Jefferson County 2023 Hazard Mitigation Plan

Prepared for:

Jefferson County
Department of Emergency Services

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Prepared by:

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Certification of Annual Review Meetings

YEAR	DATE OF MEETING	PUBLIC OUTREACH ADDRESSED? *	SIGNATURE
2023			
2024			
2025			
2026			
2027			

**Confirm yes here annually and describe on record of change page.*

Record of Changes

DATE	DESCRIPTION OF CHANGE MADE, MITIGATION ACTION COMPLETED, OR PUBLIC OUTREACH PERFORMED	CHANGE MADE BY (PRINT NAME)	CHANGE MADE BY (SIGNATURE)

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Acronyms

AACT:	American Academy of Clinical Toxicology
ACHA:	American College Health Association
ACMT:	American College of Medical Toxicology
AHJ:	Authority Having Jurisdiction
AMD:	Acid Mine Drainage
ANSI:	American National Standards Institute
ASAM:	American Society of Addiction Medicine
ASHRAE:	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASIRT:	Association for Safe International Road Travel
BFE:	Base Flood Elevation
CBRNE:	Chemical, Biological, Radiological, Nuclear, or Explosive
CDC:	Centers for Disease Control and Prevention
CERT:	Community Emergency Response Team
CFR:	Code of Federal Regulations
CFS:	Commodity Flow Study
CHSN:	College Health Surveillance Network
CCIDRAP:	Center for Infectious Disease Research and Policy
CRS:	Community Rating System
DCNR:	Department of Conservation and Natural Resources
DDAP:	Department of Drug and Alcohol Programs
DEA:	Drug Enforcement Administration
DFIRM:	Digital Flood Insurance Rate Map
DMA:	Disaster Mitigation Act
DPS:	Department of Public Safety
EF:	Enhanced Fujita
EIA:	Energy Information Administration
EMA:	Emergency Management Agency
EMPG:	Emergency Management Performance Grant

EMS:	Emergency Medical Services
EOP:	Emergency Operations Plan
EPA:	Environmental Protection Agency
EPCRA:	Emergency Planning and Community Right-To-Know Act
EPZ:	Emergency Planning Zone
FBI:	Federal Bureau of Investigations
FEMA:	Federal Emergency Management Agency
FMA:	Flood Mitigation Assistance Grant Program
FRA:	Federal Railroad Association
GIS:	Geographic Information Systems/Sciences
HAZUS:	Hazards U.S. Software
HMA:	Hazard Mitigation Assistance
HMEP:	Hazardous Material Emergency Planning Grant
HMGP:	Hazard Mitigation Grant Planning
HMP:	Hazard Mitigation Plan
HMRF:	Hazardous Material Response Fund
HSCA:	Hazardous Sites Cleanup Act
HSGP:	Homeland Security Grant Program
HVE:	Homegrown Violent Extremist
ICC:	International Code Council
IES:	Illuminating Engineering Society
LEPC:	Local Emergency Planning Committee
LGTBQ:	Lesbian, Gay, Bisexual, Trans & Queer
LPT:	Local Planning Team
MAT:	Medication-Assisted Treatment
MPC:	Municipalities Planning Code
NARM:	Notification and Resource Manual
NAS:	Neonatal Abstinence Syndrome
NCDC:	National Climatic Data Center
NCEI:	National Centers for Environmental Information

NFIP: National Flood Insurance Program

NFPA: National Fire Protection Association

NIH: National Institute of Health

NLD: National Levee Database

NOAA: National Oceanic and Atmospheric Administration

NTP: Narcotic Treatment Program

NWS: National Weather Service

OIH: Opioid-Induced Hyperalgesia

OUD: Opioid Use Disorder

PA DCED: Pennsylvania Department of Community and Economic Development

PA DEP: Pennsylvania Department of Environmental Protection

PA DOA: Pennsylvania Department of Agriculture

PA GWIS: Pennsylvania Groundwater Information System

PA HART: Pennsylvania Helicopter Aquatic Rescue Team

PAWNVCP: Pennsylvania West Nile Virus Control Program

PDMP: Prescription Drug Monitoring Program

PDSI: Palmer Drought Severity Index

PEMA: Pennsylvania Emergency Management Agency

PennDOT: Pennsylvania Department of Transportation

PHMSA: Pipeline and Hazardous Materials Safety Administration

PISC: Pennsylvania Invasive Species Council

POD: Points of Dispensing

PWSA: Public Water Service Area

RF: Risk Factor

SARA: Superfund Amendments and Reauthorization Act

SC: Steering Committee

SFHA: Special Flood Hazard Area

TRI: Toxic Release Inventory

UCC: Uniform Construction Code

US HHS:	United States Department of Health and Human Services
USACE:	Untied States Army Corp of Engineers
USDA:	United States Department of Agriculture
USDA FS:	United States Department of Agriculture Forest Service
USGS:	United States Geological Survey
WL:	Working Level
WMD:	Weapon of Mass Destruction
WUI:	Wildland Urban Interface

Executive Summary

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. Hazard mitigation focuses attention and resources on county and municipal policies and actions that will produce successive benefits over time. State and local governments engage in hazard mitigation planning to identify risks and vulnerabilities associated with natural as well as human-caused hazards and develop long-term strategies for protecting people and property from future hazard events. Mitigation plans are key to breaking the cycle of disaster damage, reconstruction, and repeated damage. This plan represents the work of citizens, elected and appointed government officials, business leaders, and volunteer and nonprofit groups to protect community assets, preserve the economic viability of the community, and save lives.

In 2022, the Jefferson County Department of Emergency Services contracted the services of a consulting agency to revise and update the Jefferson County Hazard Mitigation Plan. The plan was successfully updated in accordance with the requirements set forth by PEMA and FEMA. The updated Jefferson County Hazard Mitigation Plan was adopted by the Jefferson County Commissioners in 2023. Thirty-one of the thirty-four municipalities adopted the 2018 Jefferson County Hazard Mitigation Plan as the municipal hazard mitigation plan, and it is anticipated that all participating municipalities will adopt the 2023 Jefferson County Hazard Mitigation Plan Update.

The Jefferson County Commissioners secured a grant to complete the 2023 update to the Jefferson County Hazard Mitigation Plan. MCM Consulting Group, Inc. was hired to assist the county with the update of the plan. The planning kick-off meeting was conducted on October 26, 2022.

The planning process for the 2023 Jefferson County Hazard Mitigation Plan Update consisted of the following:

- Identification and prioritization of the hazards that may affect the county and its municipalities.
- Assessment of the county's and municipalities' vulnerability to these hazards.
- Identification of the mitigation actions and projects that can reduce that vulnerability.
- Development of a strategy for implementing the actions and projects, including identifying the agency(ies) responsible for that implementation.

Throughout the planning process, the general public was given the opportunity to comment on the existing HMP and provide suggestions for the updated version. Due to COVID-19, public meetings were conducted via an online survey to provide residents an opportunity to provide input on the HMP. Several meetings were held in person with a virtual option, and participants were invited to submit surveys and other documents via an online survey.

The following hazards were identified by the local planning team as presenting the highest risk to the county and its municipalities:

Natural hazards:

- Drought
- Earthquake
- Flooding, Flash Flooding, Ice Jam Flooding
- Hurricane and Tropical Storm
- Invasive Species
- Landslide
- Pandemic and Infectious Disease
- Radon Exposure
- Subsidence/Sinkhole
- Tornado/Windstorm
- Wildfire
- Winter Storm

Human-caused hazards:

- Civil Disturbance
- Dam Failure
- *Emergency Services
- Environmental Hazards / Hazardous Materials
- Levee Failure
- Nuclear Incident
- Opioid Epidemic
- Terrorism/Cyberterrorism Incidents
- Transportation Accidents
- Utility Interruption

A total of eighteen hazards have been identified in the 2023 Jefferson County Hazard Mitigation Plan. A total of seventeen identified hazards were listed in the previous 2018 plan update. The new hazards include blighted properties and opioid epidemic; however, the nuclear incident profile was removed.

To mitigate against the effects of these hazards, the local planning team identified the following goals for hazard mitigation over the next five years:

- Reduce potential injury/death and damage to existing community assets due to floods, flash floods, and ice jams.
- Reduce potential injury/death and damage to community assets due to all hazards.
- Promote disaster-resistant future development.
- Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.
- Improve response and recovery capabilities.
- Protect critical infrastructure.

Mitigation actions are specific projects and activities that help achieve goals. A total of twenty-two actions were developed for this plan update as they pertain to hazards identified by the local planning team. The 2018 Jefferson County Hazard Mitigation Plan consisted of thirteen total actions. The individual objectives and actions that will be implemented are shown in Section 6.4. Each municipality was provided the opportunity to submit new project opportunity forms for this update. During the 2018 HMP update there were no published project opportunity forms, however, project opportunities were developed in association with the mitigation actions of the 2018 plan. A total of twelve project opportunities were submitted for this plan update.

The 2023 Jefferson County Hazard Mitigation Plan is the cornerstone to reducing Jefferson County's vulnerability to disasters. It is the commitment to reducing risks from hazards and serves as a guide for decision makers as they commit resources to reducing the effects of hazards. Hazard mitigation is the only phase of emergency management specifically dedicated to breaking the cycle of damage, reconstruction, and repeated damage.

The 2023 Jefferson County Hazard Mitigation Plan is a living document that reflects ongoing hazard mitigation activities and requires monitoring, evaluating, and updating to ensure the mitigation actions are implemented. To facilitate the hazard mitigation planning process and adhere to regulatory requirements, the plan will be reviewed annually, and any major revisions will be incorporated into the five-year update.

1. Introduction

1.1. Background

The Jefferson County Board of Commissioners, in response to the Disaster Mitigation Act of 2000 (DMA 2000), organized a countywide hazard mitigation planning effort to prepare, adopt, and implement a multi-jurisdictional Hazard Mitigation Plan (HMP) for Jefferson County and all of its thirty-four municipalities. The Jefferson County Department of Emergency Services was charged by the County Board of Commissioners to prepare the 2023 plan. The 2023 HMP has been utilized and maintained during the five-year life cycle.

The Jefferson County Commissioners were successful in securing hazard mitigation grant funding to update the county hazard mitigation plan. The pre-disaster mitigation grant funding was administered by the Pennsylvania Emergency Management Agency and provided to Jefferson County as a sub-grantee. The Jefferson County Commissioners assigned the Jefferson County Department of Emergency Services with the primary responsibility to update the hazard mitigation plan. MCM Consulting Group, Inc. was selected to complete the update of the HMP. A local hazard mitigation planning team was developed comprised of government leaders and citizens from Jefferson County. This updated HMP will provide another solid foundation for the Jefferson County Hazard Mitigation Program.

Hazard mitigation describes sustained actions taken to prevent or minimize long-term risks to life and property from hazards and to create successive benefits over time. Pre-disaster mitigation actions are taken in advance of a hazard event and are essential to breaking the disaster cycles of damage, reconstruction, and repeated damage. With careful selection, successful mitigation actions are cost-effective means of reducing risk of loss over the long term.

Hazard mitigation planning has the potential to produce long-term and recurring benefits. A core assumption of mitigation is that current dollars invested in mitigation practices will significantly reduce the demand for future dollars by lessening the amount needed for recovery, repair, and reconstruction. These mitigation practices will also enable local residents, businesses, and industries to reestablish themselves in the wake of a disaster, getting the economy back on track sooner with less interruption.

1.2. Purpose

The purpose of this all-hazard mitigation plan (HMP) is:

- Protect life, safety, and property by reducing the potential for future damages and economic losses that result from hazards.

- Qualify for additional grant funding, in both the pre-disaster and the post-disaster environment.
- Speed recovery and redevelopment following future disaster events.
- Demonstrate a firm local commitment to hazard mitigation principles.
- Comply with both state and federal legislative requirements for local hazard mitigation plans.

1.3. Scope

This Jefferson County Multi-Jurisdictional Hazard Mitigation Plan serves as a framework for saving lives, protecting assets, and preserving the economic viability of the thirty-four municipalities in Jefferson County. The HMP outlines actions designed to address and reduce the impact of a full range of natural hazards facing Jefferson County, including drought, earthquakes, flooding, tornadoes, hurricanes/tropical storms, invasive species, and severe winter weather. Human-caused hazards such as transportation accidents, emergency services shortage, hazardous materials spills, and fires are also addressed.

A multi-jurisdictional planning approach was utilized for the Jefferson County HMP update, thereby eliminating the need for each municipality to develop its own approach to hazard mitigation projects, common mitigation goals and objectives, and an evaluation of a broad capabilities assessment examining policies and regulations throughout the county and its municipalities.

1.4. Authority and References

Authority for this plan originates from the following federal sources:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C., Section 322, as amended
- Code of Federal Regulations (CFR), Title 44, Parts 201 and 206
- Disaster Mitigation Act of 2000, Public Law 106-390, as amended.
- National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 et seq.

Authority for this plan originates from the following Commonwealth of Pennsylvania sources:

- Pennsylvania Emergency Management Services Code. Title 35, Pa C.S. Section 101
- Pennsylvania Municipalities Planning Code of 1968, Act 247 as reenacted and amended by Act 170 of 1988.
- Pennsylvania Stormwater Management Act of October 4, 1978. P.L. 864, No. 167

The following Federal Emergency Management Agency (FEMA) guides and reference documents were used to prepare this document:

- FEMA 386-1: Getting Started. September 2002
- FEMA 386-2: Understanding Your Risks: Identifying Hazards and Estimating Losses. August 2001
- FEMA 386-3: Developing the Mitigation Plan. April 2003
- FEMA 386-4: Bringing the Plan to Life. August 2003
- FEMA 386-5: Using Benefit-Cost Review in Mitigation Planning. May 2007
- FEMA 386-6: Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning. May 2005
- FEMA 386-7: Integrating Manmade Hazards into Mitigation Planning. September 2003
- FEMA 386-8: Multijurisdictional Mitigation Planning. August 2006
- FEMA 386-9: Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects. August 2008
- FEMA Local Multi-Hazard Mitigation Planning Guidance. July 1, 2008
- FEMA National Fire Incident Reporting System 5.0: Complete Reference Guide. January 2008
- FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards. January 2013
- FEMA Rehabilitation of High Hazard Potential Dams: Grant Program Guidance, June 2020

The following Pennsylvania Emergency Management Agency (PEMA) guides and reference documents were used to prepare this document:

- PEMA: Hazard Mitigation Planning Made Easy!
- PEMA Mitigation Ideas: Potential Mitigation Measures by Hazard Type: A Mitigation Planning Tool for Communities. March 6, 2009
- PEMA: All-Hazard Mitigation Planning Standard Operating Guide, 2020.

The following document produced by the National Fire Protection Association (NFPA) provided additional guidance for updating this plan:

NFPA 1600: Standard on Disaster/Emergency Management and Business Continuity Programs. 2011

2. Community Profile

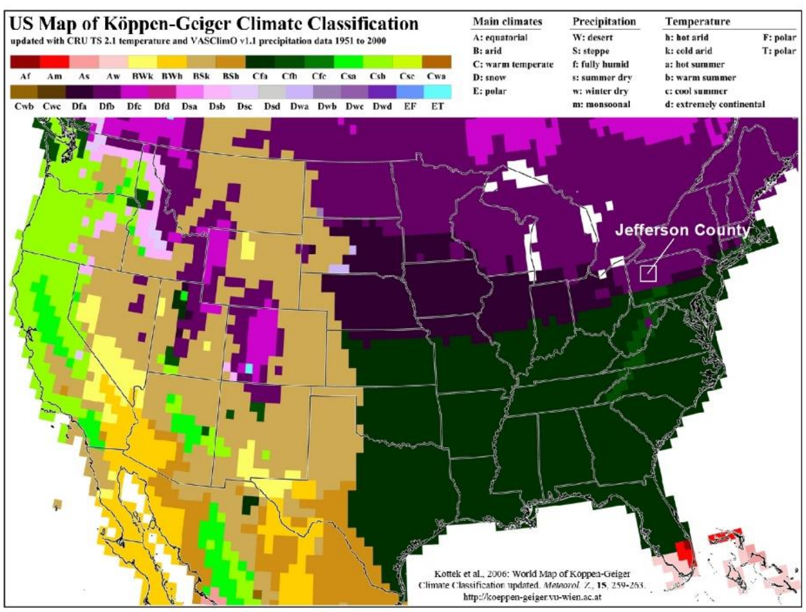
2.1. Geography and the Environment

Jefferson County covers approximately 657 square miles and is situated in west-central Pennsylvania. The county is bordered by Forest County and Elk County in the north, by Clearfield County to the east, by Indiana County to the south, and by Armstrong County and Clarion County to the west. Jefferson County lies within two physiographic provinces of Pennsylvania—the Pittsburgh low plateau section and the high plateau section. The county is the 48th ranked county in terms of population within the Commonwealth of Pennsylvania. There is a total of 652 square miles of land and 4.4 square miles of water.

Jefferson County presents a wide range of topographic features. The surface ranges from almost level on plateaus and in valleys, to rolling and hilly in other areas. Elevations in the county range from a high of 2160 feet and a low of 932 feet near Punxsutawney.

The Köppen-Geiger Climate Areas map classifies Jefferson County, and the rest of Pennsylvania, as Humid Continental, which can be seen in *Figure 1 – Köppen-Geiger Climate Map*.

Figure 1 - Köppen-Geiger Climate Map



According to current data, the climate in Jefferson County is temperate, characterized by moderately hot summers and moderately severe winters. In winter, the average temperature is 27˚F and the average daily minimum temperature is 18 ˚F. In summer, the average temperature is

67˚F and the average daily maximum temperature is 78˚F. The average amount of snowfall each winter is 45 inches.

River and stream valleys dominate the landscape of Jefferson County. Clarion River is the primary feature and defines the northern border of the county.

Jefferson County is comprised of three watersheds shown in *Table 1 – Watersheds in Jefferson County*:

Table 1 - Watersheds in Jefferson County

Watersheds in Jefferson County
Clarion Watershed
Middle Allegheny Redbank Watershed
Upper West Branch Susquehanna Watershed

2.2. Community Facts

Jefferson County is a county that is located within the Commonwealth of Pennsylvania. Jefferson County was founded on March 26, 1804, from part of Lycoming County and then later organized in 1830. Jefferson County is named for President Thomas Jefferson and is also home to Punxsutawney Phill the most famous groundhog that predicts when spring will come every February 2nd on Groundhog Day. Jefferson County seat is in Brookville.

The following boroughs and townships are located in Jefferson County:

- Boroughs: Big Run, Brockway, Brookville, Corsica, Falls Creek, Punxsutawney, Reynoldsville, Summerville, Sykesville, Timblin, Worthville
- Townships: Barnett, Beaver, Bell, Clover, Eldred, Gaskill, Heath, Henderson, Knox, McCalmont, Oliver, Perry, Pine Creek, Polk, Porter, Ringgold, Rose, Snyder, Union, Warsaw, Washington, Winslow, Young

Table 2 – Historical and Cultural Places shows a listing of buildings in Jefferson County on the National Register of Historical Places.

Table 2 - Historical and Cultural Places

Historical and Cultural Places	
Name	**Description**
Brookville Presbyterian Church and Manse	Located in Brookville Historic District, this church was built in 1904. This Church was added to the National Register of Historic Places in 1982.

Historical and Cultural Places	
Name	**Description**
Jefferson Theater	Located in Punxsutawney, Jefferson Theater was built in 1905 and then closed in 1978. It was added to the National Register of Historic Places in 1985.
Gray-Taylor House	Located in Brookville Historic District. This house was built in 1882 and then added to the National Register of Historic Places in 1979.
Taylor, Phillip House	Located in Brookville, this home was built in 1841 and then was used as a soldier convalescent home in 1889. This home was added to the National Register of Historic Places in 1982.
Joseph E Hall House	Located in the Brookville Historic District, this home was built in 1848 and then was used as the town's public library until the late 1970's. This home was added to the National Register of Historic Places in 1978.
T.M Kurtz House	Located in Punxsutawney, this home was built in 1904. This was home to Theodore M. Kurtz who was a businessman and a member of the Pennsylvania State Senate. This home was added to the National Register of Historic Places in 1988.
Christian Miller House	Located in Punxsutawney, this home was built in 1870. This home was added to the National Register of Historic Places in 1995.
Redferd Segers House	Located in Snyder Township. This home was built in 1870 and was home to Refferd Segers who was a prominent local businessman. This home was added to the National Register of Historic Places in 2000.
United Stated Post Office-Punxsutawney	Located in Punxsutawney, this post office was built in 1912 and then added to the National Register of Historic Places in 2000.
Brockwayville Passenger Depot, Buffalo, Rochester, and Pittsburgh Railroad	Located in Brockway, this railroad depot was built in 1913 and then added to the National Register of Historic Places in 2003.

Historical and Cultural Places	
Name	**Description**
Herpel Brothers Foundry and Machine Shop	Located in Reynoldsville, this shop was built in 1905 and then was added to the National Register of Historic Places in 2004.
Source: National Register of Historic Place, 2023	

2.3. Population and Demographics

The total population for Jefferson County is 44,492 based on 2020 United States Census Bureau. The total change in population for Jefferson County from 2010 to 2020 was a decrease of 708 and a change of 1.6%. The most populous municipality is Punxsutawney Borough. The municipalities in the county that had the largest percentage of decrease from 2010 to 2020 was Corsica Borough with a 10.6% decrease. The municipality that had the highest percentage of increase for the period from 2010 to 2020 was Worthville Borough with a 19.4% increase. *Table 3 – Population Change in Jefferson County* illustrates the trends and data from United States Census Bureau. These figures are based off data from the United States Census Bureau in 2020. The population density is shown in *Figure 4 – Jefferson County Population Density*.

Table 3 - Population Change in Jefferson County

Population Change in Jefferson County from 2010-2020			
Municipality	**2010 Census**	**2020 Census**	**Percent of Change 2010-2020**
Barnett Township	254	234	-7.9%
Beaver Township	498	465	-6.6%
Bell Township	2,056	2,010	-2.2%
Big Run Borough	624	647	3.7%
Brockway Borough	2,072	2,276	9.8%
Brookville Borough	3,924	3,995	1.8%
Clover Township	448	432	-3.6%
Corsica Borough	357	319	-10.6%
Eldred Township	1,226	1,271	3.7%
Falls Creek Borough	989	994	0.5%
Gaskill Township	708	673	-4.9%
Heath Township	124	114	-8.1%
Henderson Township	1,816	1,940	6.8%
Knox Township	1,042	1,011	-3.0%
McCalmont Township	1,082	1,137	5.1%

Population Change in Jefferson County from 2010-2020			
Municipality	**2010 Census**	**2020 Census**	**Percent of Change 2010-2020**
Oliver Township	1,083	1,000	-7.7%
Perry Township	1,226	1,248	1.8%
Pine Creek Township	1,352	1,323	-2.1%
Polk Township	265	284	7.2%
Porter Township	305	295	-3.3%
Punxsutawney Borough	5,962	5,769	-3.2%
Reynoldsville Borough	2,759	2,549	-7.6%
Ringgold Township	741	773	4.3%
Rose Township	1,255	1,156	-7.9%
Snyder Township	2,547	2,370	-6.9%
Summerville Borough	528	504	-4.5%
Sykesville Borough	1,157	1,115	-3.6%
Timblin Borough	157	147	-6.4%
Union Township	855	844	-1.3%
Warsaw Township	1,424	1,368	-3.9%
Washington Township	1,926	1,892	-1.8%
Winslow Township	2,622	2,546	-2.9%
Worthville Borough	67	80	19.4%
Young Township	1,749	1,711	-2.2%
TOTAL	**45,200**	**44,492**	-1.6%
Source: United States Census Bureau (2022), 2020 Census Data			

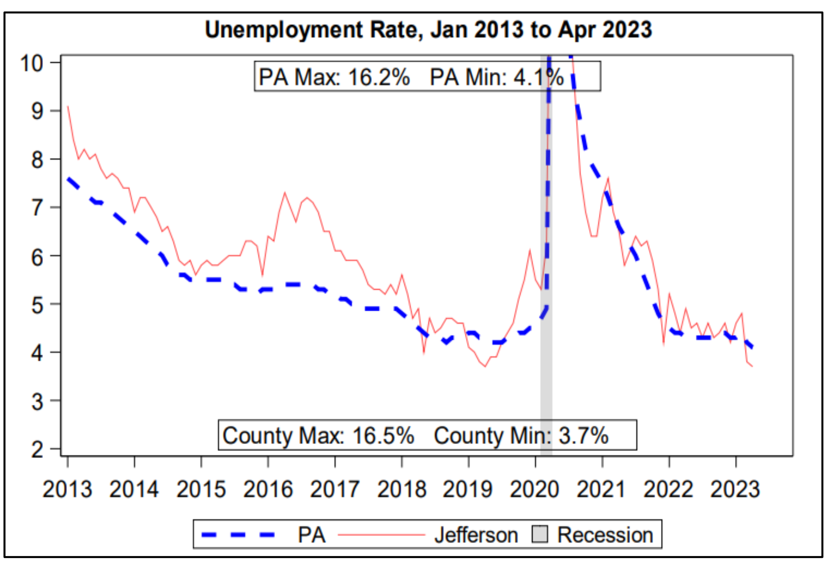
There are approximately 22,069 housing units in Jefferson County, Pennsylvania. Of these housing units, there are an estimated 17,745 households within the county. Married couples make up a plurality of households in the county with an average household size of 2.47 persons. The estimated owner-occupied housing rate of Jefferson County is 75.4 with an overall occupancy rate of 75.4 of all units. The median value of the owner-occupied housing units in Jefferson County from 2017 to 2021 is 108,900. The median monthly owner’s costs for a structure with a mortgage was $988 and the median monthly owner’s costs for a structure without a mortgage was $420. The median gross rent for rental properties in Jefferson County was $711 for the same date range.

The racial composition of the county is 97.7% White, 0.6% Black or African American, 1.0% Hispanic or Latino, 0.3% American Indian and Alaska Native, 0.3% Asian, 0% native Hawaiian and other Pacific Islander, and 1.1% two or more races. The median age of Jefferson County is 40 years of age, which is lower than the median age of Pennsylvania at 40.9 and higher than the national median of 38.1 years of age. The percentage of Jefferson County under the age of 5 years old is 5.4%, between the ages of 18 and 64 years old is 50.8% and aged 65 years old and older is 21.7%

The median household income for households in Jefferson County is $52,815 and the poverty rate of Jefferson County is 13.3% of the total population. The poverty rate for the Commonwealth of Pennsylvania as a whole is 12.1%. There are approximately 2,841 veterans in Jefferson County. The median veteran income in Jefferson County as of 2020 was $51,528, with 4.2% of Jefferson County veterans living below the poverty level. The veteran unemployment rate in the county was approximately 4.5%.

The Covid-19 Pandemic created an increase in unemployment and interruptions in employment throughout the United States, to include Pennsylvania and Jefferson County. According to Pennsylvania Department of Labor and Industry data, there was a large spike in unemployment both across the Commonwealth and Jefferson County. At the height of the Covid-19 Pandemic in the spring of 2020, the unemployment rate for Jefferson County hit 6.8% of the working population of the county. That is lower than the peak unemployment percentage for Pennsylvania, which peaked at 16.5% of the working population of the entire state. *Table 4 – Unemployment Rate Jan. 2013 to Apr. 2023* illustrates the trend and large spike in unemployment. The unemployment rate for Jefferson County in July 2020 was 6.8% which roughly accounted for 1,407 working age adults (ages 16 to 65). The total estimated workforce for Jefferson County was 19,244 working age adults (ages 16 to 65) in March 2020.

Table 4 - Unemployment Rate Jan. 2013 to Apr. 2023



Source: Pennsylvania Department of Labor & Industry

Jefferson County leading industries are education, healthcare, social services, manufacturing, and retail trade. The primary employment providers within Jefferson County are displayed below in *Table 5 – Jefferson County Top Employers.*

Table 5 - Jefferson County Top Employers

Jefferson County Top Employers	
Ranking	**Company**
1	Beverage Air Corp
2	Owens-Brockway Glass Container
3	Punxsutawney Area Hospital Inc
4	Metal Powder Products LLC
5	Punxsutawney Area School District
6	Miller Welding & Machine Co
7	Goodwill Industries of North Central PA
8	Brookville Area School District
9	Wal-Mart Associates Inc
10	JDRC Managed Services LLC
Source: Pennsylvania Department of Labor & Industry, 2023	

The top employers' data was obtained through the Pennsylvania Department of Labor and Industry, Center for Workforce Information and Analysis. This data only provided a list of employers, their ranking, and North American Industry Classification System (NAICS) descriptions. *Table 6 – Quarterly Census of Employment and Wages, 2021 Annual Averages in Jefferson County* only calls out how many locations per NAICS description and total number of employees.

Table 6 - Quarterly Census of Employment and Wages, 2021 Annual Averages in Jefferson County

Quarterly Census of Employment and Wages, 2021 Annual Averages in Jefferson County					
NAICS	**Description**	**Number of Locations**	**Number of Employees**	**Employment Percentage**	**Average Wages**
11	Agriculture, Forestry, Fishing, and Hunting	N/A	N/A	N/A	N/A
21	Mining, Quarrying, and Oil & Gas	24	335	6.2%	$78,147.00
22	Utilities	N/A	N/A	N/A	N/A
23	Construction	89	608	0.9%	$47,329.00

Quarterly Census of Employment and Wages, 2021 Annual Averages in Jefferson County					
NAICS	**Description**	**Number of Locations**	**Number of Employees**	**Employment Percentage**	**Average Wages**
31-33	Manufacturing	108	3,716	2.7%	$53,231.00
42	Wholesale Trade	35	256	0.5%	$53,980.00
44-45	Retail Trade	149	1,622	1.1%	$30,330.00
48-49	Transportation and Warehousing	87	541	0.6%	$51,637.00
51	Information	17	112	0.5%	$49,584.00
52	Finance and Insurance	43	220	0.3%	$48,718.00
53	Real Estate, Rental, and Leasing	22	83	0.5%	$38,718.00
54	Professional and Technical Services	66	460	0.5%	$53,290.00
55	Management of Companies and Enterprises	11	123	0.3%	$68,533.00
56	Administrative and Waste Services	43	497	0.6%	$47,258.00
61	Educational Services	17	888	0.7%	$47,477.00
62	Healthcare and Social Assistance	194	2,564	1.0%	$39,497.00
71	Arts, Entertainment, and Recreation	12	95	0.4%	$14,709.00
72	Accommodation and Food Services	94	974	1.0%	$13,918.00
81	Other Services (Except Public Administration)	108	494	1.0%	$27,149.00
92	Public Administration	52	537	0.9%	$41,441.00
-	**Total, All Industries**	**950**	**9,466**	**N/A**	**$626,239.00**
Source: NAICS (North American Industry Classification System), PA DLI, 2023					

2.4. Land Use and Development

Jefferson County is composed of thirty-four municipalities, which include:

- Twenty-three townships
- Eleven boroughs

Jefferson County has approximately 417,280 acres of total land area, and 2,816 acres of water area, with a population density per square mile of sixty-eight persons, based on 2020 data estimates. Forested areas make up approximately 71% of the county, while agriculture makes up approximately 19% of the total land area in Jefferson County, and high density urban, low density urban, water, transitional, resource extraction, quarries, and wetlands account for 10% of the remaining land area.

2.5. Data Sources

The following data sources were used during the update process:

- United States Census Bureau.
- National Climatic Data Center (NCDC).
- National Oceanic and Atmospheric Administration (NOAA).
- Pennsylvania Department of Conservation and Natural Resources (PA DCNR).
- Pennsylvania Department of Environmental Protection (PA DEP).
- Pennsylvania Department of Labor and Industry (PA DLI).
- Pennsylvania Groundwater Information System (PaGWIS).
- Pennsylvania Emergency Incident Reporting System. (PEIRS)
- Pennsylvania Emergency Management Agency (PEMA).
- Jefferson County Comprehensive Plan 2023

The countywide Digital Flood Insurance Rate Maps (DFIRM) were used for all flood risk analysis and estimation of loss. The Jefferson County DFIRMs were approved and effective in 2013. The DFIRM database provides flood frequency and elevation information used in the flood hazard risk assessment. Other Jefferson County GIS datasets including road centerlines, structures, and municipalities were utilized in conjunction with the DFIRM data.

In order to assess the vulnerability of different jurisdictions to the hazards, data on past occurrences of damaging weather events was compiled. A large number of natural-hazard events were gathered from the National Climatic Data Center (NCDC) database. The NCDC is a division of the United States Department of Commerce’s National Oceanic and Atmospheric Administration (NOAA). Information on hazard events is compiled by the NCDC from data gathered by the National Weather Service (NWS), another division of NOAA. The data is then presented by the NCDC as tabular data that can be queried in the United States Storm Events database, which “documents the occurrences of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce” (NOAA, 2006). The classification of storm events in the database is based off of data collected from around the United States and the Commonwealth of

Pennsylvania, so the data may not be filed under the correct storm category due to user input error. The reason for this data issue results from some storm events falling under multiple categories, including but not limited to winter storm, ice storm, tornado, hurricane / tropical storm, flooding, and flash flooding. Many of the events listed in the United States Storm Events database can fall under multiple of these categories. In an effort to include a comprehensive list of prior storm events for Jefferson County, search queries with multiple storm classifications were conducted for each hazard.

Throughout the risk and vulnerability assessment included in Section 4 of this Hazard Mitigation Plan, descriptions of limited data indicate some areas in which the county and the municipalities can improve their ability to identify vulnerable structures and improve loss estimates. As the county and municipal governments work to increase their overall technical capacity and implement comprehensive planning goals, they will also attempt to improve the ability to identify areas of increased vulnerability.

This hazard mitigation plan evaluates the vulnerability of the county's community lifelines. For the purposes of this plan, critical infrastructure facilities are those entities that are essential to the health, welfare, and safety of the community. This includes but is not limited to airports, emergency medical service (EMS) stations, communication facilities and towers, day care centers and preschools, fire departments, hospitals and medical facilities, police departments, schools, and senior living facilities. The locations of these facilities were provided by the Jefferson County GIS Department.

Geographic Information Systems (GIS) Data

GIS data was utilized in risk assessment, estimation of loss and the development of map products for the hazard mitigation plan update. The foundation of data was available from the Jefferson County GIS Department. Some of the utilized data was downloaded from the Pennsylvania Spatial Data Access (PASDA). A large portion of the plan utilizes census data from the United States Census Bureau, but the 2020 census data collection and dissemination was disrupted due to the Covid-19 Pandemic in 2020 and 2021. The 2020 census was delayed, and the information received during the census was spread out due to social distancing and the limiting of census takers going door to door to gather information.

The Jefferson County GIS Department provided the following layers for use in the development of hazard profiles and hazard profile mapping for the 2023 Hazard Mitigation Plan Update:

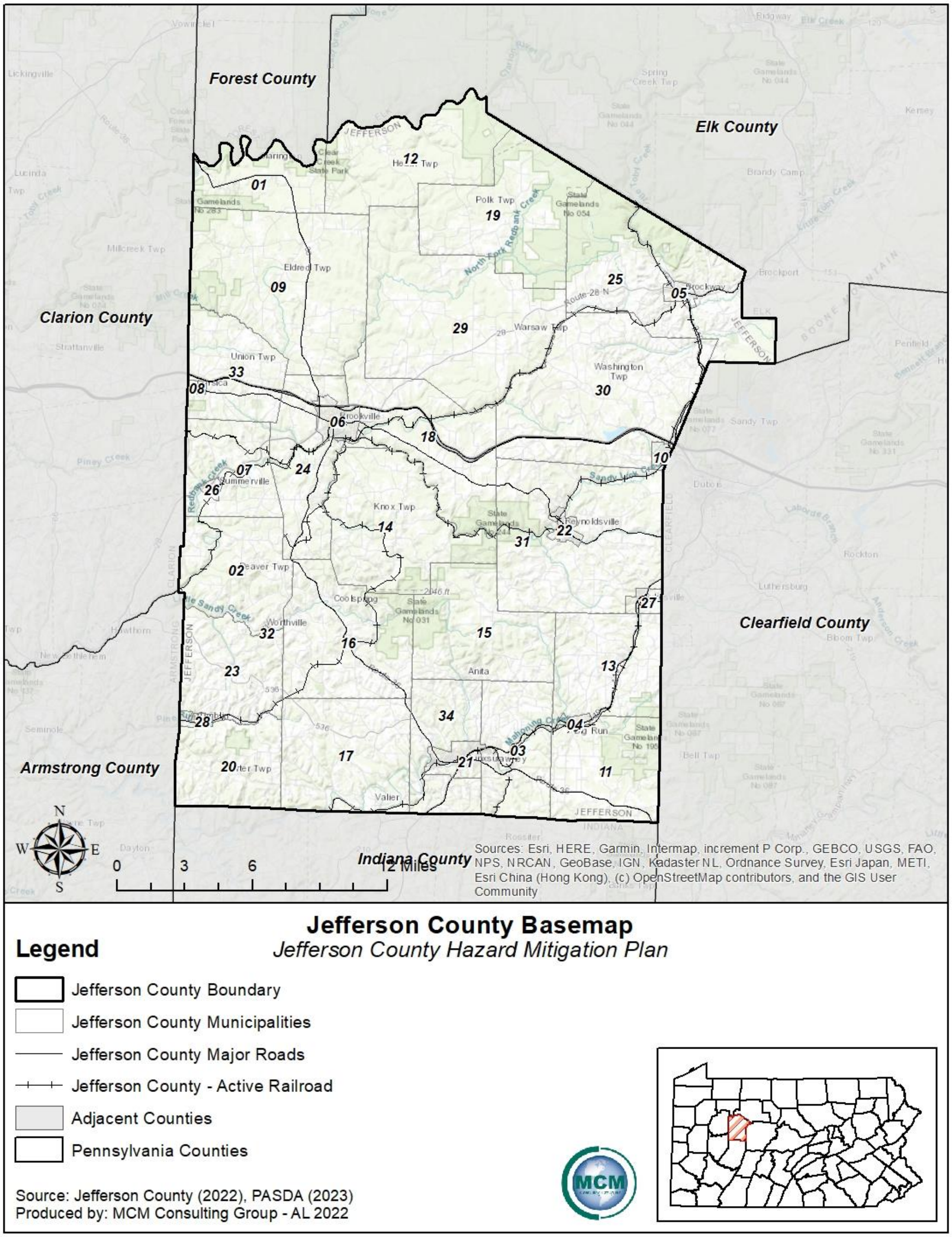
- Jefferson County EMS Station Locations
- Jefferson County Firehouse Locations
- Jefferson County Hospitals
- Jefferson County Municipalities
- Jefferson County Road Centerlines

- Jefferson County Schools
- Jefferson County Site Structure Address Points

The following GIS Data layers were developed for use in the 2023 Hazard Mitigation Plan Update:

- Jefferson County Airports
- Jefferson County Boundary
- Jefferson County Community Lifeline Locations
- Jefferson County Conventional Oil and Gas Wells
- Jefferson County Courthouse
- Jefferson County Dam Inventory
- Jefferson County Electric Substations
- Jefferson County Forested Lands (Deciduous, Evergreen, and Deciduous/Evergreen)
- Jefferson County Ground Water Withdrawal Points
- Jefferson County Large Watersheds
- Jefferson County Natural Areas (Gamelands, State Forests, State Parks)
- Jefferson County Police Departments
- Jefferson County Power Transmission Lines
- Jefferson County Public Supply Areas
- Jefferson County Tornado Impacted Municipalities
- Jefferson County Traffic Information
- Jefferson County Toxic Release Inventory (TRI) Locations
- Jefferson County Unconventional Oil and Gas Wells
- Jefferson County Water Wells
- Jefferson County Wildland Urban Interface
- Jefferson County Zip Codes

Figure 2 - Jefferson County Basemap



Basemap Continued:

Jefferson County Basemap - Page 2
Jefferson County Hazard Mitigation Plan

Legend

Jefferson County Boundary
Jefferson County Municipalities
Jefferson County Major Roads
Jefferson County - Active Railroad
Adjacent Counties
Pennsylvania Counties

Municipality Listing:

1. Barnett Township
2. Beaver Township
3. Bell Township
4. Big Run Borough
5. Brockway Borough
6. Brookville Borough
7. Clover Township
8. Corsica Borough
9. Eldred Township
10. Falls Creek Borough
11. Gaskill Township
12. Heath Township
13. Henderson Township
14. Knox Township
15. McCalmont Township
16. Oliver Township
17. Perry Township
18. Pinecreek Township
19. Polk Township
20. Porter Township
21. Punxsutawney Borough
22. Reynoldsville Borough
23. Ringgold Township
24. Rose Township
25. Snyder Township
26. Summerville Borough
27. Sykesville Borough
28. Timblin Borough
29. Union Township
30. Warsaw Township
31. Washington Township
32. Winslow Township
33. Worthville Borough
34. Young Township

Source: Jefferson County (2022), PASDA (2023)
Produced by: MCM Consulting Group - AL 2022

Figure 3 - Jefferson County Watersheds

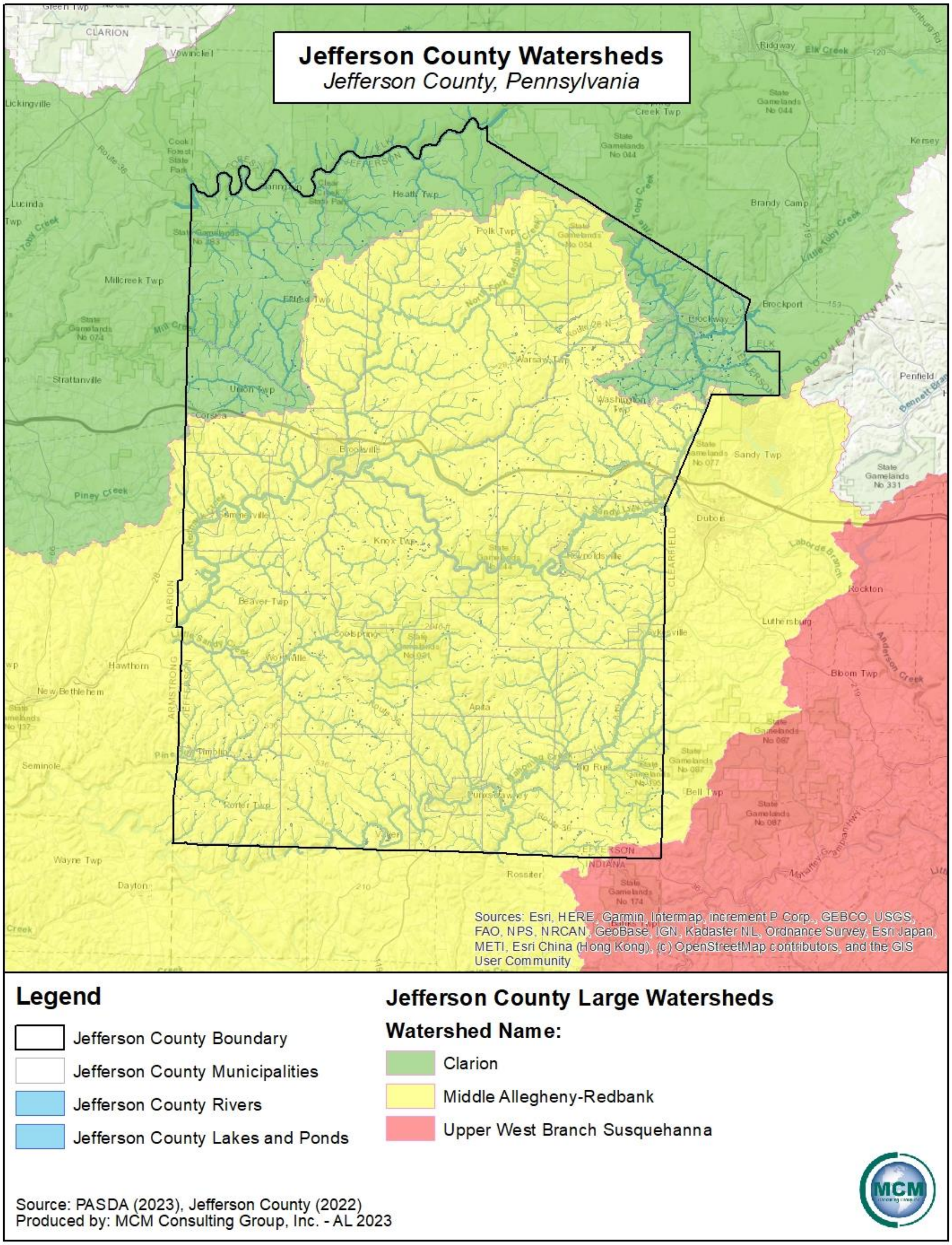


Figure 4 - Jefferson County Population Density

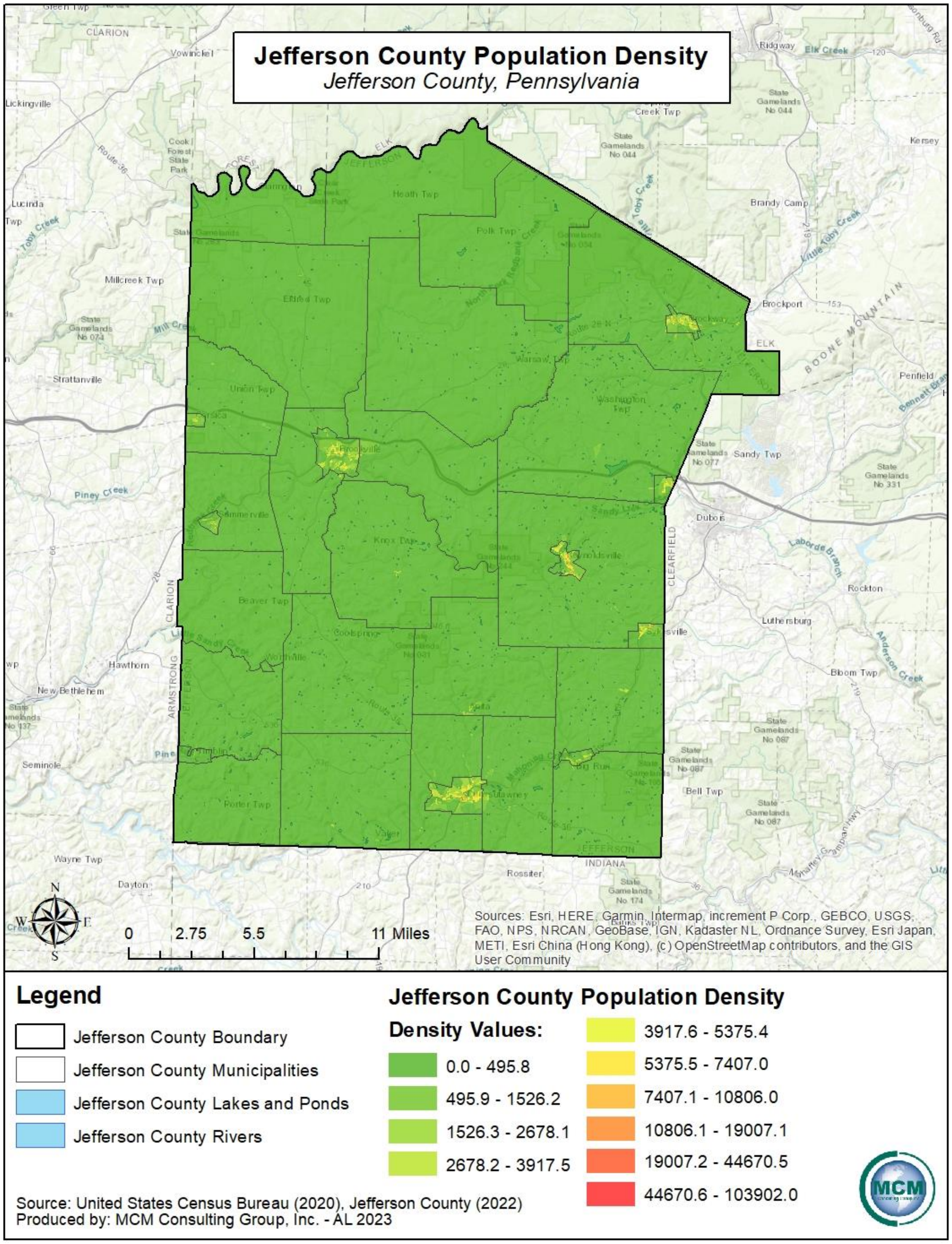
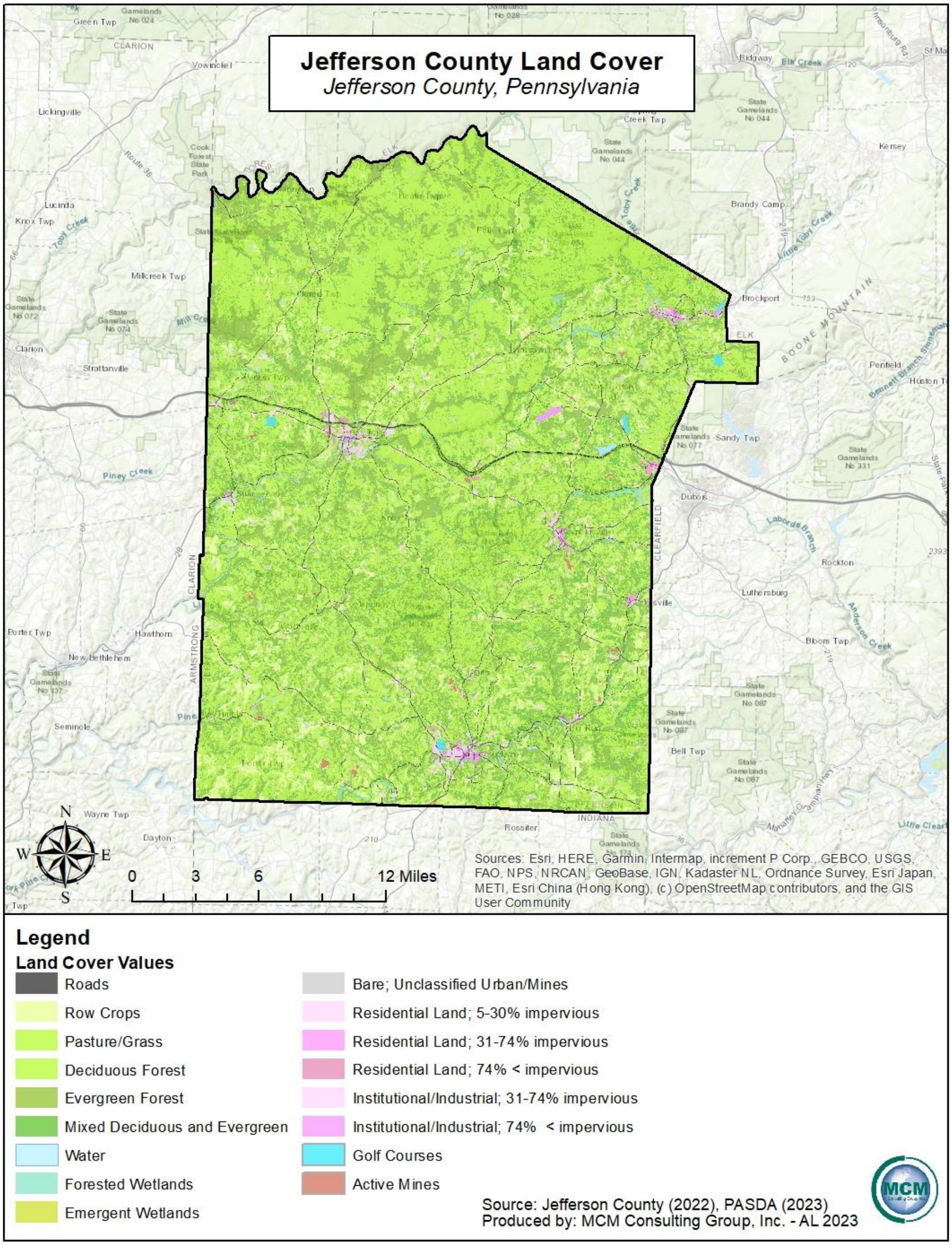


Figure 5 - Jefferson County Land Cover



3. Planning Process

3.1. Update Process and Participation Summary

The Jefferson County Hazard Mitigation Plan update began September 19, 2022. The Jefferson County Commissioners were able to secure a hazard mitigation grant to start the process. The Jefferson County Department of Emergency Services was identified as the lead agency for the Jefferson County Hazard Mitigation Plan update. The planning process involved a variety of key decision makers and stakeholders within Jefferson County. Jefferson County immediately determined that the utilization of a contracted consulting agency would be necessary to assist with the plan update process. MCM Consulting Group, Inc. was selected as the contracted consulting agency to complete the update of the hazard mitigation plan. The core hazard mitigation team, which was referred to as the steering committee, included officials from the Jefferson County Department of Emergency Services and MCM Consulting Group, Inc. (MCM).

The process was developed around the requirements laid out in the Federal Emergency Management Agency (FEMA) Local Hazard Mitigation Crosswalk, referenced throughout this plan, as well as numerous other guidance documents including, but not limited to, Pennsylvania's All-Hazard Mitigation Standard Operating Guide, FEMA's State and Local Mitigation Planning How-to Guide series of documents (FEMA 386-series), and the National Fire Protection Association (NFPA) 1600 Standard on Disaster/Emergency Management and Business Continuity Programs.

MCM Consulting Group, Inc. assisted Jefferson County Department of Emergency Services in coordinating and leading public involvement meetings, local planning team meetings, analysis, and the writing of the updated HMP. The Jefferson County Local Planning Team (LPT) worked closely with MCM in the writing and review of the HMP. MCM conducted project meetings and local planning team meetings throughout the update process. Due to COVID-19, meetings were held with the option to attend virtually. Meeting agendas, meeting minutes and sign-in sheets were developed and maintained for each meeting conducted by MCM. These documents are detailed in Appendix C of this plan.

Public meetings with local elected officials were held, as well as work sessions and in-progress review meetings with the Jefferson County Local Planning Team and staff. At each of the public meetings, respecting the importance of local knowledge, municipal officials were strongly encouraged to submit hazard mitigation project opportunity forms, complete their respective portions of the capability's assessment and review, and eventually adopt the county hazard mitigation plan. Jefferson County will continue to work with all local municipalities to collect local hazard mitigation project opportunities.

The HMP planning process consisted of:

- Applying for and receiving a hazard mitigation planning grant (HMPG) to fund the planning project.
- Announcing the initiative via press releases and postings on the county website.
- Involving elected and appointed county and municipal officials in a series of meetings, training sessions, and workshops.
- Identifying capabilities and reviewed the information with the municipalities.
- Identifying hazards.
- Assessment of risk and analyzing vulnerabilities.
- Identifying mitigation strategies, goals, and objectives.
- Developing an implementation plan.
- Announcing completion via press releases and postings on the county website.
- Plan adoption at a public meeting of the Jefferson County Board of Commissioners.
- Plan submission to FEMA and PEMA.

The 2023 Jefferson County HMP was completed June 12, 2023. The 2023 plan follows an outline developed by PEMA which provides a standardized format for all local HMPs in the Commonwealth of Pennsylvania. The 2023 HMP format is consistent with the PEMA recommended format. The 2023 Jefferson County HMP combined dam failure and levee failure profiles, terrorism and cyber security. The 2023 Jefferson County HMP added additional hazard profiles to the HMP; blighted properties, emergency services, and opioid epidemic, and these additional profiles increased the subsections in section 4.3 of the HMP. The 2023 Jefferson County HMP removed nuclear incidents from the hazard profiles; this was in the 2018 HMP plan because of a company with a nuclear component, this company is no longer in business within Jefferson County, and the county is not in the direct plume path of any nuclear power plants.

3.2. The Planning Team

The 2023 Jefferson County Hazard Mitigation Plan update was led by the Jefferson County Steering Committee. The Jefferson County Steering Committee provided guidance and leadership for the overall project. The steering committee assisted MCM Consulting Group, Inc. with dissemination of information and administrative tasks. *Table 7 – Steering Committee* outlines the individuals that comprised this team.

Table 7 - Steering Committee

Jefferson County Hazard Mitigation Plan Update Steering Committee		
Name	**Organization**	**Position**
Tracy William Zents	Jefferson County Department of Emergency Services	Director
Marcie Caine	Jefferson County Department of Emergency Services	Deputy EMA Planner
Dianne Hetrick	Jefferson County Department of Emergency Services	Administrative Assistant
Michael Rearick	MCM Consulting Group, Inc.	Director of Operations
Adam Leister	MCM Consulting Group, Inc.	Senior GIS Consultant
Valerie Zents	MCM Consulting Group, Inc.	Senior Consultant
Daniel Becker	MCM Consulting Group, Inc.	Consultant

In order to represent the county, the Jefferson County Steering Committee developed a diversified list of potential local planning team (LPT) members. Members that participated in the 2018 hazard mitigation plan were highly encouraged to join the 2023 team. The steering committee then provided invitations to the prospective members and provided a description of duties to serve on the LPT. The invitations for members of the LPT were disseminated by the Jefferson County Department of Emergency Services utilizing letters, email, and telephone calls. The LPT worked throughout the process to plan and hold meetings, collect information, and conduct public outreach.

The stakeholders listed in *Table 8 – Local Planning Team* served on the 2023 Jefferson County Hazard Mitigation Local Planning Team, actively participated in the planning process by attending meetings, completing assessments, surveys, and worksheets and/or submitting comments.

Table 8 - Local Planning Team

Jefferson County Hazard Mitigation Plan Local Planning Team		
Name	**Organization**	**Position**
Tracy William Zents	Jefferson County Department of Emergency Services	EMA Director
Marcie Caine	Jefferson County Department of Emergency Services	Deputy EMA
Dianne Hetrick	Jefferson County Department of Emergency Services	Administrative Assistant
Laurie Wayne	Brockway Borough	Borough Manager

Jefferson County Hazard Mitigation Plan Local Planning Team		
Name	**Organization**	**Position**
Patrick Watkavitch	Brockway Borough Municipal Authority	Board Member
Erich May	Brookville Area Schools	Superintendent
Jeff Pisarcik	Jefferson County	Commissioner
Mike Guidice	Punxsutawney Area Schools	Principal
Charlie Hughes	PEMA	Emergency Management Specialist
Aaron Haines	Brookville Municipal Authority	Water Commissioner
Bob Shaffer	DUJ Airport	Airport Manager
Christina Earl	American Red Cross	Disaster Program Manager
Elizabeth Keth	Penn Highlands – Brookville	RN
Toby Santik	Punxsutawney Borough	Borough Manager
Brian Mullallar	Brockway Area Schools	Principal
Seth Kerr	Jefferson County GIS	GIS Director
Jill Martin	Butler County Community College BC3	Director
Rhonda Barkley	Summerville Borough	Borough Manager

3.3. Meetings and Documentation

Meetings with local elected officials and the local planning team were held as needed. At each of the meetings, municipal officials were strongly encouraged to submit hazard mitigation project opportunity forms, complete their respective portions of the capability assessment, review and eventually adopt the multi-jurisdictional HMP. *Table 9 – HMP Process Timeline* lists the meetings held during the HMP planning process, which organizations and municipalities attended and the topic that was discussed at each meeting. All meeting agendas, sign-in sheets, presentation slides, and other documentation is in Appendix C.

The draft plan was made available for public review on June 12, 2023. The draft was advertised on Jefferson County's social media page and was made available digitally on the Jefferson County website at:

www.jeffersoncountypa.com

The public comment period remained open until July 12, 2023. All public comments were submitted via an online survey or in writing to Marcie Caine at the Jefferson County Department of Emergency Services. Public commenting was available during the public comment period via a Survey Monkey link that was advertised on the county website and social media pages. No public comments were received for this planning period, so no comments are included in Appendix C of this hazard mitigation plan update.

Table 9 - HMP Process Timeline

Jefferson County HMP Process Timeline		
Date	**Meeting**	**Description**
09/19/2022	Steering Committee Kickoff	Kickoff meeting of the steering committee.
10/26/2022	Local Planning Team Kickoff	Kickoff meeting of the local planning team.
10/26/2022	Municipality Kickoff	Kickoff meeting of the municipalities.
11/15/2022	Local Planning Team	Risk factor assessment and select new hazard profiles.
02/07/2023	Local Planning Team	Review 2018 goals, objectives, and mitigation actions.
02/07/2023	Municipality Meeting	Mitigation opportunity form development.
02/07/2023	Public Meeting	Public meeting for risk assessment section review.
02/21/2023	Local Planning Team	2023 mitigation actions drafted.
04/11/2023	Local Planning Team	Finalize 2023 mitigation action plan.
05/11/2023	Local Planning Team	
06/06/2023	Public Meeting	Draft plan presentation.

3.4. Public and Stakeholder Participation

Jefferson County engaged numerous stakeholders and encouraged public participation during the HMP update process. Advertisements for public meetings were completed utilizing the local newspaper and the Jefferson County website. Copies of those advertisements are in Appendix C. Municipalities and other county entities were invited to participate in various meetings and encouraged to review and update various worksheets and surveys. Copies of all meeting agendas, meeting minutes and sign-in sheets are located in Appendix C. Worksheets and surveys completed by the municipalities and other stakeholders are located in appendices of this plan update as well. Municipalities were also encouraged to review hazard mitigation related items with other constituents located in the municipality like businesses, academia, private and nonprofit interests.

The tools listed below were distributed with meeting invitations, provided directly to municipalities for completion and return to the Jefferson County Department of Emergency Services or at meetings to solicit information, data, and comments from both local municipalities and other key stakeholders. Responses to these worksheets and surveys are available for review at the Jefferson County Department of Emergency Services.

1. **Risk Assessment Hazard Identification and Risk Evaluation Worksheet**: Capitalizes on local knowledge to evaluate the change in the frequency of occurrence, magnitude, or impact and/or geographic extent of existing hazards and allows communities to evaluate hazards not previously profiled using the Pennsylvania Standard List of Hazards.
2. **Capability Assessment Survey**: Collects information on local planning, regulatory, administrative, technical, fiscal, and political capabilities that can be included in the countywide mitigation strategy.
3. **Municipal Project Opportunity Forms and Mitigation Actions**: Copies of the 2018 mitigation opportunity forms that were included in the current HMP were provided to the municipalities for review and amendment. These opportunities are located in Appendix G. The previous mitigation actions were provided and reviewed at update meetings. New 2023 municipal project opportunity forms are included as well, located in Appendix G.

In an effort to capture public input, the Jefferson County LPT held in-person meetings and offered on-line surveys. Members of the public were also encouraged to contact Jefferson County Department of Emergency Services or MCM Consulting Group, Inc. with any comments or questions regarding this update. Any public comment that was received during public meetings or during the draft review of the plan were documented and included in the plan. Copies of newspaper public meeting notices, website posted public notices, and other correspondence are included in Appendix C of this plan.

Jefferson County invited all contiguous counties to review the 2023 draft hazard mitigation plan. A letter was sent to the emergency management coordinator in Armstrong, Clarion, Clearfield, Elk, Forest, and Indiana counties in Pennsylvania, on. Copies of these letters are included in Appendix C Multi-Jurisdictional Planning.

3.5. Multi-Jurisdictional Planning

Jefferson County used an open, public process to prepare this HMP. Meetings and letters to municipal officials were conducted to inform and educate them about hazard mitigation planning and its local requirements. Municipal officials provided information related to existing codes and ordinances, the risk and impacts of known hazards on local infrastructure and critical facilities and recommendations for related mitigation opportunities. The pinnacle to the municipal involvement process was the adoption of the final plan. *Table 10 – Municipality Worksheets, Surveys, and Forms Participation* reflects the municipalities participation by completing worksheets, surveys, and forms.

Table 10 - Municipality, Worksheets, Surveys, and Forms Participation

Jefferson County HMP Worksheets, Surveys, and Forms Participation				
Municipality	**Capability Assessment Survey**	**Risk Assessment Hazard Identification and Risk Evaluation Worksheet**	**NFIP**	**Hazard Mitigation Opportunity Form Review and Updates**
Barnett Township				
Beaver Township	X	X	X	
Bell Township	X	X	X	
Big Run Borough	X	X	X	
Brockway Borough	X	X	X	
Brookville Borough		X		
Clover Township	X	X	X	
Corsica Borough	X	X	X	X
Eldred Township		X		
Falls Creek Borough	X	X	X	
Gaskill Township			X	
Heath Township	X	X	X	X
Henderson Township	X	X	X	X
Knox Township	X	X	X	
McCalmont Township	X	X	X	X
Oliver Township	X	X	X	
Perry Township	X	X	X	X
Pine Creek Township	X	X	X	
Polk Township	X	X	X	
Porter Township	X	X	X	
Punxsutawney Borough	X	X		
Reynoldsville Borough	X	X	X	
Ringgold Township	X	X	X	X
Rose Township	X	X	X	
Snyder Township		X	X	X
Summerville Borough				
Sykesville Borough	X	X	X	X
Timblin Borough		X		
Union Township	X	X		
Warsaw Township	X	X	X	
Washington Township	X	X	X	

Jefferson County HMP Worksheets, Surveys, and Forms Participation				
Municipality	**Capability Assessment Survey**	**Risk Assessment Hazard Identification and Risk Evaluation Worksheet**	**NFIP**	**Hazard Mitigation Opportunity Form Review and Updates**
Winslow Township				
Worthville Borough	X	X	X	
Young Township	X	X	X	

The majority of the thirty-four municipalities within Jefferson County adopted the 2018 Jefferson County Hazard Mitigation Plan as the municipal hazard mitigation plan. The goal of the Jefferson County Local Planning Team is to have 100% participation by municipalities in adopting the 2023 Jefferson County Hazard Mitigation.

The table above was completed with the most accurate information available at the time of the writing of this Hazard Mitigation Plan Update. Since the writing of this plan, some of the municipalities listed above have provided information to Jefferson County which updates their participation status.

4. Risk Assessment

4.1. Update Process Summary

A key component to reducing future loss is to first have a clear understanding of what the current risks are and what steps may be taken to lessen their threat. The development of the risk assessment is a critical first step in the entire mitigation process, as it is an organized and coordinated way of assessing potential hazards and risks. The risk assessment identifies the effects of both natural and human-caused hazards and describes each hazard in terms of its frequency, severity, and county impact. Numerous hazards were identified as part of the process.

A risk assessment evaluates threats associated with a specific hazard and is defined by probability and frequency of occurrence, magnitude, severity, exposure, and consequences. The Jefferson County risk assessment provides in-depth knowledge of the hazards and vulnerabilities that affect Jefferson County and its municipalities. This document uses an all-hazards approach when evaluating the hazards that affect the county and the associated risks and impacts each hazard presents.

This risk assessment provides the basic information necessary to develop effective hazard mitigation/prevention strategies. Moreover, this document provides the foundation for the Jefferson County Emergency Operations Plan (EOP), local EOPs and other public and private emergency management plans.

The Jefferson County risk assessment is not a static document, but rather, is a biennial review requiring periodic updates. Potential future hazards include changing technology, new facilities and infrastructure, dynamic development patterns and demographic and socioeconomic changes into or out of hazard areas. By contrast, old hazards, such as brownfields and landfills, may pose new threats as county conditions evolve.

Using the best information available and geographic information systems (GIS) technologies, the county can objectively analyze its hazards and vulnerabilities. Assessing past events is limited by the number of occurrences, scope and changing circumstances. For example, ever-changing development patterns in Pennsylvania have a dynamic impact on traffic patterns, population density and distribution, storm water runoff and other related factors. Therefore, limiting the risk assessment to past events is myopic and inadequate.

The Jefferson County Local Planning Team (LPT) reviewed and assessed the change in risk for all natural and human-caused hazards identified in the 2018 hazard mitigation plan. The mitigation planning team then identified hazards that were outlined within the Pennsylvania Hazard Mitigation Plan but not included in the 2018 Jefferson County Hazard Mitigation Plan that could impact Jefferson County. The team utilized the hazard identification and risk evaluation worksheet that was provided by the Pennsylvania Emergency Management Agency.

The Jefferson County Steering Committee met with municipalities and provided guidance on how to complete the municipal hazard identification and risk evaluation worksheet. Twenty-nine municipalities in Jefferson County returned a completed worksheet. This information was combined with the county information to develop an overall list of hazards that would need to be profiled.

Once the natural and human-caused hazards were identified and profiled, the local planning team then completed a vulnerability assessment for each hazard. An inventory of vulnerable assets was completed utilizing GIS data and local planning team knowledge. The team used the most recent Jefferson County assessment data to estimate loss to particular hazards. Risk factor was then assessed to each of the twenty-six hazards utilizing the hazard prioritization matrix. This assessment allows the county and its municipalities to focus on and prioritize local mitigation efforts on areas that are most likely to be damaged or require early response to a hazard event.

4.2. Hazard Identification

4.2.1. Presidential and Gubernatorial Disaster Declarations

Table 11 – Presidential & Gubernatorial Disaster Declaration contains a list of all Presidential and Gubernatorial disaster declarations that have affected Jefferson County and its municipalities from 1955 through 2022, according to the Pennsylvania Emergency Management Agency.

Table 11 - Presidential & Gubernatorial Disaster Declarations

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
May, 1956	Flood	Presidential
September, 1963	Drought	Presidential
January, 1966	Heavy Snow	Gubernatorial
February, 1972	Heavy Snow	Gubernatorial
June, 1972	Flood (Agnes)	Presidential
February, 1974	Truckers Strike	Gubernatorial
July, 1974	Flood	Gubernatorial
August, 1974	Flood	Gubernatorial
July, 1976	High Winds/Flooding	Gubernatorial
January, 1977	Gas Shortage/Severe Winter Weather	Presidential
July, 1977	Flash Flood	Presidential

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
January, 1978	Heavy Snow	Gubernatorial
February, 1978	Blizzard	Gubernatorial
June, 1981	Flash Flood	Presidential
March, 1993	Blizzard	Presidential
January, 1994	Severe Winter Storms	Presidential
January, 1996	Severe Winter Storm	Presidential
January, 1996	Flooding	Presidential
July, 1996	Flooding	Presidential
December, 1998	Drought	Gubernatorial
September, 1999	Hurricane Floyd	Presidential
September, 2003	Hurricane Isabel/Henri	Presidential
September, 2004	Tropical Depression Ivan	Presidential
September, 2005	Hurricane Katrina	Gubernatorial
September, 2005	Hurricane Katrina	Presidential
June, 2006	Flooding	Presidential
September, 2006	Tropical Depression Ernesto	Gubernatorial
February, 2007	Severe Winter Storm	Gubernatorial
February, 2007	Waive regulations limiting hours-of-service for commercial vehicle drivers	Gubernatorial
April, 2007	Severe Winter Storm	Gubernatorial
February, 2010	Severe Winter Storm	Gubernatorial
January, 2011	Severe Winter Storm	Gubernatorial
August, 2011	Severe Storms and Flooding (Lee/Irene)	Gubernatorial
April, 2012	Spring Winter Storms	Gubernatorial
October, 2012	Hurricane Sandy	Gubernatorial
October, 2012	Hurricane Sandy	Presidential
June, 2013	High Winds, Thunderstorms, Heavy Rain, Tornado, Flooding	Gubernatorial
June, 2013	Severe Storms, Tornadoes, Flooding	Presidential
October, 2013	Severe Storms, Tornadoes and Flooding	Presidential
January, 2014	Extreme Weather, Utility Interruption	Gubernatorial
February, 2014	Severe Winter Storm	Gubernatorial
February, 2014	Severe Winter Storm	Presidential

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
January, 2015	Severe Winter Storms	Gubernatorial
August, 2015	Severe Storms	Gubernatorial
January, 2016	Severe Winter Storm	Gubernatorial
January, 2016	Severe Winter Storm and Snowstorm	Presidential
October, 2016	Severe Storms and Flooding	Presidential
March, 2017	Severe Winter Storm	Gubernatorial
January, 2018	Opioid Crisis	Gubernatorial
August, 2018	Severe Weather and Flooding	Gubernatorial
August, 2018	Severe Storms and Flooding	Presidential
January, 2019	Severe Winter Storms	Gubernatorial
January, 2020	Covid-19	Presidential
May, 2020	Civil Disturbance (George Floyd)	Gubernatorial
October, 2020	Civil Disturbance (Walter Wallace Jr.)	Gubernatorial
December, 2020	Severe Winter Storms	Gubernatorial
February, 2021	Severe Winter Storms	Gubernatorial
August, 2021	Hurricane Ida	Gubernatorial
August, 2021	Hurricane Ida	Presidential
Source: Pennsylvania Emergency Management Agency and Federal Emergency Management Agency		

4.2.2. Summary of Hazards

The Jefferson County LPT was provided the Pennsylvania Standard List of Hazards to be considered for evaluation in the 2023 HMP Update. Following a review of the hazards considered in the 2018 HMP and the standard list of hazards, the local planning team decided that the 2023 plan should identify, profile, and analyze twenty-one hazards. These twenty-one hazards include all the hazards profiled in the 2018 plan except for nuclear incidents, that hazard was removed as the hazard source was removed from the county. The list below contains the hazards that have the potential to impact Jefferson County as identified through previous risk assessments, the Jefferson County Hazard Vulnerability Analysis and input from those who participated in the 2023 HMP update. Hazard profiles are included in Section 4.3 for each of these hazards.

Identified Natural Hazards

Drought

Drought is defined as a deficiency of precipitation experienced over an extended period of time, usually a season or more. Droughts increase the risk of other hazards, like wildfires, flash floods, and landslides or debris flows. This hazard is of particular concern in Pennsylvania due to the prevalence of farming and other water-dependent industries, water dependent recreation uses, and residents who depend on wells for drinking water.

Earthquake

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper ten to twenty miles of the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of underground caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons and disrupt the social and economic functioning of the affected area.

Flooding, Flash Flooding, and Ice Jam Flooding

Flooding is the temporary condition of partial or complete inundation of normally dry land, and it is the most frequent and costly of all-natural hazards in Pennsylvania. Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location, often along mountain streams and in urban areas where much of the ground is covered by impervious surfaces. Winter flooding can include ice jams which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams.

Hurricane/Tropical Storm

Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counterclockwise (in the Northern Hemisphere) and whose diameter averages 10-30 miles across. Potential threats from hurricanes include powerful winds, heavy rainfall, storm surges, coastal and inland flooding, rip currents, tornadoes, and landslides. The Atlantic hurricane season runs from June 1 to November 30.

Landslide

In a landslide, masses of rock, earth or debris move down a slope. Landslides can be caused by a variety of factors, including earthquakes, storms, fire, and human modification of land. Areas that are prone to landslide hazards include previous landslide areas, areas on or at the base of slopes, areas in or at the base of drainage hollows, developed hillsides with leach field septic systems, and areas recently burned by forest or brush fires.

Radon Exposure

Radon is a radioactive gas produced by the breakdown of uranium in soil and rock that can lead to lung cancer in people exposed over a long period of time. Most exposure comes from breathing in radon gas that enters homes and buildings through foundation cracks and other openings. According to the DEP, approximately 40% of Pennsylvania homes have elevated radon levels.

Subsidence/Sinkhole

Land subsidence is a gradual settling or sudden sinking of the ground surface due to the movement of subsurface materials. A sinkhole is a subsidence feature resulting from the sinking of surficial material into a pre-existing subsurface void. Subsidence and sinkholes are geologic hazards that can impact roadways and buildings and disrupt utility services. Subsidence and sinkholes are most common in areas underlain by limestone and can be exacerbated by human activities such as water, natural gas, and oil extraction.

