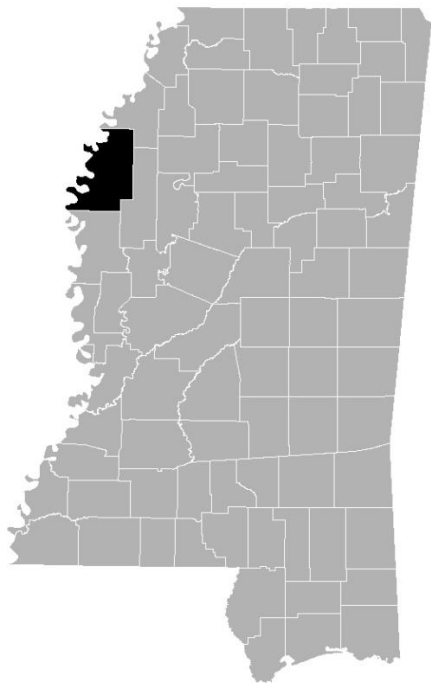


FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 1

BOLIVAR COUNTY, MISSISSIPPI AND INCORPORATED AREAS



COMMUNITY NAME	COMMUNITY NUMBER
ALLIGATOR, TOWN OF	280012
BENOIT, TOWN OF	280013
BEULAH, TOWN OF	280014
BOLIVAR COUNTY, UNINCORPORATED AREAS	280011
BOYLE, TOWN OF	280015
CLEVELAND, CITY OF	280016
DUNCAN, TOWN OF	280017
GUNNISON, TOWN OF	280018
MERIGOLD, TOWN OF	280019
MOUND BAYOU, CITY OF	280020
PACE, TOWN OF	280021
RENOVA, TOWN OF	280065
ROSEDALE, CITY OF	280022
SHAW, CITY OF	280023
SHELBY, CITY OF	280024
WINSTONVILLE, TOWN OF	280025



FEMA

PRELIMINARY
11/14/2018

REVISED:

TBD

FLOOD INSURANCE STUDY NUMBER
28011CV001B

Version Number 2.3.3.3

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Volume 1
Exhibits

Flood Profiles	<u>Panel</u>
Bear Pen Canal	01 P
Big Sunflower River	02-03 P
Jones Bayou	04-05 P
Lead Bayou/West Main Canal	06 P
Mississippi River	07-08 P
Pecan Bayou	09 P
Porter Bayou	10 P

Published Separately

Flood Insurance Rate Map (FIRM)

FLOOD INSURANCE STUDY REPORT BOLIVAR COUNTY, MISSISSIPPI

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 60.3, *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 Bolivar County, Mississippi.

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 1. 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.

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
Alligator, Town of	280012	08030207	28011C0080D	
Benoit, Town of	280013	08030207	28011C0375D	
Beulah, Town of	280014	08030207	28011C0265D	
Bolivar County, Unincorporated Areas	280011	08030207 08020100 08030100 08030209	28011C0025D 28011C0050D 28011C0070D 28011C0075D 28011C0080D 28011C0090D 28011C0100D 28011C0125D 28011C0130D 28011C0140D 28011C0150D 28011C0160D	

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
Bolivar County, Unincorporated Areas (continued)	280011	08020100 08030207 08030100 08030209	28011C0170D 28011C0175D 28011C0190D 28011C0200D 28011C0225D 28011C0235D 28011C0250D 28011C0255D 28011C0265D 28011C0275D 28011C0280D 28011C0285D 28011C0290D 28011C0294D 28011C0295D 28011C0305D 28011C0310E 28011C0313D 28011C0314D 28011C0315E 28011C0320E 28011C0350D 28011C0375D 28011C0400D 28011C0405D 28011C0407D 28011C0410D 28011C0415D 28011C0420D 28011C0426D 28011C0427D 28011C0428D 28011C0429D 28011C0435D 28011C0450D 28011C0475D 28011C0500D 28011C0525D 28011C0532D 28011C0535D 28011C0545D 28011C0550D 28011C0575D	
Boyle, Town of	280015	08030207	28011C0428D 28011C0429D	
Cleveland, City of	280016	08030207	28011C0294D 28011C0313D 28011C0314D 28011C0407D	

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
Cleveland, City of (continued)	280016	08030207	28011C0426D 28011C0427D 28011C0428D 28011C0429D	
Duncan, Town of	280017	08030207	28011C0070D 28011C0090D	
Gunnison, Town of	280018	08020100 08030207	28011C0130D 28011C0140D	
Merigold, Town of	280019	08030207	28011C0305D	
Mound Bayou, City of	280020	08030207	28011C0190D 28011C0305D	
Pace, Town of	280021	08030207	28011C0290D	
Renova, Town of	280065	08030207	28011C0313D 28011C0314D 28011C0315E	
Rosedale, City of	280022	08020100 08030207	28011C0235D	
Shaw, City of	280023	08030207	28011C0532D 28011C0535D	
Shelby, City of	280024	08030207	28011C0160D 28011C0170D	
Winstonville, Town of	280025	08030207	28011C0170D 28011C0190D	

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 31, "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 Bolivar County became effective on March 21, 2017. Refer to Table 28 for information about subsequent revisions to the FIRMs.

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

<u>Old Zone</u>	<u>New Zone</u>
A1 through A30	AE
V1 through V30	VE
B	X (shaded)
C	X (unshaded)

The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Visit the FEMA Web site at www.fema.gov/national-flood-insurance-program-community-rating-system or contact your appropriate FEMA Regional Office for more information about this program.

- Previous FIS Reports and FIRMs may have included levees that were accredited as reducing the risk associated with the 1% annual chance flood based on the information available and the mapping standards of the NFIP at that time. For FEMA to continue to accredit the identified levees, the levees must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled "Mapping of Areas Protected by Levee Systems."

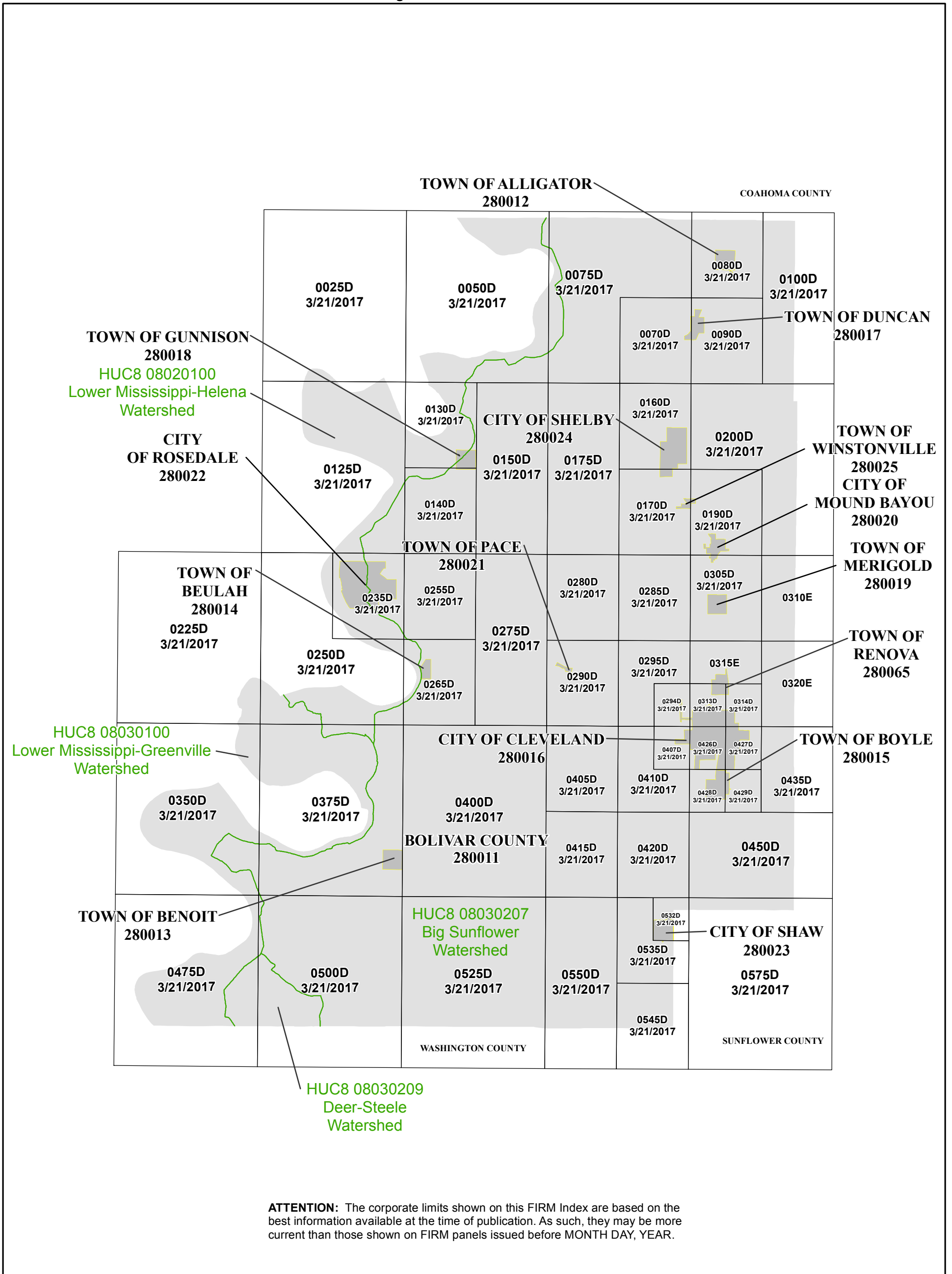
Since the status of levees is subject to change at any time, the user should contact the appropriate agency for the latest information regarding levees presented in Table 9 of this FIS Report. For levees owned or operated by the U.S. Army Corps of Engineers (USACE), information may be obtained from the USACE national levee database (nld.usace.army.mil). For all other levees, the

user is encouraged to contact the appropriate local community.

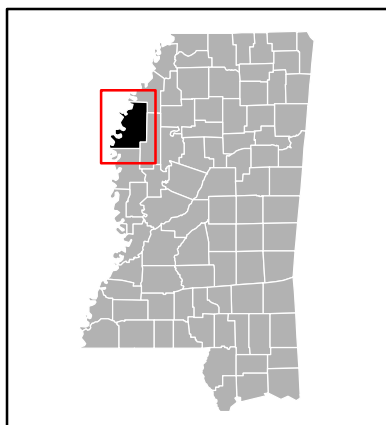
- FEMA has developed a *Guide to Flood Maps* (FEMA 258) and online tutorials to assist users in accessing the information contained on the FIRM. These include how to read panels and step-by-step instructions to obtain specific information. To obtain this guide and other assistance in using the FIRM,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

The FIRM Index in Figure 1 shows the overall FIRM panel layout within Bolivar 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 United States Geological Survey (USGS) Hydrologic Unit Code – 8 (HUC-8) codes.

Figure 1: FIRM Panel Index




1 inch = 5 miles 1:300,000
 0 2.5 5 10 Miles
 Map Projection:
 State Plane Mississippi West 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](https://MSC.FEMA.GOV)
 SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION



NATIONAL FLOOD INSURANCE PROGRAM
 FLOOD INSURANCE RATE MAP INDEX

BOLIVAR COUNTY, MISSISSIPPI and Incorporated Areas

PANELS PRINTED:
 0025, 0050, 0070, 0075, 0080, 0090, 0100, 0125, 0130, 0140, 0150,
 0160, 0170, 0175, 0190, 0200, 0225, 0235, 0250, 0255, 0265, 0275,
 0280, 0285, 0290, 0294, 0295, 0305, 0310, 0313, 0314, 0315, 0320,
 0350, 0375, 0400, 0405, 0407, 0410, 0415, 0420, 0426, 0427, 0428,
 0429, 0435, 0450, 0475, 0500, 0525, 0532, 0535, 0545, 0550, 0575



FEMA
 PRELIMINARY
 MAP NUMBER
 28011CIND08
 MAP REVISED

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 Map Information 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 Map Information 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 28 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.

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.

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.

Figure 2: FIRM Notes to Users

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 Transverse Mercator, Mississippi West Zone. The horizontal datum was the North American Datum of 1983 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 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 31 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on this FIRM was provided in digital format by Mississippi Department of Environmental Quality, Mississippi Automated Resource Information System, and the United States Census Bureau. Ortho imagery was produced by Surdex Corporation in 2015 and 2016 and has a 1 - foot 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 Bolivar County, Mississippi, 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 28 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 **TBD**.

Figure 2: FIRM Notes to Users

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Bolivar County, Mississippi, effective **TBD**.

ACCREDITED LEVEE: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit www.fema.gov/national-flood-insurance-program.

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 Bolivar County.

