TETRA TECH

# Addendum to the Master Drainage Plan

*for*

***Hopkinsville Surface and Stormwater Utility***

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***Hopkinsville Surface and Stormwater Utility***
***101 North Main Street***
***Hopkinsville, Kentucky 42240***

*May 23, 2007*


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## 1.0 INTRODUCTION

The Hopkinsville Surface and Stormwater Utility selected Tetra Tech in May 2006 to develop a Master Drainage Plan that would address drainage and flooding problems in the City of Hopkinsville. Tetra Tech prepared the plan and submitted it to the utility board in a report dated January 22, 2007. The report consisted of three parts: (1) identification of surface drainage projects to improve the existing drainage system of pipes, culverts, and channels throughout the city, (2) flood mitigation measures for the South Fork of the Little River, and (3) flood mitigation measures for the North Fork of the Little River.

This addendum was prepared to:

- Provide information to better explain the operation of the North Fork watershed lakes
- Address the impact of the Eagle Way bridges on flood levels on the North Fork and South Fork of the Little River
- Address the impact of the Pennyrile Parkway extension on flood levels on the South Fork of the Little River
- Address the impact of cleaning the river on flood levels

## 2.0 NORTH FORK WATERSHED LAKES

The Master Drainage Plan indicated that the North Fork watershed lakes currently provide significant flood control for the North Fork. In addition, the report showed that even if the water supply volume of the lakes were used for additional flood control (by lowering the water level), the additional flood reduction in the city would only be 0.5 to 1.0 foot. Figure 1 through Figure 5 of this addendum provides information that helps to explain these results.

Figure 1 shows the current water supply volume and flood control volume for each lake. For comparison purposes, it also shows the runoff volume of 4.1 inches for each watershed. This number was used because it is the 100-year 3-hour design storm for the city. Figure 1 shows that each watershed lake currently provides significant flood control. As shown in Table 1 below, Lake Tandy has a storage capacity of 88% of the runoff volume, while Lake Morris has a storage

capacity of 184%, Lake Boxley has a storage capacity of 87%, and Lake Blythe has a storage capacity of 78%.

**TABLE 1 - NORTH FORK WATERSHED LAKES**
**EXISTING FLOOD STORAGE**

| Lake | Existing Flood Storage (million gallons) A | Runoff Volume of 4.1 inches (million gallons) B | Storage Capacity as a Percent of Runoff Volume (A/B) |
|---|---|---|---|
| Tandy | 380 | 434 | 88 |
| Morris | 980 | 534 | 184 |
| Boxley | 600 | 690 | 87 |
| Blythe | 190 | 245 | 78 |

Figure 2 through Figure 5 shows the 100-year inflow and outflow hydrograph for each watershed lake. As shown in Table 2 below, Lake Tandy reduces the peak flow by 75%, while Lake Morris reduces it by 92%, Lake Boxley by 79%, and Lake Blythe by 73%.

**TABLE 2 - NORTH FORK WATERSHED LAKES**
**100-YEAR PEAK FLOW REDUCTION**

| Lake | Peak Inflow (cfs) | Peak Outflow (cfs) | Percent Reduction |
|---|---|---|---|
| Tandy | 1462 | 360 | 75 |
| Morris | 2429 | 193 | 92 |
| Boxley | 1466 | 308 | 79 |
| Blythe | 1246 | 342 | 73 |

## 3.0 EAGLE WAY BRIDGES

Figure 6 through Figure 12 shows the flood profiles provided by AMEC as part of their work in Hopkinsville related to updating the floodplain maps. Figure 6 shows the South Fork at Eagle Way and a small (less than one foot) difference in the 100-year water level between the upstream and downstream side of the bridge. Figure 10 shows the North Fork at Eagle Way and no

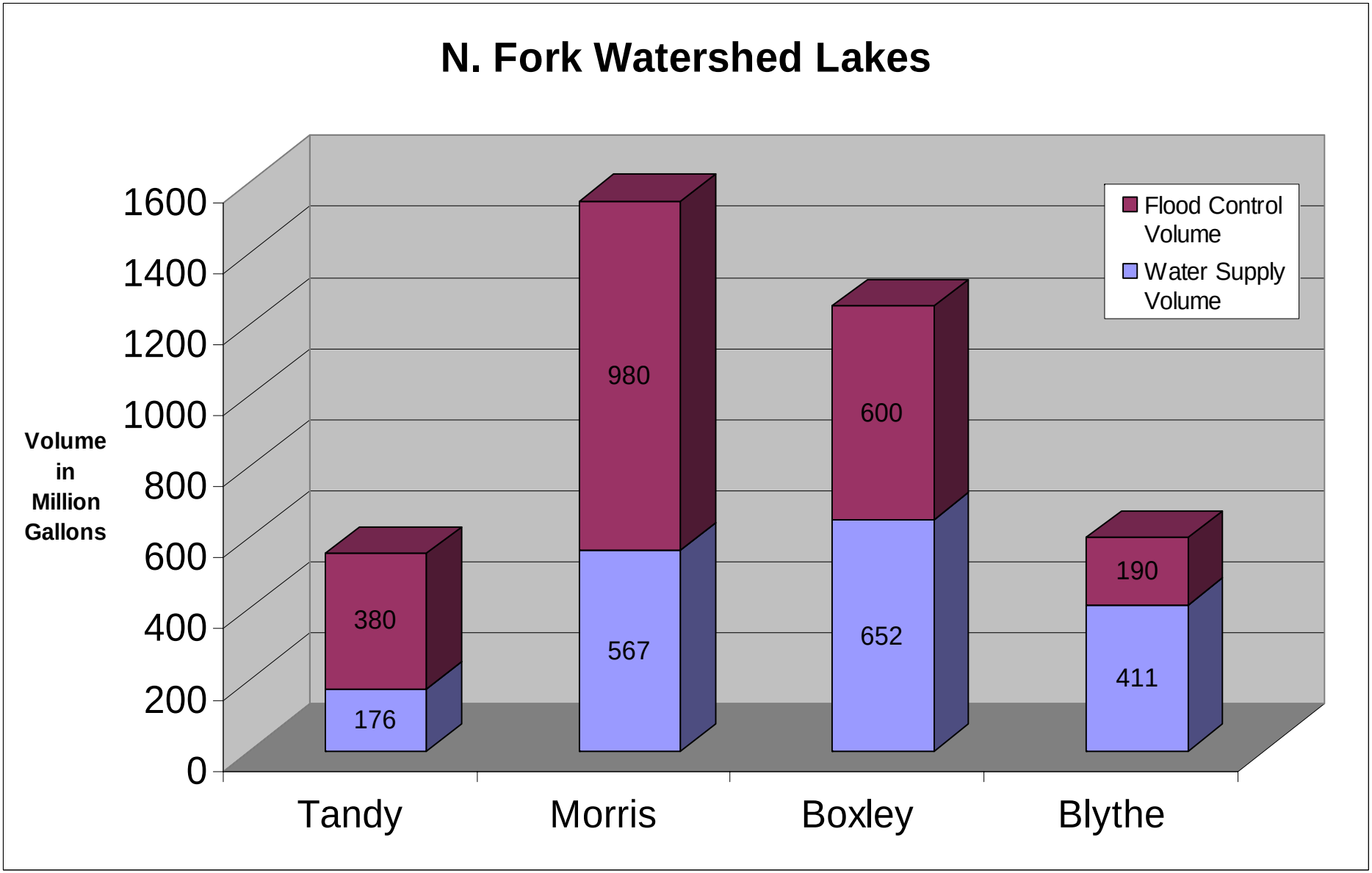
difference in the 100-year water level between the upstream and downstream side of the bridge. This indicates that the bridge structures are not creating a significant obstruction to flow.

