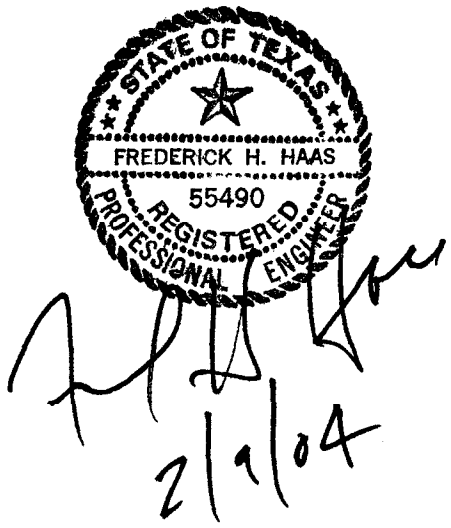
APPENDIX C

HEC-RAS MODEL FOR THE CALCULATION OF THE 100-YEAR WATER SURFACE PROFILE



HEC-RAS Plan: 100YR River: Ditch A Reach: 5

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	Max Chl Dpth (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Sta W.S. Lft (ft)	Sta W.S. Rgt (ft)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
5	12874	257.00	3477.00	3478.09	3477.76	1.09	3478.13	0.002948	1.71	373.88	640.51	150.30	266.62	0.39
5	12874	257.00	3477.00	3478.09	3477.76	1.09	3478.13	0.002948	1.71	373.88	640.51	150.30	266.62	0.39
5	12874	257.00	3477.00	3478.09	3477.76	1.09	3478.13	0.002948	1.71	373.88	640.51	150.30	266.62	0.39
5	12874	257.00	3477.00	3478.09	3477.76	1.09	3478.13	0.002948	1.71	373.88	640.51	150.30	266.62	0.39
5	11337	257.00	3469.00	3470.06	3470.03	1.06	3470.31	0.016594	3.96	433.62	551.32	64.97	117.70	0.93
5	11337	257.00	3469.00	3470.06	3470.03	1.06	3470.31	0.016594	3.96	433.62	551.32	64.97	117.70	0.93
5	11337	257.00	3469.00	3470.06	3470.03	1.06	3470.31	0.016594	3.96	433.62	551.32	64.97	117.70	0.93
5	11337	257.00	3469.00	3470.06	3470.03	1.06	3470.31	0.016594	3.96	433.62	551.32	64.97	117.70	0.93
5	10937	257.00	3464.00	3465.38	3465.18	1.38	3465.56	0.008826	3.45	487.13	588.43	74.55	101.30	0.71
5	10937	257.00	3464.00	3465.38	3465.18	1.38	3465.56	0.008826	3.45	487.13	588.43	74.55	101.30	0.71
5	10937	257.00	3464.00	3465.38	3465.18	1.38	3465.56	0.008826	3.45	487.13	588.43	74.55	101.30	0.71
5	10937	257.00	3464.00	3465.38	3465.18	1.38	3465.56	0.008826	3.45	487.13	588.43	74.55	101.30	0.71
5	10288	257.00	3456.00	3456.67	3456.67	0.67	3456.87	0.022674	3.57	427.42	615.18	71.89	187.76	1.02
5	10288	257.00	3456.00	3456.67	3456.67	0.67	3456.87	0.022674	3.57	427.42	615.18	71.89	187.76	1.02
5	10288	257.00	3456.00	3456.67	3456.67	0.67	3456.87	0.022674	3.57	427.42	615.18	71.89	187.76	1.02
5	10288	257.00	3456.00	3456.67	3456.67	0.67	3456.87	0.022674	3.57	427.42	615.18	71.89	187.76	1.02
5	9690	325.00	3450.00	3451.19	3450.87	1.19	3451.26	0.004338	2.13	482.85	733.67	152.62	250.83	0.48
5	9690	325.00	3450.00	3451.19	3450.87	1.19	3451.26	0.004338	2.13	482.85	733.67	152.62	250.83	0.48
5	9690	325.00	3450.00	3451.19	3450.87	1.19	3451.26	0.004338	2.13	482.85	733.67	152.62	250.83	0.48
5	9690	325.00	3450.00	3451.19	3450.87	1.19	3451.26	0.004338	2.13	482.85	733.67	152.62	250.83	0.48
5	9009	325.00	3445.00	3446.12	3446.04	1.12	3446.32	0.014428	3.57	482.15	652.03	91.07	169.88	0.86
5	9009	325.00	3445.00	3446.12	3446.04	1.12	3446.32	0.014428	3.57	482.15	652.03	91.07	169.88	0.86
5	9009	325.00	3445.00	3446.12	3446.04	1.12	3446.32	0.014428	3.57	482.15	652.03	91.07	169.88	0.86
5	9009	325.00	3445.00	3446.12	3446.04	1.12	3446.32	0.014428	3.57	482.15	652.03	91.07	169.88	0.86
5	8130	325.00	3440.00	3441.25	3440.85	1.25	3441.30	0.002988	1.84	507.15	781.10	176.81	273.95	0.40
5	8130	325.00	3440.00	3441.25	3440.85	1.25	3441.30	0.002988	1.84	507.15	781.10	176.81	273.95	0.40
5	8130	325.00	3440.00	3441.25	3440.85	1.25	3441.30	0.002988	1.84	507.15	781.10	176.81	273.95	0.40
5	8130	325.00	3440.00	3441.25	3440.85	1.25	3441.30	0.002988	1.84	507.15	781.10	176.81	273.95	0.40
5	7717	325.00	3437.80	3438.44	3438.44	0.64	3438.64	0.022265	3.64	350.26	574.17	89.29	223.91	1.02
5	7717	325.00	3437.80	3438.44	3438.44	0.64	3438.64	0.022265	3.64	350.26	574.17	89.29	223.91	1.02
5	7717	325.00	3437.80	3438.44	3438.44	0.64	3438.64	0.022265	3.64	350.26	574.17	89.29	223.91	1.02
5	7717	325.00	3437.80	3438.44	3438.44	0.64	3438.64	0.022265	3.64	350.26	574.17	89.29	223.91	1.02
5	7253	364.00	3435.00	3436.09	3435.67	1.09	3436.12	0.001631	1.28	419.36	910.46	284.83	491.10	0.29
5	7253	364.00	3435.00	3436.09	3435.67	1.09	3436.12	0.001631	1.28	419.36	910.46	284.83	491.10	0.29
5	7253	364.00	3435.00	3436.09	3435.67	1.09	3436.12	0.001631	1.28	419.36	910.46	284.83	491.10	0.29
5	7253	364.00	3435.00	3436.09	3435.67	1.09	3436.12	0.001631	1.28	419.36	910.46	284.83	491.10	0.29
5	6343	687.00	3430.00	3430.46	3430.46	0.46	3430.67	0.022292	3.65	817.89	1287.51	188.08	469.62	1.02
5	6343	687.00	3430.00	3430.46	3430.46	0.46	3430.67	0.022292	3.65	817.89	1287.51	188.08	469.62	1.02
5	6343	687.00	3430.00	3430.46	3430.46	0.46	3430.67	0.022292	3.65	817.89	1287.51	188.08	469.62	1.02
5	6343	687.00	3430.00	3430.46	3430.46	0.46	3430.67	0.022292	3.65	817.89	1287.51	188.08	469.62	1.02
5	5363	687.00	3425.00	3426.02	3425.54	1.02	3426.05	0.001698	1.41	740.20	1479.77	486.85	739.57	0.31
5	5363	687.00	3425.00	3426.02	3425.54	1.02	3426.05	0.001698	1.41	740.20	1479.77	486.85	739.57	0.31
5	5363	687.00	3425.00	3426.02	3425.54	1.02	3426.05	0.001698	1.41	740.20	1479.77	486.85	739.57	0.31
5	5363	687.00	3425.00	3426.02	3425.54	1.02	3426.05	0.001698	1.41	740.20	1479.77	486.85	739.57	0.31
5	4221	790.00	3420.00	3420.71	3420.71	0.71	3420.96	0.020617	4.01	571.82	974.07	196.80	402.25	1.01
5	4221	790.00	3420.00	3420.71	3420.71	0.71	3420.96	0.020617	4.01	571.82	974.07	196.80	402.25	1.01
5	4221	790.00	3420.00	3420.71	3420.71	0.71	3420.96	0.020617	4.01	571.82	974.07	196.80	402.25	1.01
5	4221	790.00	3420.00	3420.71	3420.71	0.71	3420.96	0.020617	4.01	571.82	974.07	196.80	402.25	1.01
5	3489	790.00	3416.00	3416.92	3416.52	1.91	3416.96	0.002177	1.66	126.92	870.25	493.43	743.33	0.35
5	3489	790.00	3416.00	3416.92	3416.52	1.91	3416.96	0.002177	1.66	126.92	870.25	493.43	743.33	0.35
5	3489	790.00	3416.00	3416.92	3416.52	1.91	3416.96	0.002177	1.66	126.92	870.25	493.43	743.33	0.35
5	3489	790.00	3416.00	3416.92	3416.52	1.91	3416.96	0.002177	1.66	126.92	870.25	493.43	743.33	0.35
5	2889	790.00	3413.80	3414.32	3414.32	0.52	3414.51	0.022050	3.36	185.72	786.06	226.05	600.34	0.99
5	2889	790.00	3413.80	3414.32	3414.32	0.52	3414.51	0.022050	3.36	185.72	786.06	226.05	600.34	0.99
5	2889	790.00	3413.80	3414.32	3414.32	0.52	3414.51	0.022050	3.36	185.72	786.06	226.05	600.34	0.99
5	2889	790.00	3413.80	3414.32	3414.32	0.52	3414.51	0.022050	3.36	185.72	786.06	226.05	600.34	0.99
5	2774	790.00	3409.00	3413.71	3412.70	4.71	3413.72	0.000067	0.99	176.53	629.07	1102.27	452.54	0.08
5	2774	790.00	3409.00	3413.71	3412.70	4.71	3413.72	0.000067	0.99	176.53	629.07	1102.27	452.54	0.08
5	2774	790.00	3409.00	3413.71	3412.70	4.71	3413.72	0.000067	0.99	176.53	629.07	1102.27	452.54	0.08
5	2774	790.00	3409.00	3413.71	3412.70	4.71	3413.72	0.000067	0.99	176.53	629.07	1102.27	452.54	0.08
5	2773	Culvert												
5	2734	790.00	3408.90	3412.70	3412.70	3.80	3412.73	0.000281	1.71	84.13	515.36	662.35	431.23	0.16
5	2734	790.00	3408.90	3412.70	3412.70	3.80	3412.73	0.000281	1.71	84.13	515.36	662.35	431.23	0.16
5	2734	790.00	3408.90	3412.70	3412.70	3.80	3412.73	0.000281	1.71	84.13	515.36	662.35	431.23	0.16
5	2734	790.00	3408.90	3412.70	3412.70	3.80	3412.73	0.000281	1.71	84.13	515.36	662.35	431.23	0.16
5	1888	803.00	3408.00	3408.49	3408.49	0.49	3408.70	0.021935	3.68	276.91	809.93	218.32	533.02	1.01
5	1888	803.00	3408.00	3408.49	3408.49	0.49	3408.70	0.021974	3.68	276.94	809.87	218.19	532.93	1.01
5	1888	803.00	3408.00	3408.49	3408.49	0.49	3408.70	0.021974	3.68	276.94	809.87	218.19	532.93	1.01
5	1888	803.00	3408.00	3408.49	3408.49	0.49	3408.70	0.021974	3.68	276.94	809.87	218.19	532.93	1.01
5	1060	841.00	3402.70	3404.50	3403.77	1.80	3404.54	0.001751	1.65	614.45	1554.00	511.24	626.40	0.32

	841.00	3402.70	3405.00	3403.77	2.30	3405.01	0.000467	0.91	540.97	1554.00	921.10	1013.03	0.17
	841.00	3402.70	3406.00	3403.77	3.30	3406.00	0.000042	0.42	394.00	1554.00	2007.61	1160.00	0.06
	841.00	3402.70	3407.00	3403.77	4.30	3407.00	0.000009	0.26	247.00	1554.00	3241.11	1307.00	0.03

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
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Davis, California 95616-4687
(916) 756-1104

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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: WCS
Project File : FloodPlain.prj
Run Date and Time: 2/4/04 9:56:12 AM

Project in English units

Project Description:
100year

PLAN DATA

Plan Title: 2-04-04MANY
Plan File : D:\program files\WCS\FloodPlain.p21

Geometry Title: 1-20-04SecRemoved
Geometry File : D:\program files\WCS\FloodPlain.g03

Flow Title : 100YrAM2-04-04Many
Flow File : D:\program files\WCS\FloodPlain.f21

Plan Summary Information:

Number of:	Cross Sections	= 18	Mulitple Openings	=	0
	Culverts	= 1	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

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: 100YrAM2-04-04Many
Flow File : D:\program files\WCS\FloodPlain.f21

Flow Data (cfs)

River	Reach	RS	100 Yr.-WS3404.5	100 Yr.-WS3405	100 Yr.-WS3406	100 Yr.-WS3407
Ditch A	5	12674	257	257	257	257
Ditch A	5	9690	325	325	325	325
Ditch A	5	7253	364	364	364	364
Ditch A	5	6343	687	687	687	687
Ditch A	5	4221	790	790	790	790
Ditch A	5	1888	803	803	803	803
Ditch A	5	1060	841	841	841	841

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Ditch A	5	100 Yr.-WS3404.5	Critical	Known WS = 3404.5
Ditch A	5	100 Yr.-WS3405	Critical	Known WS = 3405
Ditch A	5	100 Yr.-WS3406	Critical	Known WS = 3406
Ditch A	5	100 Yr.-WS3407	Critical	Known WS = 3407

GEOMETRY DATA

Geometry Title: 1-20-04SecRemoved
Geometry File : D:\program files\WCS\FloodPlain.g03

CROSS SECTION RIVER: Ditch A
REACH: 5 RS: 12674

INPUT
Description: Sta. 12674
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3482	380	3478	560	3477	635	3478	761	3480
964	3482								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

100	.033	380	.033	635	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
380	635	1206	1337	1433	.1	.3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

			Left OB	Channel	Right OB
E.G. Elev (ft)	3478.13	Element			
Vel Head (ft)	0.05	Wt. n-Val.	0.033	0.033	0.033
W.S. Elev (ft)	3478.09	Reach Len. (ft)	1206.00	1337.00	1433.00
Crit W.S. (ft)	3477.76	Flow Area (sq ft)	0.27	149.79	0.24
E.G. Slope (ft/ft)	0.002948	Area (sq ft)	0.27	149.79	0.24
Q Total (cfs)	257.00	Flow (cfs)	0.08	256.85	0.07
Top Width (ft)	266.62	Top Width (ft)	6.12	255.00	5.51
Vel Total (ft/s)	1.71	Avg. Vel. (ft/s)	0.30	1.71	0.30
Max Chl Dpth (ft)	1.09	Hydr. Depth (ft)	0.04	0.59	0.04
Conv. Total (cfs)	4733.3	Conv. (cfs)	1.5	4730.5	1.3
Length Wtd. (ft)	1336.99	Wetted Per. (ft)	6.12	255.01	5.51
Min Ch El (ft)	3477.00	Shear (lb/sq ft)	0.01	0.11	0.01
Alpha	1.01	Stream Power (lb/ft s)	0.00	0.19	0.00
Frctn Loss (ft)	7.80	Cum Volume (acre-ft)	9.42	58.71	1.69
C & E Loss (ft)	0.02	Cum SA (acres)	11.65	95.98	1.54

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: Ditch A
REACH: 5 RS: 11337

INPUT
Description: Sta. 11337
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3477	315	3474	392	3472	435	3470	499	3469
550	3470	591	3472	694	3474				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	435	.033	550	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
435	550	545	400	332	.1	.3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

			Left OB	Channel	Right OB
E.G. Elev (ft)	3470.31	Element			
Vel Head (ft)	0.24	Wt. n-Val.	0.033	0.033	0.033
W.S. Elev (ft)	3470.06	Reach Len. (ft)	545.00	400.00	332.00
Crit W.S. (ft)	3470.03	Flow Area (sq ft)	0.04	64.88	0.04
E.G. Slope (ft/ft)	0.016594	Area (sq ft)	0.04	64.88	0.04
Q Total (cfs)	257.00	Flow (cfs)	0.03	256.95	0.02
Top Width (ft)	117.70	Top Width (ft)	1.38	115.00	1.32
Vel Total (ft/s)	3.96	Avg. Vel. (ft/s)	0.59	3.96	0.59
Max Chl Dpth (ft)	1.06	Hydr. Depth (ft)	0.03	0.56	0.03
Conv. Total (cfs)	1995.1	Conv. (cfs)	0.2	1994.7	0.2
Length Wtd. (ft)	400.00	Wetted Per. (ft)	1.38	115.02	1.32
Min Ch El (ft)	3469.00	Shear (lb/sq ft)	0.03	0.58	0.03
Alpha	1.00	Stream Power (lb/ft s)	0.02	2.31	0.02
Frctn Loss (ft)	4.72	Cum Volume (acre-ft)	9.42	55.42	1.68
C & E Loss (ft)	0.02	Cum SA (acres)	11.55	90.30	1.43

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

CROSS SECTION RIVER: Ditch A
REACH: 5 RS: 10937

INPUT
Description: Sta. 10937
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3470	351	3468	428	3467	465	3466	536	3464
543	3464	609	3466	683	3468	811	3472		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	428	.033	609	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
428	609	729	649	445	.1 .3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

			Left OB	Channel	Right OB
E.G. Elev (ft)	3465.56	Element			
Vel Head (ft)	0.18	Wt. n-Val.		0.033	
W.S. Elev (ft)	3465.38	Reach Len. (ft)	729.00	649.00	445.00

Crit W.S. (ft)	3465.18	Flow Area (sq ft)		74.55	
E.G. Slope (ft/ft)	0.008826	Area (sq ft)		74.55	
Q Total (cfs)	257.00	Flow (cfs)		257.00	
Top Width (ft)	101.30	Top Width (ft)		101.30	
Vel Total (ft/s)	3.45	Avg. Vel. (ft/s)		3.45	
Max Chl Dpth (ft)	1.38	Hydr. Depth (ft)		0.74	
Conv. Total (cfs)	2735.6	Conv. (cfs)		2735.6	
Length Wtd. (ft)	649.00	Wetted Per. (ft)		101.34	
Min Ch El (ft)	3464.00	Shear (lb/sq ft)		0.41	
Alpha	1.00	Stream Power (lb/ft s)		1.40	
Frctn Loss (ft)	8.69	Cum Volume (acre-ft)	9.42	54.78	1.68
C & E Loss (ft)	0.00	Cum SA (acres)	11.54	89.31	1.43

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: Ditch A
REACH: 5 RS: 10288

INPUT
Description: Sta. 10288
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3464	177	3462	238	3460	298	3458	493	3456
519	3456	662	3457	778	3457.1	857	3458	903	3460
947	3462	989	3464						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	298	.033	857	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
298	857	552	598	633	.1	.3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

E.G. Elev (ft)	3456.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.		0.033	
W.S. Elev (ft)	3456.67	Reach Len. (ft)	552.00	598.00	633.00
Crit W.S. (ft)	3456.67	Flow Area (sq ft)		71.89	
E.G. Slope (ft/ft)	0.022674	Area (sq ft)		71.89	

Q Total (cfs)	257.00	Flow (cfs)		257.00	
Top Width (ft)	187.76	Top Width (ft)		187.76	
Vel Total (ft/s)	3.57	Avg. Vel. (ft/s)		3.57	
Max Chl Dpth (ft)	0.67	Hydr. Depth (ft)		0.38	
Conv. Total (cfs)	1706.8	Conv. (cfs)		1706.8	
Length Wtd. (ft)	598.00	Wetted Per. (ft)		187.77	
Min Ch El (ft)	3456.00	Shear (lb/sq ft)		0.54	
Alpha	1.00	Stream Power (lb/ft s)		1.94	
Frctn Loss (ft)	4.59	Cum Volume (acre-ft)	9.42	53.69	1.68
C & E Loss (ft)	0.04	Cum SA (acres)	11.54	87.16	1.43

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.

CROSS SECTION RIVER: Ditch A
REACH: 5 RS: 9690

INPUT
Description: Sta. 9690
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3454.5	202	3454	381	3452	632	3450	638	3450
799	3452	897	3454	1010	3458				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	381	.033	799	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
381	799	639	681	658	.1	.3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

E.G. Elev (ft)	3451.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.033	

W.S. Elev (ft)	3451.19	Reach Len. (ft)	639.00	681.00	658.00
Crit W.S. (ft)	3450.87	Flow Area (sq ft)		152.62	
E.G. Slope (ft/ft)	0.004338	Area (sq ft)		152.62	
Q Total (cfs)	325.00	Flow (cfs)		325.00	
Top Width (ft)	250.83	Top Width (ft)		250.83	
Vel Total (ft/s)	2.13	Avg. Vel. (ft/s)		2.13	
Max Chl Dpth (ft)	1.19	Hydr. Depth (ft)		0.61	
Conv. Total (cfs)	4934.2	Conv. (cfs)		4934.2	
Length Wtd. (ft)	681.00	Wetted Per. (ft)		250.84	
Min Ch El (ft)	3450.00	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)		0.35	
Frctn Loss (ft)	4.93	Cum Volume (acre-ft)	9.42	52.14	1.68
C & E Loss (ft)	0.01	Cum SA (acres)	11.54	84.15	1.43

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: Ditch A
REACH: 5 RS: 9009

INPUT
Description: Sta. 9009
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3452	203	3450	325	3448	492	3446	596	3445
637	3446	892	3448	1007	3450	1124	3452		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	325	.033	892	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
325	892	898	879	794	.1	.3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

E.G. Elev (ft)	3446.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.		0.033	
W.S. Elev (ft)	3446.12	Reach Len. (ft)	898.00	879.00	794.00
Crit W.S. (ft)	3446.04	Flow Area (sq ft)		91.07	
E.G. Slope (ft/ft)	0.014428	Area (sq ft)		91.07	

Q Total (cfs)	325.00	Flow (cfs)		325.00	
Top Width (ft)	169.88	Top Width (ft)		169.88	
Vel Total (ft/s)	3.57	Avg. Vel. (ft/s)		3.57	
Max Chl Dpth (ft)	1.12	Hydr. Depth (ft)		0.54	
Conv. Total (cfs)	2705.7	Conv. (cfs)		2705.7	
Length Wtd. (ft)	879.00	Wetted Per. (ft)		169.90	
Min Ch El (ft)	3445.00	Shear (lb/sq ft)		0.48	
Alpha	1.00	Stream Power (lb/ft s)		1.72	
Frctn Loss (ft)	4.96	Cum Volume (acre-ft)	9.42	50.24	1.68
C & E Loss (ft)	0.04	Cum SA (acres)	11.54	80.86	1.43

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: Ditch A
REACH: 5 RS: 8130

INPUT
Description: Sta. 8130
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3448	303	3444	419	3442	654	3440	663	3440
852	3442	995	3444	1104	3446				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	419	.033	852	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
419	852	399	413	456	.1	.3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

E.G. Elev (ft)	3441.30	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.		0.033	
W.S. Elev (ft)	3441.25	Reach Len. (ft)	399.00	413.00	456.00
Crit W.S. (ft)	3440.85	Flow Area (sq ft)		176.81	
E.G. Slope (ft/ft)	0.002988	Area (sq ft)		176.81	
Q Total (cfs)	325.00	Flow (cfs)		325.00	
Top Width (ft)	273.95	Top Width (ft)		273.95	

Vel Total (ft/s)	1.84	Avg. Vel. (ft/s)		1.84	
Max Chl Dpth (ft)	1.25	Hydr. Depth (ft)		0.65	
Conv. Total (cfs)	5945.6	Conv. (cfs)		5945.6	
Length Wtd. (ft)	413.00	Wetted Per. (ft)		273.96	
Min Ch El (ft)	3440.00	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)		0.22	
Frctn Loss (ft)	2.64	Cum Volume (acre-ft)	9.42	47.54	1.68
C & E Loss (ft)	0.02	Cum SA (acres)	11.54	76.38	1.43

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: Ditch A
REACH: 5 RS: 7717

INPUT
Description: Sta 7717
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3442	233	3440	383	3438	492	3437.8	510	3438
657	3439	747	3440	879	3442				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	233	.033	747	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
233	747	444	464	510	.1	.3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

E.G. Elev (ft)	3438.64	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.		0.033	
W.S. Elev (ft)	3438.44	Reach Len. (ft)	444.00	464.00	510.00
Crit W.S. (ft)	3438.44	Flow Area (sq ft)		89.29	
E.G. Slope (ft/ft)	0.022265	Area (sq ft)		89.29	
Q Total (cfs)	325.00	Flow (cfs)		325.00	
Top Width (ft)	223.91	Top Width (ft)		223.91	
Vel Total (ft/s)	3.64	Avg. Vel. (ft/s)		3.64	
Max Chl Dpth (ft)	0.64	Hydr. Depth (ft)		0.40	
Conv. Total (cfs)	2178.1	Conv. (cfs)		2178.1	

Length Wtd. (ft)	464.00	Wetted Per. (ft)		223.91	
Min Ch El (ft)	3437.80	Shear (lb/sq ft)		0.55	
Alpha	1.00	Stream Power (lb/ft s)		2.02	
Frctn Loss (ft)	1.76	Cum Volume (acre-ft)	9.42	46.28	1.68
C & E Loss (ft)	0.05	Cum SA (acres)	11.54	74.02	1.43

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.

CROSS SECTION RIVER: Ditch A
REACH: 5 RS: 7253

INPUT
Description: Sta. 7253
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3438	109	3438.7	321	3438	424	3436	668	3435
906	3436	1005	3438	1200	3440	1365	3442		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	424	.033	906	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
424	906	756	910	980	.1 .3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

E.G. Elev (ft)	3436.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.033	0.033	0.033
W.S. Elev (ft)	3436.09	Reach Len. (ft)	756.00	910.00	980.00
Crit W.S. (ft)	3435.67	Flow Area (sq ft)	0.21	284.42	0.20
E.G. Slope (ft/ft)	0.001631	Area (sq ft)	0.21	284.42	0.20
Q Total (cfs)	364.00	Flow (cfs)	0.05	363.91	0.05
Top Width (ft)	491.10	Top Width (ft)	4.64	482.00	4.46

Vel Total (ft/s)	1.28	Avg. Vel. (ft/s)	0.23	1.28	0.23
Max Chl Dpth (ft)	1.09	Hydr. Depth (ft)	0.05	0.59	0.05
Conv. Total (cfs)	9012.2	Conv. (cfs)	1.2	9009.9	1.1
Length Wtd. (ft)	910.00	Wetted Per. (ft)	4.64	482.00	4.46
Min Ch El (ft)	3435.00	Shear (lb/sq ft)	0.00	0.06	0.00
Alpha	1.00	Stream Power (lb/ft s)	0.00	0.08	0.00
Frctn Loss (ft)	5.42	Cum Volume (acre-ft)	9.41	44.29	1.68
C & E Loss (ft)	0.02	Cum SA (acres)	11.52	70.26	1.40

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: Ditch A
REACH: 5 RS: 6343

INPUT
Description: Sta. 6343
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3434	346	3433	663	3432	732	3431	860	3430.2
981	3430	1273	3430	1320	3431.5	1566	3432		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	663	.033	1320	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
663	1320	767	980	1051	.1	.3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

E.G. Elev (ft)	3430.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.		0.033	
W.S. Elev (ft)	3430.46	Reach Len. (ft)	767.00	980.00	1051.00
Crit W.S. (ft)	3430.46	Flow Area (sq ft)		188.08	
E.G. Slope (ft/ft)	0.022292	Area (sq ft)		188.08	
Q Total (cfs)	687.00	Flow (cfs)		687.00	
Top Width (ft)	469.62	Top Width (ft)		469.62	
Vel Total (ft/s)	3.65	Avg. Vel. (ft/s)		3.65	
Max Chl Dpth (ft)	0.46	Hydr. Depth (ft)		0.40	
Conv. Total (cfs)	4601.3	Conv. (cfs)		4601.3	

Length Wtd. (ft)	980.00	Wetted Per. (ft)		469.63	
Min Ch El (ft)	3430.00	Shear (lb/sq ft)		0.56	
Alpha	1.00	Stream Power (lb/ft s)		2.04	
Frctn Loss (ft)	4.09	Cum Volume (acre-ft)	9.41	39.35	1.68
C & E Loss (ft)	0.05	Cum SA (acres)	11.48	60.32	1.35

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.

CROSS SECTION RIVER: Ditch A
REACH: 5 RS: 5363

INPUT
Description: Sta. 5363
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3432	282	3430	550	3428	742	3426	885	3425
1097	3425	1476	3426	1877	3428	1966	3428	2160	3430

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	742	.033	1476	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
742	1476	1199	1142	713	.1	.3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

E.G. Elev (ft)	3426.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.033	0.033	0.033
W.S. Elev (ft)	3426.02	Reach Len. (ft)	1199.00	1142.00	713.00
Crit W.S. (ft)	3425.54	Flow Area (sq ft)	0.02	486.80	0.04
E.G. Slope (ft/ft)	0.001698	Area (sq ft)	0.02	486.80	0.04
Q Total (cfs)	687.00	Flow (cfs)	0.00	687.00	0.00
Top Width (ft)	739.57	Top Width (ft)	1.80	734.00	3.77

Vel Total (ft/s)	1.41	Avg. Vel. (ft/s)	0.08	1.41	0.08
Max Chl Dpth (ft)	1.02	Hydr. Depth (ft)	0.01	0.66	0.01
Conv. Total (cfs)	16669.9	Conv. (cfs)	0.0	16669.8	0.1
Length Wtd. (ft)	1142.00	Wetted Per. (ft)	1.80	734.00	3.77
Min Ch El (ft)	3425.00	Shear (lb/sq ft)	0.00	0.07	0.00
Alpha	1.00	Stream Power (lb/ft s)	0.00	0.10	0.00
Frctn Loss (ft)	5.07	Cum Volume (acre-ft)	9.41	31.76	1.68
C & E Loss (ft)	0.02	Cum SA (acres)	11.46	46.78	1.30

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: Ditch A
REACH: 5 RS: 4221

INPUT
Description: Sta. 4221
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3423	341	3422	544	3421	640	3420	669	3420
753	3420.2	829	3420	837	3420	1030	3421	1320	3422
1407	3423	1497	3424						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	544	.033	1407	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff, Contr.	Expan.
544	1407	749	732	843	.1	.3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

E.G. Elev (ft)	3420.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.		0.033	
W.S. Elev (ft)	3420.71	Reach Len. (ft)	749.00	732.00	843.00
Crit W.S. (ft)	3420.71	Flow Area (sq ft)		196.80	
E.G. Slope (ft/ft)	0.020617	Area (sq ft)		196.80	
Q Total (cfs)	790.00	Flow (cfs)		790.00	
Top Width (ft)	402.25	Top Width (ft)		402.25	
Vel Total (ft/s)	4.01	Avg. Vel. (ft/s)		4.01	
Max Chl Dpth (ft)	0.71	Hydr. Depth (ft)		0.49	

Conv. Total (cfs)	5502.0	Conv. (cfs)		5502.0	
Length Wtd. (ft)	736.33	Wetted Per. (ft)		402.26	
Min Ch El (ft)	3420.00	Shear (lb/sq ft)		0.63	
Alpha	1.00	Stream Power (lb/ft s)		2.53	
Frctn Loss (ft)	3.65	Cum Volume (acre-ft)	9.41	22.80	1.68
C & E Loss (ft)	0.06	Cum SA (acres)	11.44	31.89	1.27

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.
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 RIVER: Ditch A
REACH: 5 RS: 3489

INPUT
Description: Sta. 3489
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3417	258	3416.5	299	3416	309	3415	318	3416
405	3416	422	3416	539	3416.4	581	3416.2	642	3416.4
744	3416	830	3416	918	3418	1068	3420	1159	3421

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	539	.033	918	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
539	918	464	500	457	.1 .3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

E.G. Elev (ft)	3416.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.033	0.033	
W.S. Elev (ft)	3416.92	Reach Len. (ft)	464.00	500.00	457.00
Crit W.S. (ft)	3416.52	Flow Area (sq ft)	260.10	233.33	
E.G. Slope (ft/ft)	0.002177	Area (sq ft)	260.10	233.33	
Q Total (cfs)	790.00	Flow (cfs)	401.97	388.03	

Top Width (ft)	743.33	Top Width (ft)	412.08	331.25	
Vel Total (ft/s)	1.60	Avg. Vel. (ft/s)	1.55	1.66	
Max Chl Dpth (ft)	1.91	Hydr. Depth (ft)	0.63	0.70	
Conv. Total (cfs)	16933.4	Conv. (cfs)	8616.2	8317.2	
Length Wtd. (ft)	482.36	Wetted Per. (ft)	412.18	331.26	
Min Ch El (ft)	3416.00	Shear (lb/sq ft)	0.09	0.10	
Alpha	1.00	Stream Power (lb/ft s)	0.13	0.16	
Frctn Loss (ft)	2.43	Cum Volume (acre-ft)	7.18	19.18	1.68
C & E Loss (ft)	0.02	Cum SA (acres)	7.89	25.72	1.27

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: Ditch A
REACH: 5 RS: 2989

INPUT
Description: Sta. 2989
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
170	3414.8	196	3414	436	3413.8	613	3414	651	3414
700	3414	747	3414	761	3414	841	3415.01	920	3416
976	3418	1067	3420						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
170	.033	436	.033	841	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
436	841	317	215	172	.3	.5

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

E.G. Elev (ft)	3414.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.19	Wt. n-Val.	0.033	0.033	
W.S. Elev (ft)	3414.32	Reach Len. (ft)	317.00	215.00	172.00
Crit W.S. (ft)	3414.32	Flow Area (sq ft)	101.56	124.49	
E.G. Slope (ft/ft)	0.022050	Area (sq ft)	101.56	124.49	
Q Total (cfs)	790.00	Flow (cfs)	372.18	417.82	
Top Width (ft)	600.34	Top Width (ft)	250.28	350.06	
Vel Total (ft/s)	3.49	Avg. Vel. (ft/s)	3.66	3.36	

Max Chl Dpth (ft)	0.52	Hydr. Depth (ft)	0.41	0.36	
Conv. Total (cfs)	5320.2	Conv. (cfs)	2506.4	2813.8	
Length Wtd. (ft)	260.56	Wetted Per. (ft)	250.29	350.06	
Min Ch El (ft)	3413.80	Shear (lb/sq ft)	0.56	0.49	
Alpha	1.01	Stream Power (lb/ft s)	2.05	1.64	
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	5.25	17.13	1.68
C & E Loss (ft)	0.09	Cum SA (acres)	4.36	21.81	1.27

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: 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 RIVER: Ditch A
REACH: 5 RS: 2774

INPUT
Description: Sta. 2774 Upstream of culverts
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3413.8	175	3413.8	204	3412	261	3412	298	3411.2
402	3410.9	437	3410	469	3409	491	3409	511	3410
560	3412	641	3414	725	3416				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	437	.033	511	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
437	511	40	40	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
888	F		
888	F		

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

E.G. Elev (ft)	3413.72	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.033	0.033	0.033
W.S. Elev (ft)	3413.71	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)	3412.70	Flow Area (sq ft)	588.63	322.19	191.45

E.G. Slope (ft/ft)	0.000067	Area (sq ft)	588.63	322.19	191.45
Q Total (cfs)	790.00	Flow (cfs)	374.76	317.56	97.68
Top Width (ft)	452.54	Top Width (ft)	260.47	74.00	118.07
Vel Total (ft/s)	0.72	Avg. Vel. (ft/s)	0.64	0.99	0.51
Max Chl Dpth (ft)	4.71	Hydr. Depth (ft)	2.26	4.35	1.62
Conv. Total (cfs)	96197.5	Conv. (cfs)	45634.1	38669.0	11894.4
Length Wtd. (ft)	40.00	Wetted Per. (ft)	260.55	74.04	118.13
Min Ch El (ft)	3409.00	Shear (lb/sq ft)	0.01	0.02	0.01
Alpha	1.20	Stream Power (lb/ft s)	0.01	0.02	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	2.74	16.03	1.30
C & E Loss (ft)		Cum SA (acres)	2.51	20.77	1.04

CULVERT RIVER: Ditch A
REACH: 5 RS: 2773

INPUT
Description:
Distance from Upstream XS = 8
Deck/Roadway Width = 24
Weir Coefficient = 3
Upstream Deck/Roadway Coordinates
num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
26	3413.8		100	3413.8		402	3412.7	
500	3412.8		600	3413.9		700	3415.7	

Upstream Bridge Cross Section Data
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3413.8	175	3413.8	204	3412	261	3412	298	3411.2
402	3410.9	437	3410	469	3409	491	3409	511	3410
560	3412	641	3414	725	3416				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	437	.033	511	.033

Bank Sta: Left	Right	Coeff Contr.	Expan.
437	511	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
888	F		
888	F		

Downstream Deck/Roadway Coordinates
num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
26	3413.8		100	3413.8		402	3412.7	
500	3412.8		600	3413.9		700	3415.7	

Downstream Bridge Cross Section Data
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
26	3413.8	100	3412.4	155	3412	299	3411.4	349	3410
387	3408.9	391.4	3408.9	395.8	3408.9	400.2	3408.9	404.6	3408.9
409	3408.9	434	3410	487	3412	568	3414	658	3416

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
26	.033	349	.033	434	.033

Bank Sta: Left Right Coeff Contr. Expan.
349 434 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
888	F		
888	F		

Upstream Embankment side slope = 3 horiz. to 1.0 vertical
Downstream Embankment side slope = 3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins = 3412.7
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span
Culvert #1 Pipe Arch 1.833 2.43
FHWA Chart # 34- 18 inch corner radius; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	n Value	Entrance Loss Coef	Exit Loss Coef
1	39	.024	.5	1

Number of Barrels = 6
Upstream Elevation = 3409
Centerline Stations

Sta.	Sta.	Sta.	Sta.	Sta.	Sta.
469	473.4	477.8	482.2	486.6	491

Downstream Elevation = 3408.9
Centerline Stations

Sta.	Sta.	Sta.	Sta.	Sta.	Sta.
387	391.4	395.8	400.2	404.6	409

CULVERT OUTPUT Profile #100 Yr.-WS3405
Culvert ID : Culvert #1

Culv Q (cfs)	124.90	Culv Ful Lngh (ft)	39.00
# Barrels	6	Culv Vel US (ft/s)	4.73
Q Barrel (cfs)	20.82	Culv Vel DS (ft/s)	4.73
E.G. US. (ft)	3413.72	Culv Inv El Up (ft)	3409.00
W.S. US. (ft)	3413.71	Culv Inv El Dn (ft)	3408.90
E.G. DS (ft)	3412.73	Culv Frctn Ls (ft)	0.49
W.S. DS (ft)	3412.70	Culv Ext Lss (ft)	0.32
Delta EG (ft)	0.98	Culv Ent Lss (ft)	0.17
Delta WS (ft)	1.01	Q Weir (cfs)	665.10
E.G. IC (ft)	3413.62	Weir Sta Lft (ft)	176.47
E.G. OC (ft)	3413.72	Weir Sta Rgt (ft)	582.62
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	3410.83	Weir Max Depth (ft)	1.01
Culv WS Outlet (ft)	3410.73	Weir Avg Depth (ft)	0.66
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	266.04
Culv Crt Depth (ft)	1.16	Min El Weir Flow (ft)	3412.71

CROSS SECTION RIVER: Ditch A

REACH: 5 RS: 2734

INPUT
Description: Sta. 2734 Downstream of culverts
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
26	3413.8	100	3412.4	155	3412	299	3411.4	349	3410
387	3408.9	391.4	3408.9	395.8	3408.9	400.2	3408.9	404.6	3408.9
409	3408.9	434	3410	487	3412	568	3414	658	3416

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
26	.033	349	.033	434	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
349	434	745	846	1015	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
888	F		
888	F		

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

			Left OB	Channel	Right OB
E.G. Elev (ft)	3412.73	Element			
Vel Head (ft)	0.03	Wt. n-Val.	0.033	0.033	0.033
W.S. Elev (ft)	3412.70	Reach Len. (ft)	745.00	846.00	1015.00
Crit W.S. (ft)	3412.70	Flow Area (sq ft)	273.94	288.37	100.04
E.G. Slope (ft/ft)	0.000281	Area (sq ft)	273.94	288.37	100.04
Q Total (cfs)	790.00	Flow (cfs)	211.62	491.68	86.70
Top Width (ft)	431.23	Top Width (ft)	264.87	85.00	81.36
Vel Total (ft/s)	1.19	Avg. Vel. (ft/s)	0.77	1.71	0.87
Max Chl Dpth (ft)	3.80	Hydr. Depth (ft)	1.03	3.39	1.23
Conv. Total (cfs)	47090.5	Conv. (cfs)	12614.4	29308.0	5168.1
Length Wtd. (ft)	841.78	Wetted Per. (ft)	264.90	85.04	81.40
Min Ch El (ft)	3408.90	Shear (lb/sq ft)	0.02	0.06	0.02
Alpha	1.44	Stream Power (lb/ft s)	0.01	0.10	0.02
Frctn Loss (ft)	0.77	Cum Volume (acre-ft)	2.34	15.75	1.17
C & E Loss (ft)	0.05	Cum SA (acres)	2.27	20.69	0.95

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 cr

oss
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 i
ndicates
that there is not a valid subcritical answer. The program defaulted to critical dep
th.
Note: Multiple critical depths were found at this location. The critical depth with the l
owest, valid,
energy was used.

CROSS SECTION RIVER: Ditch A
REACH: 5 RS: 1888

INPUT
Description: Sta. 1888
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3410.2	110	3410	331	3408	532	3408	690	3408
1180	3410								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	100	.033	1180	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	1180	305	828	980	.1	.3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

			Left OB	Channel	Right OB
E.G. Elev (ft)	3408.70	Element			
Vel Head (ft)	0.21	Wt. n-Val.		0.033	
W.S. Elev (ft)	3408.49	Reach Len. (ft)	305.00	828.00	980.00
Crit W.S. (ft)	3408.49	Flow Area (sq ft)		218.19	
E.G. Slope (ft/ft)	0.021974	Area (sq ft)		218.19	
Q Total (cfs)	803.00	Flow (cfs)		803.00	
Top Width (ft)	532.93	Top Width (ft)		532.93	
Vel Total (ft/s)	3.68	Avg. Vel. (ft/s)		3.68	
Max Chl Dpth (ft)	0.49	Hydr. Depth (ft)		0.41	
Conv. Total (cfs)	5417.1	Conv. (cfs)		5417.1	
Length Wtd. (ft)	828.00	Wetted Per. (ft)		532.93	
Min Ch El (ft)	3408.00	Shear (lb/sq ft)		0.56	
Alpha	1.00	Stream Power (lb/ft s)		2.07	
Frctn Loss (ft)	1.14	Cum Volume (acre-ft)		10.83	
C & E Loss (ft)	0.06	Cum SA (acres)		14.69	

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.

