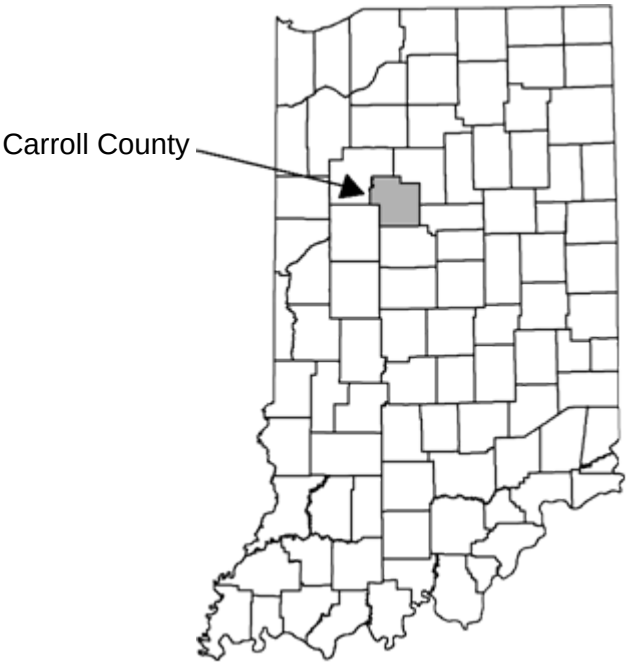
FLOOD INSURANCE STUDY

CARROLL COUNTY, INDIANA
AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
BURLINGTON, TOWN OF	180318
CAMDEN, TOWN OF	180319
CARROLL COUNTY (UNINCORPORATED AREAS)	180019
DELPHI, CITY OF	180020
FLORA, TOWN OF	180021
*YEOMAN, TOWN OF	180558

*No Special Flood Hazard Areas identified



PRELIMINARY

February 19, 2016

REVISED: TBD

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
18015CV000B

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) report may not contain all data available within the Community Map Repository. Please contact the Community Map Repository for any additional data.

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS report at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult with community officials and check the Community Map Repository to obtain the most current FIS report components.

Selected Flood Insurance Rate Map panels for the community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
B	X (Shaded)
C	X

Initial Countywide FIS Effective Date: January 16, 2015

Revised Countywide FIS Effective Date: To Be Determined

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

LIST OF TABLES

TABLE OF CONTENTS (Continued)

EXHIBITS

Exhibit 1 – Flood Profiles

PUBLISHED SEPARATELY

Flood Insurance Rate Map

FLOOD INSURANCE STUDY

CARROLL COUNTY, INDIANA
AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and supersedes the FIS reports and Flood Insurance Rate Maps (FIRMs) in the geographic area of Carroll County, Indiana, including the City of Delphi, the Towns of Burlington, Camden, Flora, Yeoman, and the unincorporated areas of Carroll County (hereinafter referred to collectively as Carroll County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. This information will also be used by Carroll County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

The Digital Flood Insurance Rate Map (DFIRM) and FIS report for this countywide study have been produced in digital format. Flood hazard information was converted to meet the Federal Emergency Management Agency (FEMA) DFIRM database specifications and Geographic Information System (GIS) format requirements. The flood hazard information was created and is provided in a digital format so that it can be incorporated into local GIS and be accessed more easily by the community.

Please note that no special flood hazard areas have been identified within the corporate limits of the Town of Yeoman. However, for the purpose of complete county-wide mapping of Carroll County, this town is still included in this FIS and FIRMs.

1.2 Authority and Acknowledgments

The sources of authority for this FIS report are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

Pre-Countywide

Information on the authority and acknowledgements for each jurisdiction included in this FIS, as compiled from previously printed pre-countywide FIS reports is shown below.

The hydrologic and hydraulic analyses for Carroll County (Unincorporated Areas) were performed by the U.S. Geological Survey (USGS) for FEMA, under Inter-Agency Agreement No. EMW-85-E-1823, Project Order No. 18. This study was completed in October 1986.

FIS reports were not published for the communities of Burlington, Camden, Flora, Yeoman, or Delphi; therefore, the authorities and acknowledgements for those communities are not available.

Initial Countywide (January 16, 2015)

For the initial countywide FIS, the hydrologic and hydraulic analyses for approximate stream reaches of Carroll County were performed by Lawson-Fisher Associates, on behalf of the Indiana Department of Natural Resources, under Indiana Public Works Project No. E060022. The Indiana Department of Natural Resources managed the production of this study as part of their Cooperating Technical Partner agreement with the Federal Emergency Management Agency dated April 29, 2004, which was defined by the Indiana DNR Mapping Activity Statement 08-01 dated June 23, 2005 and funded under agreement number EMC-2008-CA-7017.

Redelineation of the previously effective flood hazard information for the initial countywide FIS report, correction to the North American Vertical Datum of 1988, and conversion of the unincorporated and incorporated areas of Carroll County into the countywide format was performed by Lawson-Fisher Associates, on behalf of the Indiana Department of Natural Resources, under Indiana Public Works Project Number E060022. The Indiana Department of Natural Resources managed the production of this study as part of their Cooperating Technical Partner agreement with the Federal Emergency Management Agency dated April 29, 2004, which was defined by the Indiana DNR Mapping Activity Statement 08-01 dated July 7, 2008 and funded under agreement number EMC-2008-CA-7017.

Revised Countywide (TBD)

This FIS revision was initiated by a Physical Map Revision (PMR) request and included incorporation of enhanced hydraulic analyses performed on

two portions of the Tippecanoe River by the Strategic Alliance for Risk Reduction (STARR). Incorporation of these studies into this FIS and accompanying FIRMs was performed by STARR as part of FEMA Contract No. HSFEHQ-09-D-0370, Task Order No. HSFE05-11-J-0080. This work was completed in _____.

Spatial data used for this project is projected in the GCS North American 1983 coordinate system, referenced to the North American Datum of 1983 (NAD83) with a vertical datum of North American Vertical Datum of 1988 (NAVD88).

1.3 Coordination

The purpose of an initial Consultation Coordinated Officer's (CCOs) meeting is to discuss the scope of the FIS. A final CCO meeting is held to review the results of the study.

Pre-Countywide

The dates of the initial and final CCO meetings held for the previously effective, pre-countywide FIS reports covering the geographic area of Carroll County, Indiana are shown in Table 1 (Reference 1). The initial and final CCO meetings were attended by the study contractor, FEMA (or the Federal Insurance Administration), the Indiana Department of Natural Resources (IDNR), and the affected communities.

Table 1. CCO Meeting Dates for Pre-Countywide FIS

Community Name	Initial CCO Date	Final CCO Date
Carroll County (Unincorporated Areas)	December 1984	November 29, 1988

Initial Countywide (January 16, 2015)

For the initial countywide FIS, an initial CCO meeting was held on November 29, 2007, and was attended by FEMA, Natural Resources Conservation Service (NRCS), IDNR, the Carroll County SWCD, the Carroll County Plan Commission, the Carroll County Surveyor, the City of Delphi, and the Towns of Burlington, Camden, Flora, and Yeoman.

The results of the countywide study were reviewed at the final CCO meeting held on April 14, 2011, and attended by representatives of FEMA, IDNR and representatives from Carroll County. All problems raised at that meeting have been addressed.

Revised Countywide (TBD)

For this revised countywide FIS, the results of the study were reviewed at the final CCO meeting held on _____, and attended by representatives of _____. All problems raised at that meeting have been addressed.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Carroll County, Indiana, including the incorporated communities in Section 1.1.

Pre-Countywide

Streams studied by previously by detailed or approximate methods for pre-countywide FIS reports are listed in Table 2.

Table 2. Streams Studied Previously for Pre-Countywide FISs

Stream Studied By Detailed Methods	
Tippecanoe River	Wabash River
Streams Studied by Approximate Methods	
Bachelor Run	Rattlesnake Creek
Burnetts Creek	Rock Creek
Deer Creek	Tippecanoe River
Little Deer Creek	Wabash River
Middle Fork Wildcat Creek	Wildcat Creek
Pleasant Run	

Initial Countywide (January 16, 2015)

For the 2015 initial countywide FIS, approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards as identified during the initial CCO meeting. For the 2015 initial countywide study, seven new stream reaches (as shown in Table 3) were studied using approximate methods. The scope and methods of new approximate studies were proposed and agreed upon by FEMA, the IDNR, and Carroll County. New detailed study streams and streams that were re-studied by detailed methods for the 2015 initial countywide FIS are also shown in Table 3.

