

STATE OF OKLAHOMA  
DEPARTMENT OF  
TRANSPORTATION

200 N. E. 21st Street  
Oklahoma City, Oklahoma 73105  
June 13, 1980

RECEIVED  
JUN 17 1980  
78077  
SURVEY DIVISION

P. O. Box 471  
Perry, Oklahoma

Kay County Commissioners  
Kay County - District One  
Airport Road  
Ponca City, Oklahoma 74601

SURVEY DIVISION	
✓ RLS	6-17-80
✓ OCC.	6/19/80
✓ JPA	6-17-80
AWZ	
X ✓ GP	6-20-80
RDA	
ROC	
SDD	
ISW	
RLM	
Div.	
EJN	

Dear Commissioners:

Attached for your information is a copy of the report of a hydraulic review study of the Bois d'Arc Creek bridge on US-60 as per your request of March 17, 1980. This study was prepared by our Bridge Division as related to accepted design standards.

R. L. Stringer  
Division Engineer

RLS/mds

Attachment to Mr. Andrews

cc: Mr. E. B. Kidd, Ass't. Director-Design  
Mr. Veldo Goins, Bridge Engineer  
Mr. J. P. Andrews, Survey Project Engineer  
File

FILE: FLOOD KAY CO. 18.6.9 Kay Co.

STATE TRANSPORTATION COMMISSION

CHAIRMAN—WILLIAM R. NASH, VICE CHAIRMAN—MRS. R. L. PARKER, SECRETARY—JAMES H. GUNGOLL, MEMBERS—JAMES W. ALLEN, W. E. ALLFORD, J. E. CARTER, JOHNNY M. PERRY, H. B. ATKINSON, DIRECTOR—R. A. WARD

AN EQUAL OPPORTUNITY EMPLOYER

ANTHONY F. VAP  
1000 W. 8TH  
NEWCASTLE, OKLAHOMA  
74647  
DISTRICT TWO

CHAIRMAN  
TOM W. HALL  
WEST FT GUSON  
BLACKWELL, OKLAHOMA  
74631  
DISTRICT THREE

ESTA T. KIRK  
AIRPORT ROAD  
PONCA CITY, OKLAHOMA  
74601  
DISTRICT ONE

DIV #4 FILE COPY

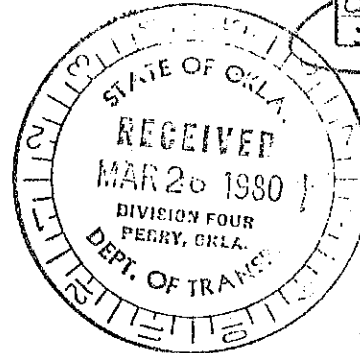
BOARD OF  
KAY COUNTY COMMISSIONERS  
KAY COUNTY, OKLAHOMA

MAINT.		
CONSTR.		
F/M		
ACCTG.		
WHSE.		
OFF. MGR.		
SHOP		
RES. ENGR.		
TRAFFIC		

*Copy for Div 4  
3/23/1980 mds*

March 17, 1980

R. L. Stringer  
Oklahoma Department of Transportation  
200 N.E. 21st Street  
Oklahoma City, OK 73105



Dear Mr. Stringer:

At our March 17, 1980 Board of County Commissioners meeting a group of homeowners and residents of Bois de'Arc in Ponca City appeared to bring to our attention a flooding problem, apparently created by the building of State Highway 60.

A spokesman for the group stated that there was no flooding prior to 1951, but since the building of State Highway 60 and construction of the bridge, there are not sufficient outlets for natural drainage of water in that area without flooding the community.

We are asking you for your findings and your evaluation of this problem. We would appreciate a reply as soon as possible.

Done by order of the Board of County Commissioners, County of Kay, State of Oklahoma, this 17th day of March, 1980.

