# FLOOD INSURANCE STUDY

## CITY OF FRANKLIN, VIRGINIA
### INDEPENDENT CITY

FEBRUARY 1980


FEDERAL EMERGENCY MANAGEMENT AGENCY
FEDERAL INSURANCE ADMINISTRATION
COMMUNITY NUMBER - 510060

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FLOOD INSURANCE STUDY
CITY OF FRANKLIN, VIRGINIA

# 1.0 INTRODUCTION

## 1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Franklin, Virginia, 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 Franklin 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 for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-8-76, Project Order No. 12. This study, which was completed in March 1979, covered all significant flooding sources in Franklin.

## 1.3 Coordination

Streams requiring detailed study were identified at the initial Consultation and Coordination Officer's (CCO) meeting in February 1976. This meeting was attended by representatives of the Federal Insurance Administration, the Virginia State Water Control Board, the study contractor and officials of the City of Franklin. The results of the study were reviewed at a final CCO meeting held on August 28, 1979.

## 2.0 AREA STUDIED

### 2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Franklin, Virginia. The area of study is shown on the Vicinity Map (Figure 1).

Detailed study methods were used to evaluate flooding caused by overflow of the Blackwater River. Backwater from the Blackwater River also affects portions of three small tributaries designated as Tributaries 1, 2 and 3 to Blackwater River. 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 1984.

### 2.2 Community Description

The City of Franklin is located in the southeastern portion of Virginia bordering on the eastern portion of Southampton County. The total land area contained within the city limits is 3.8 square miles. It is situated approximately 19 miles west of Suffolk, 8.5 miles east of Courtland, and 8.5 miles north of the Virginia-North Carolina state line. According to U.S. Census Bureau figures, the population has increased from 6,880 in 1970 to 7,258 in 1975 (Reference 1).

U.S. Highway 58 (2nd Avenue) and the Seaboard Coast Line Railway pass through the heart of Franklin. A short distance upstream from Highway 58, the Norfolk, Franklin, and Danville Railway crosses the Blackwater River and passes through the northern part of the city. Commercial, older residential and public buildings, and a sewage treatment plant are located in the Blackwater River flood plain in the eastern part of the community.

The city has a temperate climate with an average annual temperature of about 59 degrees Fahrenheit (°F) and a mean annual precipitation of about 46 inches. Monthly rainfall is largest during July and August (Reference 2).

The Blackwater River flows south past Franklin and forms the eastern boundary of the city. Its headwaters are near the city of Petersburg and it joins the Nottoway River near the Virginia-North Carolina state line about 8.5 miles downstream. The river and its tributaries flow through several swamps upstream from Franklin. At the U. S. Geological Survey (USGS) gaging station, 6 miles north of the city, the river's drainage area is 617 square miles.

