PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
DISTRICT 6.0

Bridge/Dam Repair
3rd Street Bridge/Dam over Broomalls Run
Borough of Media
Delaware County, Pennsylvania

State Project No. 0-47147-04-3RD–0630-231

Hydrologic and Hydraulic Report

November 2001

Prepared for:

Borough of Media, Pennsylvania
and
Pennsylvania Department of Transportation

Prepared by:

Schnabel Engineering Associates, Inc.
510 East Gay Street
West Chester, PA 19380

Table of Contents

HYDROLOGIC AND HYDRAULIC REPORT

1. Site Data

1.1 Location

The 3rd Street Bridge/Dam embankment is approximately 29 ft high and 500 ft long, located on Broomalls Run, a tributary of Ridley Creek. The dam crest is a road/bridge known as 3rd Street, which serves as a major traffic link between Upper Providence Township and Media, Pennsylvania (see Figure 1, Appendix B).

1.2 Existing Structures

According to Pennsylvania Department of Environmental Protection PADEP criteria, the dam is classified as a Class C (small), Category 1 (high) hazard dam. The dam was reportedly constructed circa 1884 as an earth and rock fill dam for the purpose of harvesting ice from the impounded water. In 1920, the lake was acquired for recreational purposes by the Media Swimming and Rowing Club. Around 1930, stone masonry walls were constructed along the upstream and downstream edges of the dam crest by a Government WPA Project to support the bridge and road.

Around 1996, a section of the stone masonry wall at the downstream edge of the bridge crest failed due to undermining. The failure was related to concentrated stormwater runoff flowing through the openings in the bridge crest wall. The Borough of Media closed the bridge and road after the failure.

The existing structures at the site consist of a masonry box culvert and three elliptical corrugated metal pipes (CMP). The spillway capacity of the bridge/dam has been previously reported as seriously inadequate and in an unsafe, nonemergency condition. The (PADEP) Division of Dam Safety has requested upgrades to the bridge/dam so that it will meet current requirements for spillway capacity, as described below.

1.3 High Water Marks

According to the US Army Corps of Engineers Phase I Report (March 1980), the maximum known water level at the dam was about EL 190.8, or about 4.8 ft above normal pool and 1.1 ft below top of roadway. During this flood, the spillway was reportedly blocked by tree limbs. No other information relative to high water marks is available. There are no reports of the dam ever having been overtopped.

1.4 Stream and Fish Habitat

The lake provides habitat for various warm water fish such as bass, catfish, perch, carp, and bluegill. The lake also provides habitat for snapping turtles and bullfrogs. The Country Club reportedly hosts an annual fishing contest each year.

Downstream of the dam, fishing is permitted within the county park. Broomalls Run is not a stocked stream, but it drains into Ridley Creek which is a stocked stream. No surveys were performed on Broomalls Run, but based on information from the PA Fish & Boat Commission and the DEP, species that may live in the stream include Black-nosed Dace, Red-breast sunfish, White Suckers, Creek Chubs, Pistilated Dace and Shiners. Additional information regarding habitat for Ridley Creek (of which Broomalls Run is a tributary) can be found in the Environmental Assessment.

1.5 Stream Bed and Bank Stability

Previous borings at the site indicate that bedrock is shallow at the site, generally about EL 160 along the centerline of the dam. A shallow scour hole immediately below the existing spillway appears to have stabilized at about one foot below the surrounding streambed, likely indicating top of rock at that location. The stream bed and banks within several hundred feet downstream of the dam appear stable. About 600 ft downstream of the dam, bank erosion is occurring.

1.6 Photographs

Photos of the site are included in Appendix A.

1.7 Factors Affecting Water Stages

Water level is controlled by the structures described in Section 1.2. The elevated timber walkway upstream of the culverts could potentially cause debris build-up and increase lake level during flood events.

1.8 Potential for Debris Build-Up

See Section 1.7 above.

1.9 Site Inspections

The site has been observed several times by the hydraulic engineer. The lake level at each visit was at normal pool with about one inch of flow through the masonry culvert. The failed section of roadway has progressively worsened as roadway runoff continues to erode the downstream slope of the dam/roadway.

2. Hydrologic Analysis

2.1 Drainage Area and Runoff Parameters

The drainage area contributing to 3rd Street Bridge/Dam was computed at 0.55 square mile (see Figure 1, Appendix B). The SCS Runoff Curve Number (CN) for the watershed was calculated from the soil types and land usage in the watershed. The drainage basin consists of B and C hydrologic soil types, and land usage consists primarily of residential development with ¼ and ⅛ acre lots. Following the procedures outlined in the SCS Urban Hydrology for Small Watersheds (TR 55), a CN of 79 was computed. The CN computations are included in Appendix B.

The Soil Conservation Service (SCS) dimensionless unit hydrograph method, based on physical site characteristics, was used for the hydrologic analysis. The SCS method consists of a single parameter T_L, equal to the lag time (hours) between the center of mass of rainfall excess and the peak of the unit hydrograph. Lag time was computed as $T_L = 0.6$ Tc, where Tc is the sum of travel times of overland flow, shallow concentrated flow and channel flow from the most remote point of the basin. A summary of the computations is attached.

2.2 Flood Records

No flood records for the site (other than noted in Section 1.3) were located. It is not known whether the dam has ever been overtopped.

2.3 Design Flood Discharge

According to Pennsylvania Department of Environmental Protection (PADEP) criteria, the dam is classified as a Class C (small), Category 1 (high) hazard dam. Accordingly, the 3rd Street bridge/dam is required by the PADEP Division of Dam Safety to safely pass the ½ Probable Maximum Flood (½ PMF). The present spillway culverts have been estimated to safely pass between a 10-year and 25-year flood event, or about 13% of the PMF. The Phase I Inspection Report described the spillway capacity as "seriously inadequate" and in an "unsafe, nonemergency condition".

2.4 Flood-Frequency Analysis

Rainfall values for the PMF were obtained from Hydrometeorological Report Number 51 (HMR51). Probable Maximum Precipitation (PMP) values of 27.0 and 34.3 inches were utilized for the six and 24-hour precipitation depths, respectively. Because the watershed area is less than ten square miles, the PMP was considered to be uniformly distributed over the basin, with temporal distribution based on the standard distribution of the PM card in HEC-1. Using these PMP values, the PMF, and subsequently the ½ PMF (design flood), was computed using the Army COE HEC-1 computer program.

For estimating floods with return periods up to 100 years, PADOT projects typically are based on the Intensity-Duration-Frequency Charts contained in DM 2. Studies by Aron and Wall (1987) indicate that the average time distribution of 24-hr storms in Pennsylvania are well represented by the SCS Type II distribution,[1] with the SCS Type II distribution being slightly more conservative. Therefore, the SCS Type II distribution was used in conjunction with a 24-hr rainfall total as noted in Table 2.1 (PDT-IDF Region 5). Rainfall-runoff conversion and hydrograph routing were performed using the Army COE HEC-1 computer program.

Table 2.1
24-Hour Rainfall

Storm Return Period	24-Hour Rainfall (in.)
2 Yr	3.4
5 Yr	4.2
10 Yr	5.1
25 Yr	6.2
50 Yr	7.2
100 Yr	8.4
½ PMF	17.1 (approx)

[1] Aron, G., Wall, D.J., et al., "Regional Rainfall Intensity-Duration-Frequency Curves for Pennsylvania", Water Resources Bulletin, American Water Resources Association, June 1987.

3. Hydraulic Analysis

3.1 Existing Spillway

The existing structures at the site consist of a masonry box culvert and three elliptical CMPs. The masonry culvert has its invert at EL 185.9, which controls the lake at approximately EL 186. The culvert has a mouth opening of 9.5 ft wide by 5.2 ft high, which tapers to 7.75 ft wide by 5.5 ft high at about 6 ft from the culvert face. The floor of the culvert drops an estimated 0.8 ft over the tapered section, and about 0.2 ft over the remaining 28 ft culvert length, for a total drop of about one foot over its length. The three CMPs measure 43 inches wide by 27 inches high, with flow through the pipes controlled by a concrete weir/apron at about EL 186.4.

The capacity of the existing culverts was computed using the HY-8 computer program. The combined rating curve was input into HEC-1, and the hydrographs for each storm noted in the previous section were routed through the lake and culverts. As can be observed in Figure 3.1, the bridge/dam is computed to overtop for floods in excess of a 10-year event.

3.2 Proposed Spillway and Culvert

As described above, the existing spillway is seriously inadequate. To prevent dam failure for floods up to the ½ PMF, these culverts must be replaced with a spillway of much greater capacity. We attempted to maintain the existing hydraulic regime (flows and water elevations) upstream and downstream of the dam, in as far as is practicable. This was done in an attempt to avoid significant adverse alteration of flood flows and elevations for a given storm event. These two conflicting requirements are complicated by the fact that the existing culverts operate under orifice control at relatively low discharges, which is difficult to match with a free overflow (high capacity) structure. Overtopping protection as a means of expanding spillway capacity was not considered feasible, given the need to provide fencing along the upstream edge of roadway, and the need to rehabilitate the existing structures.

As noted above, we attempted to approximate the existing discharges for the more frequent events. Under existing circumstances, floods of 25-year return period and greater were assumed to instigate overtopping failure of the dam and resulting uncontrolled release of storage. Therefore, no attempt was made to imitate existing computed discharges beyond this magnitude. The proposed spillway is a concrete box-drop inlet structure, similar to those utilized by the Natural Resources Conservation Service (NRCS). The drop-box inlet will have a two-stage weir, at EL 185.9 (normal pool) and EL 191.1. In addition, it was necessary to raise the top of dam to EL 195.5 by means of a parapet to prevent overtopping during the design flood.

The drop-box inlet will discharge to a 16 ft x 6 ft precast concrete box culvert, and outlet to a straight drop stilling basin. The culvert was designed using the FHWA HY-8 computer program. The combined headwater rating curve for the box-drop inlet and culvert system is contained in Appendix B. Pre & Post Stage-Discharge-Frequency Curves are presented in Figure 3.1. As can be noted from the figure, relatively frequent events maintain a similar discharge and stage, while less frequent events have slightly higher discharges and lower stages. It was not economically feasible to

prevent a nominal increase in flood outflows while providing safe flood passage for a ½ PMF design flood. A summary of flood routing for the ½ PMF is presented in Table 3.1.

Figure 3.1
3rd Street Dam
Stage-Discharge-Frequency Curve

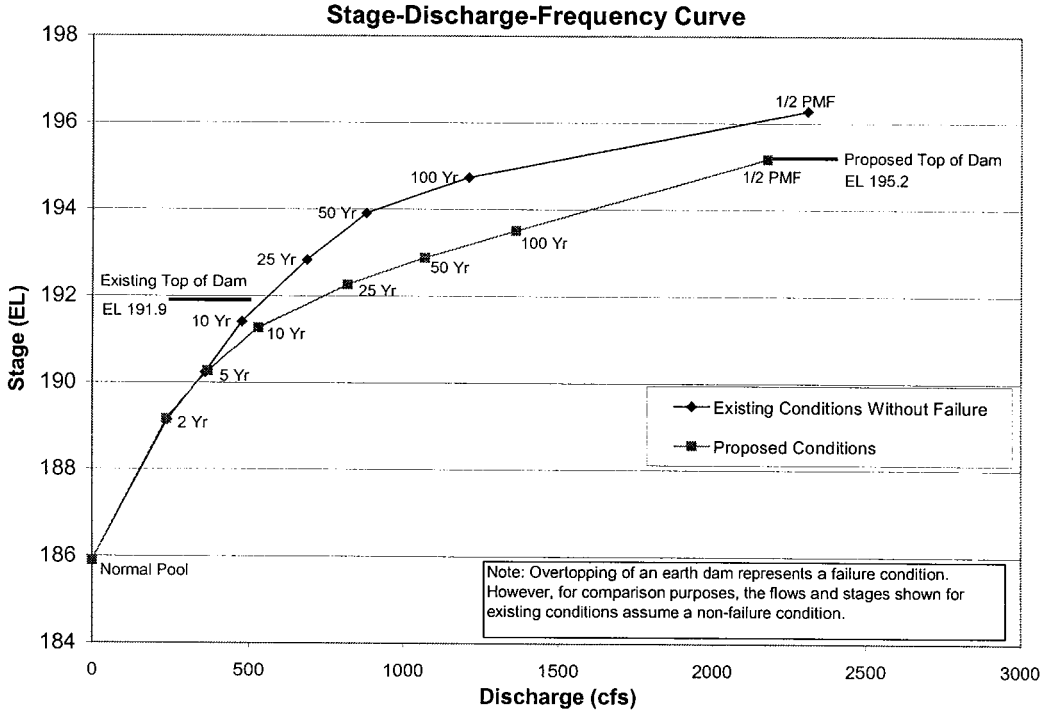


Table 3.1
Spillway Design Flood – Routing Summary

½ PMF Inflow	2400 cfs
½ PMF Outflow	2190 cfs
½ PMF Stage	EL 195.2
Proposed Top of Dam	EL 195.2

3.3 Stream Diversion Considerations

Although the pond cannot be completely drained for construction, it may be temporarily lowered by several feet using an existing 10-inch cast-iron pipe situated about 2.5 to 3 ft below normal pool. Additionally, the existing spillway bridge/culverts can be used as emergency bypass for higher flood events. A cofferdam to above normal pool will need to be utilized for construction of the box-inlet drop spillway.

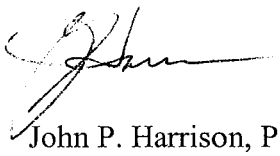
A temporary stream crossing at the downstream toe would likely be of benefit to the contractor.

3.4 Channel Changes/Protection

Because the design includes flattening of the downstream slope for stability, approximately 100 LF of Broomalls Run will be filled. This is discussed in greater detail in the Categorical Exclusion Evaluation. The short length of new channel between the proposed stilling basin and the stream will match the cross section of the existing stream, and will be stabilized with riprap.

Flow from the box culvert will discharge into a straight drop stilling basin, designed in accordance with FHWA HEC 14. Although the discharge capacity of the spillway and culvert system is approximately 2200 cfs (½ PMF), a stilling basin designed for this flow was inordinately large and unnecessary. Rock is located at shallow depth near the toe of the dam and discharge for the ½ PMF design storm exceeds the 50-year flood peak for less than one hour. Therefore, the stilling basin was designed for a discharge of 1070 cfs (50-year flood event). We anticipate that construction of the stilling basin will require some rock excavation. For floods in excess of the 50-year event, nominal scour downstream of the basin may occur. However, as can be observed at the site, the existing 10 ft drop into the streambed has resulted in little scour due to rock at shallow elevation.

Water Surface Profiles for the stream were computed using the COE HEC-RAS computer program, and the profiles served as a basis for the design of the stilling basin. The profiles are presented in Appendix B.



John P. Harrison, P.E.
Associate
Schnabel Engineering Associates, Inc.

JPH:DBC:hcf

Appendix A

Photos

Photo 1

Broomalls Lake and upstream side of bridge/dam. View is looking south.

Photo 2

Broomalls Run. View is downstream, SW.

Photo 3

Third Street Dam Spillway. View is NNE.

Photo 4

Stormwater outlet pipe. View is east.

Photo 5

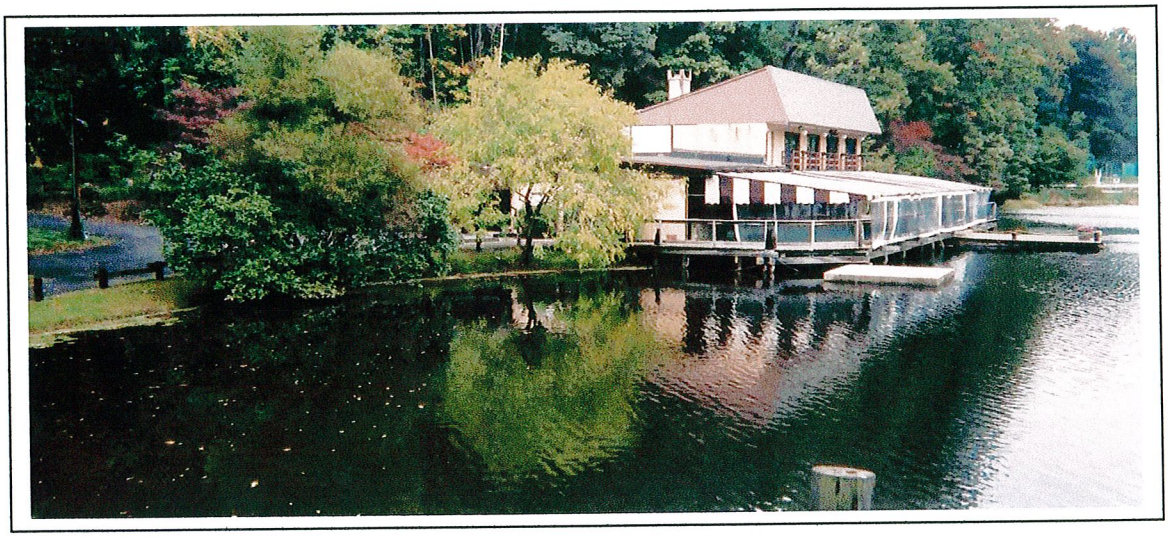
Roadway looking east.

Photo 6

Roadway looking west.

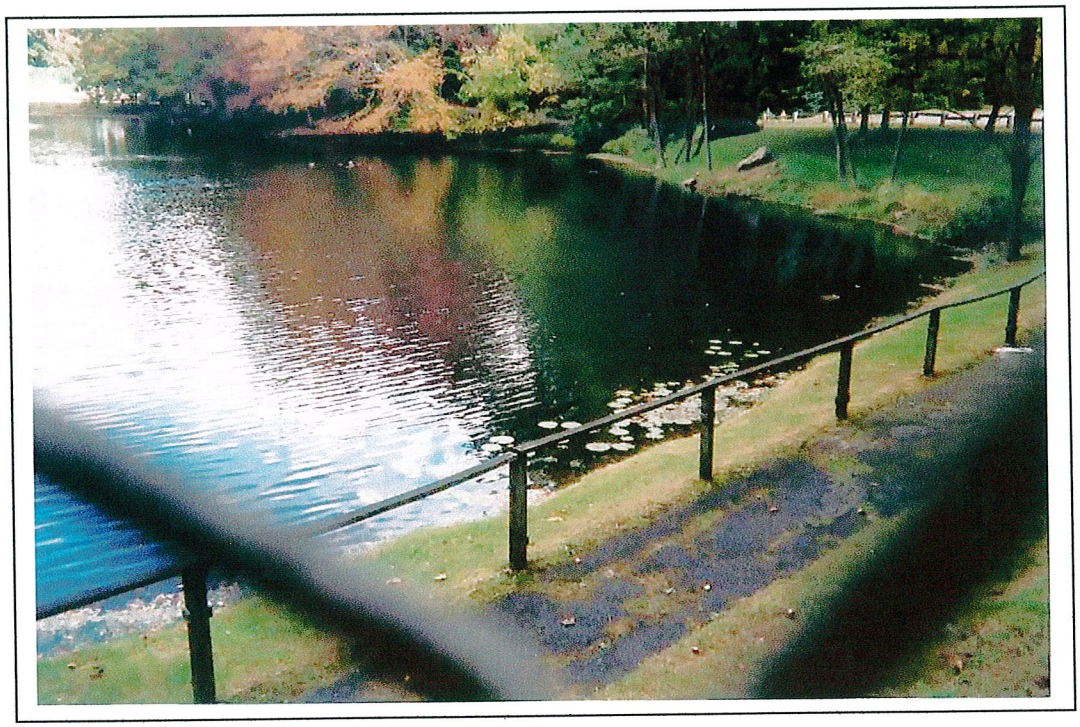
Schnabel Engineering

Photo 7



Broomalls Lake. View is NNW.

Photo 8



Broomalls Lake. View is NNE.

Schnabel Engineering

Photo 9

Upstream walkway along edge of lake and above culvert level.

Photo 10

Upstream walkway.