Tornadoes/Windstorm

A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground. About 1,250 tornadoes hit the U.S. each year, with about sixteen hitting Pennsylvania. Damaging winds exceeding 50-60 miles per hour can occur during tornadoes, severe thunderstorms, winter storms, or coastal storms. These winds can have severe impacts on buildings, pulling off the roof covering, roof deck, or wall siding and pushing or pulling off the windows.

Wildfire

A wildfire is an unplanned fire that burnt in a natural area. Wildfires can cause injuries or death and can ruin homes in their path. Wildfires can be caused by humans or lightning, and can happen anytime, though the risk increases in period of little rain. In Pennsylvania, 98% of wildfires are caused by people.

Winter Storm

A winter storm is a storm in which the main types of precipitation are snow, sleet, or freezing rain. A winter storm can range from a moderate snowfall or ice event over a period of a few hours to blizzard conditions with wind-driven snow that lasts for several days. Most deaths from winter storms are not directly related to the storm itself, but result from traffic accidents on icy roads, medical emergencies while shoveling snow, or hypothermia from prolonged exposure to cold.

Identified Human Caused Hazards

Blighted Properties

Buildings and other engineered structures, including bridges, may collapse if their structural integrity is compromised, especially due to effects from other natural or human-made hazards. Older buildings or structures, structures that are not built to standard codes, or structures that have been weakened are more susceptible to be affected by these hazards.

Dam Failure

Dam failure is the uncontrolled release of water (and any associated wastes) from a dam. This hazard often results from a combination of natural and human causes, and can follow other hazards such as hurricanes, earthquakes, and landslides. The consequences of dam failures can include property and environmental damage and loss of life.

Emergency Services

Emergency medical services (EMS) and fire department services play a crucial role in the emergency response system, and the functionality of these emergency services directly impacts many of the other hazard profiles in this report. Both EMS and fire services face challenges from lack of funding and lower rates of volunteerism.

Environmental Hazards/Hazardous Materials

Environmental hazards are hazards that pose threats to the natural environment, the built environment and public safety through the diffusion of harmful substances, materials, or products. Environmental hazards include the following:

- Hazardous material releases: at fixed facilities or as such materials are in transit and including toxic chemicals, infectious substances, biohazardous waste and any materials that are explosive, corrosive, flammable, or radioactive (PL 1990-165, § 207(e)).

- Air or Water Pollution; the release of harmful chemical and waste materials into water bodies or the atmosphere, for example (National Institute of Health Sciences, July 2009; Environmental Protection Agency, Natural Disaster PSAs, 2009).
- Superfund Facilities: hazards originating from abandoned hazardous waste sites listed on the National Priorities List (Environmental Protection Agency, National Priorities List, 2009).
- Manure Spills: involving the release of stored or transported agricultural waste, for example (Environmental Protection Agency, Environmental Impacts of…, 1998).
- Product Defect or Contamination; highly flammable or otherwise unsafe consumer products and dangerous foods (Consumer Product Safety Commission, 2003).

Hazardous material releases can contaminate air, water, and soils and have the potential to cause injury or death. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events.

Levee Failure

A levee is a human-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to provide protection from temporary flooding (FEMA, 2016). A levee failure or breach occurs when a levee fails to prevent flooding on the landside of the levee. The consequences of a sudden levee failure can be catastrophic, with the resulting flooding causing loss of life, emergency evacuations, and significant property damage.

Opioid Epidemic

An opioid epidemic is the rapid increase in the use of prescription and non-prescription opioid drugs in the United States beginning in the late 1990s and continuing throughout the first two decades of the 2000s. Opioids are a diverse class of moderately strong painkillers, including oxycodone, hydrocodone, and a very strong painkiller, fentanyl, which is synthesized to resemble other opiates such as opium-derived morphine and heroin. The potency and availability of these substances, de-spite their high risk of addiction and overdose, have made them popular both as for-mal medical treatments and as recreation-al drugs. Due to their sedative effects on the part of the brain which regulates breathing, opioids in high doses present the potential for respiratory depression and may cause respiratory failure and death.

The Commonwealth of Pennsylvania, along with other states in the nation has enact-ed legislation to curb the prescription and distribution of these drugs to try to prevent addiction rising from abuse as a painkiller. This includes but is not limited to restrictions to prescribing to minors, quantity limits, a prescription database with entry requirements and other limits to its availability.

Terrorism/Cyberterrorism Incidents

Terrorism is use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber-attacks (computer-based); and the use of chemical, biological, nuclear, and radiological weapons. Cyber-attacks have become an increasingly pressing concern. Cyberterrorism refers to acts of terrorism committed using computers, networks, and the internet. The most widely cited definition comes from Denning's Testimony before the Special Oversight Panel on Terrorism: "Cyberterrorism…is generally understood to mean unlawful attacks and threats of attack against computers, networks, and the information stored therein when done to intimidate or coerce a government or its people in furtherance of political or social objectives. Further, to qualify as cyberterrorism, an attack should result in violence against persons or property, or at least cause enough harm to generate fear".

Transportation Accidents

Transportation accidents are technological hazards involving the nation's system of land, sea, and air transportation infrastructure. A flaw or breakdown in any component of this system can and often does result in a major disaster involving loss of life, injuries, property and environmental damage, and economic consequences.

Urban Fire and Explosions

Urban fires and explosions include those fires and explosions that occur within urban, or developed, regions, and often pose an increased threat due to their tendency to easily spread to neighboring structures. The effects may be minor or severe and include injury, loss of life, property damage, and residential or economic disruption/displacement.

Utility Interruption

Utility interruption hazards are hazards that impair the functioning of important utilities in the energy, telecommunications and public works and information network sectors. Utility interruption hazards include the following:

- Geomagnetic Storms; including temporary disturbances of the Earth's magnetic field resulting in disruptions of communication, navigation, and satellite systems (National Research Council et al., 1986).

- Fuel or Resource Shortage; resulting from supply chain breaks or secondary to other hazard events, for example (McGrady County, PA, 2005).
- Electromagnetic Pulse; originating from an explosion or fluctuating magnetic field and causing damaging current surges in electrical and electronic systems (Institute for Telecommunications Sciences, 1996).
- Information Technology Failure; due to software bugs, viruses, or improper use (Rainer Jr., et al, 1991).
- Ancillary Support Equipment; electrical generating, transmission, system-control, and distribution-system equipment for the energy industry (Hirst & Kirby, 1996).
- Public Works Failure; damage to or failure of highways, flood control systems, deep-water ports and harbors, public buildings, bridges, dams, for example (Unit-ed States Senate Committee on Environment and Public Works, 2009).
- Telecommunications System Failure; Damage to data transfer, communications, and processing equipment, for example (FEMA, 1997)
- Transmission Facility or Linear Utility Accident; liquefied natural gas leakages, explosions, facility problems, for example (United States Department of Energy, 2005)
- Major Energy, Power, Utility Failure; interruptions of generation and distribution, power outages, for example (United States Department of Energy, 2000).

4.2.3. Climate Change

Impacts of Climate Change on Identified Hazards

Humans have become the dominant species on Earth and our society and influence is globalized. Human activity such as the large-scale consumption of fossil fuels and de-forestation has caused atmospheric carbon dioxide concentrations to significantly increase and a notable diversity of species to go extinct. The result is rapid climate change unparalleled in Earth's history and an extinction event approaching the level of a mass extinction (Barnosky et al., 2011; Wake & Vredenburg, 2008). The corresponding rise of average atmospheric temperatures is intensifying many natural hazards, and further threatening biodiversity. The effects of climate change on these hazards are expected to intensify over time as temperatures continue to rise, so it is prudent to be aware of how climate change is impacting natural hazards.

The most obvious change is in regard to extreme temperature. As average atmospheric temperatures rise, extreme high temperatures become more threatening, with record high temperatures outnumbering record low temperatures 2:1 in recent years. As climate change intensifies, it is expected that the risk of extreme heat will be amplified whereas the risk of extreme cold will be attenuated. Some studies show increased insect activities during a similar rapid warming event in Earth's history. Other studies make projections that with the warming temperatures and lower annual precipitation that are expected with climate change, there will be an expansion of the suitable climate for mosquitos, potentially increasing the risk of infectious disease.

Climate change is likely to increase the risk of droughts (Section 4.3.1). Higher average temperatures mean that more precipitation will fall as rain rather than snow, snow will melt earlier in the spring, and evaporation and transpiration will increase. Along with the prospect of decreased annual precipitation, the risk of hydrological and agricultural drought is expected to increase (Sheffield & Wood, 2008). Correspondingly this will impact wildfires. Drought is accompanied by drier soils and forests, resulting in an elongated wildfire season and more intense and long-burning wildfires (Pechony & Shindell, 2010). However, the Southwest United States is at a greater risk of this increased drought and wildfire activity than Jefferson County in the Eastern United States.

While it may seem counterintuitive considering the increased risk of drought, there is also an increased risk of flooding associated with climate change (Section 4.3.3). Warmer temperatures mean more precipitation will fall as rain rather than snow. Combined with the fact that warmer air holds more moisture, the result is heavier and more intense rainfalls and dam and levee failures. Similarly, winter storms are expected to become more intense, if possibly less frequent. Climate change is also expected to result in more intense hurricanes and tropical storms. With the rise of atmospheric temperatures, ocean surface temperatures are rising, resulting in warmer and more moist conditions where tropical storms develop (Stott et al., 2010). A warmer ocean stores more energy and is capable of fueling stronger storms. It is projected that the Atlantic hurricane season is elongating, and there will be more category 4 and 5 hurricanes than before (Trenberth, 2010).

Climate change is contributing to the introduction of new invasive species (Section 4.3.6). As maximum and minimum seasonal temperatures change, non-native species are able to establish themselves in previously inhospitable climates where they have a competitive advantage. This may shift the dominance of ecosystems in the favor of non-native species, contributing to species loss and the risk of extinction.

This type of sudden global change is novel to humanity. Despite the myriad of well thought out research, there is still much uncertainty surrounding the future of the Earth. All signs point to the intensification of the hazards mentioned above, especially if human society and individuals do not make swift and significant changes combat species losses.

4.3. Hazard Profiles

4.3.1. Drought

4.3.1.1 Location and Extent

While Pennsylvania is generally more water-rich than many U.S. states, the commonwealth may experience drought conditions intermittently throughout the calendar year. A drought is broadly defined as a time period of prolonged dryness that contributes to the depletion of ground and surface water. Droughts are regional climatic events, so when such an event occurs in Jefferson County, impacts are not restricted to the county and are often more widespread. The spatial extent of the impacted area can range from localized areas in Pennsylvania to the entire Mid-Atlantic region.

There are three types of droughts:

Meteorological Drought – A deficiency of moisture in the atmosphere compared to average conditions. Meteorological drought is defined by the duration of the deficit and degree of dryness and is often associated with below average rainfall. Depending on the severity of the drought, it may or may not have a significant impact on agriculture and the water supply.

Agricultural Drought – A drought inhibiting the growth of crops, due to a moisture deficiency in the soil. Agricultural drought is linked to meteorological and hydrologic drought.

Hydrologic Drought – A prolonged period without rainfall that has an adverse effect on streams, lakes, and groundwater levels, potentially impacting agriculture.

Droughts are often the leading contributing factor to wildfires, as they leave areas with little to no moisture. Droughts can have adverse effects on farms and other water-dependent industries resulting in local economic loss. Areas of extensive agriculture use are particularly vulnerable to drought; 80,411 of Jefferson County, or roughly .052% of the 419,200 total land acreage, make up farmland (United States Department of Agriculture [USDA], 2017 Census). The total number of farms for Jefferson County is 468 and the average acreage for farms in Jefferson County is 172 acres. Jefferson County ranks 50th of sixty-seven counties in the commonwealth for agricultural production, totaling over $22 million annually. Agricultural production from crops, including nursery and greenhouse crops, accounts for more than $11 million in commerce annually. Production from livestock, poultry, and their products accounts for $11 million annually. Acreage for farming has decreased since the 2012 USDA Census when there was a reported total of .061% farming and drought vulnerable acres.

4.3.1.2 Range of Magnitude

The average annual precipitation of 34 to 52 inches occurs primarily during the spring and summer months. This value is derived from an average of ten years of mean annual precipitation data for Jefferson County. Rural farming areas of Jefferson County are most at risk when a drought occurs. A drought can create a significant financial burden for the community. Approximately 50% of Jefferson County farms are family-owned and operated. Additionally, 58% of the county's farmland use is devoted to crop cultivation and 9% to livestock and poultry. Wildfires are often the most severe secondary effect associated with drought. Wildfires can devastate wooded and agricultural areas, structures near high wildfire loads, and farm production facilities, and threaten natural resources. Prolonged drought conditions can have a lasting impact on the economy and can cause major ecological changes, such as increases in scrub growth, flash flooding, and soil erosion.

Long-term water shortages during severe drought conditions can have a significant impact on agribusiness, public utilities, and other industries reliant on water for production services. Jefferson County also has a growing agritourism business that would be threatened by long-term drought.

Local municipalities may, with the approval of the Pennsylvania Emergency Management Council, implement local water rationing. These individual water rationing plans, authorized through provisions of 4 PA code Chapter 120, will require specific limits on individual water consumption to achieve significant reductions in use. Under mandatory water usage restrictions imposed by the commonwealth and/or local municipalities, procedures are provided for granting of variances to consider individual hardships and economic dislocations. *Table 12 – Drought Preparation Phases* shows the FEMA-defined levels of drought severity along with suggested actions, requests, and goals.

Table 12 - Drought Preparation Phases

Drought Preparation Phases				
Phase	**General Activity**	**Actions**	**Request**	**Goal**
Drought Watch	Early stages of planning and alert for drought possibility.	Increased water monitoring, awareness, and preparation for response among government agencies, public water suppliers, water users, and the public.	Voluntary water conservation.	Reduce water use by 5%.
Drought Warning	Coordinate a response to imminent drought conditions and potential water shortages.	Reduce shortages – relieve stressed sources, develop new sources if needed.	Continue voluntary water conservation, impose mandatory water use restrictions if needed.	Reduce water use by 10 – 15%.
Drought Emergency	Management of operations to regulate all available resources and respond to emergency.	Support essential and high priority water uses and avoid unnecessary uses.	Possible restrictions on all nonessential water uses.	Reduced water use by 15%.
Source: Pennsylvania Department of Environmental Protection, 2017				

The commonwealth uses five parameters to assess drought conditions:

- Stream flows (compared to benchmark records)
- Precipitation (measured as the departure from normal, thirty-year average precipitation)
- Reservoir storage levels in a variety of locations such as three New York City reservoirs in the upper Delaware River Basin
- Groundwater elevations in a number of counties (comparing to past month, past year, and historic records)
- Soil moisture via the Palmer Drought Index as seen in *Table 13 – Palmer Drought Severity Index*, which is a soil moisture algorithm calibrated for relatively homogenous regions which measures dryness based on recent precipitation and temperature.

Table 13 - Palmer Drought Severity Index

Palmer Drought Severity Index	
Severity Category	**PDSI Value**
Extremely Wet	4.0 or more
Very Wet	3.0 to 3.99
Moderately Wet	2.0 to 2.99
Slightly Wet	1.0 to 1.99
Incipient Dry Spell	0.5 to 0.99
Near Normal	0.49 to -0.49
Incipient Dry Spell	-0.5 to -0.99
Mild Drought	-1.0 to -1.99
Moderate Drought	-2.0 to -2.99
Severe Drought	-3.0 to -3.99
Extreme Drought	-4.0 or less
Source: PDSI	

The effects of a drought can be far-reaching both economically and environmentally. Economic impacts include reduced productivity of aquatic resources, mandatory water use restrictions, well failures, cutbacks in industrial production, agricultural losses, and limited recreational opportunities. Environmental impacts of drought include the following: *Table 14 – Economic and Environmental Impacts of Drought Events* qualifies the potential economic and environmental impacts from a drought event.

Table 14 - Economic and Environmental Impacts of Drought Events

Economic and Environmental Impacts of Drought Events	
Economic	**Environmental**
- Reduced productivity of aquatic resources - Mandatory water use restrictions - Well failures - Cutbacks in industrial production - Agricultural losses - Limited recreational opportunities	- Hydrologic effects - Adverse effects on animal populations - Damage to plant communities - Increased number and severity of fires - Reduced soil quality - Air quality effects - Loss of quality in landscape

4.3.1.3 Past Occurrence

The Pennsylvania Department of Environmental Protection (PA DEP) maintains the most comprehensive data on drought occurrences across the commonwealth. Descriptions of drought status categories (i.e., watch, warning, and emergency) are included in the "Range of Magnitude" section above. The declared drought status from 1980 to 2021 is shown in *Table 15 – Past Drought Events in Jefferson County*.

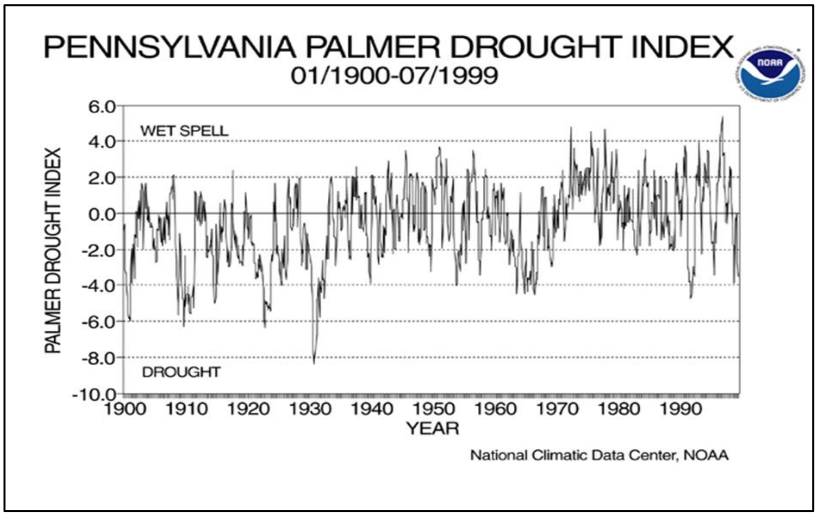
The National Oceanic and Atmospheric Administration (NOAA) has archived records showing extreme droughts for the commonwealth in 1931 and a prolonged event in the 1960s as seen in *Figure 6 – Pennsylvania Palmer Drought Index 1900 – 1999*.

Based on the county's more recent disaster history and other drought occurrence data, the worst drought event in Jefferson County occurred in the summer of 1999. Extended dry weather spurred Governor Thomas Ridge to declare a drought emergency in fifty-five counties. During this event, precipitation deficits for that summer averaged five to seven inches below normal; the Susquehanna River hit record low flows, streams were dry, and many wells were depleted. Crop damage losses totaled over $500 million statewide, and those losses equated to 70% to 100% of crop production. There were additional losses from the decline of milk production. Also, the state asked municipal and private water suppliers to restrict local water use.

Table 15 - Past Drought Events in Jefferson County

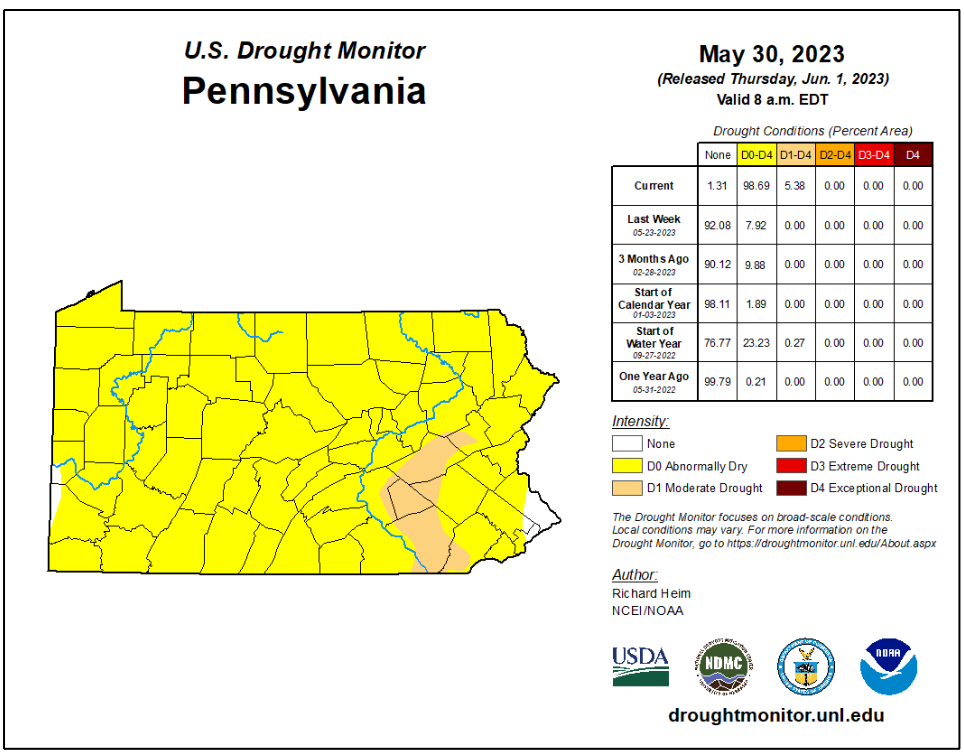
Past Drought Events in Jefferson County			
Start Date	**End Date**	**Drought Status**	**Event Duration**
07/07/1988	08/24/1988	Watch	48
08/24/1988	12/12/1988	Warning	110
03/02/1989	05/15/1989	Watch	74
06/28/1991	07/24/1991	Watch	26
07/24/1991	08/16/1991	Warning	23
08/16/1991	04/20/1992	Emergency	248
04/20/1992	09/11/1992	Warning	144
09/01/1995	12/18/1995	Watch	108
12/03/1998	12/16/1998	Warning	13
12/16/1998	03/15/1999	Emergency	89
03/15/1999	06/18/1999	Watch	95
06/18/1999	02/25/2000	Warning	252
02/25/2000	05/05/2000	Watch	70
08/24/2001	05/13/2002	Watch	262
04/11/2006	06/30/2006	Watch	80
08/06/2007	09/5/2007	Watch	30
11/07/2008	01/26/2009	Watch	80
09/16/2010	12/17/2010	Watch	92
08/05/2011	09/02/2011	Watch	28
08/02/2016	11/03/2016	Watch	93
09/10/2020	01/07/2021	Watch	119
Source: Pennsylvania Department of Environmental Protection, 2023 **Gubernatorial Disaster Declaration			

Figure 6 - Pennsylvania Palmer Drought Index 1900 – 1999



The warmest July on record in Pennsylvania occurred in 2020, and sixteen counties entered Drought Watch status on August 21 of that year. In June 2021, dry conditions were again affecting the commonwealth. *Figure 7 – U.S. Drought Monitor, Pennsylvania* illustrates the conditions of drought in Pennsylvania at the time of the report.

Figure 7 - U.S. Drought Monitor, Pennsylvania



4.3.1.4 Future Occurrence

It is difficult to forecast the exact severity and frequency of future drought events. Climate change will lead to increased uncertainty and extremity of climate events. As Jefferson County has experienced severe drought between 5% to 10% of the time between 1895 and 1995 as seen in *Figure 8 – Palmer Drought Severity Index*. This report can be used to make a rough estimate of the future probability of drought in Jefferson County, although it does not account for changes introduced by climate change. Drought conditions are expected to become more severe with climate change, as evaporation and transpiration will increase with higher temperatures.

Figure 8 - Palmer Drought Severity Index

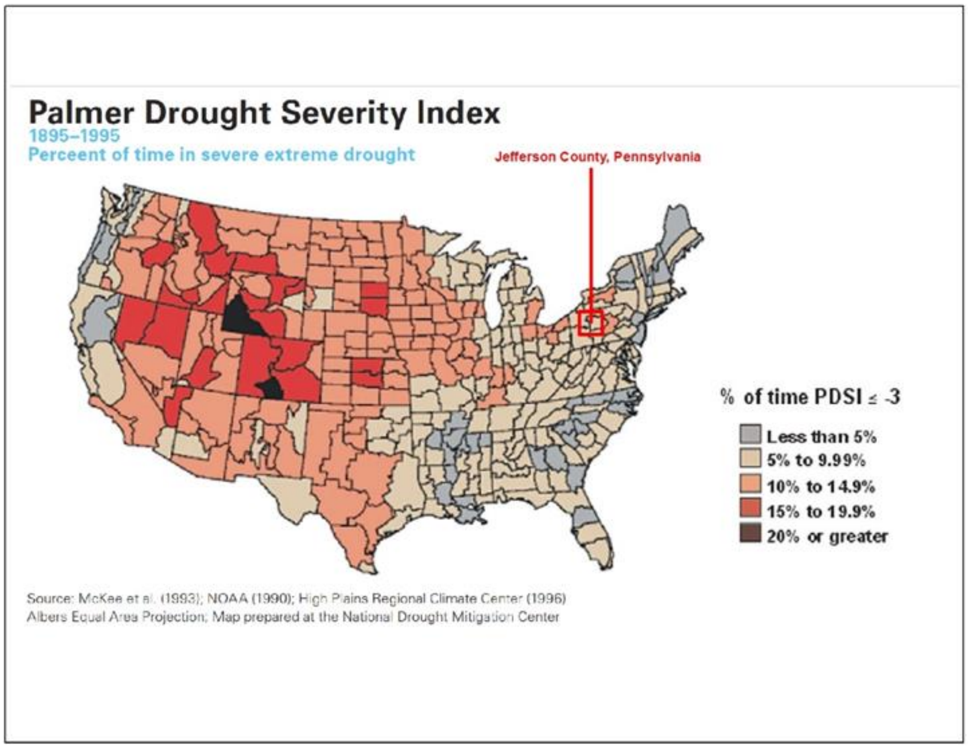


Figure 7 – U.S. Drought Monitor, Pennsylvania shows that Jefferson County is currently under abnormally dry conditions.

The potential for a drought to occur in Jefferson County is high. Given the frequency of drought watches issued for Jefferson County and its municipalities, the county can reasonably expect to be under a drought watch at least once per year. While some form of drought condition frequently exists in Jefferson County, the impact depends on the duration of the event, severity of conditions, and area affected. The map above shows that Jefferson County, and most of Pennsylvania, is currently (and most often) in normal (non-drought) conditions.

4.3.1.5 Vulnerability Assessment

The magnitude of drought vulnerability depends on the duration and area of impact. However, other factors contribute to the severity of a drought. Unseasonably high temperatures, prolonged winds, and low humidity can heighten the impact of a drought.

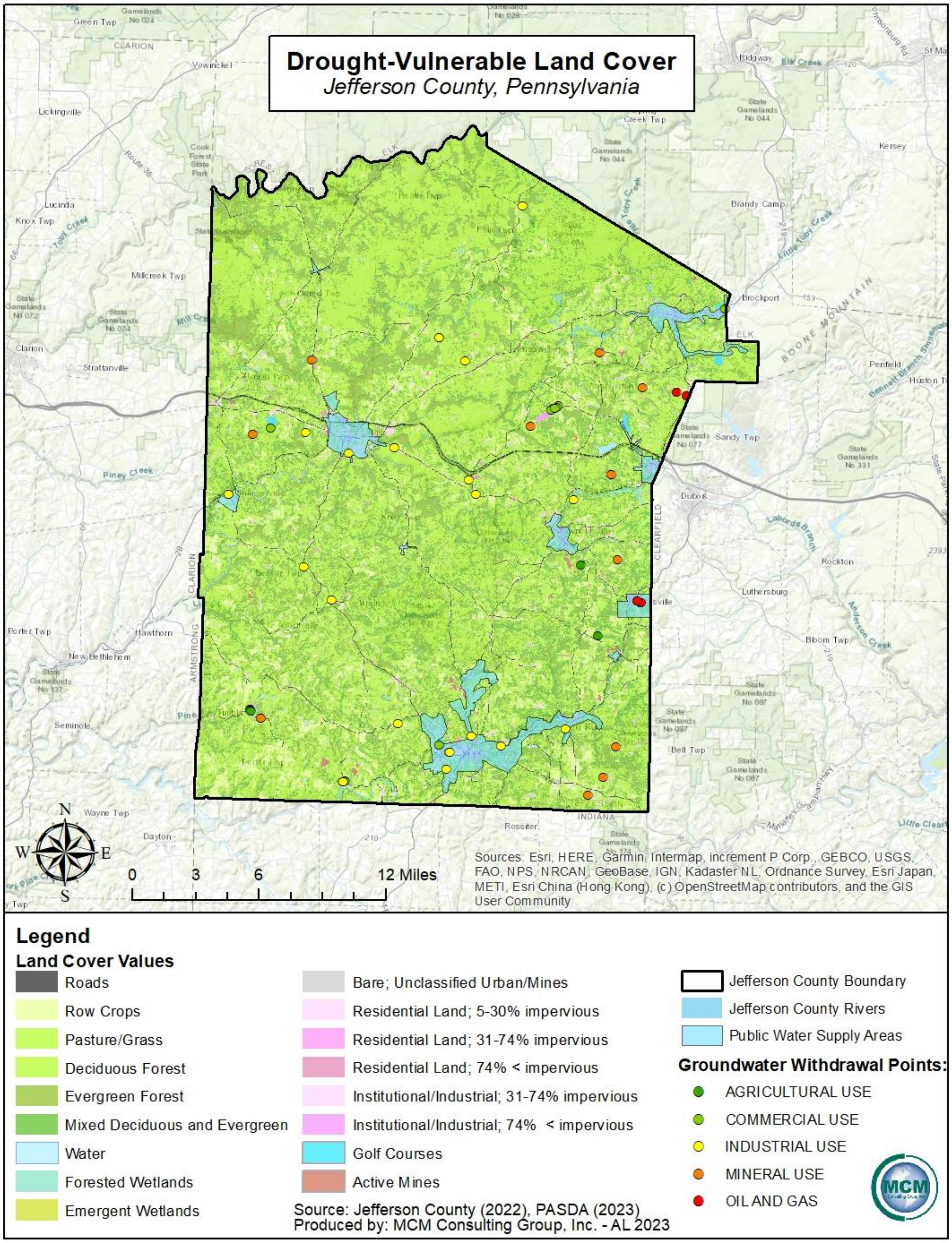
Extended periods of drought can lead to lowered stream levels, altering the delicate balance of riverine ecosystems. Certain tree species are susceptible to fungal infections during prolonged periods of soil moisture deficit. Fall droughts pose a particular threat because groundwater levels are typically at their lowest following height of the summer growing season.

There are many hazards that can be considered cascading hazards related to drought events. Wildfire is the most severe cascading hazard effect associated with drought. Wildfires can devastate wooded and agricultural areas, threatening natural resources and farm production facilities. With drought events, water infiltration into the ground becomes more difficult. This lack of infiltration can result in flash flooding events in areas of steep slopes, canyons, and rolling hills. A loss of vegetation from a drought can also increase the occurrence of landslides in areas of steep slopes with loose packed soil profiles. A discussion on the county's vulnerability to flash floods, landslides, and wildfires can be found in Section 4.3.3.5, 4.3.5.5, and 4.3.9.5 respectively.

Additionally, emergency services can be adversely impacted by drought as a cascading hazard. Local fire departments often utilize ponds, creeks, and streams for water onboard fire apparatus. With low water levels in waterbodies, responders may be unable to draft enough water to efficiently respond to and extinguish a fire. Also, with an increased number of potential wildfires due to drought conditions, agencies may not have the personnel to efficiently respond to all fires in a timely manner.

A map of properties with tillable agricultural land use, forestry, and other land in the county vulnerable to drought is shown below in *Figure 9 – Drought-Vulnerable Land Cover and Public Water Supply*.

Figure 9 - Drought Vulnerable Land Cover and Public Water Supply

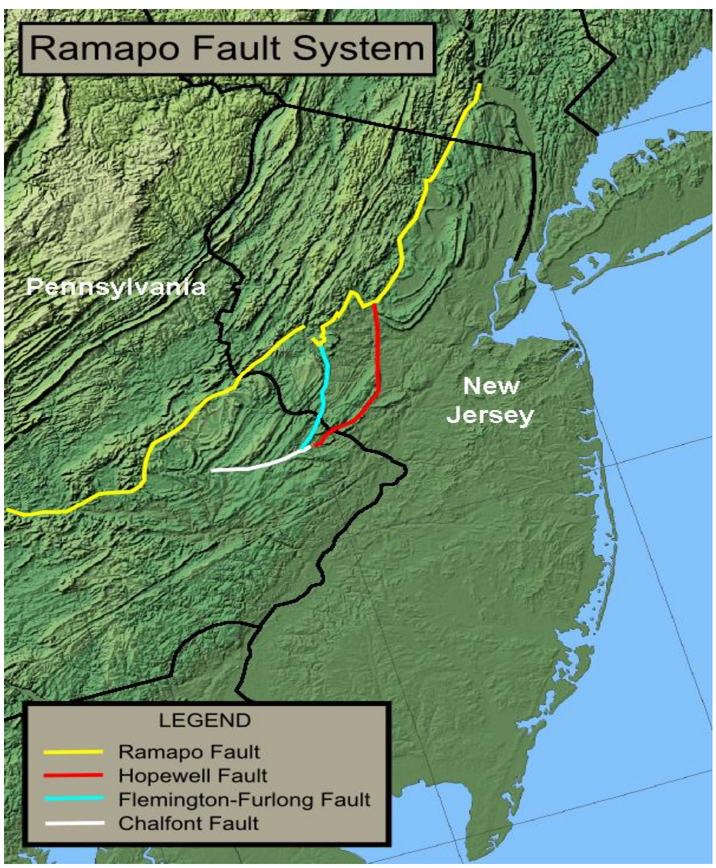


4.3.2. Earthquake

4.3.2.1 Location and Extent

An earthquake is sudden movement of the earth's surface caused by the release of stress accumulated within or along the edge off the earth's tectonic plates, a volcanic eruption, or by a human induced explosion (DCNR, 2007). Earthquake events in Pennsylvania, including Jefferson County, are usually mild events, impacting areas no greater than Sixty miles in diameter from the epicenter. A majority of earthquakes occur along boundaries between tectonic plates, and some earthquakes occur at faults on the interior of plates. Today, Eastern North America, including Jefferson County, Pennsylvania, is far from the nearest plate boundary. That plate boundary is the Mid-Atlantic Ridge and is approximately 2,000 miles to the east, under the Atlantic Ocean. The Ramapo Fault System runs through New York, New Jersey, and eastern Pennsylvania (See *Figure 10 – Ramapo Fault System)*. This fault system is associated with some small earthquakes, and it is thought unlikely to produce significant disruption.

Figure 10 - Ramapo Fault System



When the supercontinent of Pangaea broke apart about 200 million years ago, the Atlantic Ocean began to form. Since then, many faults have developed. Locating all the faults would be an ideal approach to identifying the region's earthquake hazard; however, many of the fault lines in this region have no seismicity associated with them. The best way to determine earthquake history for Jefferson County is to conduct a probabilistic earthquake-hazard analysis with the earthquakes that have already happened in and around the county. (See *Figure 11 – Pennsylvania Earthquake Hazard Zones*). Nevertheless, the United States Geological Survey (USGS) indicates that Jefferson County has an extremely low earthquake risk, and no historical earthquake events have occurred.

Natural gas extraction of the Marcellus/Utica Shale formation (see *Figure 12 - Pennsylvania Oil and Gas Geology*) has occurred in many regions of the commonwealth, but eastern and southeastern Pennsylvania are not among them. Hydraulic fracturing, or fracking, is used to extract the gas, and the process is thought to lead to an increase in seismic activity (Meyer, 2016).

However, fracking does not appear to be linked to the increased rate of magnitude three and larger earthquakes (USGS 2014). In recent years, permits for extraction of the natural gas and oil in the commonwealth have been issued by the Pennsylvania Department of Environmental Protection, and sixteen records of requested permits for gas extraction or injection wells were found for Jefferson County at the writing of this plan.

4.3.2.2 Range of Magnitude

Earthquakes result in the propagation of seismic waves, which are detected using seismographs. These seismograph results are measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. *Table 16 – Richter Scale* summarizes Richter Scale magnitudes as they relate to the spatial extent of impacted areas. The Modified Mercalli Intensity Scale (*Table 17 – Modified Mercalli Intensity Scale*) is an alternative measure of earthquake intensity that is scaled by the impacts of the earthquake event. Earthquakes have many secondary impacts, including disrupting critical facilities, transportation routes, public water supplies and other utilities.

Table 16 - Richter Scale

Richter Scale	
Richter Magnitude	**Earthquake Effects**
Less than 3.5	Not generally felt but recorded.

Richter Scale	
Richter Magnitude	**Earthquake Effects**
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most, slight damage to well-designed buildings; can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas where people live up to about 100 kilometers across.
7.0-7.9	Major earthquake; can cause serious damage over large areas.
8.0 or greater	Great earthquake; can cause serious damage in areas several hundred kilometers across.

Table 17 - Modified Mercalli Intensity Scale

Modified Mercalli Intensity Scale			
Scale	**Intensity**	**Earthquake Effects**	**Richter Scale Magnitude**
I	**Instrumental**	Detected only on seismographs.	<4.2
II	**Feeble**	Some people feel it.	
III	**Slight**	Felt by people resting, like a truck rumbling by.	
IV	**Moderate**	Felt by people walking.	
V	**Slightly Strong**	Sleepers awake; church bells ring.	<4.8
VI	**Strong**	Trees sway; suspended objects swing; objects fall off shelves.	<5.4
VII	**Very Strong**	Mild alarm, walls crack, plaster falls.	<6.1
VIII	**Destructive**	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged.	<6.9
IX	**Ruinous**	Some houses collapse, ground cracks, pipes break open.	
X	**Disastrous**	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread.	<7.3

Modified Mercalli Intensity Scale			
Scale	**Intensity**	**Earthquake Effects**	**Richter Scale Magnitude**
XI	**Very Disastrous**	Most buildings and bridges collapse, roads, railways, pipes, and cables destroyed, general triggering of other hazards.	<8.1
XII	**Catastrophic**	Total destruction, trees fall, ground rises and falls in waves.	>8.1

4.3.2.3 Past Occurrence

According to USGS, two known earthquakes have had an epicenter within Jefferson County since 1724, before which local seismology cannot be known. However, several seismic events that occurred outside the county boundary may have been felt in the region.

On August 23, 2011, a 5.9 earthquake occurred in Virginia, and a 2.2 earthquake shook Reading, Pennsylvania (Berks County), on July 19, 2019. Further, a 3.4 earthquake struck Mifflintown (Juniata County) on June 13, 2019, and Bolivar (Westmoreland County) experienced a 2.9 event on October 6, 2020. Parts of the county may have experienced some of the shock waves from these minor earthquakes and others that have occurred around the region, most notably New Jersey. The strongest recorded earthquake in Pennsylvania history (5.2) occurred on September 25, 1998 in northwestern Pennsylvania and is known as the Pymatuning Earthquake for its epicenter near Pymatuning Lake. The effects of the earthquake were felt across the commonwealth and were blamed for many wells in the region near the epicenter losing their water, while new springs appeared and old wells reemerged. A three-month date range revealed 120 dry household-supply wells on the ridge of Jamestown and Greenville, Pennsylvania. Declines of up to 100 feet were observed on a ridge where at least eighty of the wells resided. The degree of the damage varied. Some of the wells lost all power or could barely hold their yields and some of the water in wells turned black or began to smell of sulfur.

The most likely impetus of the wells drying was due to an increase in hydraulic conductivity of shale rock under this area caused by the earthquake. The quake affected the existing faults and created new faults in the shale. This created more permeability for the water to leak down from the hilltops on the ridge down to the valleys following the contours of the Meadville shale.

Because the effects of large earthquakes can be felt hundreds of miles away, the historical earthquake epicenters near Jefferson County are shown below at *Figure X – Pennsylvania*

Earthquake Activity. A wider depiction of earthquake occurrences in the northeastern United States may be found here: *https://earthquake.usgs.gov/earthquakes/map/?extent=14.26438,-141.32813&extent=56.51102,-48.60352*

4.3.2.4 Future Occurrence

Earthquake activity and intensities are difficult to predict, but a probabilistic analysis of prior earthquakes can assist in gauging the likelihood of future occurrences. *Figure 11 – Pennsylvania Earthquake Hazard Zones* shows that Jefferson County is in a low hazard zone for earthquake activity according to the USGS (2014), suggesting a low probability of earthquake occurrence. However, according to the USGS, there has been a recent trend increasing the frequency of magnitude three and larger earthquakes in the central and eastern U.S. This can be seen in *Table 18 – Recent Earthquake Trends in Central and Eastern United States*. This uptick in seismicity may be due to hydraulic fracturing activities, and specifically occurs due to wastewater from the fracking process being injected into the earth (Meyer, 2016). Recent studies have moved towards being able to predict such induced seismicity by looking at uplift after injections, but more work needs to be done to confirm uplift as a reliable indicator of induced seismicity (Shirzei et al., 2016). It is important to note that seismicity can occur even after wells become inactive and injection rates decline (Shirzaei et al., 2016).

Isostatic Rebound is a hypothesis for earthquake occurrence that has been conceptualized for many years, according to Charles Scharnberger, a retired professor of geology at Millersville University, who monitors the seismic station there. Scharnberger said Pennsylvania earthquakes are somewhat of a mystery, but they could have something to do with the westward shift of the North American tectonic plate. Though the plates meet in California, where most of the seismic activity occurs, that movement still causes stress, squeezing and pressure along the entire length of the plate, reverberating as far back as the East Coast. A 3.4 earthquake like the one in Mifflintown, Juniata County in 2019 is in the medium range for Pennsylvania and may occur every couple of years. According to the USGS, this was the strongest earthquake felt or originating in Pennsylvania that year. It was followed by a 1.3 aftershock.

The chances of a devastating earthquake are low, but do exist, according to Scharnberger, His calculations on the probability of a severe earthquake based on the historic record indicate it is about a one in 200 chance in any given year.

Table 18 - Recent Earthquake Trends in Northeastern United States

Earthquake Trends in Northeastern U.S.	
Year	**Number of Magnitude 3+ Earthquakes**
2015	0
2016	3
2017	4
2018	0
2019	5
2020	3
Source: USGS, 2020	

4.3.2.5 Vulnerability Assessment

According to the U.S. Geological Society Earthquake Hazards Program, an earthquake hazard is anything associated with an earthquake that may affect a resident's normal activities. For Jefferson County, this could include surface faulting, ground shaking, landslides, liquefaction, dried or rejuvenated water wells, tectonic deformation, and seiches (sloshing of a closed body of water from earthquake shaking).

Earthquakes usually occur without warning and can impact areas a great distance from their point of origin (epicenter). Ground shaking is the greatest risk to building damage within Jefferson County. Risk to public safety and loss of life from an earthquake is dependent upon the severity and proximity of the event. Injury or death to those inside buildings, or people walking below building ornamentation and chimneys is a higher risk to Jefferson County's general public during an earthquake. Infrastructure is more at risk on the east coast than the west coast because its buildings are older.

Figure 11 - Pennsylvania Earthquake Hazard Zones

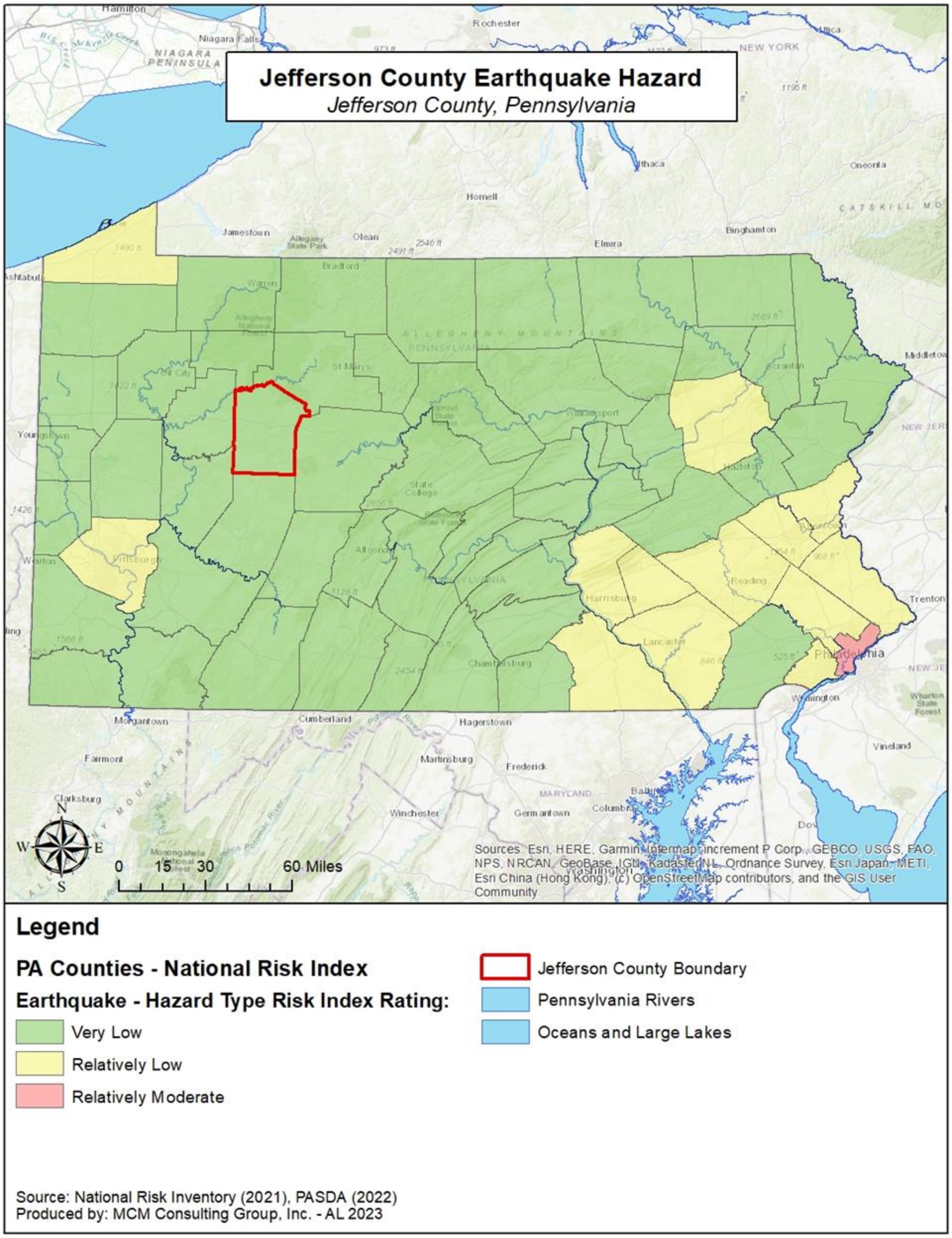


Figure 12 - Pennsylvania Oil and Gas Geology

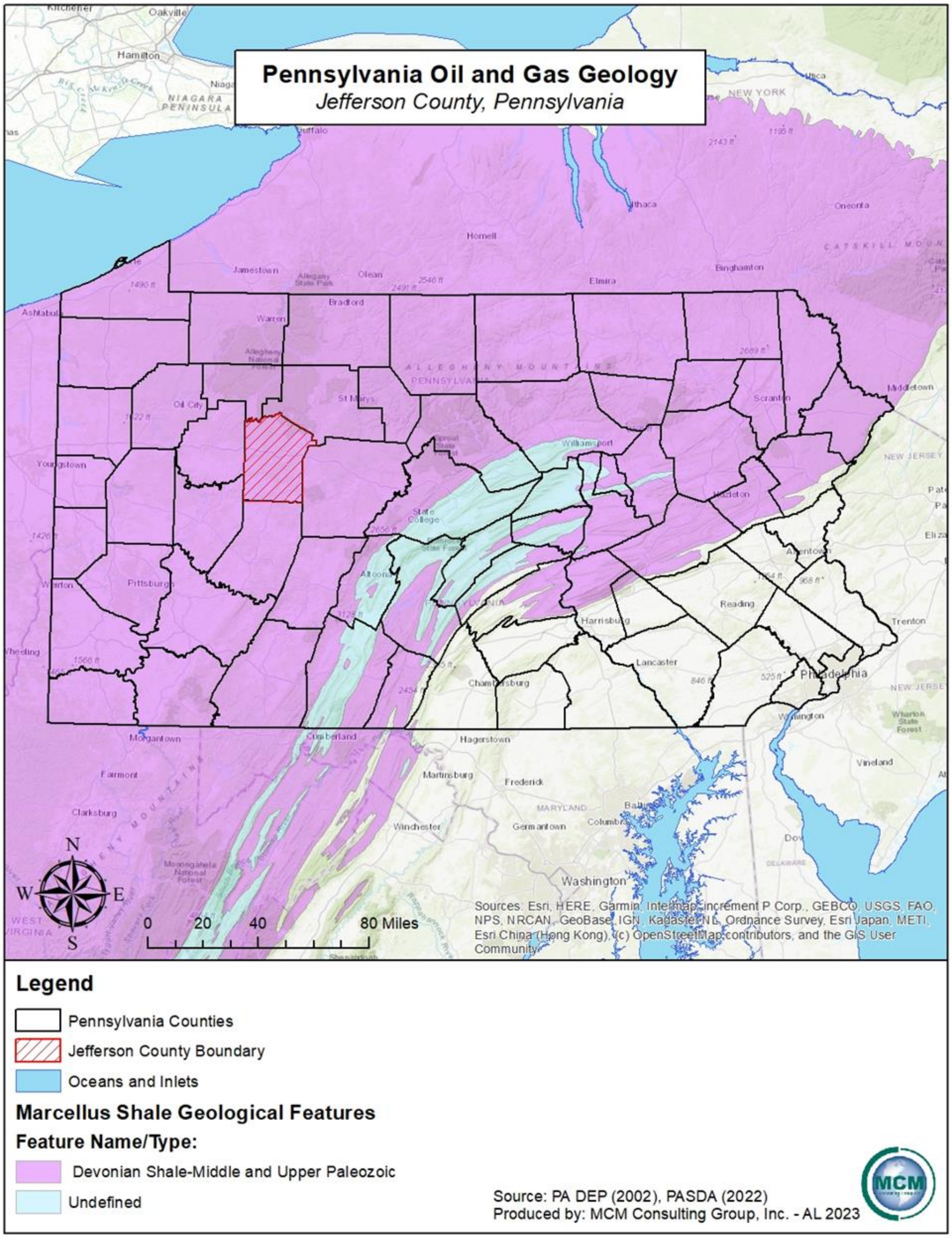
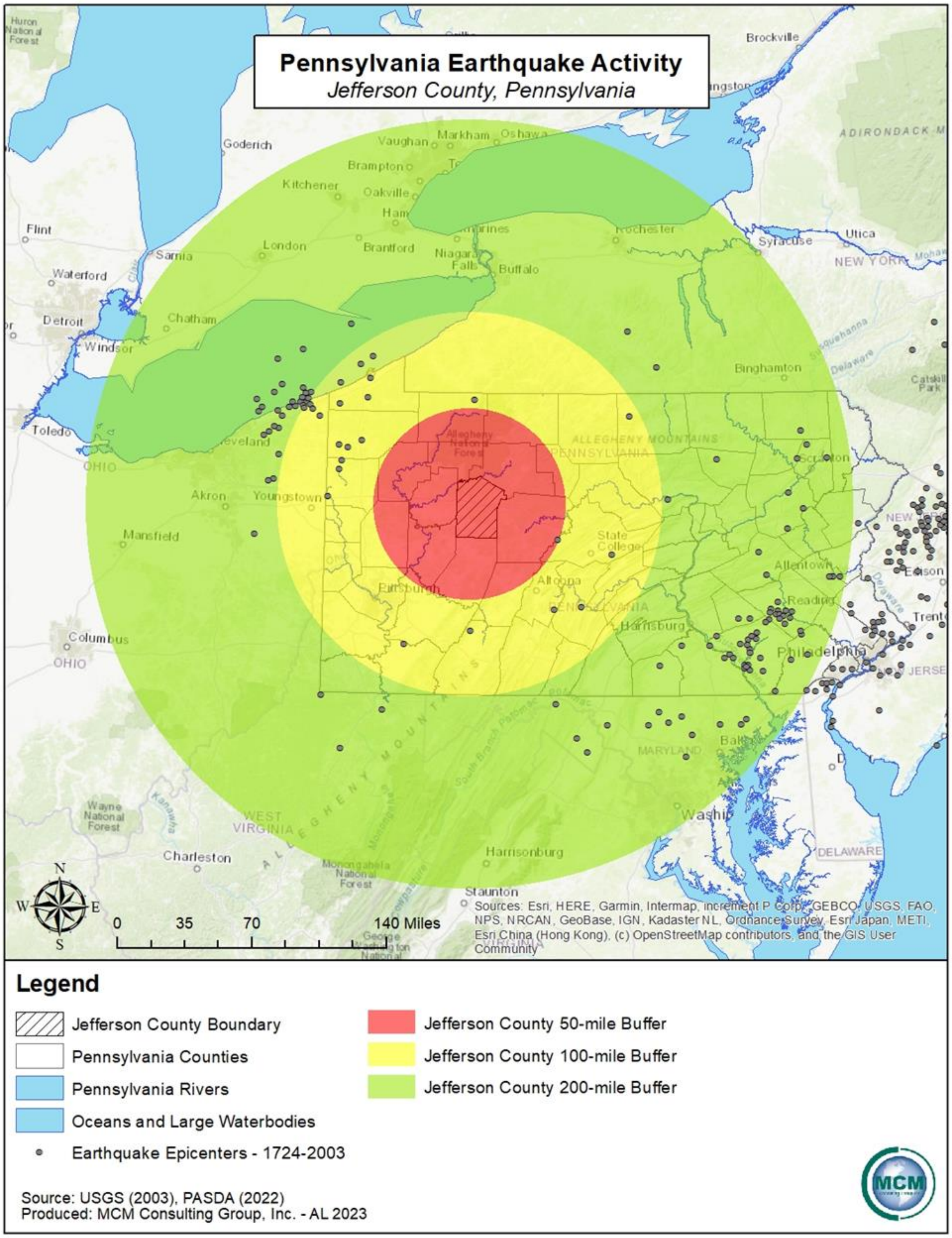


Figure 13 - Pennsylvania Earthquake Activity



4.3.3. Flooding, Flash Flooding, and Ice Jam Flooding

4.3.3.1 Location and Extent

Flooding is the temporary condition of partial or complete inundation on normally dry land and it is the most frequent and costly of all hazards in Pennsylvania. Flooding events are generally the result of excessive precipitation. General flooding is typically experienced when precipitation occurs over a given river basin for an extended period. Flash flooding is usually the result of heavy, localized precipitation falling in a short period of time over a given location, often in mountain streams and mountainous regions, and in urban areas where much of the ground is covered in impervious surfaces. Flash floods are relatively common in Jefferson County and the severity of those flood events is dependent upon a combination of creek, stream, and river basin topography and physiography, hydrology, precipitation, and weather patterns. Present soil conditions, the degree of vegetative clearing, and the presence of impervious cover must also be considered when determining the severity of a flood or flood event.

Winter flooding can include ice jams, which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams. All forms of flooding can damage infrastructure.

Floodplains are lowlands adjacent to rivers, streams, and creeks that are subject to recurring floods. The size of the floodplain is described by the recurrence interval of a given flood event. Flood recurrence intervals are explained in more detail in section 4.3.3.4. However, in assessing the potential spatial extent of flooding, it is important to know that a floodplain associated with a flood that has a 10% chance of occurring in a given year is smaller than a floodplain associated with a flood that has a 0.2% chance of occurring.

The National Flood Insurance Program (NFIP) publishes digital flood insurance rate maps (DFIRMs). These maps identify the 1% annual chance of flood area. The special flood hazard area (SFHA) and base flood elevations (BFE) are developed from the 1% annual chance flood event as seen in *Figure 14 – Flooding and Floodplain Diagram*. Structure located within the SFHA have a 26% chance of flooding in a thirty-year period. The SFHA serves as the primary regulatory boundary used by FEMA, the Commonwealth of Pennsylvania, and the Jefferson County local government. Federal floodplain management regulations and mandatory flood insurance purchase requirements apply to the following high-risk special flood hazard areas in *Table 19 – Flood Hazard High Risk Zones*. Appendix D of this hazard mitigation plan includes a flooding vulnerability map for each municipality in Jefferson County with vulnerable structures and community lifeline facilities identified using the most current DFIRM data for Jefferson County.

Past flooding events have been primarily caused by heavy rains, which cause small creeks and streams to overflow their banks, often leading to road closures. Flooding poses a threat to community lifeline facilities, agricultural areas, and those who reside or conduct business in the floodplain. The most significant hazard exists for facilities in the floodplain that process, use, or store hazardous materials. A flood could potentially release and transport hazardous materials throughout the area. Most flood damage to a property and structure located in the floodplain is caused by water exposure to the interior, high velocity water, and debris flow.

Figure 14 - Flooding and Floodplain Diagram

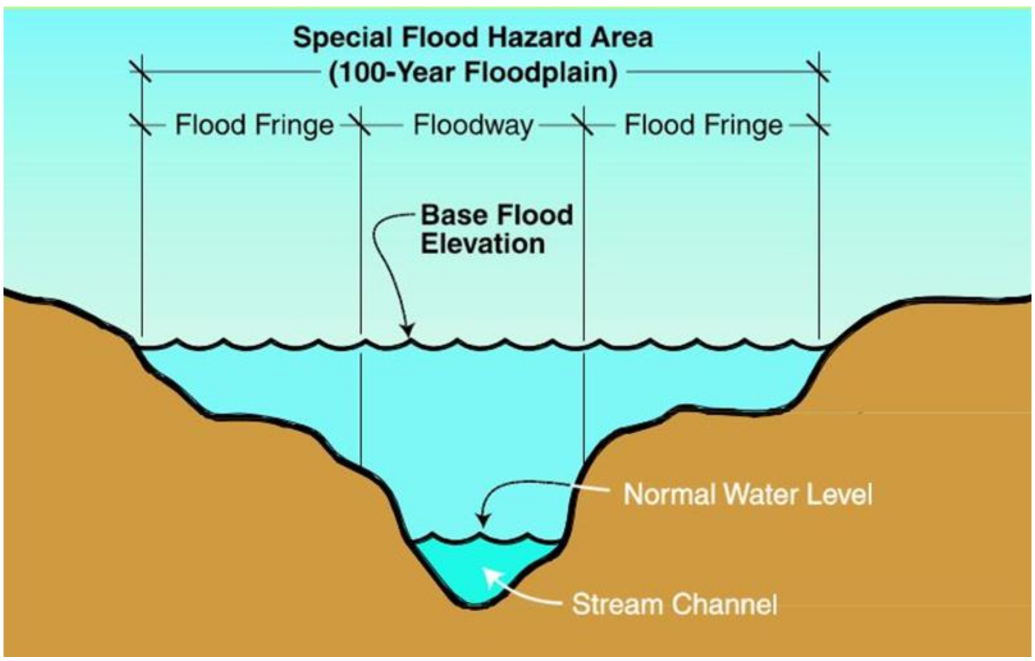


Table 19 - Flood Hazard High Risk Zones

Flood Hazard High Risk Zones	
Zone	**Description**
A	Areas subject to inundation by the 1% annual chance flood event. Because detailed hydraulic analysis has not been performed, no base flood elevations or flood depths are shown.
AE	Areas subject to inundation by the 1% annual chance flood event determined by detailed methods. BFEs are shown within these zones.
AH	Areas subject to inundation by the 1% annual chance shallow flooding (usually areas of ponding) where average depths are 1 – 3 feet. BFEs derived from detailed hydraulic analysis are shown in this zone.

Flood Hazard High Risk Zones	
Zone	**Description**
AO	Areas subject to inundation by the 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are 1 – 3 feet. Average flood depths derived from detailed hydraulic analysis are shown within this zone.
AR	Areas that result from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide base flood protection.
Source: FEMA, 2017	

4.3.3.2 Range of Magnitude

The Allegheny River Basin has caused significant flooding in Jefferson County, specifically on the following streams, creeks, and their tributaries:

- Clarion River
    - Raught Run
    - Callen Run
    - Lepper Run
    - Pine Run
    - Mill Creek

Several factors determine the severity of floods, including rainfall intensity and duration, topography, ground cover, and the rate of snowmelt. Water runoff is greater in areas with steep slopes and little to no vegetative ground cover. The mountainous terrain of Jefferson County can cause more severe floods as runoff reaches receiving water bodies more rapidly over steep terrain. The is of particular concern for areas along steep slopes and on the edges of valleys throughout Jefferson County.

Urbanization typically results in the replacement of vegetative ground cover with impermeable surfaces like asphalt and concrete, increasing the volume of surface runoff and stormwater, particularly in areas with poorly planned stormwater drainage systems. A large amount of rainfall over a short time span can cause flash flood events. Flash floods can occur very quickly and with little warning. A flash flood can also be deadly because of the rapid rise in water levels and devastating flow velocities. The more developed areas in the county can be easily susceptible to flash floods because of the significant presence of impervious surfaces, such as streets, sidewalks, parking lots, and driveways. Additionally, small amounts of rain can cause floods in locations where the soil is still frozen, saturated from a previous wet period or if the areas is largely covered in impermeable surfaces such as parking lots, paved roadways, and other developed areas. The county occasionally experiences intense rainfall from tropical storms in later summer and early fall, which can potentially cause flooding as well.

Severe flooding can cause injuries and deaths and can have long-term impacts on the health and safety of citizens. Severe flooding can also result in significant property damage, potentially disrupting the regular function of community lifeline facilities and can have widespread negative effects on local economies. Industrial, commercial, and public infrastructure facilities can become inundated with flood waters, threatening the continuity of government and business. The vulnerable populations must be identified and located in flooding situations, as they are often home bound. Mobile homes and manufactured structures are especially vulnerable to high water levels. Flooding can have significant environmental impacts when the flood water release and/or transport hazardous materials.

Severe flooding also comes with secondary effects that could have long lasting impacts on the population, economy, and infrastructure within Jefferson County. Power failures are the most common secondary effect associated with flooding. Coupled with a shortage of critical services and supplies, power failures could cause a public health emergency. Community lifelines, such as sewage and water treatment facilities, can fail, causing sewage overflows and the contamination of groundwater and drinking water. Flooding also has the potential to trigger other hazards, such as landslides, hazardous material spills, and dam failures.

The maximum threat of flooding for Jefferson County is estimated by looking at the potential loss data and repetitive loss data, both analyzed in the risk assessment section of the hazard mitigation plan. In these cases, the severity and frequency of damage can result in permanent population displacement, and business may close if they are unable to recover from the disaster.

Estimation of potential loss is completed through FEMA's HAZUS software, A level two HAZUS scenario was performed for the entirety of Jefferson County. The FEMA Global Flood Risk Report and other reports generated by the software at the end of the scenario were utilized to estimate the amount of damage and loss from a flood. The total building loss for a 100-year flood based on a HAZUS level two scenario is displayed in *Table 20 – HAZUS Building Economic Loss Figures*. The total business interruption vales occurring from a proposed 100-year flood based on FEMA HAZUS data is illustrated in *Table 21 – HAZUS Business Interruption Economic Loss Figures*. *Figure 15 – Loss by Occupancy Type* illustrates the breakdown of economic losses by either residential, commercial, industrial, or other use type.

Table 20 - HAZUS Building Loss Figures

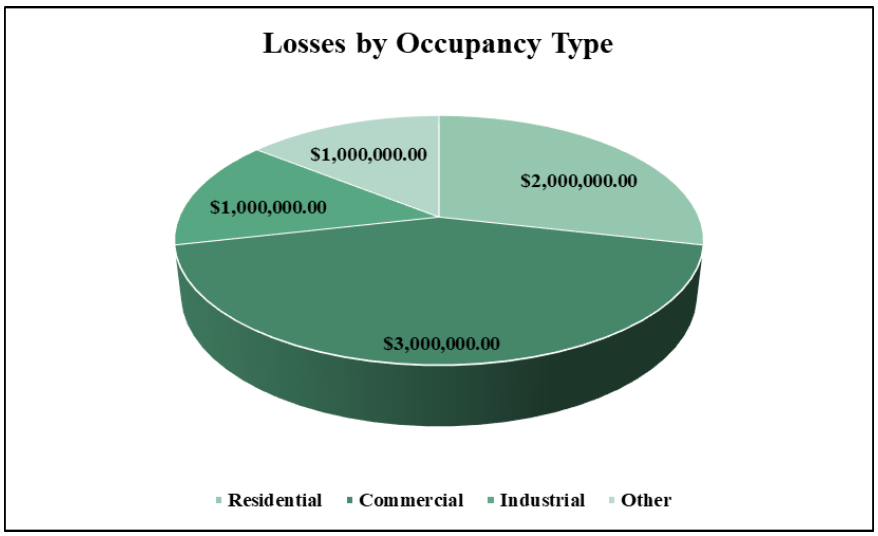
HAZUS Building Economic Loss Figures					
	Residential	**Commercial**	**Industrial**	**Other**	**Total**
Building:	$470,000.00	$70,000.00	$120,000.00	$10,000.00	$670,000.00
Content:	$180,000.00	$300,000.00	$400,000.00	$90,000.00	$970,000.00
Inventory:	$0.00	$0.00	$80,000.00	$0.00	$80,000.00
Subtotal:	$650,000.00	$370,000.00	$600,000.00	$100,000.00	$1,720,000.00

HAZUS Building Economic Loss Figures					
	Residential	Commercial	Industrial	Other	Total
Source: HAZUS, 2023					

Table 21 - HAZUS Business Interruption Economic Loss Figures

HAZUS Business Interruption Economic Loss Figures					
	Residential	Commercial	Industrial	Other	Total
Income:	$60,000.00	$1,260,000.00	$20,000.00	$160,000.00	$1,500,000.00
Relocation:	$500,000.00	$220,000.00	$10,000.00	$90,000.00	$820,000.00
Rental Income:	$150,000.00	$120,000.00	$0.00	$20,000.00	$290,000.00
Wage:	$150,000.00	$1,160,000.00	$20,000.00	$1,040,000.00	$2,370,000.00
Subtotal:	$860,000.00	$2,760,000.00	$50,000.00	$1,310,000.00	$4,980,000.00
Source: HAZUS, 2023					

Figure 15 - Loss by Occupancy Type



Although floods can cause deaths, injuries, and damage to property, they are naturally occurring events that benefit riparian systems which have not been disrupted by human actions. Such benefits include groundwater recharge and the introduction of nutrient rich sediments which improves soil fertility. However, human development often disrupts natural riparian buffers by changing land use and land cover, and the introduction of chemical or biological contaminants that often accompany human presence and can contaminate habitats after flood events.

4.3.3.3 Past Occurrence

Jefferson County has experienced numerous flooding, flash flooding, and ice jam events in the past. The flooding and flash flooding were caused by a variety of heavy storms, inclement weather, tropical storms, and other issues. A summary of recent flood event history for Jefferson County from January 2014 to March 2023 is found in *Table 22 – Past Flood and Flash Flood Events*. Details of each event can be found in NOAA's National Center for Environmental Information (NCEI) database. Additional data was also acquired by examining Jefferson County's WebEOC information from 2014 to 2022.

Table 22 - Past Flood and Flash Flood Events

Past Flood and Flash Flood Events			
Event Location	**Event Date**	**Event Type**	**Property Damage Estimate**
Big Run Borough	06/18/2014	Flood	$5,000.00
Brookville Borough	08/21/2014	Flash Flood	$50,000.00
Clover Township	08/21/2014	Flash Flood	$25,000.00
Reynoldsville Borough	09/29/2015	Flood	$0.00
Sykesville Borough	08/28/2016	Flood	$5,000.00
Clover Township	08/28/2016	Flood	$10,000.00
Summerville Borough	01/12/2017	Flood	$2,000.00
Brookville Borough	01/12/2017	Flood	$5,000.00
Warsaw Township	01/12/2017	Flood	$2,000.00
Ringgold Township	01/12/2017	Flood	$2,000.00
Brookville Borough	07/24/2017	Flash Flood	$0.00
Clover Township	01/12/2018	Flood	$0.00
Reynoldsville Borough	08/21/2018	Flood	$0.00
Brockway Borough	08/21/2018	Flash Flood	$0.00
Henderson Township	09/10/2018	Flood	$1,000.00
Polk Township	07/07/2019	Flash Flood	$1,000.00
Sykesville Borough	07/07/2019	Flash Flood	$5,000.00
Jefferson County (Entire County)	10/31/2019	Flood	$0.00
Brockway Borough	07/07/2020	Flood	$10,000.00
Brookville Borough	08/12/2021	Flash Flood	$5,000.00
Eldred Township	08/26/2021	Flash Flood	$0.00
		Total:	**$128,000.00**
Source: NCEI NOAA, 2023 *Property Damage Values are estimated and are not exact figures. Data from NCEI and WebEOC			

The National Flood Insurance Program (NFIP) identifies properties that frequently experience flooding. Repetitive loss properties are structures insured under the NFIP which have had at least two paid flood losses of more than $1,000 over any ten-year period since 1978. The hazard mitigation assistance (HMA) definition of a repetitive loss property is a structure covered by a contract for flood insurance made available under the NFIP that has incurred flood-related damage on two occasions, in which the cost of repair, on average, equaled or exceeded 25% of the market value of the structure at the time of each such flood event; and at the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage. *Table 23 – Repetitive Loss Properties* illustrates the communities that have repetitive loss properties, the total building payments, the contents payments, and the number of losses. There are forty-five repetitive loss properties in Jefferson County. *Table 24 – Summary of Type of Repetitive Loss Properties by Municipality* illustrates the breakdown of type of repetitive loss properties in Jefferson County.

A property is considered a severe repetitive loss property either when there are at least four losses each exceeding $5,000 or when there are two or more losses where the building payments exceed the property value. *Table 25 – Severe Repetitive Loss Properties* illustrates the communities within Jefferson County that have severe repetitive loss properties, the total building payments, the contents payments, and the number of losses. The data used in the table is based on data provided by PEMA.

Most municipalities in Jefferson County participate in the NFIP. Information on each participating municipality can be found in *Table 26 – Municipal NFIP Policies & Vulnerability*.

Table 23 - Repetitive Loss Properties

Repetitive Loss Properties					
Community Name	**Community Number**	**Cumulative Building Payment**	**Cumulative Contents Payment**	**Sum of Total Paid**	**Losses**
Big Run Borough	420508	$12,425.57	$7,081.59	$18,507.16	2
Big Run Borough	420508	$8,505.67	$0.00	$8,505.67	2
Big Run Borough	420508	$27,215.05	$5,192.35	$32,407.40	2
Big Run Borough	420508	$20,293.91	$0.00	$20,293.91	2
Big Run Borough	420508	$19,379.45	$0.00	$19,379.45	2
Big Run Borough	420508	$14,881.43	$0.00	$14,881.43	2
Brookville Borough	420510	$4,847.13	$1,418.93	$6,266.06	2
Brookville Borough	420510	$8,406.66	$2,208.00	$10,614.66	2
Brookville Borough	420510	$21,340.63	$5,000.00	$26,340.63	2

Repetitive Loss Properties					
Community Name	**Community Number**	**Cumulative Building Payment**	**Cumulative Contents Payment**	**Sum of Total Paid**	**Losses**
Henderson Township	421729	$63,995.74	$2,824.41	$66,820.15	4
Punxsutawney Borough	420512	$19,931.81	$1,796.10	$21,727.91	4
Punxsutawney Borough	420512	$25,807.25	$7,689	$33,496.25	3
Punxsutawney Borough	420512	$68,164.68	$82,243.41	$150,408.09	4
Punxsutawney Borough	420512	$14,957.06	$1,006.29	$15,963.35	3
Punxsutawney Borough	420512	$20,316.45	$0.00	$20,316.45	3
Punxsutawney Borough	420512	$9,951.04	$0.00	$9,951.04	2
Punxsutawney Borough	420512	$209,362.38	$352,903.41	$562,265.79	2
Punxsutawney Borough	420512	$20,060.80	$0.00	$20,060.8	2
Punxsutawney Borough	420512	$6,090.18	$0.00	$6,090.18	2
Punxsutawney Borough	420512	$12,900.94	$632.51	$13,533.45	2
Punxsutawney Borough	420512	$11,684.85	$2,033.67	$13,718.52	2
Punxsutawney Borough	420512	$13,535.02	$0.00	$13,535.02	2
Punxsutawney Borough	420512	$19,767.80	$92.73	$19,860.53	2
Reynoldsville Borough	420513	$6,023.86	$16,266.38	$2,290.24	3
Reynoldsville Borough	420513	$77,000.00	$53,900	$130,900.00	3
Reynoldsville Borough	420513	$111,200.66	$0.00	$111,200.66	3
Reynoldsville Borough	420513	$28,468.02	$0.00	$28,468.02	2
Reynoldsville Borough	420513	$20,168.30	$6,219.5	$26,387.80	3
Reynoldsville Borough	420513	$14,959.27	$257.68	$15,216.95	2
Reynoldsville Borough	420513	$40,200.00	$8,380.67	$48,580.67	3
Reynoldsville Borough	420513	$75,500.00	$0.00	$75,500.00	3
Reynoldsville Borough	420513	$19,828.44	$32,754.09	$52,582.53	2
Reynoldsville Borough	420513	$43,951.62	$1,784.28	$45,735.90	2
Reynoldsville Borough	420513	$41,000.00	$15,625.45	$56,625.45	2
Reynoldsville Borough	420513	$34,187.67	$0.00	$34,187.67	2
Reynoldsville Borough	420513	$52,448.07	$0.00	$52,448.07	2
Snyder Township	421735	$39,327.97	$60,467.09	$99,795.06	4
Summerville Borough	420514	$21,138.08	$0.00	$21,138.08	2
Summerville Borough	420514	$36,886.97	$10,000.00	$46,886.97	2
Winslow Township	421215	$14,561.97	$14,594.22	$29,156.19	6
Young Township	421737	$23,911.44	$7,480.18	$31,391.62	5
Young Township	421737	$26,936.10	$0.00	$26,936.10	4
	Total:	**$1,381,519.94**	**$699,851.94**	**$2,060,371.88**	**110**
Source: FEMA, 2023					

Table 24 - Summary of Type of Repetitive Loss Properties by Municipality

Summary of Type of Repetitive Loss Properties by Municipality					
Municipality	Type				
	Non-Residential	2-4 Family	Single Family	Condo	Other Residential
Bell Township	0	0	1	0	0
Big Run Borough	0	1	5	0	0
Brookville Borough	1	0	2	0	0
Henderson Township	0	0	1	0	0
Punxsutawney Borough	5	0	9	0	0
Reynoldsville Borough	6	0	8	0	0
Snyder Township	0	0	1	0	0
Summerville Borough	0	0	2	0	0
Winslow Township	0	0	1	0	0
Young Township	0	0	2	0	0
Total:	**12**	**1**	**32**	**0**	**0**
Source: FEMA, 2023					

Table 25 - Severe Repetitive Loss Properties

Severe Repetitive Loss Properties					
Community Name	Community Number	Cumulative Building Payments	Cumulative Contents Payments	Sum of Total Paid	Losses
Bell Township	422244	$22,692.07	$6,479.40	$29,171.47	2
Punxsutawney Borough	420512	$15,046.11	$0.00	$15,046.11	2
Reynoldsville Borough	420513	$93,349.59	$7,543.02	$100,892.61	4
Total:		**$131,087.77**	**$14,022.42**	**$145,110.19**	**8**
Source: FEMA, 2023					

Table 26 - Municipal NFIP Policies & Vulnerability

Municipal NFIP Policies	
Community Name	Community Number
Bell Township	422244
Big Run Borough	420508
Brookville Borough	420510
Henderson Township	421729
Punxsutawney Borough	420512

Municipal NFIP Policies	
Community Name	**Community Number**
Reynoldsville Borough	420513
Snyder Township	421735
Summerville Borough	420514
Winslow Township	421215
Young Township	421737
Source: FEMA, 2023	

4.3.3.4 Future Occurrence

Flooding is a frequent problem throughout the Commonwealth of Pennsylvania. Jefferson County will certainly be impacted by flooding events in the future, as Jefferson County experiences some degree of flooding annually. The threat of flooding is compounded in the late winter and early spring months, as melting snow can overflow streams, creeks, and tributaries, increasing the amount of groundwater, clogging stormwater culverts and bridge openings. The NFIP recognizes the 1% annual chance flood, also known as the base flood of a one-hundred-year flood, as the standard for identifying properties subject to federal flood insurance purchase requirements. A 1% annual chance flood is a flood which has a 1% chance of occurring in a given year or is likely once every one-hundred years. The digital flood insurance maps (DFIRMs) are used to identify areas subject to the 1% annual chance of flooding.