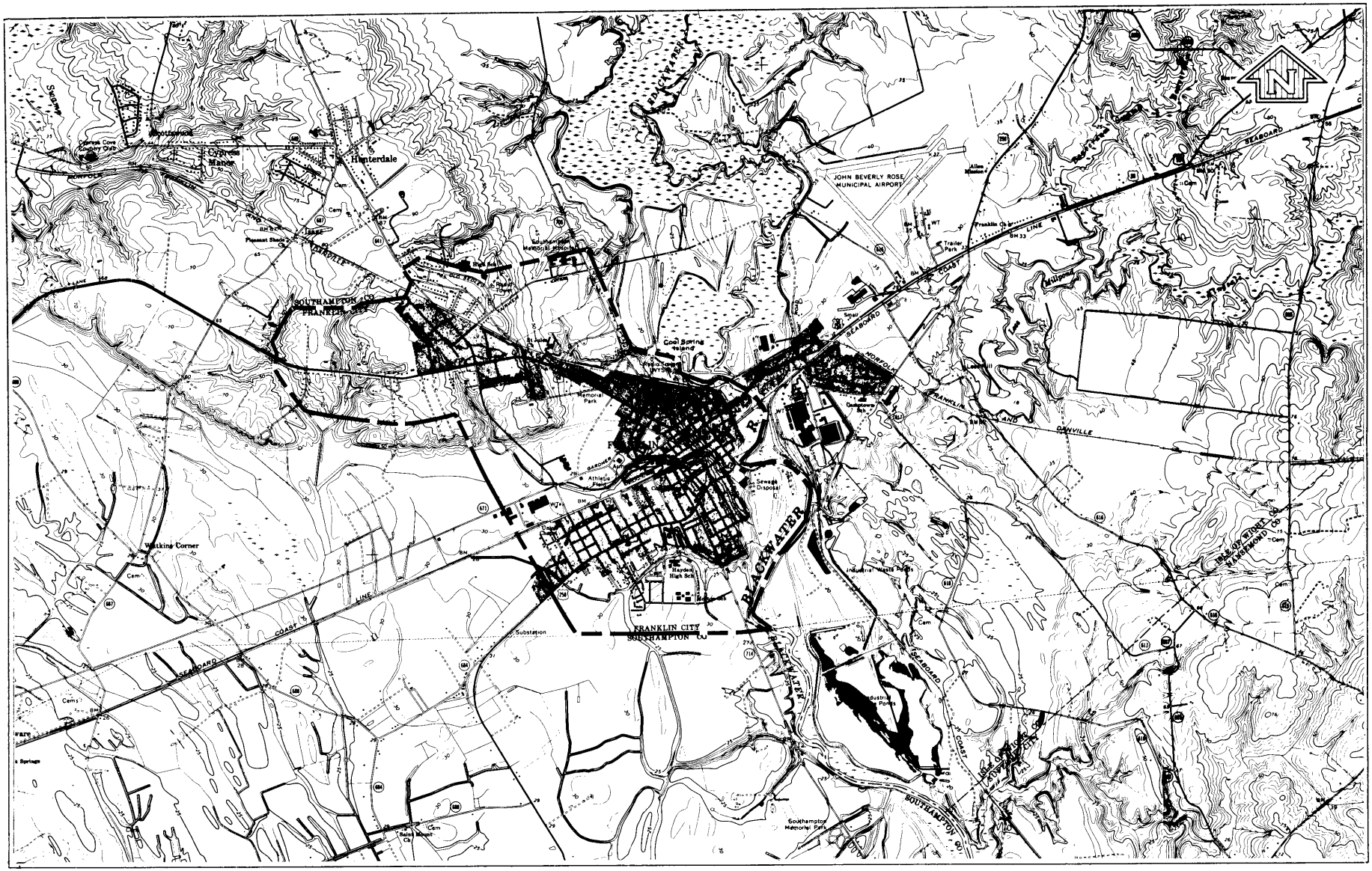



FIGURE 1

**DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT**
**Federal Insurance Administration**

# CITY OF FRANKLIN, VA
## (INDEPENDENT CITY)

**APPROXIMATE SCALE**

4400 0 4400 8800 13,200 FEET

## VICINITY MAP

The Blackwater River at Franklin is navigable and used by Union Camp Corporation tug boats and barges as well as pleasure craft. There is a slight tide effect at low-water controlled by the wind.

In the Blackwater River basin, elevations vary from about 180 feet in the headwater area to about 5 feet at the mouth. Topography at Franklin varies from about 5 to 80 feet. Land use in the Blackwater River basin is about 67 percent forest cover, 25 percent cropland, 3 percent pasture, 4 percent urban, and 1 percent water (Reference 3). The basin is located in the Coastal Plain Physiographic Province. The surface of the Coastal Plain is a series of relatively flat terraces remaining from earlier marine transgressions and regressions. The surface is covered by unconsolidated or slightly cemented sand, gravel, clay, and shell beds deposited by streams and seas from the Cretaceous Period to the present.

## 2.3 Principal Flood Problems

The past history of flooding near the City of Franklin indicates that flooding may occur during any season of the year. The majority of major floods have occurred during January to March and August to October (Reference 4).

The flood of record occurred in August 1940 and the second highest recorded flood was in September 1960. The discharges for these floods at the Franklin gaging station are 21,000 cfs and 9,420 cfs respectively (Reference 4). The estimated recurrence interval for these floods are 180 years and 20 years, respectively.

## 2.4 Flood Protection Measures

There are no existing or planned flood control structures within the city on the Blackwater River which would have an effect on base flood water-surface elevations.

Flood plain management measures in the City of Franklin are described in the Virginia Uniform Statewide Building Code. This building code was adopted by the City of Franklin and is enforced by a building official. The code states that, where a structure is located in the 100-year flood plain, the lowest floor must be built at or above the 100-year flood elevation, except for non-residential structures which may be flood-proofed to that level (Reference 5).

The city has mapped the August 1940 flood (flood of record), and regulates development in the flood plain on the basis of the historic floodmarks (Reference 6). Since this flood (180-year flood) exceeds the 100-year flood, the present regulations exceed statewide building code regulations.

## 3.0 ENGINEERING METHODS

For the flooding source studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data 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 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 ten) and, for any 90-year period, the risk increases to about 60 percent (six in ten). 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 the peak discharge-frequency relationships for floods of the selected recurrence intervals for the flooding source studied in detail affecting the community.

