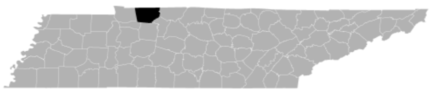
FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 3



MONTGOMERY COUNTY, TENNESSEE

AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
CLARKSVILLE, CITY OF	470137
MONTGOMERY COUNTY, UNINCORPORATED AREAS	470136

FEMA

REVISED:

JANUARY 15, 2021

FLOOD INSURANCE STUDY NUMBER
47125CV001B

Version Number 2.4.3.6

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Published Separately

Flood Insurance Rate Map (FIRM)

FLOOD INSURANCE STUDY REPORT
MONTGOMERY COUNTY, TENNESSEE

SECTION 1.0 – INTRODUCTION

1.1 The National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a voluntary Federal program that enables property owners in participating communities to purchase insurance protection against losses from flooding. This insurance is designed to provide an alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods.

For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, sea-walls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked.

In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection.

The U.S. Congress established the NFIP on August 1, 1968, with the passage of the National Flood Insurance Act of 1968. The NFIP was broadened and modified with the passage of the Flood Disaster Protection Act of 1973 and other legislative measures. It was further modified by the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004. The NFIP is administered by the Federal Emergency Management Agency (FEMA), which is a component of the Department of Homeland Security (DHS).

Participation in the NFIP is based on an agreement between local communities and the Federal Government. If a community adopts and enforces floodplain management regulations to reduce future flood risks to new construction and substantially improved structures in Special Flood Hazard Areas (SFHAs), the Federal Government will make flood insurance available within the community as a financial protection against flood losses. The community's floodplain management regulations must meet or exceed criteria established in accordance with Title 44 Code of Federal Regulations (CFR) Part 60, *Criteria for Land Management and Use*.

SFHAs are delineated on the community's Flood Insurance Rate Maps (FIRMs). Under the NFIP, buildings that were built before the flood hazard was identified on the community's FIRMs are generally referred to as "Pre-FIRM" buildings. When the NFIP was created, the U.S. Congress recognized that insurance for Pre-FIRM buildings would be prohibitively expensive if the premiums were not subsidized by the Federal

Government. Congress also recognized that most of these floodprone buildings were built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. The NFIP requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as “Post-FIRM” buildings.

1.2 Purpose of this Flood Insurance Study Report

This Flood Insurance Study (FIS) Report revises and updates information on the existence and severity of flood hazards for the study area. The studies described in this report developed flood hazard data that will be used to establish actuarial flood insurance rates and to assist communities in efforts to implement sound floodplain management.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive than the minimum Federal requirements. Contact your State NFIP Coordinator to ensure that any higher State standards are included in the community’s regulations.

1.3 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of Montgomery County, Tennessee.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the United States Geological Survey (USGS) 8-digit Hydrologic Unit Code (HUC-8) sub-basins affecting each, are shown in Table 1. The 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.

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Clarksville, City of	470137	05130205 05130206	47125C0063D 47125C0065D[1] 47125C0070D[1] 47125C0088D 47125C0090D[1] 47125C0095D[1] 47125C0201D 47125C0202D 47125C0204D 47125C0206D 47125C0207D	

[1] Panel Not Printed

Table 1: Listing of NFIP Jurisdictions continued

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Clarksville, City of (continued)	470137	05130205 05130206	47125C0208D 47125C0209D 47125C0215E 47125C0216E 47125C0217E 47125C0220E 47125C0226D 47125C0227D 47125C0228D 47125C0229D 47125C0235D 47125C0236E 47125C0237D 47125C0238E 47125C0239E 47125C0241D 47125C0242D 47125C0243E 47125C0244E 47125C0261D 47125C0262D 47125C0263D 47125C0264D 47125C0335E 47125C0351E 47125C0352E 47125C0356E 47125C0357E 47125C0380E	
Montgomery County, Unincorporated Areas	470136	05130205 05130206	47125C0020D[1] 47125C0040D 47125C0045D 47125C0063D 47125C0095D[1] 47125C0115D 47125C0120D[1] 47125C0140D[1] 47125C0160D 47125C0170D[1]	

[1] Panel Not Printed

Table 1: Listing of NFIP Jurisdictions continued

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Montgomery County, Unincorporated Areas (continued)	470136	05130205 05130206	47125C0180D 47125C0181D 47125C0182D 47125C0185D[1] 47125C0190D[1] 47125C0195E 47125C0201D 47125C0202D 47125C0203D 47125C0204D 47125C0206D 47125C0208D 47125C0215E 47125C0216E 47125C0217E 47125C0220E 47125C0235D 47125C0236E 47125C0238E 47125C0239E 47125C0242D 47125C0244E 47125C0251D 47125C0255D[1] 47125C0260D 47125C0261D 47125C0262D 47125C0263D 47125C0264D 47125C0270D 47125C0280D[1] 47125C0286D 47125C0290D[1] 47125C0305E 47125C0310E 47125C0315E 47125C0320E 47125C0330E 47125C0335E	

[1] Panel Not Printed

Table 1: Listing of NFIP Jurisdictions continued

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Montgomery County, Unincorporated Areas (continued)	470136	05130205 05130206	47125C0340E 47125C0341E 47125C0345D[1] 47125C0351E 47125C0352E 47125C0353D[1] 47125C0354E 47125C0356E 47125C0357E 47125C0360E 47125C0362E 47125C0365D[1] 47125C0370E 47125C0380E 47125C0382D 47125C0385D[1] 47125C0390E 47125C0395E 47125C0405D[1] 47125C0430D[1] 47125C0435E 47125C0451E 47125C0455E 47125C0460E 47125C0480E 47125C0485E 47125C0491E	

[1] Panel Not Printed

1.4 Considerations for using this Flood Insurance Study Report

The NFIP encourages State and local governments to implement sound floodplain management programs. To assist in this endeavor, 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% annual chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1% annual chance and 0.2% annual chance floodplains; and 1% annual chance floodway. This information is presented on the FIRM and/or in many components of the FIS Report, including Flood Profiles, Floodway Data tables, Summary of Non-Coastal Stillwater Elevations tables, and Coastal Transect Parameters tables (not all components may be provided for a specific FIS).

This section presents important considerations for using the information contained in this FIS Report and the FIRM, including changes in format and content. Figures 1, 2, and 3 present information that applies to using the FIRM with the FIS Report.

- Part or all of this FIS Report may be revised and republished at any time. In addition, part of this FIS Report may be revised by a Letter of Map Revision (LOMR), which does not involve republication or redistribution of the FIS Report. Refer to Section 6.5 of this FIS Report for information about the process to revise the FIS Report and/or FIRM.

  It is, therefore, the responsibility of the user to consult with community officials by contacting the community repository to obtain the most current FIS Report components. Communities participating in the NFIP have established repositories of flood hazard data for floodplain management and flood insurance purposes. Community map repository addresses are provided in Table 30, "Map Repositories," within this FIS Report.

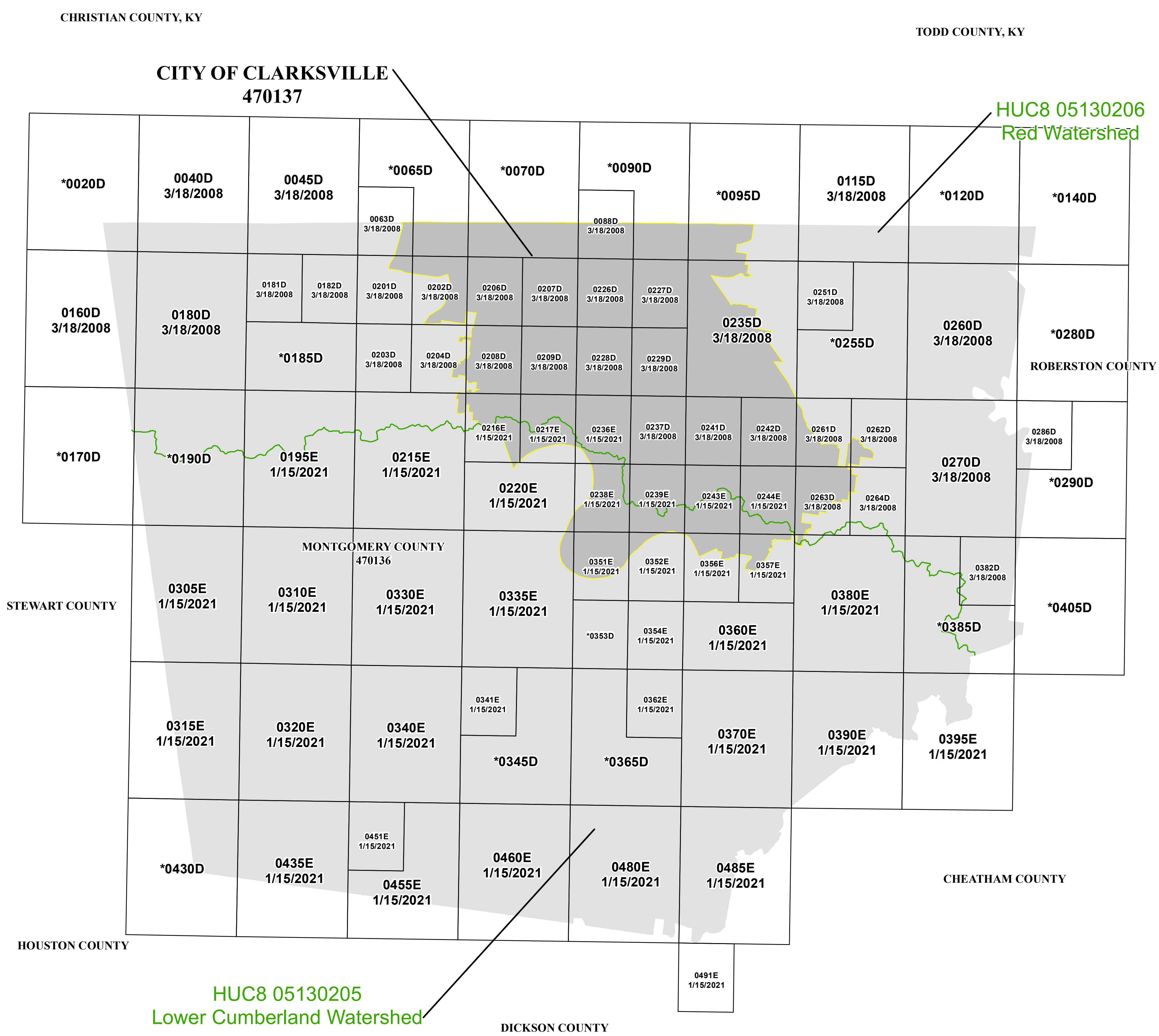
- New FIS Reports are frequently developed for multiple communities, such as entire counties. A countywide FIS Report incorporates previous FIS Reports for individual communities and the unincorporated area of the county (if not jurisdictional) into a single document and supersedes those documents for the purposes of the NFIP.

