	24-hour (hours)	6-hour (hours)	24-hour (hours)
208L	0.163	0.196	0.192	0.229	0.144	0.177	0.173	0.210
208M	0.175	0.213	0.204	0.246	0.200	0.248	0.237	0.291
208N	0.167	0.208	0.200	0.242	0.133	0.170	0.163	0.201
208O	0.108	0.133	0.129	0.154	0.087	0.109	0.106	0.128
208P	0.167	0.204	0.196	0.238	0.166	0.209	0.199	0.247
208Q	0.083	0.092	0.092	0.108	0.100	0.111	0.111	0.134
208R	0.129	0.158	0.154	0.183	0.112	0.141	0.136	0.165
208S	0.138	0.171	0.163	0.200	0.107	0.136	0.129	0.163
208T	0.108	0.133	0.129	0.158	0.057	0.072	0.070	0.087
208U	0.096	0.117	0.113	0.133	0.092	0.114	0.110	0.133
208V	0.113	0.138	0.133	0.163	0.099	0.124	0.120	0.149
208W	0.150	0.183	0.179	0.217	0.098	0.122	0.119	0.147
208X	0.263	0.325	0.342	0.388	0.152	0.192	0.203	0.234
210B	0.125	0.154	0.150	0.183	0.116	0.147	0.142	0.178
210C	0.175	0.213	0.208	0.254	0.198	0.245	0.240	0.299
210D	0.163	0.200	0.192	0.233	0.092	0.116	0.110	0.137
210E	0.158	0.196	0.188	0.229	0.144	0.182	0.173	0.217
210F	0.329	0.383	0.433	0.458	0.290	0.343	0.393	0.418
210G	0.167	0.204	0.196	0.242	0.130	0.163	0.156	0.197
210H	0.179	0.221	0.217	0.263	0.138	0.175	0.171	0.212
210I	0.150	0.183	0.179	0.221	0.088	0.110	0.108	0.136
210J	0.142	0.175	0.167	0.208	0.097	0.122	0.116	0.148
210K	0.167	0.204	0.196	0.238	0.171	0.214	0.205	0.253
209A	0.150	0.183	0.179	0.221	0.131	0.164	0.159	0.201
209C	0.146	0.179	0.171	0.208	0.116	0.145	0.138	0.172
209B	0.117	0.142	0.138	0.167	0.111	0.138	0.133	0.165
209D	0.125	0.158	0.150	0.183	0.103	0.134	0.127	0.158
209E	0.154	0.192	0.183	0.225	0.128	0.163	0.155	0.195
209F	0.117	0.146	0.138	0.171	0.098	0.126	0.118	0.150
209G	0.138	0.167	0.158	0.192	0.158	0.196	0.185	0.229
209H	0.154	0.192	0.183	0.221	0.125	0.159	0.152	0.186
209I	0.117	0.146	0.142	0.171	0.074	0.095	0.092	0.113
210L	0.158	0.192	0.188	0.229	0.127	0.156	0.153	0.191
210M	0.179	0.221	0.213	0.258	0.157	0.198	0.190	0.236
210N	0.108	0.138	0.129	0.163	0.069	0.090	0.084	0.108
211K	0.158	0.192	0.188	0.225	0.124	0.153	0.149	0.183
211G	0.167	0.200	0.196	0.233	0.193	0.237	0.231	0.281
211I	0.083	0.104	0.100	0.121	0.055	0.071	0.068	0.083
211H	0.133	0.163	0.154	0.188	0.119	0.148	0.140	0.174
211J	0.113	0.138	0.133	0.163	0.114	0.142	0.137	0.171
211M	0.129	0.158	0.154	0.183	0.103	0.129	0.125	0.152
211N	0.092	0.113	0.108	0.133	0.058	0.073	0.070	0.088
211O	0.138	0.167	0.163	0.200	0.099	0.122	0.119	0.150

Table S-10

Summary of Clark Unit Hydrograph Parameters
100-year and 10-year Future Condition Tc and R values

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	Tc				R			
Subbasin ID	100-year		10-year		100-year		10-year	
	6-hour (hours)	24-hour (hours)	6-hour (hours)	24-hour (hours)	6-hour (hours)	24-hour (hours)	6-hour (hours)	24-hour (hours)
211P	0.138	0.167	0.163	0.196	0.137	0.169	0.165	0.203
211L	0.183	0.229	0.221	0.271	0.189	0.242	0.232	0.291
211Q	0.171	0.208	0.200	0.246	0.101	0.126	0.120	0.151
211R	0.183	0.225	0.217	0.263	0.158	0.199	0.191	0.236
211U	0.142	0.175	0.167	0.200	0.359	0.454	0.430	0.527
211S	0.117	0.142	0.138	0.167	0.087	0.108	0.104	0.129
211V	0.133	0.163	0.158	0.192	0.168	0.210	0.204	0.252
211T	0.096	0.117	0.113	0.138	0.099	0.124	0.119	0.148
211W	0.121	0.150	0.146	0.175	0.060	0.076	0.073	0.090
211X	0.138	0.167	0.163	0.200	0.091	0.112	0.109	0.137
211A	0.125	0.150	0.146	0.175	0.094	0.115	0.112	0.137
211B	0.088	0.108	0.104	0.125	0.078	0.099	0.094	0.116
211C	0.104	0.125	0.121	0.146	0.084	0.103	0.099	0.122
211D	0.100	0.125	0.121	0.146	0.077	0.099	0.096	0.118
211E	0.083	0.100	0.096	0.117	0.071	0.087	0.083	0.103
211F	0.125	0.154	0.150	0.183	0.096	0.122	0.118	0.147
211Y	0.175	0.213	0.208	0.254	0.154	0.190	0.186	0.232
211Z	0.117	0.146	0.138	0.167	0.090	0.115	0.108	0.134
211AA	0.163	0.200	0.192	0.229	0.330	0.415	0.396	0.483
211AB	0.096	0.117	0.113	0.138	0.170	0.212	0.204	0.254
211AC	0.100	0.125	0.121	0.146	0.079	0.101	0.097	0.120
211AD	0.213	0.263	0.250	0.304	0.151	0.190	0.180	0.224
211AE	0.183	0.221	0.213	0.258	0.149	0.184	0.176	0.219
211AF	0.171	0.208	0.204	0.250	0.126	0.157	0.153	0.192

APPENDIX E

Channel routing data from the Ftn Hills FDS report

Table R-2c
Reach Route Hydraulic Data for the 100-year, 6-hour Storm
Future Condition

Routing Reach	Reach						Manning's Equation				Computed Using HEC-1 Summary Data					NSTEPS from HEC-1 Input File
	Slope in ft/ft	Length in feet	Average n value	Discharge, in cfs			Channel Base Width in feet	Flow Top Width in feet	Flow Depth in feet	Channel Velocity in fps	Wave Celerity in fps	Velocity Range in fps		Travel Time in hours	NSTEPS Computed	
				Top	Bottom	Average						Min.	Max.			
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
501502	0.020	3000	0.045	524	511	518	30.0	76.3	1.9	5.6	8.3	4.3	7.5	0.1000	6	6
502503	0.018	2453	0.045	699	687	693	120.0	232.0	1.2	3.9	5.8	3.1	5.1	0.1167	7	7
503504	0.010	1151	0.045	0	0	0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	1	1
508507	0.003	934	0.026	232	224	228	14.0	83.8	2.8	3.0	3.9	1.9	3.9	0.0667	4	4
511512	0.011	760	0.050	482	472	477	20.0	96.3	2.5	4.8	4.2	1.9	4.8	0.0500	3	3
513514	0.024	2403	0.045	380	366	373	20.0	73.0	1.6	5.2	5.7	3.0	5.0	0.1167	7	7
515517	0.019	3340	0.045	599	590	595	20.0	71.8	2.3	5.8	9.3	4.8	8.4	0.1000	6	6
516517	0.021	6720	0.045	524	495	510	40.0	69.6	1.7	5.8	8.0	4.5	6.5	0.2333	14	14
517518	0.017	4367	0.045	1181	1163	1172	16.6	109.6	3.3	8.6	10.4	5.4	9.1	0.1167	7	7
518519	0.022	1796	0.052	1199	1192	1196	45.4	83.7	2.8	7.1	15.0	6.0	22.5	0.0333	2	2
519591	0.018	1274	0.050	1257	1254	1256	68.8	86.8	2.9	6.4	10.6	4.2	16.0	0.0333	2	2
520591	0.025	2014	0.025	123	119	121	16.0	44.6	0.6	7.3	16.8	6.7	25.2	0.0333	2	2
522523	0.020	3275	0.050	334	309	322	15.0	76.3	1.8	4.3	6.1	3.3	5.1	0.1500	9	9
523524	0.018	1732	0.057	502	484	493	20.8	77.0	2.5	5.2	5.8	2.9	5.4	0.0833	5	5
523548	0.019	2680	0.025	68	60	64	40.0	77.2	0.4	3.8	4.1	2.2	3.4	0.1833	11	11
524525	0.021	1045	0.035	555	550	553	22.2	43.4	2.4	7.7	8.7	3.5	13.1	0.0333	2	2
525526	0.021	1520	0.035	596	586	591	19.8	36.8	2.7	8.4	25.3	7.6	38.1	0.0167	1	2
526527	0.018	2129	0.035	798	776	787	42.6	61.3	2.1	8.0	11.8	5.3	13.3	0.0500	3	2
528530	0.071	2594	0.043	548	545	547	10.0	23.9	2.8	12.4	14.4	6.5	16.3	0.0500	3	3
530531	0.040	2426	0.059	1340	1326	1333	15.0	49.4	4.9	10.0	13.5	6.1	15.2	0.0500	3	3
531532	0.046	3391	0.064	1504	1490	1497	18.0	48.4	4.4	11.0	14.1	6.8	14.2	0.0667	4	4
532533	0.028	1555	0.048	1854	1850	1852	17.0	54.7	4.5	11.5	13.0	5.2	19.5	0.0333	2	2
533534	0.024	7145	0.047	2132	2100	2116	87.0	126.1	2.9	8.4	11.9	6.5	9.9	0.1667	10	10
534535	0.022	2037	0.047	2427	2417	2422	75.0	143.0	4.4	8.1	11.3	5.1	12.8	0.0500	3	3
535536	0.024	2975	0.066	2441	2419	2430	15.6	229.2	4.9	7.7	6.2	3.3	5.3	0.1333	8	8
536537	0.021	1480	0.050	326	326	326	45.7	55.0	1.8	4.6	8.2	3.7	9.3	0.0500	3	3
537538	0.021	2155	0.050	346	343	345	5.2	48.2	2.5	5.3	9.0	4.3	9.0	0.0667	4	4
538540	0.021	2176	0.050	442	441	442	41.1	71.6	1.7	5.1	5.2	2.7	4.5	0.1167	7	7
539540	0.026	1872	0.050	205	196	201	10.0	51.9	1.6	4.5	6.2	3.1	5.9	0.0833	5	5

Table R-2c
Reach Route Hydraulic Data for the 100-year, 6-hour Storm
Future Condition

Routing Reach	Reach						Manning's Equation				Computed Using HEC-1 Summary Data					NSTEPS from HEC-1 Input File
	Slope in ft/ft	Length in feet	Average n value	Discharge, in cfs			Channel Base Width in feet	Flow Top Width in feet	Flow Depth in feet	Channel Velocity in fps	Wave Celerity in fps	Velocity Range in fps		Travel Time in hours	NSTEPS Computed	
				Top	Bottom	Average						Min.	Max.			
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
540541	0.020	4207	0.049	560	553	557	17.5	81.4	2.4	7.8	5.8	3.2	4.8	0.2000	12	12
541548	0.032	1138	0.045	658	657	658	7.8	86.4	2.2	6.7	6.3	2.8	7.1	0.0500	3	3
542543	0.007	686	0.040	188	184	186	26.8	35.0	2.2	3.5	11.4	3.4	17.2	0.0167	1	1
543544	0.028	597	0.040	0	0	0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	1	1
543547	0.028	2395	0.040	252	241	247	34.5	39.6	1.7	5.6	8.0	4.0	7.5	0.0833	5	5
544545	0.023	985	0.019	171	167	169	30.0	65.5	0.6	7.2	16.4	4.9	24.7	0.0167	1	1
545547	0.026	1216	0.040	84	81	83	26.7	30.6	1.0	3.5	6.8	3.0	7.6	0.0500	3	3
545546	0.016	428	0.020	84	83	84	30.0	68.9	0.5	4.8	7.1	2.1	10.7	0.0167	1	1
546547	0.033	749	0.021	271	269	270	16.0	40.7	1.0	11.1	0.0	0.0	0.0	0.0000	1	1
547548	0.018	2165	0.047	758	732	745	29.8	69.7	2.5	7.2	12.0	5.4	13.6	0.0500	3	3
548549	0.017	3258	0.080	1172	1160	1166	66.1	92.8	3.4	4.7	6.0	3.3	5.1	0.1500	9	9
549626	0.017	2044	0.120	3524	3504	3514	13.5	207.6	7.7	4.3	5.7	2.9	5.1	0.1000	6	6
550552	0.053	4410	0.045	687	675	681	10.0	22.7	3.4	12.6	18.4	8.8	18.4	0.0667	4	4
551552	0.053	4410	0.045	424	416	420	10.0	20.1	2.7	10.7	14.7	7.3	13.8	0.0833	5	5
552553	0.034	1336	0.056	1312	1308	1310	21.0	104.6	2.3	7.4	11.1	4.4	16.7	0.0333	2	2
553556	0.026	2393	0.049	1440	1432	1436	7.5	46.1	4.9	10.7	20.0	8.0	30.0	0.0333	2	2
554555	0.065	2497	0.045	312	303	308	20.0	37.4	1.4	8.3	13.9	6.2	15.6	0.0500	3	3
555556	0.048	3353	0.050	489	475	482	35.0	60.4	2.1	7.3	11.2	5.6	10.5	0.0833	5	5
556557	0.026	2298	0.047	1906	1899	1903	30.4	101.0	2.6	8.8	12.8	5.7	14.4	0.0500	3	3
557558	0.024	2652	0.045	2067	2055	2061	72.0	99.1	3.7	8.8	14.7	6.6	16.6	0.0500	3	3
558560	0.019	1986	0.045	2110	2104	2107	71.6	93.4	4.0	8.2	11.0	5.0	12.4	0.0500	3	3
559560	0.023	2170	0.045	160	151	156	10.0	44.8	1.4	4.4	7.2	3.6	6.8	0.0833	5	5
560585	0.027	3127	0.026	294	294	294	35.5	67.0	0.9	7.3	10.4	5.2	9.8	0.0833	5	5
561563	0.086	2335	0.045	480	468	474	18.0	26.6	1.9	11.7	38.8	11.7	58.5	0.0167	1	1
562563	0.111	3745	0.046	144	141	143	5.0	19.4	1.0	9.9	15.6	7.5	15.6	0.0667	4	4
563564	0.054	2762	0.080	864	833	849	4.5	29.4	5.0	9.6	15.3	6.9	17.3	0.0500	3	3
564565	0.040	3243	0.080	1195	1151	1173	8.6	63.4	3.7	7.3	10.8	5.4	10.2	0.0833	5	5
565568	0.033	2254	0.057	1398	1371	1385	17.9	52.2	3.7	9.6	18.8	7.5	28.2	0.0333	2	2
566567	0.041	1463	0.080	590	572	581	11.7	52.3	3.7	5.9	12.2	4.9	18.3	0.0333	2	2

Table R-2c
Reach Route Hydraulic Data for the 100-year, 6-hour Storm
Future Condition

Routing Reach	Reach						Manning's Equation				Computed Using HEC-1 Summary Data					NSTEPS from HEC-1 Input File
	Slope in ft/ft	Length in feet	Average n value	Discharge, in cfs			Channel Base Width in feet	Flow Top Width in feet	Flow Depth in feet	Channel Velocity in fps	Wave Celerity in fps	Velocity Range in fps		Travel Time in hours	NSTEPS Computed	
				Top	Bottom	Average						Min.	Max.			
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
567568	0.039	3650	0.057	892	855	874	16.4	54.4	2.6	8.3	12.2	6.1	11.4	0.0833	5	5
568573	0.032	2067	0.079	2210	2187	2199	8.7	68.2	6.2	8.8	11.5	5.2	13.0	0.0500	3	3
569570	0.040	1696	0.038	703	693	698	10.6	25.0	3.8	14.2	28.2	8.5	42.5	0.0167	1	1
571572	0.057	1379	0.020	35	33	34	32.0	44.2	0.2	5.9	11.5	4.6	17.3	0.0333	2	2
572573	0.034	1285	0.041	1187	1172	1180	22.5	46.8	2.9	13.0	21.4	6.4	32.2	0.0167	1	1
574575	0.037	823	0.050	911	906	909	6.4	28.3	5.0	10.9	0.0	0.0	0.0	0.0000	1	1
575576	0.042	2342	0.054	1002	985	994	0.5	32.1	4.2	12.2	19.5	7.8	29.3	0.0333	2	2
576577	0.034	740	0.055	1146	1143	1145	0.1	30.3	5.0	12.2	12.3	3.7	18.5	0.0167	1	1
577578	0.015	1078	0.047	3345	3329	3337	24.1	93.9	6.1	9.8	17.9	5.4	27.0	0.0167	1	1
578587	0.019	1628	0.047	1078	1073	1076	15.3	58.5	3.2	7.9	9.0	4.1	10.2	0.0500	3	3
579580	0.060	1751	0.048	951	942	947	5.0	29.0	3.3	14.7	29.1	8.7	43.9	0.0167	1	1
580581	0.044	2339	0.048	1285	1267	1276	10.0	48.8	3.4	12.3	19.5	7.8	29.3	0.0333	2	2
581582	0.046	4012	0.048	2031	1981	2006	5.0	42.5	4.9	15.5	22.3	10.0	25.1	0.0500	3	3
582583	0.023	1725	0.057	2498	2472	2485	10.0	78.7	5.6	9.9	14.4	5.7	21.6	0.0333	2	2
583584	0.036	3107	0.069	2567	2536	2552	26.1	73.6	6.4	9.0	10.4	5.2	9.7	0.0833	5	5
584597	0.026	3704	0.050	925	903	914	64.7	108.8	2.1	6.1	7.7	4.1	6.6	0.1333	8	8
586587	0.031	1905	0.036	246	245	246	10.0	28.5	1.6	8.7	10.6	4.8	11.9	0.0500	3	3
587595	0.017	1039	0.047	1112	1105	1109	20.0	47.3	3.3	8.1	17.3	5.2	26.0	0.0167	1	1
588590	0.034	1117	0.051	448	437	443	13.4	43.7	2.4	7.1	18.6	5.6	28.0	0.0167	1	1
589590	0.042	1751	0.050	306	299	303	12.7	21.2	2.7	7.7	14.6	5.8	21.9	0.0333	2	2
591521	0.014	915	0.050	1321	1319	1320	75.9	98.1	3.1	5.9	7.6	3.0	11.5	0.0333	2	2
592593	0.041	2062	0.050	234	226	230	7.8	20.2	2.6	6.6	11.5	5.1	12.9	0.0500	3	3
593594	0.020	988	0.056	1545	1532	1539	14.9	74.8	4.4	8.1	8.2	3.3	12.4	0.0333	2	2
594595	0.020	2093	0.050	1636	1595	1616	5.9	136.9	5.2	6.4	11.6	5.2	13.1	0.0500	3	3
595596	0.011	1095	0.049	1603	1595	1599	32.4	213.2	5.5	4.7	4.6	2.2	4.6	0.0667	4	4
597598	0.025	2822	0.050	900	883	892	32.2	71.5	3.0	6.8	9.4	4.7	8.8	0.0833	5	5
599608	0.015	1476	0.044	1631	1630	1631	15.2	82.4	4.7	7.6	12.3	4.9	18.5	0.0333	2	2
600601	0.018	2406	0.025	373	366	370	14.1	39.6	2.3	8.5	13.4	6.0	15.1	0.0500	3	3
601602	0.015	1765	0.040	663	651	657	23.8	37.5	3.5	7.2	9.8	4.4	11.1	0.0500	3	3

Table R-2c
Reach Route Hydraulic Data for the 100-year, 6-hour Storm
Future Condition

Routing Reach	Reach						Manning's Equation				Computed Using HEC-1 Summary Data					NSTEPS from HEC-1 Input File
	Slope in ft/ft	Length in feet	Average n value	Discharge, in cfs			Channel Base Width in feet	Flow Top Width in feet	Flow Depth in feet	Channel Velocity in fps	Wave Celerity in fps	Velocity Range in fps		Travel Time in hours	NSTEPS Computed	
				Top	Bottom	Average						Min.	Max.			
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
602603	0.021	2610	0.048	950	923	937	12.7	40.7	3.6	8.8	14.5	6.5	16.4	0.0500	3	3
603622	0.020	2745	0.045	1313	1284	1299	50.6	70.8	3.5	7.7	11.4	5.5	11.5	0.0667	4	4
604606	0.065	2784	0.027	18	17	18	16.0	49.3	0.3	4.1	4.2	2.3	3.5	0.1833	11	11
606607	0.029	1061	0.055	256	253	255	10.0	28.1	2.4	5.9	8.9	3.5	13.3	0.0333	2	2
607608	0.015	1008	0.045	295	290	293	1.0	38.0	3.5	5.5	8.4	3.4	12.6	0.0333	2	2
608613	0.020	1338	0.049	1642	1641	1642	26.2	85.4	3.2	8.2	11.2	4.5	16.8	0.0333	2	2
609611	0.020	470	0.050	69	69	69	10.0	15.5	1.4	4.2	3.9	1.6	5.9	0.0333	2	2
610611	0.021	1090	0.045	278	272	275	18.5	29.7	2.3	5.7	9.1	3.6	13.7	0.0333	2	2
611612	0.027	925	0.020	32	27	30	18.0	41.9	0.4	4.8	3.9	1.8	3.9	0.0667	4	4
613621	0.025	718	0.050	1639	1632	1636	42.7	82.4	2.9	9.0	0.0	0.0	0.0	0.0000	1	1
614615	0.040	1114	0.020	43	43	43	32.0	52.7	0.2	5.4	6.2	2.8	7.0	0.0500	3	3
615618	0.134	499	0.022	36	36	36	14.0	19.2	0.5	11.4	8.3	2.5	12.5	0.0167	1	1
615619	0.049	2444	0.024	19	19	19	2.3	14.3	0.6	5.6	6.8	3.5	6.1	0.1000	6	6
616617	0.055	1131	0.060	74	72	73	5.0	24.2	1.3	4.3	9.4	3.8	14.2	0.0333	2	2
617618	0.035	1912	0.060	372	359	366	40.4	53.7	1.7	5.4	10.6	4.8	12.0	0.0500	3	3
618619	0.029	1837	0.060	518	507	513	8.0	33.3	4.2	6.3	10.2	4.6	11.5	0.0500	3	3
619620	0.029	800	0.027	194	194	194	40.0	96.5	0.7	5.7	13.3	4.0	20.1	0.0167	1	1
620621	0.039	915	0.050	741	723	732	10.1	29.4	4.2	9.1	15.2	4.6	22.9	0.0167	1	1
621622	0.014	3830	0.051	1866	1865	1866	2.7	104.8	3.9	7.3	10.6	5.5	9.6	0.1000	6	6
622549	0.012	1697	0.125	2429	2409	2419	189.8	211.5	4.1	3.1	5.7	2.8	5.3	0.0833	5	5
623624	0.011	701	0.025	149	148	149	16.0	50.2	0.9	6.1	11.7	3.5	17.6	0.0167	1	1
624626	0.024	637	0.069	238	231	235	65.4	145.0	1.3	3.0	5.3	2.1	8.0	0.0333	2	2
625626	0.025	1350	0.020	96	92	94	34.0	68.1	0.6	5.8	11.3	4.5	16.9	0.0333	2	2
626627	0.021	625	0.061	3692	3689	3691	63.2	127.8	4.7	8.3	10.4	3.1	15.7	0.0167	1	1

APPENDIX F

Area-capacity and spillway rating relations for the five dams

Storage and Discharge vs Stage Data for Golden Eagle Park Dam (4)

HY8 Output

Stage (ft)	Discharges Circular (cfs)	Arch (cfs)	Total (cfs)
1694.51	0	0	0
1697.79	66	14	80
1699.13	113	47	160
1700.46	159	81	240
1702.20	206	114	320
1704.48	255	145	400
1707.34	304	176	480
1710.74	354	206	560
1714.50	402	235	637
1715.00	408	239	647
1717.00	431	253	684
1719.00	453	266	719
1722.00	483	284	767
1724.00	501	297	798
1725.00	510	301	811
1727.00	526	313	839
1728.00	534	318	852

Uneven Weir Output

Stage (ft)	Discharge (cfs)
1714.50	0
1715.00	4
1715.50	140
1716.00	431
1716.50	882
1717.00	1499
1717.50	2293
1718.00	3242
1718.50	4336
1719.00	5537
1719.50	6817
1720.00	8182
1720.50	9633
1721.00	11151
1721.50	12752
1722.00	14762
1722.50	17547
1723.00	20877
1723.50	24687
1724.00	28946
1724.50	33637
1725.00	38754
1725.50	44238
1726.00	49808
1726.50	55636
1727.00	61727
1727.50	68076
1728.00	74675

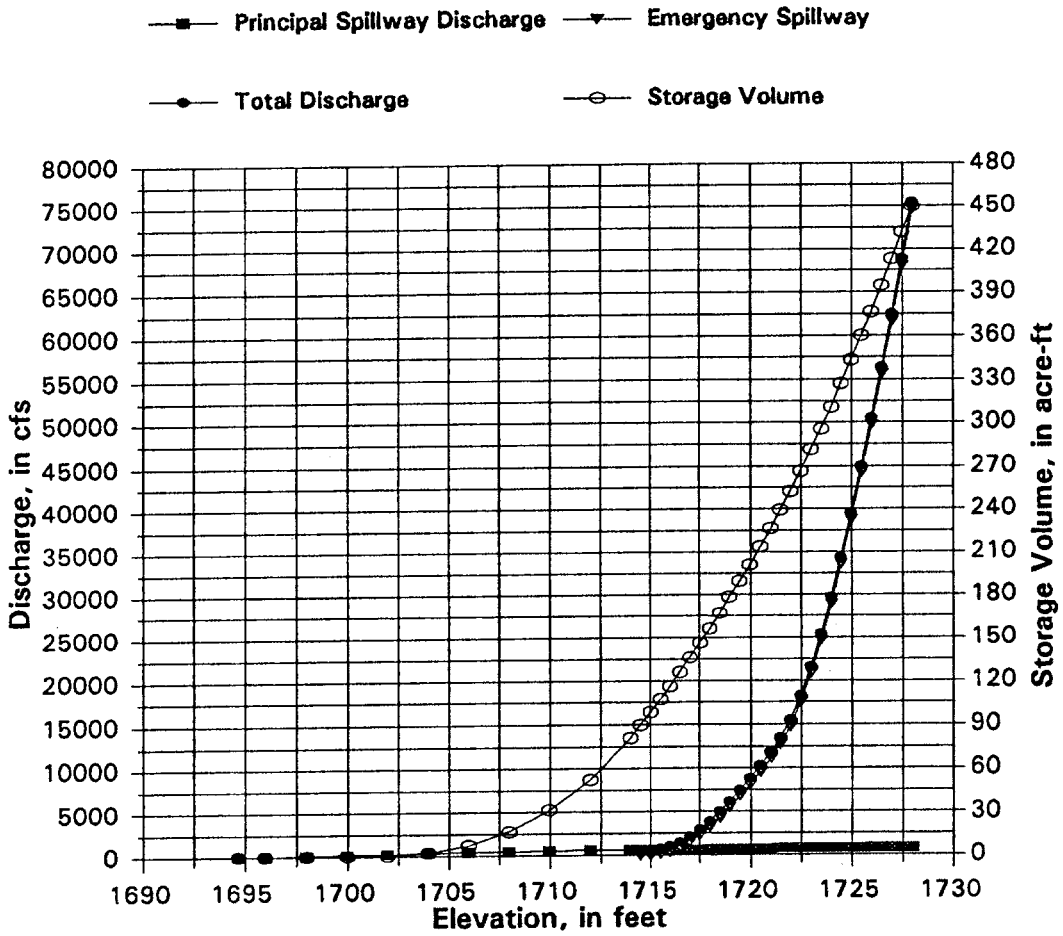
GVSCE

Stage NGVD 29 Datum	Surface Area (acres)	Storage Volume (acre-feet)	Discharge, in cfs Principal Spillway	Emergency Spillway	Total
1694.69	0.00	0.00	0	---	0
1696.00	0.00	0.00	38	---	38
1698.00	0.00	0.00	95	---	95
1700.00	0.05	0.03	214	---	214
1702.00	0.45	0.47	312	---	312
1704.00	1.54	2.35	384	---	384
1706.00	3.61	7.35	443	---	443
1708.00	5.99	16.85	497	---	497
1710.00	8.91	31.66	543	---	543
1712.00	12.23	52.71	587	---	587
1714.00	15.99	80.85	628	---	628
1714.50	---	90	637	0	637
1715.00	---	98	646	4	651
1715.50	---	107	656	140	795
1716.00	19.36	116.14	665	431	1097
1716.50	---	126	675	882	1557
1717.00	---	136	684	1499	2182
1717.50	---	146	693	2293	2986
1718.00	20.73	156.22	701	3242	3943
1718.50	---	167	710	4336	5046
1719.00	---	179	719	5537	6256
1719.50	---	190	727	6817	7543
1720.00	23.97	200.89	735	8182	8917
1720.50	---	214	743	9633	10376
1721.00	---	226	751	11151	11902
1721.50	---	239	759	12752	13511
1722.00	27.28	252.10	767	14762	15529
1722.50	---	267	775	17547	18321
1723.00	---	281	782	20877	21659
1723.50	---	296	790	24687	25477
1724.00	31.13	310.47	797	28946	29743
1724.50	---	327	804	33637	34442
1725.00	---	344	811	38754	39565
1725.50	---	360	818	44238	45056
1726.00	35.04	376.60	825	49808	50633
1726.50	---	395	832	55636	56467
1727.00	36.73	413	838	61727	62566
1727.50	---	432	845	68076	68921
1728.00	38.42	450.02	852	74675	75527

Tri-Co.

Stage NGVD 29 Datum	Stage Local Datum	Storage Volume (acre-feet)	Total Discharge (cfs)
1694.74	1696.00	---	0
1696.74	1698.00	---	150
1698.74	1700.00	0.00	285
1700.74	1702.00	2.25	420
1702.74	1704.00	7.88	510
1704.74	1706.00	15.75	555
1706.74	1708.00	28.13	610
1708.74	1710.00	44.25	645
1710.74	1712.00	65.63	705
1712.74	1714.00	91.88	755
1714.74	1716.00	129.38	825
1715.74	1717.00	148.13	1650
1716.74	1718.00	170.63	4875
1718.74	1720.00	213.75	10710
1720.74	1722.00	267.00	13665

Note: NE Corner of High School Cafeteria EL = 1716.49



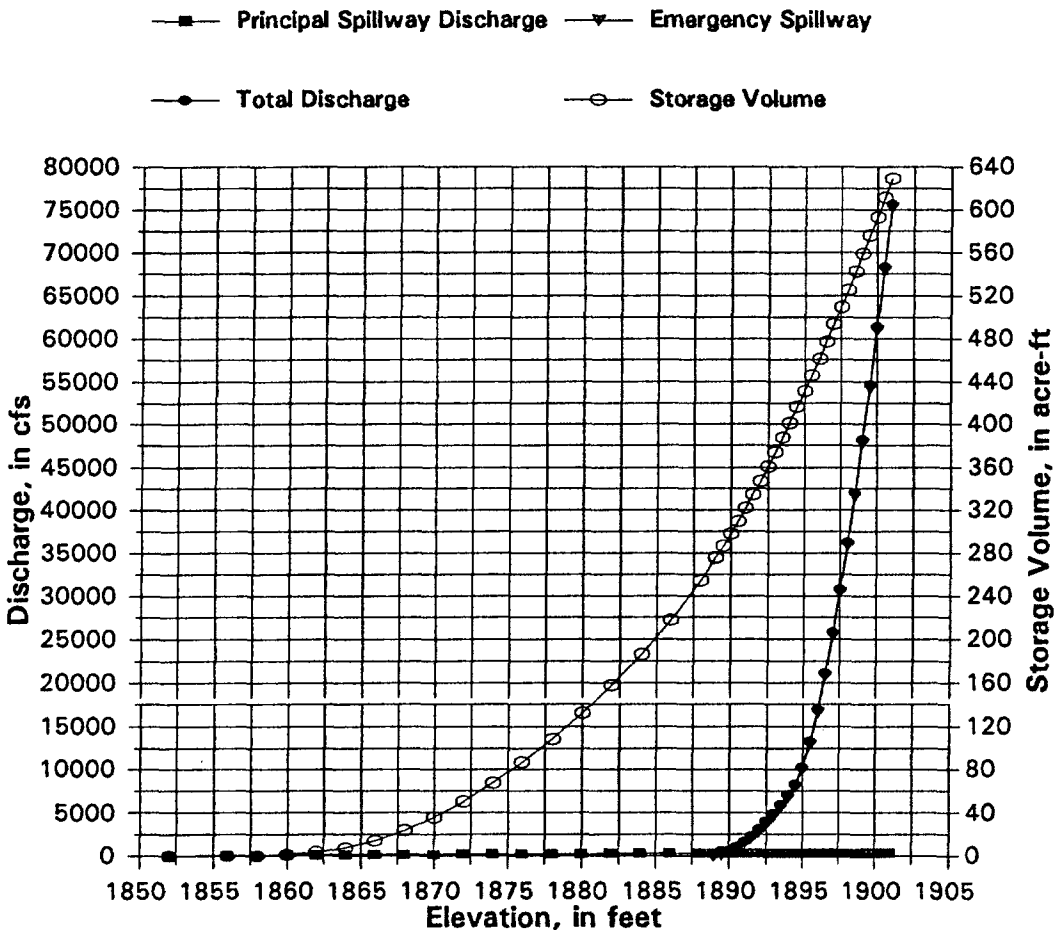
Rating Curves for Golden Eagle Park Dam (No. 4)

Storage and Discharge vs Stage Data for Hesperus Dam (No. 36)

HY8 Output		Uneven Weir Output	
Stage (ft)	Culvert Discharge (cfs)	Stage (ft)	Discharge (cfs)
1855.05	38	1889.00	0.02
1856.40	76	1889.50	70.63
1858.27	114	1890.00	329.86
1860.67	152	1890.50	744.72
1863.70	190	1891.00	1303.00
1867.64	228	1891.50	1977.36
1872.38	266	1892.00	2752.33
1878.39	304	1892.50	3619.39
1886.89	342	1893.00	4572.82
1895.00	367	1893.50	5608.48
1896.85	372	1894.00	6723.22
1900.13	380	1894.50	7937.76
1901.00	382	1895.00	9921.05
		1895.50	12926.31
		1896.00	16583.29
		1896.50	20771.35
		1897.00	25417.14
		1897.50	30474.29
		1898.00	35909.52
		1898.50	41697.38
		1899.00	47817.50
		1899.50	54253.13
		1900.00	60990.12
		1900.50	68016.40
		1901.00	75321.42

GVSCE					
Stage NGVD 29 Datum	Surface Area (acres)	Storage Volume (acre-feet)	Discharge, in cfs		
			Principal Spillway	Emergency Spillway	Total
1856.00	0.07	0.09	63	---	63
1858.00	0.35	0.48	108	---	108
1860.00	0.91	1.69	142	---	142
1862.00	1.37	3.96	168	---	168
1864.00	2.58	7.84	193	---	193
1866.00	4.04	14.41	211	---	211
1868.00	5.44	23.85	228	---	228
1870.00	6.67	35.94	245	---	245
1872.00	7.93	50.53	262	---	262
1874.00	9.20	67.64	276	---	276
1876.00	10.26	87.09	289	---	289
1878.00	11.27	108.61	301	---	301
1880.00	12.35	132.22	311	---	311
1882.00	13.50	158.07	320	---	320
1884.00	14.88	186.43	329	---	329
1886.00	16.85	218.14	338	---	338
1888.00	19.87	254.82	345	---	345
1888.98	---	276	347	0	347
1889.00	---	276	348	0	348
1889.50	---	287	350	71	652
1890.00	23.38	298.02	351	330	681
1890.50	---	310	353	745	1098
1891.00	---	322	355	1303	1658
1891.50	---	335	357	1977	2334
1892.00	25.56	346.95	358	2752	3110
1892.50	---	361	359	3619	3978
1893.00	---	374	360	4573	4933
1893.50	---	388	363	5608	5971
1894.00	28.78	401.26	365	6723	7088
1894.50	---	416	366	7938	8304
1895.00	---	431	368	9921	10289
1895.50	---	446	369	12926	13295
1896.00	31.34	461.36	370	16583	16953
1896.50	---	477	371	20771	21143
1897.00	---	494	373	25417	25790
1897.50	---	510	374	30474	30848
1898.00	32.98	525.67	375	35910	36285
1898.50	---	542	376	41697	42073
1899.00	33.94	559.13	377	47818	48195
1899.50	---	576.34	379	54253	54632
1900.00	34.90	593.55	380	60990	61370
1900.50	---	611.37	381	68016	68397
1901.00	36.39	629.19	382	75321	75703

Tri-Co.			
Stage		Storage Volume (acre-feet)	Total Discharge (cfs)
NGVD 29 Datum	Local Datum		
1853.39	1854.65	0.00	0
1858.74	1860.00	2.00	142
1862.74	1864.00	7.00	188
1866.74	1868.00	11.00	225
1870.74	1872.00	21.00	256
1874.74	1876.00	47.00	284
1878.74	1880.00	84.00	310
1882.74	1884.00	138.00	333
1886.74	1888.00	223.00	355
1888.74	1890.00	284.00	366
1889.74	1891.00	315.00	1036
1890.74	1892.00	347.00	2280
1891.74	1893.00	380.00	3920
1892.74	1894.00	407.00	5898
1893.74	1895.00	443.00	8183
1894.74	1896.00	473.00	10755



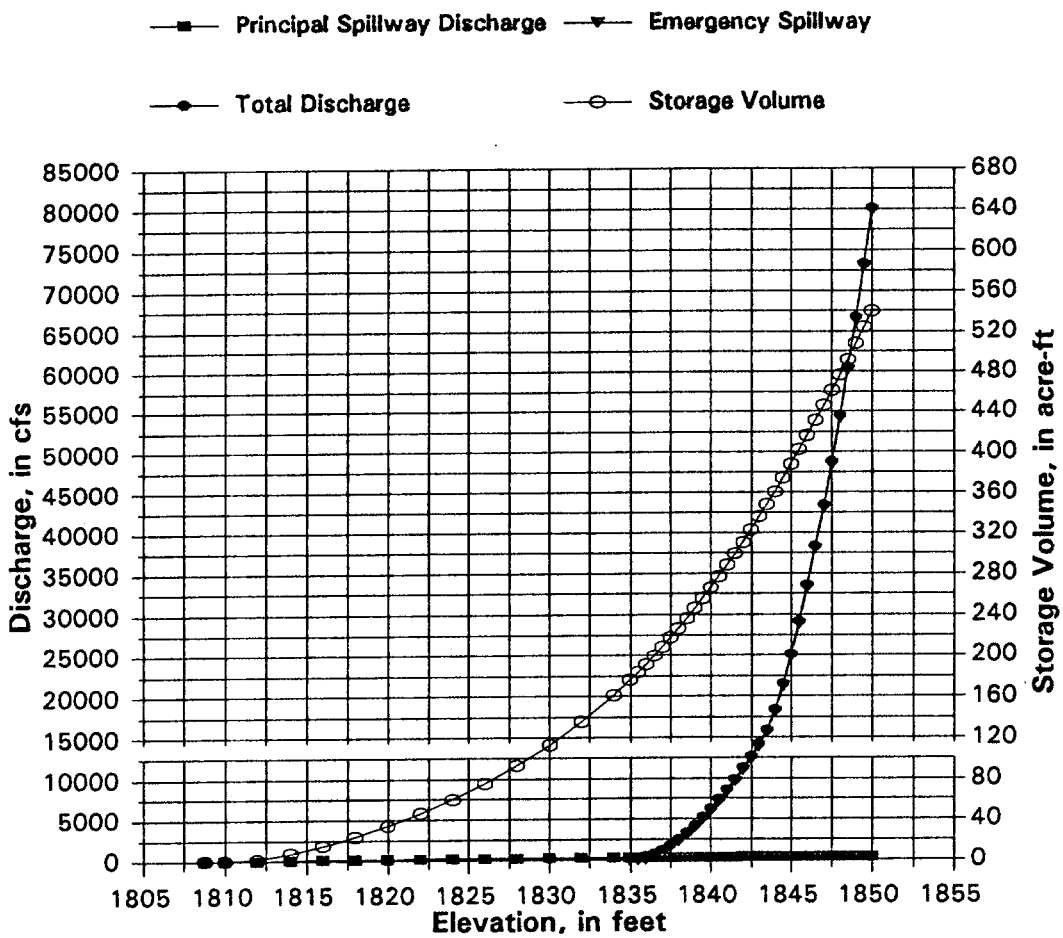
Rating Curves for Hesperus Dam (No. 36)

Storage and Discharge vs Stage Data for Aspen Dam (No. 6)

HY8 Output		Uneven Weir Output	
Stage (ft)	Culvert Discharge (cfs)	Stage (ft)	Discharge (cfs)
1808.61	0	1835.00	0
1811.33	40	1835.50	2
1812.89	80	1836.00	122
1814.85	120	1836.50	442
1817.67	160	1837.00	926
1821.32	200	1837.50	1531
1825.73	240	1838.00	2241
1831.10	280	1838.50	3047
1833.92	298	1839.00	3942
1837.21	315	1839.50	4922
1838.25	320	1840.00	5983
1841.00	332	1840.50	7124
1843.04	340	1841.00	8342
1845.00	347	1841.50	9636
1845.88	350	1842.00	11004
1849.08	360	1842.50	12443
1850.00	363	1843.00	13952
		1843.50	15612
		1844.00	18097
		1844.50	21240
		1845.00	24860
		1845.50	28891
		1846.00	33293
		1846.50	38041
		1847.00	43118
		1847.50	48509
		1848.00	54205
		1848.50	60196
		1849.00	66475
		1849.50	73037
		1850.00	79878

GVSCE					
Stage NGVD 29 Datum	Surface Area (acres)	Storage Volume (acre-feet)	Discharge, in cfs		
			Principal Spillway	Emergency Spillway	Total
1808.79	0	0	0	---	0
1810.00	0.11	0.00	20	---	20
1812.00	1.99	1.71	57	---	57
1814.00	3.46	7.09	102	---	102
1816.00	4.27	14.81	136	---	136
1818.00	4.97	24.04	163	---	163
1820.00	5.65	34.65	184	---	184
1822.00	6.40	46.70	206	---	206
1824.00	7.34	60.43	224	---	224
1826.00	8.22	75.98	242	---	242
1828.00	9.28	93.47	257	---	257
1830.00	10.45	113.19	272	---	272
1832.00	12.02	135.64	285	---	285
1834.00	13.84	161.48	296	---	296
1835.00	---	176	303	0	303
1835.50	---	184	305	2	307
1836.00	16.15	191.44	307	122	429
1836.50	---	200	310	442	752
1837.00	17.60	208.31	313	926	1239
1837.50	---	217	316	1531	1846
1838.00	18.85	226.53	318	2241	2559
1838.50	---	236	320	3047	3367
1839.00	---	246	323	3942	4265
1839.50		256	325	4922	5247
1840.00	20.92	266.28	328	5983	6311
1840.50	---	277	330	7124	7454
1841.00	---	289	332	8342	8674
1841.50	---	300	334	9636	9970
1842.00	23.64	310.81	336	11004	11339
1842.50	---	323	338	12443	12781
1843.00	---	336	340	13952	14292
1843.50	---	348	342	15612	15954
1844.00	26.45	360.88	343	18097	18440
1844.50	---	375	345	21240	21585
1845.00	---	389	347	24860	25207
1845.50	---	402	349	28891	29239
1846.00	28.99	416.30	350	33293	33643
1846.50	---	431	352	38041	38393
1847.00	---	446	353	43118	43471
1847.50	---	461	355	48509	48864
1848.00	31.12	476.39	357	54205	54561
1848.50	---	492	358	60196	60554
1849.00	---	509	360	66475	66835
1849.50	---	525	361	73037	73399
1850.00	33.28	540.78	363	79878	80241

