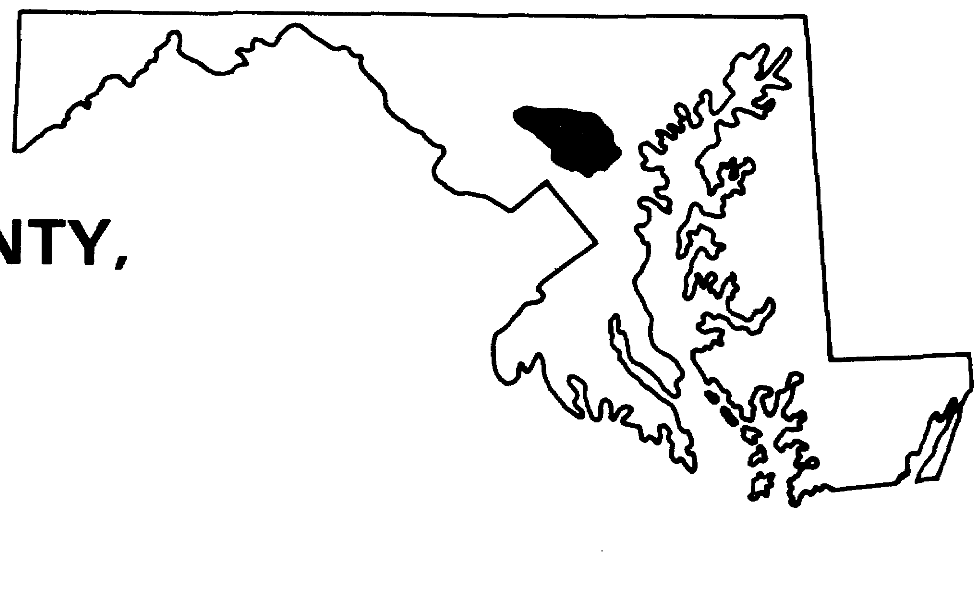
FLOOD INSURANCE STUDY

HOWARD COUNTY, MARYLAND

VOLUME 1 OF 2



DECEMBER 4, 1986

Federal Emergency Management Agency

COMMUNITY NUMBER - 240044

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY
HOWARD COUNTY, MARYLAND

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in Howard County, Maryland, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in their efforts to promote sound flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

This Flood Insurance Study is a revision of an original study conducted by Greenhorne & O'Mara for the Federal Emergency Management Agency (FEMA), under Contract No. H-3595. The original study was completed in 1976.

For the revised portions of the study, Howard County contracted Gannett Fleming Corddry and Carpenter, Inc., to study Guilford Branch; CH2M Hill, Inc., to study Hammond Branch and twelve of its tributaries; and Purdum and Jeschke to study Bonnie Branch and one tributary. The Maryland Department of Natural Resources and the Baltimore Regional Planning Council jointly conducted a study of the Patapsco and the South Branch Patapsco Rivers. Howard County contracted Kidde Consultants, Inc., to study Deep Run and five of its tributaries and Century Engineering, Inc., to study a portion of the Little Patuxent River and thirteen of its tributaries. Kidde Consultants, Inc., were also contracted to study the Middle Patuxent River and three of its tributaries, and Clydes Branch and eighteen of its tributaries.

1.3 Coordination

During the course of the original study, the Soil Conservation Service (SCS), the U. S. Army Corps of Engineers (COE), the U. S. Geological Survey (USGS), and the Howard County Department of Public Works and Department of Civil Defense were notified about the nature and extent of the project. At the same time, pertinent data and information were solicited from these sources. Howard County provided detailed topographic and planimetric maps that were used in the compilation of the study. In addition, the county provided vertical control data and recent land-use and zoning maps. Information on local flood problems and history, as well as a report on flooding on Tiber-Hudson Branch, were also provided by the county. The information received from the other sources referenced above included preliminary hydrologic calculations and studies, as well as historic discharge data. Contacts with the SCS and the COE were made several times during the original study to minimize and reconcile all possible conflicts with previous studies.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers Howard County, Maryland. For the purpose of this study, there are no incorporated areas within Howard County. The entire county is, therefore, included in the report. The area of study is shown on the Vicinity Map (Figure 1).

In addition to the original detailed studies of the Little Patuxent River and Dorsey Run, this revision incorporates a new analysis for a portion of the Little Patuxent River, new analyses for Red Hill Branch and Plumtree Branch, and detailed studies of 59 additional streams within the county.

The streams studied by detailed methods are shown in the following tabulation:

Stream	Limit of Detailed Study
Patapsco River	From the downstream county boundary at the confluence of Deep Run to the upstream county boundary at the confluence of the South Branch Patapsco River
South Branch Patapsco River	From its confluence with the Patapsco River to approximately 0.2 mile upstream of Interstate 70

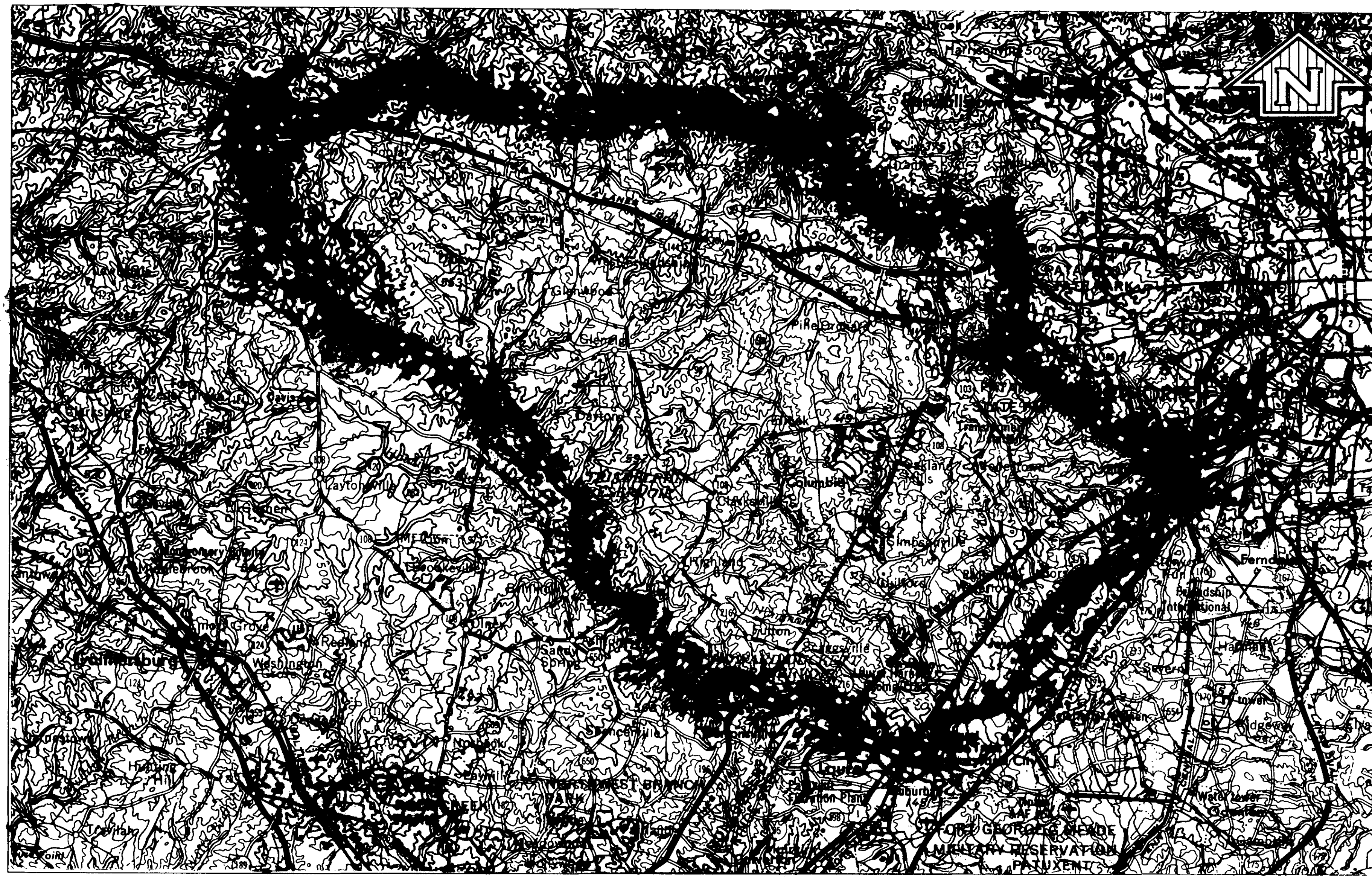


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

Stream	Limit of Detailed Study
Deep Run	From its confluence with the Patapsco River to approximately 1.46 miles upstream of Old Montgomery Road
Stream DR-1	From its confluence with Deep Run to approximately 900 feet upstream of Bellanca Drive
Stream DR-2	From its confluence with Stream DR-1 to approximately 150 feet downstream of Interstate 95
Stream DR-3	From its confluence with Stream DR-1 to approximately 0.4 mile upstream of Interstate 95
Stream DR-4	From its confluence with Stream DR-3 to approximately 1 mile upstream of Interstate 95
Stream DR-5	From its confluence with Deep Run to approximately 1.1 miles upstream of Centennial Lane
Bonnie Branch	From its confluence with the Patapsco River to approximately 150 feet downstream of the intersection of Bonnie Branch Road and an access road
Tributary to Bonnie Branch	From its confluence with Bonnie Branch to approximately 0.6 mile upstream of Roundhill Road
Patuxent River	From the downstream county boundary at Chessie Systems (Baltimore and Ohio Railroad) to the T. Howard Duckett Reservoir (Rocky Gorge Dam)
Little Patuxent River	From the downstream county boundary to approximately 90 feet upstream of Turf Valley Road
Beaver Run Branch	From its confluence with the Little Patuxent River to approximately 300 feet upstream of Bright Plume Road
Tributary to Beaver Run Branch	From its confluence with Beaver Run Branch to approximately 150 feet upstream of Donliegh Drive
Lake Elkhorn Branch	From its confluence with the Little Patuxent River to approximately 0.5 mile upstream of Old Montgomery Road
Stream LPR-1	From its confluence with the Little Patuxent River to approximately 60 feet downstream of the Patuxent Parkway

Stream	Limit of Detailed Study
Wilde Lake Branch	From its confluence with the Little Patuxent River to approximately 250 feet upstream of Hesperus Drive
Stream LPR-2	From its confluence with the Little Patuxent River to approximately 0.3 mile upstream of Lightning View Road
Stream LPR-3	From its confluence with the Little Patuxent River to approximately 60 feet upstream of Annapolis Road
Stream LPR-4	From its confluence with the Little Patuxent River to approximately 0.8 mile upstream of Ten Mills Road
Clark's Creek	From its confluence with the Little Patuxent River to approximately 1.1 miles upstream of Centennial Lane
Stream LPR-5	From its confluence with the Little Patuxent River to approximately 0.2 mile upstream of Carliton Drive
Red Hill Branch	From its confluence with the Little Patuxent River to approximately 300 feet downstream of Avoca Avenue
Plumtree Branch	From its confluence with Red Hill Branch to approximately 0.4 mile downstream of Interstate 70
Stream LPR-6	From its confluence with the Little Patuxent River to approximately 0.6 mile downstream of Centennial Lane
Dorsey Run	From the downstream county boundary to approximately 30 feet downstream of Montgomery Road
Guilford Branch	From U. S. Route 1 to approximately 90 feet downstream of Interstate 95
Hammond Branch	From its confluence with the Little Patuxent River to approximately 0.9 mile upstream of Pindell School Road
Stream HB-1	From its confluence with Hammond Branch to approximately 60 feet upstream of U. S. Route 1
Stream HB-2	From its confluence with Hammond Branch to 0.2 mile upstream of an access road
Stream HB-3	From its confluence with Hammond Branch to approximately 0.2 mile downstream of an access road

Stream	Limit of Detailed Study
Stream HB-4	From its confluence with Hammond Branch to approximately 0.2 mile upstream of Ford Road
Stream HB-5	From its confluence with Hammond Branch to approximately 0.4 mile upstream of the confluence
Stream HB-6	From its confluence with Hammond Branch to approximately 0.5 mile upstream of the confluence
Stream HB-7	From its confluence with Hammond Branch to approximately 0.1 mile upstream of Hel Road
Stream HB-8	From its confluence with Hammond Branch to approximately 0.4 mile upstream of the confluence
Stream HB-9	From its confluence with Hammond Branch to approximately 0.2 mile upstream of a private drive
Stream HB-10	From its confluence with Hammond Branch to approximately 0.5 mile upstream of the confluence
Stream HB-11	From its confluence with Hammond Branch to approximately 210 feet upstream of Cherrytree Drive
Stream HB-12	From its confluence with Hammond Branch to approximately 0.5 mile upstream of the confluence
Middle Patuxent River	From its confluence with the Little Patuxent River to approximately 0.1 mile upstream of Roxbury Hills Road
Sanner Road Tributary	From its confluence with the Middle Patuxent River to approximately 0.3 mile upstream of the confluence
Vista Road Tributary	From its confluence with the Middle Patuxent River to approximately 0.3 mile upstream of Newberry Drive
Clydes Branch	From its confluence with the Middle Patuxent River to approximately 0.45 mile upstream of Ten Oaks Road
Stream CB-1	From its confluence with Clydes Branch to approximately 0.15 mile upstream of State Route 32
Stream CB-2	From its confluence with Stream CB-1 to approximately 300 feet downstream of State Route 108

Stream	Limit of Detailed Study
Stream CB-3	From its confluence with Clydes Branch to approximately 300 feet downstream of State Route 108
Stream CB-4	From its confluence with Clydes Branch to approximately 0.11 mile upstream of State Route 32
Stream CB-5	From its confluence with Clydes Branch to approximately 0.40 mile upstream of Folly Quarter Road
Stream CB-6	From its confluence with Stream CB-5 to approximately 0.64 mile downstream of Folly Quarter Road
Stream CB-7	From its confluence with Stream CB-5 to approximately 0.34 mile downstream of Folly Quarter Road
Stream CB-8	From its confluence with Stream CB-5 to approximately 0.4 mile upstream of Folly Quarter Road
Stream CB-9	From its confluence with Stream CB-6 to approximately 0.65 mile upstream of the confluence
Stream CB-10	From its confluence with Clydes Branch to approximately 0.28 mile downstream of State Route 32
Stream CB-11	From its confluence with Clydes Branch to approximately 0.71 mile upstream of the confluence
Stream CB-12	From its confluence with Clydes Branch to approximately 0.51 mile upstream of the confluence
Stream CB-13	From its confluence with Stream CB-12 to approximately 0.26 mile upstream of the confluence
Stream CB-14	From its confluence with Clydes Branch to approximately 0.89 mile upstream of the confluence
Stream CB-15	From its confluence with Stream CB-14 to approximately 0.28 mile upstream of the confluence
Stream CB-16	From its confluence with Clydes Branch to approximately 0.22 mile upstream of Ten Oaks Road
Stream CB-17	From its confluence with Stream CB-16 to approximately 0.22 mile upstream of Ten Oaks Road

Stream	Limit of Detailed Study
Stream CB-18	From its confluence with Stream CB-16 to approximately 400 feet downstream of Ten Oaks Road
Benson Branch	From its confluence with the Middle Patuxent River to approximately 0.6 mile upstream of Quarter Folly Road.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

Cattail Creek, Horse Run, several unnamed streams, and the remaining portions of the South Branch Patapsco River, Dorsey Run, Guilford Branch, and the Patuxent River within the county boundary were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and Howard County.

2.2 Community Description

Howard County is located in the piedmont of the Appalachian Mountains in the central portion of Maryland, approximately halfway between the City of Baltimore and the City of Washington, D. C. It is bordered by Carroll County to the north, Baltimore County to the northeast, Anne Arundel County to the southeast, Prince Georges County and the City of Laurel to the south, Montgomery County to the southwest, and Frederick County to the northwest.

According to the U. S. Bureau of the Census, the population of Howard County was 62,394 in 1970 (Reference 1). Although rural in nature, the county's location between Baltimore and Washington, D. C., has made it one of the fastest growing counties in the state. Estimated population levels for 1973 were 80,800, an increase of almost 30 percent over a three year period. Estimated population levels for 1985 were 150,000. Most development and urbanization has occurred around the City of Columbia.

A moderate range of temperature within the county results from seasonal weather changes along the eastern seaboard. The temperature varies from a low of 20 degrees Fahrenheit (°F) in the winter to a high of 90°F in the summer during an average year. Weather conditions are fairly uniform throughout the county. The average annual rainfall is 42.8 inches.

The topography of Howard County varies in elevation from 100 to 800 feet. Since the county is primarily rural, the terrain generally has a good vegetative cover of hardwoods and conifers, integrated with abundant farms and pasture lands typical of the piedmont areas on the eastern coast of the United States.

The county is drained by five major streams, including the Patuxent River, the Little Patuxent River, the Middle Patuxent River, the Patapsco River, and the South Branch Patapsco River. The Patuxent River flows southeast along the western and southern borders of the county and continues through central and southern Maryland before discharging into the Chesapeake Bay. It drains the southern portion of Howard County.

The Little Patuxent River drains portions of central and southern Howard County, discharging into the Patuxent River 15.9 miles below the county boundary. The Middle Patuxent River flows southeast through central Howard County and discharges into the Little Patuxent River approximately 0.9 mile downstream of the Vollmerhausen Road bridge over the Little Patuxent River.

The Patapsco River flows southeast along the northeastern border of the county and discharges into the Chesapeake Bay. It drains an area of 365 square miles, including portions of Carroll, Howard, Baltimore, and Anne Arundel Counties and a small part of the City of Baltimore near the harbor.

The South Branch Patapsco River has a drainage area of 86 square miles. It flows east along the northern border of the county to its confluence with the Patapsco River.

Development within the flood plains of the Patapsco River near Ellicott City and the Little Patuxent River near Columbia is particularly susceptible to flood damage due to a large amount of urbanization. This was demonstrated by the amount of damage sustained in these areas during Hurricane Agnes in 1972.

2.3 Principal Flood Problems

Flooding on the Patuxent, Little Patuxent, Middle Patuxent, Patapsco, and South Branch Patapsco Rivers is most likely to occur in the summer and early fall months during hurricanes or tropical storms. Large flows on the remaining streams within the county, which have relatively small drainage areas, can also occur during intense thunderstorms and frontal storms, as well as the tropical storms and hurricanes.

Large magnitude floods have occurred in Howard County on several occasions. The Little Patuxent River experienced floods in 1952 and 1971, although no significant damage occurred in either case. The Patapsco River experienced large floods in 1896 and 1923 causing substantial damage to commercial and industrial areas, particularly in the Ellicott City and Elkridge areas.

The most damaging and largest recorded discharges on the major streams within the county occurred on June 22, 1972, during Hurricane Agnes. The magnitude of the discharges ranged from two to four times greater than the previously recorded maximum.

Damage estimates throughout the county following Hurricane Agnes ranged as high as $8,000,000. The majority of this damage occurred along the Patapsco River in the Ellicott City and Elkridge areas, where $250,000 in damage occurred to private property, $275,000 to county property, and $6,442,000 to commercial and industrial property. Damage along the Little Patuxent River totaled approximately $470,000, including $125,000 to private property, $305,000 to county property, and $40,000 to commercial property. Damage along the Patuxent and Middle Patuxent Rivers was approximately $100,000, primarily to private property. In addition, $215,000 in damage occurred to roads and bridges throughout the county. These figures reflect the worst county-wide flood damage on record.

2.4 Flood Protection Measures

Several reservoirs have been constructed to provide flood control capabilities along the Patuxent and Patapsco Rivers. T. Howard Duckett (Rocky Gorge) and Triadelphia Reservoirs are maintained by the Washington Suburban Sanitary Commission on the Patuxent River northwest of the City of Laurel.

Liberty Reservoir, which is maintained by the City of Baltimore, provides flood control on the North Branch Patapsco River in Carroll and Baltimore Counties. In turn, this controls the discharge of the Patapsco River for those areas below Woodstock in Howard County.

The Centennial Dam is presently under construction. It will be located on the Little Patuxent River north of State Route 108 and east of Centennial Lane.

Facilities for the control of local runoff from developing urban areas have been constructed within the county. These include Wilde Lake and Lake Kitamagundi, both of which control runoff in Columbia.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

For the portion of the Little Patuxent River (downstream of a point approximately 5.25 miles upstream of the U. S. Route 1 bridge) taken from the original study for Howard County, flood-frequency discharge curves were developed at four locations along the river using the log-Pearson Type III method as described in Bulletin 15 (References 2 and 3). These flows were based on existing conditions. No adjustments were made for projected urbanization. The original values for the mean, standard deviation, and skew coefficient were developed for the four study points by the Baltimore District of the COE (Reference 4). They were computed using a regionalized statistical analysis of historic discharge data from the Little Patuxent River and neighboring watersheds. These values were adjusted for the purpose of the original study to account for the large increase in maximum yearly peak discharge which occurred during Hurricane Agnes in June 1972.

When computing the mean and regionalized standard deviation, Hurricane Agnes discharges were used as raw data. However, when computing the skew coefficient, the coefficient values obtained using Hurricane Agnes discharges were weighted, using equivalent years of record, against a regionalized value previously developed by the USGS (Reference 5). The value obtained corresponds closely to that of the adjacent Patuxent River watershed and reflects an adjusted regionalized skew coefficient.

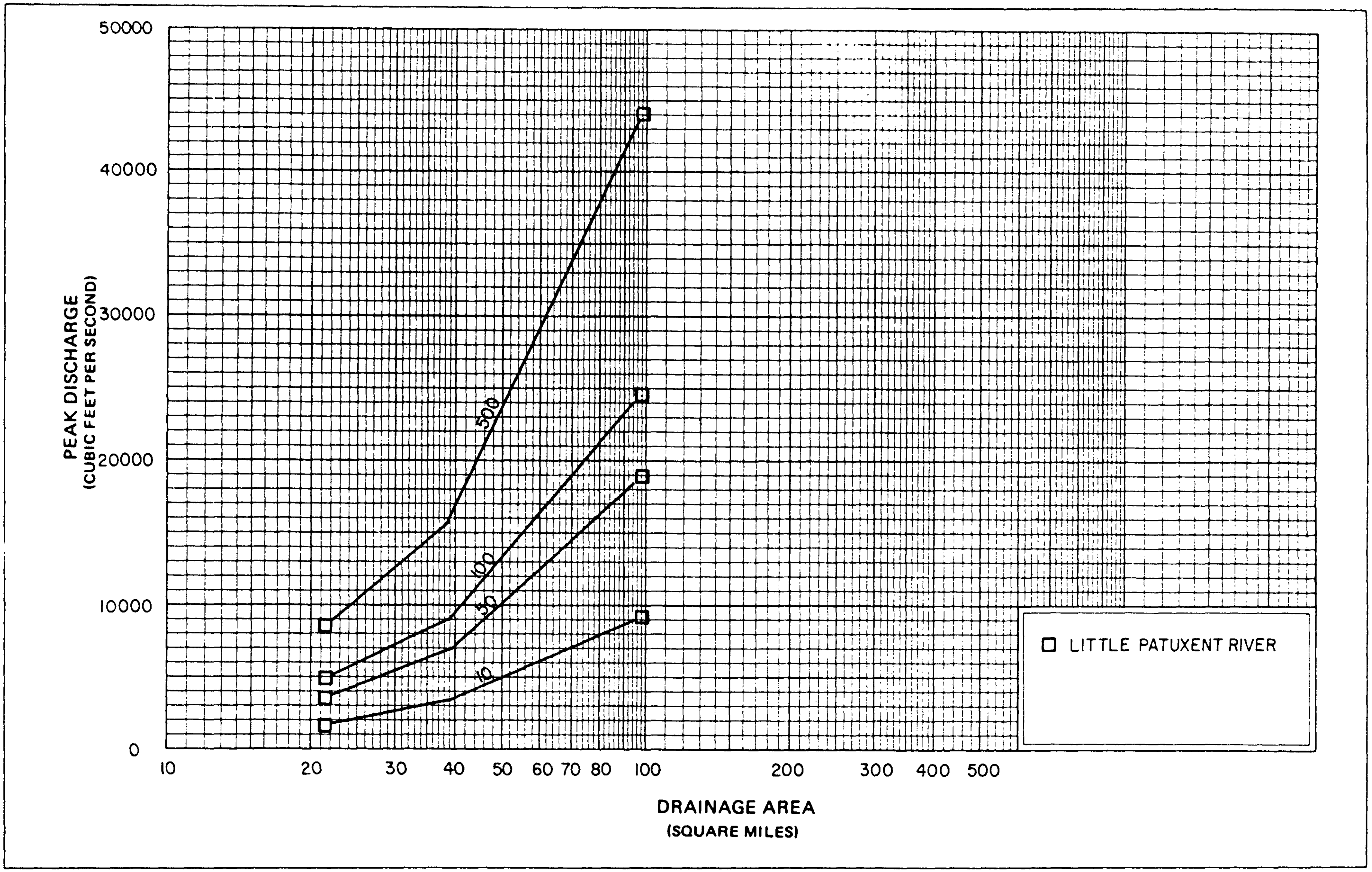
Discharges for Dorsey Run were obtained from the original study for Howard County (Reference 2). The frequency-discharge curves were computed using a regionalized empirical relationship published in USGS Water-Supply Paper 2001-C, which was developed for the piedmont areas of Maryland and Virginia (Reference 6).

The results obtained for the original study of the Little Patuxent River and Dorsey Run were compared with work done previously by the SCS and the COE in the same watershed. The discharges obtained on the Little Patuxent River were slightly larger than those computed by the SCS. This deviation was due to the value used for the regionalized skew coefficient, which will vary depending on the method used to incorporate Hurricane Agnes discharges into the historic data. Curves delineating the frequency-discharge versus drainage area relationships for these streams are shown in Figure 2. The curve for the Little Patuxent River is not applicable for the river upstream of a point approximately 5.25 miles upstream of the U. S. Route 1 bridge, as this portion of the stream has since been restudied. Discharges for the 500-year flood were determined by a straight line extrapolation of a semi-log graph of flood discharges computed for frequencies up to 100 years.

Discharges for the Patapsco and South Branch Patapsco Rivers were determined in a joint venture by the Maryland Department of Natural Resources and the Baltimore Regional Planning Council (Reference 7). Rainfall information was determined using a Thiessen polygon procedure with data from rainfall gages located in Carroll, Baltimore, and Anne Arundel Counties. Technical Paper No. 40 was used to calibrate the 10-, 50-, and 100-year storms (Reference 8). Further calibration was done by modeling Hurricane Agnes and comparing hydrographs to hydrographs obtained from stream gage records.

Discharges for Deep Run and its five tributaries were determined by Kidde Consultants, Inc. (Reference 9). Rainfall intensity-duration curves were derived using the method described in Technical Paper No. 40 (Reference 8). These curves were then routed using the SCS TR-20 program (Reference 10).

For Bonnie Branch and its tributary, discharges were determined by Purdum and Jeschke (Reference 11). The SCS TR-55 program was used to determine an approximate range of discharges for the streams (Reference 12). The COE HEC-2 step-backwater computer program was used to produce elevation-



FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD.

FREQUENCY - DISCHARGE, DRAINAGE AREA CURVES

LITTLE PATUXENT RIVER

FIGURE 2

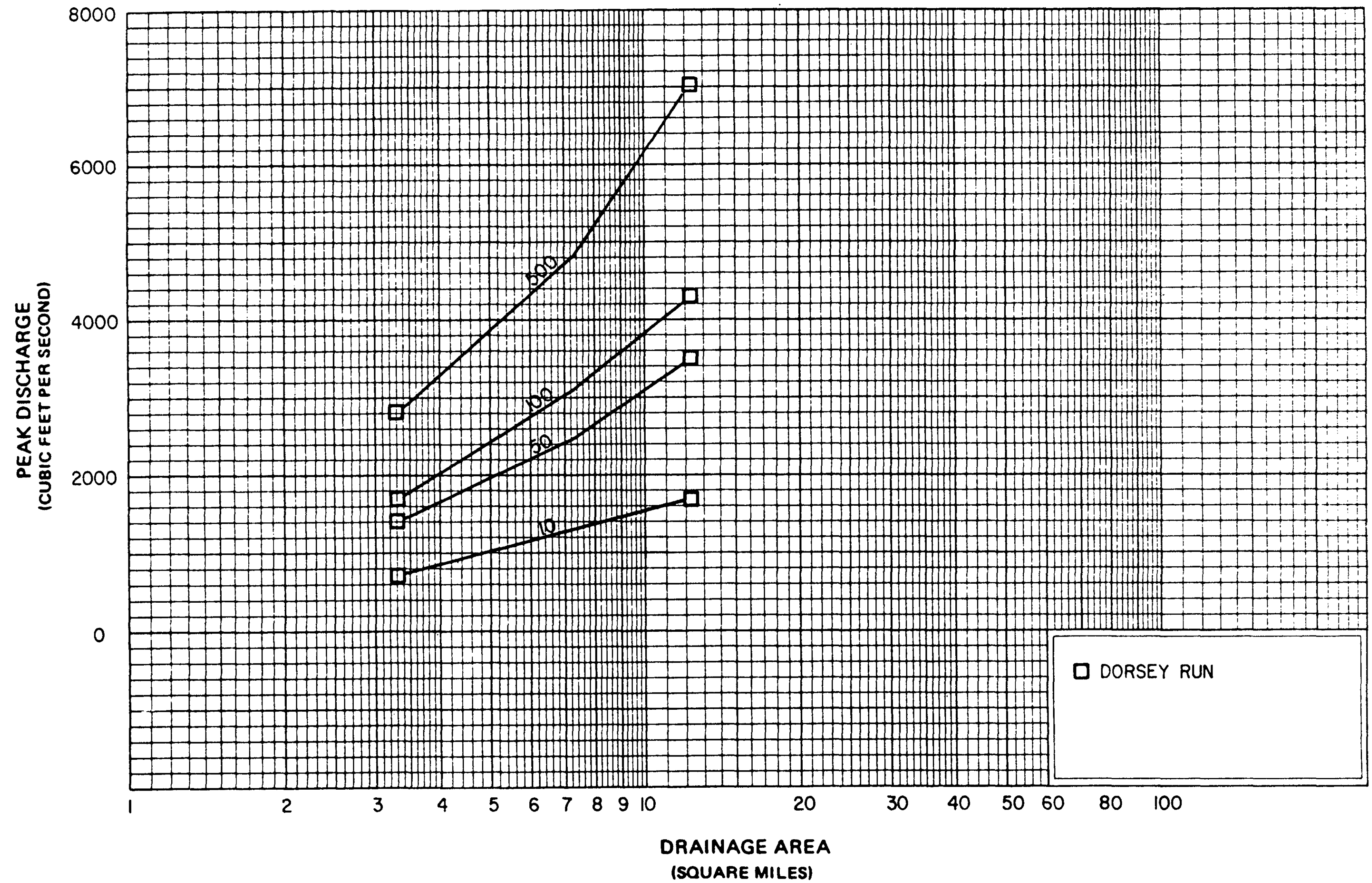


FIGURE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD.

FREQUENCY - DISCHARGE, DRAINAGE AREA CURVES

DORSEY RUN

discharge data from these discharges (Reference 13). The elevation-discharge data were then manually converted to rating curves. Total rainfall depths for the 10-, 50-, and 100-year storms were derived from Technical Paper No. 40 (Reference 8). The TR-20 computer model used the predetermined rating curves to calculate water-surface elevations (Reference 10).

Discharges for the Patuxent River were obtained from the Flood Insurance Studies for Prince Georges County and the City of Laurel (References 14 and 15). Flood-flow frequency data were based on a statistical analysis of stage-discharge records covering a 26-year period at gaging stations operated by the USGS (Reference 16). This analysis followed the standard log-Pearson Type III method as outlined by the Water Resources Council (Reference 3). Consideration was given to the effects of the T. Howard Duckett (Rocky Gorge) and Triadelphia Reservoirs, which are located upstream of the study area. The effects of these reservoirs were found to be insignificant on large floods, particularly a flood as great as the 100-year flood.

For the revised portion of the Little Patuxent River and for its tributaries, discharges were determined by Century Engineering, Inc. (Reference 17). The watershed was divided into 137 sub-areas. Rainfall intensity-duration curves were derived from Technical Paper No. 40 and then routed using the TR-20 program (References 8 and 10). Discharges developed for given conditions were checked against historic data, including Hurricanes Agnes and Eloise.

Discharges for Guilford Branch were determined by Gannett Fleming Corddry and Carpenter, Inc. (Reference 18). The COE HEC-2 computer program was used to establish water-surface elevation-discharge rating curves for random discharges on Guilford Branch (Reference 13). Technical Paper No. 40 was used to develop the 10- and 100-year frequency storms (Reference 8). The Guilford Branch watershed was then divided into sub-areas, and the SCS TR-20 computer program was used to route discharges downstream and to determine water-surface elevations at selected cross sections (Reference 10). Rating curves and the established rainfall patterns were used as input.

For Hammond Branch and its tributaries, discharges were developed by CH2M Hill, Inc. (Reference 19). Stage-discharge-area relationships were developed using the HEC-2 computer model with random discharges (Reference 13). The 10- and 100-year frequency storms were determined as described in the Howard County Drainage Design Manual, Volume 1, Storm Drainage (Reference 20). The study area was divided into 30 sub-basins, and the flood discharges were routed downstream using the TR-20 model (Reference 10).

