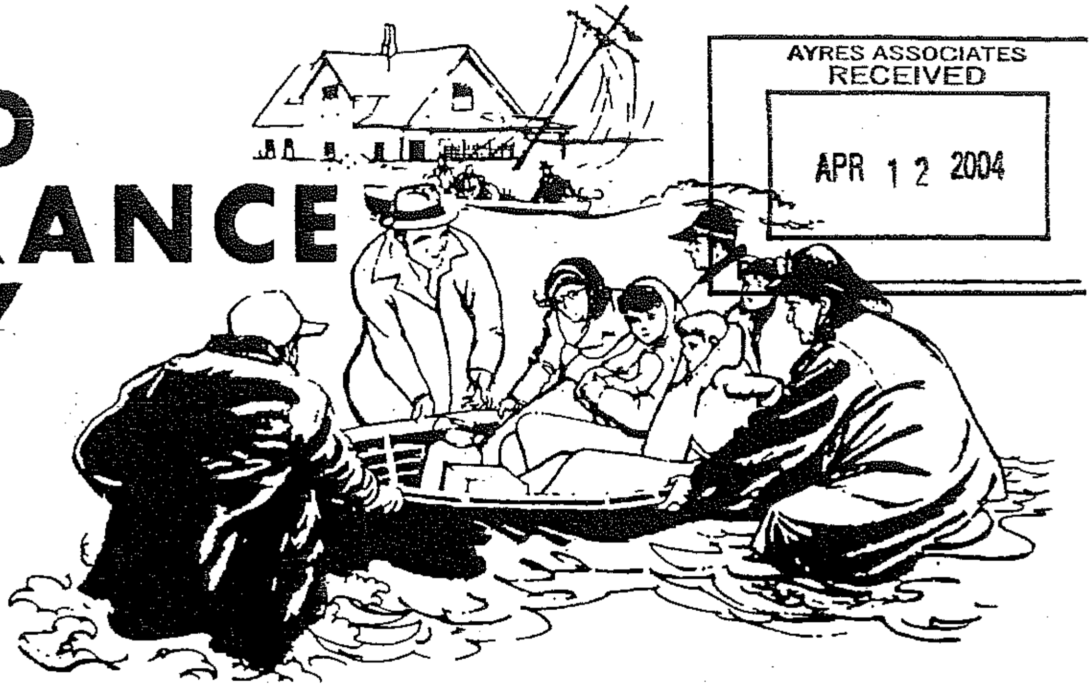
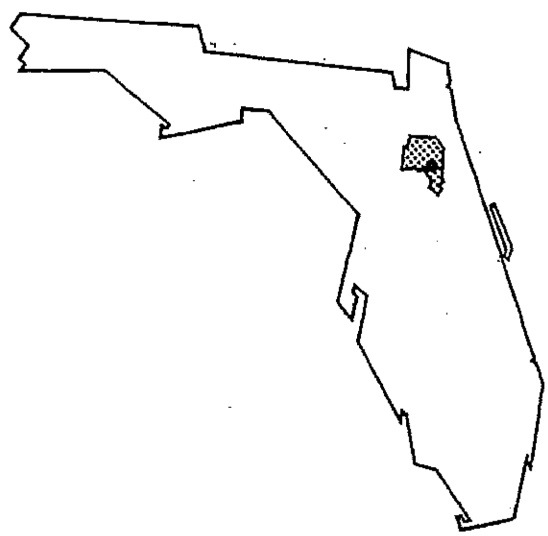
Appendix 3-A
Putnam County Flood Insurance Studies (excerpts)

FLOOD INSURANCE STUDY



CITY OF CRESCENT CITY, FLORIDA
PUTNAM COUNTY



JUNE 1979

U.S. DEPARTMENT of HOUSING & URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

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1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the City of Crescent City, Putnam County, Florida, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Crescent City to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

Shorelines of lakes requiring detailed study were identified at a meeting attended by representatives of the study contractor, the Federal Insurance Administration, and the City of Crescent City on February 3, 1976. The city officials furnished city boundary maps.

The results of this study were reviewed at a final community coordination meeting held on November 9, 1978. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the city. No problems were raised at the meeting.

1.3 Authority and Acknowledgments

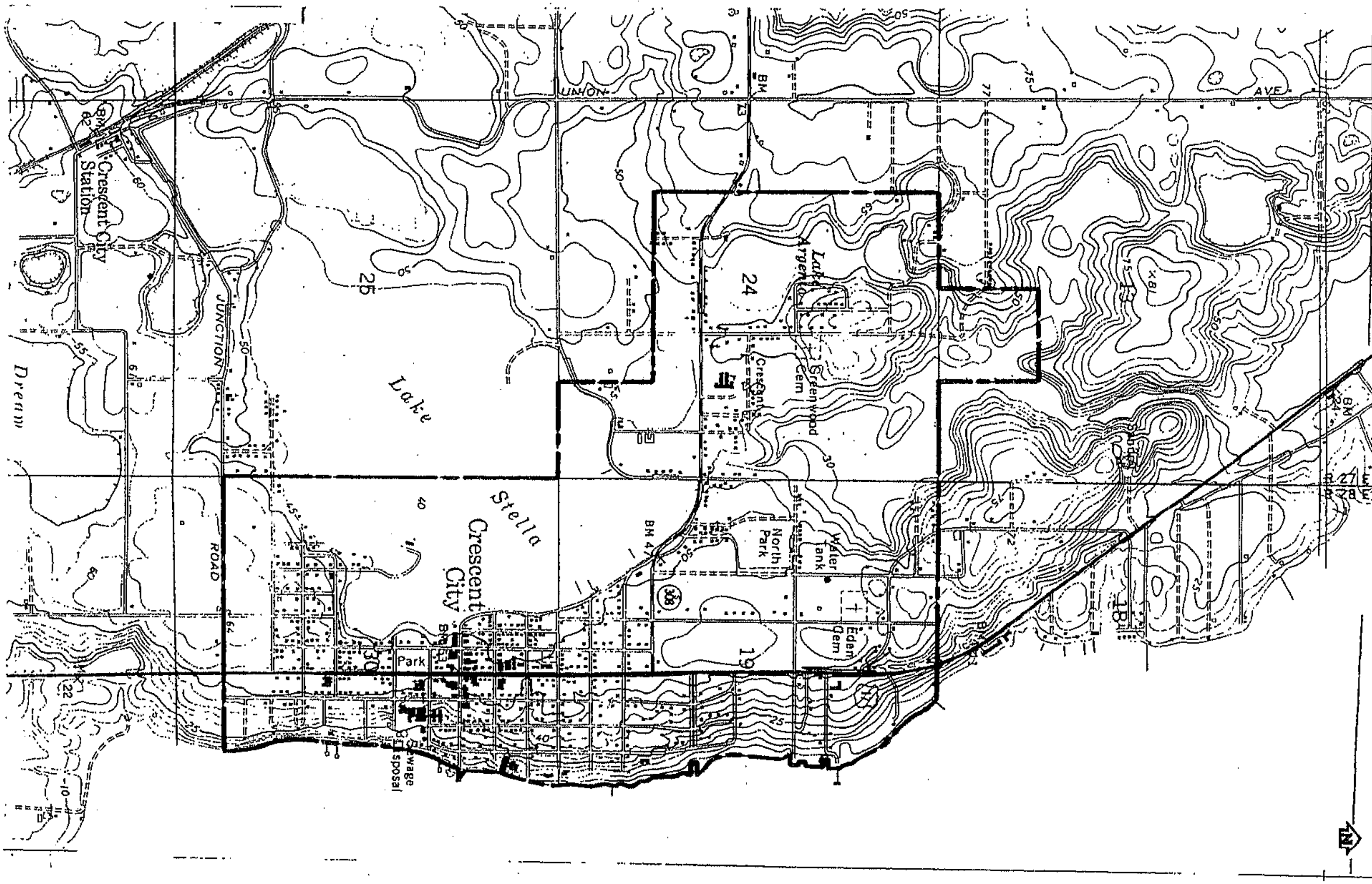
The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey, Water Resources Division, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 18. This work, which was completed in May 1978, covered all significant flooding sources affecting the City of Crescent City.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Crescent City, Putnam County, Florida. The area of study is shown on the Vicinity Map (Figure 1).



DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF CRESCENT CITY, FL
(PUTNAM CO.)

VICINITY MAP

FIGURE 1

The limits of detailed and approximate studies in the City of Crescent City were determined by the Federal Insurance Administration, with community and study contractor consultation at the meeting in February 1976.

Floods caused by increased lake levels in Lake Stella and Crescent Lake were studied in detail. Flooding on Lake Argenta, Lake Omega, and the Lake Stella Drainage Outlet were studied by approximate methods.

Approximate methods of analyses were used to study those areas having low development potential or minimal flood hazard.

Those areas studied by detailed methods were chosen with consideration given to all proposed construction and forecasted development through 1983.

2.2 Community Description

The City of Crescent City is located in the southeastern part of Putnam County, on the western shore of Crescent Lake, in northeastern Florida. It is situated approximately 21 miles south of the Town of Palatka, the county seat of Putnam County, and approximately 20 miles inland from the Atlantic Ocean. The adjacent community to the south is the Town of Pomona Park.

Crescent Lake, which is shaped like a moon in crescent, forms the eastern corporate limits, which was named after the lake soon after the close of the Civil War. In 1975, the population of Crescent City was 1802, an increase of 68 since the 1970 census (Reference 1).

The climate in the region is temperate with temperatures ranging from 82.4°F in summer to 58.5°F, in winter. The average annual rainfall is approximately 55 inches, with the greatest amounts occurring during summer thunderstorms and during tropical depressions or hurricanes in the fall (Reference 2).

2.3 Principal Flood Problems

Floods caused by Crescent Lake, Lake Stella, and Lake Argenta can occur in unpredictable cycles. It is possible for the cumulative effect of slightly above normal rainfall for several consecutive years to cause greater floods than those caused by 1 year of exceedingly high rainfall. Yet, an unfortunate combination of high lake levels, high ground-water levels, and exceedingly high rainfall associated with either several consecutive summer thunderstorms or a hurricane can produce extreme flooding. Any unusual combination of meteorologic and hydrologic conditions can produce a rise in the level of these lakes that would inundate the areas adjacent to their normal shorelines.

Interviews with long established local residents provided information on historic high waters for Crescent Lake and Lake Stella. It was reported that a hurricane in 1928 caused Crescent Lake to reach a point that, when surveyed in 1978, was 7.2 feet. Also pointed out was a high-water level on Crescent Lake caused by Hurricane Donna on September 11, 1960. This mark was determined to be 6.6 feet. In September 1964, Hurricane Dora was reported to have caused Lake Stella to reach a maximum level of 40.7 feet.

These elevations were estimated to be between 50- and 100-year frequencies. No information was obtained about high water on Crescent Lake for Hurricane Dora.

2.4 Flood Protection Measures

No special flood protection structures have been constructed in the City of Crescent City.

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 equalled 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 premium 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 equalled 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 occurrence) 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 here 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 and Hydraulic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

No significant lake-level record has been collected within the community. Lake-level records for 12 lakes in Alachua, Clay, and Marion Counties, which are adjacent to Putnam County, were used to define maximum lake volume-frequency relationships for each site. Seven of these lake-level records have data for more than 20 years, with the maximum length of record being 35 years. Of the 12 records, the shortest is 14 years. The drainage areas for these lakes range from 0.19 square mile to 319 square miles, and the surface areas of these lakes range from 0.015 square mile (9.6 acres) to 20.6 square miles (more than 13,000 acres). The range of change in the water level is from less than 2 feet to more than 30 feet. These lakes are also vastly different in outflow characteristics, from completely closed (no outflow at any flood frequency) to outflow at all flood frequencies.

Flood-frequency curves were defined for each of the 12 lake-level records. These curves were developed in terms of lake volume measured above a defined base. Volumes were adjusted for outflow as applicable, and the base level was defined as the mean lake stage. After all annual data (based on the year beginning June 1 and ending May 31) were adjusted, analyses were carried out to determine the best technique for fitting flood-frequency curves to the lake volume data.

A log-Pearson Type III distribution, using the average skew coefficient as outlined in U.S. Water Resources Council Bulletin 17 (Reference 3), was found to be an acceptable technique for fitting flood-frequency curves to the lake volume data. Values of the 10-, 50-, 100-, and 500-year volumes were obtained for each of the 12 lakes from this log-Pearson Type III distribution.

A regression analysis of frequency data-versus-drainage area for the 12 lakes was used to define a regional relationship for each recurrence interval. The analyses showed that the drainage area explained nearly all of the variation in the lake volumes.

Regression analysis was also used to define a regional relationship between the mean lake stage and grassline elevation along the lake shore. The analysis showed that the elevation of the grassline along the lake shoreline explained nearly all of the variation in the mean lake stage.

The regional relations for mean lake stage and lake volume at the selected recurrence intervals were used with an elevation change in volume curve to determine the water-surface elevations at the 10-, 50-, 100-, and 500-year recurrence intervals.

Elevations for floods of the selected recurrence intervals on Crescent Lake and Stella Lake are shown in Table 1.

Table 1. Summary of Elevations

Flooding Source and Location	Elevation (Feet) 10-Year	50-Year	100-Year	500-Year
Crescent Lake				
At Crescent City	5.24	6.73	7.33	8.61
Lake Stella				
At Crescent City	39.60	40.52	40.84	41.51

Analyses of the hydraulic characteristics of Dunns Creek in Putnam County were performed within the framework of the Flood Insurance Study for the unincorporated areas of Putnam County to provide elevations for floods of the selected recurrence intervals on Crescent Lake (Reference 4).

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

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage State and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Insurance Administration as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each flooding source studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at scale of 1:24,000, with a contour interval of 5 feet (Reference 5). These maps were enlarged to a scale of 1:4800.

In cases where the 100- and 500-year flood boundaries are close together, only the 100-year flood boundary has been shown.

For sources of flooding studied by approximate methods, the boundary of the 100-year flood was developed from a U.S. Geological Survey Flood-Prone Area Map at a scale of 1:24,000, with a contour interval of 5 feet (Reference 6).

Flood boundaries are indicated on the Flood Insurance Rate Map (Exhibit 1). On this map, the 100-year flood boundary corresponds to the boundary of the areas of special flood hazards (Zones A2 and A4); and the 500-year flood boundary corresponds to the boundary of the areas of moderate flood hazards (Zone B).

Small elevations within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Insurance Administration has developed a process to transform the data from the engineering study 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 affecting the City of Crescent City.

5.1 Reach Determinations

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

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 reaches determined for the flooding sources of the City of Crescent City are summarized in Table 2.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is the Federal Insurance Administration device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, 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 water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective Flood Hazard Factors, the entire incorporated area of the City of Crescent City was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or Flood Hazard Factors determined.
Zones A2 and A4:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to Flood Hazard Factors.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also 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.

The flood elevation differences, Flood Hazard Factors, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community are summarized in Table 2.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Crescent City 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 elevations are the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Insurance Administration.

6.0 OTHER STUDIES

The U.S. Geological Survey has undertaken a Flood Insurance Study for the unincorporated areas of Putnam County (Reference 4). Flood profiles for Dunns Creek to Crescent Lake have been prepared for the Putnam County Flood Insurance Study. The results of the Putnam County study were used in this report for flood elevations on Crescent Lake.

This study is authoritative for the purposes of the National Flood Insurance Program; data presented herein either supersede or are compatible with all previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Federal Insurance Administration, Regional Director, 1371 Peachtree Street NE., Atlanta, Georgia 30309.

8.0 BIBLIOGRAPHY AND REFERENCES

1. University of Florida, Division of Population Studies, Estimates of Population, Gainesville, Florida, February 1976

2. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Climatological Data for Florida, Annual Summary, 1976

3. U.S. Water Resources Council, "Guidelines for Determining Flood Flow Frequency," Bulletin 17, March 1976

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Crescent Lake Reach 1	0001	-2.09	-0.60	1.28	020	A4	7
Lake Stella Reach 1	0001	-1.24	-0.32	0.67	010	A2	41

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF CRESCENT CITY, FL
(PUTNAM CO.)

FLOOD INSURANCE ZONE DATA

CRESCENT LAKE-LAKE STELLA

TABLE 2

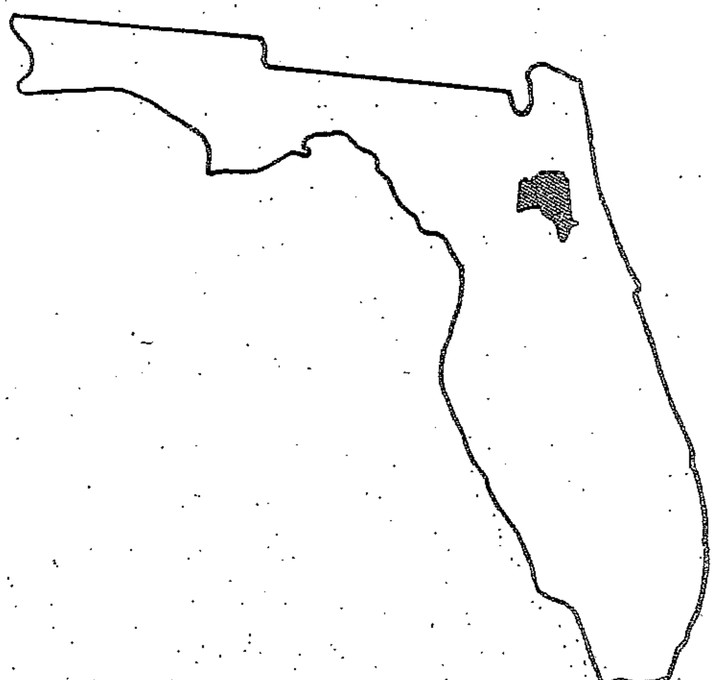
4. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Putnam County, Florida (unincorporated areas), unpublished

5. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Map, Scale 1:24,000, Contour Interval 5 feet: Crescent City, Florida (1970)

6. ------------, 7.5-Minute Series Flood-Prone Area Maps, Scale 1:24,000, Contour Interval 5 feet: Crescent City, Florida (1970)

FLOOD INSURANCE STUDY

PUTNAM COUNTY, FLORIDA
(UNINCORPORATED AREAS)



REVISED:
AUGUST 16, 1994

Federal Emergency Management Agency

COMMUNITY NUMBER - 120272

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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.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision (LOMR) process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Old Zone(s)	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Initial FIS Effective Date: FIS report - March 16, 1981 (Flood Insurance Rate Map dated September 16, 1981)

Revised FIS Date: August 16, 1994

FLOOD INSURANCE STUDY
PUTNAM COUNTY, FLORIDA (UNINCORPORATED AREAS)

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates a previous FIS/Flood Insurance Rate Map (FIRM) for the Unincorporated Areas of Putnam County, Florida. This information will be used by Putnam County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP). The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain 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 FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for the original study were prepared by the U. S. Geological Survey (USGS), Water Resources Division, for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. IAA-H-17-75. That work was completed in June 1978.

The hydrologic and hydraulic analyses for this study were prepared by Engineering Methods & Applications, Inc. (the study contractor) for FEMA, under Contract No. EMW-91-C-3369. This work was completed in January 1992.

1.3 Coordination

The purpose of an initial Consultation Coordination Officer's (CCO) meeting is to discuss the scope of the FIS. A final CCO meeting is held to review the results of the study.

For the original study, an initial CCO meeting was held on October 1, 1975. An intermediate meeting was held on October 23, 1978, to present the results of the study to the community. A final CCO meeting was held on August 29, 1980. Both the initial and final CCO meetings were attended by representatives of Putnam County, the USGS, Water Resources Division, and FEMA.

For this revised study, an initial CCO meeting was held on July 14, 1990, and a final CCO meeting was held on May 25, 1993. An intermediate meeting was held on November 8, 1991, which was attended by representatives of Engineering Methods & Applications, Inc. and a representative of the Putnam County Planning, Zoning, and Building Department. The initial and final CCO meetings were attended by representatives of Putnam County, the study contractor, and FEMA.

The following organizations were contacted for purposes of coordination and acquisition of information for this study: Florida Department of Transportation; Georgia Pacific, Technical and Forestry Departments; National Weather Service; National Ocean Service; Putnam County Planning, Zoning & Building Department; Putnam County Public Works Department; St. Johns River Water Management District, U. S. Army Corps of Engineers (USACE), Jacksonville District; U. S. Department of Agriculture, Soil Conservation Service (SCS); and the USGS, Water Resources Division.

2.0 AREA STUDIED

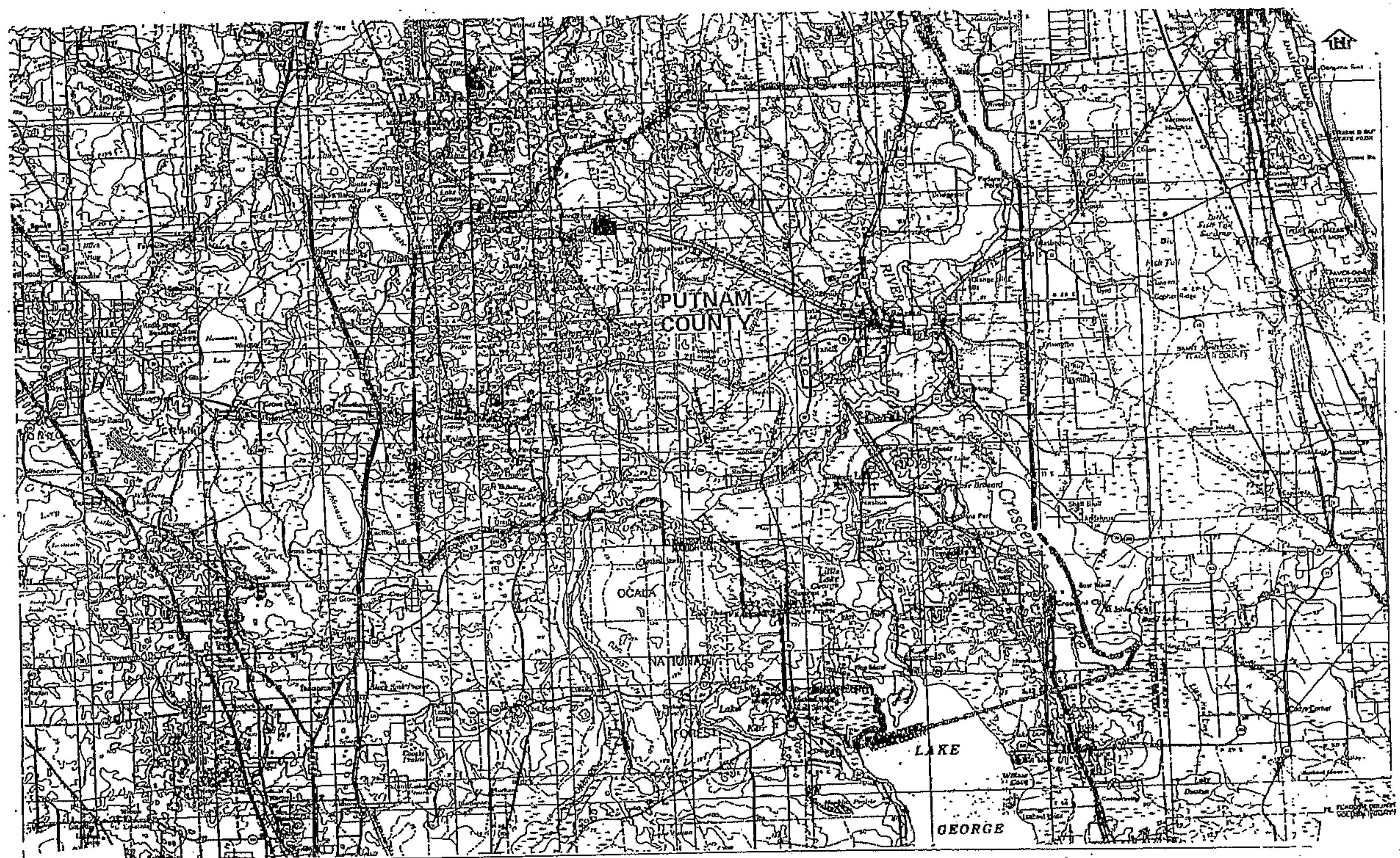
2.1 Scope of Study

This FIS covers the Unincorporated Areas of Putnam County, Florida. The area of study is shown on the Vicinity Map (Figure 1). The areas not included in this study are the City of Palatka, the Town of Pomona Park, City of Crescent City, and the Town of Interlachen.