APPENDIX B

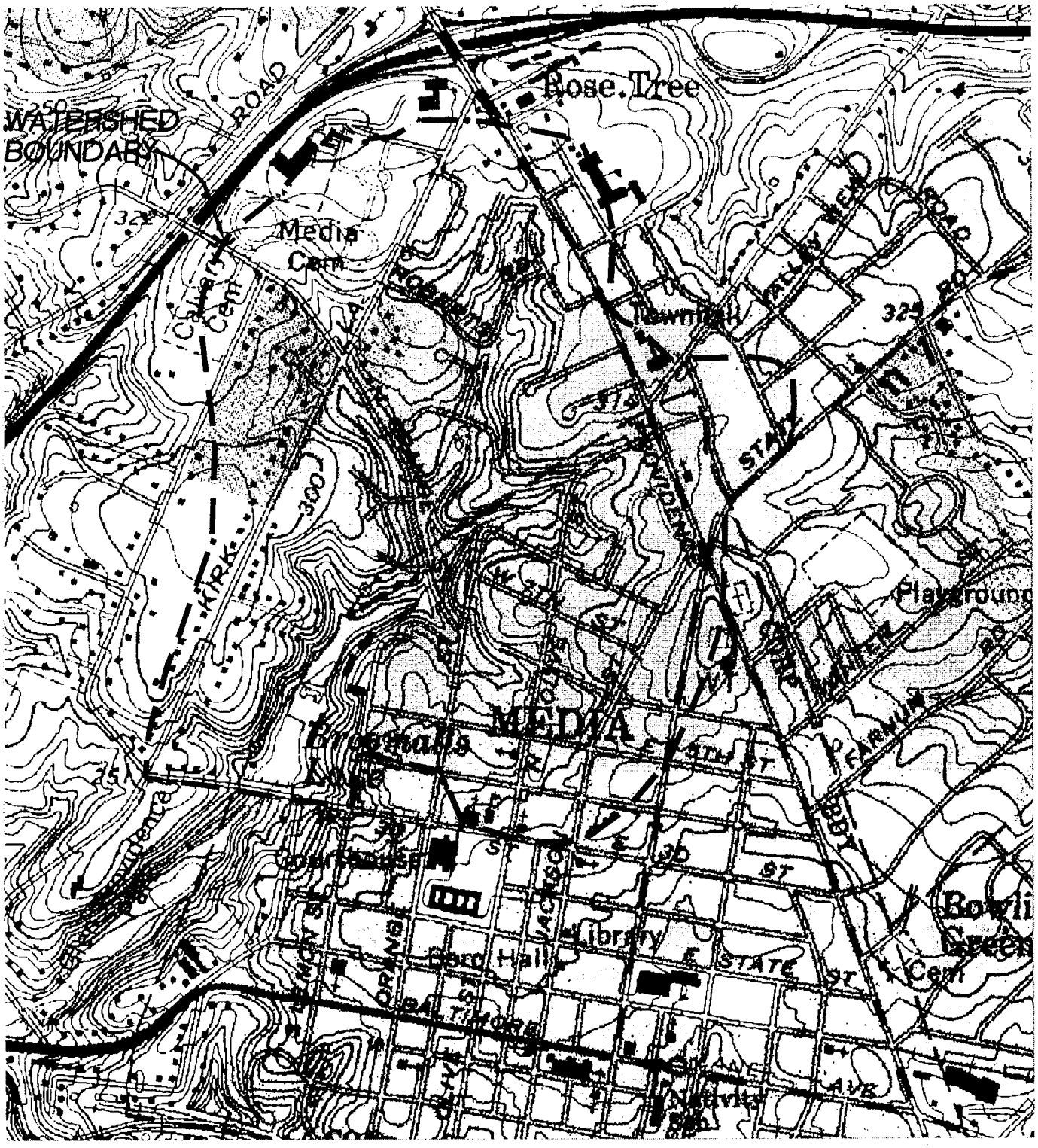
Hydrologic & Hydraulic Calculations

Contents

FIGURE 1

3RD STREET DAM BRIDGE
MEDIA, PENNSYLVANIA
00151134

LOCATION MAP



GRAPHIC SCALE

0 500' 1000'

1 inch = 1000 ft.

LEGEND

WATERSHED BOUNDARY

N

Schnabel Engineering

Reference: USGS 7.5 Minute Quadrangle, Media, Pennsylvania, Revised 1994

Worksheet 2: Runoff Curve Number*

Project: **3rd Street Bridge/Dam** By: JPH Date: 3/16/2001
Location: **Media Borough, Delaware County, PA**
Subbasin: **Subbasin #1**
Dev. Condition: **Present**

Soil Name and Hydrologic Group	Cover Description (Cover type, treatment, and hydrologic description; % impervious; connected or connected, etc)	CN* Table 2-2	CN* Fig. 2-3	CN* Fig. 2-4	Area** Percent	Product CN*Area
Glenelg & Manor (B)	Residential 1/4 acre lots	75			30	2250
Glenelg & Manor (B)	Residential 1/8 acre lots	85			24	2040
Glenelg & Manor (B)	Open Space (Cemetary)	61			5	305
Glenelg & Manor (B)	Woods, good cond	55			6	330
Glenville (C)	Residential 1/4 acre lots	83			18	1494
Glenville (C)	Residential 1/8 acre lots	90			14	1260
Wehadkee (D)	Open Land, Scrub, good cond	73			2	146
Water	Lake	100			1	100
		Totals:			100	7925

*Use only one CN source per line.
**Indicate units (acres, square miles, or %)

Composite CN= 79

Worksheet 3: Time of Concentration (Tc)*

Project:	**3rd Street Bridge/Dam**	By:	JPH	Date:	3/16/2001
Location:	**Media Borough, Delaware County, PA**				
Subbasin:	**Total**				
Dev. Condition:	**Present**				

Note: Attach map indicating flow segments

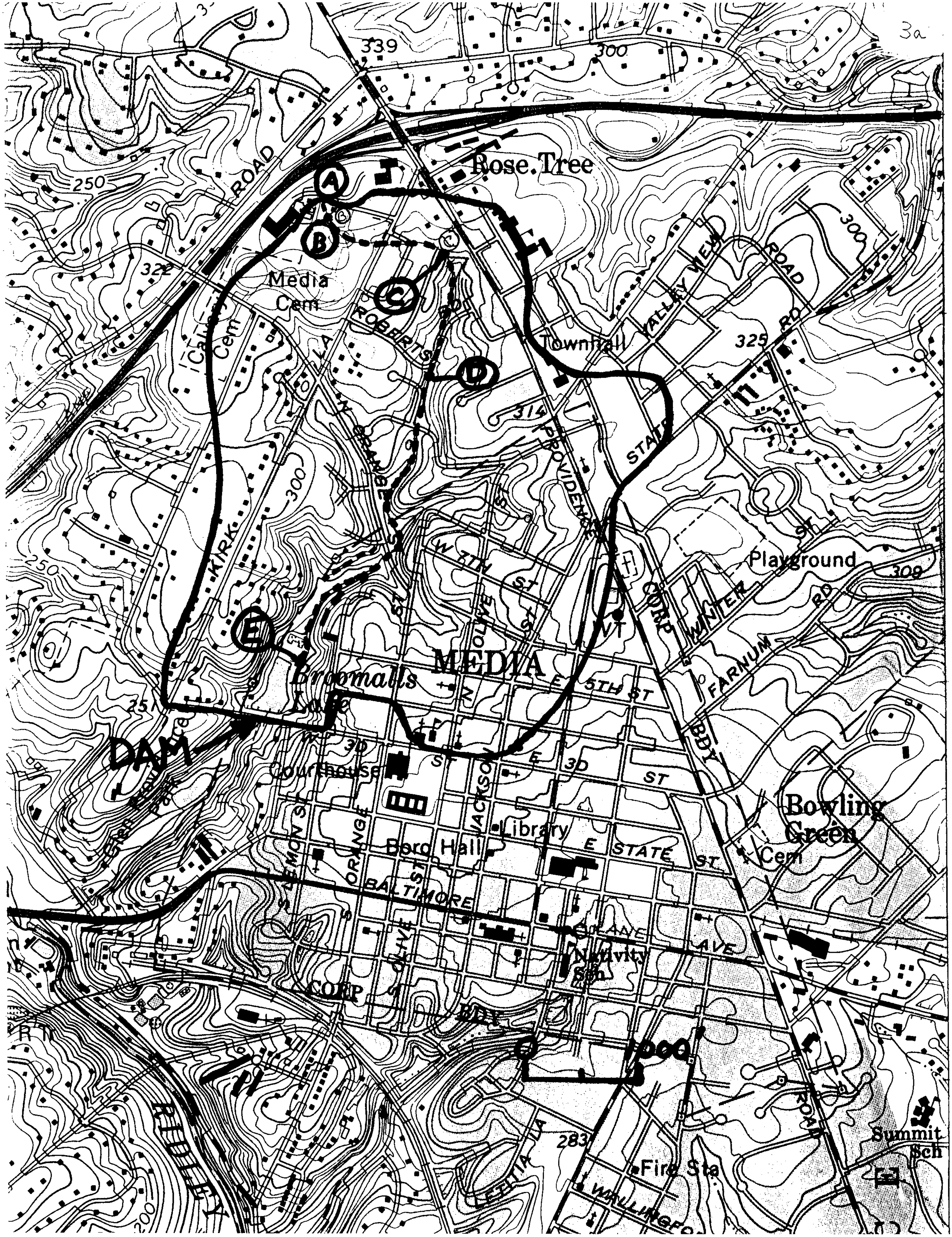
Sheet Flow		Segment	A-B
1	Surface Description (Table 3-1)		Grass
2	Manning's n (Table 3-1)		0.24
3	Flow Length L (L<= 300 ft)	ft	150
4	Two Yr Rainfall, P2	in	3.4
5	Land Slope, s	ft/ft	0.02
6	Tt=.007(nL)^.8/(P2^0.5*s^0.4)	hr	0.32

Shallow Concentrated Flow		Segment	B-C
7	Surface Description (paved/unpaved)		unpaved
8	Flow Length L	ft	1100
9	Watercourse Slope, s	ft/ft	0.035
10	Average Velocity, V (Fig 3-1)	fps	3.02
11	Tt=L/(3600V)	hr	0.10

Channel Flow		Segment	C-D	D-E
12a	Channel Bottom Width, B	ft	4	7
12b	Channel Side Slope z, where zH:1V		0.75	2
12c	Full Bank Flow Depth, d	ft	3	3
12d	Cross Sectional Flow Area, A	sf	18.75	39
13	Wetted Perimeter, P		11.50	20.42
14	Hydraulic Radius, R=A/P		1.63	1.91
15	Channel Slope, S	ft/ft	0.03	0.015
16	Manning's n		0.060	0.050
17	V=1.49*R^.667*S^.5/n	fps	5.96	5.62
18	Flow Length L		1100	3100
19	Tt=L/(3600V)	hr	0.05	0.15
20	**Total Tt or Tc (6+11+19)**	**hr**	**0.62**	
		LAG (hr)	**0.37**	

*Ref: Procedure from SCS TR-55, Urban Hydrology for Small Watersheds (June 1986)

3a



339
300
Rose Tree
ROAD
250
322
A
B
C
D
E
Media
Cem
Calvary
Cem
ROBERTS
Townhall
VALLEY VIEW
ROAD
325
RD
314
PROVIDENCE
STATE
ORANGE
KIRK
300
W 7TH ST
OLIVE
ST
Playground
309
WINTER
RD
FARNUM
CORP
BDY
MEDIA
Broomalls
Lake
E 5TH ST
251
DAM
W 3D
ST
E 3D
ST
Courthouse
Glen Providence Park
Library
Boro Hall
E STATE ST
LEMON ST
ORANGE
OLIVE ST
JACKSON
BALTIMORE
AVE
Bowling
Green
Cem
Nativity
Sch
CORP
BDY
1000
RIDLEY
ROAD
Summit
Sch
283
Fire Sta
LETITIA
WALLINGFORD
200

BROOMALL.PRN

1

CURRENT DATE: 11-13-2001
CURRENT TIME: 08:08:06

FILE DATE: 06-05-1998
FILE NAME: BROOMALL

****
********** FHWA CULVERT ANALYSIS **********
********** HY-8, VERSION 4.0 **********
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	185.90	184.90	34.01	1 RCB	7.75	5.20	.040	IMPR SLT REC
2	186.00	180.00	35.51	3 CMPA	3.58	2.25	.028	CONVENTIONAL
3								
4								
5								
6								

****

SUMMARY OF CULVERT FLOWS (CFS) FILE: BROOMALL DATE: 06-05-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
185.90	0	0	0	0	0	0	0	0	0
187.83	90	59	31	0	0	0	0	0	4
188.66	180	100	80	0	0	0	0	0	3
189.35	270	140	130	0	0	0	0	0	3
190.21	360	195	165	0	0	0	0	0	3
191.14	450	261	189	0	0	0	0	0	2
192.02	540	329	210	0	0	0	0	0	2
192.55	630	423	221	0	0	0	0	0	15
193.54	720	479	241	0	0	0	0	0	2
194.77	810	547	263	0	0	0	0	0	4
196.15	900	615	285	0	0	0	0	0	3
197.00	951	652	299	0	0	0	0	OVERTOPPING	

****

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: BROOMALL DATE: 06-05-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
185.90	0.00	0	0	0.00
187.83	-0.00	90	0	0.03
188.66	0.00	180	-0	-0.00
189.35	-0.00	270	0	0.04
190.21	0.00	360	-0	-0.03
191.14	0.00	450	-0	-0.05
192.02	-0.01	540	1	0.17
192.55	0.00	630	-14	-2.20
193.54	0.00	720	-0	-0.01
194.77	-0.00	810	0	0.00
196.15	0.01	900	-1	-0.07

****

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

****

2

BROOMALL.PRN

CURRENT DATE: 11-13-2001 FILE DATE: 06-05-1998
CURRENT TIME: 08:08:06 FILE NAME: BROOMALL

****

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (7.75 BY 5.2) RCB

****

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	185.90	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-4.90
59	187.84	1.68	1.94	2-M2c	1.23	1.21	6.23	1.21	0.00	-4.90
100	188.66	2.40	2.76	2-M2c	1.76	1.73	7.44	1.73	0.00	-4.90
140	189.35	3.00	3.45	2-M2c	2.23	2.16	8.32	2.16	0.00	-4.90
195	190.21	3.75	4.31	2-M2c	2.83	2.70	9.30	2.70	0.00	-4.90
261	191.14	4.55	5.24	2-M2c	3.51	3.28	10.25	3.28	0.00	-4.90
329	192.02	5.32	6.12	2-M2c	4.18	3.84	11.08	3.84	0.00	-4.90
423	192.55	6.59	6.65	6-FFn	5.20	4.53	10.49	5.20	0.00	-4.90
479	193.54	7.53	7.64	6-FFn	5.20	4.93	11.89	5.20	0.00	-4.90
547	194.76	8.80	8.86	6-FFn	5.20	5.20	13.58	5.20	0.00	-4.90
615	196.14	10.24	10.09	6-FFn	5.20	5.20	15.27	5.20	0.00	-4.90

****

El. inlet face invert 185.90 ft El. outlet invert 184.90 ft
El. inlet throat invert 185.10 ft El. inlet crest 185.90 ft

****

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	185.90
OUTLET STATION (FT)	34.00
OUTLET ELEVATION (FT)	184.90
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0294
CULVERT LENGTH ALONG SLOPE (FT)	34.01

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	7.75 FT
BARREL RISE	5.20 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.040
INLET TYPE	IMPR SLT RECT
INLET EDGE AND WALL	SQUARE EDGE TOP (26-90 DEG WINGWALL)
INLET DEPRESSION	FALL INCLUDED IN SLOPE TAPER

****

□

3

CURRENT DATE: 11-13-2001 FILE DATE: 06-05-1998
CURRENT TIME: 08:08:06 FILE NAME: BROOMALL

****

IMPROVED INLET FOR CULVERT # 1 - 1 (7.75 BY 5.2) RCB

****

DIS-CHARGE Flow (cfs)	HEAD-WATER Elev. (ft)	INLET CONTROL Depth (ft)	OUTLET CONTROL Depth (ft)	FLOW TYPE <F4>	CREST CONTROL Elev. (ft)	FACE CONTROL Elev. (ft)	THROAT CONTROL Elev. (ft)	TAILWATER Elev. (ft)
0	185.90	0.00	0.00	0-NF	185.90	185.90	185.10	180.00
59	187.84	1.68	1.94	2-M2c	187.58	187.58	186.94	180.00
100	188.66	2.40	2.76	2-M2c	188.30	188.30	187.67	180.00

140	189.35	3.00	3.45	2-M2c	188.90	188.90	188.32	180.00
195	190.21	3.75	4.31	2-M2c	189.65	189.65	189.13	180.00
261	191.14	4.55	5.24	2-M2c	190.45	190.45	190.01	180.00
329	192.02	5.32	6.12	2-M2c	191.22	191.22	190.84	180.00
423	192.55	6.59	6.65	6-FFn	192.18	192.49	191.93	180.00
479	193.54	7.53	7.64	6-FFn	192.73	193.43	192.60	180.00
547	194.76	8.80	8.86	6-FFn	193.36	194.70	193.42	180.00
615	196.14	10.24	10.09	6-FFn	193.96	196.14	194.30	180.00

***** SLOPE-TAPERED IMPROVED INLET **********

FACE WIDTH	9.50 FT
SIDE TAPER (4:1 TO 6:1) (X:1)	6.00
FALL SLOPE (2:1 TO 3:1) (X:1)	3.00
FALL	0.80 FT
MITERED FACE (Y/N)	N
FACE-CREST LENGTH IF MITERED	9.50 FT

CURRENT DATE: 11-13-2001 FILE DATE: 06-05-1998
CURRENT TIME: 08:08:06 FILE NAME: BROOMALL

PERFORMANCE CURVE FOR CULVERT # 2 - 3 (3.583333 BY 2.25) CMPA

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	186.89	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
31	187.84	1.84	1.84	1-S2n	0.42	0.77	10.01	0.42	0.00	0.00
80	188.67	2.67	2.67	5-S2n	0.69	1.32	13.57	0.69	0.00	0.00
130	189.34	3.34	3.34	5-S2n	0.91	1.71	15.37	0.93	0.00	0.00
165	190.21	4.21	4.21	5-S2n	1.05	1.91	16.34	1.08	0.00	0.00
189	191.13	5.13	5.13	5-S2n	1.15	2.03	16.86	1.19	0.00	0.00
210	192.02	6.02	6.02	5-S2n	1.23	2.12	17.26	1.28	0.00	0.00
221	192.55	6.55	6.55	5-S2n	1.28	2.18	17.48	1.33	0.00	0.00
241	193.54	7.54	7.54	5-S2n	1.36	2.25	17.82	1.43	0.00	0.00
263	194.77	8.77	8.77	5-S2n	1.47	2.25	18.16	1.53	0.00	0.00
285	196.14	10.14	10.14	5-S2n	1.57	2.25	18.47	1.65	0.00	0.00

El. inlet face invert	186.00 ft	El. outlet invert	180.00 ft
El. inlet throat invert	0.00 ft	El. inlet crest	186.89 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	186.40
OUTLET STATION (FT)	35.00
OUTLET ELEVATION (FT)	180.00
NUMBER OF BARRELS	3
SLOPE (V-FT/H-FT)	0.1714
CULVERT LENGTH ALONG SLOPE (FT)	35.51

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	PIPE ARCH
BARREL SPAN	3.58 FT
BARREL RISE	2.25 FT
BARREL MATERIAL	STEEL OR ALUMINUM
BARREL MANNING'S N	0.028
INLET TYPE	CONVENTIONAL

INLET EDGE AND WALL HEADWALL
INLET DEPRESSION YES

****

CURRENT DATE: 11-13-2001 FILE DATE: 06-05-1998
CURRENT TIME: 08:08:06 FILE NAME: BROOMALL

****

IMPROVED INLET FOR CULVERT # 2 - 3 (3.583333 BY 2.25) CMPA

****

DIS-CHARGE Flow (cfs)	HEAD-WATER Elev. (ft)	INLET CONTROL Depth (ft)	OUTLET CONTROL Depth (ft)	FLOW TYPE <F4>	CREST CONTROL Elev. (ft)	FACE CONTROL Elev. (ft)	THROAT CONTROL Elev. (ft)	TAILWATER Elev.
0	186.89	0.00	0.00	0-NF	186.89	186.00	0.00	180.00
31	187.84	1.84	1.84	1-S2n	187.84	186.98	0.00	180.00
80	188.67	2.67	2.67	5-S2n	188.67	187.96	0.00	180.00
130	189.34	3.34	3.34	5-S2n	189.34	189.11	0.00	180.00
165	190.21	4.21	4.21	5-S2n	189.76	190.21	0.00	180.00
189	191.13	5.13	5.13	5-S2n	190.04	191.13	0.00	180.00
210	192.02	6.02	6.02	5-S2n	190.26	192.02	0.00	180.00
221	192.55	6.55	6.55	5-S2n	190.38	192.55	0.00	180.00
241	193.54	7.54	7.54	5-S2n	190.58	193.54	0.00	180.00
263	194.77	8.77	8.77	5-S2n	190.80	194.77	0.00	180.00
285	196.14	10.14	10.14	5-S2n	191.03	196.14	0.00	180.00

****
****

***** FALL SUMMARY **********

MAXIMUM ALLOWABLE FALL		6.40 FT
INLET DEPRESSION		0.40 FT
FALL SLOPE	(X:1)	1.00
CREST WIDTH		4.00 FT

****

CURRENT DATE: 11-13-2001 FILE DATE: 06-05-1998
CURRENT TIME: 08:08:06 FILE NAME: BROOMALL

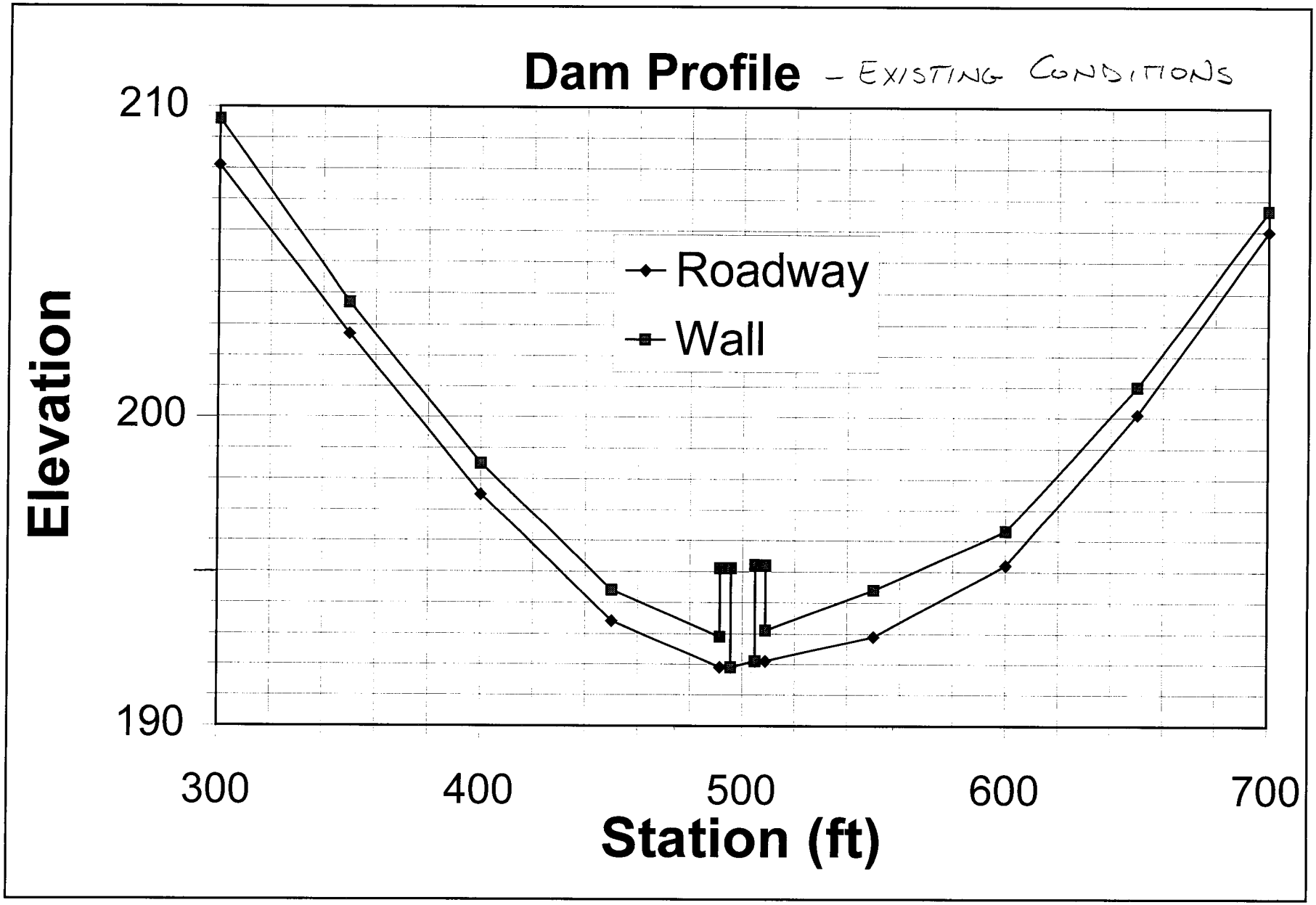
****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
180.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	34.00
CREST LENGTH (FT)	100.00
OVERTOPPING CREST ELEVATION (FT)	197.00

****


Dam Profile - EXISTING CONDITIONS
Elevation
210
200
190
Roadway
Wall
300
400
500
600
700
Station (ft)

2YR-100YR
EXISTING COND.

