FLOOD PLAIN MANAGEMENT STUDY

GAP CREEK
CONWAY COUNTY
ARKANSAS

COOPERATING AGENCIES

City of Plumerville

The Conway County Conservation District

and

The Arkansas Soil and Water Conservation Commission

U. S. Department of Agriculture
Soil Conservation Service
Post Office Box 2323
Little Rock, Arkansas 72203

AUGUST 1981

TABLE OF CONTENTS

A. Introduction

The Plumerville City Council and the Conway County Conservation District requested the Arkansas Soil and Water Conservation Commission to make a flood plain management study on Gap Creek and its Town Branch (No Name Branch) tributary in Conway County, with emphasis on flood prone areas within the City of Plumerville. The objectives of the City of Plumerville and the Conway County Conservation District in requesting the Gap Creek (Plumerville) Flood Plain Management Study are to identify:

a. Areas subject to flooding from 10-year and 100-year frequency flood events (see glossary).

b. Existing flood damages

c. Natural values

d. Flood plain management alternatives

The Gap Creek Flood Plain Management Study was prepared in accordance with the August 1974 Joint Agreement for Flood Hazard Analysis and Flood Plain Studies between the Arkansas Soil and Water Conservation Commission (AS&WCC) and the United States Department of Agriculture, Soil Conservation Service (SCS). SCS was designated as the agency to carry out the flood plain management study by the AS&WCC. Participation by the SCS is authorized under Section 6, Public Law 83-566; Recommendation 3, A Unified National Program for Flood Plain Management, Water Resources Council, September 1979; Executive Order 11988, May 24, 1977 and the U. S. Department of Agriculture Secretary's Memorandums 1606 and 1607, November 7, 1966.

The AS&WCC supplied information concerning federally subsidized flood insurance. The City of Plumerville provided office space, secured survey rights-of-way and participated in an April 2, 1981 public meeting where study findings were presented.

The Gap Creek study was based in part on information gathered in the field, including level surveys by SCS personnel. The peak flows were based upon statistical methods in absence of stream gage data using Arkansas Geological Commission Water Resources Circular 11 (WRC 11) "Floods in Arkansas, Magnitude and Frequency Characteristics Through 1968," by James L. Patterson. The water surface elevations were determined for the Gap Creek and Town Branch stream reaches using the peak discharges computed by the WRC 11 method and the Water Surface Profile 2 Program (WSP2). The WSP2 Program is a computational procedure for determining water surface profiles using hydraulic relationships and measured or estimated physical data.

Hydrologic studies involve many factors which are constantly changing and affect the flood elevations and peak discharges. Examples of these variables are existing soil moisture conditions, flood plain and watershed vegetation, and flood flow restrictions. These factors, along with the unpredictability of precipitation events, make hydrologic studies an approximation of floodwater elevations occurring with a given set of conditions. Factors considered in this study were conditions existing at the time of the field investigations.

B. Study Area Description

Gap Creek Watershed is in south-central Conway County, 37 miles west-northwest of Little Rock, Arkansas. (See the vicinity map on page 3.) The upper end of the drainage area is in the upland region of the Arkansas River Valley. From the upland region, Gap Creek passes through the undulating lowlands to the outlet, the Arkansas River.

The Gap Creek area has a humid subtropical climate with a mean annual temperature of 62 degrees Fahrenheit and mean annual precipitation of 46 inches. Summer temperatures average 82 degrees Fahrenheit and winter temperatures average 43 degrees Fahrenheit. Extremes of 111 and of -15 degrees Fahrenheit have been recorded.

Of the 46 inches of annual precipitation, half occurs from April through September. Much of this rain falls during short duration, high intensity storms.

The major streams in the study area are Gap Creek and Town Branch. There are 20 structures built on the Town Branch flood plain; whereas, there is little development except for a limited number of road crossings on the Gap Creek flood plain. Since Gap Creek directly effects Town Branch, a detailed study was conducted to establish different flood elevations in the total study area. See Vicinity Map on page 3 for definition of study area.