*Norma Lee Cook  
for the Board*

Norma Lee Cook, Secretary  
for the Board of County Commissioners  
County of Kay, State of Oklahoma

NLC/ki



STATE OF OKLAHOMA  
DEPARTMENT OF  
TRANSPORTATION

200 N. E. 21st Street  
Oklahoma City, Oklahoma 73105

P. O. Box 471  
Perry, Oklahoma 73077

March 6, 1980

Mrs. Virginia Moore  
#3 Riverside Drive  
Ponca City, Oklahoma 74601

Dear Mrs. Moore:

Attached for your information are copies of Flood Study Information developed over several years for the area adjacent to Bois d'Arc Creek and Bois d'Arc Creek Sub-Division. As you can see, this problem has been reviewed several times. You will see where suggested changes were considered but were determined to be diversion of drainage and declared to be illegal according to Mr. Stout's letter. It appears that the recent 12" rainfall was the reason for the flooding situation.

After your review of these facts, if I can be of further assistance, please call.

A handwritten signature in cursive script, appearing to read "R. L. Stringer".

R. L. Stringer  
Division Engineer

RLS/mds

cc: Mr. J. B. Andrews, Survey Project Engineer  
File

STATE TRANSPORTATION COMMISSION

CHAIRMAN—WILLIAM R. NASH, VICE CHAIRMAN—MRS. R. L. PARKER, SECRETARY—JAMES H. GUNGOLL, MEMBERS—JAMES W. ALLEN,  
W. E. ALLFORD, J. E. CARTER, JOHNNY M. PERRY, H. B. ATKINSON, DIRECTOR—R. A. WARD

AN EQUAL OPPORTUNITY EMPLOYER

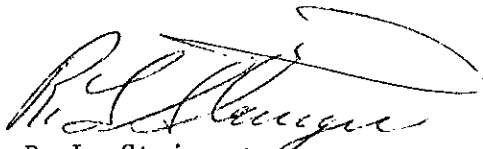
# Oklahoma Dept. of Transportation

Date March 31, 1980

To Mr. E. B. Kidd, Assistant Director-Design Div.  
From R. L. Stringer, Division Engineer  
Subject Flooding Complaint US-60 Kay County

Attached is a letter from the Kay County Commissioners concerning a flooding problem in the vicinity of US-60 and Bois'd'Arc creek in Kay county. Your advice and assistance would be appreciated.

Thank you for your assistance.



R. L. Stringer  
Division Engineer

RLS/mds

cc: File

# Oklahoma Dept. of Transportation

Date June 11, 1980

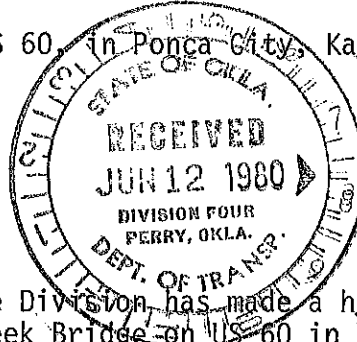
To Robert L. Stringer

From Veldo M. Goins

Subject Bois d'Arc Creek Bridge, US 60, in Ponca City, Kay County

DIV #4 FILE COPY

MAINT.		
CONSTR.		
F/M		
ACCTG.		
WHSE.		
OFF. MGR.		
SHOP		
RES. ENGR.		
TRAFFIC		



At your request, the Bridge Division has made a hydraulic review study of the Bois d'Arc Creek Bridge on US 60 in Ponca City. The study specifically looks at the heavy rain that occurred on November 20, 1979. Attached is our summary report for your use.

You will note that the 11 inches of rain that occurred on this date probably exceeded a 500-year flood. The bridges and road are designed for a 50-year flood. Obviously bridges and roads cannot be designed for a 500-year flood due to the extreme cost. A flood of this magnitude inundates the entire flood plain.

If you have any questions or if we can be of further assistance, please advise.

*Veldo M. Goins*  
Veldo M. Goins, P.E.  
Bridge Engineer

VMG/bjw

Attach

cc: Mr. Kidd

FLOOD STUDY REPORT - BOIS D'ARC CREEK

Heavy Rain Occurring Nov. 20, 1979

in Ponca City

Kay County

A Hydrologic and Hydraulic review was conducted for the flood of November, 1979, in the vicinity of Bois d'Arc and US 60, in Ponca City. Exhibits I thru VII were utilized in this review. Exhibit I was taken from the Climatological Data for the month of November, 1979, published by the National Oceanic and Atmospheric Administration. Exhibit II was taken from Technical Paper No. 40, published by the Weather Bureau, U. S. Dept. of Commerce. Exhibits III thru VII were taken from a Flood Insurance Study conducted by USGS for Ponca City.

