COUNTY OF MCKEAN DEPARTMENT OF EMERGENCY SERVICES
COUNTY OF MCKEAN OFFICE OF GEOGRAPHIC INFORMATION SYSTEMS
& THE MCKEAN COUNTY PLANNING COMMISSION

2019 McKean County Hazard Mitigation Plan

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November 2019

McKean County Hazard Mitigation Plan

Certification of Annual Review Meetings

The McKean County Hazard Mitigation Planning Team has reviewed this Hazard Mitigation Plan. See Section 8 of the McKean County 2019 Hazard Mitigation Plan for further details regarding this form. The director of the Hazard Mitigation Planning Team hereby certifies the review.

YEAR	DATE OF MEETING	PUBLIC OUTREACH ADDRESSED?*	SIGNATURE
2020			
2021			
2022			
2023			
2024			
2025			

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

McKean County Hazard Mitigation Plan

Record of Changes

DATE	DESCRIPTION OF CHANGE MADE, MITIGATION ACTION COMPLETED, OR PUBLIC OUTREACH PERFORMED	CHANGE MADE BY (PRINT NAME)	CHANGE MADE BY (SIGNATURE)
3/26/2020	Updates and edits (dates of approval) to the adoption resolutions on the last pages of the plan.	Sean McLaughlin	Sean McLaughlin

REMINDER: ***Please attach all associated meeting agendas, sign-in sheets, handouts, and minutes.***

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Table of Acronyms

ACRONYM	FULL NAME	ACRONYM	FULL NAME
ACS	US Census American Community Survey	NCDC	National Climate Data Center
CAC	Community Assistance Contacts	NCPRPDC	North Central Pennsylvania Regional Planning and Development Commission
CAV	Community Assistance Visits	NDMC	National Drought Mitigation center
CDBG	Community Development Block Grants	NFIP	National Flood Insurance Program
CFR	Code of Federal Regulations	NFPA	National Fire Protection Association
CRS	Community Ratings System	NLCD	National Land Cover Database
DCED	Department of Community and Economic Development	NOAA	National Oceanic and Atmospheric Administration
DCNR	Department of Conservation and Natural Resources	NOAA-NWSFO	National Oceanic and Atmospheric Administration - National Weather Service Field Office
DCNR-BOF	Department of Conservation and Natural Resources-Bureau of Forestry	NRC	Nuclear Regulatory Commission
DEP	Pennsylvania Department of Environmental Protection	NWS	National Weather Service
DFIRM	Digital Flood Insurance Rate Map	PaGWIS	Pennsylvania Groundwater Information System
EMPG	Emergency Management Performance Grants	PASDA	Pennsylvania Spatial Data Access
EOP	Emergency Operations Plan	PDSI	Palmer Drought Severity Index
EPA	Environmental Protection Agency	PEMA	Pennsylvania Emergency Management Agency

EPCRA	Emergency Planning and Community Right-to-Know Act	PennDOT	Pennsylvania Department of Transportation
EPZ	Emergency Planning Zone	PHGA	Peak Horizontal Ground Acceleration
ESRI	Environmental Systems Research Institute	PISC	Pennsylvania Invasive Species Council
FBFM	Flood Boundary and Floodway Maps	PSARC	Pennsylvania Search and Rescue Council
FEMA	Federal Emergency Management Agency	RAMPP	Risk Assessment, Mapping, and Planning Partners
FEMA CIS	Federal Emergency Management Agency Community Information System	RF	Risk Factor
FIRM	Flood Insurance Rate Map	RFC	Repetitive Flood Claims
HMGP	Hazard Mitigation Grant Program	SALDO	Subdivision and Land Development Ordinance
HMP	Hazard Mitigation Plan	SARA	Superfund Amendments and Reauthorization Act
HMPT	Hazard Mitigation Planning Team	SFHA	Special Flood Hazard Area
HMPU	Hazard Mitigation Plan Update	SFIP	State Flood Insurance Program
HMSC	Hazard Mitigation Steering Committee	SRL	Severe Repetitive Loss Grant Program
HVA	Hazards Vulnerability Analysis	TRI	EPA Toxic Release Inventory
LEPC	Local Emergency Planning Committee	UCC	Universal Construction Code
MCCD	McKean County Conservation District	US BLS	United States Bureau of Labor Statistics
MCGISC	McKean County GIS Coordinator	US DOT	United States Department of Transportation
MCEMA	McKean County Emergency Management Agency	USACE	United States Army Corps of Engineers
MCPC	McKean County Planning Commission	USDA	United States Department of Agriculture
MRLC	Multi-Resolution Land Characteristics Consortium	USGS	United States Geological Survey
NCAR	National Center for Atmospheric Research	WYO	Write Your Own

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1. Introduction

1.1. Background

Across the United States, natural and human-made disasters have led to increasing levels of deaths, injuries, property damage, and interruption of business and government services. The time, money, and effort needed to recover from these disasters exhausts resources, diverting attention from important public programs and private agendas. Since 1970 there have been 44 Presidential Disaster Declarations and nine Presidential Emergency Declarations in Pennsylvania, five and three, respectively, of which have included McKean County. In addition to these Presidential Declarations, there have been 26 Gubernatorial Declarations or Proclamations affecting McKean County since 1970. The emergency management community, citizens, elected officials and other stakeholders in McKean County, Pennsylvania recognize the impact of disasters on their community and support proactive efforts needed to reduce the impact of natural and human-made hazards.

Hazard mitigation describes sustained actions taken to prevent or minimize long-term risks to life and property from hazards and create successive benefits over time. Pre-disaster mitigation actions are taken in advance of a hazard event and are essential to breaking the disaster cycle 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 by breaking the cycle of loss. 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 re-establish themselves in the wake of a disaster, getting the economy back on track sooner and with less interruption.

Accordingly, the McKean County Hazard Mitigation Planning Team (HMPT), composed of McKean County government staff, in cooperation with the elected officials of the County and its municipalities, have prepared this Hazard Mitigation Plan (HMP) update. The Plan is the result of work by citizens of the County to develop a pre-disaster multi-hazard mitigation plan that will not only guide the County towards greater disaster resistance, but will also respect the character and needs of the community.

1.2. Purpose

The purpose of this All-Hazard Mitigation Plan Update (HMPU) is:

- To protect life, safety, and property by reducing the potential for future damages and economic losses that result from natural hazards';
- To qualify for additional grant funding, in both the pre-disaster and the post-disaster environment;
- To speed recovery and redevelopment following future disaster events;
- To demonstrate a firm local commitment to hazard mitigation principles; and

- To comply with both state and federal legislative requirements for local hazard mitigation plans.

1.3. Scope

The McKean County 2019 Hazard Mitigation Plan update has been prepared to meet requirements set forth by the Federal Emergency Management Agency (FEMA) and Pennsylvania Emergency Management Agency (PEMA) in order for the County to be eligible for funding and technical assistance from state and federal hazard mitigation programs. It will be updated and maintained to address both natural and human-made hazards determined to be of significant risk to the County and/or its local municipalities. Updates will take place at a minimum every five years, but they will also take place following significant disaster events.

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; and
- 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; and
- Pennsylvania Stormwater Management Act of October 4, 1978. P.L. 864, No. 167.

The following FEMA guides and reference documents were used to prepare this document:

- FEMA 386-1: *Getting Started*. September 2015.
- FEMA 386-2: *Understanding Your Risks: Identifying Hazards and Estimating Losses*. September 2015.
- FEMA 386-3: *Developing the Mitigation Plan*. September 2015.
- FEMA 386-4: *Bringing the Plan to Life*. September 2015.
- FEMA 386-5: *Using Benefit-Cost Review in Mitigation Planning*. September 2013.
- FEMA 386-6: *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning*. September 2015.
- FEMA 386-7: *Integrating Manmade Hazards into Mitigation Planning*. September 2015.
- FEMA 386-8: *Multijurisdictional Mitigation Planning*. March 2009.
- FEMA 386-9: *Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects*. August 2008.
- FEMA *Local Multi-Hazard Mitigation Planning Guidance*. August 2019.
- FEMA *National Fire Incident Reporting System 5.0: Complete Reference Guide*. January, 2015.

The following PEMA guides and reference documents were used prepare this document:

- PEMA: *Hazard Mitigation Planning Made Easy!*
- PEMA Mitigation Ideas: *Potential Mitigation Measures by Hazard Type: A Mitigation Planning Tool for Communities*. October 2013.
- PEMA: *Standard Operating Guide*. October 2013.

The following additional guidance document produced by the National Fire Protection Association (NFPA) was used to update this plan:

- NFPA 1600: *Standard on Disaster/Emergency Management and Business Continuity Programs*. 2019.

2. Community Profile

2.1. Geography and Environment

McKean County is located in the northwestern/north central part of Pennsylvania along the Commonwealth's border with New York. Smethport, the county seat, is located 115 miles east of Erie, 155 miles north/northeast of Pittsburgh, 220 miles northwest of Harrisburg, PA, and 100 miles south from Buffalo, NY. The majority of the County is forested land, and approximately 20 percent of the county's land area is covered by the Allegheny National Forest. The County also hosts 3,166 acres of state forestlands and 24,380 acres of state game lands, enhancing the rural feel of the County and providing numerous opportunities for recreation (McKean County EMA 2018). Figure 2.1-1 provides a base map of McKean County.

The County has a land area of 985 square miles and is located in the Appalachian Plateau Province. Within this province, the County falls into two sections. Most of the County falls into the Deep Valleys Section, consisting of steep-sloped, deep valleys separated by narrow uplands, while the southwestern part of McKean county is located in the High Plateau Section, which boasts broad, rounded to flat uplands cut by deep valleys (DCNR, 2000). The topography of the county is elevated with some points being higher than 2,000 feet. The natural history of the County created surface deposits of sand, gravel, silt, and clay and subterranean deposits of coal, oil, and natural gas.

McKean County lies mostly in Allegheny River Watershed, but the southeastern portion of the County falls in the Upper/Middle Susquehanna River Drainage basin (MCGISC, 2019). The Allegheny River drains most of the county. Other waters, mostly tributaries of the Allegheny River, draining the county are the Tunungwant, Oswayo, Potato, and Tionesta Creeks and the West Branch of the Clarion River, as seen in Figure 2.1-2.

Figure 2.1-1: McKean County base map.

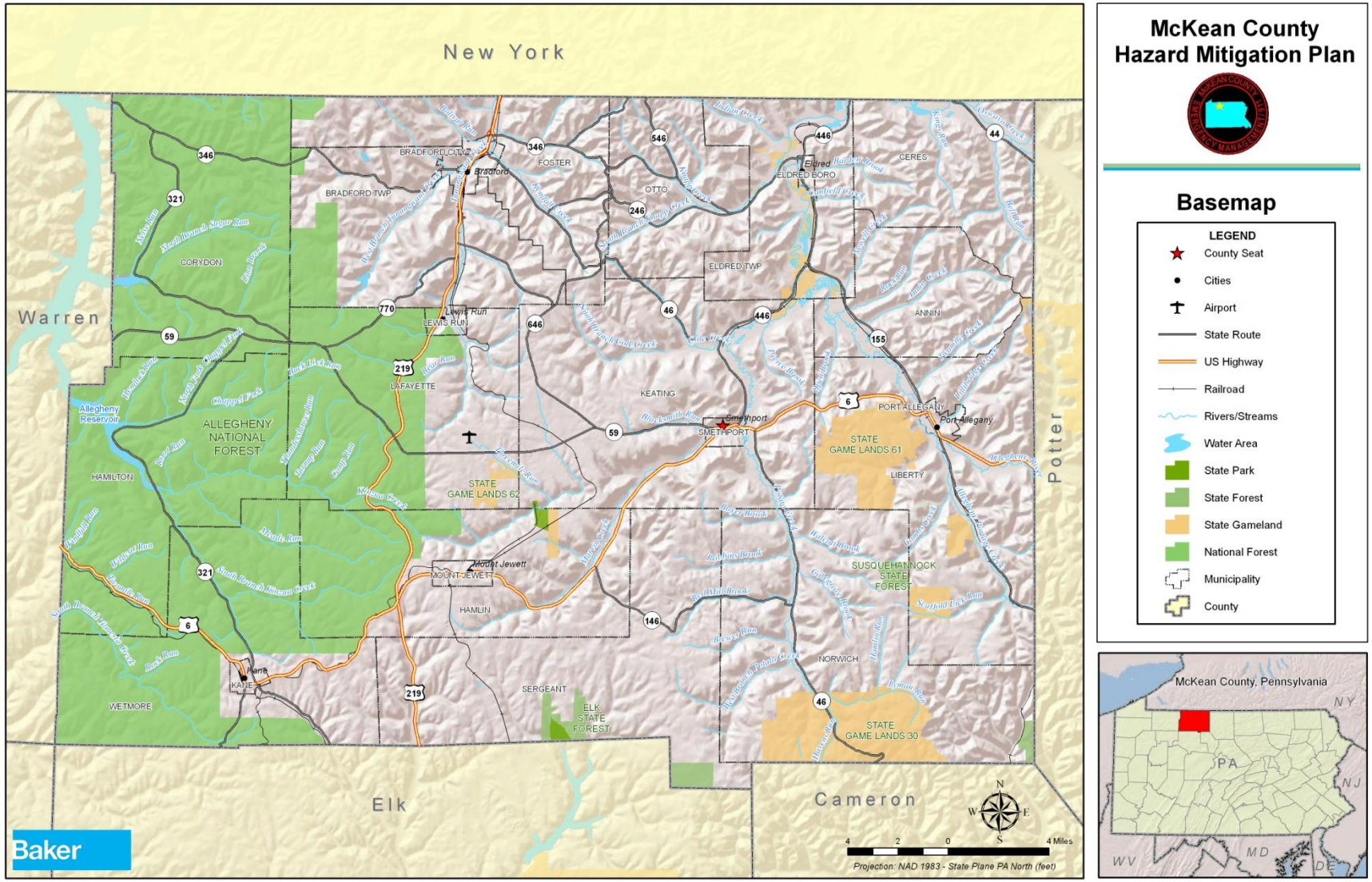
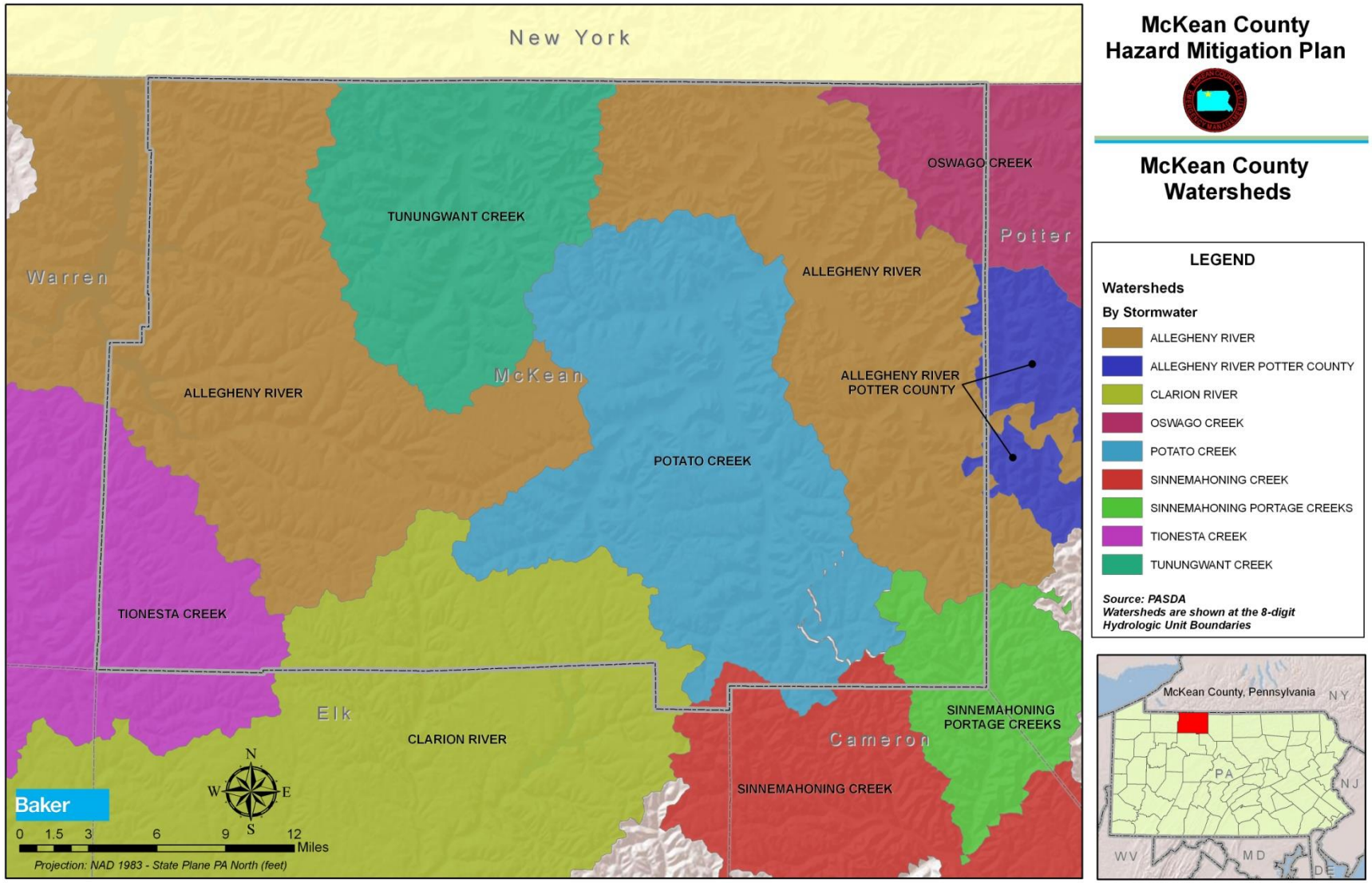


Figure 2.1-2: McKean County watersheds.



2.2. Community Facts

McKean County is composed of six boroughs (Eldred, Kane, Lewis Run, Mount Jewett, Port Allegany, and Smethport), fifteen townships (Annin, Bradford, Ceres, Corydon, Eldred, Foster, Hamilton, Hamlin, Keating, Lafayette, Liberty, Norwich, Otto, Sergeant, and Wetmore), and one city (Bradford).

Named after Governor Thomas McKean, McKean County was one of the last frontier counties in Pennsylvania. While erected in 1804, it was then still a complete wilderness, and the county was formed in part to assist in establishing Pennsylvania claims in a region that had been asserted to be under the jurisdiction of Connecticut. Prior to 1784, the lands within the new county were a part of "Seneca Land" or hunting grounds for the Iroquois. The famous Canoe Place (present-day Port Allegany), a portage route connecting the Allegheny and Susquehanna headwaters by way of Sinnemahoning Creek, was located within the limits of the county. Canoe Place appears on some of the earliest known maps of this region. Early settlers of the county from either the north or south followed this historic route of the Indians.

The growth of McKean was slow; as late as 1821 there were only 211 taxable properties in the entire county. It was not until 1826 that McKean became a completely independent unit. The first courthouse was completed the same year at Smethport and by this date the towns of Ceres, Bradford, and Port Allegany were laid out. Following the Civil War, McKean County experienced a boom resulting from the first commercial development of oil and gas in 1876-78. Bradford's prosperity has been associated with the oil industry from the earliest days. Here the first oil exchange was established in 1877, two years after the first oil producing well was drilled.

McKean County quickly became a leader in the oil industry and today is the largest producer of world renowned Pennsylvania oil; the world's oldest continually operating oil refinery is located in the County. It is also a leading producer of natural gas. Lumbering was another great industry of the era and rich stands of pine timber were cut; even now, McKean County has the third highest concentration of logging establishments in Pennsylvania.

The economy of McKean County depends on manufacturing, education and health services, and mining. Manufacturing accounts for 15% of all County workers; trade, transportation, and utilities employ 5% of workers; and education and health services employ 20% of all workers (MCPC, 2019). As such, most of the major employers in the county are manufacturers, though the Bradford Regional Medical Center, Bradford Area School District, Wal-Mart, and the University of Pittsburgh are also top-ten employers.

Tourism also provides considerable (and growing) income for the county. McKean County is 90% forest lands, and the Allegheny River and Allegheny National Forest provide many of the recreation and scenic areas in the county. Other primary attractions include the Kinzua Dam, camping, fishing and hunting, and historic sites.

2.3. Population and Demographics

According to the 2018 American Community Survey's estimated statistics, McKean County is home to 40,968 people. Since 2010, the County's population decreased from 43,450

individuals, a 5.71% loss. This signifies the continuation of a declining population trend since 1970. Table 2.3-1 provides a distribution of County population per municipality.

Using this estimate as a base, the overall County population density is 41.6 persons per square mile in 2018; the population density in 2010 was 44.1 persons per square mile. Our current population is concentrated around the City of Bradford, Bradford and Foster Townships and Kane Borough; the remainder of the County is sparsely populated with some concentrations in the remaining boroughs. According to available census data, as shown below, no municipality has experienced an increase in population. This is recent change that we expect to continue and the 2020 census to reinforce.

Table 2.3-1: Population change in McKean County from 2010-2018 (US Census Bureau, American Community Survey, 2018).

MUNICIPALITY	2010 POPULATION	2018 ESTIMATED POPULATION	PERCENT CHANGE
Annin Township	694	667	-3.89%
Bradford City	8,770	8,280	-5.59%
Bradford Township	4,805	4,618	-3.89%
Ceres Township	905	858	-5.19%
Corydon Township	275	266	-3.27%
Eldred Borough	825	770	-6.67%
Eldred Township	1,592	1,518	-4.65%
Foster Township	4,316	4,075	-5.58%
Hamilton Township	543	506	-6.81%
Hamlin Township	734	690	-5.99%
Kane Borough	3,730	3,477	-6.78%
Keating Township	3,021	2,875	-4.83%
Lafayette Township	2,350	2,126	-9.53%
Lewis Run Borough	617	572	-7.29%
Liberty Township	1,612	1,520	-5.71%
Mount Jewett Borough	919	856	-6.86%
Norwich Township	583	545	-6.52%
Otto Township	1,556	1,481	-4.82%
Port Allegany Borough	2,157	2,017	-6.49%
Sergeant Township	141	132	-6.38%
Smethport Borough	1,655	1,543	-6.77%
Wetmore Township	1,650	1,576	-4.48%
COUNTY	**43,450**	**40,968**	**-5.71%**

The median household income in McKean County, according to the 2017 American Community survey is $45,866, which is significantly lower than the national median household income of $57,652. Household size is slightly less than the US average (2.63 persons per household) at 2.27 persons per household. The percent of families living below the poverty level is estimated

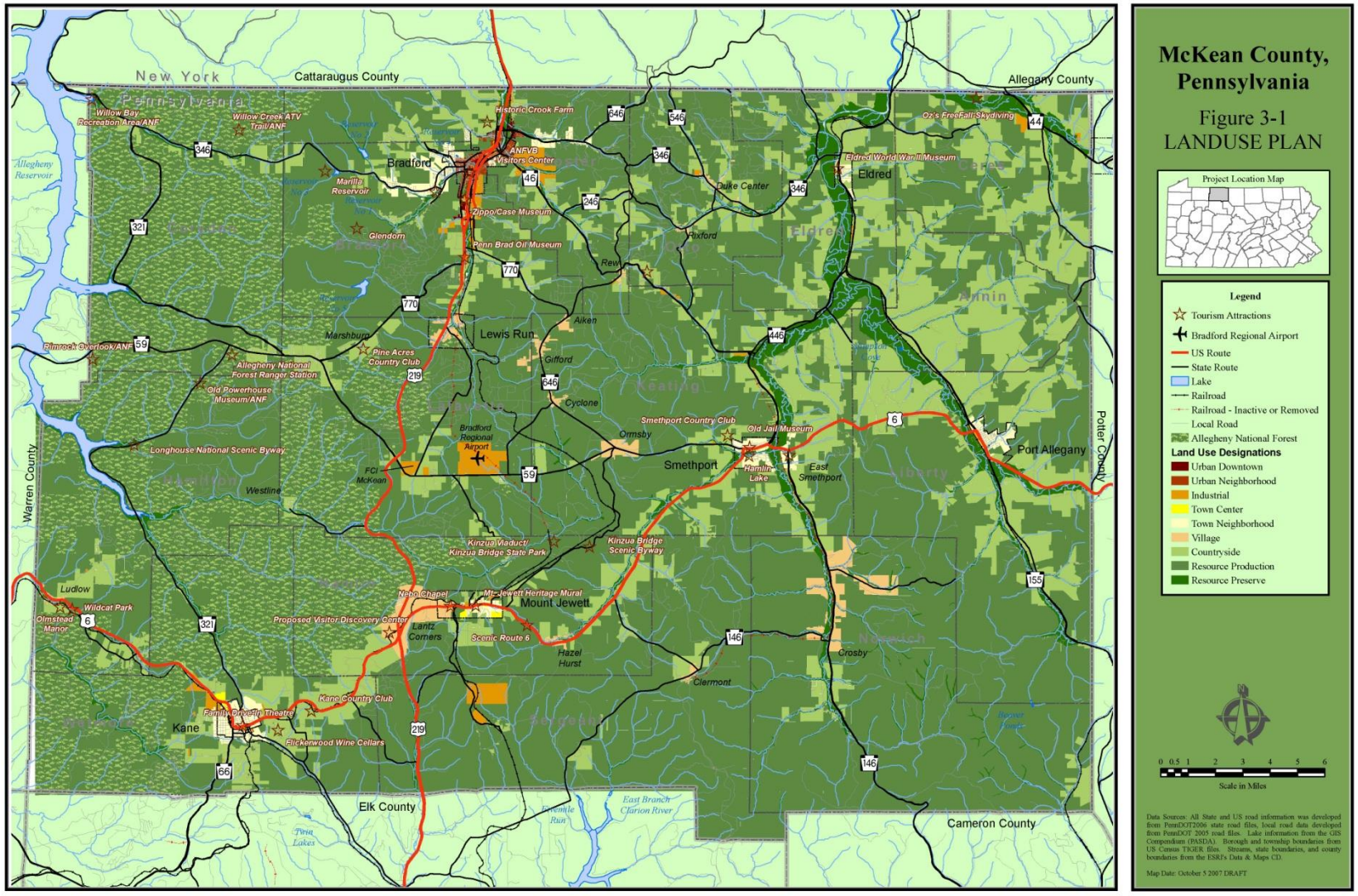
at around twenty percent, and the percent of individuals living below poverty level approaches seventeen percent (US Census SAIPE 2017).

The median age in the County is 42.5, but overall the County is aging. The national median age is 37.8. About eighteen percent of County residents are older than 65 years of age, and the County Comprehensive Plan reports significant losses of children and young adults (MCPC, 2018). With eighteen percent of our population being over 65, signifies that McKean will continually experience a decrease in population, which may be rapid, over the next twenty to thirty years. McKean County is a fairly homogeneous county; over 95% of individuals identify as White. Approximately two percent of individuals are Black or African American and 1.2% of individuals are two or more races. The remaining individuals are Asian, American Indian/Alaska Natives, or some other race.

2.4. Land Use and Development

Approximately ¾ of McKean County's land area is undeveloped. According to our previous comprehensive plan, adopted in 2007, approximately 77% of McKean County's land is undeveloped forested lands while the remaining fifteen percent is dedicated to agriculture. The agricultural uses are largely concentrated in the northeast part of the County (MCPC 2019). Intensely developed uses such as commercial, industrial, institutional, residential, and public utility lands account for slightly more than 50,000 acres in the County. These intense uses are generally concentrated around Bradford city, the boroughs, the Bradford Regional Airport, and the intersection of the major transportation corridors: US 219 & US Route 6 (i.e. Lantz Corners) as shown in Figure 2.4-1.

Figure 2.4-1: McKean County Land Use Map (extracted from the 2007 Comprehensive Plan).



The land use patterns in the County have been gradual over the past forty years. The Comprehensive Plan reports that the most significant change from 1977-2007 was an increase in agricultural lands, residential uses, and commercial uses; these uses went from representing 3.3% of the County's land area to approximately eight percent. While this is an increase in intensive uses, it remains a very, very minute part of the overall land use of the County. These newer intensive uses were largely created by community, economic, and retail development. Industrial land has remained fairly constant in the County, increasing by 0.1% in forty years.

Using datasets from the American Community Survey reinforces the trend of negative development that we are experiencing. In 2010, 52.7% of McKean County citizens were employed full-time, representing 18,774 people while 1,813 or 5.1% were unemployed. In 2017, 52.6% of McKean County was employed full time, representing 18,316 people while 1,475 or 4.2% were unemployed. In 2010 there were 17,324 total households and in 2017 there were 17,199. Lastly, in 2010 the median age was 40.9 and in 2017 the median age was 42.5. To summarize, less jobs and less full time employment opportunities, less total households, and a greater median age suggest that McKean County is experiencing negative development despite that our land use changes represent positive development.

Despite that our land uses have increased since our last Hazard Mitigation Plan, our population, households, employed citizens, and business have all decreased. These trends are not only represented in available data sources, but have been felt within our communities. Small "mom & pop" businesses continue to close. Examples include small grocery stores in Otto Township and Eldred Borough and downtown retail shops in all the boroughs. The Kane Area School District consolidated its elementary and middle school into one facility. Keating Township lost a manufacturing facility and Smethport Borough's Christmas store, considered America's oldest Christmas store closed. Sergeant Township lost one of its only business, a bar and grill. Port Allegany Borough lost its Pittsburgh Corning facility that manufactured glass, which was one of the borough's largest employers. Wetmore Township lost a forest product facility and another forest product facility closed their dimension mill. Bradford City lost a manufacturing facility. Bradford Township's forest product facility furloughed half of its employees and another natural resource extraction business closed. Bradford Regional Medical Center, the largest hospital and largest employer decided to close its labor and delivery (obstetrics) unit due to declining birth rates. BRMC noted that in 2009 there were 325 births and in 2018 there were 179 births, with this closure there is no longer a hospital in McKean County in which a baby can be delivered. With these circumstances being felt throughout the county a few other phenomena have also occurred including: repetitive loss in younger populations, especially those that do not return after college, less first responders especially younger first responders, and decreased tax base.

Our current, limited development revolves around the County's transportation system. The main highways in the County are US 219 and US 6. US 219 is the major north-south route through the County; it is a two-lane highway heavily populated by slow-moving logging and petroleum industry product transportation. Route 6 is a scenic byway and State Heritage Corridor for Pennsylvania. While it is McKean's major east-west route, Route 6 is largely a rural highway. McKean County has one airport, Bradford Regional Airport, which has limited daily flight traffic.

2.5. Data Sources and Limitations

The McKean County tax assessment database was used as an inventory of parcels throughout the County. The list of critical facilities provided in **Appendix D** was developed by local knowledge and expertise of the McKean County DES and digitized by the McKean County GIS.

The countywide Preliminary Digital Flood Insurance Rate Map, dated March 31, 2010, was used for all flood risk analysis; these maps were adopted by all the municipalities in 2016. The DFIRM database provides flood frequency and elevation information used in the flood hazard risk assessment. Other GIS datasets including *road centerlines, parcels,* and *structures* were provided by the McKean County EMA, McKean County Assessment office, and the McKean County GIS Coordinator. Additional data for the base map was provided by the Pennsylvania Game Commission and the Pennsylvania Department of Conservation and Natural Resources. Population data from the 2010 Census and the 2018 estimated populations were obtained from the American Community Survey of the U.S. Census Bureau (2019). The County is confident in the precision of the 2018 population values even though they are considered estimates.

When applicable, PEIRS incident data spanning approximately the last 8 years (1/1/2002 - 6/1/2009) was used in the 2011 plan update. Data from the Knowledge Center Incident Reporting System (KC) is utilized for the update for incident data from 2011 forward. Although PEIRS and KC data proved valuable, primarily in the human-made hazards section where few records of past occurrences exist, data limitations exist in that the reporting system is not mandatory. As a result, while PEIRS and KC reports provide important information on the frequency of past events, because it is a voluntary reporting system, the number and frequency of events may be under-reported. PEIRS/KC information was used in the following hazard profile sections: Disorientation, Terrorism, Urban Fire and Explosion, and Utility Interruption.

Additional information used to complete the risk assessment for this plan was taken from various government agency and non-government agency sources. Those sources are cited where appropriate throughout the plan and on each map with full references listed in **Appendix A – Bibliography**. It should be noted that numerous GIS datasets were obtained from the Pennsylvania Spatial Data Access (PASDA) website (http://www.pasda.psu.edu/). PASDA is the official public access geospatial information clearinghouse for the Commonwealth of Pennsylvania. PASDA was developed by the Pennsylvania State University as a service to the citizens, governments, and businesses of the Commonwealth. PASDA is a cooperative project of the Governor's Office of Administration, Office for Information Technology, Geospatial Technologies Office and the Penn State Institutes of Energy and the Environment of the Pennsylvania State University.

In order to assess the vulnerability of different jurisdictions to the hazards, data on past occurrences of damaging hazard events was gathered. For a number of historic natural-hazard events, the National Climatic Data Center (NCDC) database was utilized. NCDC is a division of the US Department of Commerce’s National Oceanic and Atmospheric Administration (NOAA). Information on hazard events is compiled by NCDC from data gathered by the National Weather Service (NWS), another division of NOAA. NCDC then presents it on their website in various formats. The data used for this plan came the US Storm Events database, which “documents

the occurrence 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, 2019).

This HMPU evaluates the vulnerability of the County's critical facilities. For the purposes of this plan, critical facilities are those entities that are essential to the health and welfare of the community, and the day to day functions of the communities. This includes law enforcement, emergency responding agencies, hospitals, nursing homes, schools, municipal water treatment plants, municipal sewage treatment facilities, and selected governmental institutions (ex. Courthouse, National Guard Readiness Center, McKean County Jail, and the Federal Correctional Institute at McKean). Table 2.5-1 summarizes the critical facilities in McKean County by type and by municipality. For a complete listing of critical facilities, please see **Appendix D**.

Table 2.5-1: Summary of Critical Facilities by Type and Municipality.

MUNICIPALITY	CRITICAL FACILITY TYPE													
	911 And Emergency Services	Airport	College Or University	Fire Department	Hospital	Nursing Home	Police	School	Sewage Treatment Plant	Prison	EMS Service	Municipal Water Systems	Misc.	Grand Total
Annin Township	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Bradford City	0	0	0	1	1	3	1	7	0	0	1	0	0	**14**
Bradford Township	0	0	1	1	0	1	2	1	0	0	0	1	0	**7**
Ceres Township	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Corydon Township	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
Eldred Borough	0	0	0	1	0	0	0	1	1	0	0	1	0	**4**
Eldred Township	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
Foster Township	0	0	0	2	0	0	1	0	1	0	0	0	0	**4**
Hamilton Township	0	0	0	1	0	0	0	0	1	0	0	0	0	**2**
Hamlin Township	0	0	0	1	0	0	0	0	1	0	0	2	0	**4**
Kane Borough	0	0	0	1	1	1	1	1	0	0	1	1	0	**7**
Keating Township	1	0	0	1	0	1	1	0	0	1	1	0	0	**6**
Lafayette Township	0	1	0	1	0	0	1	0	0	1	0	1	1	**6**
Lewis Run Borough	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
Liberty Township	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Mount Jewett Borough	0	0	0	1	0	0	0	0	1	0	1	1	0	**4**
Norwich Township	0	0	0	1	0	0	0	0	1	0	0	0	0	**2**
Otto Township	0	0	0	1	0	0	1	1	1	0	0	0	0	**4**
Port Allegany Borough	0	0	0	1	0	0	1	4	1	0	1	1	0	**9**
Sergeant Township	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
Smethport Borough	0	0	0	1	0	1	2	2	1	0	0	1	1	**9**
Wetmore Township	0	0	0	0	0	0	0	1	2	0	0	1	0	**4**
Grand Total	**1**	**1**	**1**	**19**	**2**	**7**	**11**	**18**	**11**	**2**	**5**	**10**	**2**	**90**

While data was provided on the use types of parcels in McKean County, specific use of all structures which are not critical facilities does not exist. The number of mobile home structures was estimated for vulnerability and loss estimates in Section 4 by the number of structures on parcels which were designated for mobile or manufactured homes. This is clearly an estimation of mobile homes but allows a preliminary look at the unique risks faced by this type of structure. County officials noted that the numbers of mobile homes per jurisdiction seemed accurate with the exception of Smethport Borough, where not all parcels containing mobile homes were designated as such and thus, numbers of mobile homes is likely an underestimation. This was the only instance where structure designations were estimated in the HMPU.

Estimating potential losses that may occur as a result of hazard events requires a full range of information and accurate data. There are a number of site-specific characteristics that reduce a given structure's vulnerability and consequential losses. Examples include first-floor elevation, the number of stories, construction type, foundation type and the age and condition of the structure. The property tax assessment database includes the building and land assessment value for each parcel but does not include information on key variables that impact vulnerability, such as the age and value of individual structures, specific information on building height, construction type and first floor elevations.

Throughout the risk and vulnerability assessment included in Section 4, descriptions of limited data indicate some areas in which the County and 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.

3. Planning Process

3.1. Update Process and Participation Summary

The McKean County Hazard Mitigation Team, now the Hazard Mitigation Planning Team (HMPT), was first formed in 2004 in order to complete the first McKean County HMP. The North Central Pennsylvania Regional Planning and Development Commission (NCPRPDC) assisted the County Hazard Mitigation Team with facilitating the mitigation planning efforts over six months in 2004. The core Hazard Mitigation Team included McKean County officials from the Commissioners' Office, Emergency Management Agency, Planning Commission, and Assessment Office and representatives from the NCPRPDC. Input and data were provided by the US Army Corps of Engineers, the McKean County Conservation District, the Pennsylvania Department of Community and Economic Development, PEMA, and FEMA. Municipal representatives provided information through informational sessions, completing hazard vulnerability questionnaires, and providing hazard mitigation opportunities using PEMA's Hazard Mitigation Project Opportunity Form.

To begin the 2019 HMP update process, the McKean County Emergency Management Agency mailed meeting invitations to the Code Enforcement Officer and Emergency Management Coordinator (when applicable) in each municipality as well as the County Commissioners, adjacent county commissioners, and other stakeholders from state and local agencies, non-profits, and advocacy organizations. During the first meeting, a Contact Information Sheet was collected from each attendee; the HMPT mailing list was created from this contact information. Section 3.2 provides as discussion of the HMPT as well as a table of members and the organization or jurisdiction they represented.

Three public meetings were held by the McKean County DES. All three meetings were poorly attended, despite that they were publicly advertise in local media and open to anyone. We quickly realized that in order to garner 100% participation from all the municipalities, we needed to schedule individual meetings with all 22 municipalities and travel to their municipal offices. We did so and met with all municipalities (except for one that completed the forms via email) in May of 2019. At these meetings, we discussed hazard mitigation and had the municipal representatives complete Evaluation of Identified Hazard and Risks forms. Almost six months later, after much of the document had been edited and revised to reflect current phenomena, we met with all 22 municipalities in October and November of 2019 to discuss and finalize the mitigation actions. All 22 municipalities agreed to participate in some of the mitigation actions that were applicable to their municipality. In meeting with the 22 municipalities, we gained valuable feedback from them and obtained previously unknown knowledge that relates to hazards and risks in the county. Also we were able to better explain and educate the municipal representatives on why the plan is necessary, how it can be utilized, and why it needs to be in place. Lastly, the municipalities repeatedly mentioned that they preferred meeting with us face-to-face so that we were better able to explain and assist them in decision making.

A brief description of each meeting that was held can be found in Section 3.3. In addition we describe each meeting in detail and are available upon request

Table 3.1-1: Summary of participation from local municipalities during the 2019 Hazard Mitigation Planning Process.

MUNICIPALITY	MEETINGS AND FORMS COMPLETED							
	KICK-OFF MEETING April 25, 2019	**RISK ASSESSMENT SUMMARY MEETINGS** May – June 2019	**RISK ASSESSMENT PUBLIC MEETING** August 29, 2019	**EVALUATION OF IDENTIFIED HAZARDS AND RISKS FORM** (Completed during Risk Assessment Summary & Mitigation Meetings held in May/June)	**CAPABILITY ASSESSMENT SURVEY FORM** (Completed during Risk Assessment Summary & Mitigation Meetings held in May/June)	**MITIGATION ACTION REVIEW** Public Meeting October 29, 2019	**MITIGATION ACTION REVIEW FORMS**	**HMP COMMENT FORM**
Annin Township		X		X	X		X	
Bradford City		X		X	X		X	
Bradford Township		X		X	X		X	
Ceres Township		X		X	X		X	
Corydon Township	X	X		X	X		X	
Eldred Borough	X	X		X	X		X	
Eldred Township		X		X	X		X	
Foster Township		X		X	X		X	
Hamilton Township		X		X	X		X	
Hamlin Township		X		X	X		X	
Kane Borough		X	X	X	X		X	
Keating Township	X	X		X	X		X	
Lafayette Township	X	X		X	X		X	
Lewis Run Borough		X		X	X		X	
Liberty Township		X		X	X		X	
Mount Jewett Borough	X	X		X	X		X	
Norwich Township		X		X	X		X	
Otto Township	X	X		X	X		X	
Port Allegany Borough		X		X	X		X	
Sergeant Township		X		X	X		X	

Table 3.1-1: Summary of participation from local municipalities during the 2019 Hazard Mitigation Planning Process.

MUNICIPALITY	MEETINGS AND FORMS COMPLETED							
	KICK-OFF MEETING April 25, 2019	**RISK ASSESSMENT SUMMARY MEETINGS** May – June 2019	**RISK ASSESSMENT PUBLIC MEETING** August 29, 2019	**EVALUATION OF IDENTIFIED HAZARDS AND RISKS FORM** (Completed during Risk Assessment Summary & Mitigation Meetings held in May/June)	**CAPABILITY ASSESSMENT SURVEY FORM** (Completed during Risk Assessment Summary & Mitigation Meetings held in May/June)	**MITIGATION ACTION REVIEW** Public Meeting October 29, 2019	**MITIGATION ACTION REVIEW FORMS**	**HMP COMMENT FORM**
Smethport Borough		X		X	X		X	
Wetmore Township	X	X		X	X		X	

3.2. The Planning Team

The 2019 McKean County HMP update was led by a Hazard Mitigation Planning Team (HMPT), which included:

1. Tracy Carl, current Director of the McKean County Office of Emergency Services
2. Gerard Rettger, Deputy Director of the McKean County Office of Emergency Management Agency
3. Bruce Manning, former Director of the McKean County Office of Emergency Management Agency (retired), and current hazardous material officer
4. Sean P. McLaughlin, McKean County GIS Coordinator
5. Jeremy S. Morey, Director of the McKean County Planning Commission

In order to represent the diverse stakeholders in the County, the HMPT developed a diversified list of potential participants. Invitations were extended not only to municipal and county officials but also to adjacent jurisdictions, non-profit organizations, major employers, and federal, state, and county agencies with an interest or focus on hazard mitigation and emergency management. The HMPT worked throughout the process to plan and hold meetings, collect information, and conduct public outreach.

