STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION TITLE PAGE

CLIENT & PROJECT: Private Fuel Storage, LLC-Private Fuel Storage Facility				PAGE 1 OF 24 Plus 26 attached pages
CALCULATION TITLE (Indicative of Objective): PFSF Flood Analysis at 3-mile-long Portion of Rail Spur				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)	16		345T

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
Ven Nan Zeng 03/03/99 Ven Nan Zeng	George H.C. Liang 03/09/99 George H.C. Liang	George H.C. Liang 03/09/99 George H.C. Liang	Original Issue		☐	☒
					☐	☐
					☐	☐
					☐	☐
					☐	☐

DISTRIBUTION

GROUP	NAME & LOCATION	COPY SENT	GROUP	NAME & LOCATION	COPY SENT
Records Mgmt Fire File	Records Center	☐			☐
		☒			☐
		☒			☐
		☐			☐

RECORD OF CHANGES

Rev No.	Description of Changes	Pages Revised	Pages Added	Pages Replaced
0	Original Issue	N/A	N/A	N/A

CALCULATION IDENTIFICATION NUMBER			REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP G(B)	CALCULATION NUMBER 16	OPTIONAL TASK CODE N/A	PAGE 3 of 24

TABLE OF CONTENTS

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP G(B)	CALCULATION NUMBER 16	OPTIONAL TASK CODE N/A	PAGE 4 of 24

1, OBJECTIVES

The objective of the calculation is to determine water surface elevation in the flood way crossing the 3-mile portion of the proposed rail spur. The 100-year and the PMF (Probable Maximum Flow) flood events are evaluated based on the existing natural ground topography.

2, REFERENCES

1. 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.

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

3. "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.

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

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

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

7. 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.

8. "Engineering Hydrology" by Victor M. Ponce.

9. USGS topographic maps (1:24,000 scale):
   (1) Hickman Knolls
   (2) Tabbys Peak
   (3) Tabby's Peak, SW
   (4) Tabby's Peak, SE

10. "Time of Concentraction vs Drainage Area for Mountain Watershed in Utah", U.S. Corps of Engineers (Provided by Water Resource Dept., State of Utah).

3, DESCRIPTION

The estimation of the flood level elevation involves two steps:

(1) Perform hydrological analysis to determine PMF and the 100-year flow.
(2) Perform hydraulic analysis to calculate water surface elevation of the flows.

3.1, Determine Probable Maximum Flow (PMF)

The first step to determine PMF is to calculate Probable Maximum Precipitation (PMP) using data and procedures provided in Reference 1. The PMP is then input to the HEC-1 program (Reference 6) to calculate the runoff hydrograph. The peak value of the hydrograph is taken as the PMF.

The HEC-1 input options are as follows:

(1) The Soil Conservation Service (SCS) Curve Number 70 is assumed to account for the infiltration and other precipitation losses.
(2) Conversion from precipitation excess (precipitation - infiltration and other losses) to runoff hydrograph is accomplished by using SCS dimensionless unit hydrograph method (a HEC-1 input option). The unit hydrograph for the 64 square mile basin is synthesized based on the dimensionless hydrograph through the "lag time" parameter. In this calculation, the lag time parameter is approximated by 0.6 times Tc, the concentration time.
(3) The concentration time is estimated in Section 5.

3.2, Determine 100-year flow

The 100-year flow is the design basis for the railroad embankment, culverts, or the trestles.

Two methods are used to estimate the 100-year flow:

(1) FHWA method - FHWA (Federal Highway Administration) has developed a method to estimate peak runoff based on hydrological analysis of many small watersheds. The step-by-step procedure of this method is described in Ref. 2.

(2) USGS Method - The USGS has also developed flood-regionalization procedure to predict the magnitude of peak runoff. The 50 states are divided into several "hydrophysiographic" zones. Within each zone, regression equations are developed to compute peak runoff for various return periods of flood.

The larger flow calculated from the 2 methods is taken as the 100-year flow.

3.3, Water Surface Elevation

Water surface elevation is calculated using HEC-RAS program (References. 4 and 5). The geometry of the flood way channel is based on the USGS topographic maps (Ref. 9). Only the targeted portion of the flood way that runs through the proposed 3-mile-long railroad is calculated.

3.4, Computer Programs

As mentioned above, the HEC-1 Program is used to perform hydrological analysis for the PMF. The HEC-RAS program is used to calculate water surface for both PMF and 100-year flood. The two programs have been test and qualified by Stone & Webster (References 4, 5, 6, and 7) for used in the QA Category 1 analysis.

4, DRAINAGE BASIN

The drainage area in which the runoff concentrates to the proposed 3-mile railroad is outlined in Figure 1. The area is about 64 square miles and the centroid of the area is located at:

Latitude: 40°21'
Longitude: 112°52'

The distance from the farthest point of the basin boundary to the railroad is about 9 miles.

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP G(B)	CALCULATION NUMBER 16	OPTIONAL TASK CODE N/A	PAGE 7 of 24

Top of Fig 1

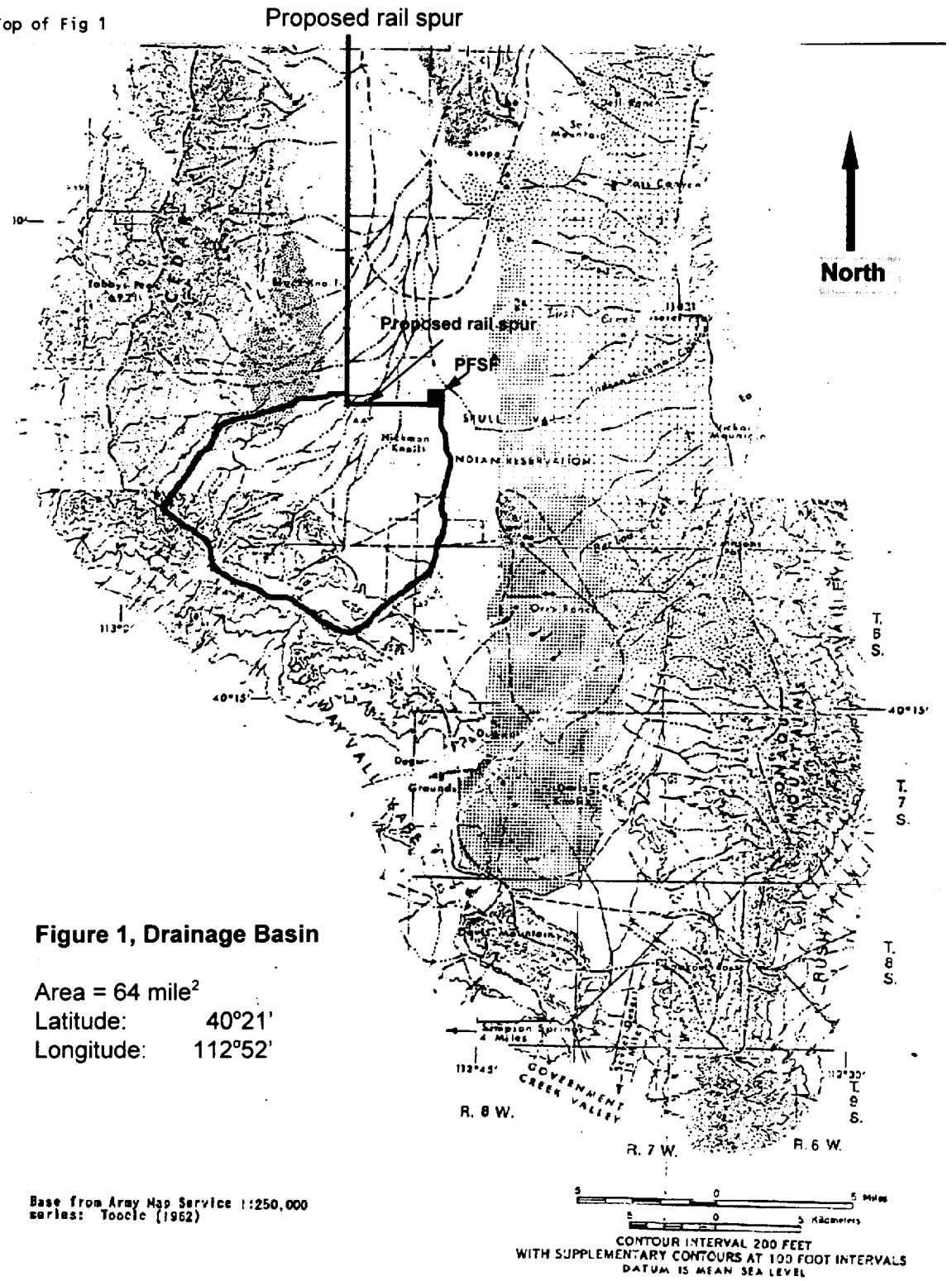


Figure 1, Drainage Basin

Area = 64 mile^2
Latitude: 40°21'
Longitude: 112°52'

End of Figure 1

5, CONCENTRATION TIME

The concentration time is estimated as follows:

(1) Using Hathaway Equation (Ref. 8), the concentration time is calculated in Table 1. The 'n' term in the equation is to account for the soil types.

Tc = 4.26 hours

Table 1

PFSF, Calculate Concentration Time Using Hathaway Equation

Hathaway Formula: $Tc=0.0606 \times (L \times n)^{0.467} / S^{0.234}$, n is the roughness for various types of surface
L is in kilo-meter, s=slope, m/m
Tc is in hour.

	From Elev 1 ft	To Elev 2 ft	L mile	L ft	L Km	S	n	Tc hour	
	6220	4900	4.8	25344	7.7	0.052083	0.6	2.48	Timber land
	4900	4550	4.0	21120	6.4	0.016572	0.2	1.78	Pasture
Total			**8.8**					**4.26**	

