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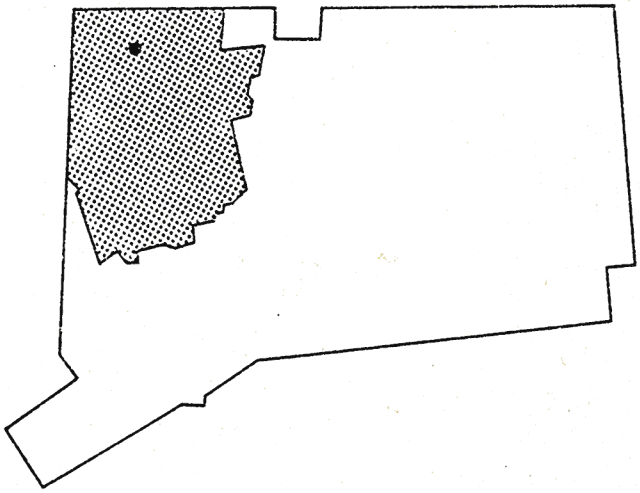
FLOOD INSURANCE STUDY



TOWN OF WINCHESTER, CONNECTICUT
LITCHFIELD COUNTY

JANUARY 1978

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

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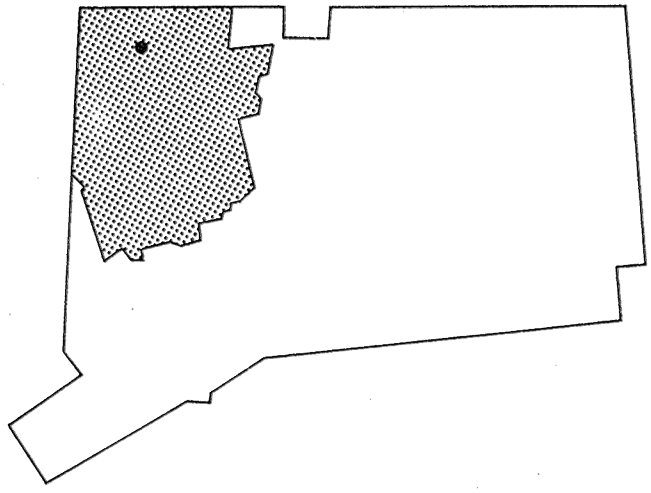
FLOOD INSURANCE STUDY



TOWN OF WINCHESTER, CONNECTICUT
LITCHFIELD COUNTY

JANUARY 1978

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 Winchester, Litchfield County, Connecticut, 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 Winchester 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

Coordination for this study included telephone discussions with the Town Clerk to discuss available mapping and established channel encroachment lines.

A final community coordination meeting was held on August 31, 1977. The meeting was attended by representatives of the Federal Insurance Administration; the U.S. Army Corps of Engineers, New England Division; and the community.

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. Army Corps of Engineers, New England Division, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-2-73, Project Order No. 2. This work, which was completed in December 1974, covered all significant flooding sources affecting the Town of Winchester.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Winchester, Litchfield County, Connecticut. The Algonquin State Forest and the Paugnut State Forest were not included in this study. The area of study is shown on the Vicinity Map (Figure 1).

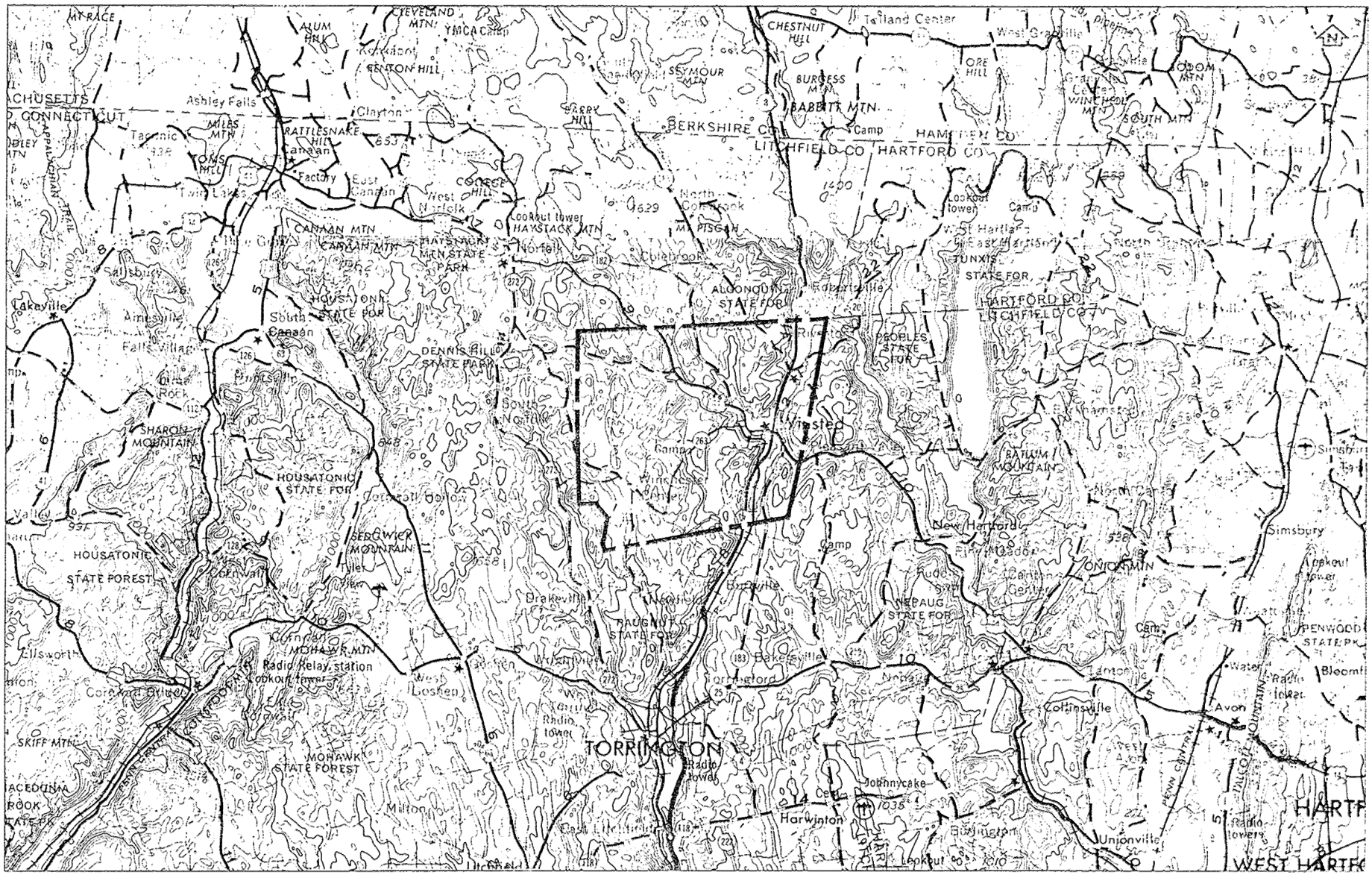


FIGURE 1

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Federal Insurance Administration

TOWN OF WINCHESTER, CT

(LITCHFIELD CO.)

APPROXIMATE SCALE

5 0 5 10 15 MILES

VICINITY MAP

Floods caused by overflow of the Mad River and the Still River were studied in detail. No other streams were studied in detail because the small valley sections, steep streambeds, and existing flood retardation dams indicate that any flooding that might occur would not affect developed or developable property.

Those areas studied in detail were chosen with consideration given to all proposed construction and future development through 1979.

2.2 Community Description

The Town of Winchester is located in the northwestern part of Connecticut, approximately 20 miles north of Waterbury. It is bordered by the Towns of Colebrook, Barkhampsted, Torrington, Goshen, and Norfolk. Winchester has a land area of 34 square miles and a population of approximately 12,000. Principle industries in Winchester include ball bearings, enamel wire, electrical goods, and other metal products. The City of Winsted is within the Town of Winchester, which is located in the lower part of the Mad River basin in Litchfield County.

The climate in the watershed is variable and is marked by frequent, relatively short periods of precipitation. The mean annual temperature is 45°F, with moderately severe winters and warm summers. Mean annual precipitation is just over 50 inches, and is uniformly distributed throughout the year.