Table 3. Streams Studied Previously for the Initial Countywide FIS

Stream	Limits of Approximate Study
Bachelor Run	Deer Creek to Ayres Ditch
Burnetts Creek	Wabash River to County Line
Deer Creek	Mouth to Cass County Line
Little Deer Creek	Mouth to Howard County Line
Middle Fork Wildcat Creek	CR 800 S to Clinton County Line
Rock Creek	Mouth to Cass County Line
Wildcat Creek	Tippecanoe County Line to Howard County Line
Stream	**Limits of Redelineation Study**
Tippecanoe River	White-Tippecanoe County Line to Oakdale Dam
Wabash River	Tippecanoe County Line to limit of detailed study

Revised Countywide (TBD)

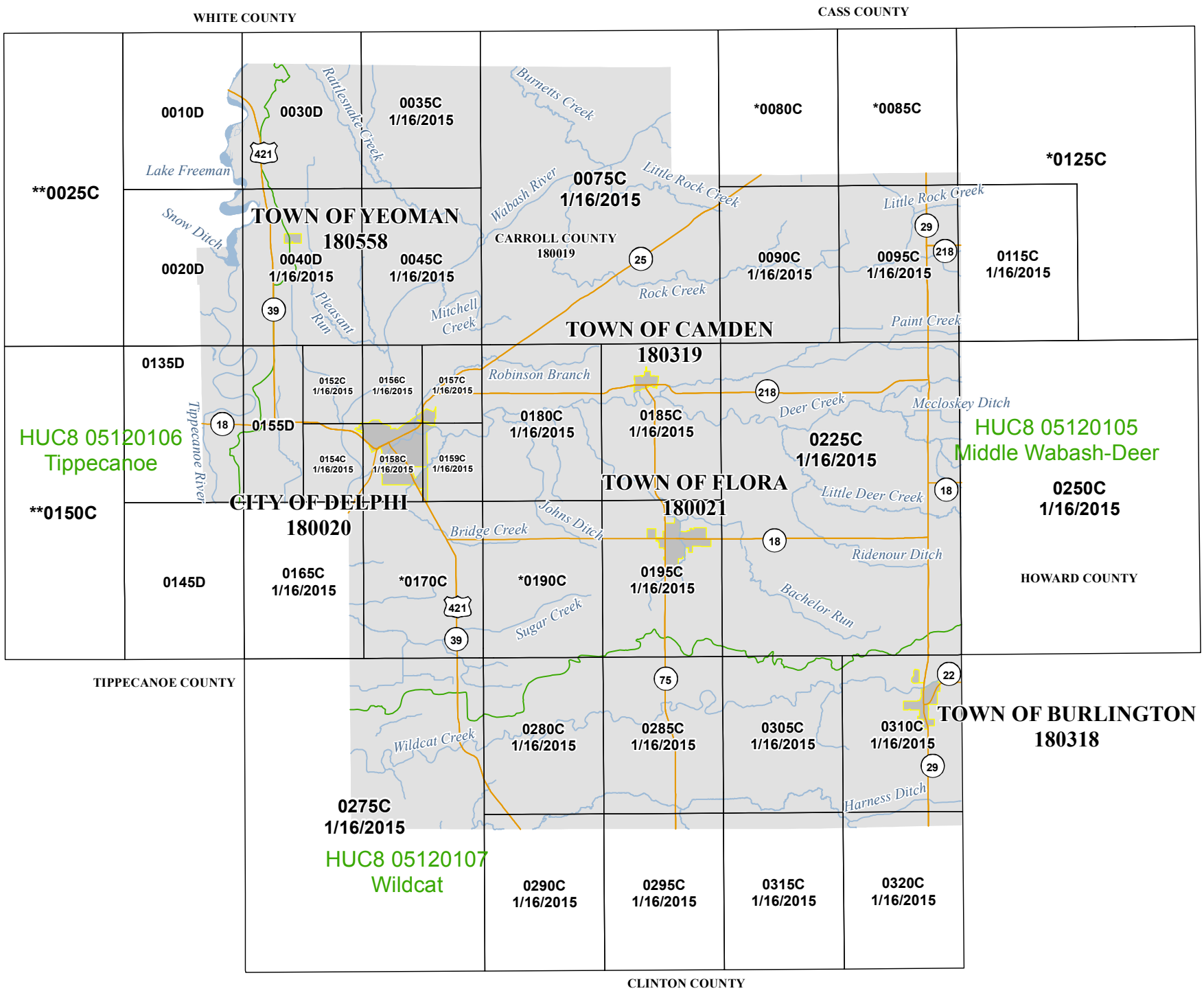
For this revised countywide FIS, two portions of the Tippecanoe River were restudied by detailed methods. The limits of study are listed in Table 4.

Table 4. Limits of Detailed Studies for this Revised Countywide FIS

Stream	Limits of Detailed Study
Tippecanoe River *(Lower Segment)*	From the Oakdale Dam to just downstream of the Carroll / Tippecanoe County line near County Road 150 N.
Tippecanoe River *(Upper Segment)*	From just downstream of Lake Shafer and the Norway Dam to just downstream of U.S. Route 421.

No Letters of Map Revisions (LOMRs) or Letters of Map Amendments (LOMAs) were incorporated into this revised countywide FIS. A Summary of Map Actions (SOMA), which lists the status of the Letters of Map Changes (LOMCs) associated with Carroll County, is included in the Technical Support Data Notebook (TSDN) associated with this FIS update. Copies of the TSDN may be obtained from the Community Map Repository.

Figure 1. FIRM Panel Index



1 inch = 19,167 feet 1:230,000

0 5,000 10,000 20,000 30,000 40,000 feet

Map Projection:
State Plane Indiana West, FIPS 1302;
North American Datum 1983

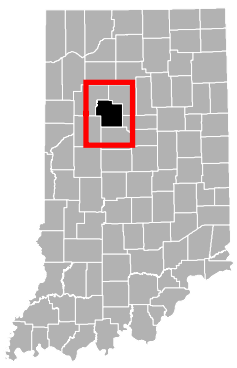
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTP://MSC.FEMA.GOV

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

* PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS
** PANEL NOT PRINTED - AREA OUTSIDE COUNTY BOUNDARY

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

CARROLL COUNTY, INDIANA and Incorporated Areas

PANELS PRINTED:

0010, 0020, 0030, 0035, 0040, 0045, 0075, 0090, 0095, 0115, 0135, 0145, 0152, 0154, 0155, 0156, 0157, 0158, 0159, 0165, 0180, 0185, 0195, 0225, 0250, 0275, 0280, 0285, 0290, 0295, 0305, 0310, 0315, 0320

FEMA

MAP NUMBER
18015CIND0B

PRELIMINARY
2/19/2016

MAP REVISED

2.2 Community Description

Carroll County is located in north-central Indiana and is bordered by Cass and White Counties to the north, Cass and Howard Counties to the east, Clinton County to the south, and Tippecanoe and White Counties to the west. Carroll County is located approximately 50 miles northwest of Indianapolis. Carroll County is served by US route 421, and State Routes 218, 75, 29, 25, and 18.

The climate in Carroll County ranges from hot and humid in the summertime to cold during the winter season. Average daytime temperatures during the summer fall around 72.8 ºF, while winter temperatures average at approximately 28.5 ºF. Precipitation for Carroll County totals an annual amount of 37.85 inches.

According to U.S. Census Data, the 2014 population estimate for Carroll County was reported to be 19,923. Table 5 lists the population of the incorporated areas in Carroll County.