The following flooding sources were studied by detailed methods in the original study: the St. Johns River, Dunns Creek, Acosta Creek, Crescent Lake, Lake Stella, Lake Broward, and Grassy Lake. In this restudy, the following flooding sources were studied by detailed methods: Castle Lake, Clearwater Lake, Clubhouse Lake, Cranes Ponds, Cue Lake, Georges Lake, Halfmoon Lake, Lake Grandin, Long Lake, Putnam Prairie/Wall Lake, Redwater Lake, Saratoga Lake, Star Lake, and Sugarbowl Lake; Etonia Creek for 10.2 miles starting from County Road 309; Falling Branch for 3.2 miles from the mouth to Georges Lake; Simms Creek for 7.7 miles ending at the county boundary; Tributary 1 to Simms Creek for 5.5 miles from the mouth; Tributary 1-A to Simms Creek for 1.6 miles starting from the mouth; and Tributary 2 to Simms Creek for 5.1 miles from the mouth to the county boundary. Acosta Creek was restudied for 3.1 miles starting at the mouth, and Dunns Creek was restudied for 5.7 miles starting at the mouth.

Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2). 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.

All or portions of the following flooding sources were studied by approximate methods: the Oklawaha River, Orange Creek, Little Orange Creek, Rice Creek, Simms Creek, Etonia Creek, and numerous



APPROXIMATE SCALE

4 0 4 8 12 MILES

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)

VICINITY MAP

FIGURE 1

smaller streams, lakes, and ponds. 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 the unincorporated areas of Putnam County.

2.2 Community Description

Putnam County is in the northeastern part of the Central Peninsula, Florida. Putnam County is bordered by Clay and Bradford Counties to the north; St. Johns and Flagler Counties to the east; Volusia and Marion Counties to the south; and Alachua County to the west.

The county has a population of 65,070, according to a 1990 census (Reference 1). The economy of the area is typical of an area comprised chiefly of small towns and rural communities. The county is served by the Southern Railway and the Seaboard Coast Line Railroad, U. S. Highway 17, and several primary state highways. The St. Johns River, which flows on the eastern border of northeastern Putnam County, serves as a maritime link with Jacksonville, Florida.

The St. Johns River is a large river that rises in a marsh approximately 25 feet in elevation near Fort Pierce, Florida, 312 miles from its mouth near Mayport, Florida. The river flows generally northerly to Jacksonville and then easterly to the ocean. The drainage area of the St. Johns River is 9,430 square miles, which is nearly one-sixth of the land area of Florida.

The St. Johns River discharges approximately one-tenth of the 40-billion-gallon average daily surface runoff from the State of Florida, a large part of the 150-billion-gallon average daily rainfall of the state (Reference 2).

Three major tributaries enter the St. Johns River in the Putnam County study area. These tributaries are the Oklawaha River, Dunns Creek, and Rice Creek. The Oklawaha River and its tributaries drain approximately one-fourth of the southwestern part of the county. Dunns Creek, flowing out of Crescent Lake, drains a small area of the southwestern part of the county. The Etonia Creek basin, consisting primarily of Simms and Rice Creeks, drains approximately one-third of the northwestern part of the county.

Topography within the county ranges from gently rolling highlands to flat, wide, swampy stream valleys. Land-surface elevations range from approximately 200 feet to approximately sea level along the St. Johns River. Precipitation within the study area ranges from 33 inches to 75 inches per year, and averages approximately 55 inches, most of which is in the summer (Reference 3). The average summer temperature is approximately 72 degrees Fahrenheit (°F), and the average winter daily minimum temperature is approximately 58°F.

2.3 Principal Flood Problems

The flooding in Putnam County can arise from two distinct sources. First, rainfall runoff associated with slow moving frontal systems, thunderstorms, and tropical storms can cause overflow of streams and lakes, ponding, and sheetflow. Second, the sporadic passage of tropical storms and hurricanes through the area can result in flooding from storm surge and tides along the St. Johns River.

In this restudy, four USGS gage sites are available within the study area. These include USGS No. 02245050 on Etonia Creek at Bardin, USGS No. 02245000 on Etonia Creek near Florahome, USGS No. 02245140 on Simms Creek near Bardin, and USGS No. 02244440 on Dunns Creek near Satsuma (Reference 4). Gage data at these locations is very limited. Only 16 years of discharge data starting from 1974 are available at the gage sites on Etonia Creek (02245050) and Simms Creek (02245140). These records do not include data for historical flood years, such as 1946, 1964, 1965, and 1973 (Reference 5). The Dunns Creek gage is in the process of being recalibrated by USGS and data are available for 1978 through 1986 only (References 4 and 6). The Etonia Creek gage near Florahome was operational from 1949 to 1951.

Low-lying areas of Putnam County are subject to periodic flooding caused by overflow of the St. Johns River, Dunns Creek, the Oklawaha River, Orange Creek, Little Orange Creek, Rice Creek, Simms Creek, Etonia Creek, and numerous small streams. The soils in the area are mostly sands, causing lower peaks when storms are preceded by periods of little rain. During the principal rainy season, which is from June to October, saturated soils can cause rapid runoff and higher peak discharges, particularly on the smaller streams during intense storms.

Floods caused by Crescent Lake, Lake Stella, Lake Broward, and Grassy Lake can occur in unpredictable cycles. It is possible for the cumulative effect of slightly above-normal rainfall for several consecutive years to cause greater floods than those caused by one year of exceedingly high rainfall. However, a combination of high lake levels; high ground-water levels; and exceedingly high rainfall, which is associated either with several consecutive summer thunderstorms or with a hurricane, can produce extreme flooding. Any unusual combination of meteorologic and hydrologic conditions can produce a rise in the level of these lakes and can result in inundation of the areas adjacent to their normal shorelines.

In 1964, Hurricane Dora caused shallow flooding by ponding and some stream flooding in low-lying areas. The St. Johns River at Rice Creek reached an elevation of 5.62 feet.

2.4 Flood Protection Measures

No special flood protection structures have been built in the county; however, the Florahome Drainage District has improved some drainage ditches in order to accommodate large flows. Rodman Dam and Lake Oklawaha are located along the southern border of Putnam County. The dam was completed, and flow through spillway began on September 30, 1968. A diversion exists for boat traffic from Lake Oklawaha to the St. Johns River through the Cross-Florida Barge Canal.

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 floodplain 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.

In the original study, a regional relationship of drainage area to mean annual peak discharge and the 10- and 50-year floods, including adjustments for storage in lakes and swamps, was used to define discharge-frequency data for the detailed study of Dunns and Acosta Creeks (Reference 7). The 100-year and 500-year floods were derived by extrapolation.

For all streams in this restudy, except Falling Branch, USGS regional regression equations were used to compute discharges for 10-, 50-, 100-, and 500-year floods. These equations and their usage are described in a publication entitled, Technique for Estimating Magnitude and Frequency of Floods on Natural-Flow Streams in Florida (Reference 8). The regression model relates peak discharge to drainage area, lake area, and slope. Drainage area and lake area were determined from USGS Quadrangle maps and aerial stereo photographs (References 9 and 10). The basin slope was determined from surveyed cross sections and USGS quadrangle maps.

Acosta and Dunns Creeks were restudied because of the approximate nature of the original hydrologic analyses.

In this restudy, the regional estimate of discharges can usually be improved when a gaged site is present on the stream. The improvement is accomplished by adjusting regional discharges by a ratio of the gage log-Pearson discharges to the regional estimate (Reference 13). Four USGS gage sites are available within the streams studied by detailed methods in Section 2.3. However, the period of record for these gages corresponds to a period of lower than average rainfall. Consequently, the requirement of stationarity is not fulfilled and log-Pearson estimates of extremes would not be valid. This conclusion was confirmed by analyzing data from a long-term gage on South Fork Black Creek in Clay County just north of the streams studied by detailed methods. Two log-Pearson analyses were performed on the data, one for the entire period of record (1939 to the present) and the second for the period from 1973 to the present, corresponding to the data in question. The second analysis produced 100-year peak discharges approximately half of the first analysis; therefore, the gage data for Putnam County sites were not used to improve the regional estimates of the discharges.

A summary of the drainage area-peak discharge relationships for a portion of the streams studied by detailed methods 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
DUNNS CREEK					
At U. S. Highway 17	596.9	8,048	13,673	16,520	24,340
East line of Section 9, T 11S, R 27E	575.0	7,950	13,506	16,318	24,055
ACOSTA CREEK					
At mouth	5.0	683	1,203	1,456	2,127
700 feet upstream of west line of Section 26, T 11S, R 26E	3.5	480	857	1,041	1,547
East line of Section 26, T 11S, R 26E	2.3	320	579	708	1,079
ETONIA CREEK					
At Bardin Road	216.8	2,498	4,393	5,342	7,745
Just upstream of confluence of unnamed tributary near the center of Section 1, T 9S, R 25E	211.9	2,404	4,235	5,152	7,482

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
ETONIA CREEK (continued)					
Just upstream of confluence of Rice Creek	183.1	1,866	3,319	4,053	5,954
Just upstream of confluence of Falling Branch	172.4	1,720	3,070	3,754	5,548
FALLING BRANCH					
At mouth	9.0	775	1,354	1,551	2,117
Just upstream of confluence of tributary in Section 30, T 8S, R 25E	5.1	167	253	284	379
SIMMS CREEK					
At the Trail Road on east line of Section 5, T 9S R26E	46.1	3,154	5,357	6,422	9,145
Upstream of confluence of Tributary 1 to Simms Creek (Section 28, T 8S, R26E)	25.0	2,076	3,562	4,281	6,138
At the Trail Road in NW corner or Section 27, T8S, R2	18.5	1,655	2,857	3,439	4,957
Just upstream of confluence of Tributary 2 to Simms Creek (Section 22, T 8S, R26E)	10.7	1,185	2,061	2,486	3,616
At the road in Section 9, T 8S, R 26E	8.6	936	1,642	1,987	2,929
At the county boundary (Sun Garden Road)	5.9	712	1,259	1,526	2,267
TRIBUTARY 1 TO SIMMS CREEK					
At mouth	11.2	1,212	2,107	2,542	3,698
At north line of Section 29, T 8S, R 26E	9.3	1,029	1,799	2,174	3,186
Just upstream of confluence of tributary on east line of Section 19 T8S, R26E	8.7	945	1,656	2,005	2,955
Just upstream of confluence of Tributary 1-A to Simms Creek (Section 18, T 8S, R 26E)	4.3	557	991	1,205	1,806
At the road in NW corner of Section 18, T 8S, R26E	3.2	410	737	900	1,371

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 1-A TO SIMMS CREEK					
At mouth	2.1	412	735	891	1,316
At the Trail Road near east line of Section 13, T 8S, R26E	1.8	322	580	706	1,063
At the Trail Road near NW corner of Section 13, T 8S, R 25E	0.9	136	253	312	499
TRIBUTARY 2 TO SIMMS CREEK					
At mouth	7.7	819	1,442	1,746	2,558
At the Trail Road on east line of Section 17, T 8S, R26E	5.9	599	1,067	1,298	1,935
At the Trail Road in NW quadrant of Section 8, T 8S, R26E	4.4	423	763	933	1,415
At the Trail Road in Section 6, T 8S, R 26E	3.4	316	575	705	1,082

In the original study, gaging stations on the St. Johns River near the mouth of Rice Creek (15 years of record), near Deland, Florida (41 years of record), and at Jacksonville, Florida (24 years of record), were the principal sources of data for defining the stage-frequency relationship for the St. Johns River. Values of the 10-, 50-, 100-, and 500-year stages were obtained from a log-Pearson Type III distribution of annual peak stages (Reference 12). These stage-frequency profiles agree with those profiles published by the USACE (Reference 13).

In the original study, no lake-level records had been collected within the county. Lake-level records for 12 lakes in Alachua, Clay, and Marion Counties, which are adjacent to Putnam County, were used to define maximum lake volume-frequency relationships for each site. Seven of these lake-level records had data for more than 20 years, and the maximum length of record is 35 years. Of the 12 records, the shortest is 14 years. The drainage areas for these lakes ranged from 0.19 square mile to 319 square miles, and the surface areas of these lakes ranged from 0.015 square mile (9.6 acres) to 20.6 square miles (more than 13,000 acres). The range of change in lake level was from less than two feet to more than 30 feet. These lakes were also vastly different in outflow characteristics from completely closed (no outflow at any flood frequency) to outflow at all flood frequencies.

Flood-frequency curves in the original study were defined for each of the 12 lake-level records. These curves were developed in terms of lake volume measured above a defined base. Volumes were adjusted for outflow, as applicable, and the base level was defined as the mean lake stage. After all annual data (based on a year beginning on June 1 and ending on May 31) were adjusted, analyses were carried out to determine the best technique for fitting flood-frequency curves to the lake-volume data. A log-Pearson Type III distribution, using the average skew coefficient as outlined in U.S. Water Resources Council Bulletin 17A, was found to be an acceptable technique for fitting flood-frequency curves to the lake-volume data (Reference 12). Values of the 10-, 50-, 100-, and 500-year volumes were obtained for each of the 12 lakes from this log-Pearson Type III distribution.

In the original study, a regression analysis of frequency data versus drainage area for the 12 lakes was used to define a regional relationship for each recurrence interval. The analysis showed that drainage basin size explained nearly all of the variation in the lake volumes.

In the original study, regression analysis was also used to define a regional relationship between the mean lake stage and grassline elevation along the lake shores of the 12 lakes. The analysis showed that the elevation of the grassline along the shoreline explained nearly all of the variation in mean lake stage.

The regional relationships in the original study for mean lake stage and for lake volume at the selected recurrence intervals were used with an elevation-change in volume curve for Lake Broward to determine the water-surface elevations for the 10-, 50-, 100-, and 500-year recurrence intervals.

In this restudy, lake flood elevations were calculated from 10-, 50, 100-, and 500-year runoff volumes determined by a detailed HEC-1 analysis of each lake (Reference 14). The HEC-1 model for Georges Lake also included Falling Branch since the lake serves as headwaters for the stream. The HEC-1 models used the SCS curve numbers to estimate rainfall losses. The curve numbers were developed using aerial photographs and the Putnam and Alachua Counties Soil Maps (References 10, 15, and 16). Snyder's unit hydrograph was used to transform excess rainfall to runoff. Unit Hydrograph parameters were calibrated from long term USGS gages located in Clay County immediately to the north of Putnam County. The Modified Puls method was used to simulate flood wave movement through lakes and river reaches.

In this restudy, the lake analyses accounted for the fact that many lakes in the county have been at unusually low levels in recent years, levels that are not representative of long-term normal conditions. The low levels have resulted from a rain shortfall and would be quickly reversed after a short period of rain surplus. To simply superimpose the HEC-1 flood volumes on the current levels of these lakes would significantly underestimate the flood hazard (by over ten feet in some instances). For this study, lake base-stage variability was determined from both groundwater and lake stage data that revealed a common underlying fluctuation pattern associated with long-term fluctuations in regional rainfall totals. Although four of the lakes identified for detailed study (Grandin, Georges, Redwater, and Star) either show little of this variation or are otherwise affected by streams or controls, it was necessary to account for base-stage variability in the treatment of the other seven (Clubhouse, Cue, Long, Sugarbowl, Crane Ponds, Saratoga, and Castle). This was done by superimposing the HEC-1 volumes, not on the current stages, but on a range of possible antecedent lake elevations, and by then weighting the results to reflect the likelihood of each particular volume/base-stage combination.

The stillwater elevations for the 10-, 50-, 100-, 500-year floods have been determined for the streams listed below and are summarized in Table 2, "Summary of Stillwater Elevations."

TABLE 2 - SUMMARY OF STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (feet*) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
St. Johns River				
At northern corporate limits	4.4	5.6	6.1	7.3
At confluence of Rice Creek	4.4	5.6	6.1	7.3
At U. S. Highway 17	4.5	5.6	6.2	7.3
At confluence of Dunns Creek	4.6	5.8	6.3	7.5
At confluence of Acosta Creek	4.6	5.9	6.4	7.7
At southern corporate limits	4.8	6.2	6.8	8.0
Grassy Lake	81.4	82.4	82.7	83.4
Castle Lake	69.0	70.4	70.8	72.1
Clearwater Lake	82.6	83.3	83.6	84.2
Clubhouse Lake	87.7	88.7	89.0	90.0
Cranes Ponds	39.5	39.6	39.7	39.8
Crescent Lake	5.2	6.7	7.3	8.6
Cue Lake	91.7	92.6	92.7	93.5
Georges Lake	100.0	100.7	101.0	101.6
Halfmoon Lake	**	**	99.0	99.4
Lake Broward	40.9	41.9	42.3	43.0
Lake Grandin	82.6	83.3	83.6	84.2
Lake Stella	39.6	40.5	40.8	41.5

*National Geodetic Vertical Datum of 1929
**Data not computed

TABLE 2 - SUMMARY OF STILLWATER ELEVATIONS - continued

FLOODING SOURCE AND LOCATION	ELEVATION (feet*) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
Long Lake	91.3	92.4	92.7	93.9
Putnam Prairie/Wall Lake	**	**	96.5	97.3
Redwater Lake	80.9	82.0	82.4	83.8
Saratoga Lake	65.9	66.9	67.0	68.0
Star Lake	78.9	79.2	79.3	79.6
Sugarbowl Lake	39.5	39.6	39.7	39.8

*National Geodetic Vertical Datum of 1929
**Data 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.

In the original study, non-tidal water-surface elevations of floods of the selected recurrence intervals were computed through the use of the USGS E-431 step-backwater computer model (Reference 17). The mean daily elevation of the St. Johns River was used as the starting water-surface elevation for Dunns Creek. For Acosta Creek, the slope/area method was used to determine starting water-surface elevations.

In this restudy, water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (Reference 18). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations were calculated using normal depth or mean tide. Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

In the original study, cross-sectional data for the hydraulic analyses of Dunns and Acosta Creeks were obtained from aerial photographs flown in March 1976 and from field verification and corrections made in March 1978 (Reference 19). The below-water sections were obtained by field measurement.

In this restudy, cross sections for the flooding sources studied by detailed methods were obtained from field surveys. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

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 FIRM (Exhibit 2).

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations. The following tabulation shows the channel and overbank "n" values for the streams studied by detailed methods:

Stream	Channel "n"	Overbank "n"
Acosta Creek	0.070-0.100	0.100-0.150
Dunns Creek	0.030-0.035	0.120-0.150
Etonia Creek	0.070	0.200
Falling Branch	0.026-0.065	0.150
Simms Creek	0.070	0.200
Tributary 1 to Simms Creek	0.025-0.070	0.100-0.150
Tributary 1-A to Simms Creek	0.070	0.150
Tributary 2 to Simms Creek	0.030-0.070	0.100-0.150

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.

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

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist in developing floodplain management measures.

4.1 Floodplain 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 floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the streams studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 5 and 10 feet (References 20 and 21).

For the streams studied by approximate methods, the 100-year floodplain boundaries remain unchanged from the delineation shown on the previously printed FIS for the unincorporated areas of Putnam County (Reference 22).

The 100- and 500-year floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, and numbered A Zones), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain 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.

For the streams studied by approximate methods, only the 100-year floodplain boundaries are shown on the FIRM (Exhibit 2).

4.2 Floodways

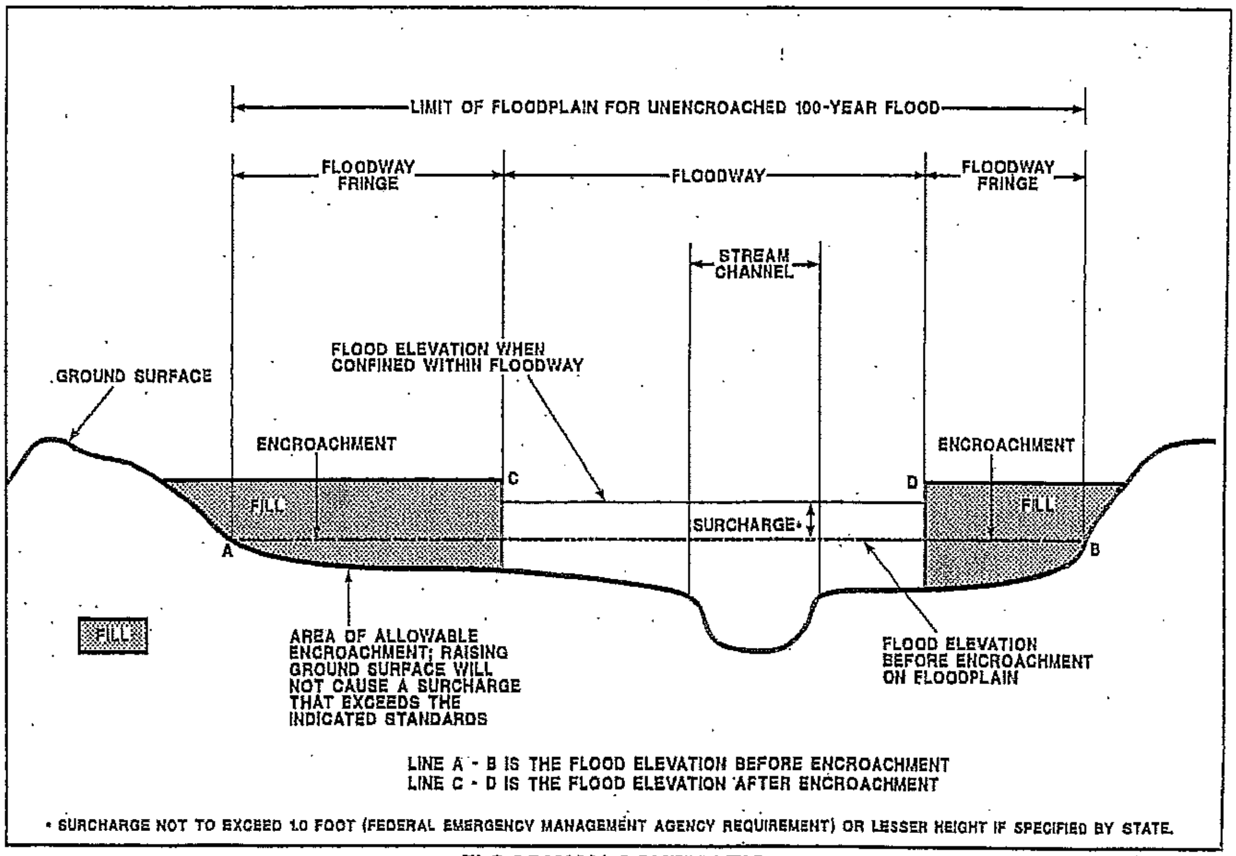
Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development 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 floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain 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 floodways in this study is presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 3). The computed floodways are shown on the FIRM (Exhibit 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. No floodway was computed for the St. Johns River.

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in Table 3 for certain downstream cross sections of Dunns Creek and Acosta Creek are lower than the regulatory flood elevations in that area, which must take into account the 100-year flooding due to backwater from other sources.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 3, "Floodway Data." In order to reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain 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 floodplain development are shown in Figure 2.



