FLOOD INSURANCE STUDY

CARROLL COUNTY, OHIO
AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
CARROLL COUNTY (UNINCORPORATED AREAS)	390763
CARROLLTON, VILLAGE OF	390048
DELLROY VILLAGE OF	390049
LEESVILLE, VILLAGE OF	390050
MAGNOLIA, VILLAGE OF (CARROLL AND STARK COUNTIES)	390051
MALVERN, VILLAGE OF	390052
SHERRODSVILLE, VILLAGE OF	390054

PRELIMINARY

March 18, 2016

Revised:
To Be Determined

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
39019CV000B

NOTICE TO
FLOOD INSURANCE STUDY USERS

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

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

Initial Countywide FIS Effective Date: **June 4, 2010**

Revised Countywide FIS Effective Date(s): **To Be Determined**

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Sandy Creek (Upper Reach) Panels 02P-04P

Published Separately –

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY

CARROLL COUNTY, OHIO AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) revises and supersedes the FIS reports, Flood Insurance Rate Maps (FIRMs) and/or Flood Boundary and Floodway Maps (FBFMs) in the geographic area of Carroll County, including the Villages of Carrollton, Dellroy, Leesville, Magnolia, Malvern, and Sherrodsville and the unincorporated areas of Carroll County (hereinafter referred to collectively as Carroll County); and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Please note that the Village of Magnolia is located in both Carroll and Stark Counties and is included in its entirety in this FIS. Also note that the Village of Minerva is located in Carroll, Columbiana, and Stark Counties and will be included in its entirety in the FIS and FIRM for Stark County.

This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR. 60.3.

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

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

1.2 Authority and Acknowledgements

The source of authority for this FIS is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

Pre-Countywide

The hydrologic and hydraulic analyses for the September 1990 study for the unincorporated areas of Carroll County were performed by Burgess & Niple, Ltd., (the study contractor) for the Federal Emergency

Management Agency (FEMA), under Contract No. EMW-86-C-2551. This study was completed in January 1988 (Reference 1).

The hydrologic and hydraulic analyses for July 3, 1995 study for the Village of Malvern were prepared for the FIS for the unincorporated areas of Carroll County by Burgess & Niple, Ltd., for FEMA, under Contract No. EMW-86-C-2551 (Reference 2).

Initial Countywide (June 4, 2010)

Approximate hydrologic and hydraulic analyses for the initial countywide FIS were performed by Stantec Consulting Services, Inc. (Stantec) for FEMA under Contract No. HSFE05-05- D-0026, Task Order No. 12. This work, which was completed in October 2007, covered unprotected flooding sources affecting Carroll County.

In addition to incorporating the existing two FISs for communities within Carroll County, the initial countywide FIS includes approximate studies, redelineation of all effective profiles, and incorporation of approved Letter of Map Changes (LOMC). The vertical datum was shifted to North American Vertical Datum of 1988 (NAVD88). The digital floodplain data was merged into a single, updated DFIRM. The DFIRM includes 2007 digital orthophotography (Reference 3), five-foot contours (Reference 4), topographic break lines and spot elevations, political boundaries, road centerlines with street names, railroads with names, airports, rivers, lakes, streams, bridges and other hydraulic structures, and elevation reference marks.

Revised Countywide (To Be Determined)

This FIS revision was initiated by a Physical Map Revision (PMR) request and included incorporation of enhanced hydrologic and hydraulic analyses performed on a portion of Sandy Creek by Strategic Alliance for Risk Reduction (STARR). Incorporation of these studies into this FIS and accompanying FIRMS was performed by STARR as part of FEMA Contract No. HSFEHQ-09-D-0370, Task Order No. HSFE05-11-J-0080. This work was completed in _____.

1.3 Coordination

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

Pre-Countywide

The dates of the initial and final CCO meetings held for Carroll County and the incorporated communities within its boundaries are shown in Table 1 (References 1 and 2).

Table 1. Carroll County CCO Meetings

Community Name	Initial CCO Date	Final CCO Date
Carroll County (Unincorporated Areas)	January 30, 1986	November 2, 1989
Village of Malvern	*	January 27, 1994

* Data not published

Initial Countywide (June 4, 2010)

Results of the technical aspects of the initial countywide study were coordinated with, reviewed and approved by the Ohio Department of Natural Resources (ODNR), the State coordinating agency.

On September 12, 2006, an initial CCO meeting was held concerning the initial countywide FIS. That meeting was attended by representatives of Carroll County, FEMA, ODNR and Stantec. The results of the initial countywide study were reviewed at the final CCO meeting held on July 27, 2009, attended by representatives of Carroll County, ODNR and Stantec.

Revised Countywide (To Be Determined)

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

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Carroll County, Ohio, including the incorporated communities listed in Section 1.1 and excluding the Village of Minerva.

The areas studied by detailed methods were selected with priority given to all known flood hazards of projected development or proposed construction.

For the initial countywide FIS, no detailed analyses were performed. Detailed floodplains for Sandy Creek (Upper Reach) were redelineated using information from the September 28, 1990 FIS report for Carroll County, Ohio and the July 3, 1995 FIS report for the Village of Malvern (References 1 and 2). For this revised FIS, a new detailed hydraulic analysis was performed on a different portion of Sandy Creek (Lower Reach) as shown in Table 2. All flooding sources studied by detailed methods are shown in Table 3.

Table 2. Limits of New or Revised Detailed Studies

Flooding Source	Limits of Detailed Study
Sandy Creek (Lower Reach)	From the Tuscarawas / Carroll County boundary to the northeastern corporate limits of Magnolia

