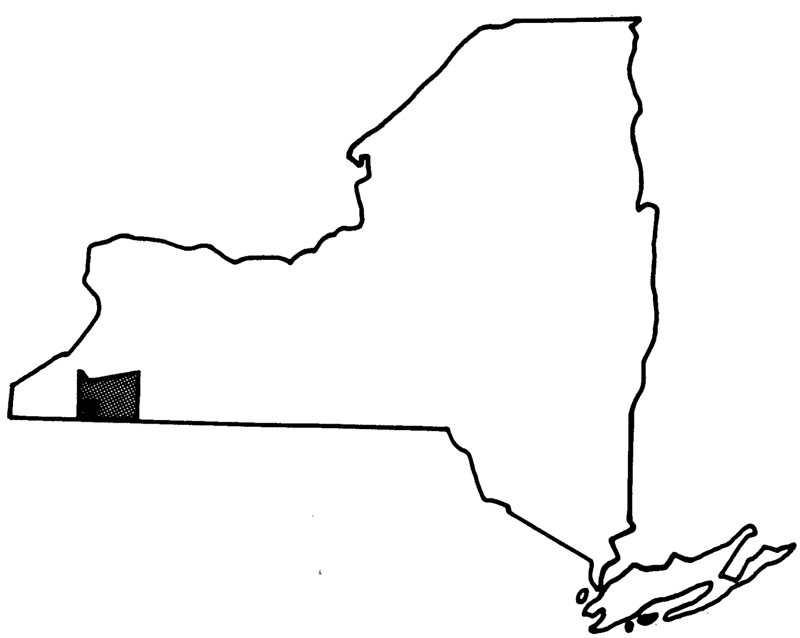
FLOOD INSURANCE STUDY

VILLAGE OF RANDOLPH NEW YORK
CATTARAUGUS COUNTY



FEBRUARY 1978

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

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FLOOD INSURANCE STUDY
VILLAGE OF RANDOLPH, NEW YORK

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 Village of Randolph, Cattaraugus County, New York, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The initial use of this information will be to convert the Village of Randolph to the regular program of flood insurance by the Federal Insurance Administration (FIA). Further use of this information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

The purpose of the Flood Insurance Study was explained at a meeting held on July 28, 1975, with representatives of the FIA, the Village of Randolph, the Cattaraugus County Planning Board, the New York State Department of Environmental Conservation (DEC), and Erdman, Anthony Associates.

A search for basic data was made at all levels of government. The U. S. Army Corps of Engineers (COE), and the U. S. Department of Agriculture, Soil Conservation Service (SCS), provided information which served as part of the input for the hydraulic analysis. The U. S. Geological Survey (USGS) was contacted to obtain contour maps showing drainage boundaries and flow information. Gage information was unavailable for Elm Creek, Battle Creek, or Little Conewango Creek.

On August 25, 1976, a meeting was held with officials of the village to obtain additional local input. The final Consultation and Coordination meeting was held on January 19, 1977, where the final draft of the Flood Insurance Study was presented for further local comment.

1.3 Authority and Acknowledgements

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 done by the New York State Department of Environmental Conservation for the Federal Insurance Administration, under Contract No. H-3856. This work, which was completed in March of 1975, covered all significant flooding sources in the Village of Randolph.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Village of Randolph. The area of study is shown on the Vicinity Map (Figure 1).

Because of development within the flood plain areas, it was agreed between the FIA, and the Village of Randolph that Little Conewango, Battle, and Elm Creeks, with a total length within the community of 5.06 miles, were to be studied in detail. It was also agreed that two unnamed tributaries that flow into Little Conevango Creek were to be studied by approximate methods because of the lack of development and moderately steep overbank slopes.

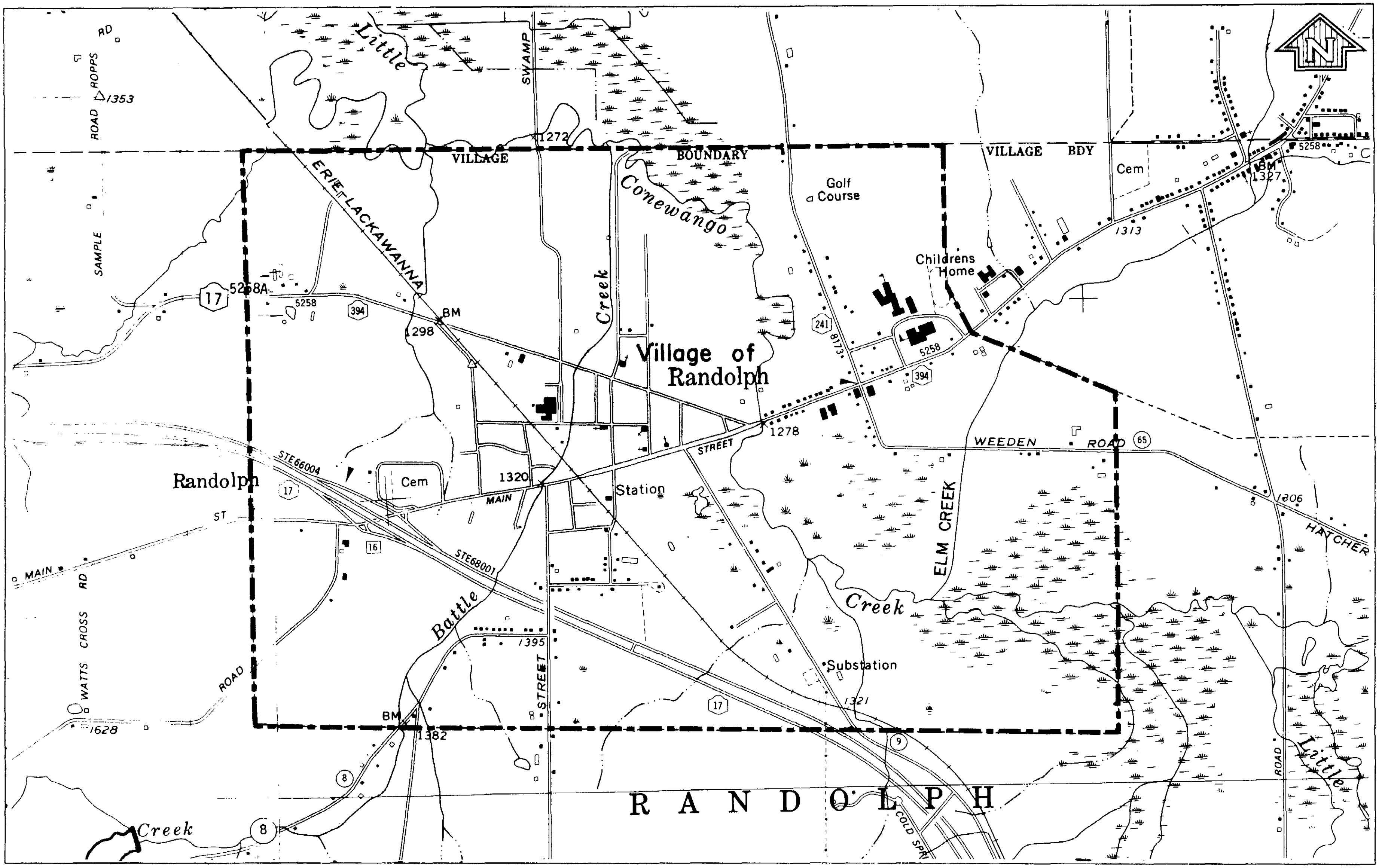
The areas studied in detail were chosen with consideration given to all forecasted development and proposed construction for the next five years (through March 1980).