FLOODWAY SCHEMATIC Figure 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Acosta Creek								
A	150[1]	246	1,045	1.4	6.4	2.1[3]	2.8	0.7
B	730[1]	153	934	1.6	7.3	7.3	7.7	0.4
C	1,580[1]	263	1,690	0.9	9.2	9.2	10.1	0.9
D	2,795[1]	144	1,256	1.2	15.0	15.0	15.1	0.1
E	4,745[1]	287	2,115	0.7	16.4	16.4	17.4	1.0
F	5,730[1]	104	604	2.4	19.3	19.3	20.2	0.9
G	7,320[1]	193	1,213	1.2	27.1	27.1	28.1	1.0
H	8,560[1]	218	1,049	1.4	29.1	29.1	29.9	0.8
I	9,930[1]	171	884	1.2	33.6	33.6	34.6	1.0
J	11,640[1]	91	432	2.4	39.1	39.1	40.0	0.9
K	13,465[1]	113	489	2.1	47.8	47.8	48.7	0.9
L	15,415[1]	93	563	1.3	56.2	56.2	56.7	0.5
M	16,325[1]	88	415	1.7	57.9	57.9	58.8	0.9
Etonia Creek								
A	885[2]	868	9,138	0.6	21.6	21.6	22.5	0.9
B	3,935[2]	798	7,243	0.7	22.2	22.2	23.2	1.0
C	7,195[2]	715	4,818	1.1	24.3	24.3	25.2	0.9
D	11,125[2]	588	4,206	1.3	27.5	27.5	28.2	0.7
E	13,445[2]	674	4,983	1.1	29.8	29.8	30.8	1.0
F	18,920[2]	873	6,151	0.9	32.9	32.9	33.8	0.9
G	23,620[2]	882	4,985	1.0	35.7	35.7	36.7	1.0
H	26,620[2]	630	4,078	1.3	38.3	38.3	39.2	0.9
I	30,130[2]	477	3,753	1.4	41.5	41.5	42.1	0.6
J	33,170[2]	508	4,408	1.2	43.5	43.5	44.3	0.8

[1]Distance in feet from mouth
[2]Distance in feet from Bardin Road
[3]Elevation computed without consideration of backwater effects from St. Johns River

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL (UNINCORPORATED AREAS)

FLOODWAY DATA

ACOSTA CREEK - ETONIA CREEK

TABLE 3

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Etonia Creek (continued)								
K	35,602[1]	611	5,207	1.0	44.6	44.6	45.5	0.9
L	38,182[1]	559	4,126	1.2	46.4	46.4	47.4	1.0
M	41,207[1]	439	3,115	1.3	50.5	50.5	51.1	0.6
N	43,717[1]	309	2,925	1.4	54.0	54.0	54.9	0.9
O	46,717[1]	318	2,701	1.5	58.3	58.3	59.2	0.9
P	49,937[1]	238	2,214	1.8	64.4	64.4	65.4	1.0
Q	51,332[1]	115	1,028	3.7	67.6	67.6	68.2	0.6
R	55,567[1]	178	1,980	1.9	74.6	74.6	75.4	0.8
S	58,137[1]	159	2,155	1.7	76.7	76.7	77.4	0.7
T	61,747[1]	291	2,942	1.2	78.7	78.7	79.5	0.8
U	65,927[1]	264	1,891	1.9	81.2	81.2	82.1	0.9
Falling Branch								
A	2,070[2]	56	505	3.1	70.3	70.3	71.3	1.0
B	2,994[2]	115	1,114	1.4	71.6	71.6	72.5	0.9
C	3,723[2]	121	1,028	1.4	72.1	72.1	73.1	1.0
D	5,663[2]	139	923	1.6	74.1	74.1	75.1	1.0
E	7,713[2]	218	1,705	0.9	75.8	75.8	76.8	1.0
F	9,491[2]	251	806	1.8	78.8	78.8	79.7	0.9
G	13,067[2]	46	181	1.6	84.3	84.3	85.3	1.0
H	15,388[2]	28	107	1.8	101.0	101.0	101.5	0.5

[1]Distance in feet from Bardin Road
[2]Distance in feet from Etonia Creek

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)

FLOODWAY DATA

ETONIA CREEK - FALLING BRANCH

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
Simms Creek								
A	15,750	773	7,858	0.8	21.1	21.1	22.1	1.0
B	19,170	575	5,042	1.3	23.3	23.3	24.3	1.0
C	20,955	613	5,543	1.2	25.3	25.3	26.3	1.0
D	23,915	824	7,125	0.9	27.1	27.1	28.1	1.0
E	27,205	668	5,485	1.2	29.2	29.2	30.2	1.0
F	30,165	553	5,072	1.3	32.2	32.2	33.2	1.0
G	32,485	745	5,625	0.8	34.5	34.5	35.5	1.0
H	34,225	670	4,129	0.8	36.0	36.0	37.0	1.0
I	37,425	328	2,108	1.2	42.5	42.5	43.5	1.0
J	40,715	414	2,418	1.0	47.9	47.9	48.9	1.0
K	42,965	332	1,896	1.3	52.9	52.9	53.9	1.0
L	44,995	263	1,617	1.5	58.2	58.2	59.2	1.0
M	46,745	280	1,660	1.5	63.3	63.3	64.3	1.0
N	48,545	193	1,259	2.0	67.4	67.4	68.3	0.9
O	50,970	246	1,671	1.2	72.5	72.5	73.5	1.0
P	53,300	188	1,184	1.7	77.4	77.4	78.4	1.0
Q	55,280	241	1,575	1.3	81.5	81.5	82.5	1.0
R	58,110	230	1,427	1.4	87.2	87.2	88.2	1.0

[1]Distance in feet from mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)

FLOODWAY DATA

SIMMS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Etonia Creek (continued)								
K	35,602[1]	611	5,207	1.0	44.6	44.6	45.5	0.9
L	38,182[1]	559	4,126	1.2	46.4	46.4	47.4	1.0
M	41,207[1]	439	3,115	1.3	50.5	50.5	51.1	0.6
N	43,717[1]	309	2,925	1.4	54.0	54.0	54.9	0.9
O	46,717[1]	318	2,701	1.5	58.3	58.3	59.2	0.9
P	49,937[1]	238	2,214	1.8	64.4	64.4	65.4	1.0
Q	51,332[1]	115	1,028	3.7	67.6	67.6	68.2	0.6
R	55,567[1]	178	1,980	1.9	74.6	74.6	75.4	0.8
S	58,137[1]	159	2,155	1.7	76.7	76.7	77.4	0.7
T	61,747[1]	291	2,942	1.2	78.7	78.7	79.5	0.8
U	65,927[1]	264	1,891	1.9	81.2	81.2	82.1	0.9
Falling Branch								
A	2,070[2]	56	505	3.1	70.3	70.3	71.3	1.0
B	2,994[2]	115	1,114	1.4	71.6	71.6	72.5	0.9
C	3,723[2]	121	1,028	1.4	72.1	72.1	73.1	1.0
D	5,663[2]	139	923	1.6	74.1	74.1	75.1	1.0
E	7,713[2]	218	1,705	0.9	75.8	75.8	76.8	1.0
F	9,491[2]	251	806	1.8	78.8	78.8	79.7	0.9
G	13,067[2]	46	181	1.6	84.3	84.3	85.3	1.0
H	15,388[2]	28	107	1.8	101.0	101.0	101.5	0.5

[1]Distance in feet from Bardin Road
[2]Distance in feet from Etonia Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL

(UNINCORPORATED AREAS)

FLOODWAY DATA

ETONIA CREEK - FALLING BRANCH

TABLE 3

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
Simms Creek								
A	15,750	773	7,858	0.8	21.1	21.1	22.1	1.0
B	19,170	575	5,042	1.3	23.3	23.3	24.3	1.0
C	20,955	613	5,543	1.2	25.3	25.3	26.3	1.0
D	23,915	824	7,125	0.9	27.1	27.1	28.1	1.0
E	27,205	668	5,485	1.2	29.2	29.2	30.2	1.0
F	30,165	553	5,072	1.3	32.2	32.2	33.2	1.0
G	32,485	745	5,625	0.8	34.5	34.5	35.5	1.0
H	34,225	670	4,129	0.8	36.0	36.0	37.0	1.0
I	37,425	328	2,108	1.2	42.5	42.5	43.5	1.0
J	40,715	414	2,418	1.0	47.9	47.9	48.9	1.0
K	42,965	332	1,896	1.3	52.9	52.9	53.9	1.0
L	44,995	263	1,617	1.5	58.2	58.2	59.2	1.0
M	46,745	280	1,660	1.5	63.3	63.3	64.3	1.0
N	48,545	193	1,259	2.0	67.4	67.4	68.3	0.9
O	50,970	246	1,671	1.2	72.5	72.5	73.5	1.0
P	53,300	188	1,184	1.7	77.4	77.4	78.4	1.0
Q	55,280	241	1,575	1.3	81.5	81.5	82.5	1.0
R	58,110	230	1,427	1.4	87.2	87.2	88.2	1.0

[1]Distance in feet from mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)

FLOODWAY DATA

SIMMS CREEK

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
Tributary 1 to Simms Creek								
A	1,885	306	1,481	1.7	32.6	32.6	33.6	1.0
B	4,665	189	1,073	2.4	40.2	40.2	41.2	1.0
C	7,321	339	2,914	0.7	51.5	51.5	52.5	1.0
D	9,447	248	1,152	1.9	53.0	53.0	54.0	1.0
E	11,887	188	741	2.9	59.5	59.5	60.2	0.7
F	13,263	162	1,095	1.8	66.6	66.6	67.1	0.5
G	14,135	160	1,115	1.8	68.3	68.3	69.3	1.0
H	15,813	145	1,332	1.5	75.0	75.0	75.9	0.9
I	17,363	144	966	1.2	77.5	77.5	78.5	1.0
J	19,976	164	673	1.8	84.5	84.5	85.5	1.0
K	22,327	169	648	1.4	94.6	94.6	95.3	0.7
L	23,302	301	818	1.1	96.9	96.9	97.2	0.3
M	24,802	419	760	1.2	101.0	101.0	102.0	1.0
N	26,402	330	992	0.9	103.7	103.7	104.6	0.9
Tributary 1-A to Simms Creek								
A	1,390	121	619	1.4	78.3	78.3	79.3	1.0
B	4,665	516	1,526	0.5	89.6	89.6	90.6	1.0
C	6,190	248	770	0.9	90.7	90.7	91.7	1.0
D	8,070	148	298	1.0	99.7	99.7	100.7	1.0

[1]Distance in feet from mouth

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL

(UNINCORPORATED AREAS)

FLOODWAY DATA

TRIBUTARY 1 TO SIMMS CREEK - TRIBUTARY 1-A TO SIMMS CREEK

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
Tributary 2 to Simms Creek								
A	4,878	219	1,217	1.4	49.1	49.1	50.0	0.9
B	6,588	174	891	2.0	53.8	53.8	54.8	1.0
C	10,650	174	826	1.6	67.1	67.1	67.9	0.8
D	12,675	179	747	1.7	73.1	73.1	74.1	1.0
E	15,825	152	743	1.7	84.5	84.5	85.5	1.0
F	17,929	163	823	1.1	94.1	94.1	95.1	1.0
G	20,679	214	975	1.0	97.6	97.6	98.6	1.0
H	23,029	224	858	1.1	100.8	100.8	101.7	0.9
I	25,317	350	1,254	0.6	104.5	104.5	105.5	1.0
J	26,317	438	1,529	0.5	104.8	104.8	105.8	1.0
Dunns Creek								
A	5,592	420	5,653	2.9	6.3	1.5[2]	2.5	1.0
B	11,032	396	6,198	2.7	6.3	2.3[2]	3.1	0.8
C	16,357	325	5,510	3.0	6.3	2.9[2]	3.7	0.8
D	21,847	291	5,155	3.2	6.3	3.6[2]	4.3	0.7
E	24,667	328	6,398	2.6	6.3	4.0[2]	4.7	0.7
F	29,442	349	6,577	2.5	6.3	4.3[2]	5.0	0.7

[1]Distance in feet from mouth
[2]Elevation computed without consideration of backwater effects from St. Johns River

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)

FLOODWAY DATA

TRIBUTARY 2 TO SIMMS CREEK - DUNNS CREEK

TABLE 3

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable. The FIRM includes flood hazard information that was presented separately on the Flood Boundary and Floodway Map in the previously printed FIS for Putnam County.

7.0 OTHER STUDIES

Flood Insurance Studies have been prepared for the Towns of Interlachen, Pomona Park; the Cities of Crescent City and Palatka; and the Unincorporated Areas of St. Johns, Clay, Alachua, Marion, Volusia, and Flagler Counties (References 23, 24, 25, 26, 27, 28, 29, 30, 31, and 32.)

Because it is based on more up-to-date analyses, this FIS supersedes the previously printed FIS for the Unincorporated Areas of Putnam County

(Reference 22). This FIS also supersedes the Flood Boundary and Floodway Map for Putnam County, which was published as part of the previously printed FIS. The information on the FBFM has been added to the FIRM accompanying this FIS.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA, Mitigation Division, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

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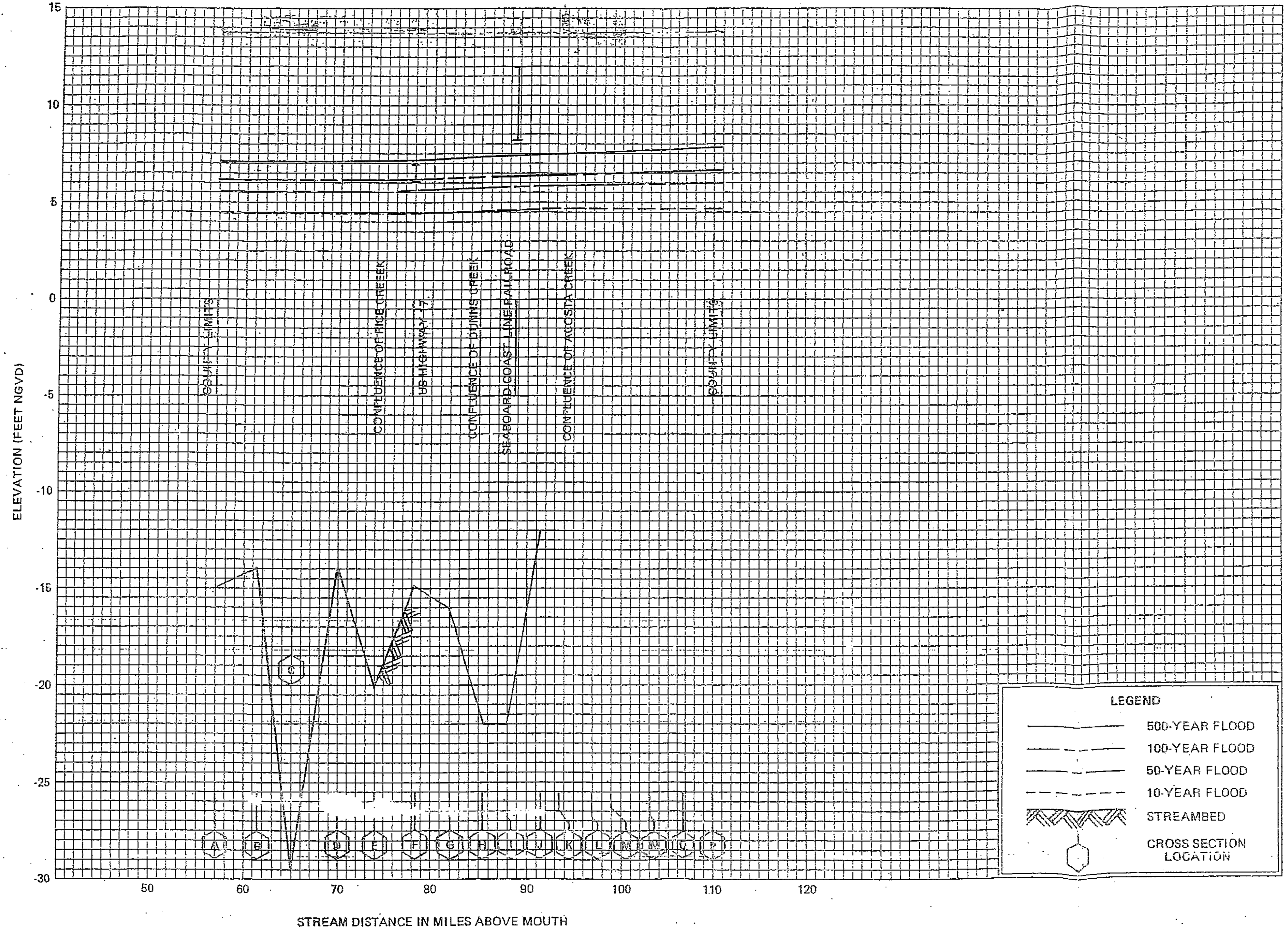


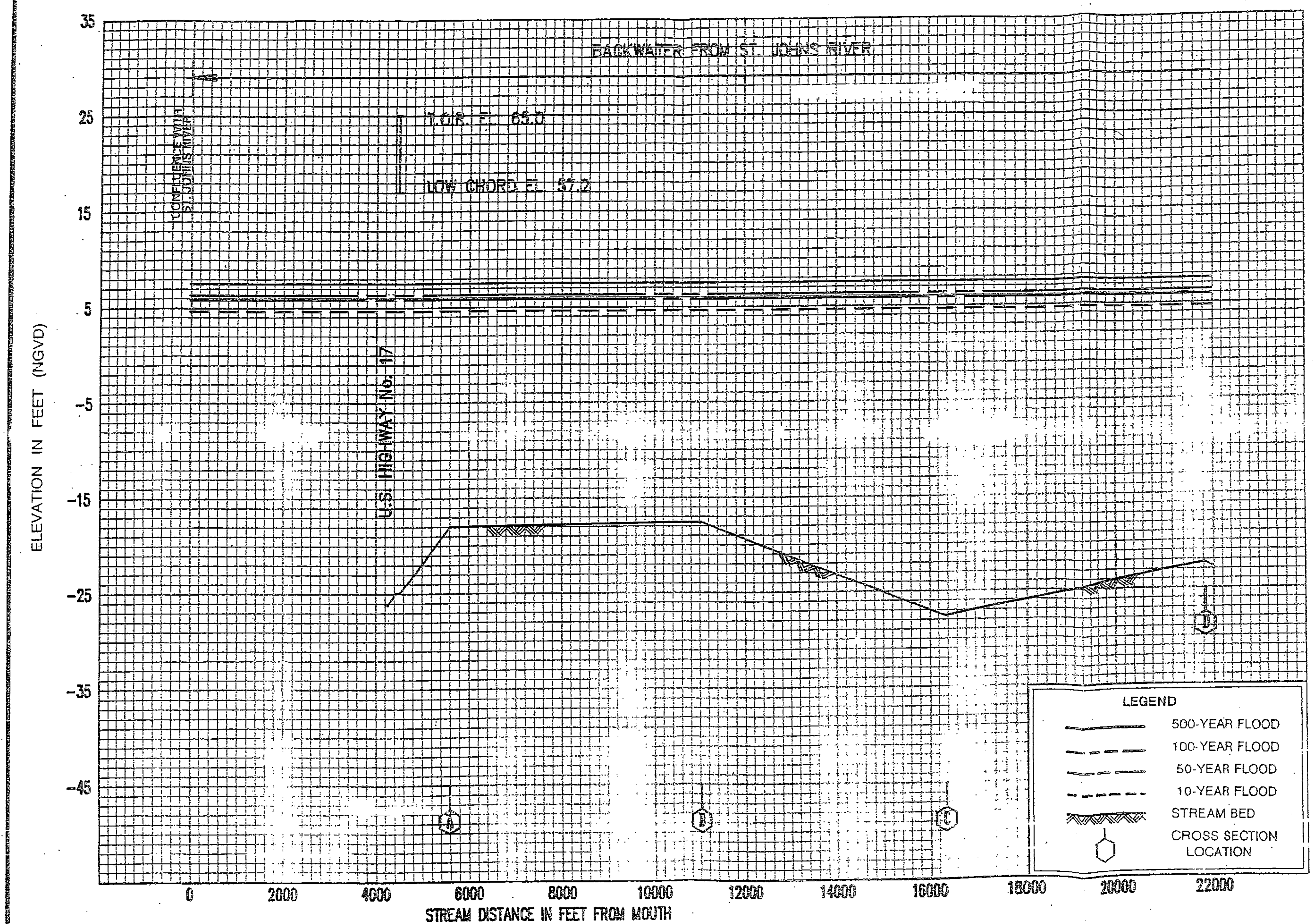
FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)

FLOOD PROFILES

ST. JOHNS RIVER

01P



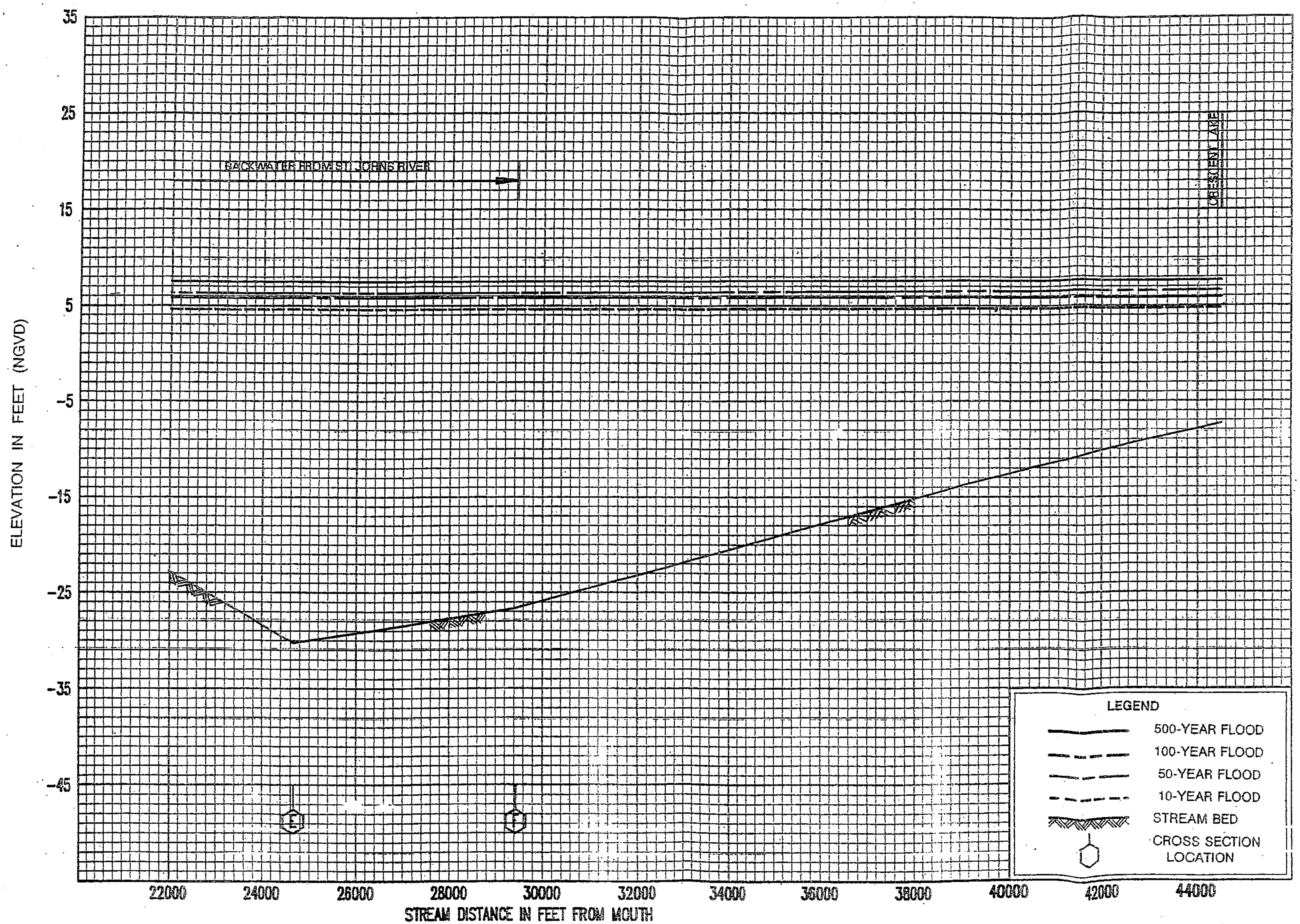
FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)

FLOOD PROFILES

DUNNS CREEK

02P

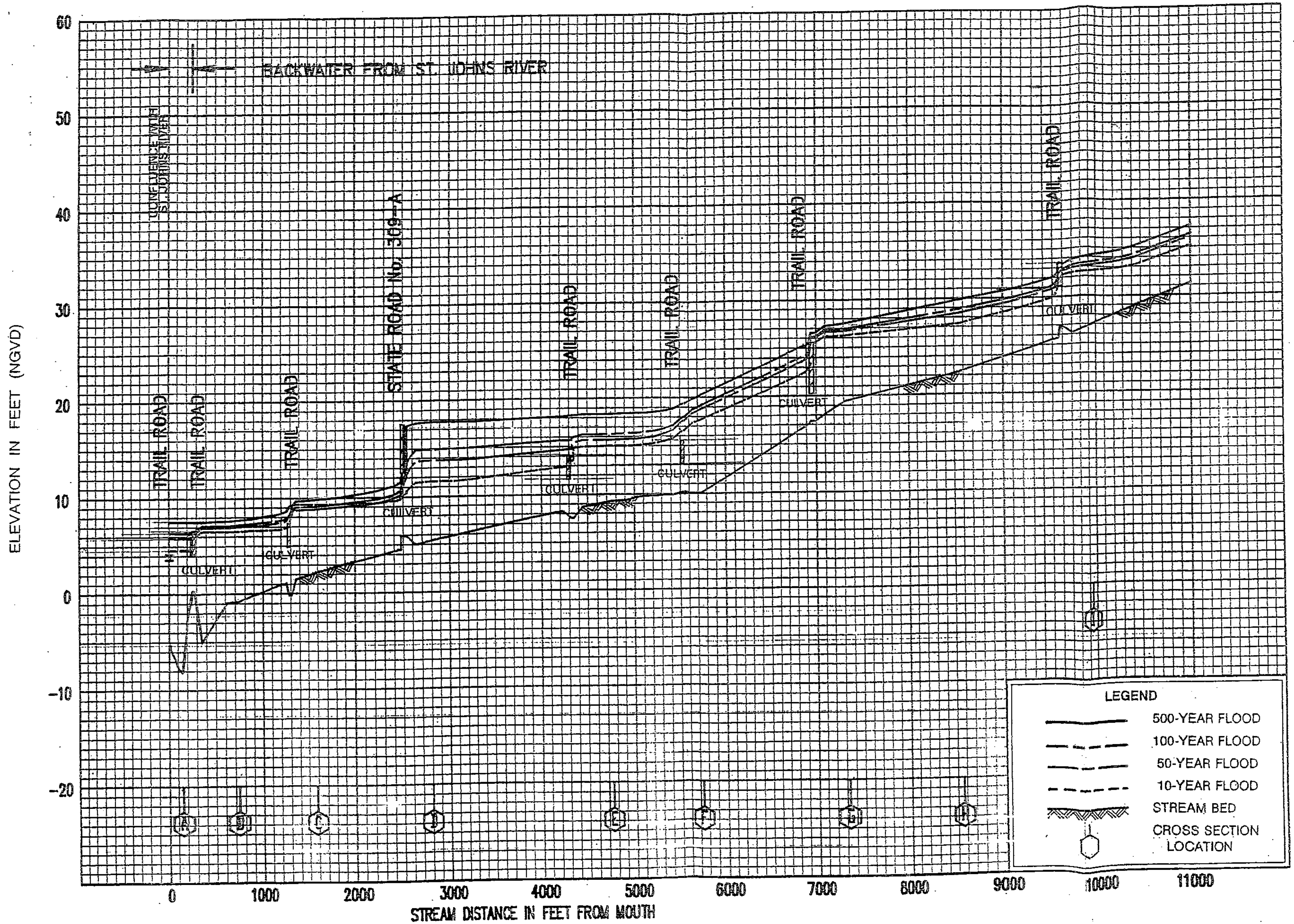


FLOOD PROFILES

DUNNS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)