## 4.0 PENNYRILE PARKWAY EXTENSION

Figures 13 and 14 show the extension of the Pennyrile Parkway. The parkway crosses the 100-year floodplain of a tributary to the South Fork at Eagle Way. However, it appears the parkway will not cause an obstruction to water flowing in the South Fork itself based on the location of the parkway relative to the location of the floodway and the flow path of the water.

## 5.0 CLEANING THE RIVER

Routine cleaning of the river of logjams and other debris is necessary to maintain the capacity of the open channel and to prevent clogging of culverts and bridges, thus preventing even higher flood levels. Removal of vegetation and trees along the stream banks would not significantly reduce flood levels and could destabilize the stream banks and cause erosion.




**4.1 inches of runoff equals:**

Lake Tandy, 3900 acres, - 434 million gallons
Lake Morris, 4800 acres, - 534 million gallons
Lake Boxley, 6200 acres, - 690 million gallons
Lake Blythe, 2200 acres, - 245 million gallons

Figure No. 1

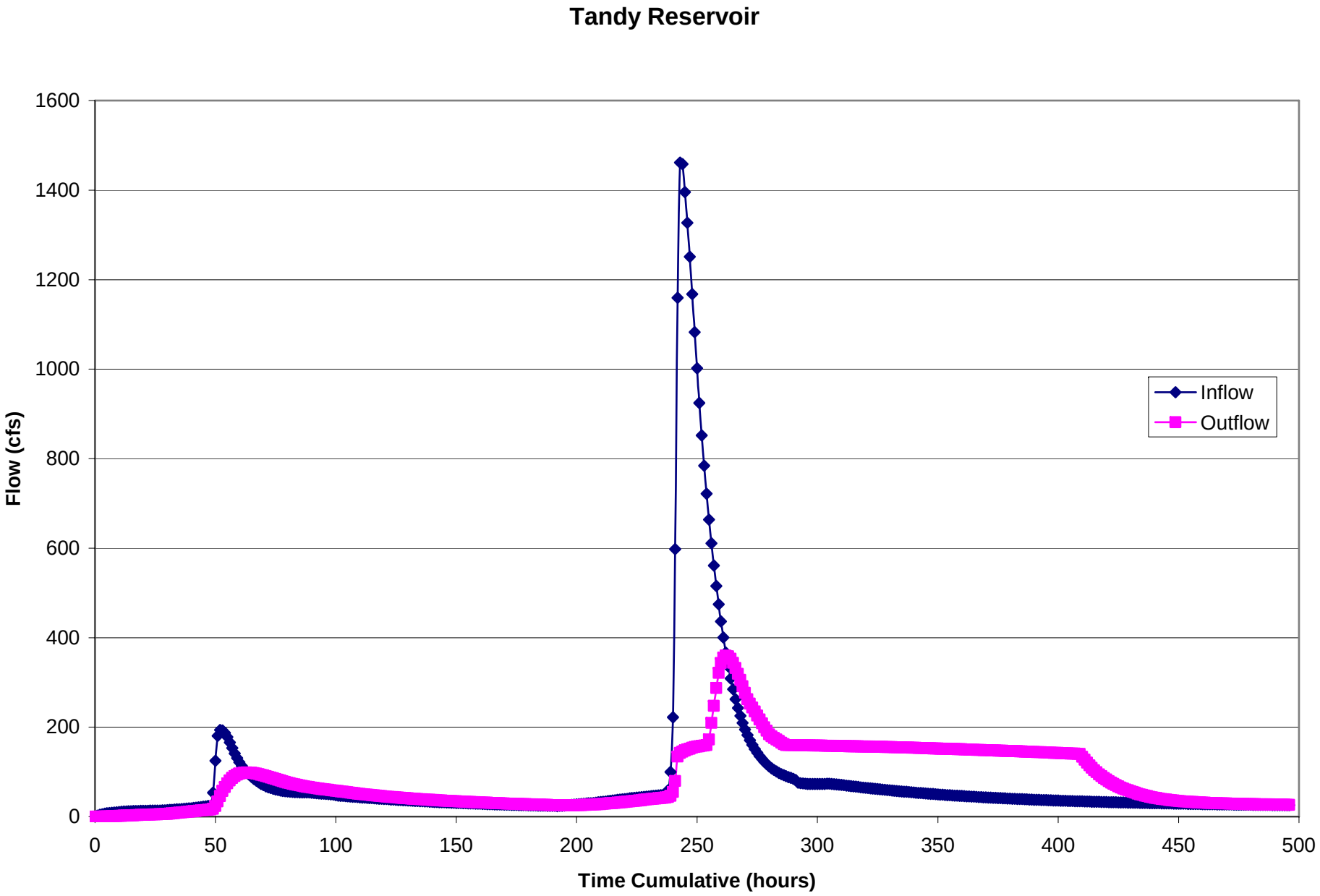

Tandy Reservoir
1600
1400
1200
1000
800
600
400
200
0
Flow (cfs)
0
50
100
150
200
250
300
350
400
450
500
Time Cumulative (hours)
Inflow
Outflow

Figure No. 2

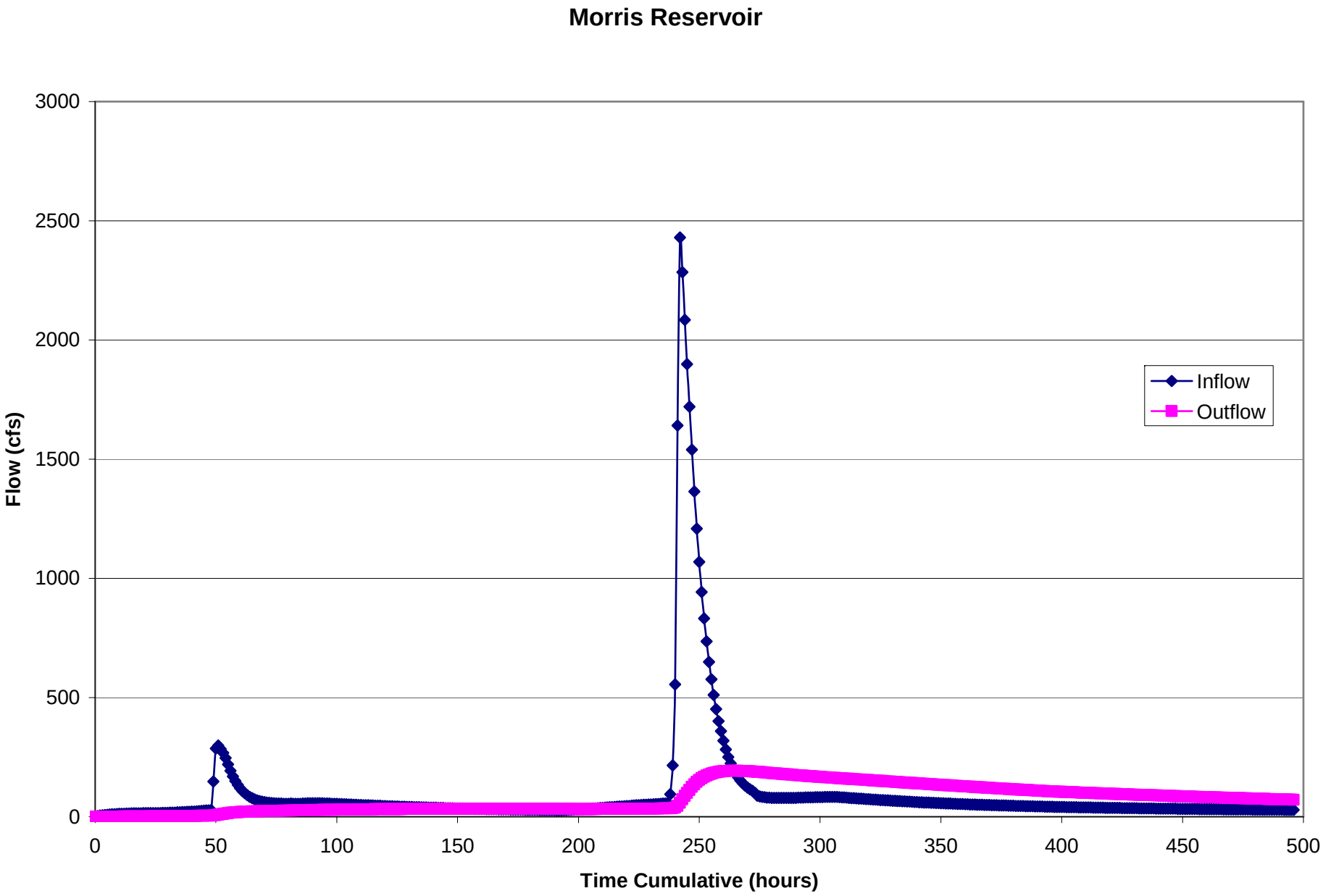

Morris Reservoir
3000
2500
2000
1500
1000
500
0
Flow (cfs)
0
50
100
150
200
250
300
350
400
450
500
Time Cumulative (hours)
Inflow
Outflow