2.2 Community Description

The entire village is located within the northeastern part of the Town of Randolph, County of Cattaraugus, in southwest New York State. It has an area of 3.1 square miles.

In 1960, the population of the village was 1,414 and in 1970 it was 1,498 (Reference 1).

The area along the flood plains is primarily agricultural and secondarily, residential and commercial. The land is generally flat and is filled with till and other glacial deposits (Reference 2). Area elevations range between 1,300 and 1,400 feet. Average annual temperature is about 46°F with monthly average variations of 24°F to 69°F. Precipitation is approximately 43 inches per year, of which 25 inches becomes runoff. The precipitation is generally well distributed throughout the year, with slightly lower averages during January, February, March, and April (Reference 3).



DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

VILLAGE OF RANDOLPH, N. Y.
(CATTARAUGUS COUNTY)

APPROXIMATE SCALE

2000 0 2000 4000 6000 FEET

VICINITY MAP

FIGURE 1

Elm Creek begins in the Town of Conewango. It enters the Village of Randolph at its northeast corner and flows southward to its confluence with the Little Conewango Creek within the southeast portion of the village.

Battle Creek begins in the Town of Randolph. It enters the Village of Randolph in the southwest corner and flows northerly to its confluence with the Little Conewango Creek two hundred feet north of the boundary of the village, in the Town of Conewango.

Little Conewango Creek begins in the southeast portion of the Town of Randolph and flows east into the Town of Cold Springs. It reenters the Town of Randolph in the northeast corner. It enters the Village of Randolph on the village's eastern border; and travels north leaving the village on its northern border into the Town of Conewango, where it flows into the Conewango Creek. That Creek forms the town boundaries for the Towns of Carroll and Kiantone before flowing into the Commonwealth of Pennsylvania where it joins the Allegheny River. The Allegheny River joins with the Monongahela River at Pittsburgh to form the Ohio River.

The flood plains of the creeks are illustrated with photos shown in Figures 2 through 5.

2.3 Principal Flood Problems

Due to steep terrain of the surrounding area, Randolph is subject to flash flooding from cyclonic disturbances of high intensity, even if such storms are of short duration. The most frequent floods result from these disturbances in winter or early spring, augmented by melting snow.

There is no dependable record of major floods within the area, as there are no gaging stations located in or near the village. Interviews with local residents, however, indicate that the event of September 1967 is thought to be the maximum known occurrence for the area.

2.4 Flood Protection Measures

There are no flood protection measures located within the village. Benefit is derived, however, from the Conewango Creek Watershed Project of the SCS (Reference 4). The Watershed Project is an improvement works plan to provide watershed protection, flood prevention, public and private fish and wildlife development, and agricultural water management. This is to be accomplished

Figure 2 - Little Conewango Creek at Randolph (Looking North at Main Street)

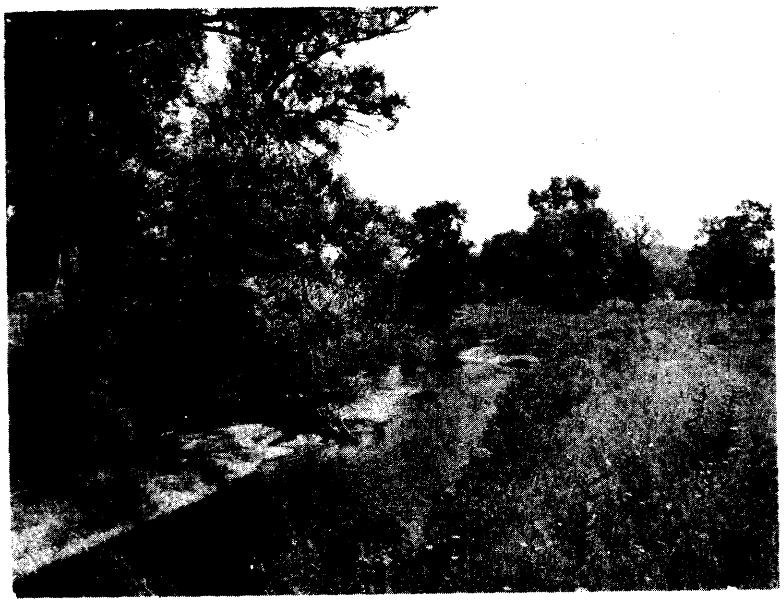


Figure 3 - Elm Creek at Randolph (Looking North at Weeden Road).

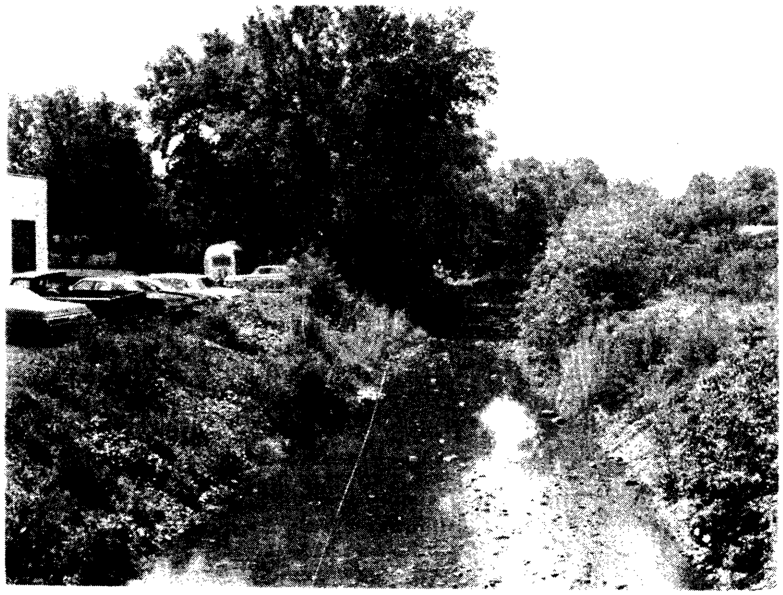


Figure 4 - Battle Creek at Randolph (Looking South at Main Street)

Figure 5 - Battle Creek at Randolph (Looking North near Main Street)

through the construction of 20 floodwater retardation structures, 8 of which are already completed, and 20 miles of various channel improvements. Two of the completed structures (Sites 16 and 16A) are located on Elm Creek upstream from the Village of East Randolph, and provide flood protection benefits to the Villages of Randolph and East Randolph. A third completed structure (Site 19) is located on Battle Creek about 4,500 feet upstream of the southern village boundary. This structure provides flood protection benefits to the Village of Randolph only.