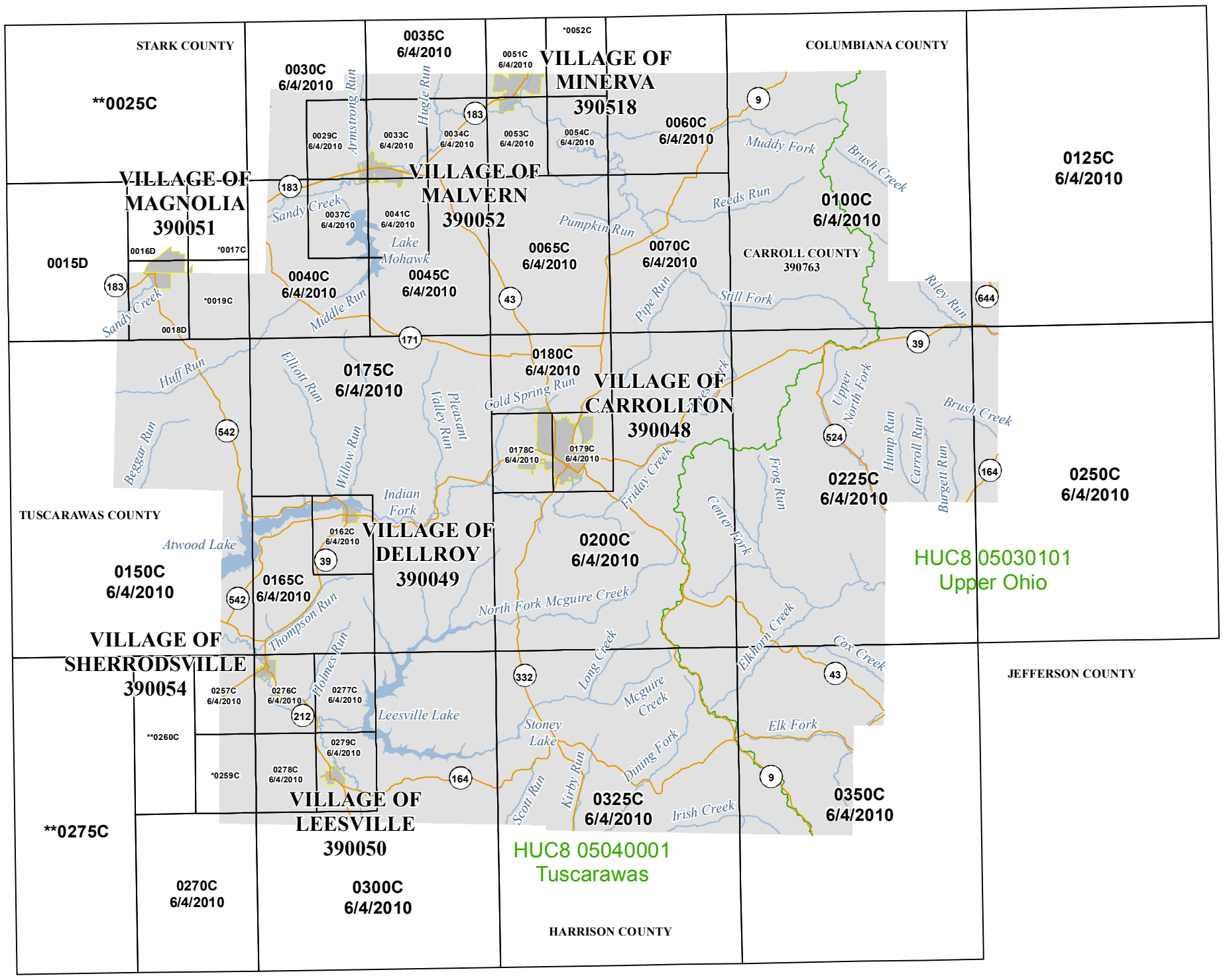
Table 3. Limits of Detailed Studies

Flooding Source	Limits of Detailed Study
Sandy Creek (Lower Reach)	From the Tuscarawas / Carroll County boundary to the northeastern corporate limits of Magnolia
Sandy Creek (Upper Reach)	From the Stark / Carroll County boundary to the Carroll County (Unincorporated Areas) / Village of Minerva corporate limits just upstream of the railroad crossing, excluding the Village of Minerva

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards.

For the initial countywide FIS, additional approximate analyses were performed to protect areas where flood hazards were not previously identified. This analysis included Armstrong Run and tributaries, Bear Hole Run, Beggar Run and tributaries, Big Sandy Creek and tributaries, Carroll Run, Center Fork and tributaries, Cold Spring Run and tributaries, Conotton Creek and tributaries, Dining Fork, Elk Lick, Elkhorn Creek and tributary, Elliott Run and tributary, Friday Creeks and tributaries, Frog Run, Gantz Creek and tributary, Gault Creek, Hazel Run, Holmes Run, Honey Run and tributary, Huff Run, Hugle Run, Hump Indian Fork and tributaries, Irish Creek, Kirby Run, Lick Run, Little Sandy Creek Tributary, McGuire Creek and tributaries, Middle Run, Muddy Fork and tributary, North Fork and tributaries, Pipe Run and tributaries, Pipes Fork and tributaries, Pleasant Valley Run and tributary, Pumpkin Run, Reeds Run and tributary, Riley Run and tributary, Semple Run and tributary, Still Fork and tributaries, Strawcamp Run, Thompson Run, Town Creek and tributaries, Trail Run, Unnamed Stream 1, Unnamed Stream 2, Upper North Fork, Wholebark Run, Willow Run and tributaries, and Yellow Creek and tributary. No new approximate analyses were conducted as a part of this revised FIS.

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



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 [most recent FIRM panel date].

N

1 inch = 18,333 feet 1:220,000

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

Map Projection:
State Plane Ohio North, FIPS 3401;
North American Datum 1983

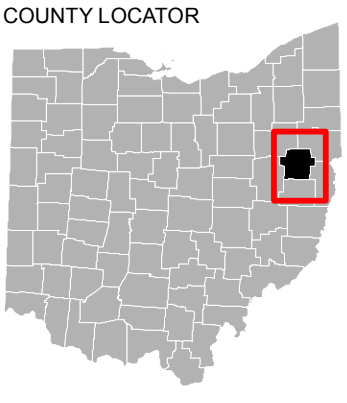
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTP://MSC.FEMA.GOV

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

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

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

CARROLL COUNTY, OHIO and Incorporated Areas

PANELS PRINTED:

0015, 0016, 0018, 0029, 0030, 0033, 0034, 0035, 0037, 0040, 0041, 0045, 0051, 0053, 0054, 0060, 0065, 0070, 0100, 0125, 0150, 0162, 0165, 0175, 0178, 0179, 0180, 0200, 0225, 0250, 0257, 0270, 0276, 0277, 0278, 0279, 0300, 0325, 0350

FEMA

MAP NUMBER
39019CIND0B

MAP REVISED

PRELIMINARY
3/18/2016

2.2 Community Description

Carroll County is located in eastern Ohio and encompasses approximately 399 square miles. It is bordered on the northwest by Stark County, on the northeast by Columbiana County, on the southeast by Jefferson County, on the south by Harrison County, and on the southwest by Tuscarawas County.

The major transportation arteries of Carroll County are State Route 9, which travels north-south through the county; State Route 39, which travels east-west across the county; State Route 43, which travels southeast-northwest through the county; State Route 164, which travels east-west across the southern portion of the county; State Route 171, which travels east-west across the county; State Route 183, which travels northeast-southwest across the northwestern portion of the county; State Route 332, which travels north-south through the southern portion of the county; and State Route 524, which travels north-south through the eastern portion of the county.

The 2010 population of the Carroll County was reported by the U.S. Census Bureau to be 28,836. The estimated 2014 population was 28,187 (Reference 5). The county seat is the Village of Carrollton.

The climate of Carroll County is classified as continental. Summers are moderately warm and humid with temperatures occasionally greater than 90 degrees Fahrenheit. Winters are reasonably cold and cloudy, with sub-zero temperatures occurring an average of six days per year. The average annual temperature is 50 degrees Fahrenheit (References 6-8).

The average annual precipitation for the county ranges from approximately 39 inches in the northeastern portion of the county to 37 inches in the southwestern portion of the county. Spring and summer are wetter months while fall and winter months are drier, with June and July being the wettest months and October and February being the driest months. However, the annual precipitation can be quite variable (References 7 and 8).

Carroll County is located on the unglaciated portion of the dissected Allegheny Plateau. The soil is classified into eight soil associations, with the majority of the county in the Westmoreland-Coshocton Association. This association consists of deep, gently-sloping to steep, well-drained and moderately well-drained soils (Reference 9).

Carroll County was once covered by a mixed oak forest consisting mostly of white oak, black oak, and hickory. Today, much of this forest has been cleared (References 1 and 10).

The **Village of Carrollton** is the county seat and is located in the center of Carroll County, surrounded by the unincorporated areas of Carroll County. According to the U.S. Census Bureau, the village encompasses

an area of approximately 2.4 square miles and the 2014 population estimate was 3,180 (Reference 5).

The **Village of Dellroy** is located in western Carroll County and is surrounded by the unincorporated areas of Carroll County. According to the U.S. Census Bureau, the village encompasses an area of approximately 0.2 square mile and the 2014 population estimate was 351 (Reference 5).

