0STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION TITLE PAGE

CLIENT & PROJECT: Private Fuel Storage, LLC – Private Fuel Storage Facility				PAGE 1 OF 22 +Attach. 1 (8 pgs)+Attach. 2 (9 pgs) + Attach. 3 (8 pgs)		
CALCULATION TITLE (Indicative of Objective): **PFSF Flood Analysis with Larger Drainage Basin**				QA CATEGORY ☒ ☒ - I Nuclear Safety Related ☐ - II ☐ - III ☐ - Non-Safety Related ☐ - ☐ - Fossil/Industrial Plant		
CALCULATION IDENTIFICATION NUMBER						
J.O. or W.O. NO.	DIVISION & GROUP	CURRENT CALC NO.	OPTIONAL TASK CODE	OPTIONAL WORK PACKAGE NO.		
0599602		**G(B)-12**		**345P**		
APPROVALS – SIGNATURE & DATE					CONFIRMATION REQUIRED ☒	
PREPARER(S)/DATE(S)	REVIEWER(S)/DATE(S)	INDEPENDENT REVIEWER(S)/ DATES(S)	REV. NO. OR NEW CALC. NO.	SUPERCEDES CALC. NO. OR REV. NO.	YES	NO
V. N. Zeng 02/08/1999 Ver Nan Zeng	George H.C. Liang George H.C. Liang 2/8/99	George H.C. Liang George H.C. Liang 2/8/99	0	N/A	☐	☒
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CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 2

TABLE OF CONTENTS

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 3

1, Objectives

The objective of the calculation is to determine water surface elevation in the floodway crossing the PFSF access road to the east of PFSF site. The 100-year and the PMF flood events are evaluated based on the existing natural ground topography.

2, References

1. Calculation 05996.01-G(B)-02, "**The PMF and the 100-yr Flood Flow at the Access Road Crossing and the PFSF Site**"

2. U.S. Department of Commerce, National Oceanic And Atmospheric Administration, 1977, **"Probable Maximum Precipitation Estimates, Colorado River and Great Basin Drainage"** Hydrometeorological Report No. 49.

3. "**Runoff Estimates for small Rural Watersheds and Development of a Sound Design Method**" 1977, Federal Highway Administration. Report No. FHWA-RD-77-159.

4. "**Nationwide Summary of U.S. Geological Survey Regional Regression Equations for Estimating Magnitude and Frequency of Flood for Ungaged Sites**" 1993. U.S. Geological Survey, Water-Resources Investigation Report 94-4002.

5. U.S.Army Corps of Engineers, Hydrologic Center, "**HEC-RAS, River Analysis System**", 1997.

6. Calculation 05996.01-G(B)-10, Rev 0, "**HEC-RAS Micro Computer Version 1.2 Software Test**", May 20, 1997.

7. U.S.Army Corps of Engineers, Office of the Chief Engineers, "**HEC-1, Flood Hydrograph Package**", 1981.

8. Calculation 05996.01-G(B)-08, Rev 1, "**HEC-1 Flood Hydrolograph Package, Micro Computer Version 4.0 Software Test, QS 2-7**", May 20, 1997.

9. "**Engineering Hydrology**" by Victor M. Ponce

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER **G(B)-12**	OPTIONAL TASK CODE N/A	PAGE NO. 4

3, Methodology

The estimation of the flood level involves two steps:

(1) Perform hydrological analysis to determine flood flow discharge (Runoff).
(2) Perform hydraulic analysis to calculate water surface elevation.

3.1, PMF

The PMF is defined as the most severe flood that is considered reasonably possible at a site as a result of hydrologic and meteorologic conditions. Two possible types of PMF are possible in the Skull Valley Region where PFSF is located: (1) General Storm PMF which resulted from the convergence precipitation and the orographic precipitation (see note below). (2) Local PMF - While the general storm PMF is a major concern, the summer thunder having the greatest potential rainfall intensity and short durations.may produce a larger PMF. This PMF is termed as local PMF in Reference 2 and in this calculation.

Note:

Convergence precipitation -	Precipitation caused by convective lifting , and therefore cooling of the moist air, assuming not affected by terrain.
Orographic precipitation -	Precipitation caused by lifting of moist horizontal air current over the mountain range or other natural barrier.

The general storm PMF and the local storm PMF are evaluated separately.The larger of the two is used to compute the flood level.

The first step to determine PMF is to define Probable Maximum Precipitation (PMP) from the precipitation information and procedure provided by Reference 2. The PMP is then input to the HEC-1 program (Reference 7) to calculate the runoff hydrograph.

Precipitation losses - In calculating runoff flow using HEC-1 program, the infiltration loss and other precipitation losses must be defined. The Soil Conservation Service (SCS) has developed a Curve Number Procedure for estimating runoff based on field studies of the measured runoff from numerous soil cover combinations. This method was adopted by the HEC-1 program as one of the options to account for the precipitation losses. In this analysis, the Skull Valley soil is assumed to be in the Curve Number 70 hydrologic soil group.

Unit hydrograph - The conversion of the precipitation excess (precipitation - infiltration and other losses) to runoff is accomplished by executing the HEC-1 program using SCS dimensionless unit hydrograph as basis. The "lag time" parameter, which is approximated by 0.6 times Tc (concentration time), is required to convert the dimensionless unit hydrograph to the basin unit hydrograph. The concentration time is estimated using Hathaway Equation (Ref. 9) in Table 1, This equation includes a roughness coefficient to account for different soils.

Tc = 18.31 hours

The second method using Kirpich Equation, which does not consider the soil type, is also calculated in the table for reference.

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 5

Table 1

PFSF, Estimate Concentration Time From South Rim of Basin to Access Road

Kirpich Formula: $Tc=(0.0078 \times L^{0.77}) / S^{0.385}$

Hathaway Formula: $Tc=0.0606 \times (L \times n)^{0.467} / S^{0.234}$, n is the roughness for various types of surface

	From Elev 1 ft	To Elev 2 ft	L mile	L ft	L Km	S	n	Kirpich Tc hour	Hathaway Tc hour	
	6400	5400	3.5	18480	5.6	0.054113	0.5	0.77	1.95	Trees
	5400	5200	1.0	5280	1.6	0.037879	0.2	0.34	0.77	
	5200	5000	2.5	13200	4.0	0.015152	0.5	0.97	2.24	Pasture
	5000	4800	4.9	25872	7.9	0.007730	0.5	2.11	3.59	Pasture
	4800	4600	8.4	44352	13.5	0.004509	0.5	3.94	5.24	Pasture
	4600	4465	6.0	31680	9.7	0.004261	0.5	3.11	4.53	Pasture
Total			**26.3**					**11.24**	**18.31**	

3.2, 100-year Flow

The 100-year flow is estimated using regression equations provided in References 3 and 4.

3.3, Hydraulic Analysis

Flood level profile for the PMF and the 100-year flow are computed using the HEC-RAS program (Reference 5).

3.4, Computer Programs

The two computer programs, HEC-1 for the hydrological analysis and HEC-RAS for the hydraulic calculation, have been test and qualified in Stone & Webster (References 5, 6, 7, and 8).

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER **G(B)-12**	OPTIONAL TASK CODE N/A	PAGE NO. 6

4, Hydrological Analysis

4.1, Drainage Area

As shown in Figure 1, watershed areas that contribute runoff to the floodway which flows south to north through the access road, is primarily comes from the following sources:

- West slope of the Stansbury Mountains, south of Indian Hickman Canyon.
- West slope of the Onaqui Mountains.
- North slope of the Lookout Mountain.
- South tip of the Lower Cedar Mountain Range below White Rock Spring.
- Lowlands in the valley sounded by the above 4.
-

The total drainage area is about **270 square miles.** The distance from PFSF site to the farthest boundary point near Lookout Mountain is about **26 miles**.

Precipitation runoff from the Cedar Mountain slope and the associated discharge fan would not converged to the above mentioned floodway.

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 7

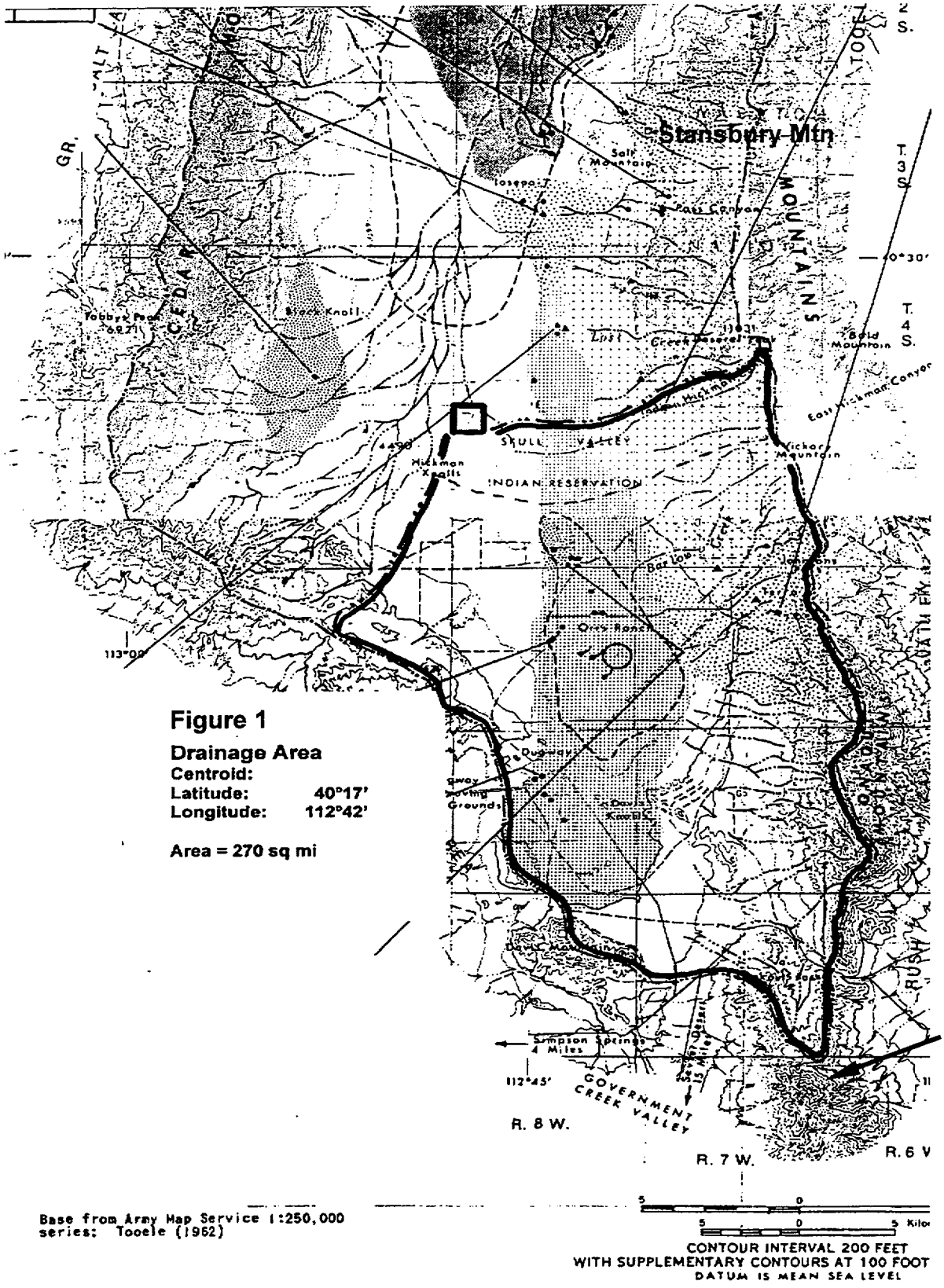


Figure 1

Drainage Area
Centroid:
Latitude: 40°17'
Longitude: 112°42'

Area = 270 sq mi

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 8

4.2, General Storm PMP

Table 1 computes general storm PMP for the 6, 12, 18, 24, 48, and 72 hours in item C. The result is plotted in Figure 2. The values of the 3-hour interval precipitation are read from Figure 2 and listed in Table 2.

Table 2 also calculates the 3-hour incremental PMP. Time distribution of the 18 hour incremental is composed in the 3-1-2-4 sequence in the last column for HEC-1 input.