The entire Town of Winchester, except for the area encompassing Lake Winchester and Park Pond in the southeastern section of town, drains to the Still River. West of the City of Winsted, numerous mountain streams, including Colebrook Brook, Indian Meadow Brook, and Rugg Brook, contribute to the Mad River drainage basin. Highland Lake and the stream of the same name drain into the south-central section of town, joining the Mad River in the City of Winsted, west of the business district.

The Still River watershed above the Colebrook Town line has an area of approximately 47.3 square miles, 33.3 square miles of which is in the Mad River watershed. The remaining 14 square miles are spread uniformly along the 10.6-mile Still River as a long, narrow area. The river originates in the Town of Torrington and flows in a northerly direction through the Town of Winchester.

The Mad River watershed has a maximum length (in a north-south direction) of approximately 7 miles, and a maximum width (in a northwest-southeast direction) of approximately 6 miles. Mad River is the principal tributary of the Still River, one of the major tributaries of the Farmington River.

The flood plain of Still River south of the Mad River is developed with a limited number of private homes and industrial properties.

Flood plain development north of the Mad River includes industrial and residential properties as well as the municipal sewage treatment plant.

The small valleys and flood plains of the Mad River basin west of the Mad River Dam are for the most part undeveloped, though some widely separated, single-family residences do exist. The City of Winsted, a densely developed, urbanized area, lies east of the Mad River Dam. The early highways were built along the easiest construction paths adjacent to the Mad River, and the expansion of the community was centered along the highway; thus, the community developed along the riverbank.

2.3 Principal Flood Problems

The Still River watershed is characterized by numerous short, steep streams that drain rapidly into large, flat areas adjacent to the Still River. When compared to the high runoff rates of the Mad River, the Still River watershed, located south of Winsted, does not contribute substantial volumes of water to peak runoff rates. The Mad River watershed is steep and hilly and flows rapidly, with resulting high floodflows.

The following are the dates of six significant floods of record that have occurred in the Still River basin, which includes the Mad River, since 1900: November 3, 1927; March 13, 1936; September 22, 1938; December 31, 1948; August 1955; and October 1955. The largest known flood in the Mad River occurred in August 1955.

The flood of 1938 on the Still River, the most damaging prior to the record flood of 1955, caused extensive residential, commercial, and highway damage along both the Mad and Still Rivers. The 1948 flood produced less overall damage, but resulted in more than three times the amount of industrial loss that was incurred in the earlier flood. The flood of August 1955, which had an estimated discharge of 15,100 cubic feet per second (cfs) at Winsted, demolished many structures and completely disrupted water, sewer, and other utilities. The destruction caused in Winsted by this flood dwarfs that of other floods. Widespread flooding occurred throughout the full length of the Mad and Still Rivers within Winchester, bringing destruction into areas that were previously unaffected. The swift current and great depth of the floodwater caused enormous urban and industrial losses, gouged out bridges and highways, and completely disrupted the transportation, power, and water supply systems. An enormous number of structures were totally destroyed, and many were broken up and washed away.

2.4 Flood Protection Measures

After the 1955 flood, several flood control measures were undertaken in Winchester. The Mad River Dam and Sucker Brook Dam were constructed. Record discharges for the August 1955 flood at the Rowley Street bridge over the Mad River and at the Gilbert Clock Company on

Still River were 15,000 and 18,200 cfs, respectively. A recurring August 1955 flood with the two dams in place would result in discharges of 5500 and 9000 cfs, respectively. Also, all of the bridges washed out in 1955 were replaced with structures of greater hydraulic capacity.

3.0 ENGINEERING METHODS

For 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 reflect 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.

The Still River basin, including the Mad River, was analyzed hydrologically by the U.S. Army Corps of Engineers in conjunction with the preparation of a Flood Plain Information study in 1972 (Reference 1). Earlier detailed hydrologic analysis of the Mad River basin was conducted by the U.S. Army Corps of Engineers in 1960 in conjunction with the design of the Mad River Dam and Reservoir (Reference 2). Hydrologic data used in this report were taken from these reports. The Frequency-Discharge, Drainage Area Curves for the Still and Mad Rivers are shown in Figure 2.

3.2 Hydraulic Analyses

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

Cross section data for streams in the area were obtained from field surveys. 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 sections are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Roughness coefficients (Manning's "n") for the streams were estimated by field inspection at each cross section.

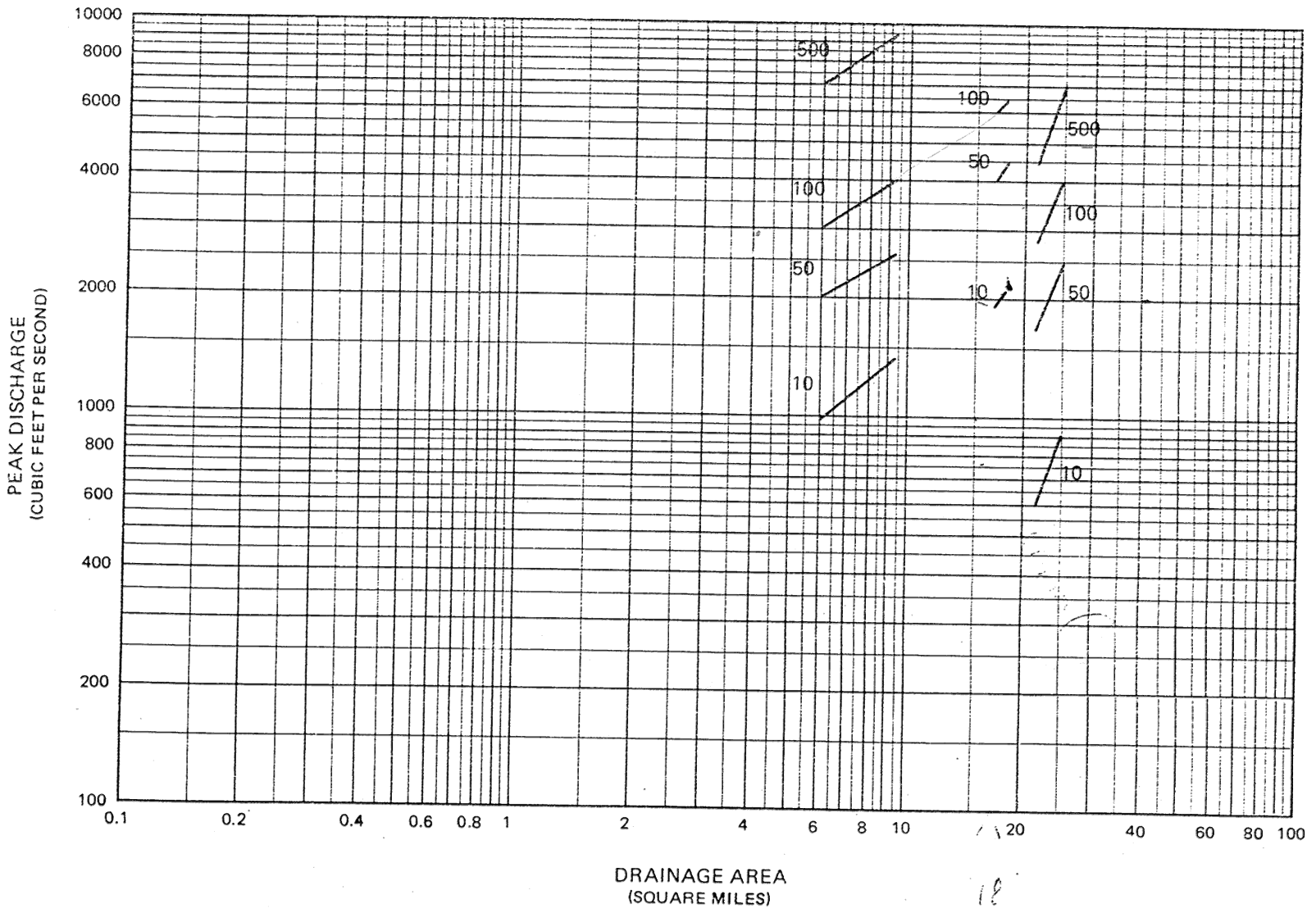


FIGURE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WINCHESTER, CT
(LITCHFIELD CO.)