HEC1 S/N: 0134300894 HMVersion: 6.33 Data File: 3rdstex3.hc1

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               MAY   1991              *
*            VERSION 4.0.1E             *
*                                       *
*  RUN DATE  11/13/2001  TIME  08:13:18 *
*                                       *
*****************************************
```

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

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

```
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
:::                                      :::
:::  Full Microcomputer Implementation   :::
:::              by                      :::
:::        Haestad Methods, Inc.         :::
:::                                      :::
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

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

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

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

    1     ID   3rd St Dam PADEP No. D23-009
    2     ID   Existing Conditions: 2,5,10,25,50 & 100 YR Floods
    3     ID
    4     IT       3                     500
    5     JR    PREC    0.40    0.50    0.60    0.74    0.86     1.0
    6     IO       5       0

    7     KK  INFLOW
    8     KM  INFLOW TO RESERVOIR
    9     BA    0.55
   10     BF    -1.0    -.05     1.5
   11     PB     8.4
   12     IN       6
   13     PC  0.0000 0.00101 0.00202 0.00305 0.00408 0.00513 0.00618 0.00725 0.00832 0.00941
   14     PC  0.0105 0.01161 0.01272 0.01385 0.01498 0.01613 0.01728 0.01845 0.01962 0.02081
   15     PC  0.0220 0.02321 0.02442 0.02565 0.02688 0.02813 0.02938 0.03065 0.03192 0.03321
   16     PC  0.0345 0.03581 0.03712 0.03845 0.03978 0.04113 0.04248 0.04385 0.04522 0.04661
   17     PC  0.0480 0.04941 0.05084 0.05229 0.05376 0.05525 0.05676 0.05829 0.05984 0.06141
   18     PC  0.0630 0.06461 0.06624 0.06789 0.06956 0.07125 0.07296 0.07469 0.07644 0.07821
   19     PC  0.0800 0.08181 0.08364 0.08549 0.08736 0.08925 0.09116 0.09309 0.09504 0.09701
   20     PC  0.0990 0.10101 0.10304 0.10509 0.10716 0.10925 0.11136 0.11349 0.11564 0.11781
   21     PC  0.1200 0.12225 0.12460 0.12705 0.12960 0.13225 0.13500 0.13785 0.14080 0.14385
   22     PC  0.1470 0.15020 0.15340 0.15660 0.15980 0.16300 0.16628 0.16972 0.17332 0.17708
   23     PC  0.1810 0.18512 0.18948 0.19408 0.19892 0.20400 0.20940 0.21520 0.22140 0.22800
   24     PC  0.2350 0.24268 0.25132 0.26092 0.27148 0.28300 0.30684 0.35436 0.43079 0.56786
   25     PC  0.6630 0.68196 0.69864 0.71304 0.72516 0.73500 0.74344 0.75136 0.75876 0.76564
   26     PC  0.7720 0.77796 0.78364 0.78904 0.79416 0.79900 0.80360 0.80800 0.81220 0.81620
   27     PC  0.8200 0.82367 0.82726 0.83079 0.83424 0.83763 0.84094 0.84419 0.84736 0.85047
   28     PC  0.8535 0.85647 0.85936 0.86219 0.86494 0.86763 0.87024 0.87279 0.87526 0.87767
   29     PC  0.8800 0.88229 0.88455 0.88679 0.88900 0.89119 0.89335 0.89549 0.89760 0.89969
   30     PC  0.9018 0.90379 0.90580 0.90779 0.90975 0.91169 0.91360 0.91549 0.91735 0.91919
   31     PC  0.9210 0.92279 0.92455 0.92629 0.92800 0.92969 0.93135 0.93299 0.93460 0.93619
   32     PC  0.9377 0.93929 0.94080 0.94229 0.94375 0.94519 0.94660 0.94799 0.94935 0.95069
   33     PC  0.9520 0.95330 0.95459 0.95588 0.95716 0.95844 0.95971 0.96098 0.96224 0.96350
   34     PC  0.9647 0.96600 0.96724 0.96848 0.96971 0.97094 0.97216 0.97338 0.97459 0.97580
   35     PC  0.9770 0.97820 0.97939 0.98058 0.98176 0.98294 0.98411 0.98528 0.98644 0.98760
   36     PC  0.9887 0.98990 0.99104 0.99218 0.99331 0.99444 0.99556 0.99668 0.99779 0.99890
   37     PC  1.0000 1.00000 1.00000 1.00000 1.00000
   38     LS       0      79
   39     UD    0.37

   40     KK     DAM
   41     RS       1    ELEV   185.9
   42     SA       0     2.6     3.9     7.5
   43     SE     170   185.9     190     200
   44     SQ       0      90     180     270     360     450     540     630     720     810
   45     SE   185.9  187.83  188.66  189.35  190.21  191.14  192.02  192.55  193.54  194.77
   46     SS   185.9
   47     ST   191.9             2.8     1.5
   48     SW    9.33    9.33      66     110     150
   49     SE   191.9     193     194     195     196

   50     KK      DS  Runoff from Downstream Basin
   51     BA     .14
   52     LS             79
   53     UD     .23

   54     KK    COMB  Combine Hydrographs
   55     HC       2
   56     ZZ
```

HEC1 S/N: 0134300894 HMVersion: 6.33 Data File: 3rdstex3.hc1

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               MAY   1991              *
*            VERSION 4.0.1E             *
*                                       *
*  RUN DATE  11/13/2001  TIME  08:13:18 *
*                                       *
*****************************************
```


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


3rd St Dam PADEP No. D23-009
Existing Conditions: 2,5,10,25,50 & 100 YR Floods

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

    IT          HYDROGRAPH TIME DATA
                      NMIN          3  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1   0  STARTING DATE
                     ITIME         0000  STARTING TIME
                        NQ          500  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      2   0  ENDING DATE
                    NDTIME        0057  ENDING TIME
                     ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL    0.05 HOURS
                       TOTAL TIME BASE   24.95 HOURS

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

    JP          MULTI-PLAN OPTION
                     NPLAN          1  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                  0.40      0.50      0.60      0.74      0.86      1.00
```

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6
					0.40	0.50	0.60	0.74	0.86	1.00
HYDROGRAPH AT										
	INFLOW	0.55	1	FLOW	385.	572.	767.	1048.	1293.	1581.
				TIME	12.25	12.25	12.25	12.25	12.25	12.25
ROUTED TO										
	DAM	0.55	1	FLOW	242.	362.	476.	682.	877.	1207.
				TIME	12.55	12.55	12.55	12.50	12.50	12.45
			** PEAK STAGES IN FEET **							
			1	STAGE	189.14	190.23	191.40	192.83	193.90	194.73
				TIME	12.55	12.55	12.55	12.50	12.50	12.45
HYDROGRAPH AT										
	DS	0.14	1	FLOW	128.	189.	254.	346.	427.	521.
				TIME	12.10	12.10	12.10	12.10	12.10	12.10
2 COMBINED AT										
	COMB	0.69	1	FLOW	283.	426.	561.	801.	1020.	1402.
				TIME	12.50	12.45	12.40	12.40	12.45	12.40

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION DAM
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	185.90	185.90	191.90
STORAGE	14.	14.	35.
OUTFLOW	0.	0.	528.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.40	189.14	0.00	24.	242.	0.00	12.55	0.00
0.50	190.23	0.00	28.	362.	0.00	12.55	0.00
0.60	191.40	0.00	33.	476.	0.00	12.55	0.00
0.74	192.83	0.93	39.	682.	0.55	12.50	0.00
0.86	193.90	2.00	45.	877.	0.80	12.50	0.00
1.00	194.73	2.83	49.	1207.	1.00	12.45	0.00

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

1/2 PMF
EXISTING COND.

HEC1 S/N: 0134300894 HMVersion: 6.33 Data File: 3rdexpmf.hc1

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               MAY   1991              *
*            VERSION 4.0.1E             *
*                                       *
*  RUN DATE  11/13/2001  TIME  08:57:05 *
*                                       *
*****************************************
```


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


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

```
:::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::
:::                                     :::
:::  Full Microcomputer Implementation  :::
:::                by                   :::
:::        Haestad Methods, Inc.        :::
:::                                     :::
:::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

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

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

HEC-1 INPUT PAGE 1

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

   1      ID   3rd St Dam PADEP No. D23-009
   2      ID   Existing Conditions: 1/2 PMF
   3      ID
   4      IT       5                     300
   5      JR    FLOW    0.50
   6      IO       5       0

   7      KK  INFLOW
   8      KM  INFLOW TO RESERVOIR
   9      BA    0.55
  10      BF    -1.0    -.05     1.5
  11      PM      27       1              NO     100     116     127
  12      LS       0      79
  13      UD    0.37

  14      KK     DAM
  15      RS       1    ELEV   185.9
  16      SA       0     2.6     3.9     7.5
  17      SE     170   185.9     190     200
  18      SQ       0      90     180     270     360     450     540     630     720     810
  19      SE   185.9  187.83  188.66  189.35  190.21  191.14  192.02  192.55  193.54  194.77
  20      SS   185.9
  21      ST   191.9             2.8     1.5
  22      SW    9.33    9.33      66     110     150
  23      SE   191.9     193     194     195     196

  24      KK      DS  Runoff from Downstream Basin
  25      BA     .14
  26      LS              79
  27      UD     .23

  28      KK    COMB  Combine Hydrographs
  29      HC       2
  30      ZZ
```