CROSS SECTION RIVER: Ditch A
REACH: 5 RS: 1060

INPUT
Description: Sta. 1060
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	3408	394	3406	879	3402.7	909	3402.7	1206	3405
1554	3404.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.033	394	.033	1554	.033

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
394	1554	60	60	.1	.3

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

			Left OB	Channel	Right OB
E.G. Elev (ft)	3405.01	Element			
Vel Head (ft)	0.01	Wt. n-Val.		0.033	
W.S. Elev (ft)	3405.00	Reach Len. (ft)			
Crit W.S. (ft)	3403.77	Flow Area (sq ft)		921.10	
E.G. Slope (ft/ft)	0.000467	Area (sq ft)		921.10	
Q Total (cfs)	841.00	Flow (cfs)		841.00	
Top Width (ft)	1013.03	Top Width (ft)		1013.03	
Vel Total (ft/s)	0.91	Avg. Vel. (ft/s)		0.91	
Max Chl Dpth (ft)	2.30	Hydr. Depth (ft)		0.91	
Conv. Total (cfs)	38907.7	Conv. (cfs)		38907.7	
Length Wtd. (ft)		Wetted Per. (ft)		1013.75	
Min Ch El (ft)	3402.70	Shear (lb/sq ft)		0.03	
Alpha	1.00	Stream Power (lb/ft s)		0.02	
Frctn Loss (ft)		Cum Volume (acre-ft)			

C & E Loss (ft) Cum SA (acres)

Warning: Divided flow computed for this cross-section.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

SUMMARY OF MANNING'S N VALUES

River:Ditch A

Reach	River Sta.	n1	n2	n3
5	12674	.033	.033	.033
5	11337	.033	.033	.033
5	10937	.033	.033	.033
5	10288	.033	.033	.033
5	9690	.033	.033	.033
5	9009	.033	.033	.033
5	8130	.033	.033	.033
5	7717	.033	.033	.033
5	7253	.033	.033	.033
5	6343	.033	.033	.033
5	5363	.033	.033	.033
5	4221	.033	.033	.033
5	3489	.033	.033	.033
5	2989	.033	.033	.033
5	2774	.033	.033	.033
5	2773	Culvert		
5	2734	.033	.033	.033
5	1888	.033	.033	.033
5	1060	.033	.033	.033

SUMMARY OF REACH LENGTHS

River: Ditch A

Reach	River Sta.	Left	Channel	Right
5	12674	1206	1337	1433
5	11337	545	400	332
5	10937	729	649	445
5	10288	552	598	633
5	9690	639	681	658
5	9009	898	879	794
5	8130	399	413	456
5	7717	444	464	510
5	7253	756	910	980
5	6343	767	980	1051
5	5363	1199	1142	713
5	4221	749	732	843
5	3489	464	500	457
5	2989	317	215	172
5	2774	40	40	40
5	2773	Culvert		
5	2734	745	846	1015
5	1888	305	828	980
5	1060	60	60	60

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Ditch A

Reach	River Sta.	Contr.	Expan.
5	12674	.1	.3
5	11337	.1	.3
5	10937	.1	.3
5	10288	.1	.3
5	9690	.1	.3
5	9009	.1	.3
5	8130	.1	.3
5	7717	.1	.3
5	7253	.1	.3
5	6343	.1	.3
5	5363	.1	.3
5	4221	.1	.3
5	3489	.1	.3
5	2989	.3	.5
5	2774	.3	.5
5	2773	Culvert	
5	2734	.3	.5
5	1888	.1	.3
5	1060	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. S
lope	Vel Chnl	Flow Area	Top Width	Froude # Chl			
/ft)	(ft/s)	(sq ft)	(cfs) (ft)	(ft)	(ft)	(ft)	(ft
5	12674	257.00	3477.00	3478.09	3477.76	3478.13	0.00
2948	1.71	150.30	266.62	0.39			
5	11337	257.00	3469.00	3470.06	3470.03	3470.31	0.01
6594	3.96	64.97	117.70	0.93			
5	10937	257.00	3464.00	3465.38	3465.18	3465.56	0.00
8826	3.45	74.55	101.30	0.71			
5	10288	257.00	3456.00	3456.67	3456.67	3456.87	0.02
2674	3.57	71.89	187.76	1.02			
5	9690	325.00	3450.00	3451.19	3450.87	3451.26	0.00
4338	2.13	152.62	250.83	0.48			
5	9009	325.00	3445.00	3446.12	3446.04	3446.32	0.01
4428	3.57	91.07	169.88	0.86			
5	8130	325.00	3440.00	3441.25	3440.85	3441.30	0.00
2988	1.84	176.81	273.95	0.40			
5	7717	325.00	3437.80	3438.44	3438.44	3438.64	0.02
2265	3.64	89.29	223.91	1.02			
5	7253	364.00	3435.00	3436.09	3435.67	3436.12	0.00
1631	1.28	284.83	491.10	0.29			
5	6343	687.00	3430.00	3430.46	3430.46	3430.67	0.02
2292	3.65	188.08	469.62	1.02			
5	5363	687.00	3425.00	3426.02	3425.54	3426.05	0.00
1698	1.41	486.85	739.57	0.31			
5	4221	790.00	3420.00	3420.71	3420.71	3420.96	0.02
0617	4.01	196.80	402.25	1.01			
5	3489	790.00	3416.00	3416.92	3416.52	3416.96	0.00

2177	1.66	493.43	743.33	0.35				
5		2989	790.00	3413.80	3414.32	3414.32	3414.51	0.02
2050	3.36	226.05	600.34	0.99				
5		2774	790.00	3409.00	3413.71	3412.70	3413.72	0.00
0067	0.99	1102.27	452.54	0.08				
5		2773	Culvert					
5		2734	790.00	3408.90	3412.70	3412.70	3412.73	0.00
0281	1.71	662.35	431.23	0.16				
5		1888	803.00	3408.00	3408.49	3408.49	3408.70	0.02
1974	3.68	218.19	532.93	1.01				
5		1060	841.00	3402.70	3405.00	3403.77	3405.01	0.00
0467	0.91	921.10	1013.03	0.17				

Profile Output Table - Report

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	Max Chl Dpth	E.G
. Elev	E.G. Slope Vel Chnl	Sta W.S. Lft	Sta W.S. Rgt	Flow Area	Top Width	Froude # Chl	
(ft)	(ft/ft) (ft/s)	(cfs) (ft)	(ft)	(ft) (sq ft)	(ft)	(ft)	
5	12674	257.00	3477.00	3478.09	3477.76	1.09	3
478.13	0.002948 1.71	373.88	640.51	150.30	266.62		0.39
5	11337	257.00	3469.00	3470.06	3470.03	1.06	3
470.31	0.016594 3.96	433.62	551.32	64.97	117.70		0.93
5	10937	257.00	3464.00	3465.38	3465.18	1.38	3
465.56	0.008826 3.45	487.13	588.43	74.55	101.30		0.71
5	10288	257.00	3456.00	3456.67	3456.67	0.67	3
456.87	0.022674 3.57	427.42	615.18	71.89	187.76		1.02
5	9690	325.00	3450.00	3451.19	3450.87	1.19	3
451.26	0.004338 2.13	482.85	733.67	152.62	250.83		0.48
5	9009	325.00	3445.00	3446.12	3446.04	1.12	3
446.32	0.014428 3.57	482.15	652.03	91.07	169.88		0.86
5	8130	325.00	3440.00	3441.25	3440.85	1.25	3
441.30	0.002988 1.84	507.15	781.10	176.81	273.95		0.40
5	7717	325.00	3437.80	3438.44	3438.44	0.64	3
438.64	0.022265 3.64	350.26	574.17	89.29	223.91		1.02
5	7253	364.00	3435.00	3436.09	3435.67	1.09	3
436.12	0.001631 1.28	419.36	910.46	284.83	491.10		0.29
5	6343	687.00	3430.00	3430.46	3430.46	0.46	3
430.67	0.022292 3.65	817.89	1287.51	188.08	469.62		1.02
5	5363	687.00	3425.00	3426.02	3425.54	1.02	3
426.05	0.001698 1.41	740.20	1479.77	486.85	739.57		0.31
5	4221	790.00	3420.00	3420.71	3420.71	0.71	3
420.96	0.020617 4.01	571.82	974.07	196.80	402.25		1.01

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 5            3489                 790.00    3416.00    3416.92    3416.52          1.91    3
416.96    0.002177       1.66        126.92        870.25     493.43     743.33          0.35

 5            2989                 790.00    3413.80    3414.32    3414.32          0.52    3
414.51    0.022050       3.36        185.72        786.06     226.05     600.34          0.99

 5            2774                 790.00    3409.00    3413.71    3412.70          4.71    3
413.72    0.000067       0.99        176.53        629.07    1102.27     452.54          0.08

 5            2773                 Culvert


 5            2734                 790.00    3408.90    3412.70    3412.70          3.80    3
412.73    0.000281       1.71         84.13        515.36     662.35     431.23          0.16

 5            1888                 803.00    3408.00    3408.49    3408.49          0.49    3
408.70    0.021974       3.68        276.94        809.87     218.19     532.93          1.01