Tri-Co.			
Stage		Storage Volume (acre-feet)	Total Discharge (cfs)
NGVD 29 Datum	Local Datum		
1808.74	1810.00	0.00	0
1814.74	1816.00	0.30	183
1818.74	1820.00	6.30	268
1822.74	1824.00	25.10	331
1826.74	1828.00	55.20	385
1830.74	1832.00	97.30	431
1834.74	1836.00	152.10	474
1835.74	1837.00	169.60	485
1836.74	1838.00	187.00	1146
1837.74	1839.00	204.50	2391
1839.74	1841.00	242.00	5950
1841.74	1843.00	281.00	10666
1843.74	1845.00	320.00	16408
1845.74	1847.00	375.00	22966



Rating Curves for Aspen Dam (No. 6)

Storage and Discharge vs Stage Data for North Heights Dam (No.11)

HY8 Output

Stage (ft)	Culvert Discharge (cfs)
1778.97	0
1778.97	0
1781.70	40
1783.26	80
1785.22	120
1788.03	160
1791.69	200
1796.10	240
1800.00	270
1801.46	280
1804.73	300
1808.62	320
1816.25	350
1819.45	360
1825.00	375

Uneven Weir Output

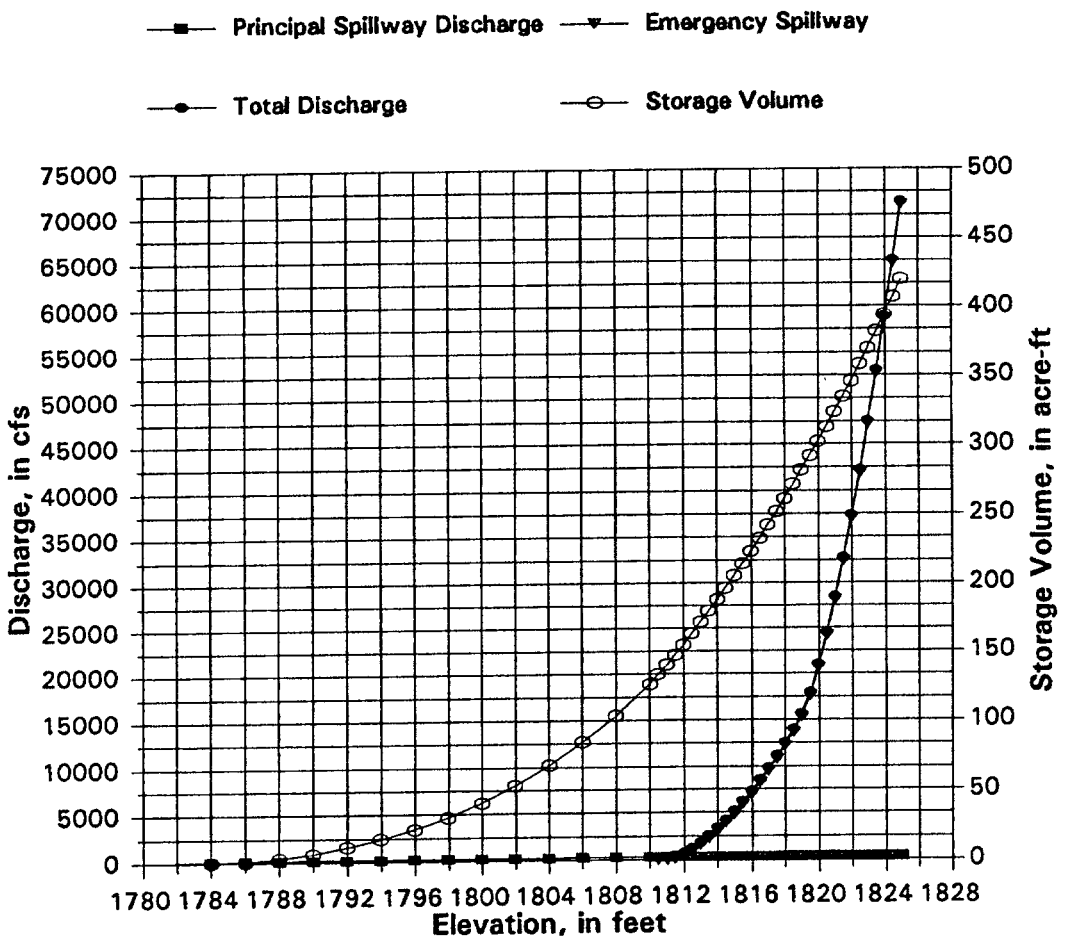
Stage (ft)	Discharge (cfs)
1810.50	0
1810.50	0
1811.00	6
1811.50	130
1812.00	466
1812.50	951
1813.00	1551
1813.50	2251
1814.00	3042
1814.50	3919
1815.00	4877
1815.50	5914
1816.00	7027
1816.50	8214
1817.00	9474
1817.50	10805
1818.00	12207
1818.50	13681
1819.00	15311
1819.50	17650
1820.00	20684
1820.50	24196
1821.00	28115
1821.50	32400
1822.00	37025
1822.50	41972
1823.00	47226
1823.50	52778
1824.00	58617
1824.50	64738
1825.00	71134

GVSCE

Stage NGVD 29 Datum	Surface Area (acres)	Storage Volume (acre-feet)	Discharge, in cfs: Principal Spillway	Emergency Spillway	Total
1779.15	0.00	0.00	0	—	0
1779.15	0.00	0.00	0	—	0
1784.00	0.09	0.15	95	—	95
1786.00	0.63	0.78	131	—	131
1788.00	1.41	2.77	160	—	160
1790.00	1.98	6.15	181	—	181
1792.00	2.62	10.73	203	—	203
1794.00	3.03	16.38	221	—	221
1796.00	3.65	23.05	239	—	239
1798.00	4.62	31.30	254	—	254
1800.00	5.59	41.49	269	—	269
1802.00	6.58	53.65	283	—	283
1804.00	7.68	67.89	294	—	294
1806.00	8.83	84.39	305	—	305
1808.00	10.23	103.43	316	—	316
1810.00	12.55	126.17	325	—	325
1810.50	—	133	327	0	327
1811.00	—	140	329	6	335
1811.50	—	147	331	130	461
1812.00	15.81	154.47	333	466	799
1812.50	—	163	335	951	1286
1813.00	—	171	337	1551	1888
1813.50	—	179	339	2251	2590
1814.00	17.16	187.43	341	3042	3383
1814.50	—	196	343	3919	4262
1815.00	—	205	345	4877	5222
1815.50	—	214	347	5914	6261
1816.00	18.44	223.03	349	7027	7376
1816.50	—	233	351	8214	8564
1817.00	—	242	352	9474	9826
1817.50	—	252	354	10805	11159
1818.00	19.92	261.38	355	12207	12563
1818.50	—	272	357	13681	14038
1819.00	—	282	359	15311	15670
1819.50	—	292	360	17650	18010
1820.00	20.71	302.00	361	20684	21045
1820.50	—	313	363	24196	24559
1821.00	—	324	364	28115	28479
1821.50	—	335	366	32400	32765
1822.00	23.18	345.87	367	37025	37392
1822.50	—	358	368	41972	42340
1823.00	—	370	370	47226	47596
1823.50	—	382	371	52778	53149
1824.00	25.19	394.23	372	58617	58989
1824.50	—	407	374	64738	65111
1825.00	25.95	419.79	375	71134	71509

Tri-Co.

Stage: NGVD 29 Datum	Stage: Local Datum	Storage Volume (acre-feet)	Total Discharge (cfs)
1778.74	1780.00	0.00	0
1782.74	1784.00	0.00	88
1786.74	1788.00	3.04	153
1790.74	1792.00	10.64	198
1794.74	1796.00	22.68	234
1798.74	1800.00	42.40	265
1802.74	1804.00	72.60	293
1806.74	1808.00	112.80	319
1810.74	1812.00	165.40	343
1812.74	1814.00	198.05	2243
1814.74	1816.00	230.70	5775
1816.74	1818.00	269.10	10502
1818.74	1820.00	307.50	16215



Rating Curves for North Heights Dam (No. 11)

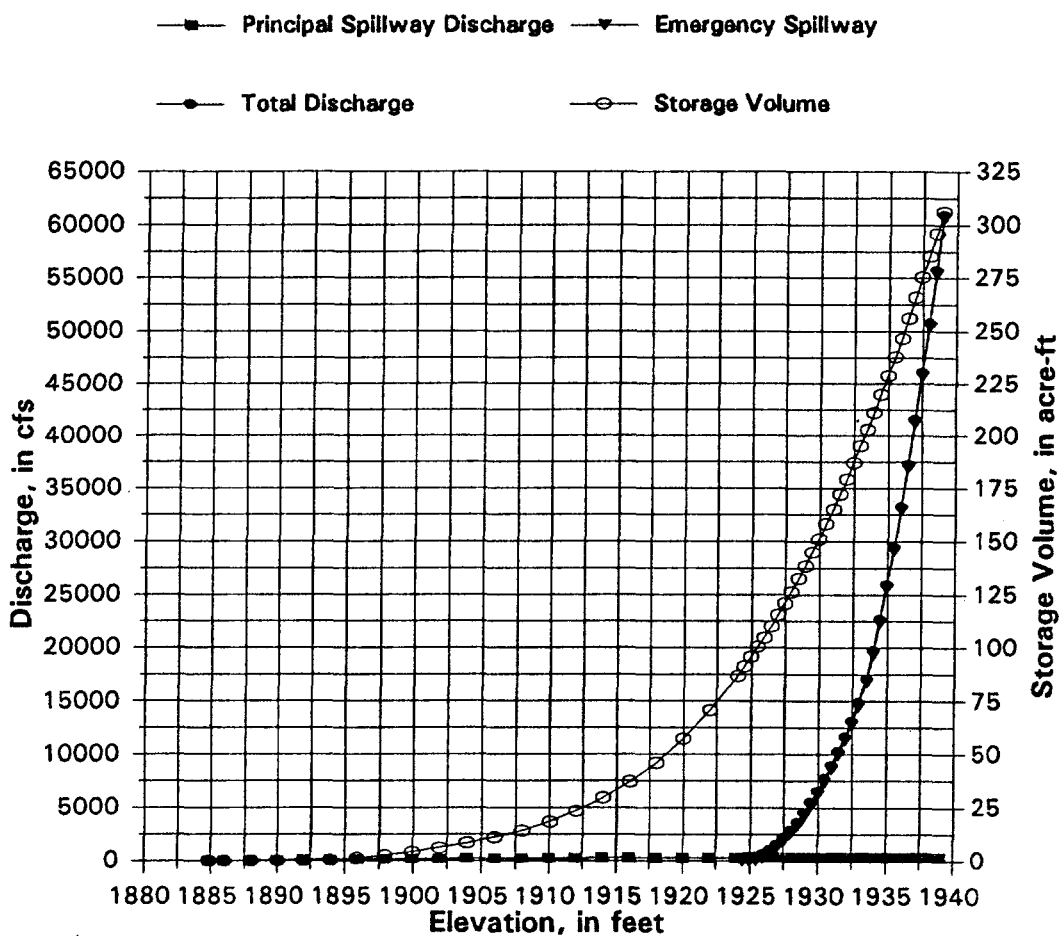
Storage and Discharge vs Stage Data for Sunridge Canyon Dam (7)

HY8 Output		Uneven Weir Output	
Stage (ft)	Culvert Discharge (cfs)	Stage (ft)	Discharge (cfs)
1884.66	0	1924.50	0
1887.40	40	1925.00	4
1888.96	80	1925.50	88
1890.92	120	1926.00	328
1893.73	160	1926.50	712
1897.39	200	1927.00	1224
1901.80	240	1927.50	1841
1907.16	280	1928.00	2553
1914.32	320	1928.50	3356
1917.31	333	1929.00	4246
1924.50	358	1929.50	5220
1926.00	362	1930.00	6277
1928.00	368	1930.50	7417
1930.00	373	1931.00	8638
1933.00	380	1931.50	9941
1935.00	385	1932.00	11326
1937.00	389	1932.50	12790
1939.00	393	1933.00	14517
		1933.50	16749
		1934.00	19390
		1934.50	22357
		1935.00	25613
		1935.50	29141
		1936.00	32928
		1936.50	36960
		1937.00	41229
		1937.50	45729
		1938.00	50456
		1938.50	55405
		1939.00	60573

GVSCE					
Stage NGVD 29 Datum	Surface Area (acres)	Storage Volume (acre-feet)	Discharge, in cfs		
			Principal Spillway	Emergency Spillway	Total
1884.84	0.00	0.00	0	—	0
1886.00	0.00	0.00	18	—	18
1888.00	0.00	0.00	55	—	55
1890.00	0.00	0.00	100	—	100
1892.00	0.14	0.09	135	—	135
1894.00	0.39	0.60	163	—	163
1896.00	0.48	1.47	185	—	185
1898.00	0.72	2.66	205	—	205
1900.00	0.92	4.30	223	—	223
1902.00	1.02	6.24	241	—	241
1904.00	1.28	8.53	257	—	257
1906.00	1.46	11.27	272	—	272
1908.00	1.83	14.55	285	—	285
1910.00	2.28	18.66	296	—	296
1912.00	2.81	23.74	307	—	307
1914.00	3.30	29.84	318	—	318
1916.00	4.04	37.17	326	—	326
1918.00	5.10	46.29	333	—	333
1920.00	6.15	57.52	341	—	341
1922.00	7.32	70.97	348	—	348
1924.00	8.37	86.65	355	—	355
1924.50	—	91	358	0	358
1925.00	—	96	359	4	363
1925.50	—	100	361	88	449
1926.00	9.90	104.90	362	328	690
1926.50	—	110	364	712	1075
1927.00	—	116	365	1224	1589
1927.50	—	121	366	1841	2207
1928.00	11.47	126.25	368	2553	2921
1928.50	—	132	369	3356	3725
1929.00	—	139	370	4246	4616
1929.50	—	145	372	5220	5592
1930.00	13.37	151.07	373	6277	6650
1930.50	—	158	374	7417	7791
1931.00	—	165	375	8638	9013
1931.50	—	172	377	9941	10317
1932.00	15.08	179.50	378	11326	11702
1932.50	—	187	379	12790	13169
1933.00	—	195	380	14517	14897
1933.50	—	203	381	16749	17131
1934.00	16.66	211.23	382	19390	19772
1934.50	—	220	383	22357	22740
1935.00	—	229	385	25613	25998
1935.50	—	238	386	29141	29527
1936.00	18.75	246.62	387	32928	33315
1936.50	—	256	388	36960	37348
1937.00	—	266	389	41229	41618
1937.50	—	276	390	45729	46119
1938.00	20.23	285.59	391	50456	50847
1938.50	—	296	392	55405	55797
1939.00	20.89	306.14	393	60573	60966

Tri-Co.			
Stage		Storage Volume (acre-feet)	Total Discharge (cfs)
NGVD 29 Datum	Local Datum		
1882.74	1884.00	0.00	0
1894.74	1896.00	2.80	198
1898.74	1900.00	6.40	233
1902.74	1904.00	11.60	265
1906.74	1908.00	18.60	293
1910.74	1912.00	28.60	319
1914.74	1916.00	41.80	343
1918.74	1920.00	61.80	365
1924.74	1926.00	108.00	395
1925.74	1927.00	128.10	829
1926.74	1928.00	148.20	1640
1928.74	1930.00	173.70	4033
1930.74	1932.00	203.70	7306
1932.74	1934.00	233.60	11384

Note: When stage > 1928 a flow split will occur into sub basin 210H. Total discharge column is for flow passing dam 7 only, it does not include diversion discharges into sub basin 210H for stages above 1928.



Rating Curves for SunRidge Canyon Dam (No. 7)

APPENDIX G

100-year flood results from the Ftn Hills FDS report

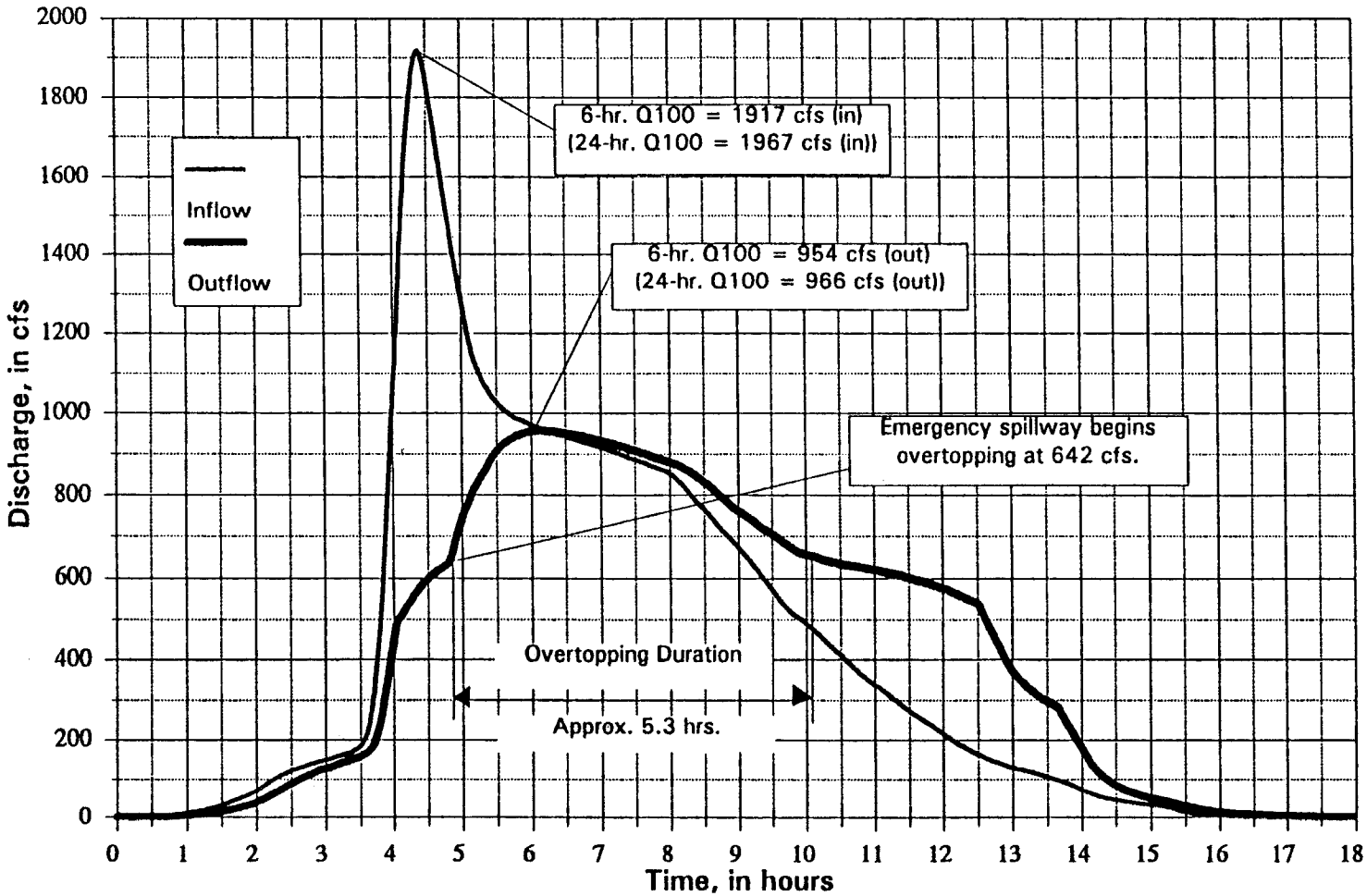


Figure F-1

Hydrograph at C599 from a 100-Year, 6-Hour Storm
Inflow and Outflow from Dam 4 Existing Condition

ex_hydgf.wb1

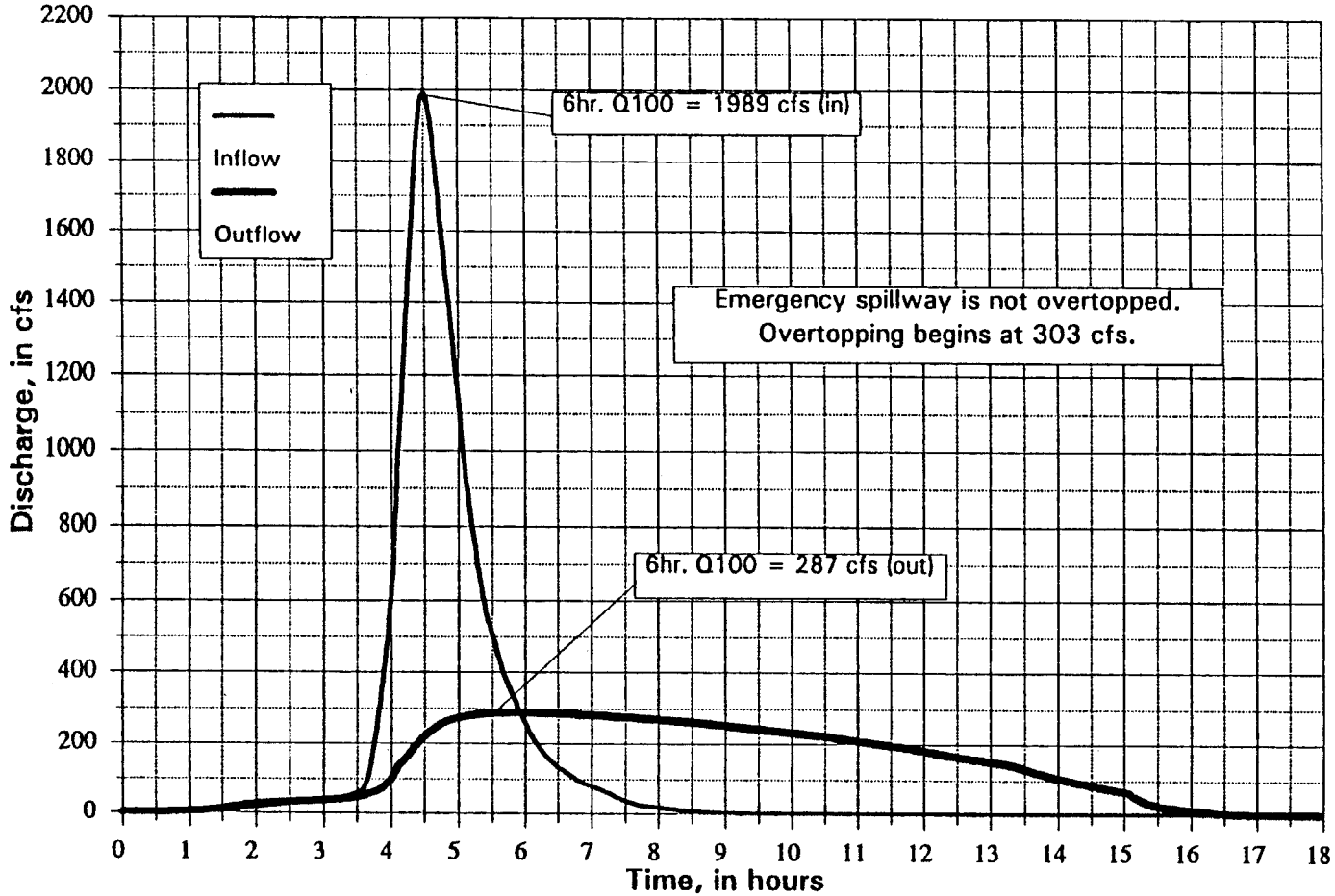


Figure F-2

Hydrograph at C560 from a 100-Year, 6-Hour Storm
Inflow and Outflow from Dam 6 Existing Condition

ex_hydgf.wb1

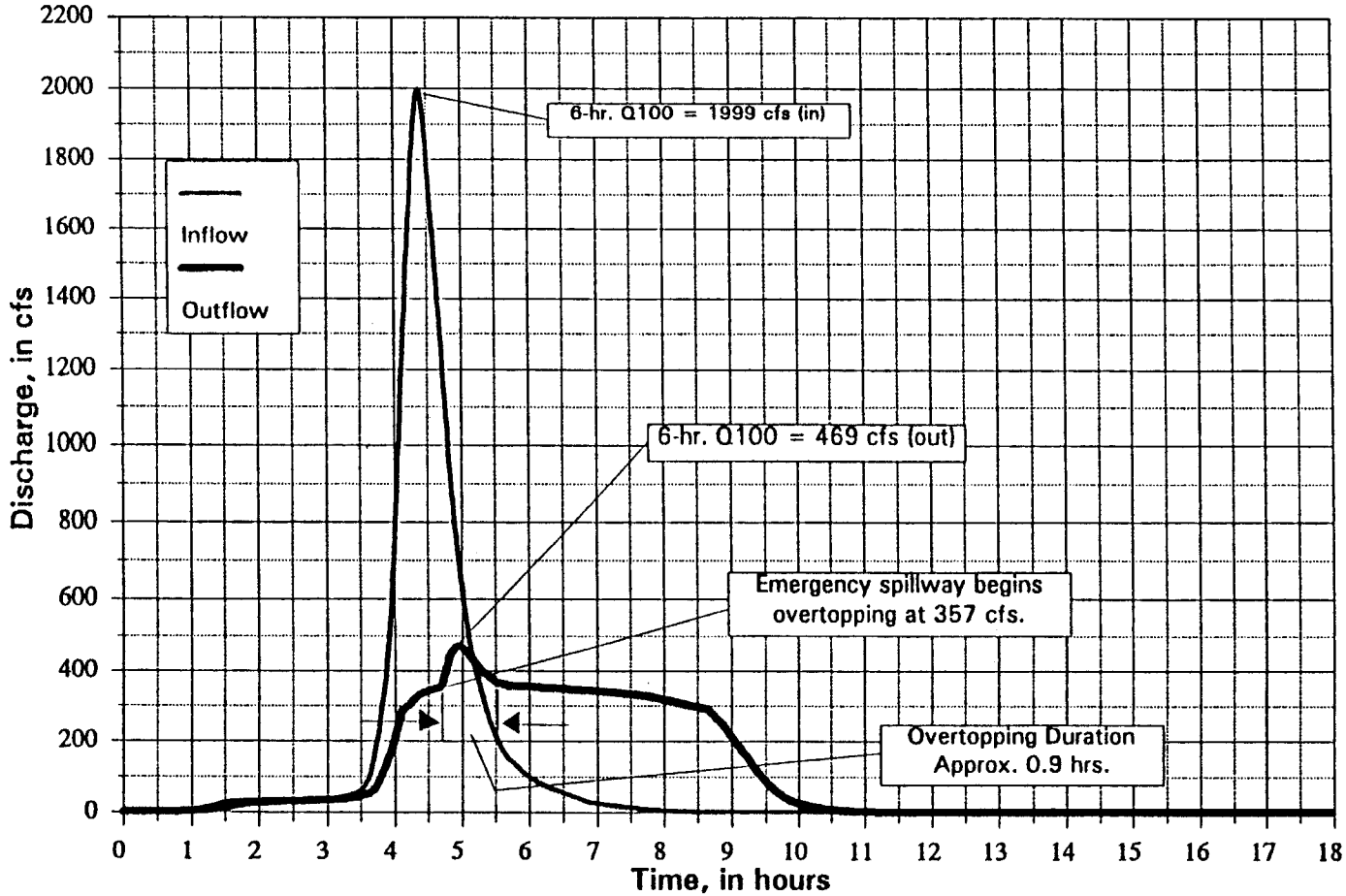


Figure F-3

Hydrograph at C584 from a 100-Year, 6-Hour Storm Inflow and Outflow from Dam 7 Existing Condition

ex_hydgf.wb1

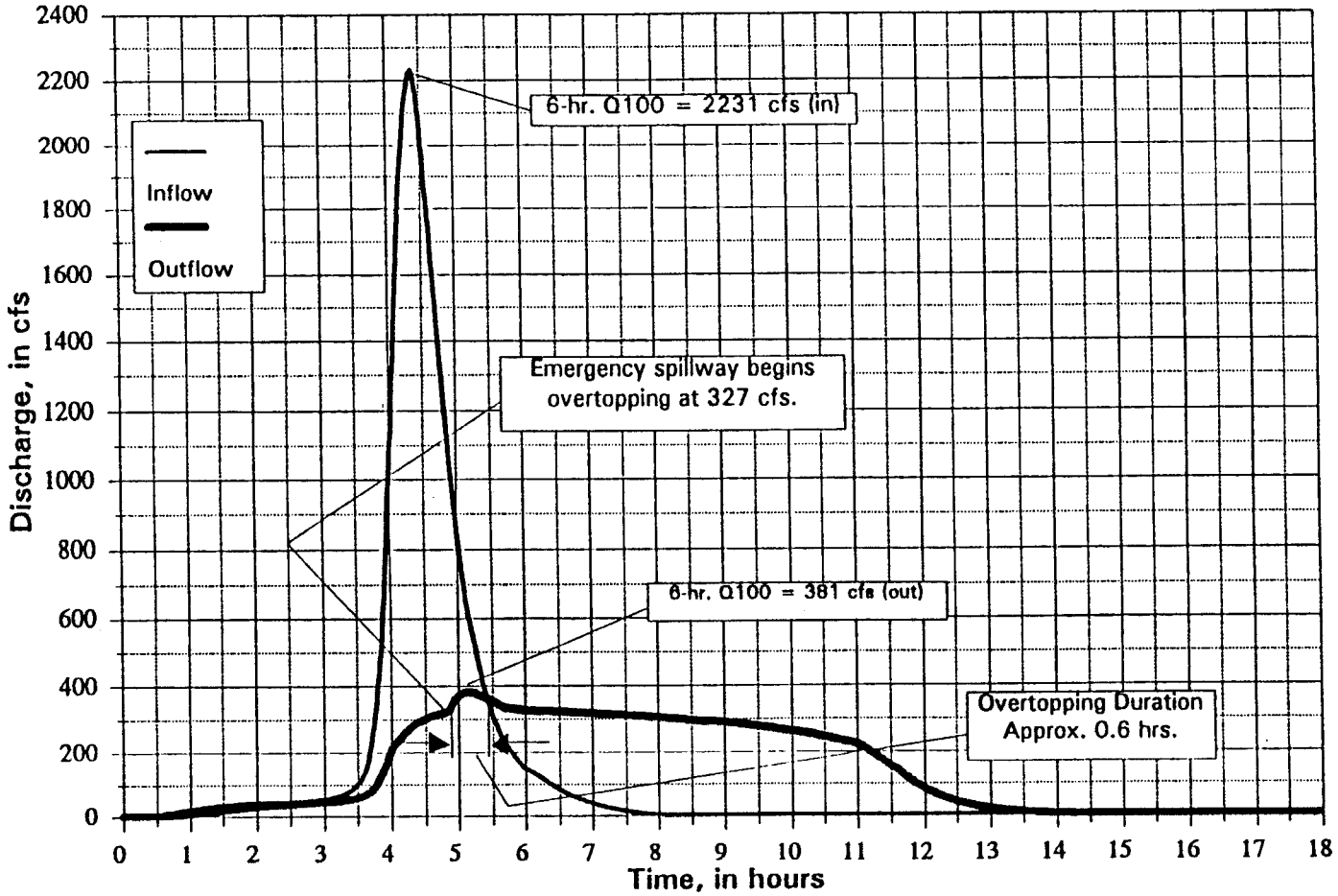


Figure F-4

Hydrograph at C578 from a 100-Year, 6-Hour Storm
Inflow and Outflow from Dam 11 Existing Condition

ex_hydgf.wb1

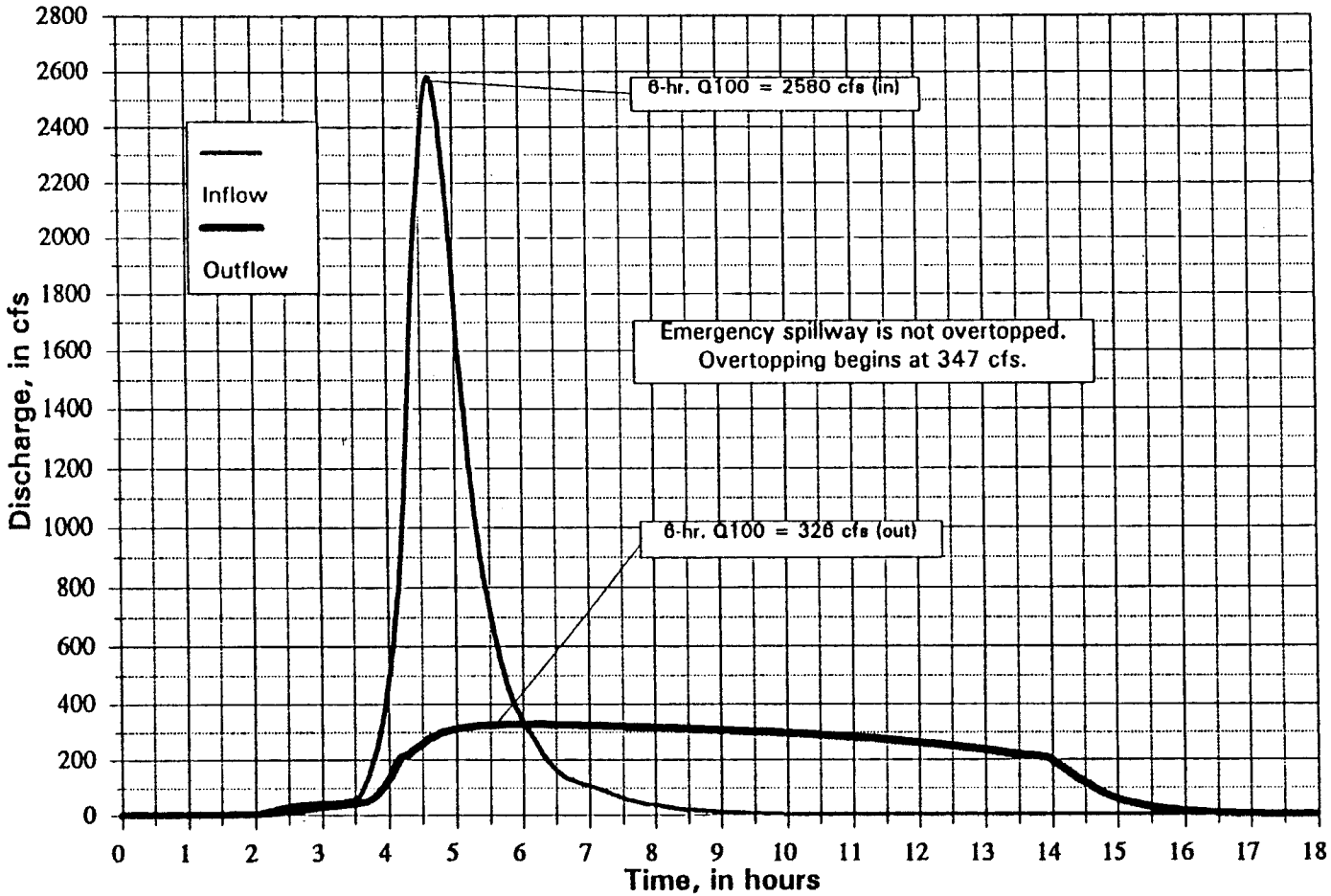


Figure F-5

Hydrograph at C536 from a 100-Year, 6-Hour Storm
Inflow and Outflow from Dam 36 Existing Condition

ex_hydgf.wb1

APPENDIX H

HEC-1 output for Aspen Dam

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
* RUN DATE  12/28/95  TIME  17:35:29   *
*                                      *
****************************************
```

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

```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X               X
XXXXXXX  XXXX    X       XXXXX   X
X     X  X       X               X
X     X  X       X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL FREVIOUS 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    Project Name: Fountain Hills Dam Break Analysis
  2           ID    Project No.:  No. 83                                File Name: DAM6-PM.IH1
  3           ID    PMF Analysis for Aspen Dam (Dam No. 6)              Date:      09/12/95
  4           ID    Based on PMP Computation                            Soure:     FU100-6.IH1
              *
  5           IT      10            0000      75
  6           IO       5
  7           IN      15
              *DIAGRAM
              *

  8           KK    207A
  9           KM   Sub-Basin   207A
 10           KM
 11           KM      The Clark Unit Hydrograph is used for this basin.
 12           KM          The Natural time-area relation is used for this basin.
 13           KM          Time of Concentration is for 100-year flood
 14           KM
 15           KM      Time of Concentration for this sub-basin is based on the following:
 16           KM          6-Hour Rainfall, Pattern No.  1.00
 17           KM          An areal rainfall reduction factor of 0.997
 18           KM
 19           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 20           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 21           KM   .45 .44 .44 .13 .09 .08 .04 .03 .03 .03 .03 .03 .01 .01 .01 .01 .01 .01
 22           KM
 23           KM          L=   1.356 miles, S=  351 feet/mile, Kb= .13
 24           KM
 25           BA   0.256
 26           PI     0.1     0.1     0.1     0.1     0.2     0.2     0.2     0.2     8.0     1.8
 27           PI     0.7     0.5   0.425   0.425   0.425   0.425   0.125   0.125   0.125   0.125
 28           PI   0.075   0.075   0.075   0.075
 29           LG    0.24    0.00    4.55    0.37   29.81
 30           UC   0.467   0.440
 31           UA       0       3       5       8      12      20      43      75      90      96
 32           UA     100
              *

 33           KK    207B
 34           KM   Sub-Basin   207B
 35           KM
 36           KM      The Clark Unit Hydrograph is used for this basin.
 37           KM          The Natural time-area relation is used for this basin.
 38           KM          Time of Concentration is for 100-year flood.
 39           KM
 40           KM      Time of Concentration for this sub-basin is based on the following:
 41           KM          6-Hour Rainfall, Pattern No.  1.00
 42           KM          An areal rainfall reduction factor of 0.997
 43           KM
 44           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 45           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 46           KM   .45 .44 .44 .13 .09 .08 .04 .04 .03 .03 .03 .03 .01 .01 .01 .01 .01 .01
 47           KM
 48           KM          L=   1.312 miles, S=  359 feet/mile, Kb= .13
 49           KM
```

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

 50           BA   0.208
 51           LG    0.24    0.00    4.45    0.38   32.42
 52           UC   0.450   0.463
 53           UA       0       3       5       8      12      20      43      75      90      96
 54           UA     100
              *

 55           KK    C550
 56           KM      Hydrograph combine 207A + 207B at C550
 57           HC       2
              *

 58           KK  550552
 59           KM      Normal depth channel route from C550 to C552
 60           KM      Source:  Hydrology Field Reconnaissance
 61           RS       1    FLOW      -1
 62           RC   0.050   0.045   0.050  4410.0  0.0528
 63           RX  1000.0  1005.0  1018.0  1028.0  1038.0  1043.0  1048.0  1055.0
 64           RY  2188.0  2184.0  2180.0  2176.0  2176.0  2180.0  2184.0  2188.0
              *

 65           KK    207C
 66           KM   Sub-Basin   207C
 67           KM
 68           KM      The Clark Unit Hydrograph is used for this basin.
 69           KM          The Natural time-area relation is used for this basin.
 70           KM          Time of Concentration is for 100-year flood.
 71           KM
 72           KM      Time of Concentration for this sub-basin is based on the following:
 73           KM          6-Hour Rainfall, Pattern No.  1.00
 74           KM          An areal rainfall reduction factor of 0.998
 75           KM
 76           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 77           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 78           KM   .45 .44 .44 .13 .09 .08 .03 .03 .03 .01 .01 .01 .00 .00 .00 .00 .00 .00
 79           KM
 80           KM          L=   0.974 miles, S=  297 feet/mile, Kb= .11
 81           KM
 82           BA   0.173
 83           LG    0.19    0.00    5.30    0.26   13.69
 84           UC   0.354   0.311
 85           UA       0       3       5       8      12      20      43      75      90      96
 86           UA     100
              *

 87           KK   C552L
 88           KM      Hydrograph combine 550552 + 207C at C552 left branch
 89           HC       2
              *
```

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

  90          KK    207D
  91          KM   Sub-Basin   207D
  92          KM
  93          KM      The Clark Unit Hydrograph is used for this basin.
  94          KM          The HEC-1 time-area relation is used for this basin.
  95          KM          Time of Concentration is for 100-year flood.
  96          KM
  97          KM      Time of Concentration for this sub-basin is based on the following:
  98          KM          6-Hour Rainfall, Pattern No.  1.00
  99          KM          An areal rainfall reduction factor of 0.997
 100          KM
 101          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 102          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 103          KM   .46 .45 .45 .15 .11 .10 .05 .05 .04 .04 .04 .04 .01 .01 .01 .01 .01 .01
 104          KM
 105          KM          L=   1.036 miles, S=  373 feet/mile, Kb= .09
 106          KM
 107          BA   0.197
 108          LG    0.18    0.00    4.35    0.38   41.30
 109          UC   0.288   0.241
              *

 110          KK  551552
 111          KM      Normal depth channel route from C551 to C552
 112          KM      Source:  100 Scale 4' CI Mapping
 113          RS       1    FLOW      -1
 114          RC   0.050   0.045   0.050  4410.0  0.0528
 115          RX  1000.0  1005.0  1018.0  1028.0  1038.0  1043.0  1048.0  1055.0
 116          RY  2188.0  2184.0  2180.0  2176.0  2176.0  2180.0  2184.0  2188.0
              *

 117          KK    207E
 118          KM   Sub-Basin   207E
 119          KM
 120          KM      The Clark Unit Hydrograph is used for this basin.
 121          KM          The Urban time-area relation is used for this basin.
 122          KM          Time of Concentration is for 100-year flood.
 123          KM
 124          KM      Time of Concentration for this sub-basin is based on the following:
 125          KM          6-Hour Rainfall, Pattern No.  1.00
 126          KM          An areal rainfall reduction factor of 0.998
 127          KM
 128          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 129          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 130          KM   .46 .46 .46 .15 .12 .11 .05 .05 .04 .04 .04 .04 .01 .01 .01 .01 .01 .01
 131          KM
 132          KM          L=   1.366 miles, S=  315 feet/mile, Kb= .07
 133          KM
 134          BA   0.157
 135          LG    0.15    0.00    4.35    0.38   44.41
 136          UC   0.308   0.370
 137          UA       0       5      16      30      65      77      84      90      94      97
 138          UA     100
              *
```

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

 139          KK   C552R
 140          KM      Hydrograph combine 551552 + 207E at C552 right branch
 141          HC       2
              *

 142          KK    C552
 143          KM      Hydrograph combine C552L + C552R at C552
 144          HC       2
              *

 145          KK  552553
 146          KM      Normal depth channel route from C552 to C553
 147          KM      Source:  Hydrology Field Reconnaissance
 148          RS       1    FLOW      -1
 149          RC   0.060   0.050   0.060  1336.0  0.0337
 150          RX   938.0  1010.0  1055.0  1061.0  1082.0  1096.0  1105.0  1274.0
 151          RY   110.0    94.3    94.4    94.0    94.3    94.5    96.2   110.0
              *

 152          KK    207F
 153          KM   Sub-Basin   207F
 154          KM
 155          KM      The Clark Unit Hydrograph is used for this basin.
 156          KM          The HEC-1 time-area relation is used for this basin.
 157          KM          Time of Concentration is for 100-year flood.
 158          KM
 159          KM      Time of Concentration for this sub-basin is based on the following:
 160          KM          6-Hour Rainfall, Pattern No.  1.00
 161          KM          An areal rainfall reduction factor of 0.998
 162          KM
 163          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 164          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 165          KM   .46 .45 .45 .14 .11 .09 .04 .04 .04 .03 .03 .03 .01 .01 .01 .01 .01 .01
 166          KM
 167          KM          L=   0.794 miles, S=  296 feet/mile, Kb= .11
 168          KM
 169          BA   0.126
 170          LG    0.20    0.00    4.40    0.39   38.35
 171          UC   0.304   0.267
              *

 172          KK    C553
 173          KM      Hydrograph combine 552553 + 207F at C553
 174          HC       2
              *

 175          KK  553556
 176          KM      Normal depth channel route from C553 to C556
 177          KM      Source:  HEC-2 Cross Section: AS 6.118
 178          RS       1    FLOW      -1
 179          RC   0.055   0.045   0.060  2393.0  0.0255
 180          RX  9904.4  9945.9  9974.0  9987.4  9994.9 10008.6 10027.0 10045.3
 181          RY  2004.2  2003.9  1991.7  1990.4  1987.9  1988.2  1997.5  2006.7
              *
```