HEC1 S/N: 0134300894 HMVersion: 6.33 Data File: 3rdexpmf.hc1

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               MAY  1991               *
*            VERSION 4.0.1E             *
*                                       *
*  RUN DATE  11/13/2001  TIME  08:57:05 *
*                                       *
*****************************************
```

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

3rd St Dam PADEP No. D23-009
Existing Conditions: 1/2 PMF

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

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

                  COMPUTATION INTERVAL     0.08 HOURS
                       TOTAL TIME BASE    24.92 HOURS

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

    JP          MULTI-PLAN OPTION
                     NPLAN          1  NUMBER OF PLANS

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

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO FLOWS RATIO 1 0.50
HYDROGRAPH AT					
	INFLOW	0.55	1	FLOW	2403.
				TIME	15.92
ROUTED TO					
	DAM	0.55	1	FLOW	2305.
				TIME	16.00
			** PEAK STAGES IN FEET **		
			1	STAGE	196.18
				TIME	16.00
HYDROGRAPH AT					
	DS	0.14	1	FLOW	751.
				TIME	15.75
2 COMBINED AT					
	COMB	0.69	1	FLOW	2805.
				TIME	15.92

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION DAM
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	185.90	185.90	191.90
STORAGE	14.	14.	35.
OUTFLOW	0.	0.	528.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.50	196.18	4.28	57.	2305.	3.92	16.00	0.00

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

3rd Street Dam - Broomhalls Lake
Proposed Spillway - Box Drop Inlet and Culvert
Rating Curves

Drop Box Floor EL: 170 (=Culvert upstream invert)

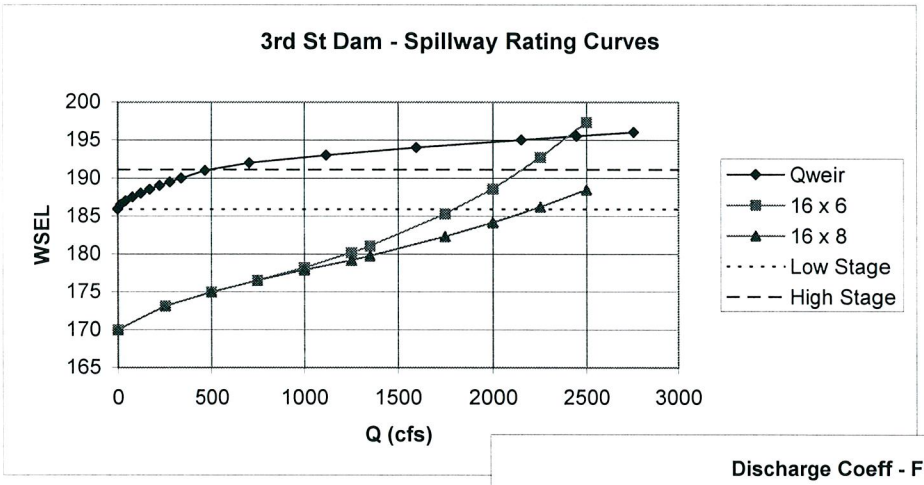
Low Stage		High Stage	
EL	185.9	EL	191.1
Length	12	Length	40
Weir Ht	15.9	Weir Ht	21.1

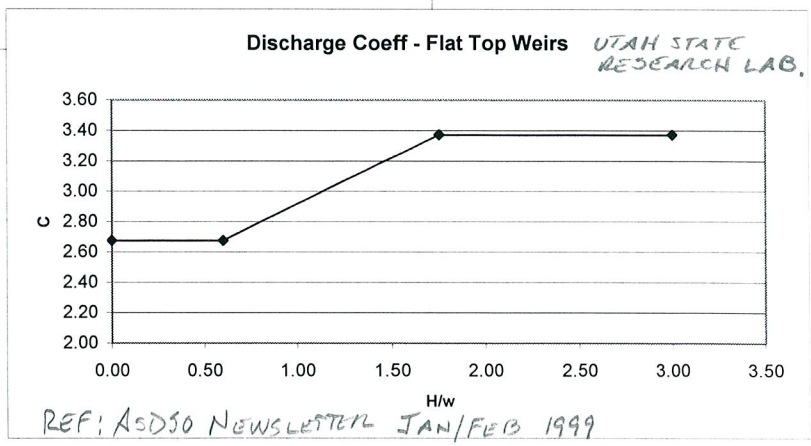
Weir Thickness,w: 1 ft

Culvert Size: 16 x 6

	Low Stage				High Stage						Submerg. Ratio	
WSEL	H	H/w	C	Q	H	H/w	C	Q	Qweir	WSELculv	low stage	high stage
185.9	0	0	2.67	0	0	0	2.67	0	0	170.0	0.00	0.00
186.5	0.6	0.6	2.67	15	0	0	2.67	0	15	170.2	0.00	0.00
187	1.1	1.1	2.98	41	0	0	2.67	0	41	170.5	0.00	0.00
187.5	1.6	1.6	3.28	80	0	0	2.67	0	80	170.9	0.00	0.00
188	2.1	2.1	3.37	123	0	0	2.67	0	123	171.3	0.00	0.00
188.5	2.6	2.6	3.37	170	0	0	2.67	0	170	171.8	0.00	0.00
189	3.1	3.1	3.37	221	0	0	2.67	0	221	172.3	0.00	0.00
189.5	3.6	3.6	3.37	276	0	0	2.67	0	276	172.8	0.00	0.00
190	4.1	4.1	3.37	336	0	0	2.67	0	336	173.4	0.00	0.00
191	5.1	5.1	3.37	466	0	0	2.67	0	466	174.5	0.00	0.00
192	6.1	6.1	3.37	609	0.9	0.9	2.86	98	707	176.3	0.00	0.00
193	7.1	7.1	3.37	765	1.9	1.9	3.37	353	1118	179.3	0.00	0.00
194	8.1	8.1	3.37	932	2.9	2.9	3.37	666	1598	183.5	0.00	0.00
195	9.1	9.1	3.37	1110	3.9	3.9	3.37	1038	2148	190.7	0.53	0.00
195.5	9.6	9.6	3.37	1203	4.4	4.4	3.37	1244	2447	196.4	1.09	1.20
196	10.1	10.1	3.37	1298	4.9	4.9	3.37	1462	2760	204.1	1.80	2.65

HY8





CURRENT DATE: 10-29-2001
CURRENT TIME: 12:57:07

FILE DATE: 10-29-2001
FILE NAME: 3RD

****
********** FHWA CULVERT ANALYSIS **********
********** HY-8, VERSION 4.0 **********
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	170.00	169.85	80.00	1 RCB	16.00	6.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

****

SUMMARY OF CULVERT FLOWS (CFS) FILE: 3RD DATE: 10-29-2001

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
170.00	0	0	0	0	0	0	0	0	1
173.13	250	250	0	0	0	0	0	0	1
174.97	500	500	0	0	0	0	0	0	1
176.52	750	750	0	0	0	0	0	0	1
178.19	1000	1000	0	0	0	0	0	0	1
180.18	1250	1250	0	0	0	0	0	0	1
182.53	1500	1500	0	0	0	0	0	0	1
185.29	1750	1750	0	0	0	0	0	0	1
188.57	2000	2000	0	0	0	0	0	0	1
192.71	2250	2250	0	0	0	0	0	0	1
197.33	2500	2500	0	0	0	0	0	0	1
200.00	2634	2634	0	0	0	0	0	OVERTOPPING	

****

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: 3RD DATE: 10-29-2001

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
170.00	0.00	0	0	0.00
173.13	0.00	250	0	0.00
174.97	0.00	500	0	0.00
176.52	0.00	750	0	0.00
178.19	0.00	1000	0	0.00
180.18	0.00	1250	0	0.00
182.53	0.00	1500	0	0.00
185.29	0.00	1750	0	0.00
188.57	0.00	2000	0	0.00
192.71	0.00	2250	0	0.00
197.33	0.00	2500	0	0.00

****

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

****

CURRENT DATE: 10-29-2001 FILE DATE: 10-29-2001
CURRENT TIME: 12:57:07 FILE NAME: 3RD

****

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (16 BY 6) RCB

****

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	170.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.15
250	173.13	3.12	3.13	2-M2c	2.07	1.97	7.94	1.97	0.00	0.15
500	174.97	4.86	4.97	2-M2c	3.30	3.13	10.00	3.13	0.00	0.15
750	176.52	6.47	6.52	2-M2c	4.36	4.10	11.45	4.10	0.00	0.15
1000	178.19	8.19	7.89	2-M2c	5.35	4.96	12.60	4.96	0.00	0.15
1250	180.18	10.18	9.20	6-FFn	6.00	5.76	13.02	6.00	0.00	0.15
1500	182.53	12.53	10.85	6-FFn	6.00	6.00	15.63	6.00	0.00	0.15
1750	185.29	15.29	12.65	6-FFn	6.00	6.00	18.23	6.00	0.00	0.15
2000	188.57	18.57	14.73	6-FFn	6.00	6.00	20.83	6.00	0.00	0.15
2250	192.71	22.71	17.09	6-FFn	6.00	6.00	23.44	6.00	0.00	0.15
2500	197.33	27.33	19.73	6-FFn	6.00	6.00	26.04	6.00	0.00	0.15

****

El. inlet face invert 170.00 ft El. outlet invert 169.85 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

****

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	170.00
OUTLET STATION (FT)	80.00
OUTLET ELEVATION (FT)	169.85
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0019
CULVERT LENGTH ALONG SLOPE (FT)	80.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	16.00 FT
BARREL RISE	6.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	1:1 BEVEL
INLET DEPRESSION	NONE

****

CURRENT DATE: 10-29-2001 FILE DATE: 10-29-2001
CURRENT TIME: 12:57:07 FILE NAME: 3RD

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
170.00

****
********** ROADWAY OVERTOPPING DATA **********
****

Straight Drop Spillway Stilling Basin

(From FHWA Hydraulic Eng. Circular 14)

Q	1070	cfs
W	16	ft
Yc	5.18	ft
Vc	12.91	fps
Crest EL	170	
TW EL	167	
Outlet EL	160.5	
Min TW (y3)	11.13	ft
Floor EL	155.87	
End Sill Ht	4.63	ft or 0.89 *Yc
Drop Ht	14.13	ft
Figure IX-A-2		
ho	-14.13	ft
ho/Yc	-2.73	
h2	-3.00	ft
h2/Yc	-0.58	
L1/Yc	3.7	(From Figure)
L1	19.16	ft
L2	4.14	ft
L3	9.06	ft
Basin Length	**32.37**	**ft**
Floor Blocks		
Height	4.14	ft
Width	2.07	ft
Spacing	2.07	ft

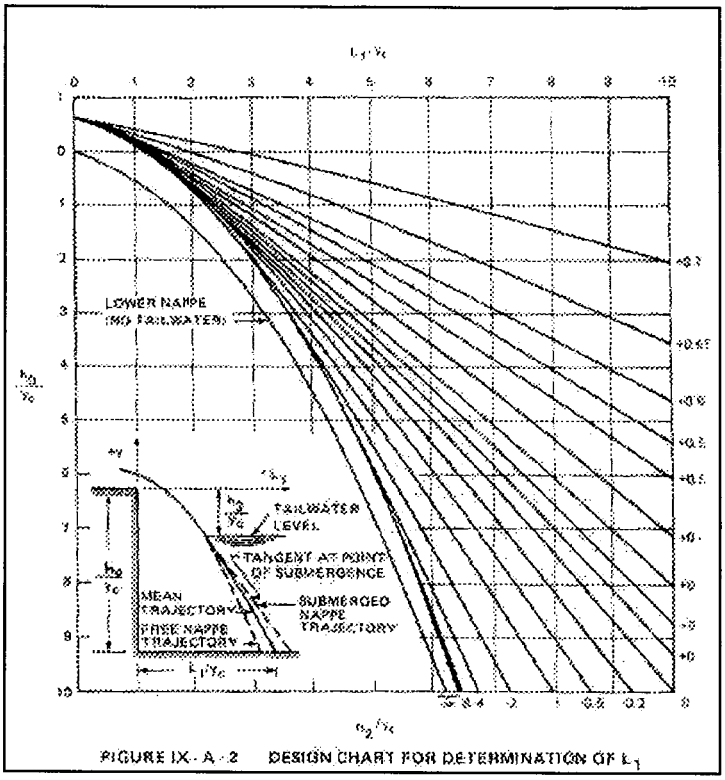


FIGURE IX-A-2 DESIGN CHART FOR DETERMINATION OF L_1

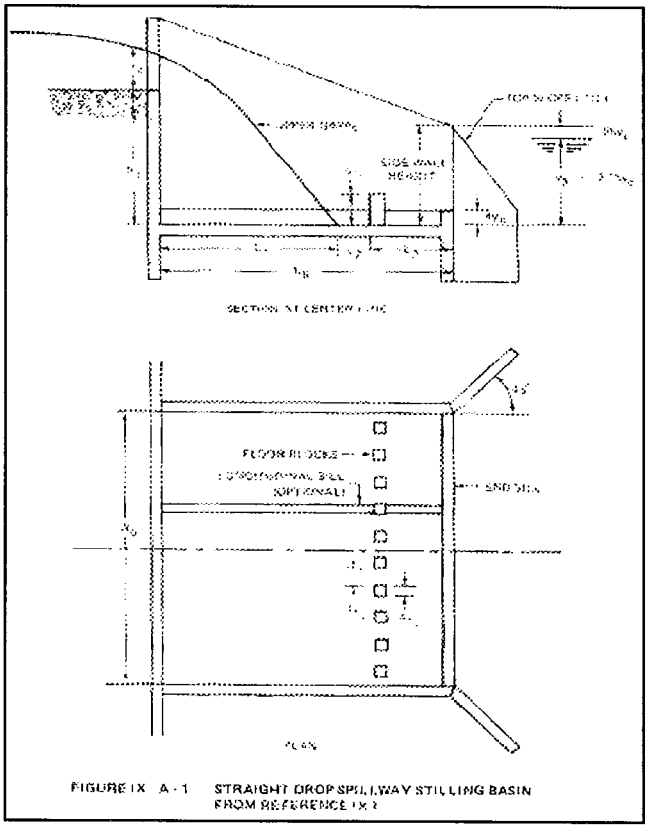
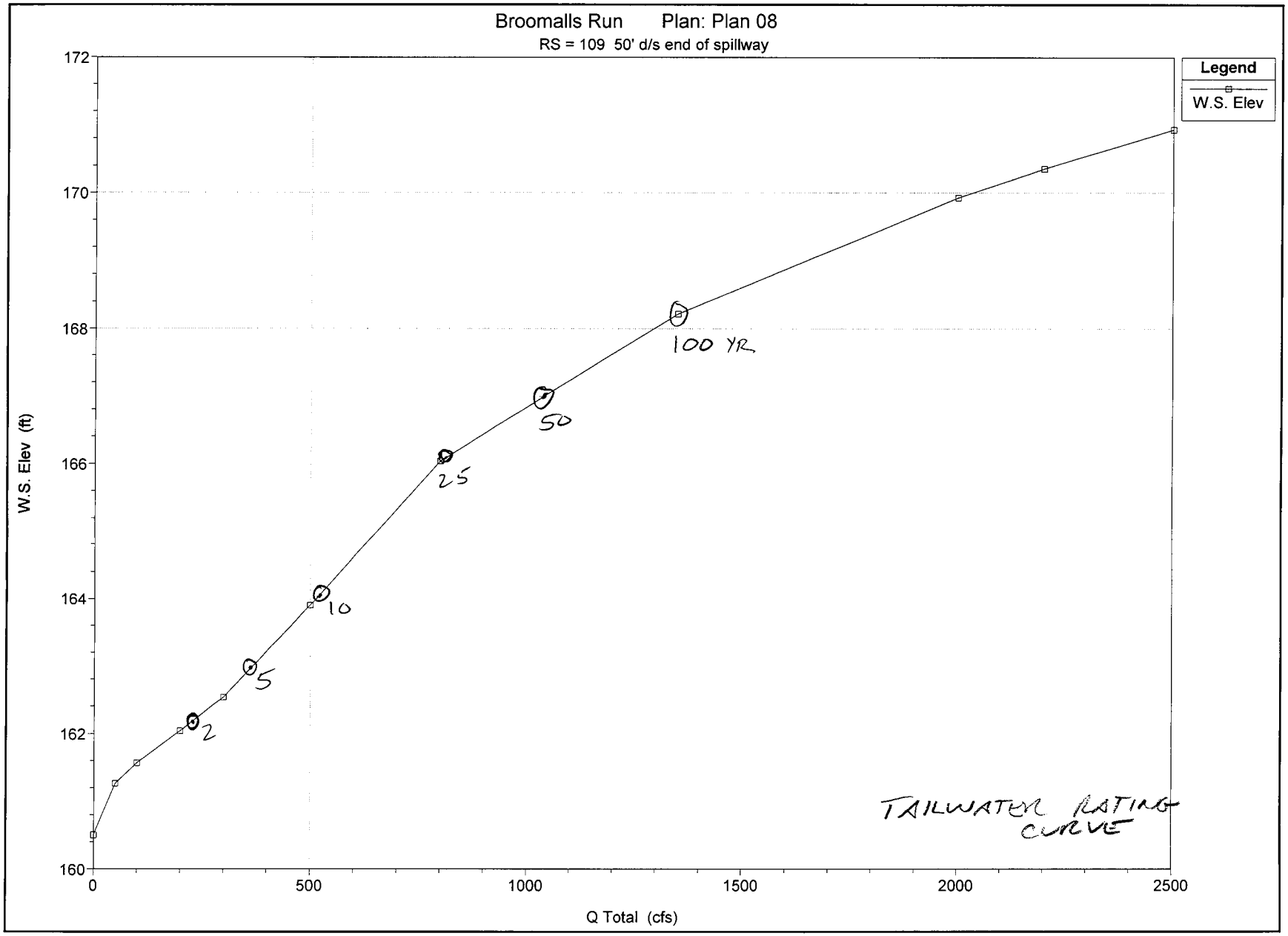


FIGURE IX A-1 STRAIGHT DROP SPILLWAY STILLING BASIN FROM REFERENCE IX-2


Broomalls Run Plan: Plan 08
RS = 109 50' d/s end of spillway
Legend
W.S. Elev
W.S. Elev (ft)
Q Total (cfs)
172
170
168
166
164
162
160
0
500
1000
1500
2000
2500
2
5
10
25
50
100 YR
TAILWATER RATING CURVE

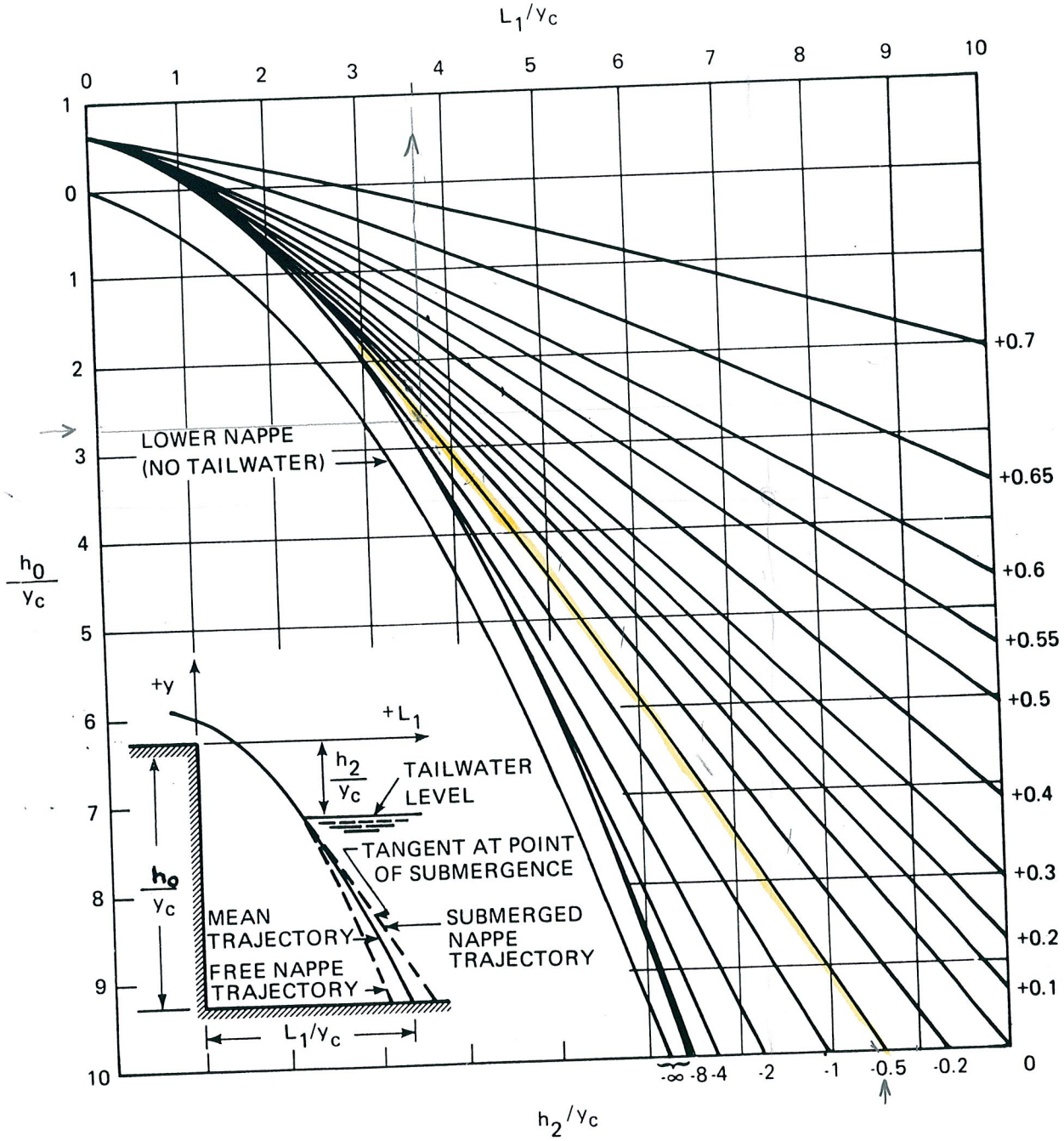
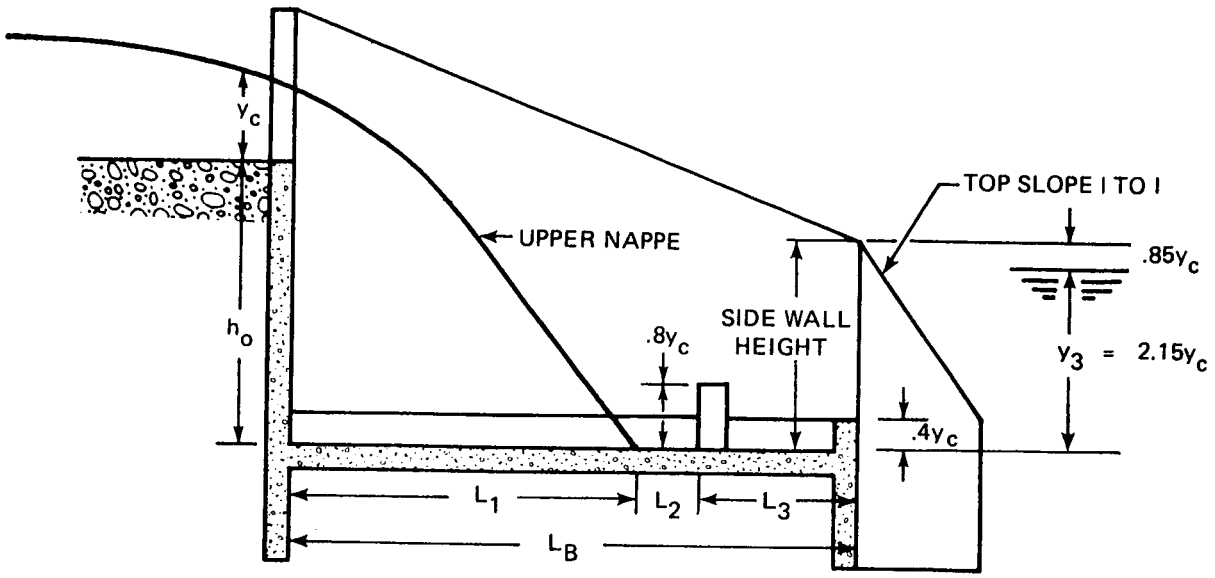
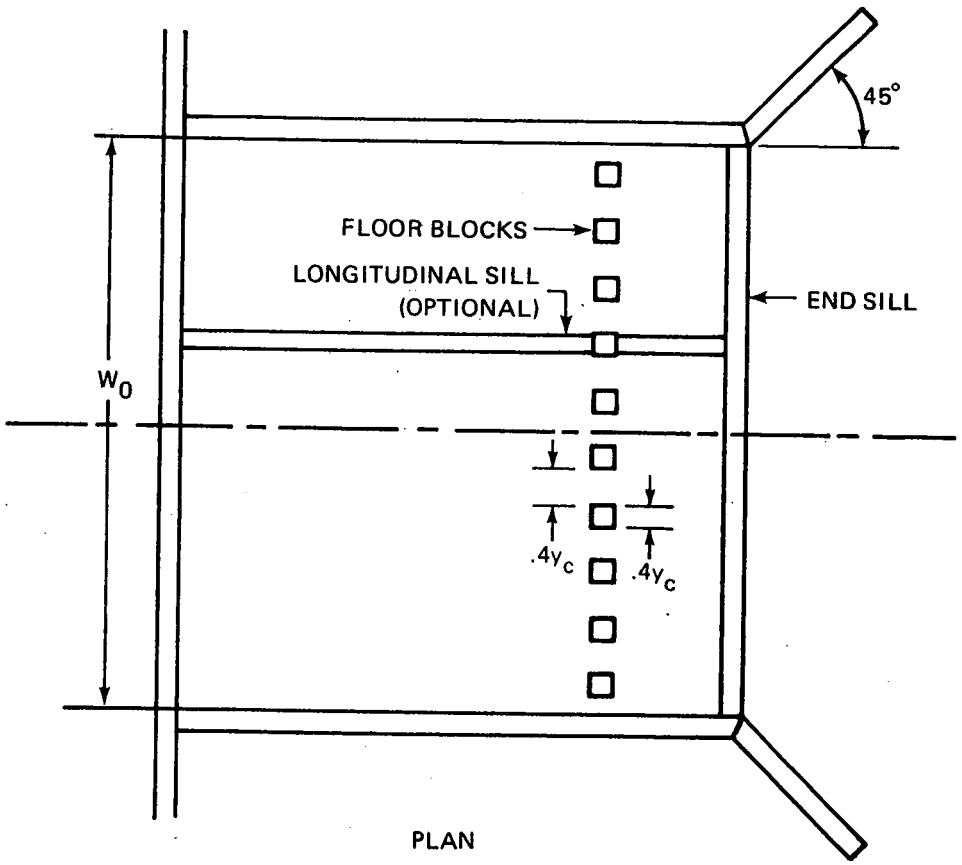


FIGURE IX - A - 2 DESIGN CHART FOR DETERMINATION OF L_1

REF: FHWA HEC-14



SECTION AT CENTER LINE



PLAN

FIGURE IX - A - 1 STRAIGHT DROP SPILLWAY STILLING BASIN FROM REFERENCE IX-I

2 YR - 100 YR
PROPOSED COND.

HEC1 S/N: 0134300894 HMVersion: 6.33 Data File: 3rdst100.hc1

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               MAY   1991              *
*            VERSION 4.0.1E             *
*                                       *
*  RUN DATE  10/15/2001  TIME  15:18:39 *
*                                       *
*****************************************
```


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


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

```
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
:::                                      :::
:::  Full Microcomputer Implementation   :::
:::                 by                   :::
:::        Haestad Methods, Inc.         :::
:::                                      :::
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

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

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

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

   1      ID   3rd St Dam PADEP No. D23-009
   2      ID   Proposed Conditions: 2,5,10,25,50 & 100 YR Floods
   3      ID
   4      IT       3                      500
   5      JR    PREC     0.40     0.50     0.60     0.74     0.86      1.0
   6      IO       5        0

   7      KK  INFLOW
   8      KM  INFLOW TO RESERVOIR
   9      BA    0.55
  10      BF    -1.0     -.05      1.5
  11      PB     8.4
  12      IN       6
  13      PC  0.0000 0.00101 0.00202 0.00305 0.00408 0.00513 0.00618 0.00725 0.00832 0.00941
  14      PC  0.0105 0.01161 0.01272 0.01385 0.01498 0.01613 0.01728 0.01845 0.01962 0.02081
  15      PC  0.0220 0.02321 0.02442 0.02565 0.02688 0.02813 0.02938 0.03065 0.03192 0.03321
  16      PC  0.0345 0.03581 0.03712 0.03845 0.03978 0.04113 0.04248 0.04385 0.04522 0.04661
  17      PC  0.0480 0.04941 0.05084 0.05229 0.05376 0.05525 0.05676 0.05829 0.05984 0.06141
  18      PC  0.0630 0.06461 0.06624 0.06789 0.06956 0.07125 0.07296 0.07469 0.07644 0.07821
  19      PC  0.0800 0.08181 0.08364 0.08549 0.08736 0.08925 0.09116 0.09309 0.09504 0.09701
  20      PC  0.0990 0.10101 0.10304 0.10509 0.10716 0.10925 0.11136 0.11349 0.11564 0.11781
  21      PC  0.1200 0.12225 0.12460 0.12705 0.12960 0.13225 0.13500 0.13785 0.14080 0.14385
  22      PC  0.1470 0.15020 0.15340 0.15660 0.15980 0.16300 0.16628 0.16972 0.17332 0.17708
  23      PC  0.1810 0.18512 0.18948 0.19408 0.19892 0.20400 0.20940 0.21520 0.22140 0.22800
  24      PC  0.2350 0.24268 0.25132 0.26092 0.27148 0.28300 0.30684 0.35436 0.43079 0.56786
  25      PC  0.6630 0.68196 0.69864 0.71304 0.72516 0.73500 0.74344 0.75136 0.75876 0.76564
  26      PC  0.7720 0.77796 0.78364 0.78904 0.79416 0.79900 0.80360 0.80800 0.81220 0.81620
  27      PC  0.8200 0.82367 0.82726 0.83079 0.83424 0.83763 0.84094 0.84419 0.84736 0.85047
  28      PC  0.8535 0.85647 0.85936 0.86219 0.86494 0.86763 0.87024 0.87279 0.87526 0.87767
  29      PC  0.8800 0.88229 0.88455 0.88679 0.88900 0.89119 0.89335 0.89549 0.89760 0.89969
  30      PC  0.9018 0.90379 0.90580 0.90779 0.90975 0.91169 0.91360 0.91549 0.91735 0.91919
  31      PC  0.9210 0.92279 0.92455 0.92629 0.92800 0.92969 0.93135 0.93299 0.93460 0.93619
  32      PC  0.9377 0.93929 0.94080 0.94229 0.94375 0.94519 0.94660 0.94799 0.94935 0.95069
  33      PC  0.9520 0.95330 0.95459 0.95588 0.95716 0.95844 0.95971 0.96098 0.96224 0.96350
  34      PC  0.9647 0.96600 0.96724 0.96848 0.96971 0.97094 0.97216 0.97338 0.97459 0.97580
  35      PC  0.9770 0.97820 0.97939 0.98058 0.98176 0.98294 0.98411 0.98528 0.98644 0.98760
  36      PC  0.9887 0.98990 0.99104 0.99218 0.99331 0.99444 0.99556 0.99668 0.99779 0.99890
  37      PC  1.0000 1.00000 1.00000 1.00000 1.00000
  38      LS       0       79
  39      UD    0.37

  40      KK     DAM
  41      RS       1     ELEV   185.9
  42      SA       0      2.6     3.9      7.5
  43      SE     170    185.9     190      200
  44      SQ       0       15      41       80      123      170      221      276      336      466
  45      SQ     707     1118    1598     2148     2447
  46      SE   185.9    186.5     187    187.5      188    188.5      189    189.5      190      191
  47      SE     192      193     194      195    196.4
  48      ST   195.5               3.1      1.5

  49      KK      DS  Downstream Area Runoff
  50      BA     .14
  51      LS              79
  52      UD     .23

  53      KK    COMB  Combine Hydrographs
  54      HC       2
  55      ZZ
```

HEC1 S/N: 0134300894 HMVersion: 6.33 Data File: 3rdst100.hc1

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              MAY   1991               *
*           VERSION 4.0.1E              *
*                                       *
*  RUN DATE  10/15/2001  TIME  15:18:39 *
*                                       *
*****************************************
```

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

3rd St Dam PADEP No. D23-009
Proposed Conditions: 2,5,10,25,50 & 100 YR Floods

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

    IT          HYDROGRAPH TIME DATA
                       NMIN           3  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME         0000  STARTING TIME
                         NQ          500  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2    0  ENDING DATE
                     NDTIME        0057  ENDING TIME
                     ICENT           19  CENTURY MARK

                COMPUTATION INTERVAL     0.05 HOURS
                    TOTAL TIME BASE    24.95 HOURS

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

    JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                  0.40      0.50      0.60      0.74      0.86      1.00
```

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 0.40	RATIO 2 0.50	RATIO 3 0.60	RATIO 4 0.74	RATIO 5 0.86	RATIO 6 1.00
HYDROGRAPH AT										
	INFLOW	0.55	1	FLOW	385.	572.	767.	1048.	1293.	1581.
				TIME	12.25	12.25	12.25	12.25	12.25	12.25
ROUTED TO										
	DAM	0.55	1	FLOW	238.	369.	528.	814.	1068.	1362.
				TIME	12.55	12.55	12.50	12.45	12.40	12.40
			** PEAK STAGES IN FEET **							
			1	STAGE	189.16	190.26	191.26	192.26	192.88	193.51
				TIME	12.55	12.55	12.50	12.45	12.40	12.40
HYDROGRAPH AT										
	DS	0.14	1	FLOW	128.	189.	254.	346.	427.	521.
				TIME	12.10	12.10	12.10	12.10	12.10	12.10
2 COMBINED AT										
	COMB	0.69	1	FLOW	279.	433.	615.	949.	1256.	1614.
				TIME	12.50	12.45	12.45	12.40	12.35	12.35

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION DAM
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	185.90	195.50	195.50
STORAGE	14.	53.	53.
OUTFLOW	0.	2255.	2255.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.40	189.16	0.00	24.	238.	0.00	12.55	0.00
0.50	190.26	0.00	28.	369.	0.00	12.55	0.00
0.60	191.26	0.00	32.	528.	0.00	12.50	0.00
0.74	192.26	0.00	37.	814.	0.00	12.45	0.00
0.86	192.88	0.00	40.	1068.	0.00	12.40	0.00
1.00	193.51	0.00	43.	1362.	0.00	12.40	0.00

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

1/2 PMF
PROPOSED COND.