The peak discharges for the Blackwater River at Franklin are based on statistical analysis of discharge records covering a 36-year period at the Franklin gaging station (No. 02049500) operated by the USGS (Reference 4). This analysis followed the standard log-Pearson Type III method as outlined by the Water Resources Council (Reference 7).

A summary of drainage area-peak discharge relationships for the Blackwater River 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 |
|---|---|---|---|---|---|
| BLACKWATER RIVER | | | | | |
| At downstream corporate limits | 713 | 8,090 | 15,500 | 20,000 | 34,800 |
| At upstream corporate limits | 671 | 7,610 | 14,600 | 18,800 | 32,700 |

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding source studied in detail were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along this flooding source.

Cross sections for the backwater analysis of the Blackwater River were obtained by field measurement and supplemented by a topographic map at an enlarged scale of 1:6,000 with a contour interval of 5 feet (Reference 8). Data for some subsections in wide flood plains and densely wooded subsections were taken from the map. All other data including all below-water sections were obtained by field measurement. All bridges were field checked to obtain elevation data and structural geometry. Survey data was obtained using a base line survey technique.

Channel roughness factors (Manning's "n") used in the hydraulic computations were based on field observations of the stream and flood plain areas. Roughness values for the main channel of the Blackwater River ranged from 0.037 to 0.060 and flood plain roughness values ranged from 0.040 to 0.12 for all floods. The acceptability of assumed hydraulic data was checked by computations that duplicated the August 1940 historic flood water profile downstream from the Seaboard Coast Line Railway (References 6 and 9).

Water-surface elevations of floods of the selected recurrence intervals were computed through use of the USGS E-431 step-backwater computer program (Reference 10). Starting water-surface elevations were calculated from a stage-discharge rating established for a cross section at State Route 189, 3.3 miles downstream from the city limits. This rating was based on stage and discharge data for the August 1940 flood, slope conveyance computations, and logarithmic plotting.

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

All elevations used in this study are referenced to the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Sea Level Datum of 1929. Locations of the elevation reference marks used in the study are shown on the maps.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are valid only if hydraulic structures remain unobstructed and do not fail.

## 4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study 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 the 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 enlarged to 1:6,000 with a contour interval of 5 feet (Reference 8). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year boundary has been shown.

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 and 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 can 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 floodway in this report is presented to local agencies as a minimum standard that can be adopted or that can be used as a basis for additional studies.

The floodway presented in this study is based on a surcharge of 0.3 foot at the downstream corporate limits considering equal conveyance reduction from each side of the flood plain. The surcharge increases to a maximum of 0.6 foot at the upstream corporate limits. The imposition of a surcharge greater than 0.3 foot at the downstream corporate limits creates a rise in the 100-year flood elevation upstream from the Seaboard Coast Line Railway bridge greater than 1 foot, which exceeds FIA guidelines.

After considering equal conveyance reduction from each side of the flood plain, the floodway boundaries were established giving consideration to the following factors: no excessive increase in main channel velocities which would erode the streambed, smooth floodway alignment, uniform width along short reaches, minimum width increments of 50 feet, and local requirements. The results of these computations were tabulated at selected cross sections for the stream segment for which the floodway was computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown. A portion of the floodway of the Blackwater River is outside of the corporate limits.

| FLOODING SOURCE | | FLOODWAY | | | BASE FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE[1] | WIDTH[2] (FT.) | SECTION AREA (SQ. FT.) | MEAN VELOCITY (F.P.S.) | REGULATORY (NGVD) | WITHOUT FLOODWAY (NGVD) | WITH FLOODWAY (NGVD) | INCREASE (FEET) |
| Blackwater River | | | | | | | | |
| A | 3,170 | 850/670 | 11,290 | 1.8 | 14.2 | 14.2 | 14.6 | 0.4 |
| B | 4,990 | 850/670 | 11,000 | 1.7 | 14.4 | 14.4 | 14.8 | 0.4 |
| C | 7,070 | 450/20 | 5,540 | 3.4 | 14.5 | 14.5 | 15.0 | 0.5 |
| D | 8,510 | 450/230 | 6,450 | 2.9 | 14.9 | 14.9 | 15.3 | 0.4 |
| E | 9,240 | 700/390 | 7,740 | 2.4 | 15.5 | 15.5 | 16.0 | 0.5 |
| F | 9,710 | 700/280 | 9,180 | 2.1 | 15.7 | 15.7 | 16.2 | 0.5 |
| G | 10,420 | 700/150 | 10,700 | 1.8 | 15.9 | 15.9 | 16.4 | 0.5 |