The long range project was authorized in April 1968 and was originally scheduled for completion by 1980. However, progress on the project has been delayed pending the completion of an Environmental ImpactStatement and some additional planning. This will delay completion until approximately 1982.

While the three structures providing flood protection to the Village of Randolph are all designed to retain 100-year flood flows from their upstream basins, their effect on major floods is limited due to the uncontrolled drainage areas below them. Sites 16 and 19, completed at the time of the "Agnes" storm in 1972, are credited, however, with saving the village from extensive flooding during that event. No other projects in the Conewango Creek Watershed Work Plan will affect flooding in the Village of Randolph.

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. Floods having recurrence intervals of 10, 50, 100, and 500 years have been selected as having special significance for flood plain management and for flood insurance premium rates. The analyses reported here are based on current conditions in the watersheds of the streams.

3.1 Hydrologic Analyses

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

To establish the hydrology for uncontrolled drainage areas larger than 5 square miles, the DEC performed a regional analysis (Reference 5) using data from the USGS. Twenty-two gaging stations with drainage areas from 3.6 to 430 square miles and located throughout the Allegheny Basin in New York, Pennsylvania and in adjacent river basins were used in the regional analysis. Stream gaging records for maximum peak flow (Reference 6) were used to establish Exceedence Interval/Discharge Curves at selected points along the waterways of the Allegheny River Basin. The statistical methods used in the regional analysis are those presented by Leo R. Beard (1962) (Reference 7). The methodology conforms with the uniform technique for determining flood flow frequencies as set forth by the Hydrology Committee of the Water Resources Council (Reference 8).

Because of the large amount of detention storage within the Conewango Creek watershed, a Bureau of Public Roads technique (Reference 9) was used to determine 10-year flood flows for Elm and Battle Creeks and for Little Conewango Creek upstream of its confluence with Elm Creek. Below the confluence of Elm Creek, the 10-year flood flow for Little Conewango Creek was determined by summation of the sub-basin flows.

The Flood Flow/Frequency Relationships obtained from the regional analysis were then used to determine flood flows for the 50-, 100-, and 500-year frequency intervals.

A summary of discharges and drainage areas for Little Conewango, Battle and Elm Creeks is presented in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
LITTLE CONEWANGO CREEK					
Downstream limit of study	33.4	1,375	1,963	2,223	2,871
Upstream limit of study	14.7	385	550	622	804
BATTLE CREEK					
Downstream corporate limits	8.5	667	953	1,079	1,393
ELM CREEK					
Mouth of Elm Creek	18.1	990	1,416	1,603	2,070

3.2 Hydraulic Analyses

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

Flood profiles were calculated using the COE HEC-2 water-surface profiles computer program (Reference 10).

Cross sections were located at close intervals above and below bridges, at control sections along the stream length, and at significant changes in ground relief and land use or land cover.

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).

Reach lengths for the channel were measured along the centerline of the channel between sections; overbank reach lengths were measured along the approximate centerline of the effective out-of-channel flow area.

Roughness coefficients (Manning's "n") were assigned on the basis of on-site field inspections and ground level photographs. These photographs were compared with USGS calibrated photographs taking into consideration channel conditions, overbank vegetation and land use. The values of the roughness coefficients were 0.07 in the overbank areas and 0.05 in the channel for Little Conewango Creek, 0.08 in the overbank areas, and 0.03 in the channel for Battle Creek, and 0.07 in the overbank areas and 0.04 in the channel for Elm Creek (Reference 11).

The starting water-surface elevations for Little Conewango Creek were calculated by the HEC-2 water-surface profiles computer program using the slope-area method. The starting water-surface elevations for Battle and Elm Creeks were obtained from the backwater analyses for Little Conewango Creek at their confluences.

Flood profiles were drawn showing computer water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Sea Level Datum of 1929. Elevation reference marks used in the study are shown on the maps.

Flood elevations higher than those computed using the HEC-2 step-backwater program can occur as a result of ice jams during spring thaws. However, adequate data are not available to establish stage frequency curves during ice periods. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures in general remain unobstructed, and dams and other flood control structures operate properly and do not fail. For the two stream reaches studied by approximate methods, elevations were determined from regional rating curves related to drainage area. Estimates of discharges and slopes, and a field view of the streams were used to determine the 100-year flood limits for these streams.

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 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 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 (developed for this study from aerial photographs) at a scale of 1" = 400' with a contour interval of 5 feet (Reference 12). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year boundary has been shown.

For the streams studied by the approximate method, the boundary for the 100-year flood was drawn at selected locations on USGS 7.5 Minute series topographic maps (Reference 13). The boundaries of 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, may not be subject to flooding; owing to limitations of the map scale or lack of detailed topographic data, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the 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 may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

The floodways in this study are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were 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 2). As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway widths were determined at cross section; between cross sections the boundaries were interpolated. In cases where the floodway and the 100-year boundaries are either close together or collinear, 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 6.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Elm Creek							
A	875	176	740	2.2	1,282.3	1,281.4	0.9
B	2,258	126	368	4.4	1,285.0	1,285.0	0.0
C	3,558	93	352	4.6	1,289.3	1,288.3	1.0

[1]FEET ABOVE MOUTH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

VILLAGE OF RANDOLPH, NY

(CATTARAUGUS CO.)

FLOODWAY DATA

ELM CREEK

TABLE 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Little Conewango Creek							
A	4,440	635	1,956	1.1	1,273.9	1,273.1	0.8
B	6,210	61	361	6.2	1,275.0	1,274.2	0.8
C	7,640	1,036	4,110	0.5	1,275.9	1,275.3	0.6
D	11,200	135/40[2]	314	7.1	1,276.3	1,275.7	0.6
E	14,160	1,437[3]	3,314	0.2	1,279.0	1,278.2	0.8
Battle Creek							
A	240	408	1,072	1.0	1,274.3	1,273.3	1.0
B	1,600	41	114	9.5	1,279.7	1,279.7	0.0
C	3,420	42	153	7.1	1,292.5	1,292.5	0.0
D	4,340	50	160	6.7	1,304.1	1,304.1	0.0
E	5,220	51	172	6.3	1,314.0	1,314.0	0.0
F	6,890	52	363	3.0	1,343.6	1,343.6	0.0
G	9,130	63	136	8.3	1,373.2	1,373.2	0.0