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

 182          KK   207G
 183          KM  Sub-Basin   207G
 184          KM
 185          KM     The Clark Unit Hydrograph is used for this basin.
 186          KM         The HEC-1 time-area relation is used for this basin.
 187          KM         Time of Concentration is for 100-year flood.
 188          KM
 189          KM     Time of Concentration for this sub-basin is based on the following:
 190          KM         6-Hour Rainfall, Pattern No.  1.00
 191          KM         An areal rainfall reduction factor of 0.997
 192          KM
 193          KM      EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 194          KM    5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 195          KM  .45 .44 .44 .13 .10 .08 .04 .03 .03 .01 .01 .01 .00 .00 .00 .00 .00 .00
 196          KM
 197          KM         L=   1.467 miles, S=  198 feet/mile, Kb= .10
 198          KM
 199          BA  0.236
 200          LG   0.17    0.00    5.60    0.23    9.10
 201          UC  0.521   0.555
              *

 202          KK  C556L
 203          KM     Hydrograph combine 553556 + 207G at C556 left branch
 204          HC      2
              *

 205          KK   207H
 206          KM  Sub-Basin   207H
 207          KM
 208          KM     The Clark Unit Hydrograph is used for this basin.
 209          KM         The Urban time-area relation is used for this basin.
 210          KM         Time of Concentration is for 100-year flood.
 211          KM
 212          KM     Time of Concentration for this sub-basin is based on the following:
 213          KM         6-Hour Rainfall, Pattern No.  1.00
 214          KM         An areal rainfall reduction factor of 0.998
 215          KM
 216          KM      EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 217          KM    5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 218          KM  .47 .46 .46 .16 .13 .12 .05 .05 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
 219          KM
 220          KM         L=   1.044 miles, S=  371 feet/mile, Kb= .05
 221          KM
 222          BA  0.124
 223          LG   0.13    0.00    4.35    0.36   46.78
 224          UC  0.204   0.215
 225          UA      0       5      16      30      65      77      84      90      94      97
 226          UA    100
              *
```

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

 227          KK  554555
 228          KM      Normal depth channel route from C554 to C555
 229          KM      Source:  100 Scale 4' CI Mapping
 230          RS       1    FLOW      -1
 231          RC   0.050   0.045   0.050  2497.0  0.0649
 232          RX  1000.0  1025.0  1080.0  1100.0  1120.0  1130.0  1140.0  1155.0
 233          RY  2192.0  2188.0  2186.0  2184.0  2184.0  2188.0  2192.0  2194.0
              *

 234          KK    207I
 235          KM   Sub-Basin   207I
 236          KM
 237          KM      The Clark Unit Hydrograph is used for this basin.
 238          KM          The Urban time-area relation is used for this basin.
 239          KM          Time of Concentration is for 100-year flood.
 240          KM
 241          KM      Time of Concentration for this sub-basin is based on the following:
 242          KM          6-Hour Rainfall, Pattern No.  1.00
 243          KM          An areal rainfall reduction factor of 0.999
 244          KM
 245          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 246          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 247          KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
 248          KM
 249          KM          L=   0.810 miles, S=  320 feet/mile, Kb= .03
 250          KM
 251          BA   0.073
 252          LG    0.09    0.00    4.40    0.35   50.00
 253          UC   0.142   0.159
 254          UA       0       5      16      30      65      77      84      90      94      97
 255          UA     100
              *

 256          KK    C555
 257          KM      Hydrograph combine 554555 + 207I at C555
 258          HC       2
              *

 259          KK  555556
 260          KM      Normal depth channel route from C555 to C556
 261          KM      Source:  200 Scale Mapping
 262          RS       1    FLOW      -1
 263          RC   0.050   0.050   0.055  3353.0  0.0480
 264          RX  1000.0  1050.0  1090.0  1095.0  1130.0  1150.0  1160.0  1185.0
 265          RY  2020.0  2016.5  2006.0  2004.0  2005.0  2006.0  2010.0  2020.0
              *

 266          KK    207J
 267          KM   Sub-Basin   207J
 268          KM
 269          KM      The Clark Unit Hydrograph is used for this basin.
 270          KM          The Urban time-area relation is used for this basin.
 271          KM          Time of Concentration is for 100-year flood.
 272          KM
```

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

 273          KM      Time of Concentration for this sub-basin is based on the following:
 274          KM          6-Hour Rainfall, Pattern No.  1.00
 275          KM          An areal rainfall reduction factor of 0.999
 276          KM
 277          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 278          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 279          KM   .47 .47 .47 .16 .13 .12 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
 280          KM
 281          KM          L=   0.714 miles, S=  248 feet/mile, Kb= .04
 282          KM
 283          BA   0.093
 284          LG    0.10    0.00    4.40    0.34   48.61
 285          UC   0.171   0.154
 286          UA       0       5      16      30      65      77      84      90      94      97
 287          UA     100
              *

 288          KK   C556R
 289          KM      Hydrograph combine 555556 + 207J at C556 right branch
 290          HC       2
              *

 291          KK    C556
 292          KM      Hydrograph combine C556L + C556R at C556
 293          HC       2
              *

 294          KK  556557
 295          KM      Normal depth channel route from C556 to C557
 296          KM      Source:  HEC-2 Cross Section: AS 5.765
 297          RS       1    FLOW      -1
 298          RC   0.055   0.045   0.060  2298.0  0.0260
 299          RX  9957.1  9995.6 10000.0 10010.0 10040.4 10084.4 10104.2 10180.7
 300          RY  1949.3  1935.9  1935.8  1936.7  1936.7  1938.2  1947.1  1949.9
              *

 301          KK    207K
 302          KM   Sub-Basin   207K
 303          KM
 304          KM      The Clark Unit Hydrograph is used for this basin.
 305          KM          The Urban time-area relation is used for this basin.
 306          KM          Time of Concentration is for 100-year flood.
 307          KM
 308          KM      Time of Concentration for this sub-basin is based on the following:
 309          KM          6-Hour Rainfall, Pattern No.  1.00
 310          KM          An areal rainfall reduction factor of 0.998
 311          KM
 312          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 313          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 314          KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .03 .01 .01 .01 .01 .01 .01
 315          KM
 316          KM          L=   0.859 miles, S=  294 feet/mile, Kb= .05
 317          KM
 318          BA   0.130
 319          LG    0.11    0.27    5.40    0.21   37.19
```

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

 320          UC   0.196   0.172
 321          UA       0       5      16      30      65      77      84      90      94      97
 322          UA     100
              *

 323          KK   C557R
 324          KM      Hydrograph combine 556557 + 207K at C557
 325          HC       2
              *

 326          KK    207L
 327          KM   Sub-Basin   207L
 328          KM
 329          KM      The Clark Unit Hydrograph is used for this basin.
 330          KM          The Urban time-area relation is used for this basin.
 331          KM          Time of Concentration is for 100-year flood.
 332          KM
 333          KM      Time of Concentration for this sub-basin is based on the following:
 334          KM          6-Hour Rainfall, Pattern No.  1.00
 335          KM          An areal rainfall reduction factor of 0.999
 336          KM
 337          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 338          KM   .48 .47 .47 .17 .14 .13 .06 .06 .06 .05 .05 .04 .01 .01 .01 .01 .01 .01
 339          KM
 340          KM          L=   0.667 miles, S=  236 feet/mile, Kb= .04
 341          KM
 342          BA   0.080
 343          LG    0.09    0.00    6.00    0.16   33.25
 344          UC   0.167   0.154
 345          UA       0       5      16      30      65      77      84      90      94      97
 346          UA     100
              *

 347          KK    C557
 348          KM      Hydrograph combine C557R + 207L at C557
 349          HC       2
              *
              * *
              * * C557 is the total flow in Ashbrook Wash downstream of Golden Eagle Blvd.
              * * at fire station
              * *
              *

 350          KK  557558
 351          KM      Normal depth channel route from C557 to C558
 352          KM      Source:  HEC-2 Cross Section: AS 5.254
 353          RS       1    FLOW      -1
 354          RC   0.055   0.045   0.060  2652.0  0.0242
 355          RX  9662.0  9965.0  9967.0 10000.0 10072.0 10095.0 10122.0 10175.0
 356          RY  1890.0  1885.9  1884.0  1878.0  1880.0  1886.0  1888.0  1890.0
              *
```

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

 357          KK    207M
 358          KM   Sub-Basin   207M
 359          KM
 360          KM      The Clark Unit Hydrograph is used for this basin.
 361          KM          The Urban time-area relation is used for this basin.
 362          KM          Time of Concentration is for 100-year flood.
 363          KM
 364          KM      Time of Concentration for this sub-basin is based on the following:
 365          KM          6-Hour Rainfall, Pattern No.  1.00
 366          KM          An areal rainfall reduction factor of 0.998
 367          KM
 368          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 369          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 370          KM   .47 .47 .46 .16 .13 .12 .06 .05 .05 .04 .03 .03 .01 .01 .01 .01 .01 .01
 371          KM
 372          KM          L=   0.636 miles, S=  295 feet/mile, Kb= .04
 373          KM
 374          BA   0.116
 375          LG    0.11    0.00    6.00    0.17   23.09
 376          UC   0.150   0.107
 377          UA       0       5      16      30      65      77      84      90      94      97
 378          UA     100
              *

 379          KK    C558
 380          KM      Hydrograph combine 557558 + 207M at C558
 381          HC       2
              *

 382          KK  558560
 383          KM      Normal depth channel route from C558 to C560
 384          KM      Source:  HEC-2 Cross Section: AS 4.839
 385          RS       1    FLOW      -1
 386          RC   0.055   0.045   0.060  1986.0  0.0185
 387          RX  9777.0  9897.0  9933.1  9970.6 10042.2 10063.4 10121.6 10204.9
 388          RY  1840.3  1837.3  1836.3  1824.3  1822.7  1828.5  1827.7  1842.7
              *

 389          KK    2070
 390          KM   Sub-Basin   2070
 391          KM
 392          KM      The Clark Unit Hydrograph is used for this basin.
 393          KM          The Urban time-area relation is used for this basin.
 394          KM          Time of Concentration is for 100-year flood.
 395          KM
 396          KM      Time of Concentration for this sub-basin is based on the following:
 397          KM          6-Hour Rainfall, Pattern No.  1.00
 398          KM          An areal rainfall reduction factor of 0.998
 399          KM
 400          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 401          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 402          KM   .47 .46 .46 .15 .12 .11 .05 .05 .05 .03 .02 .02 .01 .01 .01 .01 .01 .01
 403          KM
 404          KM          L=   0.643 miles, S=  275 feet/mile, Kb= .04
```

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

 405          KM
 406          BA   0.131
 407          LG    0.13    0.00    5.60    0.21   23.47
 408          UC   0.158   0.107
 409          UA       0       5      16      30      65      77      84      90      94      97
 410          UA     100
              *

 411          KK   C560R
 412          KM      Hydrograph combine 558560 + 207O at C560 right branch
 413          HC       2
              *

 414          KK    207N
 415          KM   Sub-Basin   207N
 416          KM
 417          KM      The Clark Unit Hydrograph is used for this basin.
 418          KM          The Urban time-area relation is used for this basin.
 419          KM          Time of Concentration is for 100-year flood.
 420          KM
 421          KM      Time of Concentration for this sub-basin is based on the following:
 422          KM          6-Hour Rainfall, Pattern No.  1.00
 423          KM          An areal rainfall reduction factor of 0.999
 424          KM
 425          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 426          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 427          KM   .47 .47 .47 .16 .13 .12 .06 .05 .05 .04 .04 .03 .01 .01 .01 .01 .01 .01
 428          KM
 429          KM          L=   0.431 miles, S=  190 feet/mile, Kb= .03
 430          KM
 431          BA   0.049
 432          LG    0.09    0.00    4.80    0.27   35.87
 433          UC   0.125   0.104
 434          UA       0       5      16      30      65      77      84      90      94      97
 435          UA     100
              *

 436          KK  559560
 437          KM      Normal depth channel route from C559 to C560
 438          KM      Source:  200 Scale Mapping
 439          RS       1    FLOW      -1
 440          RC   0.050   0.045   0.050  2170.0  0.0230
 441          RX  1000.0  1050.0  1080.0  1100.0  1110.0  1140.0  1170.0  1205.0
 442          RY  1854.0  1852.0  1850.0  1848.0  1848.0  1850.0  1852.0  1854.0
              *

 443          KK   C560I
 444          KM      Hydrograph combine C560R + 559560 at C560I
 445          KO       1
 446          HC       2
              *
              * *
              * * C560I is the total flow in Ashbrook Wash upstream of Dam 6
              * *
 447          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   8        207A
               .
               .
  33            .        207B
               .           .
               .           .
  55        C550............
               V
               V
  58       550552
               .
               .
  65            .        207C
               .           .
               .           .
  87       C552L...........
               .
               .
  90            .        207D
               .           V
               .           V
 110            .      551552
               .           .
               .           .
 117            .           .        207E
               .           .           .
               .           .           .
 139            .      C552R...........
               .           .
               .           .
 142        C552............
               V
               V
 145       552553
               .
               .
 152            .        207F
               .           .
               .           .
 172        C553............
               V
               V
 175       553556
               .
               .
 182            .        207G
               .           .
               .           .
 202       C556L...........
               .
               .
 205            .        207H
```

```
              .          V
              .          V
227           .     554555
              .          .
              .          .
234           .          .        207I
              .          .          .
              .          .          .
256           .      C555............
              .          V
              .          V
259           .     555556
              .          .
              .          .
266           .          .        207J
              .          .          .
              .          .          .
288           .      C556R...........
              .          .
              .          .
291        C556............
              V
              V
294       556557
              .
              .
301           .       207K
              .          .
              .          .
323       C557R...........
              .
              .
326           .       207L
              .          .
              .          .
347        C557............
              V
              V
350       557558
              .
              .
357           .       207M
              .          .
              .          .
379        C558............
              V
              V
382       558560
              .
              .
389           .       207O
              .          .
              .          .
411       C560R...........
              .
              .
414           .       207N
              .          V
              .          V
436           .     559560
```

```
                .          .
                .          .
443        C560I............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/28/95  TIME  17:35:29  *
*                                      *
****************************************
```

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

```
                    Project Name: Fountain Hills Dam Break Analysis
                    Project No.:  No. 83                          File Name: DAM6-PM.IH1
                    PMF Analysis for Aspen Dam (Dam No. 6)        Date:      09/12/95
                    Based on PMP Computation                      Soure:     FU100-6.IH1

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

    IT        HYDROGRAPH TIME DATA
                   NMIN         10  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1    0  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ         75  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      1    0  ENDING DATE
                 NDTIME       1220  ENDING TIME
                 ICENT          19  CENTURY MARK

              COMPUTATION INTERVAL    0.17 HOURS
                   TOTAL TIME BASE   12.33 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


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
443 KK    *     C560I  *
          *            *
          **************

445 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          1  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
```

QSCAL 0. HYDROGRAPH PLOT SCALE

446 HC HYDROGRAPH COMBINATION

ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

***

HYDROGRAPH AT STATION C560I

SUM OF 2 HYDROGRAPHS

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0310	20	7243.	1		0620	39	203.	1		0930	58	1.
1		0010	2	5.	1		0320	21	5628.	1		0630	40	164.	1		0940	59	1.
1		0020	3	17.	1		0330	22	4442.	1		0640	41	134.	1		0950	60	0.
1		0030	4	35.	1		0340	23	3652.	1		0650	42	109.	1		1000	61	0.
1		0040	5	62.	1		0350	24	3155.	1		0700	43	88.	1		1010	62	0.
1		0050	6	87.	1		0400	25	2801.	1		0710	44	72.	1		1020	63	0.
1		0100	7	117.	1		0410	26	2465.	1		0720	45	59.	1		1030	64	0.
1		0110	8	176.	1		0420	27	2044.	1		0730	46	45.	1		1040	65	0.
1		0120	9	253.	1		0430	28	1641.	1		0740	47	34.	1		1050	66	0.
1		0130	10	329.	1		0440	29	1332.	1		0750	48	25.	1		1100	67	0.
1		0140	11	411.	1		0450	30	1083.	1		0800	49	19.	1		1110	68	0.
1		0150	12	509.	1		0500	31	872.	1		0810	50	15.	1		1120	69	0.
1		0200	13	610.	1		0510	32	709.	1		0820	51	11.	1		1130	70	0.
1		0210	14	3533.	1		0520	33	576.	1		0830	52	8.	1		1140	71	0.
1		0220	15	10209.	1		0530	34	491.	1		0840	53	6.	1		1150	72	0.
1		0230	16	15755.	1		0540	35	413.	1		0850	54	4.	1		1200	73	0.
1		0240	17	16079.	1		0550	36	350.	1		0900	55	3.	1		1210	74	0.
1		0250	18	13031.	1		0600	37	301.	1		0910	56	2.	1		1220	75	0.
1		0300	19	9714.	1		0610	38	252.	1		0920	57	2.					

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	12.33-HR
16079.	2.67	(CFS)	3077.	1505.	1505.	1505.
		(INCHES)	13.313	13.386	13.386	13.386
		(AC-FT)	1526.	1534.	1534.	1534.

CUMULATIVE AREA = 2.15 SQ MI

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	207A	1971.	2.67	360.	176.	176.	0.26		
HYDROGRAPH AT	207B	1561.	2.67	293.	143.	143.	0.21		
2 COMBINED AT	C550	3532.	2.67	654.	319.	319.	0.46		
ROUTED TO	550552	3528.	2.67	654.	319.	319.	0.46	2182.99	2.67
HYDROGRAPH AT	207C	1633.	2.50	246.	120.	120.	0.17		
2 COMBINED AT	C552L	5037.	2.67	900.	439.	439.	0.64		
HYDROGRAPH AT	207D	2036.	2.50	283.	138.	138.	0.20		
ROUTED TO	551552	2053.	2.50	282.	138.	138.	0.20	2181.47	2.50
HYDROGRAPH AT	207E	1351.	2.50	226.	110.	110.	0.16		
2 COMBINED AT	C552R	3403.	2.50	508.	248.	248.	0.35		
2 COMBINED AT	C552	7829.	2.67	1408.	687.	687.	0.99		
ROUTED TO	552553	8002.	2.67	1407.	687.	687.	0.99	99.54	2.67
HYDROGRAPH AT	207F	1258.	2.50	179.	87.	87.	0.13		
2 COMBINED AT	C553	8986.	2.67	1587.	774.	774.	1.12		
ROUTED TO	553556	9179.	2.67	1586.	774.	774.	1.12	1998.72	2.67
HYDROGRAPH AT	207G	1549.	2.67	337.	165.	165.	0.24		
2 COMBINED AT	C556L	10728.	2.67	1924.	939.	939.	1.35		
HYDROGRAPH AT	207H	1434.	2.33	180.	88.	88.	0.12		
ROUTED TO	554555	1368.	2.50	180.	88.	88.	0.12	2186.71	2.50
HYDROGRAPH AT	207I	997.	2.33	107.	52.	52.	0.07		
2 COMBINED AT	C555	2270.	2.33	287.	140.	140.	0.20		
ROUTED TO	555556	2305.	2.50	287.	140.	140.	0.20	2007.72	2.50
HYDROGRAPH AT	207J	1282.	2.33	136.	66.	66.	0.09		
2 COMBINED AT	C556R	3248.	2.50	423.	206.	206.	0.29		
2 COMBINED AT	C556	12766.	2.67	2345.	1145.	1145.	1.64		
ROUTED TO	556557	13020.	2.67	2345.	1145.	1145.	1.64	1943.92	2.67

HYDROGRAPH AT	207K	1669.	2.33	182.	89.	89.	0.13		
2 COMBINED AT	C557R	13759.	2.67	2526.	1234.	1234.	1.77		
HYDROGRAPH AT	207L	1110.	2.33	120.	59.	59.	0.08		
2 COMBINED AT	C557	14276.	2.50	2645.	1292.	1292.	1.85		
ROUTED TO	557558	14473.	2.67	2644.	1292.	1292.	1.85	1886.62	2.67
HYDROGRAPH AT	207M	1816.	2.33	173.	84.	84.	0.12		
2 COMBINED AT	C558	14928.	2.67	2815.	1377.	1377.	1.97		
ROUTED TO	558560	15271.	2.67	2815.	1377.	1377.	1.97	1831.81	2.67
HYDROGRAPH AT	207O	2048.	2.33	192.	94.	94.	0.13		
2 COMBINED AT	C560R	15783.	2.67	3006.	1470.	1470.	2.10		
HYDROGRAPH AT	207N	772.	2.33	72.	35.	35.	0.05		
ROUTED TO	559560	641.	2.33	72.	35.	35.	0.05	1850.40	2.33
2 COMBINED AT	C560I	16079.	2.67	3077.	1505.	1505.	2.15		

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

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
* RUN DATE  12/28/95  TIME  17:36:27   *
*                                      *
****************************************
```

```
*************************************
*
*    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        FOUNTAIN HILLS DAM BREAK ANALYSIS
  2           ID        RESERVOIR ROUTING WITH OVERTOPPING ANALYSIS.    File Name: DAM6-RT.IH1
  3           ID        DAM 6 - ASPEN DAM
  4           ID        ******************************************************************
  5           ID        Analytical Considerations:
  6           ID        (a) Principal Spillway is clogged.
  7           ID        (b) Initial Condition is the higher between 100-year flood and
  8           ID            Spillway crest elevation.
  9           ID        (c) Input is 10-minute incremental PMF to genera te 50 per cent
 10           ID            PMF and routed hydrographs.
 11           ID        ******************************************************************
              *DIAGRAM
 12           IT      10       0       0      70
 13           IO       1
 14           JR    FLOW    0.50
 15           IN      10
              *

 16           KK   C560I
 17           KM        DAM INFLOWS FROM PMF ANALYSIS (DAM6-PM.IH1)
 18           KM        Inflows for Dam 6 (Aspen Dam)
 19           KO       1
 20           BA    2.16
 21           QI       0       5      17      35      62      87     117     176     253     329
 22           QI     411     509     610    3533   10209   15755   16079   13031    9714    7243
 23           QI    5628    4442    3652    3155    2801    2465    2044    1641    1332    1083
 24           QI     872     709     576     491     413     350     301     252     203     164
 25           QI     134     109      88      72      59      45      34      25      19      15
 26           QI      11       8       6       4       3       2       2       1       1       0
              *

 27           KK   C560O
 28           KM      Reservoir route at C560 (Dam 6).
 29           KO       1
 30           RS       1    ELEV 1835.36
 31           SV    0.00    7.09   34.65   75.98  135.64  191.44  208.31  226.53  246.00  266.28
 32           SV  289.00  310.81  336.00  360.88  389.00  416.30  446.00  476.39  509.00  540.78
 33           SE  1808.8 1814.00 1820.00 1826.00 1832.00 1836.00 1837.00 1838.00 1839.00 1840.00
 34           SE  1841.0 1842.00 1843.00 1844.00 1845.00 1846.00 1847.00 1848.00 1849.00 1850.00
 35           SQ       0       0       0       0       0     122     926    2241    3942    5983
 36           SQ    8342   11004   13952   18097   24860   33293   43118   54205   66475   79878
 37           ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   16       C560I
                V
                V
   27       C560O
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/28/95  TIME  17:36:27  *
*                                      *
****************************************
```

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

```
                    FOUNTAIN HILLS DAM BREAK ANALYSIS
                    RESERVOIR ROUTING WITH OVERTOPPING ANALYSIS.    File Name: DAM6-RT.IH1
                    DAM 6 - ASPEN DAM
                    ******************************************************************
                    Analytical Considerations:
                    (a) Principal Spillway is clogged.
                    (b) Initial Condition is the higher between 100-year flood and
                        Spillway crest elevation.
                    (c) Input is 10-minute incremental PMF to genera te 50 per cent
                        PMF and routed hydrographs.
                    ******************************************************************

 13 IO        OUTPUT CONTROL VARIABLES
                    IPRNT          1  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT         HYDROGRAPH TIME DATA
                     NMIN         10  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1    0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ         70  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      1    0  ENDING DATE
                   NDTIME       1130  ENDING TIME
                    ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL    0.17 HOURS
                     TOTAL TIME BASE   11.50 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

   JP         MULTI-PLAN OPTION
                    NPLAN          1  NUMBER OF PLANS

   JR         MULTI-RATIO OPTION
                RATIOS OF RUNOFF
               0.50
```

*** ***

```
          **************
          *            *
 16 KK    *     C560I  *
          *            *
          **************
                              DAM INFLOWS FROM PMF ANALYSIS (DAM6-PM.IH1)
                              Inflows for Dam 6 (Aspen Dam)

 19 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

 15 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN         10  TIME INTERVAL IN MINUTES
                     JXDATE      1    0  STARTING DATE
                     JXTIME           0  STARTING TIME

             SUBBASIN RUNOFF DATA

 20 BA          SUBBASIN CHARACTERISTICS
                      TAREA       2.16  SUBBASIN AREA
```

***

****

HYDROGRAPH AT STATION C560I

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0300	19	9714.	1		0600	37	301.	1		0900	55	3.
1		0010	2	5.	1		0310	20	7243.	1		0610	38	252.	1		0910	56	2.
1		0020	3	17.	1		0320	21	5628.	1		0620	39	203.	1		0920	57	2.
1		0030	4	35.	1		0330	22	4442.	1		0630	40	164.	1		0930	58	1.
1		0040	5	62.	1		0340	23	3652.	1		0640	41	134.	1		0940	59	1.
1		0050	6	87.	1		0350	24	3155.	1		0650	42	109.	1		0950	60	1.
1		0100	7	117.	1		0400	25	2801.	1		0700	43	88.	1		1000	61	1.
1		0110	8	176.	1		0410	26	2465.	1		0710	44	72.	1		1010	62	1.
1		0120	9	253.	1		0420	27	2044.	1		0720	45	59.	1		1020	63	1.
1		0130	10	329.	1		0430	28	1641.	1		0730	46	45.	1		1030	64	1.
1		0140	11	411.	1		0440	29	1332.	1		0740	47	34.	1		1040	65	1.
1		0150	12	509.	1		0450	30	1083.	1		0750	48	25.	1		1050	66	1.
1		0200	13	610.	1		0500	31	872.	1		0800	49	19.	1		1100	67	1.
1		0210	14	3533.	1		0510	32	709.	1		0810	50	15.	1		1110	68	1.
1		0220	15	10209.	1		0520	33	576.	1		0820	51	11.	1		1120	69	1.
1		0230	16	15755.	1		0530	34	491.	1		0830	52	8.	1		1130	70	1.
1		0240	17	16079.	1		0540	35	413.	1		0840	53	6.					
1		0250	18	13031.	1		0550	36	350.	1		0850	54	4.					

****

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

(CFS)	(HR)		6-HR	24-HR	72-HR	11.50-HR
16079.	2.67	(CFS)	3077.	1614.	1614.	1614.
		(INCHES)	13.245	13.319	13.319	13.319
		(AC-FT)	1526.	1534.	1534.	1534.

CUMULATIVE AREA = 2.16 SQ MI

****

HYDROGRAPH AT STATION C560I
PLAN 1, RATIO = 0.50

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0300	19	4857.	1		0600	37	151.	1		0900	55	2.
1		0010	2	3.	1		0310	20	3622.	1		0610	38	126.	1		0910	56	1.
1		0020	3	9.	1		0320	21	2814.	1		0620	39	102.	1		0920	57	1.
1		0030	4	18.	1		0330	22	2221.	1		0630	40	82.	1		0930	58	1.
1		0040	5	31.	1		0340	23	1826.	1		0640	41	67.	1		0940	59	1.
1		0050	6	44.	1		0350	24	1578.	1		0650	42	55.	1		0950	60	1.
1		0100	7	59.	1		0400	25	1401.	1		0700	43	44.	1		1000	61	1.
1		0110	8	88.	1		0410	26	1233.	1		0710	44	36.	1		1010	62	1.
1		0120	9	127.	1		0420	27	1022.	1		0720	45	30.	1		1020	63	1.
1		0130	10	165.	1		0430	28	821.	1		0730	46	23.	1		1030	64	1.
1		0140	11	206.	1		0440	29	666.	1		0740	47	17.	1		1040	65	1.
1		0150	12	255.	1		0450	30	542.	1		0750	48	13.	1		1050	66	1.
1		0200	13	305.	1		0500	31	436.	1		0800	49	10.	1		1100	67	1.
1		0210	14	1767.	1		0510	32	355.	1		0810	50	8.	1		1110	68	1.
1		0220	15	5105.	1		0520	33	288.	1		0820	51	6.	1		1120	69	1.
1		0230	16	7878.	1		0530	34	246.	1		0830	52	4.	1		1130	70	1.
1		0240	17	8040.	1		0540	35	207.	1		0840	53	3.					
1		0250	18	6516.	1		0550	36	175.	1		0850	54	2.					

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	11.50-HR
8040.	2.67	(CFS)	1539.	807.	807.	807.
		(INCHES)	6.623	6.660	6.660	6.660
		(AC-FT)	763.	767.	767.	767.

CUMULATIVE AREA = 2.16 SQ MI

*** ***

```
              **************
              *            *
27 KK         *    C560O   *
              *            *
              **************
```

Reservoir route at C560 (Dam 6).

29 KO OUTPUT CONTROL VARIABLES

IPRNT	1	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

30 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	ELEV	TYPE OF INITIAL CONDITION
RSVRIC	1835.36	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

31 SV	STORAGE	0.0	7.1	34.7	76.0	135.6	191.4	208.3	226.5	246.0	266.3
		289.0	310.8	336.0	360.9	389.0	416.3	446.0	476.4	509.0	540.8
33 SE	ELEVATION	1808.80	1814.00	1820.00	1826.00	1832.00	1836.00	1837.00	1838.00	1839.00	1840.00
		1841.00	1842.00	1843.00	1844.00	1845.00	1846.00	1847.00	1848.00	1849.00	1850.00
35 SQ	DISCHARGE	0.	0.	0.	0.	0.	122.	926.	2241.	3942.	5983.
		8342.	11004.	13952.	18097.	24860.	33293.	43118.	54205.	66475.	79878.

***

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 13952. TO 79878.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

****

HYDROGRAPH AT STATION C560O
PLAN 1, RATIO = 0.50

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STA
1		0000	1	102.	182.5	1835.4	1		0400	25	1618.	217.9	1837.5	1		0800	49	101.	181.9	1835
1		0010	2	99.	181.1	1835.3	1		0410	26	1418.	215.1	1837.4	1		0810	50	98.	180.6	1835
1		0020	3	97.	179.9	1835.2	1		0420	27	1225.	212.5	1837.2	1		0820	51	96.	179.4	1835
1		0030	4	94.	178.7	1835.1	1		0430	28	1023.	209.7	1837.1	1		0830	52	93.	178.2	1835
1		0040	5	92.	177.8	1835.0	1		0440	29	860.	206.9	1836.9	1		0840	53	90.	176.9	1835
1		0050	6	91.	177.0	1835.0	1		0450	30	733.	204.3	1836.8	1		0850	54	88.	175.7	1834
1		0100	7	89.	176.5	1834.9	1		0500	31	612.	201.7	1836.6	1		0900	55	85.	174.6	1834
1		0110	8	89.	176.3	1834.9	1		0510	32	505.	199.5	1836.5	1		0910	56	83.	173.4	1834
1		0120	9	89.	176.5	1834.9	1		0520	33	414.	197.6	1836.4	1		0920	57	80.	172.3	1834
1		0130	10	91.	177.3	1835.0	1		0530	34	341.	196.0	1836.3	1		0930	58	78.	171.3	1834
1		0140	11	94.	178.6	1835.1	1		0540	35	284.	194.8	1836.2	1		0940	59	76.	170.2	1834
1		0150	12	98.	180.4	1835.2	1		0550	36	238.	193.9	1836.1	1		0950	60	73.	169.2	1834
1		0200	13	103.	182.9	1835.4	1		0600	37	201.	193.1	1836.1	1		1000	61	71.	168.2	1834
1		0210	14	271.	194.6	1836.2	1		0610	38	170.	192.4	1836.1	1		1010	62	69.	167.2	1834
1		0220	15	2147.	225.2	1837.9	1		0620	39	142.	191.9	1836.0	1		1020	63	67.	166.3	1834
1		0230	16	5529.	261.8	1839.8	1		0630	40	122.	191.3	1836.0	1		1030	64	65.	165.4	1834
1		0240	17	7547.	281.3	1840.7	1		0640	41	120.	190.7	1835.9	1		1040	65	63.	164.5	1834
1		0250	18	7322.	279.2	1840.6	1		0650	42	119.	189.9	1835.9	1		1050	66	61.	163.7	1834
1		0300	19	5958.	266.0	1840.0	1		0700	43	116.	188.9	1835.8	1		1100	67	60.	162.9	1834
1		0310	20	4551.	252.0	1839.3	1		0710	44	114.	187.9	1835.7	1		1110	68	58.	162.1	1833
1		0320	21	3499.	240.9	1838.7	1		0720	45	112.	186.8	1835.7	1		1120	69	56.	161.3	1833
1		0330	22	2762.	232.5	1838.3	1		0730	46	109.	185.6	1835.6	1		1130	70	54.	160.5	1833
1		0340	23	2211.	226.1	1838.0	1		0740	47	107.	184.4	1835.5							
1		0350	24	1873.	221.4	1837.7	1		0750	48	104.	183.2	1835.4							

* *

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	11.50-HR
7547.	2.67	(CFS)	1516.	830.	830.	830.
		(INCHES)	6.526	6.851	6.851	6.851
		(AC-FT)	752.	789.	789.	789.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	11.50-HR
281.	2.67	211.	193.	193.	193.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	11.50-HR
1840.66	2.67	1837.03	1835.92	1835.92	1835.92

CUMULATIVE AREA = 2.16 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

					RATIOS APPLIED TO FLOWS
OPERATION	STATION	AREA	PLAN		RATIO 1
					0.50
HYDROGRAPH AT	C560I	2.16	1	FLOW	8040.
				TIME	2.67
ROUTED TO	C560O	2.16	1	FLOW	7547.
				TIME	2.67

** PEAK STAGES IN FEET **

1	STAGE	1840.66
	TIME	2.67

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

APPENDIX I

HEC-1 output for SunRidge Canyon Dam

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
* RUN DATE  12/27/95  TIME  16:57:06   *
*                                      *
****************************************
```

```
****************************************
*
*    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    Project Name: Fountain Hills Dam Break Analysis
  2           ID    Project No.:  No. 83                                  File Name: DAM7-PM.IH1
  3           ID    PMF Analysis for Sunridge Canyon Dam (Dam No. 7)      Date:      09/12/95
  4           ID    Based on PMP Computation
              *
  5           IT      10                      75
  6           IO       5
  7           IN      15
              *DIAGRAM
              *

  8           KK    209A
  9           KM   Sub-Basin   209A
 10           KM
 11           KM      The Clark Unit Hydrograph is used for this basin.
 12           KM          The HEC-1 time-area relation is used for this basin.
 13           KM          Time of Concentration is for 100-year flood.
 14           KM
 15           KM      Time of Concentration for this sub-basin is based on the following:
 16           KM          6-Hour Rainfall, Pattern No.  1.00
 17           KM          An areal rainfall reduction factor of 0.995
 18           KM
 19           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 20           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 21           KM   .46 .45 .45 .15 .11 .10 .05 .05 .04 .04 .04 .04 .01 .01 .01 .01 .01 .01
 22           KM
 23           KM          L=   1.028 miles, S=  367 feet/mile, Kb= .08
 24           KM
 25           BA   0.368
 26           PI   0.075   0.075   0.075   0.075     0.2     0.2     0.2     0.2     8.2     1.8
 27           PI     0.7     0.7     0.4     0.4     0.4     0.4    0.15    0.15    0.15    0.15
 28           PI   0.075   0.075   0.075   0.075
 29           LG    0.18    0.00    4.35    0.38   41.41
 30           UC   0.263   0.152
              *

 31           KK  579580
 32           KM      Normal depth channel route from C579 to C580
 33           KM      Source:  100 Scale 4' CI Mapping
 34           RS       1    FLOW      -1
 35           RC   0.050   0.045   0.050  1751.0  0.0600
 36           RX  1000.0  1010.0  1025.0  1030.0  1035.0  1040.0  1045.0  1048.0
 37           RY  2336.0  2332.0  2328.0  2327.5  2327.5  2328.0  2332.0  2336.0
              *

 38           KK    209C
 39           KM   Sub-Basin   209C
 40           KM
 41           KM      The Clark Unit Hydrograph is used for this basin.
 42           KM          The Urban time-area relation is used for this basin.
 43           KM          Time of Concentration is for 100-year flood.
 44           KM
 45           KM      Time of Concentration for this sub-basin is based on the following:
 46           KM          6-Hour Rainfall, Pattern No.  1.00
 47           KM          An areal rainfall reduction factor of 0.999
```

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

 48           KM
 49           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 50           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 51           KM   .47 .47 .47 .16 .13 .12 .06 .05 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
 52           KM
 53           KM          L=   0.723 miles, S=  342 feet/mile, Kb= .05
 54           KM
 55           BA   0.064
 56           LG    0.11    0.00    4.35    0.36   48.03
 57           UC   0.175   0.198
 58           UA       0       5      16      30      65      77      84      90      94      97
 59           UA     100
              *

 60           KK   C580R
 61           KM     Hydrograph combine 579580 + 209C at C580 right branch
 62           HC       2
              *

 63           KK    209B
 64           KM   Sub-Basin   209B
 65           KM
 66           KM     The Clark Unit Hydrograph is used for this basin.
 67           KM         The Urban time-area relation is used for this basin.
 68           KM         Time of Concentration is for 100-year flood.
 69           KM
 70           KM     Time of Concentration for this sub-basin is based on the following:
 71           KM         6-Hour Rainfall, Pattern No.  1.00
 72           KM         An areal rainfall reduction factor of 0.999
 73           KM
 74           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 75           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 76           KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
 77           KM
 78           KM          L=   0.716 miles, S=  403 feet/mile, Kb= .03
 79           KM
 80           BA   0.083
 81           LG    0.09    0.00    4.35    0.35   50.00
 82           UC   0.125   0.116
 83           UA       0       5      16      30      65      77      84      90      94      97
 84           UA     100
              *

 85           KK    C580
 86           KM     Hydrograph combine 580R + 209B at C580
 87           HC       2
              *

 88           KK  580581
 89           KM     Normal depth channel route from C580 to C581
 90           KM     Source:  100 Scale 4' CI Mapping
 91           RS       1    FLOW      -1
 92           RC   0.050   0.045   0.050  2339.0  0.0440
 93           RX  1000.0  1010.0  1025.0  1030.0  1040.0  1045.0  1070.0  1075.0
 94           RY  2452.0  2448.0  2444.0  2443.5  2443.5  2444.0  2448.0  2452.0
```

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

 95           KK    209D
 96           KM   Sub-Basin   209D
 97           KM
 98           KM      The Clark Unit Hydrograph is used for this basin.
 99           KM          The Urban time-area relation is used for this basin.
100           KM          Time of Concentration is for 100-year flood.
101           KM
102           KM      Time of Concentration for this sub-basin is based on the following:
103           KM          6-Hour Rainfall, Pattern No.  1.00
104           KM          An areal rainfall reduction factor of 0.997
105           KM
106           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
107           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
108           KM   .47 .47 .46 .16 .13 .12 .06 .05 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
109           KM
110           KM          L=   0.800 miles, S=  354 feet/mile, Kb= .04
111           KM
112           BA   0.244
113           LG    0.11    0.00    4.35    0.36   48.63
114           UC   0.163   0.092
115           UA      0       5      16      30      65      77      84      90      94      97
116           UA    100
              *

117           KK   C581R
118           KM      Hydrograph combine 580581 + 209D at C581 right branch
119           HC       2
              *

120           KK    209E
121           KM   Sub-Basin   209E
122           KM
123           KM      The Clark Unit Hydrograph is used for this basin.
124           KM          The Urban time-area relation is used for this basin.
125           KM          Time of Concentration is for 100-year flood.
126           KM
127           KM      Time of Concentration for this sub-basin is based on the following:
128           KM          6-Hour Rainfall, Pattern No.  1.00
129           KM          An areal rainfall reduction factor of 0.998
130           KM
131           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
132           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
133           KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
134           KM
135           KM          L=   1.018 miles, S=  341 feet/mile, Kb= .03
136           KM
137           BA   0.149
138           LG    0.09    0.00    4.35    0.35   50.00
139           UC   0.158   0.144
140           UA      0       5      16      30      65      77      84      90      94      97
141           UA    100
              *
```

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

 142        KK    C581
 143        KM      Hydrograph combine 581R + 209E at C581
 144        HC       2
            *

 145        KK  581582
 146        KM      Normal depth channel route from C581 to C582
 147        KM      Source:  100 Scale 4' CI Mapping
 148        RS       1    FLOW      -1
 149        RC   0.050   0.045   0.050  4012.0  0.0459
 150        RX  1000.0  1017.0  1052.0  1068.0  1073.0  1100.0  1117.0  1142.0
 151        RY  2120.0  2116.0  2096.0  2092.0  2092.0  2100.0  2112.0  2120.0
            *

 152        KK    209F
 153        KM   Sub-Basin   209F
 154        KM
 155        KM      The Clark Unit Hydrograph is used for this basin.
 156        KM          The HEC-1 time-area relation is used for this basin.
 157        KM          Time of Concentration is for 100-year flood.
 158        KM
 159        KM      Time of Concentration for this sub-basin is based on the following:
 160        KM          6-Hour Rainfall, Pattern No.  1.00
 161        KM          An areal rainfall reduction factor of 0.997
 162        KM
 163        KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 164        KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 165        KM   .46 .45 .45 .15 .11 .10 .05 .05 .04 .03 .03 .03 .01 .01 .01 .01 .01 .01
 166        KM
 167        KM          L=   1.191 miles, S=  332 feet/mile, Kb= .09
 168        KM
 169        BA   0.226
 170        LG    0.18    0.00    4.50    0.36   40.21
 171        UC   0.329   0.290
            *

 172        KK   C582R
 173        KM      Hydrograph combine 581582 + 209F at C582 right branch
 174        HC       2
            *

 175        KK    209G
 176        KM   Sub-Basin   209G
 177        KM
 178        KM      The Clark Unit Hydrograph is used for this basin.
 179        KM          The Urban time-area relation is used for this basin.
 180        KM          Time of Concentration is for 100-year flood.
 181        KM
 182        KM      Time of Concentration for this sub-basin is based on the following:
 183        KM          6-Hour Rainfall, Pattern No.  1.00
 184        KM          An areal rainfall reduction factor of 0.997
 185        KM
 186        KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 187        KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
```

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

 188          KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
 189          KM
 190          KM          L=   1.050 miles, S=  306 feet/mile, Kb= .03
 191          KM
 192          BA   0.204
 193          LG    0.09    0.00    4.35    0.35   49.93
 194          UC   0.167   0.130
 195          UA       0       5      16      30      65      77      84      90      94      97
 196          UA     100
              *

 197          KK    C582
 198          KM      Hydrograph combine C582R + 209G at C582
 199          HC       2
              *

 200          KK  582583
 201          KM      Normal depth channel route from C582 to C583
 202          KM      Source:  100 Scale 4' CI Mapping.
 203          RS       1    FLOW      -1
 204          RC   0.060   0.050   0.060  1725.0  0.0232
 205          RX  1000.0  1012.0  1065.0  1105.0  1125.0  1142.0  1218.0  1225.0
 206          RY  2040.0  2032.0  2020.0  2016.0  2016.0  2024.0  2036.0  2040.0
              *

 207          KK    209H
 208          KM   Sub-Basin   209H
 209          KM
 210          KM      The Clark Unit Hydrograph is used for this basin.
 211          KM          The Urban time-area relation is used for this basin.
 212          KM          Time of Concentration is for 100-year flood.
 213          KM
 214          KM      Time of Concentration for this sub-basin is based on the following:
 215          KM          6-Hour Rainfall, Pattern No.  1.00
 216          KM          An areal rainfall reduction factor of 0.999
 217          KM
 218          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 219          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 220          KM   .46 .46 .46 .15 .12 .11 .05 .05 .04 .03 .02 .02 .01 .01 .01 .01 .01 .01
 221          KM
 222          KM          L=   0.542 miles, S=  343 feet/mile, Kb= .07
 223          KM
 224          BA   0.083
 225          LG    0.15    0.00    5.60    0.22   26.57
 226          UC   0.179   0.138
 227          UA       0       5      16      30      65      77      84      90      94      97
 228          UA     100
              *

 229          KK    C583
 230          KM      Hydrograph combine 582583 + 209H at C583
 231          HC       2
              *
```