Table 5. 2014 Population Estimate of Incorporated Communities

Community	Population
Burlington, Town of	598
Camden, Town of	602
Delphi, City of	2,868
Flora, Town of	1,994
Yeoman, Town of	138

2.3 Principal Flood Problems

Major flooding in Carroll County primarily occurs along the Tippecanoe and tributaries to that river. Major floods principally occur during the winter and spring months, but can occur during any season. Generally, two types of storm events cause flooding. During the winter and spring, storms of moderate intensity and long duration, coupled with frozen ground, cause flooding to occur. During the summer, thunderstorms which have high intensities and relatively short durations can cause floods. Localized flood problems in the incorporated areas are summarized below:

Delphi, City of: The discharges and frequencies of the floods on the Wabash River, Tippecanoe River and Deer Creek at Delphi are as follows:

Table 6. Flood Crest Elevations USGS Gage for Wabash River at Delphi

Year	Discharge Cubic Feet Per Second (CFS)	Elevations (Feet, Gage Datum)
1913	145,000	28.40
1943	85,300	25.60
1944	50,800	23.48
1950	68,600	24.95
1958	61,500	25.54
1959	71,500	27.48
1963	50,000	23.00

Table 7. Flood Crest Elevations USGS Gage for Tippecanoe River Near Delphi

Year	Discharge Cubic Feet Per Second (CFS)	Elevations (Feet, Gage Datum)
1937	17,400	13.50
1950	17,200	13.43
1957	18,800	14.08
1958	21,400	14.72
1959	22,600	15.10
1968	20,600	14.36
1979	17,600	13.19
1981	19,200	13.85
1985	21,900	14.86
1991	22,100	12.87
1993	18,900	12.93
1994	20,600	13.72
2003	18,500	12.80
2005	17,400	12.33
2008	37,600	17.83

Table 8. Flood Crest Elevations USGS Gage for Deer Creek Near Delphi

Year	Discharge Cubic Feet Per Second (CFS)	Elevations (Feet, Gage Datum)
1943	18,000	19.80
1950	9,160	14.40
1958	14,400	18.26
1959	12,100	16.72
1983	8,120	12.58
1985	8,850	13.20
1989	8,480	12.89
1991	8,250	12.69
1998	10,200	14.27
2003	18,700	18.64

2.4 Flood Protection Measures

There are no NFIP approved flood control structures showing protection from a mapped flood zone. The Oakdale Dam, completed in 1925, located in northern Carroll County, approximately 7.5 miles downstream of Monticello, creates Lake Freeman. It is owned and operated by the Northern Indiana Public Service Company to provide electrical power to the area. Dam operations are regulated by the Federal Energy Regulatory Commission.

The state of Indiana has also set regulations concerning development in a floodplain. The Indiana Flood Control Act of 1945, as amending, requires that the channels and that portion of the floodplain known as the floodway be kept free and clear of interference or obstructions which could restrict the flow rate in a significant manner. The Act stipulates that the Indiana Flood Plain Management Act of 1973 further requires that floodplain management regulations adopted after July 1, 1974, meet a minimum set of standards for the delineation and regulation of flood hazard areas.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in Carroll County, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled 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 floodplain management and for flood insurance 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 equaled 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 1 year are considered. For example, the risk of having

a flood that equals or exceeds the 1-percent- annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein 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 peak discharge-frequency relationships for each flooding source studied by detailed methods affecting Carroll County. Table 9 contains a summary of peak discharges for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods, where applicable, for each flooding source studied in detail in Carroll County.

Pre-Countywide Analyses

The equations used to determine the peak discharges used in the pre-countywide analyses, in the majority of the cases, were taken from the Estimation of Peak Discharges of Indiana Streams by using log Pearson (iii) distribution. The equations presented in the report are also included in the latest version of the National Flood Frequency (NFF) program by the USGS, and are included in the USGS StreamStats application. In some cases, the discharges for a stream have been coordinated with the Indiana Department of Natural Resources, the Natural Resources Conservation Service (formally the Soil Conservation Service), the U.S. Geological Survey and the U.S. Army Corps of Engineers, through a Memorandum of Understanding dated May 6, 1976.

Initial Countywide FIS (January 16, 2015)

Peak discharges for the initial countywide FIS were taken directly from the previously-effective, 1989 pre-countywide FIS report for Carroll County, Unincorporated Areas (Reference 1).

Revised Countywide FIS (TBD)

Peak discharges for the 10-, 2-, 1-, and 0.2-percent-annual-chance recurrence floods for the upper reach of the Tippecanoe River were leveraged from the effective study. The 4-percent-annual-chance recurrence peak discharge was calculated from logarithmic regression of the source data. For the lower reach of the Tippecanoe River, flows were obtained from the coordinated curve generated for the Tippecanoe River. The 1-percent-plus peak discharges were calculated by applying the corresponding percent error for the 99% confidence interval, as described by USGS Circular 710, *Floods in Indiana: Technical Manual for Estimating their Magnitude and Frequency*. Peak discharges used in the hydraulic analyses performed on the Tippecanoe River for this revised countywide FIS are provided in Table 9.

Table 9. Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10- Percent-Annual-Chance	4- Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	1-Percent-Plus-Annual-Chance	0.2-Percent-Annual-Chance
TIPPECANOE RIVER							
Just downstream of Spring Creek	1910	19,000	22,500	25,000	28,000	36,120	34,110
Just downstream of Big Creek	1869	18,500	22,000	24,500	27,000	34,830	32,980
At Oakdale Dam	1865	18,000	21,500	24,000	26,000	33,540	31,840
At Norway Dam	1732	17,400	20,520	22,900	25,200	32,508	25,200
WABASH RIVER	N/A	N/A	N/A	N/A	N/A	N/A	N/A

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Base flood elevations on the FIRM represent the elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations. These whole-foot elevations may not exactly reflect the elevations derived from the hydraulic analyses. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM. The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Pre-Countywide Analyses

Cross sections for the backwater analyses were obtained from a variety of sources including: physical survey data, IDNR contour mapping, USGS topographic mapping and local contour mapping.

For the pre-countywide analyses, water-surface elevations for floods of the selected recurrence intervals were computed through use of the U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center's HEC-2 step-backwater computer program.

The 1-percent-annual-chance flood profile of the Tippecanoe River was developed using the 1913 historical flood profiles provided by the Indiana Department of Natural Resources. The 1913 flood profile was accepted as representative of the 1-percent-annual-chance flood. This was verified at two locations. The tailwater elevation was computed using slope-conveyance to be 577.9 feet NAVD. The 1913 flood indicated 577.7 NAVD. This again established the validity of using the 1913 profile as the 1-percent-annual-chance flood profile. The headwater elevation was computed using WSPRO, a step-backwater computer program, and this elevation was used as the 1-percent-annual-chance flood elevation between the CR 725 N bridge and the Oakdale Dam.

The Wabash River hydraulic analysis was taken from the City of Delphi FPI. The analysis was done by the USACE using the HEC-2 modeling program to perform step-backwater analyses.

Initial Countywide Analyses (January 16, 2015)

The hydraulic analyses for new approximate study reaches performed for the initial countywide FIS, were performed using the USACE's Hydrologic Engineering Center's River Analysis System (HEC-RAS) computer program. HEC-RAS is an updated version of the HEC-2 program used to perform step-backwater analyses.

Flood profiles were prepared for all streams studied by detailed methods and show computed water-surface elevations to an accuracy of 0.5 feet for floods of the selected recurrence intervals. For the initial countywide FIS, flood profiles and approved LOMRs were consolidated into continuous stream reaches and adjusted to reflect the current vertical datum as described in Section 3.3.

Channel and overbank roughness factors (Manning's "n" values) used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the stream and floodplain areas. For other streams, factors were estimated by field inspection with the aid of "n" value tables and equations.

For new approximate study areas performed for the initial countywide FIS, analyses were based on field inspection and modeling of the stream reaches using simplified HEC-RAS models. Structural measurements or field surveying was not performed. Cross section geometry was derived from topographic mapping and from the 2005 statewide orthophotography project. Starting elevations were assumed to be normal depth.

Revised Countywide Analyses (TBD)

For this revised countywide FIS, HEC-RAS was used to compute water-surface elevations for the 10-, 4-, 2-, 1-, 0.2- percent-annual-chance flood events and the 1-percent-plus-annual-chance flood event. HEC-GeoRAS, (version 4.2.93) was used to extract floodplain geometry information from the 2011 DEM obtained from the Indiana Spatial Data Portal.

Cross section locations were leveraged from the effective IDNR models. Additional sections were added to address issues with spacing. Certain bridge sections were moved further from the structure to avoid cutting through the road embankment.

For the upper reach of the Tippecanoe River, HEC-RAS 5.0.0 Beta (May 2014) was used to convert leveraged survey geometry at the bridges into a channel DEM. This data was combined with the 2011 5-ft DEM to 'burn' a channel into the terrain. Non-surveyed sections were extracted from this grid using HEC-GeoRAS to incorporate the deepened channel and overbank areas. New revised channel data was used for the lower reach of the Tippecanoe River. Overbanks with new LiDAR were cut and existing channel geometry was merged into the sections.

Eight hydraulic structures along the selected portion of the Tippecanoe River were modeled using leveraged geometry from the effective models. Structures were modeled with the assumption that bridge openings would not be obstructed by debris.

When possible, reach boundary conditions were leveraged from the effective studies. For the upper reach of the Tippecanoe River, a normal depth slope of 0.0005 feet/foot was assumed based on the bed profile of the river at the downstream end.