 5            1060                 841.00    3402.70    3405.00    3403.77          2.30    3
405.01    0.000467       0.91        540.97       1554.00     921.10    1013.03          0.17
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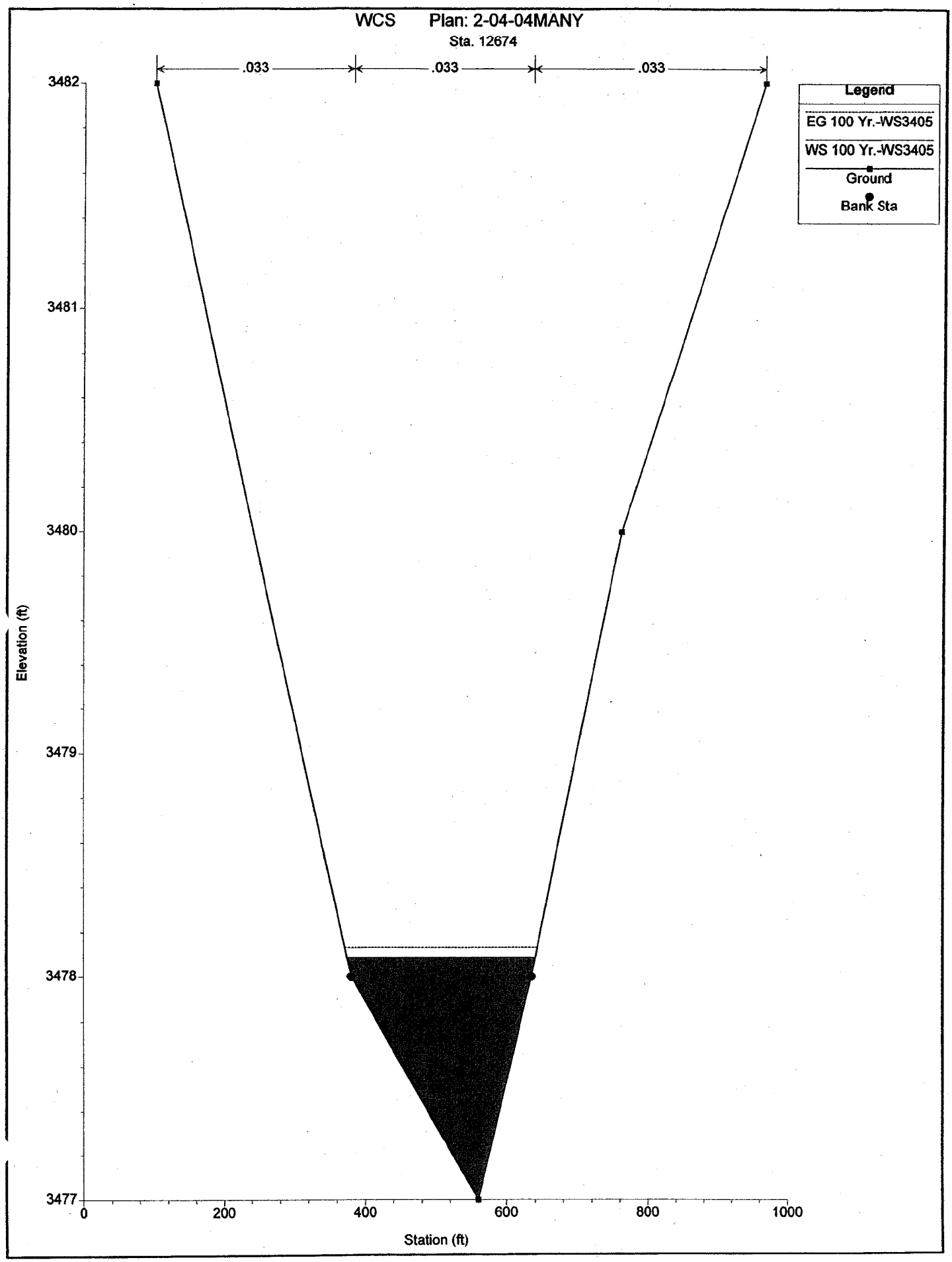
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.033
.033
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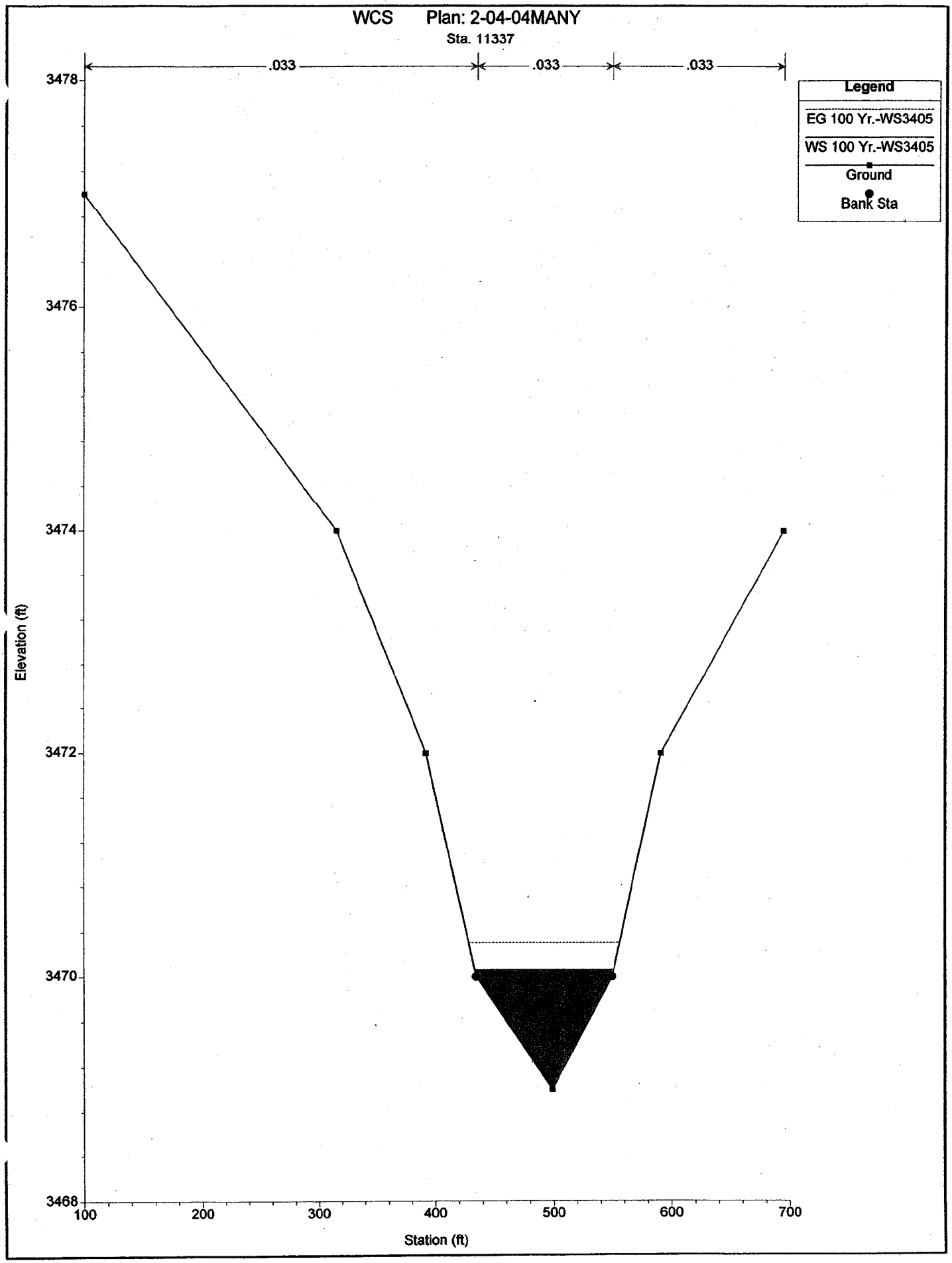
WS 100 Yr.-WS3405
Ground
Bank Sta
3482
3481
3480
3479
3478
3477
Elevation (ft)
0
200
400
600
800
1000
Station (ft)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.033
.033
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WS 100 Yr.-WS3405
Ground
Bank Sta
3478
3476
3474
3472
3470
3468
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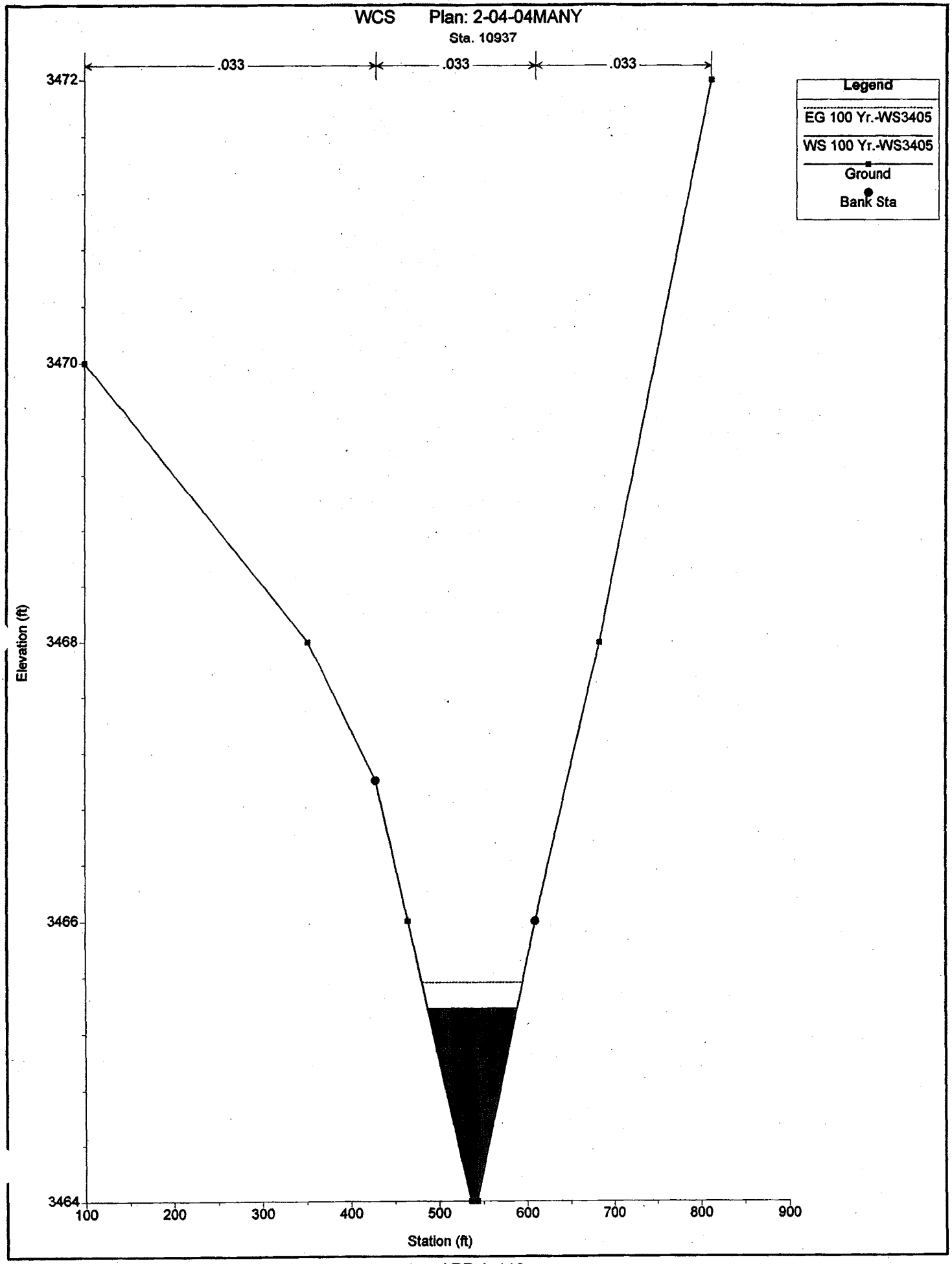
100
200
300
400
500
600
700
Station (ft)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.033
.033
Legend
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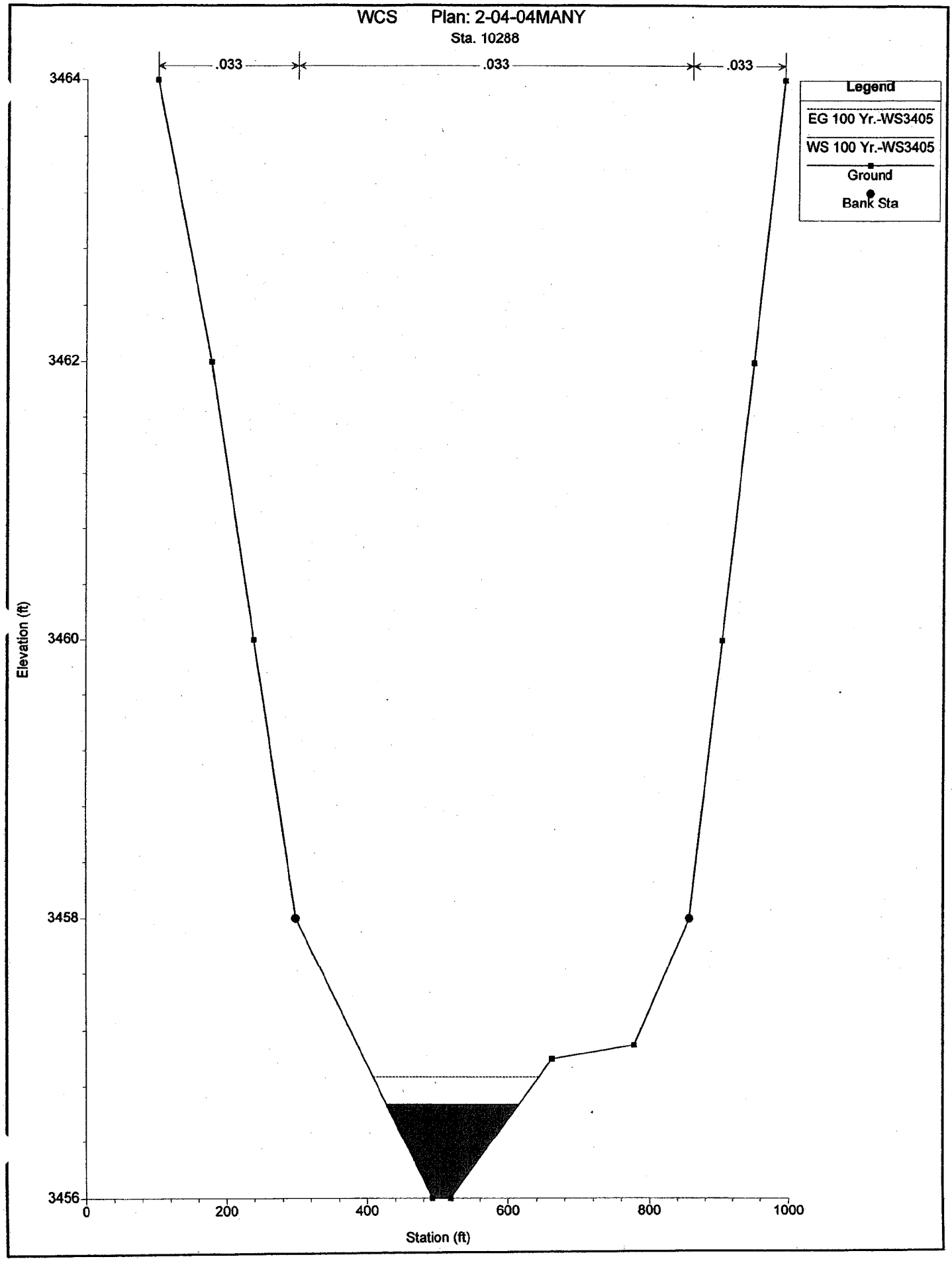
WS 100 Yr.-WS3405
Ground
Bank Sta
3472
3470
3468
3466
3464
Elevation (ft)
100
200
300
400
500
600
700
800
900
Station (ft)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Legend
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WS 100 Yr.-WS3405
Ground
Bank Sta
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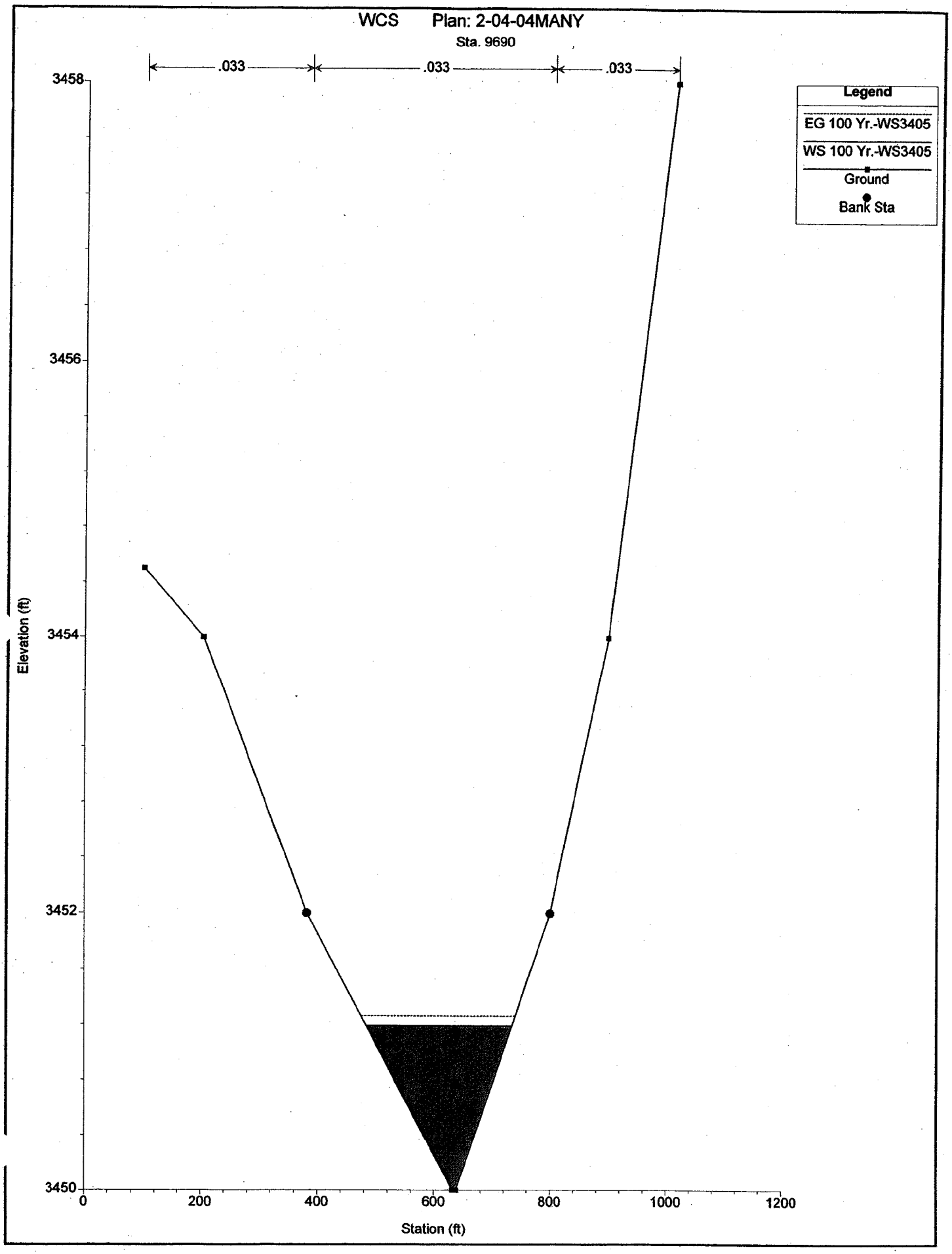
3462
3460
3458
3456
Elevation (ft)
0
200
400
600
800
1000
Station (ft)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Legend
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WS 100 Yr.-WS3405
Ground
Bank Sta
3458
3456
3454
3452
3450
Elevation (ft)
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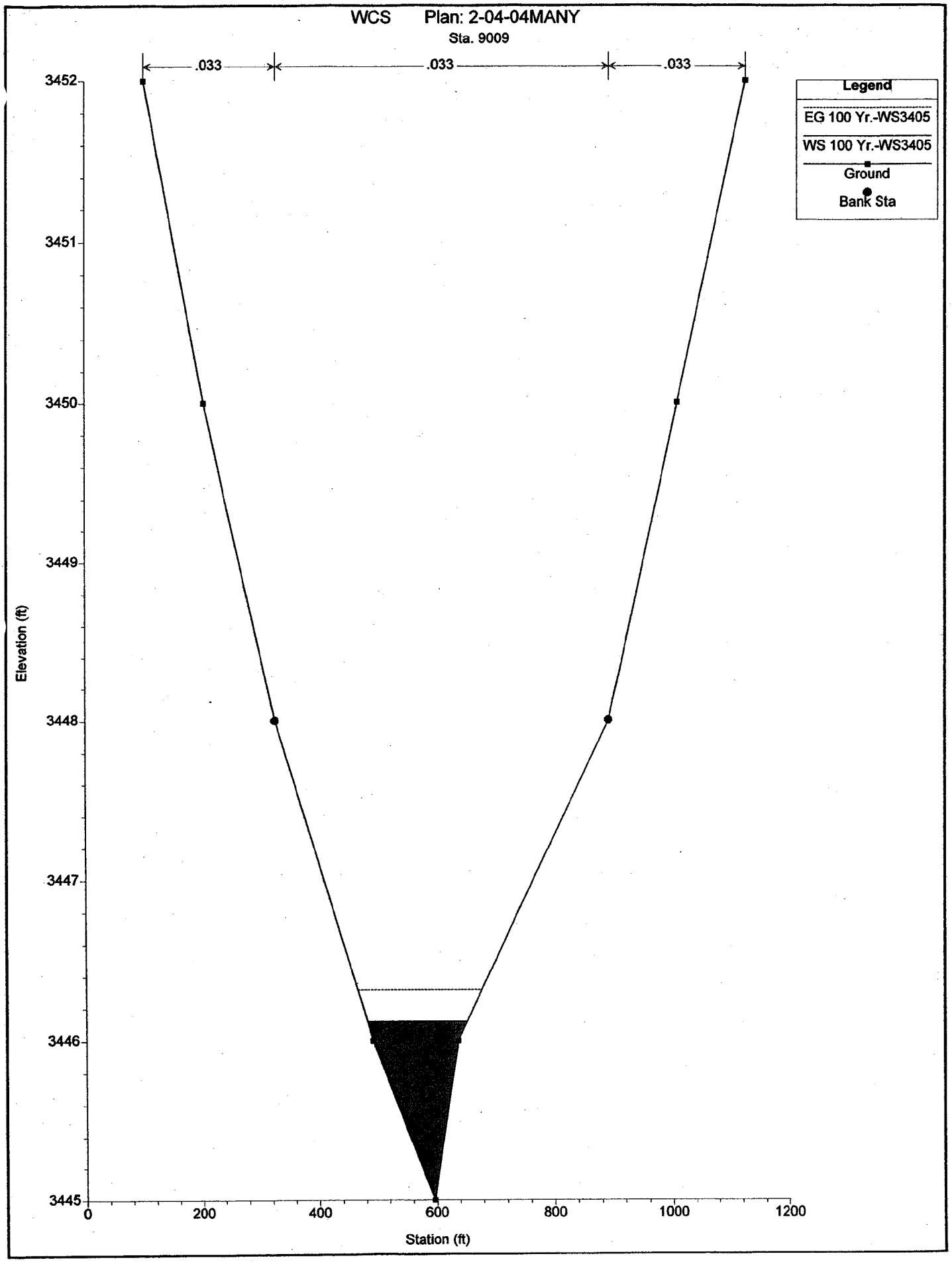
200
400
600
800
1000
1200
Station (ft)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Ground
Bank Sta
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3447
3446
3445
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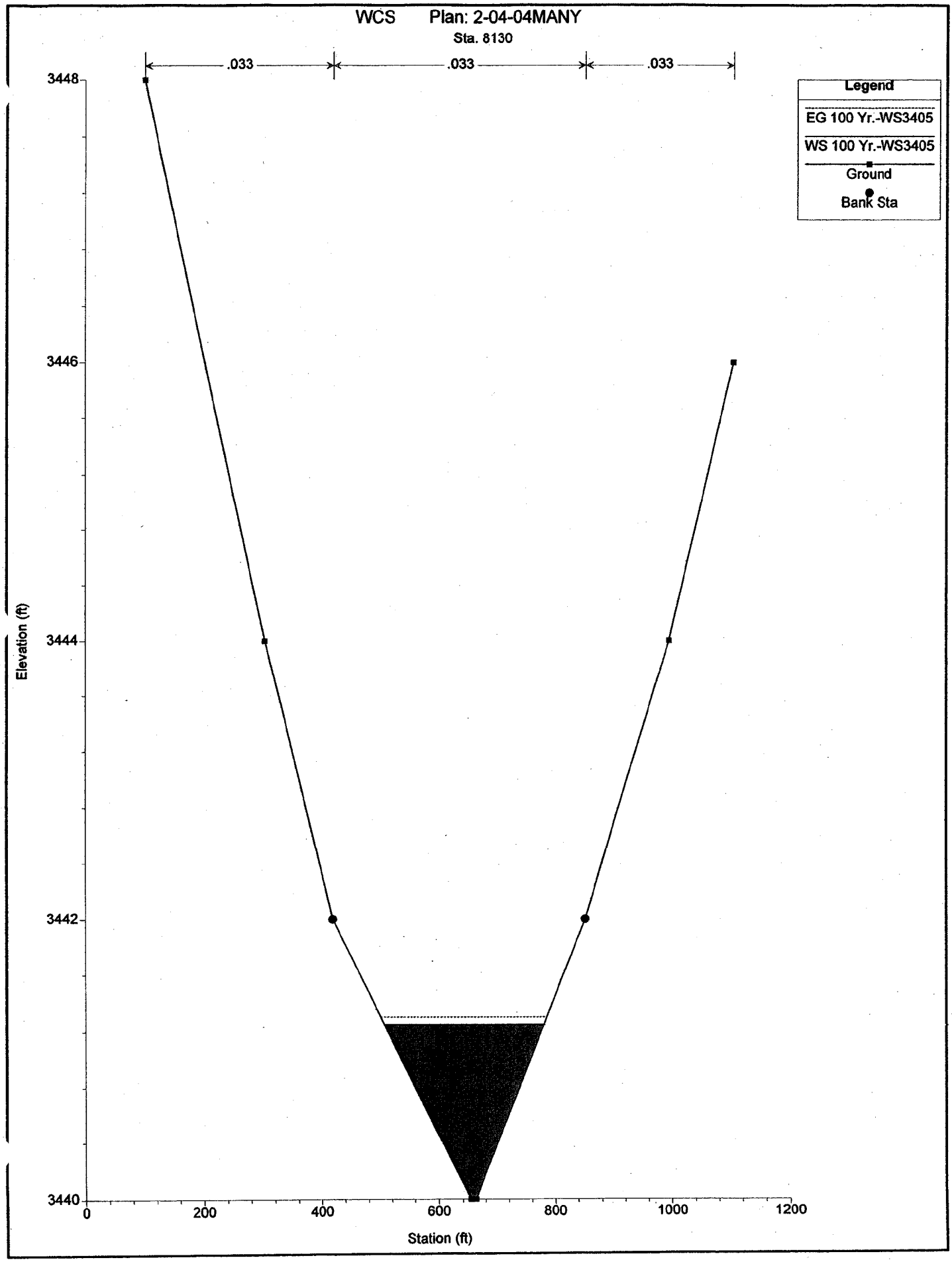
200
400
600
800
1000
1200
Station (ft)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WS 100 Yr.-WS3405
Ground
Bank Sta
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3442
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Elevation (ft)
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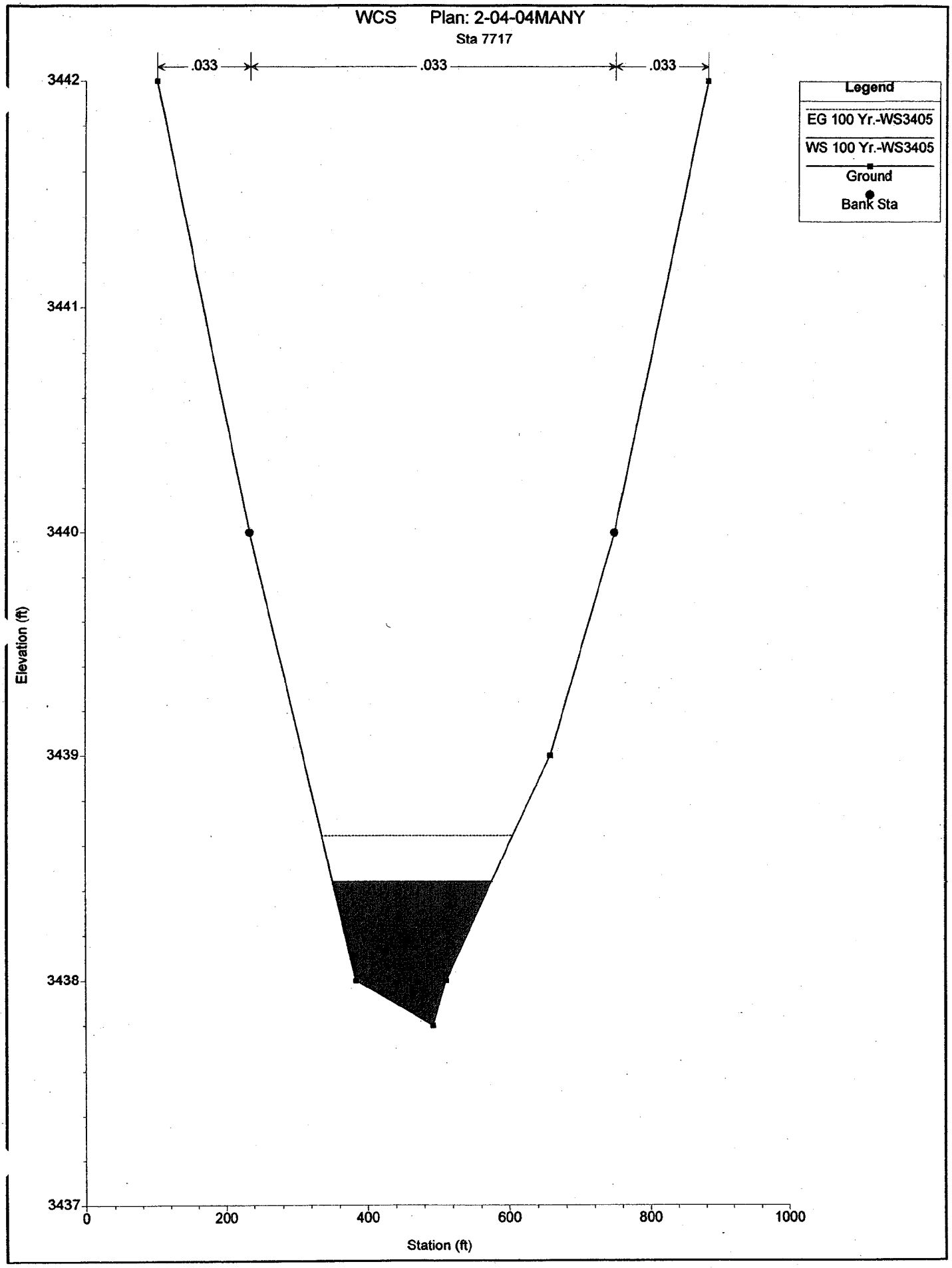
200
400
600
800
1000
1200
Station (ft)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WS 100 Yr.-WS3405
Ground
Bank Sta
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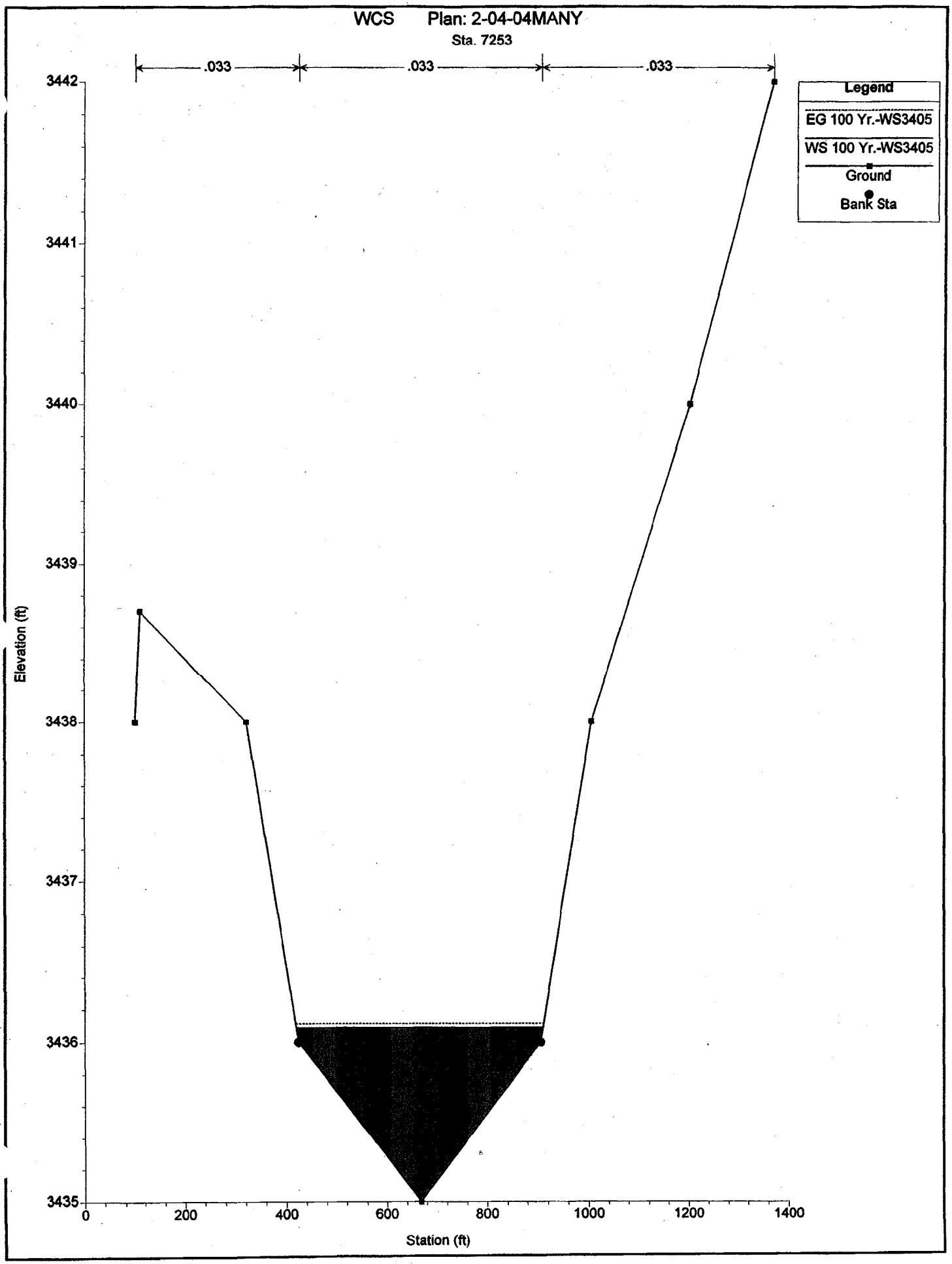
3440
3439
3438
3437
Elevation (ft)
0
200
400
600
800
1000
Station (ft)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.033
.033
Legend
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WS 100 Yr.-WS3405
Ground
Bank Sta
Elevation (ft)
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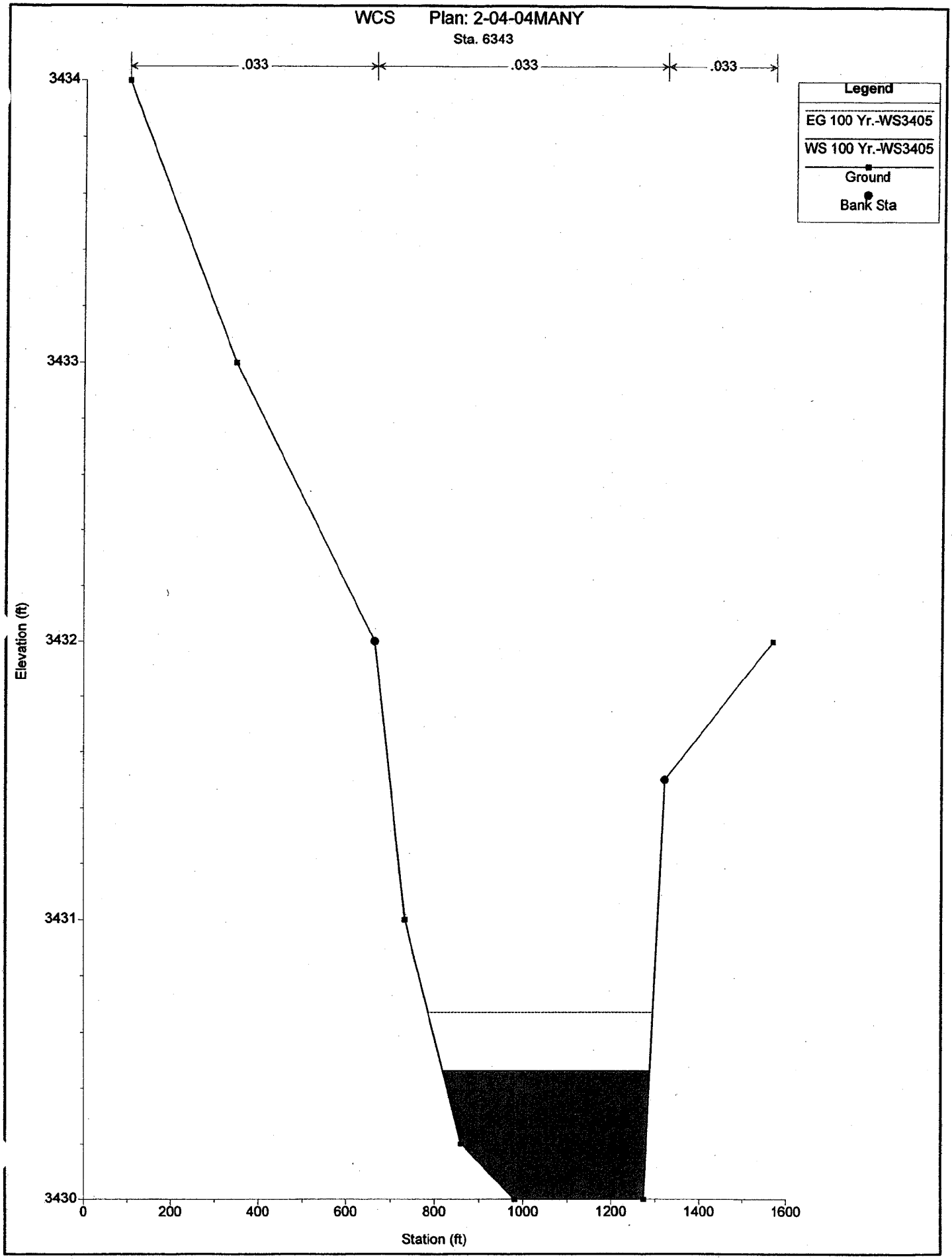
3441
3440
3439
3438
3437
3436
3435
0
200
400
600
800
1000
1200
1400
Station (ft)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.033
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Legend
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WS 100 Yr.-WS3405
Ground
Bank Sta
Elevation (ft)
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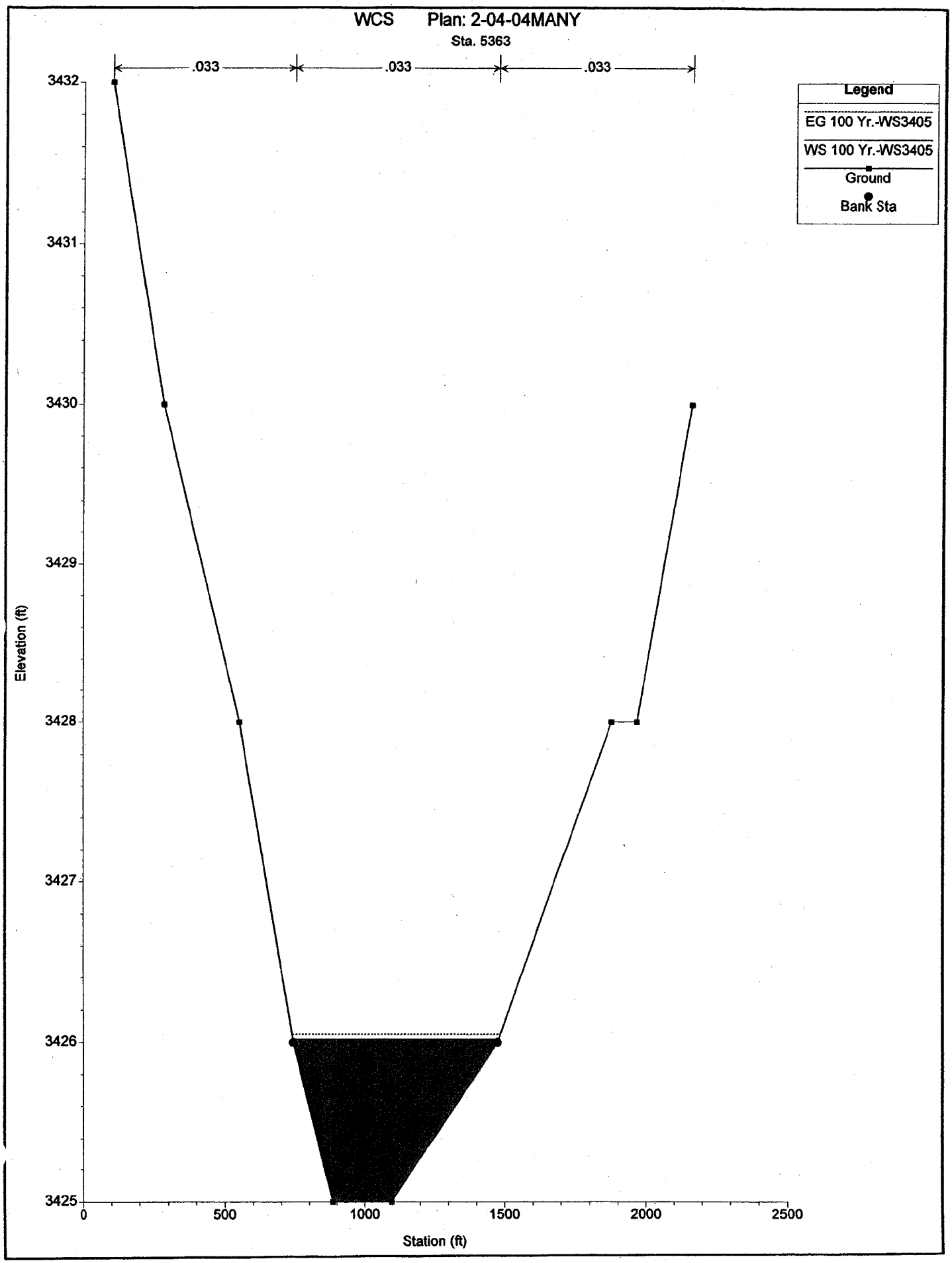
3433
3432
3431
3430
0
200
400
600
800
1000
1200
1400
1600
Station (ft)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.033
Legend
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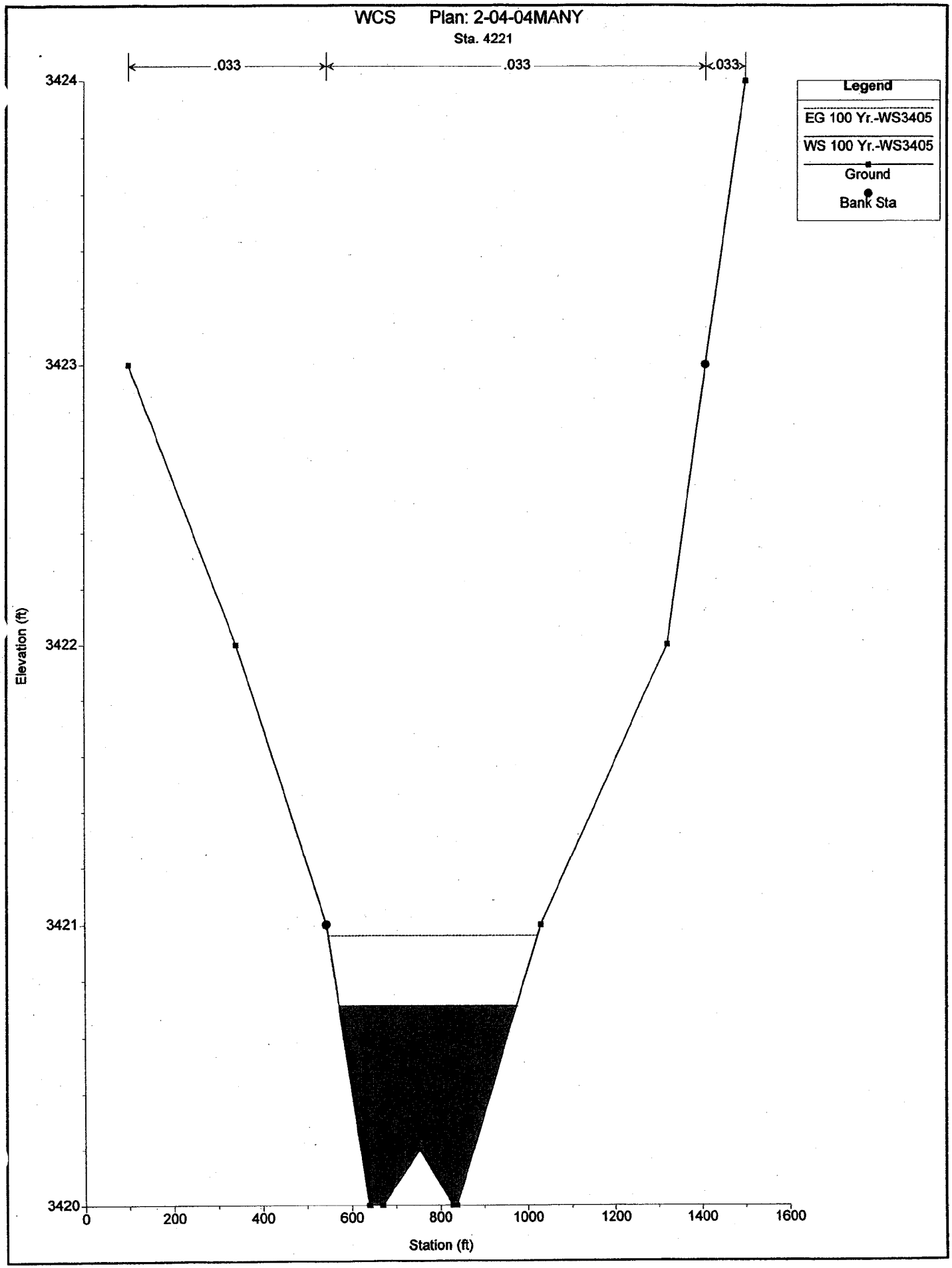
WS 100 Yr.-WS3405
Ground
Bank Sta
3432
3431
3430
3429
3428
3427
3426
3425
Elevation (ft)
0
500
1000
1500
2000
2500
Station (ft)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.033
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Legend
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WS 100 Yr.-WS3405
Ground
Bank Sta
Elevation (ft)
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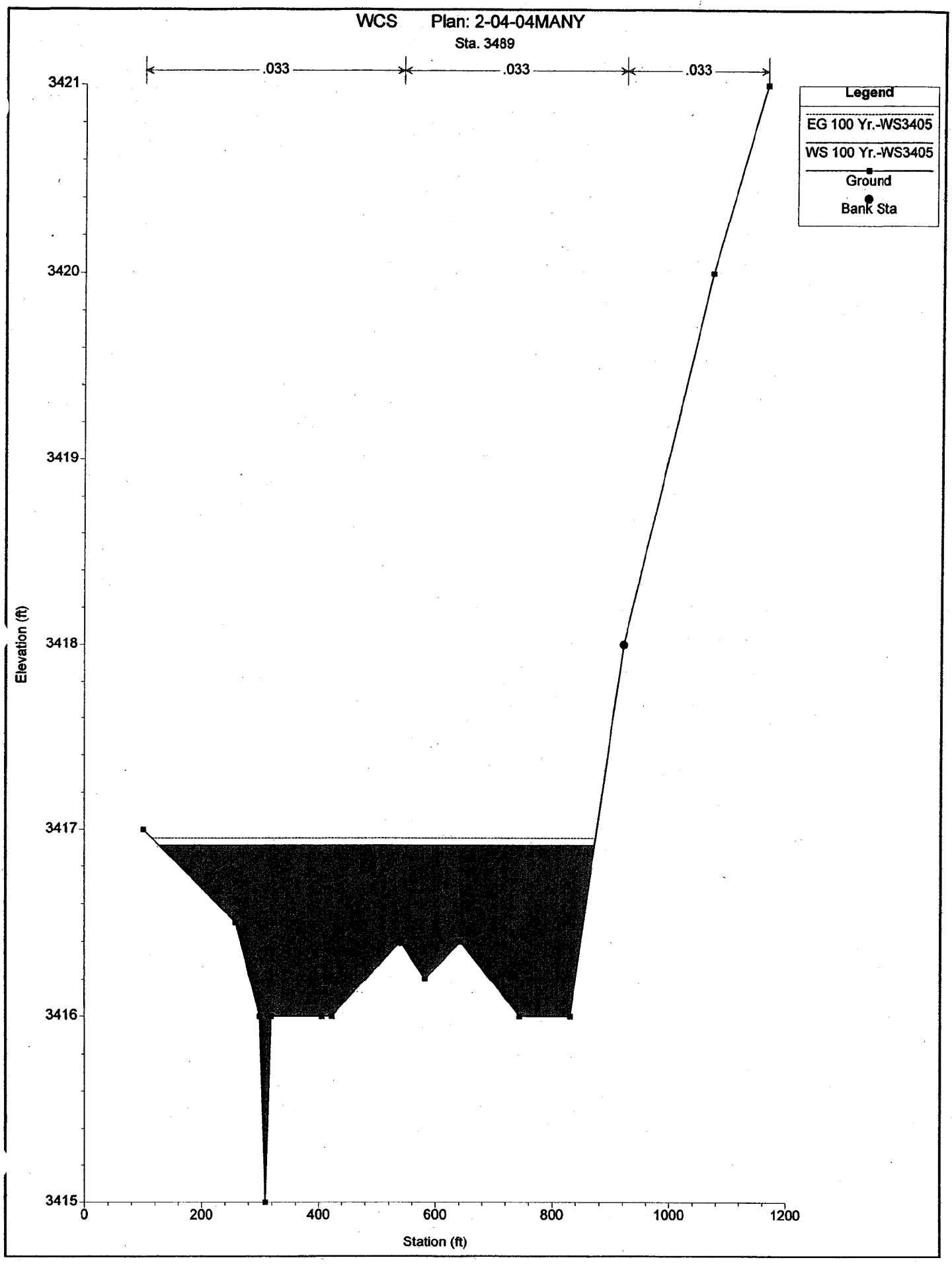
3423
3422
3421
3420
0
200
400
600
800
1000
1200
1400
1600
Station (ft)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.033
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Legend
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WS 100 Yr.-WS3405
Ground
Bank Sta
Elevation (ft)
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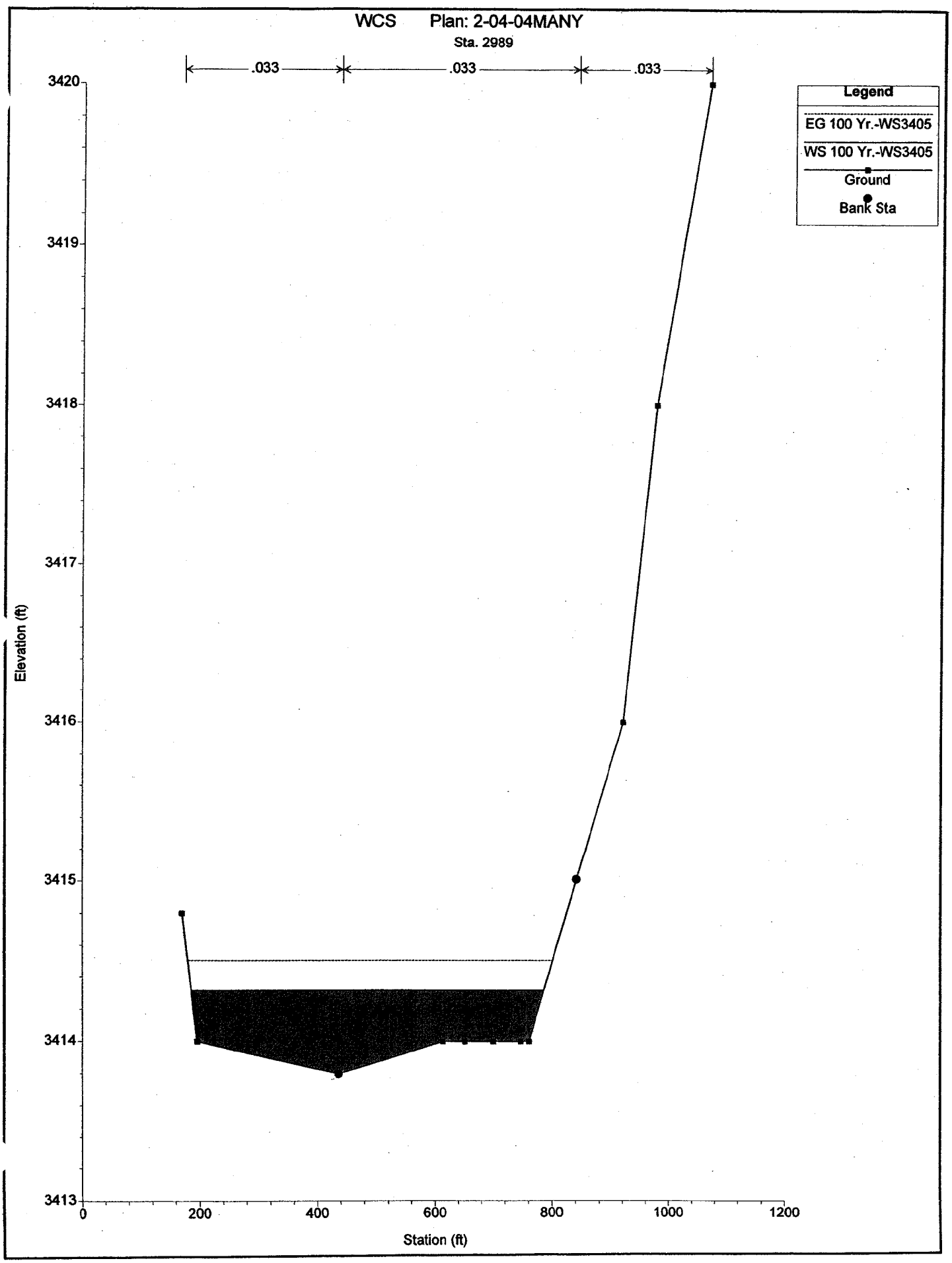
3420
3419
3418
3417
3416
3415
0
200
400
600
800
1000
1200
Station (ft)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.033
.033
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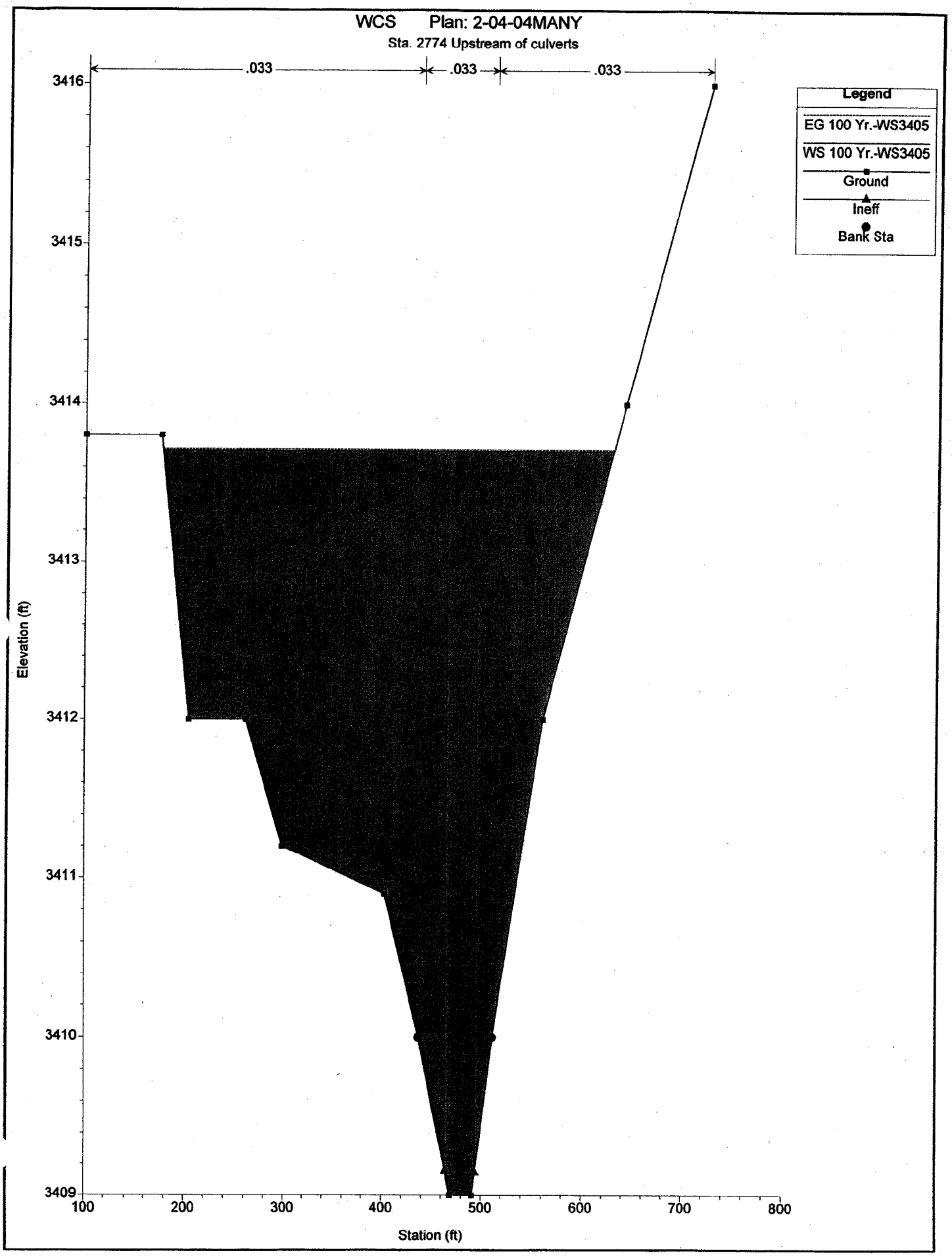
Legend
EG 100 Yr.-WS3405
WS 100 Yr.-WS3405
Ground
Bank Sta
3420
3419
3418
3417
3416
3415
3414
3413
Elevation (ft)
0
200
400
600
800
1000
1200
Station (ft)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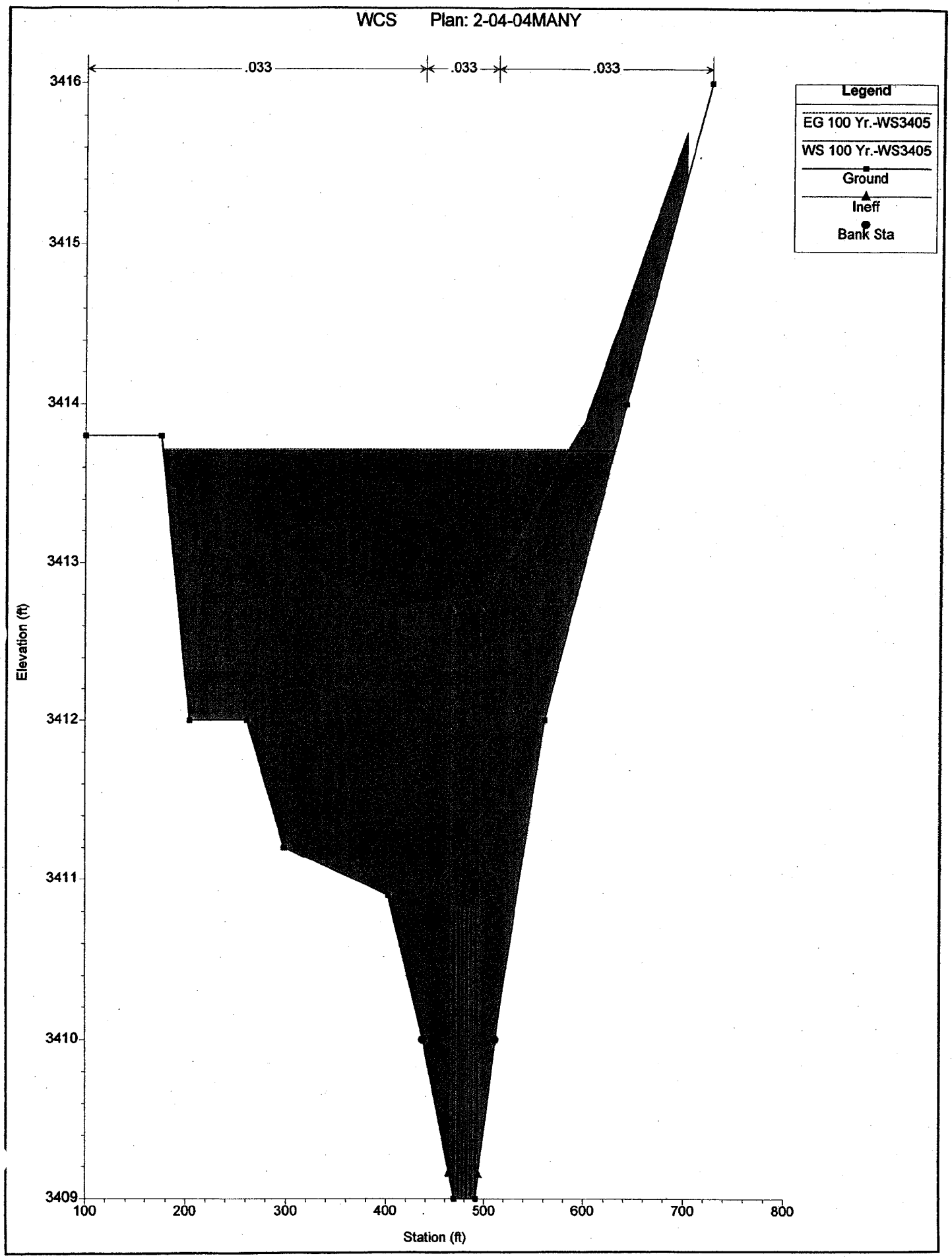
Sta. 2774 Upstream of culverts
.033
.033
.033
Legend
EG 100 Yr.-WS3405
WS 100 Yr.-WS3405
Ground
Ineff
Bank Sta
3416
3415
3414
3413
3412
3411
3410
3409
Elevation (ft)
100
200
300
400
500
600
700
800
Station (ft)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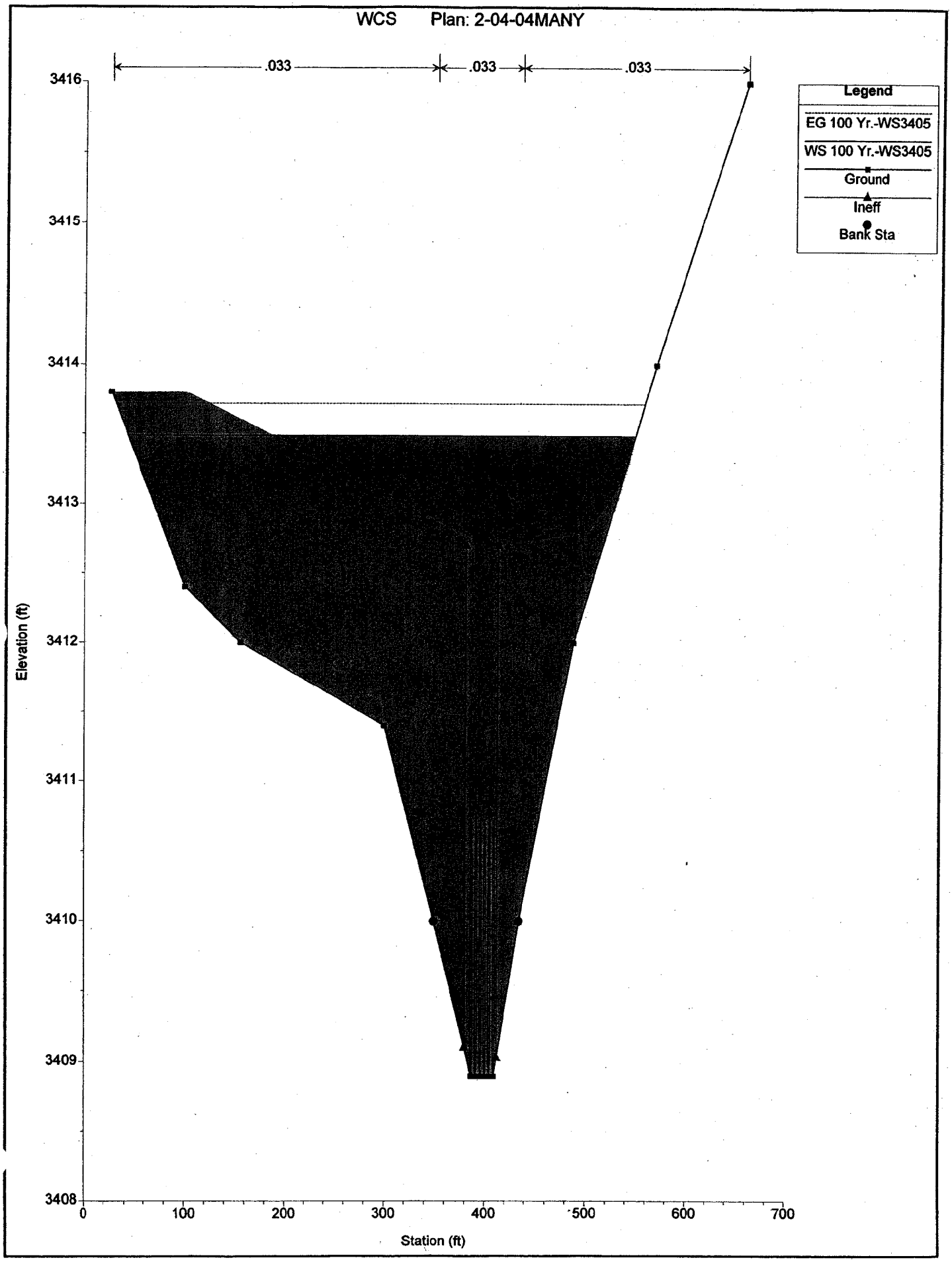
.033
.033
.033
Legend
EG 100 Yr.-WS3405
WS 100 Yr.-WS3405
Ground
Ineff
Bank Sta
Elevation (ft)
3416
3415
3414
3413
3412
3411
3410
3409
100
200
300
400
500
600
700
800
Station (ft)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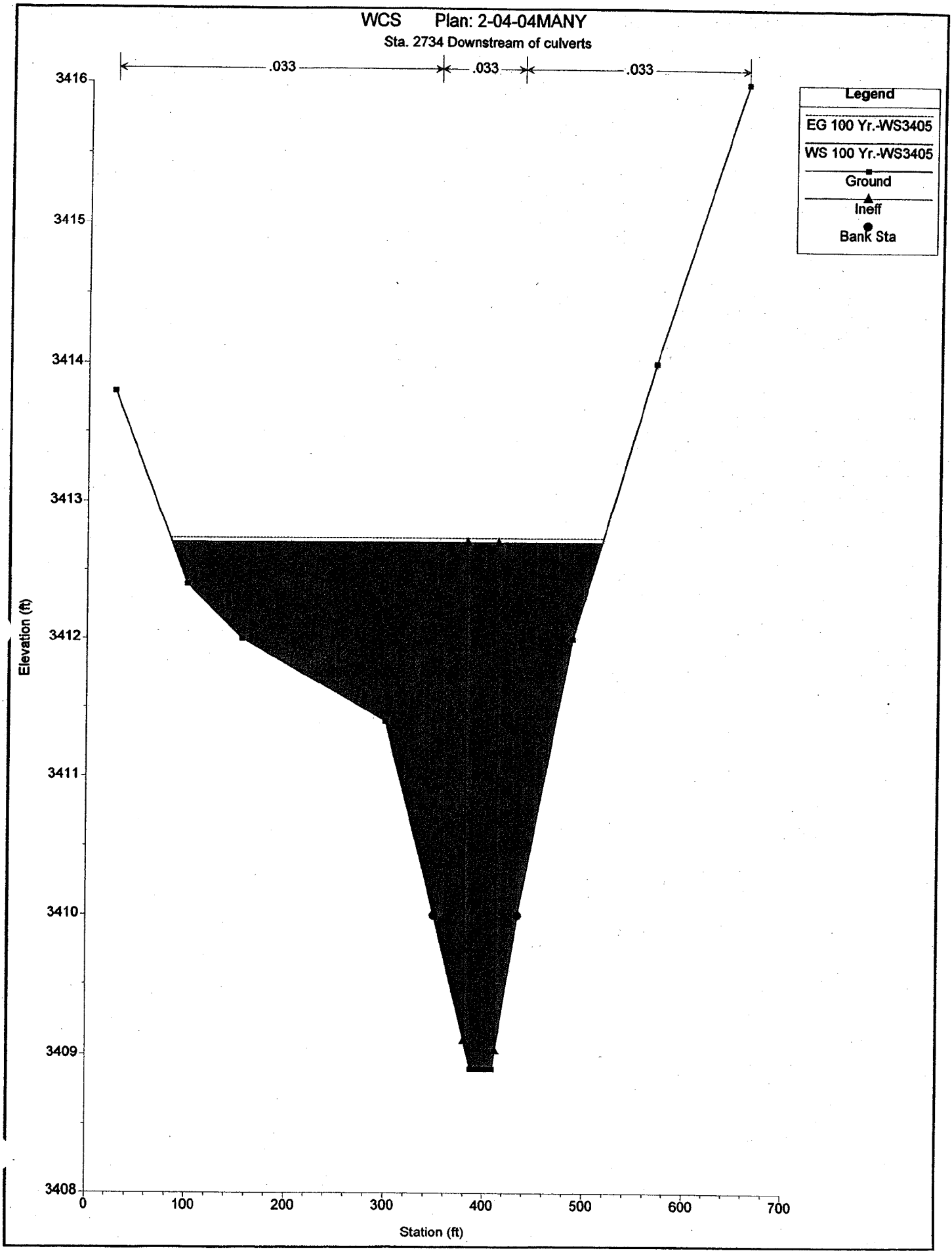
.033
.033
.033
Legend
EG 100 Yr.-WS3405
WS 100 Yr.-WS3405
Ground
Ineff
Bank Sta
Elevation (ft)
3416
3415
3414
3413
3412
3411
3410
3409
3408
0
100
200
300
400
500
600
700
Station (ft)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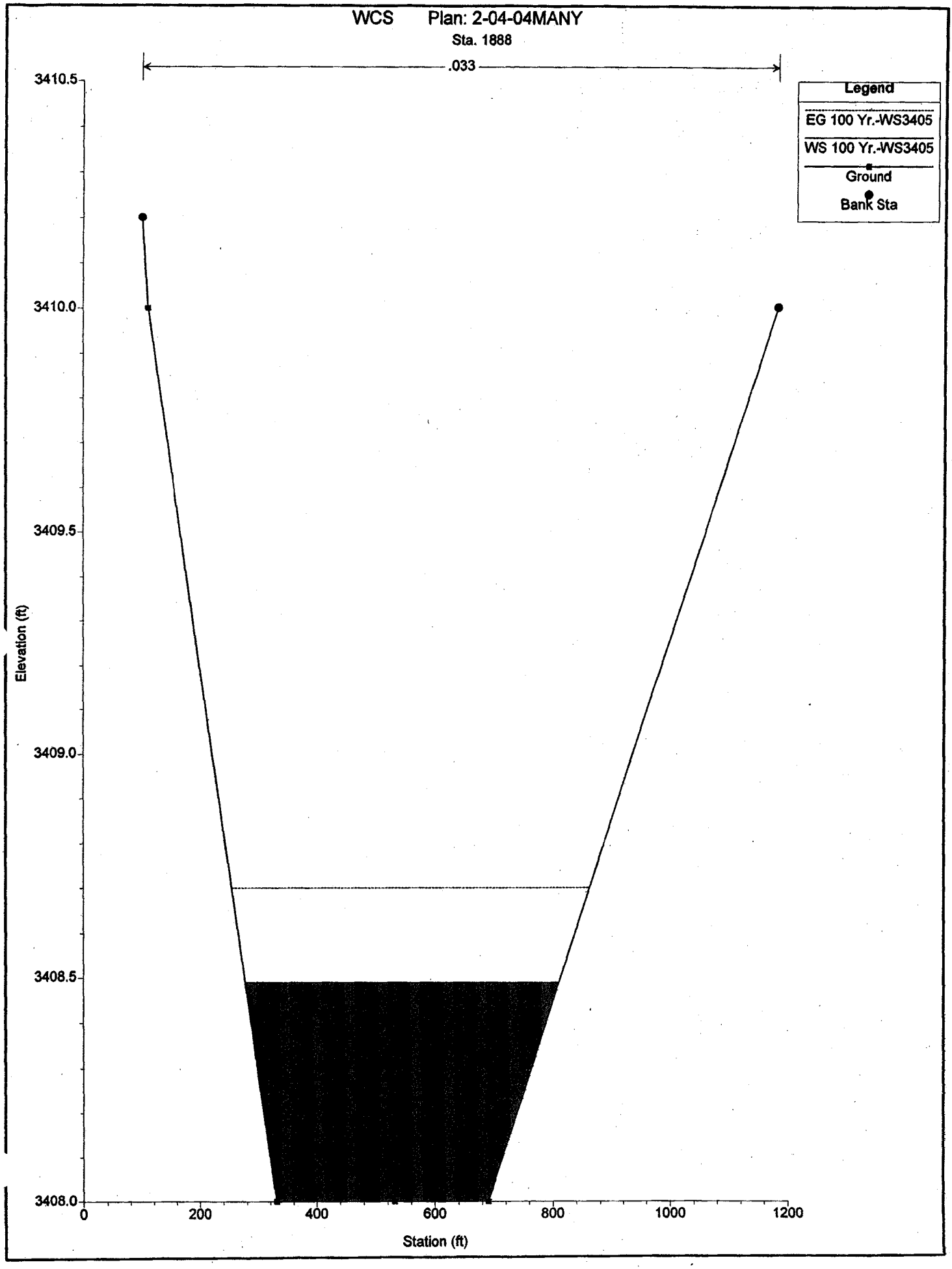
Sta. 2734 Downstream of culverts
.033
.033
.033
Legend
EG 100 Yr.-WS3405
WS 100 Yr.-WS3405
Ground
Ineff
Bank Sta
Elevation (ft)
3416
3415
3414
3413
3412
3411
3410
3409
3408
0
100
200
300
400
500
600
700
Station (ft)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Sta. 1888
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Legend
EG 100 Yr.-WS3405
WS 100 Yr.-WS3405
Ground
Bank Sta
3410.5
3410.0
3409.5
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3408.5
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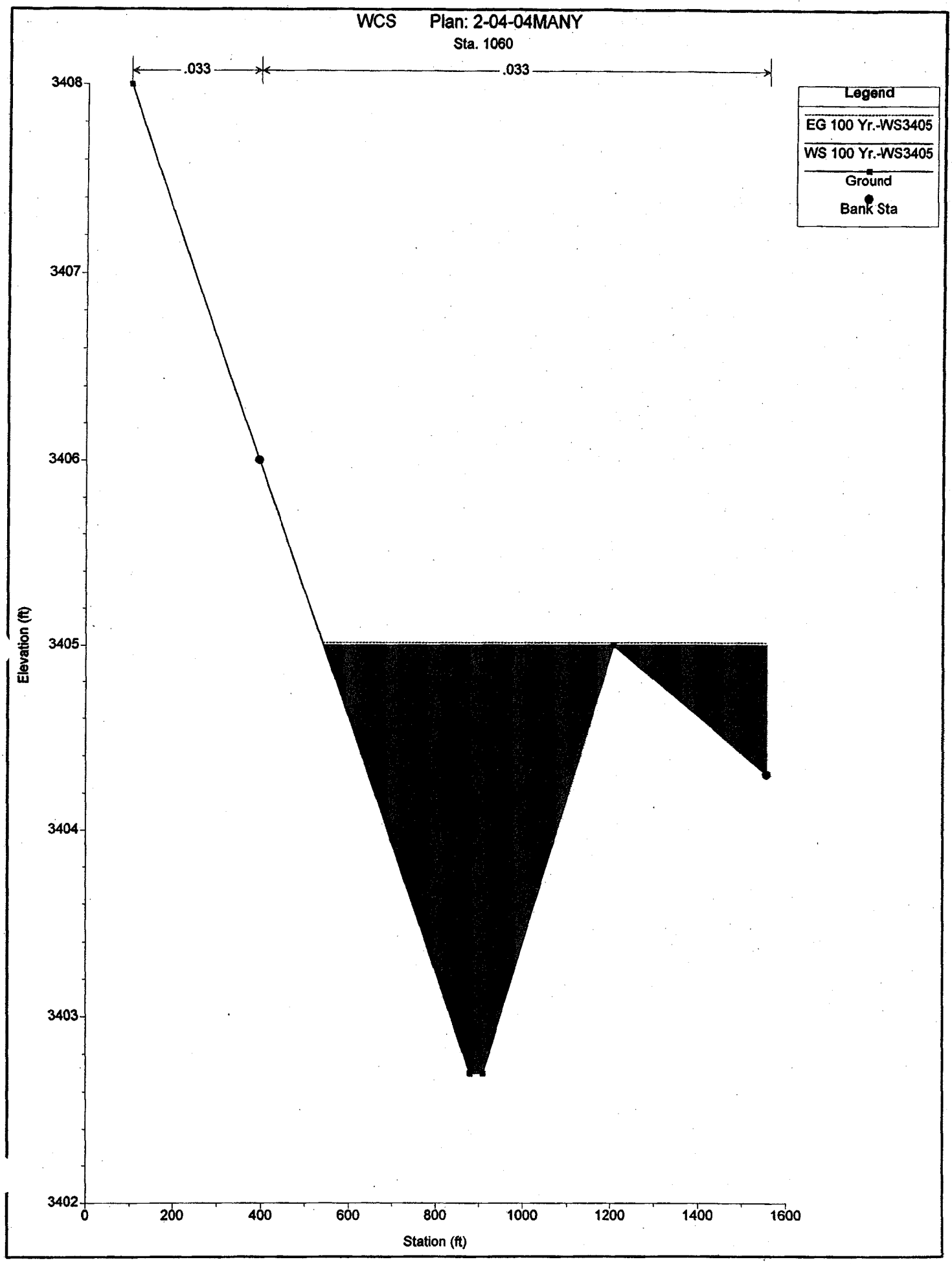
Elevation (ft)
0
200
400
600
800
1000
1200
Station (ft)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Legend
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WS 100 Yr.-WS3405
Ground
Bank Sta
3408
3407
3406
3405
3404
3403
3402
Elevation (ft)
0
200
400
600
800
1000
1200
1400
1600
Station (ft)