The stakeholders listed in Table 3.2-1 participated in the HMP update process, demonstrating their commitment to actively participate in the planning process by attending meetings, completing assessments, surveys, and worksheets, and/or submitting comments. The participants consisted of county and local officials including municipal supervisors and council members, emergency management coordinators, staff from various county departments, and the Bradford Regional Medical Center. The full list of municipal and miscellaneous stakeholders invited to participate in the process is listed below.

Table 3.2-1: Summary of participants in the 2019 HMPU.

MUNICIPALITY/ORGANIZATION	PARTICIPANT(S)
Annin Township	Dennis Thomas, Peter Causer, Jenny Nielsen
Bradford City	Teri Cannon, Carmen “Chip” Comilla, Eric Taylor
Bradford Township	James Irwin, Susan Gibiser
Ceres Township	Jeffrey Moyer, Lawrence Miller
Corydon Township	Charles Kaefer, Jan Kaefer
Eldred Borough	Shannon Weikart, Luanne Hurrle, Stephanie Mason, Daniel Plummer, Kevin Caldwell
Eldred Township	Jeffrey Rhinehart, Dave Crowe, Tim Moyer, Catherine Werlau
Foster Township	George Hocker, Shannon Morgan, Carl “Chip” McCracken, Chad Babcock
Hamilton Township	Rebecca “Becky” Davidson, Daniel “Dutch” Davidson, Brian Bastow, Nora Yasurek

Table 3.2-1: Summary of participants in the 2019 HMPU.	
MUNICIPALITY/ORGANIZATION	**PARTICIPANT(S)**
Hamlin Township	Wallace Howard, James Trussel, Jim Myers, Beth Crowely, Cheryl Putnam
Kane Borough	Gary Schull, Donald Payne, Jo Beth Brinkley, Tim Holt
Keating Township	Melissa Jo Smith, Doug Covert, Dave Vossler
Lafayette Township	John Knox, John Ryan, Michael Angelo, Kim Cole
Lewis Run Borough	Irvin Swartz, Joanne Caldwell
Liberty Township	Richard Brown, Lucinda Speeth
Mount Jewett Borough	Theresa Galloway, Annie Wolfe, Richard Kinner
Norwich Township	Paul Lathrop, Melinda Keesee
Otto Township	Gerard Rettger, Christopher Claycomb
Port Allegany Borough	Robert Vellieux, Kevin Ernst, Ellen Moshier, Glenn Drabert
Sergeant Township	Patricia Miller, Christopher Carlson
Smethport Borough	Kyle Day, Gregory Rounseville, Melody Deluca, Wayne Foltz
Wetmore Township	Elaine Bodistow, Jodi Yasurek
Bradford Regional Medical Center	Norman Strotman
McKean County Commissioners	Carol Duffy, Tom Kreiner
McKean County Economic Development Office	Sherri Geary
McKean County EMA	Gerard Rettger, Joel Anderson, Tracy Carl, Nate Burgett, Olivia Goodwill, Bruce Manning
McKean County Planning Commission	Jeremy Morey
McKean County GIS	Sean McLaughlin
Penn State Cooperative Extension, McKean County	Robert Dickinson
McKean County Conservation District	Jodi Groshek, Madeline Stanisch, Sandy Thompson
Pennsylvania Department of Conservation & Natural Resources	Dan Smith
American Red Cross	Matthew McCray

3.3. Meetings and Documentation

The following meetings were held during the planning process. All invitations, agendas, and sign-in sheets for these meetings are included and available upon request.

April 25, 2019: Community Kickoff Meeting held at the McKean County Office of Emergency Services to introduce the project and to local stakeholders, inform community representatives of the HMP update process and schedule, and make a formal request for response to the *Capability Assessment Survey* and *Evaluation of Identified Hazard and Risk Worksheet*.

May – June, 2019: Risk Assessment Summary Meetings held at municipal offices, in which township supervisors or borough/city managers and secretary/treasurers completed Evaluation of Identified Hazards and Risks forms & Capability Assessment Survey forms. These meetings began as the HMPT noticed that the previous formal request for completed documentation would not be finished in a timely manner.

July – October, 2019: Risk Assessment Review and Mitigation Solution Work Sessions held at the McKean County Office of Emergency Services to review preliminary risk assessment results, discuss mitigation goals and objectives, and select mitigation actions and projects to be included in the 2019 HMPU.

August 29, 2019: Risk Assessment Public Meeting held at the McKean County Department of Emergency Services Center where former director of the DES department gave a presentation on the different hazards and risks that were addressed, how each municipality and the HMPT ranked the hazards and risks, and what were the next steps in the process of drafting the mitigation goals and actions.

October 29, 2019: Final Public Meeting held to update the public about the HMP update process and findings. The meeting was advertised in the Bradford Era newspaper. To our dismay, no member of the public or municipal representatives attended this meeting.

October – November, 2019: Mitigation Action Review Meetings held at municipal offices in all 22 municipalities. The HMPT met with Township Road-masters/Department of Public Work Officials from boroughs, Secretary/Treasurers, Township Supervisors or Borough/City Managers, and other various officials including Emergency Management Coordinators, Code Enforcement Officers, and Fire Chiefs, Borough Council members. At these meetings we went through the list of mitigation actions, encouraged municipalities to agree to participate in actions that were applicable to them and discussed a variety of options, resources, and opportunities available when the HMP is adopted.

3.4. Public & Stakeholder Participation

Each community was given multiple opportunities to participate in the HMP update process through meetings, surveys and forms completed during meetings, participating or deferring mitigation actions, and an opportunity to comment on the draft HMP update. The four tools listed below were distributed with meeting invitations, at meetings, and upon request from members of the HMPT to solicit information, data, and comments from both local municipalities and other key stakeholders. Responses to these worksheets and surveys are included and available upon request.

1. **Evaluation of Identified Hazards and Risk Worksheet:** Capitalizes on local knowledge to evaluate the change in the frequency of occurrence, magnitude of 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, political and resiliency capabilities that can be included in the countywide mitigation strategy.
3. **Mitigation Strategy Goal and Objective Comment Worksheet:** Collected comments and suggestions from municipalities on the HMPU goals and objectives that had been vetted by the HMPT at the Internal Mitigation Strategy Review Meeting.
4. **Mitigation Action Form:** Allows communities to propose mitigation actions for the HMP and include information about each action such as a lead agency/department, implementation schedule, priority, estimated costs, and potential funding source(s).

Community participation and comments were encouraged throughout the planning process. The public was also encouraged to provide images and stories on the effects of the identified hazards in their community during the planning process. Additionally, press releases were provided to the County at the beginning of the planning process providing information on the HMP update and on opportunities for public and stakeholder involvement. A newspaper notice was published in the Bradford Era newspaper to notify the citizens of McKean County of the date and time of the public meeting.

3.5. Multi-Jurisdictional Planning

This HMP update was developed using a multi-jurisdictional approach. The County had resources such as technical expertise and historical data which some local jurisdictions lacked due to turnover of positions such as supervisors, borough managers, and secretary/treasurers. However involvement from local municipalities has been critical to the collection of local knowledge relating to hazardous event and mitigation activities. Local municipalities also have the legal authority to enforce compliance with land use planning and development issues. The County undertook an intensive effort to involve all jurisdictions in the planning process in which we succeeded by obtaining 100% participation from all 22 municipalities.

Table 3.1-1 documents jurisdictional completion of forms and surveys at the meetings described in Section 3.3 and other involvement from each jurisdiction throughout the planning process. Each municipality was emailed to schedule individualized meetings with members of the HMPT. Surveys and forms were taken to each jurisdiction, other than Keating township (which the forms were emailed to), and meetings were held by members of the Hazard Mitigation Plan Planning Team with the jurisdictional representatives. This was imperative in successfully achieving 100% participation from all municipalities. Additionally we were able to collect the most accurate data possible in reference to natural and man-made hazards that occurred within the individual municipalities. Furthermore, this method was found to be crucial in performing this HMPU and we will continue to do so going forward. In the end, 22 of 22 municipalities in the County participated in the plan, thus achieving 100% participation.

3.6. Existing Planning Mechanisms

There are numerous existing regulatory and planning mechanisms in place at the state, county, and municipal level of government which support hazard mitigation planning efforts. These tools

include the Commonwealth of Pennsylvania Standard All-Hazard Mitigation Plan, local floodplain management ordinances, the McKean County Comprehensive Plan, McKean County Emergency Operations Plan, McKean County Hazard Vulnerability Analysis (HVA), local Emergency Operation Plans, local zoning ordinances, local subdivision and land development ordinances, community wildfire protection plan, community storm-water management plan, and watershed and other environmental plans. These mechanisms were discussed at community meetings and are described in Section 5.2.

Information from several of these documents has been incorporated into this plan and mitigation actions have been developed to further integrate these planning mechanisms into the hazard mitigation planning process. In particular, information on identified development constraints and potential future growth areas was incorporated from the McKean County Comprehensive Plan so that vulnerability pertaining to future development could be established. The County HVA provided extensive information on past occurrences, vulnerability, and risk in the last five years, including anecdotal information. Floodplain management ordinance information was used to aid in the establishment of local capabilities in addition to participation in the NFIP.

4. Risk Assessment

4.1. Update Process Summary

The risk assessment provides a factual basis for activities proposed by the County in their mitigation strategy. Hazards that may affect McKean County are identified and defined in terms of their location and extent, magnitude of impacts, previous events, and probability of future events. This hazard profile structure differs from the structure used in the 2011 McKean County HMP, where each profile had some combination of history, vulnerability, and probability. However, all information from the previous plan has been incorporated and/or updated in the 2019 HMPU unless indicated.

The 2011 McKean County Hazard Mitigation Plan included a robust list of sixteen natural and human-made hazards affecting the County. To update these hazards, the HMPT were asked to assess the change in risk for all hazards identified in the 2011 plan and vote on which hazards not previously identified but included in the Pennsylvania Standard State List of Hazards provided had the potential to impact McKean County. After an analysis of the responses, consultation and input from the municipalities the decision was made to remove one hazard and add a new hazard: Nuclear Incidents and Invasive Species Infestations, respectively. Hazard profiles were then developed in order to define the characteristics of each hazard as they apply to McKean County.

Following hazard identification and profiling, a vulnerability assessment were conducted for each hazard to identify the impact of both natural and human-made hazard events on people, buildings, infrastructure, and the community, as appropriate. Each hazard is discussed in terms of its potential impact on individual communities, including the types of structures that may be at risk. 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. A vulnerability analysis was performed which identifies structures, critical facilities, and/or populations that may be impacted during hazard events and describes what events can do to physical, social, and economic assets. Depending upon data availability, assessment results consist of an inventory of vulnerable structures or populations.

4.2. Hazard Identification

4.2.1. Table of Presidential Disaster Declarations

Presidential Disaster and Emergency Declarations are issued when it has been determined that state and local governments need assistance in responding to a disaster event. Table 4.2-1 identifies Presidential Disaster and Emergency Declarations issued between 1955 through 2018 that have affected McKean County. Additional declarations beyond 2018 can be found on the FEMA website. It is important to note that for instances where hurricanes or tropical storms initiated a disaster declaration, it was largely as a result of the damage caused by the excessive precipitation and flooding effects of coastal storms, not the damaging wind speeds.

Table 4.2-1: Presidential Disaster and Emergency Declarations affecting McKean County		
DECLARATION NUMBER	**DATE**	**EVENT**
3235	September, 2005	Proclamation of Emergency – Hurricane Katrina
1485	August, 2003	Severe Storms, Tornadoes, and Flooding
1497	September, 2003	Tropical Storms Henri and Isabel
1298	August, 1999	Tropical Depression Dennis and Flash Flooding
1294	September, 1999	Hurricane Floyd
1093	January, 1996	Flooding
3105	March, 1993	Severe Snowfall and Winter Storm
737	May, 1985	Severe Storms, High Winds, and Tornadoes
721	August, 1984	Severe Storms, Flooding
340	June, 1972	Tropical Storm Agnes

In addition to these Federally-declared events, eleven events warranted Gubernatorial Proclamations of Emergency. These events are listed in Table 4.2-2.

Table 4.2-2: McKean County Gubernatorial Proclamations of Emergency.	
DATE	**TYPE**
January 2018	Proclamation of Emergency - Opioid Crisis
March 2017	Proclamation of Emergency - Winter Storm
January 2016	Proclamation of Emergency - Winter Storm
August 2015	Proclamation of Emergency - Severe Storms
January 2015	Proclamation of Emergency - Winter Storm
February 2014	Proclamation of Emergency - Winter Storm
January 2014	Proclamation of Emergency - Extreme Weather / Utility Interruption
June 2013	Proclamation of Emergency - Severe Weather
October 2012	Proclamation of Emergency - Hurricane Sandy
April 2012	Proclamation of Emergency - Spring Winter Weather
August 2011	Proclamation of Emergency - Storms Irene & Lee
January 2011	Proclamation of Emergency - Winter Storm

February 2010	Proclamation of Emergency - Winter Storms
April 2007	Proclamation of Emergency - Winter Storm
February, 2007	Proclamation of Emergency - Severe Winter Storm
February, 2007	Proclamation of Emergency - Regulations
April, 2007	Proclamation of Emergency - Severe Winter Storm
September, 2006	Proclamation of Emergency - Tropical Depression Ernesto
September, 2005	Proclamation of Emergency - Hurricane Katrina
January, 1978	Heavy Snow
February, 1978	Blizzard
February, 1974	Truckers Strike
July, 1974	Flood
February, 1972	Heavy Snow

McKean County has also been offered Small Business Administration Disaster Assistance for four disaster events. This disaster assistance qualifies communities for access to affordable, timely, and accessible financial assistance. Table 4.2-3 provides details for these four events.

Table 4.2-3: McKean County Small Business Administration Disaster Declarations.

DATE	TYPE	AFFECTED AREAS
June 2014	Severe Storms / Flooding	Elk, McKean, Clearfield, Forest, Jefferson and Warren Counties
July, 2007	Drought	McKean, Potter and Warren Counties
August, 2006	Excessive Rain, Flooding and Flash Flooding	Erie, McKean, Potter and Warren Counties
March, 2003	Fire, Borough of Emporium	Cameron, Clearfield, Clinton, Elk, McKean and Potter Counties
April, 2003	Fire	Forest, Clarion, Elk, Jefferson, McKean, Venango and Warren Counties

Since 1970, declarations have been issued for a variety of hazard events, including hurricanes, tornadoes, severe winter storms, and flooding. A unique Presidential Emergency Declaration was issued in September 2005; through Emergency Declaration 3235, President George W. Bush declared that a state of emergency existed in the Commonwealth of Pennsylvania and ordered federal aid to supplement Commonwealth and local response efforts to help people evacuated from their homes due to Hurricane Katrina. All counties within Pennsylvania, including McKean County, were indirectly affected by Hurricane Katrina as a result of evacuee assistance.

4.2.2. Summary of Hazards

The HMPT was provided the Pennsylvania Standard List of Hazards to be considered for evaluation in the 2019 HMP. Following a review of the hazards considered in the 2011 HMP and the Standard List of Hazards, the HMPT decided that the 2019 plan should identify, profile, and analyze seventeen hazards. These seventeen hazards include all hazards profiled in the 2011 plan and the addition of Invasive Species as a hazard of concern. Table 4.2-X contains a complete list of the seventeen hazards that have the potential to impact McKean County as identified through previous risk assessments, the County Hazards Vulnerability Analysis, and input from those that participated in the 2019 HMP update. Hazard profiles are included in Section 4.3 for each of these hazards.

Table 4.2-4: Hazards identified in the 2019 McKean County Hazard Mitigation Plan and their respective definitions.

Hazard Name	Hazard Description
NATURAL HAZARDS	
Drought	Drought is a natural climatic condition which occurs in virtually all climates, the consequence of a natural reduction in the amount of precipitation experienced over a long period of time, usually a season or more in length. High temperatures, prolonged winds, and low relative humidity can exacerbate the severity of drought. This hazard is of particular concern in Pennsylvania due to the presence of farms as well as water-dependent industries and recreation areas across the Commonwealth. A prolonged drought could severely impact these sectors of the local economy, as well as residents who depend on wells for drinking water and other personal uses. (National Drought Mitigation Center, 2006).
Earthquake	An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10-20 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. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking which is dependent upon amplitude and duration of the earthquake. (FEMA, 1997).

Table 4.2-4: Hazards identified in the 2019 McKean County Hazard Mitigation Plan and their respective definitions.

Hazard Name	Hazard Description
Flood, Flash Flood, Ice Jam	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 of time. 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. The severity of a flood event is dependent upon a combination of stream and river basin topography and physiography, hydrology, precipitation and weather patterns, present soil moisture conditions, the degree of vegetative clearing as well as the presence of impervious surfaces in and around flood-prone areas (NOAA, 2009). 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 (USACE, 2007).
Invasive Species	An invasive species is a species that is not indigenous to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. These species can be any type of organism: plant, fish, invertebrate, mammal, bird, disease, or pathogen. Infestations may not necessarily impact human health, but can create a nuisance or agricultural hardships by destroying crops, defoliating populations of native plant and tree species, or interfering with ecological systems (Governor's Invasive Species Council of Pennsylvania, 2009).
Landslide	A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation reacting to the force of gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes, and changes in groundwater levels. Mudflows, mudslides, rockfalls, rockslides, and rock topples are all forms of a landslide. Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, developed hillsides, and areas recently burned by forest and brush fires. (Delano & Wilshusen, 2001).
Subsidence, Sinkhole	Subsidence is a natural geologic process that commonly occurs in areas with underlying limestone bedrock and other rock types that are soluble in water. Water passing through naturally occurring fractures dissolves these materials leaving underground voids. Eventually, overburden on top of the voids causes a collapse which can damage structures with low strain tolerances. This collapse can take place slowly over time or quickly in a single event, but in either case. Karst topography describes a landscape that contains characteristic structures such as sinkholes, linear depressions, and caves. In addition to natural processes, human activity such as water, natural gas, and oil extraction, and man-made municipal infrastructure can cause subsidence and sinkhole formations. (FEMA, 1997).

Table 4.2-4: Hazards identified in the 2019 McKean County Hazard Mitigation Plan and their respective definitions.	
Hazard Name	**Hazard Description**
Tornado, Windstorm	A wind storm can occur during severe thunderstorms, winter storms, coastal storms, or tornadoes. Straight-line winds such as a downburst have the potential to cause wind gusts that exceed 100 miles per hour. Based on 40 years of tornado history and over 100 years of hurricane history, FEMA identifies western and central Pennsylvania as being more susceptible to higher winds than eastern Pennsylvania. (FEMA, 1997). A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes or tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of high wind velocities and wind-blown debris. According to the National Weather Service, tornado wind speeds can range between 30 to more than 300 miles per hour. They are more likely to occur during the spring and early summer months of March through June and are most likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touch down briefly, but even small, short-lived tornadoes can inflict tremendous damage. Destruction ranges from minor to catastrophic depending on the intensity, size, and duration of the storm. Structures made of light materials such as mobile homes are most susceptible to damage. Waterspouts are weak tornadoes that form over warm water and are relatively uncommon in Pennsylvania. Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 2002). Based on NOAA Storm Prediction Center Statistics, the number of recorded F3, F4, & F5 tornadoes between 1950-1998 ranges from <1 to 15 per 3,700 square mile area across Pennsylvania (FEMA, 2009). A water spout is a tornado over a body of water (American Meteorological Society, 2009).
Wildfire	A wildfire is a raging, uncontrolled fire that spreads rapidly through vegetative fuels, exposing and possibly consuming structures. Wildfires often begin unnoticed and can spread quickly, creating dense smoke that can be seen for miles. Wildfires can occur at any time of the year, but mostly occur during long, dry hot spells. Any small fire in a wooded area, if not quickly detected and suppressed, can get out of control. Most wildfires are caused by human carelessness, negligence, and ignorance. However, some are precipitated by lightning strikes and in rare instances, spontaneous combustion. Wildfires in Pennsylvania can occur in fields, grass, brush, and forests. 98% of wildfires in Pennsylvania are a direct result of people, often caused by debris burns (DCNR-BOF, 2009).
Winter Storm	Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. 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. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely impair visibility and disrupt transportation. The Commonwealth of Pennsylvania has a long history of severe winter weather. (NOAA, 2009).

Table 4.2-4: Hazards identified in the 2019 McKean County Hazard Mitigation Plan and their respective definitions.	
Hazard Name	**Hazard Description**
HUMAN-MADE HAZARDS	
Dam Failure	A dam is a barrier across flowing water that obstructs, directs, or slows down water flow. Dams provide benefits such as flood protection, power generation, drinking water, irrigation, and recreation. Failure of these structures results in an uncontrolled release of impounded water. Failures are relatively rare, but immense damage and loss of life is possible in downstream communities when such events occur. Aging infrastructure, hydrologic, hydraulic and geologic characteristics, population growth, and design and maintenance practices should be considered when assessing dam failure hazards. The failure of the South Fork Dam, located in Johnstown, PA, was the deadliest dam failure ever experienced in the United States. It took place in 1889 and resulted in the Johnstown Flood which claimed 2,209 lives (FEMA, 1997). Today there are approximately 3,200 dams and reservoirs throughout Pennsylvania (Pennsylvania Department of Environmental Protection, 2009).
Disorientation	Large numbers of people are attracted to Pennsylvania's rural areas for recreational purposes such as hiking, camping, hunting, and fishing. As a result, people can become lost or trapped in remote and rugged wilderness areas. Search and rescue may be required for people who suffer from medical problems or injuries and those who become accidentally or intentionally disoriented. Search and rescue efforts are focused in and around state forest and state park lands (DCNR, 2009).
Environmental Hazards	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 Environmental Health Sciences, July 2009; EPA, Natural Disaster PSAs, 2009). • **Superfund Facilities**; hazards originating from abandoned hazardous waste sites listed on the National Priorities List (EPA, National Priorities List, 2009). • **Manure Spills**; involving the release of stored or transported agricultural waste, for example (EPA, Environmental Impacts of…, 1998). **Product Defect or Contamination**; highly flammable or otherwise unsafe consumer products and dangerous foods (Consumer Product Safety Commission, 2003).
Terrorism	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. (FEMA, 2009).

Table 4.2-4: Hazards identified in the 2019 McKean County Hazard Mitigation Plan and their respective definitions.	
Hazard Name	**Hazard Description**
Transportation Accident	Transportation accidents can result from any form of air, rail, water, or road travel. It is unlikely that small accidents would significantly impact the larger community. However, certain accidents could have secondary regional impacts such as a hazardous materials release or disruption in critical supply/access routes, especially if vital transportation corridors or junctions are present. (US DOT, 2009). Traffic congestion in certain circumstances can also be hazardous. Traffic congestion is a condition that occurs when traffic demand approaches or exceeds the available capacity of the road network. This hazard should be carefully evaluated during emergency planning since it is a key factor in timely disaster or hazard response, especially in areas with high population density. (Federal Highway Administration, 2009).
Urban Fire and Explosion	An urban fire involves a structure or property within an urban or developed area. For hazard mitigation purposes, major urban fires involving large buildings and/or multiple properties are of primary concern. The effects of a major urban fire include minor to significant property damage, loss of life, and residential or business displacement. Explosions are extremely rapid releases of energy that usually generate high temperatures and often lead to fires. The risk of severe explosions can be reduced through careful management of flammable and explosive hazardous materials. (FEMA, 1997).
Utility Interruption	Utility interruption hazards are hazards that impair the functioning of important utilities in the energy, telecommunications, 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. • **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, deepwater ports and harbors, public buildings, bridges, dams, for example (United 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).

Hazard Profiles and Vulnerability Analysis

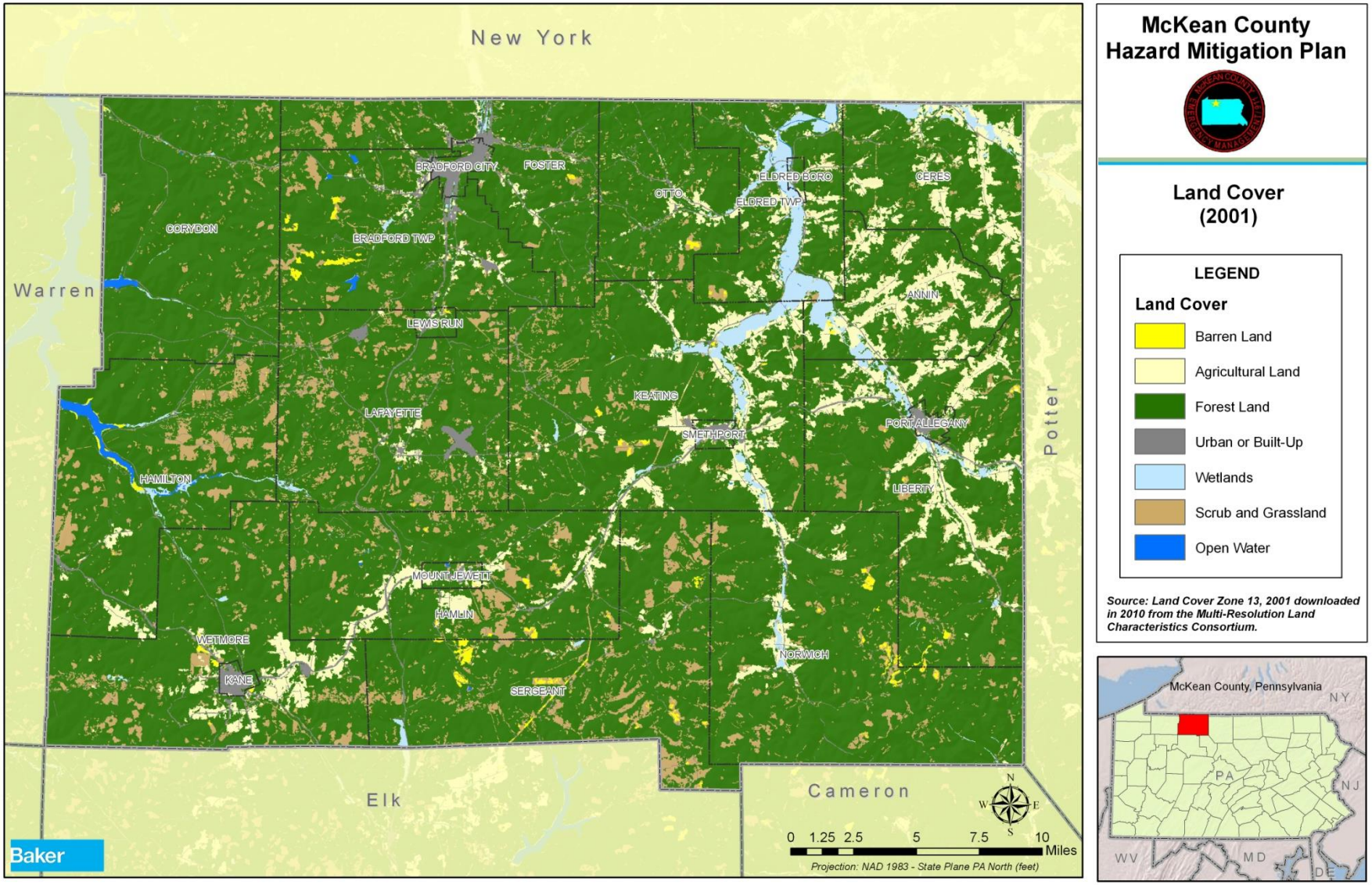
NATURAL HAZARDS

4.3 Drought

4.3.1.1 Location and Extent

Droughts are regional climatic events, so when these events occur in McKean County, impacts are felt across the County as well as in areas outside the County boundaries. The spatial extent for areas of impact can range from localized areas in Pennsylvania to the entire Mid-Atlantic region. Areas with extensive agricultural land uses are most vulnerable to drought; as shown in Figure 4.3.1-1, these uses are largely found in the northeastern portion of the County.

Figure 4.3.1-1: Land cover map of McKean County (MRLC, 2001).



4.3.1.2 Range of Magnitude

Hydrologic drought events result in a reduction of stream flows, reduction of lake/reservoir storage, and a lowering of groundwater levels. These events have adverse impacts on public water supplies for human consumption, rural water supplies for livestock consumption and agricultural operations, water quality, natural soil water or irrigation water for agriculture, soil moisture, conditions conducive to wildfire events, and water for navigation and recreation.

The Pennsylvania Department of Environmental Protection uses four parameters to assess drought conditions:

1. Stream flows (compared to benchmark records)
2. Precipitation (measured as the departure from normal, 30 year average precipitation)
3. Groundwater elevations in a number of counties (comparing to past month, past year and historic record)
4. The Palmer Drought Severity Index (PDSI) – a soil moisture algorithm calibrated for relatively homogeneous regions which measures dryness based on recent precipitation and temperature (see Table 4.3.1-1).

Table 4.3.1-1: PDSI classifications (NDMC, 2009).

SEVERITY CATEGORY	PSDI 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 wet 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

Phases of drought preparedness in Pennsylvania in order of increasing severity are:

- Drought Watch: A period to alert government agencies, public water suppliers, water users and the public regarding the potential for future drought-related problems. The focus is on increased monitoring, awareness and preparation for response if conditions worsen. A request for voluntary water conservation is made. The objective of voluntary water conservation measures during a drought watch is to reduce water uses by 5 percent in the affected areas. Due to varying conditions, individual water suppliers or municipalities may be asking for more stringent conservation actions.
- Drought Warning: This phase involves a coordinated response to imminent drought conditions and potential water supply shortages through concerted voluntary conservation measures to avoid or reduce shortages, relieve stressed sources, develop new sources, and if possible forestall the need to impose mandatory water use restrictions. The objective of voluntary water conservation measures during a drought warning is to reduce overall water uses by 10-15 percent in the affected areas. Due to varying conditions, individual water suppliers or municipalities may be asking for more stringent conservation actions.

- Drought Emergency: This stage is a phase of concerted management operations to marshal all available resources to respond to actual emergency conditions, to avoid depletion of water sources, to assure at least minimum water supplies to protect public health and safety, to support essential and high priority water uses and to avoid unnecessary economic dislocations. It is possible during this phase to impose mandatory restrictions on non-essential water uses that are provided in the Pennsylvania Code (Chapter 119), if deemed necessary and if ordered by the Governor of Pennsylvania. The objective of water use restrictions (mandatory or voluntary) and other conservation measures during this phase is to reduce consumptive water use in the affected area by fifteen percent, and to reduce total use to the extent necessary to preserve public water system supplies, to avoid or mitigate local or area shortages, and to assure equitable sharing of limited supplies.
- Local Water Rationing: Although not a drought phase, local municipalities may, with the approval of the PA Emergency Management Council, implement local water rationing to share a rapidly dwindling or severely depleted water supply in designated water supply service areas. These individual water rationing plans, authorized through provisions of the Pennsylvania Code (Chapter 120), will require specific limits on individual water consumption to achieve significant reductions in use. Under both mandatory restrictions imposed by the Commonwealth and local water rationing, procedures are provided for granting of variances to consider individual hardships and economic dislocations.

Environmental impacts of drought include:

- Hydrologic effects – lower water levels in reservoirs, lakes, and ponds; reduced streamflow; loss of wetlands; estuarine impacts; groundwater depletion and land subsidence; effects on water quality such as increases in salt concentration and water temperature
- Damage to animal species – lack of feed and drinking water; disease; loss of biodiversity; migration or concentration; and reduction and degradation of fish and wildlife habitat
- Damage to plant communities – loss of biodiversity; loss of trees from urban landscapes and wooded conservation areas
- Increased number and severity of fires
- Reduced soil quality
- Air quality effects – dust and pollutants
- Loss of quality in landscape

The worst-case drought event in McKean County occurred from August 1991 until April 1992. The County was in a state of Drought Emergency for these nine months; during this drought, McKean County experienced significant agricultural losses and reduced public water supplies. During this event, Eldred Borough had to have water trucked in from Port Allegany on two separate occasions to deal with the drought event.

4.3.1.3 Past Occurrence

Declared drought status for McKean County from 1980 to 2018 is shown in Table 4.3.1-2. Descriptions for drought status categories (i.e. *watch*, *warning*, and *emergency*) are included in Section 4.3.1.2. The Department of Environmental Protection is the agency responsible for collecting drought information. Data for all counties in the Commonwealth is available for the years 1980 through 2018.

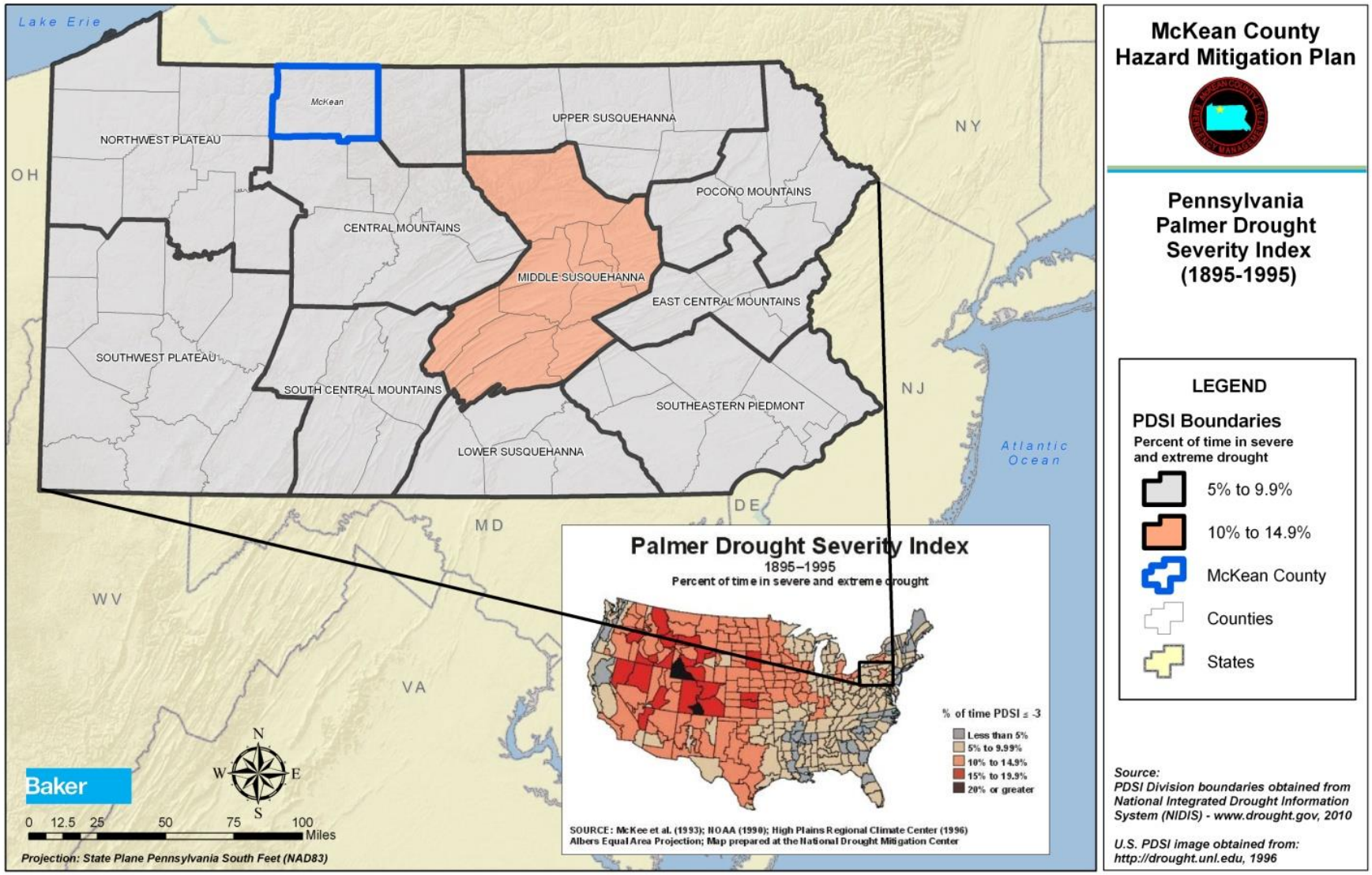
Table 4.3.1-2: Previous drought watch, warning, and emergencies in McKean County (DEP, 2019).			
DATE	**DROUGHT STATUS**	**DATE**	**DROUGHT STATUS**
Oct 22, 1985 - Oct 29, 1985	Watch	Mar 15, 1999 - Jun 10, 1999	Watch
Oct 29, 1985 - Dec 19, 1985	Watch	Jun 10, 1999 - Jun 18, 1999	Watch
Jul 7, 1988 - Aug 24, 1988	Watch	Jun 18, 1999 - Jul 20, 1999	Watch
Aug 24, 1988 - Dec 12, 1988	Warning	Jul 20, 1999 - Sep 30,1999	Watch
Mar 3, 1989 - May 15, 1989	Watch	Sep 30, 1999 - Dec 16, 1999	Warning
Jun 28, 1991 - Jul 24, 1991	Watch	Dec 16, 1999 - Feb 25,2000	Warning
Jul 24, 1991 - Aug 16, 1991	Warning	Feb 25, 2000 - May 5, 2000	Watch
Aug 16, 1991 - Sep 13, 1991 E	Emergency	Aug 24, 2001 - Nov 6, 2001	Watch
Sep 13, 1991 - Oct 21, 1991 E	Emergency	Nov 6, 2001 - Dec 5, 2001	Watch
Oct 21, 1991 - Jan 16, 1992 E	Emergency	Dec 5, 2001 - Feb 12, 2002	Watch
Jan 17, 1992 - Apr 20, 1992	Emergency	Feb 12, 2002 - May 13, 2002	Watch
Apr 20, 1992 - Jun 23, 1992	Warning	Apr 11, 2006 - Jun 30, 206	Watch
Jun 23, 1992 - Sep 11, 1992	Watch	Aug 8, 2007 - Sep 5, 2007	Watch
Sep 1, 1995 - Sep 20, 1995	Watch	Sep 5, 2007 - Oct 5, 2007	Watch
Sep 20, 1995 - Nov 8, 1995	Watch	Oct 5, 2007 - Jan 11, 2008	Watch
Nov 8, 1995 - Dec 18, 1995	Watch	Nov 7, 2008 - Jan 26, 2009	Watch
Dec 3, 1998 - Dec 8, 1998	Watch	Sept 16, 2010-Dec 17, 2010	Watch
Dec 8, 1998 - Dec 14, 1998	Watch	Aug 5, 2011 - Sep 2, 2011	Warning
Dec 14, 1998 - Dec 16, 1998	Warning	Sep 2 2011- Oct 12, 2011	Watch
Dec 16, 1998 - Jan 15, 1999	Warning	March 24, 2015 - July 10, 2015	Watch
Jan 15, 1999 - Mar 15, 1999	Warning	Aug 2, 2016 - Nov 3, 2016	Watch

The drought in 2007 resulted in the Small Business Administration releasing low-interest loans to recover from the event.

4.3.1.4 Future Occurrence

It is difficult to forecast the exact severity and frequency of future drought events in McKean County, but the County HVA reports that droughts have become more frequent in recent years, with three drought warnings affecting the County since 1999 (MCEMA, 2019). Based on national data from 1900 to July 2019, McKean County is in drought status approximately fifteen percent of the time (see Figure 4.3.1-2). This is equivalent to a PDSI value less than or equal to -2. Therefore, the future occurrence of drought can be considered *possible,* as defined by the Risk Factor methodology probability criteria (see Table 4.4-1).

Figure 4.3.1-2: PDSI Value for McKean County.



4.3.1.5 Vulnerability Assessment

The most significant losses resulting from drought events are typically found in the agriculture sector of the County's economy. For example, the drought in 1999 resulted in a Gubernatorial Proclamation of Emergency in part because of significant crop damage. Preliminary damage estimates by the US Department of Agriculture indicated possible crop losses across Pennsylvania in excess of $500 million. This figure did not include a 20 percent decrease in dairy milk production statewide, which also resulted in million dollar losses (NCDC, 2009).

While these were statewide impacts, they illustrate the potential for droughts to severely impair the local economy in more agricultural communities. McKean County ranks 62nd of the 67 counties with agricultural production totaling $5.2 million (USDA, 2012). Over 80% of this total is the production of livestock, poultry, and their products ($4.3 million); the remaining agricultural production is made up of crops, including nursery and greenhouse crops.

As indicated in the 1991-1992 drought discussed in Section 4.3.1.2, water supplies are also vulnerable to the effects of drought. Public water service is available in the Bradford City, Mt. Jewett, Port Allegany, Smethport, Eldred, Kane, and portions of Bradford and Lafayette Townships. Other areas including the villages of Gifford, Clermont, Rixford, and Cyclone rely on small community water systems (McKean County DES, 2019).

With limited public water service, most areas of the County must rely on private domestic wells. McKean County residents that use private domestic wells are more vulnerable to droughts because their drinking water can literally dry up. Table 4.3.1-3 shows the number of domestic wells per municipality; there are a total of 745 domestic wells in the County. It is important to note that the well data was obtained from the Pennsylvania Groundwater Information System (PaGWIS). **PaGWIS relies on <u>voluntary submissions</u> of well record data by well drillers; as a result, it is not a complete database of all domestic wells in the County.** This is the most complete dataset of domestic wells available.

Table 4.3.1-3: Number of domestic wells per municipality in McKean County (PaGWIS 2019).