The **Village of Leesville** is located in southwestern Carroll County and is surrounded by the unincorporated areas of Carroll County. According to the U.S. Census Bureau, the village encompasses an area of approximately 0.3 square mile and the 2014 population estimate was 156 (Reference 5).

The **Village of Magnolia** is located in northwestern Carroll County along the Stark County-Carroll County border. It is bordered on the north by the unincorporated areas of Stark County and on the south by the unincorporated areas of Carroll County. According to the U.S. Census Bureau, the village encompasses an area of approximately 0.9 square mile and the 2014 population estimate was 975 (Reference 5).

The **Village of Malvern** is located in northwestern/north-central Carroll County and is surrounded by the unincorporated areas of Carroll County. According to the U.S. Census Bureau, the village encompasses an area of approximately 0.7 square mile and the 2014 population estimate was 1,171 (Reference 5).

The **Village of Sherrodsville** is located in southwestern Carroll County and is surrounded by the unincorporated areas of Carroll County. According to the U.S. Census Bureau, the village encompasses an area of approximately 0.3 square mile and the 2014 population estimate was 299 (Reference 5).

2.3 Principal Flood Problems

The history of flooding on the streams within Carroll County indicates the flooding may occur during any season of the year; however, most major floods have occurred from January to April. The largest flood on Sandy Creek was recorded at the United States Geological Survey (USGS) stream gage at Waynesburg in Stark County (USGS Gage No. 03117500) on January 22, 1959. A peak discharge of 15,000 cfs was recorded. This flood approximately equaled the magnitude of the 0.2-percent-annual-chance flood (References 11 and 12).

More recent flooding events occurred between May 17 and May 23, on June 9, and between June 11 and June 17, 2004. Several severe thunderstorms passed over Ohio, causing flooding and widespread damage throughout much of central and eastern Ohio. Parts of Carroll County received nearly 8 inches or rainfall during the 7 day period from June 11 to June 17. Peak streamflow on Sandy Creek at USGS Gage No. 03117500 was 3,560 cfs on May 22, 2004, which was estimated to be

between a 50- and 20-percent- annual-chance flood event. At the same gage, peak streamflow was 5,110 cfs on June 15, 2004, which was estimated to be between a 20- and 10-percent-annual-chance flood event. During this period, an estimated 19 structures were damaged, with total damage costs estimated to be $126,800 (Reference 13).

At the end of August 2004, a series of severe thunderstorms and the remnants of Hurricanes Frances and Ivan caused severe flooding in eastern Ohio, resulting in 21 counties being declared Federal disaster areas. Unusually wet conditions prior to the storms contributed to the severity of the flooding. Peak streamflow on Sandy Creek at USGS Gage No. 03117500 was 7,970 cfs on September 10, 2004, which was estimated to be between a 4- and 2-percent- annual-chance flood event. The total estimated damages in Carroll County were estimated to be $275,000 (Reference 14).

A large winter storm between December 22 and 23, 2004 left approximately 12 to 18 inches of snow over much of central and north-central Ohio. Following this storm were unseasonably warm temperatures and widespread rain showers during January 2005, resulting in flooding throughout Ohio. Peak streamflow on Sandy Creek at USGS Gage No. 03117500 was 5,700 cfs on January 7, 2005, which was estimated to be between a 20- and 10-percent-annual-chance flood event. Total damages costs were estimated to be $1,116,600 (Reference 15).

Heavy rain in the amount of 3 to 4 inches in a 24-hour period over February 27 and 28, 2011, along with rapid snowmelt over saturated ground, led to severe flooding in northern Ohio. Peak streamflow on Sandy Creek at USGS Gage No. 03117500 was 5,640 cfs on February 28, 2011 (Reference 16).

2.4 Flood Protection Measures

Bolivar Dam, located on Sandy Creek along the boundary of Tuscarawas County and Stark County, is an earth-fill “dry dam” used for flood control that was initially constructed in 1938 by the U.S. Army Corps of Engineers (USACE). During historical flood events in 2005 and 2008, seepage was observed beneath the dam. Beginning in January 2015, construction began on a concrete seepage barrier with work anticipated to continue for four years. The project is cost-shared between USACE and the Muskingum Watershed Conservancy District (MWCD) (References 17 and 18).

The Village of Magnolia along Sandy Creek is located approximately 6.5 miles upstream (east) of Bolivar Dam. The Magnolia Levee is a 4,877-foot long component of the Bolivar Dam flood damage reduction project, and is also owned by the USACE. Magnolia Levee experienced significant problems during periods of high water and was in danger of failing during one of these events due to seepage. To address this problem, a filter blanket composed of sand was constructed on the land side of the levee to disperse seepage. The filter blanket was constructed 4 to 5 feet thick

and extended approximately 120 feet from the toe of the levee. This project was completed in August 2005 (Reference 19).

Due to the 2005 and 2008 seepage observed at Bolivar Dam, a construction project to inspect and re-line existing pipes penetrating the levee was completed in 2011 to 2012, and additional improvements are planned for Magnolia Levee as a part of the Bolivar Dam rehabilitation that is currently ongoing (Reference 20).

The Magnolia Levee is fully accredited for the base (1-percent-annual-chance) flood. The criteria used to evaluate protection against the 1-percent-annual-chance flood are 1) adequate design, including freeboard, 2) structural stability, and 3) proper operation and maintenance. Since the levee is fully accredited, it was included in the new detailed hydraulic analysis of Sandy Creek (Lower Reach).

Leesville Lake Dam is located in southwestern Carroll County on McGuire Creek, a tributary of Conotton Creek, and was constructed primarily for flood control, recreation, and fish and wildlife enhancement. Construction was completed in October 1936. The dam is a rolled earth fill with an impervious core. It reaches a maximum height of 74 feet and is 1,695 feet long, with a top width of 25 feet and a base width of 450 feet. At its summer pool elevation, Leesville Lake has a surface area of approximately 1,000 acres (Reference 21).

Nonstructural flood control measures in the form of land use regulations for flood protection are being used to aid in the prevention of future flood damage (Reference 22).

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods within Carroll County, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100- or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100- or 500-year floods, have a 10-, 2-, 1- and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10), and for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

This revised countywide FIS report includes information from previously published FIS reports for Carroll County (References 1 and 2). It also includes information for streams studied previously by approximate methods for the initial countywide June 2010 FIS report, and new detailed study information for Sandy Creek (Lower Reach), which was studied for this FIS report.

Pre-Countywide Analyses

Using the discharge tabulations from the FIS reports for the Villages of Waynesburg and Minerva (References 12 and 23), a log-log plot of the 1-percent-annual-chance flood-peak discharge versus drainage area for Sandy Creek (Upper Reach) was prepared. Drainage areas were determined at appropriate intermediate points along the study reach. Discharges at these intermediate points were interpolated from the log-log plot.

Initial Countywide Analyses (June 4, 2010)

Hydrologic calculations for approximate studies were performed using the regression equations presented in the USGS Water-Resources Scientific Investigations Report (SIR) 2006-5312, “A Streamflow Statistics (StreamStats) Web Application for Ohio”. Regional regression equations in this report for estimating the 1-percent-annual-chance flood-peak discharges at ungaged sites on rural, unregulated streams in Ohio were developed by means of ordinary and generalized least-squares regression techniques. Full-model, three-variable regional regression equations were developed based on selected basin characteristics and flood-frequency estimates determined for 305 streamflow-gaging stations in Ohio and neighboring states. The full-model regression equations employ three variables: drainage area, main-channel slope determined by the 10-85 method described in USGS Water-Resources SIR 2006-5312, and the percent storage in the basin (Reference 25).