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

 232        KK  583584
 233        KM      Normal depth channel route from C583 to C584
 234        KM      Source:  HEC-2 Cross Section: CL 1.664
 235        RS       1    FLOW      -1
 236        RC   0.055   0.070   0.055  3107.0  0.0356
 237        RX  9859.8  9910.3  9933.5  9995.6 10021.7 10051.0 10083.0 10127.8
 238        RY  1948.3  1944.2  1943.7  1930.9  1932.4  1941.6  1937.3  1945.2
            *

 239        KK    209I
 240        KM   Sub-Basin   209I
 241        KM
 242        KM      The Clark Unit Hydrograph is used for this basin.
 243        KM          The Urban time-area relation is used for this basin.
 244        KM          Time of Concentration is for 100-year flood.
 245        KM
 246        KM      Time of Concentration for this sub-basin is based on the following:
 247        KM          6-Hour Rainfall, Pattern No.  1.00
 248        KM          An areal rainfall reduction factor of 0.998
 249        KM
 250        KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 251        KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 252        KM   .47 .46 .46 .16 .13 .12 .05 .05 .05 .04 .03 .02 .00 .00 .00 .00 .00 .00
 253        KM
 254        KM          L=   0.691 miles, S=  347 feet/mile, Kb= .04
 255        KM
 256        BA   0.182
 257        LG    0.10    0.00    6.00    0.17   17.98
 258        UC   0.150   0.088
 259        UA       0       5      16      30      65      77      84      90      94      97
 260        UA     100
            *

 261        KK   C584I
 262        KM      Hydrograph combine 583584 + 209I at C584I
 263        KO       1
 264        HC       2
            *
            * *
            * * C584I is the total flow in Cloudburst Wash upstream of Dam 7
            * *
            *
 265        ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   8         209A
                V
                V
  31       579580
                .
                .
  38            .        209C
                .           .
                .           .
  60        C580R............
                .
                .
  63            .        209B
                .           .
                .           .
  85         C580............
                V
                V
  88       580581
                .
                .
  95            .        209D
                .           .
                .           .
 117        C581R............
                .
                .
 120            .        209E
                .           .
                .           .
 142         C581............
                V
                V
 145       581582
                .
                .
 152            .        209F
                .           .
                .           .
 172        C582R............
                .
                .
 175            .        209G
                .           .
                .           .
 197         C582............
                V
                V
 200       582583
                .
                .
 207            .        209H
```

```
                .          .
                .          .
229         C583............
                V
                V
232       583584
                .
                .
239             .        209I
                .          .
                .          .
261        C584I............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/27/95  TIME  16:57:06  *
*                                      *
****************************************
```

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

```
                    Project Name: Fountain Hills Dam Break Analysis
                    Project No.:  No. 83                              File Name: DAM7-PM.IH1
                    PMF Analysis for Sunridge Canyon Dam (Dam No. 7)  Date:      09/12/95
                    Based on PMP Computation

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

    IT        HYDROGRAPH TIME DATA
                     NMIN         10  MINUTES IN COMPUTATION INTERVAL
                    IDATE     1    0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ         75  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     1    0  ENDING DATE
                   NDTIME       1220  ENDING TIME
                    ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL    0.17 HOURS
                   TOTAL TIME BASE   12.33 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


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** **


          **************
          *            *
261 KK    *     C584I  *
          *            *
          **************

263 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          1  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
```

QSCAL 0. HYDROGRAPH PLOT SCALE

264 HC HYDROGRAPH COMBINATION

ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

***

HYDROGRAPH AT STATION C584I

SUM OF 2 HYDROGRAPHS

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0310	20	3330.	1		0620	39	118.	1		0930	58	0.
1		0010	2	5.	1		0320	21	2490.	1		0630	40	91.	1		0940	59	0.
1		0020	3	15.	1		0330	22	1966.	1		0640	41	64.	1		0950	60	0.
1		0030	4	35.	1		0340	23	1671.	1		0650	42	42.	1		1000	61	0.
1		0040	5	72.	1		0350	24	1554.	1		0700	43	26.	1		1010	62	0.
1		0050	6	98.	1		0400	25	1500.	1		0710	44	18.	1		1020	63	0.
1		0100	7	117.	1		0410	26	1358.	1		0720	45	13.	1		1030	64	0.
1		0110	8	169.	1		0420	27	1078.	1		0730	46	9.	1		1040	65	0.
1		0120	9	269.	1		0430	28	795.	1		0740	47	6.	1		1050	66	0.
1		0130	10	399.	1		0440	29	611.	1		0750	48	4.	1		1100	67	0.
1		0140	11	514.	1		0450	30	510.	1		0800	49	3.	1		1110	68	0.
1		0150	12	587.	1		0500	31	459.	1		0810	50	2.	1		1120	69	0.
1		0200	13	615.	1		0510	32	412.	1		0820	51	1.	1		1130	70	0.
1		0210	14	4744.	1		0520	33	343.	1		0830	52	1.	1		1140	71	0.
1		0220	15	14776.	1		0530	34	273.	1		0840	53	0.	1		1150	72	0.
1		0230	16	19560.	1		0540	35	214.	1		0850	54	0.	1		1200	73	0.
1		0240	17	12798.	1		0550	36	181.	1		0900	55	0.	1		1210	74	0.
1		0250	18	7267.	1		0600	37	165.	1		0910	56	0.	1		1220	75	0.
1		0300	19	4713.	1		0610	38	145.	1		0920	57	0.					

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	12.33-HR
19560.	2.50	(CFS)	2388.	1165.	1165.	1165.
		(INCHES)	13.849	13.889	13.889	13.889
		(AC-FT)	1184.	1187.	1187.	1187.

CUMULATIVE AREA = 1.60 SQ MI

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	209A	4475.	2.33	543.	264.	264.	0.37		
ROUTED TO	579580	4376.	2.50	542.	264.	264.	0.37	2334.35	2.50
HYDROGRAPH AT	209C	806.	2.33	95.	47.	47.	0.06		
2 COMBINED AT	C580R	5125.	2.33	638.	311.	311.	0.43		
HYDROGRAPH AT	209B	1297.	2.33	125.	61.	61.	0.08		
2 COMBINED AT	C580	6422.	2.33	762.	371.	371.	0.51		
ROUTED TO	580581	6265.	2.50	762.	371.	371.	0.51	2450.46	2.50
HYDROGRAPH AT	209D	4047.	2.33	365.	178.	178.	0.24		
2 COMBINED AT	C581R	9953.	2.33	1127.	549.	549.	0.76		
HYDROGRAPH AT	209E	2166.	2.33	223.	109.	109.	0.15		
2 COMBINED AT	C581	12118.	2.33	1350.	658.	658.	0.91		
ROUTED TO	581582	11065.	2.33	1350.	658.	658.	0.91	2102.81	2.33
HYDROGRAPH AT	209F	2242.	2.50	333.	162.	162.	0.23		
2 COMBINED AT	C582R	13296.	2.50	1683.	821.	821.	1.13		
HYDROGRAPH AT	209G	3074.	2.33	306.	149.	149.	0.20		
2 COMBINED AT	C582	15878.	2.33	1989.	970.	970.	1.34		
ROUTED TO	582583	16208.	2.50	1989.	970.	970.	1.34	2027.50	2.50
HYDROGRAPH AT	209H	1215.	2.33	125.	61.	61.	0.08		
2 COMBINED AT	C583	17061.	2.50	2113.	1030.	1030.	1.42		
ROUTED TO	583584	17939.	2.50	2112.	1030.	1030.	1.42	1943.89	2.50
HYDROGRAPH AT	209I	3052.	2.33	276.	134.	134.	0.18		
2 COMBINED AT	C584I	19560.	2.50	2388.	1165.	1165.	1.60		

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

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/28/95  TIME  08:48:43  *
*                                      *
****************************************
```

```
*************************************
*                                   *
*    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        FOUNTAIN HILLS DAM BREAK ANALYSIS
  2           ID        RESERVOIR ROUTING WITH OVERTOPPING ANALYSIS.    File Name: DAM7-RT.IH1
  3           ID        DAM 7 - SUN RIDGE CANYON DAM
  4           ID        ****************************************************************
  5           ID        Analytical Considerations:
  6           ID        (a) Principal Spillway is clogged.
  7           ID        (b) Initial Condition is the higher between 100-year flood and
  8           ID            Spillway crest elevation.
  9           ID        (c) Input is 10-minute incremental PMF to generate 50 per cent
 10           ID            PMF and routed hydrographs.
 11           ID        ****************************************************************
              *DIAGRAM
 12           IT      10       0       0      70
 13           IO       1
 14           JR    FLOW    0.50
 15           IN      10
              *

 16           KK   C584I
 17           KM        DAM INFLOWS FROM PMF ANALYSIS (DAM7-PM.IH1)
 18           KM        Inflows for Dam 7 (Sunridge Canyon Dam)
 19           KO       1
 20           BA    1.59
 21           QI       0       5      15      35      72      98     117     169     269     399
 22           QI     514     587     615    4744   14776   19560   12798    7267    4713    3330
 23           QI    2490    1966    1671    1554    1500    1358    1078     795     611     510
 24           QI     459     412     343     273     214     181     165     145     118      91
 25           QI      64      42      26      18      13       9       6       4       3       2
 26           QI       1       1
              *

 27           KK   C584O
 28           KM      Reservoir route at C584 (Dam 7).
 29           KO       1
 30           RS       1    ELEV 1926.31
 31           SV    0.00    0.60    4.30   11.27   23.74   46.29   86.65   96.00  104.90  126.25
 32           SV  151.07  165.00  179.50  195.00  211.23  229.00  246.62  266.00  285.59  306.14
 33           SE  1884.8 1894.00 1900.00 1906.00 1912.00 1918.00 1924.00 1925.00 1926.00 1928.00
 34           SE  1930.0 1931.00 1932.00 1933.00 1934.00 1935.00 1936.00 1937.00 1938.00 1939.00
 35           SQ       0       0       0       0       0       0       0       4     328    2553
 36           SQ    6277    8638   11325   14517   19390   25613   32928   41229   50456   60573
 37           SE  1884.8 1894.00 1900.00 1906.00 1912.00 1918.00 1924.00 1925.00 1926.00 1928.00
 38           SE  1930.0 1931.00 1932.00 1933.00 1934.00 1935.00 1936.00 1937.00 1938.00 1939.00
 39           ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   16       C584I
                V
                V
   27       C584O
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/28/95  TIME  08:48:43  *
*                                      *
****************************************
```

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

```
                    FOUNTAIN HILLS DAM BREAK ANALYSIS
                    RESERVOIR ROUTING WITH OVERTOPPING ANALYSIS.    File Name: DAM7-RT.IH1
                    DAM 7 - SUN RIDGE CANYON DAM
                    ******************************************************************
                    Analytical Considerations:
                    (a) Principal Spillway is clogged.
                    (b) Initial Condition is the higher between 100-year flood and
                        Spillway crest elevation.
                    (c) Input is 10-minute incremental PMF to generate 50 per cent
                        PMF and routed hydrographs.
                    ******************************************************************

 13 IO        OUTPUT CONTROL VARIABLES
                    IPRNT          1  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT         HYDROGRAPH TIME DATA
                     NMIN         10  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1    0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ         70  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      1    0  ENDING DATE
                   NDTIME       1130  ENDING TIME
                   ICENT          19  CENTURY MARK

                COMPUTATION INTERVAL    0.17 HOURS
                     TOTAL TIME BASE   11.50 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

   JP         MULTI-PLAN OPTION
                    NPLAN          1  NUMBER OF PLANS

   JR         MULTI-RATIO OPTION
                 RATIOS OF RUNOFF
                0.50
```

*** **

```
          **************
          *            *
 16 KK    *     C584I  *
          *            *
          **************
                          DAM INFLOWS FROM PMF ANALYSIS (DAM7-PM.IH1)
                          Inflows for Dam 7 (Sunridge Canyon Dam)

 19 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

 15 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN          10  TIME INTERVAL IN MINUTES
                     JXDATE      1    0  STARTING DATE
                     JXTIME           0  STARTING TIME

            SUBBASIN RUNOFF DATA

 20 BA          SUBBASIN CHARACTERISTICS
                      TAREA        1.59  SUBBASIN AREA
```

***

****

HYDROGRAPH AT STATION C584I

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0300	19	4713.	1		0600	37	165.	1		0900	55	1.
1		0010	2	5.	1		0310	20	3330.	1		0610	38	145.	1		0910	56	1.
1		0020	3	15.	1		0320	21	2490.	1		0620	39	118.	1		0920	57	1.
1		0030	4	35.	1		0330	22	1966.	1		0630	40	91.	1		0930	58	1.
1		0040	5	72.	1		0340	23	1671.	1		0640	41	64.	1		0940	59	1.
1		0050	6	98.	1		0350	24	1554.	1		0650	42	42.	1		0950	60	1.
1		0100	7	117.	1		0400	25	1500.	1		0700	43	26.	1		1000	61	1.
1		0110	8	169.	1		0410	26	1358.	1		0710	44	18.	1		1010	62	1.
1		0120	9	269.	1		0420	27	1078.	1		0720	45	13.	1		1020	63	1.
1		0130	10	399.	1		0430	28	795.	1		0730	46	9.	1		1030	64	1.
1		0140	11	514.	1		0440	29	611.	1		0740	47	6.	1		1040	65	1.
1		0150	12	587.	1		0450	30	510.	1		0750	48	4.	1		1050	66	1.
1		0200	13	615.	1		0500	31	459.	1		0800	49	3.	1		1100	67	1.
1		0210	14	4744.	1		0510	32	412.	1		0810	50	2.	1		1110	68	1.
1		0220	15	14776.	1		0520	33	343.	1		0820	51	1.	1		1120	69	1.
1		0230	16	19560.	1		0530	34	273.	1		0830	52	1.	1		1130	70	1.
1		0240	17	12798.	1		0540	35	214.	1		0840	53	1.					
1		0250	18	7267.	1		0550	36	181.	1		0850	54	1.					

****

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

(CFS)	(HR)		6-HR	24-HR	72-HR	11.50-HR
19560.	2.50	(CFS)	2388.	1250.	1250.	1250.
		(INCHES)	13.962	14.005	14.005	14.005
		(AC-FT)	1184.	1188.	1188.	1188.

CUMULATIVE AREA = 1.59 SQ MI

****

HYDROGRAPH AT STATION C584I
PLAN 1, RATIO = 0.50

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0300	19	2357.	1		0600	37	83.	1		0900	55	1.
1		0010	2	3.	1		0310	20	1665.	1		0610	38	73.	1		0910	56	1.
1		0020	3	8.	1		0320	21	1245.	1		0620	39	59.	1		0920	57	1.
1		0030	4	18.	1		0330	22	983.	1		0630	40	46.	1		0930	58	1.
1		0040	5	36.	1		0340	23	836.	1		0640	41	32.	1		0940	59	1.
1		0050	6	49.	1		0350	24	777.	1		0650	42	21.	1		0950	60	1.
1		0100	7	59.	1		0400	25	750.	1		0700	43	13.	1		1000	61	1.
1		0110	8	85.	1		0410	26	679.	1		0710	44	9.	1		1010	62	1.
1		0120	9	135.	1		0420	27	539.	1		0720	45	7.	1		1020	63	1.
1		0130	10	200.	1		0430	28	398.	1		0730	46	5.	1		1030	64	1.
1		0140	11	257.	1		0440	29	306.	1		0740	47	3.	1		1040	65	1.
1		0150	12	294.	1		0450	30	255.	1		0750	48	2.	1		1050	66	1.
1		0200	13	308.	1		0500	31	230.	1		0800	49	2.	1		1100	67	1.
1		0210	14	2372.	1		0510	32	206.	1		0810	50	1.	1		1110	68	1.
1		0220	15	7388.	1		0520	33	172.	1		0820	51	1.	1		1120	69	1.
1		0230	16	9780.	1		0530	34	137.	1		0830	52	1.	1		1130	70	1.
1		0240	17	6399.	1		0540	35	107.	1		0840	53	1.					
1		0250	18	3634.	1		0550	36	91.	1		0850	54	1.					

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	11.50-HR
9780.	2.50	(CFS)	1194.	625.	625.	625.
		(INCHES)	6.981	7.003	7.003	7.003
		(AC-FT)	592.	594.	594.	594.

CUMULATIVE AREA = 1.59 SQ MI

*** **

```
          **************
          *            *
27 KK     *     C584O  *
          *            *
          **************
```

Reservoir route at C584 (Dam 7).

29 KO OUTPUT CONTROL VARIABLES

IPRNT	1	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

30 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	ELEV	TYPE OF INITIAL CONDITION
RSVRIC	1926.31	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

31 SV	STORAGE	0.0	0.6	4.3	11.3	23.7	46.3	86.7	96.0	104.9	126.3
		151.1	165.0	179.5	195.0	211.2	229.0	246.6	266.0	285.6	306.1
33 SE	ELEVATION	1884.80	1894.00	1900.00	1906.00	1912.00	1918.00	1924.00	1925.00	1926.00	1928.00
		1930.00	1931.00	1932.00	1933.00	1934.00	1935.00	1936.00	1937.00	1938.00	1939.00
35 SQ	DISCHARGE	0.	0.	0.	0.	0.	0.	0.	4.	328.	2553.
		6277.	8638.	11325.	14517.	19390.	25613.	32928.	41229.	50456.	60573.
37 SE	ELEVATION	1884.80	1894.00	1900.00	1906.00	1912.00	1918.00	1924.00	1925.00	1926.00	1928.00
		1930.00	1931.00	1932.00	1933.00	1934.00	1935.00	1936.00	1937.00	1938.00	1939.00

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.60	4.30	11.27	23.74	46.29	86.65	96.00	104.90	126.25
OUTFLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	328.00	2553.00
ELEVATION	1884.80	1894.00	1900.00	1906.00	1912.00	1918.00	1924.00	1925.00	1926.00	1928.00
STORAGE	151.07	165.00	179.50	195.00	211.23	229.00	246.62	266.00	285.59	306.14
OUTFLOW	6277.00	8638.00	11325.00	14517.00	19390.00	25613.00	32928.00	41229.00	50456.00	60573.00
ELEVATION	1930.00	1931.00	1932.00	1933.00	1934.00	1935.00	1936.00	1937.00	1938.00	1939.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 2553. TO 60573.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

****

HYDROGRAPH AT STATION C5840
PLAN 1, RATIO = 0.50

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	673.	108.2	1926.3	*	1		0400	25	775.	109.2	1926.4	*	1		0800	49	5.	96.0	1925.0
1		0010	2	224.	102.0	1925.7	*	1		0410	26	724.	108.7	1926.4	*	1		0810	50	4.	96.0	1925.0
1		0020	3	136.	99.6	1925.4	*	1		0420	27	628.	107.8	1926.3	*	1		0820	51	4.	95.9	1925.0
1		0030	4	87.	98.3	1925.3	*	1		0430	28	494.	106.5	1926.1	*	1		0830	52	4.	95.9	1925.0
1		0040	5	63.	97.6	1925.2	*	1		0440	29	375.	105.4	1926.0	*	1		0840	53	4.	95.8	1925.0
1		0050	6	55.	97.4	1925.2	*	1		0450	30	313.	104.5	1926.0	*	1		0850	54	4.	95.8	1925.0
1		0100	7	54.	97.4	1925.2	*	1		0500	31	284.	103.7	1925.9	*	1		0900	55	4.	95.7	1925.0
1		0110	8	61.	97.6	1925.2	*	1		0510	32	258.	103.0	1925.8	*	1		0910	56	4.	95.7	1925.0
1		0120	9	81.	98.1	1925.2	*	1		0520	33	230.	102.2	1925.7	*	1		0920	57	4.	95.6	1925.0
1		0130	10	115.	99.1	1925.3	*	1		0530	34	200.	101.4	1925.6	*	1		0930	58	4.	95.6	1925.0

1	0140	11	161.	100.3	1925.5	*	1	0540	35	168.	100.5	1925.5	*	1	0940	59	4.	95.6	1925.0
1	0150	12	207.	101.6	1925.6	*	1	0550	36	140.	99.7	1925.4	*	1	0950	60	4.	95.5	1924.9
1	0200	13	244.	102.6	1925.7	*	1	0600	37	119.	99.2	1925.4	*	1	1000	61	4.	95.5	1924.9
1	0210	14	1069.	112.0	1926.7	*	1	0610	38	102.	98.7	1925.3	*	1	1010	62	4.	95.4	1924.9
1	0220	15	4622.	140.0	1929.1	*	1	0620	39	88.	98.3	1925.3	*	1	1020	63	4.	95.4	1924.9
1	0230	16	8797.	165.9	1931.1	*	1	0630	40	73.	97.9	1925.2	*	1	1030	64	4.	95.3	1924.9
1	0240	17	8029.	161.4	1930.7	*	1	0640	41	60.	97.5	1925.2	*	1	1040	65	4.	95.3	1924.9
1	0250	18	4868.	141.7	1929.2	*	1	0650	42	46.	97.2	1925.1	*	1	1050	66	4.	95.2	1924.9
1	0300	19	2964.	129.0	1928.2	*	1	0700	43	35.	96.8	1925.1	*	1	1100	67	4.	95.2	1924.9
1	0310	20	2094.	121.8	1927.6	*	1	0710	44	25.	96.6	1925.1	*	1	1110	68	4.	95.2	1924.9
1	0320	21	1560.	116.7	1927.1	*	1	0720	45	18.	96.4	1925.0	*	1	1120	69	4.	95.1	1924.9
1	0330	22	1187.	113.1	1926.8	*	1	0730	46	13.	96.2	1925.0	*	1	1130	70	4.	95.1	1924.9
1	0340	23	955.	110.9	1926.6	*	1	0740	47	9.	96.1	1925.0	*						
1	0350	24	831.	109.7	1926.5	*	1	0750	48	7.	96.1	1925.0	*						
						*							*						

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	11.50-HR
8797.	2.50	(CFS)	1207.	639.	639.	639.
		(INCHES)	7.057	7.158	7.158	7.158
		(AC-FT)	598.	607.	607.	607.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	11.50-HR
166.	2.50	110.	104.	104.	104.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	11.50-HR
1931.06	2.50	1926.41	1925.74	1925.74	1925.74

CUMULATIVE AREA = 1.59 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

					RATIOS APPLIED TO FLOWS
OPERATION	STATION	AREA	PLAN		RATIO 1
					0.50
HYDROGRAPH AT	C584I	1.59	1	FLOW	9780.
				TIME	2.50
ROUTED TO	C584O	1.59	1	FLOW	8797.
				TIME	2.50

** PEAK STAGES IN FEET **

1	STAGE	1931.06
	TIME	2.50

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

APPENDIX J

HEC-1 output for North Heights Dam

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
* RUN DATE  12/27/95  TIME  16:58:15   *
*                                      *
****************************************
```

```
****************************************
*
*    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    Project Name: Fountain Hills Dam Break Analysis
  2           ID    Project No.:  No. 83                              File Name: DAM11-PM.IH1
  3           ID    PMF Analysis for North Heights (Dam No. 11)       Date:      09/01/95
  4           ID    Based on PMP Computation
              *
  5           IT      10                      70
  6           IO       5
  7           IN      15
              *DIAGRAM
              *

  8           KK    208A
  9           KM   Sub-Basin   208A
 10           KM
 11           KM      The Clark Unit Hydrograph is used for this basin.
 12           KM          The Urban time-area relation is used for this basin.
 13           KM          Time of Concentration is for 100-year flood.
 14           KM
 15           KM      Time of Concentration for this sub-basin is based on the following:
 16           KM          6-Hour Rainfall, Pattern No.  1.00
 17           KM          A rainfall areal reduction factor of  0.998
 18           KM
 19           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 20           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 21           KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
 22           KM
 23           KM          L=   0.626 miles, S=  366 feet/mile, Kb= .03
 24           KM
 25           BA   0.139
 26           PI   0.075   0.075   0.075   0.075     0.2     0.2     0.2     0.2     8.0     1.8
 27           PI     0.7     0.7   0.375   0.375   0.375   0.375    0.15    0.15    0.15    0.15
 28           PI   0.075   0.075   0.075   0.075
 29           LG    0.09    0.00    4.35    0.35   49.86
 30           UC   0.121   0.075
 31           UA       0       5      16      30      65      77      84      90      94      97
 32           UA     100
              *

 33           KK  561563
 34           KM      Normal depth channel route from C561 to C563
 35           KM      Source:  100 Scale 4' CI Mapping
 36           RS       1    FLOW      -1
 37           RC   0.050   0.045   0.050  2335.0  0.0856
 38           RX  1000.0  1004.0  1009.0  1019.0  1037.0  1045.0  1060.0  1075.0
 39           RY  2280.0  2276.0  2272.0  2268.0  2268.0  2272.0  2274.0  2276.0
              *

 40           KK    208B
 41           KM   Sub-Basin   208B
 42           KM
 43           KM      The Clark Unit Hydrograph is used for this basin.
 44           KM          The Urban time-area relation is used for this basin.
 45           KM          Time of Concentration is for 100-year flood.
 46           KM
 47           KM      Time of Concentration for this sub-basin is based on the following:
```

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

 48           KM          6-Hour Rainfall, Pattern No.  1.00
 49           KM          A rainfall areal reduction factor of  1.000
 50           KM
 51           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 52           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 53           KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
 54           KM
 55           KM          L=   0.491 miles, S=  325 feet/mile, Kb= .03
 56           KM
 57           BA   0.027
 58           LG    0.09    0.00    4.35    0.35   50.00
 59           UC   0.113   0.146
 60           UA       0       5      16      30      65      77      84      90      94      97
 61           UA     100
              *

 62           KK   C563R
 63           KM      Hydrograph combine 561563 + 206B at C563 right branch
 64           HC       2
              *

 65           KK    208C
 66           KM   Sub-Basin   208C
 67           KM
 68           KM      The Clark Unit Hydrograph is used for this basin.
 69           KM          The HEC-1 time-area relation is used for this basin.
 70           KM          Time of Concentration is for 100-year flood.
 71           KM
 72           KM      Time of Concentration for this sub-basin is based on the following:
 73           KM          6-Hour Rainfall, Pattern No.  1.00
 74           KM          A rainfall areal reduction factor of  0.999
 75           KM
 76           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 77           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 78           KM   .46 .45 .45 .14 .11 .10 .05 .04 .04 .03 .03 .03 .01 .01 .01 .01 .01 .01
 79           KM
 80           KM          L=   0.639 miles, S=  387 feet/mile, Kb= .11
 81           KM
 82           BA   0.066
 83           LG    0.20    0.00    4.35    0.38   40.11
 84           UC   0.238   0.246
              *

 85           KK  562563
 86           KM      Normal depth channel route from C562 to C563
 87           KM      Source:  100 Scale 4' CI Mapping
 88           RS       1 ·   FLOW      -1
 89           RC   0.050   0.045   0.050  3745.0  0.1106
 90           RX  1000.0  1007.0  1012.0  1017.0  1022.0  1027.0  1044.0  1064.0
 91           RY  2420.0  2416.0  2412.0  2411.8  2411.8  2412.0  2416.0  2420.0
              *
```

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

 92           KK    208D
 93           KM   Sub-Basin   208D
 94           KM
 95           KM      The Clark Unit Hydrograph is used for this basin.
 96           KM          The Urban time-area relation is used for this basin.
 97           KM          Time of Concentration is for 100-year flood.
 98           KM
 99           KM      Time of Concentration for this sub-basin is based on the following:
100           KM          6-Hour Rainfall, Pattern No.  1.00
101           KM          A rainfall areal reduction factor of  0.999
102           KM
103           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
104           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
105           KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
106           KM
107           KM          L=   0.772 miles, S=  327 feet/mile, Kb= .03
108           KM
109           BA   0.075
110           LG    0.09    0.00    4.35    0.35   50.00
111           UC   0.138   0.146
112           UA       0       5      16      30      65      77      84      90      94      97
113           UA     100
              *

114           KK   C563L
115           KM      Hydrograph combine 562563 + 208D at C563 left branch
116           HC       2
              *

117           KK    C563
118           KM      Hydrograph combine C563R + C563L at C563
119           HC       2
              *

120           KK  563564
121           KM      Normal depth channel route from C563 to C564
122           KM      Source:  HEC-2 Cross Section: BR 2.667
123           RS       1    FLOW      -1
124           RC   0.080   0.080   0.080  2762.0  0.0540
125           RX  9947.0  9980.4  9986.4  9995.5 10000.0 10005.8 10021.9 10037.2
126           RY  2103.4  2089.5  2089.2  2084.5  2084.4  2084.3  2098.5  2100.6
              *

127           KK    208E
128           KM   Sub-Basin   208E
129           KM
130           KM      The Clark Unit Hydrograph is used for this basin.
131           KM          The Urban time-area relation is used for this basin.
132           KM          Time of Concentration is for 100-year flood.
133           KM
134           KM      Time of Concentration for this sub-basin is based on the following:
135           KM          6-Hour Rainfall, Pattern No.  1.00
136           KM          A rainfall areal reduction factor of  0.999
137           KM
```

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

 138          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 139          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 140          KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
 141          KM
 142          KM          L=   0.644 miles, S=  306 feet/mile, Kb= .03
 143          KM
 144          BA   0.062
 145          LG    0.09    0.00    4.35    0.35   50.00
 146          UC   0.129   0.131
 147          UA       0       5      16      30      65      77      84      90      94      97
 148          UA     100
              *

 149          KK   C564R
 150          KM     Hydrograph combine 563564 + 208E at C564 right branch
 151          HC       2
              *

 152          KK    208F
 153          KM   Sub-Basin   208F
 154          KM
 155          KM     The Clark Unit Hydrograph is used for this basin.
 156          KM         The Urban time-area relation is used for this basin.
 157          KM         Time of Concentration is for 100-year flood.
 158          KM
 159          KM     Time of Concentration for this sub-basin is based on the following:
 160          KM         6-Hour Rainfall, Pattern No.  1.00
 161          KM         A rainfall areal reduction factor of  0.999
 162          KM
 163          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 164          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 165          KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
 166          KM
 167          KM          L=   0.582 miles, S=  293 feet/mile, Kb= .03
 168          KM
 169          BA   0.069
 170          LG    0.09    0.00    4.35    0.35   49.92
 171          UC   0.125   0.109
 172          UA       0       5      16      30      65      77      84      90      94      97
 173          UA     100
              *

 174          KK    C564
 175          KM     Hydrograph combine C564R + 208F at C564
 176          HC       2
              *

 177          KK  564565
 178          KM     Normal depth channel route from C564 to C565
 179          KM     Source:  HEC-2 Cross Section: BR 2.236
 180          RS       1    FLOW      -1
 181          RC   0.080   0.080   0.080  3243.0  0.0398
 182          RX  9937.7  9965.8  9985.5 10000.0 10008.6 10016.4 10037.5 10054.4
 183          RY  1998.7  1998.1  1988.9  1988.8  1989.0  1990.4  1990.6  1999.1
              *
```

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

 184          KK    208G
 185          KM   Sub-Basin   208G
 186          KM
 187          KM      The Clark Unit Hydrograph is used for this basin.
 188          KM          The Urban time-area relation is used for this basin.
 189          KM          Time of Concentration is for 100-year flood.
 190          KM
 191          KM      Time of Concentration for this sub-basin is based on the following:
 192          KM          6-Hour Rainfall, Pattern No.  1.00
 193          KM          A rainfall areal reduction factor of  0.998
 194          KM
 195          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 196          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 197          KM   .48 .47 .47 .17 .14 .13 .06 .06 .06 .05 .05 .05 .01 .01 .01 .01 .01 .01
 198          KM
 199          KM          L=   0.772 miles, S=  299 feet/mile, Kb= .04
 200          KM
 201          BA   0.129
 202          LG    0.11    0.00    4.60    0.31   54.19
 203          UC   0.167   0.132
 204          UA       0       5      16      30      65      77      84      90      94      97
 205          UA     100
              *

 206          KK    C565
 207          KM      Hydrograph combine 564565 + 208G at C565
 208          HC       2
              *

 209          KK  565568
 210          KM      Normal depth channel route from C565 to C568
 211          KM      Source:  HEC-2 Cross Section: BR 1.853
 212          RS       1    FLOW      -1
 213          RC   0.050   0.060   0.045  2254.0  0.0333
 214          RX  9966.2  9975.6  9985.0 10000.0 10017.9 10027.6 10040.1 10052.5
 215          RY  1929.1  1924.5  1919.8  1918.3  1918.4  1919.6  1925.2  1930.8
              *

 216          KK    208H
 217          KM   Sub-Basin   208H
 218          KM
 219          KM      The Clark Unit Hydrograph is used for this basin.
 220          KM          The Urban time-area relation is used for this basin.
 221          KM          Time of Concentration is for 100-year flood.
 222          KM
 223          KM      Time of Concentration for this sub-basin is based on the following:
 224          KM          6-Hour Rainfall, Pattern No.  1.00
 225          KM          A rainfall areal reduction factor of  0.999
 226          KM
 227          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 228          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 229          KM   .47 .47 .47 .16 .13 .12 .06 .06 .05 .04 .03 .03 .01 .01 .01 .01 .01 .01
 230          KM
 231          KM          L=   0.632 miles, S=  283 feet/mile, Kb= .07
```

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

 232          KM
 233          BA   0.043
 234          LG    0.12    0.00    5.60    0.21   35.43
 235          UC   0.204   0.265
 236          UA       0       5      16      30      65      77      84      90      94      97
 237          UA     100
              *

 238          KK   C568L
 239          KM      Hydrograph combine 565568 + 208H at C568 left branch
 240          HC       2
              *
              * *
              * * Start Cholula Wash
              * *
              *

 241          KK    208I
 242          KM   Sub-Basin   208I
 243          KM
 244          KM      The Clark Unit Hydrograph is used for this basin.
 245          KM          The Urban time-area relation is used for this basin.
 246          KM          Time of Concentration is for 100-year flood.
 247          KM
 248          KM      Time of Concentration for this sub-basin is based on the following:
 249          KM          6-Hour Rainfall, Pattern No.  1.00
 250          KM          A rainfall areal reduction factor of  0.998
 251          KM
 252          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 253          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 254          KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
 255          KM
 256          KM          L=   0.823 miles, S=  363 feet/mile, Kb= .03
 257          KM
 258          BA   0.117
 259          LG    0.09    0.00    4.35    0.35   50.00
 260          UC   0.138   0.119
 261          UA       0       5      16      30      65      77      84      90      94      97
 262          UA     100
              *

 263          KK    208J
 264          KM   Sub-Basin   208J
 265          KM
 266          KM      The Clark Unit Hydrograph is used for this basin.
 267          KM          The Urban time-area relation is used for this basin.
 268          KM          Time of Concentration is for 100-year flood.
 269          KM
 270          KM      Time of Concentration for this sub-basin is based on the following:
 271          KM          6-Hour Rainfall, Pattern No.  1.00
 272          KM          A rainfall areal reduction factor of  0.999
 273          KM
 274          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 275          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 276          KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
```

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

 277          KM
 278          KM          L=   0.974 miles, S=  353 feet/mile, Kb= .03
 279          KM
 280          BA   0.081
 281          LG    0.09    0.00    4.35    0.35   50.00
 282          UC   0.154   0.190
 283          UA       0       5      16      30      65      77      84      90      94      97
 284          UA     100
              *

 285          KK    C566
 286          KM      Hydrograph combine 208I + 208J at C566
 287          HC       2
              *

 288          KK  566567
 289          KM      Normal depth channel route from C566 to C567
 290          KM      Source:  HEC-2 Cross Section: CH 0.766
 291          RS       1    FLOW      -1
 292          RC   0.080   0.080   0.080  1463.0  0.0410
 293          RX  9925.3  9949.0  9965.7  9988.3 10000.0 10016.2 10029.5 10042.7
 294          RY  2047.9  2043.7  2035.3  2033.3  2031.4  2033.0  2040.1  2047.2
              *

 295          KK    208K
 296          KM   Sub-Basin   208K
 297          KM
 298          KM      The Clark Unit Hydrograph is used for this basin.
 299          KM          The Urban time-area relation is used for this basin.
 300          KM          Time of Concentration is for 100-year flood.
 301          KM
 302          KM      Time of Concentration for this sub-basin is based on the following:
 303          KM          6-Hour Rainfall, Pattern No.  1.00
 304          KM          A rainfall areal reduction factor of  0.999
 305          KM
 306          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 307          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 308          KM   .48 .47 .47 .17 .13 .13 .06 .06 .06 .05 .05 .05 .01 .01 .01 .01 .01 .01
 309          KM
 310          KM          L=   0.431 miles, S=  317 feet/mile, Kb= .03
 311          KM
 312          BA   0.048
 313          LG    0.09    0.00    4.35    0.35   54.38
 314          UC   0.104   0.087
 315          UA       0       5      16      30      65      77      84      90      94      97
 316          UA     100
              *

 317          KK   C567L
 318          KM      Hydrograph combine 566567 + 208K at C567 left branch
 319          HC       2
              *
```

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

 320          KK    208L
 321          KM   Sub-Basin   208L
 322          KM
 323          KM      The Clark Unit Hydrograph is used for this basin.
 324          KM          The Urban time-area relation is used for this basin.
 325          KM          Time of Concentration is for 100-year flood.
 326          KM
 327          KM      Time of Concentration for this sub-basin is based on the following:
 328          KM          6-Hour Rainfall, Pattern No.  1.00
 329          KM          A rainfall areal reduction factor of  0.999
 330          KM
 331          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 332          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 333          KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .04 .04 .04 .01 .01 .01 .01 .01 .01
 334          KM
 335          KM          L=   0.655 miles, S=  334 feet/mile, Kb= .03
 336          KM
 337          BA   0.059
 338          LG    0.09    0.00    4.40    0.35   51.31
 339          UC   0.125   0.132
 340          UA       0       5      16      30      65      77      84      90      94      97
 341          UA     100
              *

 342          KK    C567
 343          KM      Hydrograph combine C567L + 208L at C567
 344          HC       2
              *

 345          KK  567568
 346          KM      Normal depth channel route from C567 to C568
 347          KM      Source:  HEC-2 Cross Section: CH 0.129
 348          RS       1    FLOW      -1
 349          RC   0.050   0.060   0.045  3650.0  0.0389
 350          RX  9945.7  9958.4  9989.8 10000.0 10016.4 10028.3 10045.4 10059.8
 351          RY  1912.1  1905.9  1899.0  1899.3  1898.9  1899.5  1907.1  1911.9
              *

 352          KK    208M
 353          KM   Sub-Basin   208M
 354          KM
 355          KM      The Clark Unit Hydrograph is used for this basin.
 356          KM          The Urban time-area relation is used for this basin.
 357          KM          Time of Concentration is for 100-year flood.
 358          KM
 359          KM      Time of Concentration for this sub-basin is based on the following:
 360          KM          6-Hour Rainfall, Pattern No.  1.00
 361          KM          A rainfall areal reduction factor of  0.998
 362          KM
 363          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 364          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 365          KM   .48 .48 .48 .17 .14 .14 .06 .06 .06 .05 .05 .05 .01 .01 .01 .01 .01 .01
 366          KM
 367          KM          L=   1.031 miles, S=  321 feet/mile, Kb= .03
```

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

 368          KM
 369          BA   0.159
 370          LG    0.09    0.00    4.40    0.34   62.04
 371          UC   0.163   0.144
 372          UA       0       5      16      30      65      77      84      90      94      97
 373          UA     100
              *

 374          KK   C568R
 375          KM      Hydrograph combine 567568 + 208M at C568 right branch
 376          HC       2
              *

 377          KK    C568
 378          KM      Hydrograph combine C568L + C568R at C568
 379          HC       2
              *

 380          KK  568573
 381          KM      Normal depth channel route from C568 to C573
 382          KM      Source:  HEC-2 Cross Section: BR 1.340
 383          RS       1    FLOW      -1
 384          RC   0.098   0.075   0.075  2067.0  0.0324
 385          RX  9921.8  9954.1  9968.9  9991.3 10000.0 10006.9 10025.2 10050.4
 386          RY  1843.8  1840.4  1835.1  1834.7  1832.7  1833.3  1838.1  1854.0
              *

 387          KK    208N
 388          KM   Sub-Basin   208N
 389          KM
 390          KM      The Clark Unit Hydrograph is used for this basin.
 391          KM          The Urban time-area relation is used for this basin.
 392          KM          Time of Concentration is for 100-year flood.
 393          KM
 394          KM      Time of Concentration for this sub-basin is based on the following:
 395          KM          6-Hour Rainfall, Pattern No.  1.00
 396          KM          A rainfall areal reduction factor of  0.999
 397          KM
 398          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 399          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 400          KM   .49 .49 .49 .18 .15 .15 .07 .07 .07 .07 .06 .06 .01 .01 .01 .01 .01 .01
 401          KM
 402          KM          L=   0.589 miles, S=  160 feet/mile, Kb= .04
 403          KM
 404          BA   0.047
 405          LG    0.09    0.00    6.20    0.15   62.49
 406          UC   0.175   0.200
 407          UA       0       5      16      30      65      77      84      90      94      97
 408          UA     100
              *
```

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

 409          KK   C573L
 410          KM      Hydrograph combine 568573 + 208N at C573 left branch
 411          HC       2
              *
              * *
              * * C573L is the total flow in Bristol Wash upstream of the confluence with
              * * Zapata Wash
              * *
              * * Start Zapata Wash
              * *
              *

 412          KK    208O
 413          KM   Sub-Basin   208O
 414          KM
 415          KM      The Clark Unit Hydrograph is used for this basin.
 416          KM          The Urban time-area relation is used for this basin.
 417          KM          Time of Concentration is for 100-year flood.
 418          KM
 419          KM      Time of Concentration for this sub-basin is based on the following:
 420          KM          6-Hour Rainfall, Pattern No.  1.00
 421          KM          An rainfall areal reduction factor of 0.997
 422          KM
 423          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 424          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 425          KM   .47 .47 .47 .16 .13 .13 .06 .06 .05 .05 .04 .04 .01 .01 .01 .01 .01 .01
 426          KM
 427          KM          L=   1.174 miles, S=  347 feet/mile, Kb= .03
 428          KM
 429          BA   0.230
 430          LG    0.09    0.00    4.60    0.31   48.49
 431          UC   0.167   0.133
 432          UA       0       5      16      30      65      77      84      90      94      97
 433          UA     100
              *

 434          KK  569570
 435          KM      Normal depth channel route from C569 to C570
 436          KM      Source:  HEC-2 Cross Section: ZA 0.493
 437          RS       1    FLOW      -1
 438          RC   0.050   0.035   0.055  1696.0  0.0404
 439          RX  9965.3  9985.5  9998.4 10000.0 10010.6 10019.1 10038.5 10038.5
 440          RY  1919.3  1912.3  1908.1  1907.8  1905.2  1908.1  1920.1  1920.1
              *

 441          KK    208P
 442          KM   Sub-Basin   208P
 443          KM
 444          KM      The Clark Unit Hydrograph is used for this basin.
 445          KM          The Urban time-area relation is used for this basin.
 446          KM          Time of Concentration is for 100-year flood.
 447          KM
 448          KM      Time of Concentration for this sub-basin is based on the following:
 449          KM          6-Hour Rainfall, Pattern No.  1.00
```

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

 450        KM          A rainfall areal reduction factor of  0.999
 451        KM
 452        KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 453        KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 454        KM   .49 .48 .48 .18 .15 .14 .07 .07 .07 .06 .06 .06 .01 .01 .01 .01 .01 .01
 455        KM
 456        KM          L=   0.471 miles, S=  312 feet/mile, Kb= .03
 457        KM
 458        BA   0.058
 459        LG    0.08    0.00    5.70    0.18   59.29
 460        UC   0.108   0.087
 461        UA      0       5      16      30      65      77      84      90      94      97
 462        UA    100
            *

 463        KK   C570R
 464        KM     Hydrograph combine 569570 + 208P at C570 right branch
 465        HC      2
            *

 466        KK    208Q
 467        KM   Sub-Basin   208Q
 468        KM
 469        KM     The Clark Unit Hydrograph is used for this basin.
 470        KM         The Urban time-area relation is used for this basin.
 471        KM         Time of Concentration is for 100-year flood.
 472        KM
 473        KM     Time of Concentration for this sub-basin is based on the following:
 474        KM         6-Hour Rainfall, Pattern No.  1.00
 475        KM         A rainfall areal reduction factor of  0.999
 476        KM
 477        KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 478        KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 479        KM   .48 .48 .48 .17 .14 .14 .06 .06 .06 .05 .05 .05 .01 .01 .01 .01 .01 .01
 480        KM
 481        KM          L=   0.823 miles, S=  324 feet/mile, Kb= .04
 482        KM
 483        BA   0.094
 484        LG    0.10    0.00    5.00    0.25   54.26
 485        UC   0.167   0.166
 486        UA      0       5      16      30      65      77      84      90      94      97
 487        UA    100
            *