MUNICIPALITY	DOMESTIC WELLS
Annin Township	38
Bradford City	15
Bradford Township	70
Ceres Township	29
Corydon Township	35
Eldred Borough	4
Eldred Township	62
Foster Township	116
Hamilton Township	16
Hamlin Township	26
Kane Borough	6
Keating Township	54
Lafayette Township	42
Lewis Run Borough	1

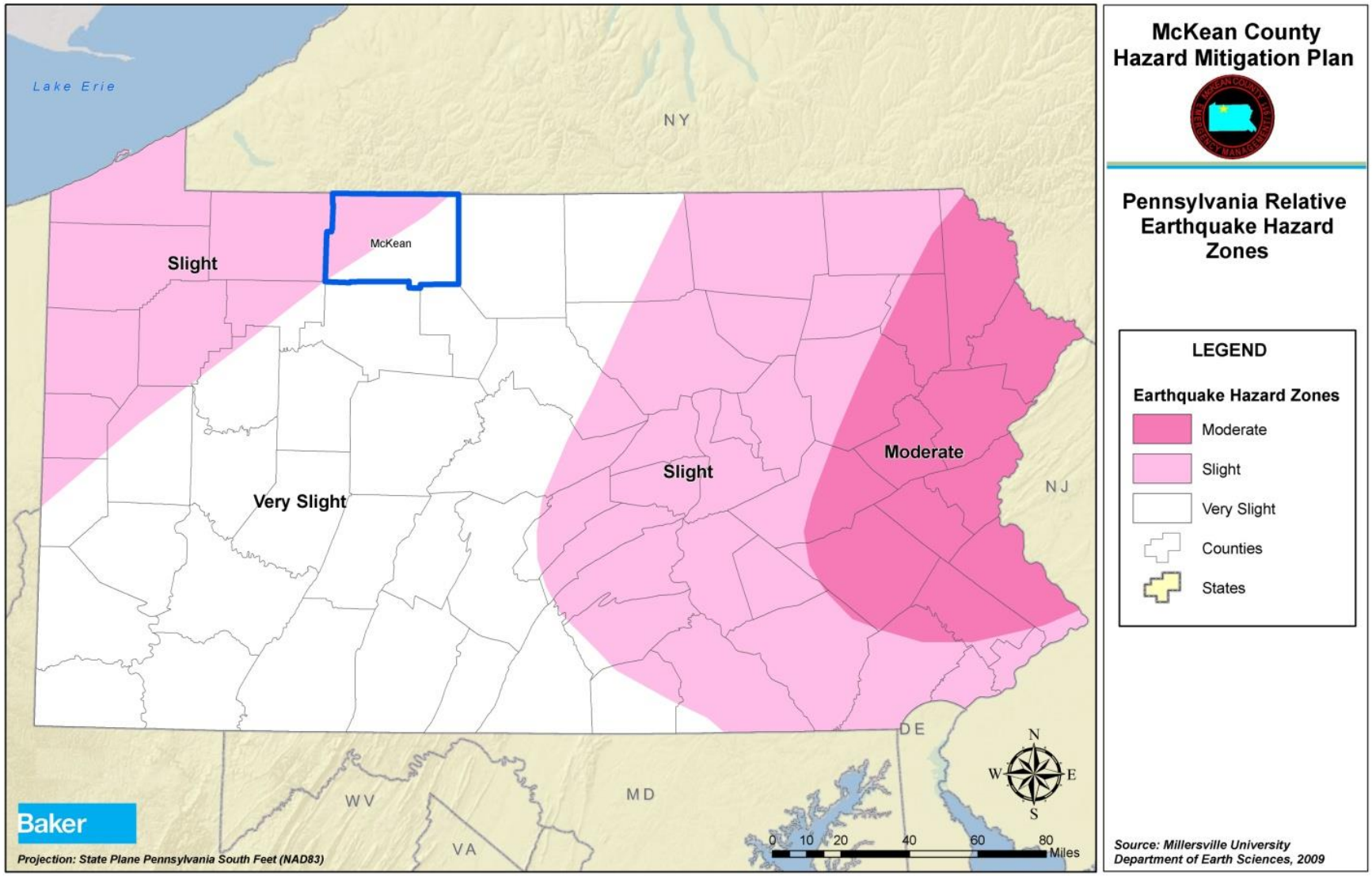
Table 4.3.1-3: Number of domestic wells per municipality in McKean County (PaGWIS 2019).	
MUNICIPALITY	**DOMESTIC WELLS**
Liberty Township	105
Mt Jewett Borough	7
Norwich Township	21
Otto Township	30
Port Allegany Borough	3
Sergeant Township	12
Smethport Borough	14
Wetmore Township	26
Unknown	13
TOTAL	**745**

4.3.2 Earthquake

4.3.2.1 Location and Extent

Earthquake events in Pennsylvania do not typically impact areas greater than 100 km from the epicenter of the event and are usually mild events. The Department of Earth Sciences at Millersville University identified relative earthquake hazard zones for Pennsylvania. As seen in Figure 4.3.2-1, the northwestern half of the County falls into the “slight” zone while the southeastern portion of the County falls into the “very slight” zone.

Figure 4.3.2-1: Earthquake hazard zones for Pennsylvania, highlighting McKean County.



4.3.2.2 Range of Magnitude

Earthquake magnitude is often measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. Table 4.3.2-1 summarizes Richter Scale Magnitudes as they relate to the spatial extent of impacted areas. A historical survey of earthquakes occurring near McKean County indicates that earthquakes have generally had magnitudes of less than 3.5, and Pennsylvania has not experienced any earthquakes with a magnitude greater than 6.0.

Table 4.3.2-1: Richter scale magnitudes and associated earthquake size effects.

RICHTER MAGNITUDES	EARTHQUAKE EFFECTS
Less than 3.5	Generally not felt, but recorded.
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.

The Richter Scale does not give any indication of the impact or damage of an earthquake, although it can be inferred that higher magnitude events cause more damage. Instead, the impact of an earthquake event is measured in terms of earthquake intensity, usually measured using the Modified Mercalli Intensity Scale, shown in Table 4.3.2-2. Because McKean County is not on an active fault line, little or no damage is expected from these earthquake events. However, since the worst earthquake recorded in Pennsylvania was a magnitude 5.2, a worst-case scenario for this hazard would be if an earthquake of similar magnitude occurred in McKean County, causing very mild damage in populated areas of the County.

Table 4.3.2-2: Modified Mercalli Intensity Scale with associated impacts.

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER SCALE MAGNITUDE
I	**Instrumental**	Detected only on seismographs	<4.2
II	**Feeble**	Some people feel it	<4.2
III	**Slight**	Felt by people resting; like a truck rumbling by	<4.2
IV	**Moderate**	Felt by people walking	<4.2
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

Table 4.3.2-2: Modified Mercalli Intensity Scale with associated impacts.			
SCALE	**INTENSITY**	**DESCRIPTION OF EFFECTS**	**CORRESPONDING RICHTER SCALE MAGNITUDE**
IX	**Ruinous**	Some houses collapse, ground cracks, pipes break open	<6.9
X	**Disastrous**	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread	<7.3
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

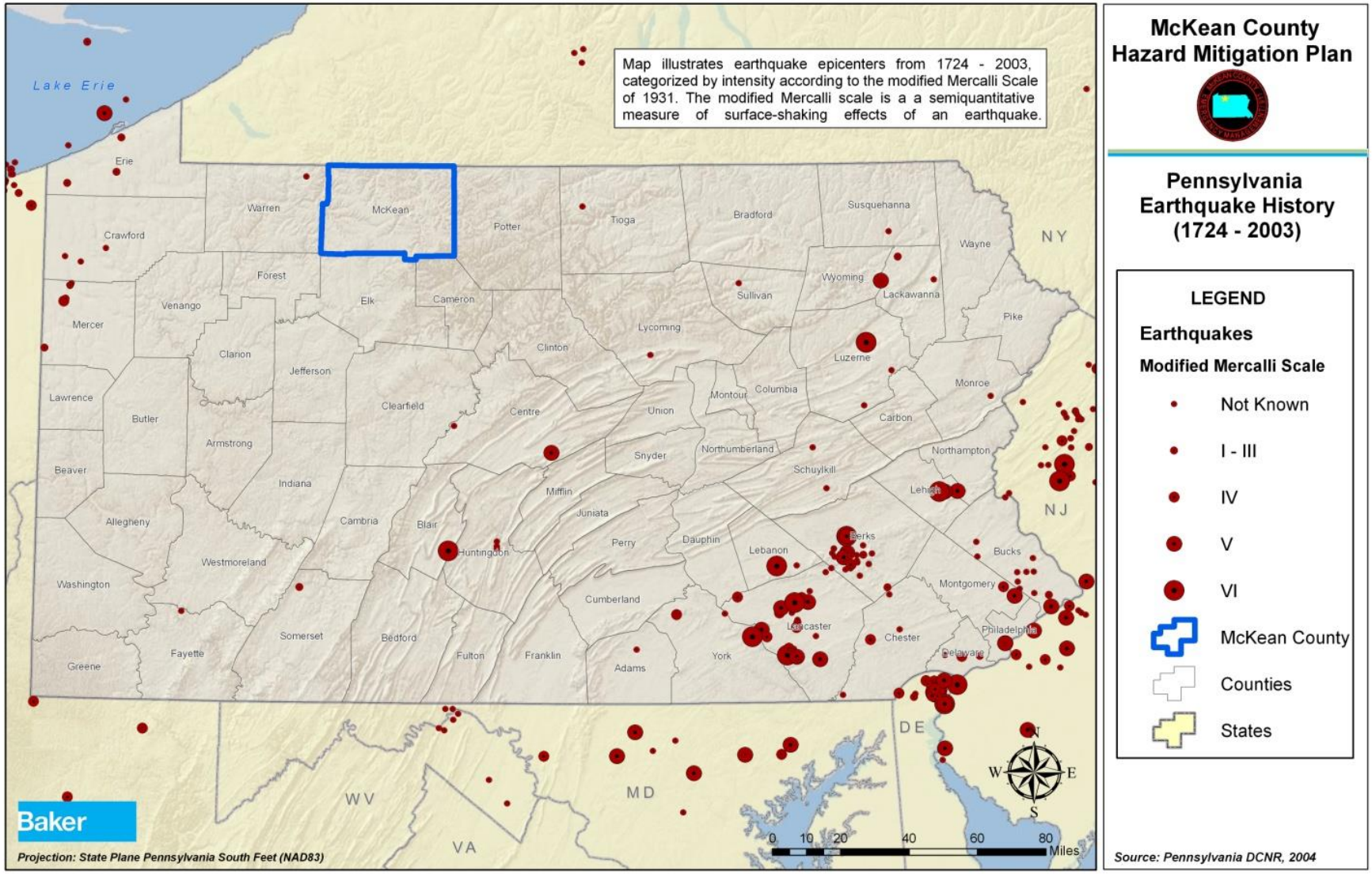
Environmental impacts of earthquakes can be numerous, widespread, and devastating, particularly if indirect impacts like economic impacts are considered. Some examples of these impacts are listed below, but are unlikely to occur in McKean County:

- Induced tsunamis and flooding or landslides and avalanches;
- Poor water quality;
- Damage to vegetation; and
- Breakage in sewage or toxic material containments.

4.3.2.3 Past Occurrence

According to records maintained by the Pennsylvania DCNR, there has never been an earthquake with an epicenter located in McKean County. However, as shown in Figure 4.3.2-2, there have been some minor events located in adjacent counties in both Pennsylvania and New York, and McKean County has, at times, experienced minor tremors from these events (MCEMA, 2019). On the whole, though, these have largely been minor events with low intensities.

Figure 4.3.2-2: McKean County earthquake history.



4.3.2.4 Future Occurrence

One way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. Peak horizontal ground acceleration (PHGA) measures the strength of ground movements in this manner. PGHA is the percent of *g* (acceleration due to gravity) experienced during the earthquake or the rate in change of motion of the earth's surface during an earthquake as a [percent of the established rate of acceleration due to gravity. In general, an acceleration of 10- to 15- percent of gravity is associated with structural damage to ordinary buildings not designed to withstand earthquakes, although soil conditions at individual sites will impact the amount of damage.

The US Geologic Survey models contours which represent earthquake ground motions that have a 2-percent probability of being experienced over a 50-year period. The PGHA value for McKean County is between four and six. These values correspond to events with low intensities and an expectation of little or no structural damage. Overall, the future occurrence of earthquakes in McKean County can be considered *unlikely*, as defined by the Risk Factor methodology probability criteria (see Table 4.4-1).

4.3.2.5 Vulnerability Assessment

Earthquakes of the magnitude seen in Northwest Pennsylvania are small and shallow. Based on the past history of earthquake events near McKean County, the County's vulnerability to this hazard is expected to be low. In the event of an earthquake, unanchored objects may be upset, but few damages are expected.

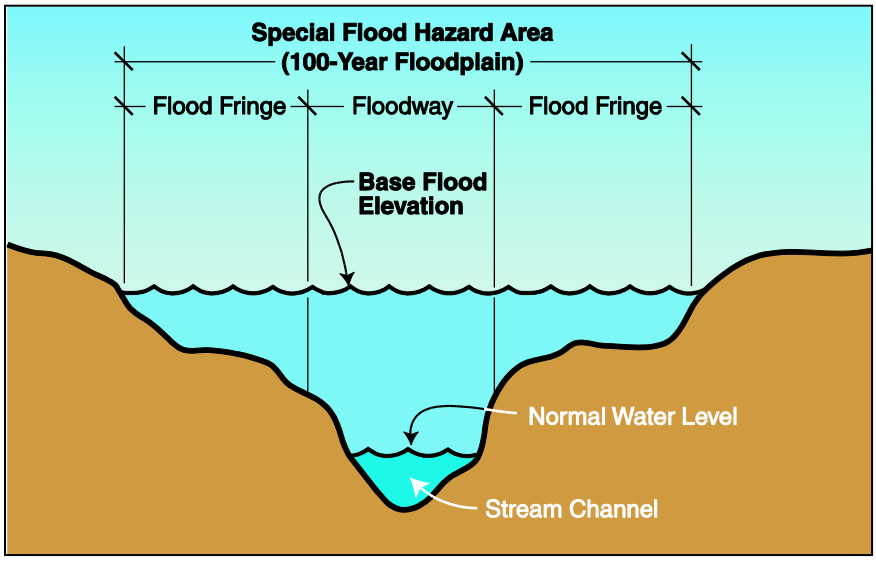
4.3.3 Flood, Flash Flood, Ice Jam

4.3.3.1 Location and Extent

A majority of McKean County is located in the Ohio River Basin, with the southwest portion located in the Upper/Middle Susquehanna River Basin. This area, like many others in Pennsylvania, is flood prone because of the mountainous terrain and because most of the communities are located along streams and river valleys. In addition, community development of the floodplain has resulted in frequent flooding. Because McKean County is an inland area, excess water from snowmelt or rainfall accumulates and overflows onto stream banks and adjacent floodplains. 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. 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 percent chance of occurring in a given year is smaller than the floodplain associated with a flood that has a 0.2% annual chance of occurring.

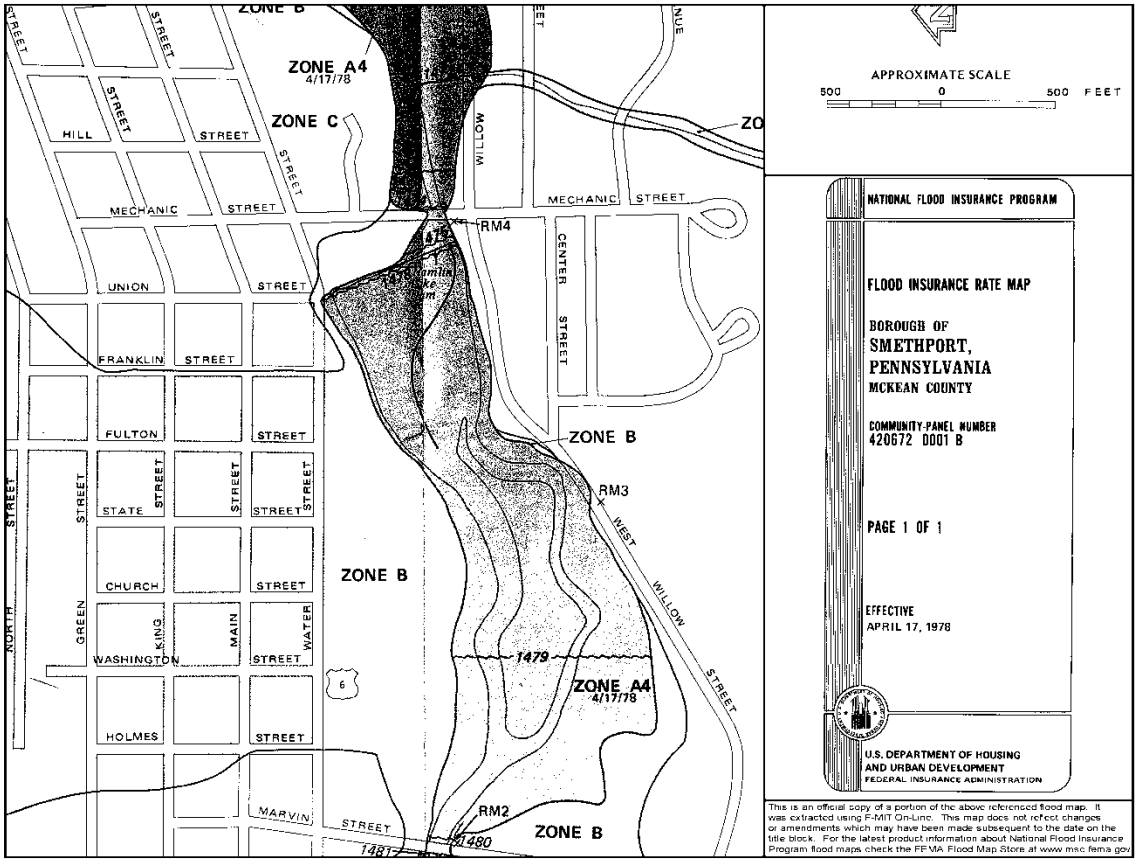
The National Flood Insurance Program (NFIP), for which Flood Insurance Rate Maps (FIRM) are published, identifies the 1% annual chance flood. This 1% annual chance flood event is used to delineate the *Special Flood Hazard Area* (SFHA) and identify *Base Flood Elevations*. Figure 4.3.3-1 illustrates these terms. The SFHA serves as the primary regulatory boundary used by FEMA, the Commonwealth of Pennsylvania and McKean County local governments.

Figure 4.3.3-1: Diagram identifying Special Flood Hazard Area, 1% annual chance (100-Year) floodplain, floodway and flood fringe.



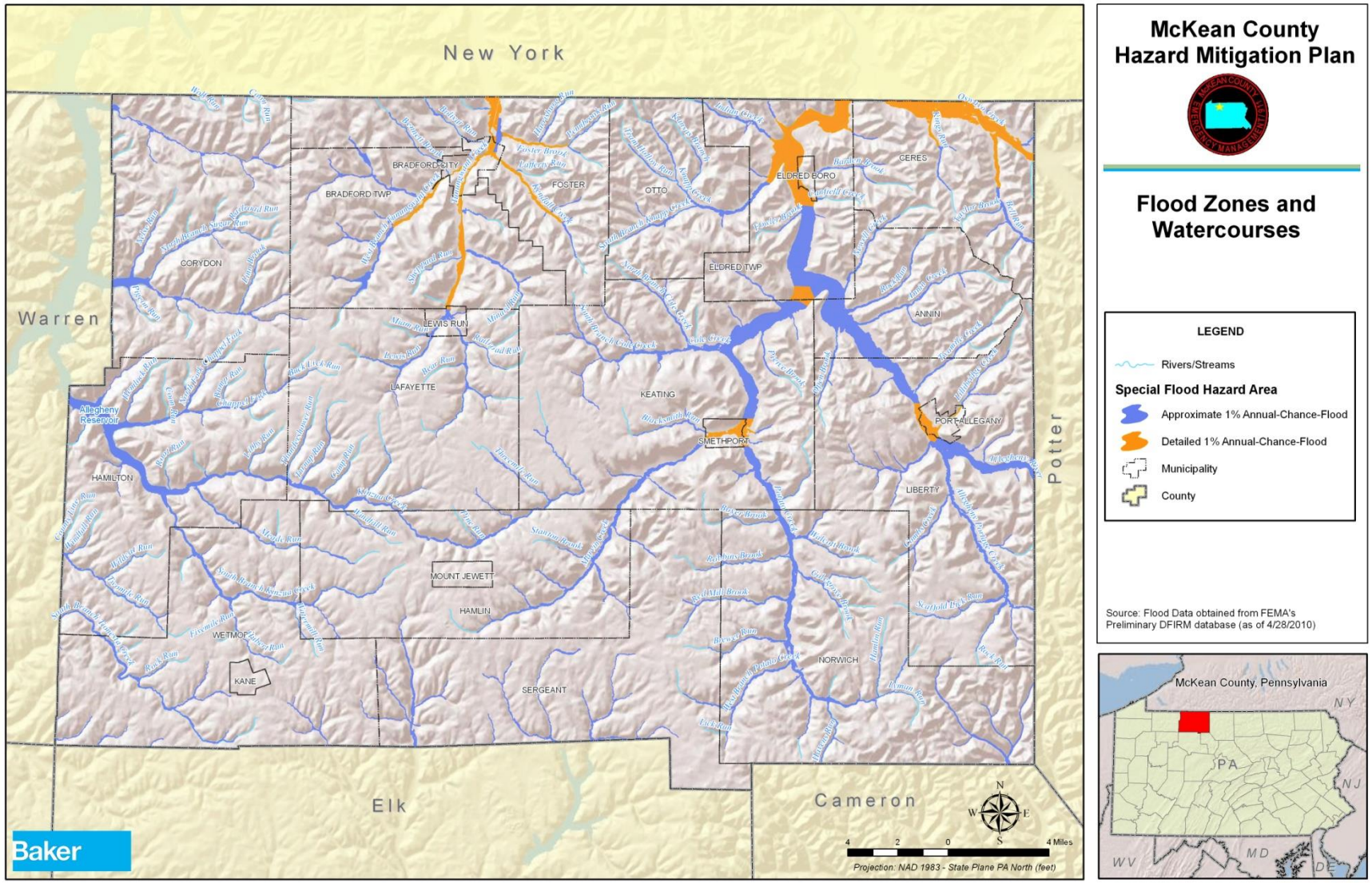
Countywide Digital Flood Insurance Rate Maps (DFIRMs) were released for McKean County on March 31, 2010 and each community received their preliminary DFIRMs in March of 2010. All communities within the County are now shown on a single set of countywide FIRMs. Previous FIRMs and Flood Boundary and Floodway Maps (FBFM) were digitized to produce a DFIRM that is compatible with GIS. Prior to the publication of this digital data, flood hazard information from FEMA was available through paper FIRMs and Q3 data. Once the final FIRMs for the entire county become effective in late 2016, they can be obtained from the FEMA Map Service Center (http://www.msc.fema.gov). These maps can be used to identify the expected spatial extent and elevation of flooding from a 1% and 0.2% annual chance event. Almost all of the municipalities in the County were determined to have SFHA; the boroughs of Mount Jewett and Kane are the exceptions. However, Mount Jewett is participating in the NFIP whereas Kane is not and has never been mapped.

Table 4.3.3-2: FIRM Panel 4206720001B, effective April 1978, showing flood hazard areas near Hamlin Lake in Smethport.



McKean County identified the Allegheny River as the major source of flooding. Other flooding occurs in the other four major watersheds in the county – Oswayo Creek, Potato Creek, Tunungwant Creek and Tionesta Creek. Figure 4.3.3-3 shows the location of watercourses and flood zones in McKean County. The location of approximate and detailed (including Base Flood Elevations) SFHAs (1% annual-chance-zones) are shown.

Figure 4.3.3-3: Map showing the location of watercourses and flood zones throughout McKean County.



4.3.3.2 Range of Magnitude

Floods are considered hazards when people and property are affected. Most injuries and deaths from flooding happen when people are swept away by flood currents and most property damage results from inundation by sediment-filled water. A large amount of rainfall over a short time span can result in flash flood conditions. Small amounts of rain can result in floods in locations where the soil is frozen or saturated from a previous wet period or if the rain is concentrated in an area of impermeable surfaces such as large parking lots, paved roadways, or other impervious developed areas.

Several factors determine the severity of floods, including rainfall intensity and duration, topography, ground cover and rate of snowmelt. Water runoff is greater in areas with steep slopes and little to no vegetative ground cover. Since the County has mountainous terrain, this can contribute to more severe floods as runoff reaches receiving water bodies more rapidly over steep terrain. Also, urbanization typically results in the replacement of vegetative ground cover with asphalt and concrete, increasing the volume of surface runoff and storm water, particularly in areas with poorly planned storm water drainage systems.

In McKean County there are seasonal differences in how floods are caused. A measurable amount of precipitation occurs around 160 to 165 days a year in McKean County – resulting in an average of 45 inches of annual rainfall and 84 inches of annual snowfall. In the winter and early spring (February to April), major flooding has occurred as a result of heavy rainfall on dense snowpack throughout contributing watersheds. Summer floods have occurred from intense rainfall on previously saturated soils. Summer thunderstorms deposit large quantities of rainfall over a short period of time that can result in flash flood events, when the velocity of floodwaters has the potential to amplify the impacts of a flood event.

Winter floods also have resulted from runoff of intense rainfall on frozen ground, and, on rare occasions, local flooding has been exacerbated by ice jams in rivers. Ice jam floods occur on rivers that are totally or partially frozen. A rise in stream stage will break up a totally frozen river and create ice flows that can pile up on channel obstructions such as shallow riffles, log jams, or bridge piers. The jammed ice creates a dam across the channel over which the water and ice mixture continues to flow, allowing for more jamming to occur. According to the Pennsylvania Emergency Incident Reporting System there has been one incident of ice jamming in 2005 in McKean County, though there may be other instances that were not reported as ice jamming. The recorded instance took place in Corydon Township on February 10, 2005, but no other details are provided in the incident report.

The worst-case flood occurred in McKean County in July 1942. The summer had been particularly stormy, but rainfall on July 17-18 caused the streams in north-central Pennsylvania into raging waters passing through fairly narrow passes; flooding was worst on the Allegheny River. Rainfall estimates for this storm ran as high as 15 inches in less than a day in the County, and Smethport received a world-record rainfall of 30.6 inches of rain in six hours on July 17. Flooding in Port Allegany claimed six lives, and the damage just to bridges and highways in Cameron, Potter, McKean, and Elk Counties was estimated at $500,000 in 1942

dollars. Across Pennsylvania, this storm caused seven deaths and $6 million in property damage.

Although floods can cause damage to property and loss of life, floods 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 sediment improving soil fertility. However, the destruction of riparian buffers, changes to land use and land cover throughout a watershed, and the introduction of chemical or biological contaminants which often accompany human presence cause environmental harm when floods occur. Hazardous material facilities are potential sources of contamination during flood events. Other negative environmental impacts of flooding include: water-borne diseases, heavy siltation, damage or loss of crops, and drowning of both humans and animals.

4.3.3.3 Past Occurrence

McKean County has a long history of flooding events. Flash flooding is the most common type of flooding that occurs in the County. Eight of the Ten Presidential Disaster and Emergency Declarations affecting McKean County have been in response to hazard events related to flooding (see Section 4.2.1: Table of Presidential Disaster Declarations). Table 4.3.3-1 lists flood event information from 1993 to 2019 obtained from the NCDC and PIERS. Estimated property damage was not available for all flooding events; for events where losses were available, the historical flood losses are recorded in Section 4.4.3: Potential Loss Estimates.

Table 4.3.3-1: Flood and flash flood events impacting McKean County from 1993-2019 (NCDC, 2011; PIERS, 2019; McKean DES, 2019). "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION
9/2/93	City of Bradford. Flash Flood – Three inches of rain fell in under 2 hours causing flooding in the city of Bradford. Rushing water tore away pavement on East Main Street.
6/13/94	Countywide. Flash Flood – Between 2 to 4 inches of rain fell in less than 3 hours causing flooding across the county. Roads were closed and private bridges washed away.
6/15/94	Borough of Mt. Jewett. Flood/Flash Flood – Flood water and downed trees covered roads.
7/6/94	Countywide. Flash Flood – Rain flooded streams across county. Street flooding and downed power lines and trees in city of Bradford.
1/19/96	Multiple Counties. Flood/Flash Flood. Region-wide flooding and flash flooding in McKean County.
5/11/96	Borough of Mt. Jewett. Flash Flood.
8/27/96	City of Bradford. Flash Flood – Heavy rains produced flash flooding. Roads were flooded in city.
7/15/97	Borough of Kane. Flash Flood – Thunderstorms moved across area causing torrential rain.
1/8/98	Countywide. Flash Flood.
7/14/98	Western Portion of the County. Flash Flood.
7/20/99	City of Bradford. Flash Flood – Between 8 and 9 inches of rain fell over 12 hours causing flooding in mountainous area surrounding city. Eight structures were destroyed and 10 people needed to be rescued.
7/31/00	City of Bradford. Flash Flood – Heavy rains flooded basements and Route 346

Table 4.3.3-1: Flood and flash flood events impacting McKean County from 1993-2019 (NCDC, 2011; PIERS, 2019; McKean DES, 2019). "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION
7/21/03	Countywide. Flood/Flash Flood – A smaller storm caused minor flooding across county; later heavy rain caused flash flooding in city of Bradford.
7/22/03	Countywide. Flood – Thunderstorms and heavy rain caused flooding across county. Route 346 in city of Bradford was closed.
8/9/03	Countywide. Flash Flood – Heavy rain caused flooding across county. Routes 246 and 346 were closed as well as 10 roads in borough of Eldred.
8/12/03	Borough of Eldred. Flash Flood – Flooding in creek caused roads state and secondary road closures across Eldred.
11/19/03	Countywide. Flash Flood – Heavy rains caused flash flooding in streams. Many streams exceeded bank full.
3/17/04	Township of Eldred. Flood.
5/9/04	Countywide. Flood/Flash Flood – Heavy rains caused roads to washout as well as deposited debris on roads. US Route 6 was closed as a result.
8/10/04	North Central Portion of the County. Flash Flood – Thunderstorms caused flash floods which closed roads south and east of Bradford.
8/30/04	North Central Portion of the County. Flash Flood – Heavy rain caused flash flooding in city of Bradford and Foster Township. Roads were closed due to high water and mudslides.
9/8/04	Multiple Counties. Flood – The remnants of Hurricane Frances produced 3 to 5 inches of rain causing minor to moderate flooding across central Pennsylvania.
9/17/04	Multiple Counties. Flood – The remnants of Hurricane Ivan resulted in heavy rains across central Pennsylvania.
1/14/05	Township of Keating. Flood – Heavy rain caused flooding and closed multiple roads in Keating Township.
2/10/05	Township of Corydon. Ice Jam.
11/29/05	Countywide. Flood – Rain caused roadway flooding.
6/27/06	Multiple Counties. Flash Flood – Heavy rain caused flash flooding throughout central and eastern Pennsylvania. Flooding resulted in closed roads in McKean County.
7/12/06	Countywide. Flash Flood – Thunderstorms produced heavy rain countywide. Flash floods caused streams to overflow and roads to close.
7/22/06	Countywide. Flood.
10/20/06	Countywide. Flood.
1/15/07	Township of Keating. Flood.
3/15/07	Northwestern Portion of the County. Flash Flood – Heavy rain and snowmelt combined to flood streams over bank full. Roads were closed especially near Bradford.
8/7/07	Countywide. Flash Flood – Heavy rains caused flash floods across county. Routes 219 and 770 were closed as well as secondary roads in Bradford.
5/28/09	Eastern Portion of the County. Flash Flood – Heavy rain produced flash flooding causing road closures across eastern parts of McKean County.
2/6/08	Port Allegany. Flood.
8/9/09	Northeastern Portion of the County. Flash Flood – Heavy rains produced flash floods causing road closures in northeastern McKean County.
8/21/09	Southern Portion of the County. Flash Flood – Short period of heavy rain caused flash flooding over roads from Farmers Valley to Kane.
1/25/10	Multiple Counties. Flood – Heavy rain combined with snowmelt caused aerial flooding across

Table 4.3.3-1: Flood and flash flood events impacting McKean County from 1993-2019 (NCDC, 2011; PIERS, 2019; McKean DES, 2019). "Countywide" indicates several locations in the County were affected.	
DATE	**LOCATION & DESCRIPTION**
	central Pennsylvania. Secondary roads were closed in McKean County.
6/27/10	Low laying streets with poor drainage in the City of Bradford flooded.
7/25/10	Run off from heavy rain flooding the Fire Station in Eldred Borough and also nearby streets.
12/01/10	Heavy rain and associated snowpack melt caused flooding and road closures countywide. One family required evacuation from their single family residence due to high water in Liberty Township.
2/28/11	Heavy rain caused water to flood first floor from drainage ditch run over, also several roadways county wide were closed.
5/16/11	Heavy rain caused Derrick Creek to overflow washing out road berms and flooding yards in Foster Township.
7/31/12	Heavy rain caused roadway flooding in Lafayette and Bradford Township.
9/11/13	Heavy rain caused several roadways to be closed due to high water in the Eastern portion of the county.
6/25/14	Passing thunders storm resulting numerous roads being closed due to flooding county wide.
9/29/15	Partial roadway washed out in Bradford City with heavy rain runoff.
7/25/16	Local grocery store in Eldred Borough experienced minor flooding from poor street drainage.
10/21/16	Port Allegany Fire Department responded and pumped several basements as a result of heavy rain,
1/1/17	Heavy rain and snow melt caused The University of Pittsburgh at Braford to evacuate one of the dorms due to encroaching water. County wide road and basement flooding occurred.
6/5/17	Heavy rain resulting in low lying poor drainage areas in the Bradford area being flooded, water reported entering one structure.

Table 4.3.3-2 provides further past occurrences of historical flooding events of the Allegheny River in Eldred, Pennsylvania listed in the County's Hazard Vulnerability Assessment. The gage zero elevation for the Allegheny River in Eldred is 1416.53 MSL.

Table 4.3.3-2: Allegheny River historic flooding events in Eldred, Pennsylvania (MCEMA, 2019).		
DATE	**STAGE**	**ELEVATION**
July 19, 1942	27.60	1443.80
May 29, 1946	21.16	1437.69
April 6, 1947	19.41	1435.61
March 23, 1948	20.04	1436.58
November 26, 1950	20.94	1437.14
March 9, 1956	20.92	1437.92
January 23, 1959	20.38	1436.58
March 6, 1964	18.96	1435.49
September 30, 1967	18.91	1435.44

Table 4.3.3-2: Allegheny River historic flooding events in Eldred, Pennsylvania (MCEMA, 2019).

DATE	STAGE	ELEVATION
June 23, 1972	29.05	1445.58
January 20, 1996	21.89	1438.42

In addition to the aforementioned past flood events, the National Flood Insurance Program 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. 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. As of March 4, 2010, there were twelve repetitive loss properties in McKean County, two of which have been mitigated (PEMA, 2010). These repetitive loss properties are located in Annin Township, Bradford City, Bradford Township, Eldred Borough, Foster Township, and Norwich Township. Table 4.3.3-3 shows the number of repetitive loss properties by municipality. There are no severe repetitive loss properties in McKean County. Since the previous HMP was completed in 2011, there have been no new properties that have been identified as repetitive loss. Therefore, the table below has remained the same since 2011.

Table 4.3.3-3: Summary of the number and type of Repetitive Loss properties by municipality (PEMA, 2019).

MUNICIPALITY	TYPE			SUM OF REPETITIVE LOSS PROPERTIES
	NON-RESIDENTIAL	2-4 FAMILY	SINGLE FAMILY	
Annin Township	**0**	**1**	**0**	**1**
Bradford City	**2**	**0**	**1**	**3**
Bradford Township	**0**	**0**	**3**	**3**
Ceres Township	0	0	0	0
Corydon Township	0	0	0	0
Eldred Borough	**1**	**0**	**0**	**1**
Eldred Township	0	0	0	0
Foster Township	**1**	**0**	**1**	**2**
Hamilton Township	0	0	0	0
Hamlin Township	0	0	0	0
Kane Borough	0	0	0	0
Keating Township	0	0	0	0
Lafayette Township	0	0	0	0

Table 4.3.3-3: Summary of the number and type of Repetitive Loss properties by municipality (PEMA, 2019).

MUNICIPALITY	TYPE			SUM OF REPETITIVE LOSS PROPERTIES
	NON-RESIDENTIAL	2-4 FAMILY	SINGLE FAMILY	
Lewis Run Borough	0	0	0	0
Liberty Township	0	0	0	0
Mount Jewett Borough	0	0	0	0
Norwich Township	**1**	**0**	**1**	**2**
Otto Township	0	0	0	0
Port Allegany Borough	0	0	0	0
Sergeant Township	0	0	0	0
Smethport Borough	0	0	0	0
Wetmore Township	0	0	0	0
TOTAL	**5**	**1**	**6**	**12**

Floods are the most common and costly natural catastrophe in the United States. In terms of economic disruption, property damage, and loss of life, floods are “nature’s number-one disaster.” For that reason, flood insurance is almost never available under industry-standard homeowner’s and renter’s policies. The best way for citizens to protect their property against flood losses is to purchase flood insurance through the NFIP.

Congress established the NFIP in 1968 to help control the growing cost of federal disaster relief. The NFIP is administered by FEMA, part of the U.S. Department of Homeland Security. The NFIP offers federally-backed flood insurance in communities that adopt and enforce effective floodplain management ordinances to reduce future flood losses.

Since 1983, the chief means of providing flood insurance coverage has been a cooperative venture of FEMA and the private insurance industry known as the Write Your Own (WYO) Program. This partnership allows qualified property and casualty insurance companies to “write” (that is, issue) and service the NFIP’s Standard Flood Insurance Policy (SFIP) under their own names.

Today, nearly 90 WYO insurance companies issue and service the SFIP under their own names. More than 4.4 million federal flood insurance policies are in force. These policies represent $650 billion in flood insurance coverage for homeowners, renters, and business owners throughout the United States and its territories.

The NFIP provides flood insurance to individuals in communities that are members of the program. Membership in the program is contingent on the community adopting and enforcing floodplain management and development regulations.

The NFIP is based on the voluntary participation of communities of all sizes. In the context of this program, a "community" is a political entity – whether an incorporated city, town, township, borough, or village, or an unincorporated area of a county or parish – that has legal authority to adopt and enforce floodplain management ordinances for the area under its jurisdiction.

National Flood Insurance is available only in communities that apply for participation in the NFIP and agree to implement prescribed flood mitigation measures. Newly participating communities are admitted to the NFIP's Emergency Program. Most of these communities quickly earn "promotion" to the Regular Program.

The Emergency Program is the initial phase of a community's participation in the NFIP. In return for the local government's agreeing to adopt basic floodplain management standards, the NFIP allows local property owners to buy modest amounts of flood insurance coverage.

In return for agreeing to adopt more comprehensive floodplain management measures, an Emergency Program community can be "promoted" to the Regular Program. Local policyholders immediately become eligible to buy greater amounts of flood insurance coverage. All participating municipalities in McKean County are in the Regular Program.

The minimum floodplain management requirements include:

- Review and permit all development in the SFHA;
- Elevate new and substantially improved residential structures above the Base Flood Elevation;
- Elevate or dry flood proof new and substantially improved non-residential structures;
- Limit development in floodways;
- Locate or construct all public utilities and facilities so as to minimize or eliminate flood damage; and
- Anchor foundation or structure to resist floatation, collapse, or lateral movement.

In addition, Regular Program communities are eligible to participate in the NFIP's CRS. Under the CRS, policyholders can receive premium discounts of 5 to 45 percent as their cities and towns adopt more comprehensive flood mitigation measures. Currently, no municipalities in McKean County participate in CRS.

Table 4.3.3-4 lists the McKean County municipalities participating in the NFIP along with the date of the initial FIRM and the current effective map date. Note that all municipalities in the County participate in the program except Kane Borough, which has no SFHA and has never been mapped.

Table 4.3.3-4: McKean County Municipal Participation in the National Flood Insurance Program (FEMA CIS, 2010 & MCPC 2019).

COMMUNITY	PARTICIPATION STATUS	CID	INITIAL FIRM IDENTIFIED	CURRENT EFFECTIVE MAP DATE
Annin Township	P	421850	8/1/87	12/22/16
Bradford City	P	420665	9/16/81	12/22/16
Bradford Township	P	422245	9/16/81	12/22/16
Ceres Township	P	421853	9/18/87	12/22/16

Table 4.3.3-4: McKean County Municipal Participation in the National Flood Insurance Program (FEMA CIS, 2010 & MCPC 2019).

COMMUNITY	PARTICIPATION STATUS	CID	INITIAL FIRM IDENTIFIED	CURRENT EFFECTIVE MAP DATE
Corydon Township	P	422473	3/1/87	12/22/16
Eldred Borough	P	420666	9/3/80	12/22/16
Eldred Township	P	421854	9/3/80	12/22/16
Foster Township	P	421855	11/18/81	12/22/16
Hamilton Township	P	421856	3/1/87	12/22/16
Hamlin Township	P	421857	3/1/87	12/22/16
Kane Borough	N	-	-	-
Keating Township	P	420667	6/1/78	12/22/16
Lafayette Township	P	421858	6/30/76	12/22/16
Lewis Run Borough	P	420669	3/1/87	12/22/16
Liberty Township	P	420668	9/1/77	12/22/16
Mount Jewett Borough*	P	420670	-	-
Norwich Township	P	421859	7/1/87	12/22/16
Otto Township	P	421860	6/1/87	12/22/16
Port Allegany Borough	P	420671	6/15/79	12/22/16
Sergeant Township	P	422474	7/3/85	12/22/16
Smethport Borough	P	420672	4/17/78	12/22/16
Wetmore Township	P	421861	4/1/87	12/22/16

**Mount Jewett Borough participates in the NFIP but has all Zone C and Zone X flood areas. As a result, they have been mapped but never had a published FIRM and therefore do not have an Initial FIRM date or a Current Effective Map Date.*

4.3.3.4 Future Occurrence

In McKean County, flooding occurs commonly and can occur during any season of the year. Therefore the future occurrence of floods in McKean County can be characterized as *highly likely,* as defined by the Risk Factor methodology probability criteria (see Table 4.4-1). Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. The NFIP uses historical records to determine the probability of occurrence for different extents of flooding. The probability of occurrence is expressed in percentages as the chance of a flood of a specific extent occurring in any given year.

The NFIP recognizes the 1%-annual-chance flood, also known as the *base 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 over a given year. The DFIRMs, once effective, will be able to be used to identify areas subject to the 1- and 0.2%-annual-chance flooding. Areas subject to 2% and 10% annual chance events are not shown on

maps; however, water surface elevations associated with these events are included in the flood source profiles contained in the Flood Insurance Study Report.

Table 4.3.2-5 shows a range of flood recurrence intervals and associated probabilities of occurrence.

Table 4.3.3-5: Recurrence intervals and associated probabilities of occurrence (FEMA, 2001).

RECURRENCE INTERVAL	CHANCE OF OCCURRENCE IN ANY GIVEN YEAR (%)
10 year	10
50 year	2
100 year	1
500 year	0.2

4.3.3.5 Vulnerability Assessment

McKean County is vulnerable to flooding that causes loss of lives, property damage, and road closures. For purposes of assessing vulnerability, the County focused on community assets that are located in the 1%-annual-chance floodplain. While greater and smaller floods are possible, information about the extent and depths for this floodplain is available for all municipalities countywide, thus providing a consistent basis for analysis. Flood vulnerability maps for each applicable local municipality, showing the 1%-annual-chance flood hazard area and addressable structures, critical facilities and transportation routes within it, are included in **Appendix D**. These maps were created using FEMA Countywide Preliminary digital data.