The effective model for the lower reach of the Tippecanoe River only contains the 1-percent-annual-chance flow and uses a known water surface elevation. Effective modeling terminates 0.95 miles above the confluence with the Wabash River, beyond the Carroll County boundary and project area. For the added profiles, a friction slope of 0.00062 feet/foot was assumed for normal depth calculations as known water surfaces were unavailable. The model was then truncated to the Carroll County extents, 6.32 miles above the Wabash River confluence. Water surface elevations from the normal depth run at section 6.32, shown in Table 10, were used as the boundary condition for the truncated model.

Table 10. Boundary Conditions for the Tippecanoe River (Lower Reach)

Profile	Water Surface Elevation (NAVD88)
10-percent-annual-chance	541.00
4-percent-annual-chance	542.07
2-percent-annual-chance	542.73
1-percent-annual-chance	543.93
1-percent-plus-annual-chance	545.17
0.2-percent-annual-chance	544.78

For the upper reach of the Tippecanoe River, Manning's "n" values were selected from published values in Open-Channel Hydraulics (Chow, 1959) based on survey photos and orthophotography. For the lower reach of the Tippecanoe River, roughness values were leveraged from the effective study. Table 11 includes the range of Manning's "n" values used for channels and overbank areas.

Table 11. Manning's "n" Values

Flooding Source	Roughness Coefficients	
	Channel	Overbanks
Tippecanoe River (Upper Reach)	0.035	0.013-0.100
Tippecanoe River (Lower Reach)	0.030	0.070

3.3 Vertical Datum

The coordinate system used in the production of the digital FIRMs is GCS North American 1983, referenced to NAD83 with a vertical datum of NAVD88.

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the finalization of the NAVD88, many FIS reports and FIRMs are being prepared using NAVD88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Structure and ground elevations in the community must, therefore, be referenced to NAVD88. It is important to note that adjacent communities may be referenced to NGVD29. This may result in differences in Base Flood Elevations (BFEs) across the corporate limits between the communities.

For the 2015 initial countywide study, a vertical datum conversion of -0.37 feet (NGVD29 – 0.37 = NAVD88) was calculated at the centroid of the county and used to convert all elevations in Carroll County from NGVD29 to NAVD88 using the National Geologic Survey's VERTCON online utility (VERTCON, 2005).

For more information on NAVD88, see the FEMA publication entitled Converting the National Flood Insurance Program to the North American Vertical Datum of 1988 (FEMA, June 1992), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent-annual-chance flood elevations and delineations of the 1- and 0.2-percent-annual-chance floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, and the Floodway Data table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic mapping and from the 2005 statewide orthophotography flight.

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, and X); and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM (Exhibit 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept,

the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The State of Indiana, however, per Indiana Code IC 14-28-1 and Indiana Administrative Code 312 IAC 10, has designated that encroachment in the floodplain is limited to that which will cause no significant increase in flood height. As a result, floodways for this study are delineated based on a flood surcharge of less than 0.15 feet. The floodways in this study were approved by the IDNR, and are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodway presented in this FIS report and on the FIRM was computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations have been tabulated for selected cross sections. In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent-annual-chance flood more than 0.14 feet at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

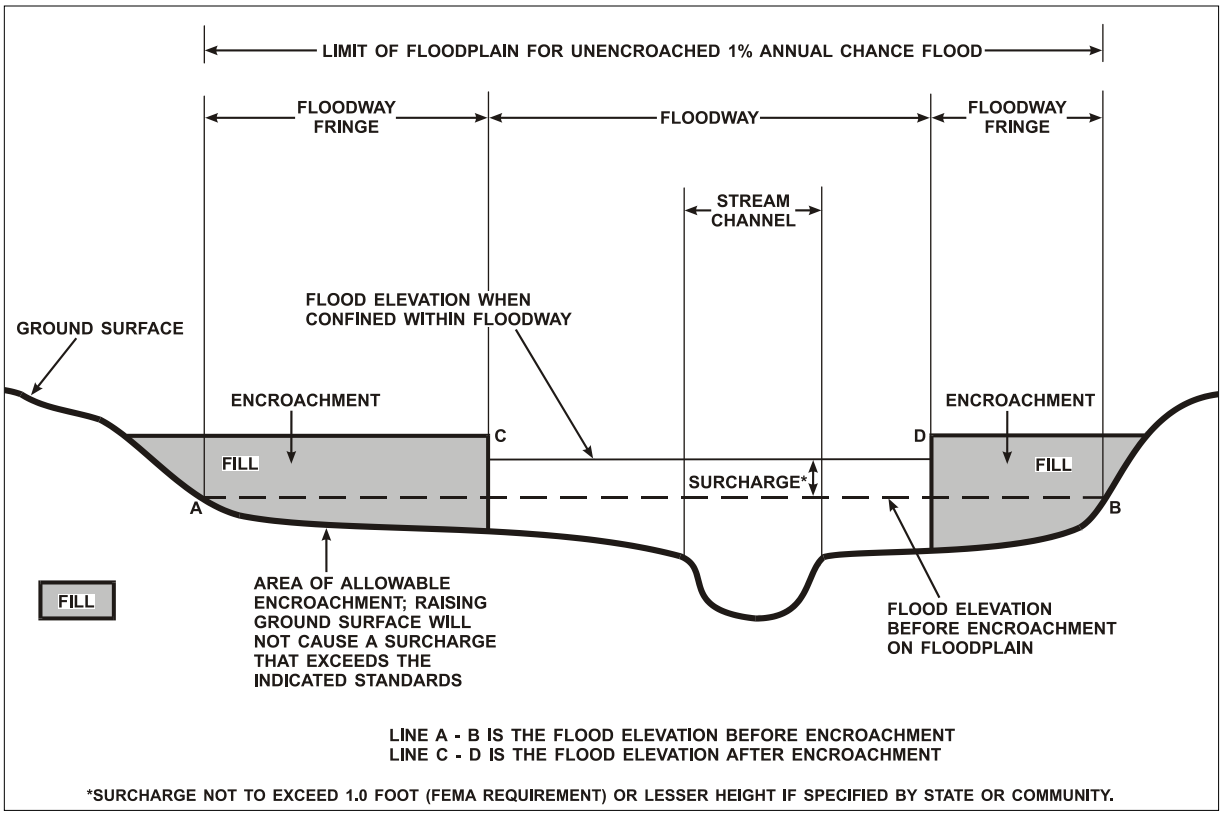


Figure 2 - Floodway Schematic

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE (FEET)
Tippecanoe River (Lower)								
A	6.44	960	8,894	3.2	544.3	544.3	544.4	0.1
B	6.89	579	5,996	4.7	545.0	545.0	545.1	0.1
C	7.31	570	6,835	4.1	545.9	545.9	546.0	0.1
D	7.75	526	5,510	5.1	546.5	546.5	546.6	0.1
E	8.53	388 / 620 [2]	5,439	5.2	548.9	548.9	548.9	0.0
F	9.04	423	4,396	6.1	550.6	550.6	550.7	0.1
G	9.57	475	3,954	6.8	552.1	552.1	552.1	0.1
H	10.13	537	5,803	4.7	554.7	554.7	554.7	0.1
I	10.69	568	5,432	5.0	556.2	556.2	556.4	0.2
J	11.45	580	5,641	4.8	557.8	557.8	557.9	0.1
K	12.19	332	3,409	7.9	558.9	558.9	559.0	0.1
L	12.94	582	6,377	4.2	562.1	562.1	562.1	0.0
M	13.49	483	5,103	5.3	563.2	563.2	563.3	0.1
N	14.05	324	3,718	7.3	565.0	565.0	565.0	0.1
O	15.16	893	4,434	6.1	568.7	568.7	568.8	0.1
P	15.82	475	4,915	5.5	570.8	570.8	570.9	0.1
Q	16.48	560	4,993	5.4	572.6	572.6	572.6	0.0
R	17.46	1,073	5,736	4.7	576.2	576.2	576.3	0.1
S	18.03	688	4,661	5.6	577.8	577.8	577.9	0.1
T	18.52	501	5,043	5.2	579.3	579.3	579.4	0.1
U	18.76	642	7,289	3.6	580.2	580.2	580.3	0.1

[1] Miles above Wabash River [2] Width Within Carroll County / Total Width

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, INDIANA
AND INCORPORATED AREAS

FLOODWAY DATA

TIPPECANOE RIVER (LOWER)

