MIAMI COUNTY HAZARD MITIGATION PLAN

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Table of Contents

List of Figures Page

List of Tables Page

01 | Introduction

INTRODUCTION

1.1 Overview

With the 2018 Miami County Hazard Mitigation Plan set to expire in May of 2023, Miami County and its constituents are aiming to adopt a new, updated hazard mitigation plan. As outlined in the Disaster Mitigation Act of 2000 (DMA2K), any local jurisdiction seeking funding from the Federal Emergency Management Agency (FEMA) must maintain an up-to-date disaster mitigation plan. This Plan meets the criteria as set forth by FEMA in the DMA2K and provides the Region and its participating jurisdictions with a comprehensive guide for future mitigation efforts to combat the hazards that affect their communities.

Natural, geological, and human-caused hazards pose a variety of risks to the lives, businesses, and properties within Miami County. As such, a Core Planning Committee within Miami County has been established with the goal of developing and implementing the 2023 Miami County Hazard Mitigation Plan. Through cooperative efforts between local, Region, state, and federal government agencies, this Plan is designed to minimize the adverse effects of hazardous events on the lives and properties of residents of the Region.

The 2023 Miami County Hazard Mitigation Plan is a multi-jurisdictional plan which considers the impacts of hazards on incorporated areas (villages and cities), counties, and unincorporated areas (townships). Miami County's incorporated areas and townships are listed below in **Table 1.1 and Table 1.2.** These jurisdictions are also displayed in **Figure 1.1** on the following page. The Plan is designed for a five-year implementation period and describes the methods and procedures utilized in its development, provides the results of community involvement activities such as survey collection, identifies the mitigation activities determined to the be most important to the County, and establishes a timeline for the implementation of the actions.

The Miami Conservancy District (MCD) will also be included in this plan as a special jurisdiction. The MCD is a pioneering organization that has been at the forefront of flood control, conservation, and watershed management since 1915. MCD was established after the disastrous 1913 flood that caused widespread destruction and loss of life in the Miami Valley region. The organization's founders recognized the urgent need for a coordinated approach to managing the region's water resources and preventing future floods.

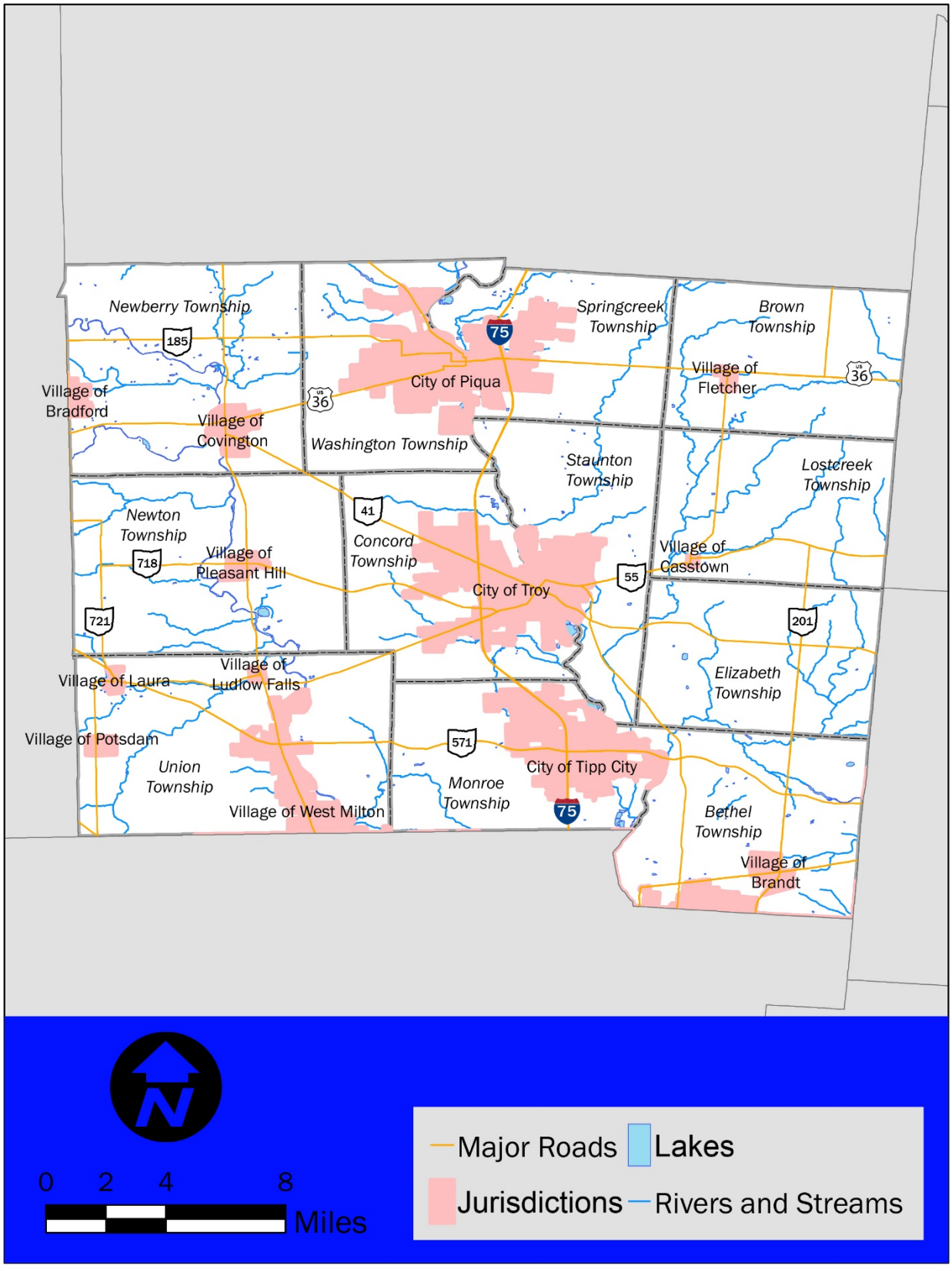
Table 1.1: Miami County Jurisdictions

Jurisdictions
City of Piqua
City of Huber Heights (partial)
City of Tipp City
City of Troy
City of Union (partial)
Village of Bradford (partial)
Village of Casstown
Village of Covington
Village of Fletcher
Village of Laura
Village of Ludlow Falls
Village of Pleasant Hill
Village of Potsdam
Village of West Milton

Table 1.2: Miami County Townships

Townships
Bethel Township
Brown Township
Concord Township
Elizabeth Township
Lost Creek Township
Monroe Township
Newberry Township
Newton Township
Spring Creek Township
Staunton Township
Union Township
Washington Township

Figure 1.1: Miami County Jurisdictions Map



This Plan is comprised of six sections, which detail the methods, analysis, and discussion surrounding the various hazards that threaten Miami County and its jurisdictions. These sections are as follows:

1. **Introduction** (Section 1) provides a discussion about the general purpose and goals that Miami County wishes to achieve throughout the development and implementation of this Plan. This section also includes a summary of the Plan's contents.
2. Section 2, **History and Demographics**, includes a description of Miami County and each participating jurisdiction, including their history, population, and other general information.
3. The process for the development of this Plan is detailed in Section 3, **Planning Process**. This section includes details about the process used to develop this Plan, including a description of who participated, how the community was involved, which hazards were included in the Plan and why, as well as how the Plan was developed through public meetings, reviews, and evaluations. This section also details the review and incorporation of existing plans, studies, reports, and technical information.
4. Section 4 contains the **Hazard Identification and Risk Assessment (HIRA)**. This section provides detailed descriptions and a corresponding analysis for each hazard that could potentially affect Miami County. The nature, location, extent, historical impact, vulnerability, and likelihood of occurrence for each hazard are provided for each hazard. These analyses include the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; an estimate of the potential dollar losses to vulnerable structures; and a general description of land uses and development trends within the community.
5. The goals, strategies, and actions for the County are then outlined in Section 5, **Hazard Mitigation**. The proposed actions are presented in tables, categorized by the associated hazard and community, and then ranked from highest to lowest priority based on feedback received from County officials and participating jurisdictions and stakeholders. Excluded hazards are also documented in this section, along with the rationale for exclusion from the Plan.
6. The final section of this Plan, **Schedule and Maintenance**, provides a summary of the proposed Plan adoption, integration, and maintenance schedule. This section describes how the Region will review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five years in order to continue to be eligible for mitigation project grant funding.

The resulting Miami County Hazard Mitigation Plan will be submitted to the Ohio Emergency Management Agency (OEMA) and subsequently FEMA for their review. Following the agency review, the jurisdictions will then review the Plan for adoption. This hazard mitigation plan serves as a helpful tool for citizens, policymakers, local businesses, and other local stakeholders who all share a public interest in keeping Miami County as safe and resilient as possible. As such, this Plan aims to:

- Minimize property damage, economic loss, injury, and loss of human life – to achieve the Plan's main goal of reducing the impact of natural and manmade hazards on the County's economy and the well-being of its citizens.
- Enhance public awareness and education – to widen the public's understanding of natural and manmade hazards and how they might affect public health and safety, the environment, the local economy, and basic day-to-day operations.
- Coordinate inter-jurisdictional preparedness measures – to encourage and ensure multi-jurisdictional cooperation in County-wide mitigation actions and programs so that they may be implemented efficiently and effectively.

- Provide decision-making tools for interested stakeholders – to formulate a comprehensive, updated analysis of Miami County's vulnerability to hazards so that decision-makers can better prepare for natural and manmade disasters.
- Achieve regulatory compliance – to ensure that the County and its political subdivisions meet state and federal mitigation planning requirements so that they may be eligible to participate in and receive funding from grant programs, policies, and regulations.

1.2 Setting

Miami County is in the western region of Ohio and has a total area of approximately 410 square miles. The County contains eight villages, three cities, two partial cities, partial village, and 12 townships (**Table 1.2**). The City of Troy serves as the County seat. Miami County is bounded by five counties: Shelby County to the north, Champaign County to the northeast, Clark County to the southeast, Montgomery County to the south, and Darke County to the west.

Land use patterns in Miami County are shown in **Figure 1.2**. Land cover in Miami County is shown in **Figure 1.3**. Land cover types include wetlands, unclassified, shrub/scrub, open water, herbaceous, crops and pasture, developed, forest, and barren land

1.3 Region Features

1.3.1 Transportation

Miami County contains several major roadways, including Interstates (I), US Routes (US) and State Routes (SR). Major roadways in Miami County include: SR-41, SR-48, SR-49, SR-55, SR-66, SR-185, SR-201, SR-202, SR-571, SR-589, SR-718, SR-721, US-36, US-40, I-75. Miami County contains 20.0 miles of interstates, 31.4 miles of US routes and 209.5 miles of state routes.

The Ohio Department of Transportation (ODOT) has record of two airports in Miami County, as well as two nearby airports in Montgomery County which are listed in **Table 1.3** below. There are four helipads in Miami County – one in the City of Piqua, one in the City of Tipp City, and two in the City of Troy.

Table 1.3: Aviation Facilities in Miami County, Ohio

Facility Name	Location	Facility Type	Ownership/Use Type
Hartzell Field	Washington Township	Airport	Public
Troy Skypark	Concord Township	Airport	Private
Phillipsburg	Village of Phillipsburg (Montgomery)	Airport	Private
Dayton International	City of Dayton (Montgomery)	Airport	Public
WACO Field	Concord Township	Airfield (Historic, Usable Runway)	Private
Upper Valley Medical Center	Concord Township	Heliport	Private (Healthcare)
Kettering Health Network	City of Troy	Heliport	Private (Healthcare)
Kettering Health Network	City of Piqua	Heliport	Private (Healthcare)
Private Helipad	City of Tipp City	Heliport	Private

The Ohio Department of Transportation (ODOT) has record of one active rail line in Miami County, which is operated by CSX Transportation. This is a freight line that runs primarily north-south through the cities of Troy, Piqua, and Tipp City. The line closely follows I-75 in Miami County.

1.3.2 Natural Features

Table 1.4, below, principal streams and water bodies in the Region. (Source: ODNR)

Table 1.4: Miami County Streams and Water Bodies

Water Body	
Great Miami River	Stillwater River
Ludlow Creek	Brush Creek
Canyon Run	Lost Creek
Spring Creek	Dry Creek
Indian Creek	Honey Creek
Pleasant Run	Painter Creek

Miami County also has several parks and nature areas which are listed in **Table 1.5** below.

Table 1.5: Parks & Nature Areas in Miami County, Ohio

Name	
Charleston Falls Preserve	Greenville Falls State Scenic River Area
Farrington Reserve	Hobart Urban Nature Preserve
FL Blankenship Riverside Sanctuary	Honey Creek Preserve
Garbry Big Woods Reserve	John A. Wannemacher Nature Reserve
Garbry Big Woods Sanctuary	Lost Creek Reserve & Knoop Agricultural Heritage Center
Goode Prairie Preserve	Maple Ridge
Goode Prairie Reserve	Stillwater Prairie Reserve
Great Miami River Recreational Trail	Twin Arch Reserve

Figure 1.2: Miami County Land Use Map

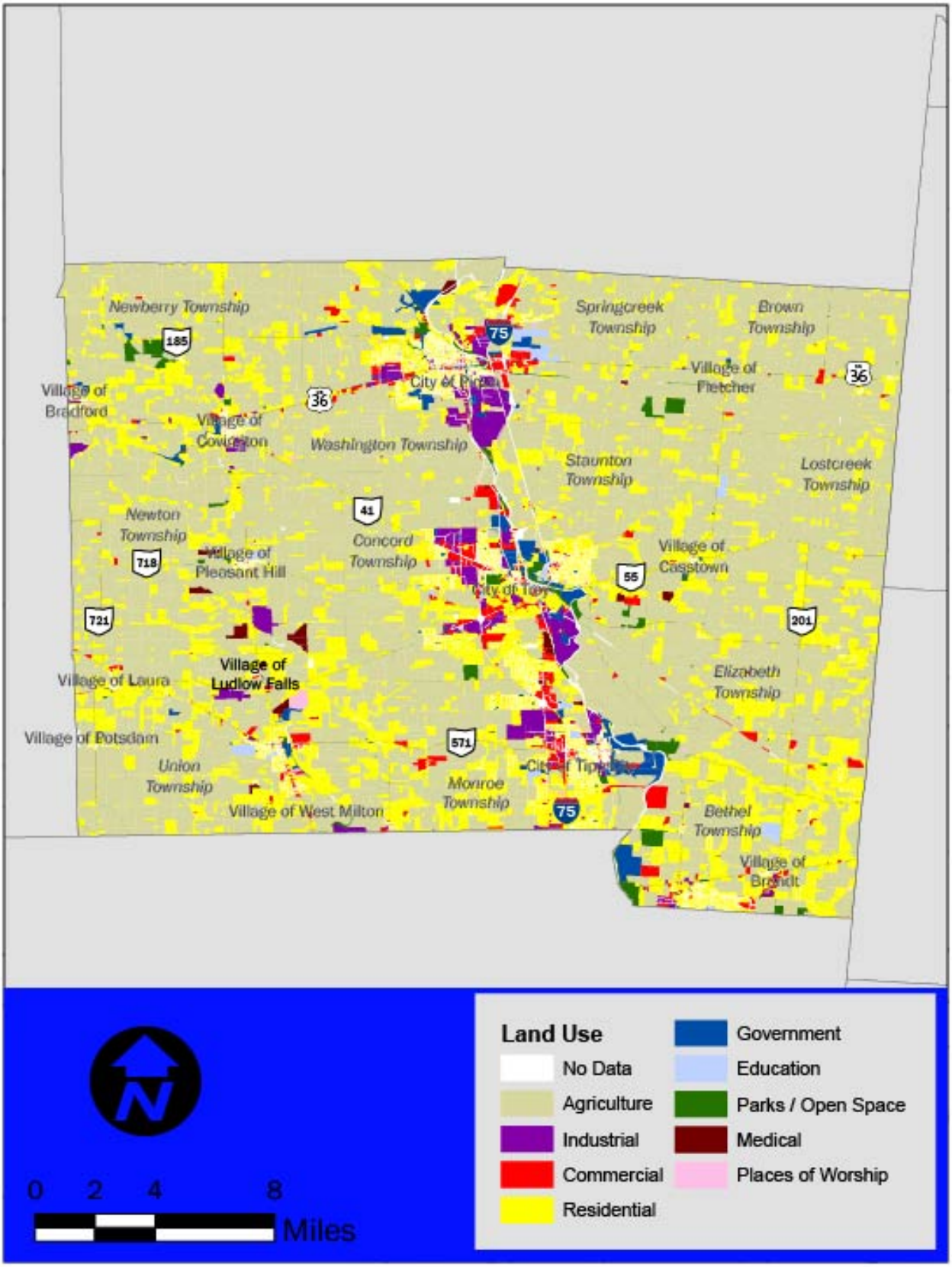
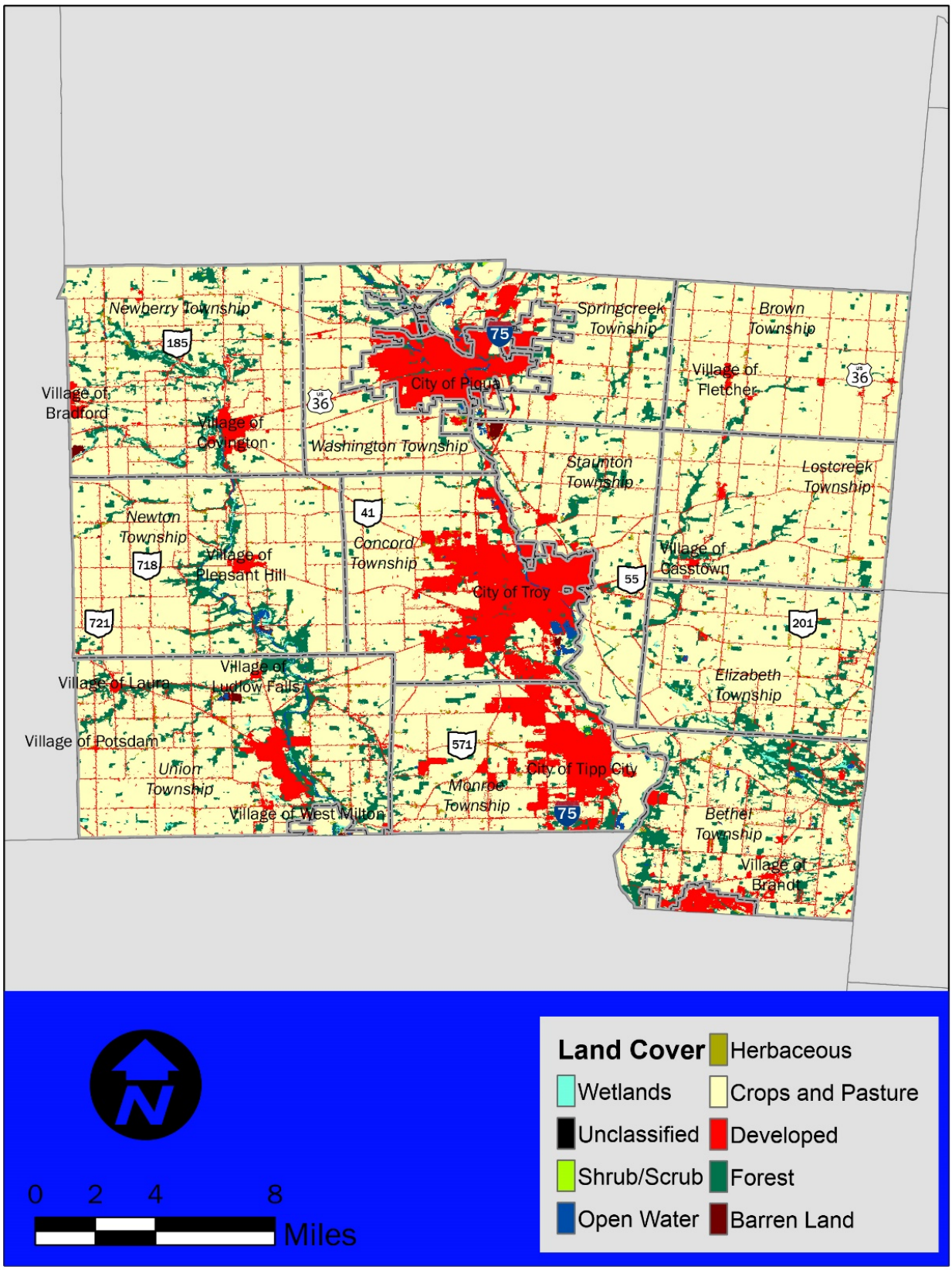


Figure 1.3: Miami County Land Cover Map



02 | History and Demographics

HISTORY AND DEMOGRAPHICS

2.1 History

In 1807, Miami County was created from part of Montgomery County. The word "Miami" is the name of an Indigenous people who once populated the area, and in their native tongue it means "Mother." Many of the early settlers of Troy, the county seat, came from Pennsylvania, Virginia and Kentucky. When the settlers first arrived, the area was a vast forest with a few natural prairies. Prior to and during the Civil War, Troy was an important stopping point on the Underground Railroad. Troy was once known for its wagon and buggy manufacturing, and in the 20th, century became known as the home of Hobart Corporation, Hobart Brothers and Troy Sunshade.

The city of Piqua was named for a myth in the Piqua tribe of the Shawnee, who lived in the area. "Pe-qua" means 'man arose from the ashes.' The city has had many important industries such as Hartzell Propeller, Favorite Stove Co. and Atlas Underwear. Tipp City, originally named 'Tippecanoe' in honor of William Henry Harrison's presidential campaign slogan of "Tippecanoe and Tyler too," was developed by John Clark and purposely took advantage of its proximity to Miami-Erie Canal. The Tipp Roller Mill was situated at Lock No.15 on the canal.

Figure 2.1: Eldean Covered Bridge

The Eldean Covered Bridge (Fig.2.1) is one of the finest examples of a long truss bridge still existing in the nation. It was constructed in 1860 and spans the Great Miami River at 224 feet in length. It was place on the Register of Historic Places in 1975. Near Piqua, the home of York Rial and the Jackson African Cemetery, quietly stand as monuments to the Randolph Freed People, who were manumitted by John Randolph of Roanoke, Virginia. Despite many trials and injustices, they endured with the help of many individuals such as the Quakers and others of like mind.

2.2 Communication Outlets

Miami County's primary communication outlets including websites, television, and social media are listed in **Table 2.1**, below:

Table 2.1: Communication outlets and social media

Communication Type	Source
Website	Miami County: https://miamicountyohio.gov/ Miami County EMA: https://miamicountyohio.gov/753/EMA Miami County Public Health: https://www.miamicountyhealth.net/ Miami Valley Chapter of the American Red Cross: https://www.redcross.org/local/ohio/central-and-southern-ohio/about-us/locations/miami-valley-chapter.html United Way of Miami County: https://unitedwaymco.org/
Twitter	Miami County: https://twitter.com/visitmiamico Miami County EMA: https://twitter.com/miamicountyema Miami County Public Health: https://twitter.com/miamicountyph

Communication Type	Source
Facebook	Miami County EMA: https://www.facebook.com/Miami-County-OH-Emergency-Management-Agency-1404960299787419/ Miami County Public Health: https://www.facebook.com/MiamiCountyPublicHealth/ Miami County Sheriff's Office: https://www.facebook.com/miamicountysherifftroy/
News/Newspaper	Dayton Daily News: https://www.daytondailynews.com/community/miami-county/ Miami Valley Today: https://www.miamivalleytoday.com/

2.3 Demographics Overview

Table 2.2, below, provides a summary of the total population changes that have occurred in Miami County between the 2010 U.S. Census and the 2020 U.S. Census. According to the U.S. Census, Miami County's population increased by 6,268 people (6.1% percent) between 2010 and 2019. All but five townships experienced population decline. The five townships with population growth include Concord, Newton, Spring Creek, Staunton, and Union Townships. Of the townships experiencing population decline, Washington Township experienced the greatest population decline, with a decrease of 73 people (4.6 percent).

A more detailed description of population, housing, and income demographics for Miami County and each jurisdiction is discussed on the following pages. Due to the COVID-19 pandemic on data collection, 2020 American Community Survey (ACS) housing and income estimates were unavailable.

Table 2.2: County/Townships population growth estimates between 2010 and 2020

Jurisdiction	2020 Population	2010 Population	Population Change	Percent Change
Miami County	108,774	102,506	6,268	6.1%
Village of Bradford (partial)	1,046	1,077	-31	-2.9%
Village of Casstown	270	267	3	1.1%
Village of Covington	2,548	2,584	-36	-1.4%
Village of Fletcher	451	473	-22	-4.7%
City of Huber Heights (partial)	5,651	959	4,692	489.3%
Village of Laura	398	474	-76	-16.0%
Village of Ludlow Falls	175	208	-33	-15.9%
City of Piqua	20,354	20,522	-168	-0.8%
Village of Pleasant Hill	1,241	1,200	41	3.4%
Village of Potsdam	225	288	-63	-21.9%
City of Tipp City	10,274	9,689	585	6.0%
City of Troy	26,305	25,058	1,247	5.0%
Village of West Milton	4,697	4,630	67	1.4%
City of Union (partial)	37	24	13	54.2%
Bethel Township	4,758	4,843	-85	-1.8%
Brown Township	1,134	1,122	12	1.1%
Concord Township	5,340	5,393	-53	-1.0%
Elizabeth Township	1,686	1,648	38	2.3%
Lostcreek Township	1,336	1,409	-73	-5.2%
Monroe Township	5,840	5,864	-24	-0.4%
Newberry Township	2,801	2,788	13	0.5%
Newton Township	2,275	2,199	76	3.5%
Springcreek Township	2,144	1,948	196	10.1%
Staunton Township	2,211	1,992	219	11.0%
Union Township	4,074	4,271	-197	-4.6%
Washington Township	1,503	1,576	-73	-4.6%

The population for "partial" jurisdictions limited to Miami County residents.

2.4 Community Profiles

2.4.1 Miami County

Tables 2.3 to 2.5 summarize Miami County's population, housing statistics, and income statistics. The tables show that the County's population increased by 6,268 people (6.11 percent) from 2011 to 2019. For housing units, the County had a combined owned and rental housing vacancy rate of 5.7 percent. Related to income, the largest percentage of households (18.7 percent) had an income

between $50,000 and $74,999; approximately 27.6 percent of households had an annual income of greater than $100,000.

Table 2.3: Miami County Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	102,734
2012 ACS Estimate	102,934
2013 ACS Estimate	103,213
2014 ACS Estimate	103,856
2015 ACS Estimate	104,075
2016 ACS Estimate	104,553
2017 ACS Estimate	105,200
2018 ACS Estimate	106,042
2019 ACS Estimate	106,987

Table 2.4: Miami County Housing Statistics 2020

Housing Statistics	Number
Total Housing Units	46,766
Occupied Housing Units (Owned & Rented)	94.3%
Vacant Housing Units (Owned & Rented)	5.7%

Table 2.5: Miami County Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	4.0%
$10,000 to $14,999	3.7%
$15,000 to $24,999	10.5%
$25,000 to $34,999	8.7%
$35,000 to $49,999	12.8%
$50,000 to $74,999	18.7%
$75,000 to $99,999	13.9%
$100,000 to $149,999	18.4%
$150,000 to $199,999	5.0%
$200,000 or more	4.2%
Median Household Income	$61,041
Mean Household Income	$77,607

2.4.2 City of Huber Heights (partial)

Tables 2.6 to 2.8 summarize the City of Huber Height's population, housing statistics, and income statistics. The tables show that the City's population increased by 89 people (0.2 percent) from 2011 to 2019. For housing units, the City had a combined owned and rental housing vacancy rate of 4.3 percent. Related to income, the largest percentage of households (20.6 percent) had an income between $50,000 and $74,999; approximately 7.0 percent of households had an annual income of less than $15,000.

Table 2.6: City of Huber Heights Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	38,065
2012 ACS Estimate	38,055
2013 ACS Estimate	38,057
2014 ACS Estimate	37,998
2015 ACS Estimate	37,979
2016 ACS Estimate	38,013
2017 ACS Estimate	38,074
2018 ACS Estimate	38,127
2019 ACS Estimate	38,154

Table 2.7: City of Huber Heights Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	17,816
Occupied Housing Units (Owned & Rented)	95.6%
Vacant Housing Units (Owned & Rented)	4.3%

Table 2.8: City of Huber Heights Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	4.8%
$10,000 to $14,999	2.2%
$15,000 to $24,999	8.0%
$25,000 to $34,999	9.7%
$35,000 to $49,999	14.7%
$50,000 to $74,999	20.6%
$75,000 to $99,999	17.8%
$100,000 to $149,999	15.8%
$150,000 to $199,999	4.0%
$200,000 or more	2.3%
Median Household Income	$62,461
Mean Household Income	$72,831

2.4.3 City of Piqua

Tables 2.9 to 2.11 summarize the City of Piqua's population, housing statistics, and income statistics. The tables show that the City's population increased by 791 people (3.9 percent) from 2011 to 2019. For housing units, the City had a combined owned and rental housing vacancy rate of 7.7 percent. Related to income, the largest percentage of households (17.7 percent) had an income between $50,000 and $74,999; approximately 12.1 percent of households had an annual income of less than $15,000.

Table 2.9: City of Piqua Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	20,541
2012 ACS Estimate	20,576
2013 ACS Estimate	20,625
2014 ACS Estimate	20,745
2015 ACS Estimate	20,782
2016 ACS Estimate	20,870
2017 ACS Estimate	20,991
2018 ACS Estimate	21,150
2019 ACS Estimate	21,332

Table 2.10: City of Piqua Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	9,205
Occupied Housing Units (Owned & Rented)	92.2%
Vacant Housing Units (Owned & Rented)	7.7%

Table 2.11: City of Piqua Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	7.3%
$10,000 to $14,999	4.8%
$15,000 to $24,999	13.2%
$25,000 to $34,999	15.4%
$35,000 to $49,999	16.6%
$50,000 to $74,999	17.7%
$75,000 to $99,999	10.8%
$100,000 to $149,999	10.4%
$150,000 to $199,999	3.2%
$200,000 or more	0.6%
Median Household Income	$43,061
Mean Household Income	$55,865

2.4.4 City of Tipp City

Tables 2.12 to 2.14 summarize the City of Tipp City's population, housing statistics, and income statistics. The tables show that the City's population increased by 416 people (4.3 percent) from 2011 to 2019. For housing units, the City had a combined owned and rental housing vacancy rate of 4.1 percent. Related to income, the largest percentage of households (19.7 percent) had an income between $50,000 and $74,999; approximately 6.9 percent of households had an annual income of less than $15,000.

Table 2.12: City of Tipp City Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	9,699
2012 ACS Estimate	9,718
2013 ACS Estimate	9,748
2014 ACS Estimate	9,810
2015 ACS Estimate	9,834
2016 ACS Estimate	9,881
2017 ACS Estimate	9,944
2018 ACS Estimate	10,024
2019 ACS Estimate	10,115

Table 2.13: City of Tipp City Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	4,373
Occupied Housing Units (Owned & Rented)	95.9%
Vacant Housing Units (Owned & Rented)	4.1%

Table 2.14: City of Tipp City Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	4.5%
$10,000 to $14,999	2.4%
$15,000 to $24,999	5.9%
$25,000 to $34,999	8.7%
$35,000 to $49,999	11.9%
$50,000 to $74,999	19.7%
$75,000 to $99,999	15.1%
$100,000 to $149,999	15.7%
$150,000 to $199,999	7.9%
$200,000 or more	8.4%
Median Household Income	$69,881
Mean Household Income	$98,381

2.4.5 City of Troy

Tables 2.15 to 2.17 summarize the City of Troy's population, housing statistics, and income statistics. The tables show that the City's population increased by 1,041 people (4.1 percent) from 2011 to 2019. For housing units, the City had a combined owned and rental housing vacancy rate of 5.6 percent. Related to income, the largest percentage of households (19.5 percent) had an income between $50,000 and $74,999; approximately 10.6 percent of households had an annual income of less than $15,000.

Table 2.15: City of Troy Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	25,240
2012 ACS Estimate	25,290
2013 ACS Estimate	25,363
2014 ACS Estimate	25,519
2015 ACS Estimate	25,574
2016 ACS Estimate	25,692
2017 ACS Estimate	25,848
2018 ACS Estimate	26,052
2019 ACS Estimate	26,281

Table 2.16: City of Troy Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	11,859
Occupied Housing Units (Owned & Rented)	94.4%
Vacant Housing Units (Owned & Rented)	5.6%

Table 2.17: City of Troy Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	6.8%
$10,000 to $14,999	3.8%
$15,000 to $24,999	10.6%
$25,000 to $34,999	8.8%
$35,000 to $49,999	15.6.%
$50,000 to $74,999	19.5%
$75,000 to $99,999	12.7%
$100,000 to $149,999	14.7%
$150,000 to $199,999	4.2%
$200,000 or more	3.4%
Median Household Income	$54,161
Mean Household Income	$70,973

2.4.6 Village of Bradford (Partial)

Tables 2.18 to 2.20 summarize the Village of Bradford's population, housing statistics, and income statistics. The tables show that the Village's population increased by 7 people (0.37 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 7.3 percent. Related to income, the largest percentage of households (22.6 percent) had an income between $50,000 and $74,999; approximately 10.1 percent of households had an annual income of less than $15,000.

Table 2.18: Village of Bradford Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	1,859
2012 ACS Estimate	1,857
2013 ACS Estimate	1,855
2014 ACS Estimate	1,859
2015 ACS Estimate	1,857
2016 ACS Estimate	1,855
2017 ACS Estimate	1,860
2018 ACS Estimate	1,862
2019 ACS Estimate	1,866

Table 2.19: Village of Bradford Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	743
Occupied Housing Units (Owned & Rented)	92.7%
Vacant Housing Units (Owned & Rented)	7.3%

Table 2.20: Village of Bradford Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	4.6%
$10,000 to $14,999	5.5%
$15,000 to $24,999	6.6%
$25,000 to $34,999	13.2%
$35,000 to $49,999	17.1%
$50,000 to $74,999	22.6%
$75,000 to $99,999	14.6%
$100,000 to $149,999	12.8%
$150,000 to $199,999	2.2%
$200,000 or more	0.9%
Median Household Income	$51,895
Mean Household Income	$60,825

2.4.7 Village of Casstown

Tables 2.21 to 2.23 summarize the Village of Casstown's population, housing statistics, and income statistics. The tables show that the Village's population increased by 11 people (4.1 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 12.8 percent. Related to income, the largest percentage of households (21.6 percent) had an income between $25,000 and $34,999; approximately 1.1 percent of households had an annual income of less than $15,000.

Table 2.21: Village of Casstown Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	267
2012 ACS Estimate	268
2013 ACS Estimate	269
2014 ACS Estimate	268
2015 ACS Estimate	269
2016 ACS Estimate	272
2017 ACS Estimate	274
2018 ACS Estimate	273
2019 ACS Estimate	278

Table 2.22: Village of Casstown Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	125
Occupied Housing Units (Owned & Rented)	87.2%
Vacant Housing Units (Owned & Rented)	12.8%

Table 2.23: Village of Casstown Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	0.0%
$10,000 to $14,999	1.1%
$15,000 to $24,999	20.5%
$25,000 to $34,999	21.6%
$35,000 to $49,999	12.5%
$50,000 to $74,999	20.5%
$75,000 to $99,999	19.3%
$100,000 to $149,999	4.5%
$150,000 to $199,999	0.0%
$200,000 or more	0.0%
Median Household Income	$45,833
Mean Household Income	$51,108

2.4.8 Village of Covington

Tables 2.24 to 2.26 summarize the Village of Covington's population, housing statistics, and income statistics. The tables show that the Village's population increased by 102 people (3.9 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 8.7 percent. Related to income, the largest percentage of households (22.2 percent) had an income between $50,000 and $74,999; approximately 9.9 percent of households had an annual income of less than $15,000.

Table 2.24: Village of Covington Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	2,606
2012 ACS Estimate	2,610
2013 ACS Estimate	2,616
2014 ACS Estimate	2,632
2015 ACS Estimate	2,637
2016 ACS Estimate	2,648
2017 ACS Estimate	2,663
2018 ACS Estimate	2,685
2019 ACS Estimate	2,708

Table 2.25: Village of Covington Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	1,135
Occupied Housing Units (Owned & Rented)	91.3%
Vacant Housing Units (Owned & Rented)	8.7%

Table 2.26: Village of Covington Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	4.1%
$10,000 to $14,999	5.8%
$15,000 to $24,999	16.3%
$25,000 to $34,999	8.3%
$35,000 to $49,999	13.0%
$50,000 to $74,999	22.2%
$75,000 to $99,999	14.0%
$100,000 to $149,999	12.0%
$150,000 to $199,999	2.0%
$200,000 or more	1.5%
Median Household Income	$50,842
Mean Household Income	$59,903

2.4.9 Village of Fletcher

Tables 2.27 to 2.29 summarize the Village of Fletcher's population, housing statistics, and income statistics. The tables show that the Village's population increased by 15 people (3.2 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 8.0 percent. Related to income, the largest percentage of households (23.6 percent) had an income between $75,000 and $94,999; approximately 5.5 percent of households had an annual income of less than $15,000.

Table 2.27: Village of Fletcher Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	468
2012 ACS Estimate	468
2013 ACS Estimate	467
2014 ACS Estimate	470
2015 ACS Estimate	471
2016 ACS Estimate	473
2017 ACS Estimate	476
2018 ACS Estimate	480
2019 ACS Estimate	483

Table 2.28: Village of Fletcher Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	187
Occupied Housing Units (Owned & Rented)	92.0%
Vacant Housing Units (Owned & Rented)	8.0%

Table 2.29: Village of Fletcher Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	3.9%
$10,000 to $14,999	1.6%
$15,000 to $24,999	16.5%
$25,000 to $34,999	2.4%
$35,000 to $49,999	15.0%
$50,000 to $74,999	17.3%
$75,000 to $99,999	23.6%
$100,000 to $149,999	13.4%
$150,000 to $199,999	4.7%
$200,000 or more	1.6%
Median Household Income	$63,438
Mean Household Income	$82,982

2.4.10 Village of Laura

Tables 2.30 to 2.32 summarize the Village of Laura's population, housing statistics, and income statistics. The tables show that the Village's population increased by 21 people (4.4 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 7.7 percent. Related to income, the largest percentage of households (26.8 percent) had an income between $50,000 and $74,999; approximately 3.2 percent of households had an annual income of less than $15,000.

Table 2.30: Village of Laura Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	473
2012 ACS Estimate	474
2013 ACS Estimate	475
2014 ACS Estimate	478
2015 ACS Estimate	479
2016 ACS Estimate	481
2017 ACS Estimate	484
2018 ACS Estimate	485
2019 ACS Estimate	494

Table 2.31: Village of Laura Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	182
Occupied Housing Units (Owned & Rented)	92.3%
Vacant Housing Units (Owned & Rented)	7.7%

Table 2.32: Village of Laura Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	1.6%
$10,000 to $14,999	1.6%
$15,000 to $24,999	8.2%
$25,000 to $34,999	9.3%
$35,000 to $49,999	14.2%
$50,000 to $74,999	26.8%
$75,000 to $99,999	17.5%
$100,000 to $149,999	14.8%
$150,000 to $199,999	3.8%
$200,000 or more	2.2%
Median Household Income	$56,875
Mean Household Income	$71,587

2.4.11 Village of Ludlow Falls

Tables 2.33 to 2.35 summarize the Village of Ludlow Falls' population, housing statistics, and income statistics. The tables show that the Village's population increased by 8 people (3.8 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 6.2 percent. Related to income, the largest percentage of households (36.0 percent) had an income between $50,000 and $74,999; approximately 5.6 percent of households had an annual income of less than $15,000.

Table 2.33: Village of Ludlow Falls Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	208
2012 ACS Estimate	209
2013 ACS Estimate	209
2014 ACS Estimate	210
2015 ACS Estimate	211
2016 ACS Estimate	212
2017 ACS Estimate	213
2018 ACS Estimate	215
2019 ACS Estimate	216

Table 2.34: Village of Ludlow Falls Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	81
Occupied Housing Units (Owned & Rented)	93.8%
Vacant Housing Units (Owned & Rented)	6.2%

Table 2.35: Village of Ludlow Falls Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	2.2%
$10,000 to $14,999	3.4%
$15,000 to $24,999	5.6%
$25,000 to $34,999	14.6%
$35,000 to $49,999	6.7%
$50,000 to $74,999	36.0%
$75,000 to $99,999	11.2%
$100,000 to $149,999	14.6%
$150,000 to $199,999	5.6%
$200,000 or more	0.0%
Median Household Income	$59,875
Mean Household Income	$64,538

2.4.12 Village of Pleasant Hill

Tables 2.36 to 2.38 summarize the Village of Pleasant Hill's population, housing statistics, and income statistics. The tables show that the Village's population increased by 50 people (4.2 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 6.7 percent. Related to income, the largest percentage of households (24.3 percent) had an income between $50,000 and $74,999; approximately 4.2 percent of households had an annual income of less than $15,000.

Table 2.36: Village of Pleasant Hill Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	1,204
2012 ACS Estimate	1,207
2013 ACS Estimate	1,210
2014 ACS Estimate	1,218
2015 ACS Estimate	1,220
2016 ACS Estimate	1,225
2017 ACS Estimate	1,233
2018 ACS Estimate	1,242
2019 ACS Estimate	1,254

Table 2.37: Village of Pleasant Hill Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	508
Occupied Housing Units (Owned & Rented)	93.3%
Vacant Housing Units (Owned & Rented)	6.7%

Table 2.38: Village of Pleasant Hill Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	2.9%
$10,000 to $14,999	1.3%
$15,000 to $24,999	8.6%
$25,000 to $34,999	9.0%
$35,000 to $49,999	19.1%
$50,000 to $74,999	24.3%
$75,000 to $99,999	17.3%
$100,000 to $149,999	14.9%
$150,000 to $199,999	1.3%
$200,000 or more	1.3%
Median Household Income	$57,794
Mean Household Income	$65,436

2.4.13 Village of Potsdam

Tables 2.39 to 2.41 summarize the Village of Potsdam's population, housing statistics, and income statistics. The tables show that the Village's population increased by 9 people (3.1 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 12.2 percent. Related to income, the largest percentage of households (31.5 percent) had an income between $50,000 and $74,999; approximately 5.4 percent of households had an annual income of less than $15,000.

Table 2.39: Village of Potsdam Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	288
2012 ACS Estimate	289
2013 ACS Estimate	290
2014 ACS Estimate	291
2015 ACS Estimate	289
2016 ACS Estimate	291
2017 ACS Estimate	292
2018 ACS Estimate	294
2019 ACS Estimate	297

Table 2.40: Village of Potsdam Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	98
Occupied Housing Units (Owned & Rented)	87.7%
Vacant Housing Units (Owned & Rented)	12.2%

Table 2.41: Village of Potsdam Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	1.8%
$10,000 to $14,999	3.6%
$15,000 to $24,999	8.1%
$25,000 to $34,999	13.5%
$35,000 to $49,999	23.4%
$50,000 to $74,999	31.5%
$75,000 to $99,999	15.3%
$100,000 to $149,999	1.8%
$150,000 to $199,999	0.9%
$200,000 or more	0.0%
Median Household Income	$49,844
Mean Household Income	$53,641

2.4.14 City of Union (partial)

Tables 2.42 to 2.44 summarize the City of Union's population, housing statistics, and income statistics. The tables show that the City's population increased by 451 people (7.0 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 15.5 percent. Related to income, the largest percentage of households (24.7 percent) had an income between $50,000 and $74,999; approximately 4.9 percent of households had an annual income of less than $15,000.

Table 2.42: City of Union City Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	6,440
2012 ACS Estimate	6,442
2013 ACS Estimate	6,444
2014 ACS Estimate	6,448
2015 ACS Estimate	6,532
2016 ACS Estimate	6,607
2017 ACS Estimate	6,642
2018 ACS Estimate	6,773
2019 ACS Estimate	6,891

Table 2.43: City of Union Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	743
Occupied Housing Units (Owned & Rented)	84.5%
Vacant Housing Units (Owned & Rented)	15.5%

Table 2.44: City of Union Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	0.0%
$10,000 to $14,999	4.9%
$15,000 to $24,999	4.9%
$25,000 to $34,999	10.1%
$35,000 to $49,999	10.8%
$50,000 to $74,999	24.7%
$75,000 to $99,999	18.9%
$100,000 to $149,999	15.3%
$150,000 to $199,999	5.8%
$200,000 or more	4.6%
Median Household Income	$70,360
Mean Household Income	$80,248

2.4.15 Village of West Milton

Tables 2.45 to 2.47 summarize the Village of West Milton's population, housing statistics, and income statistics. The tables show that the Village's population increased by 135 people (2.9 percent) from 2011 to 2019. For housing units, the Village had a combined owned and rental housing vacancy rate of 5.6 percent. Related to income, the largest percentage of households (22.2 percent) had an income between $25,000 and $34,999; approximately 7.3 percent of households had an annual income of less than $15,000.

Table 2.45: Village of West Milton Population Totals 2011-2019

Year & Source	Population Total
2011 ACS Estimate	4,657
2012 ACS Estimate	4,655
2013 ACS Estimate	4,655
2014 ACS Estimate	4,659
2015 ACS Estimate	4,679
2016 ACS Estimate	4,690
2017 ACS Estimate	4,693
2018 ACS Estimate	4,729
2019 ACS Estimate	4,792

Table 2.46: Village of West Milton Housing Statistics 2020 Estimate

Housing Statistics	Number
Total Housing Units	2,147
Occupied Housing Units (Owned & Rented)	94.4%
Vacant Housing Units (Owned & Rented)	5.6%

Table 2.47: Village of West Milton Income Statistics 2019 Estimate

Household Income Statistics	Number of Households
Less than $10,000	0.7%
$10,000 to $14,999	6.6%
$15,000 to $24,999	13.4%
$25,000 to $34,999	22.2%
$35,000 to $49,999	17.5%
$50,000 to $74,999	15.5%
$75,000 to $99,999	13.1%
$100,000 to $149,999	11.1%
$150,000 to $199,999	0.0%
$200,000 or more	0.0%
Median Household Income	$42,594
Mean Household Income	$51,642

03 | Planning Process

PLANNING PROCESS

3.1 Methodology

The Planning Process chapter describes the steps involved in the development of the 2022 Miami County Hazard Mitigation Plan, including details about who participated, how community involvement was organized and promoted throughout the community, what hazards were included in the Plan and why, as well as how stakeholder involvement played a critical role in the planning process. This chapter also explains how the Core Planning Committee was formed and how member feedback contributed to the updating of the County's Hazard Mitigation Plan.

3.2 Existing Plans and Regulations

Miami County and the State of Ohio maintain several plans and tools that were pertinent to reference in the development of the 2022 Hazard Mitigation Plan, including:

- 2017 Miami County Hazard Mitigation Plan
- Addendum to Miami County Hazard Mitigation Plan, Resolution No. 20-11-1439
- 2019 State of Ohio Hazard Mitigation Plan (SOHMP)
- 2019 Commodity Flow Study of Hazardous Materials, Miami County
- Miami County Comprehensive Plan 2006 Update
- Miami County Emergency Operations Plan, 2019
- Miami County Flood Damage Reduction Resolution
- Miami County Subdivision Regulations
- County-wide Zoning Resolutions

3.3 Miami County Authority to Adopt Plan

County Commissioners are elected at large for four-year terms. Board responsibilities include financial management, management of county facilities, and personnel administration. The authority to adopt plans comes from statutory law and from Chapter 307 of the Ohio Revised Code.

The Miami County Department of Development is composed of four sub-departments: building regulations, community development, economic development, and planning and zoning. The economic development department is responsible for demographics, site development, and workforce development. The community development department is responsible for Community Development Block Grant projects, Fair Housing compliance, and improving housing throughout the County. Building regulations include building permits, building code regulations, and residential permits. Planning and zoning include comprehensive planning, flood damage reduction resolutions, and County administered zoning.

Table 3.1 lists the existing authorities and regulations in place in Miami County and its municipalities.

Table 3.1: Existing Authorities and Regulations in Miami County's Municipalities

Community	Planning Commission	Comprehensive Plan	Floodplain Regulation	Building Codes*	Zoning Ordinances	Capital Budget	Public Works Budget
Miami County	Yes	Yes	Yes	Yes	Yes	Yes	Limited in-kind wages only
City of Huber Heights (partial) (Not participating)	Yes	Yes	Yes	Yes	Yes	Yes	Limited in-kind wages only
City of Piqua	Yes	Yes	Yes	Yes	Yes	Yes	Limited in-kind wages only
City of Tipp City	Yes	Yes	Yes	Yes	Yes	Yes	Limited in-kind wages only
City of Troy	Yes	Yes	Yes	Yes	Yes	Yes	Limited in-kind wages only
City of Union (partial) (Not participating)	No	Yes	Yes	Yes	Yes	Yes	Limited in-kind wages only
Village of Bradford (partial)	No	No	Yes	Yes	Yes	(none)	Limited in-kind wages only
Village of Casstown	No	No	Yes	Yes	Yes	(none)	Limited in-kind wages only
Village of Covington	Yes	Yes	Yes	Yes	Yes	Yes	Limited in-kind wages only
Village of Fletcher	No	No	Yes	Yes	No	(none)	Limited in-kind wages only
Village of Laura	No	No	Yes	Yes	Yes	(none)	Limited in-kind wages only
Village of Ludlow Falls	No	No	Yes	Yes	No	(none)	Limited in-kind wages only
Village of Pleasant Hill	Yes	No	Yes	Yes	Yes	(none)	Limited in-kind wages only

Community	Planning Commission	Comprehensive Plan	Floodplain Regulation	Building Codes*	Zoning Ordinances	Capital Budget	Public Works Budget
Village of Potsdam	No	No	Yes	Yes	No	(none)	Limited in-kind wages only
Village of West Milton	Yes	Yes	Yes	Yes	Yes	Yes	Limited in-kind wages only

* All jurisdictions within the state now follow the Ohio Building Code (Ohio Administrative Code 4101:1)

The Miami County Planning & Zoning Department administers county zoning for eight of the twelve townships in the county including: Concord, Monroe, Newberry, Newton, Springcreek, Staunton, Union and Washington Townships. The townships of Bethel, Brown, Elizabeth and Lostcreek administer their own zoning.

The Miami Conservancy District (MCD) is a political subdivision under State law. The MCD Conservancy Court is made up of nine Common Pleas Court judges and can adopt plans and amendments, establish districts and subdistricts, and appoint a Board of Directors. They are also able to approve financing methods and activities. The Board of Directors for the MCD is made up of three members with staggered five-year terms. They establish district policy, which is then implemented by a general manager.

The MCD is made up of two subdistricts: the Aquifer Preservation Subdistrict and the River Improvement Corridor Subdistrict. These subdistricts are individually funded, and the funds are not interchangeable. MCD funding comes from property owners and jurisdictions that benefit the MCD services. Other sources of funding include grants and agreements.

Any gaps and limitations in authority to implement mitigation strategies or to incorporate mitigation strategies into existing and future planning efforts is addressed my mitigation action #10 in **Table 5.2**.

3.4 Notification Process

Core Planning Committee members were invited to participate at the beginning of the planning process through a Kickoff Meeting announcement. Prior to each additional meeting, members of the Core Planning Committee were invited to participate via an email notification sent by the Miami County EMA Director. Representatives included City/Village Mayors, City Managers, City Engineers, City/Village Administrators, Fire/EMS Chief, Public Safety Director, Project Managers, Management Analysts, Fiscal Officers, Utility Service Directors, Council Members, and Township Trustees. **Table 3.2** lists the participating jurisdictions and representatives and how they participated. Representatives from the following entities were invited to participate in the planning process:

Miami County

- Miami County Commissioners
- Miami County EMA
- Miami County Development Department
- Miami Conservancy District
- Miami County Park District
- Miami County Communications Center
- Miami County Auditor's Office
- Miami County Education Service Center
- Miami County Public Health
- Miami County Engineer's Office
- Miami Soil and Water Conservation District
- Miami County Sheriff's Office
- Miami County IT

City and Village Members

- City of Huber Heights (Not participating)
- City of Piqua
- City of Tipp City
- City of Troy
- City of Union (Not participating)
- Village of Bradford
- Village of Casstown
- Village of Covington
- Village of Fletcher
- Village of Laura
- Village of Ludlow Falls
- Village of Pleasant Hill
- Village of Potsdam
- Village of West Milton

Township Members

- Bethel Township
- Brown Township
- Concord Township
- Elizabeth Township
- Lost Creek Township
- Monroe Township
- Newberry Township
- Newton Township
- Spring Creek Township
- Stauton Township
- Union Township
- Washington Township

Other Organizations

- Ohio Emergency Management Agency
- Edison State Community College
- Miami County OSU Extension Office
- Tipp City Schools
- Troy City Schools
- Kettering Health
- Pioneer Electric
- United Way of Miami County*
- Meijer Distribution
- AES Ohio
- Davita Kidney Care
- Spinnaker Coating
- New Path, Inc.*
- Salvation Army*
- Upper Valley Medical Center
- Hobart Brothers Company
- American Red Cross*
- Independent News Media/Writer

Neighboring Counties

- Shelby County
- Champaign County
- Clark County

Please note that the City of Union and the City of Huber Heights are not participating in this plan update, as they will be participating in the Montgomery County hazard mitigation plan.

The public was invited to participate via public notices in the *Dayton Daily News, My Miami County Magazine,* as well as through social media posts on the Miami County EMA's Twitter and Facebook accounts, for both the November 2021 as well as the February 2022 meetings.

Stakeholders marked with an * were selected for their work with vulnerable or underserved populations.

Table 3.2: Participating Jurisdictions

Community/ Organization	Region/ Group	Representative(s)	Surveys Completed			Meetings Attended		
			Goals & Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
Miami County								
Miami County EMA	All	Joel Smith, Director	✓	✓	✓	✓	✓	
Miami County EMA	All	Mashell Stith, LEPC info coordinator	✓	NR		✓		
Miami County Administrator	North	Charlotte Colley, County Administrator	✓	NR		✓	✓	
Miami County Auditor's Office	Central	Amber Murray, real estate supervisor/ appraiser	✓	NR		✓	✓	
Miami County Commissioner	West	Greg Simmons, Miami County Commissioner		NR		✓		
Miami County Communications Center	Central	Jeffrey Busch, Director	✓	NR		✓		
Miami County Development Department	North	Dan Suerdieck, Planning & Zoning Manager	✓	✓		✓		
Miami County Engineer's Office	South	Paul P. Huelskamp, Miami County Engineer	✓	NR		✓		
Miami County IT	West	Adam Emswiler, Director	✓	NR		✓		
Miami County OSU Extension Office	South	Amanda Bennett, Extension Educator		NR		✓		
Miami County Park District	Central	J. Scott Myers, Executive Director	✓	NR				
Miami County Public Health	South	Nate Bednar, Director of Community Services	✓	NR				12/9/21
Miami County Sheriff's Office	West	Steve Lord, Chief Deputy	✓	✓		✓		

Community/ Organization	Region/ Group	Representative(s)	Surveys Completed			Meetings Attended		
			Goals & Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
Cities and Villages								
City of Piqua	North	Amy Havenar, City Engineer	✓	NR	✓	✓		
City of Piqua	North	Chris Boeke. Health and Sanitation; Lee Adams		NR	✓	✓	✓	
City of Tipp City	South	Cameron Haller, Chief Emergency Services	✓	✓	✓	✓		
City of Troy	Central	Robin Oda, Mayor; Eric Krites, Asst Fire Chief; Stan Kegley, Project Manager; Nikki Reese, Community Development Manager	✓	NR	✓	✓	✓	
Village of Bradford	North	Ron Hoelscher	✓	NR	✓			
Village of Casstown	Central	Art Blackmore, Firefighter/former Chief	✓	NR	✓			
Village of Casstown	Central	Tim Schreadley	✓	NR	✓			
Village of Covington	North	Kyle Hinkelman, Village Administrator	✓	✓	✓	✓		
Village of Fletcher	North	Penny Reed, Mayor	✓	NR	✓	✓	✓	
Village of Laura	West	Kenneth James, Mayor	✓	✓	✓			
Village of Ludlow Falls	West	Chad Allen	✓	NR				
Village of Pleasant Hill	West	Jeff Derksen		NR	✓		✓	
Village of Potsdam	West	Steve Post, Mayor	✓	NR	✓	✓		
Village of West Milton	West	Anthony Miller, Mayor; Jeff Sheridan, Village Manager	✓	NR	✓	✓	✓	

Community/ Organization	Region/ Group	Representative(s)	Surveys Completed			Meetings Attended		
			Goals & Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
Townships								
Bethel Township	South	Andy Ehrhart, Fire Chief	✓	NR		✓		
Brown Township	North			NR				
Concord Township	Central	Neil Rhoades, Trustee; Don Pence, Trustee	✓	✓		✓	✓	
Elizabeth Township	Central	Randy Mott	✓	NR				
Lost Creek Township	Central	Samuel Buchman, Trustee; Walter Pemberton, Trustee	✓	NR		✓	✓	
Monroe Township	South	Philip Cox, Trustee	✓	NR		✓	✓	
Newberry Township	North	J. Jason Sargent, Chairman	✓	✓				
Newton Township	West			NR				
Spring Creek Township	North			NR				
Stauton Township	Central	Sarah Fine, Fiscal Officer	✓	NR		✓		
Stauton Township	Central	Michael Rindler, Trustee	✓	NR		✓		
Union Township	West	Dennis Albaugh, Phil Mote, Trustee Ty Dues, Supervisor	✓	NR		✓	✓	
Washington Township	North	Mikel R Brown	✓	NR				
Neighboring Counties								
Champaign County	Central	James Freeman, Director				✓		
Clark County	South	Ken Johnson, Deputy Director				✓		
Shelby County	North	Kristy Fryman, Director				✓		

Community/ Organization	Region/ Group	Representative(s)	Surveys Completed			Meetings Attended		
			Goals & Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
Other								
Ohio EMA		Samuel Reed, EM Specialist				✓	✓	
AES Ohio		Jason Willis					✓	
American Red Cross		Marc Cantrell, DPS					✓	
Davita Kidney Care		Shari Lenox, RN/Facility admin Kari Ford, RN/Facility Admin				✓	✓	
Edison State Community College		Bruce Jamison, Chief of Police Jim Bowell, Emergency Specialist				✓	✓	
Hobart Brothers Company		Tim Alber, Safety Engineer				✓	✓	
Kettering Health		James Garrett, EMA Coordinator Anthony Ryan Alexander, Director for Emergency Management and Outreach				✓	✓	
Meijer Distribution		Tom Kelley, AP Manager Dustin Garrett, AP Officer Jeff Shultz, AP Officer				✓	✓	
Miami Conservancy District		Angela Manuszak, Special Projects Manager Barry Puskas	✓	✓	✓	✓	✓	
Miami Soil and Water Conservation District		Kreig Smail, Administrator				✓	✓	

Community/ Organization	Region/ Group	Representative(s)	Surveys Completed			Meetings Attended		
			Goals & Hazard Priorities	Previous Mitigation Actions	New Mitigation Actions	1	2	Other
New Path, Inc.		William Lutz, Exec Director				✓	✓	
Pioneer Electric		Steve McClay					✓	
Salvation Army		Herb Carter, Piqua Leader				✓		
Spinnaker Coating		Ron Dye, Dir. Engineering & Environmental Affairs				✓		
Tipp City Schools		Mark Stefanik, Superintendent Kim Hagen, Business Operations Coordinator				✓		
Troy City Schools		Michael Moore, Asst. Superintendent				✓	✓	
United Way of Miami County		Sean Patrick Ford, CEO				✓		
Upper Valley Medical Center		Ivy Thoman, EM Chair & Clinical Nurse Specialist				✓	✓	
Upper Valley Career Center		Joe Davis, Instructional Supervisor				✓	✓	

NR = not required, as not all jurisdictions had a mitigation action defined in the previous plan.

If representatives were unable to attend the in-person or digital Core Planning Committee meetings, they participated via "Other" formats, including online surveys, as documented in ***Appendix G.***

Core Planning Committee members were invited to participate at the beginning of the planning process through a Kickoff announcement which was sent out via email. Prior to each planning meeting, members of the Core Planning Committee were invited to participate in two formats - first via an email notification and calendar invite, and then via a packet that provided hard copies of the kickoff materials to jurisdictions that did not respond to the email invitation. Members of the public were encouraged to attend public meetings through press releases and social media announcements via Twitter and Facebook.

All kickoff materials and information regarding each individual planning meeting were made available on the project's website - www.burtonplanning.com/Miami-hmp. The website hosted informational

handouts, meeting dates, WebEx connection links, agendas, presentations, surveys, meeting recordings, and contact information of consultant team members and the County EMA.

3.5 Meetings

The following section details the meetings that took place during the planning process. Documentation of each meeting, including newspaper postings, email announcements and attachments, meeting materials, and completed surveys, can be found in **Appendix G**.

3.5.1 Core Planning Committee Kick-off

A Kickoff Announcement was emailed to stakeholders on October 14, 2021 inviting them to participate in the 2022 Miami County Hazard Mitigation Plan update process as part of the Core Planning Committee. All kickoff materials were also made available on the project's website (www.burtonplanning.com/Miami-hmp).

The announcement outlined the following details regarding the planning process:

- Goals of the Hazard Mitigation Plan
- A summary of who is involved in the planning process
- Federal requirements of the hazard mitigation planning process
- An overview of the hazard mitigation planning process
- The proposed schedule for the Miami County Plan update
- The role of the Core Planning Committee in the update process
- Contact information for both Miami County EMA and Burton Planning Services (Consultant)
- Dates, times, and WebEx links of upcoming Core Planning and Public Meetings

For the Core Planning Committee Planning Meetings, the stakeholders were divided into four groups based on their geographical presence in the County. These groups were North, West, Central, and South groups. The list of jurisdictions and organizations in each group is provided in **Table 3.2**.

3.5.2 Core Planning Committee Meeting 1

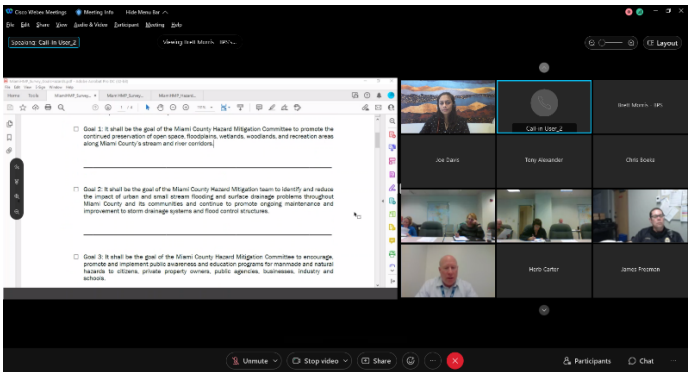
The first Core Planning Committee meeting took place on Wednesday, November 17, 2021 and Thursday, November 18, 2021 at 9:30 AM and 1:00 PM on both days. Due to the ongoing pandemic, this meeting was held in a hybrid format, that is, participants could join the meetings by either attending in-person at the Hobart Center for County Government, 510 W Water Street Troy, Ohio 45373, or by joining virtually using WebEx (**Figure 3.1**). Members of the Core Planning Committee that joined virtually were able to connect using the WebEx App on their phone or desktop or call into the meeting using a phone number. A total of 59 people attended the meeting, including three representatives from the Consultant team and the Director of the Miami County Emergency Management Agency.

The engagement process began by providing multiple options for participants to sign into the meetings. Physical sign-in sheets were available for those attending in-person. Participants attending virtually could sign in using the SurveyMonkey survey, via the chat function, or by sending an email or text to the County EMA. Participants were reminded multiple times throughout the course of the meeting to sign-in. The team also informed attendees that they could ask questions using the chat feature, or by unmuting themselves and asking their questions at any time throughout the meeting.

The meeting began with a presentation delivered by Ruchi Agarwal, Senior Planner at Burton Planning Services. Attendees were introduced to the fundamentals of the hazard mitigation planning process,

including requirements of the plan update process, potential hazards that could be addressed, benefits of hazard mitigation planning, potential types of projects that could be federally funded as a result of the hazard mitigation plan, and the role that the Core Planning Committee would serve in the development of the 2022 Miami County Hazard Mitigation Plan.

Figure 3.1: Core Planning Meeting 1 held via WebEx and In-person



Following the completion of the presentation, Brett Morris, Resiliency Planner at Burton Planning Services, guided the attendees through two surveys, detailed below. Each participant was provided multiple methods of completing the survey, including a physical hard copy of the survey (for in-person attendees), a fillable PDF that could be completed on their computer, or an online SurveyMonkey version. Links to survey locations were provided throughout the meeting. All meeting materials including links to the meeting recordings were made available on the project's website so attendees could compete surveys at their own pace.

Goals and Hazard Priority Survey:

Part 1 of this survey was to reflect on the goals included in the 2017 Hazard Mitigation Plan to determine if they were still relevant to the 2022 Plan. Each attendee reviewed the previous goals and determined if they were still applicable, provided comments or edits to the goals that needed changed, and suggested new goals to potentially be included in the Plan.

Discussion on the Goals Survey centered around the relevance of the previous goals. Attendees indicated a preference for adding goals related to hazardous materials incident response capability of the County, access to safe potable water, retrofitting critical facilities with disaster-resistant design practices and equipment, and making emergency shelters and facilities in the County ADA compliant.

Part 2 of this survey was to review all hazards that could be included in the 2022 Hazard Mitigation Plan and prioritize them. As such, attendees were asked to rate each hazard on a scale of zero to five, with five indicating that the hazard poses the greatest possible threat to the community and zero indicating that the hazard should not be included in the 2022 Plan. Attendees rated hazards that were included in the 2017 Hazard Mitigation Plan, as well as all potential hazards that could be included in the 2022 Plan.

Following the completion of this survey, a discussion continued on which hazards were deemed most important and which hazards attendees did not think needed to be included. Attendees emphasized on including 'non-hazardous mass transportation incidents' as a new hazard due to the County's proximity to Dayton International Airport and I-75. Attendees also recommended the addition of 'cyber threats and security issues' within the terrorism hazard.

Previous Mitigation Actions Status Survey

The purpose of the Previous Mitigation Actions Status Survey was to have attendees review the mitigation actions that were included in the 2017 Hazard Mitigation Plan, reflect on the status of each action, and determine if that action should be included in the 2022 Hazard Mitigation Plan.

3.5.3 Public Meeting 1

The first public meeting took place on Thursday, November 18, 2021 at 6:30 PM. Similar to the Core Planning Committee meetings, this meeting was held in a hybrid format with participants having the choice of attending in-person or virtually using WebEx. Stakeholders who were unable to attend the Core Planning Committee Meeting 1, were invited to attend the Public Meeting 1. A total of seven people attended the meeting, including two representatives from the Consultant team, as well as the Director and the LEPC Information Coordinator of the Miami County Emergency Management Agency.

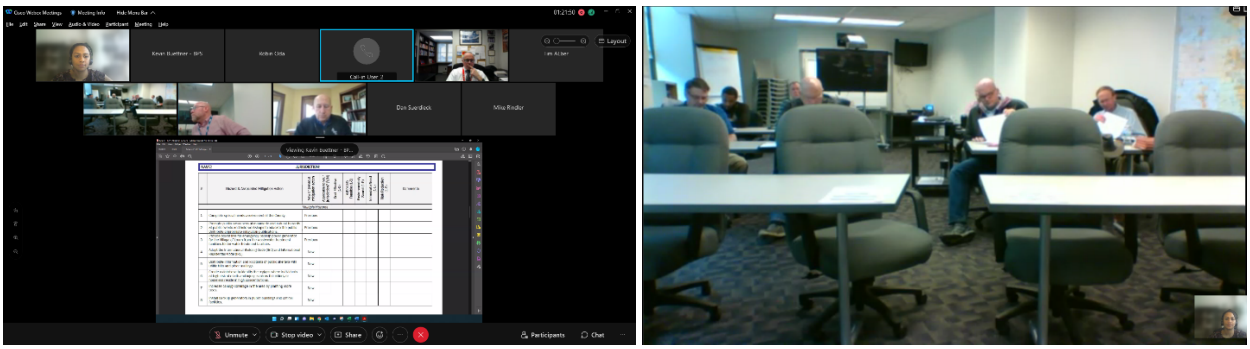
The Public Meeting followed the same structure as the Core Planning Meeting 1 starting with sign-in forms, followed by introductions, delivery of the presentation, and finally completing the Goals and Hazard Priority Survey.

3.5.4 Core Planning Committee Meeting 2

The second Core Planning Committee meeting took place on Wednesday, February 16, 2022, and Thursday, February 17, 2022, at 9:30 AM and 1:00 PM on both days. Due to the ongoing pandemic, this meeting was held in a hybrid format, that is, participants could join the meetings by either attending in-person at the Hobart Government Building, 510 W. Walter Street, Troy, OH 45373, or by joining virtually using WebEx (**Figure 3.2**). Members of the Core Planning Committee that joined virtually were able to connect using the WebEx App on their phone or desktop or call into the meeting using a phone number. A total of 43 people attended the meeting, including three representatives from the Consultant team and the Director of the Miami County Emergency Management Agency.

The meeting began with a brief introduction from Ruchi Agarwal, Senior Planner at Burton Planning Services. Ms. Agarwal then provided multiple options for participants to sign into the meetings, followed by a presentation which provided an update on the hazard mitigation planning process, including requirements of the planning process and results from the Goals and Hazard Priority Survey as well as the Previous Mitigation Actions Status Survey distributed at the previous meeting.

Figure 3.2: Core Planning Meeting 2 held via WebEx and In-person



Following the completion of the presentation, Brett Morris, Resiliency Planner at Burton Planning Services, guided the attendees through the Mitigation Actions Scoring Matrix, as described below. Each participant was provided multiple methods of completing the survey, including a physical hard copy of the survey (for in-person attendees), a fillable PDF that could be completed on their computer, or an online SurveyMonkey version. Links to survey locations were provided throughout the meeting.

All meeting materials including links to the meeting recordings were made available on the project's website so attendees could compete surveys at their own pace.

Mitigation Actions Scoring Matrix:

This survey helps determine the mitigation actions attendees would like to see in their community to mitigate the impacts of hazards. Attendees were provided a list of previous and newly proposed mitigation actions and were asked if the action was relevant to their community. If attendees indicated that the mitigation action was relevant, they were asked to score the action in five categories: cost effective, technically feasible, environmentally sound, immediate need, and total risk reduction. These scores will help determine the priority of all mitigation actions included in the 2022 Hazard Mitigation Plan.

Discussion on the Mitigation Actions Scoring Matrix during the meetings centered around topics such as flood mitigation, urban and flash floods, high hazard dams, wetland improvements, site cleanup for potable water, and barriers faced by vulnerable populations.

3.5.5 Public Meeting 2

The second public meeting took place on Thursday, February 17, 2022, at 6:30 PM. Similar to the Core Planning Committee meetings, this meeting was held in a hybrid format with participants having the choice of attending in-person or virtually using WebEx. Stakeholders who were unable to attend the Core Planning Committee Meeting 2, were invited to attend the Public Meeting 2. A total of four people attended the meeting, including one representative from the Consultant team, and the Director of the Miami County Emergency Management Agency.

The Public Meeting followed the same structure as the Core Planning Meeting 1 starting with sign-in forms, followed by introductions, delivery of the presentation, results from the surveys distributed at the previous meeting, and finally completing the Mitigation Actions Scoring Matrix.

3.6 Public Comment Period

The 2023 Miami County Hazard Mitigation Plan was made available to the public and Core Planning Committee for review for a 15-day public comment period on October 28, 2022. Hard copies of the Hazard Mitigation Plan were made available for review in-person at the Miami County EMA office, and a digital Draft Plan was made available online on the project's website. Both physical and digital surveys were provided to the public and the Core Planning Committee for their comments on the Plan.

3.7 Planning Process

Stakeholder and public input are essential for determining the hazard prioritization, as well as which hazards should be included or excluded from the Plan. Based on feedback from the Core Planning Committee, it was determined that landslides are not hazards of concern to Miami County and its communities and have not been included in previous hazard mitigation plans, nor were they included in this Plan. However, as discussed above, 'non-hazardous mass transportation incidents' has been included as a new hazard due to the County's proximity to Dayton International Airport and I-75, and 'cyber threats and security issues' has been included with the terrorism hazard. More details about how survey feedback assisted in the determination of plan goals, which hazards to include and exclude, as well as the mitigation actions can be found in **Chapter 5, Hazard Mitigation.**

Chapter 4, Hazard Identification and Risk Assessment follows this chapter, and is organized alphabetically and not in order of risk. The ranking of hazard priorities can be found in **Chapter 5, Hazard Mitigation.**

04 | Hazard Risk Assessment

HAZARD RISK ASSESSMENT

4.1 Dam & Levee Failure

4.1.1 Description

FEMA defines a dam as "any artificial barrier of at least a minimum size, including appurtenant works, that impounds or diverts water or liquid-borne solids on a temporary or long-term basis." Dam failure occurs when that impounded water is suddenly released in an uncontrollable manner. A dam/levee failure can result in the uncontrolled release of floodwaters downstream of a facility, resulting in a flood wave that can cause significant damage to buildings and infrastructure downstream. The unexpected nature of dam collapse also increases the likelihood of loss of life in the impacted area due to reduced warning times.

Dam infrastructure can be affected by natural hazards, such as floods; man-made threats, such as sabotage; and an imbalance between a dams age and amount of resources invested towards dam maintenance, such as dam settlement and cracking, or movement of the dam's foundation. Dam failures can be caused by seepage, structural failure, or water overtopping the reservoir. A majority of dams in the U.S. are privately owned but regulated by the State or Federal government.

The National Flood Insurance Program (NFIP) defines a levee as "a man-made structure, usually an earthen embankment, designed and constructed in accordance with the sound engineering practice to contain, control, or divert the flow of water so as to reduce risk from temporary flooding." Levees are built parallel to waterways in order to reduce the risk of flood damage to neighboring infrastructure. Levee failure can occur from improper maintenance, erosion, seepage, subsidence, and when the man-made structure fails.

Common dam- and levee-related terms include:

- **Spillway:** A structure that is part of a dam or found beside a dam which allows the controlled release of water from a reservoir.
- **Outlet works:** Used to regulate or release water flow from a dam. An outlet works is a device which consists of one or more pipes or tunnels which move water through the dam.
- **Auxiliary spillway**: Also known as an emergency spillway, the auxiliary spillway is a secondary spillway only designed to operate during periods of increased water inflow or high reservoir levels.
- **Structural failure:** Caused by foundation defects such as settlement and slope instability or earthquakes.
- **Mechanical failure:** Dam failure due to malfunctioning gates, conduits, or valves.
- **Hydraulic failure:** Occurs when water overtops the dam, usually causes by inadequate spillway design, blockages in spillways, or dam crest settlement.
- **Levee System**: A flood protection system which consists of a levee or other structures, such as closure or drainage devices.

Normally, water passes through a dam via the main spillway or outlet works. During periods of increased water inflow or high reservoir levels, water should pass through an auxiliary spillway. Dam failure or partial failures are typically caused by structural, mechanical, or hydraulic failures, rather than during extreme storm events.

According to the U.S. Army Corps of Engineers (USACE), dams can be classified by their hazard potential. The three hazard potential classes are:

- **High Hazard Potential:** During the event of a dam failure loss of life is probable, which is the primary attribute for assigning this designation to a dam. Economic losses, environmental damages, and lifeline impacts are also likely, but are not required for this designation.
- **Significant Hazard Potential:** No loss of life is expected during a dam failure, but economic losses, environmental damages, and lifeline impacts are likely.
- **Low Hazard Potential:** No loss of life is expected during a dam failure and no lifeline impacts are expected. Environmental damages and economic losses are expected to be limited to the dam owner's property.

Emergency action planning is an important component of dam safety. FEMA describes an Emergency Action Plan (EAP) as a document which identifies hazardous conditions at a dam and outlines the actions to be followed to minimize property damage and loss of life. In addition to procedures for issuing early warning messages, the EAP also includes inundation maps which outline critical areas for action in case of a dam failure. The EAP should be updated at least every 5 years.

4.1.2 Location

Dam and levee failure can occur throughout Miami County where dams or levees are located. The Miami Conservancy District maintains 55 miles of levees located in 11 cities, six of which are located in Miami County. Dam failure is more likely to occur if the dam is not maintained or operated correctly but can occur in other situations as well. Miami County has three dams classified as having high hazard potential, three as having significant hazard potential, and one as having low hazard potential. **Table 4.1.1** lists all dams within Miami County, organized alphabetically by hazard potential and **Figure 4.1.1** shows the location within Miami County. **Table 4.1.2** lists all levee systems within Miami County, organized alphabetically by jurisdiction.