Exhibit I shows that on November 20, 1979, the amount of precipitation for Ponca City was 11.11 inches, while on the 19th and 21st of same month, it was nil and 0.05". From this data, a storm duration of 24 hours can be assumed conservatively. Exhibit II shows that for a 100-year storm of 24-hour duration, the amount of precipitation for Ponca City would be 8.3". This indicates that the storm of November 20, 1979, produced an amount of rainfall 34% in excess of a 100-year storm of the same duration. Exhibit III shows the discharges of Bois D'arc associated with the 10-year, 50-year, 100-year, and 500-year floods. Exhibit IV shows that the computed water surface elevation of the 100-year flood downstream and upstream from US 60, are 947.4' (Section Y-55) and 948.9' (Section Y-70) respectively. This would indicated that the 100-year backwater due to bridge is 1.5 feet. Exhibit V shows that for Reach 1, the 500-year computed highwater would be 1.4 feet above that of the 100-year

Flood Study Report

flood. The extreme highwater for the November, 1979, flood, measured by the Survey Crew at the overflow structure 1,000 feet north of US 60 was 952.2. Exhibit VI shows that the 500-year computed highwater at that location is 951.0' below the 952.2' mark. The 1979 flood exceeded the 500-year flood and probably approached the probable maximum flood.

In conclusion, US Highway 60 and bridges in that area were designed to accommodate the 50-year flood. Flooding of properties could not have been attributed to the encroachment of highway on floodplain, but to their location in or adjacent to the floodplain when that tremendous flood took place. The flood of November, 1979, is so rare that its magnitude might have approached that of the Probable Maximum Flood. A flood of this magnitude would have caused damage to houses within the floodplain with or without the highway.