[1]FEET ABOVE CORPORATE LIMITS
[2]RIGHT CHANNEL/LEFT CHANNEL
[3]THIS WIDTH EXTENDS BEYOND THE CORPORATE LIMITS

TABLE 2

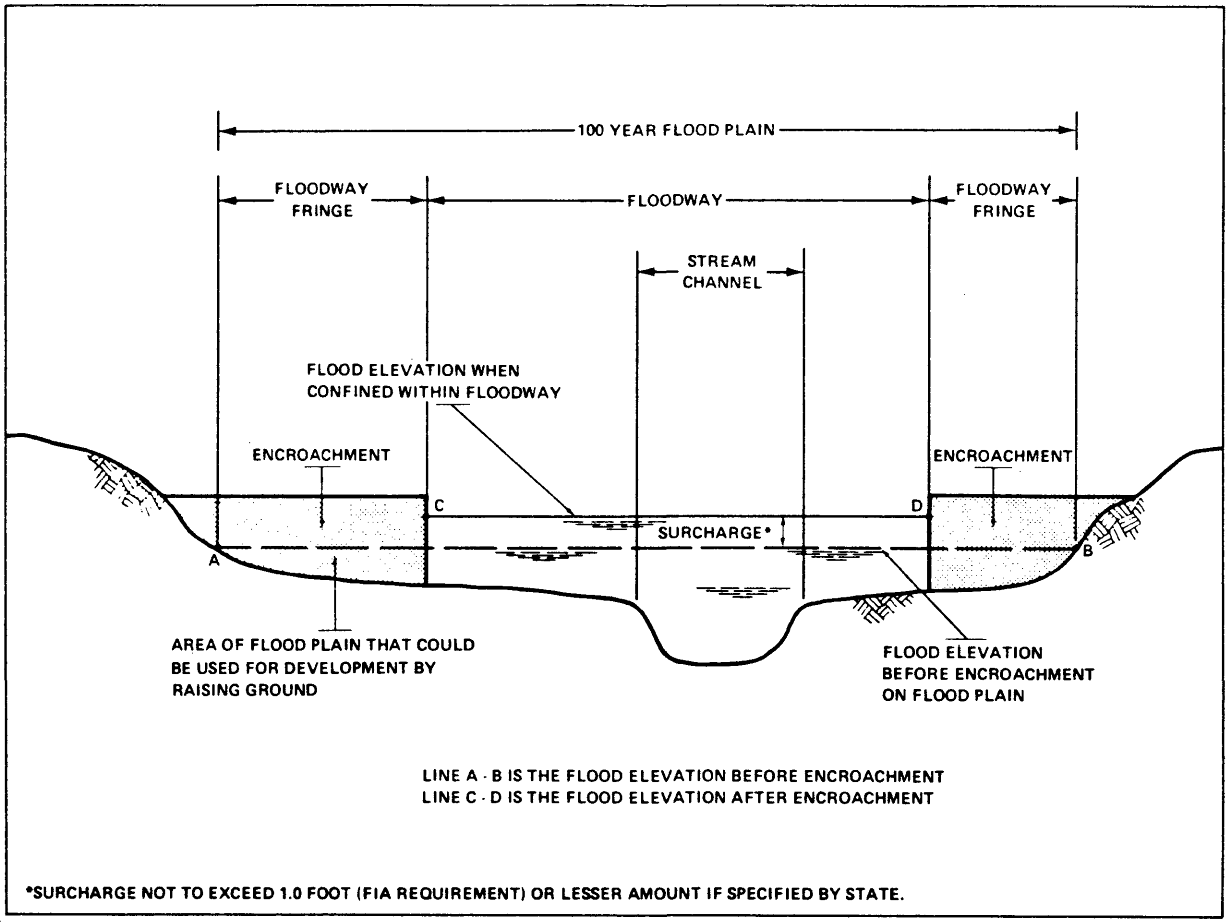
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

VILLAGE OF RANDOLPH, NY

(CATTARAUGUS CO.)

FLOODWAY DATA

LITTLE CONEWANGO CREEK AND BATTLE CREEK



FLOODWAY SCHEMATIC Figure 6

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 flooding source affecting the Village of Randolph.

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 of 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

Four reaches meeting this criterion were required for the flooding sources of the Village of Randolph. This includes 1 each on Little Conewango and Battle Creeks, and 2 on Elm Creek. The locations of the reaches are shown on the Flood Profiles (Exhibit 1).

5.2 Flood Hazard Factors

The FHF is the FIA device used to correlate flood information with insurance rate tables. Correlations between property damages from floods and 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 of water-surface elevations between 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, 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 area of study 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 FHFs determined.
Zones A1, A2:	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 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; or, areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the Village of Randolph.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Village of Randolph 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 FIA.

6.0 OTHER STUDIES

No other flood studies exist for the Village of Randolph although the SCS wrote the Conewango Creek Watershed, Work Plan (Reference 4). There is a Flood Insurance Report for the Village of East Randolph (Reference 14) which borders the village. No data disagreements occur between these studies and this Flood Insurance Study.

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

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.)			
Little Conewango Creek							
Reach 1	01	-0.59	-0.18	+0.37	005	A1	Varies
Battle Creek							
Reach 1	01	-1.09	-0.32	+0.71	010	A2	Varies
Elm Creek							
Reach 1	01	-0.48	-0.20	+0.41	005	A1	Varies
Reach 2	01	-0.78	-0.25	+0.47	010	A2	Varies

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

TABLE 3

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

VILLAGE OF RANDOLPH, NY

(CATTARAUGUS CO.)

FLOOD INSURANCE ZONE DATA

LITTLE CONEWANGO CREEK, BATTLE CREEK AND ELM CREEK

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, Department of Housing and Urban Development, 26 Federal Plaza, New York, New York 10007.