Discharges for the Middle Patuxent River and its tributaries were determined by Kidde Consultants (Reference 21). The 57.8-square mile drainage area of the Middle Patuxent River was divided into 64 sub-areas. Rainfall for these sub-areas was determined by the method described in Technical Paper No. 40 (Reference 8). The hydrographs derived for each sub-area were routed using the TR-20 computer program to develop a composite hydrograph of the watershed (Reference 10).

Discharges for Clydes Branch and its tributaries were also determined by Kidde Consultants (Reference 22). Rainfall intensity- duration curves were derived using the method described in Technical Paper No. 40 (Reference 8). These curves were then routed using the SCS TR-20 computer program (Reference 10).

A summary of drainage-area peak discharge relationships for the streams studied by detailed methods, except for the Little Patuxent River downstream of a point approximately 5.25 miles upstream of the U. S. Route 1 bridge and for Dorsey Run, is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
PATAPSCO RIVER					
At the downstream side of Hanover Street	315.47	16,000	31,800	43,900	*
Approximately 100 feet downstream of State Route 144	293.09	15,000	30,200	42,200	*
Approximately 0.3 mile downstream of the confluence of the South Branch Patapsco River	255.76	14,300	29,500	41,600	*
SOUTH BRANCH PATAPSCO RIVER					
At the upstream side of Marriotsville Road	64.39	8,600	16,700	24,400	*
Approximately 0.6 mile upstream of Gaither Road	42.21	8,300	16,300	24,000	*
Approximately 0.2 mile downstream of Woodbine Road	30.65	7,400	15,200	22,900	*

*Not computed

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
DEEP RUN					
At Hanover Road	17.82	*	*	11,900	*
At Interstate 95	2.87	*	*	2,300	*
STREAM DR-1					
At its confluence with Deep Run	5.12	*	*	4,150	*
STREAM DR-2					
At its confluence with Stream DR-1	1.00	*	*	1,100	*
STREAM DR-3					
At U. S. Route 1	1.88	*	*	2,000	*
STREAM DR-4					
At its confluence with Stream DR-3	0.87	*	*	950	*
STREAM DR-5					
At Dorsey Road	2.75	*	*	2,400	*
BONNIE BRANCH					
Approximately 900 feet upstream of Bonnie Branch Road	1.55	1,346	1,984	2,498	*
Approximately 870 feet downstream of the confluence of Tributary to Bonnie Branch	0.98	929	1,361	1,702	*
Approximately 960 feet upstream of the confluence of Tributary to Bonnie Branch	0.39	390	569	718	*
TRIBUTARY TO BONNIE BRANCH					
Approximately 230 feet upstream of the confluence with Bonnie Branch	0.50	497	728	909	*

*Not computed

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
TRIBUTARY TO BONNIE BRANCH (continued)					
Approximately 950 feet upstream of Roundhill Road	0.28	281	414	518	*
PATUXENT RIVER					
Below the confluence of Western Branch	524.2	29,000	53,000	66,000	96,000
Above the confluence of Western Branch	415.4	24,500	43,000	52,500	77,000
Below the confluence of the Little Patuxent River	341.8	19,000	35,000	45,000	70,000
Above the confluence of the Little Patuxent River[1]	180	8,200	17,000	24,000	45,000
At the Laurel gage[1]	---	4,000	13,500	22,000	40,000
At the Unity gage[1]	---	4,500	11,000	15,500	33,000
LITTLE PATUXENT RIVER					
At Chessie Systems (Baltimore and Ohio Railroad)	39.67	5,106	*	10,218	*
Approximately 2,000 feet upstream of Old State Route 96	27.78	4,560	*	9,265	*
At Clarksville Pike	17.18	3,557	*	7,156	*
At U. S. Route 40	6.66	1,337	*	2,501	*
Approximately 2,500 feet upstream of Bethany Lane	5.01	1,074	*	2,127	*
Approximately 1 mile upstream of Turf Valley Road	0.48	583	*	1,230	*
BEAVER RUN BRANCH					
At its confluence with the Little Patuxent River	0.18	1,003	*	1,941	*

[1]Affected by regulation at T. Howard Duckett Reservoir (Rocky Gorge)

*Not computed

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
TRIBUTARY TO BEAVER RUN BRANCH					
At its confluence with Beaver Run Branch	0.20	373	*	697	*
LAKE ELKHORN BRANCH					
At its confluence with the Little Patuxent River	0.13	1,031	*	2,201	*
STREAM LPR-1					
At its confluence with the Little Patuxent River	0.27	1,095	*	1,820	*
WILDE LAKE BRANCH					
At its confluence with the Little Patuxent River	0.38	1,259	*	2,293	*
STREAM LPR-2					
At its confluence with the Little Patuxent River	0.30	703	*	1,412	*
STREAM LPR-3					
At its confluence with the Little Patuxent River	0.20	538	*	977	*
STREAM LPR-4					
At its confluence with the Little Patuxent River	0.14	398	*	602	*
CLARK'S CREEK					
At its confluence with the Little Patuxent River	0.22	1,120	*	2,366	*

*Not computed

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
STREAM LPR-5					
At its confluence with the Little Patuxent River	0.16	223	*	435	*
RED HILL BRANCH					
At its confluence with the Little Patuxent River	0.13	1,780	*	3,553	*
PLUMTREE BRANCH					
At its confluence with Red Hill Branch	0.17	976	*	1,852	*
STREAM LPR-6					
At its confluence with the Little Patuxent River	0.30	929	*	1,823	*
GUILFORD BRANCH					
At U. S. Route 1	1.26	456	*	961	*
At Interstate 95	0.33	119	*	259	*
HAMMOND BRANCH					
At Interstate 95	5.40	1,516	*	2,709	*
At U. S. Route 29	2.96	1,254	*	2,533	*
STREAM HB-1					
At its confluence with Hammond Branch	0.28	385	*	632	*
STREAM HB-2					
At its confluence with Hammond Branch	0.18	120	*	257	*
STREAM HB-3					
At its confluence with Hammond Branch	0.09	103	*	215	*

*Not computed

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
STREAM HB-4					
At its confluence with Hammond Branch	0.13	152	*	270	*
STREAM HB-5					
At its confluence with Hammond Branch	0.11	124	*	241	*
STREAM HB-6					
At its confluence with Hammond Branch	0.25	218	*	395	*
STREAM HB-7					
At its confluence with Hammond Branch	0.15	165	*	360	*
STREAM HB-8					
At its confluence with Hammond Branch	0.25	214	*	392	*
STREAM HB-9					
At its confluence with Hammond Branch	0.27	232	*	425	*
STREAM HB-10					
At its confluence with Hammond Branch	0.22	126	*	268	*
STREAM HB-11					
At its confluence with Hammond Branch	0.19	178	*	343	*
STREAM HB-12					
At its confluence with Hammond Branch	0.32	196	*	402	*
MIDDLE PATUXENT RIVER					
At its confluence with the Little Patuxent River	57.82	4,098	*	7,915	*

*Not computed

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
MIDDLE PATUXENT RIVER (continued)					
At State Route 108 (Clarksville Pike)	37.16	3,695	*	6,625	*
At State Route 32 (Guilford Road)	11.40	2,277	*	4,523	*
At Pfefferkorn Road	3.89	1,000	*	2,073	*
SANNER ROAD TRIBUTARY					
At its confluence with the Middle Patuxent River	2.42	663	*	1,389	*
VISTA ROAD TRIBUTARY					
At its confluence with the Middle Patuxent River	0.21	127	*	265	*
CLYDES BRANCH					
Upstream of its confluence with the Middle Patuxent River	8.69	*	*	5,504	*
STREAM CB-1					
At its confluence with Clydes Branch	2.22	*	*	1,498	*
STREAM CB-2					
At its confluence with Stream CB-1	0.12	*	*	134	*
STREAM CB-3					
At its confluence with Stream CB-1	0.19	*	*	174	*
STREAM CB-4					
At its confluence with Stream CB-1	0.56	*	*	462	*

*Not computed

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
STREAM CB-5					
At its confluence with Clydes Branch	1.83	*	*	1,408	*
STREAM CB-6					
At its confluence with Stream CB-5	0.15	*	*	159	*
STREAM CB-7					
At its confluence with Stream CB-5	0.14	*	*	123	*
STREAM CB-8					
At its confluence with Stream CB-5	0.14	*	*	123	*
STREAM CB-9					
At its confluence with Stream CB-6	0.21	*	*	199	*
STREAM CB-10					
At its confluence with Clydes Branch	1.04	*	*	816	*
STREAM CB-11					
At its confluence with Clydes Branch	0.26	*	*	195	*
STREAM CB-12					
At its confluence with Clydes Branch	0.13	*	*	150	*
STREAM CB-13					
At its confluence with Stream CB-12	0.09	*	*	96	*
STREAM CB-14					
At its confluence with Clydes Branch	0.48	*	*	370	*

*Not computed

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
STREAM CB-15					
At its confluence with Stream CB-14	0.23	*	*	176	*
STREAM CB-16					
At its confluence with Clydes Branch	0.58	*	*	633	*
STREAM CB-17					
At its confluence with Stream CB-16	0.21	*	*	174	*
STREAM CB-18					
At its confluence with Stream CB-16	0.12	*	*	161	*
BENSON BRANCH					
At its confluence with the Middle Patuxent River	2.90	631	*	1,330	*

*Not computed

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections for the backwater analyses of the portion of the Little Patuxent River from the original study and for Dorsey Run were compiled using sections provided by the SCS and field-surveyed sections which were extended using existing Howard County topographic maps (Reference 23). These sections were located at close intervals above and below bridges and culverts, in addition to points in the flood plain, in order to determine backwater effects of these structures in highly urbanized areas.

Cross sections for the Patapsco River and the South Branch Patapsco River were supplied by the Maryland Water Resources Administration. Cross sections for Deep Run and its tributaries, Bonnie Branch, Tributary to Bonnie Branch, the Patuxent River, Guilford Branch, and Hammond Branch and its tributaries were compiled from recent field surveys. For the Patuxent River, additional information and supplemental cross sections were determined from detailed USGS topographic maps (Reference 24).

Cross sections for the restudied portion of the Little Patuxent River and for its tributaries were determined from three sources. These included SCS cross sections taken from PL566 studies for the Little Patuxent River watershed, from work performed by Greenhorne & O'Mara, and from field surveys.

Cross sections for the Middle Patuxent River and its tributaries were field surveyed by Kidde Consultants, Inc. The Maryland Department of Natural Resources also provided survey data. Cross sections for Clydes Branch and its tributaries were determined from recent field surveys.

For Dorsey Run, locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Water-surface elevations of floods of the selected recurrence intervals for the Patapsco River, the South Branch Patapsco River, Bonnie Branch, Tributary to Bonnie Branch, the Patuxent River, the Little Patuxent River in its entirety and all its tributaries, Dorsey Run, and Clydes Branch and its tributaries were computed using the COE HEC-2 step-backwater computer program (Reference 13). Water-surface elevations for Guilford Branch and Hammond Branch and its tributaries were determined using the SCS TR-20 computer program (Reference 10). For Deep Run and its tributaries, the "Backwater/ Frontwater Curves" computer program was used in developing water-surface elevations (Reference 25). Headwater elevations at structures along Deep Run and its tributaries were computed by the computer program "Weir/ Structure Flow at Control Sections" (Reference 26). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

No 500-year profile was calculated for the Patapsco River, the South Branch Patapsco River, Deep Run and its tributaries, Bonnie Branch, Tributary to Bonnie Branch, the Little Patuxent River and its tributaries, Guilford Branch, Hammond Branch and its tributaries, the Middle Patuxent River and its tributaries, and Clydes Branch and its tributaries. No 50-year profile was computed for Deep Run and its tributaries, Guilford Branch, Hammond Branch and its tributaries, the Middle Patuxent River and its tributaries, and Clydes Branch and its tributaries. No 10-year profile was computed for the Little Patuxent River and its tributaries, the Middle Patuxent River and its tributaries, and Clydes Branch and its tributaries.

Starting water-surface elevations for the portion of the Little Patuxent River from the original study were obtained from a previous study performed by the COE (Reference 27). Starting water-surface elevations for Dorsey Run were determined assuming coincident peak flows at its confluence with the Little Patuxent River.

Starting water-surface elevations for the South Branch Patapsco River were determined assuming coincident peak flows at its confluence with the Patapsco River. Starting water-surface elevations for the Patuxent River were obtained from the Flood Insurance Study for the City of Laurel (Reference 15). For all other revised streams, except for Deep Run and its tributaries and Clydes Branch and its tributaries, starting water-surface elevations were determined by normal depth calculations.

For Deep Run and its tributaries, starting water-surface elevations were determined by conducting Gumbel and log-Pearson Type III analyses on the Hollofield gage (USGS gage No. 1-5890) data for the Patapsco River in order to determine discharges (Reference 28). These discharges were projected to the Penn Central Railroad by examining relative drainage areas and assuming the same relationship for the discharges. The headwater elevations at the Penn Central Railroad were then computed using the "Hydraulics of Bridge Waterways" computer program (Reference 29). These headwater elevations were projected to the confluence of Deep Run with the Patapsco River, where they were used as the starting water-surface elevations for Deep Run. Starting water-surface elevations for the tributaries to Deep Run were determined assuming coincident peak flows at their respective points of confluence with Deep Run.

Starting water-surface elevations for Clydes Branch were obtained from the Middle Patuxent River Drainage Study (Reference 21). Starting water-surface elevations for all tributaries to Clydes Branch were determined assuming coincident peak flows at their respective points of confluence.

For all streams studied by detailed methods, channel roughness factors (Manning's "n") used in the hydraulic computations were assigned on the basis of field inspection of flood plain areas and, for selected sections, on previous studies by the SCS. The channel "n" and overbank "n" values for Clydes Branch and its tributaries are shown in the following tabulation:

Stream	Channel "n"	Overbank "n"
Clydes Branch	0.012-0.050	0.012-0.100
Stream CB-1	0.012-0.050	0.025-0.040
Stream CB-2	0.050	0.040-0.100
Stream CB-3	0.050	0.040
Stream CB-4	0.025-0.050	0.012-0.040
Stream CB-5	0.012-0.050	0.012-0.100
Stream CB-6	0.012-0.050	0.012-0.100
Stream CB-7	0.050	0.040-0.100
Stream CB-8	0.050	0.040-0.100
Stream CB-9	0.050	0.100
Stream CB-10	0.050	0.040-0.100
Stream CB-11	0.050	0.040-0.100
Stream CB-12	0.050	0.040-0.100
Stream CB-13	0.050	0.040-0.100
Stream CB-14	0.050	0.040-0.100
Stream CB-15	0.050	0.040-0.100
Stream CB-16	0.012-0.050	0.040-0.100
Stream CB-17	0.012-0.050	0.012-0.040
Stream CB-18	0.012-0.050	0.012-0.100

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and

500-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps (References 23, 30, and 31).

Flood boundaries for the portion of the Little Patuxent River downstream of a point approximately 5.25 miles upstream of the U. S. Route 1 bridge and for Dorsey Run may have been adjusted slightly from the original study for Howard County to more accurately reflect flood conditions (Reference 2). Base flood elevations for these streams also may have been adjusted slightly to more accurately reflect the profiles.

For the streams studied by approximate methods, the boundary of the 100-year flood was delineated using USGS flood-prone area maps (Reference 32).

The 100- and 500-year flood plain boundaries are shown on the Flood Boundary and Floodway Map (Exhibit 2). In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodway in this study is presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodway presented in this study was computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross sections for the stream segment for which a floodway is computed (Table 2).

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Dorsey Run								
A	2.69	50	230	18.8	160.9	160.9	160.9	0.0
B	2.83	280	2,780	1.5	168.1	168.1	168.1	0.0
C	2.95	210	1,750	1.8	168.1	168.1	168.2	0.1
D	3.18	279	1,210	3.8	168.1	168.1	168.6	0.5
E	3.21	385	2,190	2.8	169.4	169.4	169.9	0.5
F	3.46	181	520	8.2	170.1	170.1	170.3	0.2
G	3.84	227	980	4.2	177.0	177.0	177.9	0.9
H	4.28	213	580	7.8	185.2	185.2	185.6	0.4
I	4.76	239	990	3.7	194.8	194.8	195.4	0.6
J	4.78	107	660	3.0	197.2	197.2	197.8	0.6
K	5.16	35	150	11.7	208.9	208.9	208.7	-0.2
L	5.41	40	160	10.9	221.3	221.3	221.4	0.1
M	5.43	30	140	11.8	225.0	225.0	225.1	0.1
N	5.60	*	110	15.1	233.0	233.0	233.0	0.0
O	5.84	127	280	9.3	259.3	259.3	259.4	0.1
P	6.02	114	390	6.9	266.7	266.7	267.0	0.3
Q	6.35	40	210	8.1	275.5	275.5	275.9	0.4
R	6.41	*	150	11.3	278.9	278.9	279.4	0.5
S	6.45	*	760	2.8	282.4	282.4	282.5	0.1
T	6.79	57	170	11.3	284.9	284.9	284.7	-0.2
U	6.80	67	350	6.7	286.7	286.7	286.5	-0.2
V	7.13	122	270	7.7	297.8	297.8	298.5	0.7
W	7.36	92	420	5.0	310.2	310.2	310.8	0.6

[1]Miles above mouth
*Floodway coincident with channel banks

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOODWAY DATA

DORSEY RUN

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Dorsey Run (continued)								
X	7.39	141	750	2.3	313.3	313.3	313.9	0.6
Y	7.62	49	180	9.9	325.6	325.6	326.4	0.8
Z	7.82	90	460	4.1	337.0	337.0	337.9	0.9

[1]Miles above mouth

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOODWAY DATA

DORSEY RUN

TABLE 2

The floodways determined in the original study for the Little Patuxent River, Red Hill Branch, and Plumtree Branch are not included in the revised study because the floodways are not consistent with the technical data developed for the revised study. No revised floodway data are available for these three streams. Howard County is presently administering the original floodways and has the option to continue to do so. The original floodway determined for Dorsey Run has been retained, as this stream was not restudied.

Floodways were not delineated for any of the streams in the revised study since no floodways were determined in the reports which were the basis for the revision.

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year flood plain boundaries are either close together or collinear, only the floodway boundary has been shown.

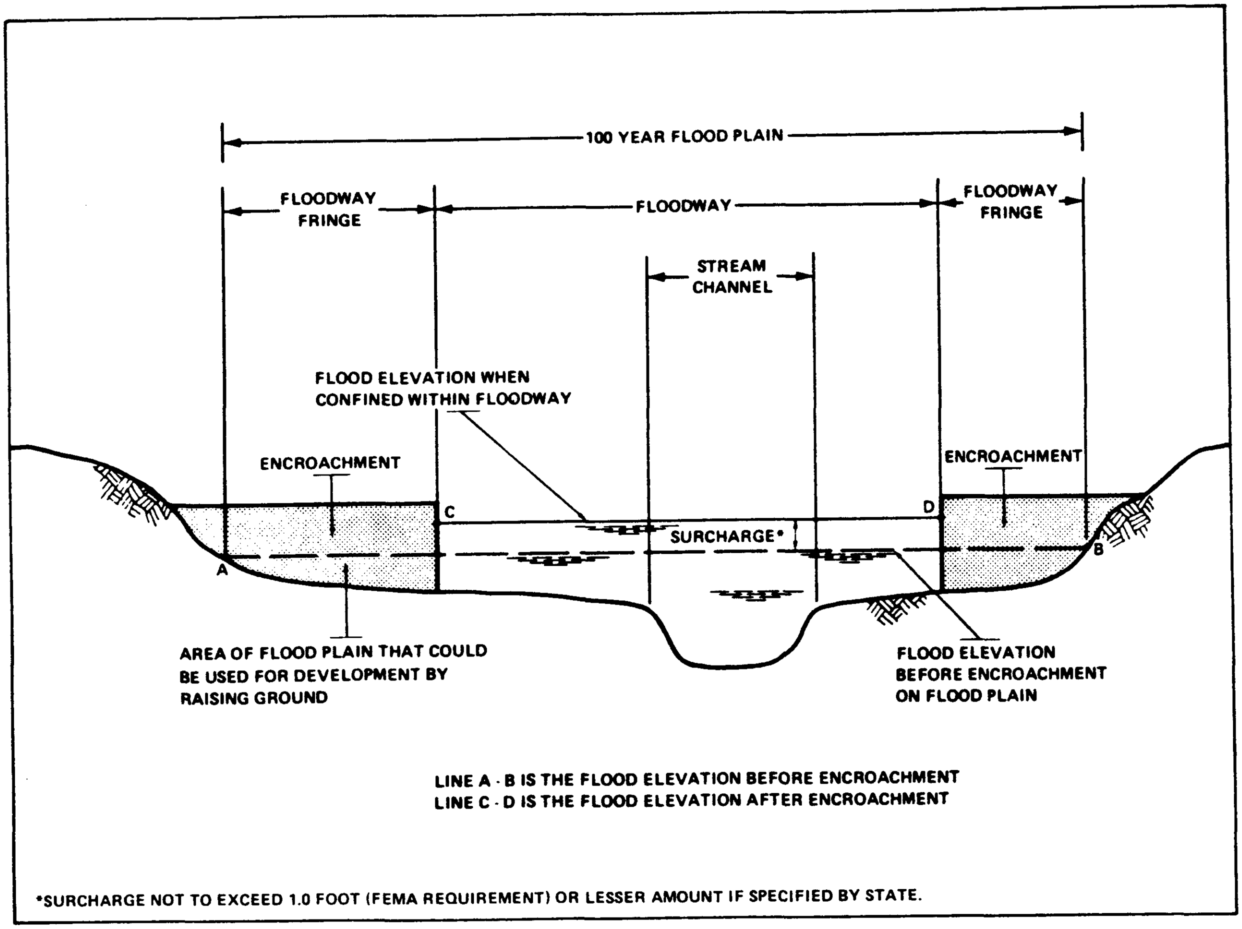
The area between the floodway and 100-year flood plain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 3.

5.0 INSURANCE APPLICATION

To establish actuarial insurance rates, data from the engineering study must be transformed into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail in Howard County.

5.1 Reach Determinations

Reaches are defined as sections of flood plain that have relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference may not have a variation greater than that indicated in the following tabulation for more than 20 percent of the reach:



FLOODWAY SCHEMATIC Figure 3

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding sources of Howard County are shown on the Flood Profiles (Exhibit 1) and summarized in Table 3.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to establish relationships between depth and frequency of flooding in any reach. This relationship is then

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
South Branch Patapsco River (continued)							
Reach 8	03	-5.0	*	*	050	A10	Varies
Reach 9	02,03	-6.3	*	*	065	A13	Varies
Reach 10	02	-3.3	*	*	035	A7	Varies
Reach 11	02	-5.3	*	*	055	A11	Varies
Reach 12	02	-2.8	*	*	030	A6	Varies
Reach 13	01,02	-7.6	*	*	075	A15	Varies
Reach 14	01	-3.5	*	*	035	A7	Varies
Reach 15	01	-7.9	*	*	080	A16	Varies
Reach 16	01	-5.0	*	*	050	A10	Varies
Reach 17	01	-8.9	*	*	090	A18	Varies
Reach 18	01	-15.0	*	*	150	A25	Varies
Deep Run							
Reach 1	36	-1.1	-0.3	*	010	A2	Varies
Reach 2	36,40	-2.1	-0.6	*	020	A4	Varies
Reach 3	40	-1.4	-0.9	*	015	A3	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

TABLE 3

FLOOD INSURANCE ZONE DATA

SOUTH BRANCH PATAPSCO RIVER - DEEP RUN

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
South Branch Patapsco River (continued)							
Reach 8	03	-5.0	*	*	050	A10	Varies
Reach 9	02,03	-6.3	*	*	065	A13	Varies
Reach 10	02	-3.3	*	*	035	A7	Varies
Reach 11	02	-5.3	*	*	055	A11	Varies
Reach 12	02	-2.8	*	*	030	A6	Varies
Reach 13	01,02	-7.6	*	*	075	A15	Varies
Reach 14	01	-3.5	*	*	035	A7	Varies
Reach 15	01	-7.9	*	*	080	A16	Varies
Reach 16	01	-5.0	*	*	050	A10	Varies
Reach 17	01	-8.9	*	*	090	A18	Varies
Reach 18	01	-15.0	*	*	150	A25	Varies
Deep Run							
Reach 1	36	-1.1	-0.3	*	010	A2	Varies
Reach 2	36,40	-2.1	-0.6	*	020	A4	Varies
Reach 3	40	-1.4	-0.9	*	015	A3	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOOD INSURANCE ZONE DATA

SOUTH BRANCH PATAPSCO RIVER - DEEP RUN

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Deep Run (continued)							
Reach 4	35,40	-2.2	-0.7	*	020	A4	Varies
Reach 5	35	5.3	-2.7	*	055	A11	Varies
Reach 6	29,35	-1.0	-0.3	*	010	A2	Varies
Stream DR-1							
Reach 1	36	-1.6	-0.6	*	015	A3	Varies
Reach 2	36	-1.1	-0.7	*	010	A2	Varies
Reach 3	36	-4.1	-1.4	*	040	A8	Varies
Reach 4	35,36	-2.0	-0.7	*	020	A4	Varies
Reach 5	35	-8.0	-1.1	*	080	A16	Varies
Reach 6	35	-2.9	-0.9	*	030	A6	Varies
Reach 7	35	-0.8	-0.3	*	010	A2	Varies
Stream DR-2							
Reach 1	36	-1.7	-0.6	*	015	A3	Varies
Reach 2	36	-0.9	-0.1	*	010	A2	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOOD INSURANCE ZONE DATA

DEEP RUN - STREAM DR-1 - STREAM DR-2

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Stream DR-3							
Reach 1	35	-2.6	-1.2	*	025	A5	Varies
Reach 2	35	-1.3	-1.4	*	015	A3	Varies
Reach 3	35	-0.5	-0.2	*	005	A1	Varies
Reach 4	35	-1.6	-1.1	*	015	A3	Varies
Stream DR-4							
Reach 1	35	-0.8	-0.4	*	010	A2	Varies
Reach 2	35	-2.0	-0.2	*	020	A4	Varies
Reach 3	35	-0.7	-0.3	*	005	A1	Varies
Stream DR-5							
Reach 1	40	-1.3	0.0	*	015	A3	Varies
Reach 2	40	-0.5	-0.1	*	005	A1	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOOD INSURANCE ZONE DATA

STREAM DR-3 - STREAM DR-4 - STREAM DR-5

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Bonnie Branch							
Reach 1	29	-1.6	*	*	015	A3	Varies
Reach 2	29	-0.9	*	*	010	A2	Varies
Reach 3	29	-1.8	*	*	020	A4	Varies
Reach 4	29	-1.0	*	*	010	A2	Varies
Reach 5	29	-1.8	*	*	020	A4	Varies
Reach 6	29	-1.5	*	*	015	A3	Varies
Reach 7	29	-3.5	*	*	035	A7	Varies
Reach 8	29	-2.2	*	*	020	A4	Varies
Reach 9	29	-1.6	*	*	015	A3	Varies
Reach 10	29	-1.7	*	*	020	A4	Varies
Reach 11	29	-1.2	*	*	010	A2	Varies
Reach 12	29	-2.3	*	*	025	A5	Varies
Reach 13	29	-1.1	*	*	010	A2	Varies
Reach 14	29	-1.9	*	*	020	A4	Varies
Reach 15	29	-0.8	*	*	010	A2	Varies
Tributary to Bonnie Branch							
Reach 1	29	-0.9	*	*	010	A2	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOOD INSURANCE ZONE DATA

BONNIE BRANCH - TRIBUTARY TO BONNIE BRANCH

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Patuxent River							
Reach 1	45	-9.2	*	*	090	A18	Varies
Little Patuxent River							
Reach 1	43,44	-9.8	*	*	100	A20	Varies
Reach 2	43	-6.5	*	*	065	A13	Varies
Reach 3	34,39, 43	-5.8	*	*	060	A12	Varies
Reach 4	34	-8.2	*	*	085	A17	Varies
Reach 5	34	-5.6	*	*	055	A11	Varies
Reach 6	28,34	-7.4	*	*	075	A15	Varies
Reach 7	16,17, 23,28	-4.5	*	*	045	A9	Varies
Beaver Run Branch							
Reach 1	33,34, 39	-5.8	*	*	060	A12	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOOD INSURANCE ZONE DATA

PATUXENT RIVER - LITTLE PATUXENT RIVER - BEAVER RUN BRANCH

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Tributary to Beaver Run Branch Reach 1	34	-5.8	*	*	060	A12	Varies
Lake Elhorn Branch Reach 1	34,39	-3.2	*	*	030	A6	Varies
Stream LPR-1 Reach 1	34	-2.7	*	*	025	A5	Varies
Wilde Lake Branch Reach 1	27,28	-3.7	*	*	035	A7	Varies
Stream LPR-2 Reach 1	28	-4.8	*	*	050	A10	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOOD INSURANCE ZONE DATA

TRIBUTARY TO BEAVER RUN BRANCH - LAKE ELKHORN BRANCH - STREAM LPR-1 - WILDE LAKE BRANCH - STREAM LPR-2

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Stream LPR-3							
Reach 1	28	-4.1	*	*	040	A8	Varies
Stream LPR-4							
Reach 1	28	-5.0	*	*	050	A10	Varies
Clark's Creek							
Reach 1	27,28	-4.2	*	*	040	A8	Varies
Stream LPR-5							
Reach 1	28	-5.3	*	*	055	A11	Varies
Red Hill Branch							
Reach 1	28	-1.9	*	*	020	A4	Varies
Reach 2	28	-8.5	*	*	085	A17	Varies
Reach 3	28,29	-3.5	*	*	035	A7	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOOD INSURANCE ZONE DATA

STREAM LPR-3 - STREAM LPR-4 - CLARK'S CREEK - STREAM LPR-5 - RED HILL BRANCH

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Plumtree Branch							
Reach 1	23,28	-3.2	*	*	030	A6	Varies
Reach 2	17,23	-1.5	*	*	015	A3	Varies
Stream LPR-6							
Reach 1	22,23	-3.4	*	*	035	A7	Varies
Dorsey Run							
Reach 1	44	-7.6	-2.4	+2.5	075	A15	Varies
Reach 2	44	-4.9	-2.3	+2.6	050	A10	Varies
Reach 3	40,44	-1.2	-0.5	+1.0	010	A2	Varies
Reach 4	40	-2.5	-0.8	+1.6	025	A5	Varies
Reach 5	40	-3.7	-0.8	+6.5	035	A7	Varies
Reach 6	35,40	-1.9	-0.5	+1.1	020	A4	Varies
Reach 7	35	-4.3	-1.0	+1.5	045	A9	Varies
Reach 8	35	-2.9	-0.6	+1.0	030	A6	Varies
Reach 9	35	-1.3	-0.4	+0.8	015	A3	Varies
Reach 10	35	-2.0	-0.4	+0.8	020	A4	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOOD INSURANCE ZONE DATA

PLUMTREE BRANCH - STREAM LPR-6 - DORSEY RUN

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Guilford Branch							
Reach 1	43	-1.5	*	*	015	A3	Varies
Reach 2	39,43	-3.1	*	*	030	A6	Varies
Reach 3	39	-1.4	*	*	015	A3	Varies
Hammond Branch							
Reach 1	43	-2.1	*	*	020	A4	Varies
Reach 2	43	-1.4	*	*	015	A3	Varies
Reach 3	42,43	-3.0	*	*	030	A6	Varies
Reach 4	38,42	-1.6	*	*	015	A3	Varies
Stream HB-1							
Reach 1	43	-1.5	*	*	015	A3	Varies
Stream HB-2							
Reach 1	43	-0.8	*	*	010	A2	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOOD INSURANCE ZONE DATA

GUILFORD BRANCH - HAMMOND BRANCH - STREAM HB-1 - STREAM HB-2

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Stream HB-3							
Reach 1	43	-0.8	*	*	010	A2	Varies
Stream HB-4							
Reach 1	43	-1.0	*	*	010	A2	Varies
Stream HB-5							
Reach 1	43	-1.3	*	*	015	A3	Varies
Stream HB-6							
Reach 1	43	-0.8	*	*	010	A2	Varies
Stream HB-7							
Reach 1	42	-2.0	*	*	020	A4	Varies
Reach 2	42,43	-0.7	*	*	005	A1	Varies
Stream HB-8							
Reach 1	42	-0.5	*	*	005	A1	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOOD INSURANCE ZONE DATA

STREAM HB-3 · STREAM HB-4 · STREAM HB-5 · STREAM HB-6 · STREAM HB-7 · STREAM HB-8

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Stream HB-9							
Reach 1	38,42	-0.5	*	*	005	A1	Varies
Stream HB-10							
Reach 1	38	-1.1	*	*	010	A2	Varies
Stream HB-11							
Reach 1	38	-0.4	*	*	005	A1	Varies
Stream HB-12							
Reach 1	38	-1.0	*	*	010	A2	Varies
Middle Patuxent River							
Reach 1	38,39, 43	-6.9	*	*	070	A14	Varies
Reach 2	38	-4.2	*	*	040	A8	Varies
Reach 3	38	-8.8	*	*	090	A18	Varies
Reach 4	33,38	-4.1	*	*	040	A8	Varies
Reach 5	33	-6.9	*	*	070	A14	Varies

*Not computed

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOOD INSURANCE ZONE DATA

STREAM HB-9 · STREAM HB-10 · STREAM HB-11 · STREAM HB-12 · MIDDLE PATUXENT RIVER

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Middle Patuxent River (continued)							
Reach 6	33	-5.2	*	*	050	A10	Varies
Reach 7	27,33	-8.1	*	*	080	A16	Varies
Reach 8	22,27	-5.0	*	*	050	A10	Varies
Reach 9	22	-7.8	*	*	080	A16	Varies
Reach 10	15,21, 22	-5.7	*	*	055	A11	Varies
Reach 11	15	-4.3	*	*	040	A8	Varies
Reach 12	15	-5.7	*	*	060	A12	Varies
Reach 13	14,15	-3.8	*	*	040	A8	Varies
Reach 14	08,14	-4.7	*	*	045	A9	Varies
Reach 15	08	0.0	*	*	005	A1	Varies
Reach 16	08	-1.3	*	*	010	A2	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD CO., MD

FLOOD INSURANCE ZONE DATA

MIDDLE PATUXENT RIVER

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Sanner Road Tributary							
Reach 1	38	-1.3	*	*	015	A3	Varies
Vista Road Tributary							
Reach 1	38	-6.2	*	*	060	A12	Varies
Reach 2	38	-3.1	*	*	030	A6	Varies
Reach 3	38	-9.4	*	*	095	A19	Varies
Reach 4	38	-1.3	*	*	015	A3	Varies
Clydes Branch							
Reach 1	27	-1.1	*	*	010	A2	Varies
Reach 2	26,27	-0.3	*	*	005	A1	Varies
Stream CB-1							
Reach 1	26,27 32	-0.3	*	*	005	A1	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

FLOOD INSURANCE ZONE DATA

SANNER ROAD TRIBUTARY — VISTA ROAD TRIBUTARY — CLYDES BRANCH — STREAM CB-1

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Stream CB-2 Reach 1	26,27	-0.2	*	*	005	A1	Varies
Stream CB-3 Reach 1	26,32	-0.3	*	*	005	A1	Varies
Stream CB-4 Reach 1	32	-0.3	*	*	005	A1	Varies
Stream CB-5 Reach 1	21,26	-0.2	*	*	005	A1	Varies
Stream CB-6 Reach 1	26	-0.2	*	*	005	A1	Varies
Stream CB-7 Reach 1	21,26,27	-0.2	*	*	005	A1	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

FLOOD INSURANCE ZONE DATA

STREAM CB-2 — STREAM CB-3 — STREAM CB-4 — STREAM CB-5 — STREAM CB-6 — STREAM CB-7

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Stream CB-8 Reach 1	21	0.0	*	*	005	A1	Varies
Stream CB-9 Reach 1	21,26	-0.3	*	*	005	A1	Varies
Stream CB-10 Reach 1	26	-0.3	*	*	005	A1	Varies
Stream CB-11 Reach 1	26	-0.2	*	*	005	A1	Varies
Stream CB-12 Reach 1	26	-0.3	*	*	005	A1	Varies
Stream CB-13 Reach 1	26	-0.3	*	*	005	A1	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

FLOOD INSURANCE ZONE DATA

STREAM CB-8 — STREAM CB-9 — STREAM CB-10 — STREAM CB-11 — STREAM CB-12 — STREAM CB-13

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Stream CB-14 Reach 1	26	-0.1	*	*	005	A1	Varies
Stream CB-15 Reach 1	26	0.0	*	*	005	A1	Varies
Stream CB-16 Reach 1	26	-0.3	*	*	005	A1	Varies
Stream CB-17 Reach 1	26	0.0	*	*	005	A1	Varies
Stream CB-18 Reach 1	26	-0.7	*	*	005	A1	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

FLOOD INSURANCE ZONE DATA

STREAM CB-14 — STREAM CB-15 — STREAM CB-16 — STREAM CB-17 — STREAM CB-18

TABLE 3

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Benson Branch							
Reach 1	21,22	-5.1	*	*	050	A10	Varies
Reach 2	21	-2.6	*	*	025	A5	Varies
Reach 3	21	-4.9	*	*	050	A10	Varies
Reach 4	21	-2.8	*	*	030	A6	Varies
Reach 5	21	-6.0	*	*	060	A12	Varies
Reach 6	21	-0.7	*	*	005	A1	Varies
Reach 7	21	-3.0	*	*	030	A6	Varies
Reach 8	21	-0.2	*	*	005	A1	Varies
Reach 9	21	-4.2	*	*	040	A8	Varies
Reach 10	21	-2.1	*	*	020	A4	Varies
Reach 11	21	-2.9	*	*	030	A6	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

*Not computed

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

FLOOD INSURANCE ZONE DATA

BENSON BRANCH

TABLE 3

used with depth-damage relationships for various classes of structures to establish actuarial insurance rate tables.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations rounded to the nearest one-half foot, multiplied by 10, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, it is rounded to the nearest whole foot.