Table 1, General Storm PMP Computation (Refer all figures and tables to Ref. 2)

General Storm PMP Computation									
Drainage: Floodway at access road		**Latitude: 40°17'**			**Month: August**				
Area (mi^2): 270 mi^2		**Longitude: 112°42'**							
A. Convergence PMP									
1. Drainage average value	Fig 2.5 - 2.16	**10.7**	in						
2. Reduction for barrier elev	Fig 2.18	**55**	%						
3. Rarrier-elev reduced PMP	1 x 2	**5.9**	in						
						Duration (hrs)			
		6	**12**	**18**	**24**	**48**	**72**		
4. Duration variation	Fig 2.25 - 2.27,								
	& Table 2.7	**67**	**85**	**94**	**100**	**116**	**123**	%	
5. Convergence PMP for indicated duration	3 x 4	3.9	5.0	5.5	5.9	6.8	7.2	in	
6. Incremental 10 mi2 PMP	Successive - of 5	3.9	1.1	0.5	0.4	0.9	0.4	in	
7. Area reduction	Fig 2.28 & 2.29	**72**	**89**	**94**	**98**	**100**	**100**	%	
8. Areally reduced PMP	6 x 7	2.8	0.9	0.5	0.3	0.9	0.4	in	
9. Drainage average PMP	Accu 8	2.8	3.8	4.3	4.6	5.6	6.0	in	
B. Orographic PMP									
1. Drainage average orographic index	Fig 3.11a - d	**4**	in						
2. Areal reduction	Fig 3.20	**88.5**	%						
3. Adjustment for month	Fig 3.12 - 3.17	**100**	%						
4. Arealy & seasonally adjustmented PMP	1 x 2 x 3	3.5	in						
						Duration (hrs)			
		6	**12**	**18**	**24**	**48**	**72**		
5. Durational variation	Table 3.9	30	57	80	100	159	187	%	
6. Orographic PMP for given duration	4 x 5	1.1	2.0	2.8	3.5	5.6	6.6	in	
C. Total PMP									
1. A9+B6		**3.9**	**5.8**	**7.1**	**8.2**	**11.2**	**12.6**	in	

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 9

Figure 2, General PMP (3 hr interval)

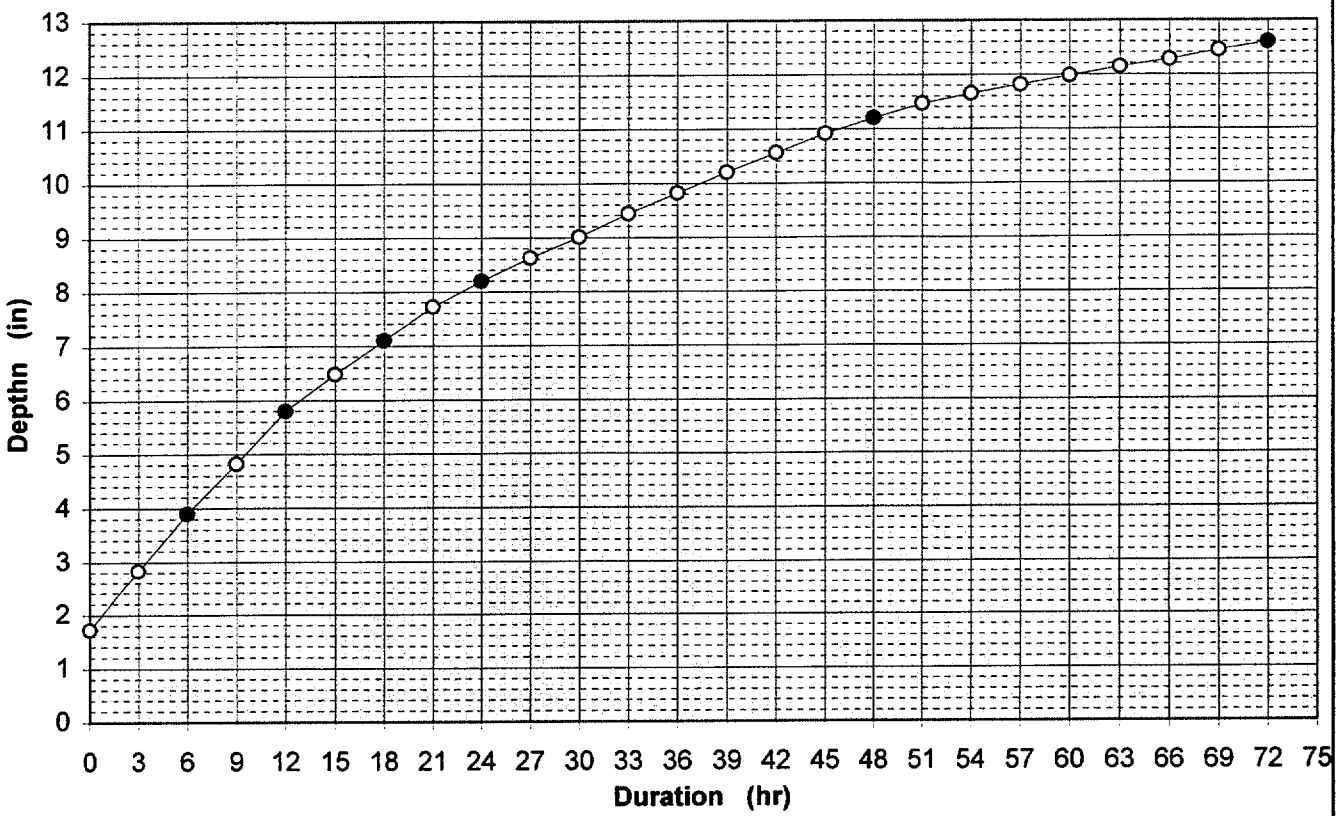


Table 2, Synthetic Rainfall Hyetograph

	Hour	3-hour PMP (in)	PMP Increment		Input to HEC-1 Hyetograph (in)
	0	1.72			
1	3	2.83	2.83	3	0.18
	6	3.90	1.07		0.27
	9	4.82	0.92		0.29
	12	5.80	0.98		0.35
	15	6.48	0.68		0.36
	18	7.10	0.62		0.38
2	21	7.72	0.62	1	0.62
	24	8.20	0.48		0.68
	27	8.63	0.43		0.92
	30	9.01	0.38		0.98
	33	9.44	0.43		1.07
	36	9.82	0.38		2.83
3	39	10.20	0.38	2	0.62
	42	10.56	0.36		0.48
	45	10.91	0.35		0.43
	48	11.20	0.29		0.43
	51	11.47	0.27		0.38
	54	11.65	0.18		0.38
4	57	11.81	0.16	4	0.17
	60	11.98	0.17		0.17
	63	12.14	0.16		0.16
	66	12.28	0.14		0.16
	69	12.45	0.17		0.15
	72	12.60	0.15		0.14

CALCULATION IDENTIFICATION NUMBER			REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 11

4.3, Local Storm PMP

Table 3 computes local storm PMP at ¼, ½, ¾ and 1, 2, 3, 4 ,5 and 6 hours, The resulting precipitation is shown in item 7 of the table and is plotted in Figure 3.

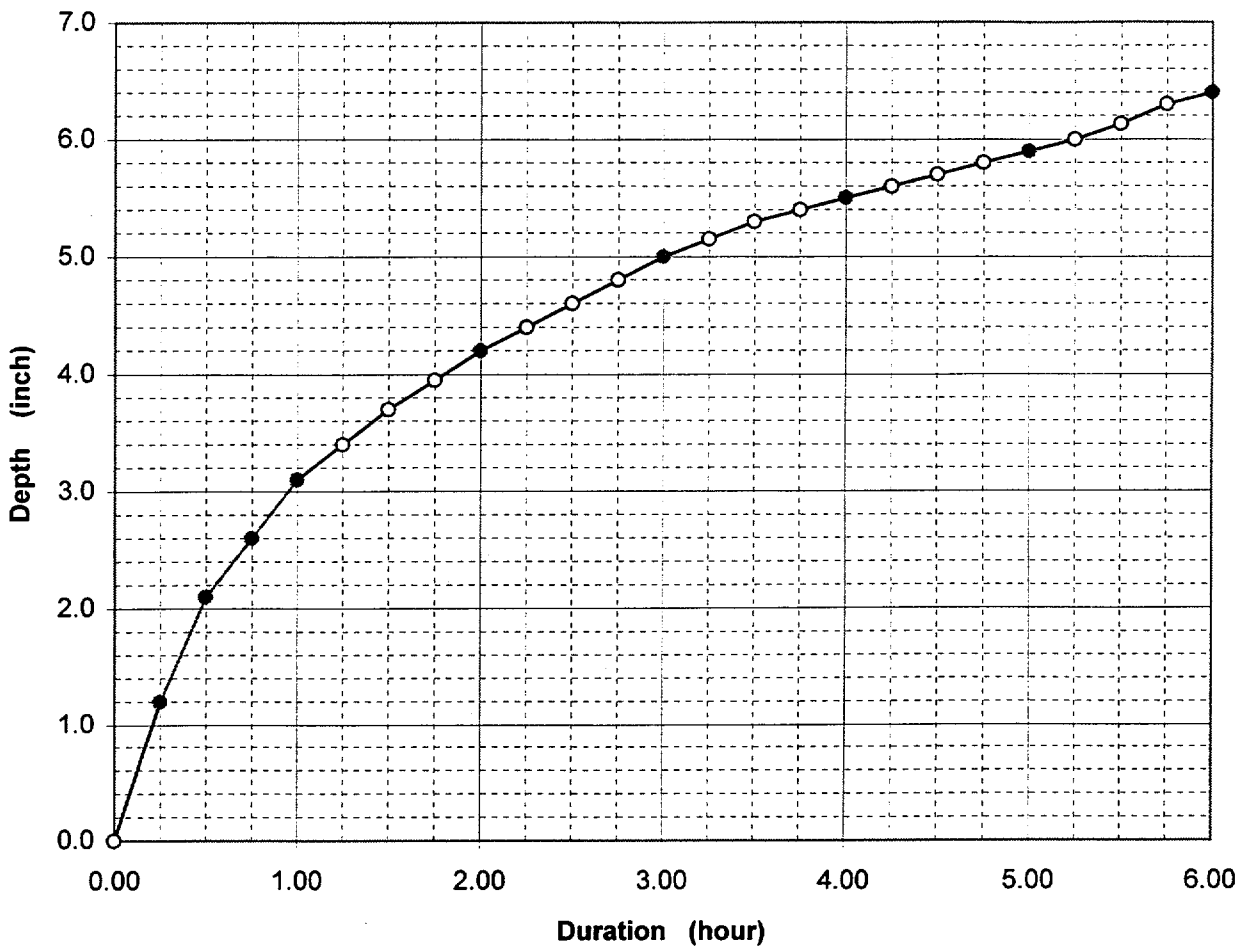
From Figure 3, the 15-min pmp is interpolated and the corresponding incremental are calculated in Table 4. The incremental precipitation is rearranged in 5-3-1-2-4-6.sequence to form time distribution precipitation for HEC-1 input.

Table 3, Local Storm PMP Computation (Refer all figures and tables to Ref. 2)

Local Storm PMP Computation										
PFSF (Private Fuel Storage Facility) Project										
Based on NOAA Report No. 49 "Probable Maximum Precipitation Estimates, Colorado River and Great Basin Drainages"										
Drainage: Access Road		**Latitude: 40°17'**								
Area (mi^2): 270 mi^2		**Longitude: 112°42'**			**Minimum Elev: 4465 ft**					
1. Average 1-hr 1 mi2 PMP for drainge	Fig 4.5, Page 115	10.1 in								
2a. Reduction for elev										
No adjustment up to 5000'										
5% decrease/1000' above 5000'		100 %								
2b. 1 x 2a		10.1 in								
3. Average 6/1 hour ratio for drainage	Fig 4.7 - Page 118	1.4								
					Duration (hrs)					
		0.25	**0.50**	**0.75**	**1.00**	**2.00**	**3.00**	**4.00**	**5.00**	**6.00**
4. Durational variation for 6/1-hr ratio of 3	Table 4.4, Page 12	63	83	93	100	118	126	132	137	140 %
5. 1-mi2 PMP for indicated durations	2b x 4	6.4	8.4	9.4	10.1	11.9	12.7	13.3	13.8	14.1 in
6. Areal reduction	Fig 4.9, Page 123	19.0	24.5	27.5	31.0	35.0	39.0	41	43	45 %
7. Area reduced PMP	5 x 6	1.2	2.1	2.6	3.1	4.2	5.0	5.5	5.9	6.4 in
8. Incremental PMP	Success (-) in 7									
	15 min increments				3.1	1.0	0.8	0.5	0.5	0.4 in
		1.2	0.8	0.5	0.5					
9. Time sequences of incremental PMP										
Hourly increments					0.5	0.8	3.1	1	0.5	0.4
Four largest 15-min.		**1.2**	**0.8**	**0.5**	**0.5**					

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 12

Figure 3, Local PMP (15-min interval)



CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 13

Table 4

Computation of 15-min PMP and Incremental

Duration	No	Depth	No	Incremental	HEC-1 Input 5-3-1-2-4-6	
0.00		0.0				
0.25	**1**	1.2	**1**	1.2	**5**	0.1
0.50		2.1		0.9		0.1
0.75		2.6		0.5		0.1
1.00		3.1		0.5		0.1
1.25	**2**	3.4	**2**	0.3	**3**	0.2
1.50		3.7		0.3		0.2
1.75		4.0		0.3		0.2
2.00		4.2		0.3		0.2
2.25	**3**	4.4	**3**	0.2	**1**	1.2
2.50		4.6		0.2		0.9
2.75		4.8		0.2		0.5
3.00		5.0		0.2		0.5
3.25	**4**	5.2	**4**	0.2	**2**	0.3
3.50		5.3		0.1		0.3
3.75		5.4		0.1		0.3
4.00		5.5		0.1		0.3
4.25	**5**	5.6	**5**	0.1	**4**	0.2
4.50		5.7		0.1		0.1
4.75		5.8		0.1		0.1
5.00		5.9		0.1		0.1
5.25	**6**	6.0	**6**	0.1	**6**	0.1
5.50		6.1		0.1		0.1
5.75		6.3		0.2		0.1
6.00		6.4		0.1		0.1

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER **G(B)-12**	OPTIONAL TASK CODE N/A	PAGE NO. 14

5, PMF and 100-year Runoff Flow

PMF

The result of HEC-1 runs made for the general PMF and the local PMF are included in Attachments 1 and 2. The peaks of hydrographs are:

General PMF: Q = 52983 cfs
Local PMF Q = 40237 cfs

Since the general PMF is greater, the final PMF for the hydraulic computation is determined to be:

Q_{PMF} = 53,000 cfs

100-year flow

FHWA Method: Q_{100} = 2,430 cfs (Table 5)
USGS Method: $Q_{100} = 68.1 \times A^{0.63} = (68.1)(270^{0.63}) = 2317$ cfs

Use Q100 = 2430 cfs for hydraulic analysis.