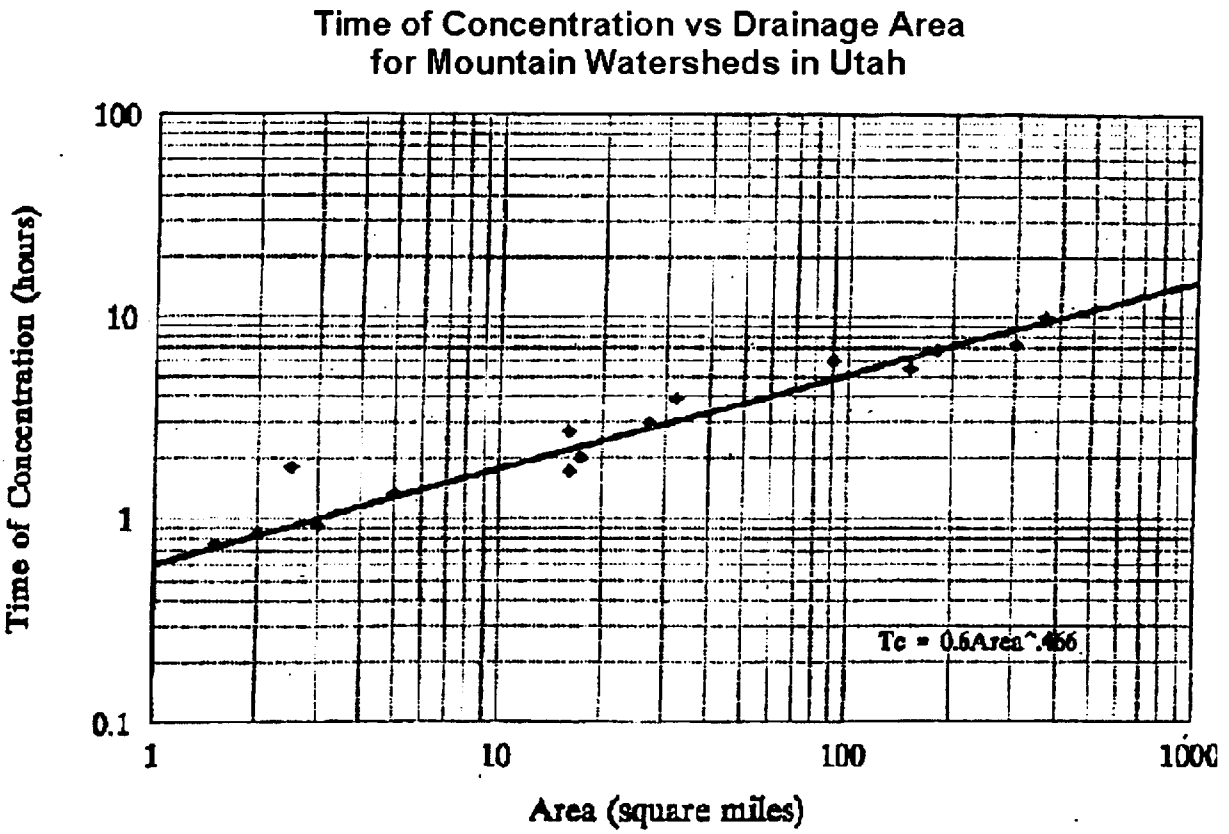
(2) The second method uses the regression equation (Figure 2) developed by U.S. Corps of Engineers (Ref. 10).

$Tc = 0.6 \times Area^{0.466}$, Area is in $Mile^2$, Tc in hours.
$Tc = 0.6 \times Area^{0.466} = 0.6 \times 64^{0.466} = 4.17$ hours

(3) Result of Concentration Time : **Tc = 4.17 hours**

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP G(B)	CALCULATION NUMBER 16	OPTIONAL TASK CODE N/A	PAGE 9 of 24

Figure 2



6, PMF

As described in Ref. 1, two possible types of PMF may occur in the basin: (1) General Storm PMF - A combined effect of the convergence precipitation and the orographic precipitation. The convergence precipitation is caused by cooling of the moist air as the air current is lifted. The orogoaphic precipitation is caused by lifting of moist horizontal air current over the mountain range or other natural barrier. (2) Local PMF - While the general storm PMF is usually a major concern, precipitation during a summer thunder storm having the greatest potential rainfall intensity and short durations may produce a larger runoff. This type of runoff is termed as local storm PMF in Reference 1.

6.1, General Storm PMF

Table 2 computes general storm PMP for the 6, 12, 18, 24, 48, and 72 hours in the item designates as "C, Total PMP", and the results are plotted in Figure 3. The values of the 3-hour interval precipitation are read from the figure and listed in Table 3 with the 6 calculated PMP's.

Table 3 also calculates 3-hour incremental precipitation. The 4-18 hour incremental, which is equal to the sum of the 3-hour incremental within the 18 hour, are calculated to be 7.20, 2.47, 1.66, and 0.87 inches. It indicates that the magnitude of the 4 18-hour increments are in the descending order.

For the HEC-1 input, the 4 18-hour incremental is re-distributed in the 3-1-2-4 sequence. The resulting HEC-1 input data is listed in the last column of Table 3.

The program input data and output of HEC-1 is included as Attachment 1. The result indicates that peak runoff hydrograph is

$$Q_{\text{general PMF}} = 20{,}972 \text{ cfs.}$$

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

PFSF, General Storm PMP Computation

Based on NOAA Report No. 49 "Probable Maximum Precipitation Estimates,Basin Drainages, Colorado River and Great Basin Drainages".

Drainage: Floodway at 3-mile-long Rail Crossing **Latitude: 40°21'** **Month: August**

Area (mi^2): 64 mi^2 **Longitude: 112°52'**

				Duration (hrs)				
		6	12	18	24	48	72	
A. Convergence PMP								
1. Drainage average value	Fig 2.5 - 2.16	10.5						in
2. Reduction for barrier elev	Fig 2.18	55						%
3. Rarrier-elev reduced PMP	1 x 2	5.8						in
4. Duration variation	Fig 2.25 - 2.27, & Table 2.7	68	85	94	100	116	123	%
5. Convergence PMP for indicated duration	3 x 4	3.9	4.9	5.4	5.8	6.7	7.1	in
6. Incremental 10 mi2 PMP	Successive - of 5	3.9	1.0	0.5	0.3	0.9	0.4	in
7. Area reduction	Fig 2.28 & 2.29	86	95.5	97.5	99	100	100	%
8. Areally reduced PMP	6 x 7	3.4	1.0	0.5	0.3	0.9	0.4	in
9. Drainage average PMP	Accu 8	3.4	4.3	4.8	5.2	6.1	6.5	in
B. Orographic PMP								
1. Drainage average orographic index	Fig 3.11a - d	3.2						in
2. Areal reduction	Fig 3.20	95						%
3. Adjustment for month	Fig 3.12 - 3.17	100						%
4. Arealy & seasonally adjustmented PMP	1 x 2 x 3	3.0						in
				Duration (hrs)				
		6	12	18	24	48	72	
5. Durational variation	Table 3.9	29.5	56.5	79.5	100	159.5	188	%
6. Orographic PMP for given duration	4 x 5	0.9	1.7	2.4	3.0	4.8	5.7	in
C. Total PMP								
1. A9+B6		**4.2**	**6.0**	**7.2**	**8.2**	**10.9**	**12.2**	in

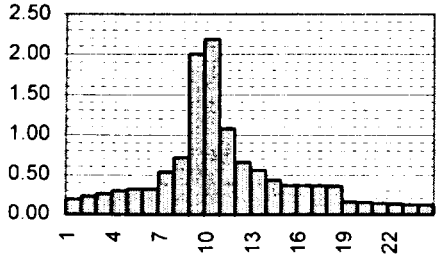
2. PMP for other duration from smooth curve fitted to plot of computed data

3. Compare with local-storm PMP

Table 3, General Storm, incremental precipitation for HEC-1 input

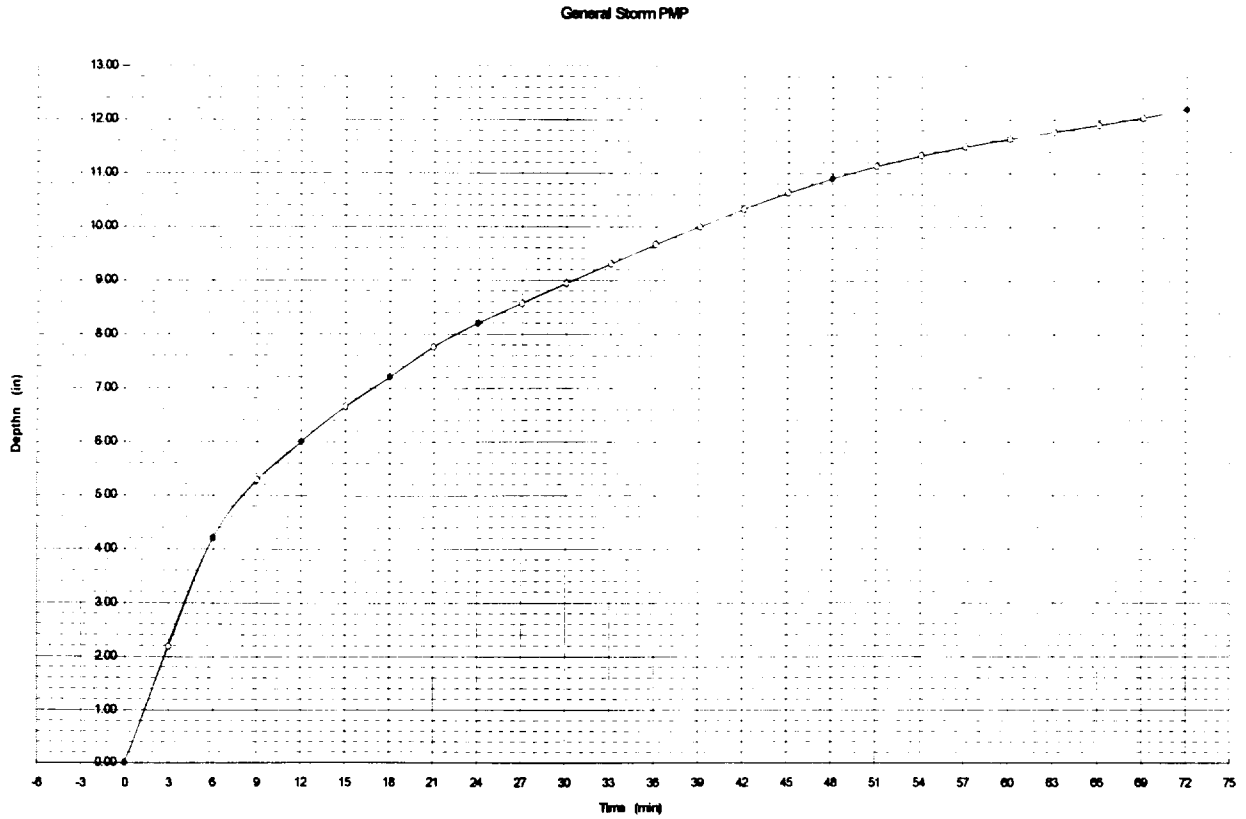
Determination of 3 hour Precipitation, Precipitation Incremental and Hyetograph

Time Hour	Precipitation in		3-hour Incremental in	18-hour Incremental in		HEC-1 input Hyetograph in
0	0.00					
3	2.19	1	2.19		3	0.20
6	**4.20**		2.01			0.23
9	5.28		1.08			0.26
12	**6.00**		0.72			0.31
15	6.66		0.66			0.33
18	**7.20**		0.54	7.20		0.33
21	7.76	2	0.56		1	0.54
24	**8.20**		0.44			0.72
27	8.57		0.37			2.01
30	8.94		0.37			2.19
33	9.31		0.37			1.08
36	9.67		0.36	2.47		0.66
39	10.00	3	0.33		2	0.56
42	10.33		0.33			0.44
45	10.64		0.31			0.37
48	**10.90**		0.26			0.37
51	11.14		0.23			0.37
54	11.33		0.20	1.66		0.36
57	11.50	4	0.16		4	0.16
60	11.64		0.15			0.16
63	11.77		0.13			0.15
66	11.90		0.13			0.14
69	12.04		0.14			0.13
72	**12.20**		0.16	0.87		0.13



CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP G(B)	CALCULATION NUMBER 16	OPTIONAL TASK CODE N/A	PAGE 13 of 24

Figure 3



6.2, Local PMF

Table 4 computes local storm PMP for the ¼, 2/4, ¾, 1, 2, 3, 4, 5, and 6 hours in the item designates as "7, Area reduced PMP". The 9 calculated values are plotted in Figure 4. The 15 minute precipitation depths are read from the curve and listed in Table 5.

Table 5 also calculates the 15-min and the 1-hour increment. The magnitudes of the incremental precipitations are in the descending order.