APPENDIX D

HEC-HMS MODEL FOR THE CALCULATION OF THE 500-YEAR PEAK DISCHARGES

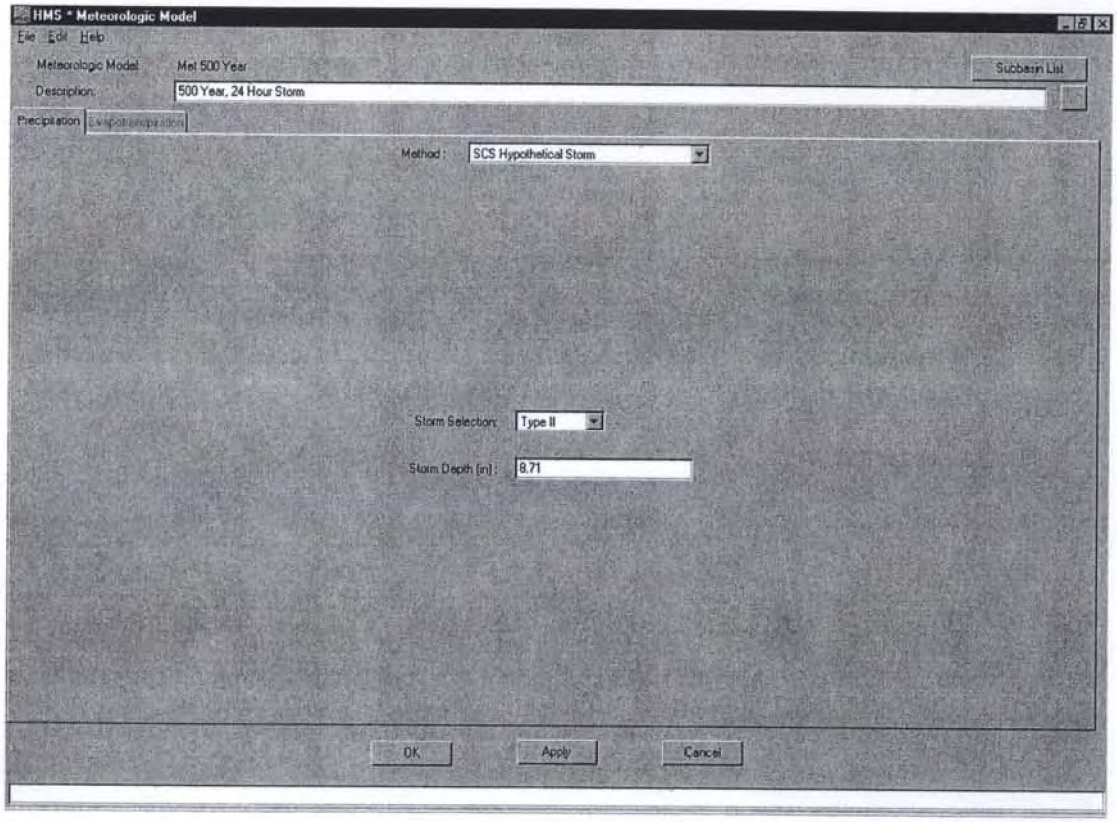
HMS * Summary of Results

Project : WCS Run Name : 500 Year Storm

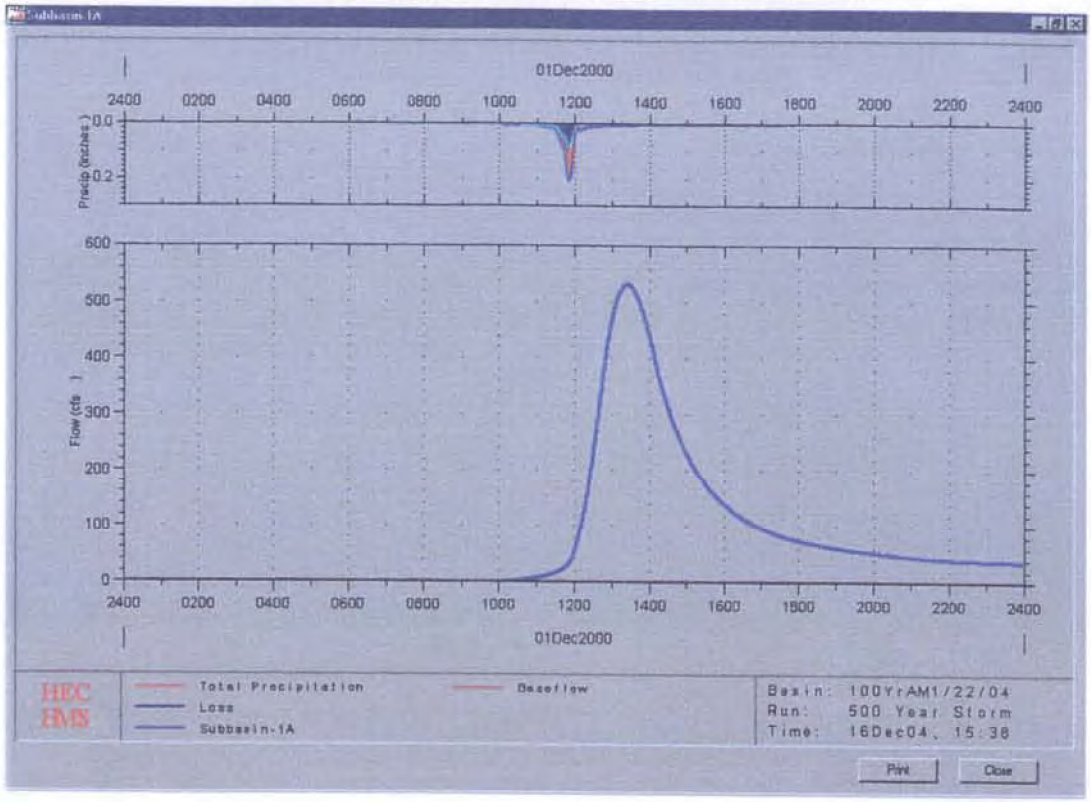
Start of Run : 01Dec00 0000 Basin Model : 100YrAM1/22/04
End of Run : 02Dec00 0000 Met. Model : Met 500 Year
Execution Time : 16Dec04 1252 Control Specs : Control 1

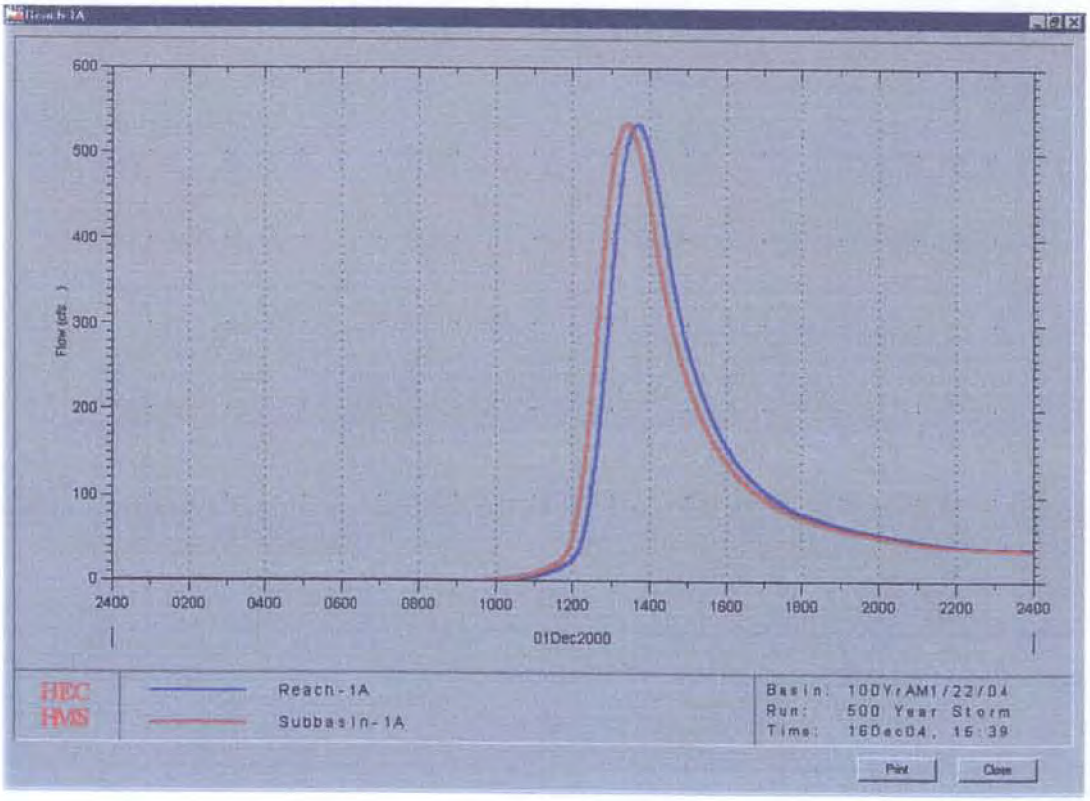
Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Subbasin-4	641.22	01 Dec 00 1233	99.591	0.490
Reach-2	641.22	01 Dec 00 1248	99.086	0.490
Subbasin-2	949.25	01 Dec 00 1302	213.56	1.063
playa	0.0	30 Nov 00 2400	0.0	1.063
Reach-1	0.0	30 Nov 00 2400	0.0	1.063
Subbasin-1A	533.30	01 Dec 00 1325	146.15	0.691
Reach-1A	533.30	01 Dec 00 1342	145.29	0.691
Subbasin-1B	376.03	01 Dec 00 1239	63.679	0.314
Junction-1A	676.52	01 Dec 00 1327	208.96	1.005
Reach-1B	676.52	01 Dec 00 1330	208.75	1.005
Subbasin-3	186.82	01 Dec 00 1239	31.637	0.156
Junction-1	769.83	01 Dec 00 1300	240.38	2.224
Reach-3	769.83	01 Dec 00 1317	238.95	2.224
Subbasin-5A	256.07	01 Dec 00 1232	39.040	0.192
Junction-2	1495.7	01 Dec 00 1253	377.08	2.906
Reach-4	1495.7	01 Dec 00 1314	374.29	2.906
Subbasin-5B	276.18	01 Dec 00 1249	53.528	0.265
Junction-3	1716.7	01 Dec 00 1312	427.82	3.171
Reach-5	1716.7	01 Dec 00 1326	425.68	3.171
Subbasin-6	116.97	01 Dec 00 1223	15.099	0.074
Junction-4	1742.7	01 Dec 00 1325	440.78	3.245
Reach-6	1742.7	01 Dec 00 1325	440.78	3.245
Subbasin-7	93.976	01 Dec 00 1301	20.903	0.104
Junction-5	1823.2	01 Dec 00 1325	461.69	3.349

Meteorologic Model Input



WCS FACILITY
FLOOD PLAIN STUDY HYDROGRAPHS





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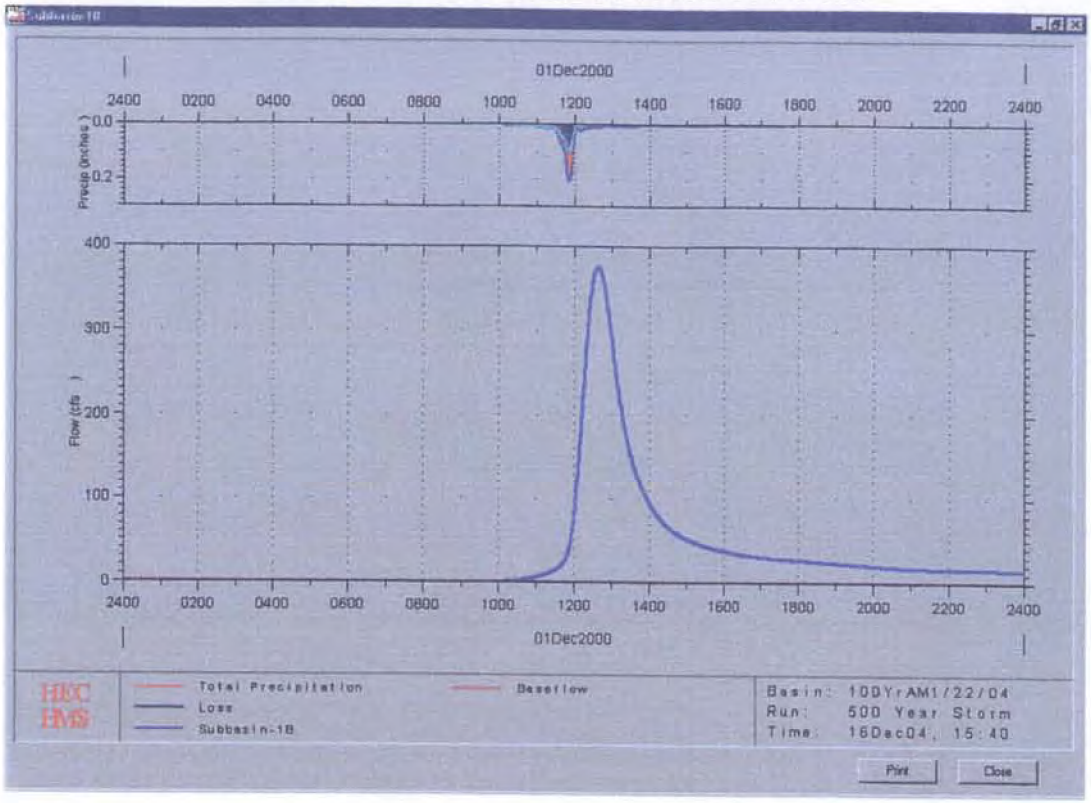

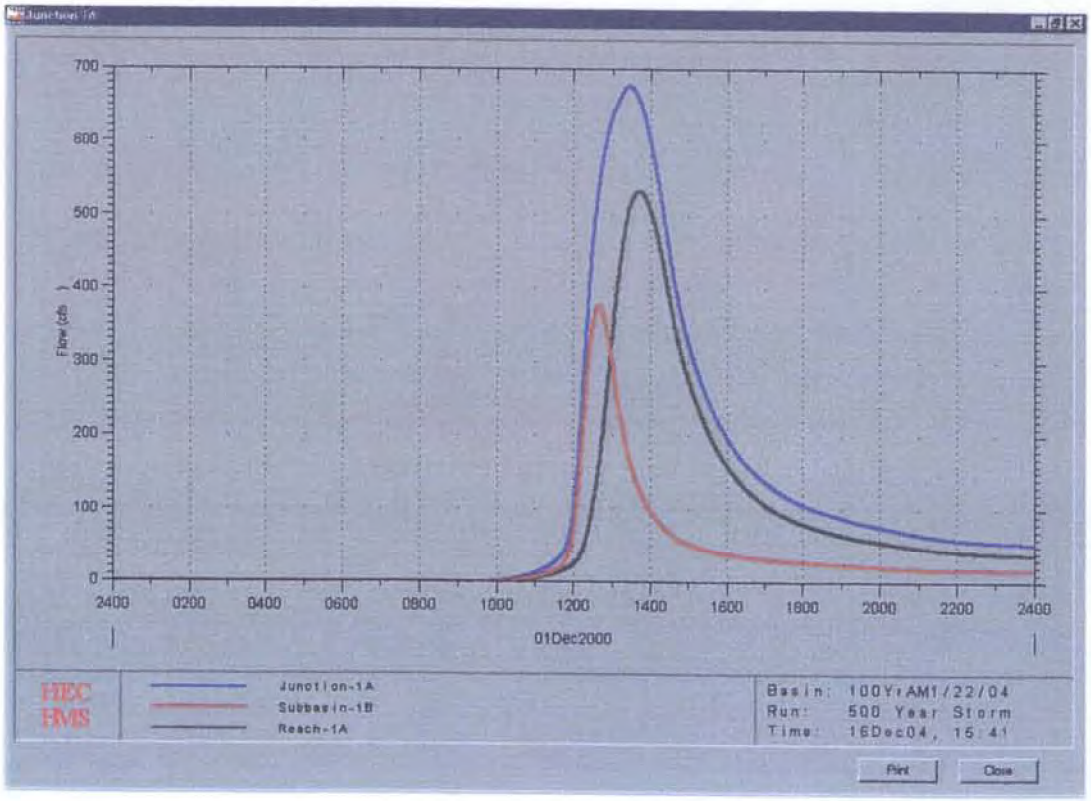

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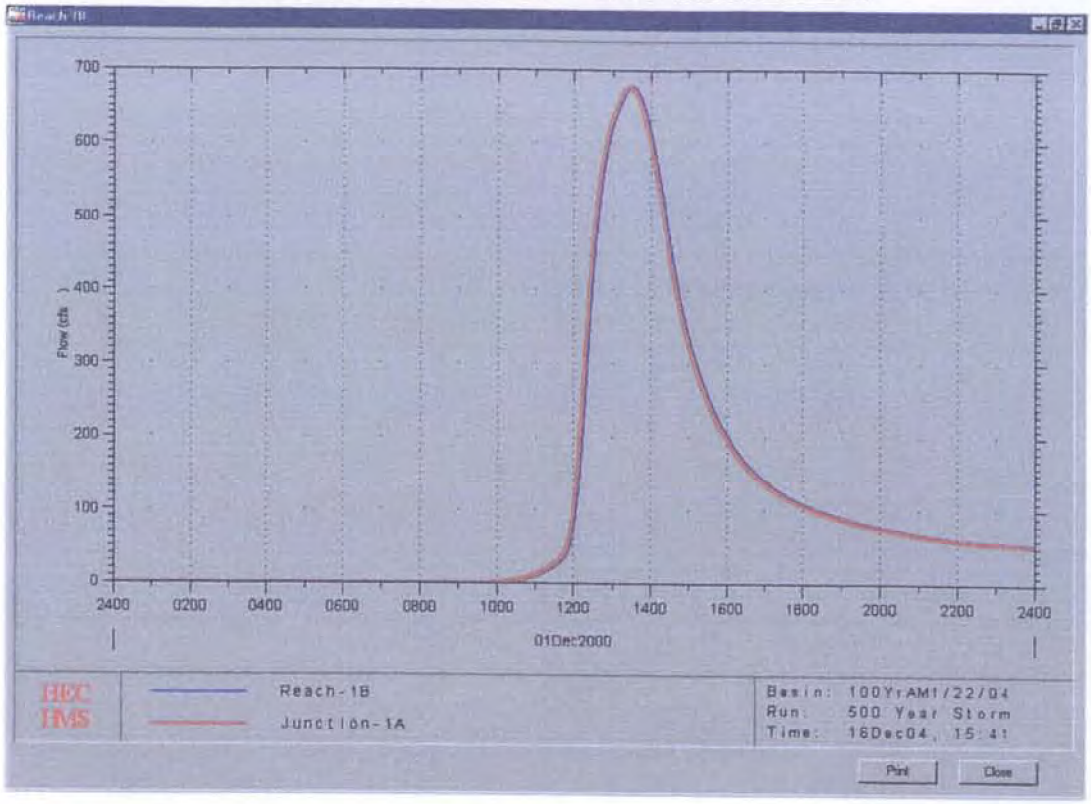

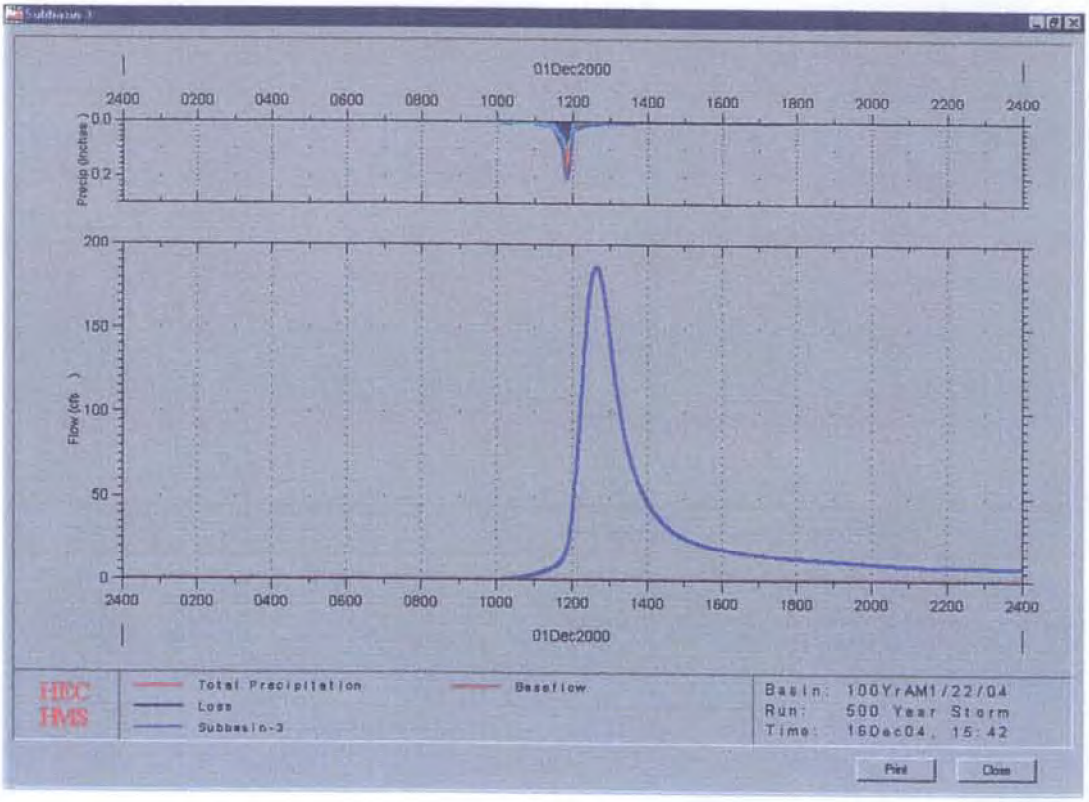

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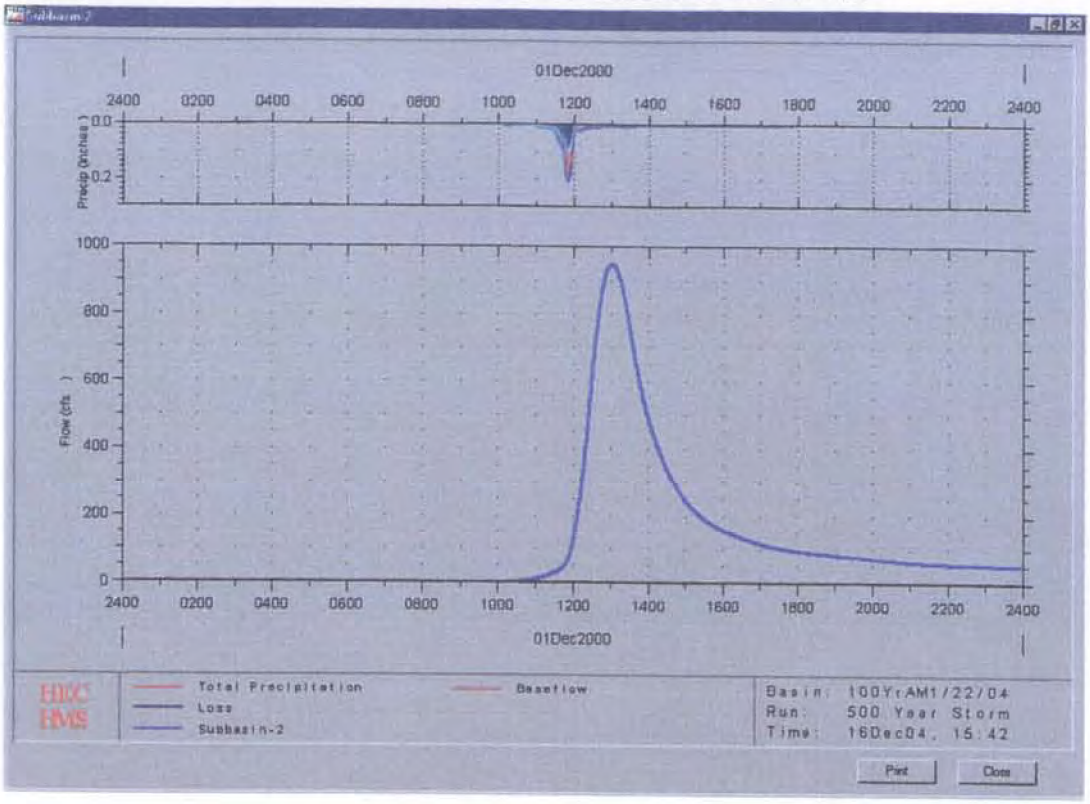

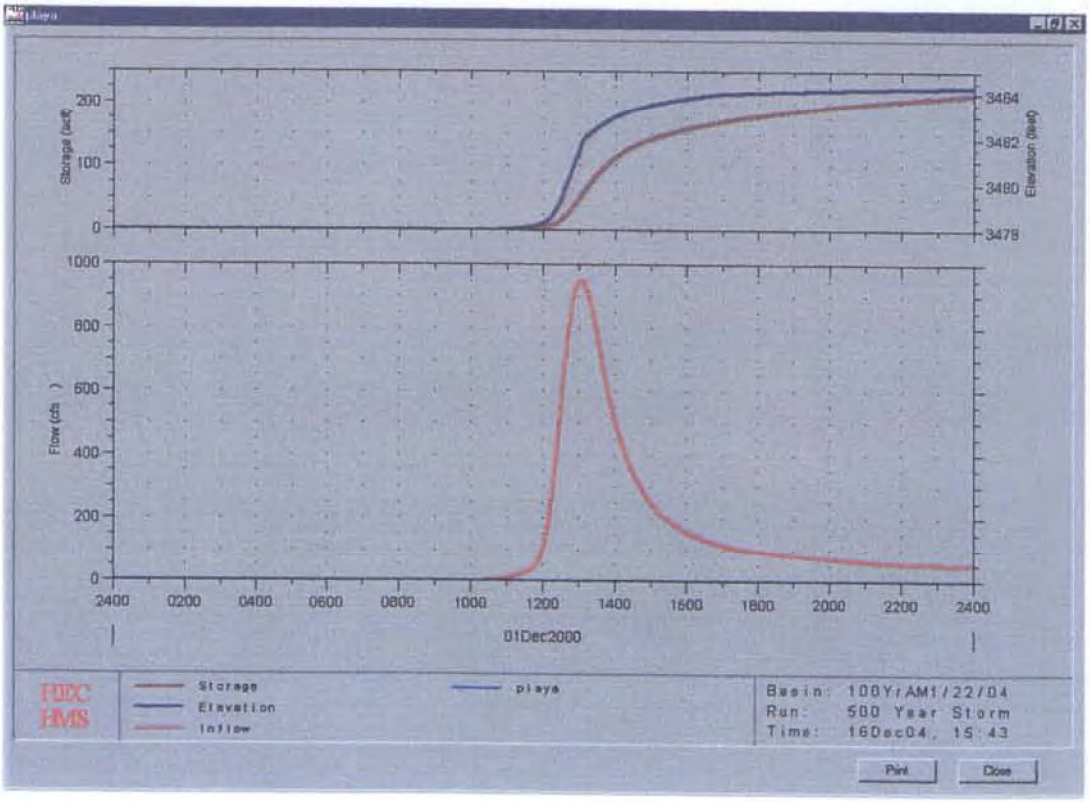

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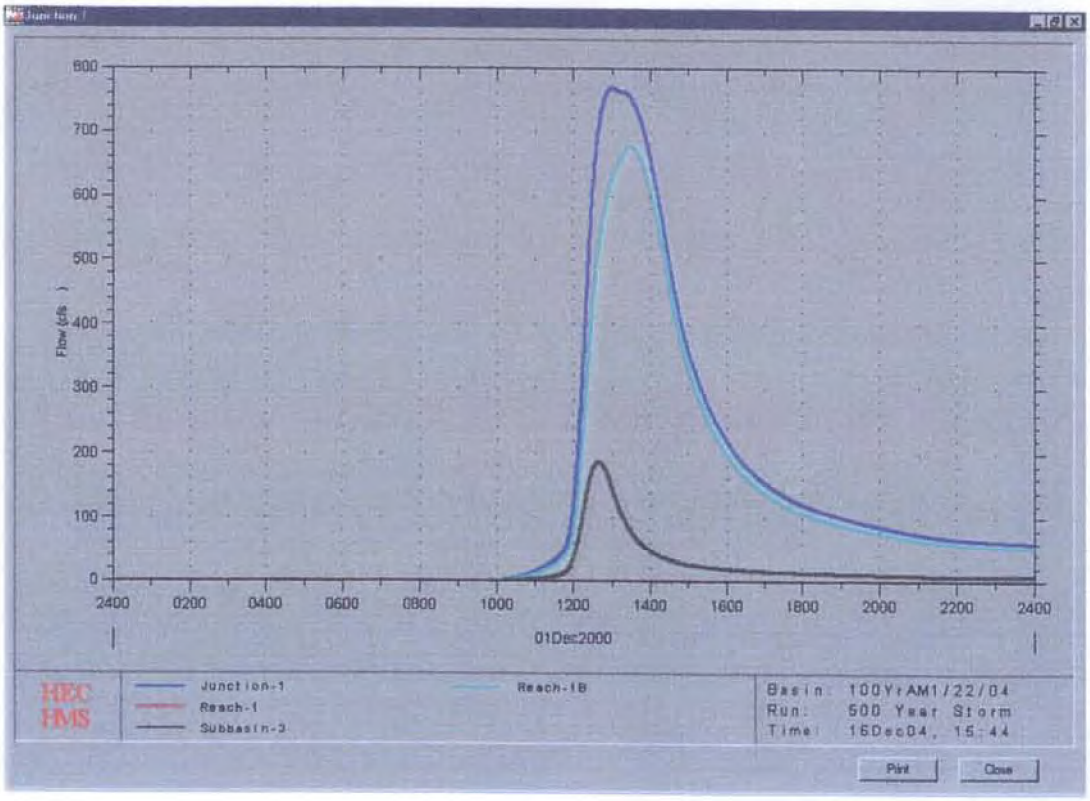

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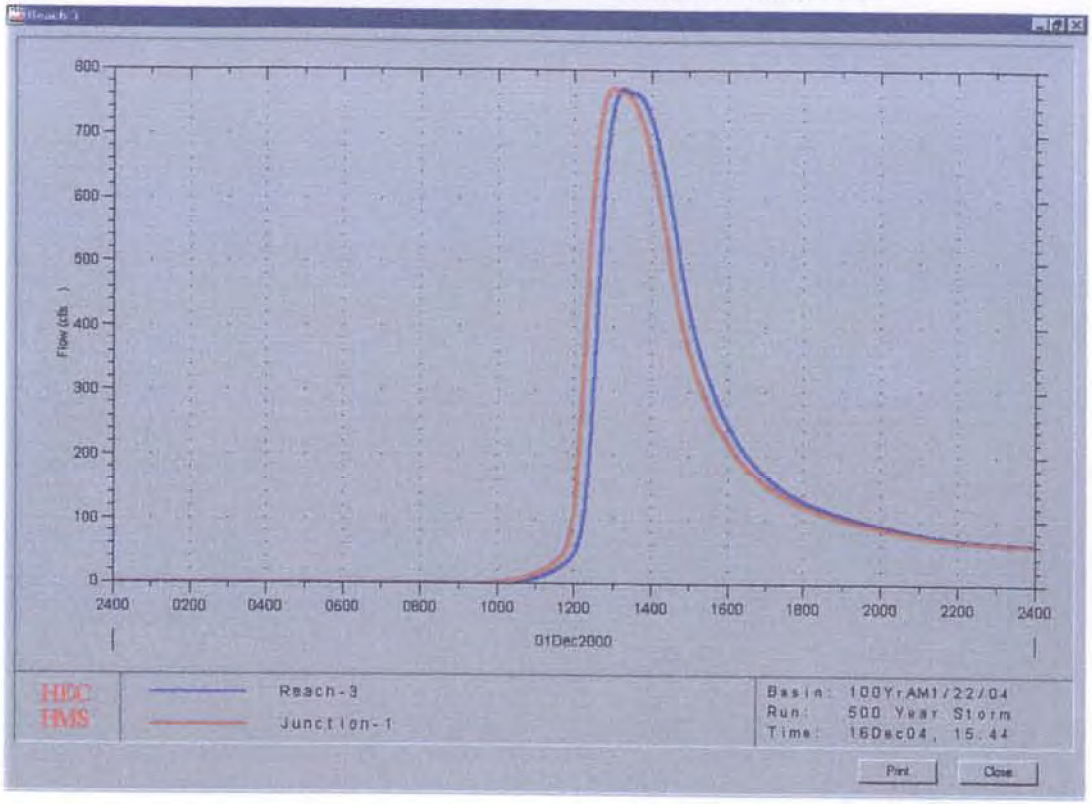
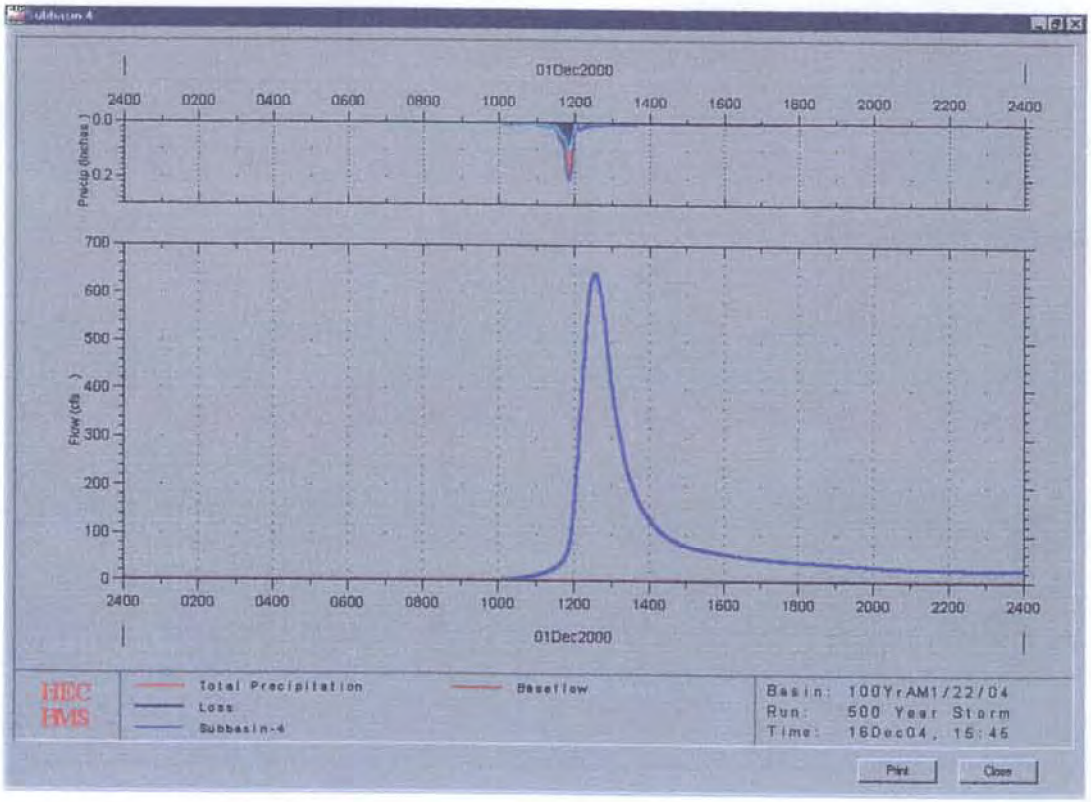
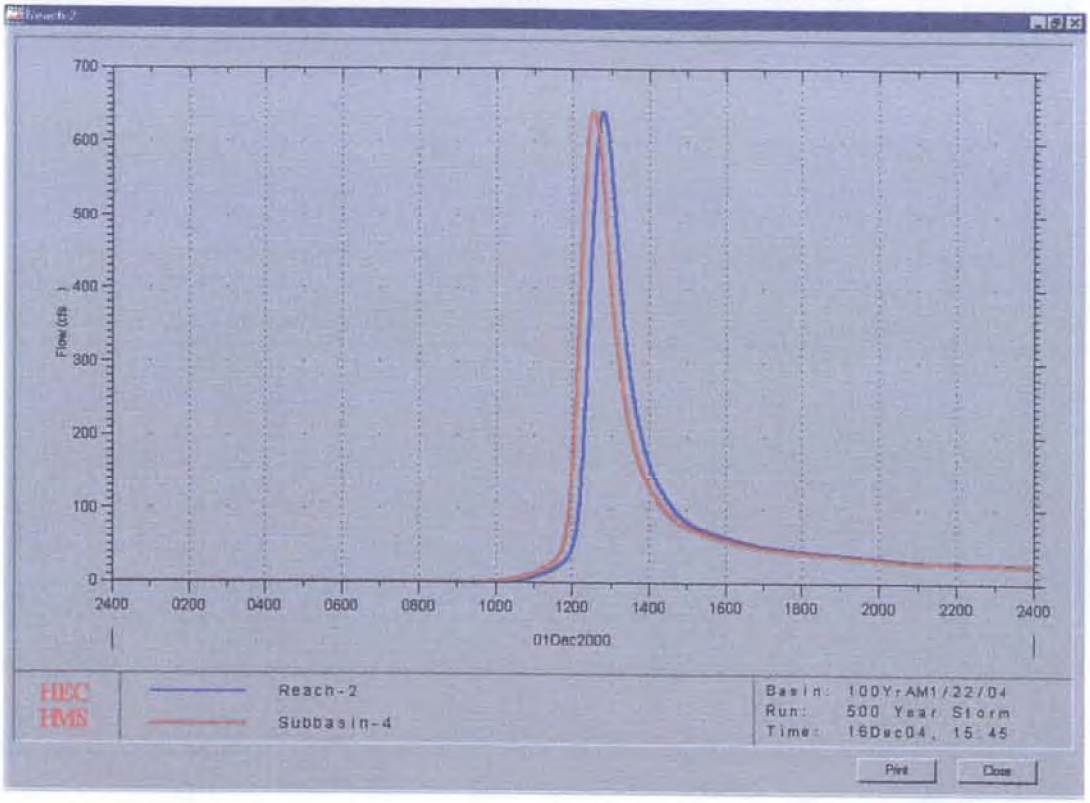
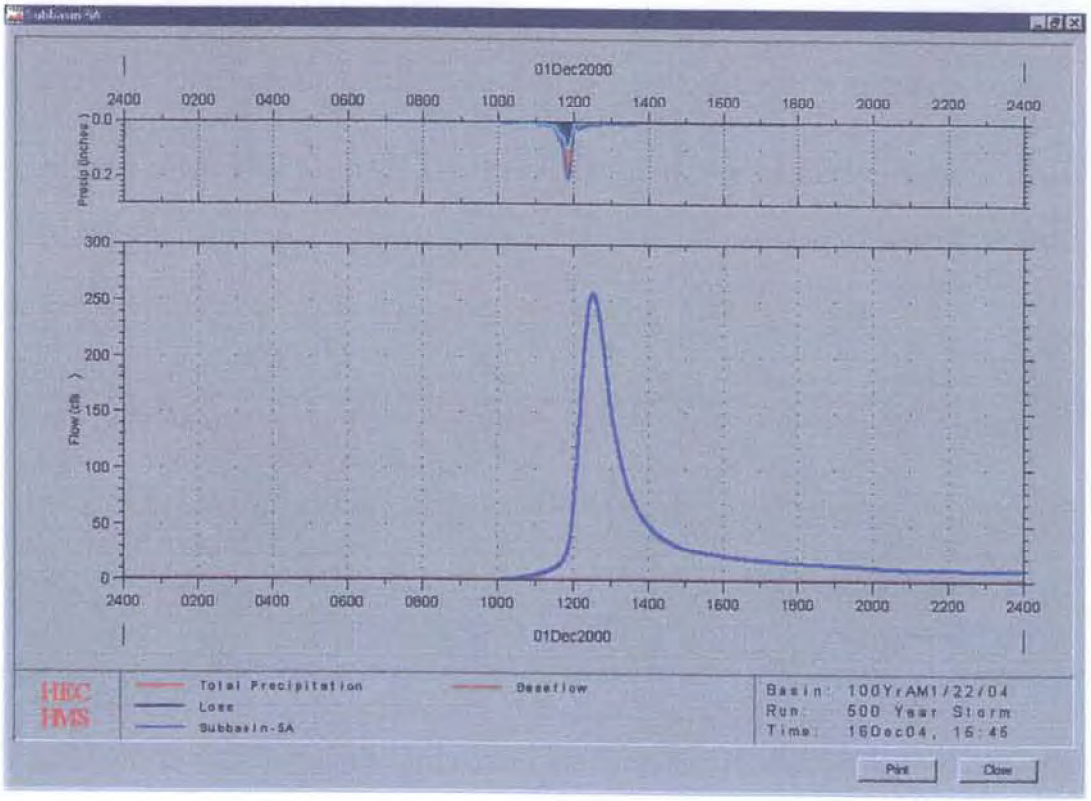