HEC1 S/N: 0134300894 HMVersion: 6.33 Data File: 3rdhpmf.hc1

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              MAY   1991               *
*           VERSION 4.0.1E              *
*                                       *
*  RUN DATE  10/26/2001  TIME  17:24:26 *
*                                       *
*****************************************
```

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

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

```
:::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::
:::                                     :::
:::  Full Microcomputer Implementation  :::
:::                 by                  :::
:::        Haestad Methods, Inc.        :::
:::                                     :::
:::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

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

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

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

    1     ID   3rd St Dam PADEP No. D23-009
    2     ID   Calculate Lake Elevations for 1/2 PMF-Future Conditions
    3     ID
    4     IT       5                    300
    5     JR    FLOW      .5
    6     IO       5       0

    7     KK  INFLOW
    8     KM  INFLOW TO RESERVOIR
    9     BA    0.55
   10     BF    -1.0    -.05     1.5
   11     PM      27       1              NO     100     116     127
   12     LS       0      79
   13     UD    0.37

   14     KK     DAM
   15     RS       1    ELEV   185.9
   16     SA       0     2.6     3.9     7.5
   17     SE     170   185.9     190     200
   18     SQ       0      15      41      80     123     170     221     276     336     466
   19     SQ     707    1118    1598    2148    2447
   20     SE   185.9   186.5     187   187.5     188   188.5     189   189.5     190     191
   21     SE     192     193     194     195   196.4
   22     ST   195.5     500     3.3     1.5
   23     ZZ
```

HEC1 S/N: 0134300894 HMVersion: 6.33 Data File: 3rdhpmf.hc1