Figure No. 3

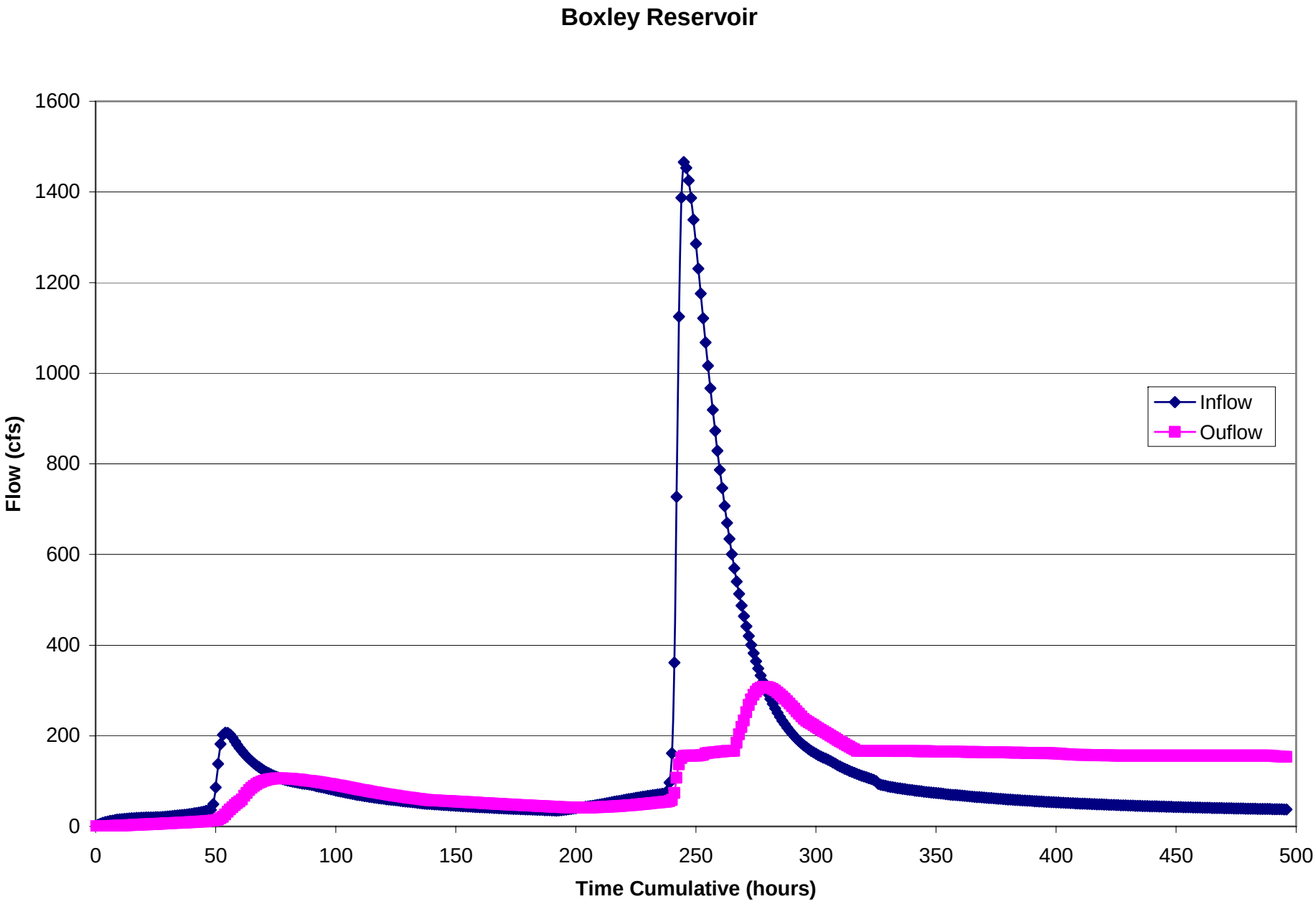

Boxley Reservoir
1600
1400
1200
1000
800
600
400
200
0
Flow (cfs)
0
50
100
150
200
250
300
350
400
450
500
Time Cumulative (hours)
Inflow
Ouflow