Figure 3: Map Legend for FIRM

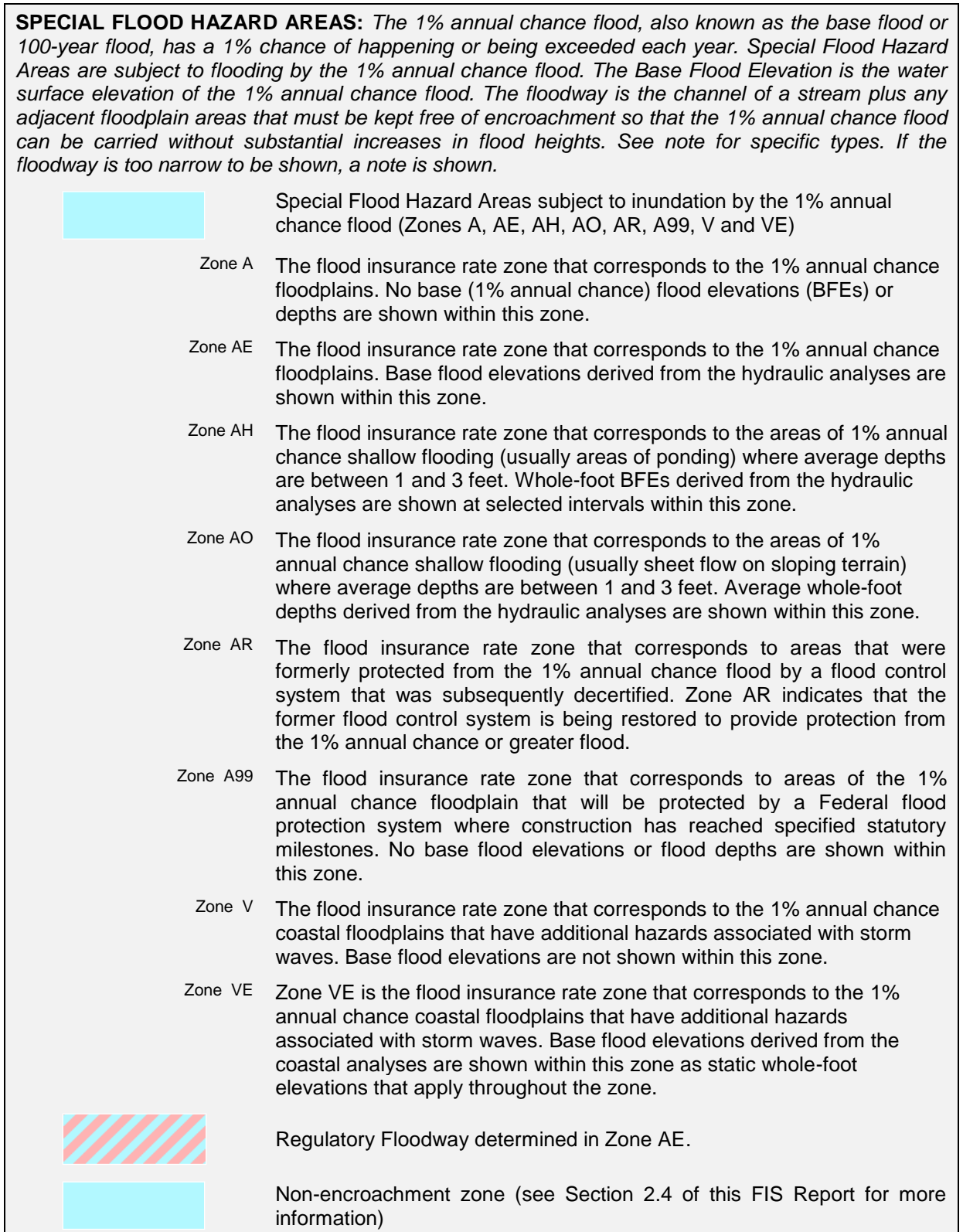


Figure 3: Map Legend for FIRM





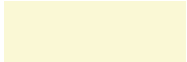





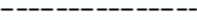


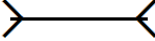
OTHER AREAS OF FLOOD HAZARD	
	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.
	Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate 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. See Notes to Users for important information.
	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.
	Unshaded Zone X: Areas of minimal flood hazard.
FLOOD HAZARD AND OTHER BOUNDARY LINES	
	Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)
(ortho) (vector)	
	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	
 <i>Aqueduct Channel Culvert Storm Sewer</i>	Channel, Culvert, Aqueduct, or Storm Sewer
 <i>Dam Jetty Weir</i>	Dam, Jetty, Weir
	Levee, Dike, or Floodwall
 <i>Bridge</i>	Bridge

Figure 3: Map Legend for FIRM


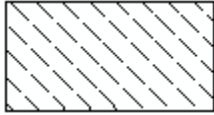

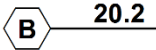

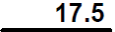
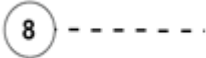









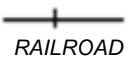



COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA): <i>CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.</i>	
 CBRS AREA 09/30/2009	Coastal Barrier Resources System Area: Labels are shown to clarify where this area shares a boundary with an incorporated area or overlaps with the floodway.
 OTHERWISE PROTECTED AREA 09/30/2009	Otherwise Protected Area
REFERENCE MARKERS	
 22.0	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
 20.2	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
 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
 	<p>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.</p> <p>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.</p>
 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	
 <i>Missouri Creek</i>	River, Stream or Other Hydrographic Feature
	Interstate Highway
	U.S. Highway
	State Highway
	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
4276^{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 Bolivar 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 23), 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 Bolivar 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 13. 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
Bear Pen Canal	Bolivar County, Unincorporated Areas; Cleveland, City of	Approximately 390 feet downstream of College Street	Approximately 2,210 feet upstream of College Street	08030207	0.5	Y	AE	05/01/1977
Bear Pen Canal	Bolivar County, Unincorporated Areas; Cleveland, City of	Approximately 2,210 feet upstream of College Street	Approximately 4,225 upstream of State Highway 8	08030207	2.0	N	AE	05/01/1977
Big Sunflower River	Bolivar County, Unincorporated Areas	Sunflower County boundary	Sunflower County boundary	08030207	7.1	N	AE	04/01/2016
Goffs Bayou	Bolivar County, Unincorporated Areas; Rosedale, City of	Approximately 3,000 feet downstream of State Highway 1	At State Highway 1	08030207	0.6	N	A	06/01/2010
Goffs Bayou Tributary 1	Bolivar County, Unincorporated Areas; Rosedale, City of	At State Highway 1	Approximately 1.2 miles upstream of State Highway 1	08030207	1.2	N	A	06/01/2010
Holmes Lake	Bolivar County, Unincorporated Areas; Shelby, City of	Approximately 1.0 mile downstream of West Second Avenue	Approximately 4,070 feet upstream of West Second Avenue	08030207	1.7	N	A	06/01/2010
Jones Bayou	Bolivar County, Unincorporated Areas; Boyle, Town of	Approximately 2,640 feet downstream of State Highway 446	Approximately 130 feet upstream of Laughlin Road	08030207	0.5	N	A	06/01/2010
Jones Bayou	Bolivar County, Unincorporated Areas; Cleveland, City of	Approximately 130 feet upstream of Laughlin Road	Approximately 1,060 feet upstream of West Rosemary Road	08030207	3.5	Y	AE	06/01/2010
Jones Bayou	Bolivar County, Unincorporated Areas; Merigold, Town of	Approximately 2,390 feet downstream of South Street	Approximately 2,000 feet upstream of St. Mary Street	08030207	1.1	N	A	06/01/2010
Jones Bayou Tributary 9	Merigold, Town of	Confluence with Jones Bayou	Approximately 1,965 feet upstream of the confluence with Jones Bayou	08030207	0.4	N	A	06/01/2010

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
Lanes Bayou	Bolivar County, Unincorporated Areas; Rosedale, City of	Approximately 1.3 miles downstream of Thomas Road	At Thomas Road	08030207	1.3	N	A	06/01/2010
Lanes Bayou Tributary 1	Bolivar County, Unincorporated Areas; Rosedale, City of	Approximately 1.3 miles downstream of Brown Street	At Brown Street	08030207	1.3	N	A	06/01/2010
Lead Bayou	Bolivar County, Unincorporated Areas	Sunflower County boundary	Approximately 800 feet upstream of the confluence of Lead Bayou Tributary 1	08030207	0.6	N	AE	03/01/1986
Mississippi River	Bolivar County, Unincorporated Areas	Washington County boundary	Coahoma County boundary	08020100 08030100	72.0	N	AE	03/01/1986
Mound Bayou	Bolivar County, Unincorporated Areas; Mound Bayou, City of	Approximately 2,840 feet downstream of East Martin Luther King Junior Drive	Approximately 720 feet upstream of North West Main Avenue	08030207	1.3	N	A	06/01/2010
Mound Bayou Tributary 6	Bolivar County, Unincorporated Areas; Shelby, City of	Approximately 2,640 feet downstream of Chamber Road	Approximately 530 feet upstream of Parchman Road	08030207	5.0	N	A	06/01/2010
Pecan Bayou	Bolivar County, Unincorporated Areas; Cleveland, City of	Approximately 4,225 feet downstream of Yale Street	Approximately 80 feet upstream of Maple Street	08030207	1.5	Y	AE	05/01/1977
Porter Bayou	Bolivar County, Unincorporated Areas; Shaw, City of	Sunflower County boundary	At Gilbert Road	08030207	7.5	N	AE	03/01/1986
West Main Canal	Bolivar County, Unincorporated Areas; Cleveland, City of; Renova, Town of	Approximately 800 feet upstream of the confluence of Lead Bayou Tributary 1	At Old Highway 61	08030207	7.7	N	AE	05/01/1977

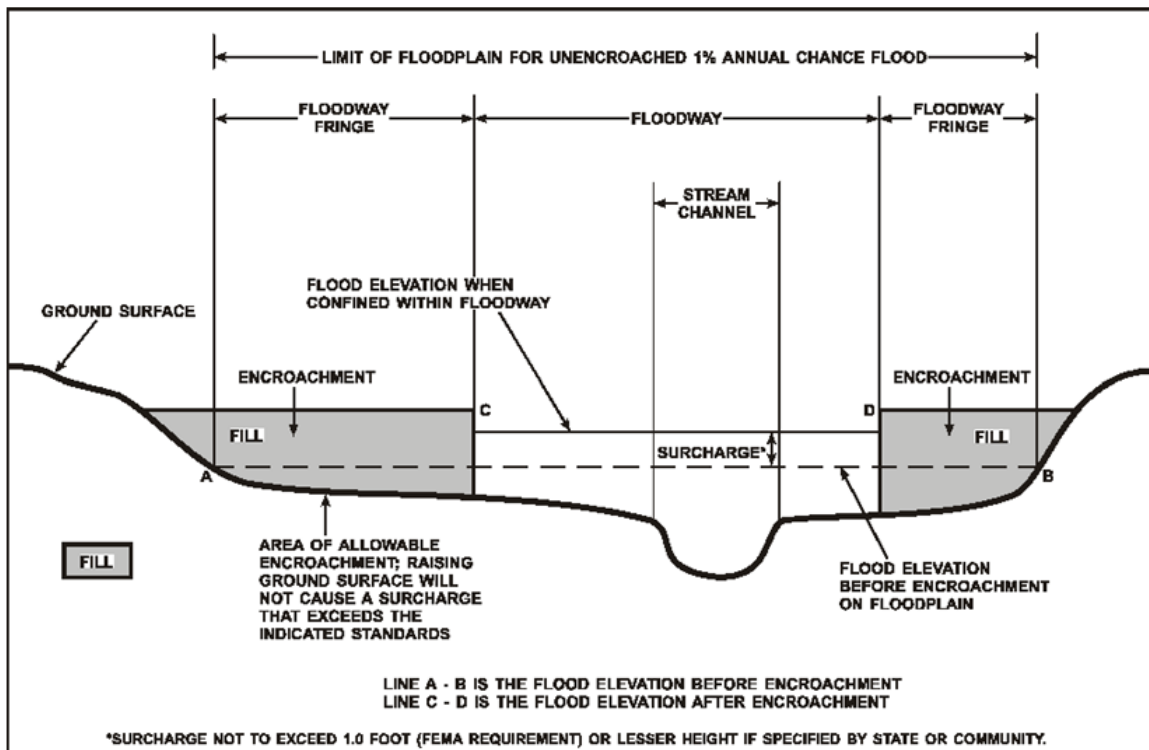
2.2 Floodways

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. Regulations for Mississippi require communities in Bolivar County to limit increases caused by encroachment to 1.0 foot and several communities have adopted additional restrictions. 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 24, "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 Mississippi require communities in Bolivar 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 25, "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 to this Flood Risk Project.

2.5.1 Water Elevations and the Effects of Waves

This section is not applicable to 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 Bolivar County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Alligator, Town of	A, X
Benoit, Town of	A, X
Beulah, Town of	A, X
Bolivar County, Unincorporated Areas	A, AE, X
Boyle, Town of	A, X
Cleveland, City of	AE, X
Duncan, Town of	A, X
Gunnison, Town of	AE, X
Merigold, Town of	A, X
Mound Bayou, City of	A, X
Pace, Town of	A, X
Renova, Town of	AE, X
Rosedale, City of	A, AE, X
Shaw, City of	A, AE, X
Shelby, City of	A,X
Winstonville, Town of	A,X

3.2 Coastal Barrier Resources System

This section is not applicable to this Flood Risk Project.