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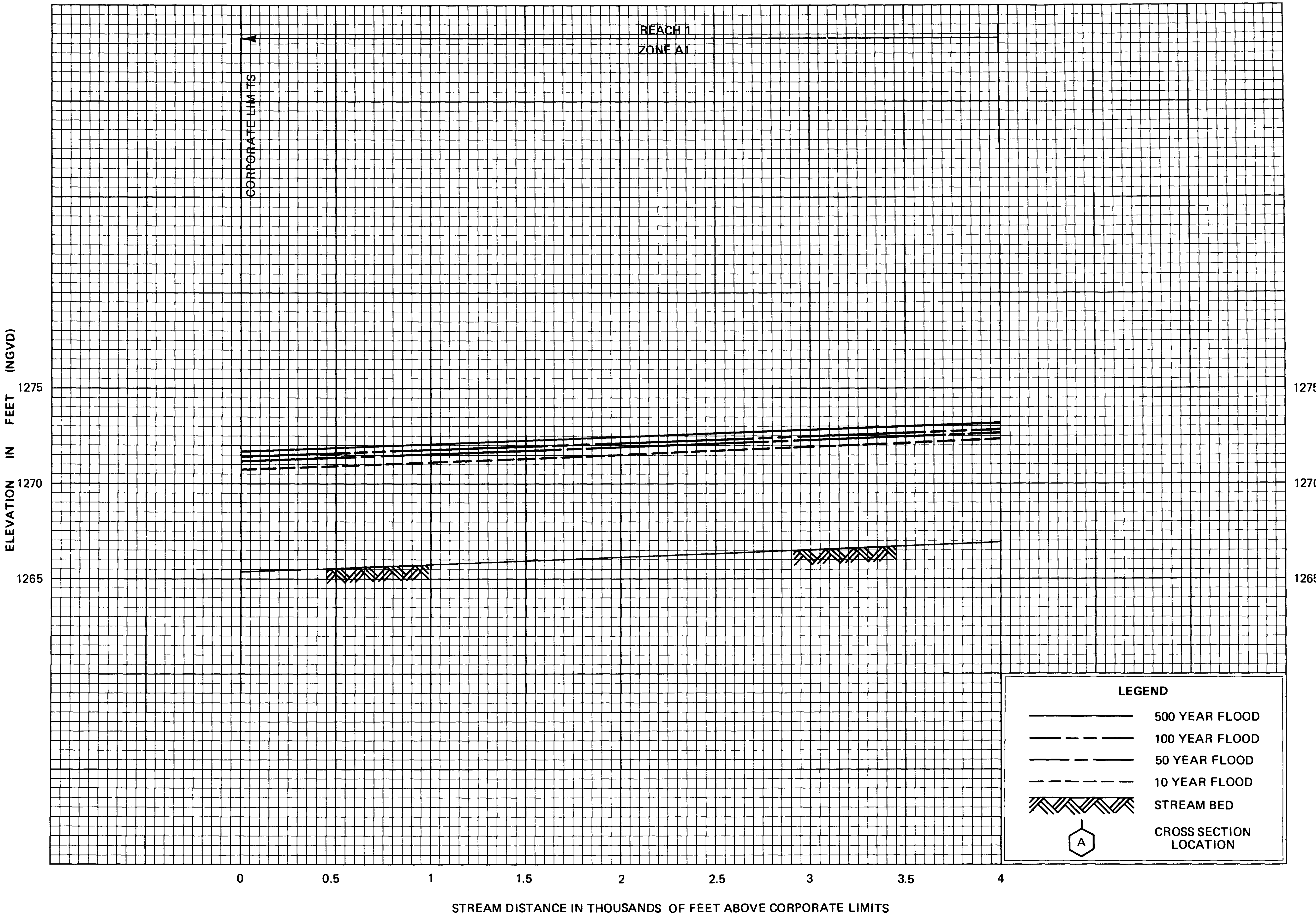


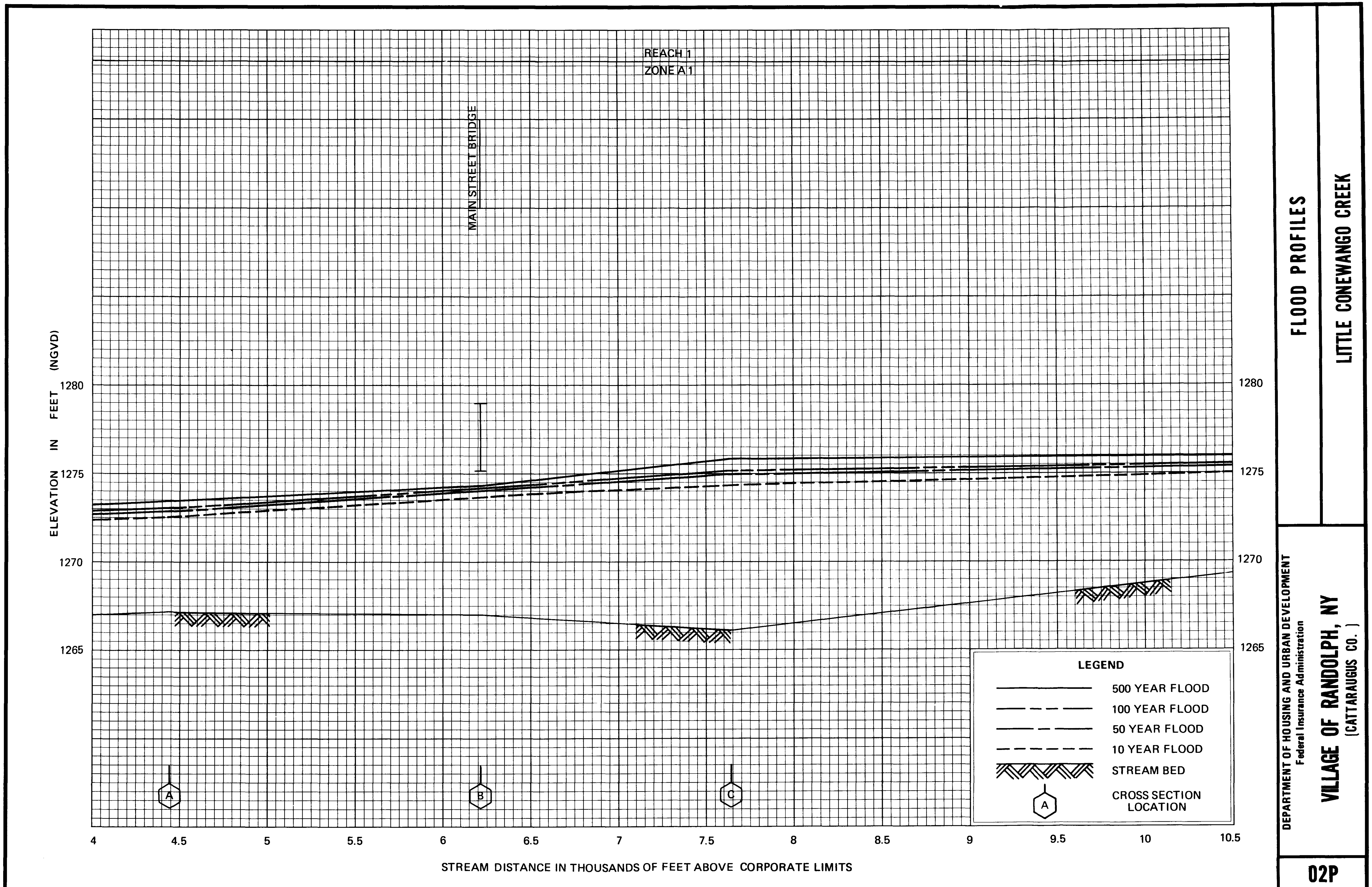
FLOOD PROFILES

LITTLE CONEWANGO CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

VILLAGE OF RANDOLPH, NY
(CATTARAUGUS CO.)