Table 4.1.1: Dams in Miami County, Ohio

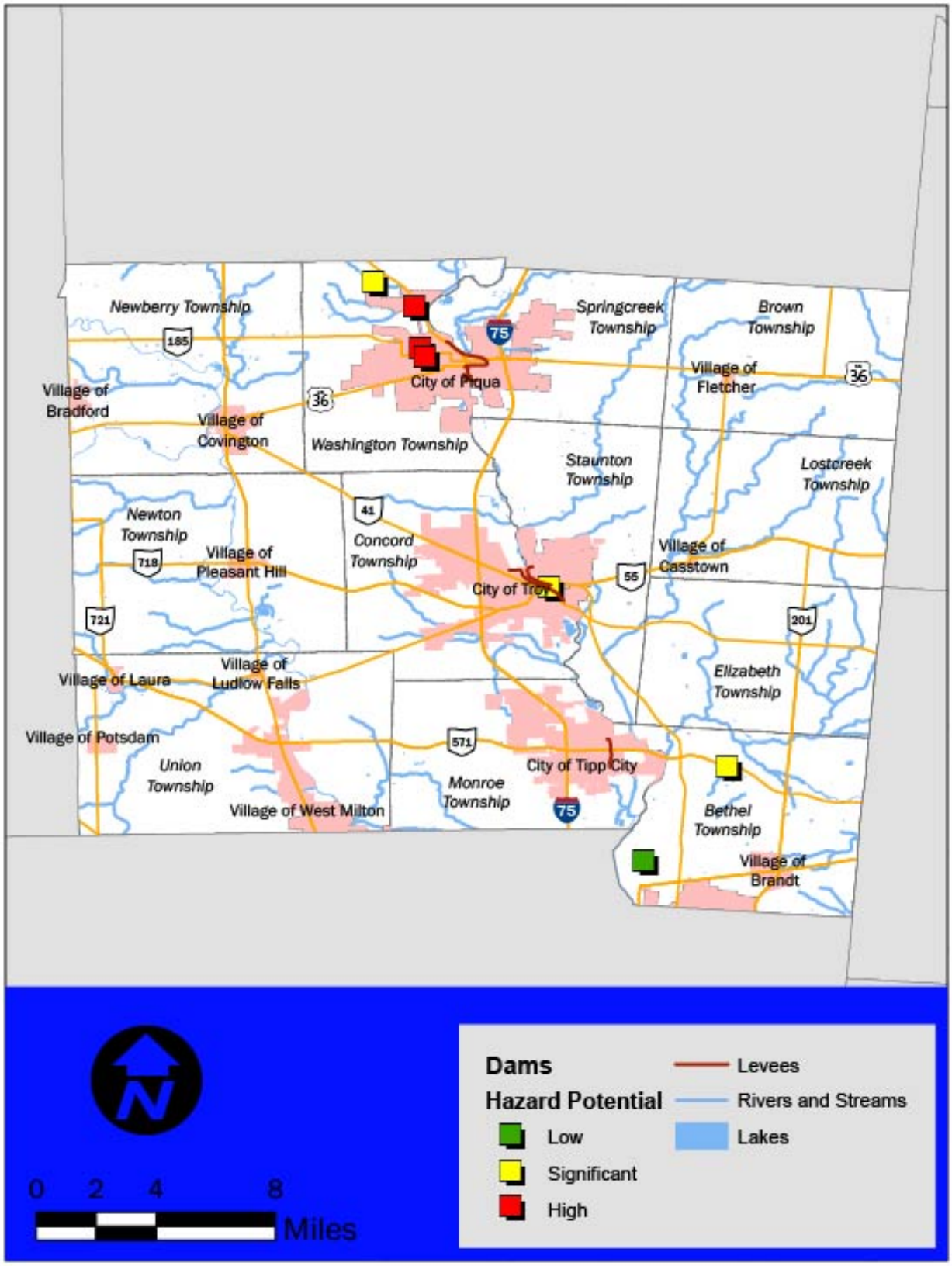
Class	Name	Owner Type	City	NID Storage (Acre ft.)	Length (ft.)	Height (ft.)	Condition	EAP
High	Echo Lake Dam	Government	Piqua	142	660	14.2	Poor	Yes
High	Swift Run Lake Dam	Government	Piqua	629	1,520	39.4	Poor	Yes
High	Franz Pond Dam	Government	Piqua	92	600	20.6	Poor	Yes
Significant	Troy Low Head Dam	Government	Troy	150	380	9.38	Poor	No
Significant	Decker Lake Dam	State	Piqua	163	305	16.2	Poor	Yes
Significant	Hidden Lake Dam	Private	Bethel Twp	24	1,390	20.5	Poor	No
Low	Hart Pond Dam	Private	Bethel Twp	28.4	315	25.2	Satisfactory	No

Table 4.1.2: Levee Systems in Miami County, Ohio

Name	Sponsor	City	Number of Segments	Length (miles)	Population (Behind Levee)	Buildings (Behind Levee)	Property Value (Behind Levee)
Piqua Levee 4	Miami Conservancy District	Piqua	1	0.23	68	24	$10.8M
Piqua Local Flood Protection (PIQL1)	Miami Conservancy District	Piqua	2	0.91	574	215	$67.7M
Piqua Local Flood Protection (PIQR1)	Miami Conservancy District	Piqua	1	0.66	1,464	649	$395M
Tipp City Levee	Miami Conservancy District	Tipp City	1	1.01	251	105	$92.3M
Troy Levee 1	Miami Conservancy District	Troy	1	1.9	7,325	2,492	$1.35B
Troy Levee 2	Miami Conservancy District	Troy	1	1.09	1,499	17	$45M

Table 4.1.2 summarizes the location of each levee and what is 'behind the levee'. Each levee has a population and number of buildings it protects. In addition, the property value is the combined land and building value. The levee systems in Miami County protect a total population of 11,181 residents, a total of 3,502 buildings, and a total property value of $1.96 billion.

Figure 4.1.1: Dam Locations in Miami County, Ohio and the City of Piqua



4.1.3 Extent

Dams can fail in various ways. Two common causes of dam failures occur when water flows over the top of a dam (overtopping) and when water flows through the dam, causing erosion (seepage).

Overtopping occurs when a reservoir behind a dam, overflows. The overflow of water can cause erosion to the dam, its foundation, and the surrounding area. The spillway of a dam can also overflow, when can contribute to water back up. Erosion caused by overtopping can contribute to a dam breach. Overtopping is the most common cause of dam failure.

Seepage is when water flows through a dam, causing erosion. Erosion can occur over time, weakening the structural integrity of a dam and its systems. If the flow of water is not addressed, internal erosion can lead to a partial or complete dam collapse. Animal burrows, cracks in the structure of the dam, or roots from nearby plant life can lead to internal erosion.

As previously mentioned, Class I dams have a total storage volume greater than 5,000 acre-feet or a height of greater than 60 feet. Sudden failures of Class I dams would increase the probability that one of the following conditions would result in:

- Loss of human life.
- Structural collapse of at least one residence or one commercial or industrial business; and/or
- All items listed below for failure of Class II and III dams.

Sudden failures of Class II dams would result in at least one of the following conditions:

- Disruption of a public water supply or wastewater treatment facility, release of health hazardous industrial or commercial waste, or other health hazards.
- Flooding of residential, commercial, industrial, or publicly owned structures.
- Flooding of high value property.
- Damage or disruption to major roads including, but not limited to, interstate and state highways and the only access to residential or other critical areas such as hospitals, nursing homes, or correction facilities as determined by the chief.
- Damage or disruption to railroads or public utilities.
- Damage to downstream class I, II, or II dams or levees or other dams or levees of high value. Damage to dams or levees can include, but is not limited to, overtopping of the structure. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potential affected property

Sudden failures of Class III dams would result in at least one of the following conditions:

- Property losses including, but not limited to, rural buildings not otherwise described in the Ohio Administrative Code Rule 1501:21-12-01 (2010), and class IV dams and levees not otherwise listed as high-value properties in this rule; and/or
- Damage or disruption to local roads including, but not limited to, roads not otherwise listed as major roads

Sudden failures of Class IV dams would result in property losses restricted mainly to the dam and rural lands, and the loss of human life is not probable.

4.1.4 High Hazard Potential Dams (HHPDs)

There are three High Hazard Potential Dams (HHPDs) in Miami County (**Figure 4.1.2**). All three are in the City of Piqua. These three dams and there surrounding area together may also be referred to as "the canal." Since all three dams are within the same jurisdiction and along the same canal, there are no known issues for coordination on dam safety. The three dams are:

1. Echo Lake Dam (NID OH02103)
2. Franz Pond Dam (NID OH02104)
3. Swift Run Lake Dam (NID OH00515)

The U.S. Army Corps of Engineers (USACE) lists the condition for all three dams as "poor." All three dams have a prepared Emergency Action Plan (EAP). Swift Run Lake Dam is the largest of the three dams, and the height is between 25-50 feet and the length is 1,520 feet. All three dams were completed by 1876.

Additional data, described below, was provided by the Utilities Director for the City of Piqua in coordination with the Miami County EMA. The City of Piqua provided inundation maps and emergency action plans (EAPs) for each of the High Hazard Potential Dams. Impacts on critical facilities and community lifelines were not addressed outside of the existing assessment in the EAPs. Sections 6.10 and 6.11 of the Swift Run Lake, Echo Lake and Franz Pond Dams & Hydraulic Canal Levee Emergency Action Plan include inundation maps and potential impact areas.

The three dams have been treated as one entity for the purpose of recording their history. In 1924, there was a dam failure due to overtopping after 3.26 inches of rain fell within a two-hour period. In 1936, there was another dam failure due to overtopping at Forest Hill Cemetery. In 1961, the southern end of the canal failed during the installation of an additional utility pipe. The canal was relined in 1984-1985 after a leak in the embankment, and it was relined again in 2000-2001. Another small leak was repaired in the northern section of the canal near Echo Lake Dam. The most recent leak was detected in 2017, about 200 feet south of the sluice gate at Swift Run Lake. This leak was repaired by mixing soil with bentonite and compacting.

Currently the canal is currently being studied to identify potential upgrades and other fixes. Two public meetings have been held so far for this study, both in late 2021. The Ohio Department of Natural Resources (ODNR) was late updated on the status of this project in December 2021.

There are five condition grades given by the USACE: A (excellent), B (good), C (poor), D (inadequate), F (failed). All three HHPD in Miami County are rated as "poor." The USACE defines a "poor" condition as:

- Component (dam) is fully functional,
- A critical design flaw potentially exists in terms of structural/operational capacity or functionality, but must be further substantiated by owning District,
- Documentation, testimonies, and/or observation can confirm a progressing degradation of the components condition,
- A clear mode of failure cannot be confirmed,
- The components performance is not presently affected by the deficiency, but is likely due to the substantiated progress in degradation,
- The feature mission requirement(s) (i.e., flood control, water quality, water supply, etc.) are not presently affected by the deficiency, but likely due to the substantiated progress in degradation,

- Normal operating procedures and routine maintenance requirement are not presently affected by the deficiency, but likely due to the substantiated progress in degradation,
- Safety of personnel and end users not present affected by the deficiency.

High Hazard Potential Dams (HHPDs): Data Deficiencies

The following data missing, unavailable, or has not been provided:

1. A Potential Failure Mode Analysis (PFMA)
2. Impacts on critical facilities and community lifelines
3. Multi-jurisdictional dam impact study

High Hazard Potential Dams (HHPDs): Cascading Impacts

1. Earthquakes

Severe earthquakes are unlikely in Miami County. However, even minor seismic activity can cause cracks to form in the dam's foundation.

2. Flooding

Riverine flooding can cause overtopping. Overtopping occurs when water levels rise rapidly and exceed the height of the dam. Erosion, sediment, and debris can also be carried by a flood into the reservoir behind a dam, reducing the dam's overall capacity. Dams can also be weakened by quickly flowing waters, causing cracks or weakening dam infrastructure.

3. Wildfires

While severe wildfires are unlikely in Miami County, there is 100% of small or mild wildfires in the County every year. Wildfires can impact dam safety in several ways. Erosion and debris caused by wildfires end up in reservoirs, which can reduce overall dam capacity. While unlikely in Miami County, wildfires can also cause direct damage to dam infrastructure.

4. Impacts along the Great Miami River

If a dam failure should occur at any number of the HHPDs listed above, all jurisdictions along the Great Miami River that are downstream from the City of Piqua could suffer from flooding and decreased water quality.

Population and economic impacts on the City of Piqua and downstream communities would depend on the severity of the dam failure. Economic impacts could include widespread business closings, cost of repairs and recovery, and washed-out roadways. Population impacts could include loss of life from flooding, destruction of homes, and widespread utility failure.

Figure 4.1.2: High Hazard potential Dams in Miami County, Ohio

4.1.5 History

According to the National Performance of Dams Program (NPDP), hosted by Stanford University, dam failures have been reported in every state. Using historical records, the NPDP has cataloged dam failures from 1848 to 2017. During this time Ohio had 271 incidents and 18 dam failures, out of a total of 1,495 dams. There have been no recorded dam failures in Miami County.

4.1.6 Probability

The likelihood of dam failure will vary by the individual dam. Regular dam inspections are necessary to identify potential risks to the dam and to mitigate them. Due to limitation of data, dam and levee failures are unlikely but possible

4.1.7 Vulnerability Assessment

Individual dams will have different potential impacts. The discussions in the sections below are general, and assume the dam has a high hazard potential classification.

Infrastructure Impact

Dam failure can impact roadways, including interstates and state routes, by blocking them due to high water or by filling them with debris. Water, sediment, and refuse materials from a dam failure can permanently damage or destroy homes and businesses.

Population Impact

Dam failure has caused damage to homes in the past by rapidly washing away properties. After dam failure events, shelter may need to be provided to those impacted by the event. Deaths and injuries are also possible during dam failure events.

For social vulnerability, dam/levee failure is not in the National Risk Index as it is not a natural disaster. However, natural disasters like flooding can occur due to or as a result of dam failure. The risk index for flooding in Miami County is 54.3 (“relatively low”), as such the risk for dam failure would also be relatively low. People that are most vulnerable to dam/levee failure are those who live within the dam inundation areas. The index indicates an expected annual loss of $670,000 due to flood events with 1.8 events occurring per year.

Property Damage

During a dam failure, large amounts of water, sediment, and refuse materials can inundate communities downstream and cause permanent destruction to homes and buildings in the floodplain.

Loss of Life

Loss of life is possible during a Class I dam failure, especially when the failure occurs unexpectedly or without warning, or when there is no evacuation protocol in place. The potential for loss of life is heightened by Class I dams due to the volume of water impounded by the dam. The loss of life would likely be the result of drowning in the flood waters or being trapped in a structure that is damaged or collapsed due to the flooding.

Economic Losses

Dam failure floods can halt economic activity, block roadways, and destroy agricultural crops. Building contents are also likely to be lost during a failure event, especially for properties located downstream or within the floodplain.

Miami Conservancy District (MCD)

The Miami Conservancy District contains five dams and 55 miles of levees. Each City that as one of these dams or levees has caretakers to maintain them. A dam failure within the watershed could lead to a cascading effect. Flooding caused by a dam failure within the watershed could cause severe environmental consequences, such as altering the natural course of the river, lowering water quality through debris and pollutants, and negatively impact aquatic ecosystems.

Loss of life and economic damage could also be high, depending on the hazard potential of the dam. Please see section **4.1.3. Extent** for a discussion of the hazard potential dam classes.

4.1.7 Future Trends

Land Use and Development Trends

Any development near dams should occur in coordination with floodplain managers and private dam owners or managers. While development is unlikely to cause dam failure, nearby development will be at risk if a dam failure occurs.

Climate Change

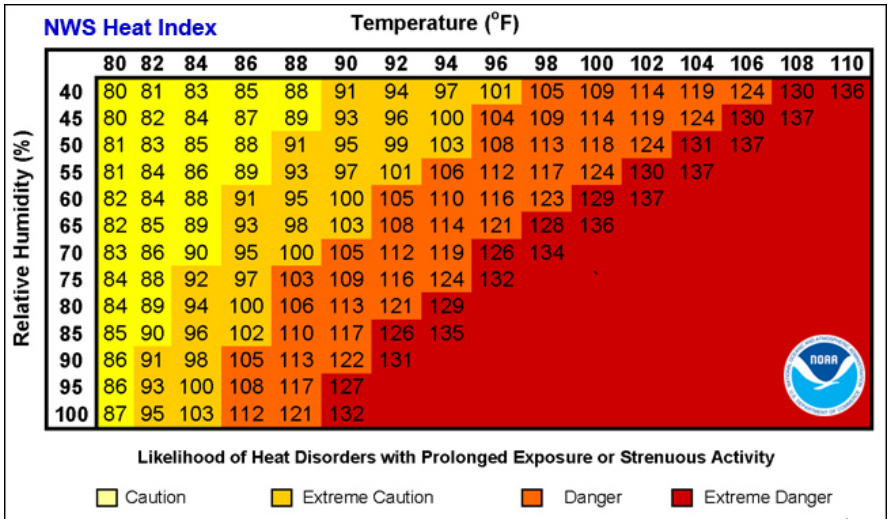
Climate change may increase the frequency and/or the severity of the impacts from a dam failure event. Climate change is having an uneven effect on precipitation (rain and snow) in the U.S. – some areas are experiencing increased precipitation and flooding, while others suffer from drought. If Miami County experiences effects of climate change related to heavy rainfall, more frequent and severe flooding could occur, which could lead to or be caused by dam failure. Aging dam infrastructure coupled with climate change could result in more frequent dam failures. According to the 2018 National Climate Assessment, dams and levees can fail after moderate or extreme rainfall. As precipitation frequency and intensity increase with climate change, the probability and severity of dam failure may increase as well, especially if this infrastructure is not maintained, upgraded, or, if necessary, redesigned.

4.2 Drought & Extreme Heat

4.2.1 Description

According to the Federal Emergency Management Agency (FEMA), extreme heat is a period of high heat and humidity with temperatures above 90 degrees for at least two to three days. In extreme heat the human body works extra hard to maintain a normal temperature, which can lead to death. Extreme heat is responsible for the highest number of annual deaths among all weather-related hazards. Humid conditions, which add to the discomfort of high temperatures, occur when a high-pressure weather system traps hazy, moist air near the ground. Extreme heat may also contribute to the formation of a drought if moisture and precipitation are lacking. The National Weather Service's Heat Index Chart is provided in Figure 4.2.1.

Figure 4.2.1: Heat Index Chart (Source: National Weather Service)



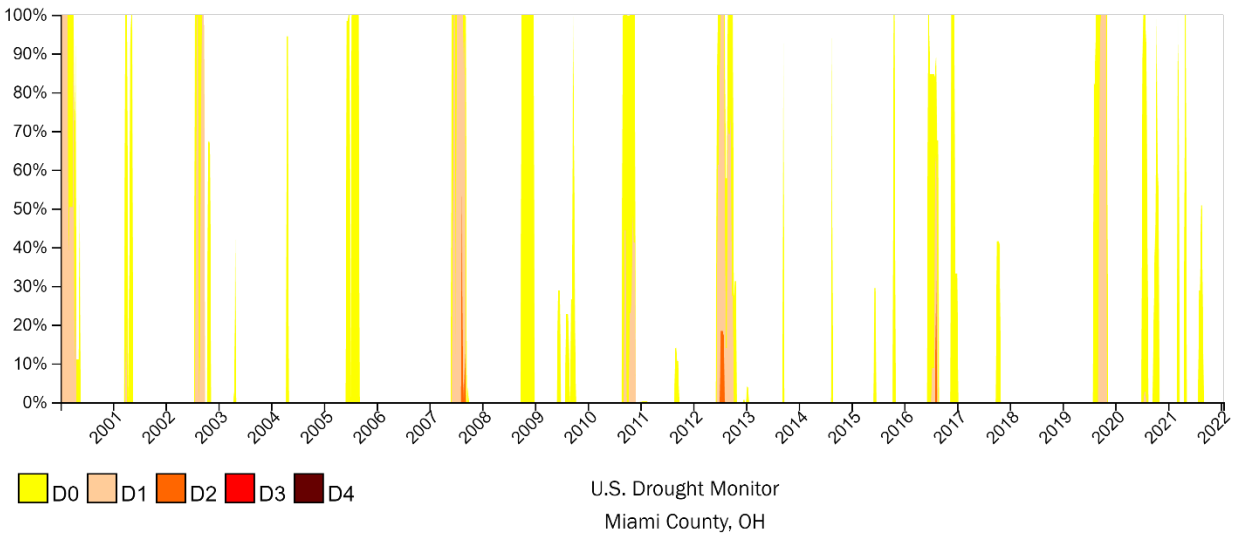
Extreme heat events are often accompanied by drought conditions when the events are prolonged. A drought is a shortage in atmospheric moisture or precipitation over an extended period. Droughts are common throughout all climatic zones and can range in length from a couple weeks to multiple years or decades in some areas. In 2012, Miami County experienced the most intensive drought conditions, with 100% of the County considered to be in at least a Moderate Drought (D1) and 20% of the County in a Severe Drought (D2).

According to the National Oceanic and Atmospheric Administration (NOAA), there are three common types of droughts: Meteorological, Agricultural, and Hydrological. Meteorological drought severity is calculated by the amount of the rainfall deficit (compared to annual averages) and the length of the dry period. Agricultural drought is based on the effects to agriculture by factors such as rainfall and soil water deficits or diminished groundwater/reservoir levels needed for irrigation. Hydrological drought is based on the effects of rainfall shortages on the water supply, such as stream flow, reservoir and lake levels, and groundwater table decline.

4.2.2 Location

Drought (and extreme heat) is a countywide hazard that can affect all locations and jurisdictions in Miami County. More specifically, this hazard typically occurs at a regional scale. Droughts most commonly occur in Ohio from spring through autumn; however, they may occur at any time throughout the year. Figure 4.2.2 depicts the drought monitor history for Miami County from 2000 through 2021. The drought in the summer and fall of 2012 was one of the worst on record for Miami County.

Figure 4.2.2: Drought in Miami County from 2000 to 2021



D0 = Abnormally Dry, D1 = Moderate Drought, D2 = Severe Drought, D3 = Extreme Drought, D4= Exceptional Drought

4.2.3 Extent

Due to the regional nature of droughts and extreme heat events, effects may be noticed throughout the County in both the urbanized and rural areas. All jurisdictions with the County may be affected in a single drought event. In Miami County, droughts are often linked to prolonged periods of above average temperatures and little to no precipitation.

Initial effects of drought can be noticed within a short period, as soils may dry out and plants may wither and die. When drought conditions persist over several weeks, months, or years, effects may be more pronounced with reductions in water levels of wells, lakes, reservoirs, streams, and rivers. Water supply issues for agriculture, commercial/industrial activities, and private consumption may arise if drought conditions persist over a long term.

The extent of the drought is determined by the Palmer Drought Severity Index (PDSI), shown below in **Table 4.2.1.** In this way, the Index can be utilized as a tool to help define disaster areas and indicate the availability of irrigation water supplies, reservoir levels, range conditions, amount of stock water, and potential for forest fires. The Palmer Drought Severity Index depicts prolonged (in months or years) abnormal dryness or wetness and is slow to respond, changing little from week to week. It also reflects long-term moisture runoff, recharge, and deep percolation, as well as evapotranspiration.

Table 4.2.1: Palmer Drought Severity Index Classifications and Federal Drought Categories

Palmer Drought Severity Index	Category	Description
-1.0 to -1.9	D0	Abnormally Dry
-2.0 to -2.9	D1	Moderate Drought
-3.0 to -3.9	D2	Severe Drought
-4.0 to -4.9	D3	Extreme Drought
-5.0 or less	D4	Exceptional Drought

The Palmer Drought Severity Index is a standardized index with values typically falling between -4.00 and +4.00, although extreme conditions can be greater in value (includes federal drought categories).

Negative values indicate drought conditions while positive values represent wet conditions. Values around zero represent near normal conditions.

Abnormally dry (D0) and moderate drought (D1) conditions occur frequently and typically do not adversely affect agricultural activities unless conditions are sustained in nature. Severe and extreme drought (D2 & D3, respectively) conditions begin to impact agricultural crops, leading to potential economic losses. These more severe events also may impact drinking water resources, especially if the source is a lake or reservoir. Sustained severe droughts may alter the ability of the soil to absorb water, leading to potential flash flooding when rainfall resumes.

Drought conditions can contribute to the escalation of risk of wildfires due to the prevalence of agricultural land throughout Miami County. A wildfire is an uncontrolled fire that burns an area of combustible vegetation and typically occurs in rural areas. The Ohio Department of Natural Resources (ODNR) identifies Ohio's wildfire seasons as occurring primarily in the spring (March, April, and May) before vegetation has "greened-up" and in the fall (October and November) when lead drop occurs. During these times and especially when weather conditions are warm, windy with low humidity, cured vegetation is particularly susceptible to burning.

Wildfires will most likely impact Miami County through property and crop damage.

4.2.4 History

U.S. Drought Monitor (USDM) describes severe drought as a time when crops suffer, the numbers of wildfires are high and the soil is dry, cracked and pulling away from foundations. In an extreme drought, yields are minimal, livestock are stressed, and lawns go dormant. Data shows that Miami County has experienced severe drought four times since the year 2000. Periods of severe drought specific to Miami County are provided in Table 4.2.2 (Source: U.S. Drought Monitor).

Table 4.2.2: Periods of Drought in Miami County, Ohio, 2000-2021

Start Date	End Date	# Consecutive Weeks
8/14/2007	8/27/2007	2
9/4/2007	9/10/2007	1
7/10/2012	8/13/2012	5
8/9/2016	8/15/2016	1

According to the State of Ohio Enhanced Hazard Mitigation Plan, Miami County experienced 69 total fire events from January 1, 2007 to December 31, 2017 which average to approximately 6 events per year. These events burned a total of 407 acres, averaging 5.9 acres per event. Of the 69 events, 56 events (81 percent) burned less than ten acres, while 13 events (19 percent) burned between ten and 99.9 acres.

Severe Drought (D2), July-August 2012

Dry conditions began in the spring and early summer continued into July 2012. Combined with extreme heat, substantial crop loss was experienced throughout the County and across much of the state. Rainfall was widely scattered and was not sufficient to break the drought until mid-August.

4.2.5 Probability

Miami County has experienced droughts in the past, and the potential exists for the County to experience droughts in the future. Seasons of drought and extreme heat have the potential to occur during any particular year, when necessary, conditions are met. More specifically, the County has record of four severe drought events from 2000 to 2021, which amounts to an approximate 20 percent chance of a drought occurring any given year. A more detailed commodity loss analysis is provided in the Vulnerability Assessment, below.

4.2.6 Vulnerability Assessment

Drought projections suggest that some regions of the U.S. will become drier and that most will have more extreme variations in precipitation. Even if current drought patterns remained unchanged, warmer temperatures will amplify drought effects. Drought and warmer temperatures may increase risks of large-scale insect outbreaks and wildfires. Drought and warmer temperature may accelerate tree and shrub death, changing habitats and ecosystems in favor of drought-tolerant species. Forest and rangeland managers can mitigate some of these impacts and build resiliency in forests through appropriate management actions. Miami County is primarily agricultural outside of the urbanized/developed areas and does not have any recognized forests or rangelands.

Infrastructure Impact

Drought does not have a significant impact on infrastructure or structures. The greatest impacts of drought are on agricultural interests, as crops may fail, and livestock may not have sufficient water resources. Economic losses are the greatest threat from droughts to Miami County. According to the 2017 Census of Agriculture developed by the United States Department of Agriculture (USDA), top crop items based on acreage for Miami County include soybeans for beans, corn for grain, and wheat.

Population Impact

Although there is no history of population impact, extreme heat can have an impact on the population of the entire county. Groups who live in areas with minimal tree cover or urban areas may experience higher temperatures relative to outlying areas due to the urban heat island affects. Groups that particularly vulnerable to extreme heat, such as older adults and people with chronic health conditions may experience illness or injury, such as heat cramps, heat exhaustion, and heat stroke.

For social vulnerability, the National Risk Index does not have a rating for drought, but it does have a rating for "Heat Wave" for a score of 39.4 ("relatively low"), due to the history of minimal population impacts in the County. The index indicates an expected annual loss of $47,000 due to heat wave events with 0.9 events occurring per year.

Property Damage

During extreme heat events, utility failure may occur due to overuse of electricity for cooling. Property damage is a possibility due to extreme heat. Vehicles are at risk of breaking down from excessive heat, as heat can reduce battery life and reduce the efficiency of the cooling system resulting in overheated engines. Extreme heat can also cause a home to dry out and prematurely age. Excessive heat in combination with lack of rainfall (drought) can cause soil to shrink and crack, which puts stress on a home's foundation that can be costly to fix. Drought and warmer temperatures may increase risks of large-scale insect outbreaks and wildfires. Drought and warmer temperatures may also accelerate tree and shrub death, changing habitats and ecosystems in favor of drought-tolerant species.

Loss of Life

Loss of life is possible during extreme heat events, especially for young children, the elderly, and individuals with respiratory conditions.

Economic Losses

Economic losses are a threat from extreme heat and droughts to Miami County. Crops and livestock may be compromised during prolonged extreme heat events. Human productivity can also be affected when working conditions become too hot. According to the United States Department of Agriculture County Estimates for Ohio State the number of acres harvested, and bushels produced for Soybeans and Corn decreased between 2021 and 2022. Corn acres planted increased between 2021 and 2022, however crop yields decreased by 1,300 acres and 1,834,000 bushels. Overall, there was a

decrease in production value for corn and soybeans, equaling a loss of approximately $22,370,000 between 2021 and 2022 **(Table 4.2.3)**.

Table 4.2.3: Miami County Crop Yields 2021 to 2022

Commodity	Soybeans			Corn		
	Change	2022	2021	Change	2022	2021
Planted (Acres)	-800	81,800	82,600	200	73,400	73,200
Harvested (Acres)	-600	81,700	82,300	-1,300	70,000	71,300
Production (Bushels)	-732,000	4,404,000	5,136,000	-1,834,000	12,383,000	14,217,000
Price Per Unit	-	$14.40	$14.40	-	$6.45	$6.45
Production Value	-$10,540,00	$63,417,000	$73,958,000	-$11,829,000	$79,870,000	$91,699,000

4.2.7 Future Trends

Land Use and Development Trends

Drought is most likely to impact agriculture land uses and land uses that house or serve vulnerable populations, such as schools, daycares, hospitals, and nursing homes.

Climate Change

Climate change may increase the frequency and/or the severity of the impacts from drought and extreme heat events. As the climate gets warmer, there will be an associated increase in the number and severity of droughts and extreme heat events. Warmer global temperatures may be associated with a prolonged growing season, but this trend may also increase the risk of crop stress due to excessive heat and crop damage due to increased pests and disease. The longer growing season may help some crops but crops like corn and soybean will be negatively affected by the severe heat in the summer, which will decrease these crops' yields. Additionally, in recent Ohio history, there has not been a recorded instance of excessive heat for more than two days, but climate change is expected to increase the occurrence and duration of heat waves in the coming decades.

4.3 Earthquakes

4.3.1 Description

Earthquakes are sudden and rapid movements of the Earth's crust and are caused by the abrupt shifting of rocks deep underneath the earth's surface. These movements vary in length and may last from a few seconds to several minutes.

The seismicity, or seismic activity, of an area refers to the frequency, type, and size of earthquakes experienced over a period of time. Earthquakes are measured using observations from seismometers. The Moment Magnitude Scale (MMS), which was developed in the 1970s, is the most common scale on which earthquakes larger than approximately 5.0 in magnitude are reported for the entire world. Earthquakes smaller than magnitude 5.0, which are more numerous, are reported by national seismological observatories and measured most commonly on the local magnitude scale – also referred to as the Richter Scale. These two scales are numerically similar over their range of validity. Earthquakes of magnitude 3.0 or lower are often almost imperceptible or weak, while earthquakes of magnitude 7.0 or greater can potentially cause serious damage over larger areas.

Damage from an earthquake also depends on the earthquake's depth in the Earth's crust. The shallower an earthquake's epicenter, the more damage to structures it will cause. Alternatively, an earthquake can also be measured by its intensity. The Modified Mercalli Intensity Scale (MMI) ranges in value I to XII, in roman numerals (**Table 4.3.1**).

Earthquakes can happen anywhere without warning; they are low-probability, high-consequence events. Most major earthquakes in the U.S. have occurred in California as well as in Alaska, Hawaii, Oregon, Puerto Rico, Washington and the entire Mississippi River Valley. There have been recorded earthquakes throughout the U.S., and the Ohio River Valley has experienced earthquakes exceeding the 3.0 magnitude within the last 25 years.

4.3.2 Location

Earthquakes are countywide hazards and can affect all areas and jurisdictions within Miami County. According to the Ohio Department of Natural Resources, Ohio is located on the periphery of the New Madrid Seismic Zone, an area in and around Missouri that was the site of the largest earthquake sequence to occur in the country. Additionally, West Central Ohio is the area of Ohio with the highest risk for earthquakes in the State.

4.3.3 Extent

Earthquakes pose a risk to life and property depending on the severity. To monitor earthquakes, the State of Ohio and the Ohio Department of Natural Resources (ODNR) Division of Geological Survey coordinates a 21-station network (**Figure 4.3.1**) of seismograph stations throughout the state in order to continuously record earthquake activity. The Ohio Seismic Network (OhioSeis) stations are distributed across the state but are concentrated in the most seismically active areas or in areas that provide optimal conditions for detecting earthquakes. While the seismic network cannot predict earthquakes or provide an alert prior to an event, it can provide insight into earthquake risks in the state so that intelligent decisions about building and facility design and construction, insurance coverage, and other planning decisions can be made by individuals, business and industry, and governmental agencies.

The Vernon A Luthman WA (VLOH) seismometer situated in central Shelby County, the Sycamore State Park Station (SSPO) in Montgomery County, and the Kiser Lake State Park Station (KLOH) seismometer situated in western Champaign County are located in the closest proximity to Miami County. Seismic station 049A of United States Geological Survey (USGS) US Array is located in Newberry Township in northwestern Miami County.

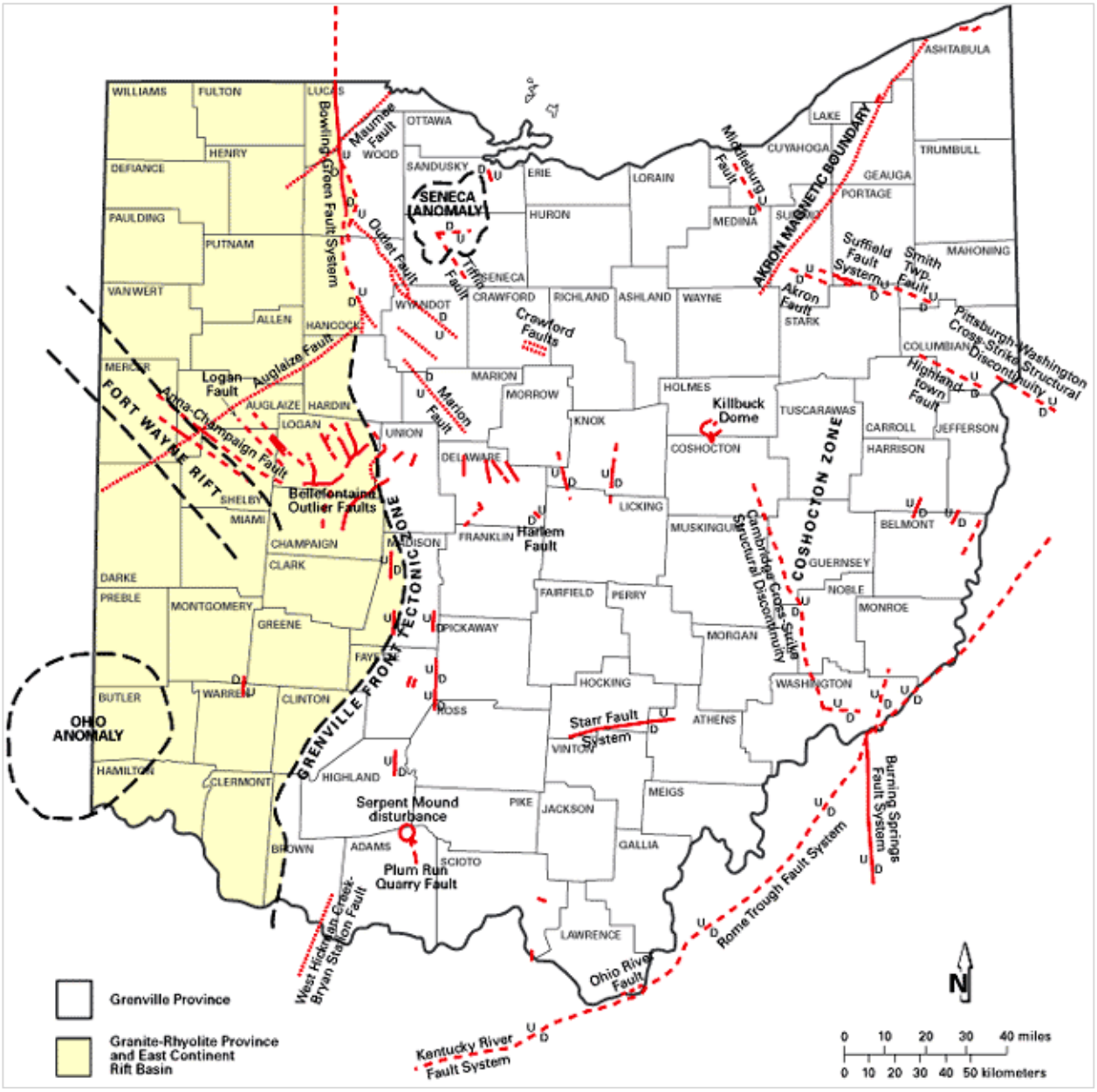
Earthquakes can yield a variety of different outcomes. With the ground shaking associated with earthquake events, buildings have a high potential to be impacted. If soil liquefaction, or the mixing of sand and soil with groundwater occurs, buildings can sink into the ground. Earthquakes also have the potential to rupture dams or levees along a river, resulting in flooding and even tsunamis (see Dam Failure section). Earthquakes can cause landslides or avalanches in high-risk areas and can cause mines to subside. Furthermore, earthquakes that break gas and power lines can result in fires.

Table 4.3.1: Modified Mercalli Intensity Scale

Modified Mercalli Intensity Scale		Magnitude
I	Detected only by sensitive instruments.	1.5
II	Felt by few persons at rest, especially on upper floors; delicately suspended objects may swing.	2
III	Felt noticeably indoors, but not always recognized as earthquake; standing autos rock slightly, vibrations like passing truck.	2.5
IV	Felt indoors by many, outdoors by few, at night some awaken; dishes, windows, doors disturbed; standing autos rock noticeably.	3
V	Felt by most people; some breakage of dishes, windows, and plaster; disturbance of tall objects.	3.5
VI	Felt by all, many frightened and run outdoors, falling plaster and chimneys, damage small.	4
VII	Everybody runs outdoors; damage to buildings varies depending on quality of construction; noticed by drivers of autos.	4.5
VIII	Panel walls thrown out of frames; walls, monuments, chimneys fall; sand and mud ejected; drivers of autos disturbed.	5
IX	Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken.	5.5
X	Most masonry and frame structures destroyed; ground cracked, rails bent, landslides.	6
XI	Few structures remain standing; bridges destroyed, fissures in ground, pipes broken, landslides, rails bent.	6.5
XII	Damage total; waves seen on ground surface, lines of sight and level distorted, objects thrown up into air.	7 7.5 8

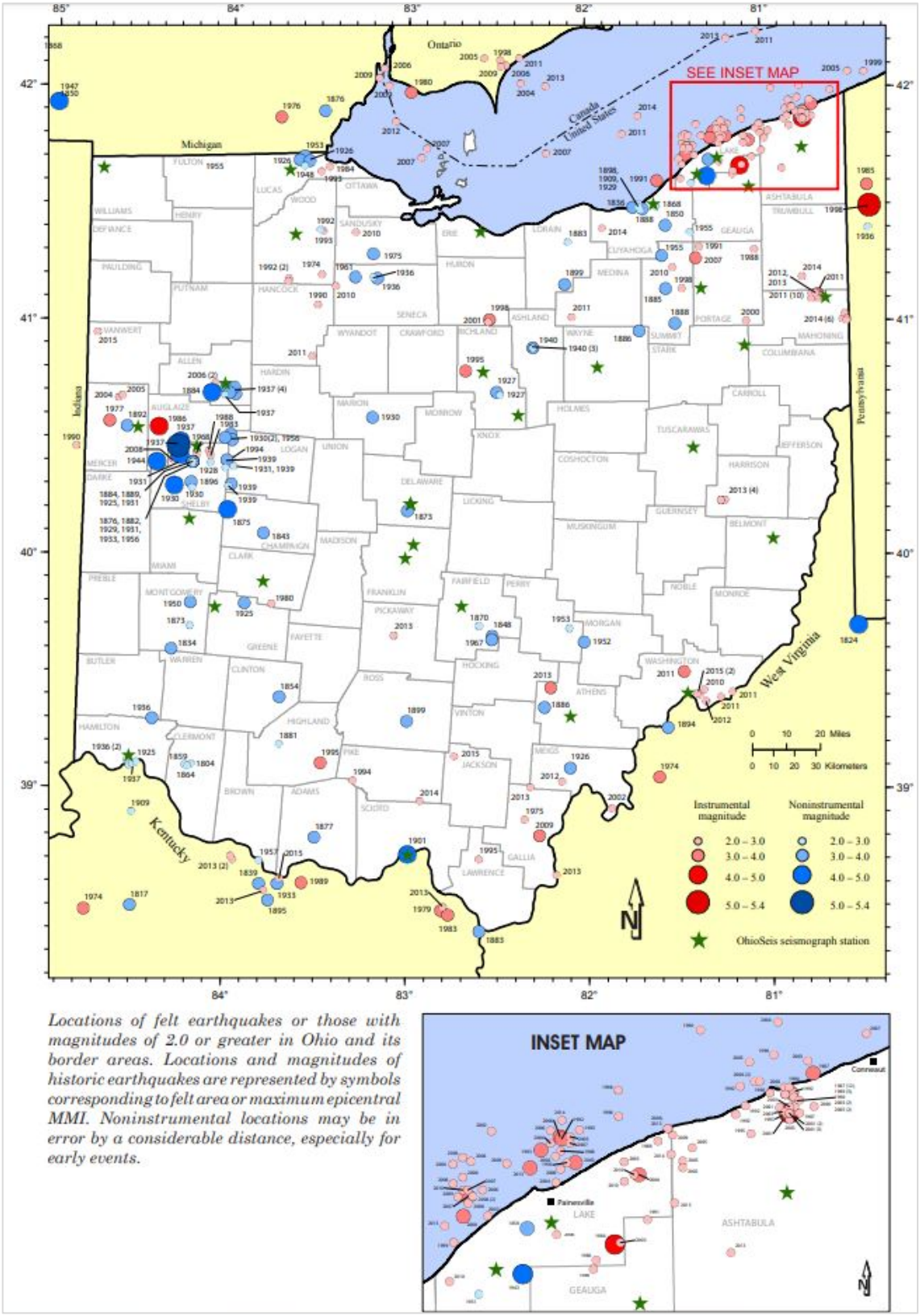
Source: ODNR

Figure 4.3.1 Map of Deep Structures in Ohio



Source: ODNR

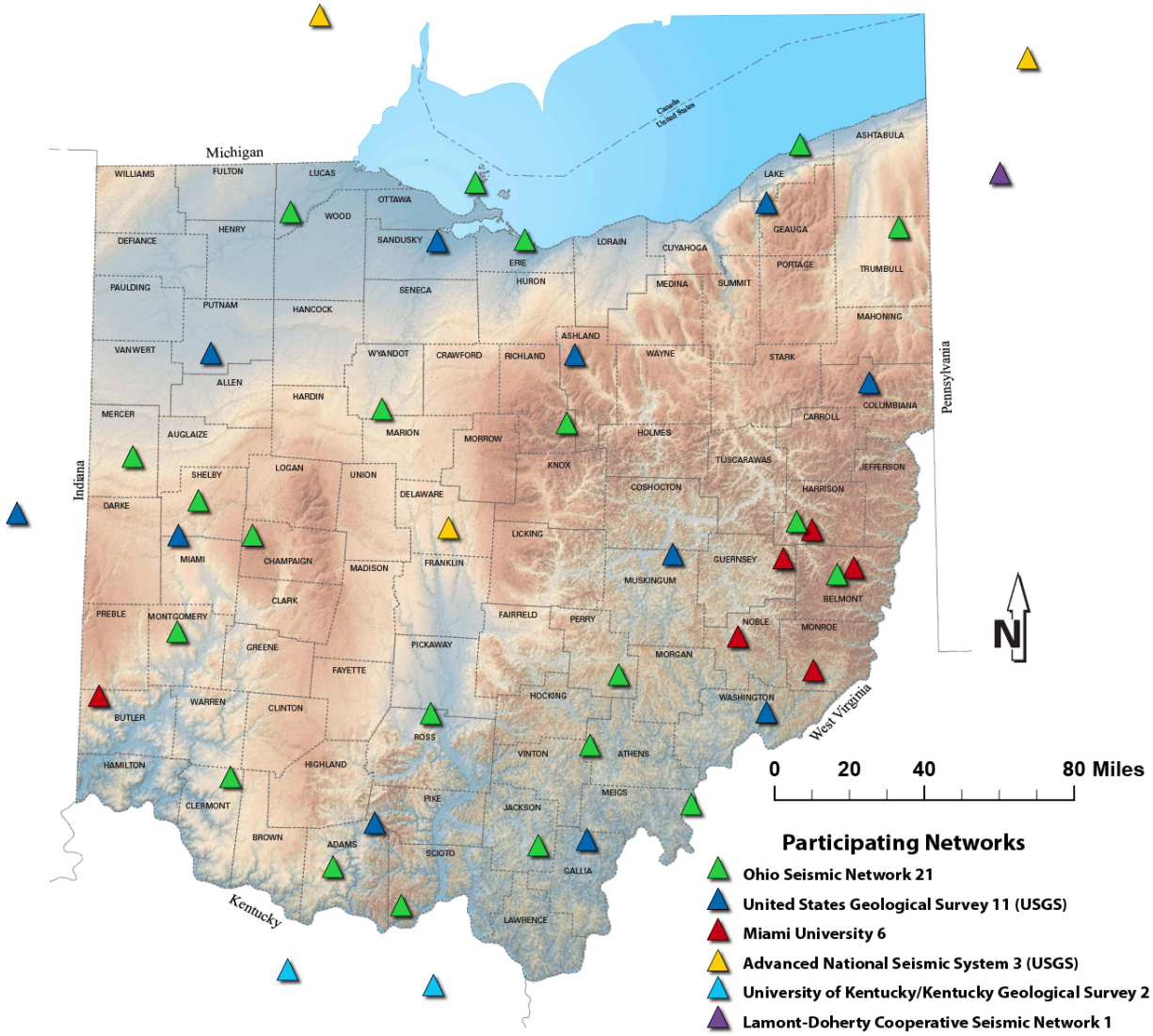
Figure 4.3.2: Earthquake Epicenters and Seismometers in Ohio



Locations of felt earthquakes or those with magnitudes of 2.0 or greater in Ohio and its border areas. Locations and magnitudes of historic earthquakes are represented by symbols corresponding to felt area or maximum epicentral MMI. Noninstrumental locations may be in error by a considerable distance, especially for early events.

Source: ODNR

Figure 4.3.3: Ohio and Cooperative Seismic Monitoring Network Stations



Source: ODNR

4.3.4 History

The State of Ohio has experienced more than 300 earthquakes since 1776. Most of these events have been small in 2 to 3 magnitude range, while fifteen (15) earthquakes have caused minor-to-moderate damage. The largest historic earthquake in western Ohio was centered in Shelby County in 1937. This event was estimated to have had a magnitude of 5.4 on the Richter scale. **Figures 4.3.2 and 4.3.3**, above, displays epicenters of all historical earthquakes with a magnitude greater than 2.0, as well as the location of seismometers in the State of Ohio.

The Ohio Department of Natural Resources (ODNR) and the United States Geological Survey (USGS) maintains a record of earthquake events. No known earthquakes are thought to have originated in Miami County, though earthquakes originating in neighboring counties may have been felt in Miami County in the last 10 years. Earthquakes registering at 2.0 or greater are supplied below.

Earthquake in Shelby County on January 15, 2021

A 2.1 magnitude earthquake with weak shaking was recorded in Shelby County on January 15, 2021 at 12:22 AM EST. The epicenter of this event was located in Dinsmore Township (40.434°N, 84.111°W). It had a depth of about 4.2 miles (6.7km). There are no reported damages or losses of life from this event.

Earthquake in Shelby County on July 14, 2020

A 2.5 magnitude earthquake with weak shaking was recorded in Shelby County on July 14, 2020 at 6:41 PM EST. The epicenter of this event was located in Dinsmore Township (40.421°N, 84.109°W. It had a depth of about 1.5 miles (2.37km). There are no reported damages or losses of life from this event.

4.3.5 Probability

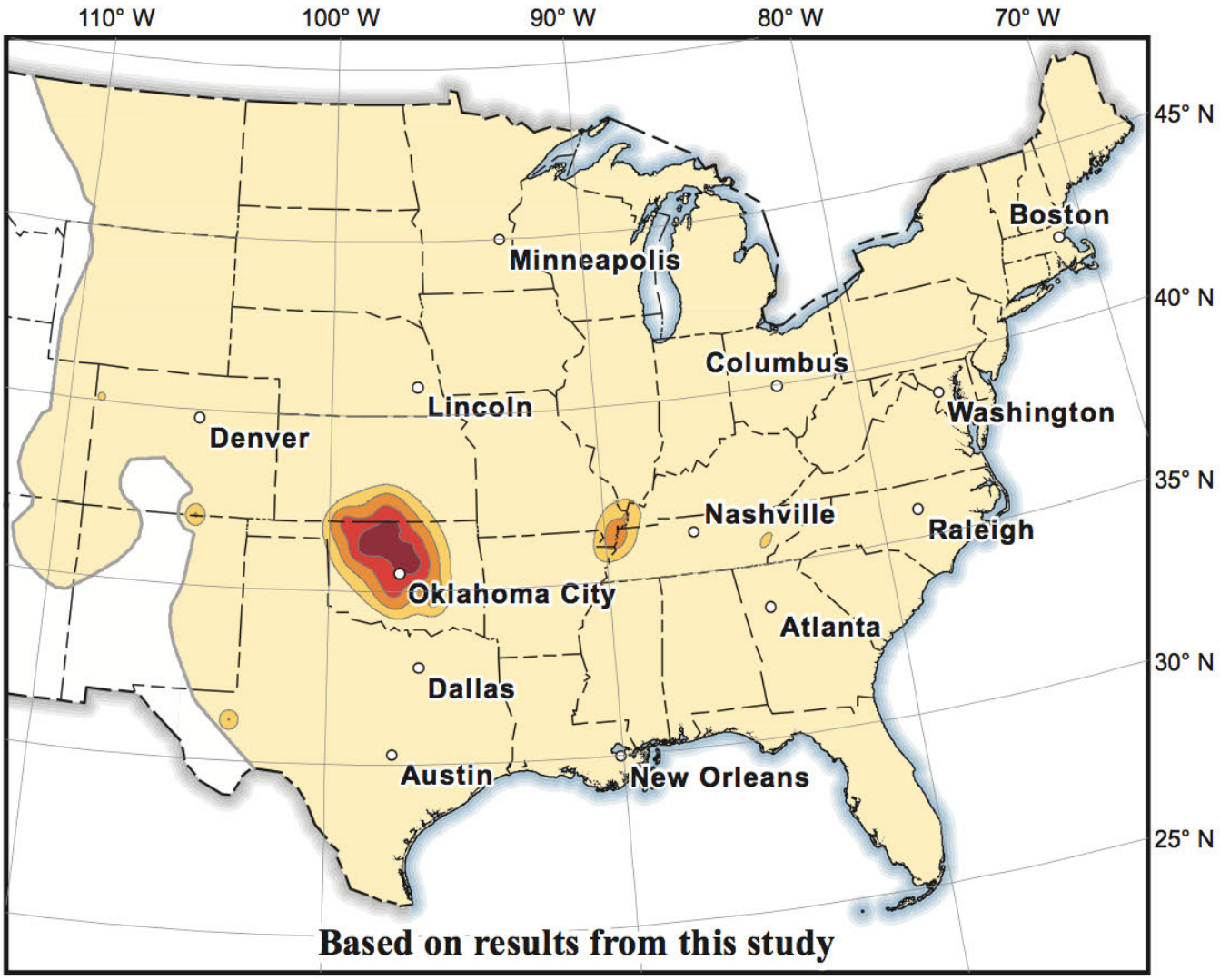
The USGS has both long-term and short-term probabilistic seismic hazard forecasts. In the 2018 one-year probabilistic seismic hazard forecast, the United States Geological Survey estimates that there is a less than one percent chance of potentially minor-damage ground shaking in 2018 for Miami County (**Figure 4.3.4**).

The USGS also determined the long-term hazard of earthquakes for the United States (**Figure 4.3.5**). The measurement used in this estimation is based on the chance of ground shaking – peak ground acceleration – as a percentage of the natural force of gravity over time. This map identifies that most of Miami County has the probability of experiencing an earthquake between 4 and 10 times in 10,000 years.

The USGS also prepared national seismic hazard maps (NSHMP) for the United States. These time-independent maps are shown for 2-percent and 10-percent probability of earthquake ground-shaking exceedance levels at specified probabilities over a 50-year time period at several hundred thousand sites across the United States. The map (**Figure 4.3.6)** identifies that Miami County has an 8- to 10-percent of peak ground acceleration for 2-percent probability of exceedance in 50 years in the southern third of the County and increasing to a 14- to 20-percent probability in the northern third of the County.

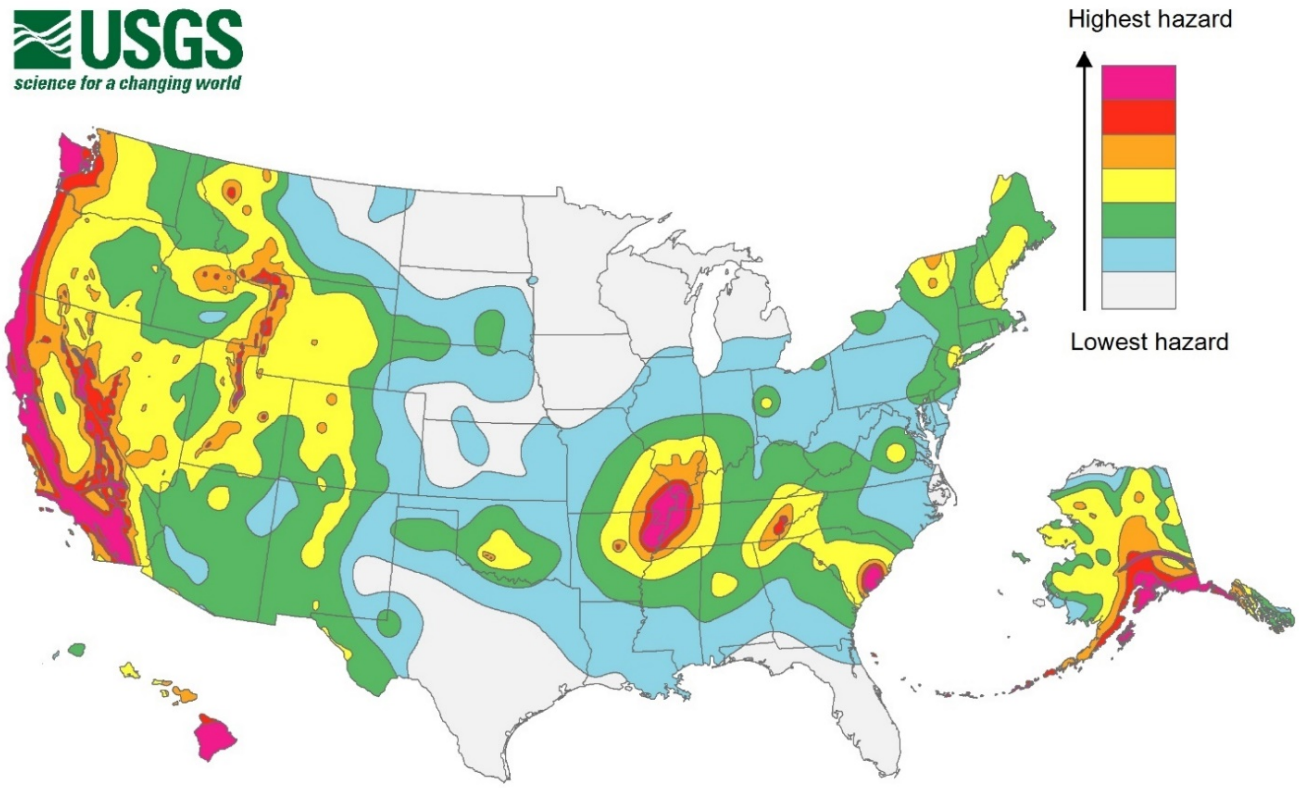
Furthermore, the ODNR indicates that the brief historic record of Ohio earthquakes suggests a risk of moderately damaging earthquakes in the western, northeastern, and southeastern parts of the State.

Figure 4.3.4: Chance of Potentially Minor-Damage Ground Shaking in 2018



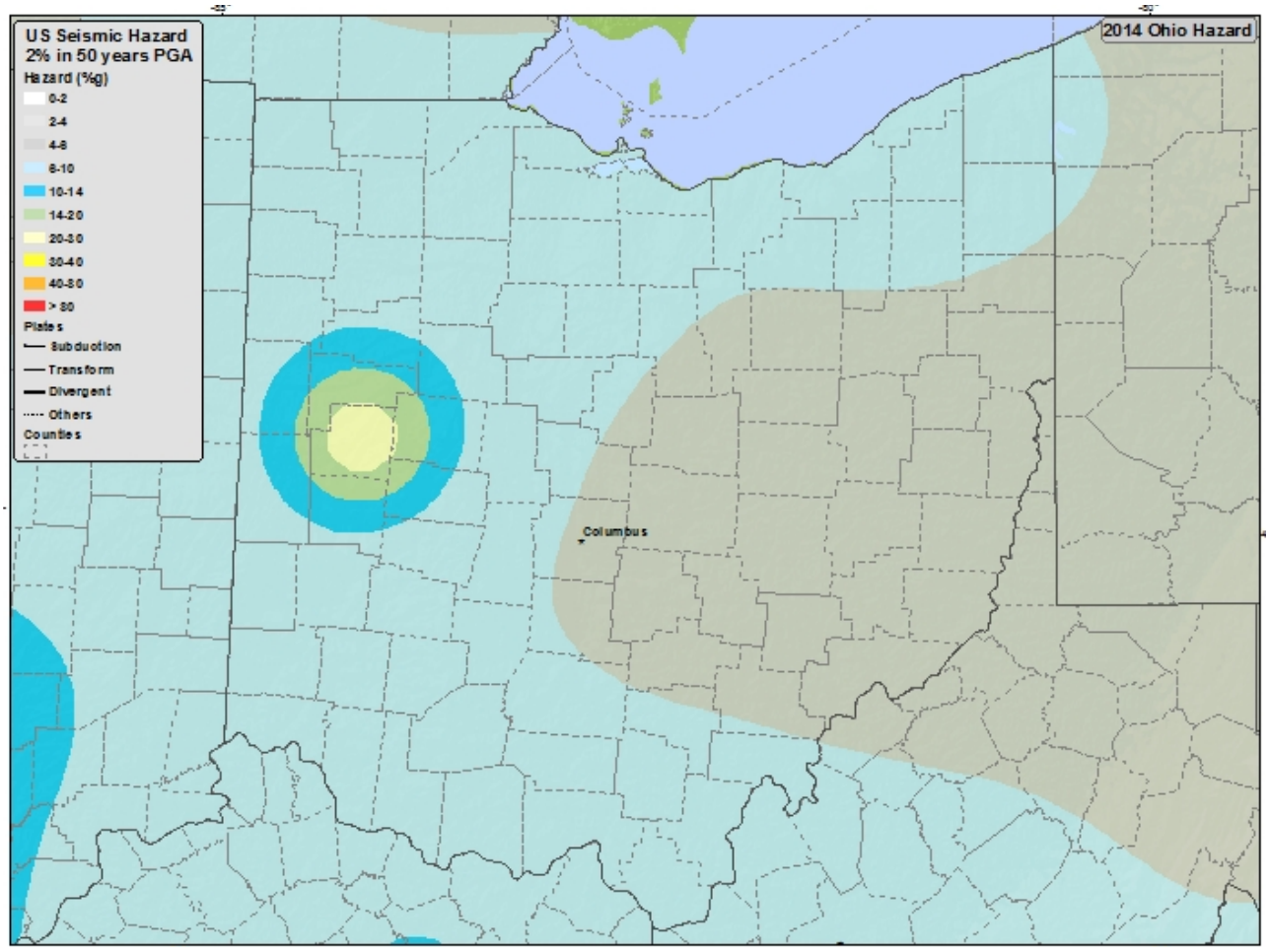
Source: USGS

Figure 4.3.5: Probability of Earthquakes in the United States



Source: USGS

Figure 4.3.6: 2014 Seismic Hazard Map of state of Ohio



4.3.6 Vulnerability Assessment

Infrastructure Impact

Since there are no recent earthquake events with recorded damages, exact damages to infrastructure are unknown. Buildings, roadways, and utilities, such as gas and power lines have the potential to be affected. Since the probability of an earthquake occurring in Miami County is less than one percent, there is a low risk of impact to infrastructure as a result.

Population Impact

There is a low risk of earthquakes occurring in Miami County. Accordingly, there is low risk of impact to the population. If an earthquake would occur within the County, the population could be impacted by loss of homes, loss of utilities, as well as potential reduction of air quality.

For social vulnerability, the National Risk Index indicates that the population in Miami County has a score of 80.2 ("relatively low"). Earthquakes are unlikely to occur in Miami County; therefore, the population is unlikely to be affected by earthquakes. Socially vulnerable populations may be more affected by earthquakes if they live in older housing units or apartment complexes that do not have adequate earthquake-resilient infrastructure. The index indicates an expected annual loss of $1.1 million due to earthquakes with a less than 0.070 percent chance of an event occurring per year.

Property Damage

With any earthquake event, there is potential for property damage to occur, as ground shaking can lead to damaged buildings. Due to the non-site-specific nature of this hazard, all structures within Miami County have potential impacts from earthquakes. FEMA's Hazus Earthquake model estimated the potential impacts that could occur in Miami County if a 5-magnitude earthquake occurred. **Tables 4.3.2 to 4.3.5** include the estimated impact quantities.

Loss of Life

Miami County has no recorded earthquake events that have resulted in loss of life; however, in the event that an earthquake occurs, there is potential for loss of life. If there are more people and structures in an earthquake prone location, there is likely to be more of an impact. Loss of life can be mitigated by educating the public on proper protection in the event of an earthquake. For example, the USGS resources on preparing for an Earthquake hazard (USGS Resources for Earthquake Preparedness) as well as the Ready Campaign (Ready.gov) is a national public service campaign designed to educate and empower the American people to prepare for, respond to, and mitigate disasters. These resources provide materials for how to educate the public on earthquake preparedness.

Economic Losses

Earthquakes have the potential to damage buildings and infrastructure, resulting in economic burden of clean up and repairs. Compared with other hazards, earthquakes are relatively unlikely to occur in Miami County, meaning there is low risk of economic loss as a result of an earthquake.

However, according to FEMA's Hazus Earthquake model (**see Appendix E**), if a 5-magnitude earthquake were to occur in Miami County, the total economic losses are estimated at $3,400.26 million, including building and lifeline-related losses. The total building-related losses were $3,117.27 million, and 18 percent of the estimated losses were related to the business interruption of the region. The largest loss was sustained by residences, which made up over 31 percent of the total loss. Hazus estimates that about 9,876 buildings will be at least moderately damaged, which is over 20 percent of existing buildings in the region, and there will be an estimated 634 buildings that will be damaged beyond repair. **Table 4.3.2** shows the potential building-related economic impacts.

Table 4.3.2: Structure Vulnerability from Earthquakes

Occupancy	$ Million	Percentage
Single Family	$783.56	25.1%
Other Residential	$174.58	5.6%
Commercial	$1,102.77	35.4%
Industrial	$466.95	15.0%
Others	$589.40	18.9%
Total	$3,117.26	100%

Additionally, Hazus estimated the potential damage to essential critical facilities, transportation lifelines, and utility lifelines, as shown in **Tables 4.3.3, 4.3.4, and 4.3.5**, respectively.

Table 4.3.3: Potential Damage to Essential Critical Facilities from Earthquakes

Classification	Total Facilities	Number Damaged	Percent Damaged
Hospitals	2	0	0.00%
Schools	48	9	18.75%
EOCs	6	0	0.00%
Police Stations	9	0	0.00%
Fire Stations	16	2	12.50%
Total	81	11	13.58%

Table 4.3.4: Potential Damage to Transportation Lifelines from Earthquakes

System	Inventory Value ($ Million)	Economic Loss ($ Million)	Loss Percentage
Highways & Bridges	$1,558.49	$12.08	0.78%
Railways & Bridges	$339.04	$2.80	0.83%
Bus	$0.00	$0.00	0.00%
Ferries & Ports	$0.00	$0.00	0.00%
Airports	$8.94	$0.85	9.51%
Total	$1,906.47	$15.73	0.83%

Table 4.3.5: Potential Damage to Utility Lifelines from Earthquakes

System	Inventory Value ($ Million)	Economic Loss ($ Million)	Loss Percentage
Potable Water Lines	$77.39	$2.27	2.93%
Wastewater Facilities	$1,123.04	$177.71	15.82%
Natural Gas Pipelines	$16.97	$0.16	0.94%
Crude & Refine Oil	$0.00	$0.00	0.00%
Electric Power Facilities	$158.30	$87.03	54.98%
Communications Facilities	$0.21	$0.08	38.10%
Total	$1,375.91	$267.25	19.42%

4.3.7 Future Trends

Land Use and Development Trends

While incidence and likelihood of earthquakes is low in Miami County, all communities are at low risk. By planning for and managing land use to accomplish social, ecological, and economic sustainability, communities can reduce the negative impacts caused by earthquakes. This can be accomplished through comprehensive land-use plans and supportive federal and state policies. As such, enforcement of stricter building codes that ensure that all new developments are built up to code can reduce risk. Infrastructure (constructed facilities and lifelines) should be designed and constructed to resist earthquake shaking following the current state-of-the-art engineering and technology practices.

Climate Change

Climate change has no known effect on the probability or severity of earthquakes.

4.4 Epidemic/Pandemic

4.4.1 Description

The Centers for Disease Control and Prevention (CDC) defines an epidemic as "an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area." Moreover, the World Health Organization (WHO) defines a pandemic as "an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people."

Epidemics occur when an agent and susceptible hosts are present in adequate numbers, and the agent can be effectively conveyed from a source to the susceptible hosts. More specifically, an epidemic may result from any of the following:

- A recent increase in amount or virulence of the agent
- The recent introduction of the agent into a setting where it has not been before
- An enhanced mode of transmission so that more susceptible persons are exposed
- A change in the susceptibility of the host response to the agent
- Factors that increase host exposure or involve introduction through new portals of entry

While epidemics usually refer to infectious agents, CDC notes that non-infectious diseases such as diabetes and obesity exist in epidemic proportion in the United States. For the purposes of this report, only epidemics referring to infectious agents will be discussed. These types of infectious agents can include bacteria, viruses, fungi, and parasites.

Disease and epidemic can also impact animals that can then carry and spread harmful pathogens to people and cause illness. These are known as zoonotic diseases or zoonoses. In particular, Miami County is concerned with potential outbreaks of the COVID-19 virus, West Nile Virus, and H1N1 Influenza A virus, a virus that can impact swine and other livestock. The most common ways people can get infected with germs that can cause zoonotic diseases are:

- **Direct contact:** with the saliva, blood, urine, mucous, feces, or other body fluids of an infected animal
- **Indirect contact:** with areas or surfaces where animals live and roam
- **Vector-borne:** when bitten by a tick, or an insect like a mosquito or a flea
- **Foodborne:** from eating contaminated food or drinking something unsafe, such as unpasteurized (raw) milk, undercooked meat or eggs, or fruits and vegetables that are contaminated with feces from an infected animal
- **Waterborne:** from drinking or coming in contact with water that has been contaminated with feces from an infected animal

4.4.2 Location

Epidemics can develop with little or no warning and quickly erode the capacity of local medical care providers. A fast-developing epidemic can last several days and extend into weeks or even months in extreme cases. Epidemics can occur at any time of the year, but the warm summer months are favorable for bacteria and microorganism growth resulting in a higher risk for epidemics occurring due to these agents as seen in the case of food poisoning. Food poisoning is commonly caused by bacteria and viruses, sending over 100,000 people in America to the hospital each year. **Figure 4.4.1** indicates otherwise for COVID-19 showing that the winter months have been the deadliest. An epidemic has the potential to affect the entire County but is more likely to occur where living conditions are poor with

lack of hygiene and in densely populated areas such as the Cities of Piqua, Tipp City, and Troy, where many people live or work in close proximity.

4.4.3 Extent

According to the WHO, 70 percent of emerging human pathogens come from animals. As such, some of the most likely epidemics that could locally affect Miami County include animal-sourced pathogens such as influenza A and West Nile Viruses. Furthermore, the ever-growing global interactions can also be a source of infection transfer across borders, especially when people are unaware of the germs they may be carrying.

Such events have the potential to cause serious injury or death to large numbers of people but would cause no damage to private property or structural damage to public facilities. Economic impacts at the individual level could be due to the inability of an infected person to go to work. At its worst, cascading effects could lead to civil unrest, food and fuel shortages, or utility failure due to inability for people to provide services.

Animal Disease and Epidemic

Animal agriculture is an important part of Ohio's economy and its rural areas. However, livestock can carry diseases that can make people sick. Animal-sourced pathogens can spread to humans when contaminated animal products are consumed or by direct contact with animals and their environment, such as influenza A viruses, that only spreads through direct contact with animals.

Ohio Department of Health (ODH), and Ohio Department of Natural Resources (ODNR) provides data on the various diseases that are of concern in Ohio, that are carried and transmitted by animals. Swine Flu - Influenza A virus and its variants, Salmonellosis bacteria, Toxoplasmosis protozoa, and the West Nile Virus have moderate level of risk in Ohio. Fifteen (15) other diseases listed have low levels of risk in Ohio. It is important for the County to monitor zoonotic diseases, because of the potential for animal-human interaction in the County and avoid potential impacts on agricultural workers and the industry at large.

4.4.4 History

Epidemics have impacted the United States including Ohio several times over the past several centuries. The history of epidemics and major disease outbreaks in Miami County is as follows:

- 1830's – Cholera outbreak
- 1840 - 1979 – Poliomyelitis outbreak
- 1914 – Quarantine imposed due to outbreak of Scarlet Fever
- 1918 – The Spanish Influenza outbreak
- 2003 – West Nile Virus outbreak
- 2009 – H1N1 Influenza A Pandemic
- 2012 – 2016 – Bed bug concerns in Ohio and United States
- 2015 – 2016 – Zika Virus concerns in Ohio and United States

A brief description of some of the major outbreaks and their impacts are summarized below:

The Coronavirus (COVID-19) pandemic, March 2020 - present

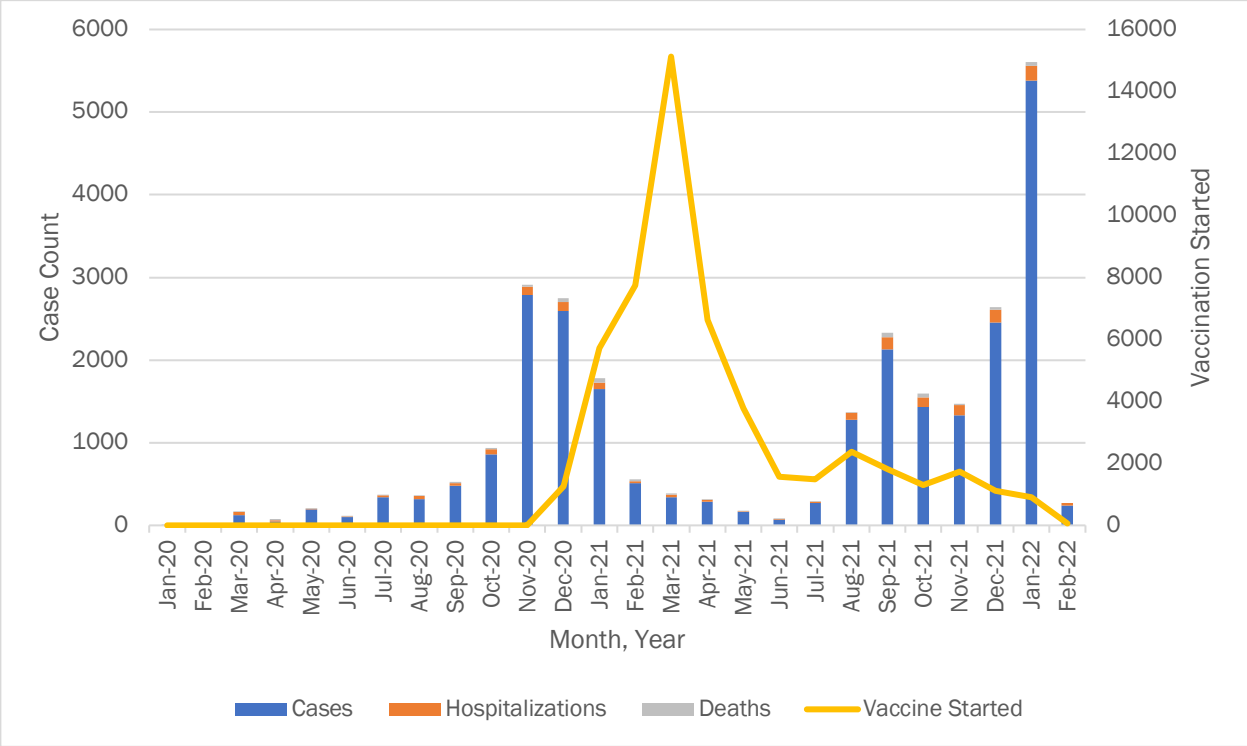
Most recently, the Coronavirus (COVID-19) pandemic has impacted the County, along with the rest of the world, beginning in March of 2020. The pandemic is an ongoing national emergency, and a National Emergency Declaration went into effect on March 13, 2020. Governor Mike DeWine and Ohio

Department of Health Director, Dr. Amy Acton, issued a stay-at-home order on March 23, 2020. At that time, the stay-at-home order included, refraining from going outdoors to public places and gatherings, to follow social distancing guidelines (at least six feet apart) in public places and at events, regulating the number of people allowed to be in closed areas or establishments, and mandating 14-day quarantine for travelers from out of state. Specific health orders and measures have changed since then.

In early May 2020, businesses and other organizations in Ohio started the process of reopening; however, by June hospitals begin to see an uptick in the number of COVID-19 hospitalizations. As the school year began, local schools utilized a combination of in-person and virtual education. **Figure 4.5.1** displays total COVID-19 case count, hospitalizations, and deaths, as well as the vaccination status in Miami County by month. Note that February 2022 data only includes February 1-10, 2022. As of February 10, 2022, Miami County has 25,401 total confirmed cases and 436 deaths attributed to COVID-19.

Food and Drug Administration (FDA) authorized Pfizer's COVID-19 vaccine for emergency use in December 2020. This vaccine, along with other authorized vaccines, was made available to the public shortly after. There was a decline in the number of cases and deaths since January 2021. However, in July 2021, the Delta variant of the COVID-19 virus was spreading fast in the United States, even in some vaccinated individuals. Miami County has about 52,623 persons who have received the first dose of vaccine.

Figure 4.4.1: Miami County COVID-19 Cases by Month



Source: Ohio Department of Health

It is important to note that the situation with COVID-19 is constantly changing. The exact long-term impacts from COVID-19 are unknown at this point. At the time this report was written, the State of Ohio was experiencing a fourth wave of the virus driven by the rise of new variants of the virus as well as COVID-19 fatigue.