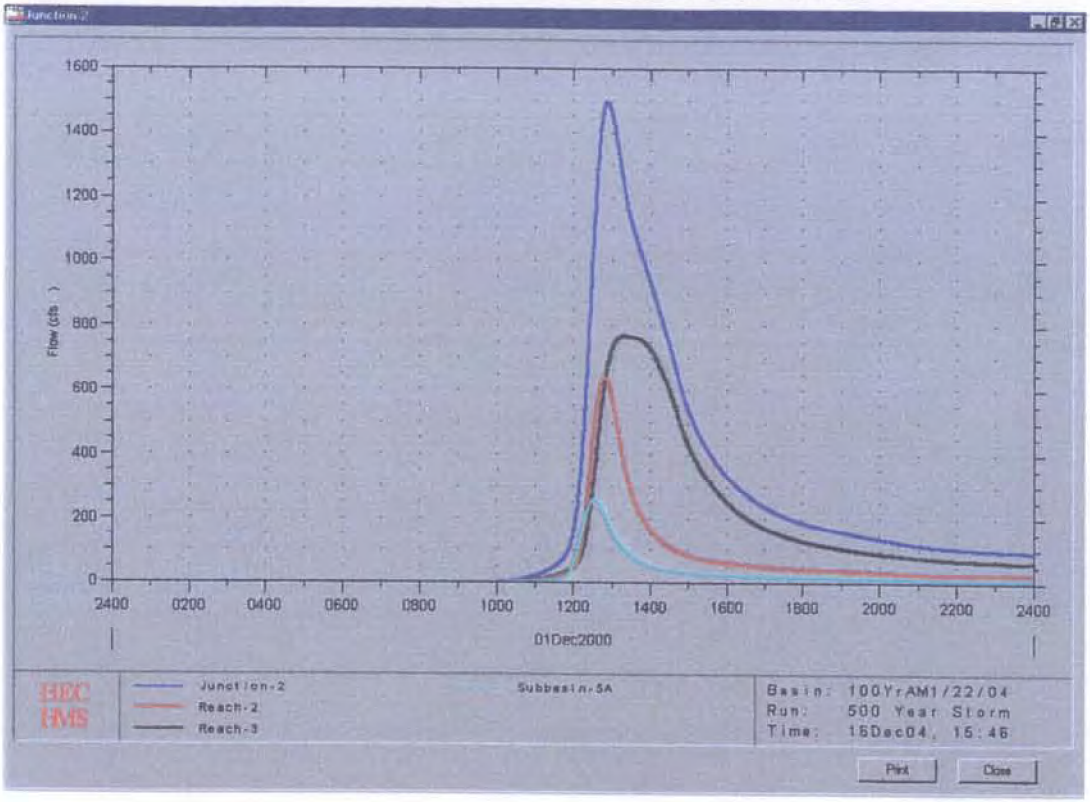


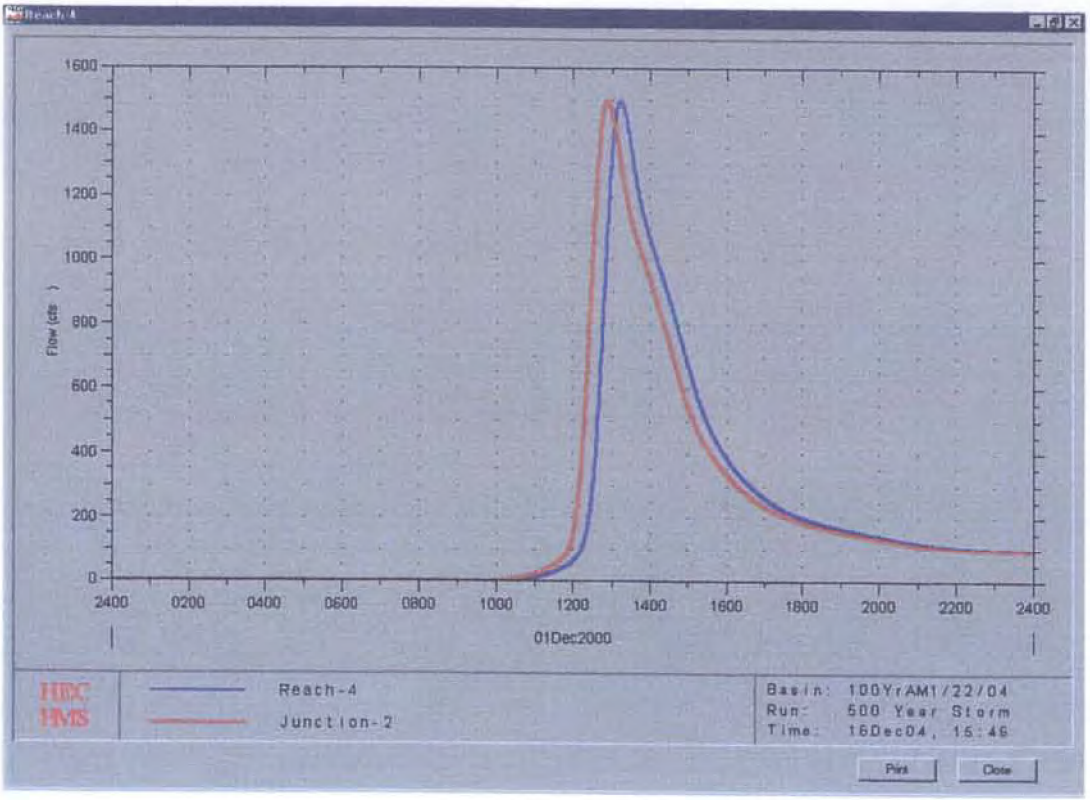
WCS FACILITY
FLOOD PLAIN STUDY HYDROGRAPHS



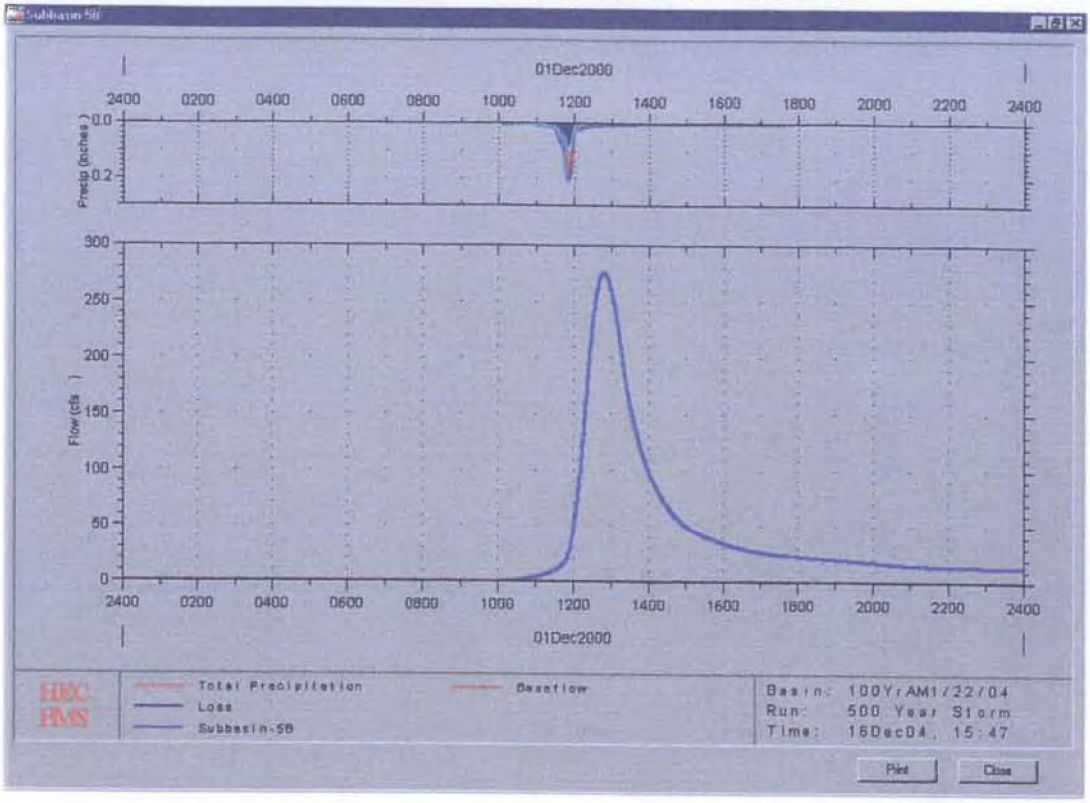


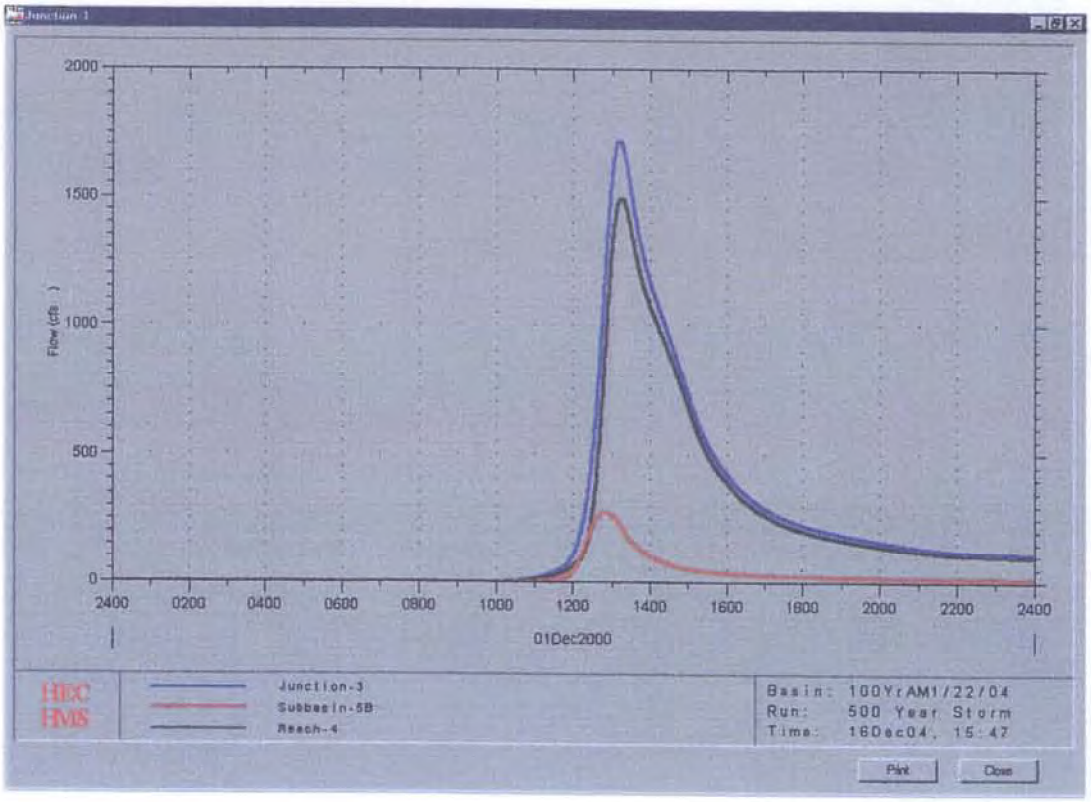
WCS FACILITY
FLOOD PLAIN STUDY HYDROGRAPHS





WCS FACILITY
FLOOD PLAIN STUDY HYDROGRAPHS





WCS FACILITY
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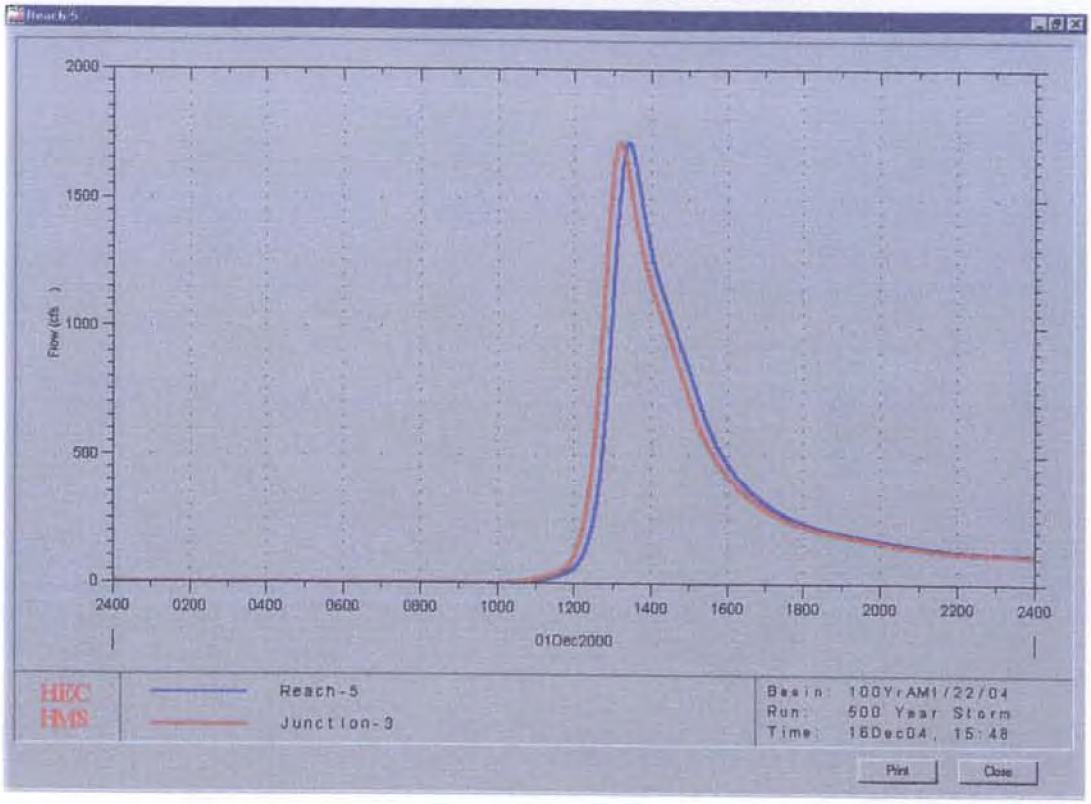

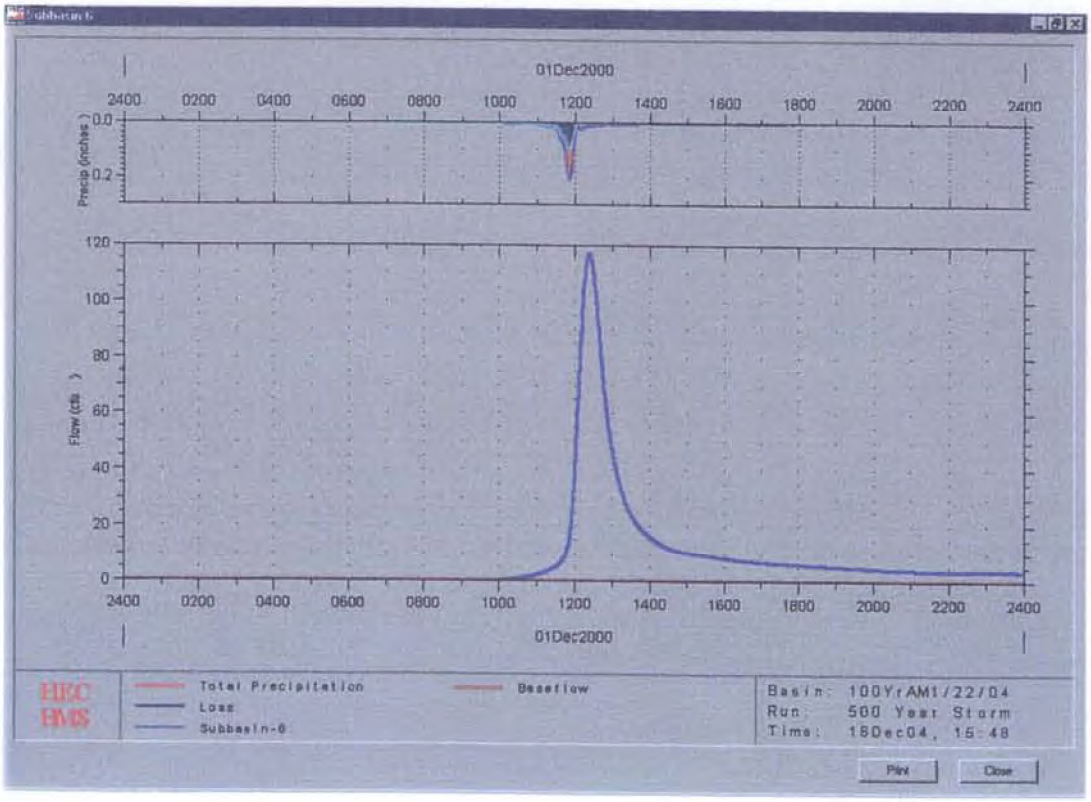

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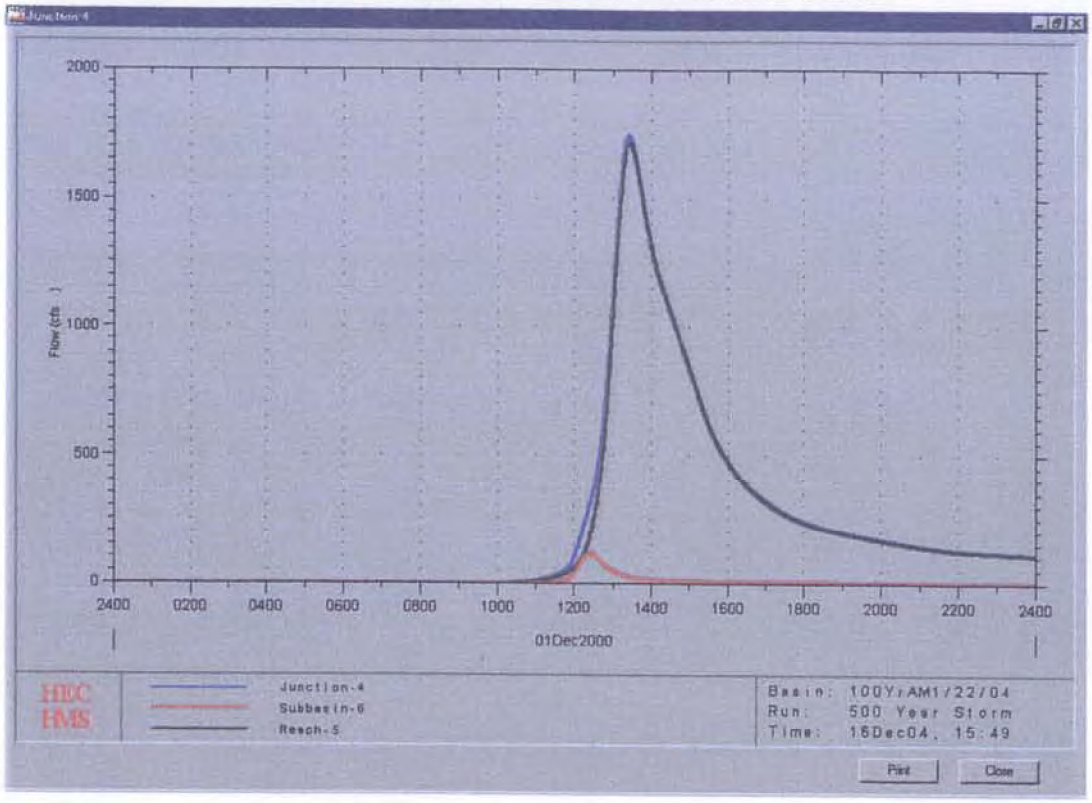
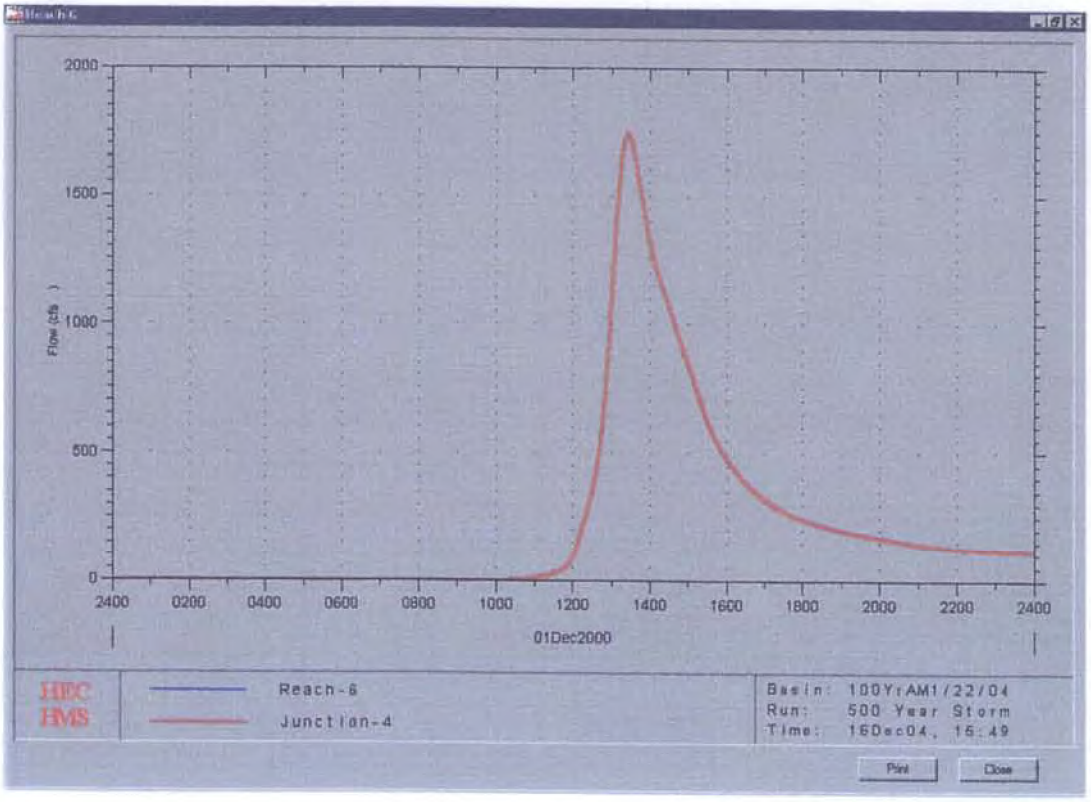
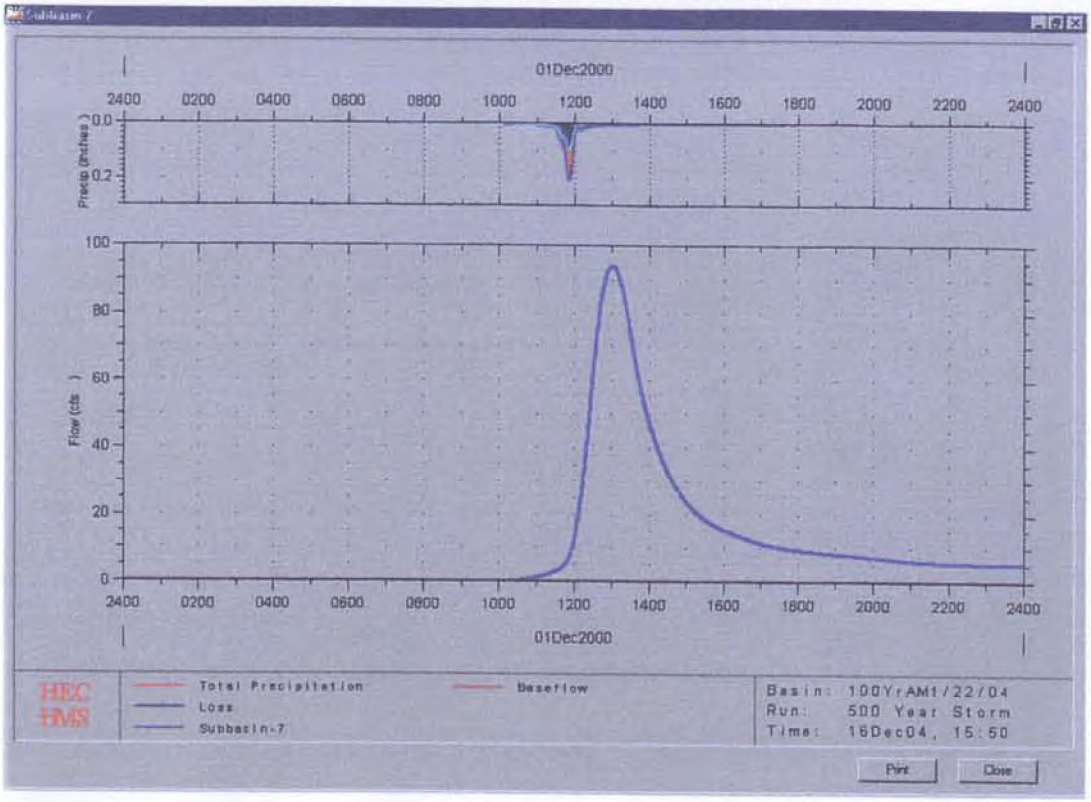
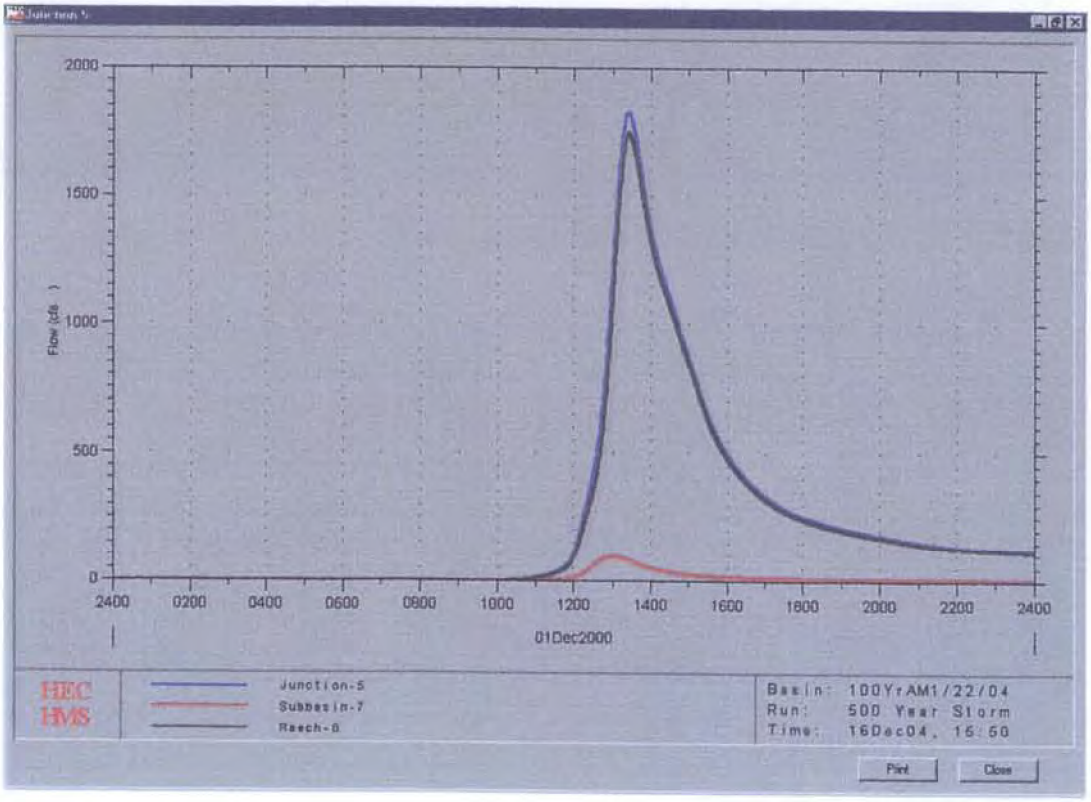




WCS FACILITY
FLOOD PLAIN STUDY HYDROGRAPHS





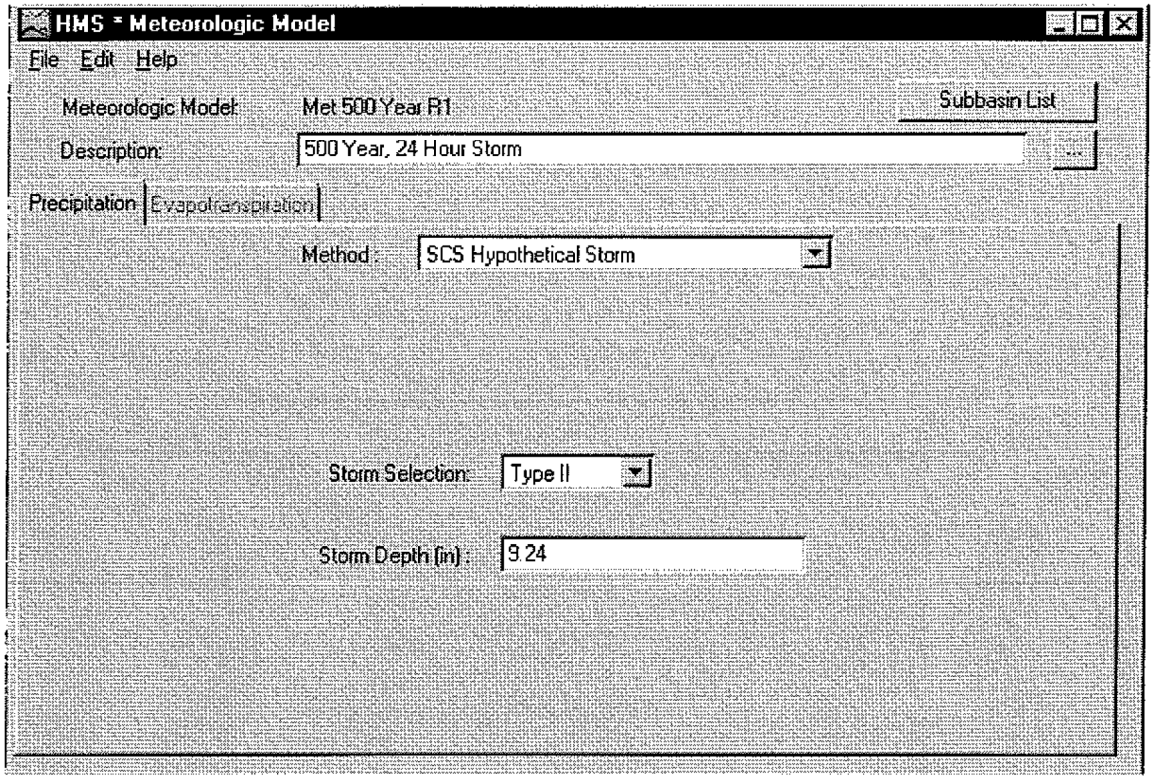
HMS * Summary of Results

Project : WCS Run Name : 500 Year R1

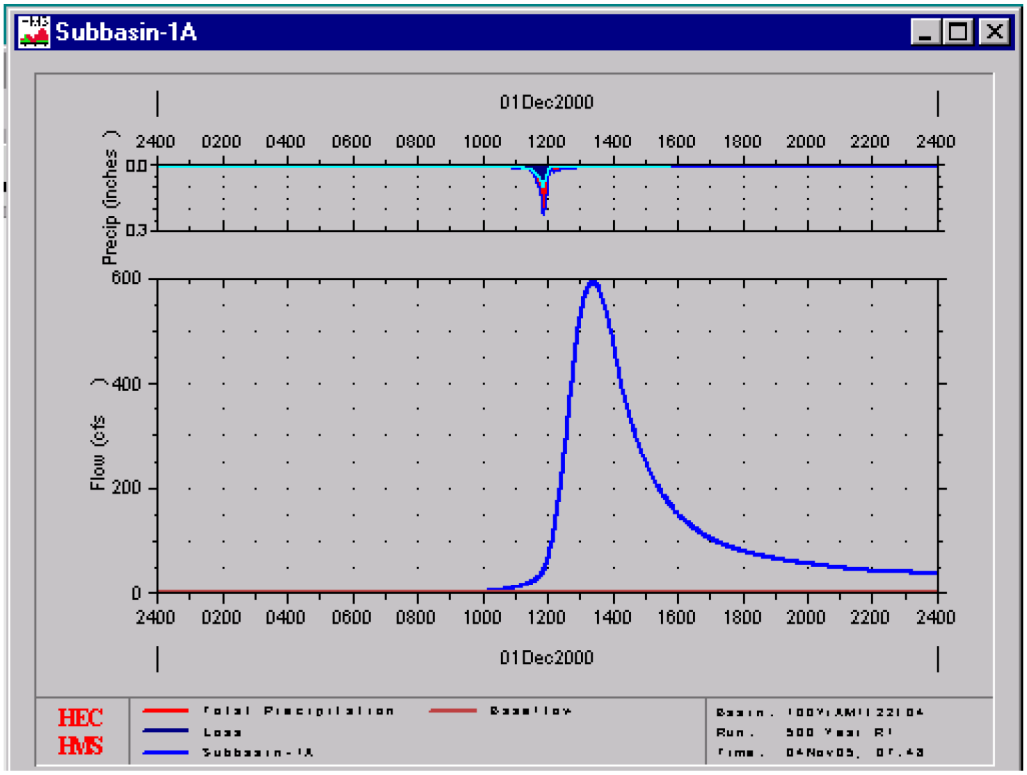
Start of Run : 01Dec00 0000 Basin Model : 100YrAM1/22/04
End of Run : 02Dec00 0000 Met. Model : Met 500 Year R1
Execution Time : 03Nov05 1631 Control Specs : Control 1

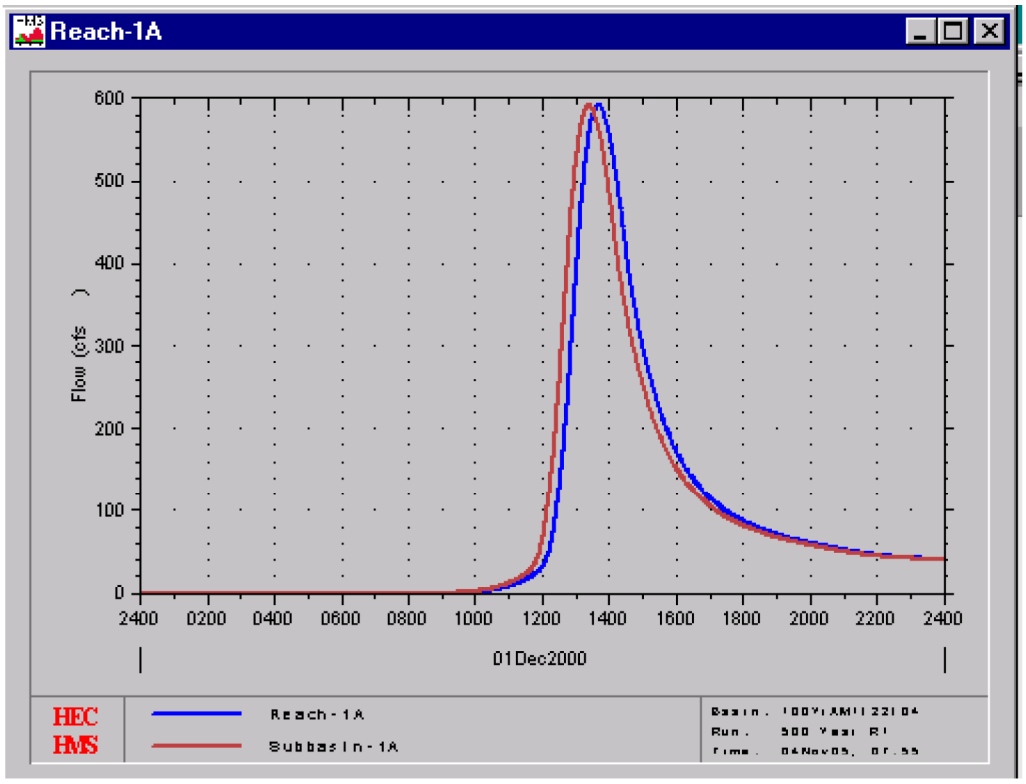
Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Subbasin-4	714.02	01 Dec 00 1233	110.29	0.490
Reach-2	714.02	01 Dec 00 1248	109.75	0.490
Subbasin-2	1057.3	01 Dec 00 1302	236.57	1.063
playa	0.0	30 Nov 00 2400	0.0	1.063
Reach-1	0.0	30 Nov 00 2400	0.0	1.063
Subbasin-1A	591.53	01 Dec 00 1325	161.43	0.691
Reach-1A	591.53	01 Dec 00 1342	160.49	0.691
Subbasin-1B	418.70	01 Dec 00 1239	70.527	0.314
Junction-1A	750.62	01 Dec 00 1327	231.02	1.005
Reach-1B	750.62	01 Dec 00 1330	230.78	1.005
Subbasin-3	208.01	01 Dec 00 1239	35.039	0.156
Junction-1	857.40	01 Dec 00 1300	265.82	2.224
Reach-3	857.40	01 Dec 00 1317	264.27	2.224
Subbasin-5A	285.12	01 Dec 00 1232	43.236	0.192
Junction-2	1668.0	01 Dec 00 1253	417.25	2.906
Reach-4	1668.0	01 Dec 00 1314	414.24	2.906
Subbasin-5B	307.55	01 Dec 00 1249	59.289	0.265
Junction-3	1913.6	01 Dec 00 1312	473.53	3.171
Reach-5	1913.6	01 Dec 00 1326	471.22	3.171
Subbasin-6	130.23	01 Dec 00 1223	16.721	0.074
Junction-4	1942.7	01 Dec 00 1325	487.94	3.245
Reach-6	1942.7	01 Dec 00 1325	487.94	3.245
Subbasin-7	104.67	01 Dec 00 1301	23.156	0.104
Junction-5	2031.8	01 Dec 00 1325	511.09	3.349

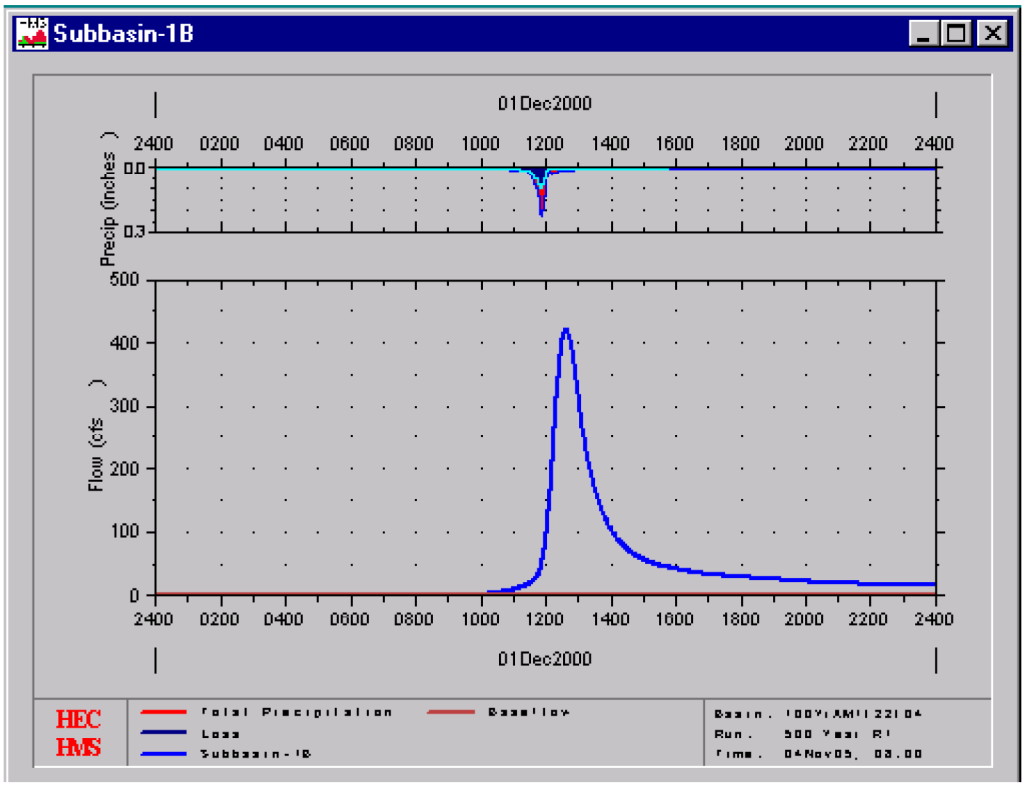
Meteorologic Model Input - 500-Year Storm

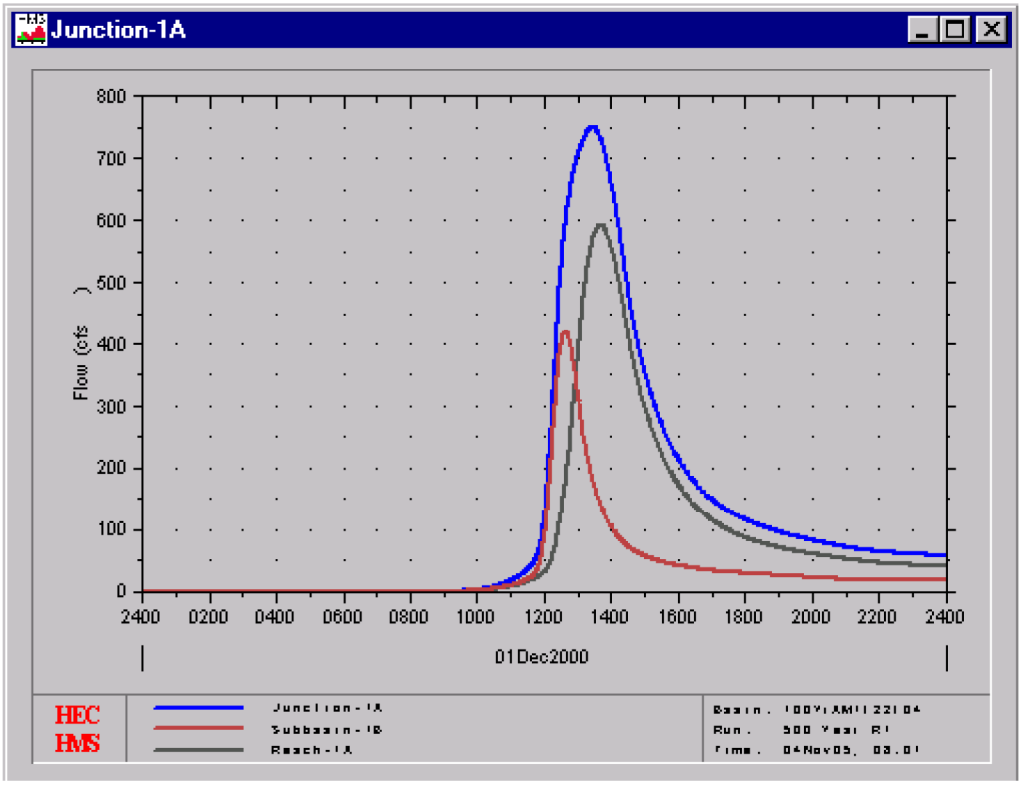


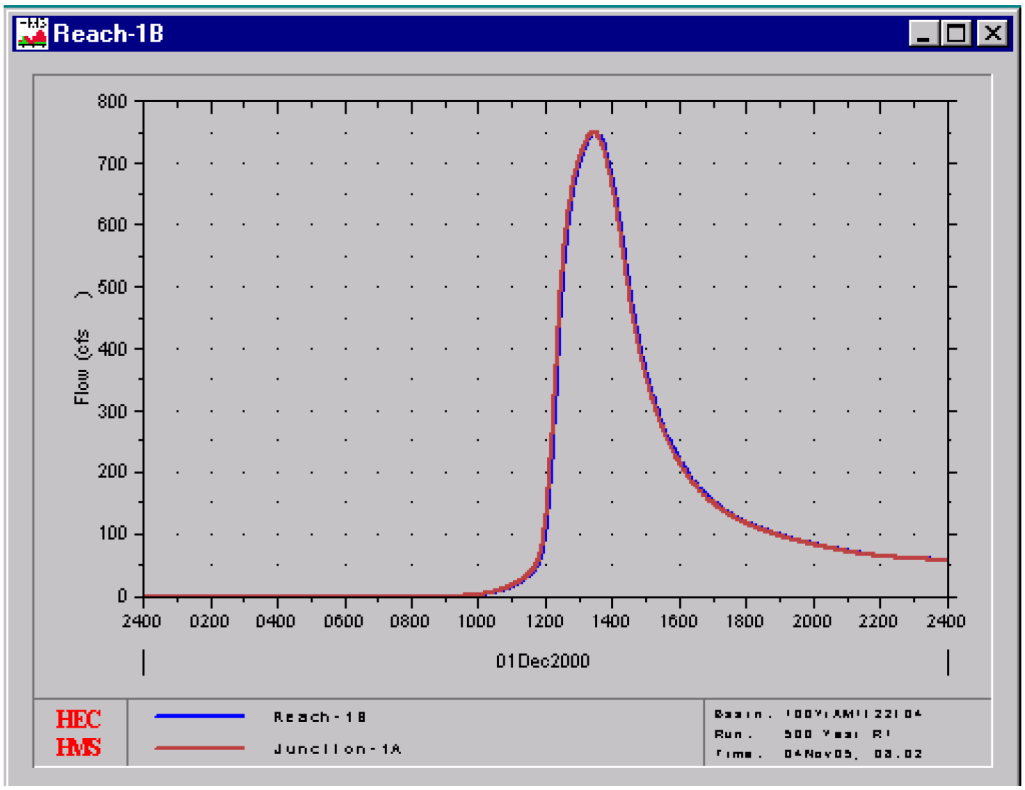
WCS FACILITY
FLOOD PLAIN STUDY HYDROGRAPHS

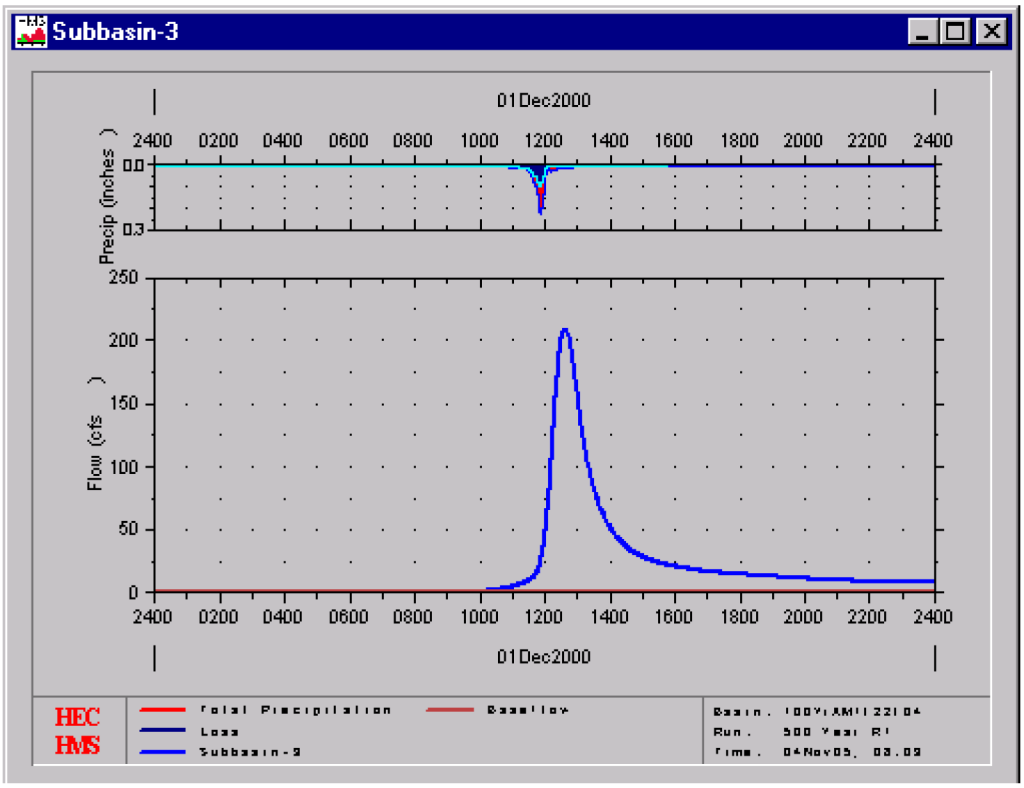


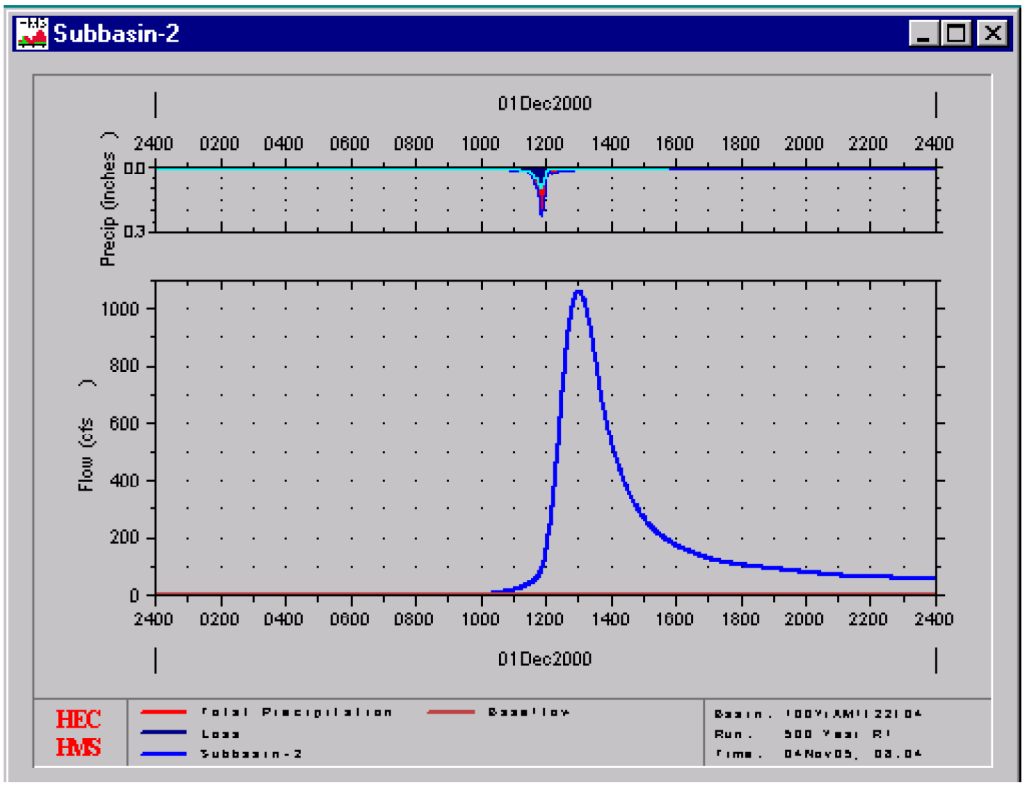


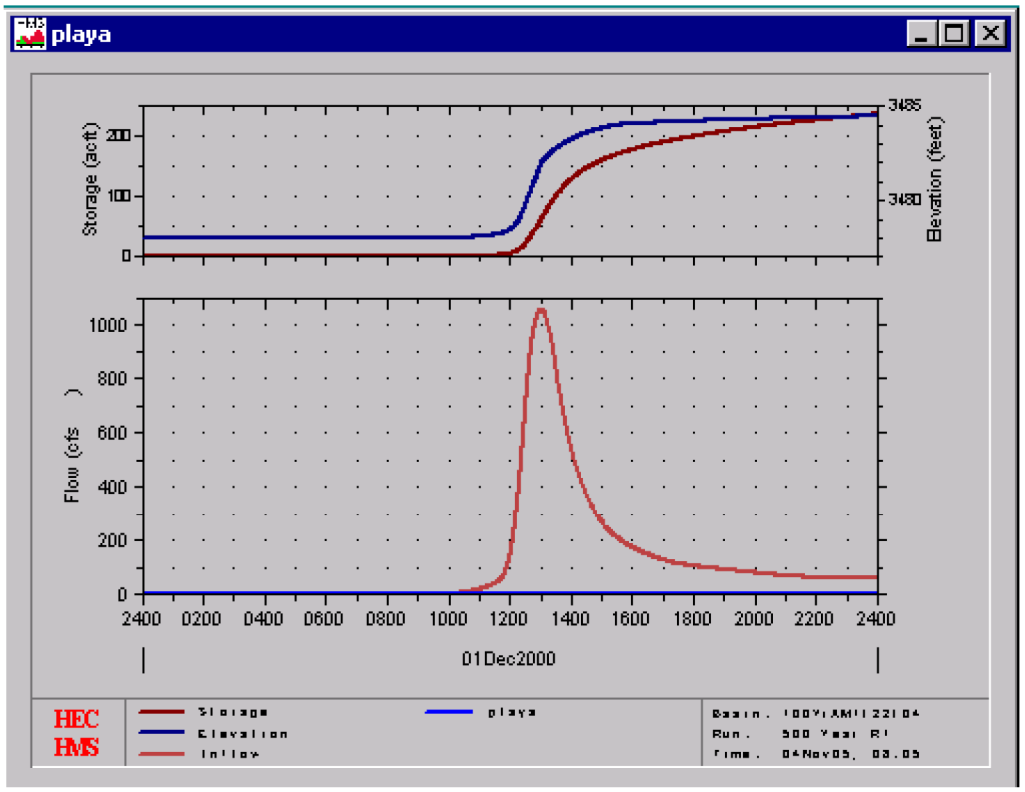

Subbasin-1B
01Dec2000
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
Precip (inches)
0.0
0.3
500
400
300
200
100
0
Flow (cfs)
01Dec2000
HEC
HMS
Total Precipitation
Baseflow
Loss
Subbasin-1B
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08.00