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER **G(B)-12**	OPTIONAL TASK CODE N/A	PAGE NO. 15

Table 5, Calculating 100-year flow using FHWA method (Based on Ref 3)

PFSF Utah

100-year Flow

FHWA Method

1	Area=	270	sq mi
	Latitute=	40°17'	
	Longitude=	112°42'	

2 Probable Maximum Runoff Peak Qp(max)

log(Area)=	2.43	
Exp=	5.70	
Qp(max)=	503666	cfs

3 Hydrophusiographic Parameters

3a	R=	12	
3b	DH=	1935	ft
3c	S=	0	
3d	Zone	17	
3e	L=	25	miles
3f	P60=	0.92	inch
3g	LL=	130	miles
3h	P10=	3.01	inch

4 10-year Runoff q10

	Q10=	1201	cfs
5	**Skip**		
6	Q100=	2428.5	7 parameter equation

6, Water Surface Profile

Cross sections in the HEC-RAS model is plotted in Figure 4. The flow discharges used in the computation are:

Q_{100} = 2,430 cfs
Q_{PMF} = 53,000 cfs

The result of the water surface can be found in Table 6 and the detail hydraulic report is included in Attachment 3.

Figure 5 plots the limit of the floodway.
Figure 6 plot the profile of the water surface.
Figures 7 to 11 shows water levels in each cross-section of Figure4.

Table 6

Profile Output Table - Standard Table 1
HEC-RAS Plan: PFSF_0 River: Skull Valey Reach: PFSF

Rivers = 1
Hydraulic Reaches = 1
River Stations = 12
Plans = 1
Profiles = 2

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	
PFSF	9400	53000.00	4495.00	4500.51	7.89	7600.73	Section D
PFSF	9400	2430.00	4495.00	4496.52	5.00	486.13	
PFSF	5900	53000.00	4473.00	4477.40	6.52	9332.06	Section C
PFSF	5900	2430.00	4473.00	4474.39	1.83	1333.60	
PFSF	4500	53000.00	4465.00	4467.99	9.26	6975.88	Section A3
PFSF	4500	2430.00	4465.00	4465.49	3.79	675.00	
PFSF	2800	53000.00	4450.00	4455.70	5.77	9184.57	Section A2
PFSF	2800	2430.00	4450.00	4451.91	2.34	1038.28	
PFSF	1300	53000.00	4445.00	4449.21	5.43	9978.53	Section A1
PFSF	1300	2430.00	4445.00	4446.32	2.12	1147.98	
PFSF	0	53000.00	4440.00	4443.31	6.33	9591.24	Section A
PFSF	0	2430.00	4440.00	4440.60	2.02	1241.60	

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 17

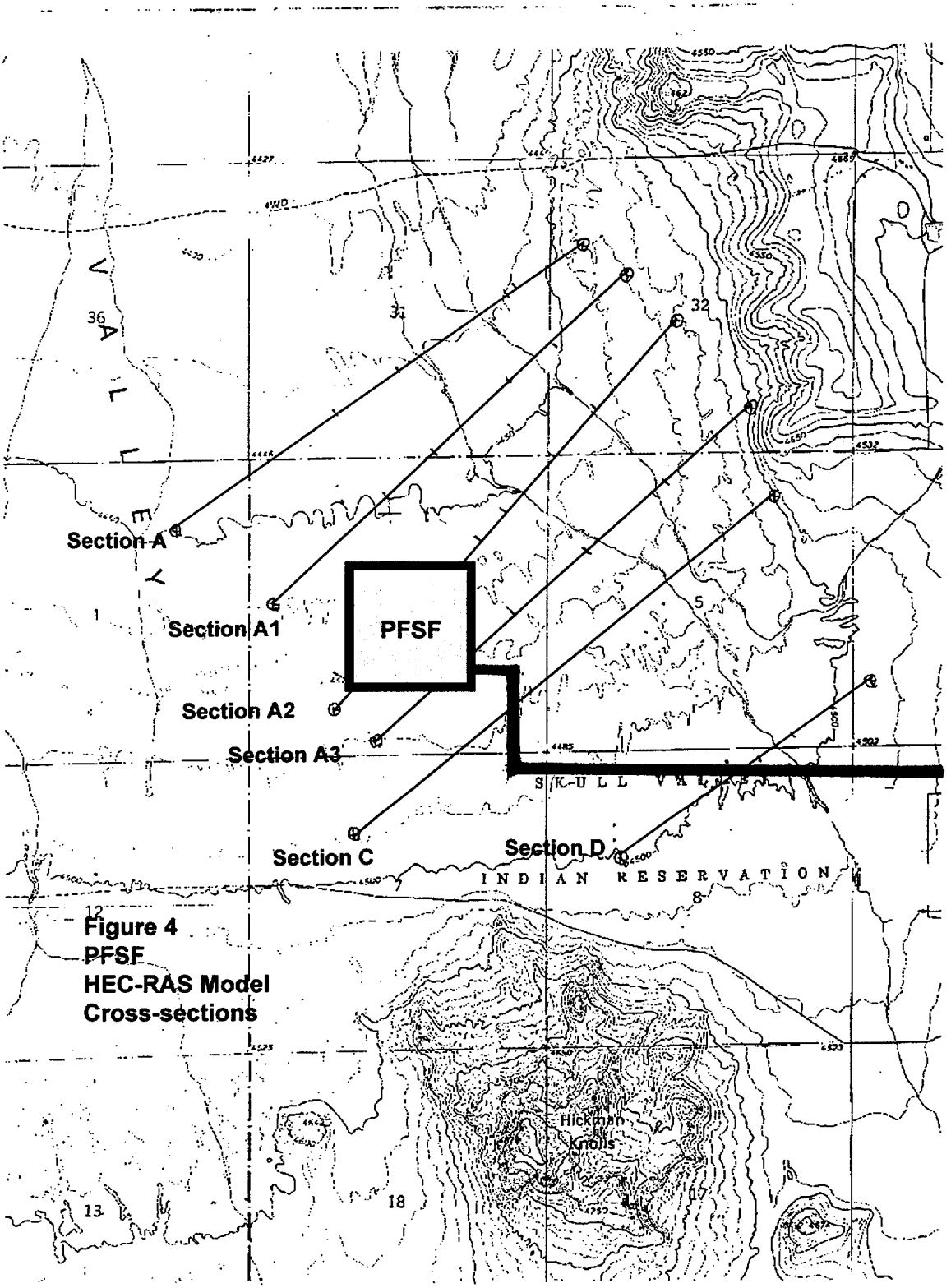


Figure 4
PFSF
HEC-RAS Model
Cross-sections

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 18

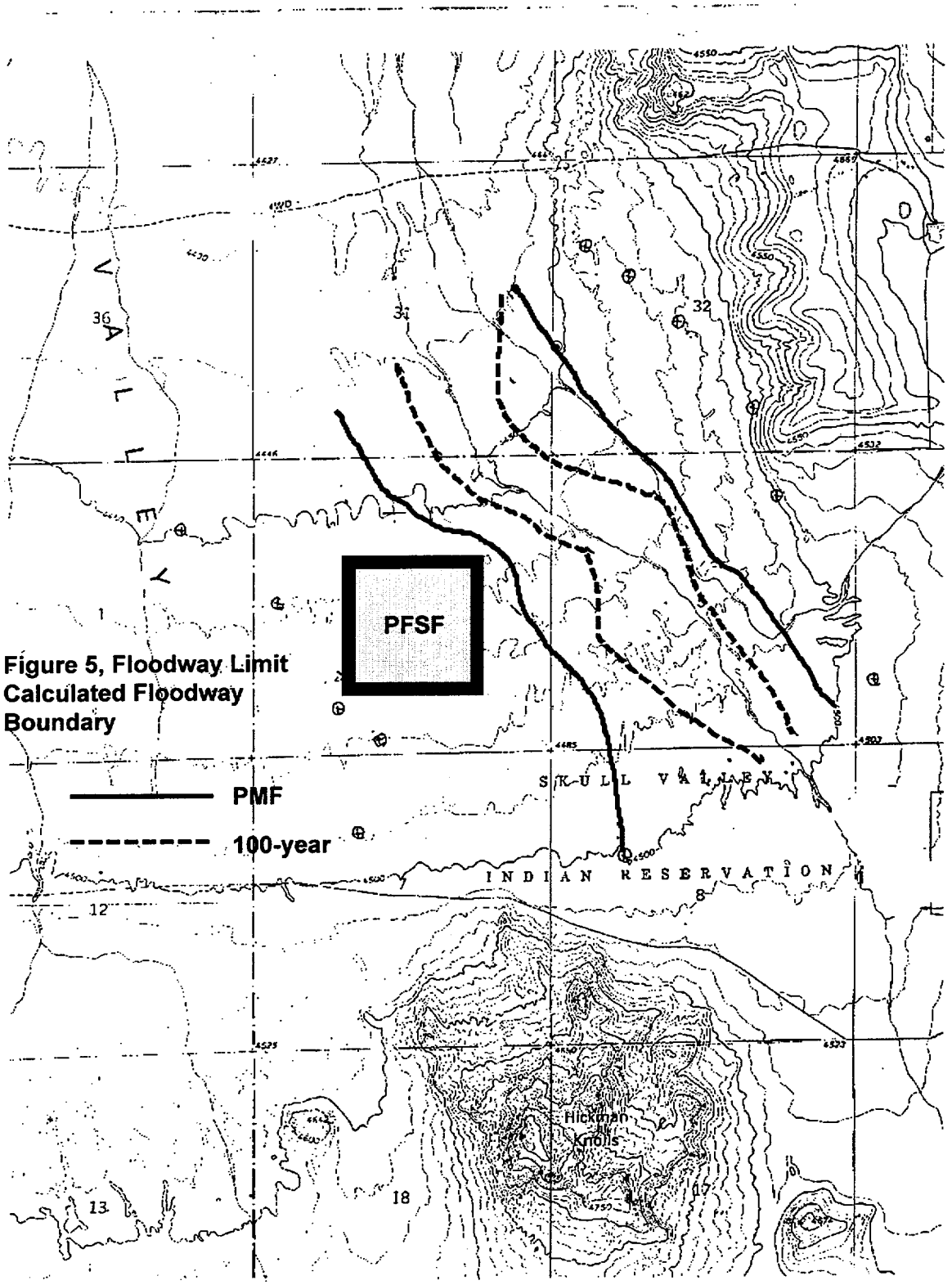


Figure 5, Floodway Limit Calculated Floodway Boundary

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 19

Figure 6, Water Surface Profile

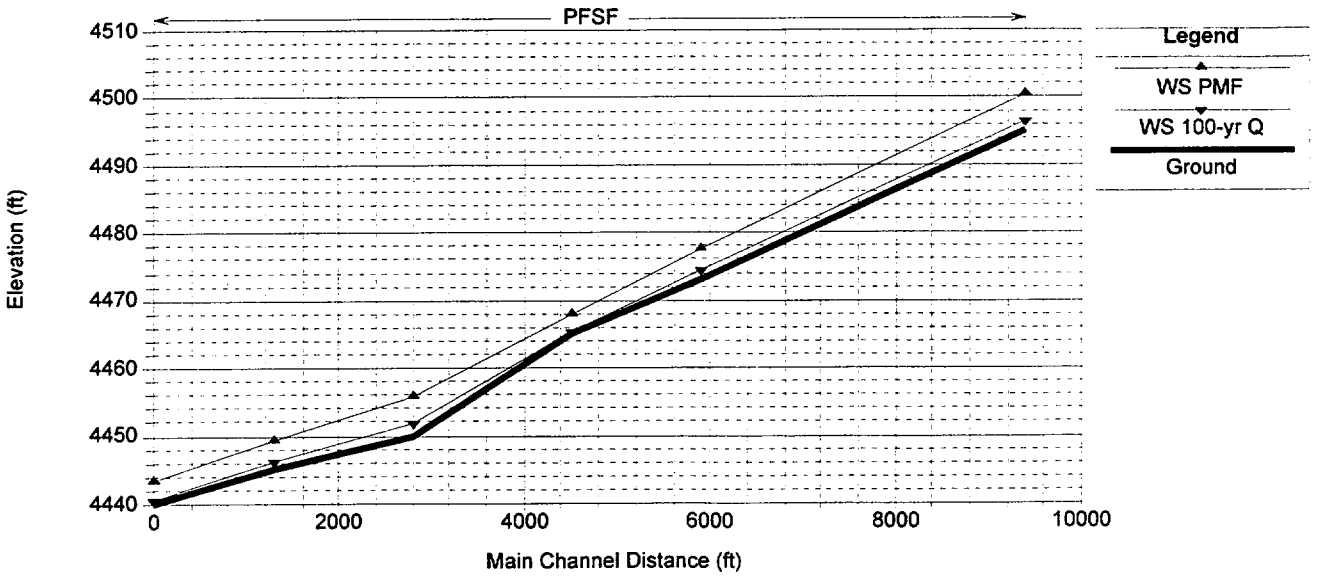
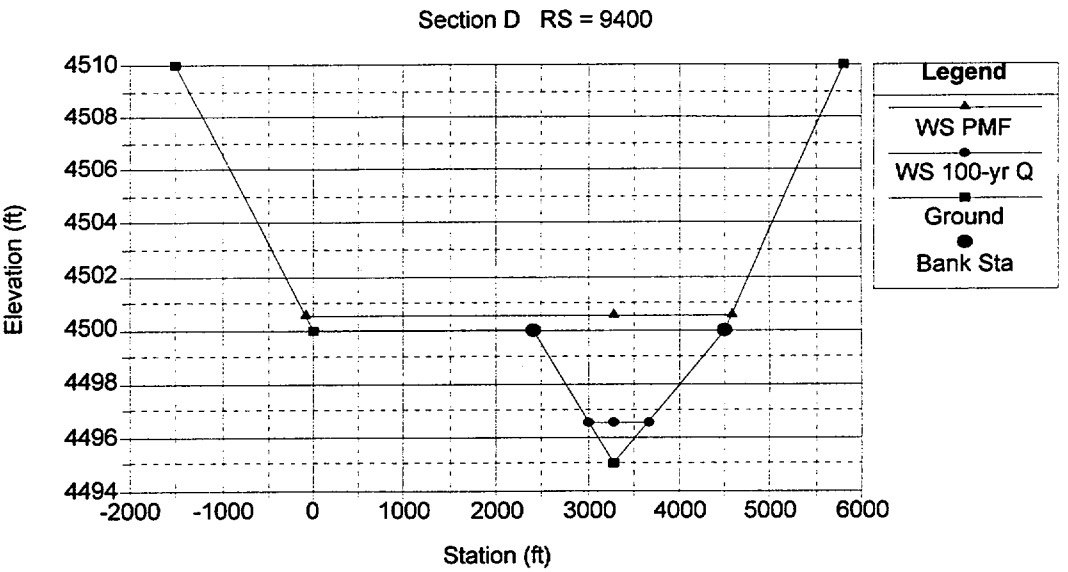