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

MAD RIVER

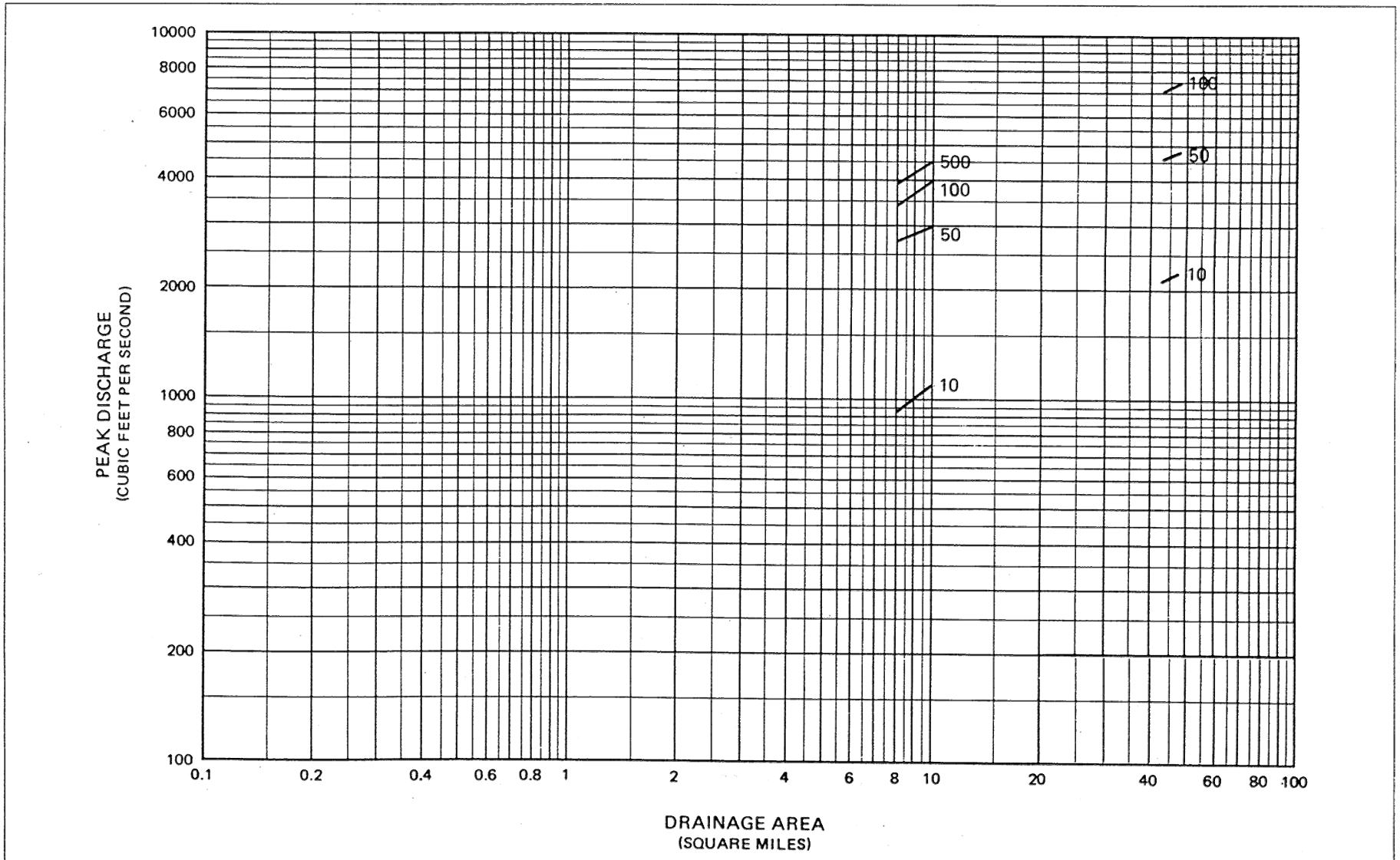


FIGURE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WINCHESTER, CT
(LITCHFIELD CO.)

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

STILL RIVER

Water-surface profiles for the 10-, 50-, 100-, and 500-year floods were developed using the HEC-2 step-backwater computer model (Reference 3).

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

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

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 a scale of 1:24,000, with a contour interval of 10 feet (Reference 4). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year boundary has been shown. The approximate flood boundaries for the bodies of water were delineated using the topographic maps mentioned above.

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 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 velocites are not produced.

Floodway widths were determined for all streams studied in detail using the encroachment option of the U.S. Army Corps of Engineers' HEC-2 computer program (Reference 3). Floodway data for Still River and a short reach of the Mad River are tabulated on Table 1. Floodway analysis of the Mad River above Cross Section E reveals that the floodway that would raise the 100-year event more than 1.0 foot is essentially at the edge of the existing channel. Also, on Still River, all flow is contained in the channel from Station 14800 to Station 19750. Thus, the floodway in these areas is not computed or depicted on the Flood Boundary and Floodway Map (Exhibit 2).

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.

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 3.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	WITH FLOODWAY	WITHOUT FLOODWAY (FEET NGVD)	DIFFERENCE
STILL RIVER							
A	1,440[1]	128	940	7.4	625.2	624.5	0.7
B	3,210[1]	164	1203	5.8	629.5	628.6	0.9
C	5,800[1]	251	1787	3.9	634.6	633.7	0.9
D	7,130[1]	115	667	10.5	635.4	634.8	0.6
E	9,660[1]	112	1073	6.5	643.8	643.3	0.5
F	10,650[1]	160	1402	5.0	644.4	643.8	0.6
G	12,800[1]	164	1155	6.1	647.0	646.0	1.0
H	13,980[1]	111	593	11.8	649.8	649.3	0.5
I	21,350[1]	93	993	4.0	699.8	698.8	1.0
J	22,530[1]	475	2704	1.5	700.2	699.2	1.0
K	23,800[1]	384	3568	1.1	700.3	699.3	1.0
L	26,800[1]	332	3789	1.1	700.5	699.5	1.0
M	28,800[1]	275	2410	1.7	700.6	699.6	1.0
N	30,000[1]	342	3684	1.1	700.7	699.7	1.0
O	31,100[1]	149	1976	2.0	701.7	700.7	1.0
P	33,480[1]	138[3]	939	4.3	702.4	701.5	0.9
Q	37,220[1]	169[3]	1113	3.6	709.3	708.6	0.7
MAD RIVER							
A	200[2]	114	1122	4.0	698.5	697.5	1.0
B	1,090[2]	59	666	6.8	698.7	697.7	1.0
C	1,960[2]	99	865	5.2	701.4	700.7	0.7
D	3,090[2]	73	406	11.1	701.9	701.2	0.7
E	3,500[2]	63	447	10.0	704.7	704.2	0.5

[1]Feet Above Corporate Limits [2]Feet Above Confluence with Still River
[3]Part of Floodway Outside Corporate Limits

TABLE 1

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WINCHESTER, CT
(LITCHFIELD CO.)