01P



REACH 1
ZONE A 1
MAIN STREET BRIDGE
ELEVATION IN FEET (NGVD)
1280
1275
1270
1265
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
10
10.5
STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CORPORATE LIMITS
A
B
C
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
LITTLE CONEWANGO CREEK
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
VILLAGE OF RANDOLPH, NY
(CATTARAUGUS CO.)
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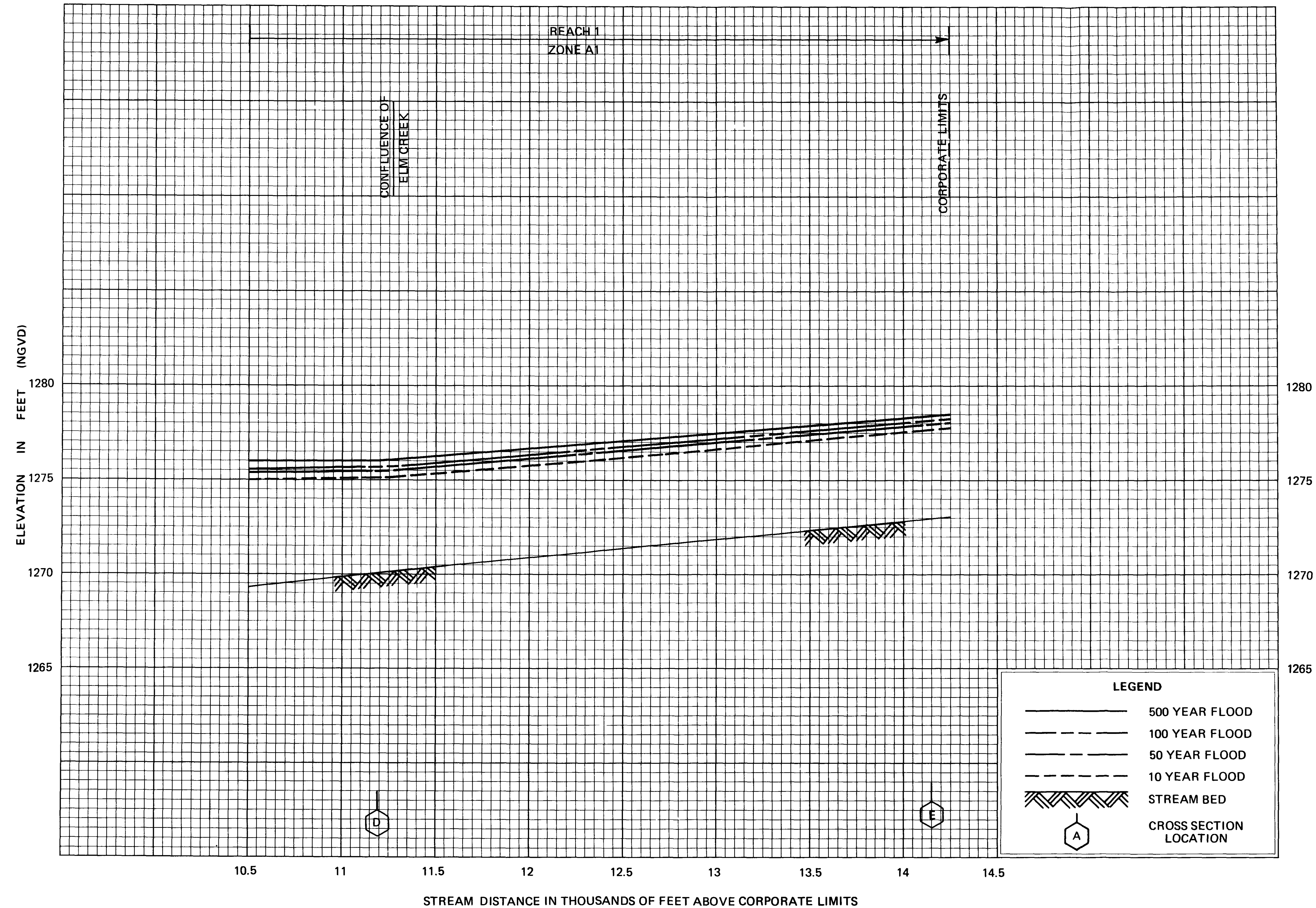