Figure 7



CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 20

Figure 8

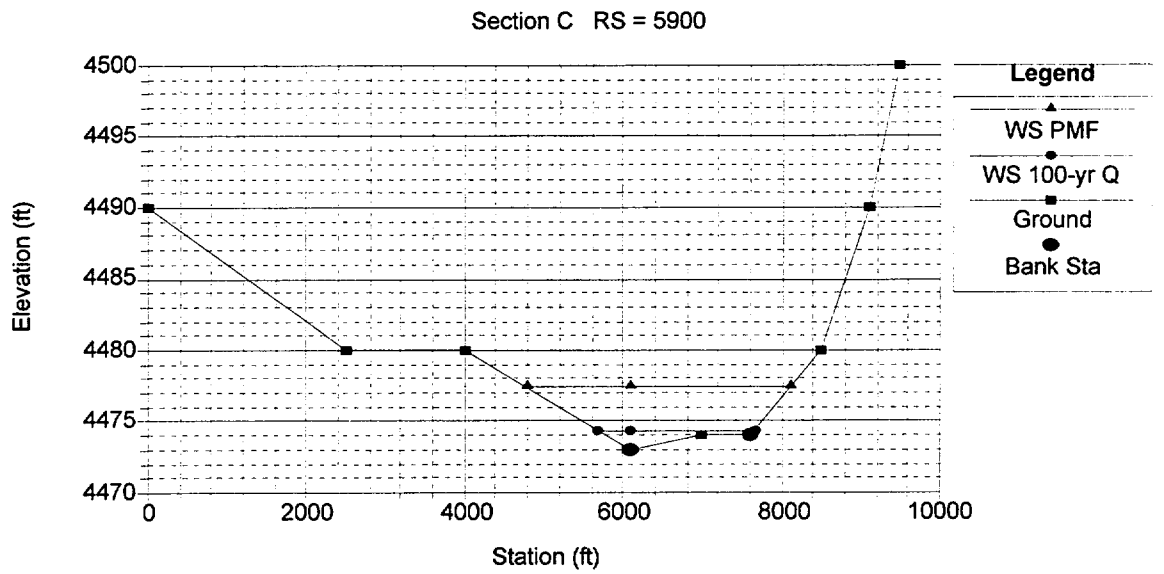
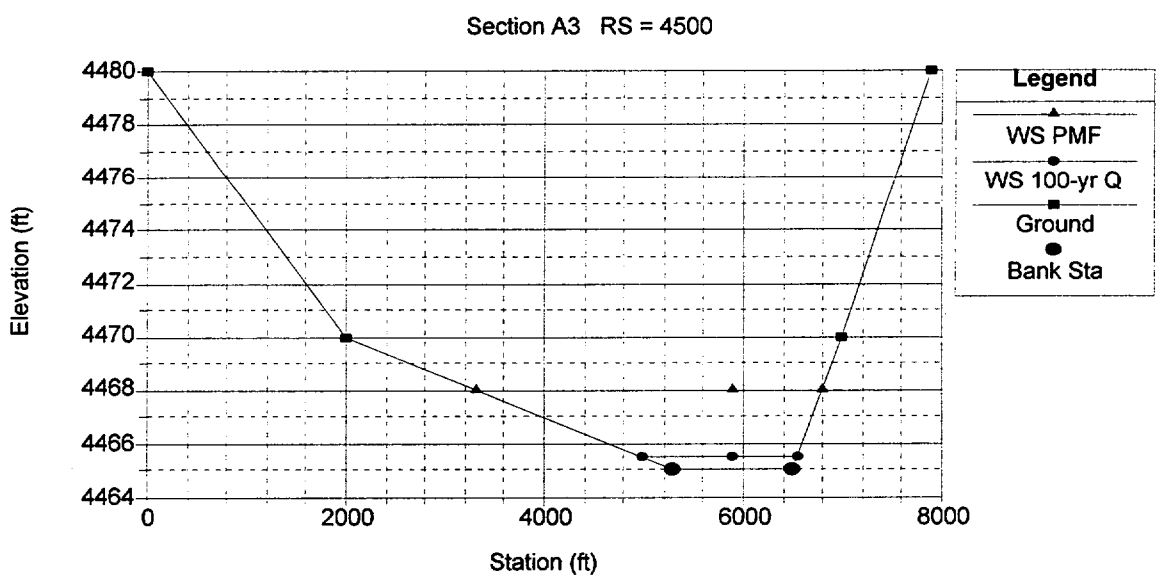


Figure 9



CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER G(B)-12	OPTIONAL TASK CODE N/A	PAGE NO. 21

Figure 10

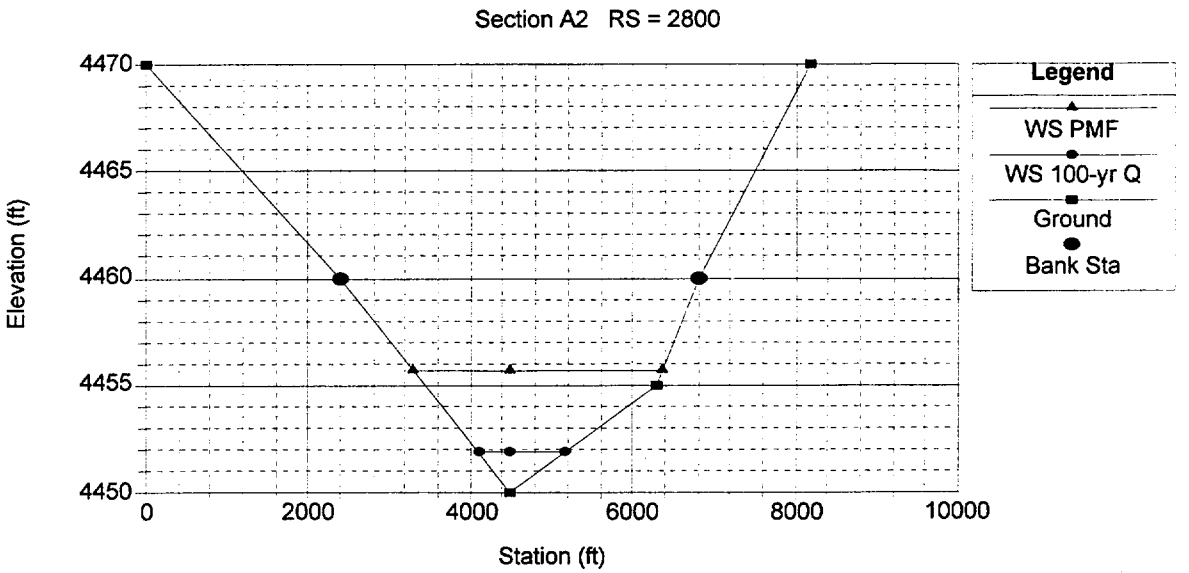
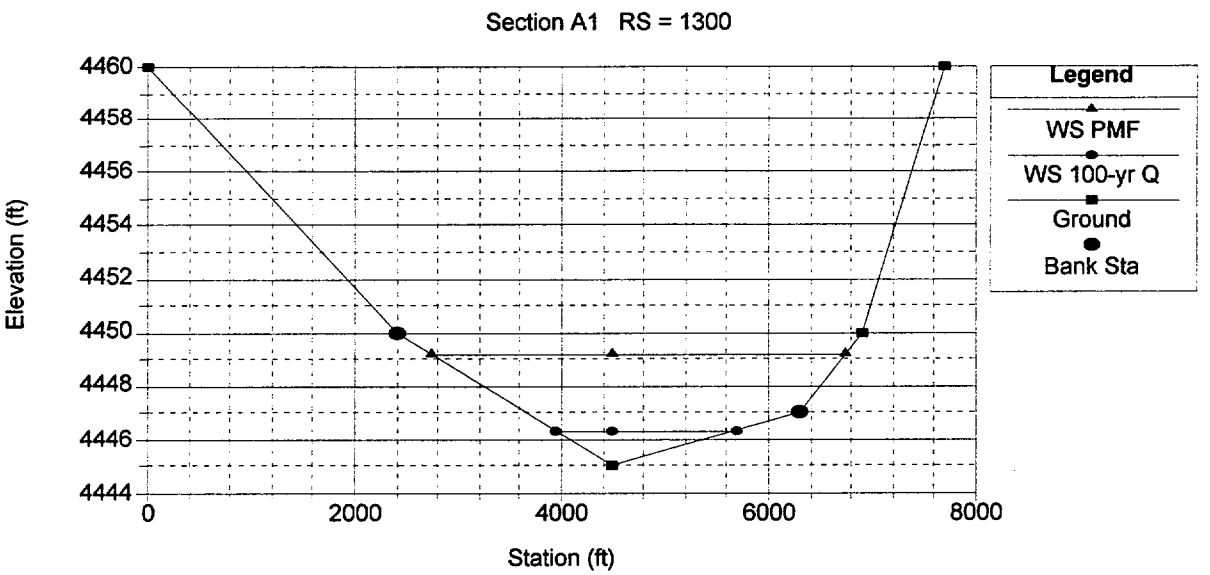


Figure 11



CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP	CALCULATION NUMBER **G(B)-12**	OPTIONAL TASK CODE N/A	PAGE NO. 22

7, Conclusion

Refering to Figure 4 and Table 6, the water level at Section A2, which has the closest point to the PFSF site is:

H_{100} = 4451.9 ft
H_{PMF} = 4455.7 ft

The access road is skew to the flood way and the water surface elevations are:

100-year flood	4496.5 ft
PMF flood	From 4500.5 ft (east bank of flood way) to 4477.4 ft (west bank).

The above water surface elevations are calculated using Manning's = 0.035. Note that these elevations, as well as other elevations in this calculation, are based on the USGS 1:24,000 topographic map datum.

Attachment 1, HEC-1 File
General Storm PMF

HEC-1 Input

```
ID   PFSF (Private Fuel Storage Facility Project)
ID   General PMF AT ACCESS RD
ID   FILE=GEN_PMF.DAT
ID
IT    60                    200
IO     2
PG    60
IN   180
PI  0.18    0.27    0.29    0.35    0.36    0.38    0.62    0.68    0.92    0.98
PI  1.07    2.83    0.62    0.48    0.43    0.43    0.38    0.38    0.17    0.17
PI  0.16    0.16    0.15    0.14
KK   010
KM  SCS DIMENSIONLESS UNIT HYDROGRAPH
BA 270.0
BF    -1            1.06
PR    60
LS     0      70       1
UD  11.0
ZZ
```

HEC-1 Output

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             SEPTEMBER 1990            *
 *              VERSION 4.0              *
 *                                       *
 *  RUN DATE  02/07/1999  TIME  12:05:44 *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
```

CNWC 0599602-G(0)-12
REV. 0 ATTACH 1 (1 OF 8)

```
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     PFSF (Private Fuel Storage Facility Project)
  2           ID     General PMF AT ACCESS RD
  3           ID     FILE=GEN_PMF.DAT
  4           ID
  5           IT      60                    200
  6           IO       2
  7           PG      60
  8           IN     180
  9           PI    0.18   0.27   0.29   0.35   0.36   0.38   0.62   0.68   0.92   0.98
 10           PI    1.07   2.83   0.62   0.48   0.43   0.43   0.38   0.38   0.17   0.17
 11           PI    0.16   0.16   0.15   0.14

 12           KK     010
 13           KM    SCS DIMENSIONLESS UNIT HYDROGRAPH
 14           BA   270.0
 15           BF      -1           1.06
 16           PR      60
 17           LS       0      70       1
 18           UD    11.0
 19           ZZ
1****************************************                ****************************************
*                                      *                *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                *    U.S. ARMY CORPS OF ENGINEERS      *
*           SEPTEMBER 1990             *                *    HYDROLOGIC ENGINEERING CENTER     *
```

CMC 059602-C(B)-12
Rev-0 Attach 1 (2 of 5)