```
**********************************************
*                                            *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)        *
*               MAY  1991                    *
*            VERSION 4.0.1E                  *
*                                            *
*  RUN DATE  10/26/2001  TIME  17:24:26      *
*                                            *
**********************************************
```

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

3rd St Dam PADEP No. D23-009
Calculate Lake Elevations for ½ PMF-Future Conditions

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

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

                  COMPUTATION INTERVAL     0.08 HOURS
                       TOTAL TIME BASE    24.92 HOURS

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

    JP          MULTI-PLAN OPTION
                     NPLAN           1  NUMBER OF PLANS

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

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO FLOWS RATIO 1 0.50
HYDROGRAPH AT					
	INFLOW	0.55	1	FLOW	2403.
				TIME	15.92
ROUTED TO					
	DAM	0.55	1	FLOW	2186.
				TIME	16.00
			** PEAK STAGES IN FEET **		
			1	STAGE	195.18
				TIME	16.00

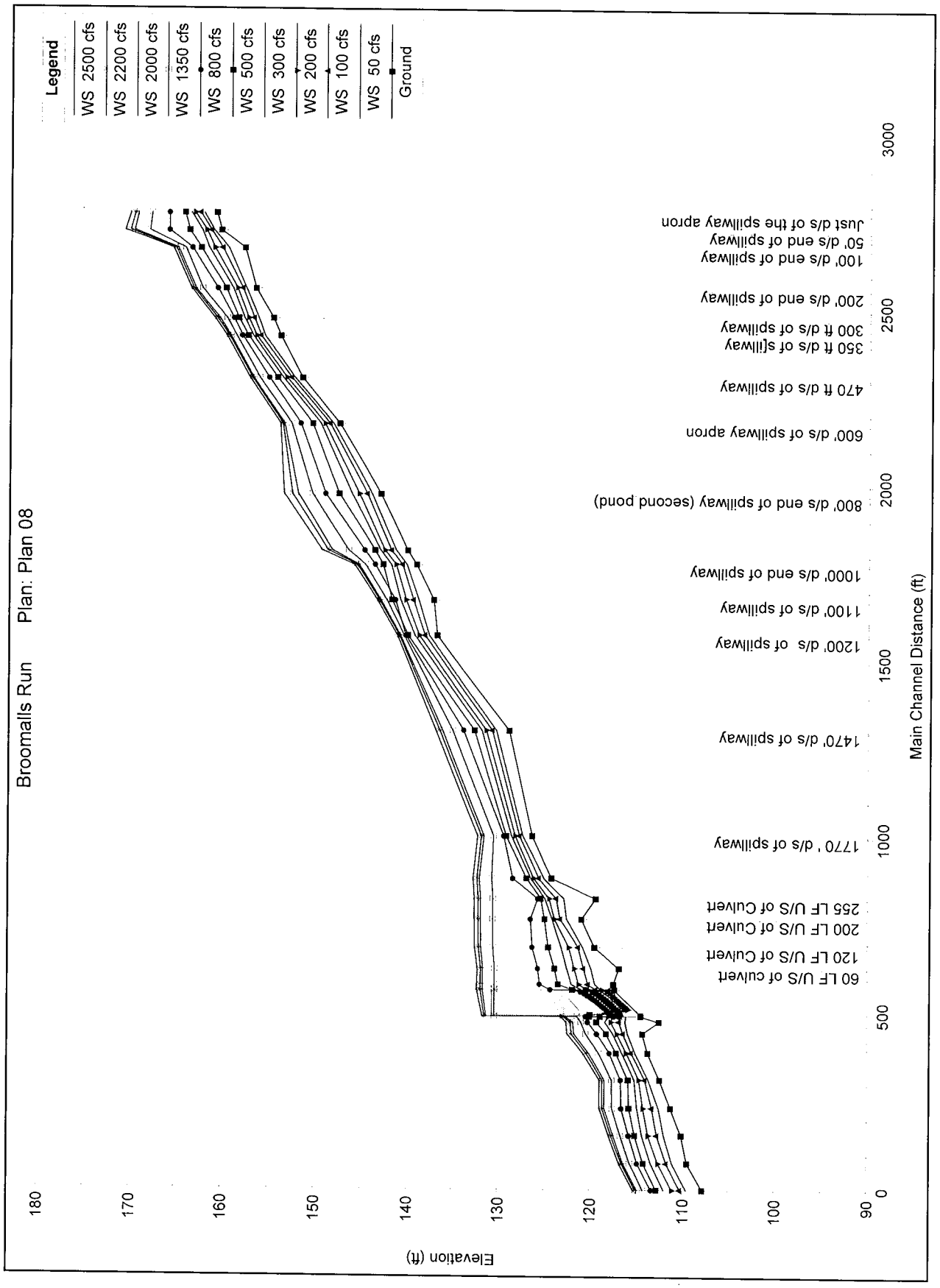
SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION DAM
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

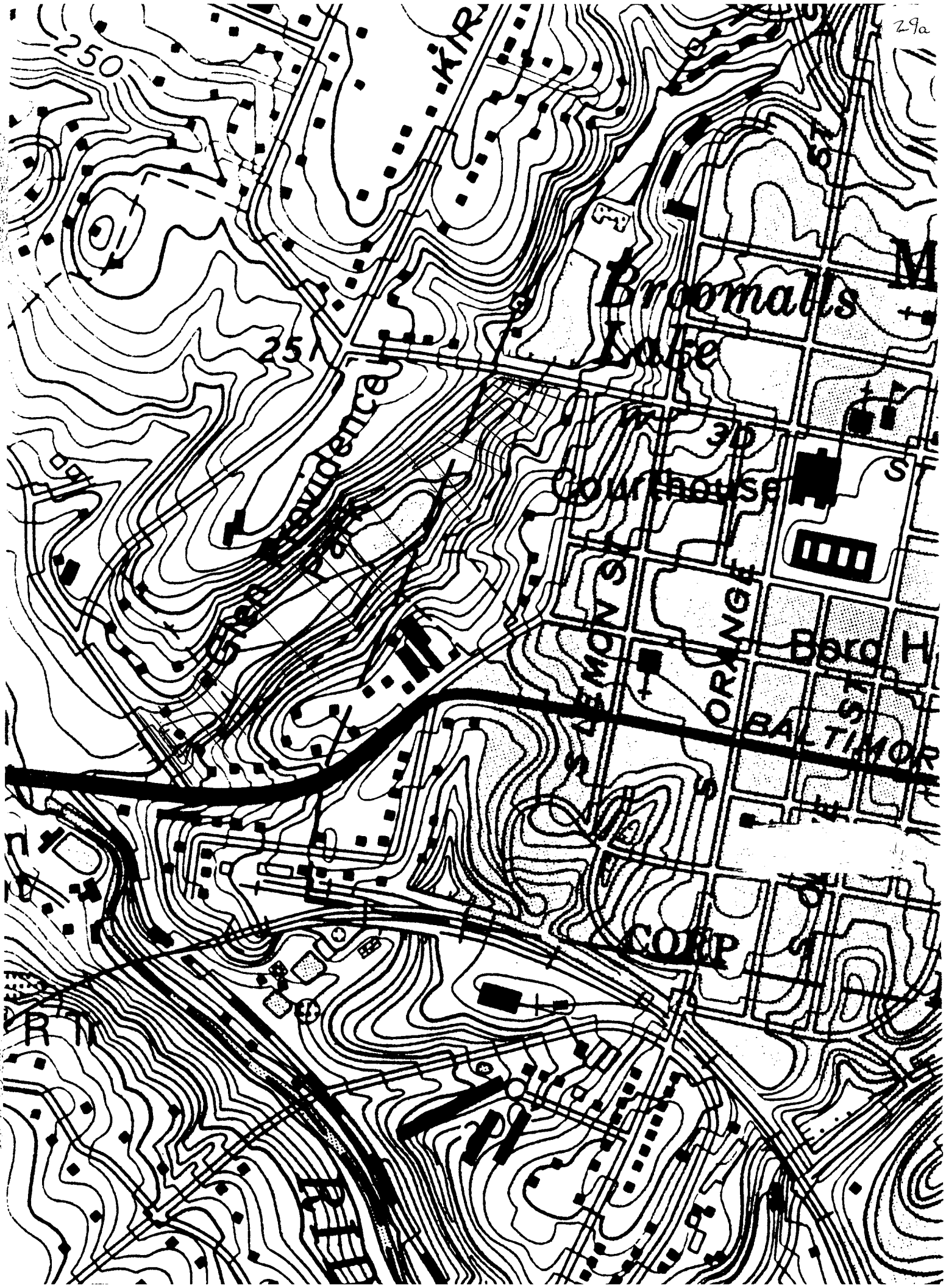
PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	185.90	195.50	195.50
STORAGE	14.	53.	53.
OUTFLOW	0.	2255.	2255.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.50	195.18	0.00	52.	2186.	0.00	16.00	0.00

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


Broomalls Run Plan: Plan 08
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Elevation (ft)
Main Channel Distance (ft)
60 LF U/S of culvert
120 LF U/S of Culvert
200 LF U/S of Culvert
255 LF U/S of Culvert
1770 ' d/s of spillway
1470' d/s of spillway
1200' d/s of spillway
1100' d/s of spillway
1000' d/s end of spillway
800' d/s end of spillway (second pond)
600' d/s of spillway apron
470 ft d/s of spillway
350 ft d/s of spillway
300 ft d/s of spillway
200' d/s end of spillway
100' d/s end of spillway
50' d/s end of spillway
Just d/s of the spillway apron


250
KIR
Broomalls
Lake
257
Providence
Courthouse
BALTIMORE
CORP

HEC-RAS Plan: Plan 07 River: Broomalls Run Reach: 1

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	110	50.00	161.00	162.33	161.99	162.42	0.008885	2.42	20.68	25.24	0.47
1	110	100.00	161.00	162.72	162.28	162.89	0.009925	3.26	30.71	25.54	0.52
1	110	200.00	161.00	163.30		163.60	0.011252	4.38	45.66	25.98	0.58
1	110	300.00	161.00	163.69		164.14	0.013402	5.36	55.92	26.27	0.65
1	110	500.00	161.00	164.39		165.09	0.015451	6.72	74.42	27.02	0.71
1	110	800.00	161.00	166.05		166.73	0.009236	6.61	121.09	29.21	0.57
1	110	1350.00	161.00	168.00		168.88	0.008250	7.52	179.61	30.83	0.55
1	110	2000.00	161.00	169.49		170.68	0.009684	8.74	228.72	35.05	0.60
1	110	2200.00	161.00	169.85		171.14	0.010171	9.11	241.52	36.07	0.62
1	110	2500.00	161.00	170.32		171.77	0.010604	9.66	259.43	40.42	0.64
1	109	50.00	160.50	161.27	161.27	161.53	0.047258	4.09	12.22	24.11	1.01
1	109	100.00	160.50	161.57	161.57	161.97	0.040911	5.06	19.77	25.31	1.01
1	109	200.00	160.50	162.04	162.04	162.64	0.035922	6.22	32.15	27.17	1.01
1	109	300.00	160.50	162.54		163.20	0.027124	6.52	46.00	29.14	0.91
1	109	500.00	160.50	163.91		164.39	0.010452	5.58	89.68	34.62	0.61
1	109	800.00	160.50	166.04		166.36	0.003239	4.61	212.13	81.28	0.38
1	109	1350.00	160.50	168.22		168.51	0.002028	4.71	422.93	111.61	0.32
1	109	2000.00	160.50	169.93		170.24	0.001763	5.09	628.49	129.24	0.31
1	109	2200.00	160.50	170.35		170.67	0.001733	5.21	683.73	131.23	0.31
1	109	2500.00	160.50	170.92		171.26	0.001714	5.40	759.58	133.23	0.31
1	108	50.00	158.00	159.74	159.11	159.87	0.007681	2.89	17.31	13.85	0.46
1	108	100.00	158.00	160.38	159.65	160.59	0.008864	3.71	26.97	16.33	0.51
1	108	200.00	158.00	161.20	160.39	161.56	0.010570	4.81	41.58	19.21	0.58
1	108	300.00	158.00	161.79	160.96	162.28	0.011833	5.60	53.56	21.28	0.62
1	108	500.00	158.00	162.63	161.86	163.33	0.013041	6.80	83.81	57.26	0.68
1	108	800.00	158.00	163.58	163.15	164.36	0.012097	7.51	153.75	90.28	0.67
1	108	1350.00	158.00	164.31	164.31	165.47	0.016242	9.60	228.52	113.44	0.80
1	108	2000.00	158.00	165.10	165.10	166.44	0.016617	10.82	327.17	135.26	0.83
1	108	2200.00	158.00	165.31	165.31	166.70	0.016764	11.15	355.71	140.94	0.84
1	108	2500.00	158.00	165.61	165.61	167.06	0.016757	11.55	399.77	149.29	0.84
1	107	50.00	156.80	157.85	157.82	158.16	0.039773	4.47	11.18	16.73	0.96
1	107	100.00	156.80	158.22	158.22	158.70	0.039231	5.54	18.07	19.30	1.01
1	107	200.00	156.80	158.80	158.80	159.49	0.035112	6.70	29.83	21.78	1.01
1	107	300.00	156.80	159.25	159.25	160.12	0.032943	7.45	40.26	23.77	1.01
1	107	500.00	156.80	160.00	160.00	161.11	0.030516	8.46	59.07	26.98	1.01
1	107	800.00	156.80	160.87	160.87	162.27	0.027677	9.49	84.40	30.72	1.00
1	107	1350.00	156.80	162.47	162.47	163.58	0.014027	8.97	224.43	128.28	0.76
1	107	2000.00	156.80	163.21	163.21	164.51	0.014585	10.18	323.01	135.93	0.80
1	107	2200.00	156.80	163.41	163.41	164.76	0.014802	10.51	349.50	137.91	0.81
1	107	2500.00	156.80	163.67	163.67	165.12	0.015144	10.99	386.86	140.66	0.83
1	106	50.00	154.90	156.48		156.60	0.009930	2.75	19.33	27.63	0.51
1	106	100.00	154.90	156.96		157.13	0.009063	3.40	35.35	39.13	0.52
1	106	200.00	154.90	157.58		157.82	0.009236	4.28	63.87	53.83	0.55
1	106	300.00	154.90	158.01		158.32	0.009582	4.90	89.65	64.35	0.57
1	106	500.00	154.90	158.63		159.05	0.010732	5.92	134.65	82.16	0.63
1	106	800.00	154.90	159.16		159.79	0.013531	7.45	182.40	97.57	0.72
1	106	1350.00	154.90	159.87		160.83	0.016916	9.50	259.71	118.34	0.84
1	106	2000.00	154.90	160.63		161.74	0.016875	10.65	353.72	127.68	0.86
1	106	2200.00	154.90	160.86		161.99	0.016455	10.85	383.64	129.78	0.85
1	106	2500.00	154.90	161.15		162.34	0.016578	11.30	420.91	132.33	0.87
1	105	50.00	154.10	155.78	155.50	155.95	0.016834	3.38	14.78	17.64	0.65
1	105	100.00	154.10	156.22	155.96	156.49	0.018660	4.20	24.40	29.48	0.71
1	105	200.00	154.10	156.71	156.56	157.16	0.019861	5.48	44.28	51.20	0.78
1	105	300.00	154.10	157.07	156.99	157.63	0.020160	6.28	65.68	67.15	0.80
1	105	500.00	154.10	157.61	157.59	158.30	0.020372	7.34	108.29	90.92	0.83
1	105	800.00	154.10	158.22	158.22	158.96	0.019911	8.12	170.76	109.66	0.84
1	105	1350.00	154.10	158.86	158.86	159.86	0.022459	9.86	242.55	114.46	0.93
1	105	2000.00	154.10	159.48	159.48	160.72	0.024107	11.37	314.41	119.07	0.99
1	105	2200.00	154.10	159.63	159.63	160.96	0.024761	11.82	333.39	120.26	1.01
1	105	2500.00	154.10	159.90	159.90	161.31	0.024766	12.30	365.13	122.22	1.02
1	104	50.00	151.70	152.53	152.53	152.83	0.044877	4.36	11.48	19.78	1.01
1	104	100.00	151.70	152.89	152.89	153.31	0.040017	5.22	19.15	23.00	1.01
1	104	200.00	151.70	153.41	153.41	154.00	0.035895	6.19	32.33	27.69	1.01
1	104	300.00	151.70	153.81	153.81	154.53	0.033714	6.79	44.16	31.30	1.01
1	104	500.00	151.70	154.41	154.41	155.36	0.029413	7.82	64.97	38.74	0.99
1	104	800.00	151.70	155.29	155.29	156.30	0.019746	8.23	121.15	93.22	0.86
1	104	1350.00	151.70	156.34	156.34	157.32	0.014516	8.72	253.27	147.96	0.78
1	104	2000.00	151.70	156.99	156.99	158.15	0.015310	9.94	354.31	161.35	0.82

TW RATING CURVE THIS SECTION

HEC-RAS Plan: Plan 07 River: Broomalls Run Reach: 1 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	104	2200.00	151.70	157.15	157.15	158.38	0.015819	10.33	379.55	164.52	0.84
1	104	2500.00	151.70	157.39	157.39	158.69	0.016089	10.78	420.47	169.55	0.86
1	96	50.00	147.63	148.31	148.19	148.50	0.024234	3.45	14.51	22.04	0.75
1	96	100.00	147.63	148.67	148.51	148.98	0.023448	4.42	22.63	22.82	0.78
1	96	200.00	147.63	149.23	149.02	149.72	0.022610	5.62	35.62	24.02	0.81
1	96	300.00	147.63	149.70	149.44	150.33	0.021529	6.37	47.09	25.03	0.82
1	96	500.00	147.63	150.58		151.37	0.018093	7.15	69.96	26.93	0.78
1	96	800.00	147.63	151.87		152.74	0.013435	7.51	106.50	29.71	0.70
1	96	1350.00	147.63	152.85	152.85	153.97	0.013909	8.93	223.80	135.96	0.74
1	96	2000.00	147.63	153.63	153.63	154.89	0.014172	10.01	331.27	141.39	0.77
1	96	2200.00	147.63	153.82	153.82	155.13	0.014404	10.34	358.69	142.74	0.78
1	96	2500.00	147.63	154.08	154.08	155.47	0.014840	10.82	396.26	144.57	0.79
1	95	50.00	143.17	144.15	143.91	144.34	0.017992	3.57	14.01	15.28	0.66
1	95	100.00	143.17	144.67	144.33	144.99	0.017181	4.52	22.11	15.70	0.67
1	95	200.00	143.17	145.54	144.98	146.02	0.015373	5.54	36.08	16.40	0.66
1	95	300.00	143.17	146.31	145.51	146.89	0.013936	6.13	48.96	17.02	0.64
1	95	500.00	143.17	147.67	146.42	148.40	0.012237	6.86	72.85	18.12	0.60
1	95	800.00	143.17	149.13	147.55	150.12	0.012774	7.99	100.13	19.30	0.62
1	95	1350.00	143.17	150.55	150.55	150.59	0.000680	1.70	794.86	233.85	0.16
1	95	2000.00	143.17	152.10	150.55	152.15	0.000436	1.72	1166.43	244.72	0.14
1	95	2200.00	143.17	152.72	150.55	152.77	0.000357	1.68	1319.65	249.06	0.13
1	95	2500.00	143.17	153.62	150.55	153.66	0.000281	1.64	1546.16	255.35	0.12
1	94.5	50.00	140.25	141.50	141.22	141.69	0.015320	3.42	14.62	14.97	0.61
1	94.5	100.00	140.25	142.02	141.64	142.33	0.016048	4.45	22.45	15.43	0.65
1	94.5	200.00	140.25	142.72	142.30	143.27	0.019070	5.99	33.41	16.05	0.73
1	94.5	300.00	140.25	143.17	142.84	144.01	0.023705	7.36	40.74	16.46	0.82
1	94.5	500.00	140.25	143.78	143.78	145.27	0.034035	9.81	50.97	17.00	1.00
1	94.5	800.00	140.25	144.92	144.92	146.89	0.033549	11.27	70.95	18.02	1.00
1	94.5	1350.00	140.25	146.64	146.64	149.29	0.033227	13.07	103.32	19.56	1.00
1	94.5	2000.00	140.25	148.34	148.34	151.61	0.033011	14.51	137.88	21.08	1.00
1	94.5	2200.00	140.25	148.82	148.82	152.25	0.032967	14.87	147.97	21.50	1.00
1	94.5	2500.00	140.25	149.49	149.49	153.16	0.032989	15.37	162.61	22.10	1.00
1	94	50.00	139.22	140.32	140.32	140.72	0.042071	5.03	9.94	12.88	1.01
1	94	100.00	139.22	140.81	140.81	141.36	0.037827	5.96	16.77	15.42	1.01
1	94	200.00	139.22	141.49	141.49	142.25	0.034242	7.00	28.56	19.03	1.01
1	94	300.00	139.22	142.02	142.02	142.92	0.031562	7.59	39.86	25.24	1.00