Figure No. 4

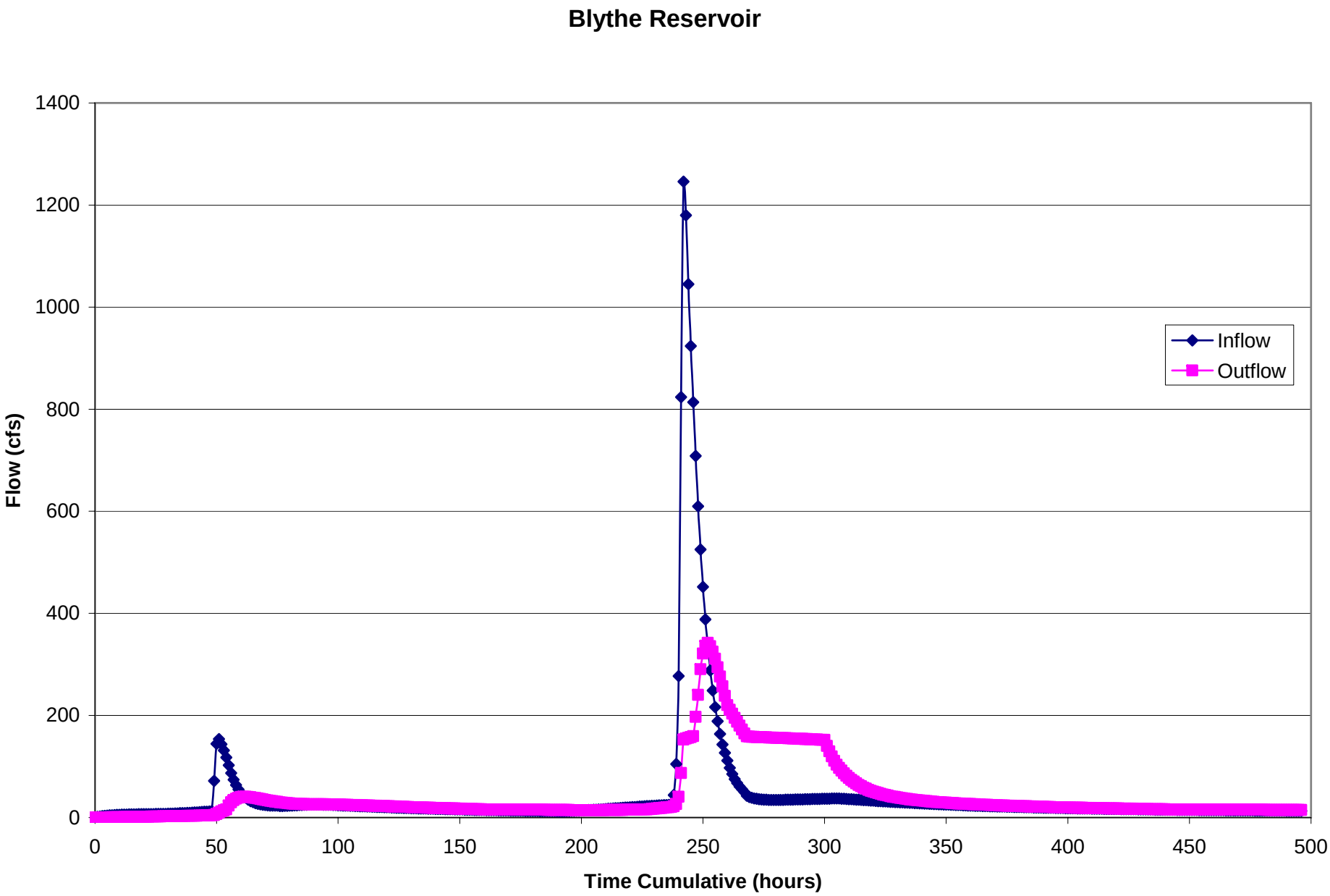

Blythe Reservoir
1400
1200
1000
800
600
400
200
0
Flow (cfs)
0
50
100
150
200
250
300
350
400
450
500
Time Cumulative (hours)
Inflow
Outflow

Figure No. 5

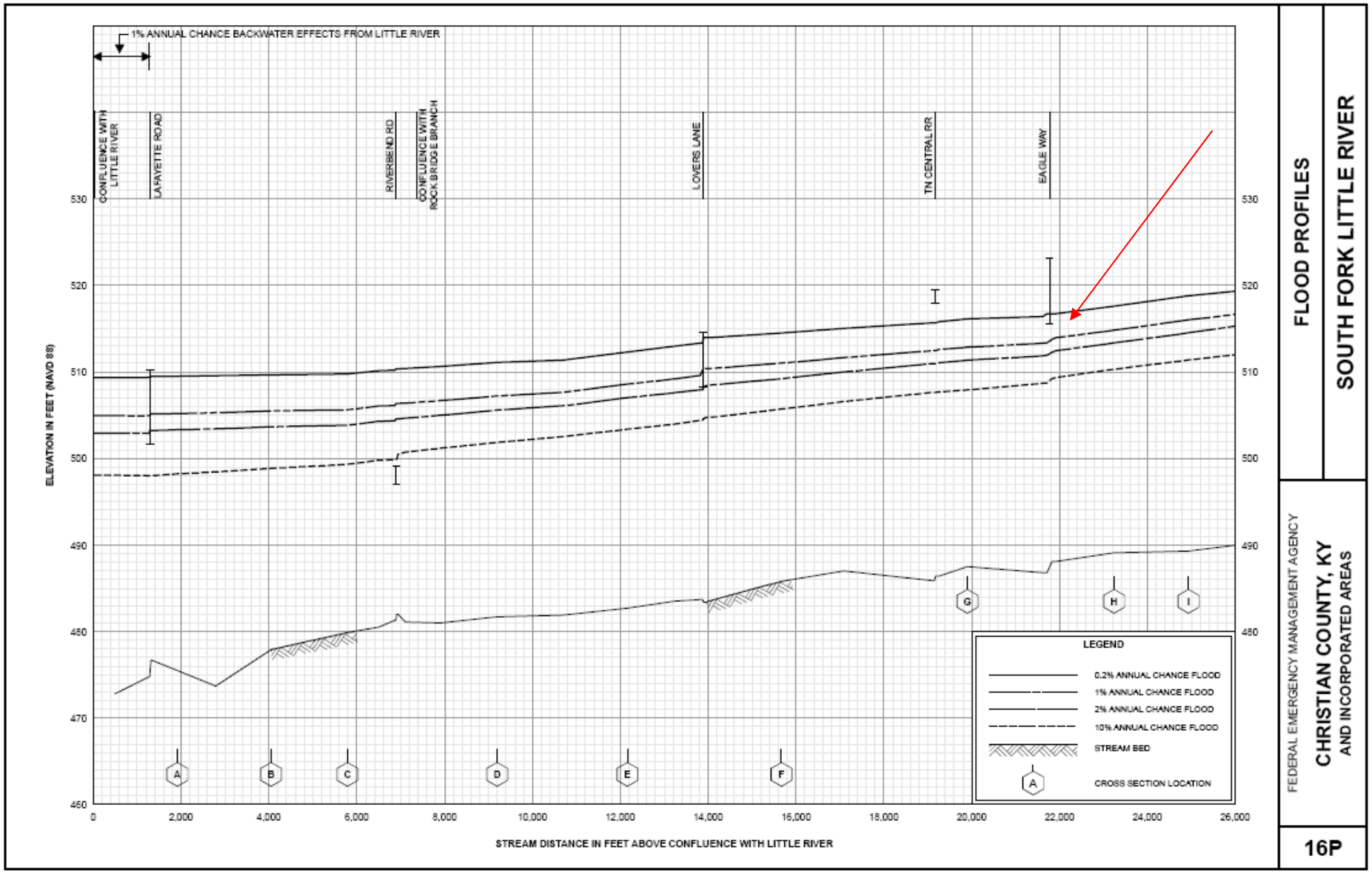
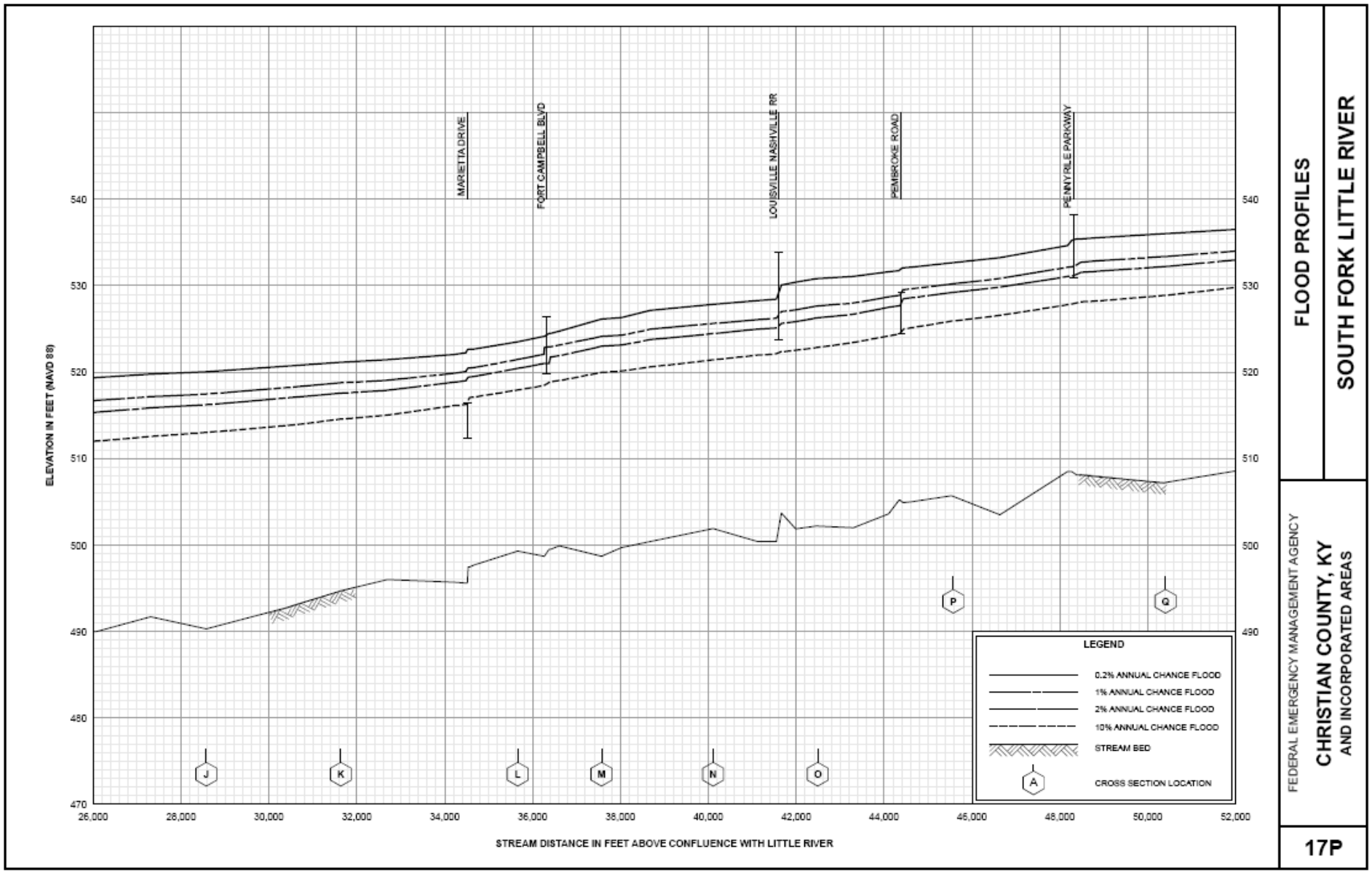