For the HEC-1 input, the 6 1-hour increments is re-distributed in the order of 5-3-1-2-4-6 sequence in the last column.

The program input data and output of HEC-1 is shown in Attachment 2. The result indicates that peak runoff hydrograph is

$$Q_{\text{Local PMF}} = 68{,}500 \text{ cfs.}$$

Table 4

PFSF, Local Storm PMP Computation

Based on NOAA Report No. 49 "Probable Maximum Precipitation Estimates, Colorado River and Great Basin Drainages"

Drainage: Floodway at 3-mile-long rail crossing **Latitude: 40°21'**
Area (mi^2): 64 mi^2 **Longitude: 112°52'** **Minimum Elev: 4470 ft**

1. Average 1-hr 1 mi2 PMP for drainge	Fig 4.5, Page 115	9.8 in								
2a. Reduction for elev										
No adjustment up to 5000'										
5% decrease/1000' above 5000'		100.0 %								
2b. 1 x 2a		9.8 in								
3. Average 6/1 hour ratio for drainage	Fig 4.7 - Page 118	1.3								
					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 120	74	89	95	100	114	121	125	128	130 %
5. 1-mi2 PMP for indicated durations	2b x 4	7.3	8.7	9.3	9.8	11.2	11.9	12.3	12.5	12.7 in
6. Areal reduction	Fig 4.9, Page 123	58.0	65.0	68.0	70.0	74.0	76.0	77	79	80 %
7. Area reduced PMP	5 x 6	4.2	5.7	6.3	6.9	8.3	9.0	9.4	9.9	10.2 in
8. Incremental PMP	Success (-) in 7									
	15 min increments				6.9	1.4	0.7	0.4	0.5	0.3 in
		4.2	1.5	0.7	0.5					

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP G(B)	CALCULATION NUMBER 16	OPTIONAL TASK CODE N/A	PAGE 15 of 24

Table 5, Local thunder Storm, incremental precipitation for HEC-1 input

Determination of 15 min Precipitation, Precipitation Incremental and Hyetograph

Time Hour	Precipitation in		15-min Increment in	1-hour Increment in		5-3-1-2-4-6 HEC-1 Hyetograph in
0	0					
0.25	**4.20**	**1**	4.20		**5**	0.10
0.50	**5.70**		1.50			0.12
0.75	**6.30**		0.60			0.13
1.00	**6.90**		0.60	6.90		0.15
1.25	7.30	**2**	0.40		**3**	0.14
1.50	7.65		0.35			0.16
1.75	8.00		0.35			0.17
2.00	**8.30**		0.30	1.40		0.23
2.25	8.53	**3**	0.23		**1**	0.60
2.50	8.70		0.17			1.50
2.75	8.86		0.16			4.20
3.00	**9.00**		0.14	0.70		0.60
3.25	9.12	**4**	0.12		**2**	0.40
3.50	9.20		0.08			0.35
3.75	9.31		0.11			0.35
4.00	**9.40**		0.09	0.40		0.30
4.25	9.50	**5**	0.10		**4**	0.12
4.50	9.65		0.15			0.11
4.75	9.77		0.12			0.09
5.00	**9.90**		0.13	0.50		0.08
5.25	9.97	**6**	0.07		**6**	0.09
5.50	10.06		0.09			0.09
5.75	10.11		0.05			0.07
6.00	**10.20**		0.09	0.30		0.05

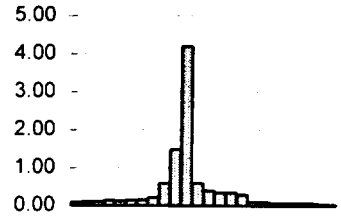
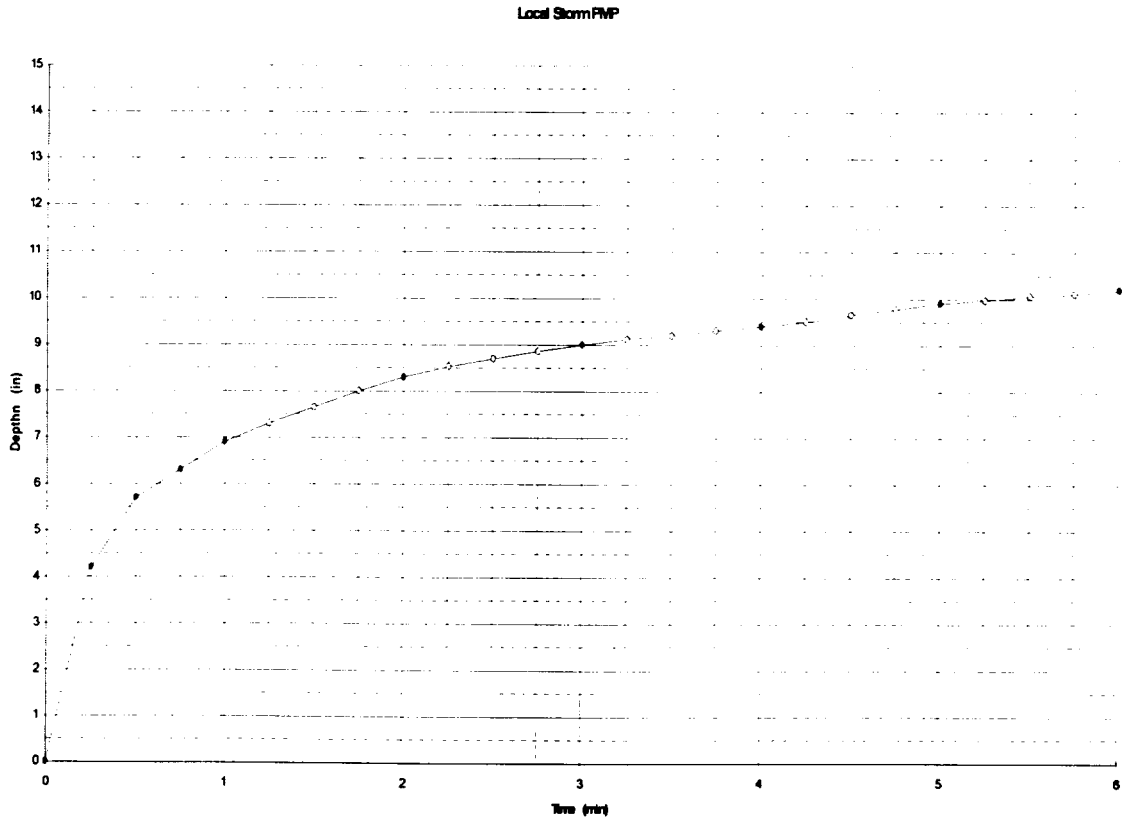


Figure 4



6.3, Result of PMF

As calculated in Sections 6.1 and 6.2,

$$Q_{\text{Local Storm PMF}} = 68{,}500 \text{ cfs.}$$
$$Q_{\text{General Storm PMF}} = 20{,}972 \text{ cfs.}$$

Since peak runoff results caused by a local thunder storm is larger than that of a general storm, the PMF is determined to be

$$\mathbf{Q_{PMF} = 68{,}500 \text{ cfs.}}$$

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP G(B)	CALCULATION NUMBER 16	OPTIONAL TASK CODE N/A	PAGE 17 of 24

7, 100-YEAR FLOW

Methods to estimate Q_{100} were described in Section 3. As calculated in Table 6,

Q100 = 1,400 cfs

Table 6, Calculation of 100-year flow using FHWA and USGS methods

PFSF

Determination of the 100-year Flow

FHWA Method

1	Area=	64 sq mi	
	Latitute=	40°21'	
	Longitude=	112°52'	
2	**Probable Maximum Runoff Peak Qp(max)**		
	log(Area)=	1.81	
	Exp=	5.28	
	Qp(max)=	190806.8 cfs	Probable Maximum runoff peak
3	**Hydrophusiographic Parameters**		
3a	R=	16	Iso-irodent factorAppendix C-49
3b	DH=	1630 ft	Elevation different, 6100-4470
3c	S=	0	Water storage
3d	Zone	17	Hydrophysiographic zone, Appendix B-49
3e	L=	8.33 miles	Length of main channel
3f	P60=	1 inch	10-year, 60-min rainfall, Appendix D-49
3g	LL=	65 miles	Cumulative channel length
3h	P10=	3.29 inch	10-year, 10-min rainfall intensity, Appendix E-49
4	**10-year Runoff q10**		
	Q10=	699 cfs	3 parameter equation
	Q10=	543 cfs	5 parameter equation
	Q10=	433 cfs	7 parameter equation
5	**Skip**		
6	Q100=	1390.6	3 parameter equation
	Q100=	1073.5	5 parameter equation
	Q100=	849.1	7 parameter equation

USGS Method

$Q100 = 68.1 \times Area^{0.63}$

A= 64.0 mi^2

Q100= 935.5 cfs

Conclusion **Q100=1400 cfs**

8, WATER SURFACE ELEVATION

Water surface elevations of the PMF flood and the 100-year flood are calculated using HEC-RAS program (Ref. 4). The location of the 4 cross-sections, A, B, C, and D, are marked on Figure 9. The geometry of the cross-sections were based on the USGS topographic maps (1/24,000 scale) (Ref. 9).

The result of the water surface elevation is listed in Table 7. Plots of the flood limit is shown in Figure 9, and water levels in the 4 cross sections are shown in Figures 5-8.

Table 7, Summary of HEC-RAS Result

Profile Output Table - Standard Table 1
HEC-RAS Plan: Nature River: PFSF 3mile Rail Reach: West

Rivers = 1
Hydraulic Reaches = 1
River Stations = 8
Plans = 1
Profiles = 2

Reach	River Sta	Q Total (cfs)	W.S. Elev (ft)	Vel Chnl (ft/s)	Flow Area R (sq ft)	Top Width (ft)	Froude # Chl
West Section A	9000	68500.00	4521.18	4.29	194.51	13836.12	0.70
West	9000	1400.00	4520.33	0.32	14.94	13520.86	0.10
West Section B	5000	68500.00	4481.17	5.17	407.19	11973.78	0.84
West	5000	1400.00	4480.10	1.29	2.86	11173.24	0.73
West Section C	2000	68500.00	4461.87	4.01	957.25	10092.58	0.52
West	2000	1400.00	4460.16	1.03	6.80	8725.78	0.46
West Section D	0	68500.00	4453.68	4.18		8776.07	0.54
West	0	1400.00	4450.45	1.51		2285.89	0.42

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP G(B)	CALCULATION NUMBER 16	OPTIONAL TASK CODE N/A	PAGE 19 of 24