Table 4: Coastal Barrier Resources System Information

[Not applicable to this Flood Risk Project]

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

Table 5 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 5: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Big Sunflower	08030207	Big Sunflower River, Pecan Bayou, West Main Canal	Largest watershed within Bolivar County, encompassing the most of the county	3,154
Lower Mississippi-Greenville	08030100	Mississippi River	The biggest flooding source is Mississippi River	601
Lower Mississippi-Helena	08020100	Mississippi River	The biggest flooding source is Mississippi River	594
Deer-Steele	08030209	Steel Bayou	A small portion of this watershed within Bolivar County	823

4.2 Principal Flood Problems

Table 6 contains a description of the principal flood problems that have been noted for Bolivar County by flooding source.

Table 6: Principal Flood Problems

Flooding Source	Description of Flood Problems
All Flooding Sources	Due to Bolivar County's location in the Mississippi Delta Region, it was subjected to almost yearly flooding until the levee system was built along the Mississippi River. The first levee segment, from DeSoto County to the Coahoma/Bolivar County boundary was certified by Vicksburg District on February 15, 2011 (MGI 2014).
Pecan Bayou, Bear Pen Canal and West Main Canal	In the City of Cleveland, floods are caused on Pecan Bayou and Bear Pen Canal by short, intense rainfalls, as opposed to rains of longer duration. Flooding was experienced along Pecan Bayou in March 1973 and May 1975, 1974. West Main Canal is influenced by high water on the Big Sunflower River and an area immediately east of Cleveland was flooded in 1973 (FEMA 1989a).

Table 7 contains information about historic flood elevations in the communities within Bolivar County.

Table 7: Historic Flooding Elevations

Flooding Source	Location	Historic Peak (Feet NAVD88)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Pecan Bayou	Along Pecan Bayou	N/A	March 1973 May 1975 1975	N/A	FEMA 1989a
West Main Canal	East of Cleveland	N/A	1973	N/A	FEMA 1989a

4.3 Non-Levee Flood Protection Measures

Table 8 contains information about non-levee flood protection measures within Bolivar County such as dams, jetties, and/or dikes. Levees are addressed in Section 4.4 of this FIS Report.

Table 8: Non-Levee Flood Protection Measures

[Not Applicable to this Flood Risk Project]

4.4 Levees

For purposes of the NFIP, FEMA only recognizes levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with comprehensive floodplain management criteria. The Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10) describes the information needed for FEMA to determine if a levee system reduces the risk from the 1% annual chance flood. This information must be supplied to FEMA by the community or other party when a flood risk study or restudy is conducted, when FIRMs are revised, or upon FEMA request. FEMA reviews the information for the purpose of establishing the appropriate FIRM flood zone.

Levee systems that are determined to reduce the risk from the 1% annual chance flood are accredited by FEMA. FEMA can also grant provisional accreditation to a levee system that was previously accredited on an effective FIRM and for which FEMA is awaiting data and/or documentation to demonstrate compliance with Section 65.10. These levee systems are referred to as Provisionally Accredited Levees, or PALs. Provisional accreditation provides communities and levee owners with a specified timeframe to obtain the necessary data to confirm the levee's certification status. Accredited levee systems and PALs are shown on the FIRM using the symbology shown in Figure 3 and in Table 9. If the required information for a PAL is not submitted within the required timeframe, or if information indicates that a levee system no longer meets Section 65.10, FEMA will de-accredit the levee system and issue an effective FIRM showing the levee-impacted area as a SFHA.

FEMA coordinates its programs with USACE, who may inspect, maintain, and repair levee systems. The USACE has authority under Public Law 84-99 to supplement local efforts to repair flood control projects that are damaged by floods. Like FEMA, the USACE provides a program to allow public sponsors or operators to address levee system maintenance deficiencies. Failure to do so within the required timeframe results

in the levee system being placed in an inactive status in the USACE Rehabilitation and Inspection Program. Levee systems in an inactive status are ineligible for rehabilitation assistance under Public Law 84-99.

FEMA coordinated with the USACE, the local communities, and other organizations to compile a list of levees that exist within Bolivar County. Table 9, "Levees," lists all accredited levees, PALs, and de-accredited levees shown on the FIRM for this FIS Report. Other categories of levees may also be included in the table. The Levee ID shown in this table may not match numbers based on other identification systems that were listed in previous FIS Reports. Levees identified as PALs in the table are labeled on the FIRM to indicate their provisional status.

Please note that the information presented in Table 9 is subject to change at any time. For that reason, the latest information regarding any USACE structure presented in the table should be obtained by contacting USACE and accessing the USACE national levee database. For levees owned and/or operated by someone other than the USACE, contact the local community shown in Table 31.

Table 9: Levees

Community	Flooding Source	Levee Location	Levee Owner	USACE Levee	Levee ID	Covered Under PL84-99 Program?	FIRM Panel(s)
Bolivar County, Unincorporated Areas	Mississippi River	Left Bank	US Army Corps of Engineers	Yes	5905000021	No	28011C0025D 28011C0050D 28011C0125D 28011C0130D 28011C0225D 28011C0235D 28011C0250D 28011C0265D 28011C0350D 28011C0375D 28011C0475D

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 13. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 10. Stream gage information is provided in Table 12.

Table 10: 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
Bear Pen Canal	At the southern corporate limits of the City of Cleveland ¹	3.57	383	*	696	749	858
Bear Pen Canal	At State Highway 8	2.68	632	*	823	911	1,104
Bear Pen Canal	At the northern corporate limits of the City of Cleveland	1.20	334	*	432	478	578
Big Sunflower River	Bolivar / Sunflower County boundary	694	7,966	8,884	9,501	10,070	11,260
Holmes Lake	Approximately 0.3 mile upstream of State Highway 32	9.67	*	*	*	2,175	*
Jones Bayou	Approximately 2,640 feet downstream of State Highway 446	8.00	*	*	*	496	*
Jones Bayou	At Laughlin Street	7.65	266	*	389	441	536
Jones Bayou	At Yale Street	7.43	257	*	386	436	528
Jones Bayou	At Fayette Davis Street	5.70	220	*	318	360	433
Jones Bayou	At U.S. Highway 61	3.72	*	*	*	929	*
Lead Bayou	At Sunflower County boundary	24.3	1,930	*	2,330	2,565	*
Mound Bayou	Approximately 0.05 mile upstream of Ford Road	13.15	*	*	*	2,193	*
Mound Bayou	At U.S. Highway 61	5.25	*	*	*	1,206	*

Table 10: 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
Mississippi River	At the southern corporate limits of Memphis, TN	932,800	1,435,000	*	1,810,000	1,960,000	*
Pecan Bayou	About 9,500 feet upstream of State Highway 446	1.64	609	*	780	863	1,045
Pecan Bayou	At Yale Street	0.95	420	*	533	596	725
Pecan Bayou	At Bishop Road	0.65	382	*	482	537	654
Pecan Bayou	At Maple Street	0.30	204	*	256	285	348
Porter Bayou	At the confluence of West Prong Indian Bayou	35.8	*	*	*	1,600	*
West Main Canal	At mouth	9.10	725	*	875	960	*
West Main Canal	At Sunflower Road	3.90	580	*	700	770	*
West Main Canal	At White Street	3.20	725	*	875	960	*
West Main Canal	Just upstream of the confluence of Canal No. 8	2.60	580	*	700	770	*
West Main Canal	At Pearman Road	2.20	335	*	405	445	*

* Not Calculated for this Flood Risk Project

¹ Discharge values affected by culvert at State Highway 8

Figure 7: Frequency Discharge-Drainage Area Curves

[Not applicable to this Flood Risk Project]

Table 11: Summary of Non-Coastal Stillwater Elevations

[Not applicable to this Flood Risk Project]

Table 12: 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
Big Sunflower River	07288280	USGS	Big Sunflower River near Merigold, MS	553	1993	2014

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 on Table 24, "Floodway Data."

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 13. Roughness coefficients are provided in Table 14. 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 13: 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
Bear Pen Canal	Approximately 390 feet downstream of College Street	Approximately 2,210 feet upstream of College Street	Other	HEC-2 (USACE 1984)	05/01/1977	AE w/ floodway	In Bear Pen Canal above State Highway 8 area, water-surface profiles were based on reservoir routing because the highway embankment creates excessive storage and makes a steady state solution inappropriate. In that area, water-surface profiles were based on reservoir routing because the highway embankment creates excessive storage and makes a steady state solution inappropriate. The culvert at this location causes smaller peak discharges to occur downstream than those encountered upstream (FEMA 1989b).
Bear Pen Canal	Approximately 2,210 feet upstream of College Street	Approximately 4,225 upstream of State Highway 8	Other	HEC-2 (USACE 1984)	05/01/1977	AE	In Bear Pen Canal above State Highway 8 area, water-surface profiles were based on reservoir routing because the highway embankment creates excessive storage and makes a steady state solution inappropriate. In that area, water-surface profiles were based on reservoir routing because the highway embankment creates excessive storage and makes a steady state solution inappropriate. The culvert at this location causes smaller peak discharges to occur downstream than those encountered upstream (FEMA 1989b).
Big Sunflower River	Sunflower County boundary	Sunflower County boundary	Gage Analysis	HEC-RAS 4.1.0 (USACE 2010)	04/01/2016	AE	
Goffs Bayou	Approximately 3,000 feet downstream of State Highway 1	At State Highway 1	Regression Equations (USGS 1991)	HEC-RAS 4.1.0 (USACE 2010)	06/01/2010	A	

Table 13: 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
Goffs Bayou Tributary 1	At State Highway 1	Approximately 1.2 miles upstream of State Highway 1	Regression Equations (USGS 1991)	HEC-RAS 4.1.0 (USACE 2010)	06/01/2010	A	
Holmes Lake	Approximately 1.0 mile downstream of West Second Avenue	Approximately 4,070 feet upstream of West Second Avenue	Regression Equations (USGS 1991)	HEC-RAS 4.1.0 (USACE 2010)	06/01/2010	A	Selected streams were analyzed using an enhanced approximate approach instead of limited detailed studies. The differences between enhanced approximate and limited detailed studies are that Zone A designation is applied, Base Flood Elevations and cross sections are not shown on the DFIRMs, and no flood profiles are included in the FIS report for the enhanced approximate streams. Limited detailed survey methods were still used and floodway analyses were performed for these streams. In the event newer topographic data becomes available, the streams studied by enhanced approximate methods can easily be converted back to a traditional limited detailed study.

Table 13: 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
Jones Bayou	Approximately 2,640 feet downstream of State Highway 446	Approximately 130 feet upstream of Laughlin Road	HEC-HMS 3.4.0 (USACE 2009)	HEC-RAS 4.1.0 (USACE 2010)	06/01/2010	A	Selected streams were analyzed using an enhanced approximate approach instead of limited detailed studies. The differences between enhanced approximate and limited detailed studies are that Zone A designation is applied, Base Flood Elevations and cross sections are not shown on the DFIRMs, and no flood profiles are included in the FIS report for the enhanced approximate streams. Limited detailed survey methods were still used and floodway analyses were performed for these streams. In the event newer topographic data becomes available, the streams studied by enhanced approximate methods can easily be converted back to a traditional limited detailed study.
Jones Bayou	Approximately 130 feet upstream of Laughlin Road	Approximately 1,060 feet upstream of West Rosemary Road	HEC-HMS 3.4.0 (USACE 2009)	HEC-RAS 4.1.0 (USACE 2010)	06/01/2010	AE w/ floodway	The drainage area north of McWimus Road is not included for the study reach of Jones Bayou since upstream, near the Town of Merigold, the runoff is directed to the Jones Bayou cutoff draining to the Sunflower River. The storage at low area along the stream is considered in the model (FEMA 2017).