  The initial Countywide FIS Report for Montgomery County became effective on March 18, 2008. Refer to Table 27 for information about subsequent revisions to the FIRMs.

- FEMA has developed a *Guide to Flood Maps* (FEMA 258) and online tutorials to assist users in accessing the information contained on the FIRM. These include how to read panels and step-by-step instructions to obtain specific information. To obtain this guide and other assistance in using the FIRM, visit the FEMA Web site at www.fema.gov/online-tutorials.

The FIRM Index in Figure 1 shows the overall FIRM panel layout within Montgomery County, and also displays the panel number and effective date for each FIRM panel in the county. Other information shown on the FIRM Index includes community boundaries, flooding sources, watershed boundaries, and USGS HUC-8 codes.

Figure 1: FIRM Index



ATTENTION: The corporate limits shown on this FIRM Index are based on the best information available at the time of publication. As such, they may be more current than those shown on FIRM panels issued before JANUARY 15, 2021.

N

1 inch = 20,000 feet 1:240,000

0 5,500 11,000 22,000 33,000 44,000 feet

Map Projection:
State Plane Lambert Conformal Conic,
Tennessee Zone; North American Datum 1983

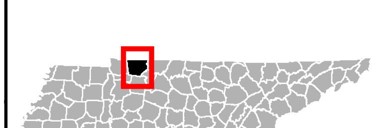
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

* PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

MONTGOMERY COUNTY, TENNESSEE and Incorporated Areas

PANELS PRINTED:

0040, 0045, 0063, 0088, 0115, 0160, 0180, 0181,0182, 0195,0201, 0202, 0203, 0204, 0206, 0207, 0208, 0209, 0215, 0216, 0217, 0220, 0226, 0227, 0228, 0229, 0235, 0236, 0237, 0238, 0239, 0241, 0242, 0243, 0244, 0251, 0260, 0261, 0262, 0263, 0264, 0270, 0286, 0305, 0310, 0315, 0320, 0330, 0335, 0340, 0341, 0351, 0352, 0354, 0356, 0357, 0360, 0362, 0370, 0380, 0382, 0390, 0395, 0435, 0451, 0455, 0460, 0480, 0485, 0491

FEMA

MAP NUMBER
47125CIND0B

MAP REVISED
JANUARY 15, 2021

Each FIRM panel may contain specific notes to the user that provide additional information regarding the flood hazard data shown on that map. However, the FIRM panel does not contain enough space to show all the notes that may be relevant in helping to better understand the information on the panel. Figure 2 contains the full list of these notes.

Figure 2: FIRM Notes to Users

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Mapping and Insurance eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at 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. Users may determine the current map date for each FIRM panel by visiting the FEMA Flood Map Service Center website or by calling the FEMA Mapping and Insurance eXchange.

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 27 in this FIS Report.

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

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 Non-Coastal 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.

Figure 2: FIRM Notes to Users

PROJECTION INFORMATION: The projection used in the preparation of the map was State Plane Lambert Conformal Conic, Tennessee Zone. The horizontal datum was the North American Datum 1983; Western Hemisphere. 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 www.ngs.noaa.gov.

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 30 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on this FIRM was provided by the State of Tennessee, Department of Finance & Administration, Strategic Technologies Solutions, GIS Services at https://tnmap.tn.gov/. Data was also obtained from the United States Department of Transportation and the State of Tennessee, Controller of the Treasury Office of Local Government. Ortho imagery was originally produced by the Tennessee Department of Transportation in 2013 and has a 10 inch ground sample distance. For information about base maps, refer to Section 6.2 "Base Map" in this FIS Report.

The map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map.

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 Montgomery County, Tennessee, 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 27 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.

ATTENTION: The corporate limits shown on this FIRM Index are based on the best information available at the time of publication. As such, they may be more current than those shown on FIRM panels issued before January 15, 2021.

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Montgomery County, Tennessee, effective January 15, 2021.

Figure 2: FIRM Notes to Users

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 3 shows the full legend of all map features. Note that not all of these features may appear on the FIRM panels in Montgomery County.

Figure 3: Map Legend for FIRM

SPECIAL FLOOD HAZARD AREAS: *The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1% annual chance flood. The Base Flood Elevation is the water surface elevation of the 1% 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% 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% 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% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.
Zone AE	The flood insurance rate zone that corresponds to the 1% 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% 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% 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% 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% annual chance or greater flood.
Zone A99	The flood insurance rate zone that corresponds to areas of the 1% 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% 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% 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.
	Regulatory Floodway determined in Zone AE.
	Non-encroachment zone (see Section 2.4 of this FIS Report for more information)

Figure 3: Map Legend for FIRM

OTHER AREAS OF FLOOD HAZARD	
	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.
	Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% 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% annual chance flood.
	Area with Flood Risk due to Levee: Areas where a non-accredited levee, dike, or other flood control structure is shown as providing protection to less than the 1% 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.
NO SCREEN	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 3: Map Legend for FIRM

REFERENCE MARKERS	
22.0	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
B 20.2	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
5280 21.1	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
17.5	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
8	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.
513	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 3: Map Legend for FIRM

BASE MAP FEATURES	
Missouri Creek	River, Stream or Other Hydrographic Feature
234	Interstate Highway
234	U.S. Highway
234	State Highway
234	County Highway
MAPLE LANE	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
RAILROAD	Railroad
	Horizontal Reference Grid Line
	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
$^{42}76^{000m}$**E**	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16’ 52.5”	Corner Coordinates (Latitude, Longitude)

SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS

2.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1% annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2% annual chance (500-year) flood is employed to indicate additional areas of flood hazard in the community.

Each flooding source included in the project scope has been studied and mapped using professional engineering and mapping methodologies that were agreed upon by FEMA and Montgomery County as appropriate to the risk level. Flood risk is evaluated based on factors such as known flood hazards and projected impact on the built environment. Engineering analyses were performed for each studied flooding source to calculate its 1% annual chance flood elevations; elevations corresponding to other floods (e.g. 10-, 4-, 2-, 0.2-percent annual chance, etc.) may have also been computed for certain flooding sources. Engineering models and methods are described in detail in Section 5.0 of this FIS Report. The modeled elevations at cross sections were used to delineate the floodplain boundaries on the FIRM; between cross sections, the boundaries were interpolated using elevation data from various sources. More information on specific mapping methods is provided in Section 6.0 of this FIS Report.

Depending on the accuracy of available topographic data (Table 22), study methodologies employed (Section 5.0), and flood risk, certain flooding sources may be mapped to show both the 1% and 0.2% annual chance floodplain boundaries, regulatory water surface elevations (BFEs), and/or a regulatory floodway. Similarly, other flooding sources may be mapped to show only the 1% annual chance floodplain boundary on the FIRM, without published water surface elevations. In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundary is shown on the FIRM. Figure 3, “Map Legend for FIRM”, describes the flood zones that are used on the FIRMs to account for the varying levels of flood risk that exist along flooding sources within the project area. Table 2 and Table 3 indicate the flood zone designations for each flooding source and each community within Montgomery County, respectively.