The H1N1 Influenza A Pandemic ((H1N1)pdm09 virus), 2009 - present

The swine flu was identified in humans in California in April 2009. On June 11, 2009 the WHO declared it a pandemic. The new (H1N1)pdm09 virus spread between humans through infected droplets from a cough or sneeze. By June 19, 2009, all 50 states in the United States had reported cases of 2009 H1N1 infection.

As of June 24, 2009, there were 91 confirmed cases of swine flu in Ohio and 44 possible cases. By February 2010, the state had recorded 51 deaths. From April 12, 2009 to April 10, 2010, CDC estimated there were approximately 60.8 million cases, 274,304 hospitalizations, and 12,469 deaths in the United States due to the (H1N1)pdm09 virus. Between October 2009 and November 2009, the FDA announced its approval of five vaccines to protect against the virus. In October, five Miami County Medical Reserve Corps volunteers participated in a local H1N1 vaccination clinic. On August 10, 2010, WHO declared an end to the global 2009 H1N1 influenza pandemic. However, (H1N1)pdm09 virus continues to circulate as a seasonal flu virus, and cause illness, hospitalization, and deaths every year.

To monitor large-scale outbreaks of Influenza A Viruses among swine, pigs at Agricultural Fairs in Ohio are randomly checked each year by the Ohio State University's Department of Veterinary Preventive Medicine. They found that, on average, at least one animal at 25 percent of County fairs tests positive for swine flu.

The West Nile Virus, 2002 - present

West Nile virus (WNV) is the leading cause of mosquito-borne disease in the United States. It is most commonly spread to people by the bite of an infected mosquito. Cases of WNV occur during mosquito breeding season, which starts in the summer and continues through fall. Ohio's environment contributes to the breeding of mosquitoes with its hot weather, and areas that have stagnant water not being washed out during low rainfall months.

There are no vaccines or medications currently available to treat infected people. Most people infected with WNV do not feel sick. Only 1 in 5 people who are infected develop a fever and other symptoms. Very rarely the infections are serious and sometimes cause fatal illness.

WNV caused growing concern in Ohio in 2002 when 4,156 cases of the WNV were reported nationally resulting in 284 fatalities. That year, 441 cases were reported in Ohio. By 2003, the number dropped to 108 and has not reached triple digits since. Between 2002 and 2011, there were 64 reported human cases of WNV in Butler, Champaign, Clark, Greene, Miami, Montgomery and Warren counties. The number have gradually decreased with only two cases in 2011, one case each in Montgomery and Miami counties. However, the risk remains high. According to ODH, the number of mosquito samples testing positive for WNV in 2012 was 213 compared to 38 in 2011, the most since 2002. Some areas in Miami County where infected mosquitoes have been detected are – one on the south side of Troy in Kensington Park on Renwick Way in Troy and the other in Kyle Park on South First St. in Tipp City.

The best way to stay safe from West Nile virus is to avoid mosquitoes and mosquito bites. It is recommended that you:

- Use EPA registered repellants when you go outdoors
- Avoid outdoor activity during peak mosquito biting hours (dusk to dawn)
- Wear long sleeve shirts and long pants when you go outdoors
- Use screens on windows and doors. Repair holes in screens to keep mosquitoes outside
- Once a week, empty and scrub, turn over, cover, or throw out items that hold water,
- such as tires, buckets, planters, toys, pools, birdbaths, flowerpots, or trash containers.

4.4.5 Probability

Epidemics are rare, do not occur at regular intervals, and can begin without warning. Based on historical events, an epidemic has occurred once in about every 20-25 years.

However, various factors such as increasing urbanization, increased urban density, rapid globalization and mobility of people, demand for animal protein, climate change, habitat loss, and increased interactions at the human-animal interface increase the probability of a trigger event that may lead to the spread of a pathogen. If these trends continue, public health systems will have less time to detect and contain a pandemic before it spreads (Madhav N, Oppenheim B, Gallivan M, et al. 2017).

Furthermore, as global weather patterns shift and permafrost in areas of the world melts, there will be more opportunity for pathogens that have been frozen within layers of permafrost to be released, exposing humans to new diseases. As such, there will be more potential for epidemics to arise. In addition, the recent increase of disease emergence from animals associated with environmental change suggests a high probability of epidemics in the coming decades.

4.4.6 Vulnerability Assessment

Given the lack of data for historic epidemic events in the County, it is difficult to estimate potential damages. Additionally, the long-term impacts of a widespread virus like COVID-19 are still unknown. The following assessment was developed to provide a general vulnerability assessment for epidemics in Miami County.

Infrastructure Impact

There is likely to be little-to-no impact to infrastructure in the event of an epidemic. However, hospitals, in particular, will be challenged during an epidemic. Hospitals will need to double or even triple their supplies, facilities, and staff, while depending on other critical infrastructure outside of its own organization such as transportation. The failure of one such system can trigger a cascading effect of breakdowns in systems. This makes interconnected systems highly vulnerable to epidemics. The construction and infrastructure sectors relying on global supply chains and supply of labor from around the world, can also have damaging impacts.

Epidemics, such as the COVID-19 outbreak, caused offices to close down and downtown areas become empty. However, on the other hand, during COVID-19 Pandemic, cities around the world saw a rise in pedestrian only spaces, bicycle lanes, and outdoor dining spaces. While most of these measures are temporary till the pandemic lasts, some places have made it permanent.

Population Impact

The population of Miami County is likely to be significantly impacted should an epidemic occur. Day-to-day life can be significantly interrupted. People may be asked to quarantine, and schools and businesses may close causing unemployment and significant economic losses.

While diseases are especially fatal to older adults and those with a weakened immune system, population groups that are faced with long-standing systemic health and social inequities are at an increased risk of getting sick and dying during an epidemic. These groups include many racial and minority groups, people with disabilities, people in prison, and people living in dense areas without sufficient access to basic amenities (Source: CDC). In addition, those with mental health concerns are also vulnerable and can be worsened by isolation during an epidemic if not approached sensitively.

For social vulnerability, although this hazard was not included in the National Risk Index, epidemic/pandemic could be widespread throughout the County and have some effects on the socially vulnerable populations.

Property Damage

Property damage is not likely to occur as a direct result of an epidemic event. but most property insurances and policies do not cover losses resulting from a disease outbreak. This can cause detrimental damage to properties. Furthermore, there could be a loss of revenue from a closed facility or event.

Loss of Life

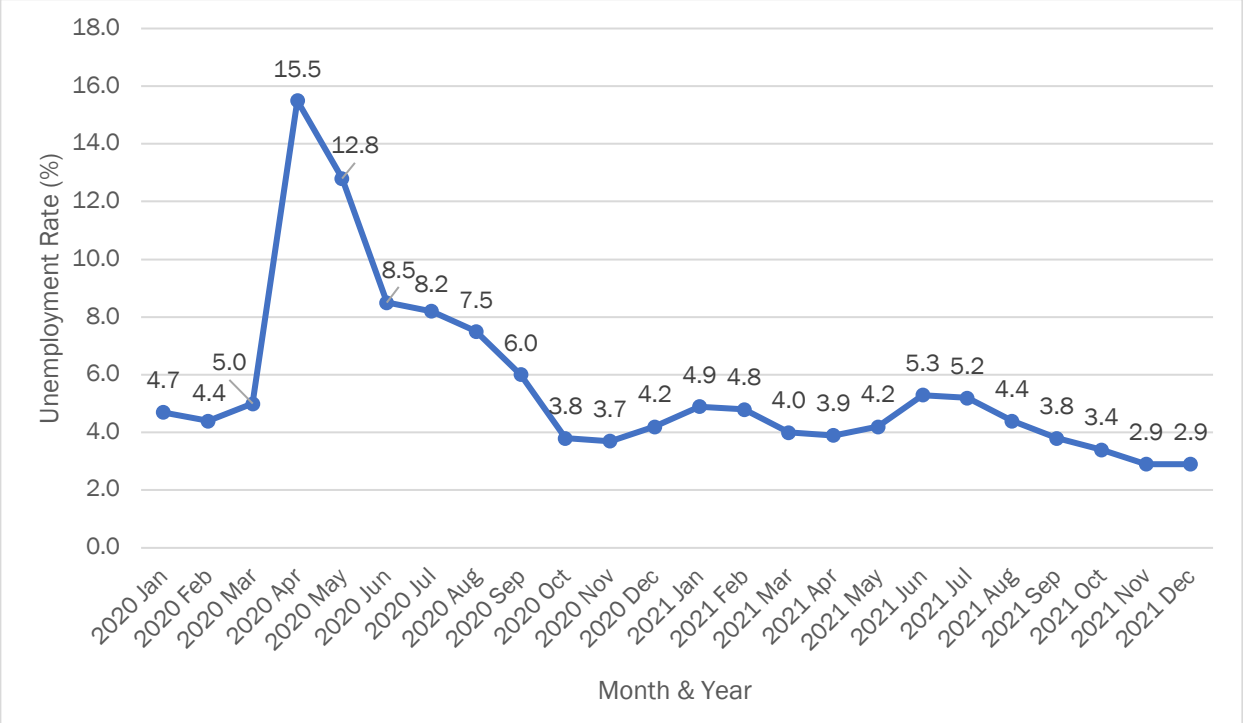
Loss of life is a potential outcome from any epidemic event. Epidemics are especially fatal to older adults and those with a pre-existing weak immune system. Adults of any age with medical conditions such as, but not limited to, cancer, diabetes, chronic lung and kidney diseases, heart conditions, liver disease, down syndrome, HIV infection, dementia or other neurological conditions, obesity, and pregnancy, are more likely to get severely sick or die from diseases and epidemics such as the Spanish Flu and COVID-19 (Source: CDC).

Economic Losses

While there is no widely accepted methodology for estimating the economic impacts of pandemics, losses would likely be observed through the inability for individuals to work. Large-scale epidemics then can have a significant impact on production and the supply chain. As such, these events can disrupt the flow of the economy. In the long run, the threat of epidemics is low, and there is little risk that economic losses will occur in the County due to an epidemic. With that being said, the COVID-19 pandemic has proven to be a multiple-month event resulting in ongoing losses. The full extent of this pandemic is still to be determined.

Figure 4.4.2 displays the unemployment rate for Miami County from January 2020 through December 2021. This shows the significant increase in unemployment associated with COVID-19 and accompanying business closures mandated by the State of Ohio during the most part of 2020.

Figure 4.4.2: Unemployment Rates in Miami County in 2020 and 2021 by Month



Source: Bureau of Labor Statistics

Other important economic impacts indicators may include a visible surge in the number of Supplemental Nutrition Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF), Medicaid, and Ohio's Prevention, Retention and Contingency (PRC) program applications as well as a rise in collections from Unemployment Claims for the payment of child support. These figures help capture snapshots suggesting some of the impacts of COVID-19. A detailed economic analysis of the impacts of COVID-19 can be completed once more data has been collected and made publicly available.

Economic impacts can also be observed should a swine influenza outbreak occur. Swine influenza costs pork produces approximately $3.23 - $10.31 per pig produced (national average).

4.4.7 Future Trends

Land Use and Development Trends

Land use and development are not likely to be impacted by epidemics. Adequate healthcare and emergency facilities as well as transportation systems and infrastructure should be maintained at close proximity to dense areas.

Climate Change

Climate change has no known effect on the probability of pandemics.

4.5 Flooding

4.5.1 Description

FEMA describes a flood as "a general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters [and] the unusual and rapid accumulation or runoff of surface waters from any source." Floods are typically riverine, coastal, or shallow. Flash floods are floods that occur quickly, even occurring without visible signs of precipitation.

Urban flooding is a type of flood that can occur in areas of development that have a high level of impervious surfaces, such as concrete. The level of development and the level of stormwater management practices impact the severity of urban flooding.

Common flood-related terms include:

- **100-Year Flood:** A flood that has a one percent chance to occur each year. The 100-year floodplain can be seen in **Figure 4.5.1: Flood Hazard Map**. The elevation of the water from the 100-year flood is called the Base Flood. Mitigation strategies should be based on the base flood elevation.
- **Floodplain:** An area that has the potential to flood from any source.
- **Floodway:** Sometimes referred to as a regulatory floodway. FEMA defines a floodway as "the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the Base Flood without cumulatively increasing the water surface elevation more than a designated height."
- **Flash flood:** Flash floods are typically caused by heavy rainfall over a short period of time. These floods are particularly dangerous because they can occur in minutes and can sometimes occur even without rainfall, such as when an ice jam breaks or dissolves. Areas impacted by wildfires are particularly susceptible to flash floods.

4.5.2 Location

Flooding can occur throughout Miami County. Flash flooding is more likely to occur in developed areas. **Figure 4.5.1** shows the location of the 100-year floodplain.

4.5.3 Extent

Miami County currently has 68 flood insurance maps (see **Appendix F**). The most recent update is from June 2020.

Miami County and ten communities within the County participate in the National Flood Insurance Program (NFIP) (**Table 4.5.1**). These communities include the Villages of Covington, Fletcher, Laura, Pleasant Hill, and West Milton, and the Cities of Huber Heights, Piqua, Tipp City, and Troy. The City of Huber Heights is also a part of Greene and Montgomery counties. The City of Union is also a part of Montgomery County. The Village of Potsdam is outside of FEMA floodplains and therefore does not participate in the NFIP. The Villages of Bradford, Casstown, and Ludlow Falls do not participate in the NFIP. (**Figure 4.5.1**). According to FEMA, there are no jurisdiction in Miami County that participate in the Community Rating System (CRS).

Dan Suerdieck is the floodplain manager for Miami County. The floodplain manager is responsible for implementing the addressed commitments and requirements of the NFIP found in this section and any relevant mitigation actions listed in **Table 5.2**

Communities that are participating in the National Flood Insurance Program (NFIP) are required to adopt and enforce regulations and codes that apply to new development in Special Flood Hazard Areas (SFHAs). These local floodplain management regulations must contain, at a minimum, NFIP

requirements and standards that apply not only to new structures, but also to existing structures which are Substantially Improved (SI), or Substantially Damaged (SD) from any cause, whether natural or human-induced hazards.

According to 44 CFR 59.1, Substantial improvement means any reconstruction, rehabilitation, addition or other improvement to a structure, the total cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement. Likewise, substantial damage means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. SI/SD requirements are also triggered when any combination of costs to repair and improvements to a structure in an SFHA equals or exceeds 50 percent of the structure's market value (excluding land value).

$$\frac{(Cost\ to\ Repair) + (Cost\ of\ Improvements)}{Market\ Value\ of\ Structure} \geq 50\ Percent$$

Enforcing the SI/SD requirements is an important part of a community's floodplain management responsibilities. The purpose of the SI/SD requirements is to protect the property owner's investment and safety, and, over time, to reduce the total number of buildings that are exposed to flood damage, thus reducing the burden on taxpayers through the payment of disaster assistance. SD/SI requirements are enforced by the local floodplain administrator and monitored by the Ohio Department of Natural Resources (ODNR) Floodplain Management Program during Community Assistance Visits. If a local floodplain administrator is overwhelmed by the number of SD/SI inspections after a large event, ODNR has developed a network of building code officials that are trained in conducting SD/SI field determinations. Help with SD/SI inspections can be requested through the county emergency management agency director.

For more information regarding Substantial Improvement and Substantial Damage, please refer to FEMA's Substantial Improvement/ Substantial Damage Desk Reference, P-758 or contact the ODNR Floodplain Management Program.

Figure 4.5.1: 100-Year Flood Zone in Miami County, Ohio

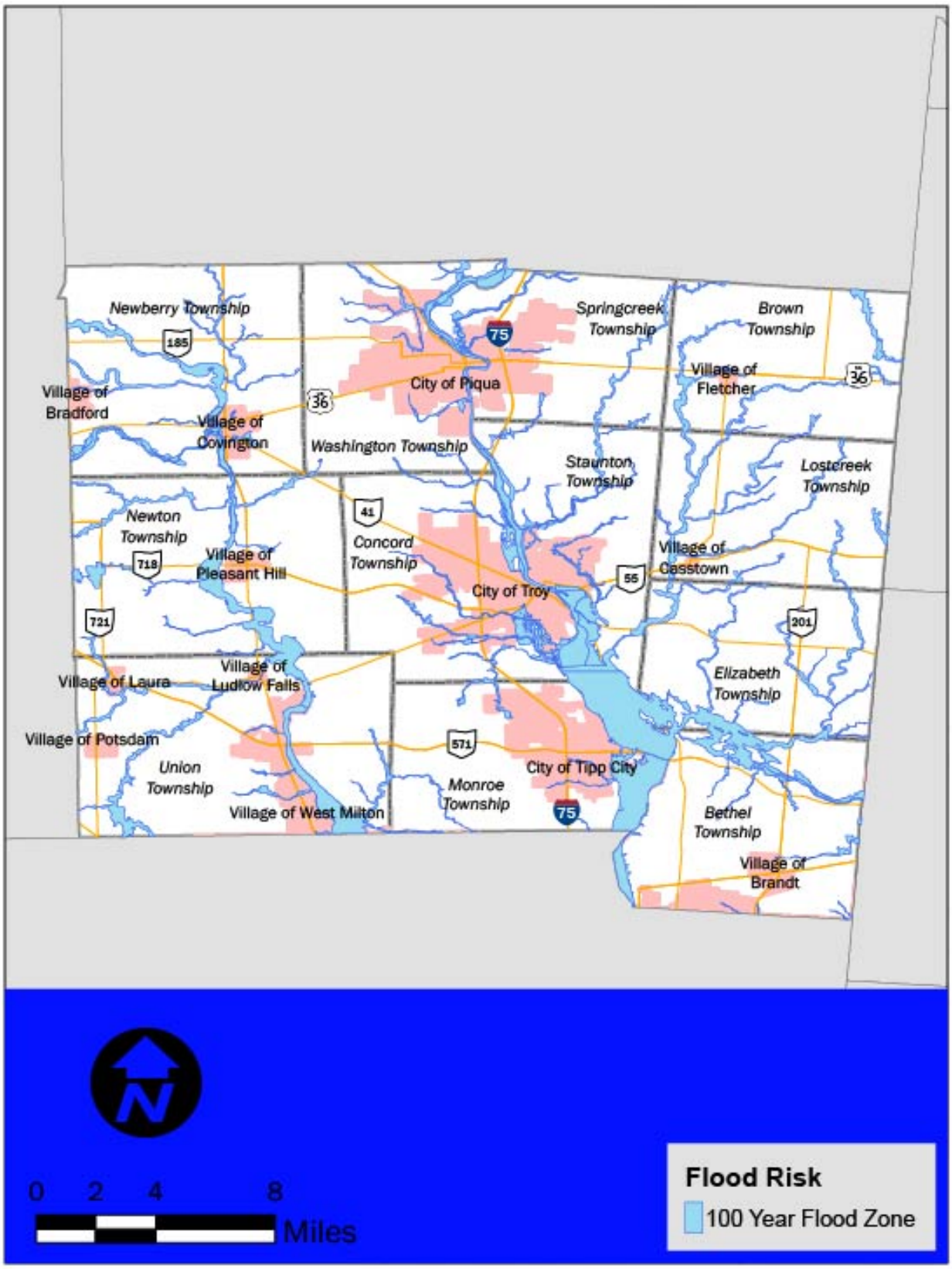


Table 4.5.1: National Flood Insurance Program Participation for Miami County, Ohio

Community Name	County Name	Mitigated	Occupancy	Total Losses	Average Paid	Total Paid
Miami County *	Miami County	No	Othr-Nonres	5	$28,049.10	$140,245.49
Miami County	Miami County	Yes	Single Fmly	2	$49,267.56	$98,535.12
Miami County	Miami County	No	Single Fmly	3	$15,893.01	$47,679.04
Miami County	Miami County	No	Othr-Nonres	2	$18,847.64	$37,695.28
Miami County	Miami County	No	Single Fmly	3	$9,809.45	$29,428.36
Miami County	Miami County	No	Single Fmly	2	$46,151.57	$92,303.14
Miami County	Miami County	No	Single Fmly	2	$19,969.49	$39,938.98
Miami County	Miami County	No	Single Fmly	2	$17,479.94	$34,959.88
Miami County	Miami County	No	Single Fmly	2	$19,899.20	$39,798.39
Miami County	Miami County	No	Single Fmly	2	$18,616.56	$37,233.12
Miami County	Miami County	No	Single Fmly	2	$26,355.33	$52,710.66
Miami County	Miami County	No	Single Fmly	2	$6,875.03	$13,750.06
Miami County	Miami County	No	Single Fmly	2	$22,859.97	$45,719.94
City of New Carlisle	Miami County	No	Single Fmly	2	$1,972.57	$3,945.14
City of Troy	Miami County	No	Other Resid	2	$1,373.65	$2,747.29
City of Troy	Miami County	No	Single Fmly	3	$3,064.43	$9,193.28
City of Troy	Miami County	No	Single Fmly	2	$9,700.14	$19,400.28
City of Troy	Miami County	No	Single Fmly	2	$72,292.92	$144,585.84

*The first column, highlighted in yellow, represents a severe repetitive loss property.

There are 17 repetitive loss properties and one severe repetitive loss property (highlighted in yellow) in Miami County, Ohio. FEMA defines a repetitive loss property as an insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. FEMA defines a severe repetitive loss property as a single family property that is covered under flood insurance by the NFIP and has incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding $5,000 and with cumulative amount of such claims payments exceeding $20,000; or for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

4.5.4 History

The Great Miami River is a tributary of the Ohio River, is 160 miles long, and originates at the man-made Indian Lake in Logan County (northeast of Miami County). In March 1913 rain events dropped nine to 11 inches of rain in the Miami Valley over a three-day period. The soil was saturated from the

melting snow, leaving no pore space for the rain. The rainwater filled the rivers and streams, causing the Great Flood of 1913. The Miami Valley lost 260 lives and had over $100 million in property damage (over $2 billion today). The citizens rallied and raised over $2 million to develop a comprehensive flood protection program, hire an engineer, and the Miami Conservancy District was created in 1914. The Miami Conservancy District has built five dams and 55 miles of levee along the Great Miami River, with the goals of protecting lives and property within the Great Miami River Watershed.

According to the NCEI, there have been 63 floods or flashfloods in Miami County between January 1996 and October 2021. These events have caused $1,488,000 in property damages. There are no recorded crop losses. Average annual damage from floods and flashfloods amounts to around $60,000. There are no reported injuries or deaths from floods and flash floods in Miami County. Described below are the three most damaging events, by property damage, over the past two decades. All events are listed individually in **Appendix A**.

Flash Flooding in Miami County on May 21, 2014

Thunderstorms developed in an unstable air mass ahead of a cold front. These thunderstorms were capable of producing large hail, damaging winds, heavy rainfall, flooding, and flash flooding. Some of the flooding lingered into the morning of May 22, 2014.

Water rescues were performed across the County, but especially in the City of Troy and the City of Tipp City areas for people being trapped in cars stranded by flash flooding. The flash flooding was caused by heavy rainfall. This event caused $1,300,000 in property damage.

Flooding in the Town of Covington on December 22, 2013

Low pressure drew an unseasonably warm and moist air mass across the region. Convection organized ahead of the low pressure and brought heavy rainfall and damaging winds to the area from the evening of December 21 into the morning of December 22. Some of the flooding lingered into December 25. High standing water up to three feet deep covered roads around the Town of Covington and submerged cars. This event caused $50,000 in property damage.

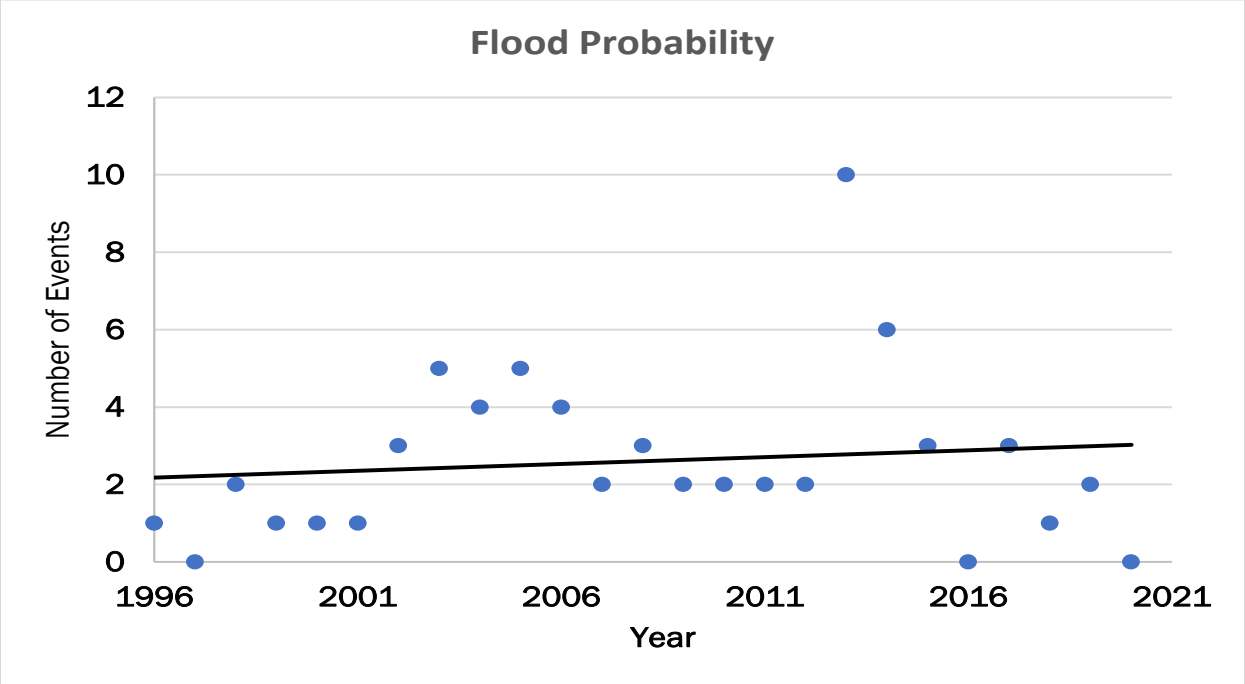
Flooding in Miami County on July 7, 2003

Several clusters of heavy thunderstorms continued to move across western Ohio during the early morning, and again in the afternoon. An additional two to four inches of rain fell from the thunderstorms, exacerbating flooding in water-logged areas. Throughout the region, roads were flooding, and creeks and streams overflowed. Evacuations were necessary along the Great Miami River. This event caused $30,000 in property damage.

4.5.5 Probability

Figure 4.5.2 shows the trend of flood events over time since January 1996, as this is the earliest year with complete data from the NCDC. The trend of flood occurrences per year increases slightly over time, which means Miami County can expect to have more annual flood events than have occurred in the recent past.

Figure 4.5.2 Flood Probability



4.5.6 Vulnerability Assessment

Infrastructure Impact

Floods can impact roadways, including interstates and state routes by blocking them due to high water or by filling them with debris.

Population Impact

Floods and flash floods have caused damages to occupied homes in the past. During flood events, shelter may need to be provided to those impacted by flooding.

For social vulnerability, in the National Risk Index, "riverine flooding" had a score of 54.3 ("relatively low"). People that are most vulnerable to flooding are those who live within the 100-year floodplain in structures that are not elevated about the base flood elevation. The index indicates an expected annual loss of $670,000 due to flood events with 1.8 events occurring per year.

Property Damage

Property damage is likely during floods to both residential and non-residential properties. According to FEMA's Hazus Flood model (**see Appendix E**), the value of all properties exposed to 100-year floods is $4.9 million, or 20.2 percent of all properties in the County, as detailed in **Table 4.5.2**.

Table 4.5.2: Structure Vulnerability from Flooding

Occupancy	County Exposure ($1,000)	100-Year Floodplain Exposure ($1000)	Percentage Exposure in 100-Year Floodplain
Residential	$13,134,004	$2,344,856	17.85%
Commercial	$4,688,544	$828,275	17.67%
Industrial	$2,416,295	$563,426	23.32%
Agricultural	$2,268,544	$735,028	32.40%
Religion	$436,140	$90,579	20.77%
Government	$267,549	$170,096	63.58%
Education	$828,411	$124,504	15.03%
Total	$24,039,487	$4,856,764	20.20%

Additionally, Hazus estimated the potential damage to essential critical facilities. No impacts were estimated to occur, as shown in **Table 4.5.3**.

Table 4.5.3 Potential Damage to Essential Critical Facilities from Flooding

Classification	Total Facilities	Number Damaged	Percent Damaged
Hospitals	2	0	0%
Schools	48	0	0%
EOCs	6	0	0%
Police Stations	9	0	0%
Fire Stations	16	0	0%
Totals	81	0	0%

Loss of Life

There is one reported death from a flood event on March 19, 2008. Loss of life is possible in future floods or flashfloods.

Economic Losses

Floods can halt economic activity, block roadways, and destroy agricultural crops. Building contents up to $25,000 are expected to be exposed during a 100-Year flood event. Crop losses are also expected during floods or flashfloods.

Miami Conservancy District (MCD)

According to the MCD website, the MCD is responsible for flood protection for all of the Great Miami River from the City of Piqua to the City of Hamilton. The MCD works to protect and improve the quantity of quality of water within the Great Miami River Watershed. This includes reinforcing natural systems, data collection, and educational programs. Because of the size of the Great Miami River Watershed as well as urbanization and development, many jurisdictions and residents are at risk from flooding in the area.

As many as 2.3 million people get their drinking water from the Great Miami River Watershed. There are 1.5 trillion gallons of drinking water stored in the Buried Valley Aquifer, which lies within the Great Miami River Watershed. There are 6,600 miles of streams and river flows within the watershed. These systems could be damaged by direct flooding or by the flow of debris and pollutants.

4.5.7 Future Trends

Land Use and Development Trends

Any development that occurs in flood zones will be at risk. Development in these areas should be limited. Flash flooding is more likely to occur in areas with a high percentage of impervious surfaces. Future land use practices should limit the percentage of impervious surfaces. **Chapter 5** contains mitigation actions that address these issues.

Climate Change

According to the International Panel on Climate Change, climate change has impacted human and natural systems. For example, infrastructure and stormwater systems in the Midwest are threatened by increased precipitation frequency and intensity induced by climate change (NCA 2018). According to the SOHMP, increased precipitation and variability by climate change will also increase the likelihood and intensity of flood events, which will mostly occur during the summer and fall months. The OEMA predicts a ten to 40 percent increase in stream flows after 2040. These events will mainly occur late summer to early winter, increasing the likelihood of cool season flood events in the late autumn and early winter. Additionally, heavy precipitation events and precipitation are projected to increase during winter and spring, causing flooding, sewer overflow, inundated roadways, and infrastructure damage. Emergency action plans, green infrastructure, and anticipating extreme events are important steps to prepare for climate change.

4.6 Hazardous Materials

4.6.1 Description

According to the Ohio Environmental Protection Agency (OEPA), hazardous materials can be defined in different ways depending on the law or regulation administered by the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the Department of Transportation (DOT), and the U.S. Nuclear Regulatory Commission (NRC).

- The Institute for Hazardous Materials Management defines hazardous materials as "any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors."
- OSHA's definition includes any substance or chemical which is a health hazard or a physical hazard, including carcinogens, toxic agents, irritants, corrosives, and sensitizers, as well as agents that interact to be harmful to the human body, explosive, or flammable.
- The Environmental Protection Agency's definition includes the Occupational Safety and Health Administration definition. It also adds any item or chemical which can cause harm to people, plants, or animals when released into the environment.
- The Department of Transportation defines hazardous materials as any item or chemical which, when being transported or moved in commerce, is a risk to public safety or the environment.

The OEPA indicates that there are five categories in which materials can be hazardous, including acute, chronic, fire, reactive, or sudden release of pressure. The U.S. Nuclear Regulatory Committee regulates materials that produce ionizing radiation, which includes by-product material and radioactive substances.

The Emergency Planning and Community Right to Know Act, or EPCRA, was passed as Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA), which requires a facility that processes, uses, or stores extremely hazardous substances or hazardous substances as classified by the Occupational Safety and Health Administration hazard communication standard. This is also codified in the Ohio Revised Code (ORC) Chapter 3750 and the Ohio Administrative Code Chapter 3750.

4.6.2 Location

Hazardous material spills can occur wherever hazardous materials are stored and during shipment to these facilities. **Table 4.6.1** lists the facilities that both have a Hazardous Substance or Extremely Hazardous Substance and a Risk Report on file with the EPA. Having a risk report does not mean the risk is high, but that the facility has had their risk screened and is an active facility. The facilities can easily be searched using the EPA's Toxic Release Inventory searching tool. The Toxic Release Inventory tracks over 650 toxic chemicals and the facility's pollution prevention, waste management, and any chemical releases. **Figure 4.6.1** shows the areas which are at the highest risk of being impacted by hazardous materials spills. These areas were calculated by identifying normal shipping routes and placing a one-mile buffer around these routes.

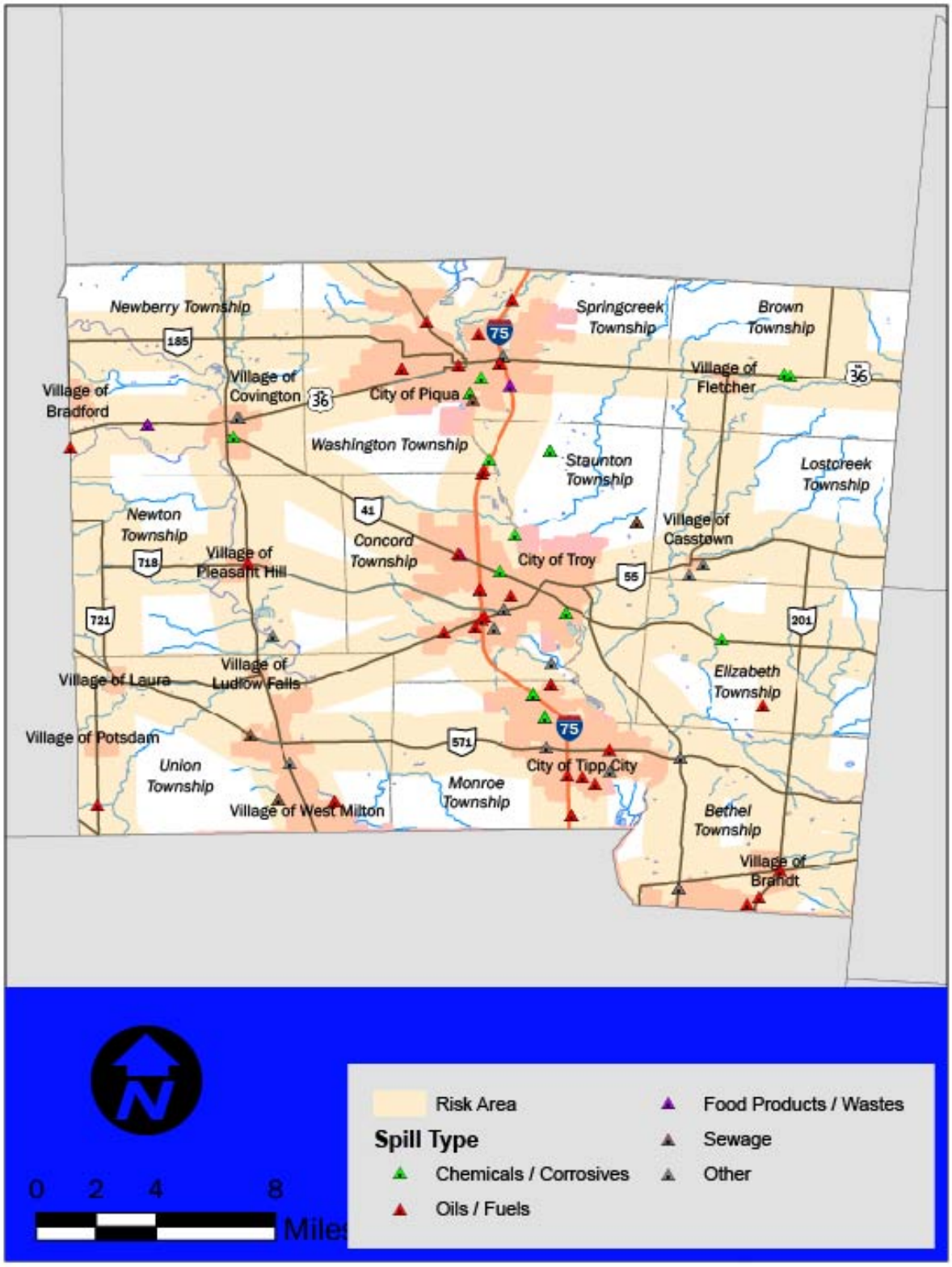
Table 4.6.1 Location of Facilities with Hazardous/Extremely Hazardous Substances

FACILITY NAME	ADDRESS
3 Sigma Llc	1985 W Stanfield Rd Troy, Oh
Abbott Laboratories	1 Abbott Park Way Tipp City, Oh
Catlow	2750 Us Rt 40 Tipp City, Oh
Clopay Building Products Co Inc. - Troy	1400 W State Route 55 Troy, Oh
Conagra Foods	801 Dye Mill Road Troy, Oh
Crane Pumps & Systems Inc	420 E Third St Piqua, Oh
Dap Products Inc	875 N Third St Tipp City, Oh
Deltech Polymers Corp	1250 S Union St Troy, Oh
F&P America Manufacturing Inc	2101 Corporate Dr Troy, Oh
Faurecia Exhaust Systems Inc Troy East Facility	1255 Archer Dr Troy, Oh
Goodrich Aircraft Wheels & Brakes	101 Waco St Troy, Oh
Hartzell Fan Inc	910 S Downing Piqua, Oh
Hartzell Propeller Inc	One Propeller Pl Piqua, Oh
Hobart Brothers Co	600 W Main St Troy, Oh
Hobart Brothers Co Filler Metals Operations Troy	101 Trade Square E Troy, Oh
Hobart Brothers Co Kings Chapel	98 N Kings Chapel Dr Troy, Oh
Hobart Brothers Filler Metals Operation - Piqua	8585 Industry Park Dr Piqua, Oh
Hobart Plant 27	750 Lincoln Ave Troy, Oh
Novacel (Troy Laminating & Coating,Inc)	421 S Union St Troy, Oh
Perrigo Pbm Covington Llc	400 Hazel St Covington, Oh
Piqua Champion Foundry	918 S Main St Piqua, Oh
Polysource Inc	555 E Statler Rd Piqua, Oh
Precision Aero Corp (Troy)	1500 Experiment Farm Rd Troy, Oh
Retterbush Fiberglass Corp	719 Long Dr Piqua, Oh
Sew Eurodrive	2001 W Main St Troy, Oh

4.6.3 Extent

The Environmental Protection Agency (EPA) defines Extremely Hazardous Substances as substances that could cause serious irreversible health effects from accidental releases. The EPA keeps records of facilities with Extremely Hazardous Substances because these facilities have a higher probability of spills due to the higher amounts of hazardous materials at their sites. Each potential hazardous material has varying levels of toxicity. The concentration of these materials should be measured in parts-per-million to determine whether they present a threat. Many chemicals are safe at low amounts and low concentrations but can become dangerous and even toxic at high amounts and concentrations. Additionally, some chemicals can be flammable and can become more volatile when exposed to oxygen. In ground spills, untreated chemical and waste spills can contaminate the soil and drinking water, creating toxic environmental conditions. Corrosive, flammable, or explosive chemicals can create infrastructure damage depending on the location, amount spilled, and the circumstances of the incident. In worst case scenarios, large spills can trigger evacuations of residents and close transportation routes used for hazardous materials transportation, which can also affect local residents.

Figure 4.6.1: Hazardous Materials Risk Area



4.6.4 History

There have been 79 recorded hazardous material spills and releases in Miami County from January 2017 through December 2021. Estimated property and crop damages have not been recorded. **Figure 4.6.2** shows the locations and types of hazardous materials spills in Miami County as recording by the Ohio Environmental Protection Agency (OEPA). The number of exposed properties, properties that have a chance that itself and its contents may sustain loss or damage, are also listed in **Figure 4.6.2.** A table containing all recorded hazardous materials spills can be found in **Appendix A**.

4.6.5 Probability

Due to their unpredictable nature and the influence of human error, the probably of hazardous materials spills are difficult to quantify. Since hazardous material spills can occur at any time and they should be considered likely events.

4.6.6 Vulnerability Assessment

Infrastructure Impact

Roadways, waterways, and groundwater may be impact by hazardous materials spills. Road closures may occur as a direct or indirect result of hazardous materials spills.

Population Impact

The local population may be directly exposed to hazardous materials. If a large spill occurs, some residents may need to be evacuated and given shelter elsewhere.

For social vulnerability, although this hazard was not included in the National Risk Index, hazardous materials could be widespread throughout the County and have some effects on any resident of Miami County.

Property Damage

Depending on the chemical, property damage is likely. Properties near Extremely Hazardous Substance facilities are likely to be damaged during a spill.

Loss of Life

While some hazardous materials can be toxic, loss of life from hazardous materials spills is unlikely. It is possible, however, and extreme precaution should be taken in the event of a spill.

Economic Losses

Economic losses can occur from the loss of hazardous materials that may be needed in manufacturing or for other processes. Road closures may lead to slowed commerce, and businesses impacted by hazardous materials spills may suffer property damage, damage to goods, or be required to close. **Table 4.6.1** provides property values for all structures at risk during hazardous materials spills.

Table 4.6.2: Structure Vulnerability from Hazardous Materials Spills

Structure Type	Number of Exposed Properties	Exposed Property %	Value of Vulnerable Structures		
			Land	Building	Total
Residential	39,898	82%	$460,101,580	$1,433,100,460	$1,893,202,040
Non-Residential	9,025	18%	$584,072,330	$723,838,680	$1,307,911,010
Critical Facilities	35	0%	$1,324,940	$21,769,940	$23,094,880
Total	48,923	100%	$1,044,173,910	$2,156,939,140	$3,201,113,050

4.6.7 Future Trends

Land Use and Development Trends

Development that has occurred since the previous plan and any future development near hazardous materials storage facilities may be impacted by hazardous materials spills. All land uses are equally impacted by potential hazardous materials spills.

4.7 Invasive Species

4.7.1 Description

Harmful species are species that have potential negative impacts on the environment and economy of Miami County. Harmful species are both native and invasive. The National Oceanic and Atmospheric Administration (NOAA) defines an invasive species as "an organism that causes ecological or economic harm in a new environment and is not native." Harmful species are species that are native to a region, but that also cause significant ecological, public health, or economic harm. Their growth is often encouraged through human activity.

Invasive species can be terrestrial (land dwelling) or aquatic (water dwelling). Terrestrial species include plants, trees, shrubs, animals, birds, and insects, as well as fungi, bacteria, molds, and viruses. Aquatic species include aquatic plants and algae, fish, mollusks, amphibians, and insects, as well as fungi, bacteria, molds, and viruses.

4.7.2 Location

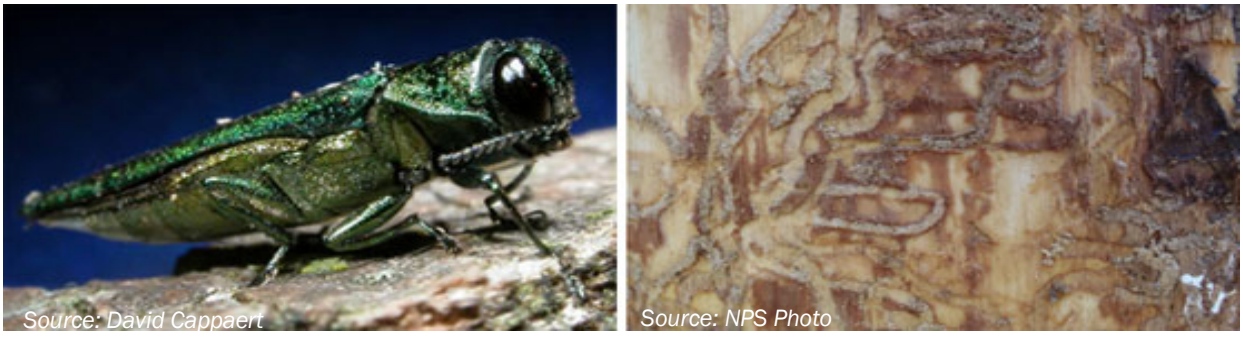
Invasive species have the potential to impact any location within the County. The most invasive of terrestrial species degrade the State's woodlands, wetlands, and prairies. Aquatic Invasive Species use rivers to spread. Ohio has over 66,000 miles of streams, 262 miles of Great Lakes shoreline, nearly 2,000 inland lakes and reservoirs, and shares major watersheds with other states and Canada. Miami County lies in the Mississippi River basin, which is an ecologically diverse river system, and is susceptible to invasions through the Ohio River and its tributaries.

4.7.3 Extent

Once invasive species become widely established, controlling their spread is both technically difficult and expensive, making eradication nearly impossible. Invasive species can usually overtake native species and alter the natural wildlife habitat.

The most common invasive species in Miami County is the **Emerald Ash Borer (EAB) (Figure 4.7.1).** The Emerald Ash Borer is an exotic beetle that feeds on ash trees inhibiting its ability to transport water and nutrients. This insect was first found in Ohio in 2002 and has since been found in every county in the State. Ash trees within 15 miles of a confirmed Emerald Ash Borer infestation are at risk of attack. Since the EAB has been found in every county, there are no quarantines in effect with Ohio's borders. Ohio is still listed in the Federal quarantine boundary.

Figure 4.7.1: Emerald Ash Borer and Feeding Tunnels



Approximately 2,300 plant species occur in the wild in Ohio. Of these, about 78 percent are native, that is, they were found in the region before the times of European settlement. Of the remaining 22 percent, fewer than 100 have been identified to be problems in natural areas. According to the Ohio Invasive Plants Council, there are 38 banned invasive plant species in Ohio and more under consideration (**Table 4.7.1**). These plants cannot be sold, distributed, or imported.

Studies conducted by Ohio Department of Natural Resources, Ohio Sea Grant, and the Ohio State University have identified over 70 invasive aquatic species in Ohio (**Table 4.7.2**). With the exception of White Perch, it is unlawful to possess, import, or sell these species live.

Table 4.7.1: Plant Invasive Species in Ohio as of January 7, 2018

Scientific Name	Common Name
Ailanthus altissima #	Tree-of-heaven
Alliaria petiolate #	Garlic mustard
Berberis vulgaris	Common barberry
Butomus umbellatus	Flowering rush
Celastrus orbiculatus	Oriental bittersweet
Centaurea stoebe ssp. Micranthos	Spotted knapweed
Dipsacus fullonum #	Common teasel
Dipsacus laciniatus #	Cutleaf teasel
Egeria densa	Brazilian elodea
Elaegnus angustifolia #	Russian olive
Elaegnus umbellate #	Autumn olive
Epilobium hirsutum	Hairy willow herb
Frangula alnus #	Glossy buckthorn
Heracleum mantegazzianum	Giant hogweed
Hesperis matronlis	Dame's rocket
Hydrilla verticillata	Hydrilla
Hydrocharis morsus-ranae	European frog-bit
Lonicera japonica #	Japanese honeysuckle
Lonicera maackii #	Amur honeysuckle
Lonicera morrowii #	Morrow's honeysuckle
Lonicera tatarica #	Tatarian honeysuckle
Lythrum salicaria	Purple loosestrife
Lythrum virgatum (effective January 7, 2019)	European wand loosestrife
Microstegium vimineum	Japanese stiltgrass
Myriophyllum aquaticum	Parrotfeather
Myriophyllum spicatum	Eurasian water-milfoil
Nymphoides peltata	Yellow floating heart
Phragmites australis #	Common reed
Potamogeton crispus	Curley-leaved pondweed
Pueraria montana var. lobate	Kudzu

Scientific Name	Common Name
Pyrus calleryana (effective January 7, 2023)	Callery pear
Ranunculus ficaria	Fig buttercup, lesser celandine
Rhamnus cathartica #	Common Buckthorn
Rosa multiflora #	Multiflora rose
Trapa natans	Water chestnut
Typha angustifolia	Narrow-leaved cattail
Typha x glauca	Hybrid cattail
Vincetoxicum nigrum	Black Swallow-Wort

Table 4.7.2: Aquatic Invasive Species in Ohio

Type	Scientific Name	Common Name
Fish	*Alosa pseudoharengus*	Alewife
Fish	*Carassius auratus* #	Goldfish
Fish	*Carassius Carassius*	Crucian Carp
Fish	*Carassius gibelio*	Prussian Carp
Fish	*Channa app. and Parachanna app.*	Snakeheads
Fish	*Claris batrachus*	Walking Catfish
Fish	*Ctenopharyngodon Idella*	Grass Carp
Fish	*Cyprinus carpio* #	Common Carp
Fish	*Fundulus catenatus*	Northern Studfish
Fish	*Fundulus diaphanus*	Eastern Banded Killifish
Fish	*Gambusia holbrooki and Gambusia affinis*	Eastern & Western Mosquitofish
Fish	*Gasterosteus aculeatus*	Three Spine Stickleback
Fish	*Gymnocephalus cernuus*	Ruffe
Fish	*Hypophthalmichthys harmandi*	Large-scale Silver Carp
Fish	*Hypophthalmichthys molitrix*	Silver Carp
Fish	*Hypophthalmichthys nobilis*	Bighead Carp
Fish	*Lates niloticus*	Nile Perch
Fish	*Leuciscus idus*	Ide
Fish	*Morone americana*	White Perch
Fish	*Mylopharyngodon piceus*	Black Carp
Fish	*Neogobius melanostomus*	Round Goby
Fish	*Osmerus mordax*	Rainbow Smelt
Fish	*Perca fluviatilis*	European Perch

Type	Scientific Name	Common Name
Fish	*Perccottus glenii*	Amur Sleeper
Fish	*Petromyzon marinus*	Sea Lamprey
Fish	*Phoxinus phoxims*	Eurasian Minnow
Fish	*Proterorhinus marmoratus*	Tubenose Goby
Fish	*Pseudorasbora parva*	Stone Moroko
Fish	*Rhodeus sericeus*	Bitterling
Fish	*Rutilus sericeous*	Roach
Fish	*Sander lucioperca*	Zander
Fish	*Scardinius erythrophthalmus*	European Rudd
Fish	*Silurus glanis*	Wels Catfish
Fish	*Tinca tinea*	Tench
Mollusks	*Bellamya (Cipangopaludina)*	Mystery Snails
Mollusks	*Bithynia tentaculata*	Faucet Snail
Mollusks	*Corbicula fluminea* #	Asian Clam
Mollusks	*Dreissena bugensis*	Quagga Mussel
Mollusks	*Dreissena polymorpha*	Zebra Mussel
Mollusks	*Limnoperna fortune*	Golden Mussel
Mollusks	*Potamopyrgus antipodarum*	New Zealand Mudsnail
Crustaceans	*Bythotrephes longimanus*	Spiny Waterflea
Crustaceans	*Cercopagis pengoi*	Fishhook Waterflea
Crustaceans	*Cherax destructor*	Yabby
Crustaceans	*Cherax tenuimanus*	Marron
Crustaceans	*Dikerogammarus villosus*	Killer Shrimp
Crustaceans	*Eriocheir sinensis*	Chinese Mitten Crab
Crustaceans	*Faxonius virilis*	Virile Crayfish
Crustaceans	*Hemimysis anomala*	Bloody-red Shrimp
Crustaceans	*Procambarus clarki*	Red Swamp Crayfish
Plant	*Butomus umbellatus*	Flowering-rush
Plant	*Egeria densa*	Brazilian Waterweed
Plant	*Hydrilla verticillata*	Hydrilla
Plant	*Hydrocharis morsus-ranae*	European Frog-bit
Plant	*Iris pseudacorus*	Yellow Iris
Plant	*Ludwigia peploides*	Creeping Water-primrose
Plant	*Lysimachia nummularia* #	Moneywort

Type	Scientific Name	Common Name
Plant	*Lythrum salicaria*	Purple Loosestrife
Plant	*Marsilea quadrifolia*	European Water Clover
Plant	*Myriophyllum aquaticum*	Parrotfeather
Plant	*Myriophyllum spicatum*	Eurasian Watermilfoil
Plant	*Najas minor*	Brittle Naiad
Plant	*Nelumbo nucifera*	Pink Lotus
Plant	*Nitellopsis obtusa*	Starry Stonewort
Plant	*Nymphoides peltata*	Yellow Floating Heart
Plant	*Phalaris arundinacea*	Reed Canary Grass
Plant	*Phragmites australis*	Common Reed (Phragmites)
Plant	*Pistia stratiotes*	Water Lettuce
Plant	*Potamogeton crispus*	Curly-Leaf Pondweed
Plant	*Trapa natans*	Water Chestnut
Plant	*Typha angustifolia, Typha x glauc*	Narrowleaf and Hybrid Cattails

#Species most likely found in Miami County

Other invasive species that have the potential to impact Ohio and Miami County include:

Asian Long-Horned Beetles are wood-boring beetles native to Asia that were unintentionally introduced to North America, likely in wood packing material. A southern Ohio county experienced an infestation in 2011. They pose a significant threat to forested land.

The **Gypsy Moth** is a non-native, invasive species whose larval form feeds on over 300 species of trees and shrubs, especially oak trees. The first Gypsy Moth was trapped in Ashtabula County in 1971 and has since been found across the entire state. The Ohio Department of Agriculture and the USDA Forest Service have run three separate programs since 1989 to suppress and slow the spread of the species. While Miami County is not a quarantined county, Gypsy Moths pose a threat to foliage in the area.

Mute Swans are non-native invasive species found on public lakes across Ohio. During the breeding season, March through May, adult mute swans become highly territorial and will fight to push native birds out of their nesting area. Mute swans have attacked humans and pets during this time as well. Mute swans can consume submerged aquatic vegetation and usually uproot the whole plant leaving nothing behind. This takes away natural habitat from fish and leaves little food source for native waterfowl. The removal of aquatic vegetation can also cause water quality issues and erosion problems.

Two-spotted Spider Mites are closely related to arachnids. They are a mite that thrives in the warmer temperatures of summertime, affecting over 180 species of plants from field crops to houseplants through both consumption of the foliage and damage from their webs. Forested and agricultural areas are especially susceptible to this pest's detrimental effects.

White Nose Syndrome is a fungal disease infecting and killing bats. Bats provide several ecological benefits such as plant pollination, seed dispersal, pest control, and contributions to the medical field. In Ohio, there are 11 species of bats that consume tons of nocturnal insects each year including moths, beetles, flies, true bugs, and hoppers. A White Nose Syndrome case was confirmed in Ohio in 2011.

4.7.4 History

There are no known impacts of invasive species particular to Miami County except the Emerald Ash Borer, which has spread to all 88 counties in Ohio. Additionally, it is possible that any of the species listed above have at one point affected the County and its residents.

4.7.5 Probability

Since there are many invasive species throughout Ohio, it is probable that Miami County will experience some of the invasive species listed above, especially those noted as most likely to be found in the County (**Tables 4.7.1 and 4.7.2**).

4.7.6 Vulnerability Assessment

Infrastructure Impact

There are no likely impacts to public roadways or utilities. Public trees may be destroyed or impacted by various invasive species. Aquatic invasive species could destroy water quality, make poor habitat for fish, and clog water intake pipes. Some species also increase fire potential and can be problematic to levees, dams, and irrigation systems.

Population Impact

There are no likely impacts on the local population. Recreational activities such as boating, and fishing may be mildly impacted.

For social vulnerability, although this hazard was not included in the National Risk Index, invasive species could be widespread throughout the County and have some effects on the socially vulnerable populations who are involved in agriculture.

Property Damage

Property damage, in the form of reduced values from impacts on landscaping, is likely.

Loss of Life

Loss of life due to the effects of invasive species is unlikely. Some of these species consumed as food could lead to diseases and other health impact in humans.

Economic Losses

Economic impacts can vary greatly depending on the target and the invasive species and their impacts on those targets. Agricultural revenue losses may be experienced if crops are affected by an invasive species. Also, there may be indirect economic losses with degradation of forested lands and tree canopies. Examples include reduction in viable lumber for construction, increased heating and cooling costs, and reduced property value.

4.7.7 Future Trends

Land Use and Development Trends

There could be slight impacts on development and land use due to invasive species. Some invasive species can be particularly damaging to crops, agricultural land, and wetlands.

Climate Change

According to the Fourth National Climate Assessment, warming temperature caused by climate change is aiding in the spread of invasive species. Climate change can favor non-native invasive species over native ones due to the tolerance of invasive species to warmer climate zones and native species'

decreased resistance to the new extreme weather in their environment. Species and ecosystems are typically most at risk when temperature increases occur with land use changes, habitat loss, environmental pollution, and the presence of non-native species. These changes can make ecosystems more favorable to invasive species.

4.8 Severe Summer Weather

4.8.1 Description

Severe summer weather events may include severe thunderstorms and thunderstorm-induced wind events, hail, and lightning. Non-thunderstorm high wind events, tornadoes, and flooding may also be related to severe summer weather and due to the potential threat of these events, they are each discussed in separate risk assessments. While tropical storms and hurricanes are also forms of severe storms, Miami County does not have any record of such events affecting the County; therefore, the County has not deemed tropical storms and hurricanes to be a threat, and these specific types of weather will not be addressed further.

According to the National Weather Service (NWS), a severe thunderstorm is a thunderstorm that produces a tornado, winds of at least 58 MPH, and/or hail at least one inch in diameter. A Severe Thunderstorm Watch is issued by the NWS if conditions are favorable for the development of severe thunderstorms. A watch is usually in place for four to eight hours, during which time people should be prepared to move to a safe place if threatening weather approaches.

A Severe Thunderstorm Warning is issued if either the WSR-88D radar indicates a severe thunderstorm or if a spotter reports a storm producing hail or winds meeting the criteria outlined in the description above. The WSR-88D radar is an advanced Weather Surveillance Doppler Radar utilized by the NWS to generate a radar image. The NWS recommends that people in the affected area seek safe shelter immediately, as severe thunderstorms have the potential to produce tornadoes with little-to-no advance warning. Lightning frequency is not a criterion for issuing a severe thunderstorm warning. The warnings are usually issued for one hour and can be issued without a Severe Thunderstorm Watch already in effect. The National Weather Service Forecast Office in Wilmington, Ohio is responsible for issuing Severe Thunderstorm Watches and Warnings for Miami County.

Lightning is caused by a rapid discharge of electrical energy that has built up in the atmosphere between clouds, the air, or the ground. Lightning strikes can be either direct or indirect. A direct strike is when lightning strikes a building or a specific zone, which can result in fusion points melting holes of varying sizes at the point of impact of materials with high resistivity. An indirect lightning strike is when lightning causes power surges that disrupt electrical equipment.

Severe summer storms can also create strong winds – often called “straight-line” winds – to differentiate thunderstorm winds from tornadic winds. These winds, which have the potential to cause damage, are caused by an outflow generated by a thunderstorm downdraft.

Hail is a type of frozen precipitation that occurs when thunderstorm updrafts carry raindrops upward into extremely cold atmospheric zones where they freeze before falling to the ground. The resulting hailstones can fall at speeds greater than 100 MPH and range in size from smaller than 0.50 inches (the size of a pea) to 4.5 inches (the size of a softball) (Source: National Weather Service).

4.8.2 Location

Severe summer storms are generally a regional (Midwest) hazard and all of Miami County is susceptible to severe summer weather.

4.8.3 Extent

Severe summer storm events have the potential to create large-scale damage in Miami County. Specifically, lightning is responsible for approximately 50 deaths annually across the United States, as well as hundreds of injuries (Source: NOAA). Winds associated with severe summer storms have the potential to cause damage by bringing down tree limbs and generating widespread power outages. Additionally, hail can result in property damage.

Severe summer storms can lead to flooding, downed trees and power lines, and other dangerous conditions.

4.8.4 History

According to the National Centers for Environmental Information (NCEI), there have been 169 thunderstorm wind events, 58 hail events, three heavy rain events, and five lightning events recorded in Miami County from March 1990 to December 2020. According to the Federal Emergency Management Agency, five of these events were declared federal disasters. These events resulted in over $1.5 million in property damage and $50,000 in crop damage. These events were responsible for one death and seven injuries. These events are summarized in **Table 4.8.1**, below:

Table 4.8.1: Thunderstorm-Related Events in Miami County since 1990

Severe Storm Event Type	Number of Events	Injuries	Deaths	Property Damages	Crop Damages
Thunderstorm Wind	169	3	0	$1,456,700	$0
Hail	58	0	0	$25,250	$50,000
Heavy Rain	3	0	0	$1,000	$0
Lightning	5	4	1	$24,000	$0
Total	235	7	1	$1,506,950	$50,000

Miami County has been associated with one severe summer weather disaster declaration (2019) since the previous hazard mitigation plan.

Thunderstorm Wind Event, May 19, 2019

During a severe thunderstorm, trees were toppled by thunderstorm-induced high winds. Two people were injured when a tree fell onto a house in Arapaho Trail in Tipp City. This event cause $100,000 in damages throughout the County.

Thunderstorm Wind Event, June 29, 2012

A very hot and unstable airmass interacted with northwesterly flow aloft to produce a derecho across northern Illinois. This derecho then moved rapidly east southeast across the Ohio Valley producing widespread straight line wind damage. This rare derecho affected nearly every county in southeast Indiana, northern Kentucky, and Ohio with severe winds. This caused widespread power outages that lasted several days in some locations. Isolated large hail also occurred with the stronger portions of the system. In Miami County, a tree fell on a pickup truck due to thunderstorm winds. One person in the truck was injured.

Severe Thunderstorm, September 4, 2011

Severe thunderstorms caused damage to numerous large trees that were either sheared or uprooted. Nineteen loaded semi-trailers were overturned, and two air conditioning units were blown off a roof at a distribution center. Eight wooden high voltage electric poles were snapped. Another semi-trailer was overturned on a highway. These occurrences were due to damaging thunderstorm winds. Total damage estimates were approximately $250,000.

Lightning, June 2, 2007

During a thunderstorm, lightning caused the injuries of a man and his two sons taking cover under a tree in Troy during the Troy Strawberry Festival. Injuries were non-life threatening.

Lightning, April 9, 2001

During an early spring thunderstorm, lightning caused the death of a man taking cover near a tree in a city park in the City of Piqua.

Lightning, June 3, 1996

Lightning was reported to have stricken a woman doing dishes inside of her home near a window.

Hailstorm, June 6, 1994

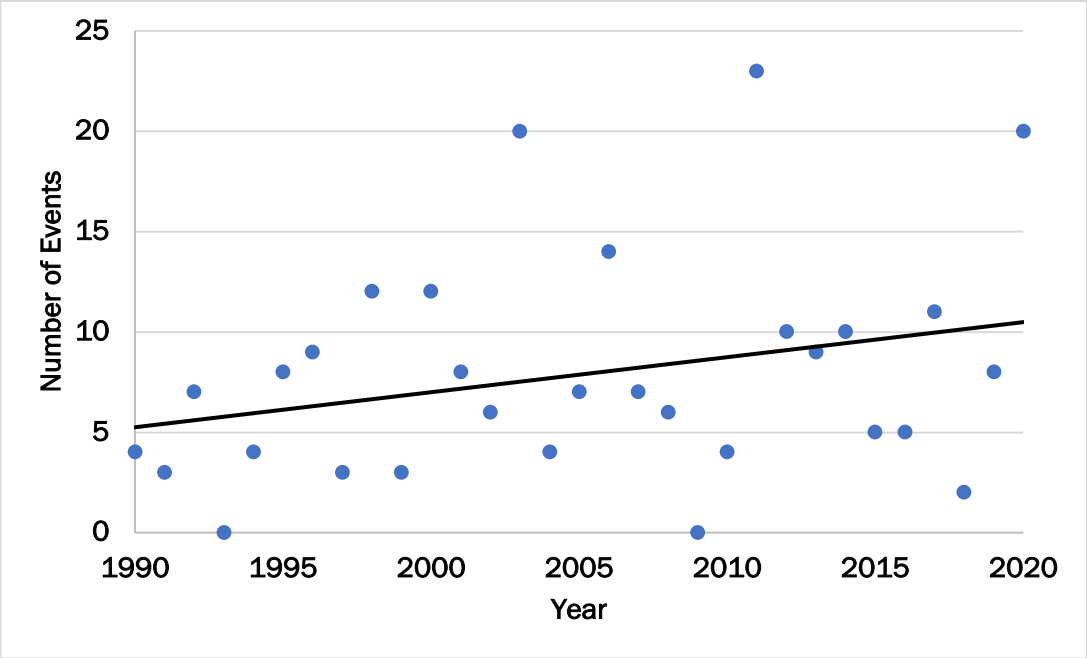
Severe thunderstorms created large hail, impacting the southern portion of the County, near the City of Tipp City. This hailstorm caused $50,000 in crop damages, the largest such event between 1990 and 2020.

4.8.5 Probability

According to the NCEI, there have been 235 severe summer storm events reported in Miami County from March 1990 to December 2020 with total losses reaching more than $1.5 million in property damage and $50,000 in crop damage. This amounts to between seven and eight severe storm events annually with average annual damages of $50,000.

Furthermore, **Figure 4.8.1** below shows the trend in number of thunderstorm events per year since 1990. The trend line has a positive slope, which indicates that the number of severe summer storms has increased over the last 30 years and is projected to increase over the next five years. Years prior to 1990 are excluded from the probability calculation due to missing and/or unreliable data reporting.

Figure 4.8.1: Severe Summer Storm Probability



4.8.6 Vulnerability Assessment

Infrastructure Impact

Above-ground infrastructure is at risk for storm damage by wind and falling debris. For infrastructure, high winds and hail are the most damaging part of a severe storm. Thunderstorm winds can strip bark from trees and detach limbs. If large branches fall, they can damage buildings and supporting above-

ground infrastructure. In the most severe storms with high winds, large trees can be uprooted and have the potential to fall on buildings including houses, which can cause harm or death.

Utilities are at risk for damage by severe summer storms as well. Electrical lines are spread throughout the County connecting homes, businesses, and other facilities. Severe storms are likely to down tree limbs and generate other debris that can affect above-ground electrical lines causing power outages. Downed power lines that are still live are extremely hazardous and can cause death by electrocution.

Population Impact

According to the US Census 2020 population estimates, the population of Miami County is 108,774. Summer storms are random in nature and affect the entire area of the County. Everyone should be prepared during a storm event. Populations residing in mobile home parks are particularly vulnerable and should seek out shelters.

For social vulnerability, according to the National Risk Index, hail and lightning had scores of 18.2 ("very low") and 75.0 ("relatively moderate") for Miami County. This information indicates that severe summer storms are exposing the population of Miami County to some risk from storm events. The index indicates an expected annual loss of $22,000 due to hail events and $270,000 due to lightning events, with 3.7 and 68.3 events occurring per year, respectively.

Property Damage

As described above, these events have caused an average of $50,000 in property damages annually. Due to the non-site-specific nature of this hazard, **Table 4.8.2** lists all structures within Miami County as having potential impacts from severe storms.

Loss of Life

One fatality occurred during an early spring thunderstorm in April 2001. A man took shelter under a tree in a city park in Piqua. Lightning struck the tree, killing the man. Due to widespread destructive potential of severe summer weather, there is always potential for injuries and fatalities during severe weather.

Economic Losses

Severe summer weather usually causes minor damage to structures, such as blowing shingles off roofs and downed branches breaking windows or falling onto buildings and above-ground infrastructure. More severe damage may also result, such as structural damage to high profile buildings during derecho events. Of the 235 severe summer storm events since 1990, 33 events resulted in property damage of $10,000 or more.

Table 4.8.2: Structure Vulnerability from Severe Storms

Structure Type	Number of Properties Exposed	Value of Vulnerable Structures		
		Land	Building	Total
Residential	43,384	$524,073,200	$1,577,825,860	$2,101,899,060
Non-Residential	10,049	$584,072,330	$723,838,680	$1,307,911,010
Critical Facilities	35	$1,324,940	$21,769,940	$23,094,880
Total	53,433	$1,108,145,530	$2,301,664,540	$3,409,810,070

**Note: Critical Facilities are non-residential structures, and their value is incorporated into the non-residential totals as well. Calculated totals are determined by summing the residential and non-residential values.*

4.8.7 Future Trends

Land Use and Development Trends

Severe summer weather can occur anywhere. Any development that has occurred since the previous plan and any future development has the potential to be impacted by severe summer weather.

Climate Change

Preliminary research suggests that the frequency and intensity of severe thunderstorms could increase as the climate changes, according to the National Climate Assessment. Future modeling techniques could reveal additional information about the correlation between atmospheric changes and severe thunderstorm formation and intensity.

4.9 Severe Winter Weather

4.9.1 Description

Severe winter weather includes winter storms, heavy snow, ice storms, and extreme cold/wind chills. Winter storms are events that have snow, sleet, ice, or freezing rain as their primary type of precipitation. While the precipitation itself is typically not dangerous, frozen roads, damaged infrastructure, and exposure to cold can cause death and injury.

A winter storm forms under the right combination of three causes:

1. Below freezing temperatures in the clouds and near the ground, which are necessary to make snow and ice.
2. Lift, which raises the moist air from the clouds and causes precipitation. Warm air colliding with cold air and being forced to rise over the cold is an example of lift.
3. Moisture is needed to form clouds and precipitation. Air blowing across a body of water is a common source of moisture.

Winter storms are categorized by their type: blizzards, ice storms, and snow squalls.

- **Blizzards** are winter storms that are a combination of blowing snow and winds greater than 35 mph which lead visibility of ¼ mile or less for at least three hours. Heavy snowfalls and severe cold often accompany blizzards, but this is not required. Ground blizzards occur when strong winds pick up snow that has already fallen.
- **Ice Storms** occur when at least a quarter inch of ice accumulates on exposed surfaces. Roads and sidewalks can become dangerously slick, and trees and powerlines can easily break under the weight of accumulated ice.
- **Snow Squalls** are brief, intense snow showers accompanied by strong winds. Impacts may be significant.

4.9.2 Location

Winter storms are typically large events that will impact the entire County and have the potential to impact surrounding counties at the same time.

4.9.3 Extent

The average annual snowfall in Miami County is approximately 16 inches. Snowfall typically occurs between November and March, though snow has been recorded in October and April. January is the coldest month on average.

4.9.4 History

According to the National Centers for Environmental Information (NCEI), there have been 114 winter weather events including blizzards, heavy snow, extreme cold/wind chills, and ice storms in Miami County since January 1996. These events caused a total of $651,000 in property damage, resulting one death according to NCEI.

There has been one emergency declaration related to winter storms covering Miami County. The public assistance amount for each emergency declaration was divided between all jurisdictions impacted by the events.

Table 4.9.1: Severe Winter Weather Events in Miami County since 1996

Severe Storm Event Type	Number of Events	Injuries	Deaths	Property Damages
Blizzard	1	0	0	$0
Extreme Cold/Wind Chill	2	0	0	$20,000
Heavy Snow	13	0	0	$81,000
Ice Storm	4	0	0	$0
Winter Storm	94	0	1	$550,000
Total	114	0	1	$651,000

Major Winter Storm, December 22, 2004

Starting December 22, 2004, what has become known as the "Christmas snowstorm of 2004" blew through the region and buried the area. Piqua recorded 20 inches of snow by 9am on December 23, 2004. The temperature dropped to -10 degrees by December 25th, and winds blew up to 36 miles per hour creating blizzard and ground blizzard conditions. This storm was responsible for $25,000 in property damages.

Major Disaster Declaration on March 14, 2003 (FEMA-1453-DR)

Severe winter storms and record/near record snow impacted 31 counties including Miami County on February 14, 2003. A total of $2,609,145.45 in Individual Assistance funds were approved with 1,559 applications approved and $31,856,038.61 in public assistance were distributed throughout all impacted counties.

Major Winter Storm, January 1-13, 1999

In three weather events from January 1-13, 1999, a mix of snow, freezing rain and low temperatures led to nearly two weeks of difficult weather conditions. In some parts of the area, up to one inch of ice accumulated.

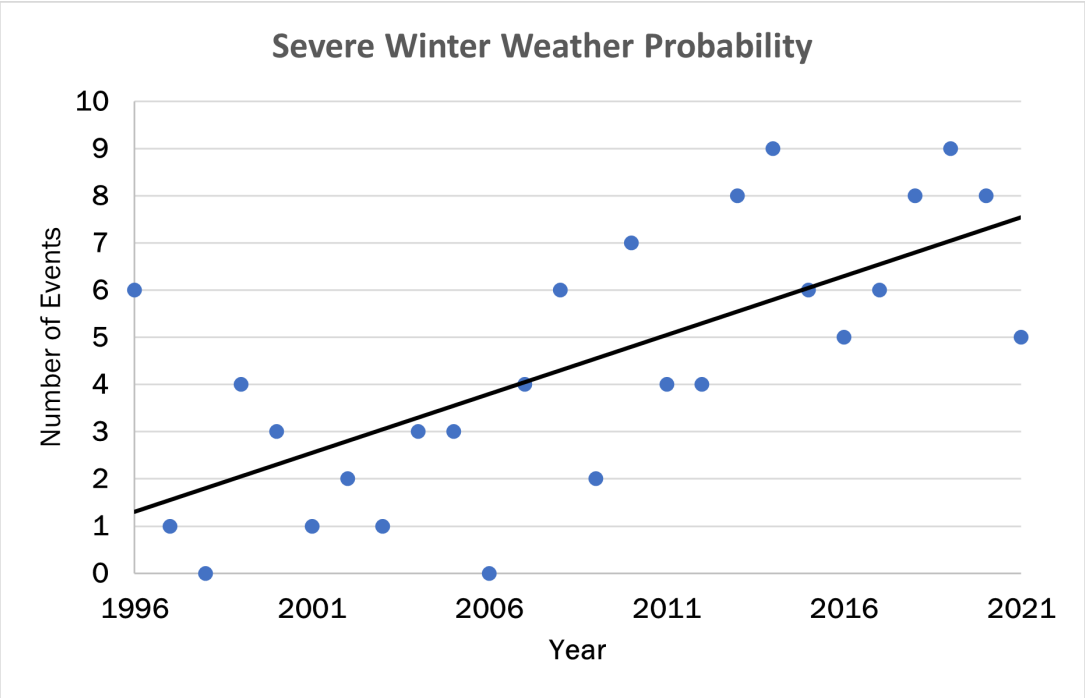
Major Winter Storms, January 2-11, 1996

Over multiple days between January 2 and January 11, 1996, three waves of winter storms and snow impacted the area. In the first wave, up to a foot of snow fell in some parts of the region before more heavy snow produced the most accumulation since the Blizzard of 1978. Then, in a third wave, ice and snow mixed for difficult conditions. This storm caused one death of a 47-year-old man from exposure to the elements and $500,000 in property damages.

4.9.5 Probability

According to the NCEI, there have been a total of 114 winter storm and winter weather events reported in Miami County from January of 1996 to December 2021, with total losses amounting to $651,000 in property damage. This amounts to approximately four winter storm events annually with average annual damages of $26,000. **Figure 4.9.1** shows the trend of severe winter weather events over time between January 1996 and December 2021. The trend line increasing over time showing that winter storm events are becoming more common each year.

Figure 4.9.1: Severe Winter Weather Probability



4.9.6 Vulnerability Assessment

Infrastructure Impact

Winter storms can cause damage to overhead utilities. Wires in particular can collapse under the weight of accumulated snow and ice. Debris can block roadways or damage property as tree limbs can also collapse under the weight of accumulated snow and ice. Water pipes can be frozen under extreme low temperatures that may accompany severe winter storms. Roads and sidewalks can be blocked by the accumulation of snow, as well as being iced over.

Population Impact

All residents of Miami County are expected to be impacted by severe winter storms. The elderly and children may be more severely impacted by extreme cold.

For social vulnerability, according to the National Risk Index, winter weather and ice storm has a score of 85.2 ("relatively moderate") and 51.7 ("relatively low") in Miami County. There have been numerous winter weather events in Miami County, although typically they did not result in an emergency declaration. The index indicates an expected annual loss of $290,000 due to winter weather and $61,000 due to ice storm, with 2.9 and one events occurring per year, respectively.

Property Damage

Property can be damaged by accumulated snow and ice, debris, and falling wires. Extreme low temperatures can also freeze the water in pipes which could cause them to explode. All buildings in the County are exposed and vulnerable to winter storms.

Loss of Life

There is one reported direct or indirect deaths from severe winter weather events in Miami County. This death was due to exposure to the elements during the 1996 snowstorm. During any severe winter weather event, there is a potential for loss of life. Deaths may occur during the event due to exposure, structural failure from heavy snow, or vehicle accidents.