Junction-1A
800
700
600
500
400
300
200
100
0
Flow (cfs)
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
01Dec2000
HEC
HMS
Junction-1A
Subbasin-1B
Reach-1A
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08.01

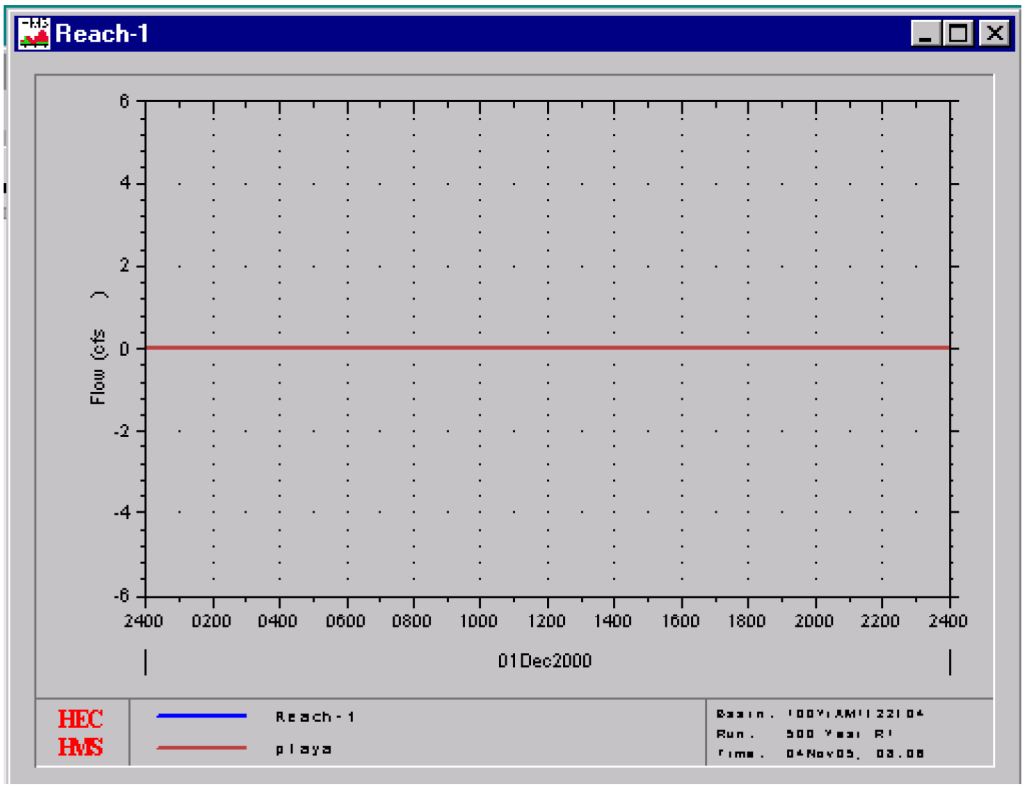

Reach-1B
800
700
600
500
400
300
200
100
0
Flow (cfs)
2400
0200
0400
0600
0800
1000
1200
1400
1600
1800
2000
2200
2400
01Dec2000
HEC
HMS
Reach-1B
Junction-1A
Basin. 100YrAMII2204
Run. 500 Year R1
Time. 04Nov05, 08.02

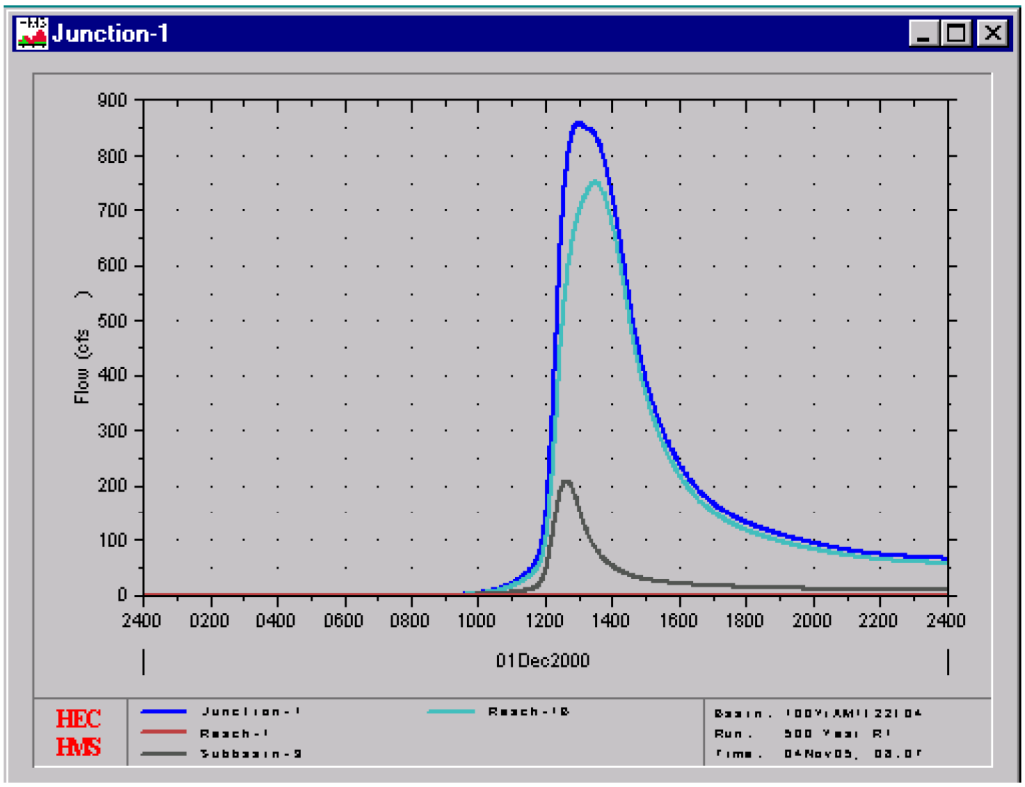

Subbasin-3
01Dec2000
2400
0200
0400
0600
0800
1000
1200
1400
1600
1800
2000
2200
2400
Precip (inches)
0.0
0.3
250
200
150
100
50
0
Flow (cfs)
01Dec2000
HEC
HMS
Total Precipitation
Baseflow
Loss
Subbasin-3
Basin. 100YrAMII2204
Run. 500 Year R1
Time. 04Nov05, 08.09

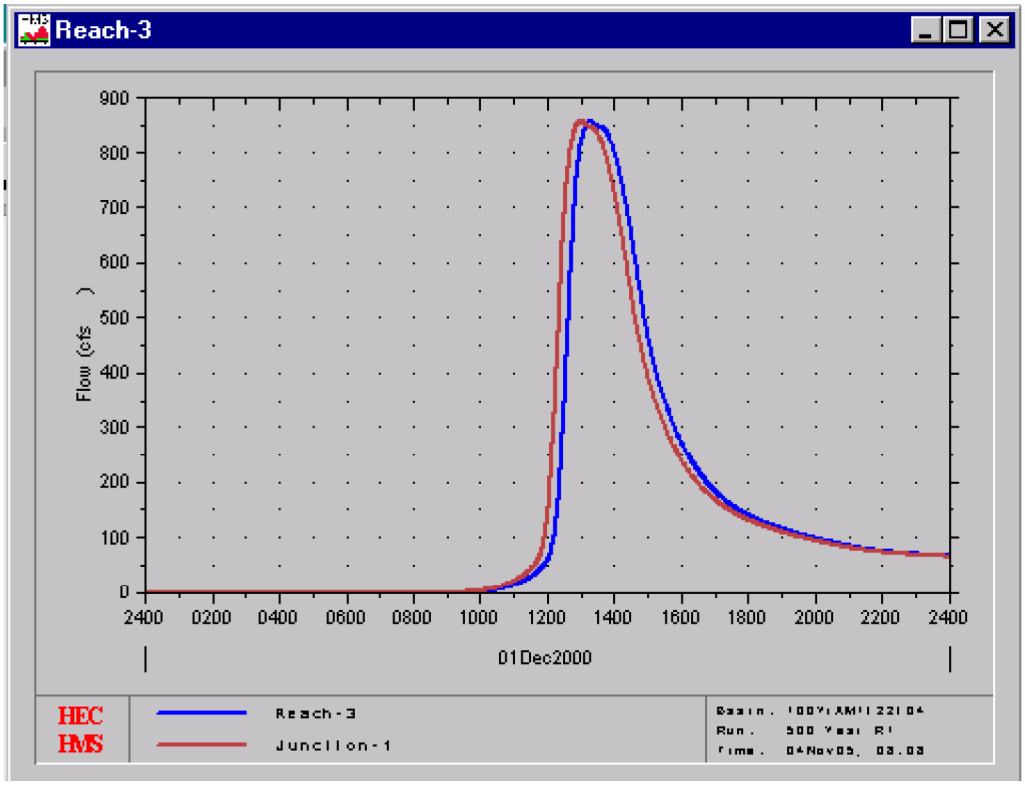

Subbasin-2
01Dec2000
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
Precip (inches)
0.0
0.3
Flow (cfs)
1000
800
600
400
200
0
01Dec2000
HEC HMS
Total Precipitation
Loss
Subbasin-2
Baseflow
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08.04

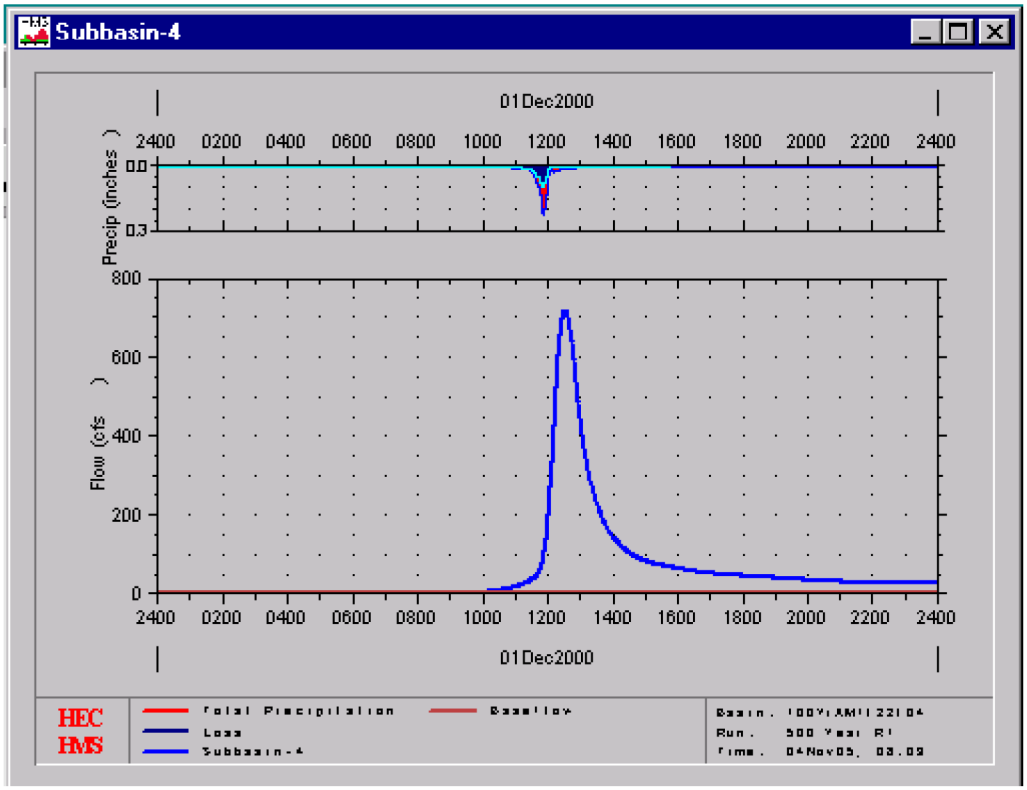

playa
Storage (acft)
200
100
0
3485
3480
Elevation (feet)
Flow (cfs)
1000
800
600
400
200
0
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
01Dec2000
HEC HMS
Storage
Elevation
Inflow
playa
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08.05

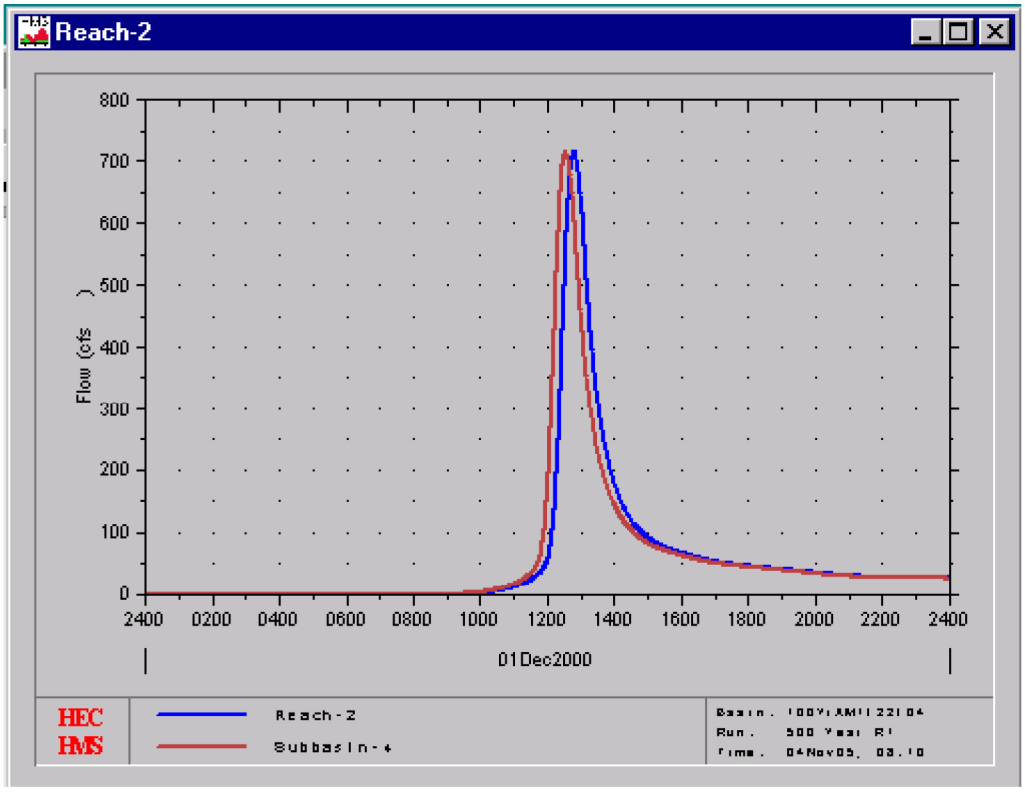
WCS FACILITY
FLOOD PLAIN STUDY HYDROGRAPHS

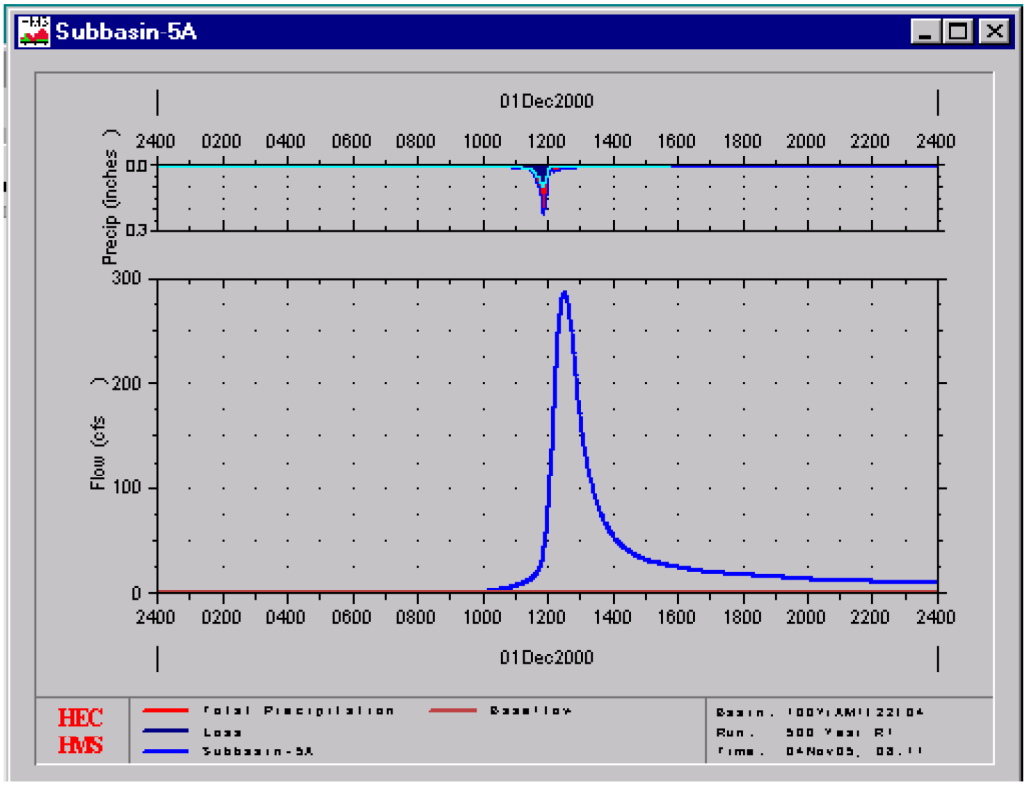


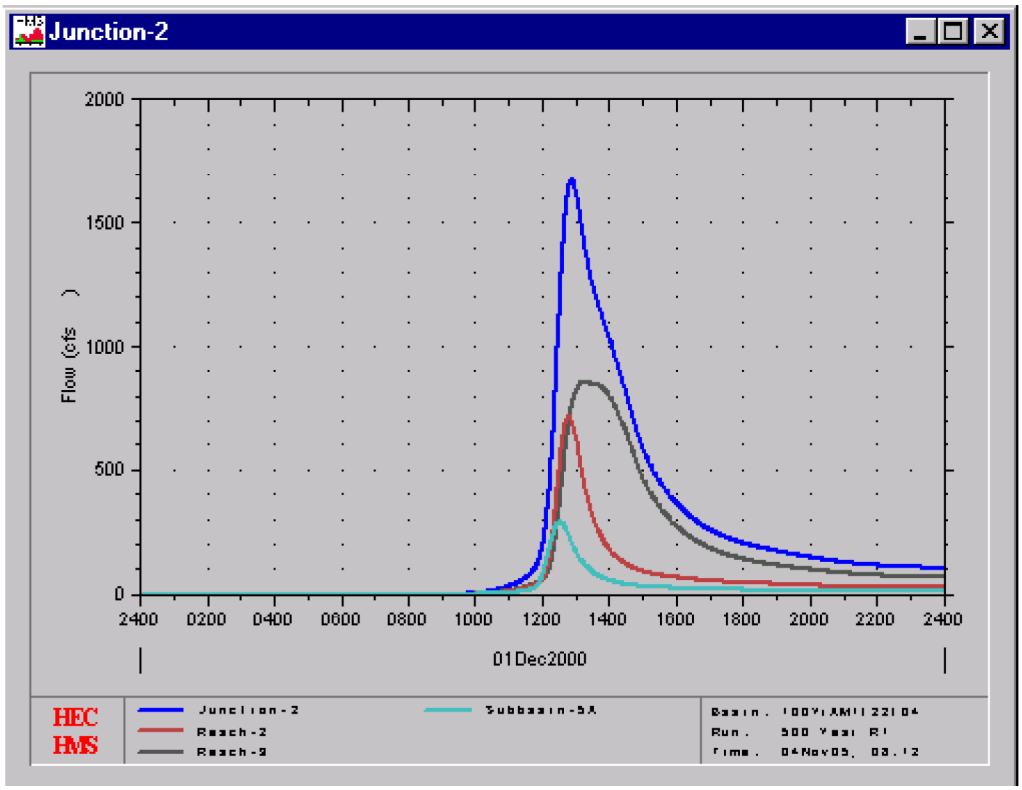


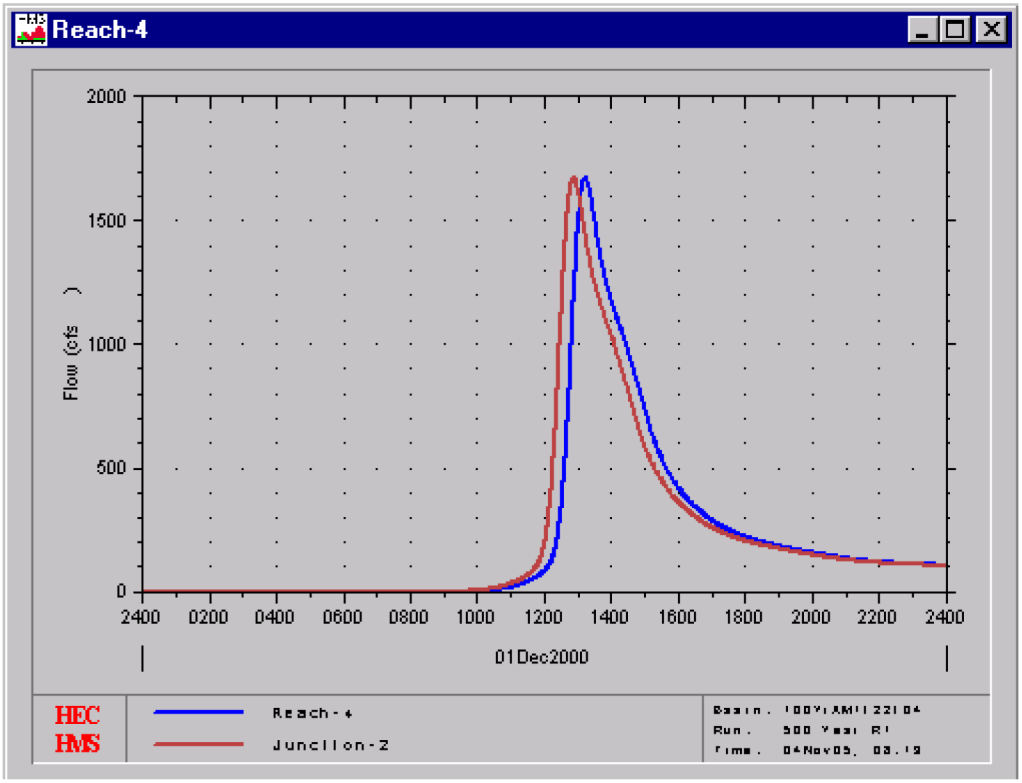

Reach-3
900
800
700
600
500
400
300
200
100
0
Flow (cfs)
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
01Dec2000
HEC HMS
Reach-3
Junction-1
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08:08

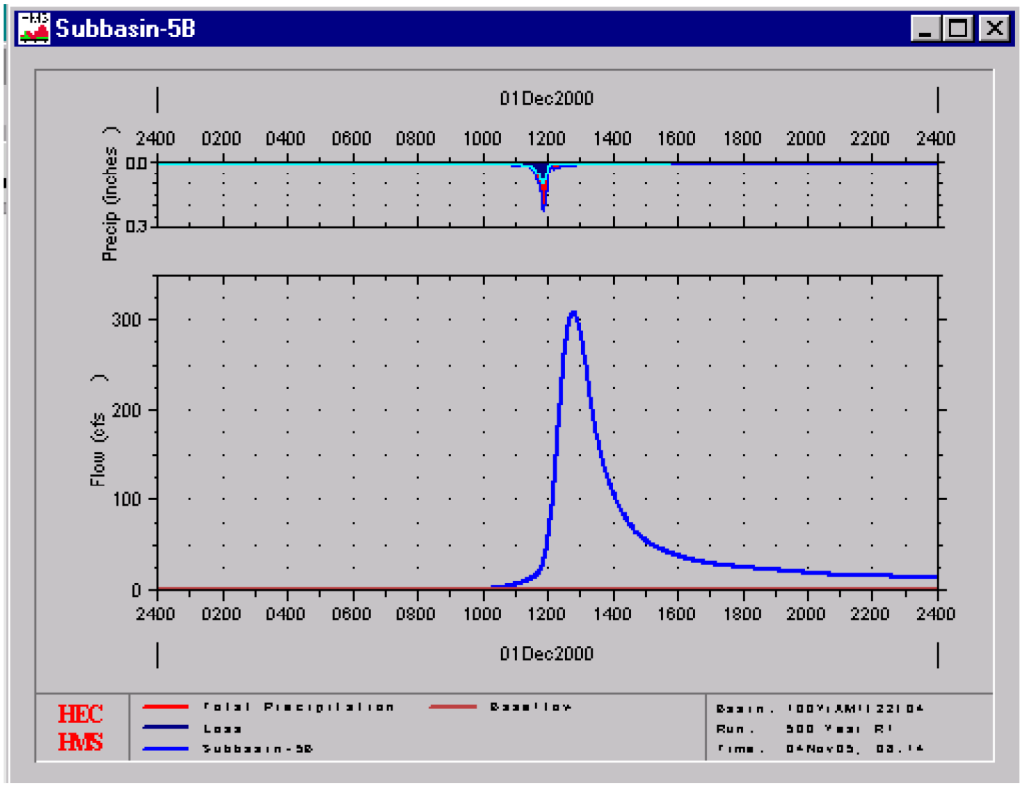

Subbasin-4
01Dec2000
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
Precip (inches)
0.0
0.3
800
600
400
200
0
Flow (cfs)
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
01Dec2000
HEC HMS
Total Precipitation
Loss
Subbasin-4
Baseflow
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08:08

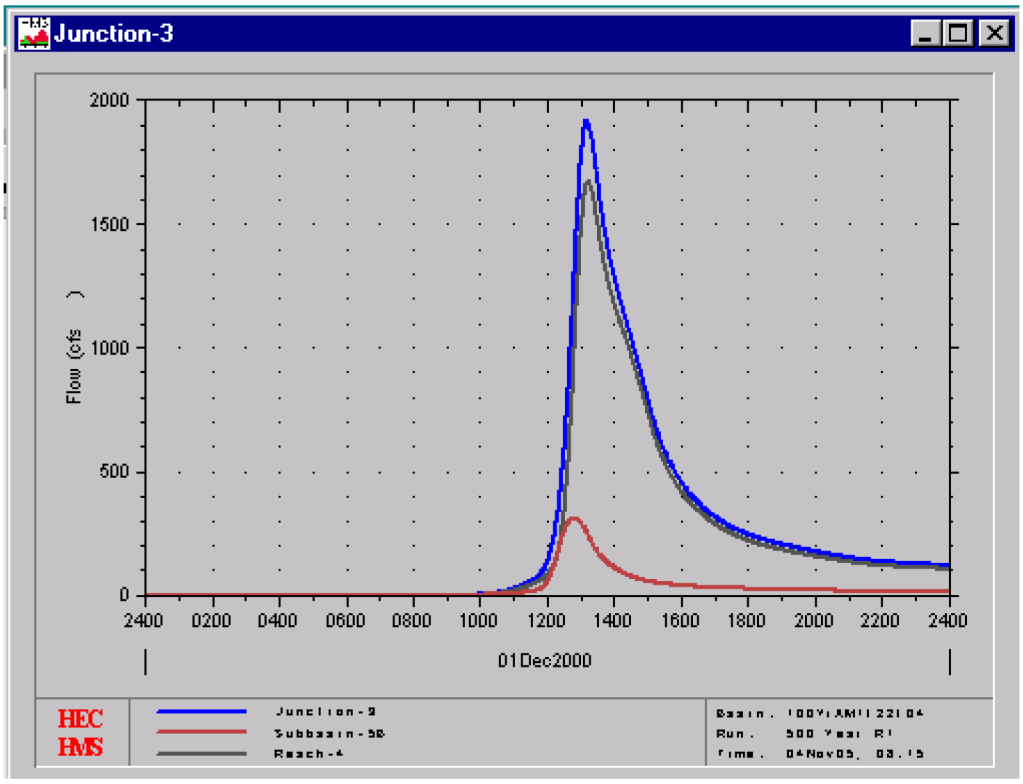

Reach-2
800
700
600
500
400
300
200
100
0
Flow (cfs)
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
01Dec2000
HEC HMS
Reach-2
Subbasin-4
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08:10

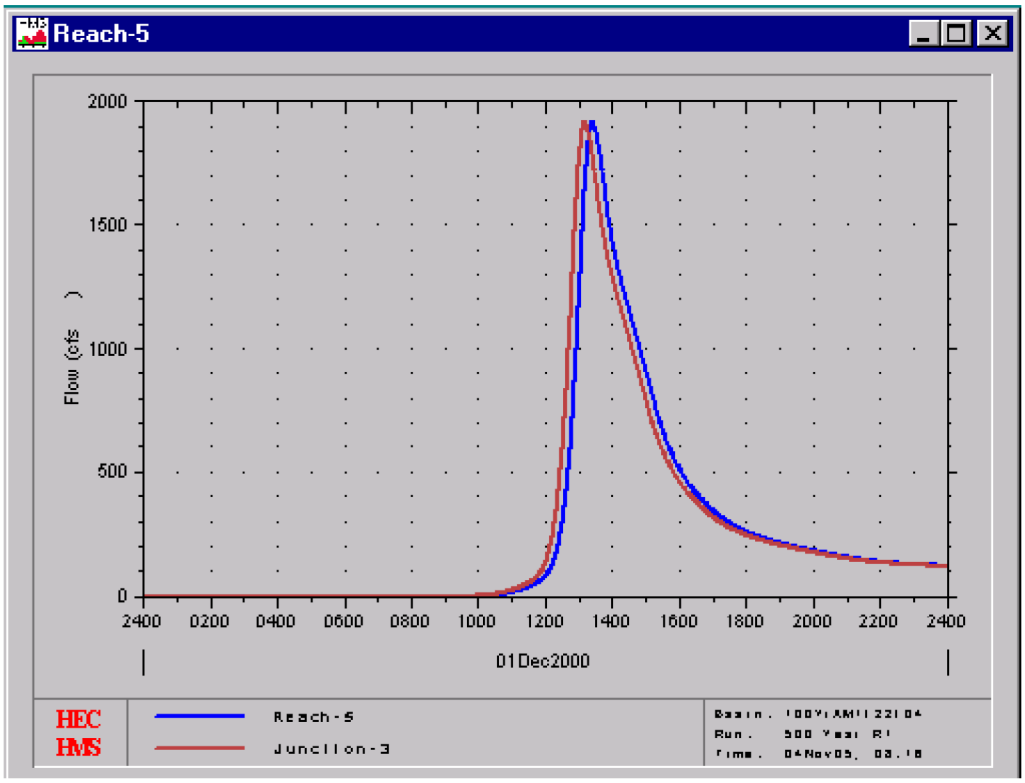

Subbasin-5A
01Dec2000
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
Precip (inches)
0.0
0.3
300
200
100
0
Flow (cfs)
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
01Dec2000
HEC HMS
Total Precipitation
Baseflow
Loss
Subbasin-5A
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08:11

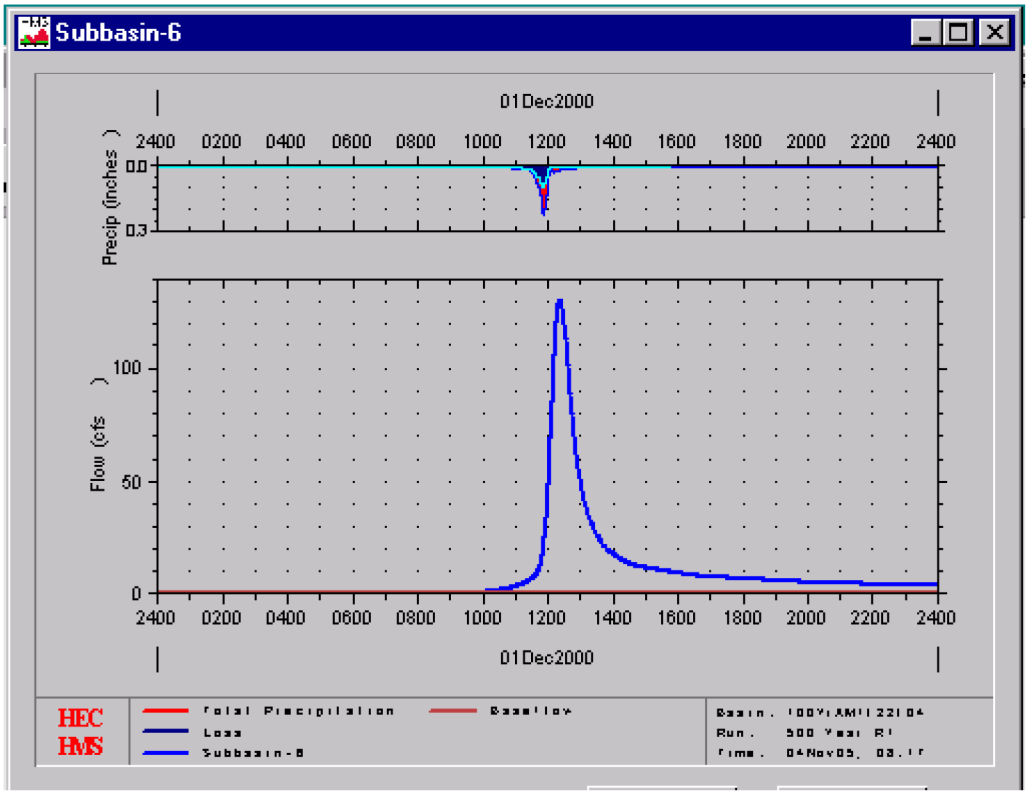

Junction-2
2000
1500
1000
500
0
Flow (cfs)
2400
0200
0400
0600
0800
1000
1200
1400
1600
1800
2000
2200
2400
01Dec2000
HEC
HMS
Junction-2
Reach-2
Reach-3
Subbasin-5A
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08:12


Reach-4
2000
1500
1000
500
0
Flow (cfs)
2400
0200
0400
0600
0800
1000
1200
1400
1600
1800
2000
2200
2400
01Dec2000
HEC
HMS
Reach-4
Junction-2
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08:19

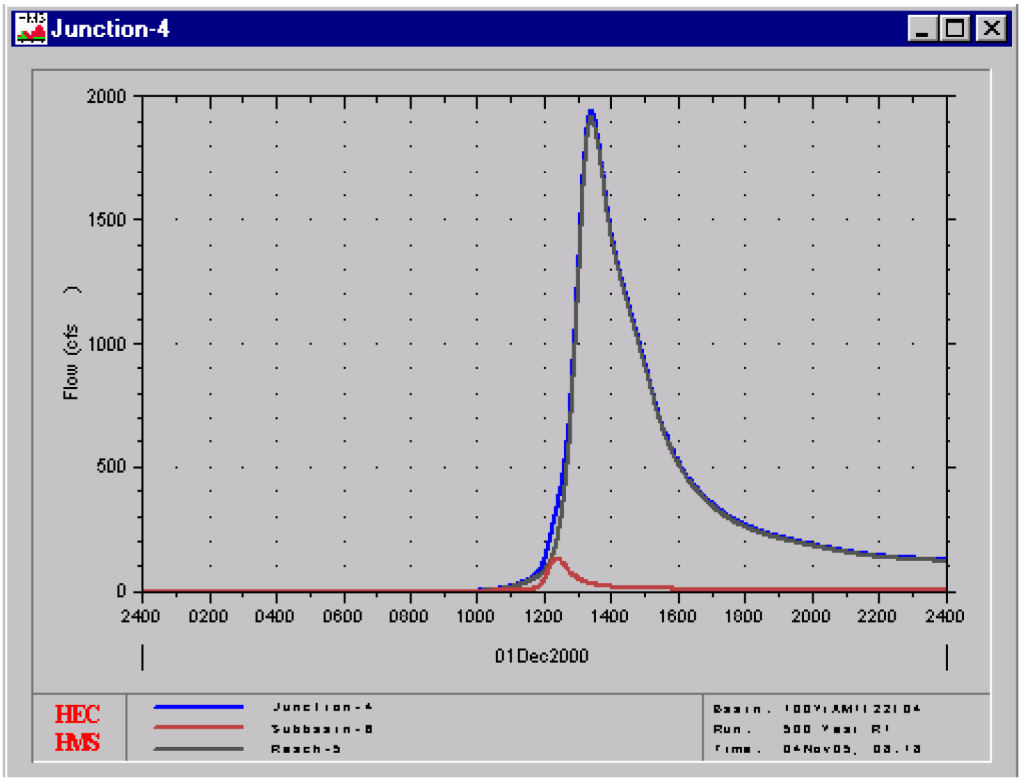

Subbasin-5B
01Dec2000
Precip (inches)
0.0
0.3
Flow (cfs)
300
200
100
0
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
01Dec2000
HEC HMS
Total Precipitation
Baseflow
Loss
Subbasin-5B