5.3 Flood Insurance Zones

Flood insurance zones and zone numbers are assigned based on the type of flood hazard and the FHF, respectively. A unique zone number is associated with each possible FHF, and varies from 1 for a FHF of 005 to a maximum of 30 for a FHF of 200 or greater.

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zones A1-A21, A25, and A26:	Special Flood Hazard Areas inundated by the 100-year flood; with base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- or 500-year floods by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding; not subdivided.

Flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding sources studied in detail in the community are shown in Table 3.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for Howard County is, for insurance purposes, the principal result of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevations. Base flood elevation lines show the locations of the expected whole-foot water-surface elevation of the base (100-year) flood. The base flood elevations and zone numbers are used by insurance agents, in conjunction with structure elevations and characteristics, to assign actuarial insurance rates to structures and contents insured under the National Flood Insurance Program.

6.0 OTHER STUDIES

Flood Insurance Studies for the unincorporated areas of Prince Georges County, the City of Laurel, and the unincorporated areas of Baltimore County, Carroll County, Montgomery County, and Anne Arundel County have been completed (References 14, 15, 33, 34, 35, and 36). The results of this study are in exact agreement with the results of those studies.

Disagreement was encountered between the discharges and corresponding frequency profiles for the original study of the Little Patuxent River and those computed by the SCS in feasibility studies conducted for local flood protection projects. This difference was due to the method by which Hurricane Agnes discharges were incorporated into historic data for a statistical regional frequency analysis. The SCS felt Hurricane Agnes should be considered as an outlier event and should not be included in historic data for analysis. Subsequent conversations with the COE, however, revealed that although the COE had made no specific computations following Hurricane Agnes in this watershed, it was their opinion that storms such as Hurricane Agnes should be included in historic data for computation. Based on these conversations and historic records in which three peak flood crests of Hurricane Agnes magnitude occurred on the Patapsco River in the past century, it was felt that Hurricane Agnes discharges should be included in the historic data. The regionalized frequency analysis of these data tends to eliminate the extremes at certain specific discharge points and reflects the effects of a storm such as Hurricane Agnes as it pertains to the entire region. This effect is specifically reflected in the regionalized skew coefficient used for the original study of the Little Patuxent River. Upon review of the discharges, it was felt that the computations were based on valid techniques and assumptions. Additionally, the deviations in discharges between the original study and the SCS studies were not large enough to warrant revision to the techniques used.

Hydrologic data previously computed for the Little Patuxent River by the COE were incorporated into the discharge computations for the original study of the Little Patuxent River and adjusted to reflect Hurricane Agnes data. No direct comparison of results could be made to the COE discharges, however, since they reflect pre-Hurricane Agnes data.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, Regional Director, Region III Office, Liberty Square Building (Second Floor), 105 South Seventh Street, Philadelphia, Pennsylvania 19106.

8.0 BIBLIOGRAPHY AND REFERENCES

1. U. S. Department of the Census, Bureau of the Census, 1970 Census of Population, Number of Inhabitants, Maryland, Washington, D. C., U. S. Government Printing Office, 1971.

2. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Howard County, Maryland, Washington, D. C., March 15, 1977.

3. Water Resources Council, "A Uniform Technique for Determining Flood Flow Frequency", Bulletin 15, Washington, D. C., December 1967.

4. U. S. Army Corps of Engineers, Baltimore District, Report on Hydrology for Little Patuxent River, Baltimore, Maryland, April 1970.

5. U. S. Department of the Interior, Geological Survey, Generalized Skew Coefficients of Annual Floods in the United States and Their Application by Clayton H. Hardison, Reston, Virginia, 1974.

6. U. S. Department of the Interior, Geological Survey, Water-Supply Paper 2001-C, Effects of Urban Development on Floods in Northern Virginia by Daniel G. Anderson, Washington, D. C., 1970.

7. Baltimore Regional Planning Council and Maryland Department of Natural Resources, Water Resources Administration, Patapsco River Basin Study, Baltimore, Maryland, March 1980.

8. U. S. Department of Commerce, Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, Washington, D. C., 1961, Revised 1963.

9. Kidde Consultants, Inc., Deep Run Basin Flood Plain Study, Baltimore, Maryland, November 1981.

10. U. S. Department of Agriculture, Soil Conservation Service, Technical Release No. 20, Computer Program, Project Formulation, Hydrology, Washington, D. C., 1965.

11. Purdum and Jeschke, Bonnie Branch Computer Model, Howard County, Ellicott City, Maryland, January 1976.

12. U. S. Department of Agriculture, Soil Conservation Service, Technical Release No. 55, Urban Hydrology for Small Watersheds, Washington, D. C., January 1975.

13. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, November 1976.

14. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Prince Georges County, Maryland, Washington, D. C., July 19, 1982.

15. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Laurel, Prince Georges County, Maryland, Washington, D. C., November 1, 1978.

16. U. S. Department of the Interior, Geological Survey, Water Resources Data for Maryland and Delaware, Part I, Surface Water Records, Washington, D. C., Published Annually.

17. Century Engineering, Inc., Little Patuxent River Hydrology Model, Towson, Maryland, May 1978.

18. Gannett Fleming Corddry and Carpenter, Inc., Guilford Area Stormwater Facility and Flooding Study, Baltimore, Maryland, February 1982.

19. CH2M Hill, Inc., Hammond Branch Drainage Study, Reston, Virginia, November 1980.

20. Howard County, Maryland, Howard County Design Manual, Volume 1, Storm Drainage, Ellicott City, Maryland, 1978.

21. Kidde Consultants, Inc., Middle Patuxent River Drainage Study, Baltimore, Maryland, September 1984.

22. Kidde Consultants, Inc., Clydes Branch Drainage Study, Volume 1, Baltimore, Maryland, February 1985.

23. Howard County, Maryland, Topographic and Planimetric Maps, Ellicott City, Maryland, 1971 and 1973.

24. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Laurel, Maryland, Photorevised 1971.

25. Tippetts-Abbott-McCarthy-Stratton, Computer Program, Backwater/Frontwater Curves.

26. Kidde Consultants, Inc., Computer Program, Weir/Structure Flow at Control Sections, Baltimore, Maryland.

27. U. S. Army Corps of Engineers, Baltimore District, Patuxent River Flood Insurance Study, Baltimore, Maryland.

28. U. S. Department of the Interior, Geological Survey, Water Resources Data for Maryland and Delaware, Washington, D. C., Published Annually 1955-1971.

29. U. S. Department of Commerce, Bureau of Public Roads, Hydraulic Design Series No. 1, Hydraulics of Bridge Waterways, Washington, D. C., 1970.

30. Planimetric Tax Map prepared for Howard County, Maryland, Scale 1"=600', Contour Interval 5 Feet, 1971, Revised 1980.

31. Topographic Maps prepared for Howard County, Scale 1"=200', Contour Interval 5 Feet.

32. U. S. Department of the Interior, Geological Survey, Flood-Prone Area Maps, College Park, Maryland.

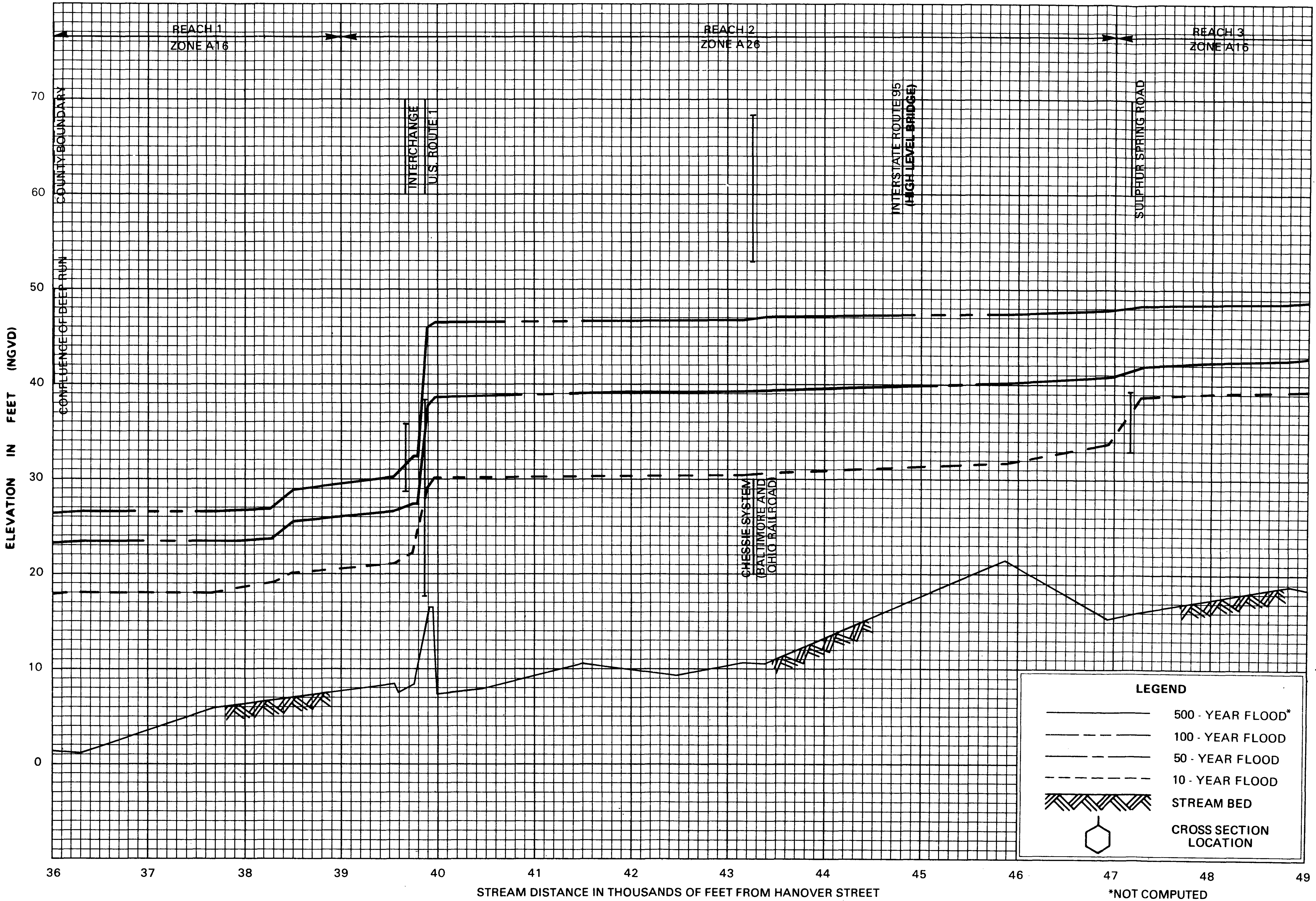
33. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Unincorporated Areas of Baltimore County, Maryland, Washington, D. C., March 2, 1981.

34. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Unincorporated Areas of Carroll County, Maryland, Washington, D. C., August 7, 1981.

35. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Montgomery County, Maryland, Washington, D. C., August 1, 1984.

36. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Anne Arundel County, Maryland, Washington, D. C., May 2, 1983.

U. S. Department of the Interior, Geological Survey, A Summary of Peak Stages and Discharges in Maryland, Delaware, and District of Columbia for Flood of June 1972, Parkville, Maryland, 1973.



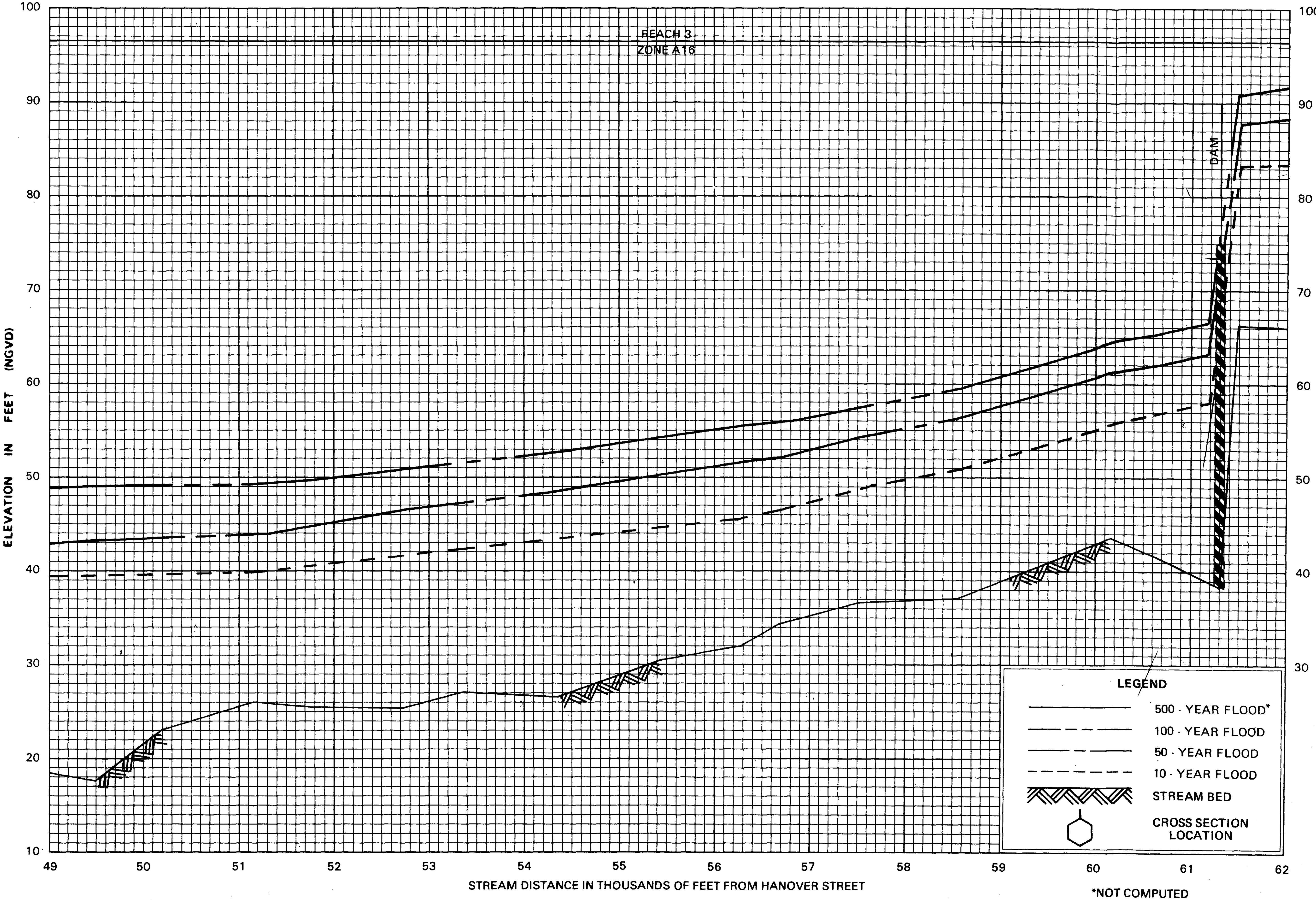
FLOOD PROFILES

PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

01P



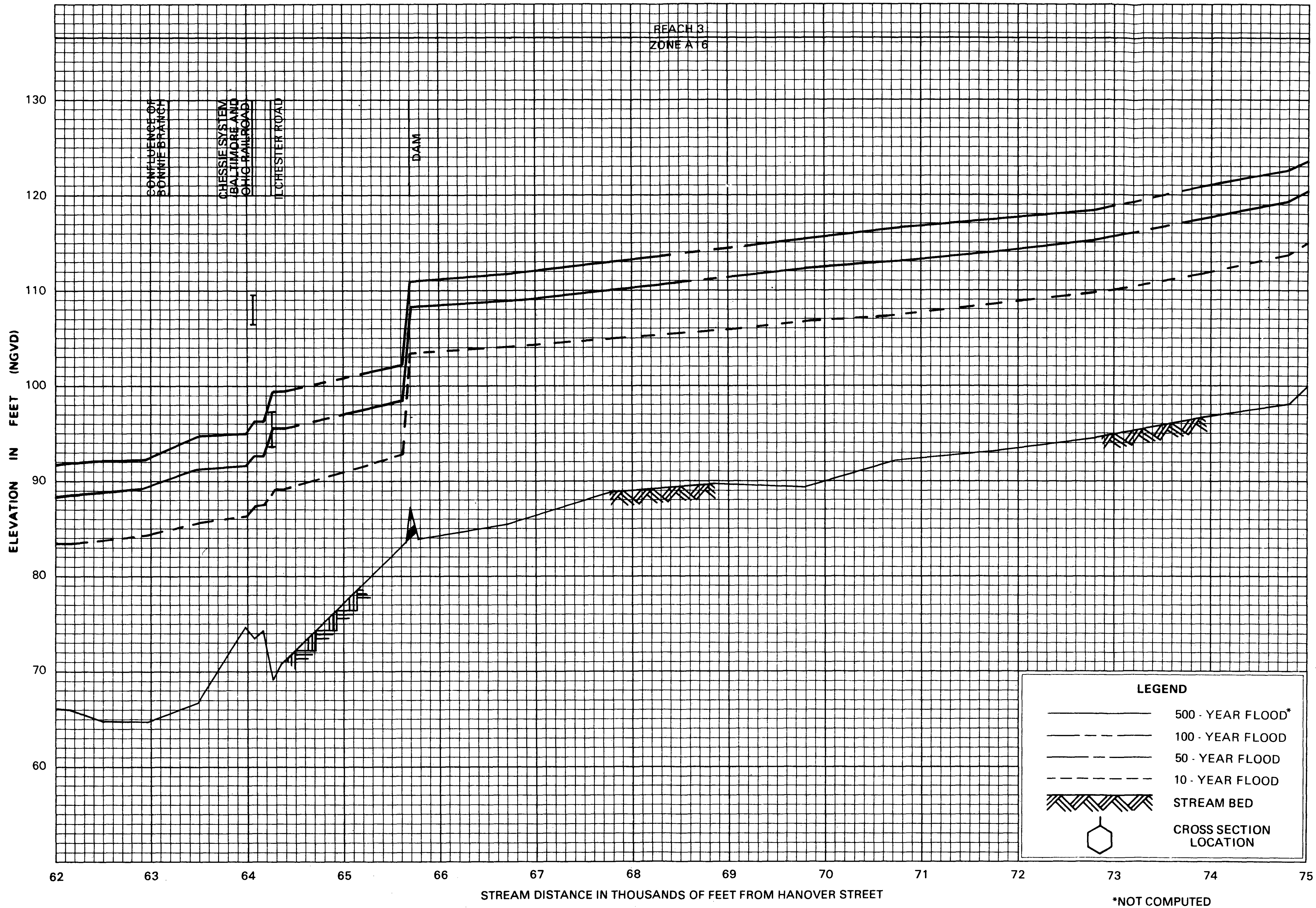
FLOOD PROFILES

PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

02P



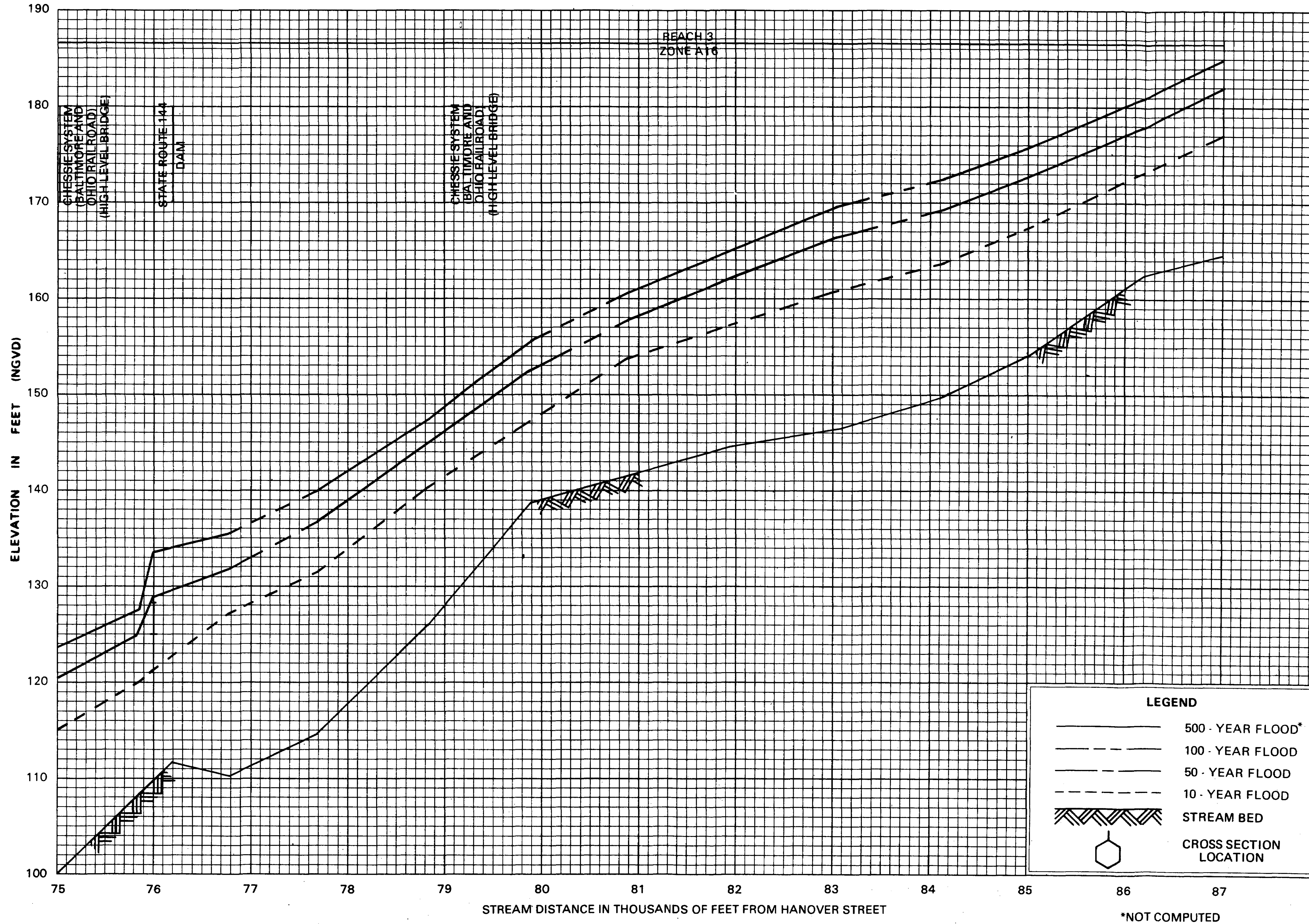
FLOOD PROFILES

PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

03P



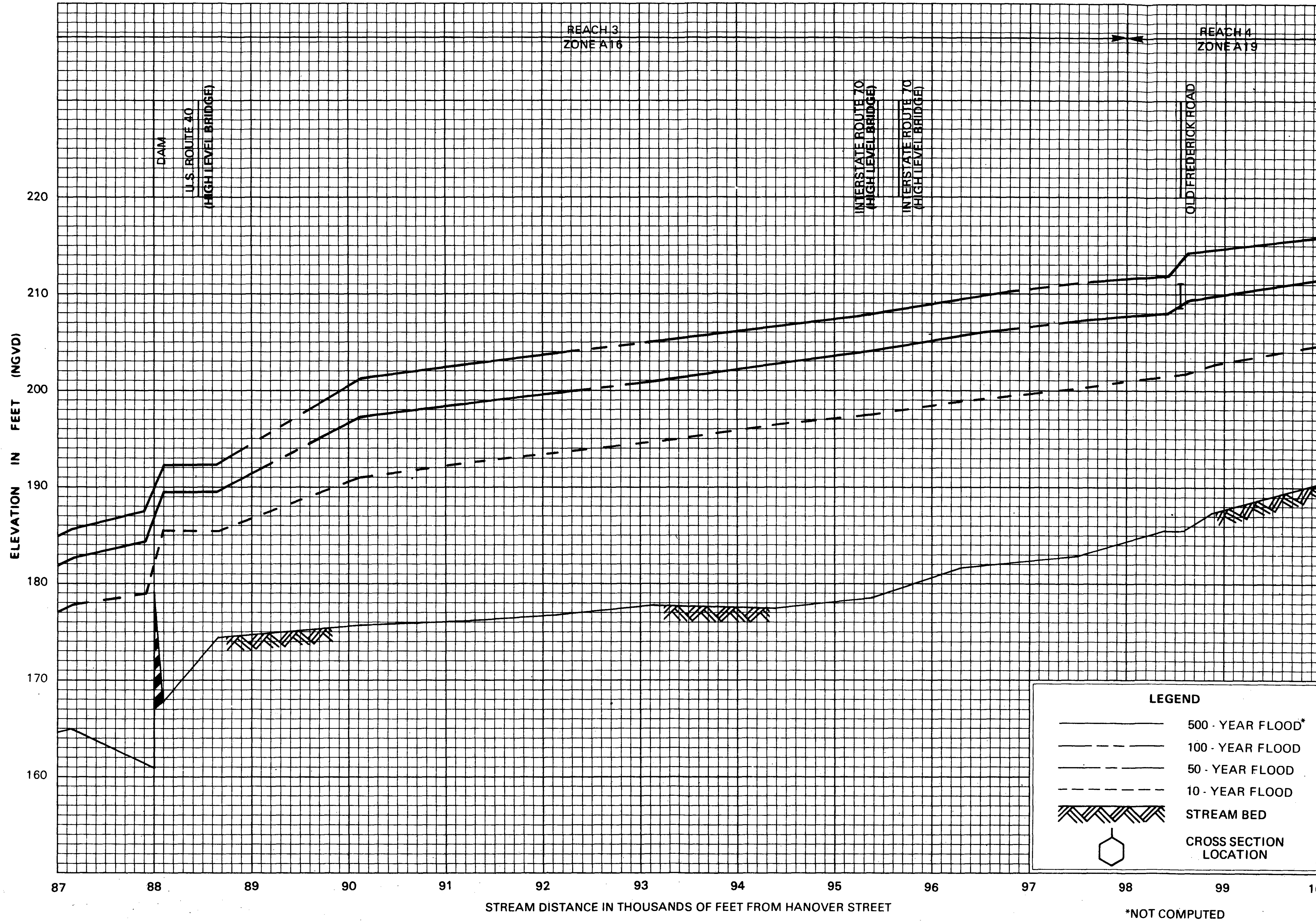
FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