 488        KK    C570
 489        KM     Hydrograph combine C570R + 208Q at C570
 490        HC      2
            *
            * *
            * * NOTE: 570572 is too short to route
            * *
            *
```

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

 491          KK    208R
 492          KM   Sub-Basin   208R
 493          KM
 494          KM      The Clark Unit Hydrograph is used for this basin.
 495          KM          The Urban time-area relation is used for this basin.
 496          KM          Time of Concentration is for 100-year flood.
 497          KM
 498          KM      Time of Concentration for this sub-basin is based on the following:
 499          KM          6-Hour Rainfall, Pattern No.  1.00
 500          KM          A rainfall areal reduction factor of  1.000
 501          KM
 502          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 503          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 504          KM   .49 .48 .48 .18 .15 .14 .07 .07 .07 .06 .06 .06 .01 .01 .01 .01 .01 .01
 505          KM
 506          KM          L=   0.238 miles, S=  327 feet/mile, Kb= .03
 507          KM
 508          BA   0.010
 509          LG    0.08    0.00    6.20    0.15   55.16
 510          UC   0.083   0.100
 511          UA       0       5      16      30      65      77      84      90      94      97
 512          UA     100
              *

 513          KK  571572
 514          KM      Normal depth channel route from C571 to C572
 515          KM      Source:  200 Scale Mapping
 516          RS       1    FLOW      -1
 517          RC   0.040   0.020   0.055  1379.0  0.0566
 518          RX  1000.0  1020.0  1040.0  1090.0  1122.0  1125.0  1135.0  1140.0
 519          RY  1894.0  1893.0  1892.0  1891.0  1891.0  1892.0  1894.0  1896.0
              *

 520          KK    C572
 521          KM      Hydrograph combine C570 + 571572 at C572
 522          HC       2
              *

 523          KK  572573
 524          KM      Normal depth channel route from C572 to C573
 525          KM      Source:  HEC-2 Cross Section: ZA 0.142
 526          RS       1    FLOW      -1
 527          RC   0.050   0.035   0.055  1285.0  0.0335
 528          RX  9961.8  9976.8  9982.5  9987.0 10009.5 10014.3 10022.1 10029.3
 529          RY  1840.3  1832.1  1831.2  1829.5  1829.2  1830.6  1831.2  1835.6
              *

 530          KK    208S
 531          KM   Sub-Basin   208S
 532          KM
 533          KM      The Clark Unit Hydrograph is used for this basin.
 534          KM          The Urban time-area relation is used for this basin.
 535          KM          Time of Concentration is for 100-year flood.
 536          KM
```

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

 537          KM      Time of Concentration for this sub-basin is based on the following:
 538          KM          6-Hour Rainfall, Pattern No.  1.00
 539          KM          A rainfall areal reduction factor of  0.999
 540          KM
 541          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 542          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 543          KM   .49 .49 .49 .18 .15 .15 .07 .07 .07 .07 .07 .07 .02 .02 .02 .02 .02 .02
 544          KM
 545          KM          L=   0.568 miles, S=  234 feet/mile, Kb= .03
 546          KM
 547          BA   0.068
 548          LG    0.08    0.00    6.20    0.15   67.07
 549          UC   0.129   0.112
 550          UA       0       5      16      30      65      77      84      90      94      97
 551          UA     100
              *

 552          KK   C573R
 553          KM      Hydrograph combine 572573 + 208S at C573 right branch
 554          HC       2
              *

 555          KK    C573
 556          KM      Hydrograph combine C573L + C573R at C573
 557          HC       2
              *
              * *
              * * NOTE: 573577 is too short to route
              * *
              * * C573 is the total flow in Bristol Wash upstream of the confluence
              * * with Montezuna Wash
              * *
              * * Start Montezuna Wash
              * *
              *

 558          KK    208T
 559          KM   Sub-Basin   208T
 560          KM
 561          KM      The Clark Unit Hydrograph is used for this basin.
 562          KM          The Urban time-area relation is used for this basin.
 563          KM          Time of Concentration is for 100-year flood.
 564          KM
 565          KM      Time of Concentration for this sub-basin is based on the following:
 566          KM          6-Hour Rainfall, Pattern No.  1.00
 567          KM          A rainfall areal reduction factor of  0.998
 568          KM
 569          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 570          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 571          KM   .48 .47 .47 .17 .14 .13 .06 .06 .06 .05 .05 .04 .01 .01 .01 .01 .01 .01
 572          KM
 573          KM          L=   0.787 miles, S=  340 feet/mile, Kb= .03
 574          KM
 575          BA   0.132
 576          LG    0.09    0.00    5.20    0.22   44.80
```

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

 577          UC   0.138   0.107
 578          UA       0       5      16      30      65      77      84      90      94      97
 579          UA     100
              *

 580          KK    208U
 581          KM   Sub-Basin   208U
 582          KM
 583          KM      The Clark Unit Hydrograph is used for this basin.
 584          KM          The Urban time-area relation is used for this basin.
 585          KM          Time of Concentration is for 100-year flood.
 586          KM
 587          KM      Time of Concentration for this sub-basin is based on the following:
 588          KM          6-Hour Rainfall, Pattern No.  1.00
 589          KM          A rainfall areal reduction factor of  0.998
 590          KM
 591          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 592          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 593          KM   .48 .47 .47 .17 .14 .13 .06 .06 .06 .05 .05 .04 .01 .01 .01 .01 .01 .01
 594          KM
 595          KM          L=   0.507 miles, S=  360 feet/mile, Kb= .03
 596          KM
 597          BA   0.134
 598          LG    0.09    0.00    5.30    0.21   44.19
 599          UC   0.108   0.057
 600          UA       0       5      16      30      65      77      84      90      94      97
 601          UA     100
              *

 602          KK    C574
 603          KM      Hydrograph combine 208T + 208U at C574
 604          HC       2
              *

 605          KK  574575
 606          KM      Normal depth channel route from C574 to C575
 607          KM      Source:  HEC-2 Cross Section: MO 0.587
 608          RS       1    FLOW      -1
 609          RC   0.070   0.050   0.055   823.0  0.0365
 610          RX  9945.0  9970.6  9986.7  9995.9 10002.3 10019.0 10036.7 10055.5
 611          RY  1932.6  1928.5  1922.9  1917.8  1917.7  1924.0  1931.1  1934.1
              *

 612          KK    208V
 613          KM   Sub-Basin   208V
 614          KM
 615          KM      The Clark Unit Hydrograph is used for this basin.
 616          KM          The Urban time-area relation is used for this basin.
 617          KM          Time of Concentration is for 100-year flood.
 618          KM
 619          KM      Time of Concentration for this sub-basin is based on the following:
 620          KM          6-Hour Rainfall, Pattern No.  1.00
 621          KM          A rainfall areal reduction factor of  1.000
 622          KM
 623          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
```

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

 624          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 625          KM   .48 .48 .48 .17 .14 .14 .07 .07 .06 .06 .06 .05 .01 .01 .01 .01 .01 .01
 626          KM
 627          KM          L=   0.354 miles, S=  319 feet/mile, Kb= .03
 628          KM
 629          BA   0.028
 630          LG    0.09    0.00    6.40    0.15   41.15
 631          UC   0.096   0.092
 632          UA       0       5      16      30      65      77      84      90      94      97
 633          UA     100
              *

 634          KK    C575
 635          KM      Hydrograph combine 574575 + 208V at C575
 636          HC       2
              *

 637          KK  575576
 638          KM      Normal depth channel route from C575 to C576
 639          KM      Source:  HEC-2 Cross Section: MO 0.307
 640          RS       1    FLOW      -1
 641          RC   0.070   0.050   0.055  2342.0  0.0423
 642          RX  9973.7  9974.0  9986.7 10000.0 10000.5 10009.7 10026.7 10037.3
 643          RY  1861.6  1861.5  1855.0  1853.0  1853.1  1854.8  1863.0  1867.1
              *

 644          KK    208W
 645          KM   Sub-Basin   208W
 646          KM
 647          KM      The Clark Unit Hydrograph is used for this basin.
 648          KM          The Urban time-area relation is used for this basin.
 649          KM          Time of Concentration is for 100-year flood.
 650          KM
 651          KM      Time of Concentration for this sub-basin is based on the following:
 652          KM          6-Hour Rainfall, Pattern No.  1.00
 653          KM          A rainfall areal reduction factor of  0.999
 654          KM
 655          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 656          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 657          KM   .48 .48 .48 .17 .14 .14 .07 .07 .06 .06 .05 .05 .01 .01 .01 .01 .01 .01
 658          KM
 659          KM          L=   0.475 miles, S=  288 feet/mile, Kb= .03
 660          KM
 661          BA   0.050
 662          LG    0.09    0.00    6.20    0.16   42.74
 663          UC   0.113   0.099
 664          UA       0       5      16      30      65      77      84      90      94      97
 665          UA     100
              *
```

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

 666          KK    C576
 667          KM      Hydrograph combine 575576 + 208W at C576
 668          HC       2
              *

 669          KK  576577
 670          KM      Normal depth channel route from C576 to C577
 671          KM      Source:  HEC-2 Cross Section: MO 0.116
 672          RS       1    FLOW      -1
 673          RC   0.070   0.050   0.055   740.0  0.0338
 674          RX  9915.1  9960.0  9985.5 10000.0 10000.1 10007.0 10023.3 10023.4
 675          RY  1826.5  1826.4  1814.5  1812.3  1812.3  1814.8  1830.3  1830.4
              *
              * *
              * * 576577 is the total flow in Montezuna Wash just upstream of the confluence
              * * with Bristol Wash
              * *
              *

 676          KK    C577
 677          KM      Hydrograph combine C577L + 576577 at C570
 678          HC       2
              *
              * *
              * * C577 is the total flow in Bristol Wash downstream of the confluence
              * * with Montezuma Wash
              * *
              *

 679          KK  577578
 680          KM      Normal depth channel route from C577 to C578
 681          KM      Source:  HEC-2 Cross Section: BR 1.099
 682          RS       1    FLOW      -1
 683          RC   0.055   0.045   0.055  1078.0  0.0147
 684          RX  9865.3  9956.6  9991.1 10010.2 10034.3 10063.4 10139.7 10201.7
 685          RY  1821.8  1810.8  1793.2  1792.5  1795.5  1796.1  1813.8  1822.8
              *

 686          KK    208X
 687          KM   Sub-Basin   208X
 688          KM
 689          KM      The Clark Unit Hydrograph is used for this basin.
 690          KM          The Urban time-area relation is used for this basin.
 691          KM          Time of Concentration is for 100-year flood.
 692          KM
 693          KM      Time of Concentration for this sub-basin is based on the following:
 694          KM          6-Hour Rainfall, Pattern No.  1.00
 695          KM          A rainfall areal reduction factor of  0.999
 696          KM
 697          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 698          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 699          KM   .47 .47 .47 .16 .13 .12 .06 .06 .05 .04 .04 .03 .01 .01 .01 .01 .01 .01
 700          KM
 701          KM          L=   0.417 miles, S=  223 feet/mile, Kb= .05
```

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

 702          KM
 703          BA   0.075
 704          LG    0.13    0.00    5.60    0.21   39.42
 705          UC   0.150   0.098
 706          UA       0       5      16      30      65      77      84      90      94      97
 707          UA     100
              *

 708          KK   C578I
 709          KM      Hydrograph combine 577578 + 208X at C578I
 710          KO       1
 711          HC       2
              *
              * *
              * * C578I is the total flow in Bristol Wash upstream of Dam 11
              * *
              *
 712          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

  8        208A
              V
              V
 33       561563
              .
              .
 40           .        208B
              .           .
              .           .
 62        C563R............
              .
              .
 65           .        208C
              .           V
              .           V
 85           .      562563
              .           .
              .           .
 92           .           .        208D
              .           .           .
              .           .           .
114           .       C563L............
              .           .
              .           .
117        C563............
              V
              V
120       563564
              .
              .
127           .        208E
              .           .
              .           .
149        C564R............
              .
              .
152           .        208F
              .           .
              .           .
174        C564............
              V
              V
177       564565
              .
              .
184           .        208G
              .           .
              .           .
206        C565............
              V
              V
209       565568
```

```
                .
                .
216             .        208H
                .          .
                .          .
238       C568L............
                .
                .
241             .        208I
                .          .
                .          .
263             .          .        208J
                .          .          .
                .          .          .
285             .        C566............
                .          V
                .          V
288             .      566567
                .          .
                .          .
295             .          .        208K
                .          .          .
                .          .          .
317             .       C567L............
                .          .
                .          .
320             .          .        208L
                .          .          .
                .          .          .
342             .        C567............
                .          V
                .          V
345             .      567568
                .          .
                .          .
352             .          .        208M
                .          .          .
                .          .          .
374             .       C568R............
                .          .
                .          .
377         C568............
                V
                V
380       568573
                .
                .
387             .        208N
                .          .
                .          .
409         C573L............
                .
                .
412             .        208O
                .          V
                .          V
434             .      569570
                .          .
                .          .
441             .          .        208P
```

```
                .          .          .
                .          .          .
463             .      C570R............
                .          .
                .          .
466             .          .       208Q
                .          .          .
                .          .          .
488             .      C570............
                .          .
                .          .
491             .          .       208R
                .          .          V
                .          .          V
513             .          .     571572
                .          .          .
                .          .          .
520             .      C572............
                .          V
                .          V
523             .     572573
                .          .
                .          .
530             .          .       208S
                .          .          .
                .          .          .
552             .      C573R............
                .          .
                .          .
555        C573............
                .
                .
558             .       208T
                .          .
                .          .
580             .          .       208U
                .          .          .
                .          .          .
602             .      C574............
                .          V
                .          V
605             .     574575
                .          .
                .          .
612             .          .       208V
                .          .          .
                .          .          .
634             .      C575............
                .          V
                .          V
637             .     575576
                .          .
                .          .
644             .          .       208W
                .          .          .
                .          .          .
666             .      C576...........
                .          V
                .          V
669             .     576577
```

```
                .          .
                .          .
676          C577...........
                V
                V
679        577578
                .
                .
686             .        208X
                .          .
                .          .
708         C578I...........
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/27/95  TIME  16:58:15  *
*                                      *
****************************************
```

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

```
                    Project Name: Fountain Hills Dam Break Analysis
                    Project No.:  No. 83                          File Name: DAM11-PM.IH1
                    PMF Analysis for North Heights (Dam No. 11)   Date:      09/01/95
                    Based on PMP Computation

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

   IT         HYDROGRAPH TIME DATA
                   NMIN         10  MINUTES IN COMPUTATION INTERVAL
                  IDATE     1    0  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ         70  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE     1    0  ENDING DATE
                 NDTIME       1130  ENDING TIME
                 ICENT          19  CENTURY MARK

             COMPUTATION INTERVAL    0.17 HOURS
                  TOTAL TIME BASE   11.50 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


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** **


          **************
          *            *
708 KK    *     C578I  *
          *            *
          **************

710 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          1  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
```

QSCAL 0. HYDROGRAPH PLOT SCALE

711 HC HYDROGRAPH COMBINATION

ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

***

HYDROGRAPH AT STATION C578I

SUM OF 2 HYDROGRAPHS

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0300	19	4695.	1		0600	37	249.	1		0900	55	1.
1		0010	2	11.	1		0310	20	3621.	1		0610	38	217.	1		0910	56	0.
1		0020	3	43.	1		0320	21	2790.	1		0620	39	159.	1		0920	57	0.
1		0030	4	87.	1		0330	22	2137.	1		0630	40	112.	1		0930	58	0.
1		0040	5	131.	1		0340	23	1941.	1		0640	41	78.	1		0940	59	0.
1		0050	6	162.	1		0350	24	1813.	1		0650	42	55.	1		0950	60	0.
1		0100	7	180.	1		0400	25	1785.	1		0700	43	40.	1		1000	61	0.
1		0110	8	245.	1		0410	26	1616.	1		0710	44	29.	1		1010	62	0.
1		0120	9	413.	1		0420	27	1253.	1		0720	45	21.	1		1020	63	0.
1		0130	10	601.	1		0430	28	917.	1		0730	46	16.	1		1030	64	0.
1		0140	11	723.	1		0440	29	749.	1		0740	47	12.	1		1040	65	0.
1		0150	12	777.	1		0450	30	675.	1		0750	48	8.	1		1050	66	0.
1		0200	13	820.	1		0500	31	633.	1		0800	49	6.	1		1100	67	0.
1		0210	14	6940.	1		0510	32	572.	1		0810	50	4.	1		1110	68	0.
1		0220	15	22456.	1		0520	33	467.	1		0820	51	3.	1		1120	69	0.
1		0230	16	24469.	1		0530	34	361.	1		0830	52	2.	1		1130	70	0.
1		0240	17	14097.	1		0540	35	299.	1		0840	53	1.					
1		0250	18	7407.	1		0550	36	269.	1		0850	54	1.					

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	11.50-HR
24469.	2.50	(CFS)	2965.	1553.	1553.	1553.
		(INCHES)	13.783	13.839	13.839	13.839
		(AC-FT)	1470.	1476.	1476.	1476.

CUMULATIVE AREA = 2.00 SQ MI

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	208A	2299.	2.33	205.	107.	107.	0.14		
ROUTED TO	561563	2345.	2.33	204.	107.	107.	0.14	2272.17	2.33
HYDROGRAPH AT	208B	381.	2.33	40.	21.	21.	0.03		
2 COMBINED AT	C563R	2726.	2.33	244.	128.	128.	0.17		
HYDROGRAPH AT	208C	664.	2.50	95.	50.	50.	0.07		
ROUTED TO	562563	689.	2.50	95.	50.	50.	0.07	2414.00	2.50
HYDROGRAPH AT	208D	1059.	2.33	110.	57.	57.	0.08		
2 COMBINED AT	C563L	1583.	2.33	205.	107.	107.	0.14		
2 COMBINED AT	C563	4309.	2.33	449.	235.	235.	0.31		
ROUTED TO	563564	3718.	2.33	448.	235.	235.	0.31	2093.84	2.33
HYDROGRAPH AT	208E	911.	2.33	91.	48.	48.	0.06		
2 COMBINED AT	C564R	4629.	2.33	539.	282.	282.	0.37		
HYDROGRAPH AT	208F	1073.	2.33	101.	53.	53.	0.07		
2 COMBINED AT	C564	5702.	2.33	641.	335.	335.	0.44		
ROUTED TO	564565	5564.	2.50	640.	335.	335.	0.44	1996.58	2.50
HYDROGRAPH AT	208G	1892.	2.33	192.	100.	100.	0.13		
2 COMBINED AT	C565	6847.	2.50	831.	435.	435.	0.57		
ROUTED TO	565568	7134.	2.50	831.	435.	435.	0.57	1926.54	2.50
HYDROGRAPH AT	208H	445.	2.33	64.	33.	33.	0.04		
2 COMBINED AT	C568L	7552.	2.50	894.	469.	469.	0.61		
HYDROGRAPH AT	208I	1773.	2.33	172.	90.	90.	0.12		
HYDROGRAPH AT	208J	1023.	2.33	119.	62.	62.	0.08		
2 COMBINED AT	C566	2796.	2.33	291.	152.	152.	0.20		
ROUTED TO	566567	2732.	2.33	290.	152.	152.	0.20	2037.92	2.33
HYDROGRAPH AT	208K	788.	2.33	71.	37.	37.	0.05		
2 COMBINED AT	C567L	3520.	2.33	361.	189.	189.	0.25		

HYDROGRAPH AT	208L	865.	2.33	87.	45.	45.	0.06		
2 COMBINED AT	C567	4385.	2.33	448.	234.	234.	0.31		
ROUTED TO	567568	3858.	2.50	447.	234.	234.	0.31	1904.27	2.50
HYDROGRAPH AT	208M	2262.	2.33	238.	124.	124.	0.16		
2 COMBINED AT	C568R	5760.	2.33	684.	358.	358.	0.46		
2 COMBINED AT	C568	13012.	2.50	1578.	827.	827.	1.07		
ROUTED TO	568573	13542.	2.50	1578.	827.	827.	1.07	1846.08	2.50
HYDROGRAPH AT	208N	579.	2.33	72.	38.	38.	0.05		
2 COMBINED AT	C573L	14021.	2.50	1650.	865.	865.	1.12		
HYDROGRAPH AT	208O	3362.	2.33	339.	177.	177.	0.23		
ROUTED TO	569570	3362.	2.33	339.	177.	177.	0.23	1912.23	2.33
HYDROGRAPH AT	208P	955.	2.33	89.	46.	46.	0.06		
2 COMBINED AT	C570R	4317.	2.33	428.	224.	224.	0.29		
HYDROGRAPH AT	208Q	1265.	2.33	141.	74.	74.	0.09		
2 COMBINED AT	C570	5582.	2.33	569.	297.	297.	0.38		
HYDROGRAPH AT	208R	160.	2.33	15.	8.	8.	0.01		
ROUTED TO	571572	157.	2.33	15.	8.	8.	0.01	1891.41	2.33
2 COMBINED AT	C572	5739.	2.33	584.	305.	305.	0.39		
ROUTED TO	572573	5703.	2.33	584.	305.	305.	0.39	1835.54	2.33
HYDROGRAPH AT	208S	1055.	2.33	105.	55.	55.	0.07		
2 COMBINED AT	C573R	6758.	2.33	689.	360.	360.	0.46		
2 COMBINED AT	C573	18973.	2.50	2337.	1225.	1225.	1.58		
HYDROGRAPH AT	208T	2067.	2.33	198.	103.	103.	0.13		
HYDROGRAPH AT	208U	2221.	2.33	201.	105.	105.	0.13		
2 COMBINED AT	C574	4288.	2.33	399.	208.	208.	0.27		
ROUTED TO	574575	4400.	2.33	399.	208.	208.	0.27	1926.81	2.33
HYDROGRAPH AT	208V	455.	2.33	42.	22.	22.	0.03		
2 COMBINED AT	C575	4856.	2.33	441.	231.	231.	0.29		
ROUTED TO	575576	4655.	2.33	441.	231.	231.	0.29	1861.25	2.33
HYDROGRAPH AT	208W	800.	2.33	76.	39.	39.	0.05		

2 COMBINED AT	C576	5454.	2.33	517.	270.	270.	0.34		
ROUTED TO	576577	5359.	2.33	517.	270.	270.	0.34	1822.37	2.33
2 COMBINED AT	C577	23039.	2.50	2854.	1495.	1495.	1.92		
ROUTED TO	577578	23782.	2.50	2853.	1495.	1495.	1.92	1806.85	2.50
HYDROGRAPH AT	208X	1201.	2.33	112.	58.	58.	0.08		
2 COMBINED AT	C578I	24469.	2.50	2965.	1553.	1553.	2.00		

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

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
* RUN DATE  12/28/95  TIME  08:47:19   *
*                                      *
****************************************
```

```
****************************************
*
*    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        FOUNTAIN HILLS DAM BREAK ANALYSIS
  2           ID        RESERVOIR ROUTING WITH OVERTOPPING ANALYSIS.    File Name: DAM11-RT.IH1
  3           ID        NORTH HEIGHTS DAM - DAM 11
  4           ID        ****************************************************************
  5           ID        Analytical Considerations:
  6           ID        (a) Principal Spillway is clogged.
  7           ID        (b) Initial Condition is the higher between 100-year flood and
  8           ID            Spillway crest elevation.
  9           ID        (c) Input is 10-minute incremental PMF to generate 50 percent
 10           ID            PMF and routed hydrographs.
 11           ID        ****************************************************************
              *DIAGRAM
 12           IT      10       0       0      70
 13           IO       1
 14           JR    FLOW    0.50
 15           IN      10
              *
              *

 16           KK   C578I
 17           KM        DAM INFLOWS FROM PMF ANALYSIS (DAM11-PM.IH1)
 18           KM        Inflows for Dam 11 (North Heights Dam)
 19           KO       1
 20           BA    2.02
 21           QI       0      11      43      87     131     162     180     245     413     601
 22           QI     723     777     820    6940   22456   24469   14097    7407    4695    3621
 23           QI    2790    2137    1941    1813    1785    1616    1253     917     749     675
 24           QI     633     572     467     361     299     269     249     217     159     112
 25           QI      78      55      40      29      21      16      12       8       6       4
 26           QI       3       2       1       1       1
              *

 27           KK   C578O
 28           KM      Reservoir route at C578 (Dam 11).
 29           KO       1
 30           RS       1    ELEV 1812.29
 31           SV    0.00    2.77   16.38   41.49   84.39  133.00  154.47  171.00  187.43  205.00
 32           SV  223.03  242.00  261.38  282.00  302.00  324.00  345.87  370.00  394.23  419.79
 33           SE  1779.2 1788.00 1794.00 1800.00 1806.00  1810.5 1812.00 1813.00 1814.00 1815.00
 34           SE  1816.0 1817.00 1818.00 1819.00 1820.00 1821.00 1822.00 1823.00 1824.00 1825.00
 35           SQ       0       0       0       0       0       0     466    1551    3042    4877
 36           SQ    7027    9474   12207   15311   20684   28115   37025   47226   58617   71134
 37           SE  1779.2 1788.00 1794.00 1800.00 1806.00  1810.5 1812.00 1813.00 1814.00 1815.00
 38           SE  1816.0 1817.00 1818.00 1819.00 1820.00 1821.00 1822.00 1823.00 1824.00 1825.00
 39           ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   16       C578I
                V
                V
   27       C578O
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/28/95  TIME  08:47:19  *
*                                      *
****************************************
```

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

```
FOUNTAIN HILLS DAM BREAK ANALYSIS
RESERVOIR ROUTING WITH OVERTOPPING ANALYSIS.    File Name: DAM11-RT.IH1
NORTH HEIGHTS DAM - DAM 11
*****************************************************************
Analytical Considerations:
(a) Principal Spillway is clogged.
(b) Initial Condition is the higher between 100-year flood and
    Spillway crest elevation.
(c) Input is 10-minute incremental PMF to generate 50 percent
    PMF and routed hydrographs.
*****************************************************************

13 IO          OUTPUT CONTROL VARIABLES
                     IPRNT           1  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

   IT          HYDROGRAPH TIME DATA
                      NMIN          10  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ          70  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      1    0  ENDING DATE
                    NDTIME        1130  ENDING TIME
                    ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL    0.17 HOURS
                      TOTAL TIME BASE   11.50 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

   JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

   JR          MULTI-RATIO OPTION
                  RATIOS OF RUNOFF
                 0.50
```

*** **

```
          **************
          *            *
 16 KK    *     C578I  *
          *            *
          **************
```

DAM INFLOWS FROM PMF ANALYSIS (DAM11-PM.IH1)
Inflows for Dam 11 (North Heights Dam)

```
 19 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

 15 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN          10  TIME INTERVAL IN MINUTES
                     JXDATE      1    0  STARTING DATE
                     JXTIME           0  STARTING TIME

             SUBBASIN RUNOFF DATA

 20 BA          SUBBASIN CHARACTERISTICS
                      TAREA        2.02  SUBBASIN AREA
```

***

****

HYDROGRAPH AT STATION C578I

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0300	19	4695.	1		0600	37	249.	1		0900	55	1.
1		0010	2	11.	1		0310	20	3621.	1		0610	38	217.	1		0910	56	1.
1		0020	3	43.	1		0320	21	2790.	1		0620	39	159.	1		0920	57	1.
1		0030	4	87.	1		0330	22	2137.	1		0630	40	112.	1		0930	58	1.
1		0040	5	131.	1		0340	23	1941.	1		0640	41	78.	1		0940	59	1.
1		0050	6	162.	1		0350	24	1813.	1		0650	42	55.	1		0950	60	1.
1		0100	7	180.	1		0400	25	1785.	1		0700	43	40.	1		1000	61	1.
1		0110	8	245.	1		0410	26	1616.	1		0710	44	29.	1		1010	62	1.
1		0120	9	413.	1		0420	27	1253.	1		0720	45	21.	1		1020	63	1.
1		0130	10	601.	1		0430	28	917.	1		0730	46	16.	1		1030	64	1.
1		0140	11	723.	1		0440	29	749.	1		0740	47	12.	1		1040	65	1.
1		0150	12	777.	1		0450	30	675.	1		0750	48	8.	1		1050	66	1.
1		0200	13	820.	1		0500	31	633.	1		0800	49	6.	1		1100	67	1.
1		0210	14	6940.	1		0510	32	572.	1		0810	50	4.	1		1110	68	1.
1		0220	15	22456.	1		0520	33	467.	1		0820	51	3.	1		1120	69	1.
1		0230	16	24469.	1		0530	34	361.	1		0830	52	2.	1		1130	70	1.
1		0240	17	14097.	1		0540	35	299.	1		0840	53	1.					
1		0250	18	7407.	1		0550	36	269.	1		0850	54	1.					

****

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

(CFS)	(HR)		6-HR	24-HR	72-HR	11.50-HR
24469.	2.50	(CFS)	2965.	1553.	1553.	1553.
		(INCHES)	13.647	13.704	13.704	13.704
		(AC-FT)	1470.	1476.	1476.	1476.

CUMULATIVE AREA = 2.02 SQ MI

****

HYDROGRAPH AT STATION C578I
PLAN 1, RATIO = 0.50

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0300	19	2348.	1		0600	37	125.	1		0900	55	1.
1		0010	2	6.	1		0310	20	1811.	1		0610	38	109.	1		0910	56	1.
1		0020	3	22.	1		0320	21	1395.	1		0620	39	80.	1		0920	57	1.
1		0030	4	44.	1		0330	22	1069.	1		0630	40	56.	1		0930	58	1.
1		0040	5	66.	1		0340	23	971.	1		0640	41	39.	1		0940	59	1.
1		0050	6	81.	1		0350	24	907.	1		0650	42	28.	1		0950	60	1.
1		0100	7	90.	1		0400	25	893.	1		0700	43	20.	1		1000	61	1.
1		0110	8	123.	1		0410	26	808.	1		0710	44	15.	1		1010	62	1.
1		0120	9	207.	1		0420	27	627.	1		0720	45	11.	1		1020	63	1.
1		0130	10	301.	1		0430	28	459.	1		0730	46	8.	1		1030	64	1.
1		0140	11	362.	1		0440	29	375.	1		0740	47	6.	1		1040	65	1.
1		0150	12	389.	1		0450	30	338.	1		0750	48	4.	1		1050	66	1.
1		0200	13	410.	1		0500	31	317.	1		0800	49	3.	1		1100	67	1.
1		0210	14	3470.	1		0510	32	286.	1		0810	50	2.	1		1110	68	1.
1		0220	15	11228.	1		0520	33	234.	1		0820	51	2.	1		1120	69	1.
1		0230	16	12235.	1		0530	34	181.	1		0830	52	1.	1		1130	70	1.
1		0240	17	7049.	1		0540	35	150.	1		0840	53	1.					
1		0250	18	3704.	1		0550	36	135.	1		0850	54	1.					

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	11.50-HR
12235.	2.50	(CFS)	1482.	777.	777.	777.
		(INCHES)	6.823	6.852	6.852	6.852
		(AC-FT)	735.	738.	738.	738.

CUMULATIVE AREA = 2.02 SQ MI

*** **

```
          **************
          *            *
27 KK     *     C578O  *
          *            *
          **************
```

Reservoir route at C578 (Dam 11).

29 KO OUTPUT CONTROL VARIABLES

IPRNT	1	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

30 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	ELEV	TYPE OF INITIAL CONDITION
RSVRIC	1812.29	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

31 SV	STORAGE	0.0	2.8	16.4	41.5	84.4	133.0	154.5	171.0	187.4	205.0
		223.0	242.0	261.4	282.0	302.0	324.0	345.9	370.0	394.2	419.8
33 SE	ELEVATION	1779.20	1788.00	1794.00	1800.00	1806.00	1810.50	1812.00	1813.00	1814.00	1815.00
		1816.00	1817.00	1818.00	1819.00	1820.00	1821.00	1822.00	1823.00	1824.00	1825.00
35 SQ	DISCHARGE	0.	0.	0.	0.	0.	0.	466.	1551.	3042.	4877.
		7027.	9474.	12207.	15311.	20684.	28115.	37025.	47226.	58617.	71134.
37 SE	ELEVATION	1779.20	1788.00	1794.00	1800.00	1806.00	1810.50	1812.00	1813.00	1814.00	1815.00
		1816.00	1817.00	1818.00	1819.00	1820.00	1821.00	1822.00	1823.00	1824.00	1825.00

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	2.77	16.38	41.49	84.39	133.00	154.47	171.00	187.43	205.00
OUTFLOW	0.00	0.00	0.00	0.00	0.00	0.00	466.00	1551.00	3042.00	4877.00
ELEVATION	1779.20	1788.00	1794.00	1800.00	1806.00	1810.50	1812.00	1813.00	1814.00	1815.00
STORAGE	223.03	242.00	261.38	282.00	302.00	324.00	345.87	370.00	394.23	419.79
OUTFLOW	7027.00	9474.00	12207.00	15311.00	20684.00	28115.00	37025.00	47226.00	58617.00	71134.00
ELEVATION	1816.00	1817.00	1818.00	1819.00	1820.00	1821.00	1822.00	1823.00	1824.00	1825.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 12207. TO 71134.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

****

HYDROGRAPH AT STATION C578O
PLAN 1, RATIO = 0.50

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	781.	159.3	1812.3	*	1		0400	25	946.	161.8	1812.4	*	1		0800	49	18.	133.8	1810.6
1		0010	2	395.	151.2	1811.8	*	1		0410	26	886.	160.9	1812.4	*	1		0810	50	14.	133.6	1810.5
1		0020	3	296.	146.6	1811.5	*	1		0420	27	781.	159.3	1812.3	*	1		0820	51	11.	133.5	1810.5
1		0030	4	227.	143.5	1811.2	*	1		0430	28	633.	157.0	1812.2	*	1		0830	52	8.	133.4	1810.5
1		0040	5	182.	141.4	1811.1	*	1		0440	29	498.	155.0	1812.0	*	1		0840	53	6.	133.3	1810.5
1		0050	6	154.	140.1	1811.0	*	1		0450	30	442.	153.4	1811.9	*	1		0850	54	5.	133.2	1810.5
1		0100	7	136.	139.3	1810.9	*	1		0500	31	412.	152.0	1811.8	*	1		0900	55	4.	133.2	1810.5
1		0110	8	128.	138.9	1810.9	*	1		0510	32	384.	150.7	1811.7	*	1		0910	56	3.	133.1	1810.5
1		0120	9	138.	139.3	1810.9	*	1		0520	33	351.	149.2	1811.6	*	1		0920	57	2.	133.1	1810.5
1		0130	10	168.	140.7	1811.0	*	1		0530	34	314.	147.5	1811.5	*	1		0930	58	2.	133.1	1810.5

1	0140	11	210.	142.7	1811.2	*	1	0540	35	275.	145.7	1811.4	*	1	0940	59	1.	133.1	1810.5
1	0150	12	253.	144.7	1811.3	*	1	0550	36	240.	144.1	1811.3	*	1	0950	60	1.	133.1	1810.5
1	0200	13	291.	146.4	1811.4	*	1	0600	37	212.	142.7	1811.2	*	1	1000	61	1.	133.0	1810.5
1	0210	14	1074.	163.7	1812.6	*	1	0610	38	187.	141.6	1811.1	*	1	1010	62	1.	133.0	1810.5
1	0220	15	6119.	215.4	1815.6	*	1	0620	39	163.	140.5	1811.0	*	1	1020	63	1.	133.0	1810.5
1	0230	16	11449.	256.0	1817.7	*	1	0630	40	138.	139.4	1810.9	*	1	1030	64	1.	133.0	1810.5
1	0240	17	9668.	243.4	1817.1	*	1	0640	41	114.	138.3	1810.9	*	1	1040	65	1.	133.0	1810.5
1	0250	18	5679.	211.7	1815.4	*	1	0650	42	93.	137.3	1810.8	*	1	1050	66	1.	133.0	1810.5
1	0300	19	3401.	190.9	1814.2	*	1	0700	43	75.	136.5	1810.7	*	1	1100	67	1.	133.0	1810.5
1	0310	20	2355.	179.9	1813.5	*	1	0710	44	60.	135.8	1810.7	*	1	1110	68	1.	133.0	1810.5
1	0320	21	1776.	173.5	1813.2	*	1	0720	45	48.	135.2	1810.7	*	1	1120	69	1.	133.0	1810.5
1	0330	22	1394.	168.6	1812.9	*	1	0730	46	38.	134.7	1810.6	*	1	1130	70	1.	133.0	1810.5
1	0340	23	1161.	165.1	1812.6	*	1	0740	47	30.	134.4	1810.6	*						
1	0350	24	1022.	162.9	1812.5	*	1	0750	48	23.	134.1	1810.6	*						
						*							*						

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	11.50-HR
11449.	2.50	(CFS)	1509.	804.	804.	804.
		(INCHES)	6.947	7.095	7.095	7.095
		(AC-FT)	748.	764.	764.	764.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	11.50-HR
256.	2.50	162.	149.	149.	149.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	11.50-HR
1817.72	2.50	1812.38	1811.54	1811.54	1811.54

CUMULATIVE AREA = 2.02 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

					RATIOS APPLIED TO FLOWS
OPERATION	STATION	AREA	PLAN		RATIO 1
					0.50
HYDROGRAPH AT	C578I	2.02	1	FLOW	12235.
				TIME	2.50
ROUTED TO	C578O	2.02	1	FLOW	11449.
				TIME	2.50

** PEAK STAGES IN FEET **

1	STAGE	1817.72
	TIME	2.50

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

APPENDIX K

HEC-1 output for Hesperus Wash Dam

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/28/95  TIME  09:03:36  *
*                                      *
****************************************
```

```
*************************************
*                                   *
*   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    Project Name: Fountain Hills Dam Break Analysis
  2           ID    Project No.:  No. 83                              File Name: DAM36-PM.IH1
  3           ID    PMF Analysis for Hesperus Wash Dam (No. 36)       Date:   09/12/95
  4           ID    Based on PMP Computation
              *
  5           IT      10                      80
  6           IO       5
  7           IN      15
              *DIAGRAM
              *

  8           KK    205A
  9           KO       5
 10           KM   Sub-Basin   205A
 11           KM
 12           KM      The Clark Unit Hydrograph is used for this basin.
 13           KM          The Natural time-area relation is used for this basin.
 14           KM          Time of Concentration is for 100-year flood.
 15           KM
 16           KM      Time of Concentration for this sub-basin is based on the following:
 17           KM          6-Hour Rainfall, Pattern No.  1.00
 18           KM          An areal rainfall reduction factor of 0.998
 19           KM
 20           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 21           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 22           KM   .45 .44 .44 .13 .09 .08 .04 .04 .03 .03 .03 .03 .01 .01 .01 .01 .01 .01
 23           KM
 24           KM          L=   0.870 miles, S=  378 feet/mile, Kb= .14
 25           KM
 26           BA   0.118
 27           PI     0.1     0.1     0.1     0.1   0.175   0.175   0.175   0.175     7.7     1.8
 28           PI     0.7     0.7   0.425   0.425   0.425   0.425   0.175   0.175   0.175   0.175
 29           PI   0.075   0.075   0.075   0.075
 30           LG    0.25       0    4.35    0.40   35.00
 31           UC   0.350   0.350
 32           UA       0       3       5       8      12      20      43      75      90      96
 33           UA     100
              *

 34           KK    205B
 35           KM   Sub-Basin   205B
 36           KM
 37           KM      The Clark Unit Hydrograph is used for this basin.
 38           KM          The Natural time-area relation is used for this basin.
 39           KM          Time of Concentration is for 100-year flood.
 40           KM
 41           KM      Time of Concentration for this sub-basin is based on the following:
 42           KM          6-Hour Rainfall, Pattern No.  1.00
 43           KM          An areal rainfall reduction factor of 0.997
 44           KM
 45           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 46           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 47           KM   .45 .44 .44 .13 .09 .08 .04 .04 .03 .03 .03 .03 .01 .01 .01 .01 .01 .01
 48           KM
 49           KM          L=   0.759 miles, S=  129 feet/mile, Kb= .14
```

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

 50         KM
 51         BA   0.211
 52         LG    0.25       0    4.35    0.40   35.00
 53         UC   0.508   0.340
 54         UA       0       3       5       8      12      20      43      75      90      96
 55         UA     100
            *

 56         KK    C528
 57         KO       5
 58         KM      Hydrograph combine 205A + 205B at C528
 59         HC       2
            *

 60         KK  528530
 61         KO       5
 62         KM      Normal depth channel route from C528 to C530
 63         KM      Source:  Hydrology Field Reconnaissance
 64         RS       1    FLOW      -1
 65         RC   0.060   0.043   0.060  2594.0  0.0709
 66         RX  1000.0  1018.0  1031.0  1042.0  1052.0  1066.0  1093.0  1107.0
 67         RY    96.3    92.2    89.9    85.9    85.7    91.5    91.2    96.3
            *

 68         KK    205C
 69         KM   Sub-Basin   205C
 70         KM
 71         KM      The Clark Unit Hydrograph is used for this basin.
 72         KM          The Natural time-area relation is used for this basin.
 73         KM          Time of Concentration is for 100-year flood.
 74         KM
 75         KM      Time of Concentration for this sub-basin is based on the following:
 76         KM          6-Hour Rainfall, Pattern No.  1.00
 77         KM          An areal rainfall reduction factor of 0.999
 78         KM
 79         KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 80         KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 81         KM   .45 .44 .44 .13 .09 .08 .04 .04 .03 .03 .03 .03 .01 .01 .01 .01 .01 .01
 82         KM
 83         KM          L=   0.618 miles, S=  331 feet/mile, Kb= .15
 84         KM
 85         BA   0.059
 86         LG    0.25       0    4.35    0.41   35.00
 87         UC   0.308   0.343
 88         UA       0       3       5       8      12      20      43      75      90      96
 89         UA     100
            *

 90         KK   C530R
 91         KM     Hydrograph combine 528530 + 205C at C530 right branch
 92         HC       2
            *
```

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

 93           KK    205D
 94           KM   Sub-Basin   205D
 95           KM
 96           KM      The Clark Unit Hydrograph is used for this basin.
 97           KM          The Natural time-area relation is used for this basin.
 98           KM          Time of Concentration is for 100-year flood.
 99           KM
100           KM      Time of Concentration for this sub-basin is based on the following:
101           KM          6-Hour Rainfall, Pattern No.  1.00
102           KM          An areal rainfall reduction factor of 0.996
103           KM
104           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
105           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
106           KM   .45 .44 .44 .13 .09 .08 .04 .04 .03 .03 .03 .03 .01 .01 .01 .01 .01 .01
107           KM
108           KM          L=   1.020 miles, S=  361 feet/mile, Kb= .13
109           KM
110           BA   0.319
111           LG    0.25       0    4.35    0.40   35.00
112           UC   0.379   0.246
113           UA      0       3       5       8      12      20      43      75      90      96
114           UA    100
              *

115           KK    205E
116           KM   Sub-Basin   205E
117           KM
118           KM      The Clark Unit Hydrograph is used for this basin.
119           KM          The Natural time-area relation is used for this basin.
120           KM          Time of Concentration is for 100-year flood.
121           KM
122           KM      Time of Concentration for this sub-basin is based on the following:
123           KM          6-Hour Rainfall, Pattern No.  1.00
124           KM          An areal rainfall reduction factor of 0.997
125           KM
126           KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
127           KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
128           KM   .45 .44 .44 .13 .09 .08 .04 .04 .03 .03 .03 .03 .01 .01 .01 .01 .01 .01
129           KM
130           KM          L=   1.357 miles, S=  358 feet/mile, Kb= .14
131           KM
132           BA   0.218
133           LG    0.25       0    4.35    0.40   35.00
134           UC   0.488   0.508
135           UA      0       3       5       8      12      20      43      75      90      96
136           UA    100
              *