LEGEND

Corporate Limits

Stream

Study Area

LIMIT OF STUDY

PARKER CORPORATE LIMITS

INT RTE 40

CORPORATE LIMITS

NESBITT AVE

NESBITT AVE

CORPORATE LIMITS

TAYLOR

BOWORE

CANNAN

SIMMS

BOYD

CHURCH

MALONE

OVERCUP

VAN BUREN

BROWN

MOORE

U S HWY 64

U S HWY 64

RAILROAD AVE

MISSOURI PACIFIC R R

LIMIT OF STUDY

CORPORATE LIMITS

GAP CREEK

GAP CREEK

HILL

LIMIT OF STUDY

CORPORATE LIMITS

N

VICINITY MAP

CITY OF PLUMERVILLE, ARKANSAS

FLOOD PLAIN MANAGEMENT STUDY

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

LITTLE ROCK, ARKANSAS

400 0 400 800

SCALE

ARKANSAS

Map prepared
by Field Personnel

USDA-SCS-FORT WORTH, TEXAS 1981

EXHIBIT 1

C. Natural Values

1. Soil resources and land use

The watershed of Gap Creek consists of two segments; rolling hills and bottomland. The rolling hills are found in the upper parts of the watershed. Soils in this area are Mountainburg Enders and Linder. These soils are well drained loams on low hills with narrow to broad winding ridgetops, steep side slopes and narrow drainageways. The main land uses in this segment are grassland and forestland.

Soils comprising the bottomland soils are Leadvale-Taft and Moreland-Roellen. Leadvale-Taft soils vary from "moderately well drained to somewhat poorly drained". These loamy soils are level to gently sloping on local stream terraces. Moreland-Roellen soils are level poorly drained clay soils on broad flood plains and low terraces. Land uses within this area are pasture and cropland.

Land use in the Gap Creek drainage area is as follows: 87 acres cropland; 2,739 acres grassland; 1,556 acres woodland; 544 acres of urban area; and 216 acres of other (water, streams, roads, etc.). Dispersed throughout the area are 2,439 acres of prime farmland which is 47 percent of the watershed.

2. Wildlife, Fish and Water Quality

Town Branch is an upland intermittent stream with a narrow flood plain. Frequency and duration of flooding along this tributary is not sufficient to create wetland vegetation. Practically all of the flood plain contains homes and other structures resulting in only a narrow band of streambank vegetation. This streambank vegetation is suitable for songbird, small mammal, amphibian and reptile habitat. The quantity and quality of this habitat is not sufficient to support populations of squirrel, deer, or turkey. Fish habitat is very limited due to the lack of sufficient water flow during most of the summer and fall months. A few existing pools of water do provide habitat for a few minnows and sunfish that are adapted to life in stagnant pools. Water in the stream should be of good quality with the primary pollution source being runoff from nearby streets.

The Gap Creek flood plain is very narrow upstream from Plumerville's eastern boundary. Downstream from this point the flood plain expands and merges with alluvial areas formed by the Arkansas River. Urban development within the flood plain of Gap Creek is very limited. Woodland and pasture are interspersed within this flood plain with most of the woodland occurring as a narrow band adjacent to the stream. Within the study limits, frequency and duration of flooding along Gap Creek is not sufficient to create wetlands as defined by Circular 39. Wetlands do occur along Gap Creek about one mile downstream from the flood plain management study limits. Existing woodland along Gap provides habitat for squirrel, rabbit, songbirds and a variety of other wildlife.

Fish habitat is somewhat limited due to the lack of significant water flow during summer and fall. However, pools three to five feet deep within the stream should support populations of several species of warmwater fish. The stream is not of sufficient size to support a significant sport fishery. Water quality is impacted by effluent from a sewage lagoon located in the flood plain immediately downstream from Plumerville.

D. Flood Problems:

A 100-year frequency flood event would flood 20 acres of urban land (scattered housing) and 42 acres of forestland (see Exhibits 3A, 3B, and 3C) and would damage three single family dwellings and 13 commercial establishments. A 10-year frequency flood event would damage three commercial establishments. Future upland land use changes are not expected to appreciably change the nature of flooding.

High water interferes with proper functioning of the community's sewage systems and inundates a county road, which could adversely affect emergency services to isolated farms.

Obsolete buildings in the flood prone area are not being replaced. Thus flood damages are likely to decline over time; however, flood problems will remain a concern in the absence of remedial actions.

E. Existing Flood Plain Management

State or local ordinances that control development of flood prone areas of Plumerville are not being implemented. The public, through the Plumerville City Council, expressed a desire for a program that would include structural measures and nonstructural measures. These measures would include enlarging bridge openings and an implementation of a flood insurance program.

The public is concerned about financing structural measures, as the community's resources are limited. They have also expressed a desire to implement flood plain management ordinances to be eligible for a federally subsidized flood insurance program, which would provide financial security to flood prone area property owners and occupants.

F. Alternatives and Opportunities

Five alternatives were studied to solve the Gap Creek flood plain problems; primarily the reduction of flood damages within the city limits of Plumerville.

Alternative 1 consists of the installation of flood water retarding dams and the implementation of a floodplain management program, similar to the program described as Alternative No. 3, to control future development in remaining flood hazard areas. Alternative 1 would not achieve the desired results as the installation of dams at the few available structure sites would not significantly alleviate flood problems in Plumerville.