FLOODWAY DATA

STILL RIVER-MAD RIVER

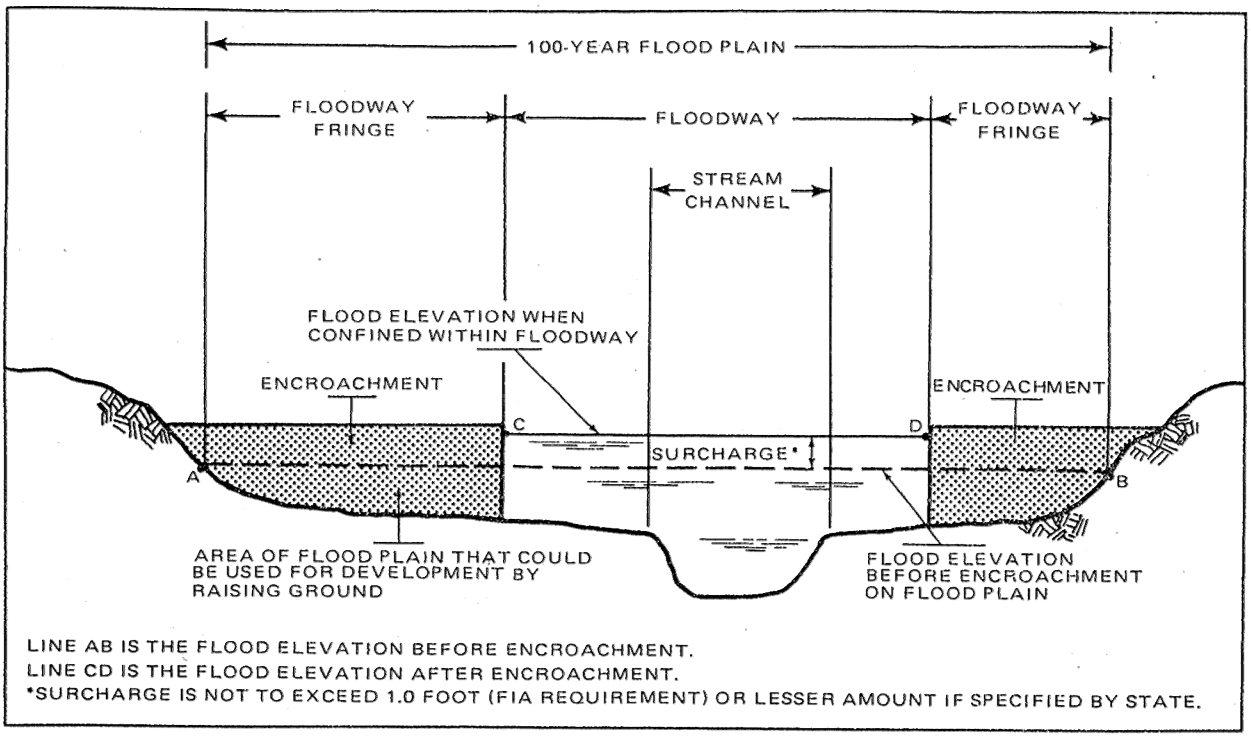


Figure 3. Floodway Schematic

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 Winchester.

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
2 to 7 feet	1.0 foot

Six reaches meeting the above criterion were required for the flooding sources of Winchester. These included three on Still River and three on Mad River. The locations of the reaches are shown on the Flood Profiles (Exhibit 1).

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 Winchester 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 A6, A7, A8, and A10:	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; and 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 2, "Flood Insurance Zone Data," summarizes the flood elevation differences, Flood Hazard Factors, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Winchester 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

As stated in Section 3.1, the U.S. Army Corps of Engineers have performed previous hydrologic analyses in the Still River basin, which includes the Mad River. Those studies (References 1 and 2) were used as the basis for this report; therefore, they are in agreement with the results presented in this report.

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

7.0 LOCATION OF DATA

All hydrologic and hydraulic data prepared for this study, including floodway computations, are being retained by the U.S. Army Corps of Engineers, New England Division, through 1981.

8.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Army Corps of Engineers, Flood Plain Information, Still and Mad Rivers, Winchester, Connecticut, May 1972

2. ----------, Design Memorandum No. 1, Mad River Dam and Reservoir, October 1960

3. ----------, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, October 1973

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)			
STILL RIVER							
Reach 1	0001	-3.7	-1.6	1.3	035	A7	Varies - See Map
Reach 2	0001,0002	-5.2	-2.0	4.2	050	A10	Varies - See Map
Reach 3	0002	-2.9	-0.7	1.8	030	A6	Varies - See Map
MAD RIVER							
Reach 1	0001	-5.2	-2.0	4.5	050	A10	Varies - See Map
Reach 2	0001	-3.1	-1.2	2.6	030	A6	Varies - See Map
Reach 3	0001	-3.9	-1.5	4.6	040	A8	Varies - See Map

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

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WINCHESTER, CT
(LITCHFIELD CO.)

FLOOD INSURANCE ZONE DATA

STILL RIVER-MAD RIVER

4. U.S. Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 feet: Norfolk, Connecticut (1956), Photorevised (1969); Winsted, Connecticut (1956), Photorevised (1969)

Connecticut Department of Transportation, Construction of Main Street-Winsted, Indian Meadow Brook and Mill Brook--U.S. Route 44, Hartford, Connecticut, 1957

----------, Construction of Bridge and Approaches-Division Street Over Mad River, Hartford, Connecticut, 1956

----------, Construction of Bridges and Approaches-White Street Over Still River; Lake Street Over Mad River; Munroe Street Over Mad River; Meadow Street Over Mad River Holabird Avenue Over Still River, Hartford, Connecticut, 1956

----------, Construction of Bridges and Approaches-Rugg Brook Road Over Mad River, Yates Road Over Mad River, Hartford, Connecticut, 1956

Connecticut Department of Transportation, Construction of South Main Street Over Still River, Hartford, Connecticut, 1948

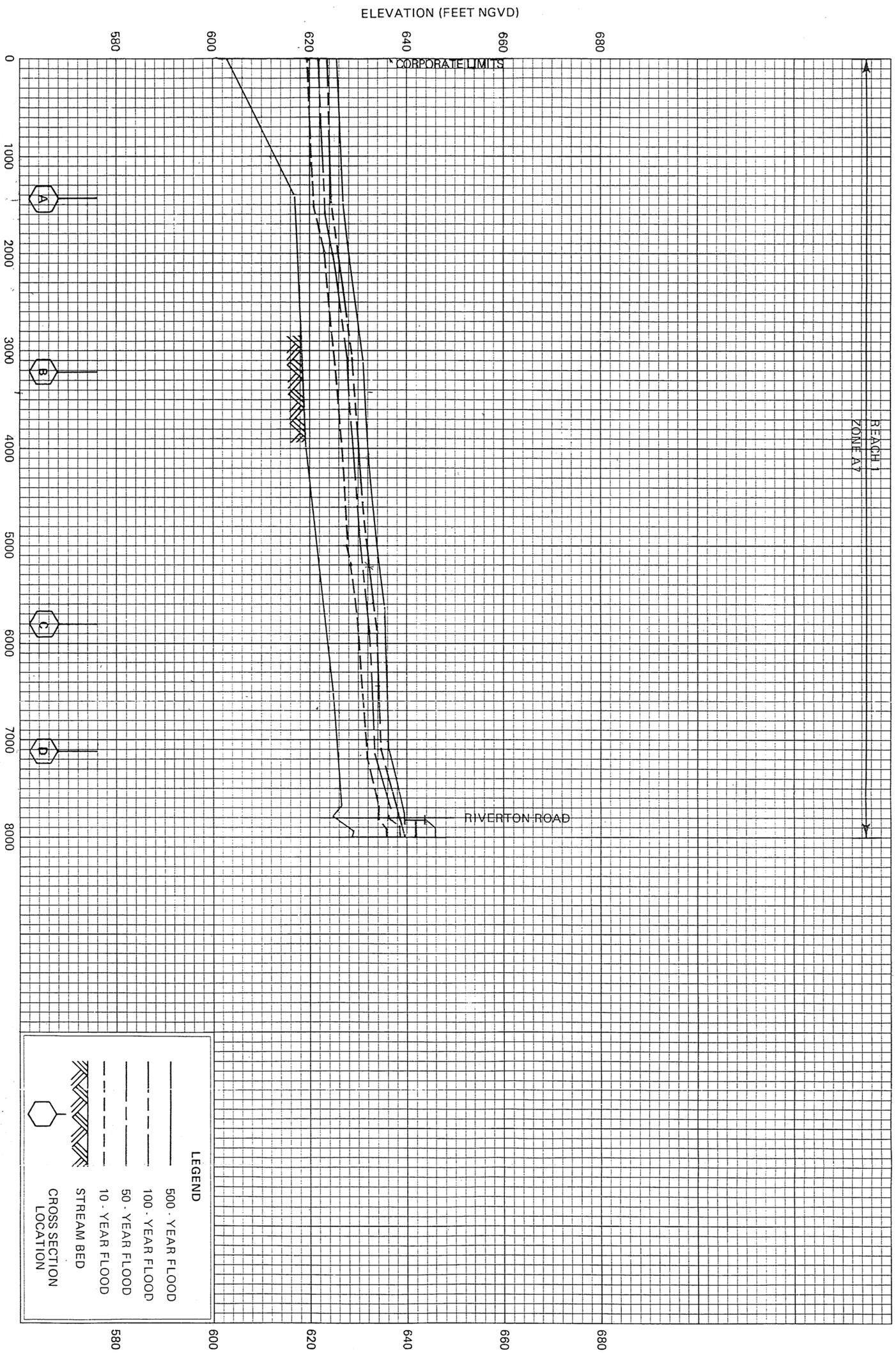
----------, Pedestrian Bridge Over Mad River, 1962