FLOOD PROFILES

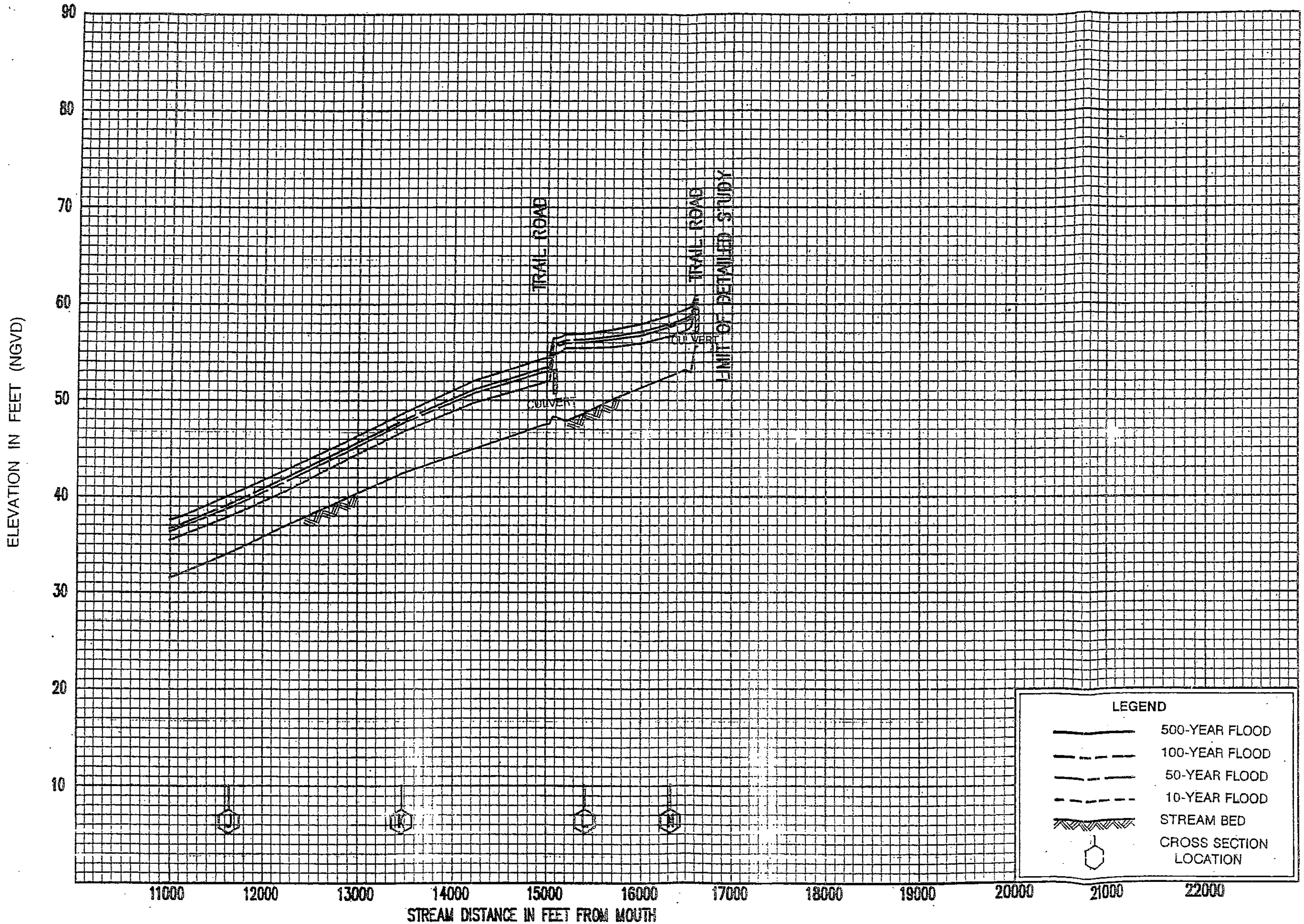
ACOSTA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL

(UNINCORPORATED AREAS)

04P



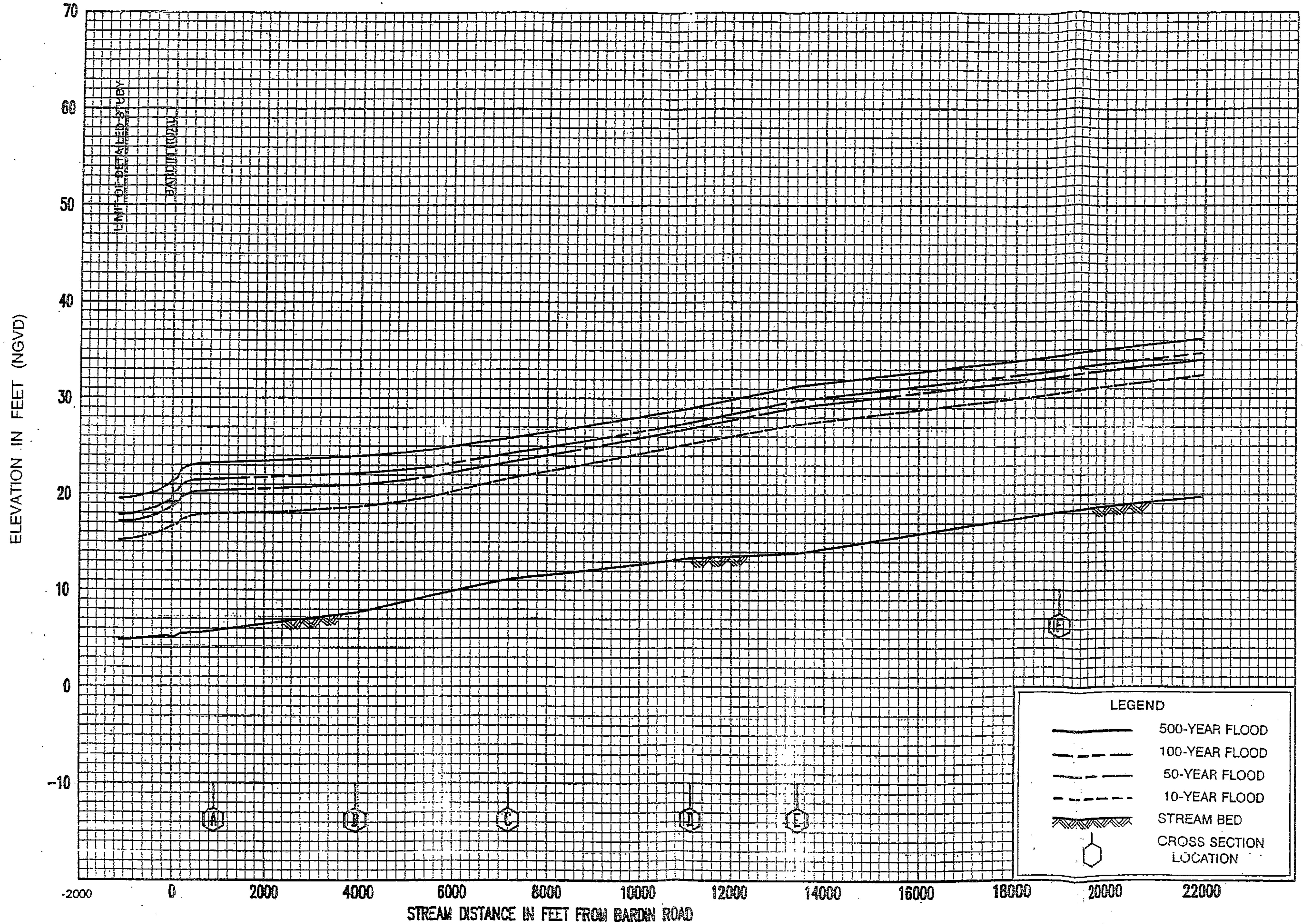
FLOOD PROFILES

ACOSTA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL

(UNINCORPORATED AREAS)



FEDERAL EMERGENCY MANAGEMENT AGENCY

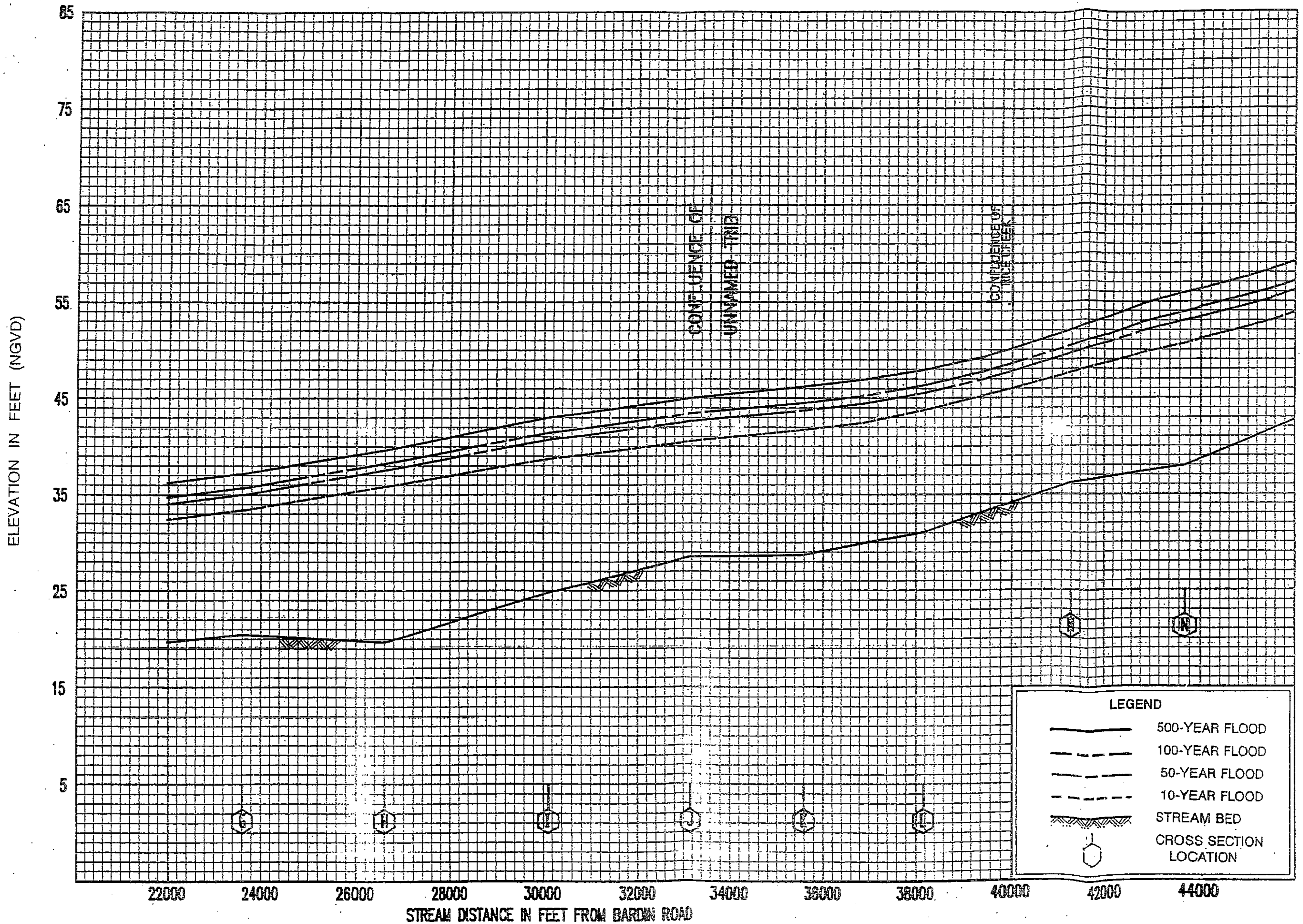
PUTNAM COUNTY, FL

(UNINCORPORATED AREAS)

FLOOD PROFILES

ETONIA CREEK

06P

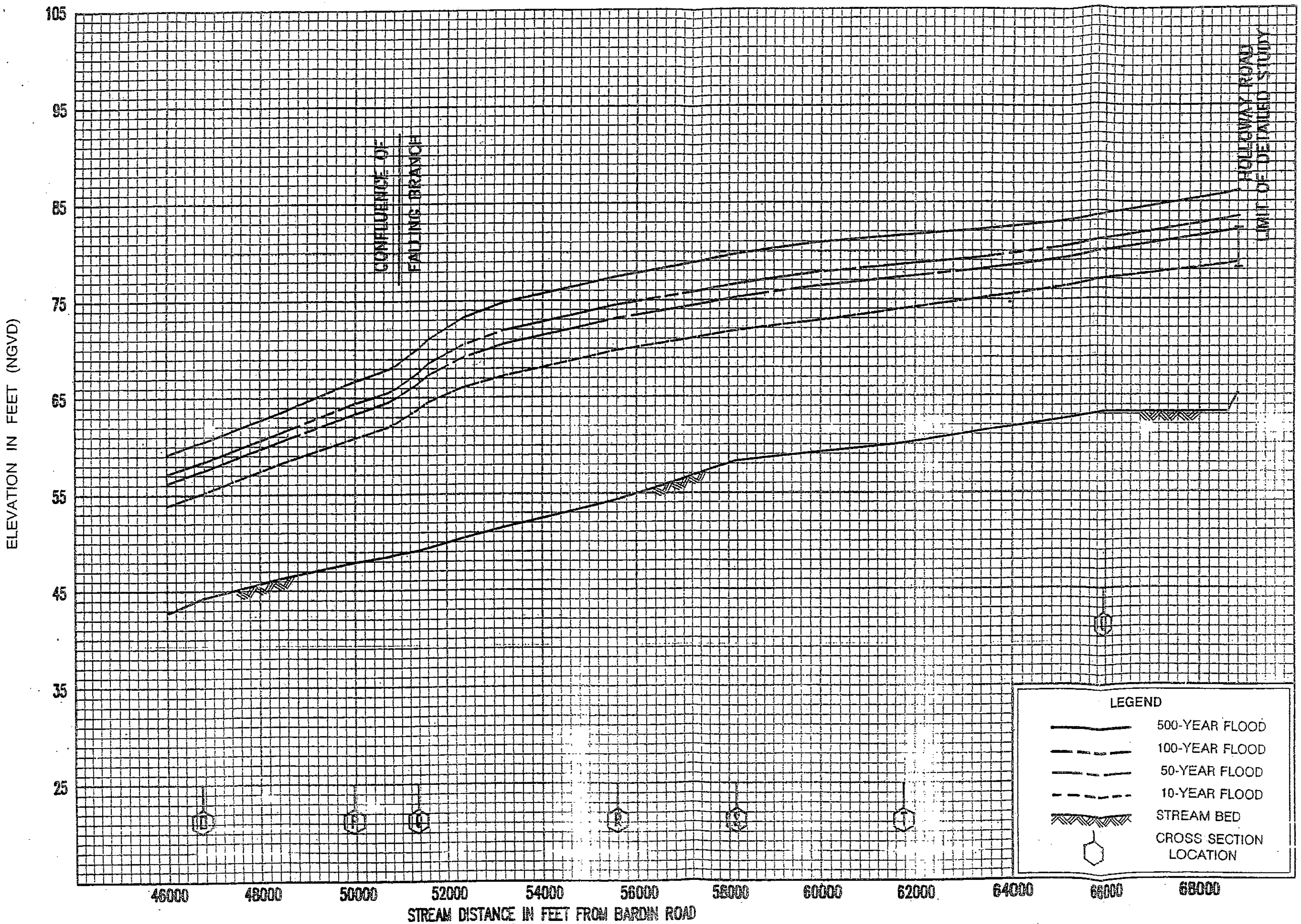


FLOOD PROFILES

ETONIA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)



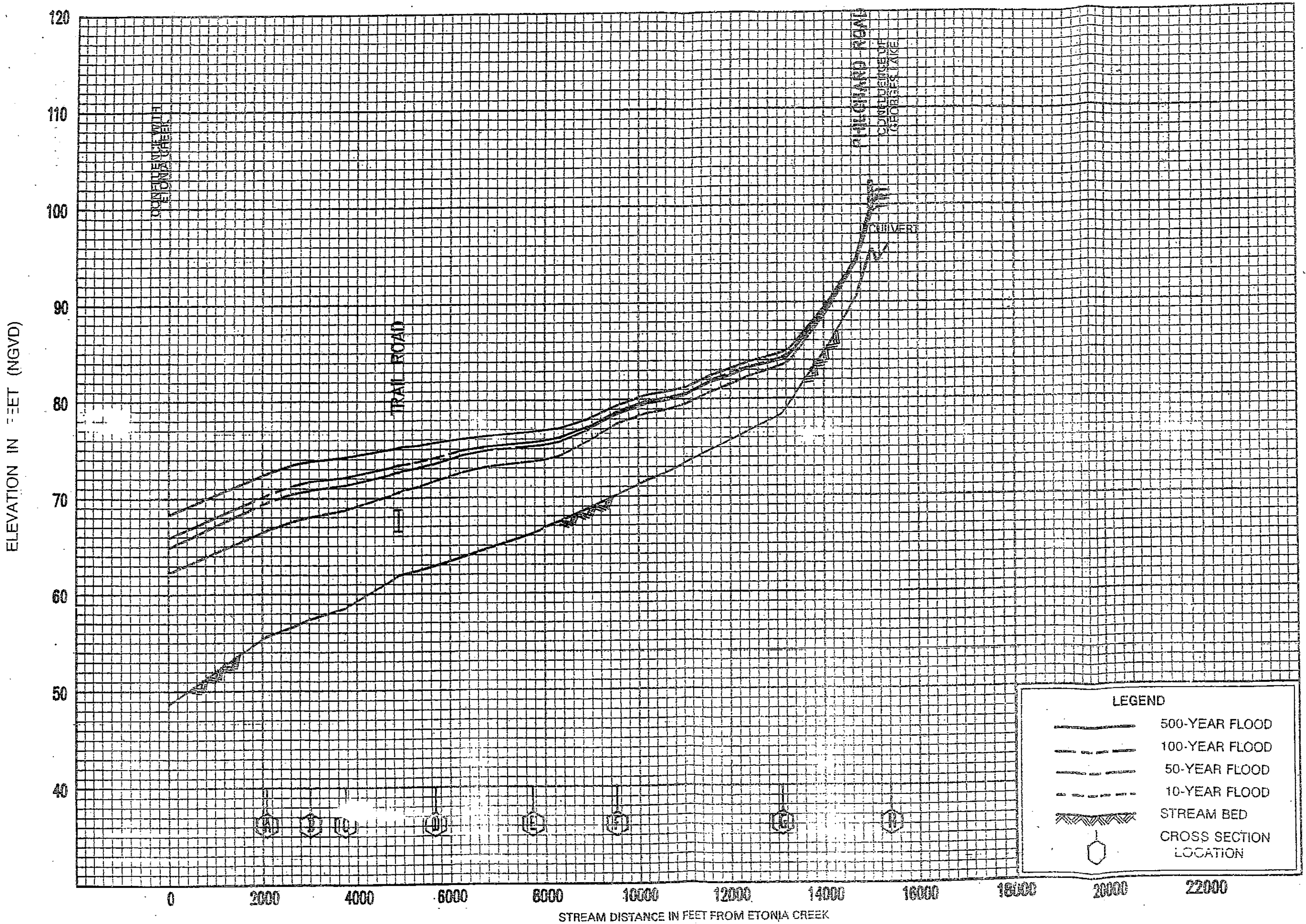
FLOOD PROFILES

ETONIA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL

(UNINCORPORATED AREAS)



FLOOD PROFILES

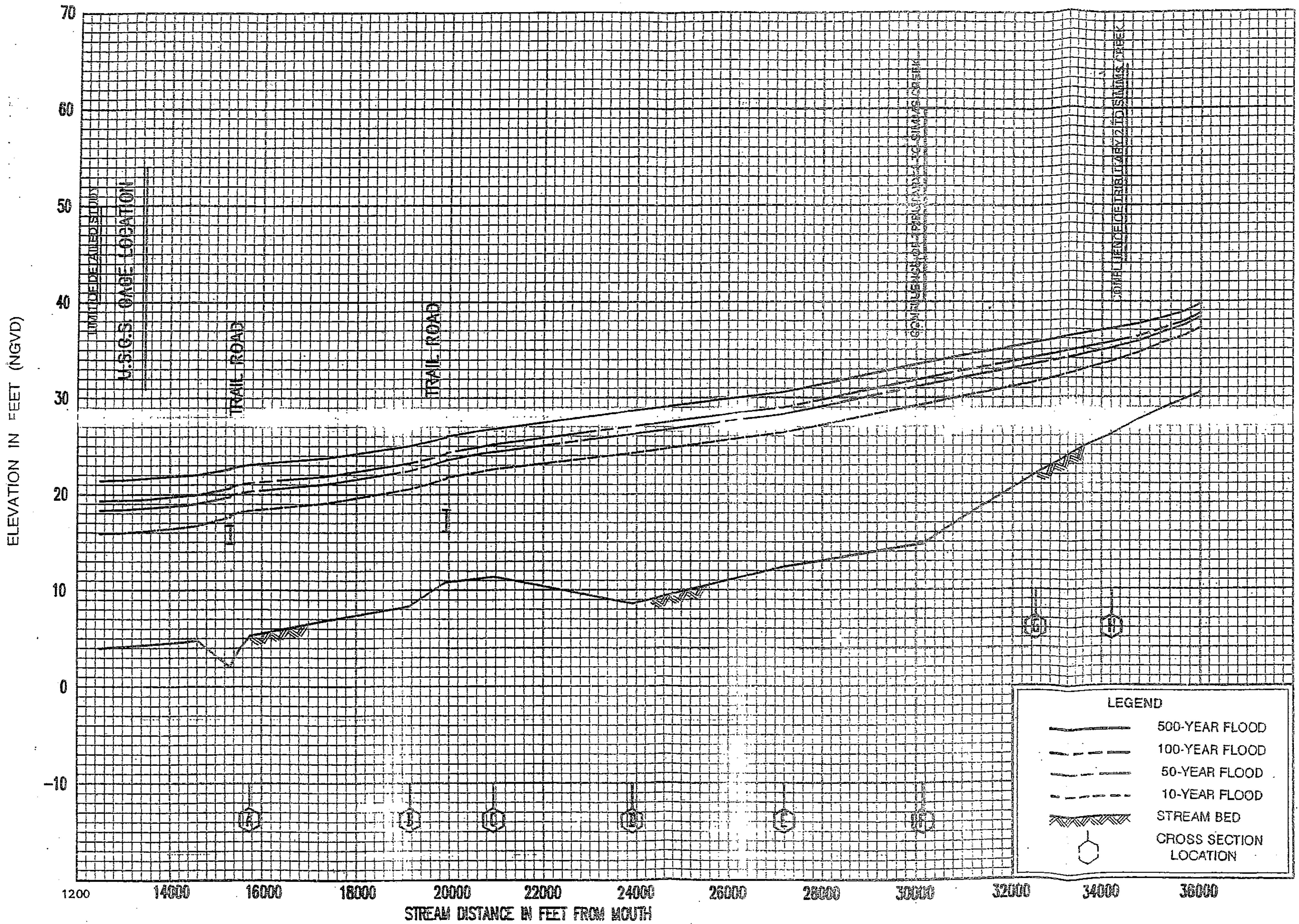
FALLING BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL

(UNINCORPORATED AREAS)

09P



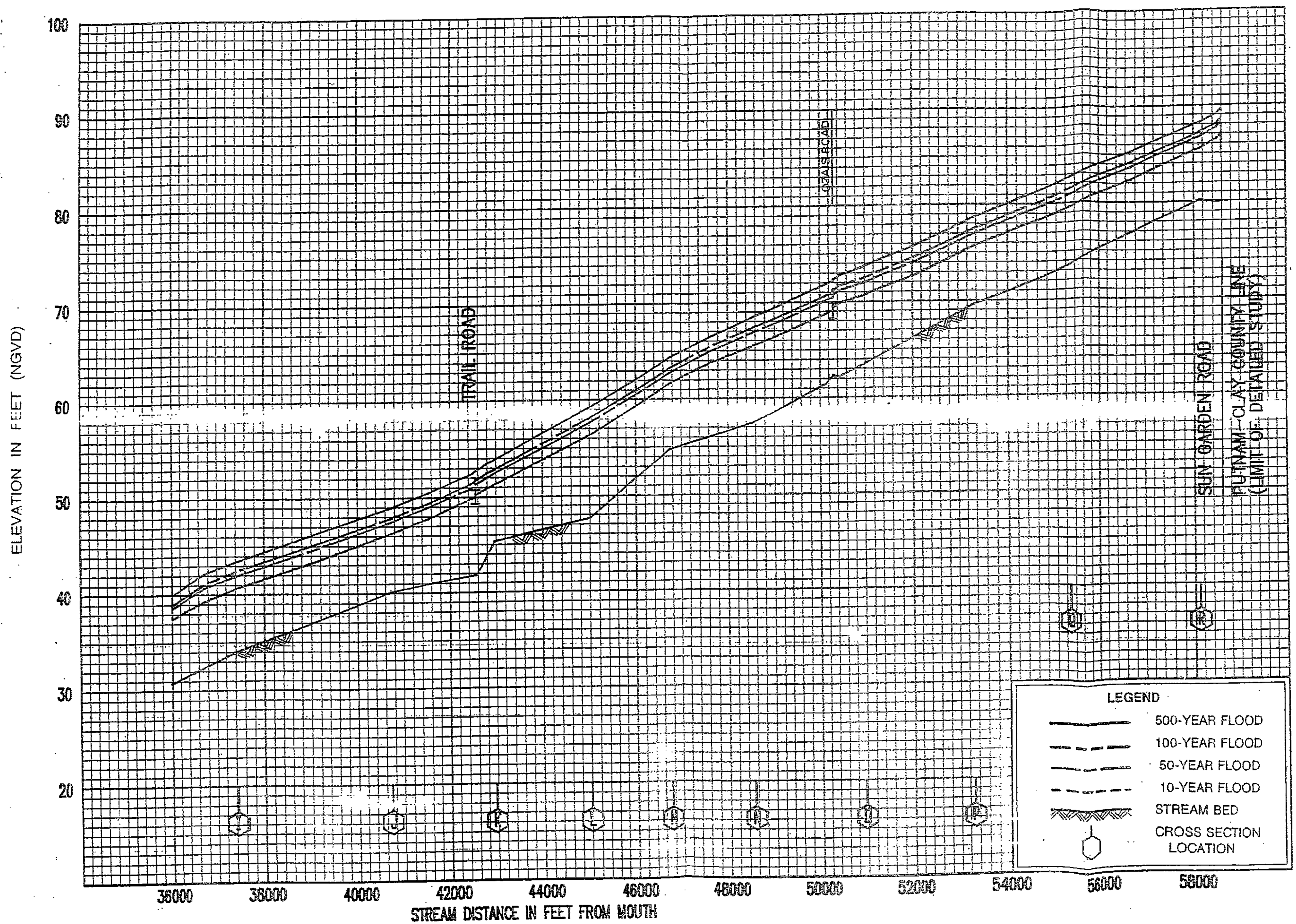
FLOOD PROFILES

SIMMS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL

(UNINCORPORATED AREAS)



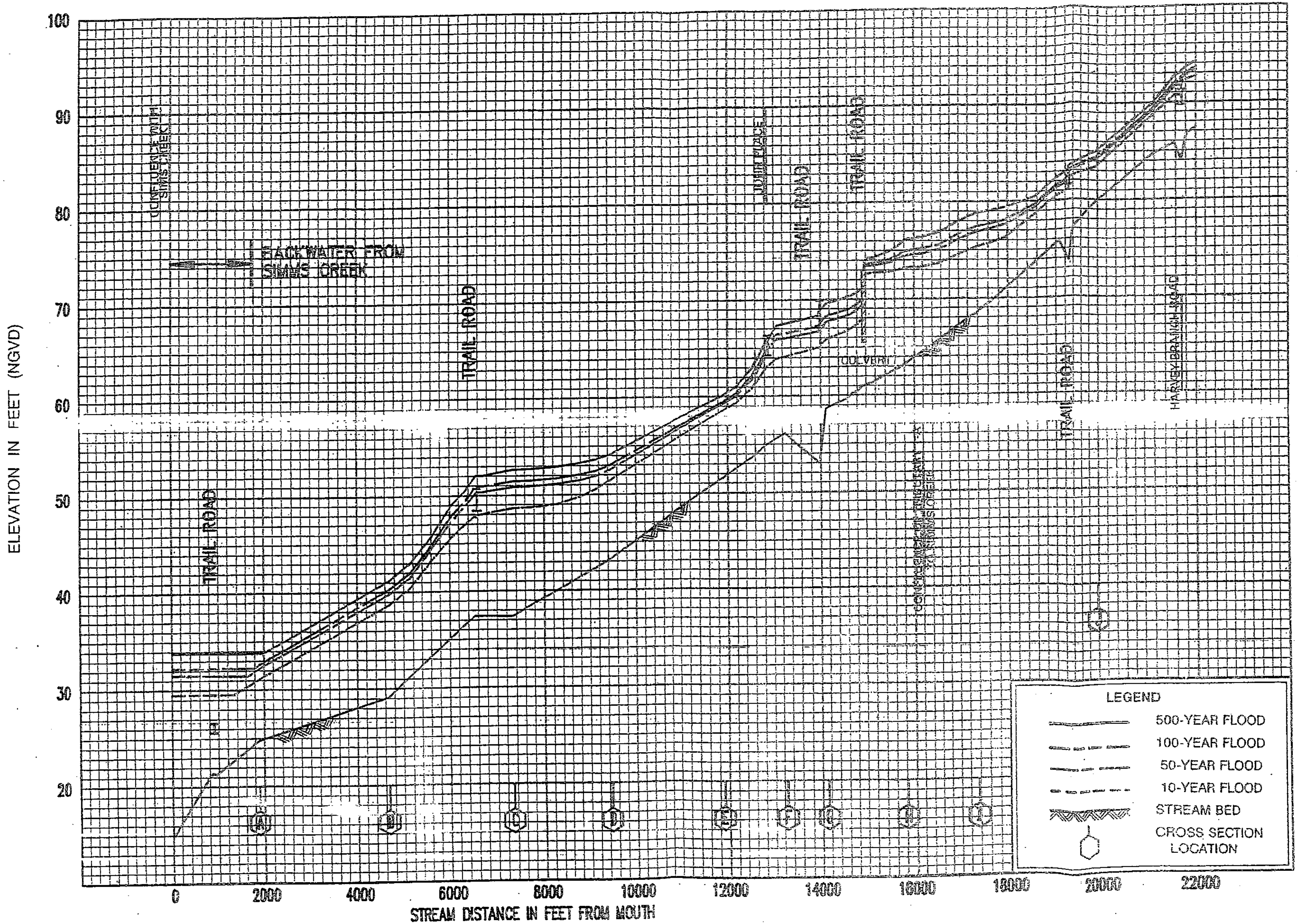
FLOOD PROFILES

SIMMS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)

11P



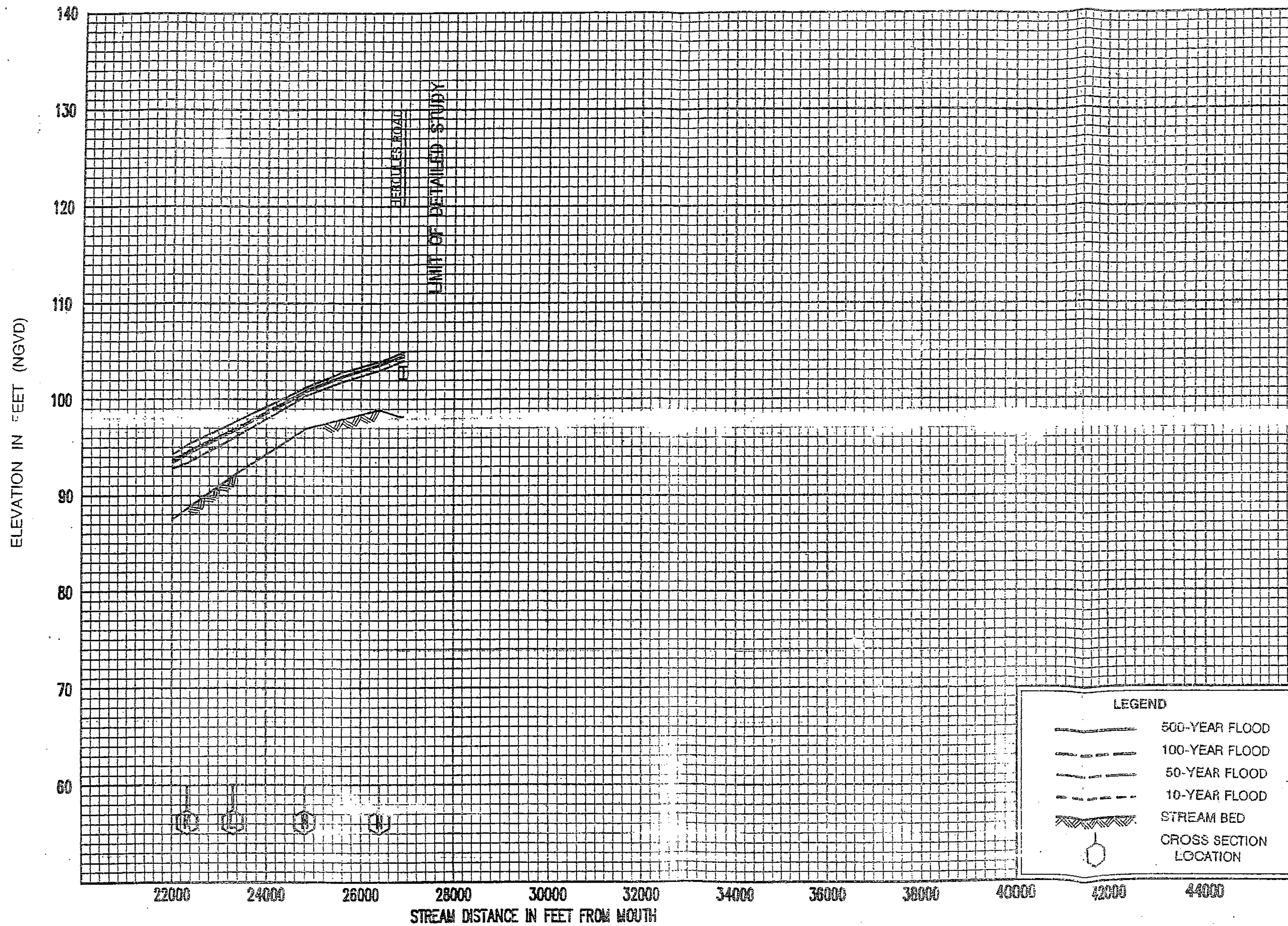
FLOOD PROFILES

TRIB 1 TO SIMMS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)

12P

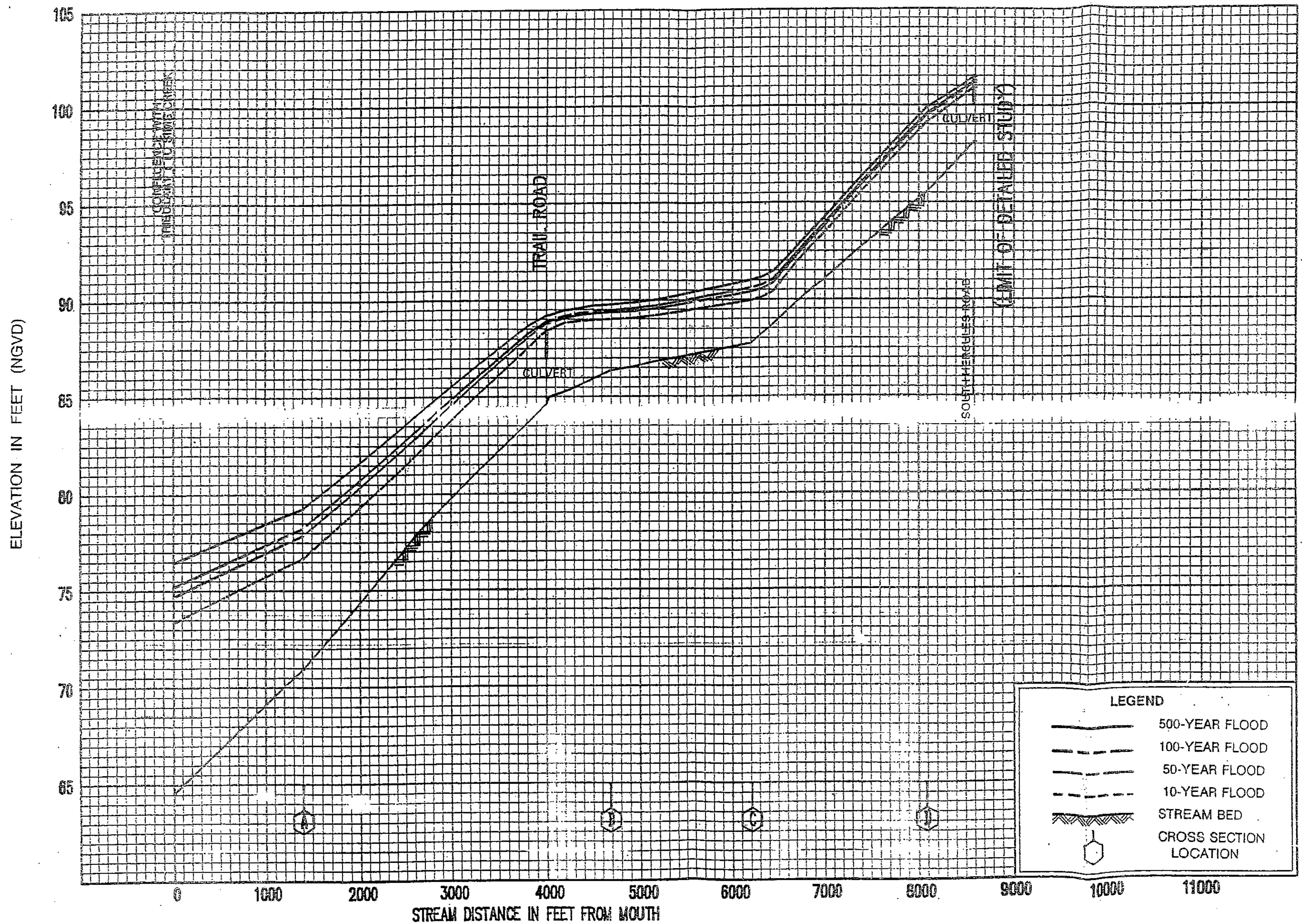


FLOOD PROFILES

TRIB 1 TO SIMMS CREEK

FEDEFAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)

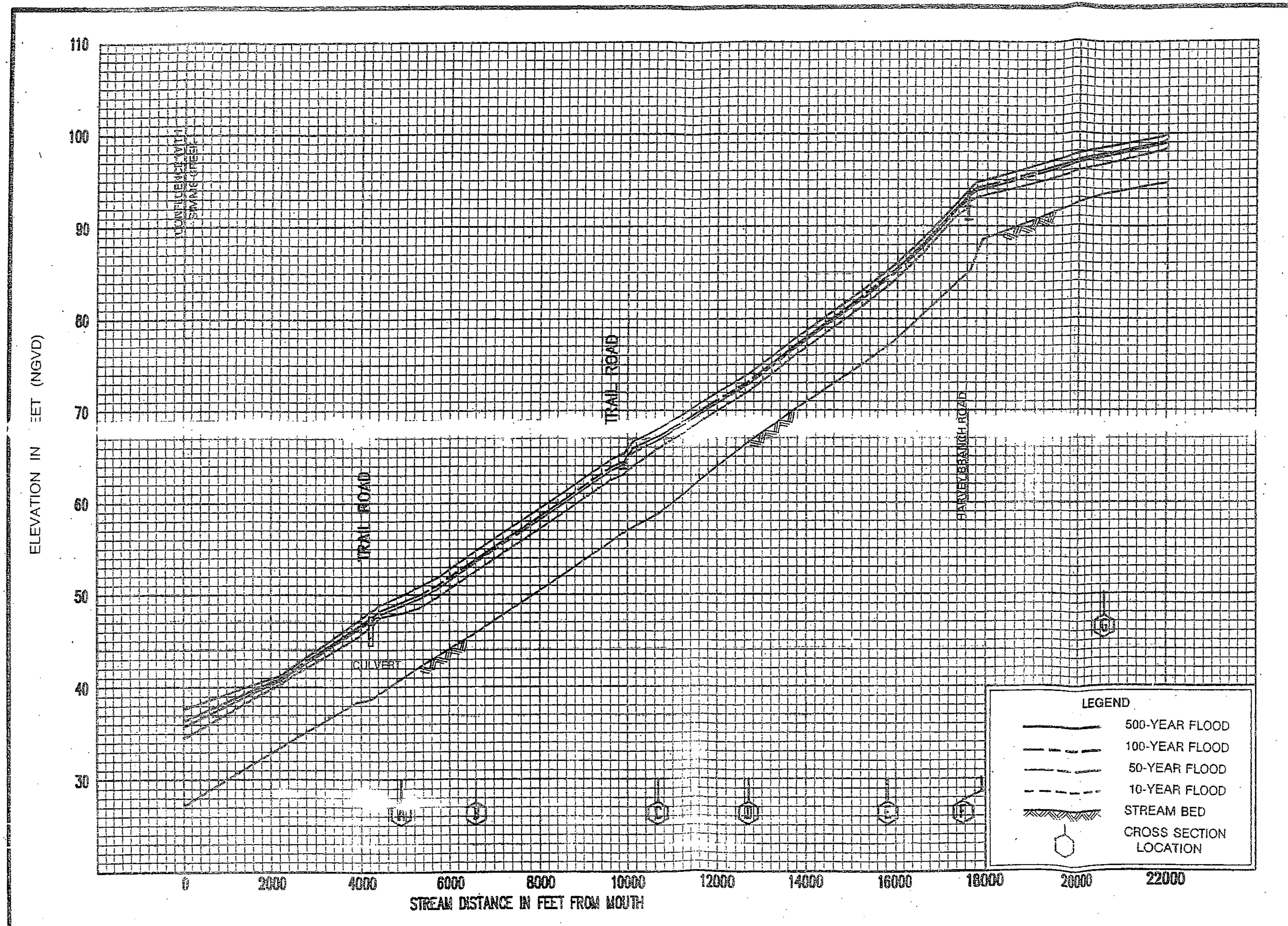


FLOOD PROFILES

TRIB 1-A TO SIMMS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)



FLOOD PROFILES

TRIB 2 TO SIMMS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL

(UNINCORPORATED AREAS)

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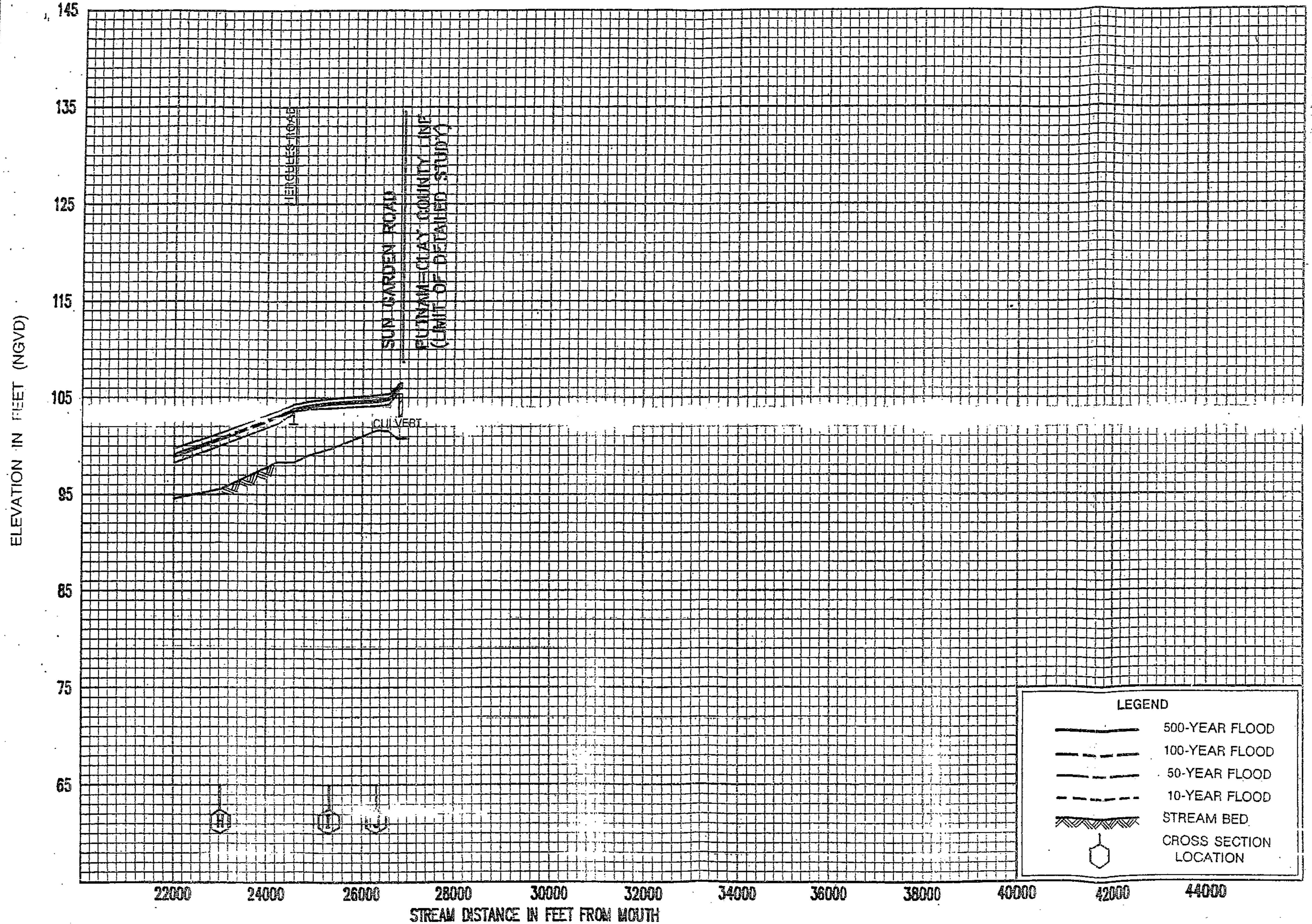


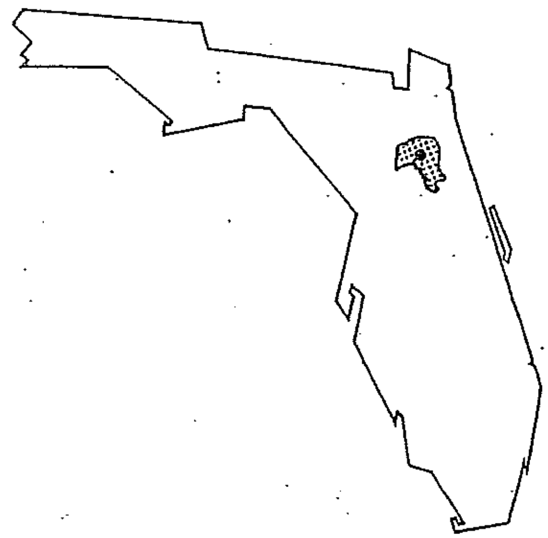
FLOOD PROFILES

TRIB 2 TO SIMMS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

PUTNAM COUNTY, FL
(UNINCORPORATED AREAS)

FLOOD INSURANCE STUDY



TOWN OF INTERLACHEN, FLORIDA

PUTNAM COUNTY

JUNE 1979

U.S. DEPARTMENT of HOUSING & URBAN DEVELOPMENT

FEDERAL INSURANCE ADMINISTRATION

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PUBLISHED SEPARATELY:

FLOOD INSURANCE STUDY

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the Town of Interlachen, Putnam County, Florida, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Interlachen to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

Sources of flooding requiring detailed study were identified at a meeting attended by representatives of the U.S. Geological Survey (study contractor), the Federal Insurance Administration, and the Town of Interlachen in February 1976. The town officials furnished town boundary maps.