Table 2, “Flooding Sources Included in this FIS Report,” lists each flooding source, including its study limits, affected communities, mapped zone on the FIRM, and the completion date of its engineering analysis from which the flood elevations on the FIRM and in the FIS Report were derived. Descriptions and dates for the latest hydrologic and hydraulic analyses of the flooding sources are shown in Table 12. Floodplain boundaries for these flooding sources are shown on the FIRM (published separately) using the symbology described in Figure 3. On the map, the 1% annual chance floodplain corresponds to the SFHAs. The 0.2% annual chance floodplain shows areas that, although out of the regulatory floodplain, are still subject to flood hazards.

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. The procedures to remove these areas from the SFHA are described in Section 6.5 of this FIS Report.

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Antioch Creek	Montgomery County, Unincorporated Areas	Confluence with Budds Creek	Approximately 2,250 feet upstream of Antioch Church Road	05130205	3.2	N	AE	10/01/2017
Baggett Branch	Montgomery County, Unincorporated Areas	Confluence with East Fork Yellow Creek / Sullivan Branch	Approximately 840 feet upstream of Bryant Hollow Road	05130205	2.4	N	AE	10/01/2017
Bascomb Eldridge Creek	Montgomery County, Unincorporated Areas	Confluence with Blooming Grove Creek	Approximately 3,325 feet upstream of Poplar Springs Road	05130205	0.8	N	AE	10/01/2017
Big Bartons Creek	Montgomery County, Unincorporated Areas	Confluence with Cumberland River	Approximately 440 feet upstream of Ryes Chapel Road	05130205	9.9	N	AE	10/01/2017
Big McAdoo Creek	Montgomery County, Unincorporated Areas	Confluence with Cumberland River	Approximately 45 feet downstream of Shady Grove Road	05130205	9.0	N	AE	10/01/2017
Big West Fork	Clarksville, City of	Confluence with Red River	Todd County, KY boundary	05130206	14.7	Y	AE	06/01/1982
Blooming Grove Creek	Montgomery County, Unincorporated Areas	Confluence with Cumberland River	Approximately 4,000 feet upstream of confluence of Bascomb Eldridge Creek	05130205	7.4	N	AE	10/01/2017
Bryant Branch	Montgomery County, Unincorporated Areas	Confluence with Baggett Branch	Approximately 2,330 feet upstream of Nolen West Russell Road	05130205	0.5	N	AE	10/01/2017
Budds Creek	Montgomery County, Unincorporated Areas	Confluence with Cumberland River	Approximately 1.22 miles upstream of Budds Creek Road	05130205	5.8	N	AE	10/01/2017

Table 2: Flooding Sources Included in this FIS Report continued

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Cumberland River	Clarksville, City of; Montgomery County, Unincorporated Areas	Stewart County boundary	Cheatham County boundary	05130205	144.8	Y	AE	06/08/1982
Dry Fork Creek	Montgomery County, Unincorporated Areas	Confluence with Noahs Spring Branch	Christian County, KY boundary	05130206	3.0	N	A	02/01/2007
East Fork Yellow Creek	Montgomery County, Unincorporated Areas	Confluence with Yellow Creek	Confluence of Baggett Branch / Sullivan Branch	05130205	7.7	N	AE	10/01/2017
Fletchers Fork	Clarksville, City of; Montgomery County, Unincorporated Areas	Confluence with Little West Fork	Approximately 790 feet upstream of New Providence Road	05130206	4.6	Y	AE	06/01/1982
Fletchers Fork	Montgomery County, Unincorporated Areas	Approximately 790 feet upstream of New Providence Road	Approximately 1.7 miles upstream New Providence Road	05130206	1.6	N	A	02/01/2007
Half Pone Creek	Montgomery County, Unincorporated Areas	Cheatham County Boundary	Cheatham County boundary	05130205	1.4	N	AE	10/01/2017
Indian Creek	Montgomery County, Unincorporated Areas	Confluence with Little Bartons Creek	Approximately 3,190 feet upstream of Buckner Road	05130205	1.0	N	AE	10/01/2017
Little Bartons Creek	Montgomery County, Unincorporated Areas	Confluence with Big Bartons Creek	Dickson County boundary	05130205	6.5	N	AE	10/01/2017
Little McAdoo Creek	Montgomery County, Unincorporated Areas	Confluence with Big McAdoo Creek	Approximately 5,200 feet upstream of State Highway 12 / Ashland City Road	05130205	2.5	N	AE	10/01/2017
Little West Fork	Clarksville, City of; Montgomery County, Unincorporated Areas	Confluence with Big West Fork	Confluence of Noahs Spring Branch	05130206	12.9	Y	AE	06/01/1982

Table 2: Flooding Sources Included in this FIS Report continued

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Louise Creek	Montgomery County, Unincorporated Areas	Confluence with Big Bartons Creek	Approximately 1.12 miles upstream of Louise Creek Road	05130205	9.5	N	AE	10/01/2017
Lower Meadowbrook Creek	Clarksville, City of	Confluence with Little West Fork	Approximately 270 feet upstream of Pine Mountain Road	05130206	1.7	Y	AE	04/24/2000
Noahs Spring Branch	Montgomery County, Unincorporated Areas	Confluence with Little West Fork Creek	Approximately 1,320 feet upstream of the confluence of Little West Fork Creek	05130206	0.3	Y	AE	06/01/1982
Noahs Spring Branch	Montgomery County, Unincorporated Areas	Approximately 1,320 feet upstream of the confluence of Little West Fork Creek	Christian County, KY boundary	05130206	3.8	N	A	02/01/2007
Passenger Creek	Montgomery County, Unincorporated Areas	Confluence with Red River	Approximately 4.0 miles upstream of the confluence of Coon Creek	05130206	7.0	N	A	02/01/2007
Piney Fork Creek	Montgomery County, Unincorporated Areas	Confluence with Little West Fork	Stewart County boundary	05130206	10.8	N	A	10/17/2006
Red River	Clarksville, City of; Montgomery County, Unincorporated Areas	Confluence with Cumberland River	Approximately 3.0 miles upstream of I-24	05130206	16.2	Y	AE	06/01/1982
Red River	Clarksville, City of; Montgomery County, Unincorporated Areas	Approximately 3.0 miles upstream of I-24	Robertson County boundary	05130206	13.1	N	A	02/01/2007
Spring Creek	Clarksville, City of; Montgomery County, Unincorporated Areas	Confluence with Big West Fork	Todd County, KY boundary	05130206	14.9	N	A	02/01/2007

Table 2: Flooding Sources Included in this FIS Report continued

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Sullivan Branch	Montgomery County, Unincorporated Areas	Confluence with East Fork Yellow Creek	Approximately 3,055 feet upstream of State Highway 13 / Shiloh Branch Road	05130205	0.9	N	AE	10/01/2017
Sulphur Fork Creek	Montgomery County, Unincorporated Areas	Confluence with Red River	Robertson County boundary	05130206	3.1	N	A	02/01/2007
Unnamed Tributary	Clarksville, City of	Confluence with Big West Fork	Approximately 1.1 miles upstream of the confluence with Big West Fork	05130206	1.1	N	A	02/01/2007
Unnamed Tributary	Montgomery County, Unincorporated Areas	Confluence with Spring Creek	Todd County, KY boundary	05130206	1.2	N	A	02/01/2007
Upper Meadowbrook Creek	Clarksville, City of; Montgomery County, Unincorporated Areas	Approximately 320 feet downstream of U.S. Highway 41-A	Approximately 350 feet upstream of Donna Drive	05130206	1.7	Y	AE	04/24/2000
Wall Branch	Clarksville, City of	Confluence with Cumberland River	Approximately 3,175 feet upstream of East Old Ashland City Road	05130205	2.6	N	AE	10/01/2017
Yellow Creek	Montgomery County, Unincorporated Areas	Confluence with Cumberland River	Houston County boundary	05130205	11.3	N	AE	10/01/2017