Table 13: 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
Jones Bayou	Approximately 2,390 feet downstream of South Street	Approximately 2,000 feet upstream of St. Mary Street	HEC-HMS 3.4.0 (USACE 2009)	HEC-RAS 4.1.0 (USACE 2010)	06/01/2010	A	Selected streams were analyzed using an enhanced approximate approach instead of limited detailed studies. The differences between enhanced approximate and limited detailed studies are that Zone A designation is applied, Base Flood Elevations and cross sections are not shown on the DFIRMs, and no flood profiles are included in the FIS report for the enhanced approximate streams. Limited detailed survey methods were still used and floodway analyses were performed for these streams. In the event newer topographic data becomes available, the streams studied by enhanced approximate methods can easily be converted back to a traditional limited detailed study.
Jones Bayou Tributary 9	Confluence with Jones Bayou	Approximately 1,965 feet upstream of the confluence with Jones Bayou	Regression Equations (USGS 1991)	HEC-RAS 4.1.0 (USACE 2010)	06/01/2010	A	
Lanes Bayou	Approximately 1.3 miles downstream of Thomas Road	At Thomas Road	Regression Equations (USGS 1991)	HEC-RAS 4.1.0 (USACE 2010)	06/01/2010	A	
Lanes Bayou Tributary 1	Approximately 1.3 miles downstream of Brown Street	At Brown Street	Regression Equations (USGS 1991)	HEC-RAS 4.1.0 (USACE 2010)	06/01/2010	A	

Table 13: 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
Lead Bayou	Sunflower County boundary	Approximately 800 feet upstream of the confluence of Lead Bayou Tributary 1	Other	HEC-2 (USACE 1984)	03/01/1986	AE	The 1% annual chance peak discharges on Porter Bayou, Lead Bayou, and West Main Canal were obtained from the USACE Detailed Project Reports (USACE 2009, MGI 2014) on these three streams. Flood-frequency relations were developed using Snyder's synthetic unit hydrographs for existing conditions at the mouths of Lead Bayou and West Main Canal and at three locations on Porter Bayou. Flood-frequency discharges were increased to represent current conditions using an empirical procedure developed by the USACE (FEMA 1989b). Rainfall information for the 10-, 2-, and 1% annual chance recurrence interval storms was obtained from Technical Paper No. 40 (USDC 1963), then plotted and extrapolated to obtain the 500-year rainfall (FEMA 1989b).
Mississippi River	Washington County boundary	Coahoma County boundary	Other	Other	03/01/1986	AE	Flood elevations for the Mississippi River were provided by the USACE (USACE 1976).

Table 13: 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
Mound Bayou	Approximately 2,840 feet downstream of East Martin Luther King Junior Drive	Approximately 720 feet upstream of North West Main Avenue	Regression Equations (USGS 1991)	HEC-RAS 4.1.0 (USACE 2010)	06/01/2010	A	Selected streams were analyzed using an enhanced approximate approach instead of limited detailed studies. The differences between enhanced approximate and limited detailed studies are that Zone A designation is applied, Base Flood Elevations and cross sections are not shown on the DFIRMs, and no flood profiles are included in the FIS report for the enhanced approximate streams. Limited detailed survey methods were still used and floodway analyses were performed for these streams. In the event newer topographic data becomes available, the streams studied by enhanced approximate methods can easily be converted back to a traditional limited detailed study.
Mound Bayou Tributary 6	Approximately 2,640 feet downstream of Chamber Road	Approximately 530 feet upstream of Parchman Road	Regression Equations (USGS 1991)	HEC-RAS 4.1.0 (USACE 2010)	06/01/2010	A	
Pecan Bayou	Approximately 4,225 feet downstream of Yale Street	Approximately 80 feet upstream of Maple Street	Other	HEC-2 (USACE 1984)	05/01/1977	AE w/ floodway	

Table 13: 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
Porter Bayou	Sunflower County boundary	At Gilbert Road	Other	HEC-2 (USACE 1984)	03/01/1986	AE	The 1% annual chance peak discharges on Porter Bayou, Lead Bayou, and West Main Canal were obtained from the USACE Detailed Project Reports (USACE 2009, MGI 2014) on these three streams. Flood-frequency relations were developed using Snyder's synthetic unit hydrographs for existing conditions at the mouths of Lead Bayou and West Main Canal and at three locations on Porter Bayou. Flood-frequency discharges were increased to represent current conditions using an empirical procedure developed by the USACE (FEMA 1989b). Rainfall information for the 10-, 2-, and 1% annual chance recurrence interval storms was obtained from Technical Paper No. 40 (USDC 1963), then plotted and extrapolated to obtain the 500-year rainfall (FEMA 1989b).
West Main Canal	Approximately 800 feet upstream of the confluence of Lead Bayou Tributary 1	At Old Highway 61	Other	HEC-2 (USACE 1984)	05/01/1977	AE	Detailed information about Little Tallahatchie River is provided in the narrative below.

Special Considerations (continued)

West Main Canal

The 1% annual chance peak discharges on Porter Bayou, Lead Bayou, and West Main Canal were obtained from the USACE Detailed Project Reports (USACE 2009, MGI 2014) on these three streams. Flood-frequency relations were developed using Snyder's synthetic unit hydrographs for existing conditions at the mouths of Lead Bayou and West Main Canal and at three locations on Porter Bayou. Flood-frequency discharges were increased to represent current conditions using an empirical procedure developed by the USACE (FEMA 1989b). Rainfall information for the 10-, 2-, and 1% annual chance recurrence interval storms was obtained from Technical Paper No. 40 (USDC 1963), then plotted and extrapolated to obtain the 500-year rainfall (FEMA 1989b). In the City of Cleveland, values of the 10-, 4-, 2-, 1-, and 0.2% annual chance discharge were obtained using the HEC-1 computer program along West Main Canal (USACE 1985). The computer program computes flood hydrographs utilizing a unit hydrograph defined by Snyder's method parameters. For this program, the initial rainfall loss, uniform loss rate, lag time, peaking coefficient "p", storm rainfall, and drainage areas were defined as input parameters (FEMA 1989b). On West Main Canal, the diversion of part of the flow to Lead Bayou above State Highway 8 was taken into account, thereby reducing flows in West Main Canal below this point. Starting elevations were determined by normal depth analysis (FEMA 1989b).

Table 14: Roughness Coefficients

Flooding Source	Channel “n”	Overbank “n”
Bear Pen Canal	0.035-0.100	0.035-0.065
Bear Pen Canal	0.035-0.100	0.035-0.065
Big Sunflower River	0.040-0.055	0.060-0.130
Goffs Bayou	0.040	0.120
Goffs Bayou Tributary 1	0.040	0.120
Holmes Lake	0.040	0.090
Jones Bayou	0.040-0.045	0.080-0.120
Jones Bayou	0.040	0.080
Jones Bayou	0.040-0.050	0.070-0.150
Jones Bayou Tributary 9	0.050	0.150
Lanes Bayou	0.040	0.120
Lanes Bayou Tributary 1	0.040	0.120
Lead Bayou	0.035-0.100	0.035-0.065
Mississippi River	*	*
Mound Bayou	0.040	0.100
Mound Bayou Tributary 6	0.040	0.120
Pecan Bayou	0.040-0.100	0.035-0.065
Porter Bayou	0.035-0.100	0.035-0.065
West Main Canal	0.040-0.100	0.035-0.065

* Data not available

5.3 Coastal Analyses

This section is not applicable to this Flood Risk Project.

Table 15: 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 16: 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 17: 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 18: Summary of Alluvial Fan Analyses

[Not applicable to this Flood Risk Project]

Table 19: 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 Bolivar County are provided in Table 20.

Table 20: Countywide Vertical Datum Conversion

[Not applicable to this Flood Risk Project]

Table 21: 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 22.

Table 22: Base Map Sources

Data Type	Data Provider	Data Date	Data Scale	Data Description
Digital Orthophoto	Surdex Corporation	2015 2016	1:6,300	Contains data used as a basemap for the study area.
Political County Boundaries	Mississippi Automated Resource Information System	2007	N/A	County Boundaries
Political Incorporated Community Boundaries	US Department of Commerce, US Census Bureau	2010	N/A	Municipal boundaries inside Bolivar County boundaries

Table 22: Base Map Sources (continued)

Data Type	Data Provider	Data Date	Data Scale	Data Description
Public Land Survey System (PLSS)	Mississippi Automated Resource Information System	2008	N/A	Township and Range Boundaries
Surface Water Features	Federal Emergency Management Agency (FEMA)	2012	N/A	Streams, rivers, and lakes derived from NHD data
Transportation: Road	Mississippi Department of Environmental Quality	2010	N/A	Roads throughout Bolivar County

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

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 24, "Floodway Data."

Table 23: Summary of Topographic Elevation Data used in Mapping

Community	Flooding Source	Source for Topographic Elevation Data			
		Description	Vertical Accuracy	Horizontal Accuracy	Citation
Bolivar County and Incorporated Areas	All flooding sources within county	1 meter resolution Light Detection and Ranging data (LiDAR)	0.09 Meters RMSE _z	0.09 meter at 95% confidence level	MRD 2010

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.

Table 24: Floodway Data

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	370	460	656	1.1	133.5	133.5	133.8	0.3
B	2,580	404	772	1.0	134.7	134.7	135.6	0.9
C-D ²								

¹ Feet above City of Cleveland corporate limits

² No floodway computed

TABLE 24

**FEDERAL EMERGENCY MANAGEMENT AGENCY
BOLIVAR COUNTY, MISSISSIPPI
AND INCORPORATED AREAS**

FLOODWAY DATA

FLOODING SOURCE: BEAR PEN CANAL

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	41,077	152	660	0.7	135.0	135.0	135.8	0.8
B	43,362	31	246	1.8	135.4	135.4	136.2	0.8
C	45,363	40	332	1.3	135.9	135.9	136.7	0.8
D	46,861	34	294	1.5	136.4	136.4	137.1	0.7
E	48,356	72	546	0.8	136.6	136.6	137.5	0.9
F	49,856	38	344	1.3	136.9	136.9	137.7	0.8
G	51,472	27	261	1.7	137.1	137.1	137.9	0.8
H	52,621	31	300	1.5	137.5	137.5	138.2	0.7
I	53,854	69	488	0.9	137.5	137.5	138.3	0.8
J	54,854	73	473	0.9	137.6	137.6	138.4	0.8
K	55,856	31	293	1.2	137.7	137.7	138.5	0.8
L	56,849	103	544	0.7	137.8	137.8	138.6	0.8
M	57,854	80	552	0.7	137.8	137.8	138.6	0.8
N	59,348	116	765	0.5	137.9	137.9	138.8	0.9

¹ Feet above mouth

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY
BOLIVAR COUNTY, MISSISSIPPI
AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: JONES BAYOU

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	9,500	368	532	1.6	134.1	134.1	134.2	0.1
B	11,600	177	583	1.0	134.8	134.8	135.8	1.0
C	13,430	1,024	1,688	0.4	135.1	135.1	136.1	1.0
D	14,910	38	256	2.2	135.3	135.3	136.2	0.9
E	15,060	251	1,051	0.5	135.5	135.5	136.4	0.9
F	16,020	55	300	1.9	136.0	136.0	136.8	0.8
G	16,820	74	129	2.2	136.8	136.8	137.3	0.5

¹ Feet above State Highway 446

TABLE 24

FEDERAL EMERGENCY MANAGEMENT AGENCY
BOLIVAR COUNTY, MISSISSIPPI
 AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: PECAN BAYOU

Non-encroachment areas 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 25. The non-encroachment width indicates the measured distance left and right (looking downstream) from the mapped center of the stream to the non-encroachment boundary based on a surcharge of 1.0 foot or less.

Table 25: Flood Hazard and Non-Encroachment Data for Selected Streams

Flooding Source	Cross Section	Stream Station ¹	1% Annual Chance Flood Discharge (cfs)	1% Annual Chance Water Surface Elevation (feet NAVD88)	Non-Encroachment Width (feet)	
					Left	Right
Big Sunflower River		788,066	10,070	130.3	133	123
Big Sunflower River	A	788,682	10,070	130.3	122	128
Big Sunflower River		789,234	10,070	130.4	270	170
Big Sunflower River		789,703	10,070	130.4	520	128
Big Sunflower River		790,156	10,070	130.4	168	124
Big Sunflower River		790,838	10,070	130.5	88	157
Big Sunflower River		791,379	10,070	130.5	92	165
Big Sunflower River		792,253	10,070	130.6	102	229
Big Sunflower River		793,288	10,070	130.6	220	146
Big Sunflower River	B	794,289	10,070	130.7	466	120
Big Sunflower River		795,178	10,070	130.7	440	137
Big Sunflower River		796,048	10,070	130.8	133	135
Big Sunflower River		796,135	10,070	131.0	135	132
Big Sunflower River		796,207	10,070	131.0	135	132
Big Sunflower River		796,988	10,070	131.0	103	148
Big Sunflower River	C	798,061	10,070	131.1	188	94
Big Sunflower River		799,478	10,070	131.2	110	134
Big Sunflower River		800,242	10,070	131.2	110	132
Big Sunflower River		801,310	10,070	131.3	88	195
Big Sunflower River		801,941	10,070	131.3	128	157
Big Sunflower River	D	803,066	10,070	131.4	179	104
Big Sunflower River		804,041	10,070	131.4	118	111
Big Sunflower River		805,292	10,070	131.5	110	137
Big Sunflower River		806,557	10,070	131.6	121	137
Big Sunflower River		807,218	10,070	131.7	134	205
Big Sunflower River	E	808,077	10,070	131.7	131	125

Table 25: Flood Hazard and Non-Encroachment Data for Selected Streams (continued)

Flooding Source	Cross Section	Stream Station ¹	1% Annual Chance Flood Discharge (cfs)	1% Annual Chance Water Surface Elevation (feet NAVD88)	Non-Encroachment Width (feet)	
					Left	Right
Big Sunflower River		808,820	10,070	131.7	120	142
Big Sunflower River		809,329	10,070	131.8	172	126
Big Sunflower River		810,138	10,070	131.8	151	138
Big Sunflower River		810,761	10,070	131.9	149	107
Big Sunflower River		811,976	10,070	132.0	191	145
Big Sunflower River		812,957	10,070	132.0	141	124
Big Sunflower River	F	813,871	10,070	132.1	99	156
Big Sunflower River		814,724	10,070	132.2	374	105
Big Sunflower River		815,491	10,070	132.2	194	71
Big Sunflower River		815,555	10,070	132.2	199	66
Big Sunflower River		815,631	10,070	132.2	199	66
Big Sunflower River		815,920	10,070	132.3	88	258
Big Sunflower River		816,437	10,070	132.3	78	423
Big Sunflower River		816,998	10,070	132.3	102	126
Big Sunflower River	G	817,411	10,070	132.3	120	113
Big Sunflower River		818,341	10,070	132.4	156	112
Big Sunflower River		818,972	10,070	132.4	138	83
Big Sunflower River		819,749	10,070	132.5	140	116
Big Sunflower River		820,566	10,070	132.5	154	138
Big Sunflower River	H	821,267	10,070	132.6	409	89
Big Sunflower River		821,907	10,070	132.6	604	201
Big Sunflower River		822,651	10,070	132.6	147	416
Big Sunflower River		823,314	10,070	132.6	88	144
Big Sunflower River		824,011	10,070	132.7	68	183
Big Sunflower River	I	824,567	10,070	132.7	325	101
Big Sunflower River		825,208	10,070	132.8	99	137

¹ Stream distance in feet above confluence with Yazoo River

6.4 Coastal Flood Hazard Mapping

This section is not applicable to this Flood Risk Project.