----------, Rowley Street Bridge Over Mad River, 1929

----------, Town Road Map, Winchester, 1968

Connecticut Water Resources Commission, Channel Encroachment Lines, Mad River and Still River, Town of Winchester, 1957

Griswold Engineering, Report on Flood Control Improvements, Still River, 1969



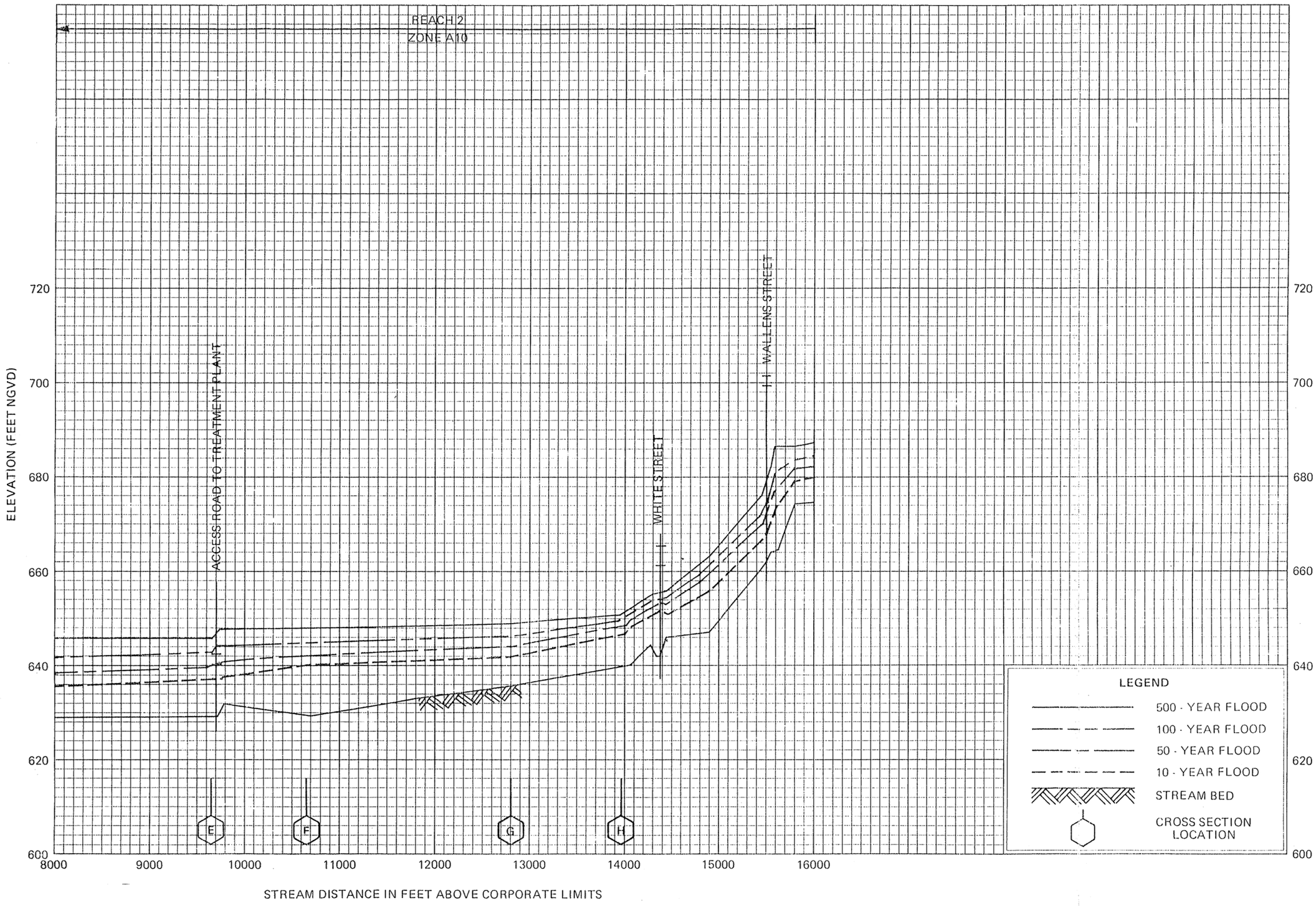
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WINCHESTER, CT
(LITCHFIELD CO.)

FLOOD PROFILES

STILL RIVER

01P



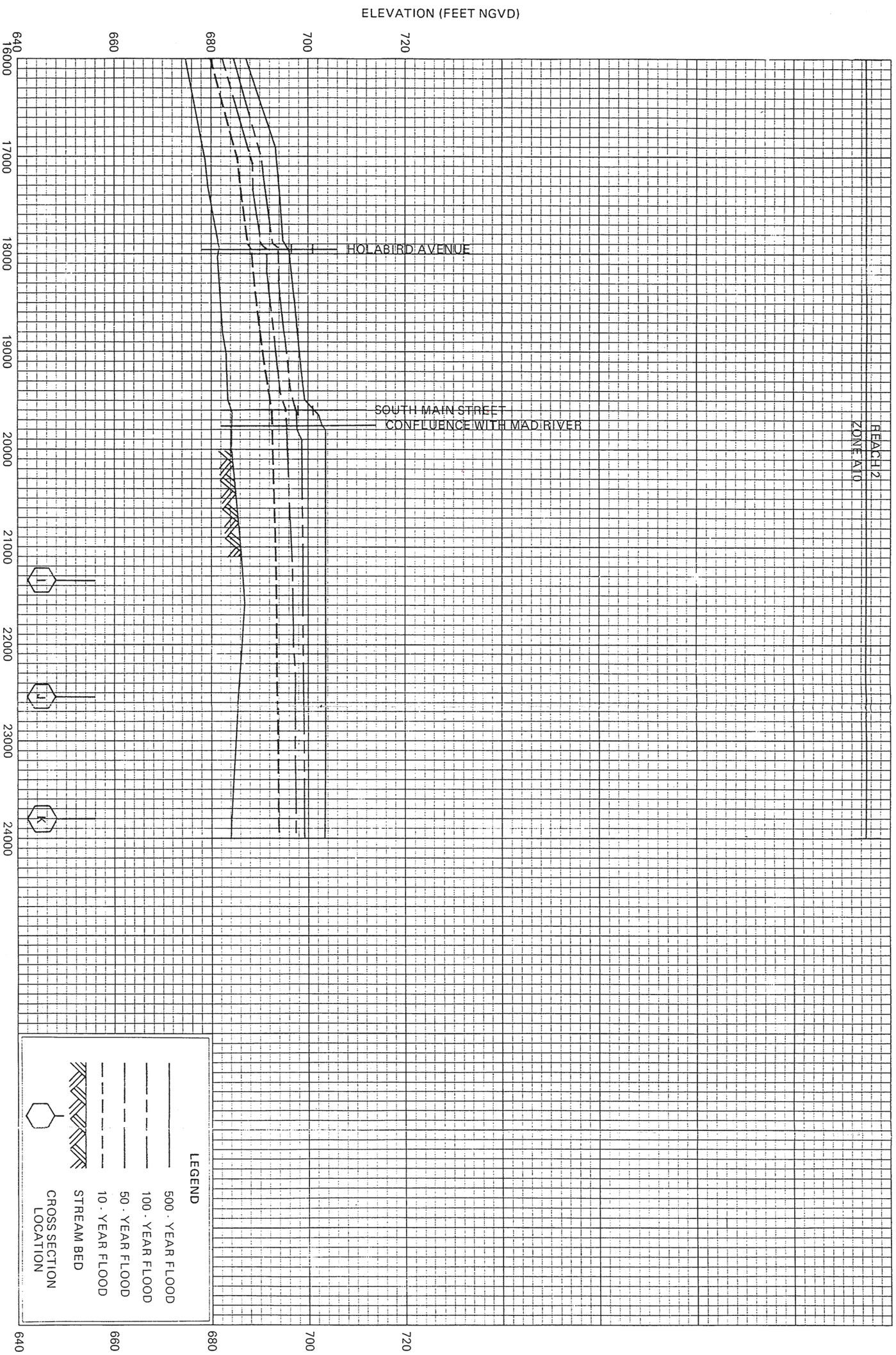
FLOOD PROFILES

STILL RIVER

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WINCHESTER, CT
(LITCHFIELD CO.)