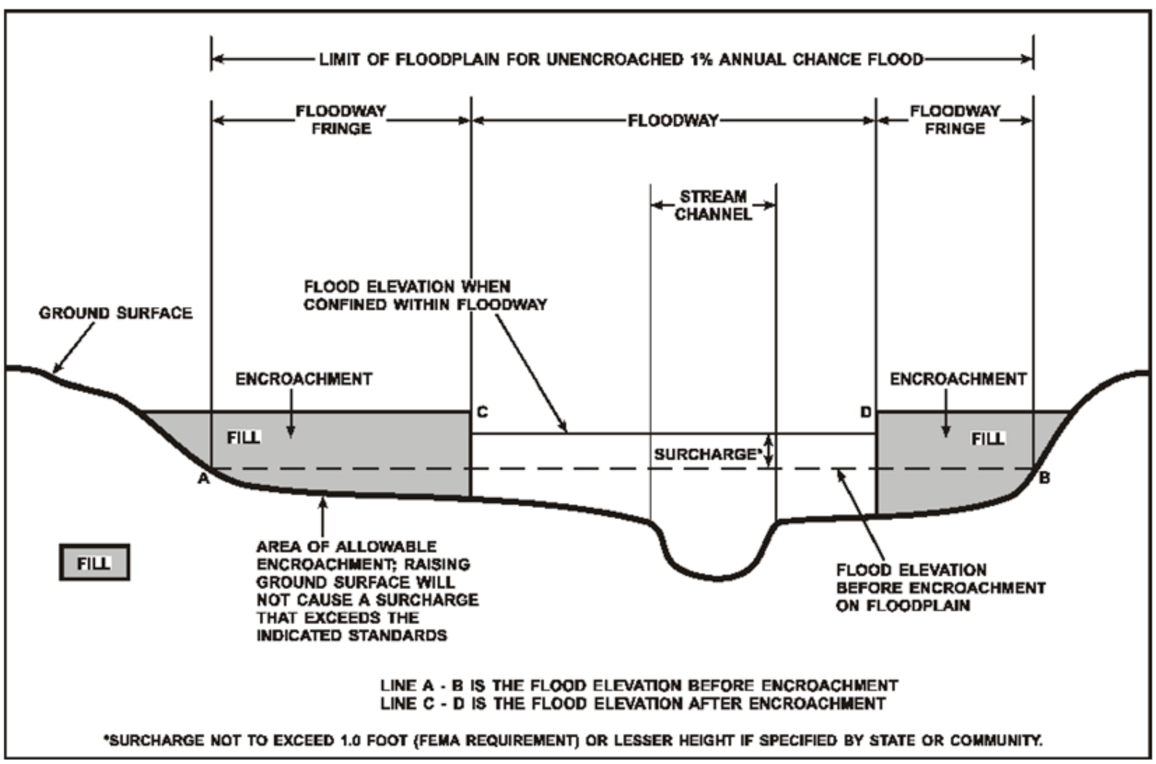
2.2 Floodways

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 balancing floodplain development against increasing flood hazard. With this approach, the area of the 1% annual chance floodplain on a river is divided into a floodway and a floodway fringe based on hydraulic modeling. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment in order to carry the 1% annual chance flood. The floodway fringe is the area between the floodway and the 1% annual chance floodplain boundaries where encroachment is permitted. The floodway must be wide enough so that the floodway fringe could be completely obstructed without increasing the water surface elevation of the 1% annual chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 4.

To participate in the NFIP, Federal regulations require communities to limit increases caused by encroachment to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this project are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway projects.

Figure 4: Floodway Schematic



Floodway widths presented in this FIS Report and on the FIRM were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. For certain stream segments, floodways were adjusted so that the amount of floodwaters conveyed on each side of the floodplain would be reduced equally. The results of the floodway computations have been tabulated for selected cross sections and are shown in Table 23, “Floodway Data.”

All floodways that were developed for this Flood Risk Project are shown on the FIRM using the symbology described in Figure 3. In cases where the floodway and 1% annual chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown on the FIRM. For information about the delineation of floodways on the FIRM, refer to Section 6.3.

2.3 Base Flood Elevations

The hydraulic characteristics of flooding sources were analyzed to provide estimates of the elevations of floods of the selected recurrence intervals. The Base Flood Elevation (BFE) is the elevation of the 1% annual chance flood. These BFEs are most commonly rounded to the whole foot, as shown on the FIRM, but in certain circumstances or locations they may be rounded to 0.1 foot. Cross section lines shown on the FIRM may also be labeled with the BFE rounded to 0.1 foot. Whole-foot BFEs derived from engineering analyses that apply to coastal areas, areas of ponding, or other static areas with little elevation change may also be shown at selected intervals on the FIRM.

Cross sections with BFEs shown on the FIRM correspond to the cross sections shown in the Floodway Data table and Flood Profiles in this FIS Report. BFEs 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.

2.4 Non-Encroachment Zones

Some States and communities use non-encroachment zones to manage floodplain development. For flooding sources with medium flood risk, field surveys are often not collected and surveyed bridge and culvert geometry is not developed. Standard hydrologic and hydraulic analyses are still performed to determine BFEs in these areas. However, floodways are not typically determined, since specific channel profiles are not developed. To assist communities with managing floodplain development in these areas, a “non-encroachment zone” may be provided. While not a FEMA designated floodway, the non-encroachment zone represents that area around the stream that should be reserved to convey the 1% annual chance flood event. As with a floodway, all surcharges must fall within the acceptable range in the non-encroachment zone.

General setbacks can be used in areas of lower risk (e.g. unnumbered Zone A), but these are not considered sufficient where unnumbered Zone A is replaced by Zone AE. The NFIP requires communities to ensure that any development in a non-encroachment area causes no increase in BFEs. Communities must generally prohibit development within the area defined by the non-encroachment width to meet the NFIP requirement. Regulations for Tennessee require communities in Montgomery County to limit increases caused by encroachment to 1.0 foot and several communities have adopted additional restrictions for non-encroachment areas.

Non-encroachment determinations may be delineated where it is not possible to delineate floodways because specific channel profiles with bridge and culvert geometry were not developed. Any non-encroachment determinations for this Flood Risk Project have been tabulated for selected cross sections and are shown in Table 24, “Flood Hazard and Non-Encroachment Data for Selected Streams.” Areas for which non-encroachment zones are provided show BFEs and the 1% annual chance floodplain boundaries mapped as zone AE on the FIRM but no floodways.

2.5 Coastal Flood Hazard Areas

This section is not applicable for this Flood Risk Project.

2.5.1 Water Elevations and the Effects of Waves

This section is not applicable for this Flood Risk Project.

Figure 5: Wave Runup Transect Schematic

[Not Applicable to this Flood Risk Project]

2.5.2 Floodplain Boundaries and BFEs for Coastal Areas

This section is not applicable to this Flood Risk Project.

2.5.3 Coastal High Hazard Areas

This section is not applicable to this Flood Risk Project.

Figure 6: Coastal Transect Schematic

[Not Applicable to this Flood Risk Project]

2.5.4 Limit of Moderate Wave Action

This section is not applicable to this Flood Risk Project.

SECTION 3.0 – INSURANCE APPLICATIONS

3.1 National Flood Insurance Program Insurance Zones

For flood insurance applications, the FIRM designates flood insurance rate zones as described in Figure 3, “Map Legend for FIRM.” Flood insurance zone designations are assigned to flooding sources based on the results of the hydraulic or coastal analyses. Insurance agents use the zones shown on the FIRM and depths and base flood elevations in this FIS Report in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

The 1% annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (e.g. Zones A, AE, V, VE, etc.), and the 0.2% annual chance floodplain boundary corresponds to the boundary of areas of additional flood hazards.

Table 3 lists the flood insurance zones in Montgomery County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Clarksville, City of	A, AE, X
Montgomery County, Unincorporated Areas	A, AE, X

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

Table 4 contains a description of the characteristics of the HUC-8 sub-basins within which each community falls. The table includes the main flooding sources within each basin, a brief description of the basin, and its drainage area.

Table 4: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Lower Cumberland	05130205	Cumberland River	This watershed contains the northern half of Montgomery County. It has the smaller presence of the two watersheds.	2,334
Red	05130206	Red River	This watershed contains the southern half of the county. It is the larger of the watersheds.	1,554

4.2 Principal Flood Problems

Table 5 contains a description of the principal flood problems that have been noted for Montgomery County by flooding source.

Table 5: Principal Flood Problems

Flooding Source	Description of Flood Problems
Cumberland River	The principal flood period in the Cumberland River Basin is late winter through early spring. In fact the floods of 1882, 1913, 1927, 1937, 1962, and 1975, have occurred from mid-December to mid-April. Although summer floods can be severe at times, especially on smaller streams such as the Red River, they are usually the result of local thunderstorms whose centers of intense rainfall are generally limited in area. The flood of March 1975 was one of the largest floods of record in the Cumberland River Basin. The flood approached the 1% annual chance frequency of occurrence on the Cumberland River. A new record under controlled conditions was reached during this flood. The Cumberland River crested 11 feet above flood stage at the City of Clarksville (USACE June 1976).

Table 6 contains information about historic flood elevations in the communities within Montgomery County.

Table 6: Historic Flooding Elevations

Flooding Source	Location	Historic Peak (Feet NAVD88)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Cumberland River	Cumberland River at City of Clarksville (USGS Gage ID 03436500)	*	1975	100	FIS 2008

* Data not available

4.3 Non-Levee Flood Protection Measures

Table 7 contains information about non-levee flood protection measures within Montgomery County such as dams, jetties, and or dikes. Levees are addressed in Section 4.4 of this FIS Report.

Table 7: Non-Levee Flood Protection Measures

[Not Applicable for this Flood Risk Project]

4.4 Levees

This section is not applicable to this Flood Risk Project.

Table 8: Levees

[Not Applicable for this Flood Risk Project]

SECTION 5.0 – ENGINEERING METHODS

For the flooding sources in the community, 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 at least once on the average during any 10-, 25-, 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-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2% annual 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 100-year flood (1-percent chance of annual exceedance) during the term of a 30-year mortgage is approximately 26 percent (about 3 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.

5.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. A summary of the hydrologic methods applied to develop the discharges used in the hydraulic analyses for each stream is provided in Table 12. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 9. Stream gage information is provided in Table 11.