Revised Countywide Analyses (To Be Determined)

For this revised countywide FIS, a new detailed study was performed on a portion of Sandy Creek (Lower Reach) from the Tuscarawas / Carroll County boundary to the northeastern corporate limits of Magnolia. Peak discharges for the 10-, 2-, 1-, and 0.2-percent-annual-chance recurrence floods at the 3,000 feet downstream of State Route 183 flow location were leveraged from the effective detailed study for Sandy Creek in Stark County (Reference 24). The 1-percent-plus discharge at this location was calculated using a Bulletin 17B analysis with a specified 99% confidence interval at USGS Gage No. 03117500, Sandy Creek at Waynesburg, OH.

Peak discharges for the 10-, 2-, 1-, 1-percent-plus, and 0.2-percent-annual-chance recurrence floods at all other flow locations along the newly studied portion of Sandy Creek were then calculated using the drainage area ratio method.

The 4-percent-annual-chance recurrence discharges for all flow locations were calculated from logarithmic regression of the 10-, 2-, 1-, and 0.2-percent-annual-chance recurrence floods.

A summary of the drainage area-peak discharge relationships for all the streams studied by detailed methods is shown in Table 4.

Table 4. Summary of Discharges

		Peak Discharges (cfs)					
Flooding Source and Location	**Drainage Area (square miles)**	**10-percent-annual-chance**	**4-percent-annual-chance**	**2-percent-annual-chance**	**1-percent-annual-chance**	**1-percent-annual-chance plus**	**0.2-percent-annual-chance**
Sandy Creek (Lower Reach)							
US of confluence of Nimishillen Creek	316	7,550	9,600	11,090	12,820	16,540	17,200
About 1,000 feet DS of Alliance Rd NW (State Route 183)	279	6,840	8,690	10,030	11,600	14,970	15,570
About 3,000 feet DS of State Route 183	264	6,540	8,310	9,600	11,100	14,320	14,900
Sandy Creek (Upper Reach)							
At Stark / Carroll County boundary	214	*	*	*	9,550	*	*
Just downstream of confluence of Pipe Run	191	*	*	*	8,700	*	*
Just upstream of confluence of Pipe Run	163	*	*	*	7,650	*	*
Just downstream of confluence of Hugle Run	160	*	*	*	7,500	*	*
Just upstream of confluence of Hugle Run	139	*	*	*	6,700	*	*
Just downstream of confluence of Still Fork	135	*	*	*	6,500	*	*

* Data not available

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data table in the FIS report. 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.

Flood profiles were drawn showing the computed WSELs for floods of the selected recurrence intervals. Flood profiles were drawn showing the computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. In cases where two or more profiles are close together, due to limitations of the profile scale, only the higher profile has been shown.

Locations of selected cross-sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and on the FIRM (published separately).

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

This section includes information from previously published FIS reports and information from the analyses performed for this FIS. All elevations are referenced to NAVD88. Elevation reference marks used in this study, and their descriptions, are shown on the FIRM.

Pre-Countywide Analyses

For the pre-countywide detailed analysis of Sandy Creek (Upper Reach), photogrammetry was employed to obtain floodplain cross sections and pertinent bridge/roadway profiles. Main channel geometry was field surveyed. Bridge geometry was either field surveyed or taken from bridge plans (References 1 and 2).

The starting water-surface elevation used in each hydraulic model was determined by extending the 1-percent-annual-chance profile in the Waynesburg FIS (References 1 and 2).

Roughness coefficients (Manning's "n") were used to compute the hydraulic conveyance of each cross section and to compute friction losses between adjacent sections. Roughness coefficients were based on field observation. Using values typical for early summer conditions, the channel "n" value utilized was 0.030, and the overbank "n" value varied between 0.050 and 0.120 (References 1 and 2).

Initial Countywide Analyses (June 4, 2010)

For the initial countywide FIS, no detailed analyses were performed. Detailed floodplains for Sandy Creek (Upper Reach) were redelineated using information from the September 28, 1990 FIS report for Carroll County, Ohio and the July 3, 1995 FIS report for the Village of Malvern (References 1 and 2).

The "profile base line" provides a link to the flood profiles included in the FIS report. The detail-studied stream centerline for Sandy Creek (Upper Reach) may have been digitized or redelineated during the creation of the initial countywide FIS. The "profile base line" was based on the best available data at the time of the effective study and is depicted as they were on the previous FIRMs. In some cases where improved topographic data was used to redelineate floodplain boundaries, the "profile base line" may deviate significantly from the channel centerline or may be outside the Special Flood Hazard Area (SFHA).

Water surface elevations for the 1-percent-annual-chance flood for the streams studied by approximate analyses were computed using the USACE HEC-RAS computer program. Starting water surface elevations were determined using the normal depth routine in the HEC-RAS program, with the downstream gradient for each stream estimated through the use of USGS topographic maps. Roughness factors for these streams were determined based on visual observation of aerial photography and standard, accepted values published in Open-Channel Hydraulics by V.T. Chow (Reference 27). Separate overbank and channel roughness values were selected for each stream reach.

Revised Countywide Analyses (To Be Determined)

For the new detailed study of Sandy Creek (Lower Reach), cross section locations were leveraged from the HEC-RAS model created for the USACE Magnolia Levee Certification Report (Reference 26). Additional sections were added to address spacing issues and improve modeling. For the lower reach, cross sections were redrawn. Channel survey data was combined with the 2007 Ohio Statewide Imagery Program (OSIP) Digital Elevation Model (DEM) (Reference 4) to determine cross section elevations.

Structures were modeled in HEC-RAS 4.1.0 using survey data, with the assumption that bridge openings would not be obstructed by debris. A low head dam located at the very upstream end of the study in Waynesburg was modeled as a weir. The dam elevation was obtained from the Stark County FIS report (Reference 24).

Known water surface elevations at Bolivar Dam were used as downstream boundary conditions. When available, elevations were leveraged from the USACE HEC-RAS model. Elevations for the 4-percent-annual-chance, 1-percent-plus-annual-chance, and the 0.2-percent-annual-chance flood profiles were obtained from Annual Exceedance Probability Curve for Bolivar Dam (Reference 26).

Manning's "n" values were selected from published values in Open-Channel Hydraulics (Reference 27) based on survey photos and orthophotography. Manning's "n" values for the channel range from 0.032 to 0.037. Manning's "n" values for the overbanks ranged from 0.030 to 0.100.

3.3 Vertical Datum

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

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Effective information for the initial countywide FIS report was converted from NGVD29 to NAVD88 based on data presented in Table 5. The average conversion of NGVD29 - 0.583 = NAVD88 was applied to convert all effective Base Flood Elevations (BFEs). Structure and ground elevations in the community must, therefore, be referenced to NAVD88. It is important to note that adjacent communities in other counties not presented in this countywide FIS may be referenced to NGVD29. This may result in differences in BFEs across the corporate limits between communities.

Table 5. Datum Conversion Calculations

Quadrangle Name	Corner	Latitude	Longitude	Conversion (ft) from NGVD29
Bergholz	SE	40.500	-80.875	-0.587
Carrollton	SE	40.500	-81.000	-0.587
Dellroy	SE	40.500	-81.125	-0.607
Homeworth	SE	40.750	-81.000	-0.535
Kensington	SE	40.625	-80.875	-0.531
Malvern	SE	40.625	-81.125	-0.591
Mineral City	SE	40.500	-81.250	-0.646
Minerva	SE	40.625	-81.000	-0.574
Robertsville	SE	40.750	-81.125	-0.561
Waynesburg	SE	40.625	-81.250	-0.614

Average Conversion -0.583
Range -0.646 to -0.531
Max Offset 0.063

For more information on NAVD88, see the FEMA publication entitled *Converting the National Flood Insurance Program to the North American Vertical Datum of 1988* (Reference 28), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Silver Spring, Maryland 20910 (internet address http://www.ngs.noaa.gov).