1% ANNUAL CHANCE BACKWATER EFFECTS FROM LITTLE RIVER
CONFLUENCE WITH LITTLE RIVER
LAFAYETTE ROAD
RIVERBEND RD
CONFLUENCE WITH ROCK BRIDGE BRANCH
LOVERS LANE
TN CENTRAL RR
EAGLE WAY
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LITTLE RIVER
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
SOUTH FORK LITTLE RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
CHRISTIAN COUNTY, KY
AND INCORPORATED AREAS
16P

Figure No. 6




FLOOD PROFILES

SOUTH FORK LITTLE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHRISTIAN COUNTY, KY
AND INCORPORATED AREAS

17P

Figure No. 7

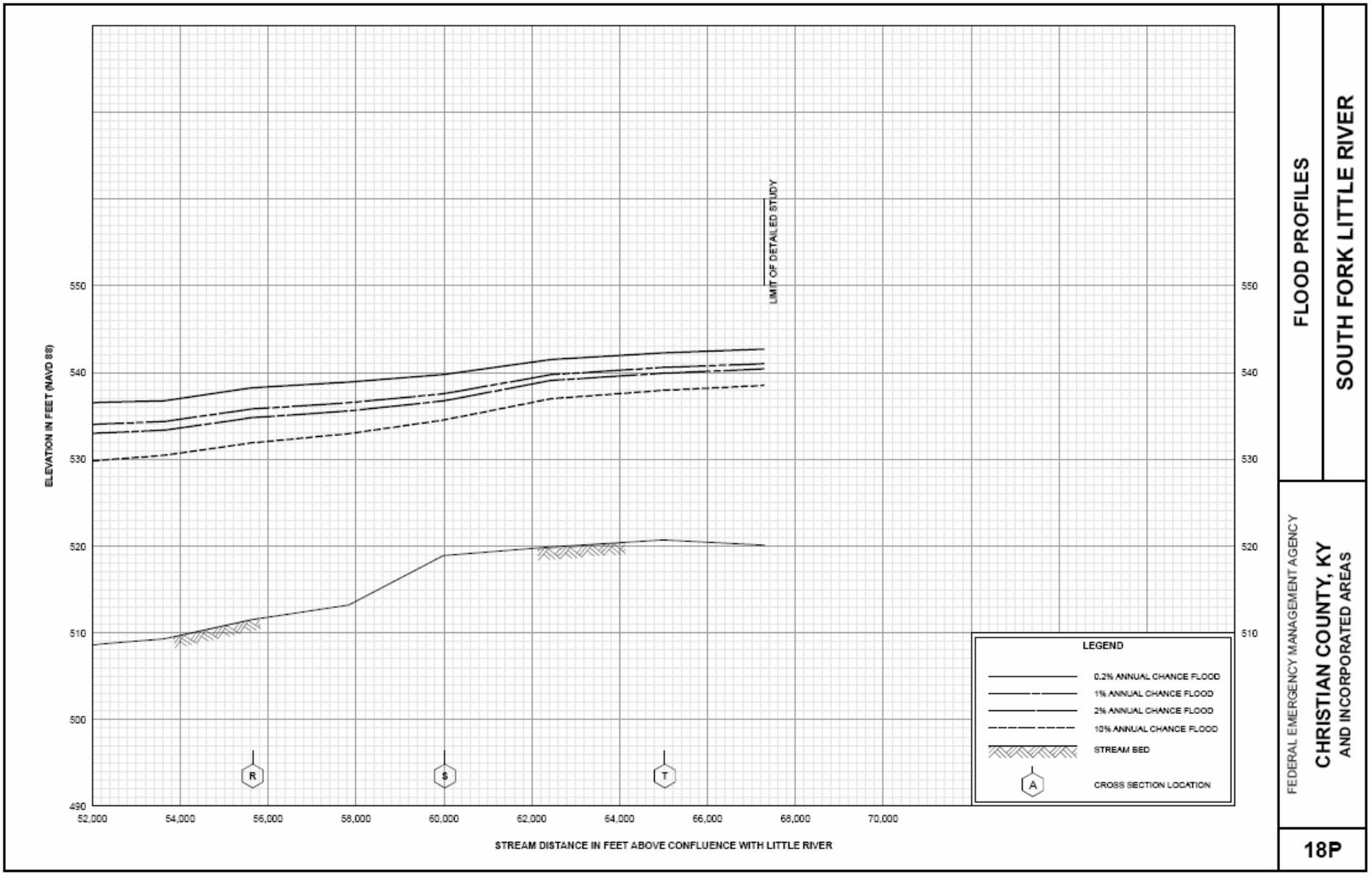

LIMIT OF DETAILED STUDY
ELEVATION IN FEET (NAVD 88)
550
540
530
520
510
500
490
52,000
54,000
56,000
58,000
60,000
62,000
64,000
66,000
68,000
70,000
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LITTLE RIVER
R
S
T
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
A
CROSS SECTION LOCATION
FLOOD PROFILES
SOUTH FORK LITTLE RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
CHRISTIAN COUNTY, KY
AND INCORPORATED AREAS
18P