Alternative 2, a channel modification option, is capable of alleviating flooding in Plumerville. In this alternative, the railroad opening on Town Branch will need to be enlarged, the Town Branch and Gap Creek channels would be enlarged and a floodplain management program to control future development on remaining flood hazard areas would be implemented. Alternative 1 and Alternative 2 have high costs of installation.

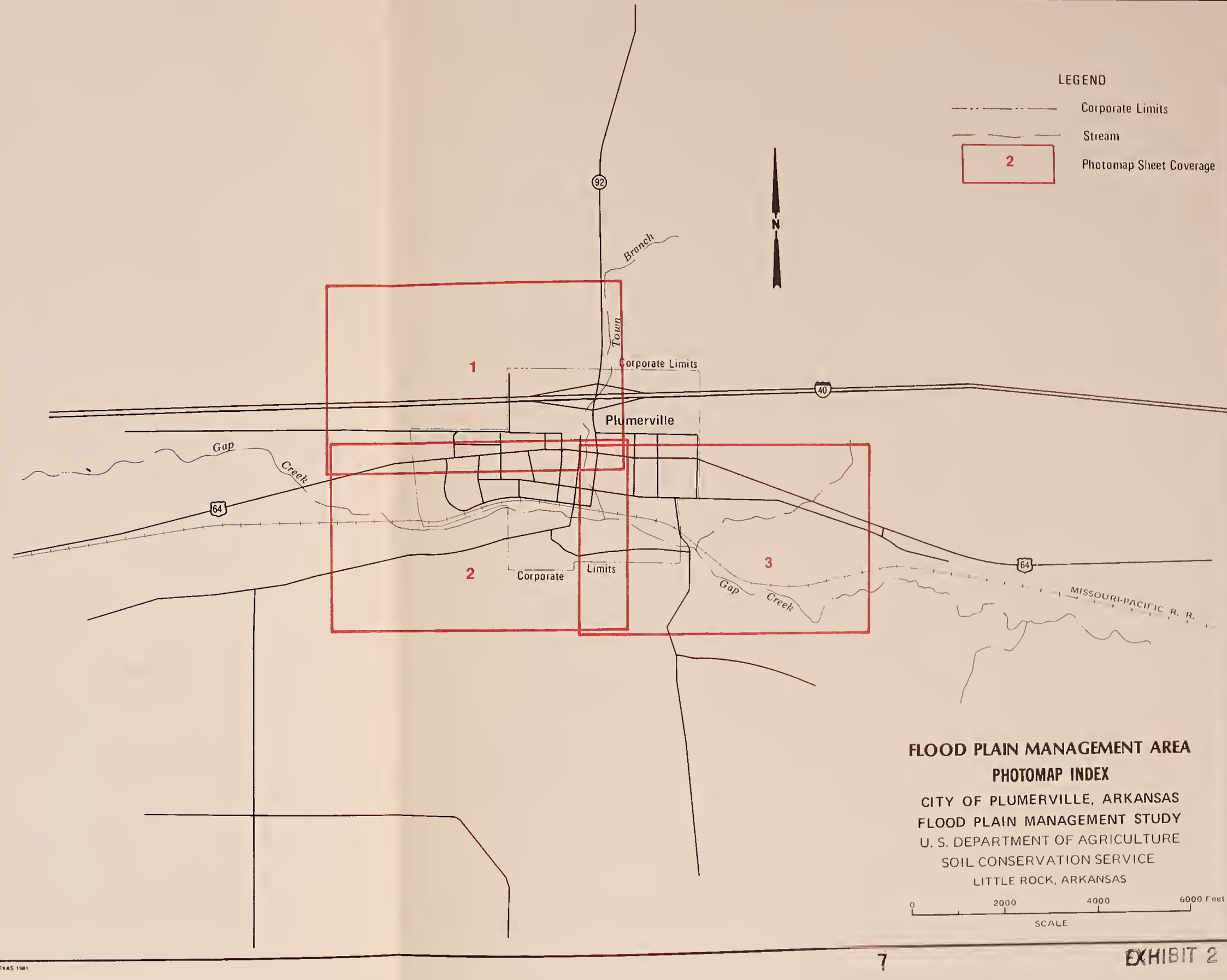
Alternative 3 involves the implementation of a flood plain management program which would make Plumerville's flood prone properties eligible for federally subsidized flood insurance. The flood plain management program would involve the enacting and the implementing of ordinances that would require that all new construction and substantial improvements in Department of Housing and Urban Development identified flood prone areas be elevated or floodproofed to the level of the base flood (100-year). Flood data presented in this report may be utilized to establish the base flood.

