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AGREEMENT RESPECTING
WATER RESOURCE MANAGEMENT

Flood Risk Mapping Study

Portugal Cove, St. Philips, and Outer Cove

Volume II - Appendices

GOVERNMENT OF
NEWFOUNDLAND
AND LABRADOR

Department of Environment

Environment Canada
Environnement Canada

Flood Risk Mapping Study
of
Portugal Cove, St. Philips, and Outer Cove

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APPENDIX A

SCS Hydrologic Soil Groups

APPENDIX A SCS Hydrologic Soil Groups

On the basis of their texture and drainage, thoroughly wetted soils can be classified into four hydrologic soil groups, A, B, C, and D, according to the soil classification system developed by the Soil Conservation Service.

A. Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well to excessively drained sands or gravels. (Low runoff potential).

B. Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures.

C. Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture.

D. Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. (High runoff potential).

APPENDIX B

Soil Series Present in the Study Basins

APPENDIX B Soil Series Present in the Study Basins

Descriptions of the soil series occurring in the study areas taken from the Newfoundland Soil Survey Report "Soils of the Avalon Peninsula" (Heringa, 1981) and are given as follows:

Bauline (Ba):

Bauline soils are developed from shallow, medium textured glacial till derived from siltstone, greywacke, slate, and minor volcanic rocks, and occupy moderately to steeply sloping terrain with slopes of 15 - 40%. Surface and internal drainage is rapid on steep slopes, but in small valleys wet conditions are prevalent most of the year. The depth of the profile ranges from 20 to 75 cm. Bauline soil areas are exceedingly stony and shallow with many rock outcrops.

Cochrane (Cr):

Cochrane soils are developed from medium textured, dark olive gray glacial till derived mainly from gray slate and siltstone, and they occur on undulating to hilly terrain with gentle to very steep slopes ranging between 5 and 20%. These soils are well to rapidly drained on the surface and there is good runoff on slopes. They are moderately well to well drained internally. The surface stoniness varies from moderately to excessively stony land.

Organic (O):

Organic soils are developed from the growth and decomposition of mosses, sedges, heath plants, and other hydrophytic vegetation. Soils are called organic if they contain at least 60 cm of fibrous peat or 40cm of well-decomposed material. Most occupy basins, depressions or gentle slopes where there is sufficient moisture to promote their development. The soils are poorly drained and usually saturated with water most of the year unless artificially drained.

Pouch Cove (Pc):

Pouch Cove soils are developed from stony, coarse textured, dark olive glacial till derived from siltstone and slate. They occur on undulating to gently rolling topography, but also on steeper slopes, and sometimes on strongly to steeply sloping land. Generally the slopes range from 2 to 10%. Pouch Cove soils are imperfectly to well drained on the surface, but have imperfect to poor drainage internally.

Red Cove (Rc):

Red Cove soils occur on the coastal hills north, east, and south of St. John's. These soils are developed from extremely stony, coarse textured, reddish gray glacial till derived from red sandstone, siltstone, slate and red conglomerate. The soils occupy strongly to very steeply sloping topography with slopes ranging between 15 and 40%. The surface drainage is very rapid, but internal drainage is poor to very poor.

Torbay (Tb):

Torbay soils are developed from moderately coarse textured and olive-coloured glacial till derived from acid slate, siltstone, and acid volcanic rocks. They occur in level to depressed areas, in basins or drainage channels, and at the bottom of hills or long slopes. Slopes are generally less than 3%. Surface drainage is poor in depressions, on level sites , and in locations where drainage is impeded by vegetation. Internal drainage is from poor to very poor. The soils are very stony to excessively stony.

APPENDIX C

Soil Survey Symbol Convention

APPENDIX C Soil Survey Symbol Convention

The following example illustrates the symbol convention used in the soil survey:

Cr: Tb

$E_{4\,II}$

The symbol has 4 components: the soil series combination (Cr:Tb), and the topographic characteristics of degree of slope (E), stoniness (4), and rockiness (II).

Soil Series Combination

A single soil series symbol indicates that the series occupies 80% of the area or more. Complex symbols denote that the first named series occupies 40 - 80% of the area, and the second and third together occupy 20 - 40% of the area. Soils occupying less than 20% of an area are not designated. In the example, Cr:Tb signifies 40-80% Cochrane series soils, and 20-40% Torbay series soils.

Degree of Slope:

A.....depressional to level, 0 to 0.5% slope

B.....very gently sloping, 0.5 to 2% slope

C.....gently sloping, 2 to 5% slope

D.....moderately sloping, 5 to 9% slope

E.....strongly sloping, 9 to15% slope

F.....steeply sloping, 15 to 30% slope

G....very steeply sloping, 30 to 60% slope

H.....extremely sloping, over 60% slope

Stoniness: (used primarily for describing agricultural suitability of the soil)

0....Non-stony

1....Slightly stony (slight to no hindrance to cultivation)

2....Moderately stony (some interference with cultivation)

3....Very stony (sufficient stones to constitute a serious handicap to cultivation)

4....Exceedingly stony (sufficient stones to prevent cultivation until considerable clearing is done)

5....Excessively stony (too stony to permit any cultivation)

Rockiness:

I.....2 - 10 % exposed bedrock

II....10 - 25% exposed bedrock

III...25 - 50% exposed bedrock

IV...50 - 90% exposed bedrock

V....over 90% exposed bedrock

APPENDIX D

Soil Combinations Present in the Study Basins

APPENDIX D Soil Combinations Present in the Study Basins

The soil combinations present in each of the watersheds are given below using the soil symbol convention described in Appendix C.

Portugal Cove

Ba	Cr	Cr	Cr	Cr	Cr:Pc	Cr:O_3	Pc:Tb	Tb:O_3	O_3
G_{4IV} ,	D_4 ,	D_{4I} ,	E_{4I} ,	E_{3I} ,	E_3 ,	D_3 ,	D_4 ,	B_4 ,	B

St. Phillips I

Cr	Cr:Pc	Cr	Cr:O_3	Cr:O_3	Cr:Tb	Cr:Tb	Cr:Tb	O_5
C_4 ,	D_{3-2} ,	F_{4II} ,	C_{4-2} ,	D_4 ,	E_{4II} ,	E_4 ,	D_4 ,	B

St. Phillips II

Cr	Cr:Pc	Cr:O_3	Cr:O_3	Cr:Tb	Cr:Tb	Cr:Tb	O_5
C_4 ,	D_{3-2} ,	C_{4-2} ,	D_4 ,	E_{4II} ,	E_4 ,	D_4 ,	B

Logy Bay

Cr:Tb	Rc:Cr	Tb:O_3	O_3
D_2 ,	G_{3IV} ,	B_4 ,	B

Outer Cove

Cr:Tb
D_2

Northeast Pond River

Ba	Cr	Cr	Cr:Pc	Pc:Tb	O_3
F_{4III} ,	E_{4I} ,	E_{3I} ,	E_3 ,	D_4 ,	B

North Pond Brook

Cr	Cr	Cr	Cr:O_3	Cr:Tb	Tb	O_3
E_{4I} ,	E_{3I} ,	E_3 ,	C_{4-2} ,	D_3 ,	B_4 ,	B

APPENDIX E

SCS Hydrologic Soil Group Classifications of Soil Combinations Present in the Study Basins

APPENDIX E SCS Hydrologic Soil Group Classifications of Soil Combinations Present in the Study Basins

Soil Symbol	Internal Drainage and Slope Characteristics	Hydrologic Soil Group
Ba Ba $G_{4\,IV}$ $F_{4\,III}$	rapid drained soil, steeply to very steeply sloping	AB
Cr Cr Cr D_4 $D_{4\,I}$ C_4	moderately well to well drained soil, gently to moderately sloping	B
Cr Cr Cr Cr E_3 $E_{3\,I}$ $E_{4\,I}$ $F_{4\,II}$	moderately well to well drained soil, strongly to steeply sloping	BC
Cr : Pc Cr : Pc E_3 $D_{3\text{-}2}$	mixture of moderately well to well drained soil with an imperfectly to poorly drained soil, moderately to strongly sloping	BC
Cr:O_3 Cr:O_3 Cr:O_3 D_3 D_4 $C_{4\text{-}2}$	mixture of moderately well to well drained soil with a very poorly drained soil, gently to moderately sloping	C
Cr:Tb Cr:Tb Cr:Tb Cr:Tb Cr:Tb D_2 D_3 D_4 E_4 E_{4II}	mixture of moderately well to well drained soil with a poorly drained soil, moderately to strongly sloping	C
Pc:Tb D_4	mixture of an imperfectly to poorly drained soil with a poorly drained soil, moderately sloping	C
Rc:Cr $G_{3\,IV}$	mixture of an imperfectly to poorly drained soil with a moderately well to well drained soil, very strongly sloping	C
Tb B_4	poorly drained soil, very gently sloping	CD
Tb:O_3 Tb:O_5 B_4 B_4	mixture of a poorly drained soil with a very poorly drained soil, very gently sloping	CD
O_3 O_5 B B	very poorly drained soil, very gently sloping	D

APPENDIX F

Curve Number and Runoff Coefficient Calculations

Portugal Cove Curve Number Calculation

Land Use	HYDROLOGIC SOIL GROUP																		Total	Total
	AB			B			BC			C			CD			D				
Categories	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	Area x CN
Pasture/Barren	0.2	50	10	0.36	61	21.96	3.4825	68	236.81	1.4	74	103.60	0.72	77	55.44	0	80	0	6.16	427.81
Residential	0.05	73	3.65	2	76	152	0.86	80	68.80	1.72	84	144.48	0	86	0	0.1	87	8.7	4.73	377.63
Wooded	1.96	40	78.4	6.37	55	350.35	2.3725	63	149.47	10.598	70	741.86	0.16	74	11.84	2.2925	77	176.5225	23.75	1508.44
Paved Road	0	79	0	0.15	84	12.6	0.0795	87	6.92	0.123	90	11.07	0	91	0	0.0075	92	0.69	0.36	31.28
Unpaved Road	0	77	0	0.09	82	7.38	0.0255	85	2.17	0.189	87	16.44	0	88	0	0	89	0	0.30	25.99
Lakes	0	100	0	0.8	100	80	0.97	100	97.00	0.86	100	86.00	0	100	0	0.19	100	19	2.82	282.00
Swamps	0	100	0	0.6	100	60	0.52	100	52	2.99	100	299.00	0.42	100	42	1.23	100	123	5.76	576.00
																		Total	43.89	3229
																		Weighted Avg CN		74

Note: Areas in square centimetres, based on 1:50,000 scale map.

Portugal Cove Runoff Coefficient Calculation

Land Use	HYDROLOGIC SOIL GROUP																		Total	Total
	AB			B			BC			C			CD			D				
Categories	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	Area x C
Pasture/Barren	0.2	0.2	0.04	0.36	0.25	0.09	3.4825	0.3	1.04	1.4	0.35	0.49	0.72	0.4	0.288	0	0.45	0	6.16	1.95
Residential	0.05	0.33	0.0165	2	0.33	0.66	0.86	0.33	0.28	1.72	0.33	0.57	0	0.33	0	0.1	0.33	0.033	4.73	1.56
Wooded	1.96	0.075	0.147	6.37	0.2	1.274	2.3725	0.25	0.59	10.598	0.3	3.18	0.16	0.35	0.056	2.2925	0.4	0.917	23.75	6.17
Paved Road	0	0.83	0	0.15	0.83	0.1245	0.0795	0.83	0.07	0.123	0.83	0.10	0	0.83	0	0.0075	0.83	0.006225	0.36	0.30
Unpaved Road	0	0.7	0	0.09	0.7	0.063	0.0255	0.7	0.02	0.189	0.7	0.13	0	0.7	0	0	0.7	0	0.30	0.21
Lakes	0	1	0	0.8	1	0.8	0.97	1	0.97	0.86	1	0.86	0	1	0	0.19	1	0.19	2.82	2.82
Swamps	0	1	0	0.6	1	0.6	0.52	1	0.52	2.99	1	2.99	0.42	1	0.42	1.23	1	1.23	5.76	5.76
																		Total	43.89	18.77
																		Weighted Avg C		0.43

Note: Areas in square centimetres, based on 1:50,000 scale map.

St. Phillips I Curve Number Calculation

Land Use Categories	*HYDROLOGIC SOIL GROUP*																		Total Area	Total Area x CN
	AB			B			BC			C			CD			D				
	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN		
Pasture/Barren	0	50	0	0.04	61	2.44	0.04	68	2.72	0.66	74	48.84	0	77	0	0.29	80	23.2	1.03	77.20
Residential	0	73	0	0	76	0	0.08	80	6.40	1.07	84	89.88	0	86	0	0	87	0	1.15	96.28
Wooded	0	40	0	1.62	55	89.1	4.83425	63	304.56	39.176	70	2742.32	0	74	0	0.692	77	53.284	46.32	3189.26
Paved Road	0	79	0	0	84	0	0.01575	87	1.37	0.084	90	7.56	0	91	0	0	92	0	0.10	8.93
Unpaved Road	0	77	0	0	82	0	0	85	0.00	0.18	87	15.66	0	88	0	0.018	89	1.602	0.20	17.26
Lakes	0	100	0	0	100	0	0.1	100	10.00	3.9	100	390.00	0	100	0	0	100	0	4.00	400.00
Swamps	0	100	0	0.48	100	48	0.3	100	30	3.81	100	381.00	0	100	0	1.21	100	121	5.80	580.00
																		Total	58.60	4369
																		Weighted Avg CN		75

Note: Areas in square centimetres, based on 1:50,000 scale map.

St. Phillips I Runoff Coefficient Calculation

Land Use Categories	*HYDROLOGIC SOIL GROUP*																		Total Area	Total Area x C
	AB			B			BC			C			CD			D				
	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C		
Pasture/Barren	0	0.2	0	0.04	0.25	0.01	0.04	0.3	0.01	0.66	0.35	0.23	0	0.4	0	0.29	0.45	0.1305	1.03	0.38
Residential	0	0.33	0	0	0.33	0	0.08	0.33	0.03	1.07	0.33	0.35	0	0.33	0	0	0.33	0	1.15	0.38
Wooded	0	0.075	0	1.62	0.2	0.324	4.83425	0.25	1.21	39.176	0.3	11.75	0	0.35	0	0.692	0.4	0.2768	46.32	13.56
Paved Road	0	0.83	0	0	0.83	0	0.01575	0.83	0.01	0.084	0.83	0.07	0	0.83	0	0	0.83	0	0.10	0.08
Unpaved Road	0	0.7	0	0	0.7	0	0	0.7	0.00	0.18	0.7	0.13	0	0.7	0	0.018	0.7	0.0126	0.20	0.14
Lakes	0	1	0	0	1	0	0.1	1	0.10	3.9	1	3.90	0	1	0	0	1	0	4.00	4.00
Swamps	0	1	0	0.48	1	0.48	0.3	1	0.30	3.81	1	3.81	0	1	0	1.21	1	1.21	5.80	5.80
																		Total	58.60	24.35
																		Weighted Avg C		0.42

Note: Areas in square centimetres, based on 1:50,000 scale map.

St. Phillips II Curve Number Calculation

Land Use Categories	HYDROLOGIC SOIL GROUP																		Total Area	Total Area x CN
	AB			B			BC			C			CD			D				
	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN		
Pasture/Barren	0	50	0	0.04	61	2.44	0	68	0.00	0.54	74	39.96	0	77	0	0.29	80	23.2	0.87	65.60
Residential	0	73	0	0	76	0	0	80	0.00	0.84	84	70.56	0	86	0	0	87	0	0.84	70.56
Wooded	0	40	0	1.62	55	89.1	4.05	63	255.15	36.7982	70	2575.87	0	74	0	0.692	77	53.284	43.16	2973.41
Paved Road	0	79	0	0	84	0	0	87	0.00	0.075	90	6.75	0	91	0	0	92	0	0.08	6.75
Unpaved Road	0	77	0	0	82	0	0	85	0.00	0.1368	87	11.90	0	88	0	0.018	89	1.602	0.15	13.50
Lakes	0	100	0	0	100	0	0.1	100	10.00	3.9	100	390.00	0	100	0	0	100	0	4.00	400.00
Swamps	0	100	0	0.48	100	48	0.3	100	30	3.81	100	381.00	0	100	0	1.21	100	121	5.80	580.00
																		Total	54.90	4110
																		Weighted Avg CN		75

Note: Areas in square centimetres, based on 1:50,000 scale map.

St. Phillips II Runoff Coefficient Calculation

Land Use Categories	HYDROLOGIC SOIL GROUP																		Total Area	Total Area x C
	AB			B			BC			C			CD			D				
	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C		
Pasture/Barren	0	0.2	0	0.04	0.25	0.01	0	0.3	0.00	0.54	0.35	0.19	0	0.4	0	0.29	0.45	0.1305	0.87	0.33
Residential	0	0.33	0	0	0.33	0	0	0.33	0.00	0.84	0.33	0.28	0	0.33	0	0	0.33	0	0.84	0.28
Wooded	0	0.075	0	1.62	0.2	0.324	4.05	0.25	1.01	36.7982	0.3	11.04	0	0.35	0	0.692	0.4	0.2768	43.16	12.65
Paved Road	0	0.83	0	0	0.83	0	0	0.83	0.00	0.075	0.83	0.06	0	0.83	0	0	0.83	0	0.08	0.06
Unpaved Road	0	0.7	0	0	0.7	0	0	0.7	0.00	0.1368	0.7	0.10	0	0.7	0	0.018	0.7	0.0126	0.15	0.11
Lakes	0	1	0	0	1	0	0.1	1	0.10	3.9	1	3.90	0	1	0	0	1	0	4.00	4.00
Swamps	0	1	0	0.48	1	0.48	0.3	1	0.30	3.81	1	3.81	0	1	0	1.21	1	1.21	5.80	5.80
																		Total	54.90	23.23
																		Weighted Avg C		0.42

Note: Areas in square centimetres, based on 1:50,000 scale map.

Logy Bay Curve Number Calculation

Land Use	*HYDROLOGIC SOIL GROUP*																		Total	Total
	AB			B			BC			C			CD			D				
Categories	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	Area x CN
Pasture/Barren	0	50	0	0	61	0	0	68	0.00	0.24	74	17.76	0.16	77	12.32	0	80	0	0.40	30.08
Residential	0	73	0	0	76	0	0	80	0.00	0.44	84	36.96	0	86	0	0	87	0	0.44	36.96
Wooded	0	40	0	0	55	0	0	63	0.00	3.48	70	243.60	0.5804	74	42.9496	0	77	0	4.06	286.55
Paved Road	0	79	0	0	84	0	0	87	0.00	0.06	90	5.40	0	91	0	0	92	0	0.06	5.40
Unpaved Road	0	77	0	0	82	0	0	85	0.00	0.03	87	2.61	0.0096	88	0.8448	0	89	0	0.04	3.45
Lakes	0	100	0	0	100	0	0	100	0.00	0	100	0.00	0	100	0	0	100	0	0.00	0.00
Swamps	0	100	0	0	100	0	0	100	0	0.3	100	30.00	0.01	100	1	0.54	100	54	0.85	85.00
																		Total	5.85	447
																		Weighted Avg CN		76

Note: Areas in square centimetres, based on 1:50,000 scale map.

Logy Bay Runoff Coefficient Calculation

Land Use	*HYDROLOGIC SOIL GROUP*																		Total	Total
	AB			B			BC			C			CD			D				
Categories	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	Area x C
Pasture/Barren	0	0.2	0	0	0.25	0	0	0.3	0.00	0.24	0.35	0.08	0.16	0.4	0.064	0	0.45	0	0.40	0.15
Residential	0	0.33	0	0	0.33	0	0	0.33	0.00	0.44	0.33	0.15	0	0.33	0	0	0.33	0	0.44	0.15
Wooded	0	0.075	0	0	0.2	0	0	0.25	0.00	3.48	0.3	1.04	0.5804	0.35	0.20314	0	0.4	0	4.06	1.25
Paved Road	0	0.83	0	0	0.83	0	0	0.83	0.00	0.06	0.83	0.05	0	0.83	0	0	0.83	0	0.06	0.05
Unpaved Road	0	0.7	0	0	0.7	0	0	0.7	0.00	0.03	0.7	0.02	0.0096	0.7	0.00672	0	0.7	0	0.04	0.03
Lakes	0	1	0	0	1	0	0	1	0.00	0	1	0.00	0	1	0	0	1	0	0.00	0.00
Swamps	0	1	0	0	1	0	0	1	0.00	0.3	1	0.30	0.01	1	0.01	0.54	1	0.54	0.85	0.85
																		Total	5.85	2.47
																		Weighted Avg C		0.42

Note: Areas in square centimetres, based on 1:50,000 scale map.

Outer Cove Curve Number Calculation

Land Use	*HYDROLOGIC SOIL GROUP*																		Total	Total
	AB			B			BC			C			CD			D				
Categories	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	Area x CN
Pasture/Barren	0	50	0	0	61	0	0	68	0.00	1.6392	74	121.30	0	77	0	0	80	0	1.64	121.30
Residential	0	73	0	0	76	0	0	80	0.00	0.3	84	25.20	0	86	0	0	87	0	0.30	25.20
Wooded	0	40	0	0	55	0	0	63	0.00	0.98	70	68.60	0	74	0	0	77	0	0.98	68.60
Paved Road	0	79	0	0	84	0	0	87	0.00	0.0435	90	3.92	0	91	0	0	92	0	0.04	3.92
Unpaved Road	0	77	0	0	82	0	0	85	0.00	0.0072	87	0.63	0	88	0	0	89	0	0.01	0.63
Lakes	0	100	0	0	100	0	0	100	0.00	0	100	0.00	0	100	0	0	100	0	0.00	0.00
Swamps	0	100	0	0	100	0	0	100	0	0.32	100	32.00	0	100	0	0	100	0	0.32	32.00
																		Total	3.29	252
																		Weighted Avg CN		76

Note: Areas in square centimetres, based on 1:50,000 scale map.

Outer Cove Runoff Coefficient Calculation

Land Use	*HYDROLOGIC SOIL GROUP*																		Total	Total
	AB			B			BC			C			CD			D				
Categories	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	Area x C
Pasture/Barren	0	0.2	0	0	0.25	0	0	0.3	0.00	1.6392	0.35	0.57	0	0.4	0	0	0.45	0	1.64	0.57
Residential	0	0.33	0	0	0.33	0	0	0.33	0.00	0.3	0.33	0.10	0	0.33	0	0	0.33	0	0.30	0.10
Wooded	0	0.075	0	0	0.2	0	0	0.25	0.00	0.98	0.3	0.29	0	0.35	0	0	0.4	0	0.98	0.29
Paved Road	0	0.83	0	0	0.83	0	0	0.83	0.00	0.0435	0.83	0.04	0	0.83	0	0	0.83	0	0.04	0.04
Unpaved Road	0	0.7	0	0	0.7	0	0	0.7	0.00	0.0072	0.7	0.01	0	0.7	0	0	0.7	0	0.01	0.01
Lakes	0	1	0	0	1	0	0	1	0.00	0	1	0.00	0	1	0	0	1	0	0.00	0.00
Swamps	0	1	0	0	1	0	0	1	0.00	0.32	1	0.32	0	1	0	0	1	0	0.32	0.32
																		Total	3.29	1.33
																		Weighted Avg C		0.40

Note: Areas in square centimetres, based on 1:50,000 scale map.

Northeast Pond River Curve Number Calculation

Land Use	*HYDROLOGIC SOIL GROUP*																		Total	Total
	AB			B			BC			C			CD			D				
Categories	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	Area x CN
Pasture/Barren	0	50	0	0	61	0	0.524	68	35.63	0.1	74	7.40	0	77	0	0	80	0	0.62	43.03
Residential	0	73	0	0	76	0	0	80	0.00	0	84	0.00	0	86	0	0	87	0	0.00	0.00
Wooded	4.9	40	196	0	55	0	1.67256	63	105.37	5.0864	70	356.05	0	74	0	0	77	0	11.66	657.42
Paved Road	0	79	0	0	84	0	0	87	0.00	0	90	0.00	0	91	0	0	92	0	0.00	0.00
Unpaved Road	0	77	0	0	82	0	0.00744	85	0.63	0.0336	87	2.92	0	88	0	0	89	0	0.04	3.56
Lakes	0	100	0	0	100	0		100	0.00	0.5	100	50.00	0	100	0	0	100	0	0.50	50.00
Swamps	0	100	0	0	100	0	0.676	100	67.6	1.45	100	145.00	0	100	0	0.65	100	65	2.78	277.60
																		Total	15.6	1032
																		Weighted Avg CN		66

Note: Areas in square centimetres, based on 1:50,000 scale map.

Northeast Pond River Runoff Coefficient Calculation

Land Use	*HYDROLOGIC SOIL GROUP*																		Total	Total
	AB			B			BC			C			CD			D				
Categories	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	Area x C
Pasture/Barren	0	0.2	0	0	0.25	0	0.524	0.3	0.16	0.1	0.35	0.04	0	0.4	0	0	0.45	0	0.62	0.19
Residential	0	0.33	0	0	0.33	0	0	0.33	0.00	0	0.33	0.00	0	0.33	0	0	0.33	0	0.00	0.00
Wooded	4.9	0.075	0.3675	0	0.2	0	1.67256	0.25	0.42	5.0864	0.3	1.53	0	0.35	0	0	0.4	0	11.66	2.31
Paved Road	0	0.83	0	0	0.83	0	0	0.83	0.00	0	0.83	0.00	0	0.83	0	0	0.83	0	0.00	0.00
Unpaved Road	0	0.7	0	0	0.7	0	0.00744	0.7	0.01	0.0336	0.7	0.02	0	0.7	0	0	0.7	0	0.04	0.03
Lakes	0	1	0	0	1	0	0	1	0.00	0.5	1	0.50	0	1	0	0	1	0	0.50	0.50
Swamps	0	1	0	0	1	0	0.676	1	0.68	1.45	1	1.45	0	1	0	0.65	1	0.65	2.78	2.78
																		Total	15.6	5.81
																		Weighted Avg C		0.37

Note: Areas in square centimetres, based on 1:50,000 scale map.

North Pond Brook Curve Number Calculation

Land Use	HYDROLOGIC SOIL GROUP																		Total	Total
	AB			B			BC			C			CD			D				
Categories	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	CN	Area x CN	Area	Area x CN
Pasture/Barren		50	0		61	0		68	0	4.25	74	314.5		77	0	0.31	80	24.8	4.56	339.3
Residential		73	0		76	0	0.939	80	75.12	0.55	84	46.2	0.1	86	8.6		87	0	1.589	129.92
Wooded		40	0		55	0	3.68	63	231.84	11.47	70	802.9	0.277	74	20.498	0.57	77	43.89	15.997	1099.128
Paved Road		79	0		84	0	0.015	87	1.305	0.272	90	24.48	0.003	91	0.273	0.08	92	7.36	0.37	33.418
Unpaved Road		77	0		82	0	0.096	85	8.16	0.118	87	10.266		88	0		89	0	0.214	18.426
Lakes		100	0		100	0		100	0	0.72	100	72		100	0		100	0	0.72	72
Swamps		100	0		100	0	0.77	100	77	2.14	100	214	0.32	100	32	0.12	100	12	3.35	335
																		Total	26.8	2027
																		Weighted Avg CN		76

Note: All areas in square centimetres, based on 1:50,000 mapping.

North Pond Brook Runoff Coefficient Calculation

Land Use	HYDROLOGIC SOIL GROUP																		Total	Total
	AB			B			BC			C			CD			D				
Categories	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	C	Area x C	Area	Area x C
Pasture/Barren	0	0.2	0	0	0.25	0	0	0.3	0	4.25	0.35	1.4875	0	0.4	0	0.31	0.45	0.1395	4.56	1.627
Residential	0	0.33	0	0	0.33	0	0.939	0.33	0.30987	0.55	0.33	0.1815	0.1	0.33	0.033	0	0.33	0	1.589	0.52437
Wooded	0	0.075	0	0	0.2	0	3.68	0.25	0.92	11.47	0.3	3.441	0.277	0.35	0.09695	0.57	0.4	0.228	15.997	4.68595
Paved Road	0	0.83	0	0	0.83	0	0.015	0.83	0.01245	0.272	0.83	0.22576	0.003	0.83	0.00249	0.08	0.83	0.0664	0.37	0.3071
Unpaved Road	0	0.7	0	0	0.7	0	0.096	0.7	0.0672	0.118	0.7	0.0826	0	0.7	0	0	0.7	0	0.214	0.1498
Lakes	0	1	0	0	1	0	0	1	0	0.72	1	0.72	0	1	0	0	1	0	0.72	0.72
Swamps	0	1	0	0	1	0	0.77	1	0.77	2.14	1	2.14	0.32	1	0.32	0.12	1	0.12	3.35	3.35
																		Total	26.8	11.36
																		Weighted Avg C		0.42

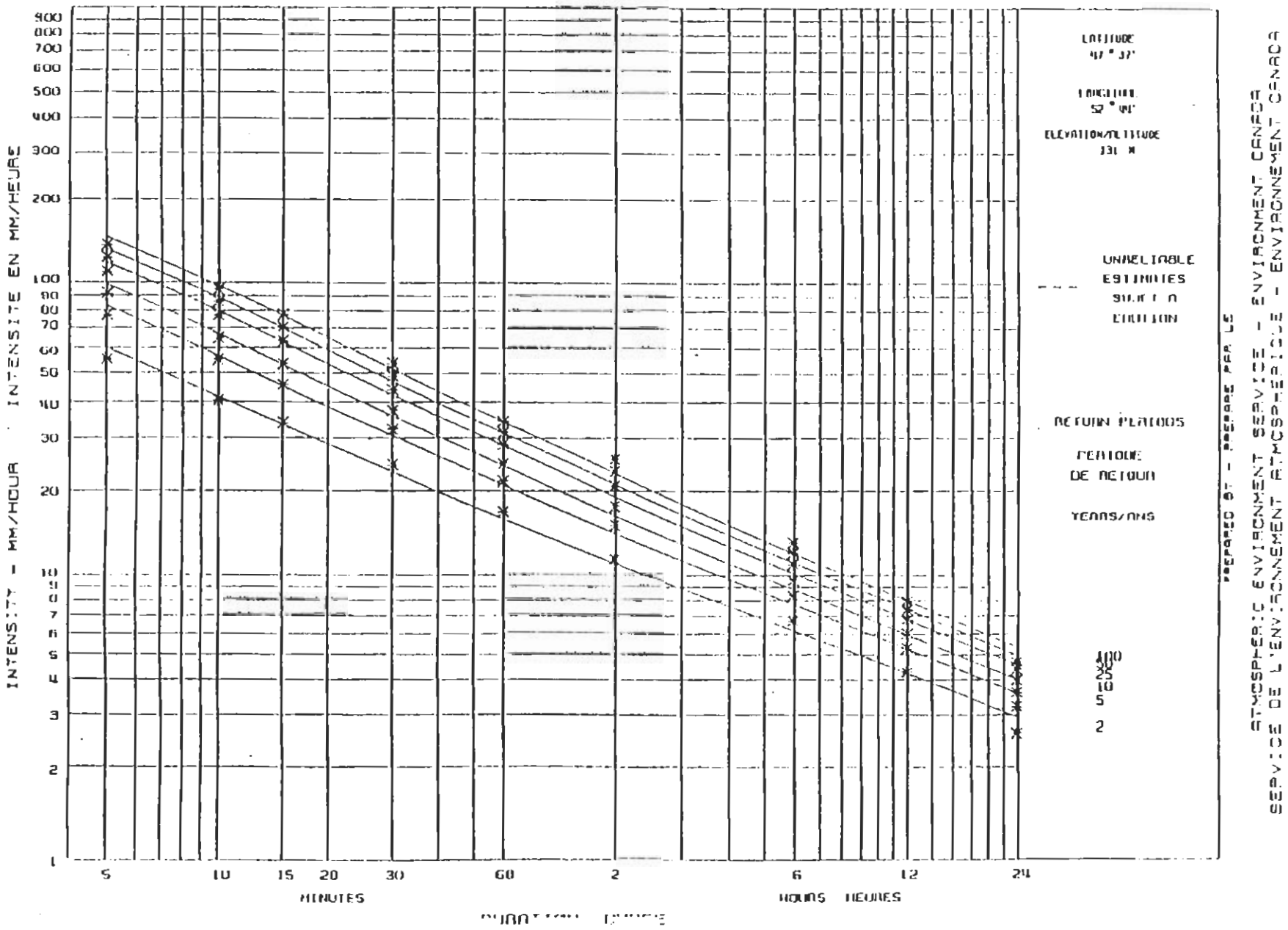
Note: All areas in square centimetres, based on 1:50,000 mapping.

APPENDIX G

Rainfall Intensity - Duration - Frequency Data

SHORT DURATION RAINFALL INTENSITY-DURATION FREQUENCY DATA FOR-
DONNEES SUR L'INTENSITE, LA DUREE ET LA FREQUENCE DES CHUTES DE PLUIE DE COURTE DUREE A ST JOHN'S AIRPORT NFLD

BASED ON RECORDING RAIN GAUGE DATA FOR THE PERIOD-
BASEES SUR LES DONNEES DU PLUVIOGRAPHES POUR LA PERIODE 1949 - 1980 31 YEARS/AN



PREPARED BY - PREPARE PAR LE
SERVICE DE L'ENVIRONNEMENT ATMOSPHERIQUE - ENVIRONMENT CANADA
ATMOSPHERIC ENVIRONMENT SERVICE - ENVIRONNEMENT CANADA

ATMOSPHERIC ENVIRONMENT SERVICE
SERVICE DE L"ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES
INTENSITE, DUREE ET FREQUENCE DES PLUIES

PREPARED BY / PREPARE PAR
THE HYDROMETEOROLOGY AND MARINE DIVISION
LA DIVISION DE L"HYDROMETEOROLOGIE ET DU CLIMAT MARITIME

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TABLE 1 ST JOHN'S AIRPORT NFLD 8403506

LATITUDE 4737 LONGITUDE 5244 ELEVATION/ALTITUDE 131 M

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YEAR ANNEE	5 MIN	10 MIN	15 MIN	30 MIN	1 H	2 H	6 H	12 H	24 H
1949	8.9	8.9	10.2	17.5	28.2	52.6	61.7	62.0	63.5
1961	3.0	4.3	5.3	6.9	8.6	13.5	25.7	35.6	38.6
1962	2.8	4.6	4.6	8.1	13.0	20.6	33.8	54.9	59.7
1963	10.2	11.2	11.7	13.7	18.5	23.6	40.9	52.3	57.9
1964	4.3	6.9	7.9	11.2	19.3	28.2	54.9	72.6	77.5
1965	5.3	7.4	9.9	13.0	17.8	19.6	32.3	51.8	59.7
1966	8.4	13.2	17.0	25.4	29.7	43.7	48.5	64.5	85.3
1967	2.3	3.8	5.3	9.9	10.9	16.3	29.5	44.4	58.4
1968	6.3	12.7	13.7	14.7	17.5	22.4	41.9	55.1	61.7
1969	5.6	7.1	8.4	8.6	11.7	19.0	30.7	34.5	48.3
1970	5.6	7.1	10.7	15.2	16.3	19.6	42.4	62.5	87.4
1971	6.3	10.4	14.5	16.0	19.0	22.1	34.3	41.1	77.7
1972	4.8	5.3	6.6	10.9	15.0	20.6	47.8	72.6	89.2
1973	5.3	6.9	7.9	10.4	16.5	30.0	49.5	65.8	67.1
1974	3.6	5.6	6.3	9.9	16.3	22.4	42.4	53.3	72.9
1975	8.1	10.4	12.2	17.8	19.0	19.6	46.5	71.9	82.3
1976	3.6	4.8	6.1	8.4	12.7	19.0	33.8	42.2	53.6
1977	3.8	5.6	7.6	11.7	17.5	23.4	38.6	40.4	41.4
1978	4.0	5.9	7.4	7.6	12.9	13.1	27.1	37.6	43.0
1979	3.2	4.2	5.9	10.2	16.2	18.1	29.3	41.9	49.2
1980	3.2	6.1	7.4	12.2	17.4	23.9	33.6	41.6	69.8
1981	-99.9	-99.9	-99.9	-99.9	15.0	22.4	46.7	72.5	82.6
1982	5.1	9.0	12.9	17.1	24.5	35.9	80.3	82.4	84.0
1983	1.6	3.2	4.8	9.6	19.2	26.5	47.3	52.8	54.7
1984	5.0	9.9	13.0	21.5	27.1	36.6	61.0	74.0	75.3
1985	5.2	7.1	9.8	11.3	14.1	18.5	36.0	54.9	82.9
1986	3.1	4.8	7.2	14.3	23.3	27.9	40.2	58.9	70.6
1987	5.1	7.3	8.6	16.2	23.5	24.2	30.6	36.6	46.8
1988	6.6	10.6	13.2	17.4	23.4	25.9	44.8	45.8	49.0
1989	2.9	4.5	6.2	8.0	10.9	19.7	43.4	51.6	51.6
1990	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	83.4
# YRS. ANNEES	29	29	29	29	30	30	30	30	31
MEAN MOYENNE	4.9	7.2	9.0	12.9	17.8	24.3	41.8	54.3	65.3
STD. DEV. ECART-TYPE	2.1	2.7	3.3	4.4	5.3	8.5	11.8	13.4	15.4
SKEW DISSYMETRIE	0.81	0.64	0.65	0.94	0.56	1.76	1.29	0.32	-0.05

NOTE:-99.9 INDICATES MSG DATA
DONNEES MANQUANTES

KURTOSIS	3.62	2.75	2.80	4.02	3.10	6.80	5.71	2.33	1.95
KURTOSIS									

WARNING / AVERTISSEMENT
YEAR 1949 HAD VALUE GREATER THAN 100 YEAR STORM.
EN 1949 L"INTENSITE DE LA PLUIE A DE PASSE
CELLE POUR UNE PERIODE DE RETOUR DE 100 ANS
DATA/LA VALEUR = 52.6 100 YEAR/ANNEE = 51.0

WARNING / AVERTISSEMENT
YEAR 1982 HAD VALUE GREATER THAN 100 YEAR STORM.
EN 1982 L"INTENSITE DE LA PLUIE A DE PASSE
CELLE POUR UNE PERIODE DE RETOUR DE 100 ANS
DATA/LA VALEUR = 80.3 100 YEAR/ANNEE = 79.0

ATMOSPHERIC ENVIRONMENT SERVICE
SERVICE DE L"ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES
INTENSITE, DUREE ET FREQUENCE DES PLUIES

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TABLE 2 ST JOHN'S AIRPORT NFLD 8403506

LATITUDE 4737 LONGITUDE 5244 ELEVATION/ALTITUDE 131 M

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RETURN PERIOD RAINFALL AMOUNTS (MM)
PERIODE DE RETOUR QUANTITIES DE PLUIE (MM)

DURATION DUREE	2 YR/ANS	5 YR/ANS	10 YR/ANS	25 YR/ANS	50 YR/ANS	100 YR/ANS	# YEARS ANNEES
5 MIN	4.6	6.4	7.6	9.2	10.3	11.4	29
10 MIN	6.8	9.2	10.8	12.8	14.3	15.8	29
15 MIN	8.5	11.4	13.4	15.8	17.6	19.4	29
30 MIN	12.2	16.1	18.7	22.0	24.4	26.8	29
1 H	17.0	21.6	24.7	28.6	31.5	34.4	30
2 H	22.9	30.4	35.4	41.7	46.3	51.0	30
6 H	39.9	50.4	57.3	66.1	72.5	79.0	30
12 H	52.1	63.9	71.8	81.7	89.1	96.4	30
24 H	62.8	76.4	85.4	96.8	105.2	113.6	31

RETURN PERIOD RAINFALL RATES EXPRESSED AS MM/HR
INTENSITE DE LA PLUIE PAR PERIODE DE RETOUR, EXPRIMEE EN MM/H
WITH 95% CONFIDENCE LIMITS / AVEC DES LIMITES DE CONFIANCE DE 95%

DURATION DUREE	2 YR/ANS	5 YR/ANS	10 YR/ANS	25 YR/ANS	50 YR/ANS	100 YR/ANS
5 MIN	55.2	77.1	91.6	109.9	123.5	137.0
	+/- 8.3	+/- 13.9	+/- 18.8	+/- 25.4	+/- 30.4	+/- 35.4
10 MIN	40.5	55.0	64.7	76.8	85.8	94.8
	+/- 5.5	+/- 9.2	+/- 12.5	+/- 16.8	+/- 20.2	+/- 23.5
15 MIN	34.0	45.7	53.4	63.2	70.4	77.6
	+/- 4.4	+/- 7.4	+/- 10.0	+/- 13.5	+/- 16.2	+/- 18.9
30 MIN	24.4	32.2	37.4	43.9	48.8	53.6
	+/- 3.0	+/- 5.0	+/- 6.7	+/- 9.1	+/- 10.9	+/- 12.6
1 H	17.0	21.6	24.7	28.6	31.5	34.4
	+/- 1.7	+/- 2.9	+/- 4.0	+/- 5.3	+/- 6.4	+/- 7.4
2 H	11.5	15.2	17.7	20.8	23.2	25.5
	+/- 1.4	+/- 2.4	+/- 3.2	+/- 4.3	+/- 5.1	+/- 6.0
6 H	6.7	8.4	9.6	11.0	12.1	13.2
	+/- 0.6	+/- 1.1	+/- 1.5	+/- 2.0	+/- 2.4	+/- 2.8
12 H	4.3	5.3	6.0	6.8	7.4	8.0
	+/- 0.4	+/- 0.6	+/- 0.8	+/- 1.1	+/- 1.3	+/- 1.6
24 H	2.6	3.2	3.6	4.0	4.4	4.7
	+/- 0.2	+/- 0.3	+/- 0.5	+/- 0.6	+/- 0.8	-/- 0.9

ATMOSPHERIC ENVIRONMENT SERVICE
SERVICE DE L"ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES
INTENSITE, DUREE ET FREQUENCE DES PLUIES

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TABLE 3 ST JOHN'S AIRPORT NFLD 8403506

LATITUDE 4737 LONGITUDE 5244 ELEVATION/ALTITUDE 131 M

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INTERPOLATION EQUATION / EQUATION D"INTERPOLATION: R = A * T ** B
R = RAINFALL RATE / INTENSITE DE LA PLUIE (MM /HR)
T = TIME IN HOURS / TEMPS EN HEURES

STATISTICS STATISTIQUES	2 YR ANS	5 YR ANS	10 YR ANS	25 YR ANS	50 YR ANS	100 YR ANS
MEAN OF R MOYENNE DE R	21.7	29.3	34.2	40.5	45.2	49.8
STD. DEV. R ECART-TYPE	18.2	25.4	30.2	36.2	40.7	45.2
STD. ERROR ERREUR STANDARD	2.0	2.5	2.8	3.3	3.7	4.0
COEFF. (A) COEFFICIENT (A)	16.0	20.9	24.2	28.3	31.3	34.4
EXPONENT (B) EXPOSANT (B)	-0.532	-0.554	-0.564	-0.574	-0.579	-0.584
MEAN % ERROR % D'ERREUR	5.3	5.1	5.1	5.1	5.1	5.2

APPENDIX H

Rational Method with SCS Curve Number, Bransby-Williams, and Airport Drainage Methods of Determining Time of Concentration

APPENDIX H

Rational Method with SCS Curve Number, Bransby-Williams, and Airport Drainage Methods of Determining Time of Concentration

Rational Formula with SCS Method of Determining Time of Concentration

Basin	CN	L (m)	Y (%)	SCN	tl (hr)	tc (hr)	I20 (mm/hr)	I100 (mm/hr)	I20 x 1.2 (mm/hr)	I100 x 1.2 (mm/hr)	C	Area (ha)	Q20 (m3/s)	Q100 (m3/s)
Portugal Cove	74	5000	4.74	89.24	1.63	2.76	18.01	23.15	21.61	27.78	0.43	1097.25	28.3	36.4
St. Phillips I	75	8250	4.12	84.67	2.53	4.30	14.46	18.43	17.35	22.11	0.43	1846.25	38.3	48.8
St. Phillips II	76	7500	4.02	80.21	2.31	3.92	15.34	19.60	18.41	23.52	0.44	1753.75	39.5	50.5
Logy Bay	76	2000	4.53	80.21	0.75	1.28	25.17	31.89	30.21	38.27	0.42	146.25	5.2	6.5
Outer Cove	76	1950	3.00	80.21	0.91	1.54	23.20	29.56	27.84	35.47	0.40	82.25	2.5	3.2
Northeast Pond River	66	2630	5.38	130.85	1.13	1.93	20.33	26.16	24.39	31.39	0.37	390.00	9.8	12.6
North Pond Brook	76	7400	4.21	80.21	2.23	3.79	15.64	20.00	18.77	24.00	0.42	670.00	14.7	18.8

Rational Formula with Bransby-Williams Formula for Determining Time of Concentration

Basin	L (km)	S (%)	A (km^2)	tc (hr)	I20 (mm/hr)	I100 (mm/hr)	I20 x 1.2 (mm/hr)	I100 x 1.2 (mm/hr)	C	Area (ha)	Q20 (m3/s)	Q100 (m3/s)
Portugal Cove	5.00	2.03	10.97	2.07	19.61	25.30	23.54	30.36	0.43	1097.25	30.9	39.1
St. Phillips I	8.25	1.38	18.46	3.50	16.31	20.90	19.58	25.08	0.43	1846.25	43.2	55.3
St. Phillips II	7.50	1.35	17.54	3.21	16.98	21.78	20.37	26.14	0.44	1753.75	43.7	56.1
Logy Bay	2.00	4.06	1.46	0.88	30.76	39.00	36.91	46.80	0.42	146.25	6.3	8.0
Outer Cove	1.95	3.33	0.82	0.95	28.87	36.48	34.64	43.78	0.40	82.25	3.2	4.0
Northeast Pond River	2.63	2.42	3.90	1.16	26.07	32.94	31.28	39.53	0.37	390.00	12.5	15.9
North Pond Brook	7.40	1.87	6.70	3.27	16.84	21.61	20.21	25.93	0.42	670.00	15.8	20.3

Rational Formula with Airport Drainage Formula for Determining Time of Concentration

Basin	L (m)	S (%)	C	tc (hr)	I20 (mm/hr)	I100 (mm/hr)	I20 x 1.2 (mm/hr)	I100 x 1.2 (mm/hr)	C	Area (ha)	Q20 (m3/s)	Q100 (m3/s)
Portugal Cove	5000	2.03	0.43	2.04	19.68	25.38	23.62	30.46	0.43	1097.25	31.0	40.0
St. Phillips I	8250	1.38	0.43	2.97	17.52	22.51	21.02	27.01	0.43	1846.25	46.4	59.6
St. Phillips II	7500	1.35	0.44	2.81	17.89	23.00	21.47	27.60	0.44	1753.75	46.1	59.2
Logy Bay	2000	4.06	0.42	1.04	26.99	34.04	32.39	40.85	0.42	146.25	5.5	7.0
Outer Cove	1950	3.33	0.40	1.13	26.33	33.25	31.59	39.90	0.40	82.25	2.9	3.6
Northeast Pond River	2630	2.42	0.37	1.52	23.39	29.78	28.06	35.73	0.37	390.00	11.3	14.3
North Pond Brook	7400	1.87	0.42	2.59	18.42	23.70	22.10	28.44	0.42	670.00	17.3	22.2

APPENDIX I

SCS TR-55 Chart Method Adjustment Tables

Ratio of drainage area to ponding and swampy area	Percentage of ponding and swampy area	Storm frequency (years)					
		2	5	10	25	50	100
500	0.2	0.92	0.94	0.95	0.96	0.97	0.98
200	.5	.86	.87	.88	.90	.92	.93
100	1.0	.80	.81	.83	.85	.87	.89
50	2.0	.74	.75	.76	.79	.82	.86
40	2.5	.69	.70	.72	.75	.78	.82
30	3.3	.64	.65	.67	.71	.75	.78
20	5.0	.59	.61	.63	.67	.71	.75
15	6.7	.57	.58	.60	.64	.67	.71
10	10.0	.53	.54	.56	.60	.63	.68
5	20.0	.48	.49	.51	.55	.59	.64

Adjustment factors where ponding and swampy areas are spread throughout the watershed or occur in central parts of the watershed

Ratio of drainage area to ponding and swampy area	Percentage of ponding and swampy area	Storm frequency (years)					
		2	5	10	25	50	100
500	0.2	0.94	0.95	0.96	0.97	0.98	0.99
200	.5	.88	.89	.90	.91	.92	.94
100	1.0	.83	.84	.86	.87	.88	.90
50	2.0	.78	.79	.81	.83	.85	.87
40	2.5	.73	.74	.76	.78	.81	.84
30	3.3	.69	.70	.71	.74	.77	.81
20	5.0	.65	.66	.68	.72	.75	.78
15	6.7	.62	.63	.65	.69	.72	.75
10	10.0	.58	.59	.61	.65	.68	.71
5	20.0	.53	.54	.56	.60	.63	.68
4	25.0	.50	.51	.53	.57	.61	.66

Adjustment factors where ponding and swampy areas are located only in upper reaches of the watershed