Figure 5

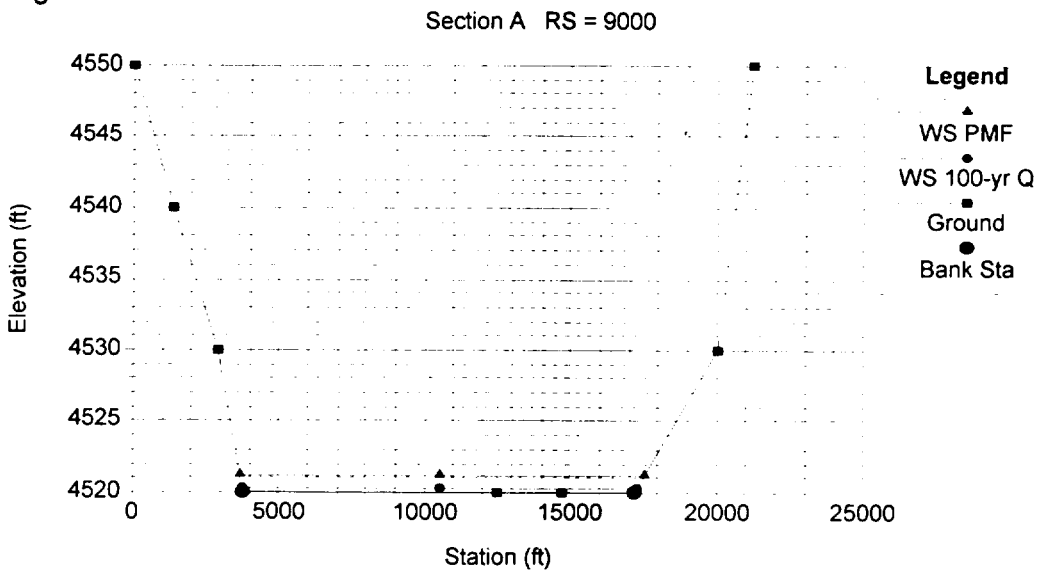
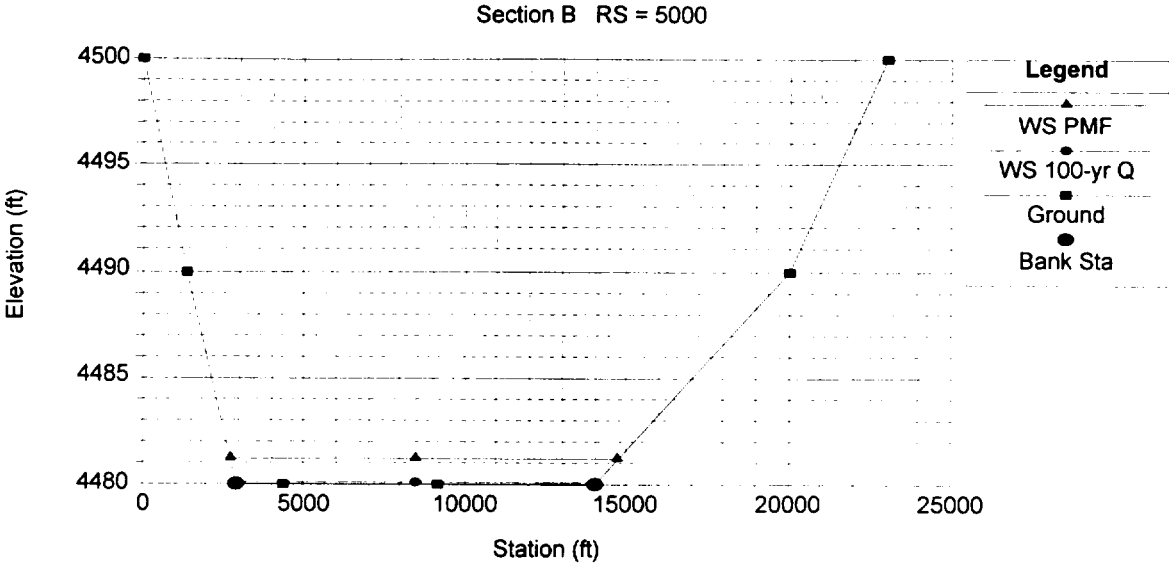


Figure 6



CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP G(B)	CALCULATION NUMBER 16	OPTIONAL TASK CODE N/A	PAGE 20 of 24

Figure 7

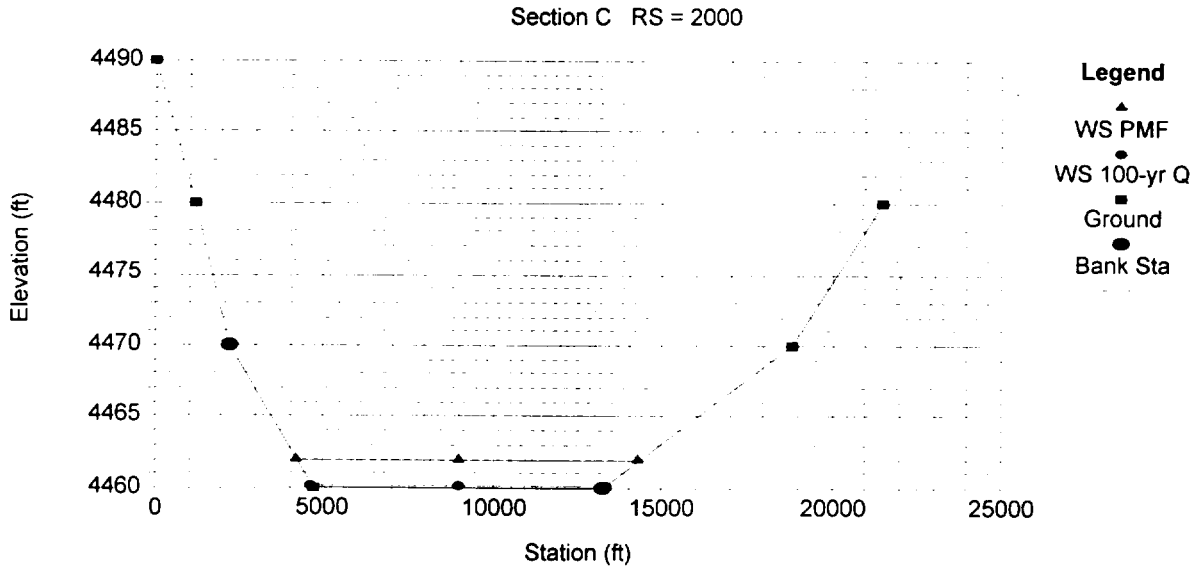
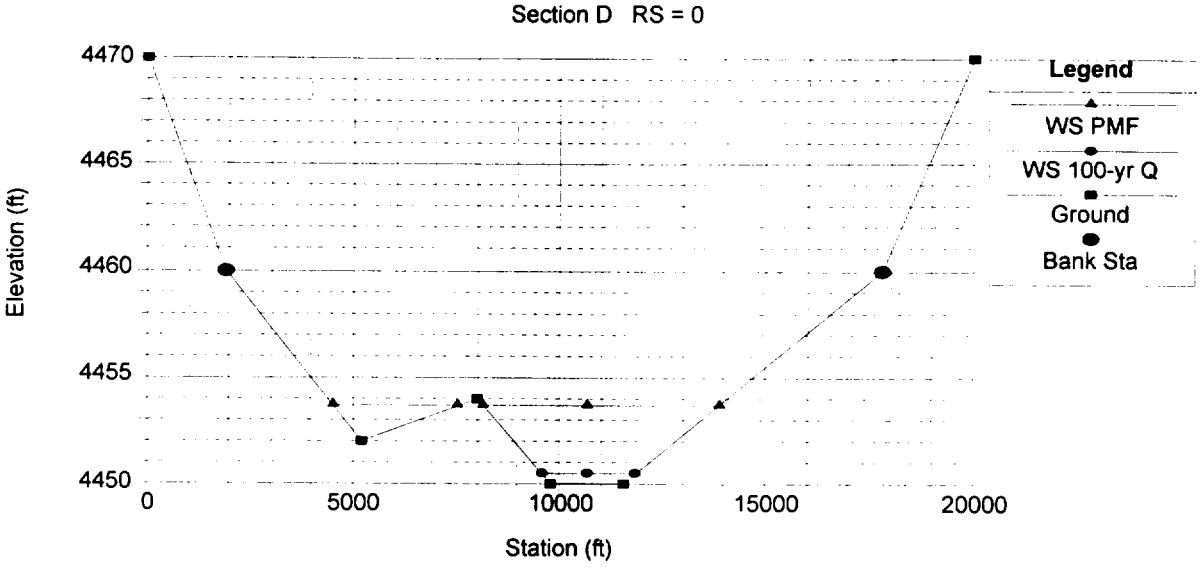


Figure 8

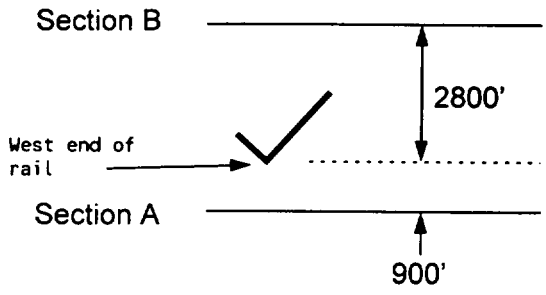


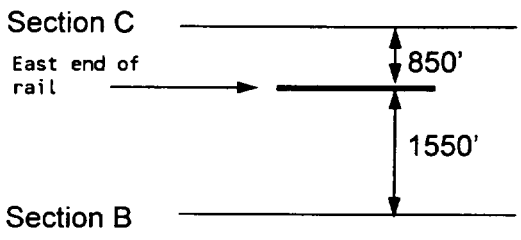
9, WATER LEVEL AT THE 3-MILE-LONG RAIL SPUR

Since the proposed rail embankment is not located on any cross section, the water surface elevation must be determined by interpolation (HEC-RAS program only calculate water level at cross sections).

From Table 7 and Figure 9, the water levels are interpolated as below::

		W.S.elev at west end (ft)		W.S.elev at east end (ft)
PMF	Section A	4521.18	Section B	4481.17
	Rail	4511.45	Rail	4468.71
	Section B	4481.17	Section C	4461.87
100-year	Section A	4520.33	Section B	4480.10
	Rail	4510.54	Rail	4467.22
	Section B	4480.10	Section C	4460.16





10, RESULT AND CONCLUSION

The result of the hydrological computation indicated that the peak runoff of the PMF flood and the 100-year flood are:

QPMF = 68,500 cfs
Q100 = 1400 cfs

Water levels near the PFSF site (Table 7, River Station 2000):