A property's vulnerability to a flood is dependent upon its location in the floodplain. Properties along the banks of a waterway are the most vulnerable. The property within the floodplain is broken into sections depending on its distance from the waterway. The ten-year flood zone has a 10% chance of being flooded every year. However, this label does not mean that this area cannot flood more than once every ten years. This label simply designates the probability of a flood of this magnitude every year. Further away from this area is the fifty-year floodplain. This area includes all of the ten-year floodplain plus additional property. The probability of a flood of this magnitude occurring during a one-year period is 2%. A summary of flood probability is shown in *Table 27 – Flood Probability Summary*.

Table 27 - Flood Probability Summary

Flood Probability Summary	
Flood Recurrence Intervals	**Annual Chance of Occurrence**
10-year	10.00%
50-year	2.00%

Flood Probability Summary	
Flood Recurrence Intervals	**Annual Chance of Occurrence**
100-year	1.00%
500-year	0.20%
Source: FEMA, 2009	

4.3.3.5 Vulnerability Assessment

Riverine and Stream Flooding

Jefferson County is vulnerable to stream and river flooding on an annual basis. Flooding puts the entire population at some level of risk, whether through flooding of homes, businesses, places of employment, roadways, sewers, and water infrastructure. Flooding can cause significant power outages and poor road conditions that can lead to heightened transportation accident risk.

County community lifelines are the most vulnerable buildings and services when riverine and stream flooding is considered. Community lifeline facilities are facilities that, if damaged, would present an immediate threat to life, public health, and safety. Facilities that use and store hazardous materials pose a potential threat to the environment during flooding events if flooding causes a leak, inundation, or equipment failure. Appendix D of this hazard mitigation plan includes a flooding vulnerability map for each municipality in Jefferson County, with vulnerable structures and community lifeline facilities that are located within the special flood hazard area.

Table 28 – Expected Damage to Essential Facilities (HAZUS) illustrates the estimated damage levels to certain essential facilities based on classifications in the HAZUS General Building Stock. There are no facilities that are estimated to be at least moderately damaged by a 100-year flooding event in the HAZUS Level Two scenario that was completed for Jefferson County. Plans for such an event, and the damage that would result to community lifelines and essential facilities, must be in place to successfully mitigate the potential disruption to community lifeline facilities.

Table 28 - Expected Damage to Essential Facilities (HAZUS)

Expected Damage to Essential Facilities				
Classification	**Number of Facilities**			
	Total:	**At Least Moderate:**	**At Least Substantial:**	**Loss of Use:**
Emergency Operations Center	1	0	0	0

Expected Damage to Essential Facilities				
Classification	**Number of Facilities**			
	Total:	**At Least Moderate:**	**At Least Substantial:**	**Loss of Use:**
Fire Stations	19	0	0	0
Hospitals	2	0	0	0
Police Stations	9	0	0	0
Schools	38	0	0	0
Source: HAZUS, 2023				

Table 29 - County Structures Within Special Flood Hazard Area shows the number of site structure address points within the Special Flood Hazard Area as well as the community lifeline facilities. This information was compiled using the Special Flood Hazard Area and GIS data provided by the Jefferson County GIS Department.

Table 29 - County Structures Within Special Flood Hazard Area

County Structures Within Special Flood Hazard Area		
Municipality	**Site Structure Address Points Within Flood Area**	**Community Lifelines within Flood Area**
Barnett Township	54	0
Beaver Township	4	0
Bell Township	39	0
Big Run Borough	242	1
Brockway Borough	246	2
Brookville Borough	60	0
Clover Township	35	0
Corsica Borough	0	0
Eldred Township	8	0
Falls Creek Borough	0	0
Gaskill Township	13	0
Heath Township	16	0
Henderson Township	21	0
Knox Township	10	0
McCalmont Township	6	0
Oliver Township	33	0
Perry Township	48	0
Pine Creek Township	3	0
Polk Township	1	0

County Structures Within Special Flood Hazard Area		
Municipality	**Site Structure Address Points Within Flood Area**	**Community Lifelines within Flood Area**
Porter Township	2	0
Punxsutawney Borough	340	7
Reynoldsville Borough	243	1
Ringgold Township	24	1
Rose Township	10	0
Snyder Township	85	0
Summerville Borough	49	0
Sykesville Borough	58	0
Timblin Borough	11	0
Union Township	2	0
Warsaw Township	11	0
Washington Township	10	0
Winslow Township	23	0
Worthville Borough	2	0
Young Township	90	0
Totals:	**1,799**	**12**
Source: Jefferson County, 2023		

Table 30 – Community Lifeline Facilities Additional Information illustrates the additional information including name, the municipality, and the type of facility for each community lifeline facility that falls within the Special Flood Hazard Area for Jefferson County. This information was compiled using Jefferson County's GIS information with the assistance of the Jefferson County GIS Department.

Table 30 - Community Lifeline Facilities Additional Information

Community Lifeline Facilities Additional Information	
Municipality:	**Type of Facility:**
Community Lifelines	
Big Run Borough	Fire Station (1)
Brockway Borough	Fire Station (1)
	Gas Station (1)
Punxsutawney Borough	Fire Station (1)
	Gas Station (1)
	Grocery Store (2)

Community Lifeline Facilities Additional Information	
Municipality:	**Type of Facility:**
	Homeless Shelter (1)
	Police Department (1)
	School (1)
Reynoldsville Borough	Grocery Store (1)
Ringgold Township	Electric Substation (1)

Flash Flooding

Flash flooding is a common occurrence in Jefferson County and can occur anywhere in the county. A large portion of flash flooding occurs in populated areas that have increased impervious ground cover. During the risk assessment process, numerous resources were utilized to determine flash flooding locations in Jefferson County. Municipalities were asked to identify locations within the municipality that were prone to frequent flash flooding. The National Climatic Data Center was also queried to determine flash flood vulnerable areas. This data is reflected in *Table 22 – Past Flood and Flash Flood Events* above.

Locations that are identified as vulnerable to flash flooding in Jefferson County are as follows:

- Brookville Borough (Three occurrences)
- Brockway Borough (One occurrence)
- Clover Township (One occurrence)
- Eldred Township (One occurrence)
- Polk Township (One occurrence)
- Sykesville Borough (One occurrence)

Although the above locations were identified as vulnerable areas in Jefferson County, they are not the only locations that are vulnerable to flash flooding. The Jefferson County Hazard Mitigation Team will continue to work with municipalities to identify vulnerable flash flooding locations and identify vulnerable populations and community lifelines.

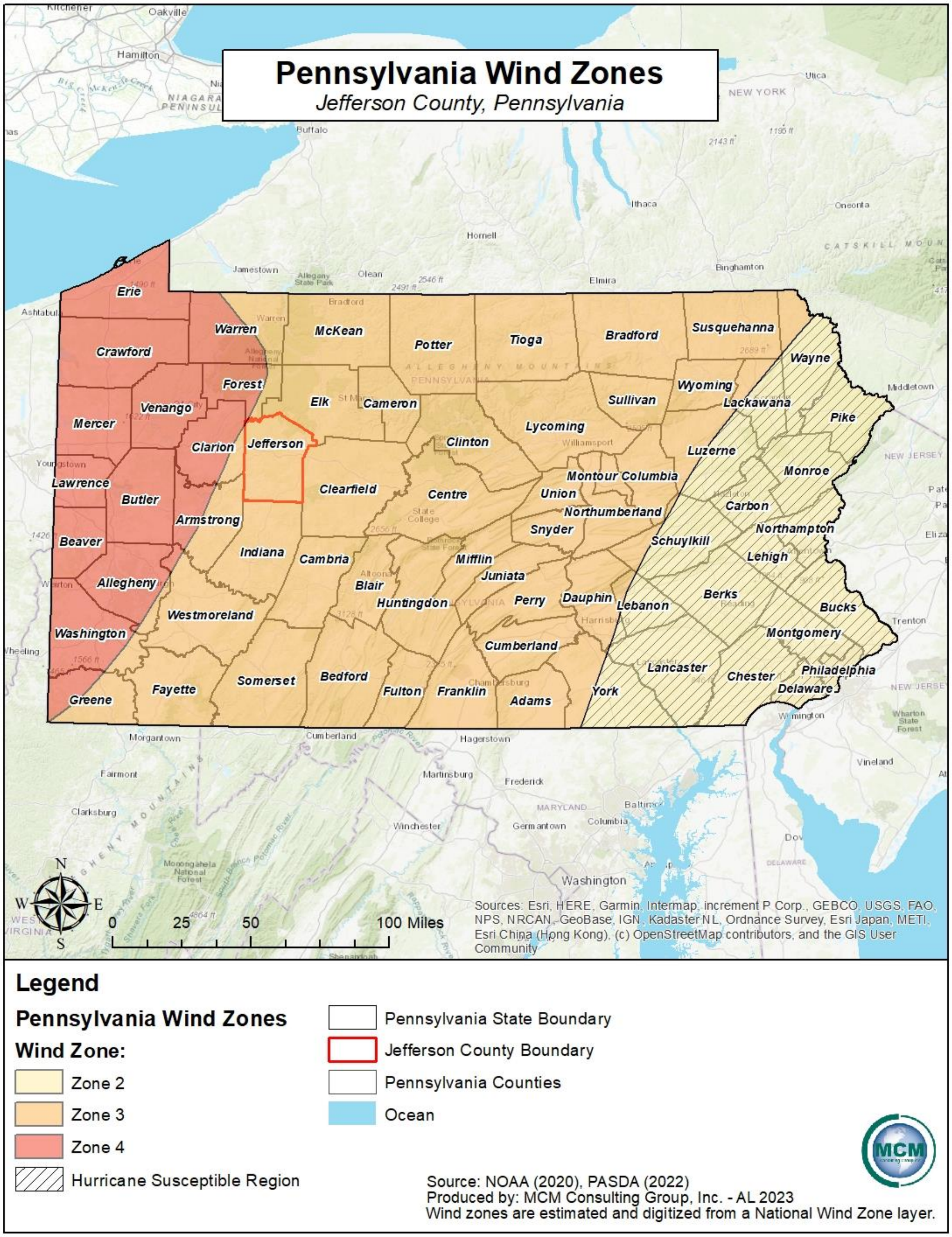
4.3.4. Hurricane and Tropical Storm

4.3.4.1 Location and Extent

Jefferson County does not have any open-ocean coastline areas. However, the impacts from coastal storms such as tropical storms and hurricanes can expand inland. Tropical depressions are cyclones with maximum sustained winds of less than 39 miles per hour (mph). The system becomes a tropical storm when the maximum sustained winds reach between 39 and 74 miles per hour. When wind speeds exceed 74 mph, the system is considered a hurricane. Tropical storms impacting Jefferson County develop in tropical or sub-tropical waters found in the Atlantic Ocean, Caribbean Sea, or Gulf of Mexico. Another type of tropical storms is the nor'easter, which is a large cyclone that rotates clockwise and is typically associated with the Atlantic Ocean and the East Coast of the United States between North Carolina and Massachusetts. The name nor'easter comes from the direction that the strongest winds typically blow from the cyclone.

While Jefferson County is located about 272 miles inland of the East Coast of the United States, tropical storms can track inland and cause heavy rainfall and strong winds. Jefferson County is located inland of the East Coast region, designated by FEMA, as being Hurricane-Susceptible (see *Figure 16 – Pennsylvania Wind Zones*). Jefferson County falls within wind zone 3 as shown in *Figure 16 – Pennsylvania Wind Zones*. Zone 3 for Jefferson County suggests that shelters and critical facilities should be able to withstand a 3-second wind guest of up to 200 mph. Tropical storms and hurricanes are regional and seasonal events that can impact very large areas that are hundreds to thousands of miles across over the life of the storm. Hurricane and tropical storm seasons are typically from June to November. All communities within Jefferson County are equally subject to the impacts of hurricanes and tropical storms that track near the county. Areas in Jefferson County which are subject to flooding, wind, and winter storm damage are particularly vulnerable.

Figure 16 - Pennsylvania Wind Zones



4.3.4.2 Range of Magnitude

Table 31 - Saffir-Simpson Scale

Saffir-Simpson Hurricane Scale		
Category	Wind Speed	
	mph	knots
5	≥156	≥135
4	131-155	114-134
3	111-130	96-113
2	96-110	84-95
1	74-95	65-83
Non-Hurricane Classifications		
Tropical Storm	39-73	34-64
Tropical Depression	0-38	0-33

The impact tropical storm or hurricane events have on an area is typically measured in terms of wind speed. Flood damage results from intense precipitation and wind, typically from coastal storms, which impact Jefferson County. Expected damage from hurricane force winds is measured using the Saffir-Simpson Scale (*Table 31 – Saffir-Simpson Scale*). The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential. Categories three, four, and five are classified as “major” hurricanes, but category one and two storms can contain potential significant storm surge. Category one storms result in very dangerous winds with some damage, while category two storms results in extremely dangerous winds with extensive damage. Category three storms result in devastating damage and category four/five storms result in catastrophic damage. Although major hurricanes comprise only 20% of all tropical cyclones making landfall, they account for over 70% of the damage in the United States. While hurricanes can cause high winds and associated impacts, it is also important to recognize the potential for flooding events during hurricanes, tropical storms, and nor’easters. In Jefferson County, wind impacts from tropical events include downed trees and utility poles to cause utility interruptions. Mobile home, because they may not be well-anchored, have a greater potential to be impacted by high winds. Additionally, these storms can produce high volumes of rainfall that cause flash flooding which can be followed by stream and riverine flooding. The risk assessment and associated impact for flooding events is included in Section 4.

4.3.4.3 Past Occurrence

Table 32 – History of Coastal Storms Impacting Jefferson County lists all coastal storms that have impacted Jefferson County from 1954 to 2021. *Figure 17 – Historic Tropical Storms/Hurricanes in Pennsylvania* identifies some past hurricanes that had an inland path through Pennsylvania. Hurricane Agnes was a severe coastal storm event in June 1972. After

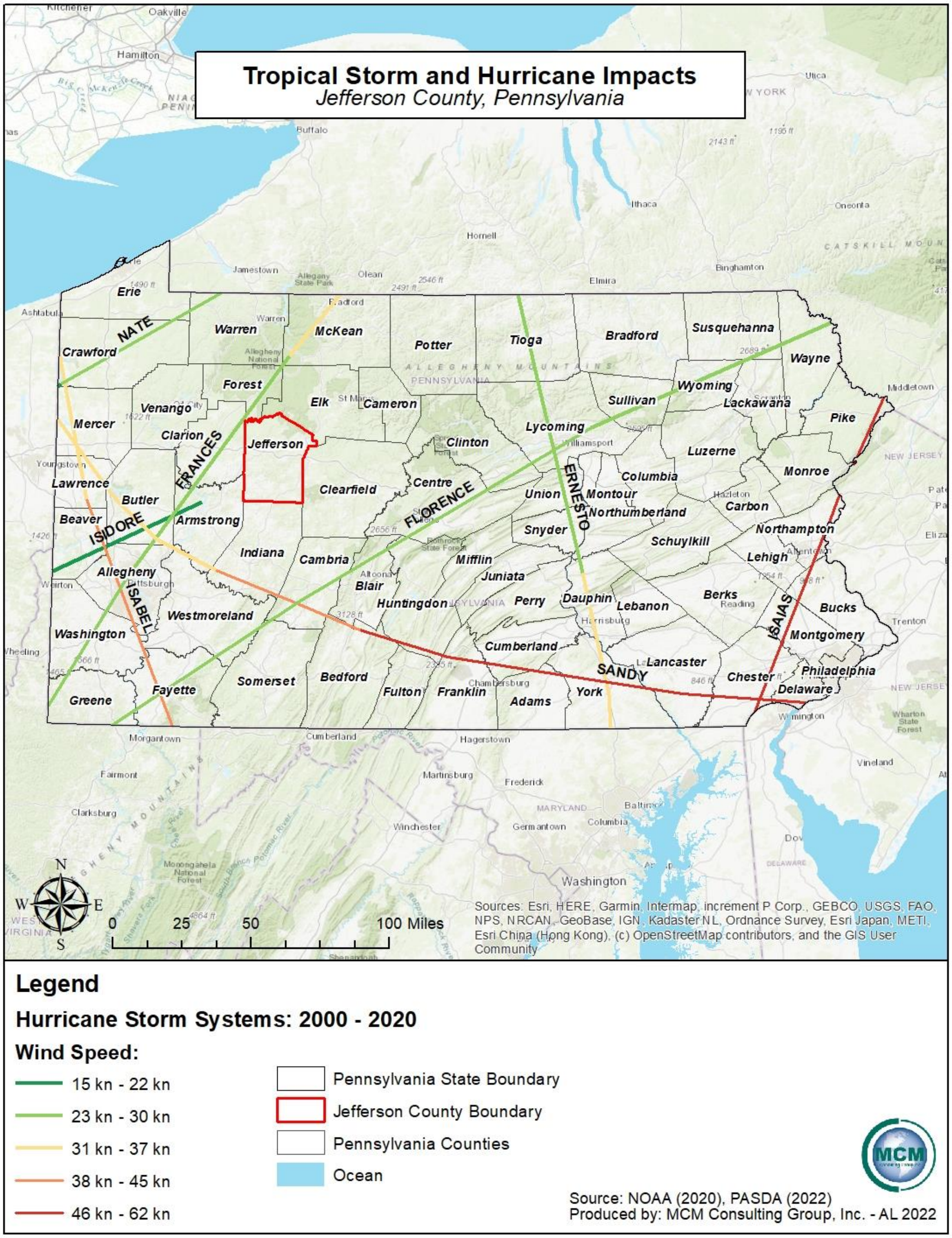
making first landfall as a hurricane near Florida, Agnes weakened and exited back into the Atlantic off the North Carolina coast. The storm moved along the coast and made a second landfall near New York City as a tropical storm and merged with an extra-tropical low-pressure system over Pennsylvania. This brought extremely heavy rains to Pennsylvania that caused major flooding. Pennsylvania incurred $2.8 billion in damages. There were fifty storm related deaths statewide. However, in Jefferson County, the most significant effects of Hurricane Agnes were due to secondary flooding**.** Agnes was only a category one hurricane but dropped more than fifteen inches of rain in the northeastern United States. Pennsylvania received the greatest amount of flood damage.

Hurricane Sandy was another coastal storm event that caused minimal damage to Jefferson County, to include wind and rain.

Table 32 - History of Coastal Storms Impacting Jefferson County

History of Coastal Storms Impacting Jefferson County			
Year	**Name**	**Category at Time of Jefferson County Impact**	**Wind Speed at Time of Jefferson County Impact**
1954	Hurricane Hazel	Extra Tropical Storm	70 knots
1955	Hurricane Connie	Tropical Storm	45 knots
1959	Hurricane Gracie	Extra Tropical Storm	25 knots
1963	Tropical Unnamed Storm	Tropical Depression	25 knots
1968	Tropical Storm Candy	Extra Tropical Storm	25 knots
1979	Hurricane Frederic	Tropical Storm	35 knots
1989	Hurricane Hugo	Extra Tropical Storm	35 knots
1996	Hurricane Fran	Tropical Depression	30 knots
2002	Hurricane Isidore	Extra Tropical Storm	20 knots
2003	Hurricane Isabel	Extra Tropical Storm	35 knots
2004	Hurricane Frances	Extra Tropical Storm	30 knots
2012	Hurricane Sandy	Extra Tropical Storm	40 knots
2017	Hurricane Nate	Extra Tropical Storm	25 knots
2018	Hurricane Florence	Extra Tropical Storm	25 knots
2021	Tropical Storm Fred	Tropical Depression	20 knots
Source: NOAA, 2020			

Figure 17 - Historic Tropical Storms/Hurricanes in Pennsylvania



4.3.4.4 Future Occurrence

Although hurricanes and tropical storms can cause flood events consistent with 100 and 500-year flood levels, the probability of occurrence of hurricanes and tropical storms is measured relative to wind speed. *Table 33 – Annual Probability of Wind Speeds* shows the annual probability of winds that reach the strength of tropical storms and hurricanes in Jefferson County and the surrounding areas based on a sample period of forty-six years. According to NOAA, there is a low probability each year that Jefferson County will experience winds from coastal storms that could cause minimal to moderate damages, however it is likely that a storm event will occur during this planning period The potential future impacts from a tropical storm or hurricane will be approximately once every four and a half years, or 22.24% annually. The probability of winds exceeding 118 mph is less than 0.1% annually (See *Table 33 – Annual Probability of Wind Speeds*.

Table 33 - Annual Probability of Wind Speeds

Annual Probability of Wind Speeds		
Wind Speed (mph)	**Saffir-Simpson Scale**	**Annual Probability of Occurrence (%)**
45-77	Tropical Storms// Category 1 Hurricane	91.59
78-118	Category 1 to 2 Hurricanes	8.32
119-138	Category 3 to 4 Hurricanes	.0766
139-163	Category 4 to 5 Hurricanes	.0086
164-194	Category 5 Hurricanes	.00054
195+	Category 5 Hurricanes	.00001
Source: FEMA, 2000		

There has been an increase in North Atlantic hurricane activity since the 1970s with locations of peak intensity tropical cyclones migrating poleward coinciding with tropics expansion. An index potential hurricane destructiveness suggests an increase over the past thirty years. Variability in tropical cyclone activity in the Atlantic is due to natural variability in ocean circulation, volcanic eruptions, and Saharan dust, as well as climate change resulting from greenhouse gases and sulfate aerosols.

Climate change is causing atmospheric temperatures to rise, which corresponds to a rise in ocean surface temperatures, resulting in warmer and moister conditions where tropical storms develop. However, the relationship between climate change and hurricanes can be complex due to the many other factors that are associated with hurricane development which include wind shear and air pollution. Warmer oceans store more energy and are capable of fueling stronger storms and it is projected that Atlantic hurricanes will become more intense and produce more precipitation as ocean surface temperatures rise. The storms associated with the tropical storms/hurricanes can also linger around for a longer period of time in a given place due to the climate change which enhances destructive impacts in the future. Other possible connections of hurricanes in near future related to climate change are the length of hurricane season and seeing more hurricanes earlier or later than usual hurricane season. There are expected to be more category four and five hurricanes in the Atlantic and the hurricane season may be elongated, all which impact the future of Jefferson County.

4.3.4.5 Vulnerability Assessment

The impacts of climate change are tangible and hazardous realities. Tropical storms tracking nearby Jefferson County can not only cause high winds, but also heavy rains to occur. A vulnerability assessment for hurricanes and tropical storms focusses on the impacts of flooding and severe winds. Flooding associated with hurricanes/tropical storms can occur in areas throughout Jefferson County which can cause damage to buildings and infrastructure. The assessment for flood-related vulnerability is addressed in Section 4.3.3 and a discussion of wind related vulnerability is addressed in Section 4.3.8.

Mobile homes are at a greater vulnerability during a hurricane or tropical storm because those locations could be less securely anchored to the ground than typical homes constructed with footings and foundations. High wind events make these locations particularly vulnerable because of sustained gale-force winds that can be associated with hurricanes and tropical storms. Mobile homes and improperly anchored homes can be found in locations throughout the county, and these are common around the entire Commonwealth of Pennsylvania.

Due to the impact of hurricanes and tropical storms, the vulnerability for Jefferson County is moderate. Potential economic losses could include direct building loss and business interruption. Direct building loss is direct damage to any building or structure. Business interruption includes relocation, employee wage loss, expenses, income loss, etc. Jefferson County’s vulnerability level is high for direct building loss. The total direct building loss amount for Jefferson County equates to $1,720,000.00. The total business interruption value for Jefferson County equates to $4,980,000.00. Therefore, the vulnerability of direct building loss and business interruption is high.

4.3.5. Landslides

4.3.5.1 Location and Extent

Rock falls and other slope failures can occur in areas of Jefferson County with moderate to steep slopes. Many slope failures are associated with precipitation events – periods of sustained above-average precipitation, specific rainstorms, or snowmelt events. Rockfalls, rockslides, rock topples, block slides, debris flows, mud flows, and mud slides are all forms of landslides. Areas experiencing erosion, decline in vegetation cover and earthquakes are also susceptible to landslides. Human activities that contribute to slope failure include altering the natural slope gradient, increasing soil and water content, and removing vegetation cover. Areas where this type of human activity is common are areas that were excavated along highways and other roadways.

The Pennsylvania Department of Conservation and Natural Resources (PA DCNR) describes landslide susceptibility in Jefferson County as generally high vulnerability and high vulnerability along lake bluffs and steam banks. *Figure 18 – Landslide Hazard Areas* shows areas of landslide susceptibility in Jefferson County. A majority of Jefferson County is located in the Appalachian Plateaus physiographic province which is known for high to moderate vulnerability to all forms of landslides. Steep slopes are evenly spread throughout the county and there are locations that can be prone to landslides in almost every municipality.

4.3.5.2 Range of Magnitude

Landslides cause damage to transportation routes, utilities, and buildings. They can also create travel delays and other side effects for transportation of people and material. Fortunately, death and injuries due to landslides are relatively rare in Pennsylvania. Almost all of the known deaths due to landslides have occurred when rocks fall or other slide along highways involve vehicles. Storm-induced debris flows are the only other type of landslide likely to cause injuries. As residential and recreational development increase on and near steep mountain slopes, the hazard from these rapid events will also increase. Most Pennsylvania landslides are moderate to slow moving and damage objects and buildings, rather than people.

The Pennsylvania Department of Transportation (PennDOT) and large municipalities incur substantial costs due to landslide damage and to additional construction costs for new roads in known landslide-prone areas. A 1991 estimate showed an average of $10 million per year is spent on landslide repair contracts across the Commonwealth of Pennsylvania and a similar amount is spent on mitigation costs for grading projects (DCNR, 2009). A number of highway sites in Pennsylvania need temporary or permanent repair at an estimated cost of between $300,000.00 and $2 million each. Similar landslide events that affect traffic and roadways throughout the commonwealth occur intermittently throughout the year. A 7,500-pound rockslide closed down parts of Pennsylvania State Route 11 in Montour County, Pennsylvania in November of 2020 for a number of weeks. Events of similar magnitude can and have occurred in and around Jefferson County.

The 2018 Pennsylvania Hazard Mitigation Plan lists Jefferson County as having a moderate incidence of landslides but high susceptibility. Jefferson County landowners and real estate developers must know the magnitude of susceptibility within the county prior to the start of development.

4.3.5.3 Past Occurrence

No comprehensive list of landslide incidents in Jefferson County is available, as there is no formal reporting system in place. PennDOT and municipal departments are responsible for slides that inhibit the flow of traffic or damage roads and bridges, but they generally only repair the road and the adjacent right-of-way areas.

On October 31, 2019, a mudslide occurred on SR 28 north of Summerville Borough. The roadway was closed for approximately five hours.

4.3.5.4 Future Occurrence

Historically, landslide events are likely to occur once every five years in Jefferson County. Mismanaged development in steeply sloped areas could increase the frequency of occurrence. Road cuts are the most common development that puts an area at an increased probability of a slide. The Pennsylvania Department of Environmental Protection (PA DEP) has an Erosion and Sediment (E & S) program that sets requirements intended to mitigate erosion associated with development projects of a certain scale. The guidelines offered in this program are similar to landslides prevention practices.

4.3.5.5 Vulnerability Assessment

Landslides are often precipitated by other natural hazards such as earthquakes or floods. A significant landslide can cause millions of dollars in damage. Continued enforcement of floodplain management and proper road and building construction can mitigate the vulnerability to landslides. Floodplain management is important where mining has occurred within proximity to watercourses and associated flat-lying areas. Surface water may permeate into areas that still have open fractures and the build-up of surface water in those fractures could lead to unexpected flood events and landslide events.

A comprehensive database of land highly prone to erosion and landslides is difficult to produce. The potential for erosion and landslides should be considered when planning construction projects in Jefferson County. There are several general factors that can be indicators of landslide prone areas including:

- Locations on or close to steep hills.
- Areas of steep road cuts or excavations.
- Steep areas where surface run-off is channeled.
- Fan shaped areas of sediment and rock accumulations.
- Evidence of past sliding such as tilted utility line, tilted trees, cracks in the ground and irregularly, surfaced ground.

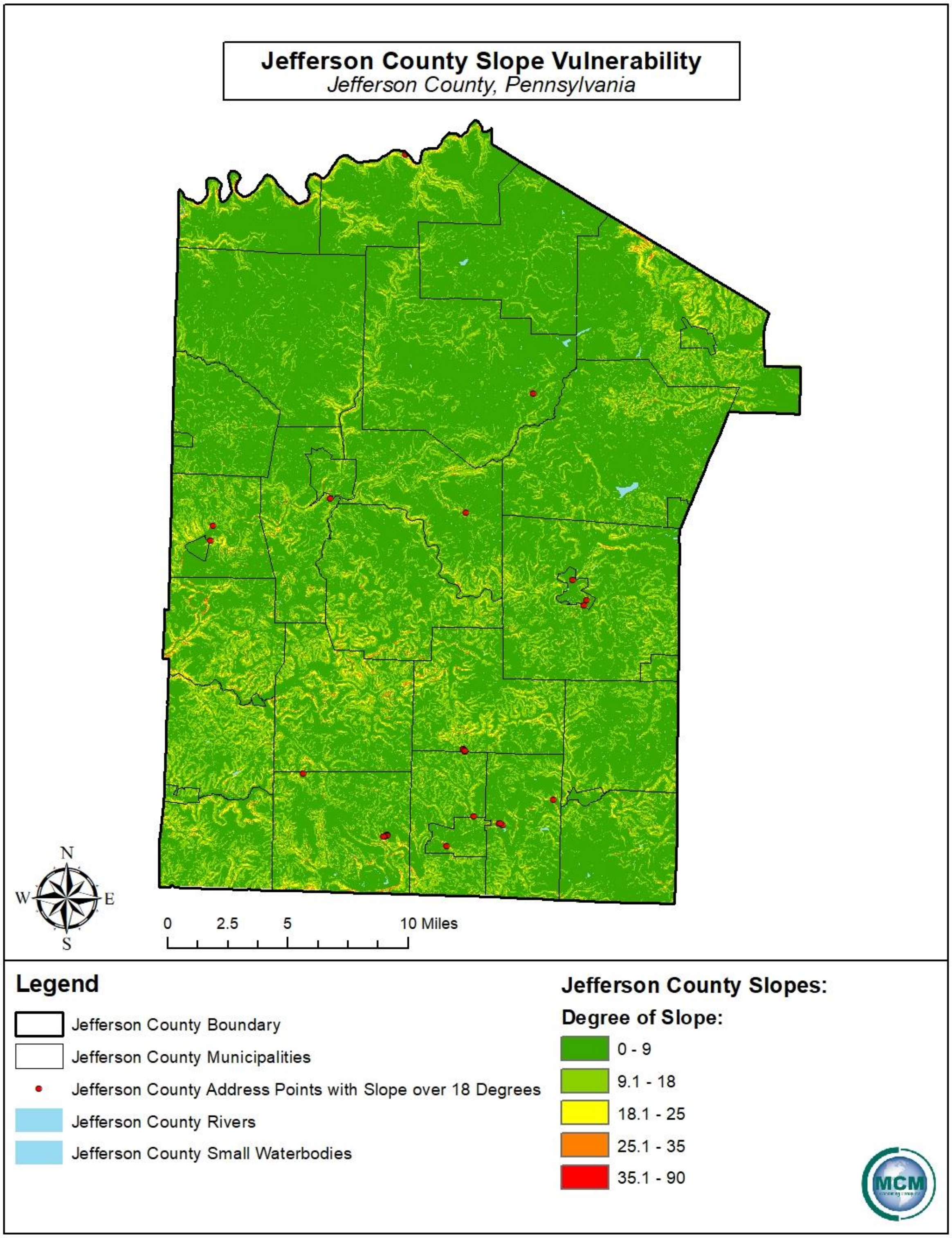
All the municipalities in Jefferson County are vulnerable to landslides. *Table 34 – Structure Vulnerability Data* illustrates the number of site structure address points per municipality and the number of structures in high slope areas. Landslide events are most likely to occur in steeply sloped areas and in places where landforms have been altered for purposes of highway construction or other development. This is especially true if development is located at the base or crest of cliffs or near large highway cut-outs. These areas should be considered vulnerable to landslides, particularly if mitigation measures have not been implemented.

Table 34 - Structure Vulnerability Data

Structure Vulnerability Data		
Municipality	**Number of Addressable Structures Per Municipality**	**Number of Structures in Slope Area**
Barnett Township	953	0
Beaver Township	623	0
Bell Township	2,069	4
Big Run Borough	536	0
Brockway Borough	1,441	0
Brookville Borough	3,031	0
Clover Township	559	2
Corsica Borough	266	0
Eldred Township	1,867	0
Falls Creek Borough	807	0
Gaskill Township	810	0
Heath Township	968	1
Henderson Township	1,575	0
Knox Township	1,350	0
McCalmont Township	1,171	6
Oliver Township	1,409	0

Structure Vulnerability Data		
Municipality	**Number of Addressable Structures Per Municipality**	**Number of Structures in Slope Area**
Perry Township	1,532	8
Pine Creek Township	1,441	1
Polk Township	934	0
Porter Township	484	0
Punxsutawney Borough	4,463	1
Reynoldsville Borough	2,101	2
Ringgold Township	866	0
Rose Township	1,294	1
Snyder Township	2,476	0
Summerville Borough	460	0
Sykesville Borough	791	0
Timblin Borough	146	0
Union Township	978	0
Warsaw Township	1,863	1
Washington Township	2,317	0
Winslow Township	2,731	1
Worthville Borough	74	0
Young Township	1,816	1
Totals:	**46,202**	**29**

Figure 18 - Landslide Hazard Areas



4.3.6. Radon Exposure

4.3.6.1 Location and Extent

Airborne radon gas is radioactive and is a step in the radioactive decay of uranium to radium. Radon is a noble gas, cannot be seen and has no odor. Like other noble gasses, radon gas is very stable, so it does not easily combine with other chemicals. Two isotopes of radon are commonly found: 222Rn and 220Rn. The 220Rn isotope has a very short half-life, so it often only exists for fifty-five seconds, not long enough to pose a hazard to humans. The 222Rn isotope has a half-life of 3.8 days which is long enough to pose a threat to humans. Still, due to the relatively short half-life of 222Rn, it only exists in relative proximity to its radioactive parent, usually within tens of feet away. Radon is a carcinogen and when inhaled, it can lead to the development of lung cancer.

Radioactivity, caused by airborne radon, has been recognized for many years as an important component in the natural background radioactivity exposure of humans, but it was not until the 1980s that the wide geographic distribution of elevated values in houses and the possibility of extremely high radon values in houses were recognized. Radon was discovered as a significant source of natural radiation for humans in 1984 in the Reading Prong geologic province in Eastern Pennsylvania, when routine monitoring of employees leaving the not yet active Limerick nuclear power plant showed readings that a construction worker working on the plant frequently exceeded expected radiation levels despite the fact that the plant was not active. The Environmental Protection Agency (EPA) guidelines state that mitigation actions should be taken if levels exceed 4pCi/L in a home, and most uranium miners have a maximum exposure of 67 pCi/L. Subsequent testing of the Limerick power plant worker's home showed high radon levels of 2,500 pCi/L (pico Curies per Liter), triggering the Reading Prong to become the focus of the first large-scale radon scare.

Radon gas is considered ubiquitous and can be found in indoor and outdoor environments. There is no known safe level of exposure to radon. For most people in Pennsylvania, the greatest risk of radon exposure is from within their home in rooms that are below, directly in contact with, or immediately above the ground. Sources of radon include radon in the air from soil and rock beneath homes, radon dissolved in water from private wells and exsolved during water use (rare in Pennsylvania), and radon emanating from uranium-rich building materials such as concrete blocks or gypsum wallboard (also rare in Pennsylvania). Key factors in radon concentration in homes are the rates of air flow into and out of the house, the location of air inflow, and the radon content of air in the surrounding soil. Because of the flow dynamics of air inside of most houses, even a small rate of soil radon gas inflow can lead to elevated radon concentrations.

There are several factors that contribute to higher radon levels in soil gas:

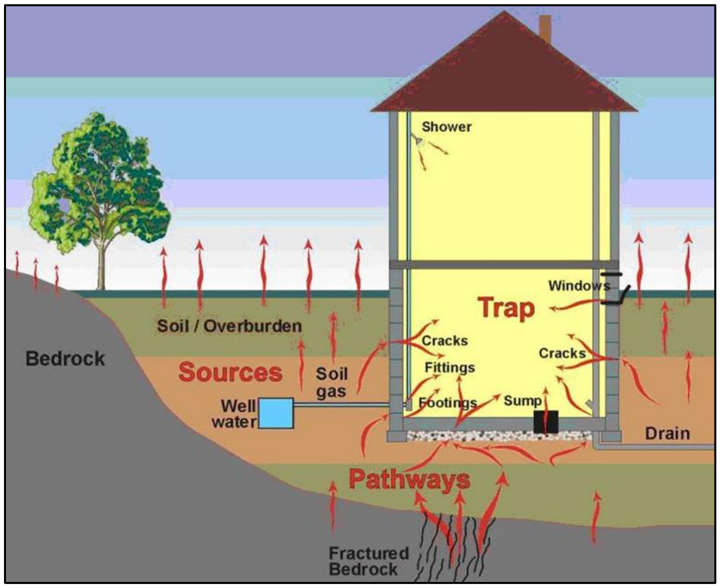
- Proximity to elevated uranium rich deposits (>50ppm). Areas within a few hundred feet of such deposits are most at risk. Such deposits are rare in Pennsylvania.
- Some more common rocks have higher than average uranium content (5 to 50 ppm), and proximity to such rocks also increases the risk of radon exposure. These rock types include black shales as well as granitic and felsic alkali igneous rocks. This is the most common source of high radon levels in Pennsylvania. The Reading Prong elevated radon levels come from Precambrian granitic gneisses.
- Other soil and bedrock properties that facilitate radon mobility. The amount of pore space in the soil and its permeability – more porous soils will allow radon to travel more easily. Limestone-dolomite soils can also be predisposed to collect radon from radium resultant from weathering of iron oxide or clay surfaces. In some cases (like State College in Centre County, PA) even with underlying bedrock having normal uranium concentrations (.5 to 5 ppm), the vast majority of locations built on limestone-dolomite soils exceed radon concentrations of 4pCi/L, and many exceeded 20 pCi/L.

The following three sources of radon in houses are now recognized (see *Figure 19 - Sketch of Radon Entry Points into a House* below):

- Radon in soil air that flows into the house
- Radon dissolved in water from private wells and exsolved during water usage; this is rarely a problem in Pennsylvania
- Radon emanating from uranium-rich building materials (e.g., concrete blocks or gypsum wallboard); this is not known to be a problem in Pennsylvania

High radon levels were initially thought to be exacerbated in houses that are tightly sealed, but it is now recognized that rates of airflow into and out of houses, plus the location of air inflow and the radon content of air in the surrounding soil, are key factors in radon concentrations. Outflows of air from a house, caused by a furnace, fan, thermal “chimney” effect, or wind effects, require that air be drawn into the house to compensate. If the upper part of the house is tight enough to impede influx of outdoor air (where radon concentration is generally <0.1 pCi/L), then an appreciable fraction of the air may be drawn in from the soil or fractured bedrock through the foundation and slab beneath the house, or through cracks and openings for pipes, sumps, and similar features. Soil gas typically contains from a few hundred to a few thousand pCi/L of radon; therefore, even a small rate of soil gas inflow can lead to elevated radon concentrations in a house.

Figure 19 - Sketch of Radon Entry Points into a House



The radon concentration of soil gas depends upon a number of soil properties, the importance of which is still being evaluated. In general, 10% to 50% of newly formed radon atoms escape the host mineral of their parent radium and gain access to the air-filled pore space. The radon content of soil gas clearly tends to be higher in soils containing higher levels of radium and uranium, especially if the radium occupies a site on or near the surface of a grain from which the radon can easily escape. The amount of pore space in the soil and its permeability for airflow, including cracks and channels, are important factors determining radon concentration in soil gas and its rate of flow into a house. Soil depth and moisture content, mineral host and form for radium, and other soil properties may also be important. For houses built on bedrock, fractured zones may supply air having radon concentrations similar to those in deep soil.

The second factor listed above is most likely the cause of high radon levels in Jefferson County. The data show that most reported zip codes in the county have high basement radon level test results. The areas and test results are shown in more detail in the past occurrence section.

4.3.6.2 Range of Magnitude

According to the EPA, about 21,000 lung cancer deaths each year in the U.S. are related to radon. It is the second leading cause of lung cancer after smoking and the number one cause of lung cancer among nonsmokers. Radon causes lung cancer by continuing to radioactively decay after being inhaled, and turning into a daughter product (218Po, 214Pb, 214Bi) which may become attached to lung tissue and induce lung cancer due to the continued radioactive decay.

The EPA reports that the national average radon concentration of indoor air of homes is about 1.3 pCi/L, and they recommend that homes be fixed if the radon level is 4pCi/L or more. There is however no safe level of radon exposure, so the EPA also recommends considering fixing a home if the radon level is between 2 pCi/L and 4 pCi/L.

Table 35 - Radon Risk for Smokers and Nonsmokers shows the relationship between various radon levels, probability of lung cancer, comparable risks from other hazards, and action thresholds. As seen in *Table 35 - Radon Risk for Smokers and Nonsmokers* below, a smoker exposed to radon has a much higher risk of lung cancer.

Table 35 - Radon Risk for Smokers and Nonsmokers

Radon Risk for Smokers and Nonsmokers			
Radon Level (pCi/L)	**If 1,000 People Were Exposed to this level over a lifetime…***	**Risk of cancer from radon exposure compares to...*****	**Action Threshold**
SMOKERS			
20	About 260 people could get lung cancer	250 times the risk of drowning	Fix Structure
10	About 150 people could get lung cancer	200 times the risk of dying in a home fire	
8	About 120 people could get lung cancer	30 times the risk of dying in a fall	
4	About 62 people could get lung cancer	5 times the risk of dying in a car crash	
2	About 32 people could get lung cancer	6 times the risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 20 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	About 3 people could get lung cancer	(Average outdoor radon level)	
NON-SMOKERS			
20	About 36 people could get lung cancer	35 times the risk of drowning	Fix Structure

Radon Risk for Smokers and Nonsmokers			
Radon Level (pCi/L)	**If 1,000 People Were Exposed to this level over a lifetime…***	**Risk of cancer from radon exposure compares to...*****	**Action Threshold**
10	About 18 people could get lung cancer	20 times the risk of dying in a home fire	
8	About 15 people could get lung cancer	4 times the risk of dying in a fall	
4	About 7 people could get lung cancer	The risk of dying in a car crash	
2	About 4 people could get lung cancer	The risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 2 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	-	(Average outdoor radon level)	
Note: Risk may be lower for former smokers * Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003). ** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.			

4.3.6.3 Past Occurrence

In 1984, the Pennsylvania Radon Bureau responded to the newly detected high radon levels with a massive radon monitoring, educational, and remediation effort. In the start of November 1986, over 18,000 homes had been screened for radon and approximately 59% were found to have radon daughter levels in excess of the 0.020 Working Level (WL) guideline. Radon daughter levels ranged up to 13 WL or 2600 pCi/L or radon gas.

The Pennsylvania Department of Environmental Protection (PA DEP) provides information for homeowners about how to test for radon in their homes, and when they receive a test result over 4 pCi/L, the PA DEP Bureau of Radiation Protection works to help homeowners repair the home and mitigate the hazard. The DEP has estimated that the national average indoor radon concentration is 1.3 pCi/L and the level for action is 4.0 pCi/L; however, they have estimated that the average indoor concentration in Pennsylvania basements is about 7.1 pCi/L and 3.6 pCi/L on the first floor. The PA DEP records all the tests they receive and categorize them in a searchable database by zip code. There are currently 2,174 zip codes in Pennsylvania, but the zip code radon test data only covers for 986 zip codes. The missing zip codes that report in the data base as "N/A" for insufficient data either had fewer than thirty test results or no test results at all.

Table 36 – Radon Test Results in Jefferson County shows a total of twelve zip codes in Jefferson County where tests were reported to the PA DEP to report their findings; those with no available data were not included in the table. The highest average radon level was reported from the 15801-zip code, which is in the eastern area of the county, with an average reading of 299.3 pCi/L within location of the basement. Most reporting zip codes in Jefferson County have average basement Radon levels significantly above the suggested EPA action level of 4 pCi/L. The average basement reading for reporting zip codes in the county is 9.18 pCi/L, and the average first floor reading is 5.95 pCi/L.

Table 36 - Radon Test Results in Jefferson County

Radon Level Test Results					
Zip Code	**Postal Community**	**Location**	**Number of Tests**	**Max Result pCi/L**	**Average Result pCi/L**
15767	Punxsutawney, PA	Basement	796	261.4	13.0
		First Floor	100	69.9	8.0
15801	Dubois, PA	Basement	4124	299.3	11.0
		First Floor	260	48.6	5.5
15823	Brockport, PA	Basement	58	36.3	4.9
		First Floor	N/A	N/A	N/A
15824	Brockway, PA	Basement	300	171.6	8.4
		First Floor	30	63.6	4.0
15825	Brookville, PA	Basement	592	114.8	9.4
		First Floor	83	51.6	4.9
15829	Corsica, PA	Basement	43	165.0	9.6
		First Floor	N/A	N/A	N/A
15840	Falls Creek, PA	Basement	115	71.9	8.4
		First Floor	N/A	N/A	N/A
15851	Reynoldsville, PA	Basement	220	115.9	9.7
		First Floor	39	35.7	4.6
15853	Ridgway, PA	Basement	326	98.4	6.0
		First Floor	52	63.2	8.7
15864	Summerville, PA	Basement	45	50.8	8.8

Radon Level Test Results					
Zip Code	**Postal Community**	**Location**	**Number of Tests**	**Max Result pCi/L**	**Average Result pCi/L**
		First Floor	N/A	N/A	N/A
15865	Sykesville, PA	Basement	65	90.3	9.1
		First Floor	N/A	N/A	N/A
16222	Dayton, PA	Basement	45	67.6	11.8
		First Floor	N/A	N/A	N/A
Source: PA DEP, 2023					

4.3.6.4 Future Occurrence

Radon exposure is likely given the geologic and geomorphic conditions in Jefferson County. The EPA and USGS have mapped radon potential in the US to help target resources and assist local governments in determining if radon-resistant features are applicable for new construction. The designations are broken down into three zones and are assigned by county, as shown in *Figure 20 – Pennsylvania Radon Levels*. Each zone reflects the average short-term measurement of radon that can be expected in a building without radon controls. Jefferson County is located within Zone 2 with counties of moderate potential for radon which indicate an intermediate likelihood of occurrence in the future.

1. Zone 1 has the highest potential and readings can be expected to exceed the 4 pCi/L recommended limit.
2. Zone 2 has a moderate potential for radon with levels expected to be between 2 and 4 pCi/L and
3. Zone 3 has a low potential with levels expected to be less than 2 pCi/L.

Due to the moderate likelihood of future occurrence, the level of radon daughters should be monitored. Radon daughters are the concentration of decay products of radon in the uranium chain. Fortunately, the presence of radon daughters can be monitored through the means as radon gas. *Table 37 - Suggested Actions and Time Frame for Exposure to Radon Daughters* provides suggested actions and time frames for varying levels of exposure to radon daughters.

Table 37 - Suggested Actions and Time Frame for Exposure to Radon Daughters

Suggested Actions and Timeframe for Exposure to Radon Daughters		
Exposure Level*	Suggested Action**	Timeframe For Plan
more than 5.0 WL***	Residents should either promptly relocate or undertake temporary remedial action to lower levels as far below 5.0 WL as possible. Smoking in high areas discouraged.	Within 2-3 days
1.0 to 5.0 WL	Residents should undertake temporary remedial action to lower levels as far below 1.0 WL as possible. Smoking in high areas discouraged.	Within 1 week
0.5 to 1.0 WL	Residents should undertake temporary remedial action to lower levels as far below 0.5 WL as possible.	Within 2 weeks
0.1 to 0.5 WL	Residents should undertake temporary remedial action to lower levels as far below 0.1 WL as possible. Higher exposure levels require action to be taken in a shorter	3 weeks to 3 months
0.02 to 0.1 WL	Residents should undertake temporary and/or permanent remedial action to lower levels below 0.02 WL. Higher exposure levels require action to be taken in a shorter	4 to 15 months

4.3.6.5 Vulnerability Assessment

Proper testing for radon levels should be conducted across Jefferson County, especially in the areas of higher incidence levels, and for those individuals and households that face the contributing risks. This testing will determine the level of vulnerability that residents face in their homes, as well as in their businesses and schools.

Jefferson County is in the EPA Radon Hazard Zone 2, meaning there is a moderate risk of radon exposure. Smokers can be up to ten times more vulnerable to lung cancer from high levels of radon depending on the level of radon they are exposed to. Additionally, older homes that have crawl spaces or unfinished basements are more vulnerable to having high radon levels. Average basement radon levels for homes who reported their results to the PA DEP are often found to be above the EPA action level of 4 piC/L. *Figure 21 – Radon Levels by Zip Code* shows the best available data from the EPA about the percentage of homes with radon levels at or above the EPA action level. The EPA estimates that an average radon mitigation system costs approximately $1,200.00. The PA DEP Bureau of Radiation Protection provide short- and long-term tests to determine radon levels, as well as information on how to mitigate high levels of radon in a building. The 2018 PA HMP estimates that there are 16,035 vulnerable buildings in

Jefferson County that are in areas with high radon test results, and the cost to mitigate the most impacted of those buildings (an estimated 20% of them or 3,207 buildings) would be $3,848,400.00.

Figure 20 - Pennsylvania Radon Levels

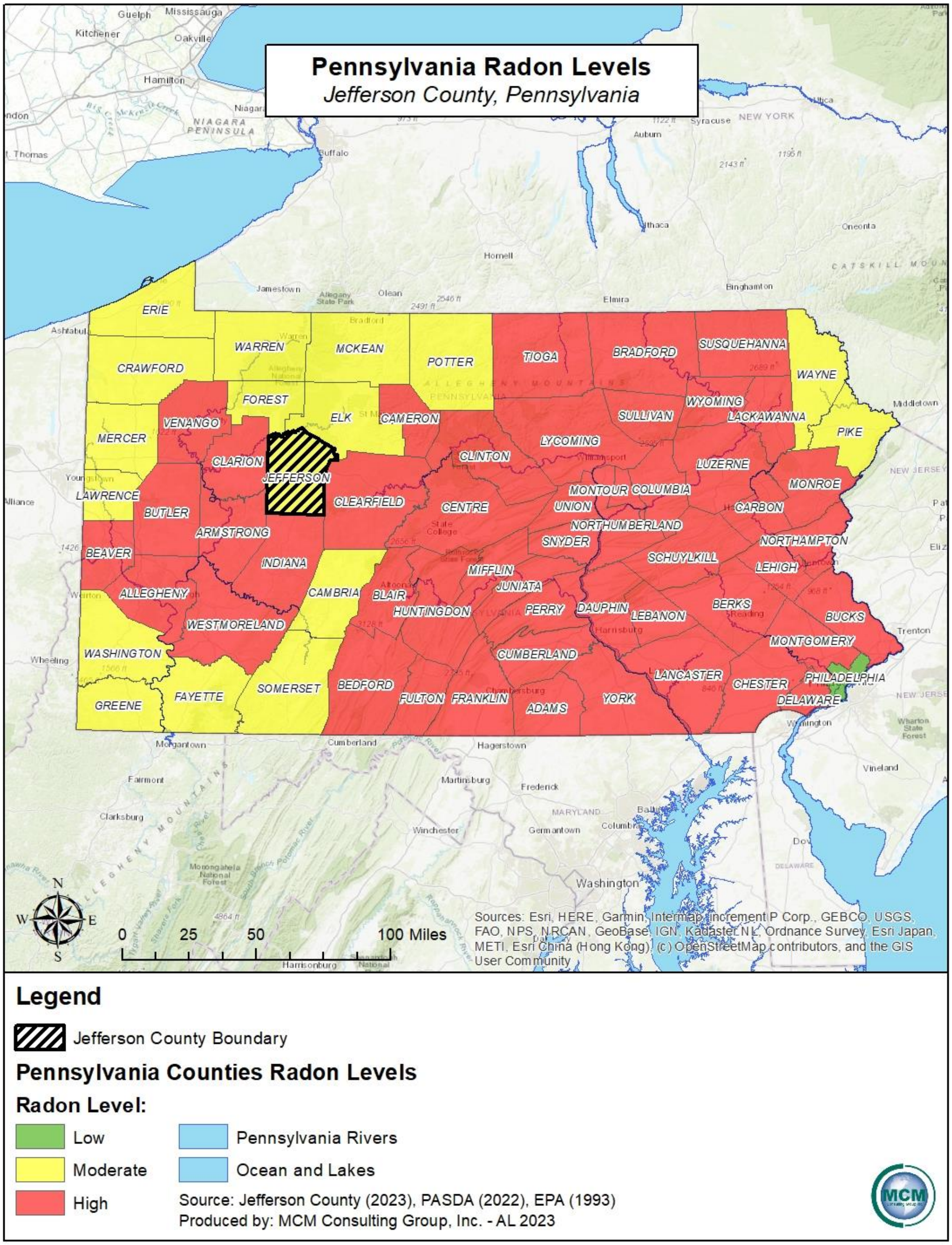
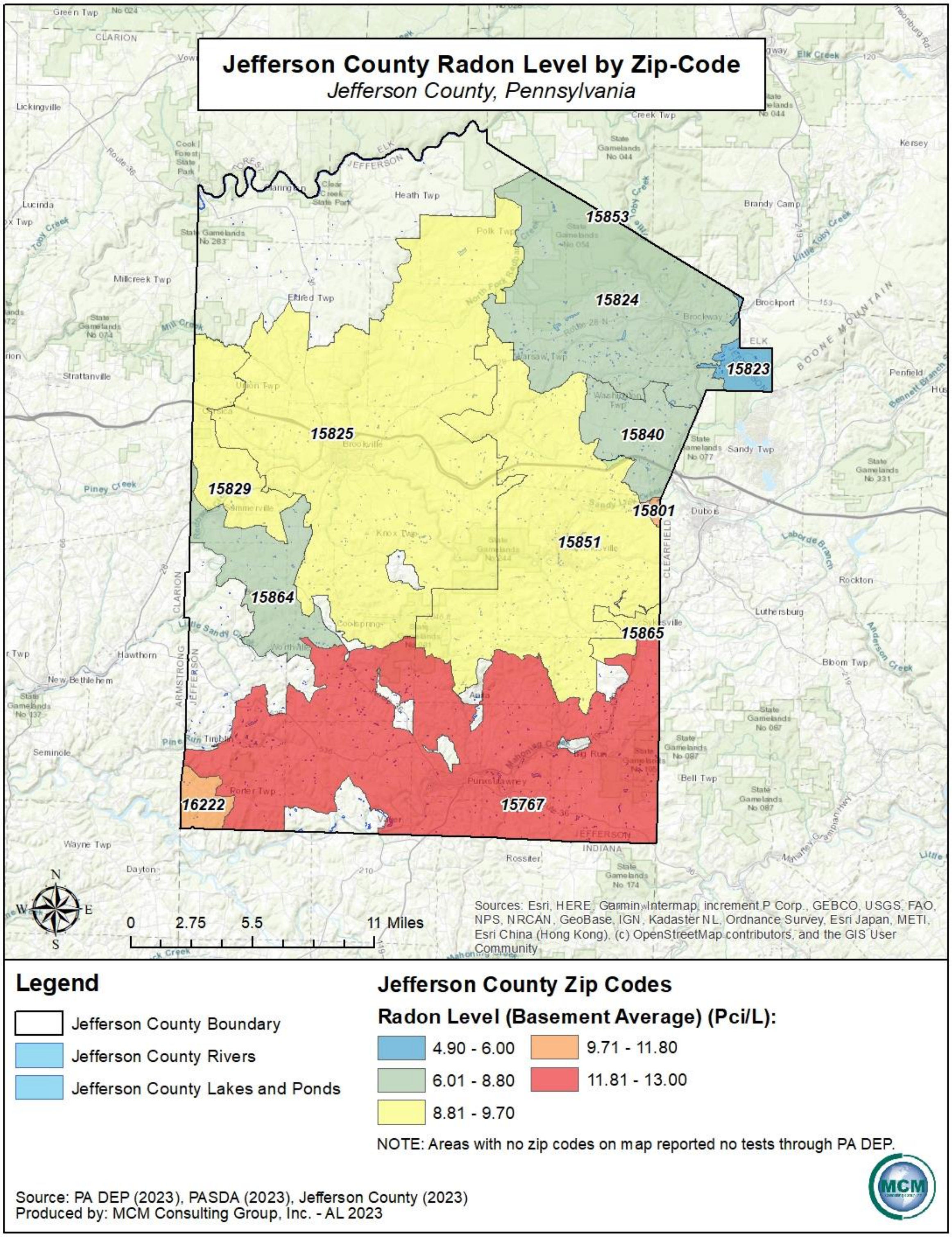


Figure 21 - Radon Levels by Zip Code



4.3.7. Subsidence and Sinkhole

4.3.7.1 Location and Extent

Subsidence is the sinking movement of the earth's surface; the result of this movement is commonly referred to as a sinkhole. There are two common causes of subsidence in Pennsylvania: 1) dissolution of carbonate rock such as limestone or dolomite and 2) mining activity. In the first case, water passing through naturally occurring fractures and bedding planes dissolves bedrock leaving voids below the surface. Eventually, overburden on top of those voids collapses, leaving surface depressions resulting in what is known as karst topography. Characteristic structures associated with karst topography include sinkholes, linear depressions, and cases. Often, sub-surface solution of limestone will not result in the immediate formation of karst features. Collapse sometimes occur only after a large amount of activity, or when a heavy burden is placed on overlying material. The bedrock geology is found mostly in the south-central and eastern portions of the Commonwealth of Pennsylvania, and Jefferson County is not located in a karst vulnerable area. Subsidence in Jefferson County is primarily due to mining activity. This plan will focus on mining activity. Jefferson County has a history of subsidence due to mining activity.

Mining activity is concentrated in the southwestern region of the state. The majority of sub-surface (i.e., underground) extraction of materials such as oil, gas, coal, metal ores (i.e., copper, iron, and zinc), clay, shale, limestone, or water can result in slow-moving or abrupt shifts in the ground surface and these areas have a higher potential to be impacted by sinkholes and subsidence. Sinkholes often develop where the cover above a mine is thin. Sinkhole development normally occurs where the interval to the ground surface is less than three to five times the thickness of the extracted seam and the maximum interval is up to ten times the thickness of the extracted seam. In western Pennsylvania, most sinkholes develop where the soil and rock above a mine are less than fifty feet thick.

Human activity can also result in subsidence or sinkhole events. Leaking water pipes or structures that convey storm-water runoff may result in areas of subsidence as the water dissolves substantial amounts of rock over time. Poorly managed stormwater can be an exacerbating factor is subsidence events. In some cases, construction, land grading, or earthmoving activities that cause changes in stormwater flow can trigger sinkhole events.

4.3.7.2 Range of Magnitude

No two subsidence areas or sinkholes are exactly alike. Variations in size and shape, time period under which they occur (i.e., gradually, or abruptly), and the proximity to development ultimately determine the magnitude of damage incurred. Events could result in minor elevation changes or deep, gaping holes in the surface. Subsidence and sinkhole events can be addressed before significant damage occurs.

Primarily, problems related to subsidence include the disruption of utility services and damages to private and public property including buildings, roads, and underground infrastructure. Isolated incidents of subsidence throughout the coal regions over the past years have affected houses, garages, and trees that have been swallowed up by subsidence holes. Lengths of local streets and highways, and countless building foundations have been damaged.

If long-term subsident or sinkhole formation is not recognized and mitigation measures are not implemented, fractures or complete collapse of building foundations and roadways may result. The worst-case scenario of a mine subsidence event for Jefferson County would be similar to an event in Allegheny County in 2013, when sixty-nine homes in Hyde Park sustained mine subsidence damage. The Pennsylvania Department of Environmental Protection responded to the subsidence by filling the mine voids at a cost of $3.7 million. If mitigation measures are not taken, the cost to fill in and stabilize sinkholes can be significant although sinkholes are limited in range of magnitude.

Voids in the earth's subsurface are created where coal was previously mined and removed. The condition removes a significant portion of the support of the overlying rock strata that usually causes the rock strata to fall or subside into the voids that may damage dwellings or other surface structures above the affected areas. Mining locations across the county should be carefully noted and avoided as sites for new construction unless the proper measures are taken to ensure the mine's soundness.

The Jefferson County local planning team assigned a risk factor assessment score of 1.8 to subsidence and sinkhole formation. This places the hazard at a low risk factor. *Figure 22 – Sinkhole Susceptibility in Pennsylvania* illustrates the portions of the Commonwealth of Pennsylvania where sinkholes and subsidence are common. The hazard for subsidence and sinkholes in these regions is very high. Jefferson County has a large portion of mining areas and is therefore one of these regions.

4.3.7.3 Past Occurrence

There is no comprehensive list of mine subsidence in Jefferson County. The Pennsylvania Department of Conservation and Natural Resources (PA DCNR) provides an online sinkhole inventory database, which lists a total of 3,619 identified sinkholes in Pennsylvania as of 2022. Of these sinkholes none fall within Jefferson County. The fact that no sinkholes were identified does not necessarily mean there are no sinkholes in Jefferson County. Additionally, the Pennsylvania Department of Environmental Protection indicates that some small incidences of sinkholes occur several times per week and cause limited damage and that many of these are related to failing infrastructure like water main breaks or collapsed pipes.

4.3.7.4 Future Occurrence

There is currently no reliable information regarding the probability of future occurrence of subsidence or sinkholes in Pennsylvania. One way of estimating the probability of future occurrences would be to project the historical trends into the future, but there is no comprehensive documentation of previous events in Jefferson County. The PA DEP has noted that mine subsidence events are constant though they vary in intensity and damage. Based on geological conditions and mining activities in Jefferson County, the annual occurrence of subsidence and sinkholes near where mining occurs is considered likely. Although precise locations of future occurrences is difficult to predict due to site-specific conditions that contribute to sinkhole development, there are several signs that can signal potential development.

The signs include:

- Slumping or falling fence posts, trees, or foundations.
- Sudden formation of small ponds.
- Wilting vegetation.
- Discolored well water.
- Structural cracks in walls and/or floors.

Based on geological conditions and mining activity, subsidence events are likely to occur in Jefferson County. If land development and mining were to occur in an area that is unstable or unsafe, a subsidence event or sinkhole is likely to form. *Figure 24 – Unsuitable Areas for Mining in Pennsylvania* illustrates the areas of Pennsylvania where mining could potentially cause a subsidence event or a sinkhole. None of these areas that are unsuitable for mining are located in or around Jefferson County.

4.3.7.5 Vulnerability Assessment

Areas of the county where commercial mining operations take place are the most vulnerable to subsidence and sinkhole hazards. Natural subsidence and sinkholes have never been reported in Jefferson County. A mined area may be differentially prone to subsidence based on its geology and depth of mineral seam, but reliable information about the different locations of varying depths of seams are not available. Geologists agree that all areas that are mined are prone to subsidence; therefore, coal mined areas are shown as vulnerable to mine subsidence. Moist of the mining that has occurred in Jefferson County was superficial mining of natural resources. The mine sites were abandoned after extraction can potentially become areas susceptible to subsidence events. These areas can be seen in *Figure 23 – Abandoned Mined Sites in Jefferson*

County. Subsidence cannot be ruled out as a potential hazard for Jefferson County. There are not state or county critical infrastructure facilities at risk in the county due to sinkholes.

Figure 22 - Sinkhole Susceptibility in Pennsylvania

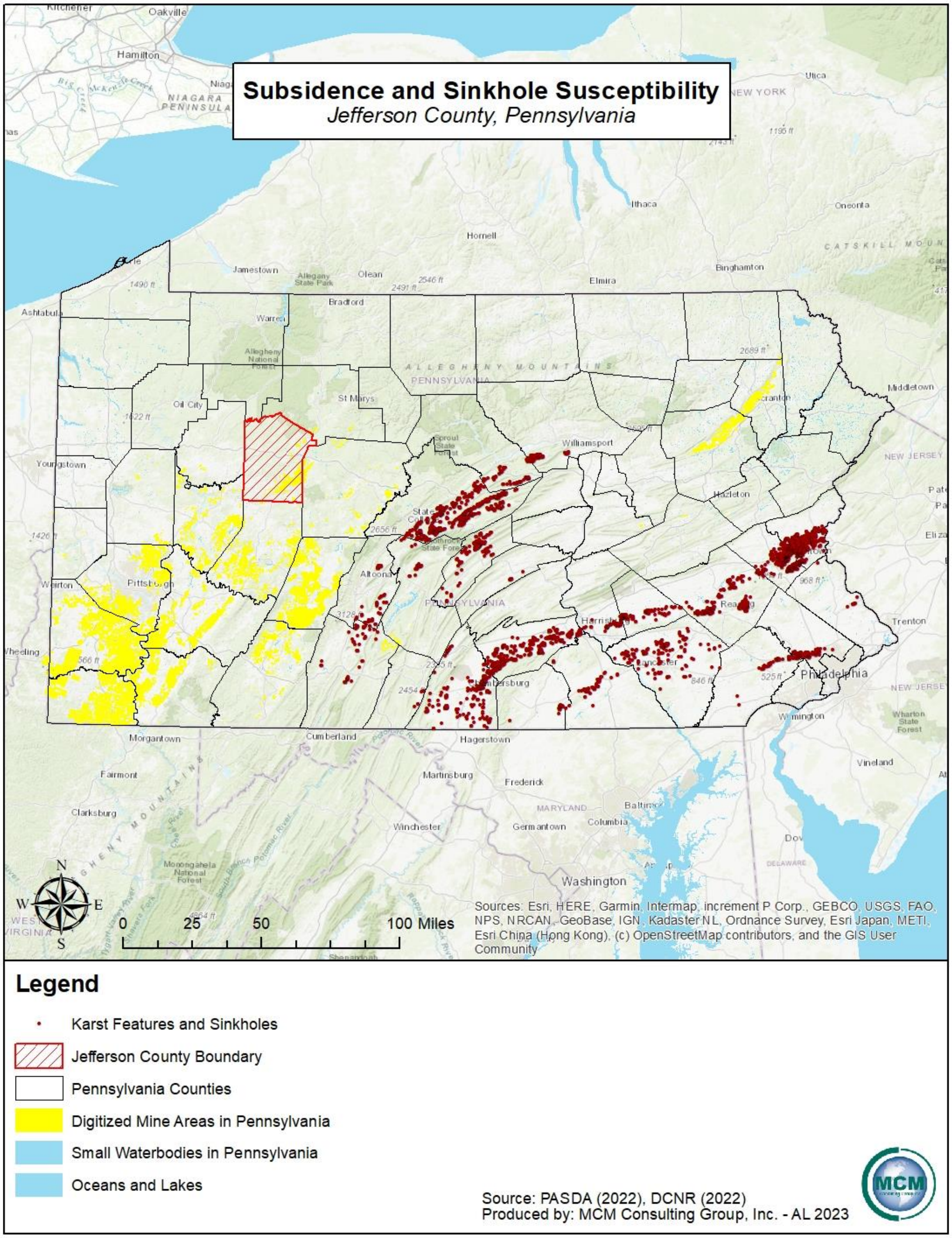


Figure 23 - Abandoned Mined Sites in Jefferson County

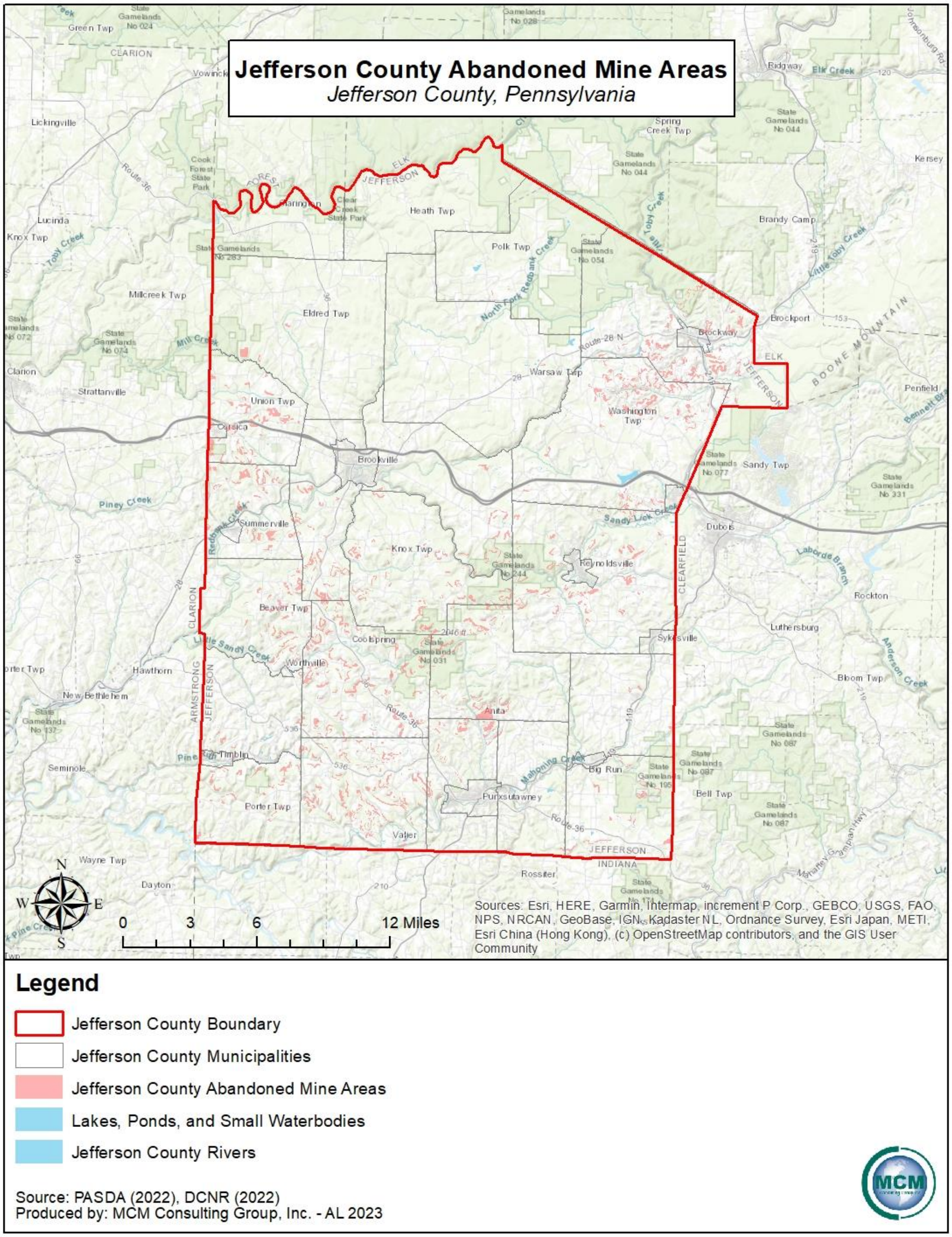
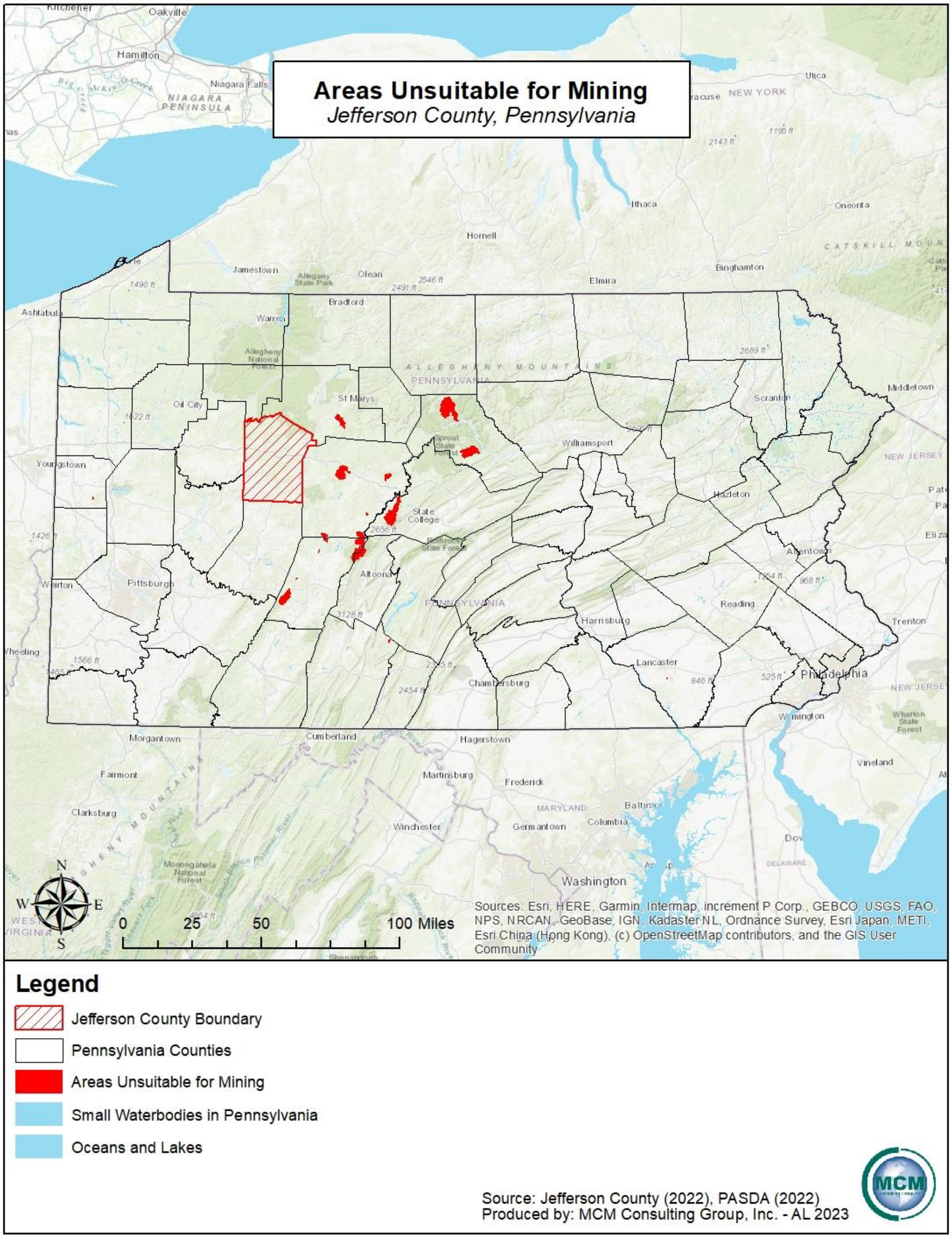


Figure 24 - Unsuitable Areas for Mining in Pennsylvania



4.3.8. Tornado/Windstorm

4.3.8.1 Location and Extent

Tornadoes and windstorms can occur throughout Jefferson County and are usually localized in their location and extent. Severe thunderstorms may result in conditions favorable for the formation of windstorms, including tornadoes. Tornadoes are nature's most violent storms and can cause fatalities and devastation to neighborhoods and municipalities within the county and region. Tornadoes can occur at any time during the day or night but are most frequent during the late afternoon and early evening, which are typically the warmest hours of the day. Tornadoes are most likely to occur in the spring and summer.