1	94	500.00	139.22	142.88	142.88	143.87	0.026255	8.07	69.11	42.80	0.94
1	94	800.00	139.22	143.76	143.76	144.83	0.022936	8.62	115.65	76.11	0.91
1	94	1350.00	139.22	144.82	144.82	145.91	0.017651	9.23	227.74	117.08	0.84
1	94	2000.00	139.22	145.52	145.52	146.85	0.018601	10.59	313.60	131.71	0.88
1	94	2200.00	139.22	145.71	145.71	147.10	0.018717	10.93	339.40	135.94	0.89
1	94	2500.00	139.22	146.01	146.01	147.45	0.018333	11.28	381.78	142.61	0.89
1	93	50.00	137.30	138.97	138.26	139.02	0.003439	1.81	27.61	25.71	0.31
1	93	100.00	137.30	139.56		139.64	0.003623	2.26	44.23	30.63	0.33
1	93	200.00	137.30	140.38		140.50	0.003726	2.77	72.12	37.46	0.35
1	93	300.00	137.30	140.99		141.14	0.003774	3.11	96.47	42.53	0.36
1	93	500.00	137.30	141.91		142.10	0.003537	3.52	156.11	73.11	0.37
1	93	800.00	137.30	141.56	140.93	142.21	0.013509	6.48	131.22	69.59	0.71
1	93	1350.00	137.30	142.48	142.02	143.36	0.014108	7.69	199.78	79.60	0.75
1	93	2000.00	137.30	143.12	142.82	144.38	0.016295	9.31	254.53	91.36	0.83
1	93	2200.00	137.30	143.28	143.05	144.66	0.017173	9.80	268.63	94.15	0.86
1	93	2500.00	137.30	143.49	143.36	145.07	0.018360	10.49	289.43	98.12	0.89
1	92	50.00	136.88	137.79	137.79	138.15	0.042541	4.80	10.41	14.59	1.00
1	92	100.00	136.88	138.24	138.24	138.75	0.038332	5.75	17.38	17.03	1.00
1	92	200.00	136.88	138.88	138.88	139.59	0.034582	6.80	29.41	20.57	1.00
1	92	300.00	136.88	139.37	139.37	140.23	0.032494	7.45	40.26	23.30	1.00
1	92	500.00	136.88	140.14	140.14	141.22	0.030454	8.36	59.78	27.54	1.00
1	92	800.00	136.88	140.40	140.40	140.72	0.014250	5.97	241.99	148.66	0.69
1	92	1350.00	136.88	140.57	140.57	141.30	0.031386	9.11	267.67	154.92	1.03
1	92	2000.00	136.88	140.99	140.99	141.98	0.035572	10.77	333.97	158.42	1.13
1	92	2200.00	136.88	141.13	141.13	142.17	0.035620	11.12	355.61	159.51	1.14
1	92	2500.00	136.88	141.32	141.32	142.44	0.035683	11.61	386.81	161.06	1.15
1	91	50.00	129.00	130.37	130.07	130.49	0.011264	2.86	18.22	24.75	0.54
1	91	100.00	129.00	130.80	130.42	131.01	0.010994	3.70	30.25	30.40	0.57
1	91	200.00	129.00	131.46	130.95	131.77	0.010287	4.69	52.83	38.83	0.59
1	91	300.00	129.00	131.93	131.38	132.34	0.010336	5.44	72.86	45.02	0.61
1	91	500.00	129.00	132.73	132.06	133.27	0.009875	6.42	112.62	55.27	0.63

HEC-RAS Plan: Plan 07 River: Broomalls Run Reach: 1 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	91	800.00	129.00	133.91	132.86	134.48	0.007443	6.86	187.08	70.58	0.58
1	91	1350.00	129.00	135.12	133.99	135.90	0.007945	8.34	282.03	86.24	0.62
1	91	2000.00	129.00	136.24	135.03	137.20	0.008198	9.56	386.85	100.75	0.65
1	91	2200.00	129.00	136.55	135.30	137.55	0.008236	9.87	418.15	104.69	0.66
1	91	2500.00	129.00	136.98	135.68	138.05	0.008255	10.28	464.88	110.31	0.66
1	90	50.00	126.50	127.50		127.57	0.008358	2.23	22.40	29.95	0.45
1	90	100.00	126.50	127.85		127.99	0.009080	3.01	33.70	33.49	0.51
1	90	200.00	126.50	128.33		128.59	0.010807	4.17	50.65	38.17	0.59
1	90	300.00	126.50	128.72		129.09	0.011335	4.95	66.28	42.03	0.62
1	90	500.00	126.50	129.27		129.86	0.013104	6.29	91.30	47.56	0.70
1	90	800.00	126.50	129.53	129.53	130.73	0.023953	9.06	103.56	50.05	0.96
1	90	1350.00	126.50	130.59	130.59	132.16	0.021115	10.56	162.52	60.60	0.95
1	90	2000.00	126.50	131.63	131.63	133.51	0.019159	11.79	230.61	70.86	0.94
1	90	2200.00	126.50	131.91	131.91	133.88	0.018753	12.12	251.11	73.66	0.94
1	90	2500.00	126.50	132.31	132.31	134.40	0.018310	12.58	281.11	77.59	0.94
1	89	50.00	124.30	125.13	125.13	125.55	0.046767	5.19	9.63	11.60	1.00
1	89	100.00	124.30	125.74	125.74	126.17	0.028629	5.53	24.20	39.90	0.81
1	89	200.00	124.30	126.32	126.32	126.75	0.022794	6.15	59.08	72.91	0.76
1	89	300.00	124.30	126.61	126.61	127.12	0.024974	7.05	81.72	80.87	0.82
1	89	500.00	124.30	127.08	127.08	127.69	0.026513	8.22	122.75	93.59	0.87
1	89	800.00	124.30	128.54	127.57	128.79	0.008036	5.99	276.77	118.38	0.51
1	89	1350.00	124.30	130.79		130.93	0.002934	4.80	576.81	145.81	0.33
1	89	2000.00	124.30	132.11		132.27	0.002756	5.27	778.29	159.28	0.33
1	89	2200.00	124.30	132.38		132.55	0.002858	5.49	821.97	161.97	0.34
1	89	2500.00	124.30	132.79		132.98	0.002951	5.76	889.84	166.07	0.35
1	88	50.00	119.50	122.96		122.99	0.000793	1.37	36.39	11.60	0.14
1	88	100.00	119.50	123.76		123.83	0.001683	2.19	45.58	11.60	0.20
1	88	200.00	119.50	124.53		124.73	0.004117	3.67	54.51	11.60	0.30
1	88	300.00	119.50	124.99		125.38	0.007184	5.01	59.88	11.60	0.39
1	88	500.00	119.50	125.46		126.36	0.015750	7.64	67.11	25.23	0.57
1	88	800.00	119.50	125.83	125.08	127.78	0.032749	11.29	80.27	45.40	0.81
1	88	1350.00	119.50	130.64		130.78	0.002205	4.33	607.17	144.24	0.23
1	88	2000.00	119.50	131.96		132.12	0.002298	4.77	807.27	157.84	0.24
1	88	2200.00	119.50	132.23		132.40	0.002428	4.97	849.51	160.47	0.25
1	88	2500.00	119.50	132.63		132.82	0.002567	5.23	915.78	164.52	0.26
1	87	50.00	121.00	122.69	122.21	122.86	0.011187	3.37	14.86	12.47	0.54
1	87	100.00	121.00	123.34	122.76	123.61	0.012660	4.15	24.86	27.97	0.60
1	87	200.00	121.00	123.93	123.76	124.30	0.015958	5.16	54.11	64.54	0.69
1	87	300.00	121.00	124.19	124.15	124.70	0.021452	6.24	72.02	74.98	0.82
1	87	500.00	121.00	125.03		125.41	0.011815	5.87	148.82	107.75	0.64
1	87	800.00	121.00	126.63		126.80	0.003443	4.37	342.42	130.02	0.38
1	87	1350.00	121.00	130.64		130.70	0.000548	2.73	1027.30	198.60	0.17
1	87	2000.00	121.00	131.96		132.03	0.000619	3.20	1296.70	210.52	0.18
1	87	2200.00	121.00	132.23		132.30	0.000664	3.38	1352.69	213.01	0.19
1	87	2500.00	121.00	132.63		132.72	0.000718	3.61	1440.01	216.85	0.20
1	86	50.00	119.60	120.86	120.86	121.28	0.042430	5.16	9.68	11.92	1.01
1	86	100.00	119.60	121.37	121.37	121.94	0.038717	6.07	16.49	14.71	1.01
1	86	200.00	119.60	122.41	122.08	122.89	0.019338	5.62	41.36	50.25	0.76
1	86	300.00	119.60	123.23		123.55	0.009307	4.93	86.43	60.22	0.55
1	86	500.00	119.60	124.59		124.81	0.004446	4.38	180.17	76.93	0.40
1	86	800.00	119.60	126.42		126.58	0.002196	3.99	380.64	137.50	0.30
1	86	1350.00	119.60	130.61		130.66	0.000431	2.58	1031.82	177.04	0.15
1	86	2000.00	119.60	131.91		131.99	0.000542	3.15	1276.14	197.44	0.17
1	86	2200.00	119.60	132.17		132.25	0.000592	3.34	1327.85	201.57	0.18
1	86	2500.00	119.60	132.57		132.66	0.000656	3.60	1409.60	207.95	0.19
1	85	50.00	116.90	119.95		120.07	0.005979	2.84	17.58	11.18	0.40
1	85	100.00	116.90	120.75		120.95	0.007121	3.63	27.51	13.70	0.45
1	85	200.00	116.90	121.82		122.14	0.007846	4.56	43.99	17.37	0.50
1	85	300.00	116.90	122.61		123.03	0.007837	5.17	59.16	20.63	0.51
1	85	500.00	116.90	123.90		124.44	0.007538	5.93	89.12	25.89	0.52
1	85	800.00	116.90	125.79		126.35	0.005001	6.15	155.39	47.16	0.45
1	85	1350.00	116.90	130.42		130.61	0.001015	4.11	628.42	137.40	0.22
1	85	2000.00	116.90	131.67		131.92	0.001275	4.96	809.14	152.12	0.26
1	85	2200.00	116.90	131.91		132.18	0.001400	5.27	845.01	154.96	0.27
1	85	2500.00	116.90	132.27		132.59	0.001558	5.67	902.48	159.39	0.29
1	84	50.00	117.50	119.55	118.98	119.73	0.010069	3.41	14.66	11.03	0.52
1	84	100.00	117.50	120.27	119.58	120.55	0.011030	4.26	23.47	13.34	0.57

HEC-RAS Plan: Plan 07 River: Broomalls Run Reach: 1 (Continued)

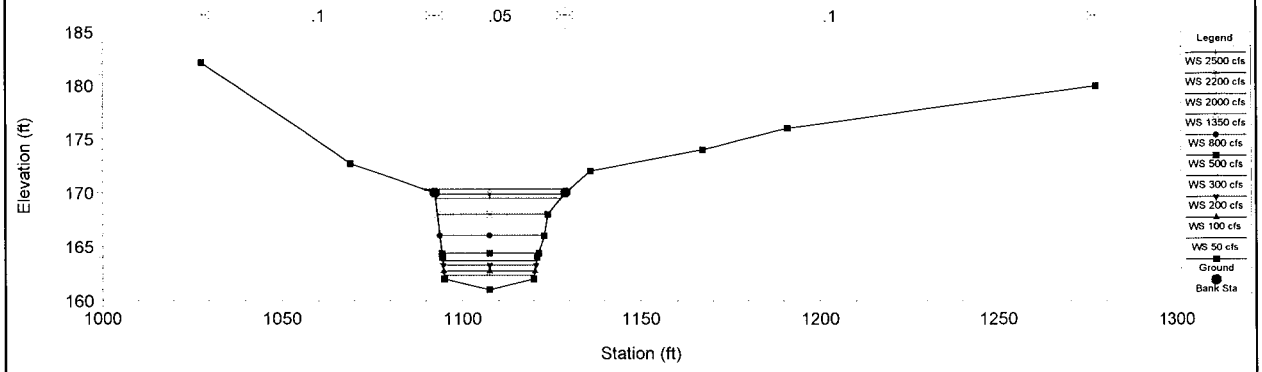
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	84	200.00	117.50	121.30	120.43	121.71	0.011196	5.14	38.90	16.63	0.59
1	84	300.00	117.50	122.12	121.08	122.61	0.010567	5.59	53.71	19.27	0.59
1	84	500.00	117.50	123.51	122.07	124.07	0.008987	5.99	83.52	23.70	0.56
1	84	800.00	117.50	125.57		126.09	0.006136	5.75	139.05	31.36	0.48
1	84	1350.00	117.50	130.42		130.55	0.001037	3.18	667.18	227.39	0.22
1	84	2000.00	117.50	131.69		131.83	0.001031	3.47	964.85	239.82	0.22
1	84	2200.00	117.50	131.93		132.08	0.001089	3.63	1022.60	242.47	0.23
1	84	2500.00	117.50	132.32		132.48	0.001129	3.81	1118.01	250.28	0.23
1	83	50.00	117.40	118.88	118.88	119.37	0.079982	5.61	8.91	9.21	1.01
1	83	100.00	117.40	119.48	119.48	120.17	0.073430	6.64	15.05	11.14	1.01
1	83	200.00	117.40	120.30	120.30	121.31	0.065597	8.05	24.85	13.77	1.01
1	83	300.00	117.40	120.95	120.95	122.21	0.061627	9.00	33.33	15.86	1.01
1	83	500.00	117.40	122.00	122.00	123.68	0.055414	10.39	48.13	19.21	1.00
1	83	800.00	117.40	124.33	123.22	125.83	0.024458	9.81	81.55	26.44	0.73
1	83	1350.00	117.40	130.42	125.13	130.52	0.001666	2.90	689.88	228.39	0.20
1	83	2000.00	117.40	131.70	127.00	131.80	0.001552	3.06	990.82	241.82	0.19
1	83	2200.00	117.40	131.94	127.00	132.05	0.001620	3.19	1049.47	245.91	0.20
1	83	2500.00	117.40	132.33	127.18	132.45	0.001658	3.33	1146.94	254.28	0.20
1	82.9	Culvert									
1	82	50.00	114.60	116.13	115.99	116.44	0.049118	4.46	11.22	14.08	0.81
1	82	100.00	114.60	116.72	116.48	117.18	0.039279	5.47	18.27	17.78	0.78
1	82	200.00	114.60	117.49	117.23	118.31	0.039778	7.25	27.59	20.05	0.84
1	82	300.00	114.60	118.01	117.87	119.23	0.045407	8.87	33.81	21.50	0.93
1	82	500.00	114.60	118.97	118.97	120.86	0.047465	11.03	45.33	24.17	1.00
1	82	800.00	114.60	120.50	120.50	121.52	0.019171	8.39	110.52	45.41	0.66
1	82	1350.00	114.60	121.43	121.43	123.08	0.026344	11.04	175.83	90.51	0.80
1	82	2000.00	114.60	122.78	122.78	124.13	0.019599	10.92	322.00	123.04	0.71
1	82	2200.00	114.60	122.99	122.99	124.40	0.020284	11.31	347.45	127.39	0.73
1	82	2500.00	114.60	123.29	123.29	124.76	0.020881	11.79	387.26	134.18	0.75
1	81	50.00	112.60	116.23		116.25	0.000838	1.03	49.30	24.15	0.12
1	81	100.00	112.60	116.86		116.90	0.001444	1.60	65.20	26.23	0.17
1	81	200.00	112.60	117.76		117.85	0.002259	2.40	90.05	29.19	0.22
1	81	300.00	112.60	118.43		118.56	0.002860	3.01	110.34	31.40	0.25
1	81	500.00	112.60	119.35	116.57	119.59	0.004067	4.06	140.52	34.42	0.31
1	81	800.00	112.60	120.27	117.51	120.68	0.005812	5.40	182.10	73.98	0.38
1	81	1350.00	112.60	121.02	118.92	121.85	0.010460	7.81	249.90	99.84	0.52
1	81	2000.00	112.60	121.94	120.20	122.99	0.012310	9.19	352.23	122.14	0.57
1	81	2200.00	112.60	122.22	121.46	123.29	0.012412	9.45	387.35	128.91	0.58
1	81	2500.00	112.60	122.64	121.88	123.72	0.012262	9.71	443.79	139.10	0.58
1	80	50.00	114.40	115.99		116.16	0.013878	3.37	14.82	14.95	0.60
1	80	100.00	114.40	116.45		116.76	0.016656	4.52	22.31	18.05	0.68
1	80	200.00	114.40	117.07	116.78	117.63	0.019174	6.08	35.10	23.01	0.77