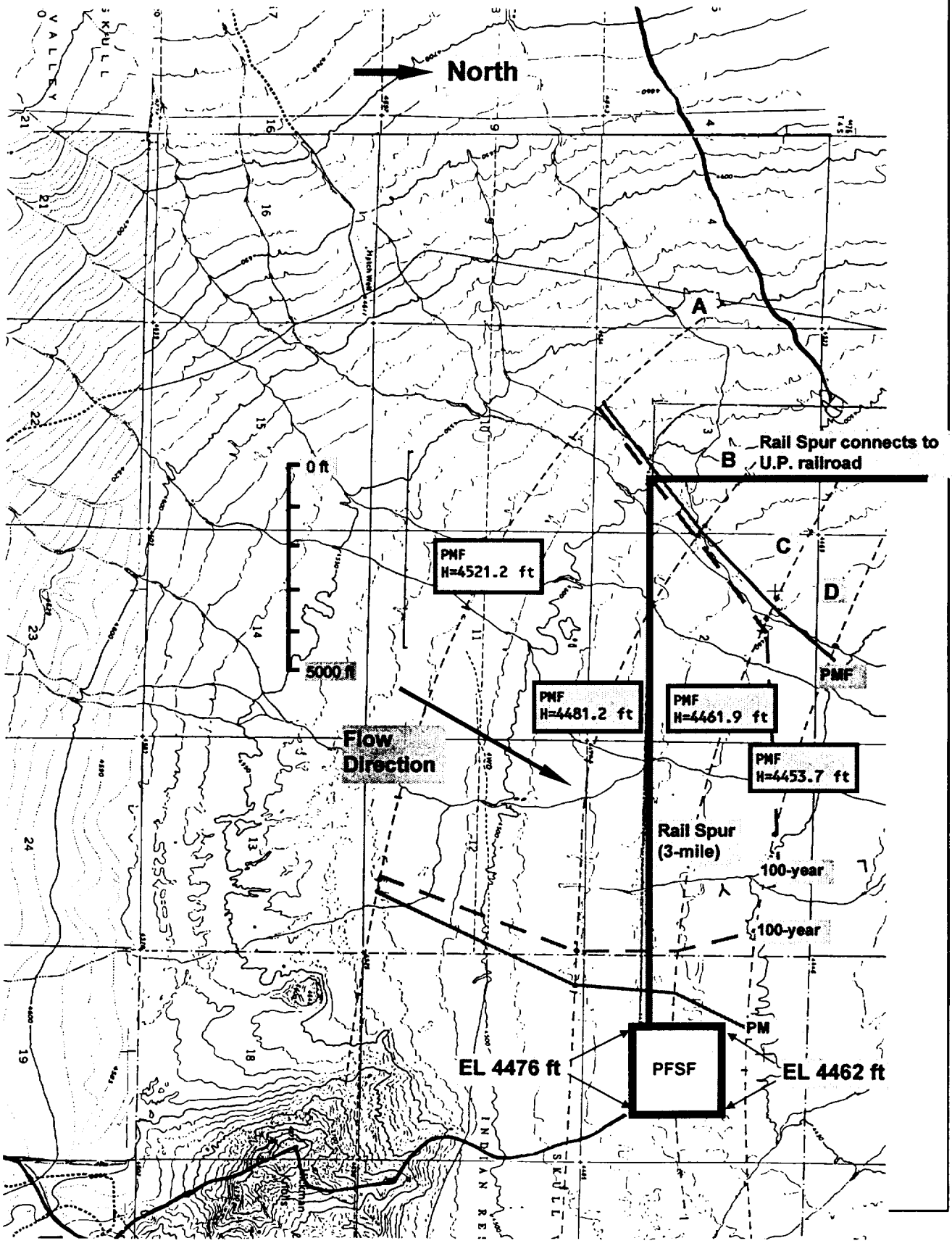
PMF flood event	4461.87 ft
100-year flood event	4460.16 ft

Water levels along the proposed 3-mile-long railroad are calculated to be:

	West End	East End
PMF flood event	4511.45 ft	4468.71 ft
100-year flood event	4510.54 ft	4467.22 ft

CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP G(B)	CALCULATION NUMBER 16	OPTIONAL TASK CODE N/A	PAGE 23 of 24

Figure 9, HEC-RAS Cross sections and Calculated flood Limits



CALCULATION IDENTIFICATION NUMBER				REV. NO. 0
J.O. OR W.O NUMBER 0599602	DIVISION AND GROUP G(B)	CALCULATION NUMBER 16	OPTIONAL TASK CODE N/A	PAGE 24 of 24

ATTACHMENTS

Attachment 1, General Storm PMF, HEC-1 Input

```
ID   PFSF (Private Fuel Storage Facility Project)
ID   General PMF AT the 3-mile-long rail spur
ID
ID
IT    60                    200
IO     2
PG    60
IN   180
PI  0.20    0.23    0.26    0.31    0.33    0.33    0.54    0.72    2.01    2.19
PI  1.08    0.66    0.56    0.44    0.37    0.37    0.37    0.36    0.16    0.16
PI  0.15    0.14    0.13    0.13
KK   010
KM  SCS DIMENSIONLESS UNIT HYDROGRAPH
BA  64.0
BF    -1            1.06
PR    60
LS     0      70       1
UD  2.5
ZZ
```

Attachment 2, General Storm PMF, HEC-1 Output

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             SEPTEMBER 1990            *
*              VERSION 4.0              *
*                                       *
*  RUN DATE  03/08/1999  TIME  11:03:32 *
*                                       *
*****************************************
```

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

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

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

   1          ID     PFSF (Private Fuel Storage Facility Project)
   2          ID     General PMF AT the 3-mile-long rail spur
   3          ID
   4          ID
```

```
            5          IT     60                    200
            6          IO      2
            7          PG     60
            8          IN    180
            9          PI   0.20    0.23    0.26    0.31    0.33    0.33    0.54    0.72    2.01    2.19
           10          PI   1.08    0.66    0.56    0.44    0.37    0.37    0.37    0.36    0.16    0.16
           11          PI   0.15    0.14    0.13    0.13

           12          KK    010
           13          KM    SCS DIMENSIONLESS UNIT HYDROGRAPH
           14          BA   64.0
           15          BF     -1            1.06
           16          PR     60
           17          LS      0      70       1
           18          UD    2.5
           19          ZZ
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            SEPTEMBER 1990             *
*             VERSION 4.0               *
*                                       *
*  RUN DATE  03/08/1999  TIME  11:03:32 *
*                                       *
*****************************************

*****************************************
*                                       *
*    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 the 3-mile-long rail spur


   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


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


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

             SUBBASIN RUNOFF DATA

 14 BA         SUBBASIN CHARACTERISTICS
                     TAREA       64.00  SUBBASIN AREA

 15 BF         BASE FLOW CHARACTERISTICS
                     STRTQ       64.00  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       2.50  LAG

                                                    ***

          PRECIPITATION STATION DATA

                  STATION    TOTAL    AVG. ANNUAL    WEIGHT
                       60    12.20          .00         1.00

          TEMPORAL DISTRIBUTIONS

          STATION       60,  WEIGHT =   1.00
                .07      .07      .07      .08      .08      .08      .09      .09      .09      .10
                .10      .10      .11      .11      .11      .11      .11      .11      .18      .18
                .18      .24      .24      .24      .67      .67      .67      .73      .73      .73
                .36      .36      .36      .22      .22      .22      .19      .19      .19      .15
                .15      .15      .12      .12      .12      .12      .12      .12      .12      .12
                .12      .12      .12      .12      .05      .05      .05      .05      .05      .05
                .05      .05      .05      .05      .05      .05      .04      .04      .04      .04
                .04      .04

                                                UNIT HYDROGRAPH
                                            15 END-OF-PERIOD ORDINATES
           2378.    7925.   10337.    8614.    5100.    2894.    1726.    1003.     569.     338.
            196.     114.      72.      34.       0.

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

                                                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        64.         *      5     0400   101     .00     .00     .00         0.
     1     0100     2     .07     .07     .00        62.         *      5     0500   102     .00     .00     .00         0.
     1     0200     3     .07     .07     .00        64.         *      5     0600   103     .00     .00     .00         0.
     1     0300     4     .07     .07     .00        67.         *      5     0700   104     .00     .00     .00         0.
     1     0400     5     .08     .08     .00        70.         *      5     0800   105     .00     .00     .00         0.
     1     0500     6     .08     .08     .00        72.         *      5     0900   106     .00     .00     .00         0.
     1     0600     7     .08     .08     .00        72.         *      5     1000   107     .00     .00     .00         0.
     1     0700     8     .09     .09     .00        72.         *      5     1100   108     .00     .00     .00         0.
```

1	0800	9	.09	.09	.00	71.	*	5	1200	109	.00	.00	.00	0.
1	0900	10	.09	.09	.00	71.	*	5	1300	110	.00	.00	.00	0.
1	1000	11	.10	.10	.00	70.	*	5	1400	111	.00	.00	.00	0.
1	1100	12	.10	.10	.00	71.	*	5	1500	112	.00	.00	.00	0.
1	1200	13	.10	.10	.01	83.	*	5	1600	113	.00	.00	.00	0.
1	1300	14	.11	.10	.01	130.	*	5	1700	114	.00	.00	.00	0.
1	1400	15	.11	.09	.02	225.	*	5	1800	115	.00	.00	.00	0.
1	1500	16	.11	.09	.02	361.	*	5	1900	116	.00	.00	.00	0.
1	1600	17	.11	.09	.02	518.	*	5	2000	117	.00	.00	.00	0.
1	1700	18	.11	.08	.03	683.	*	5	2100	118	.00	.00	.00	0.
1	1800	19	.11	.08	.03	847.	*	5	2200	119	.00	.00	.00	0.
1	1900	20	.18	.12	.06	1061.	*	5	2300	120	.00	.00	.00	0.
1	2000	21	.18	.11	.07	1411.	*	6	0000	121	.00	.00	.00	0.
1	2100	22	.18	.11	.07	1848.	*	6	0100	122	.00	.00	.00	0.
1	2200	23	.24	.13	.11	2348.	*	6	0200	123	.00	.00	.00	0.
1	2300	24	.24	.12	.12	2954.	*	6	0300	124	.00	.00	.00	0.
2	0000	25	.24	.11	.13	3613.	*	6	0400	125	.00	.00	.00	0.
2	0100	26	.67	.27	.40	4846.	*	6	0500	126	.00	.00	.00	0.
2	0200	27	.67	.23	.44	7519.	*	6	0600	127	.00	.00	.00	0.
2	0300	28	.67	.19	.48	11035.	*	6	0700	128	.00	.00	.00	0.
2	0400	29	.73	.17	.56	14470.	*	6	0800	129	.00	.00	.00	0.
2	0500	30	.73	.15	.58	17373.	*	6	0900	130	.00	.00	.00	0.
2	0600	31	.73	.13	.60	19788.	*	6	1000	131	.00	.00	.00	0.
2	0700	32	.36	.06	.30	20972.	*	6	1100	132	.00	.00	.00	0.
2	0800	33	.36	.05	.31	19906.	*	6	1200	133	.00	.00	.00	0.
2	0900	34	.36	.05	.31	17653.	*	6	1300	134	.00	.00	.00	0.
2	1000	35	.22	.03	.19	15329.	*	6	1400	135	.00	.00	.00	0.
2	1100	36	.22	.03	.19	13202.	*	6	1500	136	.00	.00	.00	0.
2	1200	37	.22	.03	.19	11321.	*	6	1600	137	.00	.00	.00	0.
2	1300	38	.19	.02	.16	9850.	*	6	1700	138	.00	.00	.00	0.
2	1400	39	.19	.02	.17	8806.	*	6	1800	139	.00	.00	.00	0.
2	1500	40	.19	.02	.17	8051.	*	6	1900	140	.00	.00	.00	0.
2	1600	41	.15	.02	.13	7454.	*	6	2000	141	.00	.00	.00	0.
2	1700	42	.15	.02	.13	6880.	*	6	2100	142	.00	.00	.00	0.
2	1800	43	.15	.02	.13	6352.	*	6	2200	143	.00	.00	.00	0.
2	1900	44	.12	.01	.11	5904.	*	6	2300	144	.00	.00	.00	0.
2	2000	45	.12	.01	.11	5510.	*	7	0000	145	.00	.00	.00	0.
2	2100	46	.12	.01	.11	5175.	*	7	0100	146	.00	.00	.00	0.
2	2200	47	.12	.01	.11	4927.	*	7	0200	147	.00	.00	.00	0.
2	2300	48	.12	.01	.11	4785.	*	7	0300	148	.00	.00	.00	0.
3	0000	49	.12	.01	.11	4711.	*	7	0400	149	.00	.00	.00	0.
3	0100	50	.12	.01	.11	4670.	*	7	0500	150	.00	.00	.00	0.
3	0200	51	.12	.01	.11	4650.	*	7	0600	151	.00	.00	.00	0.
3	0300	52	.12	.01	.11	4642.	*	7	0700	152	.00	.00	.00	0.
3	0400	53	.12	.01	.11	4634.	*	7	0800	153	.00	.00	.00	0.
3	0500	54	.12	.01	.11	4612.	*	7	0900	154	.00	.00	.00	0.
3	0600	55	.12	.01	.11	4586.	*	7	1000	155	.00	.00	.00	0.