Figure No. 8

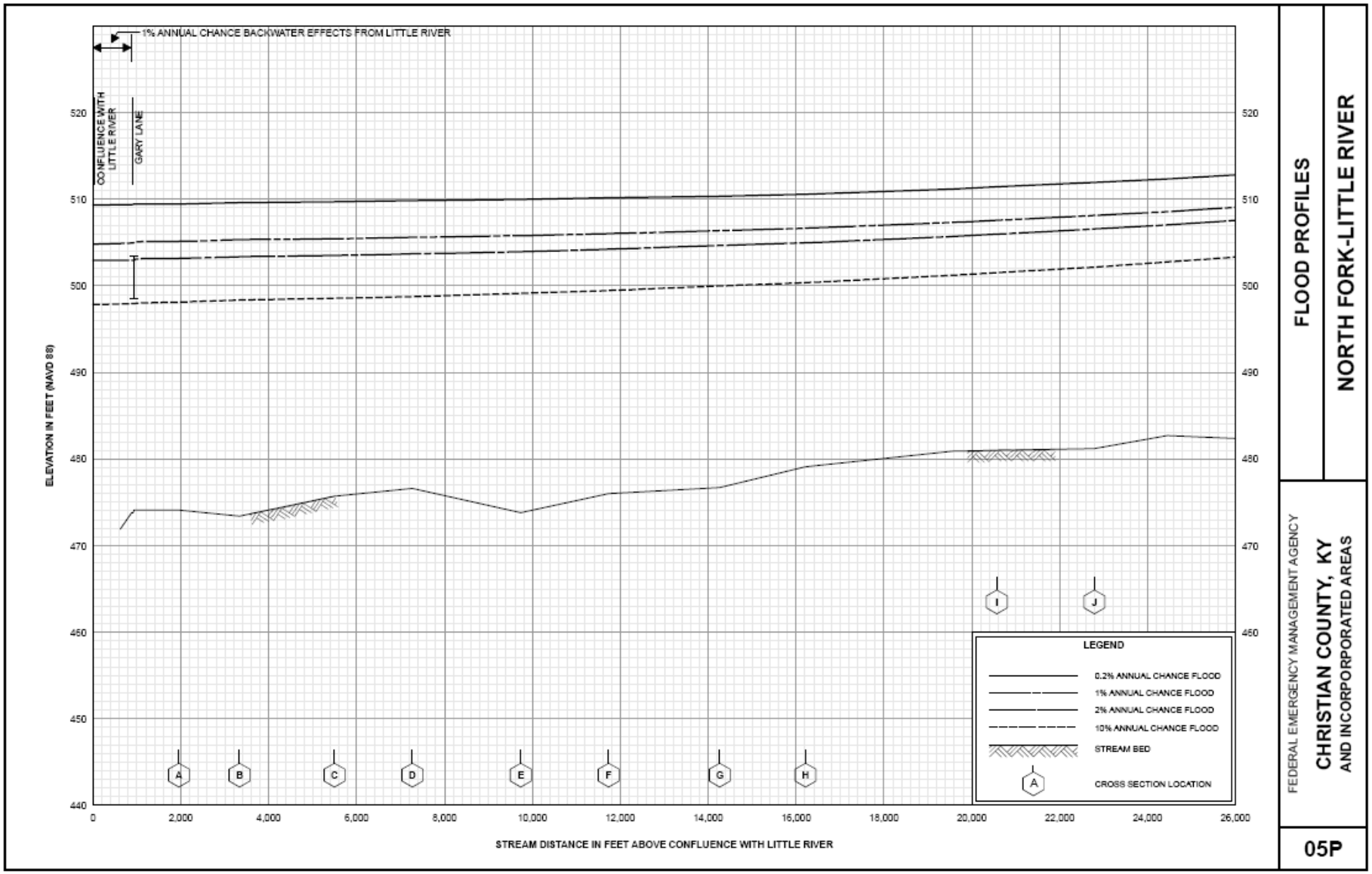

1% ANNUAL CHANCE BACKWATER EFFECTS FROM LITTLE RIVER
CONFLUENCE WITH LITTLE RIVER
GARY LANE
ELEVATION IN FEET (NAVD 88)
520
510
500
490
480
470
460
450
440
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LITTLE RIVER
A
B
C
D
E
F
G
H
I
J
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
NORTH FORK-LITTLE RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
CHRISTIAN COUNTY, KY
AND INCORPORPORATED AREAS
05P

Figure No. 9

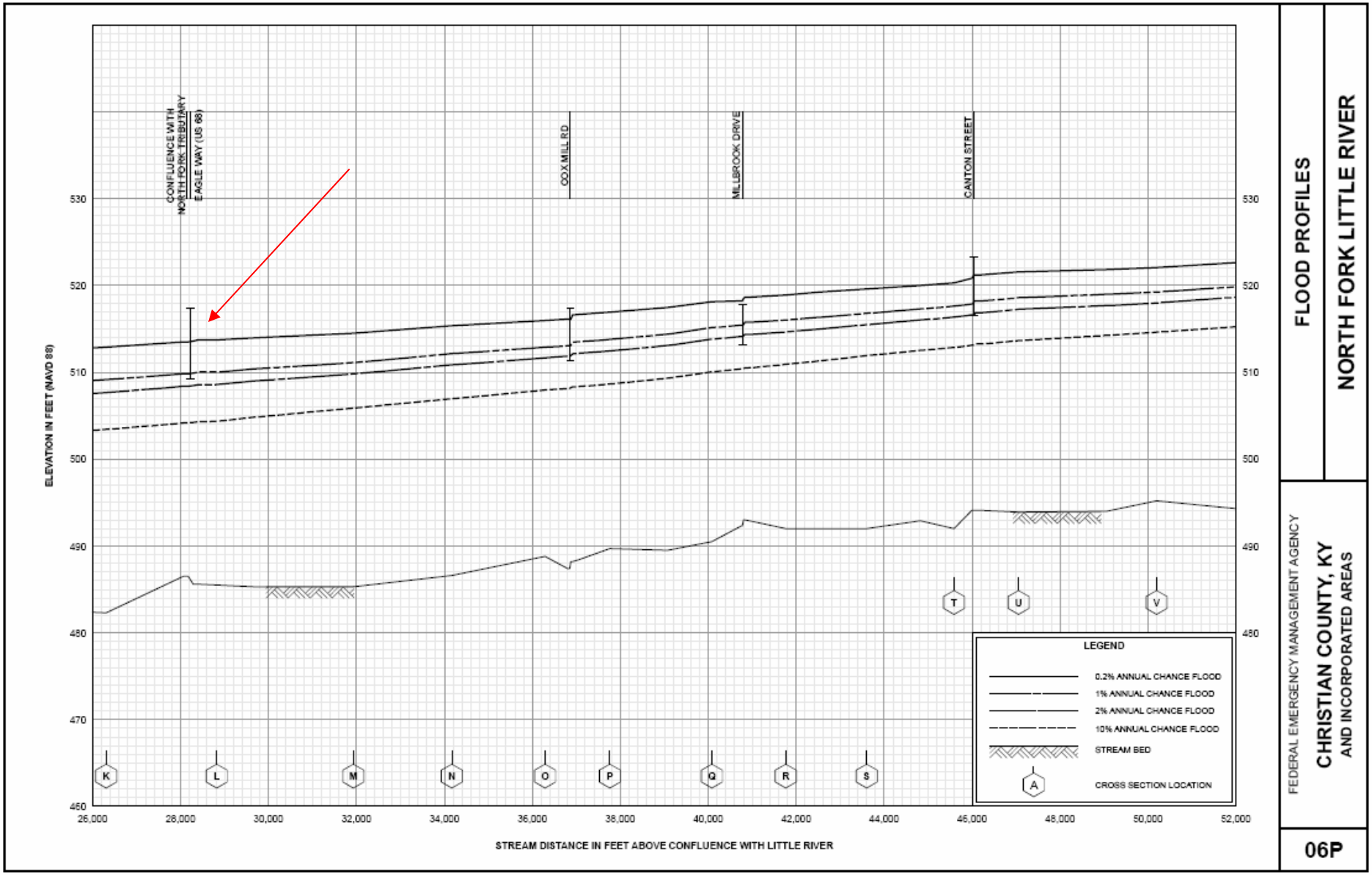
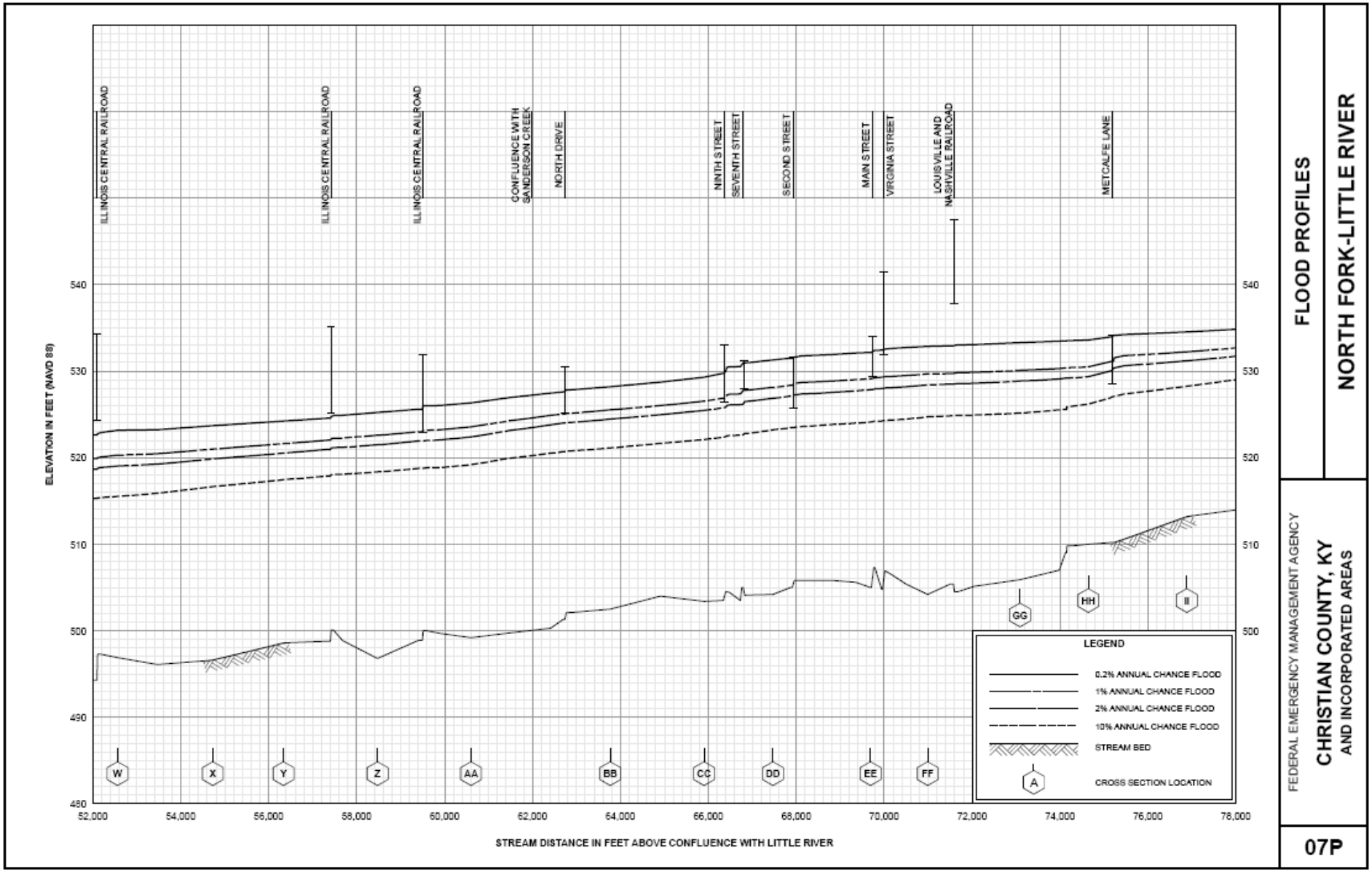