137           KK    C529
138           KM      Hydrograph combine 205D + 205E at C529
139           HC       2
              *
              * *
              * * NOTE:  529530 too short to route
```

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

 140          KK    C530
 141          KO       5
 142          KM      Hydrograph combine C529 + C530R at C530
 143          HC       2
              *

 144          KK  530531
 145          KO       5
 146          KM      Normal depth channel route from C530 to C531
 147          KM      Source:  Hydrology Field Reconnaissance
 148          RS       1    FLOW      -1
 149          RC   0.060   0.059   0.060  2426.0  0.0404
 150          RX  1000.0  1035.0  1050.0  1060.0  1075.0  1081.0  1088.0  1094.0
 151          RY    95.9    86.5    86.2    83.1    84.0    90.2    95.6    99.3
              *

 152          KK    205F
 153          KM   Sub-Basin   205F
 154          KM
 155          KM      The Clark Unit Hydrograph is used for this basin.
 156          KM          The Natural time-area relation is used for this basin.
 157          KM          Time of Concentration is for 100-year flood.
 158          KM
 159          KM      Time of Concentration for this sub-basin is based on the following:
 160          KM          6-Hour Rainfall, Pattern No.  1.00
 161          KM          An areal rainfall reduction factor of 0.998
 162          KM
 163          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 164          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 165          KM   .45 .44 .44 .13 .09 .08 .04 .04 .03 .03 .03 .03 .01 .01 .01 .01 .01 .01
 166          KM
 167          KM          L=   0.786 miles, S=  326 feet/mile, Kb= .14
 168          KM
 169          BA   0.161
 170          LG    0.25       0    4.35    0.41   35.00
 171          UC   0.350   0.269
 172          UA       0       3       5       8      12      20      43      75      90      96
 173          UA     100
              *

 174          KK    C531
 175          KO       5
 176          KM      Hydrograph combine 530531 + 205F at C531
 177          HC       2
              *

 178          KK  531532
 179          KO       5
 180          KM      Normal depth channel route from C531 to C532
 181          KM      Source:  Hydrology Field Reconnaissance
 182          RS       1    FLOW      -1
 183          RC   0.060   0.065   0.060  3391.0  0.0463
 184          RX  1000.0  1012.0  1022.0  1032.0  1050.0  1056.0  1068.0  1092.0
 185          RY    98.8    93.8    89.1    86.4    86.5    89.1    91.0    97.6
```

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

 186          KK   205G
 187          KM  Sub-Basin   205G
 188          KM
 189          KM     The Clark Unit Hydrograph is used for this basin.
 190          KM         The Natural time-area relation is used for this basin.
 191          KM         Time of Concentration is for 100-year flood.
 192          KM
 193          KM     Time of Concentration for this sub-basin is based on the following:
 194          KM         6-Hour Rainfall, Pattern No.  1.00
 195          KM         An areal rainfall reduction factor of 0.998
 196          KM
 197          KM      EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 198          KM    5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 199          KM  .45 .44 .44 .13 .09 .07 .03 .03 .03 .03 .03 .03 .01 .01 .01 .01 .01 .01
 200          KM
 201          KM         L=   0.924 miles, S=  338 feet/mile, Kb= .13
 202          KM
 203          BA  0.185
 204          LG   0.24       0    4.50    0.40   31.23
 205          UC  0.367   0.298
 206          UA      0       3       5       8      12      20      43      75      90      96
 207          UA    100
              *

 208          KK  C532L
 209          KM     Hydrograph combine 531532 + 205G at C532 left branch
 210          HC      2
              *

 211          KK   205H
 212          KM  Sub-Basin   205H
 213          KM
 214          KM     The Clark Unit Hydrograph is used for this basin.
 215          KM         The Natural time-area relation is used for this basin.
 216          KM         Time of Concentration is for 100-year flood.
 217          KM
 218          KM     Time of Concentration for this sub-basin is based on the following:
 219          KM         6-Hour Rainfall, Pattern No.  1.00
 220          KM         An areal rainfall reduction factor of 0.997
 221          KM
 222          KM      EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 223          KM    5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 224          KM  .45 .44 .44 .13 .09 .08 .04 .03 .03 .03 .03 .03 .01 .01 .01 .01 .01 .01
 225          KM
 226          KM         L=   1.464 miles, S=  325 feet/mile, Kb= .13
 227          KM
 228          BA  0.261
 229          LG   0.24       0    4.50    0.39   31.55
 230          UC  0.513   0.514
 231          UA      0       3       5       8      12      20      43      75      90      96
 232          UA    100
              *
```

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

 233          KK    C532
 234          KO       5
 235          KM      Hydrograph combine C532L + 205H at C532
 236          HC       2
              *

 237          KK  532533
 238          KO       5
 239          KM      Normal depth channel route from C532 to C533
 240          KM      Source:  Hydrology Field Reconnaissance
 241          RS       1    FLOW      -1
 242          RC   0.060   0.045   0.060  1555.0  0.0283
 243          RX  1000.0  1020.0  1030.0  1048.0  1065.0  1077.0  1092.0  1119.0
 244          RY    98.0    89.4    88.1    85.6    85.9    92.2    93.8    97.0
              *

 245          KK    205I
 246          KM   Sub-Basin   205I
 247          KM
 248          KM      The Clark Unit Hydrograph is used for this basin.
 249          KM          The Natural time-area relation is used for this basin.
 250          KM          Time of Concentration is for 100-year flood.
 251          KM
 252          KM      Time of Concentration for this sub-basin is based on the following:
 253          KM          6-Hour Rainfall, Pattern No.  1.00
 254          KM          An areal rainfall reduction factor of 0.995
 255          KM
 256          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 257          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 258          KM   .44 .44 .43 .13 .09 .08 .03 .03 .03 .01 .01 .01 .00 .00 .00 .00 .00 .00
 259          KM
 260          KM          L=   1.487 miles, S=  326 feet/mile, Kb= .11
 261          KM
 262          BA   0.354
 263          LG    0.20       0    5.20    0.28   15.18
 264          UC   0.458   0.386
 265          UA       0       3       5       8      12      20      43      75      90      96
 266          UA     100
              *

 267          KK    C533
 268          KO       5
 269          KM      Hydrograph combine 532533 + 205I at C533
 270          HC       2
              *

 271          KK  533534
 272          KO       5
 273          KM      Normal depth channel route from C533 to C534
 274          KM      Source:  Hydrology Field Reconnaissance
 275          RS       1    FLOW      -1
 276          RC   0.060   0.046   0.060  7145.0  0.0241
 277          RX  1000.0  1010.0  1060.0  1073.0  1160.0  1181.0  1223.0  1237.0
 278          RY    97.8    93.7    94.7    90.8    89.9    92.4    94.0    96.8
```

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

 279          KK   205J
 280          KM  Sub-Basin   205J
 281          KM
 282          KM     The Clark Unit Hydrograph is used for this basin.
 283          KM         The Natural time-area relation is used for this basin.
 284          KM         Time of Concentration is for 100-year flood.
 285          KM
 286          KM     Time of Concentration for this sub-basin is based on the following:
 287          KM         6-Hour Rainfall, Pattern No.  1.00
 288          KM         An areal rainfall reduction factor of 0.995
 289          KM
 290          KM      EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 291          KM    5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 292          KM  .44 .43 .42 .12 .08 .06 .03 .02 .02 .00 .00 .00 .00 .00 .00 .00 .00 .00
 293          KM
 294          KM         L=   1.633 miles, S=  243 feet/mile, Kb= .08
 295          KM
 296          BA  0.369
 297          LG   0.21       0    4.90    0.30    3.48
 298          UC  0.450   0.398
 299          UA      0       3       5       8      12      20      43      75      90      96
 300          UA    100
              *

 301          KK  C534R
 302          KM     Hydrograph combine 533534 + 205J at C534 right branch
 303          HC      2
              *

 304          KK   205K
 305          KM  Sub-Basin   205K
 306          KM
 307          KM     The Clark Unit Hydrograph is used for this basin.
 308          KM         The Natural time-area relation is used for this basin.
 309          KM         Time of Concentration is for 100-year flood.
 310          KM
 311          KM     Time of Concentration for this sub-basin is based on the following:
 312          KM         6-Hour Rainfall, Pattern No.  1.00
 313          KM         An areal rainfall reduction factor of 0.997
 314          KM
 315          KM      EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 316          KM    5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 317          KM  .44 .44 .43 .13 .09 .08 .03 .03 .03 .00 .00 .00 .00 .00 .00 .00 .00 .00
 318          KM
 319          KM         L=   1.772 miles, S=  249 feet/mile, Kb= .10
 320          KM
 321          BA  0.245
 322          LG   0.16       0    5.60    0.22    1.54
 323          UC  0.546   0.665
 324          UA      0       3       5       8      12      20      43      75      90      96
 325          UA    100
              *
```

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

 326          KK    C534
 327          KO       5
 328          KM      Hydrograph combine C534R + 205K at C534
 329          HC       2
              *

 330          KK  534535
 331          KO       5
 332          KM      Normal depth channel route from C534 to C535
 333          KM      Source:  Hydrology Field Reconnaissance
 334          RS       1    FLOW      -1
 335          RC   0.065   0.046   0.065  2037.0  0.0221
 336          RX  1000.0  1010.0  1016.0  1075.0  1150.0  1162.0  1174.0  1182.0
 337          RY    97.1    93.4    91.6    89.6    86.9    90.8    92.2    92.3
              *

 338          KK    205L
 339          KM   Sub-Basin   205L
 340          KM
 341          KM      The Clark Unit Hydrograph is used for this basin.
 342          KM          The Natural time-area relation is used for this basin.
 343          KM          Time of Concentration is for 100-year flood.
 344          KM
 345          KM      Time of Concentration for this sub-basin is based on the following:
 346          KM          6-Hour Rainfall, Pattern No.  1.00
 347          KM          An areal rainfall reduction factor of 0.998
 348          KM
 349          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 350          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 351          KM   .44 .43 .42 .12 .08 .06 .02 .02 .02 .00 .00 .00 .00 .00 .00 .00 .00 .00
 352          KM
 353          KM          L=   0.701 miles, S=  284 feet/mile, Kb= .09
 354          KM
 355          BA   0.118
 356          LG    0.19       0    5.00    0.29    0.00
 357          UC   0.254   0.206
 358          UA       0       3       5       8      12      20      43      75      90      96
 359          UA     100
              *

 360          KK    C535
 361          KO       5
 362          KM      Hydrograph combine 534535 + 205L at C535
 363          HC       2
              *

 364          KK  535536
 365          KO       5
 366          KM      Normal depth channel route from C535 to C536
 367          KM      Source:  HEC-2 Cross Section: HE 3.275
 368          RS       1    FLOW      -1
 369          RC   0.075   0.050   0.075  2975.0  0.0236
 370          RX  9852.8  9871.5  9957.7 10000.0 10015.6 10052.4 10142.4 10183.6
 371          RY  1911.6  1904.3  1906.9  1900.8  1900.8  1905.4  1905.2  1912.6
```

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

 372          KK    205M
 373          KM   Sub-Basin    205M
 374          KM
 375          KM      The Clark Unit Hydrograph is used for this basin.
 376          KM          The Urban time-area relation is used for this basin.
 377          KM          Time of Concentration is for 100-year flood.
 378          KM
 379          KM      Time of Concentration for this sub-basin is based on the following:
 380          KM          6-Hour Rainfall, Pattern No.  1.00
 381          KM          An areal rainfall reduction factor of 0.998
 382          KM
 383          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 384          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 385          KM   .46 .46 .46 .15 .12 .11 .05 .05 .04 .02 .02 .02 .01 .01 .01 .01 .01 .01
 386          KM
 387          KM          L=   0.839 miles, S=  230 feet/mile, Kb= .05
 388          KM
 389          BA   0.139
 390          LG    0.15       0    5.40    0.22   22.35
 391          UC   0.213   0.178
 392          UA       0       5      16      30      65      77      84      90      94      97
 393          UA     100
              *

 394          KK   C536R
 395          KM      Hydrograph combine 535536 + 205M at C536 right branch
 396          HC       2
              *

 397          KK    205N
 398          KM   Sub-Basin    205N
 399          KM
 400          KM      The Clark Unit Hydrograph is used for this basin.
 401          KM          The HEC-1 time-area relation is used for this basin.
 402          KM          Time of Concentration is for 100-year flood.
 403          KM
 404          KM      Time of Concentration for this sub-basin is based on the following:
 405          KM          6-Hour Rainfall, Pattern No.  1.00
 406          KM          An areal rainfall reduction factor of 0.998
 407          KM
 408          KM       EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
 409          KM     5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
 410          KM   .45 .44 .44 .13 .09 .08 .03 .03 .03 .00 .00 .00 .00 .00 .00 .00 .00 .00
 411          KM
 412          KM          L=   1.183 miles, S=  245 feet/mile, Kb= .10
 413          KM
 414          BA   0.156
 415          LG    0.15       0    5.70    0.21    0.80
 416          UC   0.413   0.457
              *
```

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

 417          KK   C536I
 418          KM      Hydrograph combine C536R + 205N at C536I
 419          KO       1
 420          HC       2
              *
              * *
              * * C536I is the total flow in Hesperus Wash upstream of Dam 36
              * *
              *
 421          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

  8        205A
              .
              .
 34           .        205B
              .           .
              .           .
 56        C528............
              V
              V
 60       528530
              .
              .
 68           .        205C
              .           .
              .           .
 90       C530R...........
              .
              .
 93           .        205D
              .           .
              .           .
115           .           .        205E
              .           .           .
              .           .           .
137           .        C529............
              .           .
              .           .
140        C530............
              V
              V
144       530531
              .
              .
152           .        205F
              .           .
              .           .
174        C531............
              V
              V
178       531532
              .
              .
186           .        205G
              .           .
              .           .
208       C532L...........
              .
              .
211           .        205H
              .           .
              .           .
233        C532............
```

```
                V
                V
237       532533
                .
                .
245             .         205I
                .            .
                .            .
267         C533............
                V
                V
271       533534
                .
                .
279             .         205J
                .            .
                .            .
301        C534R............
                .
                .
304             .         205K
                .            .
                .            .
326         C534............
                V
                V
330       534535
                .
                .
338             .         205L
                .            .
                .            .
360         C535............
                V
                V
364       535536
                .
                .
372             .         205M
                .            .
                .            .
394        C536R............
                .
                .
397             .         205N
                .            .
                .            .
417        C536I............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/28/95  TIME  09:03:36  *
*                                      *
****************************************
```

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

Project Name: Fountain Hills Dam Break Analysis
Project No.: No. 83 — File Name: DAM36-PM.IH1
PMF Analysis for Hesperus Wash Dam (No. 36) — Date: 09/12/95
Based on PMP Computation

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

   IT        HYDROGRAPH TIME DATA
                   NMIN         10  MINUTES IN COMPUTATION INTERVAL
                  IDATE     1    0  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ         80  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE     1    0  ENDING DATE
                 NDTIME       1310  ENDING TIME
                  ICENT         19  CENTURY MARK

            COMPUTATION INTERVAL    0.17 HOURS
                 TOTAL TIME BASE   13.17 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

 9 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE

57 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE

61 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE
```

```
141 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

145 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

175 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

179 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

234 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

238 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

268 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

272 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

327 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

331 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

361 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

365 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
```

*** ***

```
          **************
          *            *
417 KK    *     C536I  *
          *            *
          **************
```

419 KO OUTPUT CONTROL VARIABLES

IPRNT	1	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

420 HC HYDROGRAPH COMBINATION

ICOMP	2	NUMBER OF HYDROGRAPHS TO COMBINE

***

****

HYDROGRAPH AT STATION C536I
SUM OF 2 HYDROGRAPHS

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0320	21	10997.	1		0640	41	259.	1		1000	61	8.
1		0010	2	2.	1		0330	22	8769.	1		0650	42	212.	1		1010	62	7.
1		0020	3	6.	1		0340	23	7085.	1		0700	43	170.	1		1020	63	6.
1		0030	4	11.	1		0350	24	5793.	1		0710	44	137.	1		1030	64	5.
1		0040	5	21.	1		0400	25	4898.	1		0720	45	114.	1		1040	65	5.
1		0050	6	32.	1		0410	26	4155.	1		0730	46	95.	1		1050	66	4.
1		0100	7	45.	1		0420	27	3611.	1		0740	47	79.	1		1100	67	4.
1		0110	8	74.	1		0430	28	3116.	1		0750	48	66.	1		1110	68	3.
1		0120	9	131.	1		0440	29	2649.	1		0800	49	55.	1		1120	69	3.
1		0130	10	196.	1		0450	30	2216.	1		0810	50	46.	1		1130	70	2.
1		0140	11	279.	1		0500	31	1825.	1		0820	51	38.	1		1140	71	2.
1		0150	12	372.	1		0510	32	1487.	1		0830	52	33.	1		1150	72	2.
1		0200	13	475.	1		0520	33	1246.	1		0840	53	28.	1		1200	73	1.
1		0210	14	1796.	1		0530	34	1044.	1		0850	54	23.	1		1210	74	1.
1		0220	15	4523.	1		0540	35	865.	1		0900	55	20.	1		1220	75	1.
1		0230	16	8686.	1		0550	36	712.	1		0910	56	17.	1		1230	76	1.
1		0240	17	16041.	1		0600	37	578.	1		0920	57	14.	1		1240	77	1.
1		0250	18	19804.	1		0610	38	469.	1		0930	58	12.	1		1250	78	1.
1		0300	19	17867.	1		0620	39	378.	1		0940	59	10.	1		1300	79	1.
1		0310	20	14082.	1		0630	40	311.	1		0950	60	9.	1		1310	80	1.

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	13.17-HR
19804.	2.83	(CFS)	4090.	1875.	1875.	1875.
		(INCHES)	13.053	13.134	13.134	13.134
		(AC-FT)	2028.	2041.	2041.	2041.

CUMULATIVE AREA = 2.91 SQ MI

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	205A	1000.	2.50	167.	76.	76.	0.12		
HYDROGRAPH AT	205B	1774.	2.67	298.	136.	136.	0.21		
2 COMBINED AT	C528	2729.	2.67	464.	212.	212.	0.33		
ROUTED TO	528530	2757.	2.67	464.	212.	212.	0.33	91.22	2.67
HYDROGRAPH AT	205C	510.	2.50	83.	38.	38.	0.06		
2 COMBINED AT	C530R	3223.	2.67	547.	250.	250.	0.39		
HYDROGRAPH AT	205D	3238.	2.50	451.	206.	206.	0.32		
HYDROGRAPH AT	205E	1493.	2.67	307.	140.	140.	0.22		
2 COMBINED AT	C529	4453.	2.50	758.	346.	346.	0.54		
2 COMBINED AT	C530	7589.	2.67	1305.	596.	596.	0.93		
ROUTED TO	530531	7783.	2.67	1305.	596.	596.	0.93	93.11	2.67
HYDROGRAPH AT	205F	1583.	2.50	227.	104.	104.	0.16		
2 COMBINED AT	C531	9187.	2.67	1532.	700.	700.	1.09		
ROUTED TO	531532	9360.	2.67	1531.	700.	700.	1.09	96.46	2.67
HYDROGRAPH AT	205G	1705.	2.50	259.	118.	118.	0.19		
2 COMBINED AT	C532L	10942.	2.67	1790.	818.	818.	1.27		
HYDROGRAPH AT	205H	1753.	2.67	367.	168.	168.	0.26		
2 COMBINED AT	C532	12696.	2.67	2156.	986.	986.	1.53		
ROUTED TO	532533	12674.	2.67	2156.	986.	986.	1.53	96.34	2.67
HYDROGRAPH AT	205I	2810.	2.67	500.	228.	228.	0.35		
2 COMBINED AT	C533	15484.	2.67	2657.	1215.	1215.	1.89		
ROUTED TO	533534	14154.	2.83	2650.	1214.	1214.	1.89	96.71	2.83
HYDROGRAPH AT	205J	2874.	2.67	510.	233.	233.	0.37		
2 COMBINED AT	C534R	16528.	2.83	3159.	1447.	1447.	2.25		
HYDROGRAPH AT	205K	1391.	2.83	348.	159.	159.	0.25		
2 COMBINED AT	C534	17919.	2.83	3507.	1607.	1607.	2.50		

ROUTED TO	534535	18064.	2.83	3507.	1607.	1607.	2.50	96.05	2.83
HYDROGRAPH AT	205L	1233.	2.50	163.	74.	74.	0.12		
2 COMBINED AT	C535	18579.	2.83	3669.	1681.	1681.	2.62		
ROUTED TO	535536	18441.	2.83	3669.	1681.	1681.	2.62	1910.07	2.83
HYDROGRAPH AT	205M	1688.	2.33	202.	92.	92.	0.14		
2 COMBINED AT	C536R	18894.	2.83	3868.	1773.	1773.	2.76		
HYDROGRAPH AT	205N	1092.	2.67	223.	102.	102.	0.16		
2 COMBINED AT	C536I	19804.	2.83	4090.	1875.	1875.	2.91		

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

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/28/95  TIME  08:49:22  *
*                                      *
****************************************
```

```
*************************************
*                                   *
*   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        FOUNTAIN HILLS DAM BREAK ANALYSIS
  2           ID        RESERVOIR ROUTING WITH OVERTOPPING ANALYSIS.    File Name: DAM36-RT.IH1
  3           ID        DAM 36 - HESPERUS DAM
  4           ID        ****************************************************************
  5           ID        Analytical Considerations:
  6           ID        (a) Principal Spillway is clogged.
  7           ID        (b) Initial Condition is the higher between 100-year flood and
  8           ID            Spillway crest elevation.
  9           ID        (c) Input is 10-minute incremental PMF to generate 50 per cent
 10           ID            PMF and routed hydrographs.
 11           ID        ****************************************************************
              *DIAGRAM
 12           IT      10       0       0      70
 13           IO       1
 14           JR    FLOW    0.50
 15           IN      10
              *

 16           KK   C536I
 17           KM        DAM INFLOWS FROM PMF ANALYSIS (DAM36-PM.IH1)
 18           KM        Inflows to Dam 36 (Hesperus Dam)
 19           KO       1
 20           BA    2.91
 21           QI       0       2       6      11      21      32      45      74     131     196
 22           QI     279     372     475    1796    4523    8686   16041   19804   17867   14082
 23           QI   10997    8769    7085    5793    4898    4155    3611    3116    2649    2216
 24           QI    1825    1487    1246    1044     865     712     578     469     378     311
 25           QI     259     212     170     137     114      95      79      66      55      46
 26           QI      38      33      28      23      20      17      14      12      10       9
 27           QI       8       7       6       5       5       4       4       3       3       2
 28           QI       2       2       1       1       1       1       1       1       1       1
              *

 29           KK   C536O
 30           KM      Reservoir route at C536 (Dam 36).
 31           KO       1
 32           RS       1    ELEV  1889.0
 33           SV    0.00    3.96   35.94   87.09  132.22  186.43  254.82  276.00  298.02  322.00
 34           SV  346.95  374.00  401.26  431.00  461.36  494.00  525.67  559.13  593.55  629.19
 35           SE  1852.1  1862.0  1870.0  1876.0  1880.0  1884.0  1888.0  1889.0  1890.0  1891.0
 36           SE  1892.0  1893.0  1894.0  1895.0  1896.0  1897.0  1898.0  1899.0  1900.0  1901.0
 37           SQ       0       0       0       0       0       0       0       0     330    1303
 38           SQ    2752    4573    6723    9921   16583   25417   35910   47818   60990   75321
 39           SE  1852.1  1862.0  1870.0  1876.0  1880.0  1884.0  1888.0  1889.0  1890.0  1891.0
 40           SE  1892.0  1893.0  1894.0  1895.0  1896.0  1897.0  1898.0  1899.0  1900.0  1901.0
 41           ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   16       C536I
                V
                V
   29       C536O
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/28/95  TIME  08:49:22  *
*                                      *
****************************************
```

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

```
FOUNTAIN HILLS DAM BREAK ANALYSIS
RESERVOIR ROUTING WITH OVERTOPPING ANALYSIS.    File Name: DAM36-RT.IH1
DAM 36 - HESPERUS DAM
*****************************************************************
Analytical Considerations:
(a) Principal Spillway is clogged.
(b) Initial Condition is the higher between 100-year flood and
    Spillway crest elevation.
(c) Input is 10-minute incremental PMF to generate 50 per cent
    PMF and routed hydrographs.
*****************************************************************

 13 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN          10  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ          70  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      1    0  ENDING DATE
                     NDTIME        1130  ENDING TIME
                      ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL    0.17 HOURS
                      TOTAL TIME BASE   11.50 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

    JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                    RATIOS OF RUNOFF
                  0.50
```

*** ***

```
          **************
          *            *
 16 KK    *     C536I  *
          *            *
          **************
                          DAM INFLOWS FROM PMF ANALYSIS (DAM36-PM.IH1)
                          Inflows to Dam 36 (Hesperus Dam)

 19 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

 15 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN          10  TIME INTERVAL IN MINUTES
                     JXDATE      1    0  STARTING DATE
                     JXTIME           0  STARTING TIME

            SUBBASIN RUNOFF DATA

 20 BA          SUBBASIN CHARACTERISTICS
                      TAREA        2.91  SUBBASIN AREA
```

***

****

HYDROGRAPH AT STATION C536I

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0300	19	17867.	1		0600	37	578.	1		0900	55	20.
1		0010	2	2.	1		0310	20	14082.	1		0610	38	469.	1		0910	56	17.
1		0020	3	6.	1		0320	21	10997.	1		0620	39	378.	1		0920	57	14.
1		0030	4	11.	1		0330	22	8769.	1		0630	40	311.	1		0930	58	12.
1		0040	5	21.	1		0340	23	7085.	1		0640	41	259.	1		0940	59	10.
1		0050	6	32.	1		0350	24	5793.	1		0650	42	212.	1		0950	60	9.
1		0100	7	45.	1		0400	25	4898.	1		0700	43	170.	1		1000	61	8.
1		0110	8	74.	1		0410	26	4155.	1		0710	44	137.	1		1010	62	7.
1		0120	9	131.	1		0420	27	3611.	1		0720	45	114.	1		1020	63	6.
1		0130	10	196.	1		0430	28	3116.	1		0730	46	95.	1		1030	64	5.
1		0140	11	279.	1		0440	29	2649.	1		0740	47	79.	1		1040	65	5.
1		0150	12	372.	1		0450	30	2216.	1		0750	48	66.	1		1050	66	4.
1		0200	13	475.	1		0500	31	1825.	1		0800	49	55.	1		1100	67	4.
1		0210	14	1796.	1		0510	32	1487.	1		0810	50	46.	1		1110	68	3.
1		0220	15	4523.	1		0520	33	1246.	1		0820	51	38.	1		1120	69	3.
1		0230	16	8686.	1		0530	34	1044.	1		0830	52	33.	1		1130	70	2.
1		0240	17	16041.	1		0540	35	865.	1		0840	53	28.					
1		0250	18	19804.	1		0550	36	712.	1		0850	54	23.					

****

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

(CFS)	(HR)		6-HR	24-HR	72-HR	11.50-HR
19804.	2.83	(CFS)	4090.	2147.	2147.	2147.
		(INCHES)	13.066	13.147	13.147	13.147
		(AC-FT)	2028.	2040.	2040.	2040.

CUMULATIVE AREA = 2.91 SQ MI

****

HYDROGRAPH AT STATION C536I
PLAN 1, RATIO = 0.50

****

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0300	19	8934.	1		0600	37	289.	1		0900	55	10.
1		0010	2	1.	1		0310	20	7041.	1		0610	38	235.	1		0910	56	9.
1		0020	3	3.	1		0320	21	5499.	1		0620	39	189.	1		0920	57	7.
1		0030	4	6.	1		0330	22	4385.	1		0630	40	156.	1		0930	58	6.
1		0040	5	11.	1		0340	23	3543.	1		0640	41	130.	1		0940	59	5.
1		0050	6	16.	1		0350	24	2897.	1		0650	42	106.	1		0950	60	5.
1		0100	7	23.	1		0400	25	2449.	1		0700	43	85.	1		1000	61	4.
1		0110	8	37.	1		0410	26	2078.	1		0710	44	69.	1		1010	62	4.
1		0120	9	66.	1		0420	27	1806.	1		0720	45	57.	1		1020	63	3.
1		0130	10	98.	1		0430	28	1558.	1		0730	46	48.	1		1030	64	3.
1		0140	11	140.	1		0440	29	1325.	1		0740	47	40.	1		1040	65	3.
1		0150	12	186.	1		0450	30	1108.	1		0750	48	33.	1		1050	66	2.
1		0200	13	238.	1		0500	31	913.	1		0800	49	28.	1		1100	67	2.
1		0210	14	898.	1		0510	32	744.	1		0810	50	23.	1		1110	68	2.
1		0220	15	2262.	1		0520	33	623.	1		0820	51	19.	1		1120	69	2.
1		0230	16	4343.	1		0530	34	522.	1		0830	52	17.	1		1130	70	1.
1		0240	17	8021.	1		0540	35	433.	1		0840	53	14.					
1		0250	18	9902.	1		0550	36	356.	1		0850	54	12.					

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	11.50-HR
9902.	2.83	(CFS)	2045.	1073.	1073.	1073.
		(INCHES)	6.533	6.573	6.573	6.573
		(AC-FT)	1014.	1020.	1020.	1020.

CUMULATIVE AREA = 2.91 SQ MI

*** ***

```
          **************
          *            *
29 KK     *    C536O   *
          *            *
          **************
```

Reservoir route at C536 (Dam 36).

31 KO OUTPUT CONTROL VARIABLES

IPRNT	1	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

32 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	ELEV	TYPE OF INITIAL CONDITION
RSVRIC	1889.00	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

33 SV	STORAGE	0.0	4.0	35.9	87.1	132.2	186.4	254.8	276.0	298.0	322.0
		347.0	374.0	401.3	431.0	461.4	494.0	525.7	559.1	593.5	629.2
35 SE	ELEVATION	1852.10	1862.00	1870.00	1876.00	1880.00	1884.00	1888.00	1889.00	1890.00	1891.00
		1892.00	1893.00	1894.00	1895.00	1896.00	1897.00	1898.00	1899.00	1900.00	1901.00
37 SQ	DISCHARGE	0.	0.	0.	0.	0.	0.	0.	0.	330.	1303.
		2752.	4573.	6723.	9921.	16583.	25417.	35910.	47818.	60990.	75321.
39 SE	ELEVATION	1852.10	1862.00	1870.00	1876.00	1880.00	1884.00	1888.00	1889.00	1890.00	1891.00
		1892.00	1893.00	1894.00	1895.00	1896.00	1897.00	1898.00	1899.00	1900.00	1901.00

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	3.96	35.94	87.09	132.22	186.43	254.82	276.00	298.02	322.00
OUTFLOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	330.00	1303.00
ELEVATION	1852.10	1862.00	1870.00	1876.00	1880.00	1884.00	1888.00	1889.00	1890.00	1891.00
STORAGE	346.95	374.00	401.26	431.00	461.36	494.00	525.67	559.13	593.55	629.19
OUTFLOW	2752.00	4573.00	6723.00	9921.00	16583.00	25417.00	35910.00	47818.00	60990.00	75321.00
ELEVATION	1892.00	1893.00	1894.00	1895.00	1896.00	1897.00	1898.00	1899.00	1900.00	1901.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 9921. TO 75321.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

****

HYDROGRAPH AT STATION C5360
PLAN 1, RATIO = 0.50

****

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STA
1		0000	1	0.	276.0	1889.0	*	1		0400	25	3034.	351.1	1892.2	*	1		0800	49	92.	282.1	1889
1		0010	2	0.	276.0	1889.0	*	1		0410	26	2566.	343.7	1891.9	*	1		0810	50	80.	281.3	1889
1		0020	3	0.	276.0	1889.0	*	1		0420	27	2209.	337.6	1891.6	*	1		0820	51	69.	280.6	1889
1		0030	4	1.	276.1	1889.0	*	1		0430	28	1908.	332.4	1891.4	*	1		0830	52	59.	279.9	1889
1		0040	5	2.	276.2	1889.0	*	1		0440	29	1641.	327.8	1891.2	*	1		0840	53	51.	279.4	1889
1		0050	6	4.	276.3	1889.0	*	1		0450	30	1398.	323.6	1891.1	*	1		0850	54	44.	278.9	1889
1		0100	7	7.	276.5	1889.0	*	1		0500	31	1206.	319.6	1890.9	*	1		0900	55	38.	278.5	1889
1		0110	8	11.	276.8	1889.0	*	1		0510	32	1041.	315.5	1890.7	*	1		0910	56	32.	278.2	1889
1		0120	9	19.	277.3	1889.1	*	1		0520	33	885.	311.7	1890.6	*	1		0920	57	28.	277.8	1889
1		0130	10	31.	278.0	1889.1	*	1		0530	34	748.	308.3	1890.4	*	1		0930	58	24.	277.6	1889

1	0140	11	47.	279.1	1889.1	*	1	0540	35	630.	305.4	1890.3	*	1	0940	59	20.	277.4	1889
1	0150	12	69.	280.6	1889.2	*	1	0550	36	527.	302.9	1890.2	*	1	0950	60	17.	277.2	1889
1	0200	13	96.	282.4	1889.3	*	1	0600	37	438.	300.7	1890.1	*	1	1000	61	15.	277.0	1889
1	0210	14	184.	288.3	1889.6	*	1	0610	38	361.	298.8	1890.0	*	1	1010	62	13.	276.9	1889
1	0220	15	599.	304.6	1890.3	*	1	0620	39	315.	297.0	1890.0	*	1	1020	63	11.	276.7	1889
1	0230	16	1926.	332.7	1891.4	*	1	0630	40	289.	295.3	1889.9	*	1	1030	64	10.	276.6	1889
1	0240	17	4533.	373.4	1893.0	*	1	0640	41	261.	293.4	1889.8	*	1	1040	65	8.	276.5	1889
1	0250	18	7838.	411.6	1894.3	*	1	0650	42	234.	291.6	1889.7	*	1	1050	66	7.	276.5	1889
1	0300	19	9182.	424.1	1894.8	*	1	0700	43	208.	289.9	1889.6	*	1	1100	67	6.	276.4	1889
1	0310	20	8165.	414.7	1894.5	*	1	0710	44	184.	288.3	1889.6	*	1	1110	68	5.	276.4	1889
1	0320	21	6582.	399.5	1893.9	*	1	0720	45	161.	286.8	1889.5	*	1	1120	69	5.	276.3	1889
1	0330	22	5427.	384.8	1893.4	*	1	0730	46	141.	285.4	1889.4	*	1	1130	70	4.	276.3	1889
1	0340	23	4414.	371.6	1892.9	*	1	0740	47	123.	284.2	1889.4	*						
1	0350	24	3657.	360.4	1892.5	*	1	0750	48	106.	283.1	1889.3	*						
						*							*						

****

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	11.50-HR
9182.	3.00	(CFS)	2034.	1073.	1073.	1073.
		(INCHES)	6.498	6.572	6.572	6.572
		(AC-FT)	1008.	1020.	1020.	1020.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	11.50-HR
424.	3.00	326.	303.	303.	303.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	11.50-HR
1894.77	3.00	1891.07	1890.12	1890.12	1890.12

CUMULATIVE AREA = 2.91 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

					RATIOS APPLIED TO FLOWS
OPERATION	STATION	AREA	PLAN		RATIO 1
					0.50
HYDROGRAPH AT	C536I	2.91	1	FLOW	9902.
				TIME	2.83
ROUTED TO	C536O	2.91	1	FLOW	9182.
				TIME	3.00

** PEAK STAGES IN FEET **

1	STAGE	1894.77
	TIME	3.00

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

APPENDIX L

Breach Program output for Aspen Dam

B O S S B R E A C H (tm)

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Version : 1.10
Serial Number : 2111

PROGRAM ORIGIN :

Boss Breach (tm) is an enhanced version of Professor D. L. Fread's July 1988 NWS BREACH program.

DISCLAIMER :

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

Although Boss Corporation has endeavored to make Boss Breach error free, the program is not and cannot be certified as infallible. Therefore, Boss Corporation makes no warranty, either implicit or explicit, as to the correct performance or accuracy of this software.

In no event shall Boss Corporation be liable to anyone for special, collateral, incidental, or consequential damages in connection with or arising out of purchase or use of this software. The sole and exclusive liability to Boss Corporation, regardless of the form of action, shall not exceed the purchase price of this software.

PROJECT DESCRIPTION :

PROJECT TITLE : Fountain Hills Dambreak Analysis
PROJECT NUMBER : #83
DESCRIPTION : Breaching Analysis for Aspen Dam
ENGINEER : CCC
DATE OF RUN : 12/28/1995
TIME OF RUN : 4:45 pm

INPUT DATA :

INFLOW HYDROGRAPH DESCRIPTION :

Time Elapsed TIN(I) (hr)	Upstream Inflow QIN(I) (cfs)
.00	7544.0
.02	7878.0
.19	8040.0
.52	5686.5
.85	3218.0
1.19	2024.0
1.69	1404.0
2.19	836.0

RESERVOIR VOLUME DESCRIPTION :

Elevation HSA(I) (ft MSL)	Surface Area RSA(I) (acres)
1846.00	29.0
1844.00	26.5
1842.00	23.6
1840.00	20.9
1837.00	17.6
1832.00	12.0
1814.00	3.5
1808.80	.0

TAILWATER CROSS-SECTION DESCRIPTION :

Elevation HSTW(I) (ft MSL)	Tailwater Top Width BSTW(I) (ft)	Tailwater Manning n CMTW(I)
1799.20	.0	.0550
1801.00	32.8	.0550
1804.00	48.0	.0550
1807.00	62.4	.0550
1810.00	113.8	.0550
1812.00	333.8	.0550
1815.00	634.3	.0550
1818.00	667.9	.0550

RESERVOIR AND PIPING BREACH DESCRIPTION :

Initial Reservoir Water Surface Elevation (ft MSL, HI)	1839.60
Dam Bottom Elevation (ft MSL, HL)	1808.80
Dam Top Elevation (ft MSL, HU)	1843.20
Spillway Crest Elevation (ft MSL, HSP)	1835.40
Dam Crest Length (ft, CRL)	840.00
Dam Crest Width (ft, WC)	12.00
Ratio of Breach Width to Flow Depth (BR)	1.000
Initial Piping Failure Width (ft, H)	.10
Initial Piping Failure Elevation (ft MSL, HPI)	1808.80

DAM INNER CORE DESCRIPTION :

D50 Grain Size (mm, D50C)		18.920
Ratio of D90 to D30 Grain Sizes (UNFCC)		9.600
Porosity Ratio (PORC)		.300
Unit Weight (lb/cu ft, UWC)		120.00
Manning n of Core Material (CNC)		1.0000
Internal Friction Angle (degrees, AFRC)		40.00
Cohesive Strength (lb/sq ft, COHC)		.00
Average Upstream & Downstream Inner Core Slope (ZC)	1 :	.00

DAM OUTER CORE DESCRIPTION :

D50 Grain Size (mm, D50S)	18.920
Ratio of D90 to D30 Grain Sizes (UNFCS)	9.600
Porosity Ratio (PORS)	.300
Unit Weight (lb/cu ft, UWS)	120.00
Manning n of Core Material (CNS)	1.0000
Internal Friction Angle (degrees, AFRS)	40.00
Cohesive Strength (lb/sq ft, COHS)	.00
Average Clay Plasticity Index (PI)	.00
CA Clay Critical Shear Stress Coefficient (CA)	.000
CB Clay Critical Shear Stress Coefficient (CB)	.000

DAM FACE DESCRIPTION :

Upstream Face Slope (ZU)	1 (vertical) :	3.00
Downstream Face Slope (ZD)	1 (vertical) :	2.00
Downstream Face D50 Grain Size (mm, D50DF)		18.920
Downstream Face D90 to D30 Grain Size Ratio (UNFCDF)		9.600
Average Grass Length (inches, GL)		.00
Grass Condition Factor (1=good, 0=none, GS)		.00
Maximum Grass-Lined Channel Velocity (ft/sec, VMP)		.00

BOUNDARY CONDITIONS :

Simulation Duration (hr, TEH)	2.00
Basic Time-Step Size (hr, DTH)	.001
Iteration Error Tolerance (%, ERR)	.01
Downstream River Bottom Slope (ft/mi, SM)	258.000
Maximum Allowable Breach Bottom Width (ft, BMX)	200.000
Discharge Plot Time-Step Interval (FPT)	10.00
Time-step at which Plotting Starts (TPR)	.00

INPUT DATA :

SPILLWAY RATING CURVE :

Head SPH(I) (ft)	Spillway Flow SPQ(I) (cfs)
.00	.0
.60	122.0
1.60	926.0
2.60	2241.0
5.10	7124.0
6.60	11004.0
8.60	18097.0
10.60	33293.0

INTERNAL COMPUTATION CHECKS :

Avg. inner & outer matl. internal friction angle (rad, AFRA)	40.00
Equation 21 Theta1' (radians, TH1)	65.00
Equation 13 Critical Depth H1' (ft, H1)	.07
Equation 21 Theta2' (radians, TH2)	52.50
Equation 13 Critical Depth H2' (ft, H2)	.25
Equation 21 Theta3' (radians, TH3)	46.25
Equation 13 Critical Depth H3' (ft, H3)	.85

SUMMARY OF OUTPUT RESULTS :

GENERAL RESULTS :

Total Number of Iterations	0
Time of Breach Failure (hr, TFHI)	.19
Total Time-Steps Used (I)	3999
Total Elapsed Time (hr, T)	1.000
Outflow Hydrograph Rising Limb Duration (hr, TRS)	.245
Time at which Significant Rise in Outflow Begins (hr, TB)	.000
Dam Top Elevation (ft MSL, HU)	1843.20
Outflow at Time Zero (cfs, QO)	.0
Simplified Time of Breach Failure (hr, TFH)	-.455

TFH - Time of failure (hr) which is a linear equivalent of the outflow hydrograph rising limb duration (TRS) obtained by using the simplified dam-break discharge equation.

TFHI - Time of failure (hr) which is a linear equivalent of the outflow hydrograph rising limb duration (TRS) obtained by integrating breach outflow (QB) versus time from T=0 to T=Peak Outflow (TP).