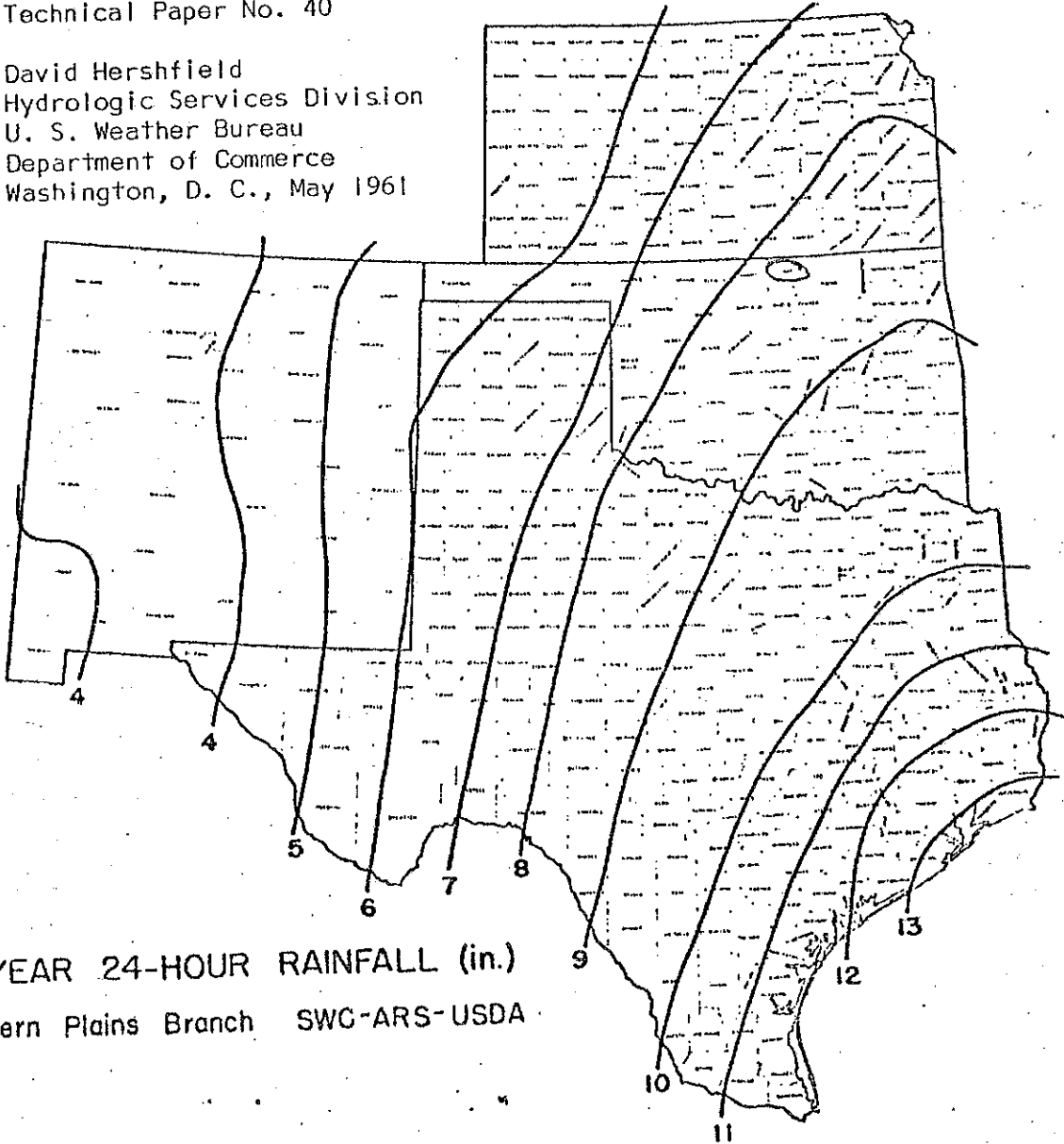




REFERENCE :

Rainfall Frequency Atlas of the  
United States for Durations from  
30 Minutes to 24 Hours and Return  
Periods from 1 to 100 Years  
Technical Paper No. 40

By: David Hershfield  
Hydrologic Services Division  
U. S. Weather Bureau  
Department of Commerce  
Washington, D. C., May 1961



100-YEAR 24-HOUR RAINFALL (in.)  
Southern Plains Branch SWC-ARS-USDA

SCALE IN MILES  
0 100 200 300  
ALBERS EQUAL-AREA PROJECTION

## 2.4 Flood Protection Measures

Most of the flood problems in Ponca City are caused by the Arkansas River, however, all floods except major floods, should be controlled by Kaw Dam. The ephemeral streams B, C, D, E, G, H, I, L and M are concrete lined with concise channels, tributaries C, D and I have flood detention ponds designed to reduce flooding downstream. Tributaries in the study area have recreational park areas in the flood plains and streets that follow the general path of the tributaries.

## 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 drainage areas of the streams.

### 3.1 Hydrologic Analyses

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

Regional relationships relating basin characteristics to discharge frequency (Reference 1) were used to determine flood discharges for streams in Ponca City. To define discharge-frequency for streams in Ponca City, regional relationships relating basin characteristics to the analysis used were outlined by Sauer (Reference 2). The 100-year flood elevations for the stream reaches delineated by approximate methods were determined by depth frequency analysis as outlined by Thomas (Reference 3).

The peak discharge drainage area relationships for the selected recurrence intervals are presented in Table 1, "Summary of Discharges".

TABLE 1 - SUMMARY OF DISCHARGES

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (sq. miles)</u>	<u>PEAK DISCHARGES (cfs)</u>			
		<u>10-YEAR</u>	<u>50-YEAR</u>	<u>100-YEAR</u>	<u>500-YEAR</u>
<u>BOIS D'ARC CREEK</u>					
At U. S. 60		7,716	15,400	19,000	30,200
At confluence of Tributary M		7,100	14,800	17,600	28,400
At Hartford Avenue		6,130	12,100	14,900	23,700