Alternative 4 consists of flood plain land use change. The steps comprising Alternative 4 include (1) enlarging the opening for Town Branch under the railroad track, (2) changing land use on the flood plain from the junction of Town Branch and Gap Creek to immediately downstream of the Plumerville sewage lagoon, and (3) implementation of a floodplain management program to control future development on remaining flood hazard areas and participation in the flood insurance program. Land use would change from forestland to grassland. No channel modification would be involved.

Alternative 5 is the "no project" alternative. By observation, the flood plain area is being evacuated as buildings become outdated and unusable.

Of the five alternatives, Alternative 4 appears the most feasible for reducing urban flood damages, but a detailed economic investigation is needed to support this conclusion. Effects of this alternative would extend upstream from the railroad bridge to Church Street along the Town Branch flood plain. Upstream of Church Street, flood insurance would need to be available to property owners since flood elevations would not be reduced. However, Alternative 3 would, through its flood insurance provisions, provide compensation to flood prone area property owners at a minimum cost when damage occurs.

With respect to environmental impacts, Alternative 4 would result in fewer impacts to existing natural values than would Alternatives 1 and 2, and more impacts than would Alternatives 3 and 5. Alternative 4 would reduce the quality of wildlife habitat on Gap Creek by 30 acres of forestland.



FLOOD PLAIN MANAGEMENT AREA
PHOTOMAP INDEX

CITY OF PLUMERVILLE, ARKANSAS
FLOOD PLAIN MANAGEMENT STUDY
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LITTLE ROCK, ARKANSAS

0 2000 4000 6000 Feet
SCALE

USDA-SCS-FORT WORTH TEXAS 1981

EXHIBIT 2

FLOOD PLAIN MANAGEMENT AREA

TOWN BRANCH

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
CITY OF PLUMERVILLE, ARKANSAS
FLOOD PLAIN MANAGEMENT STUDY
CONWAY COUNTY