Tornadoes

There are two main types of tornadoes: supercell and non-supercell. Supercell tornadoes are the most common and often the most dangerous type of tornado. A rotating updraft is key to the development of a supercell and, eventually, a tornado. Once the updraft is rotating and being fed by warm air, a tornado is formed. The other type of tornado is categorized as non-supercell, which is not as common as a supercell tornado. One type of non-supercell tornado is the "Quasi-Linear Convective Systems" (QLCS). The QLCS tornadoes typically arise during the late night or early morning hours and are typically weaker and shorter-lived than supercell tornadoes. However, QLCS are more difficult to detect effectively. Another type of non-supercell tornado is a landspout. These tornadoes are narrow, rope-like funnels that form when a thundercloud grows without a rotating updraft, which causes the spinning motion common with tornadoes to appear near the ground.

Windstorms

Windstorms are experienced on a region-wide scale. The most frequent cause of windstorms in Pennsylvania are thunderstorms, although they may also be caused by hurricanes and winter storms. Windstorms are defined as sustained wind speeds of 40 mph or greater, lasting for at least one hour, or winds of 58 mph or greater lasting for any duration. There are a wide variety of windstorm events that can take place in Jefferson County.

4.3.8.2 Range of Magnitude

Tornadoes

Each year tornadoes account for $1.1 billion in damages and cause over eighty deaths nationally. Thus far, 2011 was the second worst year on record for deadly tornadoes behind 1936. The number of tornado reports has increased since 1950. While the extent of tornado damage is usually localized, the vortex of extreme wind associated with a tornado can result in some of the most destructive forces on Earth. The damage caused by a tornado is a result of the high-wind velocity and windblown debris, also accompanied by lightning or large hail. The most violent tornadoes have rotating winds of 250 mph or more and can cause extreme destruction and turning normally harmless objects into deadly projectiles.

Tornado movement is characterized in two ways: direction/speed of spinning winds and the forward movement of the tornado, also known as the storm track. The rotational wind speeds can range from 65 to more than 200 miles per hour (mph). The speed of forward motion can range from 0 mph to 50 mph. Forward motion of a tornado path can be a few to several hundred miles in length. Widths of tornadoes vary from less than 100 feet in diameter to more than a mile wide in regard to the largest tornadoes on record. The National Centers for Environmental Information (NCEI) reports that, “the maximum winds in tornadoes are often confined to extremely small areas and vary tremendously over short distance,” which explains why one house in a tornado’s path may be completely demolished while a neighboring house could remain untouched. Some tornadoes never touch the ground and remain short lived, while others may touch the ground or “jump” along its path.

The destruction from tornadoes can range from minor to severe depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light-weight construction, such as mobile homes. The Enhanced Fujita Scale, also known as the “EF-Scale”, measures tornado strength and associated damages. The EF-Scale is an update to the earlier Fujita Scale, also known as the “F-Scale”, that was published in 1971. These scales classify U.S. tornadoes into six intensity categories based upon the estimated maximum winds occurring within the wind vortex. This scale can be seen in *Table 39 – Enhanced Fujita Scale*. The EF-Scale became effective on February 1, 2007. Since its implementation by the National Weather Service in 2007, the EF-Scale has become the definitive metric for estimating wind speeds within tornadoes based upon damage to buildings and structures. Previously recorded tornadoes are reported with the older F-Scale values, but *Table 39 – Enhanced Fujita Scale* shows F-Scale categories with corresponding EF-Scale wind speeds.

Table 38 – Wind Zones and Counties Affected in Pennsylvania identifies wind speeds that could occur across the state, which may be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities. The majority of Pennsylvania falls within Zone III, meaning that the design of shelters and critical facilities should be able to withstand a three-second gust of up to 200 mph, regardless of whether the gust is a result of a tornado, hurricane, tropical storm, or windstorm incident. The western portion of the state falls within Zone IV, which indicates shelters can withstand up to 250 mph winds, while the eastern side falls within Zone II where shelters should be designed to withstand up to 160 mph.

Table 38 - Wind Zones and Counties Affected in Pennsylvania

Wind Zones and Counties Affected in Pennsylvania	
Wind Zones with Speed	**Counties Affected**
Zone I (130 mph)	N/A
Zone II (160 mph)	Berks, Bucks, Carbon, Chester, Delaware, Lackawanna, Lancaster, Lebanon, Lehigh, Luzerne, Monroe, Montgomery, Northampton, Philadelphia, Pike, Schuylkill, Wayne, York
Zone III (200 mph)	Adams, Armstrong, Bedford, Cambria, Cameron, Centre, Clearfield, Clinton, Columbia, Cumberland, Dauphin, Elk, Fayette, Franklin, Fulton, Greene, Huntingdon, Indiana, Juniata, **Jefferson**, Lycoming, McKean, Mifflin, Montour, Northumberland, Perry, Potter, Snyder, Somerset, Sullivan, Susquehanna, Tioga, Union, Westmoreland
Zone IV (250 mph)	Allegheny, Beaver, Butler, Clarion, Crawford, Erie, Forest, Lawrence, Mercer, Venango, Warren, Washington
Source: NOAA, 2019	

Since Jefferson County falls within Zone III, shelters and critical facilities should be designed to withstand up to 200 mph winds, regardless of whether the gust is the result of a tornado, coastal storm, or windstorm event. While it is difficult to pinpoint the exact locations at the greatest risk of a tornado, the southeast, southwest, and northwest sectors of the commonwealth are more prone to tornadoes.

Tornadoes/windstorms of all types have caused the following problems in Jefferson County:

- Power failures lasting four hours or longer.
- Loss of communications networks lasting four hours or more.
- Residents requiring evacuation or provision of supplies or temporary shelter.
- Severe crop loss or damage.
- Trees down or snapped off high above the ground/tree debris-fire fuel.
- Toppled high profile vehicles, including those containing hazardous materials.

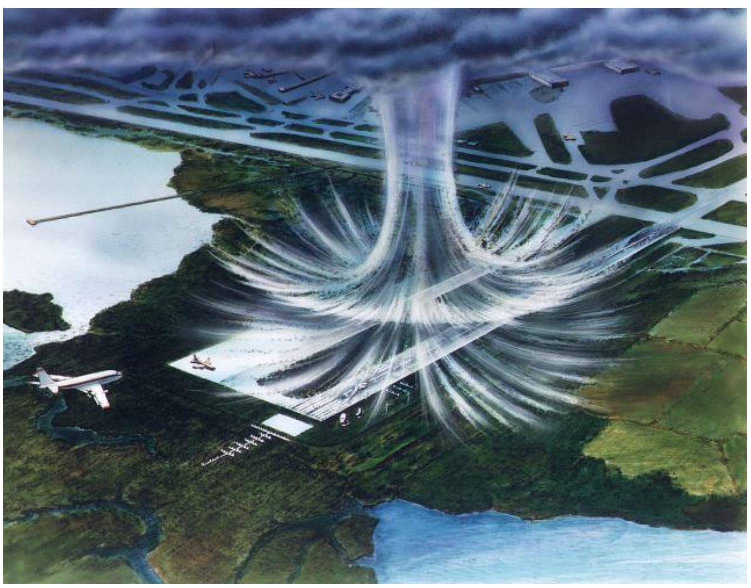
Table 39 - Enhanced Fujita Scale

Enhanced Fujita Scale			
EF-Scale Number	**Wind Speed (MPH)**	**F-Scale Number**	**Description of Potential Damage**
EF0	65–85	F0-F1	**Minor damage**: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
EF1	86-110	F1	**Moderate damage**: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111–135	F1-F2	**Considerable damage**: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136–165	F2-F3	**Severe damage**: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166–200	F3	**Devastating damage**: Well-constructed houses and whole frame houses completely leveled; cars thrown, and small projectiles generated.
EF5	>200	F3-F6	**Extreme damage**: Strong frame houses leveled off foundations and swept away; automobile-sized projectiles fly through the air in excess of 100 m (300 ft.); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.
Source: NWS, 2007			

Most of the tornadoes that have struck Jefferson County have occurred countywide. In 1985, a total of twenty-three confirmed tornadoes touched down across Eastern Ohio, Southwestern New York, and Central/Western Pennsylvania. This outbreak remains the worst in recorded history for this area. Of these twenty-three tornadoes, eight were of violent intensity (F4 or F5) with estimated wind speeds over 200 mph. Jefferson County was not impacted by the 1985 outbreak.

Windstorms

Windstorms can be broken down into multiple categories. Straight-line winds are the most common wind event and are different from tornadic winds. It is a ground level, non-rotational, wind that comes out of a thunderstorm. Downdrafts are columns of air that rapidly sinks toward the ground and are classified as either a microburst or microburst. A macroburst is the outward burst of strong winds that are near or at the surface with horizontal dimensions greater than 2 ½ miles. Macrobursts winds may begin over a smaller area and then spread out to a wider area, sometimes producing damage similar to a tornado. On the other hand, microbursts are smaller outward bursts of strong winds near or at the surface. Microbursts are less than 2 ½ miles in horizontal dimension and are typically short-lived winds that last a maximum of ten minutes, with windspeeds reaching up to 100 mph. Microburst events can be wet or dry events. Wet microbursts are typically associated with heavy precipitation at the surface. Dry microbursts do not have precipitation associated with them and are commonly found in the western portion of the United States.



A gust front is characterized by wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Derecho is a long-lived windstorm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho contains various downbursts and microbursts. If the wind damage is more than 240 miles and includes wind gusts of at least 58 mph, the event would then be classified as a derecho.

4.3.8.3 Past Occurrence

Jefferson County has experienced sixteen tornado events since 1950, and 296 wind incidents between 1955 and 2019 as seen in *Table 40 – Jefferson County Tornado History* and *Table 41 – Jefferson County High Wind History*. Numerous sources provide information in regard to past occurrences and losses associated with tornadoes/windstorms in Jefferson County and the commonwealth as a whole. Due to the number of sources available with information, specific number of events and losses could vary slightly between sources. Tornado data was only available until 2022, while windstorm data was only available until 2019, even though more recent events could have occurred. Historically, the county has experienced both severe windstorms and tornadoes.

The most recent tornado impacted Eldred and Heath townships on October 16, 2021. This tornado was described by the National Weather Service in Pittsburgh as a weak EF0, and it traveled along the Clarion River that straddles Jefferson and Elk counties. This tornado did more significant damage on the Elk County side of Clarion River along River Road.

Table 40 - Jefferson County Tornado History

Jefferson County Tornado History					
Location	**Date**	**Magnitude (F/EF Scale)**	**Deaths**	**Injuries**	**Property Damage**
Brookville and Summerville boroughs	10/02/2018	EF2	0	0	Unknown
Eldred and Heath townships	10/16/2021	EF0	0	0	Softwood and hardwood trees
Source: NOAA NCEI, 2023, Jefferson County Knowledge Center					

Table 41 - Jefferson County High Wind History

Jefferson County High Wind History			
Location	**Date**	**Magnitude (knots)**	**Property Damage**
Countywide	03/02/2018	50	Unknown
Countywide	04/27/2018	50	Unknown
Countywide	01/08/2019	51	Unknown
Countywide	02/24/2019	61	Unknown
Countywide	10/01/2019	58	Unknown
Countywide	03/29/2020	50	Unknown
Countywide	04/08/2020	75	Unknown
Countywide	08/27/2020	51	Unknown
Countywide	03/26/2021	53	Unknown
Perry, Washington, Young townships	08/12/2021	Unknown	Multiple trees and lines down – straight line winds

Jefferson County High Wind History			
Location	**Date**	**Magnitude (knots)**	**Property Damage**
Brookville, Punxsutawney, Sykesville boroughs			
Countywide	08/13/2021	61	Unknown
Countywide	10/16/2021	Unknown	Trees and lines down, EF0 tornado
Countywide	03/07/2022	62	Trees and lines down
Countywide	05/03/2022	54	Unknown
Countywide	06/22/2022	56	Unknown
Countywide	02/21/2023	53	Unknown
Countywide	03/25/2023	52	Unknown
Countywide	04/01/2023	60	Unknown
Source: NOAA NCEI, 2023, Jefferson County Knowledge Center 2022			

4.3.8.4 Future Occurrence

In the United States, tornado activity has increased in variability, with a general decrease in the number of days a year on which activity occurs, but an increase in the number of tornadoes on those days. This indicates an increase in tornado outbreaks. The future probability of a disastrous tornado occurring in Jefferson County is ranked as possible, but not highly likely. While the chance of being hit by a tornado in Jefferson County is small, the damage that results when the tornado arrives can be devastating. An EF-5 tornado, with a 0.019% annual probability of occurring, can carry wind velocities of 200 mph, resulting in a force of more than 100 pounds per square foot of surface area. This is a “wind load” that exceeds the design limits of most buildings in Pennsylvania. As jurisdictions within the county grow, and as residential and commercial construction continues, the number of people and properties will be greatly affected by tornadoes and windstorms as they increase accordingly.

Based on historic patterns, tornadoes are unlikely to remain on the ground for long distances, especially in areas of the country with hilly terrain, such as the majority of Pennsylvania. However, the high historical number of windstorms with winds at or over 50 knots indicates that the annual chance of a windstorm in the county is uniquely high. The annual tornado seasoning has begun to lengthen, with the season starting earlier than it has historically and ending later. Pennsylvania had, for example, a record number of tornadoes in April and May of 2019 compared to any other April and May on record. Climate change is causing temperatures and air moisture to increase, increasing the frequency and intensity of tornadoes and windstorms. There remains some uncertainty regarding the recurrence of tornadoes. Therefore, the number of future tornadoes and windstorm events could potentially increase due to known and unknown factors.

Based on historical incidents, there are three zones in Pennsylvania that can either experience less than one, one to four, or five to ten of EF-2 or above tornadoes per 3,700 square miles. Communities in Jefferson County, as shown in *Figure 25 – Tornado History in Jefferson County* below, are expected to have one to four tornadoes annually as a future occurrence. The approximation of one to four tornadoes annually assists with determining the rate of future tornado occurrences within Jefferson County. Future tornadoes will be similar to those that affected the county in past events.

Windstorm events occur on a more frequent basis compared to tornadoes. Jefferson County, specifically, experiences windstorm events more commonly than tornadoes, which causes power failure, loss of communication networks, and residents requiring temporary shelters and provision of supplies. Therefore, unlike tornadoes, this hazardous event has a highly likely probability for future events to occur within the county.

4.3.8.5 Vulnerability Assessment

The frequency of windstorms and minor tornadoes is expected to remain relatively constant, vulnerability increases in more densely developed areas. Factors that impact the amount of damage caused by a tornado include the strength of the tornado, the time of day, and the area of impact. Usually, such distinct funnel clouds are localized phenomena impacting a small area. However, the high winds of tornadoes make them one of the most destructive natural hazards. There can be many cascading impacts of tornadoes and windstorms including, but not limited to, transportation accidents, hazardous material spills, flooding, and power outages. A proper warning system is vital for the public to be informed of what to do and where to go during such events.

Additional dangers that accompany tornado-associated thunderstorms, and which increase the vulnerability of Jefferson County, include:

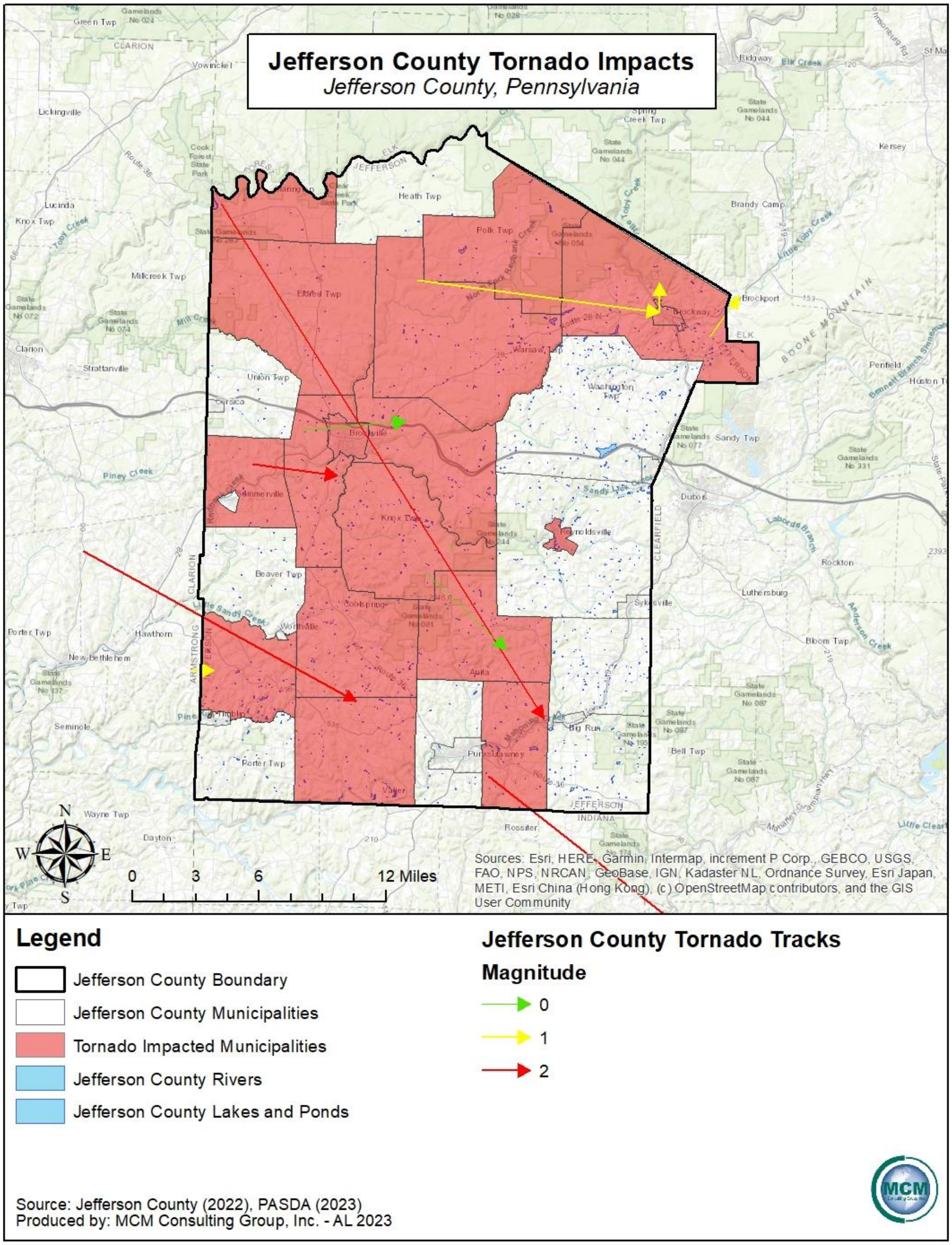
- Flash floods – 146 deaths annually nationwide.
- Lightning – 75 to 100 deaths annually nationwide.
- Damaging straight-line winds – reaching 140 mph wind speed.
- Large hail – can reach the size of a grapefruit and can cause several million in damages annually to property and crops

The economy of Jefferson County is highly vulnerable to tornadoes. While there may be severe impact on financial and commercial systems of the economy, these storms, and the damage they cause, can disrupt business long-term. The local economy is vulnerable due to the possibility of being crippled by tornadoes and windstorms and their cascading effects when buildings and supporting infrastructure are destroyed in a storm. Power outages can create work stoppages, while transportation accidents and road closures can limit transportation of goods and services. Additionally, flooding cannot be discounted as it can destroy physical structures, merchandise, and equipment essential for business operation.

Jefferson County's environment is also vulnerable to tornado events. However, since tornado events are typically localized, environmental impacts are rarely widespread. The impact of windstorms on the environment typically takes place over a large area. In either case, where these events occur, severe damage to plant species is likely. This includes uprooting or total destruction of trees and an increased threat of wildfire in areas where dead trees are not removed. Most notably, hazardous material spills can pollute ground water systems and vegetation. In the case of hazardous material spills, the local environment can be negatively impacted and can cause extensive cleanup and mitigation efforts. Jefferson County is considered a rural county that has a great amount of tourism that occurs in the surrounding hills, mountains, and state parks. Not only is the environment at risk from tornadoes and windstorms, but hikers, tourists, and hunters are also at risk when out in the environment. Consequently, in the event of a tornado or severe storm, these tourists have limited emergency notification measures which result in high vulnerability. A storm has the ability, potentially, to destroy structures, damage private and public property, and injure citizens and tourists in the area. People with disabilities, the elderly, functional needs, and non-English speaking residents are more vulnerable to tornadoes, windstorms, and their cascading effects. Without assistance to evacuate and/or seek shelter, and with potential difficulty understanding information, these at-risk populations may be unable to prepare themselves, or their homes and other possessions, to safely endure the storm.

Tornadoes, windstorms, and cascading events may affect a small portion, or the entirety, of the county. Therefore, it is important to identify specific critical facilities and assets that are most vulnerable to this hazard. Critical facilities are highly vulnerable to windstorms and tornado events. While many severe storms can cause exterior damage to structures, tornadoes can destroy structures, along with their surrounding infrastructure, immediately halting their function. Tornadoes are often accompanied by severe storms which can be threatening to critical facilities within the county. Many secondary effects from these disasters can jeopardize the operation of these critical facilities as well. Critical facilities are particularly vulnerable to power outages which can leave facilities functionless, potentially crippling infrastructure supporting the population of the county. Due to Pennsylvania Uniform Construction Code Act 45, trailers and mobile homes built before 2004, because of their lightweight construction and often unanchored design, are more vulnerable to high winds/tornadoes and will generally sustain more damage than will mobile homes built after 2004.

Figure 25 - Tornado History in Jefferson County



4.3.9. Wildfire

4.3.9.1 Location and Extent

The most prevalent causes of devastating wildfires are droughts, lighting strikes, arson, human carelessness, and in rare circumstances, spontaneous combustion. Most fires in Pennsylvania are caused by anthropogenic fires such as debris burns that spread and get out of control. A fire, started in somebody's backyard, could travel through dead grasses and weeds into bordering woodlands starting a wildfire. Major urban fires can cause significant property damage, loss of life, and residential or business displacement. While wildfires are a natural and essential part of many native Pennsylvania ecosystems (e.g., pitch pine and scrub oak woodlands), wildfires can also cause devastating damage if they are undetected and allowed to propagate unfettered. Wildfires most often occur in less developed areas such as open fields, grass, dense brush, or forests where they can spread rapidly by feeding off of vegetation and combustible fuels. Wildfires are most prevalent under prolonged dry and hot spells, or general drought conditions.

A large portion of Jefferson County is covered by forested areas, increasing the geographic extent of wildfire vulnerability in the county. Under dry conditions or droughts, wildfires have the potential to burn forests as well as croplands. For recreational enjoyment, the county boasts several local parks and natural areas that include a series of trail systems – all of which are at risk for wildfires.

4.3.9.2 Range of Magnitude

Forested areas, croplands and properties that are at the interface between wild lands and human development are most at risk for being impacted by and causing wildfires. If an urban fire or wildfire is not contained, secondary impacts including power outages may result. Other negative impacts of wildfires can include death of people, livestock, fish, and wildlife, and destruction of valuable property, timber, forage, recreational and scenic values. Wildfires can also cause severe erosion, silting of stream beds and reservoirs, and flooding due to a loss of ground cover.

Almost all of the wildfires in the county occur in remote areas or areas away from residential structures. Unlike the wildland fires that occur in other parts of the country and affect vast areas of land and residential communities, most fires in Jefferson County are contained before they cause damage or extensive property loss. However, the county recognizes that wildfires of some magnitude will continue to occur in Jefferson County and will have more detrimental effects if development in and/or around the natural areas increases.

The United States Forest Service utilizes the Forest Fire Assessment System to classify the dangers of wildfire. *Table 42 – Wildland Fire Assessment System* identifies each threat classification and provides a description of the level.

Table 42 - Wildland Fire Assessment System

Wildland Fire Assessment System *(U.S. Forest Service)*	
Rank	**Description**
Low (L)	Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.
Moderate (M)	Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur but is not persistent. Fires are not likely to become serious and control is relatively easy.
High (H)	All fine dead fuels ignite readily, and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.
Very High (VH)	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.
Extreme (E)	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks until the weather changes, or the fuel supply lessens.

4.3.9.3 Past Occurrence

The Pennsylvania Department of Conservation and Natural Resources (DCNR) has an extensive history of reported wildfires in its state forestry system and districts. Historically, Jefferson County experiences twenty and twenty-five of these types of fires annually with all fires being relatively small. However, due to the many acres of farmland, forested areas, and open space in the county, under the right conditions the potential exists for a significant wildfire. Jefferson County lies entirely in District 8 of the DCNR's Bureau of Forestry. This district encompasses entirety of Armstrong, Beaver, Butler, Clarion, Lawrence, and Mercer counties and the southern portion of Venango County. In 2021, there were a total of 149 wildfires in District 8 that were responsible for destroying 346.7 acres.

District 8 reports the following twenty-two-year wildfire summary based on observed and reported wildfires. *Table 43 – Annual Summary of Wildfire Events* illustrates the number of acres burned in a certain number of fires for District 8 from the year 2000 to the year 2021. Wildfire statistics for 2022 were not yet available at the time of this writing.

Table 43 - Annual Summary of Wildfire Events

Annual Summary of Wildfire Events			
Year	**Number of Fires**	**Acres**	**Increase or Decrease**
2000	47	358.3	-
2001	16	230.5	⇩
2002	6	161.5	⇩
2003	18	667.2	⇧
2004	4	25.9	⇩
2005	2	60.1	⇩
2006	22	239.6	⇧
2007	6	18.9	⇩
2008	7	83.3	⇧
2009	11	85.0	⇧
2010	8	274.4	⇩
2011	18	96.5	⇧
2012	73	103.0	⇧
2013	56	235.1	⇩
2014	141	377.5	⇧
2015	67	139.5	⇩
2016	59	182.9	⇩
2017	39	29.0	⇩
2018	85	116.3	⇧

Annual Summary of Wildfire Events			
Year	**Number of Fires**	**Acres**	**Increase or Decrease**
2019	81	114.7	⇩
2020	96	171.4	⇧
2021	149	346.7	⇧
Source: PA DCNR, Forestry, 2022			

In recent years, the number of prescribed burns in Pennsylvania has been increasing. This corresponds to an understanding of the need for fire in many natural ecosystems and management strategies for reducing vulnerability to wildfire; it also improves hunting opportunities.

4.3.9.4 Future Occurrence

Annual occurrence of urban fires and wildfires in Jefferson County are expected. Urban fires are most often the result of human errors, outdated wiring and occasionally, malintent (arson). The occurrence of large scale and intense wildfires is somewhat unpredictable and highly dependent on environmental conditions and human response. Weather conditions play a major role in the occurrence of wildfires, so in the event of drought conditions, wildfire caution should be heightened. Any fire without the quick response or attention of firefighters, forestry personnel, or visitors to the forest, has the potential to become a wildfire.

Climate change is expected to bring an elongated wildfire season and more intense and long-burning fires (Pechony & Shindell, 2010). In some regions of the United States, this is a very real concern. Northern California has experienced unprecedented devastating wildfires in 2017, 2018, 2019, 2020, 2021, and 2022. The fires that have been occurring in California are thought to be burning faster and hotter due to worsening drought conditions caused by increased climate change (Cvijanovic et al., 2017). Wildfire conditions in Pennsylvania are not nearly as severe as in Northern California, but the intensification is a signal that the changes brought by climate change are relevant to wildfires. In Pennsylvania, higher air temperatures and earlier warming in the spring are expected to continue, resulting in more wildfire prone conditions in the summer and fall (Shortle et al., 2015).

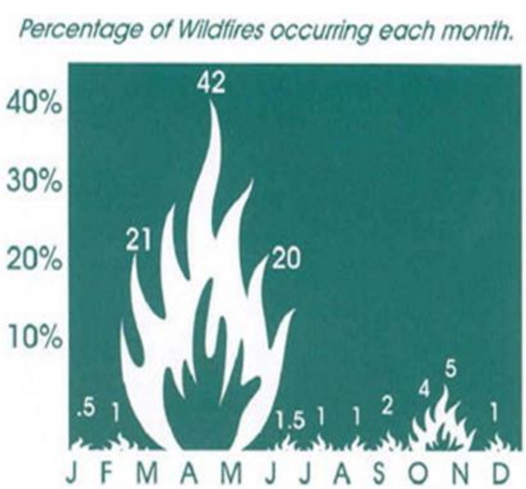
4.3.9.5 Vulnerability Assessment

The size and impact of a wildfire depends on its location, climate conditions, and the response of firefighters. If the right conditions exist, these factors may often mitigate the effects of wildfires; however, during a drought, wildfires can be devastating. The highest risk for wildfires in Pennsylvania occurs during the spring (March to May) and the fall (October to November) months and 99% of all wildfires in Pennsylvania are caused by people. Approximately 83% of all Pennsylvania wildfires occur in the months outlined above. In the spring, bare trees allow sunlight to reach the forest floor, drying fallen leaves and other ground debris and increasing wildfire vulnerability. In the fall, the surplus of dried leaves is fuel for fires. *Figure 26 – Seasonal Wildfire Percentage* shows the wildfire percentage occurrence during each month in Pennsylvania.

Firefighters and other first responders can encounter life-threatening situations due to forest and wildfires. Traffic accidents during a response and the impacts of fighting the fire once on scene are examples of first responder vulnerabilities.

The Wildland Urban Interface (WUI) was nationally mapped by a United States Department of Agriculture Forest Service effort in 2015 that used data from 1990-2010 to develop a robust dataset that related housing density and vegetative density. The dataset provides a way to identify locations where larger numbers of people are living in or near natural areas that could be at risk in the event of a wildfire. The WUI defines two types of communities – interface and intermix. Intermix refers to areas where housing and wildland vegetation intermingle, and interface refers to areas where housing is in the vicinity of a large area of dense wildland vegetation. The WUI was the fastest-growing land use type in the United States between 1990 and 2010. Factors behind the growth include population shifts, expansion of cities into the wildlands, and the expansion of new vegetation growth. The primary cause has been the migration of people, not vegetation growth.

Figure 26 - Seasonal Wildfire Percentage



Pennsylvania is among the states with the largest WUI and the most housing units in a WUI designated area. Pennsylvanians desire the proximity of natural beauty in their daily lives, and the growth in WUI housing noted above illustrates this. *Figure 26 – Wildland Urban Interface* shows the extent of Jefferson County and the critical infrastructure facilities, functional needs facilities, and fire stations. Wildfire hazard is defined by conditions that affect wildfire ignition and/or behavior such as fuel, topography, and local weather. The many addressable structures in the Wildland Urban Interface and Intermix zones are broken up by assessed parcel use codes.

There are twenty-one fire departments that serve Jefferson County, a list of which can be seen in *Table 55* of the emergency services profile. Each fire department conducts its own schedule of in-house training sessions for its members.

The response of firefighters is integral to the containment of wildfires in the county. There is a potential for fire stations and services to close, which affects response to a wildfire in Jefferson County**.** *Figure 27 – Fire Stations Locations* illustrates the position of fire stations and the location of state game lands, state forests, and natural areas within Jefferson County. It is recommended that each municipality assess vulnerabilities to department closures by building a relationship with their local providers and planning accordingly for if a local service were to close.

At the time of the writing of this plan, it is possible that the continuing emergency services shortages across the Commonwealth of Pennsylvania will impact the availability of firefighters and their response times. Many fire departments created and began to enforce new regulations regarding responding to emergencies during the pandemic.

Figure 27 - Wildland Urban Interface

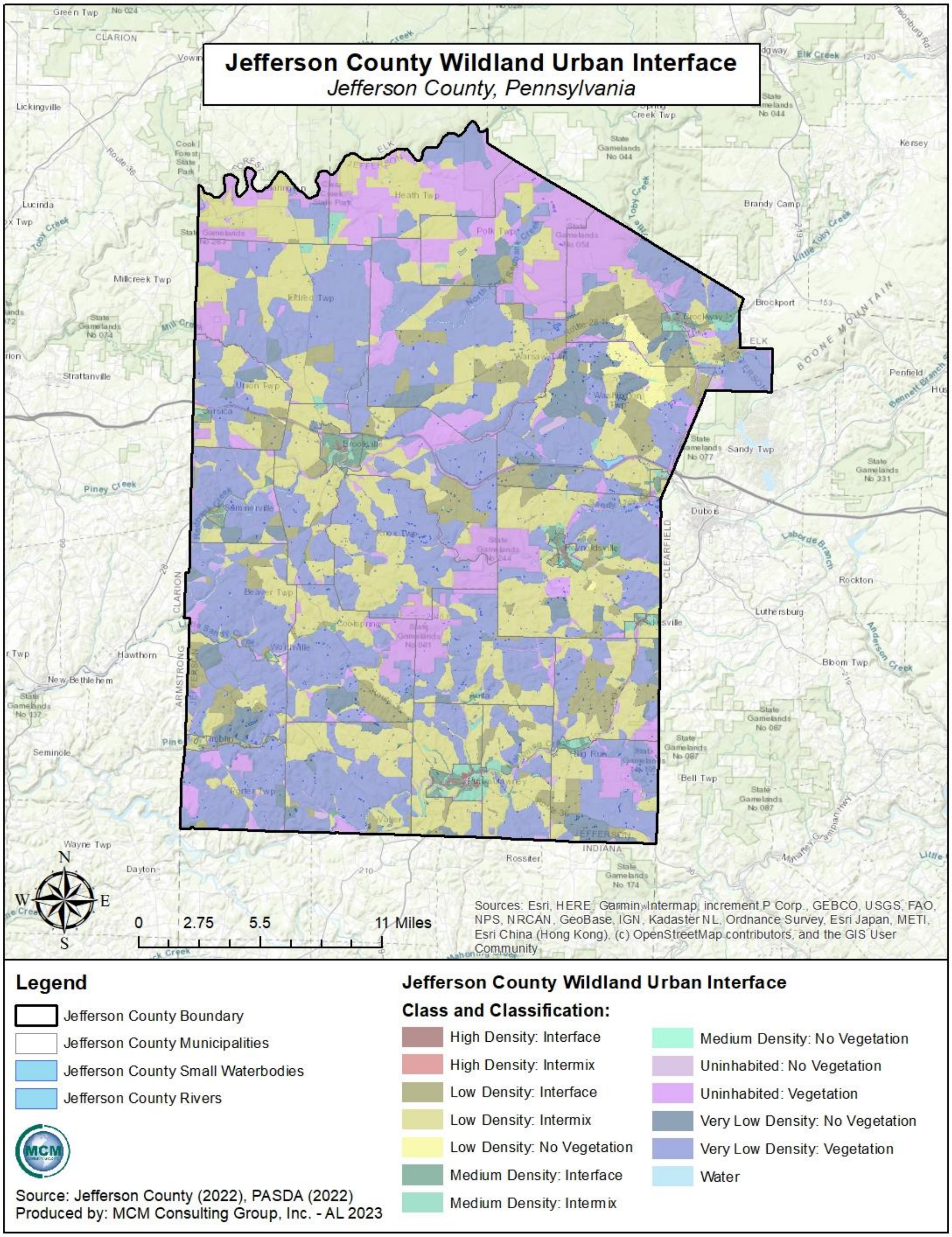
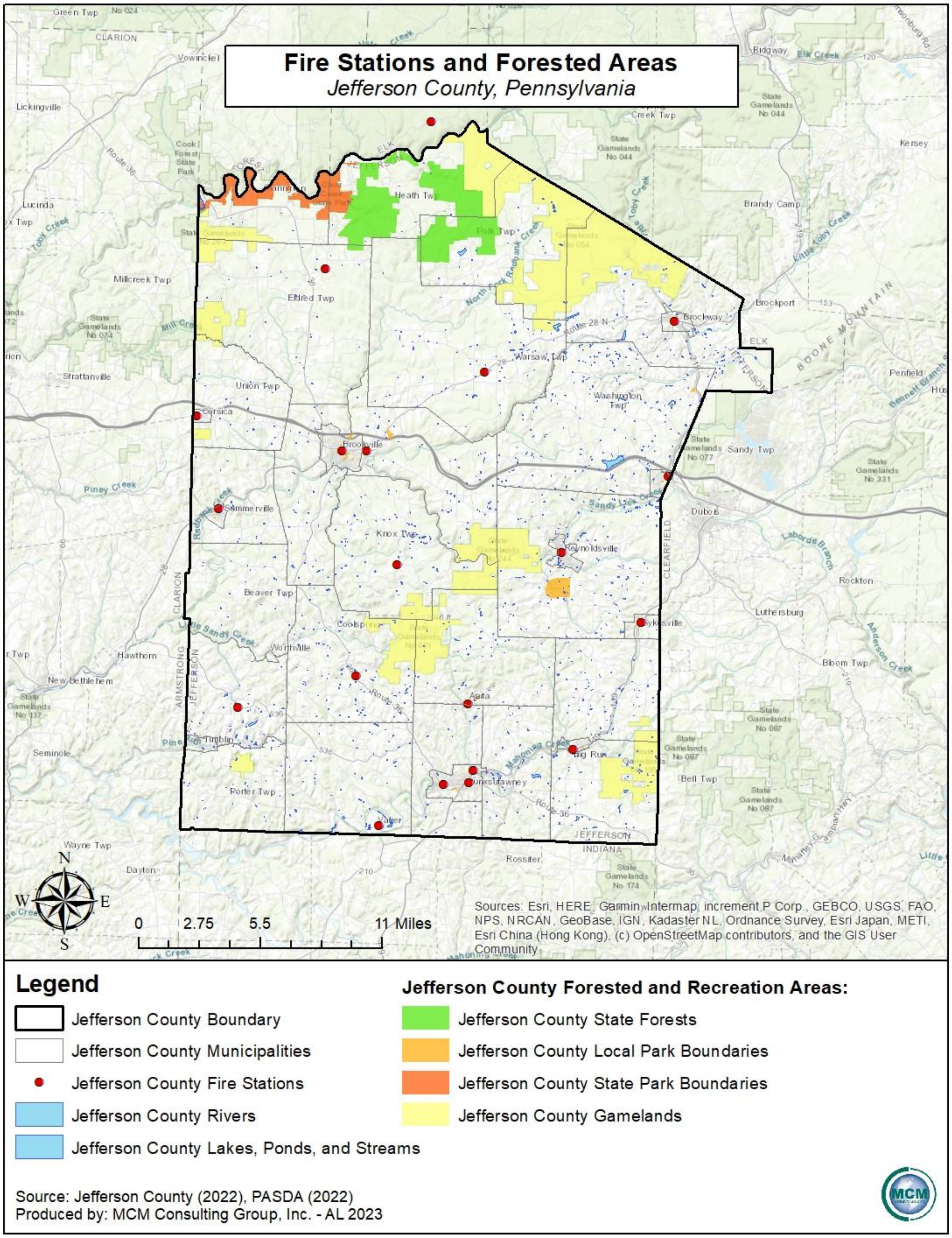


Figure 28 - Fire Station Locations



4.3.10. Winter Storm

4.3.10.1 Location and Extent

Most severe winter storm hazards include heavy snow (snowstorms), blizzards, sleet, freezing rain, and ice storms. Since most extra-tropical cyclones (mid-Atlantic cyclones locally known as Northeasters or Nor'easters), generally take place during the winter weather months, these hazards have also been grouped as a type of severe winter weather storm. According to the Pennsylvania State Hazard Mitigation Plan (PA HMP), winter storms are frequent events for the Commonwealth and occur from late October until mid-April. These types of winter events or conditions are further defined below.

- **Heavy Snow:** According to the National Weather Service (NWS), heavy snow is generally snowfall accumulating to four inches or more in depth in twelve hours or less; or snowfall accumulating to six inches or more in depth in twenty-four hours or less. A snow squall is an intense but limited duration, period of moderate to heavy snowfall, also known as a snowstorm, accompanied by strong, gusty surface winds and possibly lightning.
- **Blizzard:** Blizzards are characterized by low temperatures, wind gusts of thirty-five miles per hour (mph) or more and falling and/or blowing snow that reduces visibility to 1/4-mile or less for an extended period of time (three or more hours).
- **Sleet of Freezing Rainstorm:** Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground and other hard surfaces. Freezing rain is rain that falls as a liquid but freezes into glaze upon contact with the ground.
- **Ice Storm:** An ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. These accumulations of ice make walking and driving extremely dangerous and can create extreme hazards to motorists and pedestrians.
- **Extra-Tropical Cyclone:** Sometimes called mid-latitude cyclones, are a group of cyclones defined as synoptic scale, low pressure, weather systems that occur in the middle latitudes of the Earth. These storms have neither tropical nor polar characteristics and are connected with fronts and horizontal gradients in temperature and dew point otherwise known as "baroclinic zones". Extra-tropical cyclones are everyday weather phenomena which, along with anticyclones, drive the weather over much of the Earth. These cyclones produce impacts ranging from cloudiness and mild showers to heavy gales and thunderstorms. Tropical cyclones often transform into extra-tropical cyclones at the end of their tropical existence, usually between 30˚ and 40˚ latitude, where there is insufficient force from upper-level shortwave troughs riding the westerlies (weather

systems moving west to east) for the process of extra-tropical transition to begin. A shortwave trough is a disturbance in the mid or upper part of the atmosphere which induces upward motion ahead of it. During an extra-tropical transition, a cyclone begins to tilt back into the colder air mass with height, and the cyclone's primary energy source converts from the release of latent heat from condensation to baroclinic processes.

4.3.10.2 Range of Magnitude

The magnitude or severity of a severe winter storm depends on several factors including a region's susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, and time of occurrence during the day (e.g., weekday versus weekend), and time of season. The extent of a severe winter storm can be classified by meteorological measurements, such as those above, and by evaluating its societal impacts.

The Northeast Snowfall Impact Scale (NESIS) categorizes snowstorms in this manner. Unlike the Fujita Scale (tornado) and Saffir Simpson Scale (hurricanes), there is no widely used scale to classify snowstorms. NESIS was developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service and rank high impact, northeast snowstorms. These storms have large areas of ten-inch snowfall accumulations and greater. NESIS has five ranking categories: Notable (1), Significant (2), Major (3), Crippling (4), and Extreme (5). These rankings can be seen in *Table 44 – NESIS Winter Storm Rankings*. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus, NESIS gives an indication of a storm's societal impacts. This scale was developed because of the impact of northeast snowstorms can have on the rest of the country in terms of transportation and economic impact.

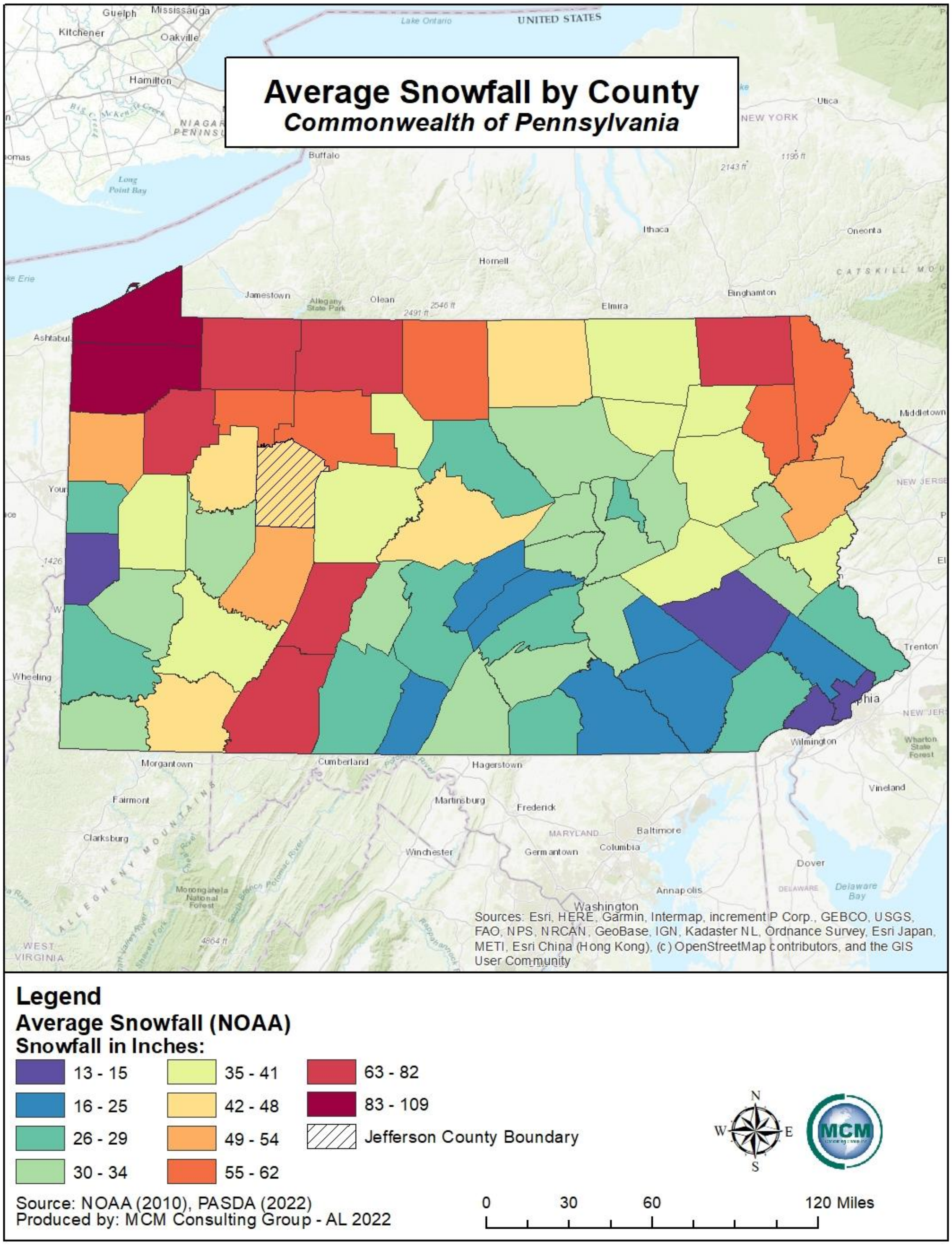
Table 44 - NESIS Winter Storm Rankings

NESIS Winter Storm Rankings			
Category	**Description**	**NESIS Range**	**Definition**
1	Notable	1.0 – 2.49	These storms are notable for their large areas of 4-inch accumulations and small areas of 10-inch snowfall.
2	Significant	2.5 – 3.99	Includes storms that produce significant areas of greater than 10-inch snows while some include small areas of 20-inch snowfalls. A few cases may even include relatively small areas of very heavy snowfall accumulations (greater than 30 inches).
3	Major	4.0 – 5.99	This category encompasses the typical major Northeast snowstorm, with large areas of 10-inch

NESIS Winter Storm Rankings			
Category	**Description**	**NESIS Range**	**Definition**
			snows (generally between 50 and 150 x 103 mi^2 – roughly one to three times the size of New York State with significant areas of 20-inch accumulations.
4	Crippling	6.0 – 9.99	These storms consist of some of the most widespread, heavy snows of the sample and can be best described as crippling to the northeast U.S, with the impact to transportation and the economy felt throughout the United States. These storms encompass huge areas of 10-inch snowfalls, and each case is marked by large areas of 20-inch and greater snowfall.
5	Extreme	10+	The storms represent those with the most extreme snowfall distributions, blanketing large areas and populations with snowfalls greater than 10, 20, and 30 inches. These are only storms in which the 10-inch accumulations exceed 200 X 103 mi^2 and affect more than 60 million people.
Source: Kocin and Uccellini, 2004			

The climate of Pennsylvania is marked by abundant snowfall. Winter weather can reach Pennsylvania as early as October and is usually in full force by late November with average winter temperatures between 20- and 40-degrees Fahrenheit. Jefferson County receives an average of about forty-eight inches of snowfall a year. Most areas of Jefferson County experience the effects of winter storms frequently. The general indication of the average annual snowfall map shows areas that are subject to a consistent risk for large quantities of snow. *Figure 29 - Pennsylvania Annual Snowfall 1981 – 2010* illustrates the long-term trends for snowfall accumulation in Pennsylvania over three decades.

Figure 29 - Pennsylvania Annual Snowfall 1981-2010



4.3.10.3 Past Occurrence

Figure 30 – Winter Storm Events by County in Pennsylvania shows the number of winter storm events from 1950 – 2013 for the Commonwealth of Pennsylvania. Jefferson County had forty-two to fifty-eight such events. *Table 45 – Recent Annual Snowfall Estimates* shows recent annual snowfall measurements as stated by NOAA. Jefferson County saw an increase in snowfall between October 2020 and April 2021 with an estimated total of 96.60 inches. Overall, Jefferson County has experienced a decrease in the annual estimated average of snowfall. On average, the annual snowfall totals have decreased in the time periods from October 2018 to April 2023. A detailed list of additional winter storms and other related events could not be obtained from the National Weather Service, Jefferson County is at the furthest outreach for the Pittsburgh Weather Forecast Office and information from the DuBois Regional Airport located in Jefferson County had missing data for the time period from October 2018 to April 2023.

A list of additional Jefferson County winter storms, and other related events is outlined in *Table 46 – Jefferson County Winter Storm History*. This information was obtained from the Knowledge Center data kept by Jefferson County, however, there was only data for the year of 2022 entered into the Knowledge Center reports.

Table 45 - Recent Annual Snowfall Estimates

Recent Annual Snowfall Estimates	
Time Span	**Snowfall Estimates (inches)**
October – December 2018	12.50
January – April 2019	33.40
October – December 2019	2.40
January – April 2020	26.20
October – December 2020	41.60
January – April 2021	55.00
October – December 2021	6.30
January – April 2022	48.3
October – December 2022	14.80
January – April 2023	7.90
Source: NOAA, 2023	

Figure 30 - Winter Storm Events by County in Pennsylvania

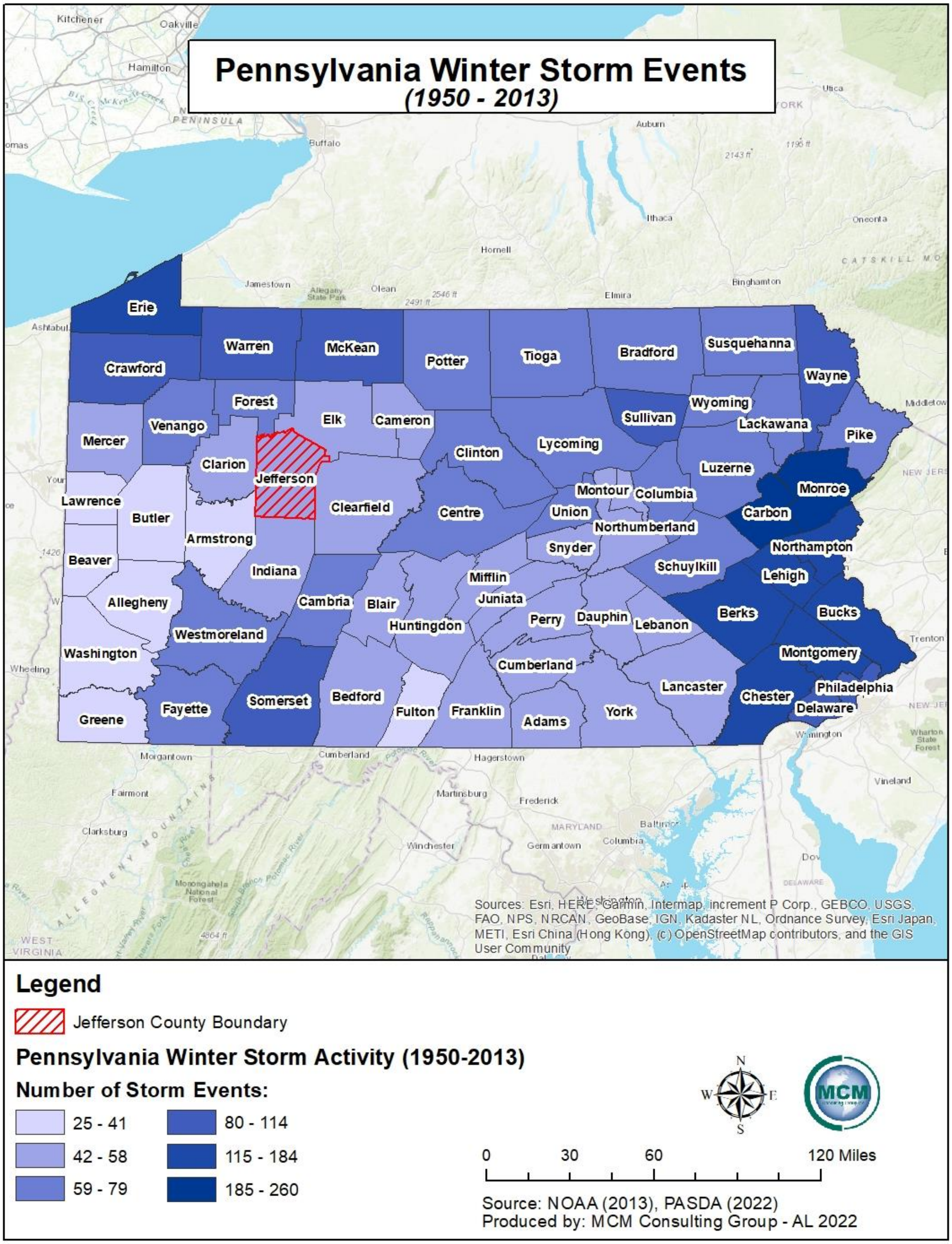


Table 46 - Jefferson County Winter Storm History

Location	Date
Countywide	01/16/2022 Winter storm Izzy
Countywide	01/24/2022
Countywide	02/24/2022
Countywide	04/18/2022
Countywide	03/09/2022
Source: Corvena Knowledge Center™, 2022	

4.3.10.4 Future Occurrence

Winter storm hazards in Pennsylvania are guaranteed yearly since the state is located at a relatively high latitudes resulting in winter temperatures that range between 0- and 32-degrees Fahrenheit for a good deal of the fall through early spring season (later October until mid-April). In addition, the state is exposed to large quantities of moisture from both the Great Lakes and the Atlantic Ocean. While it is almost certain that a number of significant winter storms will occur during the winter and fall season, what is not easily determined is how many such storms will occur during that time frame. Based on historical snow related disaster declaration occurrences, the Commonwealth of Pennsylvania can expect a snowstorm of disaster declaration proportions, on average, once every three to five years. Similarly, for ice storms, based on historical disaster declarations, it is expected that on average, ice storms of disaster proportions will occur once every seven to ten years within the state.

4.3.10.5 Vulnerability Assessment

Severe winter storms are of significant concern to Jefferson County because of their frequency and magnitude in the region. Additionally, they are of significant concern due to the direct and indirect costs associated with these events; delays caused by the storms and impacts on the people and facilities of the region related to snow and ice removal, health problems, cascade effects such as utility failure and traffic accidents, and stress on community resources.

Every year, winter weather indirectly and deceptively kills hundreds of people in the United States, primarily from automobile accidents, over exertion, and exposure. Winter storms are often accompanied by strong winds creating blizzard conditions with blinding win-drive snow, drifting snow, extreme cold temperatures, and dangerous wind chill. They are considered deceptive killers because most deaths and other impacts or losses are indirectly related to the storm. Heavy accumulations of ice can bring down trees and powerlines, disabling electrical power and communications for days or weeks. Heavy snow can immobilize a region and paralyze a city, shutting down all air and rail transportation and disrupting medical and emergency services. The economic impact of winter weather each year is quite large, with costs for snow removal, damage, and loss of business in the millions each year. Heavy snow can immobilize and strand commuters as well as stopping the flow of supplies through an area or transportation corridor. In rural areas, homes and farms may be isolated for days and unprotected livestock may be lost. Bridge and overpasses are particularly dangerous because they freeze before other transportation surfaces. For the purposes of this Hazard Mitigation Plan, the entire population of Jefferson County (44,492) is exposed to severe winter storm events. The elderly are considered the most susceptible to this hazard due to their increased risk of injury and death from falls, overexertion, and or attempts to clear ice and snow. The elderly population is also more vulnerable to utility outages in winter, especially when they are paired with winter storm events. *Table 47 – Utility Outages in Jefferson County in Winter* shows the number of power outages, phone outages, and 911 outages, that have occurred in the county during winter months. Vulnerable populations within Jefferson County may not have access to housing or their housing may be less able to withstand cold temperatures (e.g., homes with poor insulation and heating supply). The unsheltered populations of an area are at most risk to winter storm events.

Table 47 - Utility Outages in Jefferson County in Winter

Utility Outages in Jefferson County **in Winter**		
Location	**Date**	**Event**
Brookville Borough	2/4/2017	Power outage
Union Township	3/5/2017	Natural gas incident
Pine Creek Township	12/6/2017	911 Center power outage
Young Township – Hospital	2/25/2018	Phone outage
Brookville Borough – Hospital	12/09/2018	Natural gas incident
Falls Creek Borough	1/2/2019	Pole and lines down
Brookville Borough	1/18/2019	Natural gas incident
Porter Township	12/16/2019	Natural gas incident
Gaskill Township	1/12/2020	Natural gas leak
Polk Township	2/23/2020	Natural gas leak
Punxsutawney Borough	1/15/2022	Natural gas leak
Heath Township	2/25/2022	Power outage
Brookville Borough	2/27/2022	Water main break
Brookville Borough	3/7/2022	Power outage
Pine Creek Township	3/13/2022	Power outage
Source: Corvena Knowledge Center™, 2022		

The entire general building stock inventory in Jefferson County is exposed and vulnerable to the severe winter storm hazard. In general, structural impacts include damage to rood and building frames, rather than building content. There was no historic information available that identified property damages within Jefferson County due to a single severe winter storm event. Current modeling tools are not available to estimate specific losses for this hazard. A specific area that is vulnerable to the severe winter storm hazard is the floodplain. At risk general building stock and infrastructure in floodplains are presented in the flood profile due to snow and ice melt. Generally, losses from flooding associated with severe winter storms should be less than that associated with a 100-year or 500-year flood.

Full functionality of critical facilities such as police, fire, and medical facilities is essential for response during and after a severe winter storm event. These critical facility structures are largely constructed of concrete and masonry; therefore, they should only suffer minimal structural damage from severe winter storm events. Backup power is recommended critical infrastructure and facilities due to the potential for power interruption. Infrastructure at risk for this hazard includes roadways that could be damaged due to the application of salt and intermittent freezing and warming conditions that can damage roads over time. Severe snowfall requires infrastructure to clear roadways and alert citizens to dangerous conditions. In spring, this type of roadway damage must be repaired. Additionally, freezing rain and ice storms impact utilities (i.e., power lines and overhead utility wires) causing power outages for hundreds to thousands of residents.

The cost of snow and ice removal and repair of roads from the freeze/thaw process can drain local financial resources. However, because severe winter storms are a regular occurrence in this area, Jefferson County is generally well-prepared for snow and ice removal each season.

4.3.11. Blighted Properties

4.3.11.1 Location and Extent

The presence of blighted properties in Jefferson County is a nuisance for both residents and visitors to the county on a year-round basis. Blighted properties include areas of the county where the infrastructure is damaged and aging beyond occupation, habitation, and/or commercial use.

Blighted properties are described by the Pennsylvania State Statute 1945 Act 385 as:

1. Any premises which because of physical condition or use is regarded as a public nuisance at common law or has been declared a public in accordance with the local housing, building, plumbing, fire, and related codes.
2. Any premises which because of physical condition, use, or occupancy is considered an attractive nuisance to children, including but not limited to abandoned wells, shafts, basements, excavations, and unsafe fences or structures.
3. Any dwelling which because it is dilapidated, unsanitary, unsafe, vermin-infested, or lacking in the facilities and equipment required by the housing code of the municipality, has been designated by the department responsible for enforcement of the code as unfit for human habitation.
4. Any structure which is a fire hazard or is otherwise dangerous to the safety of persons or property.
5. Any structure from which the utilities, plumbing, heating, sewage, or other facilities have been disconnected, destroyed, removed, or rendered ineffective so that the property is unfit for its intended use.
6. Any vacant or unimproved lot or parcel of ground in a predominantly built-up neighborhood, which by reason neglect or lack of maintenance has become a place for the accumulation of trash or debris, or a haven for rodents or other vermin.
7. Any unoccupied property which has been tax delinquent for a period of two years prior to the effective date of Pennsylvania State Statute 1945 Act 385 or local municipality regulations and those in the future having a two-year tax delinquency.
8. Any property which is vacant but not tax delinquent, which has not been rehabilitated within one year of the receipt of notice to rehabilitate from the appropriate code enforcement agency.
9. Any abandoned property.

4.3.11.2 Range of Magnitude

Jefferson County has a large number of blighted properties that are located in urban environments, including Punxsutawney Borough, Brookville Borough, Reynoldsville Borough, Brockway Borough, and Sykesville Borough. Most of the blighted properties in Jefferson County are unsecured and highly unsafe due to one or more of the following issues: structure rot, infestation from vermin including but not limited to rats, mice, and insects, and occupation by squatters. These properties can create a risk for the county because they are unsafe for occupation and future construction.

4.3.11.3 Past Occurrence

The number of blighted properties in Jefferson County has increased in recent years. Although some properties that are considered to be blighted in Jefferson County have been demolished by the county itself. With recent market trends in real estate, a large number of vacant buildings in Jefferson County are sold prior to them being blighted.

4.3.11.4 Future Occurrence

Blighted properties in Jefferson County will continue to increase unless blighted property procedures are put into practice at the county and local levels. With the requisite policies put into place the number of blighted properties in Jefferson County is liable to decrease.

4.3.11.5 Vulnerability Assessment

Blighted properties are a significant concern when the health and safety of the citizens of Jefferson County are impacted. Blighted properties, while being an eye sore, are also a threat to the health and safety of individuals. Buildings that are blighted often can be unsafe due to building materials exposed to the environment or to unintentional consumption by humans. Buildings that have utilized asbestos in construction can become a major health hazard if the building is not maintained, the asbestos exposed, and people breath in those particles because the property has become abandoned and blighted. Another large health issue is mold in blighted properties and buildings. After a property becomes blighted, the functional systems that prevent mold from growing and spreading are often rendered useless, thus facilitating the growth of harmful mold and fungi that pose a threat to human health.

Just as blighted properties can adversely affect the health and safety of humans, it can also hurt the environment of an area. The leaching of building materials from an open or fallen property into water features, such as streams and creeks, can damage the wildlife in a water feature and hurt the public supply of drinking water. As mentioned above, asbestos is a large concern if the blighted property is of older construction. Also, potential chemicals from a blighted property, like paints and oils, can make their way into water tables, streams, and creeks, thus polluting the water features.

Blighted properties also offer shelter for animals and vermin that may not be able to find a home, and an area for breeding in the wild. This can result in the spread of rats and other pests in an area with a large concentration of blighted properties. Along with the accumulation of pests like rats, there is also a high chance of that area also attracting vermin like cockroaches. The increase in vermin can also pose a threat to human health, as vermin and pests can carry diseases which can be contracted due to close contact.

Blight can also adversely affect the infrastructure and its ability to function if the blighted properties in Jefferson County are adjacent to or near critical facilities and functional needs facilities. If a blighted property abuts a critical facility, it may be best for that structure to be torn down so that potential negative effects from the blighted property do not cause damage or limit the function of the critical facility.

Finally, blighted properties can be a problem for tourism and attracting new residents to Jefferson County. If blighted properties flourish in the county, people who travel to Jefferson County for pleasure, whether that be for summer vacations or seasonal hunting, might reconsider that travel due to the presence of blighted properties.

4.3.12. Dam and Levee Failure

4.3.12.1 Location and Extent

Dams

A dam restricts the flow of water or underground streams and often creates reservoirs for water storage. The reservoirs created by these barriers not only suppress floods but also provide water for activities such as irrigation, human consumption, industrial use aquaculture, and navigability.

Dam failures occur usually as a secondary effect of massive amounts of rainfall and flooding, causing too much water to enter the spillway system. This type of failure occurs with little to no warning. Spring thaws, severe thunderstorms, and heavy rainfall are also contributing factors to potential dam failures. Depending on the size of the body of water where the dam is constructed, additional water may come from distant upstream locations. Water contributions may also come from dam failures in adjoining counties that are along the same riverine or water features.

FEMA considers the following to be the most frequent causes of dam failures:

- Overtopping caused by floods that exceed the capacity of the dam
- Deliberate acts of sabotage
- Structural failure of materials used in dam construction
- Movement and/or failure of the foundation supporting the dam
- Settlement and cracking of concrete or embankment dams
- Piping and internal erosion of soil in embankment dams
- Inadequate maintenance and upkeep

Poor engineering or poor maintenance may also cause dam failure. The Pennsylvania Department of Environmental Protection (PA DEP) and the United States Army Corps of Engineers (USACE) awards permits for dams and also share inspection responsibilities. Inspection results are characterized as either safe or unsafe.

The National Inventory of Dams (NID) is a registry that captures information about structures that are greater than or equal to 25 feet in height or impound 50-acre-feet or more of water (an acre-foot is equal to 325,851 gallons of water); it includes structures above 6 feet in height where failure would potentially cause damage downstream. The dams are classified in terms of hazard potential as “High”, “Significant”, or “Low”, with high-hazard dams requiring emergency action plans (EAPS) There are nine high-hazard and low-hazard dams in Jefferson County that are both publicly and privately owned and are registered with the USACE in the NID. There are also two dams with a hazard classification as significant. There are seven dams within the county that are high-hazard and require an emergency action plan, and one dam that is significant-hazard and has an emergency action plan. *Table 49 – Jefferson County Dam Inventory* illustrates the dams located in Jefferson County. *Table 48 – High-Hazard Dams Municipal Summary* summarizes the high-hazard dams in Jefferson County by municipality. The municipalities not listed do not have high-hazard dams. *Table 50 – Dam Name and Purpose* lists the dams located in Jefferson County and their purpose code, and the description of purpose based on the Pennsylvania DEP codes.

Table 48 - High-Hazard Dams Municipality Summary

High-Hazard Dams – Municipal Summary	
Municipality	**Number of High-Hazard Dams**
Bell Township	1
Ringgold Township	3
Washington Township	1
Winslow Township	2
Total:	**7**
Source: PA DEP, 2023	

Table 49 - Jefferson County Dam Inventory

Jefferson County Dams							
Dam Name	**River**	**Owner Name**	**Year Completed**	**Dam Height (feet)**	**Drainage Area**	**Hazard**	**EAP**
Bishop	TR Trout Run	Carl Bishop	-	-	-	S	N
Brookville Waterworks	North Fork Creek	Brookville Borough Authority	1912	24	96.3	S	Y
Cloe Lake	Jackson Run	PA Fish and Boat Commission	1909	43	3	H	Y
Doverspike Brothers	TR Big Run	Reynoldsville Water Authority	-	27	.36	L	NR
Doverspike No. 1	Cherry Run	Doverspike Irrevocable Trust	1970	41	.4	H	Y
Kyle	Kyle Run	PA Fish and Boat Commission	1910	33	6	H	Y
Reynoldsville Storage #4	Pitchpine Run	Reynoldsville Water Authority	1961	16	.61	H	Y

Jefferson County Dams							
Dam Name	**River**	**Owner Name**	**Year Completed**	**Dam Height (feet)**	**Drainage Area**	**Hazard**	**EAP**
Reynoldsville Storage #5	Pitchpine Run	Reynoldsville Water Authority	1901	26	.6	H	Y
Sedimentation Pond L-1	TR Soldier Run	Consol Mining Company, LLC.	1992	15	.26	L	NR
Sunnyside Energy Park	Caylor Run	Sunnyside Energy Park, LLC.	1975	50	.9	H	Y
Weisner Hollow Slurry	TR Pine Run	DEP-BAMR	-	192	.33	H	Y
Source: NID 2023							

Table 50 - Dam Name and Purpose

Jefferson County Dams and Purposes		
Dam Name	**Purpose Code**	**Purpose Code Description**
Bishop	R	Recreation
Brookville Waterworks	S	Storage
Cloe Lake	R	Recreation
Doverspike Brothers	O, R	Recreation
Doverspike No. 1	R	Recreation
Kyle	R	Recreation
Reynoldsville Storage #4	S	Storage
Reynoldsville Storage #5	S	Storage
Sedimentation Pond L-1	O	Farm Pond
Sunnyside Energy Park	R	Recreation
Weisner Hollow Slurry	O	Farm Pond
Source: PA DEP 2019 & NID 2023		

The Pennsylvania Department of Environmental Protection defines a high-hazard dam as “Any dam so located as to endanger populated areas downstream by its failure”. High-hazard dams receive two inspections each year, once by a professional engineer on behalf of the owner and once by a PA DEP inspector (DEP, 2008).

Levees

Levee failures have the potential to place large numbers of people and property at risk. Unlike dams, levees are built parallel to a river or another body of water to protect the population and structures behind it from risks of damage during a flooding event. Levees do not serve a purpose beyond flood protection, unlike dams, which can serve to store water or generate energy in addition to protecting areas from flooding. The National Levee Database (NLD), like its counterpart of the National Inventory of Dams (NID), is maintained by the USACE and tracks levees across the United States. Jefferson County is home to ten levee sections, which are detailed in *Table 51 – Jefferson County Levee Inventory*.

Table 51 - Jefferson County Levee Inventory

Jefferson County Levee Inventory				
Levee Name	**Flood Source**	**Levee Type**	**Levee Bank Side**	**Levee Length (miles)**
Brockway – Left Bank Little Toby Creek	Little Toby Creek	Earthen	Left	1.18
Brockway – Left Bank Upstream Little Toby Creek	Little Toby Creek	Earthen	Left	0.46
Brockway – Right Bank Little Toby Creek	Little Toby Creek	Earthen	Right	0.84
Brookville – North Fork Levee	Redbank Creek	Earthen	Right	0.15
Brookville – Sandy Lick Creek Levee	Sandy Lick Creek	Earthen	Right	0.41
Punxsutawney – Mahoning Creek Levee 8	Mahoning Creek	Earthen	Left	0.34
Punxsutawney – Mahoning Creek Levee 9	Mahoning Creek	Earthen	Right	0.34
Punxsutawney, PA – Left Bank Mahoning Creek	Mahoning Creek	Earthen	Left	0.77
Punxsutawney, PA – Right Bank Mahoning Creek	Mahoning Creek	Earthen	Right	1.54
Reynoldsville – Right Bank Soldier Run	Soldier Run	Earthen	Right	0.59
Source: National Levee Database, 2023				

4.3.12.2 Range of Magnitude

Dams

Dam failures can pose a serious threat to communities located downstream from major dams. The impact of a dam failure is dependent on the volume of water impounded by the dam and the amount of population or assets located downstream. Catastrophic failures are characterized by the sudden, rapid, and uncontrolled release of impounded water from a dammed impoundment or water body. *Figure 31 – Jefferson County Dams* shows the location of dams within Jefferson County as well as their hazard designation.

Levees

Levee failure can be caused by a number of factors, and they can also cause catastrophic effects. Damage to the area beyond a levee, if it fails, could be more significant than if the levee was not present. Levees are designed to provide a specific level of protection, so flooding events could overtop the levees if these events exceeded the levee specifications. Additionally, levees can also fail if they are allowed to deteriorate or decay. Regular maintenance of levees is critical. *Figure 32 – Jefferson County Levee Locations* illustrates areas protected by the Jefferson County levee systems. The figures following *Figure 32 – Jefferson County Levee Locations* illustrate areas around Brockway Borough, Brookville Borough, Punxsutawney Borough, Reynoldsville Borough, Snyder Township, and Young Township that are heavily protected by levees. They are *Figure 33 – Levee Locations – Left Bank Little Toby Creek*, *Figure 34 – Levee Locations – Left Bank Upstream Little Toby Creek*, *Figure 35 – Levee Locations – Right Bank Little Toby Creek*, *Figure 36 – Levee Locations – North Fork Levee*, *Figure 37 – Levee Locations – Sandy Lick Creek Levee*, *Figure 38 – Levee Locations – Punxsutawney Mahoning Creek Levee 8*, *Figure 39 – Levee Locations – Punxsutawney Mahoning Creek Levee 9*, *Figure 40 – Levee Locations – Punxsutawney Left Bank Mahoning Creek*, *Figure 41 – Levee Locations – Punxsutawney Right Bank Mahoning Creek*, and *Figure 42 – Levee Locations – Reynoldsville Right Bank Soldier Run*.

A Levee failure of breach causes flooding in landward areas adjacent to the structure. The failure of a levee or other flood protection structure could be devastating, depending on the level of flooding for which structure is designed and the amount of landward development present. Large volumes of water may be moving at high velocities, potentially causing severe damage to buildings, infrastructure, trees, and other large objects. Levee failures are generally worse when they occur abruptly with little warning and result in deep, fast moving water through highly developed areas.

4.3.12.3 Past Occurrence

Dams

There have been no past occurrences of dam failure or major incidence occurring at the locations of dams within Jefferson County. Smaller incidents have occurred but have not had significant impacts in the county.

There have been a few historically destructive dam failures in Pennsylvania over the course of the past two hundred years. The most destructive dam failure in United States history took place in Johnstown, Pennsylvania (Cambria County) in 1889, claiming 2,209 lives. Another significant dam failure took place in Austin, Pennsylvania (Potter County) in 1911, claiming seventy-eight lives. Similarly, a dam failure in West Taylor Township, Pennsylvania (Cambria County) claimed the lives of forty people when the Laurel Run Dam, No. 2 failed during the Johnstown Flood in the early morning hours of July 20th, 1977.

Levees

The National Levee Database (NLD) lists no occurrence of levee failures or major incidents occurring in Jefferson County.

Some of the worst levee failures in the history of the United States have occurred in the American South, along parts of the Mississippi River delta. Levee failures in New Orleans, Louisiana during Hurricane Katrina from August 23 to August 31, 2005 resulted in an enormous amount of property damage and loss of lives. There were approximately fifty-three levee failures in constructed levees around the City of New Orleans. Hurricane Katrina precipitated the creation of more strict levee requirements for inspection and construction on the local, state, and federal level.

4.3.12.4 Future Occurrence

Dams

Although dam failures can occur at any time, given the right circumstances, the likelihood of a dam failure in Jefferson County is considered to be unlikely.

The presence of structural integrity and inspection programs significantly reduces the potential for major dam failure events to occur. The PA DEP inventories and regulates all the dams that meet or exceed the following criteria (PA, DEP, 2008):

- Impound water from a drainage area of greater than 100 acres
- Have a maximum water depth greater than 15 feet
- Have a maximum storage capacity of 50 acre-feet or greater

The construction, operation, maintenance, and abandonment of dams is reviewed and monitored by the PA DEP Division of Dam Safety. Dams are evaluated based on those categories such as slope stability, undermining seepage, and spillway adequacy. With more strict construction and design procedures in place, the future occurrence of a dam failure is increasingly small. The new procedures and rules protect public safety and both public and private property. Newly constructed dams are thoroughly examined by professional engineers to prevent future dam failure events.