The limits of detailed and approximate studies in Interlachen were determined by the Federal Insurance Administration with community and study contractor consultation at the meeting in February 1976.

The results of this study were reviewed at a final community coordination meeting held on November 8, 1978. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the town. This study incorporates all appropriate comments, and all problems have been resolved.

1.3 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 18. This work, which was completed in May 1978, covered all significant flooding sources affecting the Town of Interlachen.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Interlachen, Putnam County, Florida. The area of study is shown on the Vicinity Map (Figure 1).

Floods caused by increased lake levels in three lakes (Grassy, Chipco, and Lagonda), ranging in surface area from 52.5 to 107 acres, were studied in detail. Floods caused by overflow of Gum Creek from the north gasline crossing (1000 feet downstream from State Highway 20) to the downstream corporate limits of Interlachen were also studied in detail.

Interlachen and the surrounding area are dotted with numerous small lakes and depressions. Approximate methods of analyses were used to study these features, which have either low development potential or a minimal flood hazard.

Those areas studied by detailed methods were chosen with consideration given to all proposed construction and forecasted development through 1983.

2.2 Community Description

The Town of Interlachen is located near the center of Putnam County, in northern Florida. This area, dotted with numerous small lakes, is situated approximately 15 miles west of Palatka (the county seat of Putnam County), approximately 100 miles south of Jacksonville, and approximately 30 miles inland from the Atlantic Ocean.

Interlachen was settled in 1872, and the town was first known as Wilcox. The present name, Interlachen, is of Scotch form, meaning "between the lakes". In 1975, the population of Interlachen was 794, an increase of 183 since the 1970 census (Reference 1).

The climate in the region is temperate, with summer and winter temperatures ranging from 82.4°F in summer to 58.5°F in winter, respectively. The average annual rainfall is approximately 55 inches, with the greatest amounts occuring during either summer thunderstorms or the presence of tropical depressions or hurricanes in the fall (Reference 2).

2.3 Principal Flood Problems

Floods caused by increased storage in lakes can occur in unpredictable cycles. It is possible for the cumulative effect of slightly above-normal rainfall for several consecutive years to cause greater floods than those caused by 1 year of exceedingly high rainfall. Yet, an unfortunate combination of high lake levels, high ground-water levels, and exceedingly high rainfall, associated with several consecutive summer thunderstorms or a fall hurricane, could produce extreme flooding.

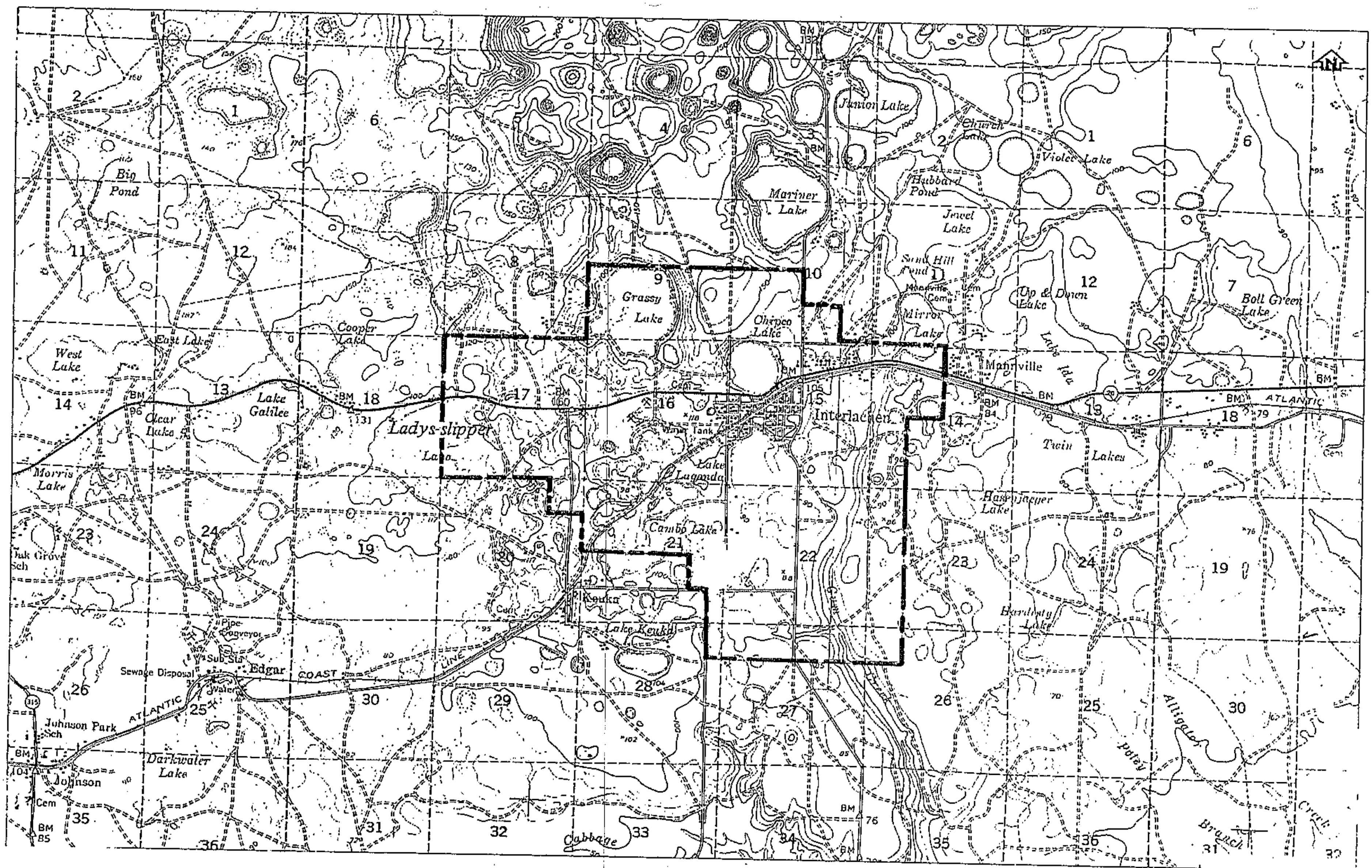

FIGURE 1

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF INTERLACHEN, FL

(PUTNAM CO.)

APPROXIMATE SCALE

1 0 1 2 3 MILES

VICINITY MAP

Interviews with long-time local residents provided information on historical high water from Lake Chipco, Grassy Lake, and Lake Lagonda. It was reported that the high water in 1948 on Lake Chipco reached a level that, when surveyed in 1978, was found to be 85.4 feet. Also pointed out were two high-water marks from 1948 on Grassy Lake (also known as Interlachen Lake) that were found to be 90.6 and 89.3 feet. Since this high-water period in 1948, Grassy Lake has been dredged in areas, and these historical water levels are not representative of present conditions. Two high-water marks for Lake Lagonda for 1948 were determined to be 79.8 and 79.0 feet.

2.4 Flood Protection Measures

No special flood protection structures have been constructed in the Town of Interlachen.

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 equalled 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 premium 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 equalled 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 occurrence) 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 here 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 maximum lake-level-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail in the community.

No lake level records have been collected within the community. Lake level records for 12 lakes in Alachua, Clay, and Marion Counties, which are adjacent to Putnam County, were used to define maximum lake volume-frequency relationships for each site. Seven of these lake level records have data for more than 20 years, with the maximum length of record being 35 years. Of the 12 records, the shortest is 14 years. The drainage area for these lakes ranges from 0.19 square mile to 319 square miles, and the surface area of these lakes ranges from 0.015 square mile (9.6 acres) to 20.6 square miles (more than 13,000 acres). The range of change in lake level is from less than 2 feet to more than 30 feet. These lakes are also vastly different in outflow characteristics, from completely closed (no outflow at any flood frequency) to outflow at all flood frequencies.

Flood-frequency curves were defined for each of the 12 lake level records. These curves were developed in terms of lake volume measured above a defined base. Volumes were adjusted for outflow as applicable, and the base level was defined as the mean lake stage. After all annual data (based on the year beginning June 1 and ending on May 31) were adjusted, analyses were carried out to determine the best technique for fitting flood-frequency curves to the lake-volume data. A log-Pearson Type III distribution, using the average skew coefficient as outlined in the U.S. Water Resources Council Bulletin 17 (Reference 3), was found to be an acceptable technique for fitting flood-frequency curves to the lake volume data. Values of the 10-, 50-, 100-, and 500-year volumes were obtained for each of the 12 lakes from this log-Pearson Type III distribution.

The frequency data for the 12 lakes were used in regression analyses along with drainage area to define a regional relation for each recurrence interval. The regression analyses showed that the drainage area explained nearly all of the variation in the lake volumes.

Regression analyses were also used to define a regional relation, based on average elevation of the grass line, to determine the mean-lake stage. These analyses showed that the elevation of the grass line along the lake shoreline explained nearly all of the variation in the mean-lake stages.

The regional relations for mean-lake stage and for lake volume at the selected recurrence intervals were used with an elevation/change in volume curve for each lake to determine the water-surface elevations for the 10-, 50-, 100-, and 500-year recurrence intervals.

Elevations for floods of the selected recurrence intervals on Grassy Lake, Lake Chipco, and Lake Lagonda are shown in Table 1.

Table 1. Summary of Lake Elevation:

Flooding Source	Drainage Area (Square Miles)	Elevation (Feet) 10-Year	50-Year	100-Year	500-Year
Grassy Lake	1.02	81.39	82.39	82.74	83.39
Lake Chipco	0.64	85.15	88.00	89.00	90.40
Lake Lagonda	0.29	79.14	80.14	80.34	80.74

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of selected recurrence intervals for the stream studied in detail in the town.

To define discharge-frequency data for Gum Creek, which is ungaged, regional relationship of drainage area to the mean annual peak discharge and the 10-, 50-, 100-, and 500-year floods (including adjustments for storage in lakes and swamps) was used (Reference 4).

Peak discharge-drainage area relationships for Gum Creek are shown in Table 2.

Table 2. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Gum Creek					
Downstream Corporate Limits	4.62	30	46	52	68
At Cross Section C	4.30	24	37	42	55
At Cross Section M	3.61	19	29	33	43
At Cross Section S	3.07	12	18	21	27

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of streams in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each stream studied in the community.

Water-surface elevations were developed for Gum Creek using the U.S. Geological Survey E-431 step-backwater computer model (Reference 5).

Cross sections for the backwater analyses of Gum Creek were obtained by field surveying. All culverts and dams were surveyed to obtain elevation data and structural geometry.

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 is computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Roughness coefficients (Manning's "n") for Gum Creek were estimated by field inspection at each cross section. Manning's "n" values ranged from 0.020 to 0.150 for the main channel and from 0.025 to 0.150 for the overbank flow areas.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

Starting water-surface elevations for Gum Creek were calculated using flow-over-weir and dam methods (Reference 6).

For the lakes studied by approximate methods, the elevation of the 100-year flood was developed from normal depth calculation and flood-prone area maps (Reference 7).

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

A prime purpose of the National Flood Insurance Program is to encourage State and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Insurance Administration as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at scale of 1:24,000, with a contour interval of 10 feet (Reference 8). These maps were enlarged to a scale of 1:4800.

In cases where the 100- and 500-year flood boundaries are close together, only the 100-year flood boundary has been shown.

For the lakes studied by approximate methods, the boundary of the 100-year flood was developed from normal depth calculations and flood-prone area maps (Reference 7).

Flood boundaries for the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2).

Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity and increases flood heights, thus increasing 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, the concept of 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 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 in order that the 100-year flood be carried without substantial increases in flood heights. As minimum standards, the Federal Insurance Administration limits such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

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 each stream segment for which a floodway is computed (Table 3).

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

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood 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 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
Gum Creek								
A	0	318	755	0.07	56.7	56.7	56.7	0.0
B	29	318	755	0.07	56.7	56.7	56.7	0.0
C	1,529	50	168	0.25	56.7	56.7	56.7	0.0
D	1,578	150	115	0.37	56.8	56.8	56.8	0.0
E	1,990	20	33	1.28	57.5	57.5	57.6	0.1
F	2,410	20	51	0.82	59.3	59.3	59.9	0.6
G	2,830	20	43	0.99	61.1	61.1	61.4	0.3
H	2,880	20	39	1.07	61.4	61.4	61.7	0.3
I	3,590	20	60	0.70	63.2	63.2	63.8	0.6
J	4,300	20	56	0.75	64.2	64.2	65.1	0.9
K	5,000	20	61	0.68	65.4	65.4	66.3	0.9
L	5,700	20	63	0.66	66.4	66.4	67.4	1.0
M	6,400	20	58	0.57	67.3	67.3	68.3	1.0
N	7,050	20	51	0.64	68.2	68.2	69.1	0.9
O	8,550	20	70	0.47	69.8	69.8	70.7	0.9
P	9,120	20	42	0.79	71.0	71.0	71.8	0.8
Q	9,700	20	40	0.83	72.7	72.7	73.4	0.7
R	10,270	20	39	0.84	74.5	74.5	75.2	0.7
S	10,850	20	33	0.63	76.1	76.1	76.8	0.7

[1] Feet Above Corporate Limits

TABLE 3

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF INTERLACHEN, FL
(PUTNAM CO.)

FLOODWAY DATA

GUM CREEK

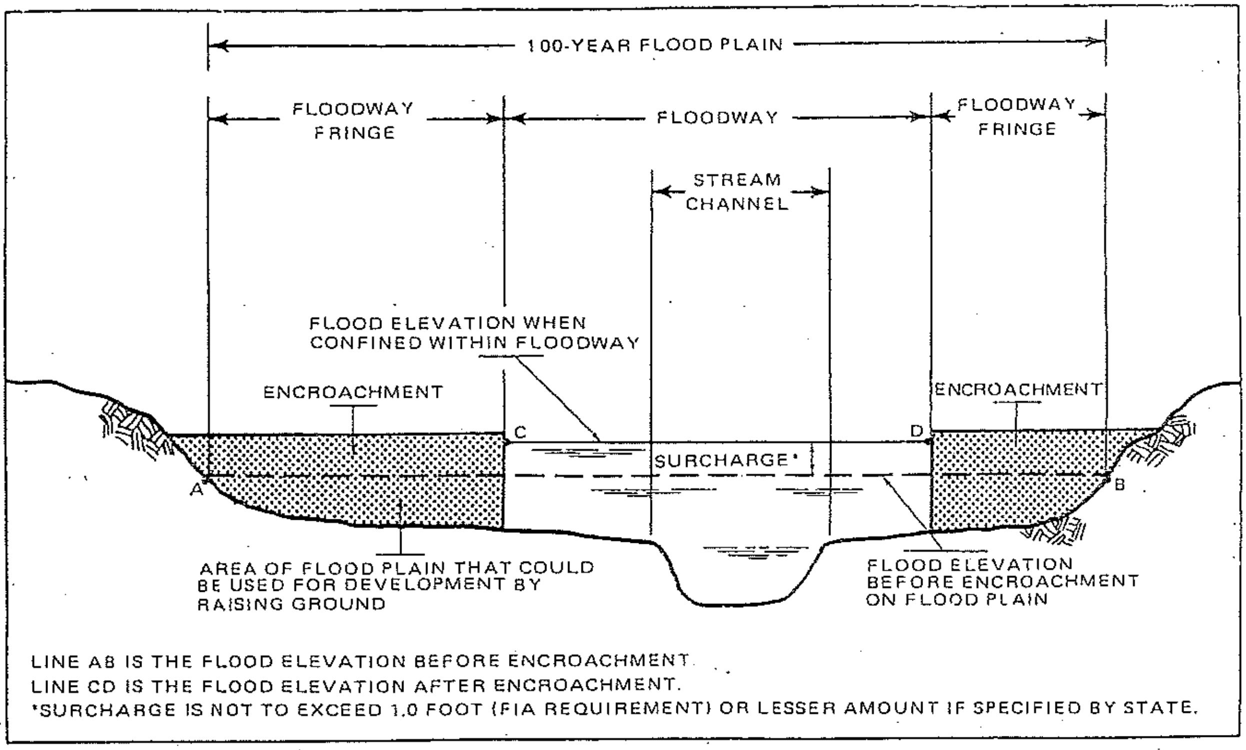

Figure 2. Floodway Schematic

The concept of a floodway is not applicable in areas affected by lacustrine flooding; therefore, no floodways were determined for the lakes in this study.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Insurance Administration has developed a process to transform the data from the engineering study 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 affecting the Town of Interlachen.

5.1 Reach Determinations

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

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 reaches determined for the flooding sources for the Town of Interlachen are shown on the Flood Profiles (Exhibit 1) and summarized in Table 4.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is the Federal Insurance Administration device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, 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 water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective Flood Hazard Factors, the entire incorporated area of the Town of Interlachen was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or Flood Hazard Factors determined.

Zones A1, A2, A3, and A8: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to Flood Hazard Factors.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Gum Creek Reach 1	0001, 0002	-0.4	-0.1	0.2	005	A1	Varies - See Map
Grassy Lake Reach 1	0003	-1.3	-0.3	0.7	015	A3	83
Chipco Lake Reach 1	0001	-3.8	-1.0	1.4	040	A8	89
Lake Lagonda Reach 1	0001	-1.2	-0.2	0.4	010	A2	80

[1] Flood Insurance Rate Map Panel   [2] Weighted Average   [3] Rounded to Nearest Foot

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF INTERLACHEN, FL
(PUTNAM CO.)

FLOOD INSURANCE ZONE DATA

GUM CREEK-GRASSY LAKE-CHIPCO LAKE-LAKE LAGONDA

TABLE 4

Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also 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.

The flood elevation differences, Flood Hazard Factors, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community are summarized in Table 4.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Interlachen is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Insurance Administration.

6.0 OTHER STUDIES

A Flood Insurance Study is being conducted for the unincorporated areas of Putnam County by the U.S. Geological Survey (Reference 9). The results of this study match the Putnam County Study.

This study is authoritative for the purposes of the National Flood Insurance Program; data presented herein either supersede or are compatible with all previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Federal Insurance Administration, Regional Director, 1371 Peachtree Street, NE., Atlanta, Georgia 30309.

8.0 BIBLIOGRAPHY AND REFERENCES

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5. ------------, Open-File Report 76-499, <u>User's Manual for Computer Program E-431: Computer Applications for Step-Backwater and Floodway Analysis</u>, J.O. Shearman, 1976

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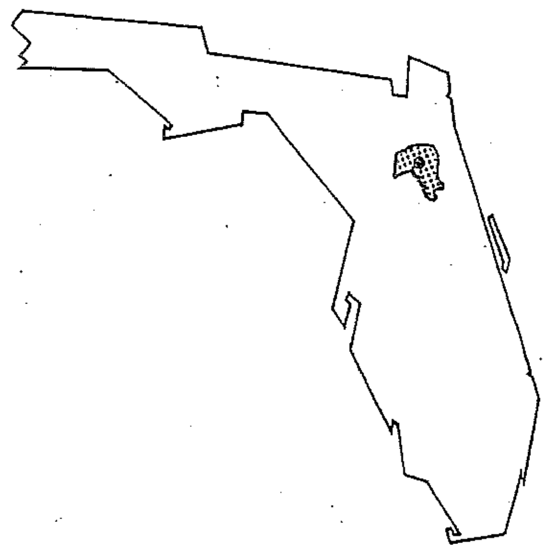
7. ------------, <u>7.5-Minute Series Flood-Prone Area Maps</u>, Scale 1:24,000, Contour Interval 10 feet: Keuka, Florida (1974); Baywood, Florida (1974); Putnam Hall, Florida (1974); Rodman, Florida (1974)

8. ------------, <u>7.5-Minute Series Topographic Maps</u>, Scale 1:24,000, Contour Interval 10 feet: Baywood, Florida (1970); Keuka, Florida (1970); Putnam Hall, Florida (1970); Rodman, Florida (1970)

9. U.S. Department of Housing and Urban Development, Federal Insurance Administration, <u>Flood Insurance Study, Putnam County, Florida, (Unincorporated Areas)</u>, unpublished

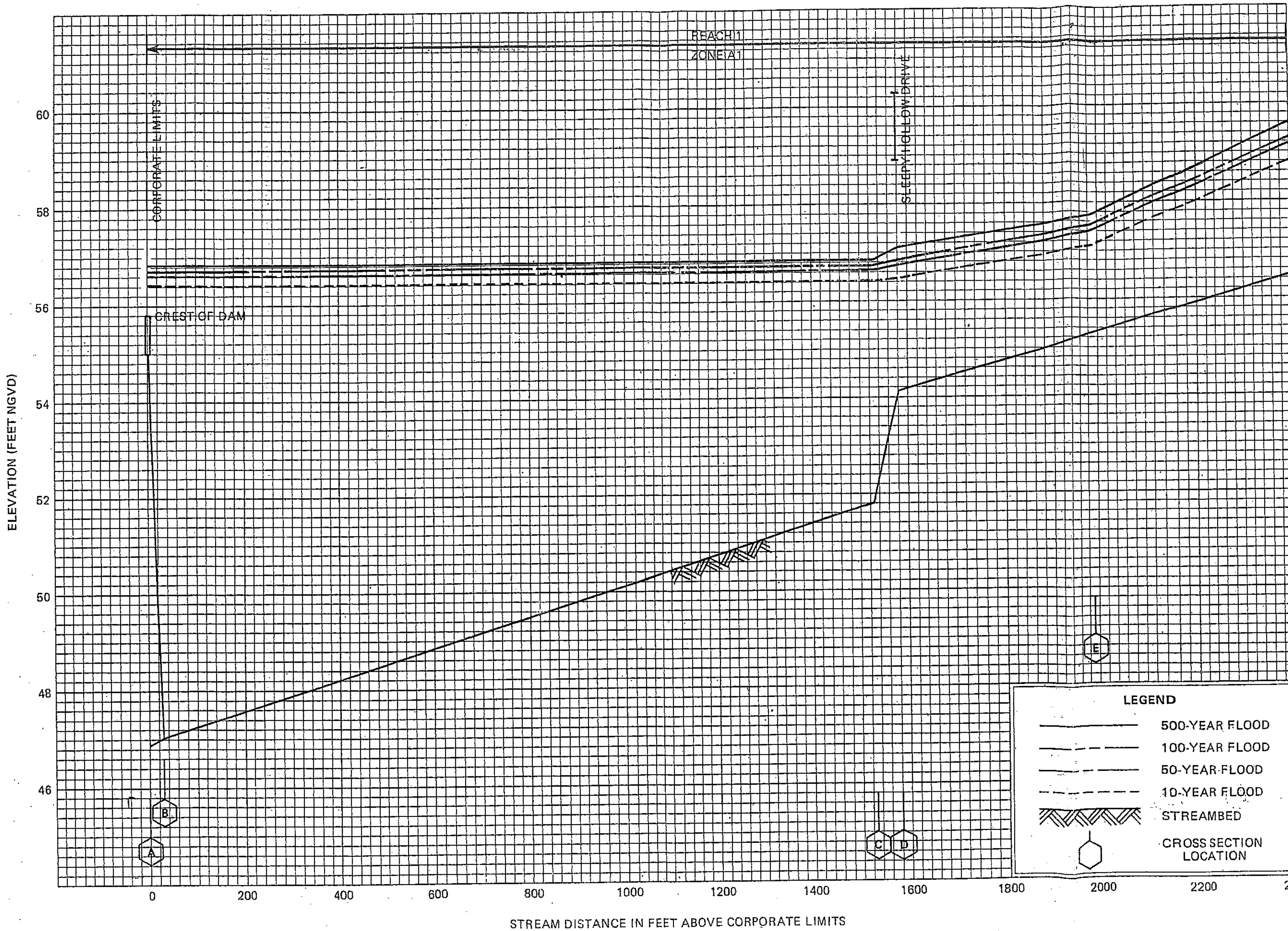
FLOOD INSURANCE STUDY

TOWN OF INTERLACHEN, FLORIDA
PUTNAM COUNTY



JUNE 1979

U.S. DEPARTMENT of HOUSING & URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION



FLOOD PROFILES

GUM CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF INTERLACHEN, FL
(PUTNAM CO.)