FLOOD PROFILES

PATAPSCO RIVER

04P

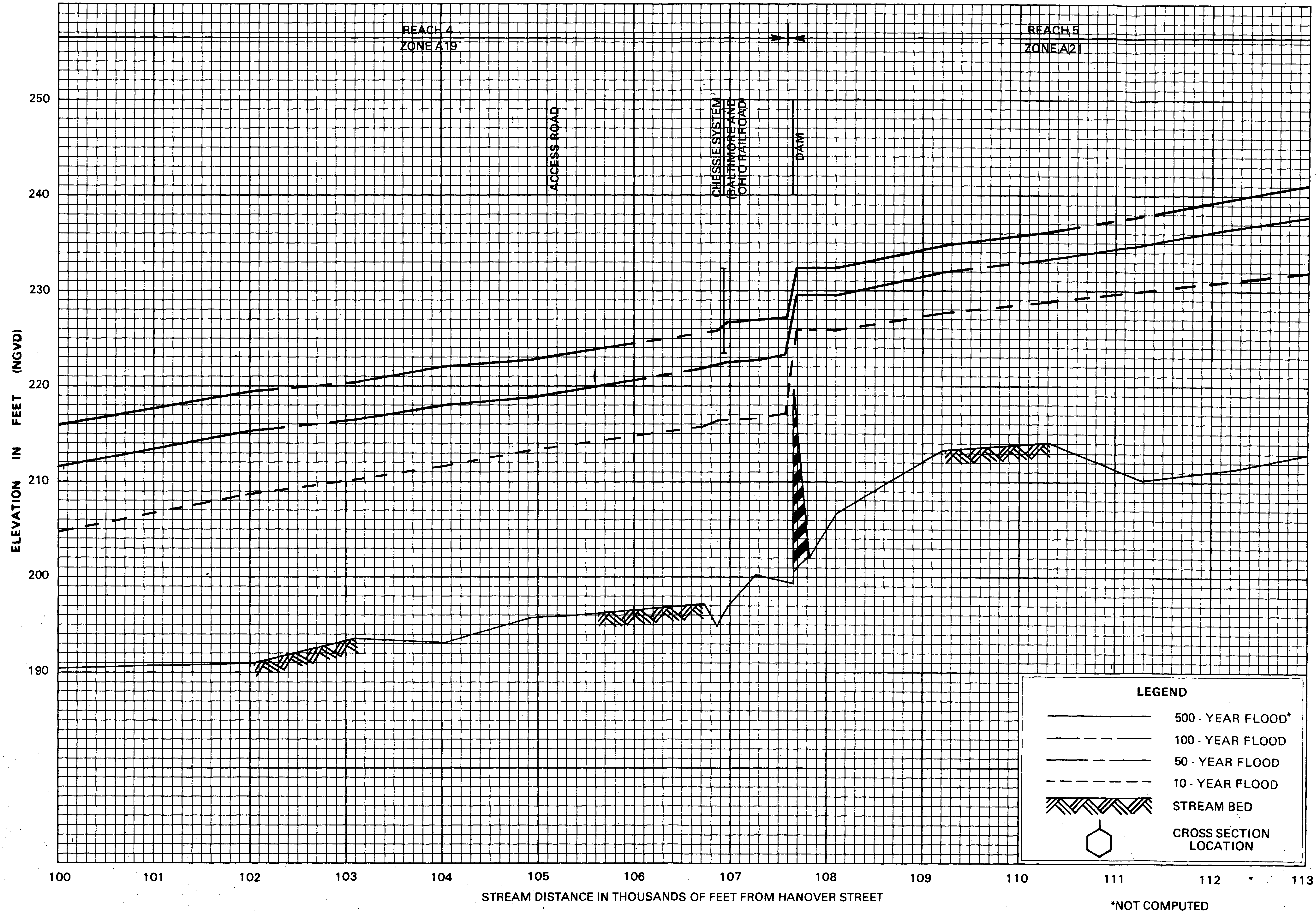


FLOOD PROFILES

PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD



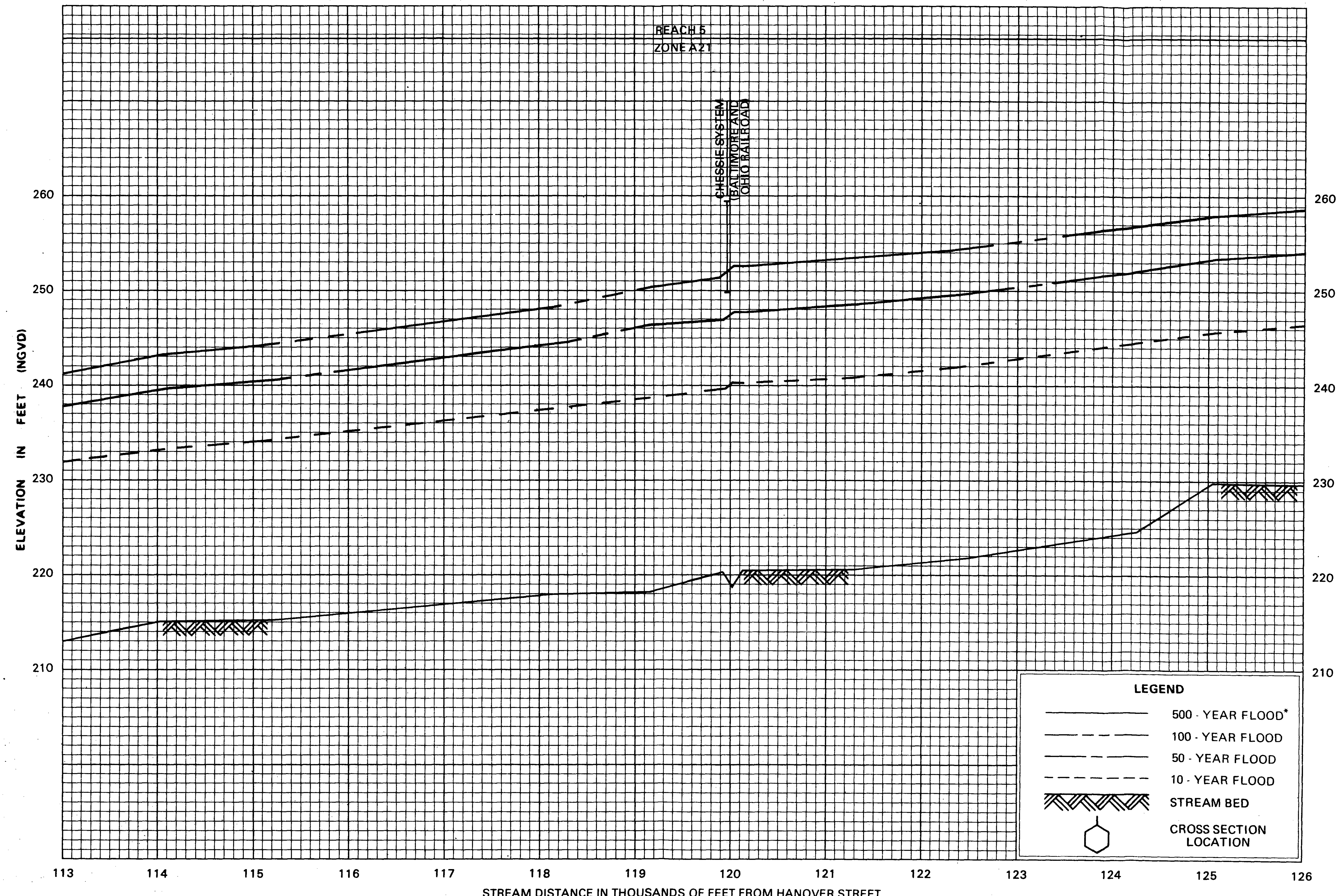
FLOOD PROFILES

PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

06P



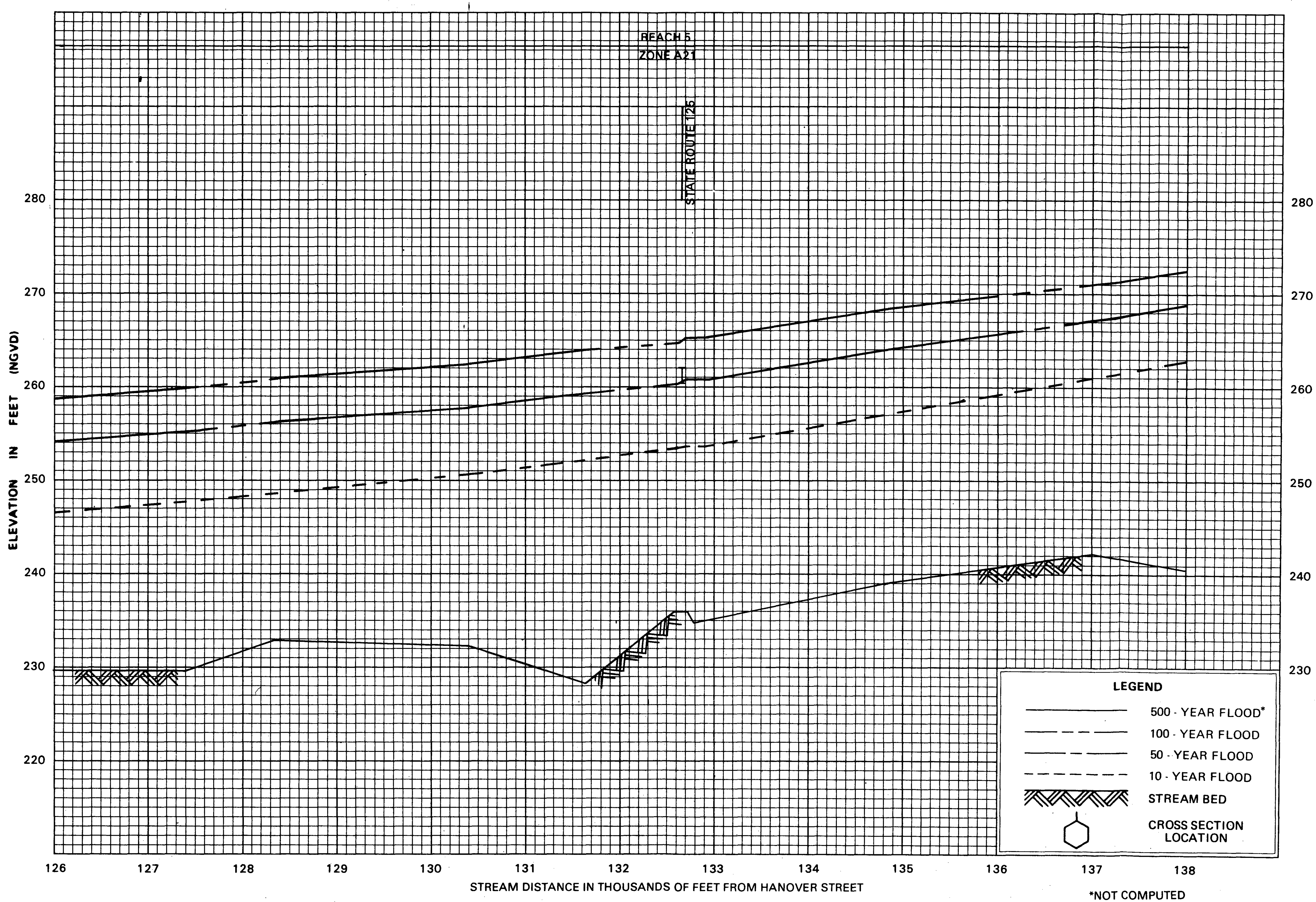
FLOOD PROFILES

PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

07P



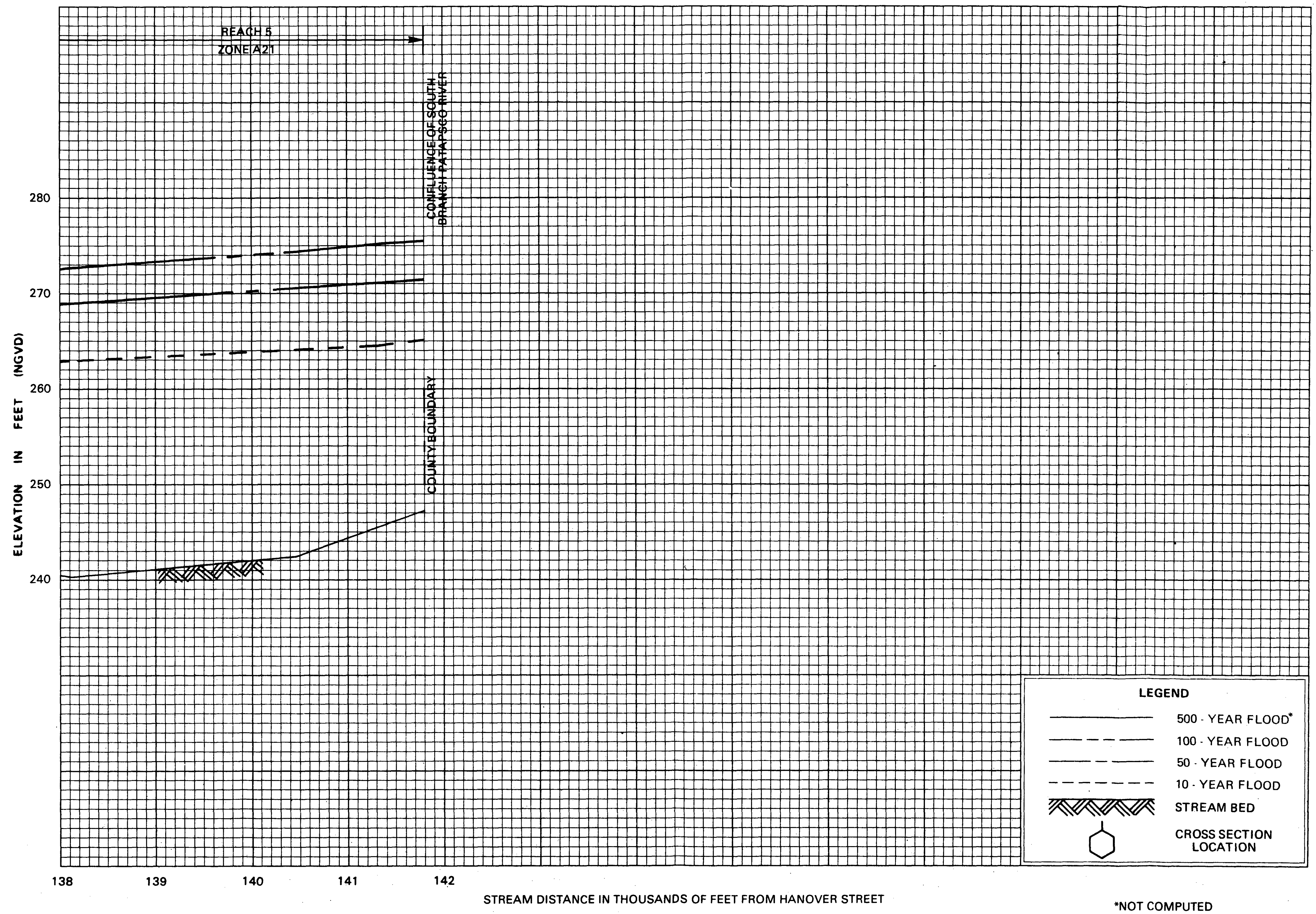
FLOOD PROFILES

PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

08P



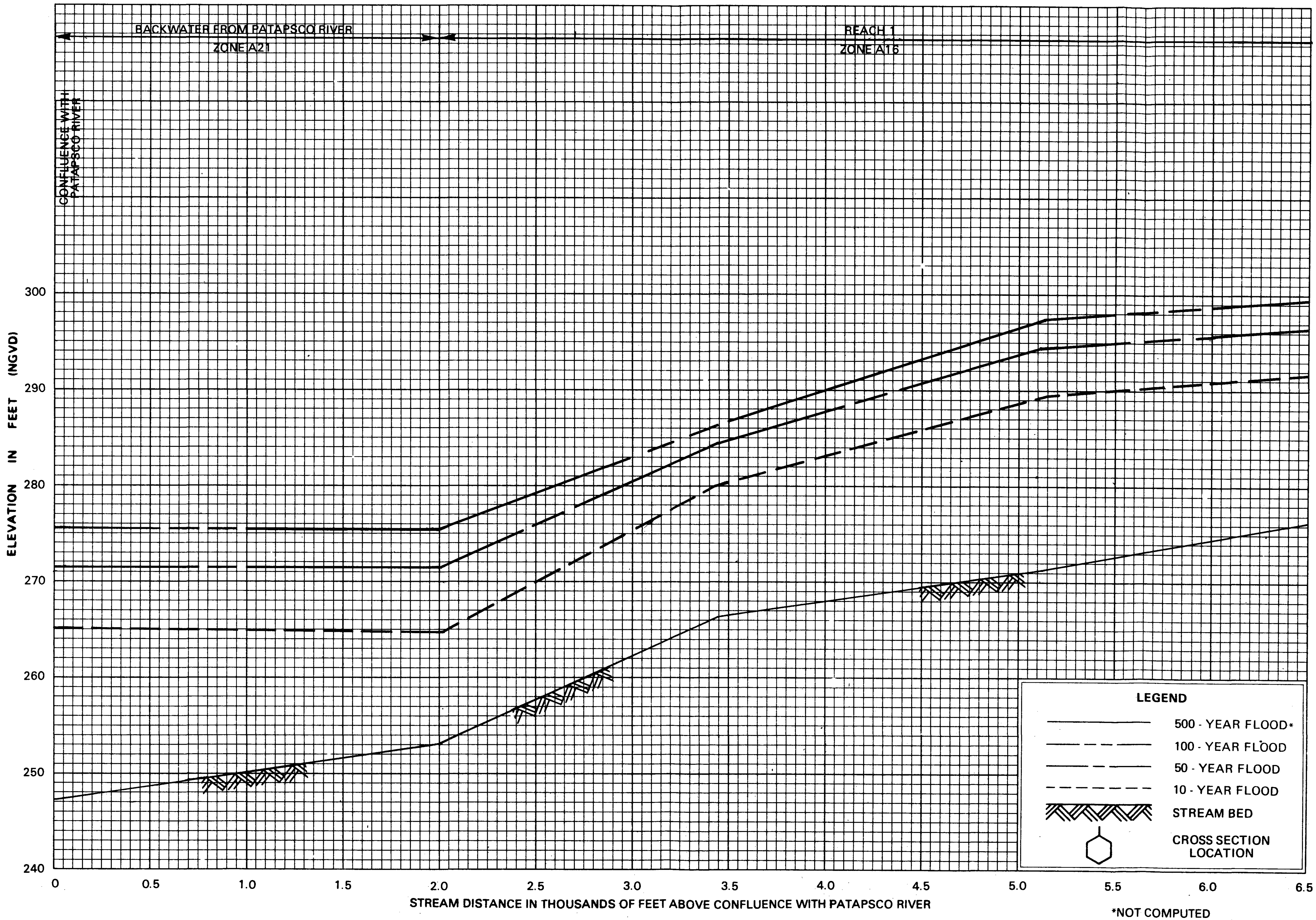
FLOOD PROFILES

PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

09P



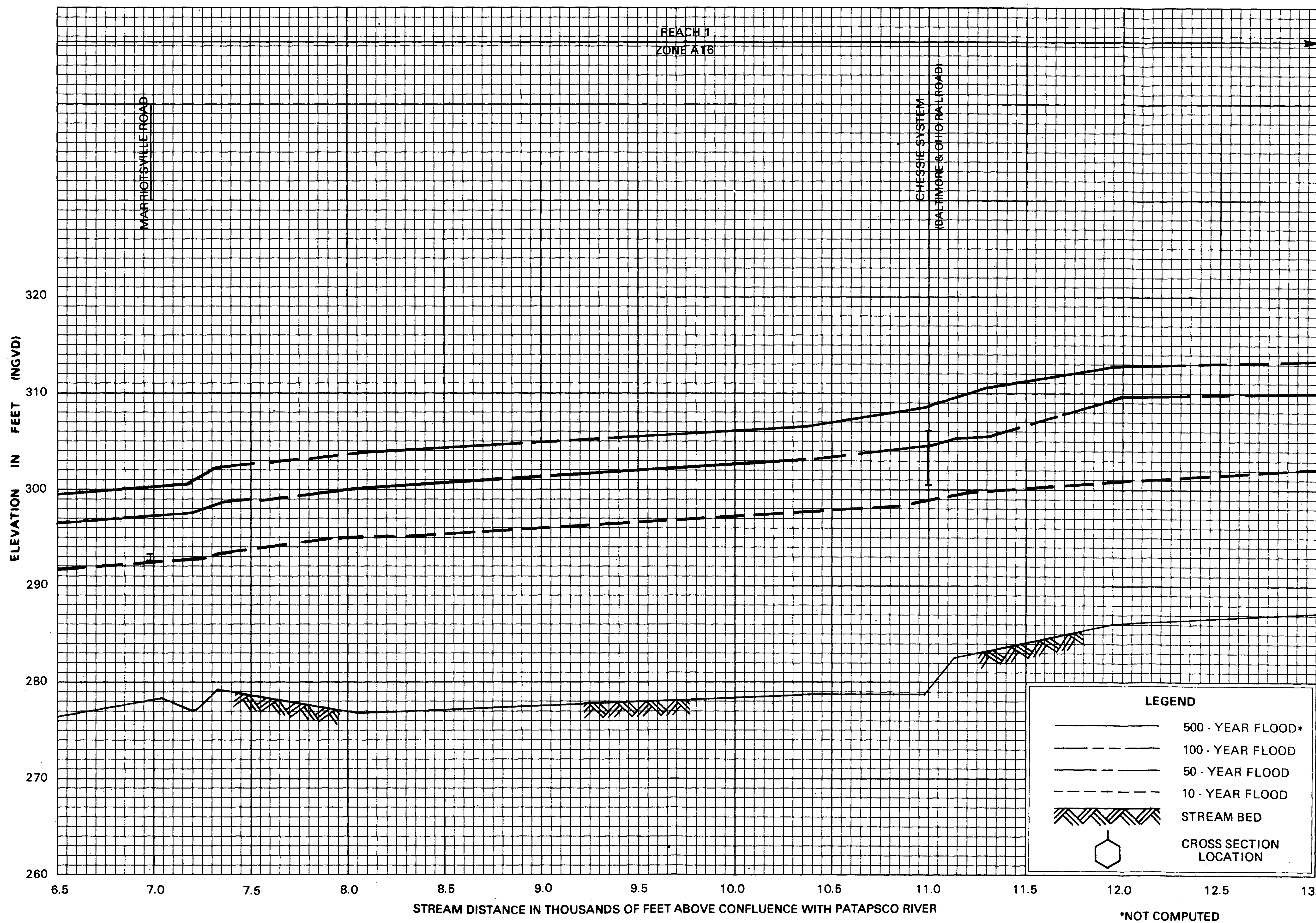
FLOOD PROFILES

SOUTH BRANCH PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

10P

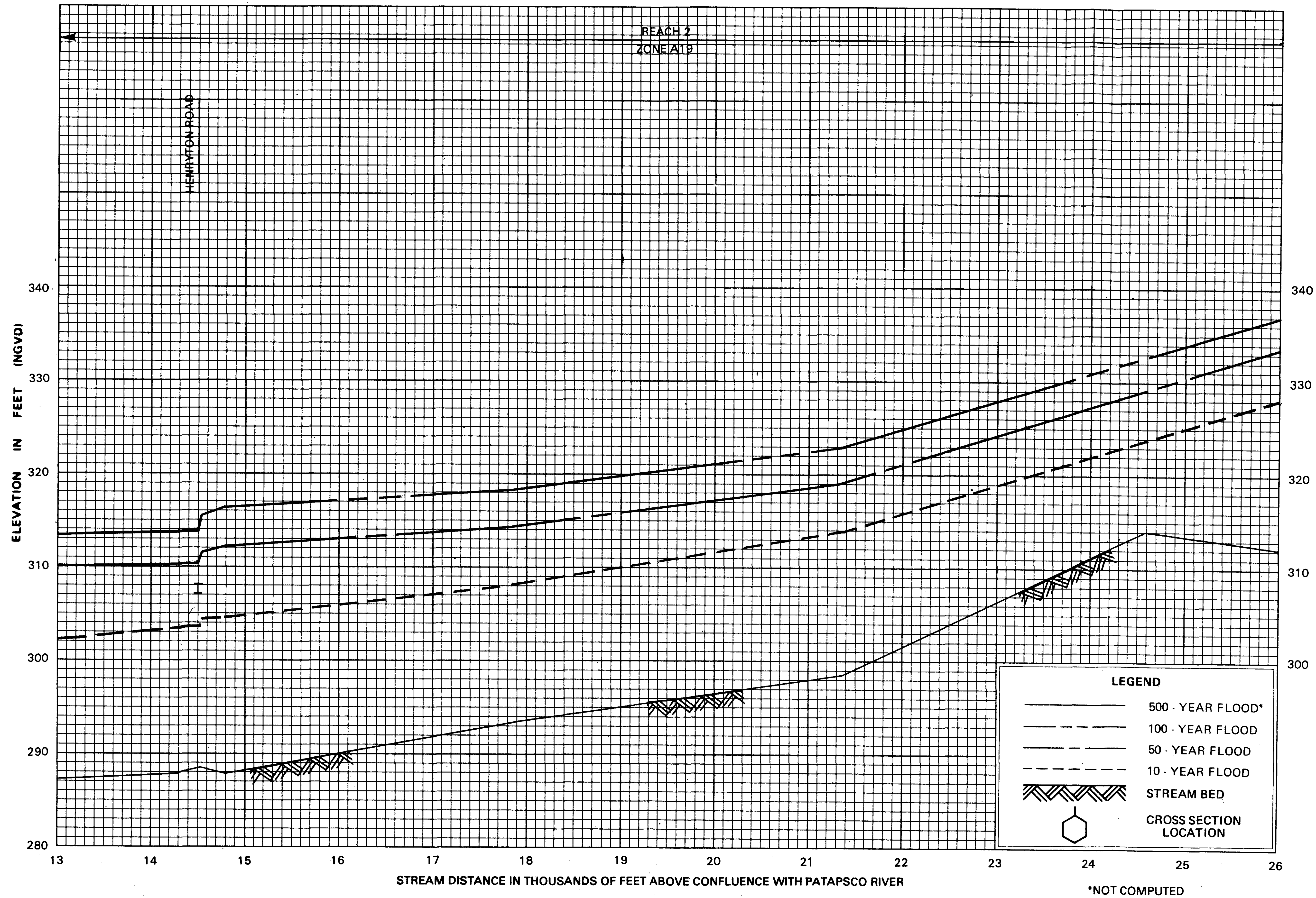


FLOOD PROFILES

SOUTH BRANCH PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD



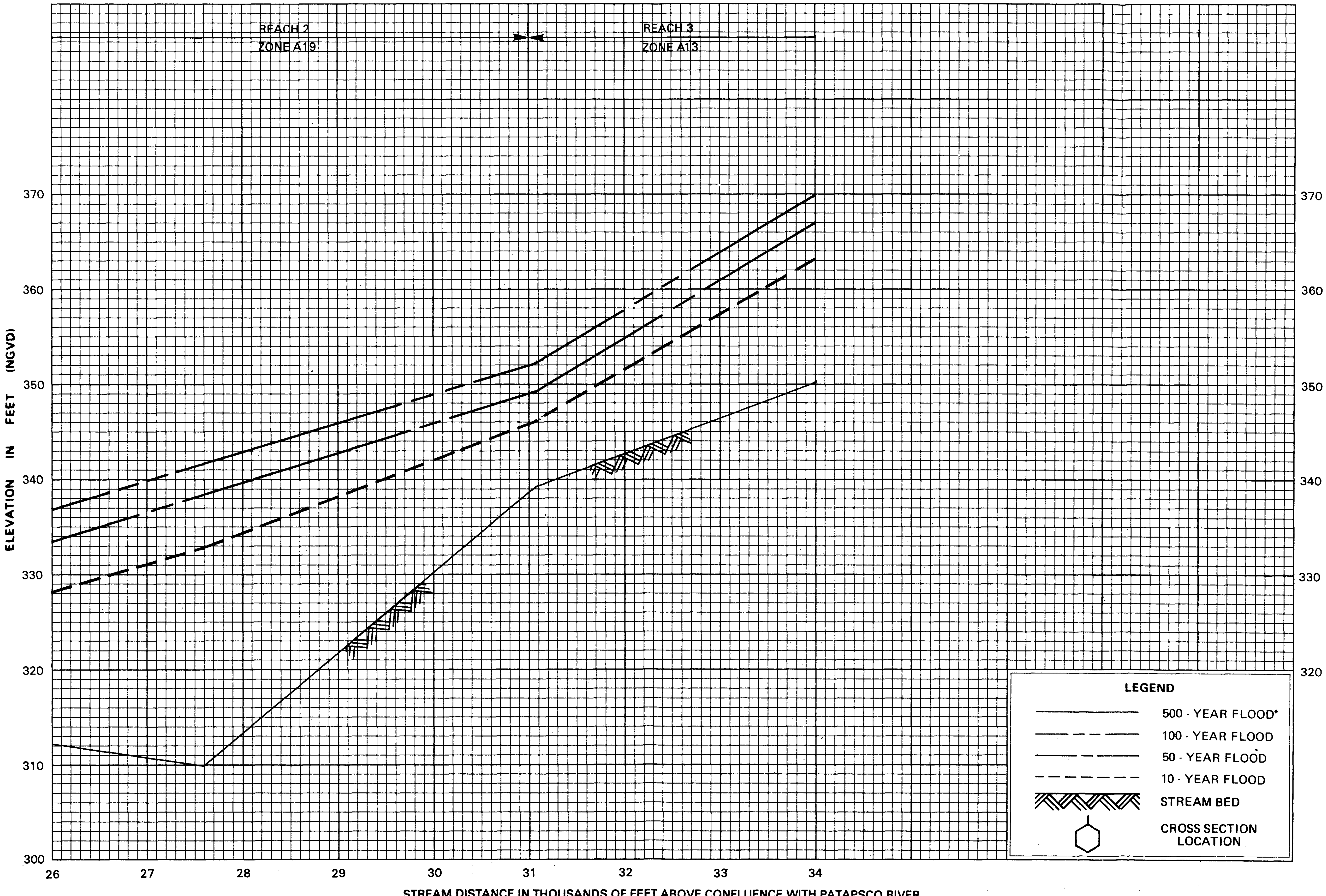
FLOOD PROFILES

SOUTH BRANCH PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

12P



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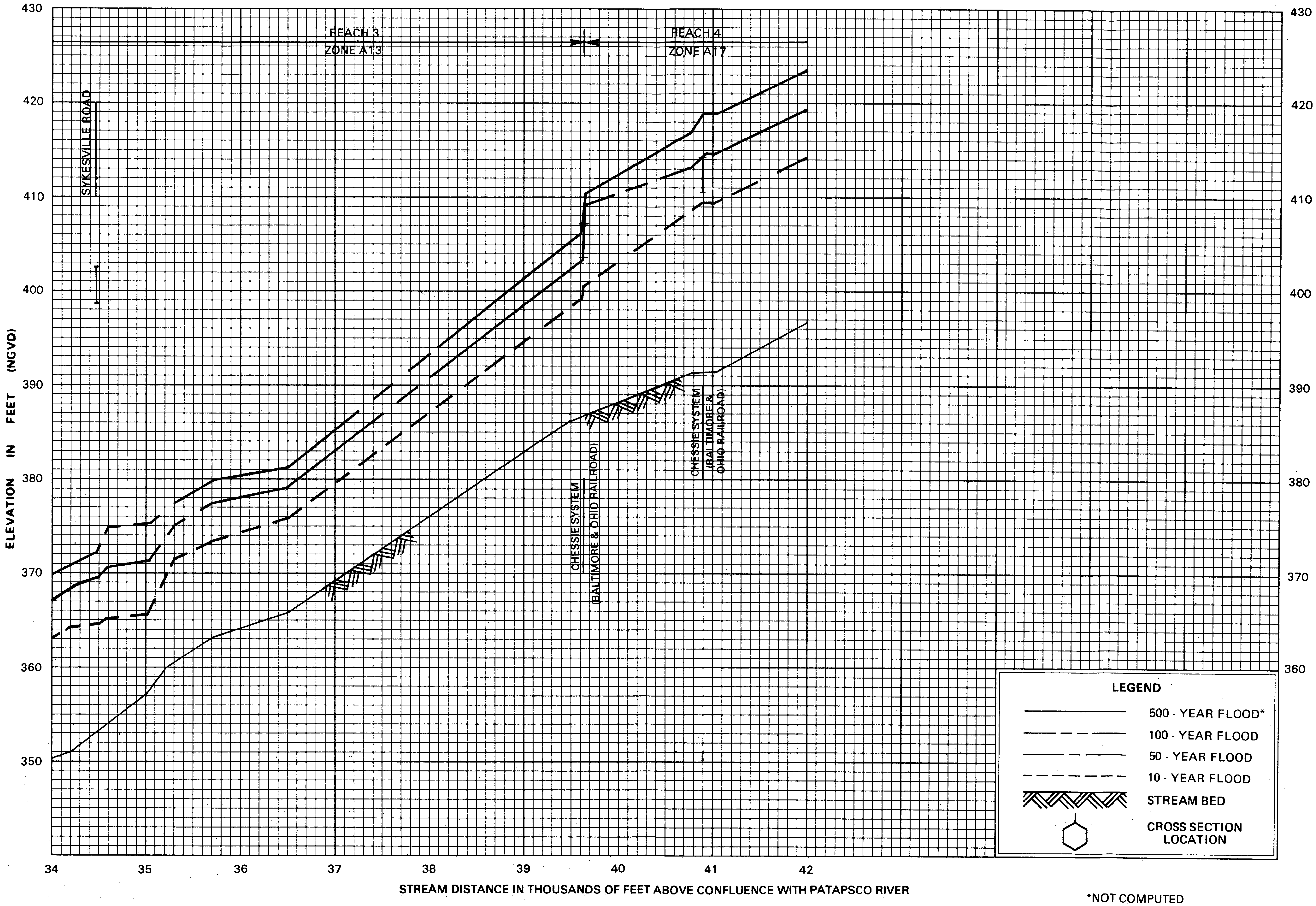
FLOOD PROFILES