Table 26: Summary of Coastal Transect Mapping Considerations

[Not applicable to this Flood Risk Project]

6.5 FIRM Revisions

This FIS Report and the FIRM are based on the most up-to-date information available to FEMA at the time of its publication; however, flood hazard conditions change over time. Communities or private parties may request flood map revisions at any time. Certain types of requests require submission of supporting data. FEMA may also initiate a revision. Revisions may take several forms, including Letters of Map Amendment (LOMAs), Letters of Map Revision Based on Fill (LOMR-Fs), Letters of Map Revision (LOMRs) (referred to collectively as Letters of Map Change (LOMCs)), Physical Map Revisions (PMRs), and FEMA-contracted restudies. These types of revisions are further described below. Some of these types of revisions do not result in the republishing of the FIS Report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood-hazard data (shown in Table 31, “Map Repositories”).

6.5.1 Letters of Map Amendment

A LOMA is an official revision by letter to an effective NFIP map. A LOMA results from an administrative process that involves the review of scientific or technical data submitted by the owner or lessee of property who believes the property has incorrectly been included in a designated SFHA. A LOMA amends the currently effective FEMA map and establishes that a specific property is not located in a SFHA.

To obtain an application for a LOMA, visit www.fema.gov/floodplain-management/letter-map-amendment-loma and download the form “MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill”. Visit the “Flood Map-Related Fees” section to determine the cost, if any, of applying for a LOMA.

FEMA offers a tutorial on how to apply for a LOMA. The LOMA Tutorial Series can be accessed at www.fema.gov/online-tutorials.

For more information about how to apply for a LOMA, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627).

6.5.2 Letters of Map Revision Based on Fill

A LOMR-F is an official revision by letter to an effective NFIP map. A LOMR-F states FEMA’s determination concerning whether a structure or parcel has been elevated on fill above the base flood elevation and is, therefore, excluded from the SFHA.

Information about obtaining an application for a LOMR-F can be obtained in the same manner as that for a LOMA, by visiting www.fema.gov/floodplain-management/letter-map-amendment-loma for the “MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill” or by

calling the FEMA Map Information eXchange, toll free, at 1-877-FEMA MAP (1-877-336-2627). Fees for applying for a LOMR-F, if any, are listed in the “Flood Map-Related Fees” section.

A tutorial for LOMR-F is available at www.fema.gov/online-tutorials.

6.5.3 Letters of Map Revision

A LOMR is an official revision to the currently effective FEMA map. It is used to change flood zones, floodplain and floodway delineations, flood elevations and planimetric features. All requests for LOMRs should be made to FEMA through the chief executive officer of the community, since it is the community that must adopt any changes and revisions to the map. If the request for a LOMR is not submitted through the chief executive officer of the community, evidence must be submitted that the community has been notified of the request.

To obtain an application for a LOMR, visit www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/mt-2-application-forms-and-instructions and download the form “MT-2 Application Forms and Instructions for Conditional Letters of Map Revision and Letters of Map Revision”. Visit the “Flood Map-Related Fees” section to determine the cost of applying for a LOMR. For more information about how to apply for a LOMR, call the FEMA Map Information eXchange; toll free, at 1-877-FEMA MAP (1-877-336-2627) to speak to a Map Specialist.

Previously issued mappable LOMCs (including LOMRs) that have been incorporated into the Bolivar County FIRM are listed in Table 27.

Table 27: Incorporated Letters of Map Change

[Not applicable to this Flood Risk Project]

6.5.4 Physical Map Revisions

Physical Map Revisions (PMRs) are an official republication of a community’s NFIP map to effect changes to base flood elevations, floodplain boundary delineations, regulatory floodways and planimetric features. These changes typically occur as a result of structural works or improvements, annexations resulting in additional flood hazard areas or correction to base flood elevations or SFHAs.

The community’s chief executive officer must submit scientific and technical data to FEMA to support the request for a PMR. The data will be analyzed and the map will be revised if warranted. The community is provided with copies of the revised information and is afforded a review period. When the base flood elevations are changed, a 90-day appeal period is provided. A 6-month adoption period for formal approval of the revised map(s) is also provided.

For more information about the PMR process, please visit www.fema.gov and visit the “Flood Map Revision Processes” section.

6.5.5 Contracted Restudies

The NFIP provides for a periodic review and restudy of flood hazards within a given community. FEMA accomplishes this through a national watershed-based mapping

needs assessment strategy, known as the Coordinated Needs Management Strategy (CNMS). The CNMS is used by FEMA to assign priorities and allocate funding for new flood hazard analyses used to update the FIS Report and FIRM. The goal of CNMS is to define the validity of the engineering study data within a mapped inventory. The CNMS is used to track the assessment process, document engineering gaps and their resolution, and aid in prioritization for using flood risk as a key factor for areas identified for flood map updates. Visit www.fema.gov to learn more about the CNMS or contact the FEMA Regional Office listed in Section 8 of this FIS Report.

6.5.6 Community Map History

The current FIRM presents flooding information for the entire geographic area of Bolivar County. Previously, separate FIRMs, Flood Hazard Boundary Maps (FHBM) and/or Flood Boundary and Floodway Maps (FBFM) may have been prepared for the incorporated communities and the unincorporated areas in the county that had identified SFHAs. Current and historical data relating to the maps prepared for the project area are presented in Table 28, "Community Map History." A description of each of the column headings and the source of the date is also listed below.

- *Community Name* includes communities falling within the geographic area shown on the FIRM, including those that fall on the boundary line, nonparticipating communities, and communities with maps that have been rescinded. Communities with No Special Flood Hazards are indicated by a footnote. If all maps (FHBM, FBFM, and FIRM) were rescinded for a community, it is not listed in this table unless SFHAs have been identified in this community.
- *Initial Identification Date (First NFIP Map Published)* is the date of the first NFIP map that identified flood hazards in the community. If the FHBM has been converted to a FIRM, the initial FHBM date is shown. If the community has never been mapped, the upcoming effective date or "pending" (for Preliminary FIS Reports) is shown. If the community is listed in Table 28 but not identified on the map, the community is treated as if it were unmapped.
- *Initial FHBM Effective Date* is the effective date of the first Flood Hazard Boundary Map (FHBM). This date may be the same date as the Initial NFIP Map Date.
- *FHBM Revision Date(s)* is the date(s) that the FHBM was revised, if applicable.
- *Initial FIRM Effective Date* is the date of the first effective FIRM for the community.
- *FIRM Revision Date(s)* is the date(s) the FIRM was revised, if applicable. This is the revised date that is shown on the FIRM panel, if applicable. As countywide studies are completed or revised, each community listed should have its FIRM dates updated accordingly to reflect the date of the countywide study. Once the FIRMs exist in countywide format, as Physical Map Revisions (PMR) of FIRM panels within the county are completed, the FIRM Revision Dates in the table for each community affected by the PMR are updated with the date of the PMR, even if the PMR did not revise all the panels within that community.

The initial effective date for the Bolivar County FIRMs in countywide format was 03/21/2017.

Table 28: Community Map History

Community Name	Initial Identification Date	Initial FHBM Effective Date	FHBM Revision Date(s)	Initial FIRM Effective Date	FIRM Revision Date(s)
Alligator, Town of	10/25/1974	10/25/1974	07/14/1978	09/04/1985	03/21/2017
Benoit, Town of	05/24/1974	05/24/1974	11/19/1976	09/27/1985	03/21/2017
Beulah, Town of	06/07/1974	06/07/1974	N/A	06/25/1976	03/21/2017
Bolivar County, Unincorporated Areas	12/23/1977	12/23/1977	N/A	07/17/1989	TBD 03/21/2017
Boyle, Town of	05/24/1974	05/24/1974	07/16/1976	03/01/1987	03/21/2017
Cleveland, City of	05/10/1974	05/10/1974	N/A	09/01/1978	03/21/2017 07/17/1989
Duncan, Town of	11/05/1976	11/05/1976	02/08/1980	08/01/1986	03/21/2017
Gunnison, Town of	06/14/1974	06/14/1974	N/A	06/25/1976	03/21/2017
Merigold, Town of	06/07/1974	06/07/1974	02/08/1980 06/18/1976	09/27/1985	03/21/2017
Mound Bayou, City of	06/07/1974	06/07/1974	08/22/1975	09/27/1985	03/21/2017
Pace, Town of	10/25/1974	10/25/1974	N/A	09/27/1985	03/21/2017
Renova, Town of	03/21/2017	N/A	N/A	03/21/2017	TBD
Rosedale, City of ¹	06/07/1974	06/07/1974	07/30/1976	09/27/1985	03/21/2017
Shaw, City of	06/07/1974	06/07/1974	06/25/1976	06/03/1986	03/21/2017
Shelby, City of	10/29/1976	10/29/1976	N/A	09/27/1985	03/21/2017
Winstonville, Town of ¹	03/21/2017	N/A	N/A	03/21/2017	N/A

¹ This community did not have map history prior to the first countywide FIRM for Bolivar County

SECTION 7.0 – CONTRACTED STUDIES AND COMMUNITY COORDINATION

7.1 Contracted Studies

Table 29 provides a summary of the contracted studies, by flooding source, that are included in this FIS Report.

Table 29: Summary of Contracted Studies Included in this FIS Report

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Bear Pen Canal	07/17/1989	U.S. Department of the Interior, Geological Survey, Water Resources Division	Inter-Agency Agreement No. EMW-85-E-1823	May 1977	Bolivar County, Unincorporated Areas; Cleveland, City of
Bear Pen Canal	07/17/1989	U.S. Department of the Interior, Geological Survey, Water Resources Division	Inter-Agency Agreement No. EMW-85-E-1823	May 1977	Bolivar County, Unincorporated Areas; Cleveland, City of
Big Sunflower River	TBD	AECOM	MS FY.11	April 2016	Bolivar County, Unincorporated Areas
Goffs Bayou	03/21/2017	AECOM	Contract No. EMA-2008-CA-5883	June 2010	Bolivar County, Unincorporated Areas; Rosedale, City of
Goffs Bayou Tributary 1	03/21/2017	AECOM	Contract No. EMA-2008-CA-5883	June 2010	Bolivar County, Unincorporated Areas; Rosedale, City of
Holmes Lake	03/21/2017	AECOM	Contract No. EMA-2008-CA-5883	June 2010	Bolivar County, Unincorporated Areas; Shelby, City of
Jones Bayou	03/21/2017	AECOM	Contract No. EMA-2008-CA-5883	June 2010	Bolivar County, Unincorporated Areas; Boyle, Town of
Jones Bayou	03/21/2017	AECOM	Contract No. EMA-2008-CA-5883	June 2010	Bolivar County, Unincorporated Areas; Cleveland, City of
Jones Bayou	03/21/2017	AECOM	Contract No. EMA-2008-CA-5883	June 2010	Bolivar County, Unincorporated Areas; Merigold, Town of
Jones Bayou Tributary 9	03/21/2017	AECOM	Contract No. EMA-2008-CA-5883	June 2010	Merigold, Town of
Lanes Bayou	03/21/2017	AECOM	Contract No. EMA-2008-CA-5883	June 2010	Bolivar County, Unincorporated Areas; Rosedale, City of
Lanes Bayou Tributary 1	03/21/2017	AECOM	Contract No. EMA-2008-CA-5883	June 2010	Bolivar County, Unincorporated Areas; Rosedale, City of
Lead Bayou	07/17/1989	U.S. Department of the Interior, Geological Survey, Water Resources Division	Inter-Agency Agreement No. EMW-85-E-1823	March 1986	Bolivar County, Unincorporated Areas