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE (FEET)
Tippecanoe River (Upper)								
A	25.96	137 / 525 [2]	5,389	4.7	608.9	608.9	608.9	0.0
B	26.32	164 / 526 [2]	6,867	3.7	609.9	609.9	609.9	0.0
C	26.63	386 / 515 [2]	7,035	3.6	610.3	610.3	610.3	0.0
D	26.93	215 / 463 [2]	6,098	4.1	610.7	610.7	610.7	0.0

[1] Miles above Wabash River [2] Width Within Carroll County / Total Width

Table 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, INDIANA
AND INCORPORATED AREAS

FLOODWAY DATA

TIPPECANOE RIVER (UPPER)

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE (FEET)
Wabash River								
A	328.18	2,754	27,285	2.9	541.2	541.2	541.2	0.0
B	328.85	1,648	22,398	3.5	541.9	541.9	541.9	0.0
C	329.22	756	14,934	5.3	542.3	542.3	542.3	0.0
D	329.54	1,948	24,700	2.9	543.0	543.0	543.0	0.0
E	329.90	2,681	16,826	4.2	543.3	543.3	543.3	0.0
F	330.09	1,986	22,165	3.2	543.6	543.6	543.6	0.0
G	330.63	1,259	20,066	3.5	544.0	544.0	544.0	0.0
H	330.80	792	13,406	5.3	544.1	544.1	544.1	0.0
I	331.07	872	14,466	4.9	544.8	544.8	544.8	0.0
J	331.36	585	11,089	6.4	545.2	545.2	545.2	0.0
K	331.87	645	11,417	6.2	546.3	546.3	546.3	0.0
L	332.62	1,357	18,499	3.8	547.7	547.7	547.7	0.0
M	332.88	1,551	20,210	3.5	548.0	548.0	548.0	0.0
N	333.12	2,173	22,976	3.1	548.2	548.2	548.2	0.0

[1] Miles above mouth

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance risk rate zone that corresponds to the 1-percent-annual- chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base (1- percent-annual-chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance risk rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance risk rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile (sq. mi.), and areas protected from the base flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance risk zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The current FIRM presents flooding information for the entire geographic area of Carroll County. Previously, separate FIRMs were prepared for each identified flood prone incorporated community and for the unincorporated areas of the county. Historical data relating to the maps prepared for each community are presented in Table 13.

7.0 OTHER STUDIES

This FIS report either supersedes or is compatible with all previous studies on streams studied in this report and should be considered authoritative for purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Flood Insurance and Mitigation Division, Federal Emergency Management Agency, Region V, 536 S. Clark Street, 6th Floor, Chicago, IL 60605.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FIRM EFFECTIVE DATE	FIRM REVISION DATE(S)
Burlington, Town of [2]	N/A	N/A	N/A	
Camden, Town of [2]	N/A	N/A	N/A	
Carroll County (Unincorporated Areas)	October 18, 1974	September 1, 1978	November 15, 1989	
Delphi, City of	November 23, 1973	June 18, 1976	August 1, 1995	
Flora, Town of	May 24, 1974	March 26, 1976	November 1, 1995	
Yeoman, Town of [1,2]	N/A	N/A	N/A	

[1] No Special Flood Hazard Areas Identified [2] This community does not have map history prior to the first countywide mapping

TABLE 13

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, INDIANA

AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

9.0 BIBLIOGRAPHY AND REFERENCES

1. Emergency Management Agency, Flood Insurance Study, Carroll County, IN (Unincorporated Areas), November 15, 1989. Washington, D.C.

2. Geobytes City Distance Tool. Accessed at http://www.geobytes.com/CityDistanceTool.htm

3. Indiana Administrative Code 310 IAC 10 Flood Plain Management accessed at http://www.in.gov/legislative/iac/T03120/A00100.PDF

4. Indiana Code IC 14-28-1, Flood Control Act, accessed at http://www.in.gov/legislative/ic/code/title14/ar28/ch1.html

5. Indiana Department of Natural Resources, Division of Water, Coordinated Discharges of Selected Streams in Indiana, accessed at http://www.in.gov/dnr/water/surface_water/coordinated_discharges/index.html

6. Indiana Department of Natural Resources, Division of Water, General Guidelines for the Hydrologic-Hydraulic Assessment of Floodplains in Indiana, December 2002.

7. Knipe, David, and Rao, A. R., Estimation of Peak Discharges of Indiana Streams by Using the Log Pearson III Distribution, Purdue University, School of Civil Engineering, Joint Transportation Research Program, Project No. C-36-620, File No. 9-8-15, 2005.

8. National Oceanic and Atmospheric Administration, National Climatic Data Center, Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Days, 1971-2000, Climatography of the United States No. 81, 2002.

9. "Population Counts, Estimates and Projections", STATS Indiana, Indiana Business Research Center, Indiana University Kelley School of Business, accessed at www.stats.indiana.edu/pop_totals_topic_page.html.

10. U.S. Army Corps of Engineers, HEC-2 Water-Surface Profiles Computer Program 723-X6, L202A, Davis, California, November 1976.

11. U.S. Department of the Interior, Geological Survey, Water Resources Investigation 35-75, Statistical Summaries of Indiana Streamflow Data, February 1976.

12. U.S. Geological Survey, Surface-Water Data for Indiana, Peak-Flow Data for Carroll County, http://nwis.waterdata.usgs.gov/in/nwis/peak.

13. U.S. Census Bureau Population Estimates, retrieved from http://factfinder.census.gov/ on November 17, 2015.

10.0 ADDITIONAL INFORMATION

Information concerning the pertinent data used in the preparation of this FIS Report can be obtained by submitting an order with any required payment to the FEMA Engineering Library. For more information on this process, see http://www.fema.gov.

10.1 FIRM Notes to Users

Each FIS report provides floodplain data, which may include a combination of the following: 10-, 4-, 2-, 1-, and 0.2-percent-annual-chance flood elevations (the 1-percent-annual-chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1-percent-annual-chance and 0.2-percent-annual-chance floodplains; and 1-percent-annual-chance floodway. This information is presented on the FIRM and/or in many components of the FIS report, including Flood Profiles and Floodway Data tables.

Figure 3 presents important considerations for using the information contained in this FIS report and the FIRM and is provided in response to changes in format and content. **Error! Reference source not found.** presents the map legend for the FIRM.

Figure 3. FIRM Notes to Users

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 13 in this FIS Report.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

PRELIMINARY FIS REPORT: FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period, at the final Consultation Coordination Officer's meeting, or during the statutory 90-day appeal period. Approved requests for changes will be shown on the final printed FIRM.

Figure 3. FIRM Notes to Users

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

BASE FLOOD ELEVATIONS: For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

FLOODWAY INFORMATION: Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.3 "Non-Levee Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION: The projection used in the preparation of the map was State Plane Indiana West, Zone 1302. The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

ELEVATION DATUM: Flood elevations on the FIRM are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 15 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on the FIRM was provided by multiple sources, including the Indiana Statewide Imagery and LiDAR Program, dated 2011.

Figure 3. FIRM Notes to Users

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Carroll County, Indiana, corresponding revisions to the FIRM Index will be incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to Table 13 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Carroll County, Indiana, effective **TBD**.

FLOOD RISK REPORT: A Flood Risk Report (FRR) may be available for many of the flooding sources and communities referenced in this FIS Report. The FRR is provided to increase public awareness of flood risk by helping communities identify the areas within their jurisdictions that have the greatest risks. Although non-regulatory, the information provided within the FRR can assist communities in assessing and evaluating mitigation opportunities to reduce these risks. It can also be used by communities developing or updating flood risk mitigation plans. These plans allow communities to identify and evaluate opportunities to reduce potential loss of life and property. However, the FRR is not intended to be the final authoritative source of all flood risk data for a project area; rather, it should be used with other data sources to paint a comprehensive picture of flood risk.

Each FIRM panel contains an abbreviated legend for the features shown on the maps. However, the FIRM panel does not contain enough space to show the legend for all map features. Figure 4 shows the full legend of all map features. Note that not all of these features may appear on the FIRM panels in Carroll County.