Table 4.3.3-6 displays the number of addressable structures, mobile home parcels and structures, and populations intersecting the SFHA along with the total number of addressable structures, structures in mobile home parcels, and population in each municipality. The number of vulnerable addressable structures was calculated by overlaying the addressable structures with the SFHA. Similarly, the estimated population in the SFHA was calculated by determining what percent of the individual municipality is considered the SFHA. That percent was multiplied by the 2017 estimated population of the municipalities; while clearly an estimate, using this method helps to minimize overestimation of flood prone populations. In order to estimate the number of mobile home structures in the SFHA, addressable structures that fall within parcels with the land use “manufactured homes” were selected; then the structures were intersected with the SFHA.

Eldred Borough, Lewis Run Borough, and Smethport Borough each have over 10% of their addressable structures located in the SFHA. However, proportionally, Eldred Borough has by far the highest percentage of structures in the SFHA; 38.63% of all structures in the municipality are located in the SFHA. Eldred Borough, Eldred Township, Port Allegany Borough, and Smethport Borough have the highest percent of their populations living in the SFHA with over 20% of the population falling within the SFHA. Of all the flood prone jurisdictions, Hamilton, Sergeant, and Wetmore Townships have comparatively lower vulnerability; less than 1% of the total addressable structures in those jurisdictions are located in the SFHA. Similarly, the

following jurisdictions are flood prone communities with the lowest amount of their population (less than 2%) living in SFHA; Corydon, Lafayette, Otto, Sergeant, and Wetmore townships. Lastly, Kane and Mount Jewett Borough are the least likely to experience a flood as neither of the two boroughs contain any land designated as the SFHA. However that does not mean that a flood will never happen in these municipalities, just that it is the least likely to occur there.

Table 4.3.3-6: Structure and population vulnerability to floods in McKean County (McKean County Assessment Office, US Census Bureau, MCGISC, 2019).

Municipality	Total Addressable Structures	Total Addressable Structures In SFHA	% Of Total Addressable Structures In SFHA	# Of Mobile Home Parcels	# Of Addressable Structures In Mobile Home Parcels	# Of Mobile Home Structures In SFHA	Total Population 2018 Estimates (Us Census Bureau)	Estimated Population In SFHA	% Land Area In SFHA
Annin Township	430	5	1.16%	61	92	2	667	54	8.03%
Bradford City	3,690	313	8.48%	8	5	0	8,280	1099	13.27%
Bradford Township	1,999	62	3.10%	73	80	8	4,618	161	3.50%
Ceres Township	523	44	8.41%	99	118	6	858	79	9.18%
Corydon Township	318	9	2.83%	39	34	1	266	4	1.44%
Eldred Borough	422	163	38.63%	27	43	13	770	275	35.71%
Eldred Township	808	57	7.05%	131	168	16	1,518	307	20.22%
Foster Township	2,078	198	9.53%	106	130	12	4,075	127	3.12%
Hamilton Township	641	3	0.47%	49	62	0	506	27	5.27%
Hamlin Township	692	8	1.16%	70	116	2	690	16	2.26%
Kane Borough	1,775	0	0.00%	33	37	0	3,477	0	0.0%
Keating Township	1,498	47	3.14%	202	260	5	2,875	170	5.91%
Lafayette Township	875	26	2.97%	146	195	0	2,126	35	1.67%
Lewis Run Borough	317	71	22.40%	33	37	12	572	72	12.54%
Liberty Township	1,029	62	6.03%	165	207	22	1,520	79	5.22%
Mount Jewett Borough	511	0	0.00%	33	34	0	856	0	0.0%
Norwich Township	636	53	8.33%	80	134	15	545	16	2.87%
Otto Township	813	12	1.48%	89	137	8	1,481	26	1.76%
Port Allegany Borough	1,006	65	6.46%	37	62	0	2,017	427	21.16%
Sergeant Township	369	2	0.54%	47	74	1	132	2	1.31%
Smethport Borough	760	110	14.47%	35	89	33	1,543	387	25.05%
Wetmore Township	1,075	1	0.09%	60	70	0	1,576	28	1.78%
TOTAL	**22,265**	**1,311**	**5.89%**	**1,623**	**2,184**	**156**	**40,968**	**3,388**	**8.24%**

Table 4.3.3-7 displays the number of critical facilities that are located in the SFHA by jurisdiction. There are 14 critical facilities that are located in the SFHA, representing 15.5% of the County's total critical facilities. Port Allegany Borough has the highest number of flood prone critical facilities with 4; other jurisdictions with critical facilities located in the SFHA include Bradford City, Eldred Borough, Eldred Township, Foster Township, and Smethport Borough.

Table 4.3.3-7: Critical facilities vulnerable to flood by municipality (MCGISC, 2019).

MUNICIPALITY	TOTAL CRITICAL FACILITIES	TOTAL CRITICAL FACILITIES IN SFHA
Annin Township	0	0
Bradford City	14	2
Bradford Township	7	0
Ceres Township	0	0
Corydon Township	1	0
Eldred Borough	4	3
Eldred Township	1	1
Foster Township	4	1
Hamilton Township	2	0
Hamlin Township	4	0
Kane Borough	7	0
Keating Township	6	0
Lafayette Township	6	0
Lewis Run Borough	1	0
Liberty Township	0	0
Mount Jewett Borough	4	0
Norwich Township	2	0
Otto Township	4	0
Port Allegany Borough	9	4
Sergeant Township	1	0
Smethport Borough	9	3
Wetmore Township	4	0
TOTAL	**90**	**14**

Additional information on flood vulnerability and losses in McKean County, including the 1%-annual-chance flood event results from HAZUS, FEMA's loss estimation software, the number of parcels vulnerable to flood hazards and the assessed value of vulnerable parcels, is provided in Section 4.4.3: Potential Loss Estimates.

4.3.3.6 Invasive Species

4.3.4.1 Threat and Extent

An invasive species is a species that is not indigenous to a given ecosystem and that is likely to cause economic or environmental harm, or pose a hazard to human health. The Commonwealth of Pennsylvania, including McKean County, hosts a number of invasive pathogens, insects, plants, invertebrates, fish, and mammals. These species have largely been introduced by the actions of humans; intentionally and unintentionally.

Invasive species threats are generally divided into two main subsets:

- ***Aquatic Invasive Species*** are nonnative viruses, invertebrates, fish, and aquatic plants that threaten the diversity or abundance of native species, the ecological stability of the infested waters, human health and safety, or commercial, agriculture, aquaculture, or recreational activities dependent on such waters.
- ***Terrestrial Invasive Species*** are nonnative arthropods, vascular plants, higher vertebrates, or pathogens that complete their lifecycle on land and whose introduction does or is likely to cause economic or environmental harm or harm to human health. Insects causing detriment to forest health, such as hemlock wooly adelgid and emerald ash borer, are also terrestrial invasive species.
  Noxious weeds, listed by Pennsylvania and/or federally, are especially harmful invasive plants. These plants have the potential to cause significant health harm to humans or livestock. Noxious weeds are regulated and treated by the PA Department of Agriculture. Visit https://www.agriculture.pa.gov/Plants_Land_Water/PlantIndustry/NIPPP/Pages/default.aspx for details.

The location and extent of these invasive threats depends on the preferred habitat of the species as well as the species' ease of movement and establishment. Invasive plants can tolerate a wide range of environmental conditions, giving them a distinct competitive advantage over desired native species. Invasive plants also establish quickly by seed or roots in disturbed areas. Construction, road work, pipelines, and powerlines can all provide routes of infestation through disturbance.

Locally, the Allegheny Plateau Invasive Plant Management Area (APIPMA) partnership is the lead organization to identify, monitor, and support treatment efforts for invasive plants. The group addresses invasive plant problems on a landscape levels over five counties. This is a collaborative partnership of county, state, and local agencies as well as private landowners, professional land management staff, and community and environmental organizations. The McKean County Conservation District is an active partner in APIPMA. The Governor's Pennsylvania Invasive Species Council (PISC), as well as the Western Pennsylvania Conservancy, PA Department of Agriculture, and PA Department of Conservation and Natural Resources, are state organizations also addressing invasive species threats.

4.3.4.2 Impacts and Hazards

The impacts of invasive species threats can range from nuisance to significant danger. Some invasive species are not considered agricultural pests and do not harm humans. Other invasive species can cause significant changes in the composition of Pennsylvania ecosystems; in particular forests. For example, the emerald ash borer has a 99% mortality rate for any ash tree it infects. This and other forest invasive species could have a significant economic impact to the county's base of logging and forest-based tourism. Other invasive species can cause illness or death in humans or livestock; in particular noxious weeds listed by the PA Department of Agriculture.

There is a wide range of environmental impacts caused by invasive species. The aggressive nature of many invasive species can cause significant reductions in biodiversity by crowding out native species. This can affect the health of individual host organisms as well as the overall well-being of the affected ecosystem. These species cause human, animal, and plant harm; degrade forest and watershed ecosystems; and can impact agricultural harvests.

The magnitude of an invasive species threat is generally amplified when the ecosystem or host species is already stressed, such as in times of drought; due to changes in climate; or when hosts succumb to insects or disease. The already weakened state of the native ecosystem causes it to be more susceptible to further infestation by additional invasive insects, diseases, or plants.

4.3.4.3 Past Occurrence

Invasive species have entered Pennsylvania since the arrival of European settlers. Pennsylvania Department of Conservation and Natural Resources lists invasive plant species across the state:
https://www.dcnr.pa.gov/Conservation/WildPlants/InvasivePlants/Pages/default.aspx
As of April 2019, there are 398 invasive species being tracked in the Pennsylvania iMapInvasives database, maintained by the Western Pennsylvania Conservancy. As of 2019, not all of these species' range reaches McKean County. There is no comprehensive list of invasive species threats specifically for McKean County.

4.3.3.4 Future Occurrence

According to the PA Invasive Species Council (PISC), the probability of future occurrence for invasive species threats is on the rise because of the growing volume of transported goods, efficiency and speed of transportation, and expanding international trade agreements. Expanded global trade has created opportunities for many organisms to be transported to and establish themselves in new countries and regions. Furthermore, climate change is contributing both to the introduction and spread of new invasive species due to their competitive advantage to thrive in a wide range of environmental conditions. As maximum and minimum seasonal temperatures change, pests are able to establish themselves in previously inhospitable climates. This also gives introduced species an earlier start and increases the magnitude of their growth. This may shift the dominance of ecosystems in the favor of non-native species.

In order to combat the increase in future occurrences, the PISC, which is a collaboration of state agencies, public organizations, and federal agencies, released the Invasive Species Management Plan in April 2018. This plan outlines the Commonwealth's goals for the management of the spread of nonnative invasive species, as well as creates a framework for responding to threats through research, action, and public outreach and communication. County-level invasive species management is under the auspices of the Allegheny Plateau Invasive Plant Management Area. Local organizations and private landowners utilize the iMapInvasives database to map invasive plant populations to identify priority areas for treatment and to monitor problematic plants.

The Allegheny Plateau Invasive Plant Management Area (APIPMA) and McKean County Conservation District (MCCD) are working on an invasive plant management and recommendation protocol for partners and municipalities to utilize. The APIPMA strategic plan provides support, stating that one major goal is to develop and/or implement techniques and practices to prevent establishment and spread of new invasions near the APIPMA boundaries and existing species from spreading into new areas within boundaries. In addition, developing and implementing techniques and practices to control known infestations of priority invasive species in the APIPMA boundaries will aid in minimizing the spread of invasive plants to new areas.

4.3.3.5 Vulnerability Assessment

McKean County's exact vulnerability will depend on the invasive species in question. In general, the following characteristics preclude an area to infestation by invasive plants:

- Lack of natural predators or diseases that kept the species under control in its native environment;
- Vacant ecological niches present that can be exploited by nonnative species;
- Generally lacking in species diversity
- Lack of a multi-tiered canopy (in the case of invasive plants);
- Recent disturbance by fire, construction, timber harvesting, or agriculture

Areas of disturbed soil such as construction zones and roadsides following work are at a higher risk of invasive plant infestations and should consider implementing best management practices to prevent infestations from occurring.

4.3.5 Landslide

4.3.5.1 Location and Extent

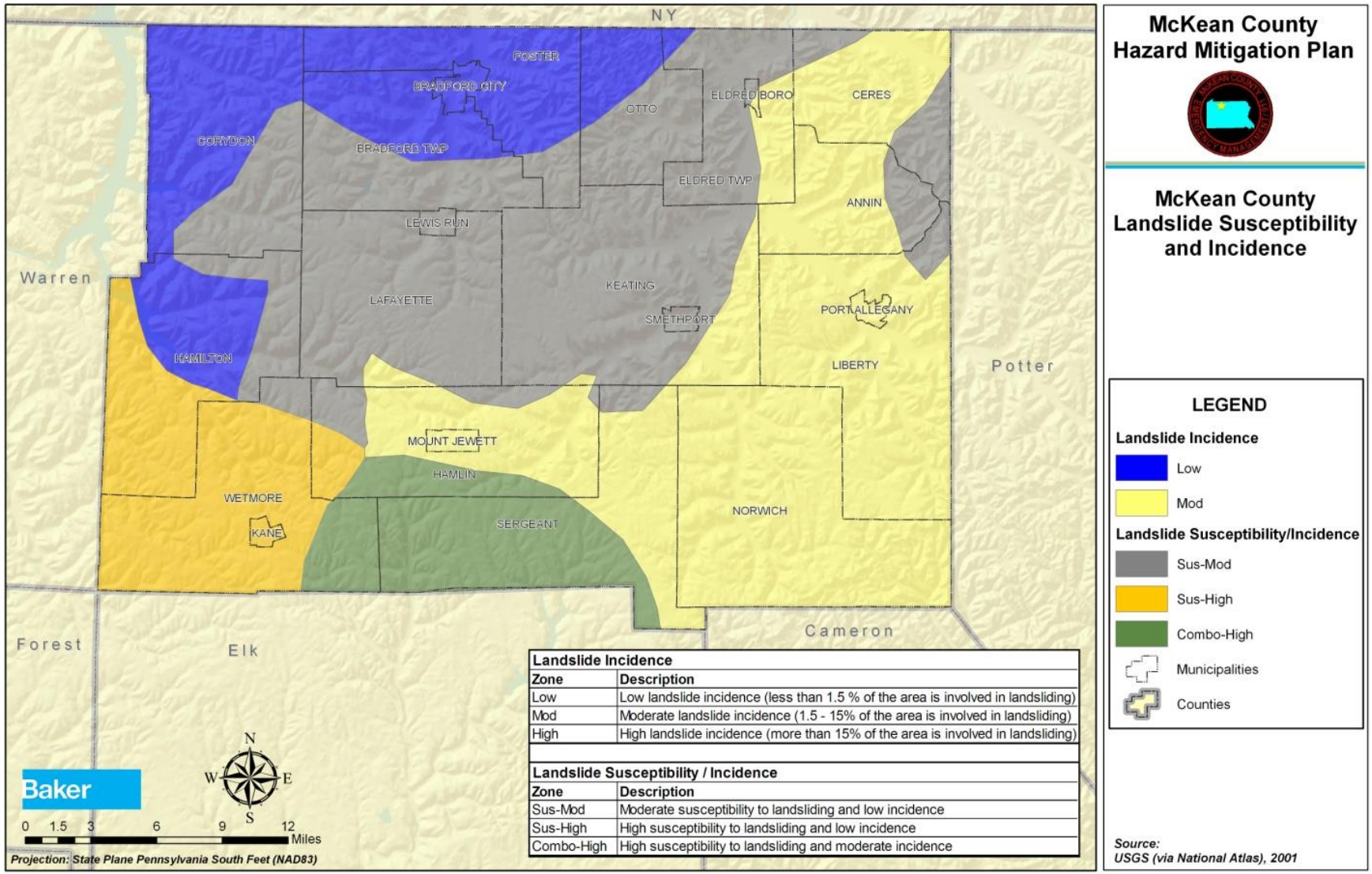
Rockfalls, rockslides, debris slide, earth flow, mud flow, and other slope failures usually occur in areas of McKean County with moderate to steep slopes and high precipitation rates, though landslides are due to both the geology of the land and human-induced factors.

In Pennsylvania, many slope failures are associated with precipitation events – periods of sustained above-average precipitation, specific rainstorms, or snowmelt events. Areas experiencing erosion, decline in vegetative cover, and earthquakes are also susceptible to

landslides. Human activities that may induce slope failure include altering the natural slope gradient, increasing soil water content, and removing vegetation from steep slopes.

The US Geologic Survey (USGS) has identified and defined the overall landslide susceptibility of all areas in McKean County. As seen in Figure 4.3.4-1, the County falls into five distinct landslide zones: Low, Mod, Sus-Mod, Sus-High, and Combo-High. The majority of the County has a low to moderate susceptibility to landslides. However, the southwest and south-central portion of the County has a Sus-High and Combo-High susceptibility, respectively. Sus-High have a high susceptibility to landslides with a low incidence of occurrence while Combo-High areas have a high susceptibility of landslide and a moderate incidence. Overall, 10.3% of the total land area of the County falls under the Sus-High landslide zone while 7.5% of the total land area of the land area of the County is classified as having Combo-High susceptibility and incidence. Jurisdictions falling into these areas of highest susceptibility include all or part of Hamilton, Hamlin, Sergeant, and Wetmore Townships and Kane Borough.

Figure 4.3.5-1: McKean County landslide susceptibility and incidence.



4.3.5.2 Range of Magnitude

Landslides cause damage to transportation routes, utilities, and buildings and can create travel delays and other side effects. Fortunately, deaths and injuries due to landslides are rare in Pennsylvania. Almost all of the known deaths due to landslides have occurred when rockfalls or other slides along highways have involved vehicles. Storm-induced debris flows are the only other type of landslide likely to cause death and injury. However, as residential and recreational development increases on and/or near steep slopes, the hazard from these rapid events will also rise. Most Pennsylvania landslides are moderate to slow moving and damage property rather than people.

The Pennsylvania Department of Transportation and large municipalities incur substantial costs due to landslide damage and to extra 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 and a similar amount is spent on mitigation costs for grading projects (DCNR, 2010).

No serious injury, death, or substantial property damage has occurred in McKean County as a result of a landslide incident. Historically the worst level of damage caused by landslides in the County has been minor roadway damage. A possible worst-case scenario for this hazard would occur if there was a large landslide on US219. As the major north-south connector road, a rockfall or debris flow along this road would not only snarl traffic and cause injuries or death but also could have a significant economic impact because the road connects McKean County's major industries with the Interstate highway system.

4.3.5.3 Past Occurrence

No comprehensive listing of landslide incidents is available at this time, and there is no comprehensive reporting system in place in the County or the Commonwealth. However, PEIRS data indicates that there have not been any reported landslides, mudslides, or rockslides in McKean County from 2002-2009. However, the McKean County EMA indicates that Foster and Lafayette Townships have a history of minor landslide events. These events have caused minor damage and injuries but no deaths.

4.3.5.4 Future Occurrence

Based on historical events, landslide events resulting in loss of life and property damage are unlikely in McKean County. However, with mixed susceptibility to landslides, especially in the south-central and southwestern portions of the County, the probability of landslides occurring in the County is considered *possible,* as defined by the Risk Factor methodology probability criteria (see Table 4.4-1). Mismanaged intensive development in steeply sloped areas could increase the frequency of occurrence.

4.3.5.5 Vulnerability Assessment

With the exception of the portions of Sergeant, Hamlin, and Wetmore Townships identified in Section 4.3.4.1, communities in McKean County have not been historically particularly vulnerable to landslides. However, transportation routes throughout the County located at the

base or crest of cliffs should be considered vulnerable to this hazard. An inventory of these areas is not currently available.

Table 4.3.4-1 illustrates the vulnerability of structures and critical facilities in McKean County located in the high landslide susceptibility areas regardless of the landslide incidence. The table indicates that Kane Borough has the highest number and proportion of structures located within the high landslide susceptibility area; the entire jurisdiction is within a high susceptibility area. Wetmore and Hamilton Townships also have over 90% of their addressable structures located within high landslide susceptibility areas. Other jurisdictions with addressable structures in the high susceptibility areas include Sergeant and Hamlin Townships, respectively.

Table 4.3.4-1 also shows the number of critical facilities located in the landslide high zones by jurisdiction and how many critical facilities are located in each municipality. A total of 14 critical facilities are located in the high landslide susceptibility areas. Critical facilities vulnerable to landslide events are concentrated in Hamlin, Sergeant and Wetmore Townships and Kane Borough. For a complete list of critical facilities and their vulnerability to landslide hazards, please see **Appendix E**. It is important to note that the vulnerability of each individual structure and critical facility will depend on a number of factors including slope, topography, precipitation, and underlying geology and soil.

Table 4.3.4-1: Number of addressable structures and critical facilities located in areas with high susceptibility to landslide (USGS, MCGISC, 2019).

MUNICIPALITY	TOTAL ADDRESSABLE STRUCTURES	NUMBER OF ADDRESSABLE STRUCTURES IN HIGH LANDSLIDE SUSCEPTIBILITY AREAS	NUMBER OF CRITICAL FACILITIES IN HIGH LANDSLIDE SUSCEPTIBILITY AREAS	TOTAL NUMBER OF CRITICAL FACILITIES PER MUNICIPALITY
Annin Township	430	0	0	0
Bradford City	3,690	0	0	14
Bradford Township	1,999	0	0	7
Ceres Township	523	0	0	0
Corydon Township	318	0	0	1
Eldred Borough	422	0	0	4
Eldred Township	808	0	0	1
Foster Township	2,078	0	0	4
Hamilton Township	641	586	2	2
Hamlin Township	692	113	1	4

Table 4.3.4-1: Number of addressable structures and critical facilities located in areas with high susceptibility to landslide (USGS, MCGISC, 2019).

MUNICIPALITY	TOTAL ADDRESSABLE STRUCTURES	NUMBER OF ADDRESSABLE STRUCTURES IN HIGH LANDSLIDE SUSCEPTIBILITY AREAS	NUMBER OF CRITICAL FACILITIES IN HIGH LANDSLIDE SUSCEPTIBILITY AREAS	TOTAL NUMBER OF CRITICAL FACILITIES PER MUNICIPALITY
Kane Borough	1,775	1,775	7	7
Keating Township	1,498	0	0	6
Lafayette Township	875	0	0	6
Lewis Run Borough	317	0	0	1
Liberty Township	1,029	0	0	0
Mount Jewett Borough	511	0	0	4
Norwich Township	636	0	0	2
Otto Township	813	0	0	4
Port Allegany Borough	1,006	0	0	9
Sergeant Township	369	184	0	1
Smethport Borough	760	0	0	9
Wetmore Township	1,075	1,007	4	4
TOTAL	**22,265**	**3,663**	**14**	**90**

4.3.6 Subsidence, Sinkhole

4.3.6.1 Location and Extent

Unlike many areas of Pennsylvania, subsidence and sinkhole potential in McKean County is not associated with the solution of carbonate bedrock by water. The County is not underlain with limestone or dolomite and does not have karst features. Instead, the County's subsidence and sinkhole concerns relate directly to the magnitude of extractive industry in the County, particularly coal, oil, and gas mines where poor engineering practices were used at the time of withdrawal, and aging municipal infrastructure (i.e. clay water and sewer pipes). Any active, inactive, improperly plugged, or abandoned well or mine site might open as a sinkhole or contribute to subsidence; these wells are located in every municipality except Eldred Borough and Smethport. As far as the location of aging municipal infrastructure, these systems are located throughout the majority of the county. This is not a major concern as sinkholes and subsidence occur sporadically due to aging infrastructure failures. For our purposes, any municipality without municipal sewer or water service is deemed less vulnerable and

municipalities with municipal water and sewer are considered more vulnerable. For more information on the location of active and abandoned oil and gas wells, see Section 4.3.12.

4.3.6.2 Range of Magnitude

Subsidence and sinkhole events may occur gradually or abruptly, and events could result in a range of impacts from minor elevation changes to deep or gaping holes in the ground surface. These kinds of events can cause severe damage in populated areas, though gradual events can be addressed before large-scale damage occurs. Subsidence and sinkhole events that are not immediately addressed may cause fractures or the complete collapse of building foundations and roadways. A possible worst-case scenario would be if a densely populated part of the County were knowingly or unknowingly situated on top of an abandoned well that caved in or a major water or sewer pipe were to burst causing leakage of the systems contents. This would cause damage to property and has the potential to cause injury and even death.

4.3.6.3 Past Occurrence

McKean County has experienced sinkholes county-wide as a results of 150 years of our county's main economy of natural resource extraction. County EMA also reports that a number of wells have been plugged by PADEP & USEPA county wide (MCEMA, 2019).

4.3.6.4Future Occurrence

The exact probability of future events is difficult to predict. However, based on McKean County's 150 years of heritage in extracting minerals from the earth, natural resource extraction related subsidence and sinkhole events can be considered *possible,* as defined by the Risk Factor methodology probability criteria (see Table 4.4-1). The potential of sinkholes and subsidence arising from aging municipal infrastructure is more likely as time goes on, as these systems continue to age and municipal budgets remain stagnant (MCEMA & MCGISC, 2019).

4.3.6.5 Vulnerability Assessment

In general, jurisdictions that are vulnerable are also those where mineral and fossil fuel extraction has occurred in the past and municipal water and sewer systems are in place. In McKean County, this means that all jurisdictions except Eldred Borough and Smethport can be considered vulnerable to extraction-related subsidence and sinkhole events; however, Annin, Ceres, Corydon, Hamilton, Norwich, Otto, & Sergeant townships are least vulnerable to infrastructure related subsidence and sinkholes due to a lack of municipal systems and services available. The vulnerability of individual structures and critical facilities to subsidence and sinkhole events will depend on underground site conditions at each location; these conditions are unknown at this time.

4.3.7 Tornado, Windstorm

4.3.7.1 Location and Extent

Tornadoes and wind storms can occur throughout McKean County though events are usually localized. However, severe thunderstorms may result in conditions favorable to the formation of numerous or long-lived tornadoes. Tornadoes can occur at any time during the day or night, but are most frequent during late afternoon into early evening, the warmest hours of the day, and most likely to occur during the spring and early summer months of March through June.

Tornado movement is characterized in two ways: direction and speed of spinning winds, and forward movement of the tornado, also known as the storm track. The forward motion of the tornado path can be a few hundred yards or several hundred miles in length. The width of tornadoes can vary greatly, but generally range in size from less than 100 feet to over a mile in width. Some tornadoes never touch the ground and are short-lived, while others may touch the ground several times.

Straight-line winds and windstorms are experienced on a more region-wide scale. While such winds usually accompany tornadoes, straight-line winds are caused by the movement of air from areas of higher pressure to areas of lower pressure. Stronger winds are the result of greater differences in pressure. Windstorms are generally defined with sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration.

4.3.7.2 Range of Magnitude

Each year, tornadoes cost numerous deaths nationwide and account for more than $1 Billion dollars in damages nationally. 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. Rotational wind speeds can range from 100 mph to more than 250 mph. In addition, the speed of forward motion can range from 0 to 50 mph. Therefore, some estimates place the maximum velocity (combination of ground speed, wind speed, and upper winds) of tornadoes at about 300 mph. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles.

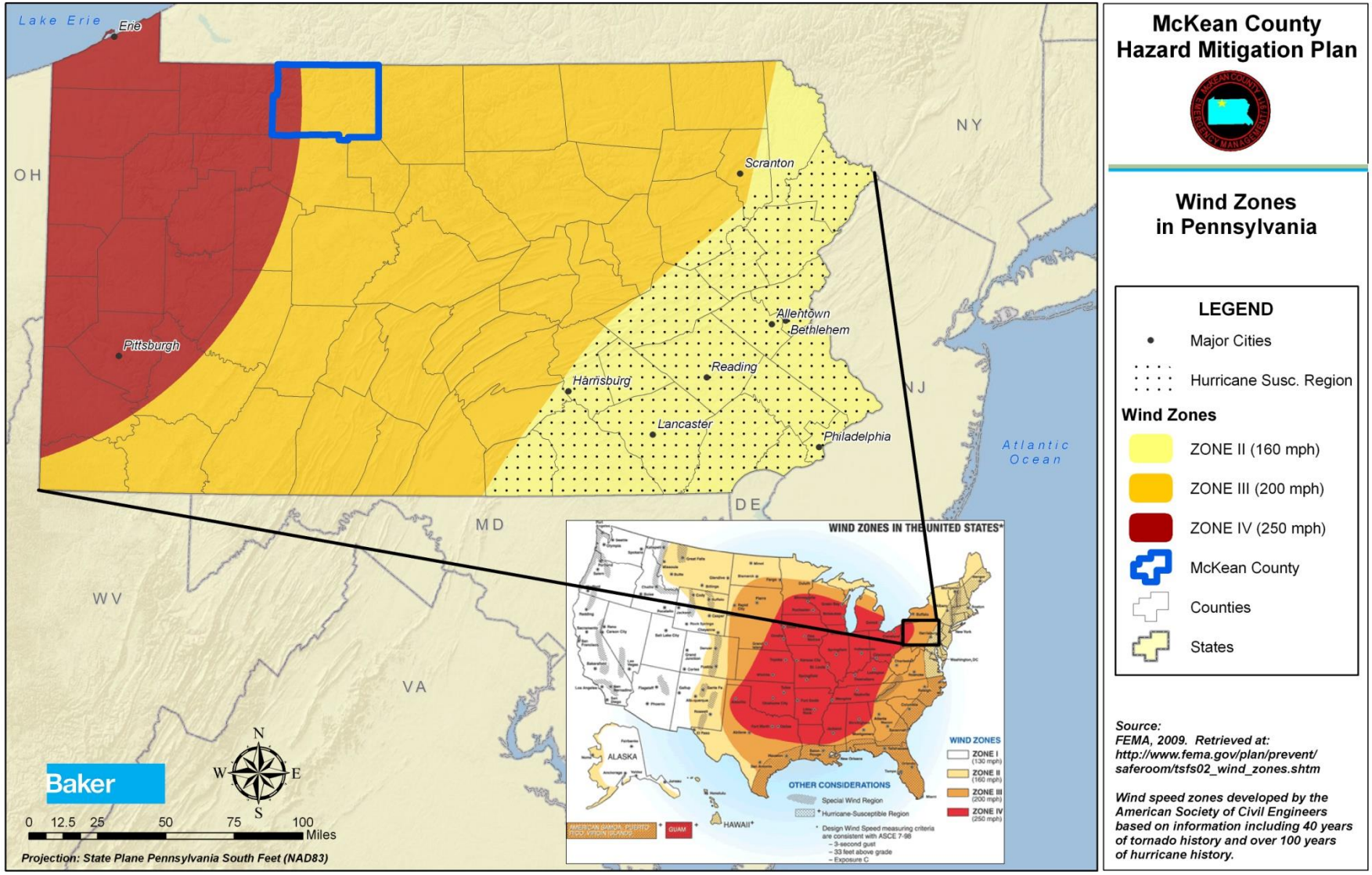
Damages and deaths can be especially significant when tornadoes move through populated, developed areas. The destruction caused by tornadoes ranges from minor to extreme as described on the EF Scale (see Table 4.3.7-1), depending on the intensity, size and duration of the storm. Typically, tornadoes cause the greatest damages to structures of light 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. It classifies United States tornadoes into six intensity categories, as shown in Table 4.3.7-1, based upon the estimated maximum winds occurring within the wind vortex. 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. F-Scale categories with corresponding EF-Scale wind speeds are provided in Table 4.3.7-1 since the magnitude of previous tornado occurrences is based on the F-Scale.

Table 4.3.7-1: Enhanced Fujita Scale (EF-Scale) categories with associated wind speeds and description of damages.

EF-SCALE NUMBER	WIND SPEED (mph)	F-SCALE NUMBER	TYPE OF DAMAGE POSSIBLE
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 missiles generated.
EF5	>200	F3-F6	**Extreme damage**: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (300 ft); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.

Figure 4.3.7-1 shows the wind speed zones developed by the American Society of Civil Engineers based on tornado and hurricane historical events. These wind speed zones are intended to guide the design and evaluation of the structural integrity of shelters and critical facilities. A majority of McKean County falls within Zone II. Shelters and critical facilities should be able to withstand a 3-second gust of up to 160 mph, regardless of whether the gust is the result of a tornado, coastal storm, or windstorm event. Therefore, these structures should be able to withstand the wind speeds experienced in an F3 tornado event. A portion of McKean County falls within Zone IV. In these areas design wind speeds for shelters and critical facilities should be able to withstand a 3-second gust of up to 250 mph. The structures in this portion of the county should be able to withstand the wind speeds associated with an F5 tornado event.

Figure 4.3.7-1: Wind Speed Zones in McKean County.



The worst case scenario for tornado events in McKean County happened in May 1985. In one day three tornadoes touched down across the county. Two of these tornadoes were F4 events, and both of these were 1,000 yards wide and traveled between 6.5 and 7.5 miles. During this event there were a total of 40 injuries and 4 deaths (NCDC, 2011).

Since tornado events are typically localized, environmental impacts are rarely widespread. However, where these events occur, severe damage to plant species is likely. This includes loss of trees and an increased threat of wildfire in areas where dead trees are not removed. Hazardous material facilities should meet design requirements for the wind zones identified in Figure 4.3.1-1 in order to prevent release of hazardous materials into the environment.

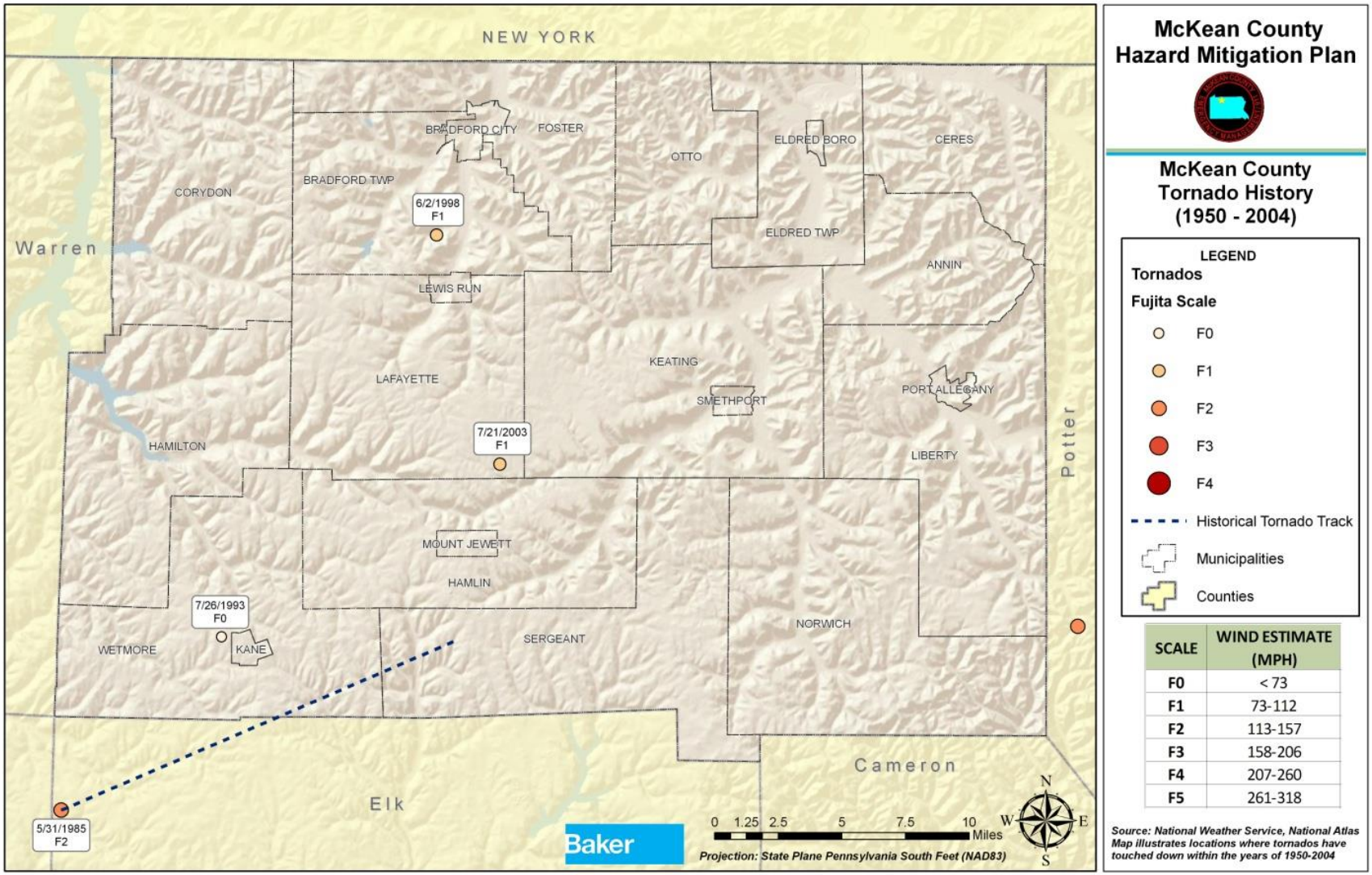
4.3.7.3 Past Occurrence

Tornadoes have occurred in all seasons and all regions of Pennsylvania, but the northern, western, and southeastern portions of the Commonwealth have been struck more frequently. One of the deadliest tornadoes in the Commonwealth occurred during a May, 1985 storm which killed six people, injured sixty, and destroyed campers, mobile homes, and businesses across the commonwealth. Three tornados touched down in McKean County during this storm. A list of tornado events that have occurred in McKean County between 1950 and 2019 is shown in Table 4.3.7-2 with an associated Fujita Tornado Scale magnitude. A map showing the approximate location of previous events from 1950-2004 whose center of circulation were located in or tracked through McKean County is included in Figure 4.3.7-1. Note that two of the tornado events associated with the 1985 swarm have not been identified on the map; this is because while their effects may have been felt or seen in McKean County, they never passed into the County. Lastly, according to the National Weather Service, there have been no confirmed tornadoes in McKean County since the July 2003 tornado that destroyed more than 50% of the Kinzua Viaduct.

Table 4.3.7-2: Previous tornado events between 1950 and 2019 in McKean County (NCDC, 2019).

LOCATION	DATE	ESTIMATED LENGTH	ESTIMATED WIDTH	MAGNITUDE	ESTIMATED PROPERTY DAMAGE ($)
McKean County	5/31/1985	7.0 mi	300 yards	F2	0
McKean County	5/31/1985	7.5 mi	1,000 yards	F4	0
McKean County	5/31/1985	6.5 mi	1,000 yards	F4	0
Custer City	6/2/1998	8.0 mi	440 yards	F1	0
Mt. Jewett	7/21/2003	5.5 mi	600 yards	F1	45,700,000

Figure 4.3.6-1: Previous tornado events between 1950 and 2004 in McKean County (NWS, 2019).



Windstorm events may be the result of thunderstorms, hurricanes, tropical storms, winter storms, or nor'easters. There have been 64 events in McKean County with wind speeds of greater than 50 knots since 2000. These windstorms have caused trees and power lines to fall across the county. The worst case scenario of a windstorm happened in July 1973 when high winds disrupted electric and telephone service, snapped utility poles and destroyed mobile homes. This storm caused over $1 million in damage in McKean County (MCEMA, 2019). A list of events greater than 50 knots that have occurred in McKean County since 2000 is shown in Table 4.3.7-3.

Table 4.3.7-3: Previous windstorm events greater than 50 knots in McKean County between 2000 and 2019 (NCDC & KC, 2019).

LOCATION	DATE	ESTIMATED WIND SPEED	DEATHS	INJURIES	ESTIMATED PROPERTY DAMAGE ($)
Multiple Counties	1/4/2000	50 kts.	0	0	0
Eldred	6/21/2001	50 kts.	0	0	0
Lantz Corners	8/19/2001	50 kts.	0	0	0
Multiple Counties	2/1/2002	63 kts.	0	0	5K
Central Pennsylvania	3/9/2002	50 kts.	0	0	50K
Bradford	6/4/2002	50 kts.	0	0	0
Kane	6/5/2002	50 kts.	0	0	0
Smethport	7/28/2002	50 kts.	0	0	0
Kane	8/2/2002	50 kts.	0	0	0
Kane	9/3/2002	50 kts.	0	0	0
Kane	7/21/2003	55 kts.	0	0	0
Central Pennsylvania	11/13/2003	71 kts.	3	0	50K
Bradford	6/14/2004	50 kts.	0	0	0
Kane	6/17/2004	50 kts.	0	0	0
Mt Jewett	7/30/2004	50 kts.	0	0	0
Kane	8/10/2004	50 kts.	0	0	0
Bradford	8/10/2004	50 kts.	0	0	0
Multiple Counties	12/1/2004	60 kts.	0	0	0
Multiple Counties	12/23/2004	60 kts.	0	0	0
Marshburg	6/6/2005	50 kts.	0	0	0
Mt Jewett	6/6/2005	50 kts.	0	0	0
Kane	6/6/2005	50 kts.	0	0	0
Kane	6/6/2005	50 kts.	0	0	2K
Eldred	6/6/2005	50 kts.	0	0	0
Kane	6/14/2005	50 kts.	0	0	0
Bradford	6/14/2005	50 kts.	0	0	0
Kane	7/26/2005	50 kts.	0	0	0
Bradford	7/26/2005	50 kts.	0	0	0
Smethport	7/26/2005	50 kts.	0	0	0
Ludlow	7/29/2005	50 kts.	0	0	0
Crosby	8/31/2005	50 kts.	0	0	0
Bradford	9/29/2005	50 kts.	0	0	0
Westline	9/29/2005	50 kts.	0	0	0
Port Allegany	11/6/2005	50 kts.	0	0	0

Table 4.3.7-3: Previous windstorm events greater than 50 knots in McKean County between 2000 and 2019 (NCDC & KC, 2019).