Table 29: Summary of Contracted Studies Included in this FIS Report (continued)

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Mississippi River	07/17/1989	U.S. Department of the Interior, Geological Survey, Water Resources Division	Inter-Agency Agreement No. EMW-85-E-1823	March 1986	Bolivar County, Unincorporated Areas
Mound Bayou	03/21/2017	AECOM	Contract No. EMA-2008-CA-5883	June 2010	Bolivar County, Unincorporated Areas; Mound Bayou, City of
Mound Bayou Tributary 6	03/21/2017	AECOM	Contract No. EMA-2008-CA-5883	June 2010	Bolivar County, Unincorporated Areas; Shelby, City of
Pecan Bayou	07/17/1989	U.S. Department of the Interior, Geological Survey, Water Resources Division	Inter-Agency Agreement No. EMW-85-E-1823	March 1986	Bolivar County, Unincorporated Areas; Cleveland, City of
Porter Bayou	07/17/1989	U.S. Department of the Interior, Geological Survey, Water Resources Division	Inter-Agency Agreement No. EMW-85-E-1823	March 1986	Bolivar County, Unincorporated Areas; Shaw, City of
West Main Canal	07/17/1989	U.S. Department of the Interior, Geological Survey, Water Resources Division	Inter-Agency Agreement No. EMW-85-E-1823	March 1986	Bolivar County, Unincorporated Areas; Cleveland, City of; Renova, Town of

7.2 Community Meetings

The dates of the community meetings held for this Flood Risk Project and previous Flood Risk Projects are shown in Table 30. These meetings may have previously been referred to by a variety of names (Community Coordination Officer (CCO), Scoping, Discovery, etc.), but all meetings represent opportunities for FEMA, community officials, study contractors, and other invited guests to discuss the planning for and results of the project.

Table 30: Community Meetings

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Alligator, Town of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
Benoit, Town of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
Beulah, Town of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
Bolivar County, Unincorporated Areas	TBD	07/09/2013	Discovery Meeting	Mississippi Department of Environmental Quality, Mississippi Emergency Management Agency, Mississippi Department of Transportation, Federal Emergency Management Agency Region IV, United States Geological Survey, Yazoo Mississippi Levee District, South Delta Planning Development District, Waggoner Engineering, and AECOM
		TBD	Flood Risk Review Meeting	TBD
		TBD	CCO Meeting	TBD
		TBD	Resilience Meeting	TBD

Table 30: Community Meetings (continued)

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Boyle, Town of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
Cleveland, City of	03/21/2017	N/A	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		09/09/1987	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
Duncan, Town of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
Gunnison, Town of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
Merigold, Town of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community

Table 30: Community Meetings (continued)

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Mound Bayou, City of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
Pace, Town of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
Renova, Town of	TBD	07/09/2013	Discovery Meeting	Mississippi Department of Environmental Quality, Mississippi Emergency Management Agency, Mississippi Department of Transportation, Federal Emergency Management Agency Region IV, United States Geological Survey, Yazoo Mississippi Levee District, South Delta Planning Development District, Waggoner Engineering, and AECOM
		TBD	Flood Risk Review Meeting	TBD
		TBD	CCO Meeting	TBD
		TBD	Resilience Meeting	TBD
Rosedale, City of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
Shaw, City of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community

Table 30: Community Meetings (continued)

Community	FIS Report Dated	Date of Meeting	Meeting Type	Attended By
Shelby, City of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
Winstonville, Town of	03/21/2017	08/28/2008	Initial CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community
		12/09/2010	Final CCO Meeting	MEMA, MDEQ, Mississippi Geographic Information, LLC, the study contractor, and the community

SECTION 8.0 – 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 www.fema.gov.

Table 31 is a list of the locations where FIRMs for Bolivar 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 31: Map Repositories

Community	Address	City	State	Zip Code
Alligator, Town of	Town Hall 13 Lake Street	Alligator	MS	38720
Benoit, Town of	Town Hall 114 West Preston Street	Benoit	MS	38725
Beulah, Town of	Town Hall 205 South Front Street	Beulah	MS	38726
Bolivar County, Unincorporated Areas	Bolivar County Administrator Office 200 South Court Street	Cleveland	MS	38732
Boyle, Town of	Town Hall 111 T M Jones Highway	Boyle	MS	38730
Cleveland, City of	Community Development Department 215 North Bayou Road	Cleveland	MS	38732
Duncan, Town of	Town Hall 204 West Park South	Duncan	MS	38740
Gunnison, Town of	Town Hall 404 Main Street	Gunnison	MS	38746
Merigold, Town of	Town Hall 107 South Front Street	Merigold	MS	38759
Mound Bayou, City of	City Hall 106 South Green Avenue	Mound Bayou	MS	38762
Pace, Town of	Town Hall 333 Jenny Washington Street	Pace	MS	38764
Renova, Town of	Town Hall 1339 Old Highway 61	Renova	MS	38732
Rosedale, City of	City Hall 304 Court Street	Rosedale	MS	38769
Shaw, City of	City Hall 101 Faison Street	Shaw	MS	38773
Shelby, City of	City Hall 305 3rd Street	Shelby	MS	38777
Winstonville, Town of	Town Hall 101 Osley Avenue	Winstonville	MS	38781

The National Flood Hazard Layer (NFHL) dataset is a compilation of effective FIRM databases and LOMCs. Together they create a GIS data layer for a State or Territory. The NFHL is updated as studies become effective and extracts are made available to the public monthly. NFHL data can be viewed or ordered from the website shown in Table 32.

Table 32 contains useful contact information regarding the FIS Report, the FIRM, and other relevant flood hazard and GIS data. In addition, information about the State NFIP Coordinator and GIS Coordinator is shown in this table. At the request of FEMA, each Governor has designated an agency of State or territorial government to coordinate that State's or territory's NFIP activities. These agencies often assist communities in developing and adopting necessary floodplain management measures. State GIS Coordinators are knowledgeable about the availability and location of State and local GIS data in their state.

Table 32: Additional Information

FEMA and the NFIP	
FEMA and FEMA Engineering Library website	www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/engineering-library
NFIP website	www.fema.gov/national-flood-insurance-program
NFHL Dataset	msc.fema.gov
FEMA Region IV	Federal Regional Center 3003 Chamblee Tucker Road Atlanta, GA 30341 (770) 220-5200
Other Federal Agencies	
USGS website	www.usgs.gov
Hydraulic Engineering Center website	www.hec.usace.army.mil
State Agencies and Organizations	
State NFIP Coordinator	Stacey D. Ricks, CFM Mississippi Emergency Management Agency PO Box 5644 Pearl, MS 39208 Office: (601) 933-6605 Fax: (601) 933-6805 sricks@mema.ms.gov
State GIS Coordinator	Position Currently Vacant MFMMI Program Director Administrator of the MS Coordinating Council for Remote and Geographic Information Systems P.O. Box 20307 Jackson, MS 39289-1307

SECTION 9.0 – BIBLIOGRAPHY AND REFERENCES

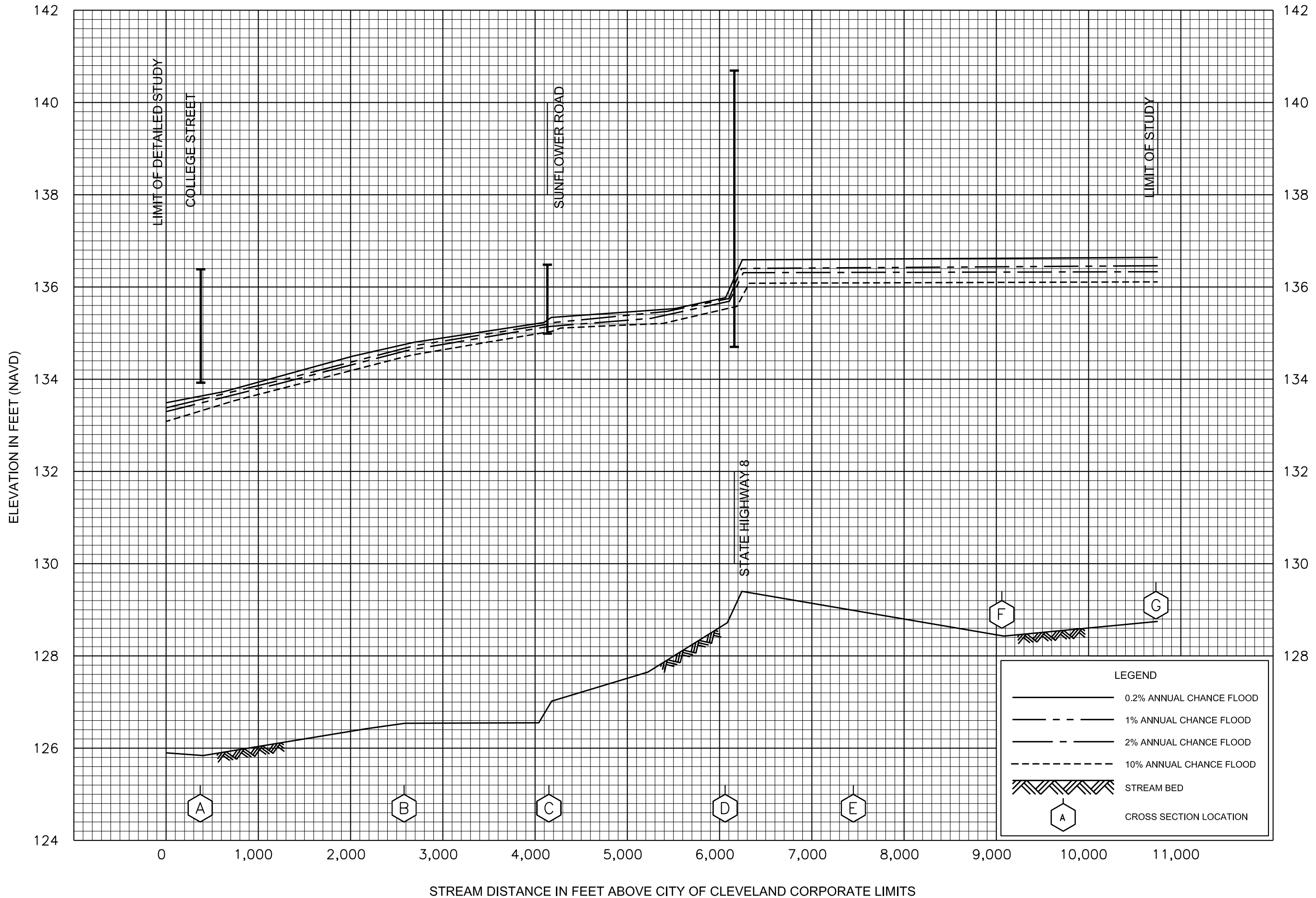
Table 33 includes sources used in the preparation of and cited in this FIS Report as well as additional studies that have been conducted in the study area.