3	0700	56	.05	.00	.05	4420.	*	7	1100	156	.00	.00	.00	0.
3	0800	57	.05	.00	.05	3926.	*	7	1200	157	.00	.00	.00	0.
3	0900	58	.05	.00	.05	3290.	*	7	1300	158	.00	.00	.00	0.
3	1000	59	.05	.00	.05	2762.	*	7	1400	159	.00	.00	.00	0.
3	1100	60	.05	.00	.05	2450.	*	7	1500	160	.00	.00	.00	0.
3	1200	61	.05	.00	.05	2273.	*	7	1600	161	.00	.00	.00	0.
3	1300	62	.05	.00	.05	2161.	*	7	1700	162	.00	.00	.00	0.
3	1400	63	.05	.00	.05	2076.	*	7	1800	163	.00	.00	.00	0.
3	1500	64	.05	.00	.05	2011.	*	7	1900	164	.00	.00	.00	0.
3	1600	65	.05	.00	.04	1957.	*	7	2000	165	.00	.00	.00	0.
3	1700	66	.05	.00	.04	1906.	*	7	2100	166	.00	.00	.00	0.
3	1800	67	.05	.00	.04	1860.	*	7	2200	167	.00	.00	.00	0.
3	1900	68	.04	.00	.04	1817.	*	7	2300	168	.00	.00	.00	0.
3	2000	69	.04	.00	.04	1773.	*	8	0000	169	.00	.00	.00	0.
3	2100	70	.04	.00	.04	1731.	*	8	0100	170	.00	.00	.00	0.
3	2200	71	.04	.00	.04	1699.	*	8	0200	171	.00	.00	.00	0.
3	2300	72	.04	.00	.04	1680.	*	8	0300	172	.00	.00	.00	0.
4	0000	73	.04	.00	.04	1670.	*	8	0400	173	.00	.00	.00	0.
4	0100	74	.00	.00	.00	1569.	*	8	0500	174	.00	.00	.00	0.
4	0200	75	.00	.00	.00	1248.	*	8	0600	175	.00	.00	.00	0.
4	0300	76	.00	.00	.00	831.	*	8	0700	176	.00	.00	.00	0.
4	0400	77	.00	.00	.00	485.	*	8	0800	177	.00	.00	.00	0.
4	0500	78	.00	.00	.00	280.	*	8	0900	178	.00	.00	.00	0.
4	0600	79	.00	.00	.00	163.	*	8	1000	179	.00	.00	.00	0.
4	0700	80	.00	.00	.00	94.	*	8	1100	180	.00	.00	.00	0.
4	0800	81	.00	.00	.00	54.	*	8	1200	181	.00	.00	.00	0.
4	0900	82	.00	.00	.00	31.	*	8	1300	182	.00	.00	.00	0.
4	1000	83	.00	.00	.00	17.	*	8	1400	183	.00	.00	.00	0.
4	1100	84	.00	.00	.00	9.	*	8	1500	184	.00	.00	.00	0.
4	1200	85	.00	.00	.00	5.	*	8	1600	185	.00	.00	.00	0.
4	1300	86	.00	.00	.00	2.	*	8	1700	186	.00	.00	.00	0.
4	1400	87	.00	.00	.00	0.	*	8	1800	187	.00	.00	.00	0.
4	1500	88	.00	.00	.00	0.	*	8	1900	188	.00	.00	.00	0.
4	1600	89	.00	.00	.00	0.	*	8	2000	189	.00	.00	.00	0.
4	1700	90	.00	.00	.00	0.	*	8	2100	190	.00	.00	.00	0.
4	1800	91	.00	.00	.00	0.	*	8	2200	191	.00	.00	.00	0.
4	1900	92	.00	.00	.00	0.	*	8	2300	192	.00	.00	.00	0.
4	2000	93	.00	.00	.00	0.	*	9	0000	193	.00	.00	.00	0.
4	2100	94	.00	.00	.00	0.	*	9	0100	194	.00	.00	.00	0.
4	2200	95	.00	.00	.00	0.	*	9	0200	195	.00	.00	.00	0.
4	2300	96	.00	.00	.00	0.	*	9	0300	196	.00	.00	.00	0.
5	0000	97	.00	.00	.00	0.	*	9	0400	197	.00	.00	.00	0.
5	0100	98	.00	.00	.00	0.	*	9	0500	198	.00	.00	.00	0.
5	0200	99	.00	.00	.00	0.	*	9	0600	199	.00	.00	.00	0.
5	0300	100	.00	.00	.00	0.	*	9	0700	200	.00	.00	.00	0.
							*							

****

TOTAL RAINFALL = 12.20, TOTAL LOSS = 3.93, TOTAL EXCESS = 8.27

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	199.00-HR
(CFS)	(HR)					
		(CFS)				
20972.	31.00		18432.	10489.	4751.	1722.
		(INCHES)	2.678	6.095	8.283	8.299
		(AC-FT)	9140.	20804.	28273.	28326.

CUMULATIVE AREA = 64.00 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	20972.	31.00	18432.	10489.	4751.	64.00		

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

Attachment 3, Local Storm PMF, HEC-1 Input

```
ID   PFSF (Private Fuel Storage Facility Project)
ID   LOCAL PMF AT 3-MILE-LONG RAIL SPUR
ID
ID
IT     5                    200
IO     2
PG    60
IN    15
PI  0.10    0.12    0.13    0.15    0.14    0.16    0.17    0.23    0.60    1.50
PI  4.20    0.60    0.40    0.35    0.35    0.30    0.12    0.11    0.09    0.08
PI  0.09    0.09    0.07    0.05
KK   010
KM  SCS DIMENSIONLESS UNIT HYDROGRAPH
BA  64.0
BF    -1            1.06
PR    60
LS     0      70       1
UD   2.5
ZZ
```

Attachment 4, Local Storm PMF, HEC-1 Output

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *            SEPTEMBER 1990             *
 *             VERSION 4.0               *
 *                                       *
 *  RUN DATE  03/08/1999  TIME  11:53:14 *
 *                                       *
 *****************************************
```

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

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
```

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

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

   1          ID     PFSF (Private Fuel Storage Facility Project)
   2          ID     LOCAL PMF AT 3-MILE-LONG RAIL SPUR
   3          ID
   4          ID
   5          IT      5                    200
   6          IO      2
   7          PG     60
   8          IN     15
   9          PI    0.10    0.12    0.13    0.15    0.14    0.16    0.17    0.23    0.60    1.50
  10          PI    4.20    0.60    0.40    0.35    0.35    0.30    0.12    0.11    0.09    0.08
  11          PI    0.09    0.09    0.07    0.05

  12          KK     010
  13          KM    SCS DIMENSIONLESS UNIT HYDROGRAPH
  14          BA    64.0
  15          BF      -1            1.06
  16          PR     60
  17          LS      0      70       1
  18          UD    2.5
  19          ZZ
```

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*         SEPTEMBER 1990                *
*          VERSION 4.0                  *
*                                       *
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET             *
*                                       *
*****************************************
```

```
*                                       *
*  RUN DATE  03/08/1999  TIME  11:53:14 *
*                                       *
*****************************************
```

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

PFSF (Private Fuel Storage Facility Project)
LOCAL PMF AT 3-MILE-LONG RAIL SPUR

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
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       64.00  SUBBASIN AREA

 15 BF         BASE FLOW CHARACTERISTICS
                    STRTQ       64.00  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        2.50  LAG