SHEET 1 OF 3

USDA-SCS-FORT WORTH, TEXAS 1981

EXHIBIT 3A

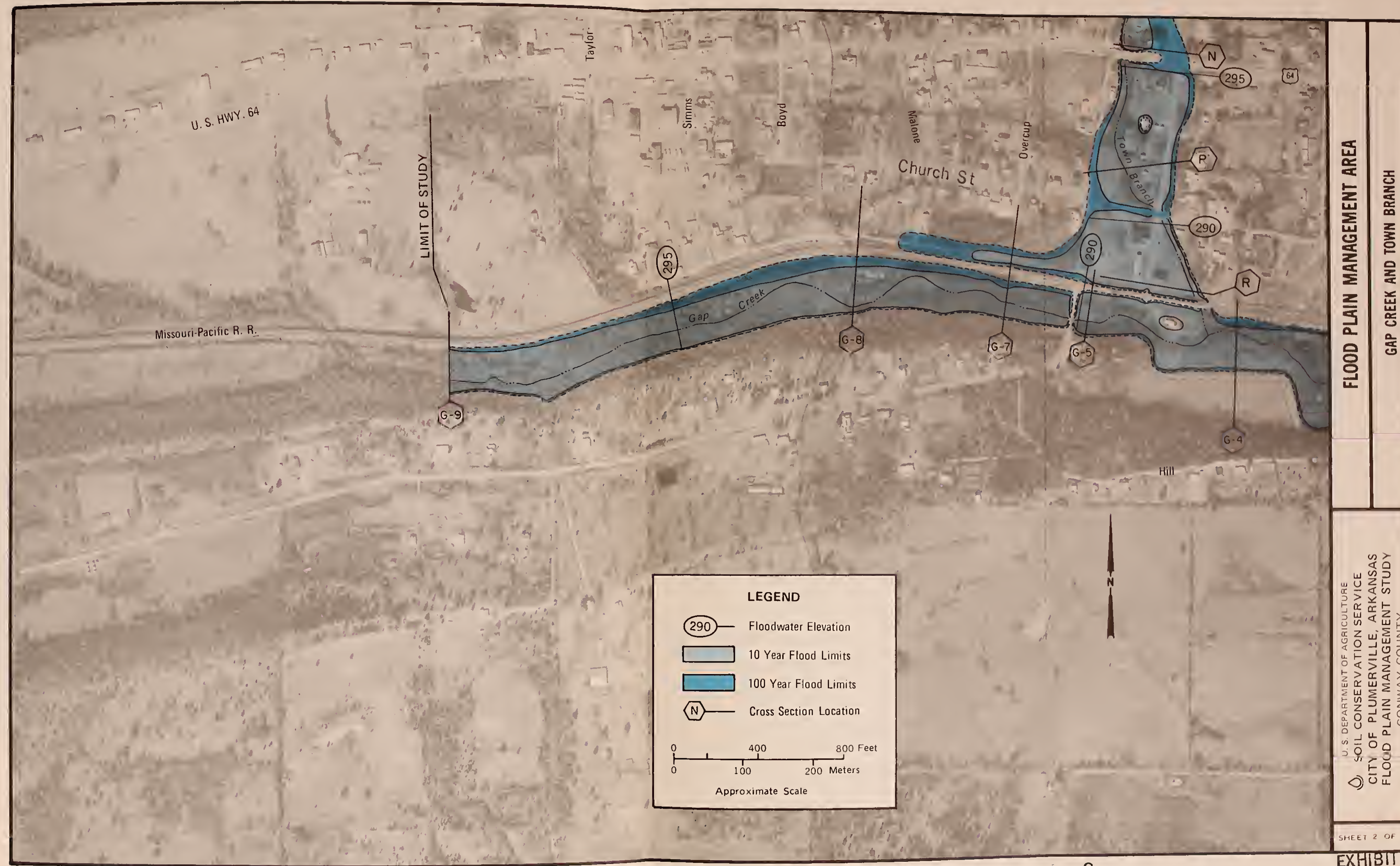

U. S. HWY. 64
LIMIT OF STUDY
Taylor
Simms
Boyd
Malone
Overcup
Church St
Town Branch
Gap Creek
Missouri-Pacific R. R.
Hill
64
N
295
R
290
G-9
G-8
G-7
G-5
G-4
LEGEND
290 Floodwater Elevation
10 Year Flood Limits
100 Year Flood Limits
N Cross Section Location
0 400 800 Feet
0 100 200 Meters
Approximate Scale
FLOOD PLAIN MANAGEMENT AREA
GAP CREEK AND TOWN BRANCH
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
CITY OF PLUMERVILLE, ARKANSAS
FLOOD PLAIN MANAGEMENT STUDY
CONWAY COUNTY
SHEET 2 OF 3
USDA-SCS-FORT WORTH TEXAS 1981

EXHIBIT 3B

N
295
64
U. S. HWY. 64
P
Town
Branch
290
Brown
Moore
Church St
R
East St
286
Gap Creek
G-4
Hill
G-3
N
LIMIT OF STUDY
Missouri-Pacific R. R.

LEGEND

290 — Floodwater Elevation

10 Year Flood Limits

100 Year Flood Limits

N — Cross Section Location

0 400 800 Feet
0 100 200 Meters
Approximate Scale

FLOOD PLAIN MANAGEMENT AREA

GAP CREEK AND TOWN BRANCH

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
CITY OF PLUMERVILLE, ARKANSAS
FLOOD PLAIN MANAGEMENT STUDY
CONWAY COUNTY

SHEET 3 OF 3

USDA-SCS FORT WORTH TEXAS 1981

EXHIBIT 3C

GLOSSARY

Storm Duration: The time during which rainfall occurs.

Flood Damages: The destruction or injury of property due to rising water levels. In this study, flood damages were assumed to occur when the flood water elevation equaled or exceeded the lowest opening point into the structure.

Flood Frequency: An expression or measure of how often a hydrologic event of given size or magnitude is equaled or exceeded. For example, a 50-year-frequency flood is equaled or exceeded in size, only once in 50 years.

Flood Plain: A land area next to a stream which is periodically covered by flood water.

Flow Restrictions: An obstacle which limits the volume of water which passes through a specific section: for example, dikes, dense vegetation, levees, culverts, bridge openings, buildings and or similar structures.

Level Surveys: The gathering of data with engineering equipment using horizontal and vertical distances to depict the features of stream valleys.

Peak Discharge or Peak Flow: The maximum volume of water per unit time that is expected to run off from an area.

Prime Farmland: The soil that is best suited for producing food, feed, forage, fiber and oilseed crops. It gives the highest yields with minimum inputs of energy and money and results in the least damage to the environment. It includes all capability Class I soils, more than 80 percent of Class II soils, and less than a third of the Class III soils.

Recurrence Interval: The average number of years within which a given event will be equaled or exceeded. A 50-year frequency flood has a recurrence interval of once every 50 years.

BIBLIOGRAPHY

1. Patterson, James L., Floods in Arkansas, Magnitude and Frequency Characteristics Through 1968, Water Resources Circular No. 11, U. S. Geological Survey, Little Rock, Arkansas, 1971.