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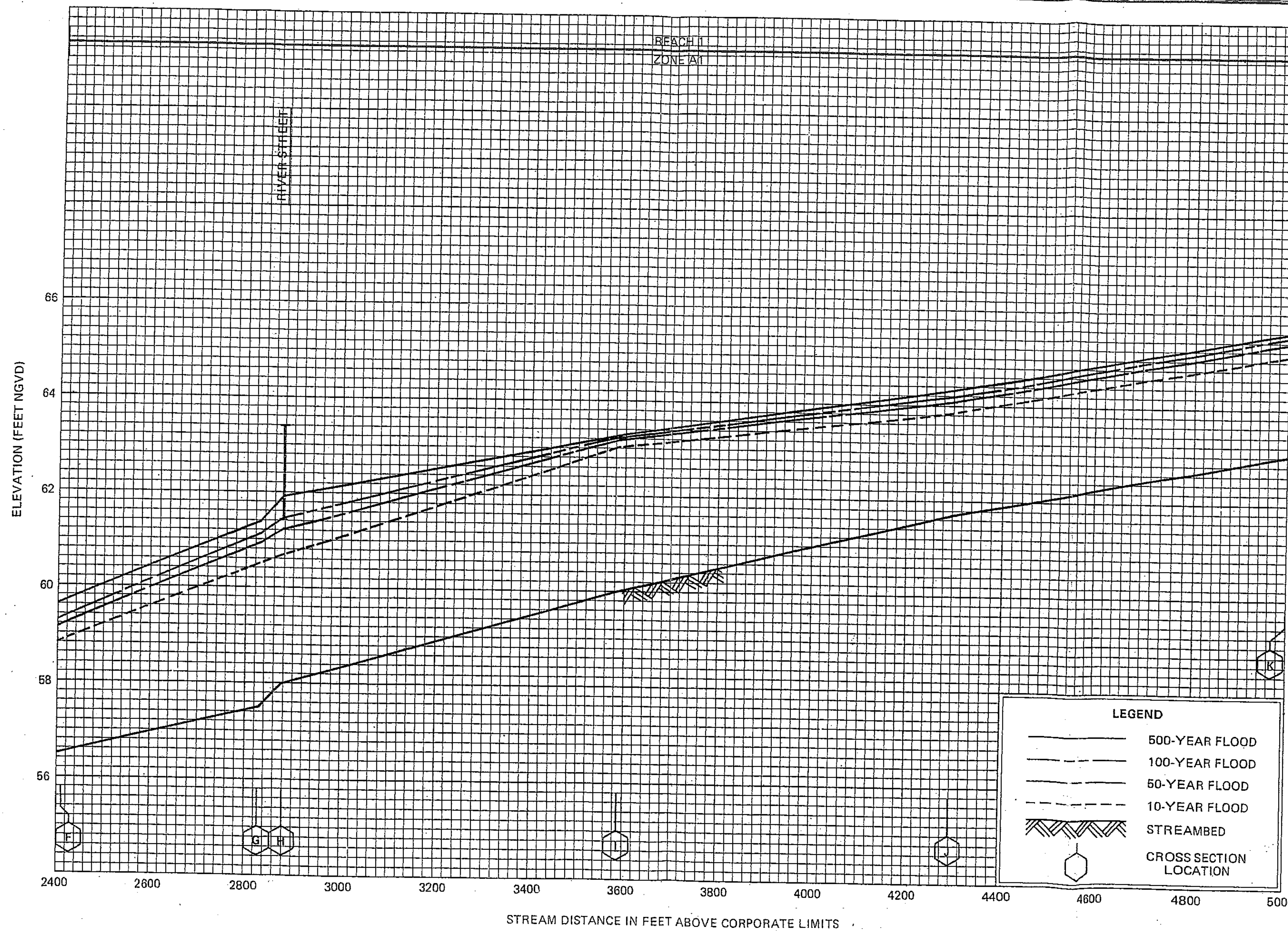

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

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(PUTNAM CO.)

FLOOD PROFILES

GUM CREEK

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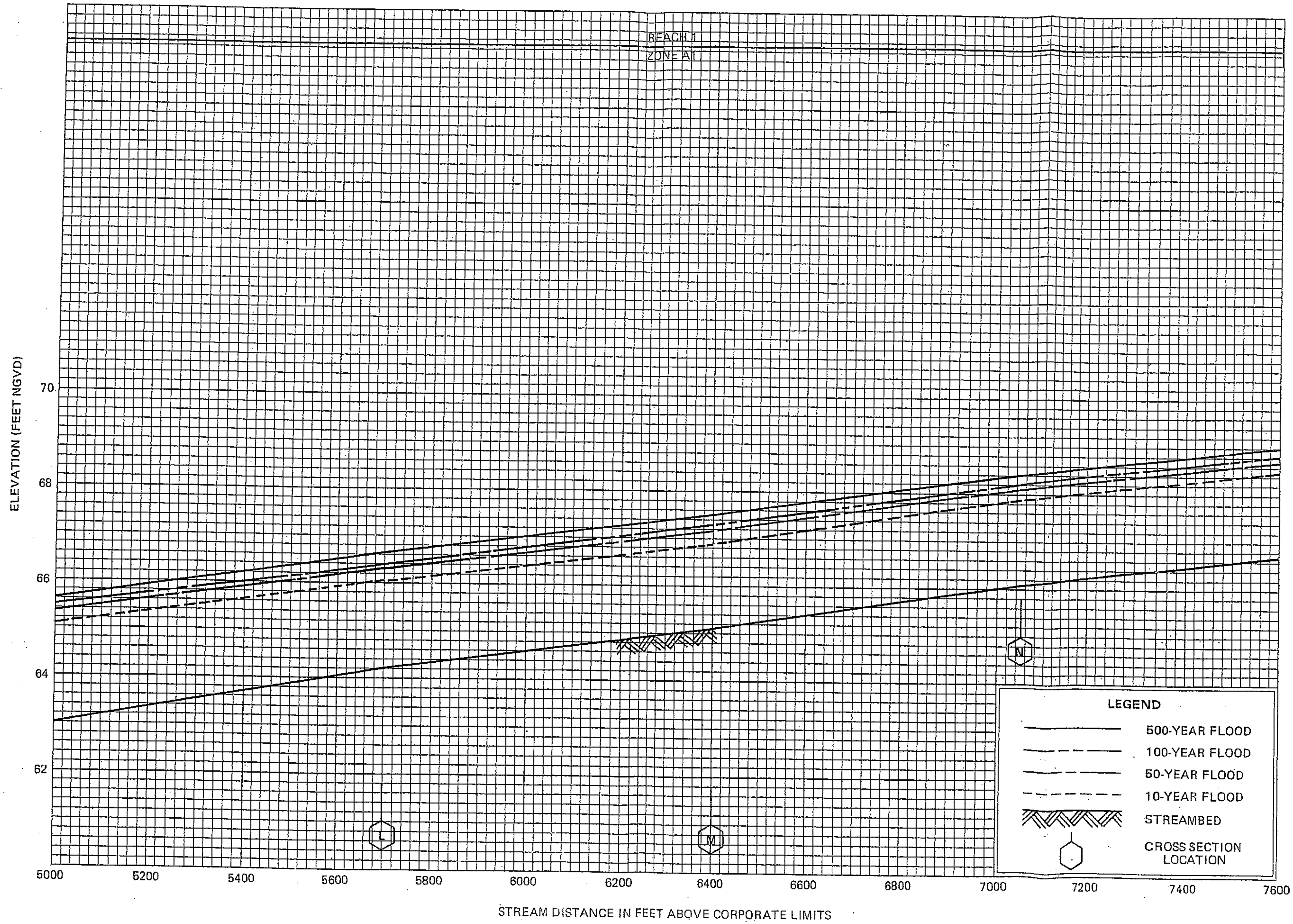

FLOOD PROFILES

GUM CREEK

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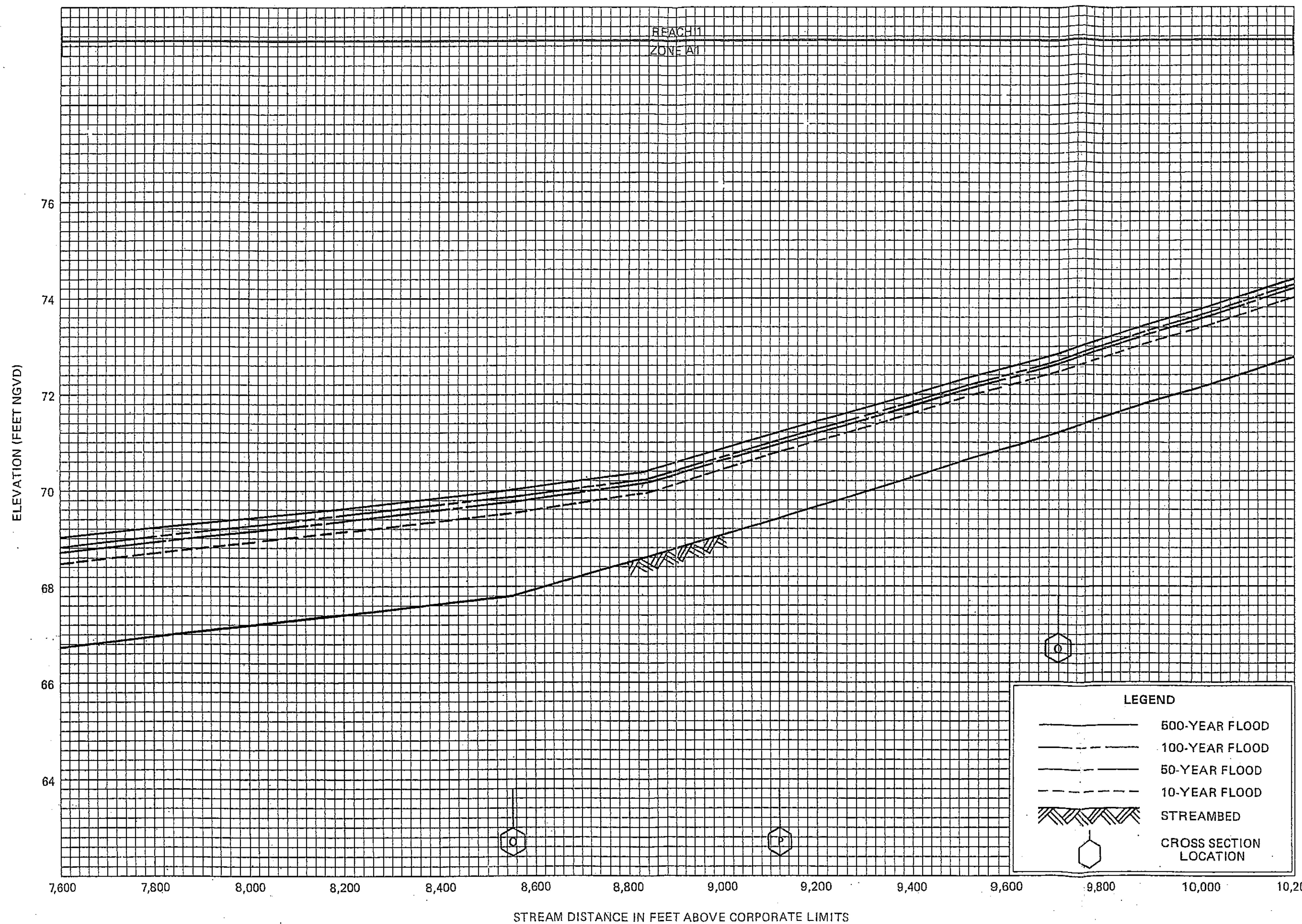

FLOOD PROFILES

GUM CREEK

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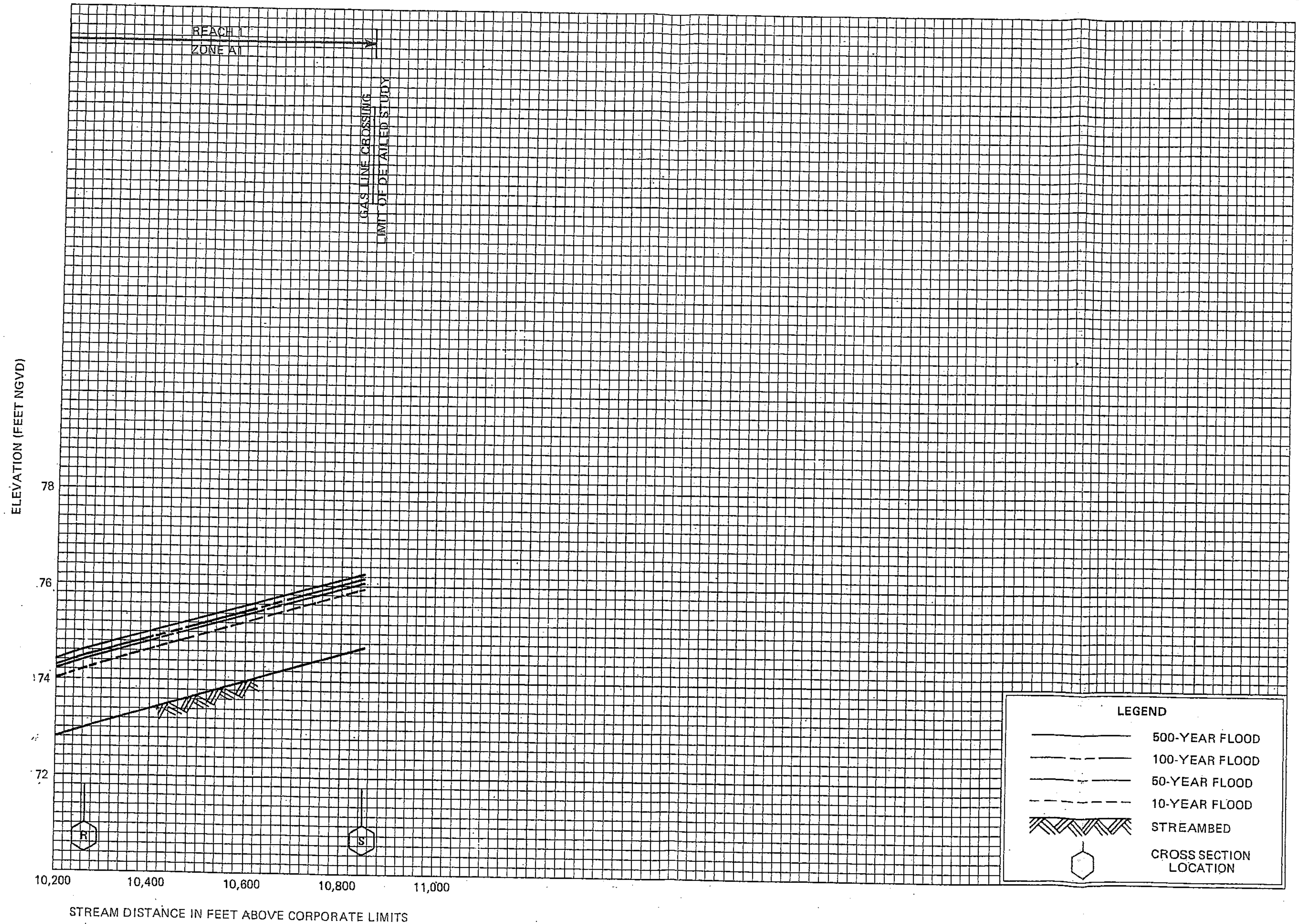

FLOOD PROFILES

GUM CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF INTERLACHEN, FL
(PUTNAM CO.)

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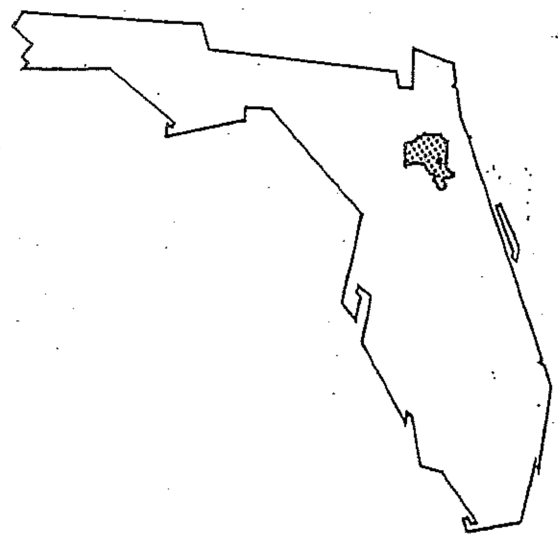
FLOOD INSURANCE STUDY

TOWN OF POMONA PARK, FLORIDA
PUTNAM COUNTY



JUNE 1979

U.S. DEPARTMENT of HOUSING & URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

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The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the Town of Pomona Park, Putnam County, Florida, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Pomona Park to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

Shorelines of lakes requiring detailed study were identified at a meeting attended by representatives of the study contractor, the Federal Insurance Administration, and the Town of Pomona Park on February 3, 1976. The town officials were contacted to provide information for the study.

The results of this study were reviewed at a final community coordination meeting held on November 8, 1978. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the town. No problems were raised at the meeting.

1.3 Authority and Acknowledgments

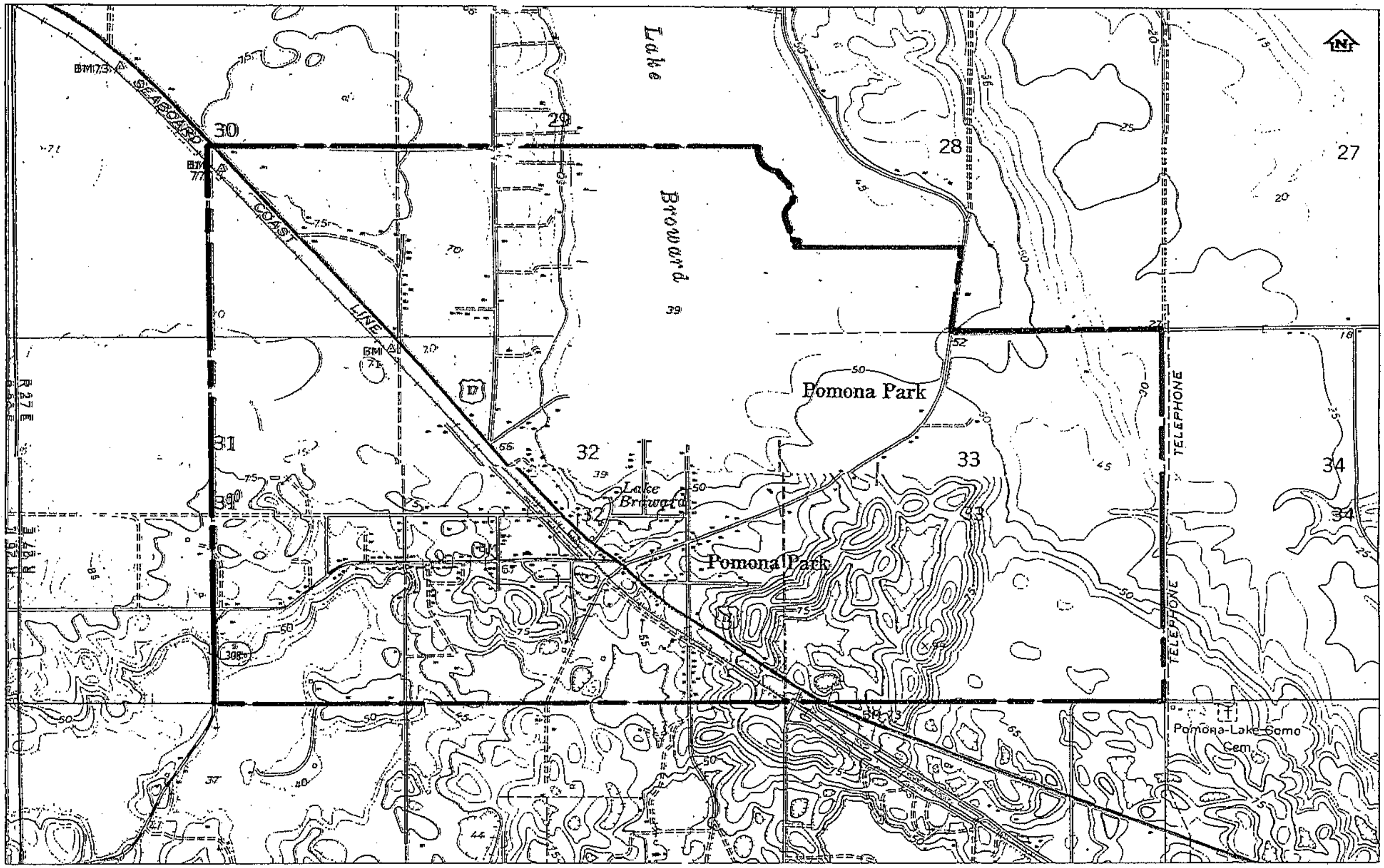
The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey, Water Resources Division, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 18. This work, which was completed in August 1978, covered all significant flooding sources affecting the Town of Pomona Park.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Pomona Park, Putnam County, Florida. The area of study is shown on the Vicinity Map (Figure 1).



APPROXIMATE SCALE

2000 0 2000 4000 6000 FEET

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF POMONA PARK, FL
(PUTNAM CO.)

VICINITY MAP

FIGURE 1

Floods caused by increased lake levels in Lake Broward were studied in detail.

Pomona Park and the surrounding area are dotted with numerous small lakes and depressions. Approximate methods of analyses were used to study these features, which have either low development potential or a minimal flood hazard.

Those areas studied by detailed methods were chosen with consideration given to all proposed construction and forecasted development through 1983.

2.2 Community Description

The Town of Pomona Park is located in the southeastern part of Putnam County, between the St. Johns River and Crescent Lake, in northeastern Florida. It is situated approximately 13 miles south of Palatka, the county seat of Putnam County, and approximately 20 miles inland from the Atlantic Ocean.

In 1975, the population of Pomona Park was 629, an increase of 51 since the 1970 census (Reference 1). The climate in the region is temperate with temperatures averaging from 58.5°F to 82.4°F The average annual rainfall is approximately 55 inches, with the greatest amounts falling during summer thunderstorms and during tropical depressions or hurricanes (Reference 2).

2.3 Principal Flood Problems

Flooding from Lake Broward can occur in unpredictable cycles. It is possible for the cumulative effect of slightly above-normal rainfall for several consecutive years to cause greater floods than those caused by 1 year of exceedingly high rainfall. Yet, an unfortunate combination of high lake levels, high ground-water levels, and exceedingly high rainfall associated with several consecutive summer thunderstorms or a hurricane could produce extreme flooding. Any unusual combination of meteorological and hydrological conditions could produce a rise in water levels. A rise in water levels would inundate the areas adjacent to Lake Broward's normal shoreline.

No information on historical high-water marks could be obtained. One resident did recall that Lake Broward Outlet was once filled with a mound of earth, and the lake rose to a very high level until the obstruction was removed with dynamite.

2.4 Flood Protection Measures

No special flood protection structures have been constructed in the town.

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 equalled 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 premium 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 equalled 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 occurrence) 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 here 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 and Hydraulic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

No lake-level record has been collected within the community. Lake-level records for 12 lakes in Alachua, Clay, and Marion Counties, which are adjacent to Putnam County, were used to define maximum lake volume-frequency relationships for each site. Seven of these lake-level records have data for more than 20 years, with the maximum length of record being 35 years. Of the 12 records, the shortest is 14 years. The drainage area for these lakes ranges from 0.19 square mile to 319 square miles, and the surface area of these lakes ranges from 0.015 square mile (9.6 acres) to 20.6 square miles (more than 13,000 acres). The range of change in lake level is from less than 2 feet to more than 30 feet. These lakes are also vastly different in outflow characteristics, from completely closed (no outflow at any flood frequency) to outflow at all flood frequencies.

Flood-frequency curves were defined for each of the 12 lake-level records. These curves were developed in terms of lake volume measured above a defined base. Volumes were adjusted for outflow as applicable, and the base level was defined as the mean-lake stage. After all annual data (based on the year beginning June 1 and ending on May 31) were adjusted, analyses were carried out to determine the best technique for fitting flood-frequency curves to the lake-volume data. A log-Pearson Type III distribution, using the average skew coefficient as outlined in U.S. Water Resources Council Bulletin 17 (Reference 3), was found to be an acceptable technique for fitting flood-frequency curves to the lake-volume data. Values of the 10-, 50-, 100-, and 500-year volumes were obtained for each of the 12 lakes from this log-Pearson Type III distribution.

A regression analysis of frequency data-versus-drainage area for the 12 lakes was used to define a regional relationship for each recurrence interval. The analysis showed that the drainage area explained nearly all of the variation in the lake volumes.