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCR/PASC (FEET)
Bois d'Arc Creek								
Y10	600	1,425	6,681	2.84	938.0	938.0	939.0	1.0
Y20	2,500	1,100	6,249	3.04	939.1	939.1	940.0	0.9
Y25	6,300	1,785	7,710	2.46	942.2	942.2	942.6	0.4
Y40	6,880	2,500	8,456	2.25	943.1	943.1	943.4	0.3
Y50	8,540	2,300	5,874	3.23	944.9	944.9	945.6	0.7
Y55	9,700	3,000	7,576	2.51	947.4	947.4	948.0	0.6
Y70	9,900	2,600	14,119	1.35	948.9	948.9	949.2	0.3
Y80	13,200	1,700	5,608	3.39	949.8	949.8	950.3	0.5
Y85	14,800	2,000	8,894	2.14	950.7	950.7	951.5	0.8
Y100	15,400	2,000	8,052	2.36	951.6	951.6	952.3	0.7
Y110	17,600	900	3,405	5.58	954.1	954.1	954.9	0.8
Y120	19,400	1,507	9,967	1.77	955.6	955.6	956.6	1.0
Y130	20,800	1,654	9,618	1.83	955.8	955.8	956.8	1.0
Y140	21,700	1,300	4,305	4.09	956.4	956.4	957.3	0.9
Y150	23,700	1,478	6,736	2.61	959.3	959.3	960.0	0.7
Y160	25,400	1,190	4,779	3.68	960.8	960.8	961.6	0.8
Y170	27,600	1,694	10,925	1.61	961.7	961.7	962.7	1.0
Y175	28,800	1,800	7,094	2.48	962.1	962.1	963.0	0.9
Y190	29,100	1,800	9,919	1.77	965.0	965.0	965.0	0.0
Y200	30,900	1,500	7,571	2.32	965.1	965.1	965.5	0.4
Y210	33,500	1,304	6,978	2.52	966.1	966.1	966.9	0.8
Y220	35,200	1,200	4,332	3.44	967.6	967.6	968.2	0.6

<sup>1</sup> Feet above county road

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT  
Federal Insurance Administration

CITY OF PONCA CITY, OK

[KAY CO.]

FLOODWAY DATA

BOIS D'ARC CREEK

FLOODING SOURCE	PANEL <sup>1</sup>	ELEVATION DIFFERENCE <sup>2</sup> BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION <sup>3</sup>
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Bois d'Arc Creek	*	-2.0	-0.5	+1.4	020	A4	Varies
Reach 1	*	-1.4	-0.3	+1.0	015	A3	Varies
Reach 2	*	-2.8	-0.8	+2.6	030	A6	Varies
Reach 3							
Reach 4	0005	-1.5	-0.6	+1.0	015	A3	Varies
Tributary L							
Reach 1	*	-0.9	-0.3	+1.1	010	A2	956.4
Reach 2	0010	-0.5	-0.1	+0.2	005	A1	Varies
Tributary M							
Reach 1	*	-1.5	-0.2	+0.7	015	A3	Varies
Reach 2	0010	-2.0	-0.4	+1.3	020	A4	Varies
Reach 3	0005, 0010	-1.0	-0.2	+0.6	010	A2	Varies
Reach 4	0005	-1.5	-0.4	+1.0	015	A3	Varies
Reach 5	0005	-2.2	-0.5	+2.0	020	A4	Varies
Reach 6	0005	-1.0	-0.2	+0.5	010	A2	Varies
Reach 7	0005	-3.2	-0.9	+2.1	030	A6	Varies
Reach 8	0005	-1.0	-0.5	+0.9	010	A2	Varies
Reach 9	0005	-2.4	-0.5	+0.7	025	A5	Varies
Reach 10	0005	-0.8	-0.2	+0.4	010	A2	Varies

<sup>1</sup>FLOOD INSURANCE RATE MAP PANEL

<sup>2</sup>WEIGHTED AVERAGE

<sup>3</sup>ROUNDED TO NEAREST FOOT - SEE MAP

\* Outside Corporate Limits

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT  
Federal Insurance Administration

CITY OF PONCA CITY, OK

[KAY CO.]