SOUTH BRANCH PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

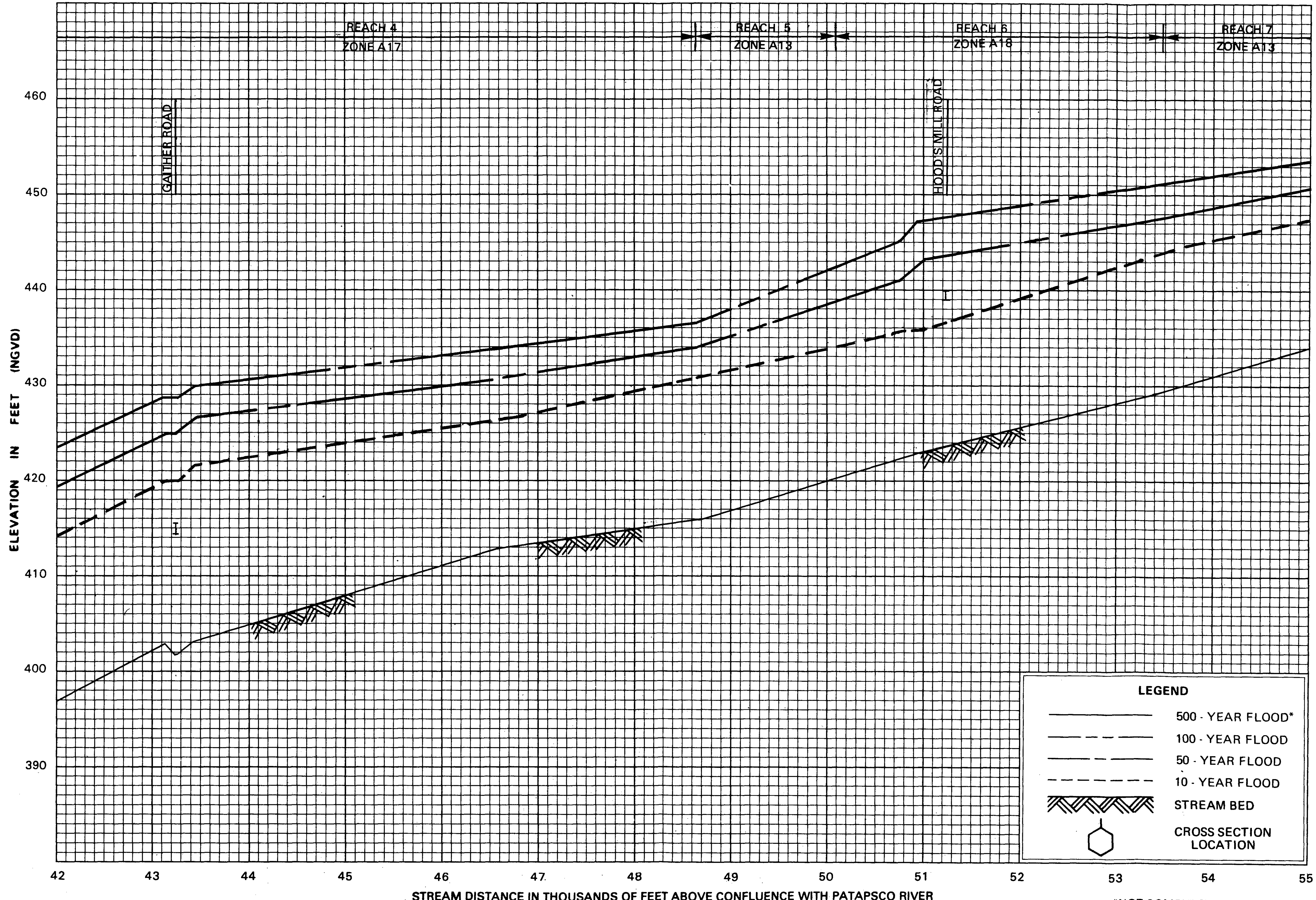


FLOOD PROFILES

SOUTH BRANCH PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

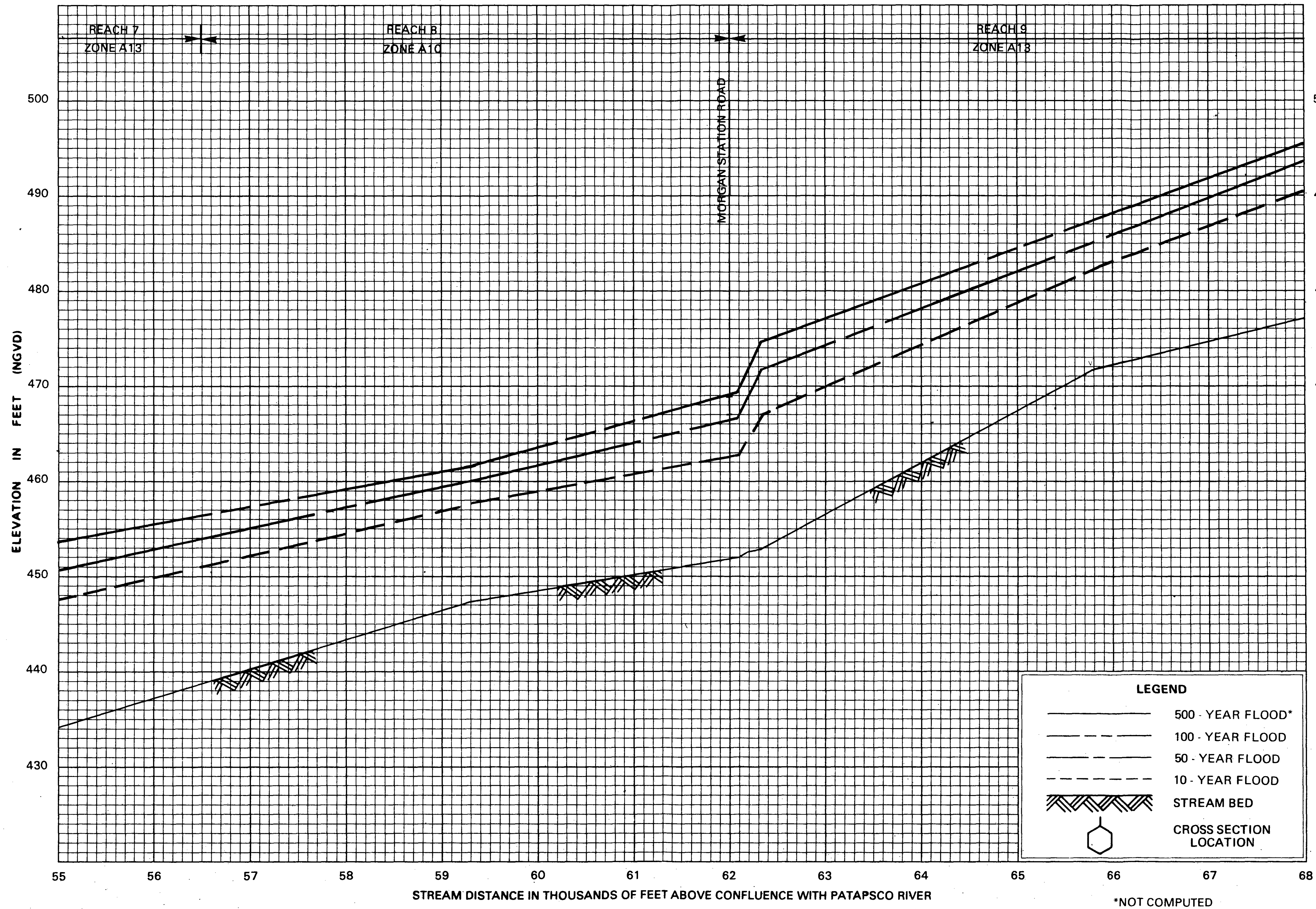


FLOOD PROFILES

SOUTH BRANCH PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

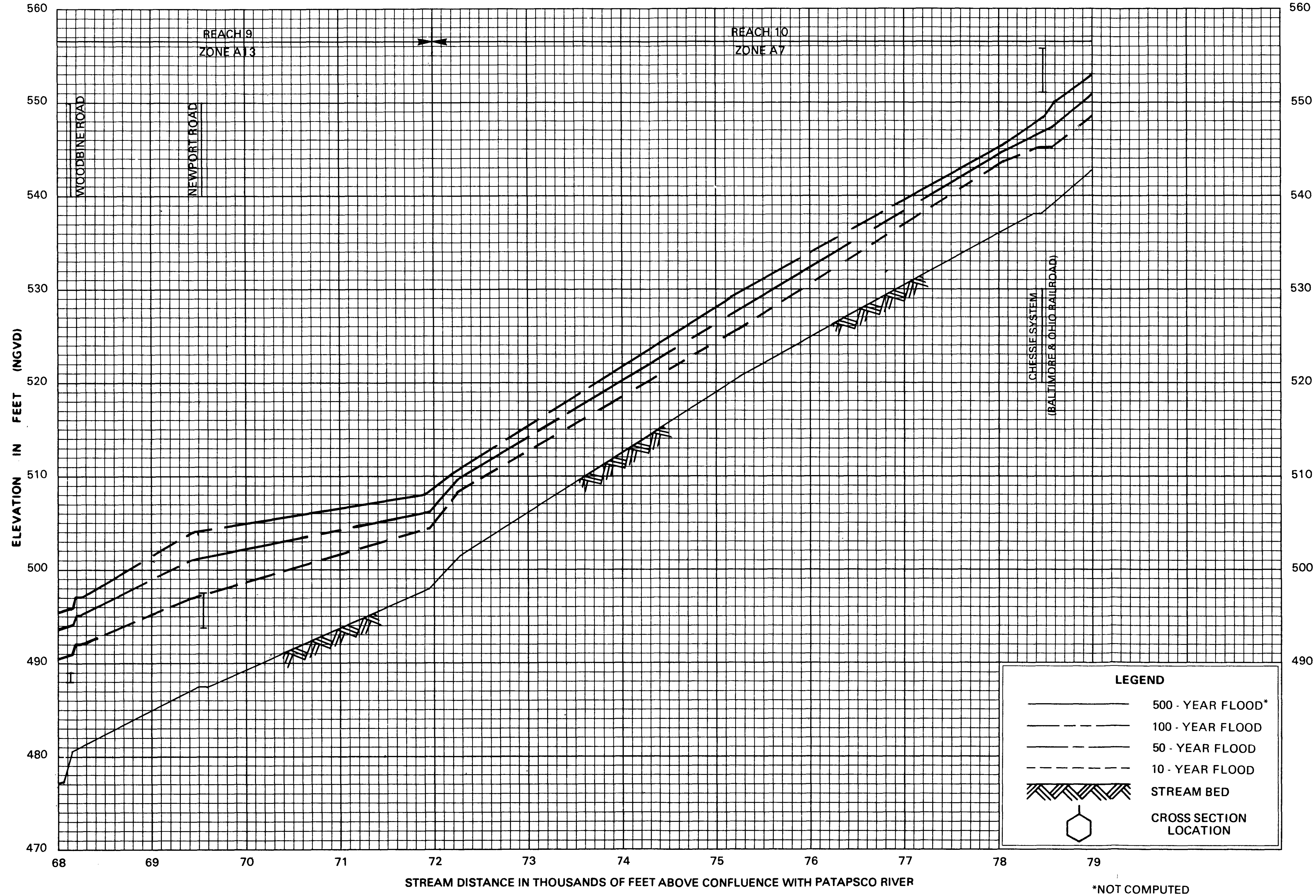


FLOOD PROFILES

SOUTH BRANCH PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD



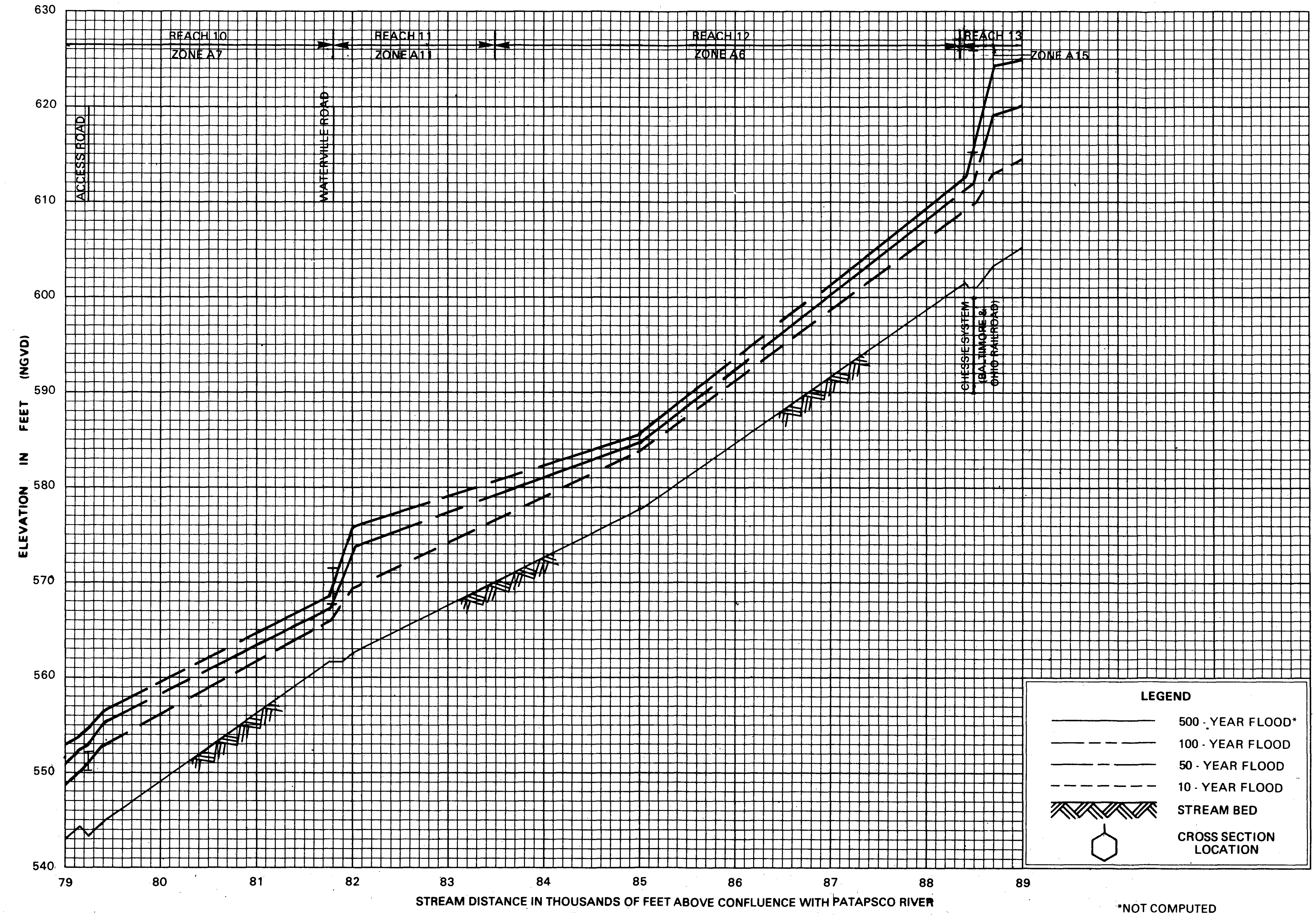
FLOOD PROFILES

SOUTH BRANCH PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

17P

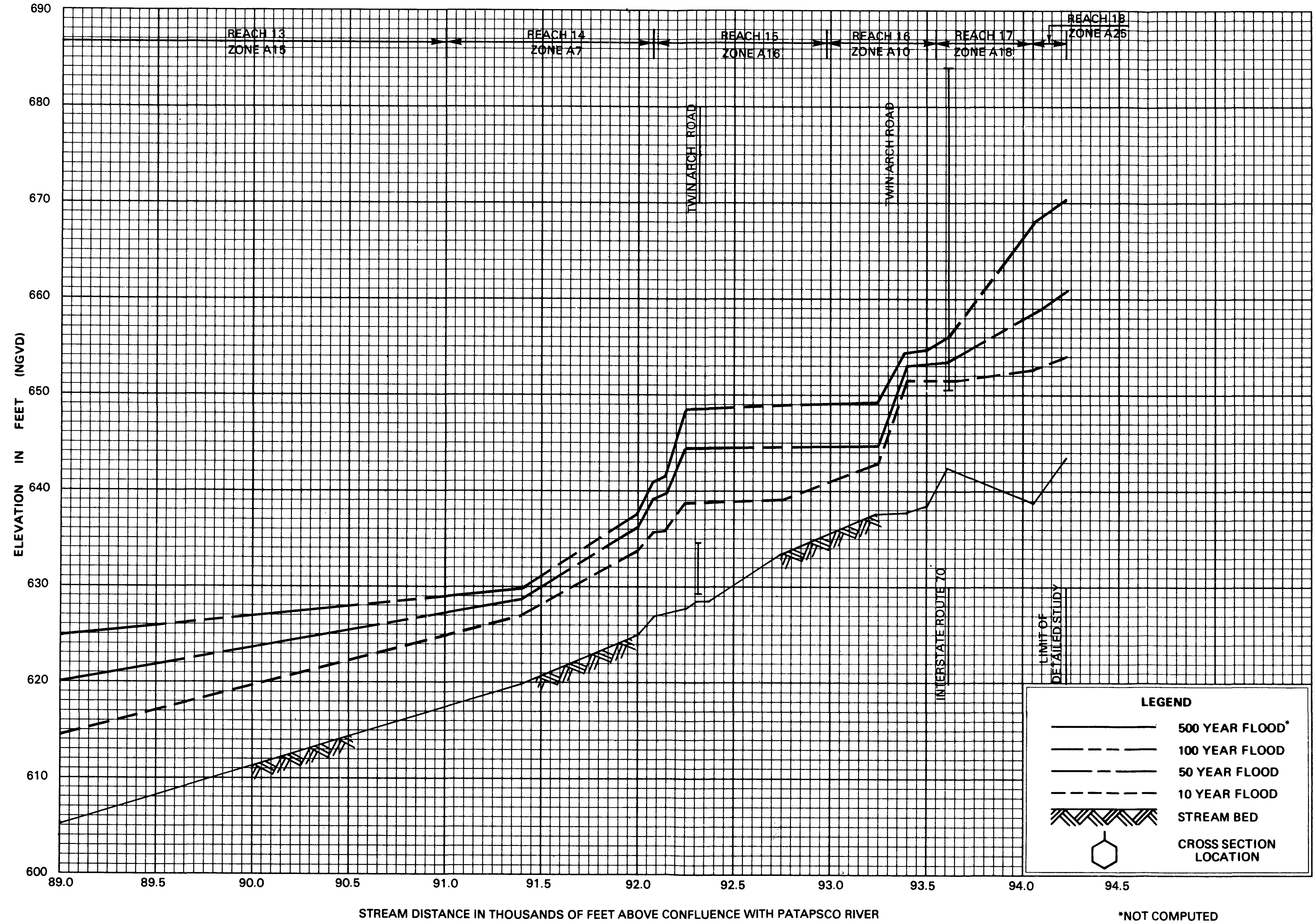


FLOOD PROFILES

SOUTH BRANCH PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD



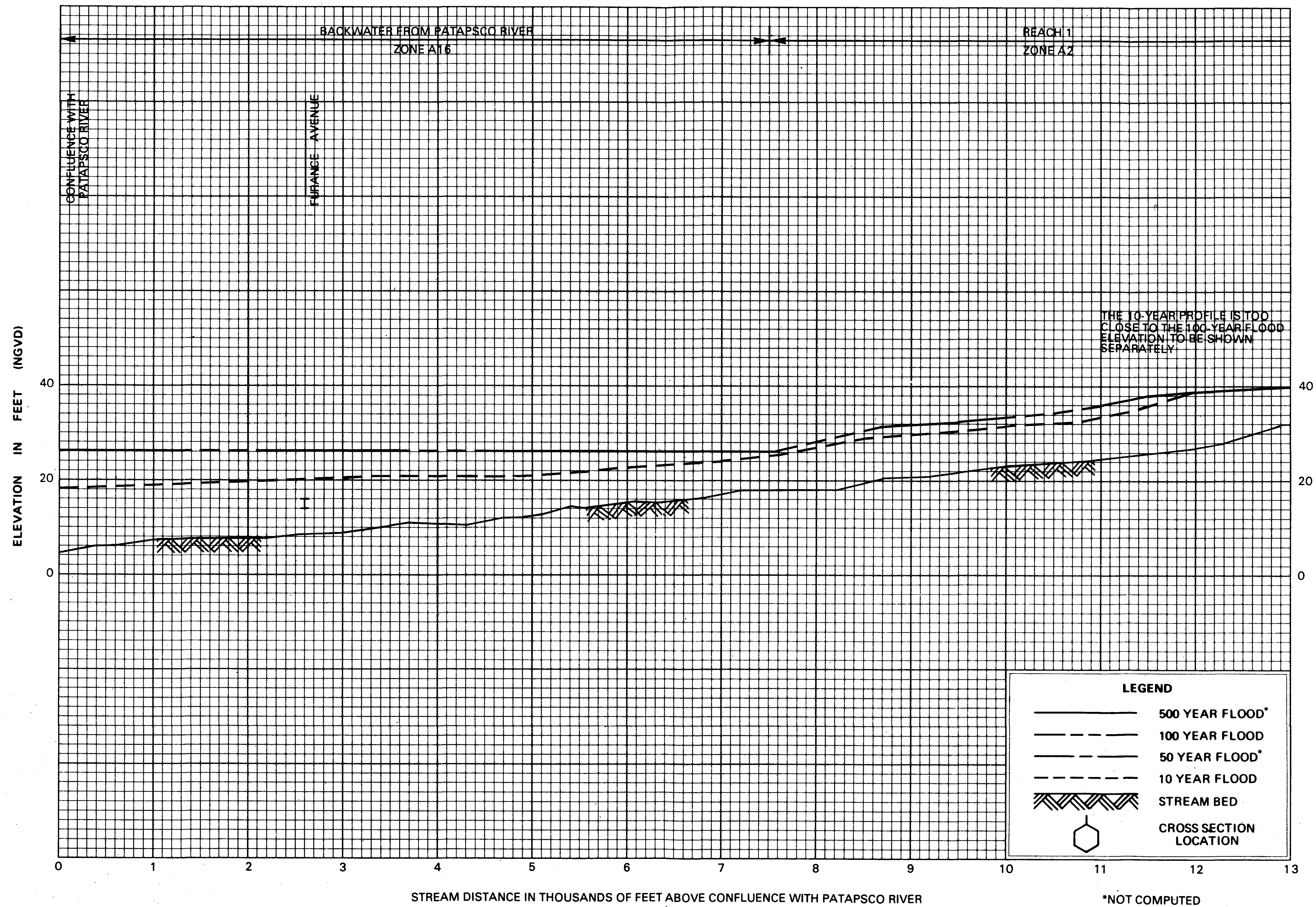
FLOOD PROFILES

SOUTH BRANCH PATAPSCO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

19P

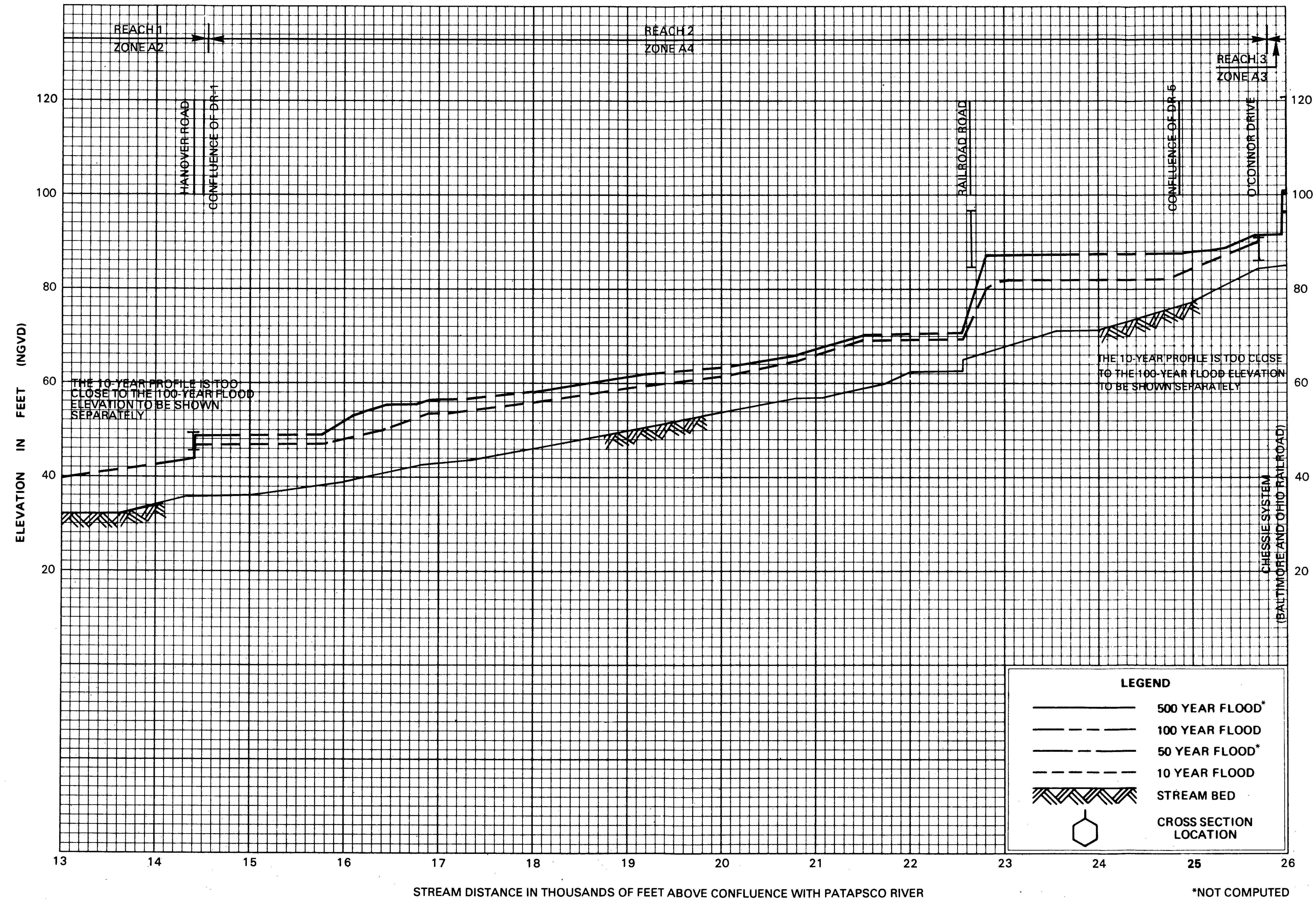


FLOOD PROFILES

DEEP RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

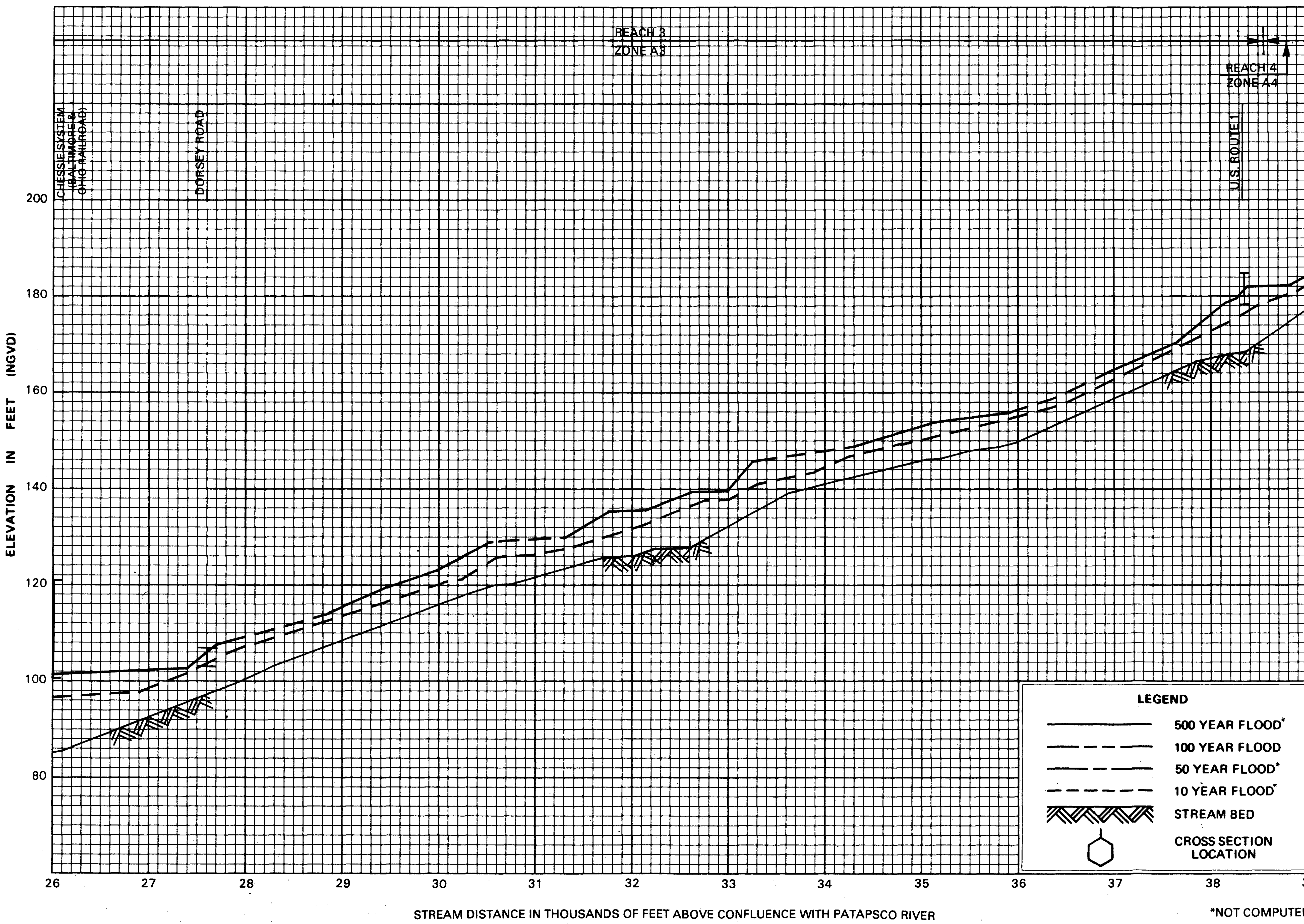


FLOOD PROFILES

DEEP RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD



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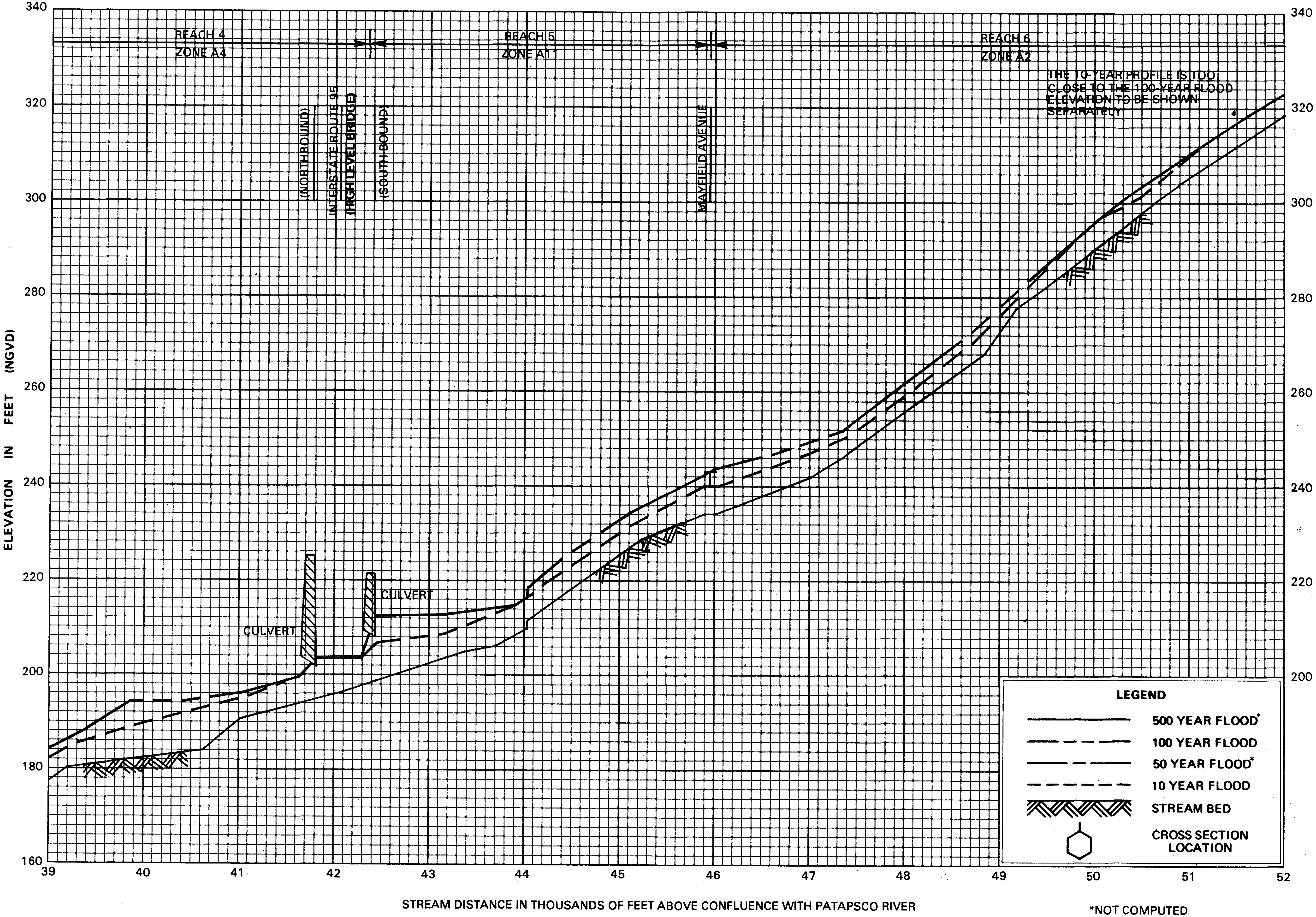
FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