Table 33: Bibliography and References

Citation in this FIS	Publisher / Issuer	<i>Publication Title</i> , "Article," Volume, Number, etc.	Author / Editor	Place of Publication	Publication Date / Date of Issuance	Link
USDC 1961	U.S. Department of Commerce, National Weather Service	Technical Paper No. 40, Rainfall Frequency Atlas of the United States		Washington, D.C.	January 1963	
FEMA 1989a	Federal Emergency Management Agency	Flood Insurance Study, Bolivar County, Mississippi, Unincorporated Areas		Washington, D.C.	July 17, 1989	
FEMA 1989b	Federal Emergency Management Agency	Flood Insurance Study, City of Cleveland, Mississippi		Washington, D.C.	July 17, 1989	
USACE 1976	U.S. Army Corps of Engineers, Hydrologic Engineering Center	Mississippi River Project Flood Studies	Vicksburg District		1976	
MGI 2014	Mississippi Geographic Information, LLC	Mississippi Delta Levee Protection Study Plan of Work Report			July 2014	
FEMA 2017	Federal Emergency Management Agency	Flood Insurance Study, Bolivar County, Mississippi and Incorporated Areas		Washington, D.C.	March 21, 2017	
USACE 1985	U.S. Army Corps of Engineers, Hydrologic Engineering Center	HEC-1, Flood Hydrograph Package, User's Manual		Davis, California	January 1985	
MRD 2010	Mississippi River Delta	Mississippi River Delta LiDAR			August 2, 2010	
USACE 2009	U.S. Army Corps of Engineers, Hydrologic Engineering Center	HEC-HMS 3.4.0, Hydrologic Modeling System, Version 3.4.0		Davis, California	August 2009	
USACE 1984	U.S. Army Corps of Engineers, Hydrologic Engineering Center	HEC-2 Water Surface Profiles, Computer Program 723-X6-L202A		Davis, California	April 1984	
USACE 2008	U.S. Army Corps of Engineers, Hydrologic Engineering Center	HEC-RAS 4.0.0, River Analysis System, Version 4.0.0, Computer Software		Davis, California	March 2008	

Table 33: Bibliography and References (continued)

Citation in this FIS	Publisher / Issuer	<i>Publication Title</i> , "Article," Volume, Number, etc.	Author / Editor	Place of Publication	Publication Date / Date of Issuance	Link
USACE 2010	U.S. Army Corps of Engineers, Hydrologic Engineering Center	HEC-RAS 4.1.0, River Analysis System, Version 4.1.0, Computer Software		Davis, California	January 2010	
USGS 1991	U.S. Department of the Interior, Geological Survey	Flood Characteristics of Mississippi Streams, Water-Resources Investigations Report 91-4037		Jackson, Mississippi	1991	
USSCS 1971	U.S. Soil Conservation Service	National Engineering Handbook, Section 16		Washington, D.C.	October 1971	
WRC 1976	US Water Resources Council	Guidelines for Determining Flood Flow Frequency		N/A	1976	