```
*            VERSION 4.0               *
*                                      *
*  RUN DATE  02/07/1999  TIME  12:05:44 *
*                                      *
****************************************
```

```
*         609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

PFSF (Private Fuel Storage Facility Project)
General PMF AT ACCESS RD
FILE=GEN_PMF.DAT

6 IO OUTPUT CONTROL VARIABLES

IPRNT	2	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

8 IN TIME DATA FOR INPUT TIME SERIES

JXMIN		180	TIME INTERVAL IN MINUTES
JXDATE	1	0	STARTING DATE
JXTIME		0	STARTING TIME

IT HYDROGRAPH TIME DATA

NMIN		60	MINUTES IN COMPUTATION INTERVAL
IDATE	1	0	STARTING DATE
ITIME		0000	STARTING TIME
NQ		200	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	9	0	ENDING DATE
NDTIME		0700	ENDING TIME
ICENT		19	CENTURY MARK

COMPUTATION INTERVAL 1.00 HOURS
TOTAL TIME BASE 199.00 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

CMC 0599602-C(B)-12
Rev 0 ATTACH 1 (3 of 8)

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
 12 KK    *       010  *
          *            *
          **************
                        SCS DIMENSIONLESS UNIT HYDROGRAPH

             SUBBASIN RUNOFF DATA

 14 BA         SUBBASIN CHARACTERISTICS
                     TAREA        270.00  SUBBASIN AREA

 15 BF         BASE FLOW CHARACTERISTICS
                     STRTQ        270.00  INITIAL FLOW
                     QRCSN           .00  BEGIN BASE FLOW RECESSION
                     RTIOR       1.06000  RECESSION CONSTANT

               PRECIPITATION DATA

 16 PR            RECORDING STATIONS          60
  0 PW                       WEIGHTS        1.00

 17 LS         SCS LOSS RATE
                     STRTL           .86  INITIAL ABSTRACTION
                     CRVNBR        70.00  CURVE NUMBER
                     RTIMP          1.00  PERCENT IMPERVIOUS AREA

 18 UD         SCS DIMENSIONLESS UNITGRAPH
                     TLAG          11.00  LAG

                                                                  ***

            PRECIPITATION STATION DATA

                    STATION    TOTAL    AVG. ANNUAL    WEIGHT
                         60    12.60            .00      1.00

             TEMPORAL DISTRIBUTIONS

             STATION       60,  WEIGHT =   1.00
                  .06       .06       .06       .09       .09       .09       .10       .10       .10       .12
                  .12       .12       .12       .12       .12       .13       .13       .13       .21       .21
                  .21       .23       .23       .23       .31       .31       .31       .33       .33       .33
```

CALC 0599602-G(B)-12
Rev. 0 ATTACH 1 (4 of 8)

.36	.36	.36	.94	.94	.94	.21	.21	.21	.16
.16	.16	.14	.14	.14	.14	.14	.14	.13	.13
.13	.13	.13	.13	.06	.06	.06	.06	.06	.06
.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
.05	.05								

UNIT HYDROGRAPH
57 END-OF-PERIOD ORDINATES

296.	927.	1755.	2805.	4146.	5798.	7642.	9219.	10329.	11019.
11290.	11290.	11019.	10407.	9712.	8924.	7957.	6823.	5758.	4905.
4245.	3668.	3175.	2815.	2455.	2140.	1844.	1588.	1391.	1199.
1051.	903.	786.	678.	587.	513.	443.	388.	334.	293.
254.	220.	191.	164.	144.	125.	113.	101.	89.	77.
66.	54.	44.	35.	25.	15.	5.			

****

HYDROGRAPH AT STATION 010

****

DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
1		0000	1	.00	.00	.00	270.	5		0400	101	.00	.00	.00	526.
1		0100	2	.06	.06	.00	255.	5		0500	102	.00	.00	.00	453.
1		0200	3	.06	.06	.00	241.	5		0600	103	.00	.00	.00	389.
1		0300	4	.06	.06	.00	228.	5		0700	104	.00	.00	.00	334.
1		0400	5	.09	.09	.00	217.	5		0800	105	.00	.00	.00	286.
1		0500	6	.09	.09	.00	208.	5		0900	106	.00	.00	.00	245.
1		0600	7	.09	.09	.00	201.	5		1000	107	.00	.00	.00	209.
1		0700	8	.10	.10	.00	195.	5		1100	108	.00	.00	.00	179.
1		0800	9	.10	.10	.00	192.	5		1200	109	.00	.00	.00	152.
1		0900	10	.10	.10	.00	190.	5		1300	110	.00	.00	.00	130.
1		1000	11	.12	.12	.00	191.	5		1400	111	.00	.00	.00	110.
1		1100	12	.12	.11	.00	193.	5		1500	112	.00	.00	.00	94.
1		1200	13	.12	.11	.01	200.	5		1600	113	.00	.00	.00	80.
1		1300	14	.12	.10	.02	216.	5		1700	114	.00	.00	.00	68.
1		1400	15	.12	.10	.02	246.	5		1800	115	.00	.00	.00	58.
1		1500	16	.12	.09	.03	295.	5		1900	116	.00	.00	.00	49.
1		1600	17	.13	.09	.03	374.	5		2000	117	.00	.00	.00	41.
1		1700	18	.13	.09	.04	490.	5		2100	118	.00	.00	.00	35.
1		1800	19	.13	.09	.04	653.	5		2200	119	.00	.00	.00	29.
1		1900	20	.21	.13	.08	877.	5		2300	120	.00	.00	.00	23.
1		2000	21	.21	.12	.09	1178.	6		0000	121	.00	.00	.00	19.
1		2100	22	.21	.11	.09	1566.	6		0100	122	.00	.00	.00	15.
1		2200	23	.23	.11	.11	2052.	6		0200	123	.00	.00	.00	11.
1		2300	24	.23	.11	.12	2650.	6		0300	124	.00	.00	.00	8.

Enc 05-9602-G(B)-12
Rev. 0 Attach 1 (5 of 8)

2	0000	25	.23	.10	.13	3373.	*	6	0400	125	.00	.00	.00	6.
2	0100	26	.31	.12	.18	4243.	*	6	0500	126	.00	.00	.00	4.
2	0200	27	.31	.11	.19	5274.	*	6	0600	127	.00	.00	.00	2.
2	0300	28	.31	.10	.20	6466.	*	6	0700	128	.00	.00	.00	1.
2	0400	29	.33	.10	.22	7820.	*	6	0800	129	.00	.00	.00	0.
2	0500	30	.33	.09	.23	9337.	*	6	0900	130	.00	.00	.00	0.
2	0600	31	.33	.09	.24	11016.	*	6	1000	131	.00	.00	.00	0.
2	0700	32	.36	.09	.27	12862.	*	6	1100	132	.00	.00	.00	0.
2	0800	33	.36	.08	.28	14855.	*	6	1200	133	.00	.00	.00	0.
2	0900	34	.36	.07	.28	16971.	*	6	1300	134	.00	.00	.00	0.
2	1000	35	.94	.17	.77	19327.	*	6	1400	135	.00	.00	.00	0.
2	1100	36	.94	.14	.80	22059.	*	6	1500	136	.00	.00	.00	0.
2	1200	37	.94	.12	.82	25246.	*	6	1600	137	.00	.00	.00	0.
2	1300	38	.21	.02	.18	28792.	*	6	1700	138	.00	.00	.00	0.
2	1400	39	.21	.02	.18	32595.	*	6	1800	139	.00	.00	.00	0.
2	1500	40	.21	.02	.18	36664.	*	6	1900	140	.00	.00	.00	0.
2	1600	41	.16	.02	.14	40923.	*	6	2000	141	.00	.00	.00	0.
2	1700	42	.16	.02	.14	45025.	*	6	2100	142	.00	.00	.00	0.
2	1800	43	.16	.02	.14	48512.	*	6	2200	143	.00	.00	.00	0.
2	1900	44	.14	.01	.13	51014.	*	6	2300	144	.00	.00	.00	0.
2	2000	45	.14	.01	.13	52459.	*	7	0000	145	.00	.00	.00	0.
2	2100	46	.14	.01	.13	52983.	*	7	0100	146	.00	.00	.00	0.
2	2200	47	.14	.01	.13	52701.	*	7	0200	147	.00	.00	.00	0.
2	2300	48	.14	.01	.13	51718.	*	7	0300	148	.00	.00	.00	0.
3	0000	49	.14	.01	.13	50175.	*	7	0400	149	.00	.00	.00	0.
3	0100	50	.13	.01	.12	48210.	*	7	0500	150	.00	.00	.00	0.
3	0200	51	.13	.01	.12	45982.	*	7	0600	151	.00	.00	.00	0.
3	0300	52	.13	.01	.12	43485.	*	7	0700	152	.00	.00	.00	0.
3	0400	53	.13	.01	.12	40830.	*	7	0800	153	.00	.00	.00	0.
3	0500	54	.13	.01	.12	38259.	*	7	0900	154	.00	.00	.00	0.
3	0600	55	.13	.01	.12	35992.	*	7	1000	155	.00	.00	.00	0.
3	0700	56	.06	.00	.05	34028.	*	7	1100	156	.00	.00	.00	0.
3	0800	57	.06	.00	.05	32280.	*	7	1200	157	.00	.00	.00	0.
3	0900	58	.06	.00	.05	30700.	*	7	1300	158	.00	.00	.00	0.
3	1000	59	.06	.00	.05	29236.	*	7	1400	159	.00	.00	.00	0.
3	1100	60	.06	.00	.05	27846.	*	7	1500	160	.00	.00	.00	0.
3	1200	61	.06	.00	.05	26436.	*	7	1600	161	.00	.00	.00	0.
3	1300	62	.05	.00	.05	25017.	*	7	1700	162	.00	.00	.00	0.
3	1400	63	.05	.00	.05	23608.	*	7	1800	163	.00	.00	.00	0.
3	1500	64	.05	.00	.05	22227.	*	7	1900	164	.00	.00	.00	0.
3	1600	65	.05	.00	.05	20898.	*	7	2000	165	.00	.00	.00	0.
3	1700	66	.05	.00	.05	19615.	*	7	2100	166	.00	.00	.00	0.
3	1800	67	.05	.00	.05	18407.	*	7	2200	167	.00	.00	.00	0.
3	1900	68	.05	.00	.05	17266.	*	7	2300	168	.00	.00	.00	0.
3	2000	69	.05	.00	.05	16218.	*	8	0000	169	.00	.00	.00	0.
3	2100	70	.05	.00	.05	15256.	*	8	0100	170	.00	.00	.00	0.
3	2200	71	.05	.00	.04	14380.	*	8	0200	171	.00	.00	.00	0.

CNC 0579602-G(B)-12
Rev. 0 ATTACH 1 (6 of 8)

3	2300	72	.05	.00	.04	13598.	*	8	0300	172	.00	.00	.00	0.
4	0000	73	.05	.00	.04	12906.	*	8	0400	173	.00	.00	.00	0.
4	0100	74	.00	.00	.00	12290.	*	8	0500	174	.00	.00	.00	0.
4	0200	75	.00	.00	.00	11714.	*	8	0600	175	.00	.00	.00	0.
4	0300	76	.00	.00	.00	11160.	*	8	0700	176	.00	.00	.00	0.
4	0400	77	.00	.00	.00	10606.	*	8	0800	177	.00	.00	.00	0.
4	0500	78	.00	.00	.00	10038.	*	8	0900	178	.00	.00	.00	0.
4	0600	79	.00	.00	.00	9434.	*	8	1000	179	.00	.00	.00	0.
4	0700	80	.00	.00	.00	8787.	*	8	1100	180	.00	.00	.00	0.
4	0800	81	.00	.00	.00	8107.	*	8	1200	181	.00	.00	.00	0.
4	0900	82	.00	.00	.00	7410.	*	8	1300	182	.00	.00	.00	0.
4	1000	83	.00	.00	.00	6713.	*	8	1400	183	.00	.00	.00	0.
4	1100	84	.00	.00	.00	6026.	*	8	1500	184	.00	.00	.00	0.
4	1200	85	.00	.00	.00	5360.	*	8	1600	185	.00	.00	.00	0.
4	1300	86	.00	.00	.00	4725.	*	8	1700	186	.00	.00	.00	0.
4	1400	87	.00	.00	.00	4135.	*	8	1800	187	.00	.00	.00	0.
4	1500	88	.00	.00	.00	3592.	*	8	1900	188	.00	.00	.00	0.
4	1600	89	.00	.00	.00	3100.	*	8	2000	189	.00	.00	.00	0.
4	1700	90	.00	.00	.00	2661.	*	8	2100	190	.00	.00	.00	0.
4	1800	91	.00	.00	.00	2282.	*	8	2200	191	.00	.00	.00	0.
4	1900	92	.00	.00	.00	1961.	*	8	2300	192	.00	.00	.00	0.
4	2000	93	.00	.00	.00	1691.	*	9	0000	193	.00	.00	.00	0.
4	2100	94	.00	.00	.00	1462.	*	9	0100	194	.00	.00	.00	0.
4	2200	95	.00	.00	.00	1267.	*	9	0200	195	.00	.00	.00	0.
4	2300	96	.00	.00	.00	1098.	*	9	0300	196	.00	.00	.00	0.
5	0000	97	.00	.00	.00	949.	*	9	0400	197	.00	.00	.00	0.
5	0100	98	.00	.00	.00	819.	*	9	0500	198	.00	.00	.00	0.
5	0200	99	.00	.00	.00	707.	*	9	0600	199	.00	.00	.00	0.
5	0300	100	.00	.00	.00	610.	*	9	0700	200	.00	.00	.00	0.
							*							

****

TOTAL RAINFALL = 12.60, TOTAL LOSS = 3.96, TOTAL EXCESS = 8.64

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	199.00-HR
+	(CFS)	(HR)					
			(CFS)				
+	52983.	45.00		51703.	40677.	20738.	7591.
			(INCHES)	1.780	5.603	8.569	8.670
			(AC-FT)	25638.	80682.	123397.	124843.

CUMULATIVE AREA = 270.00 SQ MI

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND

CMC 0599602-G(8)-12
Rev. 0 Attach 1 (70 of 81)

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	010	52983.	45.00	51703.	40677.	20738.	270.00		

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

Case 05-9602-G(B)-12
Rev. 0 Attach. 1 (8 of 8)

Attachment 2, HEC-1 File
Local Storm PMF

HEC-1 Input