FLOOD INSURANCE ZONE DATA

BOIS D'ARC CREEK-TRIBUTARY L-TRIBUTARY M

TABLE 3

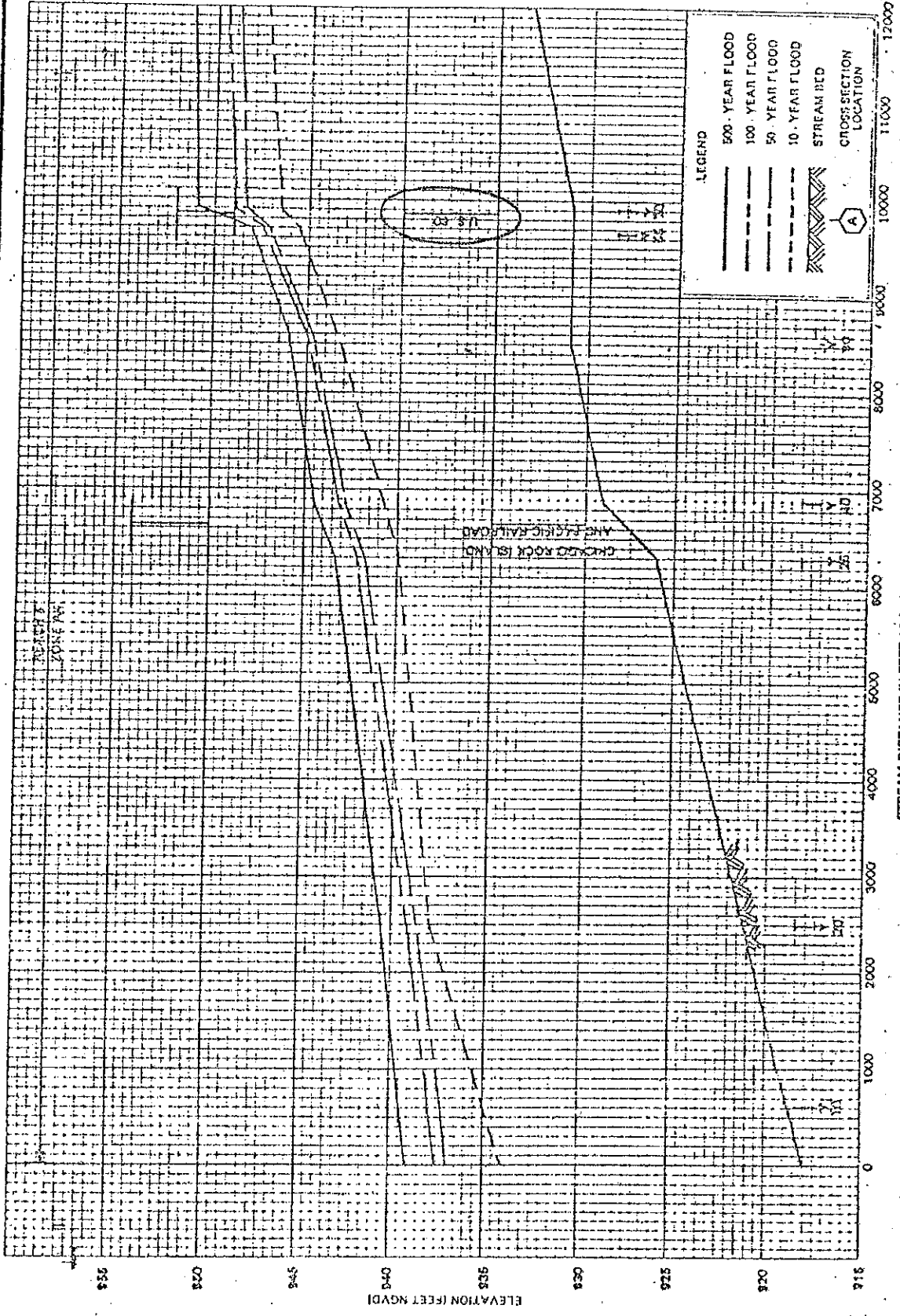
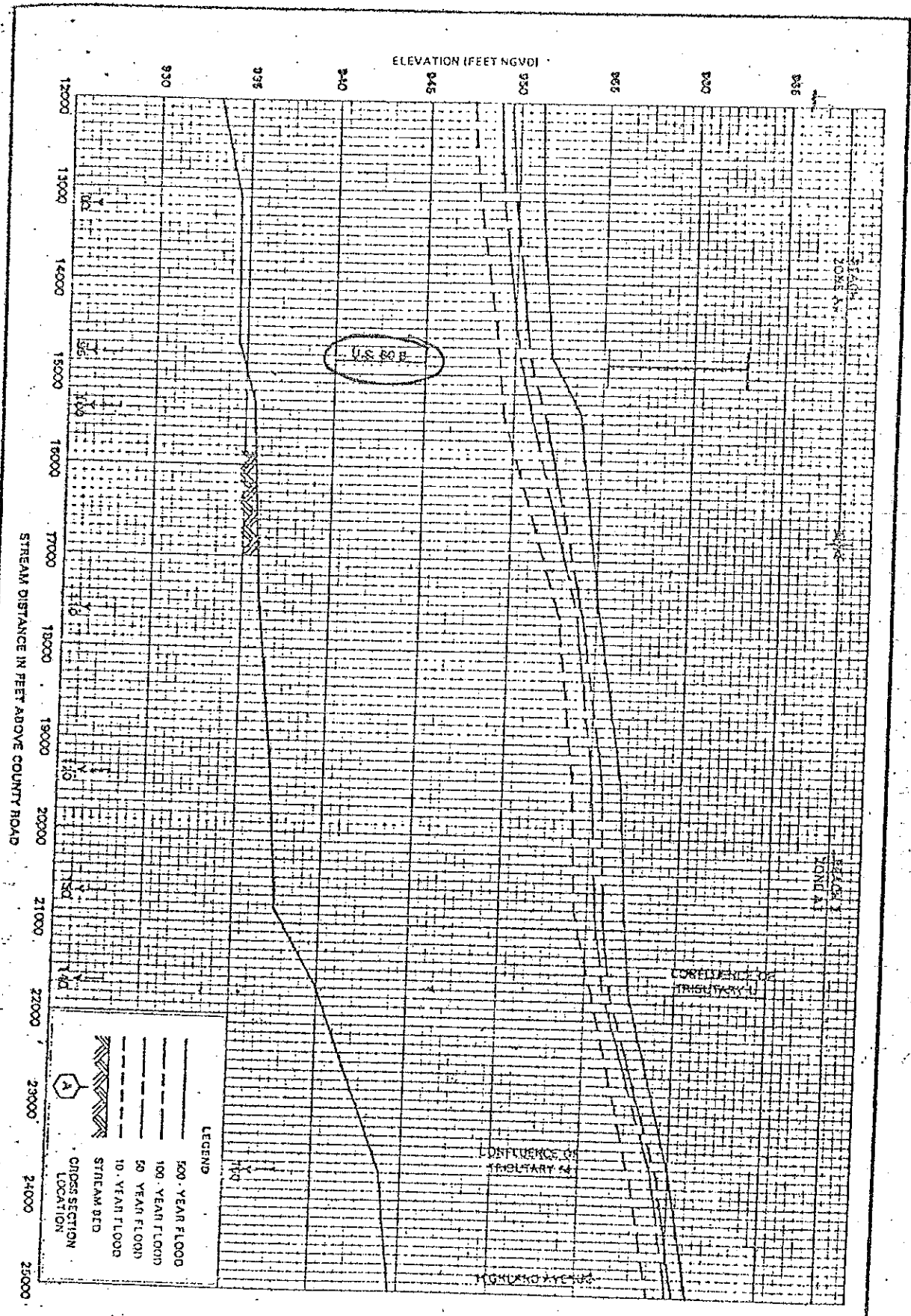


EXHIBIT VI



DEPARTMENT OF HOUSING AND BEAM DEVELOPMENT  
 Federal Housing Administration  
**CITY OF OKLAHOMA CITY, OK**  
 (KAY CO.)

**FLOOD PROFILES**  
**BOIS D'ARC CREEK**

02P