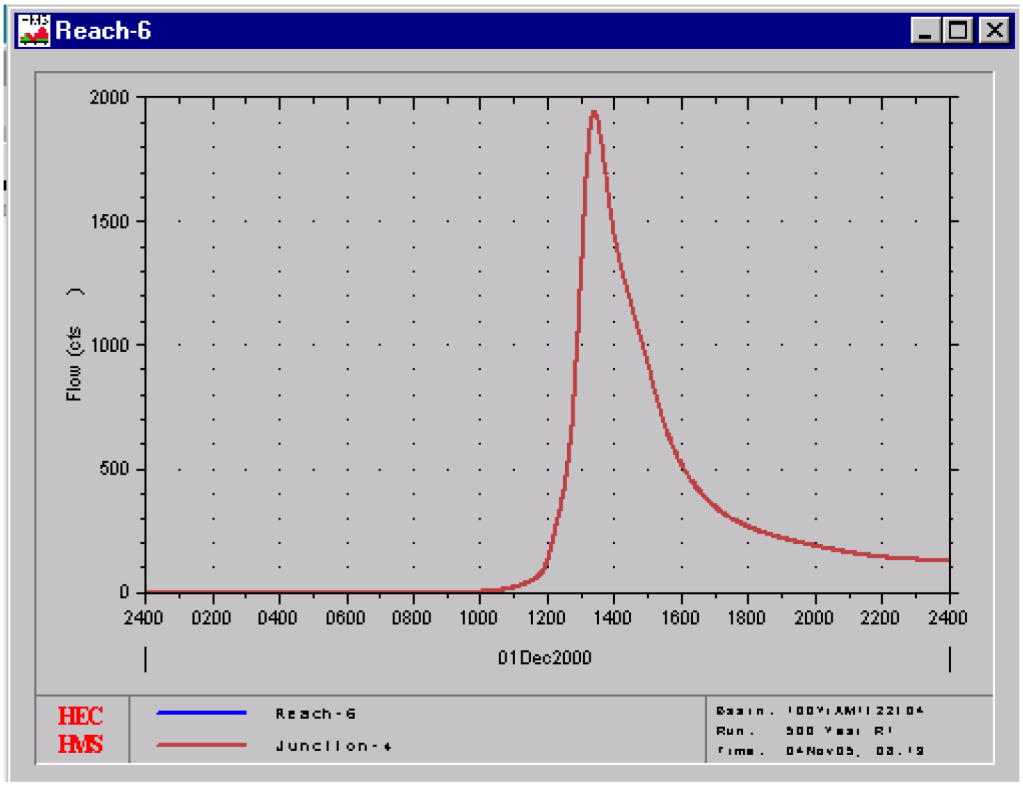

Junction-3
Flow (cfs)
2000
1500
1000
500
0
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
01Dec2000
HEC HMS
Junction-3
Subbasin-5B
Reach-4

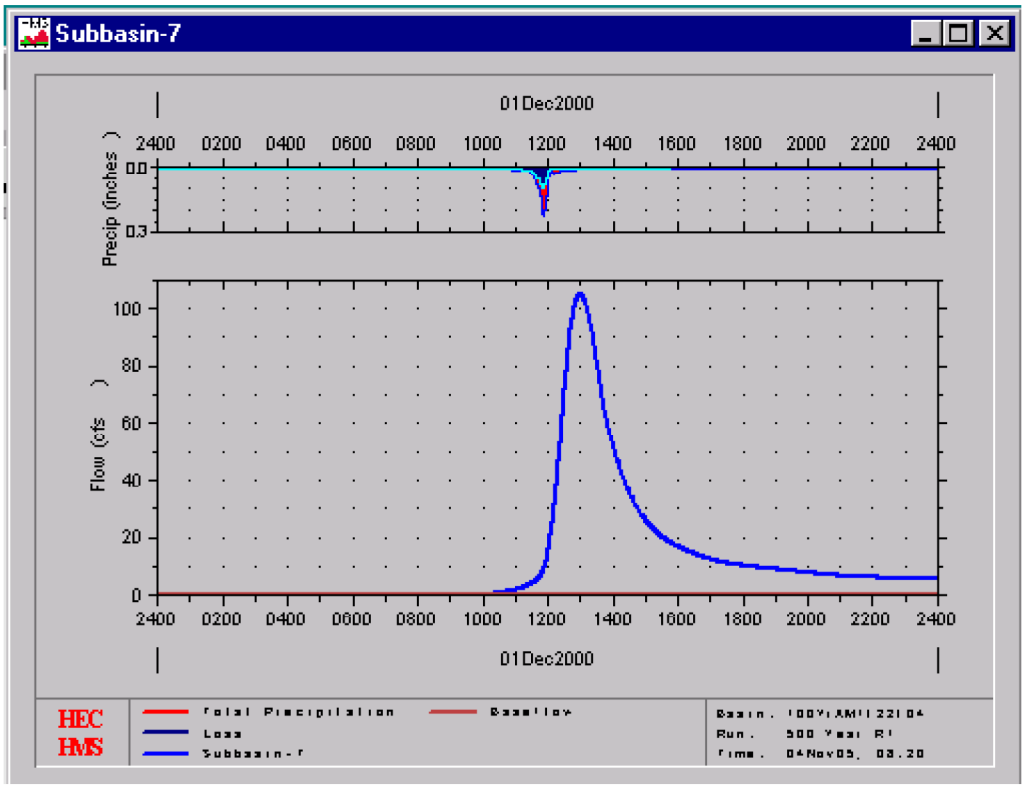

Reach-5
2000
1500
1000
500
0
Flow (cfs)
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
01Dec2000
HEC
HMS
Reach-5
Junction-3
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08.18

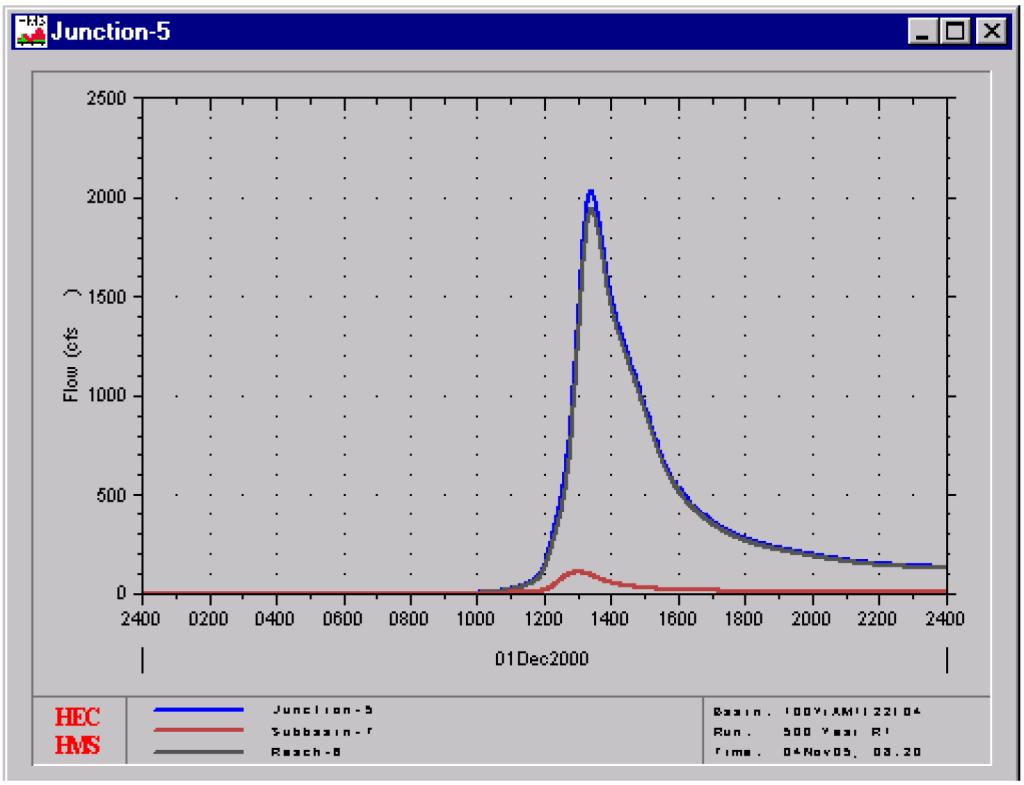

Subbasin-6
01Dec2000
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
Precip (inches)
0.0
0.3
100
50
0
Flow (cfs)
01Dec2000
HEC
HMS
Total Precipitation
Loss
Subbasin-6
Baseflow
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08.1?

WCS FACILITY
FLOOD PLAIN STUDY HYDROGRAPHS



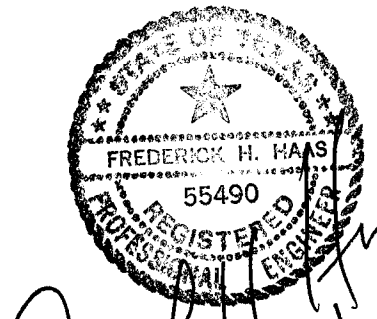



Subbasin-7
01Dec2000
Precip (inches)
0.0
0.3
Flow (cfs)
100
80
60
40
20
0
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
01Dec2000
HEC HMS
Total Precipitation
Baseflow
Loss
Subbasin-7
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08:20


Junction-5
Flow (cfs)
2500
2000
1500
1000
500
0
2400 0200 0400 0600 0800 1000 1200 1400 1600 1800 2000 2200 2400
01Dec2000
HEC HMS
Junction-5
Subbasin-7
Reach-8
Basin. 100YrAMII2204
Run. 500 Year R!
Time. 04Nov05, 08:20

APPENDIX E

HEC-HMS MODEL FOR THE CALCULATION OF THE PMP PEAK DISCHARGES



12/17/04

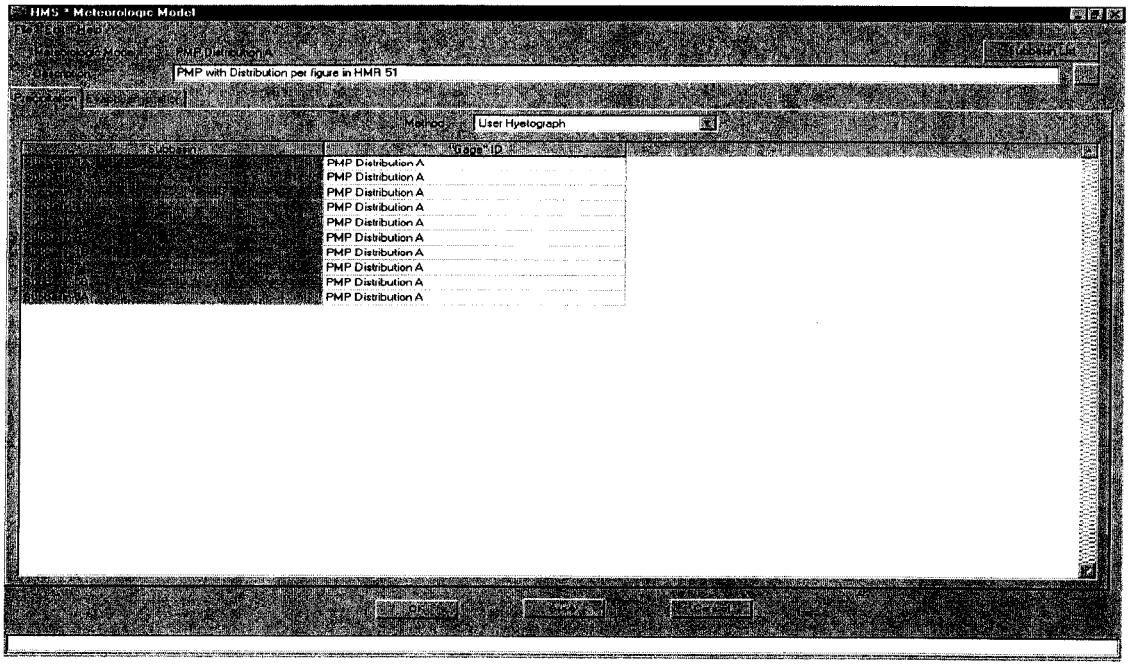
HMS * Summary of Results

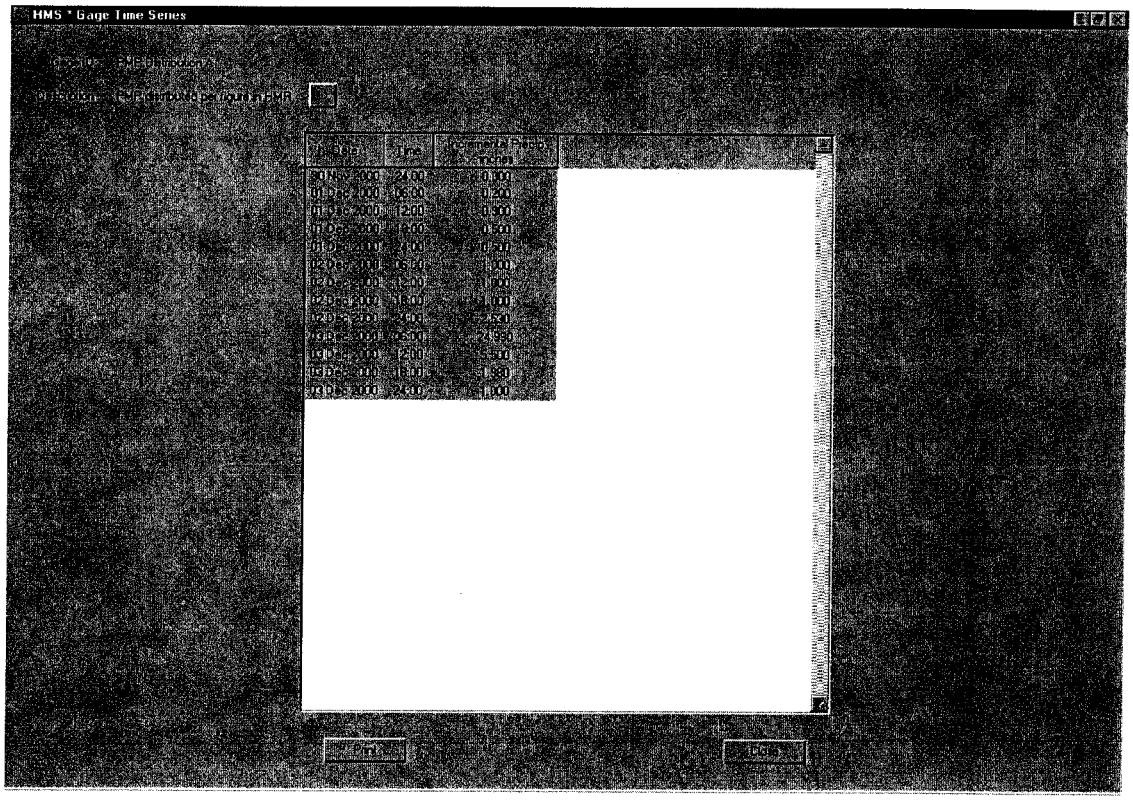
Project : WCS Run Name : PMP Dist A

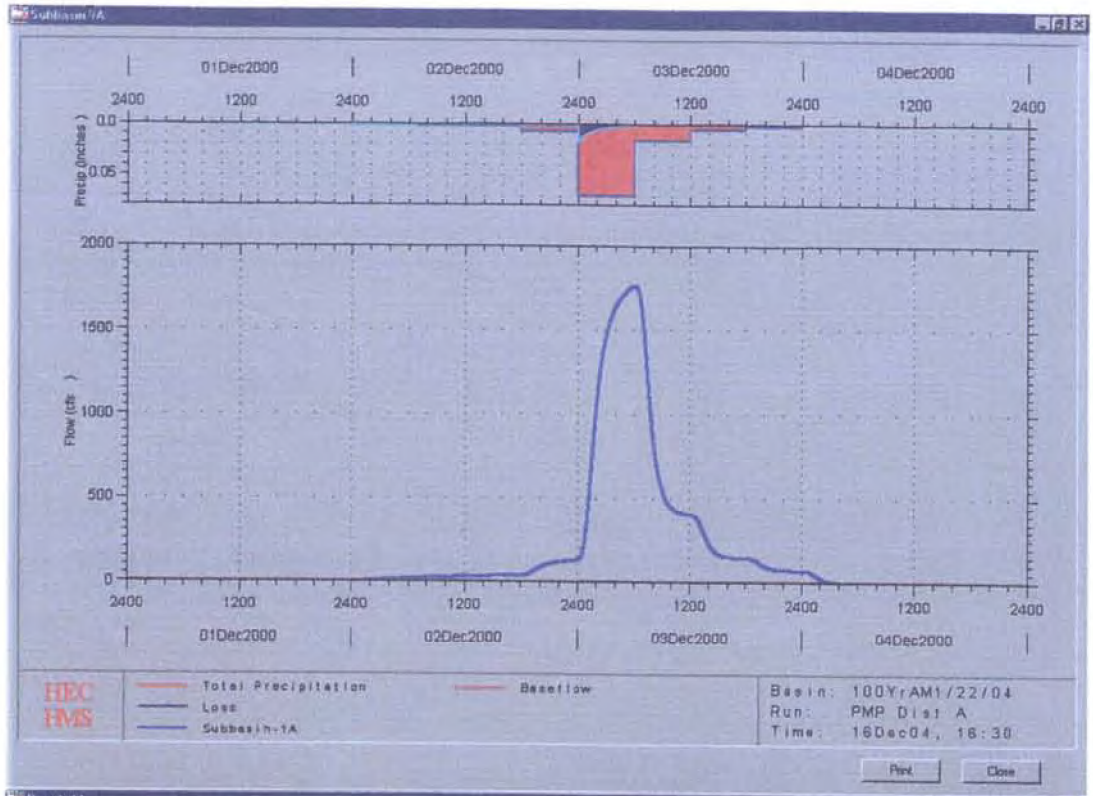
Start of Run : 01Dec00 0000 Basin Model : 100YrAM1/22/04
End of Run : 05Dec00 0000 Met. Model : PMP Distribution A
Execution Time : 15Dec04 1355 Control Specs : Control PMP

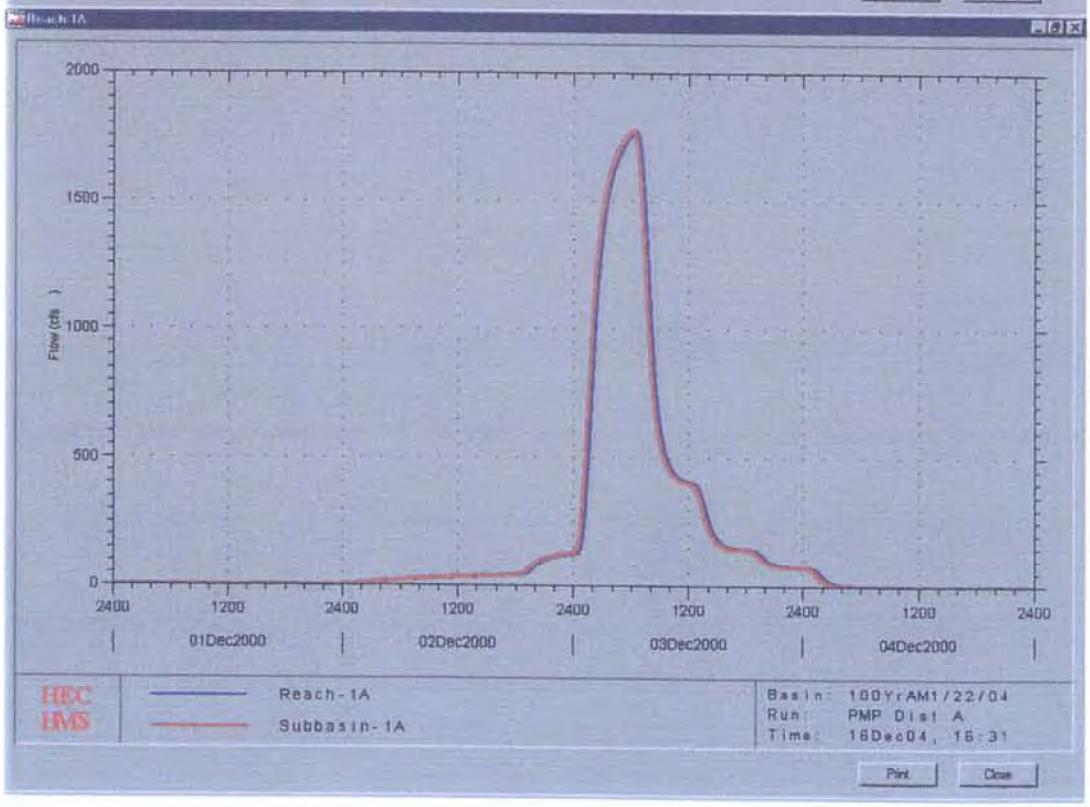
Hydrologic Element	Discharge Peak (cfs)	Time of Peak	Volume (ac ft)	Drainage Area (sq mi)
Subbasin-4	1265.5	03 Dec 00 0601	874.67	0.490
Reach-2	1265.5	03 Dec 00 0616	874.67	0.490
Subbasin-2	2726.0	03 Dec 00 0605	1897.5	1.063
playa	2194.2	03 Dec 00 0655	1440.5	1.063
Reach-1	2194.2	03 Dec 00 0730	1440.5	1.063
Subbasin-1A	1767.9	03 Dec 00 0610	1252.0	0.691
Reach-1A	1767.9	03 Dec 00 0627	1252.0	0.691
Subbasin-1B	809.97	03 Dec 00 0601	560.51	0.314
Junction-1A	2567.7	03 Dec 00 0606	1812.5	1.005
Reach-1B	2567.7	03 Dec 00 0609	1812.5	1.005
Subbasin-3	402.41	03 Dec 00 0601	278.47	0.156
Junction-1	4793.3	03 Dec 00 0625	3531.4	2.224
Reach-3	4793.3	03 Dec 00 0642	3531.4	2.224
Subbasin-5A	495.98	03 Dec 00 0601	342.73	0.192
Junction-2	6408.8	03 Dec 00 0625	4748.8	2.906
Reach-4	6408.8	03 Dec 00 0646	4748.8	2.906
Subbasin-5B	681.99	03 Dec 00 0603	473.04	0.265
Junction-3	6969.3	03 Dec 00 0639	5221.9	3.171
Reach-5	6969.3	03 Dec 00 0653	5221.9	3.171
Subbasin-6	191.50	03 Dec 00 0600	132.09	0.074
Junction-4	7042.0	03 Dec 00 0651	5354.0	3.245
Reach-6	7042.0	03 Dec 00 0651	5354.0	3.245
Subbasin-7	266.78	03 Dec 00 0604	185.65	0.104
Junction-5	7267.5	03 Dec 00 0647	5539.6	3.349

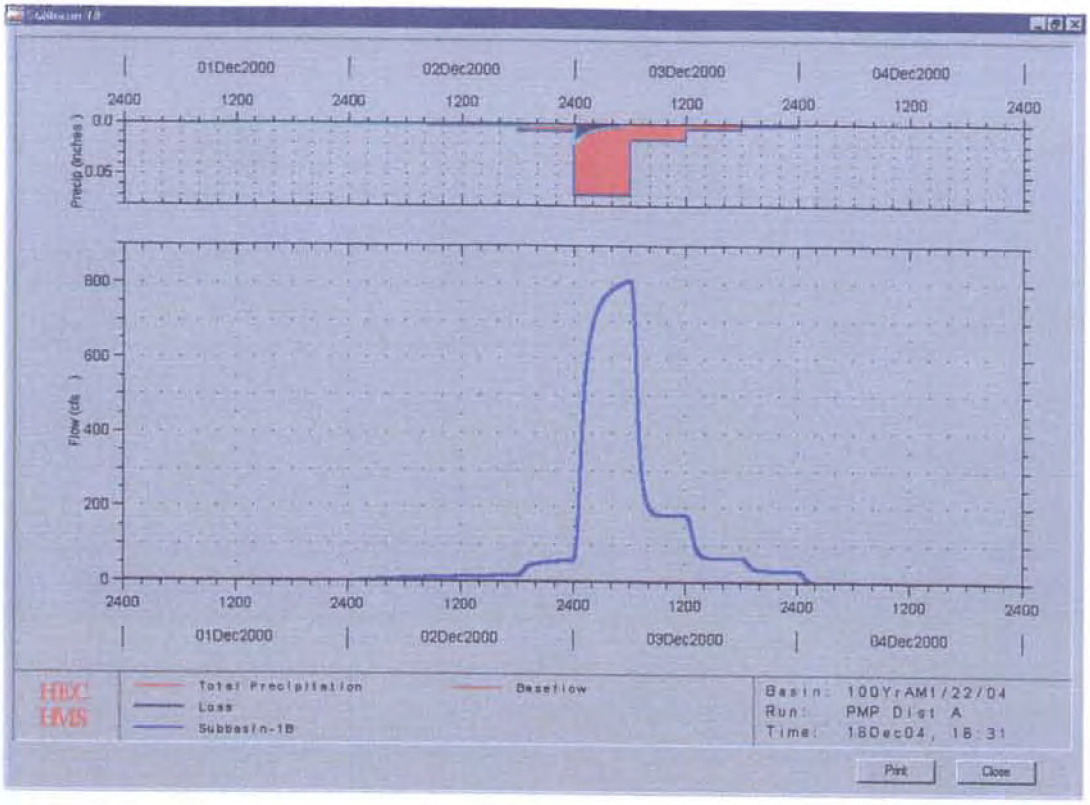
Meteorologic Model Input

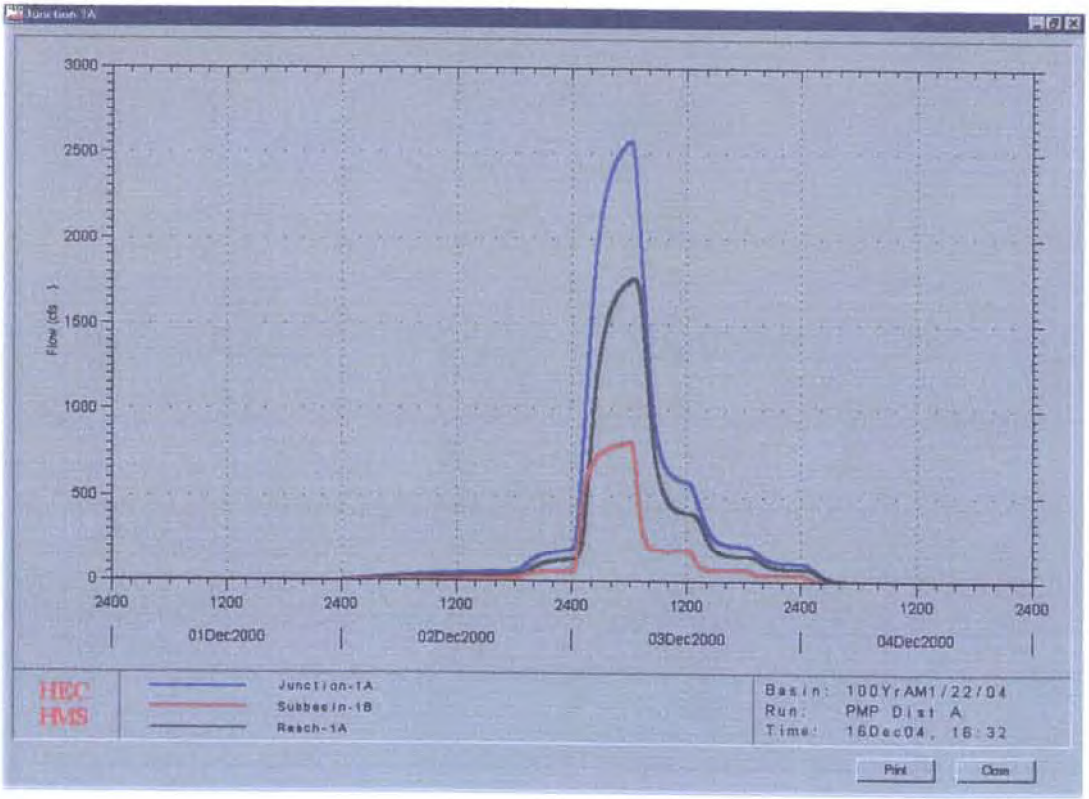


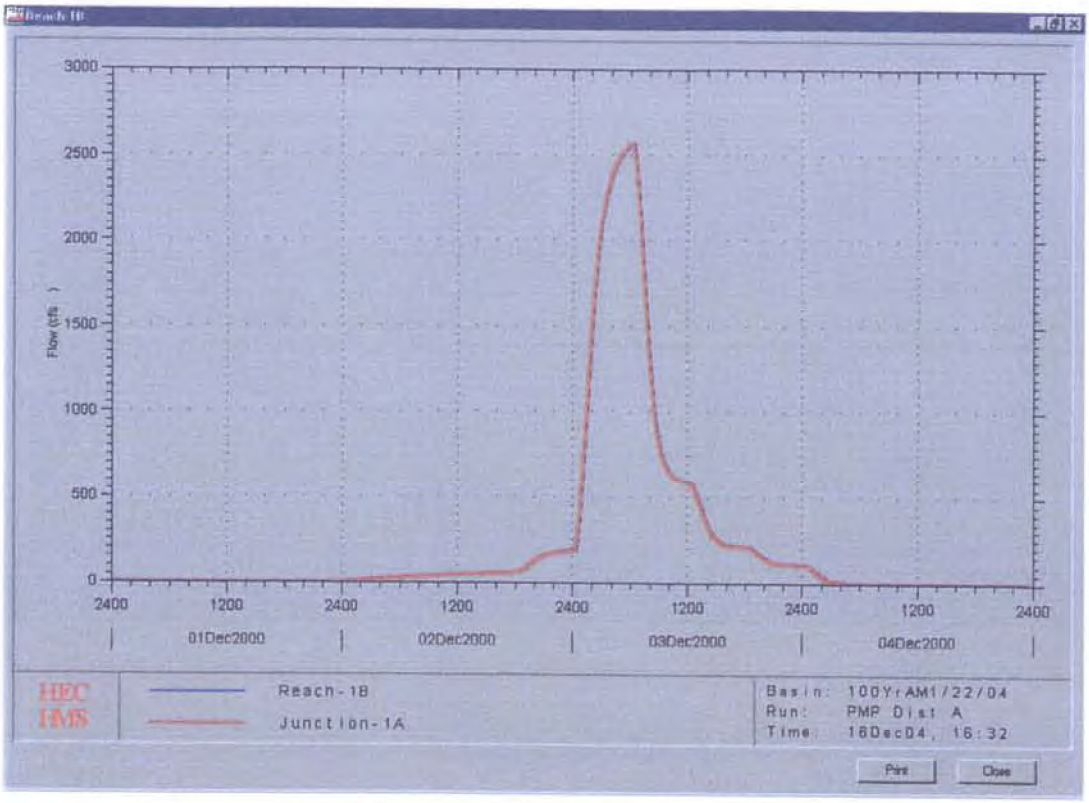


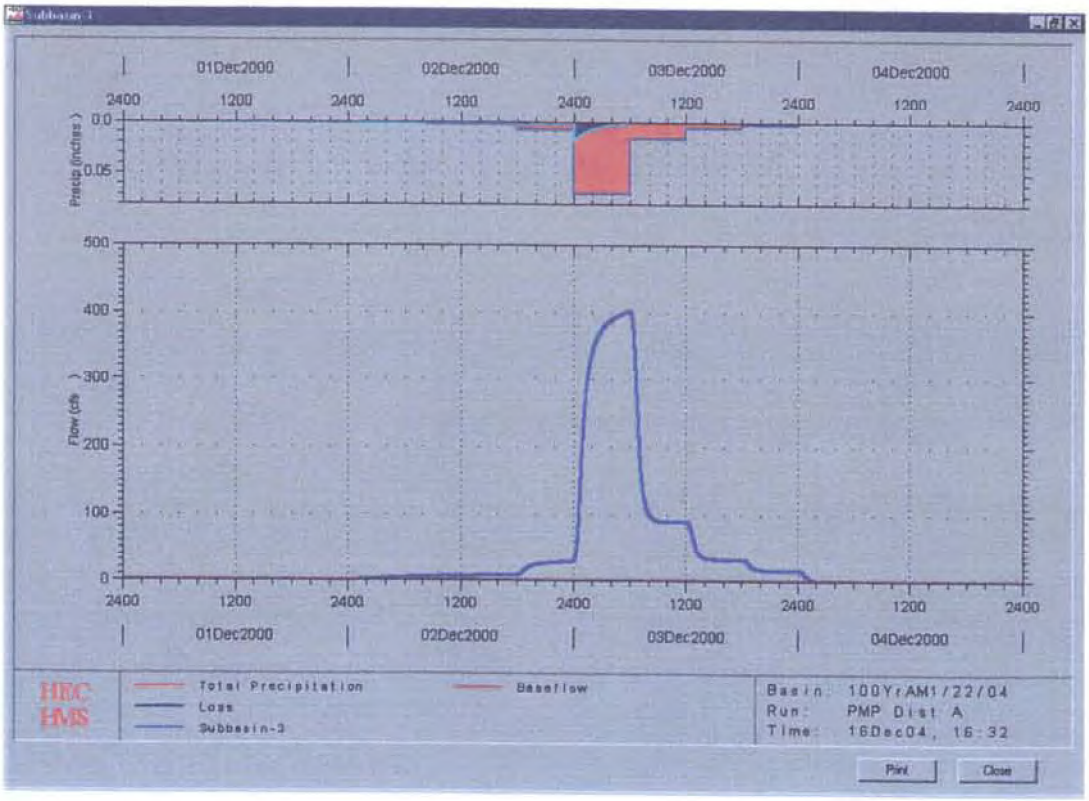

01Dec2000
02Dec2000
03Dec2000
04Dec2000
Precip (inches)
Flow (cfs)
Total Precipitation
Loss
Subbasin-1A
Baseflow
HEC HMS
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:30
Print
Close

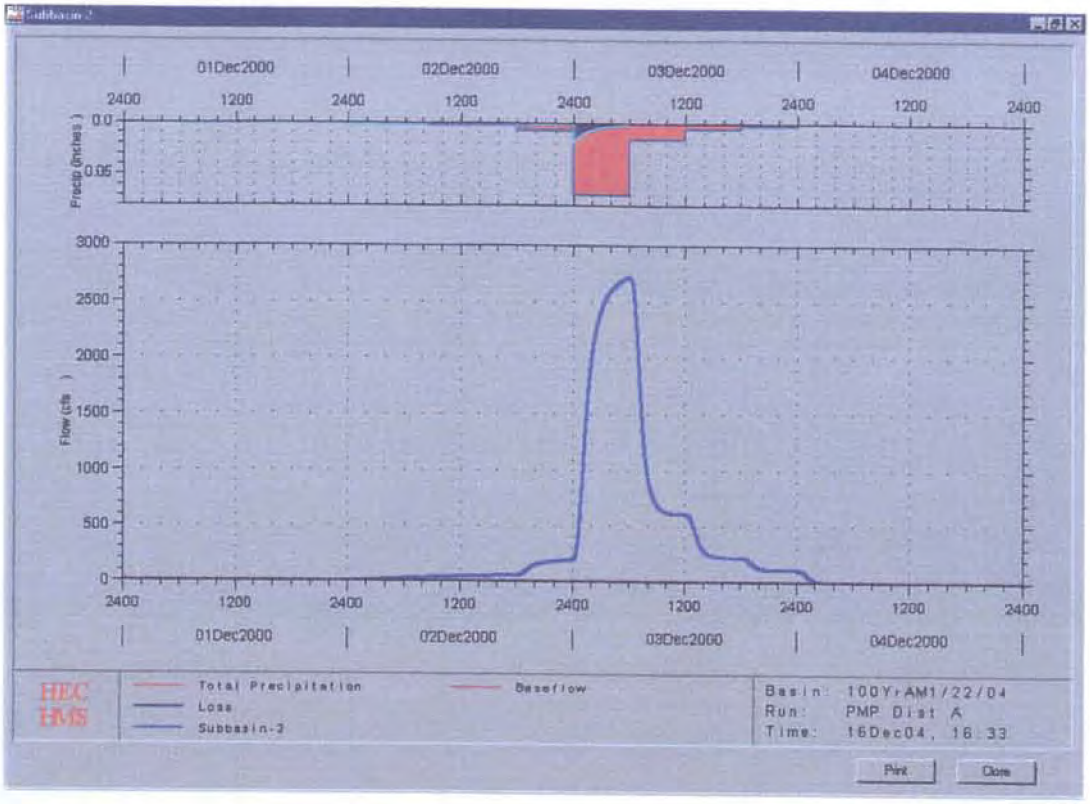

Flow (cfs)
01Dec2000
02Dec2000
03Dec2000
04Dec2000
Reach-1A
Subbasin-1A
HEC HMS
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:31
Print
Close

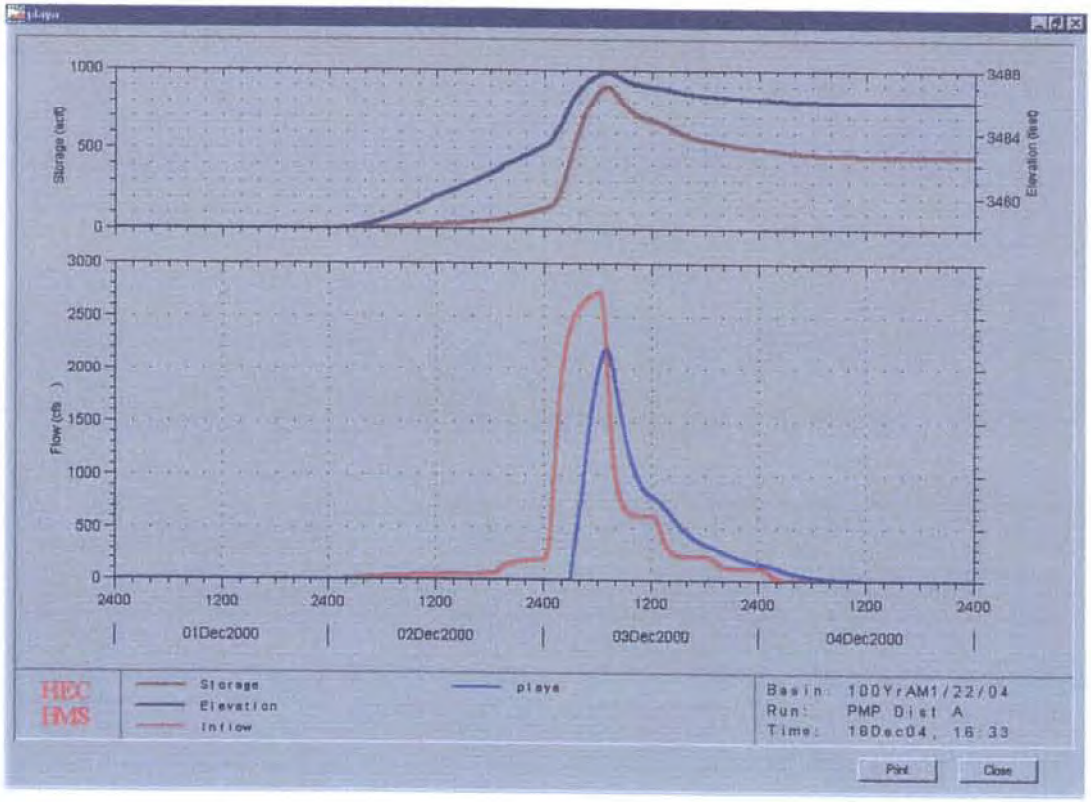

01Dec2000
02Dec2000
03Dec2000
04Dec2000
2400
1200
Precip (inches)
0.0
0.05
Flow (cfs)
800
600
400
200
0
Total Precipitation
Loss
Subbasin-1B
Baseflow
HEC HMS
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:31
Print
Close

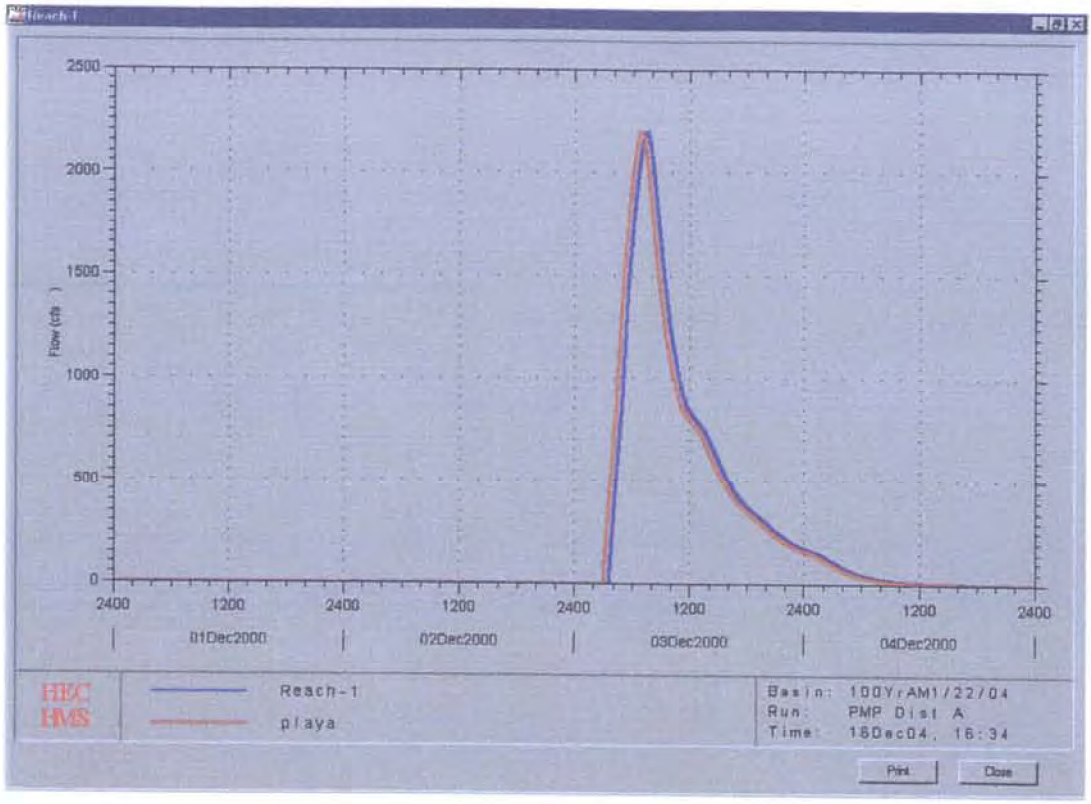

3000
2500
2000
1500
1000
500
0
Flow (cfs)
01Dec2000
02Dec2000
03Dec2000
04Dec2000
Junction-1A
Subbasin-1B
Reach-1A
HEC HMS
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:32
Print
Close

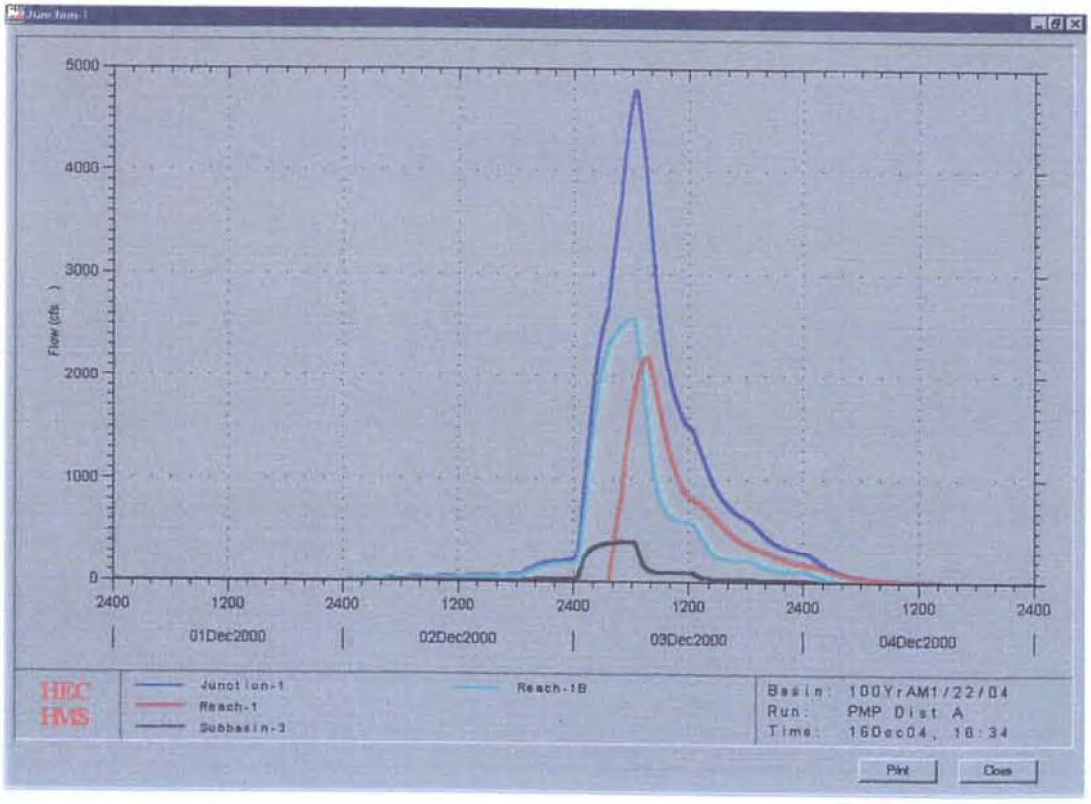

Flow (cfs)
3000
2500
2000
1500
1000
500
0
2400
1200
01Dec2000
02Dec2000
03Dec2000
04Dec2000
HEC
HMS
Reach-1B
Junction-1A
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:32
Print
Close