Levees

Although levee failures can occur at any time, given the right circumstances, the future occurrence of levee failures in Jefferson County can be considered unlikely. Most levees are designed to meet a specified level of flooding. While FEMA focuses on mapping levees that will reduce the risk of a 1% annual chance flood, other levees may be designed to protect against both smaller and larger floods.

4.3.12.5 Vulnerability Assessment

Dams

Property and populations located downstream from any dams are vulnerable to dam failures. The Pennsylvania Code (§105.91 Classification of dams and reservoirs) classifies doth dams by size and the amount of loss of life and economic loss expected in a failure event. *Table 52 – Dam Classification* displays the dam classification guide for the Commonwealth of Pennsylvania. Although the size of a dam may result in varying impacts, the hazard potential classification of category one dams is a more important indicator, since that will indicate the level of potential substantial loss of life and excessive economic loss.

Table 52 - Dam Classification

Dam Classification		
Dam Size Classification		
Class	**Impoundment Storage (Acre-Feet)**	**Dam Height (Feet)**
A	Equal to or greater than 50,000	Equal to or greater than 100
B	Less than 50,000 but greater than 1,000	Less than 100 but greater than 40
C	Equal to or less than 1,000	Equal to or less than 40
Dam Damage Classification		
Category	**Loss of Life**	**Economic Loss**
1	Substantial	Excessive
2	Few	Appreciable
3	None Expected	Minimal
Source: PA Code, 1980		

Dam failures can cause significant environmental effects, as the resulting flood from a dam failure is likely to disperse debris and hazardous materials downstream that can damage local ecosystems. Debris carried downstream can block roads, cause traffic accidents, disrupt traffic patterns, and delay the delivery of essential services along major traffic corridors. Debris flow can also cause landslides along steep slopes and embankments with low slope stability. The economic and financial impact from damage and recovery ranges from minimal to severe, depending on the magnitude of damage and scale of failure event.

Emergency action plans are developed by the owners of high-hazard dams. These plans are then disseminated to first responders and other planning partners within the county. Vulnerable populations are those residents and businesses located downstream from a high-hazard dam within the inundation area. The emergency action plan identifies a call list to notify downstream at-risk populations. Emergency action plan exercises are held every five to seven years depending on local policy.

The characteristics of the seven high-hazard dams in Jefferson County vary greatly. The Brookville Waterworks Dam, located in Brookville Borough, has the largest drainage area with a total of 96.3 acres. The dams that were constructed most recently are the Sedimentation Pond L-1 Dam, located in Winslow Township, which was constructed in 1992, and the Sunnyside Energy Park Dam in Ringgold Township, which was constructed in 1975. The dam that is the oldest in the county is Reynoldsville Storage #5 Dam, which was constructed in 1901. The Weisner Hollow Slurry Dam is the tallest in the county with a height of 192 feet. The Reynoldsville Water Authority owns the most dams in Jefferson County with a total of three. These dams are the Doverspike Brother Dam, the Reynoldsville Storage #4 Dam, and the Reynoldsville Storage #5 Dam. The dams in Jefferson County are owned by a mix of public and private owners and vary in almost every aspect. The county dams are distributed relatively evenly throughout the county and municipalities, with an even mix of high and low hazard dams in the municipalities.

The failure or partial failure of a High-Hazard Potential Dam can have impacts that affect many different jurisdictions across Jefferson County and counties adjacent to Jefferson County. A failure at any of the dams in Jefferson County would result in some inundation in at least those municipalities adjacent to the dam in question. A more comprehensive examination of risk inundation areas from High-Hazard Potential Dams can be conducted in future iterations of the Jefferson County Hazard Mitigation Plan. This dataset was not readily accessible at the time of this writing. However, each of this municipalities that could be affected by the failure of a High-Hazard Potential Dam could result in the inundation of police stations and fire departments, critical infrastructure facilities, and community lifeline locations like medical facilities, power and energy facilities, and schools, nursing homes, and senior care and long term care facilities.

Jefferson County is at risk when high-hazard potential dams are considered. There are three types of risk related to high-hazard potential dams and they are listed below in *Table 53 – High Hazard Potential Dams Risk-Type*:

Table 53 - High-Hazard Potential Dams Risk Type

High-Hazard Potential Dams Risk Types	
Type of Risk	**Description**
Incremental Risk	The risk (likelihood and consequences) to the pool area and downstream floodplain occupants that can be attributed to the presence of the dam should the dam breach prior or subsequent to overtopping, or undergo component malfunction or misoperation, where the consequences considered are over and above those that would occur without dam breach. The consequences typically are due to downstream inundation, but loss of the pool can result in significant consequences in the pool area upstream of the dam.
Non-Breach Risk	The risk in the reservoir pool area and affected downstream floodplain due to 'normal' dam operation of the dam (e.g., large spillway flows within the design capacity that exceed channel capacity) or 'overtopping of the dam without breaching' scenarios.
Residual Risk	The risk that remains after all mitigation actions and risk reduction actions have been completed. With respect to dams, FEMA defines residual risk as "risk remaining at any time" (FEMA, 2015, p A-2). It is the risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue.
Source: "Rehabilitation of High Hazard Potential Dams Grant Program Guidance," June 2020	

At this time, insufficient information is available to conduct a substantive analysis of incremental, non-breach and residual risk relative to Jefferson County's high hazard potential dams. However, it is acknowledged that incremental risk is "the risk (likelihood and consequences) to the pool area and downstream floodplain occupants that can be attributed to the presence of the dam should the dam breach prior or subsequent to overtopping, or undergo component malfunction or misoperation, where the consequences considered are over and above those that would occur without dam breach;" non-breach risk is "the risk in the reservoir pool area and affected downstream floodplain due to 'normal' dam operation of the dam (e.g., large spillway flows within the design capacity that exceed channel capacity) or 'overtopping of the dam without breaching' scenarios;" and residual risk) is "the risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue" (FEMA, 2020 Rehabilitation of High Hazard Potential Dams Grant Program Guidance)

The risk of high-hazard potential dams in Jefferson County is present but at the time of this writing, there is insufficient data to identify in exact detail the vulnerable populations and assets in inundation areas for the high-hazard potential dams. The areas downstream from the high-hazard potential dams are more vulnerable to inundation than areas that are upstream from said dams. There are current datasets to address high-hazard potential dam impacts in greater detail, but these datasets are still in development from the Pennsylvania Department of Environmental Protection, Pennsylvania Emergency Management Agency, the United States Army Corp of Engineers, and the Federal Emergency Management Agency. Once these datasets have been published and inundation data is easier to acquire, this information will be used to develop more details risk assessment and vulnerability assessments for dam failure at the high-hazard potential dams.

Levees

Each levee that is located in Jefferson County is of different length and each protects areas from a different section of waterway and flood way. The Punxsutawney – Left Bank Mahoning Creek Levee is the largest in Jefferson County with a length of 1.54 miles. The Brookville – North Fork Levee is the smallest levee in length in Jefferson County with a length of 0.15 miles. The average length of a levee in Jefferson County is approximately 0.662 miles.

The entire leveed areas for Jefferson County protect a total of 1,381 addressable structures within the county. Also protected are thirteen facility points with Jefferson County that include community lifeline facilities (municipal buildings, hospitals, police/fire/EMS, schools, childcare centers, and nursing/care homes). Each levee in Jefferson County is a mainline levee and protects along a variety land features. A failure of levees in the urban areas in Jefferson County would be catastrophic to life and property.

There are a large number of community lifeline facilities within the levee protection areas for the levees around Jefferson County. *Table 54 – Number of Vulnerable Structures within Leveed Areas* shows the number of addressable structures and facility type points in the largest levee protection areas within Jefferson County based on NLD information from 2023. The features included in the table are particularly vulnerable to levee failure because they are protected by the system. Should the levee systems fail, the structures would be at an increased risk from their flood sources.

Table 54 - Number of Vulnerable Structures within Leveed Areas

Number of Vulnerable Structures within Leveed Areas		
Leveed Area Name	**Addressable Structures in Leveed Area**	**Facility Type Points in Leveed Area**
Brockway – Left Bank Little Toby Creek	65	0

Number of Vulnerable Structures within Leveed Areas		
Leveed Area Name	**Addressable Structures in Leveed Area**	**Facility Type Points in Leveed Area**
Brockway – Left Bank Upstream Little Toby Creek	31	1
Brockway – Right Bank Little Toby Creek	216	2
Brookville – North Fork Levee	4	0
Brookville – Sandy Lick Creek Levee	19	0
Punxsutawney – Mahoning Creek Levee 8	0	0
Punxsutawney – Mahoning Creek Levee 9	4	0
Punxsutawney, PA – Left Bank Mahoning Creek	205	0
Punxsutawney, PA – Right Bank Mahoning Creek	749	10
Reynoldsville – Right Bank Soldier Run	88	0
Totals:	**1,381**	**13**

The community lifeline points in the leveed areas for Jefferson County are broken down into the following types and quantities:

- EMS Stations (2)
- Fire Stations (2)
- Gas Stations (2)
- Grocery Stores (3)
- Police Departments (1)
- Schools (3)

Figure 31 - Jefferson County Dams

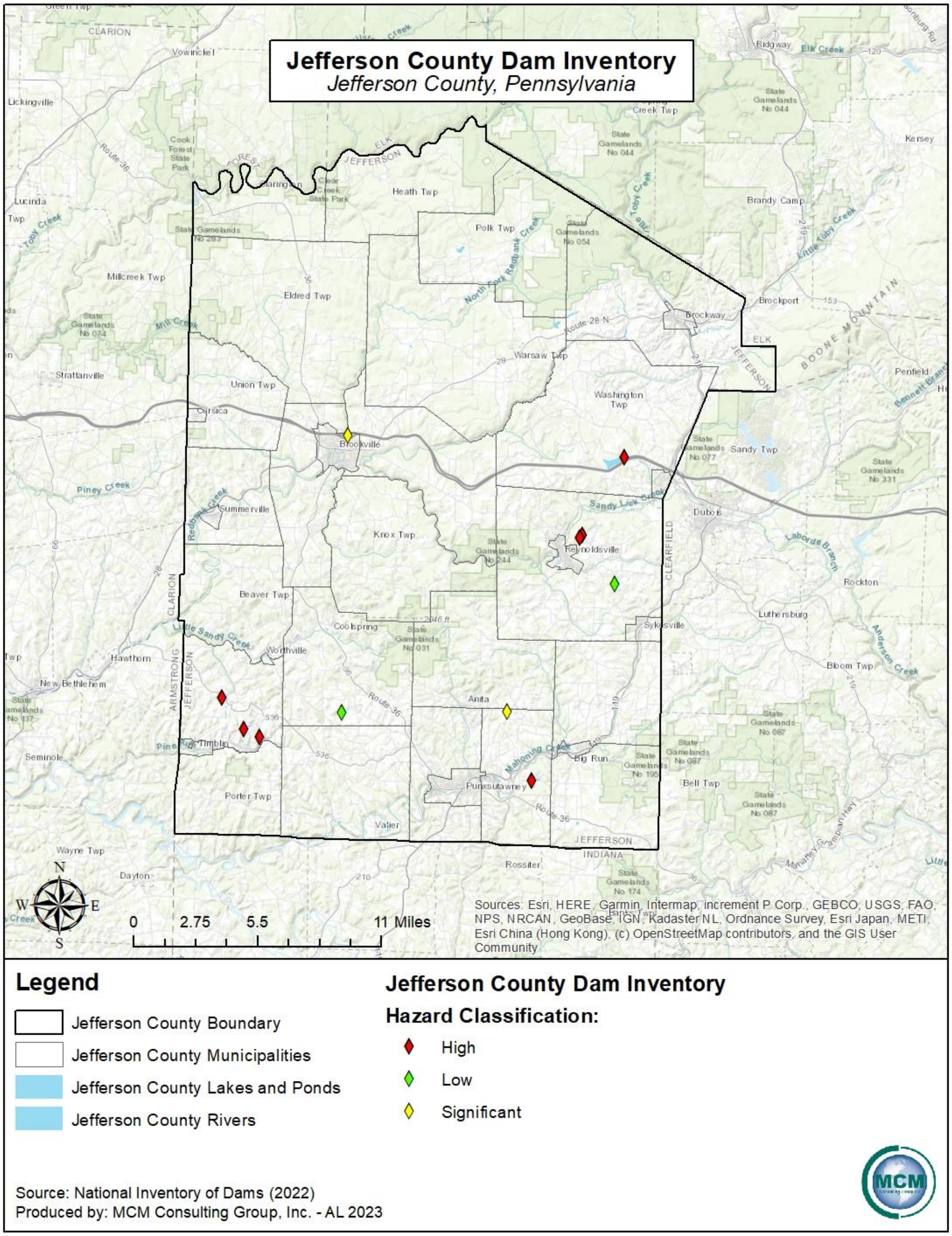


Figure 32 - Jefferson County Levee Locations

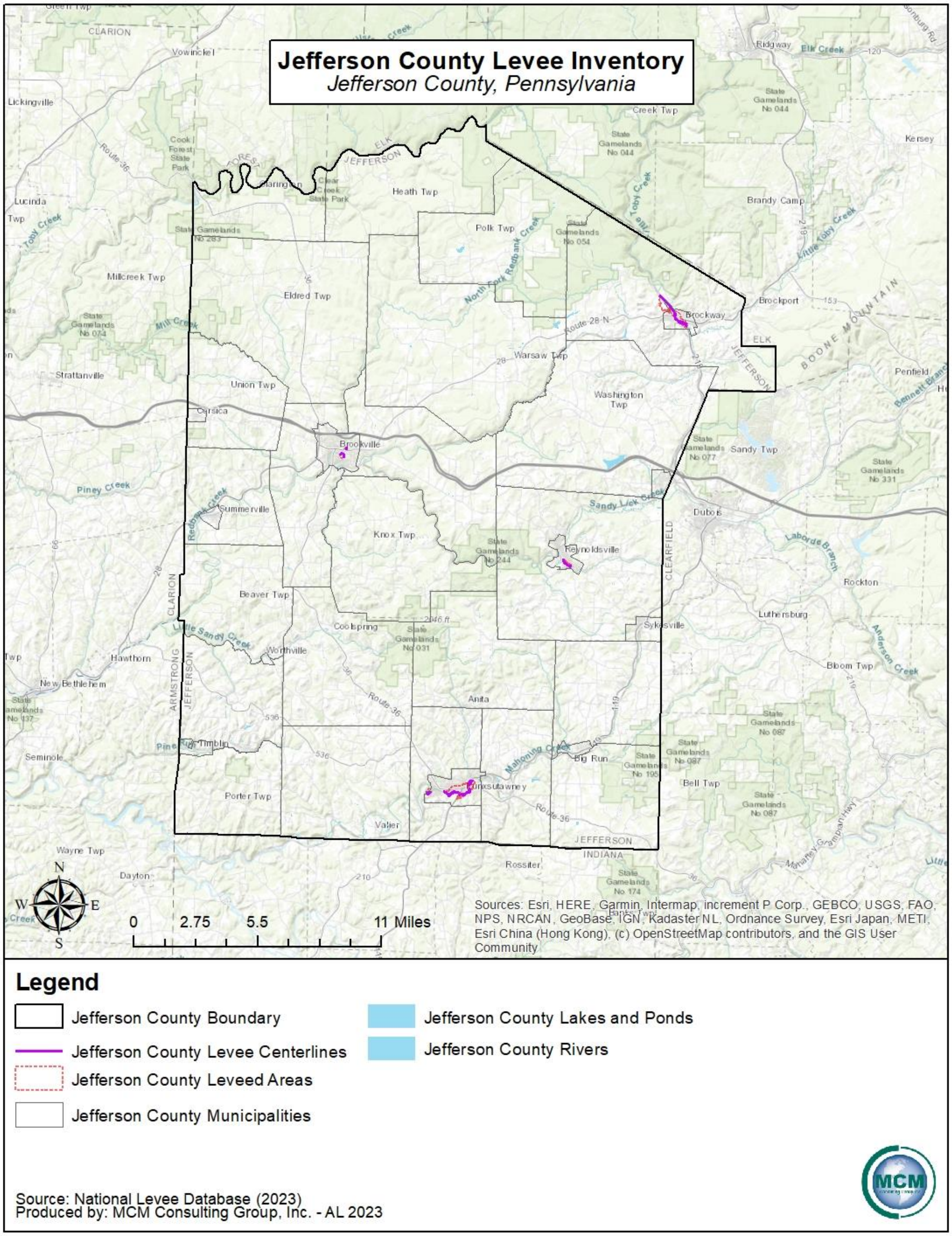


Figure 33 - Levee Locations – Left Bank Little Toby Creek

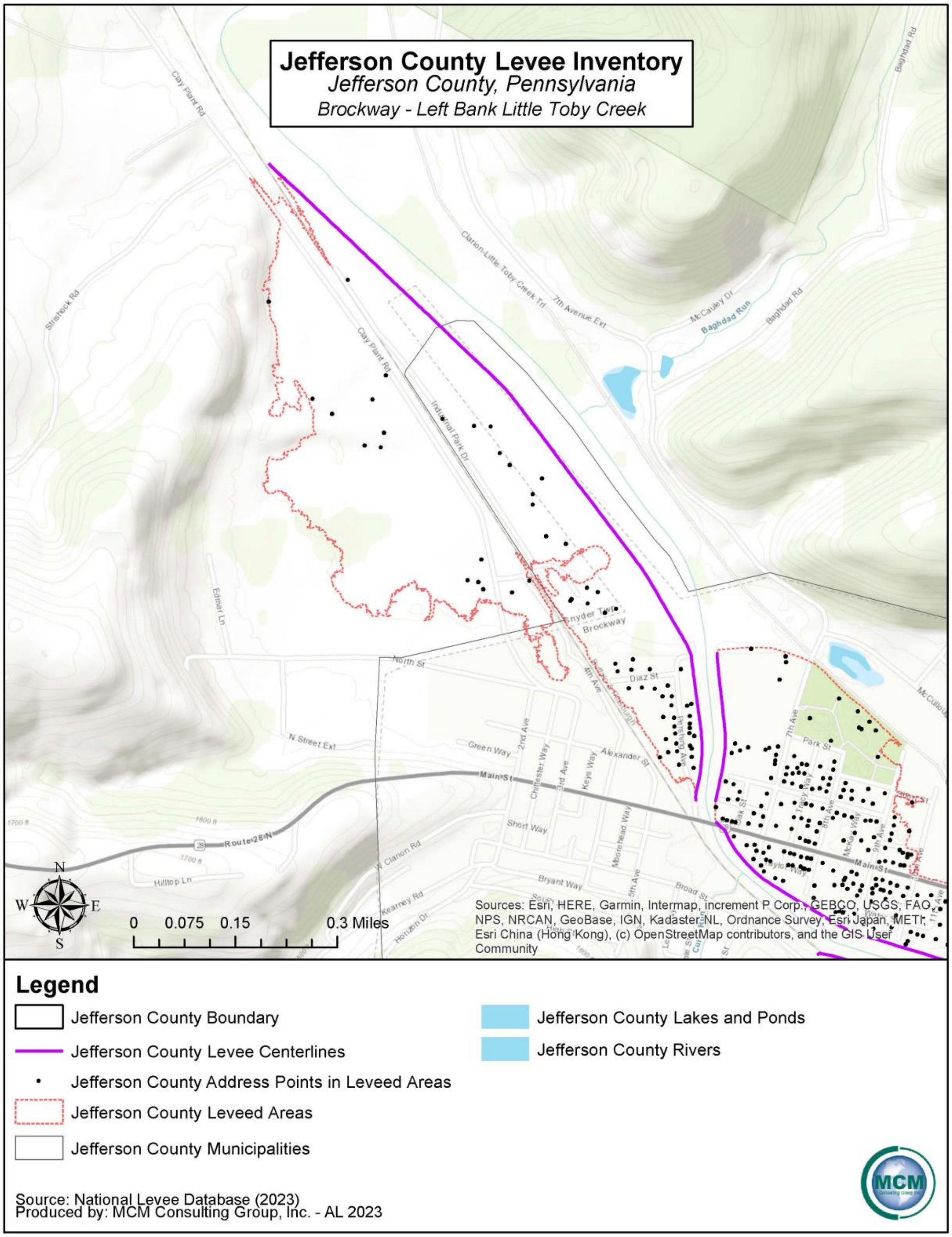


Figure 34 - Levee Locations – Left Bank Upstream Little Toby Creek

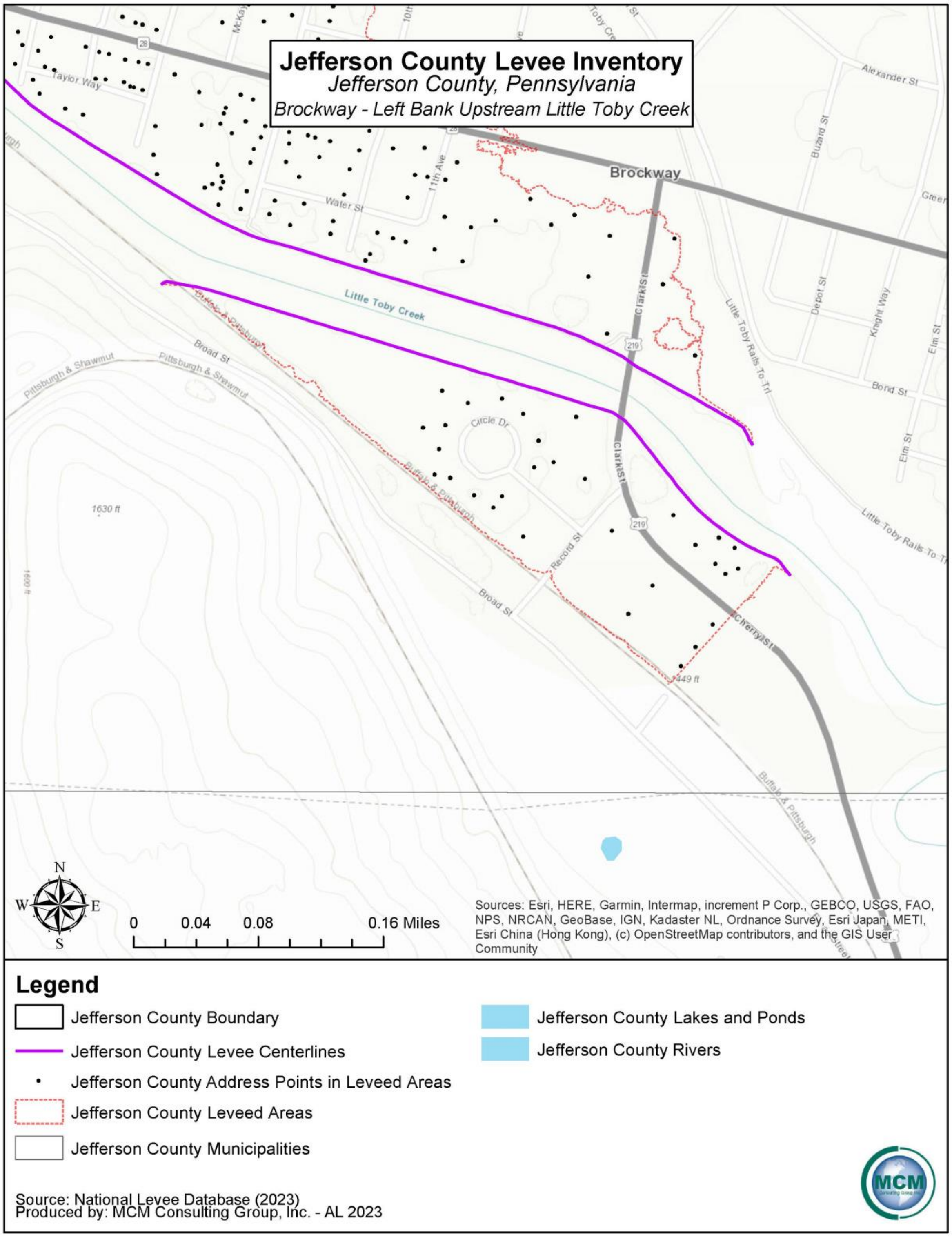


Figure 35 - Levee Locations – Right Bank Little Toby Creek

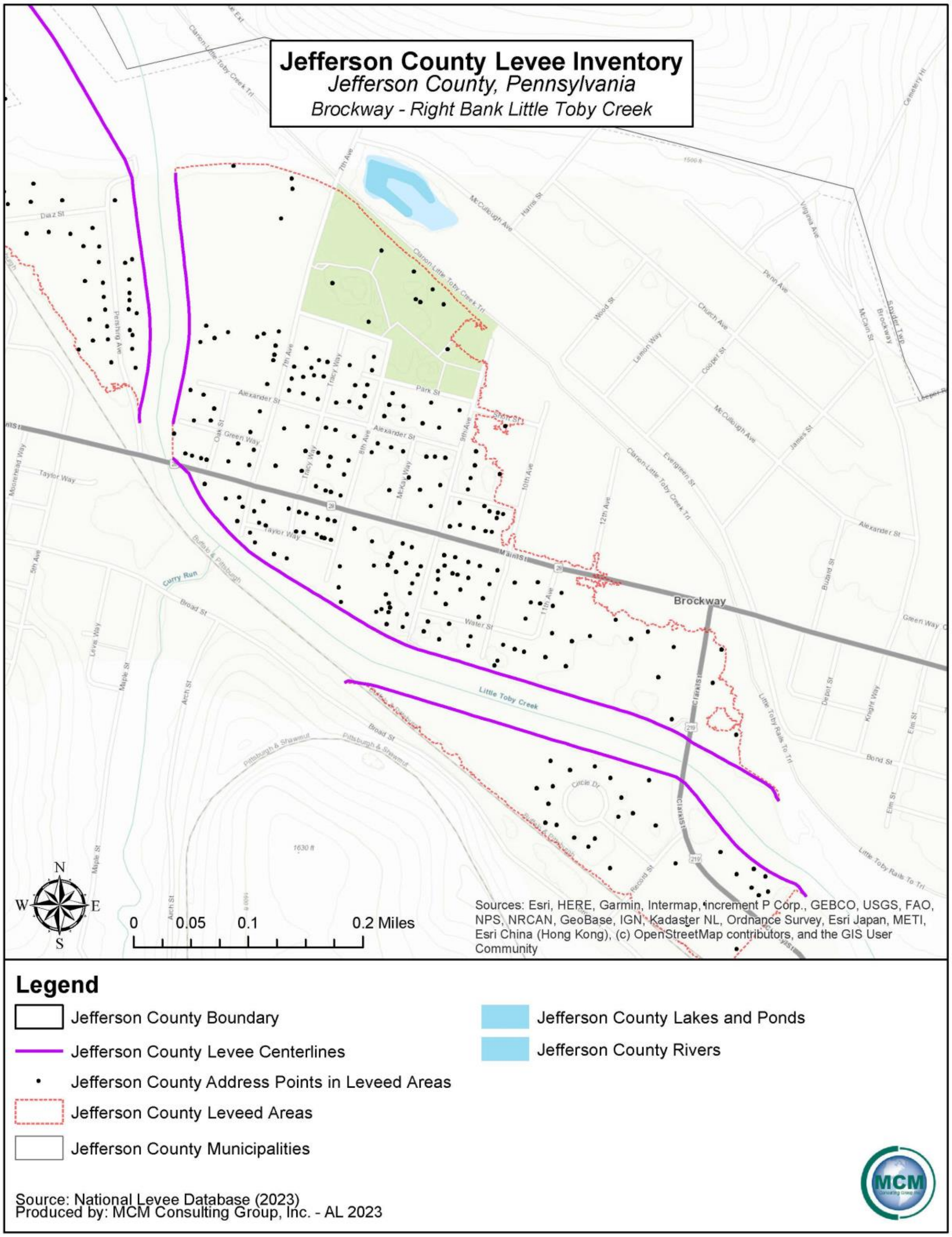


Figure 36 - Levee Locations – North Fork Levee

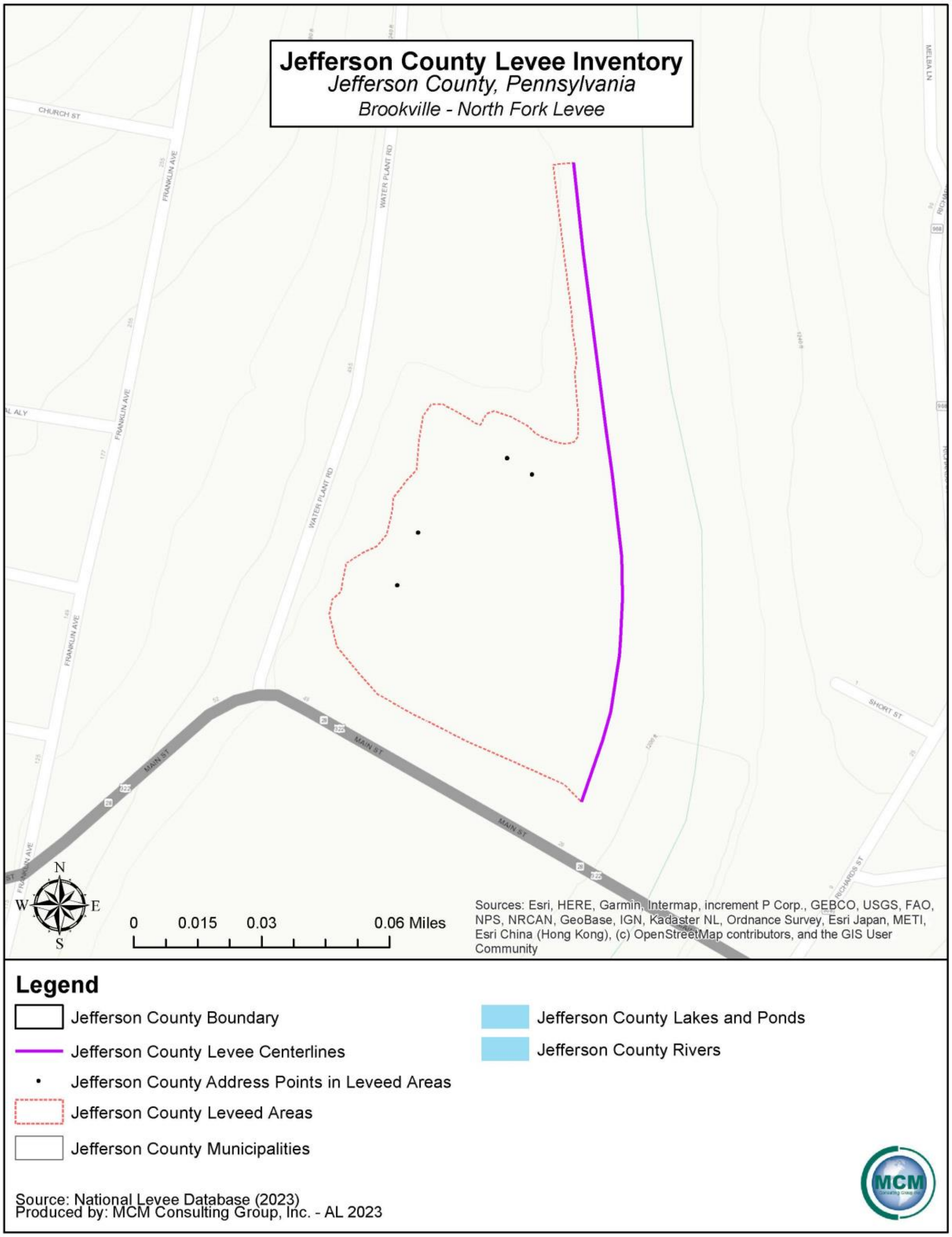


Figure 37 - Levee Locations – Sandy Lick Creek Levee

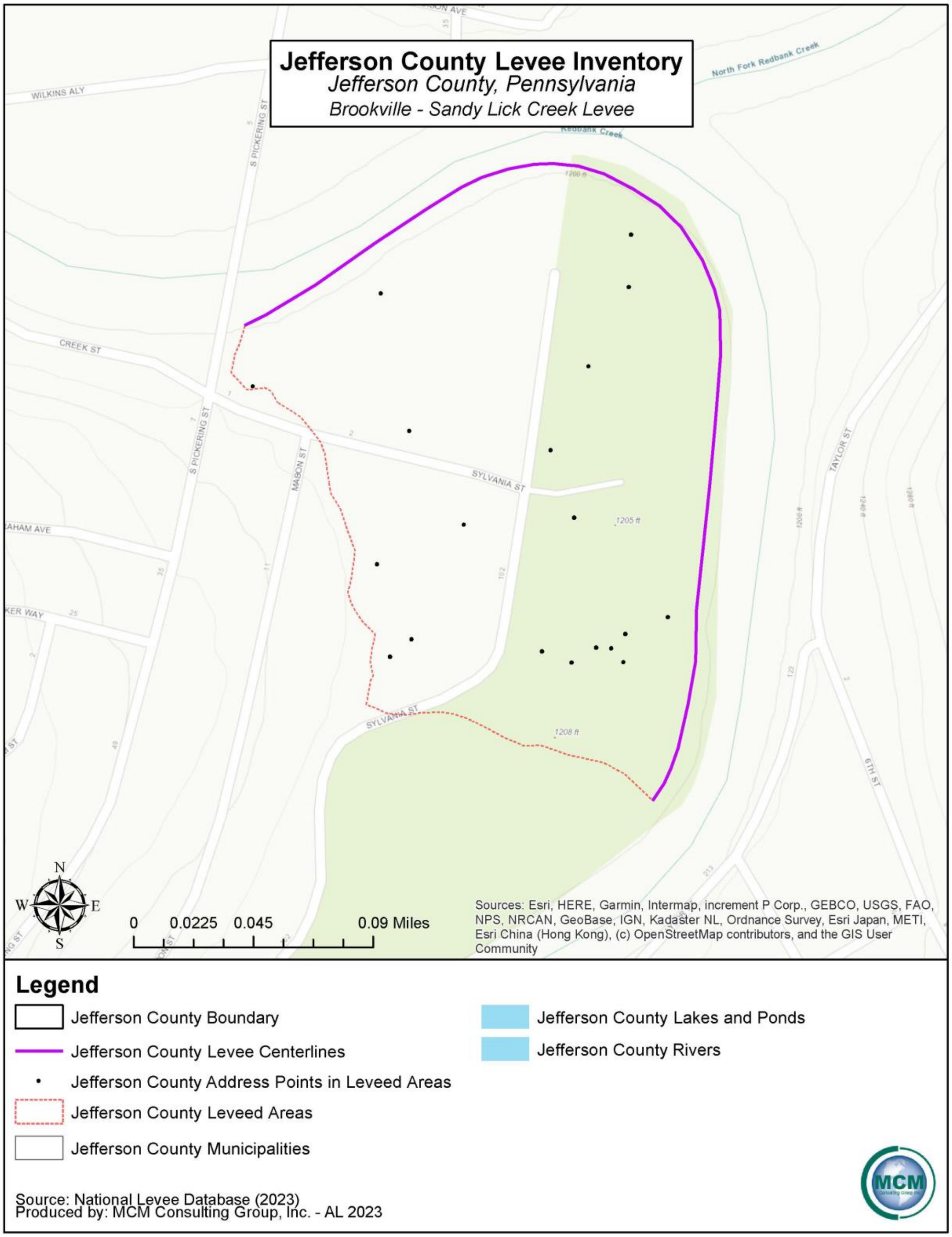


Figure 38 - Levee Locations – Punxsutawney Mahoning Creek Levee 8

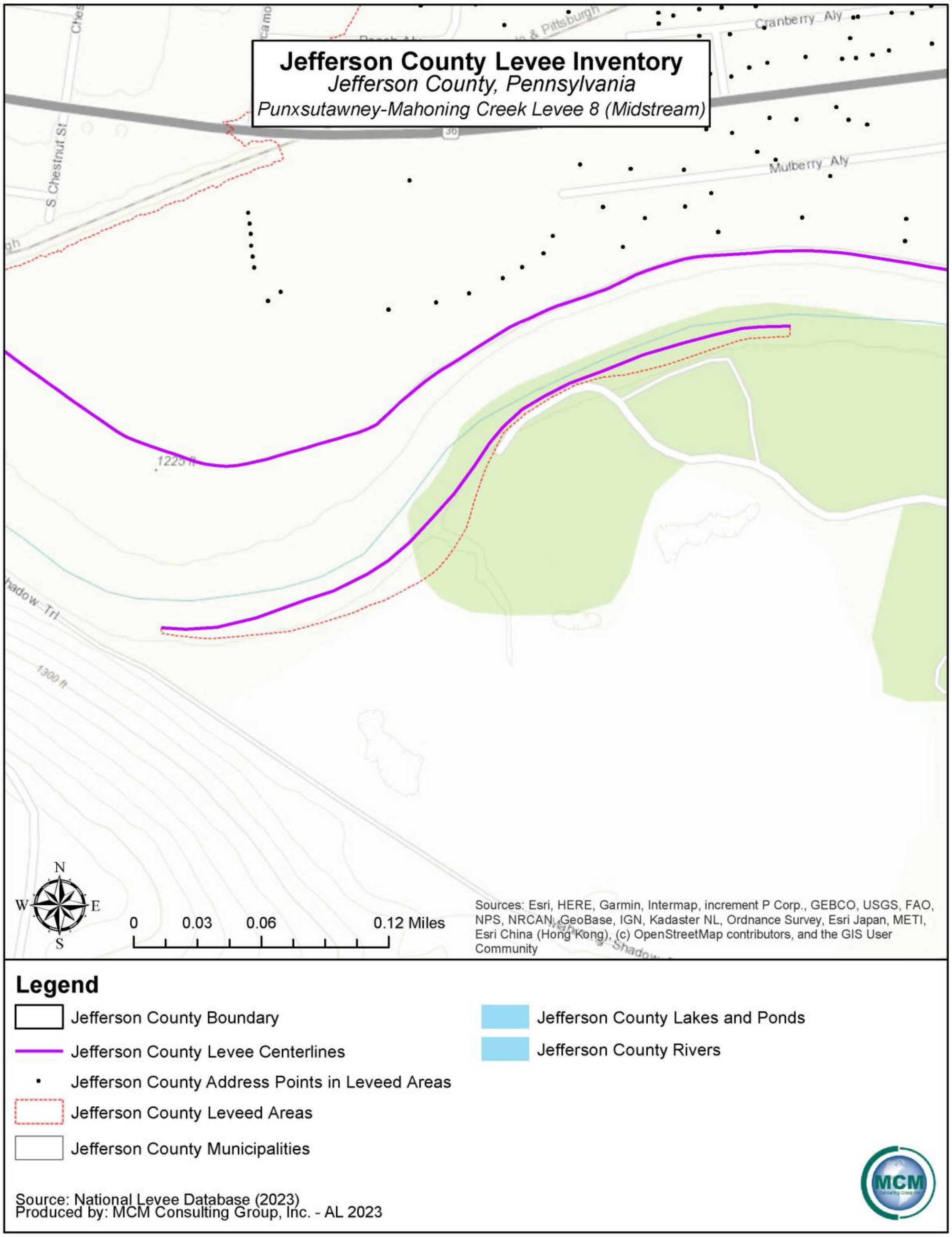


Figure 39 - Levee Locations – Punxsutawney Mahoning Creek Levee 9

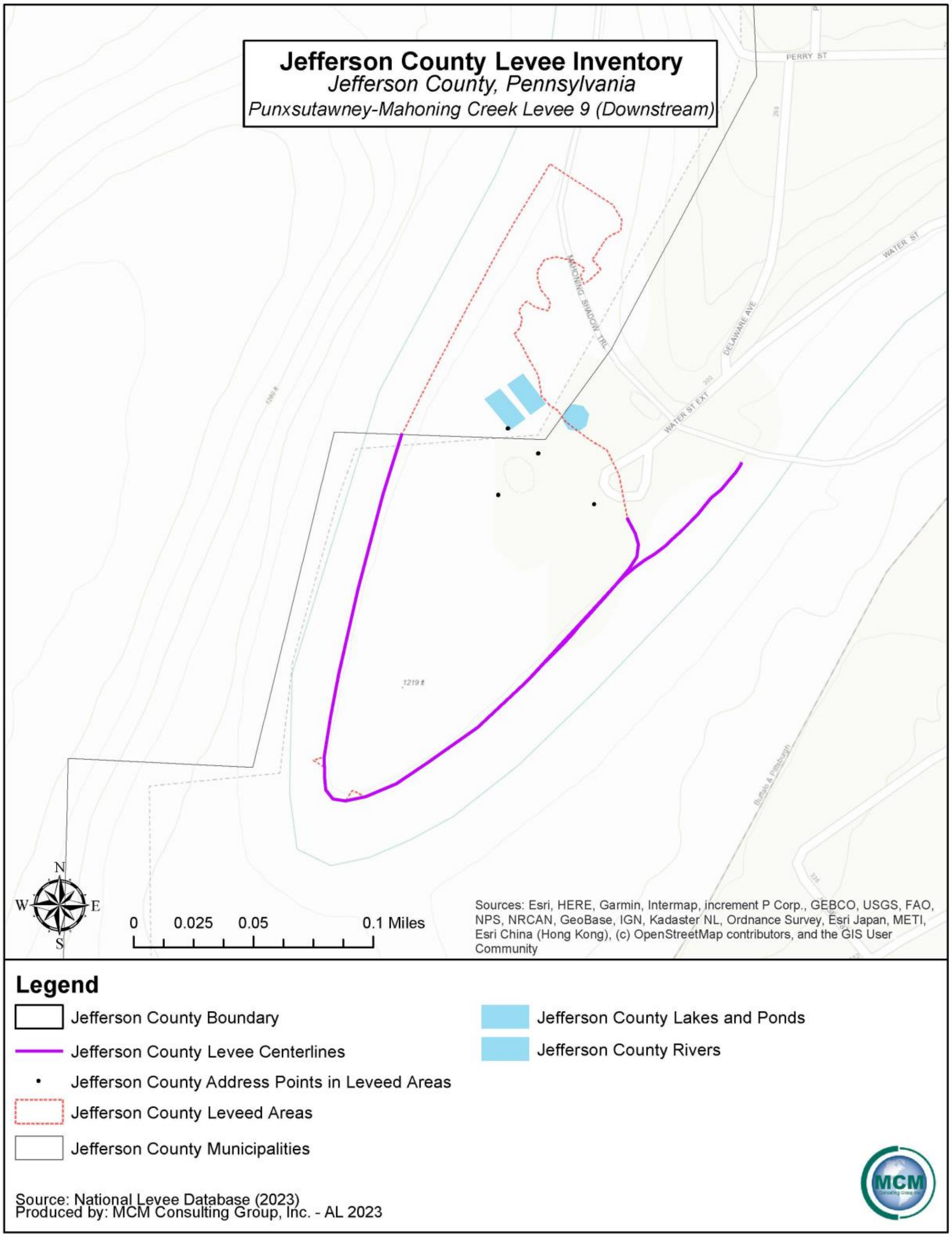


Figure 40 - Levee Locations – Punxsutawney Left Bank Mahoning Creek

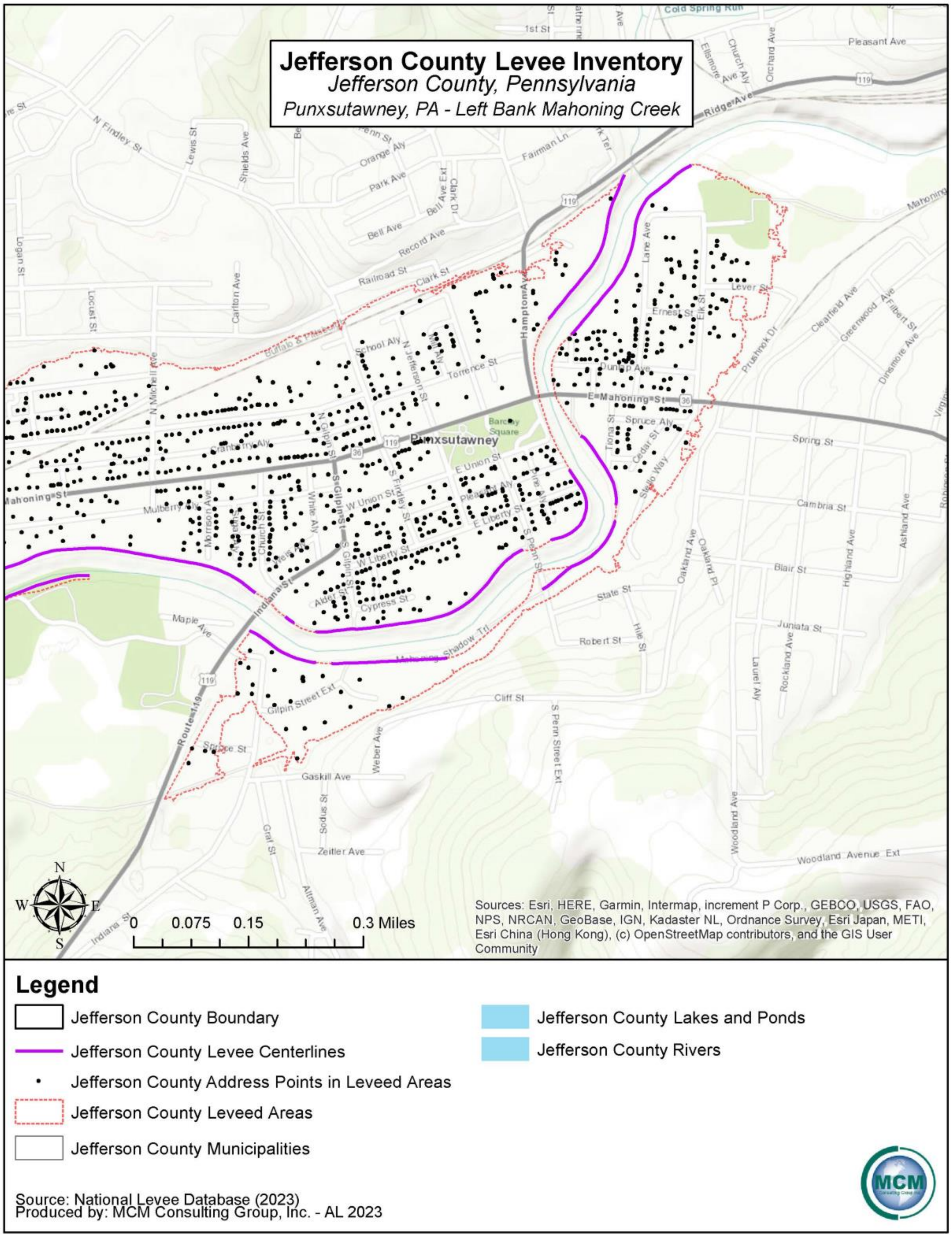


Figure 41 - Levee Locations – Punxsutawney Right Bank Mahoning Creek

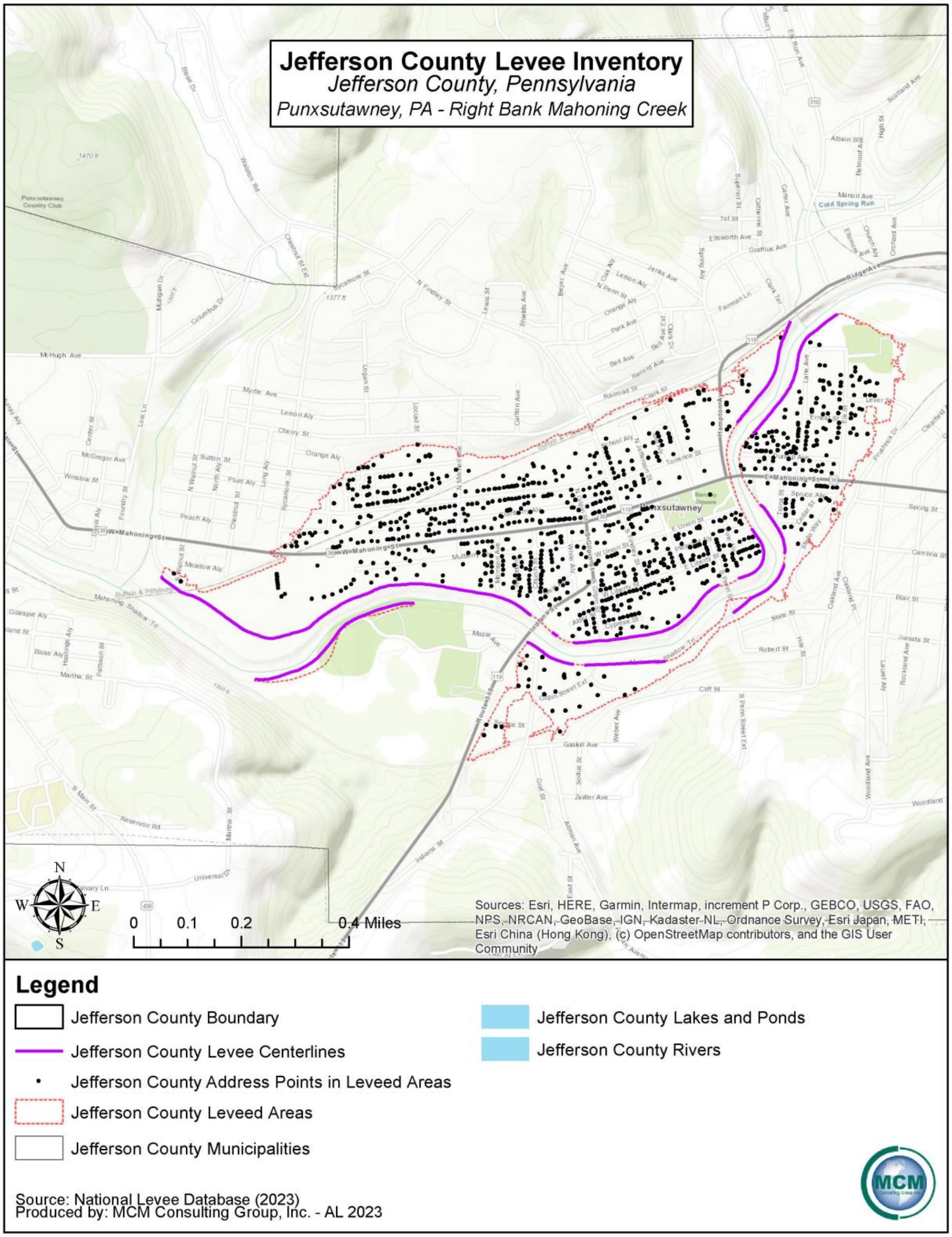
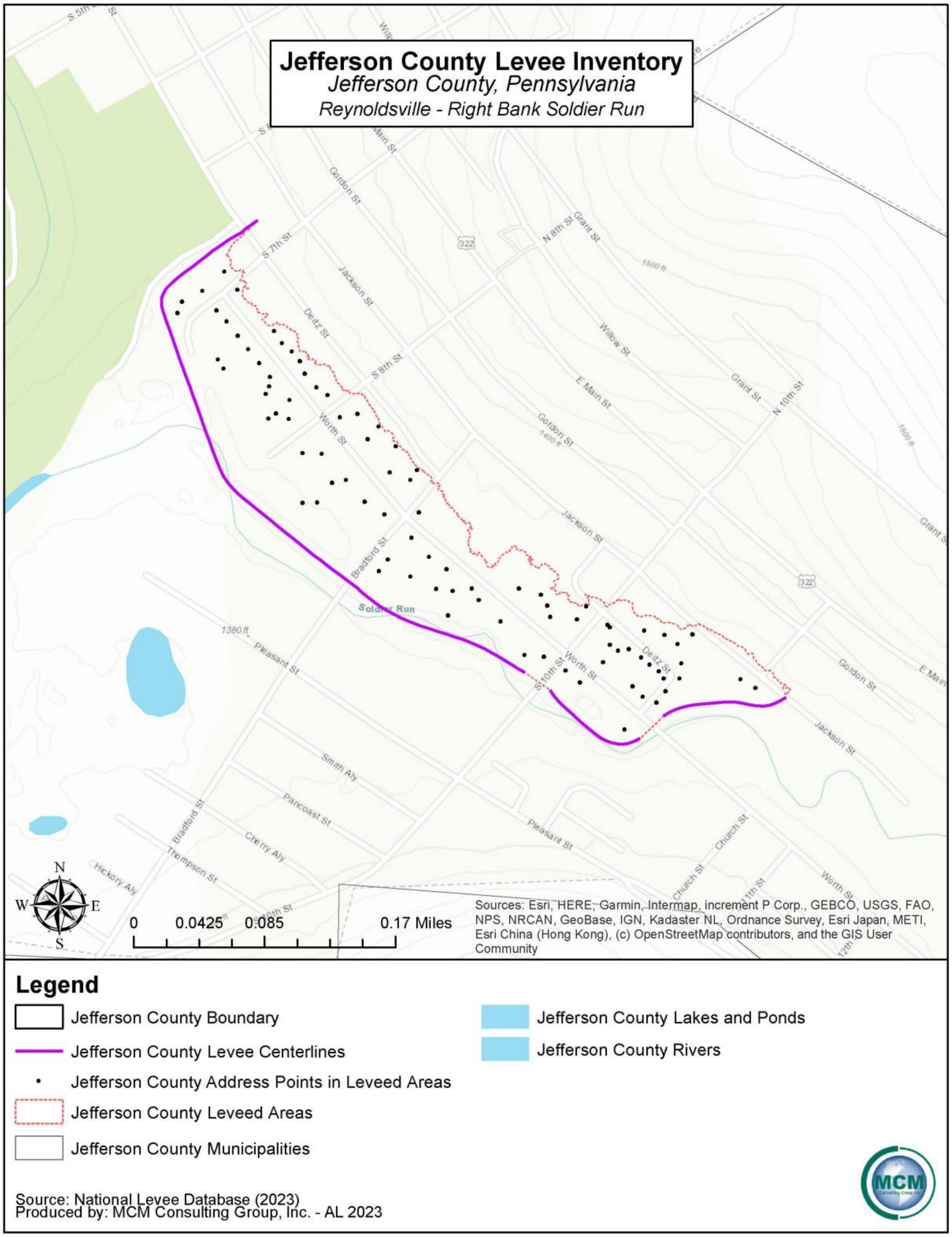


Figure 42 - Levee Locations – Reynoldsville Right Bank Soldier Run



4.3.13. Emergency Services

4.3.13.1 Location and Extent

Fire, emergency medical services (EMS), local emergency management coordinators (LEMC), and law enforcement service agencies are defined per municipality in Jefferson County. In addition to the local services, the county hosts numerous special teams. Regional and state-wide services are also available.

With the exception of law enforcement, most areas are served by volunteers instead of career personnel, which increases response time due to volunteer availability. Volunteers provide emergency services above separately from their regular careers. Often agencies struggle with the availability of skilled personnel and resources at certain times of the day. The number of responders in general has decreased, in part due to issues including funding and retention of personnel.

Additionally, the time and expense obligations of required training are a factor in the decrease in number of responders. The initial training time for fire, EMS, and law enforcement can take several months to complete. Emergency medical services, requires a regular schedule of continued education to maintain certification. In the fire service, after the initial training, there are specialty courses offered, which are recommended, but not required. For law enforcement, skills such as firearms proficiency must be maintained, and updates to new laws and regulations continues throughout the officer's career.

4.3.13.2 Range of Magnitude

Finances, changing political climates, leadership, or a significant high-profile event can trigger a system to be declared as "success" or "failure". In some cases, a combination of these factors can create a perfect storm. Unfortunately, many "failed" systems are measured by recent events, no matter how successful they may have been in the past. Although financial problems are often blamed on poor leadership, they may have many root causes. Labor rates, benefits, poor productivity, operational design, insurance reimbursements, and market regulation all have a significant direct impact on the financial viability of an organization.

Two fundamental, yet misunderstood, topics are the financial and economic variables that drive emergency service systems. These systems typically generate revenue through tax subsidies, memberships, direct sales, diversification into other lines of business, grants, or fundraising. They spend most of these revenues on direct and indirect labor, and benefits. The remaining dollars go into infrastructure, fuel, medical supplies, insurances, fleet maintenance, dispatch, and other essential items, with hopefully, some left over for recapitalization or fund balance development. The range of the issues related to emergency service shortages are felt across the entire United States of America and the Commonwealth of Pennsylvania. Jefferson County has felt emergency shortages and these shortages have had adverse effects on emergency response in the county.

4.3.13.3 Past Occurrence

There have been no official records kept on shortages to emergency services. However, there has been a decrease in the number of new volunteers in the fire service for several years. Most agencies are private organizations that lack local funding and exist based on tax dollars, fund raising, and donations received from their community. The need for fund raising adds to availability issues of volunteers. Most services past practices are not sustaining the current needs for funding and manpower. Without financial support from the communities, services may not be able to remain in operation to serve those same communities. Recruitment and personnel retention are a key to success.

Jefferson County has had multiple events that were caused by emergency service shortages, most significantly from 2020 to 2022, exacerbated by the COVID-19 pandemic. EMS response during the pandemic had an approximately 25% turnover rate. Quick response service (QRS) was placed on limited response during the COVID-19 pandemic, to limit the amount of exposure to volunteers. However, this shortage has not been caused exclusively by the COVID-19 pandemic and was occurring before the pandemic across Jefferson County and the Commonwealth of Pennsylvania. The decline in EMS services in Jefferson County started in the 1990s. At that time there were eight ambulance providers stationed in Jefferson County. Today, there are five EMS stations. Summerville EMS relinquished their EMS license on July 1, 2022, but kept their QRS licensure. Summerville EMS started their ambulance service in 1952, and the ambulance service was incorporated within the volunteer fire service. Volunteer ambulance services in Jefferson County, according to the Department of Emergency Services, currently have a 40% turnover rate of medical calls. Jefferson County has conducted two meetings in 2023 to address the EMS crisis within the county.

4.3.13.4 Future Occurrence

Historically, it has been difficult for small communities to have a paid fire or EMS service, therefore requiring volunteers. Fewer volunteers to perform the tasks associated with fire, medical, and rescue operations, can negatively affect a service’s ability to respond to emergencies. Additionally, operational needs are impacted if there are fewer volunteers to raise funds. Without fundraising and community support these fire departments and volunteer EMS agencies will experience broader challenges. Municipalities can help offset some of the financial burdens to their local fire company with a fire tax.

There are also challenges for individuals who volunteer, including dedicating time beyond their current employment, family, and community commitments to dedicate to training, responding, and fundraising. Training is essential to provide for the general knowledge and safety of volunteers. Becoming certified as a volunteer firefighter requires hundreds of hours of training. With a decrease in the numbers of new volunteers, many current volunteers are aging and unable to perform at the same levels they once were.

Fire departments and EMS agencies, often are tasked with responding to a variety of emergencies, including not only fire and medical emergencies, but also incidents requiring rescue, containment of hazardous materials, or assistance to law enforcement. Volunteers need to be well trained and able to respond to different scenarios as needed.

The future occurrence of emergency service shortages is likely to continue in Jefferson County and across the Commonwealth of Pennsylvania. With a lack of new recruits and officers for emergency services, response will continue to be hindered and response times will continue to be high. Institutional change is the most efficient way to decrease the likelihood of emergency service shortages in Jefferson County, but that type of change is slow and often long-term.

4.3.13.5 Vulnerability Assessment

The possibility that EMS agencies and fire services could fail creates a vulnerability to all Jefferson County communities. Occasionally, residents of communities mistakenly think that their local fire department is a paid service. Most municipal fire departments are volunteer agencies and need the support of their communities to maintain their departments.

Personnel shortages have been occurring in law enforcement for several reasons. More students are pursuing other professional careers instead of becoming public safety professionals than previously. This trend could be an effect of the recent changes in the social climate toward law enforcement, the increased number of college students pursuing graduate school degrees, or many other factors. As with any profession, becoming a law enforcement officer requires a commitment of time and money for training at local, state, or federal levels. The selection of law enforcement officers includes not only physical and mental aptitudes, but also a comprehensive physiological screening.

If any current public service agency fails to provide enough personnel to perform their required duties, then those duties must be provided for by another service agency that may be many miles away, creating an increased response time. An increased response time could lead to additional or greater severity in injury or property damage. Many communities in Pennsylvania have already experienced the closure of emergency response agencies.

It is recommended that each municipality assess their own vulnerabilities by maintaining and building relationships with their local providers and working with them to make to plan accordingly for if a local service were to close its operations. Consolidation of services is a possible solution for agencies that are struggling to maintain operations. Statistics, response times, and all times associated with units dispatched are easily obtainable from the county 911 center. Municipalities should research all of the factors which would be part of a consolidation of emergency services with neighboring communities.

The emergency services departments in Jefferson County need to be supported to create and or discover new ways to not only recruit but to retain volunteers. If left unattended, the issue will continue and the lack of response will grow, leaving communities more vulnerable to loss of life and loss of property. Community education is a key factor in the maintenance of emergency response agencies. In addition, continued support, and efforts to inform legislature could all prove to be important in assuring that these services remain in operation into the future. At the time of the writing of this plan, a number of bills has been introduced in both the House of Representative and the Senate as a result of a two-year study initiated by Senate Resolution 6 (SR6). The final report can be found here: http://pehsc.org/wp-content/uploads/2014/05/SR-6-REPORT-FINAL.pdf.

Emergency response agencies that currently provide services within Jefferson County are identified in the following tables, *Table 55 – Jefferson County Fire Departments* identifies the municipalities served. All fire departments in Jefferson County are volunteer. *Table 56 – Jefferson County EMS Agencies* identifies each emergency medical service agency and the municipalities served. *Table 57 – Jefferson County Law Enforcement Agencies* identifies each police department to include the Pennsylvania State Police (PSP) and the municipalities served. *Table 58 – Jefferson County Specialty Teams* lists the teams and their specialty. This information was provided by the Jefferson County Emergency Services. *Figure 43 – Jefferson County Emergency Service Locations* illustrates the locations of these services.

Table 55 - Jefferson County Fire Departments

Jefferson County Fire Departments		
Station name	Station Number	Municipalities covered
Big Run VFD	17	Big Run Borough Henderson Township Gaskill Township Bell Township (Portion) Banks Township (Indiana County)
Brockway VFD	1	Brockway Borough Snyder Township
Brookville VFD	2	Brookville Borough
Central VFD	20	Punxsutawney Borough Young Township Bell Township

Jefferson County Fire Departments		
Station name	Station Number	Municipalities covered
Corsica VFD	3	Corsica Borough Union Township Clarion Township Clarion Township (Clarion County) Limestone Township (Clarion County) Millcreek Township (Clarion County)
Elk Run VFD	30	Punxsutawney Borough Young Township Bell Township
Falls Creek VFD	4	Falls Creek Borough Washington Township Winslow Township (Portion)
Horton Township VFD (Elk County)	7	Horton Township (Elk County)
Knox Township VFD	13	Knox Township
Lindsey Fire Company	40	Punxsutawney Borough Young Township Bell Township
McCalmont Township FD	16	McCalmont Township Young Township (Portion) Bell Township (Portion)
Oliver Township VFD	5	Oliver Township
Pine Creek VFD	10	Pine Creek Township Rose Township
Perry Township VFD	12	Perry Township North Mahoning Township (Indiana County)
Reynoldsville VFD	6	Reynoldsville Borough Winslow Township Washington Township (Portion)
Ringgold VFD	9	Worthville Borough Timblin Borough Ringgold Township Porter Township
Sigel VFD	14	Heath Township Millstone Township (Elk County)
Sigel VFD	19	Eldred Township Barnett Township

Jefferson County Fire Departments		
Station name	Station Number	Municipalities covered
		Heath Township Millstone Township (Elk County)
Summerville VFD	7	Summerville Borough Clover Township Beaver Township Redbank Township (Clarion County)
Sykesville VFD	8	Sykesville Borough Winslow Township (Portion) Henderson Township (Portion)
Warsaw VFD	15	Warsaw Township Polk Township

Table 56 - Jefferson County EMS Agencies

Jefferson County EMS Agencies			
Station name	Service provided	Municipalities covered	
		Full coverage	Portion covered
Brockway Area Ambulance Service, Inc.	Brockway Borough	Brockway Borough Snyder Township	Horton Township (Elk County) Polk Township Washington Township

Jefferson County EMS Agencies			
Station name	Service provided	Municipalities covered	
		Full coverage	Portion covered
Jefferson County EMS	Brookville Borough and Punxsutawney Borough	Barnett Township Beaver Township Bell Township Brookville Borough Clover Township Corsica Borough Eldred Township Gaskill Township Heath Township Knox Township McCalmont Township Oliver Township Perry Township Pine Creek Township Porter Township Punxsutawney Borough Rose Township Summerville Borough Timblin Borough Union Township Warsaw Township Worthville Borough Young Township	Polk Township
Reynoldsville Area Ambulance	Reynoldsville Borough	Reynoldsville Borough	Winslow Township Washington Township
Sykesville Ambulance	Sykesville Borough	Sykesville Borough Big Run Borough Henderson Township	Winslow Township Gaskill Township Brady Township (Clearfield County)

Table 57 - Jefferson County Law Enforcement Agencies

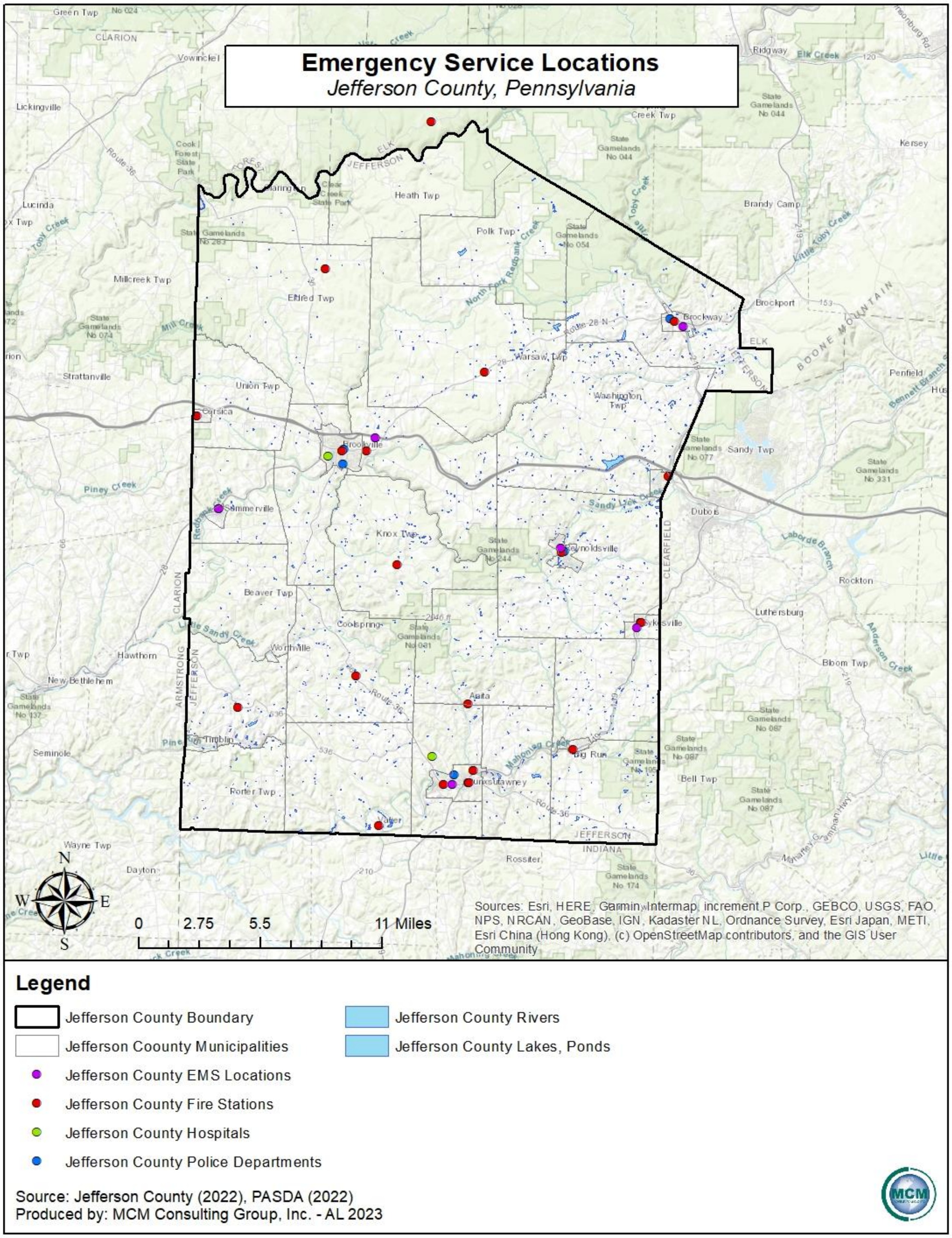
Jefferson County Police Departments	
Station name	Municipalities covered
Brockway Borough Police Department	Brockway Borough
Brookville Borough Police Department	Brookville Borough
Pennsylvania State Police	Jefferson County
Punxsutawney Borough Police Department	Punxsutawney Borough
Reynoldsville Borough Police Department	Reynoldsville Borough

Jefferson County Police Departments	
Station name	Municipalities covered
Sykesville Borough Police Department	Sykesville Borough
Jefferson County Sheriff's Department	Jefferson County
DuBois School Police District	DuBois Area School District

Table 58 - Jefferson County Specialty Teams

Jefferson County Specialty Teams	
Team Name	Specialty
Brockway VFD Aerial Unit	Aerial Rescue
Brookville VFD Aerial Unit	Aerial Rescue
Elk Run VFD Water Rescue Team	Water Rescue
Falls Creek VFD Water Rescue Team	Water Rescue
Lindsey Fire Company Aerial Unit	Aerial Rescue
Pine Creek VFD K-9	K-9 Unit Search and Rescue
Reynoldsville VFD Aerial Unit	Aerial Rescue

Figure 43 - Jefferson County Emergency Service Locations



4.3.14. Environmental Hazards

4.3.14.1 Location and Extent

Transportation

Environmental hazards are most commonly due to hazardous materials incidents occurring when such materials are manufactured, used, stored, or transported. Most hazardous materials incidents are unintentional, however hazardous materials could also be released in a criminal or terrorist act. A release, whether it is intentional or accidental, can result in injury or death and may contaminate air, water and/or soils. Hazardous materials incidents can be generally broken down into the subcategories of transportation and fixed facility. This section will focus on environmental hazards and how they relate to transportation of hazardous materials.

Tanker trucks, tractor trailers, and rail cars often are used to transport hazardous materials. When there are transportation incidents involving these types of vehicles, hazardous materials can be released in significant quantities. *Figure 46 – Environmental Hazard Transportation Vulnerability* shows major transportation routes through Jefferson County, including Interstate 80, United States Route 322, United States Route 219, United States Route 119, and Pennsylvania Route 36.

Fixed Facility

Hazardous materials incidents can be broken down into the subcategories of transportation and fixed facility. This section of the report focuses on environmental hazardous materials at fixed facilities.

In Pennsylvania, facilities that use, manufacture, or store hazardous materials must comply with Title III of the federal Superfund Amendments and Reauthorization Act (SARA), and the Commonwealth's reporting requirements under the Hazardous Materials Emergency Planning and Response Act (1990-165), as amended. There are sixty-nine SARA Title III facilities in Jefferson County. These facilities listed as SARA sites should not be considered an exhaustive and comprehensive list of all locations where hazardous materials reside in the county. *Figure 45 – Hazardous Waste Locations* identifies hazardous material fixed facilities in Jefferson County.

Fixed facilities are also monitored by the Environmental Protection Agency (EPA). The EPA has identified hazardous materials sites, not regulated by SARA Title III, and are known as Toxic Releases Inventory (TRI) sites. Facilities which employ ten or more full time employees, and which manufacture or process more than 25,000 pounds (or use more than 10,000 pounds) of any SARA Section 313-listed toxic chemical in the course of a calendar year are required to report TRI information to the EPA. The EPA is the federal enforcement agency responsible for SARA Title III and PEMA classifications. As of 2023, there are thirteen toxic release inventory (TRI) facilities in Jefferson County, all located around Big Run Borough, Brockway Borough, Brookville Borough, Falls Creek Borough, Punxsutawney Borough, Reynoldsville Borough, Summerville Borough, and Sykesville Borough.

Oil and gas extraction facilities can also be sources of hazardous material release. Most wells in the county are active, but there are also many inactive and abandoned wells. *Figure 44 – Oil & Gas Well Locations* shows the location of all oil and gas wells in the county along with their proximity to surface waters.

4.3.14.2 Range of Magnitude

<u>Transportation</u>

While often accidental, releases can occur because of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, environmental hazards are known as secondary events. Hazardous materials can include toxic chemicals, radioactive materials, infectious substances, or hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas.

Hazardous material release can contaminate air, water, and soil, and can possibly cause injuries, poisonings, or deaths. Hazardous materials fall into nine hazards classes. These hazard classes are as follows:

- Class #1: Explosives
- Class #2: Gases (flammable, non-flammable, non-toxic, and toxic)
- Class #3: Flammable and Combustible Liquids
- Class #4: Flammable Solids (spontaneously combustible and dangerous when wet materials/water reactive substances)
- Class #5: Oxidizing substances and organic peroxides
- Class #6: Toxic Substances and Infectious Substances
- Class #7: Radioactive Materials
- Class #8: Corrosive Substances
- Class #9: Miscellaneous Hazardous Materials / Substances

All nine hazard classes can be found in transportation incidences.

<u>Fixed Facility</u>

All nine hazard classes can be found at fixed facilities. Certain conditions can exacerbate release incidents and these events include fixed facilities:

- Micrometeorological effects of buildings and terrain which alters the dispersion of hazardous materials.
- Proximity to surface water and ground water resources.

- Compliance with applicable codes (e.g., building or fire codes) and maintenance failures (e.g., fire protection and containment features can substantially increase the damage to the facility itself and to surrounding buildings.

The type of material released, distance, and related response time of emergency responders also significantly impact severity and scope of hazardous material releases and clean-up efforts. Areas most proximal to the release are usually at the greatest level of risk, but depending on the material, a release can travel great distances or remain present in the environment for long periods of time (centuries or millennia for some radioactive materials) resulting in chronic and extensive impacts on people and the environment.

Oil and gas well drilling can have a variety of effects on the environment. Abandoned oil and gas wells, not properly plugged can contaminate groundwater and consequently drinking water wells. Surface waters and soil are sometimes polluted by brine, a salty wastewater product of oil and gas well drilling, and from oil spills occurring at the drilling site or from a pipeline breach. A pipeline breach or an accidental dispersal can spoil public drinking water supplies and can be particularly detrimental to vegetation and aquatic animals, making water safety an important factor in oil and gas extraction. In some cases, associated with hydraulic fracturing (fracking), methane has been found contaminating drinking water in surrounding areas.

Natural gas fires occur when natural gas is ignited at the well site. Often, these fires erupt during drilling when a spark from machinery or equipment ignites the gas. The initial explosion and resulting flames have the potential to seriously injure or kill individuals in the immediate area. These fires are often difficult to extinguish due to the intensity of the flame and the abundant fuel source.

4.3.14.3 Past Occurrence

Transportation

Jefferson County has had a large number of vehicle accidents that have resulted in fuel spills within the county. There are seventeen recorded events from 2018 to 2023. There was one anti-freeze spill event recorded on May 14th, 2018. More recent events are recorded in the WebEOC and county reporting software and are summarized in *Table 59 – Hazardous Material Incidents*. Transportation accidents that involved hazardous materials were included in the table below.