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

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

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

4.1 Floodplain Boundaries

In order to provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base

for floodplain management purposes. The 0.2-percent-annual-chance floods are employed to indicate additional areas of flood risk in the community.

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

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

For Sandy Creek (Upper Reach), the 1-percent-annual-chance floodplain boundaries were redelineated as a part of the initial countywide FIS using the flood elevations determined at each cross section and digital basemap information. Between cross sections, the boundaries were interpolated using digital basemap information. This data includes 2007 digital orthophotography and contours at 5-foot intervals (References 3 and 4). The original basemap information used included USGS topographic maps with contours at 20-foot intervals (References 29 and 30). The 0.2-percent-annual-chance flood was not studied as a part of the previously published FIS reports for communities within Carroll County and was not studied as a part of the initial countywide FIS.

4.2 Floodways

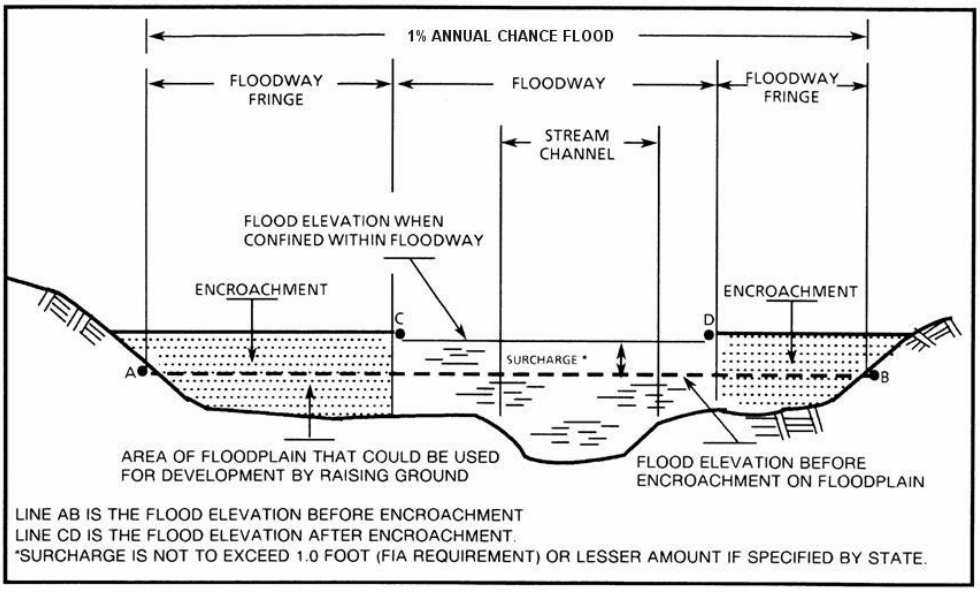
Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the l-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the l-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodway presented in this countywide FIS report and on the FIRM was computed for certain stream segments on the basis of equal

conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations have been tabulated for selected cross sections. In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and l-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent-annual-chance flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

Figure 2. Floodway Schematic



The floodways presented in this study were initially computed on the basis of equal conveyance reduction from each side of the floodplain. In those areas where problems arose with the equal conveyance reduction encroachment option of the HEC-2 or HEC-RAS backwater programs, modifications were applied based on experience.

In the redelineation efforts for the initial countywide study, the floodways were not recalculated. As a result, there were areas where the previous floodway did not fit within the boundaries of the redelineated 1-percent-annual-chance floodplain. In these areas, the floodway was reduced. Water surface elevations with and without a floodway, the mean velocity in the floodway, and the location and area at each surveyed cross section as determined by hydraulic methods can be seen in Table 6, Floodway Data. The width of the floodway depicted by the FIRM panels and the amount of reduction to fit the floodway inside the 1-percent-annual-chance floodplain, if necessary, is also listed.

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SANDY CREEK								
O	66,164	1,374	18,287	0.7	952.4	952.4	953.3	0.9
P	69,838	2,300	27,440	0.5	952.4	952.4	953.4	1.0
Q	74,576	1,065	9,806	1.3	952.5	952.5	953.4	0.9
R	76,141	505	4,395	2.6	953.4	953.4	954.2	0.8
S	78,056	130 / 753[2]	6,540	1.8	953.9	953.9	954.7	0.8
T	79,995	103 / 733[2]	5,616	2.1	954.2	954.2	955.2	1.0

[1] Feet above confluence with Tuscarawas River

[2] Width of floodway within Village of Magnolia / Total floodway width

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, OH

AND INCORPORATED AREAS

FLOODWAY DATA

SANDY CREEK (LOWER REACH)

FLOODING SOURCE		FLOODWAY				1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	WIDTH REDUCED FROM PRIOR STUDY (FEET)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SANDY CREEK									
A	95,440	361	3,481	2.7	328	969.2	969.2	970.2	1.0
B	98,030	1,340	7,687	1.2		970.8	970.8	971.8	1.0
C	100,495	766	2,154	4.4	276	973.2	973.2	973.3	0.1
D	102,700	575	2,278	4.2		977.3	977.3	977.5	0.2
E	105,890	130	855	11.2		981.3	981.3	982.3	1.0
F	109,470	200	1,357	7.0		990.7	990.7	990.8	0.1
G	112,250	647	3,906	2.4		993.7	993.7	994.5	0.8
H	115,570	650	3,631	2.1		995.6	995.6	996.5	0.9
I	118,080	550	2,830	2.7		996.8	996.8	997.8	1.0
J	121,100	128	1,009	7.6		998.4	998.4	998.9	0.5
K	123,910	109	1,000	7.7		1,002.8	1,002.8	1,003.0	0.2
L	127,550	311	2,060	3.7		1,006.9	1,006.9	1,007.9	1.0
M	130,335	850	1,481	5.2		1,011.5	1,011.5	1,011.5	0.0
N	133,300	584	1,748	3.8		1,017.0	1,017.0	1,017.7	0.7
O	137,040	800	3,054	2.2		1,021.8	1,021.8	1,022.0	0.2
P	140,550	89	720	9.3		1,026.8	1,026.8	1,026.8	0.0
Q	142,360	96	814	8.2		1,029.4	1,029.4	1,029.4	0.0
R	143,540	31 / 134 [2]	1,211	5.4		1,031.6	1,031.6	1,032.4	0.8
S	148,082	279 / 350 [2]	2,449	1.6		1,034.6	1,034.6	1,035.6	1.0

[1] Feet above confluence with Tuscarawas River
[2] Width of floodway within Carroll County (Unincorporated Areas) / Total floodway width

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, OH
AND INCORPORATED AREAS

FLOODWAY DATA

SANDY CREEK (UPPER REACH)

5.0 INSURANCE APPLICATION

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

Zone A	The flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or base flood depths are shown within this zone.
Zone AE	The flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.
Zone X	The flood insurance risk zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by levees. No BFEs or base flood depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP (FIRM)

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

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

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains, floodways, and the

locations of selected cross sections used in the hydraulic analyses and floodway computations.