[1] Feet above corporate limits

[2] Width/width within corporate limits

TABLE 2

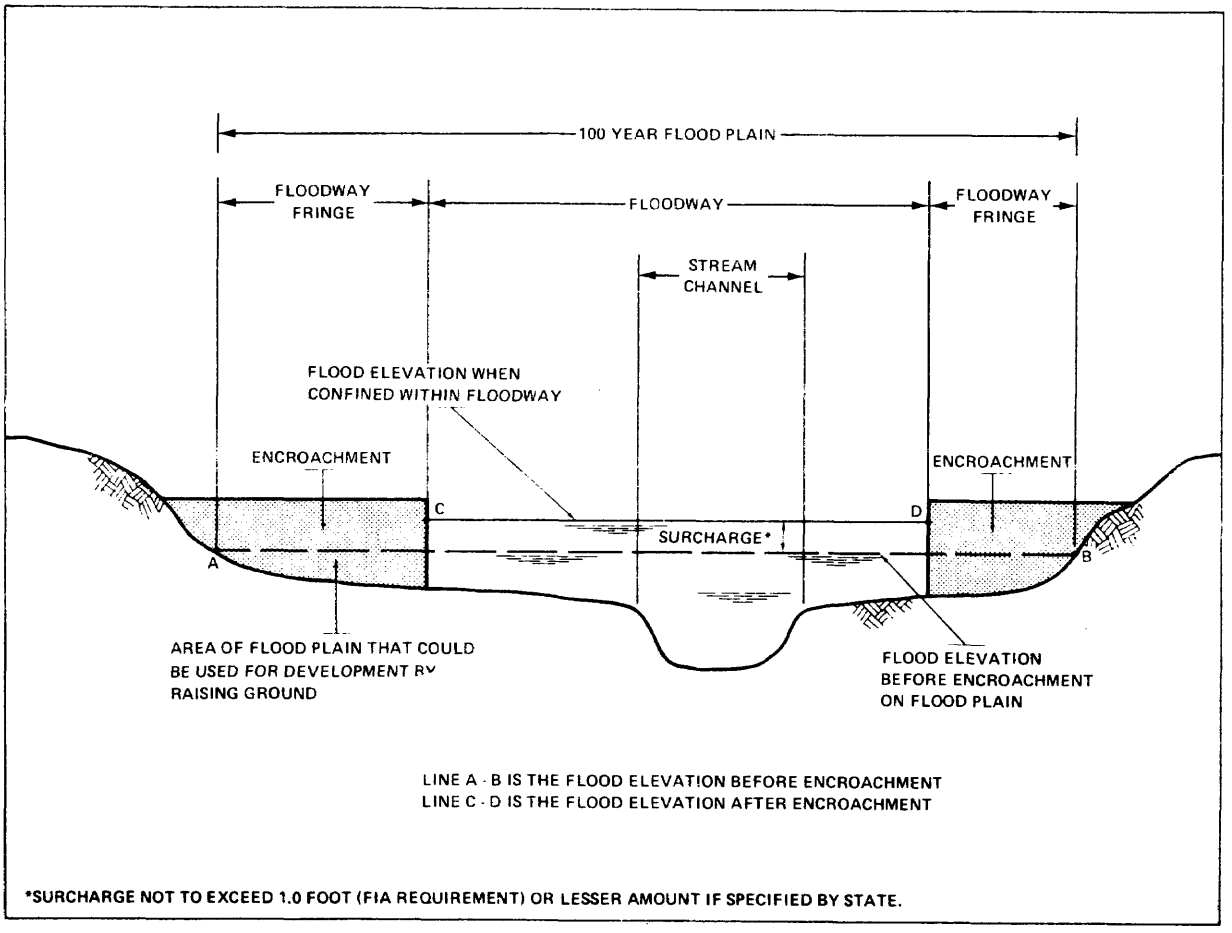
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

# CITY OF FRANKLIN, VA
(INDEPENDENT CITY)

## FLOODWAY DATA

## BLACKWATER RIVER

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 by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.




**FLOODWAY SCHEMATIC** Figure 2

## 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 the flooding source affecting the City of Franklin.

### 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 Blackwater River at Franklin. The location of the reach is shown on the Flood Profile (Exhibit 1) and is summarized in the Flood Insurance Zone Data Table (Table 3).