Figure 4. Map Legend for FIRM

SPECIAL FLOOD HAZARD AREAS: *The 1-percent-annual-chance flood, also known as the base flood or 100-year flood, has a 1 percent chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1-percent-annual-chance flood. The Base Flood Elevation is the water surface elevation of the 1-percent-annual-chance flood. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. See note for specific types. If the floodway is too narrow to be shown, a note is shown.*

	Special Flood Hazard Areas subject to inundation by the 1-percent-annual-chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)
Zone A	The flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains. No base (1-percent-annual-chance) flood elevations (BFEs) or depths are shown within this zone.
Zone AE	The flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone.
Zone AH	The flood insurance rate zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the hydraulic analyses are shown at selected intervals within this zone.
Zone AO	The flood insurance rate zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the hydraulic analyses are shown within this zone.
Zone AR	The flood insurance rate zone that corresponds to areas that were formerly protected from the 1-percent-annual-chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1-percent-annual-chance or greater flood.
Zone A99	The flood insurance rate zone that corresponds to areas of the 1-percent-annual-chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or flood depths are shown within this zone.
Zone V	The flood insurance rate zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone.
Zone VE	Zone VE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.

Figure 4. Map Legend for FIRM

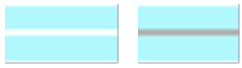
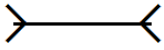
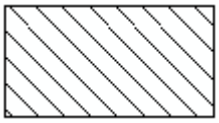
	Regulatory Floodway determined in Zone AE.
OTHER AREAS OF FLOOD HAZARD	
	Shaded Zone X: Areas of 0.2-percent-annual-chance flood hazards and areas of 1-percent-annual-chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.
	Future Conditions 1-Percent-Anual-Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.
	Area with Reduced Flood Risk due to Levee: Areas where an accredited levee, dike, or other flood control structure has reduced the flood risk from the 1-percent-annual-chance flood.
OTHER AREAS	
	Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.
	Unshaded Zone X: Areas of minimal flood hazard.
FLOOD HAZARD AND OTHER BOUNDARY LINES	
 (ortho) (vector)	Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)
	Limit of Study
	Jurisdiction Boundary
	Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet
GENERAL STRUCTURES	
Aqueduct *Channel* *Culvert* *Storm Sewer*	Channel, Culvert, Aqueduct, or Storm Sewer
Dam *Jetty* *Weir*	Dam, Jetty, Weir
	Levee, Dike, or Floodwall
 *Bridge*	Bridge

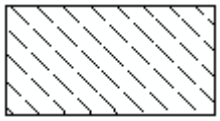
Figure 4. Map Legend for FIRM

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA): *CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.*



CBRS AREA 09/30/2009

Coastal Barrier Resources System Area: Labels are shown to clarify where this area shares a boundary with an incorporated area or overlaps with the floodway.



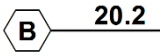
OTHERWISE PROTECTED AREA 09/30/2009

Otherwise Protected Area

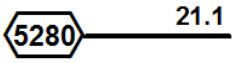
REFERENCE MARKERS

River mile Markers

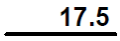
CROSS SECTION & TRANSECT INFORMATION



Lettered Cross Section with Regulatory Water Surface Elevation (BFE)



Numbered Cross Section with Regulatory Water Surface Elevation (BFE)

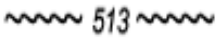


Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)

Coastal Transect

Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.

Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.



Base Flood Elevation Line

ZONE AE (EL 16)

Static Base Flood Elevation value (shown under zone label)

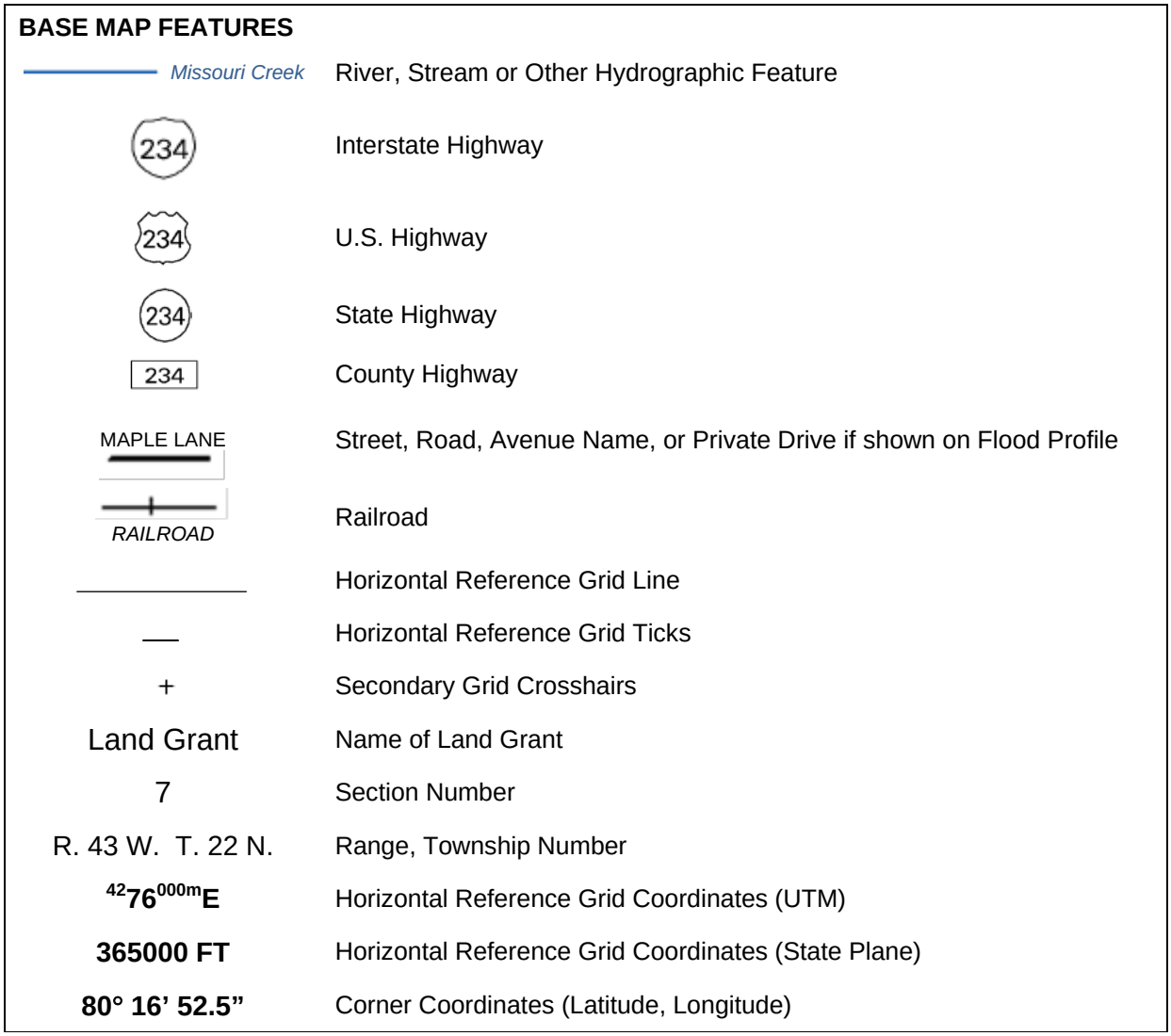
ZONE AO (DEPTH 2)

Zone designation with Depth

ZONE AO (DEPTH 2) (VEL 15 FPS)

Zone designation with Depth and Velocity

Figure 4. Map Legend for FIRM



10.2 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of Carroll County, Indiana.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the 8-digit Hydrologic Unit Codes (HUC-8) sub-basins affecting each, are shown in Table 14. The Flood Insurance Rate Map (FIRM) panel numbers that affect each community are listed. If the flood hazard data for the community is not included in this FIS Report, the location of that data is identified.

The location of flood hazard data for participating communities in multiple jurisdictions is also indicated in the table.

Jurisdictions that have no identified SFHAs as of the effective date of this study are indicated in the table. Changed conditions in these communities (such as urbanization or annexation) or the availability of new scientific or technical data about flood hazards could make it necessary to determine SFHAs in these jurisdictions in the future.