The current FIRM presents flooding information for the entire geographic area of Carroll County. Previously, separate FIRMs were prepared for each incorporated community and the unincorporated areas of the county with identified special flood hazard areas. Historical data relating to the maps prepared for each community are presented in Table 7.

7.0 OTHER STUDIES

This countywide FIS incorporates all previously published FISs and FIRMs for the incorporated and unincorporated areas within Carroll County.

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

Revised countywide studies are in progress for Tuscarawas and Stark Counties. The results of these studies will be in agreement with the results of this countywide study.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Flood Insurance and Mitigation Division, Federal Emergency Management Agency, 536 South Clark Street, Sixth Floor, Chicago, Illinois 60605.

Future revisions may be made that do not result in the republishing of the FIS Report. To ensure that any user is aware of all revisions, it is advisable to contact the map repository of flood hazard data located in the community.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Carroll County, Unincorporated Areas	November 4, 1977	None	September 28, 1990	
Carrollton, Village of	January 16, 1974	May 21, 1976	August 19, 1985	
Dellroy, Village of	August 9, 1974	May 21, 1976	August 19, 1987	
Leesville, Village of [1]	N/A	N/A	N/A	
Magnolia, Village of	May 3, 1974	January 30, 1976	September 1, 1986	
Malvern, Village of	January 23, 1974	May 21, 1976	July 3, 1995	
Sherrodsville, Village of	August 9, 1974	June 4, 1976	September 4, 1987	

[1] This community does not have map history prior to the first countywide mapping

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, OH
(AND INCORPORATED AREAS)

COMMUNITY MAP HISTORY

9.0 BIBLIOGRAPHY AND REFERENCES

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10.0 ADDITIONAL INFORMATION

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

10.1 FIRM Notes to Users

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

Figure 3 presents important considerations for using the information contained in this FIS report and the FIRM and is provided in response to changes in format and content. Figure 4 presents the map legend for the FIRM.

Figure 3. FIRM Notes to Users

NOTES TO USERS

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

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

For community and countywide map dates, refer to Table 7 in this FIS Report.

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

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

Figure 3. FIRM Notes to Users

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

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

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

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "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 Ohio North, Zone 3401. The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

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

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

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 9 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on the FIRM was provided by multiple sources. Base map files were provided in digital format by the Ohio Statewide Imagery Program dated 2007.

Figure 3. FIRM Notes to Users

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

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Carroll County, Ohio, 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 7 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

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

ACCREDITED LEVEE NOTES TO USERS: 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 http://www.fema.gov/business/nfip/index.shtm.

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

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

Figure 4. Map Legend for FIRM

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

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

Figure 4. Map Legend for FIRM

	Regulatory Floodway determined in Zone AE.
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.
OTHER AREAS	
	Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.
	Unshaded Zone X: Areas of minimal flood hazard.
FLOOD HAZARD AND OTHER BOUNDARY LINES	
(ortho) (vector)	Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)
	Limit of Study
	Jurisdiction Boundary
	Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet
GENERAL STRUCTURES	
Aqueduct *Channel* *Culvert* *Storm Sewer*	Channel, Culvert, Aqueduct, or Storm Sewer

Figure 4. Map Legend for FIRM

Dam *Jetty* *Weir*	Dam, Jetty, Weir
	Levee, Dike, or Floodwall accredited or provisionally accredited to reduce the flood risk from the 1% annual chance flood.
	Levee, Dike or Floodwall not accredited to reduce the flood risk from the 1% annual chance flood.
Bridge	Bridge
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AND OTHERWISE PROTECTED AREAS (OPA): *CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas. See Notes to Users for important information.*	
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	
B 20.2	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
5280 21.1	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
17.5	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
8	Coastal Transect
	Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.

Figure 4. Map Legend for FIRM

	Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.
513	Base Flood Elevation Line
ZONE AE (EL 16)	Static Base Flood Elevation value (shown under zone label)
ZONE AO (DEPTH 2)	Zone designation with Depth
ZONE AO (DEPTH 2) (VEL 15 FPS)	Zone designation with Depth and Velocity
BASE MAP FEATURES	
Missouri Creek	River, Stream or Other Hydrographic Feature
234	Interstate Highway
234	U.S. Highway
234	State Highway
234	County Highway
MAPLE LANE	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
RAILROAD	Railroad
	Horizontal Reference Grid Line
	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
$^{42}76^{000m}$E	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16’ 52.5”	Corner Coordinates (Latitude, Longitude)

10.2 Jurisdictions Included in the Flood Insurance Study Project

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

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 8. The Flood Insurance Rate Map (FIRM) panel numbers that affect each community are listed. If the flood hazard data for the community is not included in this FIS Report, the location of that data is identified.

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

Table 8. Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Carroll County, Unincorporated Areas	390763	05030101, 05040001	0015, 0018, 0019[1], 0029, 0030, 0033, 0034, 0035, 0037, 0040, 0041, 0045, 0051, 0052[1], 0053, 0054, 0060, 0065, 0070, 0100, 0125, 0150, 0162, 0165, 0175, 0178, 0179, 0180, 0200, 0225, 0250, 0257, 0259[1], 0270, 0276, 0277, 0278, 0279, 0300, 0325, 0350	
Carrollton, Village of	390048	05040001	0178, 0179, 0180	
Dellroy, Village of	390049	05040001	0162	
Leesville, Village of	390050	05040001	0279	
Magnolia, Village of	390051	05040001	0016, 0017[1], 0018, 0019[1]	
Malvern, Village of	390052	05040001	0029, 0033, 0037, 0041	
Minerva, Village of	390518	05040001	N/A	Stark County FIS Report, 2016
Sherrodsville, Village of	390054	05040001	0165, 0257, 0276	