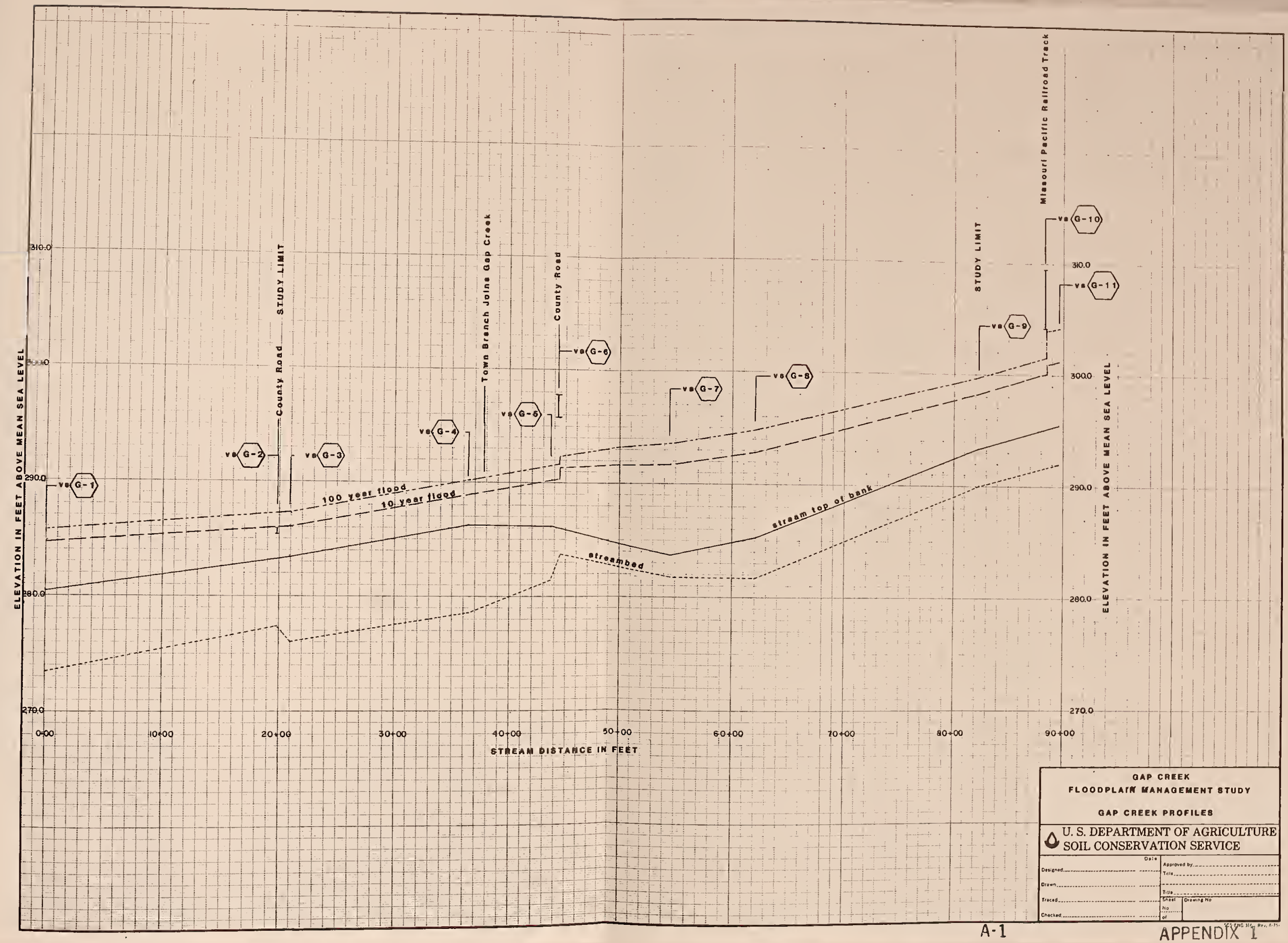
2. Questions and Answers: National Flood Insurance Program, U. S. Department of Housing and Urban Development, p.p. 7 and 12, Washington, D. C., May 1978.

3. Soil Survey of Conway County, Arkansas, U. S. Department of Agriculture, Soil Conservation Service and Forest Service.

4. Technical Release 61, WSP2 Computer Program, U.S.D.A., Soil Conservation Service.

Benchmark Data

Elevation:	297.78 msl
Designation:	Z 207 1962
Description:	In the southeast angle of the junction of U. S. Highway 64 and State Highway 92 in Plumerville, 42 feet south of the centerline of U. S. Highway 64, 2.2 feet southwest of a metal witness post, 4 feet north of a power pole, a brass disk set in the top of a square concrete post projecting 2 inches. Benchmark established by the Coast and Geodetic Survey.