LOCATION	DATE	ESTIMATED WIND SPEED	DEATHS	INJURIES	ESTIMATED PROPERTY DAMAGE ($)
Crosby	11/9/2005	60 kts.	0	0	20K
Central Pennsylvania	2/17/2006	53 kts.	0	0	20K
Marshburg	6/19/2006	50 kts.	0	0	0
Bradford	8/3/2006	50 kts.	0	0	0
Eldred	8/3/2006	50 kts.	0	0	0
Eldred	8/25/2006	50 kts.	0	0	0
Smethport	12/1/2006	50 kts.	0	0	0
Smethport	6/2/2007	50 kts.	0	0	0
Kane	6/8/2007	50 kts.	0	0	0
Bradford	8/25/2007	50 kts.	0	0	250K
McKean and Potter Counties	1/30/2008	50 kts.	0	0	0
Farmers Valley	5/31/2008	50 kts.	0	0	0
Larabee	5/31/2008	50 kts.	0	0	0
Bradford	6/28/2008	50 kts.	0	0	0
Ludlow	7/26/2008	50 kts.	0	0	0
Central Pennsylvania	9/14/2008	50 kts.	0	0	0
Bradford	8/9/2009	50 kts.	0	0	5K
Cyclone	6/6/2010	50 kts.	0	0	5K
Rew	6/28/2010	50 kts.	0	0	5K
Larabee	7/17/2010	50 kts.	0	0	5K
Duke Center	7/24/2010	50 kts.	0	0	5K
Bradford	7/24/2010	50 kts.	0	0	5K
Bradford	7/26/2012	50 kts.	0	0	5K
Lewis Run, Cyclone, & Smethport	7/27/2012	78 kts.	0	0	75K
Eastern McKean County	1/10/2016	65 kts.	0	0	0
McKean County	3/9/2017	65 kts.	0	0	0
McKean County	4/4/2018	52 kts.	0	0	0
McKean County	2/24/2019	52 kts.	0	0	0
Kane	5/29/2019	65 kts.	0	0	0
Port Allegany	8/15/2019	60 kts.	0	0	0

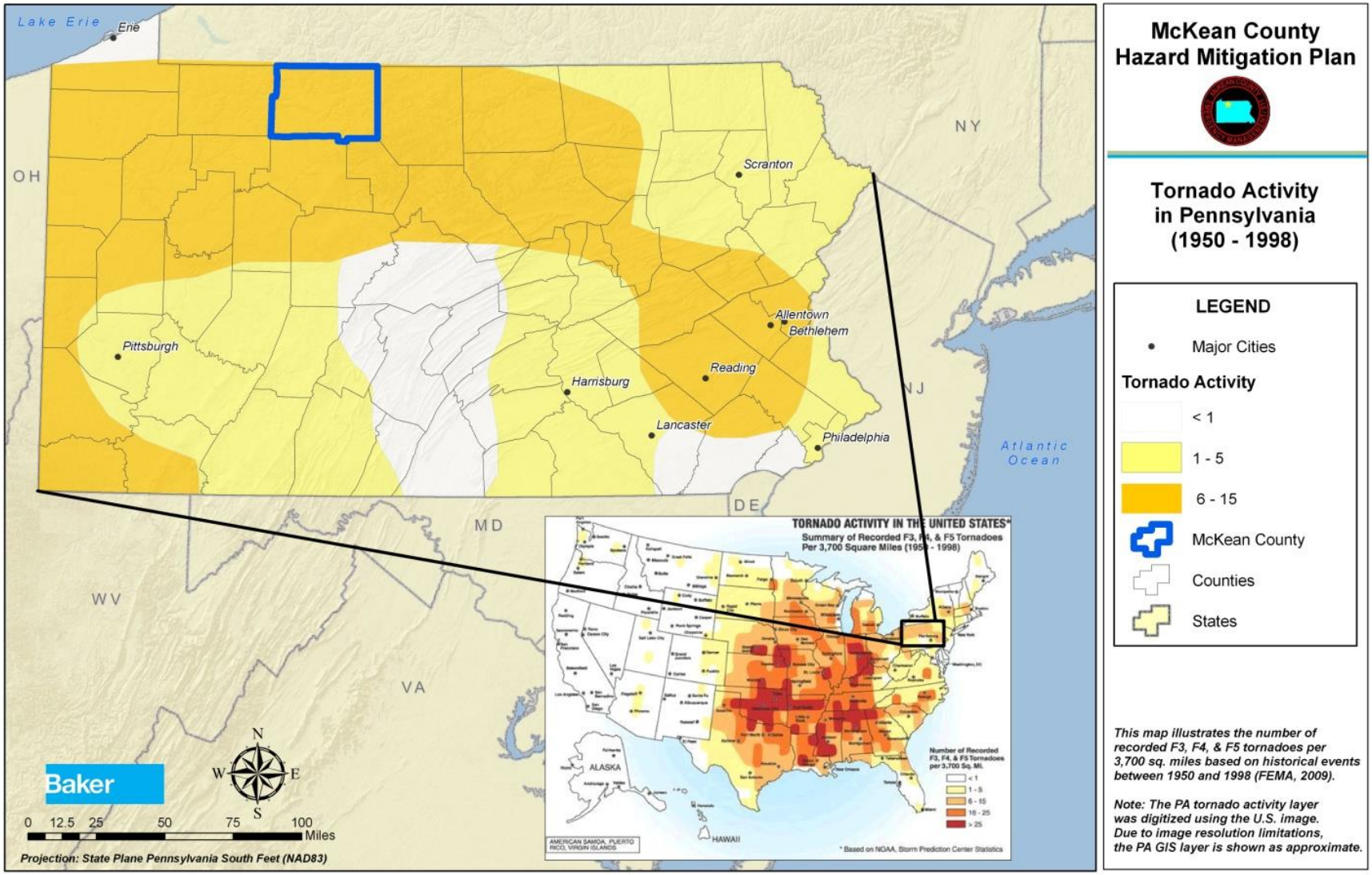
4.3.7.4 Future Occurrence

According to the National Weather Service, the Commonwealth of Pennsylvania has an annual average of ten tornadoes with two related deaths. While the chance of being hit by a tornado is small, the damage that results when the tornado arrives is devastating. An F4 tornado 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.

Based on tornado activity information for Pennsylvania between 1950 and 1998, most of McKean County lies within an area that has experienced 6 to 15 F3, F4, or F5 tornadoes per 3,700 square miles (see Figure 4.3.7-2). McKean County experiences windstorm events more

commonly than tornadoes, which causes power failures, loss of communication networks, and residents requiring temporary shelters and provision of supplies (MCEMA, 2019). The probability of future occurrence of tornado and windstorm events can be considered *likely*, as defined by the Risk Factor methodology probability criteria (see Table 4.4-1).

Figure 4.3.7-2: Tornado Activity in Pennsylvania and McKean County (FEMA, 2009).



4.3.7.5 Vulnerability Assessment

The frequency of tornadoes and windstorms is expected to remain constant across McKean County. These storms can affect the entire county, windstorms especially can occur across the entire county during one event. Although population and development trends have been decreasing in McKean County, the population and properties vulnerable to the effects of tornadoes and windstorms is expected to remain constant (MCEMA, 2019).

Due to their lightweight and unanchored design, mobile homes and commercial trailers are extremely vulnerable to high winds and will generally sustain the most damage. McKean County does not have detailed information on structure types, as described in Section 2.5. However, the number of mobile home structures was estimated by the number of structures on parcels which were designated for mobile or manufactured homes. This is clearly an estimation of mobile homes but allows a preliminary look where these structures are located. Eldred, Liberty, Lafayette, and Keating townships have the highest concentrations of mobile homes while Bradford City, Corydon Township, Kane Borough, Lewis Run Borough, Mount Jewett Borough each had fewer than forty mobile homes.

Table 4.3.3-4: Mobile parcels and addressable structures located in mobile home parcels in McKean County (McKean County Assessment Office, MCGISC 2019).

MUNICIPALITY	# OF MOBILE HOME PARCELS	# OF ADDRESSABLE STRUCTURES IN MOBILE HOME PARCELS
Annin Township	61	92
Bradford City	8	5
Bradford Township	73	80
Ceres Township	99	117
Corydon Township	39	34
Eldred Borough	39	43
Eldred Township	131	168
Foster Township	106	131
Hamilton Township	49	62
Hamlin Township	70	116
Kane Borough	33	37
Keating Township	202	259
Lafayette Township	146	159
Lewis Run Borough	33	37
Liberty Township	165	207
Mount Jewett Borough	33	34
Norwich Township	80	134
Otto Township	89	137
Port Allegany Borough	37	62
Sergeant Township	47	74
Smethport Borough	35	89
Wetmore Township	60	70

Table 4.3.3-4: Mobile parcels and addressable structures located in mobile home parcels in McKean County (McKean County Assessment Office, MCGISC 2019).		
MUNICIPALITY	**# OF MOBILE HOME PARCELS**	**# OF ADDRESSABLE STRUCTURES IN MOBILE HOME PARCELS**
TOTAL	**1,623**	**2,183**

4.3.8 Wildfire

4.3.8.1 Location and Extent

Wildfires take place in less developed or completely undeveloped areas, spreading rapidly through vegetative fuels. They can occur any time of the year, but mostly occur during long, dry, hot spells. Any small fire, if not quickly detected and suppressed, can get out of control. Most wildfires are caused by human carelessness, negligence, and ignorance. However, some are precipitated by lightning strikes and in rare instances, spontaneous combustion. Wildfires in Pennsylvania can occur in open fields, grass, dense brush, and forests.

Because a majority of McKean County's land cover is forest, the potential geographic extent of wildfires is quite large. Under dry conditions or droughts, wildfires have the potential to burn forests as well as croplands. The greatest potential for wildfires is in the spring months of March, April, and May, and the autumn months of October and November; 83% of all Pennsylvania wildfires occur in these two time periods. In the spring, bare trees allow sunlight to reach the forest floor, drying fallen leaves and other ground debris. In the fall, dried leaves are also fuel for fires. Most fires are caused by human carelessness or negligence, especially debris burning. However, some are precipitated by lightning strikes and, in rare instances, spontaneous combustion.

4.3.8.2 Range of Magnitude

Wildfire events can range from small fires that can be managed by local firefighters to large fires impacting many acres of land. Large events may require evacuation from one or more communities and necessitate regional or national firefighting support. The impact of a severe wildfire can be devastating. A worst-case scenario for wildfires occurred in McKean County in 2003 when seven total wildfires destroyed over fifty-seven acres of land and cost over $80,300 in damages and extinction costs. McKean County has not experienced a fire season of such magnitude, in terms of monetary costs, since 2003. However, other fire seasons have seen more wildfire events with less monetary damage associated with greater amounts of total area impacted, this is particularly the case for 2005, 2006, 2012, and 2018.

In addition to the risk wildfires pose to the general public and property owners, the safety of firefighters is also a concern. Although loss of life among firefighters does not occur often in Pennsylvania, it is always a risk. More common firefighting injuries include falls, sprains, abrasions or heat-related injuries such as dehydration. Response to wildfires also exposes

emergency responders to the risk of motor vehicle accidents and can place them in remote areas away from the communities that they are chartered to protect.

While some fires are not human-caused and are part of natural succession processes, a wildfire can kill people, livestock, fish and wildlife. They often destroy property, valuable timber, forage and recreational and scenic values. The most significant environmental impact is the potential for severe erosion, silting of stream beds and reservoirs, and flooding due to ground-cover loss following a fire event. Wildfire can also have a positive environmental impact in that they burn dead trees, leaves, and grasses to allow more open spaces for new vegetation to grow and receive sunlight. Another positive effect is that it stimulates the growth of new shoots on trees and shrubs and its heat can open pine cones and other seed pods.

4.8.3.3 Past Occurrence

There have been 28 wildfire events consuming 140.5 acres were reported to the Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry from 2002-2008. While this list does not include wildfires that were not reported to DCNR or that were controlled solely by the volunteer fire departments in the County, this is the most comprehensive list of wildfire occurrences available for McKean County. Of all of McKean County's jurisdictions, Sergeant Township has experienced the most wildfires with known coordinates in a single jurisdiction with 4 reported wildfires. However, Corydon Township has experienced the largest number of acres burned as a result of wildfires, with 41 acres burned. The year 2006 saw the most reported wildfire events at 11, but the largest number of acres burned in 2003, when over 57 acres burned.

McKean County keeps a record of wildfire events in the County HVA. This data may overlap with the DCNR data but is important to mention because it includes information on costs and dollar value of damage in wildfire events. A summary of wildfires in McKean County by year from 1997 to 2019 are listed in Table 4.3.8-2 below.

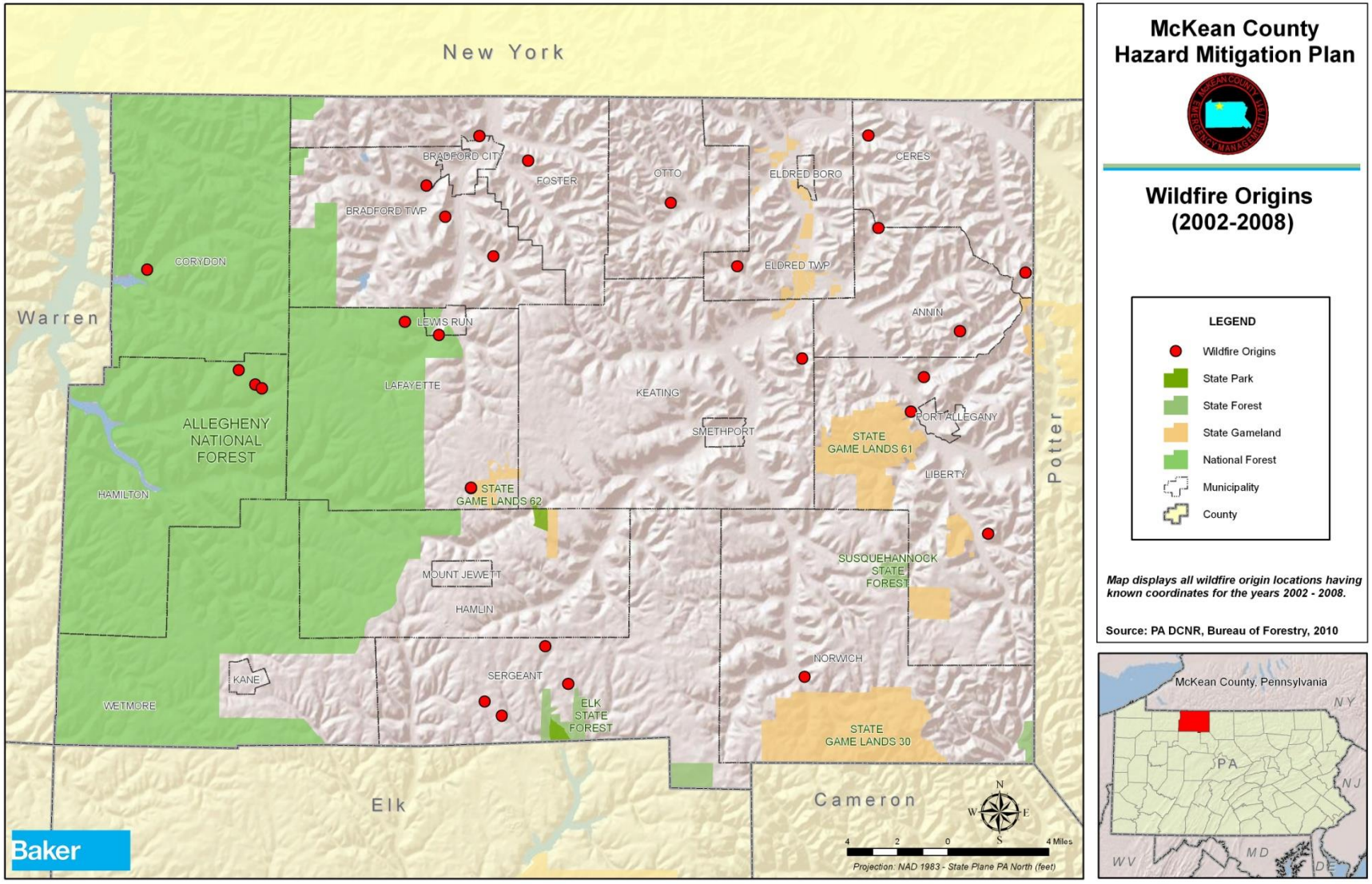
Table 4.3.8-2: Wildfire events in McKean County from 1997-2019 (DCNR & MCEMA, 2019).

YEAR	NUMBER OF REPORTED FIRES	AREA (acres)	EXTINCTION COSTS	DAMAGE
1997	3	7.1	$778.20	$104.36
1998	15	42.86	$4,753.76	$4,125.62
1999	12	20.61	$3,983.00	$4,420.00
2000	9	17.18	$3,335.00	$3,670.00
2001	3	2.28	$635.00	$208.00
2002	0	-	-	-
2003	7	57.49	$80,300.19	(Included)
2004	0	-	-	-
2005	5	82.29	$5,522.51	(Included)
2006	11	32.61	$78,027.53	(Included)
2007	3	2.2	-	-

Table 4.3.8-2: Wildfire events in McKean County from 1997-2019 (DCNR & MCEMA, 2019).				
YEAR	**NUMBER OF REPORTED FIRES**	**AREA (acres)**	**EXTINCTION COSTS**	**DAMAGE**
2008	0	-	-	-
2009	4	79.57	$2,577.19	(Included)
2010	3	22.2	$3,874.26	(Included)
2011	1	16.2	$756.26	(Included)
2012	8	48.08	$2,331.46	(Included)
2013	3	2.59	-	-
2014	2	11.35	-	-
2015	3	0.88	$283.50	(Included)
2016	1	9	-	-
2017	4	1.43	-	-
2018	8	23.13	-	-
2019	2	2	-	-

Figure 4.3.8-1 maps the origins of the wildfire events listed in Table 4.3.8-2 above. The map shows that previous occurrences of wildfires have occurred throughout the entire County, but a few jurisdictions have not had a reported wildfire: Kane, Eldred, Smethport, and Mount Jewett Boroughs and Wetmore and Hamlin Townships.

Figure 4.3.8-1: Wildfire origins in McKean County between 2002 and 2008. (DCNR-BOF, 2009)



4.8.3.4 Future Occurrence

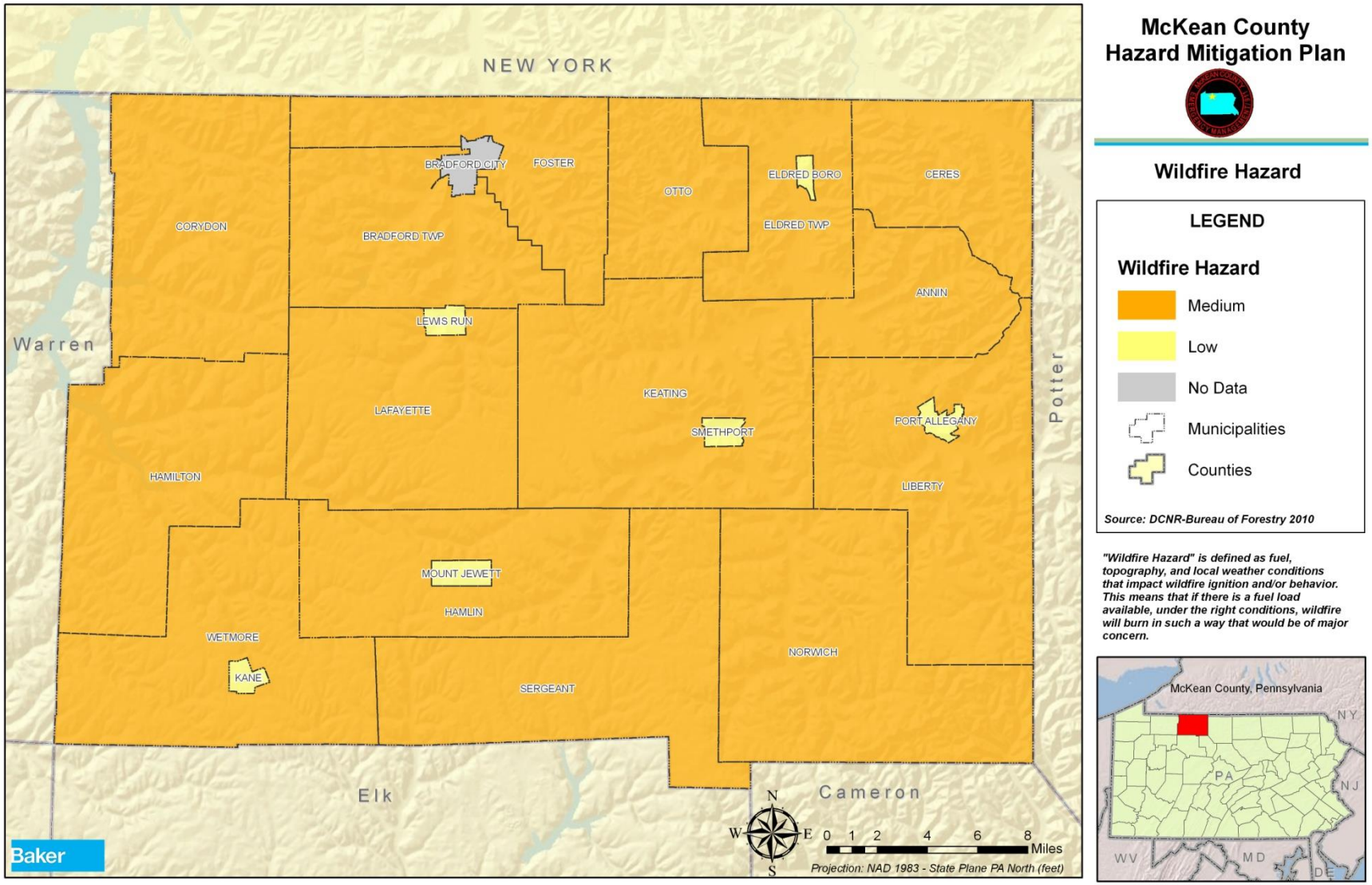
Over the five year period between 2003 and 2007, 18,132 acres of state forest have burned in Pennsylvania and over 140 acres of land have burned in McKean County in the wildfire events shown in Figure 4.3.8-1. Previous events indicate that wildfire events will continue to occur annually. Weather conditions like drought can increase the likelihood of wildfires occurring. Any fire, without the quick response or attention of fire-fighters, forestry personnel, or visitors to the forest, has the potential to become a wildfire.

The probability of a wildfire occurring in McKean County is *highly likely* in any given year, as defined by the Risk Factor methodology probability criteria (see Table 4.4-1). However, the likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response.

4.8.3.5 Vulnerability Assessment

The Pennsylvania Bureau of Forestry has conducted an independent wildfire hazard risk assessment for the various municipalities across McKean County. Results of that assessment are shown in Figure 4.3.8-2. *Wildfire hazard* is defined based on conditions that affect wildfire ignition and/or behavior such as fuel, topography and local weather. Based on this assessment, no jurisdictions have a *high* wildfire rating. However, the fifteen townships of the twenty-two municipalities within McKean County have a *medium* wildfire hazard potential: Annin, Bradford, Ceres, Corydon, Eldred, Foster, Hamilton, Hamlin, Keating, Lafayette, Liberty, Norwich, Otto, Sergeant, and Wetmore Townships. Eldred, Kane, Lewis Run, Mount Jewett, Port Allegany, and Smethport Boroughs are considered to have *low* wildfire hazard potential. No wildfire hazard calculation is available for the Bradford City. The individual vulnerability of communities will differ based on the design of the urban/wildland interface, the number of ingress and egress points into a community, and the availability of water to fight fires. However, as this assessment suggests, McKean County's boroughs and Bradford City are relatively less vulnerable to wildfire events than its townships, and compared to other counties in Pennsylvania with large swaths of forested land, McKean County has overall low wildfire vulnerability.

Figure 4.3.8-2: Wildfire hazard potential per municipality in McKean County (DCNR-BOF, 2010).



4.3.9 Winter Storm

4.3.9.1 Location and Extent

Winter storms are regional events. Every county in the Commonwealth, including McKean, is subject to severe winter storms.

Within McKean County there are variations in the average amount of snowfall that is received throughout different parts of the County because of terrain differences. Generally, the average annual snowfall in the county increases from the southeast with an annual average of 60 to 70 inches to the northwest with an annual average of over 100 inches (see Figure 4.3.9-1).

4.3.9.2 Range of Magnitude

Winter storms consist of cold temperatures, heavy snow or ice and sometimes strong winds. They begin as low-pressure systems that move through Pennsylvania either following the jet stream or developing as extra-tropical cyclonic weather systems over the Atlantic Ocean called nor'easters. Due to their regular occurrence, these storms are considered hazards only when they result in damage to specific structures or cause disruption to traffic, communications, electric power, or other utilities.

A winter storm can adversely affect roadways, utilities, business activities, and can cause frostbite or loss of life. These storms may include one or more of the following weather events:

- **Heavy Snowstorm:** Accumulations of four inches or more in a six-hour period, or six inches or more in a twelve-hour period.
- **Sleet Storm:** Significant accumulations of solid pellets which form from the freezing of raindrops or partially melted snowflakes causing slippery surfaces posing hazards to pedestrians and motorists.
- **Ice Storm:** Significant accumulations of rain or drizzle freezing on objects (trees, power lines, roadways, etc.) as it strikes them, causing slippery surfaces and damage from the sheer weight of ice accumulation.
- **Blizzard:** Wind velocity of 35 miles per hour or more, temperatures below freezing, considerable blowing snow with visibility frequently below one-quarter mile prevailing over an extended period of time.
- **Severe Blizzard:** Wind velocity of 45 miles per hour, temperatures of 10 degrees Fahrenheit or lower, a high density of blowing snow with visibility frequently measured in feet prevailing over an extended period time.

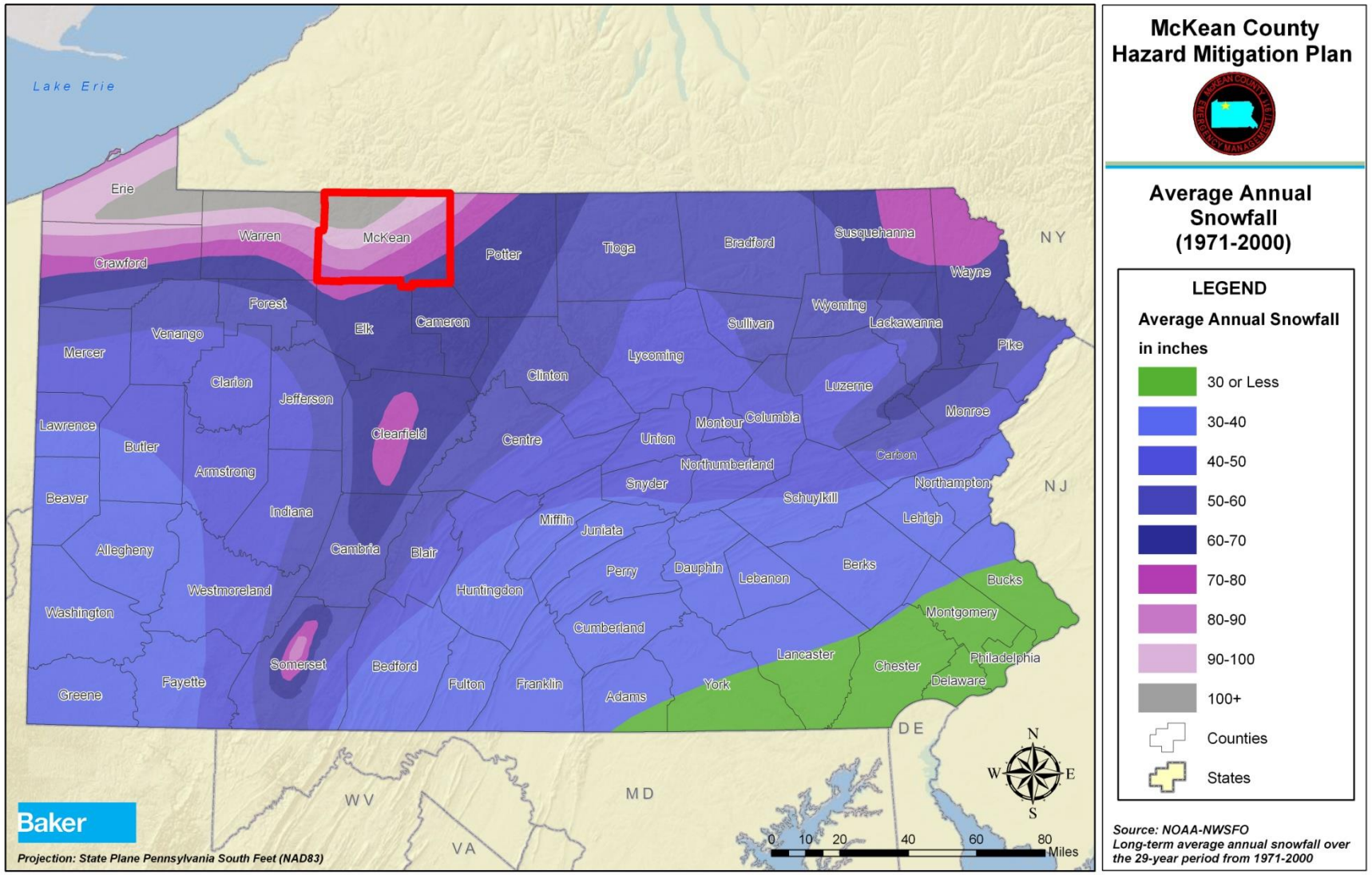
Any of the above events can result in the closing of major or secondary roads, particularly in rural locations, stranded motorists, transportation accidents, loss of utility services, and depletion of oil heating supplies. Environmental impacts often include damage to shrubbery and trees due to heavy snow loading, ice build-up and/or high winds which can break limbs or even bring down large trees. Gradual melting of snow and ice provides excellent groundwater

recharge. However, high temperatures following a heavy snowfall can cause rapid surface water runoff and severe flooding.

Figure 4.3.9-1 shows mean annual snowfall in McKean County to be between 60 and over 100 inches. One of the ten Presidential Disaster and Emergency Declarations affecting McKean have been in response to hazard events related to winter storms (see Table 4.2-1). Other reported winter storm events, including those associated with Disaster Declarations, are listed in Table 4.3.9-1.

McKean County experienced major winter storms in 1972, 1977, 1978, 1993, 1994 and 1996. There have been numerous other winter storms recorded every year, those that occurred after 1993 are listed in Table 4.3.9-1. McKean County has experienced power failures, loss of communication networks, as well as stranded motorists requiring emergency transportation and temporary shelter as a result of these storms. The worst case scenario for McKean County happened in the winter of 1994. McKean experienced multiple heavy snowstorms or blizzards between January and March of 1994. Across central Pennsylvania these storms caused $5 million of property damage as roofs collapsed under the combined weight of snow and ice from the winter storms. McKean County received 154.9 inches of snowfall that winter season (Gelber, 2002).

Figure 4.3.9-1: Mean Annual Snowfall for Pennsylvania and McKean County (NOAA –NWSFO).



4.3.9.3 Past Occurrence

McKean County and the Commonwealth of Pennsylvania have a long history of severe winter weather. Significant winter storm events that have affected McKean County since 1993 are listed in Table 4.3.9-1. The National Climactic Data Center (NCDC) data on past occurrence for winter storm events since 1993 is the only comprehensive list of data available for the county aside from information from past disaster declarations.

In the winter of 1993-1994, the state was hit by a series of protracted winter storms. The severity and nature of these storms combined with accompanying record-breaking frigid temperatures posed a major threat to the lives, safety and well-being of Commonwealth residents and caused major disruptions to the activities of schools, businesses, hospitals and nursing homes.

One of these devastating winter storms occurred in early January 1994 with record snowfall depths in many areas of the Commonwealth, strong winds, and sleet/freezing rains. Numerous storm-related power outages were reported and as many as 600,000 residents were without electricity, in some cases for several days at a time. A ravaging ice storm followed which closed major arterial roads and downed trees and power lines. Utility crews from a five-state area were called to assist in power restoration repairs. Officials from PPL Corporation stated that this was the worst winter storm in the history of the company; related damage-repair costs exceeded $5,000,000.

Serious power supply shortages continued through mid-January because of record cold temperatures at many places, causing sporadic power generation outages across the Commonwealth. The entire Pennsylvania-New Jersey-Maryland grid and its partners in the District of Columbia, New York and Virginia experienced 15-30 minute rolling blackouts, threatening the lives of people and the safety of the facilities in which they resided. Power and fuel shortages affecting Pennsylvania and the East Coast power grid system required the Governor to recommend power conservation measures be taken by all commercial, residential and industrial power consumers.

The record cold conditions resulted in numerous water-main breaks and interruptions of service to thousands of municipal and city water customers throughout the Commonwealth. Additionally, the extreme cold in conjunction with accumulations of frozen precipitation resulted in acute shortages of road salt. As a result, trucks were dispatched to haul salt from New York to expedite deliveries to Pennsylvania Department of Transportation storage sites.

In addition to the events described above, other winter storm events are listed in Table 4.3.9-1.

Table 4.3.9-1: Previous winter storm events impacting McKean County since 1993 (NCDC, 2019). Events with the location "Multiple Counties" include McKean County.

LOCATION	DATE	TYPE
McKean, Butler, Lawrence, Potter and Warren Counties	1/21/1993	Ice
McKean, Butler, Lawrence, Potter and Warren Counties	2/12/1993	Heavy Snow

Table 4.3.9-1: Previous winter storm events impacting McKean County since 1993 (NCDC, 2019). Events with the location "Multiple Counties" include McKean County.		
LOCATION	**DATE**	**TYPE**
Multiple Counties	2/16/1993	Heavy Snow
McKean and Erie Counties	2/21/1993	Heavy Snow
Multiple Counties	2/23/1993	Heavy Snow
McKean County	2/26/1993	Heavy Snow
Multiple Counties	3/4/1993	Heavy Snow
McKean County	4/22/1993	Heavy Snow
Multiple Counties	10/31/1993	Heavy Snow
Multiple Counties	1/4/1994	Heavy Snow
Multiple Counties	1/17/1994	Heavy Snow
Multiple Counties	1/27/1994	Ice
Multiple Counties	3/2/1994	Heavy Snow
McKean, Cameron, Crawford, Erie and Warren Counties	3/10/1994	Heavy Snow and Ice
Multiple Counties	1/4/1995	Heavy Snow
Multiple Counties	1/7/1995	Ice
Multiple Counties	2/15/1995	Ice
McKean, Allegheny and Greene Counties	3/8/1995	Heavy Snow
Multiple Counties	11/14/1995	Winter Storm
McKean and Warren Counties	11/21/1995	Heavy Snow Squalls
Multiple Counties	12/19/1995	Winter Storm
Multiple Counties	1/2/1996	Heavy Snow
Multiple Counties	3/7/1996	Heavy Snow
McKean and Warren Counties	11/10/1996	Heavy Snow
Multiple Counties	11/28/1996	Heavy Snow
McKean County	1/26/1997	Heavy Snow
McKean and Warren Counties	3/6/1997	Heavy Snow
Multiple Counties	3/14/1997	Ice Storm
Multiple Counties	11/14/1997	Heavy Snow
McKean and Warren Counties	12/7/1997	Heavy Snow
Multiple Counties	12/10/1997	Heavy Snow
Multiple Counties	1/15/1998	Ice Storm
McKean, Potter and Tioga Counties	3/14/1998	Heavy Snow
Multiple Counties	1/2/1999	Winter Storm
Multiple Counties	1/8/1999	Winter Storm
Multiple Counties	1/14/1999	Winter Storm
Multiple Counties	3/4/1999	Heavy Snow

Table 4.3.9-1: Previous winter storm events impacting McKean County since 1993 (NCDC, 2019). Events with the location "Multiple Counties" include McKean County.		
LOCATION	**DATE**	**TYPE**
Multiple Counties	3/6/1999	Heavy Snow
Multiple Counties	2/13/2000	Ice Storm
Multiple Counties	2/18/2000	Winter Storm
McKean and Warren Counties	11/21/2000	Heavy Snow
McKean and Warren Counties	12/5/2000	Heavy Snow
Multiple Counties	12/13/2000	Winter Storm
Multiple Counties	3/4/2001	Heavy Snow
Multiple Counties	1/6/2002	Heavy Snow
Multiple Counties	1/19/2002	Heavy Snow
McKean, Potter, Tioga and Warren Counties	1/31/2002	Ice Storm
McKean, Potter and Tioga Counties	3/24/2002	Winter Storm
McKean and Warren Counties	11/30/2002	Heavy Snow
Multiple Counties	12/5/2002	Heavy Snow
Multiple Counties	12/10/2002	Ice Storm
McKean, Cameron, Clearfield, Elk and Somerset Counties	12/13/2002	Heavy Snow
Multiple Counties	12/25/2002	Heavy Snow
Multiple Counties	1/1/2003	Ice Storm
McKean and Warren Counties	11/14/2003	Heavy Snow
Multiple Counties	12/14/2003	Heavy Snow
McKean, Cameron and Elk Counties	1/4/2004	Ice Storm
Multiple Counties	2/3/2004	Heavy Snow
Multiple Counties	2/6/2004	Ice Storm
Multiple Counties	3/16/2004	Heavy Snow
McKean and Warren Counties	12/14/2004	Heavy Snow
Multiple Counties	1/5/2005	Winter Storm
McKean and Warren Counties	1/19/2005	Heavy Snow
Multiple Counties	1/22/2005	Winter Storm
Multiple Counties	2/21/2005	Winter Storm
Multiple Counties	10/25/2005	Heavy Snow
McKean, Potter and Warren Counties	12/2/2005	Heavy Snow
Multiple Counties	12/16/2005	Winter Storm
McKean and Warren Counties	2/5/2006	Winter Storm
McKean and Warren Counties	2/13/2007	Heavy Snow

Table 4.3.9-1: Previous winter storm events impacting McKean County since 1993 (NCDC, 2019). Events with the location "Multiple Counties" include McKean County.		
LOCATION	**DATE**	**TYPE**
Multiple Counties	3/16/2007	Heavy Snow
McKean, Clinton, Lycoming and Tioga Counties	12/2/2007	Ice Storm
McKean, Cameron, Clinton, Lycoming and Tioga Counties	12/9/2007	Ice Storm
Multiple Counties	12/13/2007	Winter Storm
Multiple Counties	2/1/2008	Winter Storm
McKean and Potter Counties	2/26/2008	Winter Storm
McKean and Warren Counties	3/4/2008	Ice Storm
Multiple Counties	12/19/2008	Winter Storm
McKean and Cameron Counties	1/10/2009	Winter Storm
Multiple Counties	1/27/2009	Winter Storm
Multiple Counties	10/15/2009	Winter Storm
Multiple Counties	2/25/2010	Winter Storm
Multiple Counties	2/1/2011	Winter Storm
Multiple Counties	12/26/2012	Winter Storm
Multiple Counties	11/26/2013	Winter Storm
Warren, Cameron, Elk, Tioga, McKean, Potter, Sullivan, Northern Lycoming Counties	2/1/2015	Winter Storm
McKean & Potter Counties	1/12/2018	Winter Storm
Multiple Counties	3/1/2018	Winter Storm
Multiple Counties	11/15/2018	Winter Storm
Multiple Counties	1/19/2019	Winter Storm

4.3.9.4 Future Occurrence

Winter storms are a regular, annual occurrence in McKean County and should be considered *highly likely,* as defined by the Risk Factor methodology probability criteria (see Table 4.4-1). Approximately thirty-five winter storm events occur across Pennsylvania and about three to five in McKean County annually.

4.9.9.5 Vulnerability Assessment

Based on the information available, all communities in McKean County are essentially equally vulnerable to the direct impacts of winter storms. Residents of the mountainous areas of the County may be more susceptible, especially when emergency medical assistance is required. In addition, the more rural areas of the County are susceptible to isolation caused by winter storms. Many areas are heavily wooded which make emergency response to these areas difficult when roadways are blocked by downed trees and wires.

Vulnerability to the effects of winter storms on buildings is also dependent on the age of the building type, construction material used and condition of the structure. Table 4.3.9-3 below shows that while a majority of structures in McKean County were built since 1940, over 21,300 structures, approximately 40% of all structures in the county are 80 or more years old. Additional information on construction type and building codes enforced at time of construction would allow a more thorough assessment of the vulnerability of structures to winter storm impacts such as severe wind and heavy snow loading. However, based on the available information, the City of Bradford, Eldred Borough, Kane Borough, Mount Jewett Borough, and Smethport Borough have the most structures of any municipality in the county, and a majority of these were built prior to 1940.

Table 4.3.9-3: Age of housing units in McKean County (US Census Bureau, 2013-2017 American Community Survey, MCGISC).

Municipality	Number of Housing Units Built Prior to 1940	Percent of Total Housing Units per municipality
Annin Township	73	18.30%
Bradford City	2,541	59.26%
Bradford Township	536	29.43%
Ceres Township	113	28.18%
Corydon Township	27	9.75%
Eldred Borough	201	50.89%
Eldred Township	179	25.94%
Foster Township	547	27.52%
Hamilton Township	188	33.63%
Hamlin Township	184	34.39%
Kane Borough	1,070	60.38%
Keating Township	375	27.37%
Lafayette Township	149	19.87%
Lewis Run Borough	122	33.33%
Liberty Township	186	22.17%
Mount Jewett Borough	294	62.29%
Norwich Township	195	37.43%
Otto Township	345	46.50%
Port Allegany Borough	466	42.75%
Sergeant Township	60	18.24%
Smethport Borough	442	57.85%
Wetmore Township	227	24.49%
Total	**8,540**	**40.02%**

Because of the frequency of winter storms, strategies have been developed to respond to these events. Snow removal and utility repair equipment is present to respond to typical events. The use of auxiliary heat and electricity supplies such as wood burning stoves, kerosene heaters

and gasoline power generators reduces the vulnerability of humans to extreme cold temperatures commonly associated with winter storms. People residing in structures lacking adequate equipment to protect against cold temperatures or significant snow and ice are more vulnerable to winter storm events. Even for communities that are prepared to respond to winter storms, severe events involving snow accumulations that exceed six or more inches in a twelve hour period can cause a large number of traffic accidents, strand motorists due to snow drifts, interrupt power supply and communications, and cause the failure of inadequately designed and/or maintained roof systems.

HUMAN-MADE HAZARDS

4.3.10 Dam Failure

Due to sensitivity issues, the Dam Failure profile can be found in **Appendix F**.