Table 59 - Hazardous Material Incidents

Hazardous Material Incidents (2018 – 2022)		
Municipality	**Date**	**Event**
Brookville Borough	03/01/2018	Natural Gas Incident
Pine Creek Township	03/23/2018	Diesel Fuel Spill

Hazardous Material Incidents (2018 – 2022)		
Municipality	**Date**	**Event**
Punxsutawney Borough	03/26/2018	Fuel Spill
Reynoldsville Borough	03/28/2018	Fuel Spill
Punxsutawney Borough	03/31/2018	HazMat Incident
Brookville Borough	05/14/2018	Antifreeze Spill
Brookville Borough	07/07/2018	Fuel Spill
Eldred Township	07/17/2018	HazMat Incident
Washington Township	07/18/2018	HazMat Incident
Snyder Township	08/04/2018	Heating Oil Spill
Brookville Borough	08/06/2018	Motor Oil Spill
Reynoldsville Borough	08/06/2018	Natural Gas in Residence
Reynoldsville Borough	08/07/2018	Natural Gas in Residence
Reynoldsville Borough	08/21/2018	Natural Gas Leak
Pine Creek Township	09/05/2018	Fuel Spill
Washington Township	10/07/2018	Natural Gas Release
Brookville Borough	10/15/2018	Fuel Spill
Pine Creek Township	10/23/2018	HazMat Exposure
Winslow Township	11/29/2018	Fuel Spill
Brookville Borough	01/19/2019	Small Fuel Spill
Heath Township	03/21/2019	Oil Spill
Big Run Borough	05/22/2019	Natural Gas Leak
Ringgold Township	06/14/2019	Request for HazMat
Punxsutawney Borough	06/15/2019	Unknown Oil Incident
Reynoldsville Borough	06/18/2019	Natural Gas Odor
Reynoldsville Borough	06/19/2019	Natural Gas Leak
Eldred Township	06/19/2019	Carbon Monoxide Incident
Brookville Borough	06/28/2019	HazMat Incident
Punxsutawney Borough	07/26/2019	Gasoline Spill
Young Township	07/26/2019	Natural Gas Leak
Brookville Borough	08/02/2019	Fuel Spill
Pine Creek Township	08/05/2019	Natural Gas Leak
Snyder Township	08/15/2019	Hydraulic Fluid Spill
Brookville Borough	09/03/2019	Fuel Spill
Brookville Borough	10/11/2019	Biohazard Spill
Porter Township	11/03/2019	Gas Leak
Reynoldsville Borough	11/26/2019	HazMat Incident
Falls Creek Borough	12/28/2019	Propane Leak
Snyder Township	01/04/2020	Fuel Spill into Storm Drain
Eldred Township	06/24/2020	Fuel Spill

Hazardous Material Incidents (2018 – 2022)		
Municipality	**Date**	**Event**
Brookville Borough	07/24/2020	Possible Natural Gas Leak
Brockway Borough	07/29/2020	Natural Gas Leak Inside Residence
Brookville Borough	08/27/2020	Transformer Oil Spill
Brookville Borough	09/13/2020	Nitrogen Leak
Washington Township	10/27/2020	Hydraulic Fluid Leak
Clover Township	11/06/2020	HazMat Incident
Reynoldsville Borough	11/06/2020	Gasoline Odor in Building
Union Township	12/16/2020	Tractor Trailer w/ Fuel Spill
Brookville Borough	12/18/2020	Carbon Monoxide Incident
Brookville Borough	12/25/2020	Natural Gas Leak
Brookville Borough	01/04/2021	Odor of Natural Gas (Multiple Locations)
Eldred Township	03/25/2021	Natural Gas Leak
Brookville Borough	03/25/2021	Natural Gas Leak
Brookville Borough	03/25/2021	Fuel Spill
Washington Township	03/27/2021	Fuel Spill
Big Run Borough	05/19/2021	Odor of Gas
Washington Township	11/23/2021	Fuel Spill
Pine Creek Township	12/12/2021	Fuel Spill
Knox Township	02/06/2022	Natural Gas Leak
Punxsutawney Borough	04/26/2022	Carbon Monoxide Incident
Punxsutawney Borough	05/09/2022	Oil Spill
Punxsutawney Borough	06/04/2022	Natural Gas Release
Source: WebEOC, County Reporting System, 2023		

Hazardous materials can be transported by air, sea, and land (over the road or through pipelines). Transportation accidents along roadways is a regular occurrence and a large number of hazardous materials are transported by roadway every day.

Fixed Facility

There have been a number of hazardous material incidents in Jefferson County in the past but few of those events have been related to fixed facilities in the county. There have been very few fixed facility hazardous material events in Jefferson County. More recent events are recorded in WebEOC and county reporting software and are summarized in *Table 59 – Hazardous Material Incidents*.

The EPA tracks the management of hazardous materials in facilities that handle significant amounts of hazardous materials. The thirteen toxic release inventory (TRI) facilities in Jefferson County as of 2023 are summarized in *Table 60 – TRI Facilities*. Production-related waste managed is a collective term to refer to how much of a chemical is recycled, combusted for energy recovery, treated for destruction, or disposed of, or otherwise released on and off site.

Table 60 - TRI Facilities

Toxic Release Inventory (TRI) Facilities			
Name	**Industry Sector**	**Chemical**	**Production-related Waste Managed (lbs)**
Beverage Air	Machinery	Diisocyanates	.004
Glen-Gery Corp.	Non-metallic Mineral Product	Sulfuric Acid, Barium and Barium Compounds	50,755
Miller Welding & Machine Company	Machinery	Manganese	116,902
MPP – Falls Creek (FKA Netshape Technologies)	Fabricated Metals	Copper, Chromium, Nickel	44,059
NAC Carbon Products	Electrical Equipment	Polycyclic aromatic compounds, Benzoperylene	726
Niagara Cutter Pennsylvania, Inc.	Machinery	Cobalt	6937
Owens-Brockway Glass Container, Inc.	Non-metallic Mineral Product	Lead and Lead Compounds, Chromium and Chromium Compounds	1,083.28
Phoenix Sintered Metals, Inc.	Fabricated Metals	Copper, Nickel	11,093
Proform Powder Metals	Fabricated Metals	Copper, Nicker	105,495
Punxsutawney Finishing Works	Fabricated Metals	Chromium and Chromium Compounds, Nitrate acid, Zinc compounds	121,302.28
Sintergy, Inc.	Fabricated Metals	Copper	2,625
Star Iron Works, Inc.	Fabricated Metals	Manganese	12,076
Symmco, Inc.	Fabricated Metals	Copper	8,847
Source: EPA, 2023			

As of 2023, Jefferson County is home to 7,050 active natural gas wells.

4.3.14.4 Future Occurrence

<u>Transportation</u>

While many incidents involving hazardous material releases have occurred in Jefferson County in the past, they are generally difficult to predict. The nature of traffic accidents is that there is little to no warning for their occurrence, and they can have disastrous results. An occurrence is largely dependent upon the accidental or intentional actions of a person or group.

Fixed Facility

Hazardous material release incidents are generally difficult to predict, but the presence of such dangerous materials warrants preparation for accidental or intentional release events. Emergency response agencies in Jefferson County should be prepared to handle the types of hazardous materials housed and used the SARA Title III facilities, TRI facilities, and oil and gas wells that are located within the county. The Federal Superfund Amendments and Reauthorization Act (SARA) is also known as the Emergency Planning and Community Right-to-Know Act (EPCRA), and the Local Emergency Planning Committees (LEPCs) are designed by EPCRA to ensure that state and local communities are prepared to respond to potential chemical accidents.

4.3.14.5 Vulnerability Assessment

Transportation

Quick response to transportation accidents involving hazardous materials minimizes the volume and concentration of hazardous materials that are transported and dispersed through the air, water, and soil. Every municipality within Jefferson County is vulnerable to a hazardous materials incident caused along a transportation route. These incidents can occur along highways, railways, and pipelines. *Figure 46 – Environmental Hazard Transportation Vulnerability* identified the 2,000-foot hazard corridor for all major highways in Jefferson County. *Figure 47 – Annual Truck Traffic Percentages* identifies the annual truck traffic percentages for all of the roadways in Jefferson County.

Fixed Facility

Populations, critical infrastructure, and natural habitats within 1.5 miles of SARA Title III and Toxic Release Inventory sites are vulnerable to hazardous material incidents.

Private water suppliers such as domestic drinking water wells in the vicinity of oil and gas wells are at risk of contamination from brine and other pollutants, including methane, which can pose a fire and explosive hazard. Ideally, vulnerability of private drinking well owners would be established by comparing the distance of drinking water wells to known oil and gas well locations, but this extensive detailed data is not readily available. Private drinking water is largely unregulated and information on these wells is voluntarily submitted to the Pennsylvania Topographic and Geologic Survey by water well drillers, and the existing data is largely incomplete and/or not completely accurate. Perry Township contains the most active oil and gas wells in Jefferson County and Washington Township contains the most drinking water wells.

Perry Township is at the greatest risk for an oil and gas incident and Washington Township is at the greatest risk for ground water contamination of drinking water wells. *Table 61 – Oil and Gas Wells & Drinking Water Wells* illustrates the type of well and the local domestic drinking water wells for each municipality.

Table 61 - Oil and Gas Wells & Drinking Water Wells

Oil & Gas Wells in Jefferson County					
Municipality	**Type of Well**				**Domestic Drinking Water Wells**
	Active	**Abandoned**	**Inactive**	**Proposed**	
Barnett Township	46	0	32	11	59
Beaver Township	325	5	52	9	35
Bell Township	218	2	17	2	161
Big Run Borough	12	0	0	0	0
Brockway Borough	0	0	0	0	6
Brookville Borough	1	0	0	0	44
Clover Township	193	0	16	3	33
Corsica Borough	2	0	0	0	0
Eldred Township	226	8	113	2	83
Falls Creek Borough	0	0	0	0	14
Gaskill Township	457	4	33	65	87
Heath Township	217	7	60	4	32
Henderson Township	168	1	23	4	114
Knox Township	285	5	78	14	67
McCalmont Township	245	5	63	6	76
Oliver Township	396	1	53	13	117
Perry Township	456	92	36	7	118
Pine Creek Township	122	1	94	5	90
Polk Township	128	7	33	9	17
Porter Township	283	3	44	3	21
Punxsutawney Borough	38	0	1	1	68
Reynoldsville Borough	0	0	0	0	6
Ringgold Township	285	1	26	4	102
Rose Township	173	1	40	10	83
Snyder Township	37	0	32	14	147
Summerville Borough	5	0	0	0	4
Sykesville Borough	2	0	0	0	6
Timblin Borough	8	0	1	1	1
Union Township	87	12	21	4	22
Warsaw Township	355	0	109	1	67

Oil & Gas Wells in Jefferson County					
Municipality	Type of Well				Domestic Drinking Water Wells
	Active	Abandoned	Inactive	Proposed	
Washington Township	138	3	54	16	244
Winslow Township	336	8	58	12	227
Worthville Borough	5	0	0	1	2
Young Township	191	4	20	10	100
Total:	**5,440**	**170**	**1,109**	**231**	**2,253**
Source: PA DEP, 2022					

Figure 44 - Oil and Gas Well Locations

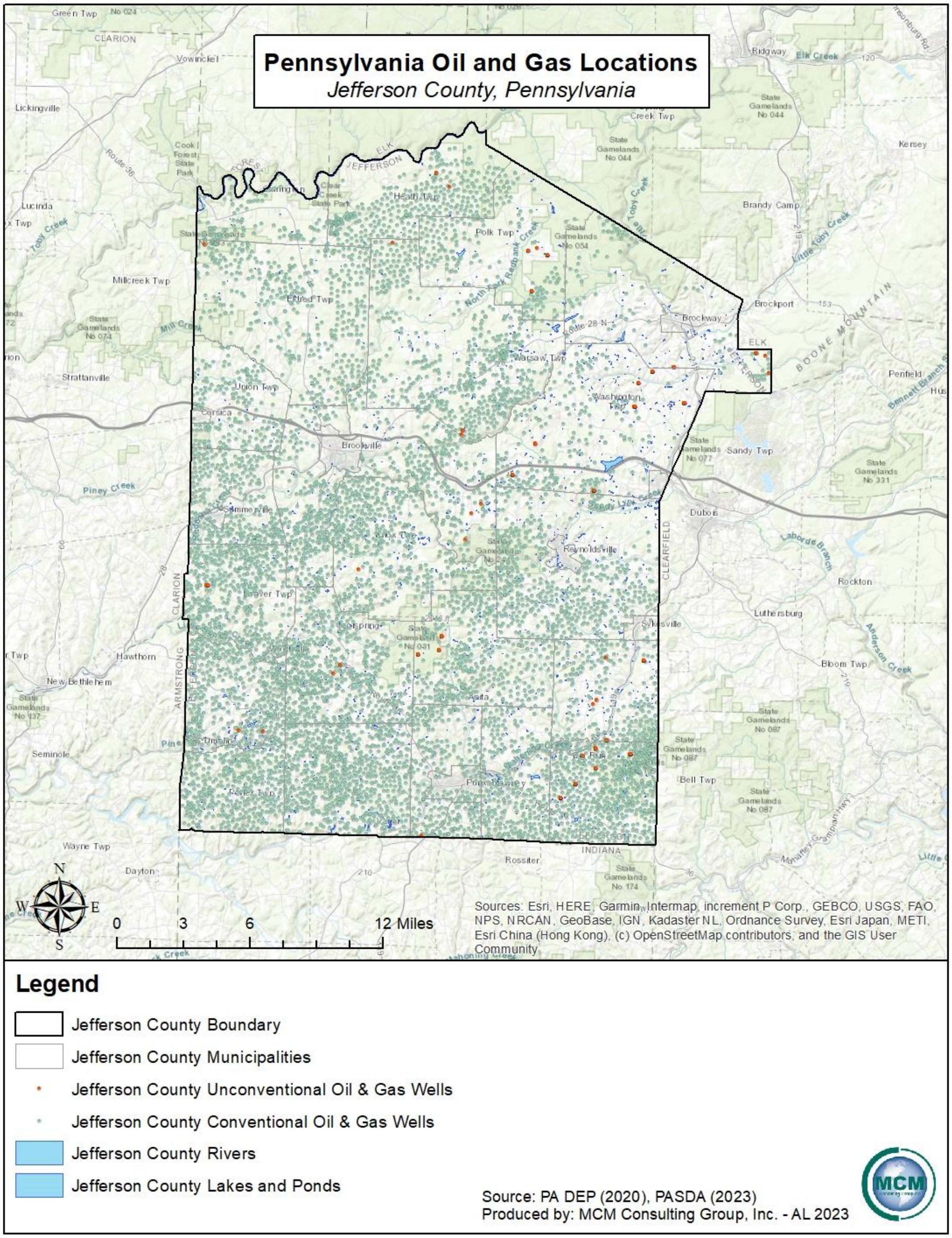


Figure 45 - Hazardous Waste Locations

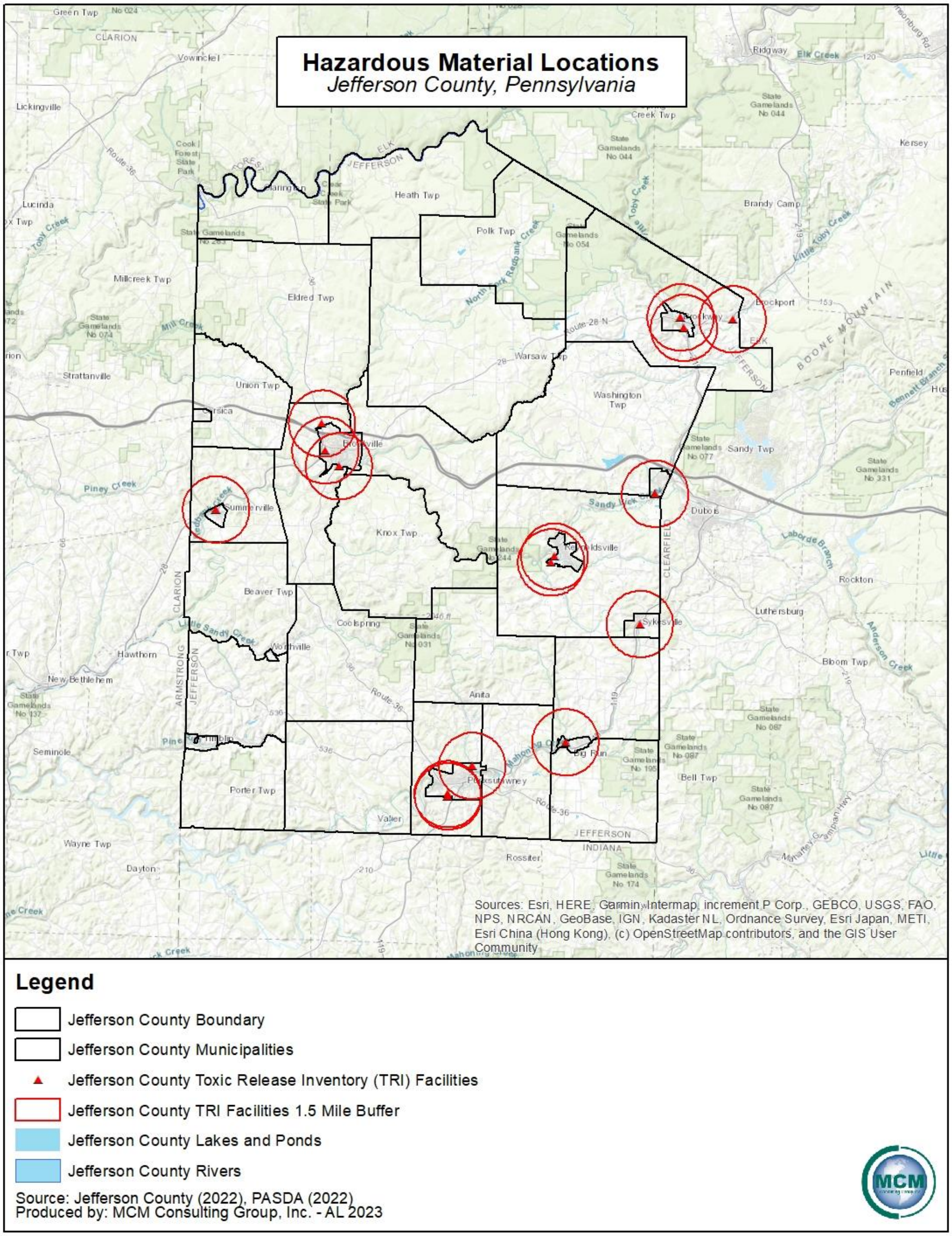


Figure 46 - Environmental Hazard Transportation Vulnerability

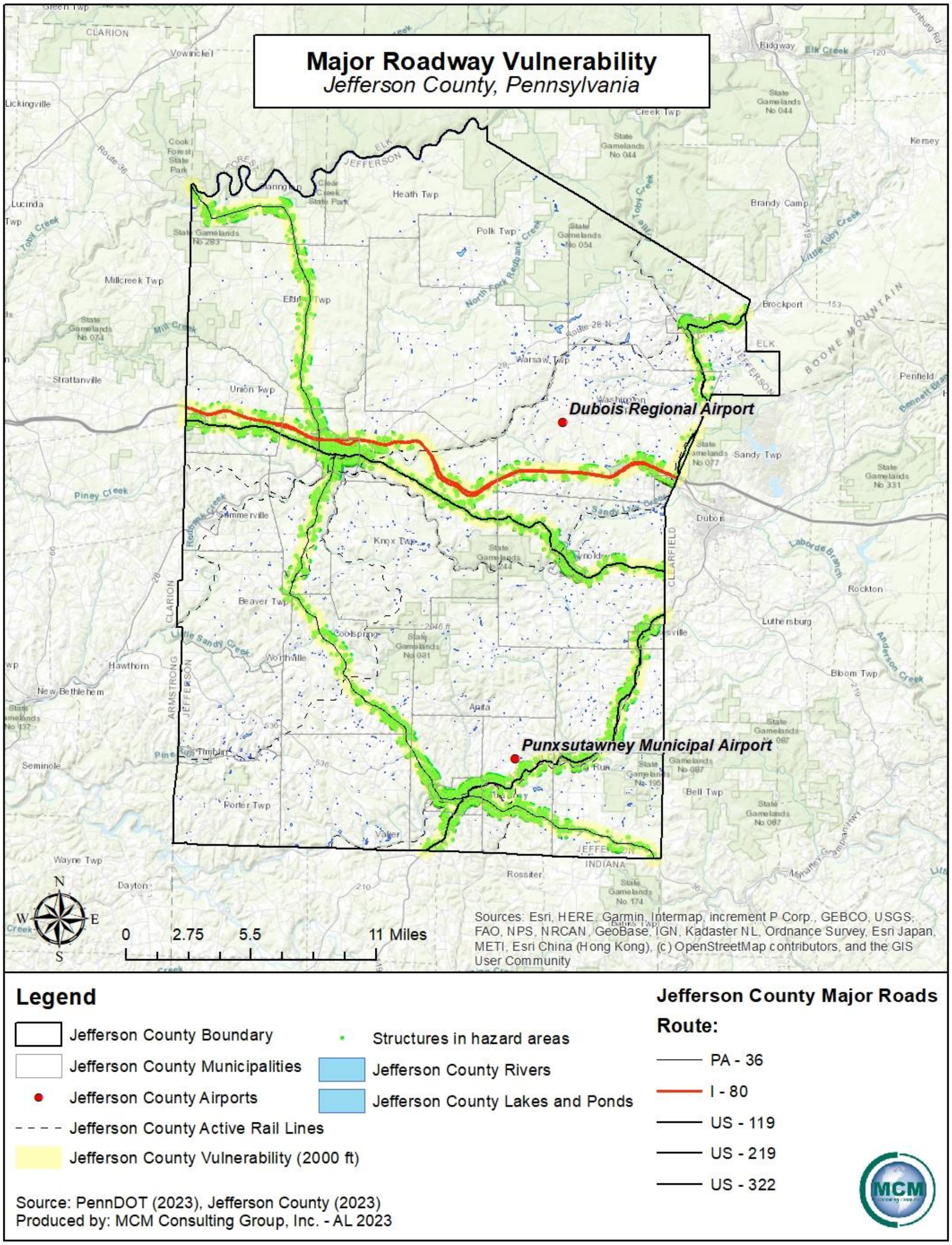
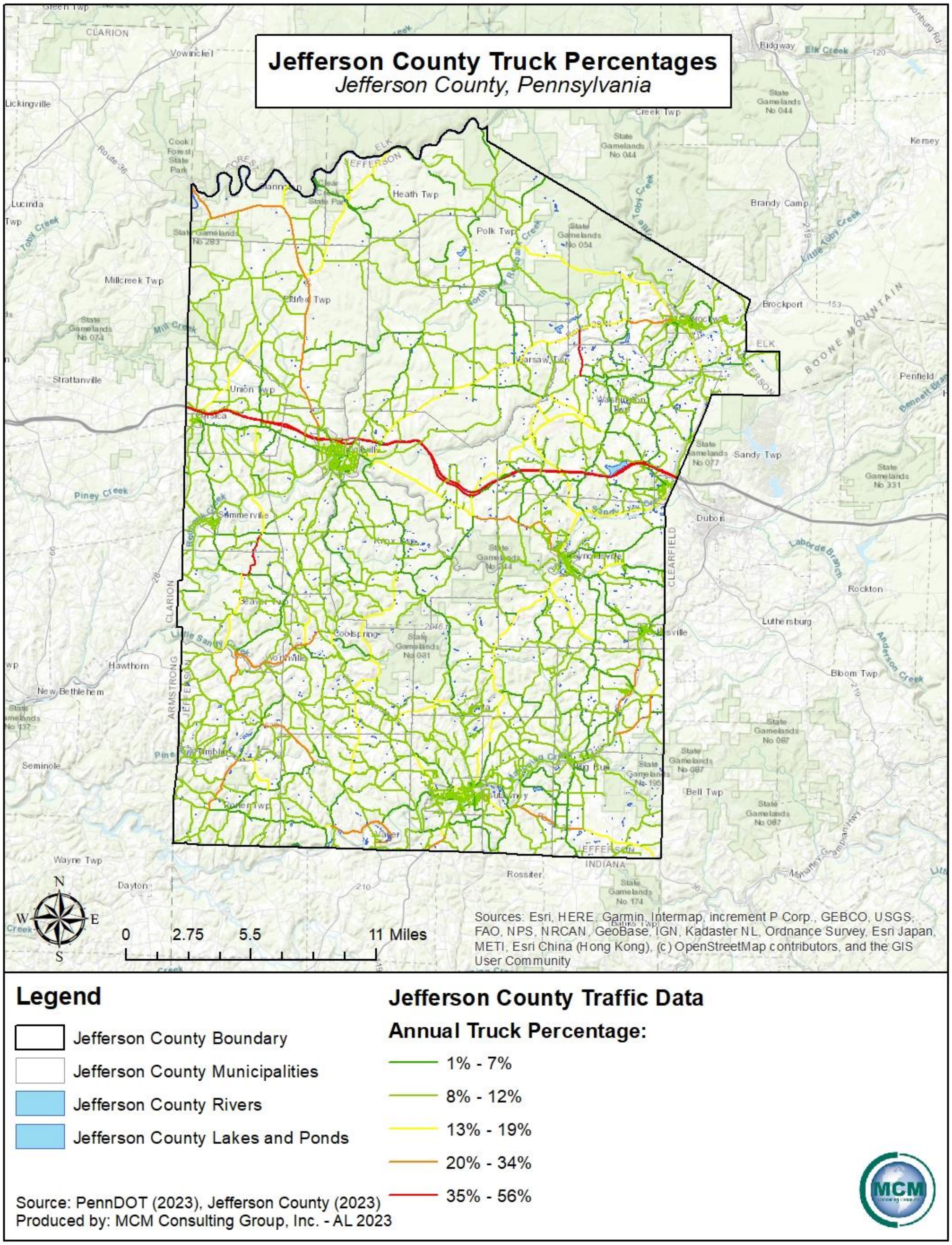


Figure 47 - Annual Truck Traffic Percentages



4.3.15. Opioid Epidemic

4.3.15.1 Location and Extent

Pennsylvania and the United States at large have been experiencing an epidemic of opioid drug abuse. According to the Pennsylvania Department of Health, the opioid overdose epidemic is the worst public health crisis in Pennsylvania. It affects Pennsylvanians across the state, from big cities to rural communities. Opioid addiction has increased drastically over the last year due to the hardships faced from the COVID-19 pandemic. Opioid use has increased since the beginning of the COVID-19 pandemic which is being attributed to the uncertainty people are feeling due to the pandemic.

Opioids, mainly synthetic opioids (other than methadone), are currently the main driver of drug overdose deaths. According to the Center for Disease Control and Prevention (CDC), 72.9% of opioid-involved overdose deaths involved synthetic opioids. Opioid addiction occurs when an individual becomes physically dependent on opioids. Opioids are a class of drug that reduces pain by interacting with receptors on nerve cells in the body and brain. The use of opioids is a broad term and includes opiates, which are drugs naturally extracted from certain types of poppy plants, and narcotics. Opioids can also be synthetically made to emulate opium. Opioid drugs are highly addictive and typically result in increasing numbers of overdose deaths both prescribed (e.g. fentanyl) and illicit (e.g. heroin) opioids. Overdose deaths from opioids occur when a large dose slows breathing, which can occur when opioids are combined with alcohol or antianxiety drugs. While generally prescribed with good intentions, opioids can be over-prescribed, resulting in addiction.

According to the Drug Enforcement Administration (DEA), opioids come in various forms such as tablets, capsules, skin patches, powder, chunks in various colors from white to brown/black, liquid form for oral or injection use, syrups, suppositories, and lollipops. The Centers for Disease Control and Prevention (CDC) defines the following as the three most common types of opioids:

- **Prescription Opioids**: Opioid medication prescribed by doctors for pain treatment. These can be synthetic oxycodone (OxyContin), hydrocodone (Vicodin), or natural (morphine).
- **Fentanyl**: A powerful synthetic opioid that is 50 to 100 times more powerful than morphine and used for treating severe pain; illegally made and distributed fentanyl is becoming more prevalent.
- **Heroin**: An illegal natural opioid processed from morphine which is becoming more commonly used in the United States.

Opioids are highly addictive. They block the body's ability to feel pain and can create a sense of euphoria. Additionally, individuals often build a tolerance to opioids, which can lead to misuse and overdose.

While other addictive substances such as methamphetamines and alcohol can be problematic for the health of individuals in Jefferson County, this profile focuses on opioid drugs and the opioid epidemic. The opioid crisis was declared to be a public health emergency on October 26, 2017. While the declaration provides validation for the scope and severity of the problem, it was not accompanied by any release of funding for mitigating actions. On January 10, 2018, Governor Tom Wolf declared the opioid epidemic to be a statewide public health disaster emergency for Pennsylvania. The declaration is intended to enhance response and increase access to treatment.

4.3.15.2 Range of Magnitude

Opioid addiction can lead to overdose, which can be fatal. This type of addiction can affect others that are not the user themselves. The most dangerous side effect of an opioid overdose is depressed breathing. The lack of oxygen to the brain causes permanent brain damage, leading to organ failure, and eventually death. Signs and symptoms include respiratory depression, drowsiness, disorientation, pinpoint pupils, and clammy skin. Opioid addiction can also be passed from mother to child in the womb. This condition, known as neonatal abstinence syndrome, has increased five-fold, according to the National Institute on Drug Abuse (NIDA). This results in an estimated 22,000 babies in the United States born with this condition. First responders such as paramedics, police officers, and firefighters are also affected by the opioid addiction crisis. First responders face exposure risk due to an increase in emergency calls due to an increase in the crisis, particularly to synthetic fentanyl. Two to three milligrams of fentanyl can cause an induced respiratory depression, arrest, and possibly death to occur. Since fentanyl is indistinguishable from several other narcotics and powdered substances, first responders must take extra precaution when dealing with calls related to drug abuse. A worst-case scenario with the opioid epidemic in Jefferson County would be a high number of overdoses between residents and/or first responders throughout the county.

According to the Center for Disease Control and Prevention (CDC), more than 192 Americans die every day from an opioid overdose. In 2021, a total of 5,343 deaths related to opioid use occurred in Pennsylvania. From February 2020 to February 2021, there was a 3.34% increase across the commonwealth of Pennsylvania. This could indicate a significant increase in opioid overdoses in Pennsylvania. Heroin and fentanyl are the two drugs most often found in overdose deaths, and they are considered to be highly available and nearly ubiquitous in Pennsylvania.

4.3.15.3 Past Occurrence

In 2021, there was an estimated total of 107,622 drug-related overdose deaths in the United States. This is the highest number of overdose deaths ever recorded in a 12-month period, according to the recent provisional date from the CDC. Jefferson County experienced a total of between fifteen and fifty-five drug related deaths from 2015 – 2020. There was a total of at most nine overdose deaths in 2015, at most nine deaths in 2016, at most nine deaths in 2017, at most nine deaths in 2018, ten deaths in 2019, and at most nine in 2020. The most common age group for opioid abuse in Jefferson County is the 35-44 years of age demographic. Based on information included in the American Community Survey, by the United States Census Bureau, there are approximately 4,932 people between the ages of 35 and 44 years of age in Jefferson County. This accounts for approximately 11.1% of the county's total population. This information is from 2021 estimates. In Jefferson County the overdose rate of males is greater than the overdose rate of females. The most used opioid in Jefferson County are fentanyl, heroin, cocaine, benzodiazepines, and Rx opioids.

Table 62 - Drugs Present in 2020 Pennsylvania Overdose Deaths

Drugs Present in 2020 PA Overdose Deaths	
Drug Category	**Percent Reported Among 2020 Decedents**
Cannabis	25%
Cocaine	20%
Heroin	15%
Fentanyl	14%
Methamphetamine	10%
Prescription Opioids	5.5%
Cathinones	5.5%
Benzodiazepines	5%
Source: DEA, 2020	

4.3.15.4 Future Occurrence

Both Jefferson County, and Pennsylvania as a whole, have seen a steady rise in opioid related deaths over the last several years, with drug-related death rates increasing at a high percentage. Future occurrences of opioid addiction and overdose are unclear as the state moves forward with overdose prevention initiatives through the use of Naloxone, alternative pain treatments, improvement of tools for families and first responders, and expansion of treatment access. The Wolf Administration has taken various approaches to help with the prevention of mass future occurrences across the Commonwealth. To help prevent future drug abuse and protect individual health among communities in Pennsylvania, the Pennsylvania's Prescription Drug Monitoring Program (PA PDMP) collects information on all filled prescriptions for controlled substances. This information helps health care providers safely prescribe controlled substances and helps patients get correct treatment. The PA PDMP also has drug take-back boxes located in the counties for an easy, convenient location where anyone can dispose of their unused, expired, or unwanted prescriptions to help lower potential drug overuse. In Jefferson County, there are six drug take-back boxes located throughout the county. The drug take-back box locations include the Brockway Drug Co, Inc., the Brockway Police Department, the Jefferson County Courthouse, the Punxsutawney Police Department, the Reynoldsville Police Department, and the Pennsylvania State Police – Troop C in Punxsutawney. These locations help reduce future occurrences of opioid use from occurring.

In the event of an opioid overdose, death can sometimes be prevented with the use of the drug naloxone. Pennsylvania Secretary of Health, Dr. Rachel Levine, previously signed updated standing order prescriptions of naloxone. The updated standing orders include the 2mg dose auto injector which has recently become available. Naloxone is a medication that can reverse an overdose that is caused by an opioid drug (i.e., prescription pain medication or heroin). Naloxone is used to block the effects of opioid and is sold under the brand name of Narcan. When administered during an overdose, naloxone blocks the effects of opioids on the brain and restores breathing within two to eight minutes. Naloxone has been used safely by medical professionals for more than 40 years and has only one function to reverse the effects of opioids on the brain and respiratory system in order to prevent death. Emergency medical responders have access to the treatment, and as of 2015, naloxone is available without a prescription in Pennsylvania. Also, with the January 10, 2018 disaster declaration, emergency medical technicians (EMTs) are now allowed to leave naloxone behind at a scene, further increasing the distribution and accessibility of the lifesaving medication. According to a study published in September 2018, drug users reported that users often have multiple overdoses in the course of their drug use, and availability of naloxone has saved many lives. While the introduction of naloxone has been a significant benefit to the fight against opioid abuse, efforts to prevent future overdoses are still underway. Naloxone is another way to reduce future occurrences of the opioid epidemic from occurring in Jefferson County.

Opioid drugs have been a problematic and addictive method for patients to deal with pain. Employing alternative approaches to pain management could prevent patients from ever being introduced to addictive opioids, especially considering the most common overdose drugs in Jefferson County have been prescription opioids. A possible alternative pain treatment comes from hemp extracted cannabidiol, or CBD. Unlike THC (the psychoactive constituent of cannabis), CBD is non-psychoactive and does not have the same intoxicating effect as THC;

however, CBD can provide relief from pain, inflammation, anxiety, and even psychosis. CBD is legal without a prescription throughout the United States of America.

4.3.15.5 Vulnerability Assessment

Opioid overdoses have resulted in many tragic deaths in Pennsylvania and many people have been affected by the epidemic through the loss of either a family member, a close friend, or member of their community. Opioid addiction is a direct detriment to the personal wellbeing of addicts, a burden to their families and communities, and a strain to the emergency response system that cares for overdose victims. In general, jurisdictions that are more densely populated are more vulnerable to opioid addiction threats as access to the drugs increases. However, rural communities in general experience larger per-capita opioid-related deaths. Jurisdictional losses in the opioid addiction crisis stem from lost wages, productivity, and resources rather than losses to buildings or land. Many counties across the Commonwealth, including Jefferson County, have seen an increase of time and resources devoted to the opioid epidemic as overdose and response increase.

The vulnerability in the county depends on the number of additional risk factors on the vulnerable population such as genetic, psychological, and environmental factors that play a role in addiction. The known risk factors of opioid misuse and addiction include poverty, unemployment, family and/or personal history of substance abuse, history of criminal activity, history of severe depression or anxiety, and prior drug/alcohol rehabilitation. In addition, women have a unique set of risk factors for opioid addiction. Women are more likely than men to have diagnosed chronic pain. Compared with men, women are also more likely to be prescribed opioid medications, to be given higher doses, and to use opioids for longer periods of time. Women may also have biological tendencies to become dependent on prescription pain relievers more quickly than men. Therefore, if the county were to have a population with a great amount of these risk factors, the county would be very vulnerable to the opioid epidemic.

The COVID-19 pandemic and its periods of quarantine caused vulnerability in opioid users throughout Jefferson County. It is likely that the emergence of COVID-19 and subsequent disruptions in health care and social safety nets combined with social and economic stressors has fueled the opioid epidemic. The COVID-19 pandemic has challenged vulnerable populations, including those with opioid use disorders. The opioid epidemic and COVID-19 pandemic are intersecting and presenting unprecedented challenges for families and communities. Opioid use affects respiratory and pulmonary health which may make those with opioid use disorders more susceptible to COVID-19. In addition, chronic respiratory disease is already known to increase overdose mortality risk among people taking opioids, and decreased lung capacity from COVID-19 could lead to similar health effects. Secondary impacts from the COVID-19 pandemic, including disruptions of treatment and recovery services, limited access to mental health services and peer support, disrupted routines, loss of work, and stress, may lead to increased opioid use and risk of relapse for those in recovery. Risk factors also arise from indirect factors including housing instability and incarceration. Those with opioid use disorders are at higher risk for housing insecurity, homelessness, and incarceration. Congregate living facilities such as homeless shelters, jails, and prisons are high-risk environments for coronavirus transmission, and there are challenges in implementing recommendations from the CDC such as social distancing and quarantine. Additionally, the pandemic took away the attention from the media, from legislators, and from public health agencies that was being focused on the opioid crisis. The opioid epidemic in Pennsylvania increased 22.9% since the beginning of the pandemic.

Additionally, first responders and medical personnel are also a very vulnerable population when dealing with the opioid epidemic. Fentanyl and related substances are hazardous materials, which cause the environment and the people around the substance to be vulnerable. Contact with fentanyl can impact first responders and others that are related to the opioid user. Depending on the potency of the drug, it can take as little as the equivalent of few grams of table salt to cause health complications. There have been several reports nationally of first responders accidentally overdosing on fentanyl through brief skin contact or the drug becoming airborne. It is best for first responders to err on the side of caution to avoid any potential exposure. The American College of Medical Toxicology (ACMT) and the American Academy of Clinical Toxicology (AACT) suggest that nitrile gloves provide sufficient protection for handling fentanyl, and for "exceptional circumstances where the drug particles or droplets suspended in the air, an N95 respirator provides sufficient protection". Other environmental structures such as streams, rivers, and lakes have been known to contain traces of opioids and other drugs within them. These traces come from human urine, feces, or medications that have been discarded in the bathroom. The Environmental Protection Agency (EPA) suggests that while the risks of pharmaceuticals found in wastewater, ambient water, and drinking water are low, further research is needed. State facilities are not at risk to the opioid crisis, but there are some occupation-specific risks that may make some employees more vulnerable. State employees working in direct patient care are vulnerable to fentanyl exposure. However, the physical plant and facilities of the Commonwealth and Jefferson County are not likely to experience losses from the opioid addiction crisis. Absenteeism associated with an opioid addiction in state facilities located in high-risk areas could lead to economic loss through lost productivity and increased medical costs. *Figure 48 – Opioid Overdose Deaths in Pennsylvania 2020* and *Figure 49 – Opioid Overdose Deaths in Pennsylvania 2021* illustrate the number of deaths per county in the state of Pennsylvania.

Figure 48 - Opioid Overdose Deaths in Pennsylvania 2020

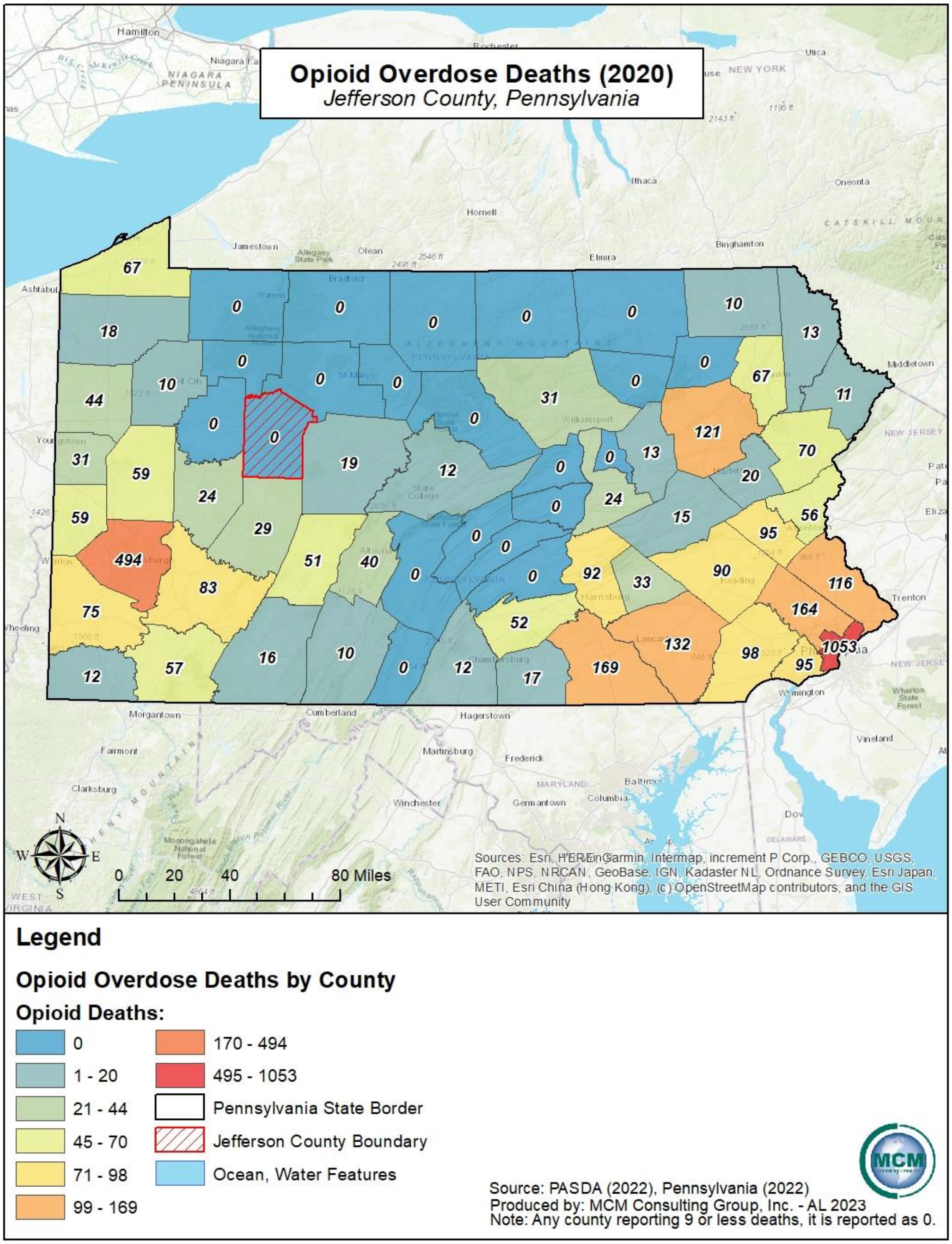
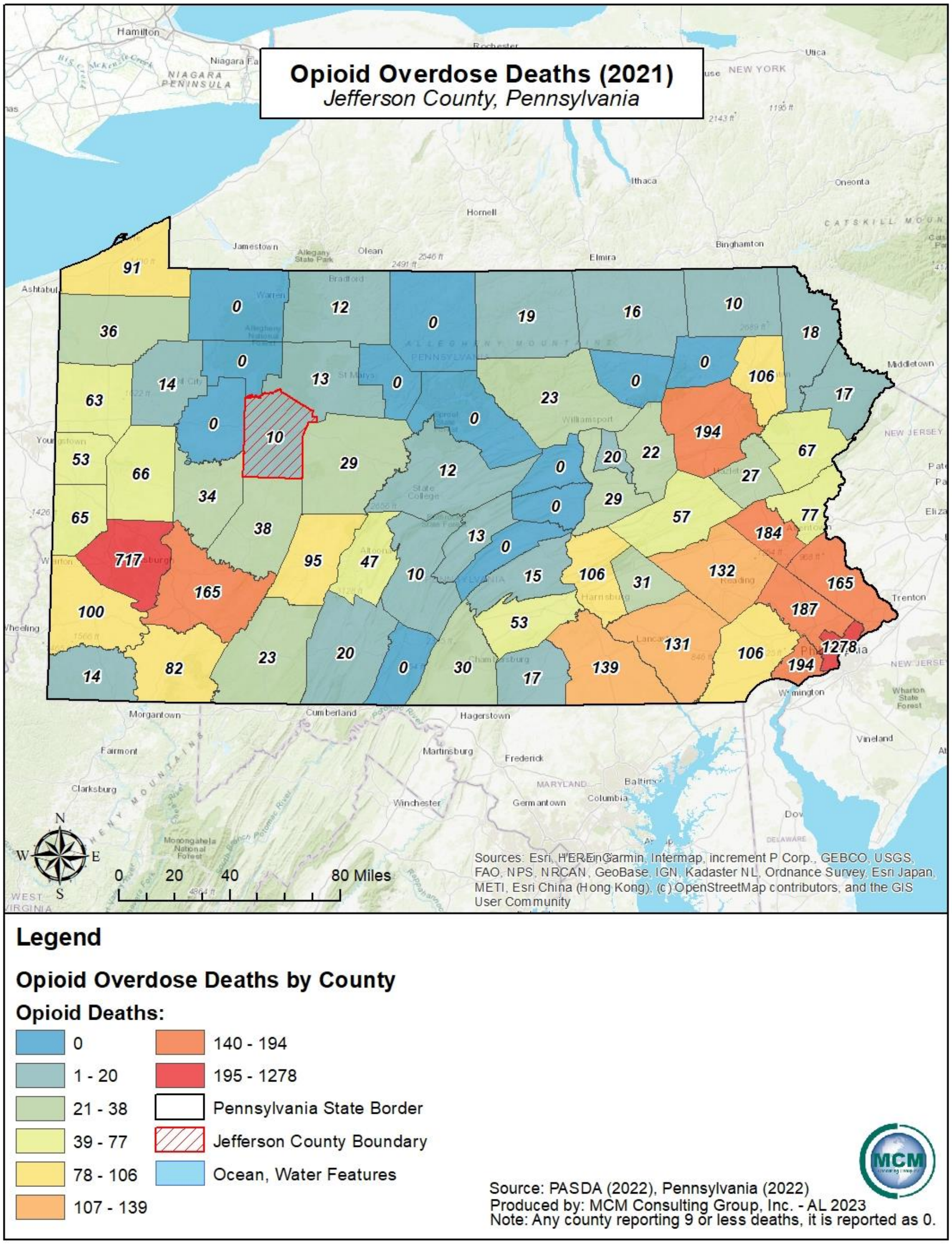


Figure 49 - Opioid Overdose Deaths in Pennsylvania 2021



4.3.16. Terrorism/Cyberterrorism

4.3.16.1 Location and Extent

Following several serious international and domestic terrorist incidents during the 1990s and early 2000s, citizens across the United States paid increased attention to the potential for deliberate, harmful actions of individuals or groups. The term "terrorism" refers to intentional, criminal, malicious acts. The functional definition of terrorism can be interpreted in many ways. Officially, terrorism is defined in the Code of Federal Regulations 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 §0.85)

Cyber-terrorism is the unlawful use of force and violence over technological methods to cause harm to financial security, identity information, personal information, and attacking personal computers, mobile phones, gaming systems, and other Bluetooth or wirelessly connected devices. Cyber-terrorism can be just as damaging to infrastructure as conventional terrorism, due to the large amount of business that is carried out over the internet, through wirelessly connected devices, or from employees of companies working remotely.

The Federal Bureau of Investigations (FBI) further characterizes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization. Often, the origin of the terrorist or person causing the hazard is far less relevant to mitigation planning than the hazard itself and the consequences. However, it is important to consider that the prevalence of homegrown violent extremists (HVEs) has increased in recent years, with individuals able to become radicalized on the internet. In a speech on August 29, 2018, addressed to the 11th annual Utah National Security and Anti-Terrorism Conference, FBI Director Christopher Wray describes HVEs as "the primary terrorist threat to the homeland here today, without question."

Community lifeline facilities are either in the public or private sector that provide essential products and/or services to the general public. Community lifeline facilities are often necessary to preserve the welfare and quality of life in the county, or fulfill important public safety, emergency response, and/or disaster recovery functions. Community lifeline facilities identified in the county are hospitals and health care facilities, schools, childcare centers, fire stations, police departments, municipal buildings, and hazardous waste facilities. In addition to critical facilities, the county contains at risk populations that should be factored into a vulnerability assessment. These populations include not only the residents and workforce in the county, but also the tourists that visit the area on a daily basis, those that are traveling through the county on any major highway and marginalized groups such as LGBTQ persons and racial, religious, or other minorities.

Potential targets include:

- Commercial facilities
- Family planning clinics/organizations associated with controversial issues
- Education facilities
- Events attracting large amounts of people
- Places of worship
- Industrial facilities, especially those utilizing large quantities of hazardous materials
- Transportation infrastructure
- Historical sites
- Cultural sites
- Government facilities

4.3.16.2 Range of Magnitude

Terrorism may include use of Weapons of Mass Destruction (WMD) (including chemical, biological, radiological, nuclear, and explosive weapons) which include arson, incendiary, explosive, armed attacks, industrial sabotage, intentional release of hazardous materials, and cyber-terrorism. Within these general categories, there are many variations. There is a wide variety of agents and ways for them to be disseminated, particularly in the case of biological and chemical weapons.

Terrorist methods can take many forms including:

- Active assailant
- Agri-terrorism
- Arson/incendiary attack
- Armed attack
- Assassination
- Biological agent
- Chemical agent
- Cyber-terrorism
- Conventional bomb or bomb threat
- Hijackings
- Release of hazardous materials
- Kidnapping
- Nuclear bomb

- Radiological agent

Active assailant incidents and threats can disrupt the learning atmosphere in schools, interfere with worship services, cause traffic to be re-routed, and use taxpayer assets by deploying police, EMS and/or fire units. Jefferson County has five school districts (public schools K through 12th grade). There are three post-secondary schools located in Jefferson County.

The areas along major transportation routes can be susceptible to forms of public transit terrorist attacks. More populated areas of the county, including the county seat of Brookville Borough, can be susceptible to chemical, biological, radiological, nuclear, or explosive (CBRNE) events due to the concentration and density of residential communities and government activity and buildings. Secondary effects from CBRNE incidents can be damaging as well. Mass evacuations could result in congestion of roadways and possibly result in breakdown of civil order, further exacerbating the situation. Government operations may be disrupted due to the need to displace or operate under reduced capacity. Radiation fallout, hazardous chemical introduction into the groundwater or biologic/germ agents can cause long-term environmental damage.

Cyber terrorism is becoming increasingly prevalent. Cyber terrorism can be defined as activities intended to damage or disrupt vital computer systems. These acts can range from taking control of a host website to using networked resources to directly cause destruction and harm. Protection of databases and infrastructure are the main goals for a safe cyber environment. Cyber terrorists can be difficult to identify because the internet provides a meeting place for individuals from various parts of the world. Individuals or groups planning a cyber-attack are not organized in a traditional manner, as they are able to effectively communicate over long distances without delay. The largest cyber terrorism threat to institutions comes from any processes that are networked or controlled via computers.

Ransomware continues to be the leading threat, with Maze ransomware accounting for nearly half of all known cases in 2020. Cybercriminals have increasingly begun to steal proprietary – and sometimes embarrassing – data before encrypting it. The cybercriminal will then threaten to publicly release the stolen files if the victims do not provide financial transactions.

4.3.16.3 Past Occurrence

No major terrorism or cyber terrorism events have occurred in Jefferson County, Pennsylvania. Cyber terrorism events are becoming more common in areas of local government, and these include counties near Jefferson County, PA. During the writing of the 2023 Jefferson County Hazard Mitigation Plan, the email of the Jefferson County Director of Emergency Services was compromised. Additionally, there have not been any active shooter events in Jefferson County; however, there have been several potential events that were thwarted prior to the actor(s) carrying out their plan of attack. Jefferson County has been promoting the "See Something, Say Something" program for eight years.

Significant international terrorism incidents in the United States include the World Trade Center bombing in 1993, the bombing of the Murrow Building in Oklahoma City in 1995, and the September 11th, 2001, attacks on the World Trade Center and the Pentagon. One of the aircrafts hijacked in the September 11th attacks crash landed in Somerset County, Pennsylvania before it reached its intended target. While fatalities and destruction at the intended target were avoided, all passengers on the flight perished.

While the largest scale terrorist incidents have often had international stimuli, many other incidents are caused by home grown actors who may have become radicalized through hate groups either in person or via the internet, and who may struggle with mental health issues. Hate groups such as the Ku Klux Klan (KKK), Aryan Nation, the New Black Panther Party, and more recently, the Alt-Right, Antifa, anarcho-communists, Proud Boys, plus conspiracy theorist believers/promoters such as QAnon, have been part of domestic terrorism in different forms. During the May 2020 George Floyd protests, anti-police individuals associated with one or more of the groups created incendiary devices to burn down the Minneapolis Third Precinct. On January 6, 2021, individuals associated with one or more of the groups, stormed the United States Capitol to disrupt the certification of the 2020 presidential election, resulting in five deaths and evacuation of Congress.

Active Shooters

An active assailant (shooter), as defined by the U.S. Department of Homeland Security, is an individual actively engaged in killing or attempting to kill people in a confined area, in most cases, active shooters use firearms and there is not necessarily a pattern or method to their selection of victims. Throughout the year in 2022, there were a total of at least 647 mass shooting incidents in the United States according to the Gun Violence Archive. Often these shooters are HVEs. *Table 63 – Gun Violence Archive Seven Year Review* outlines the number of deaths, injuries, children killed/injured, teens killed/injured, mass shooting, murder-suicides, defensive use, and unintentional shootings over the past seven years.

Table 63 - Gun Violence Archive Seven Year Review

Gun violence Archive Seven Year Review							
Seven Year Review	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Deaths – Willful, Malicious, Accidental	15,139	15,742	14,943	15,509	19,558	21,009	20,200

Gun violence Archive Seven Year Review							
Seven Year Review	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Suicides by Gun	22,938	23,854	24,432	23,941	24,292	26,328	Pending
Injuries – Willful, Malicious, Accidental	30,586	31,358	28,285	30,199	39,542	40,603	38,550
Children [aged 0-11] killed or injured	665	734	665	696	1,001	1,065	995
Teens [aged 12-17] killed or injured	3,154	3,296	2,883	3,129	4,159	4,645	5,157
Mass Shooting	383	348	336	417	610	690	647
Murder-Suicide	549	608	623	632	570	594	670
Defensive Use	1,993	2,118	1,889	1,619	1,513	1,295	1,178
Unintentional Shooting	2,235	2,065	1,696	1,912	2,336	2,027	1,626
Source: Gun Violence Archive, 2023							

Two significant events have occurred in Pennsylvania in recent history: one occurred on October 27, 2018, when eleven people were killed by a gunman in the Pittsburgh neighborhood of Squirrel Hill; the gunman was a homegrown violent extremist and attacked the congregation of the Tree of Life Synagogue in a shooting that targeted the Jewish population and was fueled by the gunman's anti-Semitic, anti-immigrant, and anti-refugee sentiments. Another event occurred in January of 2019, where a gunman killed two people and permanently injured one inside P.J. Harrigan's bar in State College and later killed a homeowner and himself. One of the most tragic recent active shooters occurred in Uvalde, Texas, where an armored and masked gunman entered the Robb Elementary School on May 24, 2022 and killed nineteen students and two teachers. Another active shooter event occurred on November 22, 2022 when an employee at a Walmart in Chesapeake, Virginia entered the breakroom of the Chesapeake Walmart and killed six individuals before taking his own life.

Other active shooter events in the United States in recent years include Virginia Tech (April 2007), Sandy Hook Elementary School (December 2012), San Bernardino, California (December 2015), an Aurora, Colorado movie theater (July 2012) a church in Charleston, South Carolina (June 2015). An *Active Shooter Incidents 20-Year Review* by the FBI concluded that there has been a significant recent increase in frequency of active shooter incidents, and that most shooters were male. The report documents data from all the incidents, including location, commercial environments, educational environments, open spaces, military and other government properties, residential locations, houses of worship, and health care facilities (FBI, 2021). *Figure 50 – Active Shooter Incidents – 20 Year Active Shooter Summary* is one page from the report that illustrates a numerical breakdown of shooting events for those twenty years. *Figure 51 – Education Environments* shows two more summary pages from the report that detail active shooter statistics in educational environments.

Figure 50 - Active Shooter Incidents - 20 Year Active Shooter Summary

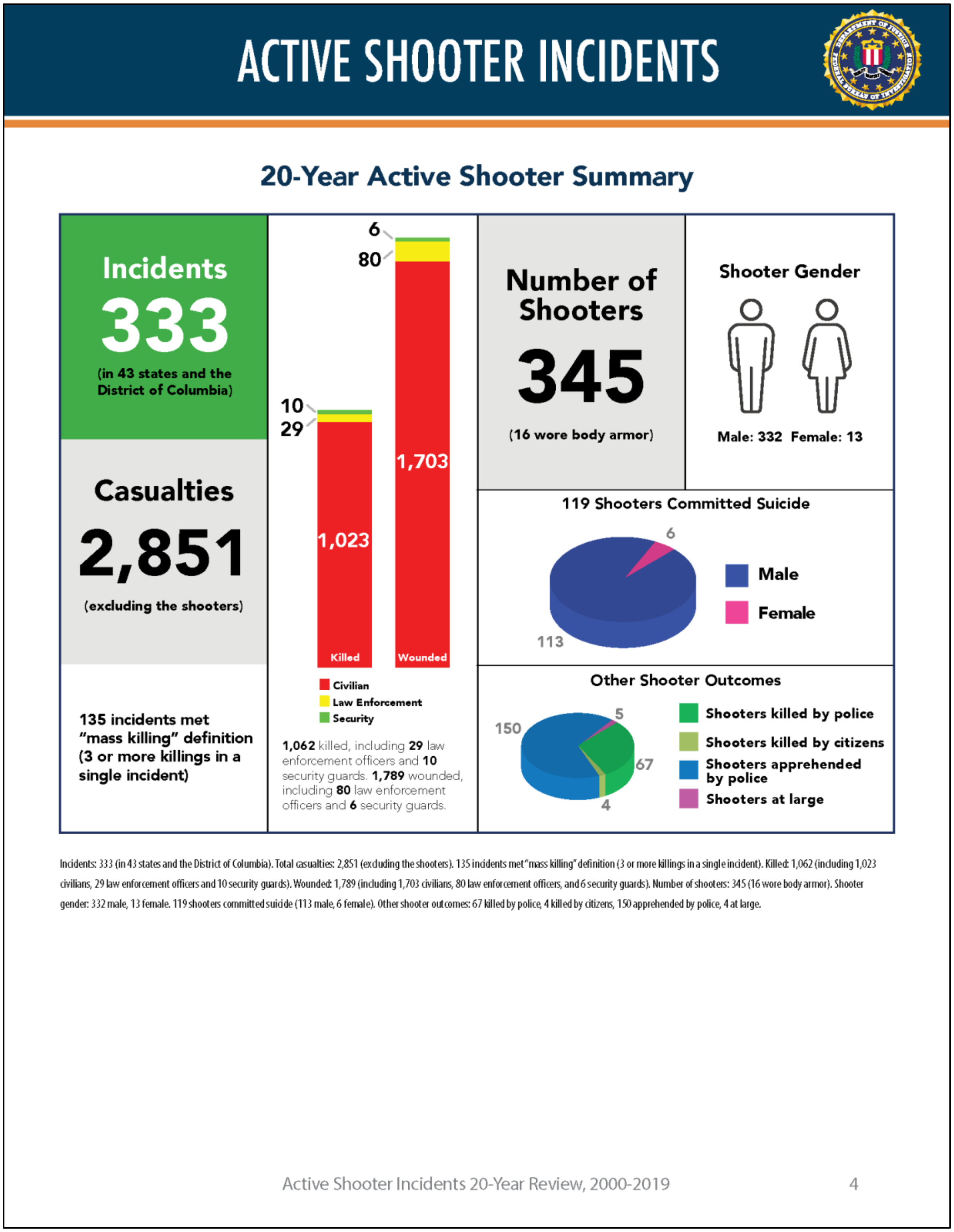


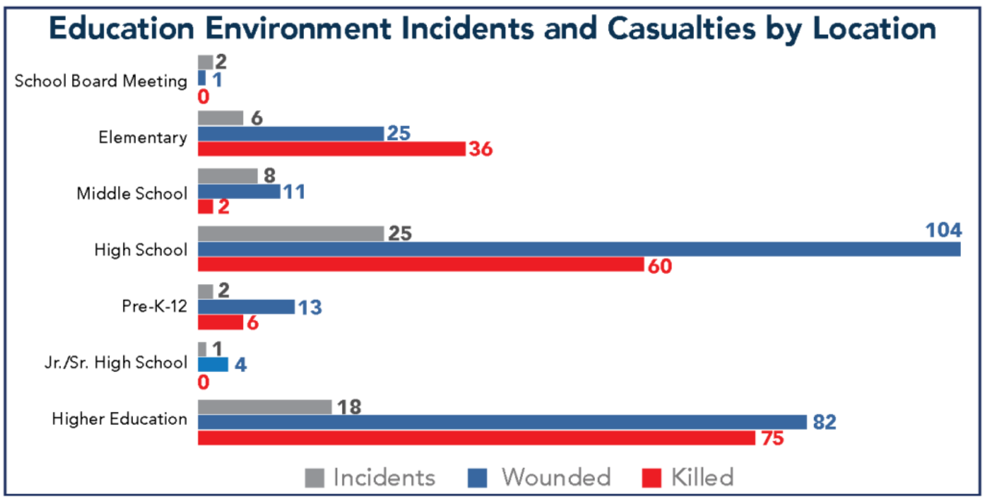
Figure 51 - Education Environments

ACTIVE SHOOTER INCIDENTS

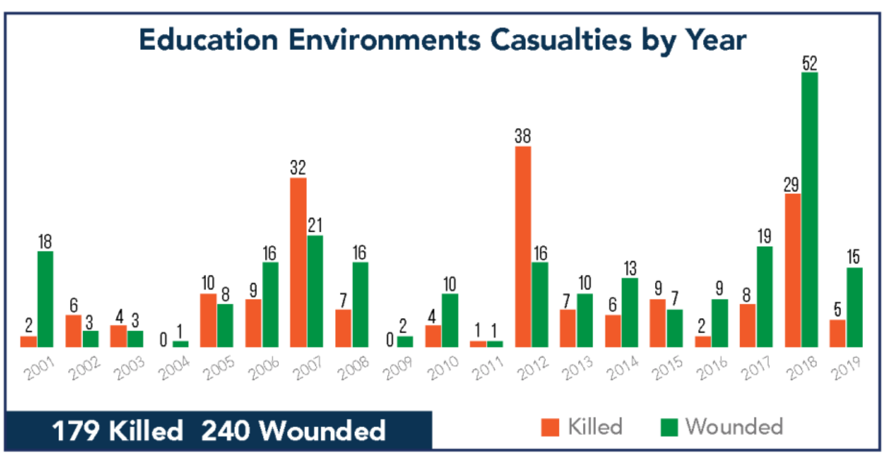
Education Environments

Quick Look:

Sixty-two incidents occurred in public and private educational settings, defined as schools covering pre-kindergarten to 12th grade, institutes of higher education, and school board meetings.



Education Environment Incidents and Casualties by Location: School Board Meeting (2 incidents, 1 wounded, 0 killed); Elementary (6 incidents, 25 wounded, 36 killed); Middle School (8 incidents, 11 wounded, 2 killed); High School (25 incidents, 104 wounded, 60 killed); Pre-K-12 (2 incidents, 13 wounded, 6 killed); Jr./Sr. High School (1 incident, 4 wounded, 0 killed); Higher Education (18 incidents, 82 wounded, 75 killed)

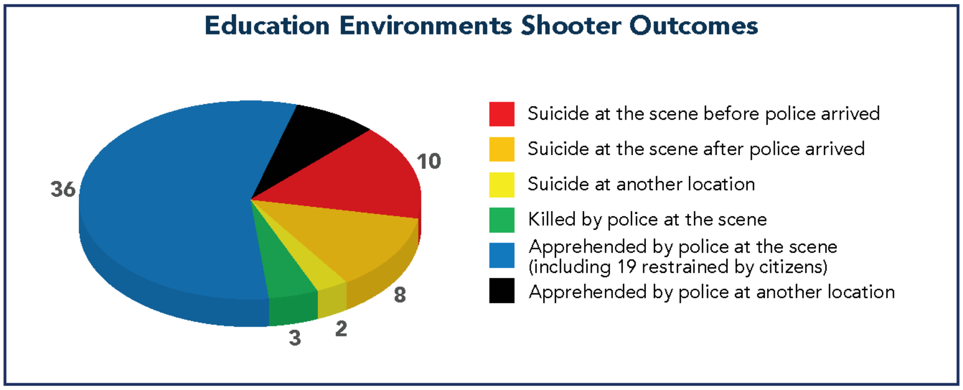


Education Environments Casualties by Year: 2001 (2 killed, 18 wounded); 2002 (6 killed, 3 wounded); 2003 (4 killed, 3 wounded); 2004 (0 killed, 1 wounded); 2005 (10 killed, 8 wounded); 2006 (9 killed, 16 wounded); 2007 (32 killed, 21 wounded); 2008 (7 killed, 16 wounded); 2009 (0 killed, 2 wounded); 2010 (4 killed, 10 wounded); 2011 (1 killed, 1 wounded); 2012 (38 killed, 16 wounded); 2013 (7 killed, 10 wounded); 2014 (6 killed, 13 wounded); 2015 (9 killed, 7 wounded); 2016 (2 killed, 9 wounded); 2017 (8 killed, 19 wounded); 2018 (29 killed, 52 wounded); 2019 (5 killed, 15 wounded)

Active Shooter Incidents 20-Year Review, 2000-2019 13

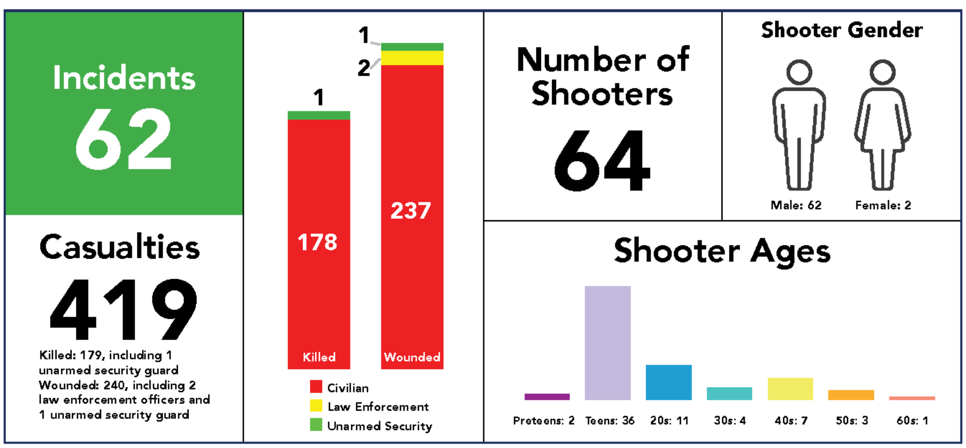
ACTIVE SHOOTER INCIDENTS

Education Environments



Education Environments Shooter Outcomes: Suicide at the scene before police arrived (10); Suicide at the scene after police arrived (8); Suicide at another location (2); Killed by police at the scene (3); Apprehended by police at the scene (including 19 restrained by citizens) (36); Apprehended by police at another location (5)

Key Findings:



Incidents: 62. Total casualties: 419. Killed: 179 (including 178 civilians and 1 unarmed security guard). Wounded: 240 (including 237 civilians, 2 law enforcement officers, and 1 unarmed security guard). Number of shooters: 64. Shooter gender: 62 male, 2 female. Shooter ages: Preteens (2); Teens (36); 20s (11); 30s (4); 40s (7); 50s (3); 60s (1).

Active Shooter Incidents 20-Year Review, 2000-2019 14

The complete report may be found here: https://www.fbi.gov/file-repository/active-shooter-incidents-20-year-review-2000-2019-060121.pdf/view.

Cyber-Threats

While Jefferson County has not been the target of any critical cyber terrorist events, the county has seen multiple security breaches due to online phishing and other scams.

One hack attack took down the largest fuel pipeline in the U.S. and led to massive gasoline shortages; it was the result of a single compromised password. Hackers gained entry into the networks of Colonial Pipeline Company on April 29, 2021 through a virtual private network account, which allowed employees to remotely access the company's computer network. On May 7, 2021, a ransom of $4.4 million was demanded by the hackers, causing Colonial to shut down the entire supply line, immediately prompting temporary gasoline shortages and panic buying up and down the East Coast. The hackers, who were an affiliate of a Russian-linked cybercrime group known as *DarkSide*, were paid the ransom. The hackers also stole nearly 100 gigabytes of data from Colonial Pipeline and threatened to leak it if the ransom was not paid, according to Bloomberg News.

Then, in early June 2021, JBS, the world's largest meat company by sales, paid an $11 million ransom to cybercriminals who temporarily knocked out plants that process roughly one-fifth of the nation's meat supply. The ransom payment, in bitcoin, was made to shield JBS meat plants from further disruption and to limit the potential impact on restaurants, grocery stores and farmers that rely on JBS, according to the company.

The attack on JBS was part of a wave of incursions using ransomware, in which companies are hit with demands for multimillion-dollar payments to regain control of their operating systems. The attacks show how hackers have shifted from targeting data-rich companies such as retailers, banks and insurers to essential-service providers such as hospitals, transport operators and food companies.

4.3.16.4 Future Occurrence

The likelihood of Jefferson County being a primary target for a major international terrorist attack is small and unlikely. More likely terrorist activity in Jefferson County includes bomb threats or other incidents at schools. Jefferson County has five school districts. There are three private Christian, twenty-one Amish, and three post-secondary schools located in Jefferson County. These locations are considered soft targets and may be vulnerable, especially to domestic incidents.

4.3.16.5 Vulnerability Assessment

Jefferson County should stay prepared for terroristic events. The existence of industrial commerce, interstate highways and freight railroad activity create soft targets that could be used to interfere with the focus of day-to-day life that the county experiences. It is important to note that the use of and exposure to biological agents can remain unknown for several days until the infected person(s), livestock, or crops begin to experience symptoms or show damages. Often such agents are contagious, and the infected person(s) must be quarantined, livestock culled, and/or crops destroyed.

Although previous events have not resulted in what are considered to be significant terrorist attacks, the severity of a future incident cannot be predicted with a total level of certainty. One of the major concerns with agroterrorism is that acts can be carried out with minimal planning, effort, or expense.

Acronis, a global technology company that develops on-premises and cloud software for backup, disaster recovery, and secure file sync and share and data access, issues an annual threat scape report on cybercrime. Entitled *The Acronis Cyberthreats Report,* it contains an in-depth review of the current threat landscape and projections for the coming year. Based on the protection and security challenges that were amplified by the shift to remote work during the COVID-19 pandemic, Acronis warns aggressive cybercrime activities will continue as criminals pivot their attacks from data encryption to data exfiltration.

The major points illustrated in the report are as follows:

- Attacks against remote workers will increase due to the movement of workers to less secure working areas.
- Ransomware will look for new victims and will become more automated.
- Legacy IT and technical solutions will struggle to keep pace with ransomware and cybercrime attacks.

According to a study carried out on the data sourced from the Federal Bureau of Investigation, Pennsylvania is ranked second worst among states when it comes to handling cyber-attacks. The study made by Information Network Associates – an international security consulting company – says an increase of 25% was witnessed in cyber-attacks between 2016 and 2017. This illustrates the amount of preparation that must occur in the commonwealth so that it can better respond to potential cybercrime attacks.

The probability of terrorist activity is more difficult to quantify than some other hazards. Instead of considering the likelihood of occurrence, vulnerability is assessed in terms of specific assets. By identifying potentially at-risk terrorist targets in communities, planning efforts can be put in place to reduce the risk of attack. Planning should work towards identifying potentially at-risk critical infrastructure and functional needs facilities in the community, prioritizing those assets and locations, and identifying their vulnerabilities relative to known potential threats.

All communities in Jefferson County are vulnerable on some level, directly or indirectly, to a terrorist attack. However, communities with schools and government infrastructure like the county seat, should be considered more likely to attract terrorist activity.

4.3.17. Transportation Accidents

4.3.17.1 Location and Extent

Transportation accidents are defined as accidents involving highway, air, and rail travel. These incidents are collectively the costliest of all hazards in the Commonwealth in terms of lives lost, injuries, and economic losses. The sheer amount of roadway, coupled with the high volume of traffic, creates the potential for serious accidents along the roads and bridges. In Jefferson County there are 263 state maintained and forty-five locally maintained bridges, according to PennDOT. Eighteen of the 308 bridges in Jefferson County are listed in poor condition by PennDOT. Major transportation routes in Jefferson County include Interstate 80, US 119, 219, and 322. State routes are also present in the county including SR 28, 36, 310, 410, 536, 830, 899, 949, and 950. *Figure 52 – Major Transportation Routes* shows the major transportation systems in Jefferson County.

Jefferson County has one commercial service airport; DuBois Area Airport, located in Washington Township. There is one general aviation airport in Jefferson County; Punxsutawney Municipal Airport. There exists a potential extent for air transportation accidents to occur due to the number of commercial air traffic that flies over the county every day. However, a half-mile radius around each airport can be considered a high-risk area since most aviation incidents occur near take-off and landing sites. This can be seen in *Figure 53 – Airports and Vulnerability Zones*.

There are several freight rail lines in Jefferson County. The railroad companies that operate within Jefferson County include Buffalo & Pittsburgh and Norfolk Southern on the Genesee & Wyoming Inc. rail lines. Rail transportation accidents are generally classified as one of these three types:

- Derailment – an accident on a railway in which a train leaves the rails
- Collision – an accident in which a train strikes something such as another train or highway motor vehicle
- Other – accidents caused by other circumstances like obstructions on rails, fire, or explosion

Rail transportation is divided into two major categories: freight and passenger. Each category can be subdivided according to carrier type: major carrier and local/regional carriers. Rail accidents can occur anywhere along the miles of rail located in Jefferson County.

There are sixty-one oil and gas wells located in Jefferson County. Washington Township has the most oil and gas wells, with a total of twenty-one; Henderson Township is second with nine, and Polk Township has eight oil and gas wells.

Pipeline infrastructure is seen throughout the county. There are nine major pipeline companies that transport hazardous materials in and through Jefferson County. Of these nine major pipelines, five are for natural gas only; one is for natural gas and propane; one is for ethane and propane; one is for natural gas and liquid natural gas; and one is for natural gas and hydrogen sulfide. *Figure 55 – Utility Pipelines Vulnerability* shows the various pipelines that run through Jefferson County.