CONFLUENCE WITH NORTH FORK TRIBUTARY
EAGLE WAY (US 68)
COX MILL RD
MILLBROOK DRIVE
CANTON STREET
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LITTLE RIVER
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
NORTH FORK LITTLE RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
CHRISTIAN COUNTY, KY
AND INCORPORATED AREAS
06P

Figure No. 10




FLOOD PROFILES

NORTH FORK-LITTLE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CHRISTIAN COUNTY, KY

AND INCORPORATED AREAS

07P

Figure No. 11

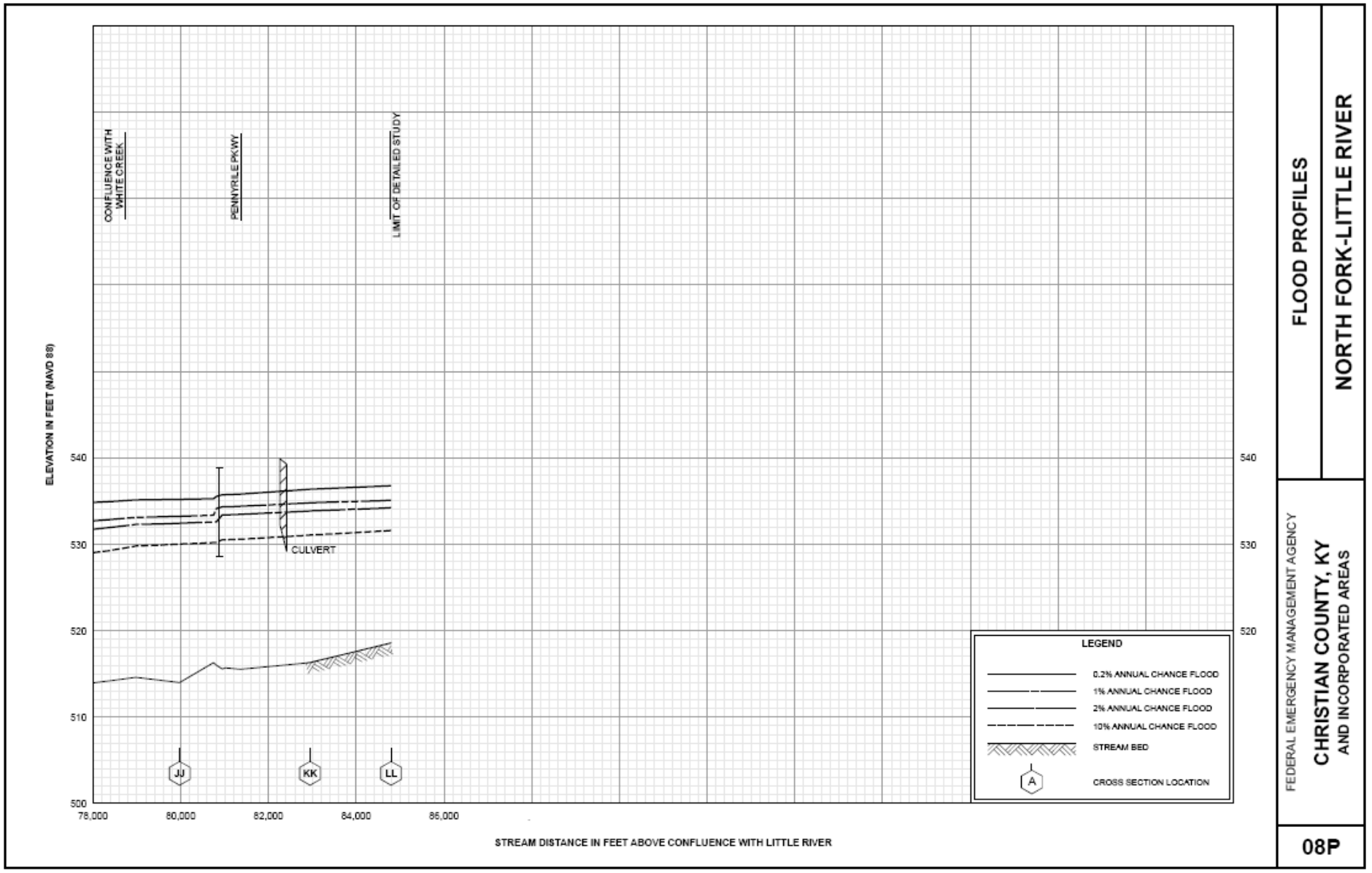

CONFLUENCE WITH WHITE CREEK
PENNYRILE PKWY
LIMIT OF DETAILED STUDY
ELEVATION IN FEET (NAVD 88)
540
530
520
510
500
78,000
80,000
82,000
84,000
86,000
CULVERT
JJ
KK
LL
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
A
CROSS SECTION LOCATION
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LITTLE RIVER
FLOOD PROFILES
NORTH FORK-LITTLE RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
CHRISTIAN COUNTY, KY
AND INCORPORATED AREAS
08P