4.3.11 Disorientation

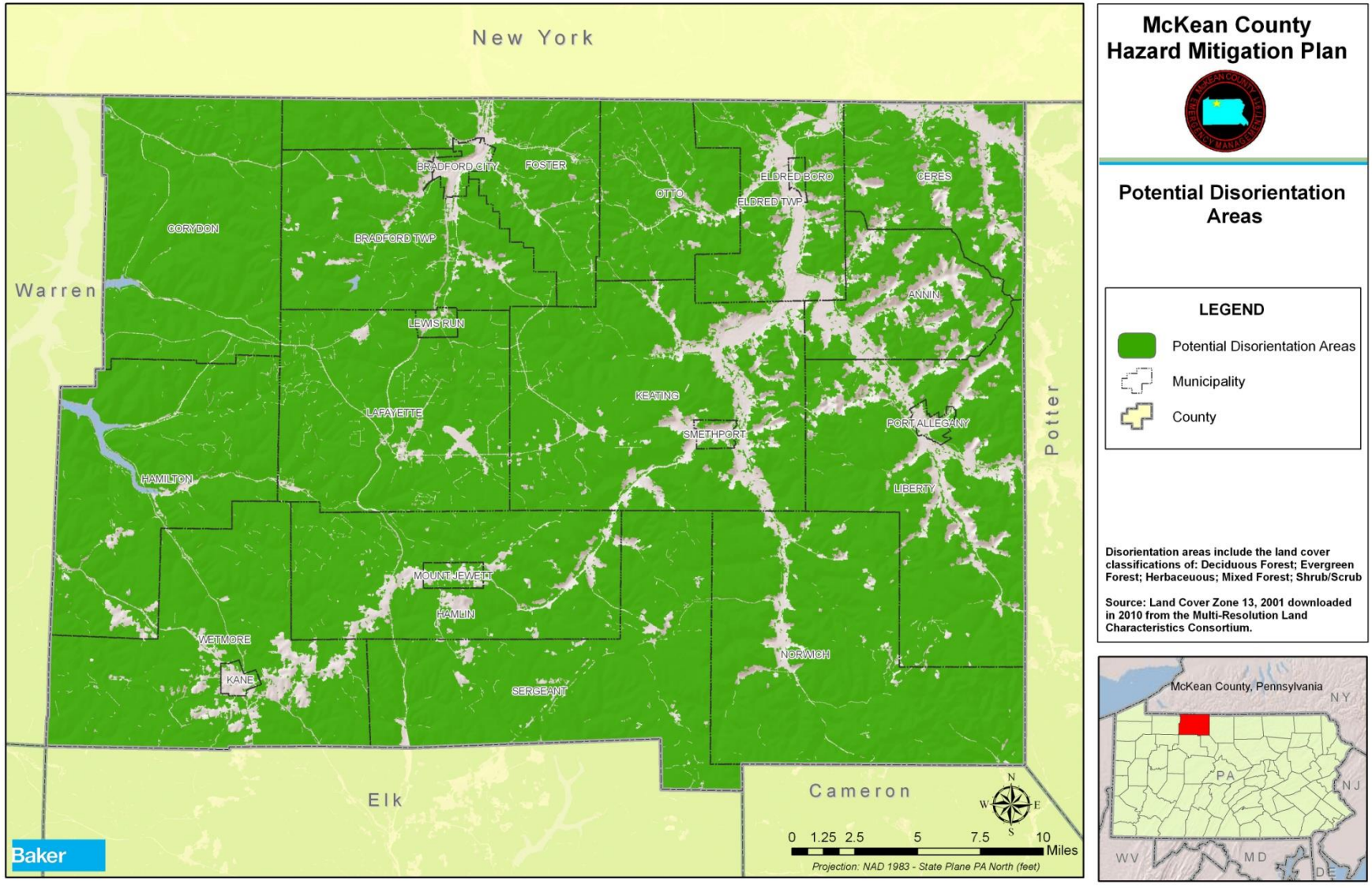
4.3.11.1 Location and Extent

Large numbers of people are attracted to Pennsylvania's rural areas for recreational purposes and, as a result, people can become lost or trapped in remote and rugged wilderness areas. Search and rescue may be required for people who suffer from medical problems or injuries and those who become accidentally or intentionally disoriented. Search and rescue efforts are often focused in and around state forest and state park lands (DCNR, 2019).

McKean County is largely rural and heavily wooded with steep mountains and numerous rivers and streams. A majority of McKean County's land area is forested and about 20 percent of the county is a part of the Allegheny National Forest. The County also hosts 3,166 acres of state forestlands and 24,380 acres of state game lands. These areas provide numerous opportunities for recreational activities, including hiking, camping, hunting, and fishing.

Because so much of the County is forested, there are significant areas in which disorientation may occur. Figure 4.3.11-1 illustrates these forested areas, derived from the National Land Cover Database, which are the potential disorientation areas in McKean County. For the most part, disorientation is possible in every jurisdiction in the County.

Figure 4.3.11-1: Potential areas of disorientation in McKean County (NLCD, 2001).



4.3.11.2 Range of Magnitude

A wide variety of factors can contribute to outcome of a search and rescue mission but the most common dangers associated with disorientation in are lack of food, water, shelter and medical care. McKean County generally has a constant abundance of water and during the warmer summer months, when shelter is less of a necessity than during winter months when extreme temperatures can pose a more serious threat. Age, physical fitness, and familiarity with the area can also have a bearing on the outcome of disorientation events. The worst case scenario associated with disorientation involves serious injury or death. There was one instance of death during a search and rescue call in McKean County in 1996 and another in 2002.

4.3.11.3 Past Occurrence

McKean County experiences several search and rescue incidents annually, particularly in Corydon Township and Hamilton Township in the Allegheny National Forest, but records of search and rescue operations are not consistent. According to McKean County's Hazard Vulnerability Analysis, there were four searches in 1994, six searches in 1995, and three searches in 1996. One of the searches in 1996 resulted in a fatality, but no details are available about this event. The County also has records of more recent operations; there were three search and rescue operations in November 2008, with use of an incident tracking system, incidents from 2009 forward are depicted in the table below.

Table 4.3.11-3 Disorientation Searches 2009-2018 (McKean DES, 2019)

Year	Number of Searches
2009	3
2010	4
2011	2
2012	3
2013	4
2014	2
2015	4
2016	3
2017	2
2018	3

4.3.11.4 Future Occurrence

It is impossible to predict when and where disorientation may occur. During times when activities such as hunting, hiking, boating and camping increase, so does the likelihood of individuals becoming disoriented. Search and rescue operations are expected to continue but can be mitigated through appropriate actions. Based on available past occurrence data the probability of the County experiencing a disorientation incident is *likely,* as defined by the Risk Factor methodology probability criteria (see Table 4.4-1).

4.3.11.5 Vulnerability Assessment

Individuals are most likely to become disorientated in areas of vast, open wilderness. Children and the elderly are more vulnerable to exposure to the elements. Hunters, hikers and all-terrain vehicle riders have been the most common victims of disorientation in the past. Many outdoor, recreational activities commonly associated with disorientation take place during the warmer months of spring and summer and pose a somewhat lesser risk because of the average temperature range during these seasons. The most dangerous period to become lost outdoors is during the winter months when heat and shelter are vital. McKean County often experiences winter storms and temperatures below freezing. This time coincides with hunting season, which poses danger to the hunters who get lost as well as the search and rescue team that searches for the missing hunters.

While prevention is the best solution to disorientation, lessening the impacts of this hazard by identifying and quickly locating individuals that have become lost or injured is equally important. There are several resources available on a state and local level for responding to search and rescue events. The DCNR is the primary coordinator for search and rescue operations efforts on state lands within Pennsylvania. The agency is responsible for over two million acres of forest land and currently has 140 people trained as search managers and search responders (DCNR 2019).

The Pennsylvania Search and Rescue Council (PSARC) is made up of representatives from DCNR, PEMA, law enforcement, emergency managers and responders, and others. PSARC sets training and operational standards to search and rescue teams throughout the Commonwealth in addition to mission response coordination, and providing search and rescue prevention and response education to local officials and the public (PSARC 2019).

4.3.12 Environmental Hazards

4.3.12.1 Location and Extent

A. HAZARDOUS MATERIALS RELEASES

Facilities that use, manufacture, or store hazardous materials in Pennsylvania must comply with both Title III of the federal Superfund Amendments and Reauthorization Act (SARA), also known as the Emergency Planning and Community Right-to-Know Act (EPCRA), and the Commonwealth's reporting requirements under the Hazardous Materials Emergency Planning and Response Act (1990-165), as amended. The community right-to-know reporting requirements keep communities abreast of the presence and release of chemicals at individual facilities. EPCRA was designed to ensure that state and local communities are prepared to

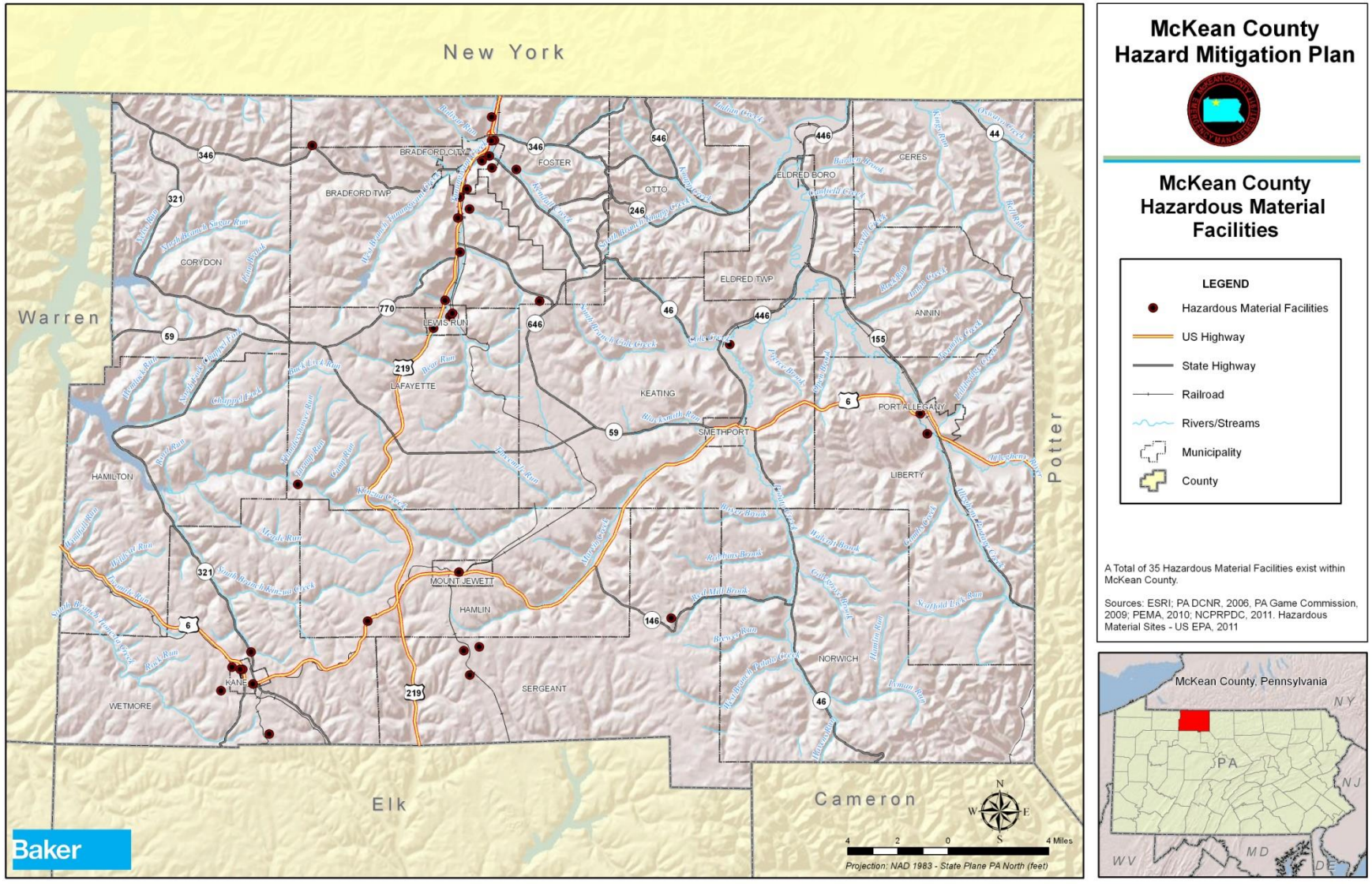
respond to potential chemical accidents through Local Emergency Planning Committees (LEPCs). LEPCs are charged with developing emergency response plans for SARA Title III facilities; these plans cover the location and extent of hazardous materials, establish evacuation plans, response procedures, methods to reduce the magnitude of a materials release, and establish methods and schedules for training and exercises. There are 18 SARA Title III Planning facilities in McKean County.

SARA Title III Planning facilities are covered under their own unique planning process and are continually evaluated through the LEPC. With this in mind, in McKean County's past Hazard Mitigation Plan, SARA Title III Planning Facilities were excluded and Hazardous material vulnerability was determined using EPA identified hazardous material sites and publicly available datasets. During our update process, we realized that the EPA identified hazardous material sites datasets were outdated and to use them for further analyses would be pointless. Therefore in this Hazard Mitigation Plan we will focus on the SARA Title II facilities that report to the LEPC in McKean County and the TRI facilities datasets that has been edited by members of the HMPT. This edited TRI facility datasets includes the TRI facilities that are still operational in McKean County. This is important to note, as the aforementioned EPA identified hazardous material sites (TRI facilities) included many facilities that are no longer operational. Additionally, McKean County has 574 SARA Title II facilities. SARA Title II facilities are defined as places that store and/or use hazardous materials. For a complete listing of SARA Title II & Title III facilities, see **Appendix H**.

Transportation of hazardous materials on highways involves tanker trucks or trailers. Unsurprisingly, large trucks are responsible for the greatest number of hazard material release incidents. Hazardous material releases from rail transport are also of concern due to collisions and derailments that result in large spills.

The development pattern in McKean County is focused along the major transportation routes, US 219 and US 6. US 219 is a two-lane highway and the major north-south route through the County; it typically has large trucks transporting logging material and coal on it. US 6 is the major east-west route through the County but is more of a rural highway. Rail lines run throughout the County from the New York border to the Elk County line through seventeen of the twenty-two jurisdictions in the County. This major transportation routes are also shown on Figure 4.3.13-1. Any accident of transported hazardous materials can pose a major hazard to residents due to the proximity of nursing homes, hospitals and resident homes to the US and Pennsylvania highway system in McKean County (MCEMA, 2019).

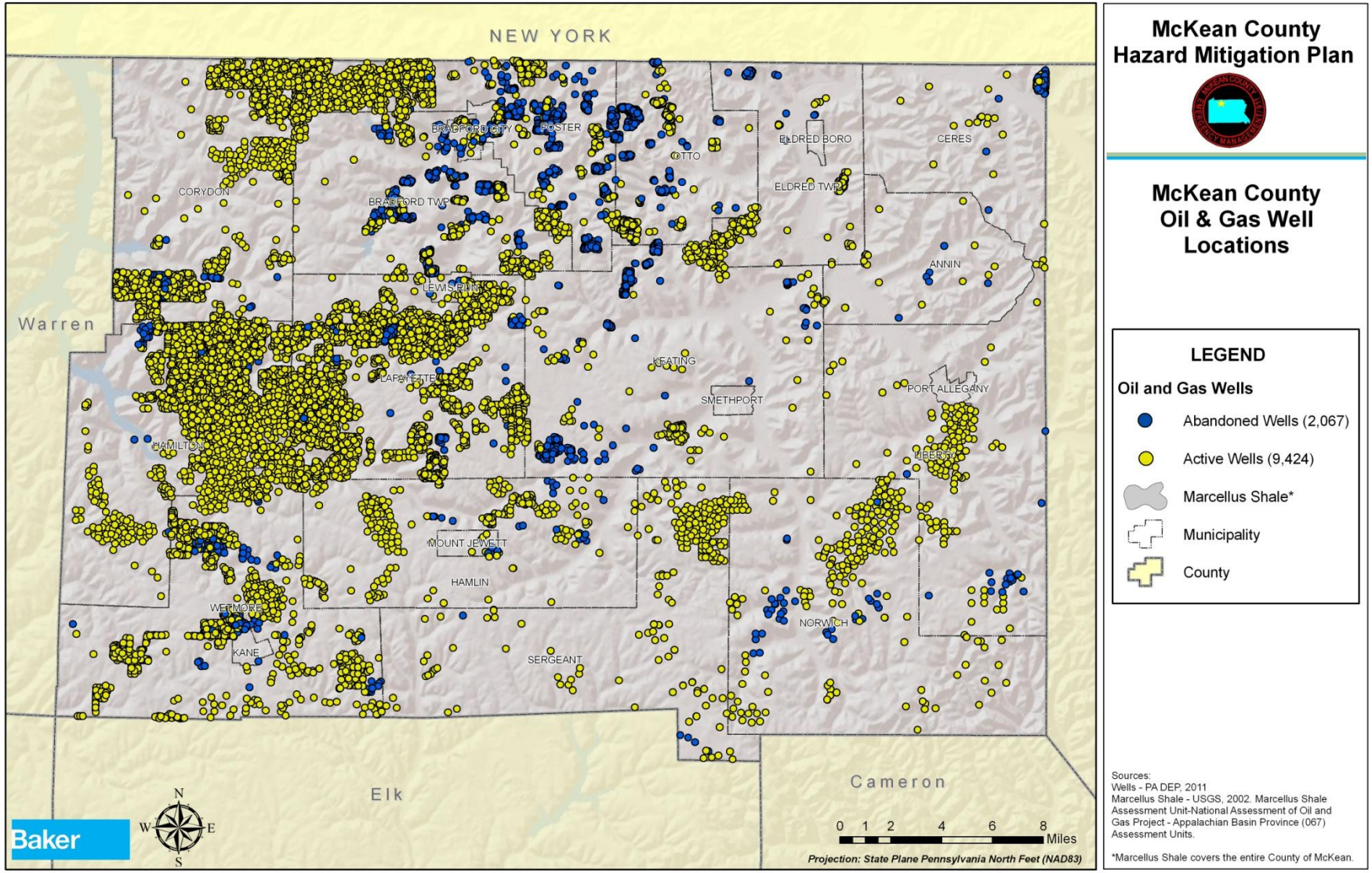
Figure 4.3.12-1: McKean County hazardous material facilities and major roadways.



C. OIL AND GAS WELL INCIDENTS

McKean County has a long history of oil and gas extraction. As such, there are oil and gas wells located across the County. The majority of existing wells – nearly 35,000 – are active, abandoned or inactive. Approximately, 13,750 are active, 17,866 are inactive, and 3,330 are abandoned. According to DEP records, these wells can be found in twenty of the twenty-two municipalities in McKean County. Figure 4.3.12-2 shows the location of all active, inactive and abandoned gas wells in McKean County, but it is important to note that this may not include long-abandoned wells from the 19th Century.

Figure 4.3.12-2: Oil and Gas wells in McKean County.



4.3.12.2 Range of Magnitude

Hazardous material releases can contaminate air, water and soils, possibly resulting in death and/or injuries. 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. Hazardous materials can include toxic chemicals, radioactive materials, infectious substances and hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas.

With a hazardous material release, whether accidental or intentional, there are several potentially exacerbating or mitigating circumstances that will affect its severity or impact. Mitigating conditions are precautionary measures taken in advance to reduce the impact of a release on the surrounding environment. Primary and secondary containment or shielding by sheltering-in-place protects people and property from the harmful effects of a hazardous material release. Exacerbating conditions, or characteristics that can enhance or magnify the effects of a hazardous material release, include:

- **Weather conditions:** affects how the hazard occurs and develops
- **Micro-meteorological effects of buildings and terrain:** alters dispersion of hazardous materials
- **Non-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.

Whether or not a hazardous materials site is contained in the SFHA is also a concern, as there could be larger-scale water contamination during a flood event should the flood compromise the production or storage of hazardous chemicals. Such a situation could be considered a worst-case scenario for a hazardous materials release because it could swiftly move toxic chemicals throughout a water supply and across great distances.

The severity of a given incident is dependent not only on the circumstances described above, but also with the type of material released and the distance and related response time for emergency response teams. The areas within closest proximity to the releases are generally at greatest risk, yet depending on the agent, a release can travel great distances or remain present in the environment for a long period of time (e.g. centuries to millennia for radioactive materials), resulting in extensive impacts on people and the environment.

B. OIL AND GAS WELLS

Oil and gas well drilling can have a variety of effects on the environment. Abandoned oil and gas wells which are 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. This can spoil public drinking water supplies and be particularly detrimental to vegetation and aquatic animals.

Natural gas well fires occur when natural gas is ignited at the well site. Occasionally, 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.

One of the worst oil and gas well incidents on record in the County occurred in October 1995. In this event, there was an explosion and fire at an oil well and rig in Lafayette Township that resulted in three injuries and one burn-related death. The rig was completely destroyed.

4.3.12.3 Past Occurrence

Cumulatively, EPA TRI records indicate that there have been a total of 43,810,269 pounds of chemicals released from fixed sites in McKean County between 1987 and 2017 (EPA, 2019). Beyond the TRI records, the McKean County EMA has records of 124 hazardous materials incidents both in transit and at a fixed site location between 1980 and 2018. These events are described in Table 4.3.12-1

Table 4.3.12-1: Previous hazardous materials incidents in McKean County between 1980 and 2019 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
9/20/1980	Bradford Township	207,000 gallons of crude oil	Explosion & fire during salvage operation at Custer City, two killed, approximately $700,000 damage.
3/7/1989	Keating Township	80,000 gallons of #2 diesel fuel	Deliberate dumping of at Herzog Brothers in Farmers Valley.
11/7/1990	McKean County	MEK (methyl ethyl ketone)	A line became plugged causing the solvent and water to overflow the tank.
11/18/1993	Potter and McKean Counties	Conrail derailment in Potter County involving 3 tankers of chlorine and 1 caustic soda.	Evacuation of about 45 in McKean County.
6/1/1994	Port Allegany Borough	Conrail hopper cars ram engine and rupture fuel tank in Port Allegany – 700 gallons of diesel fuel spill into drainage ditch which drains into Allegheny River.	Fish and frogs killed. Fuel spill into drainage ditch at Indian Echo Country Club. Oil stopped before it reached river.
12/28/1994	Bradford Township	A globe valve failure at Witco Corporation resulted in the release of hydrogen into the air.	Release of about 500 # of hydrogen into the atmosphere.

Table 4.3.12-1: Previous hazardous materials incidents in McKean County between 1980 and 2019 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
2/7/1996	Smethport Borough	150 gallons of diesel fuel spilled into small stream near EOC & County Jail	Environmental damages to stream – cleanup team from Erie Geological Consultants called in to provide cleanup.
3/28/1996	Lafayette Township	Light straight run	3,000 gallons of light straight run spilled from Crossett tanker in Lafayette Township.
7/31/1996	Bradford City	Diesel fuel	35 gallons of diesel fuel spilled in parking lot of KOA Speer Electronics from a ruptured fuel tank of a truck owned by Audert Transportation.
9/20/1996	Bradford Township	Crude oil	100 gallons of crude oil spilled along PA Route 346 in Derrick City from a storage tank owned by Donna Uhl
11/21/1996	McKean County	Corrosive waste product	10 gallons of an ammonia based corrosive spilled inside a truck in the parking lot of Zippo.
12/23/1996	Liberty Township and Port Allegany Borough	Diesel fuel	75 gallons of diesel fuel spilled to Route 155 north of Port Allegany from the fuel tank of a truck involved in an MVA.
6/9/1997	Liberty Township	Diesel fuel	30 gallons of diesel fuel spilled to roadway along U.S. Route 6 in Liberty Township from a truck involved in MVA.
9/19/1997	Eldred Township	Hazardous waste	Hazardous waste discovered at former Joyce National Powder Company in Eldred Township – Chemicals from all nine hazard classes found on-site.
5/13/1998	Foster Township	Crude oil	1,000 gallons of crude oil spilled at ARG, a SARA Title III facility in Foster Township when a check valve failed.
6/7/1998	Lafayette Township	Crude oil	About 50 gallons of crude oil were spilled to the soil from an oil release on Buck Road in Lafayette Township. DEP and Lafayette Township responded.
7/16/1998	Kane and Wetmore Township	Motor oil	A truck owned by Universal Oil Products spilled oil along U.S. Route 6 in Kane to Lantz Corners. PennDOT responded and spread sand on the spill.
9/3/1998	Port Allegany Borough	Caustic soda	A caustic soda spill occurred at a well house in the Borough of Port Allegany. About 1,000 gallons of liquid spilled to a diked, containment area when a day tank was allowed to overflow. DEP was notified and the Borough provided cleanup.

Table 4.3.12-1: Previous hazardous materials incidents in McKean County between 1980 and 2019 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
9/30/1998	Wetmore Township	Mineral oil	About 2,500 gallons of mineral oil were spilled to the road and ground surface along PA Route 66 in Wetmore Township just south of the Borough of Kane. The oil was spilled when a tanker truck overturned. Kane Fire Department, EMA personnel and DEP responded. Powell Contracting provided cleanup.
10/20/1998	Kane Borough	Chlorine	Juveniles in Kane made a homemade bomb with toilet bowl cleaner, Clorox and aluminum foil. The device exploded, but there were no injuries.
11/19/1998	Hamilton Township	Crude oil	A crude oil tank erupted in flames along Chapel Fork Road in Hamilton Township.
12/16/1998	McKean County	Liquid oxygen	Two tanks of liquid oxygen released their contents to the atmosphere when a truck owned by Wasserott's overturned along PA Route 46 south of the Village of Crosby in Norwich Township. Approximately 120 pounds of liquid oxygen escaped and vaporized into the atmosphere.
2/16/1999	Foster Township	Crude oil spill	Over 4,000 gallons of crude oil were spilled from a storage tank onto the soil and into Tuna Creek in Foster Township because of a broken valve.
3/3/1999	Bradford City	Motor oil	Approximately 50 gallons of oil were spilled from a delivery truck onto the parking lot of Bauschards in the City of Bradford.
3/18/1999	Smethport Borough	Natural gas	An undetermined quantity of natural gas was released into the atmosphere in the boiler room of the Smethport Area High School in the Borough of Smethport.
3/25/1999	Lafayette Township	Mineral oil	Approximately 500 gallons of mineral oil were spilled from a transformer onto the soil at the Federal Correctional Institution in Lafayette Township when it was struck by a forklift.
6/30/1999	Lewis Run Borough	Natural gas	A high pressure gas line ruptured in the Borough of Lewis Run. Columbia Gas responded and secured the release. No injuries were reported.

Table 4.3.12-1: Previous hazardous materials incidents in McKean County between 1980 and 2019 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
7/27/1999	Bradford Township	Chromic acid	A small amount of chromic acid was released from a tractor trailer onto East Warren Road in Bradford Township. The truck was carrying contaminated soil from a site in New York State.
11/4/1999	Hamlin Township	Diesel fuel	A tractor trailer slid through the intersection of U.S. Routes 219 and 6 at Lantz Corners due to slippery road conditions. A highway sign punctured the fuel tank causing about 20 gallons of fuel to spill to the roadway.
1/11/2000	Lafayette Township	Aviation fuel	A small quantity of aviation fuel was spilled to the soil when a single engine Piper crashed upon takeoff at the Bradford Regional Airport.
2/3/2000	Keating Township	Naptha	A small quantity of naptha spilled into Cole Creek in Farmers Valley when a relief valve failed at Honeywell.
3/27/2000	Bradford Township	Caustic soda	25 gallons of caustic soda spilled from a tote container onto the concrete at Georgia Pacific in Bradford Township.
5/17/2000	Port Allegany Borough	Diesel fuel	25 gallons of diesel fuel spilled from a Norfolk Southern locomotive in Borough of Port Allegany.
5/12/2001	McKean County	Diesel fuel	Approximately 200 gallons of diesel fuel were spilled to the ground and roadway surface when a passenger car struck an Upstate Farms tanker truck.
6/9/2001	Bradford City	Gasoline	Approximately 100 gallons of gasoline spilled to the roadway and storm drains when a nozzle was ripped from the hose of a Uni-Mart Station in the City of Bradford.
9/25/2001	Lafayette Township	Crude oil	Approximately 475 gallons of crude oil were spilled to the roadway, soil and Wintergreen Run when a Crossett tanker rolled over on U.S. Route 219 in Lafayette Township near the intersection of Westline Road.
12/20/2001	Hamlin Township	Diesel fuel	Approximately 100 gallons of diesel fuel spill were spilled to the roadway and ground surface as a result of a motor vehicle accident that occurred on U.S. Route 219 in Hamlin Township involving a passenger car and a tractor trailer. The trucking company hired an independent contractor to provide cleanup.

Table 4.3.12-1: Previous hazardous materials incidents in McKean County between 1980 and 2019 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
1/9/2002	McKean County	Hydraulic oil/Motor oil	A tractor trailer experienced motor failure and spilled 15 gallons, which was cleaned-up by the fire department. The roadway location was unspecified.
1/19/2002	Eldred Borough	Diesel fuel	A diesel spill of approximately 50 gallons occurred when a Penn DOT snow plow was struck on Route 446 in Eldred Borough. Limited effect on the environment was reported.
1/31/2002	Port Allegany Borough	Gasoline	A fuel truck at a service station in Port Allegany Borough leaked approximately 25 gallons of gasoline. No leakage into storm drains occurred.
3/12/2002	Bradford Township	Gasoline	A motor vehicle accident involving a gasoline tanker occurred on Route 219 in Bradford Township. One person was injured and the roadway was temporarily closed. The County Hazmat Team responded, as well as Weavertown Environmental. The responsible party was Rinker Oil Company of Cuba, New York, who completed the cleanup.
3/30/2002	Mount Jewett	Diesel fuel	A diesel spill of less than 40 gallons occurred in Mount Jewett Borough. Local emergency services provided cleanup. No environmental damages were reported.
11/19/2002	Foster Township	Hydraulic oil	A leaking drum in the rear of a tractor trailer spilled hydraulic oil over a three mile stretch of Route 219 in Foster Township. The American Refinery Hazmat Group responded and handled this incident. Bradford Township was affected.
3/24/2003	Bradford City	Crude oil	A pipeline leaked 50-100 barrels of crude oil in Bradford City. U.S. EPA Region III handled this incident. The oil spilled into the Tunungwant Creek.
1/21/2003	Lafayette Township	Crude oil	An undetermined quantity of crude oil was spilled into Beaver Pond in Lafayette Township. Local fire units recovered a small portion, due to torrential rain.
11/3/2003	Kane	Diesel fuel	An oily substance believed to be diesel fuel was reported on State Route 66 South of Kane Borough. The source was unknown and was handled by county emergency services.

Table 4.3.12-1: Previous hazardous materials incidents in McKean County between 1980 and 2019 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
1/11/2004	Hamilton Township	Crude oil	140 barrels of crude oil were released from a burst line into secondary containment in Hamilton Township. Some product entered Meade Run and was cleaned-up by a private contractor.
3/8/2004	Smethport	Oil	Oil was reported leaking from the ground into Lake Hamlin in Smethport. Local fire units contained the spill, which was investigated by PADEP.
6/23/2004	Keating Township	Crude oil	Approximately 400 gallons of crude oil spilled from a tank onto the ground in Keating Township. Some product entered Potato Creek and PADEP investigated.
7/14/2004	Keating Township	Diesel fuel	Approximately 30 gallons of diesel fuel spilled from a leaking fuel tank in Keating Township. Some product entered an unnamed waterway. Local cleanup occurred.
9/9/2004	Lafayette Township	Diesel fuel	An overturned tractor trailer spilled an undetermined amount of diesel fuel in Lafayette Township. Local emergency services provided cleanup.
9/28/2004	Bradford City	Diesel fuel	Approximately 70 gallons of diesel fuel spilled from a fuel tank onto the roadway in the City of Bradford. Local emergency services provided cleanup.
1/13/2005	Corydon Township	Diesel fuel	An undetermined amount of diesel fuel spilled from a ruptured tank onto a roadway in Corydon Township. No waterways were affected and local cleanup occurred.
2/8/2005	Lafayette Township	Jet fuel	Approximately 100 gallons of jet fuel spilled at Bradford Regional Airport, Lafayette Township. Airport employees provided cleanup.
4/16/2005	Bradford Township	Petroleum product	A petroleum product release was reported in Bradford Township (approximately 10 gallons in a ditch). No effect was found upon investigation.
7/14/2005	Smethport	Wax product	An unknown amount of a wax product was spilled in Smethport Borough. Penn DOT provided cleanup.

Table 4.3.12-1: Previous hazardous materials incidents in McKean County between 1980 and 2019 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
6/16/2005	Wetmore Township	Diesel fuel	Approximately 5 gallons of diesel fuel were spilled from an overturned tractor-trailer truck in Wetmore Township. Some product entered a storm drain. Local units provided cleanup.
7/20/2005	Lafayette Township	Hydraulic oil	An unknown quantity of hydraulic oil spilled on State Road 59 in Lafayette Township. This had no environmental effect and was handled by McKean EMA.
8/4/2005	Liberty Township	Oil	A tractor trailer lost its oil plug and spilled 12 gallons onto a roadway in Liberty Township. No environmental damage was reported.
9/12/2005	Lafayette Township	Hydraulic oil	A 45 gallon hydraulic oil spill occurred in Lafayette Township, Route 59. This caused a slick road condition and was cleaned up by local emergency services.
10/13/2005	Bradford Township	Motor oil	A tour bus leaked motor oil over a ½ mile roadway length in Bradford Township. Local emergency units provided cleanup.
10/14/2005	Bradford Township	Home heating oil	A home heating oil truck spilled less than 55 gallons of oil in Bradford Township. No waterways were affected and local emergency units provided cleanup.
12/24/2005	Eldred Township	Diesel fuel	Approximately 250 gallons of diesel fuel were spilled from a storage tank onto the ground in Eldred Township. Waterways were not affected and McKean EMA coordinated cleanup.
4/10/2006	Bradford City	Lubricating oil	Approximately 100 gallons of lubricating oil were spilled from a pipeline into Tunungwant Creek in the City of Bradford. American Refinery Group was on scene and emergency units coordinated cleanup.
5/16/2006	Bradford Township	Diesel fuel	Fifty gallons of diesel fuel were spilled in Bradford Township, State Route 219 due to a multi-vehicle tractor trailer accident. Local emergency units coordinated cleanup. No injuries occurred.
6/22/2006	Hamilton Township	Oil	An oil spill occurred in Hamilton Township; undetermined source and quantity. This entered Wildcat Creek and emergency units coordinated cleanup.

Table 4.3.12-1: Previous hazardous materials incidents in McKean County between 1980 and 2019 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
6/30/2006	Norwich Township	Sodium Hydroxide	Approximately 42,000 gallons of sodium hydroxide was spilled during a train derailment and entered Big Run and Sinnemahoning-Portage Creek. All aquatic life and fish were killed for an 11 mile span.
12/27/2006	Eldred Township	Crude oil	Approximately 10 gallons of crude oil spilled in a residence in Eldred Township. DEP was notified and coordinated cleanup which entered a storm ditch.
12/4/2007	McKean County	Crude Oil	A crude oil battery with a potential capacity of 1000 barrels caught fire. Warren County Hazmat Team was dispatched. Fire was eventually controlled.
12/5/2007	McKean County	Chlorine Odor	Resident complained of strong chlorine odor in the area. Caller reported 2 adults and 1 child with respiratory distress. Fire, Police, EMS, and EMA all dispatched.
6/19/2008	Bradford City & Foster Township	Elemental Sulfur	An unknown amount of elemental sulfur was released from ARG into the Tunungwant Creek. DEP was notified. ARG provided clean-up.
7/1/2008	McKean County	Caustic Soda	A tractor trailer hauling caustic soda was involved in a roll over MVA with a 200 gallon diesel fuel spill. Private contractor provided clean-up.
8/17/2008	McKean County	Crude Oil	Approximately 45,000 gallons of crude oil spilled after criminal activity caused damage to several crude oil storage tanks. Approximately half of the oil entered into the North Branch of the Chappel Fork which flows into the Kinzua Reservoir.
9/25/2008	Mount Jewett Borough	Flammable Gas	Three Mt. Jewett water wells had high LEL levels and required water to be brought in using 11 fire department tankers. A boil water advisory was issued and bottled water was made available. DEP conducted water testing and eventually allowed the wells to be used.
10/31/2008	Bradford Township	Acrolein	A SARA facility in Bradford Township had a tank release of Acrolein within the facility. Multiple units responded, including a hazmat response team. Product manufacturer provided technical guidance and sent a representative.

Table 4.3.12-1: Previous hazardous materials incidents in McKean County between 1980 and 2019 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
12/30/2008	McKean County	Antimony Trioxide	Approximately 1 ton of Antimony Trioxide and 1 ton of Sodium Nitrate was sent to the county landfill. DEP, EPA, and NRC were notified. It was determined that both chemicals could be disposed of in the landfill with the proper paperwork.
2/19/2009	Sergeant Township	Diesel Fuel	MVA with ruptured saddle tanks unknown amount of fuel lost into ditch.
4/25/2009	Bradford Township	Diesel Fuel	Fuel line rupture resulting in 150-200 gallons of fuel lost onto a dirt parking area.
12/15/2009	Eldred Township	Home Heating Oil	Tank rupture resulted in loss of 75 gallons of fuel to the ground. Home owner providing clean up.
1/24/2010	Foster Township	Brake Fluid	35 gallon drum of brake fluid found on side of roadway leaking into nearby creek. Fire department conducted clean up.
2/25/2010	Bradford City	Diesel Fuel Spill	75 gallons of diesel spilled to the cement fueling area, owner arranged for cleanup.
3/11/2010	Bradford Township	Crude Oil Spill	Tank valve accidently left open resulting in 1500 gallons of crude oil spilling into Marilla Brook. Numerous underflow dams put in place. Cleanup contractor hired by responsible oil company.
3/26/2010	Lewis Run Borough	Diesel Fuel	Tractor trailer dumped 50 gallons of fuel to the roadway which drained into nearby small stream.
4/14/2010	Corydon Township	Urine	Caller reporting 60-70 20oz Pepsi bottles containing a medium to dark caramel colored liquid which smells of ammonia along Route 321 near the North Country Trails. EMA is in route, Elk Co HAZMAT is on standby, PSP notified.
5/25/2010	Liberty Township	Unknown gas	A 16 yr. old male individual who mixed together toilet bowl cleaner and bleach causing a chemical reaction that has created chlorine gas to develop inside of the residence. The residence has been evacuated at this time and county EMA is also in route.
10/23/2010	Bradford Township	TNT / Blasting Caps	Reported directly to police that he had found TNT and blasting caps in the woods behind Kessel Construction, Found in an old oil lease building. Disposed by the Erie Bomb Squad.

Table 4.3.12-1: Previous hazardous materials incidents in McKean County between 1980 and 2019 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
4/8/2011	Lafayette Township	Transformer Oil	Source determined to be oil from an old electric transformer that was recently moved and cooling fins ruptured. Ownership of the property and transformer in question, issue between Enervest Energy and National Gas and Oil.
6/18/2011	Bradford City	Crude Oil	Small spill less than 5 gallons as a result of a line blockage on a separator tank. Pit allowed to fill with crude oil and water mixture draining through an overflow pipe into a drainage ditch that empties into the creek.
8/31/2011	Corydon Township	Crude Oil	Crude oil gathering line ruptured near stream bank releasing crude into Willow Creek. The responsible oil company if providing clean up.
9/28/2011	Eldred Borough	Hydraulic Oil	Possible oil spill in the parking lot of Fox's Pizza Den located on Main Street in Eldred Borough, determined to be hydraulic oil from an old road grader parked in the lot. Oil also noted on SR 446, PENNDOT assisted with clean up.
12/1/2011	Lafayette Township	Crude Oil	Report from PSP about a strong odor of gas on Rt. 219 south of Tally Ho. The 911 center contacted National Fuel Gas Co. County EMA responded and along with Enervest Co. A contractor earlier in the day broke a valve off an old pipeline and released some crude oil on to the ground.
4/25/2012	Hamlin Township	Potassium Permanganate	45 lb. of product mixed with 3000 gallons of water was released in Kane Creek, no adverse effects noted.
6/14/2012	Lafayette Township	Battery Acid	Load shifted in a rollback container causing a skid of old batteries to shift and short out resulting a nitric acid spill
7/20/2019	Bradford City	Used Motor Oil	Heavy rains caused used motor oil to seep from the ground and run into a nearby creek.
8/8/2012	Lafayette Township	Crude Oil	Crude oil leaked from a storage tank and into the containment dike with small amount leaking out of the dike.

Table 4.3.12-1: Previous hazardous materials incidents in McKean County between 1980 and 2019 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
4/27/2013	Lafayette Township	Crude Oil	High pressure line failed resulting in a mist of crude oil spraying into the air and ono US Route 219, estimated at 30 gallons.
5/285/2013	Hamlin Township	Diesel Fuel	100 gallons of diesel fuel spilled on to a dirt parking area, RP providing cleanup.
8/2/2013	Bradford Township	Unknown Oxidizer	Fire in compactor of a garbage truck, once dumped 5 fiver gallon pails of an oxidizer found in the load. EAP Industries provided cleanup.
10/24/2013	Hamilton Township	Crude Oil Spill	Several tank batteries were intentionally opened and drained outside of containment with crude oil in a stream. Perpetrators apprehended.
5/19/2014	Kane Borough	Oil Leak	Old underground storage tanks filled with water displacing an unknown oil substance on an old industrial lot.
7/1/2014	Corydon Township	Crude Oil Leak	Estimated 500 gallons of crude oil after a line failure during transfer. Product entered Willow Creek. RP retained a clean-up contractor.
7/16/2014	Lafayette Township	Coal Tar	Coal tar seeping from ground at a former Superfund Site in the Village of Westline. Incident turned over to PA DEP to coordinate with the US EPA
7/18/2014	Hamlin Township	Diesel Fuel	Tractor trailer struck a guard rail and spilled an estimated 100 gallons over a two stretch of before pulling into a parking area.
8/23/2014	Lafayette Township	Crude Oil	Unknown amount of oil spilled into the containment dike at a tank battery after a separator failure.
5/6/2015	Keating Township	Crude Oil	Estimated 10 barrels of oil leaked into a beaver dam adjacent to Marvin Creek. Source unknown as there is a large amount of old crude oil infrastructure in the area.
6/16/2015	Liberty Township	Diesel Fuel	MVA involving a Semi Truck resulted in a 50 gallon spill.
12/1/2015	City of Bradford	Crude Coil	Gathering line ruptured spilling as unknown amount of crude oil – repaired by the owner.