4.3.17.2 Range of Magnitude

Significant passenger vehicle, air, and rail transportation accidents can result in a wide range of outcomes from damage solely to property to serious injury or even death. The majority of motor vehicle crashes in Pennsylvania are non-fatal, but PennDOT estimates that every hour nine people are injured in a car crash, and every seven hours someone dies as a result of a car crash. Most fatal crashes occur in May and June, but the highest number of crashes overall occur in October, November, and December. Inclement weather and higher traffic volumes and speeds increase the risk for automobile accidents.

Railway and roadway accidents have the potential to result in hazardous materials release. Railroad accidents occur with less frequency than highway accidents. However, when these types of incidents occur, they often cause extensive property damage and have the potential to cause serious injuries or deaths.

The worst-case scenario for a transportation accident impacting the county would be a road or rail accident which results in a hazardous material spill in Brookville and Punxsutawney boroughs; in Punxsutawney from both rail and roads, however, in Brookville it would be a roadway accident. Such an event would constitute an immediate health hazard to the population and require evacuation.

4.3.17.3 Past Occurrence

Table 64 – PennDOT Crash Report for Jefferson County shows crash statistics recorded by the Pennsylvania Department of Transportation between 2010 and 2021. Reports for 2022 were not available at the time of this report. The year 2013 had the most total crashes in Jefferson County while 2021 had the least total crashes. There have been no crashes between trains and vehicles between the years of 2010 and 2021.

The majority of municipalities noted, on the municipality hazard identification worksheet they received, that there was no change in occurrence.

Table 64 - PennDOT Crash Report for Jefferson County

PennDOT Crash Report for Jefferson County								
Year	Vehicle accidents for Jefferson County				Vehicle Accident Deaths for Jefferson County			Train/Trolley with Motor Vehicle Crashes/ Fatalities
	Total	Fatal Accidents	Injury Crashes	Property Damage Only	Total Vehicle Accident Fatalities	Alcohol-Related Fatalities	Pedestrian Fatalities	
2010	443	7	211	225	7	5	0	0
2011	452	6	216	230	6	1	0	0
2012	438	6	221	211	6	3	0	0
2013	508	7	233	268	7	1	0	0
2014	431	5	192	234	5	2	0	0
2015	456	7	199	250	7	4	0	0
2016	458	8	182	268	8	1	0	0
2017	437	3	198	236	3	0	0	0
2018	413	4	172	237	4	0	0	0
2019	385	6	154	225	6	0	0	0
2020	378	6	163	209	6	0	0	0
2021	357	6	140	211	6	1	0	0

4.3.17.4 Future Occurrence

traffic has decreased slightly as well. However, with the increasing volume of goods and trucking through the county, transportation accidents will continue to occur routinely. Hazardous material release through transportation accidents is difficult to predict but can be assumed to happen in future events as well. The U.S. Census Bureau reports the mean travel time to work for those aged 16 plus is approximately twenty-four minutes. Automobile accidents occur frequently, and typically occur more frequently than rail or aviation accidents. In the case of highway accidents, PennDOT has taken great strides to reduce the number of highway transportation accidents through programs such as the Pennsylvania Highway Safety Corridor. In this program, PennDOT designates sections of highway where traffic citation fines are doubled in the hopes that higher fines will deter unsafe diving and reduce accidents. Transportation accidents are impossible to predict accurately; however, areas prone to these hazards can be located, quantified through analysis of historical records, and plotted on countywide and municipal base maps.

4.3.17.5 Vulnerability Assessment

A transportation accident can occur anywhere in Jefferson County. However, severe accidents are more likely to occur on the county's major highways due to the heavier traffic volumes which make highways extremely vulnerable. The vulnerability for accidents on either highway, railway, or aviation, are directly related to the population and traffic density within the county. The vulnerability increases if there are hazardous materials involved. Hazards associated with causing transportation accidents can include natural hazards that affect the environment, such as winter storms or heavy rains that cause slippery roadways or mud slides, to windstorms or tornadoes that cause high-profile vehicles or train cars to topple over. Loss of roadway use, and public transportation services would affect commuters, employment, delivery of critical municipal and emergency services, and day-to-day operations within the county.

With highway accidents, there is an added vulnerability that stems from the age and upkeep of bridges throughout the county. Unrepaired, deficient bridges may be more likely to break, thus leading to highway transportation damages or deaths. Five percent of Jefferson County bridges are in poor condition, indicating an increased vulnerability to transportation accidents, while 67% remain in fair condition.

Studying traffic and potential transportation accident patterns could provide information on vulnerability of specific road segments and nearby populations. Increased understanding of the types of hazardous materials transported through the county will also support mitigation efforts. Maintaining a record of these frequently transported materials can facilitate development of preparatory measures for response to a release. *Figure 54– Average Daily Traffic on Major Highway Vulnerability* identifies all major highways and railroads within Jefferson County.

Figure 52 - Major Transportation Routes

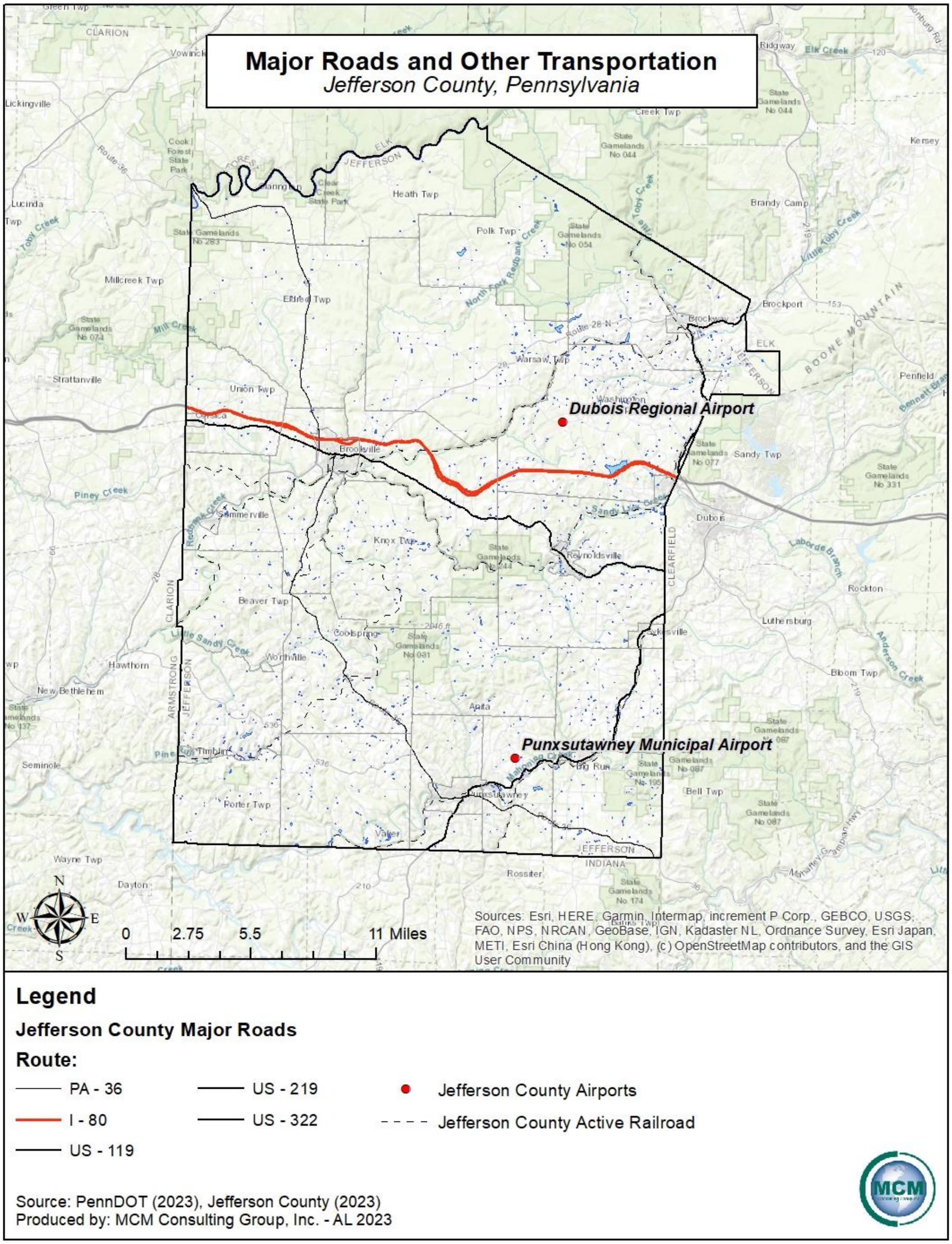


Figure 53 - Airports and Vulnerability Zones

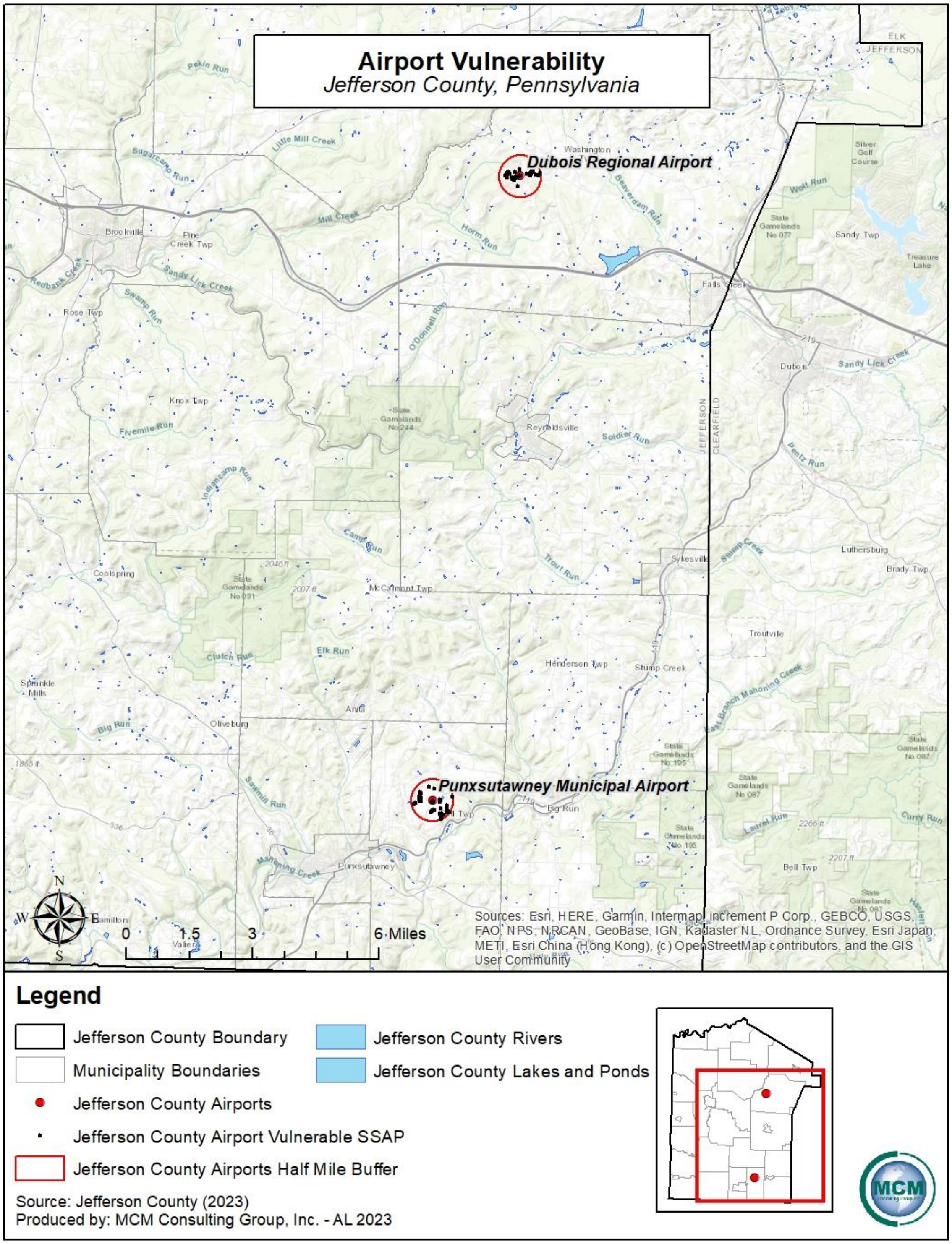


Figure 54 - Average Daily Traffic on Major Highway Vulnerability

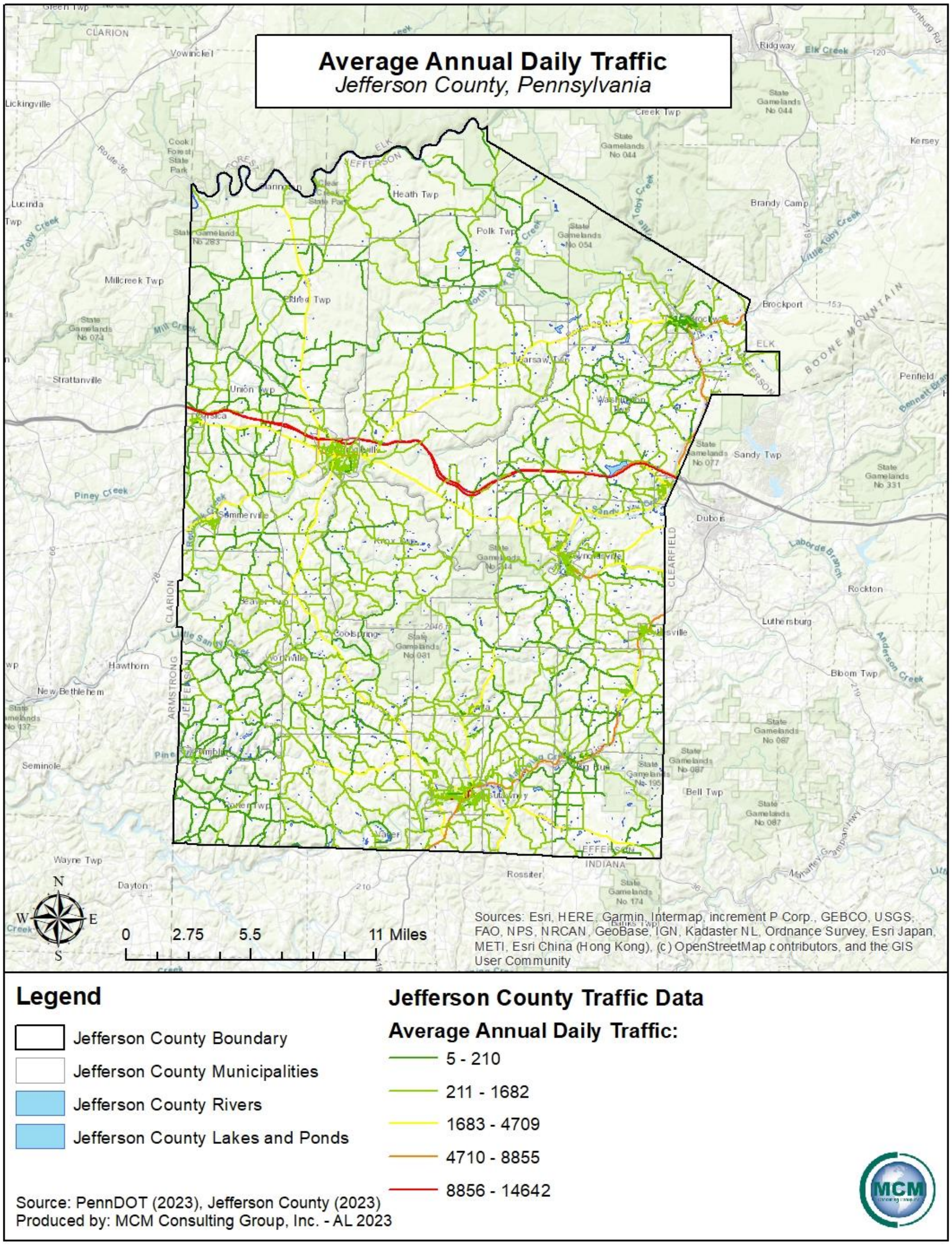
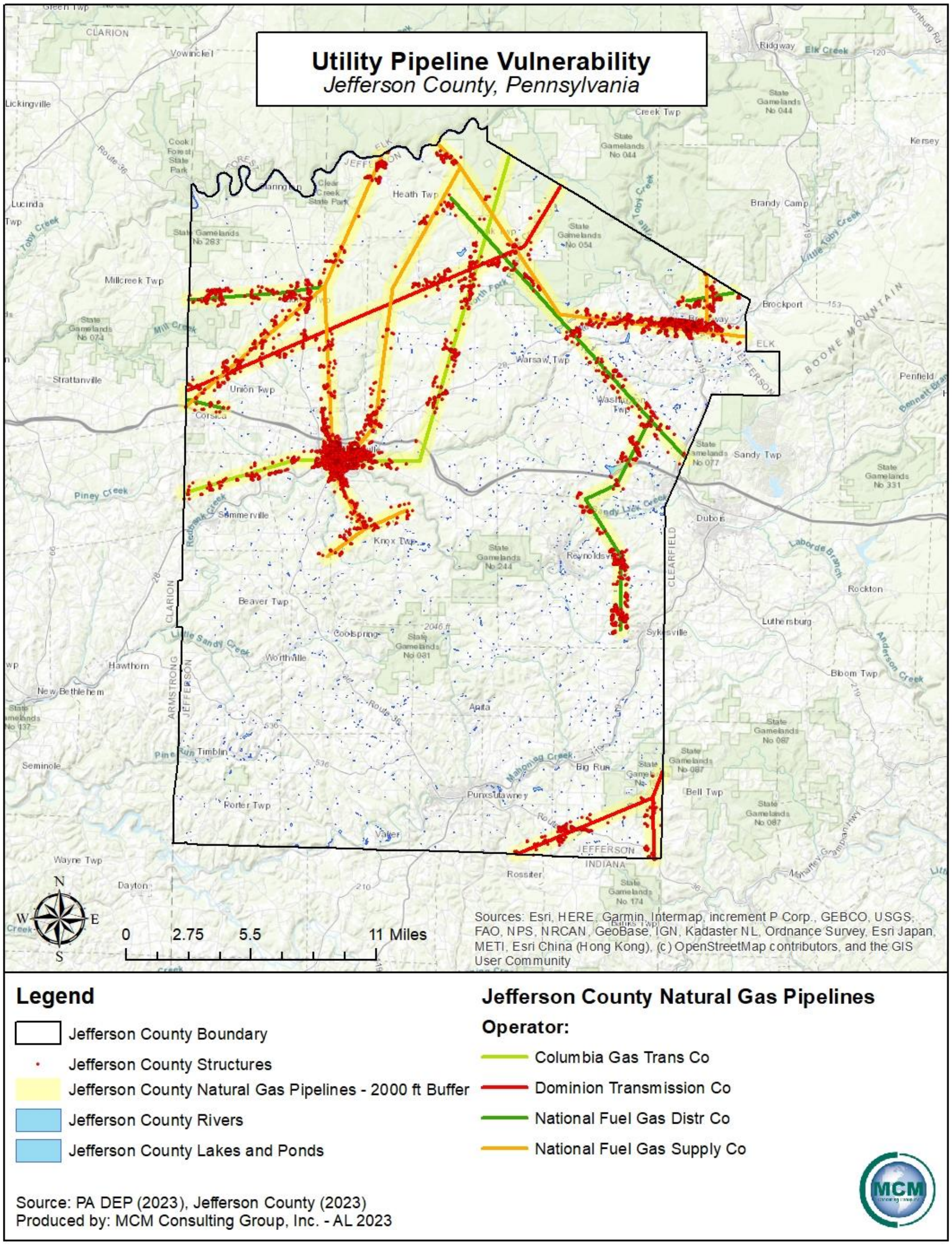


Figure 55 - Utility Pipelines Vulnerability



4.3.18. Urban Fire and Explosions

4.3.18.1 Location and Extent

Urban fire and explosion hazards incorporate vehicle and building/ structure fires, as well as overpressure ruptures, overheat explosions, or other explosions that do not ignite. Statewide, this hazard is most problematic in the denser, and more urbanized areas, occurring most often in residential structures (US Fire Administration, 2009). Urban fires can more easily spread from building to building in denser urban areas.

According to the U.S. Census Bureau, 2020 U.S. Census, Jefferson County has approximately 22,005 housing units. The American Community Survey, conducted by the United States Census Bureau in 2021 estimates a total of 22,058 housing units. This number will be used for the calculations used to determine vulnerability of buildings and structures to urban fire. Buildings that were constructed fifty or more years ago are at a higher risk of urban fires due to the improvement in fire safety engineering practices. See section 4.3.18.5 for a more in depth discussion of the number of vulnerable housing units in Jefferson County.

Fires can start from numerous causes including human errors or electrical malfunctions. Most fires are small and have little impact on the greater community other than possibly increasing insurance rates. Oftentimes large urban fires are the result of other hazards such as storms, droughts, transportation accidents, hazardous material spills, arson, or terrorism.

Natural gas exploration and extraction sites can be associated with fires and explosion events. Well flares regularly burn off excess gas, and if improperly managed, such activities can be dangerous for the surrounding areas.

4.3.18.2 Range of Magnitude

Urban fires can occur in any populated area, and fires affecting one structure happen quite often. Urban fires are most threatening when the fire can rapidly spread from one structure to another. Jefferson County is largely rural/semi-rural and does not have significant expanses of dense population.

Damages from fire and explosions ranges from minor smoke inhalation and/or water damage to the destruction of buildings. A worst-case scenario for any fire and or explosion would be in injuries and/or death of the occupants of the structures and the potential of injury or death of firefighters.

In the calendar year 2022 the Federal Emergency Management Agency's (FEMA) United States Fire Administration states that there were 2,284 civilian home fatalities nationwide, and the Commonwealth of Pennsylvania accounted for 168 of those civilian home fire fatalities. None of those fire fatalities from 2022 were located in Jefferson County.

There are economic consequences related to a fire and explosion hazard, including:

- Loss in wages due to temporarily or permanently closed businesses
- Destruction and damage to business and personal assets
- Loss of tax base
- Recovery costs
- Loss related to the ability of public, private, and non-profit entities to provide post-incident relief.

The secondary effects of urban fire and explosion events relate to the ability of public, private, and non-profit entities to provide post-incident relief. Human services agencies (community support programs, health and medical services, public assistance programs and social services) can be affected by urban fire and explosion events. Effects include causing physical damage to facilities and equipment, disruption of emergency communications, loss of health and medical facilities and supplies, and an overwhelming load of victims who are suffering from the effects of the urban fire, including loss of their home or place of business.

4.3.18.3 Past Occurrence

From 1910 to 1990, the Commonwealth of Pennsylvania experienced 13 major fires in suburban and urban settings, and 10 of them occurred after 1980. Between 1978 and 1982, the average number of deaths per fire was 2.7. After October 1990, the average number of deaths per fire decreased. *Table 63 – Urban Fire or Structure Fire Occurrence* reflects the major fires and explosions that have occurred in Jefferson County since the year 2018.

Table 65 - Urban Fire or Structure Fire Occurrence

Urban Fire or Structure Fire Occurrence – Jefferson County		
Event	**Date**	**Location**
Structure Fire	01/04/2018	Eldred Township
Commercial Structure Fire	05/19/2018	Bell Township
Structure Fire	06/08/2018	Heath Township
Dryer Fire - School	06/27/2018	Brookville Borough
Structure Fire	08/06/2018	Brookville Borough
Structure Fire	08/24/2018	Falls Creek Borough
Structure Fire	02/05/2019	Brockway Borough
Kitchen Fire – Nursing Home	02/08/2019	Brockway Borough
Structure Fire	02/25/2019	Sykesville Borough
Structure Fire*	06/03/2019	Punxsutawney Borough
Structure Fire	06/26/2019	Corsica Borough
Commercial Structure Fire	07/15/2019	Snyder Township
Commercial Structure Fire	08/01/2019	Reynoldsville Borough
Structure Fire	10/26/2019	Gaskill Township

Urban Fire or Structure Fire Occurrence – Jefferson County		
Event	**Date**	**Location**
Church Fire	11/11/2019	Punxsutawney Borough
Apartment Building Fire	11/12/2020	Punxsutawney Borough
Structure Fire	01/01/2021	Brookville Borough
Explosion and Fire	01/28/2021	Punxsutawney Borough
Structure Fire	03/04/2021	Pine Creek Township
Structure Fire	05/09/2021	Falls Creek Borough
Structure Fire	05/27/2022	Punxsutawney Borough
*Fatal Fire, Source: Jefferson County Knowledge Center, 2022		

In total, there were twenty-one structure fires, urban fires, or explosion events in Jefferson County between 2018 and 2022. There was only one fatal fire noted in the past event data provided by Jefferson County and that event occurred on June 3, 2019 in Punxsutawney, Pennsylvania. Jefferson County utilizes WebEOC to track incidents in the county, and previously used Corvena Knowledge Center. The past event data listed above came primarily from Knowledge Center.

As of May 2022, there were 5,334 active, conventional natural gas wells in Jefferson County (PA DEP, 2022). These locations should be closely monitored, and safety protocols should be strictly adhered to in order to avoid explosions and starting fires.

4.3.18.4 Future Occurrence

Small urban fires occur regularly and usually cause little damage. Areas with greater population and an increased rate of population density are at greater risk for future urban fires and explosions. The more urban areas of Jefferson County include Punxsutawney Borough, Brookville Borough, Reynoldsville Borough, Brockway Borough, and Sykesville Borough.

Any new construction must comply with PA Department of Labor's statewide uniform construction codes. One requirement in the construction codes is automatic sprinkler requirements for buildings other than one- and two-family dwellings. In most cases, this requirement will contain fires to the point of origin.

4.3.18.5 Vulnerability Assessment

Fire and explosion vulnerability greatly depends on the vulnerability of other hazards. Most fires result from the secondary effect of another hazard. The probability of a fire or explosion occurring increases with population and economic growth. The natural gas industry and exploration is active in Jefferson County, and with it comes greater risk for fire and explosion. Older structures are more vulnerable to urban fire, and fires can spread more quickly to other buildings in areas with higher concentrations of housing. There are a total of 16,127 housing

units constructed in Jefferson County between 1939 to 1979. That accounts for 73.1% of the housing units in Jefferson County. Buildings that are made up of more than one housing unit are also at an increased risk of urban fire/structure fire because of the close nature of architecture and the inability to control the risk of a fire in an adjacent unit. There are approximately 1,807 buildings in Jefferson County that are made up of at least three housing units to more than twenty units. This represents 8.2% of the total building units in Jefferson County.
Vacant housing units are at an increased vulnerability to urban fires due to a lack of attention and active maintenance. As of 2021, there were a total of 4,313 vacant housing units in Jefferson County. This accounts for 17.2% of the total housing units in Jefferson County. Mobile homes are also at an increased risk of fire, although not urban, because of construction practices that make them easier to burn and quicker to ignite. There are an estimated 1,796 mobile homes in Jefferson County. A large portion of these homes are likely seasonal camps or hunting lodges/cabins. The percentages presented above do not account for seasonal property characteristics, as a large portion of hunting cabins and camps in rural Jefferson County are unoccupied for a majority of the year.

Urban fire risk also increases as the use of wood burning, fuel, oil, kerosene, and bottled tank, or LP gas as a primary heat source increases, and the use of space heaters becomes more common. Based on information in the American Community Survey, there are approximately 827 houses using wood burning methods for their primary heat source, which corresponds to 4.7% of the housing units in Jefferson County. Fuel, oil, and kerosene are used by 1,356 housing units as the primary source of heat, which is 7.6% of the total units in the county. Approximately 1,407 housing units use bottled, tank, or LP gas for primary heating and that accounts for 7.9% of Jefferson County housing units.

The very young (those under the age of 5) and the elderly (those 65 years and older) tend to be more vulnerable to structure fires than other age groups, and often experience the highest number of deaths per fire. This is often due to lower mobility and a difference in awareness when an emergency event, such as a fire or explosion, occurs. In Jefferson County, the total population under the age of 5 is 2,511 which is 5.6% of the 2021 American Community Survey estimate. The total population 65 years of age or older is 9,296 people, or 20.9% of the total population. Combined, those under the age of 5 and 65 years or older make up approximately 26.5% of the total population.

Jefferson County has a total of twenty fire departments. More information on these locations can be found in the Emergency Services profile (Section 4.3.16) of the hazard mitigation plan. The areas for which the fire stations provide coverage are also outlined in the Emergency Services profile of this hazard mitigation plan. If the downward trend in volunteerism and emergency professional employment continues, there could be an increase in the amount of time it takes for a fire department to respond to a fire or explosion. More discussion on this topic can be found in the Emergency Services hazard profile.

Potential cascading hazards of urban fires include utility interruption and hazardous material spills. When a fire department taps into a fire hydrant in response to a fire, a drop in water pressure is typical if the fire hydrant is on a shared water main with the residents in that area. This can also result in discolored water and minor water interruptions if the fire hydrant use is pro-longed.

4.3.19. Utility Interruptions

4.3.19.1 Location and Extent

Utility interruptions can occur from an internal system failure or as a secondary impact of another hazard, such as windstorm, winter storm, extreme temperatures, or a traffic accident. Strong adverse weather conditions and storms can cause widespread disruptions in electric and telecommunications service due to power lines being brought down by falling tree branches across a region. Strong heat waves may result in rolling blackouts where power may not be available for an extended period, impacting air conditioning across a region. Space weather, specifically solar flares, can also pose a threat to utility service across the globe. Although uncommon, the northeastern seaboard and the north central regions of the United States are particularly susceptible to this hazard.

The age of utility infrastructure also plays a role in interruptions, causing longer periods of outages in a larger area. Natural gas, water, telecommunications, and electric capabilities can all experience disruptions. Worker strikes at power generation facilities have also been known to cause minor and temporary power outages and failures. Other causes for minor power outages include but are not limited to vehicle accidents and wire destruction due to animals or wildlife. Outages can also be caused by blown transformers or tripped circuit breakers in the electric system. Major power outages typically occur on a regional scale and can last both short term and long term.

The list of utility providers in Jefferson County is shown in *Table 66 – Jefferson County Utility Providers*.

Table 66 - Jefferson County Utility Providers

Jefferson County Utility Providers	
Utility Type	**Name of Utility Provider**
Electricity	Penelec United Electric (Unielec) REA/Southwest Central Rural Electric Allegheny Power/West Penn
Telephone/9-1-1/Wireless	Alltell Verizon
Natural Gas	National Fuel Columbia Gas – Large Transmission Columbia Gas – Residential Dominion Gas Dannic Energy

Jefferson County Utility Providers	
Utility Type	**Name of Utility Provider**
	T.W. Phillips EXCP (formerly Hanley & Bird)
Water	Aqua PA – Treasure Lake Brockway Borough Municipal Authority Brookville Municipal Authority Eldred Township Municipal Authority Falls Creek Borough Municipal Authority Henderson Township Municipal Authority Know Township Municipal Authority Pennsylvania American Water Co. Punxsutawney Reynoldsville Municipal Water Authority Summerville Borough Authority Sykesville Area Sewer and Water Authority
Source: Jefferson County, 2023. PA Public Utility Commission, 2023	

4.3.19.2 Range of Magnitude

Utility interruptions do not typically lead to large-scale problems by themselves. Typically, human casualties are not a direct result from outages. Many utility interruptions occur during storms or other severe weather events, and they can have secondary consequences. Typical secondary effects from a power outage can include a delay in emergency response and those services arriving in timely manner. A lack of potable drinking water can also become a major issue for areas impacted by utility interruptions.

Electricity:

Interruptions or power failures could have the following impacts:

- Public safety concerns
- Food spoilage
- Loss of heating or air conditioning
- Basement flooding due to sump pump failure
- Loss of indoor lighting
- Loss of internet service
- Stopped and stalled elevators
- Direct economic impact from retail settings

Of all the above listed impacts, the loss of heating or air conditioning poses the greatest risk to the elderly and very young populations during times of extreme temperature. Prolonged power outages also pose a risk to residents that rely on home-based medical equipment such as home-supply oxygen units. Some of the issues that are listed above can be considered more of a nuisance than a hazard, such as food spoilage due to long-term electrical outages. However, significant damage or harm can occur depending on the population affected, the duration, and the severity of the outage.

A worst-case scenario for the utility interruptions would be a county-wide power outage during winter months, forcing the evacuation of vulnerable populations to facilities outside of the county or to warming shelters within the county.

Fuel:

Interruptions of the transportation of gas and other products used for fuel can lead to a loss of heating and manufacturing capabilities. This can adversely affect the economic stability of a region and the production of needed products for consumption.

Telecommunications:

Interruptions to telecommunications systems include impacts to the 9-1-1 capabilities of a region, telephone, and internet service. The greatest risk in losing this utility to interruption is the risk of an emergency not being able to be reported to a public safety answering point (PSAP). Extensive loss of telephone and internet service can be detrimental to government, businesses, and to residents. With much of the country now dependent on wireless networks, signal interruptions can cause a large issue for people who are utilizing wireless telecommunications for work. There are also many concerns regarding safety and internet security due to the increase in people working over wireless networks that occurred during the COVID-19 pandemic. These interruptions and issues can be detrimental for the Jefferson County workforce.

4.3.19.3 Past Occurrence

Minor utility interruptions occur annually in Jefferson County and occur most often in conjunction with winter weather and/or windstorms. Jefferson County utilizes a database system to track incidents within the county. A large number of events were noted in the database system from 2012 to 2023. *Table 67 – Utility Interruptions in Jefferson County* illustrates the number of interruptions to electric, natural gas, telecommunications, and water services between 2012 and 2023.

Table 67 - Utility Interruptions in Jefferson County

Utility Interruptions in Jefferson County		
Date	**Event Type**	**Municipality**
01/01/2012	Power Outage	Brookville Borough
02/04/2012	Water Main Break	Brookville Borough
02/25/2012	Water Main Break	Brookville Borough
02/27/2012	Natural Gas Leak	Heath Township
03/27/2012	Power Outage	Bell Township
03/29/2012	Power Outage – 911 Center	Pine Creek Township
04/18/2012	Phone Outage	Pine Creek Township
05/03/2012	Water Main Break	Pine Creek Township
05/13/2012	Power Outage	Pine Creek Township
07/31/2012	Power Outage	Reynoldsville Borough
10/13/2012	Water Main Break	Union Township
10/29/2012	Power Outage	Corsica Borough
11/09/2012	Widespread Power Outage	Reynoldsville Borough
11/11/2012	Power Outage	Reynoldsville Borough
12/02/2012	Power Outage	Reynoldsville Borough
12/05/2012	Poles Down	Eldred Township
01/13/2013	Widespread Power Outage	Reynoldsville Borough
01/24/2013	Power Outage	Reynoldsville Borough
01/26/2013	Water Main Break	Brockway Borough
07/01/2013	Power Line Down	Young Township
07/05/2013	Power Line Down	Eldred Township
07/13/2013	Boil Water Advisory	Barnett Township
08/02/2013	Power Outage	Pine Creek Township
08/07/2013	Power Outage	Falls Creek Borough
12/24/2013	Water Line Break	Eldred Township
01/25/2014	Power Outage	Falls Creek Borough
01/29/2014	Power Outage	Snyder Township
02/18/2014	Boil Water Advisory	Sykesville Borough
03/04/2014	Water Line Break	Snyder Township
03/13/2014	Power Outage	Brookville Borough
04/03/2014	Partial Phone Outage	Falls Creek Borough
06/18/2014	Phone Outage - Hospital	Young Township
07/23/2014	Natural Gas Leak	Winslow Township
10/04/2014	Power Outage	Falls Creek Borough
10/13/2014	Gas Leak	Summerville Borough
11/14/2014	Power Outage	Sykesville Borough
11/24/2014	Power Outage	Sykesville Borough

Utility Interruptions in Jefferson County		
Date	Event Type	Municipality
12/06/2014	Water Main Break	Falls Creek Borough
02/07/2015	Water Interruption - Hospital	Young Township
05/23/2015	Phone Outage	Brookville Borough
06/05/2015	Power Outage	Snyder Township
06/07/2015	Phone Outage	Warsaw Township
06/09/2015	Phone Outage - Hospital	Young Township
08/06/2015	Water Main Break	Brockway Borough
08/17/2015	Gas Leak	Reynoldsville Borough
08/23/2015	Power Outage	Heath Township
09/19/2015	Water Main Break	Brockway Borough
09/19/2015	Gas Leak	Falls Creek Borough
09/21/2015	Water Main Leak	Sykesville Borough
10/06/2015	Boil Water Advisory	Sykesville Borough
11/21/2015	Water Main Break/Boil Water Advisory	Brookville Borough
12/24/2015	Water Main Break	Brockway Borough
01/19/2016	Phone Outage	Pine Creek Township
02/01/2016	Power Outage	Brookville Borough
02/25/2016	Boil Water Advisory	Sykesville Borough
03/26/2016	Power Outage - Fire	Brookville Borough
05/02/2016	Water Main Break	Reynoldsville Borough
05/09/2016	Natural Gas Leak	Warsaw Township
05/24/2016	Water Main Break	Punxsutawney Borough
06/12/2016	Power Lines Down	Winslow Township
06/19/2016	Phone Outage	McCalmont Township
07/04/2016	Gas Leak	Sykesville Borough
07/09/2016	Power Outage	Punxsutawney Borough
07/13/2016	Boil Water Advisory	Snyder Township
08/23/2016	Water Line Leak	Brookville Borough
08/28/2016	Water Main Break	Brockway Borough
08/28/2016	Water Line Break	Brookville Borough
09/20/2016	Boil Water Advisory	Brockway Borough
09/22/2016	Boil Water Advisory	Brookville Borough
10/16/2016	Transformer Fire	Brookville Borough
11/15/2016	Natural Gas Leak	Summerville Borough
12/27/2016	Phone Outage	Punxsutawney Borough
02/04/2017	Electrical Outage	Brookville Borough
03/20/2017	Phone Outage	Pine Creek Township
06/28/2017	Major Water Line Break	Big Run Borough
07/08/2017	Power Outage	Heath Township

Utility Interruptions in Jefferson County		
Date	**Event Type**	**Municipality**
08/22/2017	Water Restriction - Shortage	Summerville Borough
10/07/2017	Water Main Break	Reynoldsville Borough
11/03/2017	Boil Water Advisory	Eldred Township
12/06/2017	Power Outage	Pine Creek Township
02/25/2018	Phone Outage - Hospital	Young Township
04/04/2018	Hospital Phone Outage	Brookville Borough
04/24/2018	Phone Outage	Pine Creek Township
06/11/2018	Phone Outage	Pine Creek Township
06/19/2018	Power Lines Down	Winslow Township
08/04/2018	Gas Line Rupture	Brookville Borough
08/11/2018	Sporadic Power Outage	Brookville Borough
09/04/2018	Phone Outage	Pine Creek Township
09/10/2018	Power Outage	Reynoldsville Borough
09/24/2018	Water Main Break	Brookville Borough
09/25/2018	Phone Outage	Pine Creek Township
09/26/2018	Lines Down	Pine Creek Township
10/05/2018	Generator Failure	Pine Creek Township
01/02/2019	MVA with Lines Down	Falls Creek Borough
04/18/2019	Transformer Fire	Punxsutawney Borough
05/29/2019	Phone Outage	Pine Creek Township
06/14/2019	Phone Service Outage	Barnett Township
07/25/2019	Gas Leak	Rose Township
08/29/2019	Boil Water Advisory	Snyder Township
08/30/2019	Power Outage	Brookville Borough
09/09/2016	Water Main Break	McCalmont Township
09/11/2019	Power Outage	Falls Creek Borough
10/11/2019	Boil Water Advisory	Henderson Township
01/12/2020	Natural Gas Leak	Gaskill Township
02/23/2020	Natural Gas Leak	Polk Township
05/19/2020	Power Outage	Punxsutawney Borough
07/09/2020	Natural Gas Leak	Bell Township
08/30/2020	Phone Outage	Pine Creek Township
10/05/2020	Phone Outage	Pine Creek Township
06/08/2021	Water Main Break	Young Township
07/16/2021	Power Outage	Falls Creek Borough
07/17/2021	Water Main Break	Brookville Borough
08/01/2021	Water Main Break	Punxsutawney Borough
08/05/2021	Possible Water Main Break	Big Run Borough
02/25/2022	Power Outage	Heath Township

Utility Interruptions in Jefferson County		
Date	**Event Type**	**Municipality**
02/27/2022	Water Main Break	Brookville Borough
03/07/2022	Power Outage - Courthouse	Brookville Borough
03/13/2022	Phone Outage	Pine Creek Township
04/07/2022	Power Outage	Reynoldsville Borough
04/09/2022	Small Sewage Release	Pine Creek Township
05/18/2022	Power Outage	Union Township
Source: WebEOC, 2023		

A large number of the municipalities in Jefferson County have reported water interruption issues, phone outages, and power outage issues. The table above shows that some of these events may be related or occurred on subsequent days. Brookville Borough, Pine Creek Township, and Reynoldsville Borough reported the greatest number of events on average. This does not mean that there were fewer events in other municipalities, simply that they may not have been reported or added to the report database.

The Pennsylvania Public Utility Commission tracks the reliability of electric distribution companies (EDC) and outages. *Table 68 – 2018 Winter Storms Riley and Quinn Power Outages* by EDC compares the customers affected by power outage in Pennsylvania during these storm events and compares the to statistics from Nika from 2014 and Sandy from 2012. Some of the EDCs were not impacted by Winter Storm Quinn. PP&L customers experienced power outages for a duration of eight days with Winter Storm Quinn and Winter Storm Riley, whereas during Sandy in 2012, the duration was nine days. Nika in 2014 had a duration of just over three days.

Table 68 - 2018 Winter Storms Riley and Quinn Power Outages

2018 Winter Storms Riley and Quinn Power Outages			
Electric Distribution Company	**Customers affected by storms Riley and Quinn 2018 (Percentage of total customers)**	**Customers affected by Nika 2014 (Percentage of total customer)**	**Customers affected by Sandy 2012 (Percentage of total customers)**
Met-Ed	272,928 (49.22%)	144,000 (26.00%)	298,300 (54.00%)
PECO	794,969 (46.76%)	723,681 (42.00%)	845,703 (54.20%)
Penelec	90,856 (15.61%)	N/A	96,847 (16.40%)
PCLP	2,101 (47.44%)	N/A	4,487 (100.00%)
PP&L	261,341 (18.67%)	92,283 (7.00%)	523, 936 (37.50%)
Total:	**1,422,195**	**959,964**	**1,769,273**
Source: Winter Storm Riley and Quinn Report 2019			

Other past significant events of utility interruptions in the United States occurred on a regional basis and had varied effects related to number of impacted customers. A large water treatment plant failure occurred in Jackson, Mississippi in August of 2022 after flooding impacted the treatment facility. The city of Jackson was left without safe drinking water for close to two months until the water was deemed safe and potable in October of 2022. This event stood out as a large scale failure of community lifelines and utilities. This event also opened discussions related to equity in infrastructure repairs, as the repairs took a significant amount of time in a vulnerable socio-economic area.

4.3.19.4 Future Occurrence

Utility Interruptions are difficult to predict, and minor interruptions may occur several times a year to all utilities. Even so, utility interruptions occur more frequently as a secondary factor to severe weather events or transportation accidents.

Space weather is getting more attention as an infrastructure risk due in part to a March 2020 report by the United States Geological Survey (USGS). The report noted that geomagnetic storms caused by the dynamic action of the Sun and solar wind on the space environment surrounding the Earth can generate electric fields in the Earth's crust and mantle. These electric fields can interfere with the operation of grounded electric power-grid systems. Geomagnetic storms occur only occasionally, but when sufficiently energetic they can produce blackouts on a large scale.

As utility infrastructure ages, interruption events could occur more frequently if the maintenance of the infrastructure is not maintained. Utility providers can reduce Jefferson County's vulnerability to power outages by implementing improvement plans for utility infrastructure. Total replacement is not a feasible solution to the issue, but compromises can be reached to ensure that the new and old equipment along a utility line can work together efficiently.

4.3.19.5 Vulnerability Assessment

Resources such as electricity, communications, gas, and water supply are critical to ensure the health, safety, and general welfare of the citizenry. *Figure 56 – Jefferson County Utilities* illustrates the approximate locations of service lines and pipelines throughout Jefferson County.

Power outages can cause even greater detriment to at-risk and vulnerable populations, such as elderly (e.g., supplemental oxygen power needs) or those with functional and access needs to consider. All critical infrastructure is vulnerable to the effects of a power surge. The probability of a large-scale, extended utility failure is low; however, small-scale failures lasting short periods of time occur annually.

Long-term care facilities, senior centers, hospitals, and emergency medical facilities are all vulnerable to utility interruptions. Often back-up power generators are used at these facilities to offset electrical needs during extreme hot or cold temperature events. However, these back-up power generators must be maintained, and fuel supplies must be secured in advance of the utility interruption to ensure a seamless transition from the everyday, grid power source to the emergency generator. When officials consider maintenance and supplies for a facility, long-term use of back-up generators should be planned.

Electricity:

Severe weather is one of the largest causes of power loss. The electric power grid infrastructure can be damaged by snow, ice, high winds, lightning, flooding, falling tree limbs, and vehicle accidents involving utility poles. Small animals can also cause minor power outages by climbing along the lines and shorting out the system.

Causes of a regional scale power outage or failure could be from infrastructure failure, sabotage, human error, or worker strikes. Community lifeline facilities are vulnerable to utility interruptions, especially the loss of power. The establishment of reliable backup power at these facilities is extremely important to provide continued support of the health, safety, and well-being of Jefferson County residents and visitors.

The occurrence of severe weather related utility interruptions will increase due to climate change in the Commonwealth of Pennsylvania and the United States as a whole. Climate change will cause weather to become more severe on a more frequent basis.

Water:

Water distribution can be affected in three ways.

- The amount of water available (depends on nature)
- The quality of the water (depends on human responsibility)
- The viability of the physical components of the distribution system

Well contamination or water shortages due to drought could pose a high vulnerability to local water distribution. Drought events will continue to occur more frequently as climate change alters that available amount of ground water for consumption. This will result in greater well shortages and water utility interruptions for citizens that have well water.

Water contamination can occur naturally, by human error, or intentionally. Releases of manure and milk into the water supply can cause contamination. Overflows from sewage systems and lagoons on farms can also cause contamination of groundwater and drinking water. There are times when accidental spills and releases of hazardous materials contaminate water supplies, thereby, water supplies along transportation routes may be affected.

Gas and Liquid Pipelines:

Interruptions to natural gas distribution lines could be affected by:

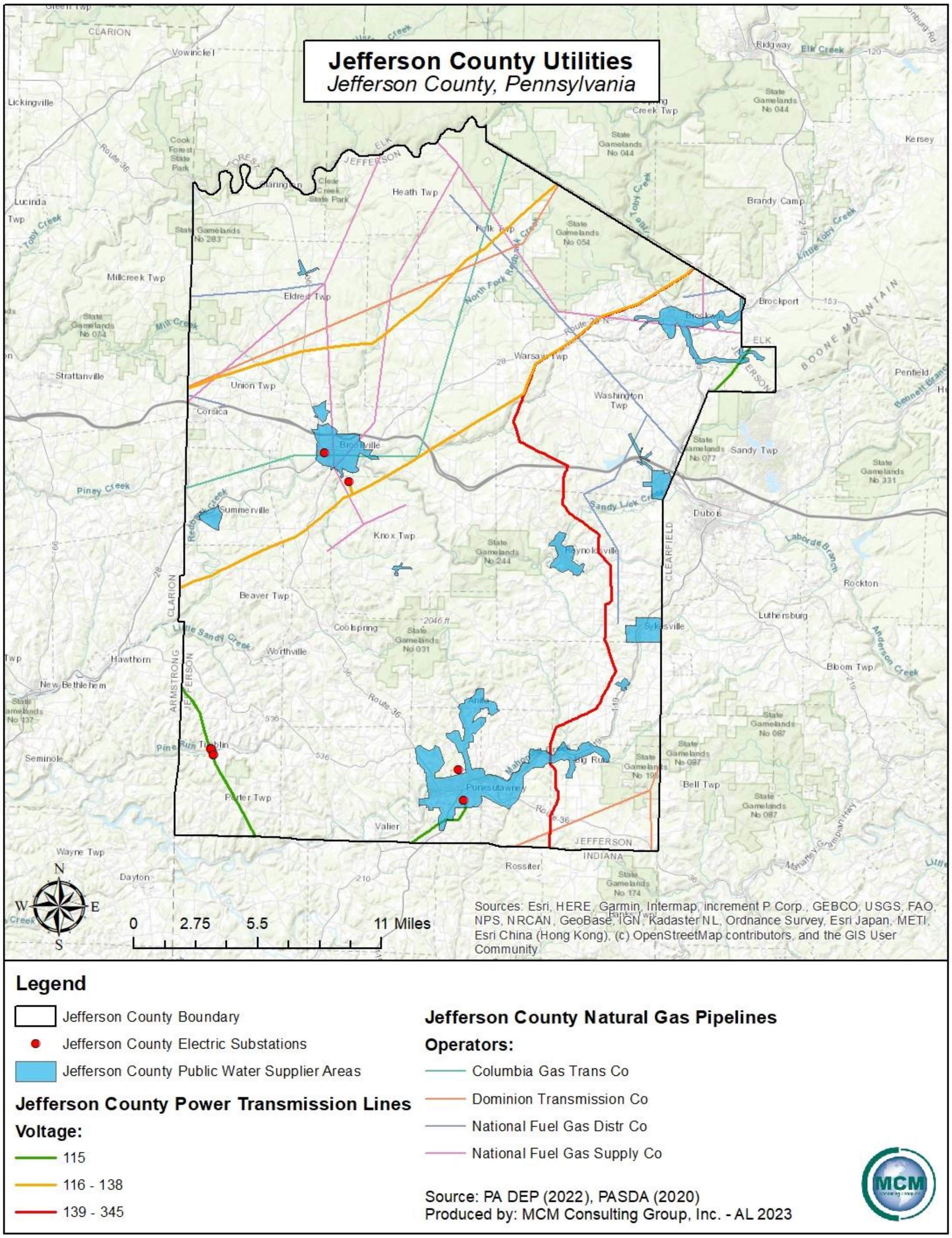
- Deterioration of line and facilities
- Puncturing the distribution lines by humans (either intentional or accidental)
- Coastal or winter storms
- Extreme heat or cold events
- Transportation accidents

Communications:

Interruptions in communications could be caused as a secondary effect of storms or high winds, infrastructure failure, or by humans (intentional or accidental). A loss of communications by emergency services would be devastating to the population of Jefferson County if 9-1-1 calls could not be received, or if emergency units could not be dispatched properly and/or timely.

No data regarding economic impacts from utility interruptions in Jefferson County are available. However, utility interruptions can cause economic impacts stemming from lost income, spoiled food and other goods, costs to the owners or operators of the utility facilities, and costs to government and community service groups.

Figure 56 - Jefferson County Utilities



4.4. Hazard Vulnerability Summary

4.4.1. Methodology

Ranking hazards helps communities set goals and priorities for mitigation based on their vulnerabilities. A risk factor (RF) is a tool used to measure the degree of risk for identified hazards in a particular planning area. The RF can also assist local community officials in ranking and prioritizing hazards that pose the most significant threat to a planning area based on a variety of factors deemed important by the planning team and other stakeholders involved in the hazard mitigation planning process. The RF system relies mainly on historical data, local knowledge, general consensus from the planning team and information collected through development of the hazard profiles included in Section 4.3. The RF approach produces numerical values that allow identified hazards to be ranked against one another; the higher the RF value, the greater the hazard risk.

RF values were obtained by assigning varying degrees of risk to five categories for each of the hazards profiled in the HMP update. Those categories include *probability*, *impact*, *spatial extent*, *warning time and duration*. Each degree of risk was assigned a value ranging from one to four. The weighting factor agreed upon by the planning team is shown in *Table 69 – Risk Factor Approach Summary Equation* To calculate the RF value for a given hazard, the assigned risk value for each category was multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the following example equation:

Table 69 - Risk Factor Approach Summary - Equation

Risk Factor Value = [(Probability x .30) + (Impact x .30) +(Spatial Extent x .20) + (Warning Time x .10) + (Duration x .10)]

Table 70 – Risk Factor Approach Summary summarizes each of the five categories used for calculating a RF for each hazard. According to the weighting scheme applied, the highest possible RF value is 4.0.

Table 70 - Risk Factor Approach Summary

Summary of Risk Factor Approach Used to Rank Hazard Risk.				
RISK ASSESSMENT CATEGORY	DEGREE OF RISK			WEIGHT VALUE
	LEVEL	CRITERIA	INDEX	
PROBABILITY *What is the likelihood of a hazard event occurring in a given year?*	**UNLIKELY**	LESS THAN 1% ANNUAL PROBABILITY	1	30%
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 10 &100% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	100% ANNUAL PROBABILTY	4	
IMPACT *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	**MINOR**	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	30%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK.	3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.	4	
SPATIAL EXTENT *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	**NEGLIGIBLE**	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	3	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	4	
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	**MORE THAN 24 HRS**	SELF-DEFINED *(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	1	10%
	12 TO 24 HRS	SELF-DEFINED	2	
	6 TO 12 HRS	SELF-DEFINED	3	
	LESS THAN 6 HRS	SELF-DEFINED	4	
DURATION *How long does the hazard event usually last?*	**LESS THAN 6 HRS**	SELF-DEFINED *(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	1	10%
	LESS THAN 24 HRS	SELF-DEFINED	2	
	LESS THAN 1 WEEK	SELF-DEFINED	3	
	MORE THAN 1 WEEK	SELF-DEFINED	4	

4.4.2. Ranking Results

Using the methodology described in Section 4.4.1, *Table 71 – Risk Factor Assessment* lists the risk factor calculated for each of twenty-six potential hazards identified in the 2023 HMP. Hazards identified as *high* risk have risk factors greater than 2.5. Risk factors ranging from 2.0 to 2.4 were deemed *moderate* risk hazards. Hazards with risk factors 1.9 and less are considered *low* risk.

Table 71 - Risk Factor Assessment

Jefferson County Hazard Ranking Based on RF Methodology.							
HAZARD RISK	HAZARD NATURAL(N) OR HUMAN-CAUSED (H)	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		PROBABILITY	ECONOMIC IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	Emergency Services	4	4	4	1	4	3.7
	Utility Interruption	4	2	3	4	3	3.1
	Winter Storm/Nor'easter	4	2	4	2	2	3
	Opioid Epidemic	4	3	2	4	1	3
	Drought	3	2	4	1	4	2.8
	Radon	4	1	4	1	4	2.8
	Windstorm	4	2	2	4	2	2.8
	Flood	2	3	3	2	3	2.6
	Flash Flood	3	2	2	4	2	2.5
	Environmental Hazards: Transportation	4	1	2	4	2	2.5
	Transportation Accidents	4	2	1	4	1	2.5
MODERATE	Hurricane, Tropical Storm	2	2	4	1	3	2.4
	Dam Failure	1	3	2	2	2	2
	Cyberterrorism	3	1	1	4	2	2
	Urban Fire and Explosion	2	2	1	4	2	2
LOW	Tornado	2	1	2	4	2	1.9
	Wildfire	2	1	2	4	2	1.9
	Earthquake	1	1	4	3	1	1.8

Jefferson County Hazard Ranking Based on RF Methodology.							
HAZARD RISK	**HAZARD NATURAL(N) OR HUMAN-CAUSED (H)**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR (RF)**
		PROBABILITY	**ECONOMIC IMPACT**	**SPATIAL EXTENT**	**WARNING TIME**	**DURATION**	
	Subsidence and Sinkhole	1	2	2	4	1	**1.8**
	Blighted Properties	2	1	2	1	4	**1.8**
	Landslide	2	1	1	4	2	**1.7**
	Environmental Hazards: Fixed Facilities	2	1	1	4	2	**1.7**
	Levee Failure	1	2	2	2	2	**1.7**
	Terrorism	1	1	1	4	2	**1.4**
	Ice Jam	1	1	2	1	2	**1.3**

Based on these results, there are eleven high risk hazards, four moderate risk hazards, and eleven low risk hazards in Jefferson County. Mitigation actions were developed for all high, moderate, and low risk hazards (see section 6.4). The threat posed to life and property for moderate and high-risk hazards is considered significant enough to warrant the need for establishing hazard-specific mitigation actions. Mitigation actions related to future public outreach and emergency service activities are identified to address low risk hazard events.

A risk assessment result for the entire county does not mean that each municipality is at the same amount of risk to each hazard. *Table 72 – Countywide Risk Factor Assessment* shows the different municipalities in Jefferson County and what the individual municipality ranking is for each hazard. This table was developed by the consultant based on the findings in the hazard profiles located in sections 4.3.1 through 4.3.19.

Table 72 - Countywide Risk Factor

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Emergency Services	Utility Interruption	Winter Storm/Nor' easter	Opioid Epidemic	Drought	Radon	Windstorm	Flood	Flash Flood
	3.7	**3.1**	**3.0**	**3.0**	**2.8**	**2.8**	**2.8**	**2.6**	**2.5**
Barnett Township	Not completed by municipality.								
Beaver Township	3.7	3.3	3.4	2.2	1.6	1.2	3.1	3.4	3.4
Bell Township	3.4	3.1	3.0	3.0	2.7	2.3	2.5	2.9	2.9
Big Run Borough	Not completed by municipality.								
Brockway Borough	3.7	3.2	3.0	2.8	2.8	2.8	2.8	2.5	2.7
Brookville Borough	3.4	3.1	3.0	3.0	2.8	2.8	2.8	2.7	2.7
Clover Township	N/A	2.8	2.0	N/A	2.2	1.3	2.1	2.1	2.1
Corsica Borough	3.1	2.9	3.2	2.3	2.5	1.8	3.3	1.1	2.1
Eldred Township	3.7	3.0	3.3	2.5	2.8	2.8	3.1	2.6	2.7
Falls Creek Borough	4.0	3.3	3.3	3.0	2.9	1.5	3.3	2.0	2.0
Gaskill Township	Not completed by municipality.								
Heath Township	3.7	3.8	4.0	3.0	2.5	1.9	4.0	2.0	2.7
Henderson Township	Not completed by municipality.								
Knox Township	3.1	3.1	3.0	2.0	N/A	3.4	2.8	2.1	N/A
McCalmont Township	3.7	2.6	3.0	2.7	2.8	2.6	2.6	2.6	2.5
Oliver Township	3.8	3.1	3.1	3.1	1.6	2.2	2.7	2.1	1.7
Perry Township	3.2	3.2	3.5	2.5	3.6	2.4	3.3	3.1	2.3
Pine Creek Township	3.7	3.1	3.0	2.4	2.8	2.3	3.0	2.1	2.5
Polk Township	3.4	3.0	3.0	3.0	2.5	2.8	3.0	2.0	2.4

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Emergency Services	Utility Interruption	Winter Storm/Nor' easter	Opioid Epidemic	Drought	Radon	Windstorm	Flood	Flash Flood
	3.7	**3.1**	**3.0**	**3.0**	**2.8**	**2.8**	**2.8**	**2.6**	**2.5**
Porter Township	3.5	3.2	3.6	2.2	3.4	2.5	3.5	2.8	22.0
Punxsutawney Borough	3.7	3.1	3.0	3.0	2.8	2.8	2.8	2.6	2.5
Reynoldsville Borough	3.7	3.0	2.9	3.5	2.6	2.6	2.9	3.0	2.8
Ringgold Township	3.8	3.1	3.3	2.2	2.8	2.5	2.9	2.0	2.0
Rose Township	3.7	2.6	4.0	2.6	3.1	2.8	4.0	4.0	3.7
Snyder Township	3.7	3.1	3.0	2.9	2.8	2.6	3.0	2.3	2.8
Summerville Borough	Not completed by municipality.								
Sykesville Borough	3.7	3.1	3.3	3.0	3.1	2.8	3.0	3.2	3.3
Timblin Borough	Not completed by municipality.								
Union Township	Not completed by municipality.								
Warsaw Township	Not completed by municipality.								
Washington Township	3.7	3.3	3.0	3.0	2.8	2.5	2.9	2.8	2.6
Winslow Township	Not completed by municipality.								
Worthville Borough	3.6	2.3	1.8	1.0	1.0	1.0	2.2	1.9	1.9
Young Township	N/A	2.4	2.4	N/A	2.4	2.3	2.4	1.9	1.9

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Environmental Hazards - Transportation	Transportation Accidents	Hurricane, Tropical Storm	Dam Failure	Cyberterrorism	Urban Fire and Explosion	Tornado	Wildfire	Earthquake
	2.5	**2.5**	**2.4**	**2.0**	**2.0**	**2.0**	**1.9**	**1.9**	**1.9**
Barnett Township	Not completed by municipality.								
Beaver Township	1.8	1.3	2.0	1.0	1.0	2.0	3.2	1.4	1.0
Bell Township	2.5	2.4	2.0	1.7	1.3	2.2	2.5	2.3	1.3
Big Run Borough	Not completed by municipality.								
Brockway Borough	1.7	2.7	2.4	1.4	2.0	1.9	1.9	1.3	1.9
Brookville Borough	2.7	2.7	2.4	2.3	2.0	2.6	1.9	2.2	1.8
Clover Township	1.0	2.2	2.4	1.0	1.3	1.7	2.1	1.6	1.7
Corsica Borough	2.7	2.3	1.7	1.0	1.6	2.2	2.7	1.6	2.6
Eldred Township	2.2	2.2	1.9	1.7	1.6	2.4	1.9	3.0	1.3
Falls Creek Borough	2.1	2.2	2.4	1.5	1.3	2.2	2.7	2.6	1.3
Gaskill Township	Not completed by municipality.								
Heath Township	2.0	1.9	1.9	1.4	1.9	2.0	2.5	3.5	1.2
Henderson Township	Not completed by municipality.								
Knox Township	N/A	1.3	2.4	N/A	1.4	1.4	1.9	1.9	1.3
McCalmont Township	2.5	2.5	2.4	2.0	2.0	2.0	1.9	1.9	1.8
Oliver Township	1.5	1.5	1.0	1.0	1.6	1.0	3.4	2.4	1.0
Perry Township	2.8	2.5	1.6	1.4	1.6	1.3	1.9	1.3	1.7
Pine Creek Township	3.1	3.0	2.2	1.5	1.7	2.0	1.9	1.9	1.5
Polk Township	2.5	1.9	2.4	1.7	3.2	2.9	2.7	2.5	2.2
Porter Township	2.9	2.6	1.5	1.0	1.6	1.7	2.7	1.6	1.5

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Environmental Hazards - Transportation	Transportation Accidents	Hurricane, Tropical Storm	Dam Failure	Cyberterrorism	Urban Fire and Explosion	Tornado	Wildfire	Earthquake
	2.5	**2.5**	**2.4**	**2.0**	**2.0**	**2.0**	**1.9**	**1.9**	**1.9**
Punxsutawney Borough	2.5	2.5	2.4	2.0	2.0	2.0	1.9	1.9	1.9
Reynoldsville Borough	2.5	2.7	1.7	1.3	1.8	2.0	2.0	1.6	1.3
Ringgold Township	2.3	2.2	2.6	1.8	1.7	1.4	2.0	2.4	1.9
Rose Township	2.9	2.7	2.0	1.0	2.6	2.4	4.0	4.0	2.2
Snyder Township	2.5	2.5	2.4	2.6	2.0	2.0	3.0	2.0	1.8
Summerville Borough	Not completed by municipality.								
Sykesville Borough	2.9	2.5	2.4	2.0	2.0	2.0	2.6	2.0	1.9
Timblin Borough	Not completed by municipality.								
Union Township	Not completed by municipality.								
Warsaw Township	Not completed by municipality.								
Washington Township	2.4	2.2	2.4	2.0	1.7	1.7	2.2	1.9	1.8
Winslow Township	Not completed by municipality.								
Worthville Borough	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.2	1.0
Young Township	2.1	2.4	2.1	1.7	1.9	1.9	2.4	2.3	1.9

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk							
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR							
JURISDICTION	Subsidence and Sinkhole	Blighted Properties	Landslide	Environmental Hazards – Fixed Facility	Levee Failure	Terrorism	Ice Jam
	1.8	1.8	1.7	1.7	1.7	1.4	1.3
Barnett Township	Not completed by municipality.						
1.0Beaver Township	1.0	1.3	1.0	1.0	1.0	1.0	1.0
Bell Township	1.8	1.8	1.8	2.5	1.7	1.3	2.9
Big Run Borough	Not completed by municipality.						
Brockway Borough	1.6	1.3	1.3	1.8	2.8	1.4	1.3
Brookville Borough	1.8	2.3	1.7	1.7	1.7	1.4	1.6
Clover Township	1.6	N/A	1.8	1.0	1.0	1.3	2.1
Corsica Borough	3.2	2.4	2.0	2.5	1.0	2.1	1.7
Eldred Township	1.5	1.7	1.7	1.7	1.1	1.4	1.1
Falls Creek Borough	1.4	1.8	1.4	1.5	1.5	1.3	1.0
Gaskill Township	Not completed by municipality.						
Heath Township	1.2	2.4	1.1	1.0	1.0	1.0	1.0
Henderson Township	Not completed by municipality.						
Knox Township	N/A	1.6	N/A	N/A	N/A	N/A	N/A
McCalmont Township	2.2	1.8	1.7	1.7	1.2	1.4	1.3
Oliver Township	1.0	1.3	1.0	1.3	1.0	1.0	1.3
Perry Township	1.1	1.2	1.6	1.6	1.1	1.7	2.3
Pine Creek Township	2.2	1.3	1.4	1.7	1.1	1.4	1.1
Polk Township	2.1	2.7	1.5	2.2	2.0	2.6	1.8
Porter Township	1.5	1.5	1.4	1.3	1.0	1.4	1.1

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk							
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR							
JURISDICTION	Subsidence and Sinkhole	Blighted Properties	Landslide	Environmental Hazards – Fixed Facility	Levee Failure	Terrorism	Ice Jam
	1.8	1.8	1.7	1.7	1.7	1.4	1.3
Punxsutawney Borough	1.8	1.8	1.7	1.7	1.7	1.4	1.3
Reynoldsville Borough	1.3	2.4	1.3	1.7	1.2	1.4	2.4
Ringgold Township	1.9	1.9	1.6	2.0	1.4	1.4	1.3
Rose Township	2.6	1.6	1.5	1.8	1.0	1.4	1.7
Snyder Township	1.8	1.8	1.7	2.8	2.6	1.4	1.9
Summerville Borough	Not completed by municipality.						
Sykesville Borough	3.2	1.9	1.7	1.7	1.7	1.4	1.2
Timblin Borough	Not completed by municipality.						
Union Township	Not completed by municipality.						
Warsaw Township	Not completed by municipality.						
Washington Township	1.8	2.1	1.4	1.7	1.7	1.4	1.3
Winslow Township	Not completed by municipality.						
Worthville Borough	1.0	1.2	1.2	1.0	1.0	1.4	1.0
Young Township	1.8	N/A	1.8	2.1	1.7	1.9	1.9

4.4.3. Potential Loss Estimates

Based on various kinds of available data, potential loss estimates were established for flooding. Estimates provided in this section are based on HAZUS-MH, version MR4, geospatial analysis, and previous events. Estimates are considered *potential* in that they generally represent losses that could occur in a countywide hazard scenario. In events that are localized, losses may be lower, while regional events could yield higher losses.

Potential loss estimates have four basic components, including:

Replacement Value: Current cost of returning an asset to its pre-damaged condition, using present-day cost of labor and materials.
Content Loss: Value of building's contents, typically measured as a percentage of the building replacement value.
Functional Loss: The value of a building's use or function that would be lost if it were damaged or closed.
Displacement Cost: The dollar amount required for relocation of the function (business or service) to another structure following a hazard event.

Flooding Loss Estimation:

Flooding is a high-risk natural hazard in Jefferson County. The estimation of potential loss in this assessment focuses on the monetary damage that could result from flooding. The potential property loss was determined for each municipality and for the entire county. The quantity of commercial and residential structures in each Jefferson County municipality is outlined in section 4.3.3 of the flooding hazard profile.

MCM Consulting Group, Inc. conducted a countywide flood study using the Hazards U.S. Multi-Hazard (HAZUS-MH) software that is provided by the Federal Emergency Management Agency. This software is a standardized loss estimation software deriving economic loss, building damage, content damage and other economic impacts that can be used in local flood mitigation planning activities.

Using HAZUS-MH, total building-related losses from a 1%-annual-chance flood in Jefferson County are estimated to equal 1.72 million dollars, with 57% of that coming from residential homes. Total economic loss, including replacement value, content loss, functional loss, and displacement cost, from a countywide 1%-annual-chance flood are estimated to equal 6.72 million dollars.

4.4.4. Future Development and Vulnerability

The 2020 census population for Jefferson County is 44,492 which is 708 fewer than the 2010 census. There was an overall decrease of 1.6% in population based on the data. Eleven municipalities have seen population increases while the remaining twenty-three had decreases in the period between 2010 and 2020, as identified in *Table 73 – 2010 – 2020 Population Change.*

Table 73 - 2010 - 2020 Population Change

Population Change in Jefferson County from 2010-2020			
Municipality	**2010 Census**	**2020 Census**	**Percent of Change 2010-2020**
Barnett Township	254	234	-7.9%
Beaver Township	498	465	-6.6%
Bell Township	2,056	2,010	-2.2%
Big Run Borough	624	647	3.7%
Brockway Borough	2,072	2,276	9.8%
Brookville Borough	3,924	3,995	1.8%
Clover Township	448	432	-3.6%
Corsica Borough	357	319	-10.6%
Eldred Township	1,226	1,271	3.7%
Falls Creek Borough	989	994	0.5%
Gaskill Township	708	673	-4.9%
Heath Township	124	114	-8.1%
Henderson Township	1,816	1,940	6.8%
Knox Township	1,042	1,011	-3.0%
McCalmont Township	1,082	1,137	5.1%
Oliver Township	1,083	1,000	-7.7%
Perry Township	1,226	1,248	1.8%
Pine Creek Township	1,352	1,323	-2.1%
Polk Township	265	284	7.2%
Porter Township	305	295	-3.3%
Punxsutawney Borough	5,962	5,769	-3.2%
Reynoldsville Borough	2,759	2,549	-7.6%
Ringgold Township	741	773	4.3%
Rose Township	1,255	1,156	-7.9%
Snyder Township	2,547	2,370	-6.9%
Summerville Borough	528	504	-4.5%
Sykesville Borough	1,157	1,115	-3.6%
Timblin Borough	157	147	-6.4%
Union Township	855	844	-1.3%
Warsaw Township	1,424	1,368	-3.9%
Washington Township	1,926	1,892	-1.8%
Winslow Township	2,622	2,546	-2.9%
Worthville Borough	67	80	19.4%
Young Township	1,749	1,711	-2.2%

Population Change in Jefferson County from 2010-2020			
Municipality	**2010 Census**	**2020 Census**	**Percent of Change 2010-2020**
TOTAL	**45,200**	**44,492**	-1.6%
Source: United States Census Bureau (2022), 2020 Census Data			

The 2021 census estimates indicates that there are approximately 22,058 housing units in Jefferson County, Pennsylvania. Of those, 80.4% of the structures are occupied-housing units. The county-wide population changes indicate a potential alteration to overall hazard vulnerability. Municipalities that undergo widespread population reductions may have more difficulty meeting personnel demands than would expanding jurisdictions. However, certain municipalities experienced significant resident increases and, thus, may be more vulnerable to certain hazards due to development and residential growth. Although expanding population zones may be especially vulnerable to hazards outlined in section 4.3 of this hazard mitigation plan update, natural and human caused hazards could potentially occur at any time regardless of population change. The Jefferson County Hazard Mitigation Local Planning Team will conduct annual reviews of this plan and the impacts all hazards have on the county and new development every year and within a time frame after a disaster or major emergency.

5. Capability Assessment

5.1. Update Process Summary

The capability assessment is an evaluation of Jefferson County's governmental structure, political framework, legal jurisdiction, fiscal status, policies and programs, regulations, ordinances, and resource availability. Each category is evaluated for its strengths and weaknesses in responding to, preparing for, and mitigating the effects of the profiled hazards. A capability assessment is an integral part of the hazard mitigation planning process. Here, the county and municipalities identify, review, and analyze what they are currently doing to reduce losses and identify the framework necessary to implement new mitigation actions. This information will help the county and municipalities evaluate alternative mitigation actions and address shortfalls in the mitigation plan.

A capabilities assessment survey was provided to the municipalities during the planning process at meetings held with Jefferson County officials. These meetings were designed to seek input from the key county and municipal stakeholders on legal, fiscal, technical, and administrative capabilities of all jurisdictions. As such, the capabilities assessment helps guide the implementation of mitigation projects and will help evaluate the effectiveness of existing mitigation measures, policies, plans, practices, and programs.

Throughout the planning process, the mitigation local planning team considered the county's thirty-four municipalities. Pennsylvania municipalities have their own governing bodies, pass, and enforce their own ordinances and regulations, purchase equipment and manage their own resources, including critical infrastructure. Therefore, these capability assessments consider the various characteristics and capabilities of municipalities under study.

The evaluation of the following categories – political framework, legal jurisdictions, fiscal status, policies and programs and regulations and ordinances – allows the mitigation planning team to determine the viability of certain mitigation actions. The capability assessment analyzes what Jefferson County, and its municipalities have the capacity to do and provides an understanding of what must be changed to mitigate loss.

Jefferson County has several resources it can access to implement hazard mitigation initiatives including emergency response measures, local planning and regulatory tools, administrative assistance and technical expertise, fiscal capabilities and participation in local, regional state, and federal programs. The presence of these resources enables community resiliency through actions taken before, during and after a hazardous event. While the capability assessment serves as a good instrument for identifying local capabilities, it also provides a means for recognizing gaps and weaknesses that can be resolved through future mitigation actions. The results of this assessment lend critical information for developing an effective mitigation strategy.

5.2. Capability Assessment Findings

Twenty-six of the thirty-four municipalities in Jefferson County completed and submitted a capability assessment survey. The results of the survey were collected, aggregated, and analyzed.

5.2.1. Planning and Regulatory Capability

Municipalities have the authority to govern more restrictively than state and county minimum requirements as long as they are compliant with all criteria established in the Pennsylvania Municipalities Planning Code (MPC) and their respective municipal codes. Municipalities can develop their own policies and programs and implement their own rules and regulations to protect and serve their residents. Local policies and programs are typically identified in a comprehensive plan, implemented through a local ordinance, and enforced by the governmental body or its appointee.

Municipalities regulate land use via the adoption and enforcement of zoning, subdivision, land development, building codes, building permits, floodplain management and/or stormwater management ordinances. When effectively prepared and administered, these regulations can lead to an opportunity for hazard mitigation. For example, the National Flood Insurance Program (NFIP) established minimum floodplain management criteria, and adoption of the Pennsylvania Floodplain Management Act (Act 166 of 1978) established even higher floodplain management standards. A municipality must adopt and enforce these minimum criteria to be eligible for participation in the NFIP. Municipalities have the option of adopting a single-purpose ordinance or incorporating these provisions into their zoning, subdivision, and land development, or building codes; thereby mitigating the potential impacts of local flooding. This capability assessment details the existing Jefferson County and municipal legal capabilities to mitigate the profiled hazards. It identifies the county and the municipal existing planning documents and their hazard mitigation potential. Hazard mitigation recommendations are, in part, based on the information contained in the assessment.