GAP CREEK
FLOODPLAIN MANAGEMENT STUDY

GAP CREEK PROFILES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date		
Designed		Approved by	
Drawn		Title	
Traced		Title	
Checked		Sheet No / of	Drawing No

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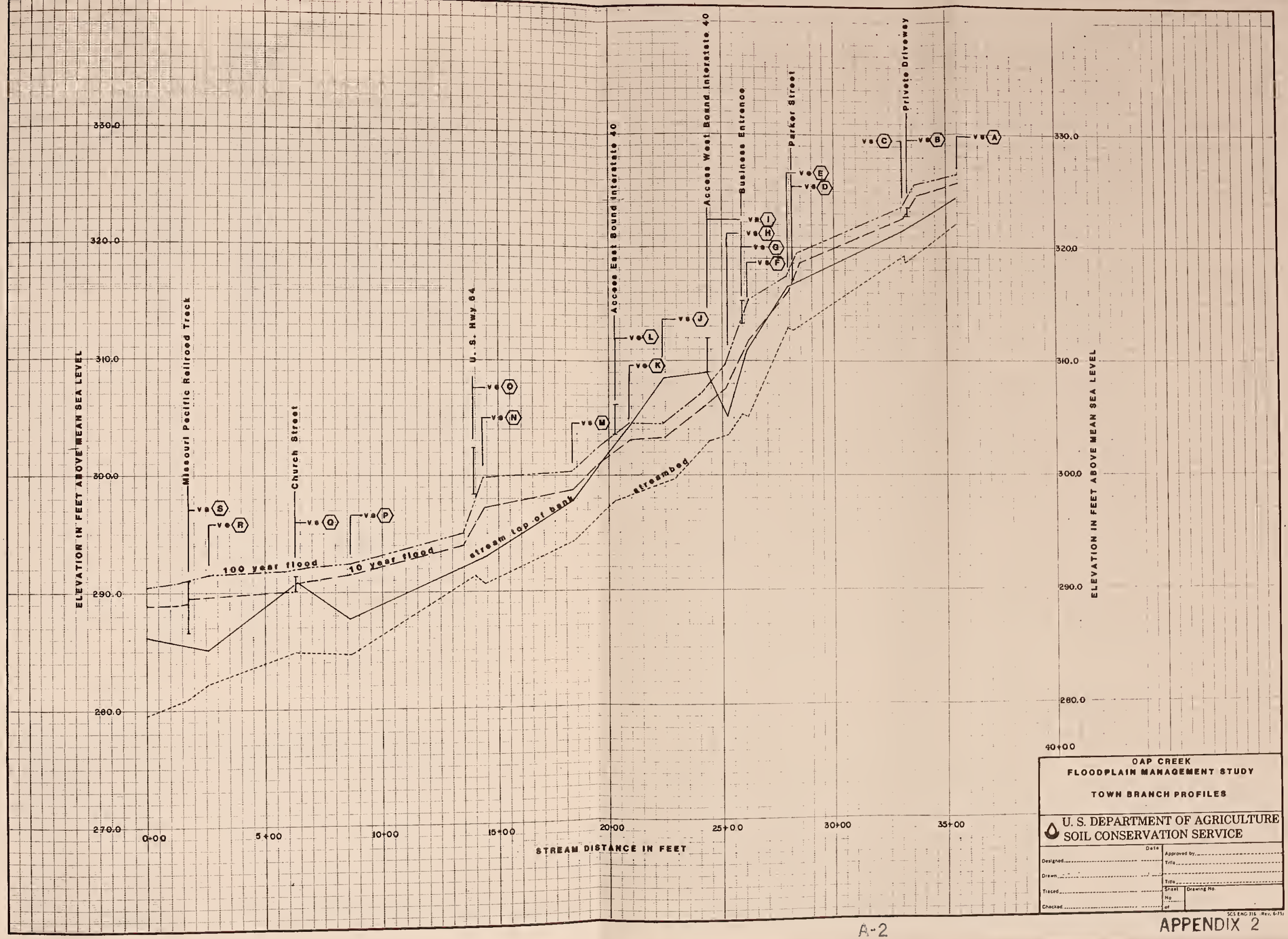

OAP CREEK
FLOODPLAIN MANAGEMENT STUDY

TOWN BRANCH PROFILES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed — Date — Approved by — Title
Drawn — Title
Traced — Sheet No. — Drawing No.
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APPENDIX 2