FLOOD PROFILES

DEEP RUN

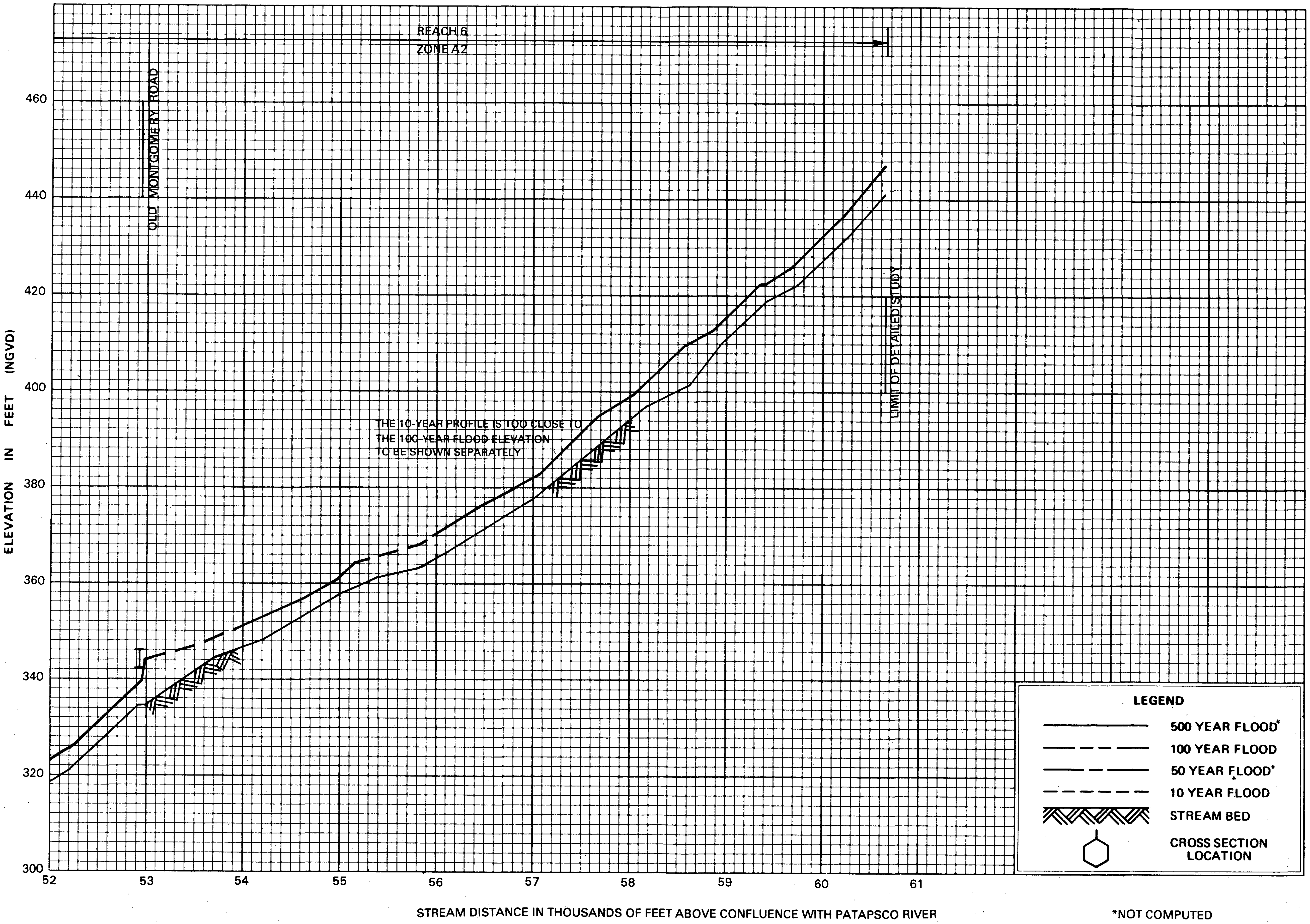


FLOOD PROFILES

DEEP RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

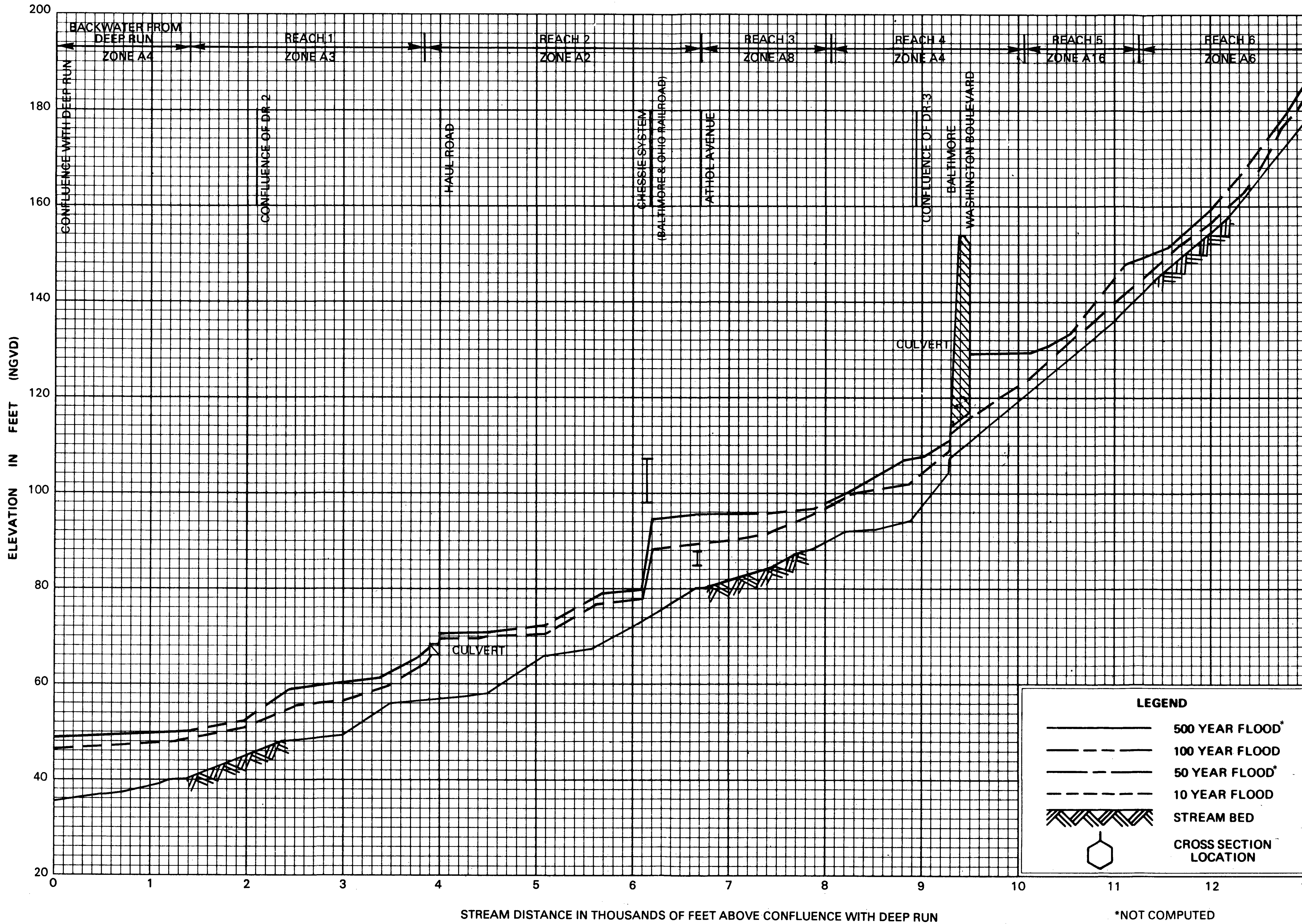


FLOOD PROFILES

DEEP RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

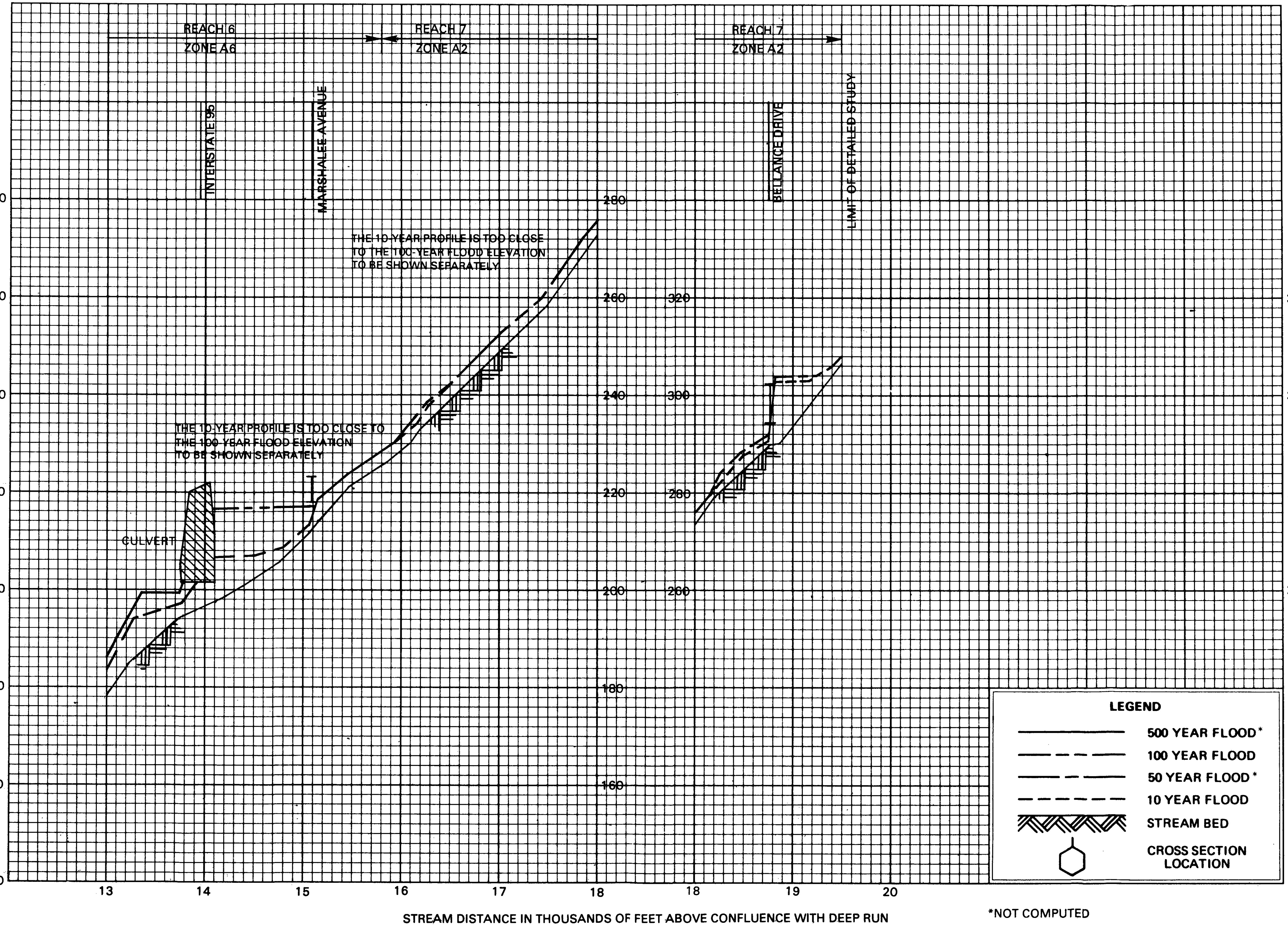


FLOOD PROFILES

STREAM DR-1

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

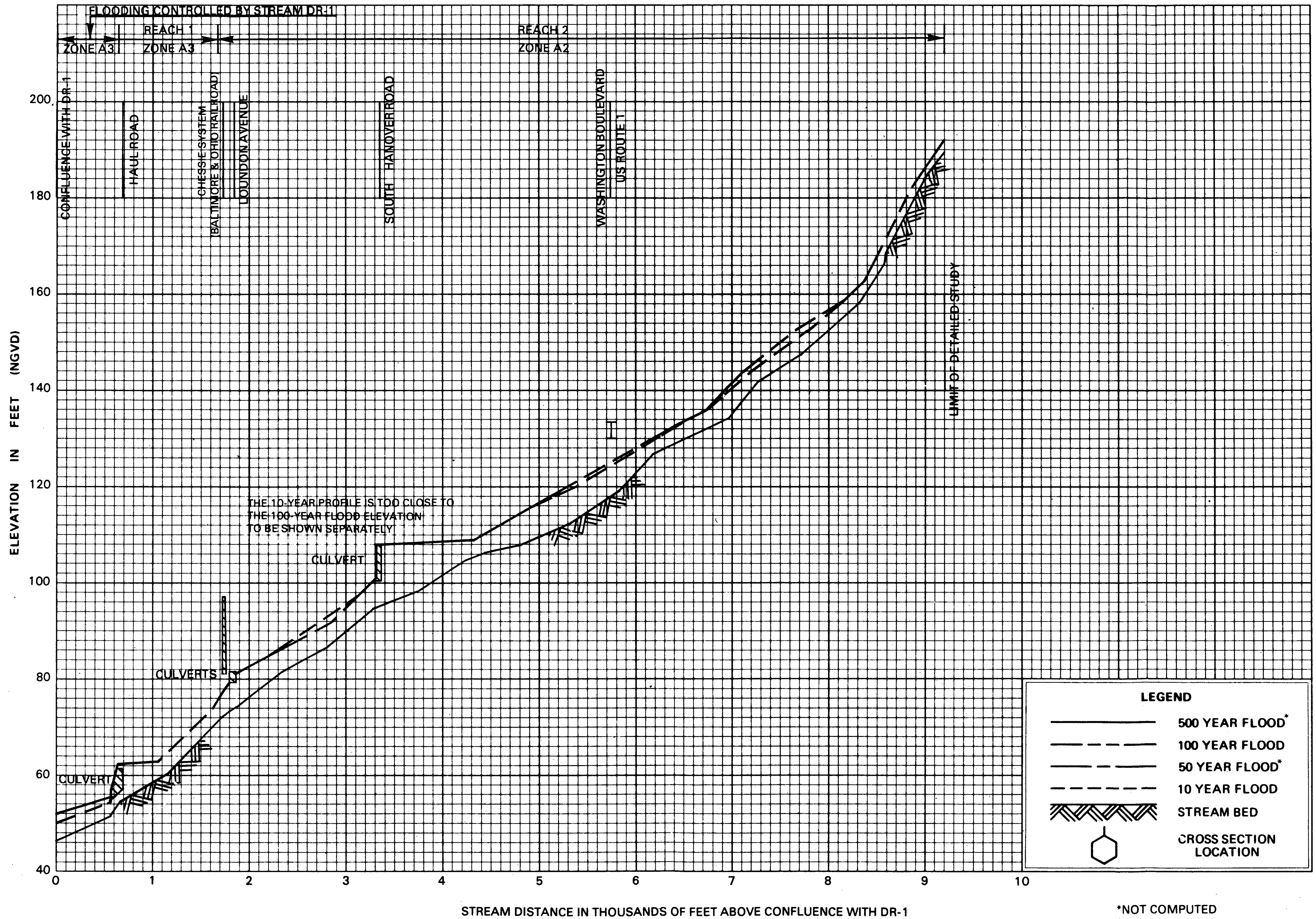


FLOOD PROFILES

STREAM DR-1

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD



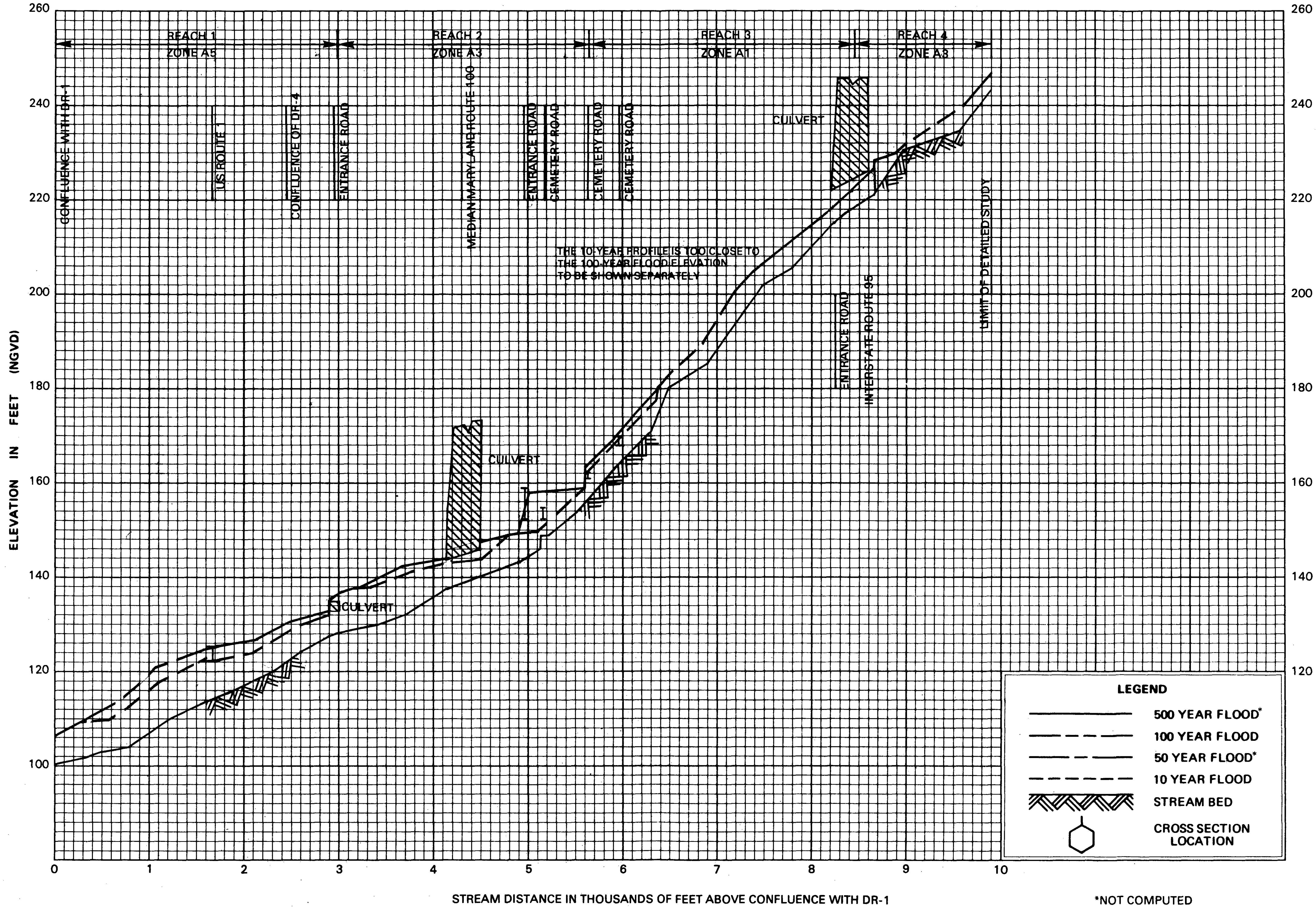
FLOOD PROFILES

STREAM DR-2

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

27P

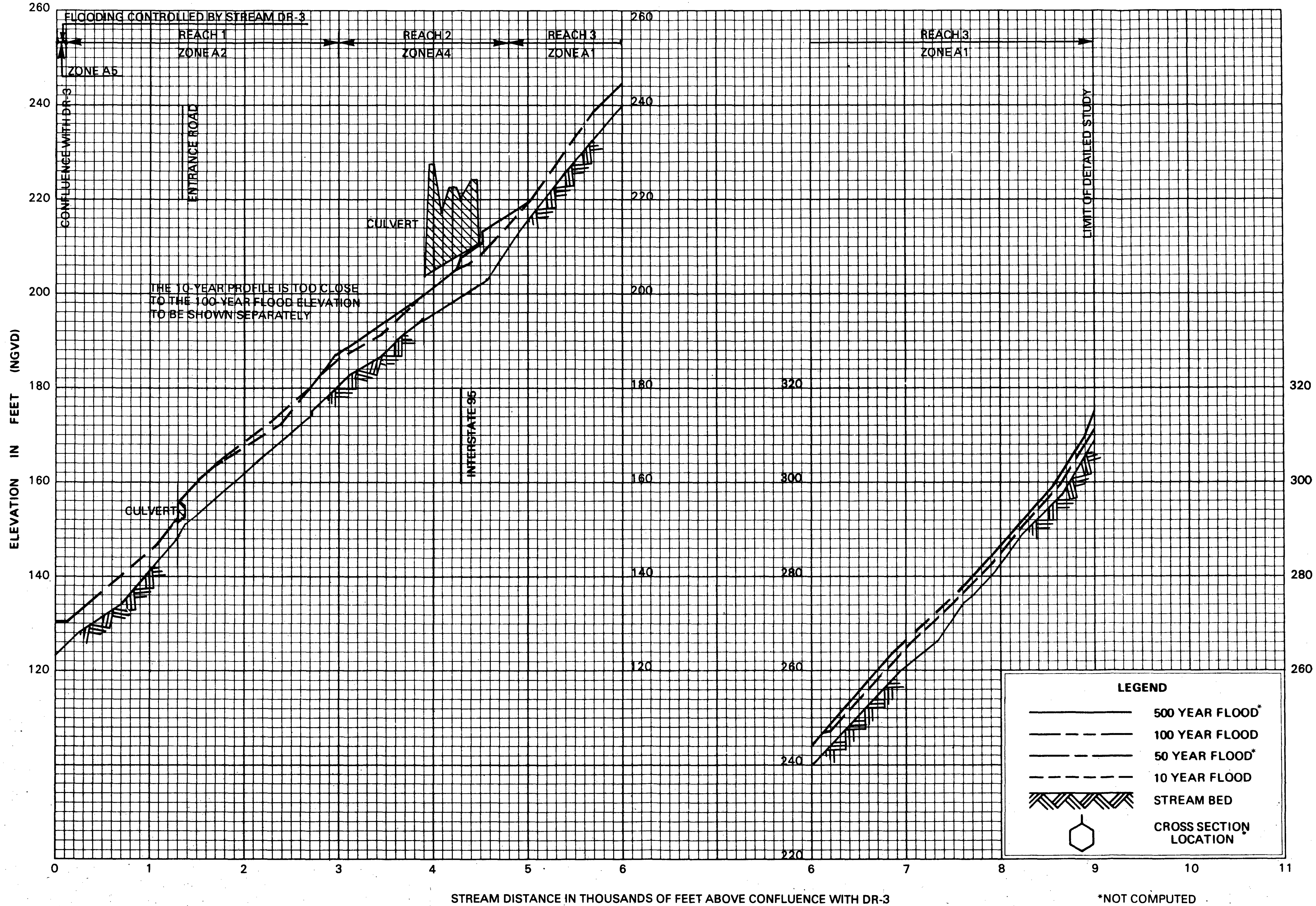


FLOOD PROFILES

STREAM DR-3

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD



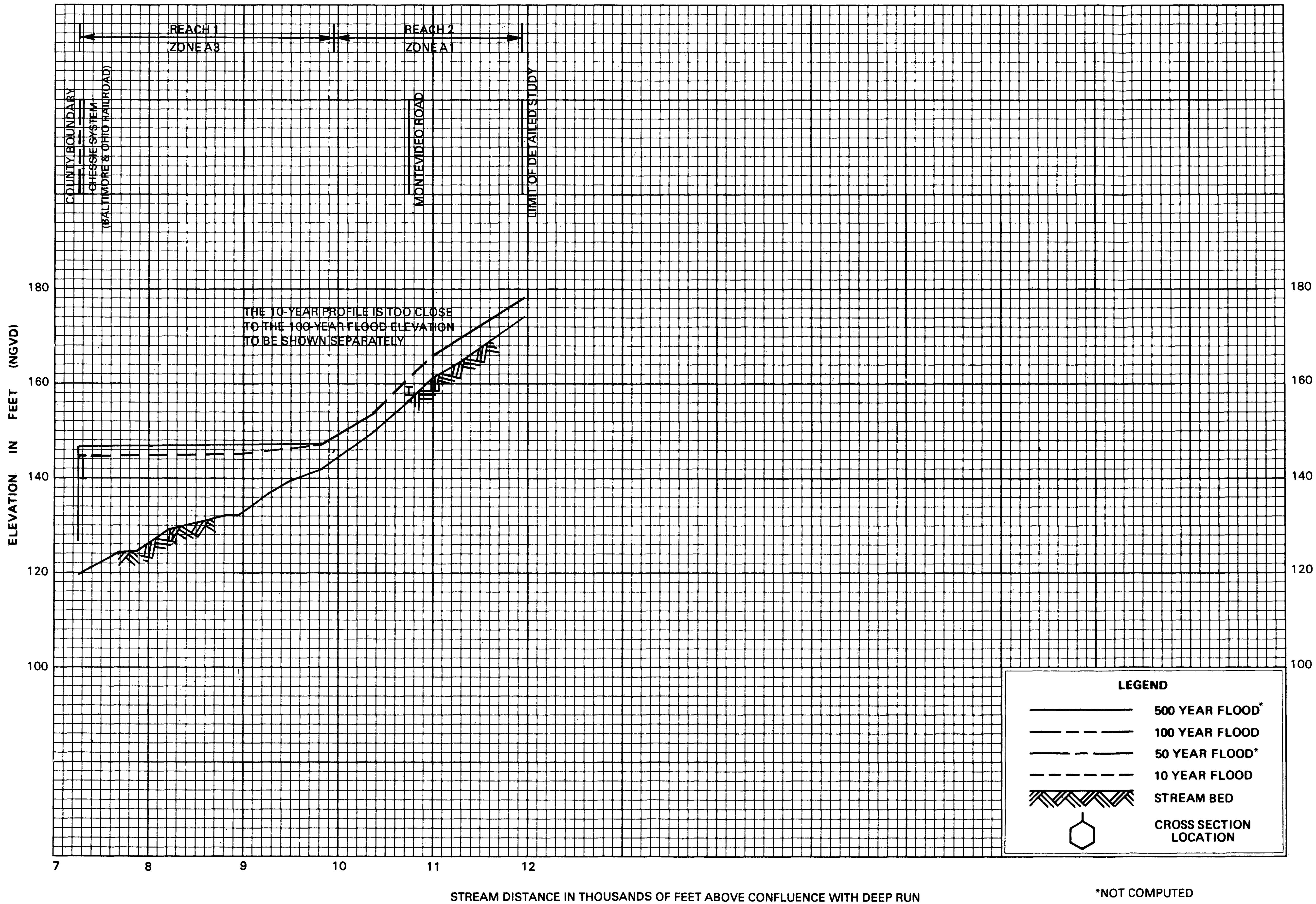
FLOOD PROFILES

STREAM DR-4

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

29P



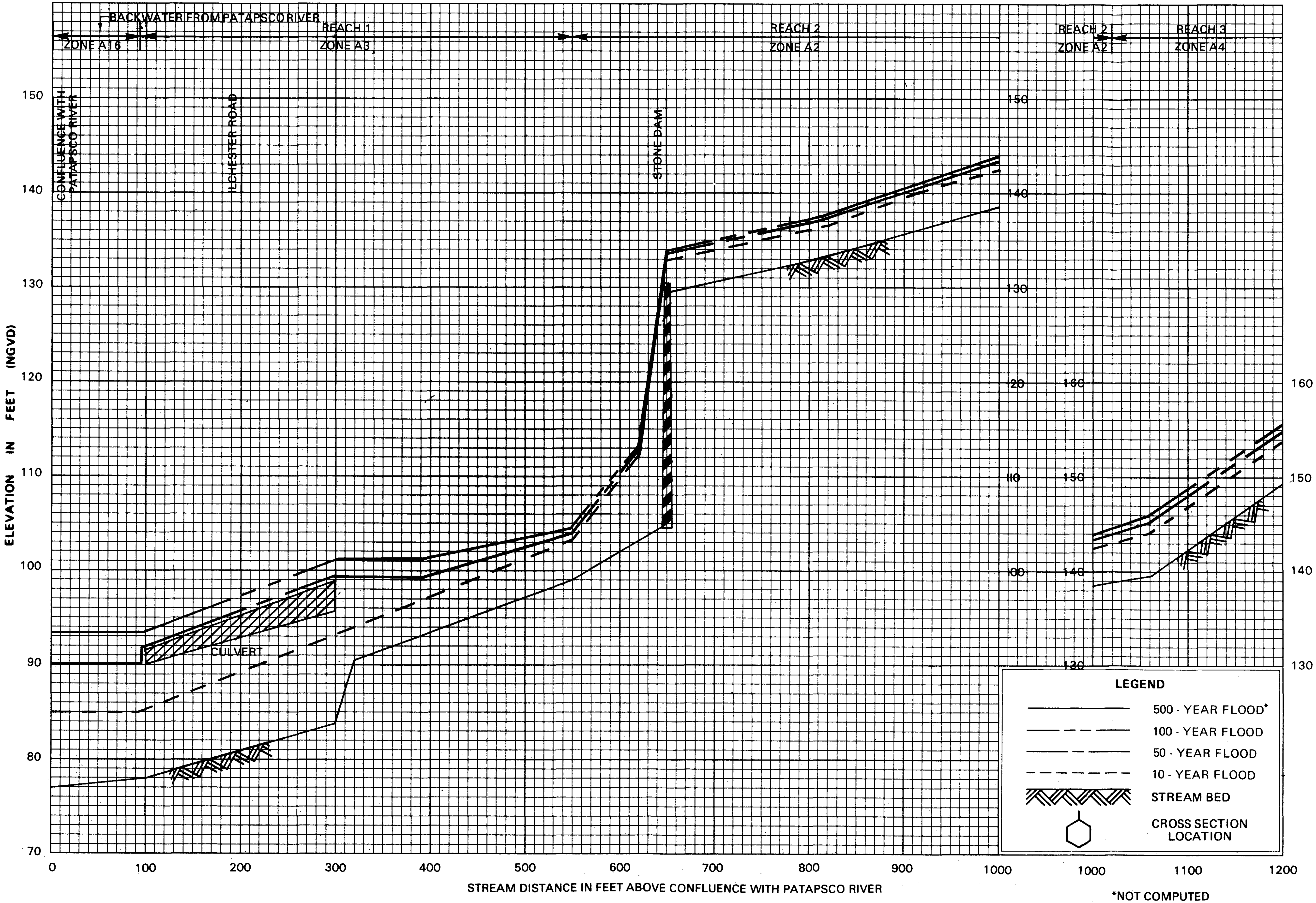
*NOT COMPUTED

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

FLOOD PROFILES

STREAM DR-5



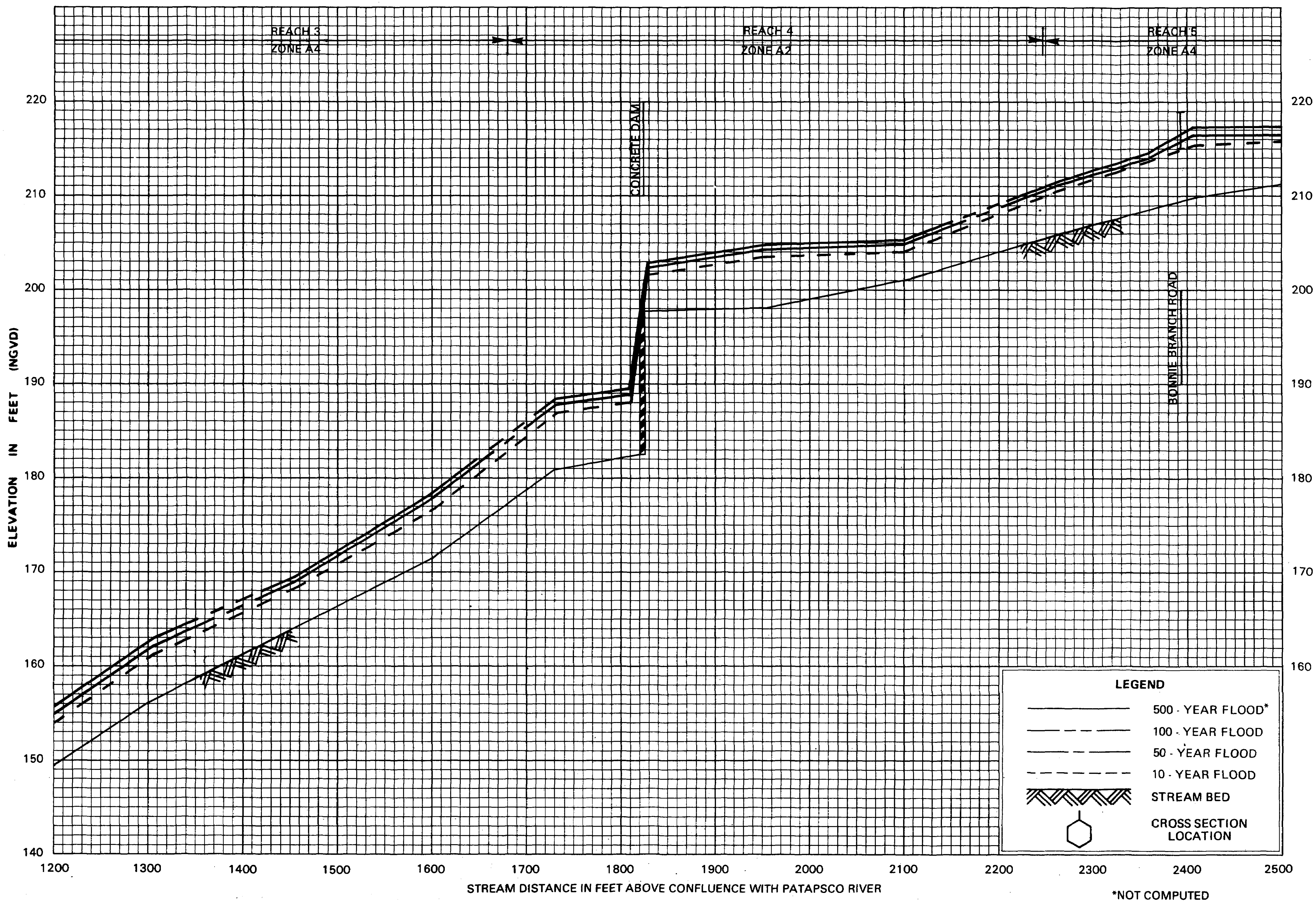
FLOOD PROFILES

BONNIE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

31P



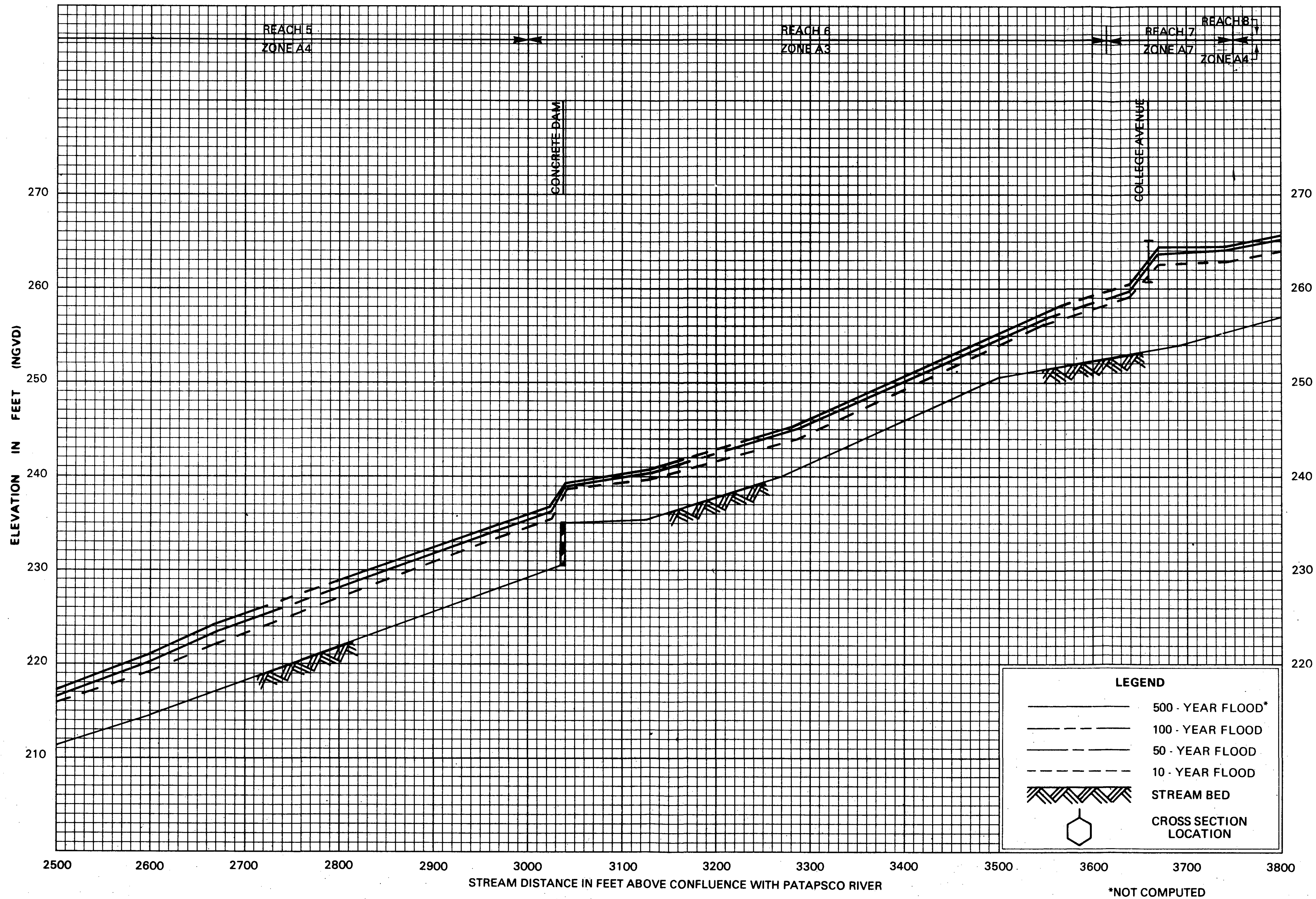
FLOOD PROFILES

BONNIE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

32P

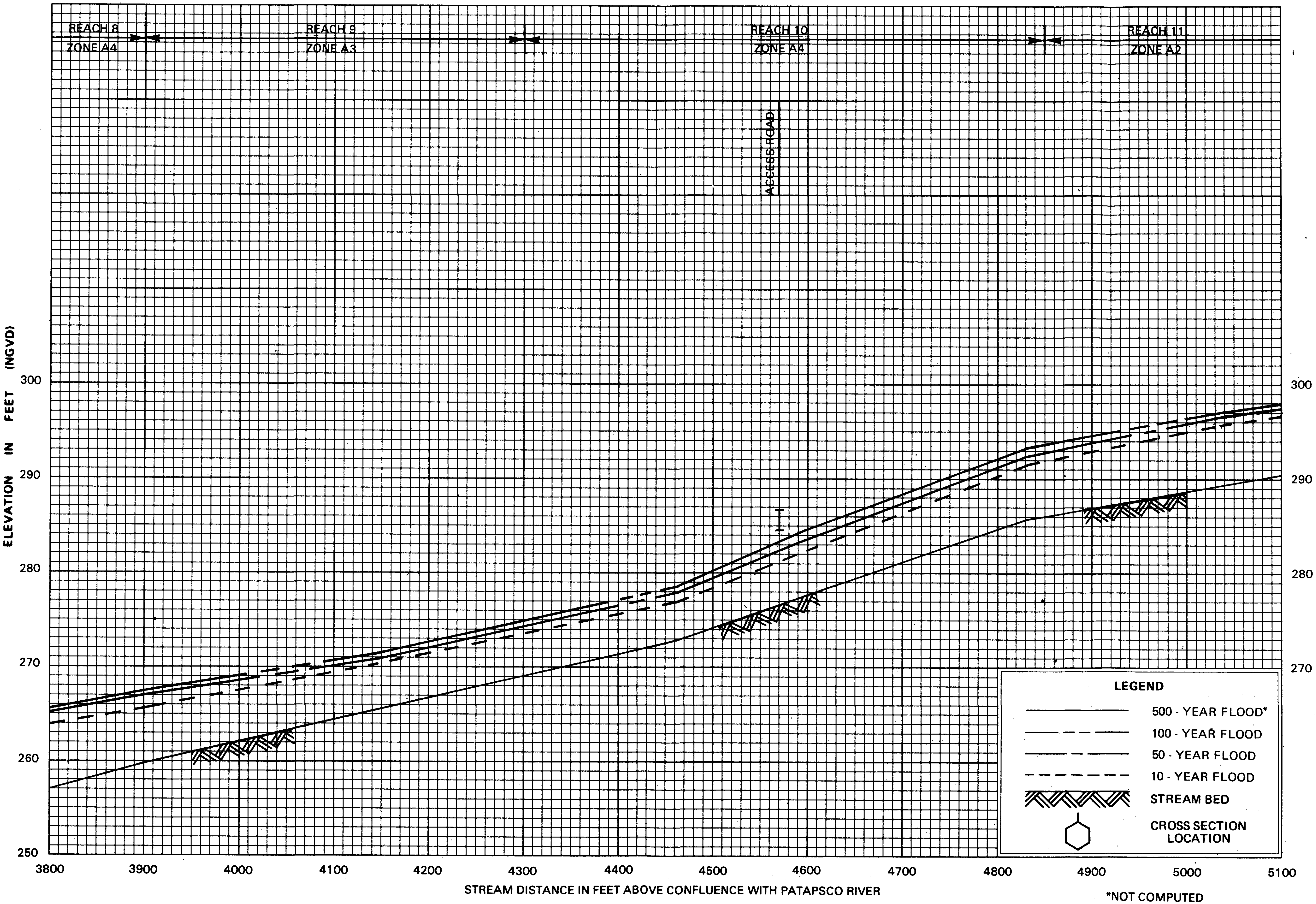


FLOOD PROFILES