Economic Losses

Economic losses can occur from businesses shutting down for potentially long periods of time. Economic activity can be completely halted during winter storms including transportation of goods. Electricity outages may lead to spoiled goods. Since winter storms occur during the winter season, damages to crops are unlikely.

4.9.7 Future Trends

Land Use and Development Trends

Winter storms can occur anywhere. Any development that has occurred since that previous plan and any future development has the potential to be impacted by winter storms. All land uses are equally impacted by severe winter weather.

Climate Change

According to the Midwest chapter of the Fourth National Climate Assessment, the average Midwest air temperature increased by more than 1.5 degrees Fahrenheit between 1900 and 2010. In recent years, however, warming has increased three times as quickly between 1980 and 2010. By the end of 2030, Ohio's climate may trend towards the climate of Southern Illinois. By 2100, Ohio might feel like Arkansas or Texas. As a result, the warming climate suggests that extreme winter weather will be less severe and less frequent in Ohio, and heavy snowfall will manifest as heavy rainfall in future years.

4.10 Terrorism

4.10.1 Description

The Terrorism hazard is assessed as a way to monitor different types of terrorism and acts of violence inflicted on a civilian population. Terrorism is defined as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (28 CFR, Section 0.85). Tools used to conduct acts of terrorism include Weapons of Mass Destruction (WMD), biological, chemical, nuclear, and radiological weapons, arson, incendiary, explosives, armed attacks, industrial sabotage, intentional hazardous materials release, and cyberterrorism.

The Federal Bureau of Investigations (FBI) produces an annual terrorism report, which contains profiles and chronologies of terrorism incidents in the United States. Terrorism can be both International and Domestic, where International Terrorism is defined as acts "perpetrated by individuals and/or groups inspired by or associated with designated foreign terrorist organizations or nations (state-sponsored)". The second is Domestic Terrorism, which is defined as acts "perpetrated by individuals and/or groups inspired by or associated with primarily U.S.-based movements that espouse extremist ideologies of a political, religious, social, racial, or environmental nature" (Source: FBI).

Types of terrorism include cyberterrorism, agroterrorism, biological terrorism, chemical terrorism, or an active aggressor situation. Stakeholders have also requested discussion on active aggressors as part of this hazard assessment. These types of terrorism and other complex/coordinated events are defined below:

- **Cyberterrorism:** Cyberterrorism is an electronic attack using one computer system against another, and attacks can be directed towards computers, networks, or entire systems. A cyber-attack may last minutes to days. Homeland Security, the FBI, and the Federal Communications Commission Department of Justice are often involved in developing countermeasures that focus on reducing the threat, vulnerability, and likelihood of attack.
- **Agroterrorism:** Agroterrorism is a direct, generally covert contamination of food supplies or the introduction of pests and/or disease agents to crops and livestock. An agricultural-based terror attack can last days to months.
- **Biological Terrorism**: Biological terrorism includes use of bacteria, viruses, or toxins to incite terror. This mode of terrorism can last minutes to months.
- **Chemical Terrorism**: Chemical terrorism includes use of nerve agents, choking agents, blood agents, or blister agents to attack normal bodily functions of the nervous, respiratory, circulatory, and skin respectively. Usually, an act of chemical-based terror lasts only minutes.
- **Active Aggressor:** An active aggressor is an armed individual or group of individuals that is intending to cause harm or inflict terror on a civilian population. An active aggressor (or group) may be armed with guns, knives, bombs, or any other weapon/implement that may be used to inflict harm. This category includes active shooters and vehicle ramming.

4.10.2 Location

Terrorism events have generally been localized within a single jurisdiction. Coordinated events have occurred historically, greatly expanding the number of affected jurisdictions. Based on the nature of the event, several jurisdictions may respond to an incident.

4.10.3 Extent

The extent of each of these terrorism events includes:

- **Cyberterrorism**: Typically, the built environment is unaffected by a cyber-attack. Inadequate security can facilitate access to critical computer systems allowing them to be used to conduct attacks. Though the infrastructure may not be destroyed, it may be made to malfunction, causing additional hazards. Cyberterrorism may also include online wire fraud, which is often targeted to the elderly. This abusive practice often extorts the elderly and results in economic losses.
- **Agroterrorism**: Agro-terrorism is a viable primary aspiration for terrorists, as agriculture is the largest single sector in the US economy. It lacks the traditional shock factor of attacks, but its extent could be large and longer lasting. The extent of the effects varies by type of incident. Inadequate security can facilitate the adulteration of food and introduction of pests and disease agents to crops and livestock resulting in animal suffering, loss of valuable animals, cost of containment of outbreaks, and lost trade and other economic effects. With agriculture being the most common land use and top industry in Miami County, farmers must be vigilant and prepared to respond to acts of terrorism.
- **Biological Terrorism**: A biological attack could cause illness and even kill hundreds of thousands of people, overwhelm public health capabilities, and create significant economic, societal, and political consequences. Public health infrastructure must be prepared to prevent illness and injury that would result from biological terrorism.
- **Chemical Terrorism**: Most chemical agents are capable of causing serious injuries or death, and their often-rapid course of action means there is very little time to act when an act of chemical terrorism occurs. Public health infrastructure must be prepared to prevent illness and injury that would result from chemical terrorism. Terrorism events that are caused due to chemicals impact the environment as well. Impacts can be large and felt by the environment in several different ways such as altering the quality of air and water, affecting sewage and wastewater systems, and displacing aquatic ecosystems and soils that sustain wildlife.
- **Active Aggressor**: Active aggressor incidents often occur in areas where a number of people gather regularly. This may be a place of employment, a neighborhood gathering area (church, recreational center, school, etc.), or other location.

Terrorist threats may also occur among school districts within the County. Threats can last several hours or even days and cause multiple problems such as disturbing a school's order, causing traffic jams, and inducing civil panic. Individuals, groups, and institutions should be aware of and understand how to react to such potential threats immediately and appropriately.

4.10.4 History

There have been no reported terrorism events in Miami County. Although events such as the World Trade Center Bombings (1993 & 2001) did not occur in Ohio, there is an implied threat in this state. In 1995, an Ohio resident was able to order samples of Plague bacilli. Although this attempt was thwarted, it indicates viability of bio-terrorist threats. Terrorist plots have been thwarted in Columbus, Dayton, Cincinnati, and Cleveland, among other locations. Mass shootings, such as a school shooting, are an example of an Active Aggressor situation.

While there are no recorded school shootings or terrorism incidents in Miami County, local officials have determined that the risk of such an incident occurring in Miami County exists. The Miami County Sheriff's Office Special Response Team serves as the primary division responsible for domestic and/or foreign security issues serving as a liaison to other state and local organizations.

4.10.5 Probability

Terrorism-related events have a low probability and are not predictable. As these events are man-made, they should be considered unlikely, but not impossible. Cyberattacks are becoming more likely with 42,068 incidents across all sectors occurring nationwide in 2016 according to the U.S. Council of Economic Affairs. Of this, 21,239 were public sector attacks and utility systems experienced 32 attacks nationwide in 2016.

4.10.6 Vulnerability Assessment

Infrastructure Impact

Above ground structures such as utility systems, government buildings, churches, libraries, and schools, as well as below-ground infrastructure such as natural gas pipelines, are at risk for terrorism damage. Acts of cyberterrorism have the potential to target systems that may influence or control infrastructure. The Homeland Security Unit conducts vulnerability assessments on critical infrastructure and other key resources in the County.

Population Impact

The population of Miami County is likely to be impacted should an act of terror occur. Outdoor events with large crowds are vulnerable to vehicle ramming incidents It is important that public health organizations are prepared to prevent illness and injury that may result from acts of terror. Local law enforcement should also be prepared to mitigate risk at large social gatherings and other potential targets.

Property Damage

Since coordinated incidents can occur anywhere within the County, property damage is a possible outcome of such an event. Agroterrorism may result in damage to crops, and an active aggressor situation may result in minimal property damage.

For social vulnerability, although this hazard was not included in the National Risk Index, terrorism could be widespread throughout the County and have some effects on any resident of Miami County.

Loss of Life

Acts of terror are likely to result in loss of life and cause long-term impact to health. It is important that public health and healthcare organizations are prepared to act quickly should an act of terror occur.

Economic Losses

Since the probability of a coordinated attack happening in Miami County is very low, local terrorism-related economic losses are estimated at zero. However, terror attacks occurring in other locations have the potential to have economic impacts in Miami County. A 2016 nationwide estimate indicates that a cyber-attack may cost the U.S. economy between $57 billion and $109 billion.

Transportation networks, such as air transportation, can be shut down as a result of terrorism impeding profits and resulting in economic losses to organizations within the County. Any nationwide complex/coordinated attack or act of terror that results in a temporary freeze of goods or services has the potential to limit or suspend economic activity in Miami County as well.

4.10.7 Future Trends

Land Use and Development Trends

Terrorism-related events can occur anywhere. Non-residential land uses are more likely to be targeted for terror events or active shooters. Schools and government buildings should have active shooter

plans in place. Farmers must be prepared for agroterrorism by locking certain areas of their farms or using cameras to monitor who is on their fields.

Climate Change

Although there are no known linkages between climate change or terrorism, security concerns linked to climate change include climate-related natural disasters, impacts on food, water, and energy supplies, increased competition over natural resources, loss of livelihoods, and forced migration and displacement.

4.11 Tornadoes and High Winds

4.11.1 Description

FEMA defines a tornado as "a violently rotating column of air extending from a thunderstorm to the ground." Tornadoes can generate wind speeds of greater than 250 MPH. Tornado paths can be as large as one-mile-wide and 50 miles long. Nationally, there is an average of 800 tornadoes reported annually across all 50 states.

In general, the midsection of the United States experiences a higher rate of tornadoes than other parts of the country because of the recurrent collision of moist, warm air moving north from the Gulf of Mexico with colder fronts moving east from the Rocky Mountains. Supercells, which form from rotating thunderstorms, are the most destructive variety of tornado.

Tornado Warnings are issued when a tornado is indicated by the WSR-88D radar or sighted in person by spotters. The WSR-88D radar is an advanced Weather Surveillance Doppler Radar utilized by the NWS to generate a radar image. Once a warning has been issued, people in the warning area should seek shelter immediately. Warnings will include the location of the tornado, as well as what communities will be in its path. A tornado warning can be issued without a tornado watch, and they are typically issued for 30 minutes at a time. If the thunderstorm responsible for the formation of the tornado is also producing large volumes of rain, the tornado warning may be combined with a Flash Flood Warning. The NWS Office will follow up any Tornado Warnings with Severe Weather Statements to provide up-to-date information on the tornado and inform the public when the warning is no longer in effect (Source: NWS). The National Weather Service Forecast Office in Wilmington, Ohio is responsible for issuing Tornado Watches /Warnings and Wind Advisories for Miami County.

4.11.2 Location

Tornadoes and non-thunderstorm induced high wind events are countywide hazards and all of Miami County is susceptible to tornadoes and non-thunderstorm induced high wind events. **Figure 4.11.1** shows the location of a worst-case scenario tornado in Miami County.

4.11.3 Extent

Tornadoes are measured by damage scale for their winds with greater damage equating greater wind speed. The original Fujita Tornado Damage Scale (F-scale) was developed in 1971 without much consideration to a structure's integrity or condition as it relates to the wind speed required to damage it. The Enhanced Fujita-scale (EF-Scale) took effect on February 1, 2007. This scale starts with the original F-scale's F0-F5 ratings and classifies tornado damage across 28 different types of damage indicators. These indicators mostly involve building/structure type and are assessed at eight damage levels from 1-8. Therefore, construction types and their relative strengths and weaknesses are incorporated into the EF classification given to a particular tornado. The most intense damage within the tornado path will generally determine the EF scale given the tornado. **Table 4.11.1** lists the classifications under the EF- and F-scale. It should be noted that the wind speeds listed in this table are estimates based on damage rather than measurements.

There are no plans by the National Oceanic Atmospheric Administration (NOAA) or the National Weather Service to re-evaluate the historical tornado data using the enhanced scale. Therefore, this Plan and subsequent plans will reference both scales until a complete switchover is deemed necessary.

Figure 4.11.1: Worst-Case Scenario Tornado

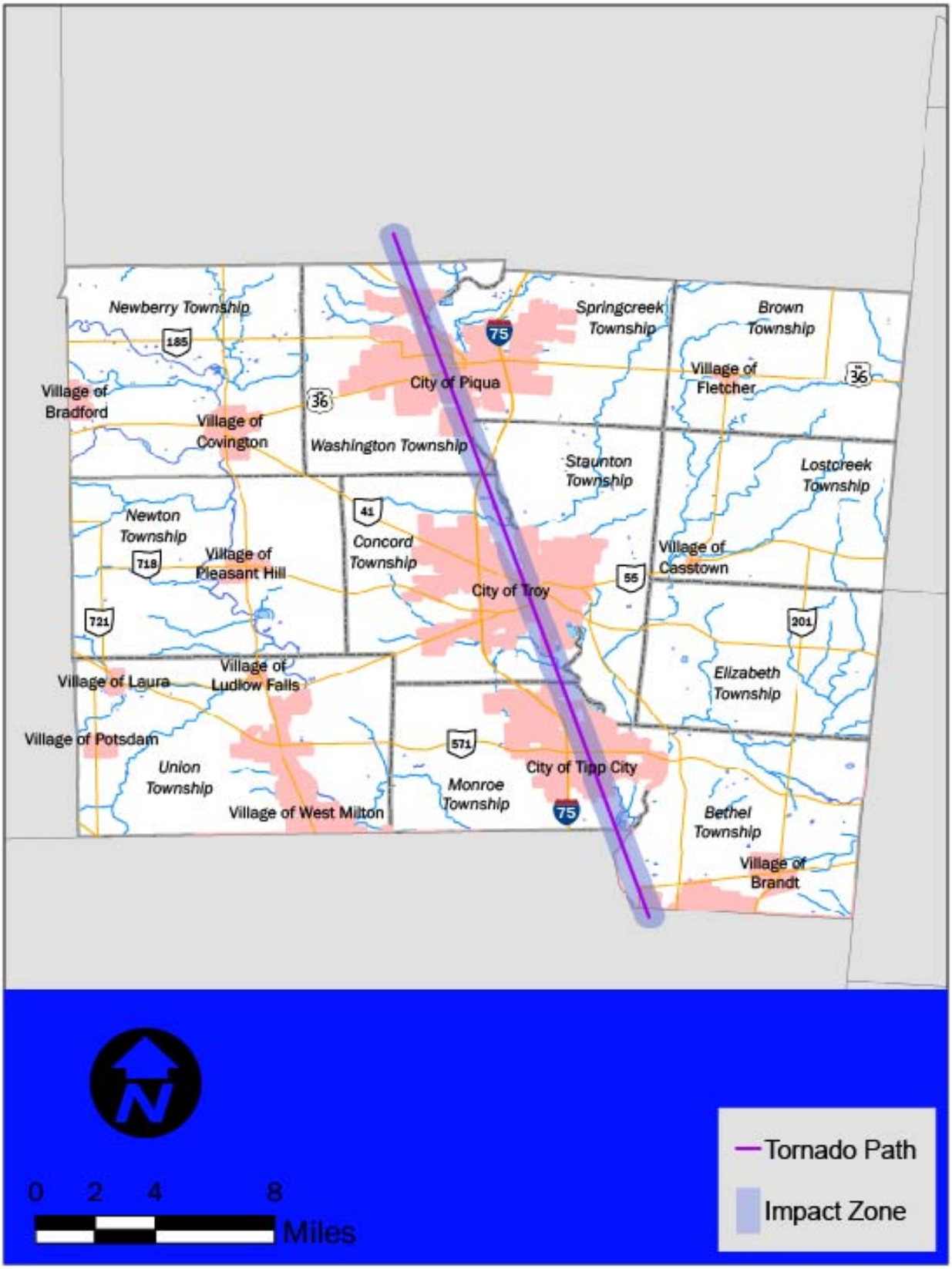


Table 4.11.1 Fujita and Enhanced Fujita Scale Classifications

Fujita Scale 3-Second Wind Gust (MPH)		Damage Levels	Enhanced Fujita Scale 3-Second Wind Gust (MPH)	
F0	45-78	Light Damage: Tree branches down.	EF-0	65-85
F1	79-117	Moderate damage: Roof damage.	EF-1	86-110
F2	118-161	Considerable damage: Houses damaged.	EF-2	111-135
F3	162-209	Severe damage: Buildings damaged.	EF-3	136-165
F4	210-261	Devastating damage: Structures leveled.	EF-4	166-200
F5	262-317	Incredible damage: Whole towns destroyed.	EF-5	Over 200

Source: SOHMP

4.11.4 History

According to the National Centers for Environmental Information (NCEI), there have been 19 tornado events, and 12 high wind events recorded in Miami County from January 1990 to December 2020. According to the Federal Emergency Management Agency, one of these events was declared a federal disaster. These events resulted in over $23 million in property damage and $3,000 in crop damage. These events were responsible for one death and one injury. These events are summarized in **Table 4.11.2**, below:

Table 4.11.2: Tornado & High Wind Events in Miami County since January 1990

Severe Storm Event Type	Number of Events	Injuries	Deaths	Property Damages	Crop Damages
Tornadoes	20	1	0	$11,380,000	$3,000
High Wind	12	0	1	$12,105,000	$0
Total	32	1	1	$23,485,000	$3,000

Miami County has been associated with one tornado disaster declaration (2019) since the previous hazard mitigation plan.

Tornado, July 24, 2022

A tornado, rated an EF-1, formed in the city of Troy near the intersection of Dorset Road and Cheshire Road (immediately east of I-75). The tornado remained on the ground for approximately 1.8 miles, with damaged limited to branches and trees downed. Minor roof damage and ancillary structures (signs) were damaged, as well as one vehicle that was struck by a falling tree. Due to the recent nature of the disaster, no property damage estimates are available. However, no fatalities or injuries were recorded.

Tornado, June 8, 2022

A tornado formed west of the Village of West Milton and traveled east, loosely in contact with the ground through the village. The tornado remained on the ground east of the village and strengthened as it approached Nashville Road, east of West Milton and west of Tipp City. As the tornado neared Interstate 75, it intensified to an EF-2 and struck several large warehouses, with the complete collapse of an external wall at the Meijer distribution center. Winds were estimated at 120 mph. Due to the recent nature of the disaster, no property damage estimates are available. However, no fatalities or injuries were recorded.

Tornado, January 10, 2020

Two tornados formed, one in the City of Troy and the second four miles southeast of the Village of Fletcher. Both tornadoes were rated an EF-0. The City of Troy tornado touched down on the southwest portion of the city, traveled 3.2 miles with wind speeds reaching 80 mph, through the city center to the Great Miami River where it weakened and lifted. Damage caused by the Troy tornado was confined to roofs and trees. The Village of Fletcher tornado traveled 6.3 miles with wind speeds reaching 70 mph through the Miami County Park Districts' Big Woods reserve and Village of Fletcher, lifting two miles northeast of Fletcher. Damage was confined to trees, barn roofs, and outbuildings. No property damage estimates are available for either tornado. However, no fatalities or injures were recorded.

Tornado, May 27, 2019

A tornado outbreak began late in the evening on May 27, with a Tornado Watch being issued at 8:26pm for areas north of Interstate 70 (including Miami County). At 10:12pm, the second Ohio tornado touched down in Darke County to the east, heading for the Village of Potsdam. This tornado was rated an EF-3. Another tornado touched down in northern Montgomery County and briefly hit undeveloped, rural areas in extreme southern Miami County. These tornadoes caused $10 million in property damages. One injury was reported by an individual in a mobile home that was overturned by the passing tornado. This event was deemed a major disaster by FEMA.

High Wind Event, September 14, 2008

The remnants of Hurricane Ike merged with a frontal boundary across the Ohio Valley. Abundant sunshine promoted significant daytime heating, causing an unstable atmosphere. Warm, dry air aloft translated down to the surface with gusty winds in excess of 70 mph persisting for a period of several hours, causing significant damage and widespread power outages. This event was the costliest high wind event, causing $12 million in damages.

High Wind Event, January 10, 2000

A high wind event occurred with the passage of cold front on January 10, 2000. A man was walking back to his house from getting his newspaper when a 30 feet tall tree fell on him. He was killed from the impact of the tree.

4.11.5 Probability

According to the NCEI, there have been 32 tornado and high wind events reported in Miami County from January 1990 to June 2022 with total losses reaching more than $23 million in property damage and $3,000 in crop damage. This amounts to one tornado and high wind event annually with average annual damages of $783,000. **Figure 4.11.2** below shows the trend in number of tornado events per year since 1990. The trend line has a positive slope, which indicates that the number of tornado events has increased over the last 32 years and is projected to increase over the next five years. Years prior to 1990 are excluded from the probability calculation due to missing and/or unreliable data reporting.

Figure 4.11.2: Tornado Event Probability

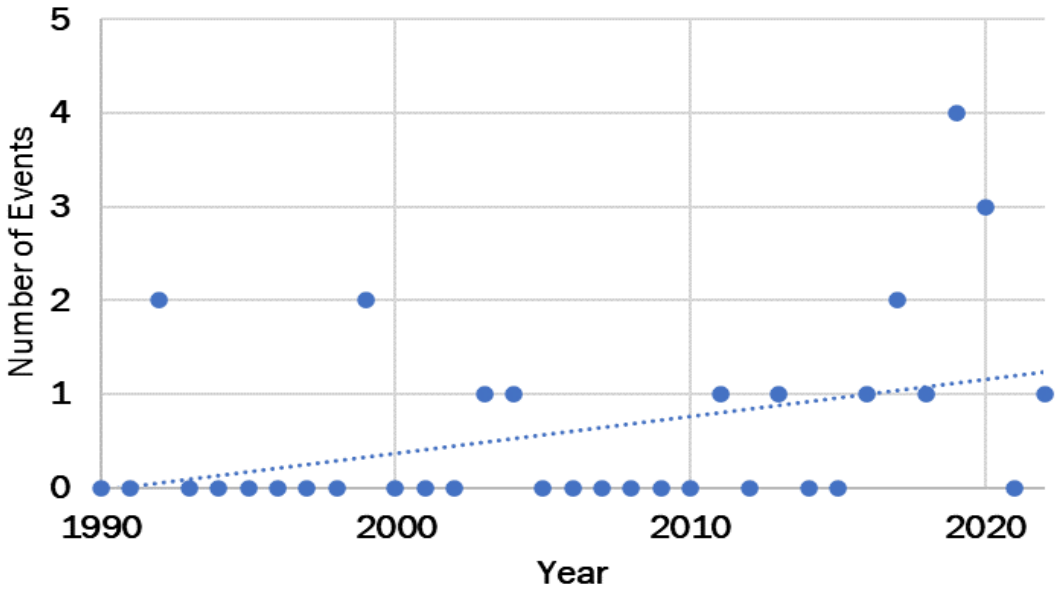
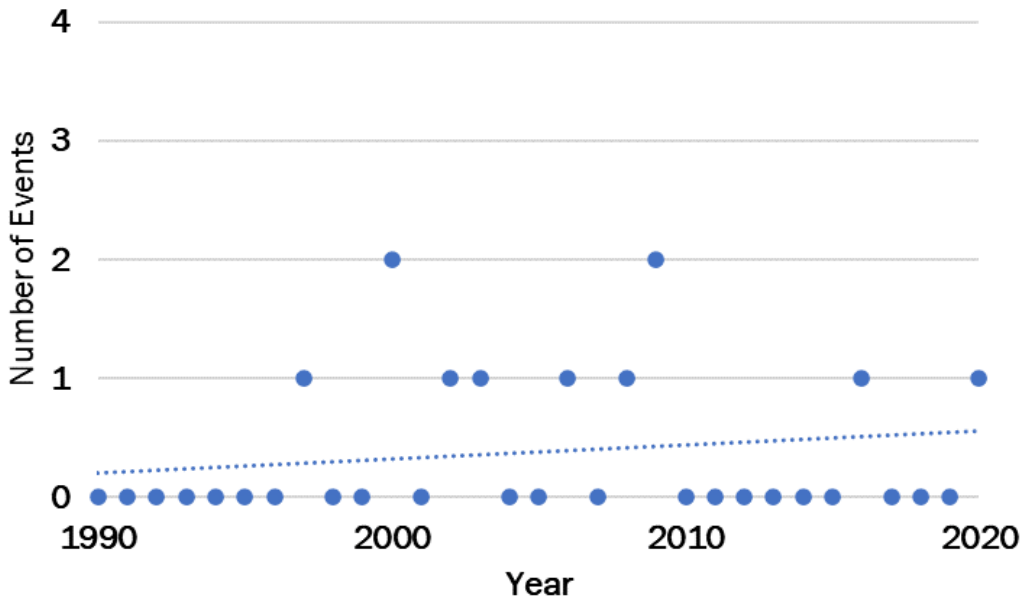


Figure 4.11.3 below shows the trend in number of high wind events per year since 1990. The trend line has a positive slope, which indicates that the number of high wind events has increased over the last 30 years and is projected to increase over the next five years. Years prior to 1990 are excluded from the probability calculation due to missing and/or unreliable data reporting.

Figure 4.11.3: High Wind Event Probability



4.11.6 Vulnerability Assessment

Infrastructure Impact

Above-ground infrastructure can be damaged by high winds and tornadoes. Debris caught in the high winds as well as fallen trees can also cause damage to buildings and infrastructure including road

closure. Above ground utility infrastructure can be damaged or destroyed, which can cause service outages.

Population Impact

Tornadoes are random in nature and have the potential to occur anywhere in the County. Everyone within the County should be prepared for a tornado and high wind events. Residents in mobile home parks are particularly vulnerable and should have a plan in place. High wind events are widespread and may impact the entire County.

For social vulnerability, according to the National Risk Index, tornadoes and strong winds have a score of 79.0 ("relatively moderate") and 80.4 ("relatively moderate") in Miami County. Tornadoes that have occurred in Miami County are typically weaker tornadoes, rated EF-2 or lower. The index indicates an expected annual loss of $3.6 million due to tornadoes and $1.1 million due to strong wind, with 0.3 and 2.7 events occurring per year, respectively.

Property Damage

Tornadoes can cause significant damage to buildings and properties. There have been 19 tornadoes and 12 high wind events in Miami County which have caused more than $11.3 million in property damage. Annually, this amounts to $783,000 in damages. **Table 4.11.3**. details the structural vulnerability from the worst-case scenario for Miami County which is demonstrated in **Figure 4.11.1**.

Loss of Life

One fatality occurred during a high wind event in January 2000. A man was struck by a falling tree while returning to his house from retrieving a newspaper. Due to the widespread nature of high wind events and the short warning time for tornadoes, the potential for loss of life exists. People located near large trees, in mobile/manufactured homes, or exposed directly to the elements may be at a higher risk for injury or loss of life.

Economic Losses

Tornadoes can cause major damage to structures and roads. Higher severity tornadoes have the potential to destroy structures. Debris also has the potential to cause damage to structures by breaking windows, damaging walls, or falling directly onto buildings and above-ground infrastructure.

Damages to utilities and roadways may also cause economic damage due to business closures, destruction of goods that require electricity, and halting economic activity. The following table (**Table 4.11.3**) projects the vulnerability to structures in Miami County based on the worst-case scenario tornado depicted in **Figure 4.11.1.** This modeling is completed only to demonstrate potential damages associated with an EF-5 tornado that tracks through the most populated areas of the County.

Table 4.11.3: Structure Vulnerability from Tornadoes

Structure Type	Number of Properties Exposed	Value of Vulnerable Structures		
		Land	Building	Total
Residential	7,920	$67,211,100	$205,336,610	$272,547,710
Non-Residential	1,793	$48,586,880	$191,737,120	$240,324,000
Critical Facilities	0	$0	$0	$0
Total	26,806	$672,033,450	$732,353,540	$1,404,386,990

**Note: Critical Facilities are non-residential structures, and their value is incorporated into the non-residential totals as well. Calculated totals are determined by summing the residential and non-residential values.*

4.11.7 Future Trends

Land Use and Development Trends

Tornadoes can occur anywhere and are common in western Ohio. Tornadoes may happen at any time of the year, though they statistically are more common in spring and autumn. Any development that has occurred since the previous plan and any future development has the potential to be impacted by tornadoes.

Climate Change

According to the Fourth National Climate Assessment, certain hazards such as rainfall and heat can be directly linked to a warmer world, but the link between climate change and tornadoes is not yet fully understood. Tornado records in the U.S. are often only available starting during the 1950s. This limited data set makes it difficult to compare trends over long periods of time. Additionally, tornado reporting was not fully standardized until 2007, when the Enhanced Fujita Scale was released. As a result, although tornadoes are exhibiting changes that may be related to climate change, scientists cannot yet fully predict the direction and magnitude of changes to tornadoes from climate change.

However, the Center for Climate and Energy Solutions has identified some short-term trends, although they are not yet linked directly to climate change. The number of days with tornadoes in the U.S. has fallen, but tornado outbreaks, or the number of tornadoes in one day, have increased. The density and strength of tornadoes has also increased. Finally, tornado distribution has shifted eastwards, which includes a move towards Ohio.

4.12 Transportation

4.12.1 Description

Hazards relating to modes of transportation and the failure of transportation systems may result in accidents and emergencies as well as other secondary effects such as fires, explosions, and release of hazardous materials. Transportation hazards can arise from aviation, marine/waterborne, public transit, rail, and road and highway systems. The Ohio Department of Transportation (ODOT) is the primary emergency support agency responsible for transportation emergencies for Miami County.

4.12.2 Location

Transportation hazards can occur anywhere within or around the County with immediate impacts limited to the site of the accident, but secondary impacts can have a wider scope. Ohio has an extensive transportation network of roads and highways, rail lines, waterways, and air travel that supports the State's economy.

Miami County contains several major roadways, including Interstates (I), US Routes (US) and State Routes (SR). Major roadways in Miami County include: SR-41, SR-48, SR-49, SR-55, SR-66, SR-185, SR-201, SR-202, SR-571, SR-589, SR-718, SR-721, US-36, US-40, I-75. Miami County contains 20.0 miles of interstates, 31.4 miles of US routes and 209.5 miles of state routes.

The Ohio Department of Transportation (ODOT) has record of two airports in Miami County, as well as two nearby airports in Montgomery County which are listed in **Table 4.12.1** below. There are four helipads in Miami County – one in the City of Piqua, one in the City of Tipp City, and two in the City of Troy.

Table 4.12.1: Aviation Facilities in Miami County, Ohio

Facility Name	Location	Facility Type	Ownership/Use Type
Hartzell Field	Washington Township	Airport	Public
Troy Skypark	Concord Township	Airport	Private
Phillipsburg	Village of Phillipsburg (Montgomery)	Airport	Private
Dayton International	City of Dayton (Montgomery)	Airport	Public
WACO Field	Concord Township	Airfield (Historic, Usable Runway)	Private
Upper Valley Medical Center	Concord Township	Heliport	Private (Healthcare)
Kettering Health Network	City of Troy	Heliport	Private (Healthcare)
Kettering Health Network	City of Piqua	Heliport	Private (Healthcare)
Private Helipad	City of Tipp City	Heliport	Private

The Ohio Department of Transportation (ODOT) has record of one active rail line in Miami County, which is operated by CSX Transportation. This is a freight line that runs primarily north-south through the cities of Troy, Piqua, and Tipp City. The line closely follows I-75 in Miami County.

4.12.3 Extent

Several factors, from mechanical failure to a collision with an animal, can cause a transportation incident. Immediate impacts of transportation emergencies can result in loss of human life or wildlife, structural damage, and disruptions in transportation system and traffic. Risk is further escalated by secondary impacts such as, fires, explosion, air pollution, and chemical incidents, that may extend beyond the site of the accident. Some of these may lead to severe impact on public and environmental health.

4.12.4 History

According to the Bureau of Transportation Statistics, the United States averaged 6,073,472 transportation accidents a year including air, highway, railroad, transit, waterborne, and pipeline accidents, and 36,626 transportation fatalities a year from 2010-2018. Fatalities in 2018 by type of transportation mode in United States and Ohio are listed in **Table 4.12.2**. Roadway crash statistics are available for Miami County as listed in **Table 4.12.3**.

A privately managed database called Plane Crash Map provides plane crash information in the United States including crashes occurred during training. They have a record of 781 fatal crashes in Ohio since 1969 of which four are in Miami County (**Table 4.12.4**).

Table 4.12.2: Transportation-related Fatalities by mode in United States and Ohio, 2018

Type/Measure	United States	Ohio
Air Fatalities	394	33
Water Fatalities (including recreational boating)	684	17
Highway Fatalities	36,560	1,068
Rail Fatalities	831	24
Transit Fatalities	251	2

Table 4.12.3: ODOT 5-year Crash Statistics, Miami County, 2017-2021

Type/Measure	2017	2018	2019	2020	2021
Total Crashes	2451	2518	2741	2052	2538
Total Injured	705	617	643	552	697
Total Killed	12	11	15	11	20
Animal Related	310	282	365	279	316
Bicycle Related	26	18	14	10	14
Motorcycle Related	29	19	30	32	30
Pedestrian Related	18	10	16	14	11

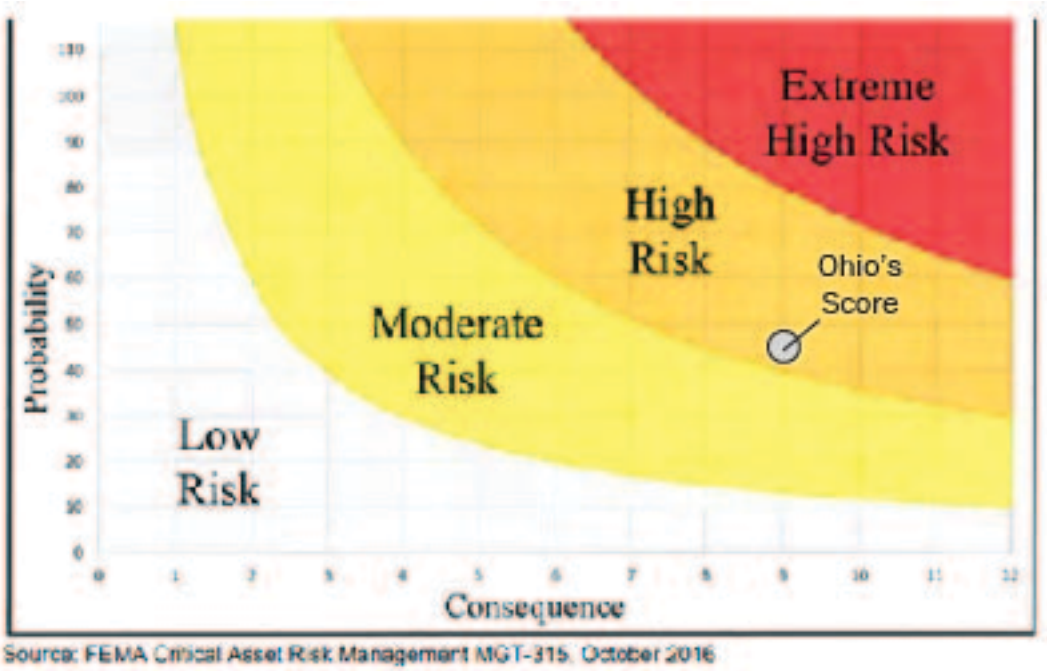
Table 4.12.4: All Plane Crashes in Miami County since 1985

Year	Nearest City	Aircraft Type	Loss of life
1989	Tipp City	Hawker Siddeley	None
1996	West Milton	Piper PA 34-220T	Pilot & Passenger
2001	Piqua	Beech BE-200	Pilot
2017	Piqua	Cessna 182M	None

4.12.5 Probability

Like other hazards, transportation events may not occur regularly, have little to no predictability, and may last a few hours. Authorities in areas with a high density of highway, air, or rail traffic should assess risks and take preventive measures accordingly. To calculate the total risk of transportation system failure, a Threat/Hazard Value (T) must be derived from the duration of the event, speed of onset, frequency, and magnitude. A Vulnerability rating (V) should be calculated by adding the risk of business, human, property, and environment) and dividing this total by 2.2. The final factor is the Consequence Value (C) which sums the seven factors in the Consequence Analysis section of the *Ohio Hazard Identification and Risk Assessment 2018*. Based on these calculations, Ohio places transportation hazards in Ohio in the moderate to high-risk zone with a probability score of 45 and a consequence value of nine (**Figure 4.12.1**).

Figure 4.12.1: Total Risk Graph



Source: FEMA Critical Asset Risk Management MGT-315, October 2016

4.12.6 Vulnerability Assessment

Infrastructure Impact

Infrastructure disruption due to transportation hazards are usually due to a direct impact of the accident. Hazards are primarily linked to bridge/structure collapse, and bridges are the most common type of collapse in the State. Secondary impacts such as limited access to other infrastructure like health services as well as widespread disruptions in roadway system may be seen.

Population Impact

Transportation hazards may lead to structure failure or environmental damages through hazardous materials releases. Environmental impacts may lead to long-term consequences. Everyone should be prepared, including individuals relying on these systems to get around.

For social vulnerability, although this hazard was not included in the National Risk Index, transportation could be widespread throughout the County and have some effects on any resident of Miami County.

Property Damage

Properties can be vulnerable to transportation incidents and crashes; especially those in proximity of the incident.

Loss of Life

Transportation incidents can result in fatalities or injuries for those on or within the immediate vicinity of an incident, and if involved in a collision. Highway accidents are the most common, however no fatalities have been recorded since 2015 in Miami County.

Economic Losses

Transportation hazards could result in large economic impacts that extend beyond the limits of the affected area, to the connected communities including their ability to get to work and participate in local economies. Miami County has four transportation related critical facilities owned by the State with total value of $12,374,292.

4.12.7 Future Trends

Land Use and Development Trends

Availability of transportation infrastructure such as railroad and airports could make the surrounding area attractive for further development. Such land development may result in transportation hazards, for example, construction of a railroad or highway through a wooded area may result in collision with wildlife. A transportation incident could result in water or air pollution, particularly from the chemicals released during impact or combustion resulting in harm to humans, animal, and aquatic life. All land uses in proximity of transportation infrastructure are equally impacted.

Climate Change

According to the National Climate Assessment, a reliable, safe, and efficient transportation system is at risk from severe weather, flooding, droughts, and increased average temperature as a result of climate change. Although warmer winters could extend the construction season and reduce winter road maintenance and ice-related vehicle accidents, climate change is expected to increase the overall cost of maintaining, repairing, and replacing transportation infrastructure. More frequent severe weather and flooding events could lead to regular road closures due to standing water or damaged infrastructure. In addition, extreme heat and droughts may affect travel and recreation along rivers.

05 | Hazard Mitigation

HAZARD MITIGATION

5.1 Hazard Mitigation Strategy

Each potential hazard, including natural, geological, and human-caused hazards, were rated by members of the Core Planning Committee, which included representatives from each jurisdiction in Miami County. Each potential hazard was rated on a scale of zero to five, with zero indicating the hazard should not be studied and five indicating the most significant threat to the representative's community. **Table 5.1** displays the average of the representatives' ratings as a Priority Score for each hazard. The hazard that scored the highest was Severe Wind and Tornadoes, (4.42). Utility failure was not considered a hazard by most of the participants, but it received a high score on a small number of surveys. The mitigation goals follow the ranking of hazards as established by the representatives of the participating jurisdictions.

Table 5.1: Hazard Priorities

Hazard	Priority Score	Rank
Multiple Hazards	5	1
Tornadoes & High Winds	4.42	2
Epidemic/Pandemic	4.02	3
Severe Winter Weather	3.94	4
Flooding	3.87	5
Severe Summer Weather	3.75	6
Hazardous Materials Incident	3.52	7
Terrorism (Cyber Attacks)	2.99	8
Dam/Levee Failure	2.94	9
Extreme Heat	2.44	10
Invasive Species/Infestation	2.19	11
Drought	2.1	12
Non-hazardous transportation incidents	1.8	13
Earthquakes	1.58	14
Landslides	0.8	15
Wildfire	0.44	16

Coastal erosion and hurricanes/tropical storms are hazards that are not applicable to Miami County and were not assessed; however, if remnants of hurricanes or tropical storms were experienced as thunderstorms, thunderstorm winds, or high/severe winds, those events were included in the severe summer weather and/or severe wind and tornadoes assessments. Several new hazards were included

in this Plan that were not included in the 2018 Plan. These hazards include epidemic/pandemic, cyberattacks, and terrorism (both of which are covered under the 'Terrorism' risk assessment).

Utility failure was rated highly by a minority of participants, while the majority of participants provided no rating. Utility failure was considered throughout the risk assessments in Chapter 4 but did not receive its own risk assessment. Wildfires received a low score and were added to the Drought risk assessment. Landslides had an average score of one or below, and therefore were considered not applicable to Miami County.

The Miami Conservancy District (MCD) is included in this plan as a special jurisdiction. Flooding and Dam Failure are the two hazards that are most likely to impact the MCD. A vulnerability assessment for the MCD can be found in **Chapter 4** under the Dam Failure and Flooding risk assessments.

Mitigation projects will only be implemented if the benefits outweigh the associated cost of the proposed project. The Core Planning Committee, in coordination with the Miami County Emergency Management Agency, performed a general assessment of each action that would require FEMA funding as part of the planning process. A detailed cost-benefit analysis of each mitigation action will be required during the project planning phase in order to determine the economic feasibility of each action. Projects will also be evaluated for social and environmental impact-related feasibility, as well as technical feasibility and any other criteria that evaluate project effectiveness. This evaluation of each project will be performed during the pre-application phase of a grant request. Project implementation will be subject to the availability of FEMA grants and other funding sources, as well as local resources.

Projects that are determined to be infeasible during this review process will be re-evaluated by members of the Core Planning Committee for re-scheduling or deletion.

All jurisdictions assigned mitigation actions have the authority to implement those mitigation actions. There are no known gaps or limitations in a jurisdiction's ability to implement any assigned mitigation action.

5.2 Hazard Mitigation Goals and Mitigation Actions

Developing achievable goals forms the foundation for all mitigation actions and activities that will aid Miami County in attaining the overall mission of the Core Planning Committee. As such, the Core Planning Committee assessed the goals of the 2018 Miami County Hazard Mitigation Plan and had the opportunity to develop new goals for the 2023 update. Goals were reviewed and established based upon their relationship to the potential adverse impact upon the community.

The goals, as well as the hazards assessed for this Plan, informed the development of actions that the Region and participating jurisdictions can take to mitigate the impacts of each of the hazards. The goals of the 2023 Miami County Hazard Mitigation Plan are as follows:

- **Goal 1:** Build community resiliency against the negative impacts of all-hazard events including, but not limited to, severe weather events, cyber threats, and health emergencies in order to reduce loss of life, property damage, and economic loss.
- **Goal 2:** Strengthen community partnerships and cooperation between public and private entities in order efficiently share resources and collectively respond to emergencies.
- **Goal 3:** Deliver programs for public information and education of manmade and natural hazards for citizens, private property owners, public agencies, businesses, industry and schools.
- **Goal 4:** Implement and promote up-to-date hazard warning and communication systems and increase awareness of and ability to support vulnerable populations.

- **Goal 5:** Strengthen the capability of facilities across the County to resist disaster and remain available to support impacted populations during disaster events; increase redundancy in utility and communication systems.
- **Goal 6:** Promote the continued preservation of open space, floodplains, wetlands, woodlands, and recreation areas along the Great Miami River and tributaries.
- **Goal 7:** Reduce the impact of urban and small stream flooding and surface drainage problems and promote ongoing maintenance and improvement to storm drainage systems and flood control structures.
- **Goal 8:** Maintain hazardous materials incident response capability by fostering active Local Emergency Planning Committee and sustaining countywide Type II Hazmat team.

5.3 Hazard Mitigation Action Priority

Members of the Core Planning Committee completed a Previous Mitigation Action Status survey, which indicated the status of mitigation actions included in the 2018 Hazard Mitigation Plan. This survey asked representatives to indicate whether the mitigation action from the previous plan was completed, deleted, deferred, unchanged, or ongoing. It also asked the representative if the action should be included in the updated Plan.

Once all mitigation actions from the previous plan were reviewed and their status indicated (**Appendix B**), all mitigation actions for the 2022 Miami County Hazard Mitigation Plan were reviewed and rated on a scale of one to five by members of the Core Planning Committee based on the several criteria, including whether the action was cost-effective, technically feasible, environmentally sound, needed immediately, and the action's total risk reduction.

All of the surveys collected were tabulated to develop a single raw score for each individual mitigation action. These scores are indicated on the Hazard Mitigation Action Priority Table on the following pages. Overall, the score was determined by two factors:

1. The rankings of the hazard, as determined by the Hazard Priority Survey (**Table 5.1**, above).
2. The ratings received from the Core Planning Committee and the public on each of the mitigation actions.

The raw scores were then ranked, and each mitigation action was assigned a number (1-61) to indicate the priority of that specific action, according to the survey responses. The lower the action priority, the higher the priority. For example, an action assigned a priority of "1" should be prioritized higher than an action assigned a priority score of "38".

Hazard Mitigation Action priorities are organized by hazard in **Table 5.2**. The lower the action priority, the higher the priority score or number. Comments from the jurisdictions responsible for each action can be found in **Appendix G**, along with all completed surveys that were used to make **Table 5.2**.

Table 5.2: Mitigation Actions Priority Table by Hazard

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
Multiple Hazards								
1	Complete special needs assessment of the County.	Miami County	1	6	Miami County EMA	Emergency Management Performance Grant (EMPG) Special Project Grants	1/1/23-12/31/27	Ongoing
2	Promote public awareness of manmade and natural hazards at public events and hold workshops to educate the public. Distribute appropriate mitigation publications.	Miami County & Participating Jurisdictions	1	7	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	Ongoing
3	Provide power line for emergency backup power generator for the Village of Laura from the wastewater treatment facilities to the water treatment facilities.	Village of Laura	1	5	Mayor/ Administrator of Village of Laura	General Operating Budget	1/1/23-12/31/27	Ongoing
4	Adopt the International Building Code (IBC) and International Residential Code (IRC).	Miami County	1	9	Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
5	Distribute information and locations of public shelters with utility bills and other mailings.	Miami County & Participating Jurisdictions	1	3	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
6	Create a database to identify the regions where individuals at high risk of death and injury, such as the elderly or homeless reside in high concentrations.	Miami County	1	2	Miami County EMA, Miami County Health Department	Staff Time	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
7	Increase canopy coverage in the area by planting more trees.	Miami County & Participating Jurisdictions	1	8	Miami County Commissioner, Mayors/ Administrators of Jurisdictions	General Operating Budget	1/1/23-12/31/27	New
8	Install backup generators in public buildings and critical facilities.	Miami County	1	4	Miami County EMA, Mayors/ Administrators of Jurisdictions	Special Project Grants	1/1/23-12/31/27	New
9	Enhance and maintain early warning systems, such as sirens and automated emergency notification systems, to warn residents of approaching severe weather.	Miami County & Participating Jurisdictions	1	1	Miami County Commissioner, Mayors/ Administrators of Jurisdictions	General Operating Budget	1/1/23-12/31/27	New
10	Work with all jurisdictions on strengthening abilities to fill in gaps and implement mitigation efforts.	Miami County & Participating Jurisdictions	1	68	Miami County Commissioner, Mayors/ Administrators of Jurisdictions	General Operating Budget	1/1/23-12/31/27	New
Dam Failure								
11	Promote continued maintenance and improvement. Ongoing levee system maintenance.	Miami County & Participating Jurisdictions	9	53	MCD, Miami County EMA, Mayors/ Administrators of Jurisdictions	General Operating Budget	1/1/23-12/31/27	Ongoing
12	Map inundation areas for all Class I and Class II dams.	Miami County	9	51	Miami County EMA	Staff Time	1/1/23-12/31/27	New
13	Rehabilitate high hazard potential dams.	City of Piqua	9	52	City of Piqua	HHPD Grant	1/1/23-12/31/27	New
14	Conduct hydraulic and safety evaluations for Piqua's dams and supporting waterways.	City of Piqua	9	50	City of Piqua	HHPD Grant	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
Drought								
15	Identify local drought indicators, such as precipitation, temperature, surface water levels, soil moisture, etc.	Miami County	12	60	Miami County EMA, OSU Ext. Office	Staff Time	1/1/23-12/31/27	New
16	Establish a regular schedule to monitor and report conditions on at least a monthly basis.	Miami County	12	61	Miami County EMA	Staff Time	1/1/23-12/31/27	New
17	Regularly (monthly, bimonthly, twice annually, annually, etc.) check for leaks in the water supply to minimize losses.	Miami County & Participating Jurisdictions	12	58	Public Works Department, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
18	Hold a regular meeting (annual or as needed) with local farmers to identify potential drought issues.	Miami County & Participating Jurisdictions	12	59	Miami County EMA, Mayors/ Administrators of Jurisdictions, OSU Ext. Office	Staff Time	1/1/23-12/31/27	New
Earthquakes								
19	Educate homeowners on safety techniques to follow during and after an earthquake.	Miami County & Participating Jurisdictions	13	62	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
Epidemic/Pandemic								
20	Complete a plan with the Public Health Department to better prepare for an epidemic or pandemic.	Miami County & Participating Jurisdictions	3	12	Miami County EMA, Miami County Health Dept.	Staff Time	1/1/23-12/31/27	New
Flooding								
21	Acquire, demolish, and/or retrofit flood prone properties	Concord Township & Miami County & Participating Jurisdictions	5	38	Mayor/ Administrator of Jurisdiction	Special Project Grants	1/1/23-12/31/27	Ongoing

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
22	Increase communication, coordination, and collaboration between community leaders, property owners, local and county building regulations, floodplain managers and zoning authorities to address risk and to provide uniformity and consistency in implementing sound mitigation practices.	Miami County & Participating Jurisdictions	5	22	Miami County EMA, Mayors/ Administrators of Jurisdictions, Miami County DOD	Staff Time	1/1/23-12/31/27	Ongoing
23	Improve the Kerns/Alexander ditch along Fenner Road west of Barnhart Road to eliminate flooding of the land around the homes in that area.	Concord Township	5	36	Mayor/ Administrator of City of Troy	General Operation Budget	1/1/23-12/31/27	Ongoing
24	Preserve floodplain areas along river corridors as natural open space areas. Provide for wetlands and woodlands protection.	Miami County & Participating Jurisdictions	5	30	Miami County DOD, Mayors/ Administrators of Jurisdictions,	Staff Time	1/1/23-12/31/27	Ongoing
25	Improve the Schaurer and Ziegenfelder ditches along State Route 718 (west and east of Washington Road) and McKaig Road to eliminate continued standing surface water issues around homes and on agriculture land and to eliminate periodic flooding of other land in the area.	Miami County & City of Troy	5	35	Mayor/ Administrator of City of Troy	General Operation Budget	1/1/23-12/31/27	Ongoing

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
26	Update and complete an inventory of buildings and building data within the 100-year flood plain boundaries of Miami County. Coordinate with recently completed GIS flood plain maps.	Miami County & Participating Jurisdictions	5	23	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	Ongoing
27	Improve the Clayton ditch in and around Beechwood Drive in the Lakeshore subdivision to eliminate flooding of homes and land in this area.	Concord Township	5	39	Mayor/ Administrator of City of Troy	General Operation Budget	1/1/23-12/31/27	Ongoing
28	Identify and reduce the impact of urban and small stream flooding. General storm water evaluation for the Covington community.	Miami County & Participating Jurisdictions	5	28	Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	Ongoing
29	Ensure that all communities that fall within a FEMA designated floodway participate in the National Flood Insurance Program.	Miami County & Participating Jurisdictions	5	26	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
30	Prohibit or limit floodplain development through regulatory and/or incentive-based measures.	Miami County & Participating Jurisdictions	5	21	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
31	Avoid or limit the density of development in the floodplain.	Miami County & Participating Jurisdictions	5	19	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
32	Require that floodplains be kept as open space.	Miami County & Participating Jurisdictions	5	20	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
33	Limit the percentage of allowable impervious surface within developed parcels.	Miami County & Participating Jurisdictions	5	33	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
34	Prepare and adopt a community-wide stormwater management master plan.	Miami County & Participating Jurisdictions	5	27	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
35	Require a drainage study with new development.	Miami County & Participating Jurisdictions	5	24	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
36	Complete a stormwater drainage study for known problem areas.	Miami County & Participating Jurisdictions	5	25	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
37	Raise utilities or other mechanical devices above expected flood levels.	Miami County & Participating Jurisdictions	5	34	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
38	Routinely clean and repair stormwater drains	Miami County & Participating Jurisdictions	5	29	Public Works Department, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
39	Require all critical facilities to meet requirements of Executive Order 11988 and be built 1 foot above the 500-year flood elevation.	Miami County & Participating Jurisdictions	5	37	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
40	Develop an open space acquisition, reuse, and preservation plan targeting hazard areas.	Miami County & Participating Jurisdictions	5	32	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
41	Encourage homeowners to purchase flood insurance.	Miami County & Participating Jurisdictions	5	31	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
Hazardous Materials								
42	Complete a commodity flow study.	Miami County & Participating Jurisdictions	7	46	Miami County EMA	Hazardous Materials Emergency Planning Grant (HMEP)	1/1/23-12/31/27	New
43	Maintain Type II certification of county HazMat Team	Miami County & Participating Jurisdictions	7	45	Miami County EMA	Hazardous Materials Emergency Planning Grant (HMEP)	1/1/23-12/31/27	New
44	Renew Memorandum of Understanding with Shelby County for HazMat Team cooperation	Miami County & Participating Jurisdictions	7	44	Miami County EMA	Hazardous Materials Emergency Planning Grant (HMEP)	1/1/23-12/31/27	New
Invasive Species								
45	Compile a list of known active invasive species within Miami County (or appropriate jurisdiction).	Miami County & Participating Jurisdictions	11	54	OSU Ext. Office, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
46	Maintain a countywide report on impacts from invasive species.	Miami County & Participating Jurisdictions	11	56	OSU Ext. Office, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
47	Map or otherwise identify ash trees.	Miami County & Participating Jurisdictions	11	55	OSU Ext. Office, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
48	Identify and apply the appropriate Emerald Ash Borer treatment method.	Miami County & Participating Jurisdictions	11	57	OSU Ext. Office, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
Severe Summer Weather								
49	Post warning signage at local parks, county fairs, and other outdoor venues about the dangers of hail, severe wind, and lightning.	Miami County & Participating Jurisdictions	6	42	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
50	Teach school children about the dangers of hail, severe wind, and lightning and how to take safety precautions.	Miami County & Participating Jurisdictions	6	41	Miami County EMA, School Districts	Staff Time	1/1/23-12/31/27	New
51	Review building codes and structural policies to ensure they are adequate to protect older structures from hail, lightning, and wind damage.	Miami County & Participating Jurisdictions	6	43	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
52	Install lightning protection devices and methods, such as lightning rods and grounding, on communications infrastructure and other critical facilities.	Miami County & Participating Jurisdictions	6	40	Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
Severe Wind & Tornadoes								
53	Encourage the construction and use of safe rooms in critical facilities, schools, hospitals, and government buildings.	Miami County & Participating Jurisdictions	2	11	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
54	Require mobile home parks to have a designated tornado safe room or shelter.	Miami County & Participating Jurisdictions	2	12	Miami County DOD, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
55	Conduct tornado drills in schools and public buildings and encourage private entities also.	Miami County & Participating Jurisdictions	2	10	Miami County EMA, Mayors/ Administrators of Jurisdictions, School Districts	Staff Time	1/1/23-12/31/27	New
Severe Winter Weather								
56	Educate elderly residents on the dangers of snow shoveling and available resources to reach out for assistance.	Miami County & Participating Jurisdictions	4	17	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
57	Identify at risk communities, particularly the elderly, and prioritize these communities for snow removal.	Miami County & Participating Jurisdictions	4	16	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
58	Install heating units in public shelters.	Miami County & Participating Jurisdictions	4	18	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
59	Work with places of worship, schools, hotels, and other large buildings to serve as public heating stations during extreme cold events.	Miami County & Participating Jurisdictions	4	15	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
60	Use snow fences or "living snow fences" (e.g., rows of trees or other vegetation) to limit blowing and drifting of snow over critical roadway segments.	Miami County & Participating Jurisdictions	4	14	Mayors/ Administrators of Jurisdictions	General Operating Budget	1/1/23-12/31/27	New
Terrorism								
61	Coordinate with law enforcement, fire, EMS, and the Ohio Department of Public Safety to identify potential risks (including cyberterrorism risks).	Miami County & Participating Jurisdictions	8	49	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
62	Create a jurisdiction-wide response plan for cyber-attacks, active shooters, and other identified potential risks.	Miami County & Participating Jurisdictions	8	48	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
63	Acquire mobile vehicle barrier system.	Miami County & Participating Jurisdictions	8	47	Miami County EMA, Mayors/ Administrators of Jurisdictions	Special Project Grants	1/1/23-12/31/27	New
Non-Hazardous Transportation Incident								
64	Identify at risk properties along rail lines.	Miami County & Participating Jurisdictions	14	65	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New

#	Mitigation Action	Community	Hazard Priority	Action Priority	Lead Agency	Funding Source	Start/ End	Status
65	Coordinate with law enforcement, fire, EMS, and nearby airports/helipads to create an emergency response plan for train derailments.	Miami County & Participating Jurisdictions	14	64	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
66	Develop and implement an emergency response plan for all transportation hazards (road, rail, and air).	Miami County & Participating Jurisdictions	14	63	Miami County EMA, Mayors/ Administrators of Jurisdictions	Staff Time	1/1/23-12/31/27	New
Wildfire								
67	Identify and map wildfire risk areas	Miami County & Participating Jurisdictions	15	66	Miami County EMA, Miami County Fire and Emergency Services Chief's Association	Staff Time	1/1/23-12/31/27	New
68	Invest in and maintain wildfire fighting capabilities in local fire districts and fire departments	Miami County & Participating Jurisdictions	15	67	Fire Departments, Pleasant Hill-Newton Township Joint Fire District	Staff Time	1/1/23-12/31/27	New

06 | Schedule and Maintenance

SCHEDULE AND MAINTENANCE

6.1 Participation Overview

The 2023 Miami County Hazard Mitigation Plan will be adopted by all jurisdictions in Miami County, including the County, all townships, and the city and villages. After the jurisdictions have adopted the plan, their signed resolutions or ordinances will be added to the plan as an Appendix.

6.2 Continued Public Involvement

The public will continue to be able to provide feedback on the Plan, as the Plan will be available through the Miami County Emergency Management Agency and Ohio Emergency Management Agency websites. The Miami County Emergency Management Agency will provide access to the Plan to all County, municipality, and township offices, and will make the Plan available in hardcopy and electronic format to the public as appropriate. The Miami County Emergency Management Agency Director will post notices of any meetings for updating and evaluating the Plan, using the usual methods for posting meeting announcements in the Region to invite the public to participate. All meetings will be open to the general public. The Miami County Emergency Management Agency will publicly announce the mitigation action items that are slated for development in the current year, as well as any updates to the Plan as part of the annual review process.

6.3 Plan Integration and Annual Review

6.3.1 Previous Integration Efforts

An important aspect of the hazard mitigation planning process is to integrate recommendations, the underlying principles, and actions of the Hazard Mitigation Plan into other essential planning and development mechanisms in the community such as comprehensive land use plans, emergency operations plan, sustainability and climate action plans, capital improvement plans, and general area plans.

The Miami County Emergency Management Agency and Local Emergency Planning Committee (LEPC) have worked to integrate the previous Hazard Mitigation Plan into planning processes in the County. The LEPC has representatives from numerous organizations, including elected officials, law enforcement, firefighting, first aid, hospital, public health, local environmental, transportation, news media, emergency management, community groups, owners/operators of subject facilities, educational, hazardous materials, and communications.

The first step in plan integration efforts is to identify existing plans in Miami County. Miami County maintains several plans and tools, including:

- 2017 Miami County Hazard Mitigation Plan
- Addendum to Miami County Hazard Mitigation Plan, Resolution No. 20-11-1439
- 2019 Commodity Flow Study of Hazardous Materials, Miami County
- Miami County Comprehensive Plan 2006 Update
- Miami County Emergency Operations Plan, 2019
- Miami County Flood Damage Reduction Resolution
- Miami County Subdivision Regulations
- County-wide Zoning Resolutions

In addition, Miami Valley Regional Planning Commission (MVRPC) that is responsible for transportation planning in Miami County maintains several plans including long-range and short-range transportation plans, active transportation plans, bike plans, and many other transportation plans.

Some examples of integrating hazard mitigation principles into existing plans are as follows:

2006 Miami County Comprehensive Plan Update

The Comprehensive Plan is a resource which creates an inventory of existing land use conditions and growth trends in Miami County. The Plan informs the public of anticipated development, outlines planning areas, and serves as a vision for environmental, social, and economic stability. This plan is an excellent platform for identifying hazards and mitigation strategies in *Section IX: Goals, Objectives, Policies*. For example, the Plan includes a goal to manage surface and groundwater to protect residents from flood hazards. New policies, such as a limit for new impervious surfaces or a restriction of new construction in flood-prone areas that require retrofitting or demolition of existing properties, could help Miami County protect residents from flood hazards.

2019 Miami County Emergency Operations Plan

The Miami County Emergency Operations Plan is designed to develop and implement response strategies for countywide emergencies, including natural, technological, and man-made events. This plan ensures continuity of government operations in the wake of an emergency situations by assigning predetermined responsibilities and actions governing members must take. Integrating hazard mitigation principles could benefit this plan by providing resources and response strategies for first responders or similar government entities. For example, in *Section IV.C: Roles and Responsibilities*, designate a Group to communicate with citizens and businesses to coordinate recovery assistance and other post-disaster strategies. Details would be elaborated upon in *Section VI.B: Logistics.*

Miami County Subdivision Regulations

The Miami County Subdivision Regulations accomplishes a few objectives, including establishing standards for development, eliminating traffic hazards through coordinated streets and highways, maintaining adequate utilities and public services, and planning provisions for schools, recreation, light, and air. Integrating certain hazard mitigation measures would support these objectives. For example, encouraging a “snow fence” of trees along streets (Section 524) or rear plat boundaries, or encouraging the placement of utility lines underground at new development (Section 560).

During the Planning Process, the members of the Core Planning Committee indicated that they are pursuing efforts associated with previous mitigation actions, such as studies on several dams have been completed, City of Piqua worked on operations improvement of high hazard dams, and the Miami Conservancy District updated the Emergency Action Plan for a dam. In addition, City of Troy removed a low dam to mitigate flooding and conducted an EPA site cleanup for drinking water, Park District/US Fish and Wildlife Service made channel improvements, City of Tipp City made wetland improvements, and some communities worked on improving access to limited mobility, language barrier reduction, as well as improving constant power for medical needs of vulnerable populations.

6.3.2 Future Integration Efforts

Local government plays a major role in the execution and implementation of mitigation strategies. This happens in large part during the daily operations that guide the development and priorities of the communities attempting to implement risk reducing actions. As such, the various departments in the communities will be responsible for networking, understanding, and highlighting the mitigation activities and opportunities they are accountable for implementing. This collaborative effort is also important to monitor funding opportunities which can be leveraged to implement the mitigation actions.

The Core Planning Committee may meet annually in order to monitor and evaluate the Miami County Hazard Mitigation Plan. During the annual meeting, a status update should be provided for each mitigation action by the responsible agency. All participating jurisdictions will be encouraged to attend this yearly plan update meeting. The meeting will coincide with the budget process so that future funding sources can be determined and set aside for actions slated for that particular year. This meeting will also be available to the public. Additionally, each jurisdiction and the County will review the Hazard Mitigation Plan during other planning processes, such as development of comprehensive plans or capital improvement plans and incorporate appropriate goals and mitigation actions into such documents. Updates will be provided on the implementation of mitigation actions, both those recommended in this plan and any additional actions. The effectiveness and utility of previously implemented mitigation actions will also be discussed during these meetings.

Furthermore, the County and its participating jurisdictions will make a concerted effort to integrate the hazard mitigation plan and its mitigation actions into existing plans and regulations, such as comprehensive plans, subdivision regulations, zoning resolutions, zoning maps, parks and open space plans, and emergency operations plans. Specifically, the County will strengthen and streamline its Emergency Operations Plan and identify means for jurisdictions to come together, proactively and on an annual basis, to discuss preparedness and response in the event of a hazard. For example, establishing communications with organizations that provide essential resources such as generators during a tornado, working closely with the Dayton Airport to reduce and mitigate crashes of planes that fly over Miami County, and incorporate actions for roadway crashes along I-75 and US-36. The County will also update its 2019 Commodity Flow Study to reduce hazmat spills and include air cargo hazardous material shipments.

The County will also update its Comprehensive Plan. The Miami County Planning & Zoning Department will coordinate with the selected consultant to integrate mitigation actions identified in this Plan into the Comprehensive Plan. Additionally, participating jurisdictions may incorporate mitigation strategies into their local area plans, zoning codes, and subdivision regulations. Miami County also intends to incorporate this Plan into the Miami County Community Health Improvement Plan and the Miami County Public Health Strategic Plan.

Finally, the Miami Conservancy District (MCD) will be integrating this plan into their future efforts (see **Chapter 5** for a list of MCD mitigation actions). The MCD specifically requested to be included into this Plan to address future flooding or dam failure issues.

6.4 Updating the Plan

The Plan must be updated within five years and re-adopted by the County and all participating jurisdictions to maintain compliance with federal regulations and ensure eligibility for certain federal mitigation grant funds. The Miami County Emergency Management Agency will identify any necessary modifications to the Plan, including changes in mitigation goals and actions that should be incorporated into the next update. The Miami County Emergency Management Agency Director and the County Commissioners will initiate the process of updating the plan in accordance with federal guidelines in sufficient time to meet state and federal deadlines.