OUTPUT RESULTS AT TIME OF PEAK OUTFLOW :

Elapsed Time (hr, TP)	.245
Spillway Outflow (cfs)	0.
Breach Outflow (cfs, QBP)	24893.
Total Outflow (cfs, QP)	24893.
Breach Top Width (ft, BRW)	28.6
Breach Bottom Width (ft, BO)	28.6
Breach Side Slope Relative to Vertical (degrees, Z)	.00

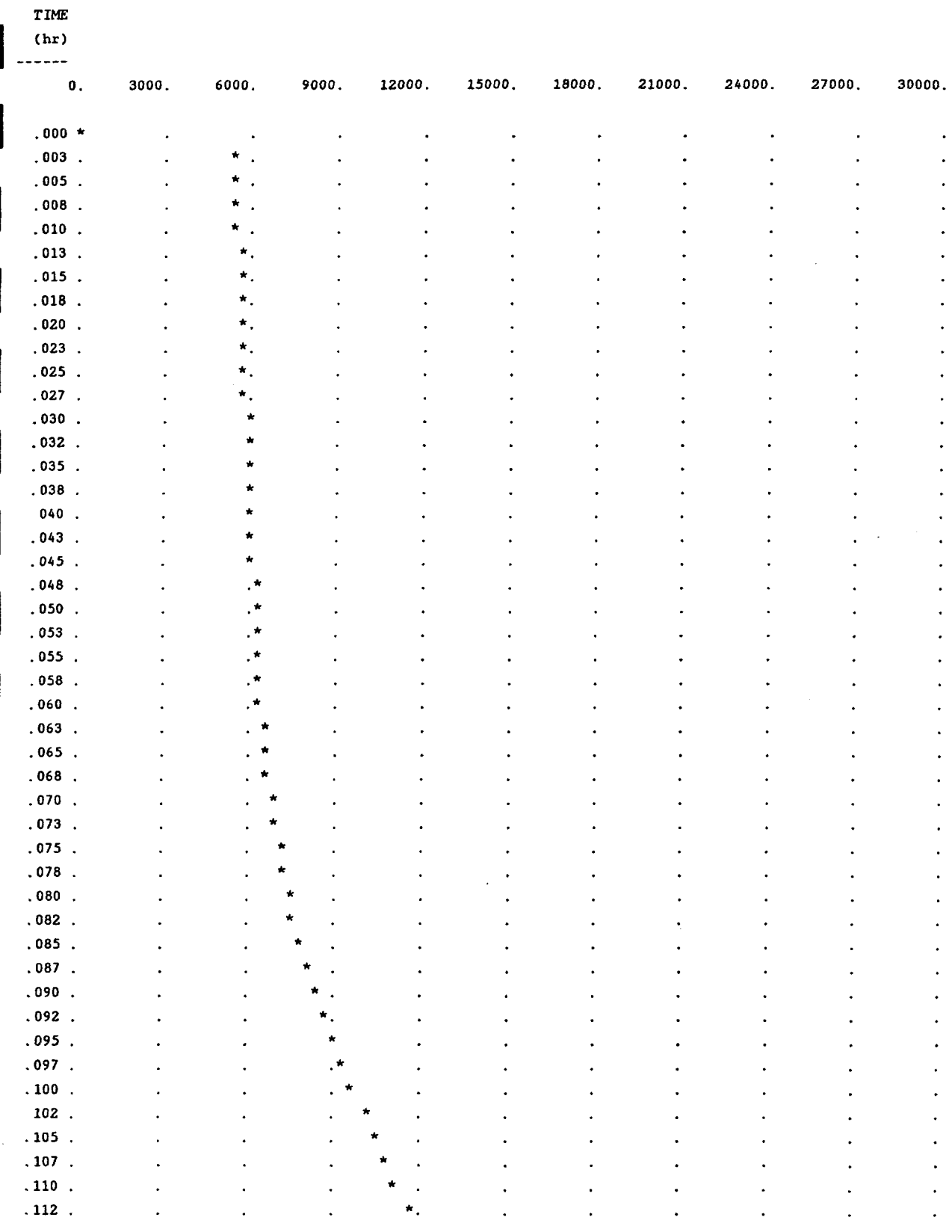
OUTPUT RESULTS AT END OF BREACH ANALYSIS :

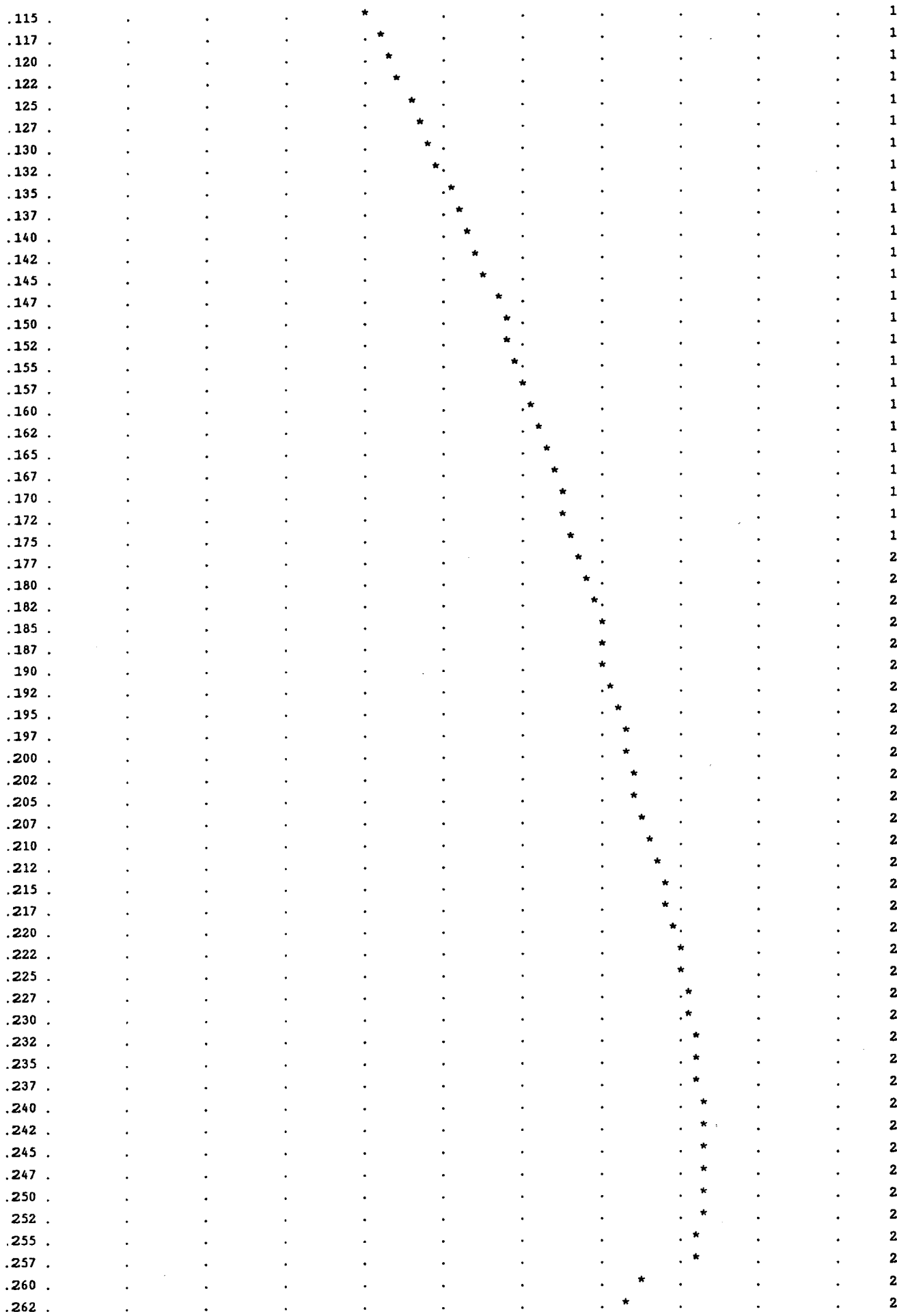
Breach Depth (ft, BRD)	34.4
Breach Bottom Elevation (ft MSL, HC)	1808.8
Breach Side Slope Relative to Vertical (degrees, AGL)	43.75
Reservoir Water Surface Elevation (ft MSL, HY)	1817.6

PROJECT TITLE : Fountain Hills Dambreak Analysis

PROJECT NUMBER : #83 12/28/1995

OUTPUT HYDROGRAPH PLOT :

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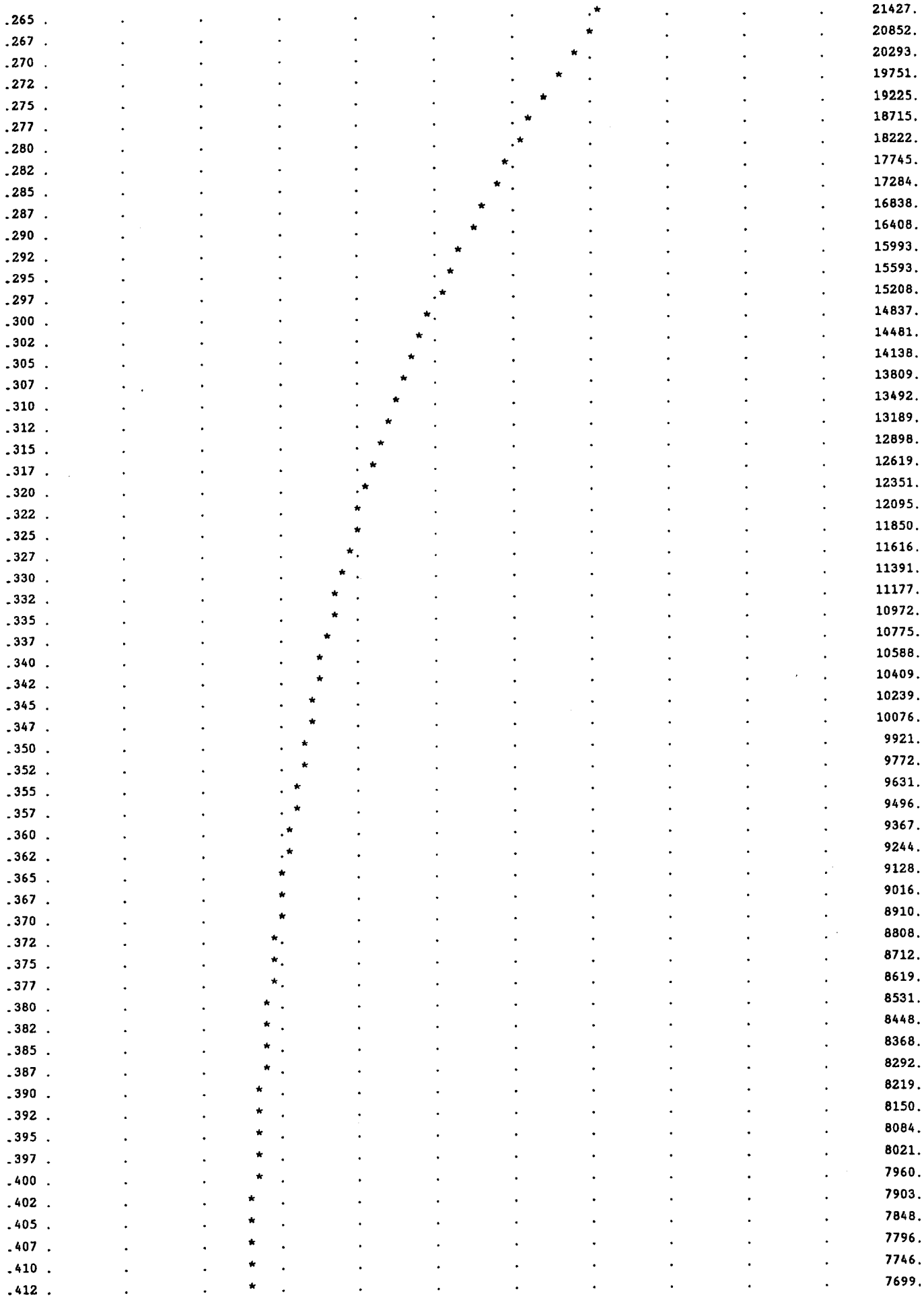
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END OF OUTPUT

APPENDIX M

Breach Program output for North Heights Dam

B O S S B R E A C H (tm)

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Version : 1.10
Serial Number : 2111

PROGRAM ORIGIN :

Boss Breach (tm) is an enhanced version of Professor D. L. Fread's July 1988 NWS BREACH program.

DISCLAIMER :

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

Although Boss Corporation has endeavored to make Boss Breach error free, the program is not and cannot be certified as infallible. Therefore, Boss Corporation makes no warranty, either implicit or explicit, as to the correct performance or accuracy of this software.

In no event shall Boss Corporation be liable to anyone for special, collateral, incidental, or consequential damages in connection with or arising out of purchase or use of this software. The sole and exclusive liability to Boss Corporation, regardless of the form of action, shall not exceed the purchase price of this software.

PROJECT DESCRIPTION :

PROJECT TITLE : Fountain Hills Dambreak Analysis
PROJECT NUMBER : #83
DESCRIPTION : Breaching Analysis of North Heights Dam
ENGINEER : CCC
DATE OF RUN : 12/28/1995
TIME OF RUN : 4:48 pm

INPUT DATA :

INFLOW HYDROGRAPH DESCRIPTION :

Time Elapsed TIN(I) (hr)	Upstream Inflow QIN(I) (cfs)
.00	11258.0
.16	12235.0
.33	7049.0
.66	3026.0
1.00	1603.0
1.33	1020.0
1.66	900.0
2.00	717.5

RESERVOIR VOLUME DESCRIPTION :

Elevation HSA(I) (ft MSL)	Surface Area RSA(I) (acres)
1822.00	23.2
1820.00	20.7
1818.00	19.9
1816.00	18.4
1812.00	15.8
1808.00	10.2
1792.00	2.6
1779.20	.0

TAILWATER CROSS-SECTION DESCRIPTION :

Elevation HSTW(I) (ft MSL)	Tailwater Top Width BSTW(I) (ft)	Tailwater Manning n CMTW(I)
1769.00	.0	.0500
1771.00	27.8	.0500
1774.00	57.0	.0500
1777.00	107.5	.0500
1780.00	155.0	.0500
1783.00	189.5	.0500
1786.00	309.0	.0500
1788.00	377.0	.0500

RESERVOIR AND PIPING BREACH DESCRIPTION :

Initial Reservoir Water Surface Elevation (ft MSL, HI)	1815.00
Dam Bottom Elevation (ft MSL, HL)	1779.20
Dam Top Elevation (ft MSL, HU)	1818.40
Spillway Crest Elevation (ft MSL, HSP)	1810.80
Dam Crest Length (ft, CRL)	820.00
Dam Crest Width (ft, WC)	12.00
Ratio of Breach Width to Flow Depth (BR)	1.000
Initial Piping Failure Width (ft, H)	.10
Initial Piping Failure Elevation (ft MSL, HPI)	1779.20

DAM INNER CORE DESCRIPTION :

D50 Grain Size (mm, D50C)		1.630
Ratio of D90 to D30 Grain Sizes (UNFCC)		142.000
Porosity Ratio (PORC)		.250
Unit Weight (lb/cu ft, UWC)		125.00
Manning n of Core Material (CNC)		1.0000
Internal Friction Angle (degrees, AFRC)		40.00
Cohesive Strength (lb/sq ft, COHC)		.00
Average Upstream & Downstream Inner Core Slope (ZC)	1 :	.00

DAM OUTER CORE DESCRIPTION :

D50 Grain Size (mm, D50S)	1.630
Ratio of D90 to D30 Grain Sizes (UNFCS)	142.000
Porosity Ratio (PORS)	.250
Unit Weight (lb/cu ft, UWS)	125.00
Manning n of Core Material (CNS)	1.0000
Internal Friction Angle (degrees, AFRS)	40.00
Cohesive Strength (lb/sq ft, COHS)	.00
Average Clay Plasticity Index (PI)	.00
CA Clay Critical Shear Stress Coefficient (CA)	.000
CB Clay Critical Shear Stress Coefficient (CB)	.000

DAM FACE DESCRIPTION :

Upstream Face Slope (ZU)	1 (vertical) :	3.00
Downstream Face Slope (ZD)	1 (vertical) :	2.00
Downstream Face D50 Grain Size (mm, D50DF)		1.630
Downstream Face D90 to D30 Grain Size Ratio (UNFCDF)		142.000
Average Grass Length (inches, GL)		.00
Grass Condition Factor (1=good, 0=none, GS)		.00
Maximum Grass-Lined Channel Velocity (ft/sec, VMP)		.00

BOUNDARY CONDITIONS :

Simulation Duration (hr, TEH)	2.00
Basic Time-Step Size (hr, DTH)	.001
Iteration Error Tolerance (%, ERR)	.01
Downstream River Bottom Slope (ft/mi, SM)	250.000
Maximum Allowable Breach Bottom Width (ft, BMX)	400.000
Discharge Plot Time-Step Interval (FPT)	10.00
Time-step at which Plotting Starts (TPR)	.00

INPUT DATA :

SPILLWAY RATING CURVE :

Head SPH(I) (ft)	Spillway Flow SPQ(I) (cfs)
.00	.0
.70	130.0
1.70	951.0
2.30	1551.0
3.70	3919.0
5.20	7027.0
7.20	12207.0
8.20	15311.0

INTERNAL COMPUTATION CHECKS :

Avg. inner & outer matl. internal friction angle (rad, AFRA)	40.00
Equation 21 Theta1' (radians, TH1)	65.00
Equation 13 Critical Depth H1' (ft, H1)	.07
Equation 21 Theta2' (radians, TH2)	52.50
Equation 13 Critical Depth H2' (ft, H2)	.24
Equation 21 Theta3' (radians, TH3)	46.25
Equation 13 Critical Depth H3' (ft, H3)	.82

SUMMARY OF OUTPUT RESULTS :

GENERAL RESULTS :

Total Number of Iterations	0
Time of Breach Failure (hr, TFHI)	.18
Total Time-Steps Used (I)	2951
Total Elapsed Time (hr, T)	.738
Outflow Hydrograph Rising Limb Duration (hr, TRS)	.213
Time at which Significant Rise in Outflow Begins (hr, TB)	.000
Dam Top Elevation (ft MSL, HU)	1818.40
Outflow at Time Zero (cfs, QO)	.0
Simplified Time of Breach Failure (hr, TFH)	-.312

TFH - Time of failure (hr) which is a linear equivalent of the outflow hydrograph rising limb duration (TRS) obtained by using the simplified dam-break discharge equation.

TFHI - Time of failure (hr) which is a linear equivalent of the outflow hydrograph rising limb duration (TRS) obtained by integrating breach outflow (QB) versus time from T=0 to T=Peak Outflow (TP).

OUTPUT RESULTS AT TIME OF PEAK OUTFLOW :

Elapsed Time (hr, TP)	.214
Spillway Outflow (cfs)	0.
Breach Outflow (cfs, QBP)	29206.
Total Outflow (cfs, QP)	29206.
Breach Top Width (ft, BRW)	28.9
Breach Bottom Width (ft, BO)	28.9
Breach Side Slope Relative to Vertical (degrees, Z)	.00

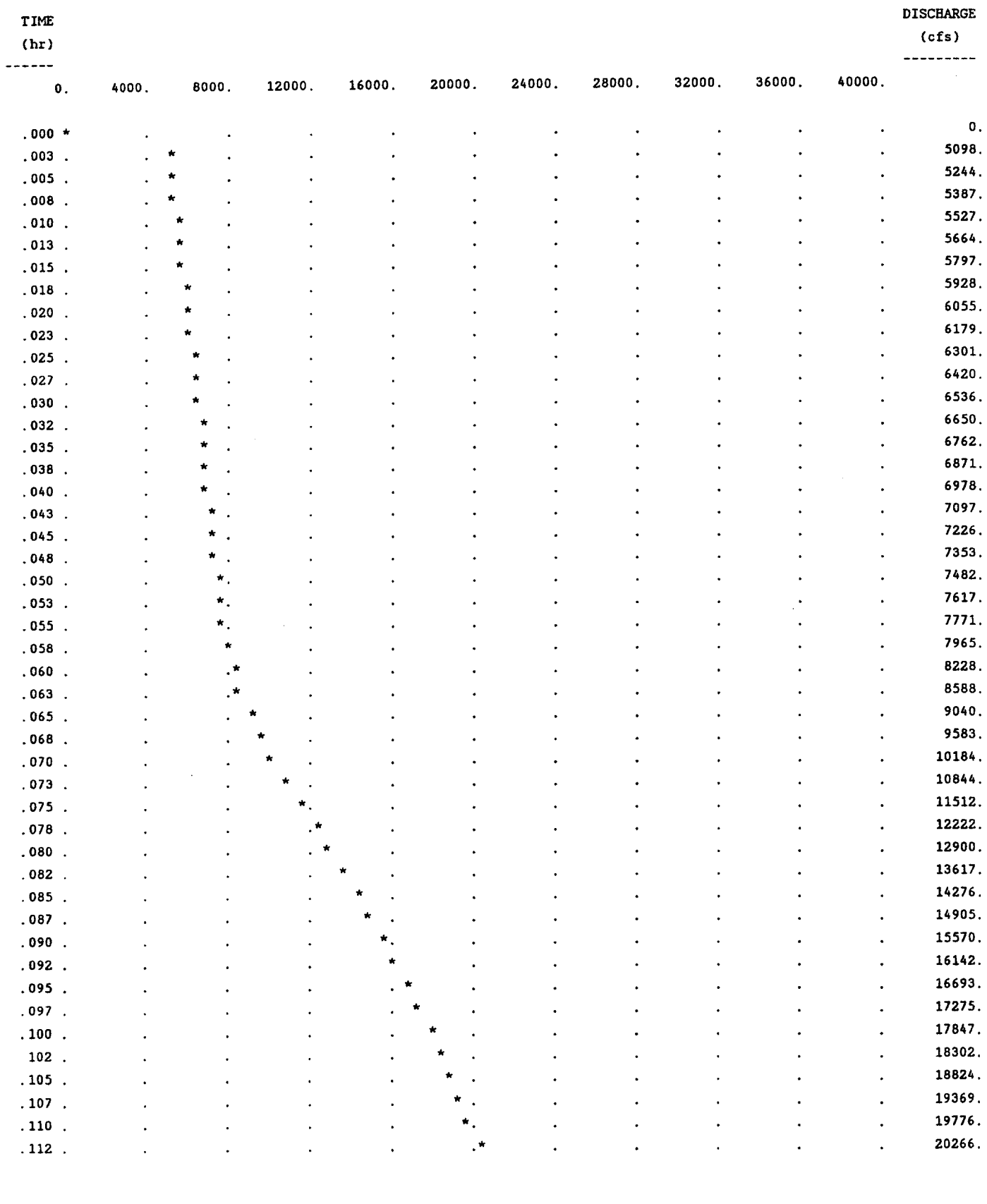
OUTPUT RESULTS AT END OF BREACH ANALYSIS :

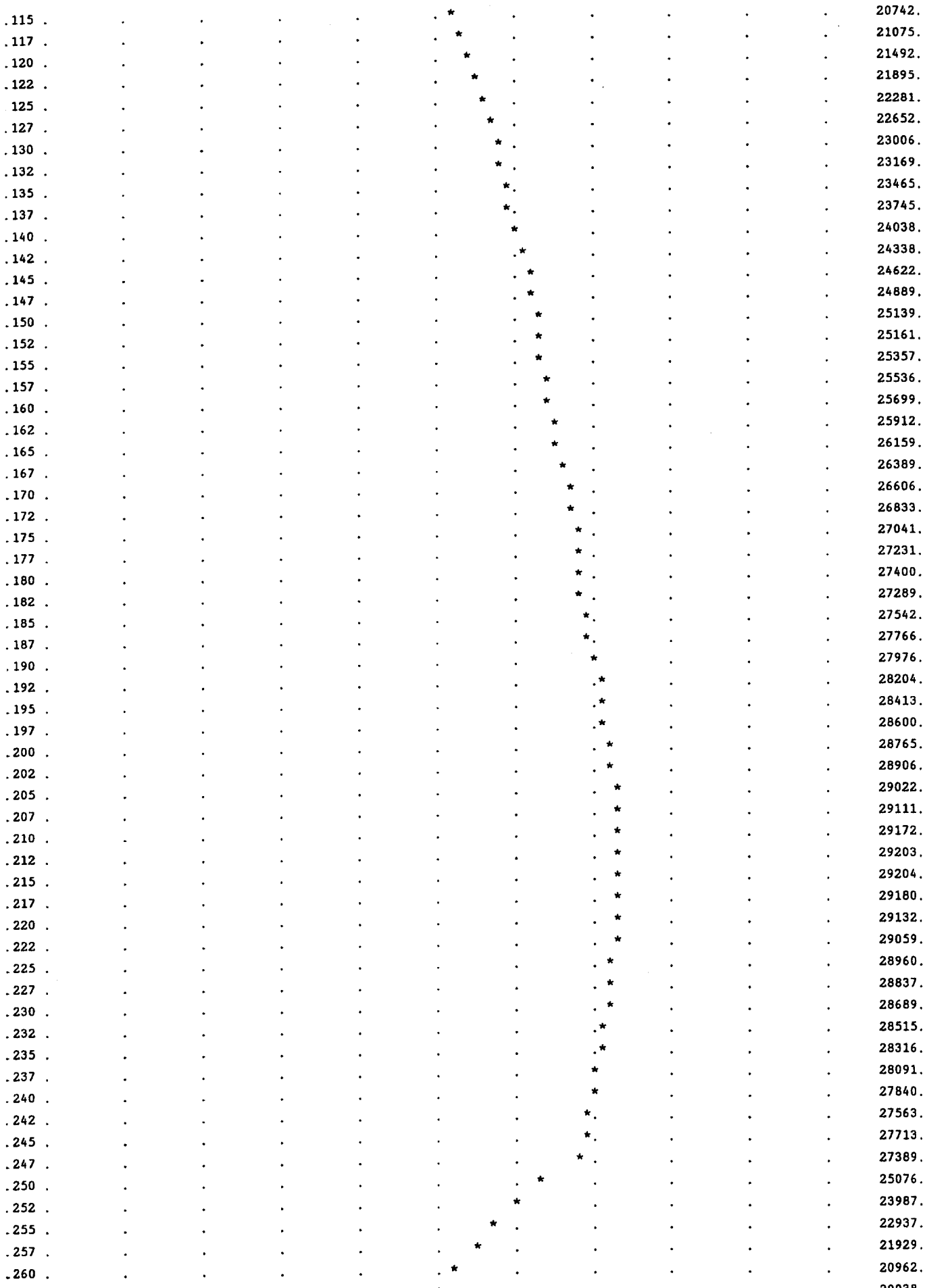
Breach Depth (ft, BRD)	39.2
Breach Bottom Elevation (ft MSL, HC)	1779.2
Breach Side Slope Relative to Vertical (degrees, AGL)	43.75
Reservoir Water Surface Elevation (ft MSL, HY)	1787.4

PROJECT TITLE : Fountain Hills Dambreak Analysis

PROJECT NUMBER : #83 12/28/1995

OUTPUT HYDROGRAPH PLOT :

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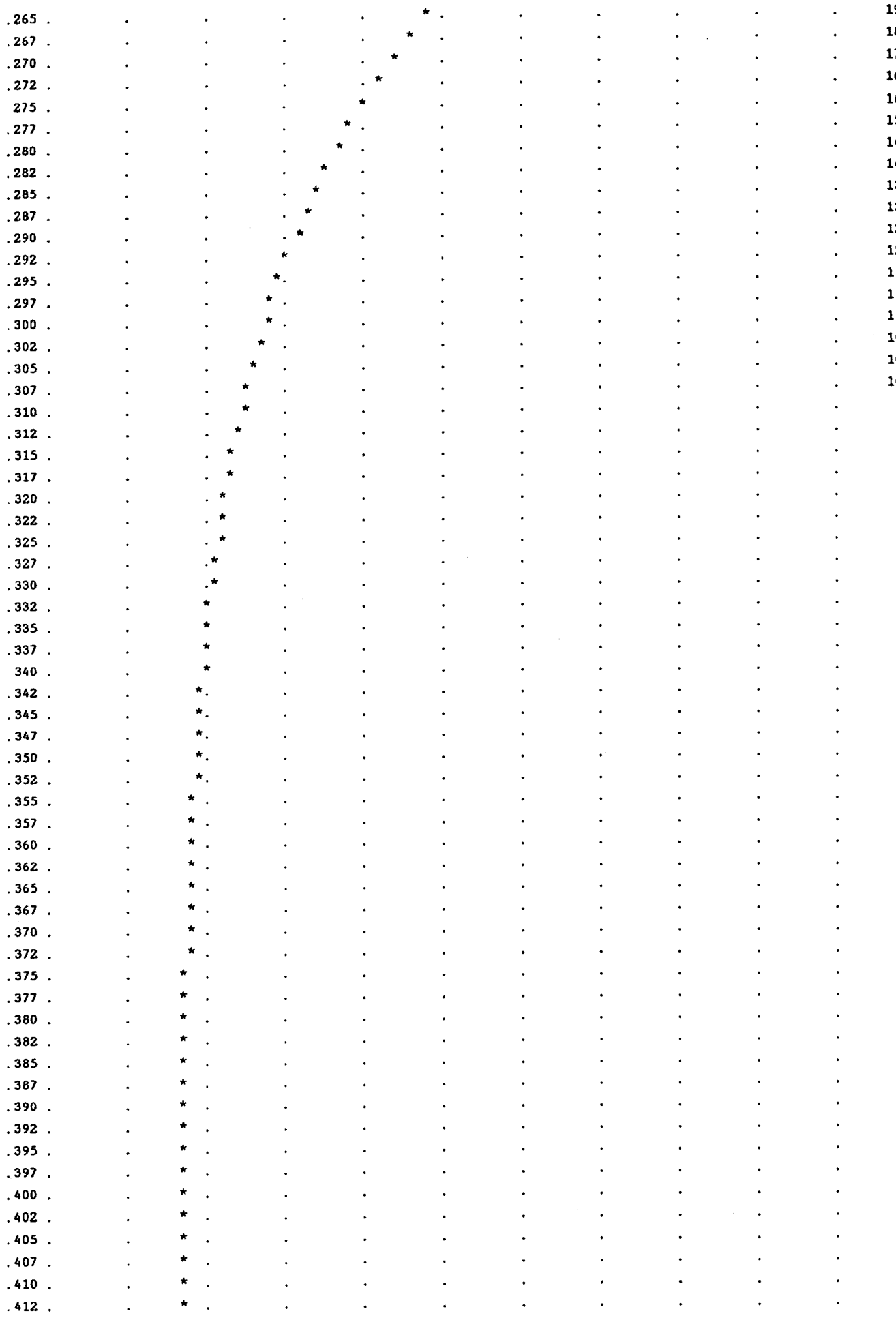
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.612	*	4167.
.615	*	4135.
.617	*	4102.
.620	*	4070.
.622	*	4038.
.625	*	4006.
.627	*	3974.
.630	*	3942.
.632	*	3910.
.635	*	3878.
.637	*	3846.
640	*	3814.
.642	*.	3782.
.645	*.	3750.
.647	*.	3718.
.650	*.	3686.
.652	*.	3654.
.655	*.	3622.
.657	*.	3590.
.660	*.	3558.
.662	*.	3526.
.665	*.	3495.
.667	*.	3465.
.670	*.	3436.
.672	*.	3409.
.675	* .	3382.
.677	* .	3357.
.680	* .	3332.
.682	* .	3308.
.685	* .	3285.
.687	* .	3263.
.690	* .	3241.
.692	* .	3220.
.695	* .	3200.
.697	* .	3180.
.700	* .	3161.
702	* .	3142.
.705	* .	3124.
.707	* .	3107.
.710	* .	3089.
.712	* .	3072.

```
.715 .     * .     .     .     .     .     .     .     .     .     .     3056.
.717 .     * .     .     .     .     .     .     .     .     .     .     3040.
.720 .     * .     .     .     .     .     .     .     .     .     .     3024.
.722 .     * .     .     .     .     .     .     .     .     .     .     3009.
.725 .    * .     .     .     .     .     .     .     .     .     .     2993.
.727 .    * .     .     .     .     .     .     .     .     .     .     2978.
.730 .    * .     .     .     .     .     .     .     .     .     .     2964.
.732 .    * .     .     .     .     .     .     .     .     .     .     2949.
.735 .    * .     .     .     .     .     .     .     .     .     .     2935.
.737 .    * .     .     .     .     .     .     .     .     .     .     2921.
```

END OF OUTPUT

APPENDIX N

Breach Program output for SunRidge Canyon Dam

B O S S B R E A C H (tm)

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Version : 1.10
Serial Number : 2111

PROGRAM ORIGIN :

Boss Breach (tm) is an enhanced version of Professor D. L. Fread's July 1988 NWS BREACH program.

DISCLAIMER :

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

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PROJECT DESCRIPTION :

PROJECT TITLE : Fountain Hills Dambreak Analysis
PROJECT NUMBER : #83
DESCRIPTION : Breaching Analysis for Sundridge Canyon
ENGINEER : CCC
DATE OF RUN : 12/28/1995
TIME OF RUN : 4:21 pm

INPUT DATA :

INFLOW HYDROGRAPH DESCRIPTION :

Time Elapsed TIN(I) (hr)	Upstream Inflow QIN(I) (cfs)
.00	6663.0
.02	7388.0
.19	9780.0
.36	6399.0
.52	3634.0
.86	2011.0
1.19	1114.0
1.52	807.0

RESERVOIR VOLUME DESCRIPTION :

Elevation HSA(I) (ft MSL)	Surface Area RSA(I) (acres)
1934.00	16.7
1932.00	15.1
1930.00	13.4
1928.00	11.5
1926.00	9.9
1918.00	5.1
1902.00	1.0
1884.80	.0

TAILWATER CROSS-SECTION DESCRIPTION :

Elevation HSTW(I) (ft MSL)	Tailwater Top Width BSTW(I) (ft)	Tailwater Manning n CMTW(I)
1880.00	.0	.0600
1884.00	27.9	.0600
1888.00	53.3	.0600
1893.00	84.0	.0600
1895.00	155.5	.0600
1898.00	195.0	.0600
1901.00	218.5	.0600
1904.00	244.2	.0600

PROJECT TITLE : Fountain Hills Dambreak Analysis

PROJECT NUMBER : #83 12/28/1995

RESERVOIR AND PIPING BREACH DESCRIPTION :

Initial Reservoir Water Surface Elevation (ft MSL, HI)	1928.90
Dam Bottom Elevation (ft MSL, HL)	1884.80
Dam Top Elevation (ft MSL, HU)	1932.40
Spillway Crest Elevation (ft MSL, HSP)	1924.80
Dam Crest Length (ft, CRL)	375.00
Dam Crest Width (ft, WC)	12.00
Ratio of Breach Width to Flow Depth (BR)	1.000
Initial Piping Failure Width (ft, H)	.10
Initial Piping Failure Elevation (ft MSL, HPI)	1884.80

DAM INNER CORE DESCRIPTION :

D50 Grain Size (mm, D50C)		2.450
Ratio of D90 to D30 Grain Sizes (UNFCC)		15.800
Porosity Ratio (PORC)		.300
Unit Weight (lb/cu ft, UWC)		120.00
Manning n of Core Material (CNC)		1.0000
Internal Friction Angle (degrees, AFRC)		35.00
Cohesive Strength (lb/sq ft, COHC)		200.00
Average Upstream & Downstream Inner Core Slope (ZC)	1 :	.50

DAM OUTER CORE DESCRIPTION :

D50 Grain Size (mm, D50S)	2.760
Ratio of D90 to D30 Grain Sizes (UNFCS)	30.200
Porosity Ratio (PORS)	.300
Unit Weight (lb/cu ft, UWS)	120.00
Manning n of Core Material (CNS)	1.0000
Internal Friction Angle (degrees, AFRS)	40.00
Cohesive Strength (lb/sq ft, COHS)	.00
Average Clay Plasticity Index (PI)	5.00
CA Clay Critical Shear Stress Coefficient (CA)	.000
CB Clay Critical Shear Stress Coefficient (CB)	.000

PROJECT TITLE : Fountain Hills Dambreak Analysis

PROJECT NUMBER : #83 12/28/1995

DAM FACE DESCRIPTION :

Upstream Face Slope (ZU)	1 (vertical) :	2.00
Downstream Face Slope (ZD)	1 (vertical) :	2.00
Downstream Face D50 Grain Size (mm, D50DF)		2.760
Downstream Face D90 to D30 Grain Size Ratio (UNFCDF)		30.200
Average Grass Length (inches, GL)		.00
Grass Condition Factor (1=good, 0=none, GS)		.00
Maximum Grass-Lined Channel Velocity (ft/sec, VMP)		.00

BOUNDARY CONDITIONS :

Simulation Duration (hr, TEH)	1.52
Basic Time-Step Size (hr, DTH)	.001
Iteration Error Tolerance (%, ERR)	.01
Downstream River Bottom Slope (ft/mi, SM)	147.300
Maximum Allowable Breach Bottom Width (ft, BMX)	400.000
Discharge Plot Time-Step Interval (FPT)	10.00
Time-step at which Plotting Starts (TPR)	.00

INPUT DATA :

SPILLWAY RATING CURVE :

Head SPH(I) (ft)	Spillway Flow SPQ(I) (cfs)
.00	.0
.70	88.0
1.20	328.0
3.20	2553.0
4.20	4246.0
6.20	8638.0
7.20	11325.0
8.20	14517.0

INTERNAL COMPUTATION CHECKS :

Avg. inner & outer matl. internal friction angle (rad, AFRA)	37.50
Equation 21 Theta1' (radians, TH1)	65.00
Equation 13 Critical Depth H1' (ft, H1)	.07
Equation 21 Theta2' (radians, TH2)	51.25
Equation 13 Critical Depth H2' (ft, H2)	21.32
Equation 21 Theta3' (radians, TH3)	43.13
Equation 13 Critical Depth H3' (ft, H3)	106.61

SUMMARY OF OUTPUT RESULTS :

GENERAL RESULTS :

Total Number of Iterations	0
Time of Breach Failure (hr, TFHI)	.16
Total Time-Steps Used (I)	3307
Total Elapsed Time (hr, T)	.827
Outflow Hydrograph Rising Limb Duration (hr, TRS)	.218
Time at which Significant Rise in Outflow Begins (hr, TB)	.000
Dam Top Elevation (ft MSL, HU)	1932.40
Outflow at Time Zero (cfs, QO)	.0
Simplified Time of Breach Failure (hr, TFH)	.027

TFH - Time of failure (hr) which is a linear equivalent of the outflow hydrograph rising limb duration (TRS) obtained by using the simplified dam-break discharge equation.

TFHI - Time of failure (hr) which is a linear equivalent of the outflow hydrograph rising limb duration (TRS) obtained by integrating breach outflow (QB) versus time from T=0 to T=Peak Outflow (TP).

OUTPUT RESULTS AT TIME OF PEAK OUTFLOW :

Elapsed Time (hr, TP)	.218
Spillway Outflow (cfs)	0.
Breach Outflow (cfs, QBP)	22291.
Total Outflow (cfs, QP)	22291.
Breach Top Width (ft, BRW)	25.6
Breach Bottom Width (ft, BO)	25.6
Breach Side Slope Relative to Vertical (degrees, Z)	.00

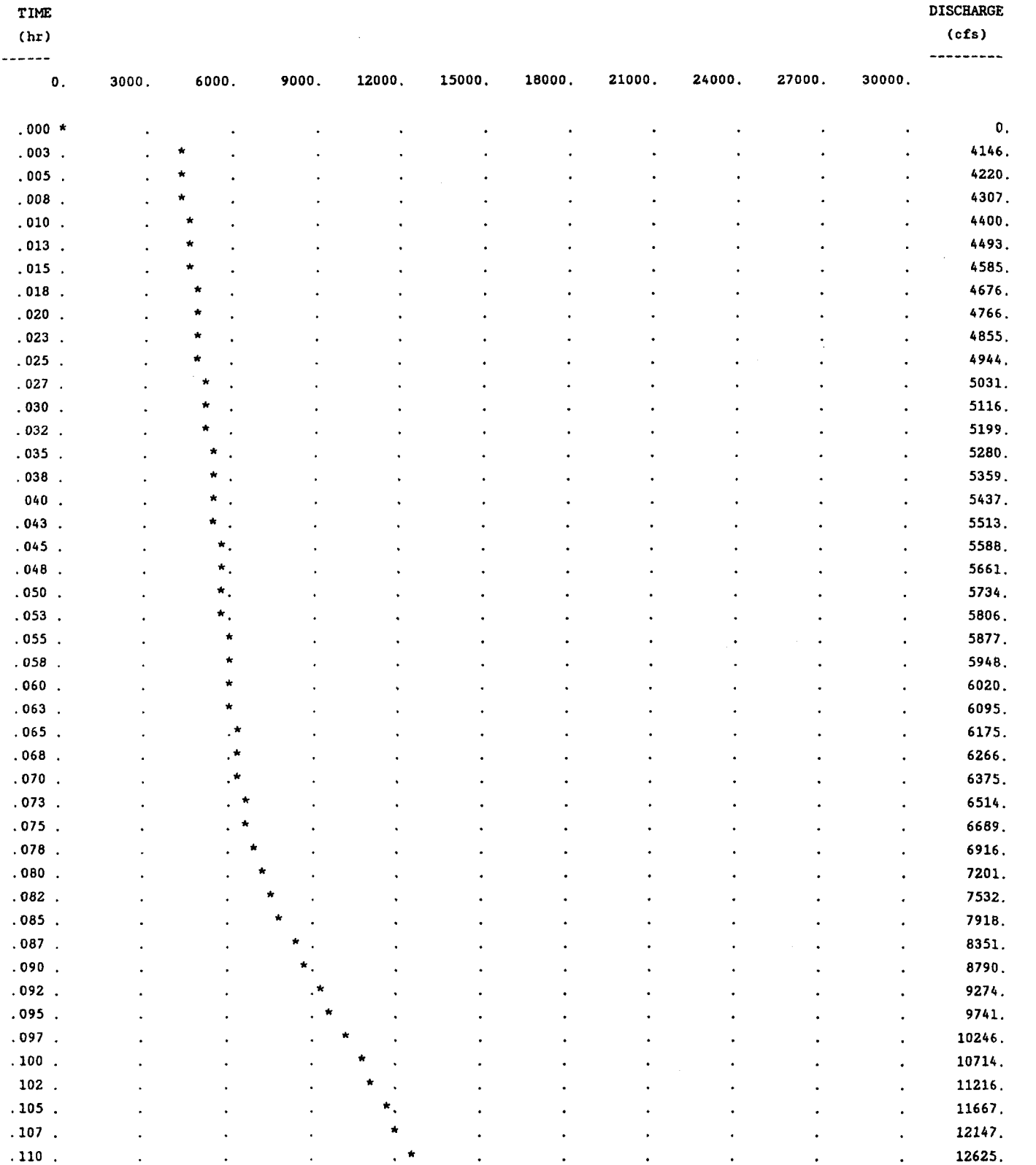
OUTPUT RESULTS AT END OF BREACH ANALYSIS :

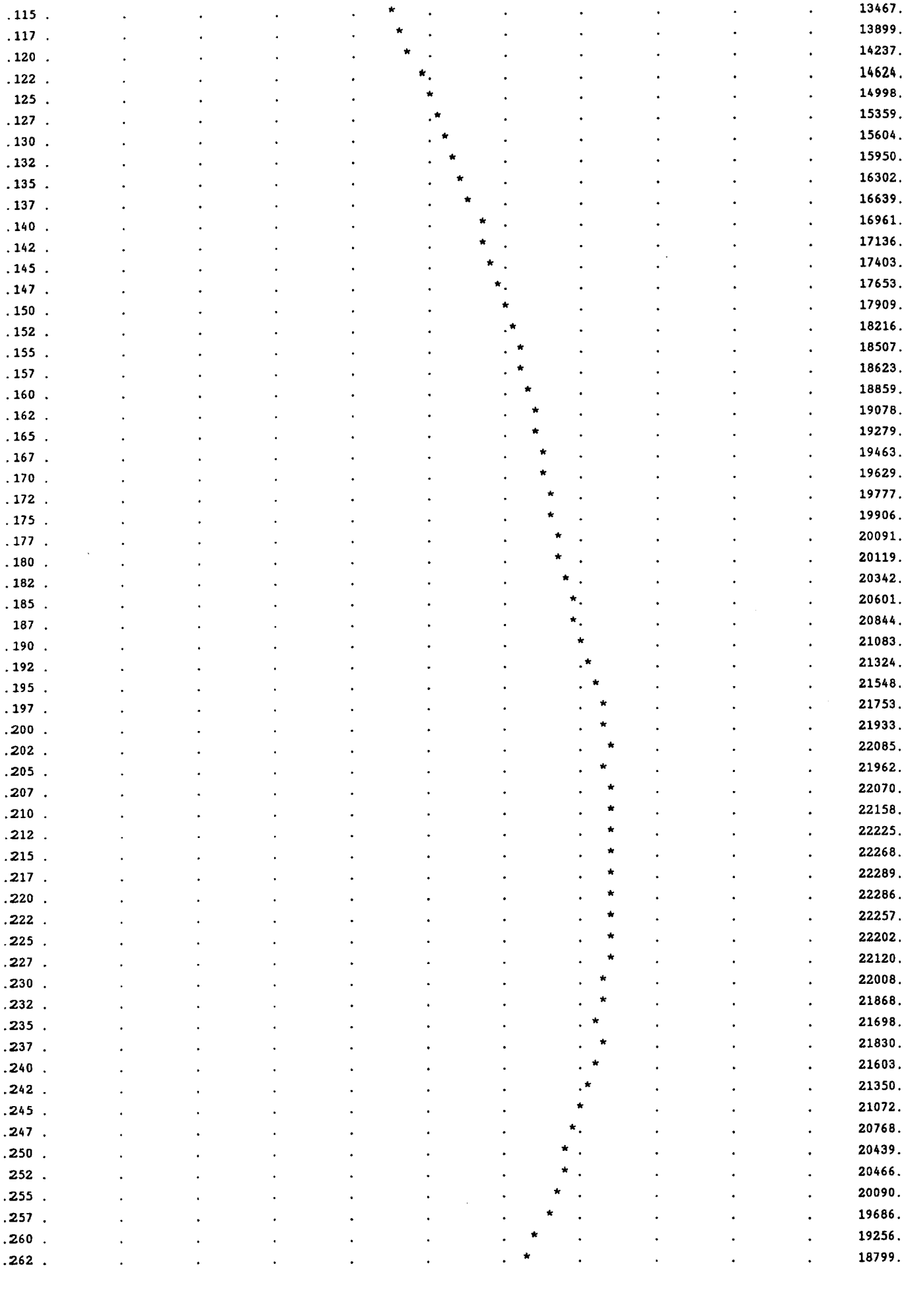
Breach Depth (ft, BRD)	47.6
Breach Bottom Elevation (ft MSL, HC)	1884.8
Breach Side Slope Relative to Vertical (degrees, AGL)	38.75
Reservoir Water Surface Elevation (ft MSL, HY)	1892.8

PROJECT TITLE : Fountain Hills Dambreak Analysis

PROJECT NUMBER : #83 12/28/1995

OUTPUT HYDROGRAPH PLOT :

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.137 16639.
.140 16961.
.142 17136.
.145 17403.
.147 17653.
.150 17909.
.152 18216.
.155 18507.
.157 18623.
.160 18859.
.162 19078.
.165 19279.
.167 19463.
.170 19629.
.172 19777.
.175 19906.
.177 20091.
.180 20119.
.182 20342.
.185 20601.
187 20844.
.190 21083.
.192 21324.
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.197 21753.
.200 21933.
.202 22085.
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.207 22070.
.210 22158.
.212 22225.
.215 22268.
.217 22289.
.220 22286.
.222 22257.
.225 22202.
.227 22120.
.230 22008.
.232 21868.
.235 21698.
.237 21830.
.240 21603.
.242 21350.
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.247 20768.
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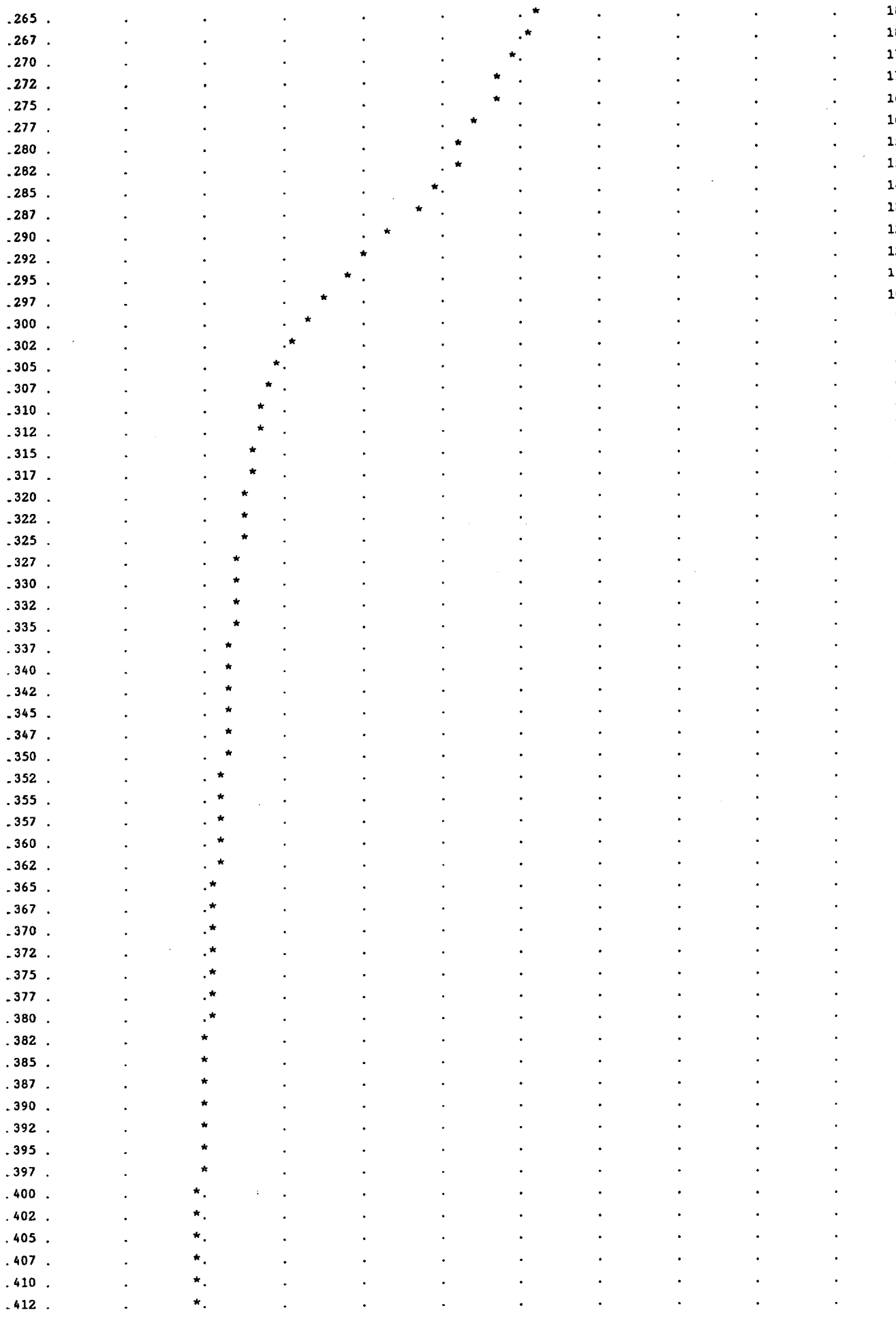
.260 19256.
.262 18799.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.292 12104.
.295 11280.
.297 10534.
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.302 9303.
.305 8849.
.307 8494.
.310 8215.
.312 7993.
.315 7816.
.317 7671.
.320 7551.
.322 7449.
.325 7360.
.327 7282.
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.400 5845.
.402 5803.
.405 5760.
.407 5718.
.410 5676.
.412 5634.