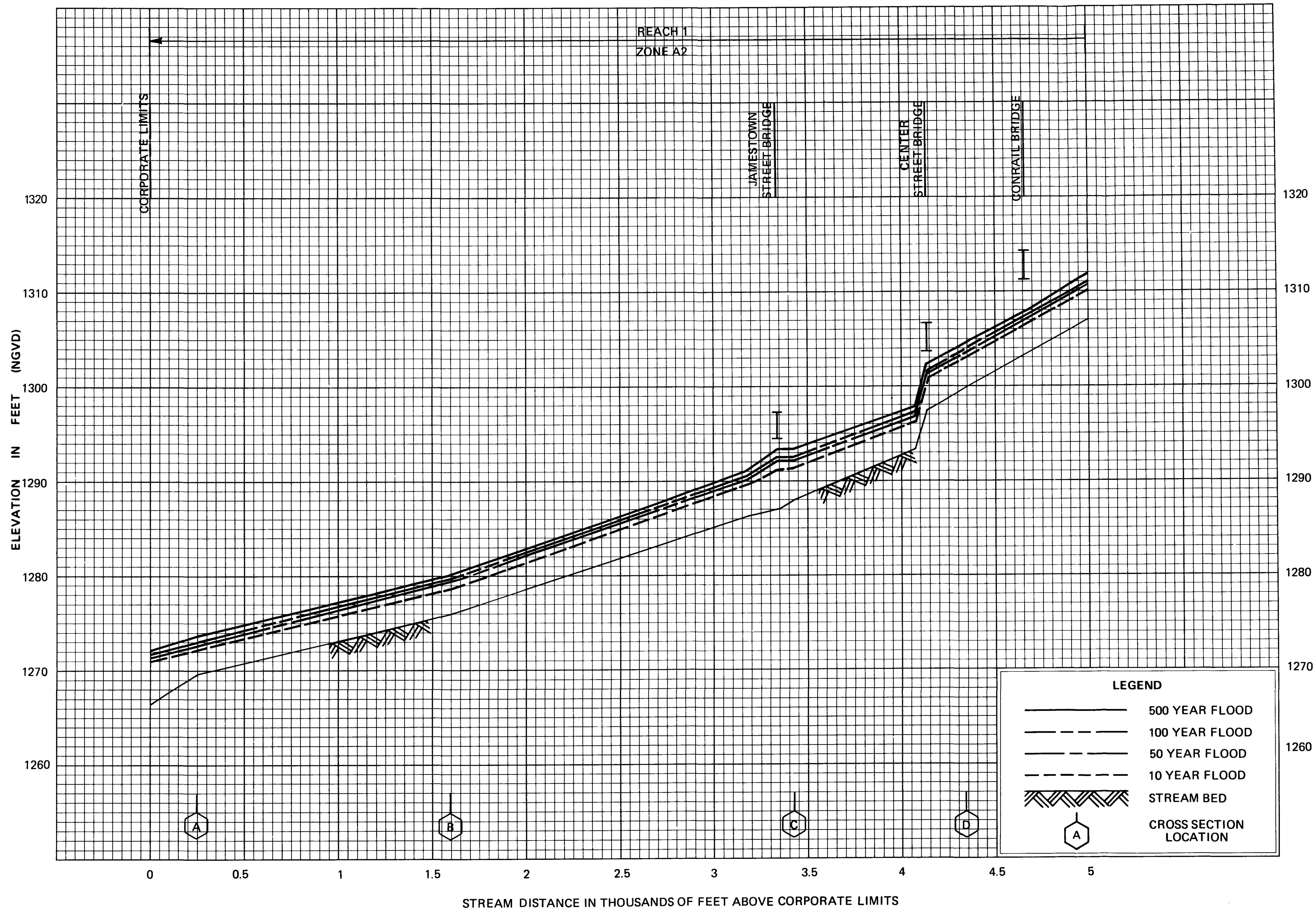
FLOOD PROFILES

LITTLE CONEWANGO CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

VILLAGE OF RANDOLPH, NY
(CATTARAUGUS CO.)

03P



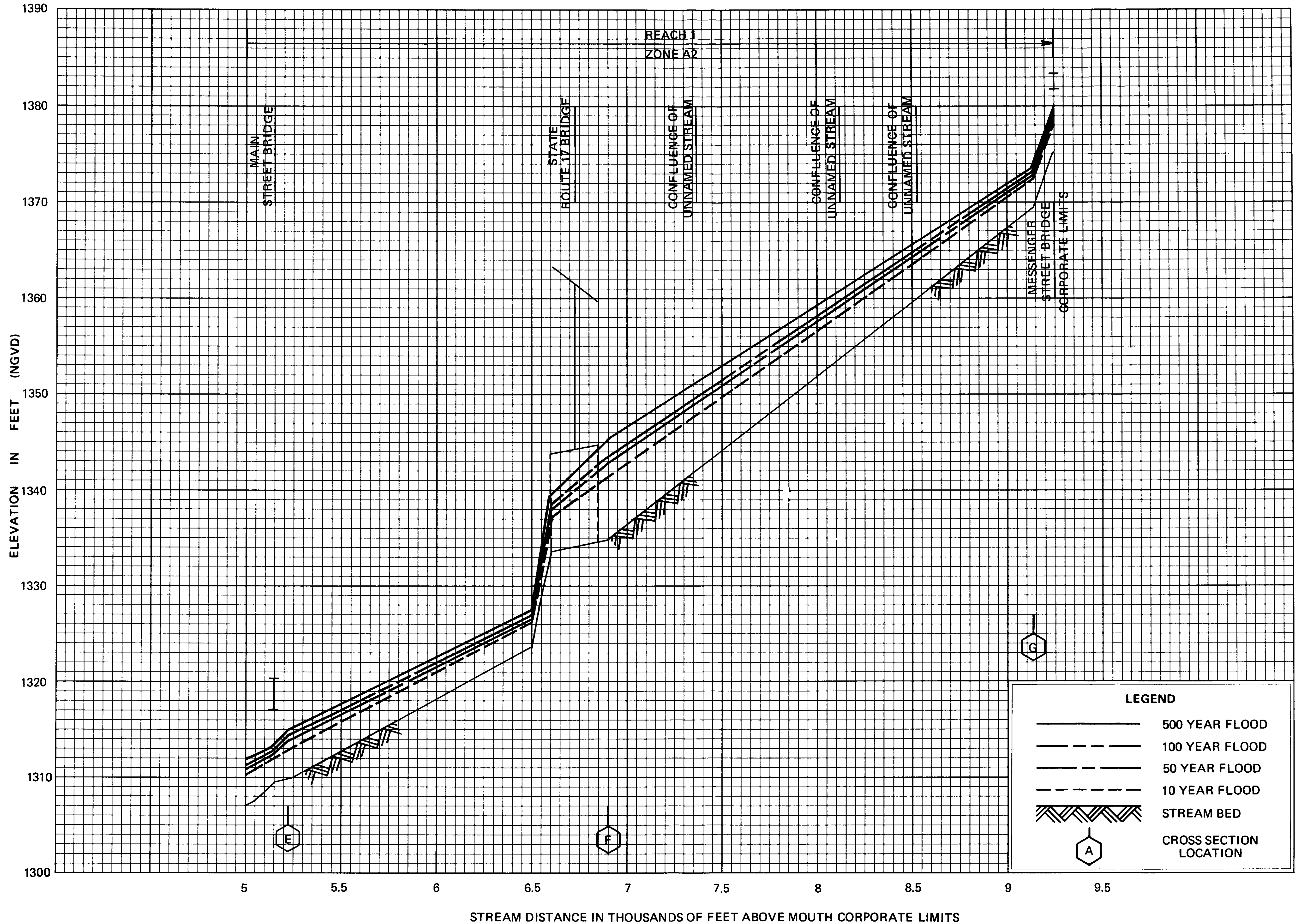
FLOOD PROFILES

BATTLE CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

VILLAGE OF RANDOLPH, NY
(CATTARAUGUS CO.)