1	80	300.00	114.40	117.51	117.34	118.30	0.020942	7.27	47.96	36.45	0.83
1	80	500.00	114.40	118.25	118.25	119.26	0.019905	8.51	80.60	47.58	0.85
1	80	800.00	114.40	119.29	119.29	120.32	0.015467	9.09	151.48	91.78	0.78
1	80	1350.00	114.40	120.46		121.45	0.012799	9.75	280.58	124.45	0.74
1	80	2000.00	114.40	121.77		122.56	0.009043	9.48	455.52	143.86	0.65
1	80	2200.00	114.40	122.10		122.87	0.008553	9.52	503.86	148.78	0.64
1	80	2500.00	114.40	122.54		123.30	0.008105	9.66	571.09	155.36	0.63
1	79	50.00	113.80	115.18		115.33	0.016163	3.12	16.03	21.10	0.63
1	79	100.00	113.80	115.60	115.32	115.84	0.016027	3.94	25.41	23.62	0.67
1	79	200.00	113.80	116.09	115.82	116.54	0.019221	5.38	37.48	25.32	0.77
1	79	300.00	113.80	116.52	116.24	117.12	0.019707	6.26	48.58	26.78	0.80
1	79	500.00	113.80	117.15	116.95	118.06	0.020559	7.73	68.94	38.92	0.86
1	79	800.00	113.80	117.87	117.87	119.15	0.021184	9.29	102.68	54.54	0.91
1	79	1350.00	113.80	119.09	119.09	120.58	0.017422	10.44	184.60	79.53	0.87
1	79	2000.00	113.80	120.14	120.14	121.82	0.015886	11.49	279.48	100.69	0.86
1	79	2200.00	113.80	120.39	120.39	122.14	0.015947	11.85	305.01	105.72	0.87
1	79	2500.00	113.80	120.77	120.77	122.59	0.015684	12.26	346.35	113.55	0.87
1	78	50.00	112.50	113.70	113.54	113.89	0.022562	3.48	14.36	20.41	0.73
1	78	100.00	112.50	114.08	113.92	114.38	0.023177	4.42	22.68	23.41	0.78
1	78	200.00	112.50	114.76		115.17	0.016564	5.18	39.62	26.35	0.71
1	78	300.00	112.50	115.26		115.79	0.015165	5.86	54.18	36.39	0.71
1	78	500.00	112.50	115.92		116.66	0.015659	7.13	88.88	66.39	0.75
1	78	800.00	112.50	116.66		117.56	0.015186	8.22	142.43	78.46	0.77
1	78	1350.00	112.50	117.62		118.78	0.015480	9.75	225.12	93.28	0.81
1	78	2000.00	112.50	118.47		119.89	0.016164	11.18	309.55	106.27	0.85

HEC-RAS Plan: Plan 07 River: Broomalls Run Reach: 1 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	78	2200.00	112.50	118.69		120.18	0.016364	11.57	333.82	109.72	0.87
1	78	2500.00	112.50	118.99		120.60	0.016906	12.17	366.89	114.45	0.89
1	77	50.00	111.30	112.59		112.70	0.010126	2.71	18.43	20.82	0.51
1	77	100.00	111.30	113.31		113.43	0.006530	2.82	35.45	26.89	0.43
1	77	200.00	111.30	114.30		114.44	0.004794	3.00	66.77	36.46	0.39
1	77	300.00	111.30	114.96		115.12	0.003952	3.20	103.13	81.23	0.37
1	77	500.00	111.30	115.79		115.98	0.003460	3.66	175.75	94.87	0.36
1	77	800.00	111.30	116.58		116.84	0.003661	4.37	256.12	107.68	0.39
1	77	1350.00	111.30	117.58		117.95	0.004247	5.46	369.64	120.43	0.43
1	77	2000.00	111.30	118.44		118.95	0.004893	6.52	478.39	131.49	0.48
1	77	2200.00	111.30	118.67		119.22	0.005065	6.81	509.06	134.44	0.49
1	77	2500.00	111.30	118.99		119.60	0.005308	7.22	553.05	138.57	0.50
1	76	50.00	110.10	112.00		112.12	0.005883	2.71	18.43	13.06	0.40
1	76	100.00	110.10	112.74		112.93	0.006572	3.46	28.90	15.61	0.44
1	76	200.00	110.10	113.69		113.99	0.006648	4.47	52.18	39.20	0.47
1	76	300.00	110.10	114.40		114.73	0.005986	4.93	89.05	64.99	0.46
1	76	500.00	110.10	115.18		115.60	0.006458	5.85	150.42	90.91	0.50
1	76	800.00	110.10	115.80		116.40	0.008399	7.30	213.19	111.08	0.58
1	76	1350.00	110.10	116.65		117.42	0.010209	8.95	314.66	125.95	0.66
1	76	2000.00	110.10	117.43		118.36	0.011425	10.30	416.83	136.12	0.71
1	76	2200.00	110.10	117.64		118.61	0.011718	10.66	445.79	138.86	0.72
1	76	2500.00	110.10	117.93		118.97	0.012162	11.17	486.78	142.66	0.74
1	75	50.00	109.50	111.07	110.81	111.34	0.018820	4.11	12.17	11.37	0.70
1	75	100.00	109.50	111.72		112.10	0.018003	4.95	20.19	13.57	0.72
1	75	200.00	109.50	112.62		113.16	0.017385	5.91	33.84	16.76	0.73
1	75	300.00	109.50	113.40		113.97	0.016875	6.04	50.77	35.60	0.73
1	75	500.00	109.50	114.25		114.82	0.015888	6.34	105.47	93.71	0.73
1	75	800.00	109.50	114.90	114.71	115.53	0.014648	7.01	176.86	120.01	0.72
1	75	1350.00	109.50	115.71	115.41	116.47	0.014172	8.12	281.85	139.36	0.74
1	75	2000.00	109.50	116.37	116.08	117.31	0.015235	9.39	378.72	155.09	0.79
1	75	2200.00	109.50	116.52	116.26	117.54	0.015913	9.81	402.19	158.67	0.81
1	75	2500.00	109.50	116.77	116.48	117.86	0.016128	10.25	443.91	164.83	0.83
1	74	50.00	107.80	109.57	109.31	109.86	0.020003	4.31	11.61	10.44	0.72
1	74	100.00	107.80	110.22	109.90	110.65	0.020008	5.24	19.10	12.59	0.75
1	74	200.00	107.80	111.12	110.73	111.74	0.020001	6.31	31.69	15.55	0.78
1	74	300.00	107.80	112.00	111.46	112.57	0.020012	6.07	49.45	26.46	0.78
1	74	500.00	107.80	112.81	112.50	113.46	0.020006	6.51	85.02	81.89	0.80
1	74	800.00	107.80	113.38	113.33	114.22	0.020009	7.64	135.03	95.63	0.83
1	74	1350.00	107.80	114.29	114.29	115.27	0.017093	8.63	247.79	157.65	0.81
1	74	2000.00	107.80	114.95	114.95	116.07	0.017230	9.70	359.01	182.53	0.84
1	74	2200.00	107.80	115.14	115.14	116.28	0.016892	9.90	395.26	189.81	0.83
1	74	2500.00	107.80	115.36	115.36	116.57	0.017398	10.38	437.69	197.99	0.85

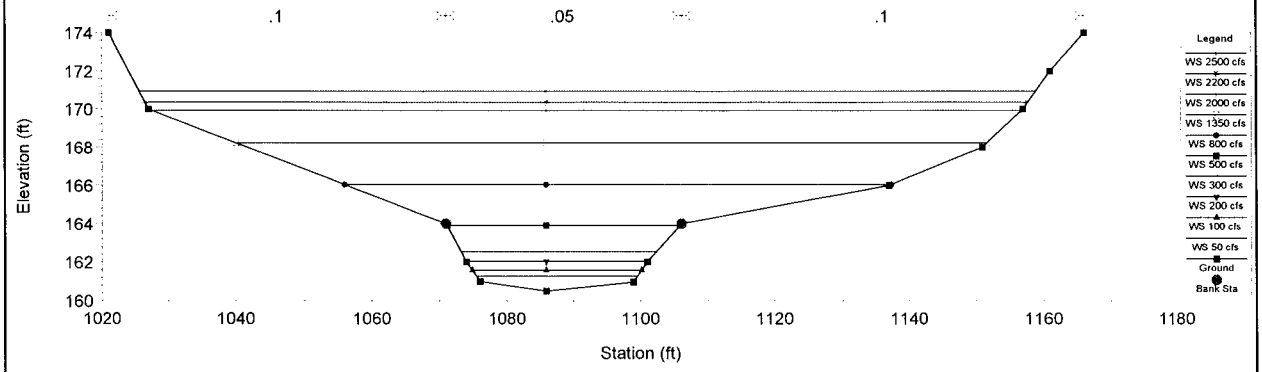
Broomalls Run Plan: Plan 08

Just d/s of the spillway apron



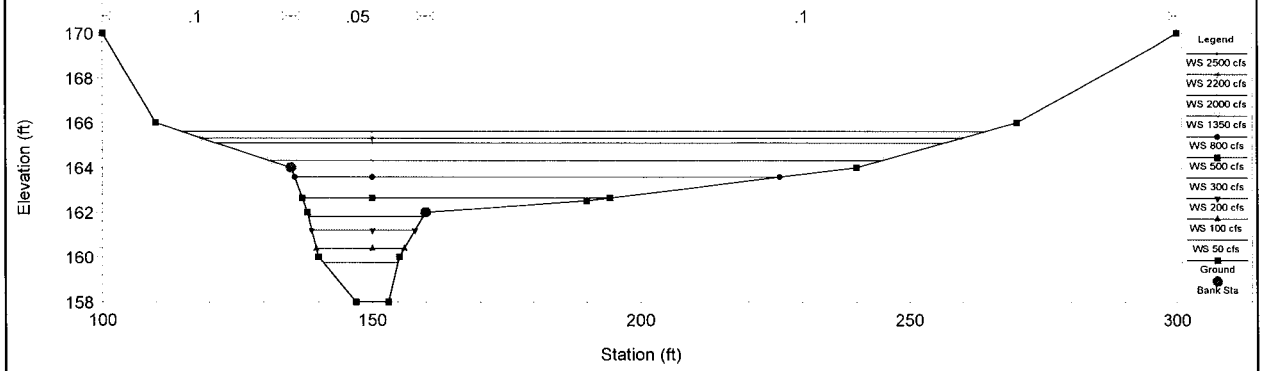
Broomalls Run Plan: Plan 08

50' d/s end of spillway



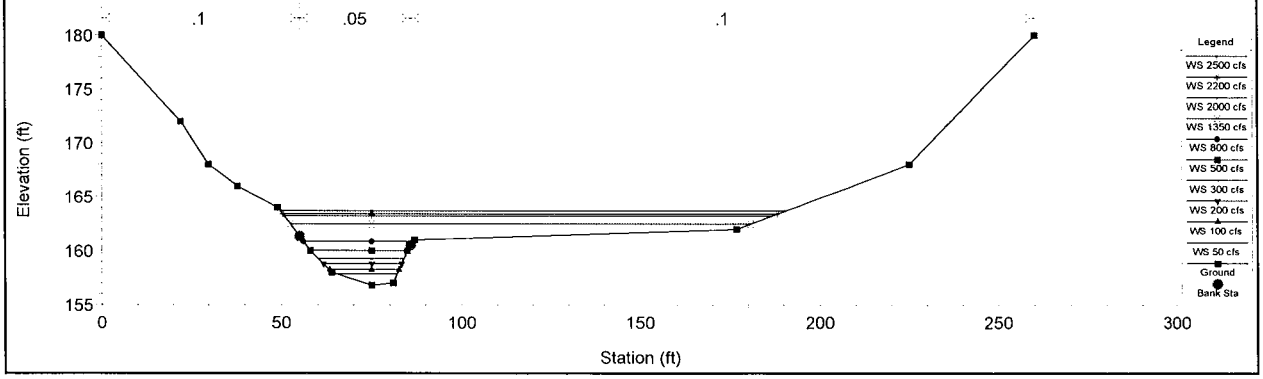
Broomalls Run Plan: Plan 08

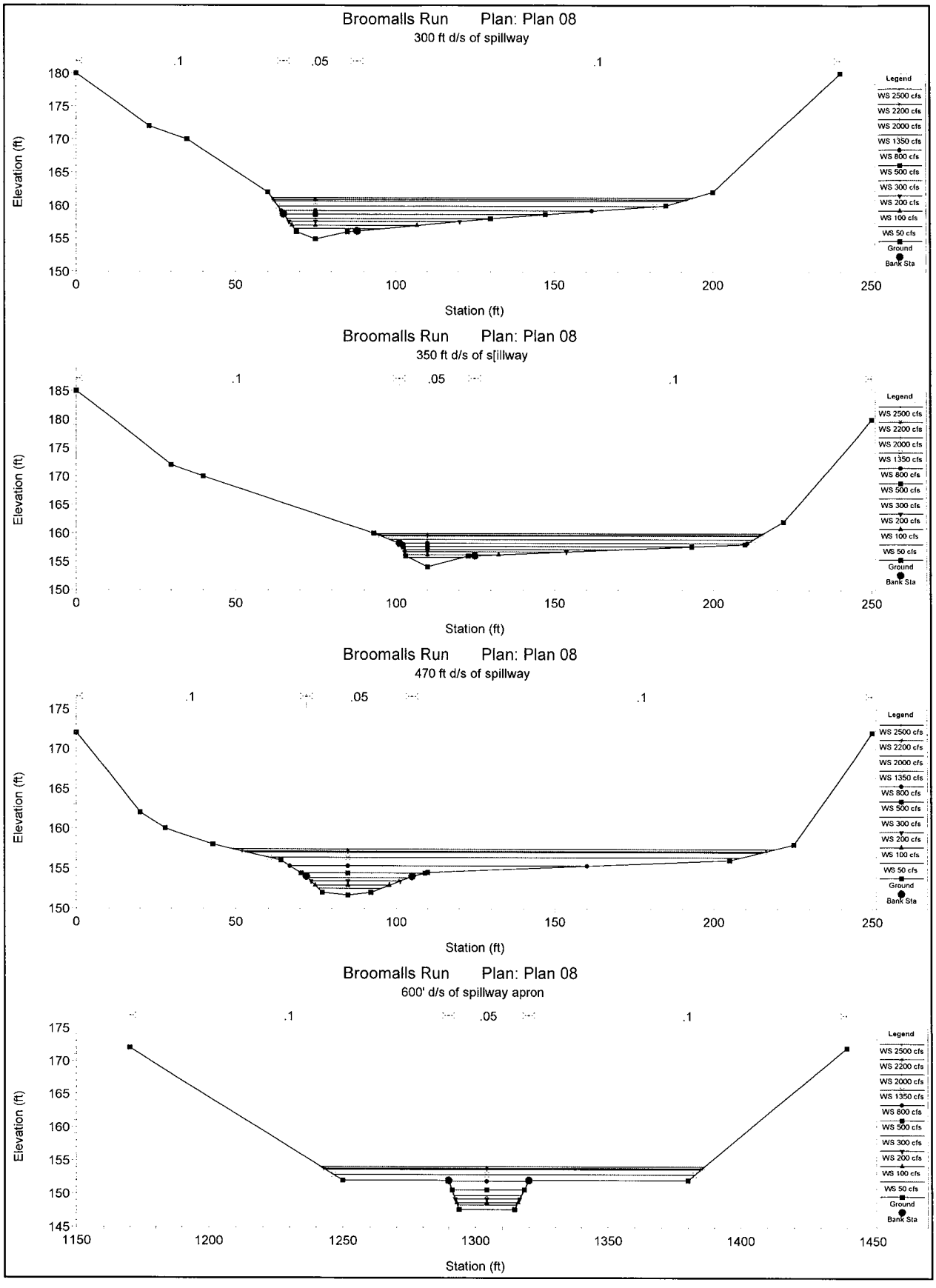
100' d/s end of spillway

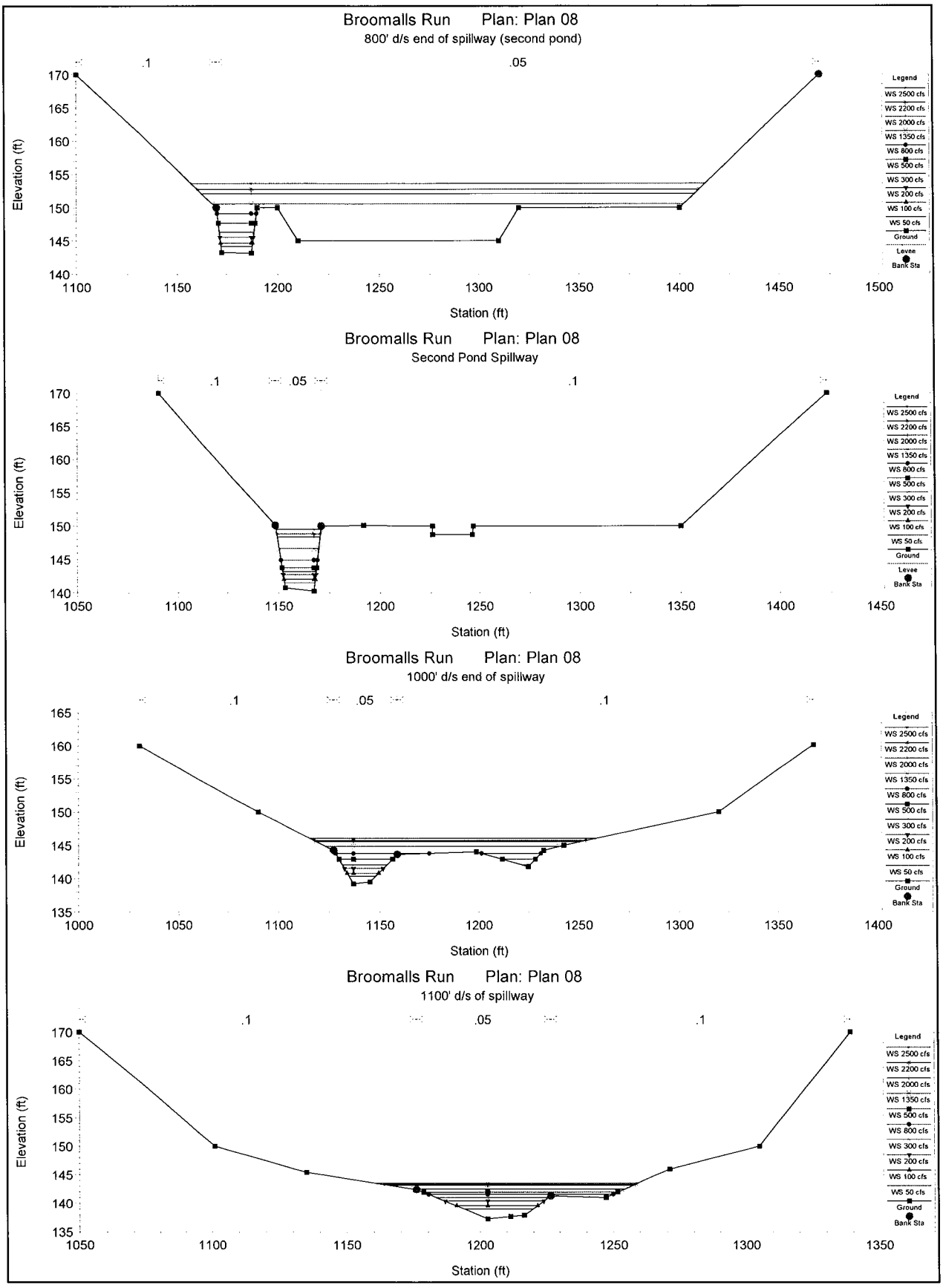


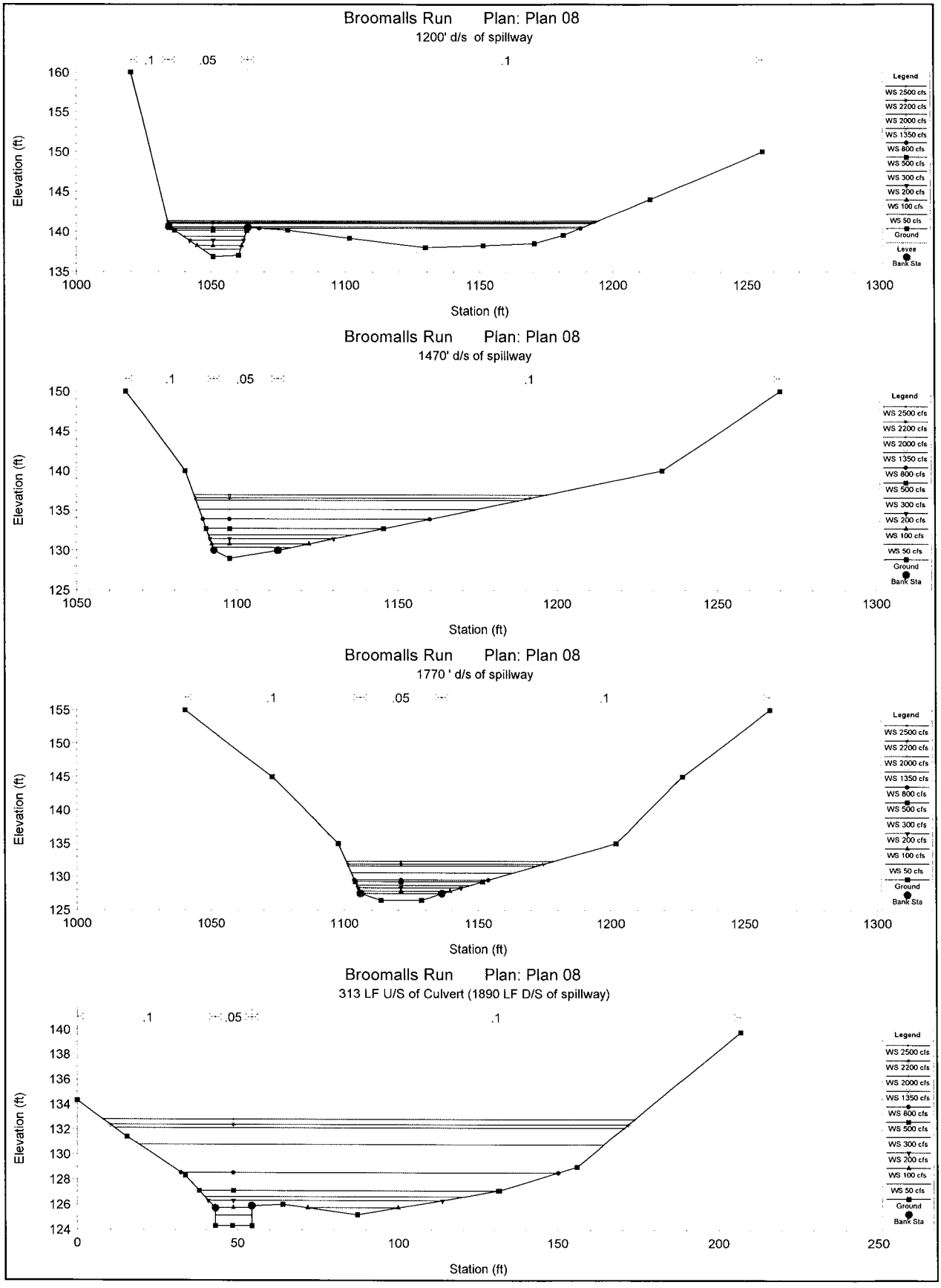
Broomalls Run Plan: Plan 08

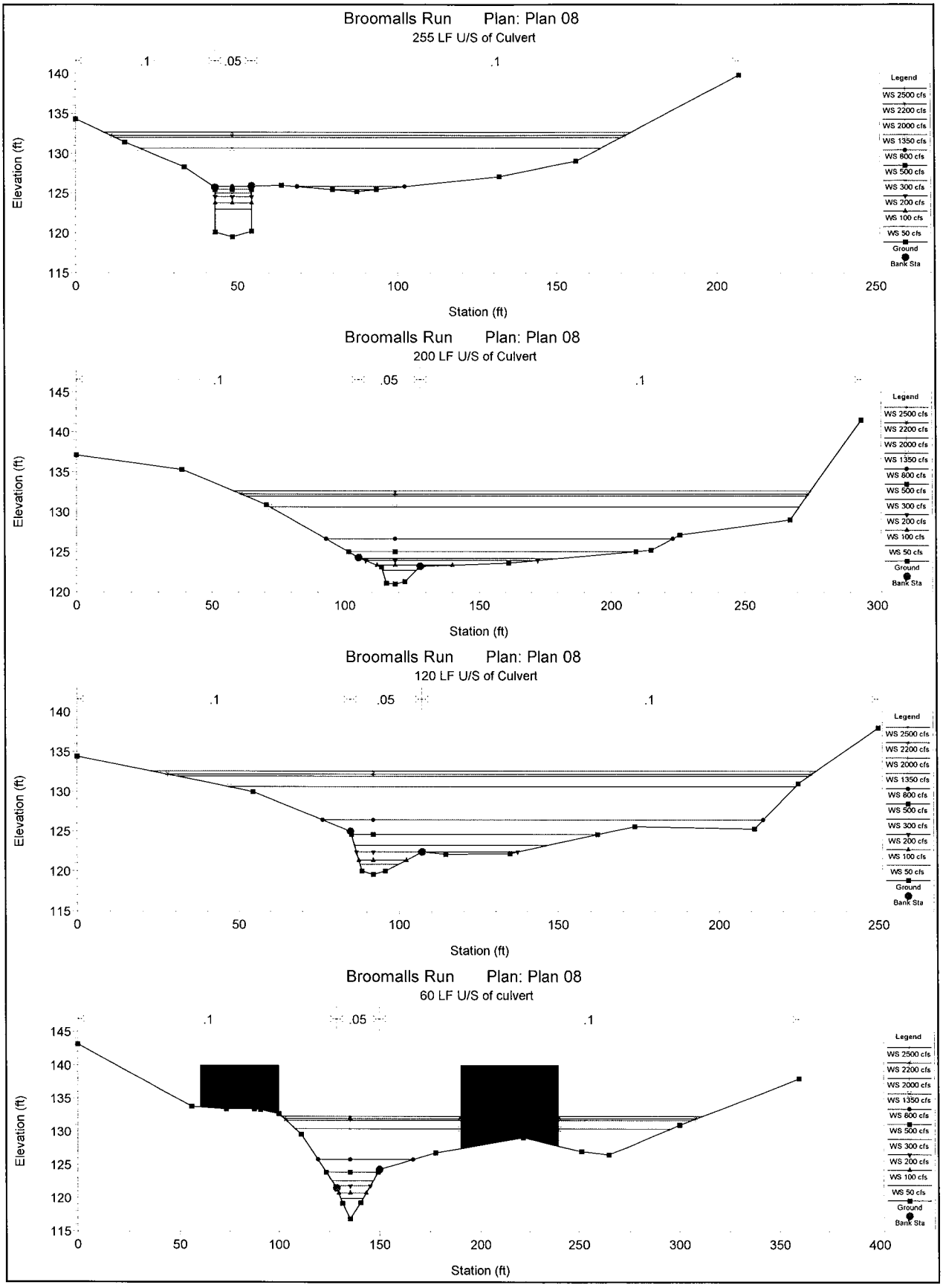
200' d/s end of spillway

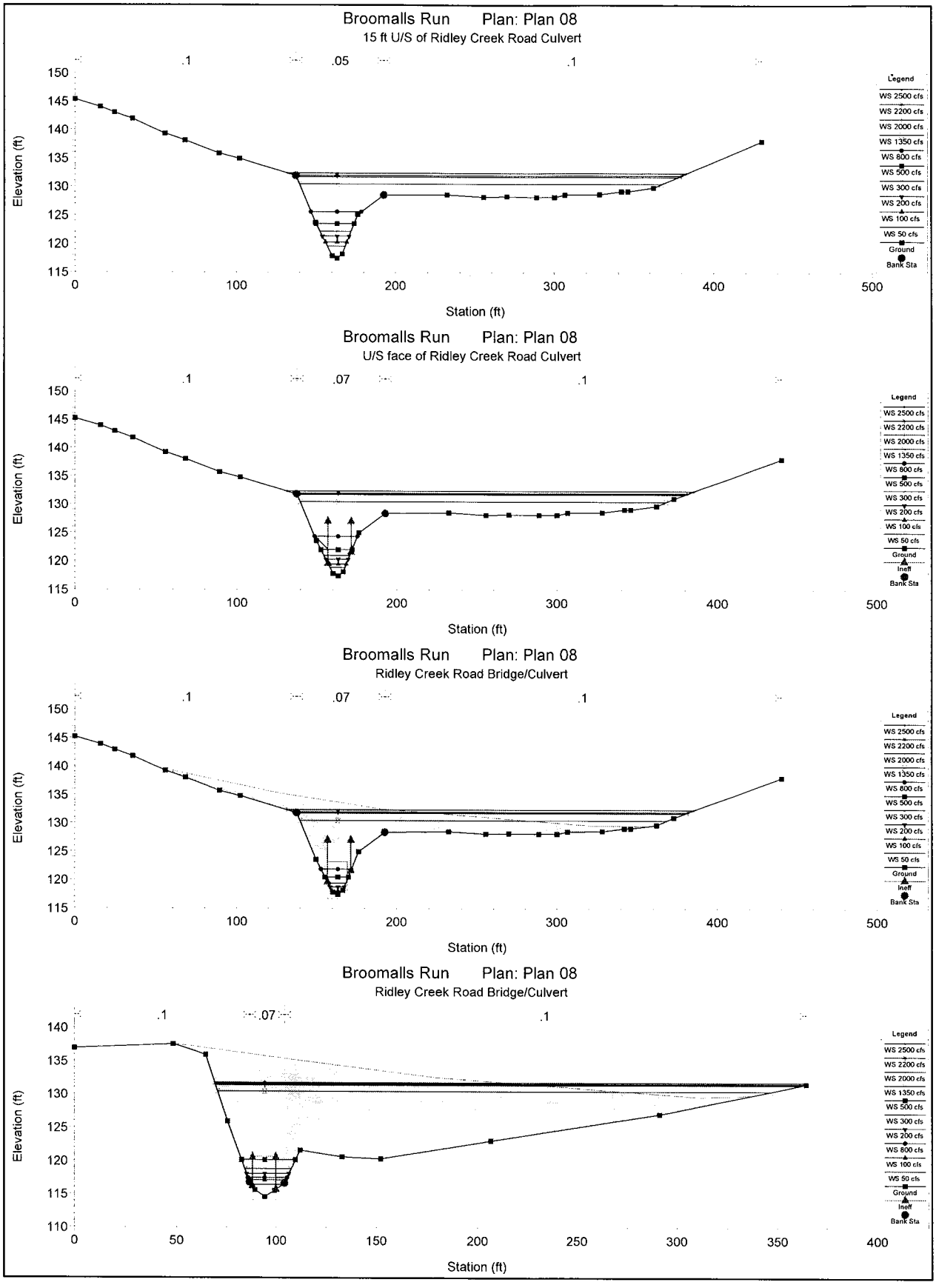


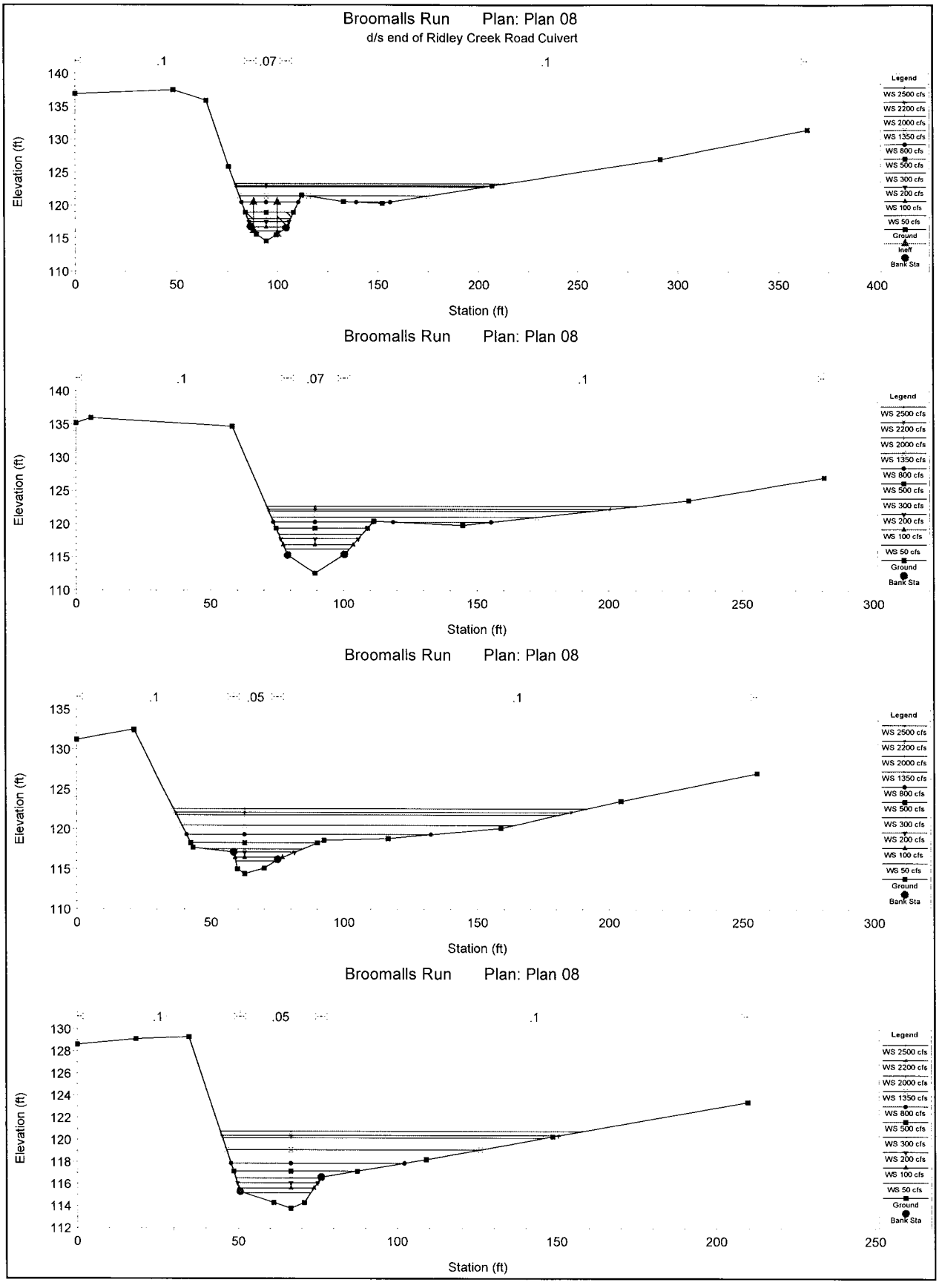

Broomalls Run Plan: Plan 08
300 ft d/s of spillway
.1
.05
.1
Elevation (ft)
180
175
170
165
160
155
150
0
50
100
150
200
250
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta
Broomalls Run Plan: Plan 08
350 ft d/s of s[illway
.1
.05
.1
Elevation (ft)
185
180
175
170
165
160
155
150
0
50
100
150
200
250
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta
Broomalls Run Plan: Plan 08
470 ft d/s of spillway
.1
.05
.1
Elevation (ft)
175
170
165
160
155
150
0
50
100
150
200
250
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta
Broomalls Run Plan: Plan 08
600' d/s of spillway apron
.1
.05
.1
Elevation (ft)
175
170
165
160
155
150
145
1150
1200
1250
1300
1350
1400
1450
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta

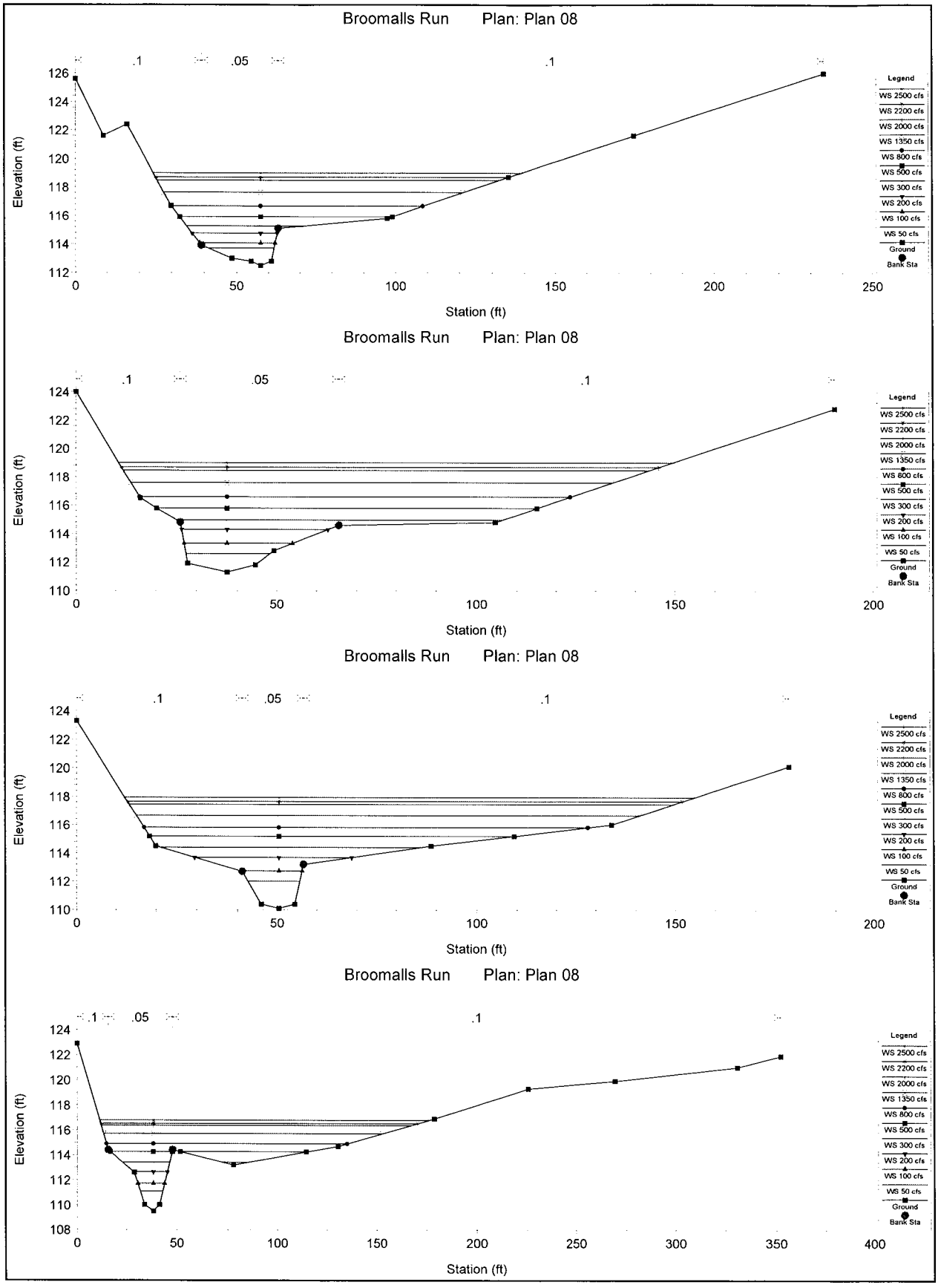

Broomalls Run Plan: Plan 08
800' d/s end of spillway (second pond)
.1
.05
Elevation (ft)
170
165
160
155
150
145
140
1100
1150
1200
1250
1300
1350
1400
1450
1500
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Levee
Bank Sta
Broomalls Run Plan: Plan 08
Second Pond Spillway
.1
.05
.1
Elevation (ft)
170
165
160
155
150
145
140
1050
1100
1150
1200
1250
1300
1350
1400
1450
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Levee
Bank Sta
Broomalls Run Plan: Plan 08
1000' d/s end of spillway
.1
.05
.1
Elevation (ft)
165
160
155
150
145
140
135
1000
1050
1100
1150
1200
1250
1300
1350
1400
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta
Broomalls Run Plan: Plan 08
1100' d/s of spillway
.1
.05
.1
Elevation (ft)
170
165
160
155
150
145
140
135
1050
1100
1150
1200
1250
1300
1350
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 500 cfs
WS 800 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta

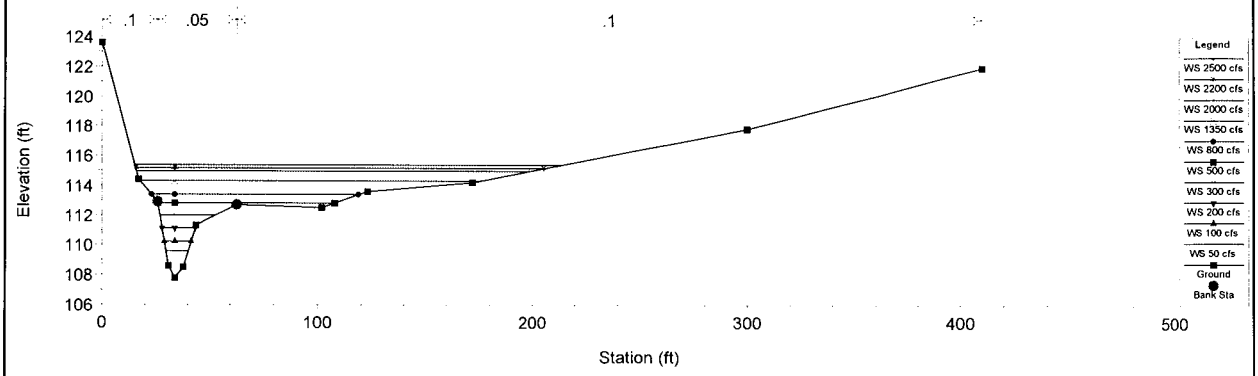

Broomalls Run Plan: Plan 08
1200' d/s of spillway
.1 .05 .1
Elevation (ft)
160
155
150
145
140
135
1000 1050 1100 1150 1200 1250 1300
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Levee
Bank Sta
Broomalls Run Plan: Plan 08
1470' d/s of spillway
.1 .05 .1
Elevation (ft)
150
145
140
135
130
125
1050 1100 1150 1200 1250 1300
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta
Broomalls Run Plan: Plan 08
1770 ' d/s of spillway
.1 .05 .1
Elevation (ft)
155
150
145
140
135
130
125
1000 1050 1100 1150 1200 1250 1300
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta
Broomalls Run Plan: Plan 08
313 LF U/S of Culvert (1890 LF D/S of spillway)
.1 .05 .1
Elevation (ft)
140
138
136
134
132
130
128
126
124
0 50 100 150 200 250
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta


Broomalls Run Plan: Plan 08
255 LF U/S of Culvert
.1
.05
.1
Elevation (ft)
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta
Broomalls Run Plan: Plan 08
200 LF U/S of Culvert
Broomalls Run Plan: Plan 08
120 LF U/S of Culvert
Broomalls Run Plan: Plan 08
60 LF U/S of culvert


Broomalls Run Plan: Plan 08
15 ft U/S of Ridley Creek Road Culvert
.1 .05 .1
Elevation (ft)
150
145
140
135
130
125
120
115
0 100 200 300 400 500
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta
Broomalls Run Plan: Plan 08
U/S face of Ridley Creek Road Culvert
.1 .07 .1
Elevation (ft)
150
145
140
135
130
125
120
115
0 100 200 300 400 500
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Ineff
Bank Sta
Broomalls Run Plan: Plan 08
Ridley Creek Road Bridge/Culvert
.1 .07 .1
Elevation (ft)
150
145
140
135
130
125
120
115
0 100 200 300 400 500
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Ineff
Bank Sta
Broomalls Run Plan: Plan 08
Ridley Creek Road Bridge/Culvert
.1 .07 .1
Elevation (ft)
140
135
130
125
120
115
110
0 50 100 150 200 250 300 350 400
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 800 cfs
WS 100 cfs
WS 50 cfs
Ground
Ineff
Bank Sta


Broomalls Run Plan: Plan 08
d/s end of Ridley Creek Road Culvert
.1
.07
.1
Elevation (ft)
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Ineff
Bank Sta
Broomalls Run Plan: Plan 08
.1
.07
.1
Elevation (ft)
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta
Broomalls Run Plan: Plan 08
.1
.05
.1
Elevation (ft)
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta
Broomalls Run Plan: Plan 08
.1
.05
.1
Elevation (ft)
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta


Broomalls Run Plan: Plan 08
.1
.05
.1
Elevation (ft)
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta
Broomalls Run Plan: Plan 08
Broomalls Run Plan: Plan 08
Broomalls Run Plan: Plan 08


Broomalls Run Plan: Plan 08
.1
.05
.1
124
122
120
118
116
114
112
110
108
106
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
WS 2500 cfs
WS 2200 cfs
WS 2000 cfs
WS 1350 cfs
WS 800 cfs
WS 500 cfs
WS 300 cfs
WS 200 cfs
WS 100 cfs
WS 50 cfs
Ground
Bank Sta