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Antioch Creek	At the confluence with Budds Creek	11.0	2,418	3,133	3,684	4,251	5,646
Antioch Creek	Approximately 1,830 feet downstream of Palmyra Road	9.7	2,217	2,874	3,380	3,902	5,184
Antioch Creek	Approximately 750 feet upstream of Palmyra Road	9.1	2,116	2,744	3,227	3,726	4,950
Antioch Creek	Approximately 2,475 feet upstream of Palmyra Road	7.1	1,771	2,298	2,704	3,124	4,154
Antioch Creek	Approximately 3,860 feet upstream of Palmyra Road	5.5	1,472	1,912	2,251	2,602	3,462
Antioch Creek	Approximately 1,330 feet downstream of Antioch Church Road	5.0	1,387	1,801	2,121	2,451	3,263
Antioch Creek	Approximately 1,015 feet upstream of Antioch Church Road	4.0	1,186	1,542	1,816	2,100	2,798
Baggett Branch	At the confluence with East Fork Yellow Creek / Sullivan Branch	10.2	2,299	2,966	3,488	4,025	5,347
Baggett Branch	Approximately 840 feet upstream of State Highway 13	9.9	2,240	2,903	3,415	3,941	5,236
Baggett Branch	Approximately 1,830 feet upstream of State Highway 13	9.2	2,134	2,767	3,255	3,757	4,992
Baggett Branch	Approximately 3,790 feet downstream of Bryant Hollow Road	8.7	2,055	2,665	3,135	3,620	4,810
Bascomb Eldridge Creek	At the confluence with Blooming Grove Creek	3.3	1,026	1,334	1,572	1,819	2,424

Table 9: Summary of Discharges continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Big Bartons Creek	At the confluence with Cumberland River	117.7	13,089	16,841	19,709	22,637	29,848
Big Bartons Creek	Approximately 1.44 miles upstream of confluence with Cumberland River	116.8	13,018	16,750	19,603	22,515	29,688
Big Bartons Creek	Approximately 3,200 feet downstream of Chapel Hill Road	115.4	12,902	16,602	19,429	22,316	29,427
Big Bartons Creek	Just upstream of the confluence of Louise Creek	96.5	11,361	14,627	17,125	19,676	25,960
Big Bartons Creek	Approximately 4,075 feet downstream of the confluence of Little Bartons Creek	95.9	11,309	14,560	17,047	19,587	25,843
Big Bartons Creek	Just upstream of the confluence of Little Bartons Creek	65.2	8,597	11,082	12,984	14,930	19,722
Big Bartons Creek	Approximately 4,500 feet upstream of the confluence of Little Bartons Creek	63.8	8,465	10,913	12,786	14,704	19,423
Big Bartons Creek	Approximately 1.67 miles downstream of Ryes Chapel Road	62.5	8,343	10,755	12,602	14,492	19,145
Big Bartons Creek	Approximately 3,200 feet upstream of Ryes Chapel Road	56.3	7,739	9,979	11,696	13,453	17,778
Big McAdoo Creek	At the confluence with Cumberland River	29.3	4,863	6,284	7,374	8,493	11,246
Big McAdoo Creek	Approximately 3,825 feet upstream of confluence with Cumberland River	27.3	4,619	5,970	7,007	8,071	10,689

Table 9: Summary of Discharges continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Big McAdoo Creek	Approximately 1.45 miles downstream of Gholson Road	26.3	4,507	5,825	6,838	7,877	10,433
Big McAdoo Creek	Approximately 3,635 feet downstream of Gholson Road	25.0	4,340	5,611	6,586	7,588	10,052
Big McAdoo Creek	Approximately 425 feet upstream of Gholson Road	24.5	4,276	5,528	6,489	7,476	9,905
Big McAdoo Creek	Approximately 1,450 feet downstream of the confluence of Little McAdoo Creek	23.4	4,145	5,359	6,292	7,250	9,606
Big McAdoo Creek	Just upstream of the confluence of Little McAdoo Creek	12.3	2,619	3,393	3,989	4,602	6,110
Big McAdoo Creek	Approximately 525 feet upstream of Hickory Point Road	11.6	2,511	3,253	3,825	4,413	5,860
Big McAdoo Creek	Approximately 720 feet downstream of State Highway 12 / Ashland City Road	10.2	2,289	2,967	3,489	4,027	5,349
Big McAdoo Creek	Approximately 1,250 feet upstream of State Highway 12 / Ashland City Road	9.1	2,123	2,752	3,237	3,737	4,966
Big McAdoo Creek	Approximately 3,000 feet downstream of McAdoo Creek Road	7.9	1,910	2,478	2,915	3,367	4,475
Big West Fork	At river mile 0.28	448	20,800	*	31,500	36,400	43,900
Big West Fork	At river mile 5.55	261	12,000	*	17,700	20,400	25,500
Big West Fork	At river mile 8.02	191	11,100	*	13,600	15,600	19,800

* Not calculated for this Flood Risk Project

Table 9: Summary of Discharges continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Blooming Grove Creek	At the confluence with Cumberland River	33.3	5,321	6,872	8,063	9,284	12,288
Blooming Grove Creek	Approximately 1.23 miles upstream of confluence with Cumberland River	32.6	5,248	6,779	7,954	9,158	12,123
Blooming Grove Creek	Approximately 3,365 feet downstream of Rawlings Road	31.5	5,118	6,612	7,758	8,934	11,826
Blooming Grove Creek	Approximately 1,550 feet upstream of Rawlings Road	30.2	4,969	6,420	7,534	8,677	11,488
Blooming Grove Creek	Approximately 3,915 feet upstream of Rawlings Road	21.2	3,862	4,995	5,865	6,759	8,959
Blooming Grove Creek	Approximately 1,050 feet downstream of State Highway 223 / Lylewood Road	19.8	3,676	4,755	5,585	6,437	8,533
Blooming Grove Creek	Approximately 800 feet upstream of State Highway 223 / Lylewood Road	19.2	3,595	4,651	5,463	6,297	8,348
Blooming Grove Creek	Approximately 900 feet upstream of Cooper Creek Road	10.9	2,400	3,110	3,657	4,221	5,605
Blooming Grove Creek	Approximately 3,800 feet downstream of the confluence of Bascomb Eldridge Creek	10.2	2,293	2,973	3,496	4,035	5,359
Blooming Grove Creek	Approximately 1,820 feet downstream of the confluence of Bascomb Eldridge Creek	9.8	2,221	2,880	3,387	3,910	5,194
Blooming Grove Creek	Just upstream of the confluence of Bascomb Eldridge Creek	5.4	1,458	1,894	2,230	2,577	3,430

Table 9: Summary of Discharges continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Blooming Grove Creek	Approximately 1,740 feet upstream of the confluence of Bascomb Eldridge Creek	5.1	1,405	1,824	2,148	2,483	3,305
Blooming Grove Creek	Approximately 2,790 feet upstream of the confluence of Bascomb Eldridge Creek	4.5	1,280	1,663	1,959	2,265	3,016
Bryant Branch	At the confluence with Baggett Branch	4.4	1,265	1,643	1,936	2,238	2,980
Bryant Branch	Approximately 2,140 feet upstream of Nolan West Russell Road	4.1	1,203	1,563	1,841	2,129	2,836
Budds Branch	At the confluence with Antioch Creek	11.2	2,450	3,175	3,734	4,308	5,721
Budds Branch	Approximately 2,230 feet downstream of Budds Creek Road	10.5	2,337	3,029	3,562	4,110	5,459
Budds Branch	Approximately 700 feet upstream of Budds Creek Road	9.7	2,212	2,868	3,373	3,893	5,172
Budds Branch	Approximately 2,610 feet upstream of Budds Creek Road	9.4	2,160	2,801	3,294	3,803	5,052
Budds Branch	Approximately 4,610 feet upstream of Budds Creek Road	4.4	1,267	1,646	1,939	2,242	2,986
Budds Branch	Approximately 1,900 feet upstream of Budds Creek Road	3.8	1,131	1,470	1,732	2,003	2,669

Table 9: Summary of Discharges continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Budds Branch	Approximately 4,730 feet upstream of Budds Creek Road	3.5	1,068	1,389	1,637	1,893	2,523
Cumberland River	At river mile 125.2	15,897	169,000	*	220,000	250,000	318,000
Cumberland River	At river mile 125.3	14,442	138,000	*	176,000	197,000	253,000
East Fork Yellow Creek	At the confluence with Yellow Creek	30.3	4,983	6,438	7,555	8,700	11,519
East Fork Yellow Creek	Approximately 1.3 miles downstream of Tarsus Road	29.8	4,923	6,360	7,463	8,596	11,381
East Fork Yellow Creek	Approximately 2,290 feet downstream of Tarsus Road	28.9	4,812	6,218	7,298	8,405	11,130
East Fork Yellow Creek	Approximately 3,500 feet upstream of Tarsus Road	26.7	4,555	5,887	6,909	7,959	10,542
East Fork Yellow Creek	Approximately 1.22 miles upstream of Tarsus Road	25.9	4,456	5,759	6,760	7,788	10,316
East Fork Yellow Creek	Approximately 1.82 miles downstream of Bailey Cobb Road	21.9	3,946	5,103	5,992	6,906	9,512
East Fork Yellow Creek	Approximately 1.12 miles downstream of Bailey Cobb Road	21.2	3,862	4,995	5,866	6,760	8,959
East Fork Yellow Creek	Approximately 1,245 feet downstream of Bailey Cobb Road	20.4	3,761	4,864	5,713	6,584	8,727
East Fork Yellow Creek	Approximately 1,500 feet downstream the confluence of Baggett Branch / Sullivan Branch	19.6	3,651	4,723	5,547	6,394	8,476