                                                          ***

            PRECIPITATION STATION DATA

                    STATION    TOTAL    AVG. ANNUAL    WEIGHT
                         60    10.20            .00      1.00

              TEMPORAL DISTRIBUTIONS

              STATION       60,  WEIGHT =   1.00
                   .03      .03      .03      .04      .04      .04      .04      .04      .04      .05
                   .05      .05      .05      .05      .05      .05      .05      .05      .06      .06
                   .06      .08      .08      .08      .20      .20      .20      .50      .50      .50
                  1.40     1.40     1.40      .20      .20      .20      .13      .13      .13      .12
```

.12	.12	.12	.12	.12	.10	.10	.10	.04	.04
.04	.04	.04	.04	.03	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.02	.02	.02	.02
.02	.02								

UNIT HYDROGRAPH
152 END-OF-PERIOD ORDINATES

120.	239.	359.	630.	909.	1189.	1540.	1899.	2258.	2718.
3197.	3675.	4282.	4920.	5558.	6286.	7044.	7802.	8476.	9114.
9752.	10261.	10699.	11138.	11457.	11697.	11936.	12066.	12105.	12145.
12145.	12105.	12066.	11936.	11697.	11457.	11202.	10923.	10644.	10350.
10031.	9712.	9369.	8970.	8572.	8153.	7674.	7195.	6733.	6334.
5935.	5554.	5275.	4996.	4721.	4481.	4242.	4005.	3805.	3606.
3406.	3261.	3115.	2970.	2824.	2678.	2533.	2411.	2291.	2171.
2052.	1932.	1812.	1724.	1645.	1565.	1485.	1405.	1326.	1260.
1200.	1140.	1080.	1020.	961.	910.	867.	823.	779.	735.
691.	654.	624.	594.	564.	534.	505.	478.	456.	434.
412.	390.	368.	348.	332.	316.	300.	284.	268.	253.
241.	229.	217.	205.	193.	182.	174.	166.	158.	150.
142.	134.	129.	124.	119.	115.	110.	105.	100.	96.
91.	86.	81.	76.	72.	67.	62.	58.	54.	50.
46.	42.	38.	34.	30.	26.	22.	18.	14.	10.
6.	2.								

****

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	64.	*	1		0820	101	.00	.00	.00	21042.
1		0005	2	.03	.03	.00	64.	*	1		0825	102	.00	.00	.00	20056.
1		0010	3	.03	.03	.00	64.	*	1		0830	103	.00	.00	.00	19093.
1		0015	4	.03	.03	.00	63.	*	1		0835	104	.00	.00	.00	18154.
1		0020	5	.04	.04	.00	63.	*	1		0840	105	.00	.00	.00	17259.
1		0025	6	.04	.04	.00	63.	*	1		0845	106	.00	.00	.00	16418.
1		0030	7	.04	.04	.00	63.	*	1		0850	107	.00	.00	.00	15634.
1		0035	8	.04	.04	.00	64.	*	1		0855	108	.00	.00	.00	14878.
1		0040	9	.04	.04	.00	64.	*	1		0900	109	.00	.00	.00	14143.
1		0045	10	.04	.04	.00	65.	*	1		0905	110	.00	.00	.00	13431.
1		0050	11	.05	.05	.00	65.	*	1		0910	111	.00	.00	.00	12746.
1		0055	12	.05	.05	.00	66.	*	1		0915	112	.00	.00	.00	12095.
1		0100	13	.05	.05	.00	67.	*	1		0920	113	.00	.00	.00	11480.
1		0105	14	.05	.05	.00	69.	*	1		0925	114	.00	.00	.00	10889.
1		0110	15	.05	.05	.00	70.	*	1		0930	115	.00	.00	.00	10319.

1	0115	16	.05	.05	.00	72.	*	1	0935	116	.00	.00	.00	9769.
1	0120	17	.05	.05	.00	75.	*	1	0940	117	.00	.00	.00	9245.
1	0125	18	.05	.05	.00	77.	*	1	0945	118	.00	.00	.00	8752.
1	0130	19	.05	.05	.00	80.	*	1	0950	119	.00	.00	.00	8293.
1	0135	20	.06	.06	.00	84.	*	1	0955	120	.00	.00	.00	7859.
1	0140	21	.06	.06	.00	87.	*	1	1000	121	.00	.00	.00	7444.
1	0145	22	.06	.05	.00	92.	*	1	1005	122	.00	.00	.00	7049.
1	0150	23	.08	.07	.01	97.	*	1	1010	123	.00	.00	.00	6674.
1	0155	24	.08	.07	.01	103.	*	1	1015	124	.00	.00	.00	6325.
1	0200	25	.08	.07	.01	112.	*	1	1020	125	.00	.00	.00	6003.
1	0205	26	.20	.16	.04	125.	*	1	1025	126	.00	.00	.00	5699.
1	0210	27	.20	.15	.05	146.	*	1	1030	127	.00	.00	.00	5408.
1	0215	28	.20	.14	.06	177.	*	1	1035	128	.00	.00	.00	5129.
1	0220	29	.50	.30	.20	237.	*	1	1040	129	.00	.00	.00	4863.
1	0225	30	.50	.25	.25	335.	*	1	1045	130	.00	.00	.00	4613.
1	0230	31	.50	.22	.28	477.	*	1	1050	131	.00	.00	.00	4379.
1	0235	32	1.40	.47	.93	765.	*	1	1055	132	.00	.00	.00	4159.
1	0240	33	1.40	.33	1.07	1225.	*	1	1100	133	.00	.00	.00	3946.
1	0245	34	1.40	.24	1.16	1873.	*	1	1105	134	.00	.00	.00	3743.
1	0250	35	.20	.03	.17	2705.	*	1	1110	135	.00	.00	.00	3549.
1	0255	36	.20	.03	.17	3754.	*	1	1115	136	.00	.00	.00	3365.
1	0300	37	.20	.03	.17	5037.	*	1	1120	137	.00	.00	.00	3193.
1	0305	38	.13	.02	.12	6465.	*	1	1125	138	.00	.00	.00	3032.
1	0310	39	.13	.02	.12	8055.	*	1	1130	139	.00	.00	.00	2877.
1	0315	40	.13	.02	.12	9821.	*	1	1135	140	.00	.00	.00	2728.
1	0320	41	.12	.01	.10	11769.	*	1	1140	141	.00	.00	.00	2586.
1	0325	42	.12	.01	.10	13929.	*	1	1145	142	.00	.00	.00	2452.
1	0330	43	.12	.01	.10	16319.	*	1	1150	143	.00	.00	.00	2326.
1	0335	44	.12	.01	.10	18929.	*	1	1155	144	.00	.00	.00	2207.
1	0340	45	.12	.01	.10	21784.	*	1	1200	145	.00	.00	.00	2094.
1	0345	46	.12	.01	.10	24902.	*	1	1205	146	.00	.00	.00	1985.
1	0350	47	.10	.01	.09	28196.	*	1	1210	147	.00	.00	.00	1881.
1	0355	48	.10	.01	.09	31651.	*	1	1215	148	.00	.00	.00	1784.
1	0400	49	.10	.01	.09	35272.	*	1	1220	149	.00	.00	.00	1693.
1	0405	50	.04	.00	.04	38878.	*	1	1225	150	.00	.00	.00	1610.
1	0410	51	.04	.00	.04	42382.	*	1	1230	151	.00	.00	.00	1530.
1	0415	52	.04	.00	.04	45762.	*	1	1235	152	.00	.00	.00	1454.
1	0420	53	.04	.00	.03	48973.	*	1	1240	153	.00	.00	.00	1381.
1	0425	54	.04	.00	.03	51963.	*	1	1245	154	.00	.00	.00	1313.
1	0430	55	.04	.00	.03	54702.	*	1	1250	155	.00	.00	.00	1251.
1	0435	56	.03	.00	.03	57210.	*	1	1255	156	.00	.00	.00	1194.
1	0440	57	.03	.00	.03	59468.	*	1	1300	157	.00	.00	.00	1139.
1	0445	58	.03	.00	.03	61446.	*	1	1305	158	.00	.00	.00	1087.
1	0450	59	.03	.00	.02	63170.	*	1	1310	159	.00	.00	.00	1037.
1	0455	60	.03	.00	.02	64638.	*	1	1315	160	.00	.00	.00	989.
1	0500	61	.03	.00	.02	65821.	*	1	1320	161	.00	.00	.00	942.
1	0505	62	.03	.00	.03	66779.	*	1	1325	162	.00	.00	.00	897.

1	0510	63	.03	.00	.03	67551.	*	1	1330	163	.00	.00	.00	853.
1	0515	64	.03	.00	.03	68118.	*	1	1335	164	.00	.00	.00	810.
1	0520	65	.03	.00	.03	68455.	*	1	1340	165	.00	.00	.00	769.
1	0525	66	.03	.00	.03	68517.	*	1	1345	166	.00	.00	.00	729.
1	0530	67	.03	.00	.03	68278.	*	1	1350	167	.00	.00	.00	690.
1	0535	68	.02	.00	.02	67811.	*	1	1355	168	.00	.00	.00	652.
1	0540	69	.02	.00	.02	67206.	*	1	1400	169	.00	.00	.00	616.
1	0545	70	.02	.00	.02	66456.	*	1	1405	170	.00	.00	.00	581.
1	0550	71	.02	.00	.02	65572.	*	1	1410	171	.00	.00	.00	547.
1	0555	72	.02	.00	.02	64560.	*	1	1415	172	.00	.00	.00	515.
1	0600	73	.02	.00	.02	63410.	*	1	1420	173	.00	.00	.00	483.
1	0605	74	.00	.00	.00	62121.	*	1	1425	174	.00	.00	.00	452.
1	0610	75	.00	.00	.00	60682.	*	1	1430	175	.00	.00	.00	421.
1	0615	76	.00	.00	.00	59081.	*	1	1435	176	.00	.00	.00	391.
1	0620	77	.00	.00	.00	57329.	*	1	1440	177	.00	.00	.00	361.
1	0625	78	.00	.00	.00	55462.	*	1	1445	178	.00	.00	.00	332.
1	0630	79	.00	.00	.00	53473.	*	1	1450	179	.00	.00	.00	303.
1	0635	80	.00	.00	.00	51398.	*	1	1455	180	.00	.00	.00	275.
1	0640	81	.00	.00	.00	49363.	*	1	1500	181	.00	.00	.00	247.
1	0645	82	.00	.00	.00	47385.	*	1	1505	182	.00	.00	.00	221.
1	0650	83	.00	.00	.00	45473.	*	1	1510	183	.00	.00	.00	196.
1	0655	84	.00	.00	.00	43650.	*	1	1515	184	.00	.00	.00	174.
1	0700	85	.00	.00	.00	41935.	*	1	1520	185	.00	.00	.00	156.
1	0705	86	.00	.00	.00	40321.	*	1	1525	186	.00	.00	.00	143.
1	0710	87	.00	.00	.00	38738.	*	1	1530	187	.00	.00	.00	133.
1	0715	88	.00	.00	.00	37195.	*	1	1535	188	.00	.00	.00	123.
1	0720	89	.00	.00	.00	35693.	*	1	1540	189	.00	.00	.00	115.
1	0725	90	.00	.00	.00	34227.	*	1	1545	190	.00	.00	.00	107.
1	0730	91	.00	.00	.00	32803.	*	1	1550	191	.00	.00	.00	99.
1	0735	92	.00	.00	.00	31430.	*	1	1555	192	.00	.00	.00	93.
1	0740	93	.00	.00	.00	30109.	*	1	1600	193	.00	.00	.00	86.
1	0745	94	.00	.00	.00	28846.	*	1	1605	194	.00	.00	.00	80.
1	0750	95	.00	.00	.00	27652.	*	1	1610	195	.00	.00	.00	75.
1	0755	96	.00	.00	.00	26477.	*	1	1615	196	.00	.00	.00	70.
1	0800	97	.00	.00	.00	25325.	*	1	1620	197	.00	.00	.00	65.
1	0805	98	.00	.00	.00	24197.	*	1	1625	198	.00	.00	.00	61.
1	0810	99	.00	.00	.00	23103.	*	1	1630	199	.00	.00	.00	58.
1	0815	100	.00	.00	.00	22050.	*	1	1635	200	.00	.00	.00	54.
							*							

****

TOTAL RAINFALL = 10.20, TOTAL LOSS = 3.76, TOTAL EXCESS = 6.44

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	16.58-HR
+ (CFS)	(HR)				
		(CFS)			

+	68517.	5.42		40836.	16086.	16086.	16086.
			(INCHES)	5.932	6.459	6.459	6.459
			(AC-FT)	20249.	22046.	22046.	22046.

CUMULATIVE AREA = 64.00 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 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	010	68517.	5.42	40836.	16086.	16086.	64.00		

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

Attachment 5, HEC-RAS Hydraulic Report

```
                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 3-mile-long rail spur, rev 1
Project File : 3_mile_1.prj
Run Date and Time: 3/8/99 2:41:36 PM

Project in English units

Project Description:
Natural PMF and 100-year flood level estimitation



PLAN DATA

Plan Title: Natural flood
Plan File : c:\a2\ras\3_mile_1.p01

          Geometry Title: Natural topo
          Geometry File : c:\a2\ras\3_mile_1.g01

          Flow Title    : PMF and 100-year Q
```

```
          Flow File     : c:\a2\ras\3_mile_1.f01

Plan Summary Information:
Number of:  Cross Sections =    4    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-year Q
Flow File : c:\a2\ras\3_mile_1.f01

Flow Data (cfs)

  River          Reach          RS                  PMF        100-yr Q
  PFSF 3mile Rail West          9000              68500            1400


Boundary Conditions

  River          Reach          Profile                    Upstream              Downstream

  PFSF 3mile Rail West          PMF                                          Normal S = 0.0042