02P



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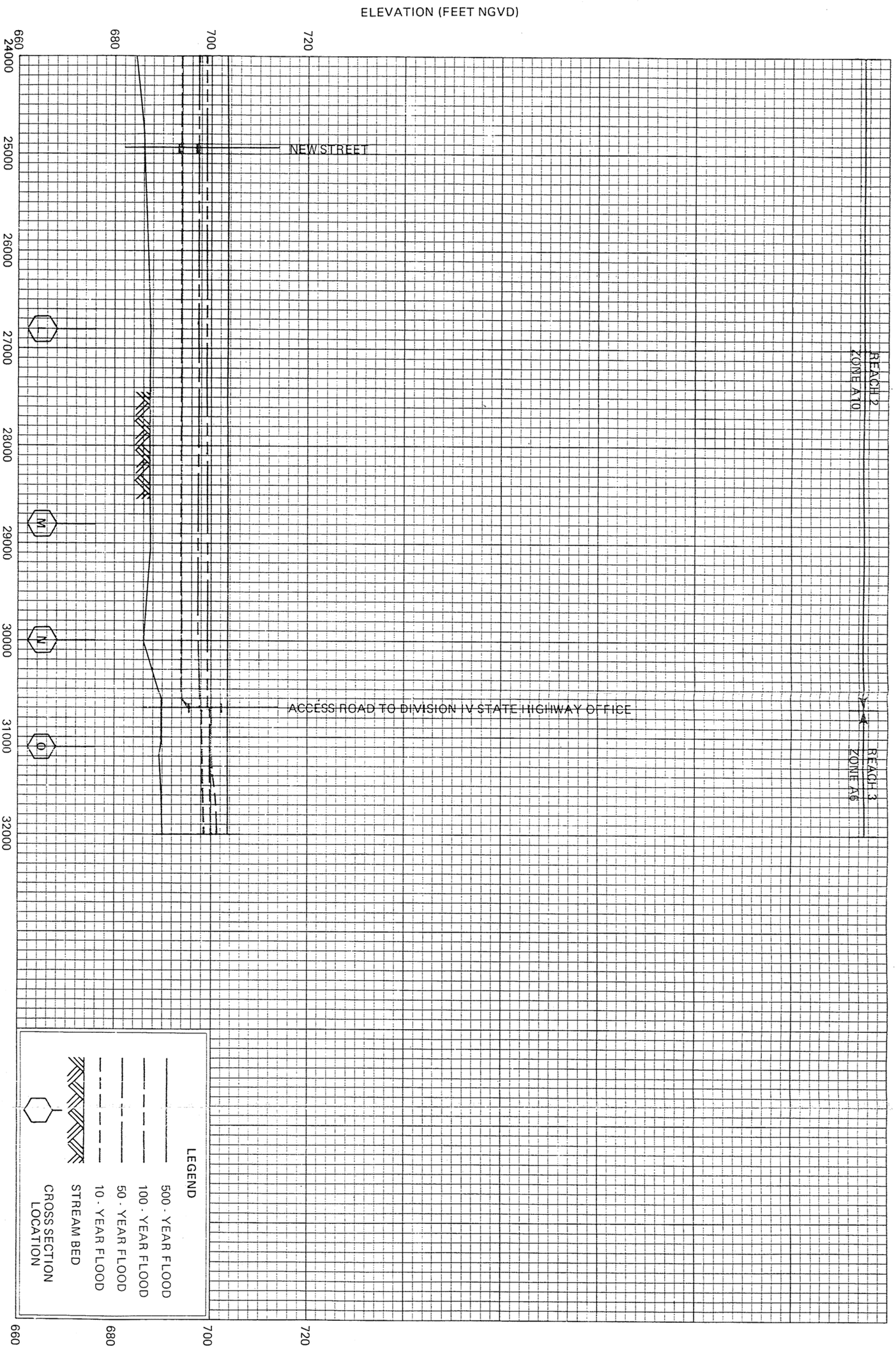
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WINCHESTER, CT
(LITCHFIELD CO.)

FLOOD PROFILES

STILL RIVER



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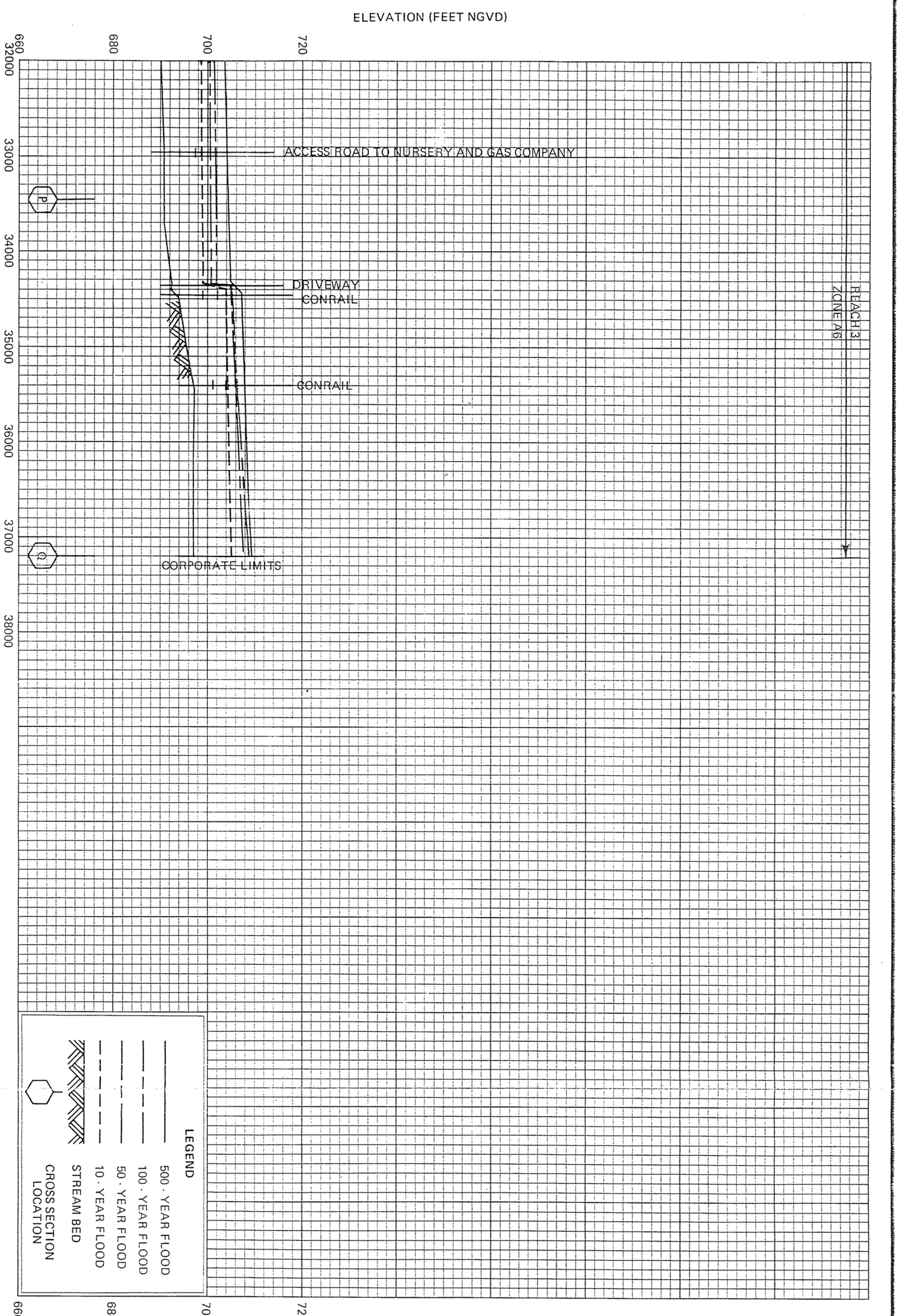
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WINCHESTER, CT

(LITCHFIELD CO.)