* Not calculated for this Flood Risk Project

Table 9: Summary of Discharges continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Fletchers Fork	At river mile 0.09	27	5,090	*	7,980	9,340	13,410
Fletchers Fork	At river mile 3.29	23	4,520	*	7,080	8,290	12,030
Fletchers Fork	At river mile 3.93	17	3,620	*	5,680	6,660	9,870
Fletchers Fork	At river mile 4.53	15	3,260	*	5,120	6,000	8,980
Half Pone Creek	Approximately 2,080 feet upstream of Gossett Road[1]	16.8	3,277	4,241	4,982	5,745	7,619
Half Pone Creek	Approximately 1.17 miles downstream of Old Clarksville Road[1]	13.7	2,824	3,657	4,299	4,958	6,581
Half Pone Creek	Approximately 1,170 feet downstream of Old Clarksville Road[1]	11.0	2,422	3,138	3,690	4,258	5,655
Indian Creek	At the confluence with Little Bartons Creek	4.9	1,359	1,766	2,079	2,404	3,200
Indian Creek	Approximately 830 feet upstream of Buckner Road	4.3	1,247	1,621	1,909	2,207	2,939
Little Bartons Creek	At the confluence with Big Bartons Creek	30.1	4,958	6,405	7,517	8,657	11,461
Little Bartons Creek	Approximately 1,755 feet upstream of Watkins Ford Road	29.1	4,843	6,257	7,343	8,458	11,199
Little Bartons Creek	Approximately 5,440 feet upstream of Watkins Ford Road	28.2	4,728	6,110	7,171	8,259	10,938

* Not calculated for this Flood Risk Project

[1] Located in Cheatham County

Table 9: Summary of Discharges continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Little Bartons Creek	Approximately 1.03 miles downstream of Old Highway 48	27.2	4,617	5,967	7,003	8,067	10,684
Little Bartons Creek	Approximately 1,350 feet downstream of Old Highway 48	26.4	4,510	5,830	6,843	7,882	10,440
Little Bartons Creek	Approximately 1,745 feet upstream of Old Highway 48	24.9	4,327	5,593	6,566	7,565	10,022
Little Bartons Creek	Approximately 1.15 miles downstream of the confluence of Indian Creek	23.2	4,123	5,330	6,258	7,211	9,555
Little Bartons Creek	Approximately 2,550 feet downstream of the confluence of Indian Creek	21.7	3,926	5,077	5,962	6,871	9,106
Little Bartons Creek	Just upstream of the confluence of Indian Creek	16.6	3,238	4,191	4,925	5,678	7,531
Little McAdoo Creek	At the confluence of McAdoo Creek	10.9	2,411	3,124	3,673	4,239	5,630
Little McAdoo Creek	Approximately 1,480 feet upstream of Hickory Point Road	10.5	2,337	3,029	3,562	4,111	5,460
Little McAdoo Creek	Approximately 2,665 feet upstream of Hickory Point Road	9.4	2,164	2,806	3,300	3,809	5,061
Little McAdoo Creek	Approximately 1,800 feet downstream of State Highway 12	9.0	2,106	2,730	3,212	3,708	4,927
Little McAdoo Creek	Approximately 1,275 feet upstream of State Highway 12	7.7	1,884	2,445	2,876	3,322	4,416

Table 9: Summary of Discharges continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Little McAdoo Creek	Approximately 4,325 feet upstream of State Highway 12	7.1	1,775	2,303	2,711	3,131	4,163
Little West Fork	At river mile 0.19	178	13,000	*	20,200	23,600	29,900
Little West Fork	At river mile 7.61	136	10,700	*	16,700	19,500	25,100
Louise Creek	At the confluence with Big Bartons Creek	18.7	3,535	4,573	5,372	6,192	8,210
Louise Creek	Approximately 1,790 feet upstream of confluence with Big Bartons Creek	18.0	3,442	4,454	5,232	6,032	7,998
Louise Creek	Approximately 1,450 feet downstream of Watkins Ford Road	17.4	3,360	4,348	5,108	5,889	7,810
Louise Creek	Approximately 710 feet upstream of Watkins Ford Road	16.2	3,189	4,128	4,850	5,592	7,418
Louise Creek	Approximately 1,370 feet downstream of Devers Road	15.3	3,066	3,969	4,663	5,378	7,135
Louise Creek	Approximately 1,260 feet upstream of Devers Road	14.6	2,961	3,834	4,506	5,197	6,896
Louise Creek	Approximately 1,875 feet downstream of Old Highway 48	13.2	2,755	3,568	4,194	4,838	6,421
Louise Creek	Approximately 1,200 feet upstream of Old Highway 48	12.2	2,613	3,385	3,979	4,591	6,094
Louise Creek	Approximately 1,900 feet downstream of Akin Road	10.8	2,397	3,106	3,653	4,215	5,598

* Not calculated for this Flood Risk Project

Table 9: Summary of Discharges continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Louise Creek	Approximately 535 feet upstream of Akin Road	9.0	2,102	2,725	3,206	3,701	4,918
Louise Creek	Approximately 2,210 feet upstream of Akin Road	8.9	2,078	2,694	3,169	3,659	4,862
Louise Creek	Approximately 1,385 feet downstream of State Highway 48	7.4	1,822	2,364	2,782	3,213	4,272
Louise Creek	Approximately 1,200 feet upstream of State Highway 48	7.0	1,750	2,271	2,673	3,087	4,105
Louise Creek	Approximately 2,560 feet upstream of State Highway 48	5.9	1,562	2,029	2,388	2,759	3,671
Louise Creek	Approximately 4,160 feet downstream of Louise Road	5.6	1,498	1,945	2,290	2,646	3,522
Louise Creek	Approximately 1,530 feet downstream of Louise Road	5.0	1,382	1,795	2,115	2,444	3,253
Louise Creek	Approximately 530 feet upstream of Louise Road	3.9	1,157	1,504	1,772	2,050	2,730
Louise Creek	Approximately 1,875 feet upstream of Louise Road	3.0	960	1,249	1,472	1,703	2,270
Louise Creek	Approximately 1,445 feet upstream of Louise Road	2.1	744	969	1,143	1,323	1,766
Lower Meadowbrook Creek	Approximately 1,100 feet upstream of the confluence with Little West Fork	710	530	740	900	1,020	1,340
Lower Meadowbrook Creek	Approximately 300 feet downstream of 101st Airborne Division Parkway	470	430	570	670	760	990

Table 9: Summary of Discharges continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Lower Meadowbrook Creek	At Paddy Run Road	362	260	260	300	340	430
Lower Meadowbrook Creek	Approximately 825 feet downstream of Shiloh Road	88	170	230	260	300	370
Lower Meadowbrook Creek	Approximately 300 feet upstream of Pine Mountain Road	36	50	70	80	90	100
Noahs Spring Branch	At river mile 13.15	136	10,700	*	16,700	19,500	25,100
Noahs Spring Branch	At river mile 13.20	71	7,500	*	12,000	14,500	18,500
Red River	At river mile 0.17	1,456	48,200	*	71,500	82,500	106,700
Red River	At river mile 1.59	1,007	36,900	*	54,800	63,300	84,000
Red River	At river mile 14.80	957	35,600	*	52,900	61,000	81,200
Sullivan Branch	At the confluence with Baggett Branch	8.3	1,985	2,574	3,028	3,497	4,647
Sullivan Branch	Approximately 2,150 feet upstream of State Highway 13	7.8	1,898	2,461	2,896	3,345	4,446
Upper Meadowbrook Creek	Approximately 450 feet downstream of U.S. Highway 41-A	1,508	1,400	1730	1,930	2,080	2,480
Upper Meadowbrook Creek	Approximately 1,375 feet downstream of Armstead Road	1,368	940	1400	1,440	1,890	2,500
Upper Meadowbrook Creek	Approximately 530 feet downstream of Lafayette Road	1,024	750	970	1,150	1,290	1,720
Upper Meadowbrook Creek	Approximately 550 feet downstream of Magnolia Drive	398	140	180	200	220	280

* Not calculated for this Flood Risk Project

Table 9: Summary of Discharges continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Upper Meadowbrook Creek	Approximately 1,200 feet upstream of Roselawn Drive	52.0	18	22	26	30	38
Wall Branch	At the confluence with Cumberland River	3.9	1,167	1,517	1,787	2,067	2,753
Wall Branch	Approximately 2,130 feet upstream of confluence with Cumberland River	3.7	1,125	1,462	1,723	1,993	2,655
Wall Branch	Approximately 1,630 feet downstream of State Highway 12 / Ashland City Road	2.2	770	1,003	1,183	1,369	1,827
Wall Branch	Approximately 1,600 feet upstream of State Highway 12 / Ashland City Road	1.8	659	858	1,013	1,173	1,566
Wall Branch	Approximately 700 feet upstream of Old Ashland City Road	1.3	531	692	817	947	1,266
Wall Branch	Approximately 2,380 feet upstream of Old Ashland City Road	1.0	449	586	692	803	1,073
Yellow Creek	At the confluence with Cumberland River	166.6	16,762	21,545	25,196	28,918	38,091
Yellow Creek	Just upstream of the confluence of East Fork Yellow Creek	134.8	14,414	18,539	21,690	24,905	32,826
Yellow Creek	Approximately 1.16 miles upstream of the confluence of East Fork Yellow Creek	133.2	14,292	18,383	21,508	24,696	32,552
Yellow Creek	Approximately 1.49 miles downstream of McFall Road	131.8	14,182	18,242	21,344	24,508	32,305