04P



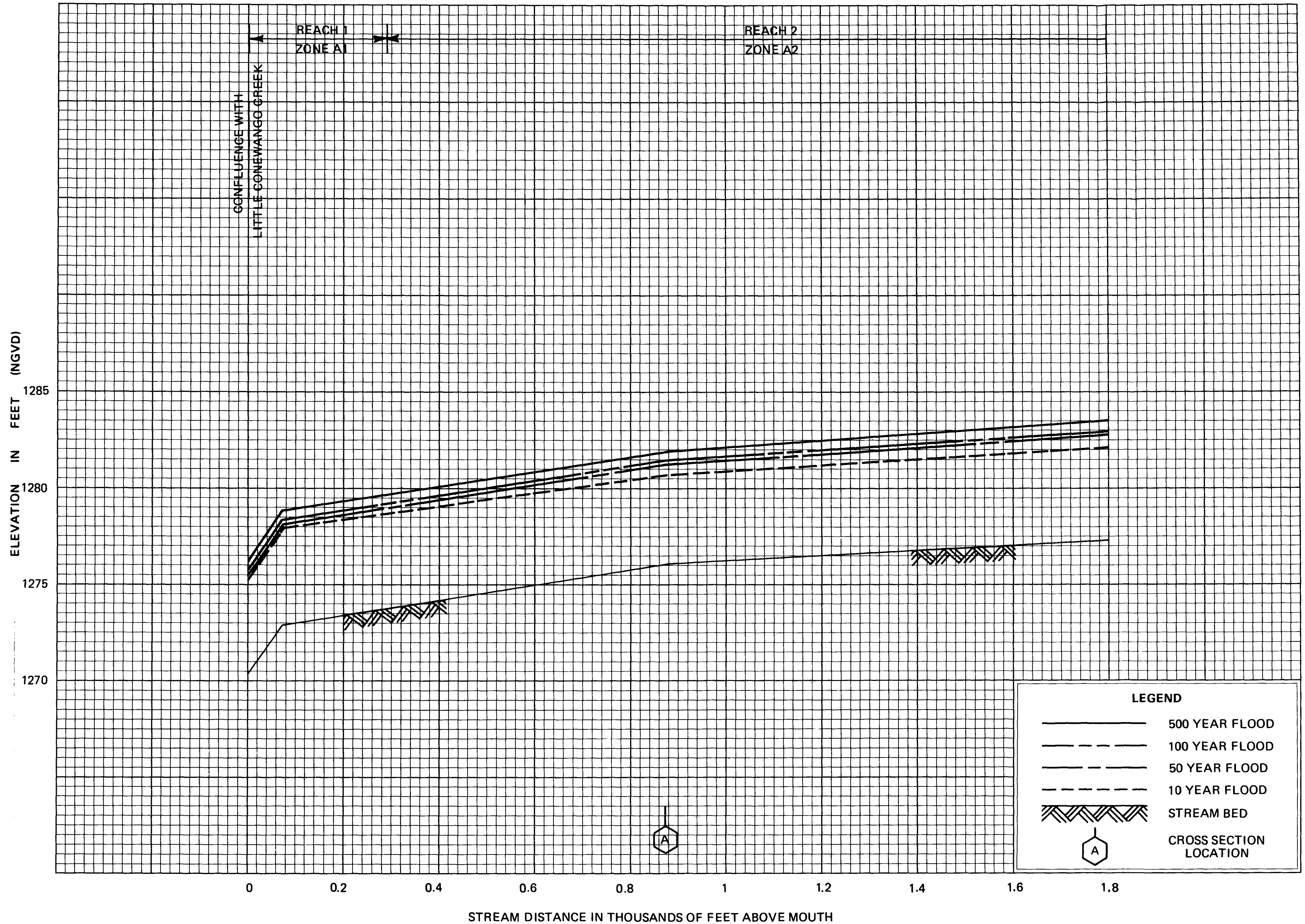
FLOOD PROFILES

BATTLE CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

VILLAGE OF RANDOLPH, NY
(CATTARAUGUS CO.)

05P



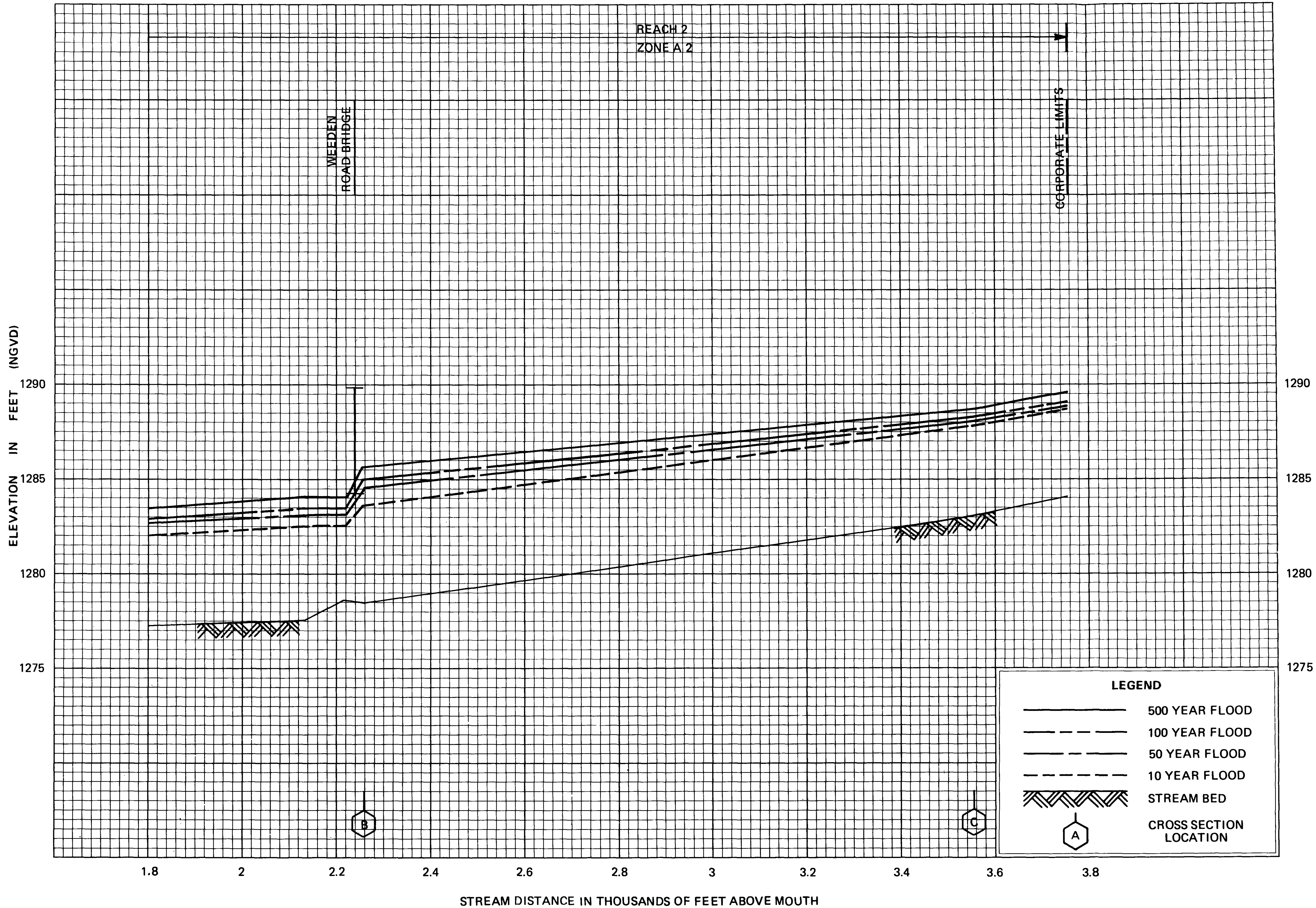
FLOOD PROFILES

ELM CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

VILLAGE OF RANDOLPH, NY
(CATTARAUGUS CO.)

06P



FLOOD PROFILES

ELM CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

VILLAGE OF RANDOLPH, NY
(CATTARAUGUS CO.)

07P