Figure No. 12

# Edward T Breathitt Parkway Extension

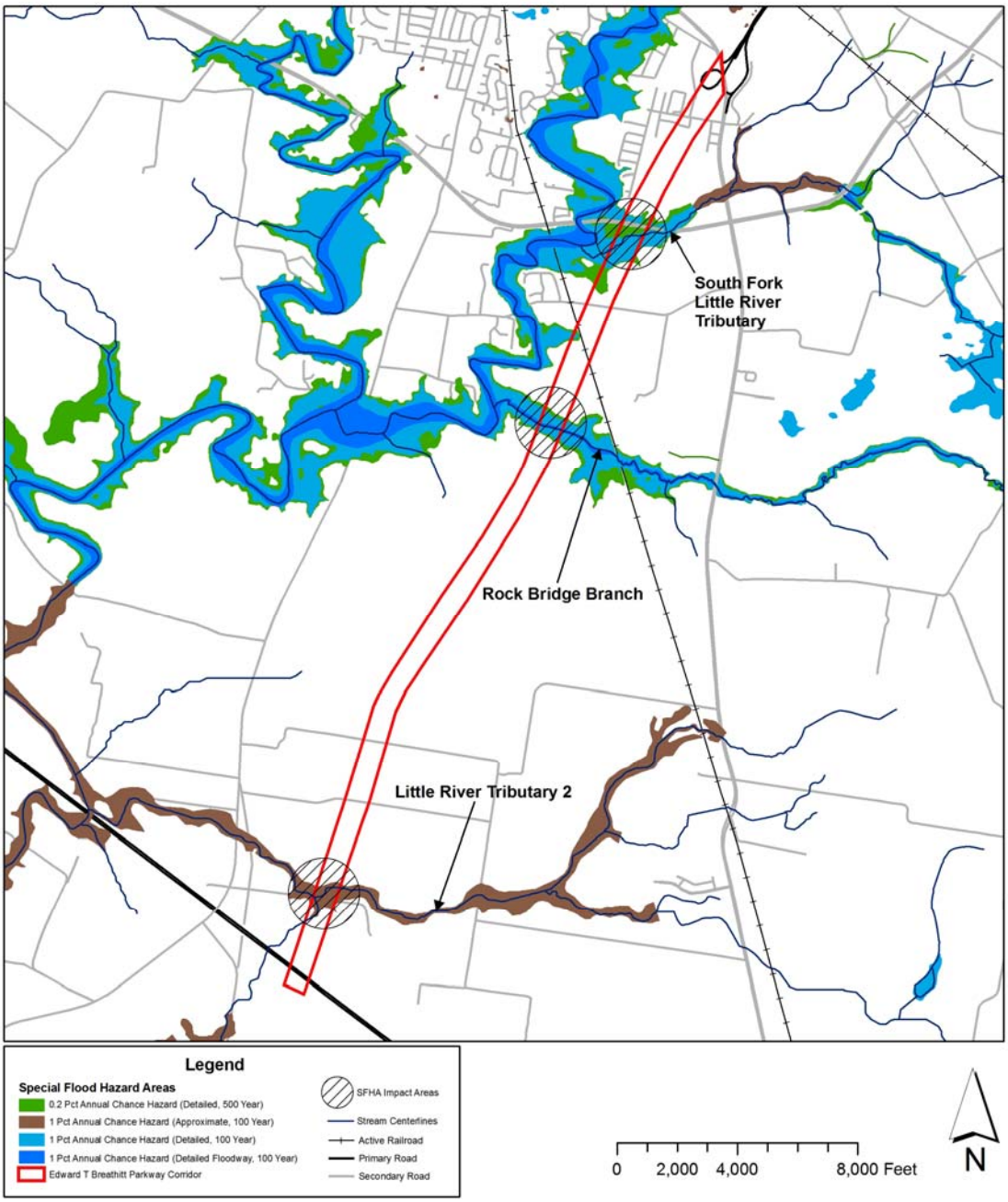



Figure No. 13

# Edward T Breathitt Parkway Extension

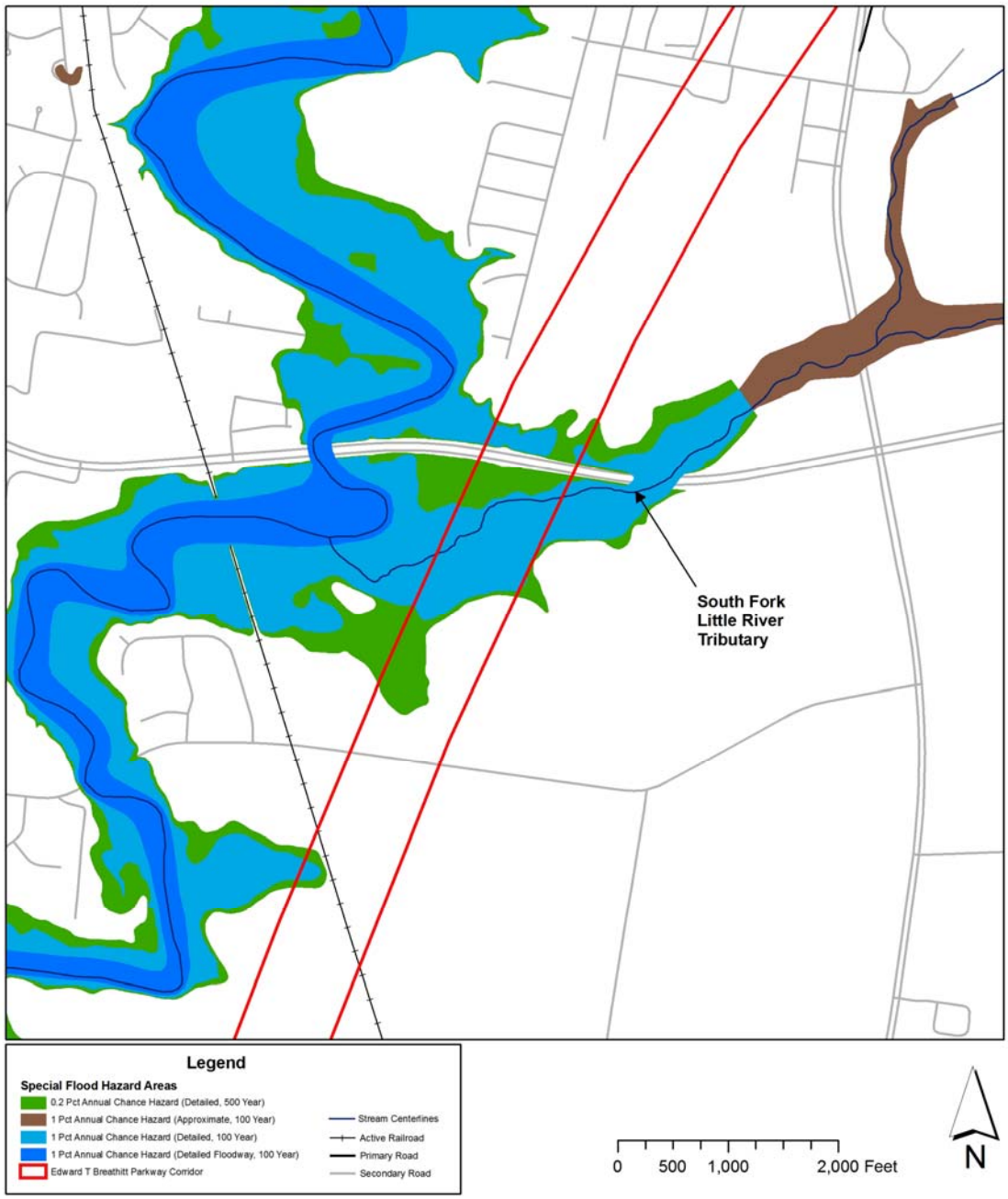



Figure No. 14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