Table 4.3.12-1: Previous hazardous materials incidents in McKean County between 1980 and 2019 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
6/28/2016	Norwich Township	Diesel Fuel Spill	Tractor Trailer hauling a bull dozer had the load shift causing the truck to go off the roadway with a resulting diesel fuel spill to the roadway and over the embankment.
11/7/2016	Port Allegany Borough	Chlorine Gas	Valve failure during tank transfer on 150 lb. Chlorine cylinder resulting in a release of gas and an evacuation of several residents.
12/5/2016	Kane Borough	Gasoline	Estimated 2000 gallons leaked from an underground storage tank at a gas station resulting in high LEL levels in several residences. Five families evacuated.
5/31/2017	Annin Township	Hydraulic Oil	Tractor Trailer jackknifed resulting in a 25-50 gallon spill of hydraulic oil to the roadway and berm.
9/3/2017	Port Allegany Borough	Sealant	Heavy rain caused a water soluble sealant to run off an athletic track into a small stream. Not environmental hazards with the product.
11/8/2017	Kane Borough	Petroleum Product	Unknown petroleum product in a duplex structure resulted in evacuation of five people. Cause never determined.
10/1/2018	Bradford City	Solvent	American Refining Group had release of 2820 gallons of solvent into the containment area of the tank. Numerous reports of odor investigations received from the Bradford Area.
10/4/2018	Bradford City	Wax	American Refining Group spilled 9700 gallons of a light wax to the ground and into the nearby stream.

B. OIL AND GAS WELLS

Environmental incidents including water contamination and fire spurring from oil and gas well drilling have occurred numerous times in Pennsylvania over the past century. There have been a reported total of fifteen incidents in McKean County between 1980 and 2018. Table 4.3.12-2 provides details of incidents at oil and gas wells reported to the McKean County EMA between 1980 and 2018.

Table 4.3.12-2: Previous oil and gas well incidents in McKean County between 1980 and 2018 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
10/2/1995	Lafayette Township	Explosion and fire at an oil well and drilling rig	Explosion and fire – four persons hurt – one person burned critically, dies two days later. Drilling rig destroyed.
11/28/1995	Bradford Township	Explosion and fire at oil well & tank farm	Two youths killed in the explosion – playing with lighter near tanks.
8/20/1998	Lafayette Township	Natural gas	A gas well exploded in flames at a gas well site of Blue Point Hill in the Village of Westline in Lafayette Township. Lafayette Township Fire Department responded.
6/23/1999	Hamlin Township	Natural gas	An abandoned gas well in Hamlin Township began releasing natural gas when a cap broke loose. It was estimated that one million cubic feet of gas was being released into the atmosphere daily.
4/13/2001	Foster Township	Crude oil	An unknown amount of crude oil was spilled to the ground surface from a well site near Fairview Heights in Foster Township.
5/18/2001	Hamilton Township	Crude oil	Approximately 1,260 gallons of crude oil were spilled from an abandoned oil well into an unknown tributary of the East Branch of the Tuna Creek in Hamilton Township.
2/14/2002	Foster Township	Crude oil	Crude oil from a well was reported leaking in Foster Township. PADEP handled this incident.
6/27/2002	Foster Township	Crude oil	An unknown amount of oil was spilled from a well leaking valve in Foster Township. Pennbrook Creek and Fosterbrook Creek were affected.
3/29/2006	Otto Township	Crude oil	An abandoned oil well was reported as leaking crude oil in Otto Township. No effect occurred and emergency units coordinated cleanup.
3/19/2010	Lewis Run Borough	Crude Oil	Crude oil found on the water of a small stream, source determined to be an abandoned well in the Allegheny National Forest. PA Dep released an emergency contract to mitigate the problem.
10/21/2010	Foster Township	Crude Oil	Unplugged oil well began seeping through a black top driveway.PA Dep released an emergency contract to plug the well.

Table 4.3.12-2: Previous oil and gas well incidents in McKean County between 1980 and 2018 (MCEMA, 2019).

DATE	LOCATION	MATERIAL INVOLVED	DESCRIPTION
11/11/2010	Lafayette Township	Natural Gas	Recent conventional gas well drilling struck pocket of high pressure gas resulting in the migrating and venting in a wetland aa ¼ mile from the well site. Driller has difficulty killing the well to stop the flow.
7/23/2011	Bradford Township	Crude Oil	Abandoned well discovered leaking in the Tunawangut Creek. Situation turned over to PA DEP.
5/13/2012	Foster Township	Crude Oil	Abandoned Well on the banks of the Tunawangut Creek began leaking, well was buried on what is now a developed recreational walking trail. US EPA issued a plugging contract for the well.
9/29/2012	Lafayette Township	Natural Gas	Recent hydro-fracking activity blew open an old well leaving an open hole 5 feet wide.

4.3.12.4 Future Occurrence

The overall probability of future occurrence of environmental hazards in McKean County is *likely,* as defined by the Risk Factor methodology probability criteria (see Table 4.4-1). The below information outlines the unique factors that contribute to future probability for hazardous materials releases and oil and gas well incidents.

A. HAZARDOUS MATERIALS RELEASE

While many incidents involving hazardous materials releases have occurred in McKean County in the past, they are generally difficult to predict. Any occurrence is largely dependent upon the accidental or intentional actions of a person or group. Intentional acts are addressed in Section 4.3.14. At the same time, though, the County cites increases in truck-based shipping as a potential source for expanding numbers of hazardous materials releases in McKean County.

B. OIL AND GAS WELL INCIDENTS

It is difficult to predict which oil and gas wells will lead to environmental hazard situations. The County has recently seen an increase in oil and gas exploration drilling which may increase the likelihood of oil and gas well incidents. However, stringent monitoring through the Pennsylvania Department of Environmental Protection will reduce the likelihood of potential impacts to the community and the environment.

4.3.12.5 Vulnerability Assessment

A. HAZARDOUS MATERIALS RELEASE

Jurisdictions that are home to one or more of the TRI facilities should be considered vulnerable to hazardous materials releases from fixed facilities. Table 4.3.12-3 illustrates the number of TRI sites by municipality in McKean County. Lewis Run has the highest concentration of TRI facilities with a total of four, while Bradford City and Bradford Township tie for the second highest concentration of TRI facilities with two per municipality. Keating, Sergeant, Wetmore Townships and Port Allegany Borough all have one TRI facility. While Foster, Lafayette, Liberty Townships and Kane Borough do not have any TRI facilities, they still are vulnerable to releases due to their close proximity to TRI facilities in neighboring municipalities. Annin, Ceres, Corydon, Eldred, Hamilton, Norwich, and Otto Townships and Eldred, Mount Jewett, and Smethport Boroughs have much lower relative vulnerability to hazardous materials incidents because they do not have TRI facilities and do not have any addressable structures or critical facilities within their jurisdictions.

Populations in and around the communities that are home to TRI sites are more vulnerable to facility releases, particularly those within 1.5 miles of the facility. Table 4.3.12-3 also shows the number of addressable structures and critical facilities within 1.5 miles of hazardous materials sites. Unsurprisingly, two of the most populous municipalities and the most densely populated municipalities in McKean County, Bradford City and Kane Borough have the highest number of addressable structures within 1.5 miles of TRI facilities, with 3,688 and 1,544, respectively. Bradford City and Port Allegany Borough have the highest amounts of critical facilities within 1.5 miles of TRI facilities with 14 and 9, respectively. Other municipalities that are home to critical facilities vulnerable to fixed hazardous materials incidents include Bradford, Foster, Wetmore Townships and Kane and Lewis Run Boroughs. Jurisdictions without hazardous materials facilities in general do not have vulnerable structures or critical facilities. However, it is important to note that even if a jurisdiction does not contain hazardous materials sites, it may be vulnerable to a release event occurring in an adjacent municipality. This is the case particularly for Lafayette, Liberty, & Kane.

Table 4.3.12-3: TRI facilities per municipality (EPA, MCGISC, 2019)

MUNICIPALITY	NUMBER OF TRI FACILITIES	TOTAL ADDRESSABLE STRUCTURES WITHIN 1.5 MILE BUFFER OF HAZARDOUS MATERIAL SITES	TOTAL CRITICAL FACILITIES WITHIN 1.5 MILE BUFFER OF HAZARDOUS MATERIAL SITES
Annin Township	0	0	0
Bradford City	2	3,688	14
Bradford Township	2	781	4
Ceres Township	0	0	0
Corydon Township	0	0	0

Table 4.3.12-3: TRI facilities per municipality (EPA, MCGISC, 2019)			
MUNICIPALITY	**NUMBER OF TRI FACILITIES**	**TOTAL ADDRESSABLE STRUCTURES WITHIN 1.5 MILE BUFFER OF HAZARDOUS MATERIAL SITES**	**TOTAL CRITICAL FACILITIES WITHIN 1.5 MILE BUFFER OF HAZARDOUS MATERIAL SITES**
Eldred Borough	0	0	0
Eldred Township	0	0	0
Foster Township	0	725	2
Hamilton Township	0	0	0
Hamlin Township	0	1	0
Kane Borough	0	1,544	5
Keating Township	1	157	0
Lafayette Township	0	14	1
Lewis Run Borough	4	317	1
Liberty Township	0	203	0
Mount Jewett Borough	0	0	0
Norwich Township	0	0	0
Otto Township	0	0	0
Port Allegany Borough	1	1,006	9
Sergeant Township	1	78	0
Smethport Borough	0	0	0
Wetmore Township	1	234	3
TOTAL	**12**	**8,748**	**39**

Transportation carriers must have response plans in place to address accidents, otherwise the local emergency response team will step in to secure and restore the area. Quick response minimizes the volume and concentration of hazardous materials that disperse through air, water and soil. Populations living within ¼ mile of major highways and railways should also be considered more vulnerable in the event of a transportation incident involving hazardous materials. For more information on the numbers of addressable structures located within ¼ mile of major highways and railways, please see Section 4.3.15.5.

B. OIL AND GAS WELL INCIDENTS

All 22 communities in McKean County are vulnerable on some level, directly or indirectly, to environmental hazards resulting from oil and gas well activity. Surface waters closest to well sites are most vulnerable to damage and oil and gas industry workers are most likely to be affected by gas well fires.

Private water supplies 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 hazard. Ideally vulnerability of private drinking well owners would be established by comparing distance of drinking water well to known oil and gas well locations but this data is not available at this time. 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 via the PaGWIS, discussed in Section 4.3.1.5.

Table 4.3.12-4 provides a municipality-by-municipality breakdown of the oil and gas wells per jurisdiction in McKean County. Hamilton and Lafayette Townships have the highest number of active oil and gas wells in the County with 2,543 and 3,354, respectively. Foster Township has, by far, the highest number of abandoned wells with 1,147. Bradford, Foster, Hamlin, Keating, Lafayette, and Otto townships have the highest amounts of inactive wells. Foster and Liberty townships have the greatest amount of private domestic drinking water wells, making them more vulnerable to contaminated drinking water. Eldred Borough and Port Allegany are the least vulnerable to the direct impacts of oil and gas well incidents as there are no wells in located within those communities.

Table 4.3.12-4: Number of oil and gas wells and domestic drinking water wells by municipality (PADEP 2019, PaGWIS 2019, MCGISC).

MUNICIPALITY	OIL AND GAS WELLS			DOMESTIC DRINKING WATER WELLS
	ACTIVE	ABANDONED	INACTIVE	
Annin Township	90	14	52	38
Bradford City	115	105	215	15
Bradford Township	754	612	2,509	70
Ceres Township	93	79	128	29
Corydon Township	1,368	45	187	35
Eldred Borough	0	0	0	4
Eldred Township	286	49	418	62
Foster Township	1,458	1,147	4,569	116
Hamilton Township	2,543	61	126	16
Hamlin Township	327	39	1,299	26
Kane Borough	12	8	15	6
Keating Township	461	296	2,161	54
Lafayette Township	3,354	149	1,961	42
Lewis Run Borough	54	22	31	1
Liberty Township	125	28	73	105
Mt Jewett Borough	8	3	11	7
Norwich Township	380	37	71	21
Otto Township	376	456	3,542	30
Port Allegany Borough	0	0	0	3
Sergeant Township	421	14	91	12
Smethport Borough	1	0	1	14
Wetmore Township	1,530	166	406	26
TOTAL	**13,756**	**3,330**	**17,866**	**745**

4.3.13 Terrorism

4.3.13.1 Location and Extent

Terrorism is a threat everywhere, but there are a number of important considerations in evaluating terrorism hazards, such as the existence of facilities, landmarks, or other buildings of international, national, or regional importance. While McKean County has many notable landmarks from a local historic perspective, this is not an area with many sites of national or international importance. The County also does not expect to be a direct target because of its low population density. Nonetheless, terrorism can take many forms and terrorists have a wide range of personal, political, or cultural agendas. Therefore, there is no location that is not a potential terrorist target.

Three types of terrorist activity are particularly relevant to McKean County: intentional hazardous material releases, bomb threats, and active shooter incidents. Bomb threats are one of the most common terroristic incidents in the County, and nationwide active shooter incidents have increased over time, not that McKean is more likely than any other county in Pennsylvania to experience either of these terroristic events, but statewide and nationwide, we are more susceptible to experience these occurrences over time. Additionally, with 18 SARA Title III facilities and 574 SARA Title II sites that traverse the County, intentional hazard materials releases are a potential threat to citizens and the environment. The impact of hazardous materials releases is addressed in Section 4.3.12.

Critical facilities including police stations, hospitals, fire stations, schools, wastewater treatment plants, water supply facilities, may be potential terrorist targets. A complete list of these facilities is included in Appendix C. Bridges, tunnels, and other key pieces of infrastructure may be a target, and the County has also identified its oil refineries as a potential terrorist target. Damage to these facilities and infrastructure could cripple transportation routes and commerce.

4.3.12.2 Range of Magnitude

The term “terrorism” refers to intentional, criminal, malicious acts, but 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). Terrorists use threats to create fear, to try to convince citizens of the powerlessness of their government, and/or to get publicity for their cause.

Terrorist attacks can take many forms, including agroterrorism, arson/incendiary attack, armed attack, assassination, biological agent, chemical agent, cyberterrorism, conventional bomb, hijackings, intentional hazardous material release, kidnapping, nuclear bomb and radiological agent (FEMA 2009). Explosives have been the traditional method of conducting terrorism, but intelligence suggests that the possibility of biological or chemical terrorism is increasing. The severity of terrorist incidents depends upon the method of attack, the proximity of the attack to people, animals, or other assets and the duration of exposure to the incident or attack device. For example, chemical agents are poisonous gases, liquids or solids that have toxic effects on people, animals, or plants. Many chemical agents can cause serious injuries or death. In this

case, severity of injuries depends on the type and amount of the chemical agent used and the duration of exposure.

Biological agents are organisms or toxins that have illness-producing effects on people, livestock and crops. Some biological agents cannot be easily detected and may take time to develop. Therefore, it can be difficult to know that a biological attack has occurred until victims display symptoms. In other cases, the effects are immediate. Those affected by a biological agent require the immediate attention of professional medical personnel. Some agents are contagious which may result in the need for victims to be quarantined.

A worst-case scenario for a terrorist incident in McKean County would be if a radioactive or "dirty" bomb would be detonated at the oil refinery in Bradford. This would result in a large explosion with a sustained fuel source in the most populous municipality with the highest population density.

4.3.13.3 Past Occurrence

There has been a high consciousness of terrorist activity in the press with few catastrophic events. The most significant terrorist attack on US soil occurred on September 11, 2001; Flight 93, the fourth hijacked aircraft in the attack, crashed in Somerset County, Pennsylvania.

The PEIRS system provides the most complete list of past terrorism events in McKean County. There have been a total of 19 terrorist activities in McKean County from 2002-2018. Suspected terrorist incidents are reported in a number of categories, as seen in Table 4.3.14-1.

Table 4.3.14-1: Threat and suspected terrorist activity events reported to PEIRS, 2002-2009 (PEMA, 2011; McKean DES, 2019)

THREAT/SUSPECTED TERRORIST ACTIVITY TYPE	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Bomb Threat	2	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	7
School Bomb Threat	0	0	2	0	1	1	0	0	0	0	1	1	0	0	0	0	0	6
Terroristic Threat	0	0	0	0	1	0	0	0	1	0	1	0	0	0	1	1	1	6
Suspected Terrorist Activity - yearly totals	*2*	*1*	*3*	*0*	*2*	*1*	*0*	*0*	*1*	*1*	*3*	*2*	*0*	*0*	*1*	*1*	*1*	*19*
**Events totaled through June 2018*																		

In addition, suspicious activity plays into terrorism hazards because of the uncertainty associated with those events. Table 4.3.14-2 displays suspicious activity events as reported to PEIRS from January 2002-December 2018.

Table 4.3.14-2: Threat and suspected terrorist activity events reported to PEIRS, 2001-2018 (PEMA, 2010; McKean DES 2019)

THREAT/SUSPICIOUS ACTIVITY TYPE	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Suspicious Activity	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
Suspicious Device	0	0	0	1	2	0	1	0	0	0	0	0	0	0	0	0	0	4
Suspicious Package	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4

Suspicious Powder	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Suspicious Substance	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Suspicious Activity yearly totals	*2*	*2*	*3*	*1*	*2*	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*13*

4.3.13.4 Future Occurrence

Based on historic events, McKean County will likely experience very minor suspicious activities almost every year, but the probability of future occurrences of terrorism is considered *unlikely*, as defined by the Risk Factor methodology probability criteria (see Table 4.4-1). These previous events have not resulted in significant terrorist attacks; however, the severity of a future incident cannot be predicted with any level of certainty.

4.3.13.5 Vulnerability Assessment

All communities in McKean County are vulnerable on some level, directly or indirectly, to a terrorist attack. Since the probability of terrorism occurring cannot be quantified in the same way as that of many natural hazards, it is not possible to assess vulnerability in terms of likelihood of occurrence and at-risk structures. Instead, vulnerability is assessed in terms of specific assets. By identifying potentially at-risk terrorist targets in the community, planning efforts can be put in place to reduce the risk of attack. FEMA's *Integrating Manmade Hazards into Mitigation Planning* (2003) encourages site-specific assessments that should be based on the relative importance of a particular site to the surrounding community or population, threats that are known to exist and vulnerabilities including:

- **Inherent vulnerability:**
  - Visibility – How aware is the public of the existence of the facility?
  - Utility – How valuable might the place be in meeting the objectives of a potential terrorist?
  - Accessibility – How accessible is the place to the public?
  - Asset mobility – is the asset's location fixed or mobile?
  - Presence of hazardous materials – Are flammable, explosive, biological, chemical and/or radiological materials present on site? If so, are they well secured?
  - Potential for collateral damage – What are the potential consequences for the surrounding area if the asset is attacked or damaged?
  - Occupancy – What is the potential for mass casualties based on the maximum number of individuals on site at a given time?
- **Tactical vulnerability:**

  Site Perimeter
  - Site planning and Landscape Design – Is the facility designed with security in mind – both site-specific and with regard to adjacent land uses?
  - Parking Security – Are vehicle access and parking managed in a way that separates vehicles and structures?

  Building Envelope

- Structural Engineering – Is the building's envelope designed to be blast-resistant? Does it provide collective protection against chemical, biological and radiological contaminants?

Facility Interior

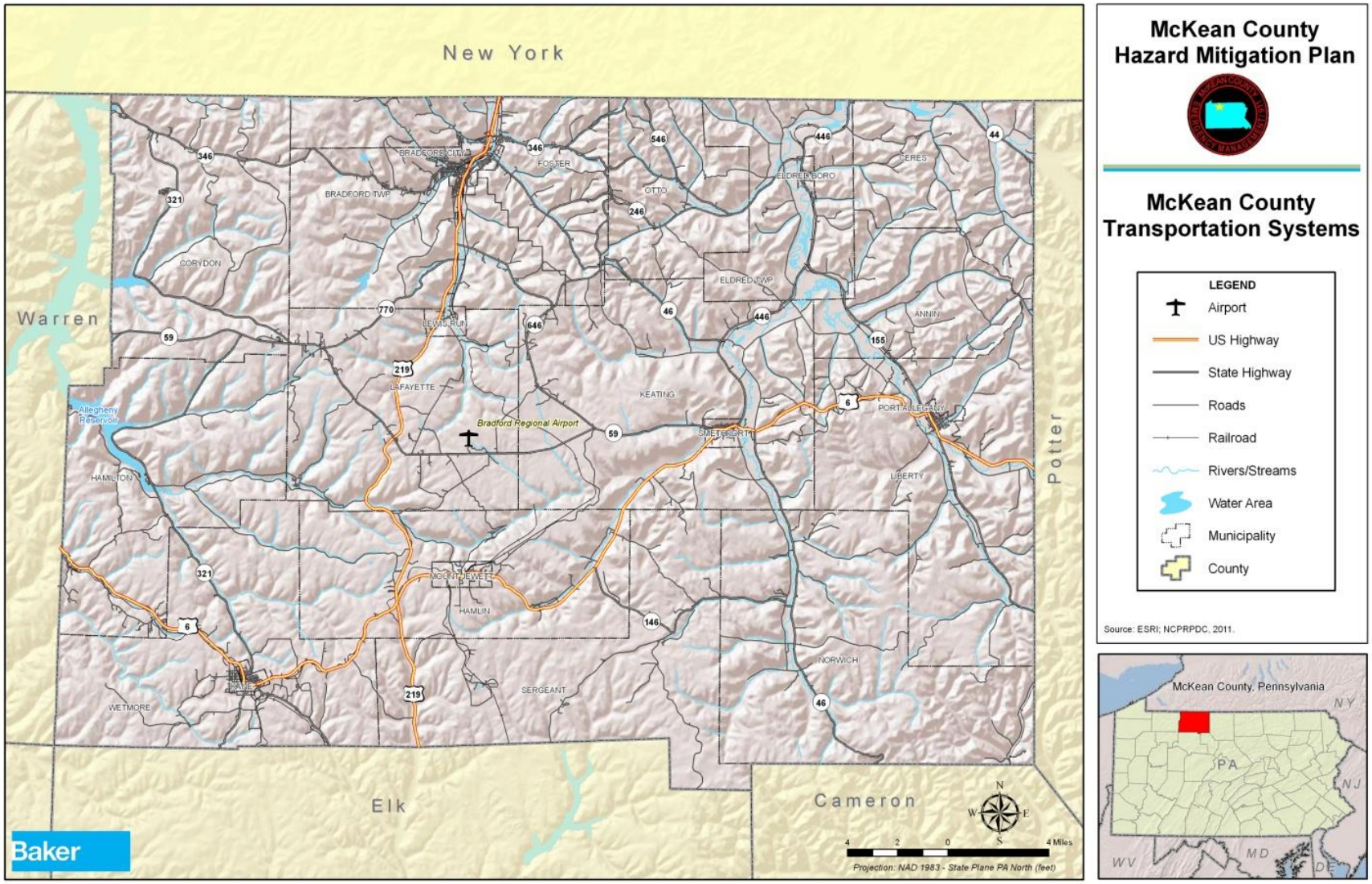
- Architectural and Interior Space Planning – Does security screening cover all public and private areas?
- Mechanical Engineering – Are utilities and HVAC systems protected and/or backed up with redundant systems?
- Electrical Engineering – Are emergency power and telecommunications available? Are alarm systems operational? Is lightning sufficient?
- Fire Protection Engineering – Are the building's water supply and fire suppression systems adequate, code-compliant and protected? Are on-site personnel trained appropriately? Are local first responders aware of the nature of the operations at the facility?
- Electronic and Organized Security – Are systems and personnel in place to monitor and protect the facility?

4.3.14 Transportation Accident

4.3.14.1 Location and Extent

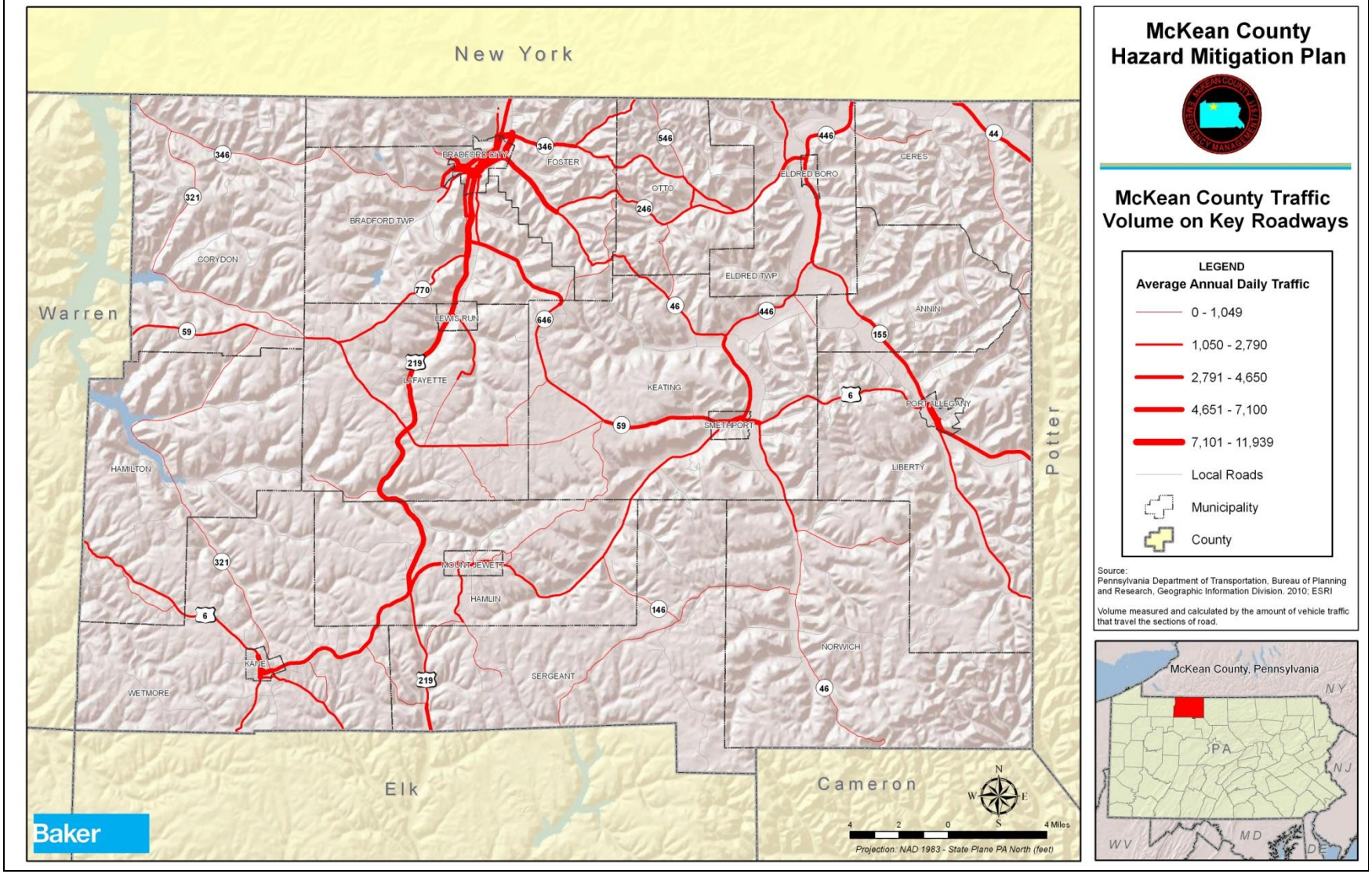
As defined for this HMPU, transportation accidents are defined as incidents involving highway, air and rail travel. The major transportation systems in McKean County, including the US and State highways, railroads and airports, are shown in Figure 4.3.15-1.

Figure 4.3.15-1: McKean County transportation system (ESRI; NCPRPDC, 2011).



There are almost 560 miles of state and federal highways and over 480 miles of surfaced secondary and municipal roads in the county, for a total of almost 1,080 miles of highway in McKean County. The county's busiest transportation routes are U.S. Routes 219 and 6, as well as Pennsylvania Routes 59, 646, 446 and 155. The heaviest traffic flows on US 6 & 219 corridors are Foster, Bradford City, Bradford Twp, Lewis Run, Lafayette, Hamlin, Sergeant, & Hamilton, Wetmore, Kane, Hamlin, Mount Jewett, Keating, Smethport, Liberty & Port Allegany. Figure 4.3.15-2 illustrates the average annual daily traffic for McKean County roads.

Figure 4.3.15-2: McKean County average daily traffic (ESRI; PennDOT 2010).



Freight rail lines pass through twelve townships, five boroughs, and Bradford City in McKean County. The freight lines transport all types of material, including hazardous material. There have been two derailments in McKean County in the past, and several other rail accidents, some of which have involved hazardous materials (see Section 4.3.12). There is a potential for a major accident again on these railways, which run close to developed areas in McKean County.

There is one airport facility in McKean County. Bradford Regional Airport is the only operational airport in the county; formerly, there was another facility which was a privately owned airstrip located in Ceres Township in which a sky-diving business utilized. There is one heliport in Kane in connection to the hospital there. A five-mile radius around the airport can be considered a high-risk area, since most aviation incidents occur near landing or take-off sites. There is an estimated population of 127 persons within a one-mile radius of Bradford Regional Airport (MCEMA, 2019).

4.3.14.2 Range of Magnitude

Significant transportation accidents can result in death or serious injury as well as extensive property loss or damage. Road and railway accidents in particular have the potential to result in hazardous materials release as well if the accident involves a vehicle carrying hazardous materials. A worst case scenario for transportation accidents in McKean County was an airplane crash in 1968. An Allegheny Airlines plane crashed 3.2 miles southeast of the runway of the Bradford Regional Airport. The accident took place on December 24, 1968; there were twenty fatalities in this crash.

4.3.14.3 Past Occurrence

The most common transportation accidents in the County involve highway incidents involving motor vehicles. Table 4.3.15-1 below summarizes the vehicular crash data from 1994-2017 for McKean County. The data was gathered through the Pennsylvania Department of Transportation *Crash Facts Statistics Report* and McKean County's records. Some data was not available for all of the years, in the case of 2018, it is noted below.

Table 4.3.15-1: Total number of crashes, traffic deaths, and traffic injuries for McKean County from 1994 – 2017 (MCEMA, 2019; PENNDOT, 2019).

YEAR	TOTAL CRASHES	TOTAL TRAFFIC DEATHS	TOTAL TRAFFIC INJURIES
1994	481	14	418
1995	531	6	421
1996	459	9	241
1997	468	7	0
1998	486	11	265
1999	0	0	0
2000	0	0	0
2001	427	5	0
2002	489	14	0

Table 4.3.15-1: Total number of crashes, traffic deaths, and traffic injuries for McKean County from 1994 – 2017 (MCEMA, 2019; PENNDOT, 2019).			
YEAR	**TOTAL CRASHES**	**TOTAL TRAFFIC DEATHS**	**TOTAL TRAFFIC INJURIES**
2003	557	3	0
2004	483	6	0
2005	506	6	0
2006	328	3	0
2007	376	9	0
2008	399	11	188
2009	339	3	153
2010	318	5	136
2011	360	10	162
2012	351	7	174
2013	383	9	176
2014	398	8	169
2015	371	7	148
2016	389	7	182
2017	347	3	139
2018 Statistics Unavailable			

Aircraft accidents have been confined mainly to the Bradford Regional Airport, although there have been some incidents of planes being involved in accidents in other parts of McKean County. A full list of aircraft accidents between 1968 and 2019 as reported in the Federal Aviation Administration *Air Traffic Accident Statistics* is included in Table 4.3.15-2.

Table 4.3.15-2: Aircraft accidents in McKean County 1968-2018 (MCEMA, 2019).		
DATE	**LOCATION**	**DETAILS**
12/24/68	Bradford Regional Airport	An Allegheny Airlines Convair 580 crashed 3.2 miles southeast of the runway. Twenty fatalities.
1/6/69	Bradford Regional Airport	An Allegheny Airlines Convair 580 crashed 5.5 miles northwest of the runway. Eleven fatalities.
March 1972	Bradford Regional Airport	Twin engine Piper Apache crashed four miles southwest of airport. Pilot and one passenger injured.
12/19/72	Mt. Alton area	American Yankee crashed from icing of wings. Two fatalities.
10/1/76	Bradford Regional Airport	Twin engine Beechcraft crashed shortly after takeoff. Two fatalities.
5/14/79	Bradford Regional Airport	Single engine Piper crashed on runway. One serious injury.
10/18/79	Bradford Regional Airport	Beechcraft crashed. Four injured.
11/27/82	Bradford Regional Airport	A Cessna Skyhawk crashed 2.5 miles southeast of airport. One serious injury.

Table 4.3.15-2: Aircraft accidents in McKean County 1968-2018 (MCEMA, 2019).		
DATE	**LOCATION**	**DETAILS**
6/22/86	Bradford Regional Airport	A single engine Beechcraft Bonanza crashed 1.5 miles southeast of runway while attempting to land. One fatality.
11/8/90	Bradford Regional Airport	Single engine Beechcraft crashed one mile east of airport. Two fatalities.
2/7/96	Bradford Regional Airport	US Air commuter plan slipped off runway due to slippery conditions. Several injuries.
6/23/96	Foster Township	A single engine Cessna made an emergency landing on US Route 219. No injuries.
1/11/00	Bradford Regional Airport	A single engine Pipe Malibu crashed after takeoff in a snow squall. No injuries.
11/26/00	Otto Township	A single engine Mooney crashed in the woods shortly after takeoff from Bradford Regional Airport. Three fatalities.
10/3/02	Bradford Regional Airport	A single engine plane crashed. One fatality.
3/31/03	Bradford Regional Airport	A twin engine plane crashed near airport. One injury.
1/10/04	Bradford Regional Airport	A Comanche plan crash landed off of runway. No injuries.
9/15/04	Bradford Regional Airport	A commercial aircraft blew a tire and skidded off the runway. No injuries.
11/28/04	Bradford Regional Airport	Plane crash. No injuries.
10/7/05	Hamlin Township	Life Star crash. One fatality.
6/14/2012	Keating Township	Ultralight crash with one fatality.
6/7/2014	Lafayette Township	Single engine plane with landing equipment failure landed safely.
10/17/2017	Lafayette Township	Single engine plane with engine failure landed safely.
11/18/2017	Lafayette Township	Single engine aircraft declared and emergency after experiencing severe turbulence, landed without incident.
4/8/2018	Keating Township	Helicopter working on transmission line struck the pole and crashed one injury and one fatality.
12/24/2018	Lafayette	Single engine plane suffered an instrument failure, landed without incident.

There have been several train derailments and incidents in past years with only the railroad equipment and property sustaining damage or loss. Three of the derailments from 1980 to 2006 released hazardous materials, which involved environmental cleanup (MCEMA, 2019). There have been no deaths or injuries due to railroad or train incidents in McKean County.

4.3.14.4 Future Occurrence

The County's population has decreased slightly over the last decade so it can be assumed that local traffic has declined slightly as well. However the trucking industry is expected to continue to grow increasing the number of long haul trucks operating in the County on a daily basis. Transportation incidents may increase slightly over the next five years without proper mitigation strategies in place. Therefore, based on this and past occurrences, the probability of

transportation accidents is characterized as *highly likely,* as defined by the Risk Factor methodology probability criteria (see Table 4.4-1).

The average rate of aviation accidents nation-wide is 8.47 accidents per 100,000 flight hours. Therefore, the likelihood of a serious aviation incident in the County is considered low.

4.3.14.5 Vulnerability Assessment

A transportation related accident can occur on any stretch of road or railway in McKean County. However, severe accidents are more likely along highways such as U.S. Routes 219 and 6 and Pennsylvania Routes 59, 646, 446 and 155, which experience heavier traffic volumes including heavy freight vehicles. The combination of high traffic volume, severe winter weather in the County and large numbers of hazardous materials haulers increase the chances of traffic accidents occurring. Like highway incidents, rail incidents can impact populations living near rail lines. These include all municipalities in McKean County except for Smethport Borough and Ceres, Corydon, and Otto Townships. McKean County is also susceptible to airplane accidents due to air traffic through Bradford Regional Airport.

Table 4.3.15-3 illustrates the vulnerability of addressable structures and critical facilities for each kind of transportation accident. For this analysis, vulnerability for highway accidents was defined as jurisdictions falling within 1 mile of Interstate and US highways, the high-speed roads likely to yield deadly crashes. Vulnerability for air traffic accidents is defined as jurisdictions falling within five miles of McKean County's only airport that has daily air traffic, Bradford Regional Airport. Similar to highway accidents, jurisdictions that are vulnerable to rail accidents are those located within 1 mile of rail lines. Using these definitions, all jurisdictions are vulnerable to at least one type of transportation accident.

The specific vulnerability of jurisdictions depends on the mode of transportation in question. Bradford City has the highest number of addressable structures and critical facilities vulnerable to both rail and highway accidents; this is partially due to the fact that Bradford City is the urban and economic hub of the County. The other jurisdiction with over 1,000 addressable structures vulnerable to rail accidents is Kane Borough. Kane also has the second-highest number of addressable structures and critical facilities vulnerable to highway accidents. Vulnerability to air accidents is more concentrated because there is only one airport in the County; only Keating Township, Lafayette Township, Hamlin Township, Mount Jewett Borough, and Lewis Run Borough have addressable structures and critical facilities vulnerable to aircraft accidents. Of these, Lafayette Township has the most addressable structures and critical facilities located in the 5-mile vulnerability zone as the Bradford Regional Airport is located in Lafayette Township.

Table 4.3.15-3: Addressable structures and critical facilities vulnerable to Transportation Accidents.							
MUNICIPALITY	**TOTAL ADDRESSABLE STRUCTURES**	**ADDRESSABLE STRUCTURES WITHIN 1 MILE OF RAILROAD**	**CRITICAL FACILITIES WITHIN 1 MILE OF RAILROAD**	**ADDRESSABLE STRUCTURES WITHIN 1 MILE OF *MAJOR HIGHWAYS**	**CRITICAL FACILITIES WITHIN 1 MILE OF *MAJOR HIGHWAYS**	**ADDRESSABLE STRUCTURES WITHIN 5 MILE RADIUS OF AIRPORT**	**CRITICAL FACILITIES WITHIN 5 MILE RADIUS OF AIRPORT**
Annin Township	430	145	0	154	0	0	0
Bradford City	3,690	3,602	14	3,690	14	0	0
Bradford Township	1,999	627	3	1,829	7	0	0
Ceres Township	523	36	0	237	0	0	0
Corydon Township	318	0	0	295	1	0	0
Eldred Borough	422	422	4	422	4	0	0
Eldred Township	808	533	0	625	1	0	0
Foster Township	2,078	777	2	1,693	4	0	0
Hamilton Township	641	475	2	531	2	0	0
Hamlin Township	692	171	1	620	4	93	0
Kane Borough	1,775	1,775	7	1,775	7	0	0
Keating Township	1,498	239	0	1,341	6	314	1
Lafayette Township	875	92	1	642	5	447	6
Lewis Run Borough	317	296	1	317	1	98	0
Liberty Township	1,029	614	0	834	0	0	0
Mount Jewett Borough	511	511	4	511	4	53	1
Norwich Township	636	0	0	538	2	0	0
Otto Township	813	0	0	789	4	0	0
Port Allegany Borough	1,006	980	7	992	7	0	0
Sergeant Township	369	86	0	155	1	0	0
Smethport Borough	760	0	0	760	9	0	0
Wetmore Township	1,075	658	4	993	4	0	0
TOTAL	**22,265**	**12,039**	**50**	**19,743**	**87**	**1,005**	**8**
*Major Highways include Interstates, US Highways and State Highways.							

4.3.15 Urban Fire and Explosion

4.3.15.1.1Location and Extent

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

Urban fires and explosions often begin as a result of other hazards, particularly severe storms, drought, transportation accidents, hazardous materials releases, criminal activity such as arson, and terrorism.

4.3.15.2 Range of Magnitude

Severe urban fires result in extensive damage to residential, commercial, and/or public property. Damages ranges from minor smoke and/or water damage to the destruction of buildings. People are often displaced for several months to years depending on the magnitude of the fire or explosion event. Urban fires and explosions can also cause injuries and death; from 1990-2019, there have been 14 fire-related deaths (MCEMA, 2019). Although most instances of fire do not reach disaster proportions, the sum of the impact of all small fires is often much greater than the impact of the few major fire and explosion hazards that occur.

There are additional economic consequences related to this hazard. Urban fires and explosions may result in lost wages due to temporarily or permanently closed businesses, destruction and damage involving business and personal assets, loss of tax base, recovery costs, and lost investments on destroyed property. 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 as well. Effects may consist of 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.

The worst-case urban fire event occurred in Bradford City in 1992, when a fire leveled an entire city block. The worst explosion event on record occurred in 2001 when an explosion and fire at the Temple Inland Forest Products site in Sergeant Township killed 4 individuals.

4.3.15.3 Past Occurrence

McKean County experiences a number of urban fire and explosion events each year, most of which are small and affect a limited number of structures. PEIRS data indicates that from 2002-2018, there have been 191 urban fire events reported to PEMA (see Table 4.3.16-1). Please note that since PEIRS is a voluntary reporting system, this is not an inclusive list of fires in the County. Of the municipalities in McKean County, Bradford City and Sergeant Township have had the highest number of urban fires reported to PEIRS with 14 events each.

Table 4.3.16-1: Urban fire events reported to PEIRS, 2002-2018 (PEMA, 2010; McKean DES, 2019)																		
URBAN FIRE EVENT TYPE	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Total**
Church Fire	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3
Refinery Fire	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	3
Silo Fire	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Structure Fire	9	2	18	13	7	8	6	17	20	19	6	7	2	9	7	8	8	176
Tire Fire	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	3
Vehicle Fire	0	0	0	0	2	0	0	0	0	1	0	0	0	1	0	0	0	4
Fire events – yearly totals	*9*	*3*	*22*	*17*	*12*	*12*	*7*	*17*	*20*	*20*	*6*	*9*	*3*	*11*	*7*	*8*	*8*	*191*

Since 2018, the end of the PEIRS data reporting time period, McKean County has experienced explosions spurred by the extensive natural gas extraction occurring across the County. In the winter of 2010-2011, there were three home explosions and fires that, while still under investigation, indicated that the cause of the explosion was a migration of methane gas either through the water supply or from wells in the vicinity of homes. These events did not result in any fatalities but did cause burn-related injuries. Figure 4.3.16-1 shows one of these events, an explosion and fire in a home in Foster Township.

Figure 4.3.16-1: Foster Township home explosion on December 13, 2010 (Olean Times Herald, 2010).

4.3.15.4 Future Occurrence

Urban fire and explosion events can be considered *possible,* as defined by the Risk Factor methodology probability criteria (see Table 4.4-1). Minor events will likely happen more frequently than major fires or explosions in the future. The greatest urban fire and explosion threats in McKean County are industrial fires. While residential fires are more common, industrial fires have a potentially higher risk because of the possibility of there being flammable chemicals and a sustained fuel source at industrial sites.

There is also a growing threat of natural gas, particularly methane, migration into homes and sparking fires and explosions. These events could occur more frequently moving forward as natural gas extraction grows in the County. For more information on oil and gas well incidents, please see Section 4.3.12.

4.3.15.5 Vulnerability Assessment

Areas where large buildings are located or development is closely spaced should be considered more vulnerable to urban fire and explosion events; in McKean County, these denser jurisdictions include Bradford City, Bradford Township, Foster Township, Eldred Borough, Kane, Lewis Run, Mount Jewett, Port Allegany, and Smethport.