BONNIE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD



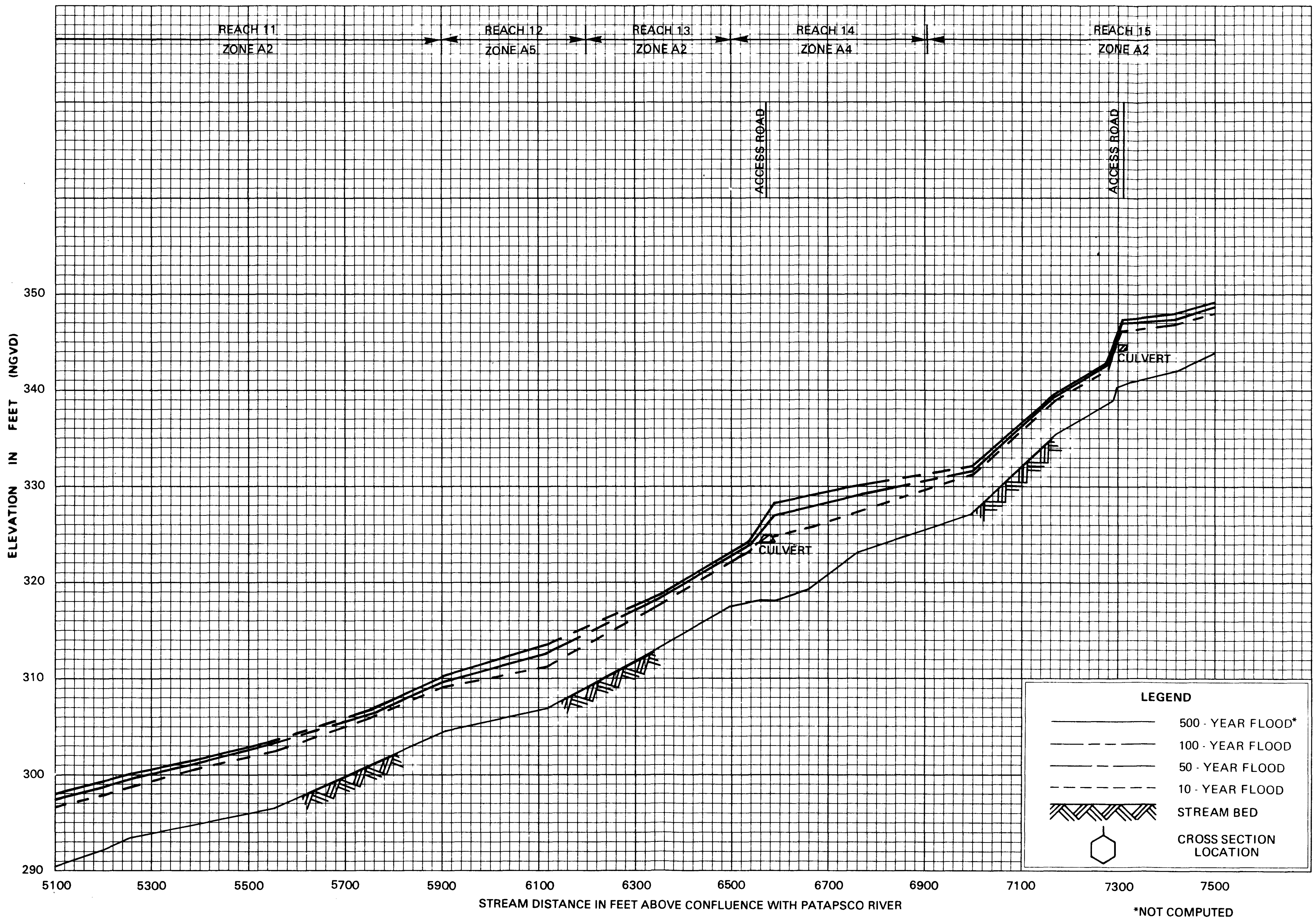
FLOOD PROFILES

BONNIE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

34P



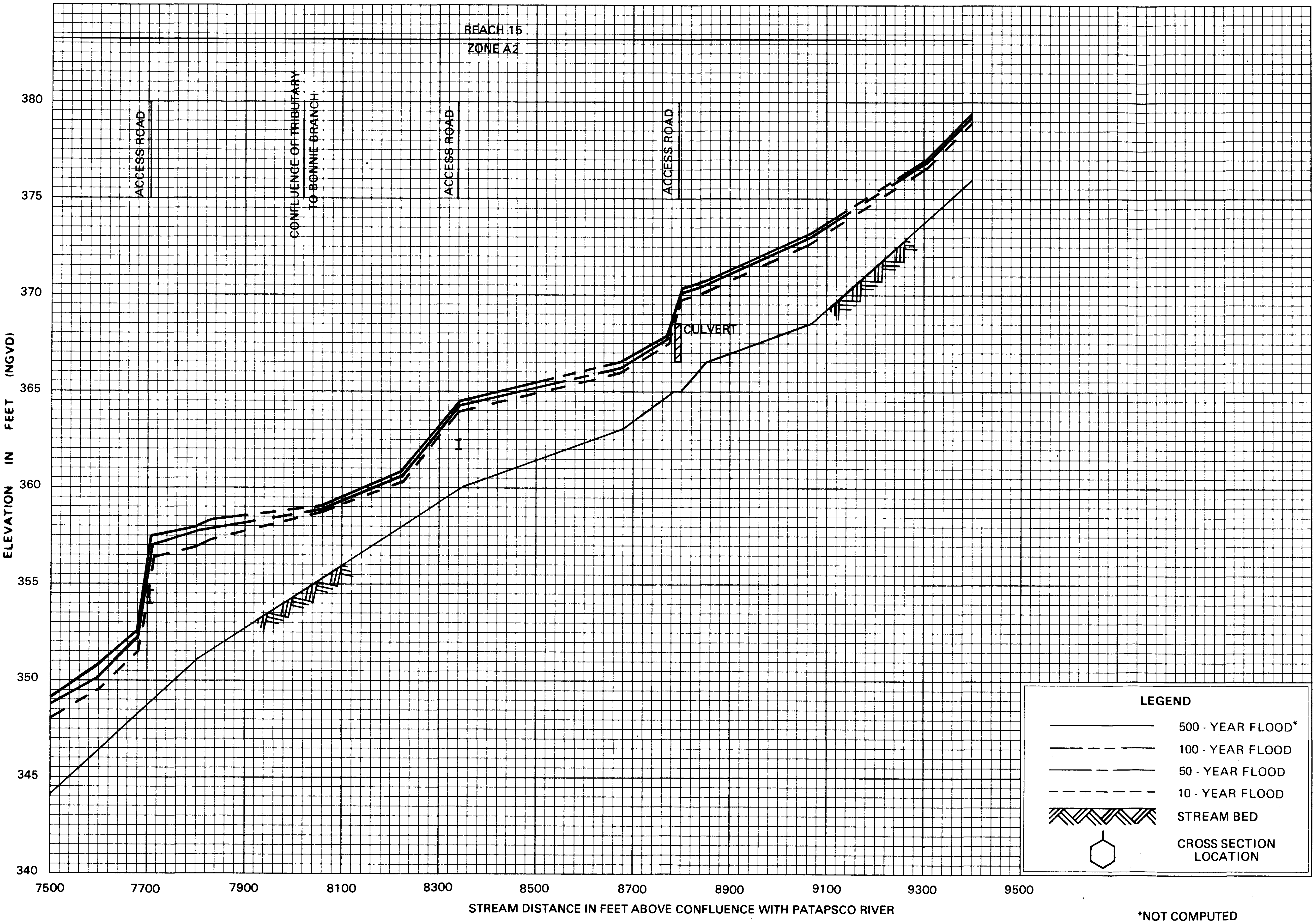
FLOOD PROFILES

BONNIE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

35P

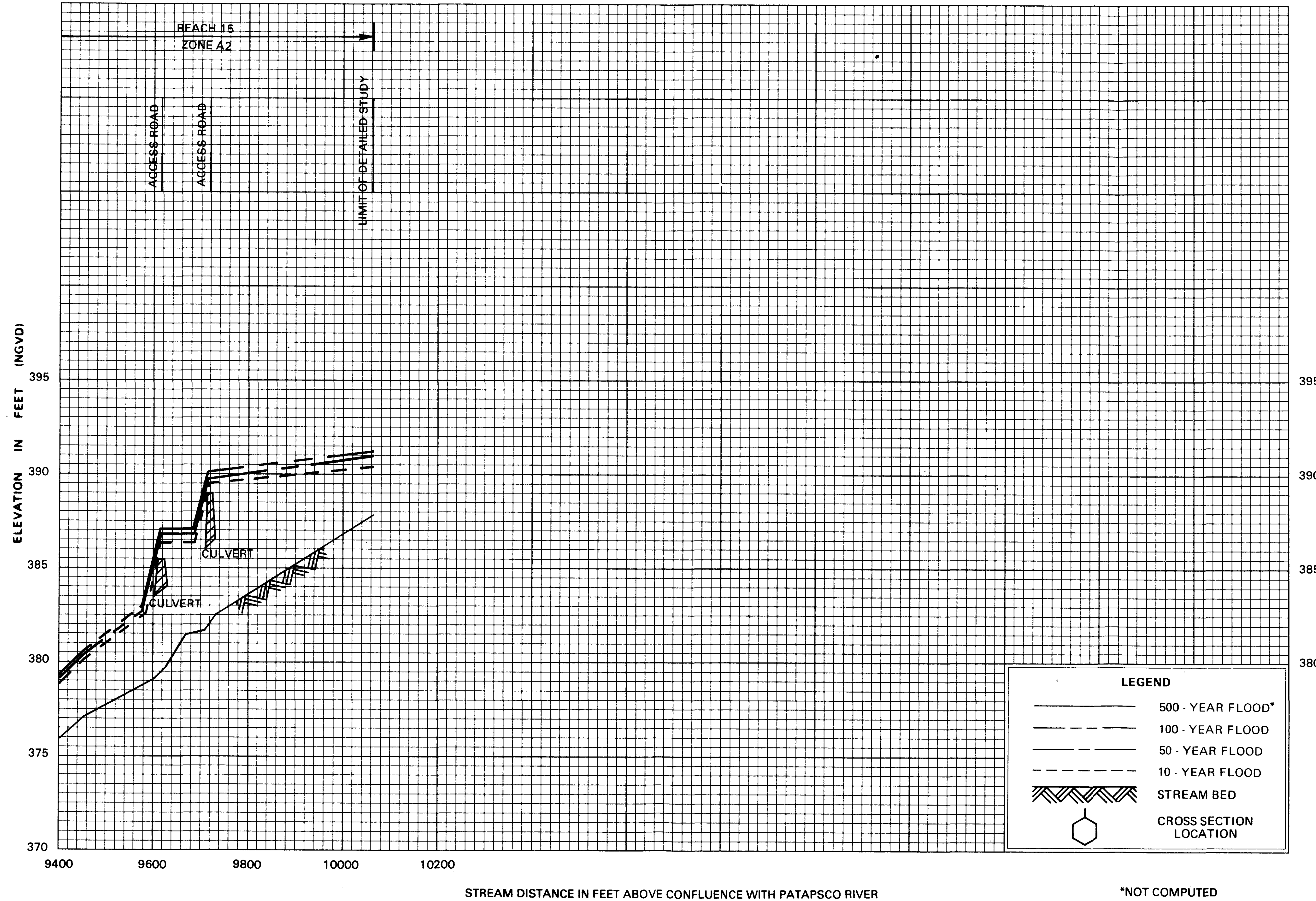


FLOOD PROFILES

BONNIE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

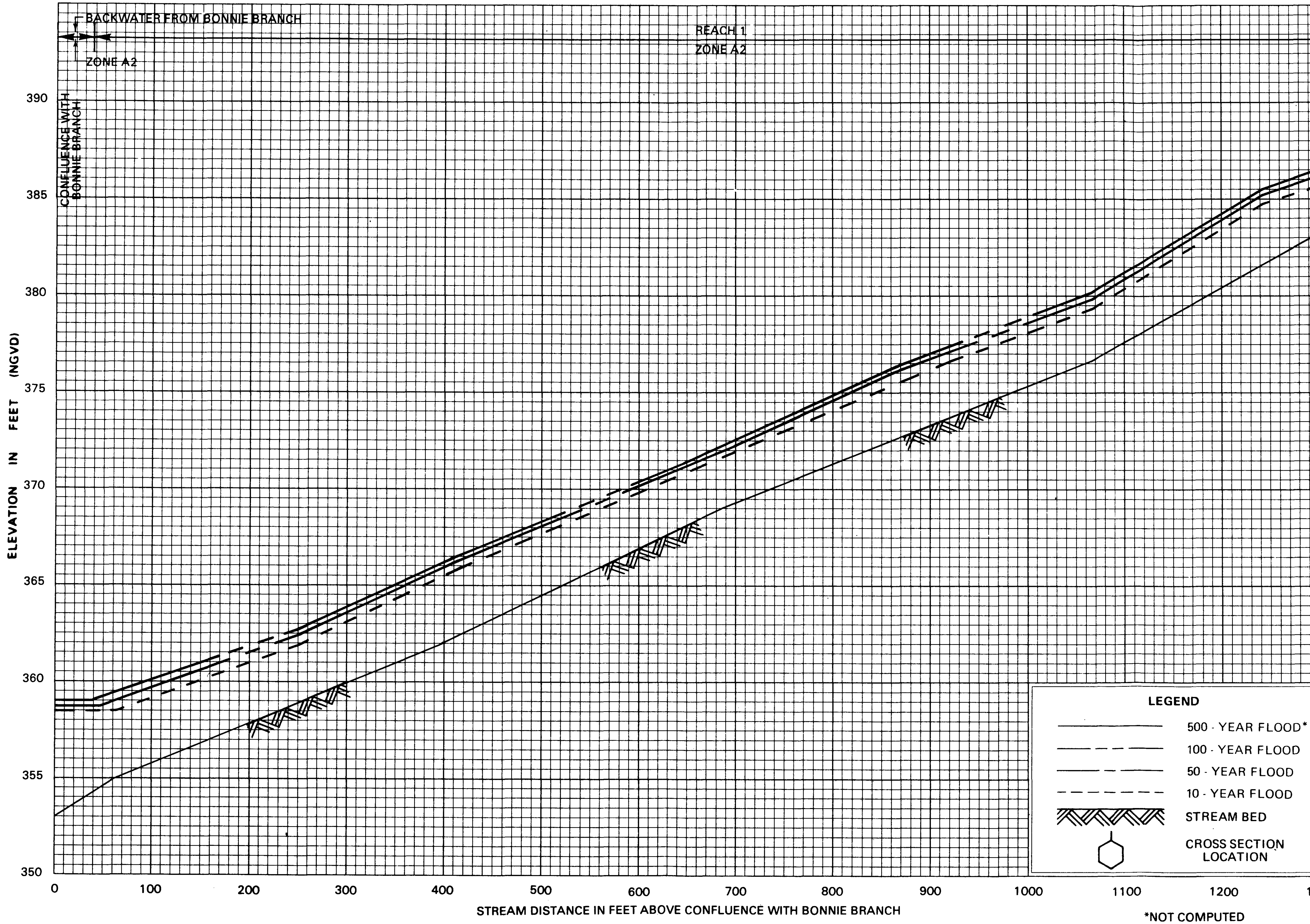


FLOOD PROFILES

BONNIE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD



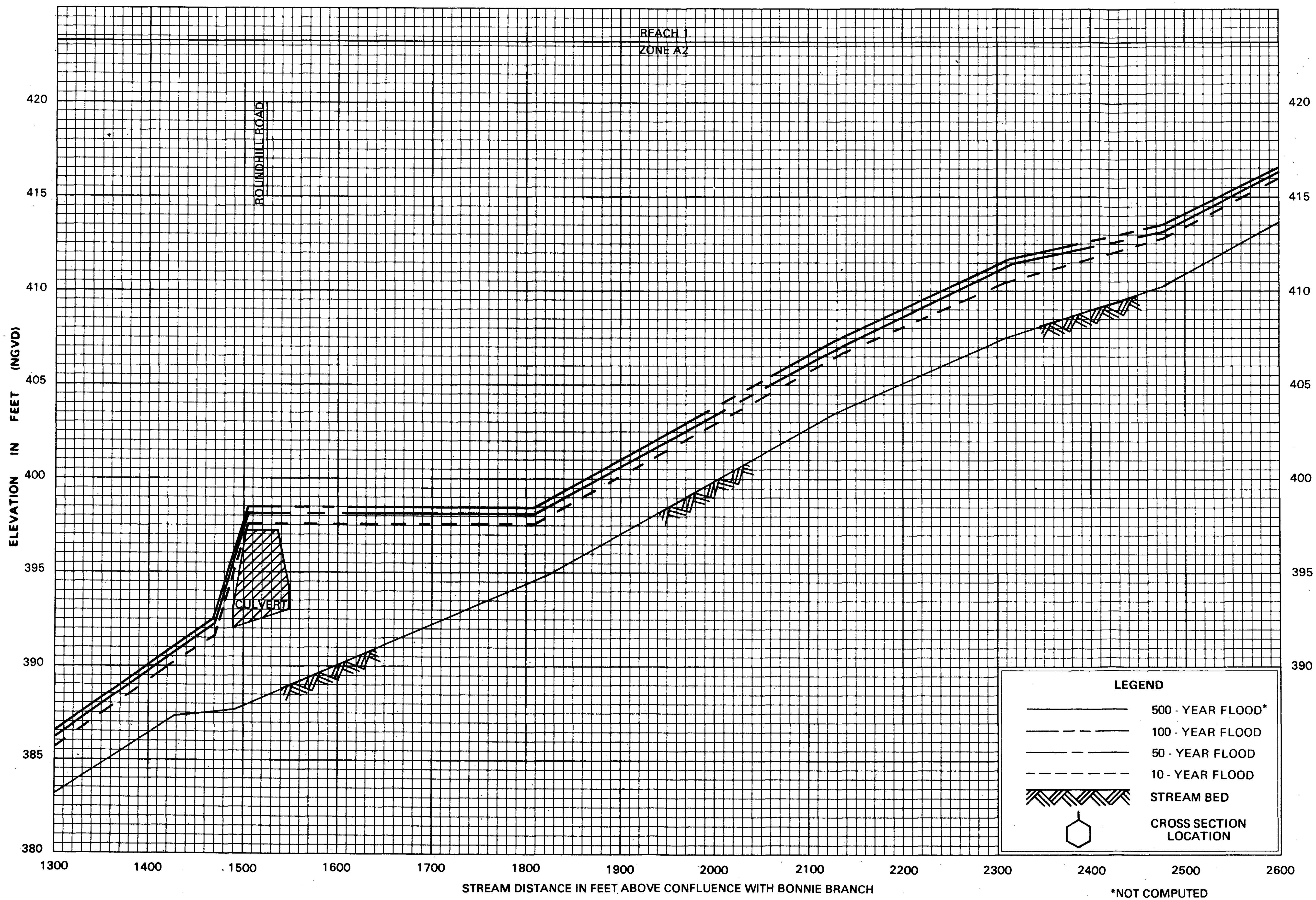
FLOOD PROFILES

TRIBUTARY TO BONNIE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

38P

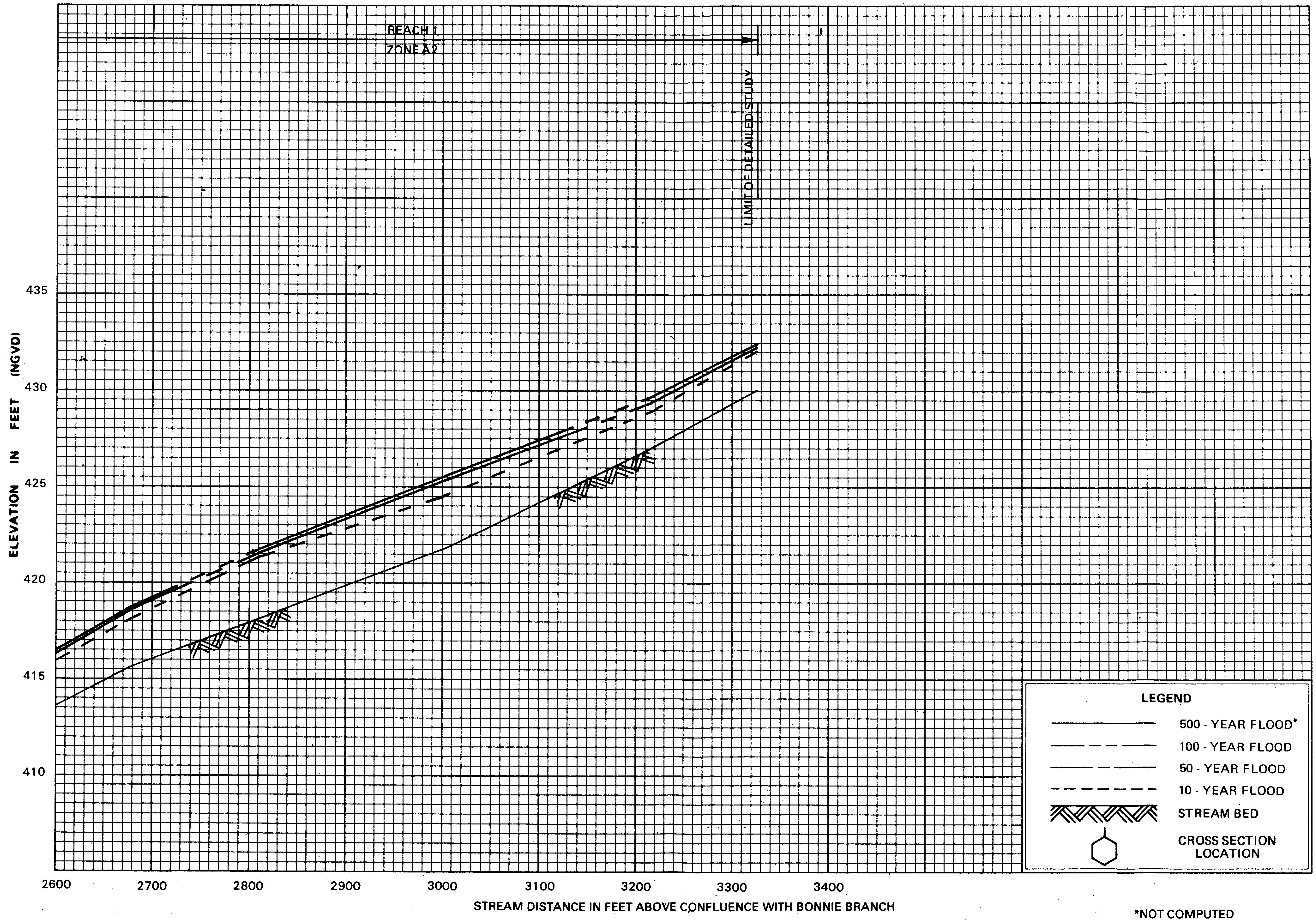


FLOOD PROFILES

TRIBUTARY TO BONNIE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

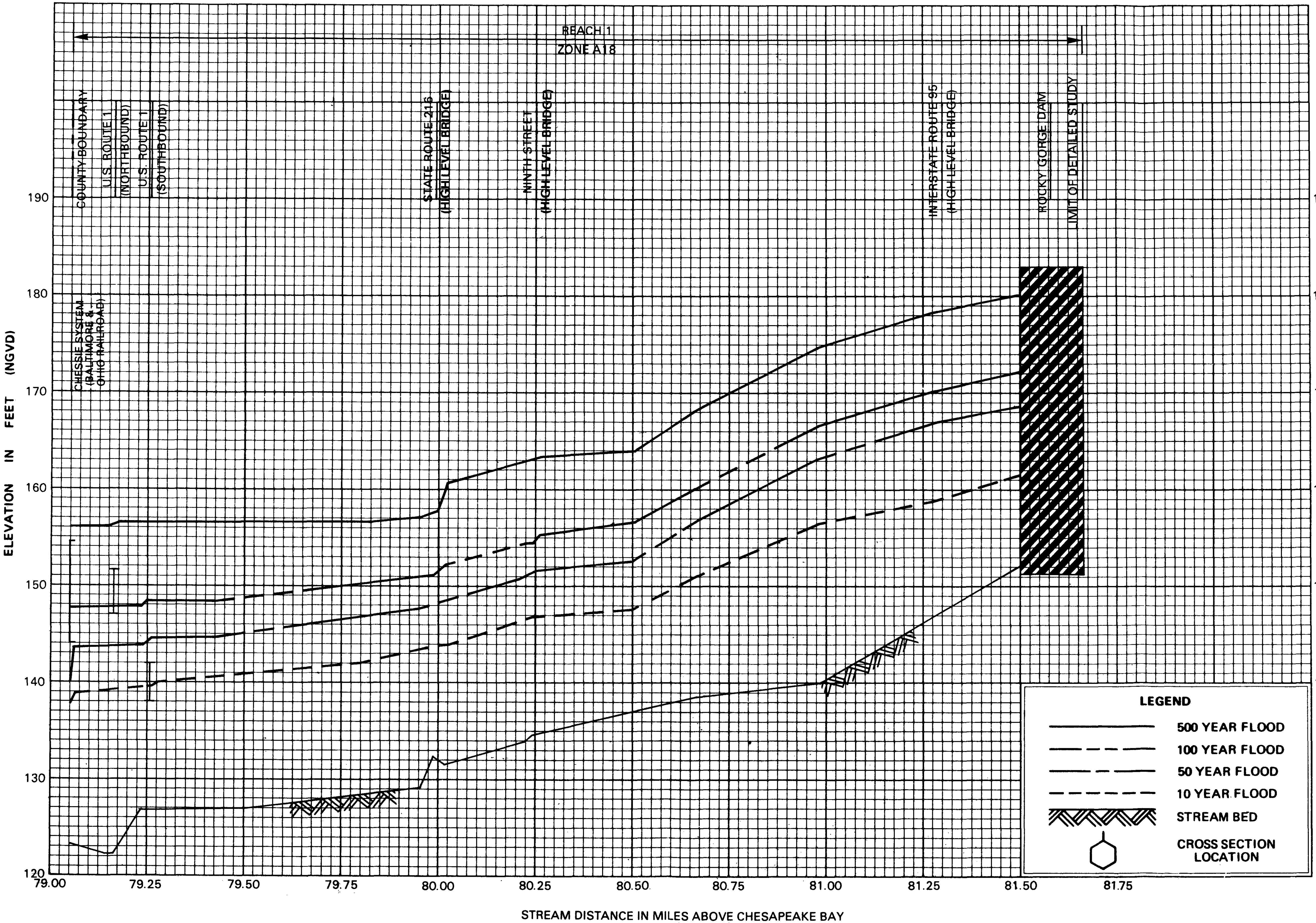


FLOOD PROFILES

TRIBUTARY TO BONNIE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD



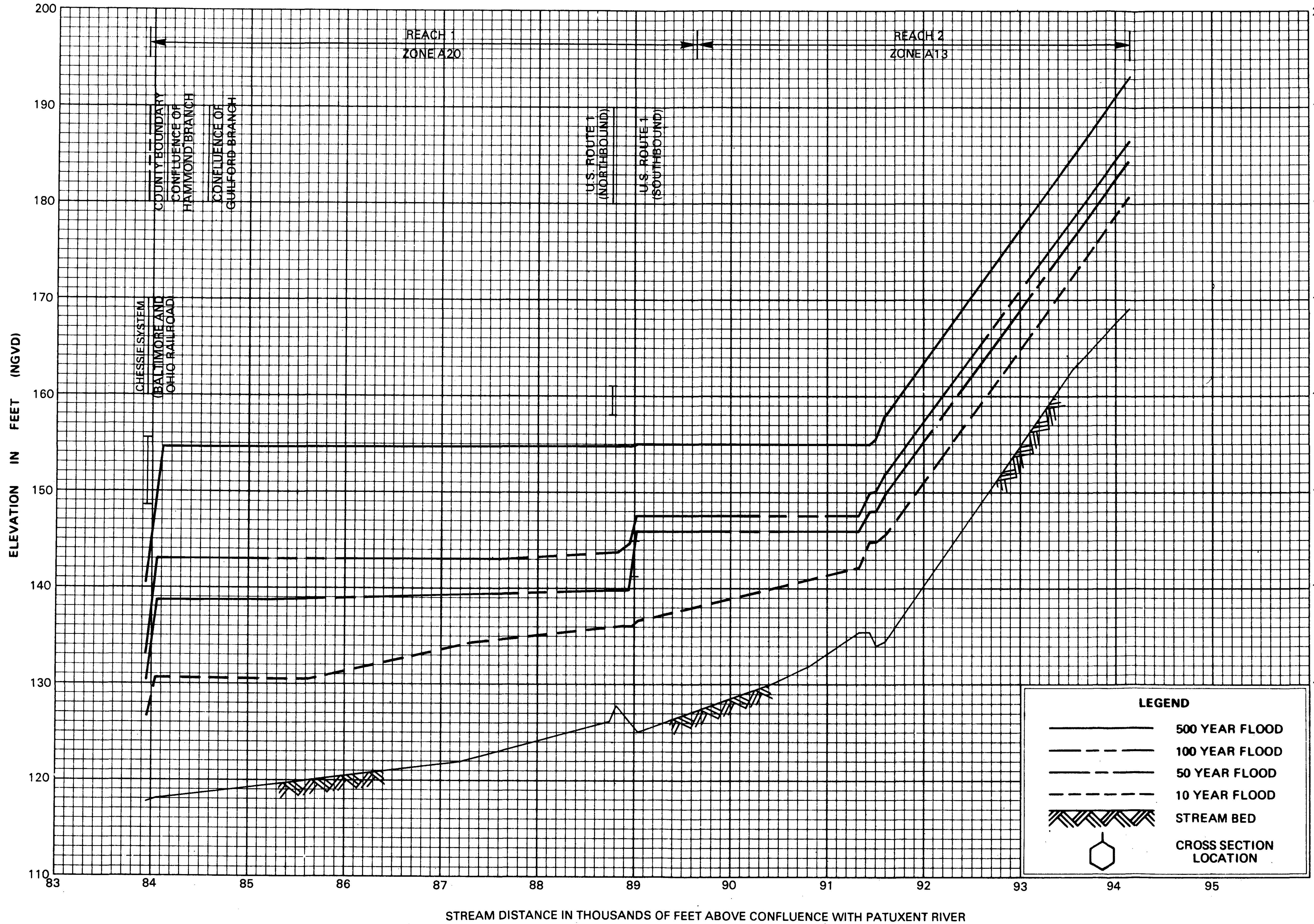
FLOOD PROFILES

PATUXENT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

41P

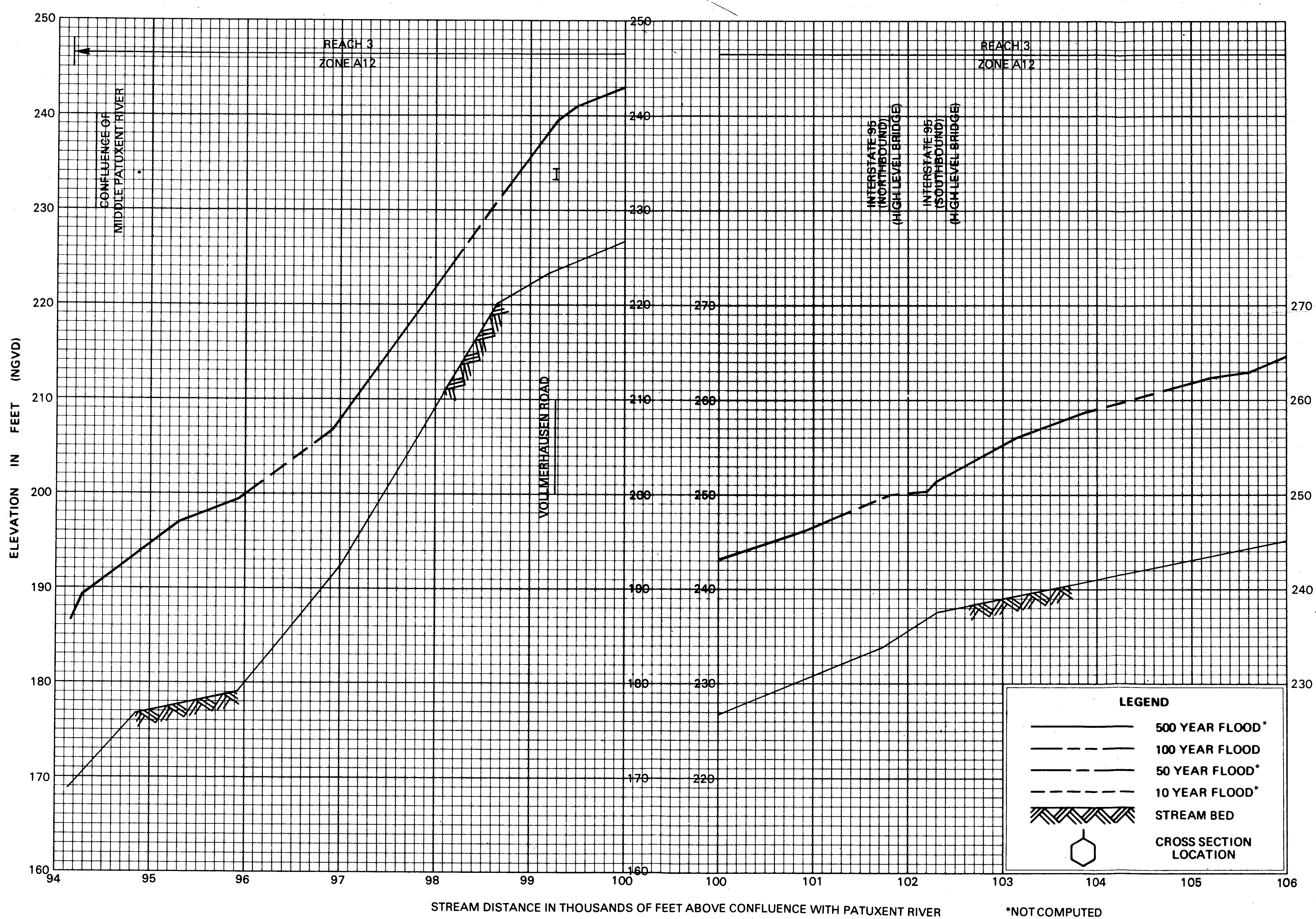


FLOOD PROFILES

LITTLE PATUXENT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD



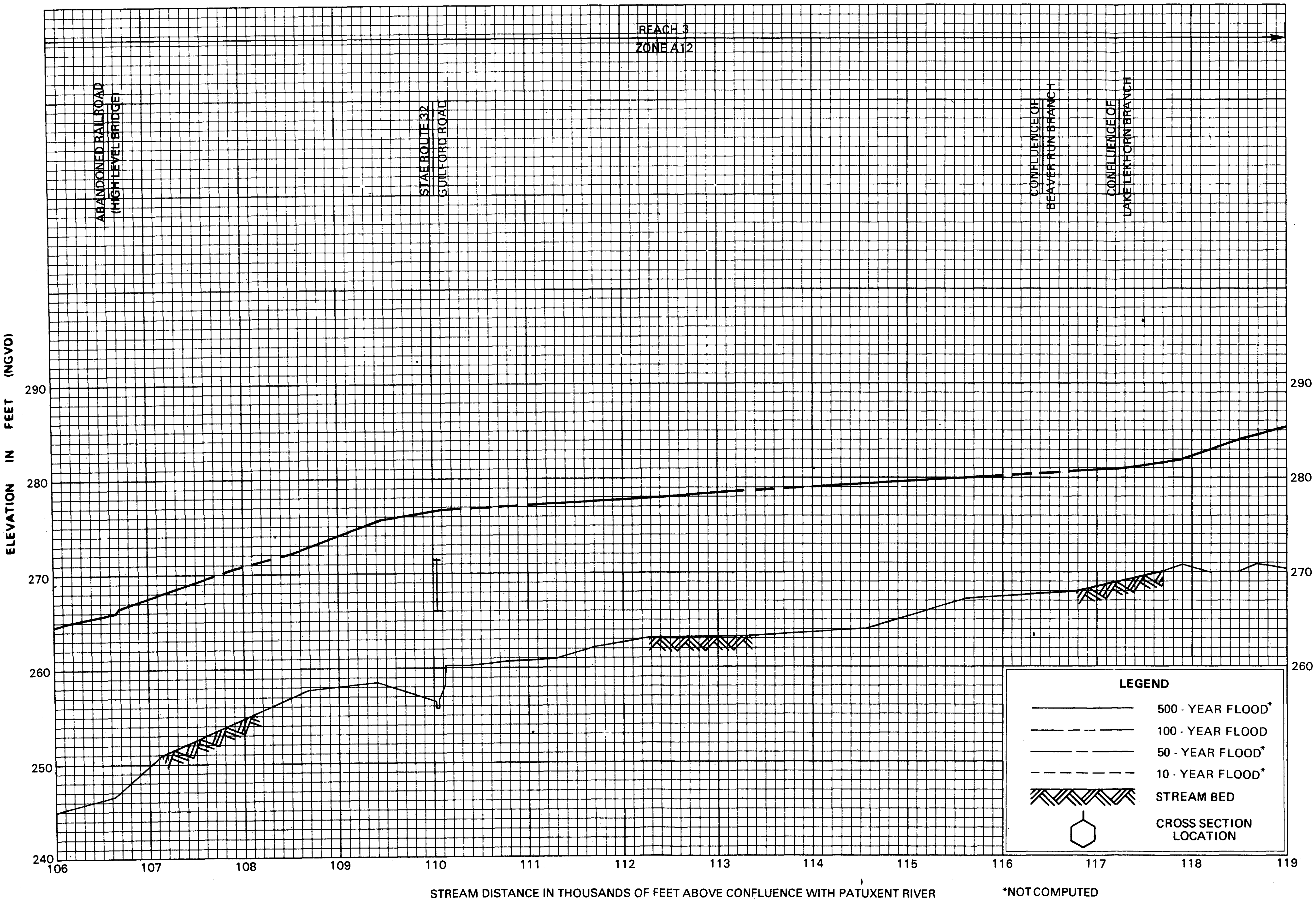
FLOOD PROFILES

LITTLE PATUXENT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

43P