GEOMETRY DATA

Geometry Title: Natural topo
Geometry File : c:\a2\ras\3_mile_1.g01

CROSS SECTION          RIVER: PFSF 3mile Rail
REACH: West               RS: 9000

INPUT
```

Description: Section A

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4550	1400	4540	2900	4530	3800	4520	12500	4520
14700	4520	17200	4520	20000	4530	21200	4550		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	3800	.035	17200	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3800	17200	4000	4000	.1	.3

CROSS SECTION OUTPUT Profile #PMF

W.S. Elev (ft)	4521.18	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.28	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4521.46	Reach Len. (ft)	4000.00	4000.00	4000.00
Crit W.S. (ft)		Flow Area (sq ft)	62.52	15794.73	194.51
E.G. Slope (ft/ft)	0.008212	Area (sq ft)	62.52	15794.73	194.51
Q Total (cfs)	68500.00	Flow (cfs)	169.07	67804.91	526.02
Top Width (ft)	13836.12	Top Width (ft)	106.08	13400.00	330.04
Vel Total (ft/s)	4.27	Avg. Vel. (ft/s)	2.70	4.29	2.70
Max Chl Dpth (ft)	1.18	Hydr. Depth (ft)	0.59	1.18	0.59
Conv. Total (cfs)	755916.0	Conv. (cfs)	1865.8	748245.4	5804.8
Length Wtd. (ft)	4000.00	Wetted Per. (ft)	106.09	13400.00	330.04
Min Ch El (ft)	4520.00	Shear (lb/sq ft)	0.30	0.60	0.30
Alpha	1.01	Stream Power (lb/ft s)	0.82	2.59	0.82
Frctn Loss (ft)	39.88	Cum Volume (acre-ft)	11.05	3086.76	96.59
C & E Loss (ft)	0.01	Cum SA (acres)	18.91	2228.93	130.21

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)	4520.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4520.33	Reach Len. (ft)	4000.00	4000.00	4000.00
Crit W.S. (ft)		Flow Area (sq ft)	4.80	4377.25	14.94
E.G. Slope (ft/ft)	0.000251	Area (sq ft)	4.80	4377.25	14.94
Q Total (cfs)	1400.00	Flow (cfs)	0.96	1396.03	3.00
Top Width (ft)	13520.86	Top Width (ft)	29.40	13400.00	91.46
Vel Total (ft/s)	0.32	Avg. Vel. (ft/s)	0.20	0.32	0.20
Max Chl Dpth (ft)	0.33	Hydr. Depth (ft)	0.16	0.33	0.16
Conv. Total (cfs)	88394.3	Conv. (cfs)	60.9	88143.9	189.5

Length Wtd. (ft)	4000.00	Wetted Per. (ft)	29.40	13400.00	91.47
Min Ch El (ft)	4520.00	Shear (lb/sq ft)	0.00	0.01	0.00
Alpha	1.00	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	39.88	Cum Volume (acre-ft)	0.28	387.15	1.31
C & E Loss (ft)	0.00	Cum SA (acres)	2.53	2055.42	13.87

Warning - The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
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: PFSF 3mile Rail
REACH: West RS: 5000

INPUT
Description: Section B
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4500	1400	4490	2900	4480	4400	4480	9200	4480
14000	4480	20000	4490	23000	4500				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	2900	.035	14000	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
2900	14000	3000	3000	.1	.3

CROSS SECTION OUTPUT Profile #PMF

W.S. Elev (ft)	4481.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.41	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4481.57	Reach Len. (ft)	3000.00	3000.00	3000.00
Crit W.S. (ft)	4481.03	Flow Area (sq ft)	101.80	12931.93	407.19
E.G. Slope (ft/ft)	0.012091	Area (sq ft)	101.80	12931.93	407.19
Q Total (cfs)	68500.00	Flow (cfs)	331.47	66842.65	1325.88
Top Width (ft)	11973.78	Top Width (ft)	174.76	11100.00	699.02
Vel Total (ft/s)	5.10	Avg. Vel. (ft/s)	3.26	5.17	3.26
Max Chl Dpth (ft)	1.17	Hydr. Depth (ft)	0.58	1.17	0.58
Conv. Total (cfs)	622951.8	Conv. (cfs)	3014.4	607879.6	12057.8
Length Wtd. (ft)	3000.00	Wetted Per. (ft)	174.76	11100.00	699.02
Min Ch El (ft)	4480.00	Shear (lb/sq ft)	0.44	0.88	0.44
Alpha	1.01	Stream Power (lb/ft s)	1.43	4.55	1.43

Frctn Loss (ft)	19.42	Cum Volume (acre-ft)	3.51	1767.81	68.96
C & E Loss (ft)	0.05	Cum SA (acres)	6.02	1104.04	82.96

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 - 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 OUTPUT Profile #100-yr Q

W.S. Elev (ft)	4480.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	4480.12	Reach Len. (ft)	3000.00	3000.00	3000.00
Crit W.S. (ft)	4480.08	Flow Area (sq ft)	0.72	1083.98	2.86
E.G. Slope (ft/ft)	0.020494	Area (sq ft)	0.72	1083.98	2.86
Q Total (cfs)	1400.00	Flow (cfs)	0.58	1397.10	2.32
Top Width (ft)	11173.24	Top Width (ft)	14.65	11100.00	58.59
Vel Total (ft/s)	1.29	Avg. Vel. (ft/s)	0.81	1.29	0.81
Max Chl Dpth (ft)	0.10	Hydr. Depth (ft)	0.05	0.10	0.05
Conv. Total (cfs)	9779.5	Conv. (cfs)	4.1	9759.3	16.2
Length Wtd. (ft)	3000.00	Wetted Per. (ft)	14.65	11100.00	58.59
Min Ch El (ft)	4480.00	Shear (lb/sq ft)	0.06	0.12	0.06
Alpha	1.00	Stream Power (lb/ft s)	0.05	0.16	0.05
Frctn Loss (ft)	19.94	Cum Volume (acre-ft)	0.02	136.40	0.49
C & E Loss (ft)	0.00	Cum SA (acres)	0.50	930.54	6.98

Warning - The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
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: PFSF 3mile Rail
REACH: West RS: 2000

INPUT
Description: Section C
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4490	1200	4480	2200	4470	4700	4460	13300	4460
18800	4470	21500	4480						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	2200	.035	13300	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
2200	13300	2000	2000	.1	.3

CROSS SECTION OUTPUT Profile #PMF

			Left OB	Channel	Right OB
W.S. Elev (ft)	4461.87	Element			
Vel Head (ft)	0.24	Wt. n-Val.		0.035	0.035
E.G. Elev (ft)	4462.11	Reach Len. (ft)	2000.00	2000.00	2000.00
Crit W.S. (ft)	4461.25	Flow Area (sq ft)		16480.33	957.25
E.G. Slope (ft/ft)	0.004016	Area (sq ft)		16480.33	957.25
Q Total (cfs)	68500.00	Flow (cfs)		66041.14	2458.86
Top Width (ft)	10092.58	Top Width (ft)		9066.43	1026.15
Vel Total (ft/s)	3.93	Avg. Vel. (ft/s)		4.01	2.57
Max Chl Dpth (ft)	1.87	Hydr. Depth (ft)		1.82	0.93
Conv. Total (cfs)	1080908.0	Conv. (cfs)		1042108.0	38800.0
Length Wtd. (ft)	2000.00	Wetted Per. (ft)		9066.43	1026.15
Min Ch El (ft)	4460.00	Shear (lb/sq ft)		0.46	0.23
Alpha	1.02	Stream Power (lb/ft s)		1.83	0.60
Frctn Loss (ft)	8.16	Cum Volume (acre-ft)		754.99	21.98
C & E Loss (ft)	0.00	Cum SA (acres)		409.61	23.56

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 - 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 OUTPUT Profile #100-yr Q

			Left OB	Channel	Right OB
W.S. Elev (ft)	4460.16	Element			
Vel Head (ft)	0.02	Wt. n-Val.		0.035	0.035
E.G. Elev (ft)	4460.17	Reach Len. (ft)	2000.00	2000.00	2000.00
Crit W.S. (ft)	4460.09	Flow Area (sq ft)		1355.24	6.80
E.G. Slope (ft/ft)	0.006954	Area (sq ft)		1355.24	6.80
Q Total (cfs)	1400.00	Flow (cfs)		1395.58	4.42
Top Width (ft)	8725.78	Top Width (ft)		8639.31	86.47
Vel Total (ft/s)	1.03	Avg. Vel. (ft/s)		1.03	0.65
Max Chl Dpth (ft)	0.16	Hydr. Depth (ft)		0.16	0.08
Conv. Total (cfs)	16788.3	Conv. (cfs)		16735.3	53.0
Length Wtd. (ft)	2000.00	Wetted Per. (ft)		8639.31	86.47
Min Ch El (ft)	4460.00	Shear (lb/sq ft)		0.07	0.03
Alpha	1.00	Stream Power (lb/ft s)		0.07	0.02

Frctn Loss (ft)	9.68	Cum Volume (acre-ft)	52.41	0.16
C & E Loss (ft)	0.00	Cum SA (acres)	250.81	1.99

Warning - The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
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 - 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: PFSF 3mile Rail
REACH: West RS: 0

INPUT
Description: Section D
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4470	1900	4460	5200	4452	8000	4454	9800	4450
11600	4450	17800	4460	20000	4470				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	1900	.035	17800	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1900	17800	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PMF

			Left OB	Channel	Right OB
W.S. Elev (ft)	4453.68	Element			
Vel Head (ft)	0.27	Wt. n-Val.		0.035	
E.G. Elev (ft)	4453.95	Reach Len. (ft)			
Crit W.S. (ft)	4452.77	Flow Area (sq ft)		16407.09	
E.G. Slope (ft/ft)	0.004199	Area (sq ft)		16407.09	
Q Total (cfs)	68500.00	Flow (cfs)		68500.00	
Top Width (ft)	8776.07	Top Width (ft)		8776.07	
Vel Total (ft/s)	4.18	Avg. Vel. (ft/s)		4.18	
Max Chl Dpth (ft)	3.68	Hydr. Depth (ft)		1.87	
Conv. Total (cfs)	1057092.0	Conv. (cfs)		1057092.0	
Length Wtd. (ft)		Wetted Per. (ft)		8776.08	
Min Ch El (ft)	4450.00	Shear (lb/sq ft)		0.49	
Alpha	1.00	Stream Power (lb/ft s)		2.05	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Warning - Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100-yr Q

W.S. Elev (ft)	4450.45	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.		0.035	
E.G. Elev (ft)	4450.49	Reach Len. (ft)			
Crit W.S. (ft)	4450.26	Flow Area (sq ft)		927.70	
E.G. Slope (ft/ft)	0.004205	Area (sq ft)		927.70	
Q Total (cfs)	1400.00	Flow (cfs)		1400.00	
Top Width (ft)	2285.89	Top Width (ft)		2285.89	
Vel Total (ft/s)	1.51	Avg. Vel. (ft/s)		1.51	
Max Chl Dpth (ft)	0.45	Hydr. Depth (ft)		0.41	
Conv. Total (cfs)	21589.3	Conv. (cfs)		21589.3	
Length Wtd. (ft)		Wetted Per. (ft)		2285.89	
Min Ch El (ft)	4450.00	Shear (lb/sq ft)		0.11	
Alpha	1.00	Stream Power (lb/ft s)		0.16	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

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.

SUMMARY OF MANNING'S N VALUES

River:PFSF 3mile Rail

Reach	River Sta.	n1	n2	n3
West	9000	.035	.035	.035
West	5000	.035	.035	.035
West	2000	.035	.035	.035
West	0	.035	.035	.035

SUMMARY OF REACH LENGTHS

River: PFSF 3mile Rail

Reach	River Sta.	Left	Channel	Right

West	9000	4000	4000	4000
West	5000	3000	3000	3000
West	2000	2000	2000	2000
West	0	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: PFSF 3mile Rail

Reach	River Sta.	Contr.	Expan.
West	9000	.1	.3
West	5000	.1	.3
West	2000	.1	.3
West	0	.1	.3