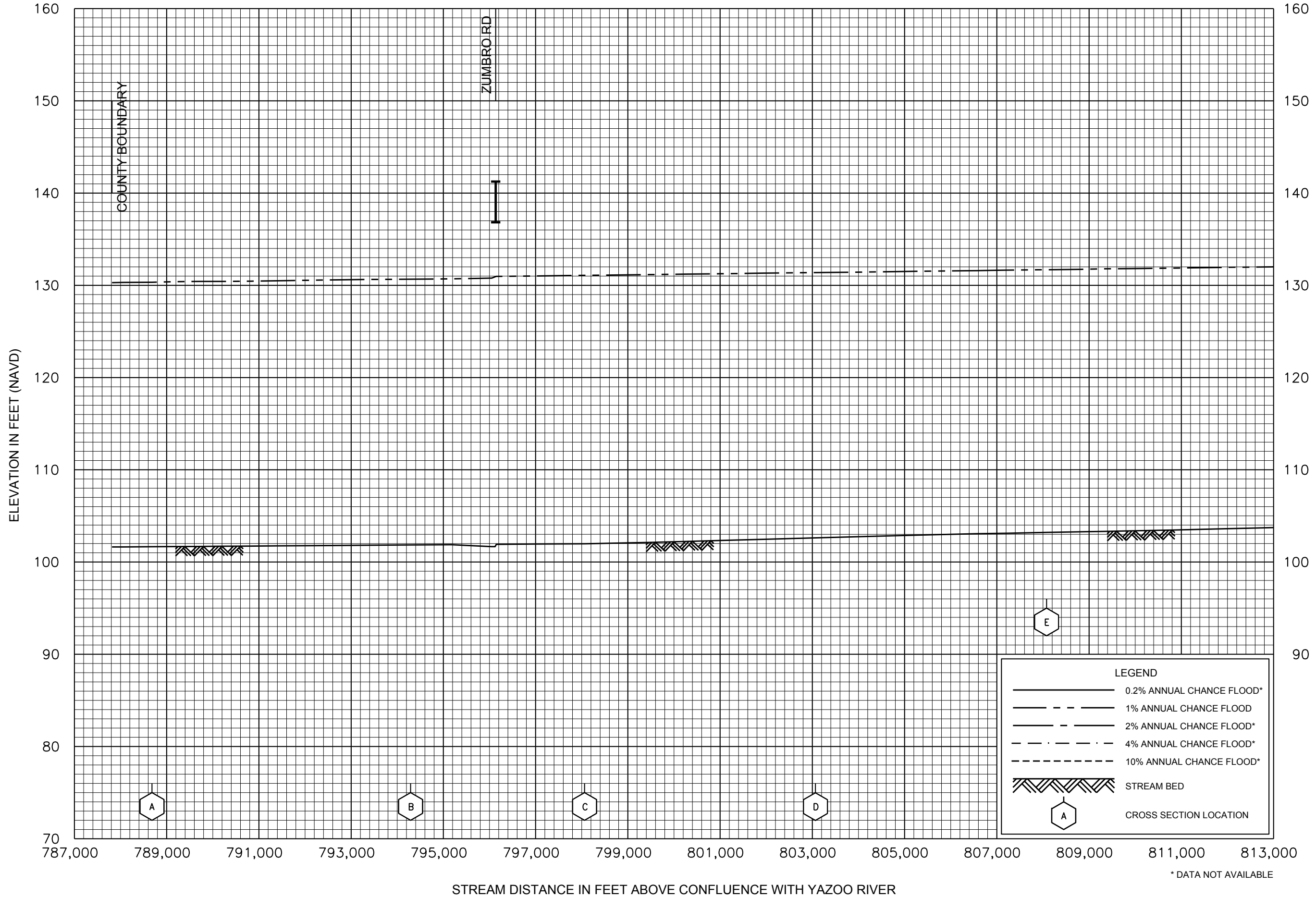
FLOOD PROFILES

BEAR PEN CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOLIVAR COUNTY, MS
AND INCORPORATED AREAS

01P

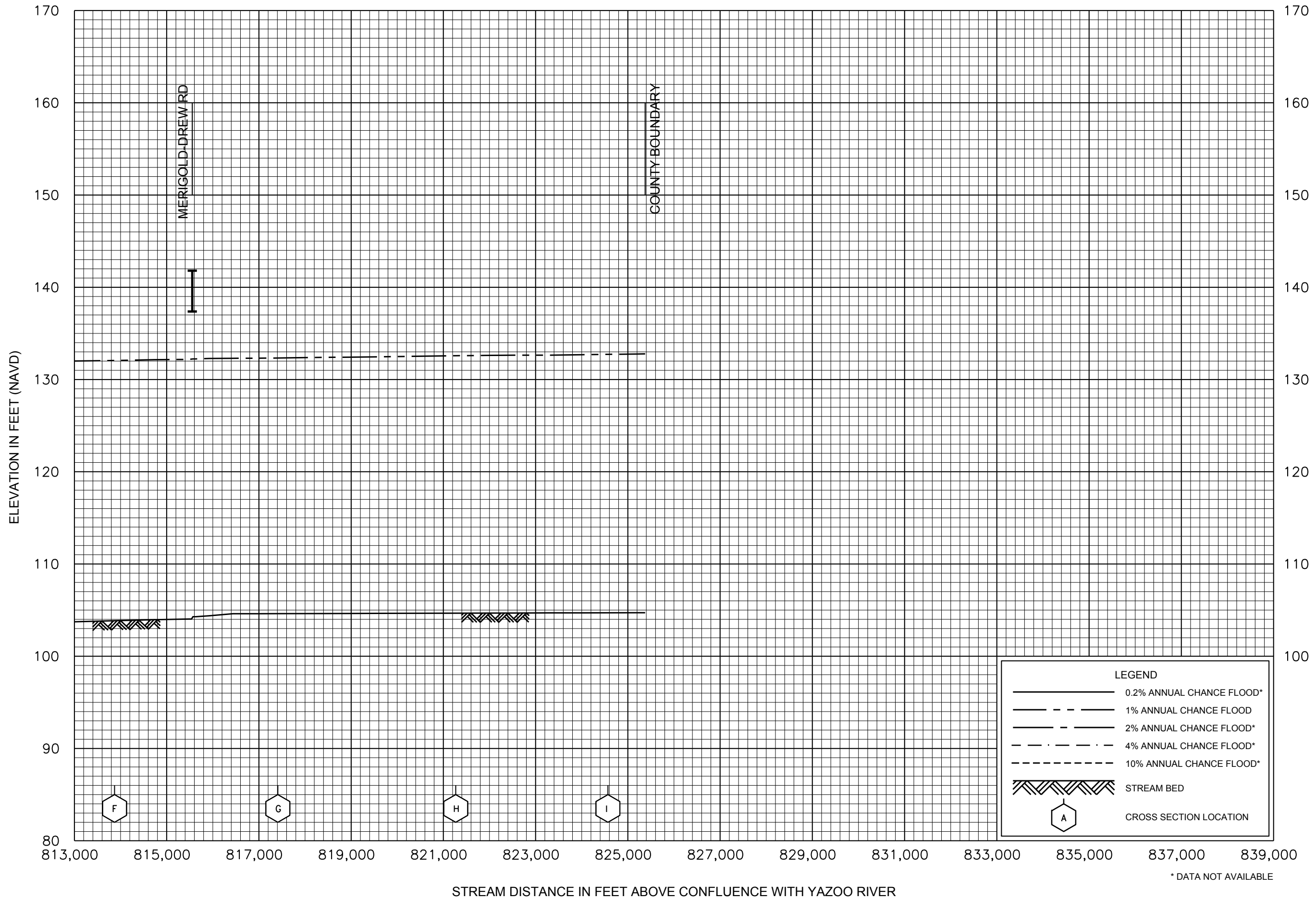


FLOOD PROFILES

BIG SUNFLOWER RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOLIVAR COUNTY, MS
AND INCORPORATED AREAS

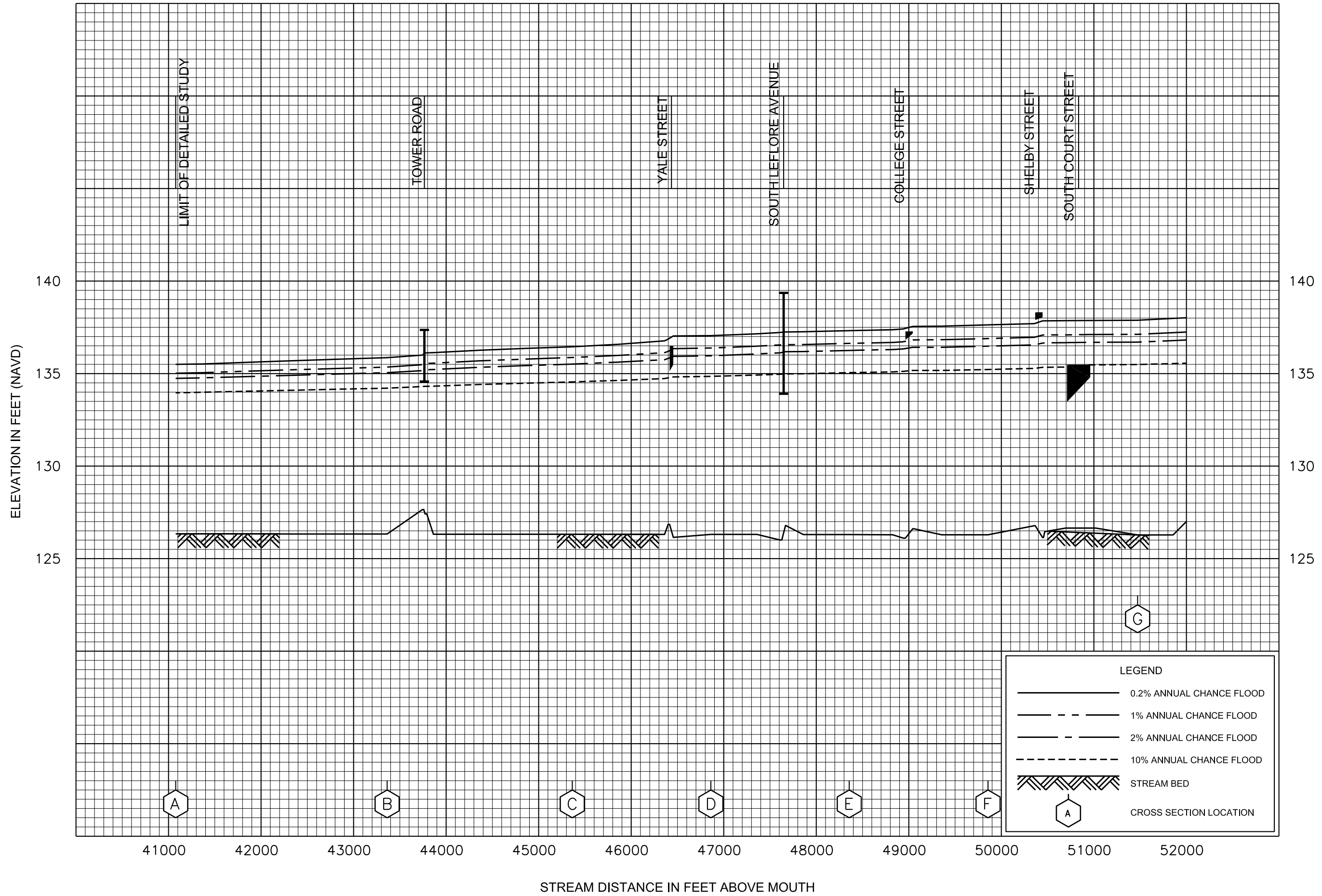


FLOOD PROFILES

BIG SUNFLOWER RIVER

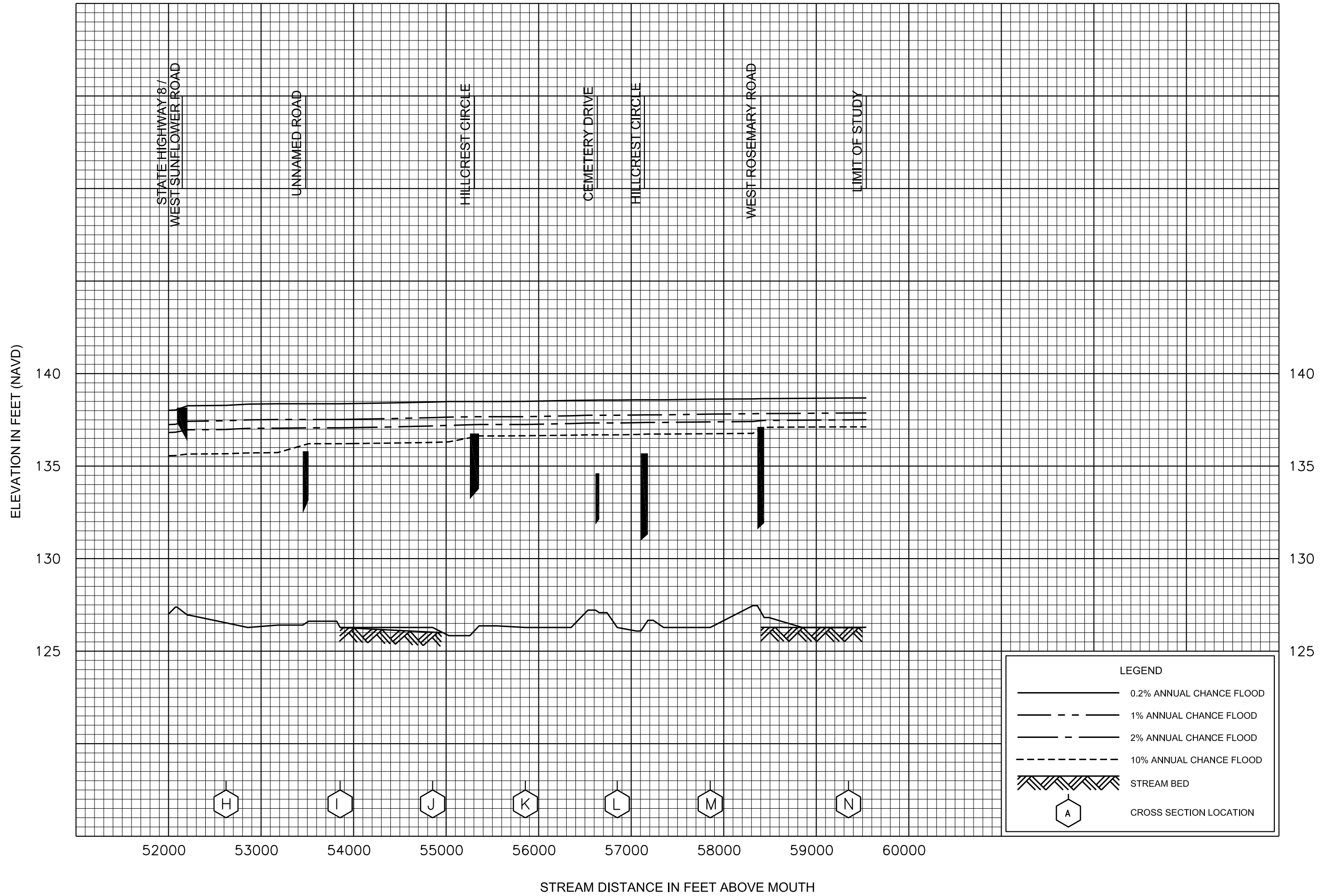
FEDERAL EMERGENCY MANAGEMENT AGENCY

**BOLIVER COUNTY, MS
AND INCORPORATED AREAS**



FLOOD PROFILES
 JONES BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY
BOLIVAR COUNTY, MS
 AND INCORPORATED AREAS

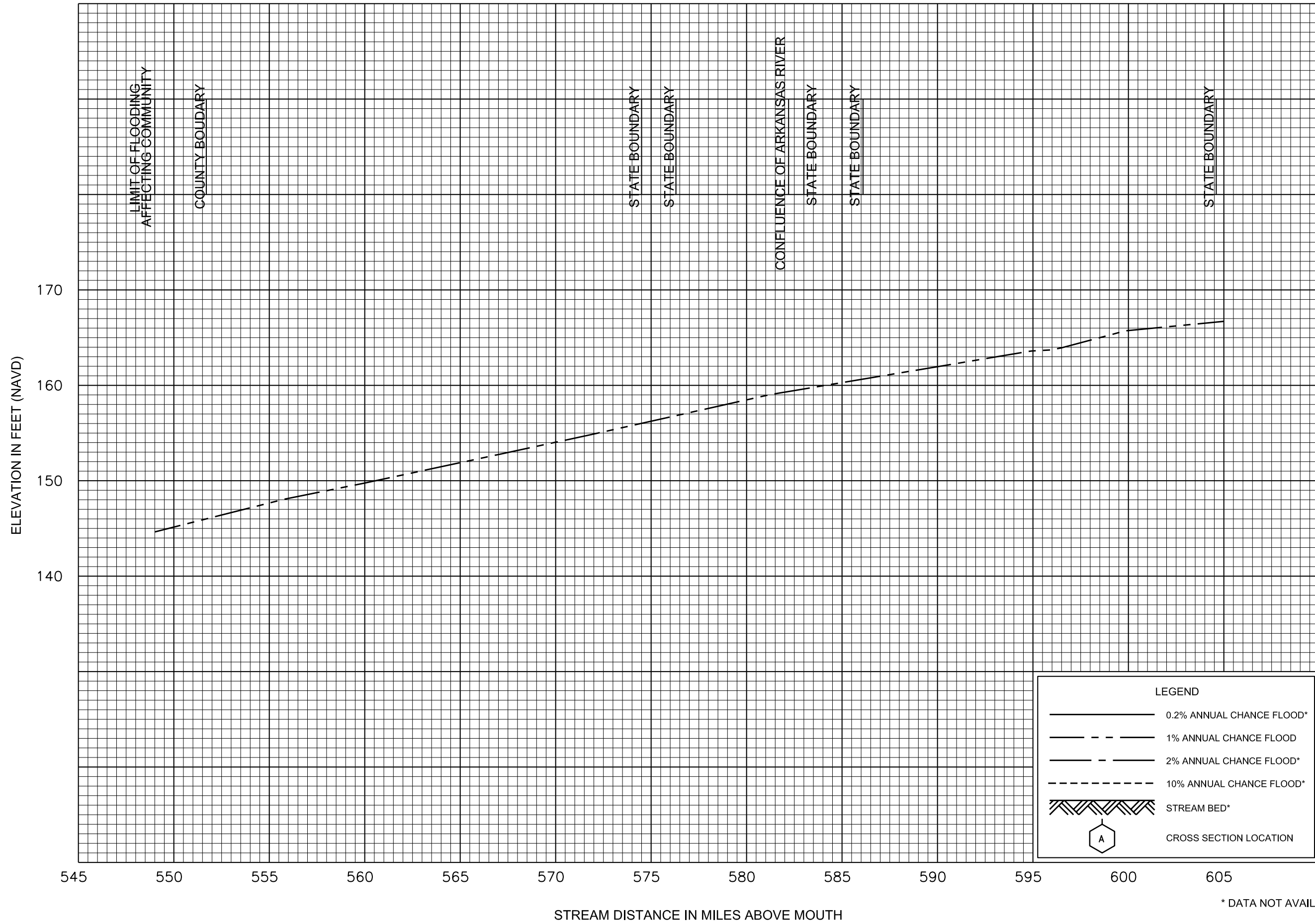


LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- - - 1% ANNUAL CHANCE FLOOD
- · - 2% ANNUAL CHANCE FLOOD
- · · 10% ANNUAL CHANCE FLOOD
- ▨ STREAM BED
- ⬡ A CROSS SECTION LOCATION

FLOOD PROFILES
JONES BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY
BOLIVAR COUNTY, MS
AND INCORPORATED AREAS



* DATA NOT AVAILABLE

LEGEND

- 0.2% ANNUAL CHANCE FLOOD*
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD*
- 10% ANNUAL CHANCE FLOOD*
- STREAM BED*
- CROSS SECTION LOCATION

FEDERAL EMERGENCY MANAGEMENT AGENCY

**BOLIVAR COUNTY, MS
AND INCORPORATED AREAS**

FLOOD PROFILES

MISSISSIPPI RIVER

ELEVATION IN FEET (NAVD)

160

170

180

605

610

615

620

STREAM DISTANCE IN MILES ABOVE MOUTH

STATE BOUNDARY

COUNTY BOUNDARY

LEGEND

- 0.2% ANNUAL CHANCE FLOOD*
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD*
- 10% ANNUAL CHANCE FLOOD*
- STREAM BED*
- CROSS SECTION LOCATION

* DATA NOT AVAILABLE

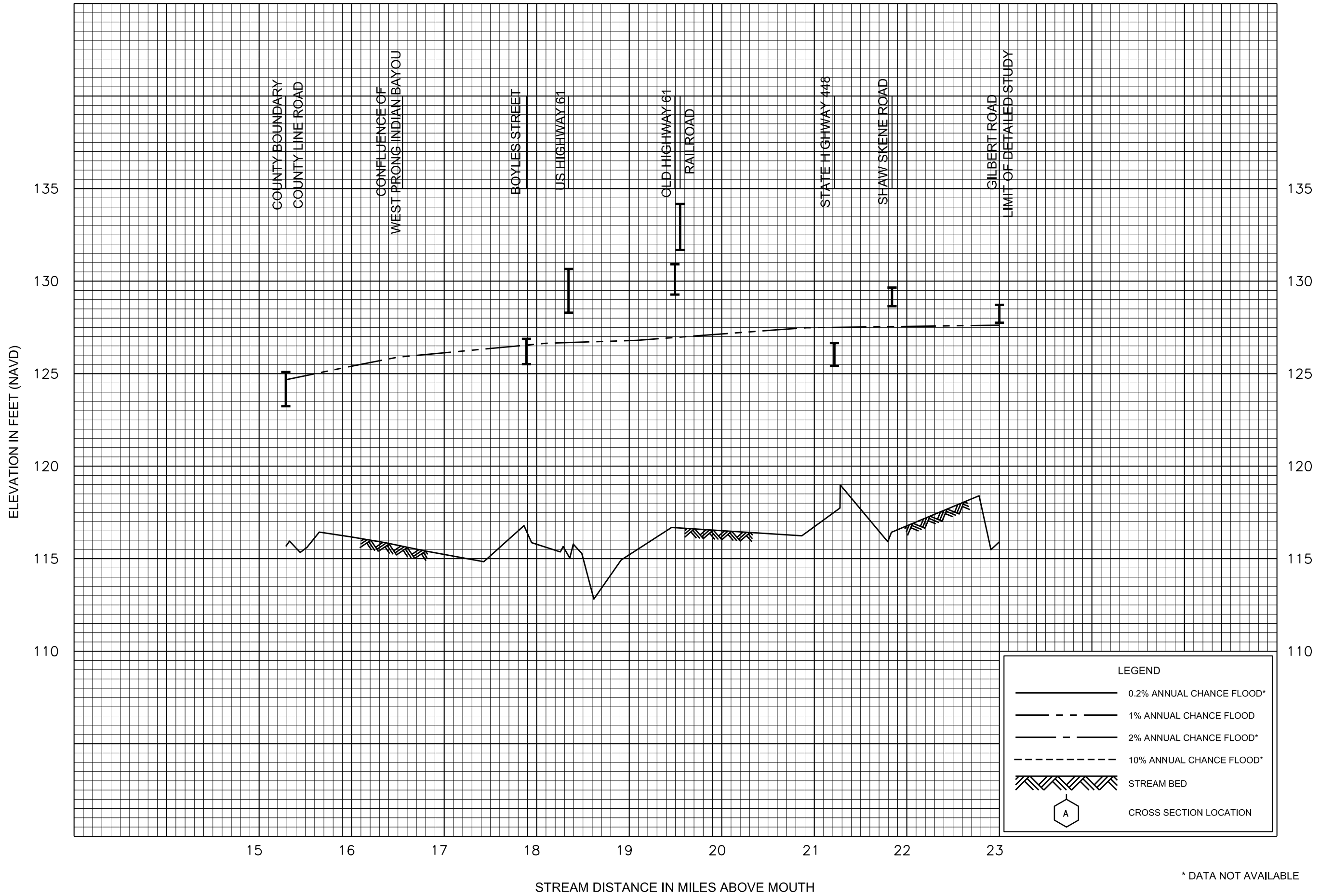
FEDERAL EMERGENCY MANAGEMENT AGENCY

BOLIVAR COUNTY, MS
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FLOOD PROFILES

MISSISSIPPI RIVER

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FLOOD PROFILES
PORTER BAYOU

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