Table 9: Summary of Discharges continued

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Yellow Creek	Approximately 2,100 feet downstream of McFall Road	130.6	14,091	18,126	21,208	24,353	32,101
Yellow Creek	Approximately 1,880 feet upstream of McFall Road	128.2	13,911	17,895	20,939	24,044	31,696
Yellow Creek	Approximately 1.22 miles upstream of McFall Road	126.8	13,801	17,754	20,774	23,856	31,449
Yellow Creek	Approximately 1.57 miles downstream of State Highway 13	125.0	13,660	17,573	20,563	23,614	31,132
Yellow Creek	Approximately 4,220 feet downstream of State Highway 13	124.0	13,584	17,476	20,450	23,485	30,962
Yellow Creek	Approximately 1,210 feet upstream of State Highway 13	122.1	13,434	17,284	20,225	23,227	30,624
Yellow Creek	Approximately 4,840 feet downstream of the county boundary	119.3	13,211	16,997	19,891	22,845	30,122

Figure 7: Frequency Discharge-Drainage Area Curves

[Not Applicable to this Flood Risk Project]

Table 10: Summary of Non-Coastal Stillwater Elevations

[Not Applicable to this Flood Risk Project]

Table 11: Stream Gage Information used to Determine Discharges

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (Square Miles)	Period of Record	
					From	To
Yellow Creek	03436700	USGS	Yellow Creek near Shiloh, TN	124	11/17/1957	04/28/2011

5.2 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.

For streams for which hydraulic analyses were based on cross sections, locations of selected cross sections are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 6.3), selected cross sections are also listed in Table 23, “Floodway Data.”

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 12. Roughness coefficients are provided in Table 13. Roughness coefficients are values representing the frictional resistance water experiences when passing overland or through a channel. They are used in the calculations to determine water surface elevations. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

Table 12: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Antioch Creek	Confluence with Budds Creek	Approximately 2,250 feet upstream of Antioch Church Road	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Baggett Branch	Confluence with East Fork Yellow Creek / Sullivan Branch	Approximately 840 feet upstream of Bryant Hollow Road	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Bascomb Eldridge Creek	Confluence with Blooming Grove Creek	Approximately 3,325 feet upstream of Poplar Springs Road	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Big Bartons Creek	Confluence with Cumberland River	Approximately 440 feet upstream of Ryes Chapel Road	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Big McAdoo Creek	Confluence with Cumberland River	Approximately 45 feet downstream of Shady Grove Road	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Big West Fork	Confluence with Red River	Todd County, KY boundary	Regression Equations (USGS 1976)	HEC-2 (USACE 1976)	06/01/1982	AE w/ Floodway	
Blooming Grove Creek	Confluence with Cumberland River	Approximately 4,000 feet upstream of confluence of Bascomb Eldridge Creek	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Bryant Branch	Confluence with Baggett Branch	Approximately 2,330 feet upstream of Nolen West Russell Road	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Budds Creek	Confluence with Cumberland River	Approximately 1.22 miles upstream of Budds Creek Road	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	

Table 12: Summary of Hydrologic and Hydraulic Analyses continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Cumberland River	Stewart County boundary	Cheatham County boundary	Other	HEC-2 (USACE 1976)	06/01/1982	AE w/ Floodway	A special study was conducted to develop regulated flood frequency flows for the Cumberland River. A storm rainfall generation computer program was used to develop a 200-year synthetic rainfall record for the Cumberland River Basin. Significant flood producing storms of the 200-year generated record were applied to a basin runoff routing simulation model to produce streamflow discharges at central points. Results of the simulation model were analyzed to estimate discharge frequency curves. These discharge frequency curves were then combined with a graphical analysis of period of record regulated flow data developed by the USACE, Nashville District, to establish adopted discharge frequency curves at all major river control points. Results of the regulated frequency study were found to yield statistically reliable estimates of floods up to and including the 100-year event. For events greater in magnitude than the 100-year flood, such as the 500-year flood, the statistical reliability of predicted flow was poor. Estimates of the 500-year flood discharges from the study were found to approximate the USACE-developed Standard Project Flood (SPF) for the majority of the Cumberland River. The SPF has been widely disseminated to the general public by the USACE, Nashville District, to be used for design purposes of developments adjacent to the Cumberland River. Because of the low reliability of estimates for extremely rare events and to maintain consistency with previously published information, the SPF is used in lieu of the 500-year flood for this study as shown on the Flood Profiles (FIS 1983 &, USACE 1979).

Table 12: Summary of Hydrologic and Hydraulic Analyses continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Dry Fork Creek	Confluence with Noahs Spring Branch	Christian County, KY boundary	Regression Equations (USGS 2000)	HEC-RAS 3.1.2 (USACE 2004)	02/01/2007	A	
East Fork Yellow Creek	Confluence with Yellow Creek	Confluence of Baggett Branch / Sullivan Branch	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Fletchers Fork	Confluence with Little West Fork	Approximately 790 feet upstream of New Providence Road	Regression Equations (USGS 1976)	HEC-2 (USACE 1976)	06/01/1982	AE w/ Floodway	
Fletchers Fork	Approximately 790 feet upstream of New Providence Road	Approximately 1.7 miles upstream New Providence Road	Regression Equations (USGS 2000)	HEC-RAS 3.1.2 (USACE 2004)	02/01/2007	A	
Half Pone Creek	Cheatham County Boundary	Cheatham County boundary	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Indian Creek	Confluence with Little Bartons Creek	Approximately 3,190 feet upstream of Buckner Road	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Little Bartons Creek	Confluence with Big Bartons Creek	Dickson County boundary	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Little McAdoo Creek	Confluence with Big McAdoo Creek	Approximately 5,200 feet upstream of State Highway 12 / Ashland City Road	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Little West Fork	Confluence with Big West Fork	Confluence of Noahs Spring Branch	Regression Equations (USGS 1976)	HEC-2 (USACE 1976)	06/01/1982	AE w/ Floodway	
Louise Creek	Confluence with Big Bartons Creek	Approximately 1.12 miles upstream of Louise Creek Road	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	

Table 12: Summary of Hydrologic and Hydraulic Analyses continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Lower Meadowbrook Creek	Confluence with Little West Fork	Approximately 270 feet upstream of Pine Mountain Road	HEC-1 (USACE 1990)	HEC-RAS 2.2 (USACE 1998)	04/24/2000	AE w/ Floodway	See LOMR Case Number 00-04-243-P, June 29, 2001 for more information. Incorporated into the March 2008 FIS (FIS 2008). HEC-1 dated November 17, 1998 HEC-RAS 2.2 dated April 24, 2000
Noahs Spring Branch	Confluence with Little West Fork Creek	Approximately 1,320 feet upstream of the confluence of Little West Fork Creek	Regression Equations (USGS 1976)	HEC-2 (USACE 1976)	06/01/1982	AE w/ Floodway	
Noahs Spring Branch	Approximately 1,320 feet upstream of the confluence of Little West Fork Creek	Christian County, KY boundary	Regression Equations (USGS 2000)	HEC-RAS 3.1.2 (USACE 2004)	02/01/2007	A	
Passenger Creek	Confluence with Red River	Approximately 4.0 miles upstream of the confluence of Coon Creek	Regression Equations (USGS 2000)	HEC-RAS 3.1.2 (USACE 2004)	02/01/2007	A	
Piney Fork Creek	Confluence with Little West Fork	Stewart County boundary	Regression Equations (USGS 2000)	HEC-RAS 3.1.2 (USACE 2004)	02/01/2007	A	
Red River	Confluence with Cumberland River	Approximately 3.0 miles upstream of I-24	Regression Equations (USGS 1976)	HEC-2 (USACE 1976)	06/01/1982	AE w/ Floodway	
Red River	Approximately 3.0 miles upstream of I-24	Robertson County boundary	Regression Equations (USGS 2000)	HEC-RAS 3.1.2 (USACE 2004)	02/01/2007	A	
Spring Creek	Confluence with Big West Fork	Todd County, KY boundary	Regression Equations (USGS 2000)	HEC-RAS 3.1.2 (USACE 2004)	02/01/2007	A	