```
ID   PFSF (Private Fuel Storage Facility Project)
ID   General PMF AT ACCESS RD
ID   FILE=LOC_PMF.DAT
ID
IT     5                    200
IO     2
PG    60
IN    15
PI  0.10    0.10    0.10    0.10    0.20    0.20    0.20    0.20    1.20    0.90
PI  0.50    0.50    0.30    0.30    0.30    0.30    0.20    0.10    0.10    0.10
PI  0.10    0.10    0.10    0.10
KK   010
KM  SCS DIMENSIONLESS UNIT HYDROGRAPH
BA 270.0
BF    -1            1.06
PR    60
LS     0      70       1
UD  11.0
ZZ
```

HEC-1 Input

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *            SEPTEMBER 1990             *
 *             VERSION 4.0               *
 *                                       *
 *  RUN DATE  02/07/1999  TIME  12:45:39 *
 *                                       *
 *****************************************

*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

Calc 0599602-G(B)-12
Rev. 0 Attach 2 (1 of 9)

```
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     PFSF (Private Fuel Storage Facility Project)
  2           ID     General PMF AT ACCESS RD
  3           ID     FILE=LOC_PMF.DAT
  4           ID
  5           IT      5                    200
  6           IO      2
  7           PG     60
  8           IN     15
  9           PI   0.10   0.10   0.10   0.10   0.20   0.20   0.20   0.20   1.20   0.90
 10           PI   0.50   0.50   0.30   0.30   0.30   0.30   0.20   0.10   0.10   0.10
 11           PI   0.10   0.10   0.10   0.10

 12           KK     010
 13           KM    SCS DIMENSIONLESS UNIT HYDROGRAPH
 14           BA   270.0
 15           BF      -1           1.06
 16           PR      60
 17           LS       0      70       1
 18           UD    11.0
```

```
          19          ZZ
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             SEPTEMBER 1990            *
*              VERSION 4.0              *
*                                       *
*  RUN DATE  02/07/1999  TIME  12:45:39 *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104              *
*                                       *
*****************************************
```

PFSF (Private Fuel Storage Facility Project)
General PMF AT ACCESS RD
FILE=LOC_PMF.DAT

6 IO	OUTPUT CONTROL VARIABLES			
	IPRNT		2	PRINT CONTROL
	IPLOT		0	PLOT CONTROL
	QSCAL		0.	HYDROGRAPH PLOT SCALE
8 IN	TIME DATA FOR INPUT TIME SERIES			
	JXMIN		15	TIME INTERVAL IN MINUTES
	JXDATE	1	0	STARTING DATE
	JXTIME		0	STARTING TIME
IT	HYDROGRAPH TIME DATA			
	NMIN		5	MINUTES IN COMPUTATION INTERVAL
	IDATE	1	0	STARTING DATE
	ITIME		0000	STARTING TIME
	NQ		200	NUMBER OF HYDROGRAPH ORDINATES
	NDDATE	1	0	ENDING DATE
	NDTIME		1635	ENDING TIME
	ICENT		19	CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 16.58 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND

CALC 0599602-G(B)-12
REV. 0 ATTACH 2 (3 of 9)

```
                STORAGE VOLUME          ACRE-FEET
                SURFACE AREA            ACRES
                TEMPERATURE             DEGREES FAHRENHEIT

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

            **************
            *            *
 12 KK      *       010  *
            *            *
            **************
                        SCS DIMENSIONLESS UNIT HYDROGRAPH

               SUBBASIN RUNOFF DATA

 14 BA           SUBBASIN CHARACTERISTICS
                       TAREA      270.00  SUBBASIN AREA

 15 BF           BASE FLOW CHARACTERISTICS
                       STRTQ      270.00  INITIAL FLOW
                       QRCSN         .00  BEGIN BASE FLOW RECESSION
                       RTIOR     1.06000  RECESSION CONSTANT

                 PRECIPITATION DATA

 16 PR              RECORDING STATIONS        60
  0 PW                         WEIGHTS      1.00

 17 LS           SCS LOSS RATE
                       STRTL         .86  INITIAL ABSTRACTION
                      CRVNBR       70.00  CURVE NUMBER
                       RTIMP        1.00  PERCENT IMPERVIOUS AREA