Ratio of drainage area to ponding and swampy area	Percentage of ponding and swampy area	Storm frequency (years)					
		2	5	10	25	50	100
500	0.2	0.96	0.97	0.98	0.98	0.99	0.99
200	.5	.93	.94	.94	.95	.96	.97
100	1.0	.90	.91	.92	.93	.94	.95
50	2.0	.87	.88	.88	.90	.91	.93
40	2.5	.85	.85	.86	.88	.89	.91
30	3.3	.82	.83	.84	.86	.88	.89
20	5.0	.80	.81	.82	.84	.86	.88
15	6.7	.78	.79	.80	.82	.84	.86
10	10.0	.77	.77	.78	.80	.82	.84
5	20.0	.74	.75	.76	.78	.80	.82

Slope (per-cent)	10 acres	20 acres	50 acres	100 acres	200 acres	500 acres	1,000 acres	2,000 acres
FLAT SLOPES								
0.1	0.49	0.47	0.44	0.43	0.42	0.41	0.41	0.40
0.2	.61	.59	.56	.55	.54	.53	.53	.52
0.3	.69	.67	.65	.64	.63	.62	.62	.61
0.4	.76	.74	.72	.71	.70	.69	.69	.69
0.5	.82	.80	.78	.77	.77	.76	.76	.76
0.7	.90	.89	.88	.87	.87	.87	.87	.87
1.0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.5	1.13	1.14	1.14	1.15	1.16	1.17	1.17	1.17
2.0	1.21	1.24	1.26	1.28	1.29	1.30	1.31	1.31
MODERATE SLOPES								
3	.93	.92	.91	.90	.90	.90	.89	.89
4	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
5	1.04	1.05	1.07	1.08	1.08	1.08	1.09	1.09
6	1.07	1.10	1.12	1.14	1.15	1.16	1.17	1.17
7	1.09	1.13	1.18	1.21	1.22	1.23	1.23	1.24
STEEP SLOPES								
8	.92	.88	.84	.81	.80	.78	.78	.77
9	.94	.90	.86	.84	.83	.82	.81	.81
10	.96	.92	.88	.87	.86	.85	.84	.84
11	.96	.94	.91	.90	.89	.88	.87	.87
12	.97	.95	.93	.92	.91	.90	.90	.90
13	.97	.97	.95	.94	.94	.93	.93	.92
14	.98	.98	.97	.96	.96	.96	.95	.95
15	.99	.99	.99	.98	.98	.98	.98	.98
16	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
20	1.03	1.04	1.05	1.06	1.07	1.08	1.09	1.10
25	1.06	1.08	1.12	1.14	1.15	1.16	1.17	1.19
30	1.09	1.11	1.14	1.17	1.20	1.22	1.23	1.24
40	1.12	1.16	1.20	1.24	1.29	1.31	1.33	1.35
50	1.17	1.21	1.25	1.29	1.34	1.37	1.40	1.43

APPENDIX J

SCS TR-55 Chart Method of Determining 20 and 100 Year Peak Flows

APPENDIX J SCS TR-55 Chart Method of Determining 20 and 100 year Peak Flows

Basin	CN	A (m)	A (acres)	Y (%)	P20 (in)	P100 (in)	S	Q20 (in)	Q100 (in)	QU (cfs/inch)	SF	PPS (%)	PF20	PF100	QP20 (cfs)	QP100 (cfs)	QP20 (m3/s)	QP100 (m3/s)
Portugal Cove	74	10,725,000	2650	4.74	4.39	5.37	3.51	1.89	2.66	500	1.0666	19.5	0.59	0.68	593.26	967.77	16.8	27.4
St. Phillips I	75	18,462,500	4562	4.12	4.39	5.37	3.33	1.96	2.75	710	1.0108	18.3	0.60	0.69	839.12	1353.36	23.8	38.3
St. Phillips II	76	17,537,500	4333	4.02	4.39	5.37	3.16	2.04	2.84	700	1.0022	19.3	0.59	0.68	845.60	1360.64	23.9	38.5
Logy Bay	76	1,462,500	361	4.53	4.39	5.37	3.16	2.04	2.84	130	1.0424	14.5	0.61	0.70	169.98	268.37	4.8	7.6
Outer Cove	76	822,500	203	3.00	4.39	5.37	3.16	2.04	2.84	92	0.9	9.7	0.64	0.71	108.28	168.02	3.1	4.8
Northeast Pond River	66	3,900,000	964	5.38	4.39	5.37	5.15	1.33	1.98	210	1.1197	21.0	0.58	0.68	181.07	315.40	5.1	8.9
North Pond Brook	76	6,700,000	1656	4.21	4.39	5.37	3.16	2.04	2.84	360	1.0189	15.2	0.61	0.69	457.48	724.25	13.0	20.5

APPENDIX K

Regional Flood Frequency Analysis Output

Regional Flood Estimates for the Island of Newfoundland

Name of watershed..... Portugal Cove
Location of watershed..... 1 Eastern
(Eastern=1, Central=2, Humber & Northern Peninsula=3, Southwest=4)

.....Physiographic Parameters					Parameter Range	
Area of watershed	(DA)	10.9725	km²		3.90	285.00
Area controlled by lakes	(ACL)	9.5725	km²		6.03	10.97
Area of lakes and swamps	(ALS)	2.145	km²		0.99	3.29
Drainage density	(DRD)	1.367	1/km		0.55	1.62
Slope of main channel	(Not Used)	2.03	%	**	0.23	1.35

..... ERROR DIAGNOSIS	T (year)	Q (m3/s)	L95[Q]	U95[Q]
	2	10.87	6.99	16.92
	10	16.37	10.28	26.06
** Use results with caution:	20	18.57	11.67	29.56
These parameters are outside	50	21.36	13.30	34.32
range for reliable results.	100	23.55	14.53	38.17
	200	25.60	15.51	42.25

Regional Flood Estimates for the Island of Newfoundland

Name of watershed..... St. Phillips
Location of watershed..... 1 Eastern
(Eastern=1, Central=2, Humber & Northern Peninsula=3, Southwest=4)

.....Physiographic Parameters					Parameter Range	
Area of watershed	(DA)	18.4625	km²		3.90	285.00
Area controlled by lakes	(ACL)	16.1625	km²		10.15	18.46
Area of lakes and swamps	(ALS)	3.3875	km²		1.66	5.54
Drainage density	(DRD)	1.11	1/km		0.55	1.62
Slope of main channel	(Not Used)	1.38	%	**	0.23	1.35

..... ERROR DIAGNOSIS	T (year)	Q (m3/s)	L95[Q]	U95[Q]
	2	14.57	9.36	22.68
	10	23.13	14.53	36.82
** Use results with caution:	20	26.18	16.45	41.67
These parameters are outside	50	30.04	18.70	48.24
range for reliable results.	100	33.07	20.40	53.60
	200	35.91	21.76	59.26

Regional Flood Estimates for the Island of Newfoundland

Name of watershed..... St. Phillips (DBH)
Location of watershed..... 1 Eastern
(Eastern=1, Central=2, Humber & Northern Peninsula=3, Southwest=4)

.....Physiographic Parameters				Parameter Range	
Area of watershed	(DA)	17.5375	km²	3.90	285.00
Area controlled by lakes	(ACL)	16.1625	km²	9.65	17.54
Area of lakes and swamps	(ALS)	3.3875	km²	1.58	5.26
Drainage density	(DRD)	1.13	1/km	0.55	1.62
Slope of main channel	(Not Used)	1.35	%	0.23	1.35

T (year)	Q (m3/s)	L95[Q]	U95[Q]
2	13.44	8.64	20.92
10	20.98	13.18	33.40
20	23.66	14.86	37.66
50	27.03	16.83	43.41
100	29.65	18.30	48.06
200	32.10	19.45	52.97

Regional Flood Estimates for the Island of Newfoundland

Name of watershed..... Logy Bay
Location of watershed..... 1 Eastern
(Eastern=1, Central=2, Humber & Northern Peninsula=3, Southwest=4)

.....Physiographic Parameters					Parameter Range	
Area of watershed	(DA)	1.4625	km²	**	3.90	285.00
Area controlled by lakes	(ACL)	1.4625	km²		0.80	1.46
Area of lakes and swamps	(ALS)	0.2125	km²		0.13	0.44
Drainage density	(DRD)	2.188	1/km	**	0.55	1.62
Slope of main channel	(Not Used)	4.06	%	**	0.23	1.35

..... ERROR DIAGNOSIS	T (year)	Q (m3/s)	L95[Q]	U95[Q]
	2	2.46	1.58	3.84
	10	3.26	2.05	5.19
** Use results with caution:	20	3.67	2.31	5.84
These parameters are outside	50	4.18	2.60	6.71
range for reliable results.	100	4.56	2.81	7.39
	200	4.91	2.98	8.10

Regional Flood Estimates for the Island of Newfoundland

Name of watershed..... Outer Cove
Location of watershed..... 1 Eastern
(Eastern=1, Central=2, Humber & Northern Peninsula=3, Southwest=4)

.....Physiographic Parameters					Parameter Range	
Area of watershed	(DA)	0.8225	km²	**	3.90	285.00
Area controlled by lakes	(ACL)	0.2	km²	**	0.45	0.82
Area of lakes and swamps	(ALS)	0.08	km²		0.07	0.25
Drainage density	(DRD)	1.398	1/km		0.55	1.62
Slope of main channel	(Not Used)	3.33	%	**	0.23	1.35

..... ERROR DIAGNOSIS	T (year)	Q (m3/s)	L95[Q]	U95[Q]
	2	3.81	2.45	5.94
	10	7.98	5.01	12.70
** Use results with caution:	20	9.73	6.11	15.49
These parameters are outside	50	12.21	7.60	19.61
range for reliable results.	100	14.33	8.84	23.23
	200	16.48	9.98	27.19

APPENDIX L

Culvert Analysis

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:09:03

FILE DATE: 12-04-1995
FILE NAME: LBC3

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	225.72	225.06	59.00	1 CMPA	6.75	4.92	.028	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: LBC3 DATE: 12-04-1995

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
225.72	0	0	0	0	0	0	0	0	1
226.84	11	11	0	0	0	0	0	0	1
227.39	23	23	0	0	0	0	0	0	1
227.81	34	34	0	0	0	0	0	0	1
228.21	45	45	0	0	0	0	0	0	1
228.53	57	57	0	0	0	0	0	0	1
228.85	68	68	0	0	0	0	0	0	1
229.15	79	79	0	0	0	0	0	0	1
229.41	90	90	0	0	0	0	0	0	1
229.45	92	92	0	0	0	0	0	0	1
229.97	113	113	0	0	0	0	0	0	1
232.28	201	201	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: LBC3 DATE: 12-04-1995

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
225.72	0.00	0	0	0.00
226.84	0.00	11	0	0.00
227.39	0.00	23	0	0.00
227.81	0.00	34	0	0.00
228.21	0.00	45	0	0.00
228.53	0.00	57	0	0.00
228.85	0.00	68	0	0.00
229.15	0.00	79	0	0.00
229.41	0.00	90	0	0.00
229.45	0.00	92	0	0.00
229.97	0.00	113	0	0.00

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

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:09:03

FILE DATE: 12-04-1995
FILE NAME: LBC3

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (6.75 BY 4.916667) 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	225.72	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.24
11	226.84	0.97	1.12	3-M1t	0.71	0.66	2.44	1.01	4.42	1.01
23	227.39	1.41	1.67	3-M1t	1.05	1.00	3.76	1.22	5.20	1.22
34	227.81	1.76	2.09	3-M1t	1.29	1.22	4.85	1.37	5.73	1.37
45	228.21	2.07	2.49	3-M2t	1.52	1.45	5.79	1.50	6.15	1.50
57	228.53	2.35	2.81	2-M2c	1.71	1.62	6.53	1.62	6.49	1.61
68	228.85	2.64	3.13	2-M2c	1.90	1.80	6.92	1.80	6.79	1.70
79	229.15	2.95	3.43	2-M2c	2.09	1.97	7.22	1.97	7.05	1.79
90	229.41	3.25	3.69	2-M2c	2.27	2.10	7.63	2.10	7.29	1.87
92	229.45	3.28	3.73	2-M2c	2.29	2.12	7.68	2.12	7.32	1.88
113	229.97	3.80	4.25	2-M2c	2.63	2.37	8.29	2.37	7.71	2.01

El. inlet face invert 225.72 ft El. outlet invert 225.06 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

```
***** SITE DATA ***** CULVERT INVERT **************
      INLET STATION (FT)                    100.00
      INLET ELEVATION (FT)                  225.72
      OUTLET STATION (FT)                   159.00
      OUTLET ELEVATION (FT)                 225.06
      NUMBER OF BARRELS                       1
      SLOPE (V-FT/H-FT)                       0.0112
      CULVERT LENGTH ALONG SLOPE (FT)        59.00

***** CULVERT DATA SUMMARY ************************
      BARREL SHAPE          PIPE ARCH
      BARREL SPAN             6.75 FT
      BARREL RISE             4.92 FT
      BARREL MATERIAL       STEEL OR ALUMINUM
      BARREL MANNING'S N    0.028
      INLET TYPE            CONVENTIONAL
      INLET EDGE AND WALL   PROJECTING
      INLET DEPRESSION      NONE
```

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:09:03

FILE DATE: 12-04-1995
FILE NAME: LBC3

TAILWATER

***** USER DEFINED CHANNEL CROSS-SECTION

FILE NAME: LBC3
FILE DATE: 12-04-1995

MAIN CHANNEL ONLY	
LEFT CHANNEL BOUNDARY	0
RIGHT CHANNEL BOUNDARY	0
MANNING N LEFT OVER BANK	0.000
MANNING N MAIN CHANNEL	0.035
MANNING N RIGHT OVER BAN	0.000
SLOPE OF CHANNEL (FT/FT)	0.0400

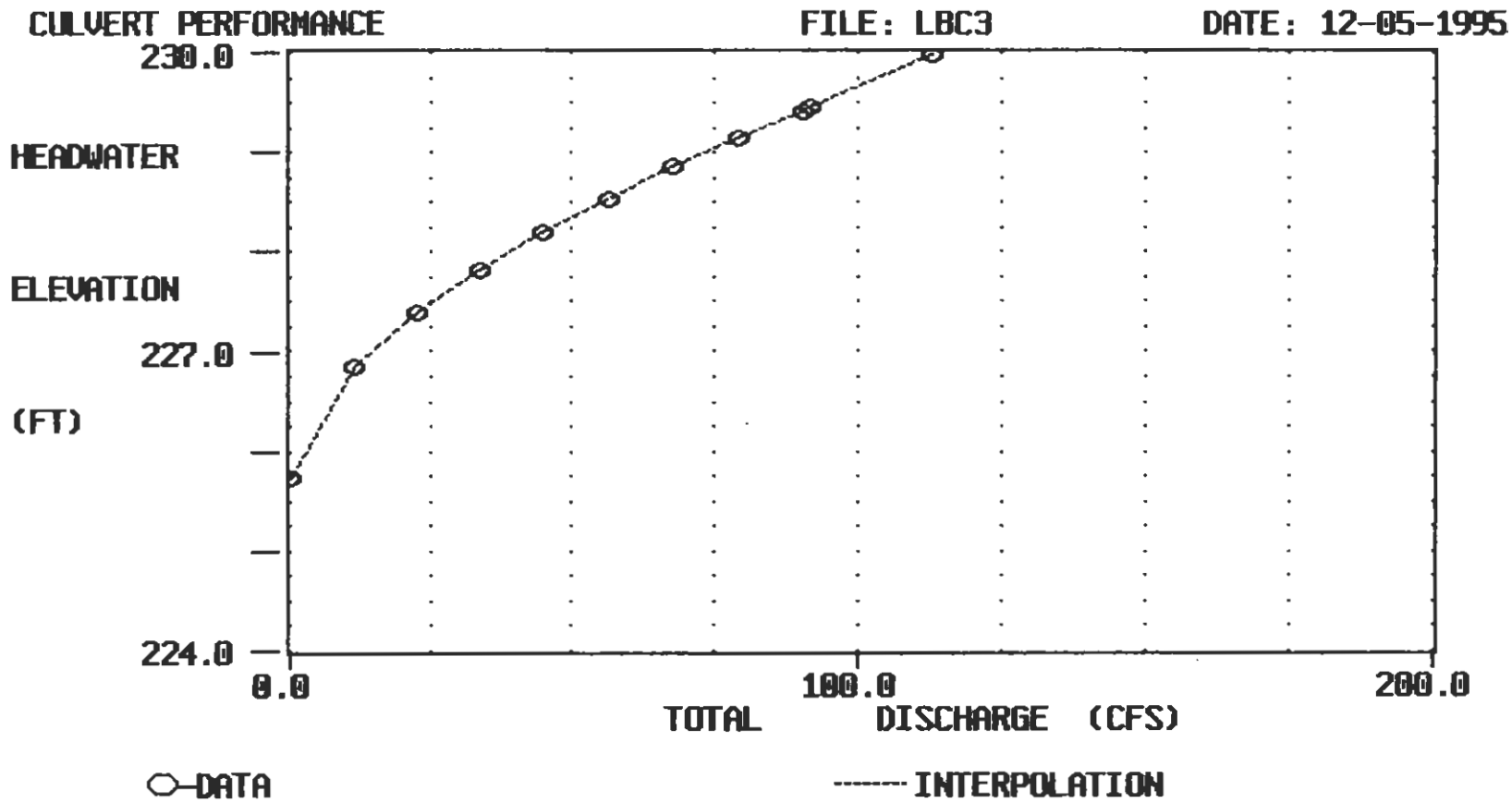
CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	231.84
2	7.61	229.00
3	22.04	229.13
4	39.90	227.54
5	49.82	225.30
6	59.22	227.16
7	73.12	228.40
8	82.83	229.80

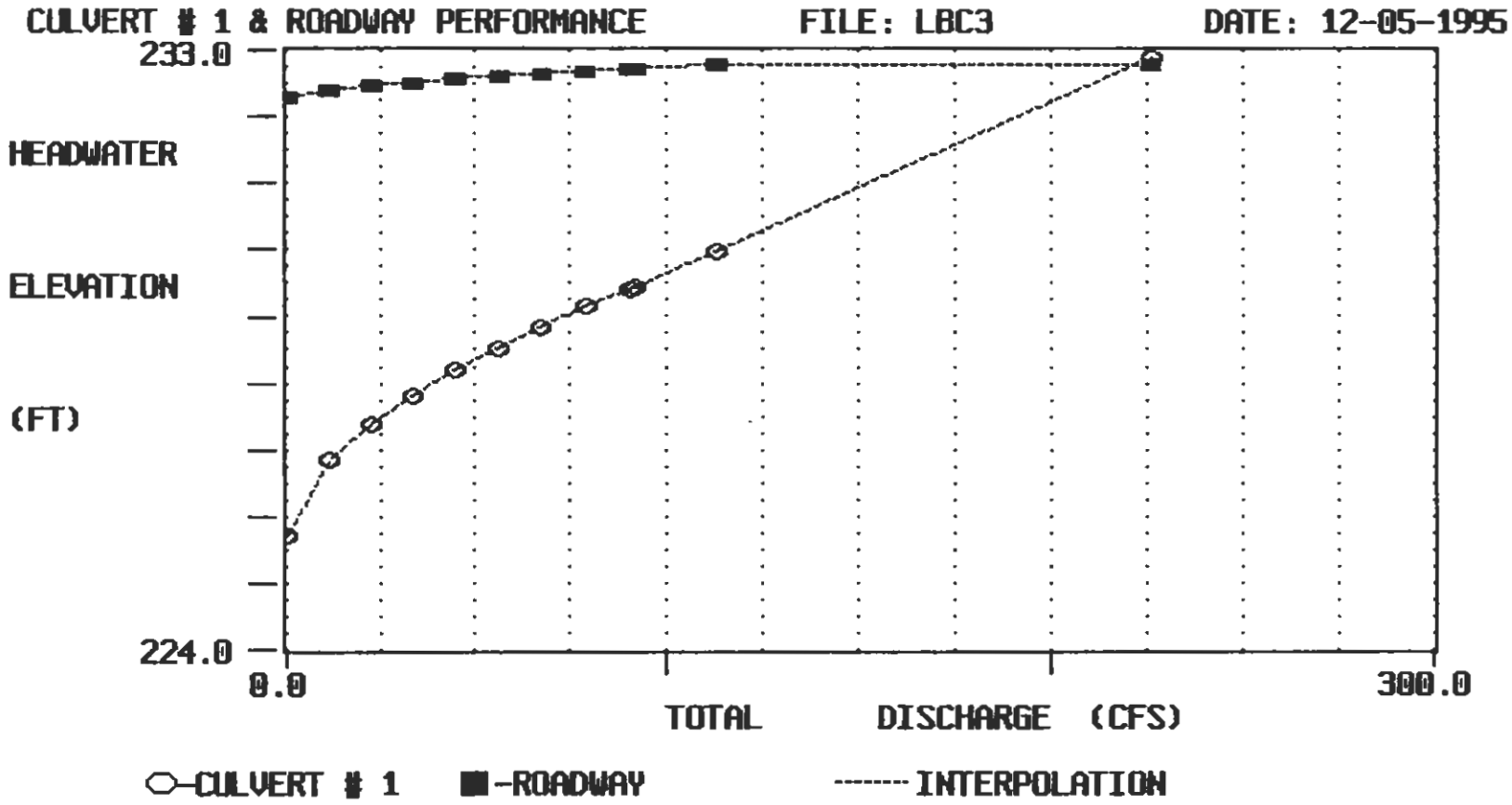
******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

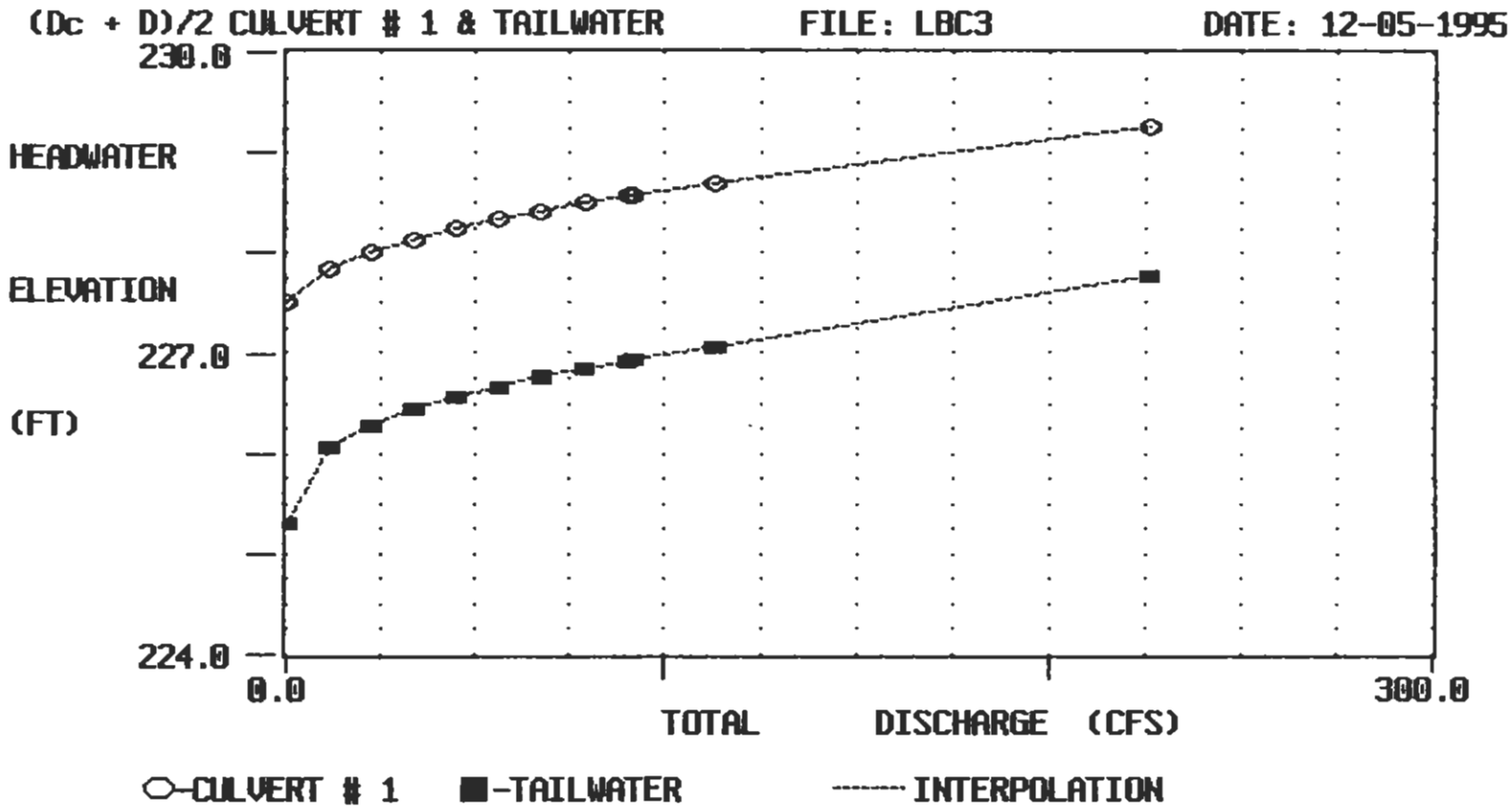
FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	225.30	0.000	0.24	0.00	0.00
11.30	226.07	1.257	1.01	4.42	0.94
22.60	226.28	1.309	1.22	5.20	1.20
33.90	226.43	1.341	1.37	5.73	1.38
45.20	226.56	1.365	1.50	6.15	1.54
56.50	226.67	1.384	1.61	6.49	1.67
67.80	226.76	1.400	1.70	6.79	1.79
79.10	226.85	1.413	1.79	7.05	1.89
90.41	226.93	1.425	1.87	7.29	1.99
91.82	226.94	1.426	1.88	7.32	2.00
113.01	227.07	1.445	2.01	7.71	2.16

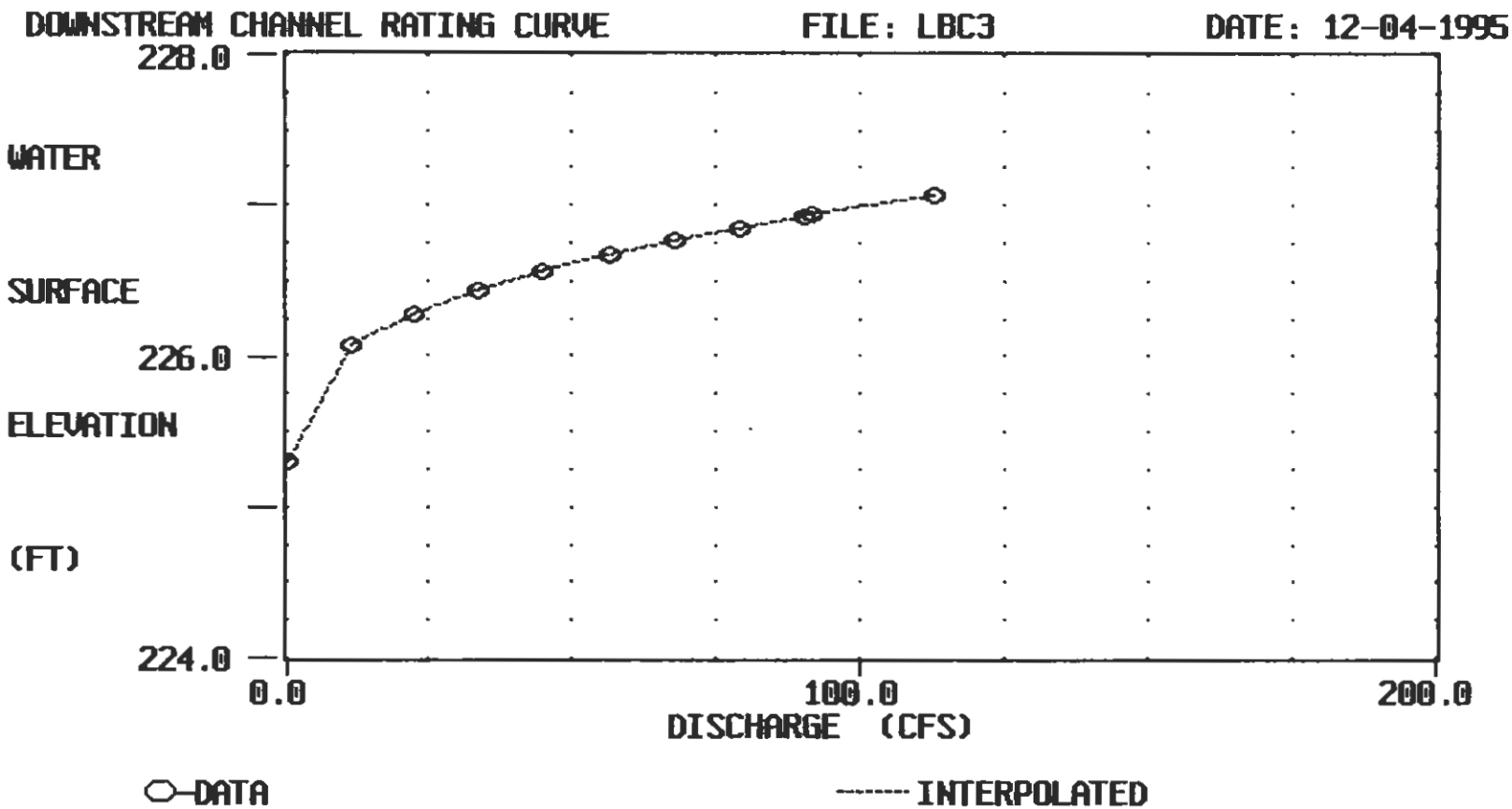
ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	100.00
OVERTOPPING CREST ELEVATION (FT)	232.28


CULVERT PERFORMANCE
FILE: LBC3
DATE: 12-05-1995
230.0
HEADWATER
ELEVATION
227.0
(FT)
224.0
0.0
100.0
200.0
TOTAL DISCHARGE (CFS)
DATA
INTERPOLATION


CULVERT # 1 & ROADWAY PERFORMANCE
FILE: LBC3
DATE: 12-05-1995
233.0
224.0
HEADWATER
ELEVATION
(FT)
0.0
300.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
ROADWAY
INTERPOLATION


(Dc + D)/2 CULVERT # 1 & TAILWATER
FILE: LBC3
DATE: 12-05-1995
230.0
HEADWATER
ELEVATION
227.0
(FT)
224.0
0.0
300.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
TAILWATER
INTERPOLATION


DOWNSTREAM CHANNEL RATING CURVE
FILE: LBC3
DATE: 12-04-1995
228.0
226.0
224.0
WATER
SURFACE
ELEVATION
(FT)
0.0
100.0
200.0
DISCHARGE (CFS)
DATA
INTERPOLATED

CURRENT DATE: 12-05-1995
CURRENT TIME: 12:40:39

FILE DATE: 12-04-1995
FILE NAME: OCC1

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	225.13	224.45	39.38	1 CSP	2.00	2.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

FILE: OCC1 CULVERT HEADWATER ELEVATION (FT) DATE: 12-04-1995

DISCHARGE	1	2	3	4	5	6	ROADWAY
0	225.13	0.00	0.00	0.00	0.00	0.00	228.67
4	226.09	0.00	0.00	0.00	0.00	0.00	228.72
7	226.57	0.00	0.00	0.00	0.00	0.00	228.75
11	227.21	0.00	0.00	0.00	0.00	0.00	228.78
14	227.57	0.00	0.00	0.00	0.00	0.00	228.80
18	228.20	0.00	0.00	0.00	0.00	0.00	228.82
21	228.96	0.00	0.00	0.00	0.00	0.00	228.84
25	229.87	0.00	0.00	0.00	0.00	0.00	228.86
28	230.70	0.00	0.00	0.00	0.00	0.00	228.87
32	232.10	0.00	0.00	0.00	0.00	0.00	228.89
35	233.43	0.00	0.00	0.00	0.00	0.00	228.91
35	233.43	0.00	0.00	0.00	0.00	0.00	0.00

The above Q and HW are for a point above the roadway.

CURRENT DATE: 12-05-1995 FILE DATE: 12-04-1995
CURRENT TIME: 12:40:39 FILE NAME: OCC1

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (2 BY 2) CSP

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	225.13	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-0.05
4	226.09	0.96	0.96	1-S2n	0.63	0.65	4.16	0.63	1.88	0.30
7	226.57	1.44	1.44	1-S2n	0.92	0.94	4.98	0.92	2.17	0.39
11	227.21	1.89	2.08	2-M2c	1.18	1.16	5.59	1.16	2.38	0.45
14	227.57	2.38	2.44	2-M2c	1.45	1.35	6.26	1.35	2.54	0.50
18	228.20	2.97	3.07	6-FFn	2.00	1.51	5.62	2.00	2.68	0.55
21	228.96	3.70	3.83	6-FFn	2.00	1.64	6.74	2.00	2.80	0.59
25	229.87	4.58	4.74	6-FFn	2.00	1.74	7.87	2.00	2.90	0.62
28	230.70	5.41	5.57	6-FFn	2.00	1.83	8.77	2.00	2.98	0.65
32	232.10	6.87	6.97	6-FFn	2.00	1.95	10.12	2.00	3.08	0.69
35	233.43	8.26	8.30	6-FFn	2.00	2.00	11.24	2.00	3.16	0.71

El. inlet face invert 225.13 ft El. outlet invert 224.45 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

```
***** SITE DATA ***** CULVERT INVERT **************
      INLET STATION (FT)                      100.00
      INLET ELEVATION (FT)                    225.13
      OUTLET STATION (FT)                     139.37
      OUTLET ELEVATION (FT)                   224.45
      NUMBER OF BARRELS                         1
      SLOPE (V-FT/H-FT)                         0.0173
      CULVERT LENGTH ALONG SLOPE (FT)          39.38

***** CULVERT DATA SUMMARY ************************
      BARREL SHAPE          CIRCULAR
      BARREL DIAMETER         2.00 FT
      BARREL MATERIAL       CORRUGATED STEEL
      BARREL MANNING'S N    0.024
      INLET TYPE            CONVENTIONAL
      INLET EDGE AND WALL   THIN EDGE PROJECTING
      INLET DEPRESSION      NONE
```

CURRENT DATE: 12-05-1995
CURRENT TIME: 12:40:39

FILE DATE: 12-04-1995
FILE NAME: OCC1

TAILWATER

***** USER DEFINED CHANNEL CROSS-SECTION

FILE NAME: OCC1
FILE DATE: 12-04-1995

MAIN CHANNEL ONLY	
LEFT CHANNEL BOUNDARY	0
RIGHT CHANNEL BOUNDARY	0
MANNING N LEFT OVER BANK	0.000
MANNING N MAIN CHANNEL	0.035
MANNING N RIGHT OVER BAN	0.000
SLOPE OF CHANNEL (FT/FT)	0.0200

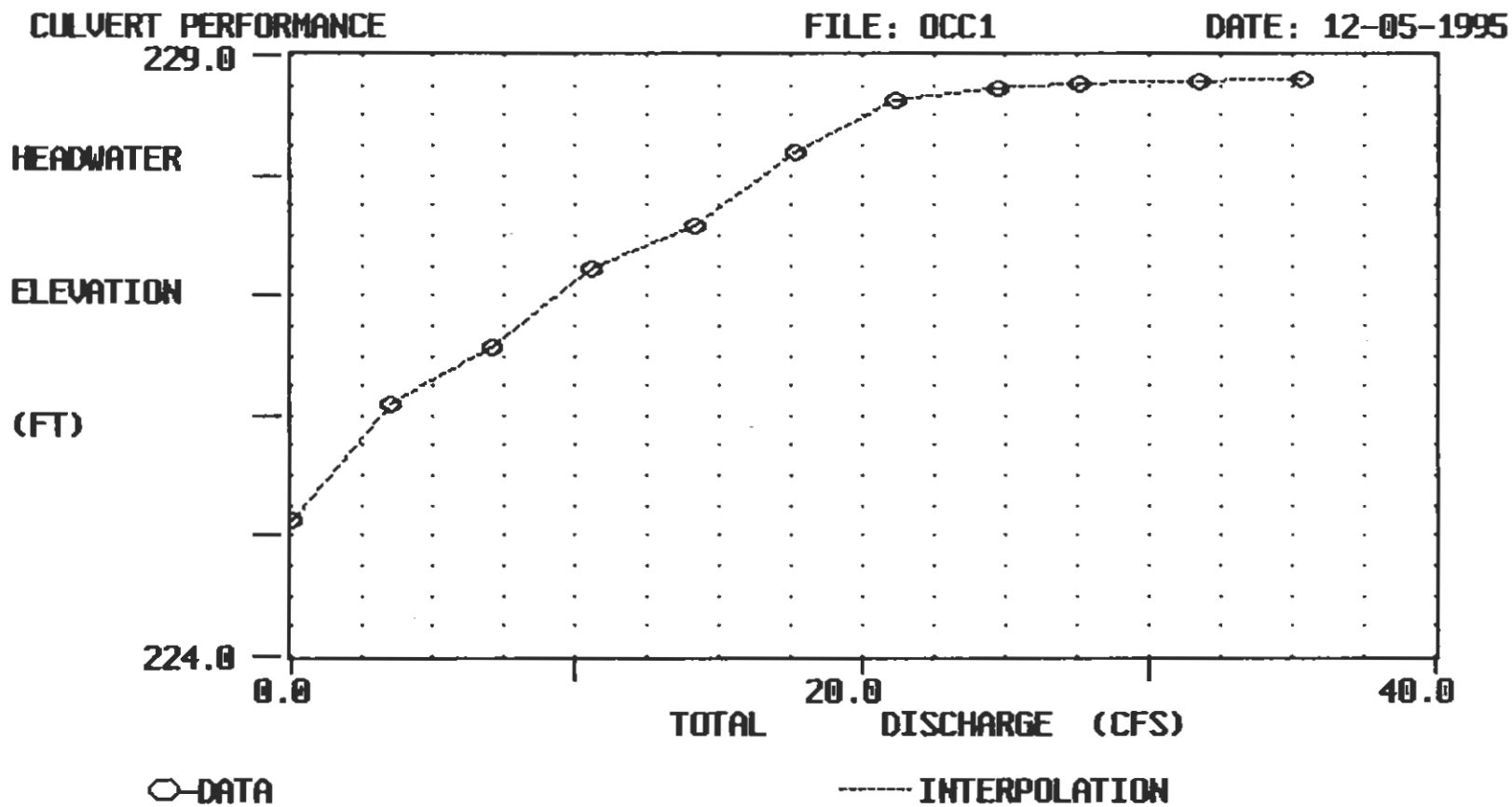
CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	227.85
2	42.65	226.70
3	82.02	224.40
4	213.25	230.32

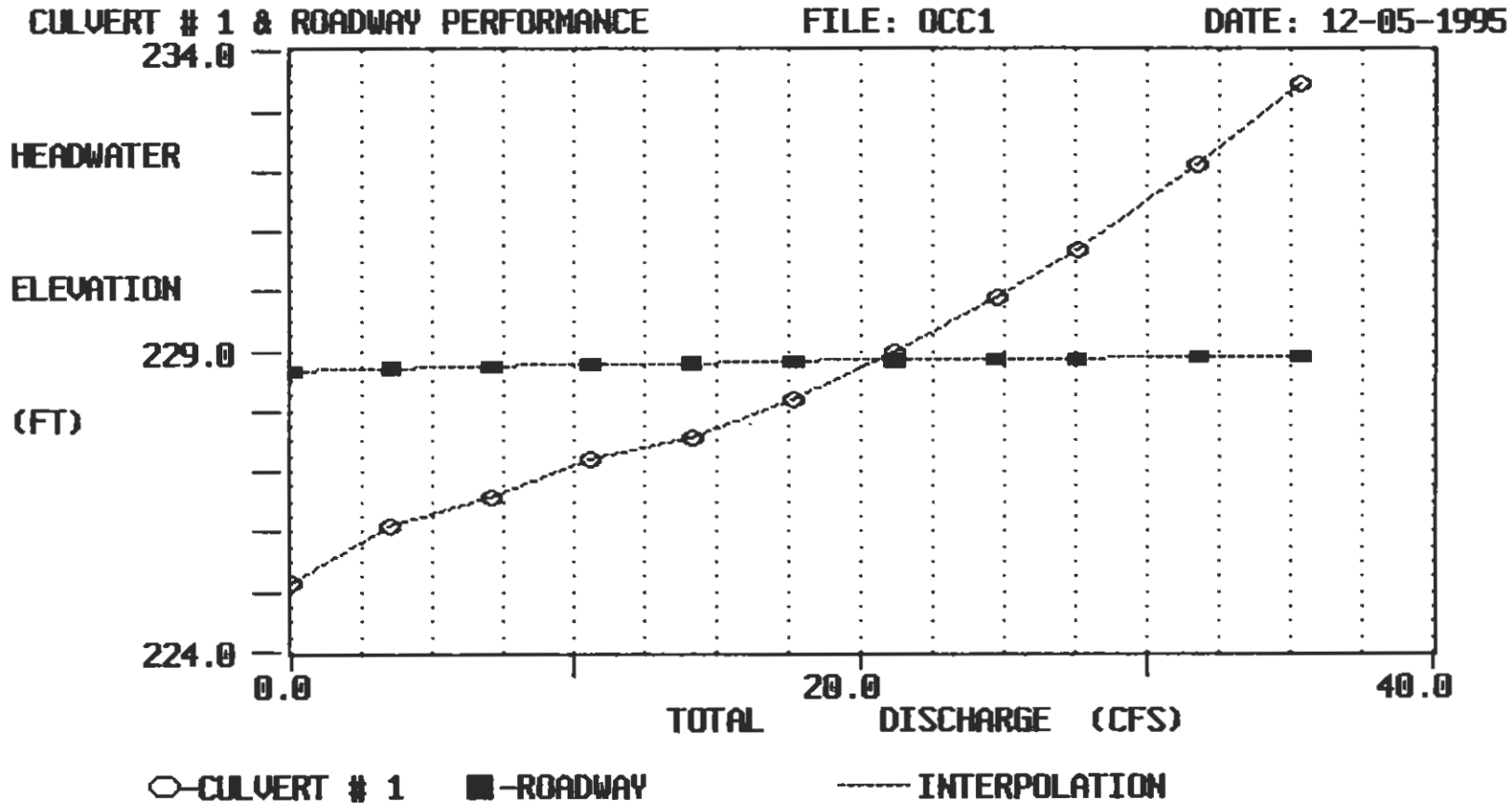
******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

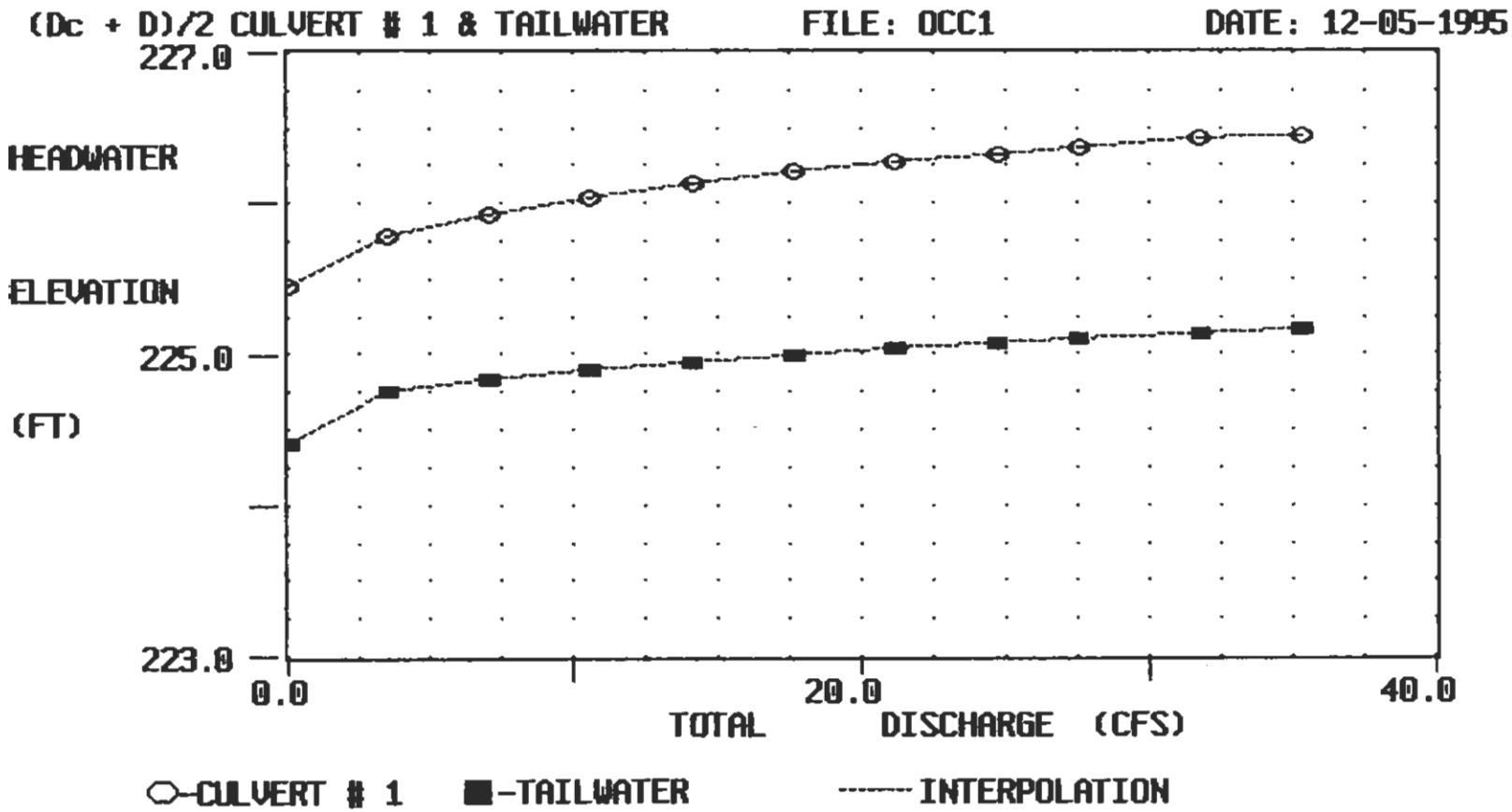
FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	224.40	0.000	-0.05	0.00	0.00
3.53	224.75	0.791	0.30	1.88	0.22
7.06	224.84	0.820	0.39	2.17	0.27
10.59	224.90	0.839	0.45	2.38	0.31
14.13	224.95	0.853	0.50	2.54	0.34
17.66	225.00	0.864	0.55	2.68	0.37
21.19	225.04	0.874	0.59	2.80	0.40
24.72	225.07	0.882	0.62	2.90	0.42
27.55	225.10	0.887	0.65	2.98	0.44
31.78	225.14	0.895	0.69	3.08	0.46
35.31	225.16	0.901	0.71	3.16	0.48

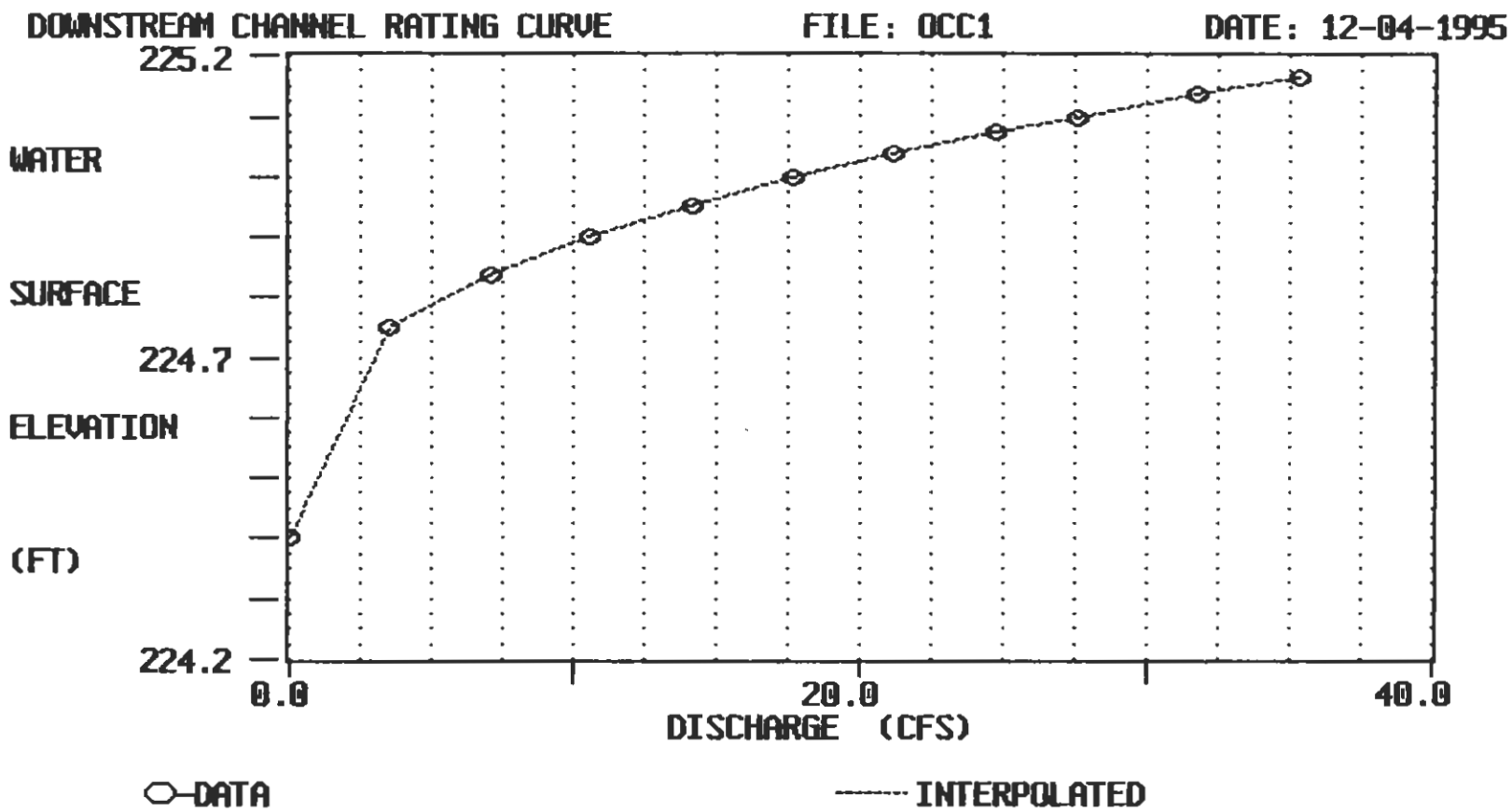
ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	20.00
CREST LENGTH (FT)	100.00
OVERTOPPING CREST ELEVATION (FT)	228.67


CULVERT PERFORMANCE
FILE: OCC1
DATE: 12-05-1995
229.0
HEADWATER
ELEVATION
(FT)
224.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
DATA
INTERPOLATION


CULVERT # 1 & ROADWAY PERFORMANCE
FILE: OCC1
DATE: 12-05-1995
234.0
HEADWATER
ELEVATION
229.0
(FT)
224.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
ROADWAY
INTERPOLATION


(Dc + D)/2 CULVERT # 1 & TAILWATER
FILE: OCC1
DATE: 12-05-1995
227.0
HEADWATER
ELEVATION
225.0
(FT)
223.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
TAILWATER
INTERPOLATION


DOWNSTREAM CHANNEL RATING CURVE
FILE: OCC1
DATE: 12-04-1995
225.2
WATER
SURFACE
224.7
ELEVATION
(FT)
224.2
0.0
20.0
40.0
DISCHARGE (CFS)
DATA
INTERPOLATED

CURRENT DATE: 12-05-1995
CURRENT TIME: 12:34:26

FILE DATE: 12-04-1995
FILE NAME: OCC2

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	210.03	209.48	16.41	1 CSP	1.00	1.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

FILE: OCC2 CULVERT HEADWATER ELEVATION (FT) DATE: 12-04-1995

DISCHARGE	1	2	3	4	5	6	ROADWAY
0	210.03	0.00	0.00	0.00	0.00	0.00	212.00
4	211.74	0.00	0.00	0.00	0.00	0.00	212.05
7	215.21	0.00	0.00	0.00	0.00	0.00	212.08
11	221.02	0.00	0.00	0.00	0.00	0.00	212.11
14	229.10	0.00	0.00	0.00	0.00	0.00	212.13
18	239.45	0.00	0.00	0.00	0.00	0.00	212.15
21	267.58	0.00	0.00	0.00	0.00	0.00	212.17
25	348.48	0.00	0.00	0.00	0.00	0.00	212.19
28	485.09	0.00	0.00	0.00	0.00	0.00	212.20
32	907.18	0.00	0.00	0.00	0.00	0.00	212.22
35	1584.57	0.00	0.00	0.00	0.00	0.00	212.24
35	1584.57	0.00	0.00	0.00	0.00	0.00	0.00

The above Q and HW are for a point above the roadway.

CURRENT DATE: 12-05-1995 FILE DATE: 12-04-1995
CURRENT TIME: 12:34:26 FILE NAME: OCC2

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (1 BY 1) CSP

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	210.03	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.52
4	211.74	1.71	1.60	3-M1f	0.82	0.80	4.50	1.00	4.97	1.04
0	210.64	0.00	0.61	0-NF	0.00	0.00	4.50	0.00	5.74	1.16
0	210.74	0.00	0.71	0-NF	0.00	0.00	4.50	0.00	6.29	1.26
0	210.81	0.00	0.78	0-NF	0.00	0.00	4.50	0.00	6.72	1.33
0	210.88	0.00	0.85	0-NF	0.00	0.00	4.50	0.00	7.08	1.40
0	210.94	0.00	0.91	0-NF	0.00	0.00	4.50	0.00	7.40	1.46
0	211.00	0.00	0.97	0-NF	0.00	0.00	4.50	0.00	7.46	1.52
0	211.05	0.00	1.02	0-NF	0.00	0.00	4.50	0.00	7.47	1.57
0	211.11	0.00	1.08	0-NF	0.00	0.00	4.50	0.00	7.53	1.63
0	211.16	0.00	1.13	0-NF	0.00	0.00	4.50	0.00	7.61	1.68

El. inlet face invert 210.03 ft El. outlet invert 209.48 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

```
***** SITE DATA ***** CULVERT INVERT ***************
      INLET STATION (FT)                      100.00
      INLET ELEVATION (FT)                    210.03
      OUTLET STATION (FT)                     116.40
      OUTLET ELEVATION (FT)                   209.48
      NUMBER OF BARRELS                         1
      SLOPE (V-FT/H-FT)                         0.0335
      CULVERT LENGTH ALONG SLOPE (FT)          16.41

***** CULVERT DATA SUMMARY ************************
      BARREL SHAPE          CIRCULAR
      BARREL DIAMETER         1.00 FT
      BARREL MATERIAL       CORRUGATED STEEL
      BARREL MANNING'S N    0.024
      INLET TYPE            CONVENTIONAL
      INLET EDGE AND WALL   THIN EDGE PROJECTING
      INLET DEPRESSION      NONE
```

CURRENT DATE: 12-05-1995
CURRENT TIME: 12:34:26

FILE DATE: 12-04-1995
FILE NAME: OCC2

TAILWATER

***** USER DEFINED CHANNEL CROSS-SECTION

FILE NAME: OCC2
FILE DATE: 12-04-1995

MAIN CHANNEL ONLY	
LEFT CHANNEL BOUNDARY	0
RIGHT CHANNEL BOUNDARY	0
MANNING N LEFT OVER BANK	0.000
MANNING N MAIN CHANNEL	0.035
MANNING N RIGHT OVER BAN	0.000
SLOPE OF CHANNEL (FT/FT)	0.0880

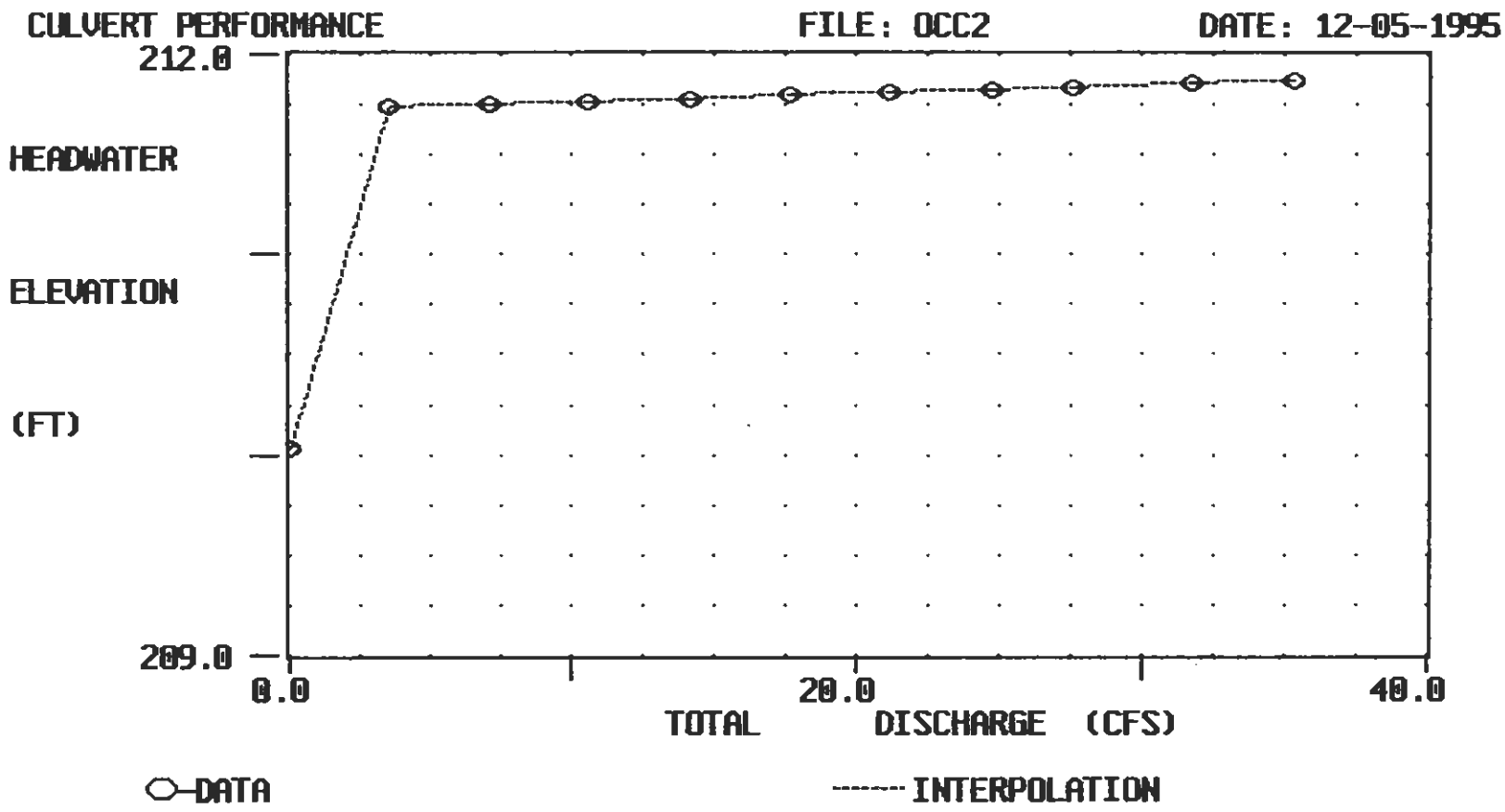
CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	211.94
2	13.12	210.96
3	16.40	210.00
4	19.68	210.96
5	23.00	212.00
6	39.40	212.20

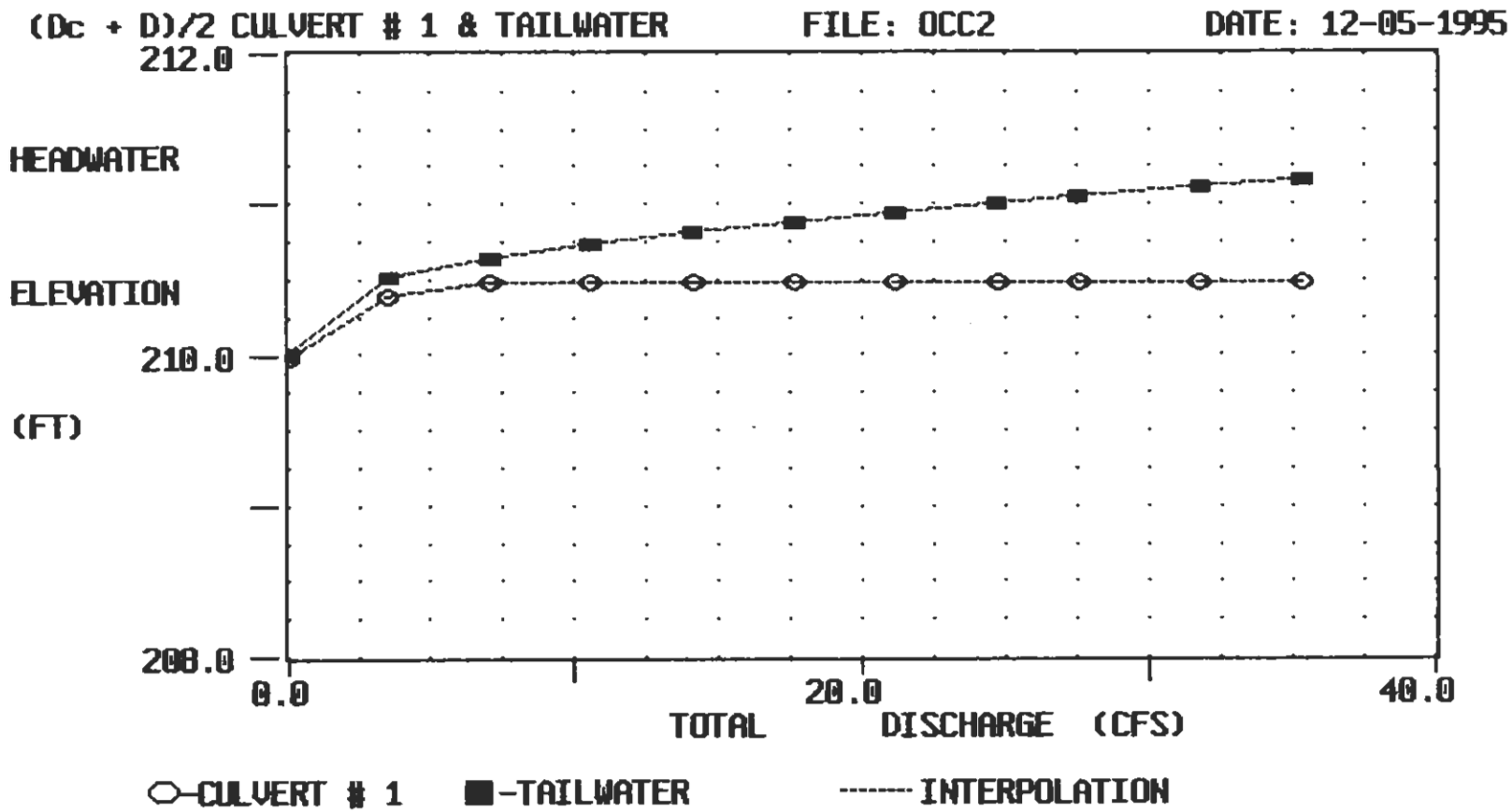
******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

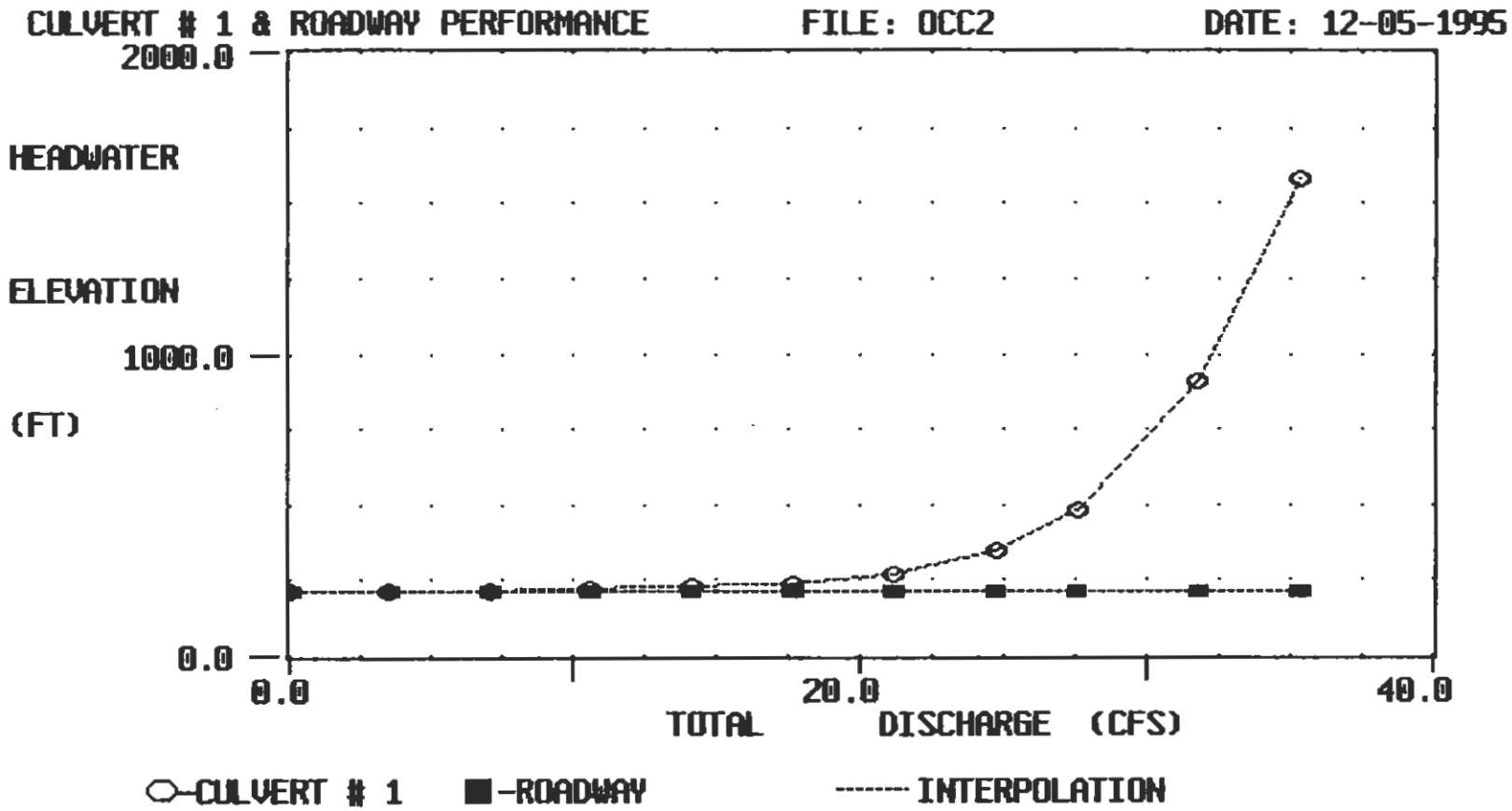
FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	210.00	0.000	0.52	0.00	0.00
3.53	210.52	1.724	1.04	4.97	1.36
7.06	210.64	1.787	1.16	5.74	1.69
10.59	210.74	1.828	1.26	6.29	1.94
14.13	210.81	1.858	1.33	6.72	2.14
17.66	210.88	1.883	1.40	7.08	2.32
21.19	210.94	1.904	1.46	7.40	2.47
24.72	211.00	1.911	1.52	7.46	2.50
27.55	211.05	1.913	1.57	7.47	2.51
31.78	211.11	1.920	1.63	7.53	2.54
35.31	211.16	1.927	1.68	7.61	2.58

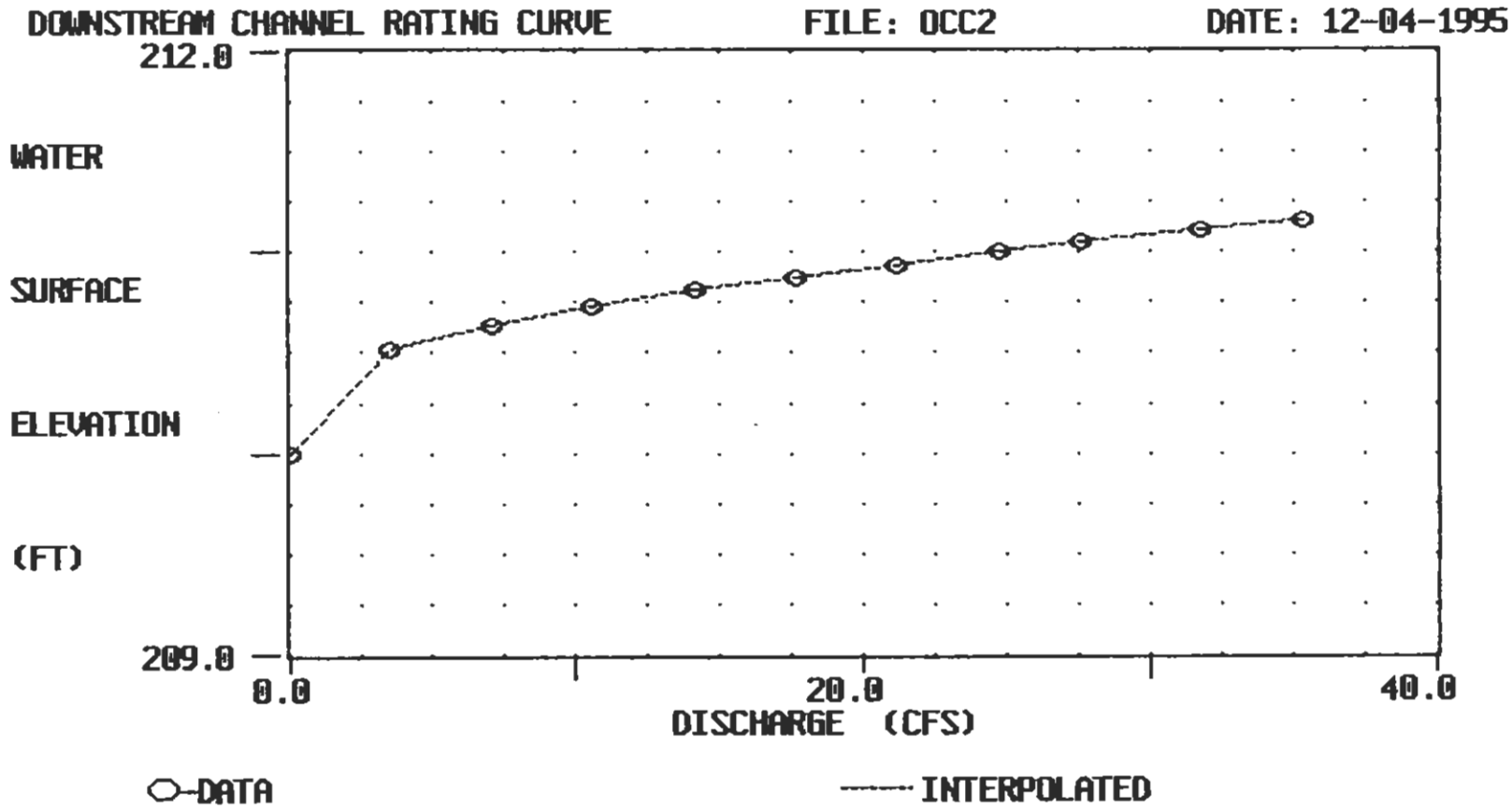
ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	20.00
CREST LENGTH (FT)	100.00
OVERTOPPING CREST ELEVATION (FT)	212.00


CULVERT PERFORMANCE
FILE: OCC2
DATE: 12-05-1995
212.0
HEADWATER
ELEVATION
(FT)
209.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
DATA
INTERPOLATION


(Dc + D)/2 CULVERT # 1 & TAILWATER
FILE: OCC2
DATE: 12-05-1995
212.0
HEADWATER
ELEVATION
210.0
(FT)
208.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
TAILWATER
INTERPOLATION


CULVERT # 1 & ROADWAY PERFORMANCE
FILE: OCC2
DATE: 12-05-1995
2000.0
HEADWATER
ELEVATION
1000.0
(FT)
0.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
ROADWAY
INTERPOLATION


DOWNSTREAM CHANNEL RATING CURVE
FILE: OCC2
DATE: 12-04-1995
212.0
WATER
SURFACE
ELEVATION
(FT)
209.0
0.0
20.0
40.0
DISCHARGE (CFS)
DATA
INTERPOLATED

CURRENT DATE: 11-29-1995
CURRENT TIME: 16:04:20

FILE DATE: 11-27-1995
FILE NAME: OCC3

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	117.85	116.45	39.39	1 CSP	2.50	2.50	.024	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: OCC3 DATE: 11-27-1995

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
117.85	0	0	0	0	0	0	0	0	1
118.98	6	6	0	0	0	0	0	0	1
119.54	11	11	0	0	0	0	0	0	1
120.05	17	17	0	0	0	0	0	0	1
120.59	23	23	0	0	0	0	0	0	1
121.21	28	28	0	0	0	0	0	0	1
121.97	34	34	0	0	0	0	0	0	1
122.06	40	35	0	0	0	0	0	5	11
122.11	45	35	0	0	0	0	0	10	6
122.11	46	35	0	0	0	0	0	11	3
122.17	57	35	0	0	0	0	0	21	6
122.00	34	34	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: OCC3 DATE: 11-27-1995

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
117.85	0.00	0	0	0.00
118.98	0.00	6	0	0.00
119.54	0.00	11	0	0.00
120.05	0.00	17	0	0.00
120.59	0.00	23	0	0.00
121.21	0.00	28	0	0.00
121.97	0.00	34	0	0.00
122.06	-0.00	40	0	0.66
122.11	-0.00	45	0	0.87
122.11	-0.00	46	0	0.97
122.17	-0.00	57	0	0.57

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

CURRENT DATE: 11-29-1995 FILE DATE: 11-27-1995
CURRENT TIME: 16:04:20 FILE NAME: OCC3

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (2.5 BY 2.5) CSP

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	117.85	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-0.05
6	118.98	1.13	1.13	1-S2n	0.61	0.78	6.05	0.61	5.46	0.59
11	119.54	1.69	1.69	1-S2n	0.88	1.12	7.30	0.88	6.50	0.78
17	120.05	2.20	2.20	1-S2n	1.10	1.39	8.25	1.09	7.19	0.92
23	120.59	2.74	2.74	5-S2n	1.31	1.61	8.72	1.31	7.73	1.03
28	121.21	3.36	3.36	5-S2n	1.50	1.81	9.17	1.50	8.17	1.13
34	121.97	4.12	4.12	5-S2n	1.71	1.98	9.46	1.71	8.55	1.21
35	122.06	4.21	4.21	5-S2n	1.73	2.00	9.50	1.74	8.89	1.28
35	122.10	4.25	4.25	5-S2n	1.74	2.00	9.51	1.75	9.19	1.35
35	122.11	4.26	4.26	5-S2n	1.74	2.00	9.51	1.75	9.22	1.36
35	122.17	4.32	4.32	5-S2n	1.75	2.01	9.54	1.76	9.71	1.48

El. inlet face invert 117.85 ft El. outlet invert 116.45 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

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

INLET STATION (FT)	100.00
INLET ELEVATION (FT)	117.85
OUTLET STATION (FT)	139.37
OUTLET ELEVATION (FT)	116.45
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0356
CULVERT LENGTH ALONG SLOPE (FT)	39.39

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

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.50 FT
BARREL MATERIAL	CORRUGATED STEEL
BARREL MANNING'S N	0.024
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	THIN EDGE PROJECTING
INLET DEPRESSION	NONE

CURRENT DATE: 11-29-1995
CURRENT TIME: 16:04:20

FILE DATE: 11-27-1995
FILE NAME: OCC3

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

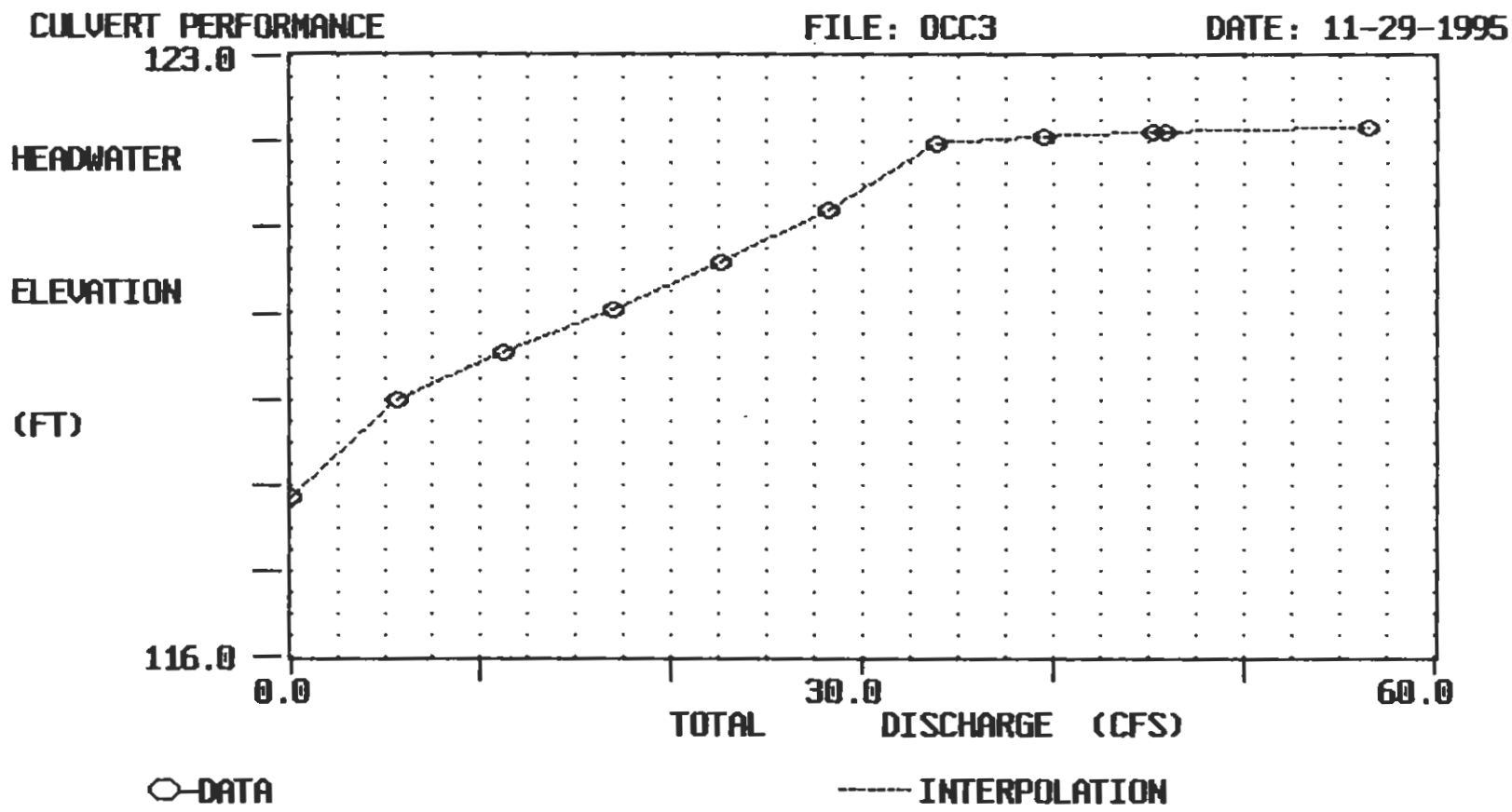
SIDE SLOPE H/V (X:1)	2.5
CHANNEL SLOPE V/H (FT/FT)	0.083
MANNING'S N (.01-0.1)	0.035
CHANNEL INVERT ELEVATION (FT)	116.40
CULVERT NO.1 OUTLET INVERT ELEVATION	116.45 FT

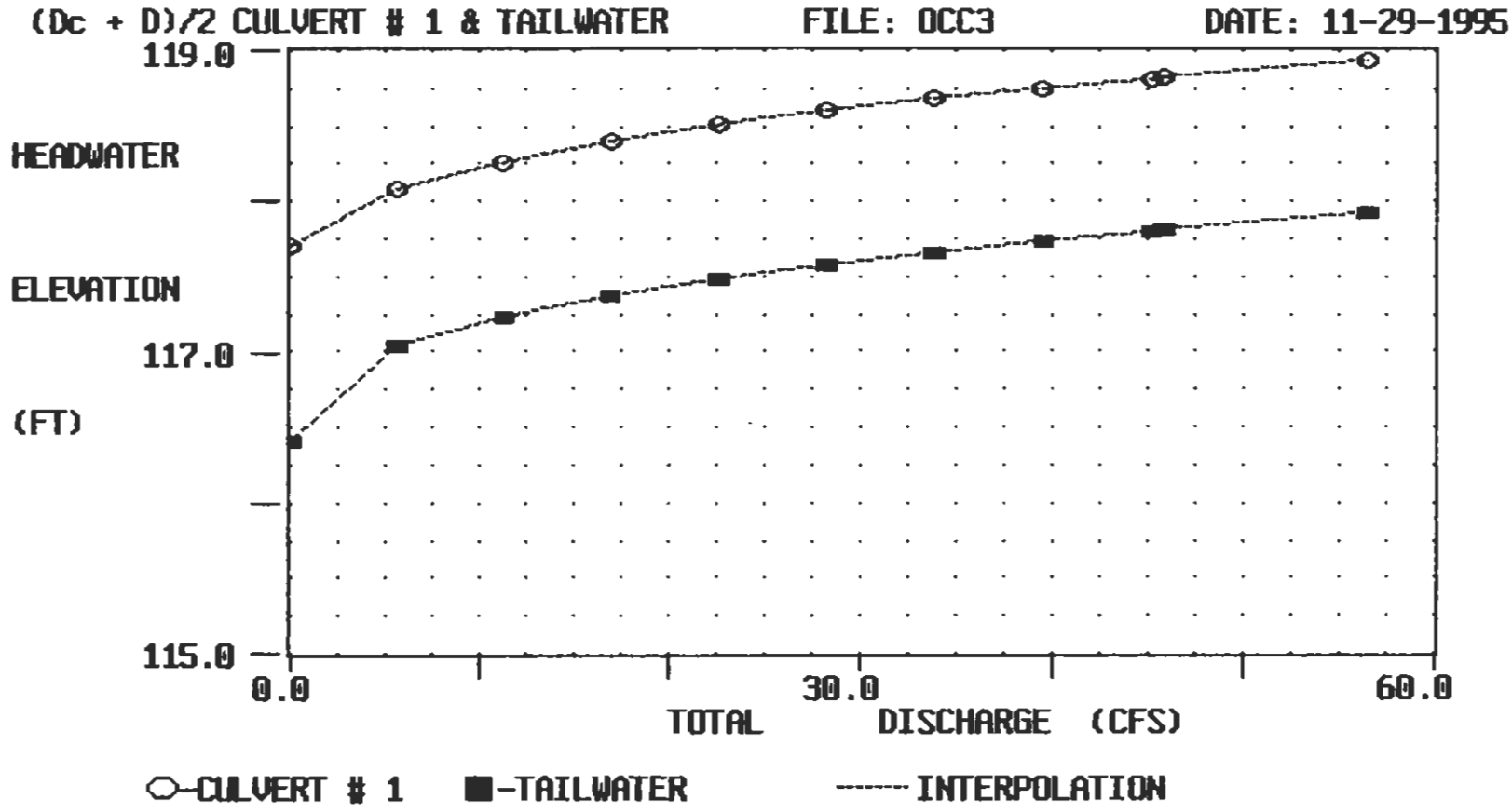
******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

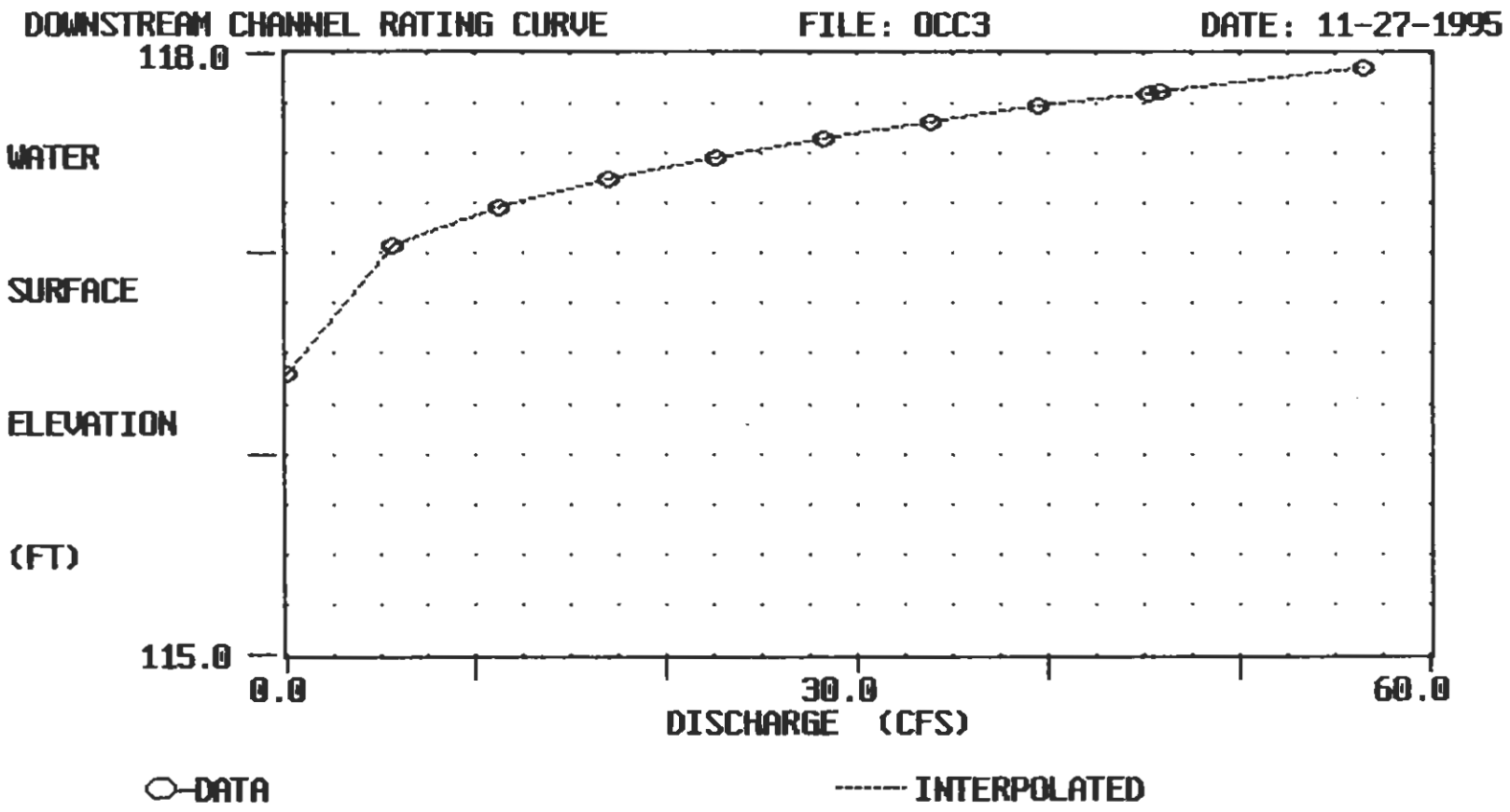
FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	116.40	0.000	0.00	0.00	0.00
5.65	117.04	1.200	0.64	5.46	3.33
11.30	117.23	1.254	0.83	6.50	4.32
16.95	117.37	1.285	0.97	7.19	5.03
22.60	117.48	1.309	1.08	7.73	5.60
28.25	117.58	1.327	1.18	8.17	6.09
33.90	117.66	1.343	1.26	8.55	6.52
39.55	117.73	1.356	1.33	8.89	6.91
45.20	117.80	1.367	1.40	9.19	7.27
45.91	117.81	1.369	1.41	9.22	7.31
56.50	117.93	1.385	1.53	9.71	7.90

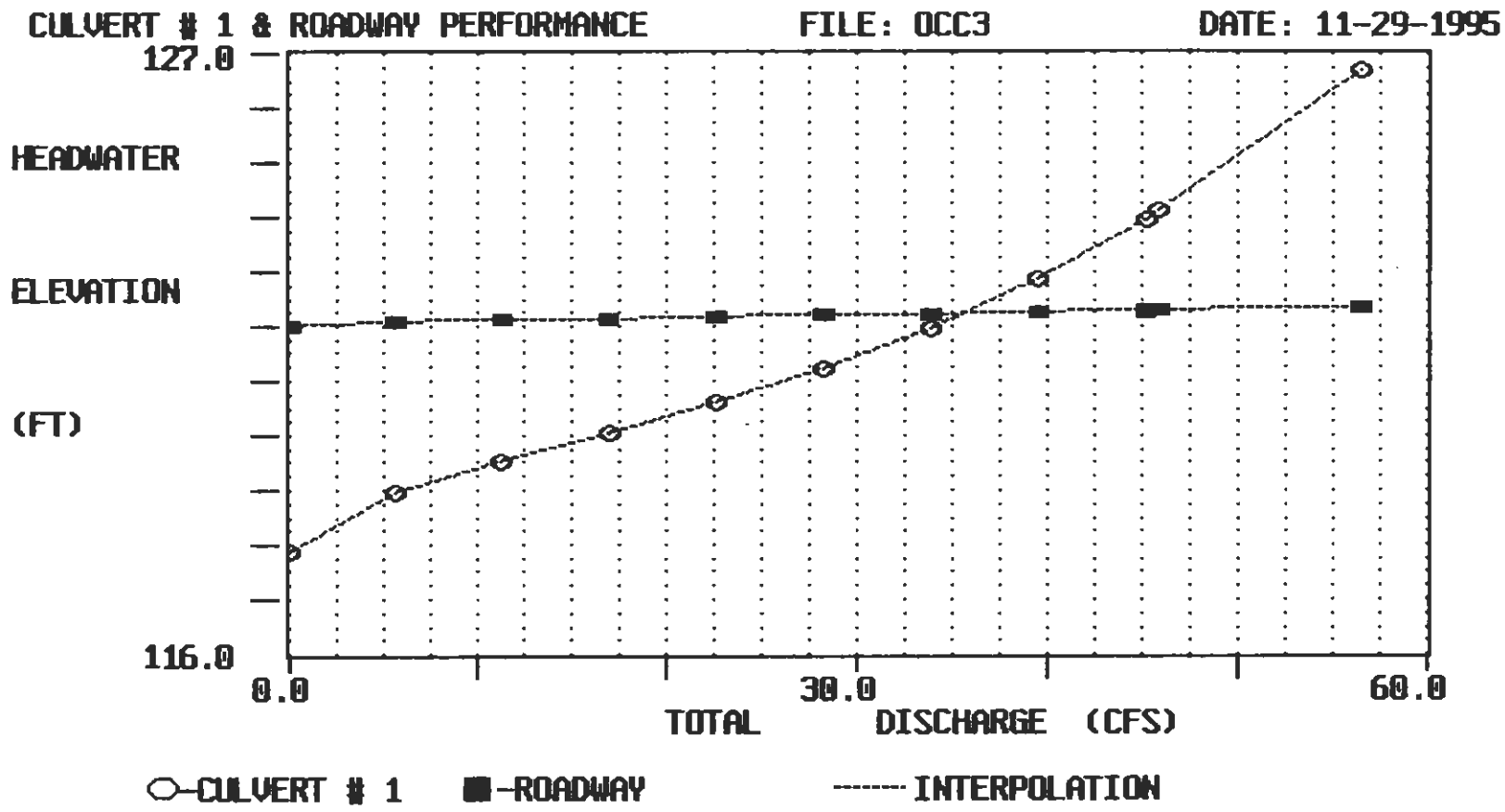
ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	10.00
CREST LENGTH (FT)	100.00
OVERTOPPING CREST ELEVATION (FT)	122.00


CULVERT PERFORMANCE
FILE: OCC3
DATE: 11-29-1995
123.0
HEADWATER
ELEVATION
(FT)
116.0
0.0
30.0
60.0
TOTAL DISCHARGE (CFS)
DATA
INTERPOLATION


(Dc + D)/2 CULVERT # 1 & TAILWATER
FILE: OCC3
DATE: 11-29-1995
119.0
HEADWATER
ELEVATION
117.0
(FT)
115.0
0.0
30.0
60.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
TAILWATER
INTERPOLATION


DOWNSTREAM CHANNEL RATING CURVE
FILE: OCC3
DATE: 11-27-1995
118.0
115.0
WATER
SURFACE
ELEVATION
(FT)
0.0
30.0
60.0
DISCHARGE (CFS)
DATA
INTERPOLATED


CULVERT # 1 & ROADWAY PERFORMANCE
FILE: OCC3
DATE: 11-29-1995
127.0
HEADWATER
ELEVATION
(FT)
116.0
0.0
30.0
60.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
ROADWAY
INTERPOLATION

CURRENT DATE: 11-29-1995
CURRENT TIME: 15:52:04

FILE DATE: 11-27-1995
FILE NAME: OCC4

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	103.91	103.31	16.41	1 CSP	4.00	4.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

FILE: OCC4 CULVERT HEADWATER ELEVATION (FT) DATE: 11-27-1995

DISCHARGE	1	2	3	4	5	6	ROADWAY
0	103.91	0.00	0.00	0.00	0.00	0.00	109.25
6	104.97	0.00	0.00	0.00	0.00	0.00	109.32
11	105.32	0.00	0.00	0.00	0.00	0.00	109.36
17	105.64	0.00	0.00	0.00	0.00	0.00	109.40
23	105.94	0.00	0.00	0.00	0.00	0.00	109.43
28	106.22	0.00	0.00	0.00	0.00	0.00	109.46
34	106.48	0.00	0.00	0.00	0.00	0.00	109.48
40	106.74	0.00	0.00	0.00	0.00	0.00	109.51
45	107.00	0.00	0.00	0.00	0.00	0.00	109.53
46	107.03	0.00	0.00	0.00	0.00	0.00	109.54
57	107.50	0.00	0.00	0.00	0.00	0.00	109.58
102	109.93	0.00	0.00	0.00	0.00	0.00	0.00

The above Q and HW are for a point above the roadway.

CURRENT DATE: 11-29-1995 FILE DATE: 11-27-1995
CURRENT TIME: 15:52:04 FILE NAME: OCC4

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (4 BY 4) CSP

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	103.91	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-0.31
6	104.97	1.06	1.06	1-S2n	0.50	0.66	5.99	0.50	4.03	0.37
11	105.32	1.41	1.41	1-S2n	0.73	0.96	7.11	0.73	4.70	0.55
17	105.64	1.73	1.73	1-S2n	0.90	1.21	7.50	0.94	5.16	0.68
23	105.94	2.03	2.03	1-S2n	1.04	1.39	8.15	1.08	5.53	0.78
28	106.22	2.31	2.31	1-S2n	1.18	1.57	8.47	1.25	5.84	0.88
34	106.48	2.57	2.57	1-S2n	1.29	1.72	8.88	1.37	6.10	0.96
40	106.74	2.83	2.83	1-S2n	1.40	1.87	9.21	1.50	6.33	1.03
45	107.00	3.09	3.09	1-S2n	1.50	2.01	9.51	1.62	6.54	1.10
46	107.03	3.12	3.12	1-S2n	1.52	2.03	9.55	1.63	6.57	1.10
57	107.50	3.59	3.59	1-S2n	1.70	2.25	10.04	1.83	6.91	1.22

El. inlet face invert 103.91 ft El. outlet invert 103.31 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

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

INLET STATION (FT)	100.00
INLET ELEVATION (FT)	103.91
OUTLET STATION (FT)	116.40
OUTLET ELEVATION (FT)	103.31
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0366
CULVERT LENGTH ALONG SLOPE (FT)	16.41

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

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	4.00 FT
BARREL MATERIAL	CORRUGATED STEEL
BARREL MANNING'S N	0.024
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	THIN EDGE PROJECTING
INLET DEPRESSION	NONE

CURRENT DATE: 11-29-1995
CURRENT TIME: 15:52:04

FILE DATE: 11-27-1995
FILE NAME: OCC4

TAILWATER

***** USER DEFINED CHANNEL CROSS-SECTION

FILE NAME: OCC4
FILE DATE: 11-27-1995

MAIN CHANNEL ONLY	
LEFT CHANNEL BOUNDARY	0
RIGHT CHANNEL BOUNDARY	0
MANNING N LEFT OVER BANK	0.000
MANNING N MAIN CHANNEL	0.035
MANNING N RIGHT OVER BAN	0.000
SLOPE OF CHANNEL (FT/FT)	0.0400

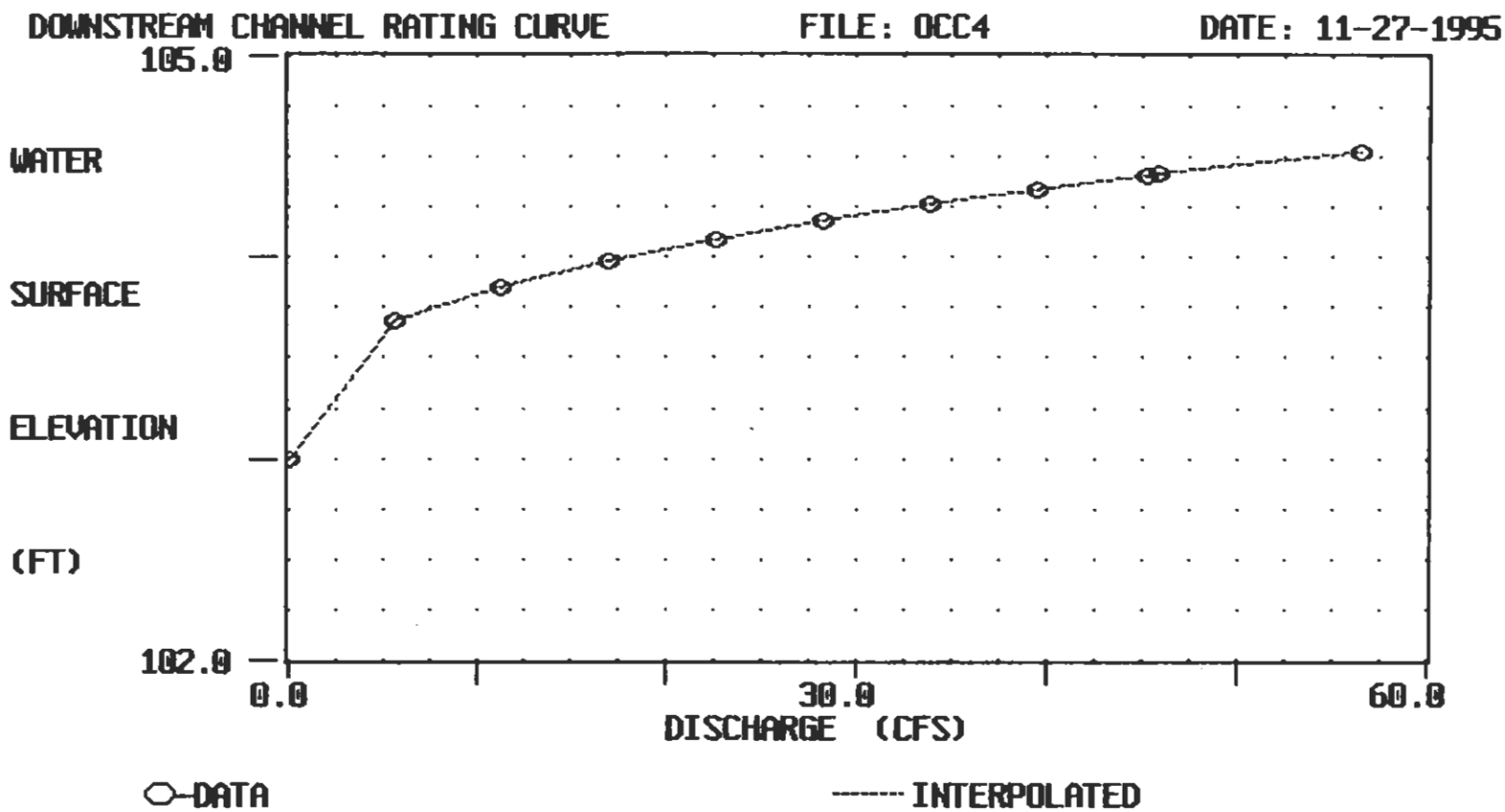
CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	108.27
2	31.17	105.81
3	39.37	103.00
4	52.50	106.10
5	65.60	108.60

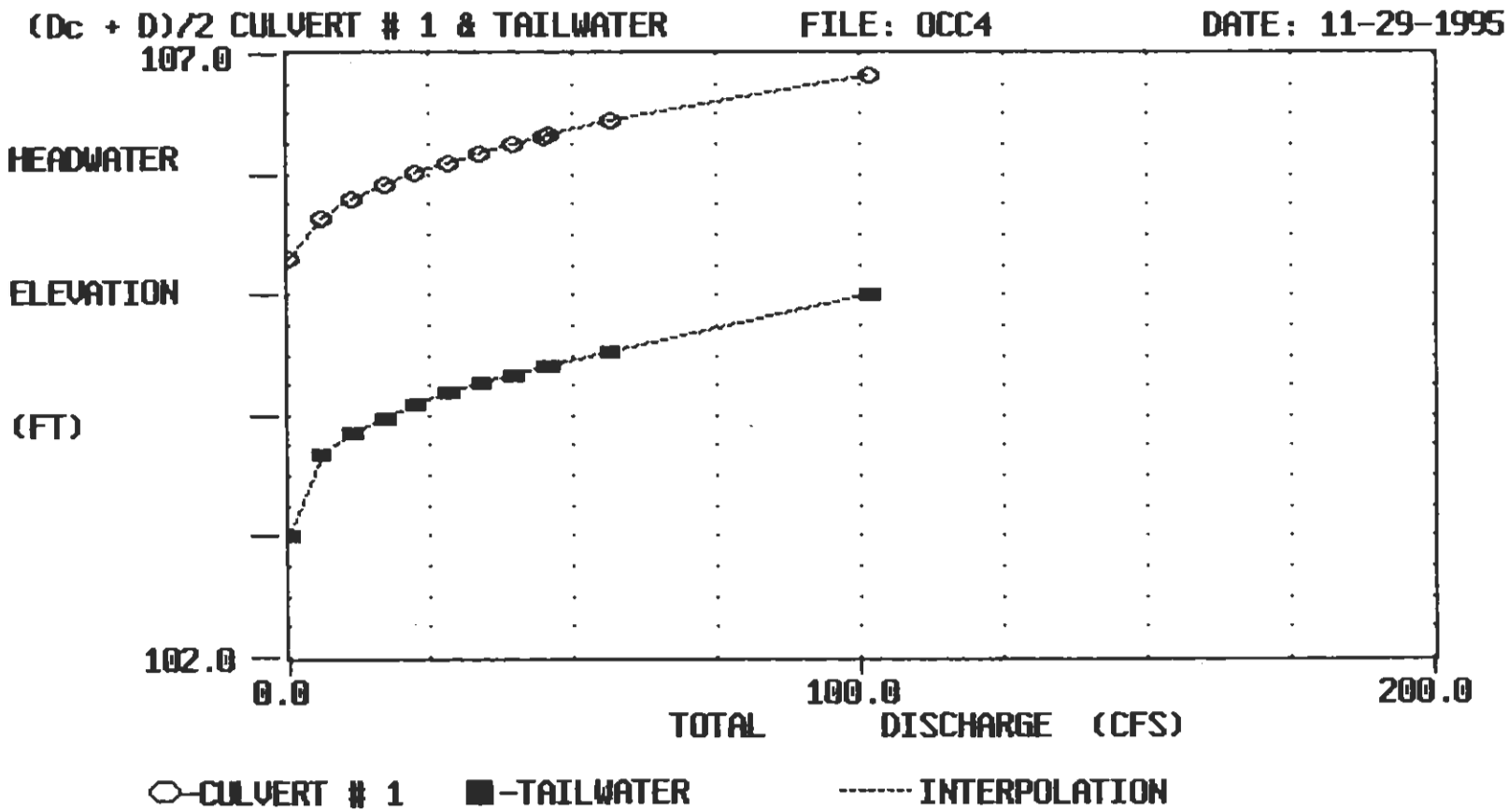
******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

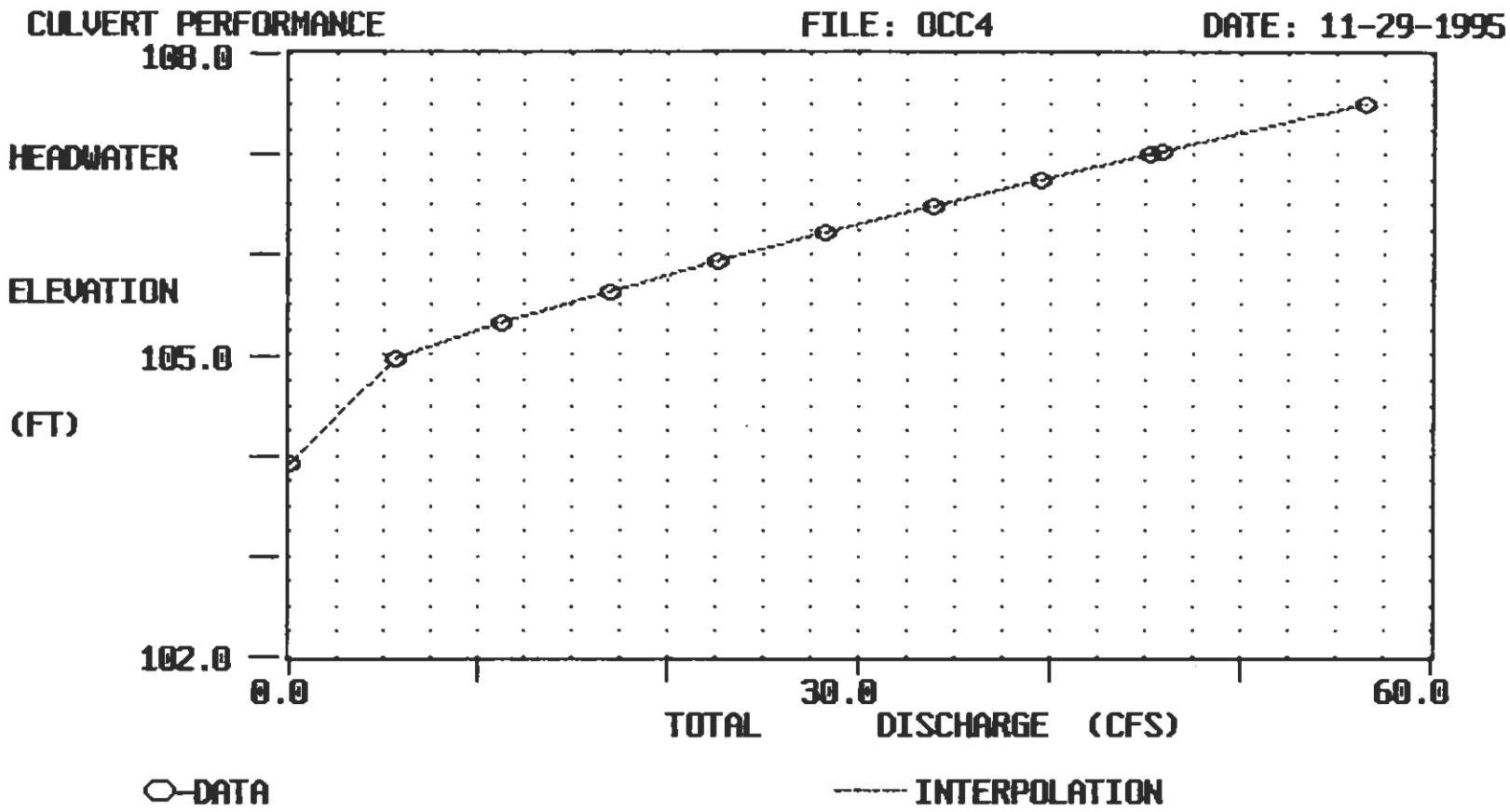
FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	103.00	0.000	-0.31	0.00	0.00
5.65	103.68	1.218	0.37	4.03	0.82
11.30	103.86	1.266	0.55	4.70	1.03
16.95	103.99	1.296	0.68	5.16	1.18
22.60	104.09	1.318	0.78	5.53	1.31
28.25	104.18	1.336	0.88	5.84	1.42
33.90	104.26	1.351	0.96	6.10	1.52
39.55	104.34	1.364	1.03	6.33	1.61
45.20	104.41	1.375	1.10	6.54	1.69
45.91	104.41	1.376	1.10	6.57	1.70
56.50	104.53	1.394	1.22	6.91	1.83

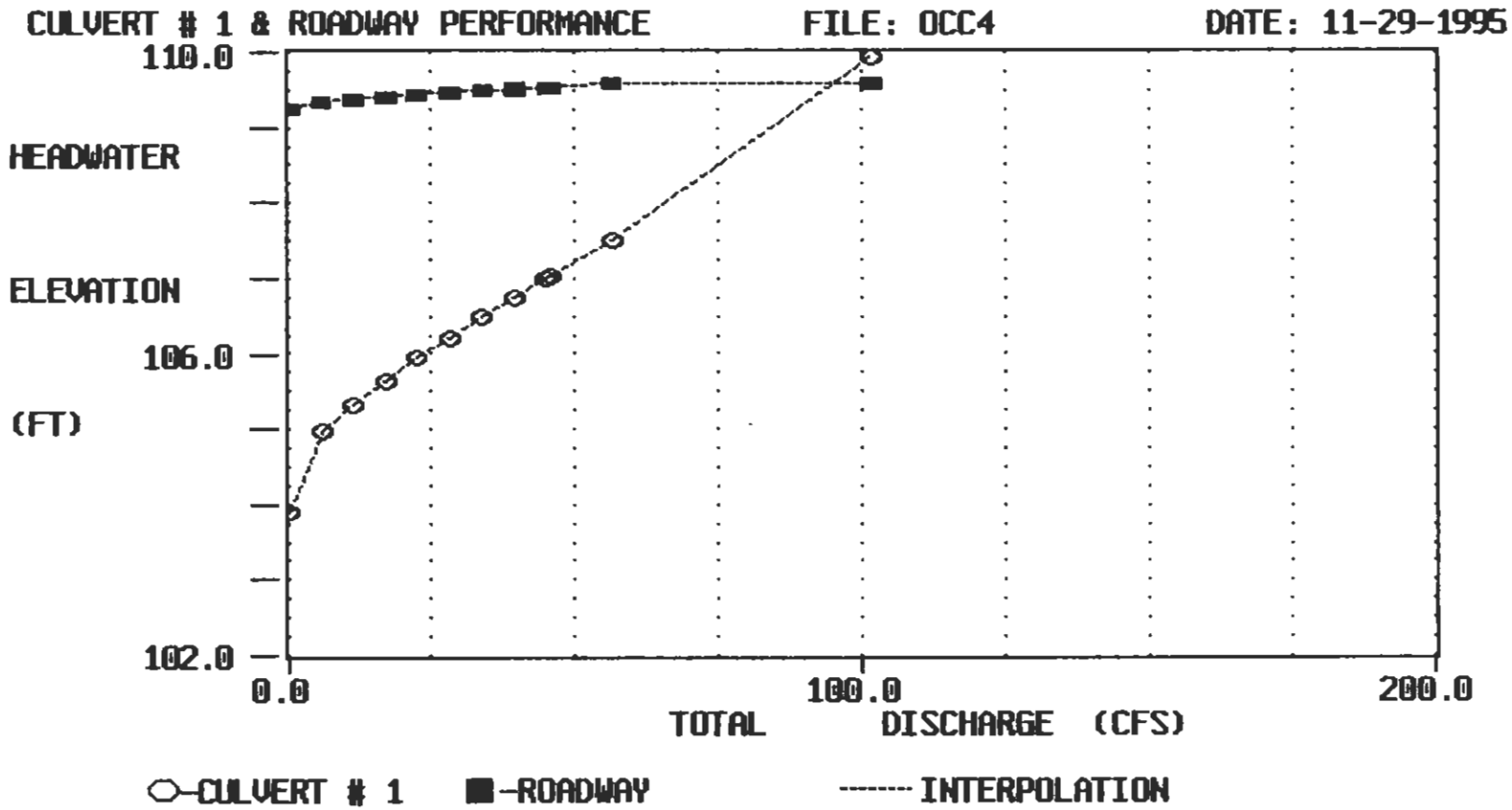
ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	10.00
CREST LENGTH (FT)	100.00
OVERTOPPING CREST ELEVATION (FT)	109.25


DOWNSTREAM CHANNEL RATING CURVE
FILE: OCC4
DATE: 11-27-1995
105.0
WATER
SURFACE
ELEVATION
(FT)
102.0
0.0
30.0
60.0
DISCHARGE (CFS)
DATA
INTERPOLATED


(Dc + D)/2 CULVERT # 1 & TAILWATER
FILE: OCC4
DATE: 11-29-1995
107.0
HEADWATER
ELEVATION
(FT)
102.0
0.0
100.0
200.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
TAILWATER
INTERPOLATION


CULVERT PERFORMANCE
FILE: OCC4
DATE: 11-29-1995
108.0
HEADWATER
ELEVATION
105.0
(FT)
102.0
0.0
30.0
60.0
TOTAL DISCHARGE (CFS)
DATA
INTERPOLATION


CULVERT # 1 & ROADWAY PERFORMANCE
FILE: OCC4
DATE: 11-29-1995
110.0
HEADWATER
ELEVATION
106.0
(FT)
102.0
0.0
100.0
200.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
ROADWAY
INTERPOLATION

CURRENT DATE: 11-29-1995
CURRENT TIME: 15:19:34

FILE DATE: 11-24-1995
FILE NAME: OCC5

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	101.45	92.27	213.45	1 CSP	2.00	2.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: OCC5 DATE: 11-24-1995

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
101.45	0	0	0	0	0	0	0	0	1
102.69	6	6	0	0	0	0	0	0	1
103.41	11	11	0	0	0	0	0	0	1
104.27	17	17	0	0	0	0	0	0	1
105.45	23	23	0	0	0	0	0	0	1
107.24	28	28	0	0	0	0	0	0	30
107.37	34	28	0	0	0	0	0	6	12
107.42	40	28	0	0	0	0	0	11	6
107.45	45	28	0	0	0	0	0	17	6
107.45	46	28	0	0	0	0	0	18	3
107.51	57	28	0	0	0	0	0	28	5
107.30	28	28	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: OCC5 DATE: 11-24-1995

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
101.45	0.00	0	0	0.00
102.69	0.00	6	0	0.00
103.41	0.00	11	0	0.00
104.27	0.00	17	0	0.00
105.45	0.00	23	0	0.00
107.24	-0.01	28	1	2.60
107.37	-0.00	34	0	0.76
107.42	-0.00	40	0	0.97
107.45	-0.00	45	0	0.53
107.45	-0.00	46	0	0.66
107.51	-0.00	57	0	0.87

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

CURRENT DATE: 11-29-1995 FILE DATE: 11-24-1995
CURRENT TIME: 15:19:34 FILE NAME: OCC5

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (2 BY 2) CSP

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	101.45	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-2.37
6	102.69	1.24	1.24	1-S2n	0.64	0.84	6.60	0.64	6.01	-1.62
11	103.41	1.96	1.96	1-S2n	0.93	1.21	7.88	0.93	7.01	-1.42
17	104.27	2.82	2.82	5-S2n	1.19	1.48	8.68	1.19	7.70	-1.28
23	105.45	4.00	4.00	5-S2n	1.47	1.68	9.14	1.47	8.25	-1.16
28	107.24	5.38	5.79	6-FFn	2.00	1.83	8.76	2.00	8.68	-1.06
28	107.38	5.43	5.93	6-FFn	2.00	1.83	8.81	2.00	8.89	-0.96
28	107.42	5.44	5.97	6-FFn	2.00	1.83	8.82	2.00	9.11	-0.87
28	107.45	5.45	6.00	6-FFn	2.00	1.83	8.83	2.00	9.34	-0.79
28	107.46	5.45	6.01	6-FFn	2.00	1.83	8.83	2.00	9.36	-0.79
28	107.50	5.47	6.05	6-FFn	2.00	1.83	8.85	2.00	9.73	-0.66

El. inlet face invert 101.45 ft El. outlet invert 92.27 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

```
***** SITE DATA ***** CULVERT INVERT **************
      INLET STATION (FT)                      4019.00
      INLET ELEVATION (FT)                     101.45
      OUTLET STATION (FT)                     4232.25
      OUTLET ELEVATION (FT)                     92.27
      NUMBER OF BARRELS                          1
      SLOPE (V-FT/H-FT)                          0.0430
      CULVERT LENGTH ALONG SLOPE (FT)          213.45

***** CULVERT DATA SUMMARY ************************
      BARREL SHAPE          CIRCULAR
      BARREL DIAMETER         2.00 FT
      BARREL MATERIAL       CORRUGATED STEEL
      BARREL MANNING'S N    0.024
      INLET TYPE            CONVENTIONAL
      INLET EDGE AND WALL   THIN EDGE PROJECTING
      INLET DEPRESSION      NONE
```

CURRENT DATE: 11-29-1995
CURRENT TIME: 15:19:34

FILE DATE: 11-24-1995
FILE NAME: OCC5

TAILWATER

***** USER DEFINED CHANNEL CROSS-SECTION

FILE NAME: OC16
FILE DATE: 11-24-1995

MAIN CHANNEL ONLY

LEFT CHANNEL BOUNDARY	0
RIGHT CHANNEL BOUNDARY	0
MANNING N LEFT OVER BANK	0.000
MANNING N MAIN CHANNEL	0.035
MANNING N RIGHT OVER BAN	0.000
SLOPE OF CHANNEL (FT/FT)	0.0870

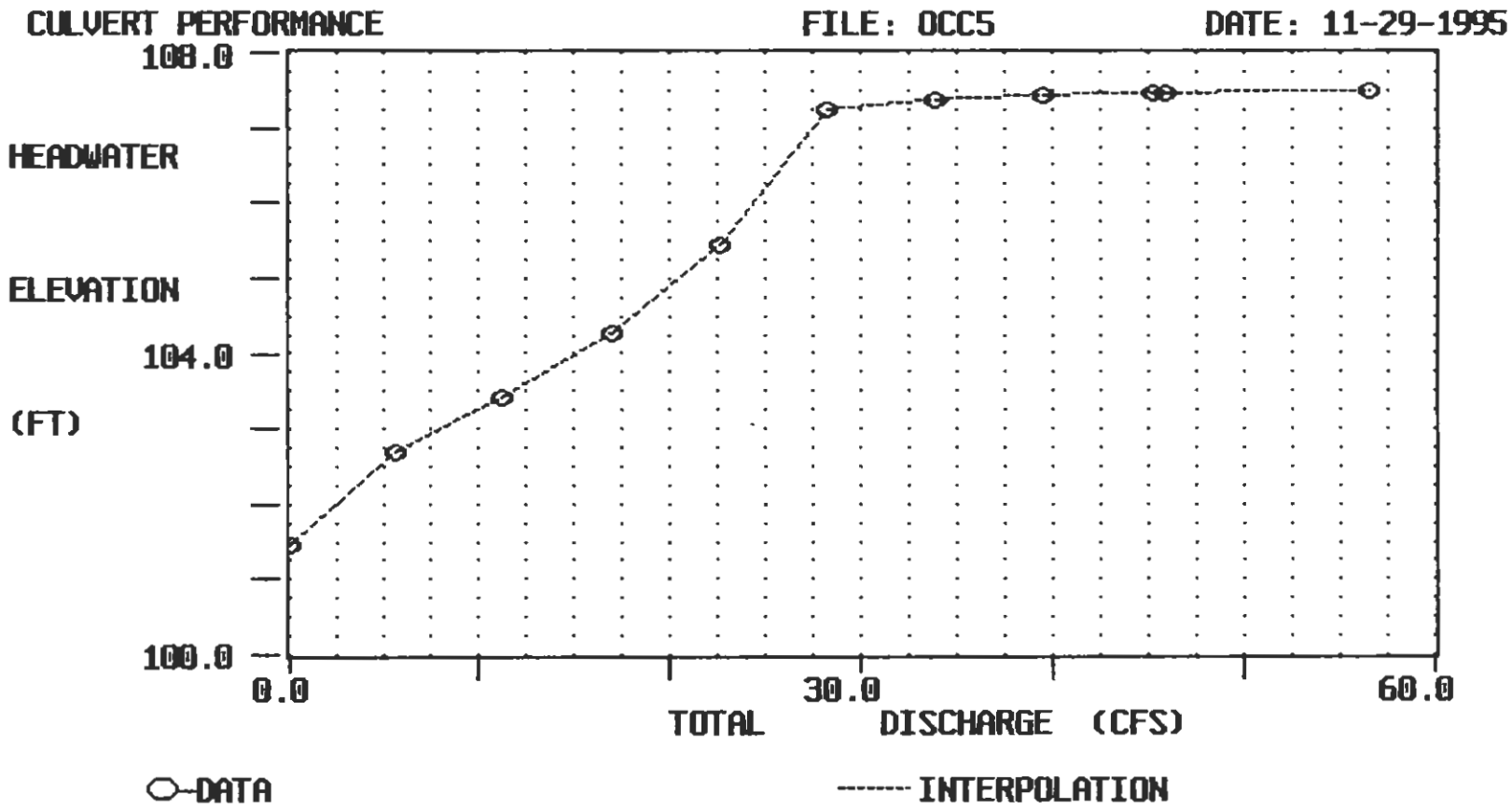
CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	102.36
2	37.73	96.13
3	52.50	92.20
4	55.77	89.90
5	59.00	91.20
6	118.10	102.36

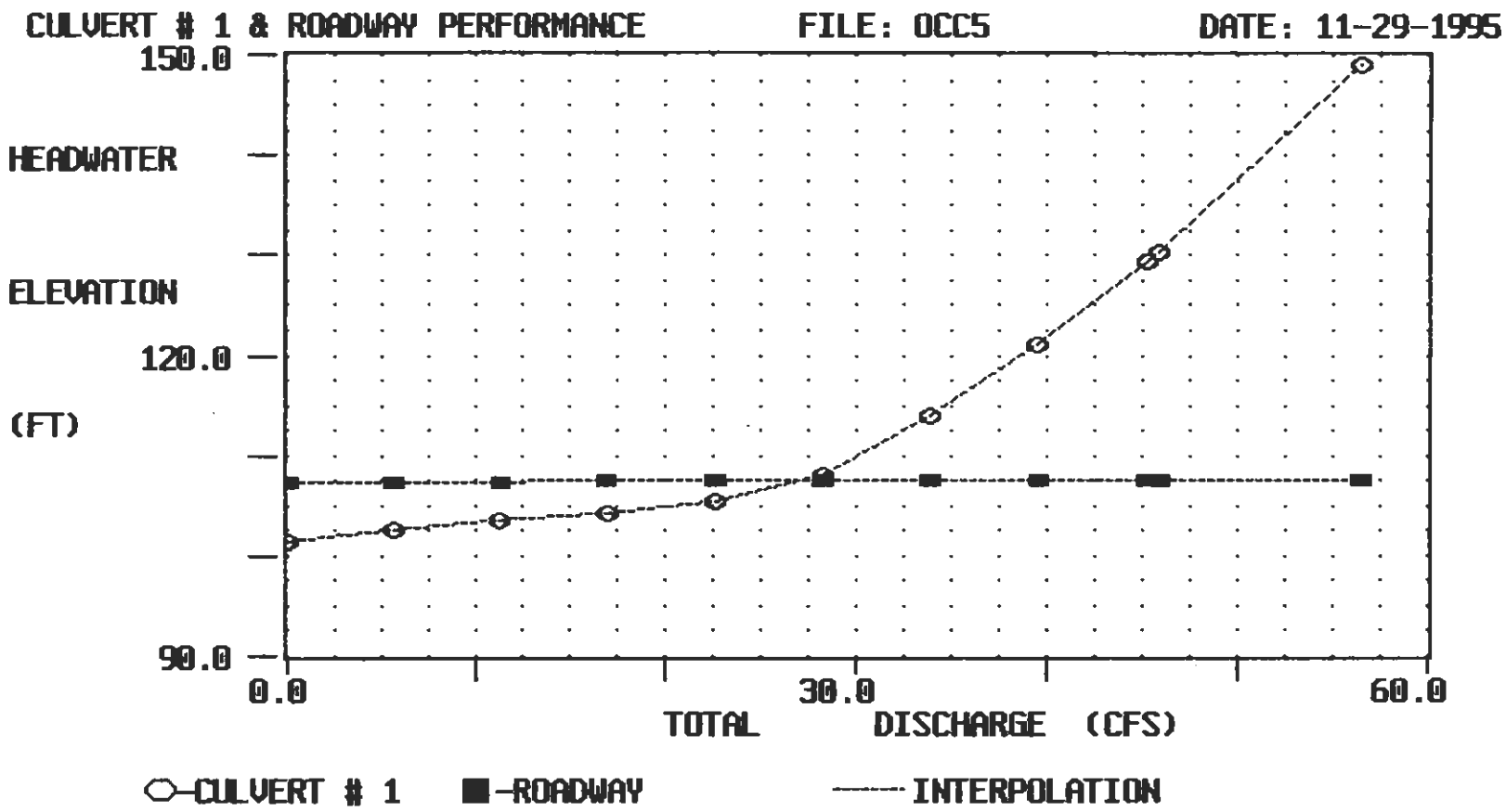
******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

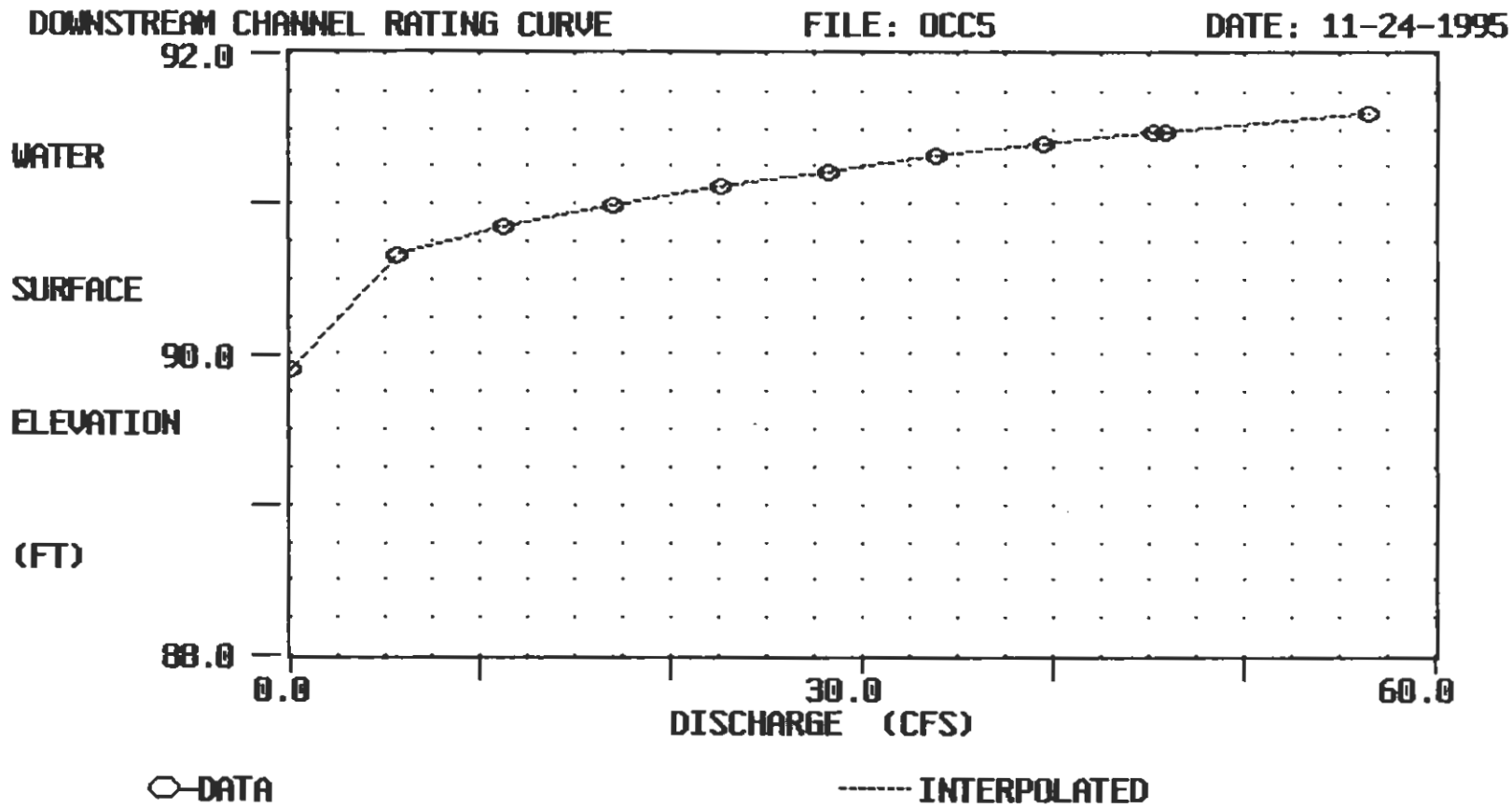
FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	89.90	0.000	-2.37	0.00	0.00
5.65	90.65	1.728	-1.62	6.01	1.81
11.30	90.85	1.795	-1.42	7.01	2.27
16.95	90.99	1.838	-1.28	7.70	2.62
22.60	91.11	1.870	-1.16	8.25	2.90
28.25	91.21	1.895	-1.06	8.68	3.13
33.90	91.31	1.913	-0.96	8.89	3.25
39.55	91.40	1.930	-0.87	9.11	3.37
45.20	91.48	1.945	-0.79	9.34	3.49
45.91	91.48	1.946	-0.79	9.36	3.51
56.50	91.61	1.970	-0.66	9.73	3.72

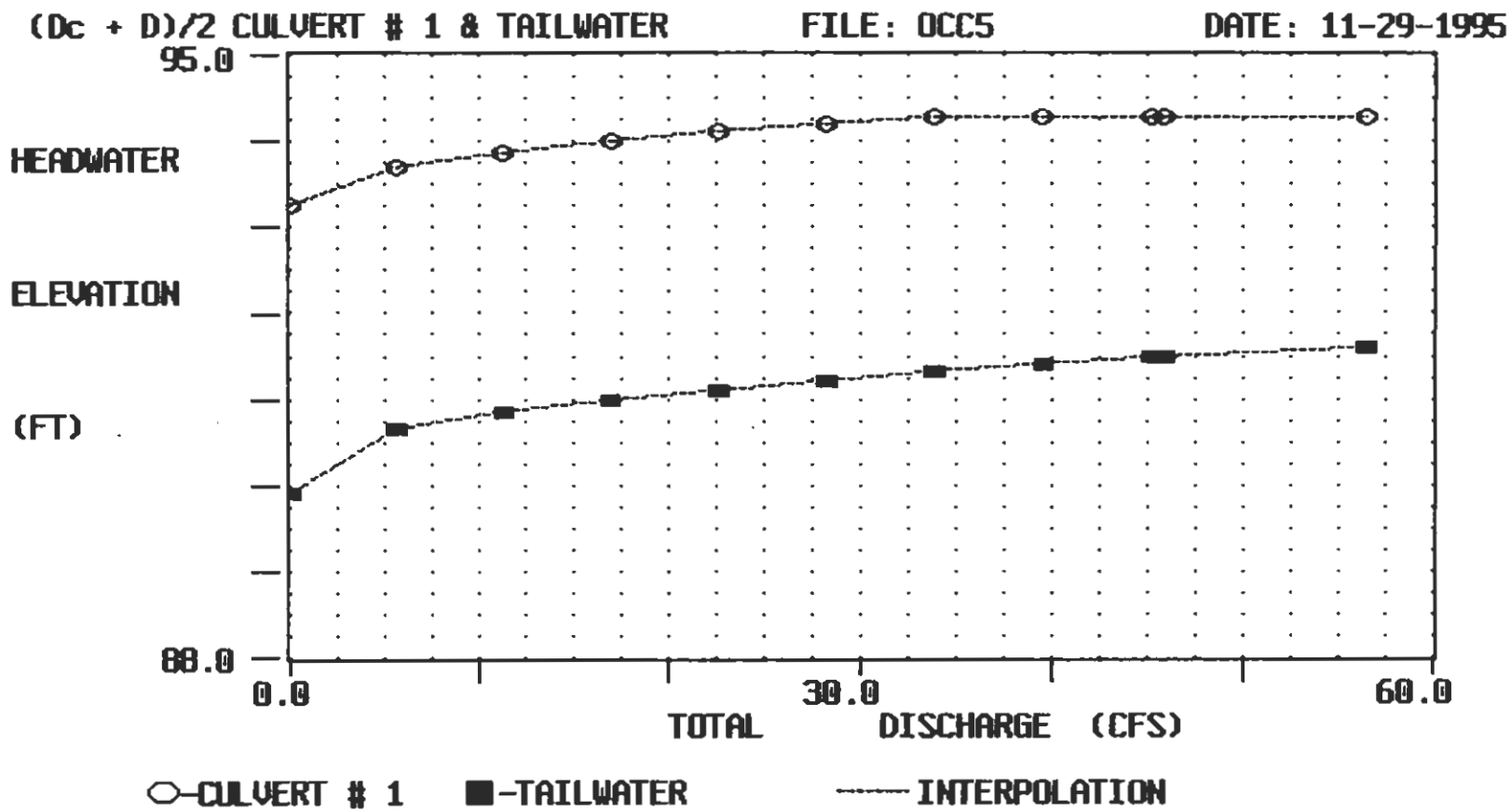
ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	20.00
CREST LENGTH (FT)	100.00
OVERTOPPING CREST ELEVATION (FT)	107.30


CULVERT PERFORMANCE
FILE: OCC5
DATE: 11-29-1995
108.0
HEADWATER
ELEVATION
104.0
(FT)
100.0
0.0
30.0
60.0
TOTAL DISCHARGE (CFS)
DATA
INTERPOLATION


CULVERT # 1 & ROADWAY PERFORMANCE
FILE: OCC5
DATE: 11-29-1995
150.0
HEADWATER
ELEVATION
120.0
(FT)
90.0
0.0
30.0
60.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
ROADWAY
INTERPOLATION


DOWNSTREAM CHANNEL RATING CURVE
FILE: OCC5
DATE: 11-24-1995
92.0
90.0
88.0
WATER
SURFACE
ELEVATION
(FT)
0.0
30.0
60.0
DISCHARGE (CFS)
DATA
INTERPOLATED


(Dc + D)/2 CULVERT # 1 & TAILWATER
FILE: OCC5
DATE: 11-29-1995
95.0
HEADWATER
ELEVATION
(FT)
88.0
0.0
30.0
60.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
TAILWATER
INTERPOLATION

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:03:51

FILE DATE: 01-12-1996
FILE NAME: PCC1

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	100.00	94.70	148.09	1 CMPA	4.75	3.17	.024	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: PCC1 DATE: 01-12-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
100.00	0	0	0	0	0	0	0	0	1
100.64	3	3	0	0	0	0	0	0	1
100.80	6	6	0	0	0	0	0	0	1
101.01	10	10	0	0	0	0	0	0	1
101.19	13	13	0	0	0	0	0	0	1
101.36	16	16	0	0	0	0	0	0	1
101.51	19	19	0	0	0	0	0	0	1
101.66	23	23	0	0	0	0	0	0	1
101.74	24	24	0	0	0	0	0	0	1
101.96	29	29	0	0	0	0	0	0	1
102.10	32	32	0	0	0	0	0	0	1
106.00	106	106	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: PCC1 DATE: 01-12-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
100.00	0.00	0	0	0.00
100.64	0.00	3	0	0.00
100.80	0.00	6	0	0.00
101.01	0.00	10	0	0.00
101.19	0.00	13	0	0.00
101.36	0.00	16	0	0.00
101.51	0.00	19	0	0.00
101.66	0.00	23	0	0.00
101.74	0.00	24	0	0.00
101.96	0.00	29	0	0.00
102.10	0.00	32	0	0.00

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

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:03:51

FILE DATE: 01-12-1996
FILE NAME: PCC1

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (4.75 BY 3.166667) 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	100.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-0.70
3	100.64	0.64	0.64	1-S2n	0.27	0.36	3.74	0.27	1.42	-0.02
6	100.80	0.80	0.80	1-S2n	0.39	0.52	5.44	0.39	1.69	0.18
10	101.01	1.01	1.01	1-S2n	0.48	0.66	6.22	0.48	1.87	0.32
13	101.19	1.19	1.19	1-S2n	0.56	0.77	6.71	0.56	2.01	0.44
16	101.36	1.36	1.36	1-S2n	0.64	0.87	7.11	0.64	2.13	0.54
19	101.51	1.51	1.51	1-S2n	0.70	0.97	7.61	0.70	2.23	0.62
23	101.66	1.66	1.66	1-S2n	0.76	1.05	8.03	0.76	2.31	0.70
24	101.74	1.74	1.74	1-S2n	0.79	1.10	8.21	0.79	2.35	0.74
29	101.96	1.96	1.96	1-S2n	0.88	1.22	8.67	0.88	2.46	0.84
32	102.10	2.10	2.10	1-S2n	0.94	1.30	9.36	0.90	2.53	0.90

El. inlet face invert 100.00 ft El. outlet invert 94.70 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

```
***** SITE DATA ***** CULVERT INVERT ***************
      INLET STATION (FT)                      100.00
      INLET ELEVATION (FT)                    100.00
      OUTLET STATION (FT)                     248.00
      OUTLET ELEVATION (FT)                    94.70
      NUMBER OF BARRELS                         1
      SLOPE (V-FT/H-FT)                         0.0358
      CULVERT LENGTH ALONG SLOPE (FT)         148.09

***** CULVERT DATA SUMMARY ************************
      BARREL SHAPE          PIPE ARCH
      BARREL SPAN             4.75 FT
      BARREL RISE             3.17 FT
      BARREL MATERIAL       STEEL OR ALUMINUM
      BARREL MANNING'S N    0.024
      INLET TYPE            CONVENTIONAL
      INLET EDGE AND WALL   PROJECTING
      INLET DEPRESSION      NONE
```

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:03:51

FILE DATE: 01-12-1996
FILE NAME: PCC1

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

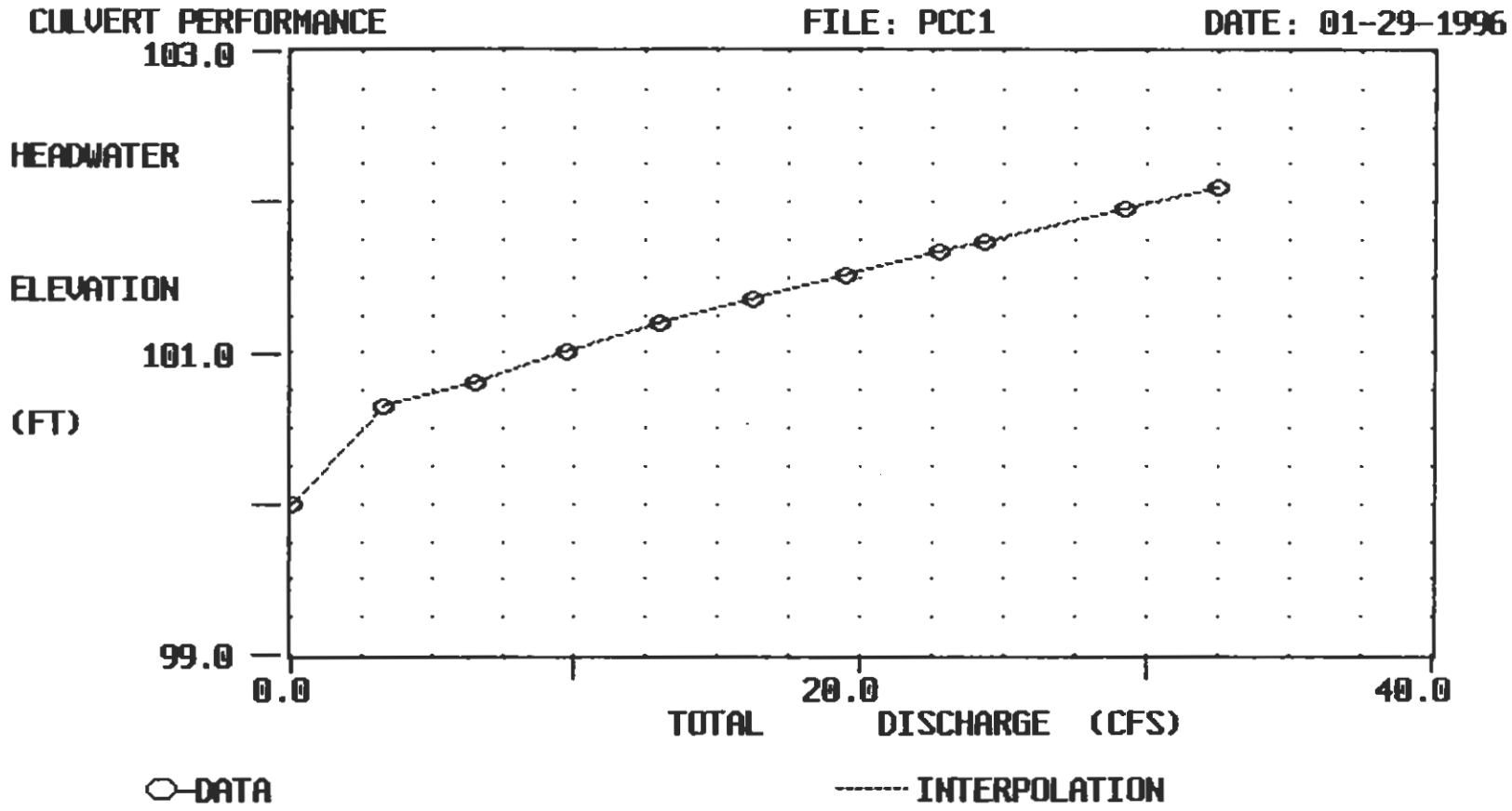
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (FT/FT)	0.040
MANNING'S N (.01-0.1)	0.100
CHANNEL INVERT ELEVATION (FT)	94.00
CULVERT NO.1 OUTLET INVERT ELEVATION	94.70 FT

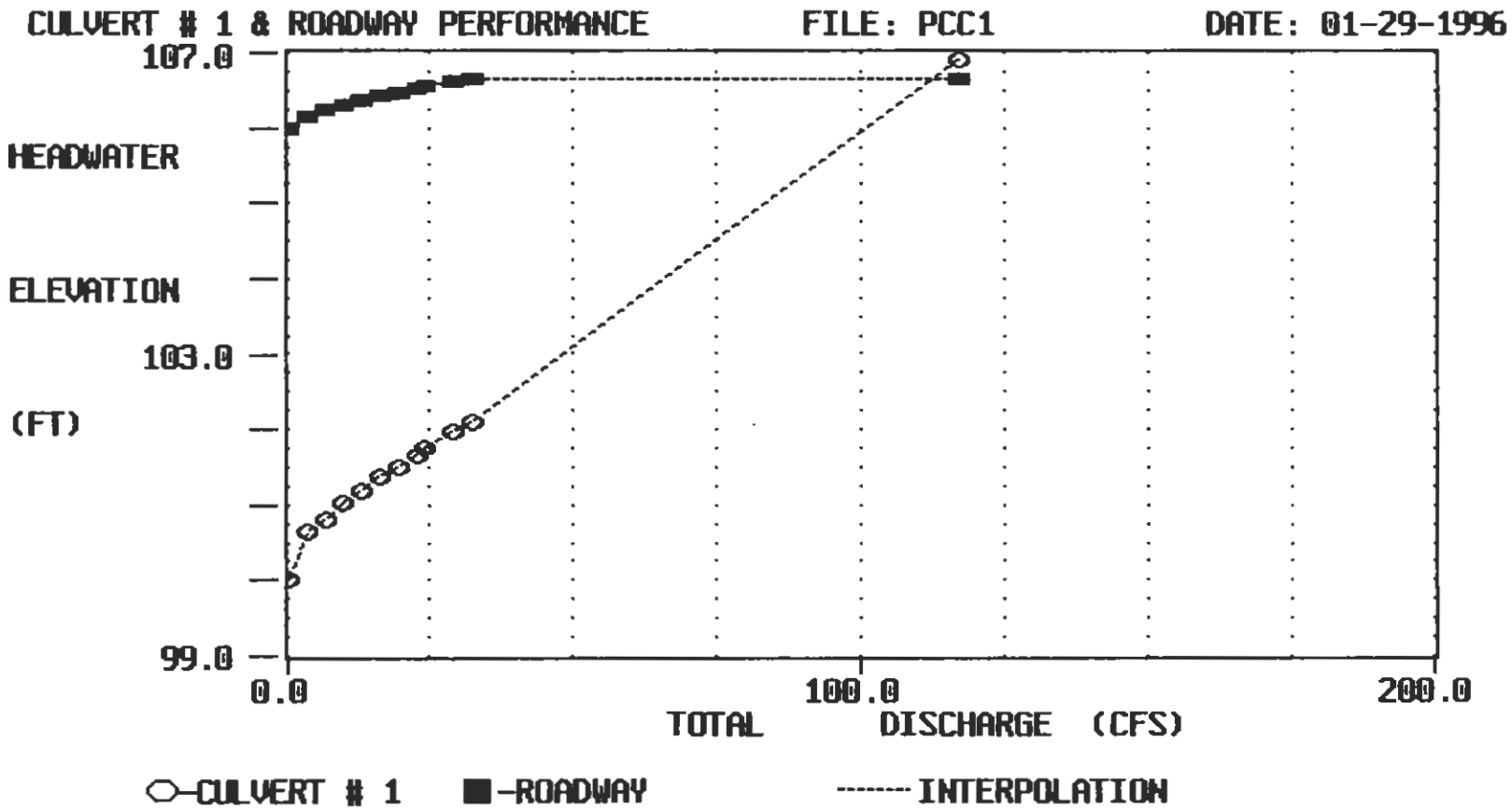
******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

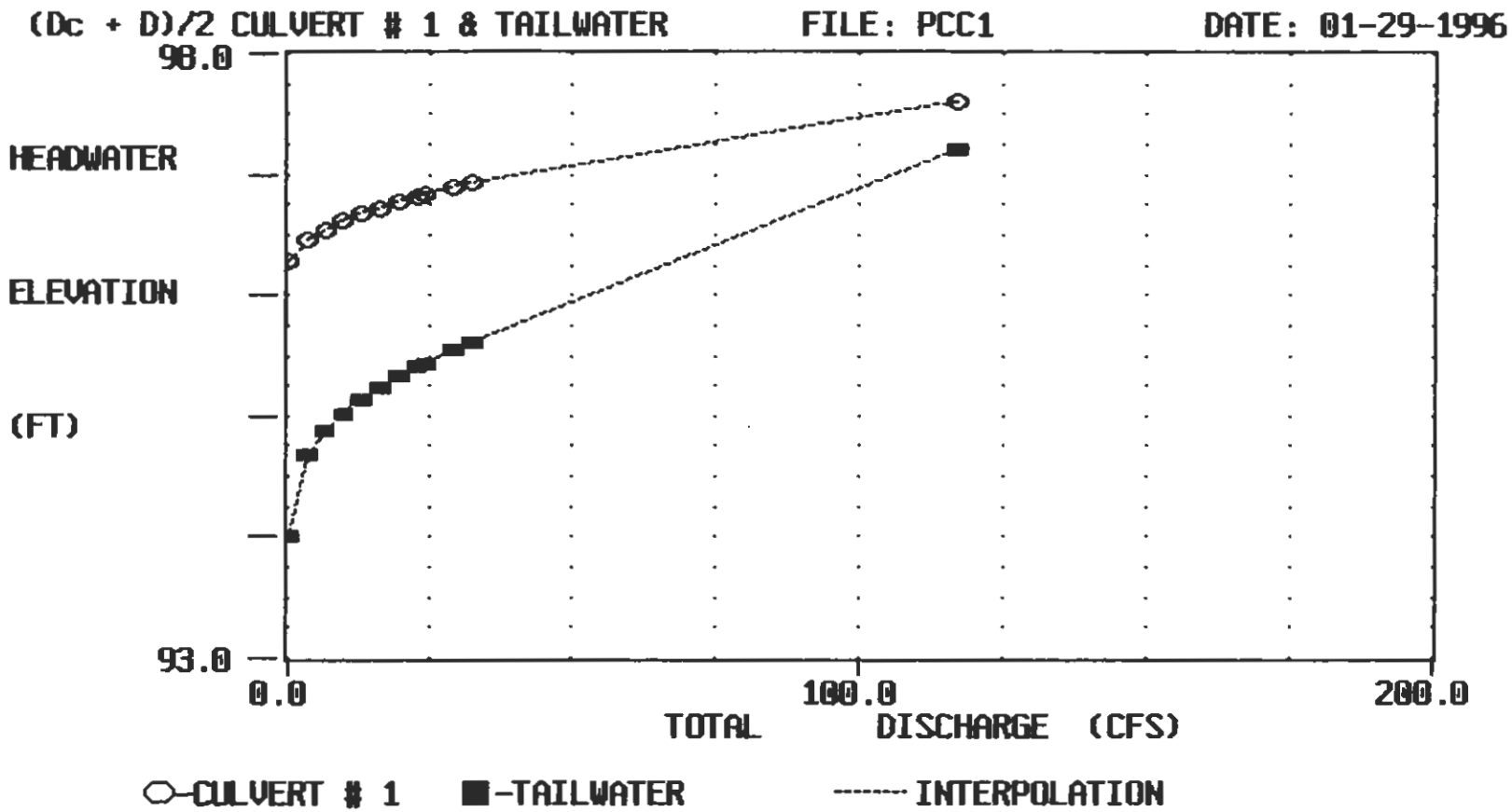
FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	94.00	0.000	0.00	0.00	0.00
3.25	94.68	0.305	0.68	1.42	1.69
6.50	94.88	0.318	0.88	1.69	2.19
9.75	95.02	0.327	1.02	1.87	2.55
13.00	95.14	0.333	1.14	2.01	2.84
16.25	95.24	0.337	1.24	2.13	3.08
19.49	95.32	0.341	1.32	2.23	3.30
22.74	95.40	0.344	1.40	2.31	3.50
24.37	95.44	0.346	1.44	2.35	3.59
29.24	95.54	0.350	1.54	2.46	3.85
32.49	95.60	0.352	1.60	2.53	4.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	20.00
CREST LENGTH (FT)	20.00
OVERTOPPING CREST ELEVATION (FT)	106.00


CULVERT PERFORMANCE
FILE: PCC1
DATE: 01-29-1996
103.0
HEADWATER
ELEVATION
101.0
(FT)
99.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
DATA
INTERPOLATION


CULVERT # 1 & ROADWAY PERFORMANCE
FILE: PCC1
DATE: 01-29-1996
107.0
HEADWATER
ELEVATION
103.0
(FT)
99.0
0.0
100.0
200.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
ROADWAY
INTERPOLATION


(Dc + D)/2 CULVERT # 1 & TAILWATER
FILE: PCC1
DATE: 01-29-1996
98.0
HEADWATER
ELEVATION
(FT)
93.0
0.0
100.0
200.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
TAILWATER
INTERPOLATION

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:17:11

FILE DATE: 01-12-1996
FILE NAME: PCC2-3

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	100.00	99.60	20.00	2 CSP	1.50	1.50	.024	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: PCC2-3 DATE: 01-12-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
100.00	0	0	0	0	0	0	0	0	1
100.70	3	3	0	0	0	0	0	0	1
101.04	6	6	0	0	0	0	0	0	1
101.36	10	10	0	0	0	0	0	0	1
101.81	13	13	0	0	0	0	0	0	1
102.09	16	16	0	0	0	0	0	0	1
102.58	19	19	0	0	0	0	0	0	1
103.16	23	23	0	0	0	0	0	0	1
103.49	24	24	0	0	0	0	0	0	1
104.11	29	27	0	0	0	0	0	2	9
104.19	32	27	0	0	0	0	0	5	5
104.00	27	27	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: PCC2-3 DATE: 01-12-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
100.00	0.00	0	0	0.00
100.70	0.00	3	0	0.00
101.04	0.00	6	0	0.00
101.36	0.00	10	0	0.00
101.81	0.00	13	0	0.00
102.09	0.00	16	0	0.00
102.58	0.00	19	0	0.00
103.16	0.00	23	0	0.00
103.49	0.00	24	0	0.00
104.11	-0.01	29	0	0.42
104.19	-0.00	32	0	0.45

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

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:17:11

FILE DATE: 01-12-1996
FILE NAME: PCC2-3

PERFORMANCE CURVE FOR CULVERT # 1 - 2 (1.5 BY 1.5) CSP

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	100.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-0.60
3	100.70	0.70	0.70	1-S2n	0.46	0.48	3.58	0.46	1.42	0.08
6	101.04	1.04	1.04	1-S2n	0.66	0.68	4.33	0.66	1.69	0.28
10	101.36	1.36	1.36	1-S2n	0.84	0.85	4.78	0.84	1.87	0.42
13	101.81	1.70	1.81	2-M2c	1.02	0.98	5.30	0.98	2.01	0.54
16	102.09	2.09	2.04	2-M2c	1.25	1.10	5.86	1.10	2.13	0.64
19	102.58	2.58	2.58	6-FFn	1.50	1.20	5.52	1.50	2.23	0.72
23	103.16	3.16	3.12	6-FFn	1.50	1.28	6.43	1.50	2.31	0.80
24	103.49	3.49	3.41	6-FFn	1.50	1.31	6.89	1.50	2.35	0.84
27	104.11	4.11	3.95	6-FFn	1.50	1.37	7.65	1.50	2.46	0.94
27	104.19	4.19	4.02	6-FFn	1.50	1.38	7.75	1.50	2.53	1.00

El. inlet face invert 100.00 ft El. outlet invert 99.60 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

```
***** SITE DATA ***** CULVERT INVERT **************
      INLET STATION (FT)                      100.00
      INLET ELEVATION (FT)                    100.00
      OUTLET STATION (FT)                     120.00
      OUTLET ELEVATION (FT)                    99.60
      NUMBER OF BARRELS                         2
      SLOPE (V-FT/H-FT)                         0.0200
      CULVERT LENGTH ALONG SLOPE (FT)          20.00

***** CULVERT DATA SUMMARY ************************
      BARREL SHAPE          CIRCULAR
      BARREL DIAMETER         1.50 FT
      BARREL MATERIAL       CORRUGATED STEEL
      BARREL MANNING'S N    0.024
      INLET TYPE            CONVENTIONAL
      INLET EDGE AND WALL   THIN EDGE PROJECTING
      INLET DEPRESSION      NONE
```

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:17:11

FILE DATE: 01-12-1996
FILE NAME: PCC2-3

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

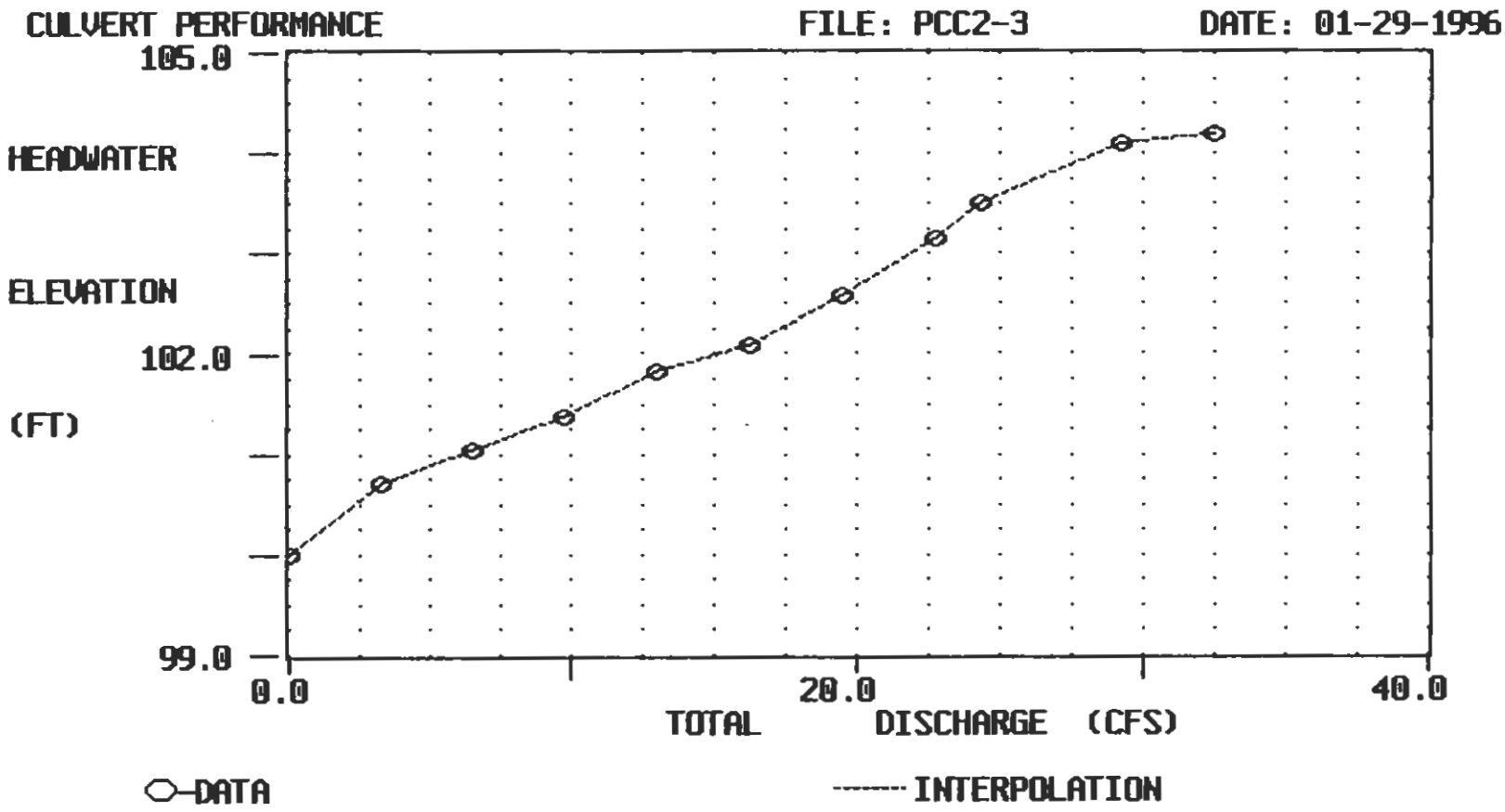
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (FT/FT)	0.040
MANNING'S N (.01-0.1)	0.100
CHANNEL INVERT ELEVATION (FT)	99.00
CULVERT NO.1 OUTLET INVERT ELEVATION	99.60 FT

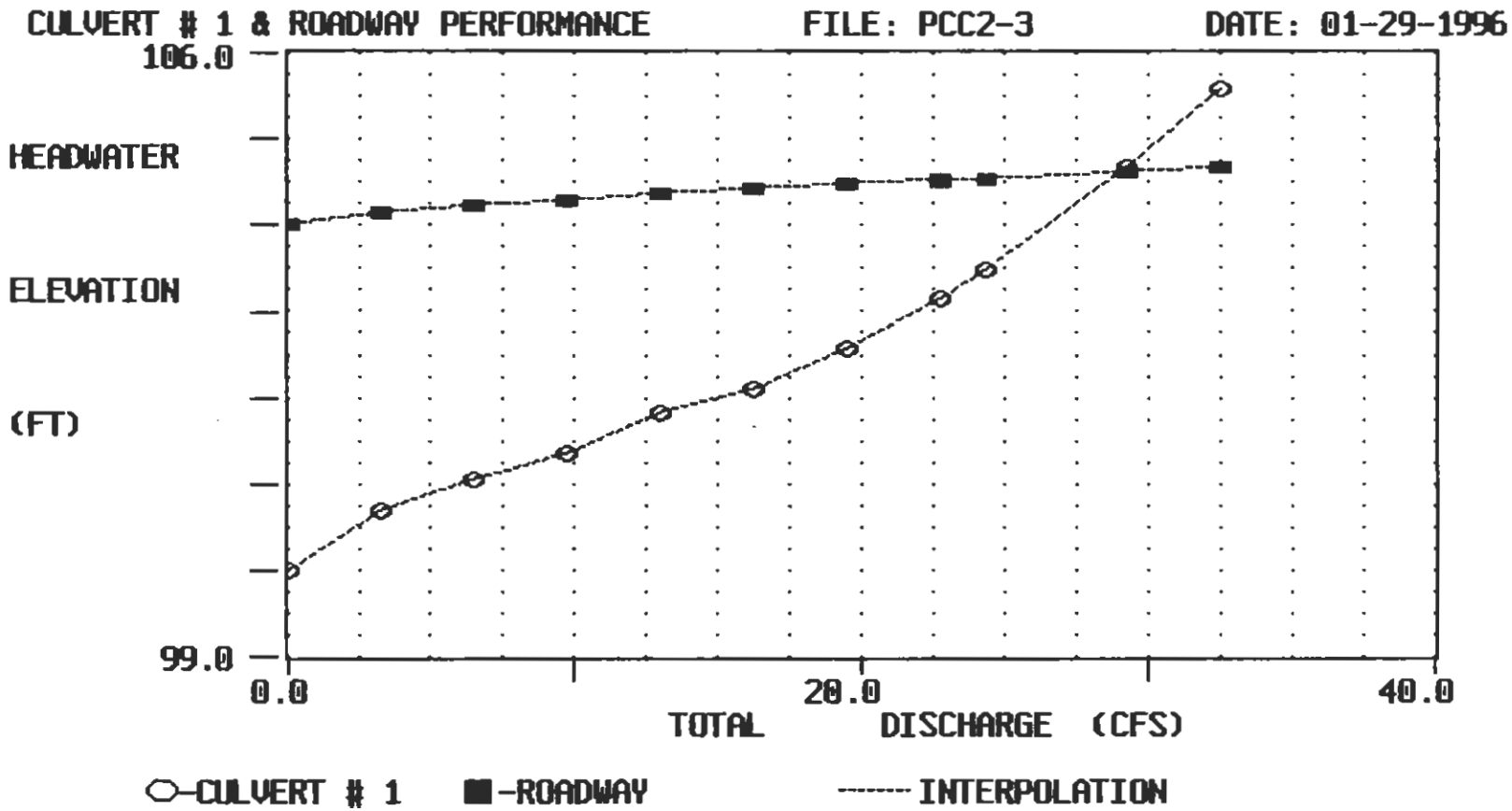
******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

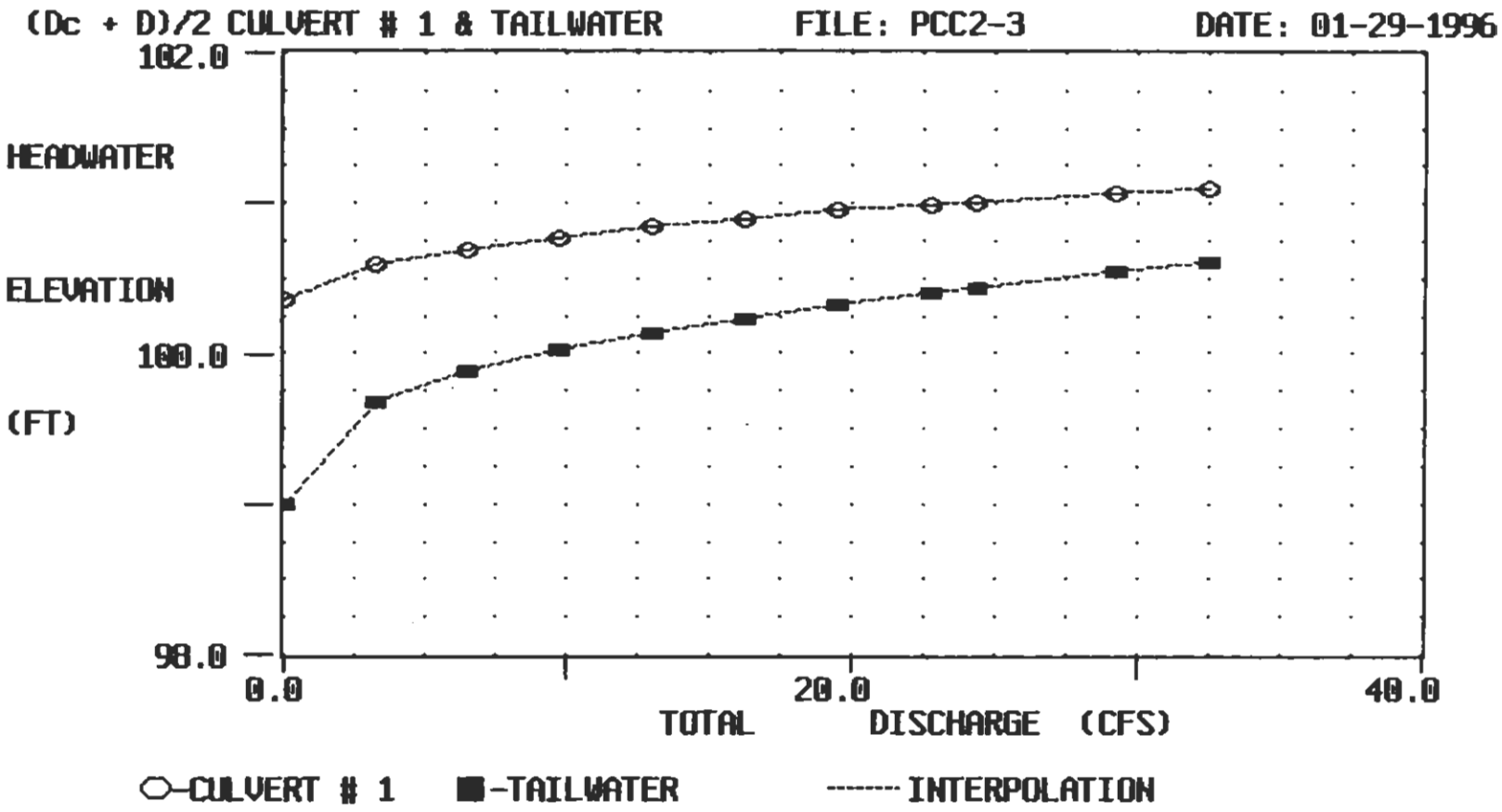
FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	99.00	0.000	0.00	0.00	0.00
3.25	99.68	0.305	0.68	1.42	1.69
6.50	99.88	0.318	0.88	1.69	2.19
9.75	100.02	0.327	1.02	1.87	2.55
13.00	100.14	0.333	1.14	2.01	2.84
16.25	100.24	0.337	1.24	2.13	3.08
19.49	100.32	0.341	1.32	2.23	3.30
22.74	100.40	0.344	1.40	2.31	3.50
24.37	100.44	0.346	1.44	2.35	3.59
29.24	100.54	0.350	1.54	2.46	3.85
32.49	100.60	0.352	1.60	2.53	4.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	20.00
CREST LENGTH (FT)	20.00
OVERTOPPING CREST ELEVATION (FT)	104.00


CULVERT PERFORMANCE
FILE: PCC2-3
DATE: 01-29-1996
105.0
HEADWATER
ELEVATION
102.0
(FT)
99.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
DATA
INTERPOLATION


CULVERT # 1 & ROADWAY PERFORMANCE
FILE: PCC2-3
DATE: 01-29-1996
106.0
HEADWATER
ELEVATION
(FT)
99.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
ROADWAY
INTERPOLATION


(Dc + D)/2 CULVERT # 1 & TAILWATER
FILE: PCC2-3
DATE: 01-29-1996
102.0
HEADWATER
ELEVATION
100.0
(FT)
98.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
TAILWATER
INTERPOLATION

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:24:34

FILE DATE: 01-12-1996
FILE NAME: PCC6

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	100.00	99.90	20.00	1 RCP	2.00	2.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: PCC6 DATE: 01-12-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
100.00	0	0	0	0	0	0	0	0	1
100.84	3	3	0	0	0	0	0	0	1
101.27	6	6	0	0	0	0	0	0	1
101.61	10	10	0	0	0	0	0	0	1
101.98	13	13	0	0	0	0	0	0	1
102.27	16	16	0	0	0	0	0	0	1
102.74	19	19	0	0	0	0	0	0	1
103.05	23	23	0	0	0	0	0	0	1
103.27	24	24	0	0	0	0	0	0	1
104.03	29	29	0	0	0	0	0	0	10
104.14	32	29	0	0	0	0	0	3	5
104.00	29	29	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: PCC6 DATE: 01-12-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
100.00	0.00	0	0	0.00
100.84	0.00	3	0	0.00
101.27	0.00	6	0	0.00
101.61	0.00	10	0	0.00
101.98	0.00	13	0	0.00
102.27	0.00	16	0	0.00
102.74	0.00	19	0	0.00
103.05	0.00	23	0	0.00
103.27	0.00	24	0	0.00
104.03	-0.01	29	0	0.73
104.14	-0.01	32	0	0.62

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

CURRENT DATE: 01-29-1996 FILE DATE: 01-12-1996
CURRENT TIME: 12:24:34 FILE NAME: PCC6

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (2 BY 2) RCP

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	100.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	%-99.90
3	100.84	0.84	0.84	1-S2n	0.58	0.63	4.25	0.58	0.00	%-99.90
6	101.27	1.27	1.27	1-S2n	0.85	0.90	5.08	0.85	0.00	%-99.90
10	101.61	1.61	1.61	1-S2n	1.07	1.11	5.69	1.07	0.00	%-99.90
13	101.98	1.91	1.98	2-M2c	1.29	1.29	6.06	1.29	0.00	%-99.90
16	102.27	2.23	2.27	2-M2c	1.54	1.45	6.65	1.45	0.00	%-99.90
19	102.74	2.59	2.74	6-FFn	2.00	1.59	6.21	2.00	0.00	%-99.90
23	103.05	3.03	3.05	6-FFn	2.00	1.69	7.24	2.00	0.00	%-99.90
24	103.27	3.27	3.22	6-FFn	2.00	1.73	7.76	2.00	0.00	%-99.90
29	104.02	4.02	3.73	6-FFn	2.00	1.86	9.14	2.00	0.00	%-99.90
29	104.14	4.14	3.81	6-FFn	2.00	1.88	9.33	2.00	0.00	%-99.90

El. inlet face invert 100.00 ft El. outlet invert 99.90 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

```
***** SITE DATA ***** CULVERT INVERT ***************
      INLET STATION (FT)                      100.00
      INLET ELEVATION (FT)                    100.00
      OUTLET STATION (FT)                     120.00
      OUTLET ELEVATION (FT)                    99.90
      NUMBER OF BARRELS                         1
      SLOPE (V-FT/H-FT)                         0.0050
      CULVERT LENGTH ALONG SLOPE (FT)          20.00

***** CULVERT DATA SUMMARY *************************
      BARREL SHAPE          CIRCULAR
      BARREL DIAMETER         2.00 FT
      BARREL MATERIAL       CONCRETE
      BARREL MANNING'S N    0.012
      INLET TYPE            CONVENTIONAL
      INLET EDGE AND WALL   GROOVED END PROJECTION
      INLET DEPRESSION      NONE
```

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:24:34

FILE DATE: 01-12-1996
FILE NAME: PCC6

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

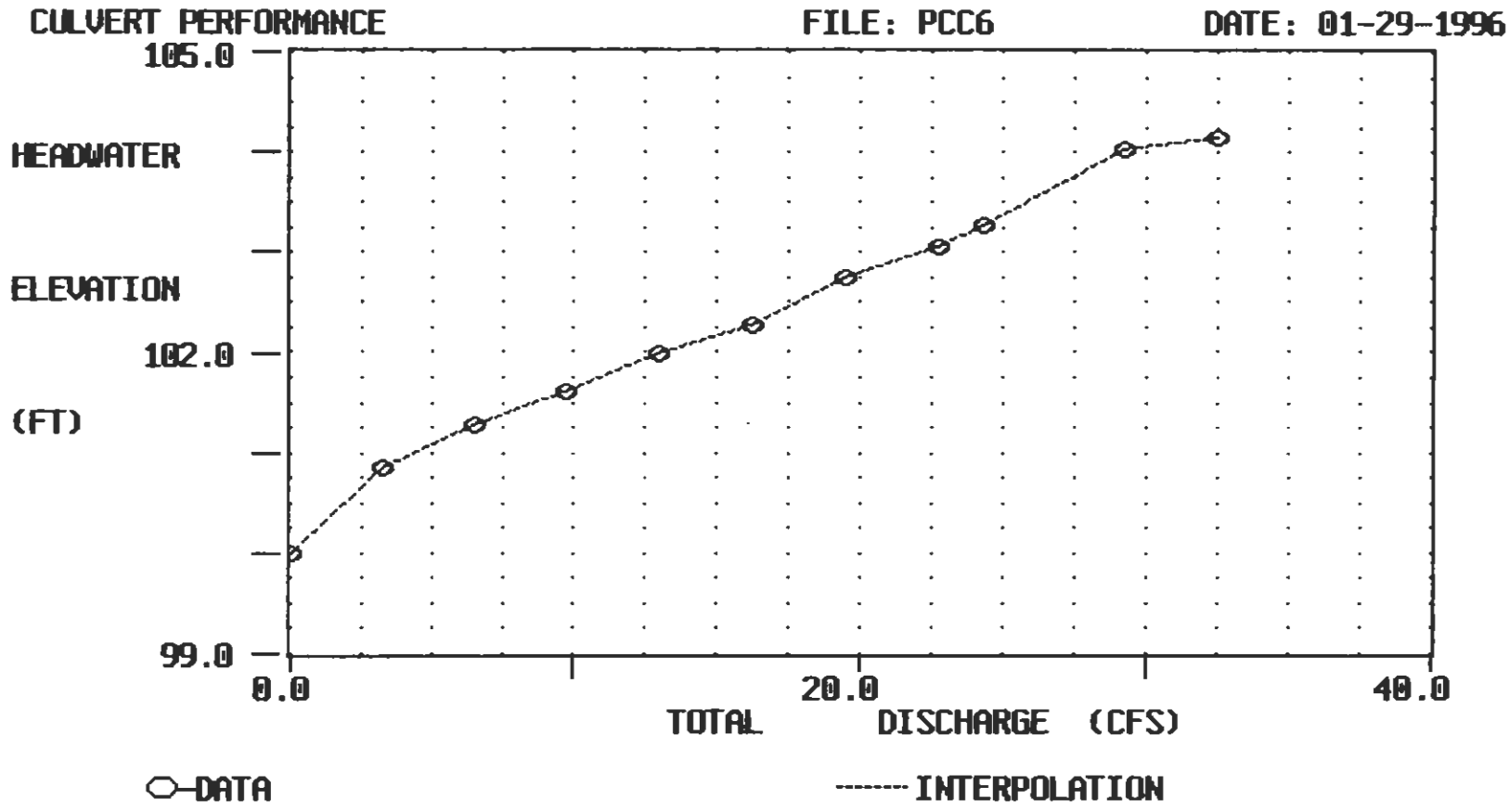
BOTTOM WIDTH (FT)	0.00
SIDE SLOPE H/V (X:1)	0.0
CHANNEL SLOPE V/H (FT/FT)	0.000
MANNING'S N (.01-0.1)	0.000
CHANNEL INVERT ELEVATION (FT)	0.00
CULVERT NO.1 OUTLET INVERT ELEVATION	99.90 FT

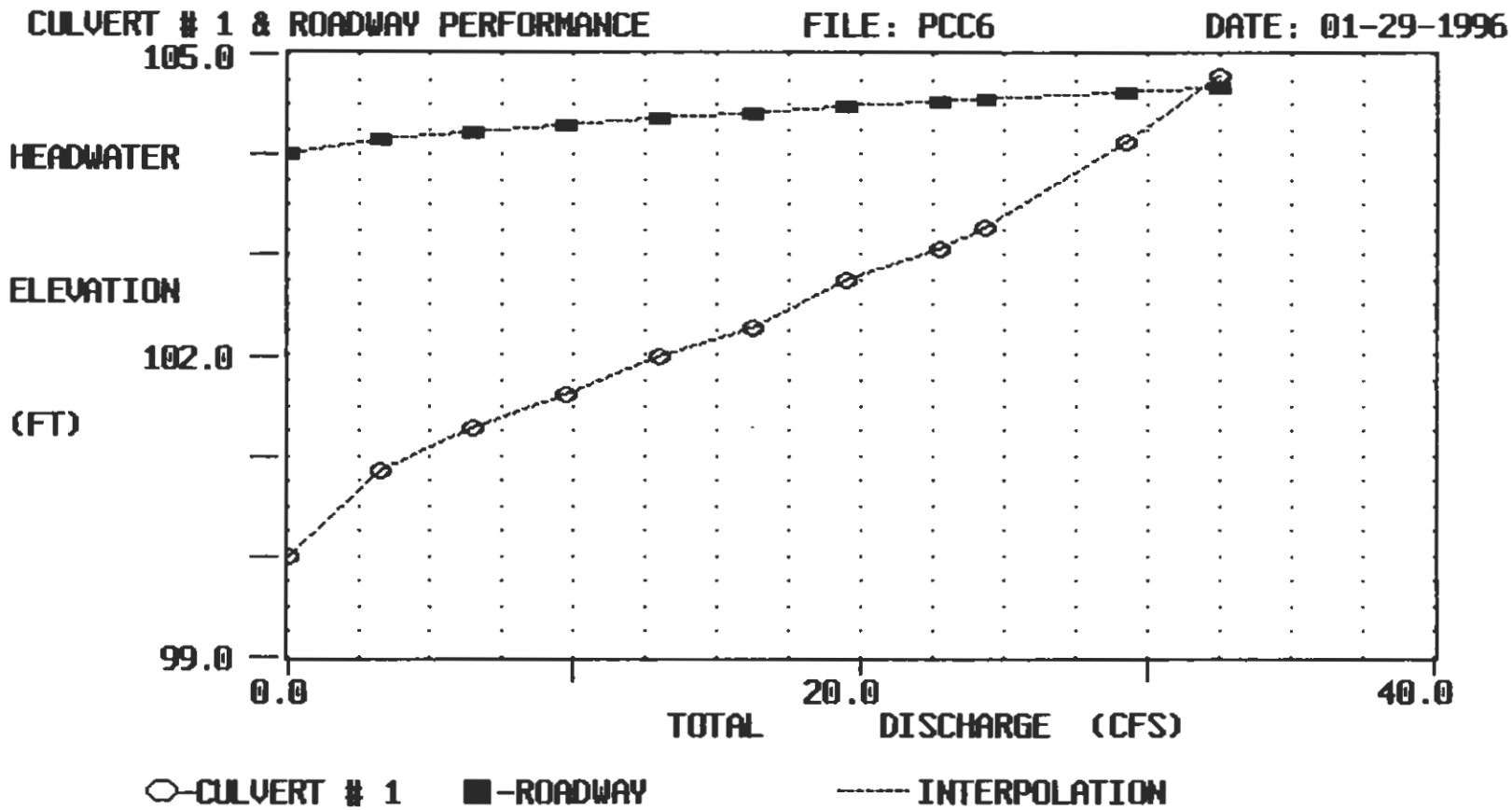
******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	0.00	0.000	0.00	0.00	0.00
3.25	0.00	0.000	0.00	0.00	0.00
6.50	0.00	0.000	0.00	0.00	0.00
9.75	0.00	0.000	0.00	0.00	0.00
13.00	0.00	0.000	0.00	0.00	0.00
16.25	0.00	0.000	0.00	0.00	0.00
19.49	0.00	0.000	0.00	0.00	0.00
22.74	0.00	0.000	0.00	0.00	0.00
24.37	0.00	0.000	0.00	0.00	0.00
29.24	0.00	0.000	0.00	0.00	0.00
32.49	0.00	0.000	0.00	0.00	0.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	20.00
CREST LENGTH (FT)	20.00
OVERTOPPING CREST ELEVATION (FT)	104.00


CULVERT PERFORMANCE
FILE: PCC6
DATE: 01-29-1996
105.0
HEADWATER
ELEVATION
102.0
(FT)
99.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
DATA
INTERPOLATION


CULVERT # 1 & ROADWAY PERFORMANCE
FILE: PCC6
DATE: 01-29-1996
105.0
HEADWATER
ELEVATION
102.0
(FT)
99.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
ROADWAY
INTERPOLATION

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:33:26

FILE DATE: 01-12-1996
FILE NAME: PCC9

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	100.00	99.10	49.21	2 CSP	0.80	0.80	.024	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: PCC9 DATE: 01-12-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
100.00	0	0	0	0	0	0	0	0	1
101.35	3	3	0	0	0	0	0	0	1
104.06	6	6	0	0	0	0	0	1	18
104.17	10	5	0	0	0	0	0	4	7
104.25	13	5	0	0	0	0	0	7	5
104.32	16	5	0	0	0	0	0	11	5
104.38	19	5	0	0	0	0	0	14	4
104.43	23	5	0	0	0	0	0	17	4
104.46	24	5	0	0	0	0	0	19	3
104.54	29	5	0	0	0	0	0	24	4
104.58	32	5	0	0	0	0	0	27	3
104.00	5	5	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: PCC9 DATE: 01-12-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
100.00	0.00	0	0	0.00
101.35	0.00	3	0	0.00
104.06	-0.00	6	0	0.82
104.17	-0.00	10	0	0.56
104.25	-0.00	13	0	0.82
104.32	-0.00	16	0	0.39
104.38	-0.00	19	0	0.65
104.43	-0.00	23	0	0.44
104.46	-0.01	24	0	0.72
104.54	-0.00	29	0	0.36
104.58	-0.00	32	0	0.75

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

CURRENT DATE: 01-29-1996 FILE DATE: 01-12-1996
CURRENT TIME: 12:33:26 FILE NAME: PCC9

PERFORMANCE CURVE FOR CULVERT # 1 - 2 (.8 BY .8) CSP

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	100.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-0.10
3	101.35	1.08	1.35	6-FFn	0.80	0.58	3.23	0.80	1.42	0.58
6	104.06	2.12	4.06	6-FFn	0.80	0.73	5.48	0.80	1.69	0.78
5	104.17	2.12	4.17	4-FFt	0.80	0.73	5.47	0.80	1.87	0.92
5	104.25	2.10	4.25	4-FFt	0.80	0.72	5.44	0.80	2.01	1.04
5	104.31	2.09	4.31	4-FFt	0.80	0.72	5.42	0.80	2.13	1.14
5	104.37	2.08	4.37	4-FFt	0.80	0.72	5.41	0.80	2.23	1.22
5	104.43	2.07	4.43	4-FFt	0.80	0.72	5.39	0.80	2.31	1.30
5	104.46	2.06	4.46	4-FFt	0.80	0.72	5.38	0.80	2.35	1.34
5	104.53	2.05	4.53	4-FFt	0.80	0.72	5.37	0.80	2.46	1.44
5	104.58	2.05	4.58	4-FFt	0.80	0.72	5.35	0.80	2.53	1.50

El. inlet face invert 100.00 ft El. outlet invert 99.10 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

```
***** SITE DATA ***** CULVERT INVERT **************
      INLET STATION (FT)                      100.00
      INLET ELEVATION (FT)                    100.00
      OUTLET STATION (FT)                     149.20
      OUTLET ELEVATION (FT)                    99.10
      NUMBER OF BARRELS                         2
      SLOPE (V-FT/H-FT)                         0.0183
      CULVERT LENGTH ALONG SLOPE (FT)          49.21

***** CULVERT DATA SUMMARY ************************
      BARREL SHAPE          CIRCULAR
      BARREL DIAMETER         0.80 FT
      BARREL MATERIAL       CORRUGATED STEEL
      BARREL MANNING'S N    0.024
      INLET TYPE            CONVENTIONAL
      INLET EDGE AND WALL   THIN EDGE PROJECTING
      INLET DEPRESSION      NONE
```

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:33:26

FILE DATE: 01-12-1996
FILE NAME: PCC9

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

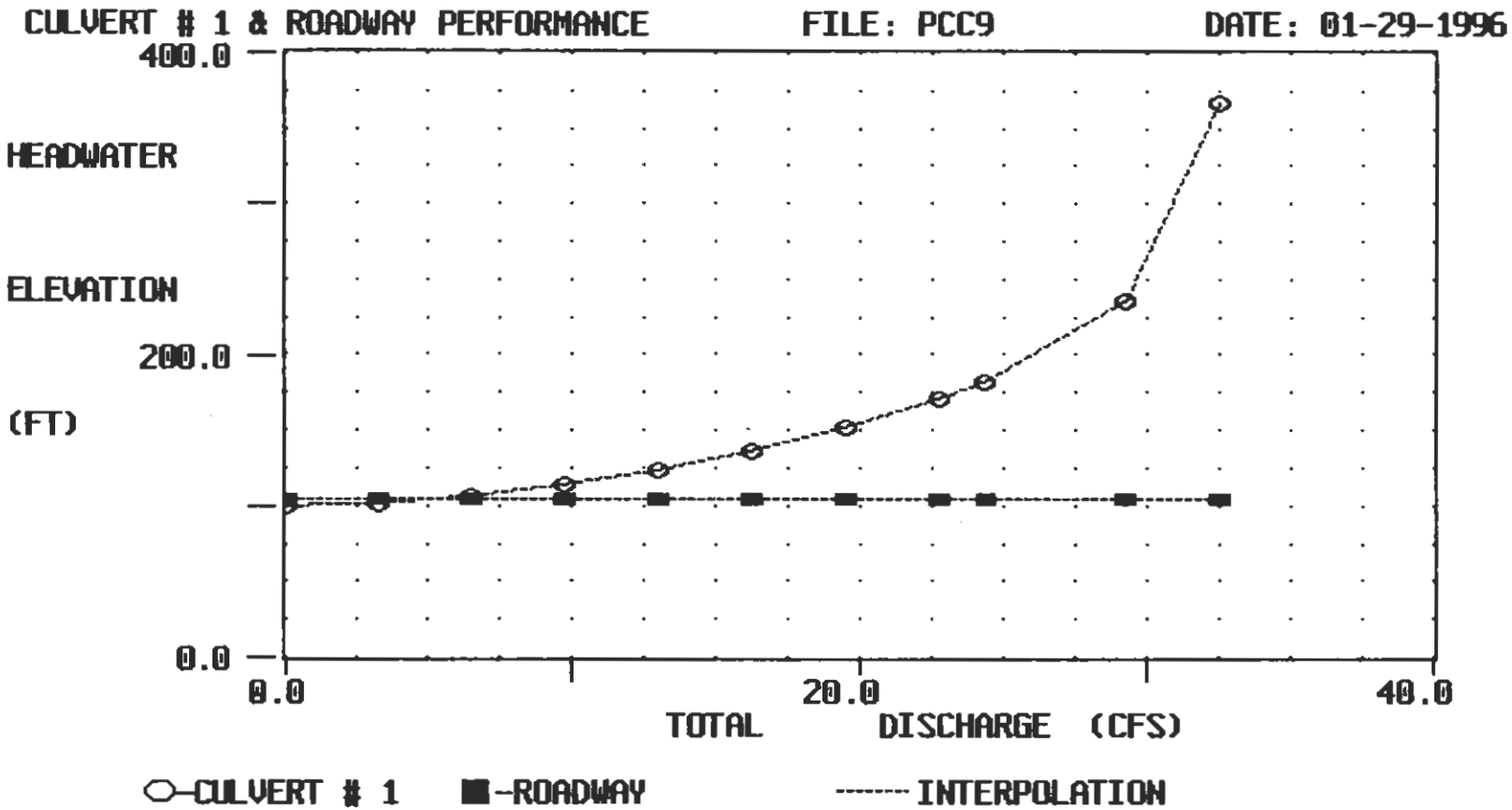
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (FT/FT)	0.040
MANNING'S N (.01-0.1)	0.100
CHANNEL INVERT ELEVATION (FT)	99.00
CULVERT NO.1 OUTLET INVERT ELEVATION	99.10 FT

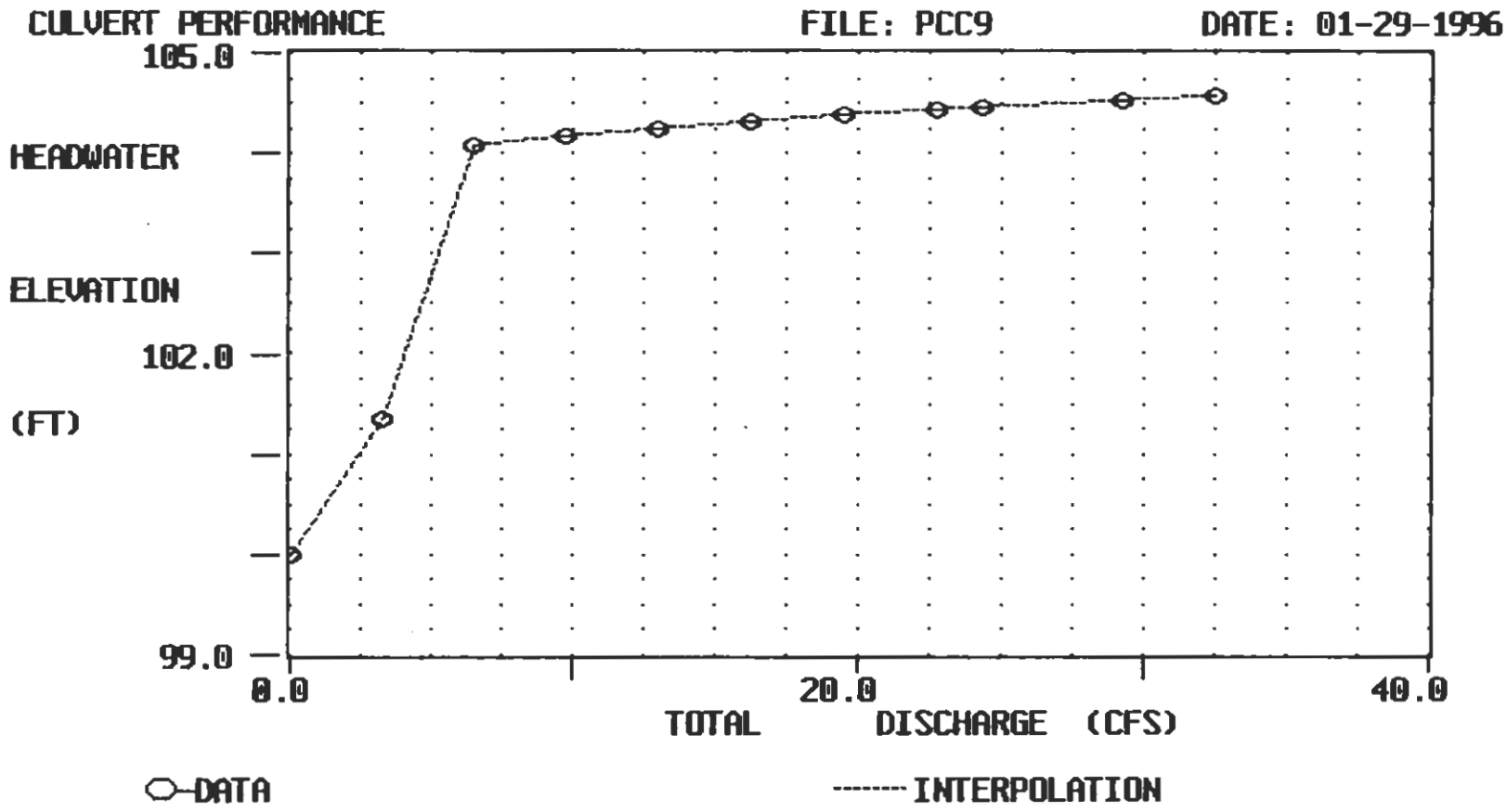
******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

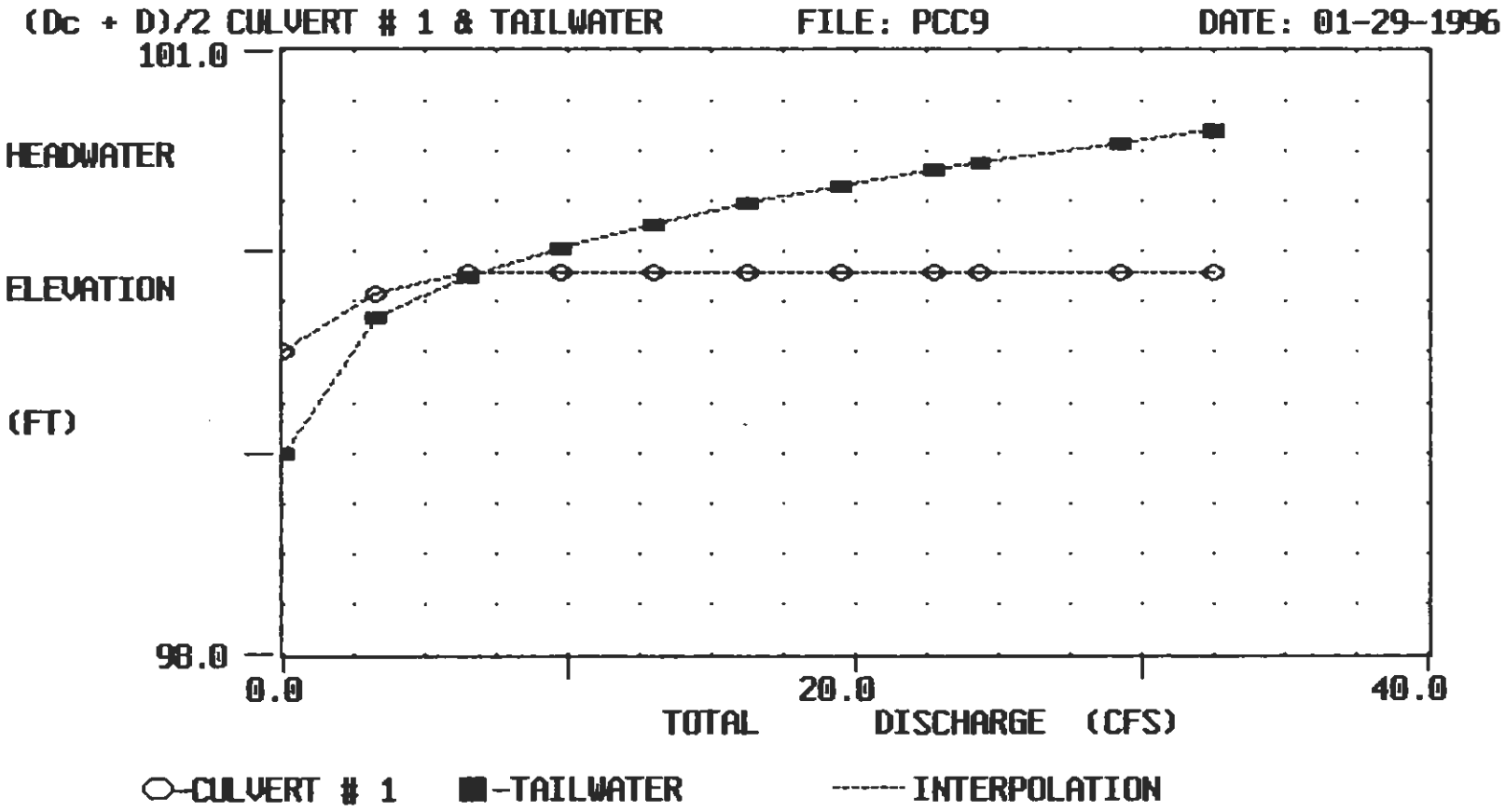
FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	99.00	0.000	0.00	0.00	0.00
3.25	99.68	0.305	0.68	1.42	1.69
6.50	99.88	0.318	0.88	1.69	2.19
9.75	100.02	0.327	1.02	1.87	2.55
13.00	100.14	0.333	1.14	2.01	2.84
16.25	100.24	0.337	1.24	2.13	3.08
19.49	100.32	0.341	1.32	2.23	3.30
22.74	100.40	0.344	1.40	2.31	3.50
24.37	100.44	0.346	1.44	2.35	3.59
29.24	100.54	0.350	1.54	2.46	3.85
32.49	100.60	0.352	1.60	2.53	4.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	20.00
CREST LENGTH (FT)	20.00
OVERTOPPING CREST ELEVATION (FT)	104.00


CULVERT # 1 & ROADWAY PERFORMANCE
FILE: PCC9
DATE: 01-29-1996
400.0
HEADWATER
ELEVATION
200.0
(FT)
0.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
ROADWAY
INTERPOLATION


CULVERT PERFORMANCE
FILE: PCC9
DATE: 01-29-1996
105.0
HEADWATER
ELEVATION
102.0
(FT)
99.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
DATA
INTERPOLATION


(Dc + D)/2 CULVERT # 1 & TAILWATER
FILE: PCC9
DATE: 01-29-1996
101.0
98.0
HEADWATER
ELEVATION
(FT)
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
TAILWATER
INTERPOLATION

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:41:38

FILE DATE: 01-12-1996
FILE NAME: PCC13

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	100.00	99.30	20.01	1 RCP	1.74	1.74	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: PCC13 DATE: 01-12-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
100.00	0	0	0	0	0	0	0	0	1
100.88	3	3	0	0	0	0	0	0	1
101.33	6	6	0	0	0	0	0	0	1
101.70	10	10	0	0	0	0	0	0	1
102.12	13	13	0	0	0	0	0	0	1
102.64	16	16	0	0	0	0	0	0	1
103.06	19	18	0	0	0	0	0	1	12
103.16	23	19	0	0	0	0	0	4	5
103.20	24	19	0	0	0	0	0	5	4
103.29	29	19	0	0	0	0	0	10	4
103.35	32	20	0	0	0	0	0	13	4
103.00	18	18	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: PCC13 DATE: 01-12-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
100.00	0.00	0	0	0.00
100.88	0.00	3	0	0.00
101.33	0.00	6	0	0.00
101.70	0.00	10	0	0.00
102.12	0.00	13	0	0.00
102.64	0.00	16	0	0.00
103.06	-0.00	19	0	0.75
103.16	-0.01	23	0	0.91
103.20	-0.01	24	0	0.74
103.29	-0.01	29	0	0.83
103.35	-0.01	32	0	0.42

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

CURRENT DATE: 01-29-1996 FILE DATE: 01-12-1996
CURRENT TIME: 12:41:38 FILE NAME: PCC13

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (1.74 BY 1.74) RCP

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	100.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-0.30
3	100.88	0.88	0.88	1-S2n	0.37	0.65	7.49	0.41	1.42	0.38
6	101.33	1.33	1.33	1-S2n	0.53	0.94	8.56	0.62	1.69	0.58
10	101.70	1.70	1.70	1-S2n	0.66	1.16	9.24	0.79	1.87	0.72
13	102.12	2.12	2.12	5-S2n	0.77	1.34	9.87	0.95	2.01	0.84
16	102.64	2.64	2.64	5-S2n	0.88	1.47	10.46	1.08	2.13	0.94
18	103.06	3.06	3.06	5-S2n	0.95	1.55	10.84	1.17	2.23	1.02
19	103.16	3.16	3.16	5-S2n	0.97	1.57	10.92	1.19	2.31	1.10
19	103.19	3.19	3.19	5-S2n	0.97	1.57	10.95	1.19	2.35	1.14
19	103.29	3.29	3.29	5-S2n	0.99	1.59	11.03	1.21	2.46	1.24
20	103.35	3.35	3.35	5-S2n	0.99	1.60	11.08	1.22	2.53	1.30

El. inlet face invert 100.00 ft El. outlet invert 99.30 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

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

INLET STATION (FT)	100.00
INLET ELEVATION (FT)	100.00
OUTLET STATION (FT)	120.00
OUTLET ELEVATION (FT)	99.30
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0350
CULVERT LENGTH ALONG SLOPE (FT)	20.01

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

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.74 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	GROOVED END PROJECTION
INLET DEPRESSION	NONE

CURRENT DATE: 01-29-1996
CURRENT TIME: 12:41:38

FILE DATE: 01-12-1996
FILE NAME: PCC13

TAILWATER

******* REGULAR CHANNEL CROSS SECTION **********

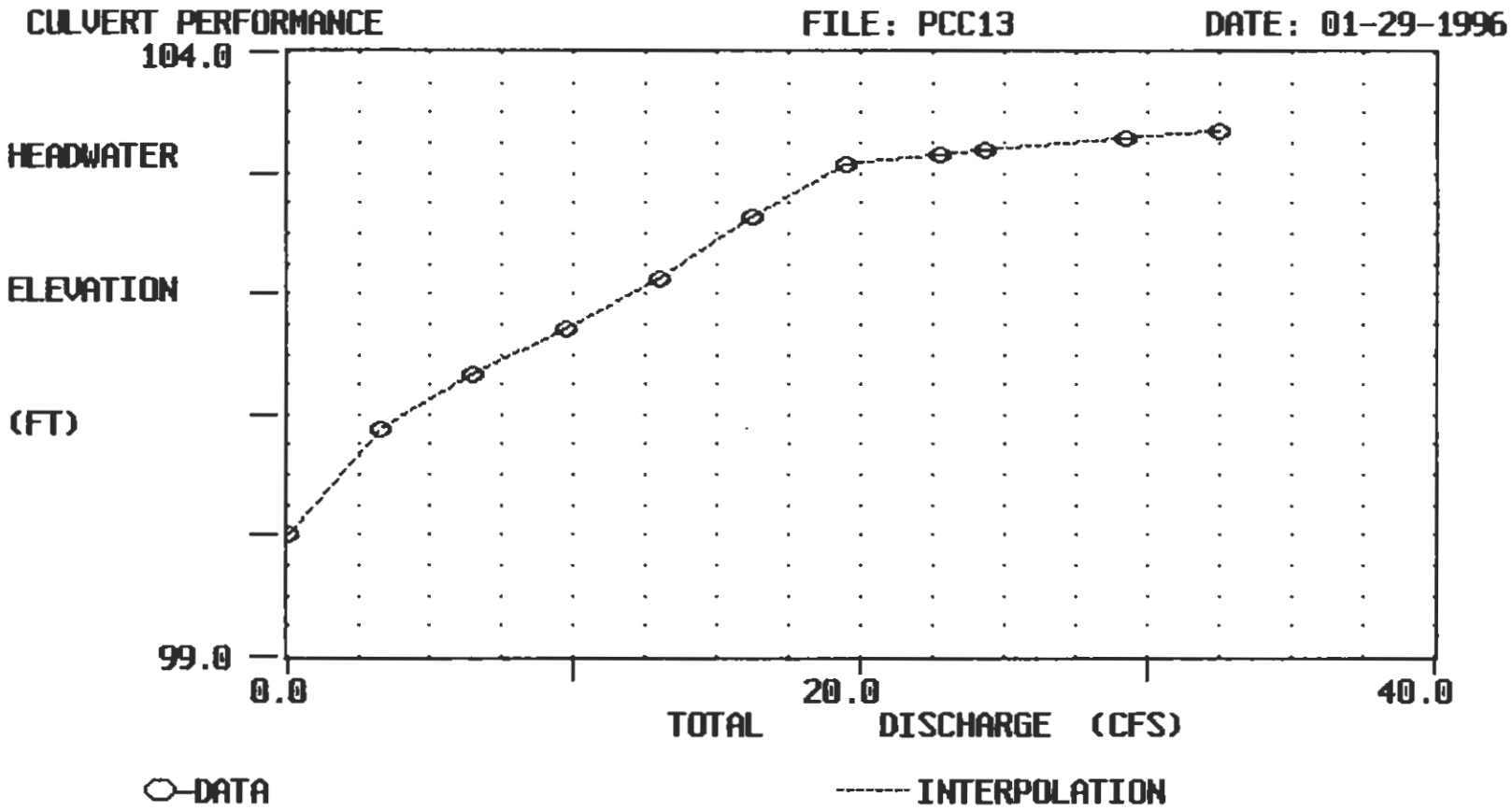
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (FT/FT)	0.040
MANNING'S N (.01-0.1)	0.100
CHANNEL INVERT ELEVATION (FT)	99.00
CULVERT NO.1 OUTLET INVERT ELEVATION	99.30 FT

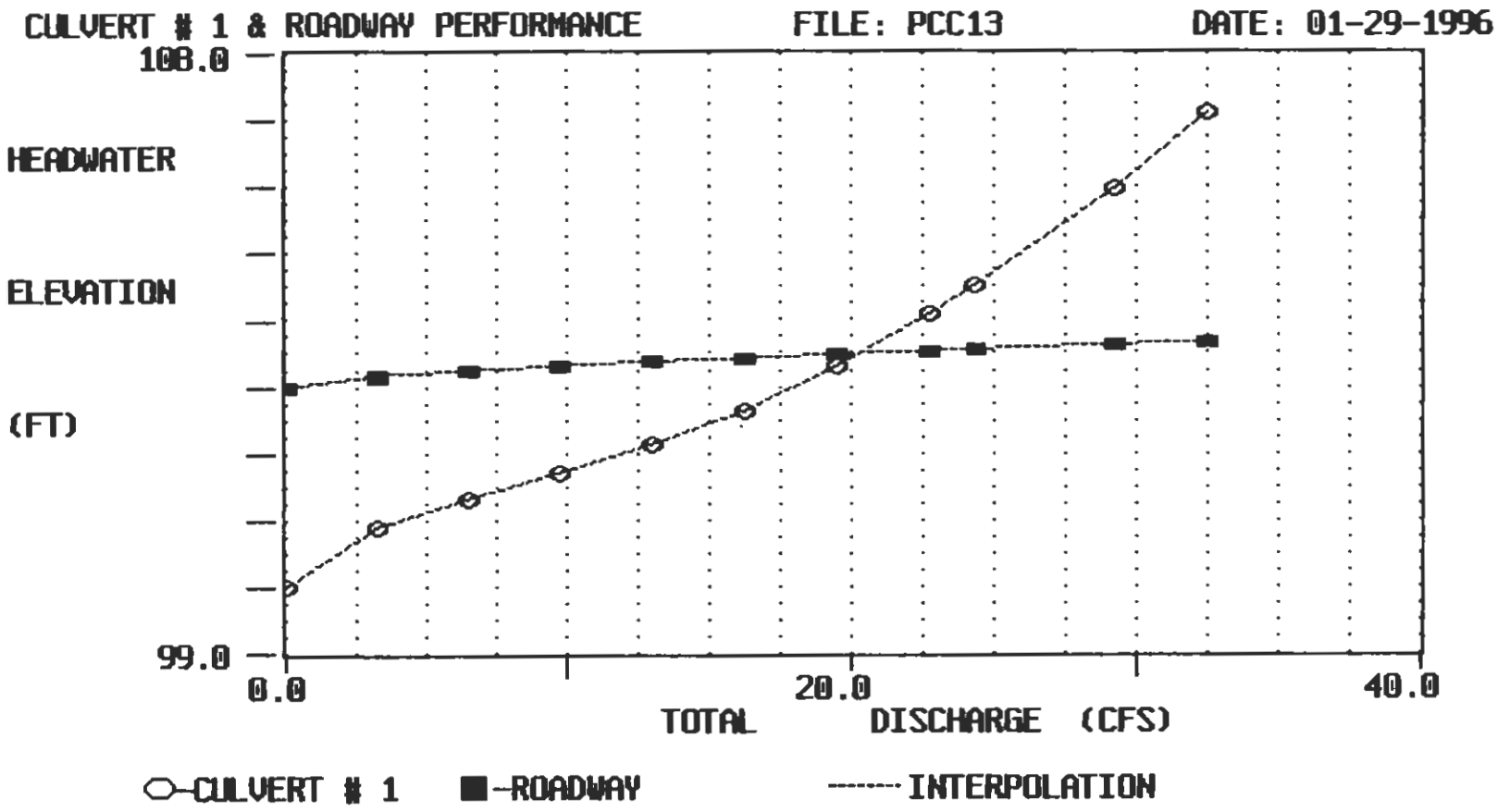
******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

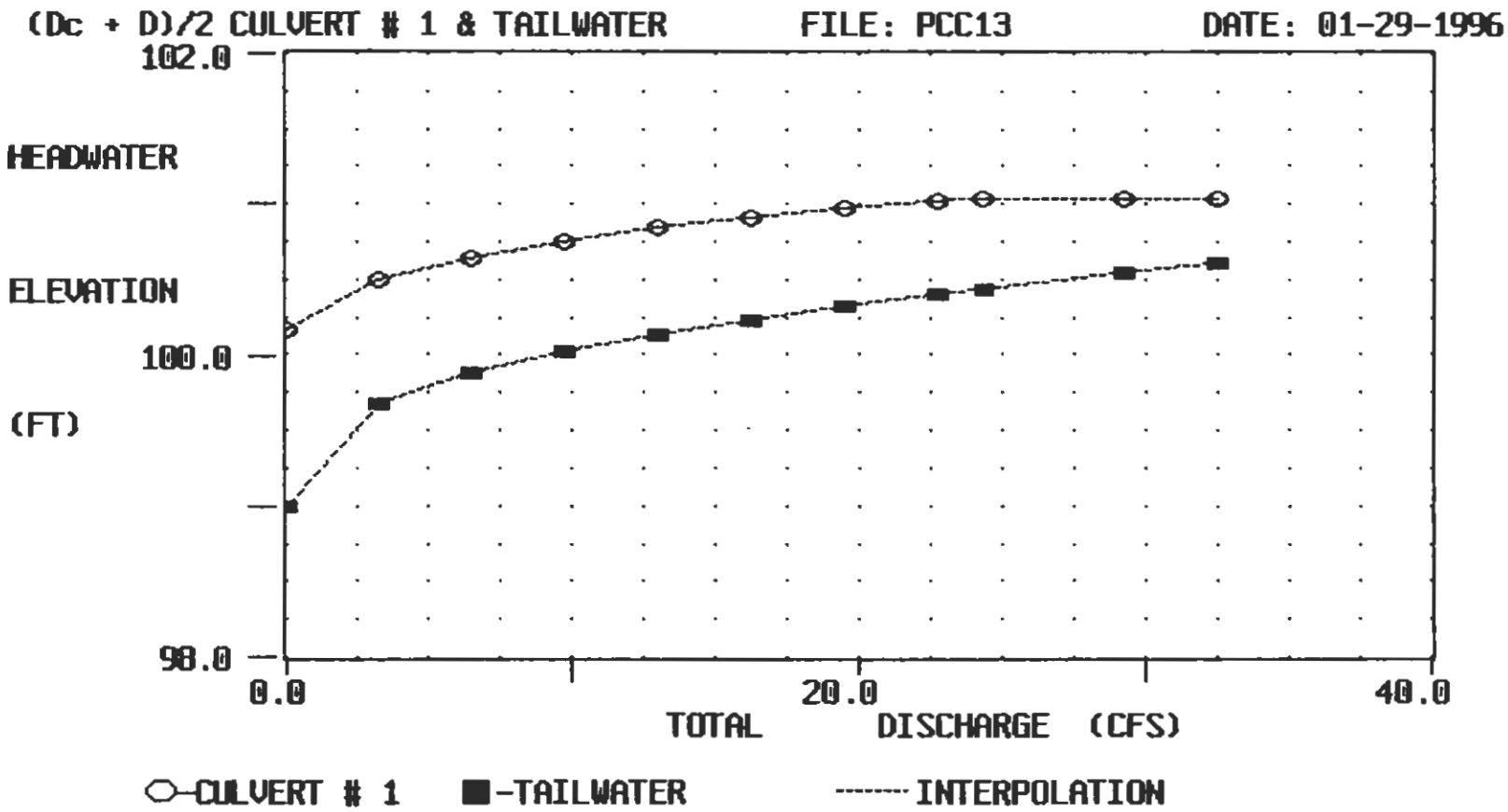
FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	99.00	0.000	0.00	0.00	0.00
3.25	99.68	0.305	0.68	1.42	1.69
6.50	99.88	0.318	0.88	1.69	2.19
9.75	100.02	0.327	1.02	1.87	2.55
13.00	100.14	0.333	1.14	2.01	2.84
16.25	100.24	0.337	1.24	2.13	3.08
19.49	100.32	0.341	1.32	2.23	3.30
22.74	100.40	0.344	1.40	2.31	3.50
24.37	100.44	0.346	1.44	2.35	3.59
29.24	100.54	0.350	1.54	2.46	3.85
32.49	100.60	0.352	1.60	2.53	4.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	20.00
CREST LENGTH (FT)	20.00
OVERTOPPING CREST ELEVATION (FT)	103.00

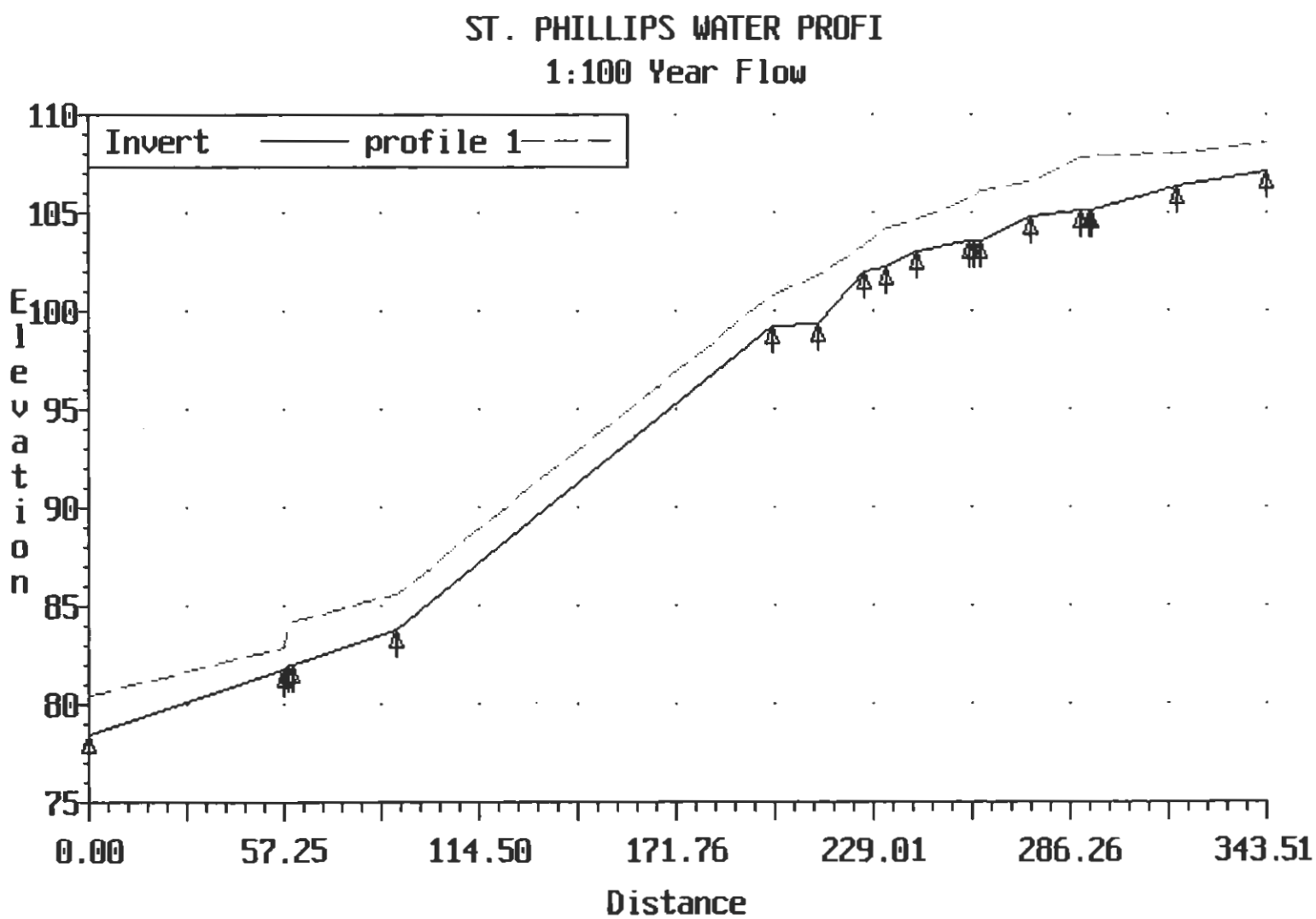

CULVERT PERFORMANCE
FILE: PCC13
DATE: 01-29-1996
104.0
HEADWATER
ELEVATION
(FT)
99.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
DATA
INTERPOLATION

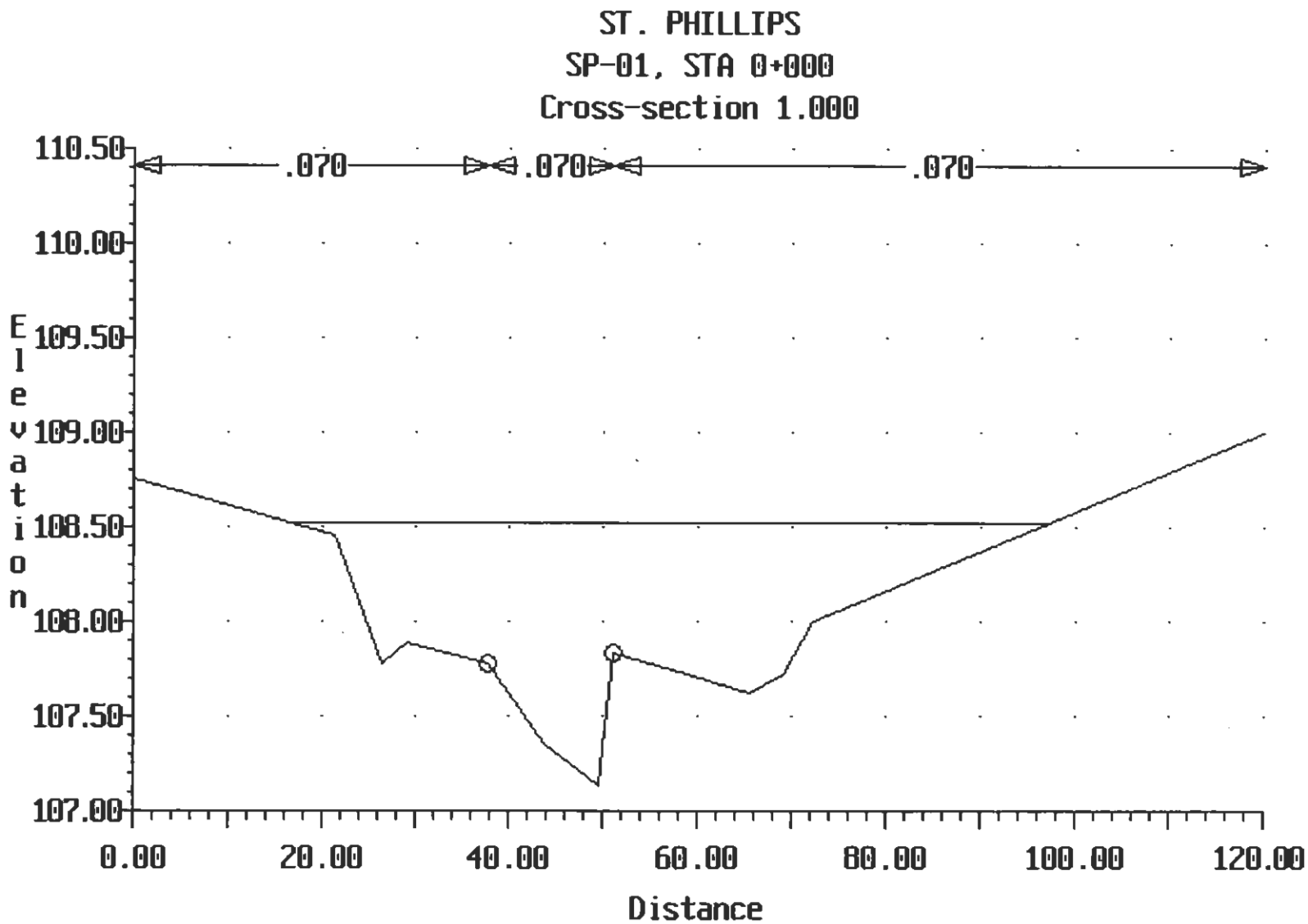

CULVERT # 1 & ROADWAY PERFORMANCE
FILE: PCC13
DATE: 01-29-1996
100.0
HEADWATER
ELEVATION
(FT)
99.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
ROADWAY
INTERPOLATION

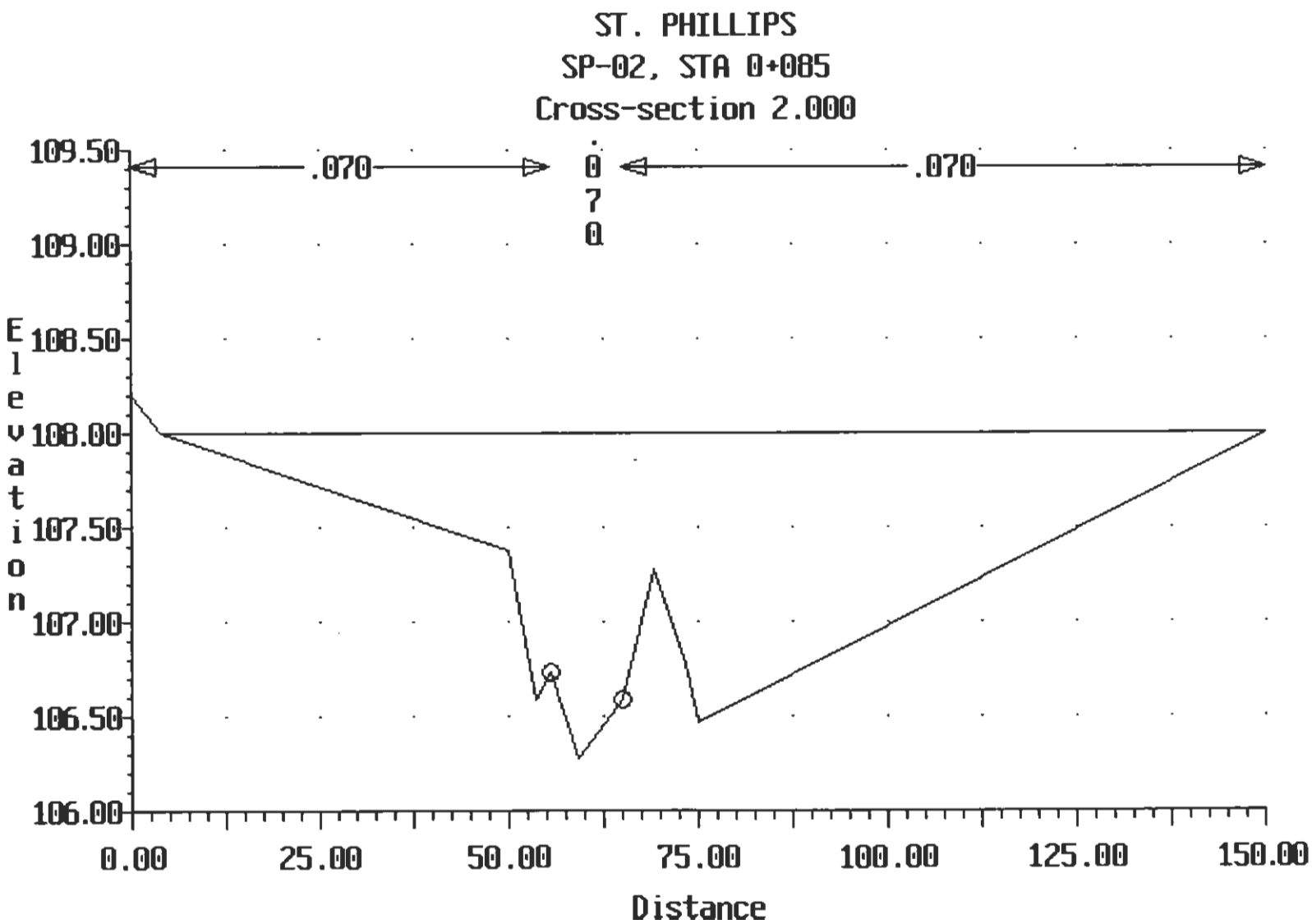

(Dc + D)/2 CULVERT # 1 & TAILWATER
FILE: PCC13
DATE: 01-29-1996
102.0
HEADWATER
ELEVATION
100.0
(FT)
98.0
0.0
20.0
40.0
TOTAL DISCHARGE (CFS)
CULVERT # 1
TAILWATER
INTERPOLATION

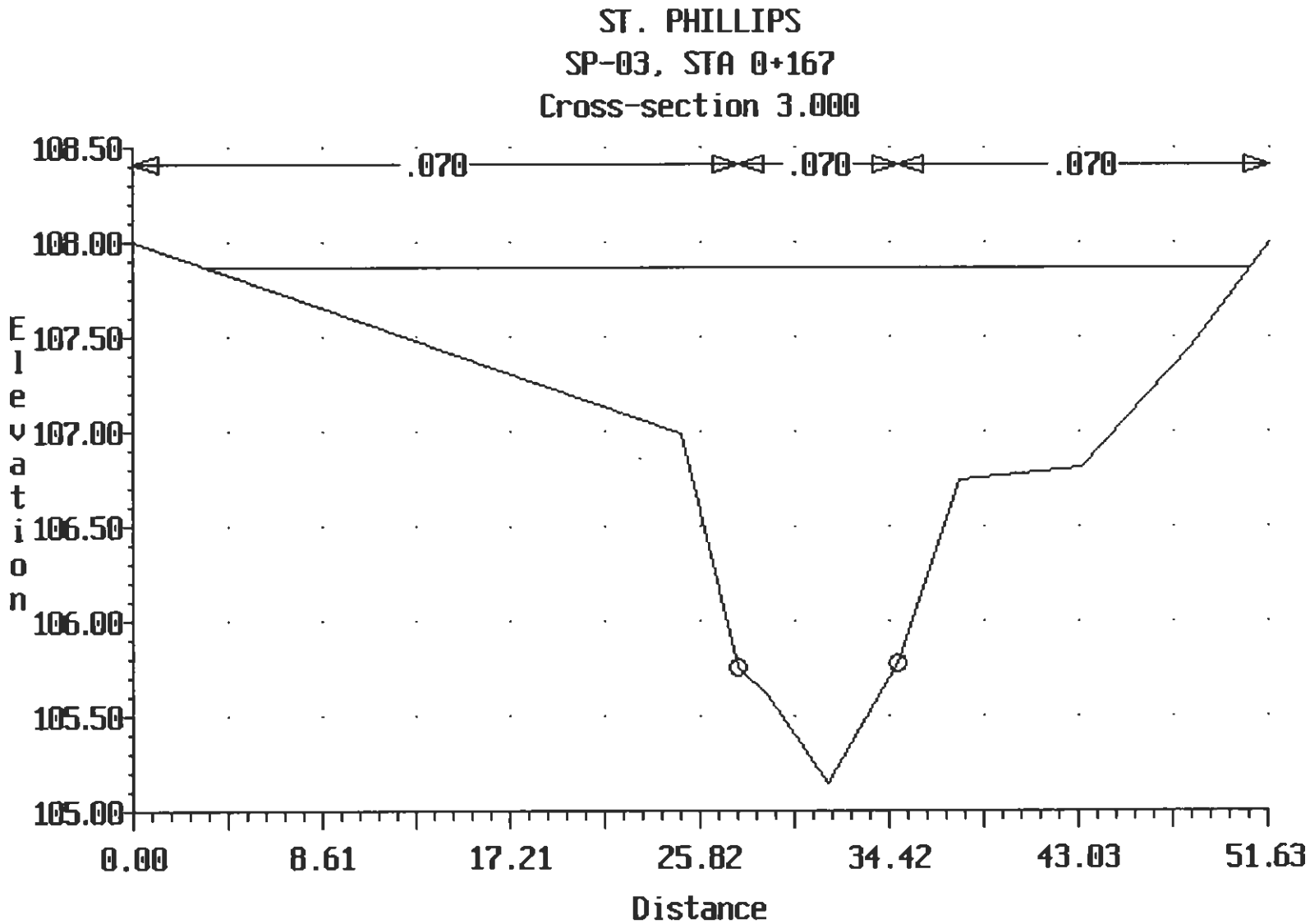
APPENDIX M

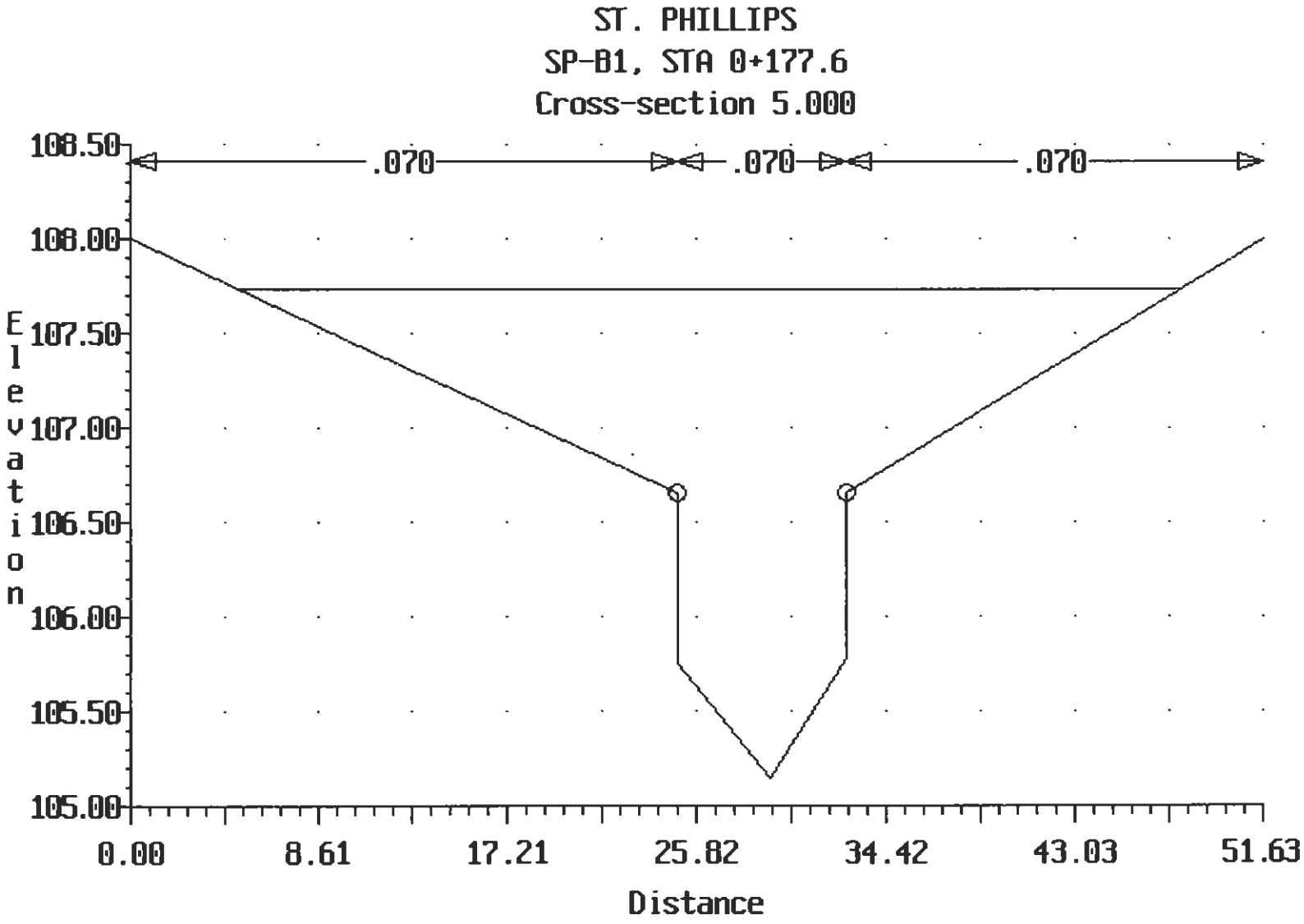
Water Level

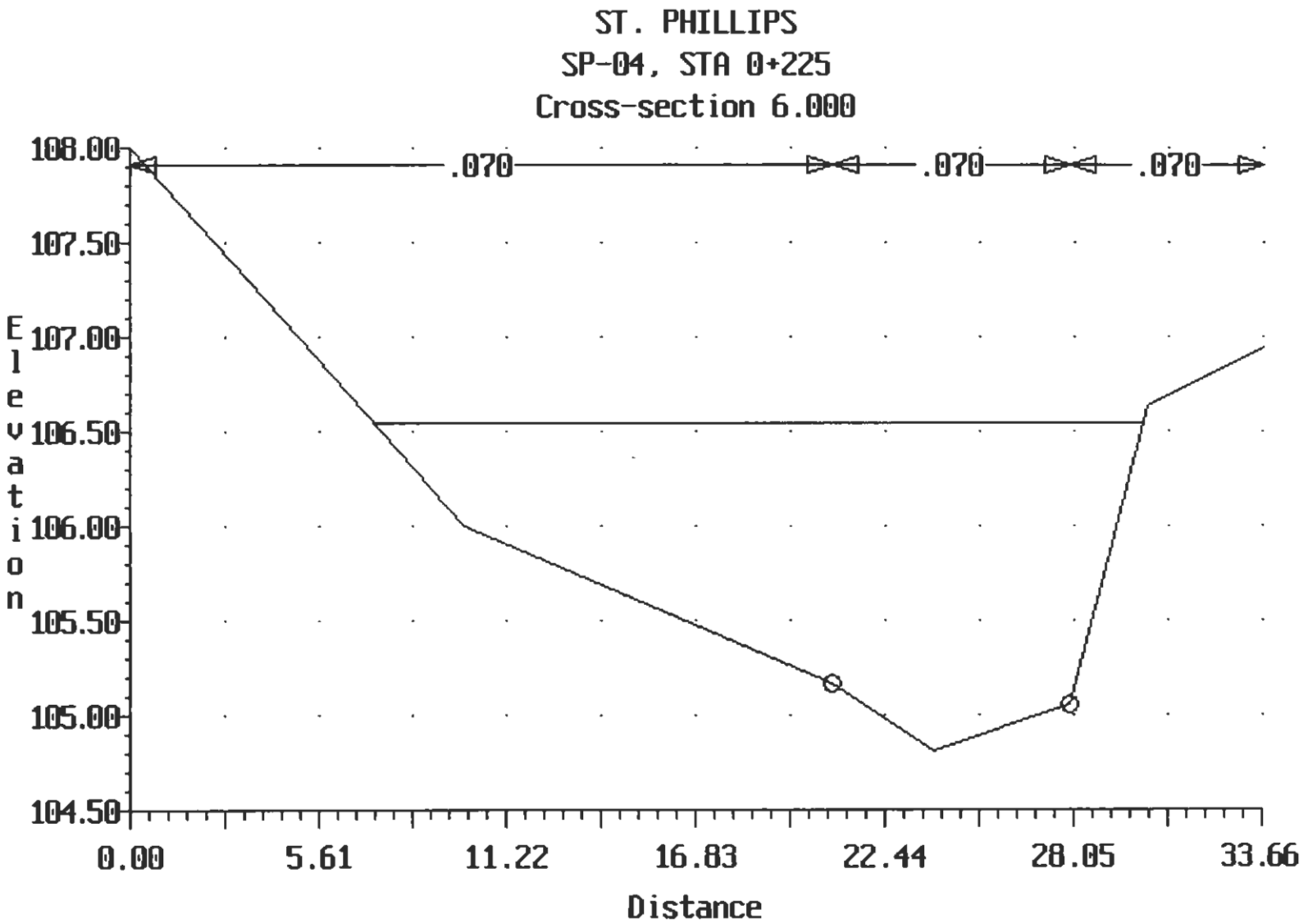

ST. PHILLIPS WATER PROFI
1:100 Year Flow
Invert
profile 1
110
105
100
95
90
85
80
75
Elevation
0.00
57.25
114.50
171.76
229.01
286.26
343.51
Distance


ST. PHILLIPS
SP-01, STA 0+000
Cross-section 1.000
.070
.070
.070
110.50
110.00
109.50
109.00
108.50
108.00
107.50
107.00
Elevation
0.00
20.00
40.00
60.00
80.00
100.00
120.00
Distance

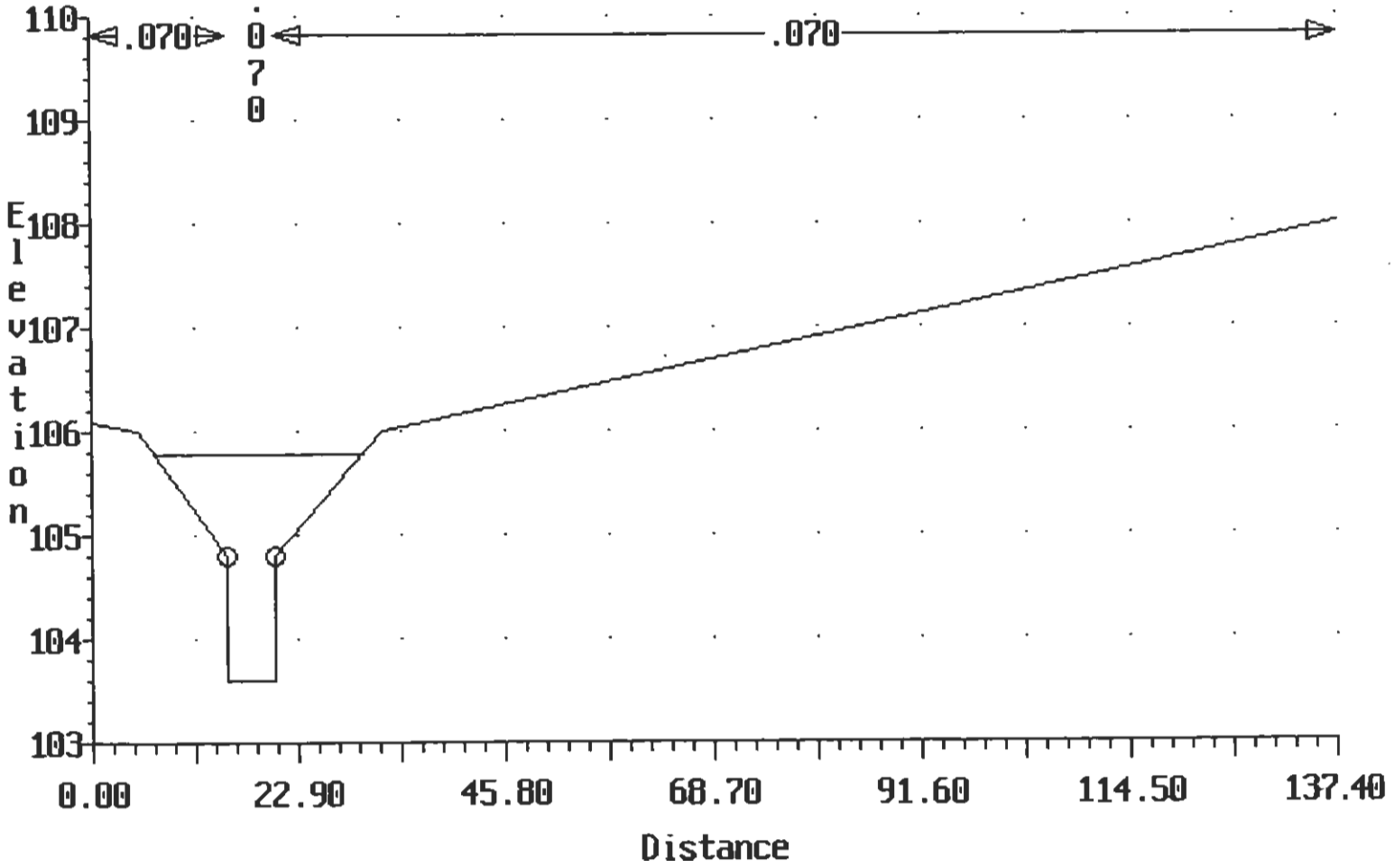

ST. PHILLIPS
SP-02, STA 0+085
Cross-section 2.000
.070
.070
0.70
Elevation
109.50
109.00
108.50
108.00
107.50
107.00
106.50
106.00
0.00
25.00
50.00
75.00
100.00
125.00
150.00
Distance

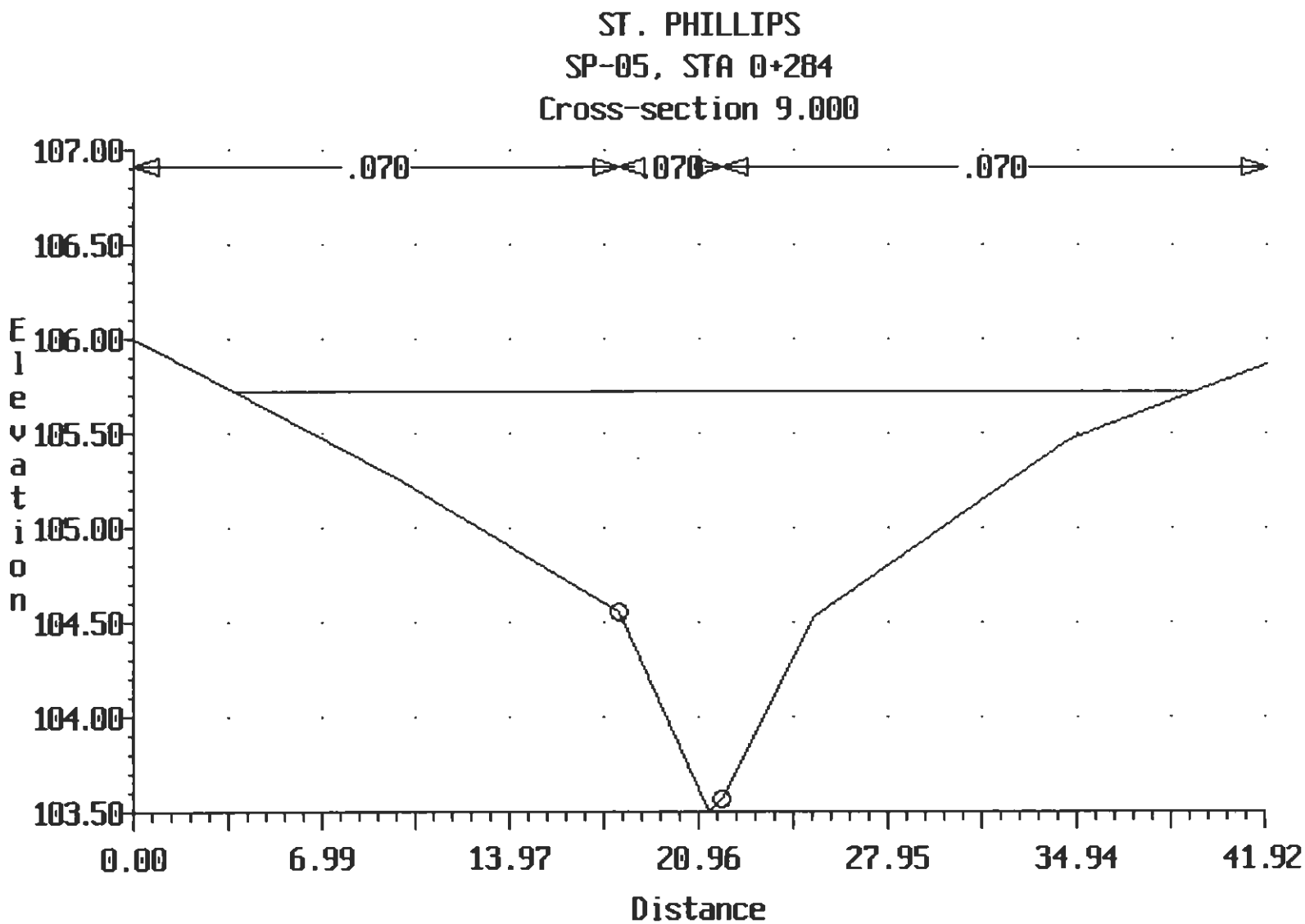

ST. PHILLIPS
SP-03, STA 0+167
Cross-section 3.000
.070
.070
.070
108.50
108.00
107.50
107.00
106.50
106.00
105.50
105.00
Elevation
0.00
8.61
17.21
25.82
34.42
43.03
51.63
Distance

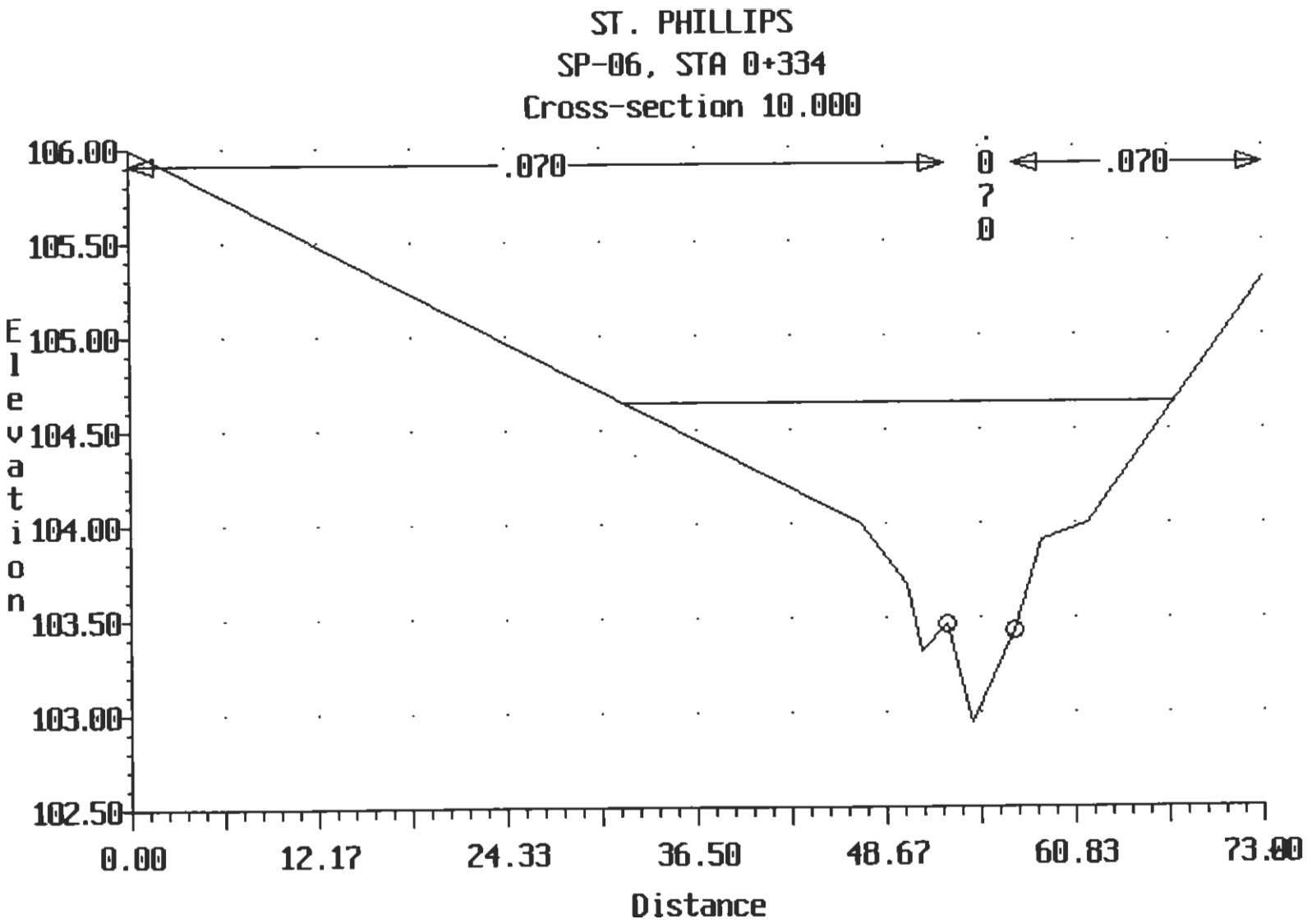

ST. PHILLIPS
SP-B1, STA 0+177.6
Cross-section 5.000
.070
.070
.070
108.50
108.00
107.50
107.00
106.50
106.00
105.50
105.00
Elevation
0.00
8.61
17.21
25.82
34.42
43.03
51.63
Distance

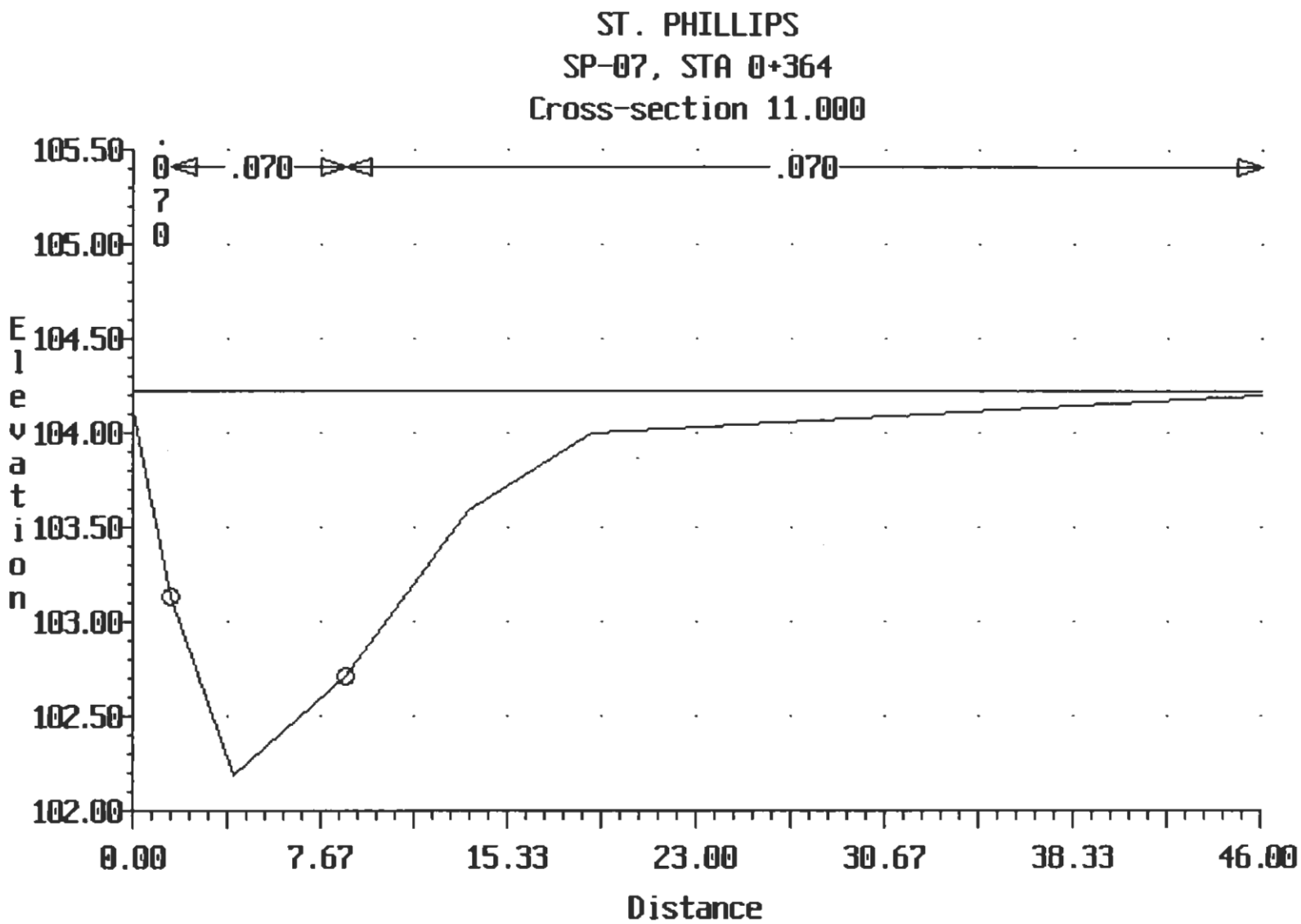

ST. PHILLIPS
SP-04, STA 0+225
Cross-section 6.000
.070
.070
.070
108.00
107.50
107.00
106.50
106.00
105.50
105.00
104.50
Elevation
0.00
5.61
11.22
16.83
22.44
28.05
33.66
Distance

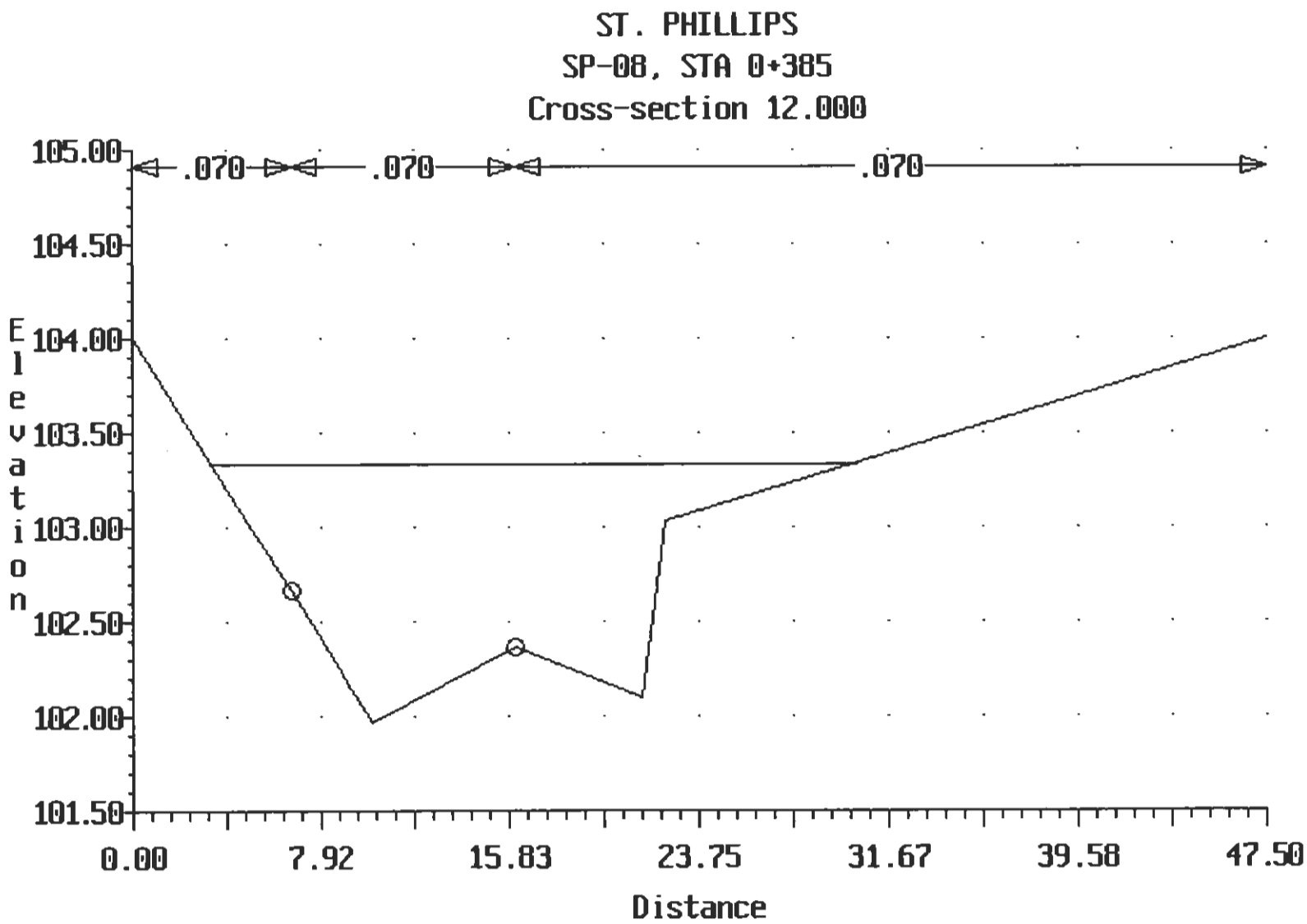
ST. PHILLIPS
SP-B2, STA 0+279
Cross-section 8.000

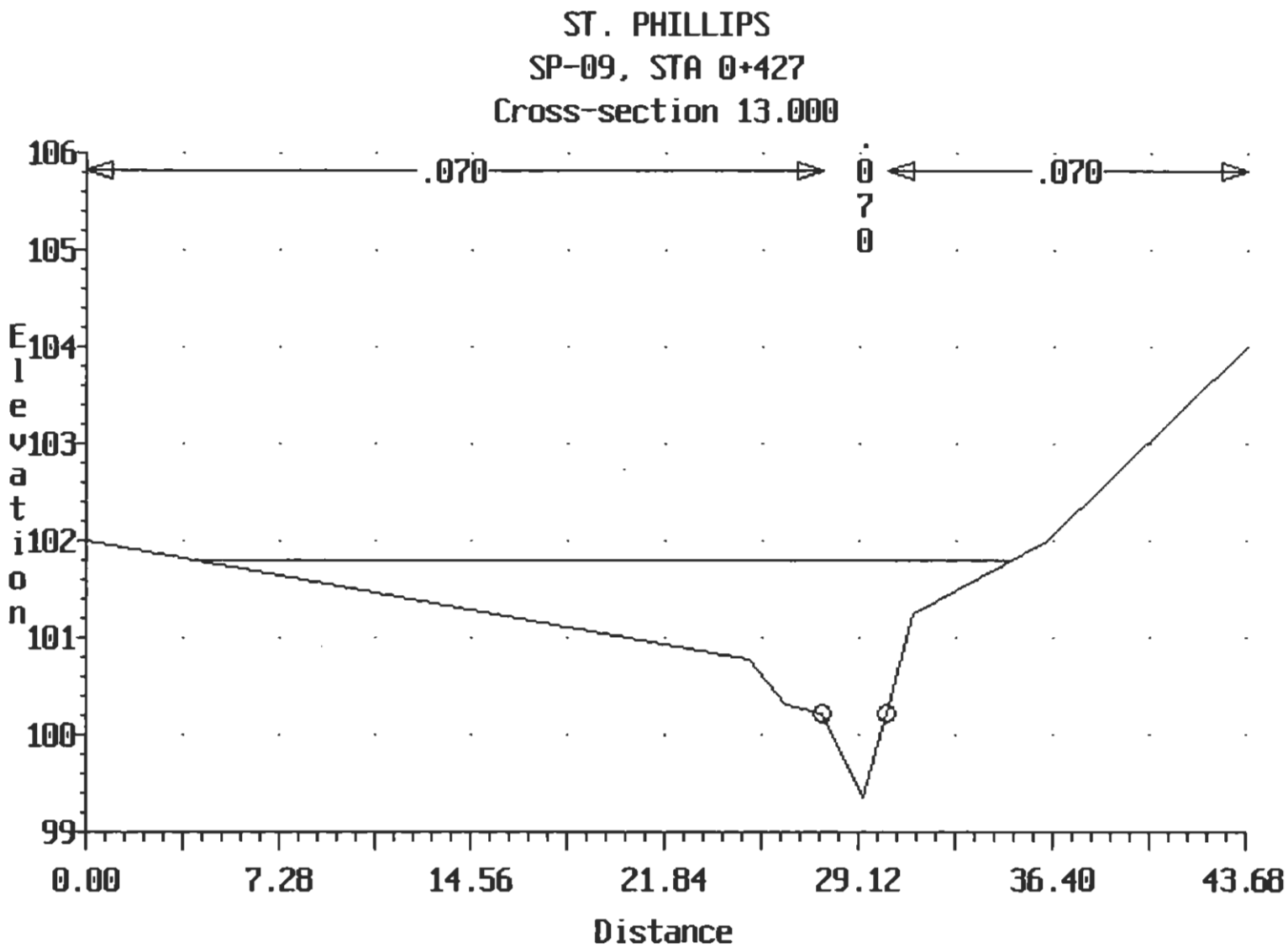



ST. PHILLIPS
SP-05, STA 0+284
Cross-section 9.000
.070
.070
.070
107.00
106.50
106.00
105.50
105.00
104.50
104.00
103.50
Elevation
0.00
6.99
13.97
20.96
27.95
34.94
41.92
Distance

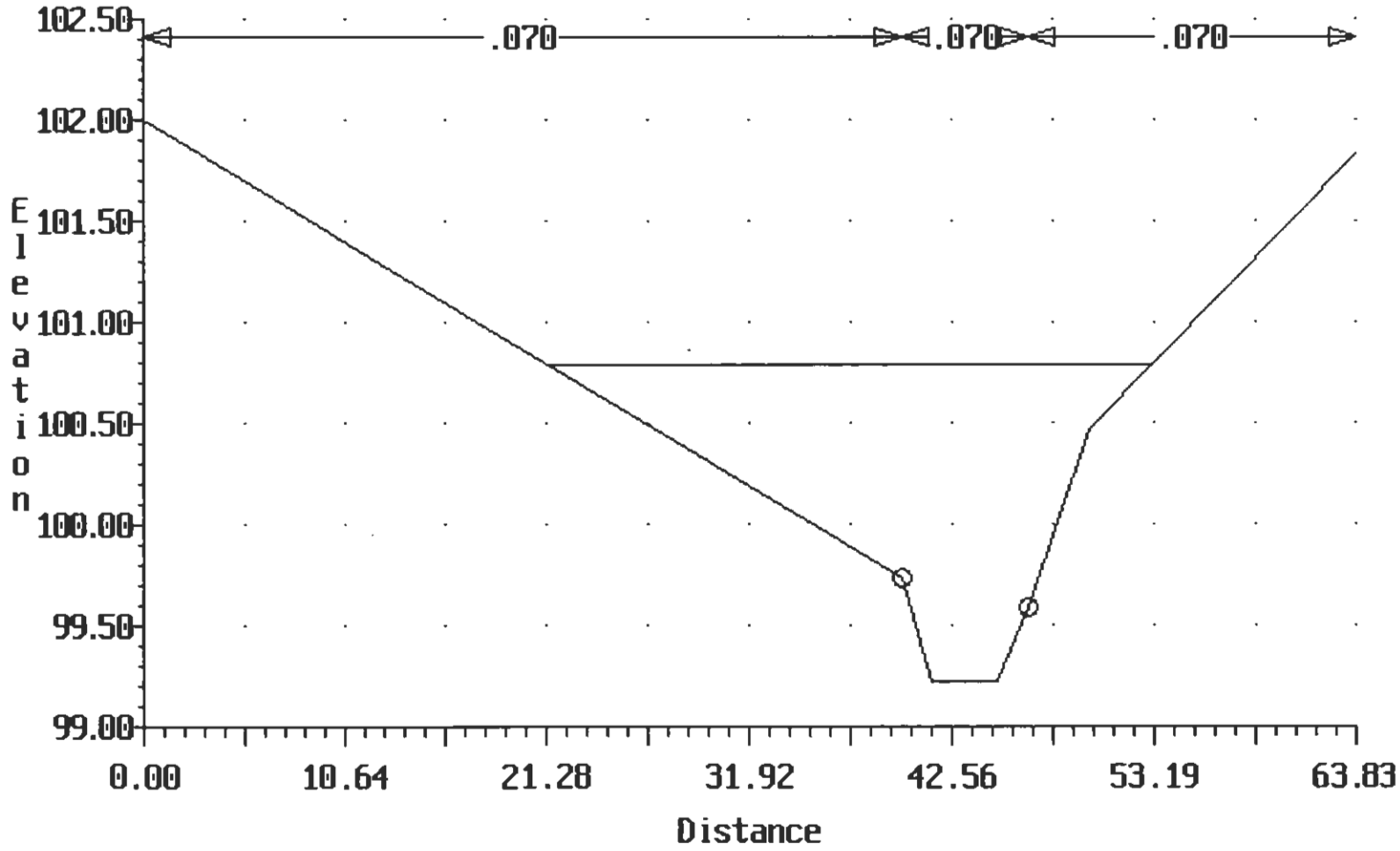

ST. PHILLIPS
SP-06, STA 0+334
Cross-section 10.000
.070
0
?
0
.070
106.00
105.50
105.00
104.50
104.00
103.50
103.00
102.50
Elevation
0.00
12.17
24.33
36.50
48.67
60.83
73.00
Distance

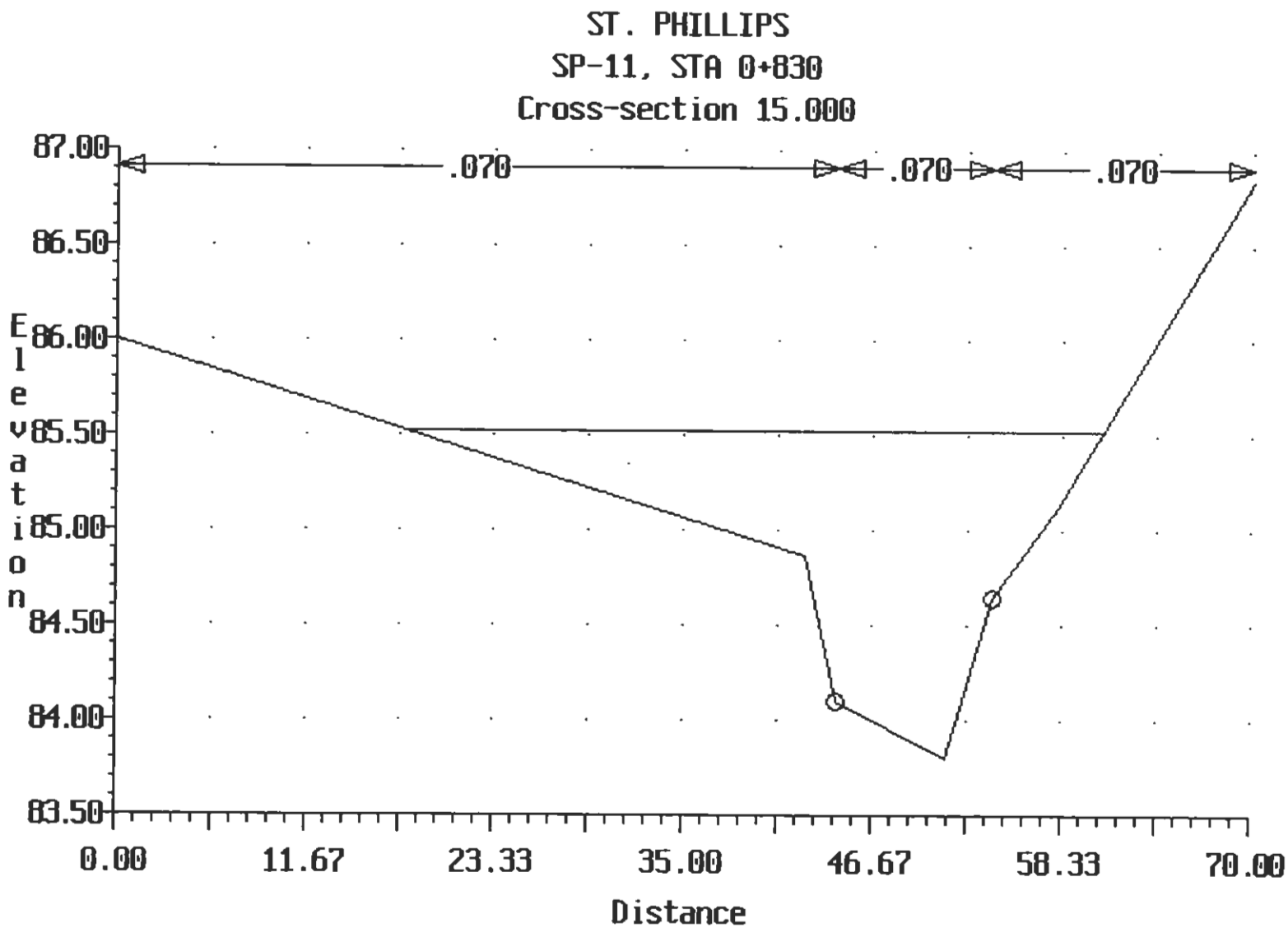

ST. PHILLIPS
SP-07, STA 0+364
Cross-section 11.000
.070
.070
.070
Elevation
105.50
105.00
104.50
104.00
103.50
103.00
102.50
102.00
0.00
7.67
15.33
23.00
30.67
38.33
46.00
Distance

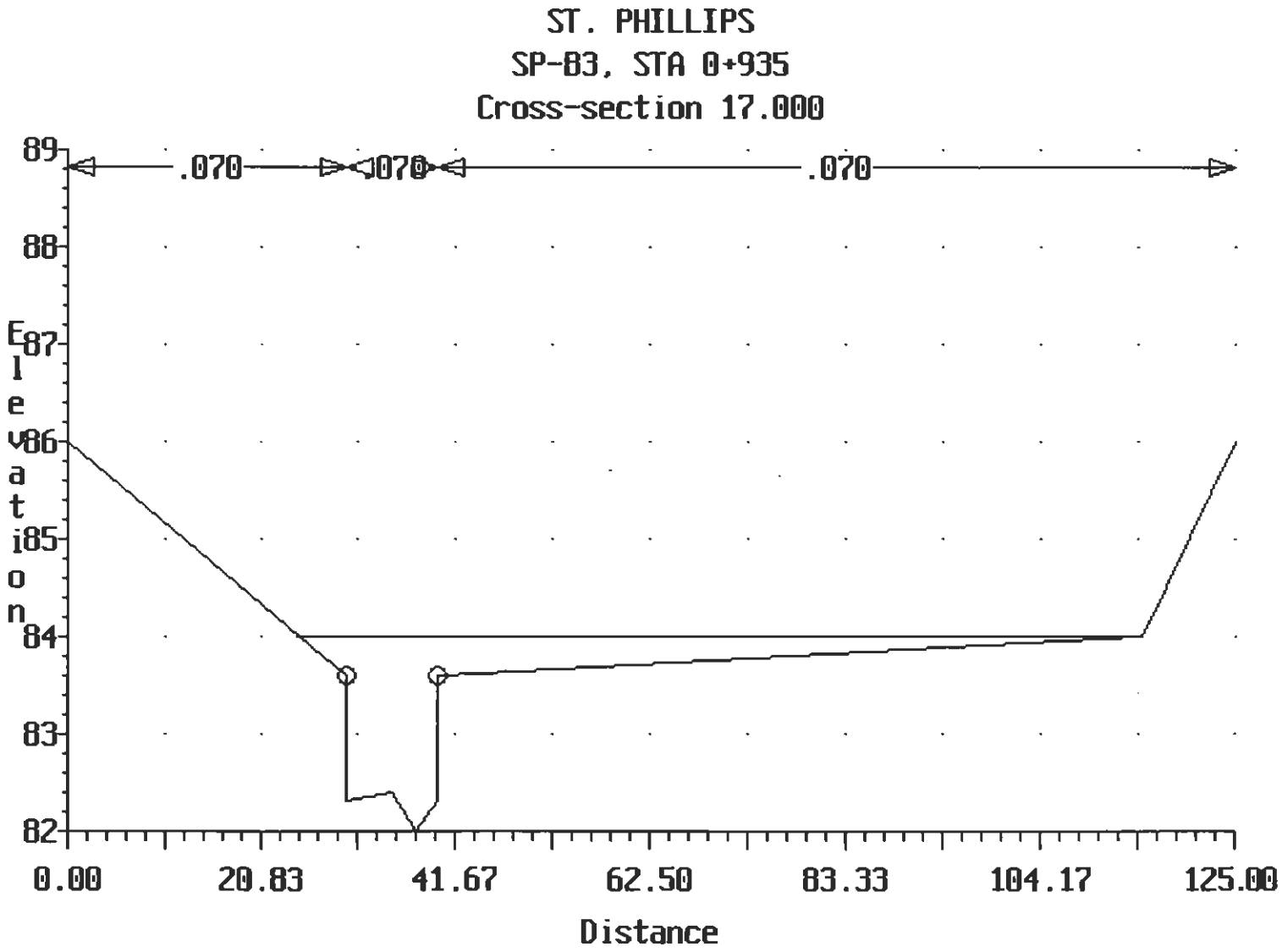

ST. PHILLIPS
SP-08, STA 0+385
Cross-section 12.000
.070
.070
.070
105.00
104.50
104.00
103.50
103.00
102.50
102.00
101.50
Elevation
0.00
7.92
15.83
23.75
31.67
39.58
47.50
Distance

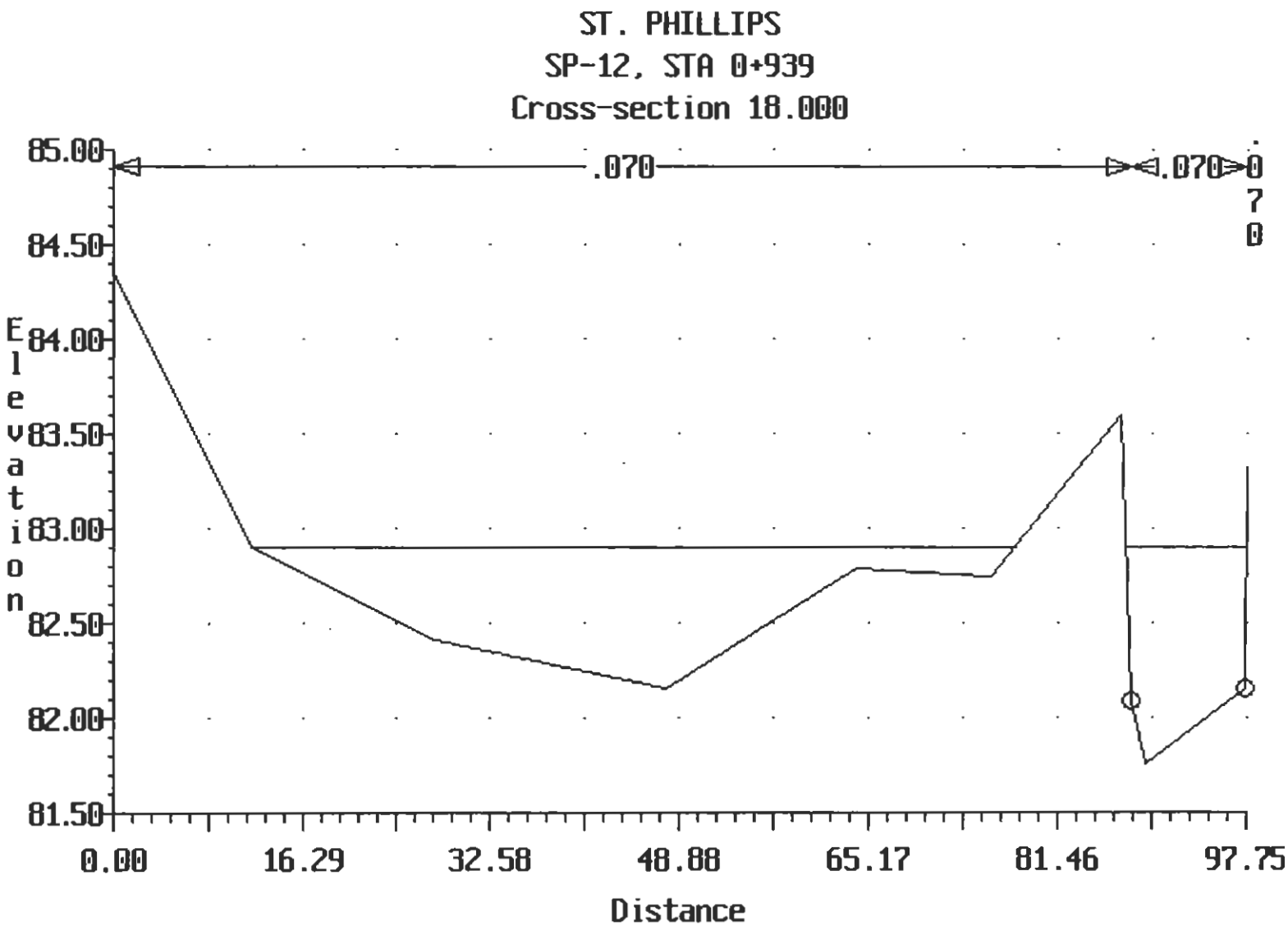

ST. PHILLIPS
SP-09, STA 0+427
Cross-section 13.000
.070
.070
.070
Elevation
106
105
104
103
102
101
100
99
0.00
7.28
14.56
21.84
29.12
36.40
43.68
Distance

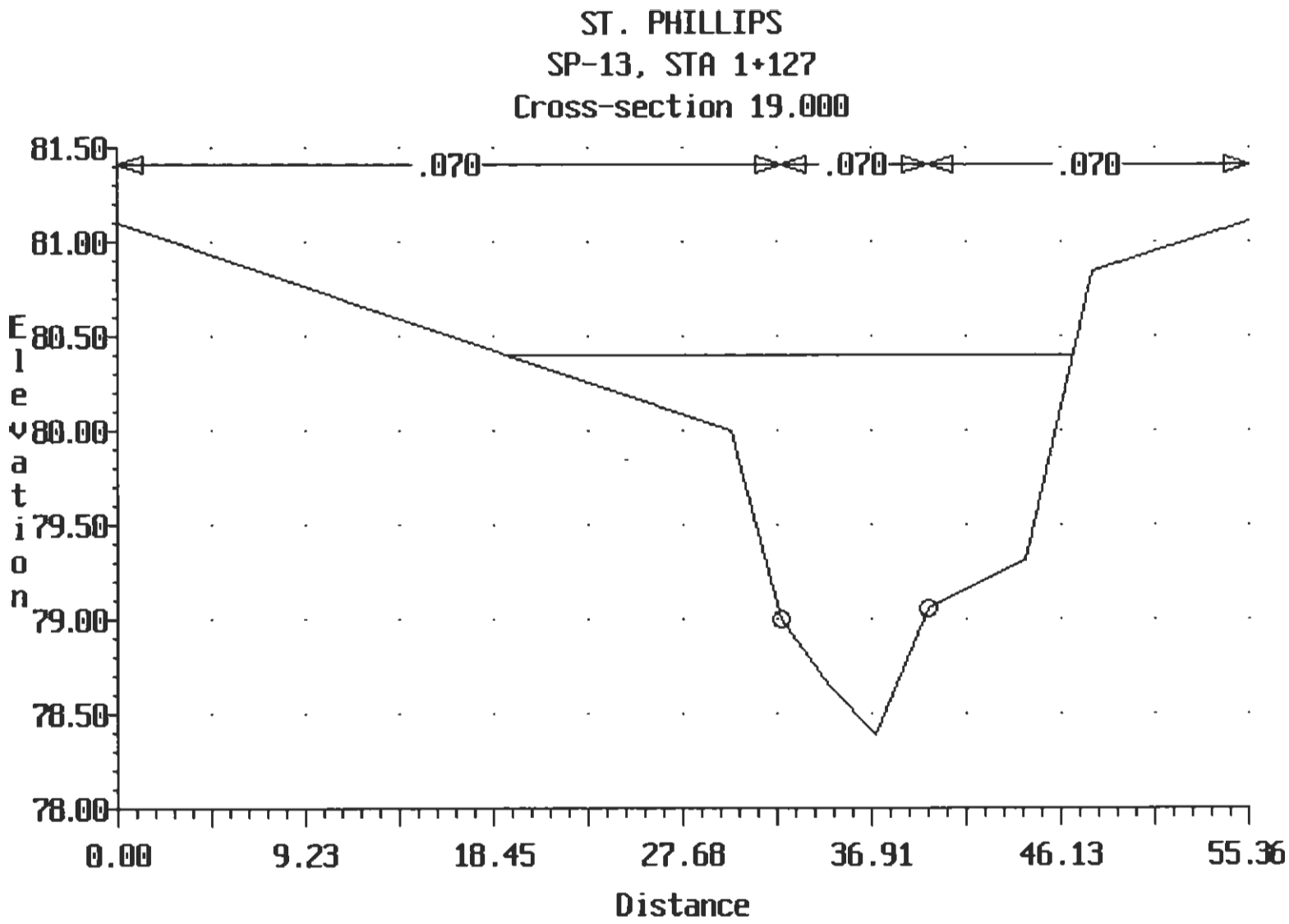
ST. PHILLIPS
SP-10, STA 0+472
Cross-section 14.000

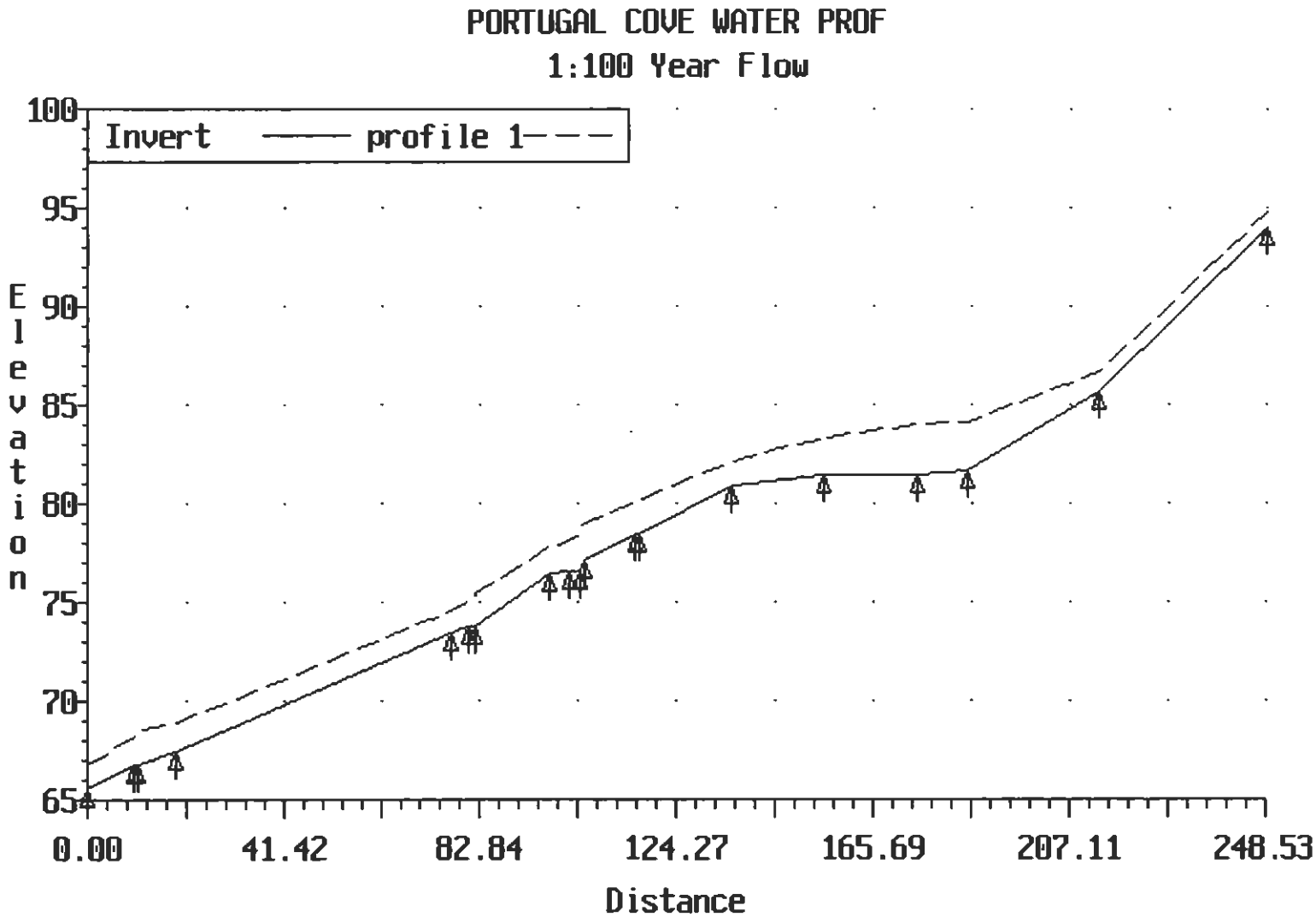


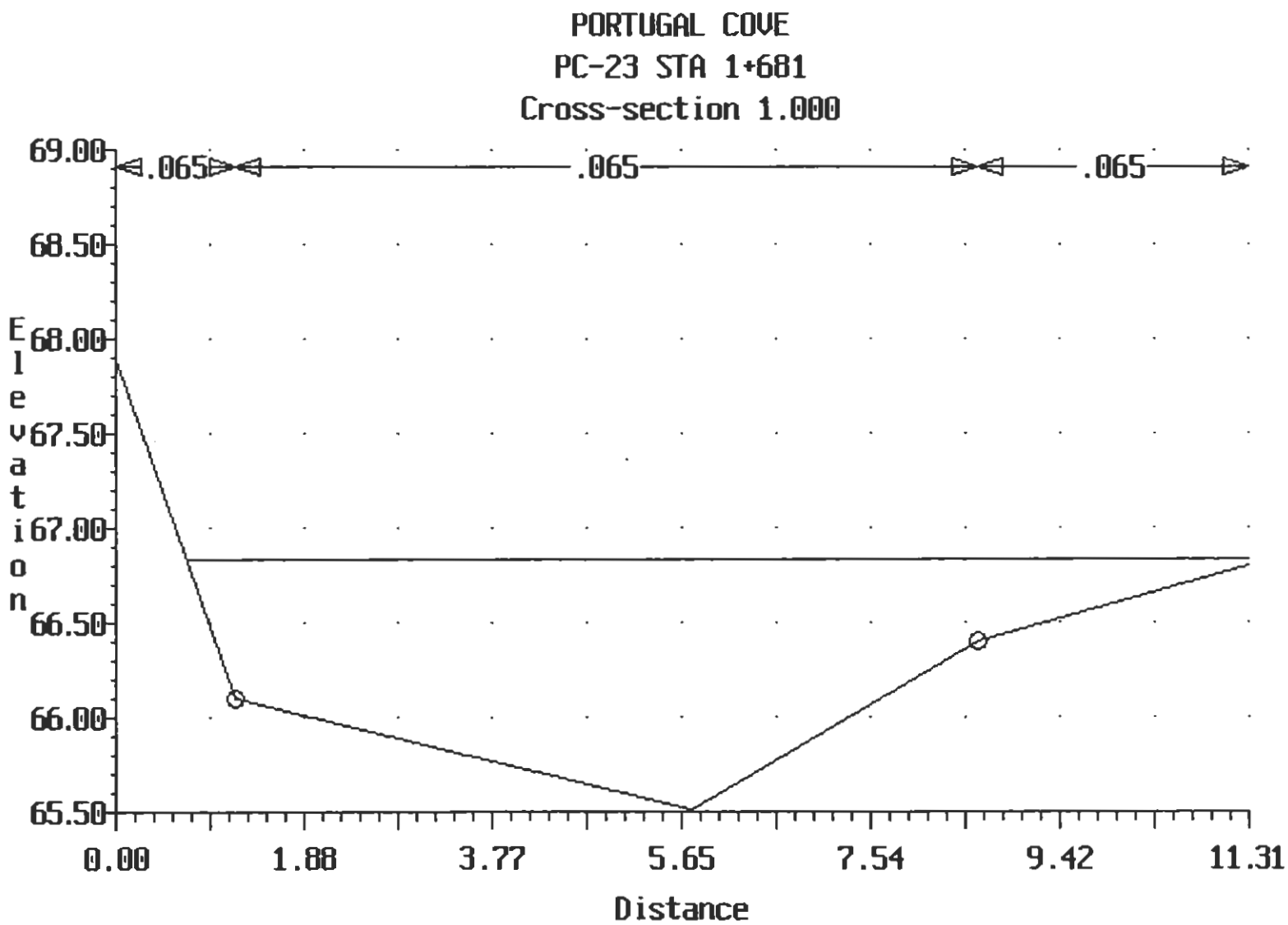

ST. PHILLIPS
SP-11, STA 0+830
Cross-section 15.000
.070
.070
.070
87.00
86.50
86.00
85.50
85.00
84.50
84.00
83.50
Elevation
0.00
11.67
23.33
35.00
46.67
58.33
70.00
Distance

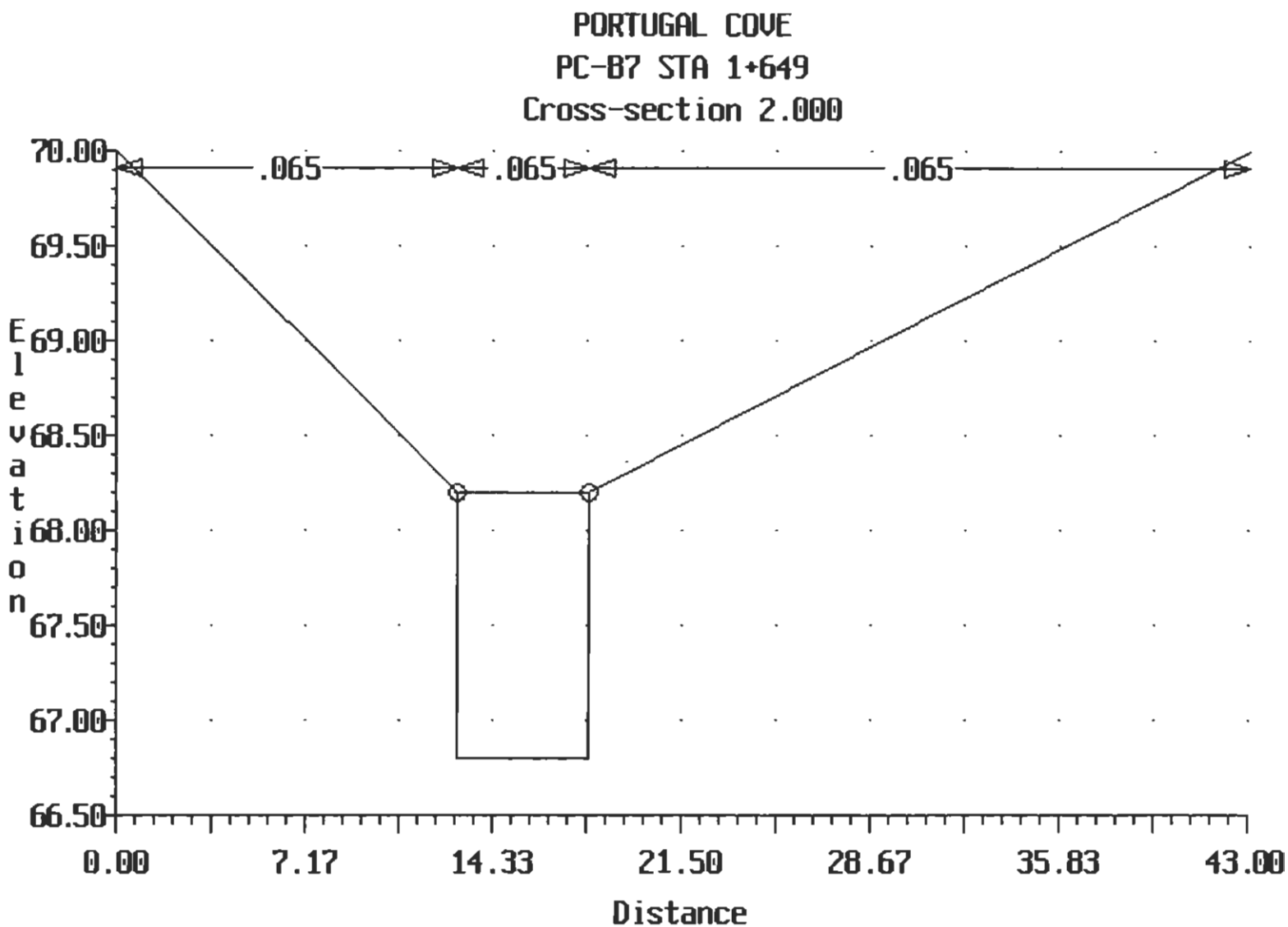

ST. PHILLIPS
SP-B3, STA 0+935
Cross-section 17.000
.070
.070
.070
89
88
87
86
85
84
83
82
Elevation
0.00
20.83
41.67
62.50
83.33
104.17
125.00
Distance

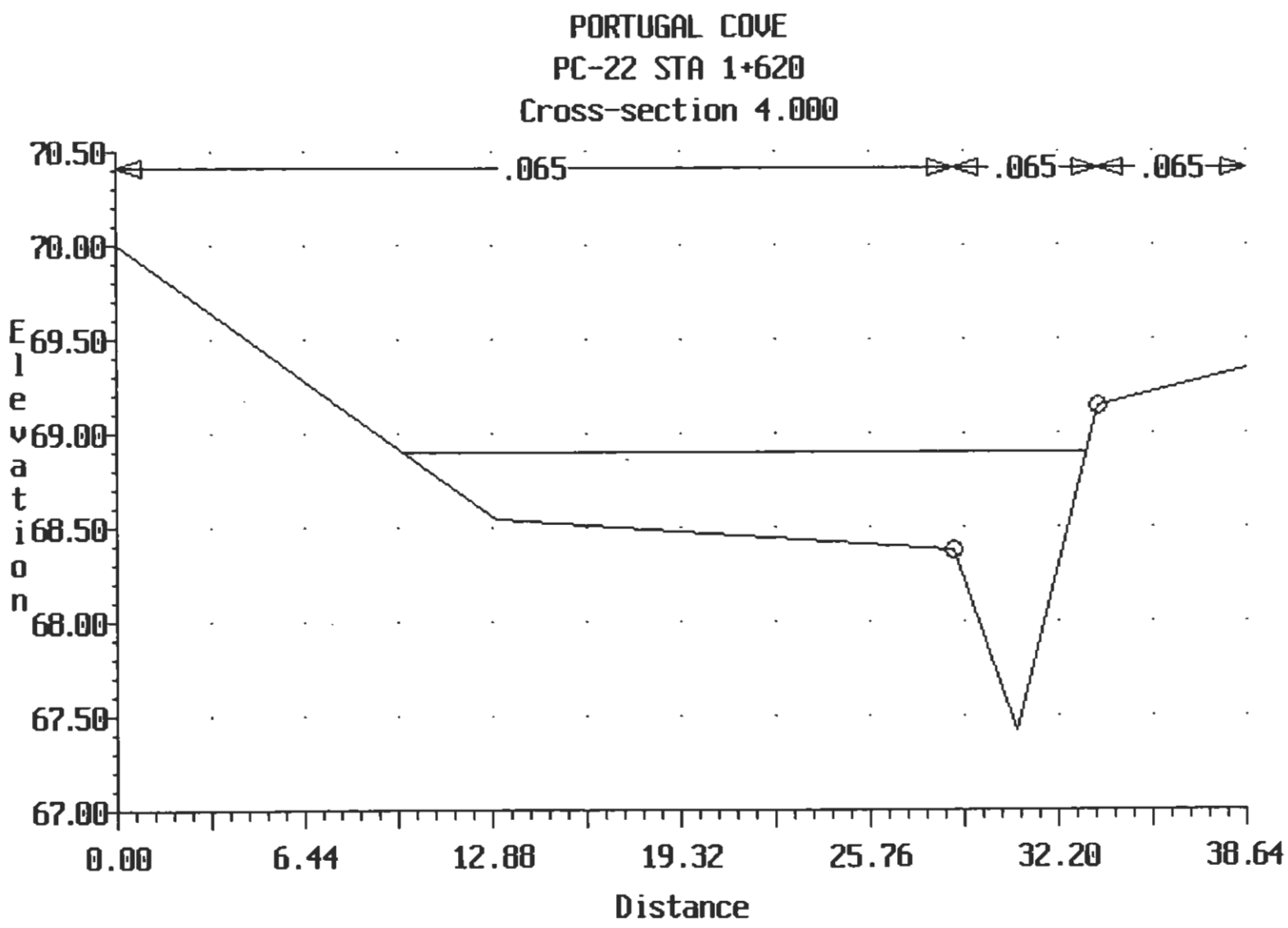

ST. PHILLIPS
SP-12, STA 0+939
Cross-section 18.000
.070
.070
.070
85.00
84.50
84.00
83.50
83.00
82.50
82.00
81.50
Elevation
0.00
16.29
32.58
48.88
65.17
81.46
97.75
Distance

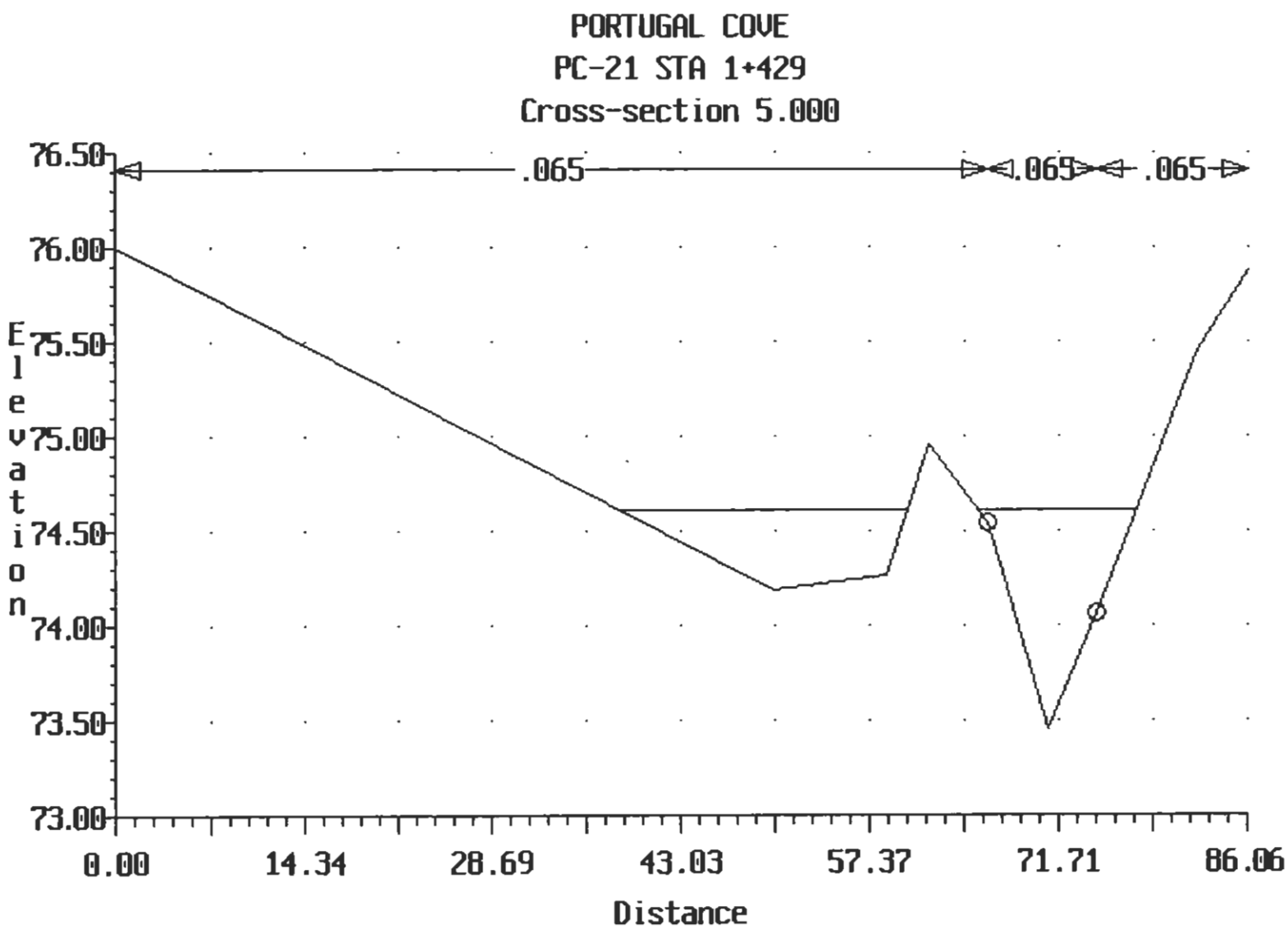

ST. PHILLIPS
SP-13, STA 1+127
Cross-section 19.000
.070
.070
.070
81.50
81.00
80.50
80.00
79.50
79.00
78.50
78.00
Elevation
0.00
9.23
18.45
27.68
36.91
46.13
55.36
Distance

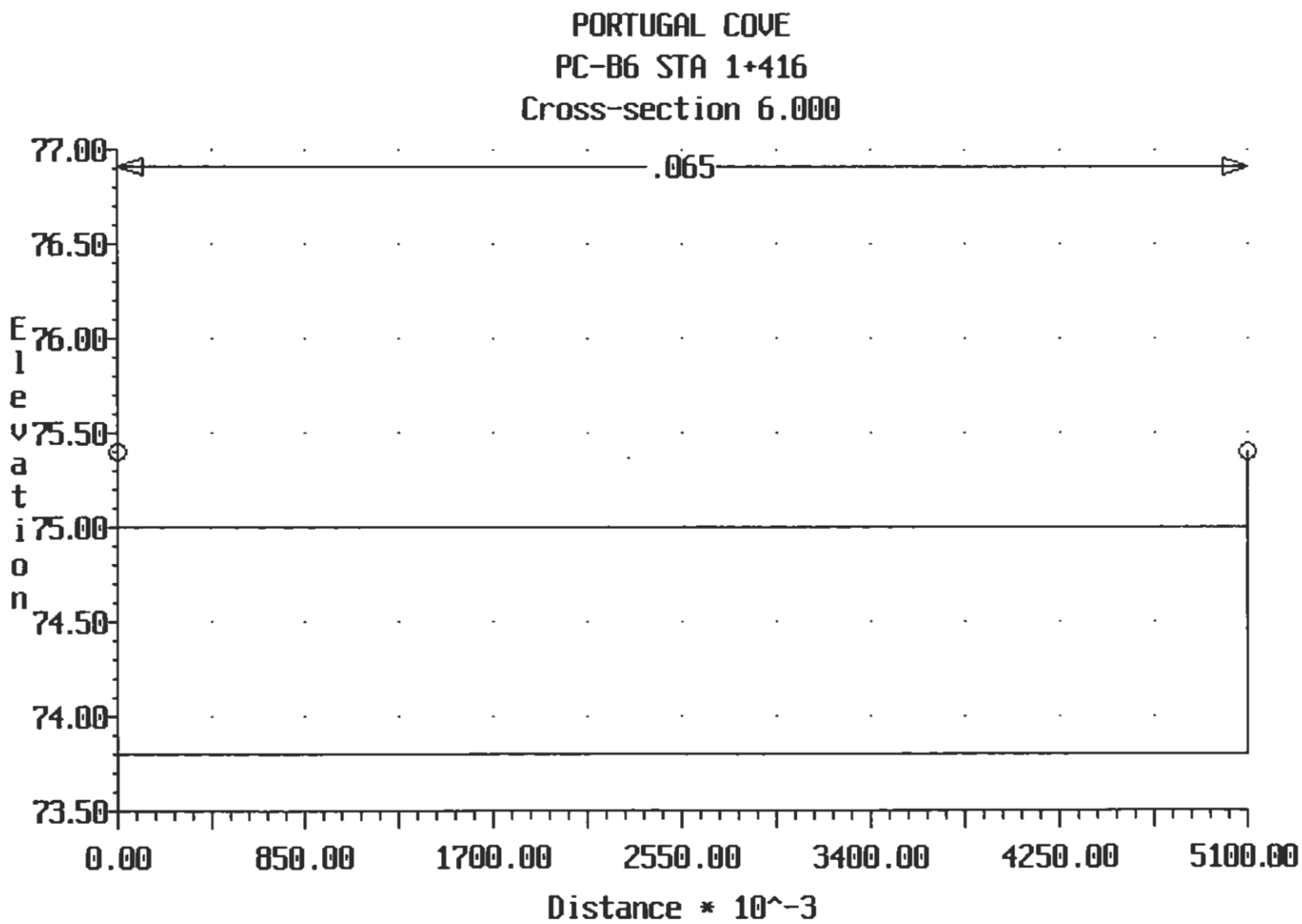

PORTUGAL COVE WATER PROF
1:100 Year Flow
Invert
profile 1
Elevation
100
95
90
85
80
75
70
65
0.00
41.42
82.84
124.27
165.69
207.11
248.53
Distance

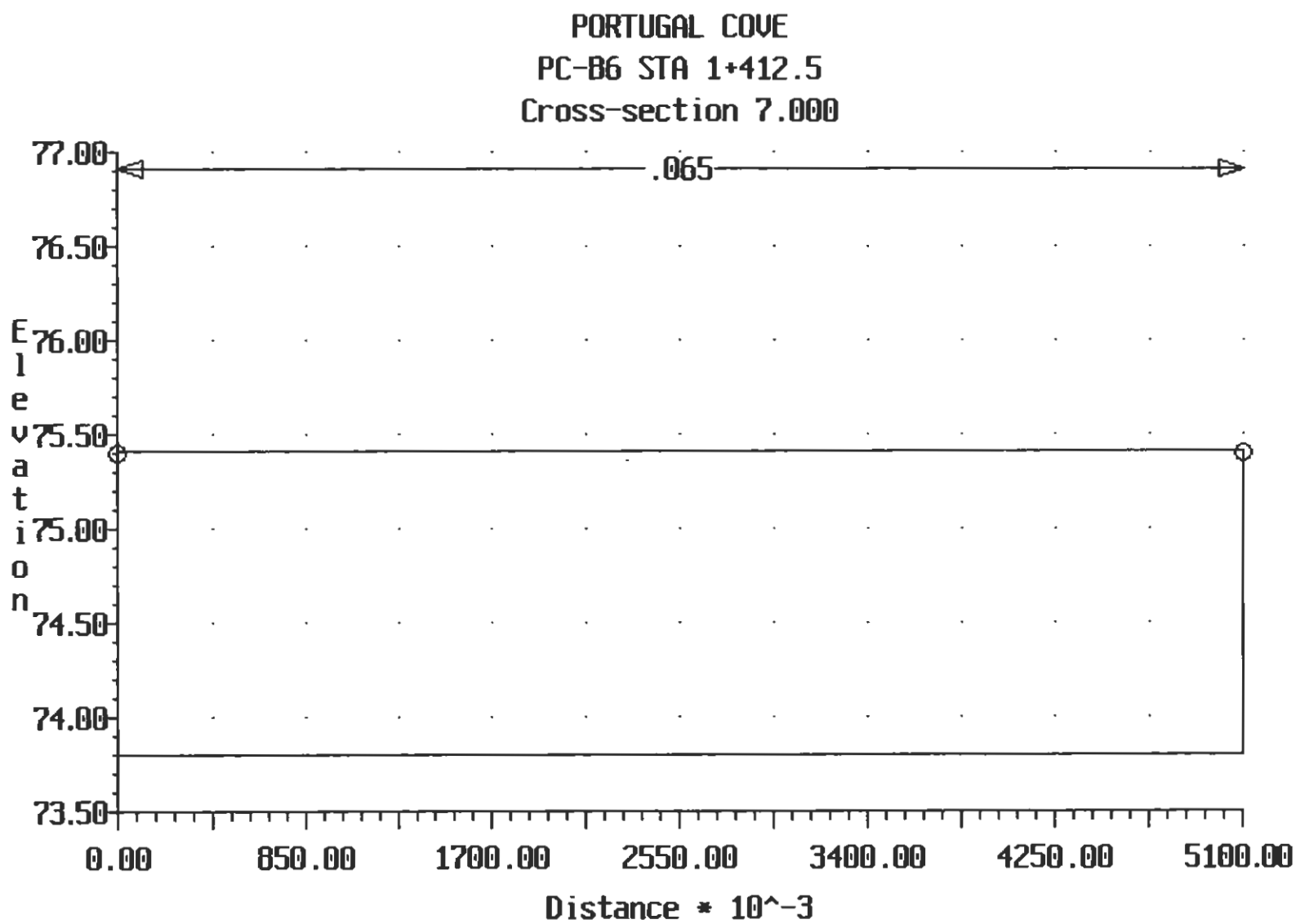

PORTUGAL COVE
PC-23 STA 1+681
Cross-section 1.000
.065
.065
.065
69.00
68.50
68.00
67.50
67.00
66.50
66.00
65.50
Elevation
0.00
1.88
3.77
5.65
7.54
9.42
11.31
Distance

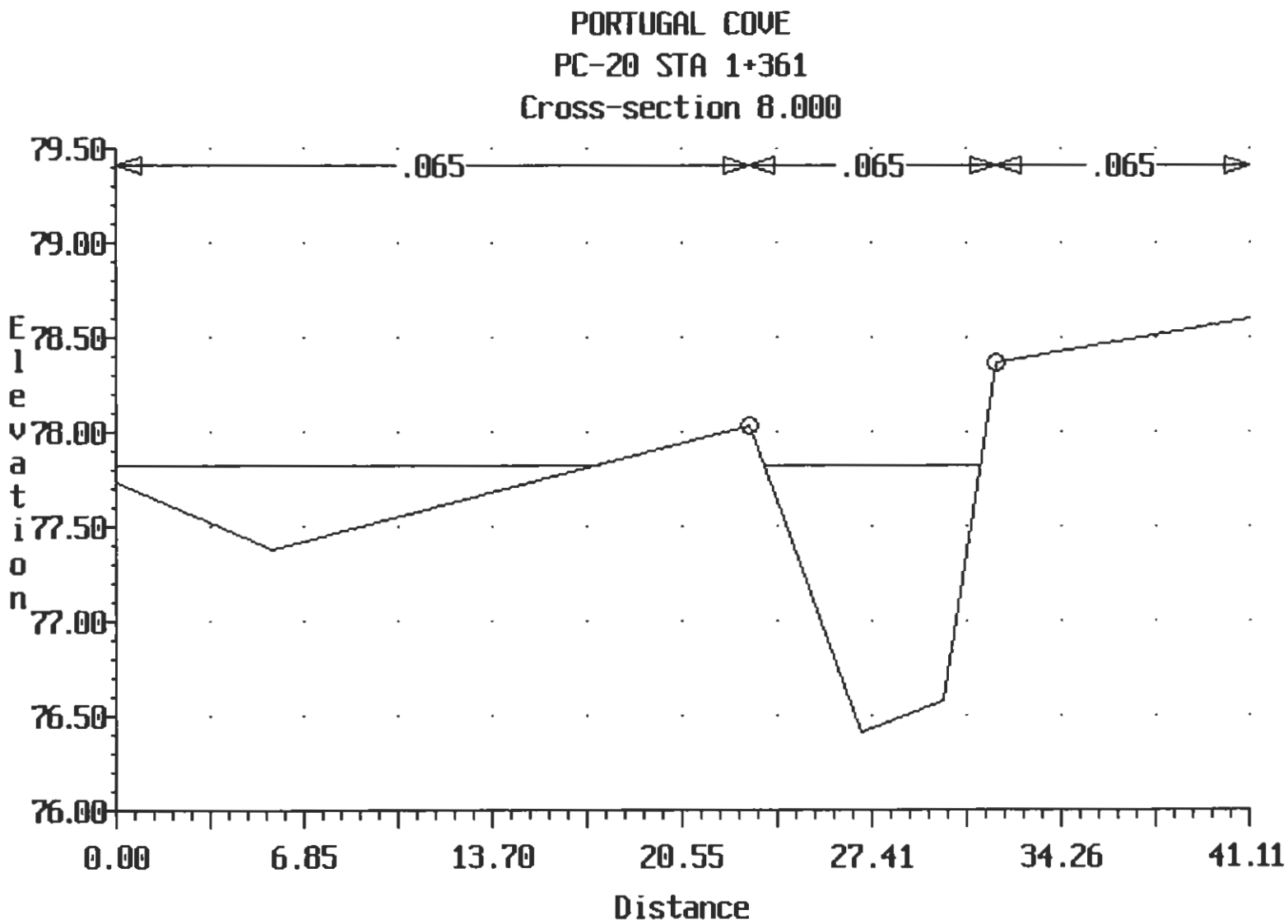

PORTUGAL COVE
PC-B7 STA 1+649
Cross-section 2.000
.065
.065
.065
70.00
69.50
69.00
68.50
68.00
67.50
67.00
66.50
Elevation
0.00
7.17
14.33
21.50
28.67
35.83
43.00
Distance

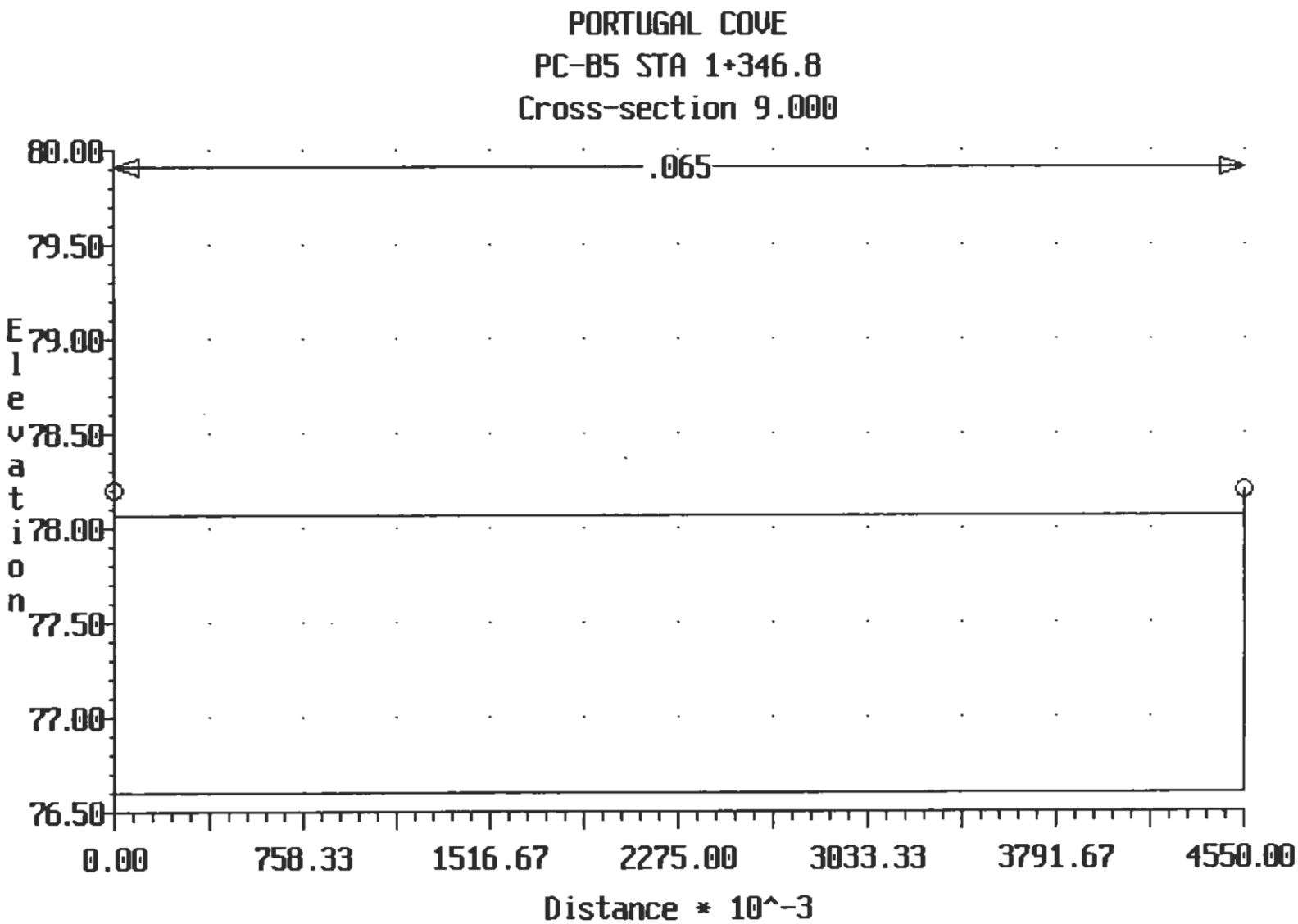

PORTUGAL COVE
PC-22 STA 1+620
Cross-section 4.000
.065
.065
.065
70.50
70.00
69.50
69.00
68.50
68.00
67.50
67.00
Elevation
0.00
6.44
12.88
19.32
25.76
32.20
38.64
Distance

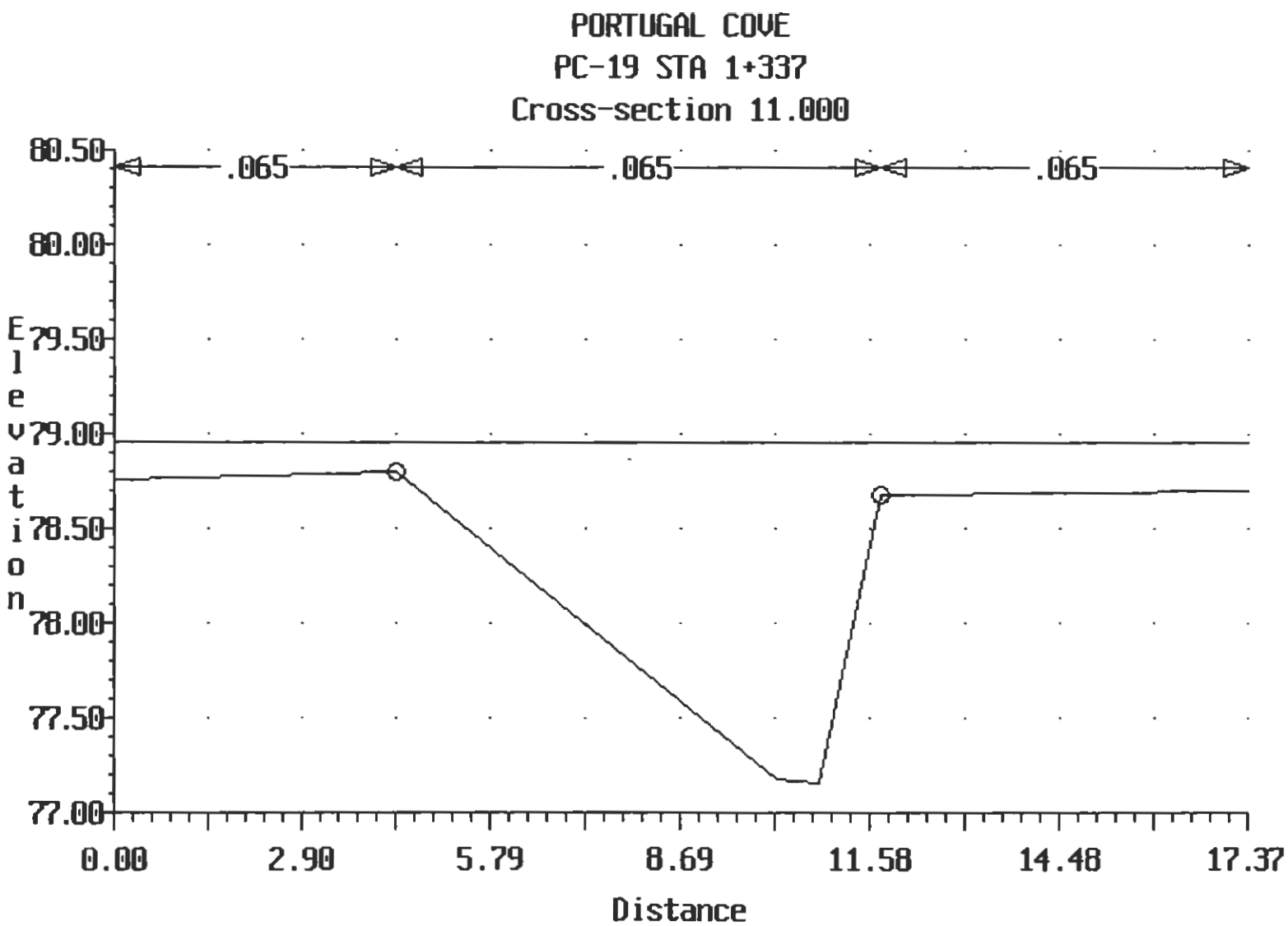

PORTUGAL COVE
PC-21 STA 1+429
Cross-section 5.000
.065
.065
.065
76.50
76.00
75.50
75.00
74.50
74.00
73.50
73.00
Elevation
0.00
14.34
28.69
43.03
57.37
71.71
86.06
Distance

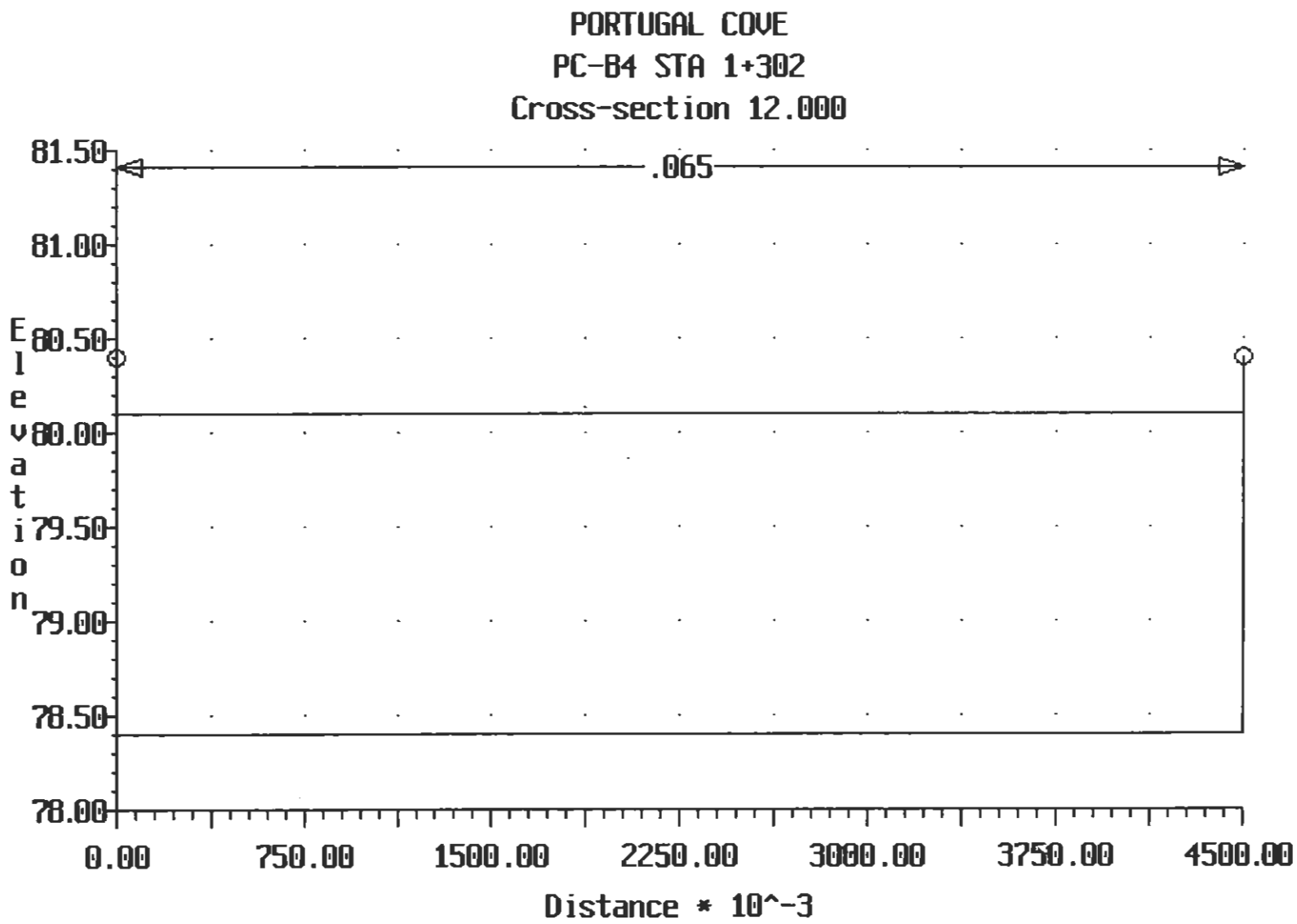

PORTUGAL COVE
PC-B6 STA 1+416
Cross-section 6.000
.065
77.00
76.50
76.00
75.50
75.00
74.50
74.00
73.50
Elevation
0.00
850.00
1700.00
2550.00
3400.00
4250.00
5100.00
Distance * 10^-3

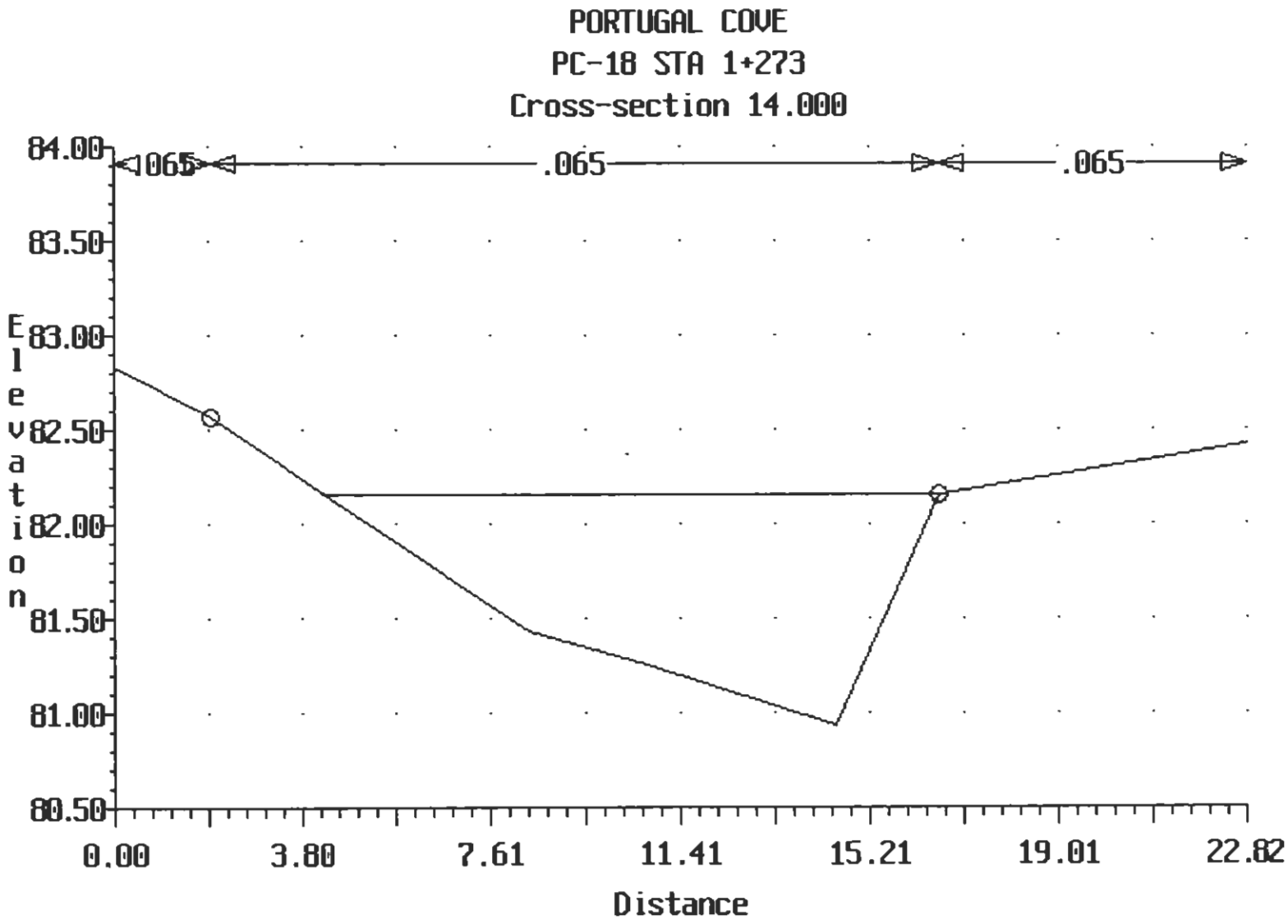

PORTUGAL COVE
PC-B6 STA 1+412.5
Cross-section 7.000
.065
77.00
76.50
76.00
75.50
75.00
74.50
74.00
73.50
Elevation
0.00
850.00
1700.00
2550.00
3400.00
4250.00
5100.00
Distance * 10^-3

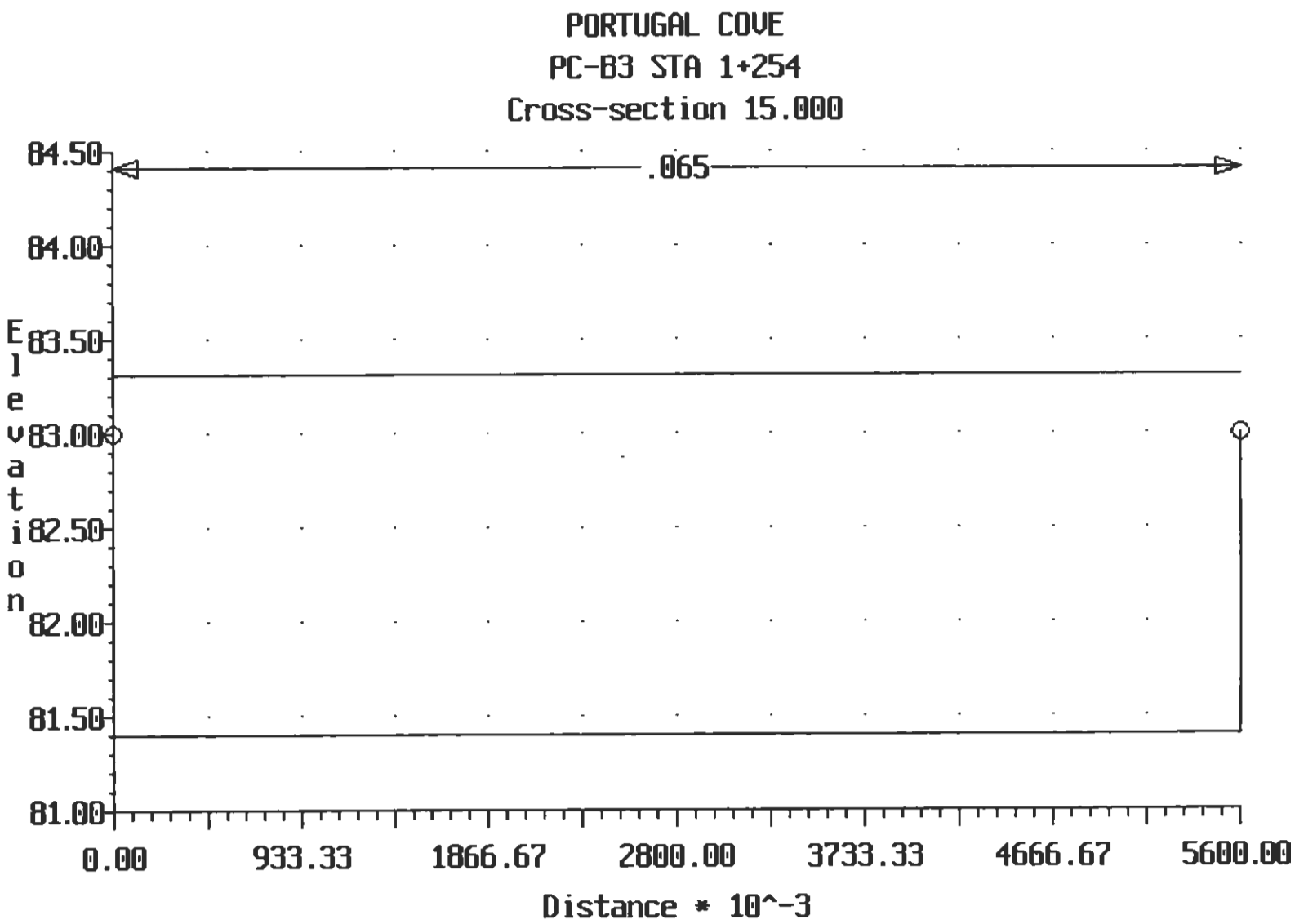

PORTUGAL COVE
PC-20 STA 1+361
Cross-section 8.000
.065
.065
.065
79.50
79.00
78.50
78.00
77.50
77.00
76.50
76.00
Elevation
0.00
6.85
13.70
20.55
27.41
34.26
41.11
Distance

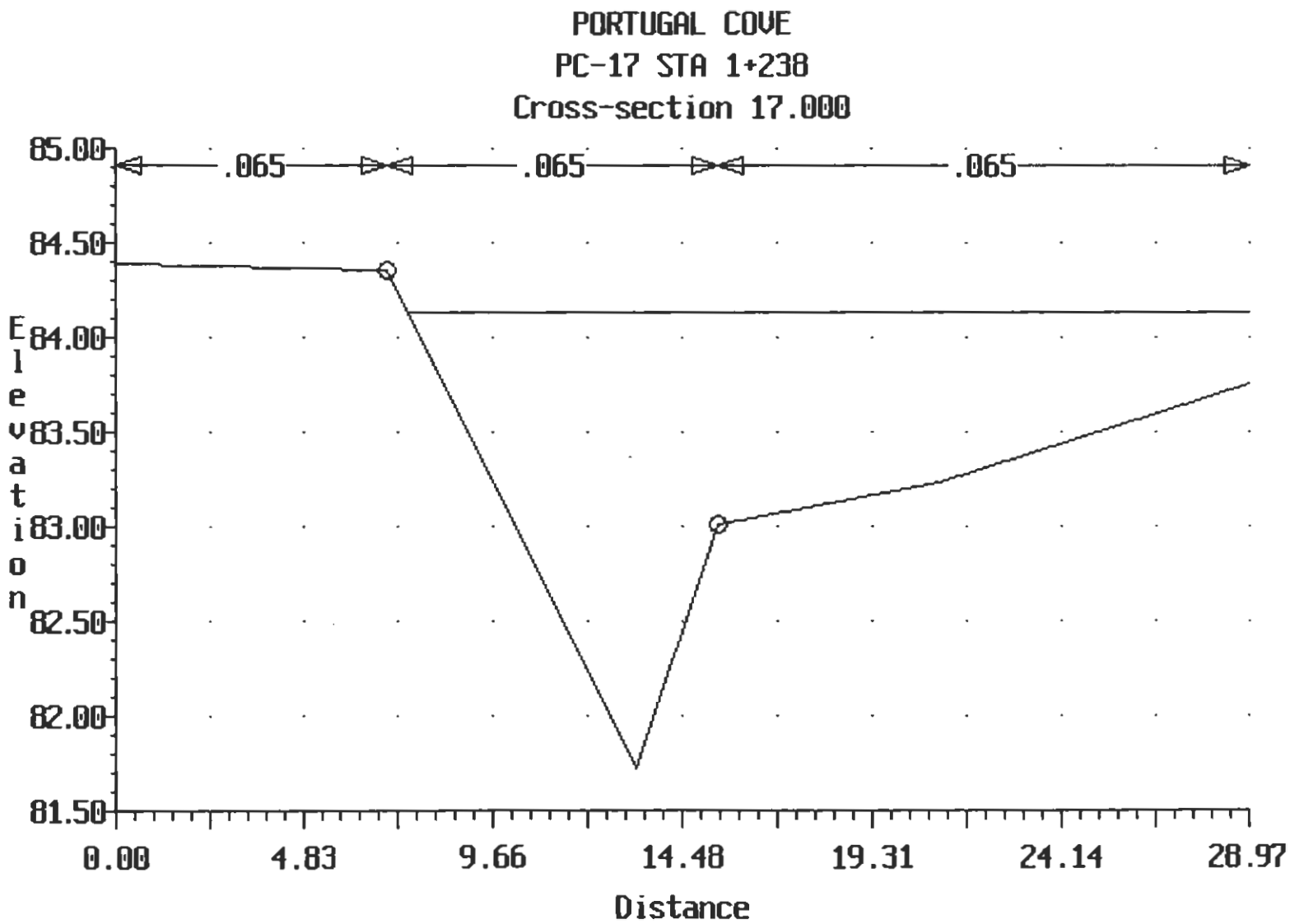

PORTUGAL COVE
PC-B5 STA 1+346.8
Cross-section 9.000
.065
80.00
79.50
79.00
78.50
78.00
77.50
77.00
76.50
Elevation
0.00
758.33
1516.67
2275.00
3033.33
3791.67
4550.00
Distance * 10^-3

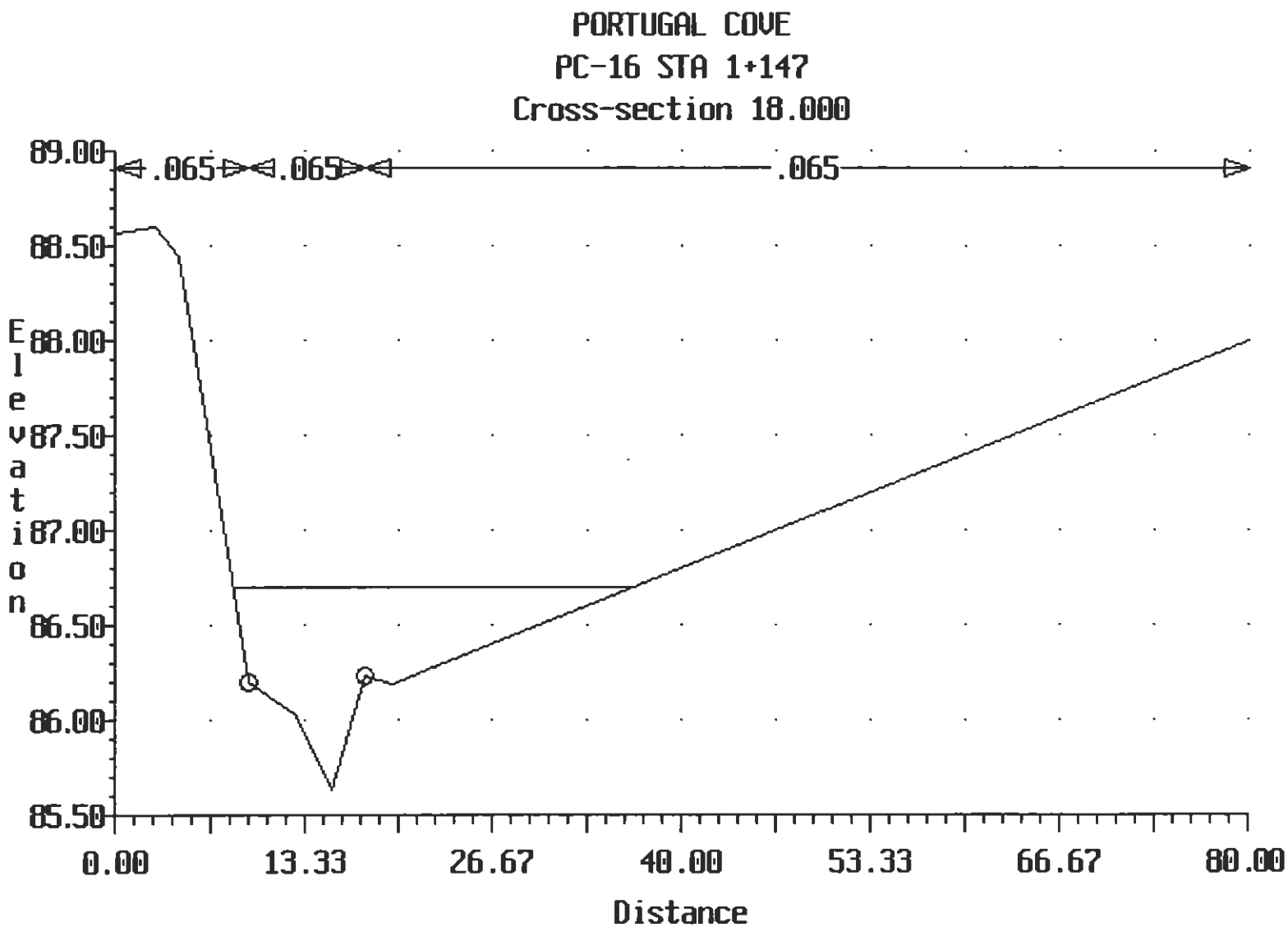

PORTUGAL COVE
PC-19 STA 1+337
Cross-section 11.000
.065
.065
.065
80.50
80.00
79.50
79.00
78.50
78.00
77.50
77.00
Elevation
0.00
2.90
5.79
8.69
11.58
14.48
17.37
Distance

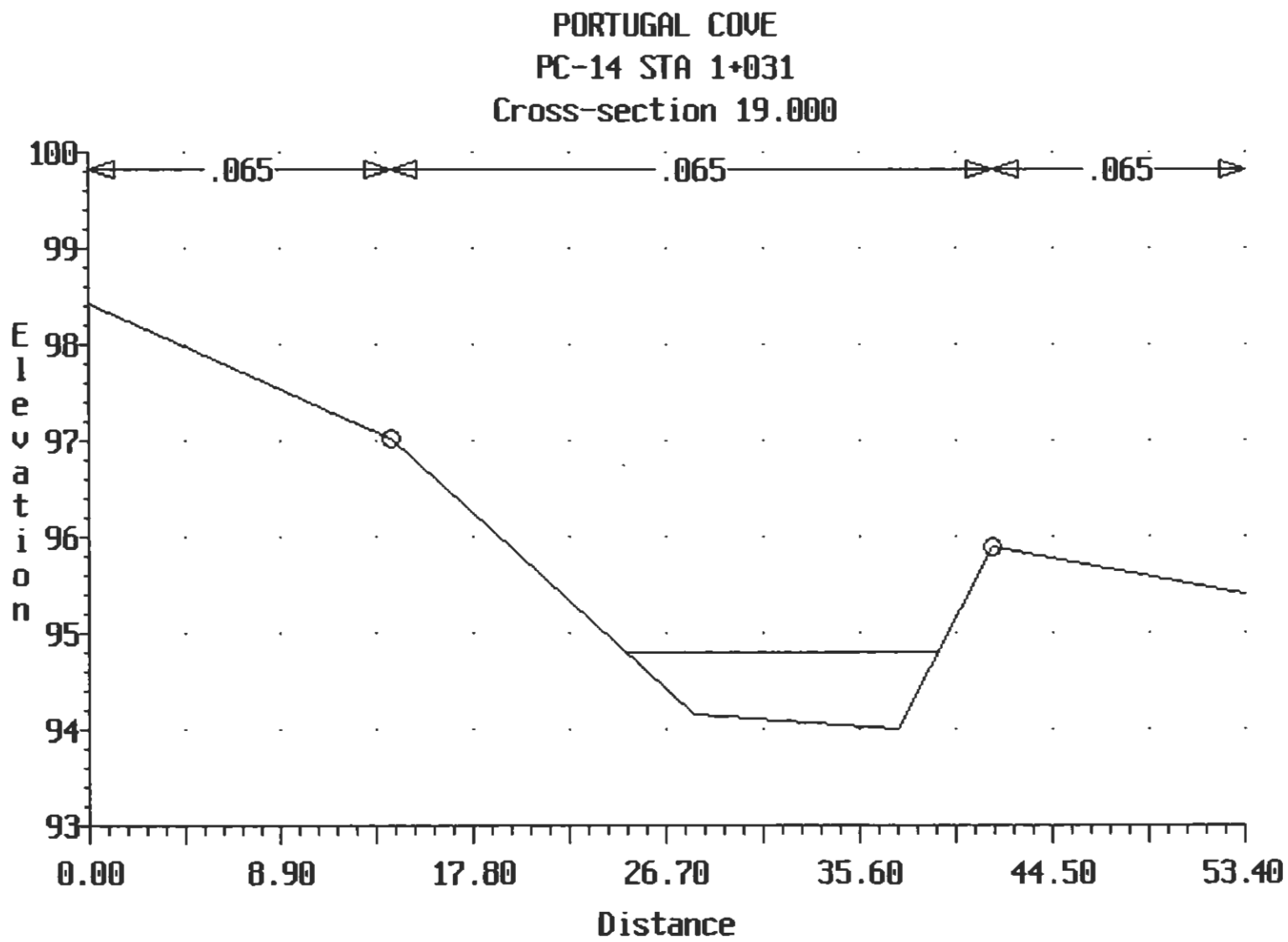

PORTUGAL COVE
PC-B4 STA 1+302
Cross-section 12.000
.065
81.50
81.00
80.50
80.00
79.50
79.00
78.50
78.00
Elevation
0.00
750.00
1500.00
2250.00
3000.00
3750.00
4500.00
Distance * 10^-3


PORTUGAL COVE
PC-18 STA 1+273
Cross-section 14.000
.065
.065
.065
84.00
83.50
83.00
82.50
82.00
81.50
81.00
80.50
Elevation
0.00
3.80
7.61
11.41
15.21
19.01
22.82
Distance


PORTUGAL COVE
PC-B3 STA 1+254
Cross-section 15.000
.065
84.50
84.00
83.50
83.00
82.50
82.00
81.50
81.00
Elevation
0.00
933.33
1866.67
2800.00
3733.33
4666.67
5600.00
Distance * 10^-3


PORTUGAL COVE
PC-17 STA 1+238
Cross-section 17.000
.065
.065
.065
85.00
84.50
84.00
83.50
83.00
82.50
82.00
81.50
Elevation
0.00
4.83
9.66
14.48
19.31
24.14
28.97
Distance


PORTUGAL COVE
PC-16 STA 1+147
Cross-section 18.000
.065
.065
.065
89.00
88.50
88.00
87.50
87.00
86.50
86.00
85.50
Elevation
0.00
13.33
26.67
40.00
53.33
66.67
80.00
Distance


PORTUGAL COVE
PC-14 STA 1+031
Cross-section 19.000
.065
.065
.065
100
99
98
97
96
95
94
93
Elevation
0.00
8.90
17.80
26.70
35.60
44.50
53.40
Distance