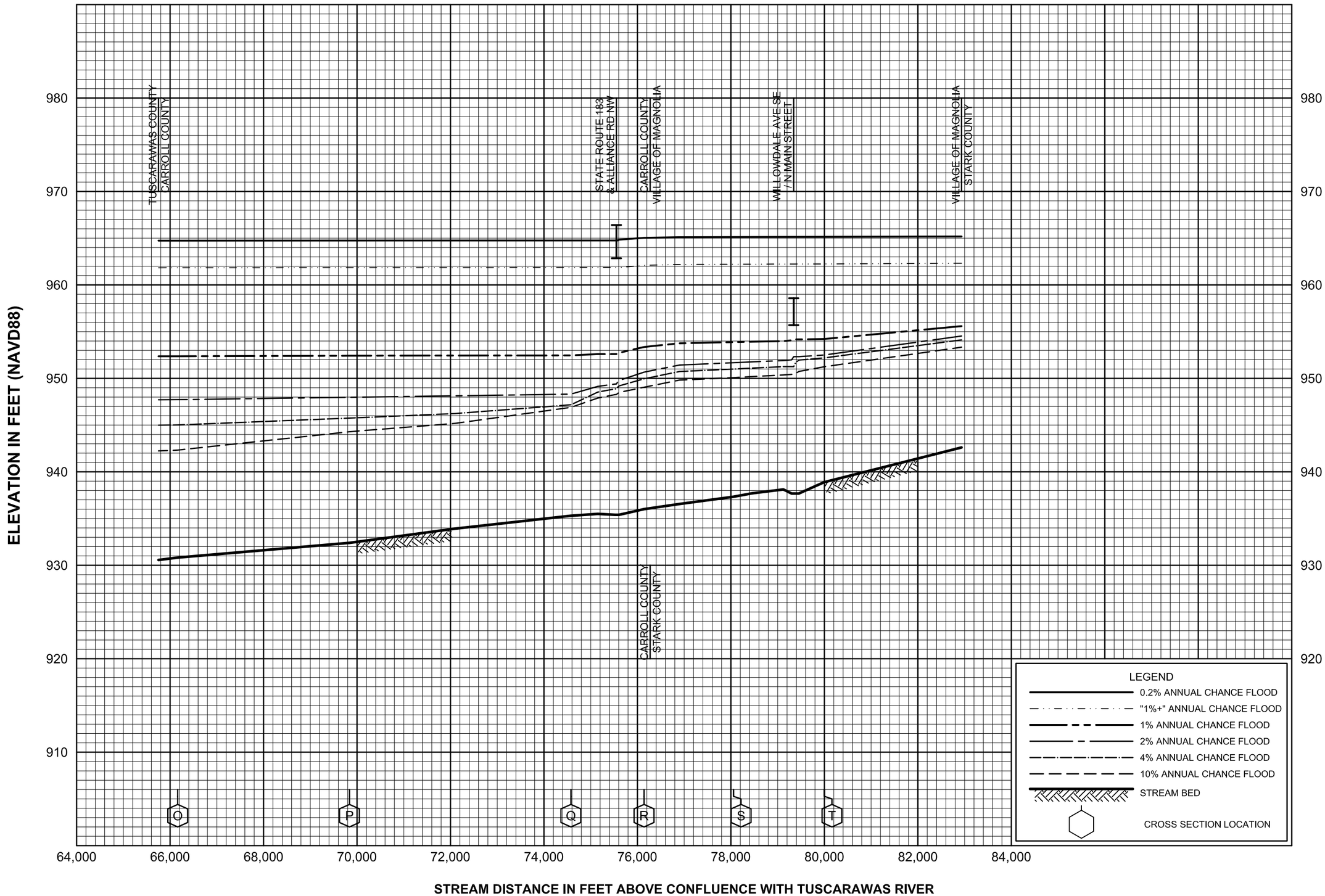
[1] Panel not printed

10.3 Map Repositories

Table 9 is a list of the locations where FIRMs for Carroll County can be viewed. Please note that the maps at these locations are for reference only and are not for distribution. Also, please note that only the maps for the community listed in the table are available at that particular repository. A user may need to visit another repository to view maps from an adjacent community.

Table 9. Map Repositories

Community	Address	City	State	Zip Code
Carroll County, Unincorporated Areas	County Courthouse 119 South Lisbon Street	Carrollton	OH	44615
Carrollton, Village of	80 Second Street SW	Carrollton	OH	44615
Dellroy, Village of	2 East Main Street	Dellroy	OH	44620
Leesville, Village of	119 South Lisbon Street	Carrollton	OH	44615
Magnolia, Village of	Village Hall 328 North Main Street	Magnolia	OH	44643
Malvern, Village of	116 West Main Street	Malvern	OH	44644
Sherrodsville, Village of	119 South Lisbon Street	Carrollton	OH	44615



FLOOD PROFILES

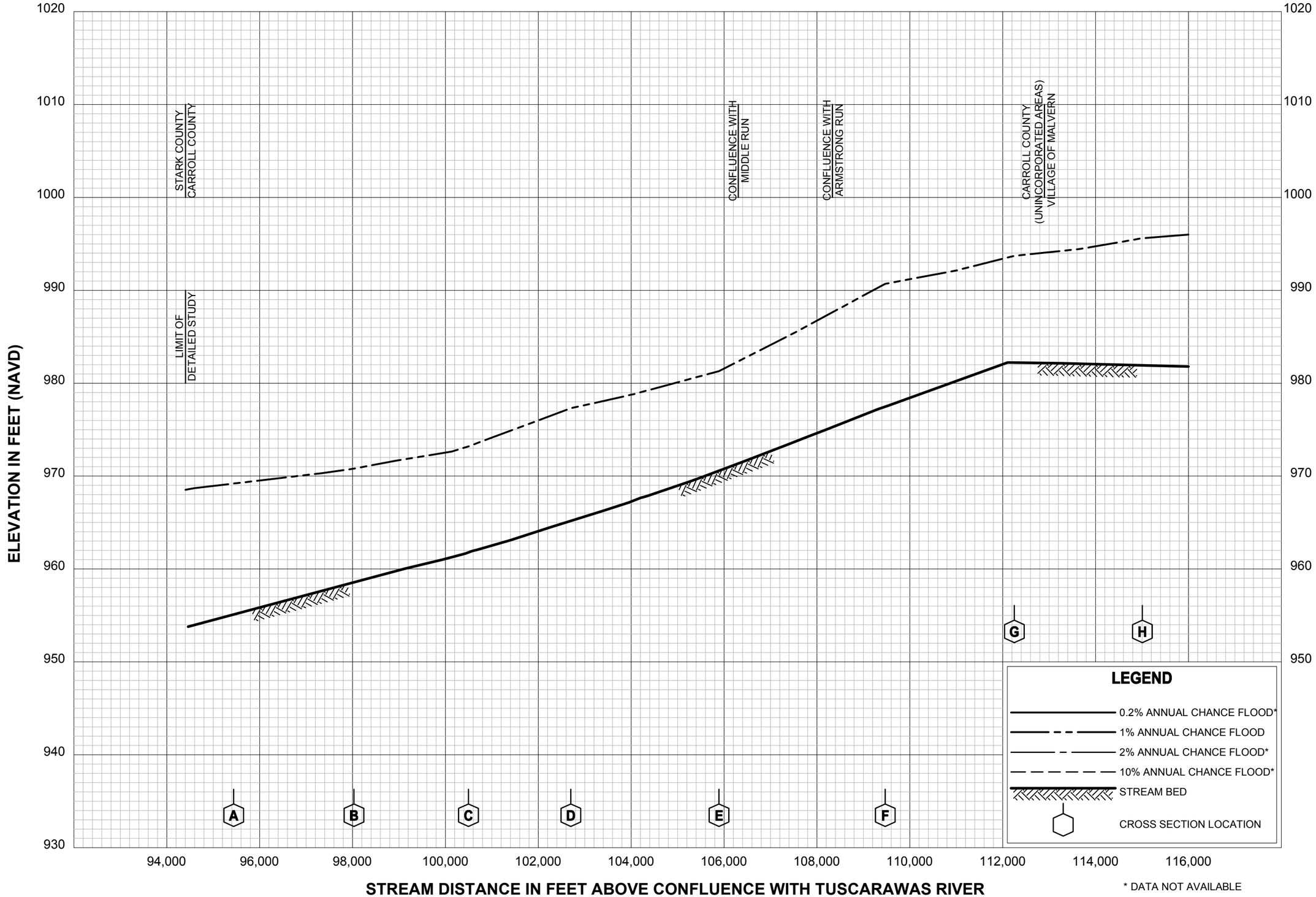
SANDY CREEK (LOWER REACH)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, OH