Appendices

Appendix A: Historical Hazard Events

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Drought	Drought	8/1/1999	N/A	0	0	$0.00	$0.00
Drought	Drought	7/1/1999	N/A	0	0	$0.00	$0.00
Extreme Temperatures	Cold/Wind Chill	2/1/1996	N/A	0	0	$20,000.00	$0.00
Extreme Temperatures	Excessive Heat	7/20/2019	N/A	0	0	$0.00	$0.00
Extreme Temperatures	Excessive Heat	7/19/2019	N/A	0	0	$0.00	$0.00
Extreme Temperatures	Excessive Heat	8/7/2007	N/A	0	0	$0.00	$0.00
Extreme Temperatures	Extreme Cold/ Wind Chill	1/30/2019	N/A	0	0	$0.00	$0.00
Flooding	Flash Flood	6/27/2019	N/A	0	0	$0.00	$0.00
Flooding	Flash Flood	6/23/2017	N/A	0	0	$0.00	$0.00
Flooding	Flash Flood	6/23/2017	N/A	0	0	$0.00	$0.00
Flooding	Flash Flood	4/29/2017	N/A	0	0	$0.00	$0.00
Flooding	Flash Flood	3/1/2017	N/A	0	0	$0.00	$0.00
Flooding	Flash Flood	7/29/2016	N/A	0	0	$0.00	$0.00
Flooding	Flash Flood	7/18/2015	N/A	0	0	$0.00	$0.00
Flooding	Flash Flood	6/26/2015	N/A	0	0	$0.00	$0.00
Flooding	Flash Flood	7/10/2013	N/A	0	0	$1,000.00	$0.00
Flooding	Flash Flood	7/10/2013	N/A	0	0	$1,000.00	$0.00
Flooding	Flash Flood	6/27/2010	N/A	0	0	$2,000.00	$1,000.00
Flooding	Flash Flood	6/3/2008	N/A	0	0	$1,000.00	$0.00
Flooding	Flash Flood	8/3/2006	N/A	0	0	$2,000.00	$0.00
Flooding	Flash Flood	7/27/2002	N/A	0	0	$3,000.00	$0.00
Flooding	Flash Flood	6/6/2001	N/A	0	0	$3,000.00	$0.00
Flooding	Flash Flood	6/6/2001	N/A	0	0	$3,000.00	$0.00
Flooding	Flash Flood	5/18/2001	N/A	0	0	$10,000.00	$0.00
Flooding	Flash Flood	7/3/2000	N/A	0	0	$5,000.00	$0.00
Flooding	Flash Flood	2/13/2000	N/A	0	0	$5,000.00	$0.00
Flooding	Flash Flood	1/3/2000	N/A	0	0	$10,000.00	$0.00
Flooding	Flash Flood	4/16/1998	N/A	0	0	$0.00	$0.00
Flooding	Flash Flood	8/17/1997	N/A	0	0	$5,000.00	$0.00
Flooding	Flash Flood	4/29/1996	N/A	0	0	$2,000.00	$0.00
Flooding	Flood	6/27/2019	N/A	0	0	$0.00	$0.00
Flooding	Flood	6/27/2019	N/A	0	0	$0.00	$0.00
Flooding	Flood	6/27/2019	N/A	0	0	$0.00	$0.00
Flooding	Flood	6/27/2019	N/A	0	0	$0.00	$0.00
Flooding	Flood	6/27/2019	N/A	0	0	$0.00	$0.00
Flooding	Flood	6/19/2019	N/A	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Flooding	Flood	4/20/2019	N/A	0	0	$0.00	$0.00
Flooding	Flood	6/19/2018	N/A	0	0	$0.00	$0.00
Flooding	Flood	6/19/2018	N/A	0	0	$0.00	$0.00
Flooding	Flood	6/19/2018	N/A	0	0	$0.00	$0.00
Flooding	Flood	12/22/2013	N/A	0	0	$0.00	$0.00
Flooding	Flood	3/19/2008	N/A	1	0	$10,000.00	$0.00
Flooding	Flood	3/18/2008	N/A	0	0	$3,000.00	$0.00
Flooding	Flood	8/3/2006	N/A	0	0	$2,000.00	$0.00
Flooding	Flood	3/12/2006	N/A	0	0	$0.00	$0.00
Flooding	Flood	6/30/2005	N/A	0	0	$0.00	$0.00
Flooding	Flood	3/28/2005	N/A	0	0	$0.00	$0.00
Flooding	Flood	1/11/2005	N/A	0	0	$10,000.00	$0.00
Flooding	Flood	1/5/2005	N/A	0	0	$20,000.00	$0.00
Flooding	Flood	1/5/2005	N/A	0	0	$10,000.00	$0.00
Flooding	Flood	5/27/2004	N/A	0	0	$0.00	$0.00
Flooding	Flood	1/4/2004	N/A	0	0	$0.00	$0.00
Flooding	Flood	9/2/2003	N/A	0	0	$0.00	$0.00
Flooding	Flood	6/17/2003	N/A	0	0	$0.00	$0.00
Flooding	Flood	5/10/2003	N/A	0	0	$0.00	$0.00
Flooding	Flood	11/10/2002	N/A	0	0	$0.00	$0.00
Flooding	Flood	8/18/2002	N/A	0	0	$0.00	$0.00
Flooding	Flood	7/27/2002	N/A	0	0	$2,000.00	$0.00
Flooding	Flood	6/6/2002	N/A	0	0	$0.00	$0.00
Flooding	Flood	6/5/2002	N/A	0	0	$0.00	$0.00
Flooding	Flood	5/29/2002	N/A	0	0	$0.00	$0.00
Flooding	Flood	5/7/2002	N/A	0	0	$0.00	$0.00
Severe Summer Storms	Hail	9/1/2019	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	3/14/2019	1.5 in	0	0	$50,000.00	$0.00
Severe Summer Storms	Hail	3/14/2019	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	1/22/2018	0.88 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/5/2017	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/16/2017	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	3/1/2017	0.88 in	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Hail	3/1/2017	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/28/2016	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/26/2016	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/26/2016	1.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/26/2016	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/29/2015	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/29/2015	1.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/29/2015	1.5 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/26/2015	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/26/2015	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	7/7/2014	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	7/7/2014	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	7/7/2014	1.25 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/21/2014	1.25 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/21/2014	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/21/2014	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/21/2014	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/21/2014	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	8/21/2013	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	8/9/2012	1.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	7/5/2012	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	7/5/2012	0.88 in	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Hail	5/1/2012	0.88 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/1/2012	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	3/15/2012	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	7/11/2011	1.25 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/11/2011	1.25 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	3/23/2011	1.25 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	3/23/2011	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	3/23/2011	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	3/23/2011	1.25 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/5/2010	1.25 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/5/2010	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/5/2010	1.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/5/2010	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/5/2010	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/2/2009	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/2/2009	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/2/2009	0.88 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/2/2009	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/30/2009	1.75 in	0	0	$30,000.00	$0.00
Severe Summer Storms	Hail	5/30/2009	1 in	0	0	$20,000.00	$0.00
Severe Summer Storms	Hail	5/30/2009	0.75 in	0	0	$1,000.00	$0.00
Severe Summer Storms	Hail	5/30/2009	0.88 in	0	0	$3,000.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Hail	5/30/2009	1 in	0	0	$5,000.00	$0.00
Severe Summer Storms	Hail	4/11/2008	0.75 in	0	0	$1,000.00	$0.00
Severe Summer Storms	Hail	11/5/2007	0.88 in	0	0	$1,000.00	$0.00
Severe Summer Storms	Hail	7/13/2007	0.75 in	0	0	$1,000.00	$0.00
Severe Summer Storms	Hail	4/11/2007	1.5 in	0	0	$10,000.00	$0.00
Severe Summer Storms	Hail	4/7/2006	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/7/2006	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/13/2005	0.75 in	0	0	$4,000.00	$0.00
Severe Summer Storms	Hail	5/21/2004	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/17/2004	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/15/2003	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/5/2003	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	3/20/2003	0.88 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	9/18/2002	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/19/2002	0.88 in	0	0	$10,000.00	$0.00
Severe Summer Storms	Hail	4/19/2002	1 in	0	0	$10,000.00	$0.00
Severe Summer Storms	Hail	4/19/2002	1 in	0	0	$7,000.00	$0.00
Severe Summer Storms	Hail	4/19/2002	0.75 in	0	0	$10,000.00	$0.00
Severe Summer Storms	Hail	2/20/2002	1 in	0	0	$5,000.00	$0.00
Severe Summer Storms	Hail	2/20/2002	0.75 in	0	0	$3,000.00	$0.00
Severe Summer Storms	Hail	5/25/2001	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/9/2001	1.75 in	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Hail	4/9/2001	1.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/10/2000	1.25 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/10/1999	1.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/16/1998	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/13/1998	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/13/1998	2.75 in	0	0	$100,000.00	$0.00
Severe Summer Storms	Hail	5/13/1998	2.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/13/1998	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	7/14/1997	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/14/1997	1.25 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/3/1996	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/24/1996	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/1/1996	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/1/1996	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/22/1995	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	6/9/1995	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/10/1995	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/10/1995	0.88 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/9/1995	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/8/1995	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	7/29/1994	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	4/12/1994	0.88 in	0	0	$5,000.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Hail	4/20/1993	1.25 in	0	0	$5,000.00	$0.00
Severe Summer Storms	Hail	5/5/1986	0.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/29/1982	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	3/16/1982	1 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	7/16/1977	1.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Hail	5/18/1957	1.75 in	0	0	$0.00	$0.00
Severe Summer Storms	Heavy Rain	12/27/2015	N/A	0	0	$0.00	$0.00
Severe Summer Storms	Heavy Rain	7/9/2013	N/A	0	0	$0.00	$0.00
Severe Summer Storms	Heavy Rain	5/16/2013	N/A	0	0	$0.00	$0.00
Severe Summer Storms	Lightning	6/11/1996	N/A	0	0	$100,000.00	$0.00
Severe Summer Storms	Lightning	5/24/1996	N/A	0	0	$50,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/10/2020	50 MPH	0	0	$500.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/10/2020	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/10/2020	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/10/2020	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/3/2020	45 MPH	0	0	$500.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/3/2020	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/10/2020	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/8/2020	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/8/2020	50 MPH	0	0	$20,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	3/20/2020	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	9/1/2019	50 MPH	0	0	$1,000.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Thunderstorm Wind	8/6/2019	45 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/6/2019	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/6/2019	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/15/2019	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/2/2019	50 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/2/2019	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/27/2019	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/27/2019	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/27/2019	50 MPH	0	0	$500.00	$0.00
Severe Summer Storms	Thunderstorm Wind	3/14/2019	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	3/14/2019	60 MPH	0	0	$100,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	3/14/2019	50 MPH	0	0	$20,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	3/14/2019	56 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	3/14/2019	60 MPH	0	0	$30,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	3/14/2019	55 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	3/14/2019	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	3/14/2019	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/9/2018	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/9/2018	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/13/2018	45 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	2/25/2018	50 MPH	0	0	$6,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/22/2017	50 MPH	0	0	$1,000.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Thunderstorm Wind	4/5/2017	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	1/10/2017	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/15/2016	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/15/2016	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/15/2016	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/23/2016	61 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/23/2016	48 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/23/2016	70 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/23/2016	61 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/23/2016	64 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/23/2016	56 MPH	0	0	$6,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/26/2016	50 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/14/2015	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/14/2015	52 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/14/2015	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/14/2015	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/14/2015	52 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/13/2015	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/13/2015	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/26/2015	50 MPH	0	0	$500.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/26/2015	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/26/2015	50 MPH	0	0	$500.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Thunderstorm Wind	6/26/2015	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/26/2015	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/26/2015	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/26/2015	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/26/2015	50 MPH	0	0	$15,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/26/2015	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/26/2015	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/26/2015	60 MPH	0	0	$30,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/18/2015	50 MPH	0	0	$1,500.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/12/2015	50 MPH	0	0	$800.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/8/2015	60 MPH	0	0	$20,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/8/2015	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/21/2014	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/29/2014	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/29/2014	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	12/21/2013	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	11/17/2013	50 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	11/17/2013	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	11/17/2013	51 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	10/31/2013	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/10/2013	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/10/2013	50 MPH	0	0	$1,000.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Thunderstorm Wind	7/10/2013	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/9/2013	52 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/9/2013	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	1/30/2013	52 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/27/2012	55 MPH	0	0	$30,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/24/2012	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/24/2012	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/29/2012	56 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/29/2012	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/29/2012	58 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/29/2012	56 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/29/2012	50 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/29/2012	53 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/29/2012	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/29/2012	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	11/14/2011	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/11/2011	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/11/2011	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/11/2011	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/11/2011	50 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/26/2011	53 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/25/2011	50 MPH	0	0	$5,000.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Thunderstorm Wind	5/25/2011	60 MPH	0	0	$25,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/23/2011	51 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/23/2011	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/23/2011	50 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/23/2011	50 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/28/2011	53 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/20/2011	60 MPH	0	0	$30,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/20/2011	69 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/20/2011	56 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/20/2011	56 MPH	0	0	$40,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/20/2011	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/16/2011	50 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	2/28/2011	55 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	10/26/2010	70 MPH	0	0	$35,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	10/26/2010	65 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	10/26/2010	60 MPH	0	0	$30,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	10/26/2010	63 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	10/26/2010	58 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	10/26/2010	60 MPH	0	0	$35,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	9/7/2010	50 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	9/7/2010	70 MPH	0	0	$70,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/12/2010	50 MPH	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Thunderstorm Wind	6/2/2010	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/2/2009	52 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	2/11/2009	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	2/11/2009	58 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	2/11/2009	56 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/8/2008	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/28/2008	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/28/2008	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/4/2008	53 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/4/2008	50 MPH	0	0	$15,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	2/6/2008	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/9/2007	50 MPH	0	0	$4,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/18/2007	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/8/2007	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/30/2007	50 MPH	0	0	$30,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/15/2007	52 MPH	0	0	$1,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/15/2007	50 MPH	0	0	$8,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/15/2007	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/11/2007	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/3/2006	50 MPH	0	0	$15,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/25/2006	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/25/2006	50 MPH	0	0	$4,000.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Thunderstorm Wind	4/14/2006	50 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/14/2006	50 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/7/2006	50 MPH	0	0	$6,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/2/2006	55 MPH	0	0	$6,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/30/2005	50 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/30/2005	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/27/2005	50 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/30/2004	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/27/2004	60 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/17/2004	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/27/2003	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/4/2003	54 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/11/2003	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/5/2003	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	9/20/2002	60 MPH	0	0	$25,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/29/2002	60 MPH	0	0	$20,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/27/2002	50 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/26/2002	50 MPH	0	0	$25,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/25/2002	50 MPH	0	0	$15,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/19/2002	55 MPH	0	0	$100,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	10/24/2001	60 MPH	0	0	$40,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/21/2001	51 MPH	0	0	$3,000.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Thunderstorm Wind	6/12/2001	50 MPH	0	0	$6,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/6/2001	55 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/18/2001	50 MPH	0	0	$15,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/9/2001	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	3/13/2001	56 MPH	0	0	$30,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	11/9/2000	50 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	9/20/2000	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/14/2000	50 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/14/2000	63 MPH	0	0	$2,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/20/2000	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/24/1999	52 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/26/1999	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/9/1999	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/12/1999	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/6/1999	50 MPH	0	0	$4,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/9/1999	100 MPH	0	0	$1,000,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	11/10/1998	50 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/19/1998	70 MPH	0	0	$20,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/19/1998	50 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/12/1998	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/28/1997	50 MPH	0	0	$25,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/28/1997	52 MPH	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Thunderstorm Wind	7/27/1997	50 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/14/1997	50 MPH	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/2/1997	50 MPH	0	0	$10,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/2/1997	70 MPH	0	0	$100,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	11/7/1996	60 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/15/1996	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/7/1996	50 MPH	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/29/1996	50 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/29/1995	Unknown	0	0	$3,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/6/1994	Unknown	0	0	$5,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/21/1994	Unknown	0	0	$50,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/19/1994	Unknown	0	1	$50,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/28/1994	Unknown	0	0	$50,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/15/1994	Unknown	0	0	$500,000.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/14/1992	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/10/1992	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/8/1991	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/3/1991	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/2/1991	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/17/1991	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/23/1991	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/9/1991	Unknown	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Thunderstorm Wind	7/9/1990	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/30/1990	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/4/1990	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	8/29/1989	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/25/1989	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/17/1989	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/25/1987	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/23/1983	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/27/1983	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/18/1982	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/29/1982	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/16/1981	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/9/1980	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/2/1980	52 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/29/1979	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	10/1/1977	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	1/13/1976	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	9/5/1975	60 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	1/11/1975	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/22/1974	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	6/20/1974	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/17/1974	Unknown	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Summer Storms	Thunderstorm Wind	4/1/1974	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	10/4/1973	Unknown	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	10/24/1967	61 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	7/25/1962	50 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/26/1962	50 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	4/25/1961	100 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	5/18/1957	62 MPH	0	0	$0.00	$0.00
Severe Summer Storms	Thunderstorm Wind	2/25/1956	100 MPH	0	0	$0.00	$0.00
Severe Wind and Tornadoes	High Wind	1/11/2020	51 MPH	0	0	$0.00	$0.00
Severe Wind and Tornadoes	High Wind	12/30/2019	50 MPH	0	0	$0.00	$0.00
Severe Wind and Tornadoes	High Wind	11/27/2019	50 MPH	0	0	$0.00	$0.00
Severe Wind and Tornadoes	High Wind	4/3/2016	50 MPH	0	0	$0.00	$0.00
Severe Wind and Tornadoes	High Wind	11/24/2014	50 MPH	0	0	$0.00	$0.00
Severe Wind and Tornadoes	High Wind	12/9/2009	52 MPH	0	0	$0.00	$0.00
Severe Wind and Tornadoes	High Wind	5/13/2009	53 MPH	0	0	$2,000.00	$0.00
Severe Wind and Tornadoes	High Wind	2/11/2009	61 MPH	0	0	$0.00	$0.00
Severe Wind and Tornadoes	High Wind	9/14/2008	67 MPH	0	0	$5,100,000.00	$0.00
Severe Wind and Tornadoes	High Wind	1/29/2008	50 MPH	0	0	$0.00	$0.00
Severe Wind and Tornadoes	High Wind	12/1/2006	37 MPH	0	0	$20,000.00	$0.00
Severe Wind and Tornadoes	High Wind	3/9/2002	53 MPH	0	0	$12,000.00	$0.00
Severe Wind and Tornadoes	High Wind	12/11/2000	58 MPH	0	0	$0.00	$0.00
Severe Wind and Tornadoes	Tornado	4/8/2020	EF0	0	0	$1,000.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Wind and Tornadoes	Tornado	3/23/2012	EF0	0	0	$50,000.00	$0.00
Severe Wind and Tornadoes	Tornado	6/27/2011	EF0	0	0	$0.00	$0.00
Severe Wind and Tornadoes	Tornado	10/26/2010	EF0	0	0	$70,000.00	$0.00
Severe Wind and Tornadoes	Tornado	10/23/2009	EF0	0	0	$2,000.00	$0.00
Severe Wind and Tornadoes	Tornado	5/30/2009	EF0	0	0	$0.00	$2,000.00
Severe Wind and Tornadoes	Tornado	5/30/2009	EF0	0	0	$10,000.00	$0.00
Severe Wind and Tornadoes	Tornado	6/3/2008	EF0	0	0	$15,000.00	$0.00
Severe Wind and Tornadoes	Tornado	5/8/2008	EF0	0	0	$5,000.00	$0.00
Severe Wind and Tornadoes	Tornado	7/11/2006	F0	0	0	$10,000.00	$0.00
Severe Wind and Tornadoes	Tornado	7/11/2006	F0	0	0	$0.00	$2,000.00
Severe Wind and Tornadoes	Tornado	7/11/2006	F0	0	0	$0.00	$10,000.00
Severe Wind and Tornadoes	Tornado	7/11/2006	F0	0	0	$0.00	$2,000.00
Severe Wind and Tornadoes	Tornado	5/9/2002	F0	0	0	$50,000.00	$0.00
Severe Wind and Tornadoes	Tornado	5/24/2001	F0	0	0	$5,000.00	$0.00
Severe Wind and Tornadoes	Tornado	5/31/1998	F1	0	0	$20,000.00	$0.00
Severe Wind and Tornadoes	Tornado	5/14/1997	F1	0	0	$20,000.00	$0.00
Severe Wind and Tornadoes	Tornado	4/28/1994	F0	0	0	$0.00	$0.00
Severe Wind and Tornadoes	Tornado	9/14/1990	F2	0	2	$2,500,000.00	$0.00
Severe Wind and Tornadoes	Tornado	6/2/1990	F0	0	0	$0.00	$0.00
Severe Wind and Tornadoes	Tornado	3/10/1986	F2	0	10	$2,500,000.00	$0.00
Severe Wind and Tornadoes	Tornado	6/24/1976	F0	0	0	$250,000.00	$0.00
Severe Wind and Tornadoes	Tornado	5/12/1970	F1	0	0	$25,000.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Wind and Tornadoes	Tornado	5/10/1969	F3	0	0	$250.00	$0.00
Severe Wind and Tornadoes	Tornado	4/23/1968	F4	0	3	$2,500,000.00	$0.00
Severe Wind and Tornadoes	Tornado	4/25/1961	F2	2	4	$250,000.00	$0.00
Severe Winter Weather	Heavy Snow	1/20/2011	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Heavy Snow	1/11/2011	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Heavy Snow	2/15/2010	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Heavy Snow	2/9/2010	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Heavy Snow	2/5/2010	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Heavy Snow	1/27/2009	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Heavy Snow	2/6/2007	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Heavy Snow	1/19/2000	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Heavy Snow	3/9/1999	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Heavy Snow	1/11/1996	N/A	0	0	$1,000.00	$0.00
Severe Winter Weather	Heavy Snow	1/4/1996	N/A	0	0	$4,000.00	$0.00
Severe Winter Weather	Ice Storm	11/14/2018	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Ice Storm	2/1/2011	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Ice Storm	2/13/2007	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Ice Storm	12/13/2000	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Ice Storm	1/24/1997	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Ice Storm	3/6/1996	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	1/19/2019	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	1/12/2019	N/A	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Winter Weather	Winter Storm	2/6/2018	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	1/12/2018	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	2/8/2016	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	3/4/2015	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	2/21/2015	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	2/15/2015	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	1/5/2015	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	11/16/2014	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	3/2/2014	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	2/14/2014	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	2/4/2014	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	1/2/2014	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	12/6/2013	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	3/24/2013	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	3/5/2013	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	12/28/2012	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	1/20/2012	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	12/16/2010	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	3/7/2008	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	2/21/2008	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	12/8/2005	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	1/22/2005	N/A	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Winter Weather	Winter Storm	1/20/2005	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	12/22/2004	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	3/16/2004	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	3/16/2004	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	1/25/2004	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	2/16/2003	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	2/15/2003	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	12/5/2002	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	1/13/1999	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	1/7/1999	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	1/1/1999	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	2/3/1998	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	3/19/1996	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Storm	1/6/1996	N/A	0	0	$500,000.00	$0.00
Severe Winter Weather	Winter Weather	2/27/2020	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/26/2020	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/8/2020	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/6/2020	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/16/2019	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/15/2019	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	11/11/2019	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	3/3/2019	N/A	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Winter Weather	Winter Weather	2/20/2019	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/10/2019	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/1/2019	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	4/6/2018	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	4/1/2018	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	3/20/2018	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/8/2018	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/29/2017	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/24/2017	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/9/2017	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	3/13/2017	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	3/4/2017	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/8/2017	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/29/2017	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/5/2017	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/16/2016	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/13/2016	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	4/8/2016	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	3/3/2016	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/24/2016	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/15/2016	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/14/2016	N/A	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Winter Weather	Winter Weather	1/20/2016	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/12/2016	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/10/2016	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/20/2015	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/14/2015	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/4/2015	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/25/2015	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	11/22/2014	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	3/12/2014	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/20/2014	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/18/2014	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/16/2013	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/14/2013	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/10/2013	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	11/26/2013	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	11/11/2013	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/21/2013	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/31/2013	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/25/2013	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	3/5/2012	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/14/2012	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/10/2012	N/A	0	0	$0.00	$0.00

Hazard	Event Type	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Severe Winter Weather	Winter Weather	2/8/2012	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/13/2012	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/2/2012	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/12/2010	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/26/2010	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/7/2010	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/19/2009	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	2/22/2008	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	1/1/2008	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/7/2007	N/A	0	0	$0.00	$0.00
Severe Winter Weather	Winter Weather	12/4/2007	N/A	0	0	$0.00	$0.00

Presidential Disaster Declarations

Declaration	Declaration Date	Type	Title	Begin	End	Designated Area
DR-4507-OH	3/31/20	Biological	Covid-19 Pandemic	1/20/20	5/11/23	Miami County
DR-4447-OH	6/18/19	Tornado	Severe Storms, Straight-Line Winds, Tornadoes, Flooding, Landslides, And Mudslide	5/27/19	5/29/19	Miami County
DR-4077-OH	8/20/12	Severe Storm	Severe Storms And Straight-Line Winds	6/29/12	7/2/12	Miami County
EM-3457-OH	3/13/20	Biological	Covid-19	1/20/20	5/11/23	Miami County
EM-3346-OH	6/30/12	Severe Storm	Severe Storms	6/29/12	7/2/12	Miami County
EM-3250-OH	9/13/05	Hurricane	Hurricane Katrina Evacuation	8/29/05	10/1/05	Miami County
EM-3198-OH	1/11/05	Snowstorm	Snow	12/22/04	12/24/04	Miami County
EM-3055-OH	1978-01-26	Snowstorm	Blizzards & Snowstorms	1/26/78	1/26/78	Miami County
EM-3029-OH	1977-02-02	Snowstorm	Snowstorms	2/2/77	2/2/77	Miami County
DR-1805-OH	2008-10-24	Severe Storm	Severe Windstorm Associated With Tropical Depression Ike	9/14/08	9/14/08	Miami County
DR-1580-OH	2005-02-15	Severe Storm	Severe Winter Storms, Flooding, And Mudslides	12/22/04	2/1/05	Miami County
DR-1556-OH	2004-09-19	Severe Storm	Severe Storms And Flooding	8/27/04	9/27/04	Miami County
DR-1453-OH	2003-03-14	Severe Storm	Severe Winter Storm And Record/Near Record Snow	2/14/03	3/18/03	Miami County
DR-1065-OH	1995-08-25	Severe Storm	Severe Storms And Flooding	8/7/95	8/18/95	Miami County
DR-167-OH	1964-03-24	Flood	Severe Storms & Flooding	3/24/64	3/24/64	Statewide
DR-90-OH	1959-01-23	Flood	Floods	1/23/59	1/23/59	Statewide
DR-57-OH	1956-05-17	Other	Windstorm	5/17/56	5/17/56	Statewide

Hazardous Material Spill History 2017 - 2020

Date Reported	Location	Reported Product	Reported Amount
8/1/20	Covington	Sheen Rainbow / Hydrocarbon	
12/10/20	Piqua	Corrosive Liquid (Nos)	325 GAL
12/10/20	Piqua	Other / All Other / Trade Name / Mixture / Solution Etc	
11/4/20	Piqua	Fuel Diesel / Diesel Fuel (Vehicle On Or Off Road)	
11/4/20	Piqua	Fuel Gasoline (25% Ethanol Not E85)	
11/1/20	Bethel Twp	Oil Crude	100 GAL
11/1/20	Bethel Twp	Oil Motor / Lube Oil / Vehicle	
11/1/20	Bethel Twp	Other / All Other / Trade Name / Mixture / Solution Etc	
12/28/20	Newberry Twp	Fuel Diesel / Diesel Fuel (Vehicle On Or Off Road)	
12/28/20	Newberry Twp	Grain (All Types) Agricultural	
9/28/20	Staunton Twp	Air Fire Tires	
9/28/20	Staunton Twp	Antifreeze Vehicle Cooling	
9/28/20	Staunton Twp	Oil Motor / Lube Oil / Vehicle	
9/28/20	Staunton Twp	Solid Waste Nos (Not Specified)	
12/24/20	Monroe Twp	Fuel Diesel / Diesel Fuel (Vehicle On Or Off Road)	400 GAL
12/24/20	Monroe Twp	Oil Hydraulic Fluid(S)	300 GAL
2/26/20	Concord Twp	Fuel Diesel / Diesel Fuel (Vehicle On Or Off Road)	160 GAL
1/24/20	Concord Twp	Fuel Ethanol / E85 / Ethyl / Gasohol (Denatured)	
1/24/20	Concord Twp	Fuel Gasoline (25% Ethanol Not E85)	
5/13/20	Lostcreek Twp	Fertilizer(S) Nos (Not Specified)	
5/13/20	Lostcreek Twp	Material Unknown	
5/13/20	Lostcreek Twp	Nitrogen Fertilizer 28%	
5/26/20	Union Twp	Material Unknown	
5/26/20	Union Twp	Oil Motor / Lube Oil / Vehicle	
5/2/20	Spring Creek Twp	Fuel Diesel / Diesel Fuel (Vehicle On Or Off Road)	100 GAL
4/1/20	Tipp City	Oil Hydraulic Fluid(S)	35 GAL
6/27/19	Troy	Acetone ((Ch3)2co)	
8/8/19	Lostcreek Twp	Air Fire Open Burning	
6/13/19	Bethel Twp	Orphan Drum(S)	1 ITM
8/4/19	Monroe Twp	Fuel Diesel / Diesel Fuel (Vehicle On Or Off Road)	
8/4/19	Monroe Twp	Other / All Other / Trade Name / Mixture / Solution Etc	
8/4/19	Monroe Twp	Propylene Glycol (C3h8o2)	
8/15/19	Brown Twp	Sheen Rainbow / Hydrocarbon	
9/21/19	Piqua	Oil Crude	5 GAL
9/21/19	Piqua	Oil Motor / Lube Oil / Vehicle	
10/28/19	Miami County	Material Unknown	
11/19/19	Troy	Material White	

Date Reported	Location	Reported Product	Reported Amount
11/19/19	Troy	Other / All Other / Trade Name / Mixture / Solution Etc	
3/12/19	West Milton	Sewage Human	
3/11/19	Covington	Waste Water	
2/27/19	Brown Twp	Fertilizer(S) Nos (Not Specified)	200 LBS
12/16/18	Elizabeth Twp	Fuel Oil/ Home Heating / Heating Oil	250 GAL
6/3/19	Troy	Fat(S) / Oil / Grease / Tallow Food Types (Fog)	
5/13/19	Tipp City	Chemical(S) Unk	
5/8/19	Troy	Ammonia (Nh3)	
8/31/18	Piqua	Oil Vegetable / Bio	
8/10/18	Tipp City	Milk	680 GAL
7/18/18	Miami County	Oil Hydraulic Fluid(S)	
10/17/18	Troy	Fuel Diesel / Diesel Fuel (Vehicle On Or Off Road)	
10/16/18	Troy	Ammonia (Nh3)	
10/10/18	Washington Twp	Oil Hydraulic Fluid(S)	
4/3/18	Concord Twp	Sheen Rainbow / Hydrocarbon	
2/25/18	Tipp City	Sewage Human	
4/16/18	Bethel Twp	Orphan Container(S)	2 ITM
3/7/18	Piqua	Oil Motor / Lube Oil / Vehicle	
4/11/18	Monroe Twp	Drum(S)	4 DRM
4/11/18	Monroe Twp	Oil Hydraulic Fluid(S)	
7/5/18	Tipp City	Oil Motor / Lube Oil / Vehicle	
4/28/18	Newberry Twp	Waste Water	200 GAL
5/11/18	Pleasant Hill	Oil Transformer Non Pcb	28 GAL
10/2/17	Miami County	Boil Alert / Boil Advisory / Drinking Water Issue(S)	
9/20/17	Piqua	Oil Hydraulic Fluid(S)	40 GAL
12/22/17	Troy	Fuel Diesel / Diesel Fuel (Vehicle On Or Off Road)	90 GAL
11/11/17	Miami County	Oil Motor / Lube Oil / Vehicle	
12/1/17	Piqua	Air Odor Gasoline / Hydrocarbon	
12/1/17	Piqua	Fuel Gasoline (25% Ethanol Not E85)	
5/26/17	Tipp City	Sulfuric Acid (H2s04)	300 GAL
5/23/17	Elizabeth Twp	Nitrogen Fertilizer 28%	1000 GAL
5/20/17	Piqua	Sewage Human	
6/8/17	Concord Twp	Material Blue	
8/22/17	Concord Twp	Boil Alert / Boil Advisory / Drinking Water Issue(S)	
7/21/17	Washington Twp	Sodium Hypochlorite (Naclo)	
7/5/17	Piqua	Fuel Diesel / Diesel Fuel (Vehicle On Or Off Road)	
7/5/17	Piqua	Sheen Rainbow / Hydrocarbon	
7/18/17	Troy	Fuel Diesel / Diesel Fuel (Vehicle On Or Off Road)	30 GAL
8/16/17	Miami County	Sheen Rainbow / Hydrocarbon	
8/16/17	Miami County	Solid Waste Nos (Not Specified)	

Date Reported	Location	Reported Product	Reported Amount
7/28/17	Tipp City	Fish Kill	
7/25/17	Piqua	Mercury / Quicksilver (Hg)	

Appendix B: Previous Mitigation Actions Status

Mitigation Action (Strategy)	Status	Associated Action in Update
Miami County		
Promote public awareness of manmade and natural hazards at public events and hold workshops to educate the public. Distribute appropriate mitigation publications.	Ongoing	#2
Complete special needs assessment of the county.	Ongoing: 30%, a data source for first responders is available, but health privacy is an obstacle	#1
Promote continued maintenance and improvement. Ongoing levee system maintenance.	Ongoing: project for Miami Conservancy District	#9
Increase communication, coordination, and collaboration between community leaders, property owners, local and county building regulations, floodplain managers, and zoning authorities to address risk and to provide uniformity and consistency in implementing sound mitigation practices.	Ongoing: 60%, enduring effort is required for completion	#20
Buyout of additional flood prone residences, businesses and structure in Concord Township, north of Troy along scenic Great Miami River	Ongoing: 30%, 3 flood prone properties were acquired, funding is needed to purchase additional properties.	#19
Improve the Kerns/Alexander ditch along Fenner Road west of Barnhart Road to eliminate flooding of the land around the homes in that area.	Unchanged: Private property	#21
Preserve floodplain areas along river corridors as natural open space areas. Provide for wetlands and woodlands protection.	Ongoing: 75% County Park District developed a committee for this.	#22
Improve the Schaurer and Ziegenfelder ditches along State Route 718 (west and east of Washington Road) and McKaig Road to eliminate continued standing surface water issues around homes and on agriculture land and to eliminate periodic flooding of other land in the area.	Deferred to City of Troy	#23
Levee repairs along Miami River within City of Tipp City (Phase 2).	Deferred to City of Tipp City	#10
Update and complete an inventory of buildings and building data within the 100-year floodplain boundaries of Miami County. Coordinate with recently completed GIS floodplain maps.	Ongoing: 50%, Updated and incorporated FEMA 100-year floodplain maps and prepared	#24

Mitigation Action (Strategy)	Status	Associated Action in Update
	partial inventory of impacted structures	
Improve the Clayton ditch in and around Beechwood Drive in the Lakeshore subdivision to eliminate flooding of homes and land in this area.	Unchanged: Private property and lack of funding	#25
Concord Township		
Buyout of additional and flood prone residences, businesses, and structures in Concord Township, north of Troy along scenic Great Miami River.	Unchanged: Lack of funding	#19
Improve the Kerns/Alexander ditch along Fenner Road west of Barnhart Road to eliminate flooding of the land around the homes in that area.	Unchanged: Lack of funding	#21
Preserve floodplain areas along river corridors as natural open space areas. Provide for wetlands and woodlands protection	Unchanged	#22
Improve the Schaurer and Ziegenfelder ditches along State Route 718 (west and east of Washington Road) and McKaig Road to eliminate continued standing surface water issues around homes and on agriculture land and to eliminate periodic flooding of other land in the area.	Unchanged: Private property, public utilities, and lack of funding added challenges	#23
Improve the Clayton ditch in and around Beechwood Drive in the Lakeshore subdivision to eliminate flooding of homes and land in this area.	Unchanged: Did not qualify for approval	#25
Village of Covington		
Identify and reduce the impact of urban and small stream flooding. General storm water evaluation for the Covington community.	Unchanged: Lack of funding, staff time, and nor a priority	#26
Village of Laura		
Provide power line for emergency backup power generator for the Village of Laura from the wastewater treatment facilities to the water treatment facilities	Ongoing	#3
City of Tipp City		
Levee repairs along Miami River within City of Tipp City (Phase 2).	Ongoing	#10

Appendix C: Critical Facilities List

The following table provides a summary of the number of critical facilities categorized by each type. Miami County maintains a complete list of all critical facilities.

Type	Count
Historic	1
Government/Institution	5
Transportation	0
Utility	15
Emergency Services	9
Medical	1
Educational	9
Commercial and Industrial	5
Post Offices	12
Library	2
Communications	1

Appendix D: Sources

Introduction:

https://www.transportation.ohio.gov/static/About/maps/counties/Miami.jpg

https://www.transportation.ohio.gov/static/Programs/Aviation/2019-2020_Ohio%20Airport_Directory.pdf

https://www.rail.ohio.gov/static/Documents/RailMapbackside.pdf

https://ohiodnr.gov/discover-and-learn/land-water/rivers-streams-wetlands

https://ohiodnr.gov/go-and-do/plan-a-visit/find-a-property/find-a-property-search

https://www.miamicountyparks.com/

History and Demographics

https://ohiohistorycentral.org/w/Miami_County#:~:text=On%20January%2016%2C%201807%2C%20the,is%20located%20in%20western%20Ohio.

https://www.mymiamicounty.com/miami-county-1750-1850

https://www.co.miami.oh.us/93/About-Us

https://www.census.gov/search-results.html?searchType=web&cssp=SERP&q=Miami%20County,%20Ohio

Planning Process

https://www.co.miami.oh.us/101/Cities-Villages-Townships

Dam/Levee Failure

https://www.fema.gov/emergency-managers/risk-management/dam-safety/national-inventory-dams

https://codes.ohio.gov/ohio-administrative-code/chapter-1501:21-13

https://www.fema.gov/emergency-managers/risk-management/dam-safety/resources-general-public

https://www.fema.gov/emergency-managers/risk-management/dam-safety/national-inventory-dams

http://npdp.stanford.edu/

https://www.publications.usace.army.mil/Portals/76/Users/182/86/2486/ER_1110-2-1156.pdf?ver=2020-01-29-103920-173

https://levees.sec.usace.army.mil/#/levees/search/in=@county%20state:Miami,%20Ohio&viewType=detail&resultsType=system&advanced=true&hideList=false&eventSystem=false

Drought & Extreme Heat

https://hazards.fema.gov/nri/drought

https://www.weather.gov/ama/heatindex

https://droughtmonitor.unl.edu/

https://www.cpc.ncep.noaa.gov/products/Drought/

https://climatedataguide.ucar.edu/climate-data/palmer-drought-severity-index-pdsi

https://www.nass.usda.gov/Publications/AgCensus/2017/#full_report

https://www.nass.usda.gov/Statistics_by_State/Ohio/Publications/County_Estimates/index.php

https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=OHIO

Earthquake

https://www.mtu.edu/geo/community/seismology/learn/earthquake-measure/

https://www.usgs.gov/programs/earthquake-hazards/modified-mercalli-intensity-scale

https://ohiodnr.gov/discover-and-learn/land-water/earthquakes/ohio-earthquake-database?=undefined

https://ohiodnr.gov/discover-and-learn/safety-conservation/geologic-hazards/ohio-seis

http://www.usarray.org/

Epidemic

https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section11.html

https://www.publichealth.com.ng/world-health-organization-who-pandemic-definition/

https://apps.who.int/iris/handle/10665/204722

https://odh.ohio.gov/know-our-programs/infectious-diseases/infectious-diseases

https://ohiodnr.gov/discover-and-learn/safety-conservation/about-ODNR/wildlife/wildlife-diseases

https://pubmed.ncbi.nlm.nih.gov/1103037/

https://coronavirus.ohio.gov/home

https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/comirnaty-and-pfizer-biontech-covid-19-vaccine

https://odh.ohio.gov/know-our-programs/zoonotic-disease-program/resources/west-nile-virus

https://odh.ohio.gov/know-our-programs/seasonal-influenza

Flooding

https://www.ncdc.noaa.gov/stormevents/

https://catalog.data.gov/dataset/digital-flood-insurance-rate-map-database-miami-county-ohio-and-incorporated-areas1

https://www.fema.gov/flood-insurance

Hazardous Materials

https://epa.ohio.gov/divisions-and-offices/environmental-response-revitalization/environmental-response-and-revitalization

https://www.osha.gov/chemical-hazards

https://www.transportation.ohio.gov/programs/environmental-services/resources/regulated-materials-review

https://www.nrc.gov/about-nrc/radiation/protects-you/reg-matls.html

https://www.epa.gov/epcra

https://codes.ohio.gov/ohio-revised-code/chapter-3750

https://codes.ohio.gov/ohio-administrative-code/3750

https://data-oepa.opendata.arcgis.com/datasets/spills-and-releases-reported-to-Ohio-epa-since-may-2017-1

Invasive Species

https://oceanservice.noaa.gov/facts/invasive.html

https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/emerald-ash-borer

https://www.oipc.info/invasive-plants-of-ohio.html

https://ohioseagrant.osu.edu/products/4j7wz/ohio-field-guide-to-ais

https://www.invasivespeciesinfo.gov/us/ohio

https://www.oipc.info/uploads/5/8/6/5/58652481/invasive_plants_of_ohio.pdf

https://ohioline.osu.edu/factsheet/W-22

https://www.nps.gov/grsm/learn/news/eab-confirmed.htm

https://agri.ohio.gov/divisions/plant-health/gypsy-moth-program/gypsy-moth-program

https://gmsts.maps.arcgis.com/apps/MapSeries/index.html?appid=38cd5cbbb3364b1195e3b812f68d004b

https://ohioline.osu.edu/factsheet/HYG-2012-11

Severe Summer Storms

https://www.weather.gov/safety/thunderstorm

https://www.weather.gov/iwx/wsr_88d

https://www.weather.gov/safety/lightning

https://www.nssl.noaa.gov/education/svrwx101/lightning/

https://www.ncei.noaa.gov/

https://www.dispatch.com/story/news/2007/06/04/lightning-hits-man-two-sons/23837694007/

https://www.weather.gov/iln/events

https://www.weather.gov/iln/20120629

Severe Winter Storms

https://www.nssl.noaa.gov/education/svrwx101/winter/types/

https://www.ncei.noaa.gov/

https://www.usdeadlyevents.com/1996-jan-6-9-blizzardsnow-midwestsouth-esp-east-coastnortheast-154-208/

https://www.weather.gov/iln/20041223

https://www.weather.gov/media/iln/climo/ilnjan99.pdf

Terrorism

https://www.law.cornell.edu/cfr/text/28/0.85

https://www.fbi.gov/resources/library

https://www.usip.org/sites/default/files/sr119.pdf

https://biosecurity.fas.org/education/dualuse-agriculture/1.-agroterrorism-and-foodsafety/index.html

https://emergency.cdc.gov/bioterrorism/

https://www.ncbi.nlm.nih.gov/books/NBK493217/

Tornadoes

https://hazards.fema.gov/nri/tornado

https://www.weather.gov/iwx/wsr_88d

https://news.uchicago.edu/explainer/fujita-scale-explained

https://www.weather.gov/oun/efscale

https://www.ncei.noaa.gov/

https://www.weather.gov/iln/20080914

https://www.weather.gov/iln/20190527

https://www.weather.gov/iln/20220608_TippCity

https://weather.com/news/news/2022-06-08-ohio-tornado-damage

Transportation

https://www.transportation.ohio.gov/about-us/resources/emergency-operations

https://www.transportation.ohio.gov/static/About/maps/counties/Miami.jpg

https://www.transportation.ohio.gov/static/Programs/Aviation/2019-2020_Ohio%20Airport_Directory.pdf

https://www.rail.ohio.gov/static/Documents/RailMapbackside.pdf

https://www.bts.gov/tsar

https://www.planecrashmap.com/map/oh/

Appendix E: FEMA Flood Maps:

https://msc.fema.gov/portal/search?AddressQuery=Bucyrus#searchresultsanchor

Appendix E: Hazus Reports

Hazus: Flood Global Risk Report

Region Name:	MiamiCo
Flood Scenario:	100 Year
Print Date:	Thursday, April 20, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

Table of Contents

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Ohio

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 37 square miles and contains 2,560 census blocks. The region contains over 44 thousand households and has a total population of 108,774 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 49,179 buildings in the region with a total building replacement value (excluding contents) of 24,039 million dollars. Approximately 82.41% of the buildings (and 54.64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 49,179 buildings in the region which have an aggregate total replacement value of 24,039 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	13,134,004	54.6%
Commercial	4,688,544	19.5%
Industrial	2,416,295	10.1%
Agricultural	2,268,544	9.4%
Religion	436,140	1.8%
Government	267,549	1.1%
Education	828,411	3.4%
Total	**24,039,487**	**100%**

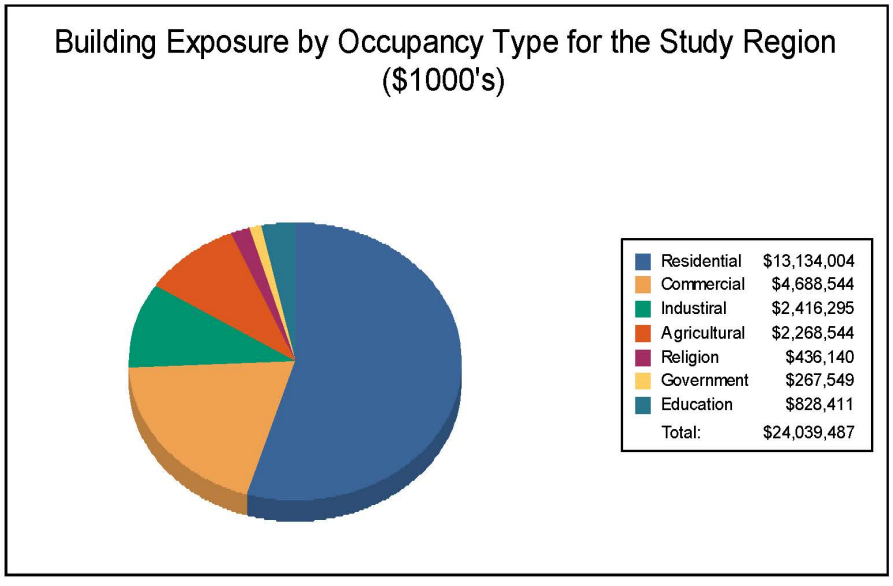
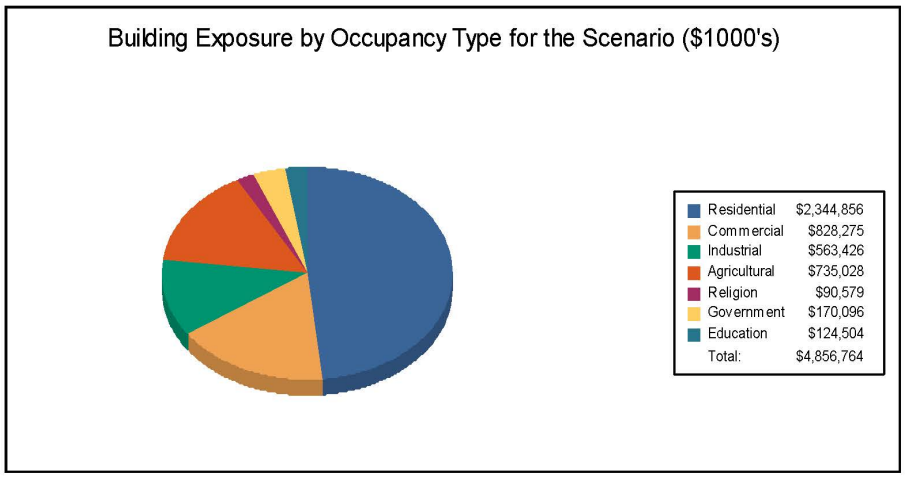


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,344,856	48.3%
Commercial	828,275	17.1%
Industrial	563,426	11.6%
Agricultural	735,028	15.1%
Religion	90,579	1.9%
Government	170,096	3.5%
Education	124,504	2.6%
Total	**4,856,764**	**100%**



Essential Facility Inventory

For essential facilities, there are 2 hospitals in the region with a total bed capacity of 221 beds.
There are 48 schools, 16 fire stations, 9 police stations and 6 emergency operation centers.

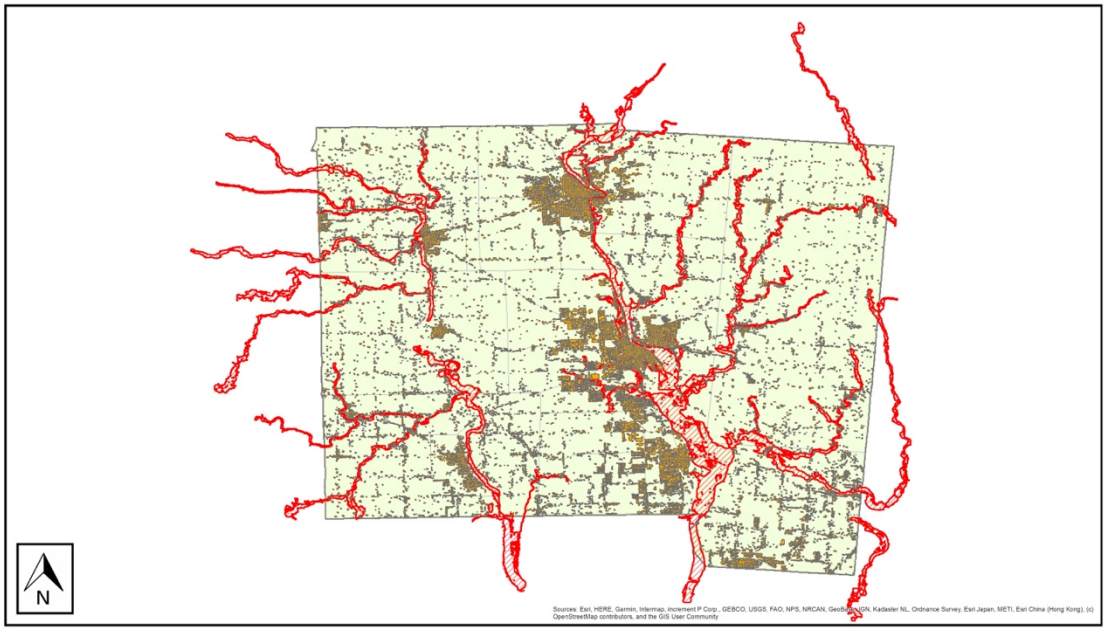
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	MiamiCo
Scenario Name:	100 Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 792 buildings will be at least moderately damaged. This is over 73% of the total number of buildings in the scenario. There are an estimated 31 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

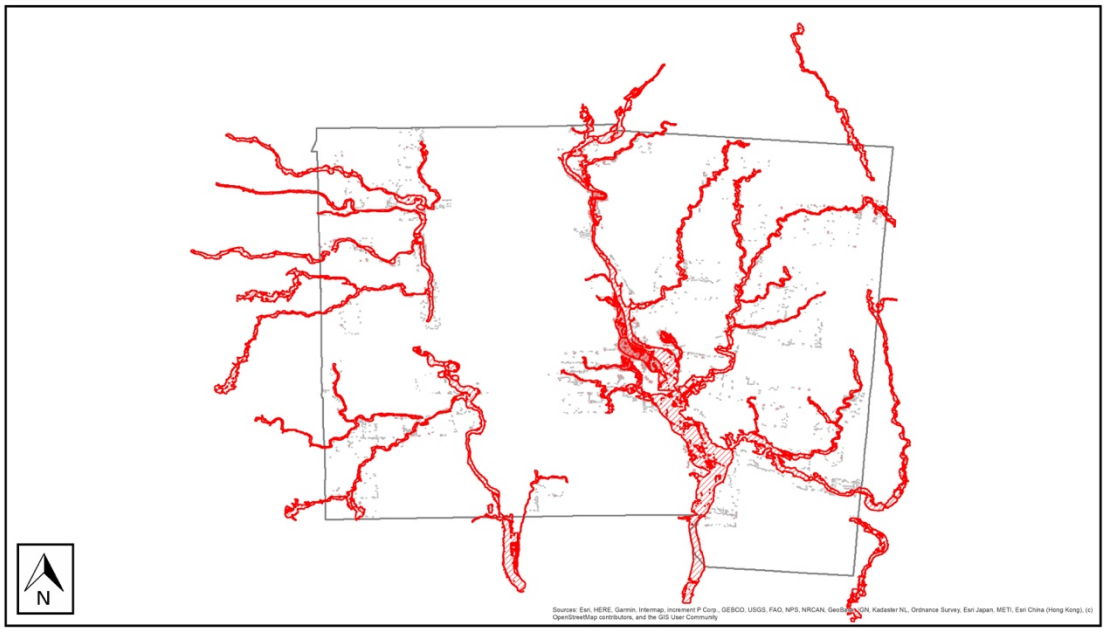


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	3	60	2	40	0	0	0	0	0	0	0	0
Commercial	18	38	23	48	1	2	1	2	0	0	5	10
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	1	100	0	0	0	0	0	0	0	0	0	0
Industrial	3	60	1	20	1	20	0	0	0	0	0	0
Religion	2	40	3	60	0	0	0	0	0	0	0	0
Residential	386	34	434	38	185	16	75	7	35	3	26	2
Total	**413**		**463**		**187**		**76**		**35**		**31**	

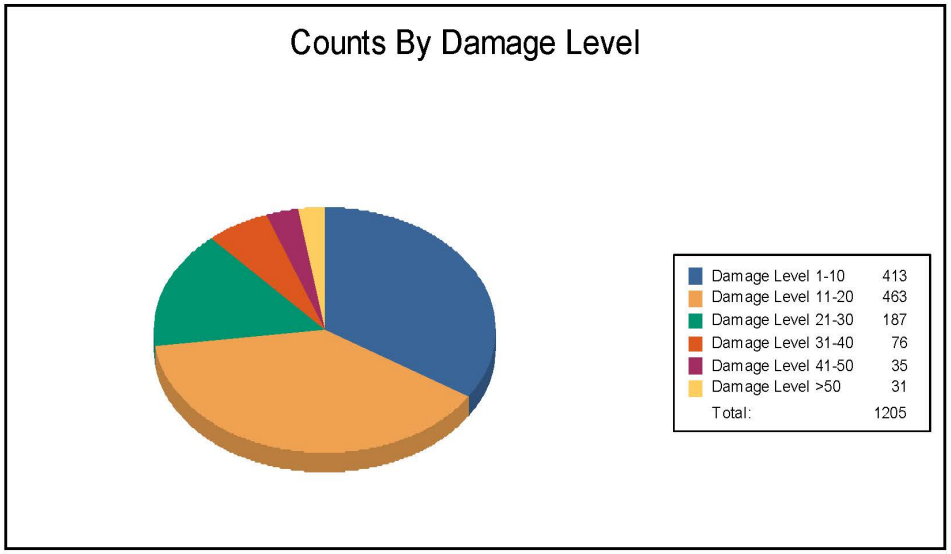


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	2	50	2	50	0	0	0	0	0	0	0	0
ManufHousing	1	100	0	0	0	0	0	0	0	0	0	0
Masonry	83	39	94	44	27	13	7	3	2	1	1	0
Steel	6	46	6	46	0	0	0	0	0	0	1	8
Wood	315	33	359	37	159	17	69	7	33	3	27	3

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 221 hospital beds available for use. On the day of the scenario flood event, the model estimates that 221 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	6	0	0	0
Fire Stations	16	0	0	0
Hospitals	2	0	0	0
Police Stations	9	0	0	0
Schools	48	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

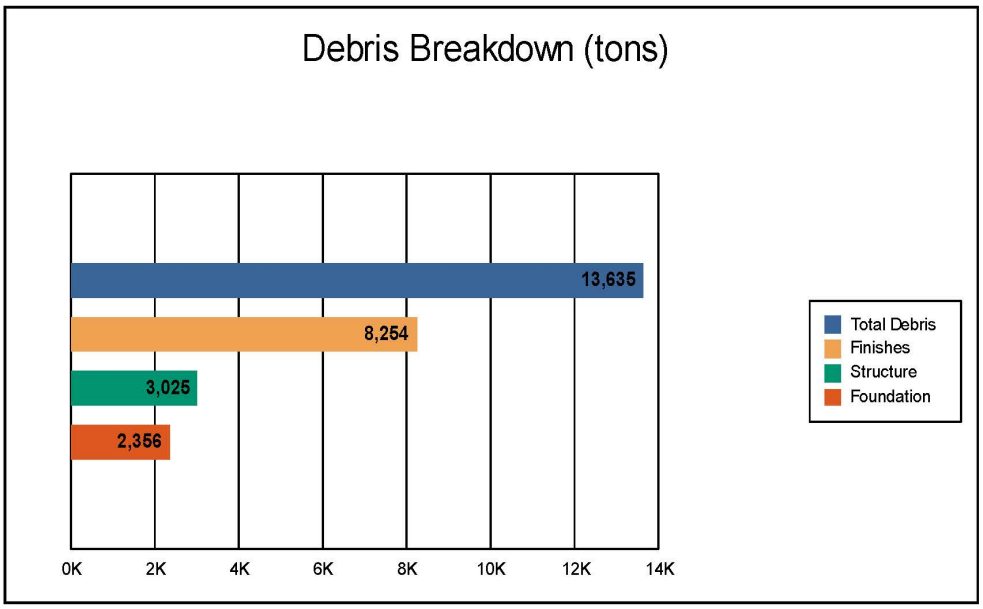
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

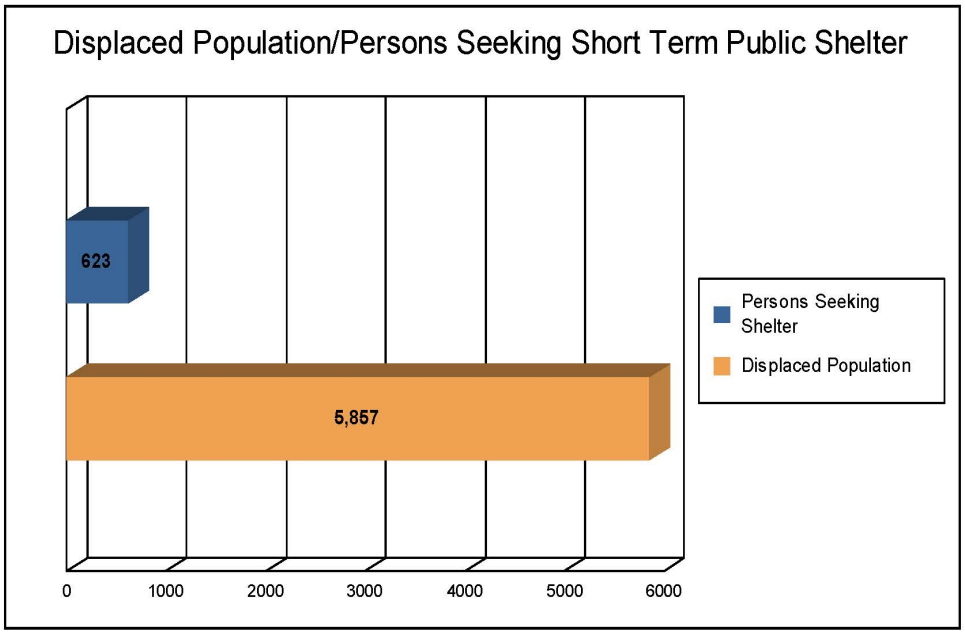


The model estimates that a total of 13,635 tons of debris will be generated. Of the total amount, Finishes comprises 61% of the total, Structure comprises 22% of the total, and Foundation comprises 17%. If the debris tonnage is converted into an estimated number of truckloads, it will require 546 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1,952 households (or 5,857 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 623 people (out of a total population of 108,774) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 889.32 million dollars, which represents 18.31 % of the total replacement value of the scenario buildings.

Building-Related Losses

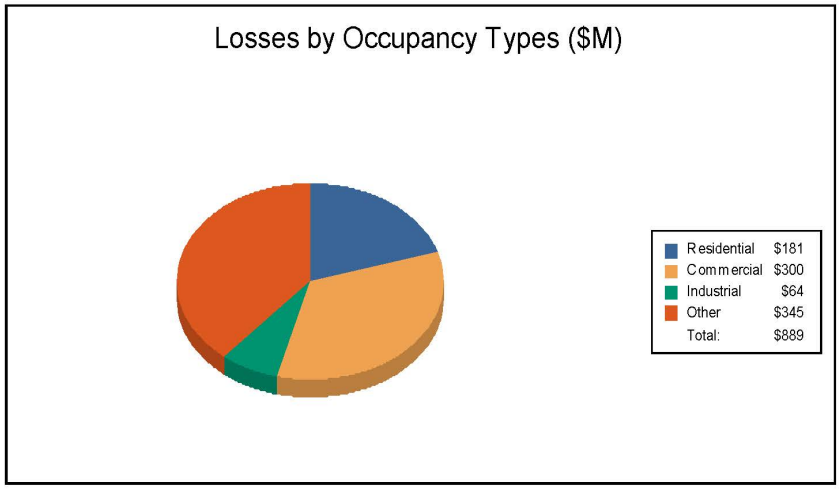
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 364.09 million dollars. 59% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 20.31% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	88.97	25.32	14.70	9.72	138.71
	Content	41.37	73.26	37.86	45.88	198.36
	Inventory	0.00	9.57	6.17	11.28	27.02
	Subtotal	**130.33**	**108.15**	**58.73**	**66.87**	**364.09**
Business Interruption						
	Income	0.16	82.00	1.32	18.21	101.68
	Relocation	34.12	20.54	1.59	13.52	69.77
	Rental Income	15.67	14.82	0.40	2.34	33.23
	Wage	0.37	74.07	1.99	244.11	320.55
	Subtotal	**50.31**	**191.44**	**5.30**	**278.18**	**525.24**
ALL	**Total**	**180.65**	**299.59**	**64.03**	**345.06**	**889.32**



Appendix A: County Listing for the Region

Ohio

- Miami

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Ohio				
Miami	108,774	13,134,004	10,905,483	24,039,487
Total	**108,774**	**13,134,004**	**10,905,483**	**24,039,487**
Total Study Region	**108,774**	**13,134,004**	**10,905,483**	**24,039,487**

Hazus: Earthquake Global Risk Report

Region Name: MiamiCo

Earthquake Scenario: Miami Co_Troy_5mag_5kmdepth

Print Date: April 20, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Ohio

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 409.91 square miles and contains 23 census tracts. There are over 44 thousand households in the region which has a total population of 108,774 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 49 thousand buildings in the region with a total building replacement value (excluding contents) of 24,042 (millions of dollars). Approximately 82.00 % of the buildings (and 55.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 1,906 and 1,375 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 49 thousand buildings in the region which have an aggregate total replacement value of 24,042 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 65% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 2 hospitals in the region with a total bed capacity of 221 beds. There are 48 schools, 16 fire stations, 9 police stations and 6 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 3,281.00 (millions of dollars). This inventory includes over 98.80 miles of highways, 325 bridges, 2,635.86 miles of pipes.

Table 1: Transportation System Lifeline Inventory

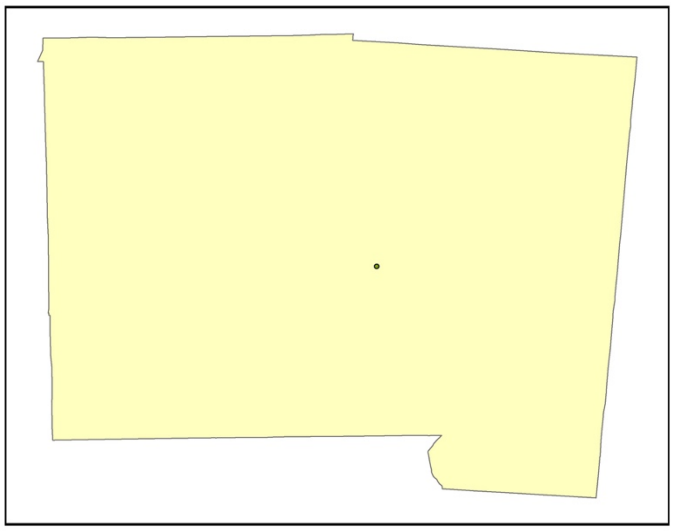
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	325	616.7055
	Segments	51	941.7858
	Tunnels	0	0.0000
	Subtotal		**1558.4913**
Railways	Bridges	14	63.5600
	Facilities	2	5.3260
	Segments	8	270.1487
	Tunnels	0	0.0000
	Subtotal		**339.0347**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
	Subtotal		**0.0000**
Bus	Facilities	0	0.0000
	Subtotal		**0.0000**
Ferry	Facilities	0	0.0000
	Subtotal		**0.0000**
Port	Facilities	0	0.0000
	Subtotal		**0.0000**
Airport	Facilities	1	5.3000
	Runways	1	3.6443
	Subtotal		**8.9443**
	Total		**1,906.50**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	42.4212
	Facilities	1	34.9650
	Pipelines	0	0.0000
		Subtotal	**77.3862**
Waste Water	Distribution Lines	NA	25.4527
	Facilities	8	1097.5904
	Pipelines	0	0.0000
		Subtotal	**1123.0431**
Natural Gas	Distribution Lines	NA	16.9685
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**16.9685**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	1	158.3024
		Subtotal	**158.3024**
Communication	Facilities	2	0.2100
		Subtotal	**0.2100**
		Total	**1,375.90**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Miami Co_Troy_5mag_5kmdepth
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-84.20
Latitude of Epicenter	40.04
Earthquake Magnitude	5.00
Depth (km)	5.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Direct Earthquake Damage

Building Damage

Hazus estimates that about 9,876 buildings will be at least moderately damaged. This is over 20.00 % of the buildings in the region. There are an estimated 634 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

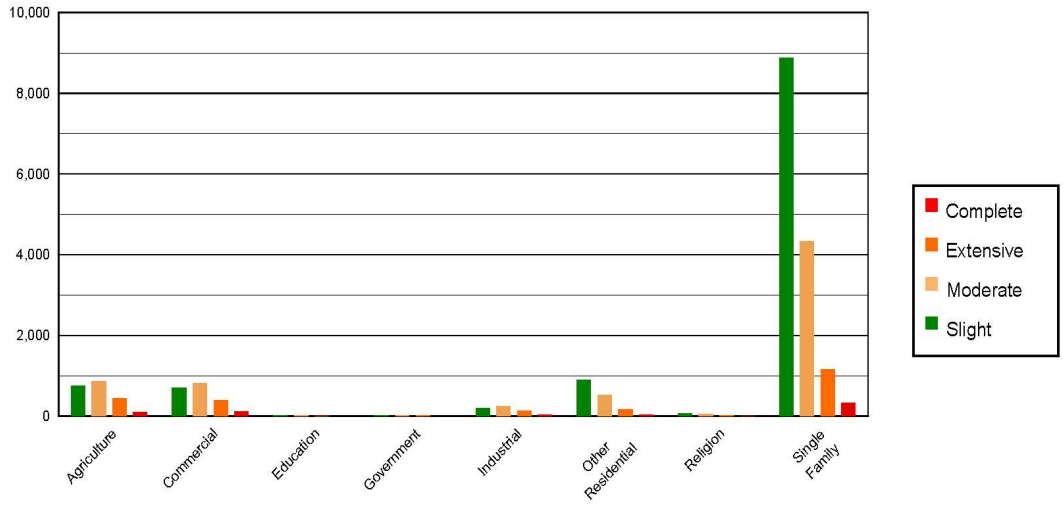


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	1801.32	6.49	747.37	6.48	864.31	12.54	438.74	18.65	106.26	16.76
Commercial	1185.32	4.27	709.81	6.16	821.29	11.92	399.87	17.00	111.71	17.62
Education	26.06	0.09	13.98	0.12	16.02	0.23	6.88	0.29	2.06	0.33
Government	37.85	0.14	22.56	0.20	29.10	0.42	12.54	0.53	3.94	0.62
Industrial	359.95	1.30	194.32	1.69	249.40	3.62	135.51	5.76	35.83	5.65
Other Residential	2033.55	7.32	892.90	7.75	523.92	7.60	160.87	6.84	39.77	6.27
Religion	155.12	0.56	67.36	0.58	59.75	0.87	28.07	1.19	7.71	1.22
Single Family	22175.64	79.84	8879.66	77.03	4326.55	62.79	1169.42	49.72	326.73	51.53
Total	**27,775**		**11,528**		**6,890**		**2,352**		**634**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	20769.20	74.78	7908.01	68.60	2889.86	41.94	352.32	14.98	24.58	3.88
Steel	899.58	3.24	417.49	3.62	718.84	10.43	455.55	19.37	123.55	19.49
Concrete	419.53	1.51	176.51	1.53	211.70	3.07	101.09	4.30	19.92	3.14
Precast	435.93	1.57	149.71	1.30	240.09	3.48	159.49	6.78	27.08	4.27
RM	119.74	0.43	34.38	0.30	56.01	0.81	35.02	1.49	3.97	0.63
URM	4961.94	17.86	2750.99	23.86	2657.28	38.57	1203.95	51.19	426.69	67.30
MH	168.88	0.61	90.86	0.79	116.57	1.69	44.46	1.89	8.23	1.30
Total	**27,775**		**11,528**		**6,890**		**2,352**		**634**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 221 hospital beds available for use. On the day of the earthquake, the model estimates that only 111 hospital beds (51.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 67.00% of the beds will be back in service. By 30 days, 90.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	2	0	0	1
Schools	48	9	0	21
EOCs	6	0	0	4
PoliceStations	9	0	0	6
FireStations	16	2	0	7

Transportation Lifeline Damage

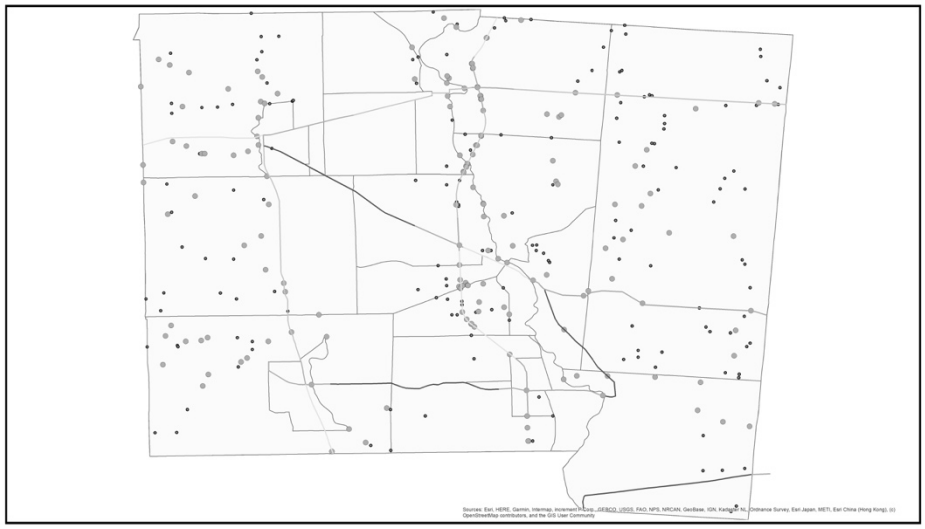


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	51	0	0	51	51
	Bridges	325	3	0	322	325
	Tunnels	0	0	0	0	0
Railways	Segments	8	0	0	8	8
	Bridges	14	0	0	14	14
	Tunnels	0	0	0	0	0
	Facilities	2	2	0	2	2
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	1	0	0	1	1
	Runways	1	0	0	1	1

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	1	0	0	1	1
Waste Water	8	2	0	0	8
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	1	1	0	0	1
Communication	2	2	0	1	2

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	1,318	212	53
Waste Water	791	106	27
Natural Gas	527	36	9
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	44,086	379	0	0	0	0
Electric Power		29,007	22,218	12,406	1,509	35

Induced Earthquake Damage

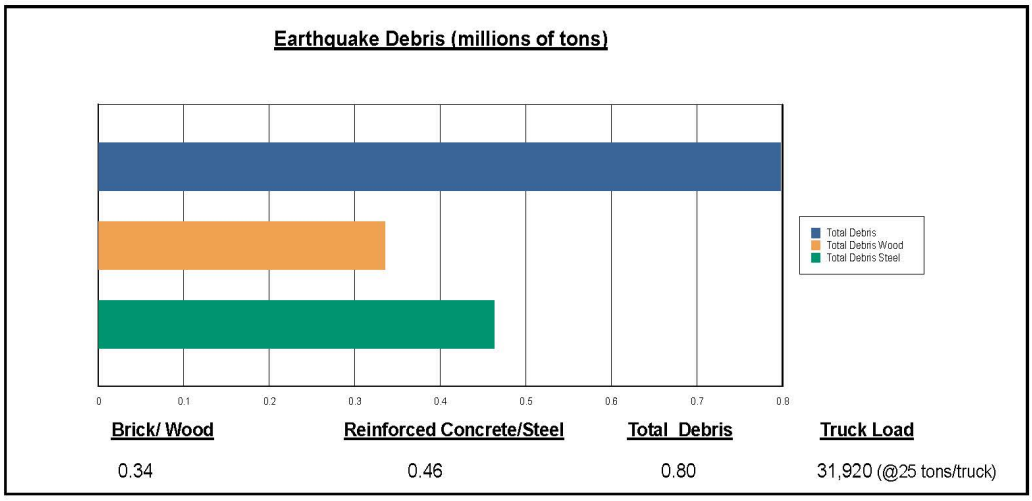
Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 798,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 42.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 31,920 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.



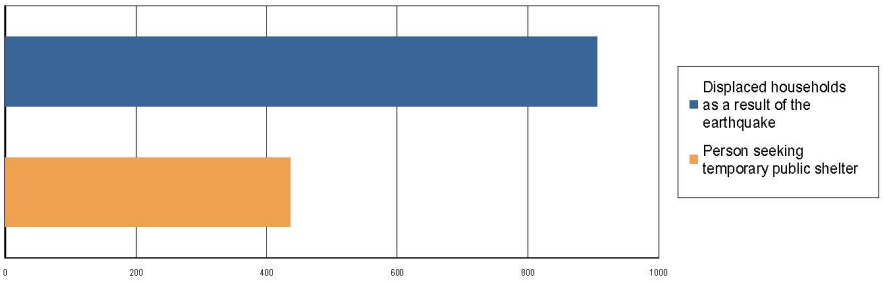
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.34	0.46	0.80	31,920 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 905 households to be displaced due to the earthquake. Of these, 436 people (out of a total population of 108,774) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
905	436

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	7.24	1.71	0.23	0.45
	Commuting	0.01	0.01	0.02	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.14	0.03	0.00	0.01
	Industrial	7.49	1.76	0.23	0.45
	Other-Residential	45.11	9.90	1.29	2.52
	Single Family	203.90	45.28	6.05	11.87
	Total	**264**	**59**	**8**	**15**
2 PM	Commercial	470.36	110.80	14.85	28.77
	Commuting	0.09	0.11	0.20	0.04
	Educational	97.25	23.41	3.34	6.47
	Hotels	0.03	0.01	0.00	0.00
	Industrial	55.21	13.04	1.72	3.31
	Other-Residential	13.67	3.09	0.42	0.79
	Single Family	61.92	14.18	1.98	3.71
	Total	**699**	**165**	**23**	**43**
5 PM	Commercial	329.45	77.79	10.52	20.10
	Commuting	1.81	2.27	4.01	0.77
	Educational	7.85	1.79	0.25	0.47
	Hotels	0.04	0.01	0.00	0.00
	Industrial	34.51	8.15	1.07	2.07
	Other-Residential	17.94	4.06	0.55	1.04
	Single Family	81.81	18.76	2.62	4.91
	Total	**473**	**113**	**19**	**29**

Economic Loss

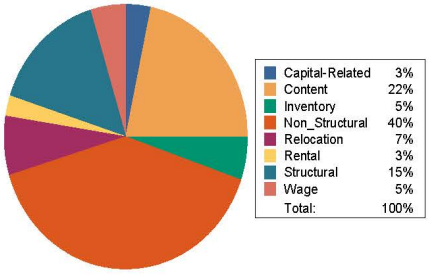
The total economic loss estimated for the earthquake is 3,400.26 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 3,117.27 (millions of dollars); 18 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 31 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

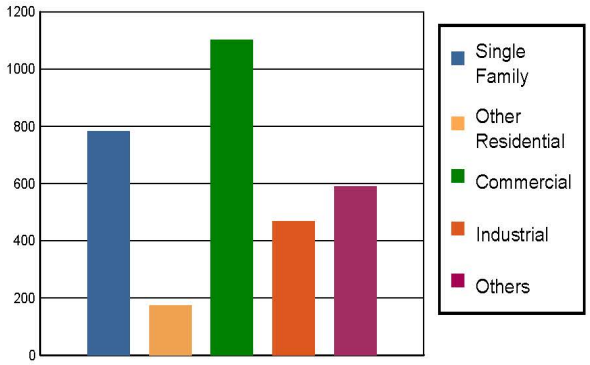


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	7.1176	118.0576	8.8845	11.4323	145.4920
	Capital-Related	0.0000	3.0281	90.0837	5.4695	4.1991	102.7804
	Rental	15.9750	11.5134	46.7755	4.2455	4.9077	83.4171
	Relocation	57.3633	7.1017	88.3438	19.5046	47.2757	219.5891
	Subtotal	**73.3383**	**28.7608**	**343.2606**	**38.1041**	**67.8148**	**551.2786**
Capital Stock Losses							
	Structural	108.1578	13.4227	147.6671	61.5496	143.0632	473.8604
	Non_Structural	427.3343	99.1564	351.0739	195.2168	181.8736	1,254.6550
	Content	174.7340	33.2377	205.1747	144.9526	122.2302	680.3292
	Inventory	0.0000	0.0000	55.5949	27.1280	74.4225	157.1454
	Subtotal	**710.2261**	**145.8168**	**759.5106**	**428.8470**	**521.5895**	**2565.9900**
	Total	**783.56**	**174.58**	**1102.77**	**466.95**	**589.40**	**3117.27**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	941.7858	0.0000	0.00
	Bridges	616.7055	12.0840	1.96
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**1558.4913**	**12.0840**	
Railways	Segments	270.1487	0.0000	0.00
	Bridges	63.5600	0.4543	0.71
	Tunnels	0.0000	0.0000	0.00
	Facilities	5.3260	2.3490	44.10
	Subtotal	**339.0347**	**2.8033**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	5.3000	0.8461	15.96
	Runways	3.6443	0.0000	0.00
	Subtotal	**8.9443**	**0.8461**	
	Total	**1,906.47**	**15.73**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	34.9650	1.3142	3.76
	Distribution Lines	42.4212	0.9518	2.24
	Subtotal	**77.3862**	**2.2660**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	1097.5904	177.2348	16.15
	Distribution Lines	25.4527	0.4781	1.88
	Subtotal	**1123.0431**	**177.7129**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	16.9685	0.1638	0.97
	Subtotal	**16.9685**	**0.1638**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	158.3024	87.0306	54.98
	Subtotal	**158.3024**	**87.0306**	
Communication	Facilities	0.2100	0.0796	37.90
	Subtotal	**0.2100**	**0.0796**	
	Total	**1,375.91**	**267.25**	

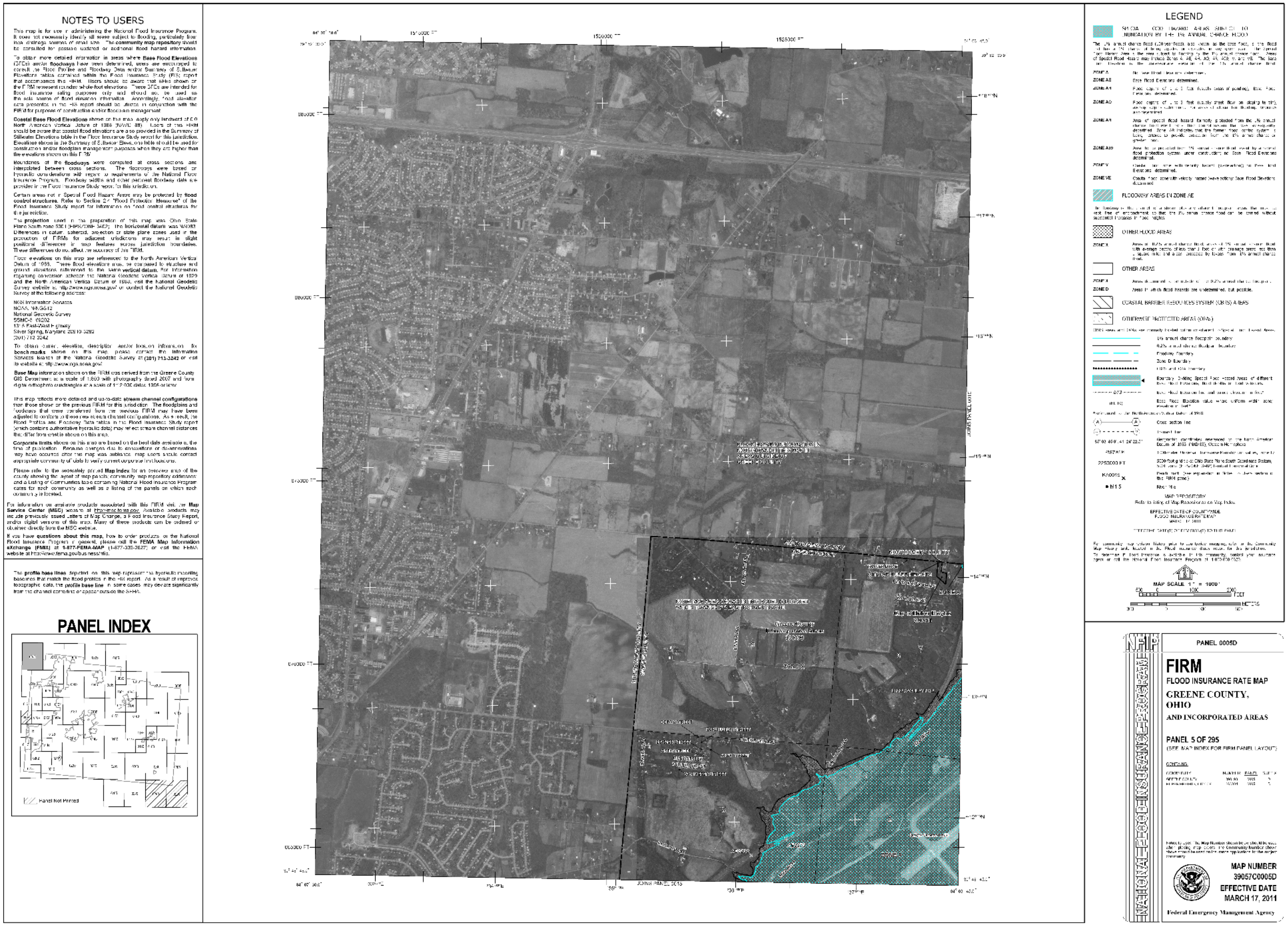
Appendix A: County Listing for the Region

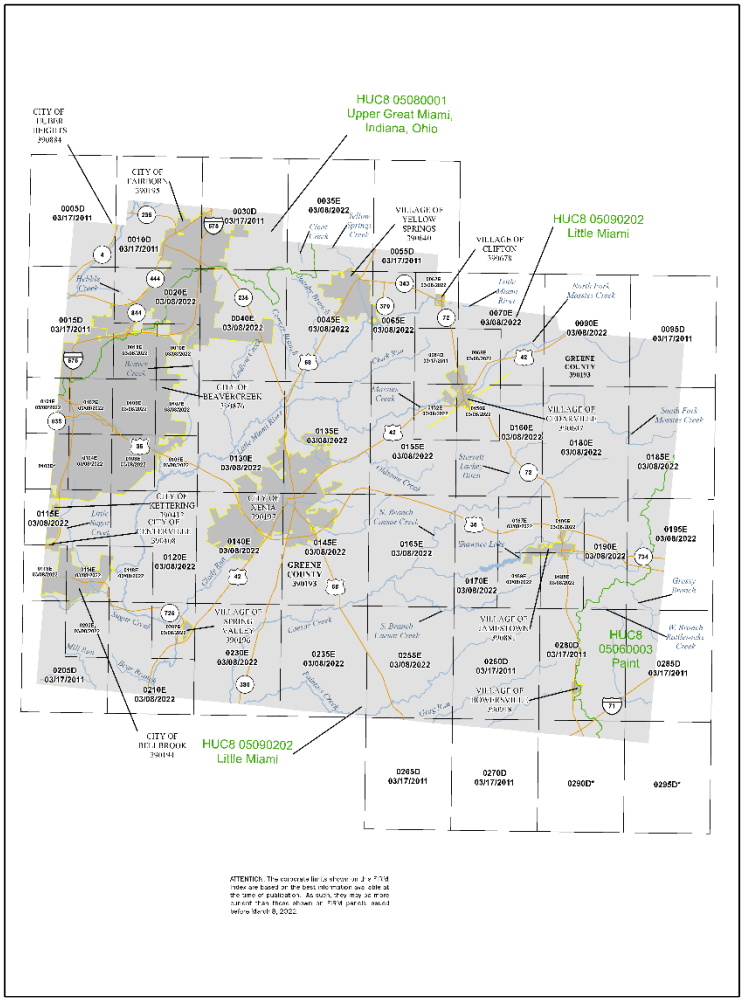
Miami,OH

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Ohio					
	Miami	108,774	13,135	10,906	24,042
Total Region		**108,774**	**13,135**	**10,906**	**24,042**

Appendix F: FEMA Flood Maps


NOTES TO USERS
PANEL INDEX
LEGEND
PANEL 0005D
FIRM
FLOOD INSURANCE RATE MAP
GREENE COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 5 OF 295
MAP NUMBER
39057C0005D
EFFECTIVE DATE
MARCH 17, 2011
Federal Emergency Management Agency



ATTENTION: The community tables 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 March 8, 2022.