APPENDIX 3

CROSS SECTION DATA

GAP CREEK

Cross Section	Drainage[1] Area	Peak Flow[2] 10-Year	Peak Flow[2] 100-Year	Flood Elevation[3] 10-Year	Flood Elevation[3] 100-Year
G-1	8.0	3043	5769	284.8	285.7
G-2	6.2	2494	4729	286.0[4]	287.3[4]
G-3	6.2	2494	4729	286.1	287.3
G-4	6.2	2494	4729	288.7	290.3
G-5	4.9	2076	3936	290.0	291.6
G-6	4.9	2076	3936	290.8[4]	292.7[4]
G-7	4.9	2076	3936	291.7	293.5
G-8	4.9	2076	3936	292.8	294.9
G-9	4.5	1942	3683	298.2	299.8
G-10	4.2	1841	3490	300.7[4]	304.2[4]
G-11	4.2	1841	3490	301.2	304.2

TOWN BRANCH

A	0.5	382	735	325.7	326.4
B	0.7	497	956	324.6[4]	325.4[4]
C	0.7	497	956	322.6	323.6
D	0.7	497	956	318.7[4]	319.6[4]
E	0.7	497	956	316.2	317.5
F	0.8	551	1061	311.8	315.4
G	0.8	551	1061	311.5[4]	315.2[4]
H	0.8	551	1061	307.6	309.8
I	0.8	551	1061	307.7[4]	309.8[4]
J	0.8	551	1061	303.3	304.5
K	0.8	551	1061	303.1	304.6
L	0.8	551	1061	302.4[4]	304.1[4]
M	1.0	657	1262	298.8	300.4
N	1.0	657	1262	297.3	299.8
O	1.0	657	1262	297.0[4]	299.4[4]
P	1.0	707	1360	291.5	292.4
Q	1.1	707	1360	290.8[4]	292.1[4]
R	1.3	806	1549	289.7	291.5
S	1.3	806	1549	289.7[4]	291.5[4]

1/ Drainage area is in square miles.

2/ Peak flows, cubic feet per second, computed by method described in Floods in Arkansas, Magnitude and Frequency Characteristics Through 1968, Water Resources Circular No. 11, U. S. Geological Survey, 1971

3/ Flood elevation in feet above mean sea level

4/ Head water elevations

APPENDIX 4

INVESTIGATION AND ANALYSIS

The data used to establish the different flood frequency elevations shown in this report were gathered by Soil Conservation Service personnel. The flood plain topography was determined by level surveys of the Gap Creek and Town Branch area. Level surveys were referenced to a standard Department of Commerce, Coast and Geodetic Survey benchmark.

Peak discharge values were computed for the different drainage areas at the respective cross sections. Arkansas Geological Commission Water Resources Circular 11 (WRC 11) was the reference used in computing the magnitude of the 10 and 100-year frequency floods. (See page A-3 for the values obtained.) Survey data were combined with the peak discharges and incorporated into the Water Surface Profile 2 (WSP2) computer program by Service personnel. A discharge versus elevation curve was constructed from the WSP2 output for each cross section used in the study. Utilizing the curves and the peak discharges, the various flood elevations were determined. The flood elevations were transferred to their respective plotted cross sections yielding the widths of the 10-year and the 100-year frequency flood plains. The horizontal distances were transferred to the aerial photographs purchased from the United States Department of Agriculture, Agricultural Stabilization and Conservation Service Aerial Photography Field Office in Salt Lake City, Utah. The SCS Cartographic Unit processed the flood plain management area maps for inclusion in this report.

The number of buildings subject to flood water damages was determined by comparing the floodwater elevations to the elevation of the lowest point of entry of the structure. The lowest point of entry is an opening such as a basement window, door frame or other similar point.

Two meetings were held in Plumerville. The first meeting on July 18, 1980 was held to acquaint SCS personnel with the community's concerns and inform the community of the Flood Plain Management Study procedures. After completion of the technical studies, a public meeting was held on April 2, 1981 to present study findings and to accept comments and responses. The primary comment was that the 10-year flood limits should be enlarged laterally. In general, the community residents accepted the study findings which included the flood plain management area boundaries and a list of possible alternatives applicable to the study objectives.

Evaluation of alternatives followed established SCS guidelines. Initially community members desired a multipurpose floodwater retarding structure incorporating municipal water supply storage. After preliminary investigations, conclusions were drawn that floodwater retarding structures would not significantly reduce urban floodwater damages. Insufficient drainage area, inadequate depth, high installation cost, and an alternate dependable water source soon to be available to Plumerville also made structures impractical. Additional alternatives, structural and nonstructural, were also considered.

During this study, natural values in the study area and drainage area of Gap Creek and Town Branch were evaluated by a staff biologist and a resource conservationist. The areas were toured and details noted. Aerial photographs and published soil surveys were also utilized in determining natural values and prime farmland in the study area. This information has been incorporated into this report.