 18 UD           SCS DIMENSIONLESS UNITGRAPH
                       TLAG       11.00  LAG

                                                                    ***

               PRECIPITATION STATION DATA

                       STATION     TOTAL    AVG. ANNUAL     WEIGHT
                            60      6.40            .00       1.00

                TEMPORAL DISTRIBUTIONS
```

CMC 059602-G(B)-12
Rev. 0 Attach 2 (4 of 9)

STATION 60, WEIGHT = 1.00

.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.03	.03	.07	.07	.07	.07	.07	.07	.07	.07
.07	.07	.07	.07	.40	.40	.40	.30	.30	.30
.17	.17	.17	.17	.17	.17	.10	.10	.10	.10
.10	.10	.10	.10	.10	.10	.10	.10	.07	.07
.07	.03	.03	.03	.03	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.03	.03								

*** WARNING *** UNIT HYDROGRAPH TRUNCATED FROM 662 TO 300 INTERVALS

*** WARNING *** VOLUME UNDER UNIT GRAPH = .92
ORDINATES OF UNIT GRAPH WERE INCREASED TO OBTAIN 1.0 INCHE OF RUNOFF.
TO PREVENT THIS, INCREASE THE COMPUTATION INTERVAL ON THE "IT" RECORD.

UNIT HYDROGRAPH
300 END-OF-PERIOD ORDINATES
VOLUME = 1.00

29.	58.	88.	117.	146.	175.	204.	234.	263.	292.
321.	350.	379.	438.	506.	574.	642.	710.	778.	846.
915.	983.	1051.	1119.	1187.	1255.	1333.	1421.	1508.	1596.
1683.	1771.	1858.	1946.	2033.	2121.	2209.	2296.	2384.	2479.
2595.	2712.	2829.	2946.	3062.	3179.	3296.	3413.	3529.	3646.
3763.	3880.	3996.	4152.	4308.	4463.	4619.	4775.	4930.	5086.
5242.	5397.	5553.	5709.	5864.	6020.	6198.	6383.	6567.	6752.
6937.	7122.	7307.	7492.	7677.	7861.	8046.	8231.	8416.	8586.
8742.	8898.	9053.	9209.	9365.	9520.	9676.	9832.	9987.	10143.
10299.	10454.	10598.	10705.	10812.	10919.	11026.	11133.	11240.	11347.
11454.	11561.	11668.	11775.	11882.	11989.	12048.	12106.	12164.	12223.
12281.	12339.	12398.	12456.	12515.	12573.	12631.	12690.	12748.	12770.
12780.	12789.	12799.	12809.	12819.	12828.	12838.	12848.	12858.	12867.
12877.	12887.	12887.	12877.	12867.	12858.	12848.	12838.	12828.	12819.
12809.	12799.	12789.	12780.	12770.	12748.	12690.	12631.	12573.	12515.
12456.	12398.	12339.	12281.	12223.	12164.	12106.	12048.	11989.	11921.
11853.	11785.	11717.	11649.	11581.	11512.	11444.	11376.	11308.	11240.
11172.	11104.	11028.	10951.	10873.	10795.	10717.	10639.	10561.	10484.
10406.	10328.	10250.	10172.	10094.	10007.	9910.	9812.	9715.	9618.
9520.	9423.	9326.	9228.	9131.	9034.	8937.	8839.	8737.	8620.
8504.	8387.	8270.	8153.	8037.	7920.	7803.	7686.	7570.	7453.
7336.	7219.	7122.	7025.	6927.	6830.	6733.	6636.	6538.	6441.
6344.	6246.	6149.	6052.	5954.	5879.	5811.	5743.	5675.	5607.
5539.	5470.	5402.	5334.	5266.	5198.	5130.	5062.	4999.	4940.
4882.	4823.	4765.	4707.	4648.	4590.	4532.	4473.	4415.	4356.
4298.	4242.	4193.	4145.	4096.	4047.	3999.	3950.	3902.	3853.

Calc 057960Z-G(B)-12
Rev. 0 Attach 2 (5 of 9)

3804.	3756.	3707.	3658.	3610.	3574.	3539.	3503.	3468.	3432.
3397.	3361.	3326.	3290.	3255.	3219.	3183.	3148.	3112.	3077.
3041.	3006.	2970.	2935.	2899.	2864.	2828.	2793.	2757.	2722.
2686.	2654.	2625.	2596.	2566.	2537.	2508.	2479.	2450.	2420.

****

HYDROGRAPH AT STATION 010

****

DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
1		0000	1	.00	.00	.00	270.	1		0820	101	.00	.00	.00	17219.
1		0005	2	.03	.03	.00	269.	1		0825	102	.00	.00	.00	17715.
1		0010	3	.03	.03	.00	267.	1		0830	103	.00	.00	.00	18216.
1		0015	4	.03	.03	.00	266.	1		0835	104	.00	.00	.00	18722.
1		0020	5	.03	.03	.00	265.	1		0840	105	.00	.00	.00	19232.
1		0025	6	.03	.03	.00	264.	1		0845	106	.00	.00	.00	19743.
1		0030	7	.03	.03	.00	262.	1		0850	107	.00	.00	.00	20252.
1		0035	8	.03	.03	.00	261.	1		0855	108	.00	.00	.00	20761.
1		0040	9	.03	.03	.00	260.	1		0900	109	.00	.00	.00	21270.
1		0045	10	.03	.03	.00	259.	1		0905	110	.00	.00	.00	21777.
1		0050	11	.03	.03	.00	258.	1		0910	111	.00	.00	.00	22285.
1		0055	12	.03	.03	.00	257.	1		0915	112	.00	.00	.00	22793.
1		0100	13	.03	.03	.00	255.	1		0920	113	.00	.00	.00	23302.
1		0105	14	.07	.07	.00	254.	1		0925	114	.00	.00	.00	23811.
1		0110	15	.07	.07	.00	253.	1		0930	115	.00	.00	.00	24320.
1		0115	16	.07	.07	.00	252.	1		0935	116	.00	.00	.00	24828.
1		0120	17	.07	.07	.00	251.	1		0940	117	.00	.00	.00	25335.
1		0125	18	.07	.07	.00	250.	1		0945	118	.00	.00	.00	25842.
1		0130	19	.07	.07	.00	249.	1		0950	119	.00	.00	.00	26343.
1		0135	20	.07	.07	.00	249.	1		0955	120	.00	.00	.00	26837.
1		0140	21	.07	.06	.00	248.	1		1000	121	.00	.00	.00	27323.
1		0145	22	.07	.06	.00	247.	1		1005	122	.00	.00	.00	27801.
1		0150	23	.07	.06	.01	247.	1		1010	123	.00	.00	.00	28271.
1		0155	24	.07	.06	.01	246.	1		1015	124	.00	.00	.00	28733.
1		0200	25	.07	.06	.01	246.	1		1020	125	.00	.00	.00	29190.
1		0205	26	.40	.31	.09	249.	1		1025	126	.00	.00	.00	29640.
1		0210	27	.40	.27	.13	256.	1		1030	127	.00	.00	.00	30085.
1		0215	28	.40	.23	.17	267.	1		1035	128	.00	.00	.00	30522.
1		0220	29	.30	.15	.15	283.	1		1040	129	.00	.00	.00	30952.
1		0225	30	.30	.14	.16	304.	1		1045	130	.00	.00	.00	31376.
1		0230	31	.30	.13	.17	329.	1		1050	131	.00	.00	.00	31795.
1		0235	32	.17	.07	.10	358.	1		1055	132	.00	.00	.00	32207.
1		0240	33	.17	.06	.10	390.	1		1100	133	.00	.00	.00	32608.
1		0245	34	.17	.06	.11	425.	1		1105	134	.00	.00	.00	32997.

CMC 0599602-G(B)-12
REV. 0 ATTACH 2 (6 OF 9)

1	0250	35	.17	.06	.11	464.	*	1	1110	135	.00	.00	.00	33376.
1	0255	36	.17	.05	.11	505.	*	1	1115	136	.00	.00	.00	33743.
1	0300	37	.17	.05	.11	551.	*	1	1120	137	.00	.00	.00	34099.
1	0305	38	.10	.03	.07	599.	*	1	1125	138	.00	.00	.00	34445.
1	0310	39	.10	.03	.07	652.	*	1	1130	139	.00	.00	.00	34783.
1	0315	40	.10	.03	.07	711.	*	1	1135	140	.00	.00	.00	35112.
1	0320	41	.10	.03	.07	779.	*	1	1140	141	.00	.00	.00	35430.
1	0325	42	.10	.03	.07	855.	*	1	1145	142	.00	.00	.00	35738.
1	0330	43	.10	.03	.07	939.	*	1	1150	143	.00	.00	.00	36037.
1	0335	44	.10	.03	.07	1033.	*	1	1155	144	.00	.00	.00	36329.
1	0340	45	.10	.03	.07	1133.	*	1	1200	145	.00	.00	.00	36612.
1	0345	46	.10	.02	.08	1239.	*	1	1205	146	.00	.00	.00	36882.
1	0350	47	.10	.02	.08	1352.	*	1	1210	147	.00	.00	.00	37140.
1	0355	48	.10	.02	.08	1471.	*	1	1215	148	.00	.00	.00	37384.
1	0400	49	.10	.02	.08	1597.	*	1	1220	149	.00	.00	.00	37615.
1	0405	50	.07	.02	.05	1729.	*	1	1225	150	.00	.00	.00	37832.
1	0410	51	.07	.01	.05	1866.	*	1	1230	151	.00	.00	.00	38037.
1	0415	52	.07	.01	.05	2008.	*	1	1235	152	.00	.00	.00	38232.
1	0420	53	.03	.01	.03	2156.	*	1	1240	153	.00	.00	.00	38416.
1	0425	54	.03	.01	.03	2310.	*	1	1245	154	.00	.00	.00	38590.
1	0430	55	.03	.01	.03	2471.	*	1	1250	155	.00	.00	.00	38753.
1	0435	56	.03	.01	.03	2639.	*	1	1255	156	.00	.00	.00	38906.
1	0440	57	.03	.01	.03	2813.	*	1	1300	157	.00	.00	.00	39052.
1	0445	58	.03	.01	.03	2994.	*	1	1305	158	.00	.00	.00	39189.
1	0450	59	.03	.01	.03	3181.	*	1	1310	159	.00	.00	.00	39318.
1	0455	60	.03	.01	.03	3374.	*	1	1315	160	.00	.00	.00	39438.
1	0500	61	.03	.01	.03	3573.	*	1	1320	161	.00	.00	.00	39549.
1	0505	62	.03	.01	.03	3777.	*	1	1325	162	.00	.00	.00	39651.
1	0510	63	.03	.01	.03	3987.	*	1	1330	163	.00	.00	.00	39743.
1	0515	64	.03	.01	.03	4202.	*	1	1335	164	.00	.00	.00	39826.
1	0520	65	.03	.01	.03	4422.	*	1	1340	165	.00	.00	.00	39901.
1	0525	66	.03	.01	.03	4648.	*	1	1345	166	.00	.00	.00	39968.
1	0530	67	.03	.01	.03	4882.	*	1	1350	167	.00	.00	.00	40028.
1	0535	68	.03	.01	.03	5124.	*	1	1355	168	.00	.00	.00	40080.
1	0540	69	.03	.01	.03	5373.	*	1	1400	169	.00	.00	.00	40126.
1	0545	70	.03	.01	.03	5631.	*	1	1405	170	.00	.00	.00	40166.
1	0550	71	.03	.01	.03	5896.	*	1	1410	171	.00	.00	.00	40199.
1	0555	72	.03	.01	.03	6168.	*	1	1415	172	.00	.00	.00	40223.
1	0600	73	.03	.01	.03	6446.	*	1	1420	173	.00	.00	.00	40236.
1	0605	74	.00	.00	.00	6730.	*	1	1425	174	.00	.00	.00	40237.
1	0610	75	.00	.00	.00	7019.	*	1	1430	175	.00	.00	.00	40227.
1	0615	76	.00	.00	.00	7315.	*	1	1435	176	.00	.00	.00	40204.
1	0620	77	.00	.00	.00	7616.	*	1	1440	177	.00	.00	.00	40170.
1	0625	78	.00	.00	.00	7921.	*	1	1445	178	.00	.00	.00	40127.
1	0630	79	.00	.00	.00	8234.	*	1	1450	179	.00	.00	.00	40075.
1	0635	80	.00	.00	.00	8555.	*	1	1455	180	.00	.00	.00	40015.
1	0640	81	.00	.00	.00	8887.	*	1	1500	181	.00	.00	.00	39947.

Calc 0599602-G(B)-12
Rev. 0 Attach 2 (7 of 9)

1	0645	82	.00	.00	.00	9228.	*	1	1505	182	.00	.00	.00	39870.
1	0650	83	.00	.00	.00	9580.	*	1	1510	183	.00	.00	.00	39786.
1	0655	84	.00	.00	.00	9941.	*	1	1515	184	.00	.00	.00	39696.
1	0700	85	.00	.00	.00	10311.	*	1	1520	185	.00	.00	.00	39600.
1	0705	86	.00	.00	.00	10688.	*	1	1525	186	.00	.00	.00	39498.
1	0710	87	.00	.00	.00	11073.	*	1	1530	187	.00	.00	.00	39388.
1	0715	88	.00	.00	.00	11464.	*	1	1535	188	.00	.00	.00	39271.
1	0720	89	.00	.00	.00	11863.	*	1	1540	189	.00	.00	.00	39148.
1	0725	90	.00	.00	.00	12269.	*	1	1545	190	.00	.00	.00	39017.
1	0730	91	.00	.00	.00	12679.	*	1	1550	191	.00	.00	.00	38880.
1	0735	92	.00	.00	.00	13096.	*	1	1555	192	.00	.00	.00	38737.
1	0740	93	.00	.00	.00	13521.	*	1	1600	193	.00	.00	.00	38587.
1	0745	94	.00	.00	.00	13954.	*	1	1605	194	.00	.00	.00	38433.
1	0750	95	.00	.00	.00	14396.	*	1	1610	195	.00	.00	.00	38273.
1	0755	96	.00	.00	.00	14847.	*	1	1615	196	.00	.00	.00	38109.
1	0800	97	.00	.00	.00	15307.	*	1	1620	197	.00	.00	.00	37942.
1	0805	98	.00	.00	.00	15774.	*	1	1625	198	.00	.00	.00	37770.
1	0810	99	.00	.00	.00	16249.	*	1	1630	199	.00	.00	.00	37594.
1	0815	100	.00	.00	.00	16731.	*	1	1635	200	.00	.00	.00	37415.
							*							

****

TOTAL RAINFALL = 6.40, TOTAL LOSS = 3.24, TOTAL EXCESS = 3.16

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	16.58-HR
+	(CFS)	(HR)					
			(CFS)				
+	40237.	14.42		37871.	19113.	19113.	19113.
			(INCHES)	1.304	1.819	1.819	1.819
			(AC-FT)	18779.	26195.	26195.	26195.

CUMULATIVE AREA = 270.00 SQ MI

1

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+					6-HOUR	24-HOUR	72-HOUR			
	HYDROGRAPH AT									
+		010	40237.	14.42	37871.	19113.	19113.	270.00		

CMC 0599602-G(B)-12
Rev. 0 ATTACH 2 (8 of 9)

CALC 0599602-G(B)-12
REV. 0 ATTACH 2 (9 OF 9)

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

CALC 0599602-G(B)-12
REV. 0 ATTACH 3 (1 OF 8)

Attachment 3

HRC-RAS File
Hydraulic Report

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                    HEC-RAS Version 2.0 April 1997
                    U.S. Army Corp of Engineers
                    Hydrologic Engineering Center
                      609 Second Street, Suite D
                      Davis, California 95616-4687
                           (916) 756-1104

     X     X  XXXXXX    XXXX        XXXX       XX      XXXX
     X     X  X        X    X       X   X     X  X    X
     X     X  X        X            X   X    X    X   X
     XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
     X     X  X        X            X  X     X    X        X
     X     X  X        X    X       X   X    X    X        X
     X     X  XXXXXX    XXXX        X    X   X    X   XXXXX

PROJECT DATA
Project Title: PFSF, PMF and 100-yr run
Project File : copy.prj
Run Date and Time: 2/7/99 1:27:22 PM

Project in English units

Project Description:
Private Fuel Storage Facility (PFSF), Flood levels



PLAN DATA

Plan Title: Natural flood
Plan File : c:\pfsf\ras\copy.p01

          Geometry Title: USGS 1:24000 map, natural topograph
          Geometry File : c:\pfsf\ras\copy.g01

          Flow Title    : PMF and 100-yr Q
          Flow File     : c:\pfsf\ras\copy.f01

Plan Summary Information:
Number of:  Cross Sections =    6    Mulitple Openings =    0
            Culverts       =    0    Inline Weirs      =    0
            Bridges        =    0

Computational Information
    Water surface calculation tolerance =  0.01
    Critical depth calculaton tolerance =  0.01
    Maximum number of interations       =  20
    Maximum difference tolerance        =  0.3
    Flow tolerance factor               =  0.001

Computational Flow Regime: Subcritical Flow
```

FLOW DATA

Flow Title: PMF and 100-yr Q
Flow File : c:\pfsf\ras\copy.f01

Flow Data (cfs)

River	Reach	RS	PMF	100-yr Q
Skull Valey	PFSF	9400	53000	2430

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Skull Valey	PFSF	PMF		Normal S = 0.0045
Skull Valey	PFSF	100-yr Q		Normal S = 0.0045

GEOMETRY DATA

Geometry Title: USGS 1:24000 map, natural topograph
Geometry File : c:\pfsf\ras\copy.g01

CROSS SECTION RIVER: Skull Valey
REACH: PFSF RS: 9400

INPUT
Description: Section D
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-1500	4510	0	4500	2400	4500	3300	4495	4500	4500
5800	4510								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-1500	.035	2400	.035	4500	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
2400	4500	3500	3500	.1	.3

CROSS SECTION OUTPUT Profile #PMF

			Left OB	Channel	Right OB
W.S. Elev (ft)	4500.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.92	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4501.43	Reach Len. (ft)	3500.00	3500.00	3500.00
Crit W.S. (ft)	4500.51	Flow Area (sq ft)	1253.81	6329.74	17.18
E.G. Slope (ft/ft)	0.007939	Area (sq ft)	1253.81	6329.74	17.18
Q Total (cfs)	53000.00	Flow (cfs)	3012.29	49961.43	26.28
Top Width (ft)	4643.96	Top Width (ft)	2477.12	2100.00	66.84
Vel Total (ft/s)	6.97	Avg. Vel. (ft/s)	2.40	7.89	1.53
Max Chl Dpth (ft)	5.51	Hydr. Depth (ft)	0.51	3.01	0.26
Conv. Total (cfs)	594832.3	Conv. (cfs)	33807.7	560729.7	294.9
Length Wtd. (ft)	3500.00	Wetted Per. (ft)	2477.13	2100.02	66.84
Min Ch El (ft)	4495.00	Shear (lb/sq ft)	0.25	1.49	0.13
Alpha	1.21	Stream Power (lb/ft s)	0.60	11.79	0.19
Frctn Loss (ft)	19.48	Cum Volume (acre-ft)	360.53	1430.64	88.46
C & E Loss (ft)	0.11	Cum SA (acres)	269.19	467.04	60.67

Warning - The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr Q

W.S. Elev (ft)	4496.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.39	Wt. n-Val.		0.035	
E.G. Elev (ft)	4496.91	Reach Len. (ft)	3500.00	3500.00	3500.00
Crit W.S. (ft)	4496.52	Flow Area (sq ft)		486.13	
E.G. Slope (ft/ft)	0.019962	Area (sq ft)		486.13	
Q Total (cfs)	2430.00	Flow (cfs)		2430.00	
Top Width (ft)	639.02	Top Width (ft)		639.02	
Vel Total (ft/s)	5.00	Avg. Vel. (ft/s)		5.00	
Max Chl Dpth (ft)	1.52	Hydr. Depth (ft)		0.76	
Conv. Total (cfs)	17199.0	Conv. (cfs)		17199.0	
Length Wtd. (ft)		Wetted Per. (ft)		639.03	
Min Ch El (ft)	4495.00	Shear (lb/sq ft)		0.95	
Alpha	1.00	Stream Power (lb/ft s)		4.74	
Frctn Loss (ft)		Cum Volume (acre-ft)	20.41	190.40	1.30
C & E Loss (ft)		Cum SA (acres)	39.42	277.00	5.82

Warning - The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Skull Valey
REACH: PFSF RS: 5900

INPUT
Description: Section C
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4490	2500	4480	4000	4480	6100	4473	7000	4474
7600	4474	8500	4480	9100	4490	9500	4500		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	6100	.035	7600	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
6100	7600	1400	1400	.1	.3

CROSS SECTION OUTPUT Profile #PMF

W.S. Elev (ft)	4477.40	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.55	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4477.95	Reach Len. (ft)	1400.00	1400.00	1400.00
Crit W.S. (ft)		Flow Area (sq ft)	2908.38	5554.98	868.69
E.G. Slope (ft/ft)	0.004117	Area (sq ft)	2908.38	5554.98	868.69
Q Total (cfs)	53000.00	Flow (cfs)	13407.62	36219.68	3372.70
Top Width (ft)	3331.49	Top Width (ft)	1321.00	1500.00	510.50
Vel Total (ft/s)	5.68	Avg. Vel. (ft/s)	4.61	6.52	3.88
Max Chl Dpth (ft)	4.40	Hydr. Depth (ft)	2.20	3.70	1.70
Conv. Total (cfs)	826041.0	Conv. (cfs)	208966.9	564508.4	52565.7
Length Wtd. (ft)	1400.00	Wetted Per. (ft)	1321.00	1500.00	510.51
Min Ch El (ft)	4473.00	Shear (lb/sq ft)	0.57	0.95	0.44
Alpha	1.10	Stream Power (lb/ft s)	2.61	6.21	1.70
Frctn Loss (ft)	8.88	Cum Volume (acre-ft)	193.32	953.18	52.87
C & E Loss (ft)	0.05	Cum SA (acres)	116.60	322.41	37.47

Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less

than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr Q

			Left OB	Channel	Right OB
W.S. Elev (ft)	4474.39	Element			
Vel Head (ft)	0.05	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4474.44	Reach Len. (ft)	1400.00	1400.00	1400.00
Crit W.S. (ft)	4474.06	Flow Area (sq ft)	289.26	1033.01	11.33
E.G. Slope (ft/ft)	0.003051	Area (sq ft)	289.26	1033.01	11.33
Q Total (cfs)	2430.00	Flow (cfs)	531.90	1889.18	8.91
Top Width (ft)	1974.90	Top Width (ft)	416.60	1500.00	58.30
Vel Total (ft/s)	1.82	Avg. Vel. (ft/s)	1.84	1.83	0.79
Max Chl Dpth (ft)	1.39	Hydr. Depth (ft)	0.69	0.69	0.19
Conv. Total (cfs)	43991.7	Conv. (cfs)	9629.3	34201.0	161.4
Length Wtd. (ft)	1400.00	Wetted Per. (ft)	416.60	1500.00	58.30
Min Ch El (ft)	4473.00	Shear (lb/sq ft)	0.13	0.13	0.04
Alpha	1.01	Stream Power (lb/ft s)	0.24	0.24	0.03
Frctn Loss (ft)	8.73	Cum Volume (acre-ft)	8.79	129.37	0.84
C & E Loss (ft)	0.02	Cum SA (acres)	22.68	191.07	3.47

Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Skull Valley
REACH: PFSF RS: 4500

INPUT
Description: Section A3
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4480	2000	4470	5300	4465	6500	4465	7000	4470
7900	4480								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	5300	.035	6500	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5300	6500	1700	1700	.1	.3

CROSS SECTION OUTPUT Profile #PMF

			Left OB	Channel	Right OB
W.S. Elev (ft)	4467.99	Element			
Vel Head (ft)	1.03	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4469.02	Reach Len. (ft)	1700.00	1700.00	1700.00
Crit W.S. (ft)	4467.99	Flow Area (sq ft)	2944.92	3584.77	446.20
E.G. Slope (ft/ft)	0.011067	Area (sq ft)	2944.92	3584.77	446.20
Q Total (cfs)	53000.00	Flow (cfs)	17186.53	33209.54	2603.93
Top Width (ft)	3470.35	Top Width (ft)	1971.62	1200.00	298.73
Vel Total (ft/s)	7.60	Avg. Vel. (ft/s)	5.84	9.26	5.84
Max Chl Dpth (ft)	2.99	Hydr. Depth (ft)	1.49	2.99	1.49
Conv. Total (cfs)	503795.0	Conv. (cfs)	163367.7	315675.5	24751.9
Length Wtd. (ft)	1700.00	Wetted Per. (ft)	1971.62	1200.00	298.75
Min Ch El (ft)	4465.00	Shear (lb/sq ft)	1.03	2.06	1.03
Alpha	1.15	Stream Power (lb/ft s)	6.02	19.12	6.02
Frctn Loss (ft)	11.06	Cum Volume (acre-ft)	99.25	806.31	31.74
C & E Loss (ft)	0.15	Cum SA (acres)	63.69	279.03	24.47

Warning - The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr Q

W.S. Elev (ft)	4465.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4465.70	Reach Len. (ft)	1700.00	1700.00	1700.00
Crit W.S. (ft)	4465.49	Flow Area (sq ft)	78.36	584.77	11.87
E.G. Slope (ft/ft)	0.020753	Area (sq ft)	78.36	584.77	11.87
Q Total (cfs)	2430.00	Flow (cfs)	186.97	2214.71	28.33
Top Width (ft)	1570.35	Top Width (ft)	321.62	1200.00	48.73
Vel Total (ft/s)	3.60	Avg. Vel. (ft/s)	2.39	3.79	2.39
Max Chl Dpth (ft)	0.49	Hydr. Depth (ft)	0.24	0.49	0.24
Conv. Total (cfs)	16868.1	Conv. (cfs)	1297.8	15373.6	196.6
Length Wtd. (ft)	1700.00	Wetted Per. (ft)	321.62	1200.00	48.73
Min Ch El (ft)	4465.00	Shear (lb/sq ft)	0.32	0.63	0.32
Alpha	1.05	Stream Power (lb/ft s)	0.75	2.39	0.75
Frctn Loss (ft)	11.31	Cum Volume (acre-ft)	2.89	103.37	0.47
C & E Loss (ft)	0.04	Cum SA (acres)	10.82	147.68	1.75

Warning - The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION RIVER: Skull Valey
REACH: PFSF RS: 2800

INPUT
Description: Section A2
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4470	2400	4460	4500	4450	6300	4455	6800	4460
8200	4470								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	2400	.035	6800	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
2400	6800	1500	1500	1500	.1 .3

CROSS SECTION OUTPUT Profile #PMF

W.S. Elev (ft)	4455.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.52	Wt. n-Val.		0.035	
E.G. Elev (ft)	4456.21	Reach Len. (ft)	1500.00	1500.00	1500.00
Crit W.S. (ft)		Flow Area (sq ft)		9184.57	
E.G. Slope (ft/ft)	0.004278	Area (sq ft)		9184.57	

Q Total (cfs)	53000.00	Flow (cfs)		53000.00	
Top Width (ft)	3065.85	Top Width (ft)		3065.85	
Vel Total (ft/s)	5.77	Avg. Vel. (ft/s)		5.77	
Max Chl Dpth (ft)	5.70	Hydr. Depth (ft)		3.00	
Conv. Total (cfs)	810318.5	Conv. (cfs)		810318.5	
Length Wtd. (ft)	1500.00	Wetted Per. (ft)		3065.87	
Min Ch El (ft)	4450.00	Shear (lb/sq ft)		0.80	
Alpha	1.00	Stream Power (lb/ft s)		4.62	
Frctn Loss (ft)	6.54	Cum Volume (acre-ft)	41.79	557.14	23.04
C & E Loss (ft)	0.02	Cum SA (acres)	25.22	195.79	18.64

Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr Q

W.S. Elev (ft)	4451.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.		0.035	
E.G. Elev (ft)	4451.99	Reach Len. (ft)	1500.00	1500.00	1500.00
Crit W.S. (ft)		Flow Area (sq ft)		1038.28	
E.G. Slope (ft/ft)	0.003234	Area (sq ft)		1038.28	
Q Total (cfs)	2430.00	Flow (cfs)		2430.00	
Top Width (ft)	1087.95	Top Width (ft)		1087.95	
Vel Total (ft/s)	2.34	Avg. Vel. (ft/s)		2.34	
Max Chl Dpth (ft)	1.91	Hydr. Depth (ft)		0.95	
Conv. Total (cfs)	42727.9	Conv. (cfs)		42727.9	
Length Wtd. (ft)	1500.00	Wetted Per. (ft)		1087.96	
Min Ch El (ft)	4450.00	Shear (lb/sq ft)		0.19	
Alpha	1.00	Stream Power (lb/ft s)		0.45	
Frctn Loss (ft)	5.60	Cum Volume (acre-ft)	1.36	71.70	0.24
C & E Loss (ft)	0.00	Cum SA (acres)	4.54	103.03	0.80

Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Skull Valley
REACH: PFSF RS: 1300

INPUT
Description: Section A1
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4460	2400	4450	4500	4445	6300	4447	6900	4450
7700	4460								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	2400	.035	6300	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
2400	6300	1300	1300	.1	.3

CROSS SECTION OUTPUT Profile #PMF

W.S. Elev (ft)	4449.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.45	Wt. n-Val.		0.035	0.035
E.G. Elev (ft)	4449.66	Reach Len. (ft)	1300.00	1300.00	1300.00
Crit W.S. (ft)		Flow Area (sq ft)		9491.21	487.31
E.G. Slope (ft/ft)	0.004435	Area (sq ft)		9491.21	487.31
Q Total (cfs)	53000.00	Flow (cfs)		51528.43	1471.57
Top Width (ft)	4008.66	Top Width (ft)		3567.16	441.50
Vel Total (ft/s)	5.31	Avg. Vel. (ft/s)		5.43	3.02
Max Chl Dpth (ft)	4.21	Hydr. Depth (ft)		2.66	1.10
Conv. Total (cfs)	795811.3	Conv. (cfs)		773715.1	22096.1
Length Wtd. (ft)	1300.00	Wetted Per. (ft)		3567.16	441.51
Min Ch El (ft)	4445.00	Shear (lb/sq ft)		0.74	0.31
Alpha	1.02	Stream Power (lb/ft s)		4.00	0.92
Frctn Loss (ft)	5.80	Cum Volume (acre-ft)	41.79	235.58	14.65
C & E Loss (ft)	0.01	Cum SA (acres)	25.22	81.58	11.04

Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr Q

W.S. Elev (ft)	4446.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.035	
E.G. Elev (ft)	4446.39	Reach Len. (ft)	1300.00	1300.00	1300.00
Crit W.S. (ft)	4445.96	Flow Area (sq ft)		1147.98	
E.G. Slope (ft/ft)	0.004331	Area (sq ft)		1147.98	
Q Total (cfs)	2430.00	Flow (cfs)		2430.00	
Top Width (ft)	1740.88	Top Width (ft)		1740.88	
Vel Total (ft/s)	2.12	Avg. Vel. (ft/s)		2.12	
Max Chl Dpth (ft)	1.32	Hydr. Depth (ft)		0.66	
Conv. Total (cfs)	36923.5	Conv. (cfs)		36923.5	
Length Wtd. (ft)	1300.00	Wetted Per. (ft)		1740.88	
Min Ch El (ft)	4445.00	Shear (lb/sq ft)		0.18	
Alpha	1.00	Stream Power (lb/ft s)		0.38	
Frctn Loss (ft)	5.73	Cum Volume (acre-ft)	1.36	34.06	0.24
C & E Loss (ft)	0.00	Cum SA (acres)	4.54	54.33	0.80

Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Skull Valey
REACH: PFSF RS: 0

INPUT
Description: Section A
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4450	5100	4440	7000	4440	7900	4450	8700	4470

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	5100	.035	7000	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5100	7000	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PMF

W.S. Elev (ft)	4443.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.53	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4443.84	Reach Len. (ft)			
Crit W.S. (ft)	4442.56	Flow Area (sq ft)	2800.50	6296.53	494.21
E.G. Slope (ft/ft)	0.004500	Area (sq ft)	2800.50	6296.53	494.21
Q Total (cfs)	53000.00	Flow (cfs)	11168.44	39860.73	1970.82
Top Width (ft)	3888.38	Top Width (ft)	1690.12	1900.00	298.26
Vel Total (ft/s)	5.53	Avg. Vel. (ft/s)	3.99	6.33	3.99
Max Chl Dpth (ft)	3.31	Hydr. Depth (ft)	1.66	3.31	1.66
Conv. Total (cfs)	790055.8	Conv. (cfs)	166484.7	594192.6	29378.5
Length Wtd. (ft)		Wetted Per. (ft)	1690.13	1900.00	298.28
Min Ch El (ft)	4440.00	Shear (lb/sq ft)	0.47	0.93	0.47
Alpha	1.12	Stream Power (lb/ft s)	1.86	5.89	1.86
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #100-yr Q

W.S. Elev (ft)	4440.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4440.66	Reach Len. (ft)			
Crit W.S. (ft)	4440.36	Flow Area (sq ft)	90.94	1134.62	16.05
E.G. Slope (ft/ft)	0.004509	Area (sq ft)	90.94	1134.62	16.05
Q Total (cfs)	2430.00	Flow (cfs)	115.81	2293.75	20.44
Top Width (ft)	2258.30	Top Width (ft)	304.56	1900.00	53.75

CMC 0599602-G(B)-12
Rev 0 ATTACH 3 (8 OF 8)

Vel Total (ft/s)	1.96	Avg. Vel. (ft/s)	1.27	2.02	1.27
Max Chl Dpth (ft)	0.60	Hydr. Depth (ft)	0.30	0.60	0.30
Conv. Total (cfs)	36188.2	Conv. (cfs)	1724.7	34159.2	304.3
Length Wtd. (ft)		Wetted Per. (ft)	304.56	1900.00	53.75
Min Ch El (ft)	4440.00	Shear (lb/sq ft)	0.08	0.17	0.08
Alpha	1.03	Stream Power (lb/ft s)	0.11	0.34	0.11
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Skull Valey

Reach	River Sta.	n1	n2	n3
PFSF	9400	.035	.035	.035
PFSF	5900	.035	.035	.035
PFSF	4500	.035	.035	.035
PFSF	2800	.035	.035	.035
PFSF	1300	.035	.035	.035
PFSF	0	.035	.035	.035

SUMMARY OF REACH LENGTHS

River: Skull Valey

Reach	River Sta.	Left	Channel	Right
PFSF	9400	3500	3500	3500
PFSF	5900	1400	1400	1400
PFSF	4500	1700	1700	1700
PFSF	2800	1500	1500	1500
PFSF	1300	1300	1300	1300
PFSF	0	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Skull Valey

Reach	River Sta.	Contr.	Expan.
PFSF	9400	.1	.3
PFSF	5900	.1	.3
PFSF	4500	.1	.3
PFSF	2800	.1	.3
PFSF	1300	.1	.3
PFSF	0	.1	.3