FLOOD PROFILES

STILL RIVER



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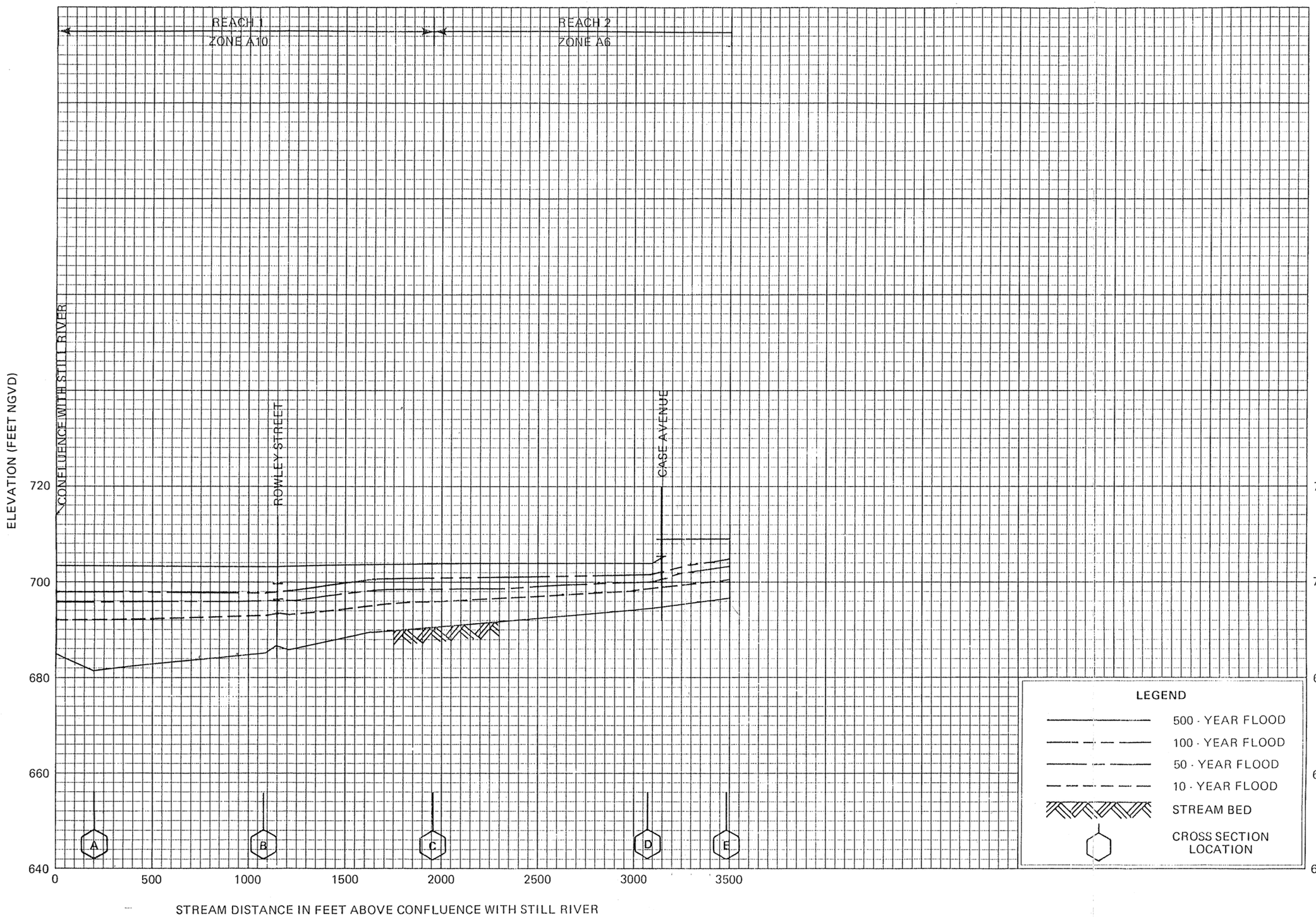
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WINCHESTER, CT
(LITCHFIELD CO.)

FLOOD PROFILES

STILL RIVER



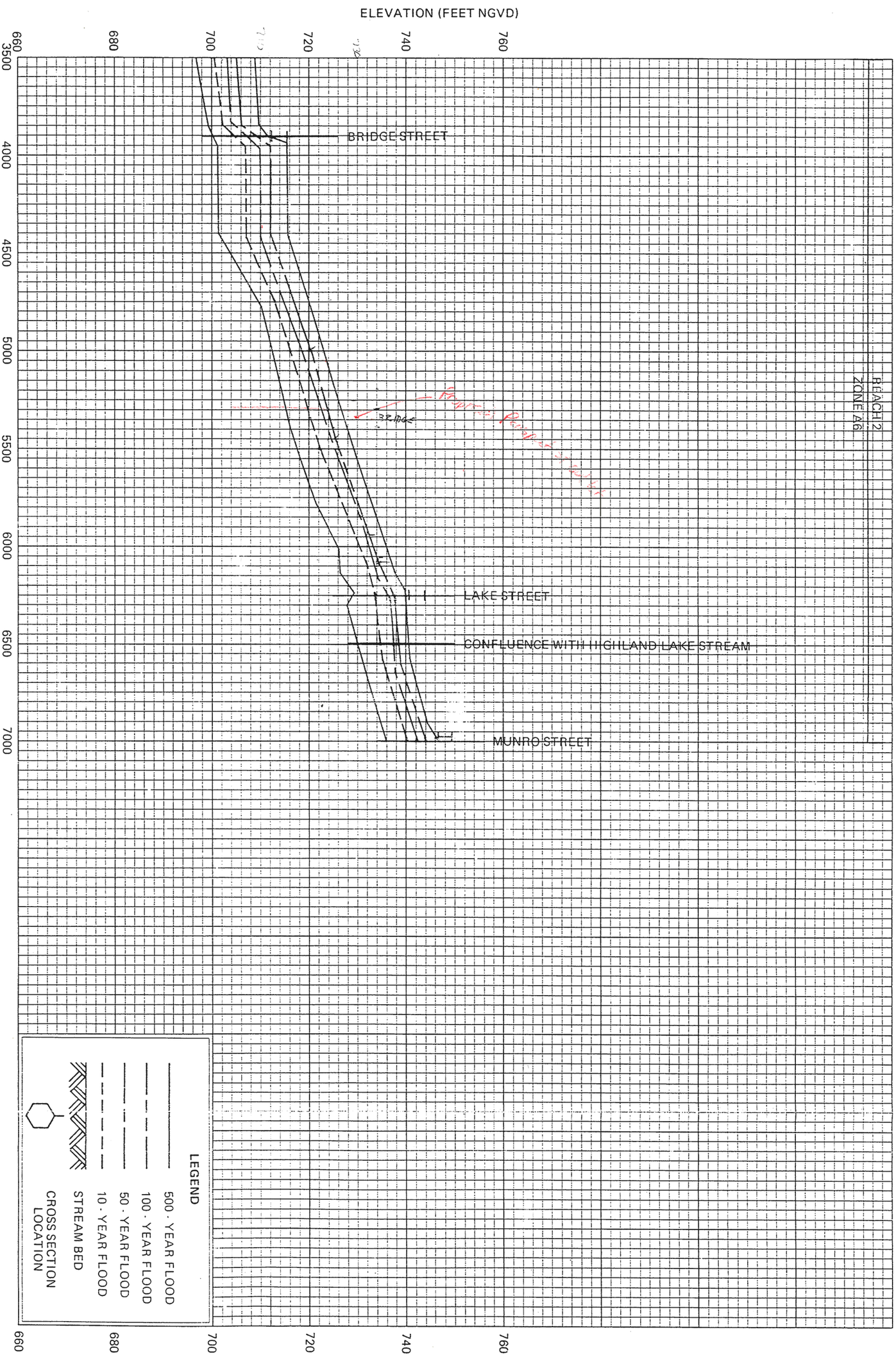
FLOOD PROFILES

MAD RIVER

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WINCHESTER, CT
(LITCHFIELD CO.)