Building Codes

Building codes are important in mitigation because they are developed for a region of the country in respect to the hazards that exist in that area. Consequently, structures that are built according to applicable codes are inherently resistant to many hazards, such as intense winds, floods, and earthquakes; and can help mitigate regional hazards, such as wildfires. In 2003, Pennsylvania implemented the Uniform Construction Code (UCC) (Act 45), a comprehensive building code that establishes minimum regulations for most new construction, including additions and renovations to existing structures.

The code applies to almost all buildings, excluding manufactured and industrialized housing (which are covered by other laws), agricultural buildings, and certain utility and miscellaneous buildings. The UCC requires builders to use materials and methods that have been professionally evaluated for quality and safety, as well as inspections to ensure compliance.

The initial election period, during which all of Pennsylvania's 2,565 municipalities were allowed to decide whether the UCC would be administered and enforced locally, officially closed on August 7, 2004. The codes adopted for use under the UCC are the 2003 International Codes issued by the International Code Council (ICC). Supplements to the 2003 codes have been adopted for use over the years since.

If a municipality has "opted in", all UCC enforcement is local, except where municipal (or third party) code officials lack the certification necessary to approve plans and inspect commercial construction for compliance with UCC accessibility requirements. If a municipality has "opted-out", the Pennsylvania Department of Labor and Industry is responsible for all commercial code enforcement in that municipality; and all residential construction is inspected by independent third-party agencies selected by the owner. The department also has sole jurisdiction for all state-owned buildings no matter where they are located. Historical buildings may be exempt from such inspections and Act 45 provides quasi-exclusion from UCC requirements.

The municipalities in Jefferson County adhere to the standards of the Pennsylvania Uniform Code (Act 45). Thirteen of the municipalities in Jefferson County reported as opted-in on building code enforcement, although all municipalities enforce their own code enforcement.

Zoning Ordinance

Article VI of the Municipalities Planning Code (MPC) authorizes municipalities to prepare and enact zoning to regulate land use. Its regulations can apply to the permitted use of land, the height and bulk of structures, the percentage of a lot that may be occupied by buildings and other impervious surfaces, yard setbacks, the density of development, the height and size of signs, and the parking regulations. A zoning ordinance has two parts, including the zoning map that delineates zoning districts and the text that sets forth the regulations that apply to each district.

Subdivision Ordinance

Subdivision and land development ordinances include regulations to control the layout of streets, the planning lots and the provision of utilities and other site improvements. The objectives of subdivision and land development ordinance are to coordinate street patterns, to assure adequate utilities and other improvements are provided in a manner that will not pollute streams, wells and/or soils, to reduce traffic congestions, and to provide sound design standards as a guide to developers, the elected officials, planning commissions, and other municipal officials. Article V of the Municipality Planning Code authorizes municipalities to prepare and enact a subdivision and land development ordinance. Subdivision and land development ordinances provide for the division and improvement of land. Of the thirty-four municipalities in Jefferson County, some have subdivision/land use ordinances, some have zoning regulations – some have both and some have neither.

Stormwater Management Plan/Stormwater Ordinance

The proper management of storm water runoff can improve conditions and decrease the chance of flooding. Pennsylvania's Storm Water Management Act (Act 167) confers on counties the responsibility for development of watershed plans. The Act specifies that counties must complete their watershed storm water plans within two years following the promulgation of these guidelines by the Pennsylvania Department of Environmental Protection (PA DEP), which may grant an extension of time for any county for the preparation and adoption of plans. Counties must prepare the watershed plans in consultation with municipalities and residents. This is to be accomplished through the establishment of a watershed plan advisory committee. The counties must also establish a mechanism to periodically review and revise watershed plans. Plan revisions must be done every five years or sooner, if necessary.

Municipalities have an obligation to implement the criteria and standards developed in each watershed storm water management plan by amending or adopting laws and regulation for land use and development. The implementation of storm water management criteria and standards at the local level are necessary since municipalities are responsible for local land use decisions and planning. The degree of detail in the ordinance depends on the extent of existing and projected land development. The watershed storm water management plan is designed to aid the municipality in setting standards for the land uses it has proposed. Municipalities within rapidly developing watersheds will benefit from the watershed storm water management plan and will use the information for sound land use considerations. A major goal of the watershed plan and the attendant municipal regulations is to prevent future drainage problems and avoid the aggravation of existing problems. All municipalities in Jefferson County have adopted the county's stormwater management plan.

Comprehensive Plan

A comprehensive plan is a policy document that states objectives and guides the future growth and physical development of a municipality. The comprehensive plan is a blueprint for housing, transportation, community facilities, utilities, and land use. It examines how the past led to the present and charts the community's future path. The Pennsylvania Municipalities Code (MPC Act 247 of 1968, as reauthorized and amended) requires counties to prepare and maintain a county comprehensive plan. In addition, the MPC requires counties to update the comprehensive plan every ten years.

Regarding hazard mitigation planning, Section 301.a(2) of the Municipality Planning Code requires comprehensive plans to include a plan for land use, which, among other provisions, suggests that the plan consider floodplains and other areas of special hazards and other similar uses. The MPC also requires comprehensive plans to include a plan for community facilities and services that recommends considering storm drainage and floodplain management.

Jefferson County last updated its comprehensive plan in 2018.

Article III of the MPC enables municipalities to prepare a comprehensive plan: however, development of a comprehensive plan is voluntary. Five of the thirty-four municipalities in Jefferson County indicated that they have adopted a comprehensive plan.

Capital Improvements Plan

The capital improvements plan is a multi-year policy guide that identifies needed capital projects and is used to coordinate the financing and timing of public improvements. Capital improvements relate to streets, storm water systems, water distribution, sewage treatment, and other major public facilities. A capital improvements plan should be prepared by the respective county's planning department and should include a capital budget. This budget identifies the highest priority projects recommended for funding in the next annual budget. The capital improvements plan is dynamic and can be tailored to specific circumstances.

Participation in the National Flood Insurance Program (NFIP)

Floodplain management is the operation of programs or activities that may consist of both corrective and preventative measures for reducing flood damage, including but not limited to such things as emergency preparedness plans, flood control works, and flood plain management regulations. The Pennsylvania Floodplain Management Act (Act 166) require every municipality identified by the Federal Emergency Management Agency (FEMA) to participate in the National Flood Insurance Program and permits all municipalities to adopt floodplain management regulations. It is in the interest of all property owners in the floodplain to keep development and land usage within the scope of the floodplain regulations for their community. This helps keep insurance rates low and ensures that the risk of flood damage is not increased by property development.

The Pennsylvania Emergency Management Agency (PEMA) was appointed by legislation in September 2021 to coordinate the Commonwealth NFIP and employ the State NFIP Coordinator. For many years prior, these roles were held by the Pennsylvania Department of Community and Economic Development (DCED), which still offers support to communities through its Floodplain Mitigation Program. PEMA provides communities, based on CFR Title 44, Section 60.3 level of regulations, with a suggested ordinance document to assist municipalities in meeting the minimum requirements of the NFIP along with the Pennsylvania Flood Plain Management Act (Act 166). These suggested or model ordinances contain provisions that are more restrictive than state and federal requirements. Suggested provisions include, but are not limited to, the below.

1. Prohibiting manufactured homes in the floodway
2. Prohibiting manufactured homes within the area measured fifty feet landward from the top-of-bank of any watercourse within a special flood hazard area
3. Special requirements for recreational vehicles within the special flood hazard area
4. Special requirement for accessory structure
5. Prohibiting new construction and development within the area measured fifty feet landward from the top-of-bank of any watercourse within a special flood hazard area
6. Providing the county conservation district an opportunity to review and comment on all applications and plans for any proposed construction or development in any identified floodplain area

Act 166 mandates municipal participation in, and compliance with, the NFIP. It also establishes higher regulatory standards for new or substantially improved structures which are used for the production or storage of dangerous materials (as defined by Act 166) by prohibiting them in the floodway. Additionally, Act 166 established the requirement that a special permit be obtained prior to any construction or expansion of any manufactured home park, hospital, nursing home, jail and prison if said structure is located within a special flood hazard area.

The NFIP's Community Rating System (CRS) provides discounts on flood insurance premiums in those communities that establish floodplain management programs that go beyond NFIP minimum requirements. Under the CRS, communities receive credit for more restrictive regulations, acquisition, relocation, or flood-proofing of flood prone buildings, preservation of open space, and other measures that reduce flood damages or protect the natural resources and functions of floodplains.

The CRS was implemented in 1990 to recognize and encourage community floodplain management activities that exceed the minimum NFIP standards. Section 541 of the 1994 Act amends Section 1315 of the 1968 Act to codify the Community Rating System in the NFIP. The section also expands the CRS goals to specifically include incentives to reduce the risk of flood-related erosion and to encourage measures that protect natural and beneficial floodplain functions. These goals have been incorporated into the CRS and communities now receive credit toward premium reductions for activities that contribute to them.

Under the Community Rating System, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet a minimum of three of the following CRS goals.

1. Reduce flood losses
2. Protect public health and safety
3. Reduce damage to property
4. Prevent increases in flood damage from new construction
5. Reduce the risk of erosion damage
6. Protect natural and beneficial floodplain functions
7. Facilitate accurate insurance rating
8. Promote the awareness of flood insurance

There are ten Community Rating System classes. Class 1 requires the most credit points and gives the largest premium reduction; class 10 receives no premium reduction. CRS premium discounts on flood insurance range from 5% for Class 9 communities up to 45% for Class 1 communities. The CRS recognizes eighteen credible activities, organized under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness.

FEMA Region III makes available to communities an ordinance review checklist which lists required provisions for floodplain management ordinances. This checklist helps communities develop an effective floodplain management ordinance that meets federal requirements for participation in the NFIP. PEMA provides communities, based on their 44 CFR 60.3 level of regulations, with a suggested ordinance document to assist municipalities in meeting the minimum requirements of the NFIP and the Pennsylvania Flood Plain Management Act (Act 166). Act 166 mandates municipal participation in and compliance with the NFIP. It also established higher regulatory standards for hazardous materials and high-risk land uses. As new Digital Flood Insurance Rate Maps (DFIRMs) are published, the Pennsylvania State NFIP Coordinator at DCED works with communities to ensure the timely and successful adoption of an updated floodplain management ordinance by reviewing and providing feedback on existing and draft ordinances.

Ten municipalities indicated that they participate in the National Flood Insurance Program. Currently, no municipalities have completed or started to complete the CRS program. Additional research will be conducted on the CRS program and mitigation actions will be developed in support of the CRS.

To spread awareness as well as capture participation levels, all municipalities were instructed to complete an NFIP survey provided by the Federal Emergency Management Agency. In total, twenty-five municipalities submitted an NFIP survey. These surveys can be found in Appendix C of this plan.

5.2.1. Administrative and Technical Capability

There are eleven boroughs and twenty-three townships within Jefferson County. Each of these municipalities conducts it daily operations and provides various community services according to local needs and limitations. Some of these municipalities have formed cooperative agreements and work jointly with their neighboring municipalities to provide services such as police protection, fire and emergency response, infrastructure maintenance, and water supply management. Other municipalities choose to operate independently and provide such services internally. Municipalities vary in staff size, resource availability, fiscal status, service provision, constituent population, overall size, and vulnerability to the profile hazards. Technical capability relates to an adequacy of knowledge and technical expertise of local government employees or the ability to contract resources for this expertise in order to effectively execute mitigation activities. Common examples of skill sets, and technical personnel needed for hazard mitigation include: planners with knowledge of land development and management practices, engineers or professionals trained in construction practices related to buildings and/or infrastructure (e.g. building inspectors), planners or engineers with an understanding of natural and/or human caused hazards, emergency managers, floodplain managers, land surveyors, scientists familiar with hazards in the community, staff with education of expertise to assess community vulnerability to hazards, personnel skilled in geographic information systems, resource development staff or grant writers, fiscal staff to handle complex grant application processes.

County Planning Commission

In Pennsylvania, planning responsibilities traditionally have been delegated to each county and local municipality through the Municipalities Planning Code (MPC). A planning agency acts as an advisor to the governing body on matters of community growth and development. A governing body may appoint individuals to serve as legal or engineering advisors to the planning agency. In addition to the duties and responsibilities authorized by Article II of the MPC, a governing body may, by ordinance, delegate approval authority to a planning agency for subdivision and land development applications. A governing body has considerable flexibility, not only as to which powers and duties are assigned to a planning agency, but also what form an agency will possess. A governing body can create a planning commission, a planning department, or both. The Jefferson County Planning Commission assists all municipalities in the county as needed.

Municipal Engineer

A municipal engineer performs duties as directed in the areas of construction, reconstruction, maintenance and repair of streets, roads, pavements, sanitary sewers, bridges, culverts, and other engineering work. The municipal engineer prepares plans, specifications and estimates of the work undertaken by the township. Most municipalities in Jefferson County have a municipal engineer under contract to perform these duties.

Personnel Skilled in GIS or FEMA HAZUS Software

A geographic information system (GIS) is an integrated, computer-based system designed to capture, store, edit, analyze, and display geographic information. Some examples of uses for GIS technology in local government are land records management, land use planning, infrastructure management, and natural resources planning. A GIS automates existing operations such as map production and maintenance, saving a great deal of time and money. The GIS also includes information about map features such as the capacity of a municipal water supply or the acres of public land. GIS data is managed, maintained, and developed by a Jefferson County GIS Department, which is available to assist all the county's municipalities. GIS data is an important tool to use in hazard mitigation planning and is instrumental in assessing the risk of municipalities to various hazards.

Emergency Management Coordinator

Emergency management is a comprehensive, integrated program of mitigation, preparedness, response, and recovery for emergencies/disasters of any kind. No public or private entity is immune to disasters and no single segment of society can meet the complex needs of a major emergency or disaster on its own. Hence, the National Preparedness Goal of 2011 also defines what it means for the whole community to be prepared for all types of disasters and emergencies and lists five mission areas which support preparedness: prevention, protection, mitigation, response, and recovery – doubling the emphasis on mitigation activities in an emergency management program.

The Pennsylvania Emergency Management Services Code (PA Title 35) requires Jefferson County and its municipalities to have an emergency management coordinator.

The Jefferson County Department of Emergency Services coordinates countywide emergency management efforts. Each municipality has a designated local emergency management coordinator who possesses a unique knowledge of the impact hazardous events have on their community.

A municipal emergency management coordinator is responsible for emergency management – preparedness, response, recovery, and mitigation within his/her respective authority having jurisdiction (AHJ). The responsibilities of the emergency management coordinator are outlined in PA Title 35 §7633.

- Prepare and maintain a current disaster emergency management plan
- Establish, equip, and staff an emergency operations center
- Provide individual and organizational training programs
- Organize and coordinate all locally available manpower, materials, supplies, equipment, and services necessary for disaster emergency readiness, response, and recovery
- Adopt and implement precautionary measures to mitigate the anticipated effects of a disaster
- Cooperate and coordinate with any public and private agency or entity
- Provide prompt information regarding local disaster emergencies to appropriate commonwealth and local officials or agencies and the public
- Participate in all tests, drills, and exercises, including remedial drills and exercises, scheduled by the agency or by the federal government

PA Title 35 requires that all municipalities in the Commonwealth have a local emergency operations plan (EOP) which is updated every two years. Nineteen of the thirty-four Jefferson County municipalities indicated that they have adopted the county EOP. The notification and resource section of the plan was developed individually by each municipality.

Federal Agency Assistance

There are many federal agencies that can provide technical assistance for mitigation activities, and these include, but are not limited to:

- United States Army Corps of Engineers (USACE)
- Department of Housing and Urban Development (HUD)
- Department of Agriculture (DOA)
- Economic Development Administration
- Emergency Management Institute (EMI)
- Environmental Protection Agency (EPA)
- Federal Emergency Management Agency (FEMA)
- Small Business Administration (SBA)

State Agency Assistance

There are many commonwealth agencies that can provide technical assistance for mitigation activities, and these include but are not limited to:

- Pennsylvania Emergency Management Agency (PEMA)
- Pennsylvania Department of Community and Economic Development
- Pennsylvania Department of Conservation and Natural Resources
- Pennsylvania Department of Environmental Protection

Political Capability

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to mitigate hazard events. The adoption of hazard mitigation measures may be seen as an impediment to growth and economic development. In many cases, mitigation may not generate interest among local officials when compared with competing priorities. Therefore, the local political climate must be considered when designing mitigation strategies, as it could be the most difficult hurdle to overcome in accomplishing the adoption or implementation of specific actions.

The capability assessment survey was used to capture information on each jurisdiction's political capability. Survey respondents were asked to identify examples of political capability, such as guiding development away from hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (i.e., building codes, floodplain management ordinances, etc.). These examples were used to guide respondents in scoring their community on a scale of "unwilling" (0) to "very willing" (5) to adopt policies and programs that reduce hazard vulnerabilities. *Table 74 – Jefferson County Community Political Capability* summarizes the results of political capability.

Table 74 - Jefferson County Community Political Capability

Jefferson County Community Political Capability						
Municipality Name	**Capability Ranking**					
	0	**1**	**2**	**3**	**4**	**5**
Barnett Township	Not Reported by Municipality					
Beaver Township				X		
Bell Township	X					
Big Run Borough		X				

Jefferson County Community Political Capability						
Municipality Name	**Capability Ranking**					
	0	**1**	**2**	**3**	**4**	**5**
Brockway Borough	Not Reported by Municipality					
Brookville Borough	Not Reported by Municipality					
Clover Township						X
Corsica Borough	Not Reported by Municipality					
Eldred Township	Not Reported by Municipality					
Falls Creek Borough	Not Reported by Municipality					
Gaskill Township	Not Reported by Municipality					
Heath Township	Not Reported by Municipality					
Henderson Township				X		
Knox Township				X		
McCalmont Township				X		
Oliver Township				X		
Perry Township	Not Reported by Municipality					
Pine Creek Township						X
Polk Township					X	
Porter Township		X				
Punxsutawney Borough	Not Reported by Municipality					
Reynoldsville Borough	Not Reported by Municipality					
Ringgold Township				X		
Rose Township				X		
Snyder Township	Not Reported by Municipality					
Summerville Borough	Not Reported by Municipality					
Sykesville Borough	Not Reported by Municipality					
Timblin Borough	Not Reported by Municipality					
Union Township				X		
Warsaw Township			X			
Washington Township				X		
Winslow Township	Not Reported by Municipality					
Worthville Borough		X				
Young Township						X

Self-Assessment

In addition to the inventory and analysis of specific local capabilities, the capability assessment survey required each local jurisdiction to conduct its own self-assessment of its capability to effectively implement hazard mitigation activities. As part of this process, county and municipal officials were encouraged to consider the barriers to implementing proposed mitigation strategies in addition to mechanisms that could enhance or further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as wither "L = Limited", "M = Moderate", or "H = High." *Table 75 – Capability Self-Assessment Matrix* summarizes the results of the self-assessment survey. Thirty-two municipalities returned this section of the assessment completed.

Table 75 - Capability Self-Assessment Matrix

Jefferson County Capability Self-Assessment Matrix				
Municipality Name	Capability Category			
	Planning and Regulatory Capability	Administrative and Technical Capability	Fiscal Capability	Community Political Capability
Barnett Township	Not Reported by Municipality			
Beaver Township	L	L	L	L
Bell Township	M	M	L	L
Big Run Borough	L	L	L	L
Brockway Borough	Not Reported by Municipality			
Brookville Borough	Not Reported by Municipality			
Clover Township	L	L	L	L
Corsica Borough	L	L	L	L
Eldred Township	Not Reported by Municipality			
Falls Creek Borough	H	M	M	M
Gaskill Township	Not Reported by Municipality			
Heath Township	L	L	L	Not Reported
Henderson Township	L	H	M	Not Reported
Knox Township	L	L	L	L
McCalmont Township	L	L	L	L
Oliver Township	L	L	L	L
Perry Township	L	L	L	L
Pine Creek Township	M	M	M	M

Jefferson County Capability Self-Assessment Matrix				
Municipality Name	Capability Category			
	Planning and Regulatory Capability	Administrative and Technical Capability	Fiscal Capability	Community Political Capability
Polk Township	M	M	L	M
Porter Township	L	L	L	L
Punxsutawney Borough	L	L	L	L
Reynoldsville Borough	L	L	L	L
Ringgold Township	M	L	L	L
Rose Township	L	L	L	L
Snyder Township	Not Reported by Municipality			
Summerville Borough	Not Reported by Municipality			
Sykesville Borough	L	L	L	L
Timblin Borough	Not Reported by Municipality			
Union Township	L	L	L	L
Warsaw Township	L	L	L	L
Washington Township	L	L	L	L
Winslow Township	Not Reported by Municipality			
Worthville Borough	L	L	L	L
Young Township	M	M	L	M

In addition to the institutional capability of the municipal government structure described above, the county itself can engage in mitigation activities. The county has its own staff, resources, budget, and objectives, which may or may not be like those of its constituent municipalities. Therefore, the county has its own capabilities to mitigate the profiled hazards through planning and coordination of local mitigation efforts. The Jefferson County GIS Department can provide needed skills in the analysis of geographic data. Other local organizations that can and do act as partners include the Jefferson County Planning Commission, the Jefferson County Conservation District, the Jefferson County Development Department, the Jefferson County Area Agency on Aging, business development organizations, and historical or cultural agencies.

Existing Limitations

Funding has been identified as the largest limitation for a municipality to complete mitigation activities. The acquisition of grants is the best way to augment this process the municipalities. The county and municipality representatives will need to rely on regional, state, and federal partnerships for future financial assistance. Development of intra-county regional partnerships and intra-municipality regional partnerships will bolster this process.

5.2.3. Financial Capability

Fiscal capability is significant to the implementation of hazard mitigation activities. Every jurisdiction must operate within the constraints of limited financial resources. The decision and capacity to implement mitigation-related activities is often strongly dependent on the presence of financial resources. While some mitigation actions are less costly than others, it is important that money is available locally to implement policies and projects. Financial resources are particularly important if communities are trying to take advantage of state or federal mitigation grant funding opportunities that require local-match contributions. Based on survey results, most municipalities within the county perceive fiscal capability to be low. The following information pertains to various financial assistance programs relevant to hazard mitigation.

State and Federal Grants

During the 1960s and 1970s state and federal grants-in-aid were available to finance many municipal programs, including streets, water and sewer facilities, airports, parks, and playgrounds. During the early 1980s, there was a significant change in federal policy, based on rising deficits and a political philosophy that encouraged states and local governments to raise their own revenues for capital programs. The result has been a growing interest in "creative financing".

Grant programs that may be utilized to accomplish hazard mitigation objectives include the: Pennsylvania Department of Community and Economic Development Community Development Block Grant (CDBG); Land Use Planning and Technical Assistance (LUPTAP); Shared Municipal Services (SMS); Community Revitalization (CR) and Floodplain Land Use Assistance Programs; the PA DEP's Growing Greener; Act 167 Stormwater Management; Source Water Protection; and Flood Protection Programs. The Flood Protection Programs include the PA DCNR's Community Conservation Partnership Program, PEMA's Pre-Disaster Mitigation (PDM) Grant, Flood Mitigation Assistance Grant Programs (FMA), and Hazard Mitigation Grant Program.

Below are some of the other state programs that may provide financial support for mitigation activities:

- DCED Flood Mitigation Program
- DCED H2O PA Flood Control Projects
- DCED H2O PA High Hazard Unsafe Dam Projects
- DCED H2O PA Water Supply, Sanitary Sewer and Storm Water Projects

- DCED PA Small Water and Sewer
- DCNR Community Conservation Partnerships Program
- DCNR Pennsylvania Heritage Areas Program
- DCNR Pennsylvania Recreational Trails Program
- DCNR Land and Water Conservation Fund

Below are some of the federal programs that may provide financial support for mitigation activities:

- FEMA Community Assistance Program – State Support Services Element (CAP-SSSE)
- FEMA Community Disaster Loan Program
- FEMA Community Rating System
- FEMA Emergency Management Performance Grants (EMPG)
- FEMA Environmental Planning and Historic Preservation Program (EHP)
- FEMA Flood Mitigation Assistance Program
- FEMA Hazard Mitigation Grant Program (HMGP)
- FEMA Individuals and Households Program (IHAP)
- FEMA National Dam Safety Program
- FEMA National Flood Insurance Program
- FEMA Pre-Disaster Mitigation Program
- FEMA Public Assistance Program (PA)
- FEMA Regional Catastrophic Preparedness Grant Program
- FEMA Repetitive Flood Claims Program (RFC)
- FEMA Severe Repetitive Loss Grant Program
- USACE Continuing Authorities Program
- USACE Flood Plain Management Services Program (FPMS)
- USACE Inspection of Completed Works Program (ICW)
- USACE National Levee Safety Program
- USACE Planning Assistance to States
- USACE Rehabilitation and Inspection Program (RIP)

Capital Improvement Financing

Because most of the capital investments involve the outlay of substantial funds, local governments can seldom pay for these facilities through annual appropriations in the annual operating budget. Therefore, numerous techniques have evolved to enable local government to pay for capital improvements over a time period exceeding one year. Public finance literature and state laws governing local government finance classify techniques that are used to finance capital improvements. The techniques include revenue bonds, lease-purchase, authorities and special district, current revenue (pay-as-you-go); reserve funds; and tax increment financing. Most municipalities have very limited local tax funds for capital projects. Grants and other funding are always priorities.

Indebtedness through General Obligation Bonds

Some projects may be financed with general obligation bonds. With this method, the jurisdiction's taxing power is pledged to pay interest and principal to retire debt. General obligation bonds can be sold to finance permanent types of improvements, such as schools, municipal buildings, parks, and recreational facilities. Voter approval for this may be required.

Municipal Authorities

Municipal authorities are most often used when major capital investments are required. In addition to sewage treatment, municipal authorities have been formed for water supply, airports, bus transit systems, swimming pools, and other purposes. Joint authorities have the power to receive grants, borrow money, and operate revenue generating programs. Municipal authorities are authorized to sell bonds, acquire property, sign contracts, and take similar actions. Authorities are governed by authority board members, who are appointed by the elected officials of the member municipalities.

Sewer Authorities

Sewer authorities include multi-purpose authorities with sewer projects. They sell bonds to finance acquisition of existing systems for construction, extension, or system improvement. Sewer authority operating revenues originate from user fees. The fee frequently is based on the amount of water consumed and payment is enforced by the ability to terminate service by the imposition of liens against real estate. In areas with no public water supply, flat rate charges are calculated on average use per dwelling unit.

Water Authorities

Water authorities are multi-purpose authorities with water projects, many of which operate both water and sewer systems. The financing of water systems for lease back to the municipality is one of the principal activities of the local government facilities' financing authorities. An operating water authority issues bonds to purchase existing facilities to construct, extend, or improve a system. The primary source of revenue is user fees based on metered usage. The cost of construction or extending water supply lines can be funded by special assessments against abutting property owners. Tapping fees also help fund water system capital costs. Water utilities are also directly operated by municipal governments and by privately owned public utilities regulated by the Pennsylvania Public Utility Commission. The Pennsylvania Department of Environmental Protection has a program to assist with consolidating small water systems to make system upgrades more cost effective.

U.S. Department of Agriculture Circuit Riding Program (Engineer)

The Circuit Riding Program is an example of intergovernmental cooperation. This program offers municipalities the ability to join to accomplish a common goal. The circuit rider is a municipal engineer who serves several small municipalities simultaneously. These are municipalities that may be too small to hire a professional engineer for their own operations yet need the skills and expertise the engineer offers. Municipalities can jointly obtain what no one municipality could obtain on its own.

5.2.4. Education and Outreach

The Jefferson County Department of Emergency Services conducts public outreach at public events to update the citizens and visitors of the county on natural and human-caused hazards. The county conservation district also conducts outreach on various activities and projects in the county.

Education activities that directly impact hazard mitigation in Jefferson County predominantly revolve around the first responders. Providing fire, medical, search and rescue training, and education enhances the response and recovery capabilities of response agencies in the county. Newly appointed emergency management coordinators are trained in both Duties and Responsibilities and damage assessment – which includes a discussion on mitigation; this training can be translated into teaching municipal employees or local emergency services to assist them during a disaster.

The county also has several websites and social media accounts that can educate residents about hazard mitigation and risk while also communicating information in the event of a disaster:

Jefferson County Department of Emergency Management:
https://www.jeffersoncountypa.com/departments/emergency-management/

Jefferson County: https://www.jeffersoncountypa.com/

The Jefferson County GIS Department website has an education and outreach capability, particularly with the county map viewer, which could be updated to include hazard mitigation data. The websites of the Jefferson County Department of Emergency Services and the Jefferson County Planning Commission also post information to educate residents, particularly in disaster preparedness, floodplain management, and zoning requirements. The Jefferson County Planning Commission currently provides access to planning documents and educational brochures about the benefits of planning and helpful guides. The DES also holds quarterly Local Emergency Planning Committee (LEPC) meetings that are open to the public, which serve as another means to conduct outreach and educate the public about hazard mitigation.

Education and outreach on the NFIP are necessary. With new regulations in flood-plain management, updated digital flood insurance rate maps and new rates for insurance policies, education, and outreach on the NFIP would assist the program. The Jefferson County Local Planning Team will identify actions necessary to complete this.

5.2.5. Plan Integration

Plan integration recognizes that hazard mitigation is most effective when it works in efficient coordination with other plans, regulations, and programs. Plan integration promotes safe, resilient growth, effective management, an overall reduction of risk, by ensuring that the goals and actions established in the Hazard Mitigation Plan are included in the comprehensive planning efforts so they can affect future land use and development. Some of the most important areas of planning and regulatory capabilities which hazard mitigation goals and actions should be integrated include comprehensive plans, the hazard mitigation plans from all surrounding or encompassing areas, EOPs, building codes, floodplain ordinances, subdivision, land development ordinances, stormwater management plans and ordinances, and zoning ordinances. All of these tools provide mechanisms for the implementation of adopted mitigation strategies.

Jefferson County Comprehensive Plan

Overview

Comprehensive plans establish the overall vision, goals, and objectives for a community's growth. The Jefferson County Comprehensive Plan was adopted by the Jefferson County Commissioners on July 11, 2018. The plan is a collaborative effort between the stakeholders in the region and contains both regional priorities and action plans for each county in the region. The plan establishes countywide goals and objectives, describes environmental and demographic characteristics, identifies potential capital improvement projects, and inventories existing planning initiatives and tools in the county.

As part of the update process, the goals and objectives in the 2018 Comprehensive Plan were reviewed, and those that are currently supportive of hazard mitigation goals and principles were identified. The plan also identified opportunities to integrate goals and objectives from the 2018 Hazard Mitigation Plan and 2023 HMP Update into the next update of the comprehensive plan.

Recommendations for Continued and Future Integration

As discussed, many of the goals and objectives outlined in the Jefferson County Comprehensive Plan are related to the hazard mitigation risks and goals established in the HMP. Several could be revised to include updated information from this HMP. Additionally, the comprehensive plan can identify the places of higher vulnerability that are identified in this plan for all the high-risk hazards, and include objectives aimed at reducing the risk to these vulnerable areas. For example, an objective of the comprehensive plan could be to encourage elevation and flood proofing of structures in the Special Flood Hazard Area (SFHA) by seeking Flood Mitigation Assistance (FMA) grants and strictly enforcing floodplain management ordinances in certain communities (See Section 4.3.3 for Flooding and Flash Flooding information). Similarly, an objective for communities that are most vulnerable to subsidence and land failure could be to educate property owners about mine subsidence, associated risks, and actions to take in the event of an emergency. These types of objectives could also be created for medium-risk hazards when appropriate.

Another key opportunity for further integration of hazard mitigation into planning and regulatory tools is to incorporate hazard mitigation goals and objectives into the future Jefferson County Comprehensive Plan update.

6. Mitigation Strategy

6.1. Update Process Summary

Mitigation goals are general guidelines that explain what the county wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results. Mitigation objectives describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date. There were five goals and twenty-three objectives identified in the 2018 hazard mitigation plan. The 2023 Jefferson County Hazard Mitigation Plan Update has five goals and twenty objectives. Objectives have been added and arranged in order to associate them with the most appropriate goal. These changes are noted in *Table 76 – 2018 Mitigation Goals and Objectives Review*. These reviews are based on the five-year hazard mitigation plan review worksheet, which includes a survey on existing goals and objectives completed by the local planning team. Municipal officials then provided feedback on the changes to the goals and objectives via a mitigation strategy update meeting. Copies of these meetings and all documentation associated with the meetings are located in Appendix C.

Actions provide more detailed descriptions of specific work tasks to help the county and its municipalities achieve prescribed goals and objectives. There were thirteen actions identified in the 2018 mitigation strategy. A review of the 2018 mitigation actions was completed by the local planning team. The results of this review are identified in *Table 77 – 2018 Mitigation Actions Review*. Actions were evaluated by the local planning team with the intent of carrying over any actions that were not started or continuous for the next five years.

Table 76 - 2018 Mitigation Goals and Objectives Review

Jefferson County 2018 Mitigation Goals and Objectives		
GOAL Objective	**Description**	**Comment**
GOAL 1	Continue the current and implement new education and awareness programs and projects to prepare for, respond to, recover from, and mitigate natural and man-made hazards in Jefferson County.	**2023 Comment:** Changed to Goal 3. Conduct education, awareness, and outreach programs and projects to prepare for, respond to, recover from, and mitigate all hazards.
Objective 1.1	Improve public awareness of the hazards in Jefferson County through use of radio spots, newspaper articles, public service announcements and other methods.	**2023 Comment:** Changed to Objective 3.1. Improve public awareness of all hazards through the use of media and associated platforms.

Jefferson County 2018 Mitigation Goals and Objectives		
GOAL Objective	**Description**	**Comment**
Objective 1.2	Make available to the public an assortment of disaster preparedness brochures.	**2023 Comment:** Changed to Objective 3.2. Offer an assortment of disaster preparedness brochures and publications.
Objective 1.3	Make available to the public information about the availability and benefits of obtaining federal flood insurance.	**2023 Comment:** Changed to Objective 3.3. Conduct education and outreach to stakeholders regarding the National Flood Insurance Program.
Objective 1.4	Ensure that emergency response personnel are adequately trained to respond to flooding and other natural and man-caused hazards.	**2023 Comment:** Changed to Objective 3.4. Conduct emergency response and emergency management training to enhance response to all hazards.
Objective 1.5	Provide safe and effective evacuation routes during flooding.	**2023 Comment:** Changed to Objective 2.2. Provide safe and effective evacuation routes during flooding or other natural weather hazards in Jefferson County.
Objective 1.6	Improve communications between the public and emergency management services.	**2023 Comment:** Changed to Objective 4.1. Moved under Goal 4.
Objective 1.7	Provide county residents with adequate warning of potential floods and other hazards.	**2023 Comment:** Changed to Objective 2.3.
GOAL 2	Continue to work with county agencies and local jurisdictions to implement plans and regulations to reduce the effects of natural and man-made hazards in Jefferson County.	**2023 Comment:** Changed to Goal 4. Coordinate and collaborate with all hazard mitigation stakeholders to develop, implement, and maintain regulations, ordinances, plans, and procedures to decrease the effects of all hazards.
Objective 2.1	Improve public and elected official's participation in the hazard mitigation process.	**2023 Comment:** Changed to Objective 4.2.

Jefferson County 2018 Mitigation Goals and Objectives		
GOAL Objective	**Description**	**Comment**
Objective 2.2	Rank all the hazard mitigation forms. Review all hazard mitigation opportunity forms submitted by the thirty-four municipalities of Jefferson County and rank them according to a viable ranking system in order to best protect the citizens, businesses, and property in Jefferson County.	**2023 Comment:** This was removed as an objective.
Objective 2.3	Acquire the ability to use the Federal HAZUS program to improve the mitigation evaluation for Jefferson County. (See Appendix for initial HAZUS Risk Assessment Report).	**2023 Comment:** Changed to Objective 2.4 Acquire the ability to use the FEMA HAZUS-MH program to improve the mitigation evaluation for Jefferson County.
Objective 2.4	Encourage residents who own or rent structures which are at risk to flooding to buy flood insurance.	**2023 Comment:** This was changed to an action. 2.1.1.
Objective 2.5	Continue efforts to secure HazMat team for responding to hazardous materials incidents in Jefferson County.	**2023 Comment:** This was changed to an action. 1.1.2.
GOAL 3	Implement infrastructure projects that will increase resiliency and reduce the effects of natural and man-made hazards in Jefferson County.	**2023 Comment:** Implement hazard mitigation projects that will increase the resilience and reduce the effects of all hazards.
Objective 3.1	Increase water storage treatment distribution systems.	**2023 Comment:** Changed to Objective 1.2 Increase water storage treatment distribution systems, culverts, and sanitary sewer systems.
Objective 3.2	Reduce sanitary sewer deficiencies by installing new or additional systems.	**2023 Comment:** This was changed to an action. 1.2.1.
Objective 3.3	Reduce storm drainage deficiencies and installation of new or upgraded culverts where needed.	**2023 Comment:** This was changed to an action. 1.2.2.
Objective 3.4	Increase water related recreation needs.	**2023 Comment:** This was removed due to inapplicability.

Jefferson County 2018 Mitigation Goals and Objectives		
GOAL Objective	**Description**	**Comment**
Objective 3.5	Encourage mitigation on physical infrastructure after disaster in Jefferson County to reduce damages from hazard events.	**2023 Comment:** No Comment**.**
GOAL 4	Implement structural projects that will increase resiliency and reduce effect of natural and man-made hazards in Jefferson County.	**2023 Comment:** Absorbed into Goal 3.
Objective 4.1	Investigate structural solutions to flooding problems.	**2023 Comment:** This was changed to an action. 2.8.1.
Objective 4.2	Implement acquisition of flooded structures in Jefferson County.	**2023 Comment:** No Comment**.**
Objective 4.3	Implement acquisition of severe repetitive loss and repetitive loss structures that have been impacted by floods.	**2023 Comment:** No Comment**.**
Objective 4.4	Implement floodproofing measures for residential and non-residential structures that could be impacted from flooding.	**2023 Comment:** No Comment**.**
GOAL 5	Implement existing and new projects and programs to increase natural functions of ecosystems in Jefferson County.	**2023 Comment:** Incorporated into objective 2.8 Investigate ways to restore or preserve natural resources and open space in municipalities to improve their flood control functions and increase natural functions of ecosystems in Jefferson County.
Objective 5.1	Investigate ways to restore natural resources and open space in municipalities to improve their flood control functions.	**2023 Comment:** Change to actions.
Objective 5.2	Continue to implement projects using Jefferson County Soil and Water Conservation District current programs to increase functions of natural resources.	**2023 Comment:** Change to actions.

Table 77 - 2018 Mitigation Actions Review

Jefferson County Mitigation Actions Review Worksheet						
	Status					
Existing Mitigation Actions *(2018 HMP)*	**No Progress/ Unknown**	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	***Review Comments***
1. Obtain additional operation, maintenance, inspection, height, length, and level of protection information for levees in Jefferson County for the next Hazard Mitigation Plan update.	X					**2023 Comment:** Unknown.
2. Issue county-wide advisory burn bans during drought periods when wildfire risks are highest and supply wildfire information to the public (brochures, news releases, etc.).			X			**2023 Comment:** No Comment**.**
3. Issue county-wide advisory water usage guidelines during times of drought and supply drought information to the public (brochures, news releases, etc.).			X			**2023 Comment:** No Comment**.**
4. Coordinate with the Pennsylvania Department of Transportation on winter storm response.			X			**2023 Comment:** No Comment**.**
5. Coordinate between county residents and utility companies on critical outage events.			X			**2023 Comment:** No Comment**.**
6. Collect data on flood vulnerable structures for use in future grant applications.	X					**2023 Comment:** Unknown.

Jefferson County Mitigation Actions Review Worksheet						
	Status					
Existing Mitigation Actions *(2018 HMP)*	No Progress/ Unknown	In Progress/Not Yet Complete	Continuous	Completed	Discontinued	*Review Comments*
7. Jefferson County Department of Emergency Services agency to continue ongoing training with LEPC four times a year.	X					**2023 Comment:** Unknown.
8. Coordinate with county GIS department for disaster planning, analysis during disaster event, mapping assistance data collection for grants.	X					**2023 Comment:** Unknown.
9. Coordinate with GIS and historic preservation staff to develop mitigation projects for historic properties in Jefferson County.	X					**2023 Comment:** Unknown.
10. Coordinated with State Police on anti-speeding measures to reduce traffic accidents on I-80.		X				**2023 Comment:** The state has kept this at 70mph.
11. Obtain literature (brochures) concerning hazards and place in public buildings to conduct education and outreach to residents and other stakeholders in the community.	X					**2023 Comment:** Unknown.
12. Increase public warning capabilities for all weather hazards.			X			**2023 Comment:** No Comment**.**

Jefferson County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	*Status*					*Review Comments*
	No Progress/ Unknown	In Progress/Not Yet Complete	Continuous	Completed	Discontinued	
13. When funding becomes available, perform acquisitions, elevations, relocations, and foundation stabilizations on hazard-prone homes and commercial structures as appropriate. Provide support to jurisdictions with grant opportunities.	X					**2023 Comment:** Unknown

6.2. Mitigation Goals and Objectives

Based on results of the goals and objectives evaluation exercise and input from the local planning team, a list of five goals and twenty corresponding objectives were developed. *Table 78 – 2023 Goals and Objectives* details the mitigation goals and objectives established for the 2023 Jefferson County Hazard Mitigation Plan.

Table 78 - 2023 Goals and Objectives

Jefferson County 2023 Mitigation Goals and Objectives	
Goal / Objective	**Description**
Goal 1	**Reduce the potential impact and losses stemming from natural and human caused hazards.**
Objective 1.1	Ensure that emergency response personnel are adequately secured or trained to respond to natural and human caused hazards, to include flooding.
Objective 1.2	Increase water storage treatment distribution systems, culverts, and sanitary sewer systems.
Objective 1.3	Encourage mitigation of physical infrastructure before and after disaster in Jefferson County to reduce damages from hazard events.
Goal 2	**Reduce impacts of flooding, flash flooding, ice jam flooding, or other natural weather hazards in Jefferson County and all watersheds.**

Jefferson County 2023 Mitigation Goals and Objectives	
Goal / Objective	**Description**
Objective 2.1	Make available to the public information about the availability and benefits of obtaining federal flood insurance.
Objective 2.2	Provide safe and effective evacuation routes during flooding or other natural weather hazards in Jefferson County.
Objective 2.3	Provide county residents with adequate warning of potential floods and other hazards.
Objective 2.4	Acquire the ability to use the FEMA HAZUS-MH program to improve the mitigation evaluation for Jefferson County.
Objective 2.5	Implement acquisition of flooded structures in Jefferson County.
Objective 2.6	Acquire, elevate, demolish, or demolish/reconstruct flood prone properties to remove or mitigate risks to homeowners and property including severe repetitive loss and repetitive loss structures.
Objective 2.7	Implement floodproofing measures for residential and non-residential structures that could be impacted from flooding.
Objective 2.8	Investigate ways to restore or preserve natural resources and open space in municipalities to improve their flood control functions and increase natural functions of ecosystems in Jefferson County.
Goal 3	**Conduct education, awareness, and outreach programs and projects to prepare for, respond to, recover from, and mitigate all hazards.**
Objective 3.1	Improve public awareness of all hazards through the use of media and associated platforms.
Objective 3.2	Offer an assortment of disaster preparedness brochures and publications.
Objective 3.3	Conduct education and outreach to stakeholders regarding the National Flood Insurance Program.
Objective 3.4	Conduct emergency response and emergency management training to enhance response to all hazards.
Goal 4	**Coordinate and collaborate with all hazard mitigation stakeholders to develop, implement, and maintain regulations, ordinances, plans, and procedures to decrease the effects of all hazards.**
Objective 4.1	Improve communications between the public and emergency management services.

Jefferson County 2023 Mitigation Goals and Objectives	
Goal / Objective	**Description**
Objective 4.2	Improve public and elected official's participation in the hazard mitigation process.
Goal 5	**Participate in FEMA's High-Hazard Potential Dam Program (HHPD).**
New Objective 5.1	Educate Jefferson County municipalities, property owners, and businesses about FEMA's HHPD program.
New Objective 5.2	Reduce long-term vulnerabilities from eligible high-hazard potential dams that pose an unacceptable risk to the public.
New Objective 5.3	Identify, by area, locations in Jefferson County that could potentially be impacted by FEMA's HHPD program.

Goal 5 and Objective 5.1, Objective 5.2, and Objective 5.3 relate to multiple mitigation actions in *Table 80 – 2023 Mitigation Action Plan*. Action 5.1.1 relates to Objective 5.1, Action 5.2.1 relates to Objective 5.2, and Action 5.3.1 and 5.3.2 relates to Objective 5.3. All three of the mitigation actions are covered by Goal 5 of the goals and objectives for the 2023 Hazard Mitigation Plan. These mitigations reduce the vulnerability of county populations and structures by educating the public on the HHPD program, enhancing local policies and procedures for HHPD planning, and digitizing dam inundation areas for future analysis and prevention of losses.

6.3. Identification and Analysis of Mitigation Techniques

This section includes an overview of alternative mitigation actions based on the goals and objectives identified in Section 6.2. There are four general mitigation strategy techniques to reducing hazard risks.

- Planning and regulations
- Structure and infrastructure
- Natural systems protection
- Education and awareness

Planning and Regulations: These actions include government authorities, policies or codes that influence the way land and buildings are developed and built. The following are some examples.

- Comprehensive plans
- Land use ordinances
- Subdivision regulations

- Development review
- Building codes and enforcement
- National Flood Insurance Program and Community Rating System
- Capital improvement programs
- Open space preservation
- Stormwater management regulations and master plans

The planning and regulations technique will protect and reduce the impact of specific hazards on new and existing buildings by improving building code standards and regulating new and renovation construction. The improved building codes will decrease the impact of risk hazards. Subdivision and land development enhancements will also augment this process. Ensuring that municipalities participate in the National Flood Insurance Program and encourage participation in the Community Rating System will decrease the impact as well.

Structure and infrastructure implementation: These actions involve modifying existing structures and infrastructure or constructing new structures to reduce hazard vulnerability. The following are examples:

- Acquisitions and elevations of structures in flood prone areas
- Utility undergrounding
- Structural retrofits
- Floodwalls and retaining walls
- Detention and retention structures
- Culverts
- Safe rooms

Structure and infrastructure implementation is a technique that removes or diverts the hazard from structure or protects the structure from a specific hazard. The new or renovated structures are therefore protected or have a reduced impact of hazards.

Natural Systems Protection: These are actions that minimize damage and losses and also preserve or restore the functions of natural systems. They include the following:

- Erosion and sediment control
- Stream corridor restoration
- Forest management
- Conservation easements
- Wetland restoration and preservation

Natural resource protection techniques allow for the natural resource to be used to protect or lessen the impact on new or renovated structures through the management of these resources. Utilization and implementation of the examples above will protect new and existing buildings and infrastructure.

Education and Awareness: These are actions to inform and educate citizens, elected officials and property owners about hazards and potential ways to mitigate them and may also include participation in national programs. Examples of these techniques include the following.

- Radio and television spots
- Websites with maps and information
- Real estate disclosure
- Provide information and training
- NFIP outreach
- StormReady
- Firewise communities

The education and awareness technique will protect and reduce the impact of specific hazards on new and existing buildings through education of citizens and property owners on the impacts that specific hazards could have on new or renovated structures. This information will allow the owner to make appropriate changes or enhancements that will lessen or eliminate the impacts of hazards.

Table 79 – Mitigation Strategy Technique Matrix provides a matrix identifying the mitigation techniques used for all low, moderate, and high-risk hazards in the county. The specific actions associated with these techniques are included in *Table 80 – 2023 Mitigation Action Plan*.

Table 79 - Mitigation Strategy Technique Matrix

Jefferson County Mitigation Strategy Technique Matrix				
Hazard	MITIGATION TECHNIQUE			
	Planning and Regulations	Structure and Infrastructure	Natural Systems Protection	Education and Awareness
Blighted	X			X
Cyberterrorism	X			X
Dam Failure	X			X
Drought	X		X	X
Earthquake	X		X	X
Emergency Services	X			X
Environmental Hazards: Fixed Facility	X			X
Environmental Hazards: Transportation	X			X
Flash Flood	X	X	X	X
Flood	X	X	X	X
Hurricane/Tropical Storm	X		X	X
Ice Jam Flood	X		X	X

Jefferson County Mitigation Strategy Technique Matrix				
Hazard	MITIGATION TECHNIQUE			
	Planning and Regulations	Structure and Infrastructure	Natural Systems Protection	Education and Awareness
Landslide	X		X	X
Levee Failure	X			X
Opioid Epidemic	X			X
Radon Exposure	X		X	X
Subsidence/Sinkhole	X			X
Terrorism	X			X
Tornado	X		X	X
Transportation Accidents	X			X
Urban Fire and Explosion	X			X
Utility Interruption	X	X		X
Wildfire	X		X	X
Windstorm	X		X	X
Winter Storm/Nor'easter	X		X	X

6.4. Mitigation Action Plan

The Jefferson County Hazard Mitigation Local Planning Team (LPT) immediately began work on the mitigation strategy section of the 2023 hazard mitigation plan (HMP) update after the risk assessment section was completed. The LPT started this section by reviewing the 2018 HMP mitigation strategy section. A review of the previous goals, objectives, actions, and project opportunities documented in the 2018 HMP was conducted. The next step the LPT completed was the brainstorming of possible new actions based on new identified risks. The LPT compiled all this information for presentations to the municipalities.

MCM Consulting Group, Inc. completed municipality meetings at various time periods via virtual platforms or in-person meetings. During all these meetings, an overview of mitigation strategy was presented, and the municipalities were informed that they needed to have at least one hazard-related mitigation action for their municipality. All municipalities were invited to attend these meetings. Municipalities that were not able to join conference calls were contacted individually.

The municipalities were notified of draft mitigation actions and encouraged to provide new mitigation actions that could be incorporated into the plan. Municipalities were provided copies of their previously submitted mitigation opportunity forms and asked to determine if the projects were still valid. Municipalities were solicited for new project opportunities as well. All agendas, sign in sheets, and other support information from these meetings is included in Appendix C.

Mitigation measures for the 2023 Jefferson County HMP are listed in the mitigation action plan. *Table 80 – 2023 Mitigation Action Plan* is the 2023 Jefferson County Mitigation Action Plan.

This plan outlines mitigation actions and projects that comprise a strategy for Jefferson County. The action plan includes actions, a benefit and cost prioritization, a schedule for implementation, any funding sources to complete the action, a responsible agency or department and an estimated cost. All benefit and cost analysis were completed using the Pennsylvania Emergency Management Agency recommended analysis tool. The completed analysis is located in Appendix H. *Table 80 – 2023 Mitigation Action Plan* is a matrix that identifies the county and/or municipalities responsible for mitigation actions in the new mitigation action plan. *Table 81 – Municipal Hazard Mitigation Actions Checklist* shows which actions are tied to specific municipalities for responsibilities. *Table 82 – Objective to Action Checklist* shows that each mitigation objective has a mitigation action item related to it. *Table 83 – Actions Tied to Hazards* illustrates the specific actions that are tied to each hazard outlined in the hazard mitigation plan.

Funding acronym definitions:

FMA: Flood Mitigation Assistance Grant Program, administered by the Federal Emergency Management Agency

HMGP: Hazard Mitigation Grant Program, administered by the Federal Emergency Management Agency

BRIC: Building Resilient Infrastructure and Communities (BRIC) Program, administered by the Federal Emergency Management Agency

EMPG: Emergency Management Performance Grant, administered by the Federal Emergency Management Agency

HSGP: Homeland Security Grant Program, administered by the Federal Emergency Management Agency

HMEP: Hazardous Material Emergency Planning Grant, administered by the Pennsylvania Emergency Management Agency

HMRF: Hazardous Material Response Fund, administered by the Pennsylvania Emergency Management Agency

HMERP: Hazard Mitigation Emergency Response Program administered by the Pennsylvania Emergency Management Agency

HHPD: Rehabilitation of High-Hazard Potential Dams Grant Program, administered by the Federal Emergency Management Agency

Table 80 - 2023 Mitigation Action Plan

Jefferson County 2023 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
1.1.1	Education and Awareness	Jefferson County Department of Emergency Services agency to continue ongoing training with LEPC at least four times a year.	All hazards				2023 - 2028	Local	Jefferson County Department of Emergency Services
1.1.2	Local Plans and Regulations	Continue efforts to secure HazMat team for responding to hazardous materials incidents in Jefferson County.	Environmental Hazards				2023 - 2028	Local	Jefferson County Department of Emergency Services
1.1.3	Local Plans and Regulations	Examine and research cybersecurity directives, best practices, and resources from the United States Department of Homeland Security's (US DHS) Cybersecurity & Infrastructure Security Agency (CISA) to lessen the impact of a potential cybersecurity incident at the county.	Cyberterrorism				2023 - 2028	Local	Jefferson County IT Department
1.1.4	Local Plans and Regulations	Implement any directives, best practices, and resources from CISA deemed applicable to Jefferson County.	Cyberterrorism				2023 - 2028	Local	Jefferson County IT Department
1.2.1	Structural and Infrastructure	Reduce sanitary sewer deficiencies by installing new or additional systems.	Utility Interruptions				2023 - 2028	Local	Jefferson County Municipaliti es
1.2.2	Structural and Infrastructure	Reduce storm drainage deficiencies and installation of new or upgraded culverts where needed.	Flash Flooding				2023 - 2028	Local	Jefferson County Municipaliti es

Jefferson County 2023 Mitigation Action Plan									
Action Number	**Mitigation Actions**		**Hazard Vulnerability**	**Prioritization**			**Implementation**		
	Category	**Description/ Action Items**		**High**	**Medium**	**Low**	**Schedule**	**Funding**	**Local Champion**
1.3.1	Local Plans and Regulations	Coordinate with State Police on anti-speeding and other roadway safety measures to reduce traffic accidents on I-80.	Traffic Accidents				2023 - 2028	Local	Jefferson County Department of Emergency Services
1.3.2	Structural and Infrastructure	Coordinate between county residents and utility companies on critical outage events.	Utility Interruptions				2023 - 2028	Local	Jefferson County Municipalities
2.1.1	Education and Awareness	Encourage residents who own or rent structures which are at risk of flooding to buy flood insurance.	Flooding				2023 - 2028	Local	Jefferson County Municipalities
2.2.1	Local Plans and Regulations	Coordinate with the Pennsylvania Department of Transportation (PennDOT) on winter storm response.	Winter Storm				2023 - 2028	Local	Jefferson County Department of Emergency Services
2.3.1	Education and Awareness	Provide warning of potential floods and other hazards using multi-media platforms.	All Natural Hazards				2023 - 2028	Local	Jefferson County Department of Emergency Services Jefferson County Municipalities

Jefferson County 2023 Mitigation Action Plan									
Action Number	**Mitigation Actions**		**Hazard Vulnerability**	**Prioritization**			**Implementation**		
	Category	**Description/ Action Items**		**High**	**Medium**	**Low**	**Schedule**	**Funding**	**Local Champion**
2.4.1	Natural Systems Protection	Investigate the county's potential for obtaining FEMA's HAZUS-MH program. Install HAZUS-MH if appropriate.	Flooding				2023 - 2028	Local	Jefferson County Department of Emergency Services Jefferson County IT Department
2.5.1	Local Plans and Regulations	Collect data on flood vulnerable structures for use in future grant applications.	Flooding Flash Flooding Ice Jam Flooding				2023 - 2028	Local	Jefferson County Department of Emergency Services
2.6.1	Structural and Infrastructure	When funding becomes available, perform acquisitions, elevations, relocations, and foundation stabilizations on hazard-prone homes and commercial structures as appropriate. Provide support to jurisdictions with grant opportunities.	Flooding				2023 - 2028	Local	Jefferson County Government
2.7.1	Education and Awareness	Provide educational materials on floodproofing measures to residential and non-residential structures.	Flooding Flash Flooding Ice Jam Flooding				2023 - 2028	Local	Jefferson County Government Jefferson County Municipaliti es
2.8.1	Local Plans and Regulations	Investigate structural solutions to flooding problems.	Flooding Flash Flooding Ice Jam Flooding				2023 - 2028	Local	Jefferson County Municipaliti es

Jefferson County 2023 Mitigation Action Plan									
Action Number	**Mitigation Actions**		**Hazard Vulnerability**	**Prioritization**			**Implementation**		
	Category	**Description/ Action Items**		**High**	**Medium**	**Low**	**Schedule**	**Funding**	**Local Champion**
2.8.2	Natural System Protections	Review natural space and open spaces in Jefferson County, including emergent wetlands and forested wetlands, for their use in flood control and prevention.	Flooding Flash Flooding Ice Jam Flooding				2023 - 2028	Local	Jefferson County Conservation District
3.1.1	Education and Awareness	Provide information for all hazards in a variety of media methods for education and outreach to residents, visitors, and other stakeholders in the county.	All hazards				2023 - 2028	Local	Jefferson County Government
3.1.2	Education and Awareness	Increase public warning capabilities for all weather hazards.	All Natural Hazards				2023 - 2028	Local	Jefferson County Department of Emergency Services Jefferson County Municipalities
3.1.3	Education and Awareness	Issue county-wide advisory water usage guidelines during times of drought and supply drought information to the public (brochures, news releases, etc.).	Drought				2023 - 2028	Local	Jefferson County Department of Emergency Services Jefferson County Municipalities
3.1.4	Local Plans and Regulations	Issue county-wide advisory burn bans during drought periods when wildfire risks are highest and supply wildfire information to the public (brochures, news releases, etc.)	Wildfire				2023 - 2028	Local	Jefferson County Department of Emergency Services

Jefferson County 2023 Mitigation Action Plan									
Action Number	**Mitigation Actions**		**Hazard Vulnerability**	**Prioritization**			**Implementation**		
	Category	**Description/ Action Items**		**High**	**Medium**	**Low**	**Schedule**	**Funding**	**Local Champion**
3.1.5	Local Plans and Regulations	Implement the change in the domain for the Jefferson County website from a .com to a .gov web address for secure access.	All Hazards				2023 - 2028	Local	Jefferson County IT Department
3.2.1	Education and Awareness	Obtain literature (brochures and pamphlets) concerning hazards and distribute in public buildings to conduct education and outreach to all stakeholders in the community.	All Hazards				2023 - 2028	Local	Jefferson County Government Jefferson County Municipalities
3.3.1	Education and Awareness	Provide awareness and educational materials on the National Flood Insurance Program to residents obtaining permits for new or updates to construction projects and all stakeholders.	Flooding				2023 - 2028	Local	Jefferson County Municipalities
3.4.1	Education and Awareness	Encourage, support, and provide training throughout the county to emergency responders and emergency management coordinators.	Emergency Services				2023 - 2028	Local	Jefferson County Department of Emergency Services
4.1.1	Education and Awareness	Continue to use social media platforms to communicate between the Department of Emergency Services and the public on education and awareness of all hazards.	All Hazards				2023 - 2028	Local	Jefferson County Department of Emergency Services Jefferson County IT Department

Jefferson County 2023 Mitigation Action Plan									
Action Number	**Mitigation Actions**		**Hazard Vulnerability**	**Prioritization**			**Implementation**		
	Category	**Description/ Action Items**		**High**	**Medium**	**Low**	**Schedule**	**Funding**	**Local Champion**
4.1.2	Local Plans and Regulations	Continue to research, implement, and/or upgrade communication methods between the Department of Emergency Services and the county's emergency responders.	All Hazards				2023 - 2028	Local	Jefferson County Department of Emergency Services Jefferson County Municipalities
4.2.1	Local Plans and Regulations	Coordinate with county GIS department for disaster planning, analysis during a disaster event, or mapping assistance data collection for grants.	All Hazards				2023 - 2028	Local	Jefferson County Department of Emergency Services Jefferson County GIS Department
4.2.2	Local Plans and Regulations	Coordinate with GIS and historic preservation staff to develop mitigation projects for historic properties in Jefferson County.	All Hazards				2023 - 2028	Local	Jefferson County Department of Emergency Services Jefferson County GIS Department
4.2.3	Natural Systems Protection	Continue to implement projects using Jefferson County Soil and Water Conservation District current programs to protect the functions of natural resources.	All Natural Hazards				2023 - 2028	Local	Jefferson County Conservation District

Jefferson County 2023 Mitigation Action Plan									
Action Number	**Mitigation Actions**		**Hazard Vulnerability**	**Prioritization**			**Implementation**		
	Category	**Description/ Action Items**		**High**	**Medium**	**Low**	**Schedule**	**Funding**	**Local Champion**
5.1.1	Education and Awareness	Provide educational pamphlets about the HHPD program to municipalities and county residents.	Dam failure				2023 - 2028	Local	Jefferson Department of Emergency Services
5.2.1	Education and Awareness	Provide education to municipalities and county residents on reducing long-term vulnerabilities to dam and levee failure.	Dams and Levees				2023 - 2028	Local	Jefferson Department of Emergency Services
5.3.1	Education and Awareness	Identify locations within Jefferson County that could be impacted by dam and levee failure.	Dams and Levees				2023 - 2028	Local	Jefferson Department of Emergency Services
5.3.2	Education and Awareness	Obtain additional operation, maintenance, inspection, height, length, and level of protection information for levees in Jefferson County for the next hazard mitigation plan update.	Levees				2023- 2028	Local	Jefferson Department of Emergency Services

Table 81 - Municipal Hazard Mitigation Actions Checklist

Municipal Hazard Mitigation Actions Checklist							
Municipality	**1.1.1**	**1.1.2**	**1.1.3**	**1.1.4**	**1.2.1**	**1.2.2**	**1.3.1**
Barnett Township					X	X	
Beaver Township					X	X	
Bell Township					X	X	
Big Run Borough					X	X	
Brockway Borough					X	X	
Brookville Borough					X	X	
Clover Township					X	X	
Corsica Borough					X	X	
Eldred Township					X	X	
Falls Creek Borough					X	X	
Gaskill Township					X	X	

Municipal Hazard Mitigation Actions Checklist							
Municipality	**1.1.1**	**1.1.2**	**1.1.3**	**1.1.4**	**1.2.1**	**1.2.2**	**1.3.1**
Heath Township					X	X	
Henderson Township					X	X	
Knox Township					X	X	
McCalmont Township					X	X	
Oliver Township					X	X	
Perry Township					X	X	
Pinecreek Township					X	X	
Polk Township					X	X	
Porter Township					X	X	
Punxsutawney Borough					X	X	
Reynoldsville Borough					X	X	
Ringgold Township					X	X	
Rose Township					X	X	
Snyder Township					X	X	
Summerville Borough					X	X	
Sykesville Borough					X	X	
Timblin Borough					X	X	
Union Township					X	X	
Warsaw Township					X	X	
Washington Township					X	X	
Winslow Township					X	X	
Worthville Borough					X	X	
Young Township					X	X	
Jefferson County or county office	X	X	X	X			X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**1.3.2**	**2.1.1**	**2.2.1**	**2.3.1**	**2.4.1**	**2.5.1**	**2.6.1**
Barnett Township	X	X					
Beaver Township	X	X					
Bell Township	X	X					
Big Run Borough	X	X					
Brockway Borough	X	X					
Brookville Borough	X	X					
Clover Township	X	X					
Corsica Borough	X	X					
Eldred Township	X	X					
Falls Creek Borough	X	X					

Municipal Hazard Mitigation Actions Checklist							
Municipality	**1.3.2**	**2.1.1**	**2.2.1**	**2.3.1**	**2.4.1**	**2.5.1**	**2.6.1**
Gaskill Township	X	X					
Heath Township	X	X					
Henderson Township	X	X					
Knox Township	X	X					
McCalmont Township	X	X					
Oliver Township	X	X					
Perry Township	X	X					
Pinecreek Township	X	X					
Polk Township	X	X					
Porter Township	X	X					
Punxsutawney Borough	X	X					
Reynoldsville Borough	X	X					
Ringgold Township	X	X					
Rose Township	X	X					
Snyder Township	X	X					
Summerville Borough	X	X					
Sykesville Borough	X	X					
Timblin Borough	X	X					
Union Township	X	X					
Warsaw Township	X	X					
Washington Township	X	X					
Winslow Township	X	X					
Worthville Borough	X	X					
Young Township	X	X					
Jefferson County or county office			X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**2.7.1**	**2.8.1**	**2.8.2**	**3.1.1**	**3.1.2**	**3.1.3**	**3.1.4**
Barnett Township	X	X			X	X	
Beaver Township	X	X			X	X	
Bell Township	X	X			X	X	
Big Run Borough	X	X			X	X	
Brockway Borough	X	X			X	X	
Brookville Borough	X	X			X	X	
Clover Township	X	X			X	X	
Corsica Borough	X	X			X	X	
Eldred Township	X	X			X	X	

Municipal Hazard Mitigation Actions Checklist							
Municipality	**2.7.1**	**2.8.1**	**2.8.2**	**3.1.1**	**3.1.2**	**3.1.3**	**3.1.4**
Falls Creek Borough	X	X			X	X	
Gaskill Township	X	X			X	X	
Heath Township	X	X			X	X	
Henderson Township	X	X			X	X	
Knox Township	X	X			X	X	
McCalmont Township	X	X			X	X	
Oliver Township	X	X			X	X	
Perry Township	X	X			X	X	
Pinecreek Township	X	X			X	X	
Polk Township	X	X			X	X	
Porter Township	X	X			X	X	
Punxsutawney Borough	X	X			X	X	
Reynoldsville Borough	X	X			X	X	
Ringgold Township	X	X			X	X	
Rose Township	X	X			X	X	
Snyder Township	X	X			X	X	
Summerville Borough	X	X			X	X	
Sykesville Borough	X	X			X	X	
Timblin Borough	X	X			X	X	
Union Township	X	X			X	X	
Warsaw Township	X	X			X	X	
Washington Township	X	X			X	X	
Winslow Township	X	X			X	X	
Worthville Borough	X	X			X	X	
Young Township	X	X			X	X	
Jefferson County or county office			X	X			X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**3.1.5**	**3.2.1**	**3.3.1**	**3.4.1**	**4.1.1**	**4.1.2**	**4.2.1**
Barnett Township			X				
Beaver Township			X				
Bell Township			X				
Big Run Borough			X				
Brockway Borough			X				
Brookville Borough			X				
Clover Township			X				
Corsica Borough			X				

Municipal Hazard Mitigation Actions Checklist							
Municipality	**3.1.5**	**3.2.1**	**3.3.1**	**3.4.1**	**4.1.1**	**4.1.2**	**4.2.1**
Eldred Township			X				
Falls Creek Borough			X				
Gaskill Township			X				
Heath Township			X				
Henderson Township			X				
Knox Township			X				
McCalmont Township			X				
Oliver Township			X				
Perry Township			X				
Pinecreek Township			X				
Polk Township			X				
Porter Township			X				
Punxsutawney Borough			X				
Reynoldsville Borough			X				
Ringgold Township			X				
Rose Township			X				
Snyder Township			X				
Summerville Borough			X				
Sykesville Borough			X				
Timblin Borough			X				
Union Township			X				
Warsaw Township			X				
Washington Township			X				
Winslow Township			X				
Worthville Borough			X				
Young Township			X				
Jefferson County or county office	X	X		X	X	X	X

Municipal Hazard Mitigation Actions Checklist						
Municipality	**4.2.2**	**4.2.3**	**5.1.1**	**5.2.1**	**5.3.1**	**5.3.2**
Barnett Township						
Beaver Township						
Bell Township						
Big Run Borough						
Brockway Borough						
Brookville Borough						
Clover Township						

Municipal Hazard Mitigation Actions Checklist						
Municipality	**4.2.2**	**4.2.3**	**5.1.1**	**5.2.1**	**5.3.1**	**5.3.2**
Corsica Borough						
Eldred Township						
Falls Creek Borough						
Gaskill Township						
Heath Township						
Henderson Township						
Knox Township						
McCalmont Township						
Oliver Township						
Perry Township						
Pinecreek Township						
Polk Township						
Porter Township						
Punxsutawney Borough						
Reynoldsville Borough						
Ringgold Township						
Rose Township						
Snyder Township						
Summerville Borough						
Sykesville Borough						
Timblin Borough						
Union Township						
Warsaw Township						
Washington Township						
Winslow Township						
Worthville Borough						
Young Township						
Jefferson County or county office	X	X	X	X	X	X

Table 82 - Objective to Action Checklist

Objective	Number of Actions
Objective 1.1	4
Objective 1.2	2
Objective 1.3	3
Objective 2.1	1
Objective 2.2	1
Objective 2.3	1
Objective 2.4	1

Objective	Number of Actions
Objective 2.5	1
Objective 2.6	1
Objective 2.7	1
Objective 2.8	1
Objective 3.1	5
Objective 3.2	1
Objective 3.3	1
Objective 3.4	1
Objective 4.1	2
Objective 4.2	3
Objective 5.1	1
Objective 5.2	1
Objective 5.3	2

Table 83 - Actions Tied to Hazard

Actions Tied to Hazard	
Hazard	**Actions Related**
Blighted	1.1.1, 3.1.1, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Cyberterrorism	1.1.1, 3.1.1, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 1.1.3, 1.1.4
Dam Failure	1.1.1, 3.1.1, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 5.1.1, 5.2.1, 5.3.1, 5.3.2
Drought	1.1.1, 2.3.1, 3.1.1, 3.1.2, 3.1.3, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Earthquake	1.1.1, 2.3.1, 3.1.1, 3.1.2, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Emergency Services	1.1.1, 3.1.1, 3.1.5, 3.2.1, 3.4.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Environmental Hazards: Fixed Facility	1.1.1, 1.1.2, 3.1.1, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Environmental Hazards: Transportation	1.1.1, 1.1.2, 3.1.1, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Flash Flood	1.1.1, 1.2.2, 2.3.1, 2.5.1, 2.7.1, 2.8.1, 2.8.2, 3.1.1, 3.1.2, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Flood	1.1.1, 2.1.1, 2.3.1, 2.4.1, 2.5.1, 2.6.1, 2.7.1, 2.8.1, 2.8.2, 3.1.1, 3.1.2, 3.1.5, 3.2.1, 3.3.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Hurricane/Tropical Storm	1.1.1, 2.3.1, 3.1.1, 3.1.2, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3

Actions Tied to Hazard	
Hazard	**Actions Related**
Ice Jam Flood	1.1.1, 2.3.1, 2.5.1, 2.7.1, 2.8.1, 2.8.2, 3.1.1, 3.1.2, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Landslide	1.1.1, 2.3.1, 3.1.1, 3.1.2, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Levee Failure	1.1.1, 3.1.1, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 5.2.1, 5.3.1, 5.3.2
Opioid Epidemic	1.1.1, 3.1.1, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Radon Exposure	1.1.1, 2.3.1, 3.1.1, 3.1.2, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Subsidence/Sinkhole	1.1.1, 2.3.1, 3.1.1, 3.1.2, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Terrorism	1.1.1, 3.1.1, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Tornado	1.1.1, 2.3.1, 3.1.1, 3.1.2, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Transportation Accidents	1.1.1, 1.3.1, 3.1.1, 3.1.2, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Urban Fire and Explosion	1.1.1, 3.1.1, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Utility Interruption	1.1.1, 1.2.1, 1.3.2, 3.1.1, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Wildfire	1.1.1, 2.3.1, 3.1.1, 3.1.2, 3.1.4, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Windstorm	1.1.1, 2.3.1, 3.1.1, 3.1.2, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3
Winter Storm/Nor’easter	1.1.1, 2.2.1, 2.3.1, 3.1.1, 3.1.2, 3.1.5, 3.2.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3

7. Plan Maintenance

7.1. Update Process Summary

Monitoring, evaluating, and updating this plan is critical to maintaining its value and success in Jefferson County's hazard mitigation efforts. Ensuring effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section explains who will be responsible for maintenance activities and what those responsibilities entail. It also provides a methodology and schedule of maintenance activities including a description of how the public will be involved on a continued basis. This HMP update also defines the municipalities' role in updating and evaluating the plan. Finally, the 2023 HMP update encourages continued public involvement and how this plan may be integrated into other planning mechanisms in the county.

7.2. Monitoring, Evaluating, and Updating the Plan

Hazard mitigation planning in Jefferson County is a responsibility of all levels of government (i.e., county, and local), as well as the citizens of the county. The Jefferson County Local Planning Team will be responsible for maintaining this multi-jurisdictional HMP. The local planning team will meet annually and following each emergency declaration to review the plan. Every municipality that has adopted this plan will also be afforded the opportunity to provide updated information or information specific to hazards encountered during an emergency or disaster. Each review process will ensure that the hazard vulnerability and risk analysis reflect the current conditions of the county, that the capabilities assessment accurately reflects local circumstances and that the hazard mitigation strategies are updated based on the county's damage assessment reports and local mitigation project priorities. The HMP must be updated on a five-year cycle. An updated HMP must be completed and approved by the end of the five-year period. The monitoring, evaluating, and updating of the plan every five years will rely heavily on the outcomes of the annual HMP planning team meetings.

The Jefferson County Local Planning Team will complete a hazard mitigation progress report to evaluate the status and accuracy of the multi-jurisdictional HMP and record the local planning team's review process. The annual plan review will be distributed to appropriate representatives at both PEMA and FEMA. The following items will be completed during the annual review and reporting process:

- Review the risk assessment section and identify occurrences of hazards within the last year. Identify date, time, damage, fatalities, and other specific information of the events. Also identify any new hazards that have occurred or increased risk with the county.

- Complete a review and update of the capability assessment section. Identify any capability weaknesses since the last review.
- Complete a review of the mitigation strategy section. Review the goals and objectives identified in the 2023 HMP and determine if any updates are needed. Provide all mitigation actions and opportunities to the county and municipalities that are applicable. Have all entities complete an action review matrix and document all results in the report. Also, add any new actions that are identified. Complete a review of each mitigation opportunity and identify the status of each opportunity on the opportunity review spreadsheet. All information will be included in the annual review report.

The Jefferson County Department of Emergency Services will maintain a copy of these records and place them in Appendix I of this plan. Jefferson County will continue to work with all municipalities regarding hazard mitigation projects, especially those municipalities that did not submit projects for inclusion in this plan.

7.3. Continued Public Involvement

The Jefferson County Department of Emergency Services will ensure that the 2023 Jefferson County Hazard Mitigation Plan is posted and maintained on the Jefferson County website and will continue to encourage public review and comment on the plan. The Jefferson County website that the plan will be located at is as follows: www.jeffersoncountypa.com

The public will have access to the 2023 Jefferson County HMP through their local municipal office, the Jefferson County Department of Emergency Services, or the Jefferson County Department of Emergency Services Information on upcoming events related to the HMP or solicitation for comments will be announced via newsletters, newspapers, mailings, and the county website.

The citizens of Jefferson County are encouraged to submit their comments to elected officials and/or members of the Jefferson County HMP Local Planning Team. To promote public participation, the Jefferson County Local Planning Team will post a public comment form as well as the Hazard Mitigation Project Opportunity Form on the county's website. These forms will offer the public various opportunities to supply their comments and observations. All comments received will be maintained and considered by the Jefferson County Hazard Mitigation Planning Team.

8. Plan Adoption

8.1. Resolutions

In accordance with federal and state requirements, the governing bodies of each participating jurisdiction must review and adopt by resolution, the 2023 Jefferson County Hazard Mitigation Plan. Copies of the adopting resolutions are included in this plan in Appendix J. FEMA Region III in Philadelphia, Pennsylvania is the final approval authority for the Hazard Mitigation Plan. PEMA also reviews the plan before submission to FEMA.

9. Appendices