Table 14. Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Burlington, Town of	180318	05120107	0310	
Camden, Town of	180319	05120105	0185	
Carroll County, Unincorporated Areas	180019	05120105, 05120107, 05120106	0010, 0020, 0030, 0035, 0040, 0045, 0075, 0080[2], 0085[2], 0090, 0095, 0115, 0125[2], 0135, 0145, 0152, 0154, 0155, 0156, 0157, 0158, 0159, 0165, 0170[2], 0180, 0185, 0190[2], 0195, 0225, 0250, 0275, 0280, 0285, 0290, 0295, 0305, 0310, 0315, 0320	
Delphi, City of	180020	05120105	0152, 0154, 0156, 0157, 0158, 0159, 0170[2]	
Flora, Town of	180021	05120105	0195	
Yeoman, Town of [1]	180558	05120105, 05120106	0040	

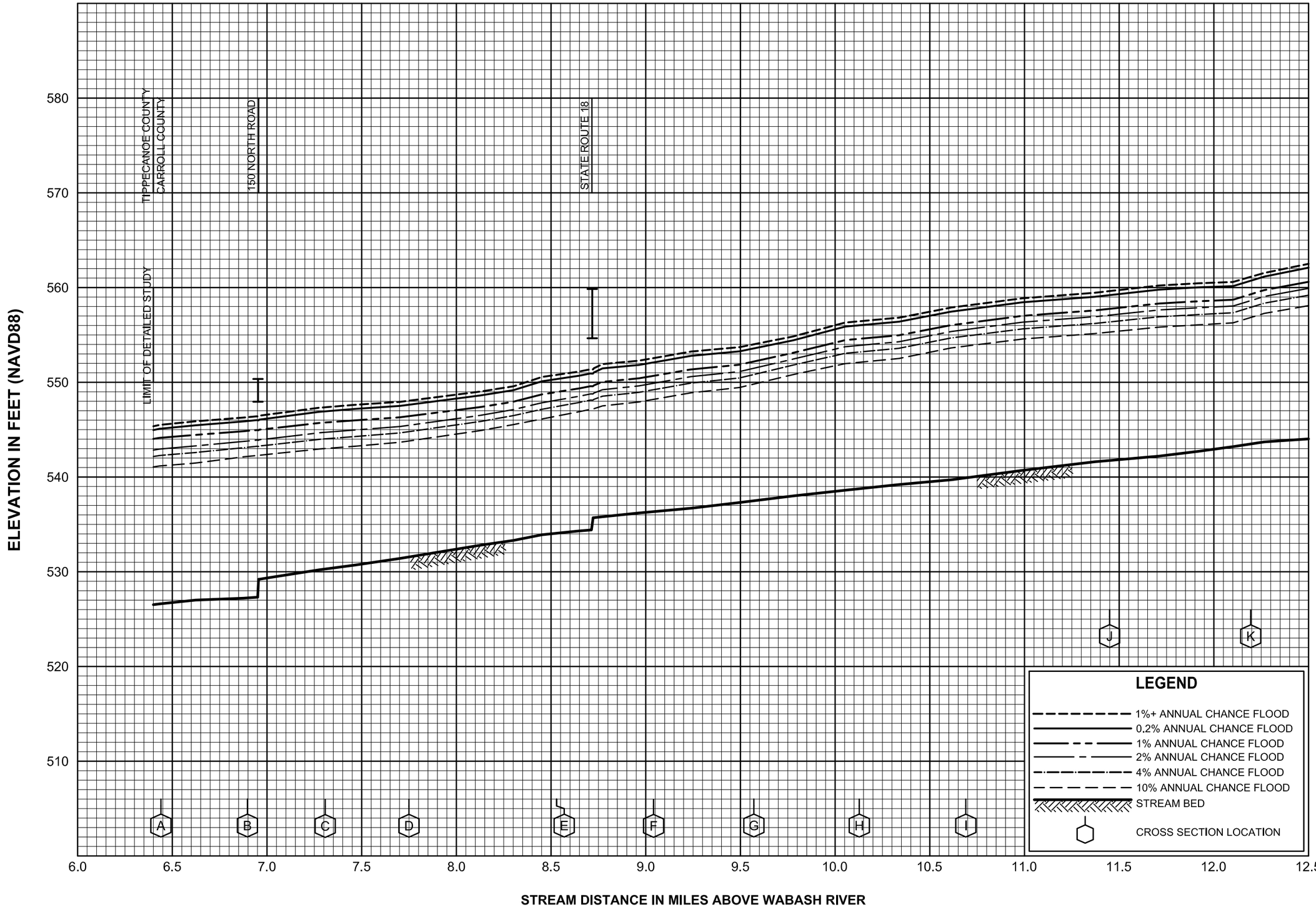
[1] No Special Flood Hazard Areas identified [2] Panel not printed

10.2 Map Repositories

Table 15 is a list of the locations where FIRMs for Carroll County can be viewed. Please note that the maps at these locations are for reference only and are not for distribution. Also, please note that only the maps for the community listed in the table are available at that particular repository. A user may need to visit another repository to view maps from an adjacent community.

Table 15. Map Repositories

Community	Address	City	State	Zip Code
Burlington, Town of	Carroll County Area Plan Commission Carroll County Courthouse 101 West Main Street	Delphi	IN	46923
Camden, Town of	Camden Town Office 153 West Main Street	Camden	IN	46917
Carroll County, Unincorporated Areas	Carroll County Area Plan Commission Carroll County Courthouse 101 West Main Street	Delphi	IN	46923
Delphi, City of	Carroll County Area Plan Commission Carroll County Courthouse 101 West Main Street	Delphi	IN	46923
Flora, Town of	Flora Town Hall 27 West Main Street	Flora	IN	46929
Yeoman, Town of	Town of Yeoman Community Center 210 North Railroad Avenue	Yeoman	IN	47997



FLOOD PROFILES

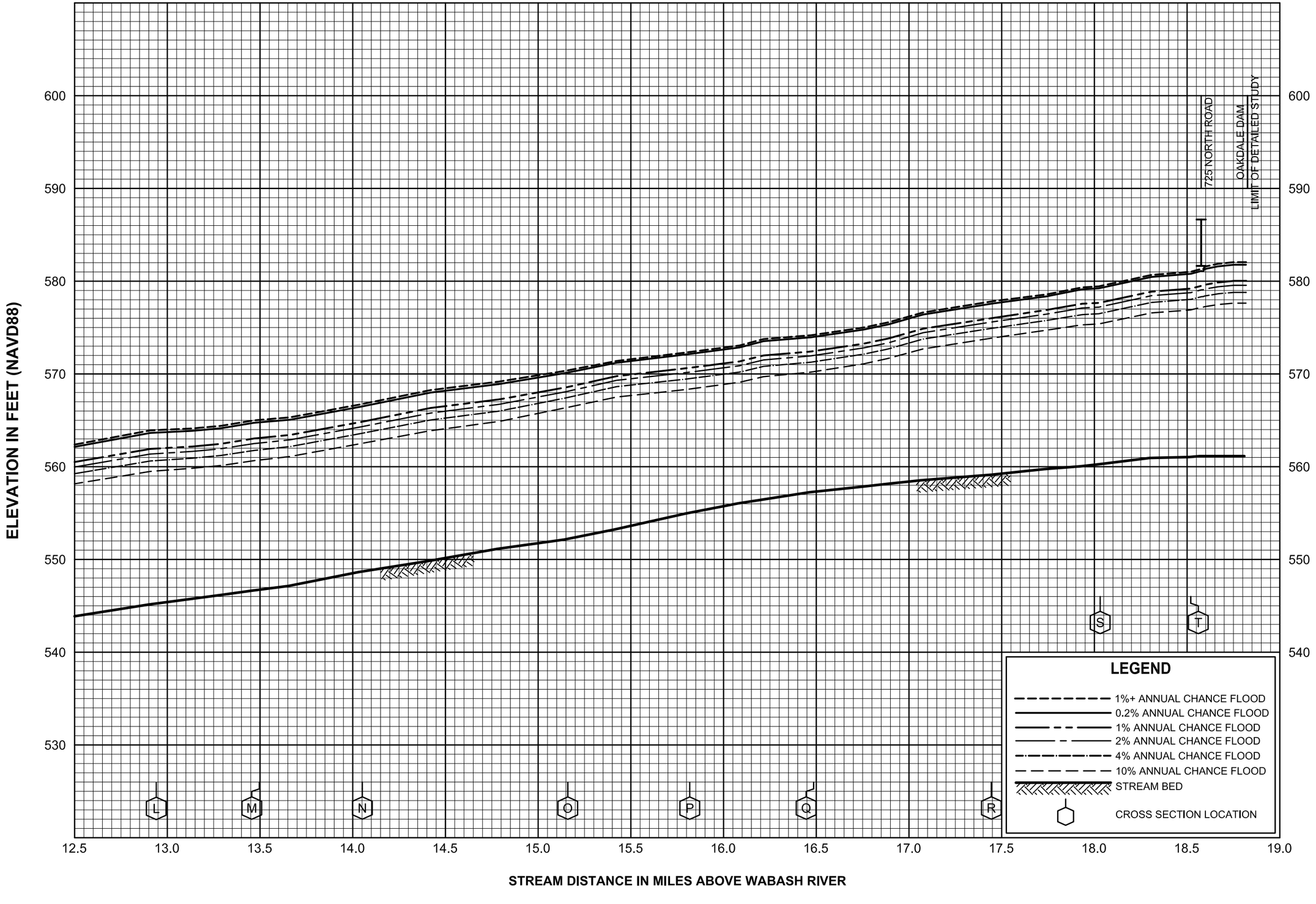
TIPPECANOE RIVER (LOWER)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, IN