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.417	*	5549.
.420	*	5507.
.422	*	5465.
425	*	5423.
.427	*	5381.
.430	*	5339.
.432	*	5296.
.435	*	5254.
.437	*	5212.
.440	*	5170.
.442	*	5128.
.445	*	5086.
.447	*	5044.
.450	*	5002.
.452	*	4959.
.455	*	4917.
.457	*	4875.
.460	*	4833.
.462	*	4791.
.465	*	4749.
.467	*	4707.
.470	*	4665.
.472	*	4622.
.475	*	4580.
.477	*	4538.
.480	*	4496.
.482	*	4454.
.485	*	4421.
487	*	4406.
.490	*	4388.
.492	*	4366.
.495	*	4342.
.497	*	4315.
.500	*	4285.
.502	*	4254.
.505	*	4221.
.507	*	4186.
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.532	*	3816.
.535	*	3788.
.537	*	3762.
.540	*	3738.
.542	*	3715.
.545	*	3694.
.547	*	3674.
.550	*	3656.
552	*	3638.
.555	*	3621.
.557	*	3604.
.560	*	3588.
.562	*	3573.

.565	. *	3558.
.567	. *	3543.
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575	. *	3501.
.577	. *	3488.
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.582	. *	3461.
.585	.*	3448.
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.595	.*	3396.
.597	.*	3383.
.600	.*	3370.
.602	.*	3357.
.605	.*	3344.
.607	.*	3332.
.610	.*	3319.
.612	.*	3306.
.615	.*	3294.
.617	.*	3281.
.620	.*	3269.
.622	.*	3256.
.625	.*	3243.
.627	.*	3231.
.630	.*	3218.
.632	.*	3206.
.635	.*	3193.
.637	.*	3181.
640	.*	3168.
.642	.*	3154.
.645	*	3138.
.647	*	3123.
.650	*	3108.
.652	*	3094.
.655	*	3080.
.657	*	3066.
.660	*	3053.
.662	*	3040.
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.667	*	3014.
.670	*	3001.
.672	*	2988.
.675	*	2975.
.677	*	2963.
.680	*	2950.
.682	*	2938.
.685	*	2925.
.687	*	2913.
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.692	*	2888.
.695	*	2876.
.697	*	2863.
.700	*	2851.
702	*.	2839.
.705	*.	2826.
.707	*.	2814.
.710	*.	2802.
.712	*.	2789.

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.722	*.	2740.
725	*.	2728.
.727	*.	2715.
.730	*.	2703.
.732	*.	2691.
.735	*.	2679.
.737	*.	2666.
.740	*.	2654.
.742	*.	2642.
.745	*.	2629.
.747	*.	2617.
.750	*.	2605.
.752	*.	2593.
.755	*.	2580.
.757	*.	2568.
.760	*.	2556.
.762	* .	2543.
.765	* .	2531.
.767	* .	2519.
.770	* .	2507.
.772	* .	2494.
.775	* .	2482.
.777	* .	2470.
.780	* .	2458.
.782	* .	2445.
.785	* .	2433.
.787	* .	2421.
790	* .	2408.
.792	* .	2396.
.795	* .	2384.
.797	* .	2372.
.800	* .	2359.
.802	* .	2347.
.805	* .	2335.
.807	* .	2322.
.810	* .	2310.
.812	* .	2298.
.815	* .	2286.
.817	* .	2273.
.820	* .	2261.
.822	* .	2249.
.825	* .	2236.
.827	* .	2224.

END OF OUTPUT

APPENDIX O

Breach Program output for Hesperus Wash Dam

B O S S B R E A C H (tm)

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Version : 1.10
Serial Number : 2111

PROGRAM ORIGIN :

Boss Breach (tm) is an enhanced version of Professor D. L. Fread's July 1988 NWS BREACH program.

DISCLAIMER :

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

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PROJECT DESCRIPTION :

PROJECT TITLE : Fountain Hills Dambreak Analysis
PROJECT NUMBER : #83
DESCRIPTION : Breaching Analysis of Hesperus Dam (36)
ENGINEER : CCC
DATE OF RUN : 12/28/1995
TIME OF RUN : 4:24 pm

INPUT DATA :

INFLOW HYDROGRAPH DESCRIPTION :

Time Elapsed TIN(I) (hr)	Upstream Inflow QIN(I) (cfs)
.00	8451.6
.13	9902.0
.29	8934.0
.46	7041.0
.96	4476.0
1.46	2475.0
1.96	1563.0
2.30	1010.5

RESERVOIR VOLUME DESCRIPTION :

Elevation HSA(I) (ft MSL)	Surface Area RSA(I) (acres)
1896.00	31.3
1894.00	28.8
1892.00	25.6
1890.00	23.4
1888.00	19.9
1876.00	10.3
1862.00	1.4
1852.00	.0

TAILWATER CROSS-SECTION DESCRIPTION :

Elevation HSTW(I) (ft MSL)	Tailwater Top Width BSTW(I) (ft)	Tailwater Manning n CMTW(I)
1848.40	.0	.0730
1850.40	41.5	.0730
1852.40	53.9	.0730
1854.40	64.6	.0730
1856.40	100.3	.0730
1858.00	187.5	.0730
1861.00	420.2	.0730
1864.00	485.0	.0730

PROJECT TITLE : Fountain Hills Dambreak Analysis

PROJECT NUMBER : #83 12/28/1995

RESERVOIR AND PIPING BREACH DESCRIPTION :

Initial Reservoir Water Surface Elevation (ft MSL, HI)	1893.30
Dam Bottom Elevation (ft MSL, HL)	1852.00
Dam Top Elevation (ft MSL, HU)	1894.20
Spillway Crest Elevation (ft MSL, HSP)	1889.00
Dam Crest Length (ft, CRL)	1060.00
Dam Crest Width (ft, WC)	12.00
Ratio of Breach Width to Flow Depth (BR)	1.000
Initial Piping Failure Width (ft, H)	.10
Initial Piping Failure Elevation (ft MSL, HPI)	1852.00

DAM INNER CORE DESCRIPTION :

D50 Grain Size (mm, D50C)		.050
Ratio of D90 to D30 Grain Sizes (UNFCC)		23.300
Porosity Ratio (PORC)		.330
Unit Weight (lb/cu ft, UWC)		115.00
Manning n of Core Material (CNC)		1.0000
Internal Friction Angle (degrees, AFRC)		35.00
Cohesive Strength (lb/sq ft, COHC)		200.00
Average Upstream & Downstream Inner Core Slope (ZC)	1 :	.50

DAM OUTER CORE DESCRIPTION :

D50 Grain Size (mm, D50S)	8.400
Ratio of D90 to D30 Grain Sizes (UNFCS)	21.120
Porosity Ratio (PORS)	.250
Unit Weight (lb/cu ft, UWS)	130.00
Manning n of Core Material (CNS)	1.0000
Internal Friction Angle (degrees, AFRS)	40.00
Cohesive Strength (lb/sq ft, COHS)	.00
Average Clay Plasticity Index (PI)	.00
CA Clay Critical Shear Stress Coefficient (CA)	.000
CB Clay Critical Shear Stress Coefficient (CB)	.000

DAM FACE DESCRIPTION :

Upstream Face Slope (ZU)	1 (vertical) :	2.00
Downstream Face Slope (ZD)	1 (vertical) :	2.00
Downstream Face D50 Grain Size (mm, D50DF)		8.400
Downstream Face D90 to D30 Grain Size Ratio (UNFCDF)		21.120
Average Grass Length (inches, GL)		.00
Grass Condition Factor (1=good, 0=none, GS)		.00
Maximum Grass-Lined Channel Velocity (ft/sec, VMP)		.00

BOUNDARY CONDITIONS :

Simulation Duration (hr, TEH)	2.30
Basic Time-Step Size (hr, DTH)	.001
Iteration Error Tolerance (%, ERR)	.01
Downstream River Bottom Slope (ft/mi, SM)	120.000
Maximum Allowable Breach Bottom Width (ft, BMX)	400.000
Discharge Plot Time-Step Interval (FPT)	10.00
Time-step at which Plotting Starts (TPR)	.00

INPUT DATA :

SPILLWAY RATING CURVE :

Head SPH(I) (ft)	Spillway Flow SPQ(I) (cfs)
.00	.0
1.00	330.0
1.50	745.0
2.50	1977.0
3.50	3619.0
5.00	6723.0
6.00	9921.0
7.00	16583.0

INTERNAL COMPUTATION CHECKS :

Avg. inner & outer matl. internal friction angle (rad, AFRA)	37.50
Equation 21 Theta1' (radians, TH1)	65.00
Equation 13 Critical Depth H1' (ft, H1)	.07
Equation 21 Theta2' (radians, TH2)	51.25
Equation 13 Critical Depth H2' (ft, H2)	20.88
Equation 21 Theta3' (radians, TH3)	43.13
Equation 13 Critical Depth H3' (ft, H3)	111.24

SUMMARY OF OUTPUT RESULTS :

GENERAL RESULTS :

Total Number of Iterations	0
Time of Breach Failure (hr, TFHI)	.24
Total Time-Steps Used (I)	3999
Total Elapsed Time (hr, T)	1.000
Outflow Hydrograph Rising Limb Duration (hr, TRS)	.285
Time at which Significant Rise in Outflow Begins (hr, TB)	.000
Dam Top Elevation (ft MSL, HU)	1894.20
Outflow at Time Zero (cfs, QO)	.0
Simplified Time of Breach Failure (hr, TFH)	-.209

TFH - Time of failure (hr) which is a linear equivalent of the outflow hydrograph rising limb duration (TRS) obtained by using the simplified dam-break discharge equation.

TFHI - Time of failure (hr) which is a linear equivalent of the outflow hydrograph rising limb duration (TRS) obtained by integrating breach outflow (QB) versus time from T=0 to T=Peak Outflow (TP).

OUTPUT RESULTS AT TIME OF PEAK OUTFLOW :

Elapsed Time (hr, TP)	.286
Spillway Outflow (cfs)	0.
Breach Outflow (cfs, QBP)	30151.
Total Outflow (cfs, QP)	30151.
Breach Top Width (ft, BRW)	30.0
Breach Bottom Width (ft, BO)	30.0
Breach Side Slope Relative to Vertical (degrees, Z)	.00

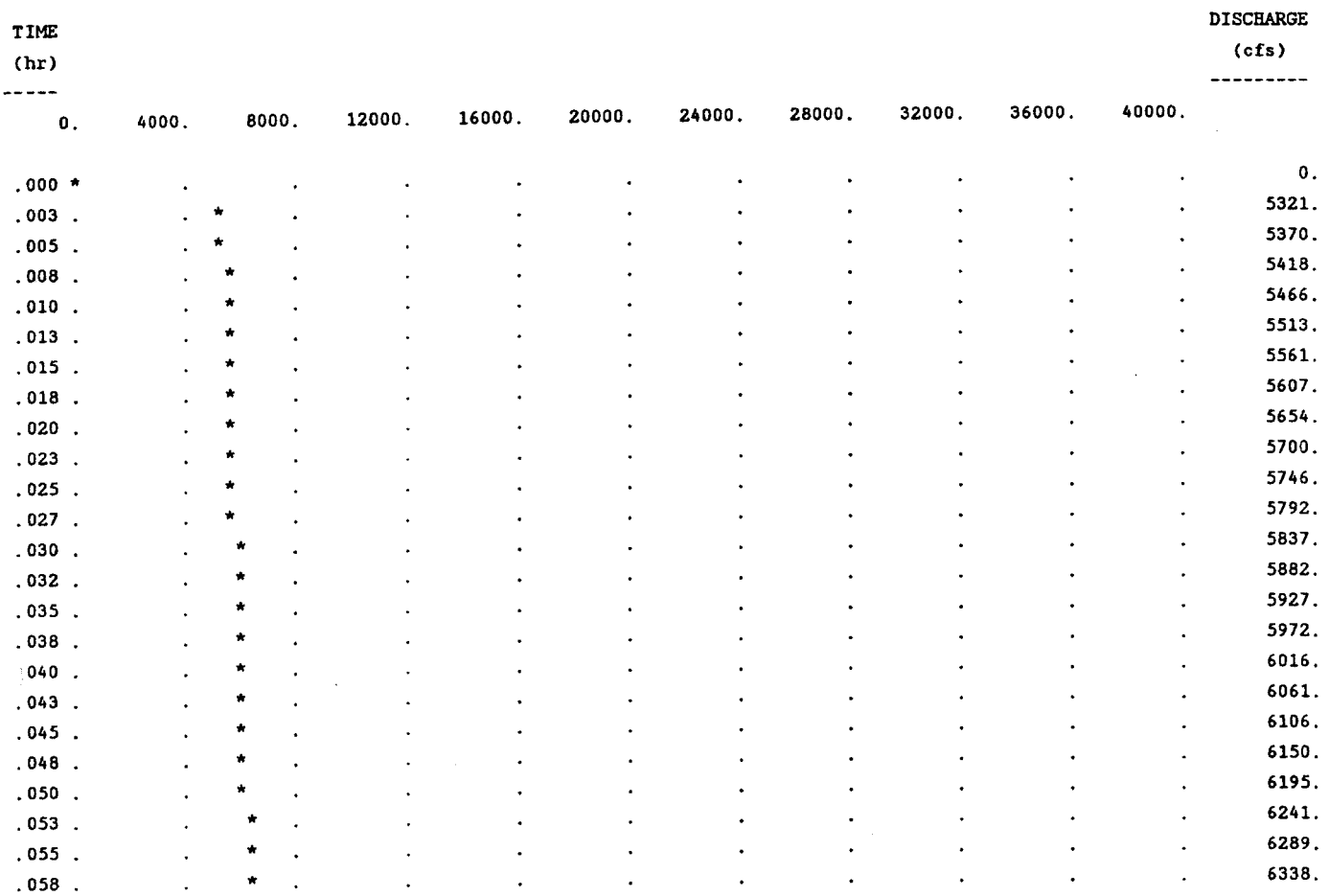
OUTPUT RESULTS AT END OF BREACH ANALYSIS :

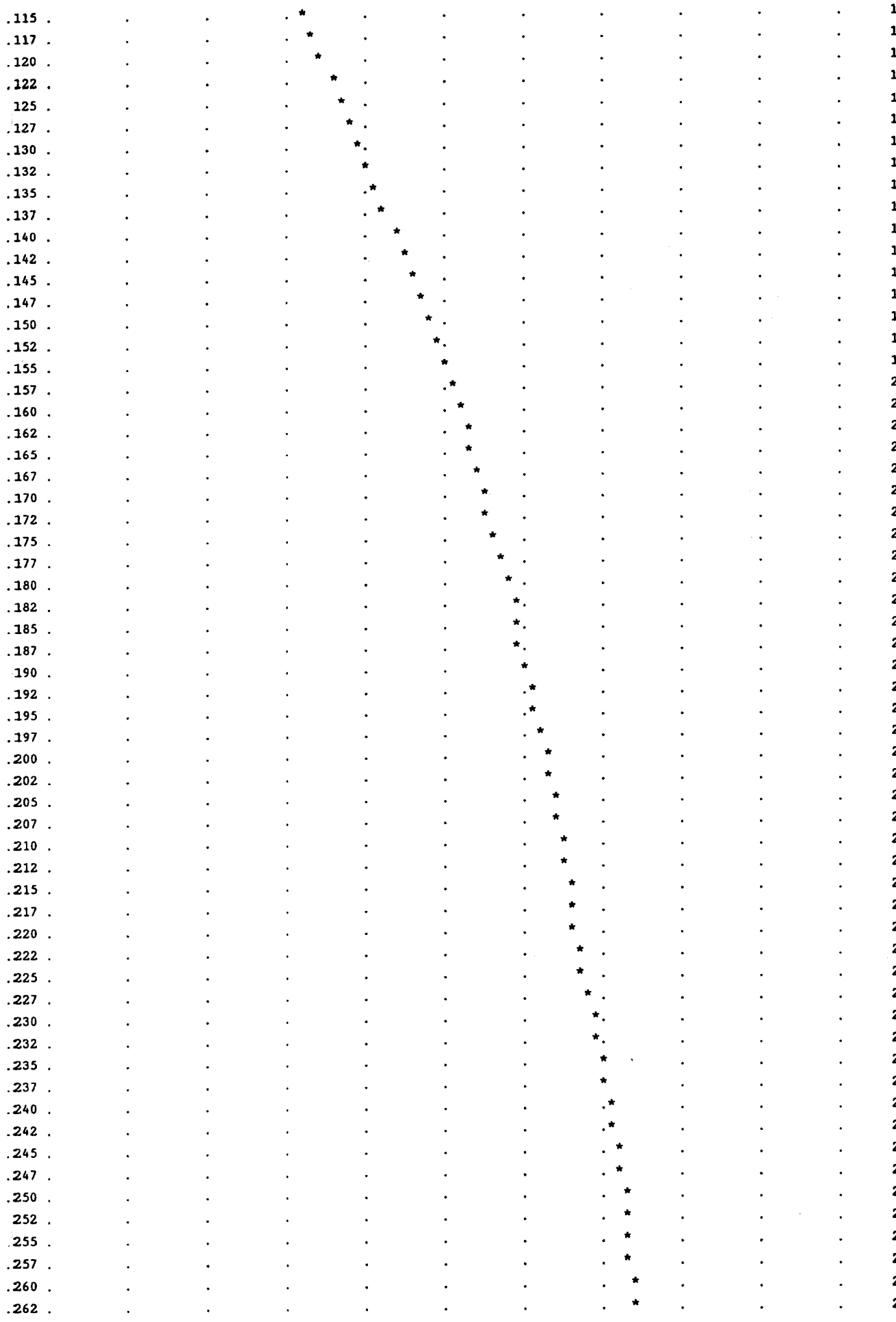
Breach Depth (ft, BRD)	42.2
Breach Bottom Elevation (ft MSL, HC)	1852.0
Breach Side Slope Relative to Vertical (degrees, AGL)	38.75
Reservoir Water Surface Elevation (ft MSL, HY)	1862.4

PROJECT TITLE : Fountain Hills Dambreak Analysis

PROJECT NUMBER : #83 12/28/1995

OUTPUT HYDROGRAPH PLOT :

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.127 15157.
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.137 16996.
.140 17453.
.142 17905.
.145 18351.
.147 18678.
.150 19087.
.152 19489.
.155 19883.
.157 20269.
.160 20646.
.162 21014.
.165 21216.
.167 21541.
.170 21857.
.172 22162.
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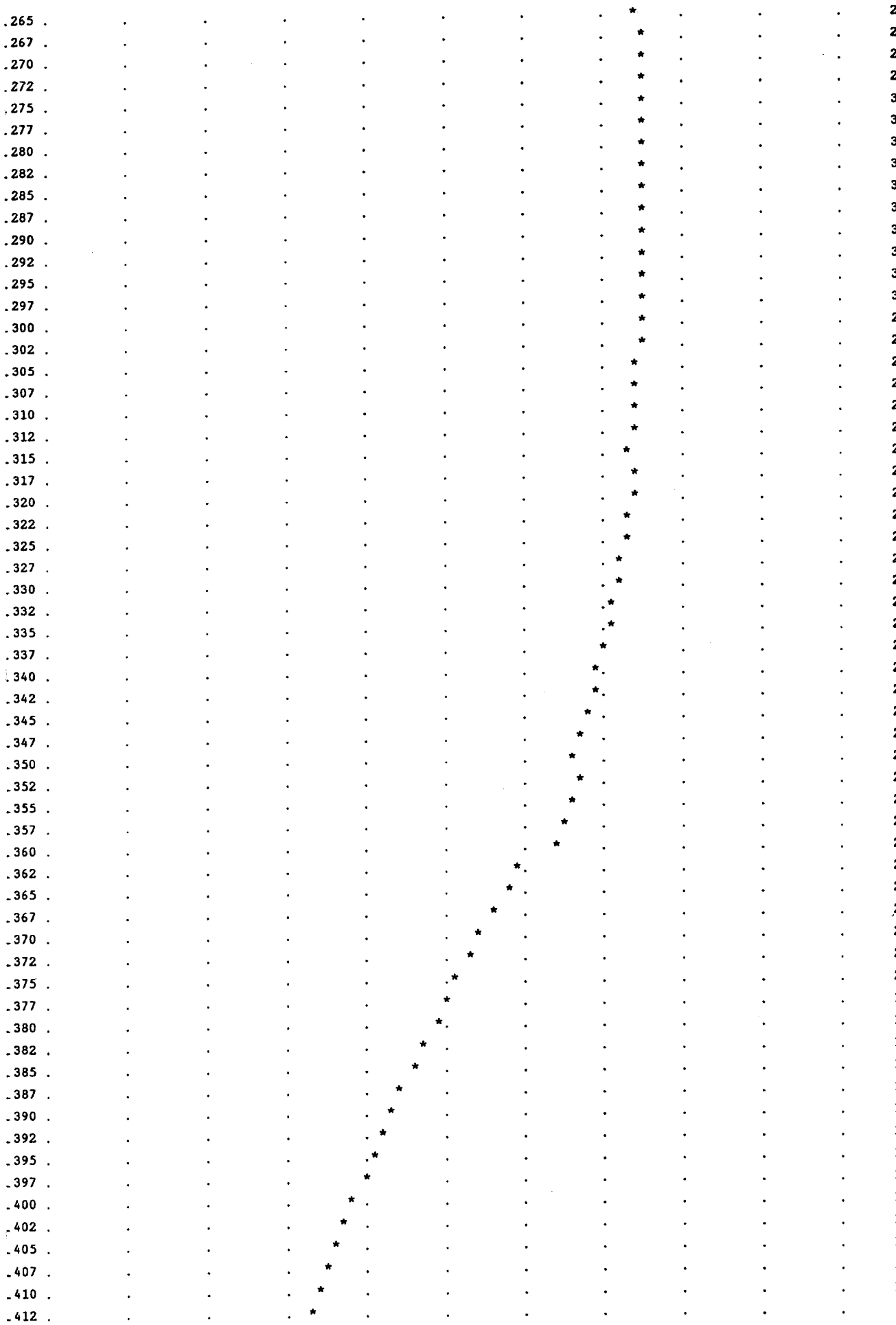
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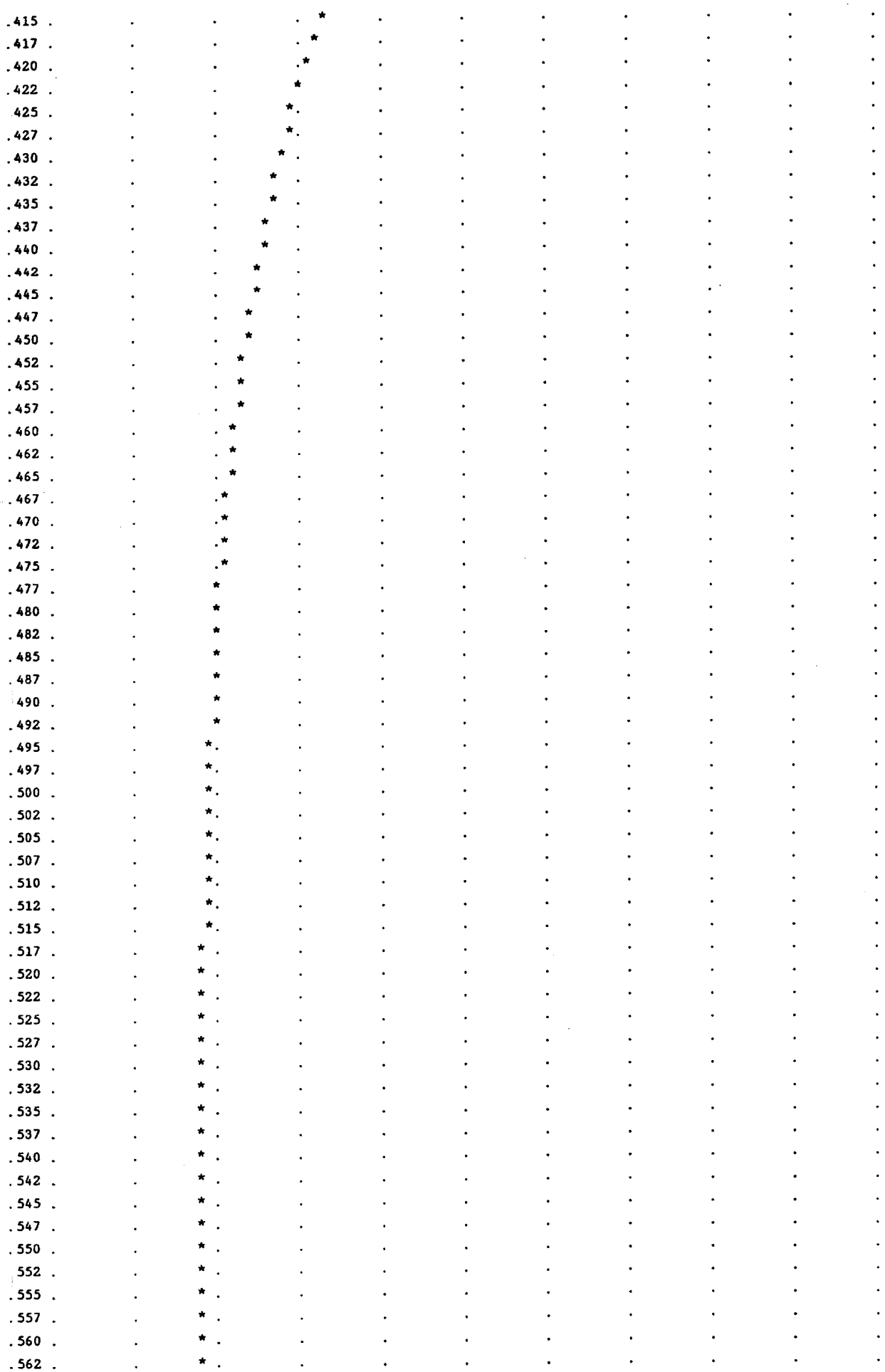
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.572	*	7056.
575	*	7040.
.577	*	7025.
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.585	*	6978.
.587	*	6963.
.590	*	6947.
.592	*	6932.
.595	*	6916.
.597	*	6901.
.600	*	6885.
.602	*	6869.
.605	*	6854.
.607	*	6838.
.610	*	6823.
.612	*	6807.
.615	*	6792.
.617	*	6776.
.620	*	6761.
.622	*	6745.
.625	*	6729.
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.632	*	6683.
.635	*	6667.
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.642	*	6621.
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.682	*	6372.
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.690	*	6326.
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.695	*	6295.
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.700	*	6264.
702	*	6249.
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.782	*	5759.
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.787	*	5729.
.790	*	5714.
.792	*	5699.
.795	*	5684.
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.845	*	5382.
.847	*	5367.
.850	*	5352.
852	*	5336.
.855	*	5321.
.857	*	5306.
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.862	*	5275.

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.875	*	5199.
.877	*	5183.
.880	*	5168.
.882	*	5154.
.885	*	5139.
.887	*	5125.
.890	*	5110.
.892	*	5096.
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.897	*	5067.
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.920	*	4935.
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.925	*	4906.
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.992	*	4510.
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1.000	*	4470.

END OF OUTPUT

APPENDIX P

HEC-1 output for Golden Eagle Park Dam

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  12/27/95  TIME  16:54:30  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    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        FOUNTAIN HILLS DAM BREAK ANALYSIS
  2           ID        Model for the Computation of PMF for Dam 4      FILE NAME: DAM4-PM.IH1
  3           ID
  4           ID        ****************************************************************
  5           ID        Analytical Considerations:
  6           ID        (a) Principal Spillway is clogged.
  7           ID        (b) Initial Condition is the higher between 100-year flood and
  8           ID            Spillway crest elevation.
  9           ID        (c) The outflow hydrograph from Dam 11 is the hydrograph associated
 10           ID            with its breaching.
 11           ID        (d) The inflow hydrographs defined here are all 1/2 PMF obtained
 12           ID            from generated 5-minute PMF
 13           ID  ***********************************************************************
              *DIAGRAM
 14           IT       5       0       0     120
 15           IO       5
 16           IN       5
              *

 17           KK   C536I
 18           KM        DAM INFLOWS FROM PMF ANALYSIS (DAM36-PM.IH1)
 19           KM        Inflows to Dam 36 (Hesperus Dam)
 20           KO       1
 21           BA    2.91
 22           QI       0     0.5     1.5     2.5     3.0     4.0     5.5     8.0    10.5    13.5
 23           QI    16.0    19.0    22.5    28.5    37.5    50.0      66    81.5      98   117.0
 24           QI   139.5     163     187   213.5     239   445.5     929    1590    2261    2992
 25           QI  4475.5  6739.5  8794.5  9897.5  9960.0  9392.5  8537.0    7634  6771.5  6027.5
 26           QI    5360  4802.5    4304    3867    3492    3150  2860.5  2630.5    2420    2232
 27           QI  2065.5    1928  1800.5    1680  1558.5    1433  1317.5    1204    1097   998.5
 28           QI     899   813.5     742   680.5   622.5   570.5     522     475   431.5   391.5
 29           QI     354     319     287   258.5   231.5   207.5   187.5   170.5     155     142
 30           QI   129.5   117.5   105.5    94.5      85      76      68      62      57      52
 31           QI    47.5    43.5    39.5      36      33      30    27.5      25      23      21
 32           QI      19    17.5    16.5    15.0      14    12.5    11.5    10.5      10       9
 33           QI     8.5     7.5       7     6.5       6     5.5       5       5     4.5     4.5
 34           QI       4       4     3.5     3.5       3       3     2.5     2.5     2.5       2
 35           QI       2       2       2     1.5     1.5     1.5     1.5       1       1       1
 36           QI       1       1       1       1     0.5     0.5     0.5     0.5     0.5     0.5
 37           QI     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.5     0.0
              *

 38           KK   C536O
 39           KM      Reservoir route at C536 (Dam 36).
 40           KO       1
 41           RS       1    ELEV  1889.0
 42           SV    0.00    3.96   35.94   87.09  132.22  186.43  254.82  276.00  298.02  322.00
 43           SV  346.95  374.00  401.26  431.00  461.36  494.00  525.67  559.13  593.55  629.19
 44           SE  1852.1  1862.0  1870.0  1876.0  1880.0  1884.0  1888.0  1889.0  1890.0  1891.0
 45           SE  1892.0  1893.0  1894.0  1895.0  1896.0  1897.0  1898.0  1899.0  1900.0  1901.0
 46           SQ       0       0       0       0       0       0       0       0     330    1303
 47           SQ    2752    4573    6723    9921   16583   25417   35910   47818   60990   75321
 48           SE  1852.1  1862.0  1870.0  1876.0  1880.0  1884.0  1888.0  1889.0  1890.0  1891.0
 49           SE  1892.0  1893.0  1894.0  1895.0  1896.0  1897.0  1898.0  1899.0  1900.0  1901.0
              *
```

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

 50           KK   C584I
 51           KM        DAM INFLOWS FROM PMF ANALYSIS (DAM7-PM.IH1)
 52           KM        Inflows for Dam 7 (Sunridge Canyon Dam)
 53           KO       1
 54           BA    1.59
 55           QI       0       1       3       5       8      13      21      30    37.5      44
 56           QI      50      55      59      71      90     109     142   176.5   208.5   236.5
 57           QI     262     281     293     301     306     962    2859  6018.5  9254.5 10015.5
 58           QI    8794    7081  5515.5    4290    3368  2710.5  2252.5  1910.5    1631    1403
 59           QI    1216    1069   966.5     889   835.5   800.5   779.5   760.3   748.5   719.5
 60           QI     664     595     516     440     382   336.5   301.5     274   253.5   239.5
 61           QI   230.5     219     203     186     168     149   131.5   116.5   104.5      96
 62           QI      90    85.5    82.5    77.5    70.5    64.5      58      51    43.5      37
 63           QI    30.5      25      20      16    12.5    10.5       9     7.5     6.5     5.5
 64           QI     4.5       4       3     2.5       2     1.5     1.5       1       1     0.5
 65           QI     0.5     0.5     0.5     0.5

 66           KK   C584O
 67           KM      Reservoir route at C584 (Dam 7).
 68           KO       1
 69           RS       1    ELEV 1926.31
 70           SV    0.00    0.60    4.30   11.27   23.74   46.29   86.65   96.00  104.90  126.25
 71           SV  151.07  165.00  179.50  195.00  211.23  229.00  246.62  266.00  285.59  306.14
 72           SE  1884.8 1894.00 1900.00 1906.00 1912.00 1918.00 1924.00 1925.00 1926.00 1928.00
 73           SE  1930.0 1931.00 1932.00 1933.00 1934.00 1935.00 1936.00 1937.00 1938.00 1939.00
 74           SQ       0       0       0       0       0       0       0       4     328    2553
 75           SQ    6277    8638   11325   14517   19390   25613   32928   41229   50456   60573
 76           SE  1884.8 1894.00 1900.00 1906.00 1912.00 1918.00 1924.00 1925.00 1926.00 1928.00
 77           SE  1930.0 1931.00 1932.00 1933.00 1934.00 1935.00 1936.00 1937.00 1938.00 1939.00
              *

 78           KK  584598
 79           KM      Normal depth channel route from C584 to C598
 80           KM      Source:  Cross Section Data is the weighted average of 2 channel sections
 81           KM               used in FU100-6.IH1.
 82           RS       1    FLOW      -1
 83           RC   0.065   0.050   0.065  6526.0 0.02571
 84           RX  9927.6  9939.8  9951.9  9985.3 10036.0 10067.5 10119.2 10188.7
 85           RY  1796.3  1791.2  1788.3  1784.1  1784.9  1988.0  1790.2  1796.4
              *

 86           KK   C578O
 87           KM        Breach Outflow Hydrograph from Dam 11 (North Heights Dam)
 88           KO       1
 89           BA    2.02
 90           QI     781     493     408     353     306     267     235     210     189     172
 91           QI     159     148     140     134     131     133     140     153     170     190
 92           QI     212     234     254     274     292     415    1175    3086  6860.3 21573.8
 93           QI   29206 13111.4  7068.4  6196.2  5139.0  4067.1  3127.9    2412    2076    1801
 94           QI    1569    1410    1275    1172    1092    1029     983     951     922     887
 95           QI     841     779     707     631     560     499     460     444     429     414
 96           QI     399     384     369     352     334     314     294     275     257     241
 97           QI     226     212     199     187     175     163     150     138     126     115
 98           QI     104      94      84      75      68      60      54      48      43      38
```

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

 99           QI      34      30      27      23      21      18      16      14      12      11
100           QI      10       8       7       6       6       5       4       4       3       3
101           QI       3       2       2       2       2       1       1       1       1       1
102           QI       1       1       1       1       1       1       1       1       1       1
103           QI       1       1       1       1       1       1       1       1       1       1
              *

104           KK  578596
105           KM      Normal depth channel route from C578O TO C596
106           KM      Source:  Cross Section Data is the weighted average of three (3) channel
107           KM               sections used in FU100-6.IH1.
108           RS       1    FLOW      -1
109           RC   0.055   0.045   0.055  3762.0 0.01624
110           RX  9928.9  9945.0  9963.1  9990.6 10012.2 10035.4 10052.8 10069.6
111           RY  1755.7  1746.3  1746.1  1741.7  1743.3  1743.7  1744.6  1755.7
              *

112           KK   C560I
113           KM        DAM INFLOWS FROM PMF ANALYSIS (DAM6-PM.IH1)
114           KM        Inflows for Dam 6 (Aspen Dam)
115           KO       1
116           BA    2.16
117           QI       0       1     3.5       6     8.5    13.5    19.5      26      32    38.5
118           QI    44.5      51      60      74      92   111.5     130   147.5     166   185.5
119           QI     207   230.5   257.5   284.5   308.5   824.5  2182.5  4084.5  5804.5    7101
120           QI  7801.5  7998.5    7713    7044    6195  5365.5    4650    4053    3522    3098
121           QI  2743.5  2444.5  2195.5    1979  1812.5    1676    1562  1467.5  1395.5  1315.5
122           QI    1213    1107    1005   906.5   811.5     728   663.5     597   534.5     479
123           QI     433   391.5     351     316   286.5   264.5     244   222.5     204   188.5
124           QI     174   161.5   149.5   137.5     124     111     100      90    81.5    73.5
125           QI    66.5      60    54.5      49    43.5      39      36    32.5      29    25.5
126           QI    22.5    19.5    16.5    14.5    12.5      11     9.5     8.5     7.5     6.5
127           QI     5.5       5     4.5     3.5       3     2.5     2.5       2     1.5     1.5
128           QI       1       1       1     0.5     0.5     0.5     0.5     0.5
              *

129           KK   C560O
130           KM      Reservoir route at C560 (Dam 6).
131           KO       1
132           RS       1    ELEV 1835.36
133           SV    0.00    7.09   34.65   75.98  135.64  191.44  208.31  226.53  246.00  266.28
134           SV  289.00  310.81  336.00  360.88  389.00  416.30  446.00  476.39  509.00  540.78
135           SE  1808.8 1814.00 1820.00 1826.00 1832.00 1836.00 1837.00 1838.00 1839.00 1840.00
136           SE  1841.0 1842.00 1843.00 1844.00 1845.00 1846.00 1847.00 1848.00 1849.00 1850.00
137           SQ       0       0       0       0       0     122     926    2241    3942    5983
138           SQ    8342   11004   13952   18097   24860   33293   43118   54205   66475   79878
              *

139           KK  560585
140           KM      Normal depth channel route from C560 to C585
141           KM      Source:  HEC-2 Cross Section: AS4.311
142           RS       1    FLOW      -1
143           RC   0.050   0.025   0.050  3127.0  0.0272
144           RX  9850.4  9950.4  9974.4 10000.0 10035.5 10059.8 10080.4 10104.4
145           RY  1772.0  1771.7  1765.3  1765.3  1765.9  1768.5  1773.3  1773.7
```

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

 146          KK   C599
 147          KM       BASIN INFLOWS ABOVE DAM NO. 4 (DAM4-PM.IH1)
 148          KM       Basin Inflows for Dam 4 (Golden Eagle Park Dam)
 149          KO      1
 150          BA   1.38
 151          QI      0       2     6.5    11.5      23    37.5      52    66.5    81.5    92.5
 152          QI   99.5     104   106.5   123.5   155.5   186.5     215     239     252   268.5
 153          QI    276     281   283.5   285.5   286.5    1604    4540  8671.5 10442.5    8846
 154          QI 6643.5    4812    3478    2598  2004.5    1606  1381.5    1220  1091.5     996
 155          QI    913     823     775   736.5   702.5   674.5   656.5     648   644.5   598.5
 156          QI    506     417   344.5     289   244.5     212   187.5     172   163.5   159.5
 157          QI  157.5   148.5     133     118     105      94      85      79    74.5      72
 158          QI     70    69.5    69.5    63.5    53.5      44    35.5    27.5      22      17
 159          QI     13      10     7.5     5.5       4       3       2     1.5     1.5       1
 160          QI      1     0.5     0.5     0.5
              *

 161          KK   C599I
 162          KM     Hydrograph combine C5840 + C5600 + C5780 + C599
 163          KO      1
 164          HC      4
 165          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

  17       C536I
               V
               V
  38       C536O
               .
               .
  50           .       C584I
               .           V
               .           V
  66           .       C584O
               .           V
               .           V
  78           .      584598
               .           .
               .           .
  86           .           .       C578O
               .           .           V
               .           .           V
 104           .           .      578596
               .           .           .
               .           .           .
 112           .           .           .       C560I
               .           .           .           V
               .           .           .           V
 129           .           .           .       C560O
               .           .           .           V
               .           .           .           V
 139           .           .           .      560585
               .           .           .           .
               .           .           .           .
 146           .           .           .           .        C599
               .           .           .           .           .
               .           .           .           .           .
 161           .       C599I.................................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION