ANALYSIS OF WATER-SURFACE PROFILES IN LEON COUNTY AND THE CITY OF TALLAHASSEE, FLORIDA

By Marvin A. Franklin and Richard A. Orr

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DONALD PAUL HODEL, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information
write to:

District Chief
U.S. Geological Survey
Suite 3015
227 North Bronough Street
Tallahassee, Florida 32301

Copies of this report can be
purchased from:

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ABSTRACT

Water-surface profiles for the 10-, 25-, 50-, and 100-year recurrence interval floods for most of the streams that drain developing areas of Leon County and the city of Tallahassee are presented. The principal streams of study are in the Lake Munson, Lake Lafayette, and Lake Jackson basins. Peak discharges were computed from regression equations based on information gained from 15 streamflow stations in the area. Standard step-backwater procedures were used to determine the water-surface elevations for the streams.

INTRODUCTION

A reliable estimate of the elevation of probable floods is essential in making flood-plain management decisions and designing structures that may be subject to flooding. Leon County and the city of Tallahassee have several developed areas that are inundated during a 10-year or less flood event. Many additional areas in the developing areas are subject to flooding, especially for events that have recurrence intervals of 25 years or greater. Recurrence interval is defined as "the average time interval between actual occurrences of a hydrological event of a given or greater magnitude" (U.S. Water Resources Council, 1981, appendix 2, p. 4).

Recognizing the need for reliable flood information, the Public Works Department of Leon County and the U.S. Geological Survey developed a cooperative study in 1978 to determine techniques that could be used to estimate the magnitude and frequency of floods. The methods used and the results of that study were presented in a report by Franklin and Losey in 1984. As a result of that study, it became apparent that the magnitude of flood peaks used in the Tallahassee and Leon County Flood Insurance Studies (FIS) were in most cases too low and that many developing flood-prone areas were not included in the original FIS for Tallahassee (Federal Emergency Management Agency, 1986) and Leon County (Federal Emergency Management Agency, 1982). The flood elevations in this report are generally higher than those in the FIS and in a study covering the Killearn Lakes area of Alford Arm Tributary by the Northwest Florida Water Management District.

Subsequently, the three major basins that drain the developing area of Leon County were studied for this report. The west, central, and east drainage ditches; North and West Branch of Gum Creek; Gum Creek; Bradford

Brook; and Munson Slough were studied in the Lake Munson basin. In the Lake Lafayette basin, Alford Arm Tributary and northeast drainage ditch, including several of its tributaries, were studied in detail. Megginnis Arm Tributary, Mall drainage ditch, Fords Arm Tributary, and Lake Overstreet outflow were the streams studied in the Lake Jackson basin. Figure 1 shows the location of the three basins, streams studied, and gaging stations used in this study.

This report describes the results of a study to determine the flood elevations for the 10-, 25-, 50-, and 100-year recurrence interval floods for selected streams in Leon County and the city of Tallahassee. It also describes methods used to collect the data needed for this study and methods used in the analysis of the data and the results of that analysis.

BASIC DATA ACQUISITION

The major part of the data acquisition for this study consisted of field surveys to determine the cross sections of the flood plain and bridge and culvert geometry. The data used in this report represent field conditions at the time the surveys were conducted. Elevations of reference marks were established at most road crossings. Where the distance between crossings was considerable, additional reference marks were set on permanent structures by running a closed level line between known benchmarks. A list of these reference marks is presented in the supplemental data section of this report. These reference marks can be used to determine the elevation of any point along the streams studied without having to run long expensive level lines from known benchmarks. Estimates of Manning's roughness coefficient, "n" (Barnes, 1967), used in the step-backwater program were made by field observations at many points along each stream.

The peak discharge for each recurrence interval flood was determined by using the regression equations presented by Franklin and Losey (1984). The equations require that the drainage area and the percentage of impervious area be known. The contributing drainage area was determined at each tributary or major road along a stream reach. The impervious area was first obtained from previous reports; revisions were made by using aerial photographs and ground observations. Table 1 gives the effective drainage area, impervious area, and computed peak discharges for selected points along each stream. Table 2 gives a summary of flood elevations at gaging stations.

METHODS AND RESULTS OF WATER-SURFACE PROFILE ANALYSIS

The U.S. Geological Survey's step-backwater computer program, described by Shearman (1976), was used to route the flood discharge through each stream reach. Although this program will route flow through a bridge, it is not designed to compute flow through a culvert. Where a culvert was encountered, the elevation for each flood event was determined at the downstream end of the culvert. The elevation at the upstream end of the culvert was determined by using standard U.S. Geological Survey procedures as described by Bodhaine (1968). If the upstream elevation was higher than the low point in the road, flow over the road was determined as described by Hulsing (1967). The combined flow through the culvert plus the flow over the road was used in determining the elevation on the upstream end of the culvert.

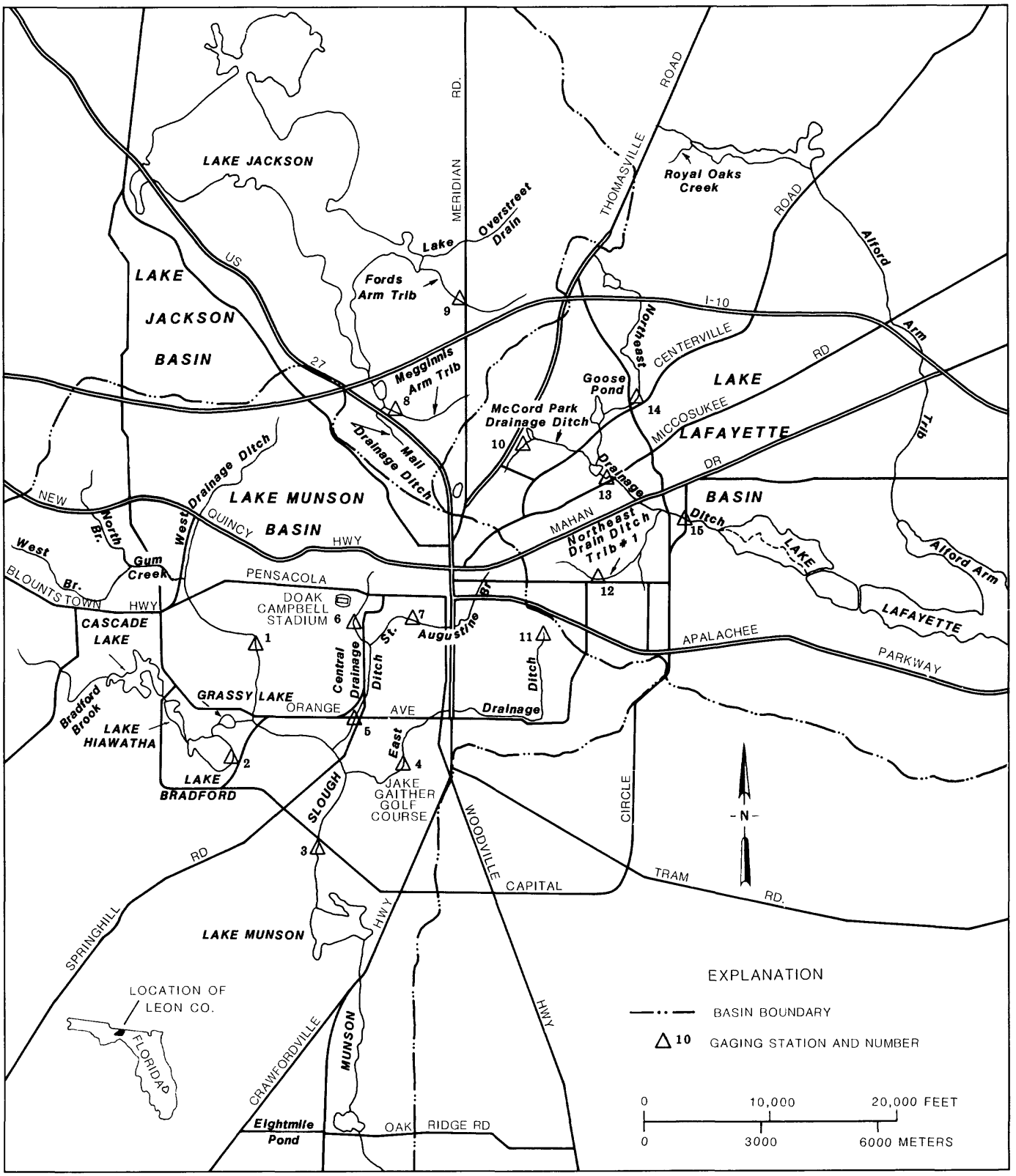

Figure 1.--Map showing location of basins and streamflow stations.

Table 1.--Summary of discharges

Flooding source and location	Effective drainage area (mi^2)	Impervious area (%)	Peak discharge (cubic feet per second) 10-yr.	25-yr.	50-yr.	100-yr.
Lake Munson Basin						
Munson Slough						
Oak Ridge Road	35	#	1,000	1,700	2,400	3,300
Capital Circle SW	33.2	14	1,190	1,850	2,500	3,350
Springhill Road	26.1	13	930	1,410	1,960	2,630
Lake Bradford Road	16.5	8.5	450	720	1,000	1,360
Bradford Brook						
Aenon Church Road	11.7	*	1,000	1,360	1,620	1,890
West drainage ditch						
Roberts Avenue	15.9	9	2,220	3,110	3,950	4,910
Above Gum Creek	4.1	20	1,580	2,060	2,470	2,910
Tharpe Street	1.6	20	770	990	1,180	1,370
Near Portland Avenue	.7	10	210	290	350	420
West drainage ditch tributary						
Jackson Bluff	1.7	18	710	930	1,110	1,800
Gum Creek						
Blountstown Highway	5.7	*	500	700	900	1,050
West Branch Gum Creek						
At Gum Creek	1.9	*	337	457	546	635
Aenon Church Road	1.4	*	292	396	473	550
North Branch Gum Creek						
At Gum Creek	3.8	*	382	518	619	720
U.S. Highway 90	2.1	*	288	336	440	550
Central drainage ditch						
Orange Avenue	8.1	20	3,460	4,450	5,280	6,160
Gamble Street	6.2	45	3,090	3,930	4,630	5,360
Airport Drive	3.3	48	2,850	3,480	3,960	4,440
Pensacola Street	2.4	40	1,880	2,310	2,650	3,000
St. Augustine Branch						
Wahnish Way	2.1	54	2,180	2,620	2,950	3,280
Myers Park Drive	1.4	54	1,610	1,930	2,170	2,400
Tennessee Street	.6	54	860	1,020	1,130	1,240
East drainage ditch						
Bragg Drive	5.4	20	1,910	2,510	3,020	3,560
Texas Street	3.5	18	1,260	1,660	1,990	2,350
Wekewa Nene	1.3	23	710	910	1,070	1,230
Hokolin Nene	.7	24	475	600	700	800
Apakin Nene	.2	25	190	235	270	305

Table 1.--Summary of discharges--Continued

Flooding source and location	Effective drainage area (mi^2)	Impervious area (%)	Peak discharge (cubic feet per second) 10-yr.	25-yr.	50-yr.	100-yr.
Lake Lafayette Basin						
Northeast drainage ditch						
Weems Road	15.7	22	985	1,470	1,930	2,510
Miccosukee Road	9.8	23	720	1,060	1,390	1,790
Centerville Road	5.7	18	375	565	740	960
Capital Circle	3.8	23	345	505	650	830
Interstate 10	1.8	15	130	195	260	335
Northeast drainage ditch tributary						
At mouth	3.9	22	335	490	635	810
Abv. Richview Rd. ditch	1.9	25	210	305	390	495
Richview Road ditch						
At mouth	1.4	15	110	170	220	280
Windrush Apartment ditch						
At mouth	.5	25	70	100	130	160
McCord Park Pond drainage ditch						
Centerville Road	2.9	31	360	515	655	820
Chamberlin Drive	2.7	30	330	470	595	745
Betton Road	1.3	40	1,150	1,420	1,620	1,820
Alford Arm Tributary						
Buck Lake Road	42.8	*	1,320	1,710	2,020	2,340
Centerville Road	10.3	10	360	565	770	1,040
Shannon Lakes West	4.3	10	180	285	385	510
Thomasville Road	1.9	5	50	85	120	160
Royal Oaks Creek						
Foxcroft Drive	1.0	20	105	155	200	255
Lake Jackson Basin						
Megginnis Arm Tributary						
Allen Road	1.5	25	360	440	490	540
Meridian Road	.5	10	170	240	290	350
Mall drainage ditch						
North Monroe Street	1.2	30	825	1,030	1,190	1,360
Spoonwood Drive	.7	35	630	775	885	995
Fords Arm Tributary						
Meridian Road	1.7	6	265	380	480	595
Timberlane Road	.4	5	85	120	150	185
Lake Overstreet outflow						
Meridian Road	1.3	*	195	280	360	450

Discharge estimate based on inflow from tributaries and volume of storage available.

* Discharge computed using Lake Lafayette regression equations.

Table 2.-- Summary of flood elevations at gaging stations

Site No.	Stream name and location	Elevation in feet above NGVD of 1929 10-year	25-year	50-year	100-year
1	West drainage ditch at Roberts Avenue	49.3	50.8	51.5	52.2
3	Munson Slough at Capital Circle SW	34.5	36.0	37.3	38.8
4	East drainage ditch at Bragg Drive	39.0	39.7	40.6	41.1
5	Central drainage ditch at Orange Ave.	41.2	42.8	43.8	45.3
6	Central drainage ditch at Airport Dr.	60.6	62.0	62.4	63.1
7	St. Augustine Branch at Wahnish Way	77.1	77.9	78.6	79.1
8	Megginnis Arm Tributary at Allen Road	113.5	113.8	114.2	114.5
9	Fords Arm Tributary at Meridian Road	109.4	109.6	109.7	109.8
10	McCord Park Pond drainage ditch above McCord Park	91.4	92.4	94.3	94.4
11	East drainage ditch at Apakin Nene	140.8	141.7	142.1	142.4
12	Governor's Square drainage ditch at Park Avenue	84.3	84.5	84.6	84.7
13	Northeast drainage ditch at Miccosukee Road	65.5	66.3	66.5	66.7
14	Northeast drainage ditch at Capital Circle	81.0	82.0	82.6	83.4
15	Northeast drainage ditch at Weems Road	50.6	51.3	51.9	52.4

Lake Munson Basin

The Lake Munson basin consists of two different types of drainage. Streams that drain the developed part of the basin have high impervious areas and produce very large peak discharges, which are usually associated with intense thunderstorm activity. The remainder of the basin drains a sandy, pervious area with little development. Numerous depressions act as receptacles for storing large volumes of water. Major flood events from this part of the basin usually occur after long periods of above average rainfall followed by an intense frontal storm.

Peak discharge, for each recurrence interval, for Munson Slough at Capital Circle (fig. 1, site 3) was first estimated by comparing the computed peak discharge for each of its major tributaries (west, central, and east), drainage ditches (sites 1, 5, 4) with that of an observed event. The peak discharge recorded at Capital Circle was much lower than the combined peak discharge of the tributaries. This is caused by the large volume of storage in Black Swamp and in the channel itself. Using the observed peak discharge as a guide, a slightly higher percentage of the total peak discharges from the major tributaries was used to estimate the peak flow at Capital Circle. For comparison, peak discharges were computed using equations developed by Bridges (1982) for natural flow streams. The discharges that were computed using this method were slightly lower than the estimated discharges. Because the Munson Slough basin contains both large storage potential and has a large impervious area, the regression equation for the Lafayette basin, which better accounts for these type conditions, was used to estimate the peak discharge in Munson Slough. The drainage area west of Grassy Lake was considered noncontributing to peaks and was deducted. This resulted in an effective drainage area of 33 mi^2 with an impervious area of 14 percent at Capital Circle. Discharges computed using this method compare favorably with those observed. Therefore, these estimates were used in this report. Starting water-surface elevations downstream from Oak Ridge Road were determined by estimating cross sections for several miles below the starting point, using topographic maps as a guide. Several different water-surface elevations, for the same discharge, were assumed and convergence was achieved before reaching the study area. Flood profiles for Munson Slough from Oak Ridge Road to Lake Bradford Road are shown in figure 2. All elevations are in feet above National Geodetic Vertical Datum of 1929 (NGVD of 1929).

Grassy Lake, Lake Bradford, Lake Hiawatha, and Cascade Lake are interconnected, however a flap gate between Lake Bradford and Grassy Lake restricts flow from Grassy Lake into Lake Bradford. Peak discharges flowing from the west drainage ditch into the Munson Slough-Grassy Lake connection are much larger than peak discharges from Lake Bradford. Therefore, Grassy Lake acts as a transition zone between Munson Slough and Lake Bradford. The U.S. Geological Survey has collected periodic water-level measurements at Lake Bradford (site 2) since 1954. A frequency analysis was performed on these data to determine the flood elevations for Lake Bradford. Flood elevations for Grassy Lake, Lake Bradford, and Cascade Lake are given in table 3.

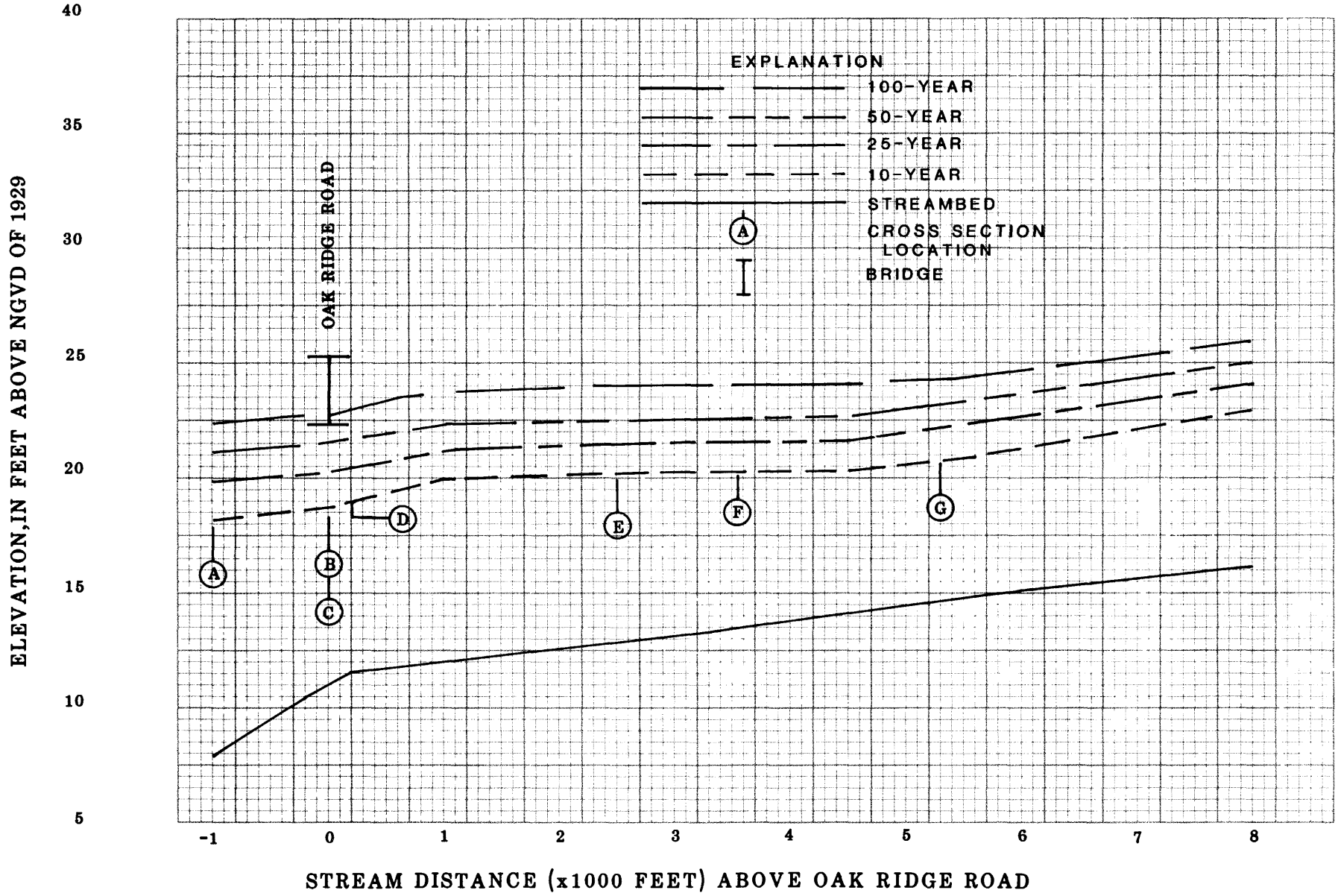

Figure 2.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Munson Slough.

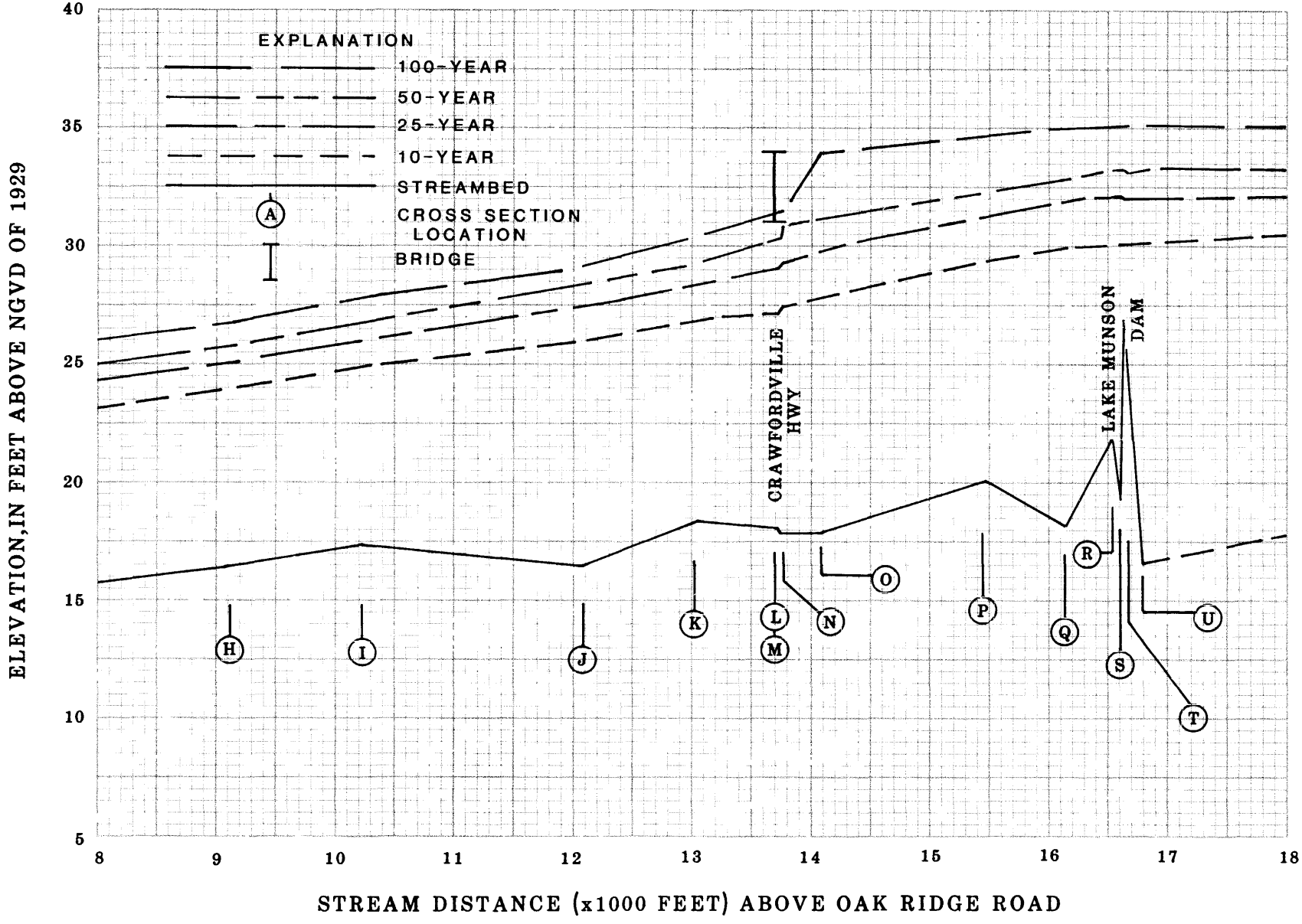

Figure 2.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Munson Slough--Continued.

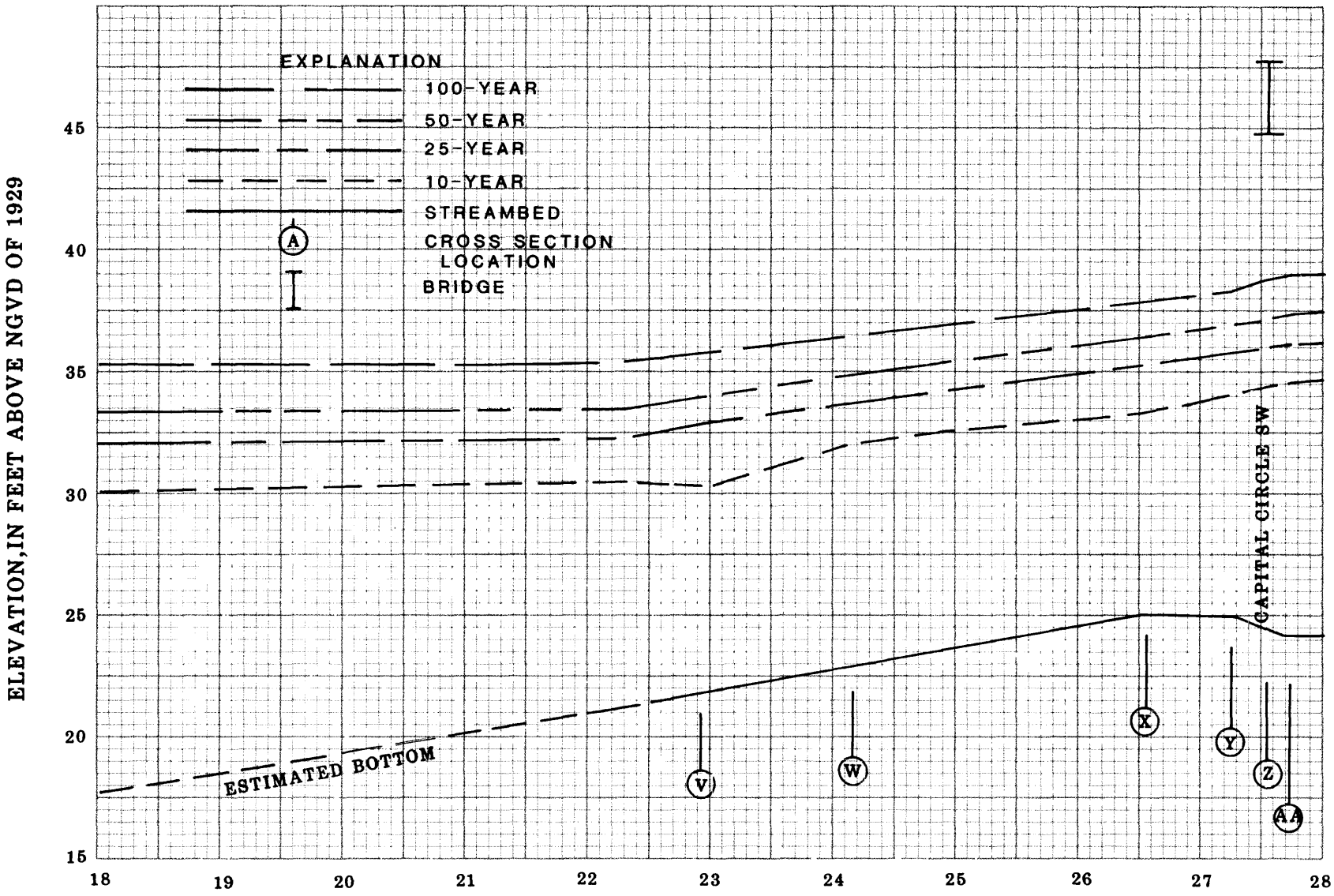

Figure 2.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Munson Slough--Continued.

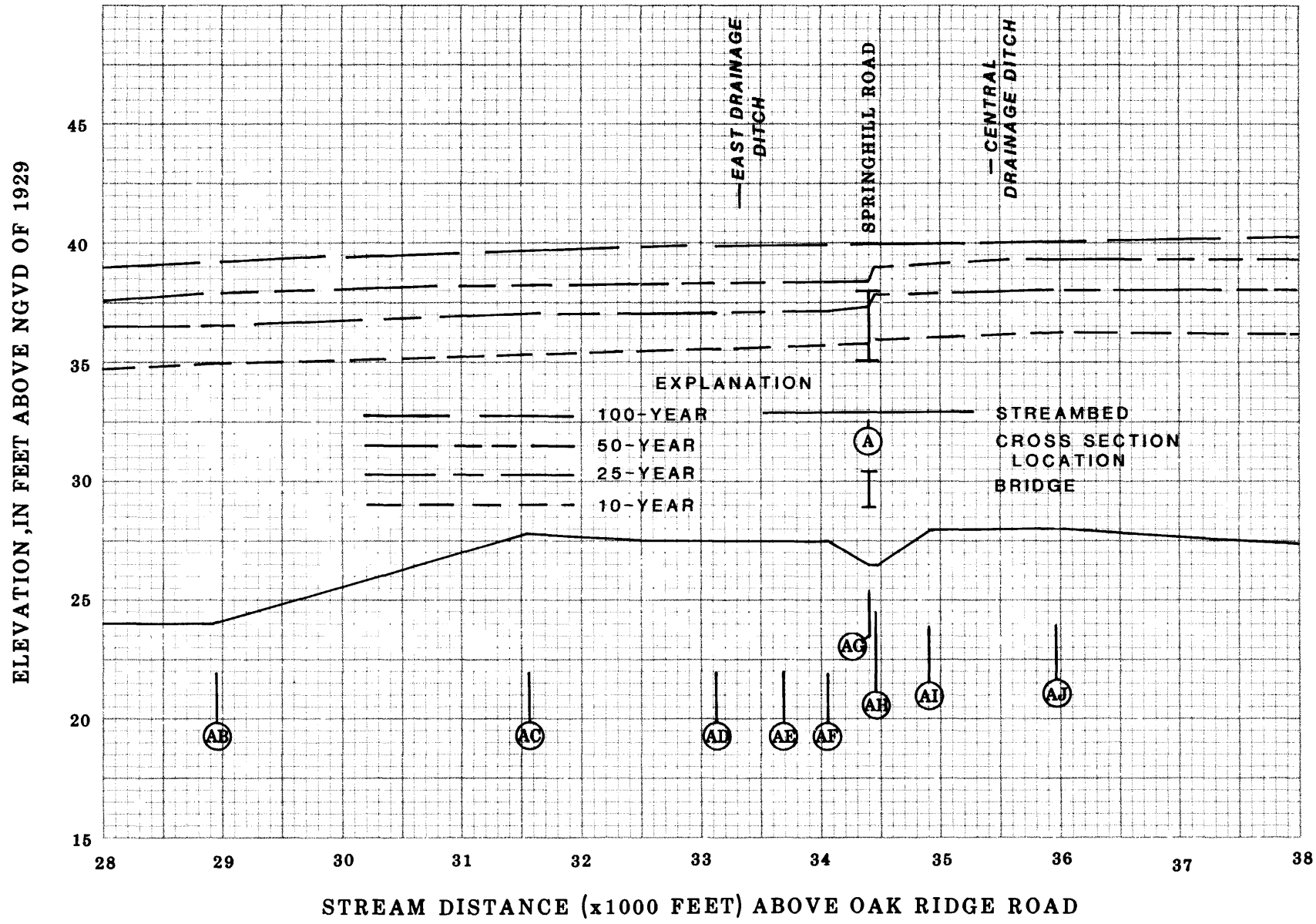

Figure 2.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Munson Slough--Continued.

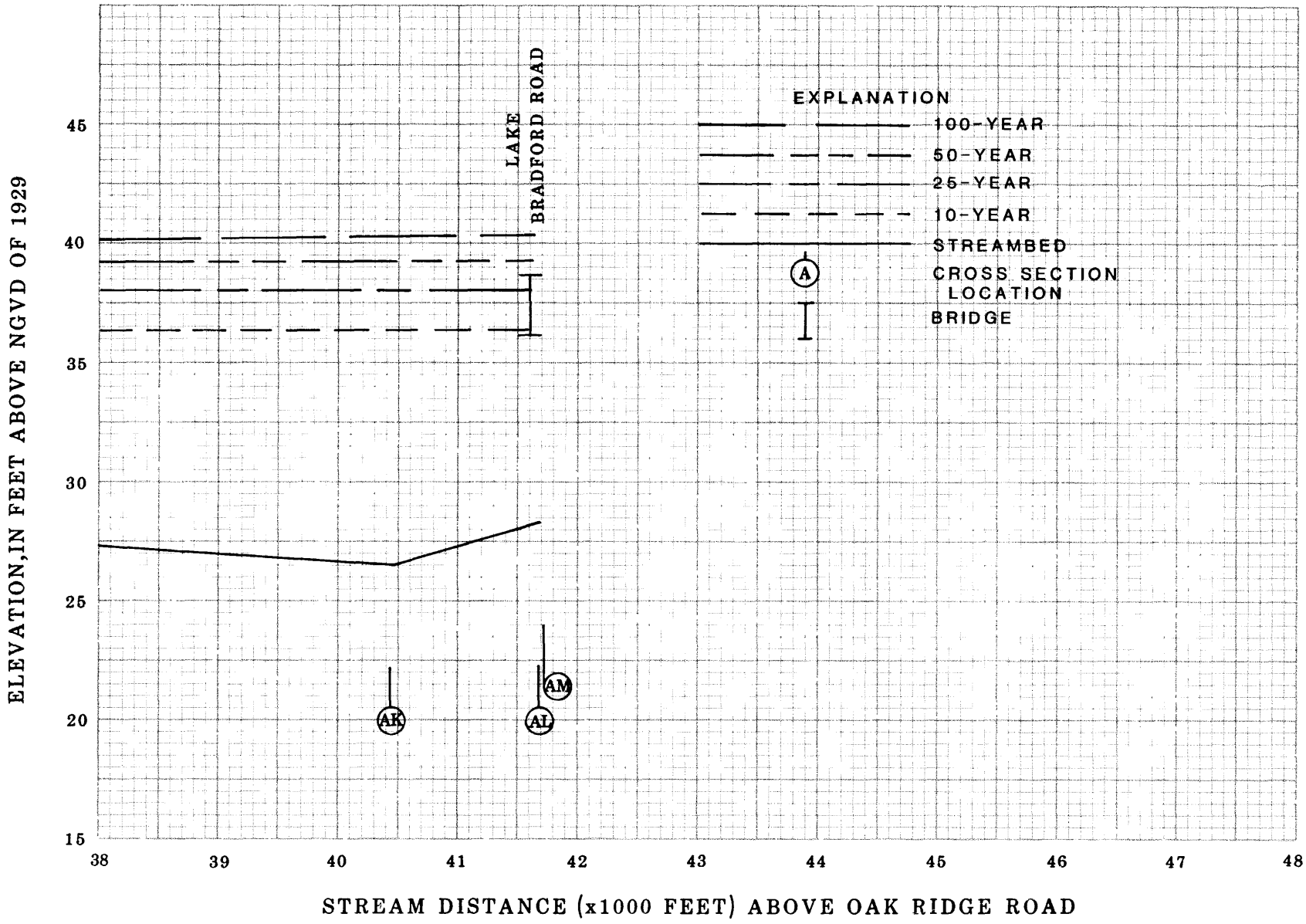

Figure 2.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Munson Slough--Continued.

Table 3.--Summary of flood elevations for lakes

Flooding source	Elevation in feet above NGVD of 1929			
	10-year	25-year	50-year	100-year
Grassy Lake	36.6	38.4	39.4	40.3
Lake Bradford	36.4	37.5	38.2	38.8
Lake Hiawatha	36.4	37.5	38.2	38.8
Cascade Lake	36.4	37.5	38.2	38.8

The computed peak discharges for Bradford Brook were not significantly different from those used in the Leon County FIS; therefore, the profiles were not rerun for this stream reach. The 25-year profile was added to be consistent with the other study areas. The flood profiles for Bradford Brook are shown in figure 3.

The peak discharges in Munson Slough at Lake Bradford Road are caused by flows from the west drainage ditch. The starting water-surface elevations for the west drainage ditch are, therefore, the same as those in Munson Slough upstream of Lake Bradford Road. The "n" values were calibrated in the reach from the mouth to Roberts Avenue (site 1) so that the rating at the gaging station was matched. Water-surface elevations above Mission Road could be lowered by removing the old railroad grade just downstream from Mission Road, but this probably would aggravate the existing problem at Tennessee Street. Figure 4 shows the flood profiles for the west drainage ditch. Figure 5 shows the profile for the west drainage ditch tributary which enters the west drainage ditch just below Mabry Street.

The peak discharges for Gum Creek are much lower than the peaks for the west drainage ditch at the mouth of Gum Creek. Because of the shorter duration of the peaks of the west drainage ditch and the vast storage potential of Gum Swamp, backwater from the west drainage ditch will not cause the peak elevation in Gum Creek. Caution should be exercised in the area near Blountstown Highway because of the possibility of reversed flow under certain conditions. The discharges used in the Leon County FIS for the West and North Branches of Gum Creek are not significantly different than those computed for this study. Flood elevations from the FIS are used in this report except that the 25-year profile has been added. Figures 6, 7, and 8 show profiles for Gum Creek, West Branch Gum Creek and North Branch Gum Creek, respectively.

Peak discharges increase rapidly from Munson Slough up the central drainage ditch to Orange Avenue. Because of channel improvements, the old gaging record at Orange Avenue (site 5) could not be used to calibrate "n" values. The rating for the gage at Airport Drive (site 6) was used to calibrate the "n" values for the reach above Lake Bradford Road. Peak discharges were reduced near Gamble Street and the railroad bridge near Doak Campbell Stadium due to storage above these structures. Flood profiles for the central drainage ditch are shown in figure 9.

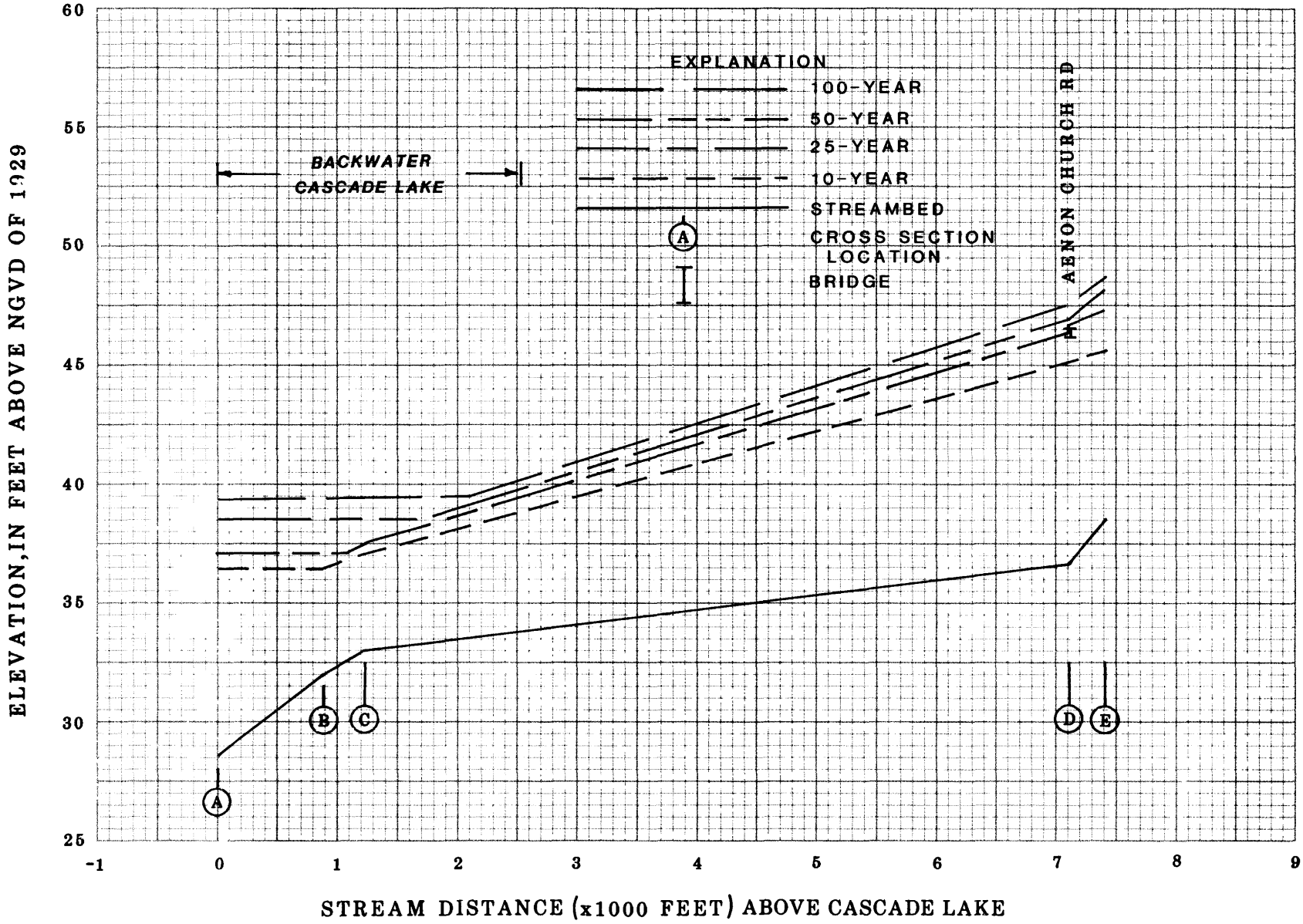

Figure 3.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Bradford Brook.

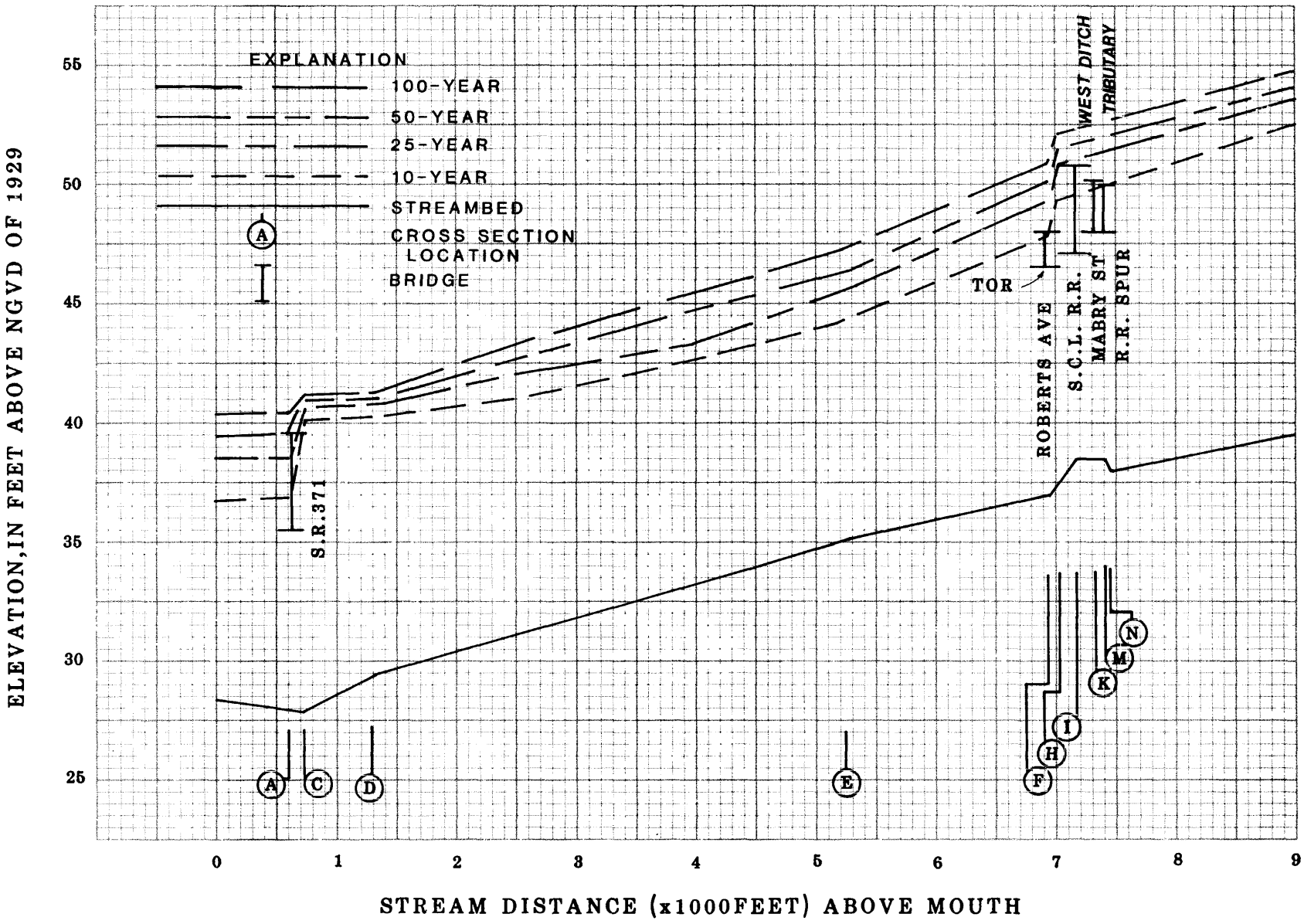

Figure 4.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for West drainage ditch.

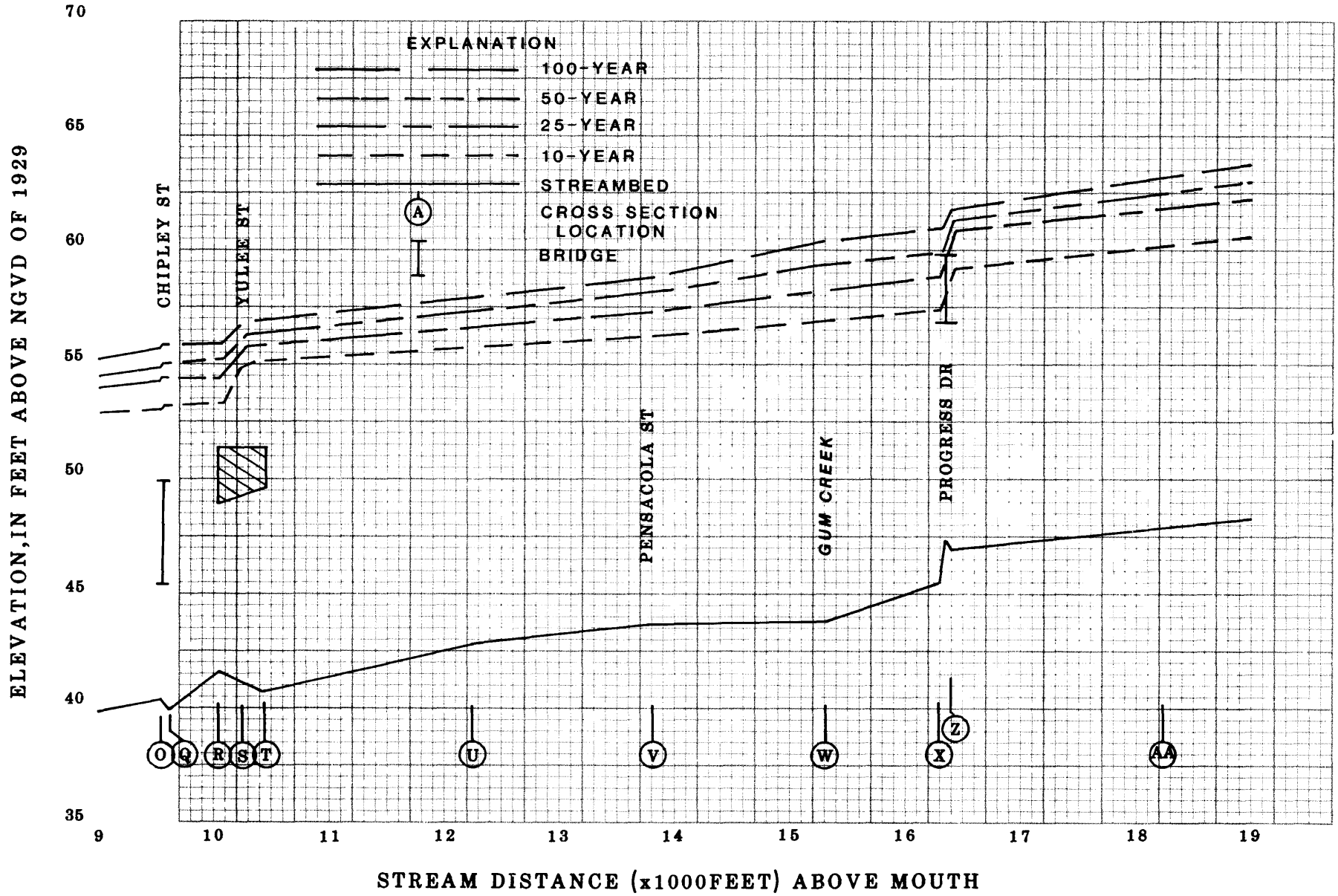

Figure 4.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for West drainage ditch--Continued.

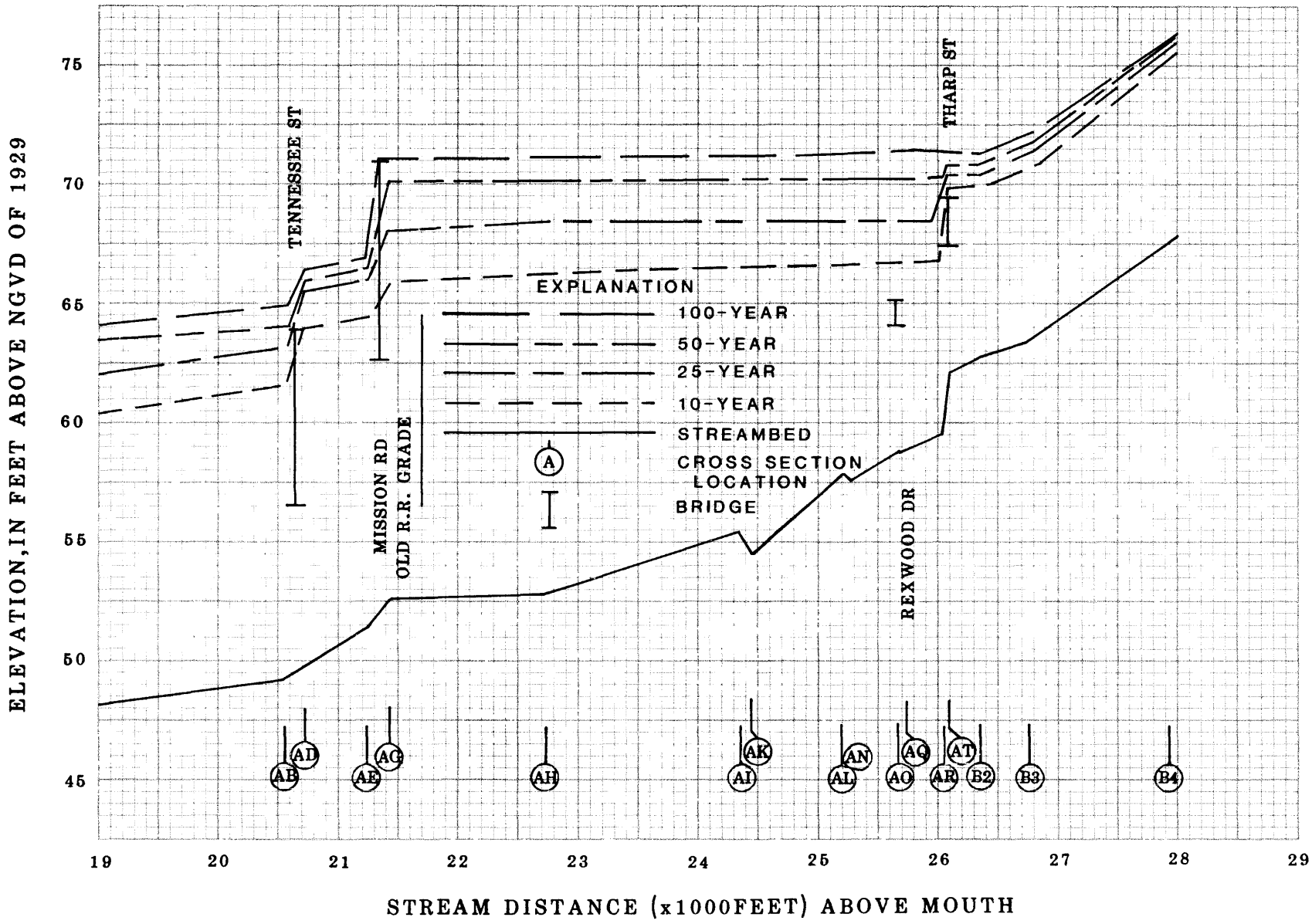

Figure 4.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for West drainage ditch--Continued.

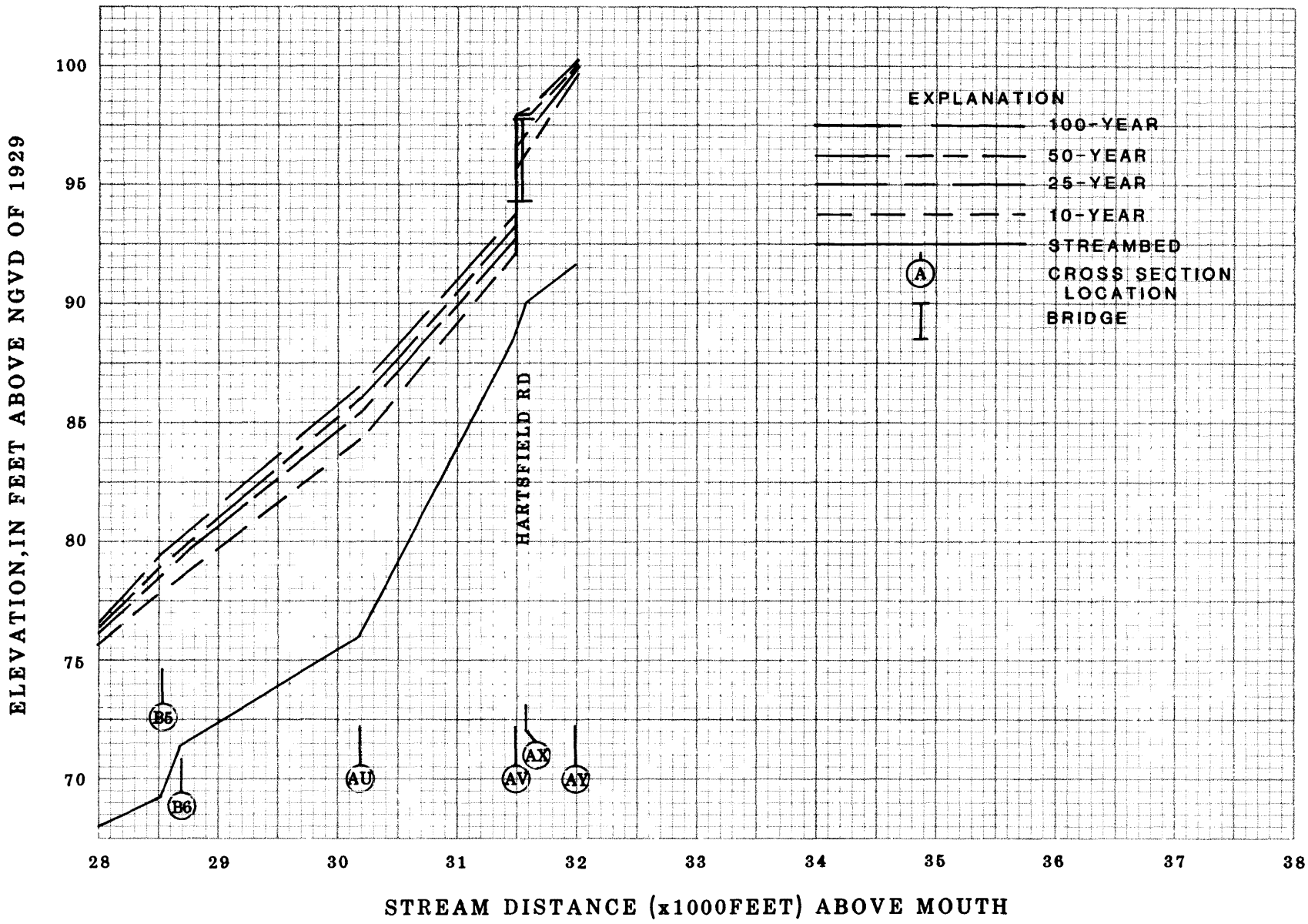

Figure 4.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for West drainage ditch--Continued.

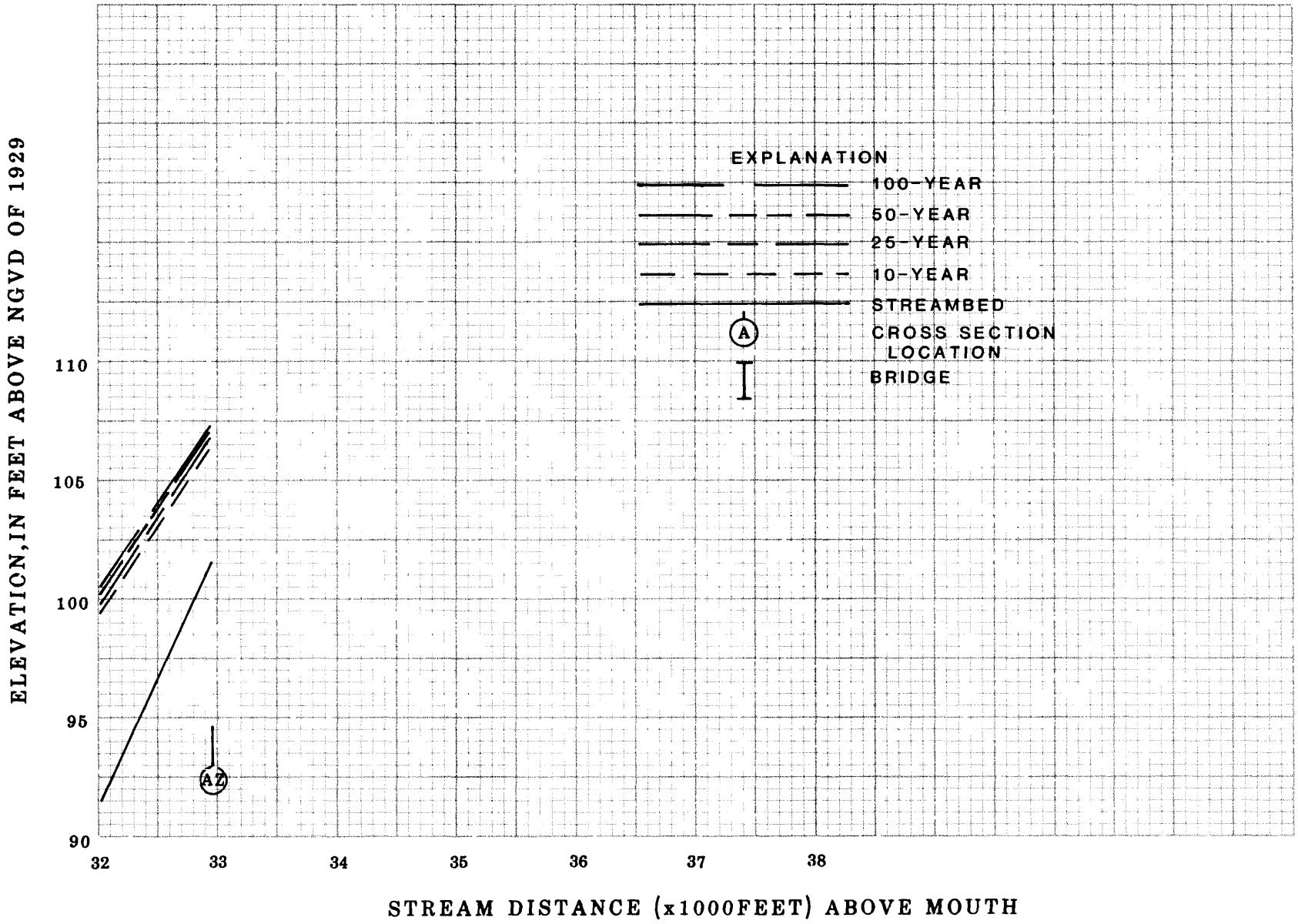

Figure 4.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for West drainage ditch--Continued.

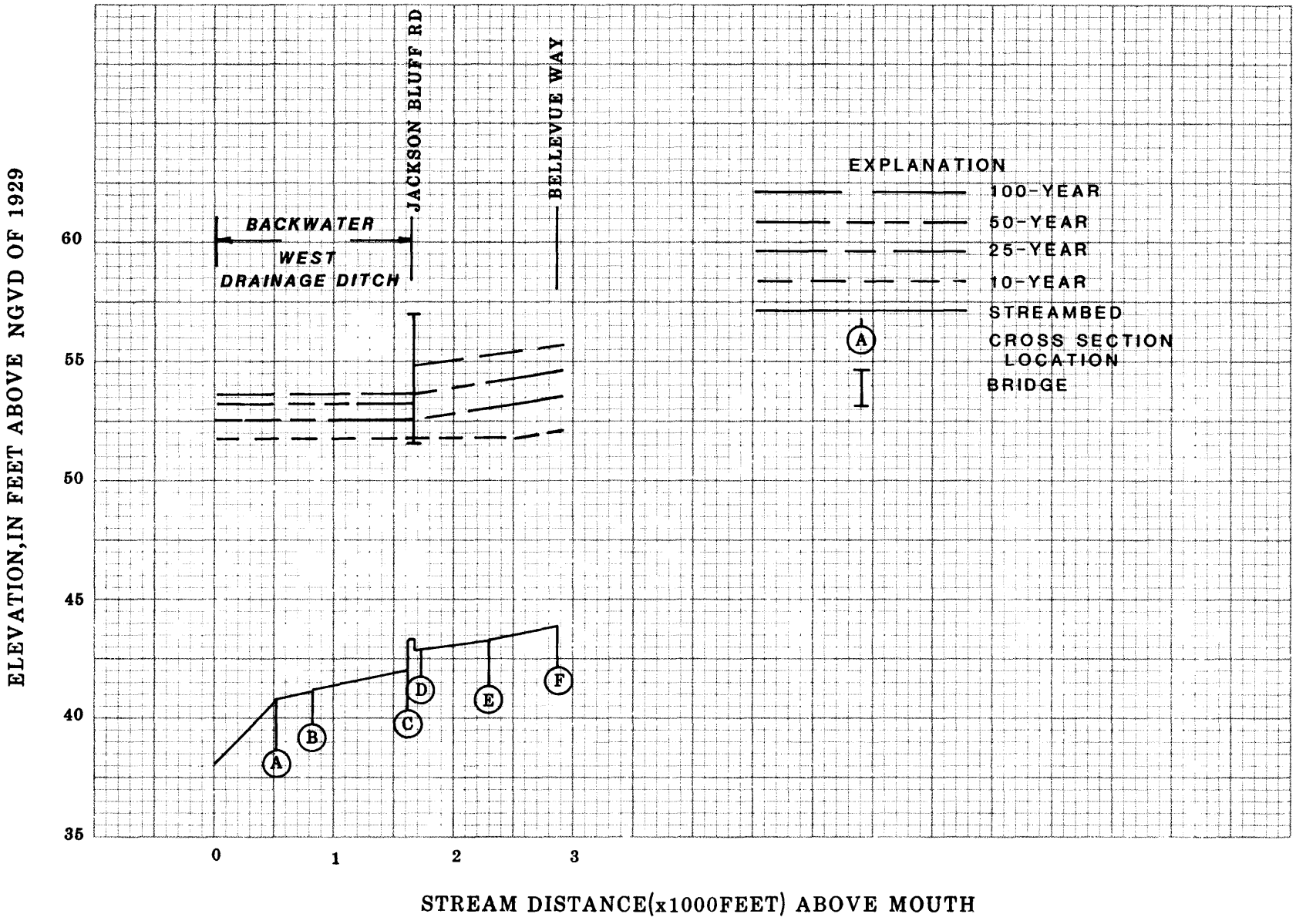

Figure 5.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for West drainage ditch tributary.

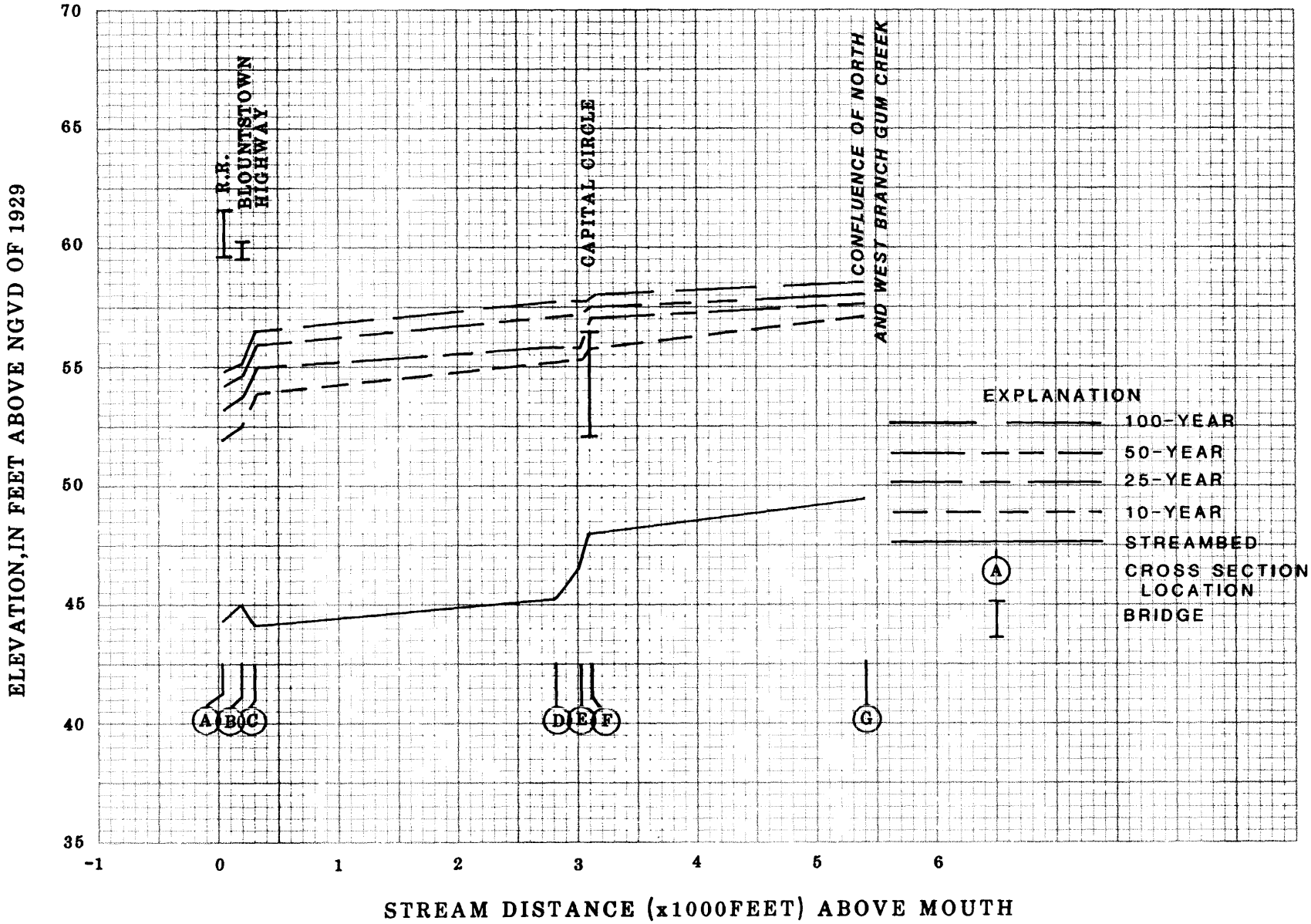

Figure 6.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Gum Creek.

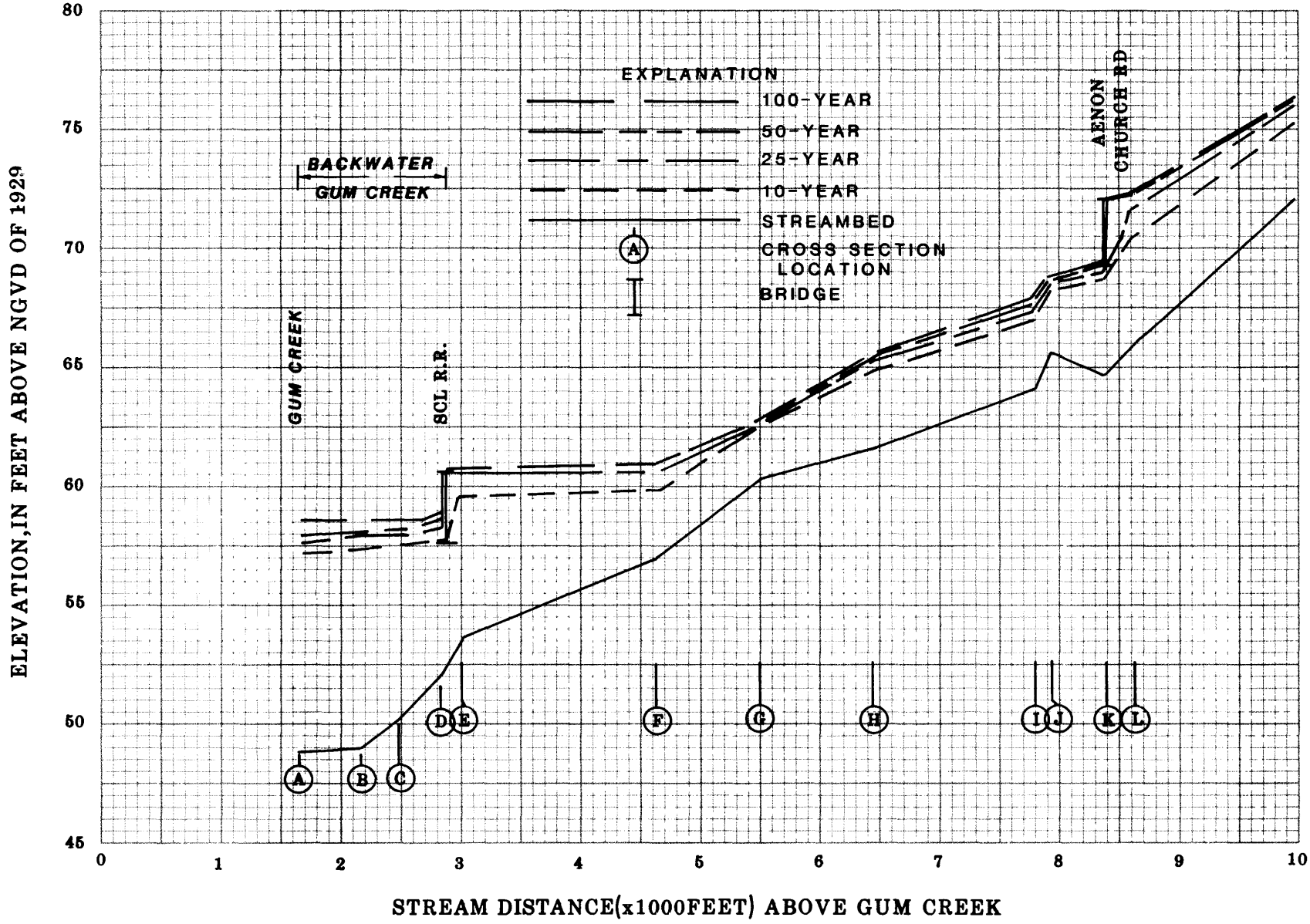

Figure 7.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for West Branch Gum Creek.

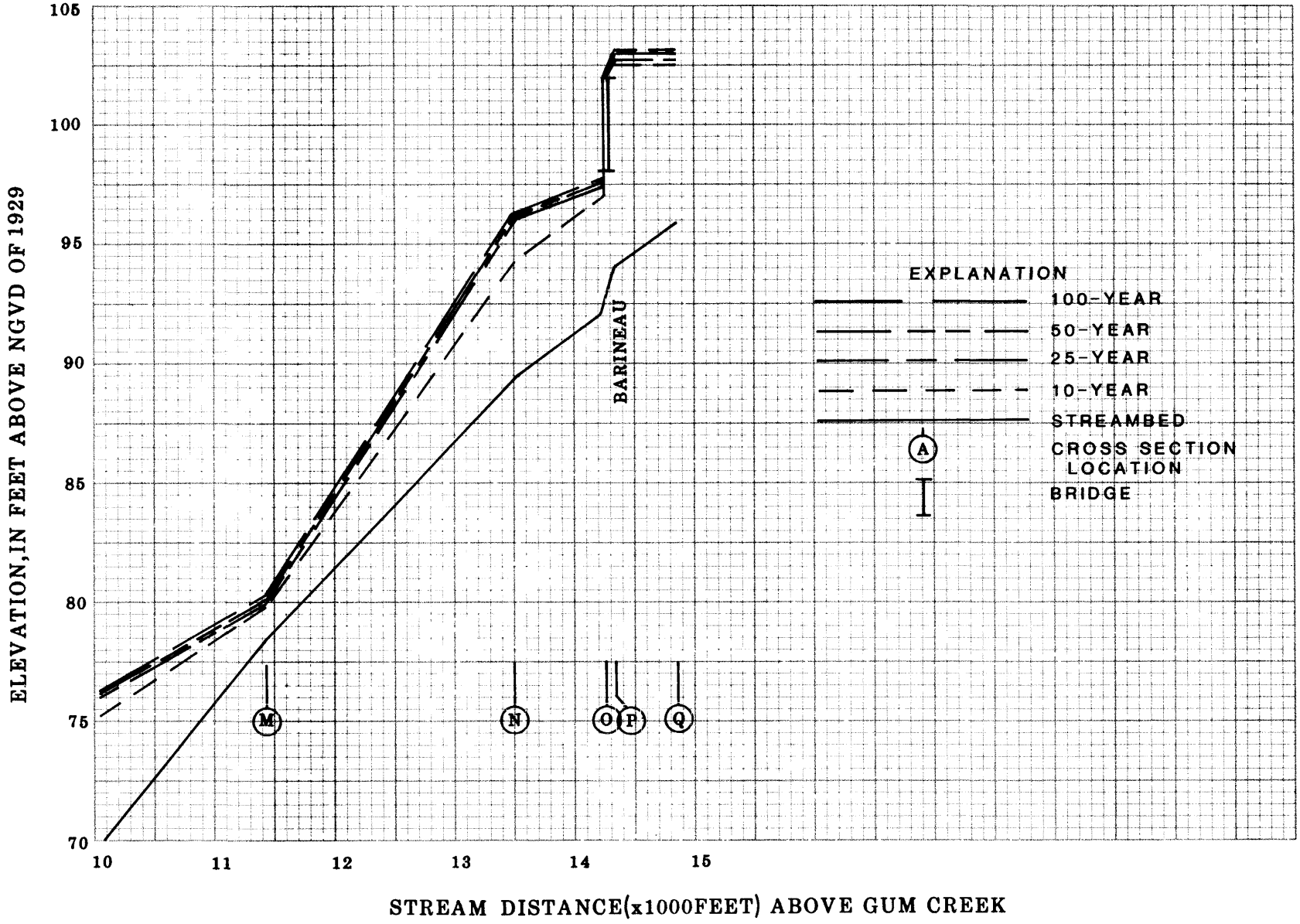

Figure 7.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for West Branch Gum Creek--Continued.

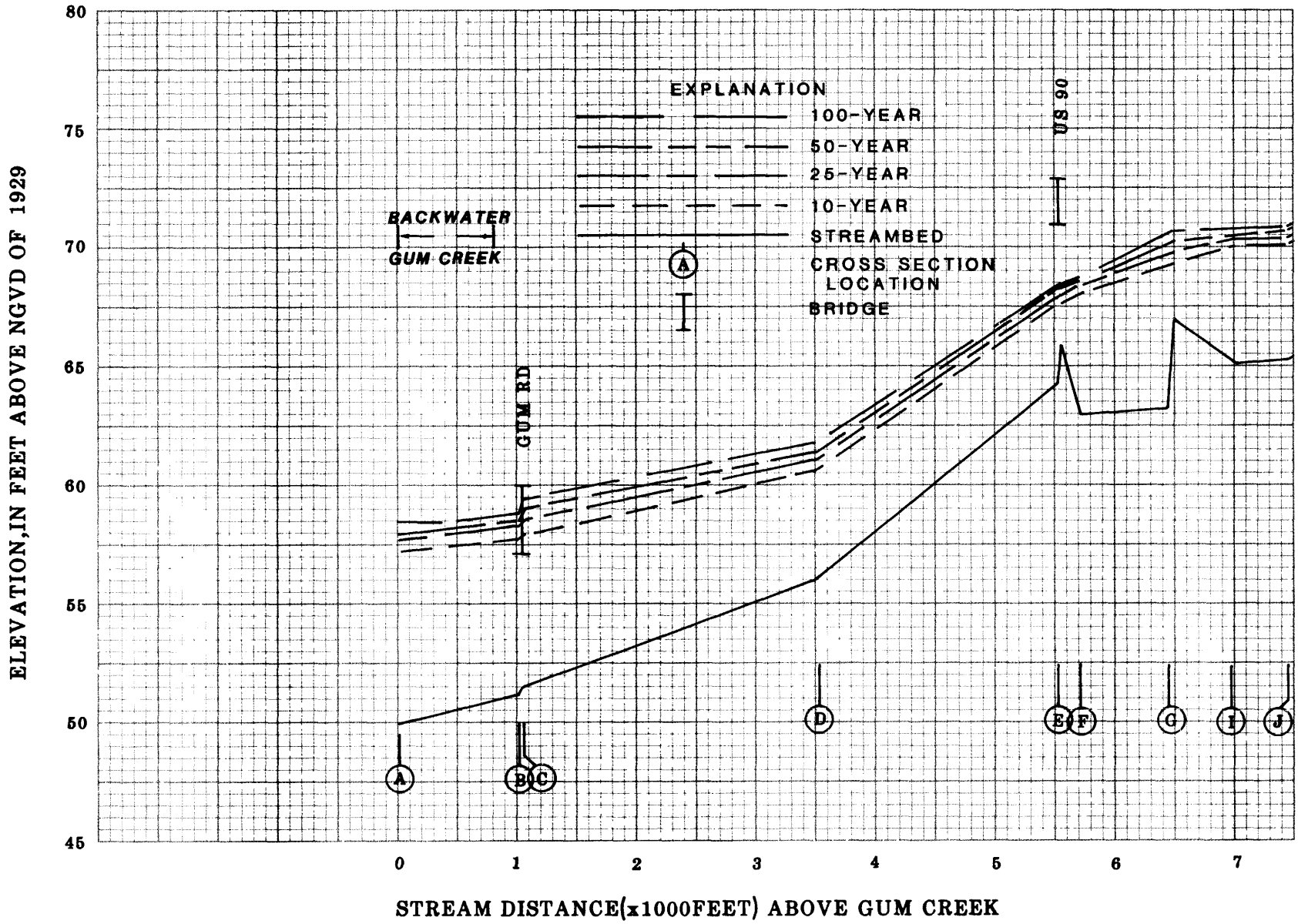

Figure 8.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for North Branch Gum Creek.

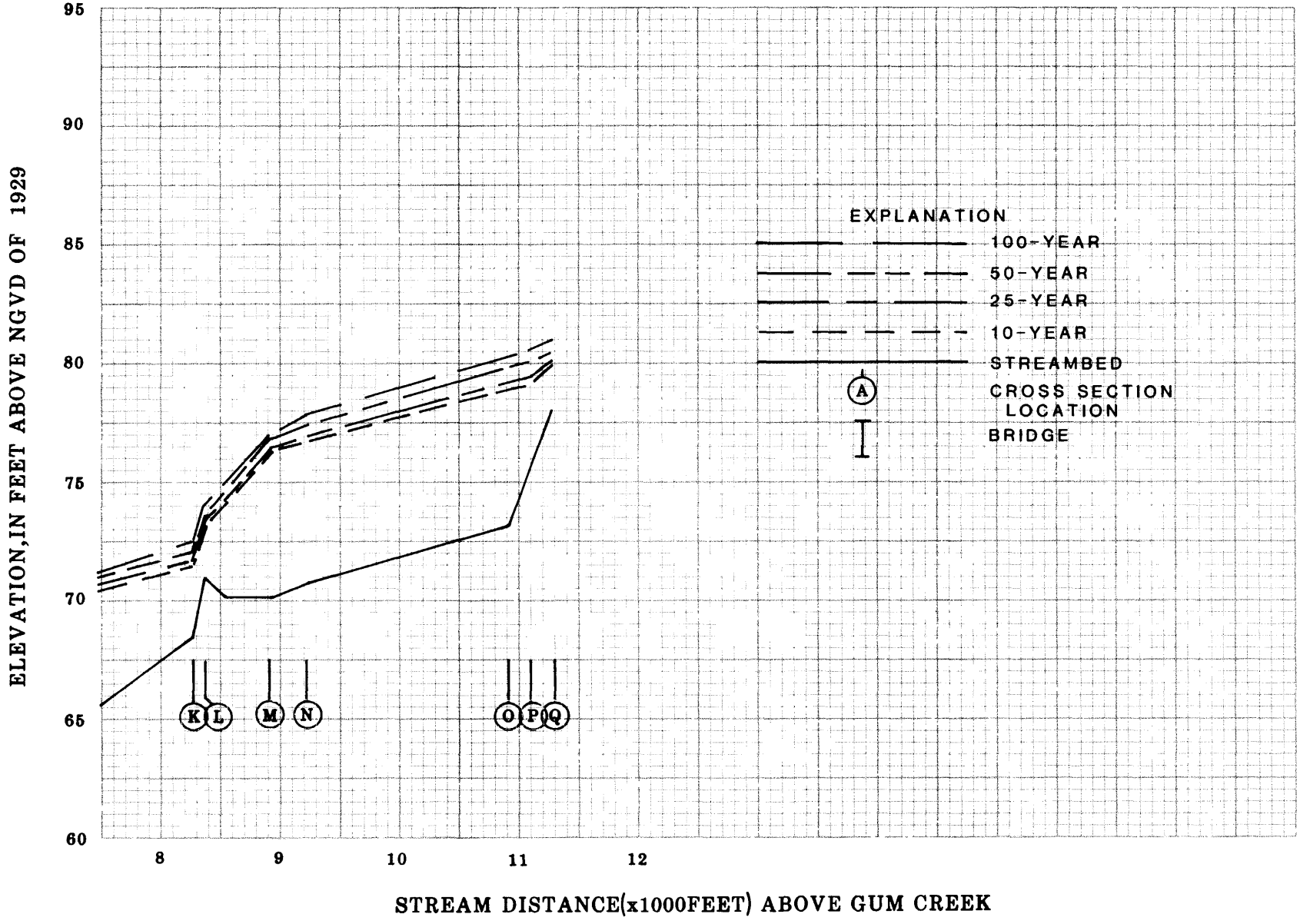

Figure 8.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for North Branch Gum Creek--Continued.

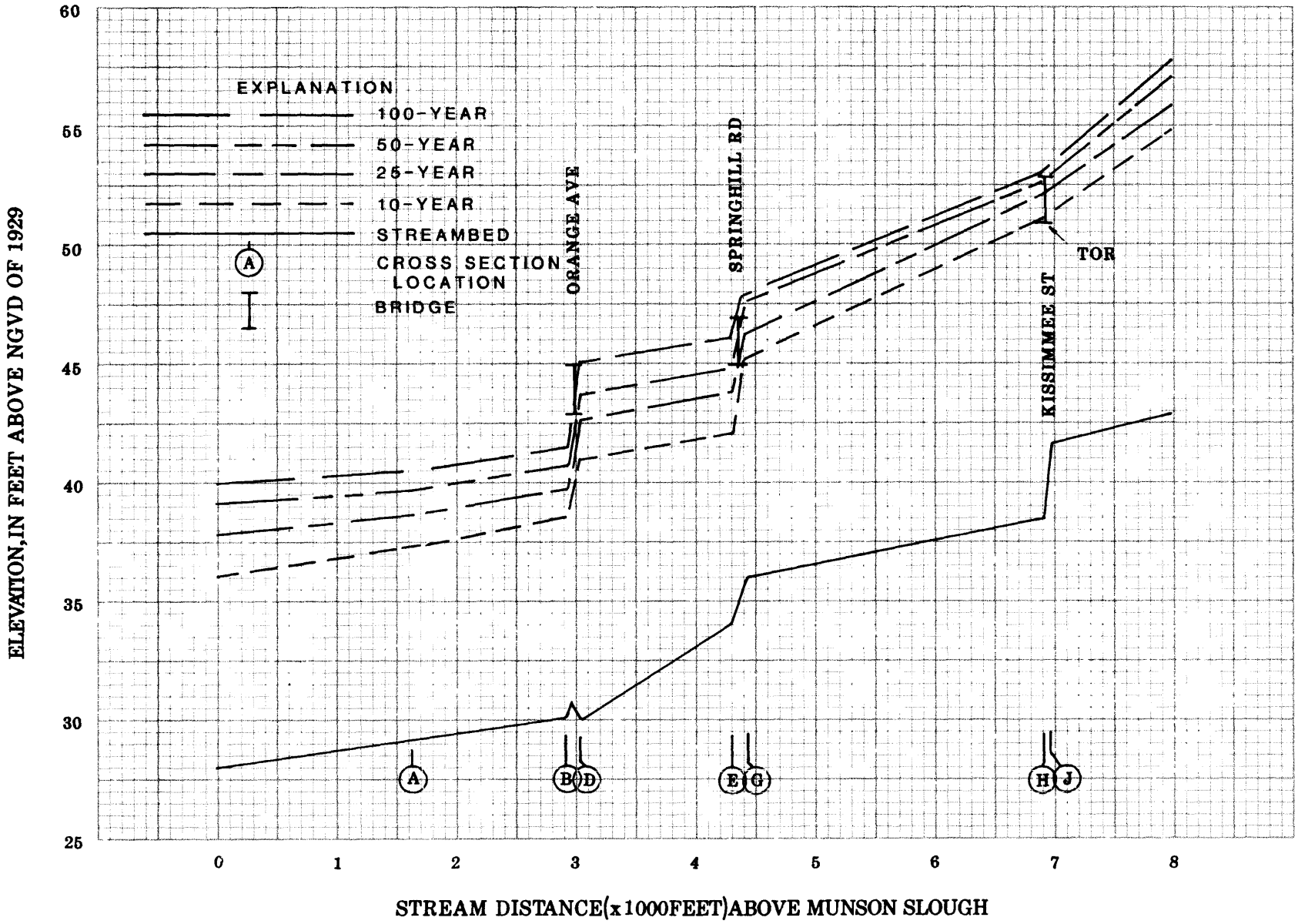

Figure 9.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Central drainage ditch.

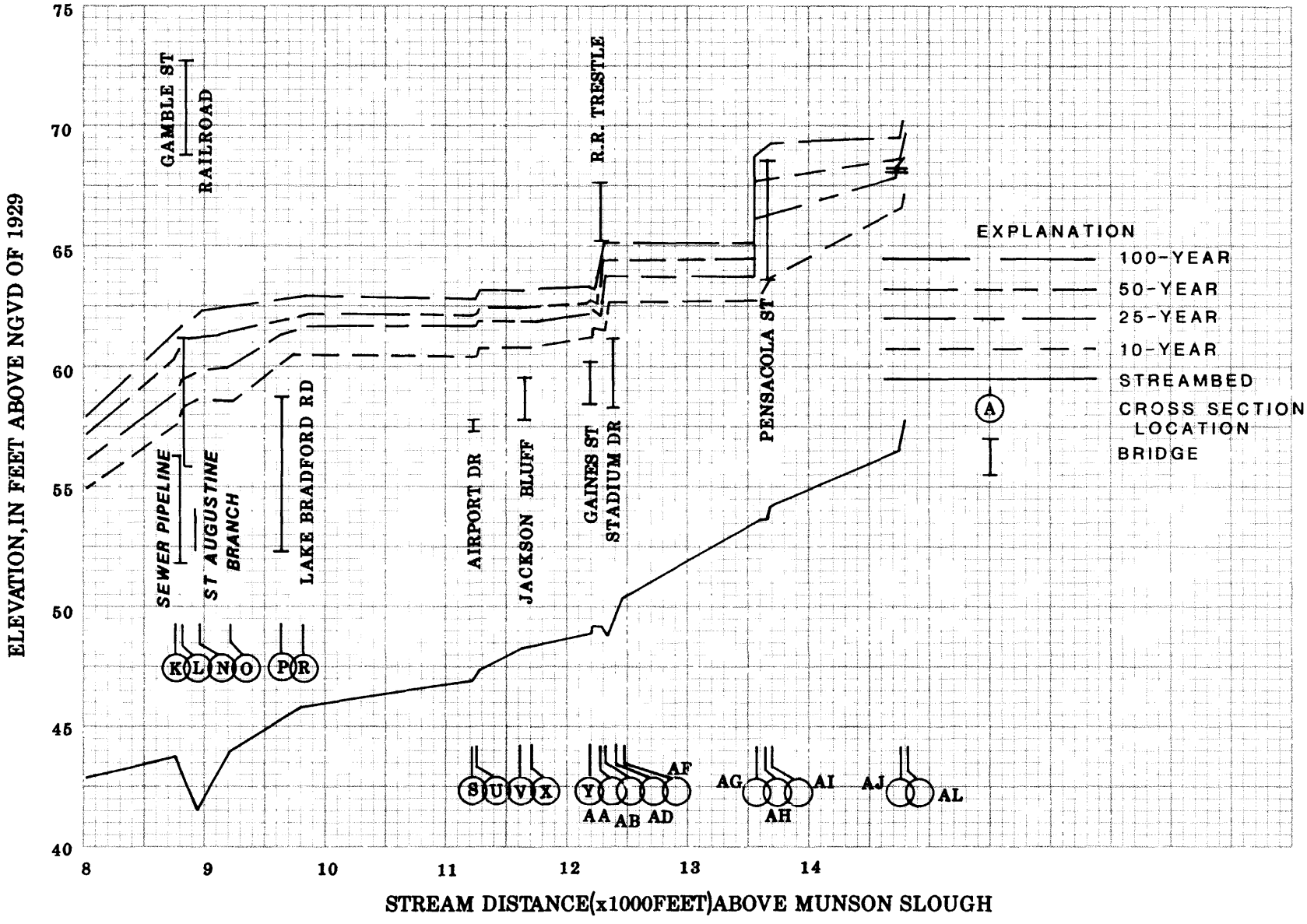

Figure 9.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Central drainage ditch--Continued.

The St. Augustine Branch joins the central drainage ditch above Gamble Street. The rating at Wahnish Way (site 7) was matched by calibrating "n" values in the reach from the mouth to Wahnish Way. The road elevation of Monroe Street is lower than the banks of the stream thereby creating an area that is subject to frequent flooding. Figure 10 shows the profiles for St. Augustine Branch.

The lower end of the east drainage ditch is subject to backwater from Munson Slough. The area around Jake Gaither Golf Course serves as a storage basin for the larger flood events. The upper end of this basin is fairly steep causing the peaks to be flashy and of short duration. Profiles for the east drainage ditch are shown in figure 11.

Lake Lafayette Basin

The two major tributaries to Lake Lafayette were studied. The northeast drainage ditch and its tributaries drain the developed and rapidly developing eastern part of Tallahassee. Alford Arm Tributary, although a much larger drainage basin, is predominantly rural. Residential development has begun in the Buck Lake Road-U.S. Highway 90 East part of the basin and is well established above Centerville Road.

Peak discharges for the Lafayette basin are significantly lower than those of other basins studied. This is due to the large volume of main channel storage that exists in this basin. This storage is the result of natural and manmade ponds on the streams in the area. Additional data collected after the equations were developed indicate that the equations are not valid in areas above any main channel ponds. **Therefore, the user of the regression equations should exercise caution when computing peak discharge in the Lafayette basin above storage areas.**

The northeast drainage ditch was studied from Weems Road to I-10. Starting water-surface elevations were determined from the stage-discharge relation for the U.S. Geological Survey gaging station at Weems Road (site 15). Peak discharge was not reduced below any of the storage facilities such as Goose Pond because the regression equations for the Lake Lafayette basin were developed with those facilities in place. The "n" values were calibrated by matching the stage-discharge relation at Miccosukee Road (site 13) and Capital Circle (site 14). Figure 12 shows the flood profiles for northeast drainage ditch.

Northeast drainage ditch tributary joins the northeast drainage ditch just west of Capital Circle and drains the area around Apalachee Parkway and Magnolia Drive. The stream reach studied runs from its mouth to Inglewood Drive. Two tributaries to northeast drainage ditch tributary were also studied. Richview Road ditch was studied from the mouth to the upstream side of Park Avenue at Richview Road and the Windrush Apartments ditch was studied from the mouth at Park Avenue (site 12) to above the apartment complex. Flood profiles for these streams are shown in figures 13, 14, and 15.

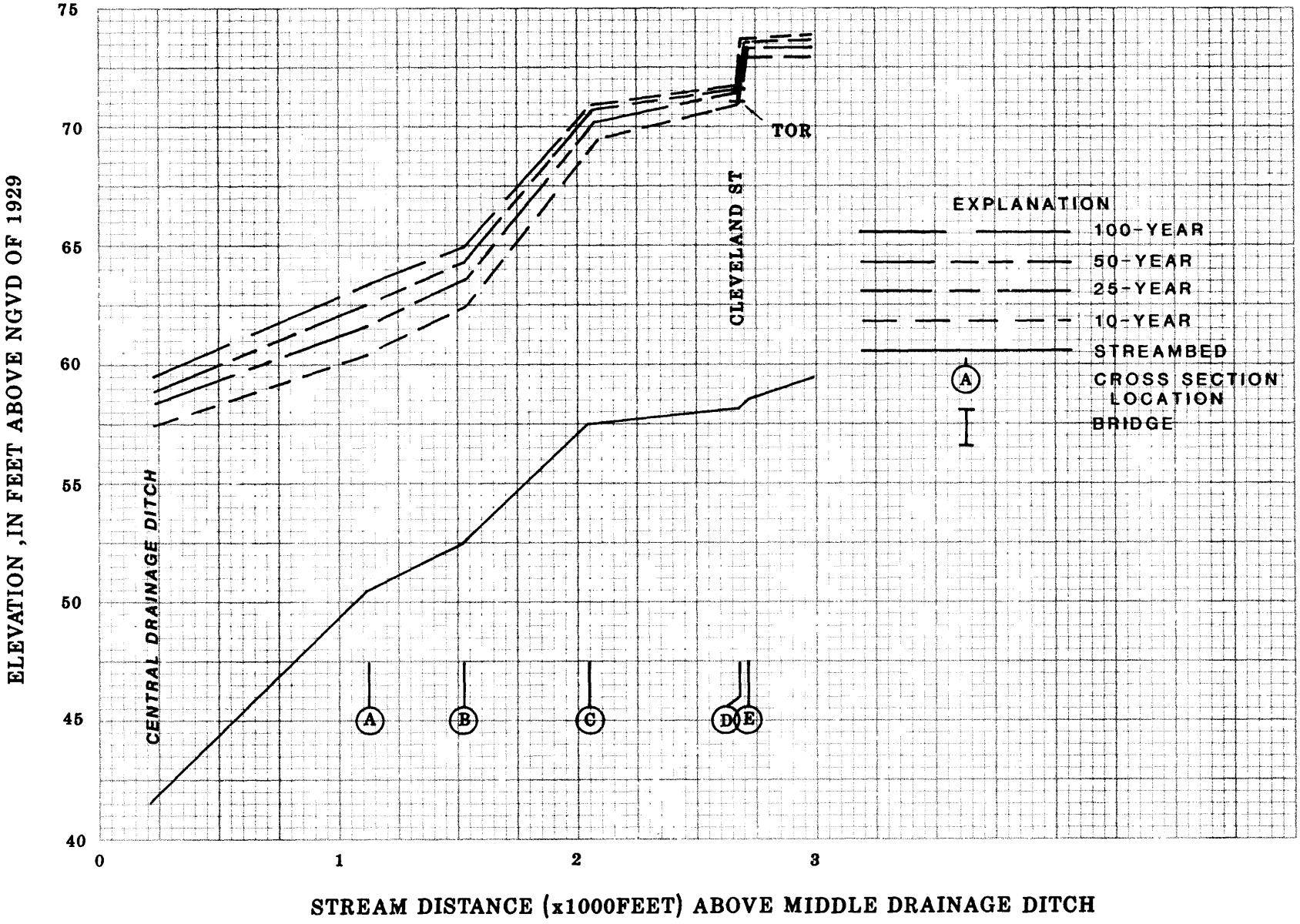

Figure 10.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for St. Augustine Branch.

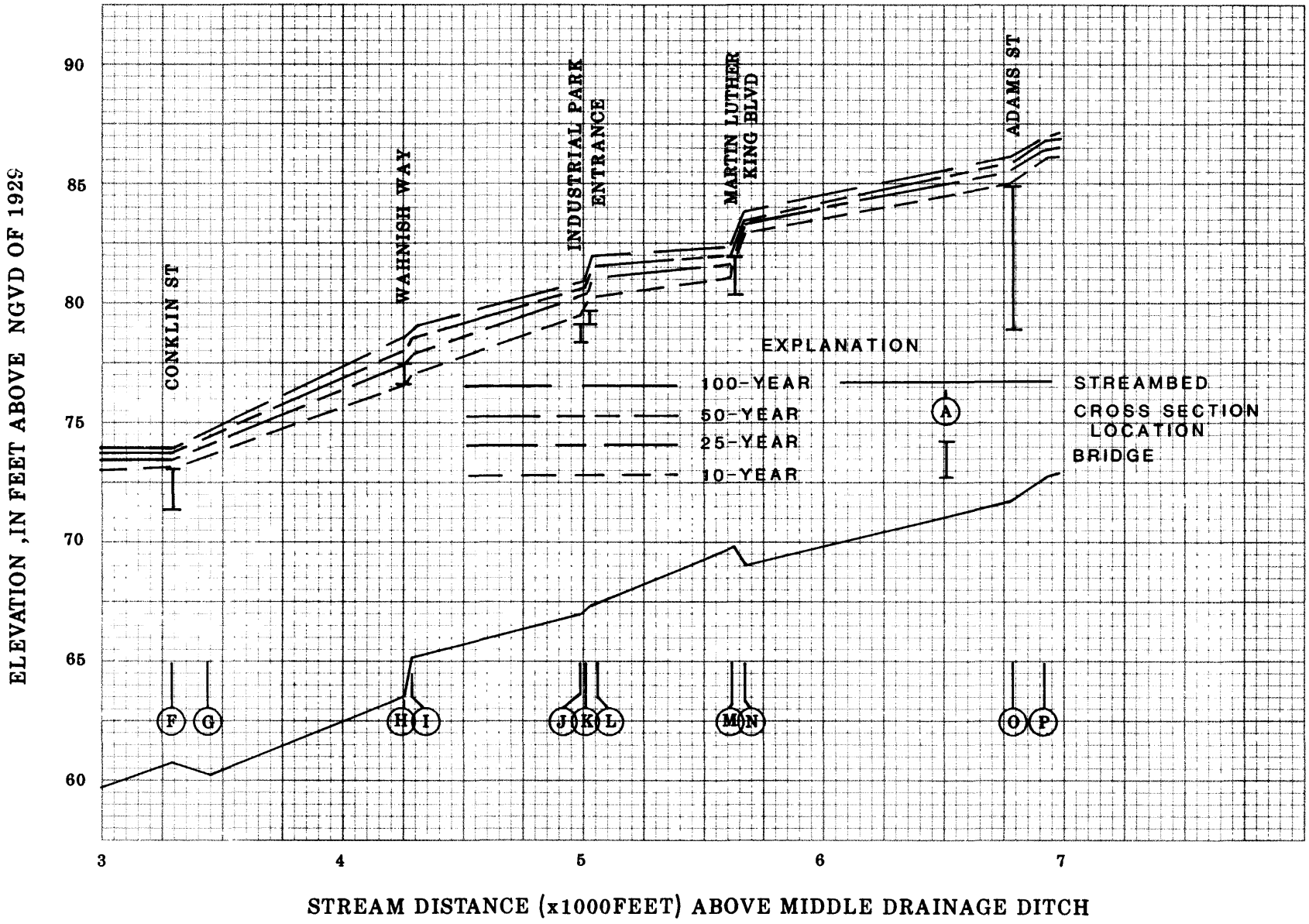

Figure 10.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for St. Augustine Branch--Continued.

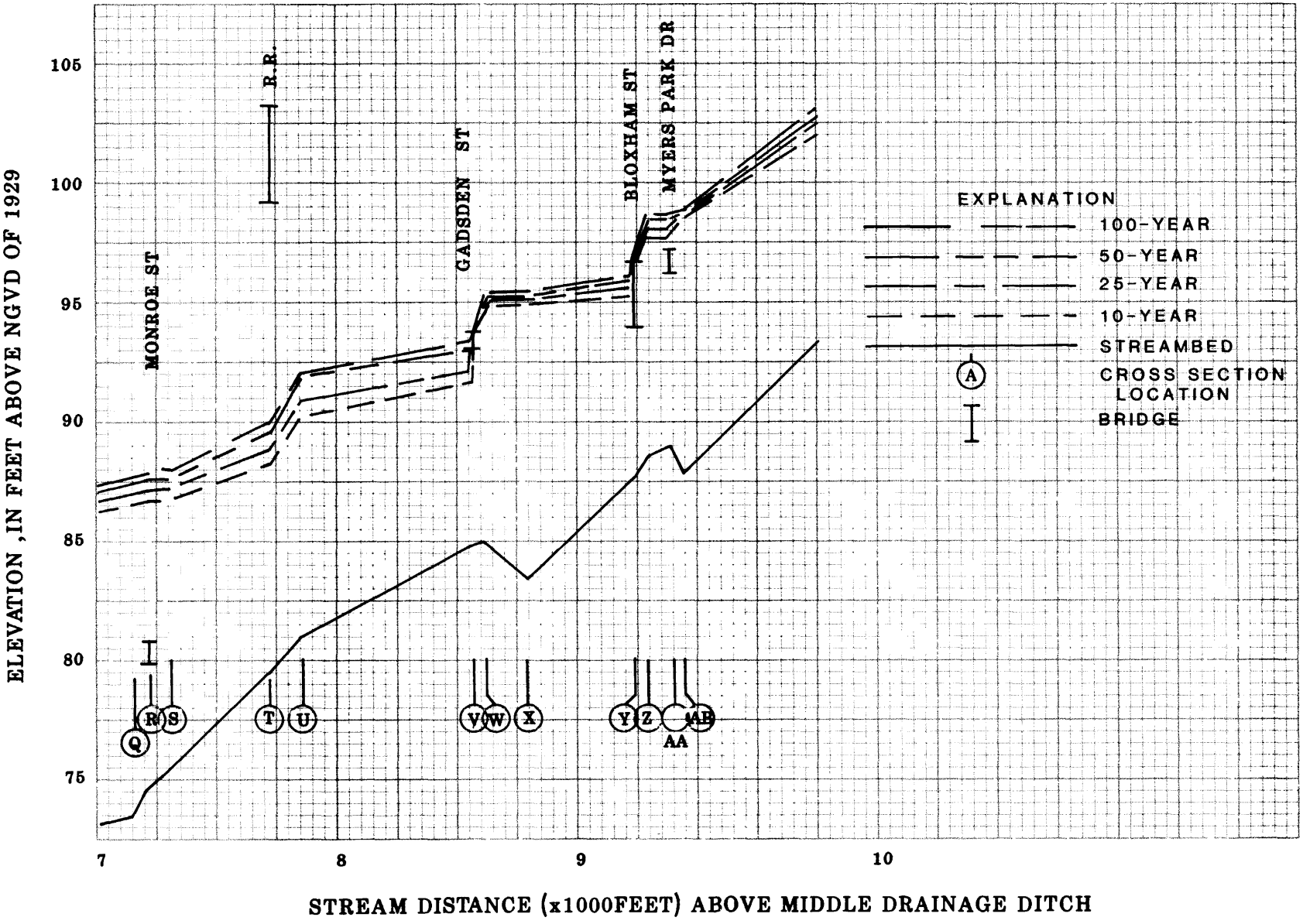

Figure 10.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for St. Augustine Branch--Continued.

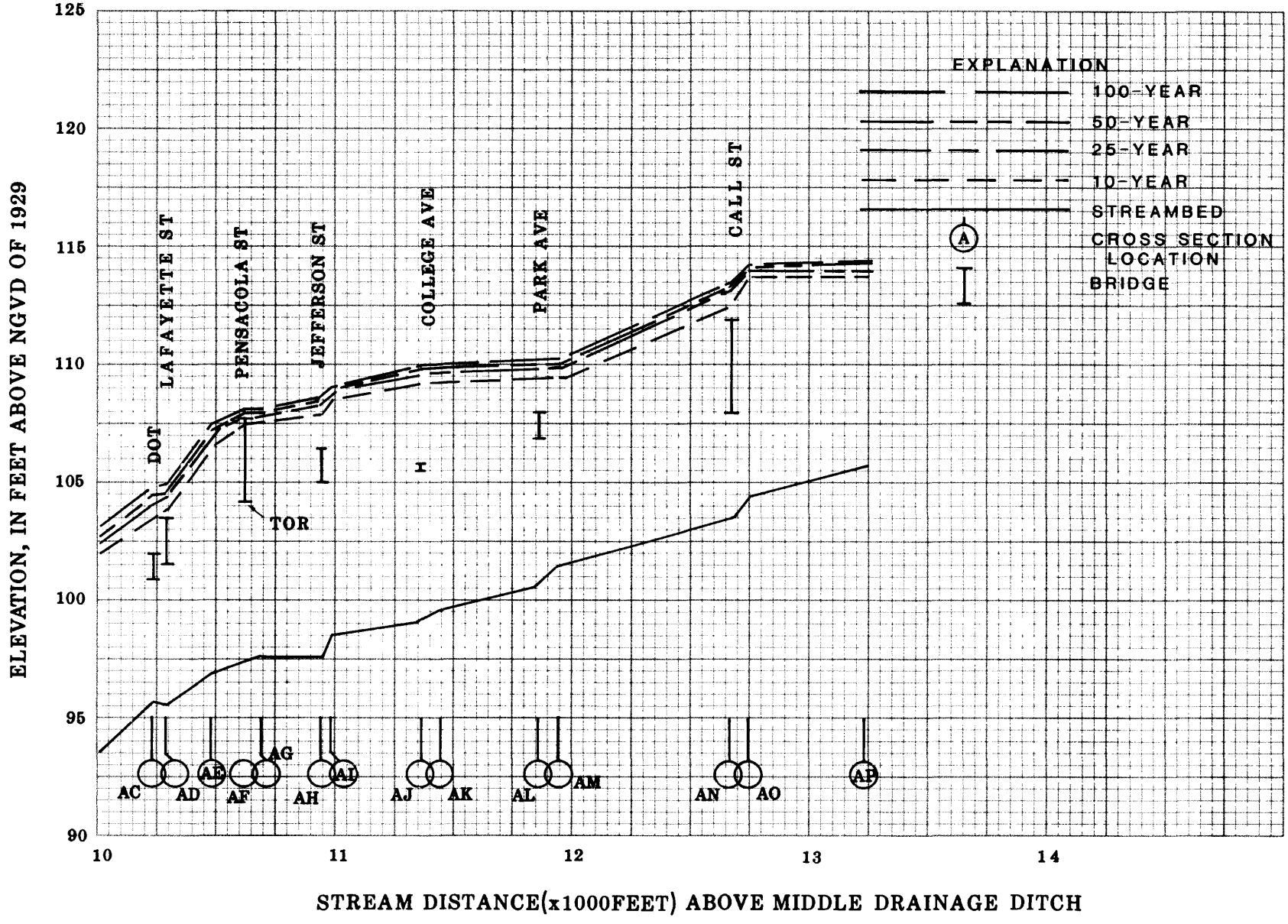

Figure 10.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for St. Augustine Branch--Continued.

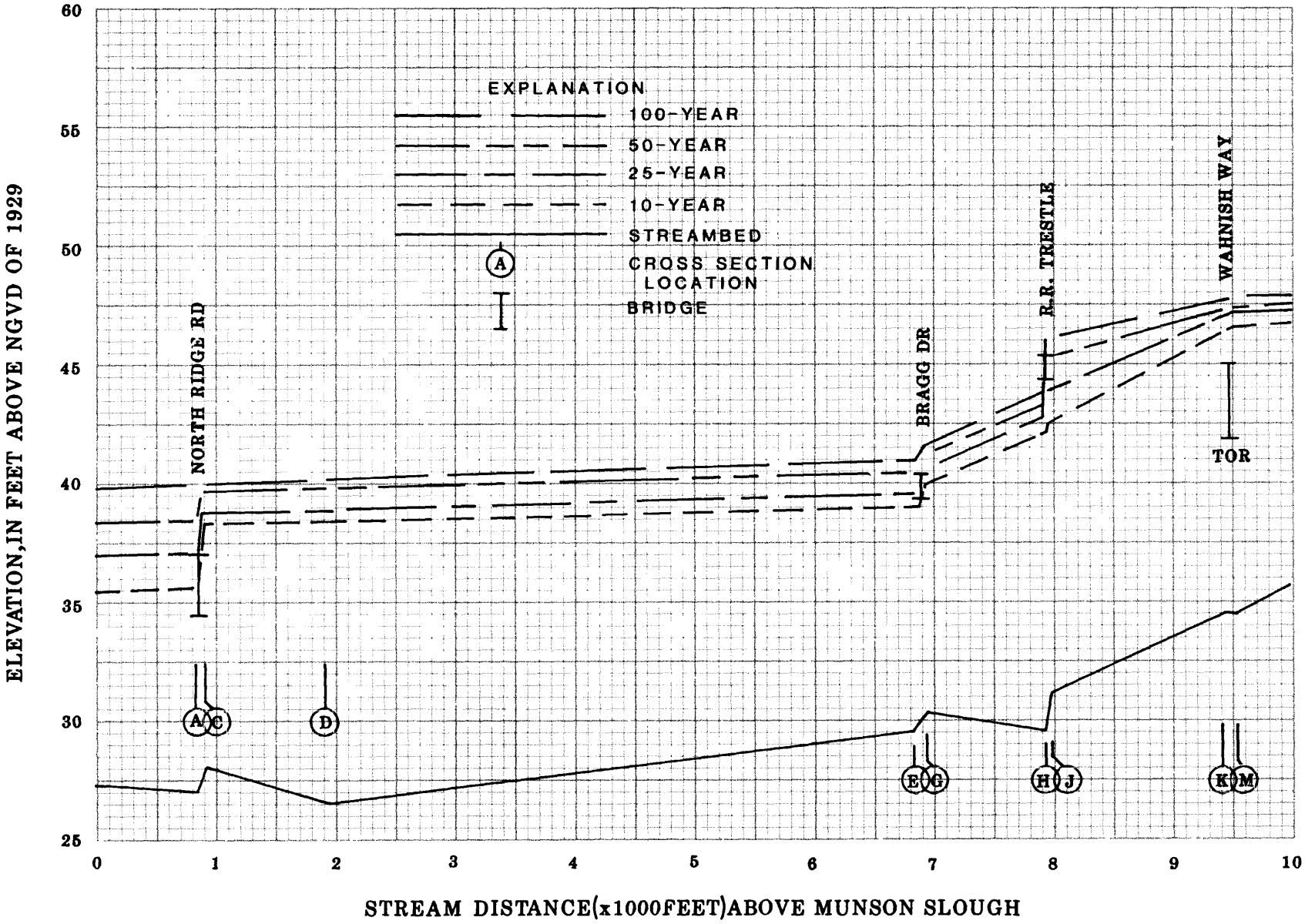

Figure 11.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for East drainage ditch.

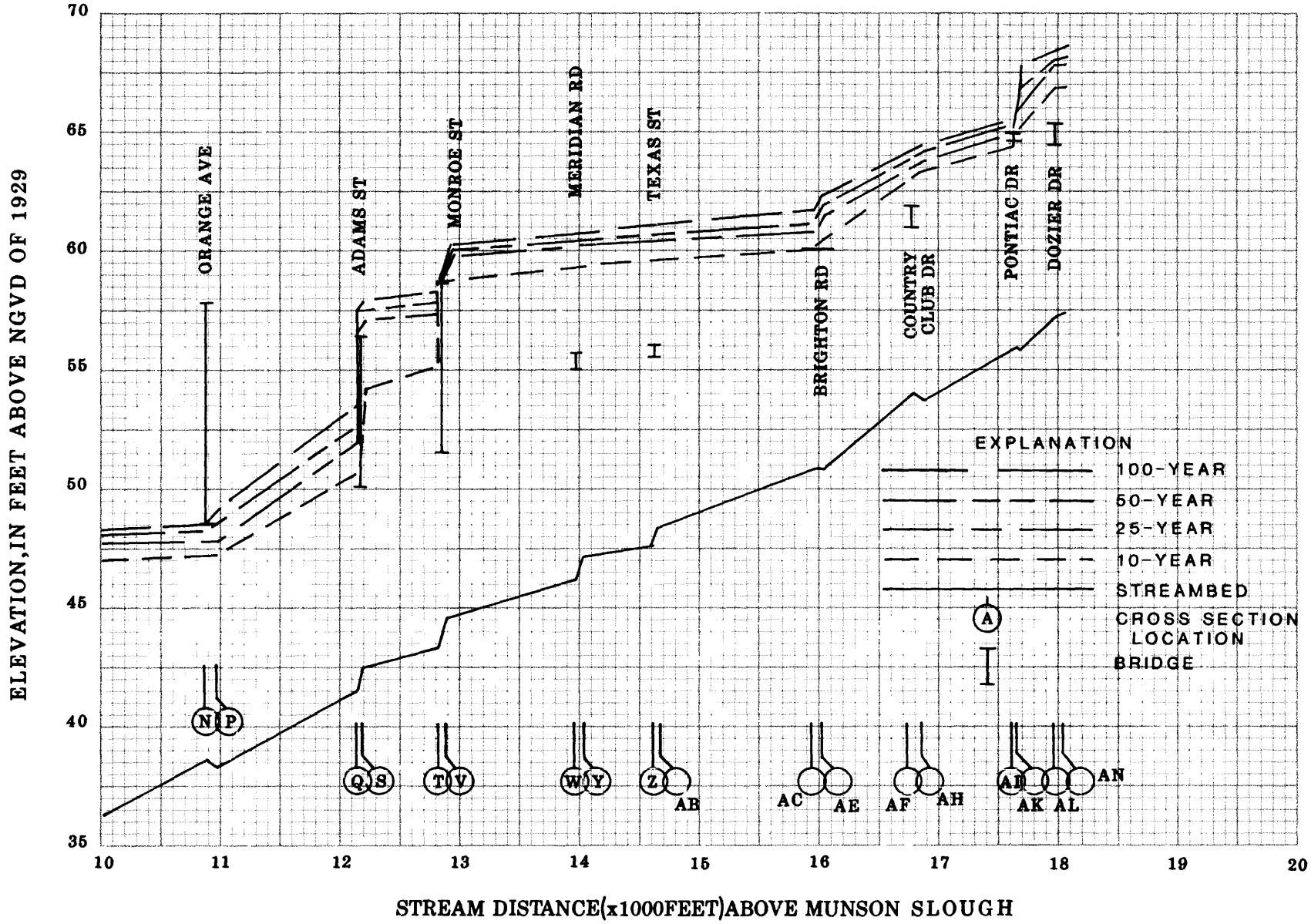

Figure 11.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for East drainage ditch--Continued.

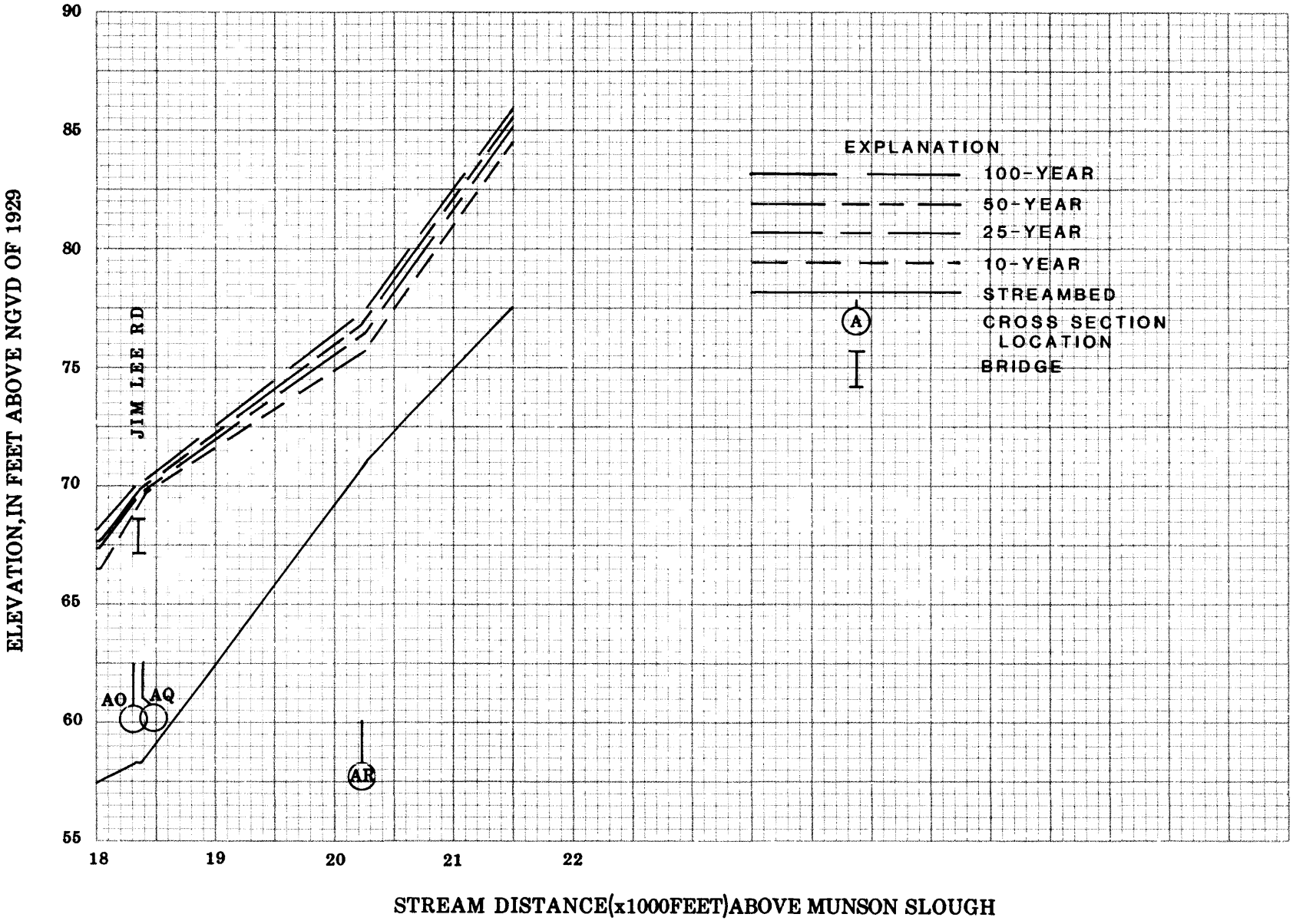

Figure 11.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for East drainage ditch--Continued.

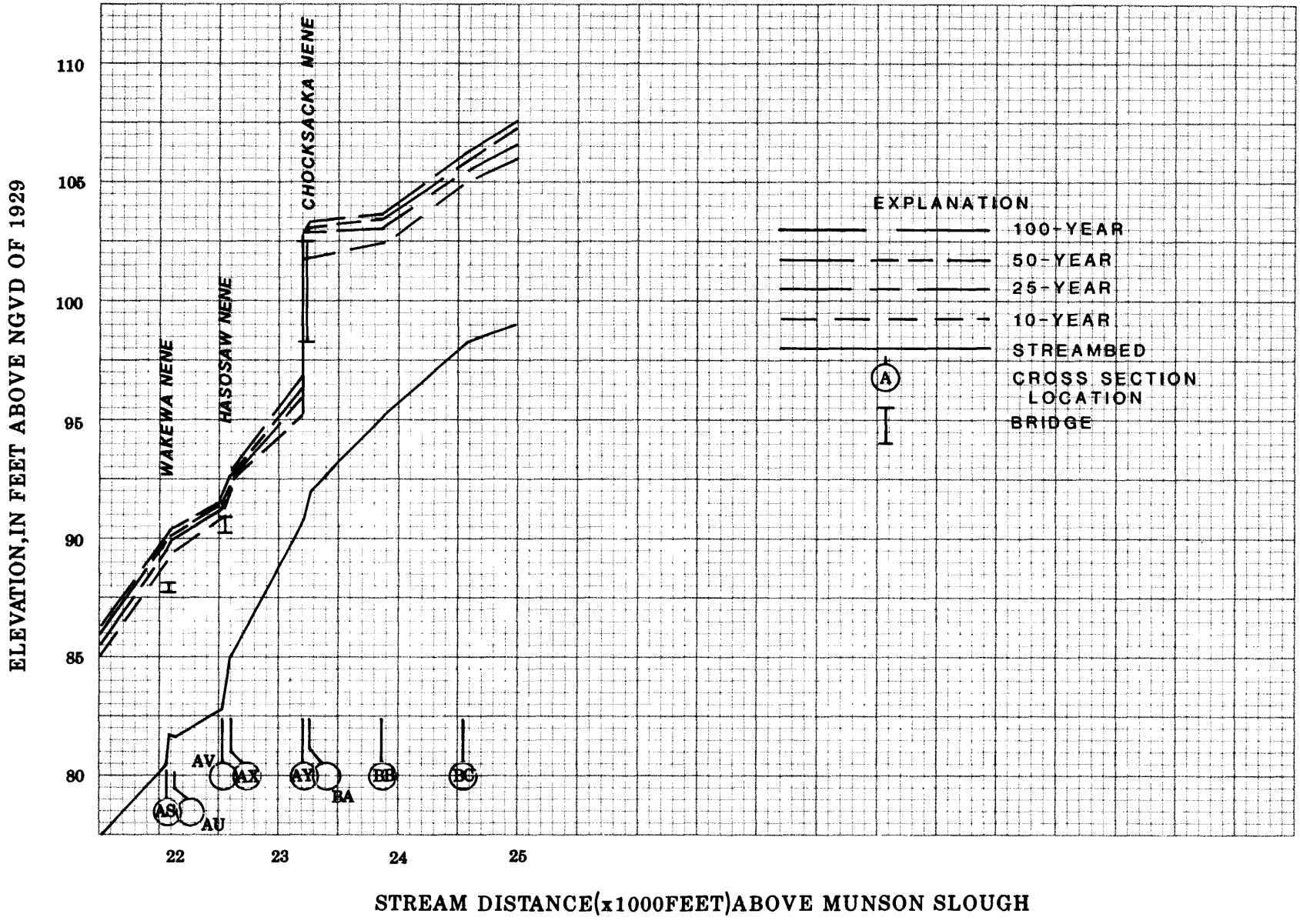

Figure 11.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for East drainage ditch--Continued.

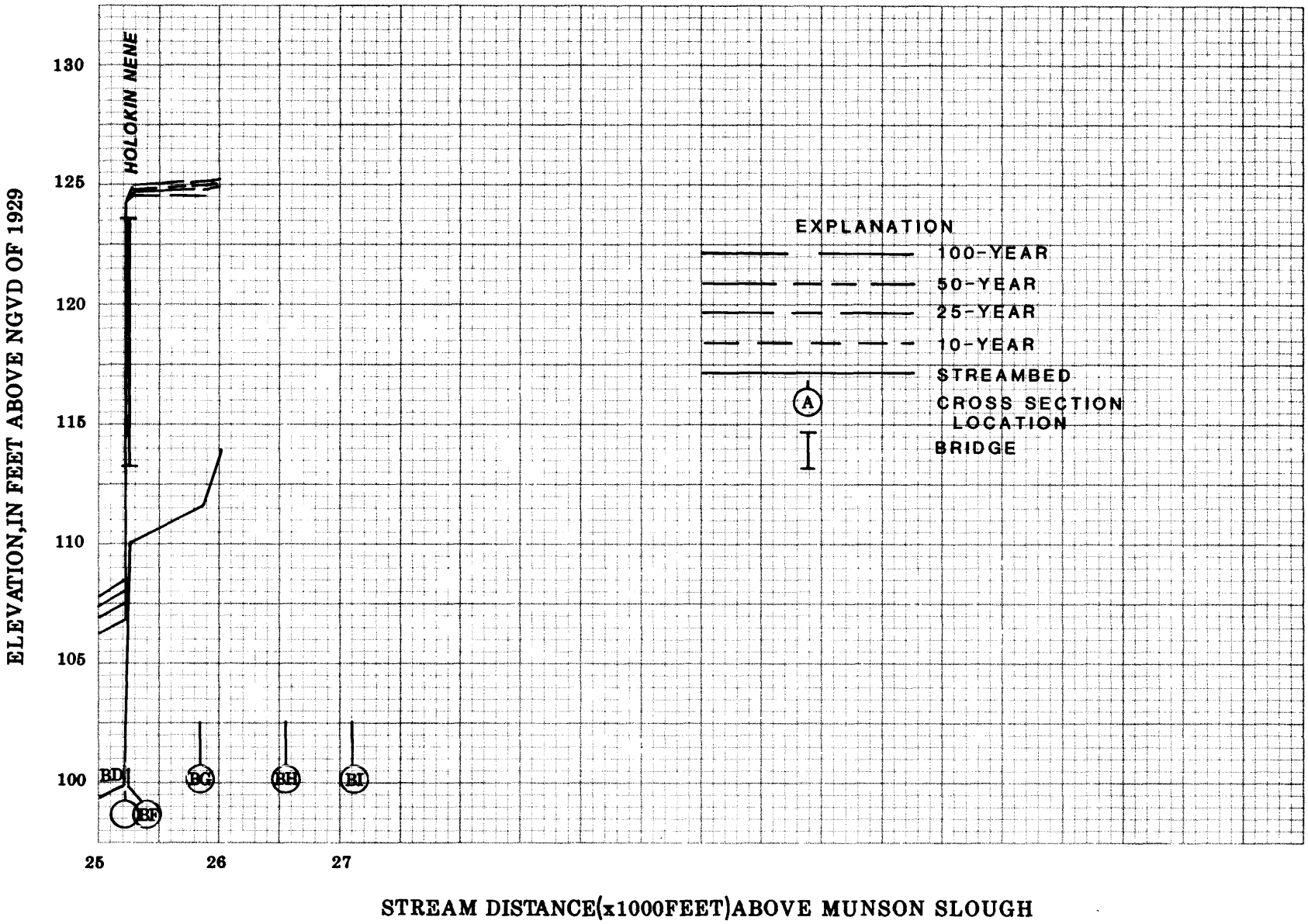

Figure 11.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for East drainage ditch--Continued.

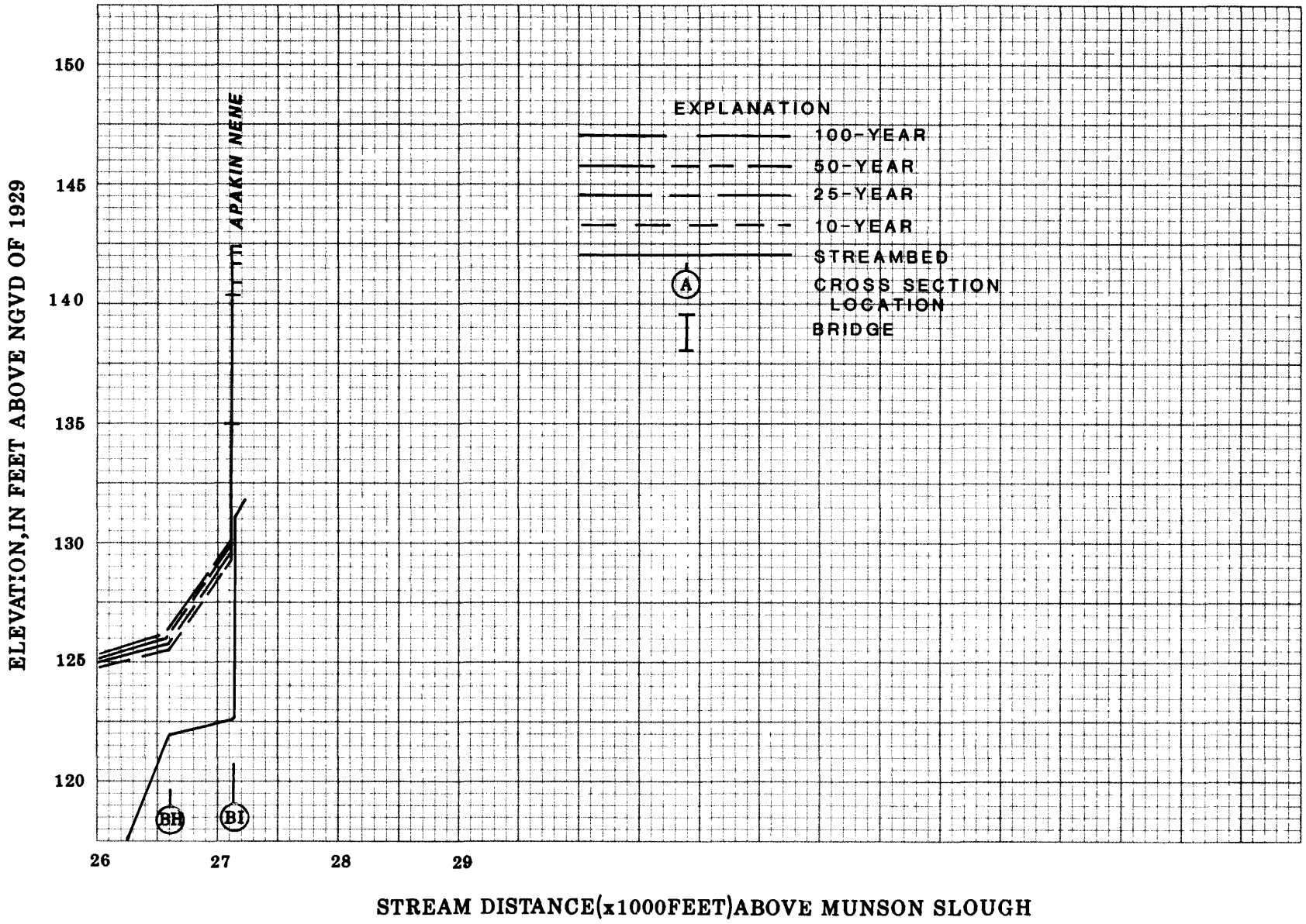

Figure 11.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for East drainage ditch--Continued.

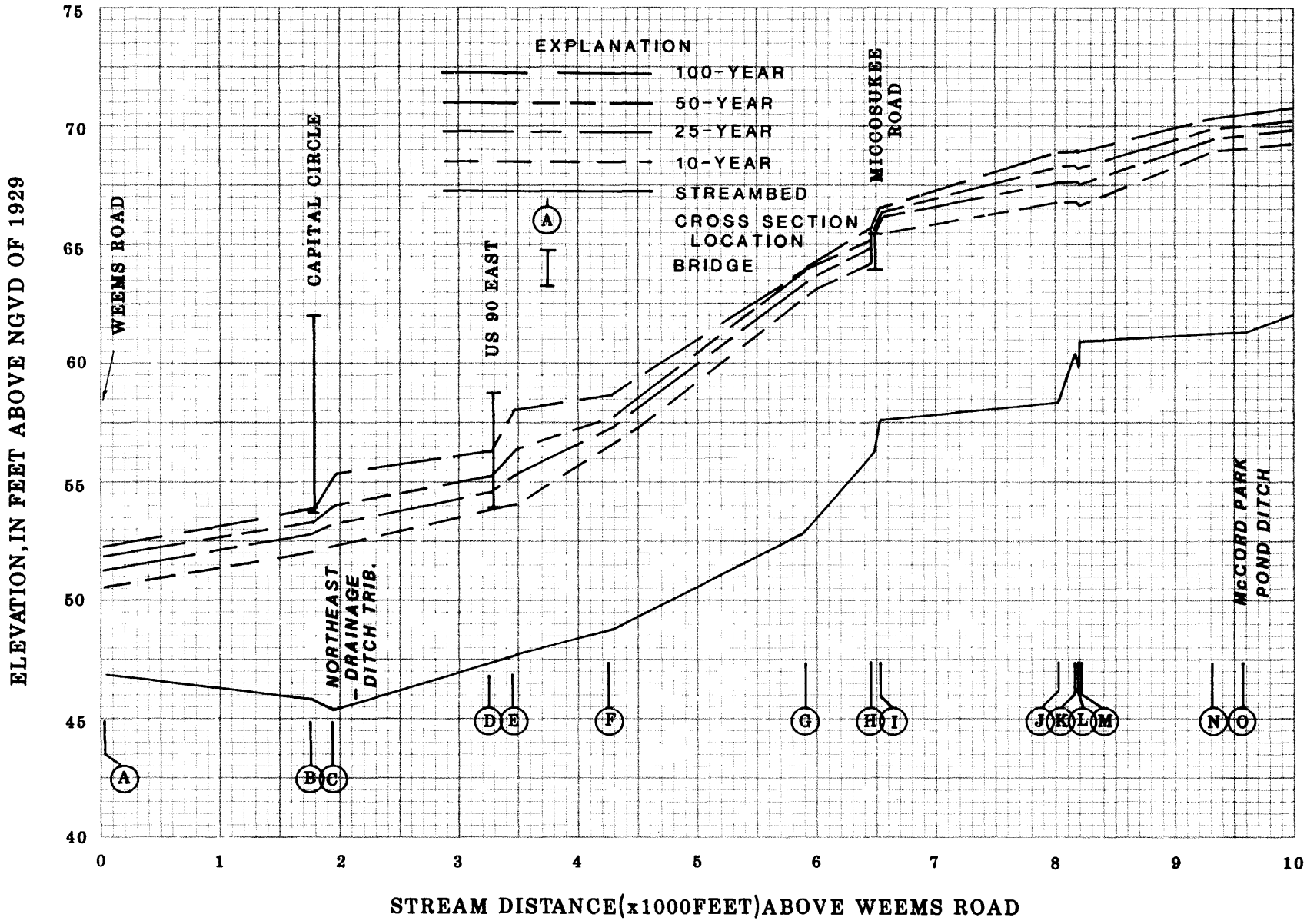

Figure 12.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Northeast drainage ditch.

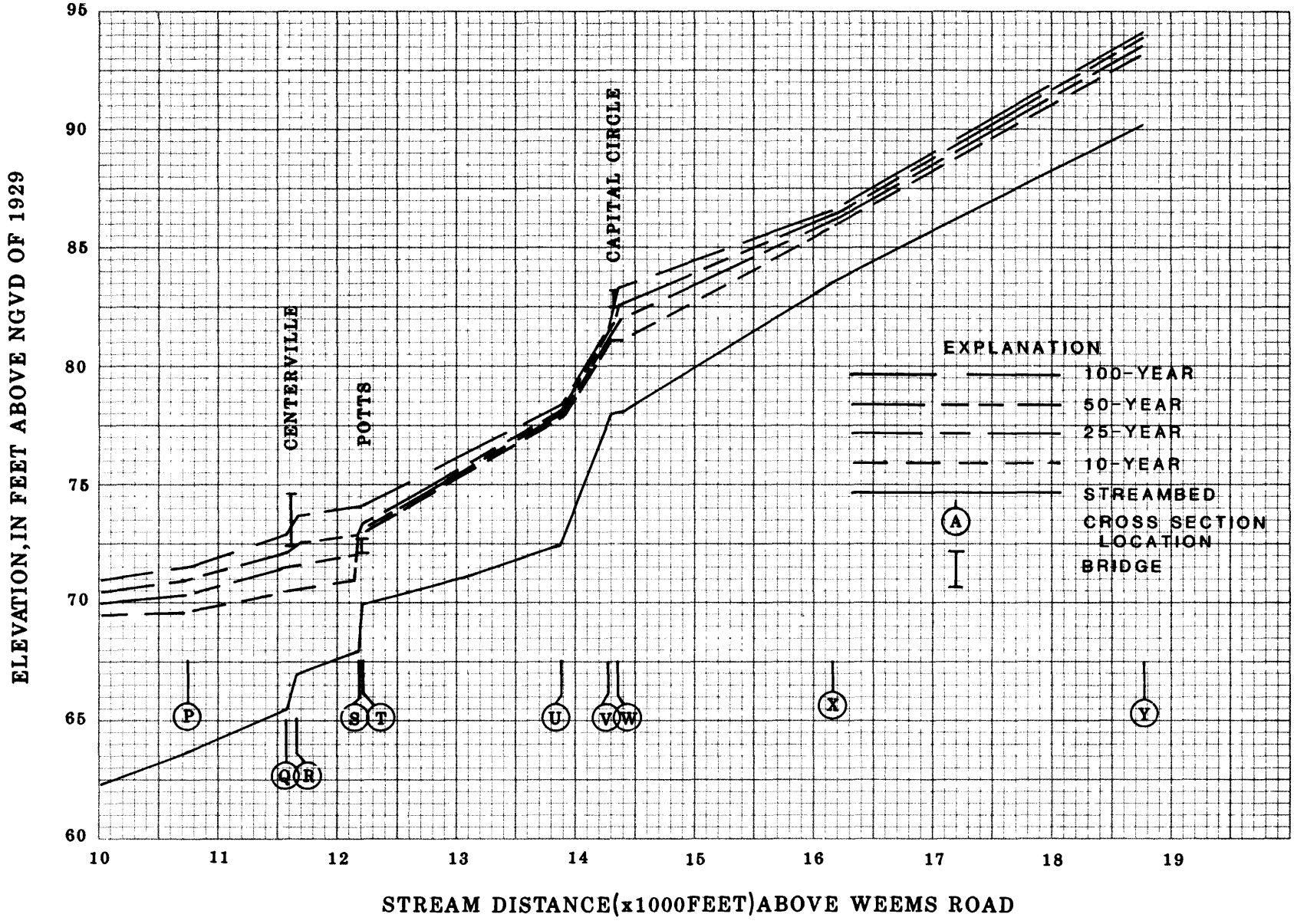

Figure 12.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Northeast drainage ditch--Continued.

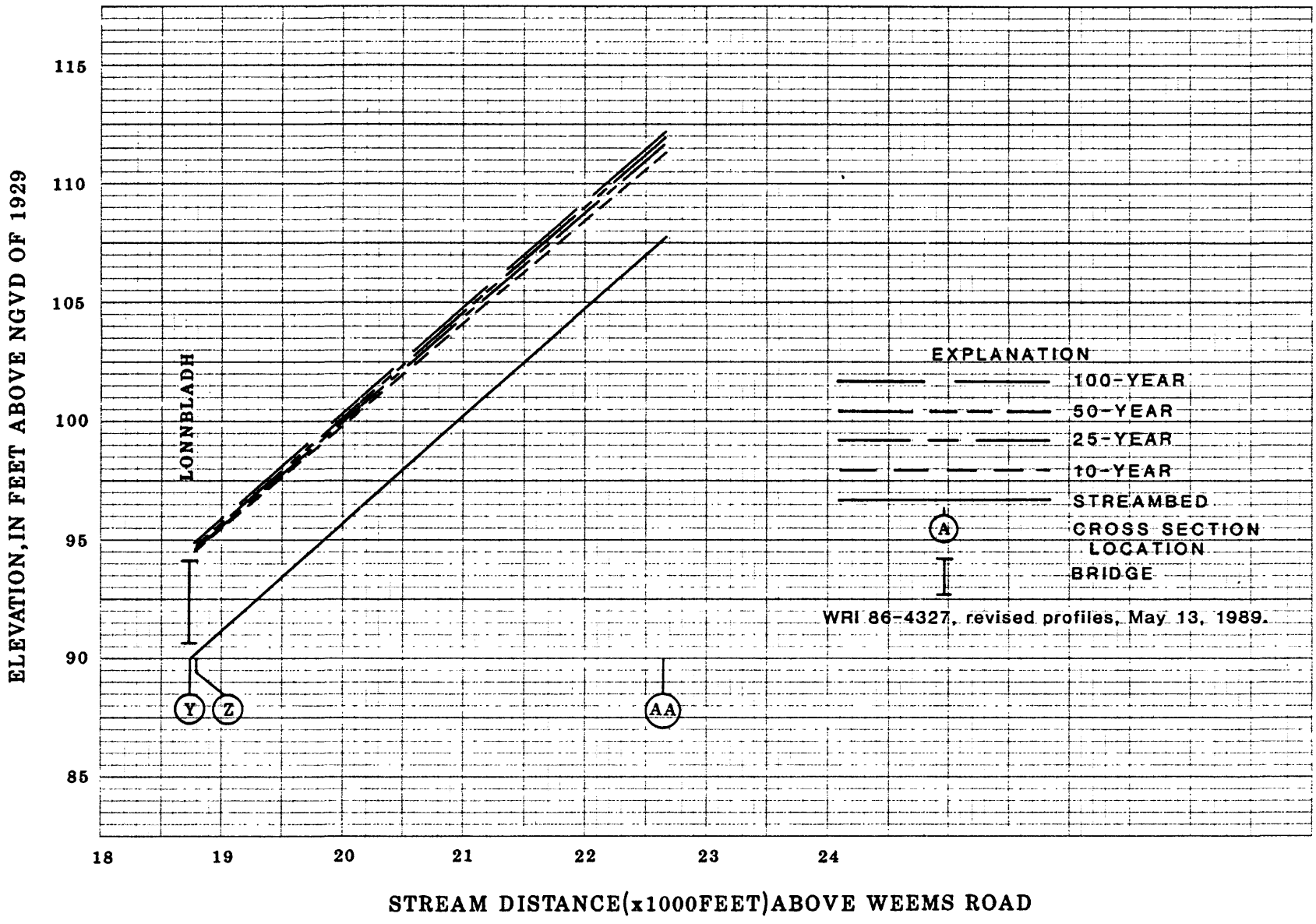

Figure 12.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Northeast drainage ditch--Continued.

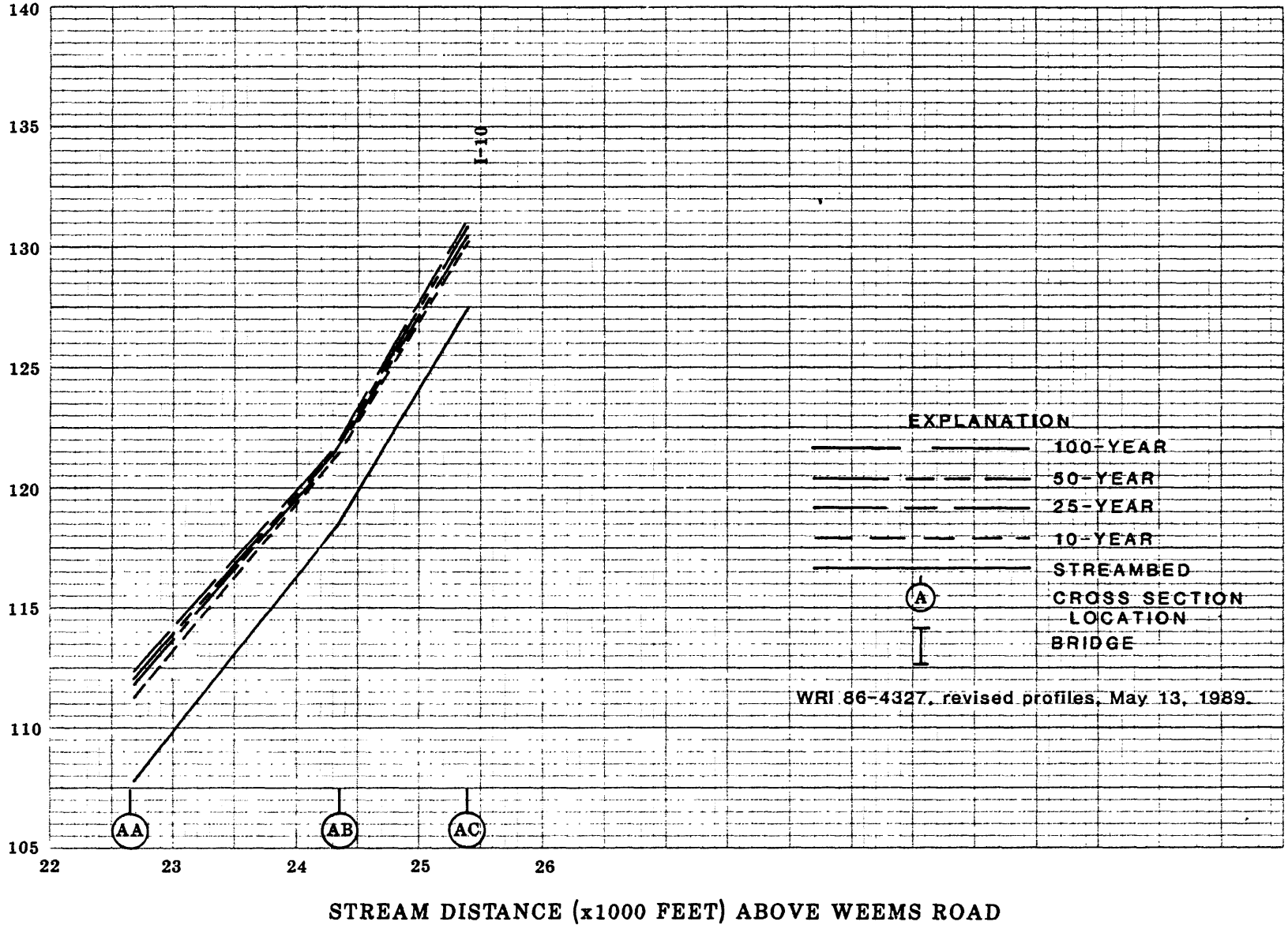

Figure 12.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Northeast drainage ditch--Continued.

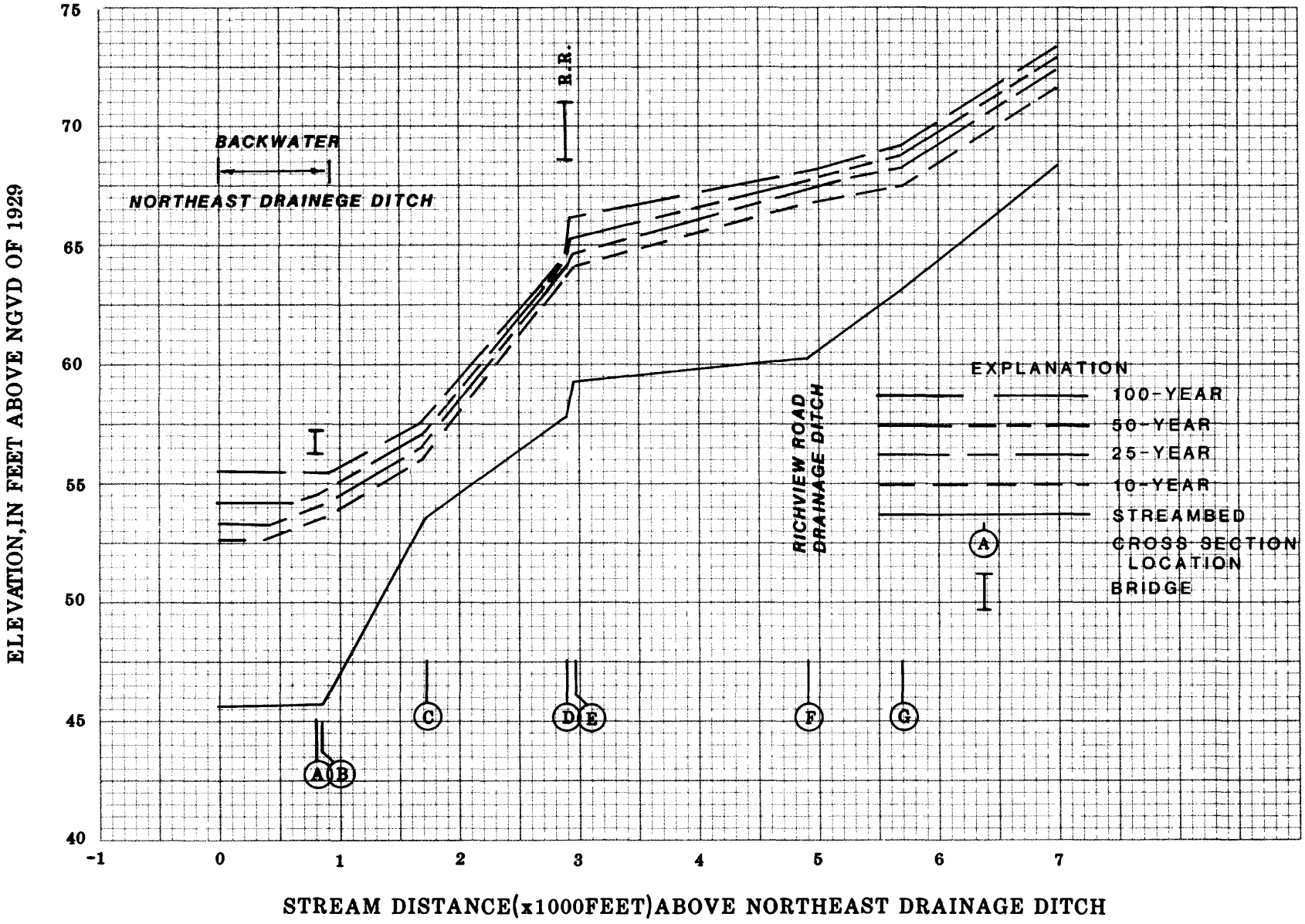

Figure 13.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Northeast drainage ditch tributary.

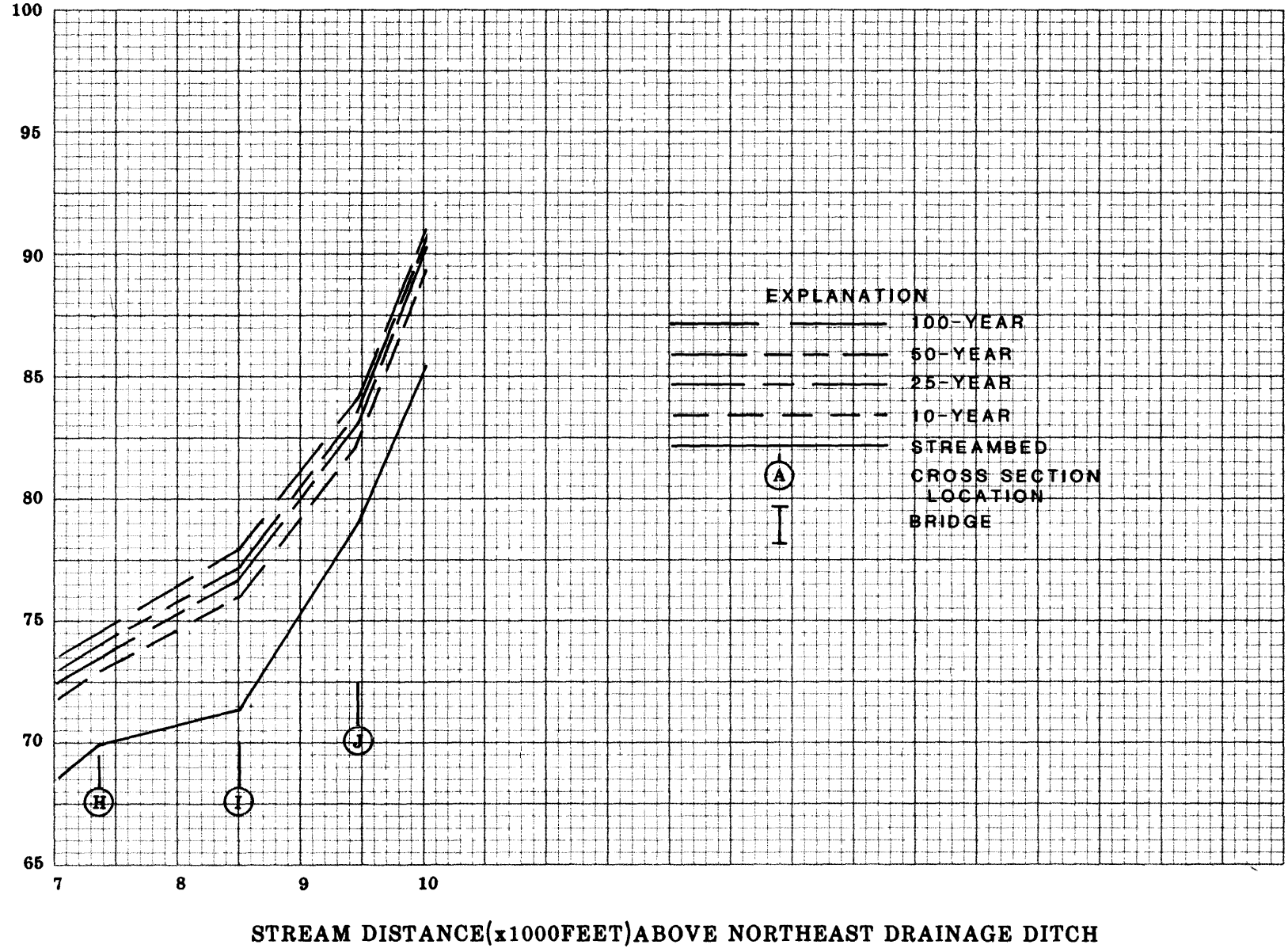

Figure 13.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Northeast drainage ditch tributary--Continued.

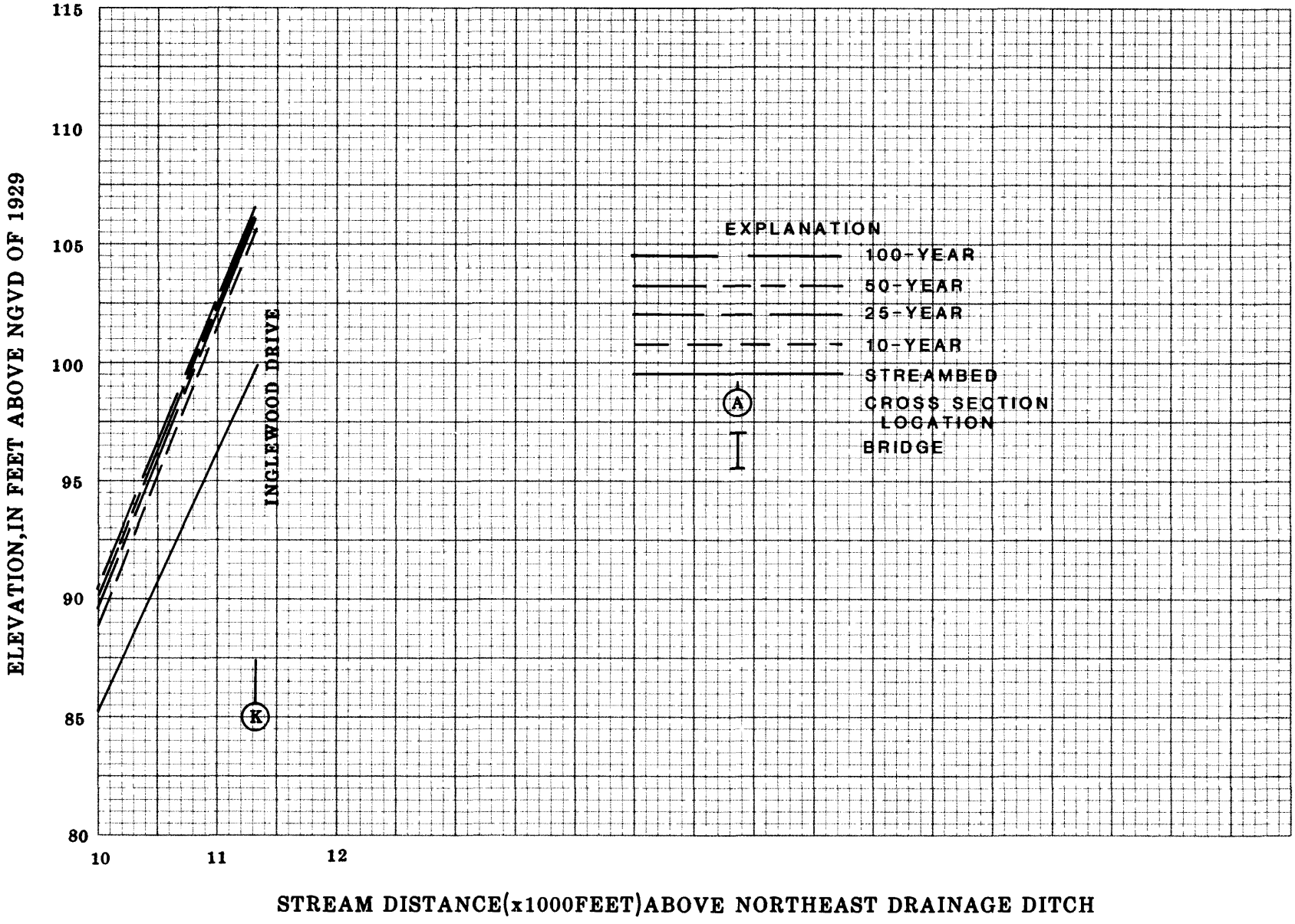

Figure 13.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Northeast drainage ditch tributary--Continued.

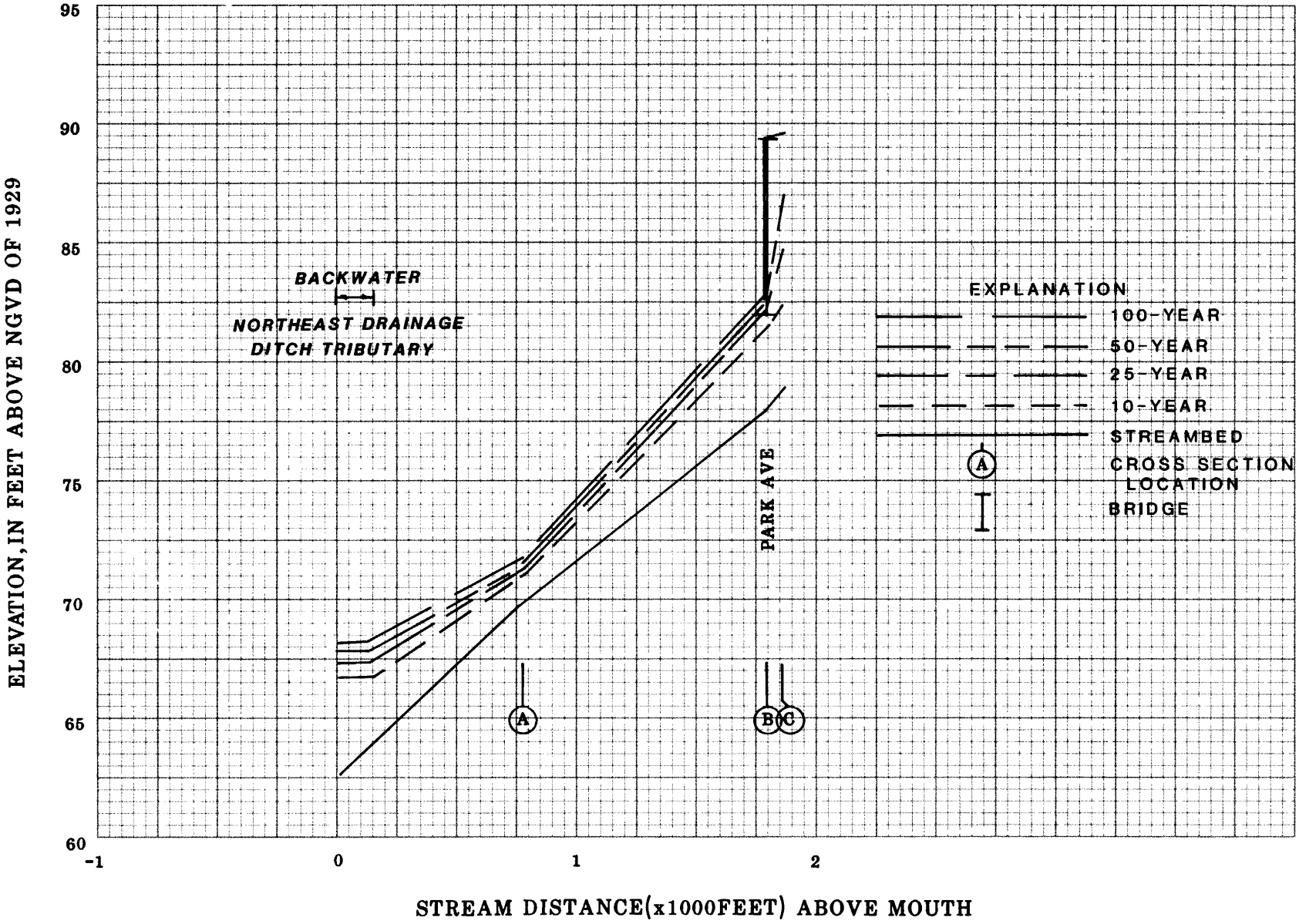

Figure 14.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Richview Road ditch.

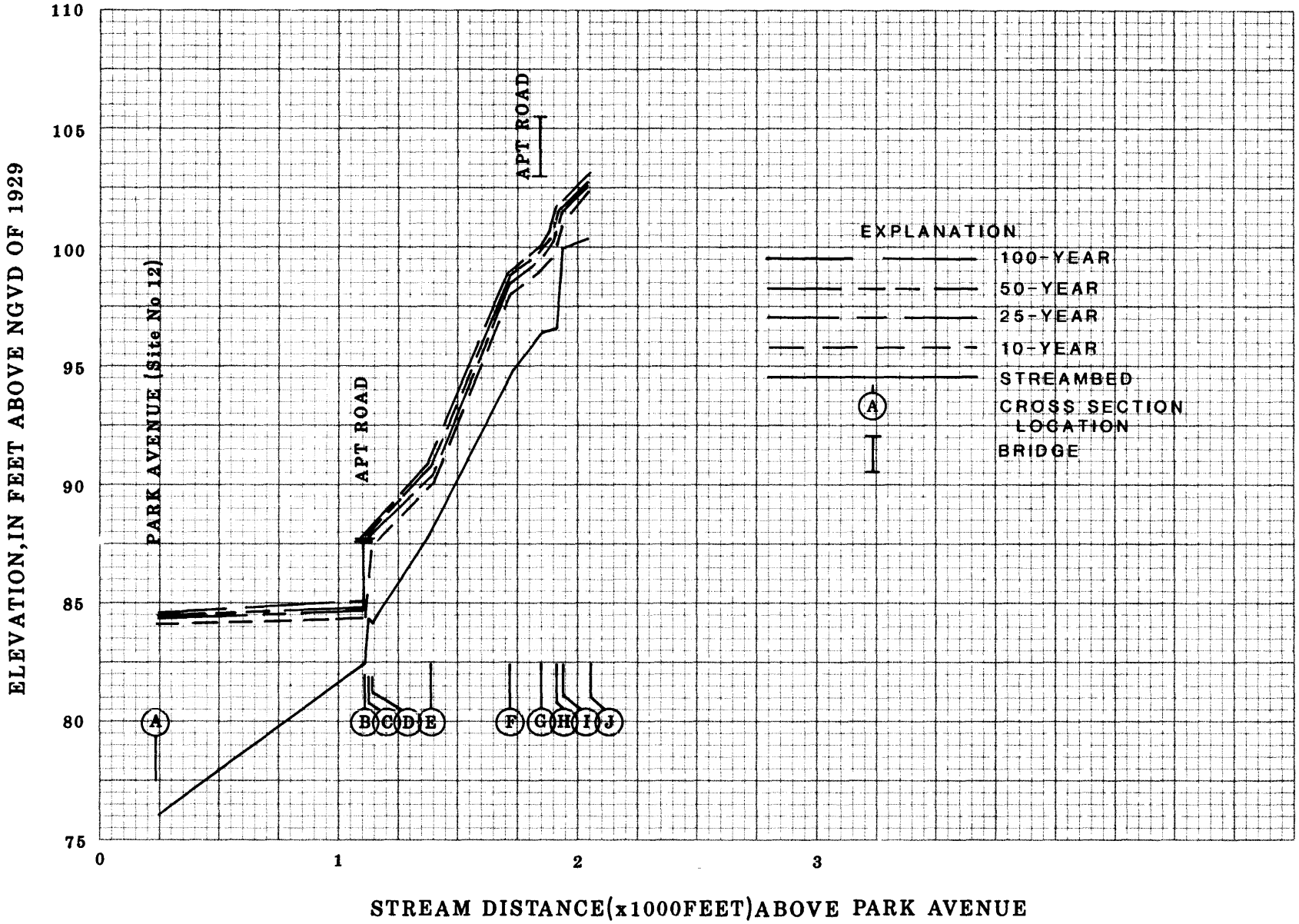

Figure 15.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Windrush Apartments ditch.

The McCord Park Pond drainage ditch was studied from the mouth to Betton Road. A gaging station installed in the summer of 1985 on the McCord Park Pond drainage ditch (site 10) above any storage ponds recorded a peak higher than the computed 100-year flood. Although the storm was a significant event, it was not a 100-year event. The discharge was increased above McCord Park by using the Lake Munson regression equation because of the decrease in storage. The new culvert under Centerville Road invalidated the rating at the old gaging station, however, the new gage above McCord Park was used to calibrate "n" values. Figure 16 shows the flood profiles for McCord Park Pond drainage ditch.

Alford Arm Tributary was studied from Lake Lafayette to Thomasville Road. The drainage areas given in table 1 above Centerville Road are contributing drainage areas and may differ from those given in the FIS which were total drainage areas. Royal Oaks Creek was also studied from its mouth to above Foxcroft Drive. The streams in the Lake Lafayette basin did not require the adjustments needed in the Lake Munson basin. The flood profiles for Alford Arm Tributary and Royal Oaks Creek are shown in figures 17 and 18.

Lake Jackson Basin

Three very different type drainage basins were studied in the Lake Jackson basin. Megginnis Arm Tributary, including the Mall drainage ditch, drain highly developed areas around North Monroe Street and John Knox Road. Fords Arm Tributary is almost undeveloped except for the very upper end of the basin around Market Square, some large residential lots along Timberlane Road, and Live Oak Plantation Road and I-10, which accounts for a significant part of the impervious area. The Lake Overstreet outflow is almost totally large residential lots, pastureland, or woods. The drainage into Lake Overstreet was considered as noncontributing.

Starting elevations for Megginnis Arm Tributary were determined by computing flow over the weir at the large detention pond, upstream (south) of Lake Shore Drive. Peak discharges were reduced for storage in the pond. The peak discharge at Allen Road is small because the very long culverts behind Tallahassee Mall, due to high friction losses, affect flows from the contributing drainage area. Eleven years of peak-discharge data were available for analysis at Allen Road (site 8). The long culverts behind Tallahassee Mall cause considerable storage upstream. Figure 19 shows the flood profiles for Megginnis Arm Tributary.

The Mall drainage ditch, a tributary to Megginnis Arm Tributary, flows north behind the Northwood Mall and eventually under North Monroe near Balsam Terrace. There is a problem with the Mall drainage ditch above a gasoline station at Torreya Drive because of high friction loss, undersized culverts under the station, and Torreya Drive. Storage volume is limited because of the constricted flood plain, however, enough storage was available to warrant the reduction of peak discharge. The flood profiles for the Mall drainage ditch are shown in figure 20.

Starting elevations for Fords Arm Tributary were determined by extending the rating at the gaging station downstream from Meridian Road (site 9) using slope-conveyance method. The slope was determined using the defined rating. The peak discharges for this basin are low because of the low percentage of impervious area. If basin development significantly increases the percentage of impervious area, flood elevations will be higher. Figure 21 shows the flood profiles for Fords Arm Tributary.

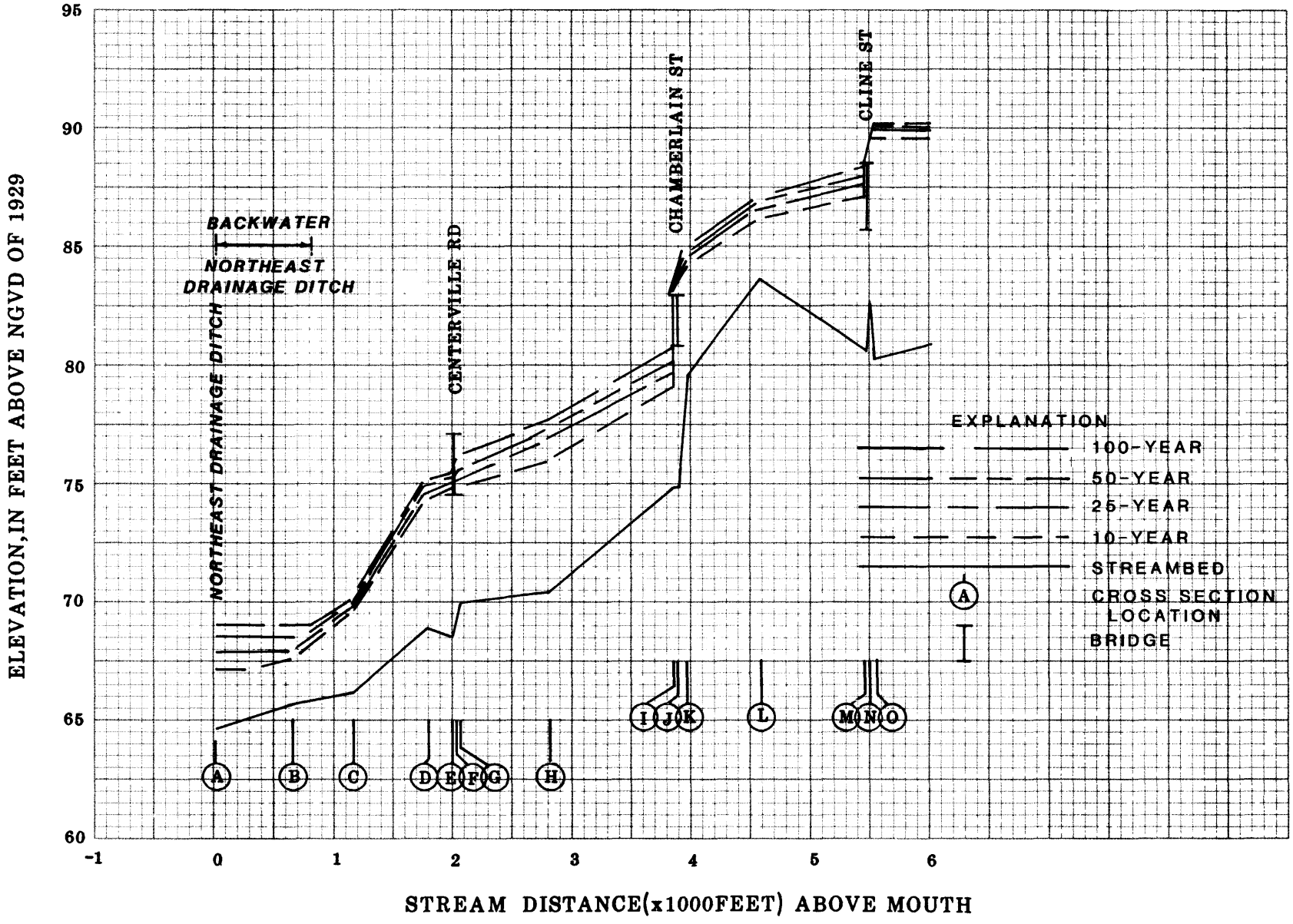

Figure 16.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for McCord Park Pond drainage ditch.

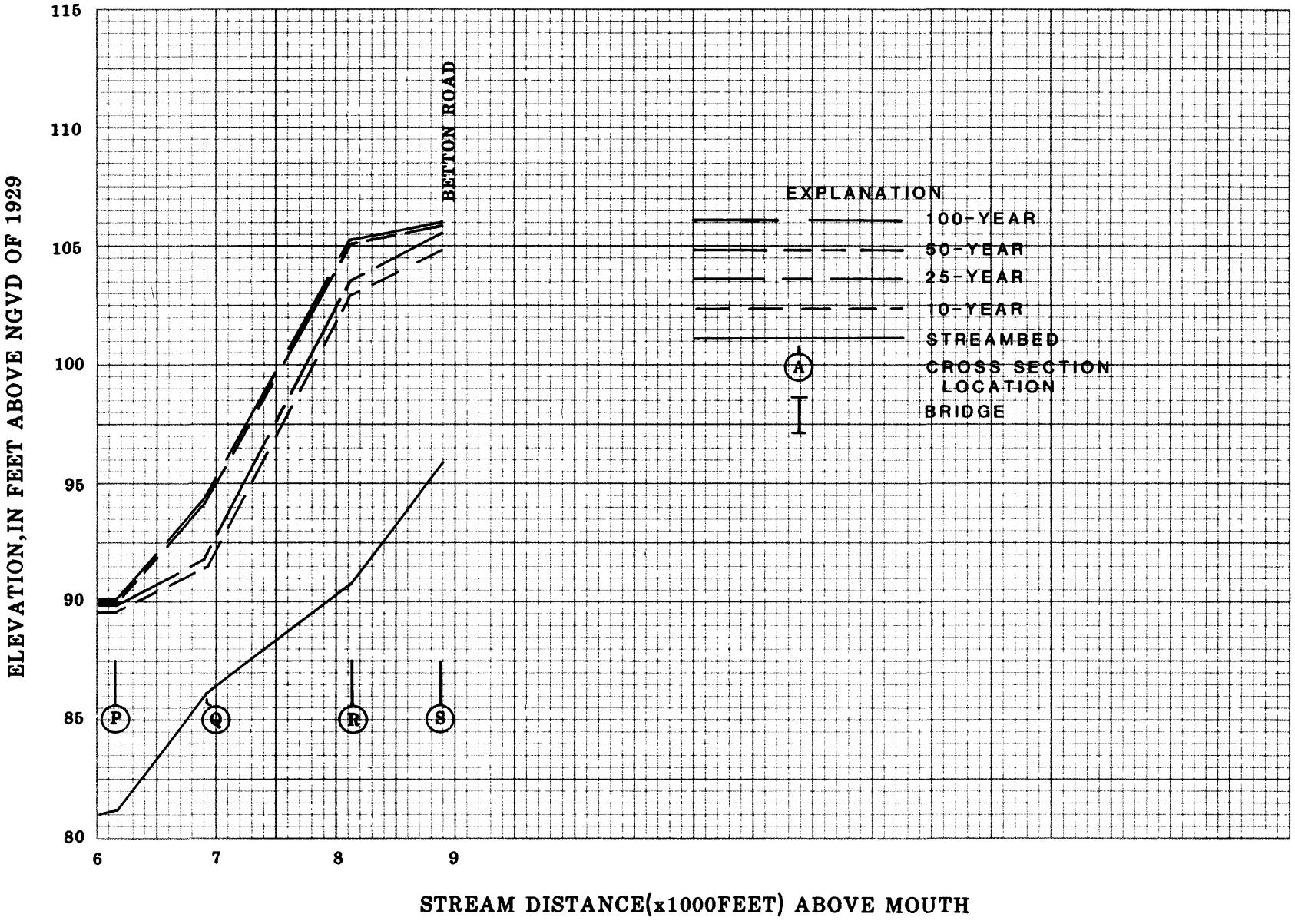

Figure 16.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for McCord Park Pond drainage ditch--Continued.

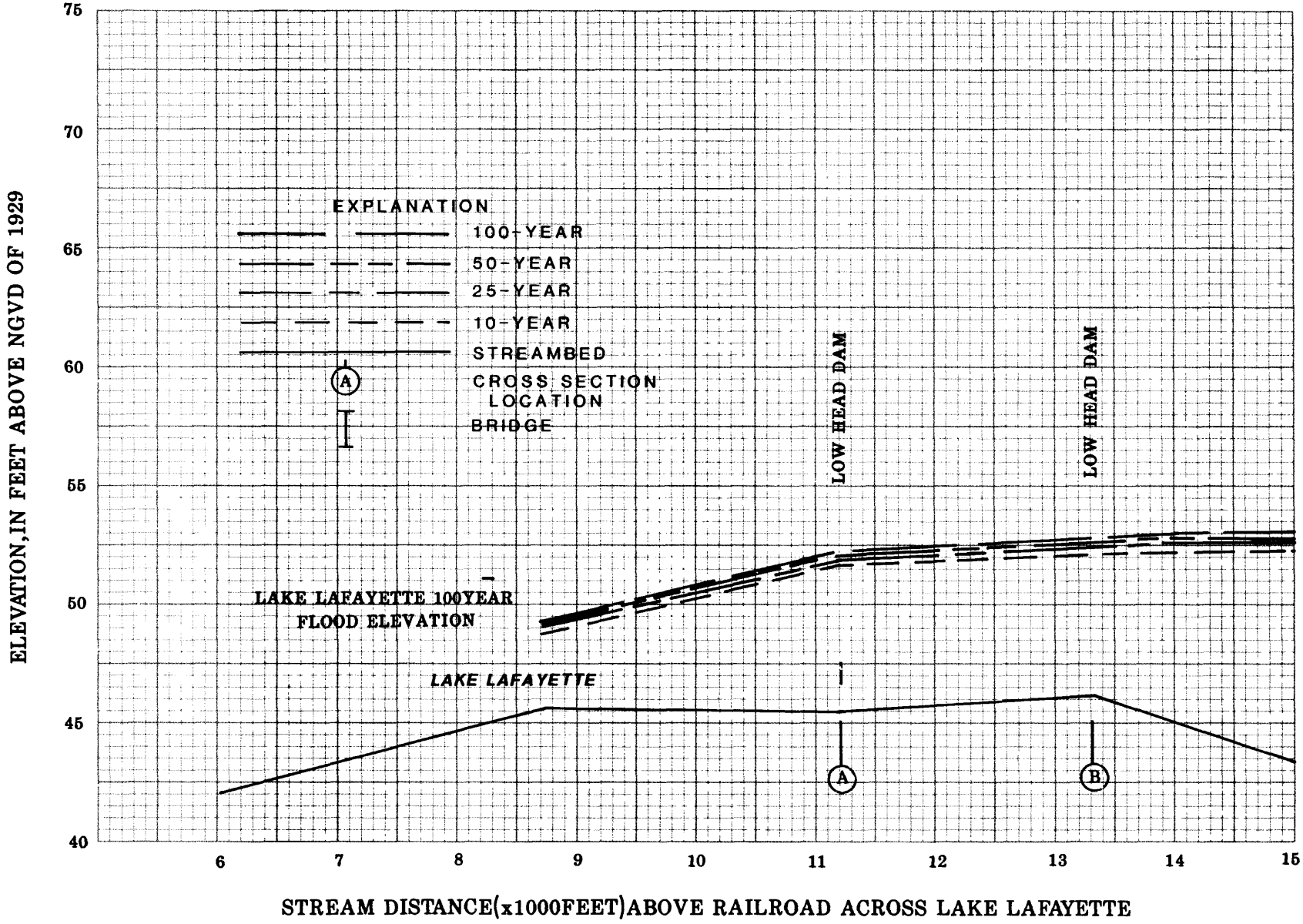

Figure 17.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Alford Arm Tributary.

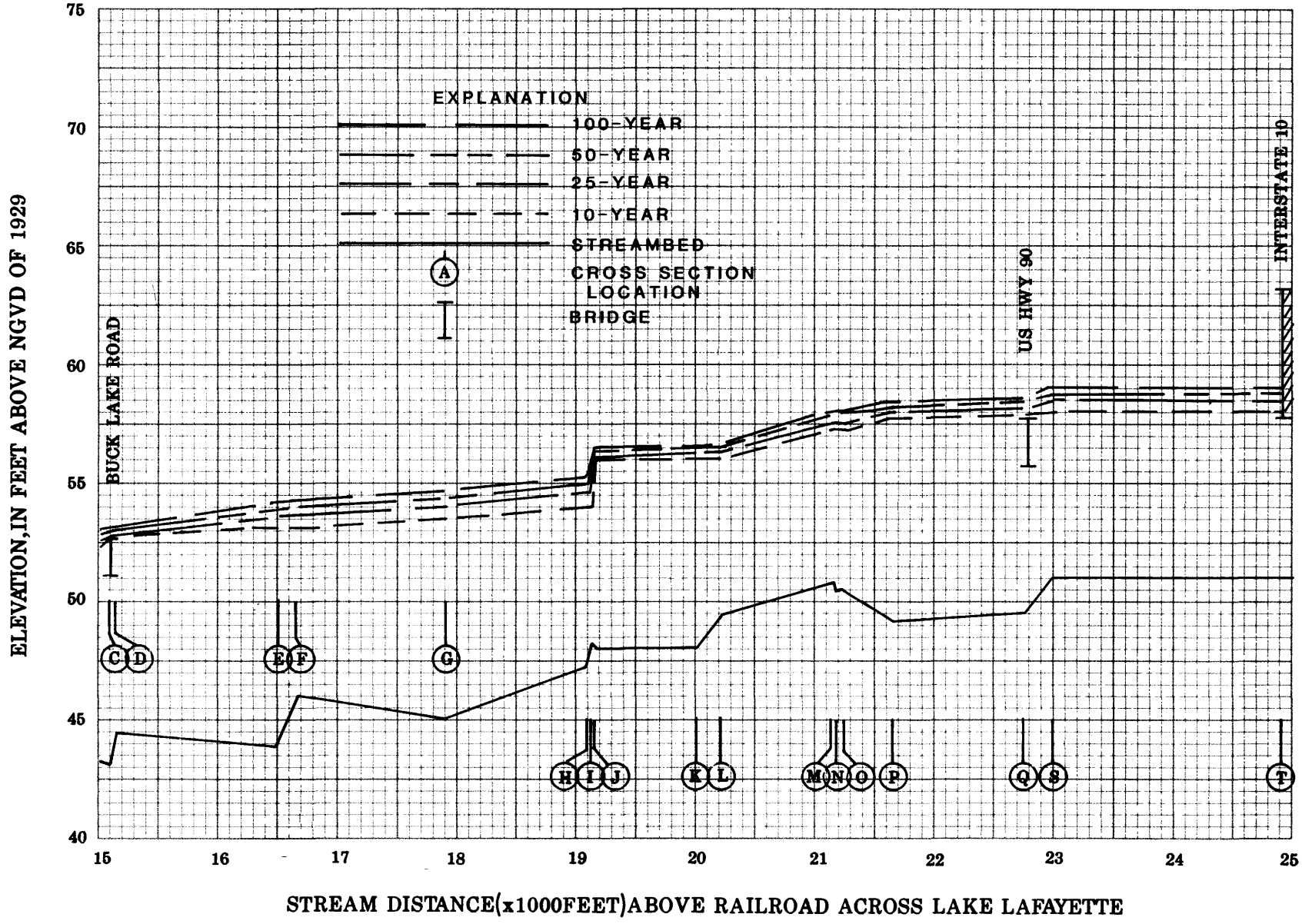

Figure 17.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Alford Arm Tributary--Continued.

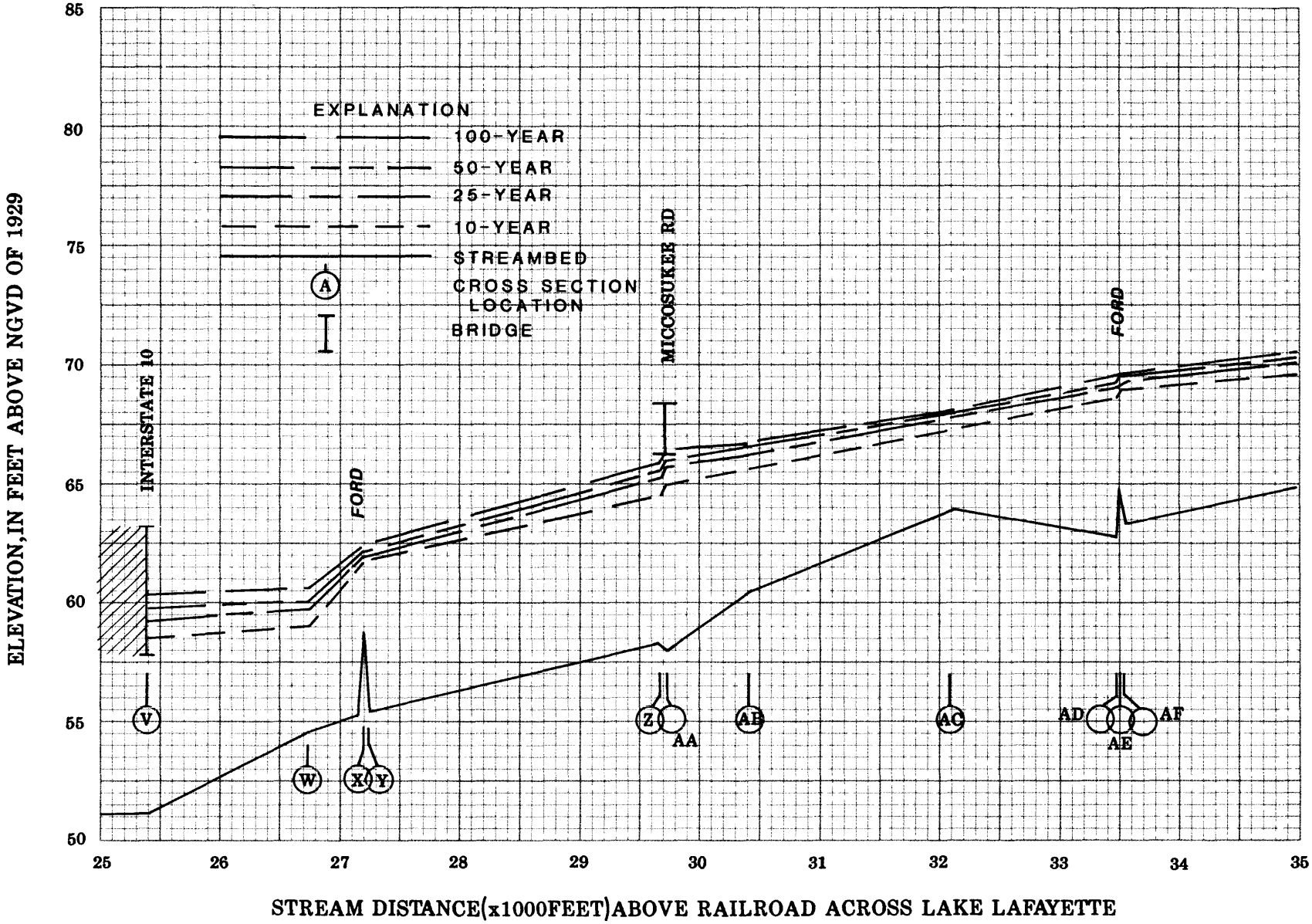

Figure 17.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Alford Arm Tributary--Continued.

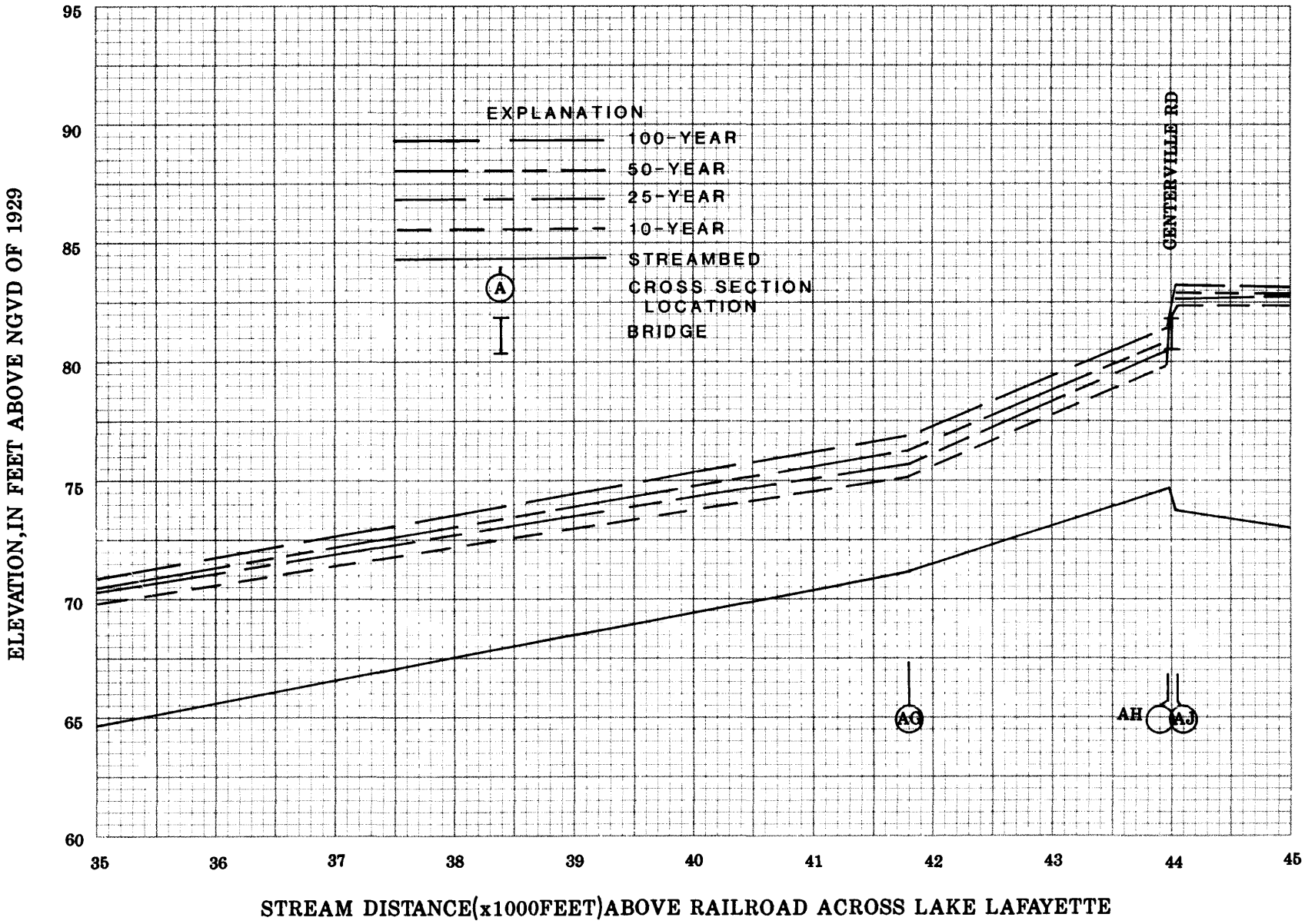

Figure 17.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Alford Arm Tributary--Continued.

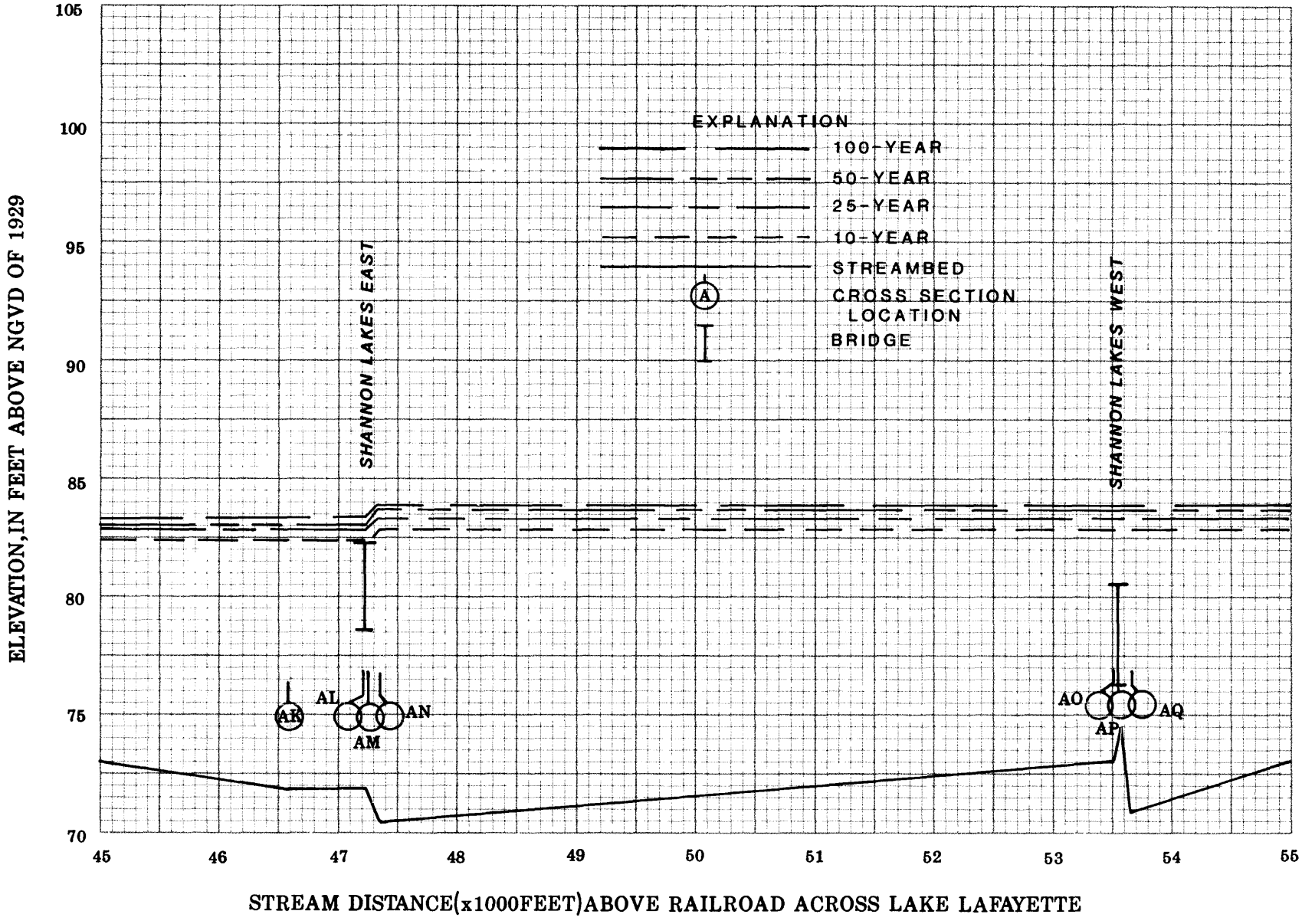

Figure 17.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Alford Arm Tributary--Continued.

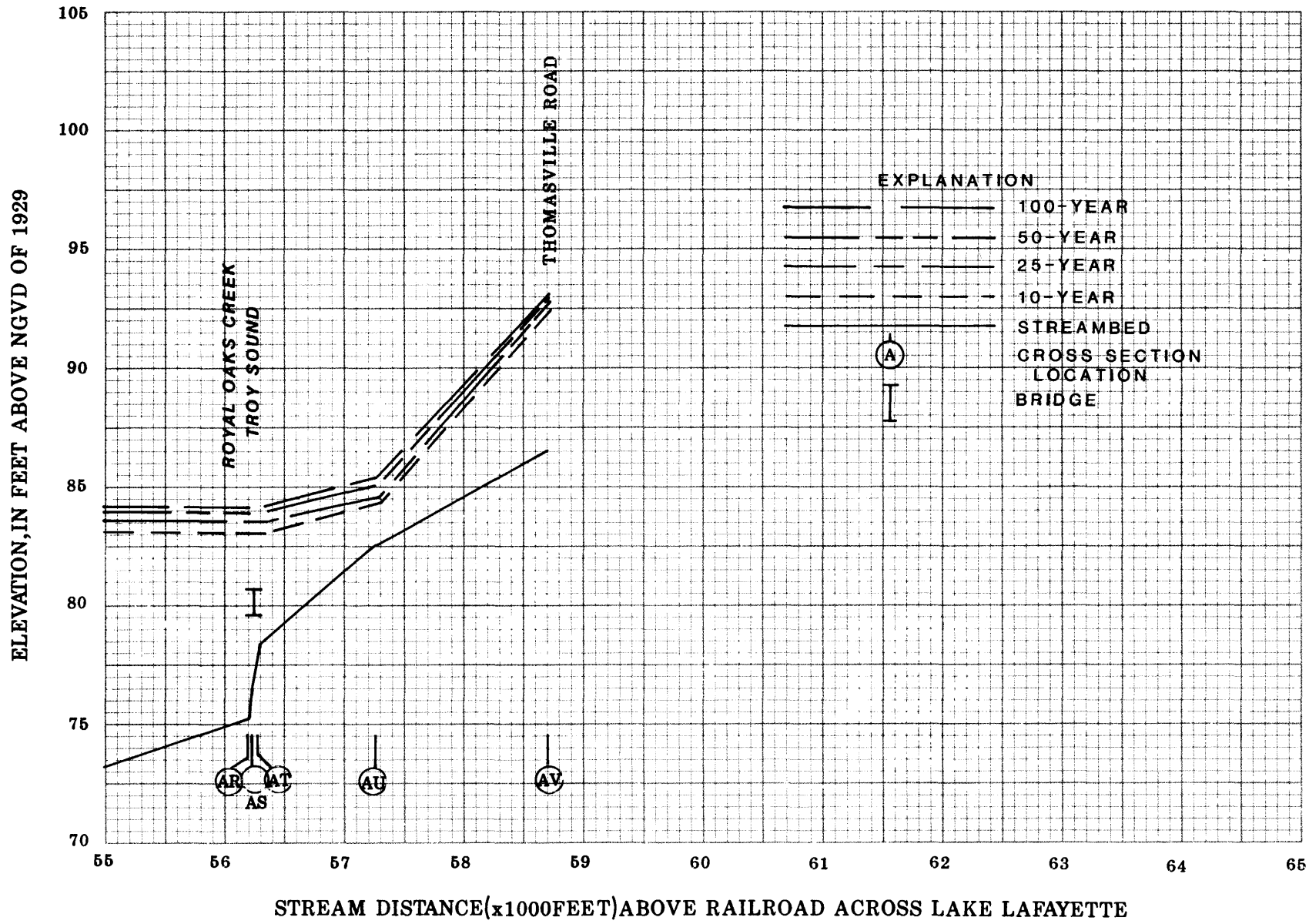

Figure 17.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Alford Arm Tributary--Continued.

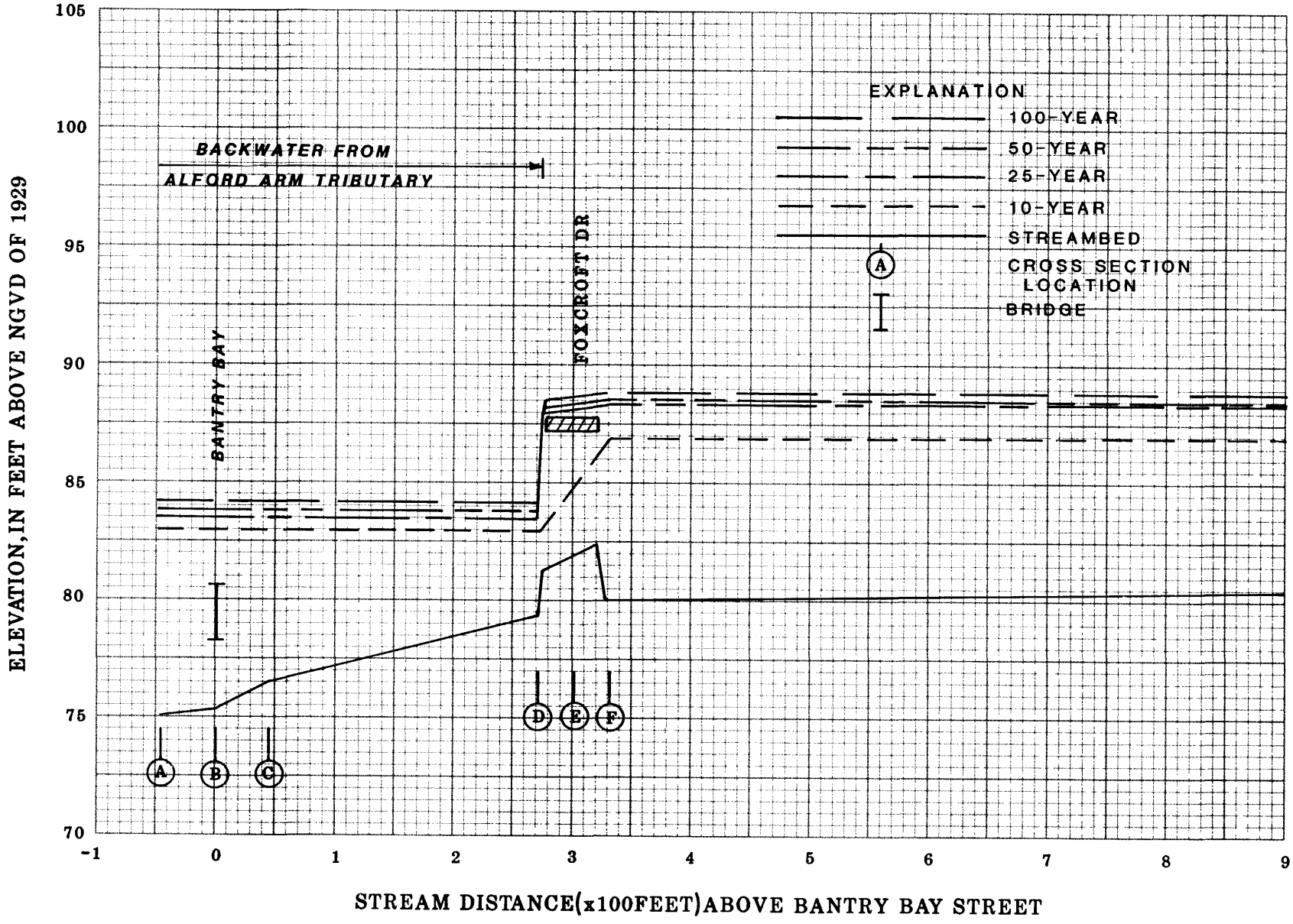

Figure 18.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Royal Oaks Creek.

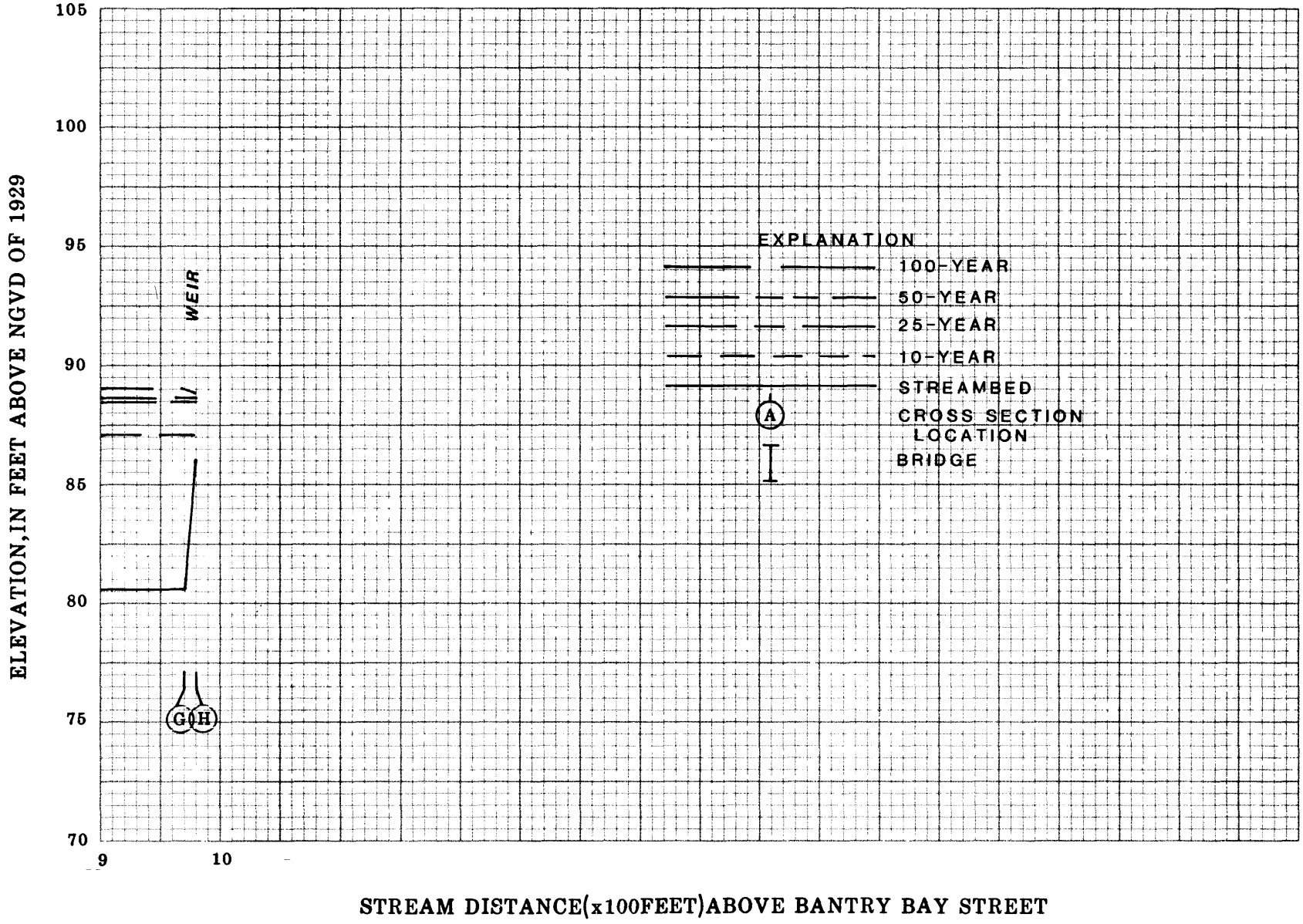

Figure 18.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Royal Oaks Creek--Continued.

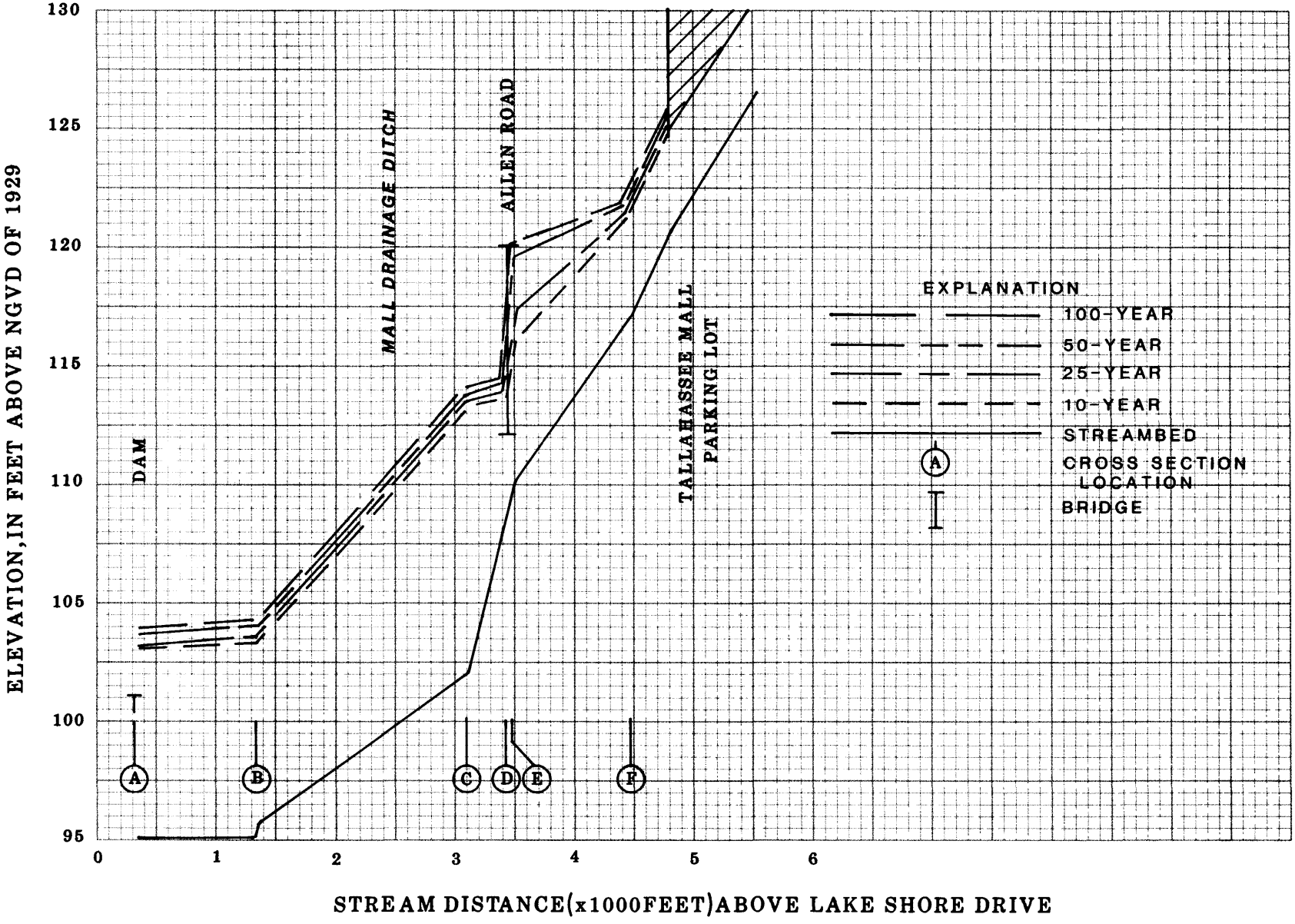

Figure 19.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Megginnis Arm Tributary.

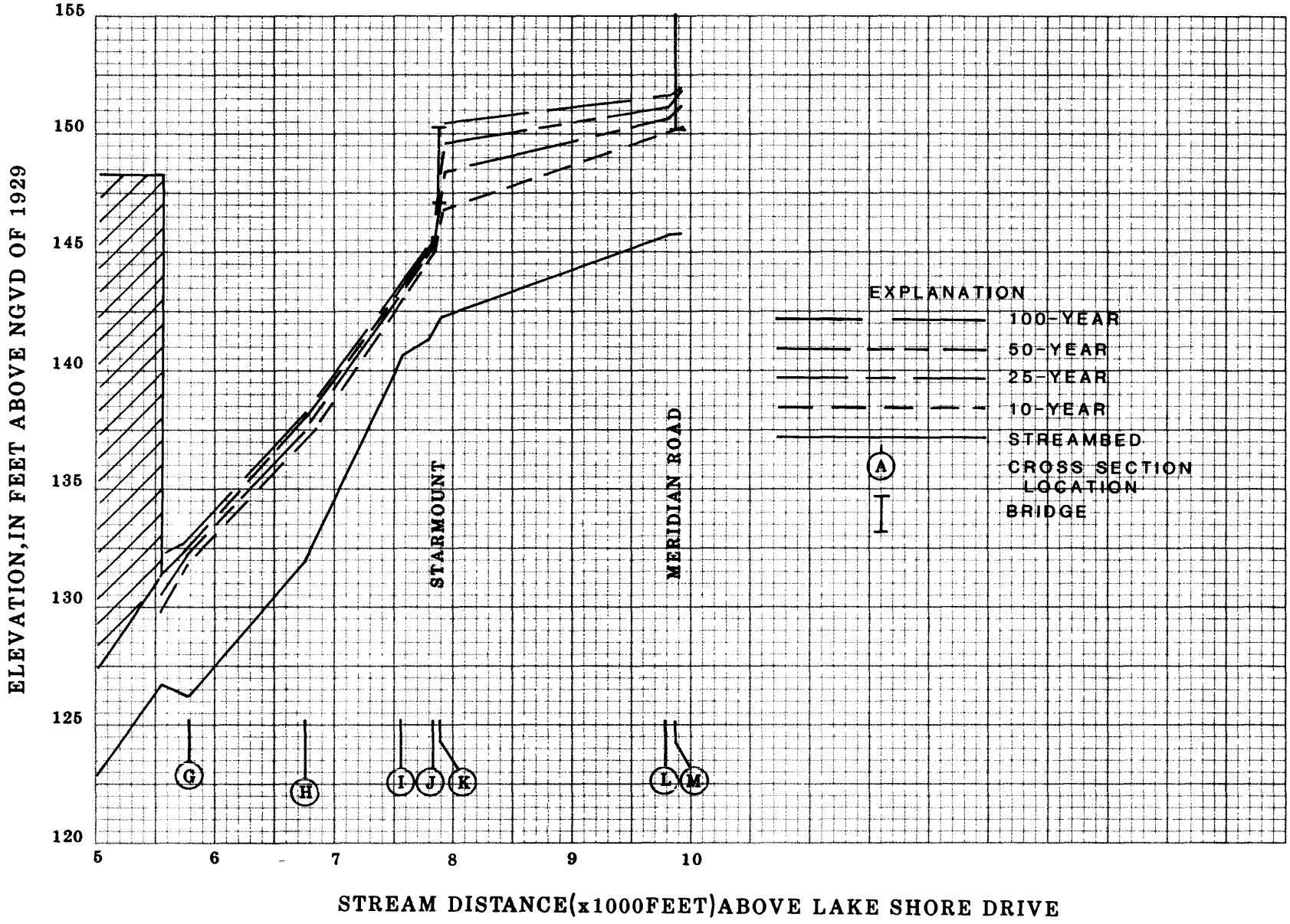

Figure 19.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Megginnis Arm Tributary--Continued.

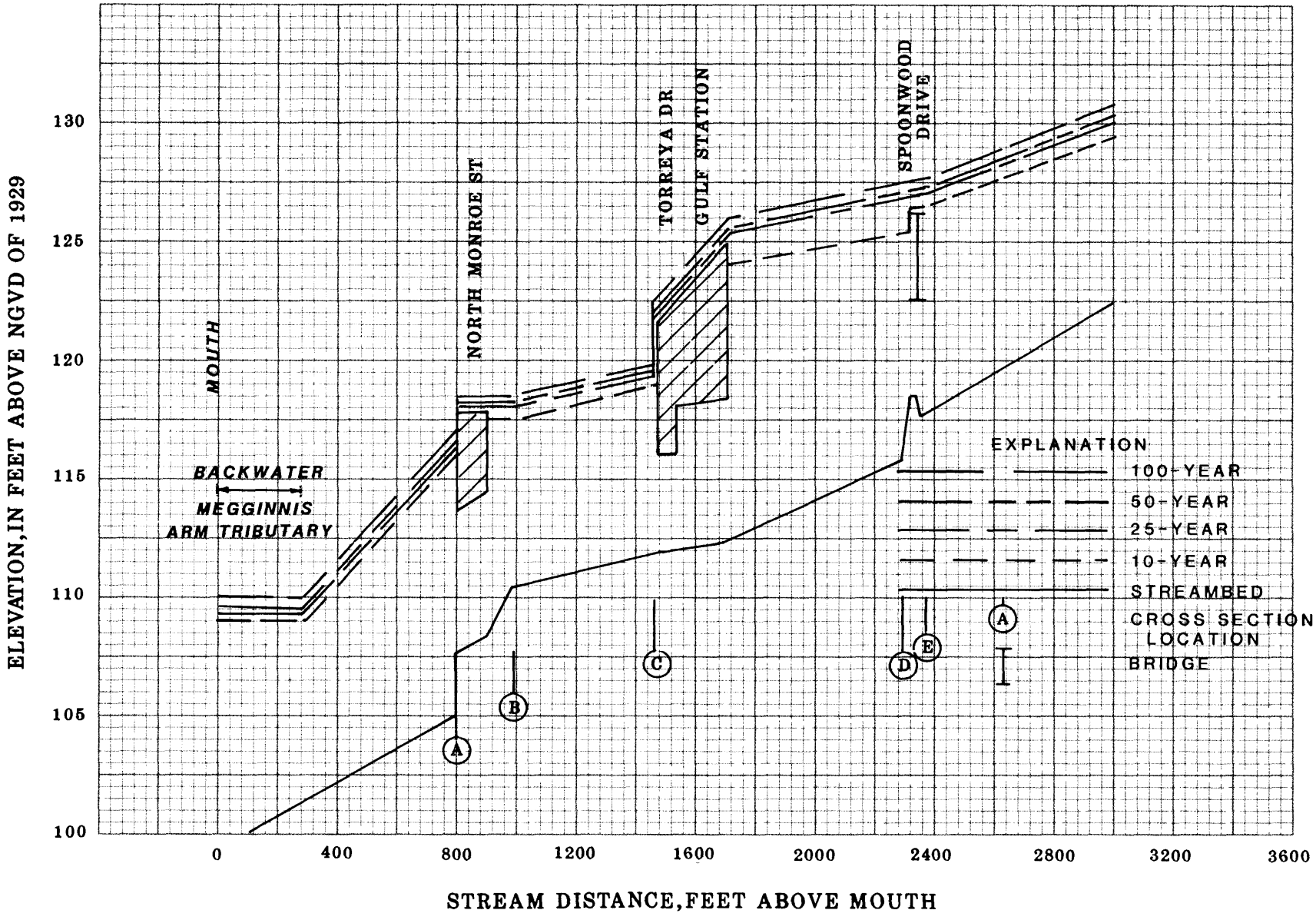

Figure 20.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Mall drainage ditch.

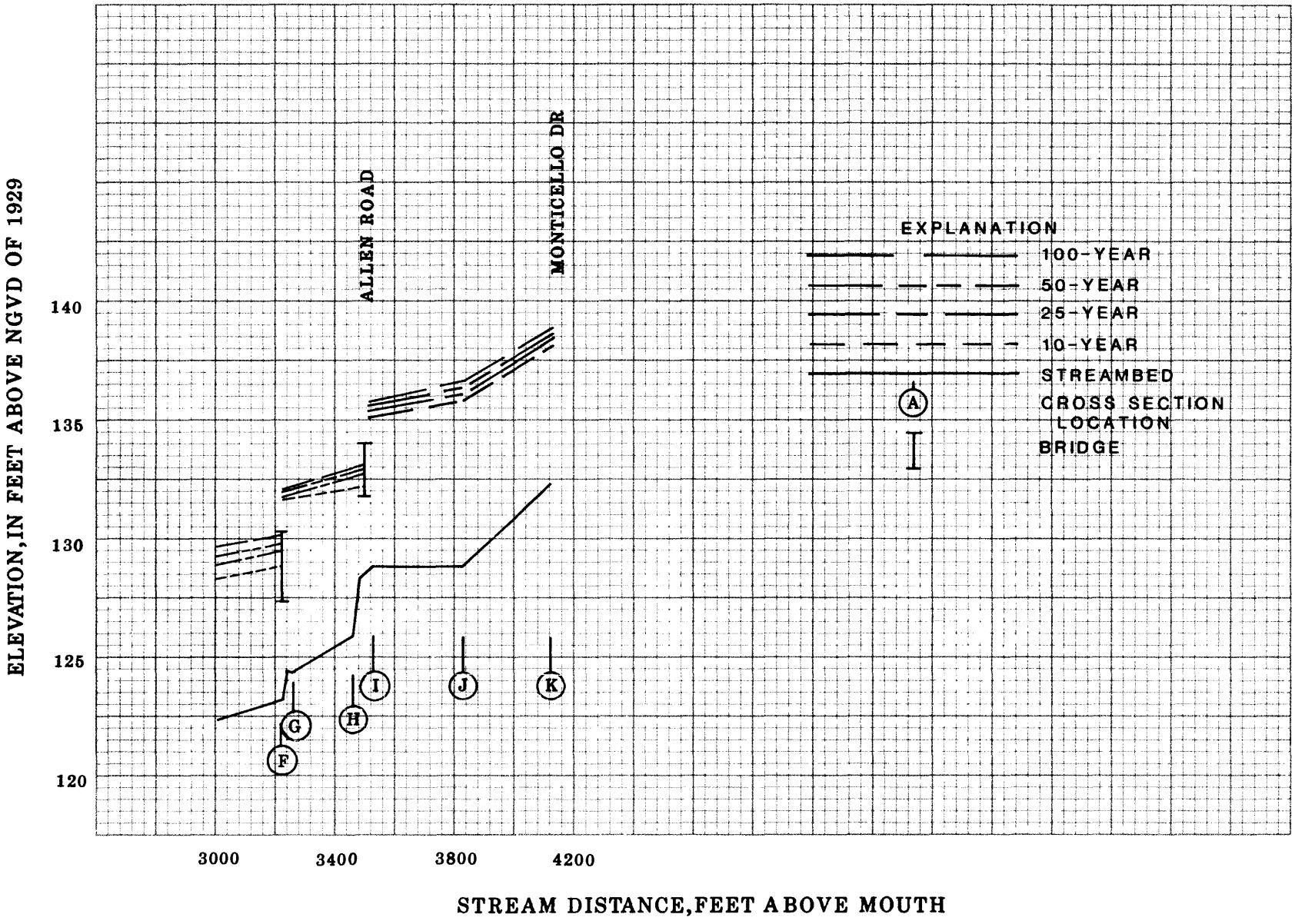

Figure 20.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Mall drainage ditch--Continued.

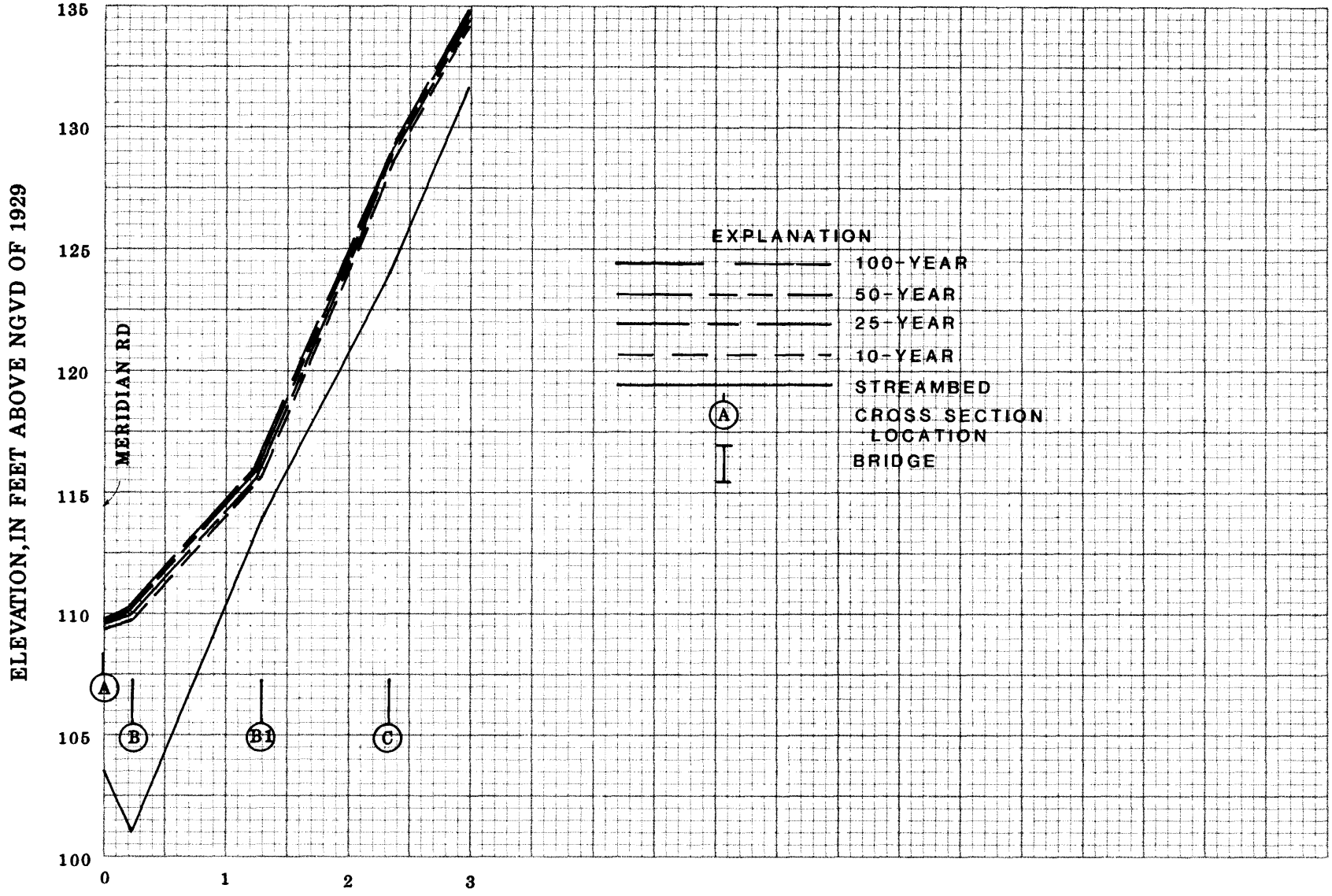

Figure 21.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Fords Arm Tributary.

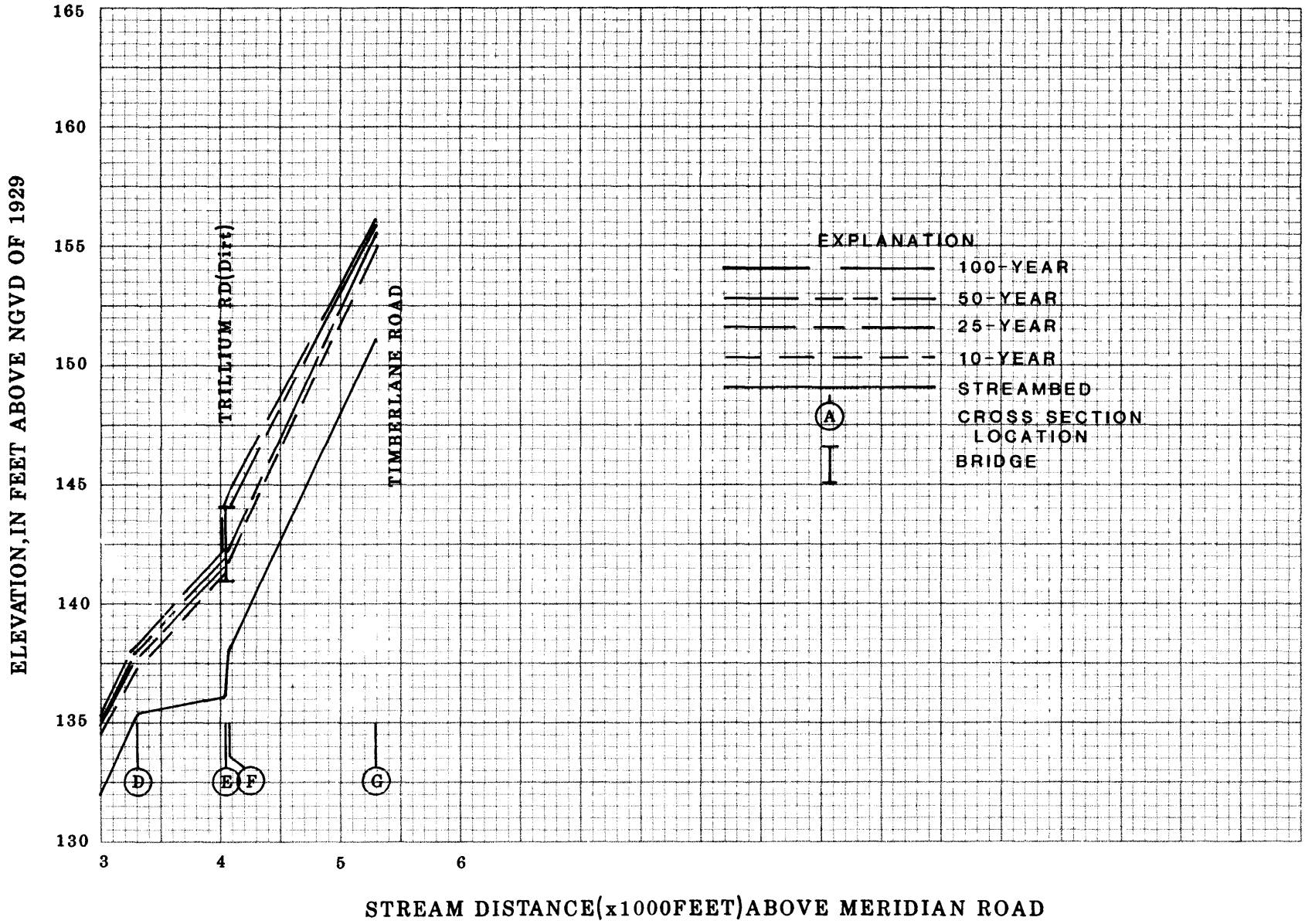

Figure 21.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Fords Arm Tributary--Continued.

Lake Overstreet outflow starting elevations were determined from a rating determined by computing flow over Meridian Road. A small pipe under the road was not used in the computation because the pipe capacity is a very small percentage of the total flow. Meridian Road will not be subject to backwater from Lake Jackson during periods of high flood elevations. The peak from stream flooding will overtop the road. The flood profiles for Lake Overstreet outflow are shown in figure 22.

SUMMARY

A U.S. Geological Survey step-backwater program was used to develop profiles of the 10-, 25-, 50-, and 100-year recurrence interval floods for the streams that drain developed areas in Leon County and the city of Tallahassee, Fla. The principal streams in the Lake Munson, Lake Lafayette, and Lake Jackson basins were studied. The flood elevations are generally higher than those in the Flood Insurance Studies for Tallahassee (1976) and Leon County (1982). The primary reason for the higher profiles is that peak discharges used in this report are larger than those used previously, largely due to changes in land use. The flood profiles for Bradford Brook, North Branch Gum Creek, and West Branch Gum Creek generally match those in the Leon County Flood Insurance Studies. Channel improvements in some areas would lower the flood elevation in that area, but would probably increase flooding downstream.

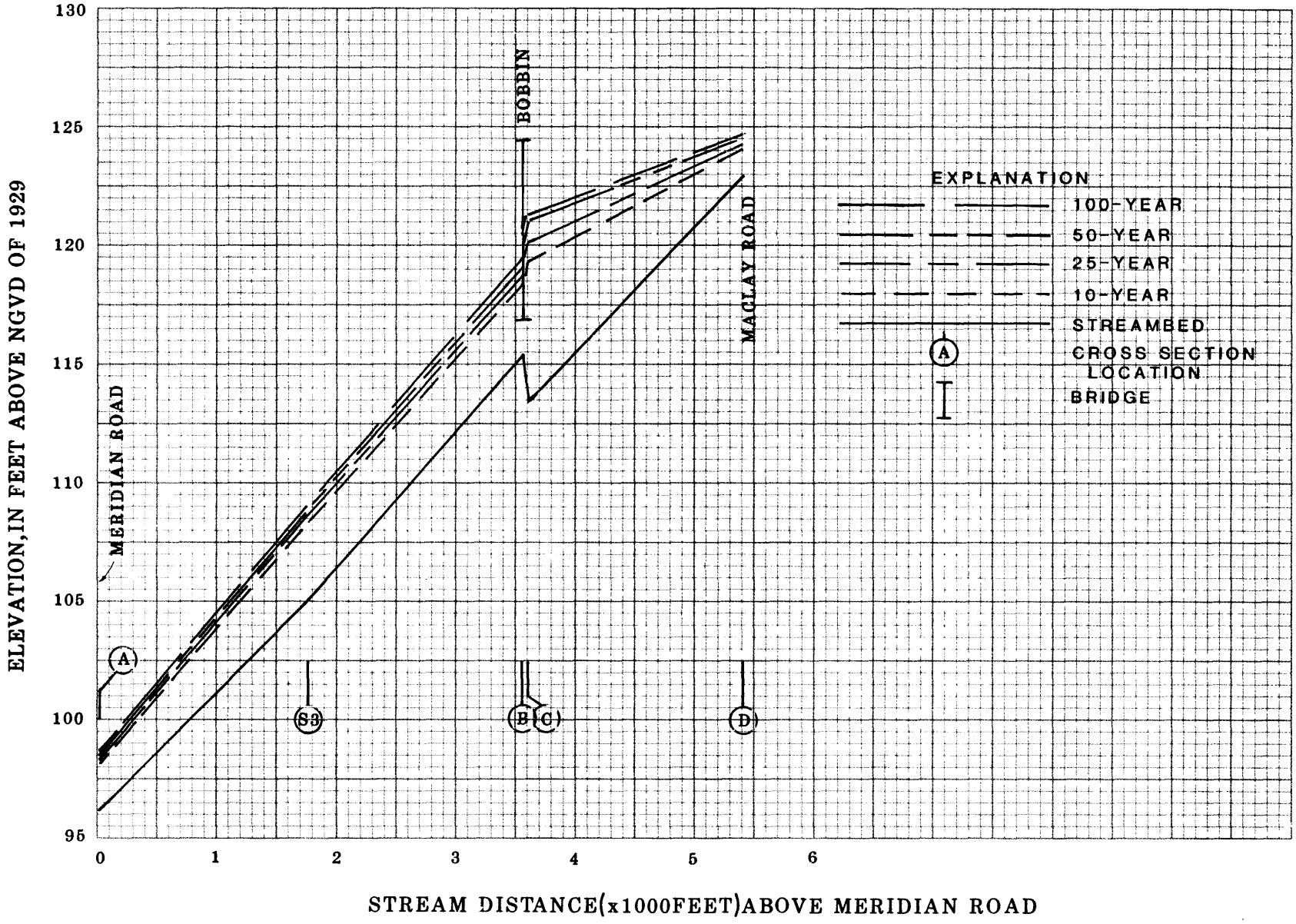

Figure 22.--Water-surface profiles for 10-, 25-, 50-, and 100-year recurrence interval floods for Lake Overstreet outflow.

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SUPPLEMENTAL DATA

LIST OF REFERENCE MARKS

Reference mark	Elevation in feet above NGVD of 1929	Description of location
		Munson Slough
MS1	33.98	Chiseled "X" on north-northwest end of bridge over Munson Slough on Crawfordville Highway (State Highway 369), 1.3 miles south of Capital Circle.
MS2	37.29	High point of nail in centerline of State Highway 369 at Munson Landing Road, 0.6 mile south of Capital Circle.
MS3	37.80	Chiseled square on east culvert wall, on State Highway 369, about 70 feet south of intersection with Eastern Drive, about 0.3 mile south of Capital Circle.
MS4	31.37	Chiseled X atop Lake Munson Dam at the staff gage.
MS5	50.55	Top of metal flange attached to north rail of Capital Circle bridge over Munson Slough, 0.7 mile east-southeast of intersection of Capital Circle and Springhill Road.
MS6	65.64	BM Z 283. Standard tablet located about 170 feet southwest of intersection of Seasons Lane and State Highway 373 (Springhill Road), 73 feet south of centerline of Seasons Lane, 39 feet northwest of centerline of State Highway 373, 0.8 mile northeast of Capital Circle.
MS7	40.16	Chiseled mark and/or paint mark atop southwest corner of bridge over Munson Slough on Lake Bradford Road.
		Lake Bradford
LB8	36.04	Top of south headwall of bridge over Bradford Brook on Lakeview Drive, 0.3 mile west of Lake Bradford Road.
LB9	38.92	Chiseled square atop northwest corner of Capital Circle (State Highway 263) bridge over Bradford Brook. Bridge is between Lake Hiawatha and Lake Cascade, and about 0.35 mile south of intersection of State Highways 263 and 371.
LB10	54.43	BM D 203. About 1.4 miles north along the paved road from the Tallahassee Municipal Airport entrance, at the junction of State Highways 371, 263, 55 feet southwest of the center of S-371, 22 feet northwest of the center of a paved road, in the top of the southwest end of the northwest concrete culvert abutment.
		Bradford Brook
BB11	99.19	Chiseled square atop concrete post, located 50 feet southeast of intersection of centerlines of Van Delia Road and Sullivan Road, and 0.4 mile east of Aenon Church Road.

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
BB12	48.41	Chiseled square 1 foot from southeast end of bridge over Bradford Brook on Aenon Church Road, 2.7 miles south of U.S. Highway 90 about 500 feet south of Aenon Church building.
		West drainage ditch
WD13	59.31	Chiseled square atop southwest wingwall of pipe-arch culvert at end of Century Park Drive.
WD14	67.75	Chiseled square atop second guardrail post from east end of culverts on upstream side of U.S. Highway 90 (Tennessee Street), 0.1 mile east of Seaboard Coastline Railroad overpass on Tennessee Street and about 0.3 mile west of intersection of Tennessee Street and Appleyard Drive.
WD15	77.02	BM Q 164. Standard disk on west side of Mission Road, 201 yards south of intersection of Tharpe Street (State Highway 158) and Mission Road, 44 feet east of east rail of Seaboard Coastline Railroad, about level with the track and set in the top of a concrete post projecting one inch.
WD16	68.10	High point of railroad spike (painted yellow) in power pole on south side of Mission Road, 94 feet east of intersection with Greenon Lane and 54 feet south of the upstream end of the culvert barrels under Mission Road.
WD17	63.33	High point of 60 D nail in power pole on east side of Greenon Lane 0.3 mile northeast of the intersection of Greenon Lane and Mission Road.
WD18	61.81	"M" in rim of "SMITH BROS. FDRY" grate set in streetward edge of sidewalk on east side of Trimble Road about 100 feet south of intersection with Avacado Drive in Countryside Mobile Park.
WD19	63.90	Chiseled square in roadward side of sidewalk on east downstream end of bridge on Vega Drive, 12 feet south of centerline of Vega Dr. and 24 feet west of Firebird Circle in Countryside Mobile Park.
WD20	69.08	Chiseled square in upstream west end of culvert headwall about 100 feet east of entrance to Maranatha Christian School on Tharpe Street (State Highway 158).
WD21	99.31	Chiseled square atop downstream headwall of culvert at intersection of Hartsfield Road and Hartsfield Way adjacent to stop sign on southeast side of intersection.
WD22	125.40	Chiseled square atop curb on east side of Talco Hills Drive at intersection with Darnell Circle.

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
WD23	50.60	Railroad spike in base of 16-inch pecan tree 72 feet west of northwest corner of bridge over drainage ditch on Roberts Avenue and 29 feet north of centerline of Roberts Avenue.
WD24	47.21	Yellow paint mark atop southeast end of culvert headwall on Chipley Street.
WD25	49.63	Chiseled square atop northeast end of culvert headwall on entrance road to businesses between Chipley Street and Yulee Street.
		Gum Creek
GC26	59.10	BM R 155. Standard disk 57 feet northeast of northeast rail, 2 feet southeast of a pile of concrete, about 0.25 mile northeast of State Highway 20 overpass and 200 to 300 feet southwest of State Highway 263 (Capital Circle).
GC27	59.86	Top of bolt atop south side of railroad bridge about 700 feet upstream from confluence with North Gum Creek and 1.0 mile west of State Highway 263 (Capital Circle); about 0.25 mile south of Gum Road.
GC28	59.65	Nail in south side of wooden railroad bridge 0.2 foot below top of bridge, 700 feet upstream from confluence with North Gum Creek, about 3,000 feet westnorthwest of State Highway 263 (Capital Circle) at railroad overpass and about 3700 feet east of Aenon Church Road.
GC29	70.57	Nail in power pole near north right-of-way of State Highway 20, 100 feet east of dirt road entrance off State Highway 20, 0.5 mile east of Aenon Church Road.
GC30	100.72	Nail in west side of power pole, 4.5 feet above ground level, at southwest corner of intersection of State Highway 20 and Aenon Church Road.
GC31	69.20	Nail in end of southeast beam of West Gum Creek Bridge on Aenon Church Road, about 0.25 mile north of State Highway 20, and 1.2 miles south of U.S. Highway 90.
GC32	77.37	Nail in east side of power pole, 30 feet west of centerline of Aenon Church Road, 60 feet south of railroad tracks, 0.9 mile south of U.S. Highway 90.
GC33	102.14	Chiseled square atop west side of Barineau Road bridge at West Gum Creek, 0.5 mile north of State Highway 20 and 0.8 mile south of U.S. Highway 90.
GC34	146.22	BM 28 CRH. Standard tablet stamped "28 CRH 1969", set in south headwall of culvert 3.9 miles along State Highway 20 from U.S. Highway 90, 17 feet south of road centerline, and 63 feet southeast of power pole no. 154.

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
GC35	156.04	BM 29 CRH. Standard disk in center of south headwall of culvert along State Highway 20, 20 feet south of centerline of road, 0.2 mile west of intersection with State Highway 260.
GC36	59.85	Top of northeast corner of cement end wall on Gum Road bridge over North Gum Creek, 0.3 mile west-southwest of State Highway 263 (Capital Circle).
GC37	54.67	Chiseled square atop northeast corner of headwall of culvert on Gum Road, about 100 feet west of State Highway 263 (Capital Circle).
GC38	56.08	Chiseled square in southwest upstream corner of culvert headwall 41 feet north of intersection of Swamp Fox Road and State Highway 263 (Capital Circle).
GC39	96.25	Nail in pine tree near west right-of-way of State Highway 263 (Capital Circle), at dirt road leading west to mobile home area; about 0.3 mile north of Gum Road,and 0.4 mile south of U.S. Highway 90.
GC40	81.59	Top of highway right-of-way marker, northeast corner of intersection of U.S. Highway 90 and State Highway 263 (Capital Circle).
GC41	73.46	Chiseled square atop east end of north end wall of U.S. Highway 90 bridge over North Gum Creek, 0.6 mile west of State Highway 263 (Capital Circle).
GC42	70.22	Top of south wingwall at south culvert opening, on west side of paved road into Bell's Mobile Home Park area, 0.7 mile west of Capital Circle along U.S. Highway 90, then about 800 feet north.
GC43	64.13	Top of roadward Dickson Marker on southeast (downstream) end of bridge curb on State Highway 20, 1.0 mile south of intersection of State Highway 20 and U.S. Highway 90 (Tennessee Street).
		Central drainage ditch
CD44	45.09	Chiseled arrow atop south edge of headwall on concrete bridge over Central Ditch on Orange Avenue, 520 feet west of State Highway 373 (Springhill Road). One foot west of center pier.
CD45	81.19	BM X 283. Standard C&GS disk set in northwest end of sidewalk of Seaboard Coastline Railroad overpass on Orange Avenue 0.27 mile east of Springhill Road (State Highway 363), and about 0.2 mile west of intersection of Holton Street and Orange Avenue.
CD46	45.10	BM Y 283. FLA. SRD disk set in top of downstream headwall, 20 feet west of east end of headwall of Orange Avenue bridge, about 300 feet west of State Highway 373 (Springhill Road).

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
CD47	49.78	Yellow paint mark atop ninth guardrail post near upstream side of culvert under Springhill Road (State Highway 373), 35 yards north of intersection of Mill Street and Springhill Road.
CD48	63.90	Chiseled "X" atop southeast end of concrete bridge guardrail on Gamble Street, immediately upstream from sewage disposal plant, and about 0.05 mile east of Lake Bradford Road.
CD49	55.01	Chiseled square atop center of northwest (upstream) culvert headwall on Lake Bradford Road, 40 feet south of the intersection of Eppes Drive and Lake Bradford Road.
CD50	63.10	Hacksaw mark cut into top of metal guardrail, near left center of guardrail, on downstream side of bridge on Airport Drive, about 0.15 mile west of its intersection with Lake Bradford Drive.
CD51	63.42	Chiseled square atop downstream handrail near southwest end of bridge on Jackson Bluff Road about 0.13 mile west of its intersection with Lake Bradford Road
CD52	55.08	Top of 1/4-inch bolt in bottom of crest stage indicator pipe mounted on downstream side of Gaines Street bridge.
CD53	63.28	Chiseled mark in top of downstream handrail, near 4th vertical post from southeast end of culverts on Stadium Drive.
CD54	62.55	Chiseled square in northwest corner of first concrete footbridge about 120 feet south of Pensacola Street, over drainage ditch southeast of Doak Campbell Stadium near east parking lot.
CD55	73.87	Chiseled square on north side of sidewalk on Wildwood Drive 130 feet west of its intersection with Woodward Avenue and approximately 50 feet west of Bldg. 904 (I.D. Card Office) for Florida State University.
		St. Augustine Branch
SA56	68.42	Chiseled square atop curb on west side of Seaboard Street, 15 feet north of its intersection with Stearns Street, and 6 feet east and 4 feet south of a railroad switch signal.
SA57	79.93	Chiseled square atop concrete street drain in curb, in southeast corner of intersection of Eugenia and Disston Streets, 21 feet east of centerline of Disston Street.
SA58	73.15	Chiseled square near center of upstream headwall of one lane bridge on Cleveland Street, 7 feet north of south end of bridge and 6 feet east of centerline of Cleveland Street.

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
SA59	81.17	Chiseled square near center of upstream handrail at bridge on Wahnish Way, 40 feet north of the intersection of Canal Street and Wahnish Way.
SA60	81.58	BM F 152. A standard disk stamped "F 1521954" set vertically in the south face of brick foundation of Seaboard Coastline Railroad freight station, 1.6 feet east of southwest corner of a corner of the building, 36 feet west of southeast corner of building, about 2.5 feet above ground, 54.5 feet west of centerline of Railroad Avenue and 23 feet north of north rail.
SA61	82.57	Chiseled square in center of downstream bridge curb on Van Buren Street, 57 feet north of its intersection with Canal Street.
SA62	81.50	Chiseled square near center of downstream side of bridge curb, on concrete bridge 40 feet upstream from a pipe arch culvert bridge at main entrance to Myers Industrial Park on Canal Street.
SA63	88.47	Chiseled square atop curb on east side of Adams Street in line with centerline of culverts, about 100 feet south of Seaboard Coastline Railroad tracks crossing Adams Street.
SA64	81.60	Chiseled square, on sidewalk, near center of upstream culvert headwall, on Monroe Street, about 100 feet south of Seaboard Coastline Railroad overpass on Monroe Street.
SA65	98.00	Base and guide meridian. A 1-foot square bronze tablet, at the intersection of extended Meridian Street and Bloxham Street, about 100 yards southeast of the old city jail, the top of center of a 12x12-inch square bronze plate on the top of a 2-foot high concrete monument which is on top of a 10-foot square concrete slab, about 21 yards north of centerline of Bloxham Street and about 3 feet above ground.
SA66	125.63	BM G 152. A standard disk stamped "G 152 1954", about 0.95 mile northeast along Seaboard Coastline Railroad from station, at the overpass of the track over Lafayette Street, in the top of the northwest end of the southeast wing wall of the overpass, 7 feet east of east rail, and about 0.5 foot below level of track.
SA67	103.76	Chiseled square atop concrete street drain, on west side of northbound lane of Franklin Blvd., 24 feet northwest of center of intersection of northbound lane of Franklin Blvd., and Pensacola Street, and 5 feet northeast of upstream east end of culvert headwall.

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
SA68	106.78	Chiseled square atop street curb, on west side of northbound lane of Franklin Blvd., 1 foot north of end of curb, 18 feet northwest of center of intersection of northbound lane of Franklin Blvd., and Jefferson Street.
SA69	105.88	Chiseled square atop street curb, on west side of northbound lane of Franklin Blvd., 24 feet northwest of center of intersection of northbound lane of Franklin Blvd and College Avenue, in line with center of sidewalk on upstream side of culvert, and 4 feet southeast of east end of upstream culvert headwall.
SA70	108.74	Chiseled square atop street curb, on west side of northbound lane of Franklin Blvd., 18 feet northwest of center of intersection of northbound lane of Franklin Blvd., and Park Avenue, and 3 feet south of south side of sidewalk on upstream side of culvert.
SA71	113.03	Chiseled square atop street curb, on west side of northbound lane of Franklin Blvd., 21 feet northwest of center of intersection of northbound lane of Franklin Blvd., and Call Street, 15 feet northeast of fire hydrant in median, and 6 feet south of east end of upstream culvert headwall.
		East drainage ditch
ED72	36.44	Chiseled square atop northeast end of upstream culvert headwall on North Ridge Road 0.4 mile south of its intersection with Springsax Road, and about 200 feet north of Sunnyside Drive.
ED73	42.13	Chiseled square atop southwest culvert headwall on Bragg Drive about 15 feet east of intersection with Glynwood Drive.
ED74	44.72	High point of vertical railroad rail, 1.6 feet above ground level at apex of curve at Lennox Drive and Glynwood Drive about 30 feet north of northeast side of road.
ED75	47.65	Chiseled square atop northwest end of culvert headwall on Wahnish Way 0.1 mile south of its intersection with Orange Avenue.
ED76	50.72	Chiseled square on east upstream end of culvert headwall on Orange Avenue, about 0.2 mile west of intersection of Orange Avenue and Adams Street.
ED77	54.70	Chiseled square in upstream southeast corner of upper culvert headwall on Adams Street 0.1 mile north of its intersection with Orange Avenue.

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
ED78	58.85	High point of 40 D nail, 1.0 foot above ground level, in east side of power pole, 30 feet south of centerline of culverts on upstream side of Monroe Street, 20 feet east of centerline of Monroe Street, 0.10 mile north of its intersection with Orange Avenue.
ED79	57.40	Chiseled square atop northeast end of culvert headwall on Meridian Road, about 0.10 mile north of its intersection with Orange Avenue.
ED80	56.93	Chiseled square atop southeast end of culvert headwall on Texas Street, about 0.10 mile north of its intersection with Polk Drive.
ED81	61.71	Chiseled square atop curb adjacent to northeast end of bridge on Brighton Road at its intersection with Orange Avenue.
ED82	63.47	Chiseled square atop curb adjacent to northeast end of bridge on Country Club Drive at its intersection with Orange Avenue.
ED83	66.20	Chiseled square in northwest end of downstream sidewalk over drainage ditch on Pontiac Drive at its intersection with Orange Avenue.
ED84	65.90	Chiseled square atop northwest downstream abutment of footbridge, immediately downstream of bridge on Dozier Road at its intersection with Orange Avenue.
ED85	69.87	Chiseled square atop northeast end of culvert headwall on Jim Lee Road at its intersection with Orange Avenue.
ED86	74.60	The northwest end of downstream culvert headwall, 25 feet north of centerline of Orange Avenue and about 0.35 mile east of intersection of Orange Avenue and Jim Lee Road.
ED87	92.00	Chiseled "X" in top of southeast (downstream) handrail of bridge on Wekewa Nene, about 0.3 mile east of Jim Lee Road.
ED88	91.80	Chiseled square atop southeast end of culvert headwall at bridge on Hasosaw Nene about 200 feet east of its intersection with Atapha Nene.
ED89	103.66	Chiseled square atop southeast end of culvert headwall at bridge on Chocksacka Nene about 0.1 mile east of West Indian Head Drive.
ED90	118.35	Chiseled square in center of downstream culvert headwall at bridge on Holokin Nene about 200 feet east of West Indian Head Drive.
ED91	140.31	Top of aluminum brace on left shoreward side of walkway to USGS raingage on Apakin Nene about 150 feet east of West Indian Head Drive.

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
		Northeast drainage ditch
NE92	47.90	Chiseled square atop downstream headwall over culverts under Weems Road, 0.5 mile south of U.S. Highway 90 at North Branch Lake Lafayette Drainage.
NE93	93.96	DOT tablet set in concrete at northwest corner of State Highway 261 (Capital Circle) bridge over railroad tracks, 0.4 mile south of U.S. Highway 90 intersection.
NE94	125.04	High point of railroad spike in power pole on southwest corner of intersection of U.S. Highway 90 and Weems Road, 3.0 feet northwest of Calvary Church sign, and 0.3 mile east-northeast of State Highway 261 (Capital Circle).
NE95	56.06	Chiseled square atop downstream culvert headwall, on U.S. Highway 90 bridge over west branch tributary to Lake Lafayette, 0.25 mile west of State Highway 261 (Capital Circle).
NE96	74.76	Chiseled square on south edge of downstream culvert headwall on Centerville Road, 22.5 feet east of west end of headwall, 20 feet south of centerline of Centerville Road, and about 0.5 mile west of intersection of Centerville Road and State Highway 261 (Capital Circle).
NE97	83.54	BM LEO 68. Florida Department of Natural Resources bronze disk, stamped "LEO 68 BSM 1983", set in top of north end of upstream culvert headwall, 125 feet north of intersection of Centerville Road and State Highway 261 (Capital Circle).
NE98	100.52	High point of 20P nail in north side of power pole, on east side of Capital Circle, 1,640 feet north of intersection of Capital Circle and Centerville Road.
NE99	96.14	High point of 16P galvanized nail on south side of power pole in southeast corner of intersection of Greer Road and Lonnbladh Road.
NE100	99.82	High point of railroad spike in south side of 42-inch gum tree near northeast corner of intersection of Lonnbladh Road and Capital Circle.
NE101	141.25	Florida DOT tablet stamped"BM I10 K 13 LEO 66 1983", set in southeast end of culvert headwall, 11 feet southwest of fire hydrant, on east side of Capital Circle at entrance to Eastgate Subdivision.
NE102	114.64	Chiseled square atop street curb, adjacent to stop sign, at southwest corner of intersection of Danshire Drive and Eastgate Way.
NE103	157.06	Chiseled square atop street curb about 30 feet south of driveway at 2525 Whisper Way.

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
		Northeast drainage ditch tributary No. 1
PA104	59.95	Chiseled square in bridge curb, 6 feet east of west upstream end of small concrete bridge at rear entrance to U-Store-It buildings on Capital Circle (State Highway 261), about 0.3 mile south and 0.2 mile west of intersection of Capital Circle and U.S. Highway 90.
PA105	69.63	BM M 152. A standard USC&GS disk stamped "M 152 1954", about 4.2 miles east along the Seaboard Coastline Railroad from the station at Tallahassee, about 0.7 mile southwest of the crossing of State Highway 261 at Perkins, 56.5 feet southeast of southeast rail, 174.5 feet east-northeast and across track from mile post 795, 1 foot northwest of a fenceline, 35 feet southeast of the second telephone pole northeast of a small trestle, 80 yards northeast of a small trestle, about level with track and set in the top of a concrete post projecting 4 inches.
PA106	72.07	Chiseled square on upstream center of concrete headwall of Seaboard Coastline Railroad trestle, about 4.15 miles east of station at Tallahassee, 0.7 mile southwest of the crossing of State Highway 261 at Perkins, 4 feet south of south rail, 16 feet west of east end of headwall, 34 yards west and across track from mile post 795.
PA107	80.89	High point of 16P nail, about 2 feet above ground level, in east side of telephone pole about 25 ft south of south rail of Seaboard Coastline Railroad track, 0.34 mile west of a small trestle, and about 1.04 miles southwest of the crossing at State Highway 261.
PA108	86.79	High point of 16P nail, 1.5 ft above ground level, in northeast side of 33-inch pine tree, about 67 yards west of centerline of intersection of Richview Road and Park Avenue, 40 feet north of centerline of Park Avenue and about 40 feet east-northeast of downstream end of culvert barrel.
PA109	87.82	Lightly chiseled square in concrete pad for sewage lift station at southwest corner of intersection of Victory Garden Drive and Park Avenue, chiseled square is 3.5 feet south of north edge of pad, 7.4 feet east of west edge of pad between two steel plates.
PA110	82.20	High point of 20P nail in north side of power pole, 21 feet south of centerline of Park Avenue, 0.5 mile west of Park Avenue entrance to Windrush Apartments, and about 0.17 mile west of intersection of Park Avenue and Victory Garden Drive.

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
PA111	92.20	High point of 16P nail in northeast side of telephone pole, on north side of Park Avenue 240 feet east of its intersection with Blairstone Road.
PA112	198.25	Chiseled square atop center of upstream headwall of 12-inch drainage culvert under Belmont Road at its intersection with Park Avenue.
PA113	116.05	Chiseled square, about 1.0 foot south of a steel plate in top of concrete street drain in northwest corner of intersection of Glenway Drive and Inglewood Drive.
		McCord Park Pond drainage ditch
MP114	77.62	High point of railroad spike, at ground level in north side of 28-inch sweetgum tree 30 feet south of Centerville Road, 200 feet west of intersection of Centerville Road and Tarpon Drive and 13 feet south-southeast of southeast end of culvert headwall.
MP115	83.41	Chiseled square in southwest corner of downstream culvert headwall at Chamberlin Drive and Trescott Drive.
MP116	94.90	Chiseled square in driveway at 2248 Trescott Drive.
MP117	93.79	Top of 16P nail in pavement on southeast side of Trescott Drive at its intersection with Cline Street.
MP118	104.11	Chiseled square in sidewalk at 2211 Thomasville Road, 20 feet north of driveway.
MP119	102.97	BM LEO 55. Florida Department of Natural Resources bronze disk, stamped "LEO 55 BSM 1983" set in top of northeast corner of concrete drainage culvert in northwest corner of intersection of south corner of intersection of South Ride and Thomasville Road.
MP120	100.72	Chiseled square in curb behind Sun Bank on Thomasville Road, 60 feet north of building housing bookkeeping department and 10 feet northwest of parking lot light.
MP121	110.24	BM LEO 56. Florida Department of Natural Resources bronze disk, stamped "LEO 56 BSM 1983", 30 feet south and 65 feet east of intersection of Mitchell Avenue and Betton Road and 2 feet east of west end of upstream culvert headwall.
		Alford Arm Tributary
AA122	53.17	Chiseled square atop south headwall of Buck Lake Road bridge over north branch of Lake Lafayette drainage, 0.7 mile east of intersection of Pedrick Road and Buck Lake Road, and 2.8 miles east of U.S. Highway 90 and Buck Lake Road.

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
AA123	119.72	Chiseled square atop headwall of bridge at northeast corner of U.S. Highway 90 and Thornton Road intersection, 3.6 miles east of State Highway 261 (Capital Circle).
AA124	57.95	Chiseled square on south side of south bridge near fourth guardrail post from west end of U.S. Highway 90 bridge over north branch of Lake Lafayette drainage, about 2,000 feet west of I-10.
AA125	74.58	Railroad spike in power pole at the southwest corner of intersection of Walden Road and Olenmeadow Road, about 900 feet south of U.S. Highway 90 and about 500 feet southwest of I-10 ramp.
AA126	59.91	Chiseled square atop northeast end wall of I-10 bridge at north drainage to Lake Lafayette, 0.4 mile northwest of U.S. Highway 90.
AA127	105.71	Chiseled square on east wall of Thornton Road culvert, at intersection with Miccosukee Road, 500 feet west of I-10 overpass.
AA128	68.89	Chiseled square atop abutment on southwest corner of concrete bridge on Miccosukee Road, 1,100 feet east-northeast of I-10 overpass.
AA129	94.01	Top of railroad spike in north side of 20-inch pine tree with orange and red reflectors attached, on south side of Miccosukee Road at entrance to stables, 0.5 mile east of I-10 overpass.
AA130	167.86	BM 236 JWM. Standard tablet 20 to 30 feet north of Shamrock South, at west right-of-way for Centerville Road, 1.4 miles north of I-10, 8.0 feet south of power pole.
AA131	80.17	Chiseled square atop northwest end wall of Centerville Road culvert at north branch of Lake Lafayette drainage, 2.7 miles northeast of I-10.
AA132	81.32	Top of sanitary seal plug (painted fluorescent orange), in steel lid, at sewage lift station, on west side of Centerville Road, 2.7 miles northeast of I-10.
AA133	82.63	Chiseled square atop curb on west side of Shannon Lakes East adjacent to light pole near curb, about 100 feet south of southwest end of culverts between Lake Killarney and Lake Kanturk.
AA134	107.76	Chiseled "U" atop street drain inlet on east side of Shannon Lakes West, at Kells Court and Shannon Lakes West intersection, 0.9 mile east of U.S. Highway 319 (Thomasville Road) and Oxbottom Road intersection.
AA135	82.15	Chiseled square in top of concrete street drain, at northeast corner of Bayshore Drive and Shannon Lakes West.
AA136	81.98	Chiseled "X" atop curb on southeast side of intersection of Bantry Bay Drive and Tory Sound Lane.

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
AA137	81.86	Chiseled square atop curb on west side of Tory Sound Lane, at first culvert south of cul-de-sac on north end of Tory Sound Lane.
AA138	86.63	Chiseled square atop curb in cul-de-sac on north end of Tory Sound Lane, in front of residence at 4700 Tory Sound Lane, and 14 feet east of driveway at 4701 Tory Sound Lane.
		Megginnis Arm Tributary
MA139	120.48	Chiseled "X" atop southwest end of downstream culvert headwall at Megginnis Arm drainage ditch on Allen Road, 0.25 mile north of its intersection with North Monroe Street (U.S. Highway 27).
MA140	154.04	High point of 16P nail in south side of 30-inch oak tree 50 feet east and 53 feet north of intersection of Starmount Drive and Starmount Lane.
MA141	161.13	High point of 16P nail, about 1.0 foot above ground level, in north side of 24-inch pine tree, 43 feet west of centerline of Meridian Road and 194 feet north of intersection of Cold Stream Drive and Meridian Road.
MA142	117.89	Chiseled square on southeast end of culvert headwall, on east side of North Monroe Street (U.S. Highway 27), 100 feet south of its intersection with Balsam Terrace and about 0.2 mile north of intersection of Allen Road and North Monroe Street.
MA143	125.79	Chiseled square atop curb of concrete street drain at southeast corner of Spoonwood Drive and Tupelo Terrace.
MA144	134.64	Chiseled square atop center of downstream headwall of culvert at intersection of Boone Blvd., and Allen Road.
MA145	158.68	High point of northeast bolt on north side of base of stop light signal switch-box in southeast corner of intersection of Allen Road and North Monroe Street (U.S. Highway 27).
MA146	137.71	Chiseled square near east end of downstream culvert headwall at intersection of Boone Blvd., and Monticello Drive.
		Fords Arm Tributary
FA147	109.03	BM LEO 20. Florida Department of Natural Resources bronze disk stamped "LEO 20 1983", marked with an orange witness post, across a small ditch, in northwest corner of intersection of Meridian Road and Rhoden Cove Road.

LIST OF REFERENCE MARKS--Continued

Reference mark	Elevation in feet above NGVD of 1929	Description of location
FA148	122.93	Chiseled square near center of upstream headwall at culverts on Bobbin Brook West, 315 feet north of its intersection with Bobbin Brook Circle.
FA149	135.11	High point of 40P nail in roadward side of power pole, at about ground level, on north side of Maclay Road, 310 feet west of Fords Arm culvert under Maclay Road, and about 0.15 mile east of intersection of Bobbin Brook West and Maclay Road.
FA150	107.84	Chiseled square near center of downstream culvert headwall on Meridian Road, about 400 feet north of intersection of Meridian Road and Lexington Drive.
FA151	108.47	Chiseled square near center of upstream culvert headwall on Meridian Road, about 400 feet north of intersection of Meridian Road and Lexington Drive.
FA152	151.99	High point of 16P nail, in north side of power pole on southwest side of intersection of Trillium Court and a dirt road leading south from Trillium Court, 0.25 mile south and east from the west intersection of Trillium Court and Timberlane Road.
FA153	166.36	Chiseled square atop east side of concrete street drain cover, 18 feet south and 119 feet west of intersection of Timberlane School Road and Timberlane Road.