AND INCORPORATED AREAS

01P



FLOOD PROFILES

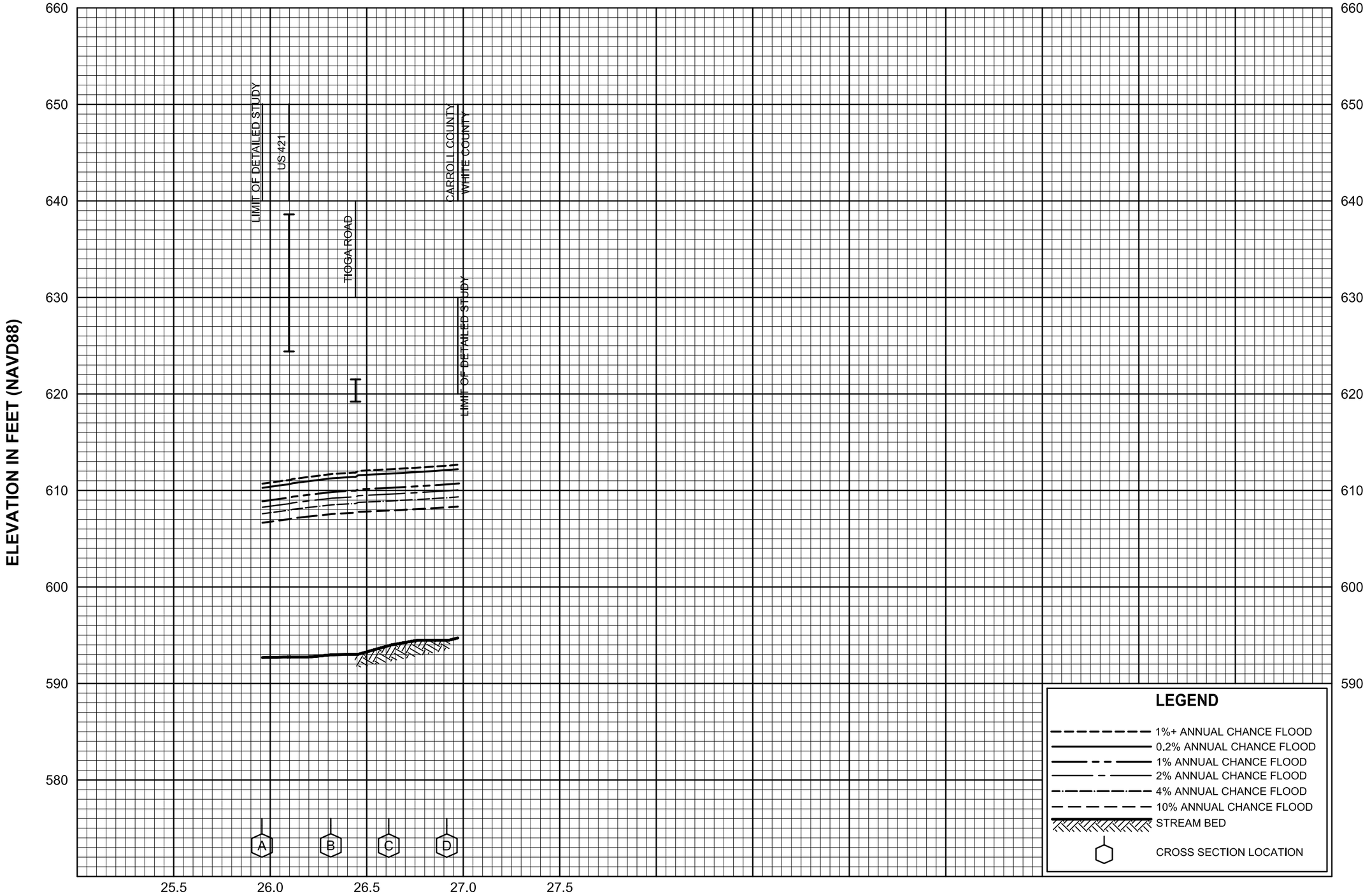
TIPPECANOE RIVER (LOWER)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, IN

AND INCORPORATED AREAS

02P



FLOOD PROFILES

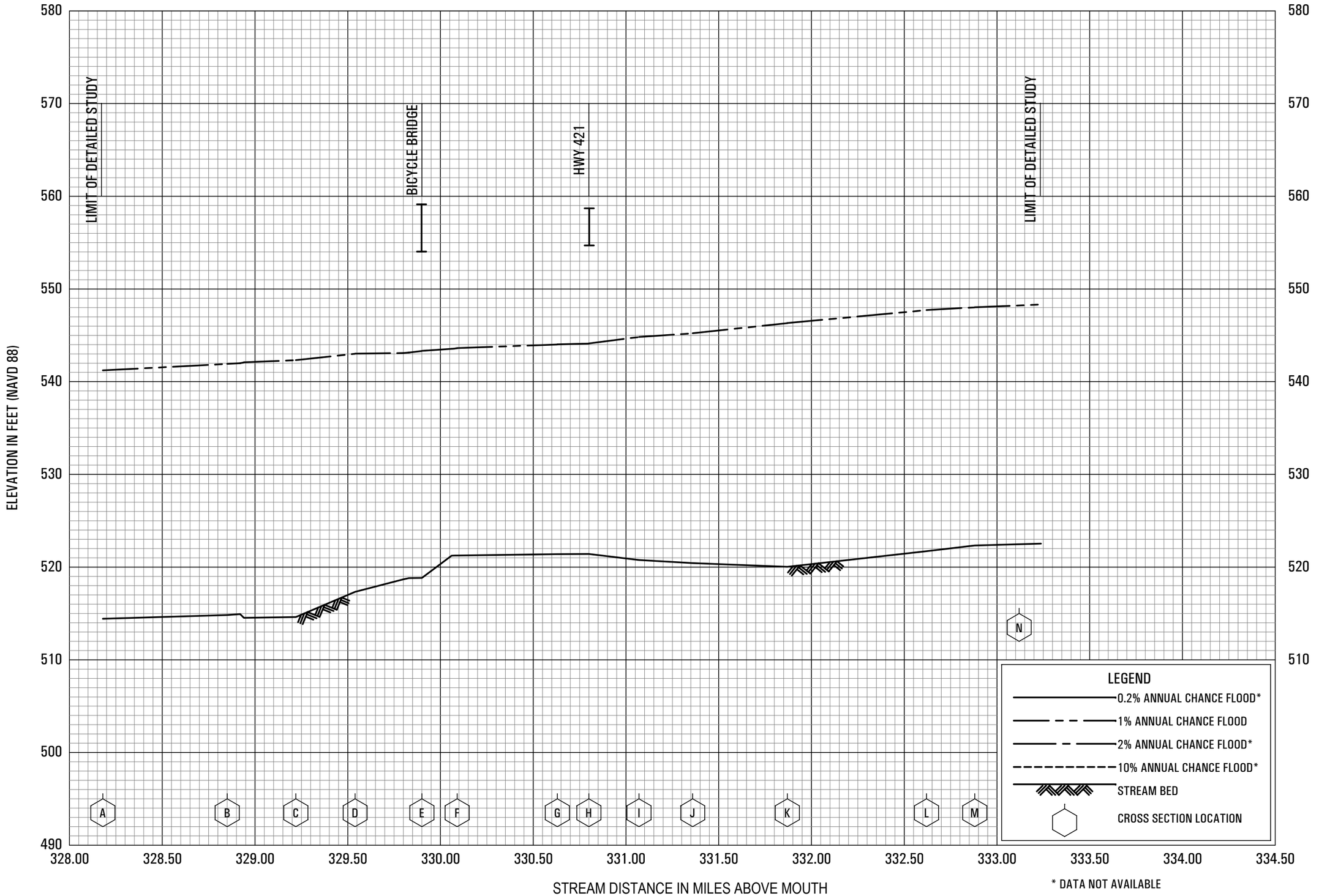
TIPPECANOE RIVER (UPPER)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, IN

AND INCORPORATED AREAS

03P



FLOOD PROFILES

WABASH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, IN

AND INCORPORATED AREAS

04P