06P



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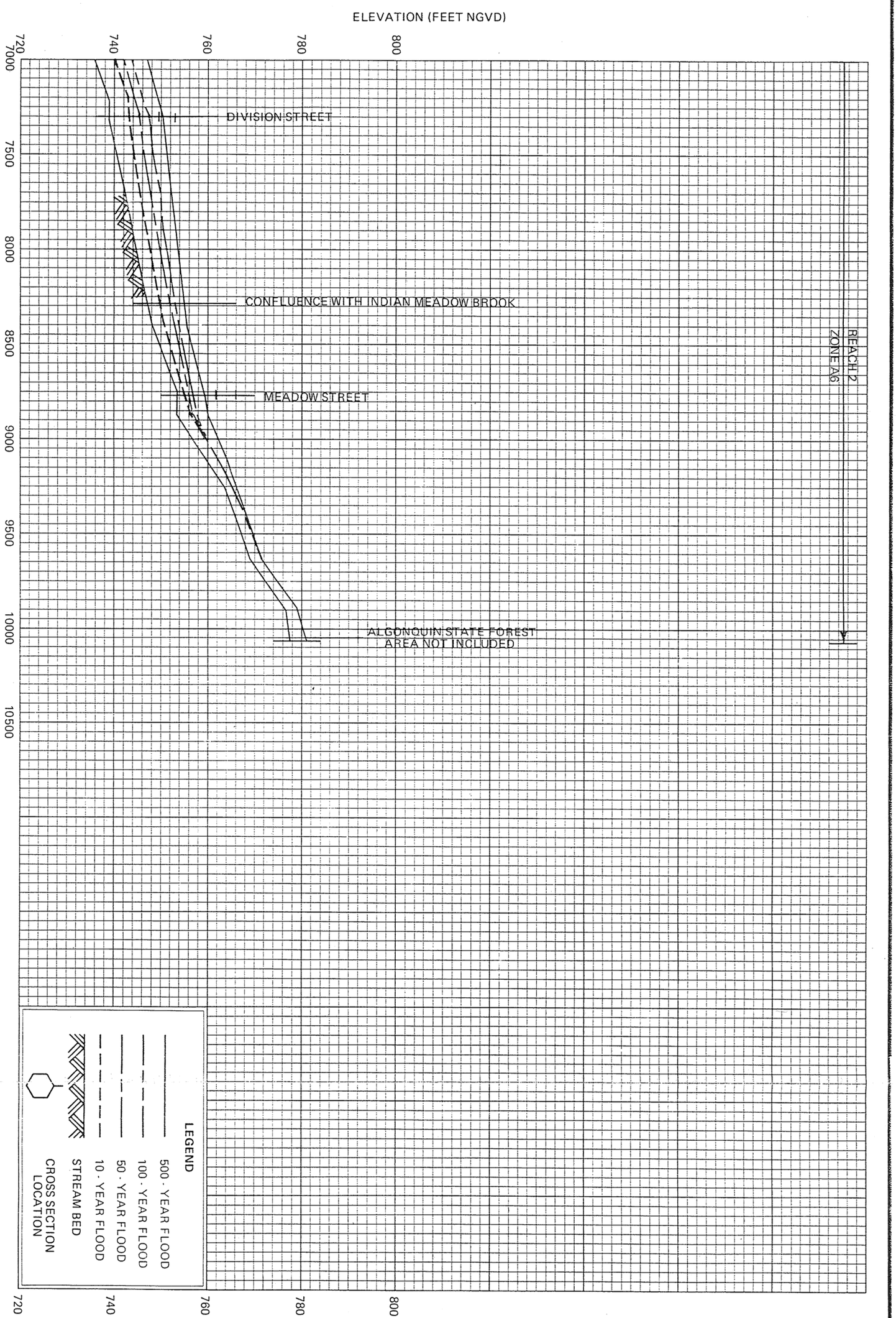
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WINCHESTER, CT
(LITCHFIELD CO.)

FLOOD PROFILES

MAD RIVER



08P

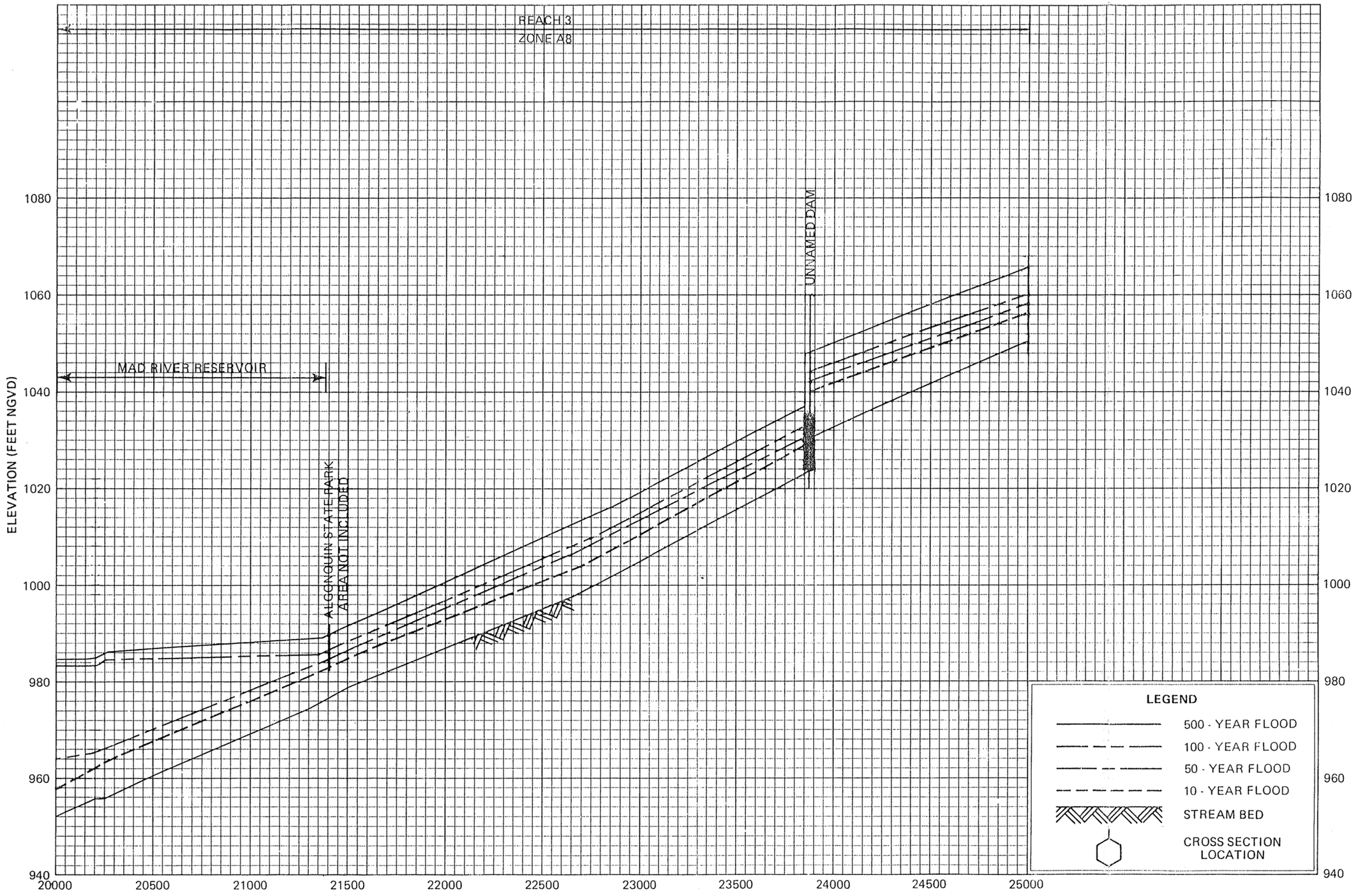
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

TOWN OF WINCHESTER, CT

(LITCHFIELD CO.)

FLOOD PROFILES

MAD RIVER



FLOOD PROFILES

MAD RIVER

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09P

REACH 3
ZONE A8

RAILROAD BRIDGE (ABANDONED)

DANBURY QUARTER ROAD

ELEVATION (FEET NGVD)

1140
1120
1100
1080
1060
1040
1020

25000 25500 26000 26500 27000 27500 28000 28500

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH STILL RIVER

LEGEND

- 500 - YEAR FLOOD
- 100 - YEAR FLOOD
- 50 - YEAR FLOOD
- 10 - YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

MAD RIVER

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10P