Table 12: Summary of Hydrologic and Hydraulic Analyses continued

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Sullivan Branch	Confluence with East Fork Yellow Creek	Approximately 3,055 feet upstream of State Highway 13 / Shiloh Branch Road	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Sulphur Fork Creek	Confluence with Red River	Robertson County boundary	Regression Equations (USGS 2000)	HEC-RAS 3.1.2 (USACE 2004)	02/01/2007	A	
Unnamed Tributary	Confluence with Big West Fork	Approximately 1.1 miles upstream of the confluence with Big West Fork	Regression Equations (USGS 2000)	HEC-RAS 3.1.2 (USACE 2004)	02/01/2007	A	
Unnamed Tributary	Confluence with Spring Creek	Todd County, KY boundary	Regression Equations (USGS 2000)	HEC-RAS 3.1.2 (USACE 2004)	02/01/2007	A	
Upper Meadowbrook Creek	Approximately 320 feet downstream of U.S. Highway 41-A	Approximately 350 feet upstream of Donna Drive	HEC-1 (USACE 1990)	HEC-RAS 2.2 (USACE 1998)	04/24/2000	AE w/ Floodway	See LOMR 00-04-243-P, June 29, 2001 for more information. Incorporated into the March 2008 FIS (FIS 2008). HEC-1 dated November 17, 1998 HEC-RAS 2.2 dated April 24, 2000
Wall Branch	Confluence with Cumberland River	Approximately 3,175 feet upstream of East Old Ashland City Road	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	
Yellow Creek	Confluence with Cumberland River	Houston County boundary	Regression Equations (USGS 2000)	HEC-RAS 4.1.0 (USACE 2010)	10/01/2017	AE	

Table 13: Roughness Coefficients

Flooding Source	Channel "n"	Overbank "n"
Antioch Creek	0.040-0.050	0.070-0.090
Baggett Branch	0.040-0.050	0.060-0.120
Bascomb Eldridge Creek	0.040-0.050	0.060-0.080
Big Bartons Creek	0.040-0.055	0.070-0.120
Big McAdoo Creek	0.045-0.050	0.070-0.100
Big West Fork	0.040	0.060
Blooming Grove Creek	0.040-0.055	0.070-0.100
Bryant Branch	0.040-0.055	0.070-0.120
Budds Creek	0.040-0.050	0.070-0.090
Cumberland River	0.030	0.090
Dry Fork Creek	0.050	0.150
East Fork Yellow Creek	0.040-0.055	0.070-0.110
Fletchers Fork	0.050	0.060
Fletchers Fork	0.050	0.150
Half Pone Creek	0.045-0.055	0.070-0.110
Indian Creek	0.045-0.055	0.070-0.100
Little Bartons Creek	0.040-0.055	0.060-0.100
Little McAdoo Creek	0.045-0.055	0.070-0.090
Little West Fork	0.050	0.070
Louise Creek	0.045-0.055	0.080-0.120
Lower Meadowbrook Creek	0.052	0.070-0.130
Noahs Spring Branch	0.050	0.065
Noahs Spring Branch	0.050	0.150
Passenger Creek	0.050	0.150
Piney Fork Creek	0.050	0.150
Red River	0.050	0.090
Red River	0.050	0.150
Spring Creek	0.050	0.150
Sullivan Branch	0.040-0.055	0.070-0.100
Sulphur Fork Creek	0.050	0.150
Unnamed Tributary	0.050	0.150
Unnamed Tributary	0.050	0.150
Upper Meadowbrook Creek	0.048	0.080-0.110
Wall Branch	0.040-0.055	0.060-0.100
Yellow Creek	0.040-0.055	0.060-0.120

5.3 Coastal Analyses

This section is not applicable to this Flood Risk Project.

Table 14: Summary of Coastal Analyses

[Not Applicable to this Flood Risk Project]

5.3.1 Total Stillwater Elevations

This section is not applicable to this Flood Risk Project.

Figure 8: 1% Annual Chance Total Stillwater Elevations for Coastal Areas

[Not Applicable to this Flood Risk Project]

Table 15: Tide Gage Analysis Specifics

[Not Applicable to this Flood Risk Project]

5.3.2 Waves

This section is not applicable to this Flood Risk Project.

5.3.3 Coastal Erosion

This section is not applicable to this Flood Risk Project.

5.3.4 Wave Hazard Analyses

This section is not applicable to this Flood Risk Project.

Table 16: Coastal Transect Parameters

[Not Applicable to this Flood Risk Project]

Figure 9: Transect Location Map

[Not applicable to this Flood Risk Project]

5.4 Alluvial Fan Analyses

This section is not applicable to this Flood Risk Project.

Table 17: Summary of Alluvial Fan Analyses

[Not Applicable to this Flood Risk Project]

Table 18: Results of Alluvial Fan Analyses

[Not Applicable to this Flood Risk Project]

SECTION 6.0 – MAPPING METHODS

6.1 Vertical and Horizontal Control

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 used for newly created or revised FIS Reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the completion of the North American Vertical Datum of 1988 (NAVD88), many FIS Reports and FIRMs are now prepared using NAVD88 as the referenced vertical datum.

Flood elevations shown in this FIS Report and on the FIRMs are referenced to NAVD88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between NGVD29 and NAVD88 or other datum conversion, visit the National Geodetic Survey website at 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 archived project documentation associated with the FIS Report and the FIRMs for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks in the area, please visit the NGS website at www.ngs.noaa.gov.

The datum conversion locations and values that were calculated for Montgomery County are provided in Table 19.

Table 19: Countywide Vertical Datum Conversion

Quadrangle Name	Quadrangle Corner	Latitude	Longitude	Conversion from NGVD29 to NAVD88 (feet)
Average Conversion from NGVD29 to NAVD88 = -0.200 feet				

Table 20: Stream-Based Vertical Datum Conversion

[Not Applicable to this Flood Risk Project]

6.2 Base Map

The FIRMs and FIS Report for this project have been produced in a digital format. The flood hazard information was converted to a Geographic Information System (GIS) format that meets FEMA's FIRM Database specifications and geographic information standards. This information is provided in a digital format so that it can be incorporated into a local GIS and be accessed more easily by the community. The FIRM Database includes most of the tabular information contained in the FIS Report in such a way that the data can be associated with pertinent spatial features. For example, the information contained in the Floodway Data table and Flood Profiles can be linked to the cross sections that are shown on the FIRMs. Additional information about the FIRM Database and its contents can be found in FEMA's *Guidelines and Standards for Flood Risk Analysis and Mapping*, www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping.

Base map information shown on the FIRM was derived from the sources described in Table 21.

Table 21: Base Map Sources

Data Type	Data Provider	Data Date	Data Scale	Data Description
County Boundary	State of Tennessee Department of Finance and Administration, GIS Department	07/03/2012	N/A	S_Pol_Ar. County Boundary.
Digital Orthophoto	Tennessee Department of Transportation, Office of Aerial Surveys	08/28/2013	N/A	S_Base_Index Orthophotography. S_Base_Index table contains information about the raster data used as a base map for Montgomery County, Tennessee.
Political Boundaries	Austin Peay State University, GIS Center	07/20/2017	N/A	S_Pol_Ar. Incorporated Community Boundaries.
Surface Water Features	U.S. Army Corps of Engineers, Nashville District	09/12/2017	1:5,000	S_Wtr_Ln. Waterlines.
Transportation Features	State of Tennessee Department of Finance and Administration, GIS Department	07/18/2017	N/A	S_Trnsport_Ln. Road Features.
Transportation Features	USDOT BTS	05/19/2017	1:24,000	S_Trnsport_Ln. Rail Features.

6.3 Floodplain and Floodway Delineation

The FIRM shows tints, screens, and symbols to indicate floodplains and floodways as well as the locations of selected cross sections used in the hydraulic analyses and floodway computations.

For riverine flooding sources, the mapped floodplain boundaries shown on the FIRM have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 22.

In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% 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.

The floodway widths presented in this FIS Report and on the FIRM were 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 Table 2 indicates the flooding sources for which floodways have been determined. The results of the floodway computations for those flooding sources have been tabulated for selected cross sections and are shown in Table 23, “Floodway Data.”

Certain flooding sources may have been studied that do not have published BFEs on the FIRMs, or for which there is a need to report the 1% annual chance flood elevations at selected cross sections because a published Flood Profile does not exist in this FIS Report. These streams may have also been studied using methods to determine non-encroachment zones rather than floodways. For these flooding sources, the 1% annual chance floodplain boundaries have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using the topographic elevation data described in Table 22. All topographic data used for modeling or mapping has been converted as necessary to NAVD88. The 1% annual chance elevations for selected cross sections along these flooding sources, along with their non-encroachment widths, if calculated, are shown in Table 24, “Flood Hazard and Non-Encroachment Data for Selected Streams.”

Table 22: Summary of Topographic Elevation Data used in Mapping

		Source for Topographic Elevation Data			
Community	Flooding Source	Description	Vertical Accuracy	Horizontal Accuracy	Citation
Clarksville, City of; Montgomery County, Unincorporated Areas	All within HUC-8 05130205	Light Detection and Ranging data (LiDAR)	2 ft	24.5 cm	TDOT 2013
Clarksville, City of; Montgomery County, Unincorporated Areas	All within HUC-8 05130206	7.5-Minute Series Topographic	N/A	N/A	USGS 2006

BFEs shown at cross sections on the FIRM represent the 1% annual chance water surface elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report.