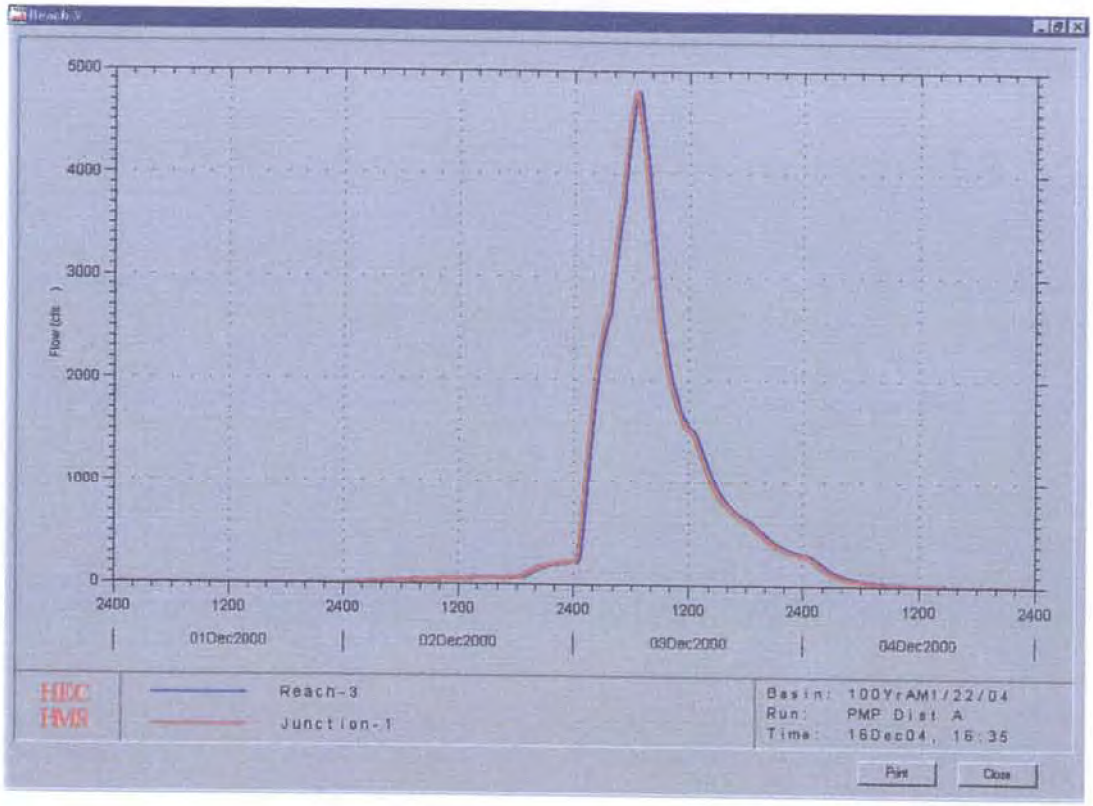

01Dec2000
02Dec2000
03Dec2000
04Dec2000
Precip (inches)
0.0
0.05
Flow (cfs)
500
400
300
200
100
0
HEC
HMS
Total Precipitation
Loss
Subbasin-3
Baseflow
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:32
Print
Close


01Dec2000
02Dec2000
03Dec2000
04Dec2000
Precip (inches)
Flow (cfs)
Total Precipitation
Loss
Subbasin-2
Baseflow
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:33
Print
Close


Storage (acft)
Elevation (feet)
Flow (cfs)
01Dec2000
02Dec2000
03Dec2000
04Dec2000
Storage
Elevation
Inflow
playa
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 18Dec04, 16:33
Print
Close


Reach-1
2500
2000
1500
1000
500
0
Flow (cfs)
2400
1200
2400
1200
2400
1200
2400
1200
2400
01Dec2000
02Dec2000
03Dec2000
04Dec2000
HEC
HMS
Reach-1
playa
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:34
Print
Close


5000
4000
3000
2000
1000
0
Flow (cfs)
2400
1200
2400
1200
2400
1200
2400
1200
2400
01Dec2000
02Dec2000
03Dec2000
04Dec2000
HEC
HMS
Junction-1
Reach-1
Subbasin-3
Reach-1B
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:34
Print
Close


5000
4000
3000
2000
1000
0
Flow (cfs)
2400
1200
01Dec2000
02Dec2000
03Dec2000
04Dec2000
HEC HMS
Reach-3
Junction-1
Basin: 100YrAM1/22/04
Run: PMP Dist A
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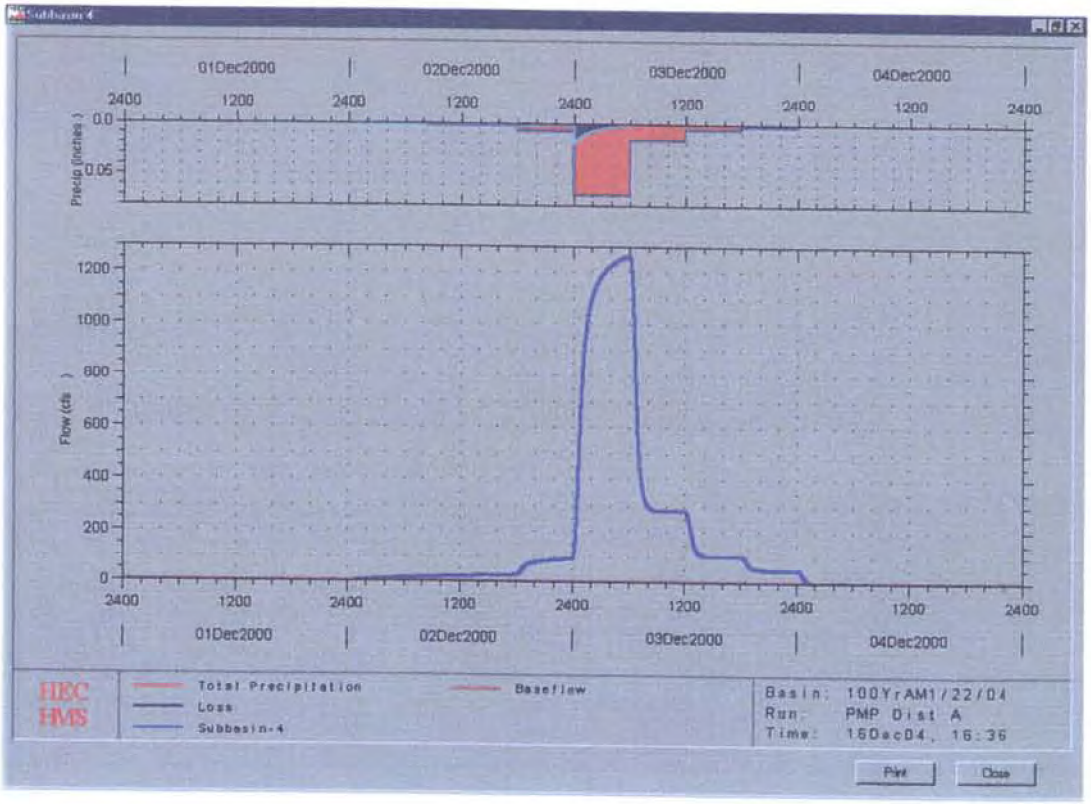
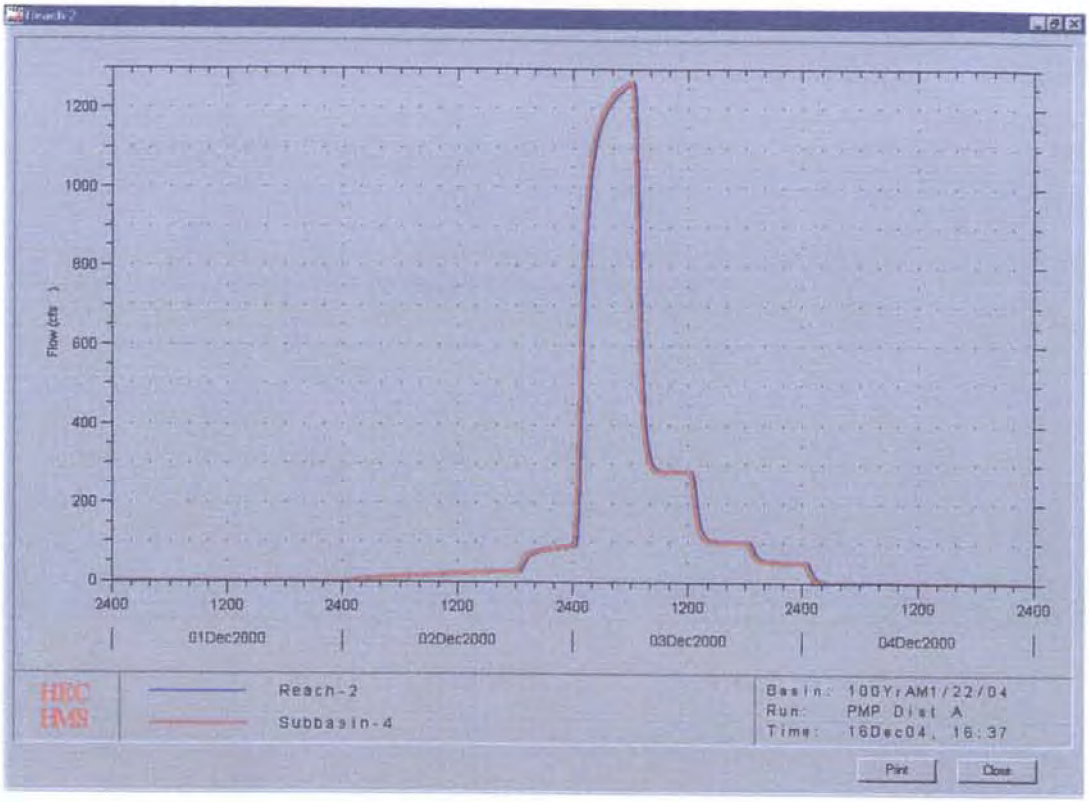
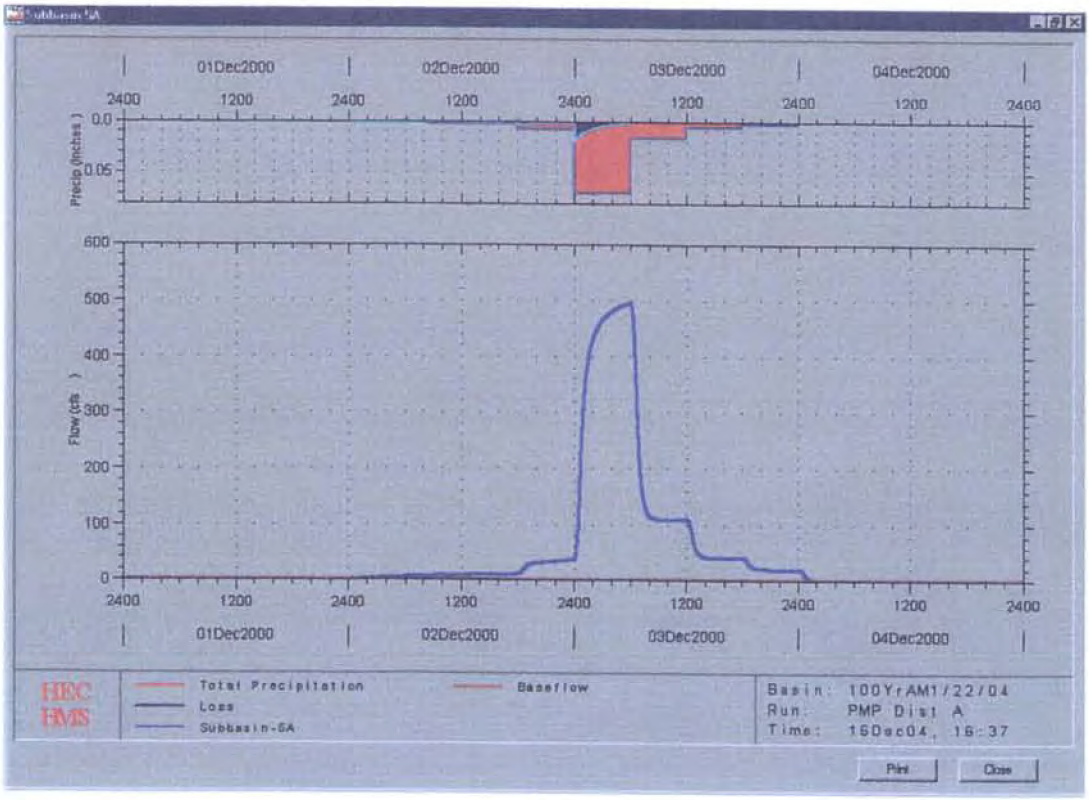
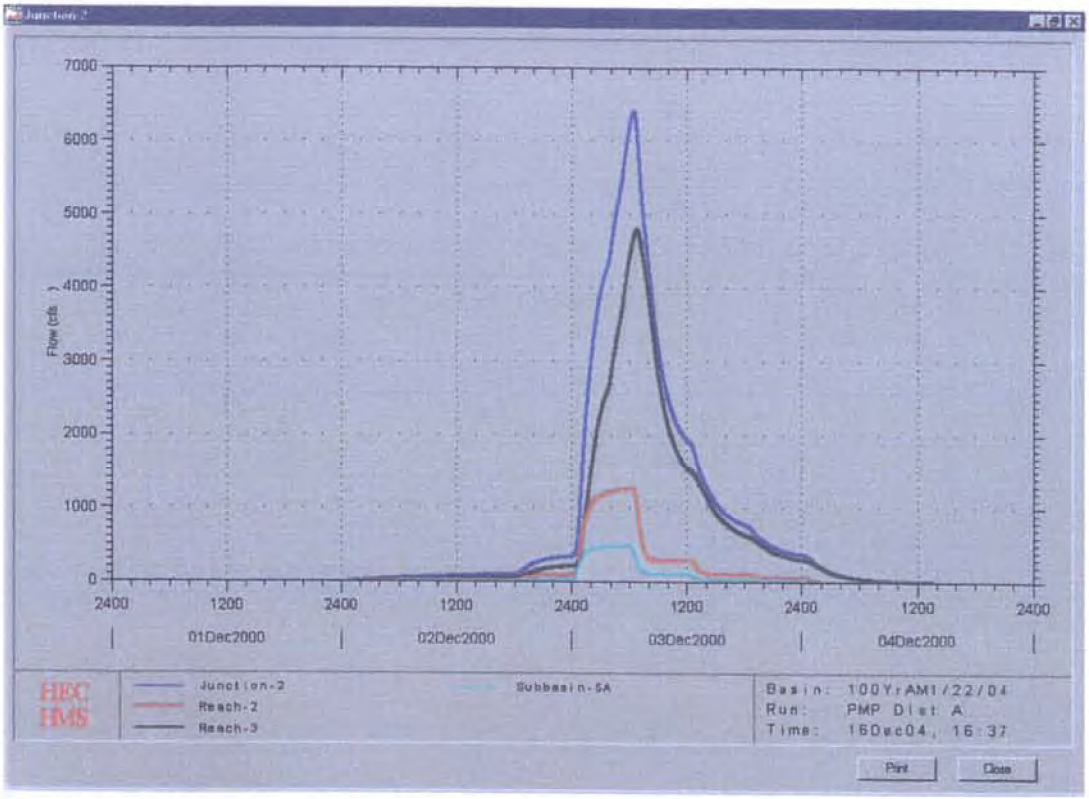
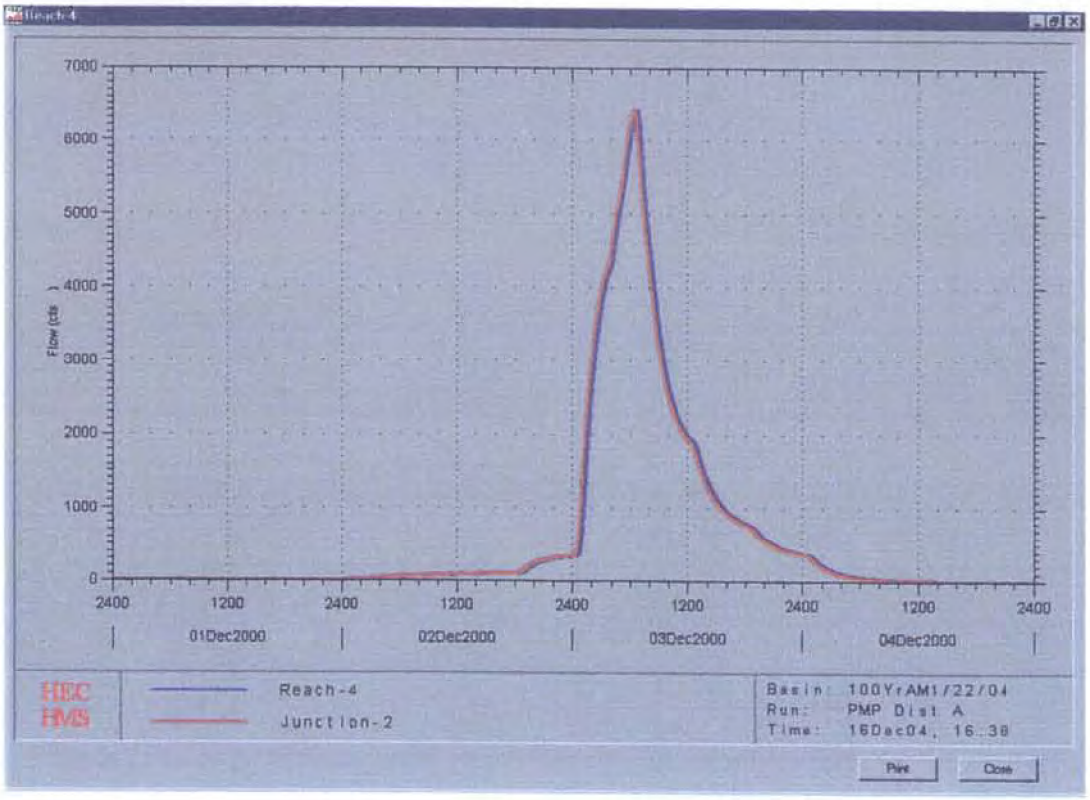
Print
Close

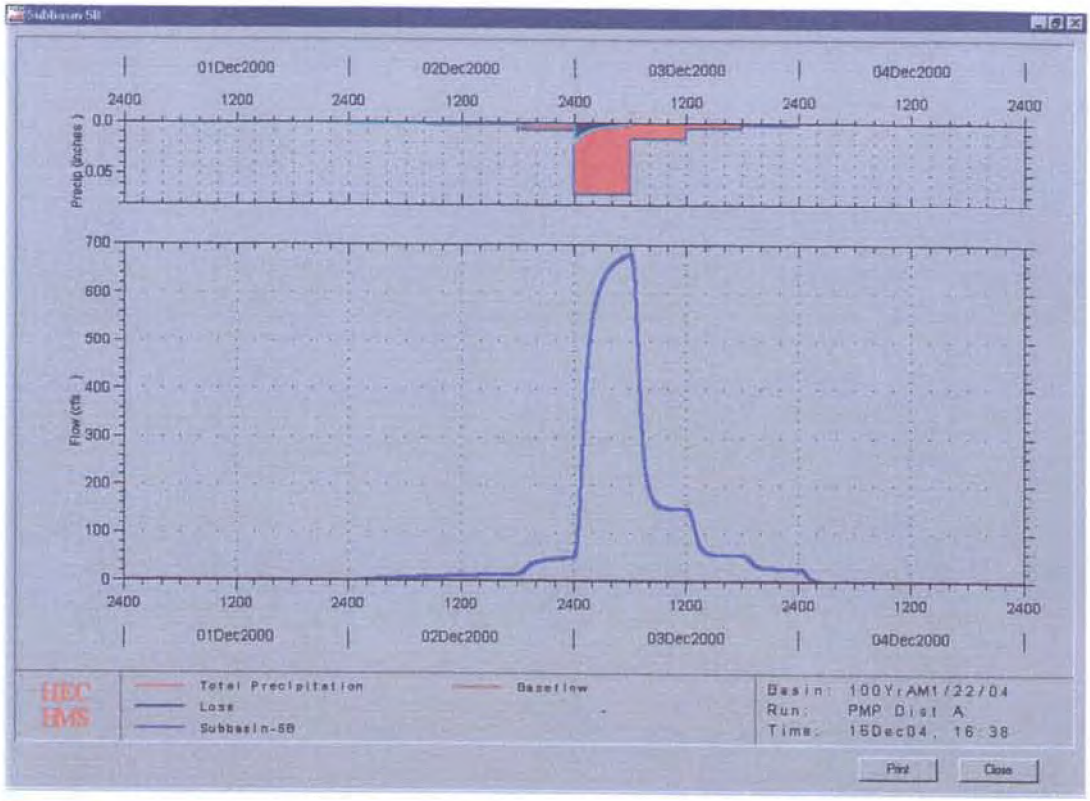

01Dec2000
02Dec2000
03Dec2000
04Dec2000
Precip (inches)
0.0
0.05
1200
1000
800
600
400
200
0
Flow (cfs)
HEC HMS
Total Precipitation
Loss
Subbasin-4
Baseflow
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:36
Print
Close

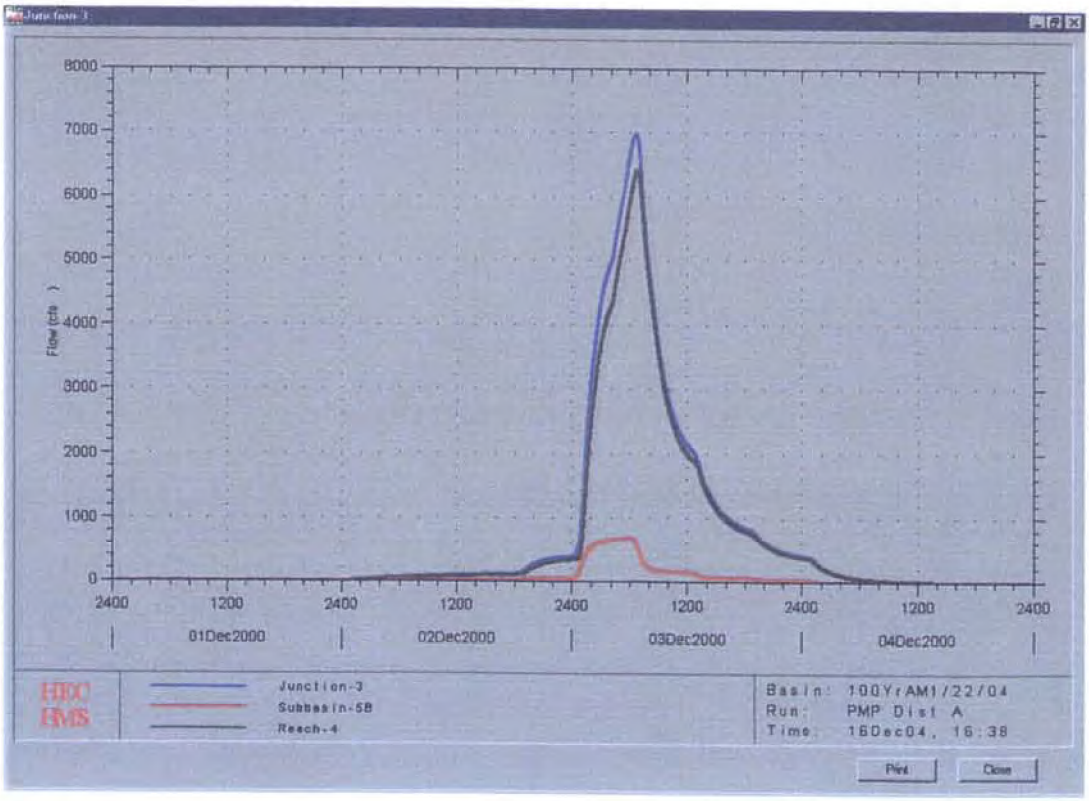

1200
1000
800
600
400
200
0
Flow (cfs)
2400
1200
01Dec2000
02Dec2000
03Dec2000
04Dec2000
HEC
HMS
Reach-2
Subbasin-4
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:37
Print
Close

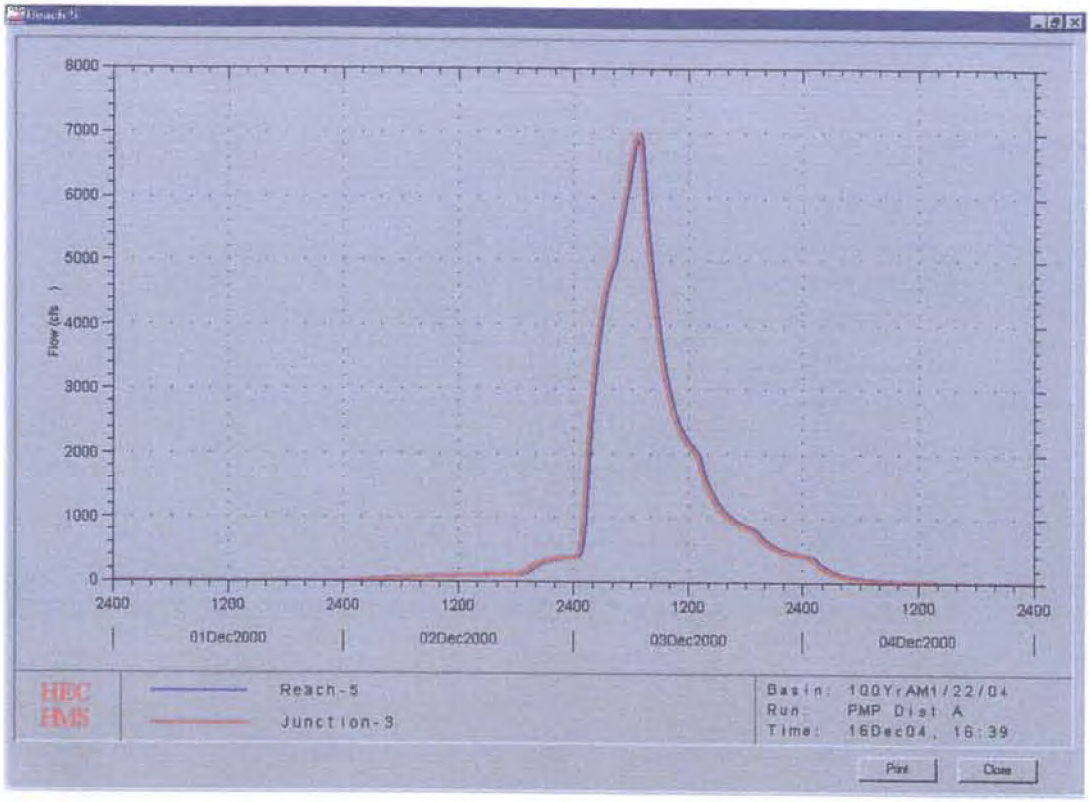

01Dec2000
02Dec2000
03Dec2000
04Dec2000
Precip (inches)
0.0
0.05
600
500
400
300
200
100
0
Flow (cfs)
HEC
HMS
Total Precipitation
Loss
Subbasin-SA
Baseflow
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:37
Print
Close


Junction-2
7000
6000
5000
4000
3000
2000
1000
0
Flow (cfs)
2400
1200
2400
1200
2400
1200
2400
1200
2400
01Dec2000
02Dec2000
03Dec2000
04Dec2000
HEC HMS
Junction-2
Reach-2
Reach-3
Subbasin-5A
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:37
Print
Close


Reach-4
7000
6000
5000
4000
3000
2000
1000
0
Flow (cfs)
2400
1200
2400
1200
2400
1200
2400
1200
2400
01Dec2000
02Dec2000
03Dec2000
04Dec2000
HEC HMS
Reach-4
Junction-2
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:38
Print
Close


01Dec2000
02Dec2000
03Dec2000
04Dec2000
2400
1200
Precip (inches)
0.0
0.05
Flow (cfs)
700
600
500
400
300
200
100
0
HEC
HMS
Total Precipitation
Loss
Subbasin-5B
Baseflow
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 15Dec04, 16:38
Print
Close


8000
7000
6000
5000
4000
3000
2000
1000
0
Flow (cfs)
2400
1200
01Dec2000
02Dec2000
03Dec2000
04Dec2000
HEC
HMS
Junction-3
Subbasin-5B
Reach-4
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 15Dec04, 16:38
Print
Close


8000
7000
6000
5000
4000
3000
2000
1000
0
Flow (cfs)
2400
1200
01Dec2000
02Dec2000
03Dec2000
04Dec2000
HEC HMS
Reach-5
Junction-3
Basin: 100YrAM1/22/04
Run: PMP Dist A
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Print
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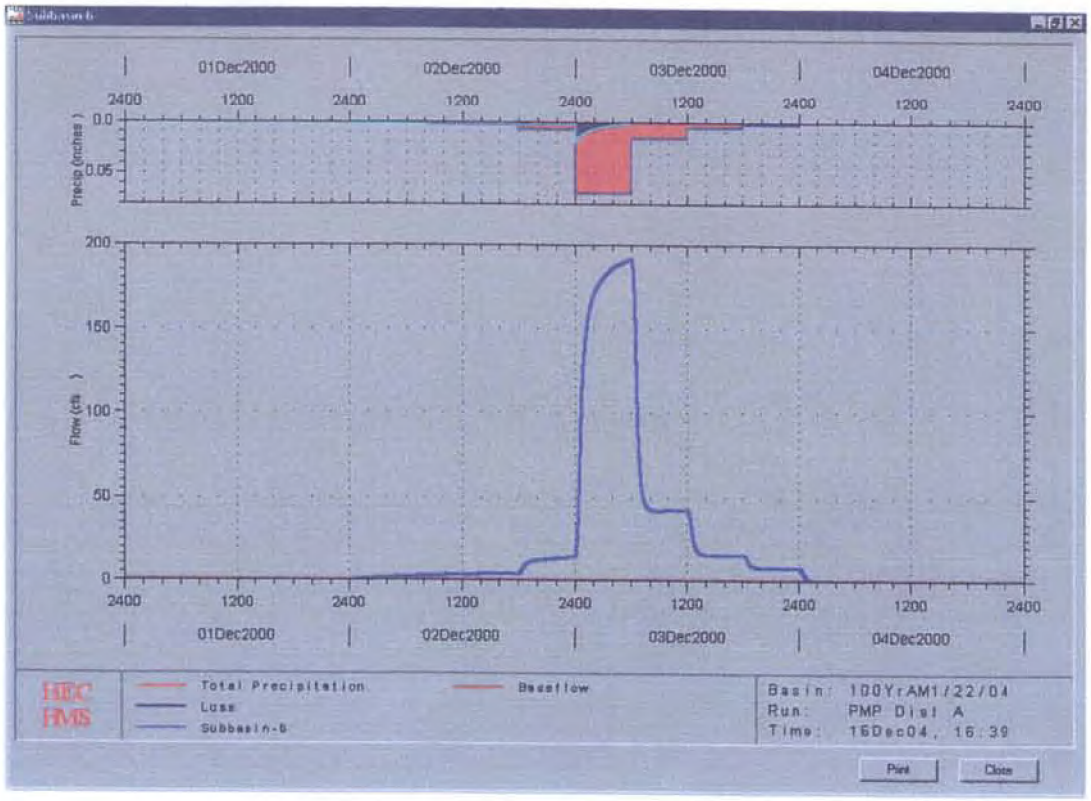
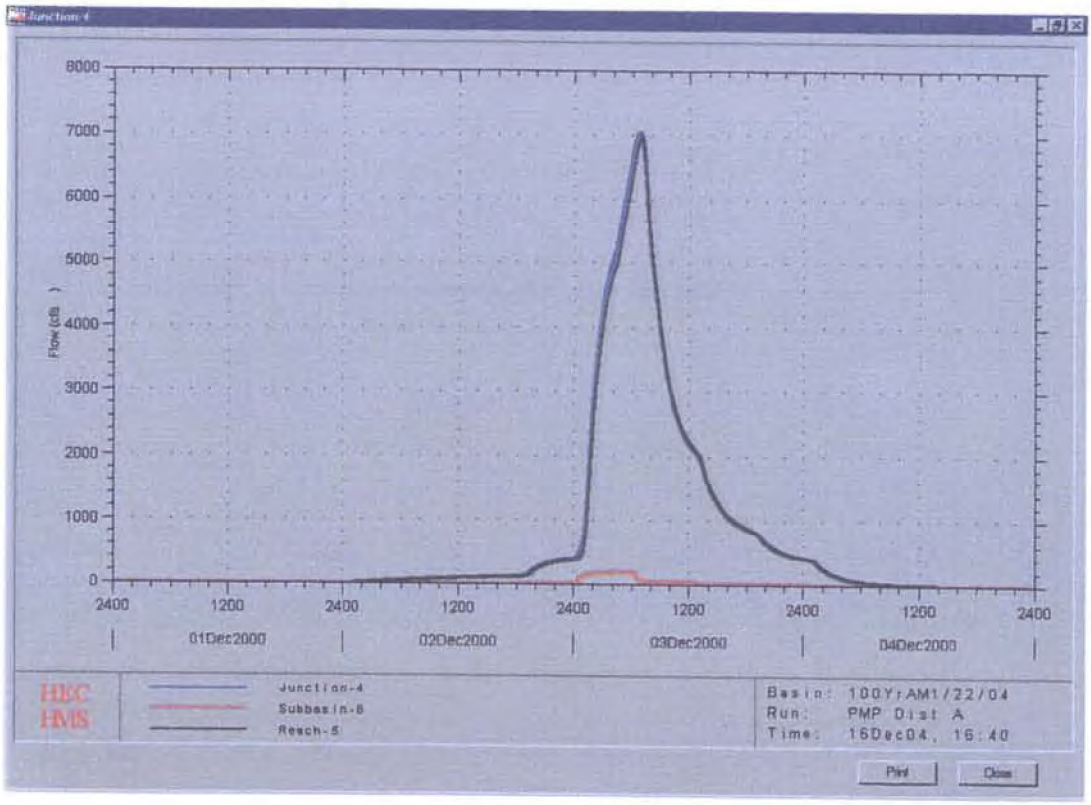
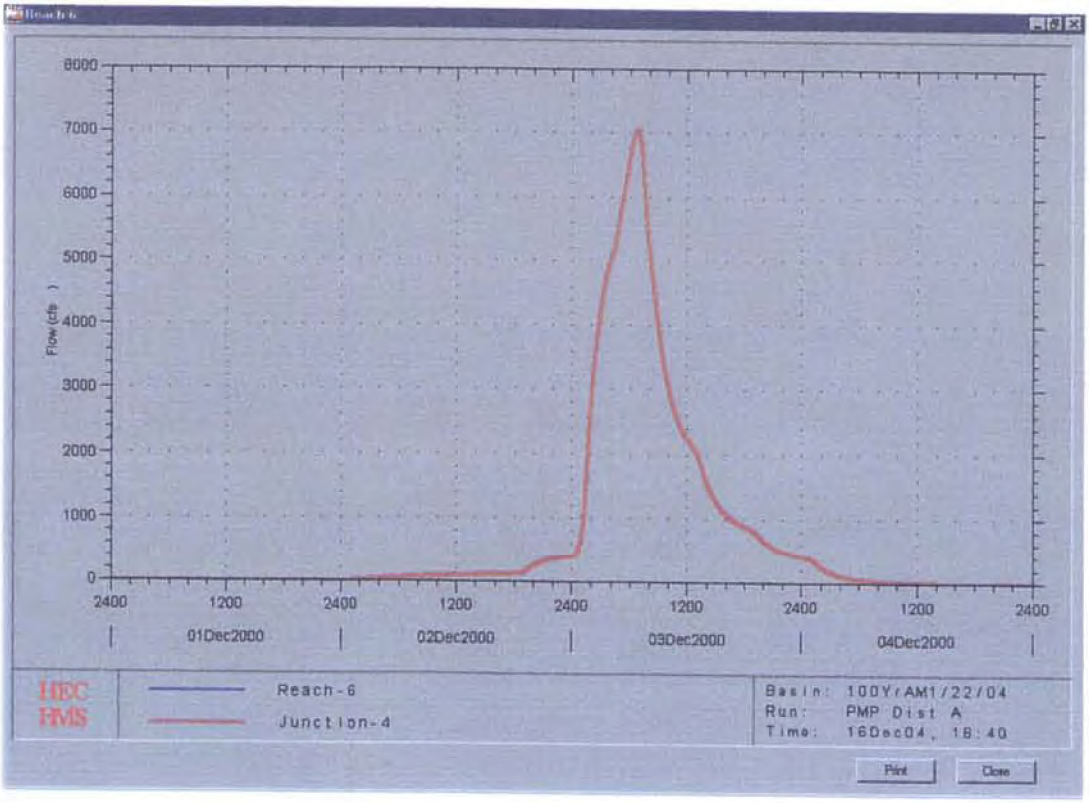
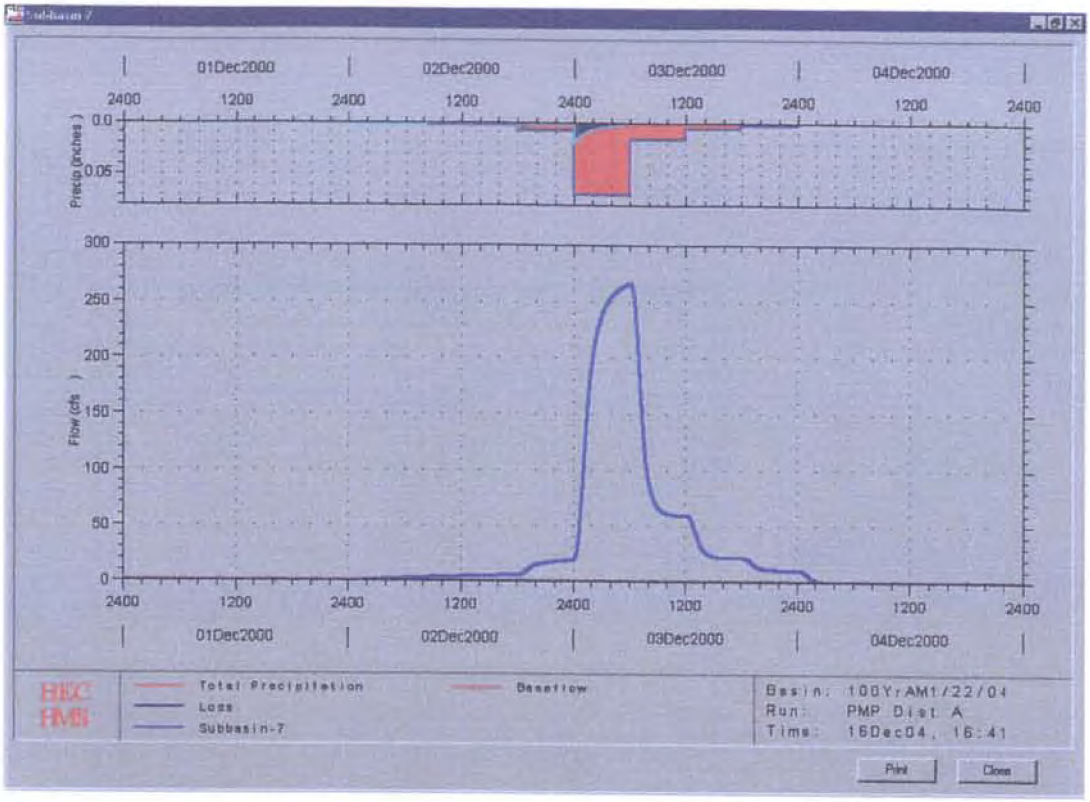
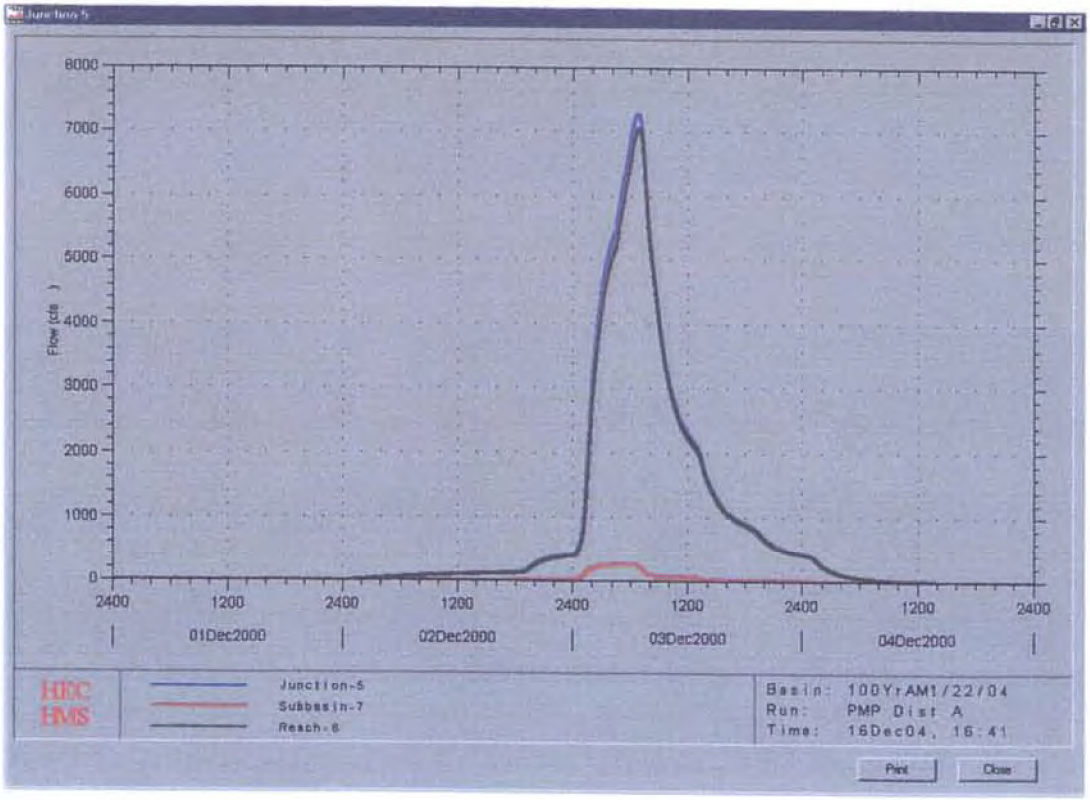

01Dec2000
02Dec2000
03Dec2000
04Dec2000
Precip (inches)
0.0
0.05
200
150
100
50
0
Flow (cfs)
HEC HMS
Total Precipitation
Loss
Subbasin-6
Baseflow
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:39
Print
Close


8000
7000
6000
5000
4000
3000
2000
1000
0
Flow (cfs)
2400
1200
01Dec2000
02Dec2000
03Dec2000
04Dec2000
HEC
HMS
Junction-4
Subbasin-8
Reach-5
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:40
Print
Close


8000
7000
6000
5000
4000
3000
2000
1000
0
Flow (cfs)
2400
1200
01Dec2000
02Dec2000
03Dec2000
04Dec2000
HEC
HMS
Reach-6
Junction-4
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 18:40
Print
Close


01Dec2000
02Dec2000
03Dec2000
04Dec2000
2400
1200
Precip (inches)
0.0
0.05
Flow (cfs)
300
250
200
150
100
50
0
HEC HMS
Total Precipitation
Loss
Subbasin-7
Baseflow
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:41
Print
Close


8000
7000
6000
5000
4000
3000
2000
1000
0
Flow (cfs)
2400
1200
01Dec2000
02Dec2000
03Dec2000
04Dec2000
HEC HMS
Junction-5
Subbasin-7
Reach-6
Basin: 100YrAM1/22/04
Run: PMP Dist A
Time: 16Dec04, 16:41
Print
Close