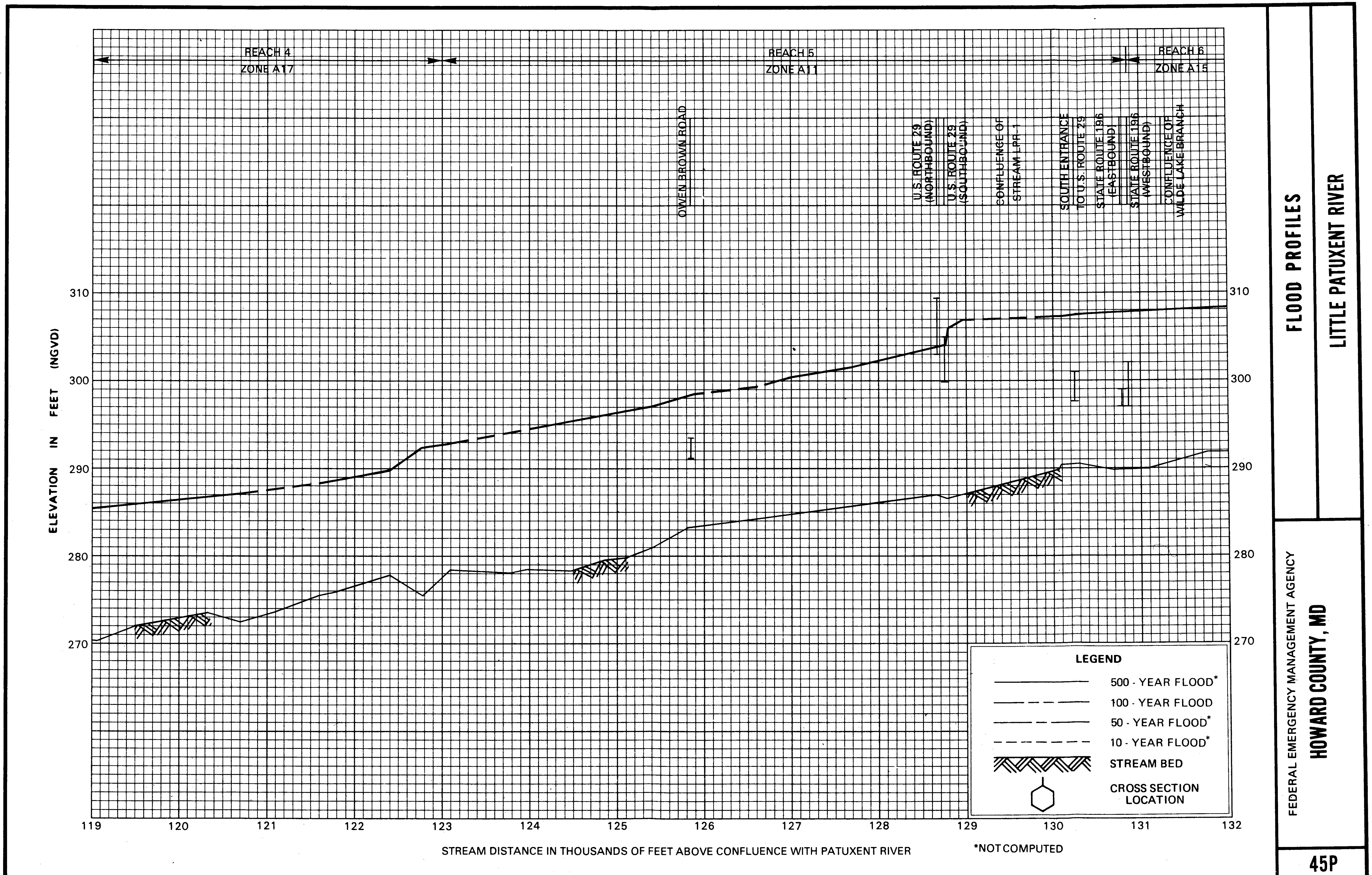


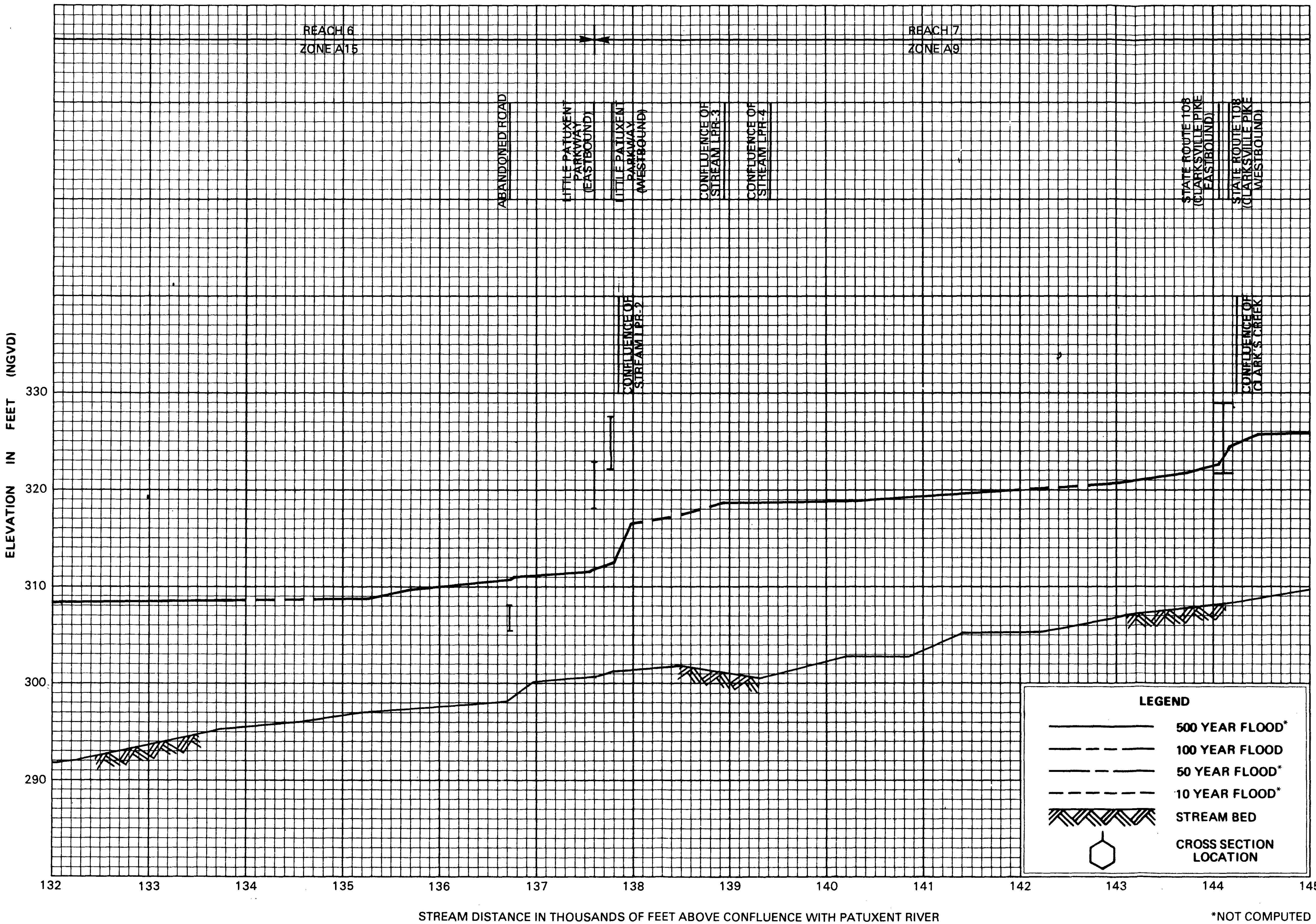
FLOOD PROFILES

LITTLE PATUXENT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD


REACH 4
ZONE A17
REACH 5
ZONE A11
REACH 6
ZONE A15
OWEN BROWN ROAD
U.S. ROUTE 29 (NORTHBOUND)
U.S. ROUTE 29 (SOUTHBOUND)
CONFLUENCE OF STREAM LPR-1
SOUTH ENTRANCE TO U.S. ROUTE 29
STATE ROUTE 196 (EASTBOUND)
STATE ROUTE 196 (WESTBOUND)
CONFLUENCE OF WILDE LAKE BRANCH
ELEVATION IN FEET (NGVD)
310
300
290
280
270
119
120
121
122
123
124
125
126
127
128
129
130
131
132
STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE WITH PATUXENT RIVER
*NOT COMPUTED
LEGEND
500 - YEAR FLOOD*
100 - YEAR FLOOD
50 - YEAR FLOOD*
10 - YEAR FLOOD*
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
LITTLE PATUXENT RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
HOWARD COUNTY, MD
45P



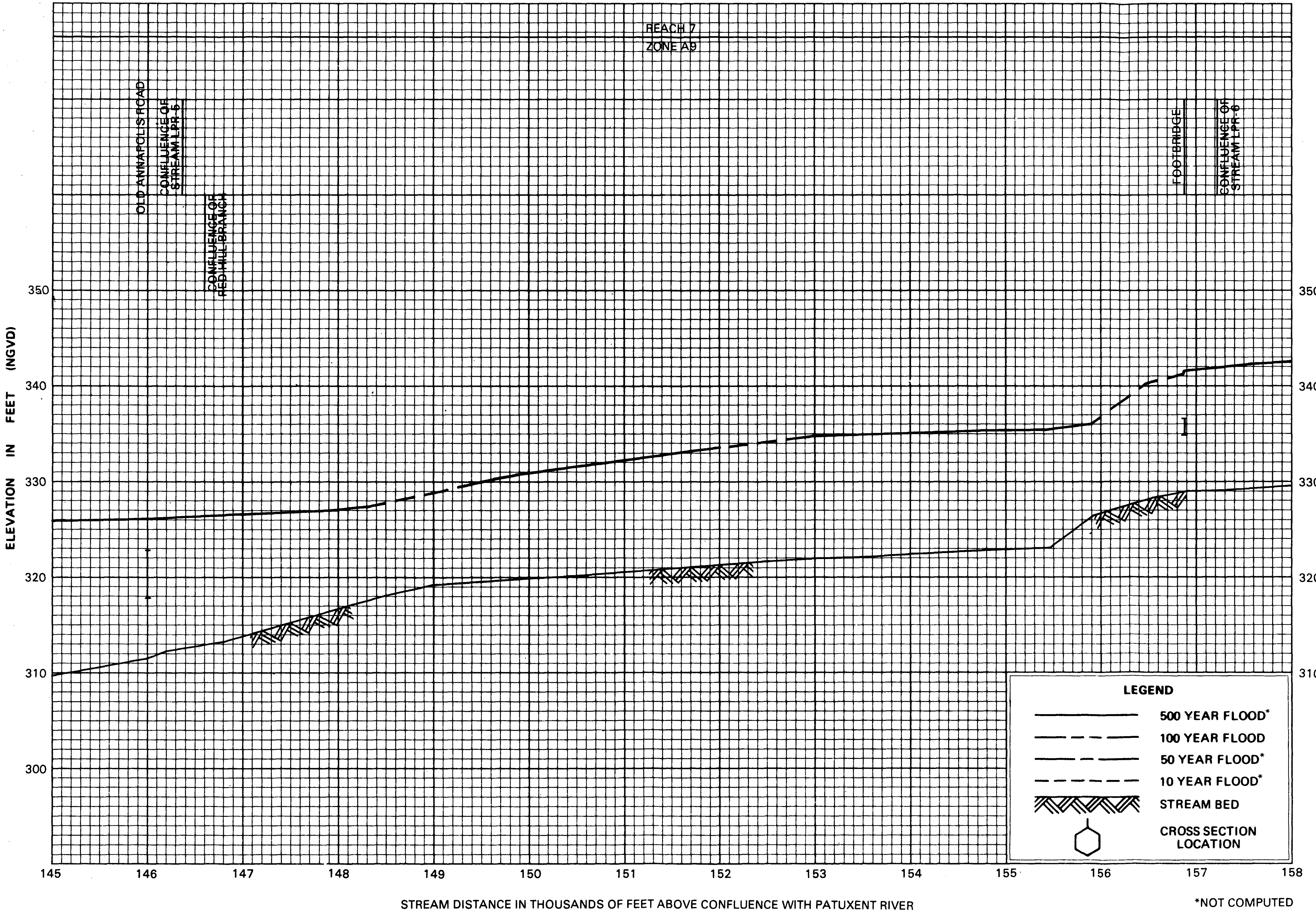
FLOOD PROFILES

LITTLE PATUXENT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

46P



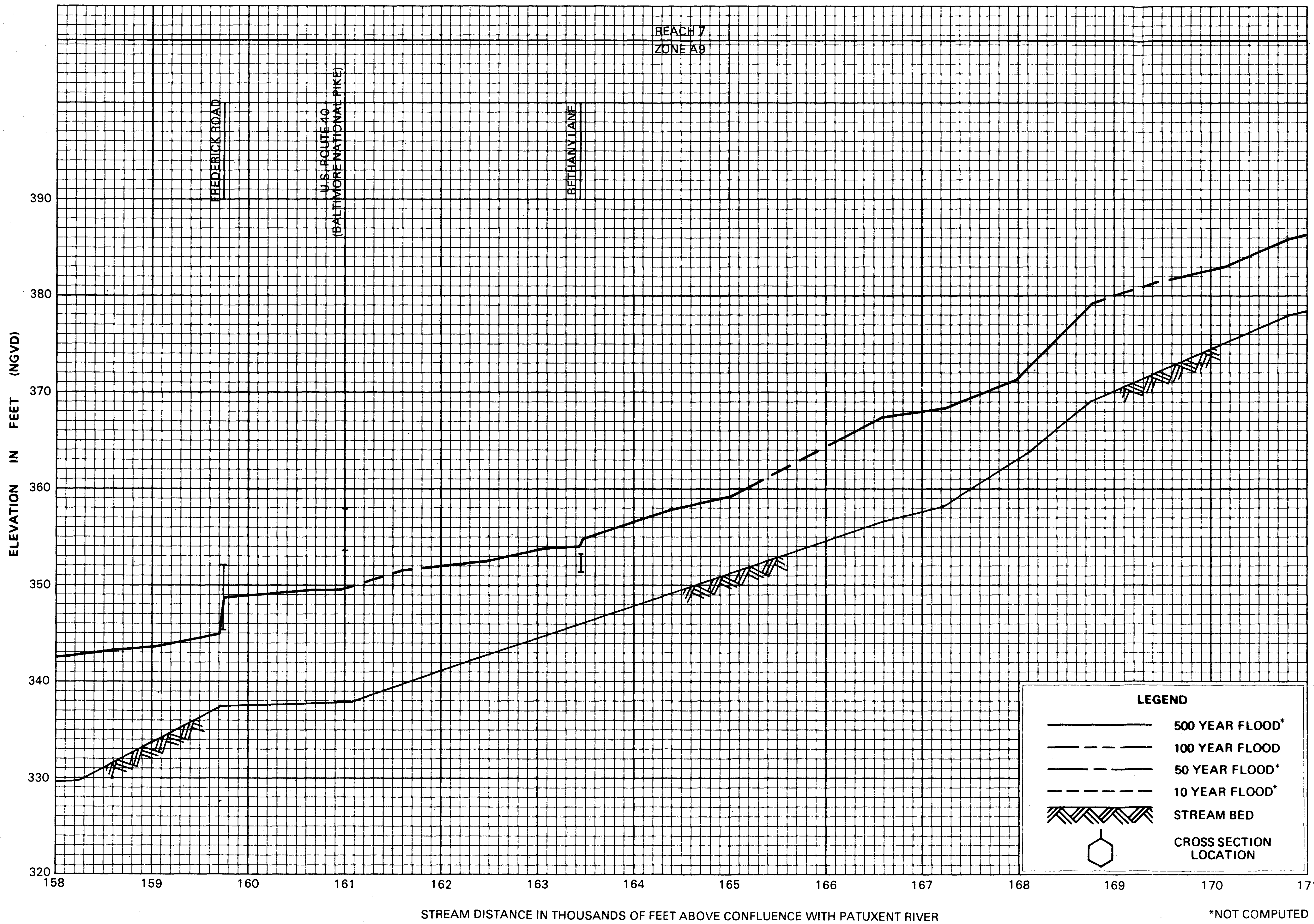
FLOOD PROFILES

LITTLE PATUXENT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD

47P

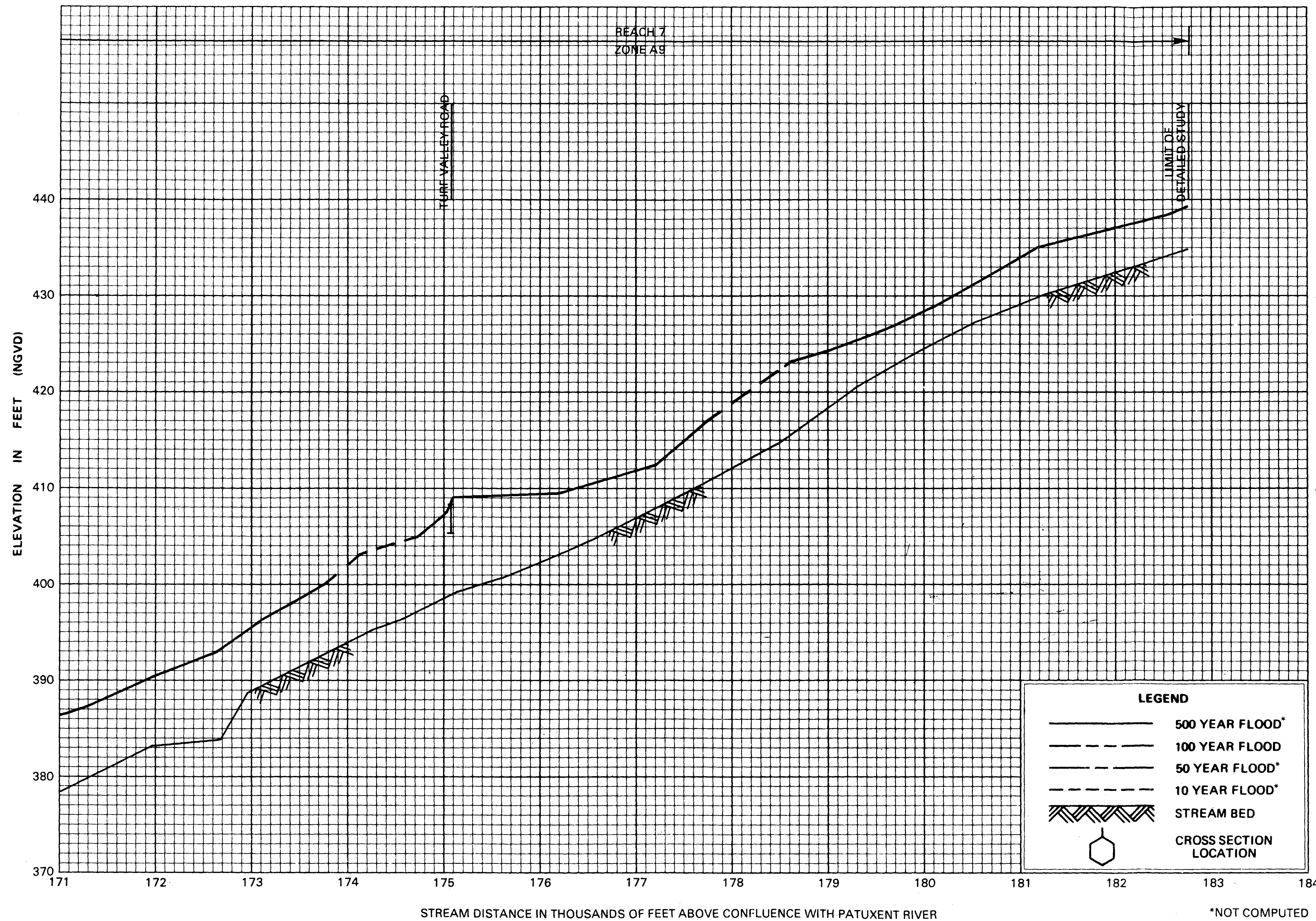


FLOOD PROFILES

LITTLE PATUXENT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD



FLOOD PROFILES

LITTLE PATUXENT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HOWARD COUNTY, MD