Regression analysis was also used to define a regional relationship between the mean-lake stage and grassline elevation along the lake shore. The analysis showed that the elevation of the grassline along the shoreline explained nearly all of the variation in mean lake stage.

The regional relations for mean lake stage and for lake volume at the selected recurrence intervals were used with an elevation/change in volume curve for Lake Broward to determine the water-surface elevations for the 10-, 50-, 100-, and 500-year recurrence intervals.

Elevations for floods of the selected recurrence intervals on Lake Broward are shown in Table 1.

Table 1. Summary of Elevations

Flooding Source and Location	Elevation (Feet) 10-Year	50-Year	100-Year	500-Year
Lake Broward At Pomona Park	40.9	41.9	42.3	43.0

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

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage State and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Insurance Administration as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For Lake Broward, studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined in the hydraulic analyses and topographic maps at a scale of 1:24,000, with a contour interval of 5 feet (Reference 4). These maps were enlarged to a scale of 1:4800.

In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

For sources of flooding studied by approximate methods, the boundary of the 100-year flood was developed from U.S. Geological Survey Flood-Prone Area Maps (Reference 5) and topographic maps (Reference 4).

Flood boundaries are indicated on the Flood Insurance Rate Map (Exhibit 1). On this map, the 100-year flood boundary corresponds to the boundary of the areas of special flood hazards (Zones A and A3); and the 500-year flood boundary corresponds to the boundary of the areas of moderate flood hazards (Zone B).

Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Insurance Administration has developed a process to transform the data from the engineering study 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 affecting the Town of Pomona Park.

5.1 Reach Determinations

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

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 location of the reach determined for the flooding source of the Town of Pomona Park is summarized in Table 2.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is the Federal Insurance Administration device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, 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 water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective Flood Hazard Factors, the entire incorporated area of the Town of Pomona Park was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or Flood Hazard Factors determined.

Zone A3: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to Flood Hazard Factors.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Lake Broward Reach 1	0001,0002	-1.4	-0.4	0.7	015	A3	42

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF POMONA PARK, FL

(PUTNAM CO.)

FLOOD INSURANCE ZONE DATA

LAKE BROWARD

TABLE 2

Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also 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.

The flood elevation differences, Flood Hazard Factors, flood insurance zones, and base flood elevations for Lake Broward, the only flooding source studied in detail in the community, are summarized in Table 2.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Pomona Park 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 elevations are the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Insurance Administration.

6.0 OTHER STUDIES

The U.S. Geological Survey has undertaken a flood study for the unincorporated areas of Putnam County (Reference 6). Only approximate study areas from that study adjoin the Pomona Park study. The data in the county study will be in agreement with the data presented here.

This study is authoritative for the purposes of the National Flood Insurance Program; data presented herein either supersede or are compatible with all previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Federal Insurance Administration, Regional Director, 1371 Peachtree Street, NE., Atlanta, Georgia 30309.

8.0 BIBLIOGRAPHY AND REFERENCES

1. University of Florida, Division of Population Studies, Florida Estimates of Population, February 1976

2. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Climatological Data for Florida, Annual Summary, 1976

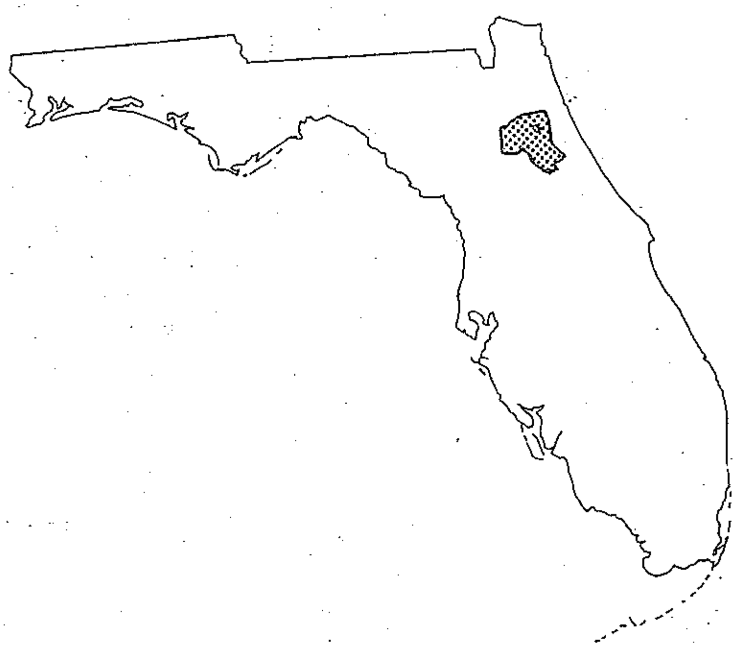
3. U.S. Water Resources Council, "Guidelines for Determining Flood Flow Frequency," Bulletin 17, March 1976

4. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 5 feet: Crescent City, Florida (1970); San Mateo, Florida (1968)

5. ------------, 7.5-Minute Series Flood-Prone Area Maps, Contour Interval 5 feet: Crescent City, Florida (1970); San Mateo, Florida (1968)

6. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Putnam County, Florida (Unincorporated Areas), in progress

FLOOD INSURANCE STUDY



CITY OF PALATKA, FLORIDA
PUTNAM COUNTY

DECEMBER 1979

FEDERAL EMERGENCY MANAGEMENT AGENCY
FEDERAL INSURANCE ADMINISTRATION

COMMUNITY NUMBER-120273

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FLOOD INSURANCE STUDY
CITY OF PALATKA, FLORIDA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Palatka, Putnam County, Florida, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the City of Palatka to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

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

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey, Water Resources Division, for the Federal Insurance Administration, under Interagency Agreement No. IAA-H-8-76, Project Order No. 18. This study was completed in March 1978.

1.3 Coordination

Streams requiring detailed study were identified at a meeting attended by representatives of the study contractor, the FIA, and representatives of the City of Palatka, on February 3, 1976. The city officials supplied city boundary maps.

On May 25, 1979, the results of the study were reviewed at the final meeting attended by representatives of the study contractor, FIA, and community officials. The study was acceptable to the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Palatka, Putnam County, Florida. The area of study is shown on the Vicinity Map (Figure 1).

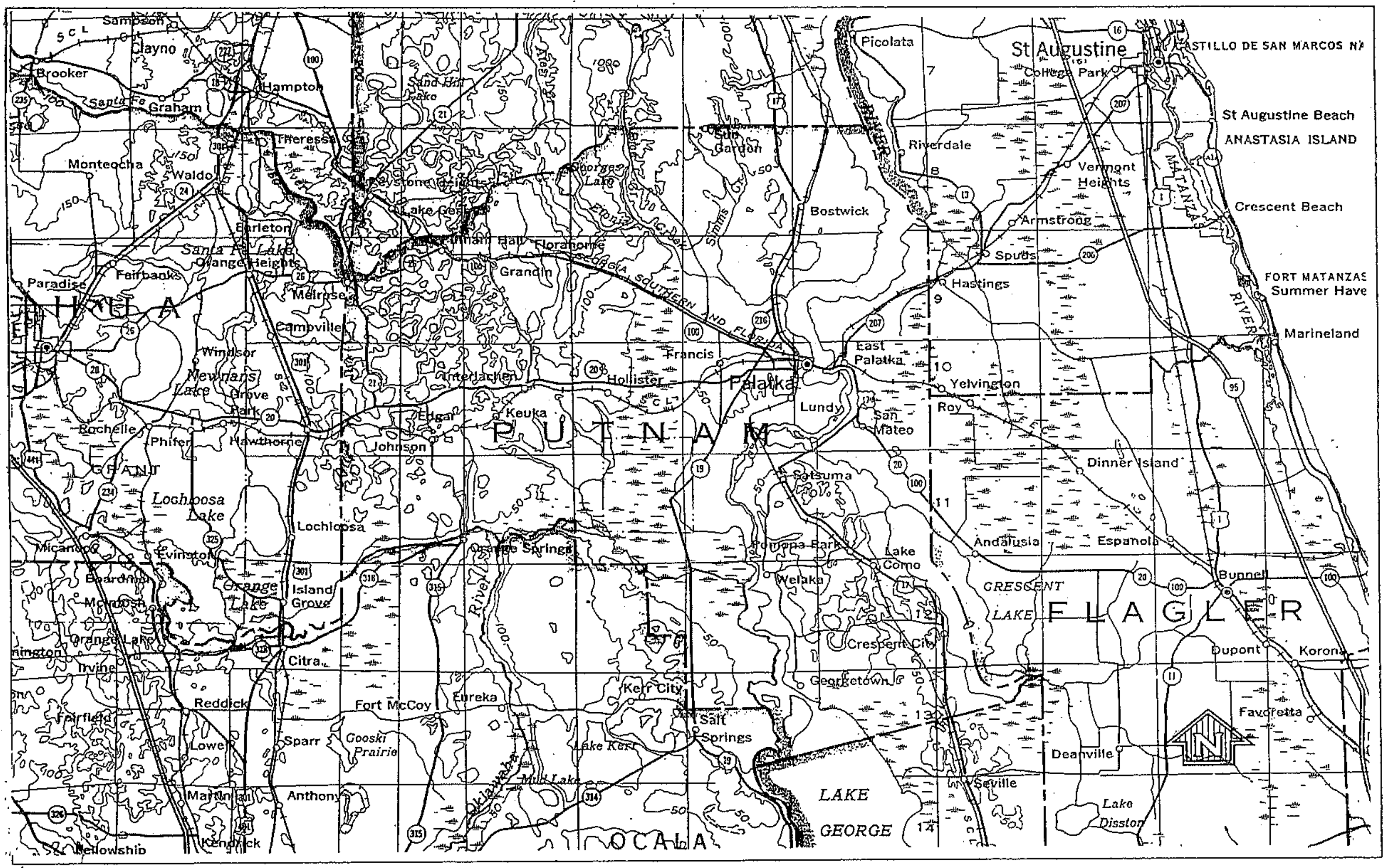


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

Federal Insurance Administration

CITY OF PALATKA, FL

(Putnam Co.)

APPROXIMATE SCALE

8 0 8 16 24 MILES

VICINITY MAP

The limits of detailed studies in Palatka were determined by FIA with community and study contractor consultation at the meeting in February 1976.

Floods caused by overflow of the St. Johns River from the downstream corporate limit of Palatka to the upstream corporate limit were studied in detail.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through March 1983.

2.2 Community Description

Palatka, the county seat for Putnam County, borders on the west bank of the St. Johns River, in the eastern portion of Putnam County. The city is located in the Central Highlands Area of northeast Florida, 22 miles inland from the Atlantic Ocean and 52 miles south of the center of Jacksonville.

Pilatka, a Seminole Indian word meaning the "crossing over" or "Cow's crossing" was the original local community name. The earliest white settlers in Pilatka came in 1820. The name was changed to Palatka in the 1870's. Palatka's early economic well-being is attributed to the winter tourist business and the cypress lumber industry. It is now chiefly an industrial, recreational and agricultural community (Reference 1). In 1975, the population of Palatka was 9,867, an increase of 423 since the 1970 census (Reference 2).

The climate in the region is temperate with temperatures ranging from a January average of 58.5 degrees F to a July average of 82.4 degrees F. The average annual rainfall is 54.84 inches, with the greatest amounts during the months of summer thunderstorms or during the presence of tropical depressions or hurricanes in the Fall months (Reference 3).

Most of the development along the St. Johns River at Palatka is at or above the 100-year flood elevation.

2.3 Principal Flood Problems

The St. Johns River, which has about a 2-foot tidal range at low-discharges, flows past the eastern side of Palatka and averages about 1 mile in width in this location. Flooding from the St. Johns River generally occurs as the result of rains associated with hurricanes. Shallow flooding caused by ponding of runoff during heavy rains occurs in some areas of the city.

The St. Johns River, at the mouth of Rice Creek, reached an elevation of 5.62 feet National Geodetic Vertical Datum of 1929 (NGVD) on September 9, 1964, when Hurricane Dora crossed into northeast Florida from the Atlantic Ocean. This elevation of the water-surface has a recurrence interval of about once in 50-years on the average.

2.4 Flood Protection Measures

No special flood protection structures have been constructed in the city.

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 equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium 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 equalled 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 one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in 10), and for any 90 year period, the risk increases to about 60 percent (six in 10). The analyses reported here 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 and Hydraulic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

A gaging station on Rice Creek near the mouth (15 years of record) about 1.4 miles downstream from the corporate limits of Palatka and a gaging station on the St. Johns River near DeLand (41 years of record) were the principle sources of data for defining the stage-frequency relationships for the river. Values of the 10-, 50-, 100-, 500-year stages were obtained from a Pearson Type III distribution of annual peak stages (Reference 4).

Elevations in this study were referenced to the National Geodetic Vertical Datum of 1929. Data from the elevation-frequency curves for the St. Johns River are shown in Table 1, "Summary of Elevations."

TABLE 1 - SUMMARY OF ELEVATIONS

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
ST. JOHNS RIVER					
At Rice Creek		4.4	5.6	6.1	7.3
At North City Limits		4.4	5.6	6.1	7.3
At. U.S. Highway 17		4.4	5.6	6.2	7.3
At South City Limits		4.5	5.7	6.2	7.4

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 includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the flood elevations determined from the profiles based on the records for the gaging stations on Rice Creek and St. Johns River near DeLand. The boundaries were determined using topographic maps at a scale of 1:24,000 with a contour interval of 5 feet (Reference 5). In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

Flood boundaries are indicated on the Flood Insurance Rate Map. On this map, the 100-year flood boundary corresponds to the boundary of the areas of special flood hazards (Zone A3); and the 500-year flood boundary corresponds to the boundary of areas of moderate flood hazards (Zone B).

4.2 Floodways

The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights.

A floodway is not applicable in areas such as those that may be inundated by floodwaters from the St. Johns River, which is tide affected, and was, therefore, not determined.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each significant flooding source affecting the City of Palatka.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods.

This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

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

One reach meeting the above criteria was required for the flooding source of the City of Palatka. This includes one reach on the St. Johns River. The location of the reach is shown on the Flood profile (Exhibit I).

5.2 Flood Hazard Factors (FHFs)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their assigned FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between the 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, the accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the City of Palatka was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations.

Zone A3:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown and zones assigned according to FHFs.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood 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; or 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.

Table 2, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevation for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Palatka is, for insurance purposes, the principal result of the Flood Insurance Study. This map (Exhibit 3) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

The U.S. Geological Survey has also undertaken a flood study for the unincorporated areas of Putnam County and Clay County which is adjacent to Putnam County. Flood profiles for the St. Johns River have been prepared for the Putnam County study. These profiles were used in this report and in the Clay County study.

In 1969 the U.S. Army Corps of Engineers published a Flood Plain Information Report for Jacksonville, Duval County, Florida. The report contained high-water profiles for the St. Johns River from Mayport to Buffalo Bluff. The 100-year elevation for Palatka, determined in that report, is in agreement with this study (Reference 6).

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.)			
St. Johns River Reach I	0002,0004	-1.7	-0.5	+1.1	015	A3	6

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF PALATKA, FL

(PUTNAM CO.)

FLOOD INSURANCE ZONE DATA

ST. JOHNS RIVER

TABLE 2

This study is authoritative for the purposes of the Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Federal Insurance Administration, Regional Director, 1371 Peachtree Street, N.E., Atlanta, Georgia 30309.

8.0 BIBLIOGRAPHY AND REFERENCES

1. Putnam County Chamber of Commerce, FACTS.

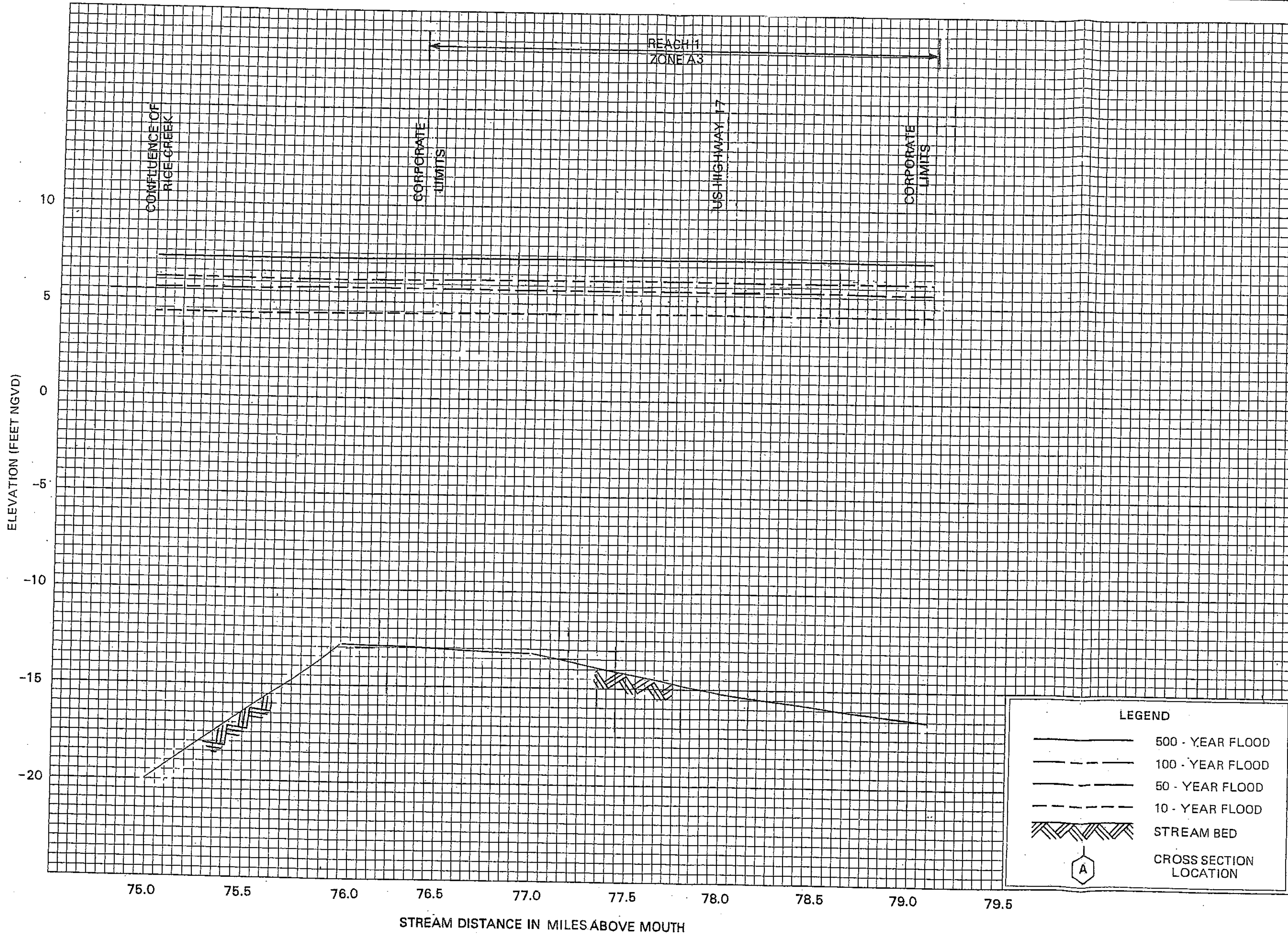
2. University of Florida, Division of Population Studies, Florida Estimates of Population, February 1976.

3. National Oceanic and Atmospheric Administration, Climatological Data for Florida, Annual Summary, 1976.

4. U.S. Water Resources Council, 1976, Guidelines for Determining Flood Flow Frequency: Bulletin No. 17 of the Hydrology Committee.

5. U.S. Geological Survey, 7.5-Minute Series Topographic Maps.

6. U.S. Army Corps of Engineers, Jacksonville District, Flood Plain Information, St. Johns River, Jacksonville, Florida, March 1969.



FLOOD PROFILES

ST. JOHNS RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF PALATKA, FL
(PUTNAM CO.)

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FLOOD INSURANCE STUDY

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the Town of Interlachen, Putnam County, Florida, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Interlachen to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

Sources of flooding requiring detailed study were identified at a meeting attended by representatives of the U.S. Geological Survey (study contractor), the Federal Insurance Administration, and the Town of Interlachen in February 1976. The town officials furnished town boundary maps.

The limits of detailed and approximate studies in Interlachen were determined by the Federal Insurance Administration with community and study contractor consultation at the meeting in February 1976.

The results of this study were reviewed at a final community coordination meeting held on November 8, 1978. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the town. This study incorporates all appropriate comments, and all problems have been resolved.

1.3 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 18. This work, which was completed in May 1978, covered all significant flooding sources affecting the Town of Interlachen.

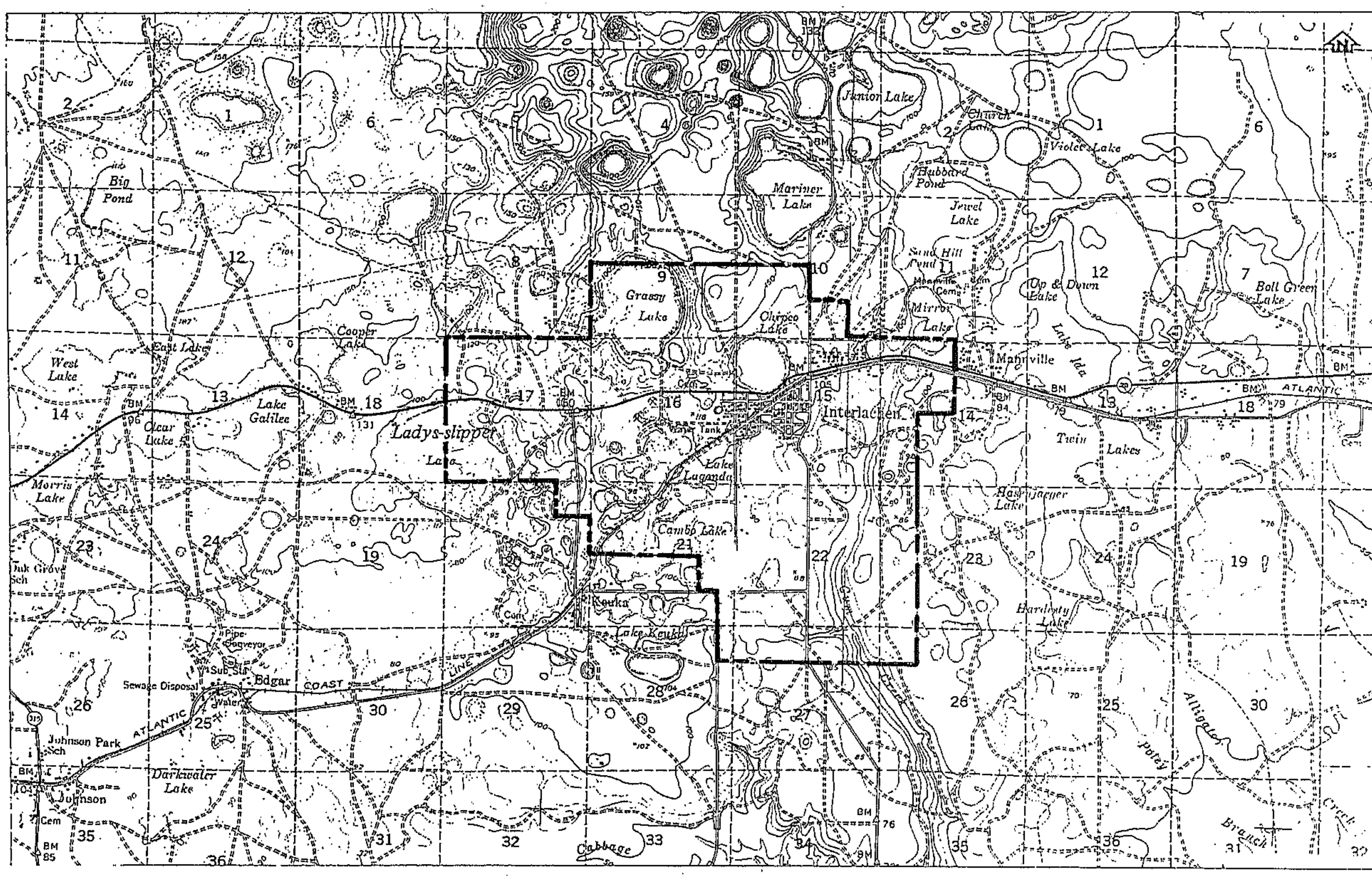

FIGURE 1	DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration **TOWN OF INTERLACHEN, FL** (PUTNAM CO.)	APPROXIMATE SCALE 1 0 1 2 3 MILES **VICINITY MAP**