### 5.2 Flood Hazard Factors

The FHF is the FIA device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their 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 0.5 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 FHFs, the entire incorporated area of Franklin 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 A14: | Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHF. |
| 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; 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. |

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

## 5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Franklin 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

A map delineating the August 1940 flood and a flood hazard boundary map were published for the City of Franklin. These maps are in exact agreement with this study (References 6 and 11). No other studies were found to exist at the time of this report.

| 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.) | | | |
| Blackwater River Reach 1 | 01 | -6.9 | -2.3 | +5.3 | 070 | A14 | 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

# CITY OF FRANKLIN, VA
(INDEPENDENT CITY)

## FLOOD INSURANCE ZONE DATA

## BLACKWATER RIVER

This study is authoritative for 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, Region III Office, Curtis Building, Sixth and Walnut Streets, Philadelphia, Pennsylvania 19106.

## 8.0 BIBLIOGRAPHY AND REFERENCES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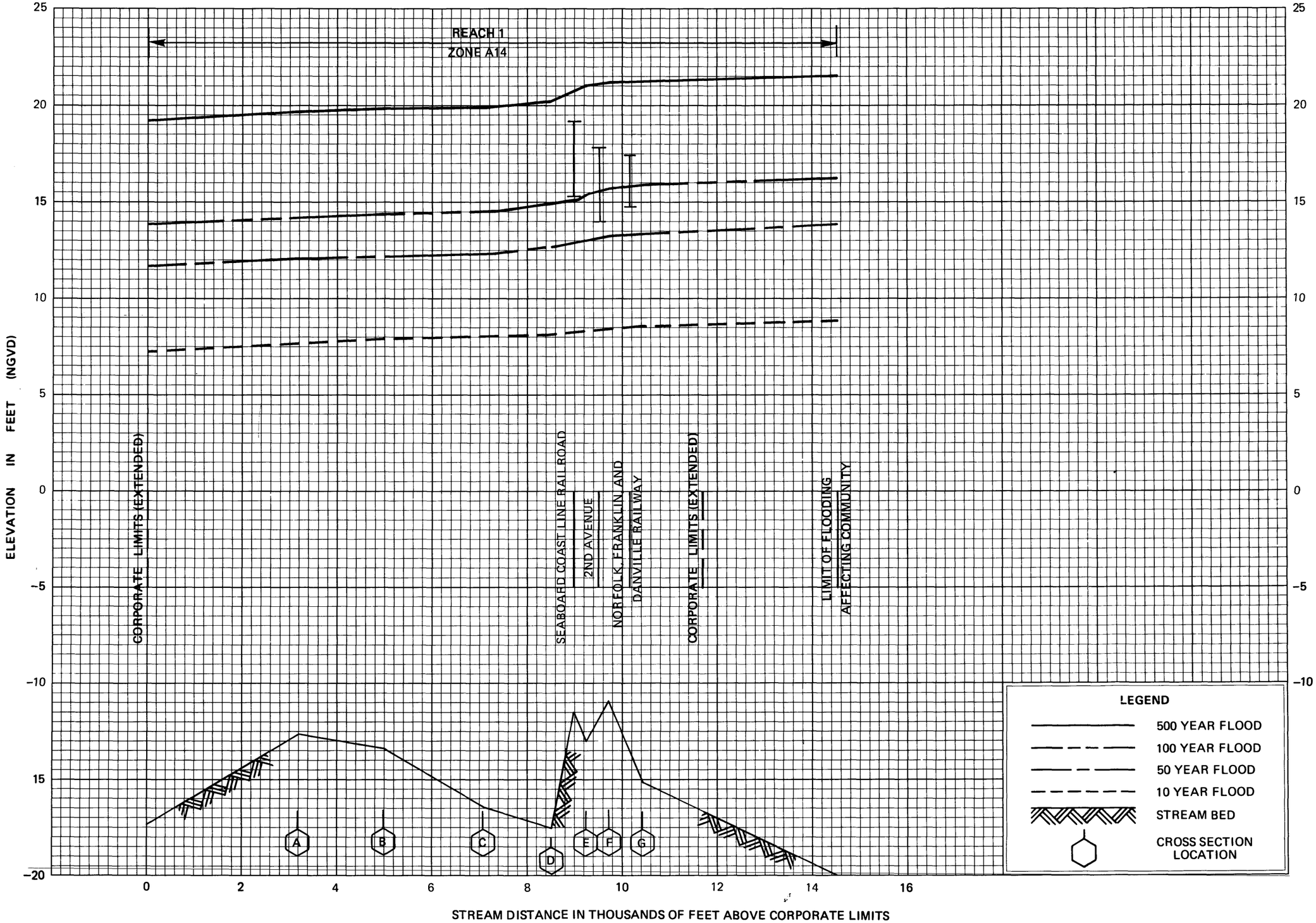
11. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Franklin, Southampton County, Virginia, April 2, 1976.




# FLOOD PROFILES

## BLACKWATER RIVER

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

## CITY OF FRANKLIN, VA
(INDEPENDENT CITY)

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