Map Projection:
NAD 1983 State Plane Ohio South FIPS 3402 Feet

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE RELATED TO NATIONAL FLOOD INSURANCE PROGRAM

HTTPS://MSC.FEMA.GOV

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION

* PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS

COUNTY LOCATOR

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP INDEX

GREENE COUNTY, OHIO and Incorporated Areas

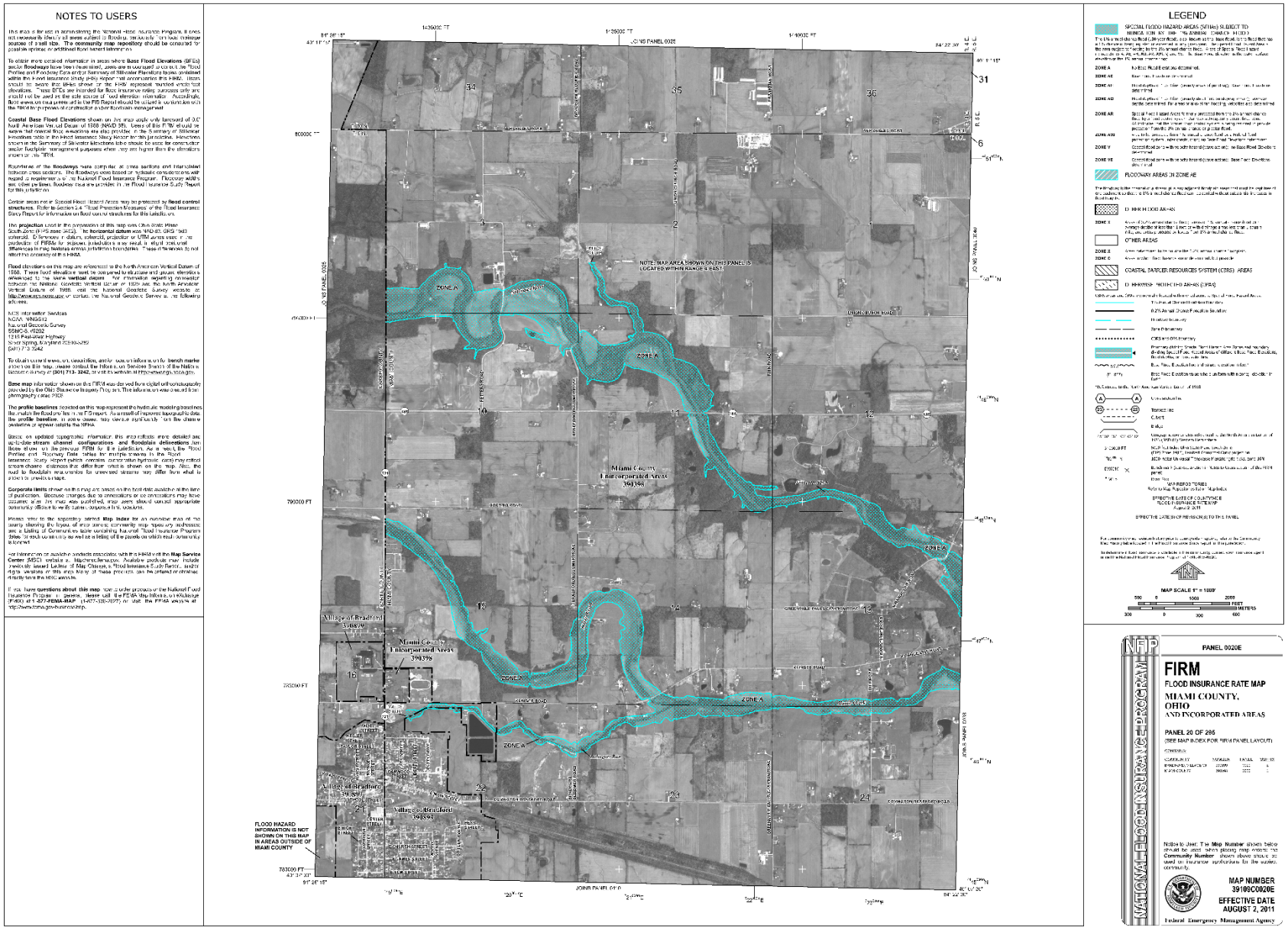
PANELS PRINTED:

0005, 0010, 0015, 0020, 0030, 0035, 0040, 0045, 0055, 0065, 0070, 0090, 0095, 0115, 0120, 0130, 0135, 0140, 0145, 0155, 0160, 0165, 0170, 0180, 0185, 0190, 0195, 0205, 0210, 0230, 0235, 0255, 0260, 0280, 0285

FEMA

MAP NUMBER
39057C0005D

MAP REVISED
MARCH 8, 2022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NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN RANGE 4 EAST
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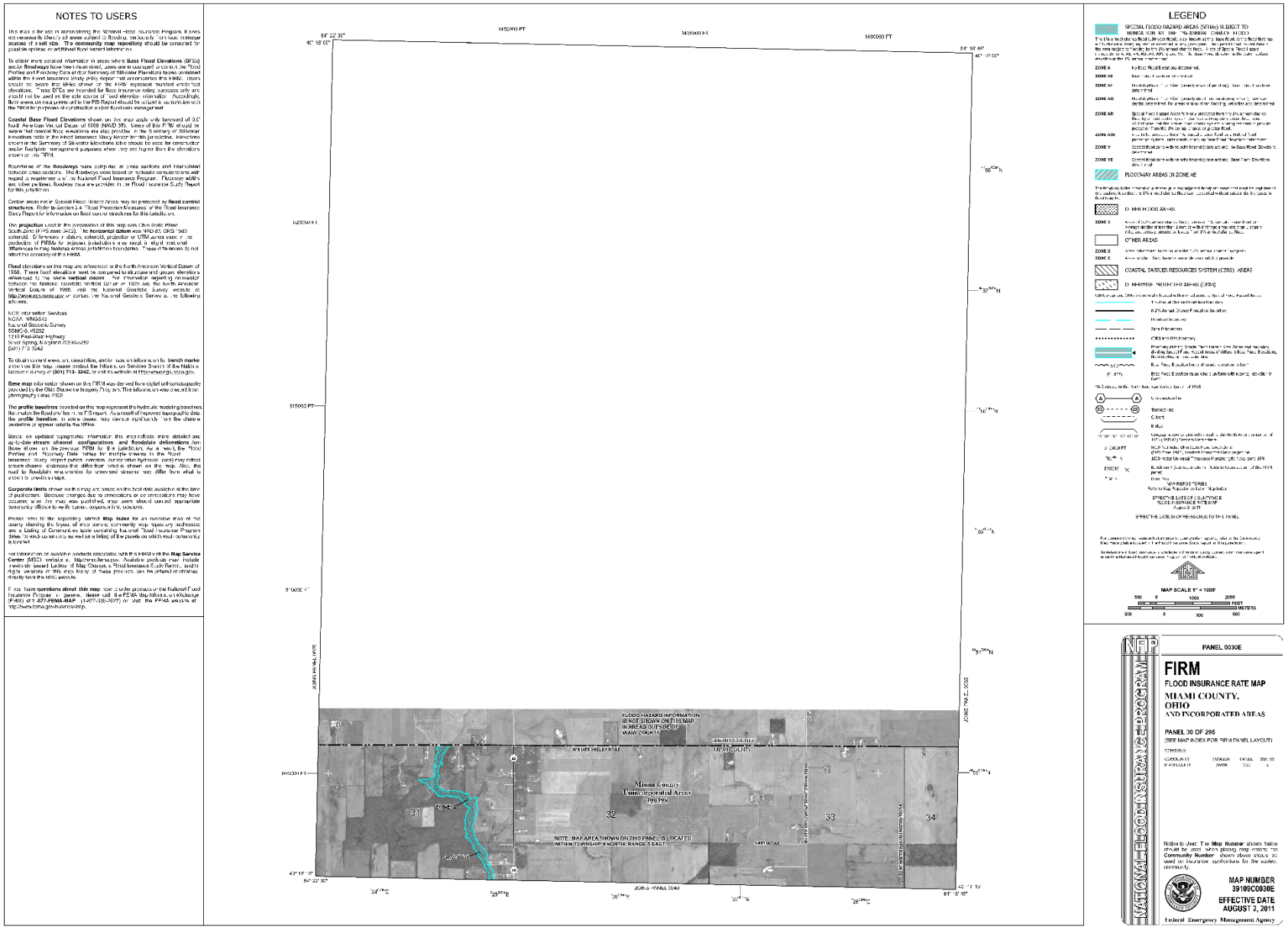
Miami County Unincorporated Areas 390108
Village of Bradford 390399
Miami County Unincorporated Areas 390398
Village of Bradford 390399
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
JOINS PANEL 0020
JOINS PANEL 0025
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 20 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
PANEL 0020E
MAP NUMBER 39109C0020E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency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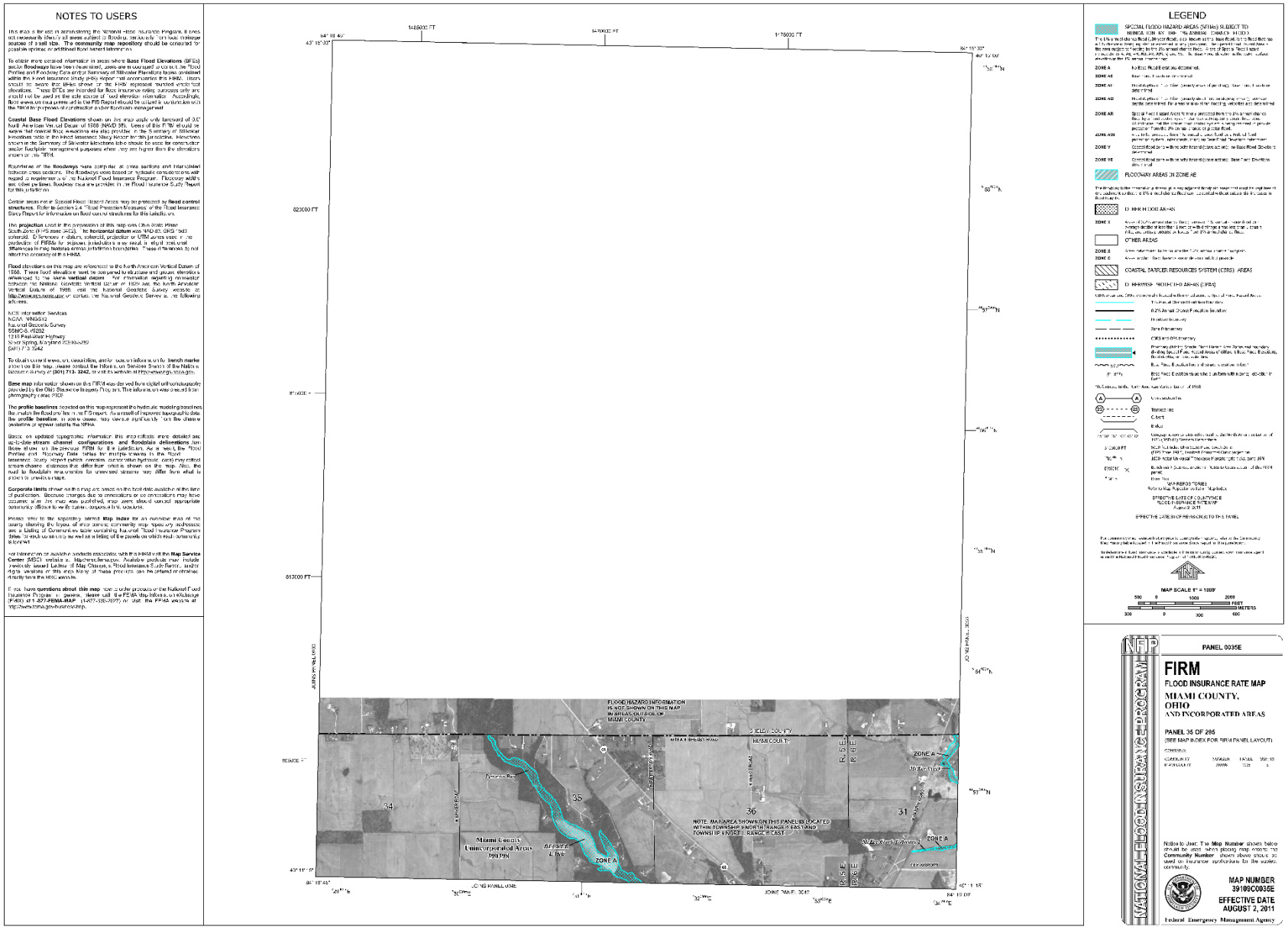
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 30 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
39109C0030E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency
Miami County
Unincorporated Areas
ZONE A
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 6 NORTH, RANGE 5 EAST
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
MAP SCALE 1" = 1000'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NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 9 NORTH, RANGE 5 EAST AND TOWNSHIP 8 NORTH, RANGE 5 EAST
Miami County Unincorporated Areas 390139N
ZONE A
PANEL 0035E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 35 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0035E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency


NOTES TO USERS
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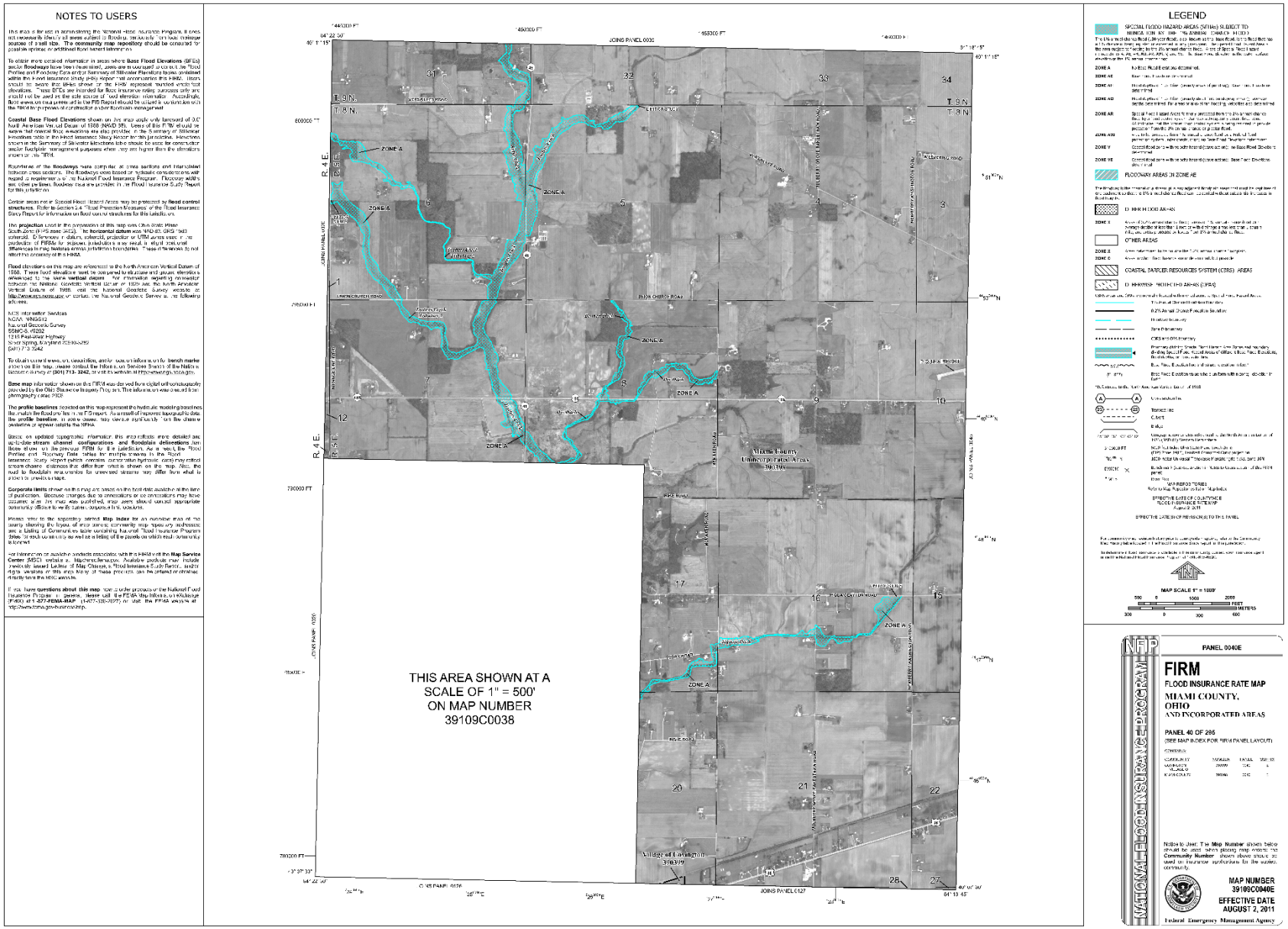
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 38 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
39109C0038E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency
ZONE A
ZONE AE
Miami County International Airport
390396
Village of Covington
390399
JOHNS PANEL 0037
JOHNS PANEL 0039
MAP SCALE 1" = 500'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Village of Lexington 390369
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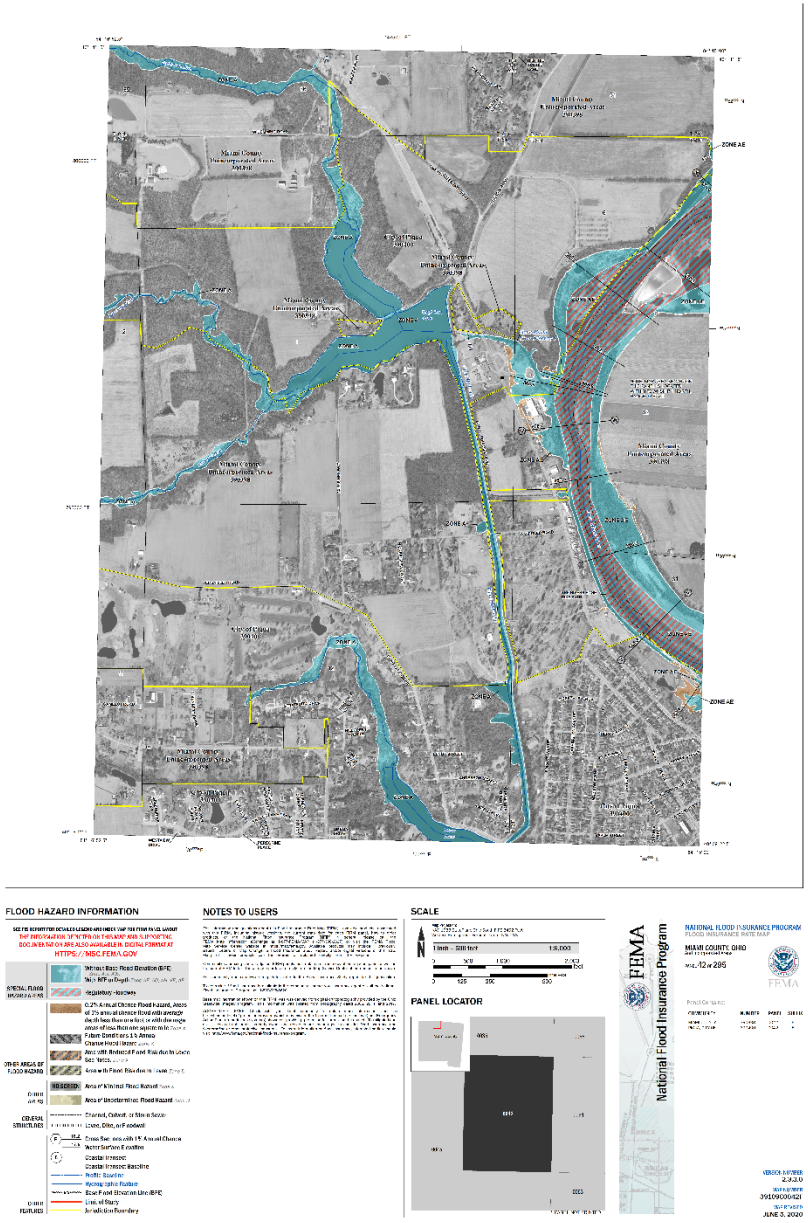
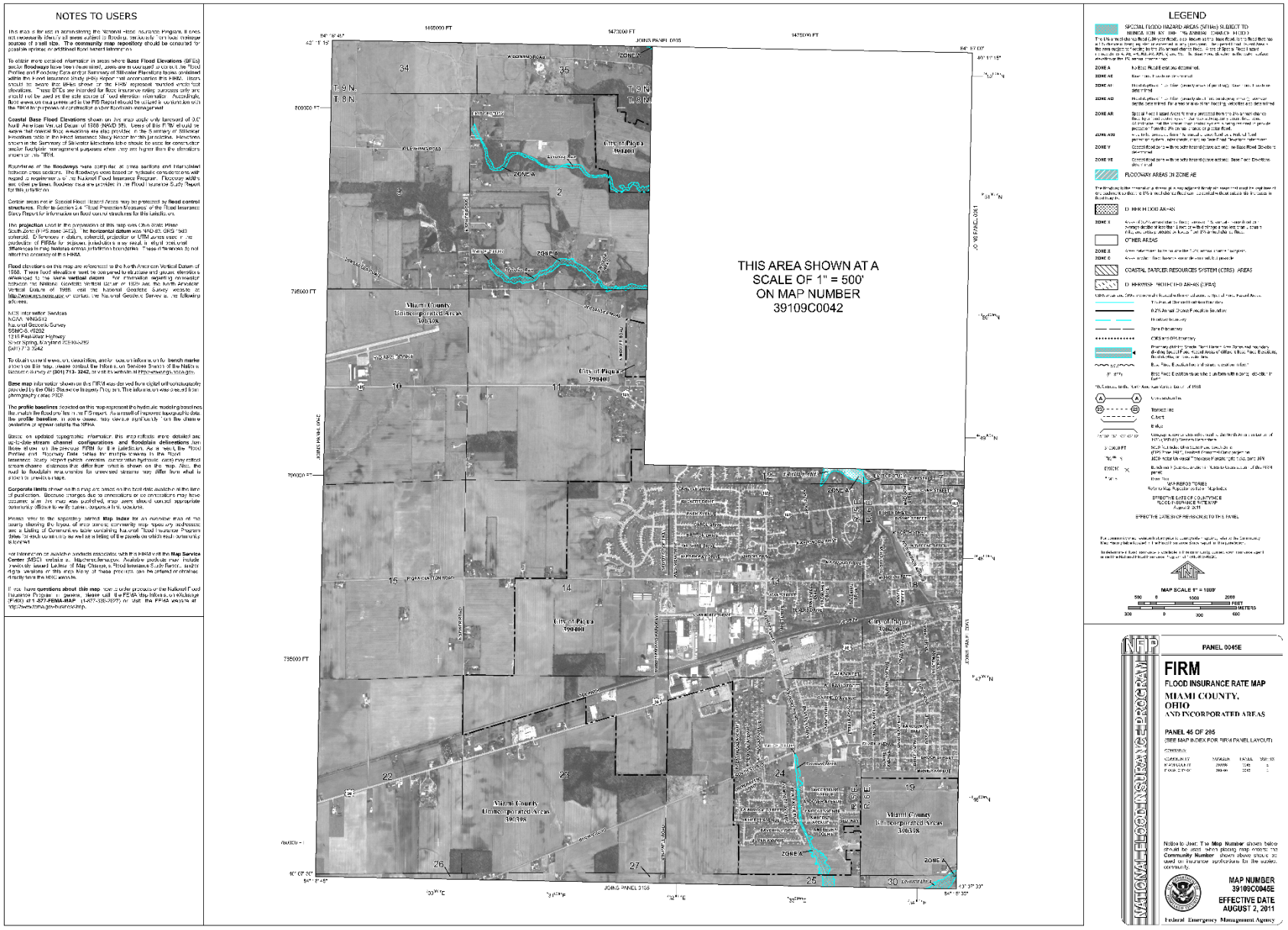
ZONE X
JOINS PANEL 0030
JOINS PANEL 0040
JOINS PANEL 0045
JOINS PANEL 0055
JOINS PANEL 0060
JOINS PANEL 0065
JOINS PANEL 0127
T 9 N
T 8 N
R 4 E
R 5 E
PANEL 0040E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 40 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0040E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency


FLOOD HAZARD INFORMATION
NOTES TO USERS
SCALE
PANEL LOCATOR
FEMA
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
and Incorporated Areas
PANEL 12 of 295
ZONE AE
ZONE X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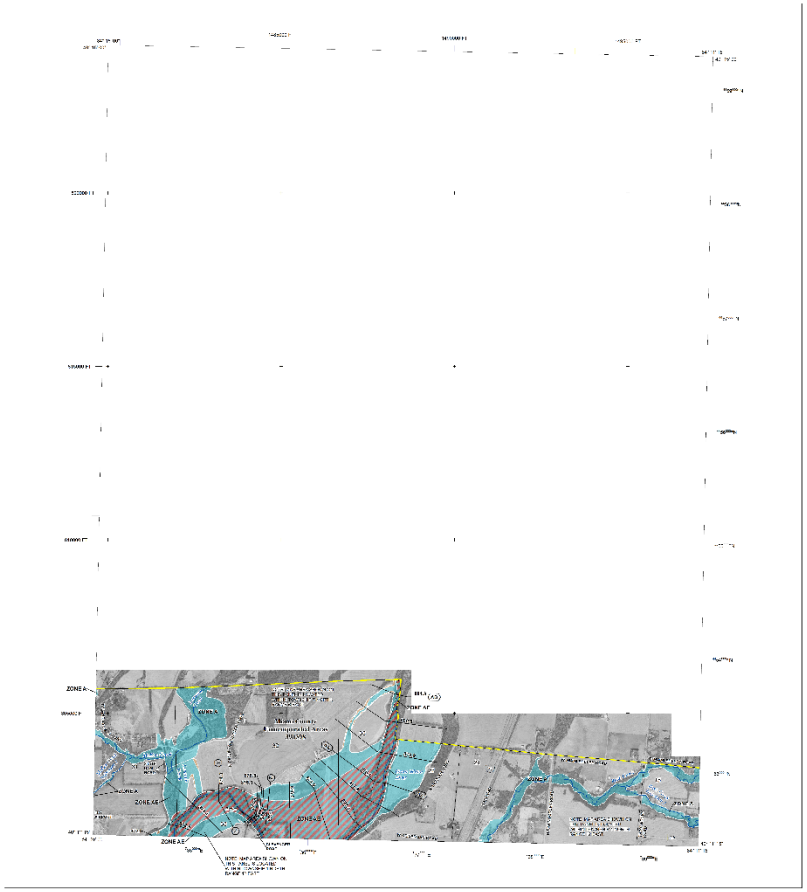
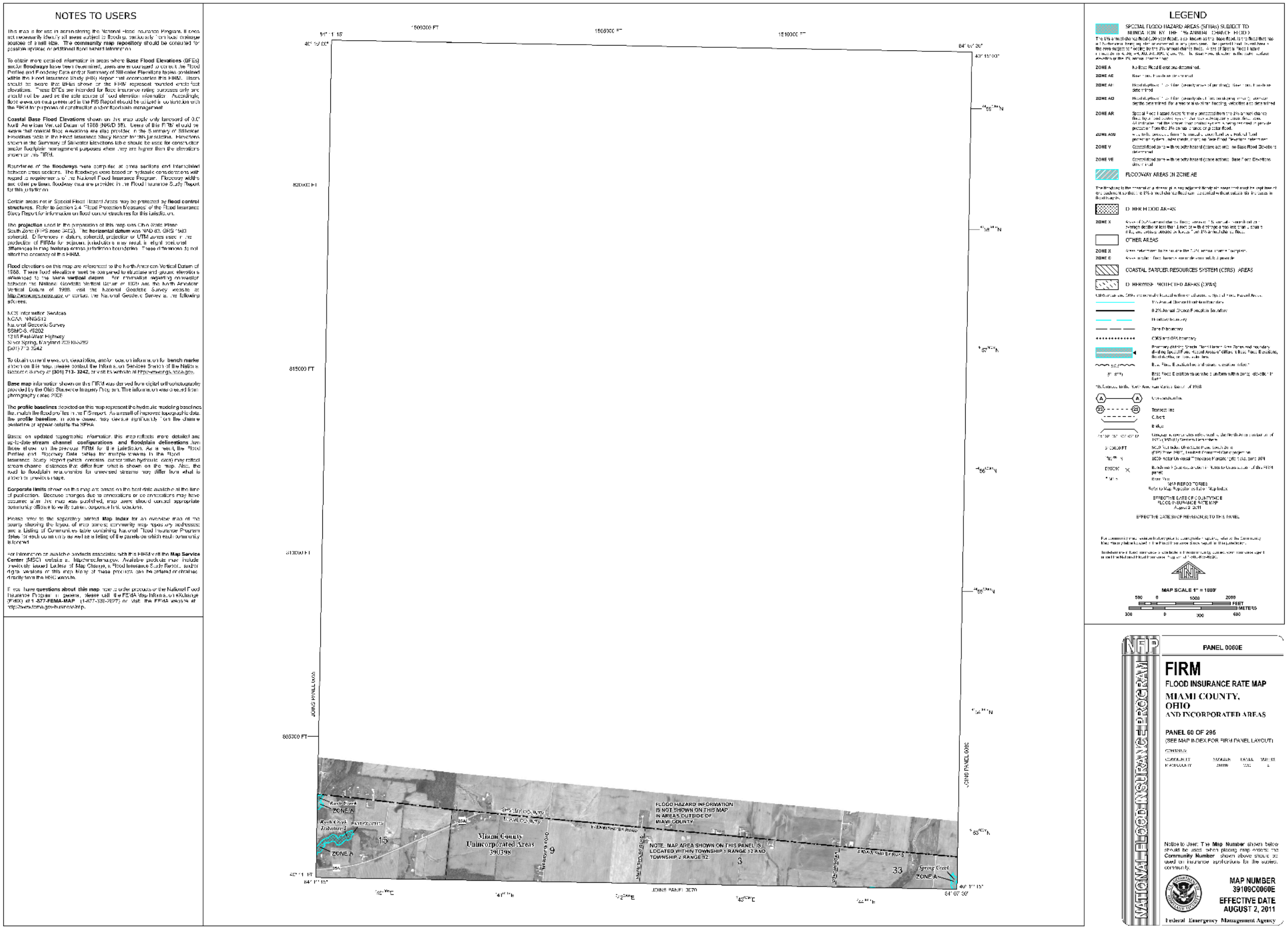
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 46 OF 295
PANEL 0046E
MAP NUMBER 39109C0046E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency


ZONE A
ZONE AE
ZONE AE
ZONE AE
ZONE AE
FLOOD HAZARD INFORMATION
NOTES TO USERS
SCALE
1 inch = 1,000 feet
1:12,000
PANEL LOCATOR
FEMA
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
and Incorporated Areas
PANEL 55 of 295
FEMA
VERSION NUMBER
2.3.2.0
MAP NUMBER
39109C0055J
MAP REVISED
JUNE 3, 2020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FLOODWAY AREAS IN ZONE AE
OTHER FLOOD AREAS
OTHER AREAS
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
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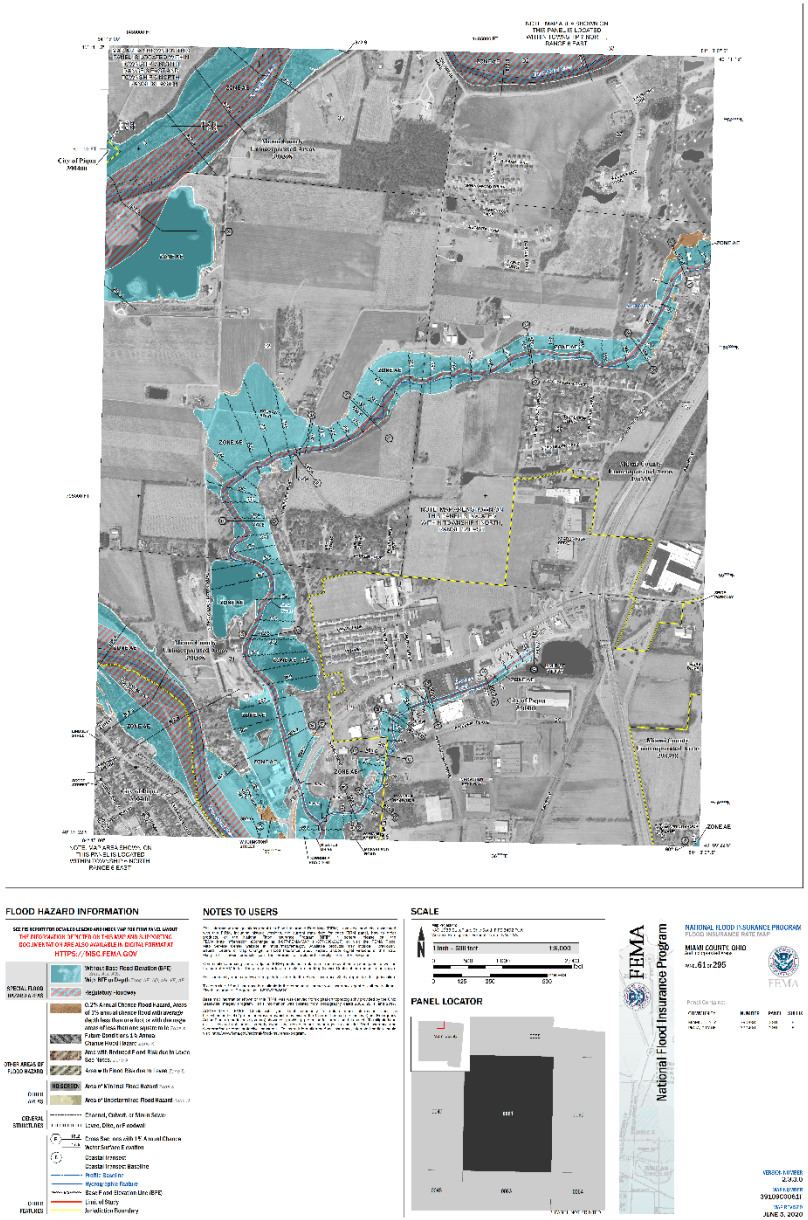
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 1 RANGE 12 AND TOWNSHIP 2 RANGE 12
Miami County
Unincorporated Areas
390398
ZONE A
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0060E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 60 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
39109C0060E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

PANEL LOCATOR

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

MIAMI COUNTY, OHIO

and Incorporated Areas

PANEL 61 OF 295


NOTES TO USERS
LEGEND
PANEL 0062E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 62 OF 295
MAP NUMBER 39109C0062E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency
Miami County Unincorporated Areas 390139
City of Piqua 390110
Miami County Unincorporated Areas 390198
Miami County Unincorporated Areas 390138
Miami County Unincorporated Areas 390108
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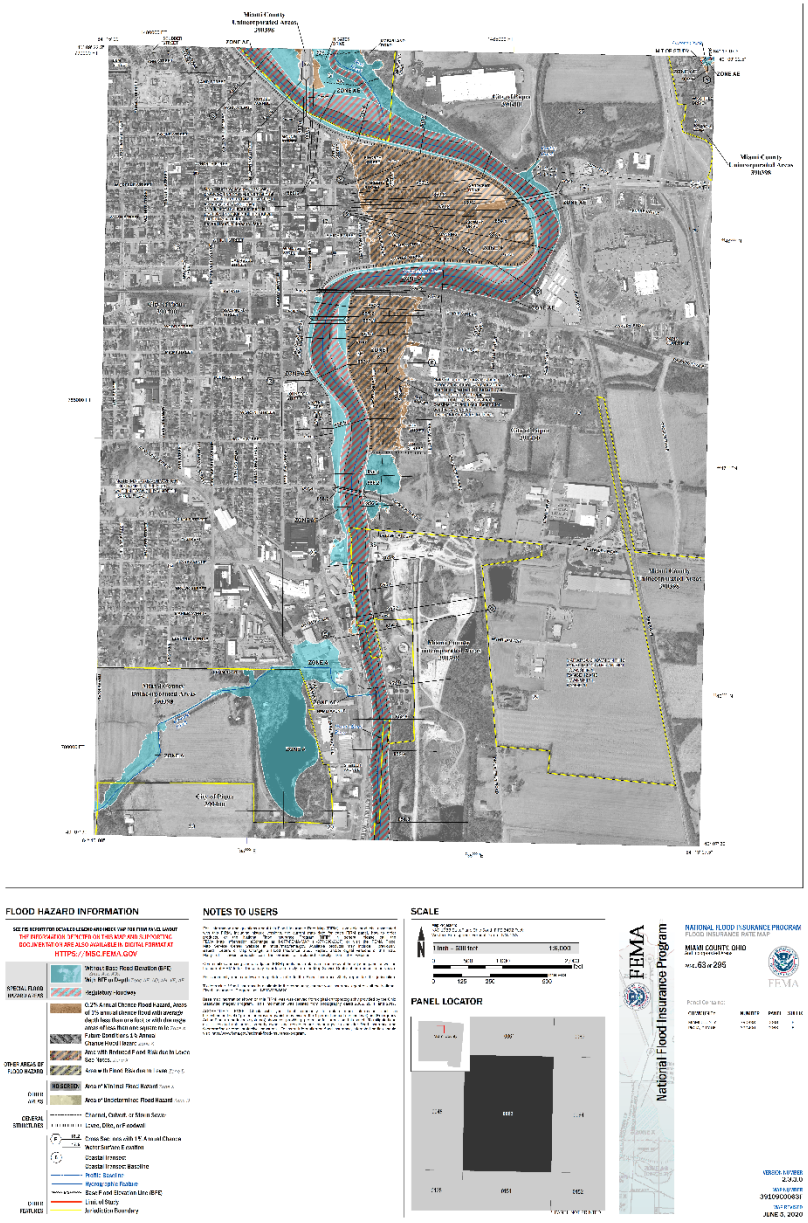
ZONE AE
ZONE A
MAP SCALE 1" = 500'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National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
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MIAMI COUNTY, OHIO
and Incorporated Areas
PANEL 63 of 285
VERSION NUMBER
2.3.2.0
MAP NUMBER
39109C0063J
MAP REVISED
JUNE 3, 2020


NOTES TO USERS
LEGEND
City of Piqua
390400
Miami County
Unincorporated Areas
390159
ZONE AE
ZONE A
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 7 RANGE 11 AND TOWNSHIP 8 RANGE 12
PANEL 0064E
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FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 64 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
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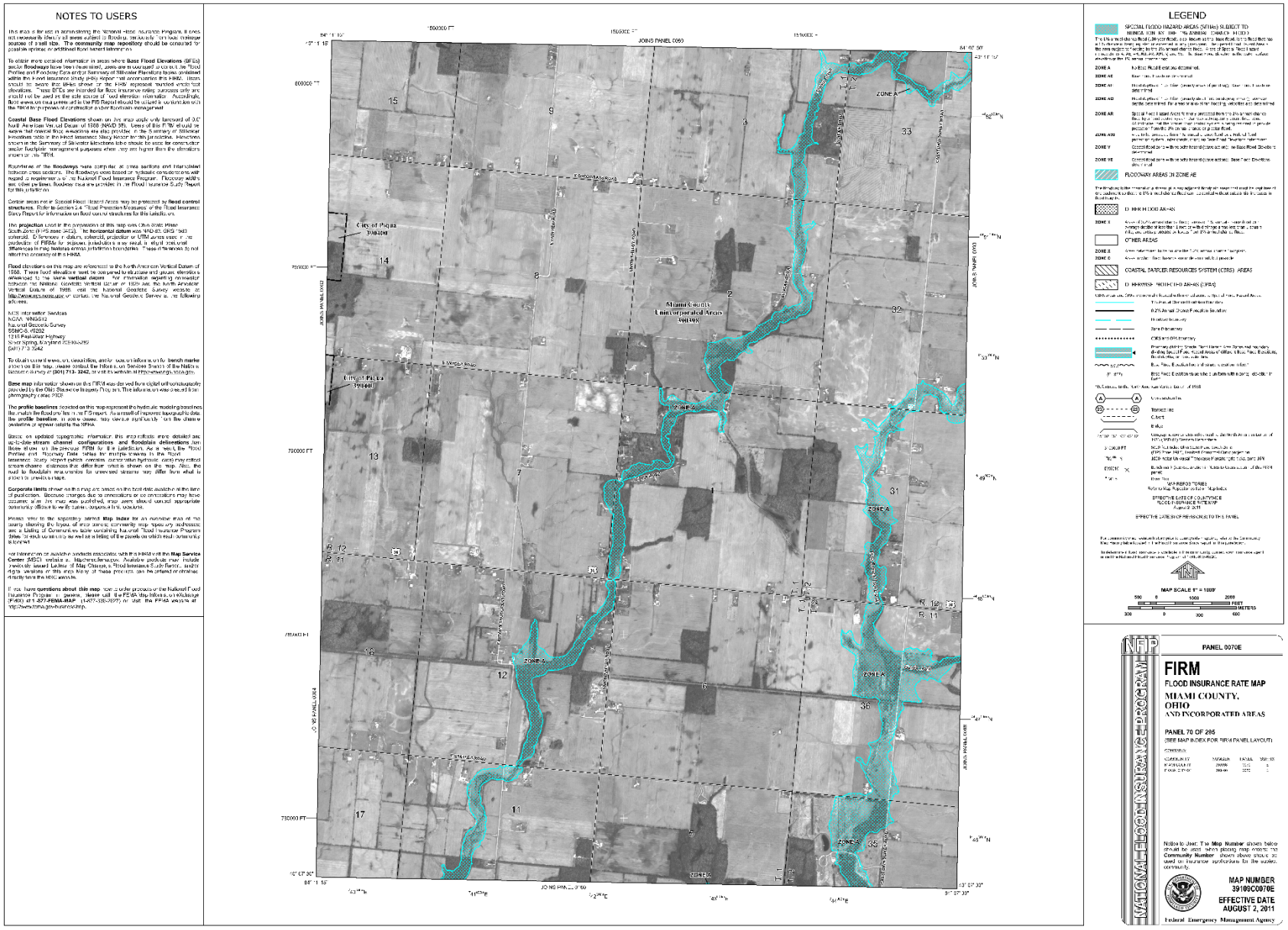
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency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JOINS PANEL 0080
ZONE A
City of Piqua
Miami County
Unincorporated Areas
390109
PANEL 0070E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 70 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
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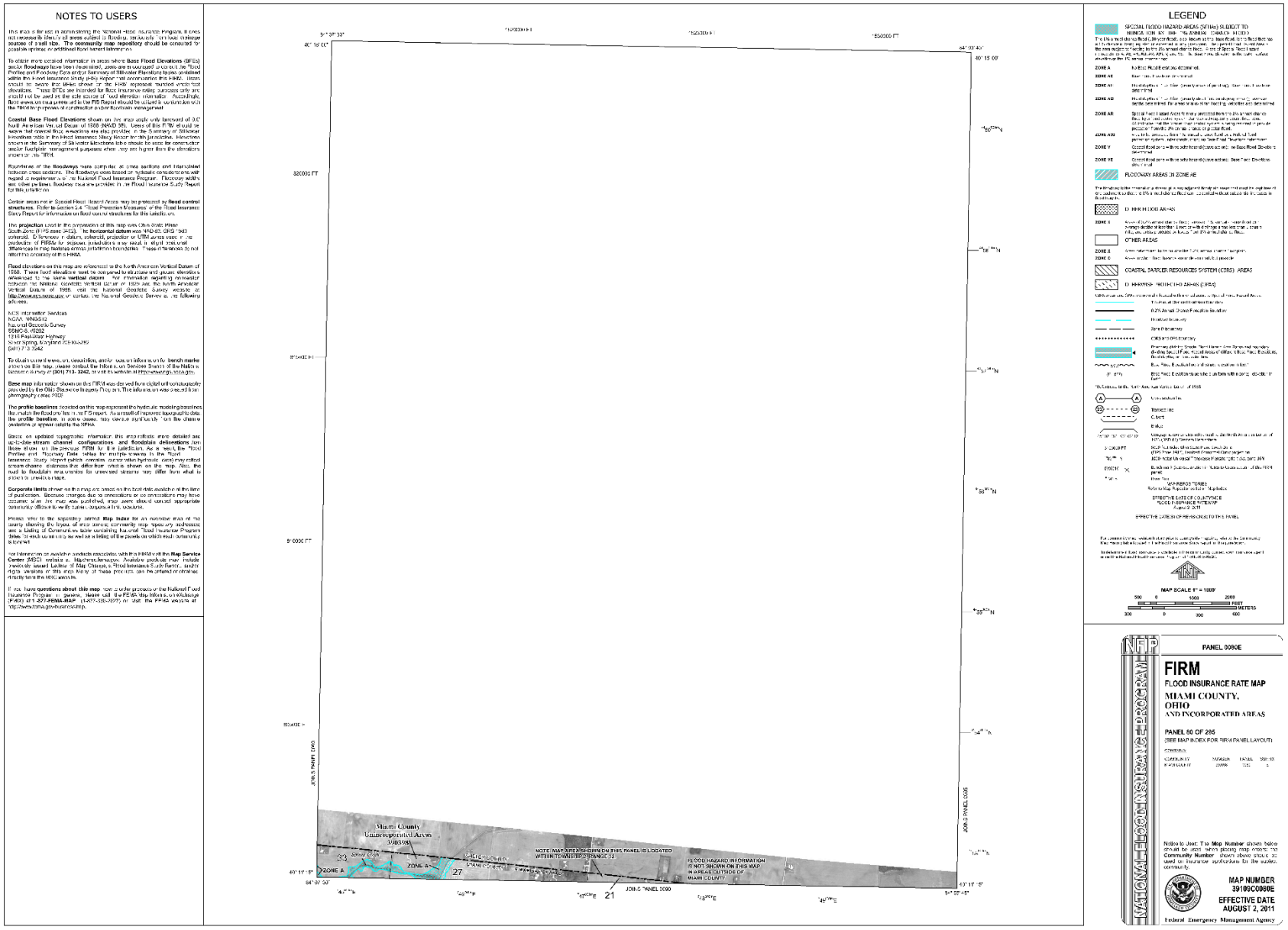
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency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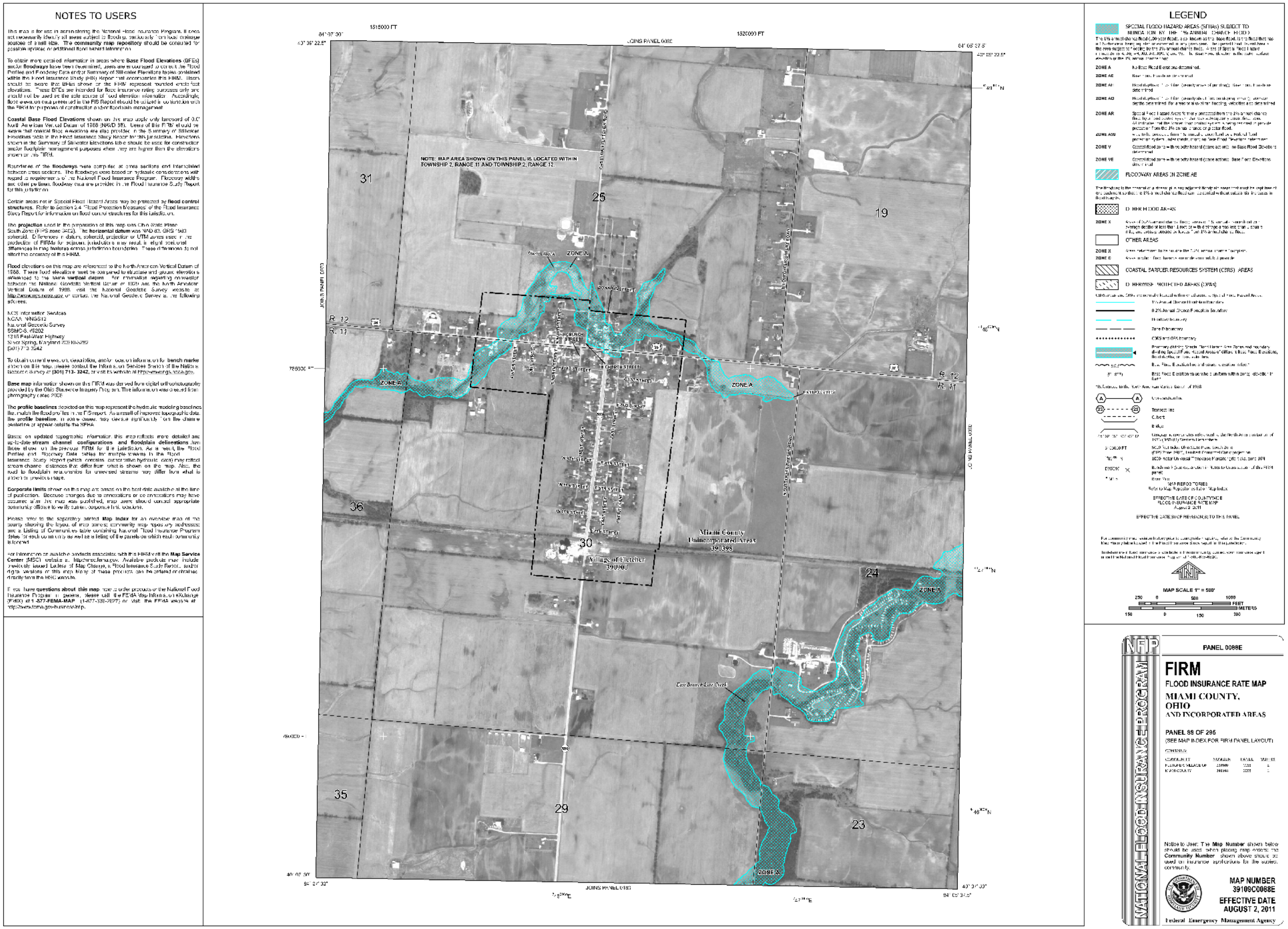
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 80 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0080E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency
Miami County
Unincorporated Areas
390098
ZONE A
ZONE AE
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 2 RANGE 12
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
JOHNS PANEL 0060
JOHNS PANEL 0080
JOHNS PANEL 0100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ZONE A
Village of Fletcher
Miami County Unincorporated Areas
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0088E
FIRM
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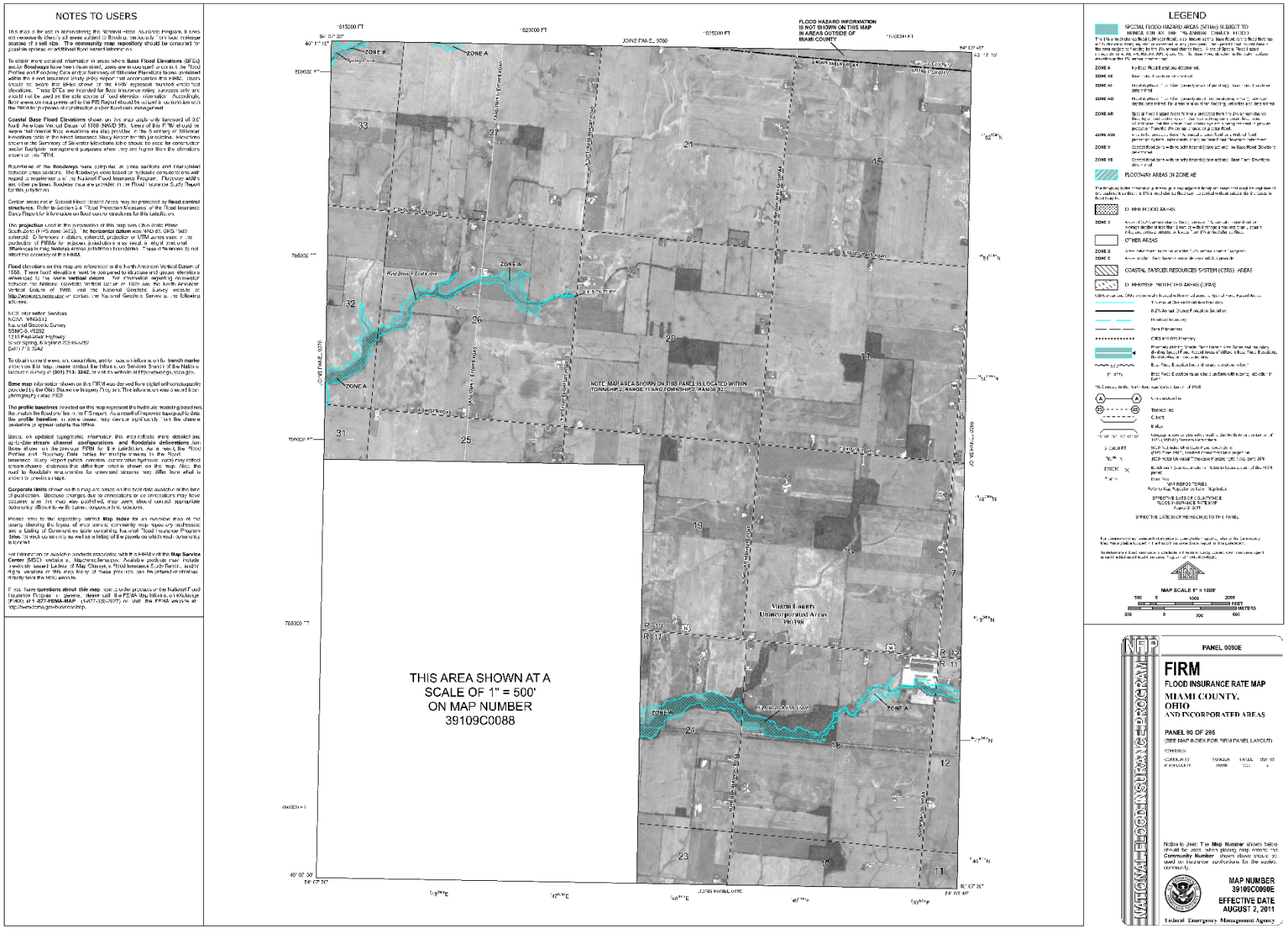
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
MAP NUMBER
39109C0088E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency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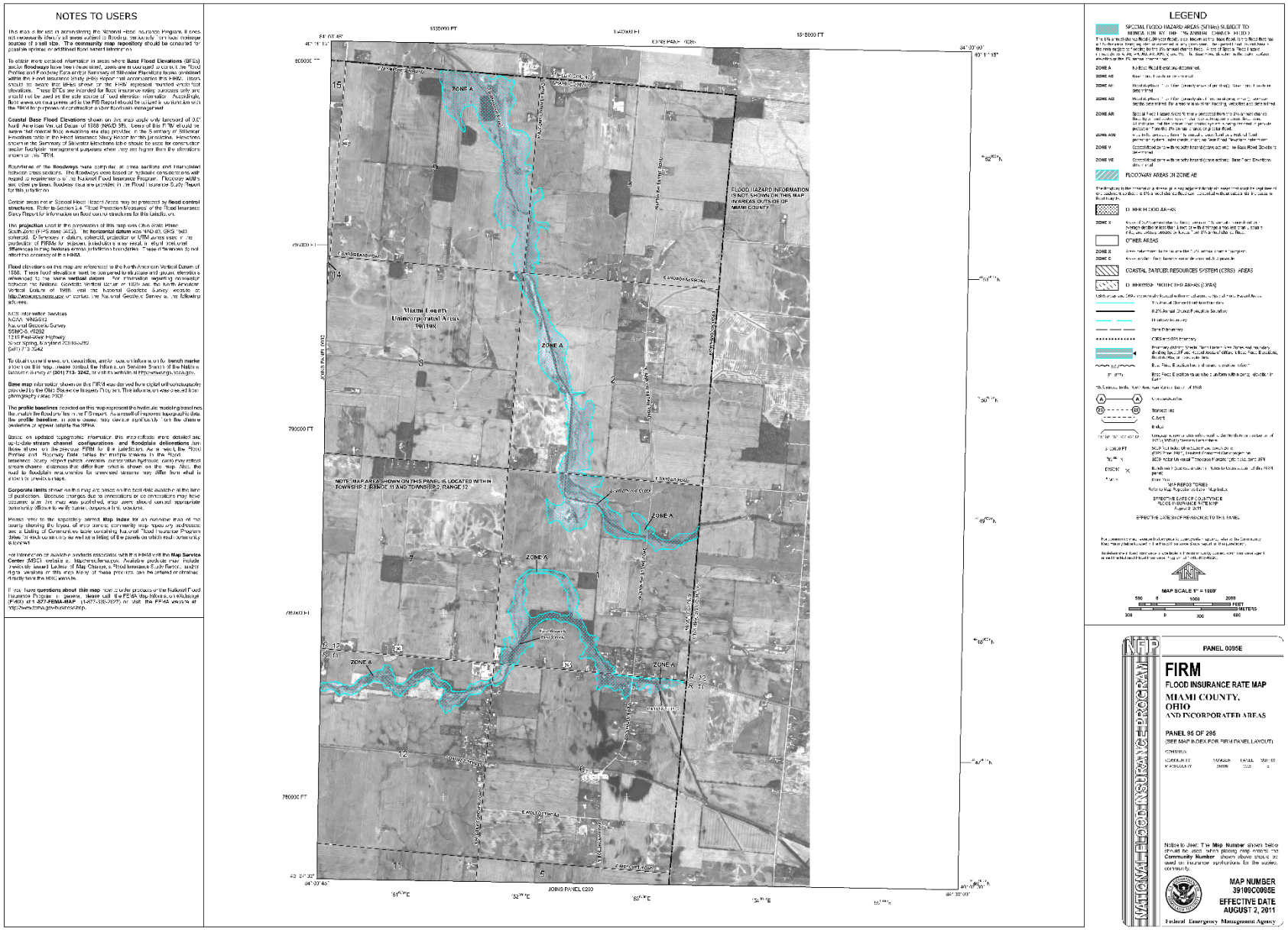
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 2, RANGE 11 AND TOWNSHIP 2, RANGE 12
Miami County Unincorporated Areas 390199
ZONE A
PANEL 0090E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 90 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0090E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency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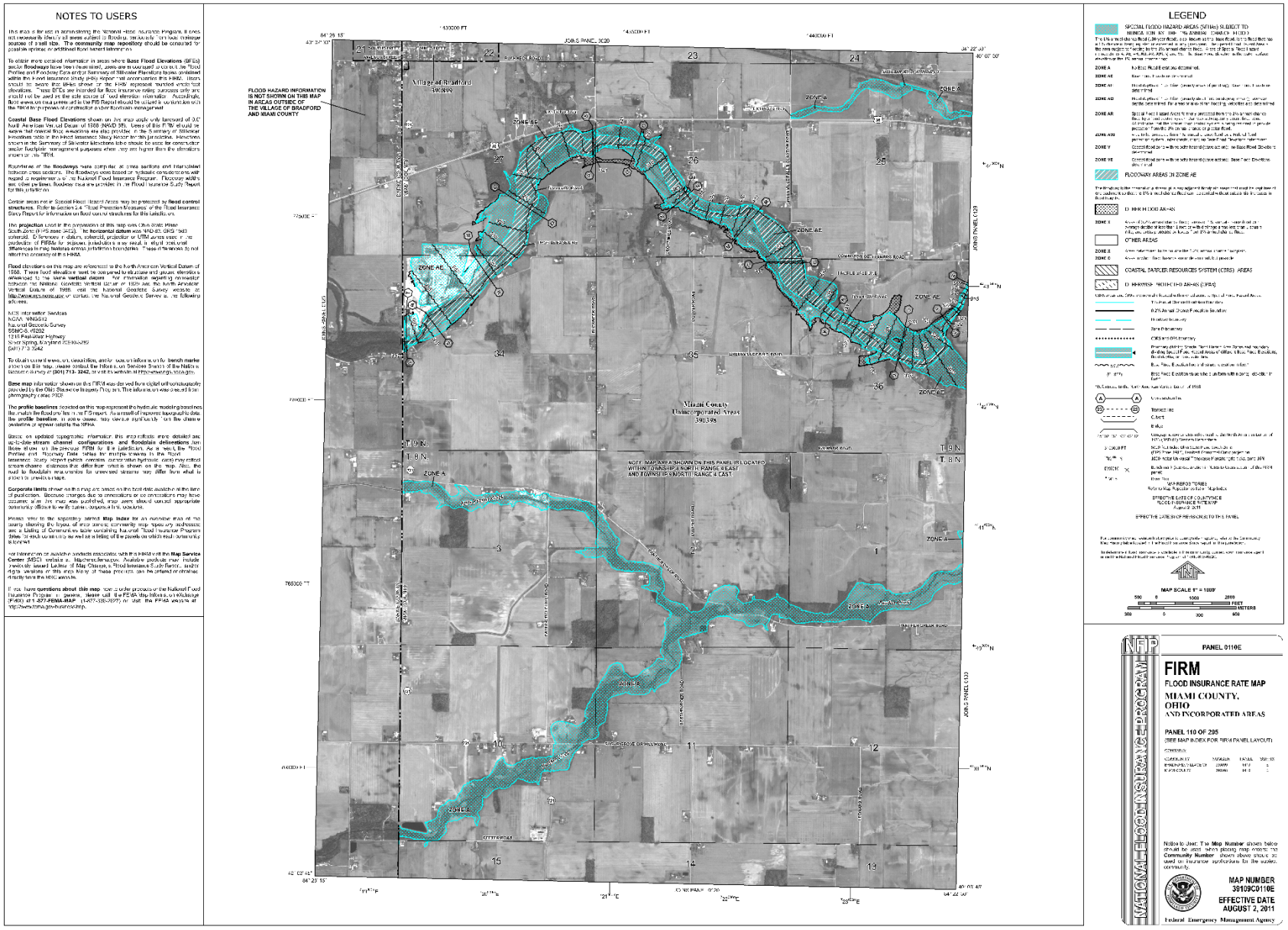
ZONE A
Miami County
Unincorporated Areas
390198
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 2, RANGE 11 AND TOWNSHIP 2, RANGE 12
JOINS PANEL 0200
FLOODWAY AREAS IN ZONE AE
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
MAP SCALE 1" = 1000'
PANEL 0095E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 95 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
39109C0095E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency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Village of Bradford 390099
Miami County Unincorporated Areas 390398
JOHNS PANEL 0020
JOHNS PANEL 0120
JOHNS PANEL 0110
ZONE A
ZONE AE
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 3 NORTH, RANGE 4 EAST AND TOWNSHIP 3 NORTH, RANGE 5 EAST
T 3 N
T 2 N
SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
FLOODWAY AREAS IN ZONE AE
OTHER AREAS
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
OTHERWISE PROTECTED AREAS (OPAs)
MAP SCALE 1" = 1000'
PANEL 0110E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 110 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
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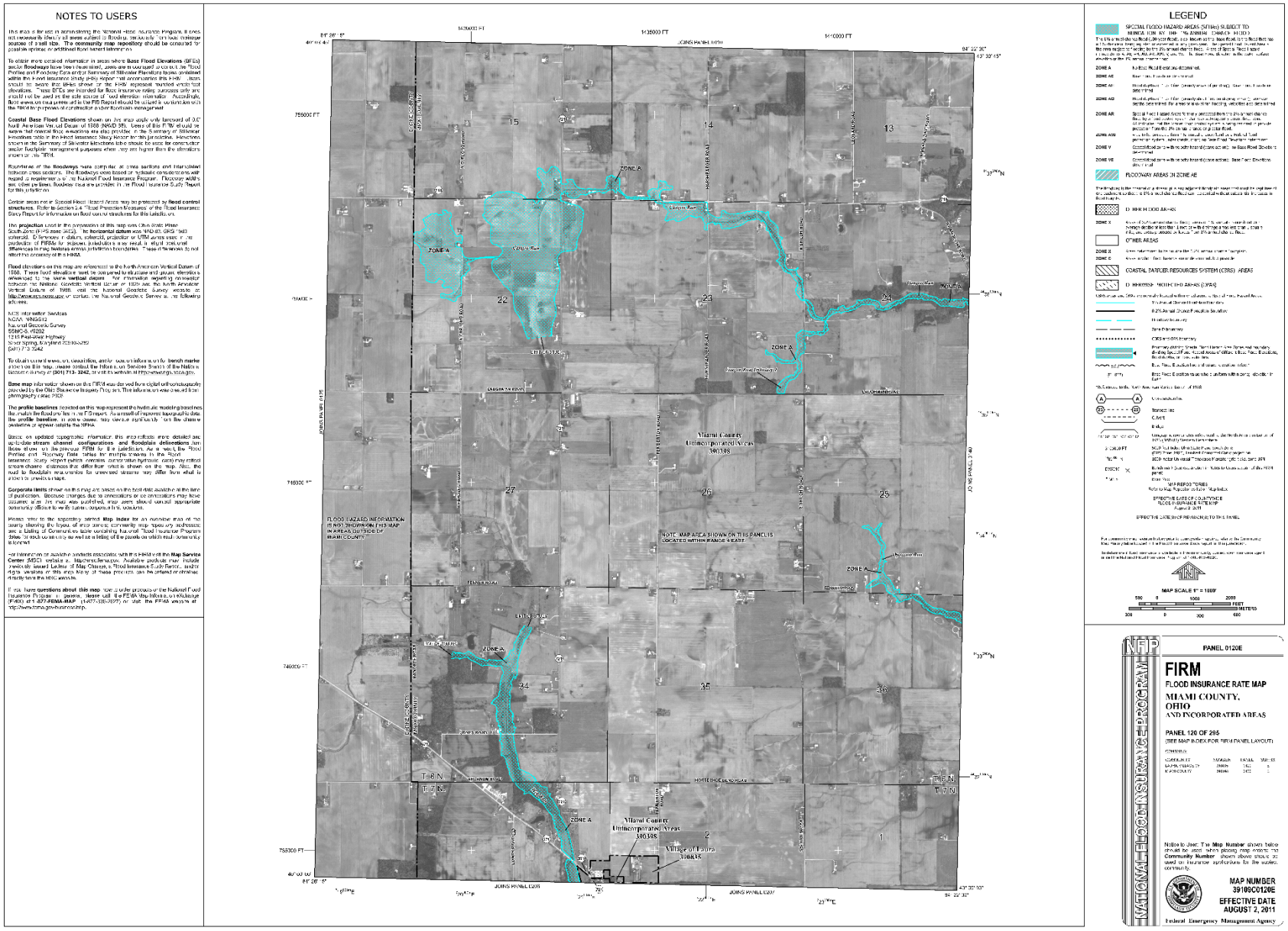
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency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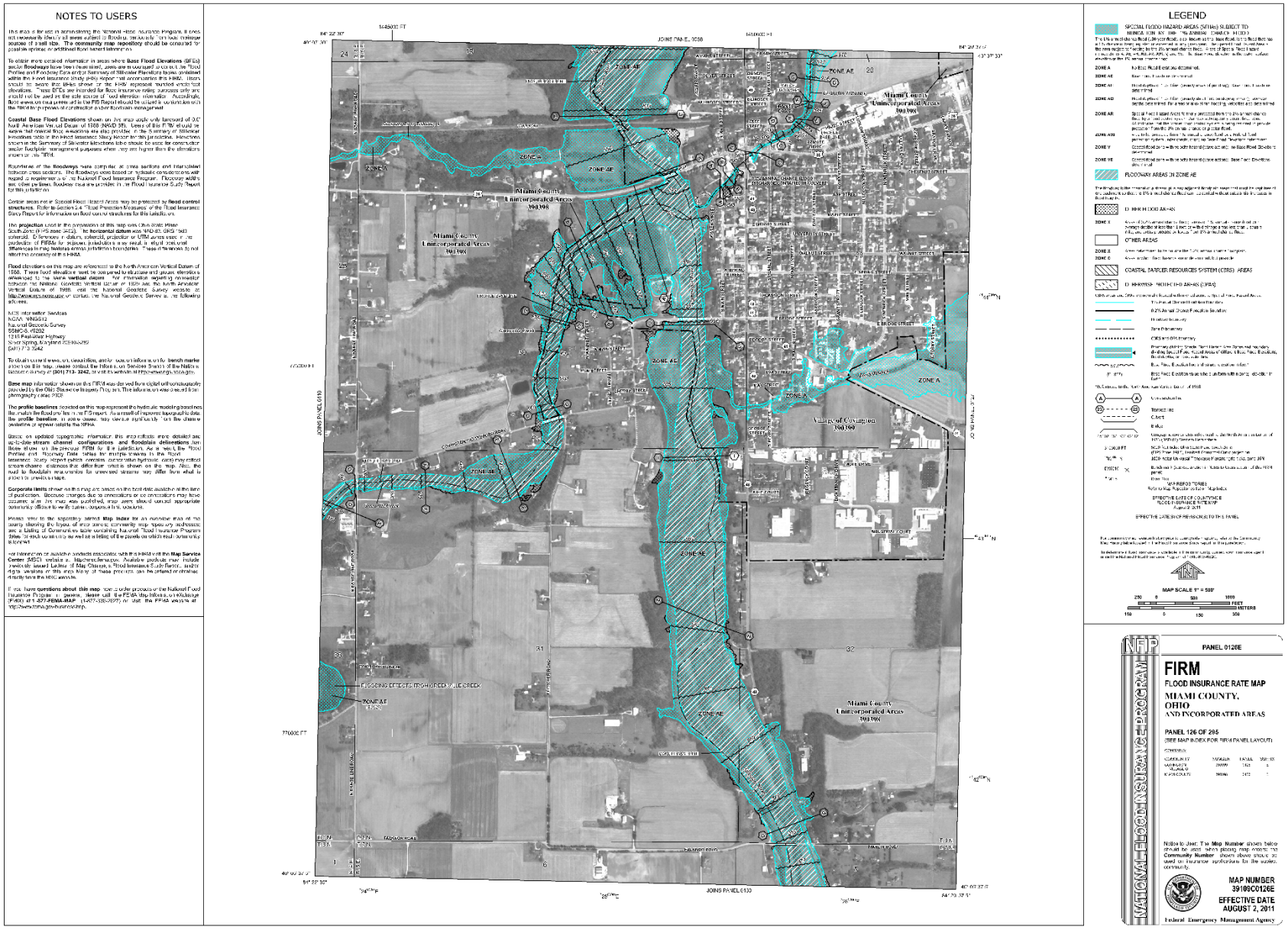
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 120 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0120E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency
ZONE A
Miami County Unincorporated Areas 390198
Village of Laura 390185
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN RANGE 4 EAST
JOINS PANEL 0110
JOINS PANEL 0130
JOINS PANEL 0240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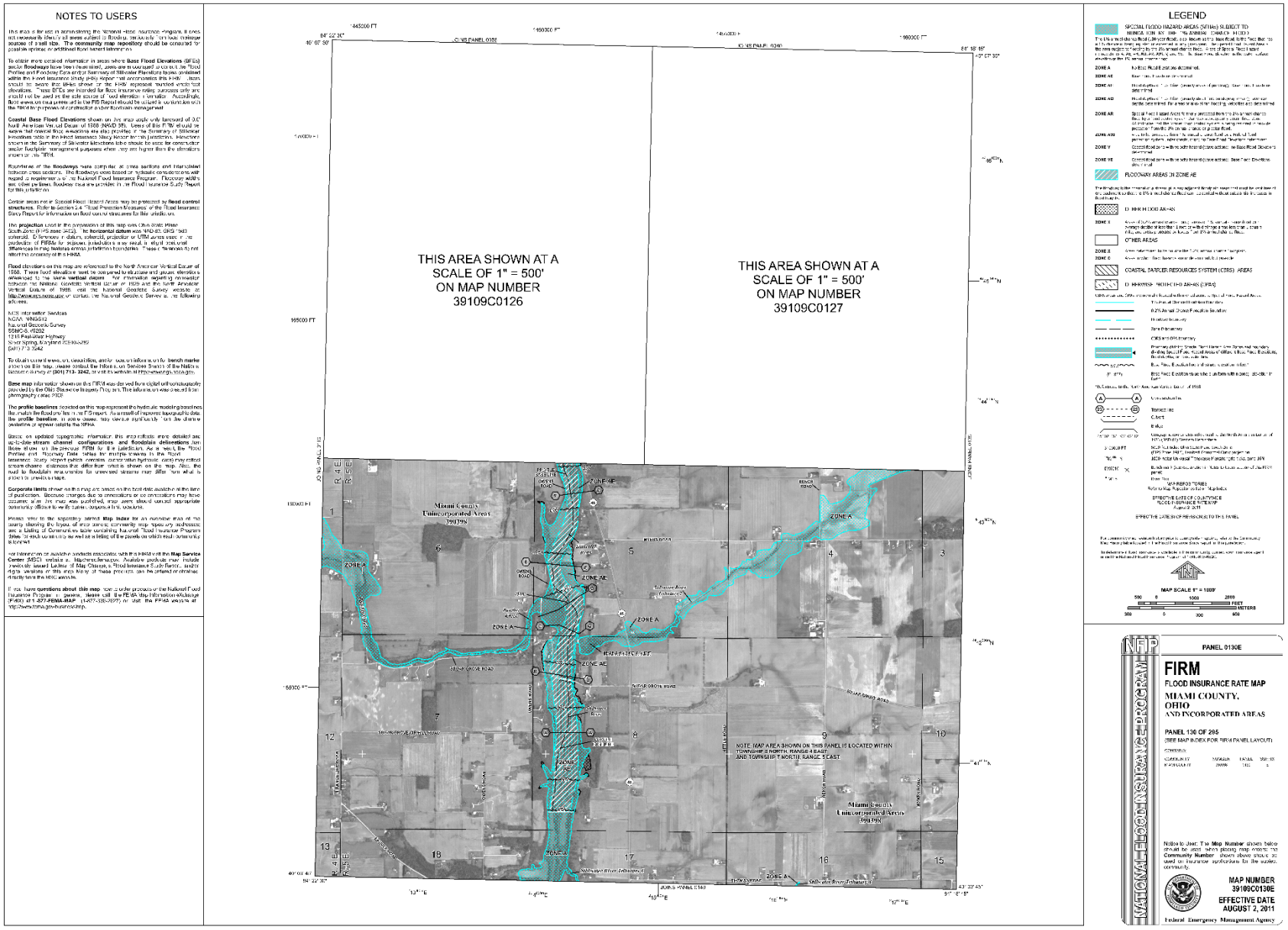
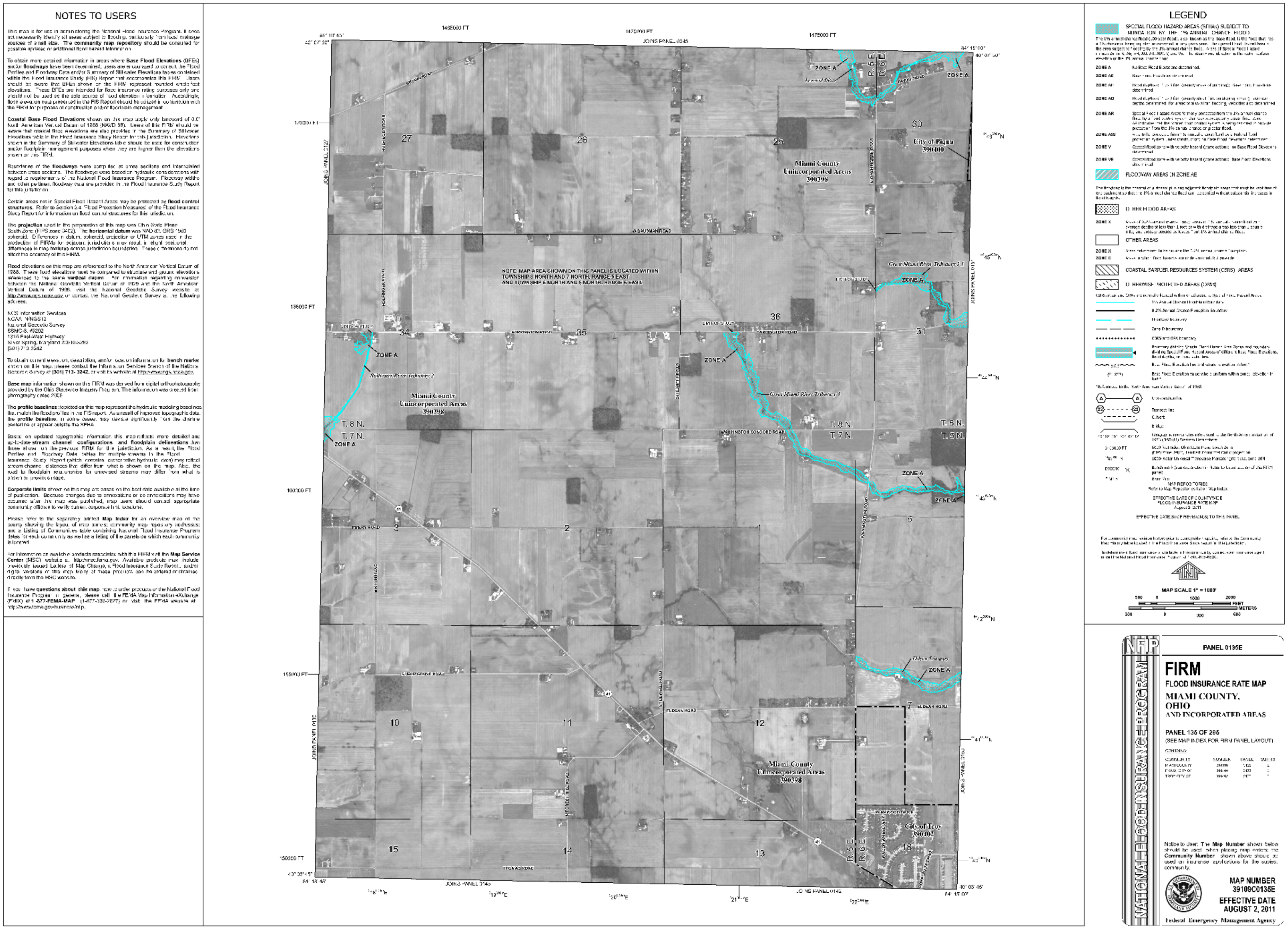
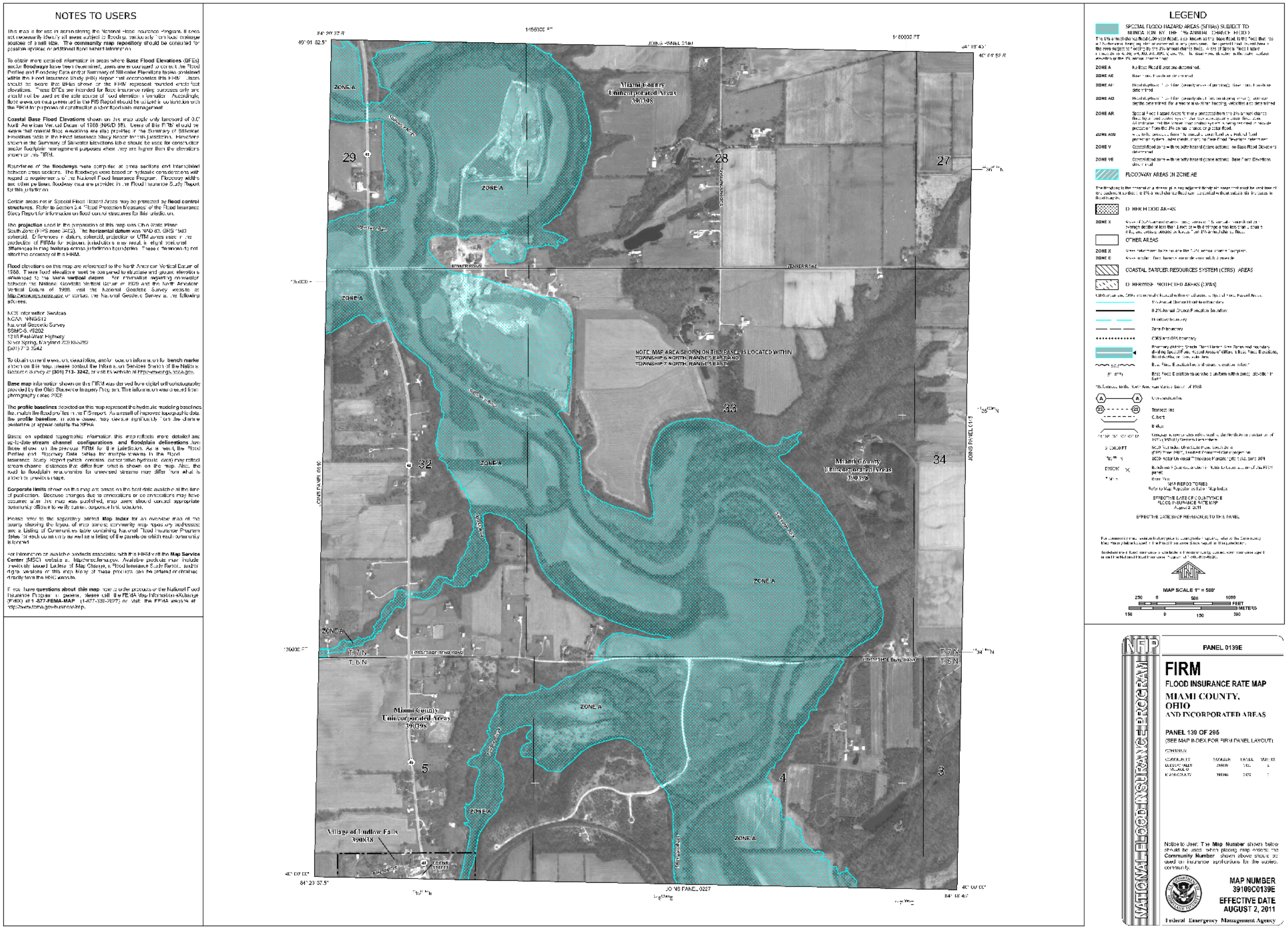
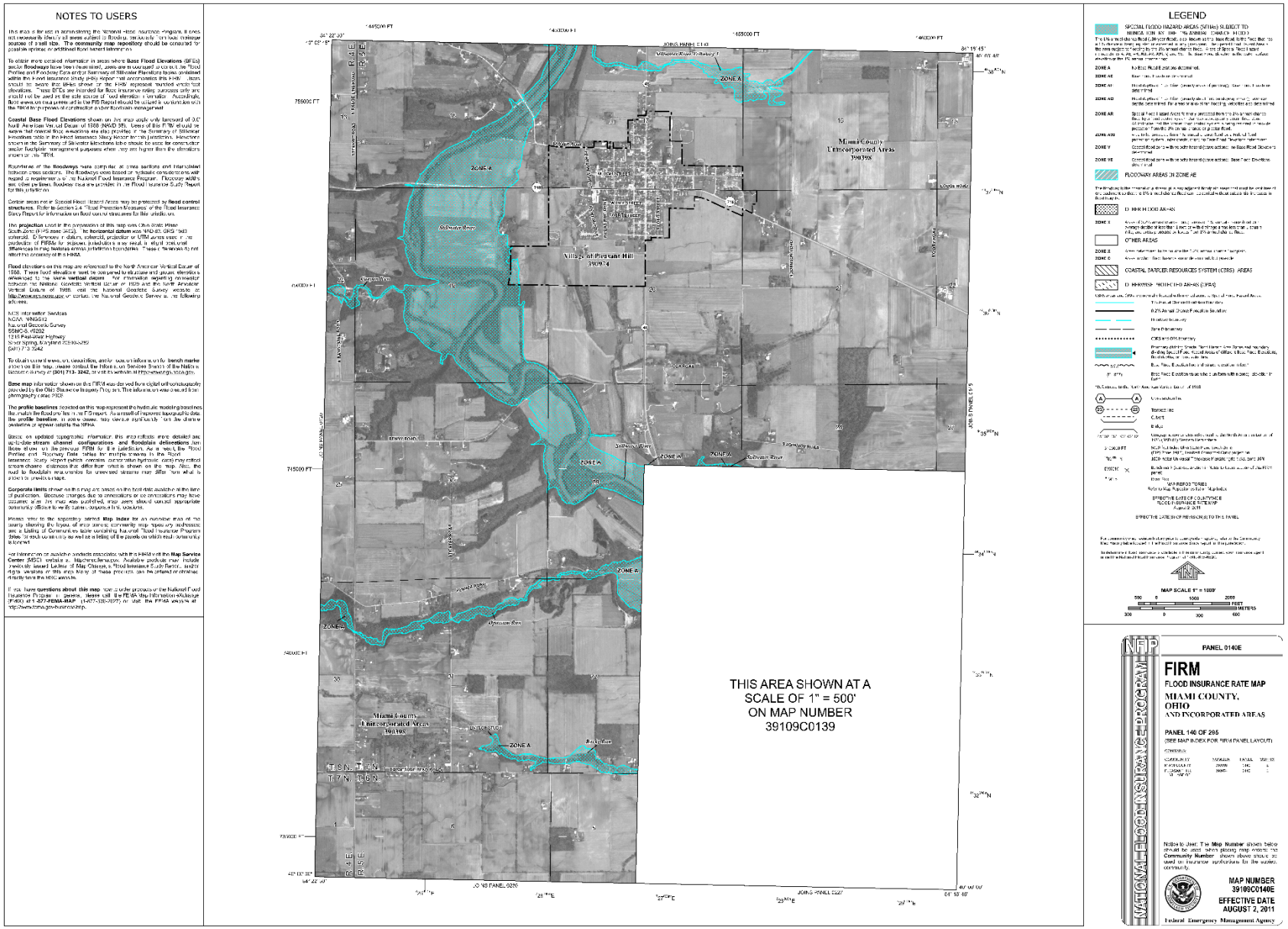
Village of Covington 390169
ZONE AE
ZONE A
ZONE X
FLOODING EFFECTS FROM GREENVILLE CREEK
PANEL 0126E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 126 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
39109C0126E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency

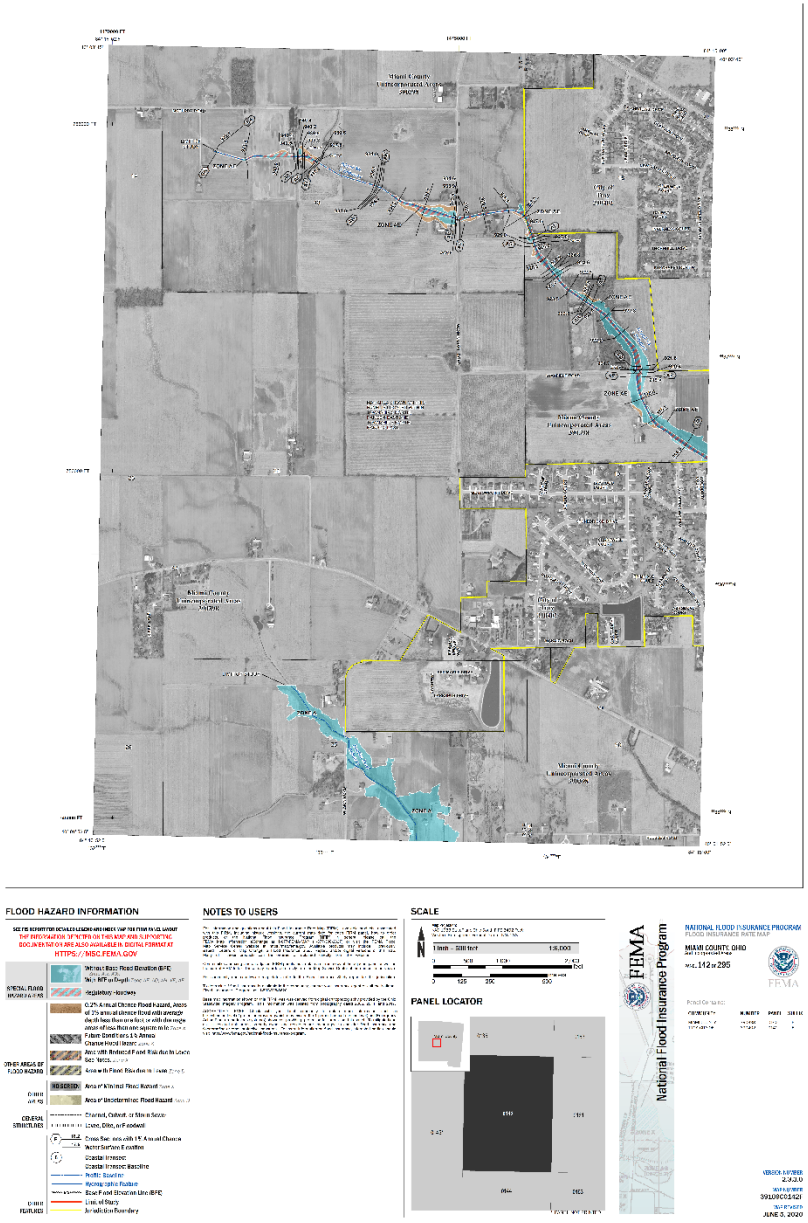

NOTES TO USERS
LEGEND
Miami County Unincorporated Areas 390398
Village of Covington 390399
Miami County Unincorporated Areas 390398
Miami County Unincorporated Areas 390398
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 7 NORTH, RANGE 5 EAST AND TOWNSHIP 8 NORTH, RANGE 5 EAST.
ZONE A
ZONE A
ZONE A
ZONE A
JOHNS PANEL 0126
JOHNS PANEL 0127
JOHNS PANEL 0128
JOHNS PANEL 0151
BROWN ROAD
BROWN ROAD
FARRINGTON ROAD
FARRINGTON ROAD
STATE ROUTE 185
STATE ROUTE 185
MAP SCALE 1" = 500'
PANEL 0127E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 127 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0127E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency


NOTES TO USERS
LEGEND
THIS AREA SHOWN AT A SCALE OF 1" = 500' ON MAP NUMBER 39109C0126
THIS AREA SHOWN AT A SCALE OF 1" = 500' ON MAP NUMBER 39109C0127
Miami County Unincorporated Areas 390399
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 6 NORTH, RANGE 4 EAST AND TOWNSHIP 7 NORTH, RANGE 5 EAST.
PANEL 0130E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 130 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0130E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency


NOTES TO USERS
LEGEND
Miami County Unincorporated Areas 390398
City of Piqua 390400
City of Troy 390402
ZONE A
T. 8 N.
T. 7 N.
MAP SCALE 1" = 1000'
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0135E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 135 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0135E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency


NOTES TO USERS
LEGEND
ZONE A
Miami County
Unincorporated Areas
390398
Village of Ludlow Falls
29
28
27
32
33
34
5
4
3
T 7 N
T 6 N
MAP SCALE 1" = 500'
FEET
METERS
NFIP
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0139E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY,
OHIO
AND INCORPORATED AREAS
PANEL 139 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
39109C0139E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency


NOTES TO USERS
LEGEND
THIS AREA SHOWN AT A SCALE OF 1" = 500' ON MAP NUMBER 39109C0139
PANEL 0140E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 140 OF 295
MAP NUMBER 39109C0140E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency



FLOOD HAZARD INFORMATION

NOTES TO USERS

SCALE

PANEL LOCATOR

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

MIAMI COUNTY, OHIO

and Incorporated Areas

PANEL 142 of 295

FEMA

VERSION NUMBER

2.3.2.0

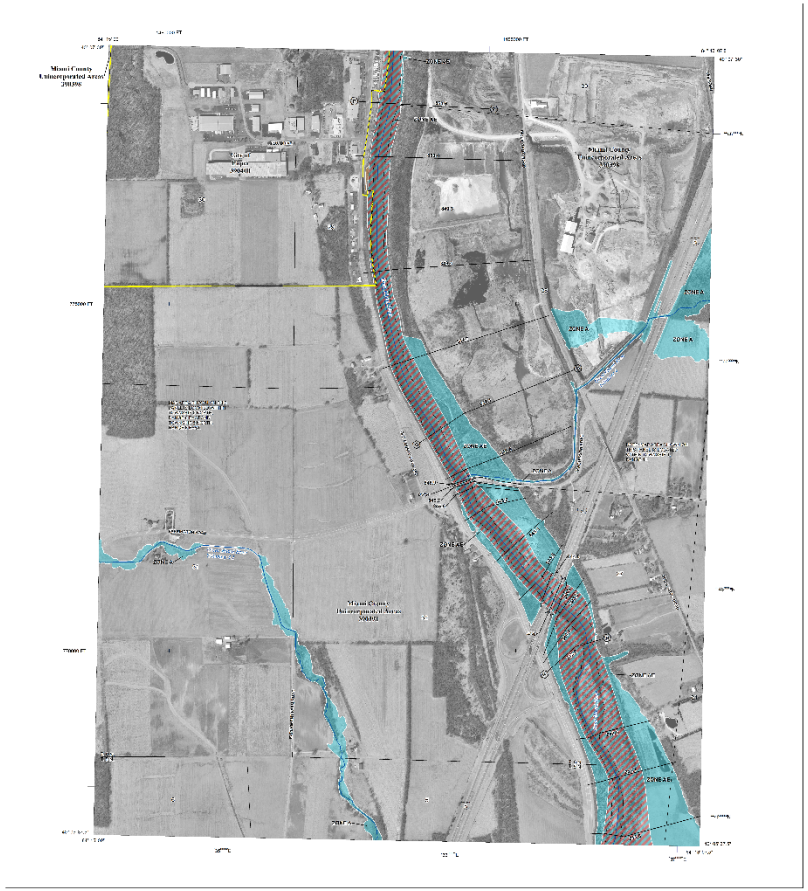
MAP NUMBER

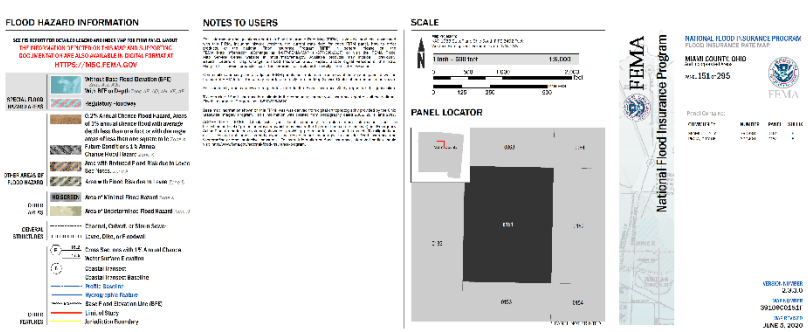
39109C0142J

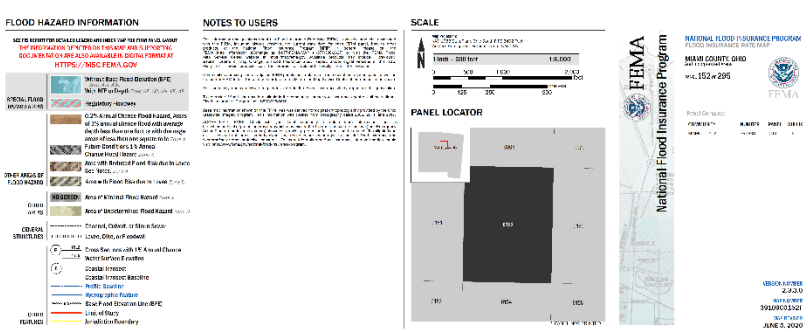
MAP REVISED

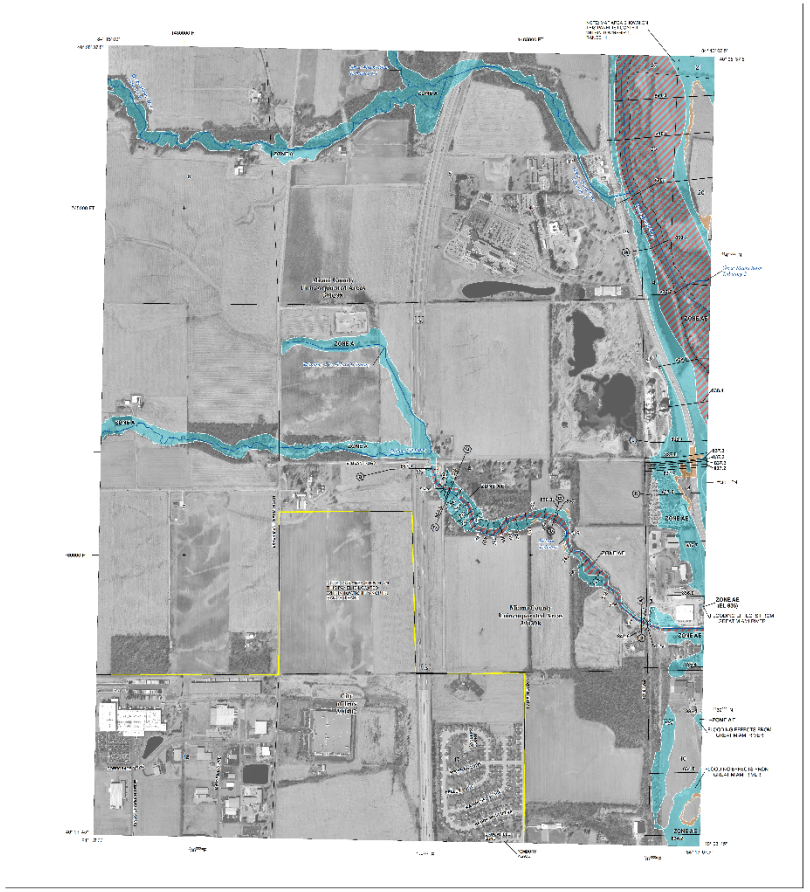
JUNE 3, 2020

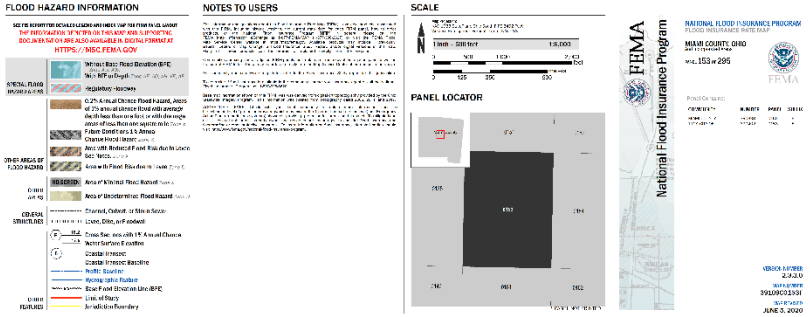

NOTES TO USERS
LEGEND
ZONE A
ZONE AE
ZONE X
Miami County Unincorporated Areas 390388
City of Troy 390402
PANEL 0144E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 144 OF 295
MAP NUMBER 39109C0144E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency

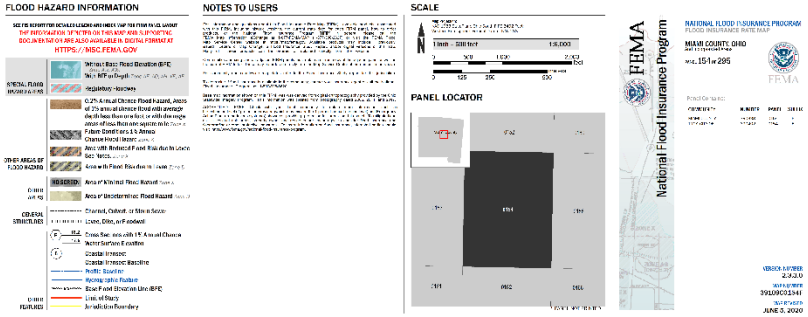


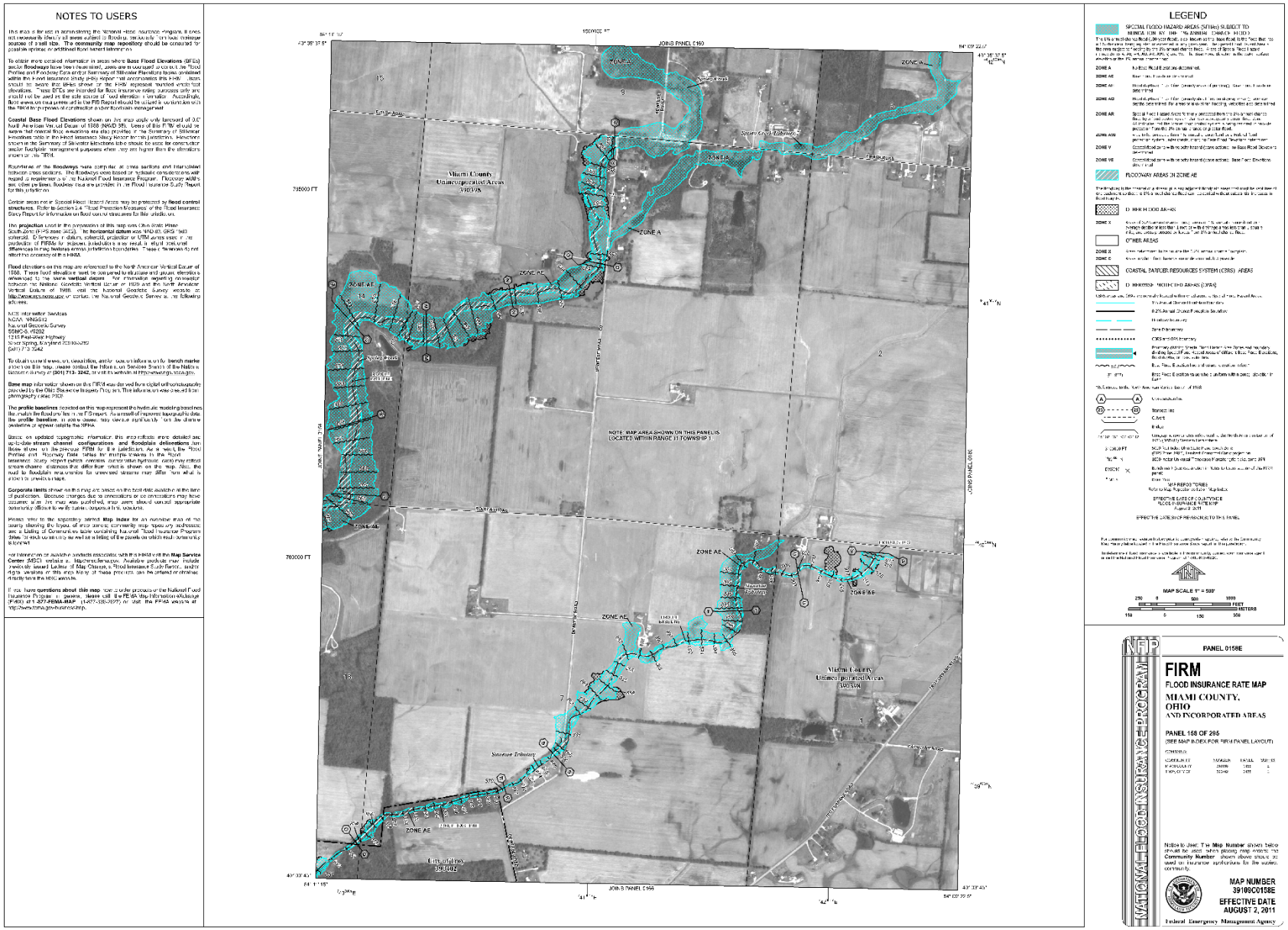

FLOOD HAZARD INFORMATION
NOTES TO USERS
SCALE
PANEL LOCATOR
National Flood Insurance Program
FEMA
NATIONAL FLOOD INSURANCE PROGRAM
MIAMI COUNTY, OHIO
VERSION NUMBER
2.3.2.0
MAP NUMBER
39109C0151J
MAP REVISED
JUNE 3, 2020

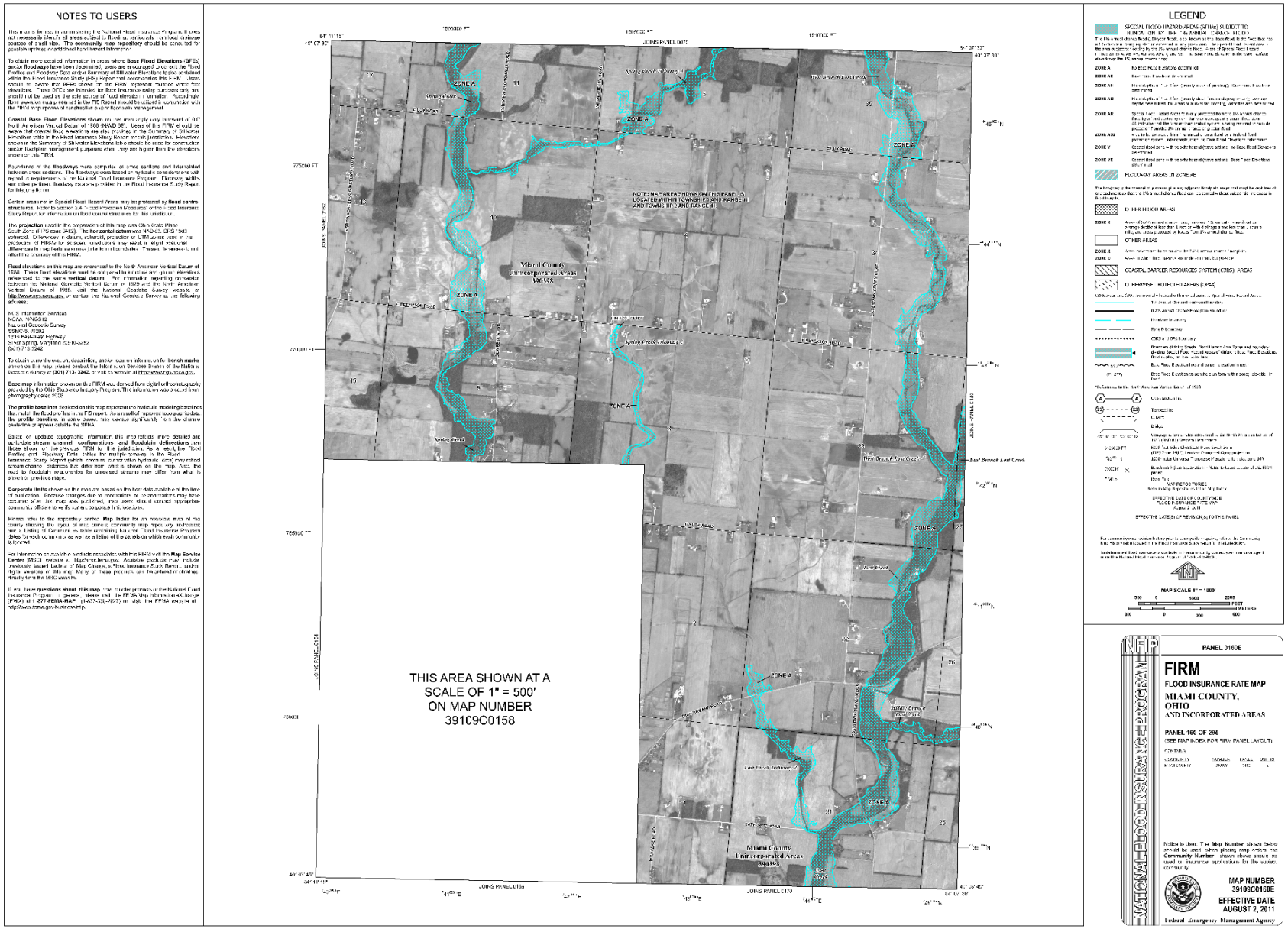

FLOOD HAZARD INFORMATION
NOTES TO USERS
SCALE
PANEL LOCATOR
National Flood Insurance Program
FEMA
NATIONAL FLOOD INSURANCE PROGRAM
MIAMI COUNTY, OHIO
VERSION NUMBER
2.3.2.0
MAP NUMBER
39109C0152J
MAP REVISED
JUNE 3, 2020

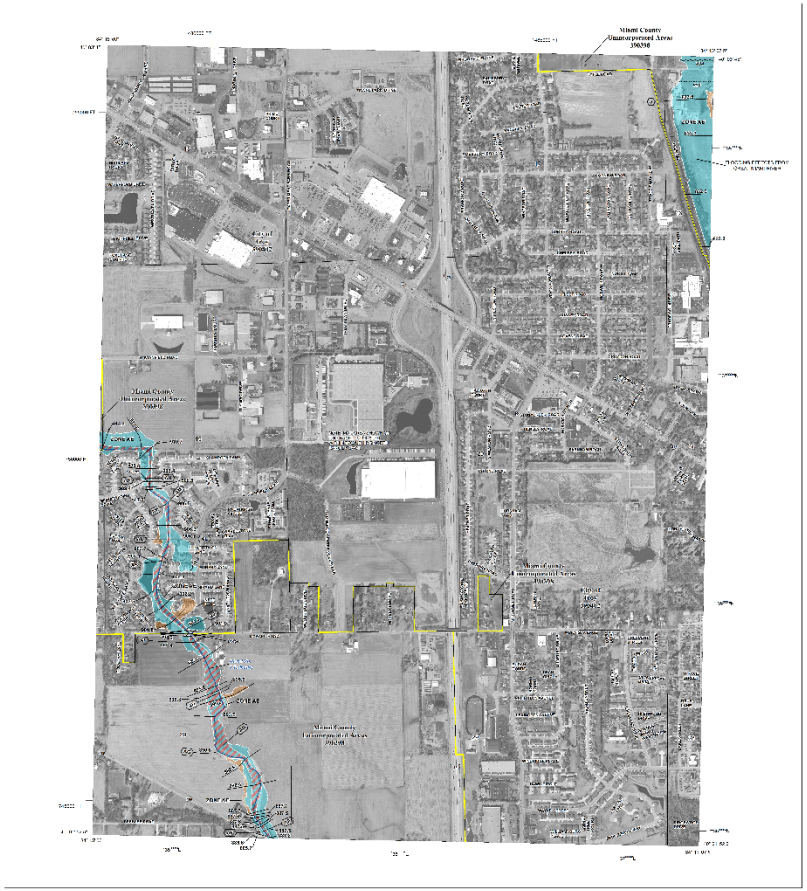


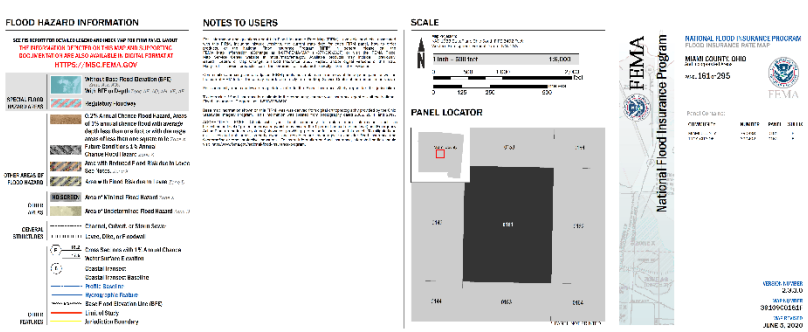

FLOOD HAZARD INFORMATION
NOTES TO USERS
SCALE
PANEL LOCATOR
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
MIAMI COUNTY, OHIO
VERSION NUMBER
2.3.2.0
MAP NUMBER
39109C0134J
MAP REVISED
JUNE 3, 2020

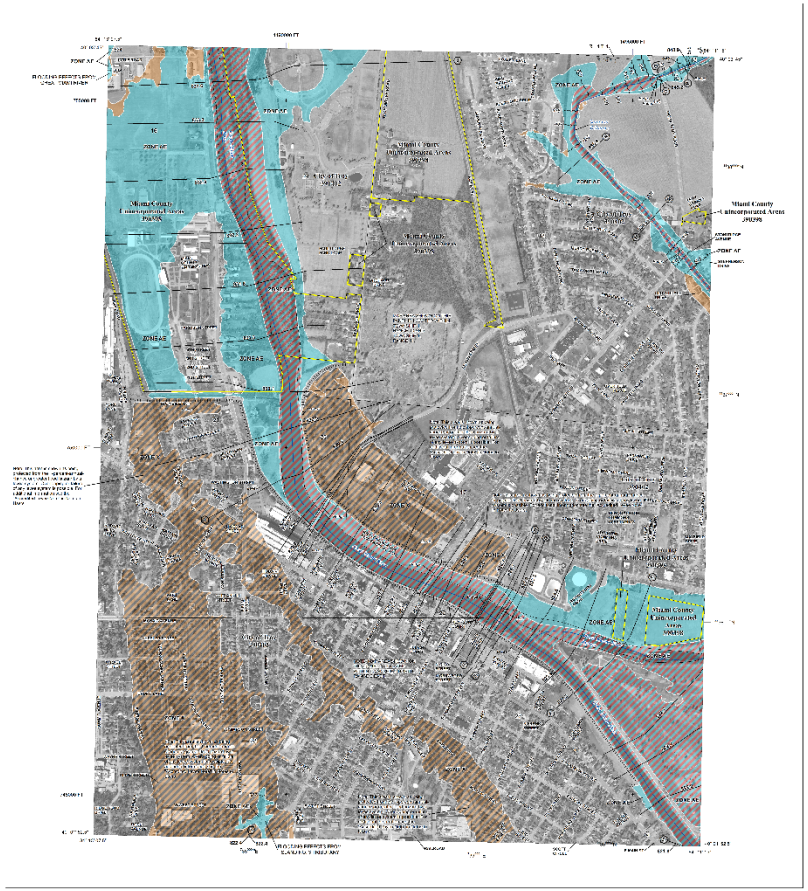

FLOOD HAZARD INFORMATION
NOTES TO USERS
SCALE
PANEL LOCATOR
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
MIAMI COUNTY, OHIO
VERSION NUMBER
2.3.2.0
MAP NUMBER
39109C0134J
MAP REVISED
JUNE 3, 2020

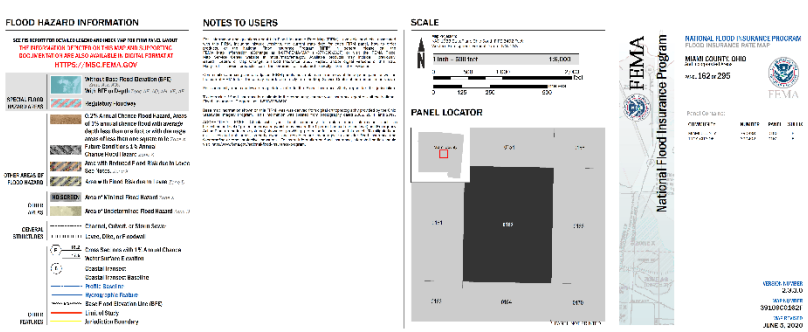

NOTES TO USERS
LEGEND
PANEL 0158E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 158 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
39109C0158E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency
Miami County Unincorporated Areas
390109
City of Troy
390402
ZONE A
ZONE AE
ZONE X
JOHNS PANEL C160
JOHNS PANEL C156
JOHNS PANEL C158
JOHNS PANEL C157
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN RANGE 11 TOWNSHIP 1.
735000 FT
783000 FT
MAP SCALE 1" = 500'

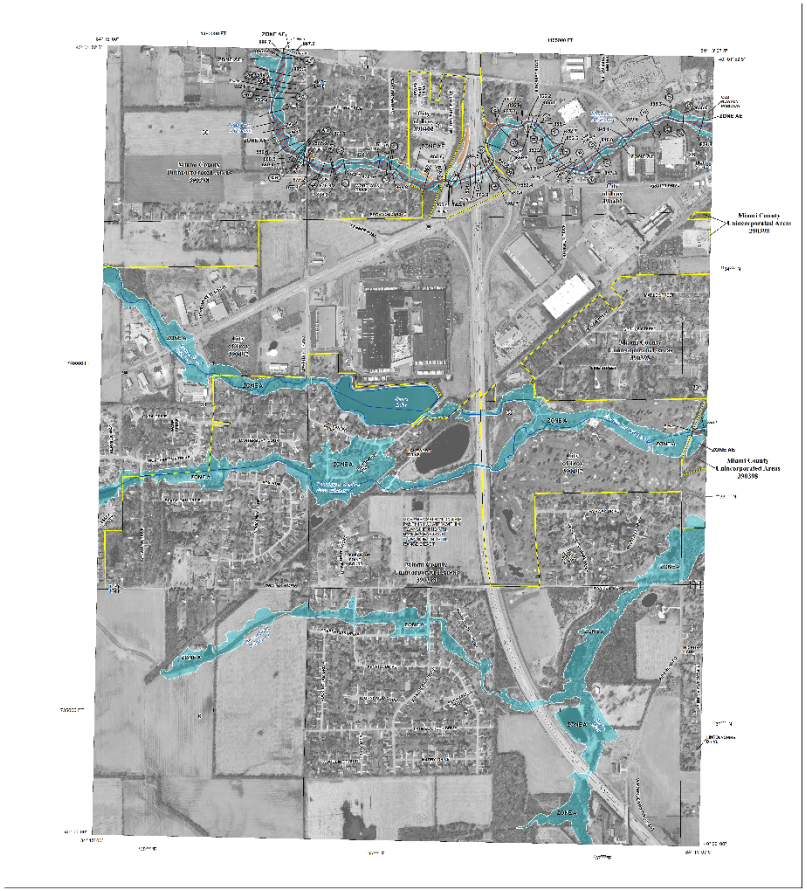

NOTES TO USERS
LEGEND
THIS AREA SHOWN AT A SCALE OF 1" = 500' ON MAP NUMBER 39109C0158
Miami County Unincorporated Areas 390395
Miami County Unincorporated Areas 390395
ZONE A
East Branch Lost Creek
Spring Creek Tributary 2
Spring Creek
Lost Creek Tributary 2
Lost Creek
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 1 AND RANGE 8 E AND TOWNSHIP 2 AND RANGE 8 E
JOINS PANEL 0079
JOINS PANEL 0158
JOINS PANEL 0170
JOINS PANEL 0154
PANEL 0160E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 160 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0160E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM

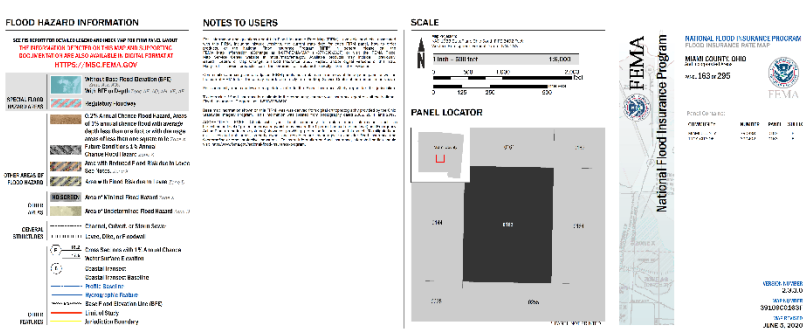


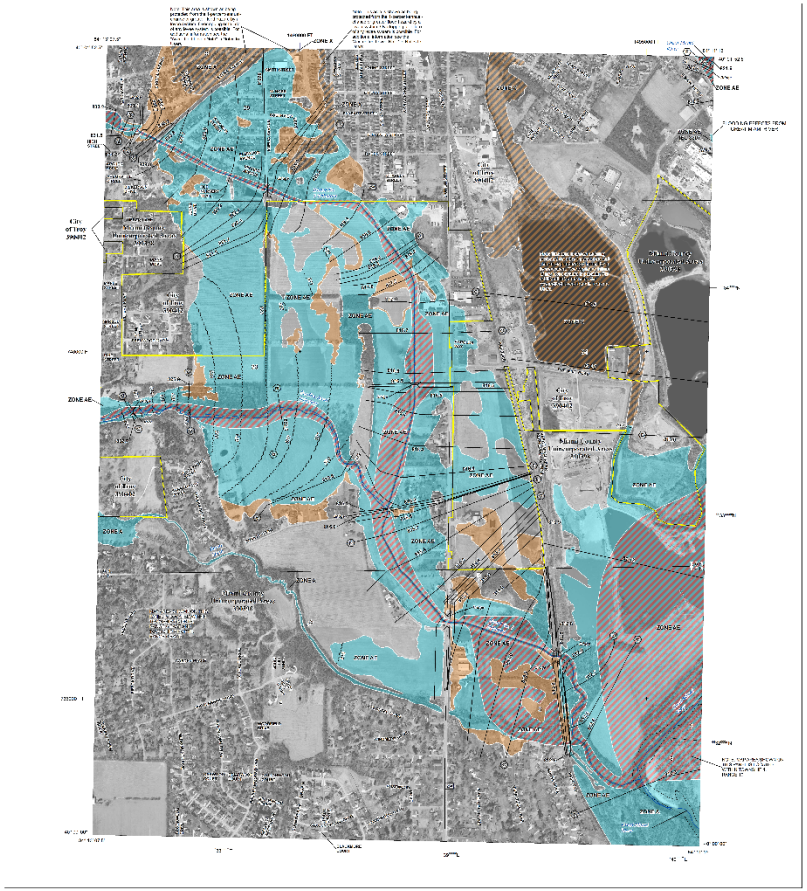

FLOOD HAZARD INFORMATION
NOTES TO USERS
SCALE
PANEL LOCATOR
National Flood Insurance Program
FEMA
NATIONAL FLOOD INSURANCE PROGRAM
MIAMI COUNTY, OHIO
VERSION NUMBER
2.3.2.0
MAP NUMBER
39109C0161J
MAP REVISED
JUNE 3, 2020

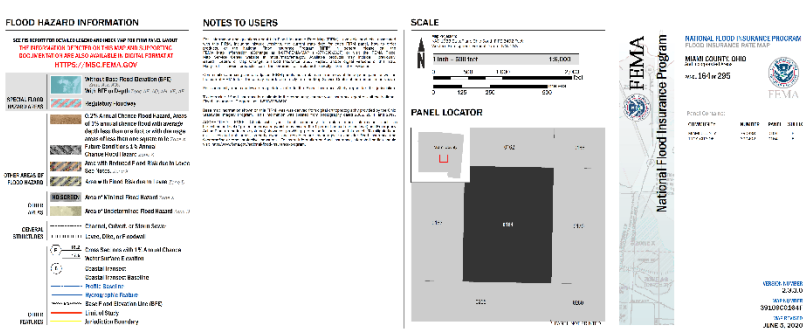


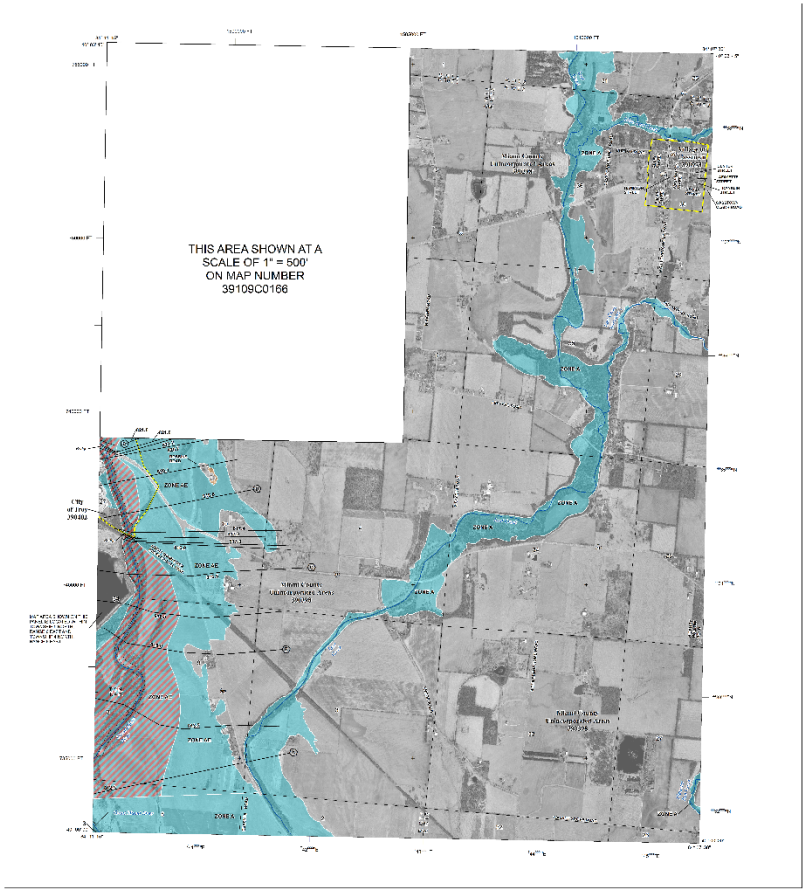

FLOOD HAZARD INFORMATION
NOTES TO USERS
SCALE
PANEL LOCATOR
National Flood Insurance Program
FEMA
NATIONAL FLOOD INSURANCE PROGRAM
MIAMI COUNTY, OHIO
VERSION NUMBER
2.3.2.0
MAP NUMBER
39109C0162J
MAP REVISED
JUNE 3, 2020

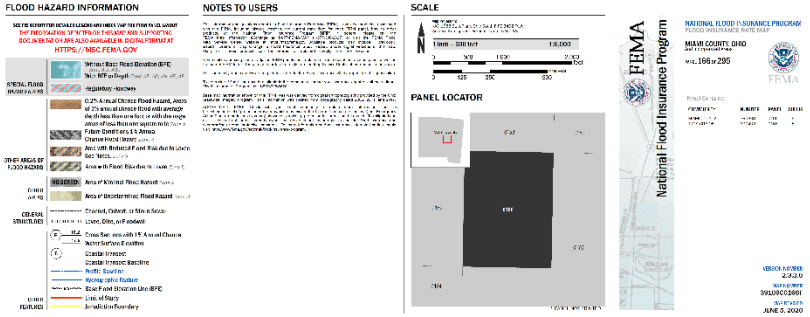


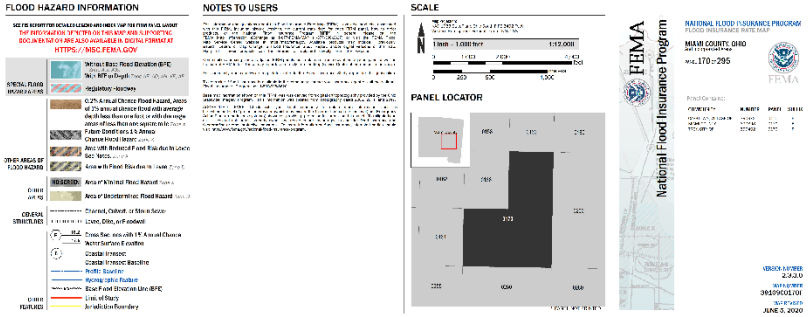

FLOOD HAZARD INFORMATION
NOTES TO USERS
SCALE
PANEL LOCATOR
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
MIAMI COUNTY, OHIO
VERSION NUMBER
2.3.2.0
MAP NUMBER
39109C0163H
MAP REVISED
JUNE 3, 2020

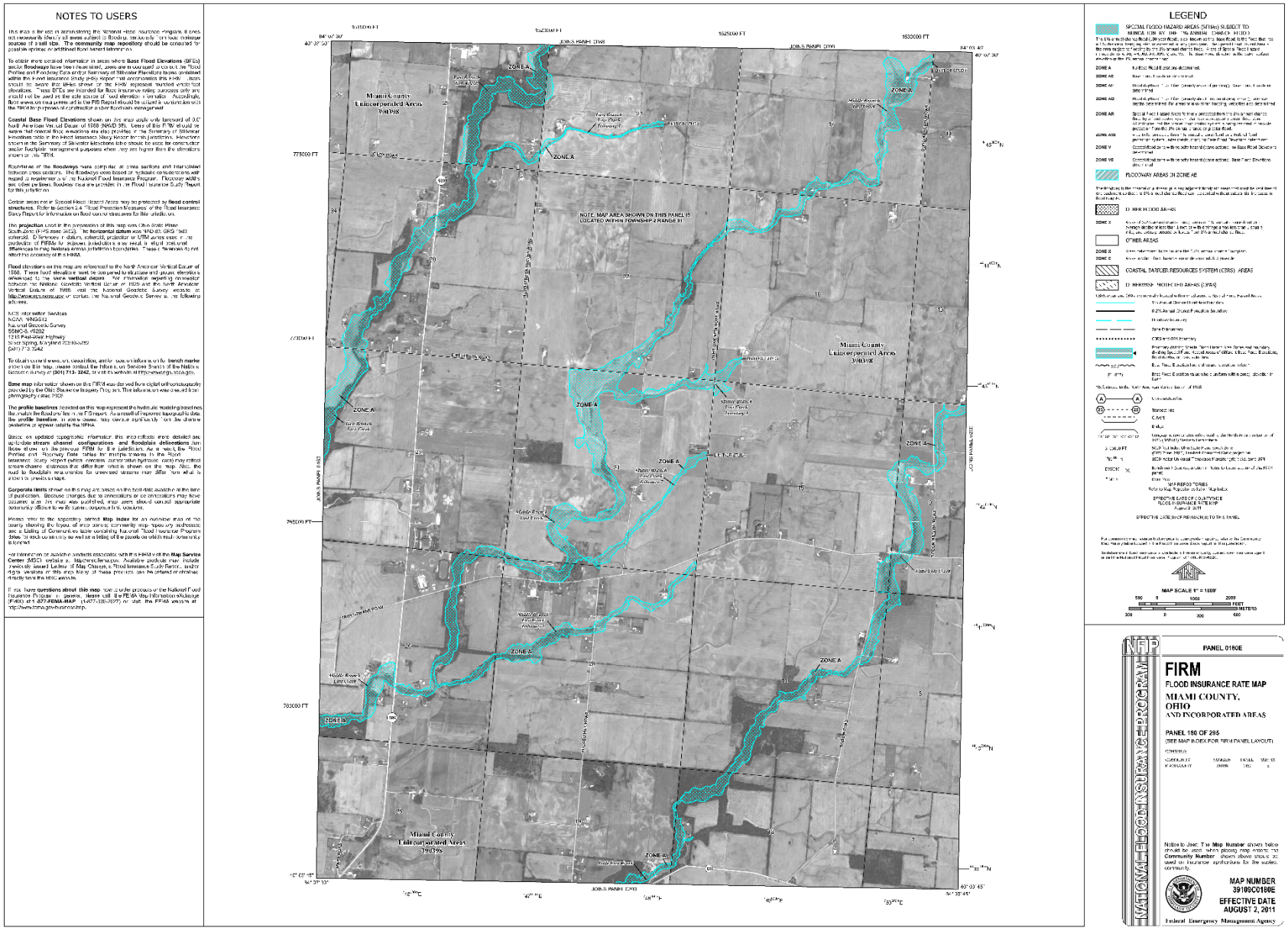


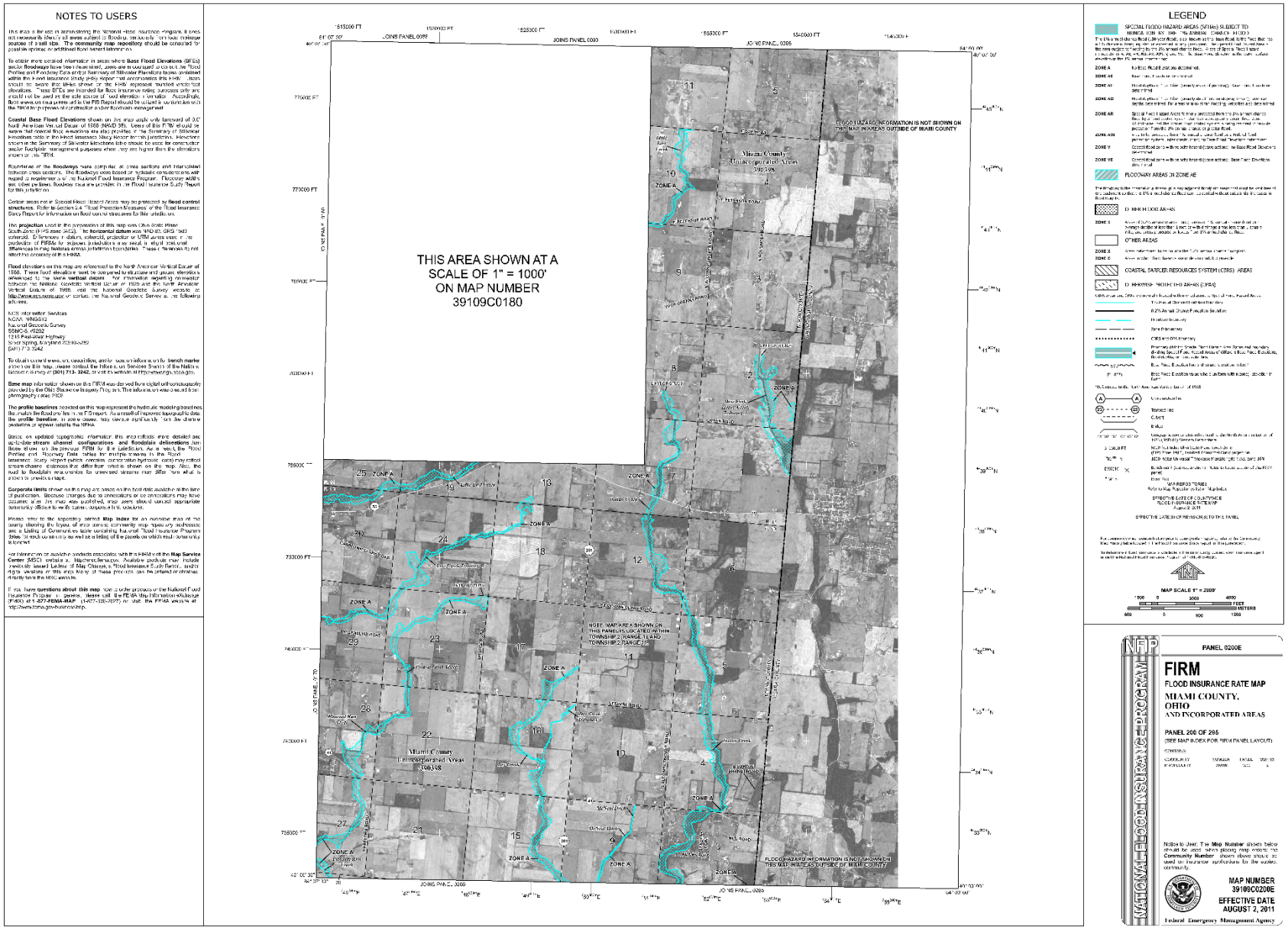

FLOOD HAZARD INFORMATION
NOTES TO USERS
SCALE
PANEL LOCATOR
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
MIAMI COUNTY, OHIO
VERSION NUMBER
2.3.2.0
MAP NUMBER
39109C0161H
MAP REVISED
JUNE 3, 2020

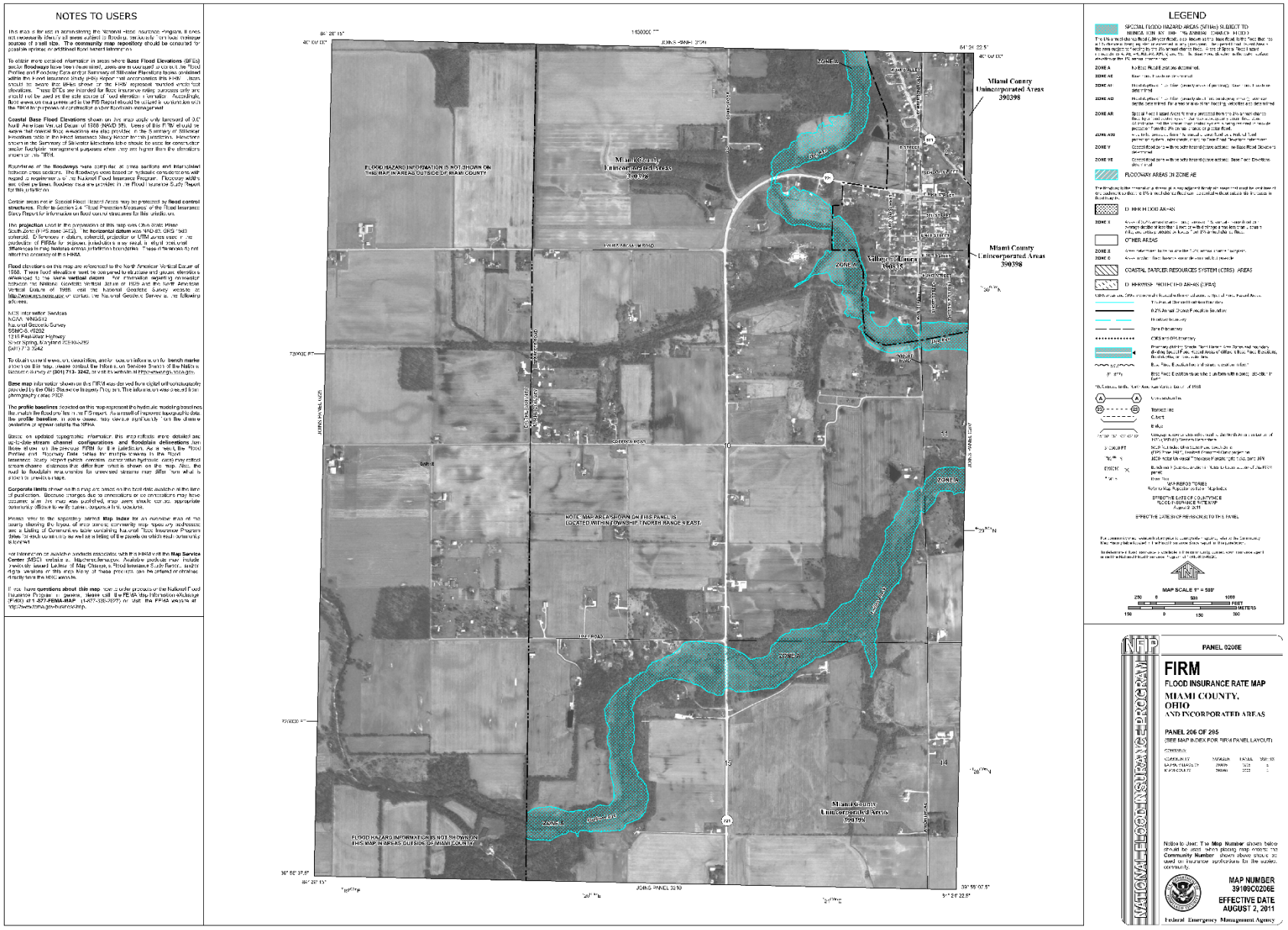

THIS AREA SHOWN AT A
SCALE OF 1" = 500'
ON MAP NUMBER
39109C0166

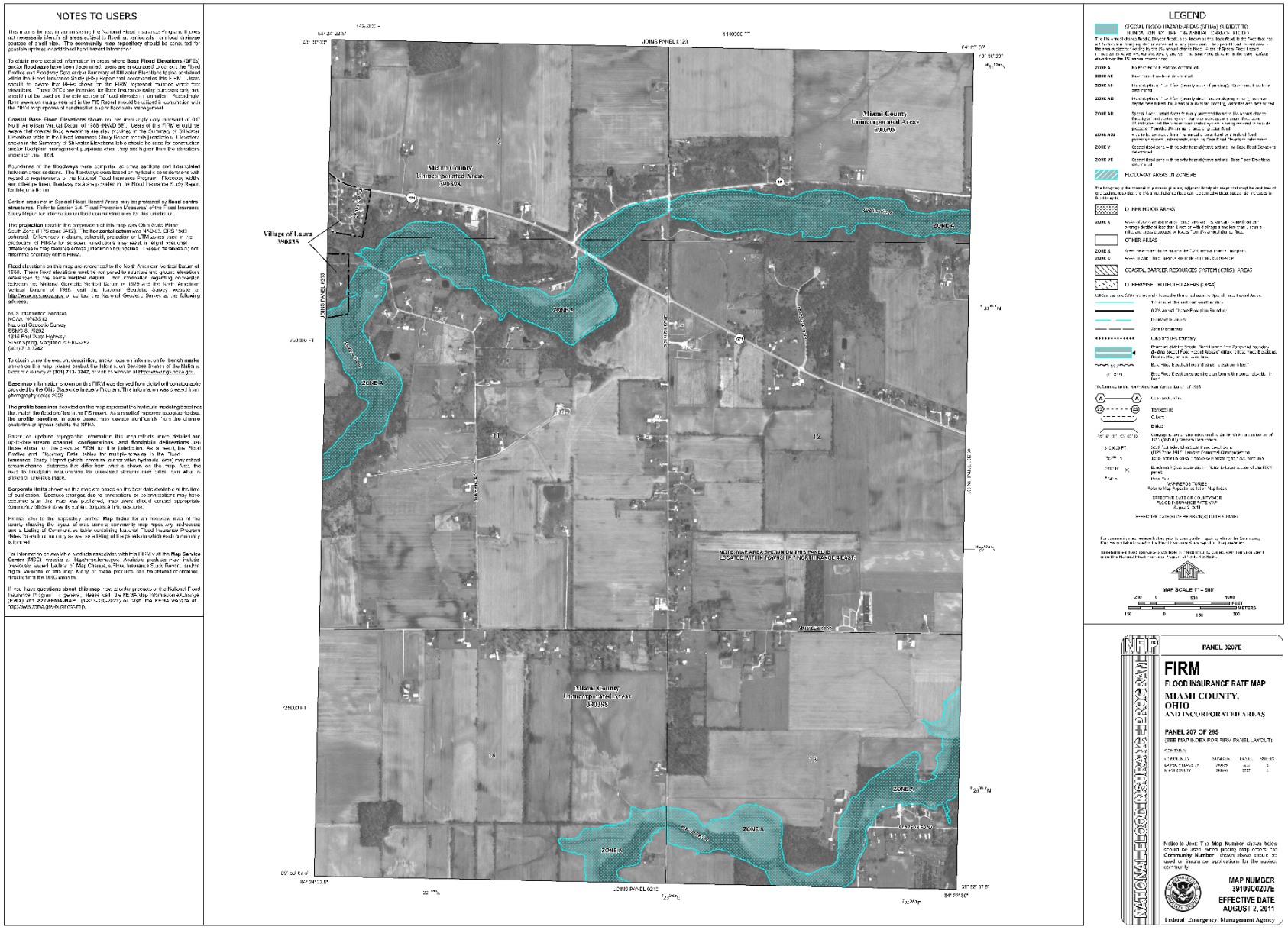

FLOOD HAZARD INFORMATION
NOTES TO USERS
SCALE
PANEL LOCATOR
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
MIAMI COUNTY, OHIO
VOL. 166 of 295
VERSION NUMBER
2.3.2.0
MAP NUMBER
39109C0166J
MAP REVISED
JUNE 3, 2020

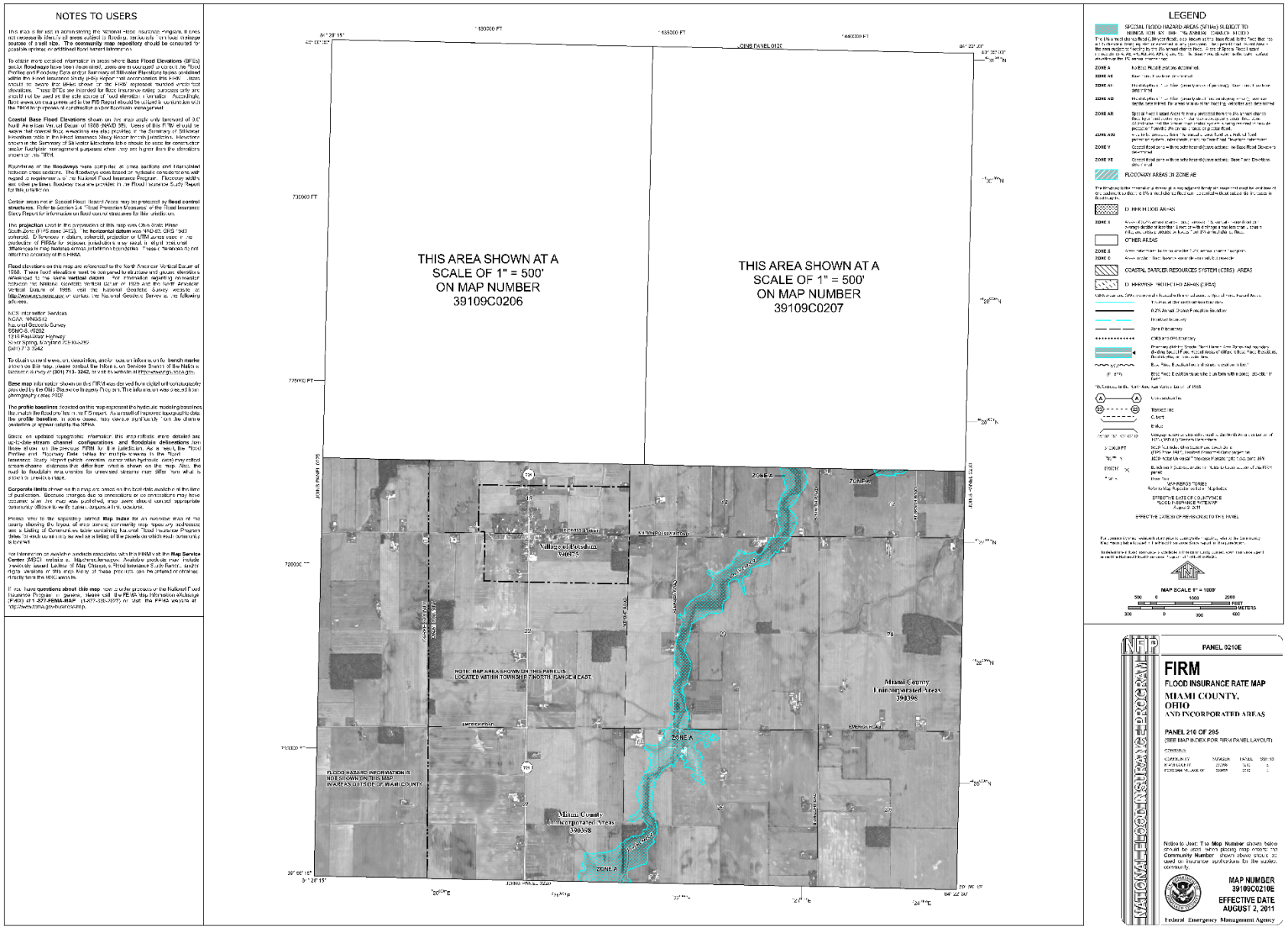

FLOOD HAZARD INFORMATION
NOTES TO USERS
SCALE
PANEL LOCATOR
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
MIAMI COUNTY, OHIO
VOL. 170 of 295
VERSION NUMBER
2.3.2.0
MAP NUMBER
39109C0170J
MAP REVISED
JUNE 3, 2020

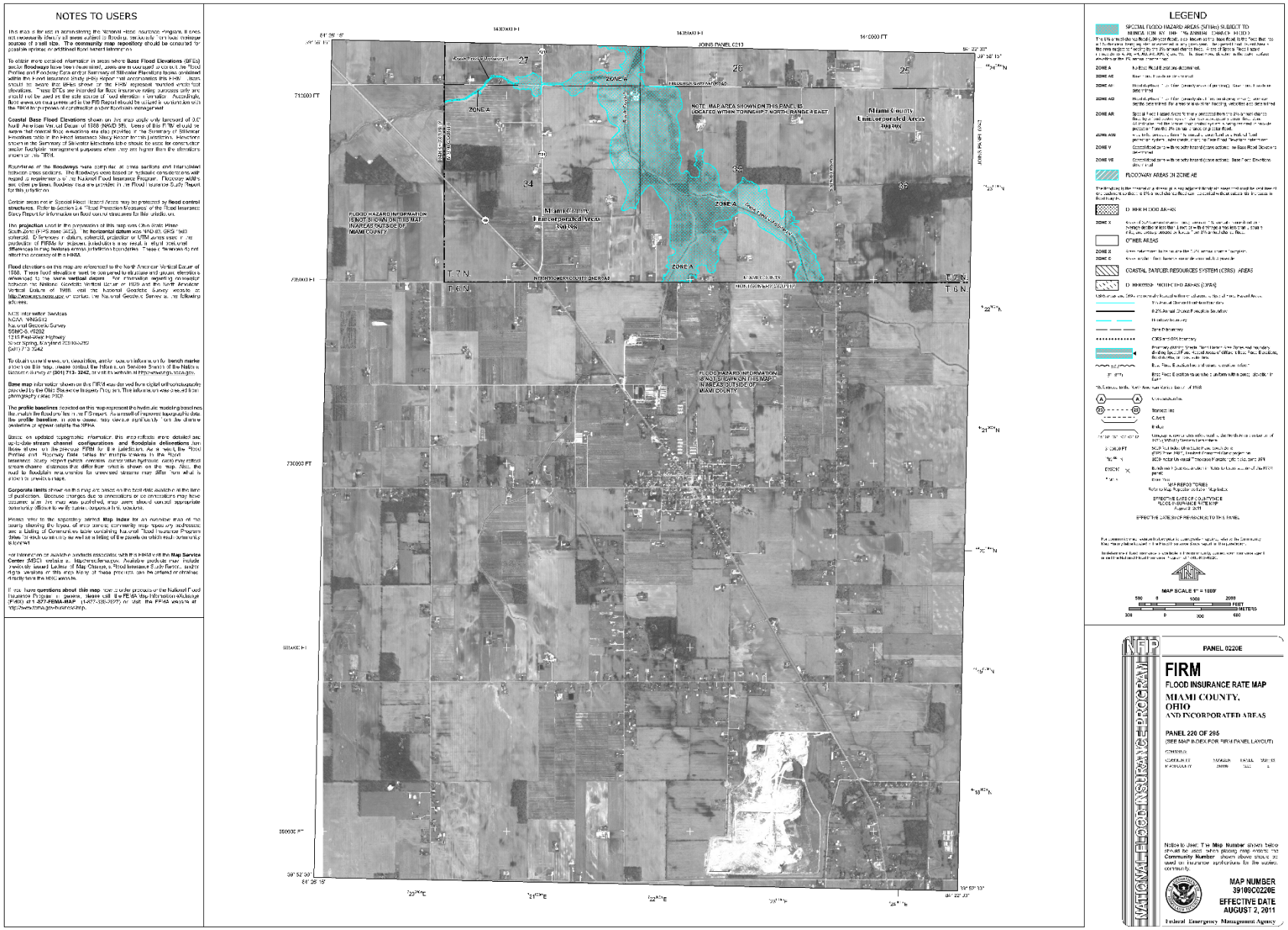

NOTES TO USERS
LEGEND
Miami County Unincorporated Areas 390398
ZONE A
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 2 RANGE 11
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 180 OF 295
PANEL 0180E
MAP NUMBER 39109C0180E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency

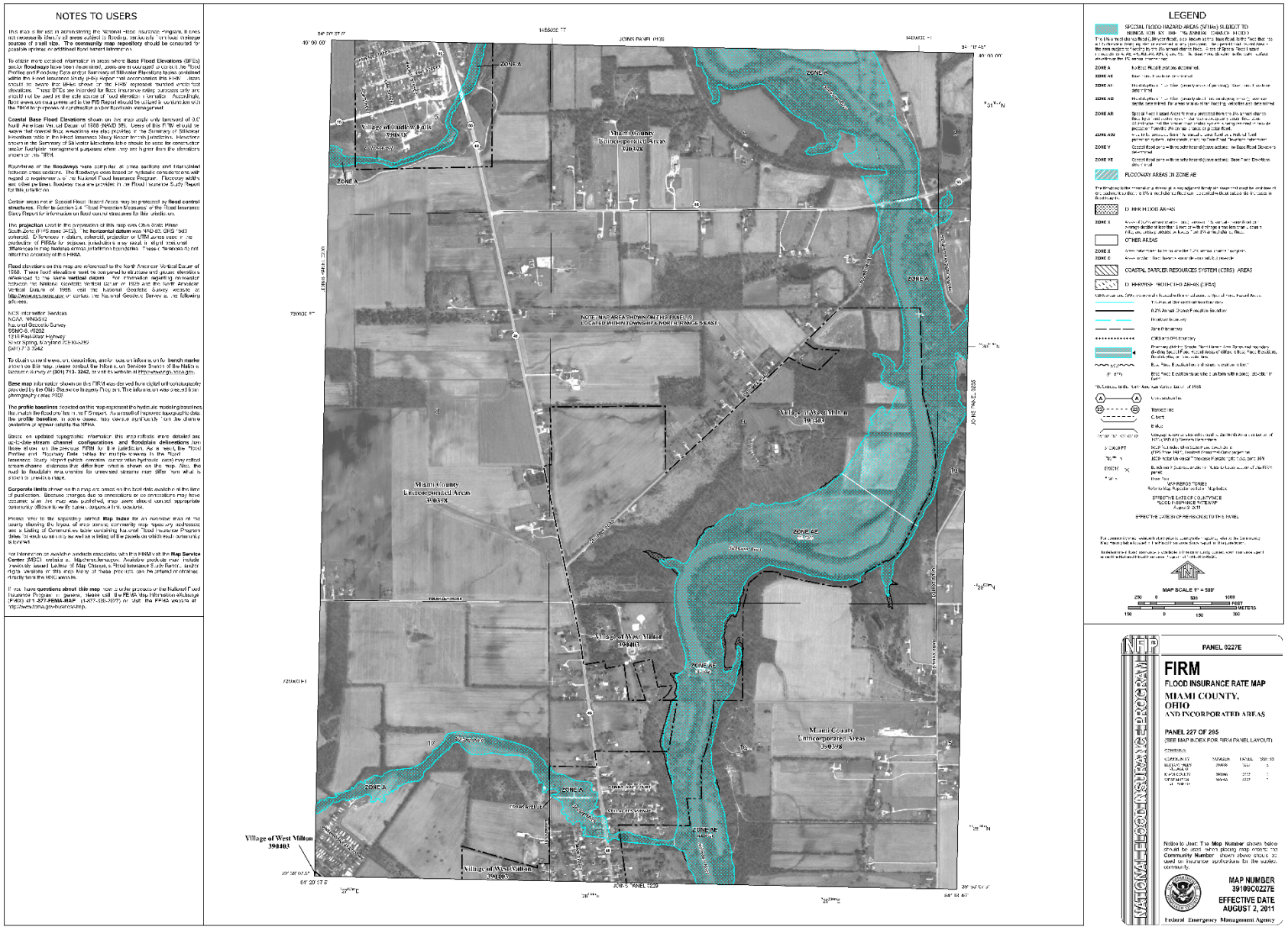

NOTES TO USERS
LEGEND
THIS AREA SHOWN AT A SCALE OF 1" = 1000' ON MAP NUMBER 39109C0180
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
Miami County Unincorporated Areas 390838
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 2 RANGE 11 AND TOWNSHIP 2 RANGE 10E
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
JOINS PANEL 0088
JOINS PANEL 0089
JOINS PANEL 0086
JOINS PANEL 0087
PANEL 0200E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 200 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0200E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency

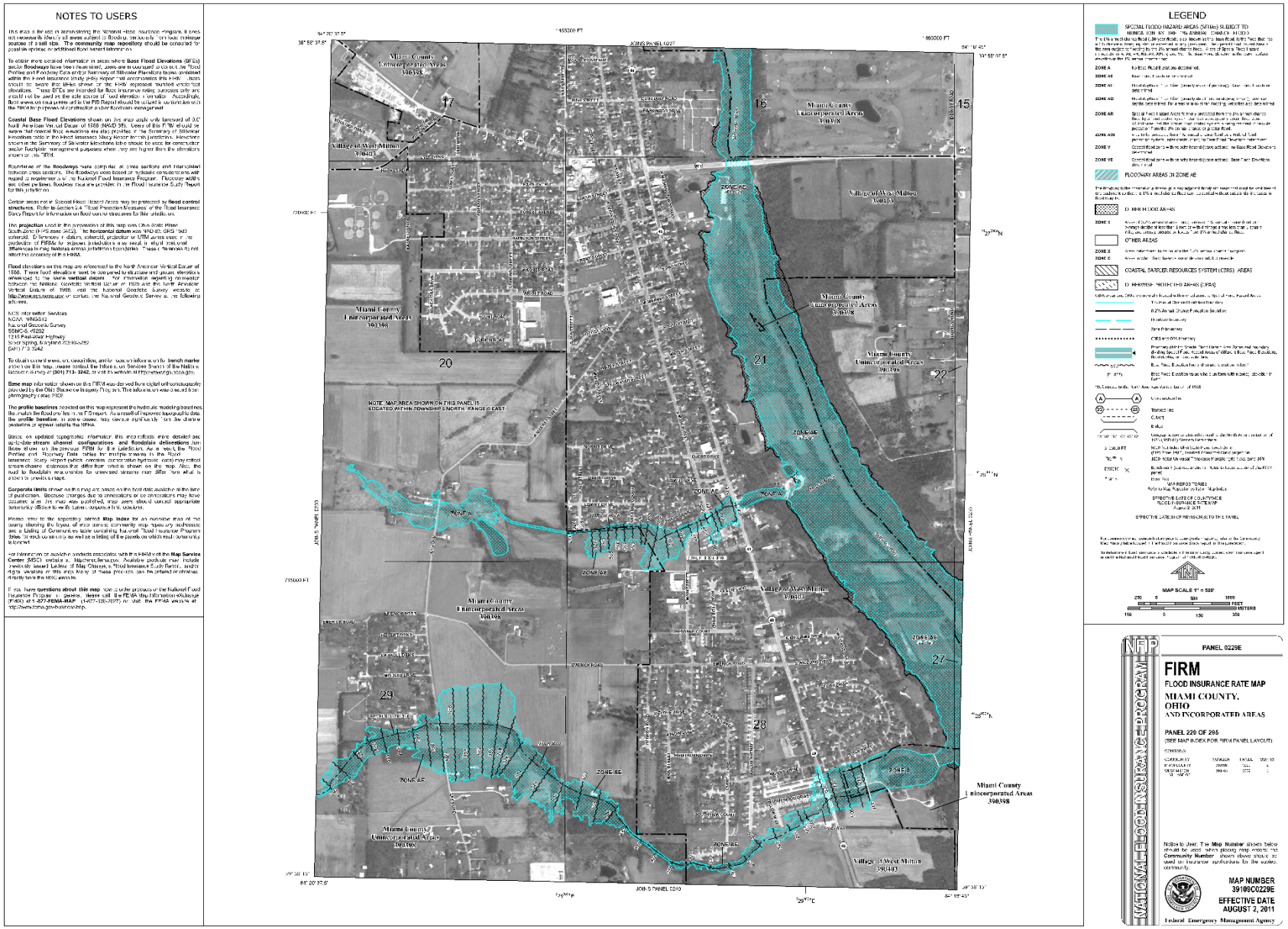

NOTES TO USERS
LEGEND
Miami County Unincorporated Areas 390398
Village of Laura 390398
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 7 NORTH RANGE 9 EAST
ZONE A
ZONE AE
OTHER AREAS
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
MAP SCALE 1" = 500'
PANEL 0206E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 206 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0206E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency

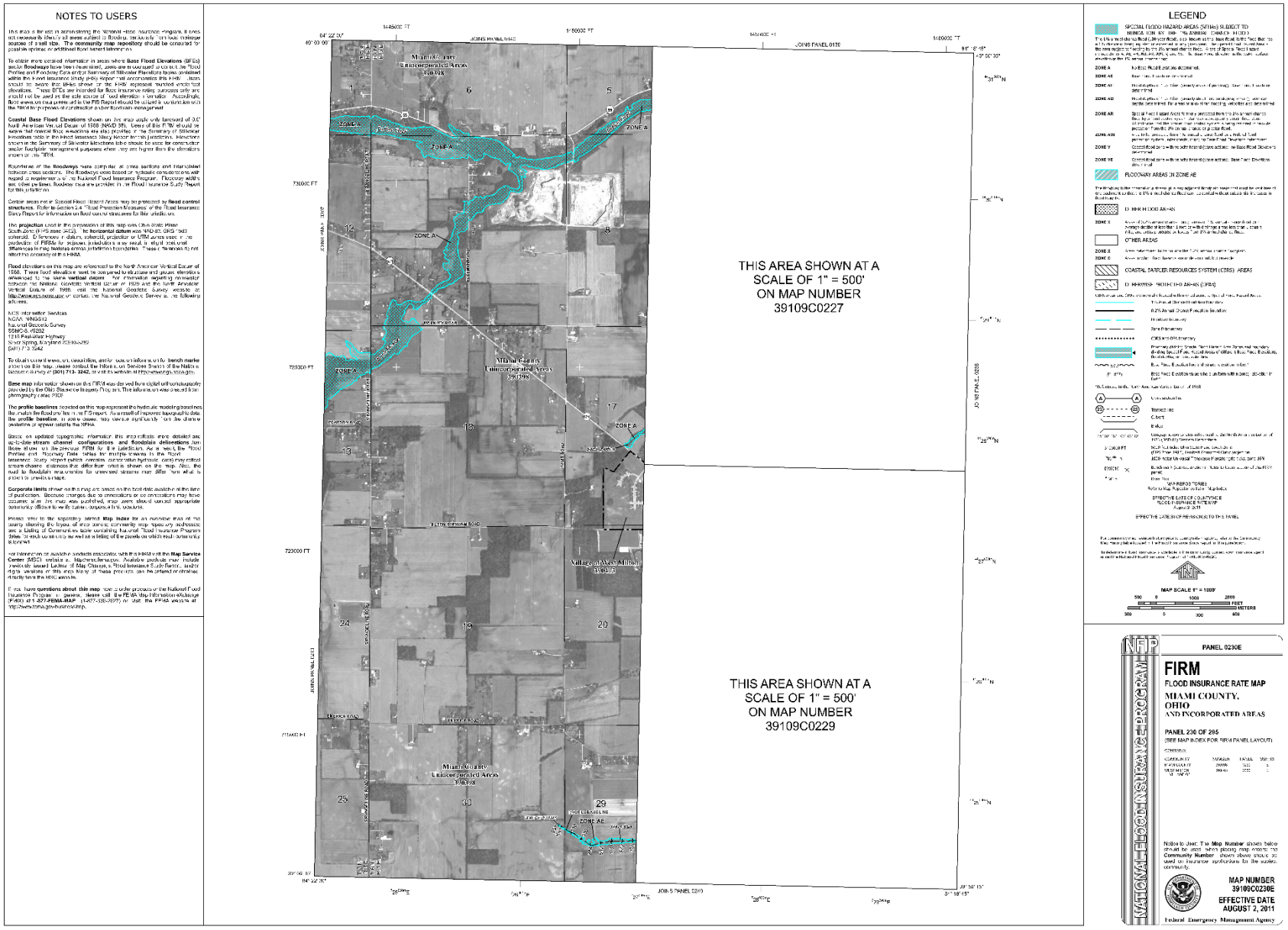

NOTES TO USERS
LEGEND
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 207 OF 295
PANEL 0207E
MAP NUMBER 39109C0207E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency
Village of Laura 390835
Miami County Unincorporated Areas 390498
Miami County Unincorporated Areas 390108
Miami County Unincorporated Areas 390498
ZONE A
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNS 1P 7 NORTH, RANGE 6 EAST.
JOINS PANEL 0120
JOINS PANEL 0208
JOINS PANEL 0212
MAP SCALE 1" = 500'

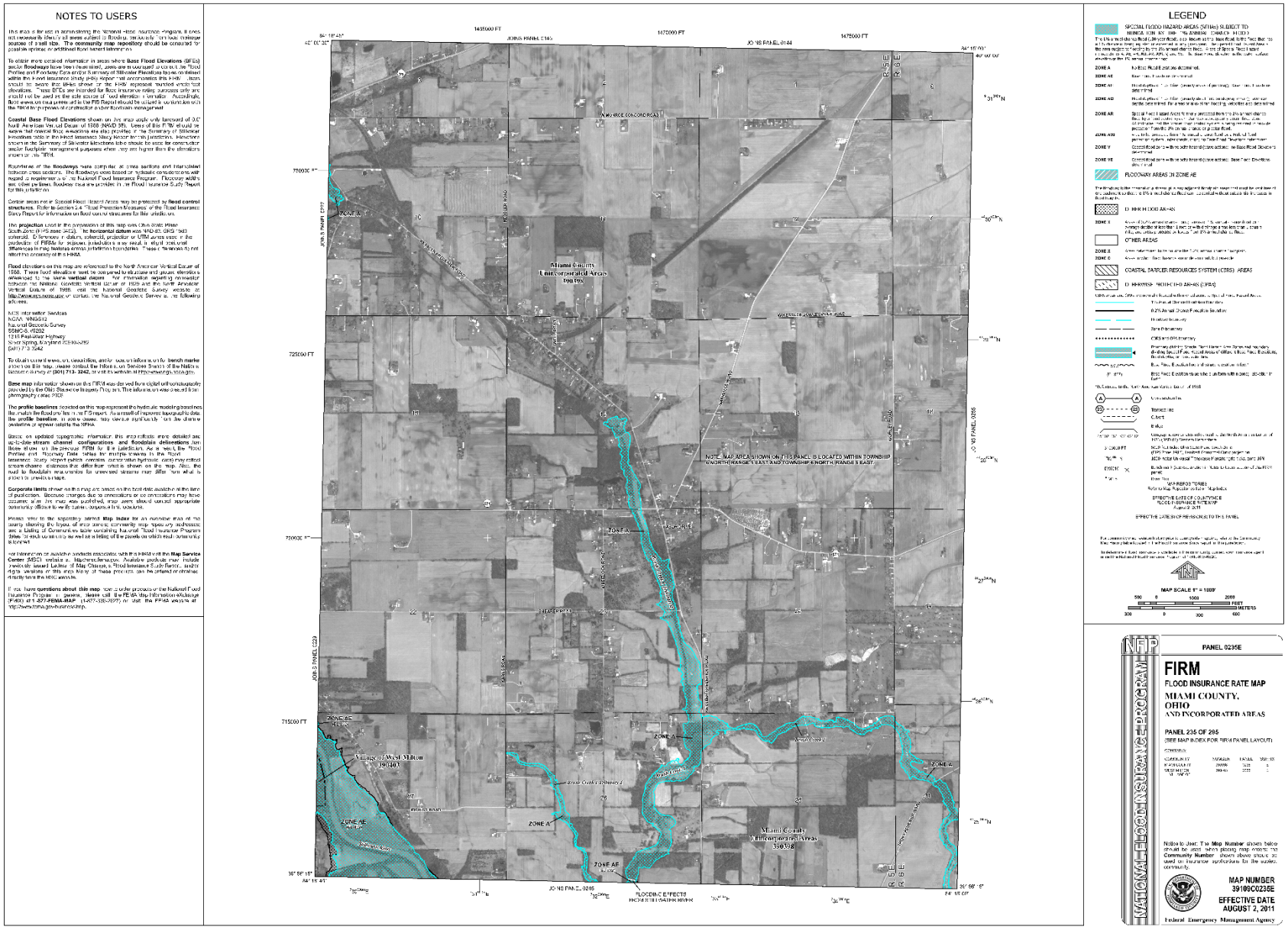

NOTES TO USERS
LEGEND
THIS AREA SHOWN AT A SCALE OF 1" = 500' ON MAP NUMBER 39109C0206
THIS AREA SHOWN AT A SCALE OF 1" = 500' ON MAP NUMBER 39109C0207
Village of Covington 390075
Miami County Unincorporated Areas 390398
Miami County Unincorporated Areas 390398
ZONE A
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 7 NORTH, RANGE 11 EAST.
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
PANEL 0210E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 210 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0210E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency

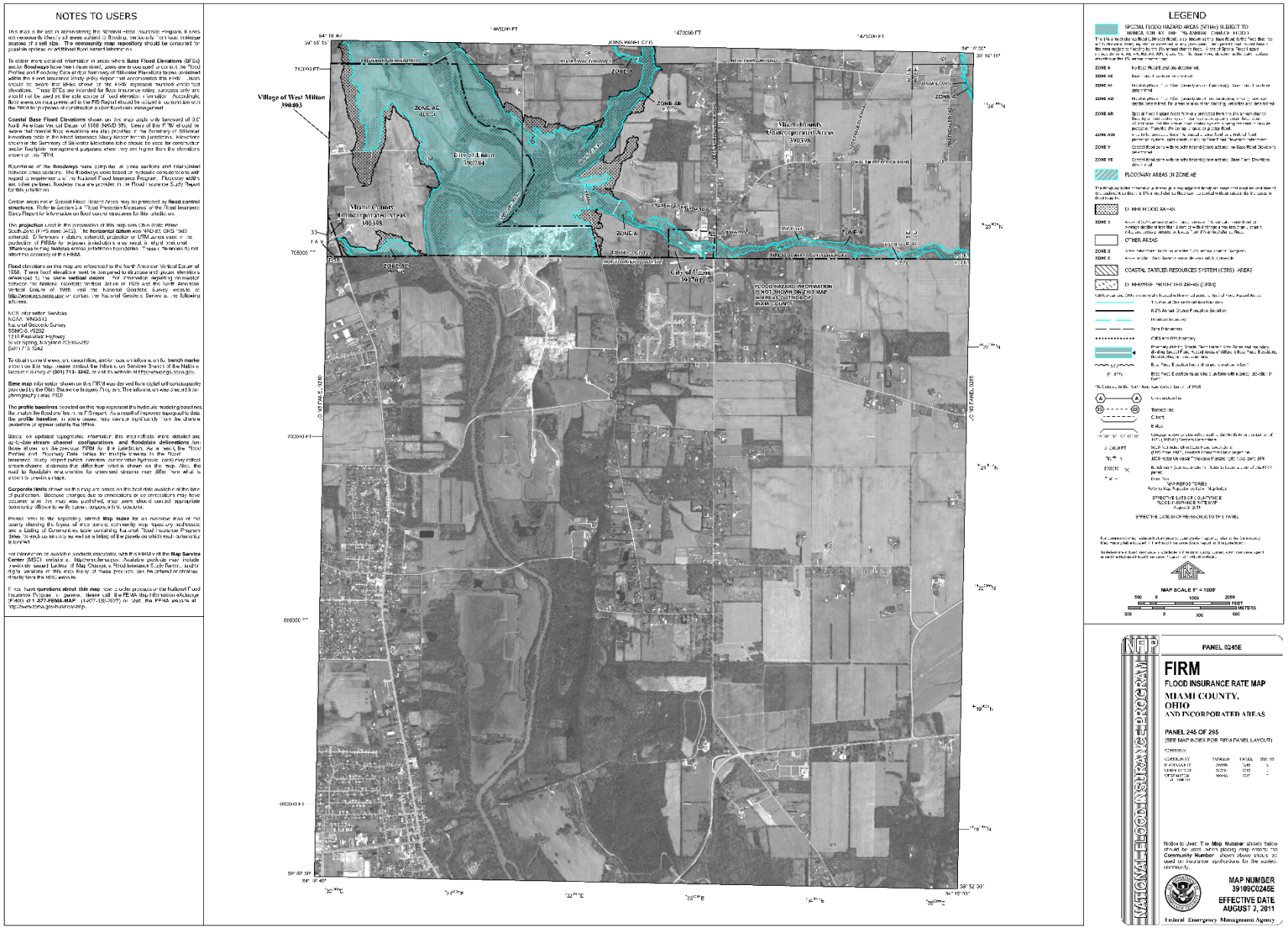

NOTES TO USERS
LEGEND
PANEL 0220E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 220 OF 295
MAP NUMBER 39109C0220E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM
Miami County Unincorporated Areas
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 7 NORTH, RANGE 6 EAST
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
ZONE A
ZONE AE
ZONE X
ZONE V
ZONE VE
FLOODWAY AREAS IN ZONE AE
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
MAP SCALE 1" = 1000'
1000 0 2000 FEET
300 0 300 600 METERS


NOTES TO USERS
LEGEND
PANEL 0227E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 227 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
Village of West Milton
390403
Miami County
Unincorporated Areas
390498
ZONE A
ZONE AE
MAP NUMBER
39109C0227E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency

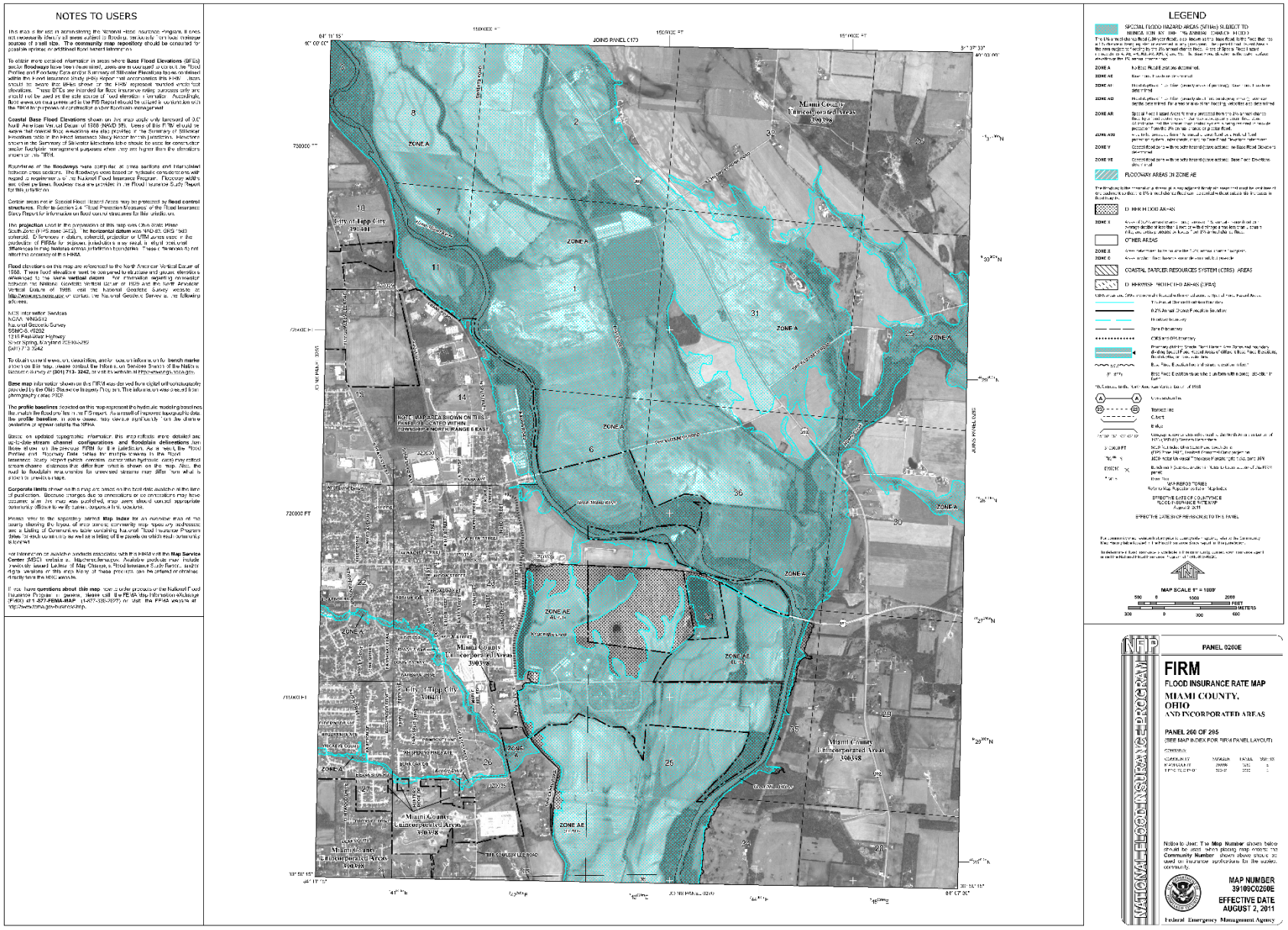

NOTES TO USERS
LEGEND
Miami County Unincorporated Areas 390498
Village of West Milton 390483
ZONE AE
ZONE A
ZONE X
PANEL 0229E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 229 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0229E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency

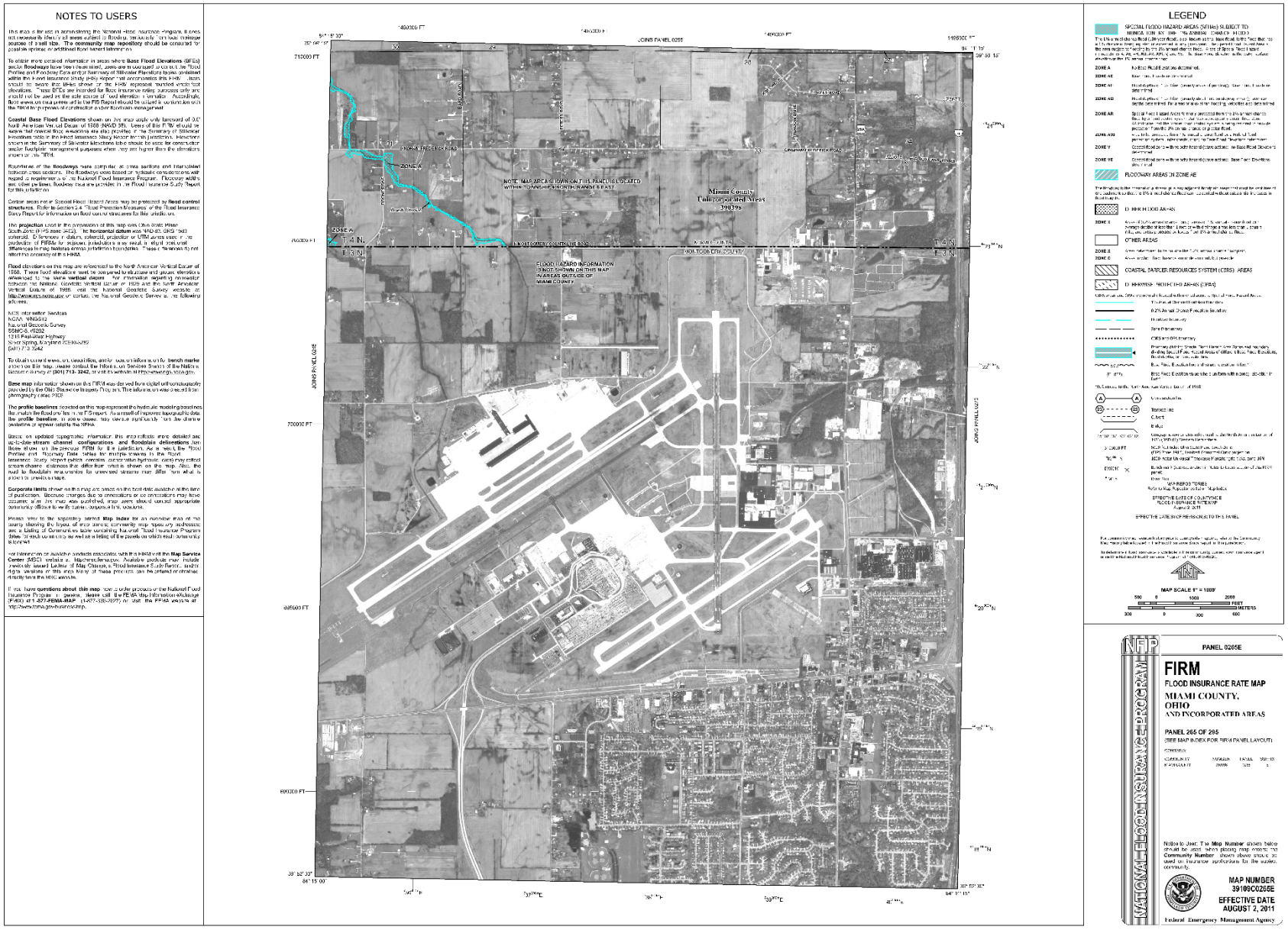

NOTES TO USERS
LEGEND
THIS AREA SHOWN AT A SCALE OF 1" = 500' ON MAP NUMBER 39109C0227
THIS AREA SHOWN AT A SCALE OF 1" = 500' ON MAP NUMBER 39109C0229
Miami County Unincorporated Areas 390308
Village of West Milton 390315
JOHNS PANEL 0215
JOHNS PANEL 0220
JOHNS PANEL 0230
JOHNS PANEL 0235
PANEL 0230E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 230 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0230E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency

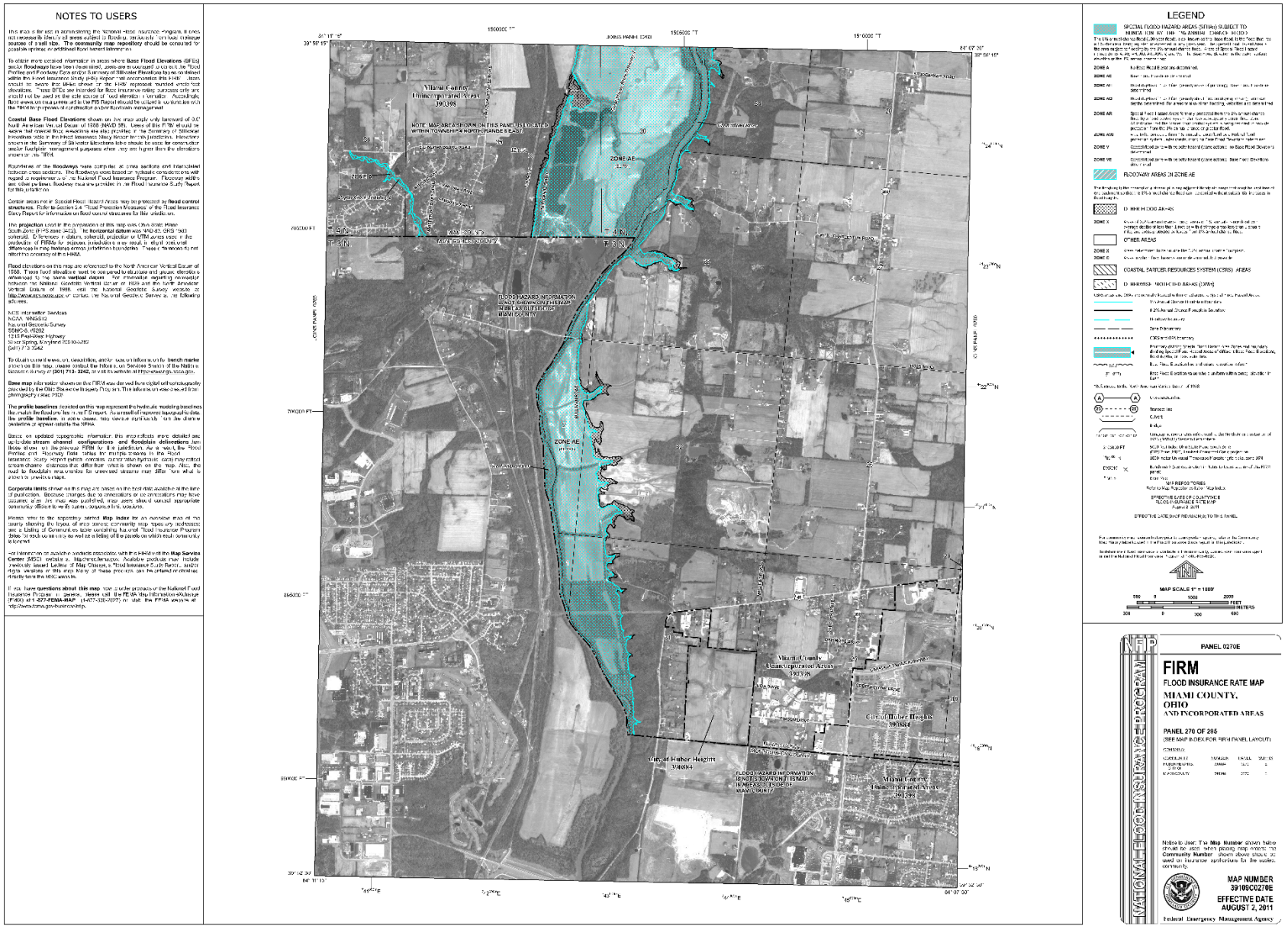

NOTES TO USERS
LEGEND
Miami County Unincorporated Areas 390139
Village of West Milton 390140
Miami County Unincorporated Areas 390138
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 6 NORTH, RANGE 5 EAST AND TOWNSHIP 6 NORTH, RANGE 6 EAST.
ZONE A
ZONE AE
ZONE AH
ZONE X
FLOODING EFFECTS FROM STILLWATER RIVERS
JOINS PANEL 0140
JOINS PANEL 0144
JOINS PANEL 0245
JOINS PANEL 0237
JOINS PANEL 0265
1465000 FT
1470000 FT
1475000 FT
725000 FT
730000 FT
735000 FT
715000 FT
MAP SCALE 1" = 1000'
PANEL 0235E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 235 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0235E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency

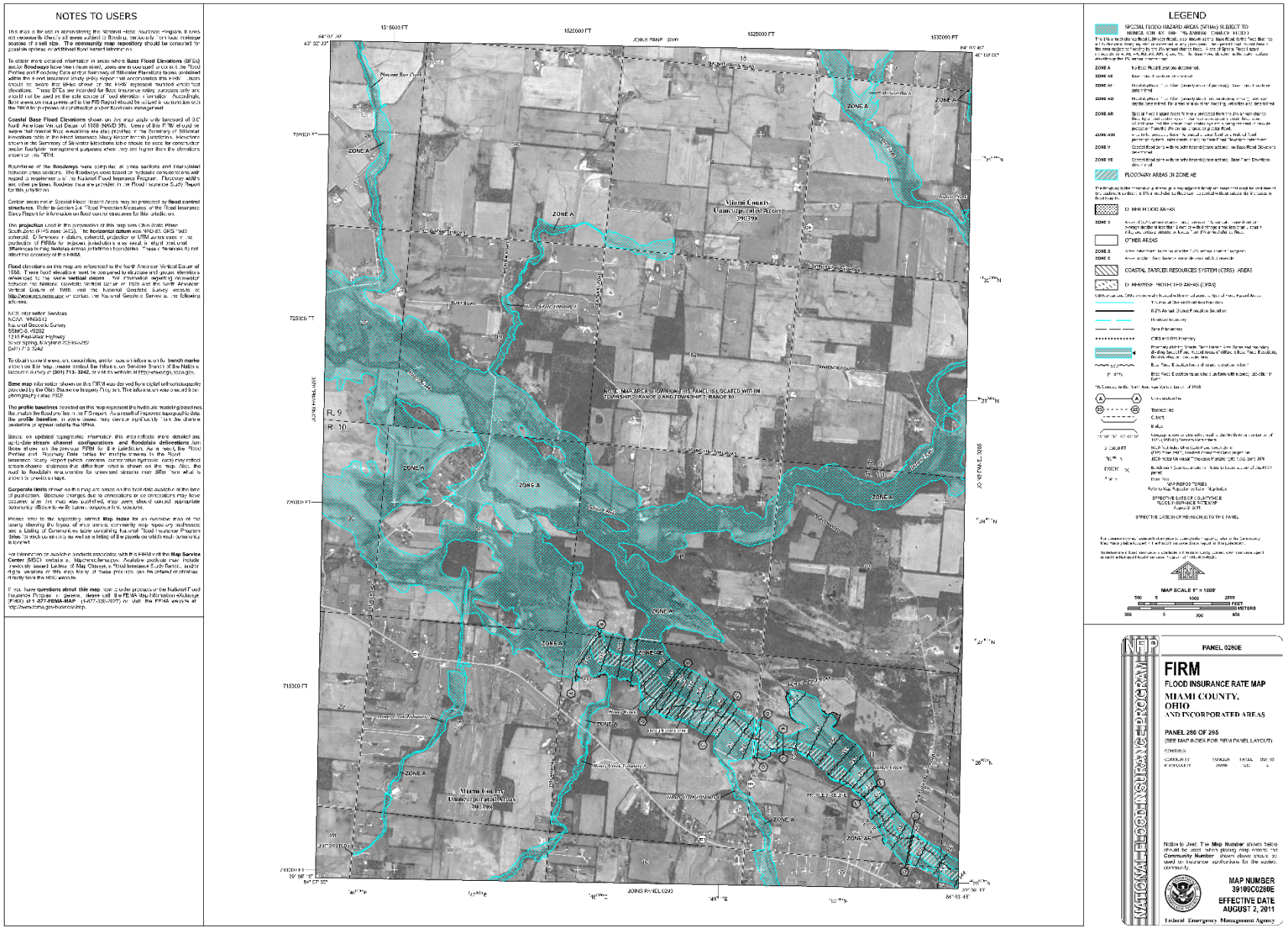

NOTES TO USERS
LEGEND
Village of West Milton
390103
City of Union
390104
Miami County Unincorporated Areas
390498
ZONE A
ZONE AE
ZONE X
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
MAP SCALE 1" = 1000'
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 245 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
PANEL 0245E
MAP NUMBER
39109C0245E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency


NOTES TO USERS
LEGEND
Miami County Unincorporated Areas 390398
City of Tipp City 390401
ZONE A
ZONE AE
ZONE X
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 4 NORTH, RANGE 6 EAST
PANEL 0255E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 255 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0255E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency


NOTES TO USERS
LEGEND
PANEL 0280E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 280 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0280E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency
Miami County Unincorporated Areas 390398
City of Tipp City 390481
ZONE A
ZONE AE


NOTES TO USERS
LEGEND
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 265 OF 295
PANEL 0265E
MAP NUMBER 39109C0265E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM
JOHNS PANEL 0265
NOTE: MAP AREAS SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 5 NORTH, RANGE 6 EAST
Miami County Unincorporated Areas 390139
T 4 N.
T 5 N.
ZONE A
FLOOD HAZARD INFORMATION SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
MAP SCALE 1" = 1000'
1000 0 1000 2000 FEET
300 0 300 600 METERS


NOTES TO USERS
LEGEND
Miami County Unincorporated Areas 390198
City of Huber Heights 390664
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 6 NORTH, RANGE 8 EAST
ZONE AE
ZONE X
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
MAP SCALE 1" = 1000'
PANEL 0270E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO AND INCORPORATED AREAS
PANEL 270 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 39109C0270E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency


NOTES TO USERS
LEGEND
PANEL 0280E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 280 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
39109C0280E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency
Miami County
Unincorporated Areas
390139N
ZONE A
ZONE AE
JOINS PANEL 0260
JOINS PANEL 0285


NOTES TO USERS
LEGEND
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
Miami County Unincorporated Areas 390398
ZONE A
ZONE AE
MAP SCALE 1" = 1000'
FEET
METERS
NFIP
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0285E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 285 OF 295
MAP NUMBER 39109C0285E
EFFECTIVE DATE AUGUST 2, 2011
Federal Emergency Management Agency


NOTES TO USERS
LEGEND
PANEL 0290E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 290 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
39109C0290E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency
Miami County
Unincorporated Areas
390039
City of Huber Heights
390184
ZONE A
ZONE AE
FLOOD HAZARDS INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY


NOTES TO USERS
LEGEND
ZONE A
Miami County
Unincorporated Areas
390190
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MIAMI COUNTY
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 2, RANGE 7
JOHN'S PANEL 0283
PANEL 0295E
FIRM
FLOOD INSURANCE RATE MAP
MIAMI COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 295 OF 295
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
39109C0295E
EFFECTIVE DATE
AUGUST 2, 2011
Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

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 Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood **control structures**. Refer to Section 7.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map was Ohio State Plane South Zone (FIPS Zone 3402). The **horizontal datum** was NAD 83, GRS 80 spheroid. Differences in datum, spheroid, projection or UTM 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 this FIRM.

Flood elevations on this map are referenced to the National Geodetic Vertical Datum of 1929. 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 or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

Qualifying bench marks for this jurisdiction are located on non-zeroed panels. To obtain current elevation, description, and/or location information for qualifying **bench marks located in the vicinity of this jurisdiction**, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from Montgomery County Digital Orthotechography with a National Standard Accuracy of +/-20 feet and dated 2000.

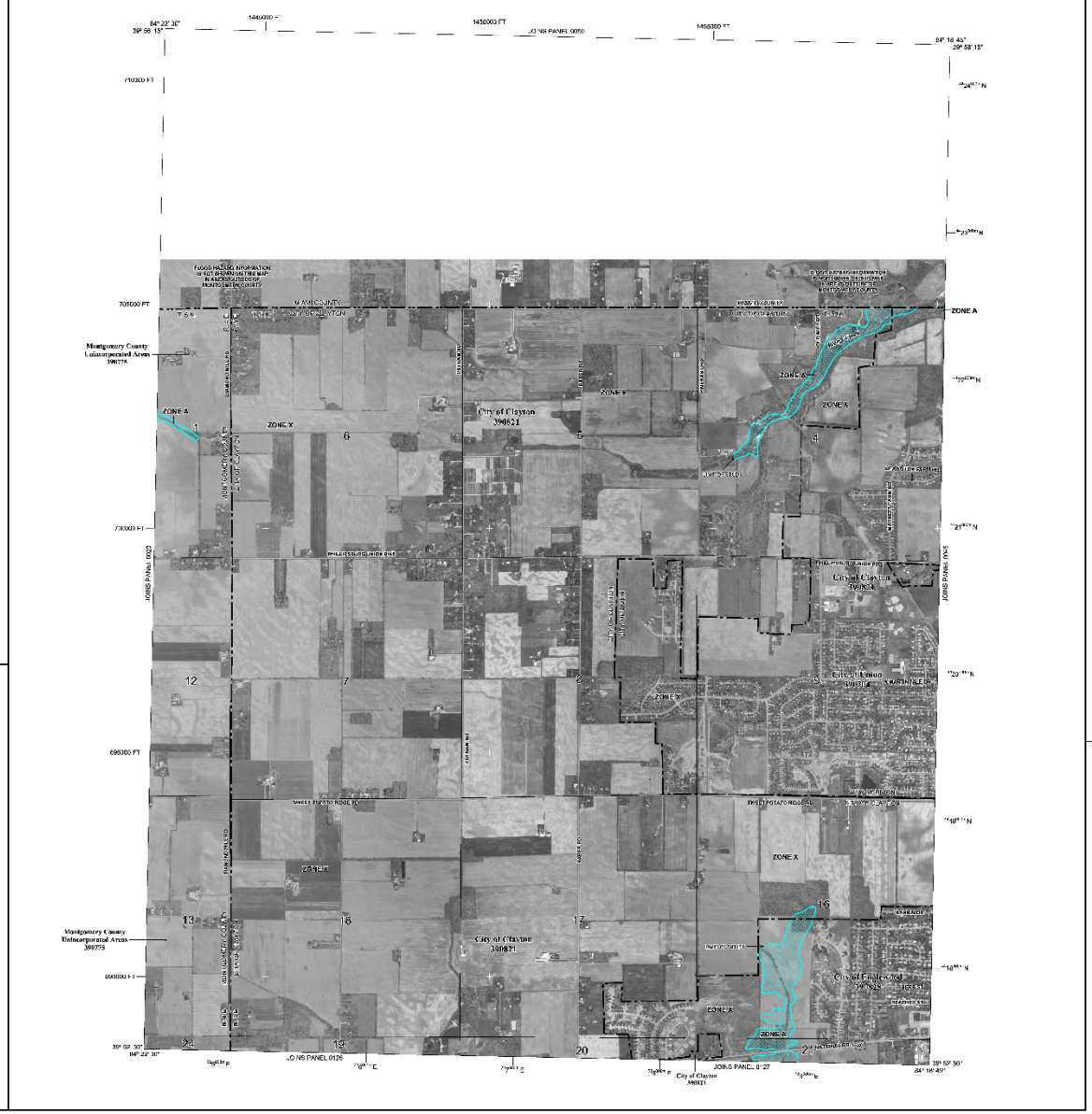
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to those new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this 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 this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and their website at www.fema.gov/msc.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at www.fema.gov.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR — Special Flood Hazard Area 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 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally Levels, other areas subject to Special Risk Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the National Geodetic Vertical Datum of 1929

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4686000 FT — 5000-foot grid ticks: Ohio State Plane coordinate system, South Zone (FIPS Zone 3402), Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
January 6, 2004

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For communities with multiple ongoing Base Flood Elevations, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
150 0 300 600 METERS

PANEL 0040E

FIRM
FLOOD INSURANCE RATE MAP

MONTGOMERY COUNTY, OHIO AND INCORPORATED AREAS

PANEL 40 OF 400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
CLAYTON, CITY OF	390821	0040	E
ENGLEWOOD, CITY OF	390783	0040	E
MONTGOMERY COUNTY	390775	0040	E
MIAMI, CITY OF	390744	0040	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
39113C0040E

EFFECTIVE DATE
JANUARY 6, 2005

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

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 Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood **control structures**. Refer to Section 7.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map was Ohio State Plane South Zone (FIPS Zone 3402). The **horizontal datum** was NAD 83, GRS 80 spheroid. Differences in datum, spheroid, projection or UTM 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 this FIRM.

Flood elevations on this map are referenced to the National Geodetic Vertical Datum of 1929. 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 or contact the National Geodetic Survey at the following address:

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National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

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Base map information shown on this FIRM was derived from Montgomery County Digital Orthotechography with a National Standard Accuracy of +-20 feet and dated 2000.

This 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 those new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this 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 this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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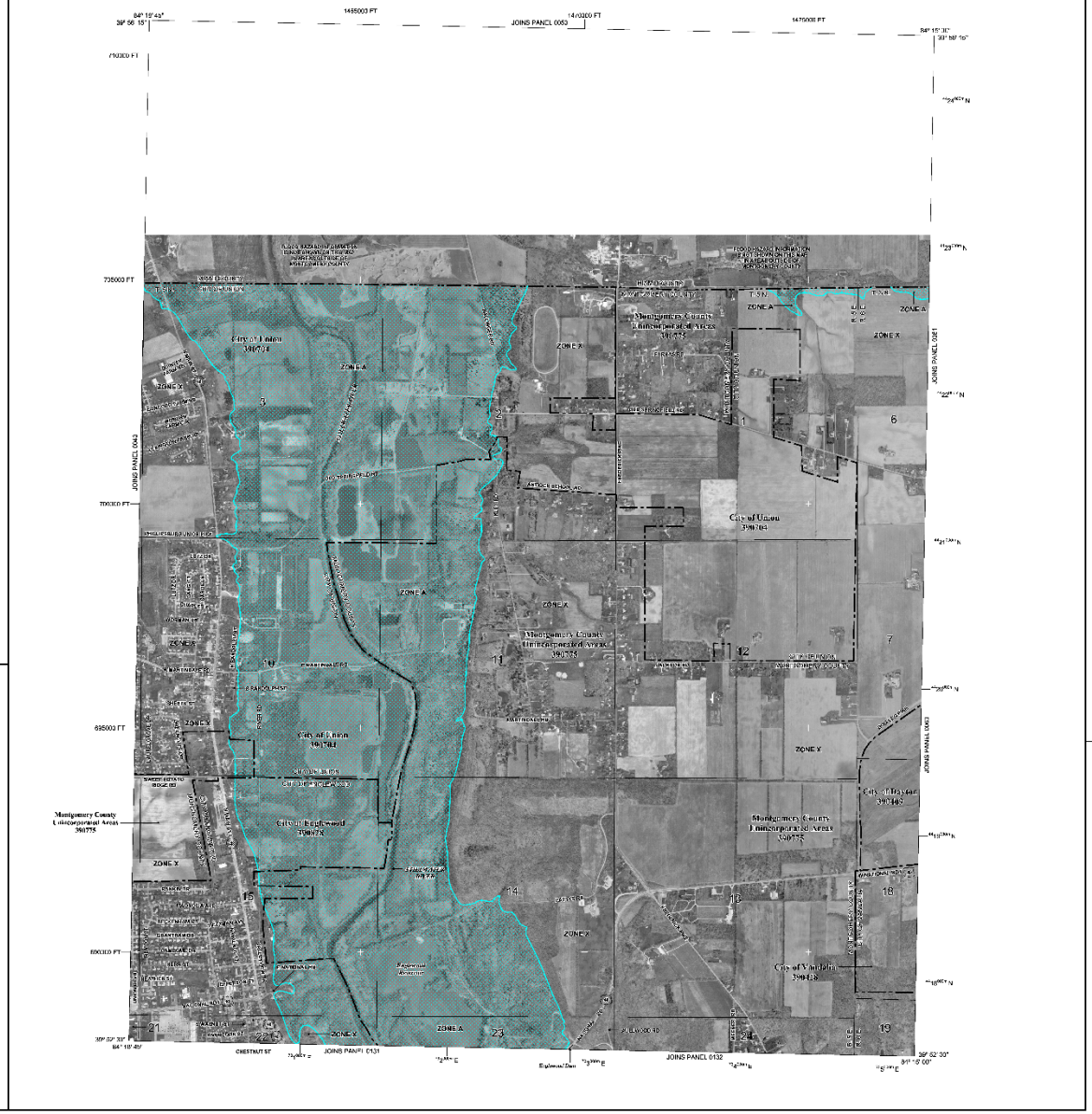


LEGEND

SPECIAL FLOOD HAZARD AREAS (SHAAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the "base flood," is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Areas is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR — Special Flood Hazard Area 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 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

~~513~~ Base Flood Elevation line and value; elevation in feet*

(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the National Geodetic Vertical Datum of 1929

A — A — Cross section line

23 — 23 — Transect line

97° 07' 30", 32° 22' 30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

4276000 FT — Ohio State Plane coordinate system, South Zone (FIPS Zone 3402), Transverse Mercator

1000-meter Universal Transverse Mercator grid values, zone 17N

5000000 FT — Bench mark (see explanation in Notes to Users section of this FIRM panel)

• M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
January 6, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For communities with multiple ongoing Base Flood Elevations (BFEs) and/or Special Flood Hazard Areas (SFHAs) in the community, the initial or final BFEs or SFHAs shown on this map will be the more restrictive of those BFEs or SFHAs.

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.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
150 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0045E

FIRM
FLOOD INSURANCE RATE MAP

MONTGOMERY COUNTY, OHIO AND INCORPORATED AREAS

PANEL 45 OF 400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
DAYTON, CITY OF	390480	0045	E
FARMERSVILLE, VILLAGE OF	390762	0045	E
MIAMISBURG, CITY OF	390766	0045	E
UNION, CITY OF	390768	0045	E
VANDALIA, CITY OF	390769	0045	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
39113C0045E

EFFECTIVE DATE
JANUARY 6, 2005

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

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 Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 7.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures in this jurisdiction.

The **projection** used in the preparation of this map was Ohio State Plane South Zone (FIPS Zone 3402). The **horizontal datum** was NAD 83, GRS 80 spheroid. Differences in datum, spheroid, projection or UTM 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 this FIRM.

Flood elevations on this map are referenced to the National Geodetic Vertical Datum of 1929. 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 or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

Qualifying **bench marks** for this jurisdiction are located on non-printed panels. To obtain current elevation, description, and/or location information for qualifying **bench marks located in the vicinity of this jurisdiction**, please contact the Information Services Branch of the National Geodetic Survey at (301) 713- 3242, or visit its website at www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from Montgomery County Digital Orthotechnography with a National Standard Accuracy of +-20 feet and dated 2000.

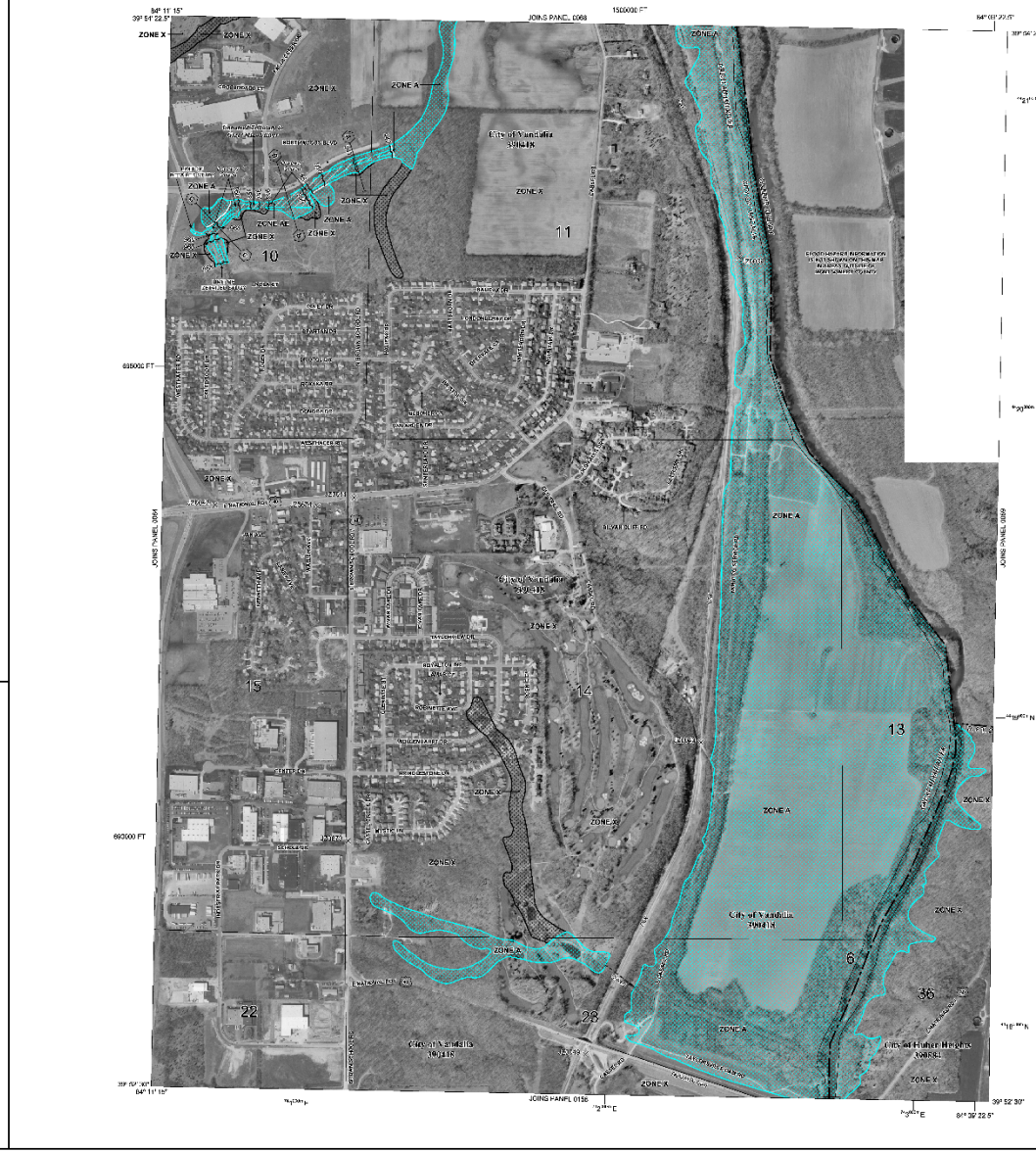
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this 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 this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and their website at www.fema.gov/msc.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877- **FEMA MAP** (1-877-336-2627) or visit the FEMA website at www.fema.gov.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.
ZONE AE — Base Flood Elevations determined.
ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR — Special Flood Hazard Area 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 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
Base Flood Elevation line and value; elevation in feet*
(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the National Geodetic Vertical Datum of 1929
Cross section line
Transect line
45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000 FT — Grid values: Ohio State Plane coordinate system, South zone (FIPS zone 3402), Transverse Mercator
5000 — Ticks: Universal Transverse Mercator grid values, zone 17N
Bench mark (see explanation in Notes to Users section of this FIR
River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 6, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

PANEL 0088E

FIRM
FLOOD INSURANCE RATE MAP

MONTGOMERY COUNTY, OHIO
AND INCORPORATED AREAS

PANEL 68 OF 400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

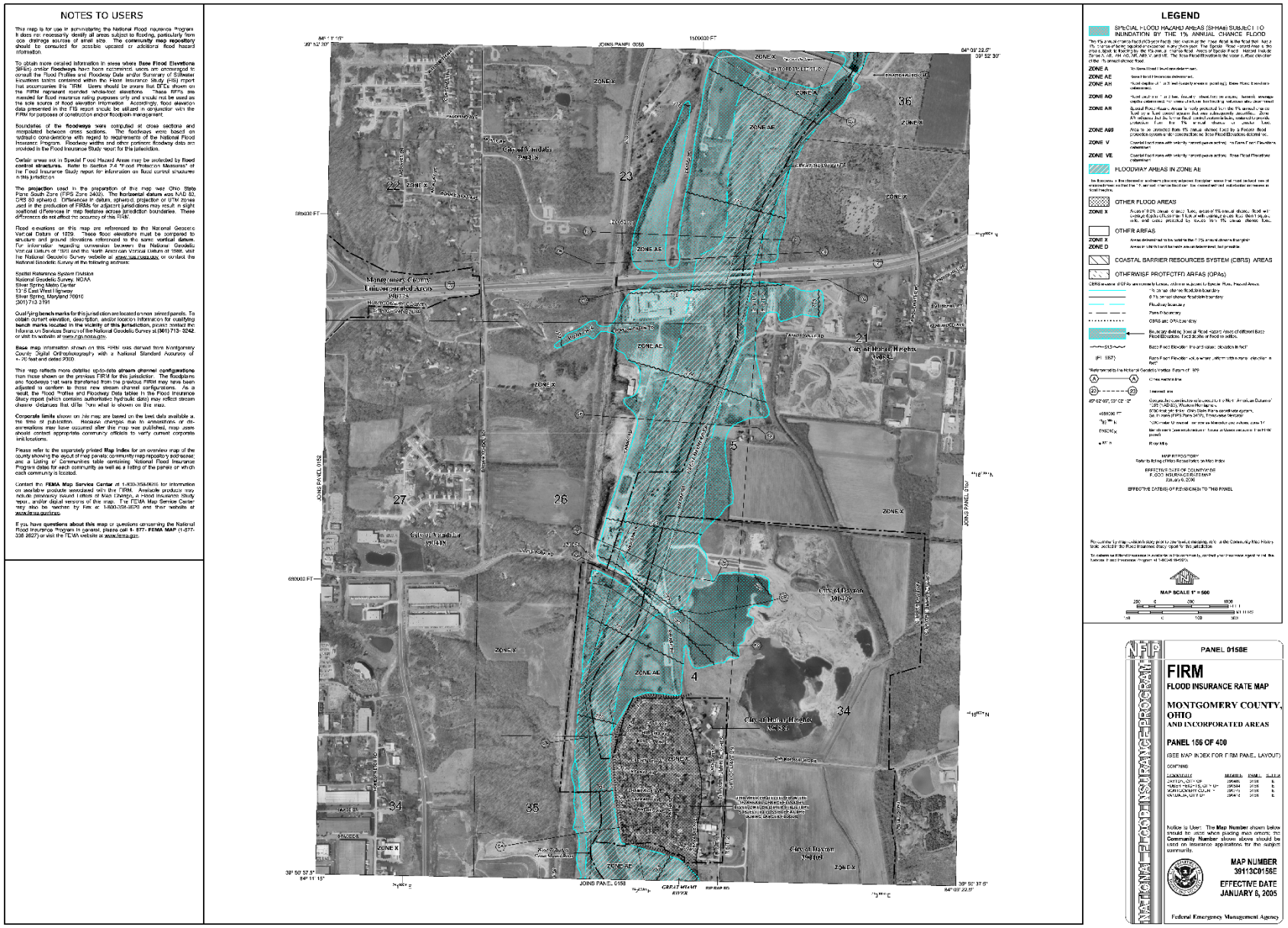
COMMUNITY	NUMBER	PANEL	SUFFIX
HUBER HEIGHTS, CITY OF	390488	0088	E
VANDALIA, CITY OF	390490	0088	E

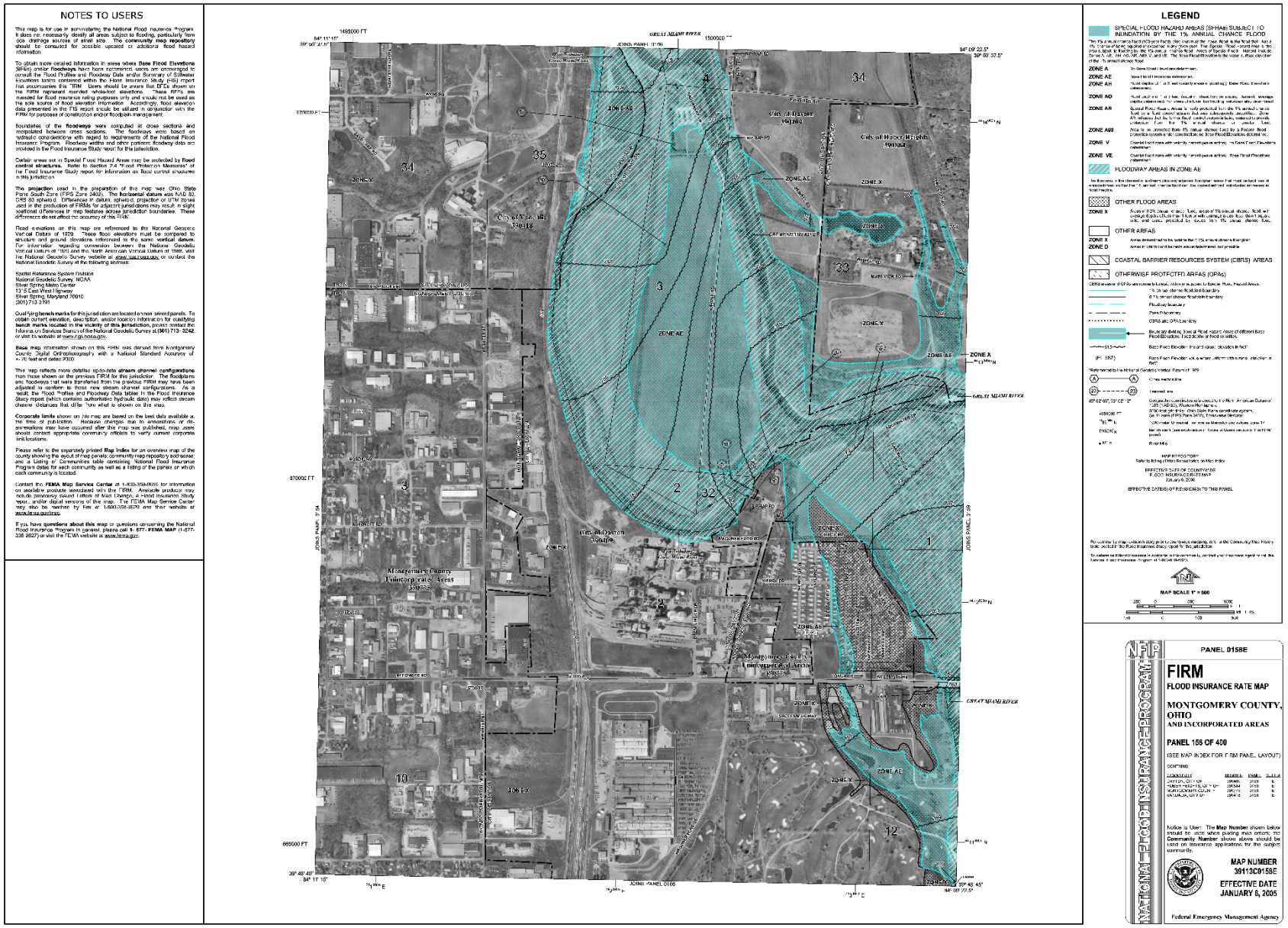
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
39113C0088E

EFFECTIVE DATE
JANUARY 6, 2005

Federal Emergency Management Agency


NOTES TO USERS
LEGEND
PANEL 0158E
FIRM
FLOOD INSURANCE RATE MAP
MONTGOMERY COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 158 OF 400
MAP NUMBER
39113C0158E
EFFECTIVE DATE
JANUARY 6, 2005
Federal Emergency Management Agency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Silver Spring Metro Center
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Silver Spring, Maryland 20910
(301) 713-3191
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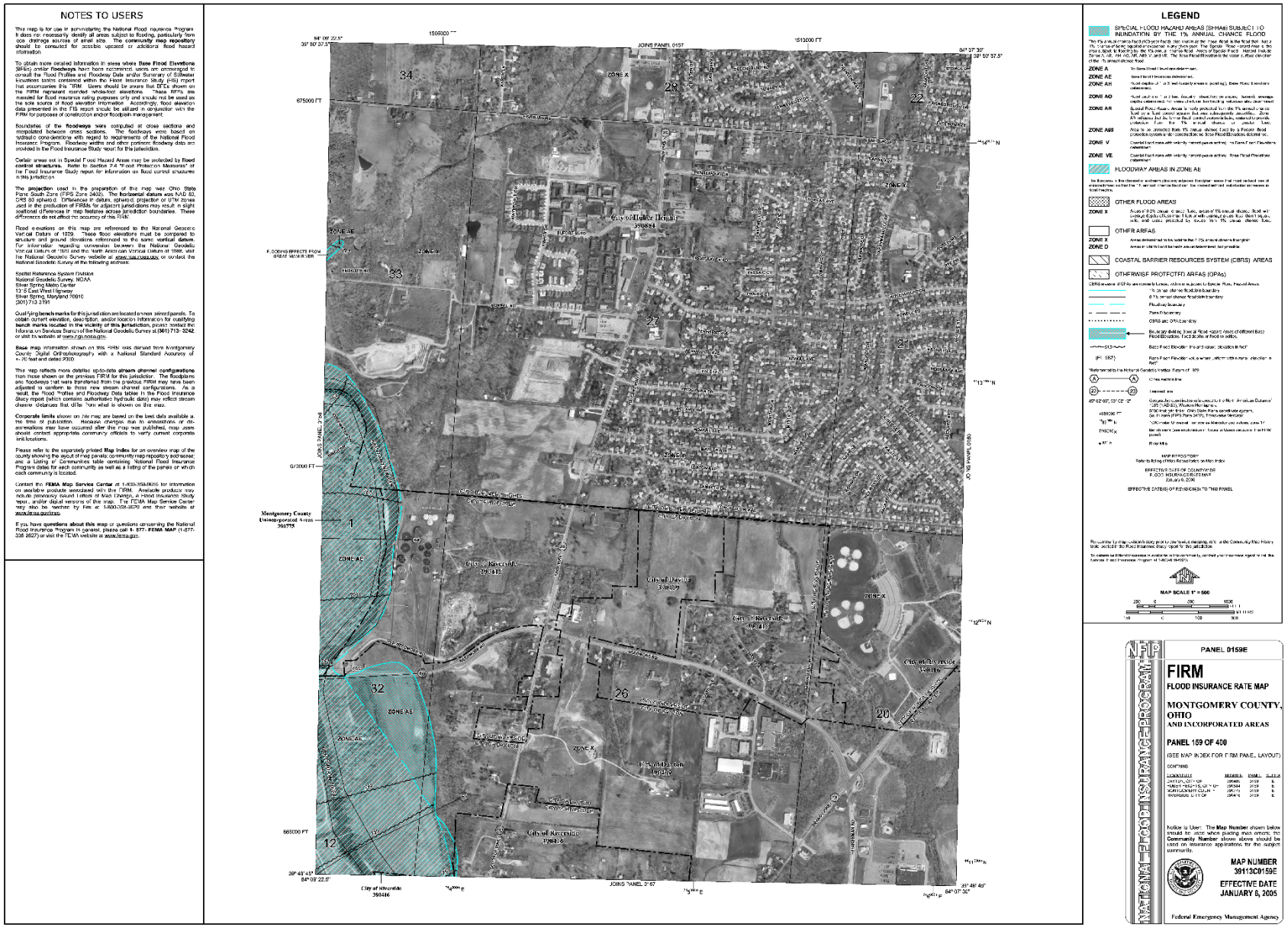
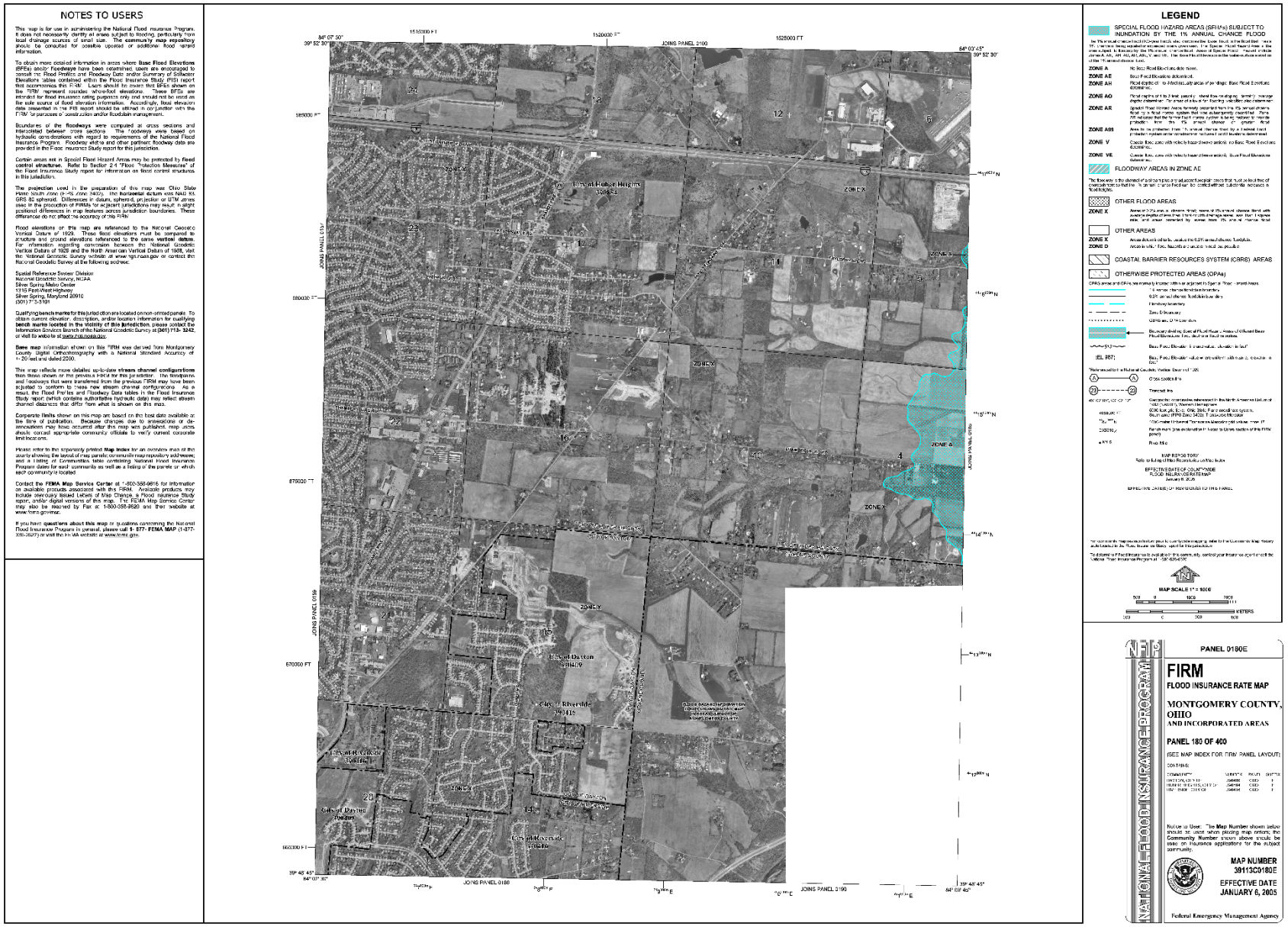
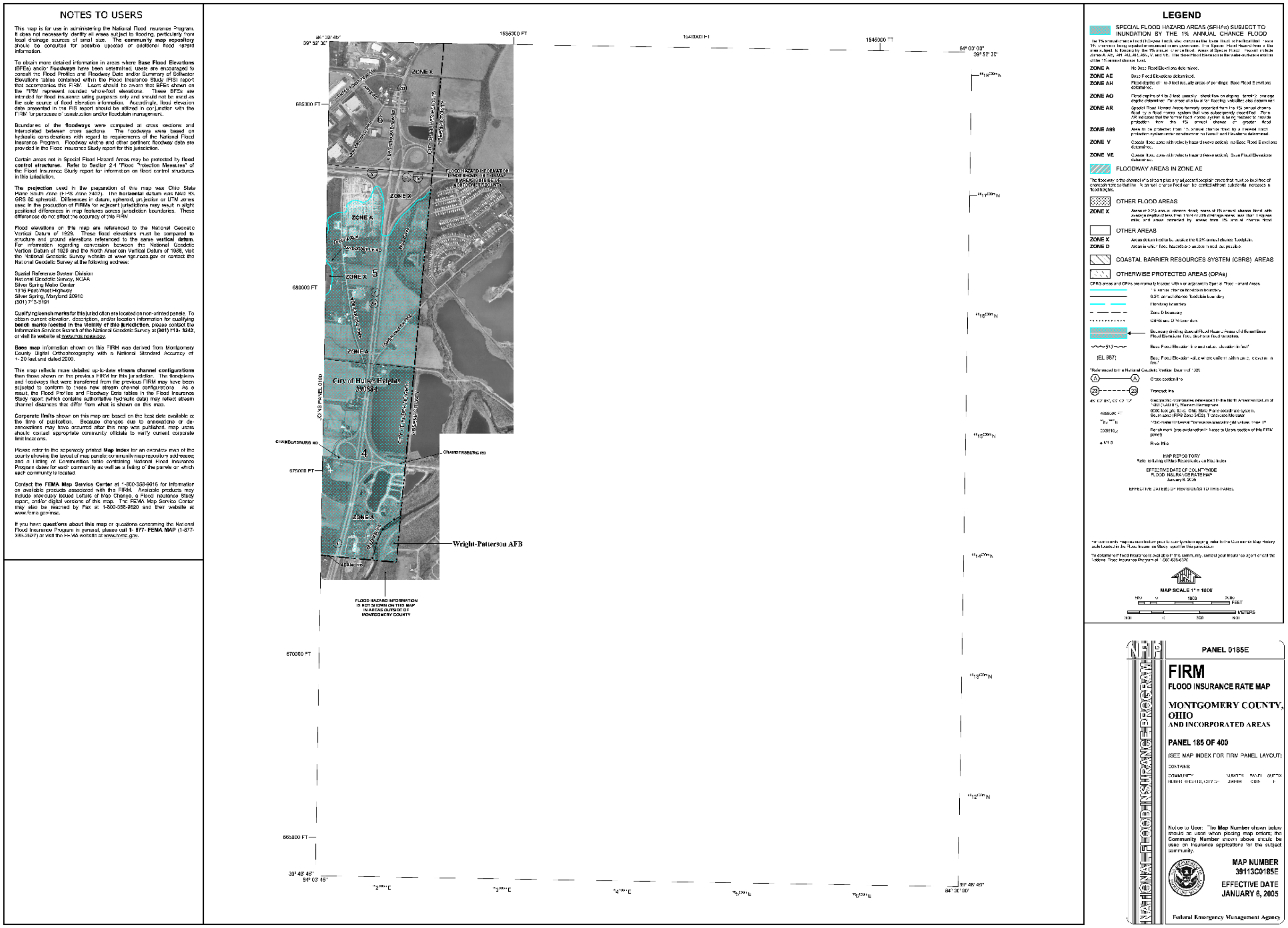
GREAT MIAMI RIVER
JOHNS PANEL 0156
JOHNS PANEL 0158
JOHNS PANEL 0166
City of Dayton
City of Harbor Heights
City of Moraine
City of Dayton Suburbs
Montgomery County Unincorporated Areas
ZONE AE
ZONE X
ZONE A
LEGEND
SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
ZONE A
ZONE AE
ZONE AH
ZONE AO
ZONE AR
ZONE A99
ZONE V
ZONE VE
FLOODWAY AREAS IN ZONE AE
OTHER FLOOD AREAS
ZONE X
OTHER AREAS
ZONE X
ZONE D
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
OTHERWISE PROTECTED AREAS (OPAs)
MAP REPOSITORY
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
January 6, 2005
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
MAP SCALE 1" = 500'
PANEL 0158E
FIRM
FLOOD INSURANCE RATE MAP
MONTGOMERY COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 158 OF 400
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
39113C0158E
EFFECTIVE DATE
JANUARY 6, 2005
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM


NOTES TO USERS
LEGEND
PANEL 0159E
FIRM
FLOOD INSURANCE RATE MAP
MONTGOMERY COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 159 OF 400
MAP NUMBER
39113C0159E
EFFECTIVE DATE
JANUARY 6, 2005
Federal Emergency Management Agency


NOTES TO USERS
LEGEND
SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
ZONE A
ZONE AE
ZONE AH
ZONE AO
ZONE AR
ZONE A99
ZONE V
ZONE VE
FLOODWAY AREAS IN ZONE AE
OTHER FLOOD AREAS
ZONE X
OTHER AREAS
ZONE X
ZONE D
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
OTHERWISE PROTECTED AREAS (OPAs)
MAP REPOSITORY
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
January 6, 2005
EFFECTIVE DATES OF REVISION(S) TO THIS PANEL
MAP SCALE 1" = 1000'
PANEL 0180E
FIRM
FLOOD INSURANCE RATE MAP
MONTGOMERY COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 180 OF 400
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
MAP NUMBER
39113C0180E
EFFECTIVE DATE
JANUARY 6, 2005
Federal Emergency Management Agency


NOTES TO USERS
LEGEND
SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
ZONE A
ZONE AE
ZONE AH
ZONE AO
ZONE AR
ZONE A99
ZONE V
ZONE VE
FLOODWAY AREAS IN ZONE AE
OTHER FLOOD AREAS
ZONE X
OTHER AREAS
ZONE X
ZONE D
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
OTHERWISE PROTECTED AREAS (OPAs)
MAP SCALE 1" = 1000'
ZONE X
ZONE A
ZONE X
City of Huber Heights
390884
ZONE A
Wright-Patterson AFB
CHAMBERSBURG RD
FLOOD HAZARD INFORMATION IS NOT SHOWN ON THIS MAP IN AREAS OUTSIDE OF MONTGOMERY COUNTY
NATIONAL FLOOD INSURANCE PROGRAM
NFIP
PANEL 0185E
FIRM
FLOOD INSURANCE RATE MAP
MONTGOMERY COUNTY, OHIO
AND INCORPORATED AREAS
PANEL 185 OF 400
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
39113C0185E
EFFECTIVE DATE
JANUARY 6, 2005
Federal Emergency Management Agency

Appendix G: Meeting Documentation