AND INCORPORATED AREAS

01P



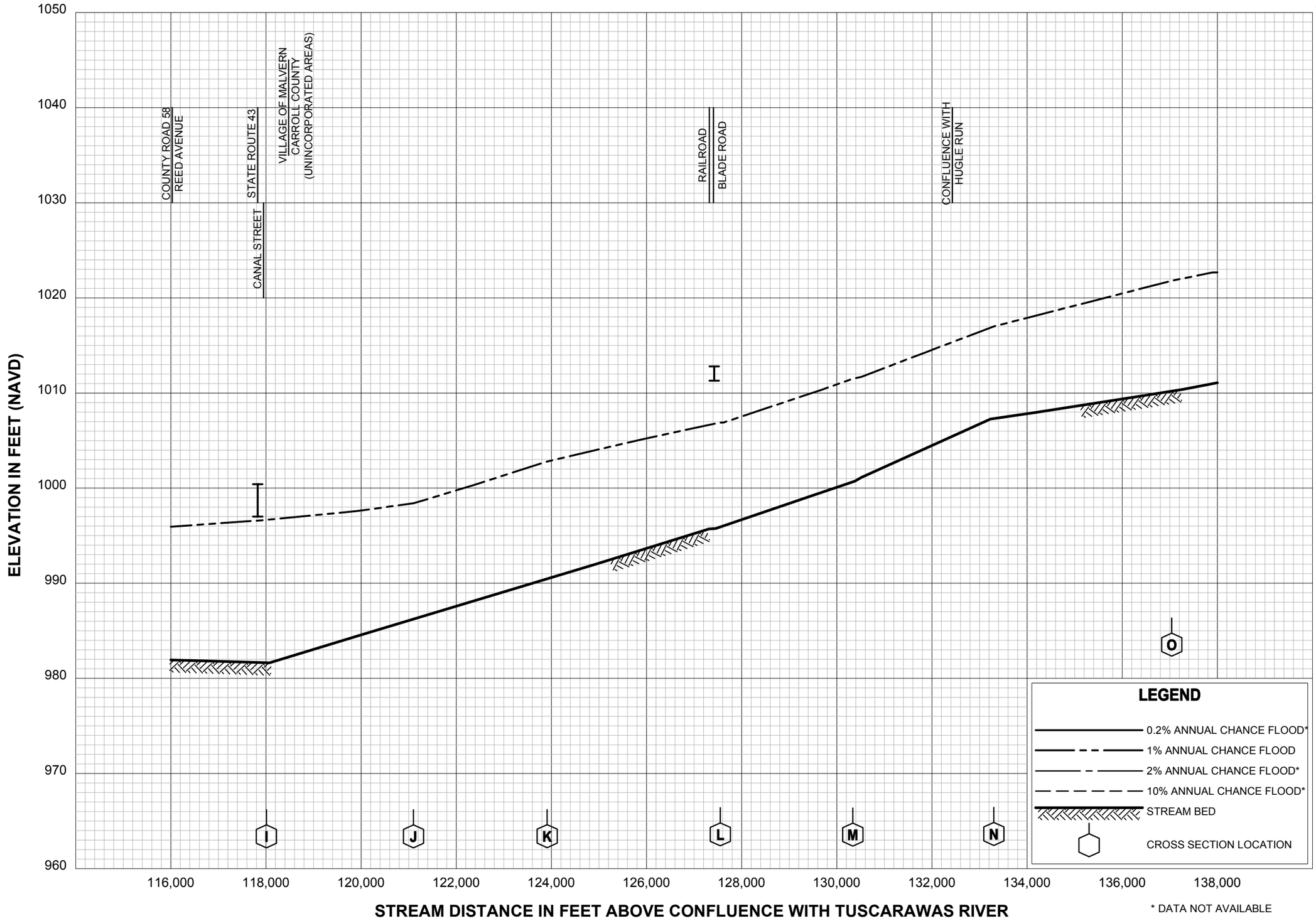
FLOOD PROFILES

SANDY CREEK (UPPER REACH)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, OH

AND INCORPORATED AREAS



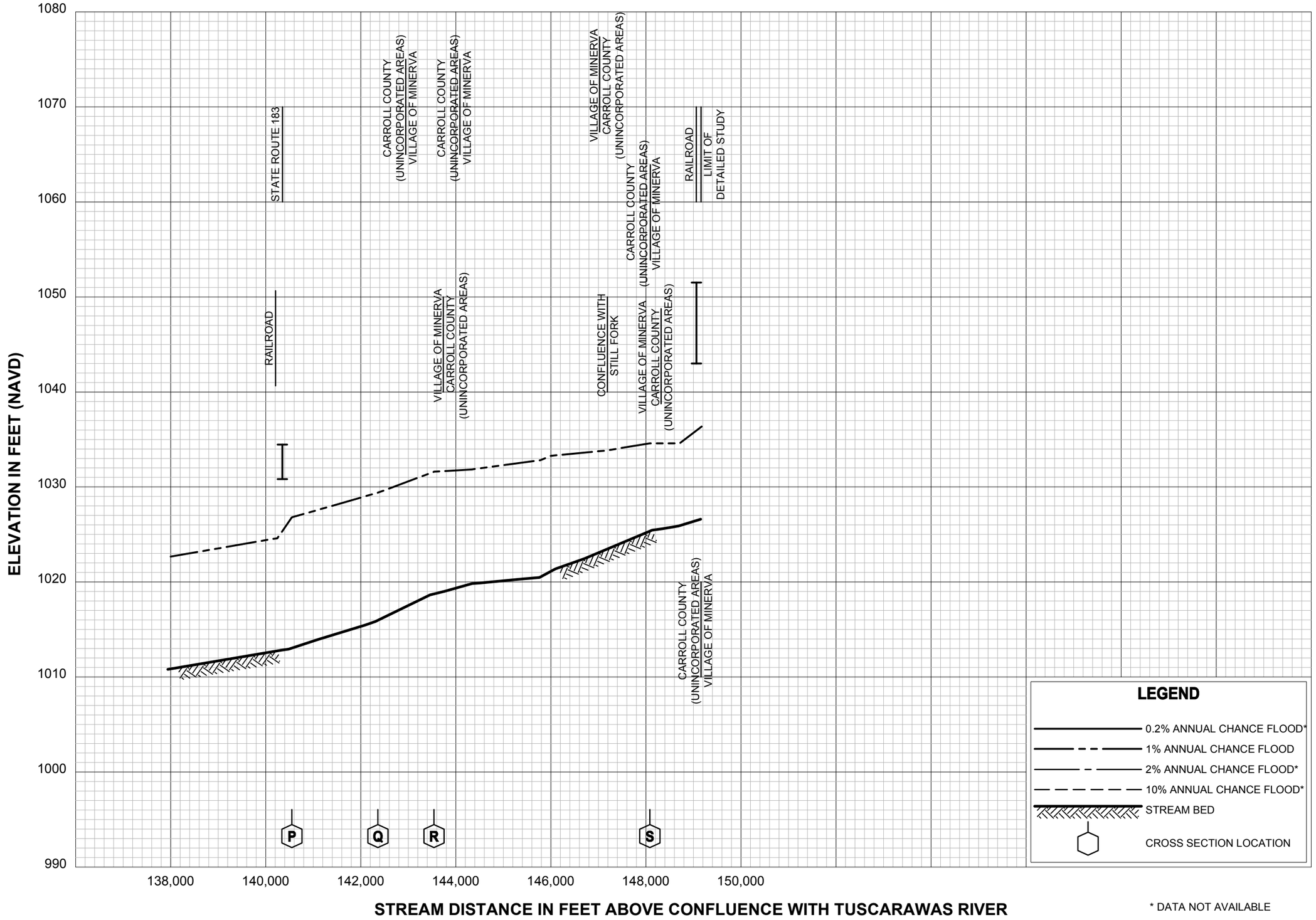
FLOOD PROFILES

SANDY CREEK (UPPER REACH)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, OH

AND INCORPORATED AREAS



* DATA NOT AVAILABLE

FLOOD PROFILES

SANDY CREEK (UPPER REACH)

FEDERAL EMERGENCY MANAGEMENT AGENCY

CARROLL COUNTY, OH

AND INCORPORATED AREAS

04P