In order to adequately assess vulnerability to urban fires and explosions, detailed information on the design specifications on the design specifications, specifically fire codes, used for the construction of individual buildings as required. As of December 31, 2006, all communities in Pennsylvania are required to comply with the Uniform Construction Codes. This includes requirements to comply with both the International Fire Code and the International Wildland Urban Interface Code. The adoption and enforcement of these codes will hopefully decrease the overall vulnerability of structures in McKean County. However, these regulations will only affect new construction, as well as additions and renovations to existing structures. Older buildings that do not meet the criteria established in these modern fire codes will continue to remain vulnerable to urban fire and explosion events. Additionally, homes that are located in proximity to natural gas drilling operations may have an added vulnerability to fires and explosions. For more information on the vulnerability of structures to oil and gas well incidents, please see Section 4.3.12.5.

4.3.16 Utility Interruption

4.3.16.1 Location and Extent

Utility interruptions in McKean County include disruptions in fuel, water, electric and telecommunications capabilities in the County, but the primary focus is on electric power failures. Utility interruptions are often a secondary impact of another hazard; for example, many of the windstorm events previously experienced in McKean County have led to widespread power outages. Severe thunderstorms, tornados, and winter storms can also lead to more regional utility interruptions, while localized outages can be caused by traffic accidents or wind damage. Heat waves may also result in rolling blackouts where power may not be available for an extended period of time. Additional utility interruptions may be caused by traffic accidents. Utility interruptions have the potential to take place throughout the County.

4.3.16.2 Range of Magnitude

Most severe utility interruptions and power failures are regional events. A loss of utilities can have numerous impacts including, but not limited to, food spoilage, loss of water supply (either because of a damaged pipeline or well pump failure), loss of heating or air conditioning, basement flooding (sump pump failure), lack of indoor lighting, and lack of telephone and internet service. These issues range from a minor nuisance to a full hazard event, but the degree of damage or harm depends on the population affected and the severity of the outage. For example, loss of heating and cooling capability is more dangerous in the winter and summer months, when heat sensitive populations like the elderly count on utilities to maintain a safe temperature.

At a minimum, utility interruptions can cause short term disruption in the orderly functioning of business, government, and private citizen functioning and activities like traffic signals, elevators, and retail sales. The winter of 1976 to 1977 caused the worst case scenario for utility

interruption in McKean County. Severe weather coupled increased demand due to extreme cold and resulted in fuel shortages across the county.

4.3.16.3 Past Occurrence

In McKean County, minor utility interruptions occur annually, most often in conjunction with winter storms, wind storms, and traffic accidents. There is no complete list of utility interruption events for the County; the most complete list of utility outages is available from PEIRS. From 2002-2018 there were 203 reported computer, phone, and power outages as shown in Table 4.3.17-1.

Table 4.3.17-1: Utility interruption events reported to PEIRS, 2002-2018 (PEMA, 2010; McKean DES, 2019)

Utility Interruptions	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	TOTAL
Computer Outages	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Phone Outage	3	0	1	0	1	0	6	14	6	3	5	2	3	3	0	2	0	48
Power Outage	1	4	5	14	18	8	11	8	17	15	12	11	8	7	5	10	9	154
Utility Interruption events – yearly totals	*4*	*4*	*6*	*15*	*19*	*8*	*17*	*22*	*23*	*18*	*17*	*13*	*11*	*10*	*5*	*12*	*9*	*203*

4.3.16.4 Future Occurrence

Minor, short-term utility interruptions may occur several times a year for any given area in McKean County, while major, long-term events may take place once every few years, but utility interruptions are difficult to predict. However, because utility interruptions are frequent by-products of severe weather events, citizens should prepare for them during severe storms. Therefore, the future occurrence of utility interruptions should be considered *likely,* as defined by the Risk Factor methodology probability criteria (see Table 4.4-1).

4.3.16.5 Vulnerability Assessment

Although the risk for future occurrence of utility interruptions is high across McKean County due to the frequency of contributing factors – traffic accidents and severe weather – these interruptions are usually short lived. Hospitals and emergency medical facilities as well as retirement homes and senior centers are particularly vulnerable to power outages. While back-up power generators are often used at these facilities, loss of electricity may result in hot or cold temperatures for which elderly populations are particularly vulnerable.

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 be used to assist local community officials in ranking and prioritizing those hazards that pose the most significant threat to their 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 opinions 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 eleven hazards profiled in the 2011 HMP. Those categories include: *probability*, *impact*, *spatial extent*, *warning time* and *duration*. Each degree of risk was assigned a value ranging from 1 to 4. The weighting factor is shown in Table 4.4-1. 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 example equation:

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

Table 4.4-1 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 4.4-1: 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% & 49.9% ANNUAL PROBABILITY	**2**	
	LIKELY	BETWEEN 50% & 90% ANNUAL PROBABILITY	**3**	
	HIGHLY LIKELY	GREATER THAN 90% 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 & 10.9% OF AREA AFFECTED	**2**	
	MODERATE	BETWEEN 11 & 25% OF AREA AFFECTED	**3**	
	LARGE	GREATER THAN 25% 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 4.4-2 lists the Risk Factor calculated for each of the sixteen potential hazards identified in the 2019 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 4.4-2: Ranking of hazard types based on Risk Factor methodology.

HAZARD RISK	HAZARD NATURAL (N) or HUMAN-MADE (M)	RISK ASSESSMENT CATEGORY					RISK FACTOR
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	Wildfire (N)	2	4	2	4	2	2.8
	Winter Storm (N)	4	1	4	1	3	2.7
	Flood, Flash Flood, Ice Jam (N)	3	2	3	3	3	2.7
	Invasive Species (N)	4	1	2	1	4	2.6
	Utility Interruption (M)	3	2	2	3	3	2.5
MODERATE	Dam Failure (M)	1	3	2	2	4	2.2
	Drought (N)	2	1	4	1	4	2.2
	Tornado, Windstorm (N)	2	2	2	3	3	2.2
	Urban Fire & Explosion (M)	3	1	1	4	2	2.0
LOW	Transportation Accidents (M)	2	1	1	4	3	1.8
	Environmental Hazards (M)	2	1	1	4	2	1.7
	Terrorism (M)	1	2	1	4	2	1.7
	Disorientation (M)	2	1	1	4	2	1.7
	Subsidence, Sinkhole (N)	1	1	1	4	2	1.4
	Landslide (N)	1	2	1	1	2	1.4
	Earthquake (N)	1	1	1	4	1	1.3

Based on these results, there are five *high* risk hazards, four *moderate* risk hazards and seven *low* risk hazards in McKean 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 4.4-3 shows the different municipalities in McKean County and whether their risk is greater than (>), less than (<), or equal to (=) the risk factor assigned to the County as a whole. This table was developed by the McKean County EMA/911 department and the McKean County GIS department. The seven individuals that performed the ranking are all lifelong residents of McKean County. We based our rankings on our knowledge of the county and the daily dynamics of the county, including which municipalities have experienced hazards in the past and what current economic conditions may contribute to the likelihood of a future hazard occurrence.

Table 4.4-3: Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk

JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR															
	Wildfire (N)	Winter Storm (N)	Flood, Flash Flood, Ice Jam (N)	Invasive Species (N)	Utility Interruption (M)	Dam Failure (M)	Drought (N)	Tornado & Windstorms(N)	Urban Fire & Explosion (M)	Transportation Accidents (M)	Environmental Hazards (M)	Terrorism (M)	Disorientation (M)	Subsidence & Sinkholes (N)	Landslides (N)	Earthquake (N)
	2.8	*2.7*	*2.7*	*2.6*	*2.5*	*2.2*	*2.2*	*2.2*	*2.0*	*1.8*	*1.7*	*1.7*	*1.7*	*1.4*	*1.4*	*1.3*
Annin Township	<	=	<	=	<	<	=	<	<	<	<	=	<	=	=	>
Bradford City	<	=	<	=	>	=	=	<	<	>	>	=	<	>	=	>
Bradford Township	<	=	=	=	<	=	=	=	>	>	>	=	<	=	=	>
Ceres Township	<	=	<	=	<	<	=	<	<	<	<	=	<	=	=	>
Corydon Township	<	=	<	=	<	<	=	<	<	<	=	=	>	=	=	>
Eldred Borough	<	=	<	=	=	<	=	>	=	<	>	=	<	=	=	>
Eldred Township	<	=	<	=	<	<	=	<	<	<	<	=	<	=	=	>
Foster Township	<	=	<	=	<	<	=	>	=	<	>	=	<	=	=	>
Hamilton Township	<	=	<	=	<	<	=	<	<	<	<	=	<	=	=	>
Hamlin Township	<	=	<	=	<	<	=	<	<	<	<	=	<	=	=	>
Kane Borough	<	=	<	=	<	<	=	<	<	>	>	=	<	=	=	>
Keating Township	<	=	<	=	=	=	=	>	<	>	>	=	<	=	=	>
Lafayette Township	<	=	<	=	<	<	=	=	<	>	=	=	>	=	=	>
Lewis Run Borough	<	=	<	=	<	<	=	<	<	<	>	=	<	=	=	>
Liberty Township	<	=	<	=	<	<	=	<	<	<	<	=	<	=	=	>

Table 4.4-3: Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk

JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR															
	Wildfire (N)	Winter Storm (N)	Flood, Flash Flood, Ice Jam (N)	Invasive Species (N)	Utility Interruption (M)	Dam Failure (M)	Drought (N)	Tornado & Windstorms(N)	Urban Fire & Explosion (M)	Transportation Accidents (M)	Environmental Hazards (M)	Terrorism (M)	Disorientation (M)	Subsidence & Sinkholes (N)	Landslides (N)	Earthquake (N)
	2.8	*2.7*	*2.7*	*2.6*	*2.5*	*2.2*	*2.2*	*2.2*	*2.0*	*1.8*	*1.7*	*1.7*	*1.7*	*1.4*	*1.4*	*1.3*
Mt. Jewett Borough	<	=	<	=	>	<	=	=	<	>	<	=	<	=	=	>
Norwich Township	<	=	<	=	<	<	=	=	<	>	<	=	<	=	=	>
Otto Township	<	=	<	=	<	<	=	<	<	<	=	=	<	=	=	>
Port Allegany Borough	<	=	<	=	<	<	=	>	<	<	<	=	<	=	=	>
Sergeant Township	<	=	<	=	<	<	=	>	<	>	=	=	=	=	=	>
Smethport Borough	<	=	<	=	>	=	=	>	<	>	<	=	<	=	=	>
Wetmore Township	<	=	<	=	>	<	=	>	<	>	>	=	>	=	=	>

4.4.3 Potential Loss Estimates

Based on various kinds of available data, potential loss estimates were established for flood, flash flood, and ice jam, tornado and windstorms, drought, nuclear incident, wildfires and winter storms. 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.

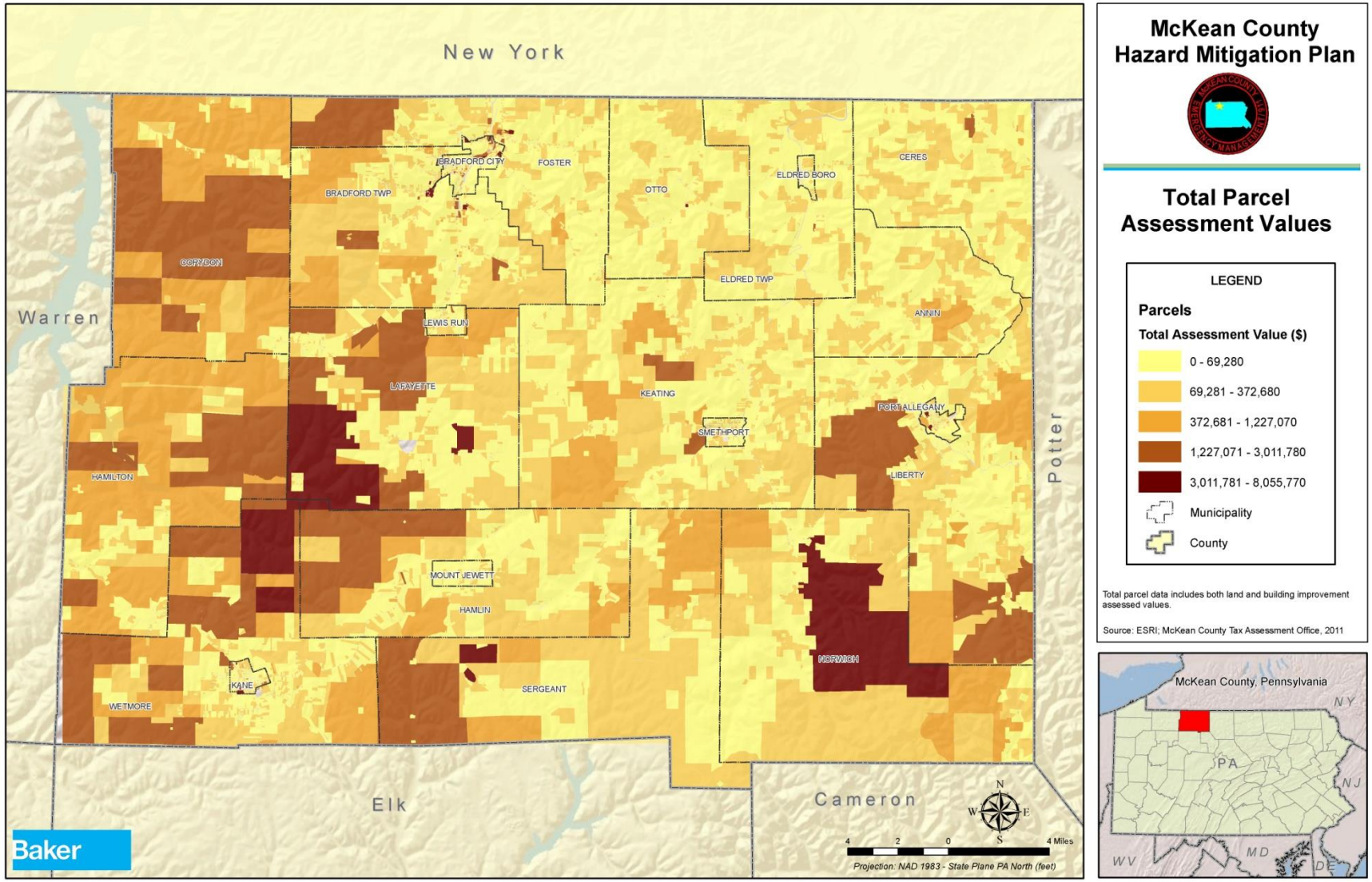
Potential loss estimates have four basic components, including:

- 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.

The parcel data used in this plan includes building values provided in the county tax assessment database. The parcel data is based off of a county-wide reassessment performed and completed in 1998 (McKean County Assessment and Tax Claim Office, 2019). These values are representative of replacement value alone; content loss, functional loss, and displacement costs are not included. Figure 4.4-1 illustrates the range of parcel values in McKean County. The 28,754 parcels in McKean County have a cumulative assessed value of over $1.6 billion, as of November 21, 2019. The average assessed value of these parcels is $57,803. As expected for the largest municipalities in the County, Bradford City and Bradford Township have the potential to experience the most loss, with assessed values exceeding $171 million and $149 million, respectively. At the other end of the spectrum, Corydon Township & Eldred Borough have the potential to experience the least amount of losses of all municipalities with less than $13.5 million and $15.7 million, respectively, in building assessed value. It is important to note that these figures are total, taxable assessed values. This is particularly pertinent to Corydon Township which is mostly federal lands and almost entirely designated as Allegheny National Forest. If you look at the total taxable and tax-exempt assessable values, Corydon has $62.82 million in assessed value.

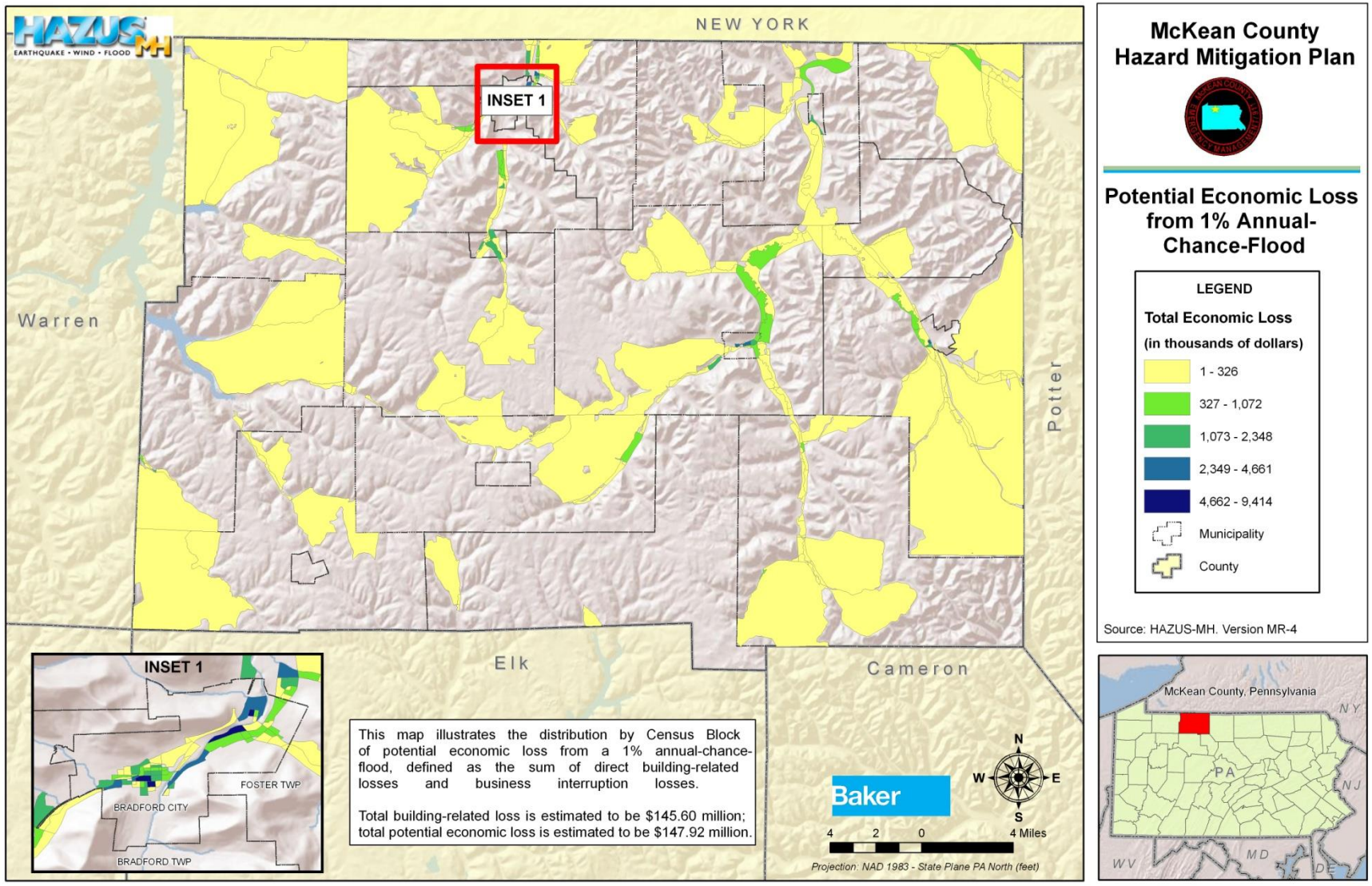
Figure 4.4-3: McKean County parcel assessed values.



The full suite of potential losses was able to be calculated for flood events using HAZUS-MH MR4, a standardized loss estimation software package available from FEMA. These studies provided estimates of total economic loss, building damage, content damage, and other economic impacts that can be used in local flood response and mitigation planning activity.

Using HAZUS-MH, total building-related losses for the 1% annual-chance flood event were estimated to be $145.6 million. Approximately 33% of these building-related losses were incurred by residential occupancies; a further 30% of building-related losses were incurred by commercial properties. Nearly 25% of the building-related losses were incurred by industrial occupancies. Figure 4.4-2 shows the spatial distribution of total economic losses at the Census block level. These total economic losses incorporate both building-related losses and business interruption losses. Some of the highest economic losses are expected in Bradford City and Smethport. Total economic loss, including replacement value, content loss, functional loss, and displacement cost was estimated at $147.9 million for the entire County. The full HAZUS results report can be found in **Appendix F**.

Figure 4.4-3: McKean County potential economic loss calculated with HAZUS-MH MR4.



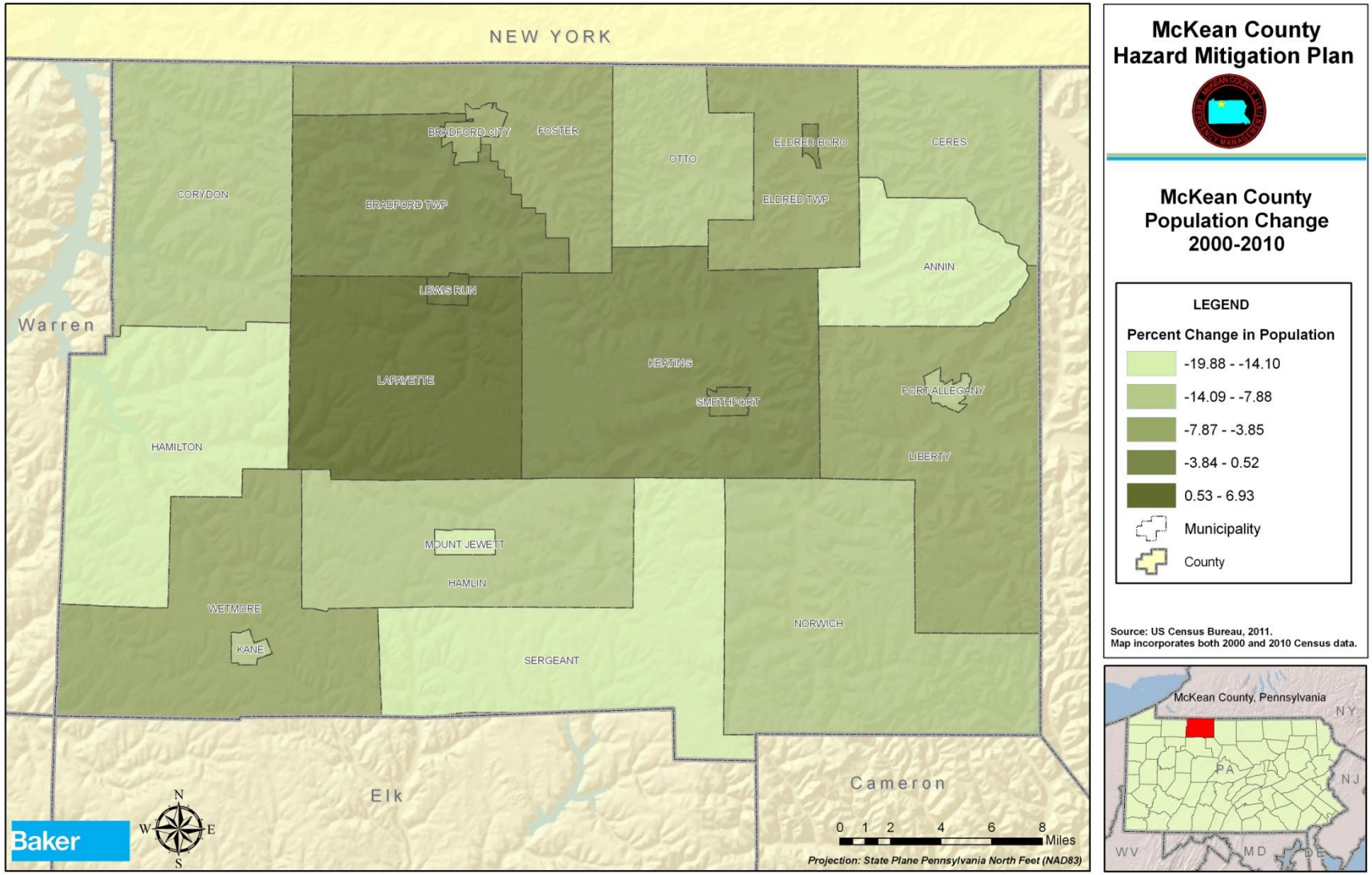
For the remaining hazards where loss estimates could be determined, loss estimates are generalized based on the historical impact of the hazard. The McKean County HVA reports that the damages from wildfire events from 1997-2007, which includes both actual damage and extinction cost, ranged from $833 in 2001 to $80,307 in 2003 and $78,028 in 2006. For droughts, the losses are largely agricultural; as a result, losses are expected to be some portion of McKean County's $5.2 million in agricultural production, depending on the magnitude of the event. Losses associated with particular natural hazard events are sometimes reported to the NCDC with the event. The reporting time frame is 1950-2010. While these historic losses give a glimpse of potential losses in hazard events, they are not reported for all events and should be considered a broad estimate. Flood losses reported to NCDC total $76.62 million and range from $5,000 to $50 million. Windstorm events have had losses ranging from $2,000 to $250,000 depending on the magnitude of the events. For winter storm events, only seven of the past events losses associated with them, but those that do had losses ranging $5,000-$5 million per event; over the reporting period for the NCDC, there were also 249 injuries associated with winter storms.

4.4.4 Future Development and Vulnerability

Risk and vulnerability to natural and human-made hazard events are not static. Risk will increase or decrease as counties and municipalities see changes in land use and development as well as changes in population. McKean County is expected to experience a variety of factors that will, in some areas, increase vulnerability to hazards while in other areas, vulnerability may stay static or even be reduced.

Population change, and the age of the population and housing stock are main indicators of vulnerability change in McKean County. As discussed in Section 2.3, the total population of McKean County has decreased by over five percent from 2010 to 2018. The population change in the County can be seen in Figure 4.4-3. All municipalities experienced population loss (US Census Bureau, ACS 2018). Although some of the larger jurisdictions in the County declined, they still maintain the highest density of population in McKean County. This population is concentrated around the City of Bradford, Bradford and Foster Townships and Kane Borough; the remainder of the County is sparsely populated with some concentrations in the remaining boroughs. Hazard vulnerability and loss estimates will be higher in these municipalities and areas.

Figure 4.4-3: Municipal population change in McKean County (US Census 2000 and 2011).



The McKean County has also experienced an aging population in the last decades (MCPC, 2019). Eighteen percent of the population is over the age of 65, and the County has seen a decline of younger residents. Older residents pose unique challenges when it comes to evacuation and/or mobility during the rescue and recovery processes that typically occur in the case of a hazard event. As there becomes more of an elderly population in the county, officials may consider partnering with human services organizations to specifically plan for this vulnerable population.

The aging housing stock in McKean County is another source of current and future vulnerability in many hazard events. A large percentage of the housing stock, approximately 40%, was built before 1940. McKean County can experience gusts of wind up to 200 and 250 miles per hour during windstorms or tornadoes. The structure of these older houses may be more at risk of destruction under these strong wind conditions and other natural hazards due to their age. These structures may also be at risk during flooding and winter storm events if the materials are either not strong enough to withstand the pressure or weight of the precipitation or are liable to leak, causing further risk of destruction to the house. Five municipalities in McKean County have more than 50% of their housing stock built before 1940. Those municipalities are Bradford City, Eldred Borough, Kane Borough, Mount Jewett Borough, and Smethport Borough. These five municipalities can be considered more vulnerable to future vulnerability because of their aging housing stock.

McKean County's Comprehensive Plans (2007 & 2019/2020) outlined future plans and priorities responding to the loss of population and land use development trends seen in the last thirty years (MCPC, 2019). Currently, 77 percent of the land in McKean County is forested; intensive land uses, including agricultural, residential, institutional, and commercial, increased from 3.3 percent in 1977 to 8 percent in 2007 to 23 percent in 2019 (MCPC, 2019). The Comprehensive Plan aims to steer future residential and commercial development to the areas that are already urban or town neighborhoods or villages – meaning the emphasis of growth and development will largely be in the boroughs, Bradford City, and other areas of the County with a town- or village-like feel. Concentrating growth may help to reduce isolation-based vulnerability of communities with few access routes, no municipal water supply, and low cell phone reception. On the other hand, higher densities mean that more people are likely to be impacted in a hazard event should it strike those more populated areas. In addition to the residential and commercial development, the Plan encompasses goals to grow the industrial sector in the area around the Bradford Regional Airport, which may alter the County's vulnerability to air accidents and environmental hazards, depending on the industries attracted.

The County also made it a priority to provide model subdivision and land development provisions for all municipalities for wellhead construction, storm water management, soil erosion, sediment control, and vegetated or forested riparian buffers. If these two priorities are accomplished, the vulnerability in the rural parts of the County to water pollution environmental and subsidence hazards will diminish. However, as mentioned above, the dense areas of population will become denser, which will increase the vulnerability and loss estimates in these areas. The population in the area around the City of Bradford, including proximal areas of Foster and Bradford Townships, will also experience higher risk environmental hazards due to

increased industrial uses. The overall change in population is not going to have a large impact on hazard risk.

5 Capability Assessment

5.1 Update Process Summary

McKean County has a number of resources it can access to implement hazard mitigation initiatives including emergency response measures, local planning and regulatory tools and resources, 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 hazard event.

The 2019 HMP identified the suite of resources available in McKean County to support hazard mitigation, including human, physical, technological, informational, and financial resources. It also indicated the presence of local plans, ordinances, and codes in applicable municipalities. Finally, the 2019 Capability Assessment specified local, state, and federal resources available for mitigation efforts. Through responses to the *Capability Assessment Survey* distributed to all 22 municipalities and input from HMPT, the 2019 HMPU provides an updated inventory of the most critical local planning tools available within each municipality and a summary of the fiscal and technical capabilities available through programs and organizations outside of the County. It also identifies emergency management capabilities and the processes used for implementation of the National Flood Insurance Program. In general, the County and its municipalities have been active in growing their capability in recent years with a 2007 County Comprehensive Plan, a 2011 Stormwater Management Planning and Ordinance development process, a 2014/2015 Solid Waste Management Plan, a 2016 update to County flood maps and floodplain ordinances and an updated Subdivision and Land Development Ordinance, and a 2017/2018 Community Wildfire Protection Plan. In the meantime, many municipalities in McKean have been working with a local consultant to develop property maintenance ordinances that address blight, public health, property depreciation. Lastly, as we are updating our Hazard Mitigation Plan in 2019/2020, we are also updating and completing our new comprehensive plan that we anticipate to be adopted in 2020.

While the capability assessment serves as a good instrument for identifying local capabilities for, 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

5.2.1 Emergency Management

The McKean County Emergency Management Agency coordinates countywide emergency management efforts. Each municipality has a designated local emergency management coordinator who possesses a unique knowledge of the impact hazard events have on their community. A significant amount of information used to develop this plan was obtained from the emergency management coordinators. The Emergency Management Services Code (PA Title 35) requires that all municipalities in the Commonwealth have a Local Emergency Operations Plan (EOP) which is updated every two years. According to the Capability Assessment Surveys completed by municipal leaders, fifteen of the jurisdictions in the County have or are in the process of developing an EOP. A countywide EOP also exists. Municipalities are not required

to sign on to the County EOP, because County staff prefers to keep municipal emergency management coordinators actively engaged at a more local level.

5.2.2 Participation in the National Flood Insurance Program (NFIP)

All jurisdictions in McKean County except Kane Borough are participants in the NFIP (see Table 5.2-1). The program is managed by local municipalities participating in the program through ordinance adoption and floodplain regulation while the McKean County Planning Commission provides an oversight and coordination role. Similarly, permitting processes needed for building construction and development in the floodplain are implemented at the municipal level through various ordinances (e.g. zoning, subdivision/land development and floodplain ordinances), but the Planning Commission provides technical assistance and guidance upon request.

In the day-to-day administration of the program, the County staff notes that all communities have a building permit procedure that is usually administered by local private companies; staff enforcement officers are rare. Administration of floodplain regulations and enforcement is strongest in the cases of a subdivision application, when the McKean County Planning Commission gives applicants the floodplain management information and requests municipal enforcement of the ordinance. While concrete information on the everyday administration of the NFIP is limited, Section 7.2 suggests that the inclusion of more information on the day-to-day administration of the NFIP is strongly suggested during the annual plan review.

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.

The Pennsylvania DCED provides communities, based on their 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:

- Prohibiting manufactured homes in the floodway.
- Prohibiting manufactured homes within the area measured 50 feet landward from the top-of bank of any watercourse within a special flood hazard area.
- Special requirements for recreational vehicles within the special flood hazard area.
- Special requirement for accessory structures.
- Prohibiting new construction and development within the area measured 50 feet landward from the top-of bank of any watercourse within a special flood hazard area.
- 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.

All jurisdictions in McKean County participating in the NFIP updated their floodplain ordinances in 2016 following a county-wide Flood map update.

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 establishes 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.

As new DFIRMs are published, the Pennsylvania State NFIP Coordinator housed 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. In addition, DCED provides guidance and technical support through Community Assistance Contacts (CAC) and Community Assistance Visits (CAV).

McKean County municipalities adopted new floodplain ordinances in 2016 following updated county-wide Flood Maps. These maps became effective on January 26th, 2016. These digital maps greatly enhance mitigation capabilities as they relate to identifying flood hazards; this effort is a significant improvement to the formerly used paper Flood Insurance Rate Maps. Residents and municipal officials are provided with mapping assistance from the McKean County Planning Commission upon request.

There are no communities in McKean County currently participating in the NFIP Community Rating System (NCPRPDC, 2019).

5.2.3 Planning and Regulatory Capability

Some of the most important planning and regulatory capabilities that can be utilized for hazard mitigation include comprehensive plans, building codes, floodplain ordinances, subdivision and land development ordinances, and zoning ordinances. These tools provide mechanisms for the implementation of adopted mitigation strategies. Table 5.2-1 summarizes their presence within each municipality.

Table 5.2-1: Summary of planning tools adopted by each municipality in McKean County (HMP Capability Assessment Surveys, 2019; MCEMA & MCGISC 2019)

COMMUNITY	COMPRE-HENSIVE PLAN	BUILDING CODE	FLOODPLAIN ORDINANCE - NFIP PARTICIPANT	SUBDIVISION & LAND DEVELOPMENT ORDINANCE	ZONING ORDINANCE
Annin Township	Yes, County	Yes	Yes	Yes, County	No
Bradford City	Yes, County. Also participates in multi-municipal regional plan.	Yes	Yes	Yes, municipal	Yes
Bradford Township	Yes, County. Also participates in multi-municipal regional plan.	Yes	Yes	Yes, municipal	Yes

Table 5.2-1: Summary of planning tools adopted by each municipality in McKean County (HMP Capability Assessment Surveys, 2019; MCEMA & MCGISC 2019)

COMMUNITY	COMPRE-HENSIVE PLAN	BUILDING CODE	FLOODPLAIN ORDINANCE - NFIP PARTICIPANT	SUBDIVISION & LAND DEVELOPMENT ORDINANCE	ZONING ORDINANCE
Ceres Township	Yes, County.	Yes	Yes	Yes, County	No
Corydon Township	Yes, County	Yes	Yes	Yes, County	No
Eldred Borough	Yes, County	Yes	Yes	Yes, County	Yes
Eldred Township	Yes, County	Yes	Yes	Yes, County	No
Foster Township	Yes, County. Also participates in multi-municipal regional plan.	Yes	Yes	Yes, municipal	Yes
Hamilton Township	Yes, County	Yes	Yes	Yes, County	No
Hamlin Township	Yes, County	Yes	Yes	Yes, County	No
Kane Borough	Yes, County	Yes	No	Yes, County	Yes
Keating Township	Yes, County	Yes	Yes	Yes, County	No
Lafayette Township	Yes, County	Yes	Yes	Yes, municipal	Yes
Lewis Run Borough	Yes, County	Yes	Yes	Yes, County	Yes
Liberty Township	Yes, County	Yes	Yes	Yes, County	No
Mount Jewett Borough	Yes, County	Yes	Yes	Yes, County	Yes
Norwich Township	Yes, County	Yes	Yes	Yes, County	No
Otto Township	Yes, County	Yes	Yes	Yes, County	No
Port Allegany Borough	Yes, County	Yes	Yes	Yes, County	Yes
Sergeant Township	Yes, County	Yes	Yes	Yes, County	No
Smethport Borough	Yes, County	Yes	Yes	Yes, County	Yes
Wetmore Township	Yes, County	Yes	Yes	Yes, County	No

Comprehensive Plans promote sound land use and regional cooperation among local governments to address planning issues. These plans serve as the official policy guide for influencing the location, type and extent of future development by establishing the basis for decision-making and review processes on zoning matters, subdivision and land development, land uses, public facilities and housing needs over time. The existing countywide Comprehensive Plan for McKean County was developed in 2007. Bradford City, Bradford Township, and Foster Township also have a multi-municipal comprehensive plan; this plan was developed in 2009 and aligns with the general goals and recommendations set out in the County comprehensive plan. County governments are required by law to adopt a comprehensive plan, while local municipalities may do so at their option. McKean is currently in the process, in coordination with Potter and Cameron counties and Michael Baker International, to develop, finalize, and adopt our new 2019/2020 comprehensive plan(s). This tri-county plan includes three individualized plans for the three counties and one tri-county regional comprehensive plan.

Building codes regulate construction standards for new construction and substantially renovated buildings. Standards can be adopted that require resistant or resilient building design practices to address hazard impacts common to a given community. In 2003, the Commonwealth of Pennsylvania implemented Act 45 of 1999, the Uniform Construction Code (UCC), a comprehensive building code that establishes minimum regulations for most new construction, including additions and renovations to existing structures. All 22 municipalities in McKean County are required to adhere to the UCC. On December 10, 2009 the Commonwealth adopted regulations of the 2009 International Code Council's codes. The effective date of the regulations is December 31, 2009. Since all municipalities in McKean County are required to abide by the UCC they will are required to enforce the 2009 building code regulations for all building permits submitted after December 31, 2009. If a design or construction contract for proposed work was signed between December 31, 2006 and December 30, 2009 then the 2006 International Codes must be abided.

Through administration of floodplain ordinances, municipalities can ensure that all new construction or substantial improvements to existing structures located in the floodplain are flood-proofed, dry-proofed, or built above anticipated flood elevations. Floodplain ordinances may also prohibit development in certain areas altogether. The NFIP establishes minimum ordinance requirements which must be met in order for that community to participate in the program. However, a community is permitted and in fact, encouraged, to adopt standards which exceed NFIP requirements. As discussed in Section 5.2.2, McKean County's 2011 Floodplain Ordinances will use this model ordinance. Through participation in the NFIP, all municipalities except Kane Borough within the County have floodplain regulations in place.

Subdivision and land development ordinances (SALDOs) are intended to regulate the development of housing, commercial, industrial or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Within these ordinances, guidelines on how land will be divided, the placement and size of roads and the location of infrastructure can reduce exposure of development to hazard events. All jurisdictions within McKean County have adopted and enforce a subdivision and land development ordinance; Bradford City, Bradford Township, Foster Township, and Lafayette Township have their own municipal SALDO while the other eighteen municipalities use the County's SALDO.

Zoning ordinances allow for local communities to regulate the use of land in order to protect the interested and safety of the general public. Zoning ordinances can be designed to address unique conditions or concerns within a given community. They may be used to create buffers between structures and high-risk areas, limit the type or density of development and/or require land development to consider specific hazard vulnerabilities. Ten of the 22 municipalities in McKean County have zoning regulations.

The Pennsylvania legislature enacted the Stormwater Management Act (Act 167 if 1978), commonly called Act 167. The Act enables the regulation of development and activities that cause accelerated runoff and encourages watershed-based planning and management of stormwater. The Department of Environmental Protection is the public agency charged with

overseeing implementation of the Act 167 plans. Act 167 Stormwater Management Plans are intended to improve stormwater management practices, mitigate potential negative impacts from future land uses, and to improve the condition of impaired waterways. The McKean County's Stormwater Management Plan was completed in 2011 and developed using a Low-Impact Development approach that manages stormwater in a manner similar to nature by managing rainfall at the source using decentralized, micro-scale controls. In conjunction with the Act 167 Plan, each municipality must adopt and implement ordinances and regulations needed to regulate development in a manner consistent with the Act 167 Plan (MCPC, 2019). McKean County's Stormwater Ordinances were adopted in April 2011. All municipalities currently participate in this plan and enforce the county's stormwater ordinance.

5.2.4 Administrative and Technical Capability

Administrative capability is described by an adequacy of departmental and personnel resources for the implementation of mitigation-related activities. Technical capability relates to an adequacy of knowledge and technical expertise of local government employees or the ability to contract outside 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/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 the education or 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.

Based on assessment results, municipalities in McKean County have low-to-moderate administrative and technical staff needed to conduct hazard mitigation-activities. There seems to be sufficient emergency management staff across the County. However, there seems to be a common lack of the other aforementioned positions. This result is not necessarily surprising since these tasks are typically contracted to outside providers. Many communities do not have their own personnel skilled in geographic information systems but McKean County has recently instituted a GIS staff position that can assist the municipalities and the regional planning commission, commonly referred to as North Central, also has GIS skilled personnel on staff to assist the municipalities. Currently, to our knowledge, no municipality has personnel on staff that has the title of grant writer. Some personnel may write grants along with their other duties. All municipalities in the County have an identified emergency management coordinator, though one individual may share duties between two municipalities.

Despite that most of our municipalities have very few skilled personnel to assist with acquiring and performing hazard mitigation actions; there are multiple resources at the county and regional level to assist the municipalities, if requested. This includes but is not limited to the McKean County Conservation District, the Penn State Cooperative Extension, McKean County Economic Development, McKean County EMA, McKean County Planning Commission, McKean County GIS, North Central Pennsylvania Regional Development and Planning Commission, environmental advocacy groups, and watershed associations.

State agencies agency which can provide technical assistance for mitigation activities include, but are not limited:

- Pennsylvania Department of Community and Economic Development
- Pennsylvania Department of Conservation and Natural Resources
- Pennsylvania Department of Environmental Protection

Federal agencies which can provide technical assistance for mitigation activities include, but are not limited to:

- Army Corp of Engineers
- Department of Housing and Urban Development
- Department of Agriculture
- Economic Development Administration
- Emergency Management Institute
- Environmental Protection Agency
- FEMA
- Small Business Administration

5.2.5 Fiscal Capability

The decision and capacity to implement mitigation-related activities is often strongly dependent on the presence of local 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 limited.

State programs which may provide financial support for mitigation activities include, but are not limited to:

- Community Conservation Partnerships Program
- Community Revitalization Program
- Floodplain Land Use Assistance Program
- Growing Greener Program
- Keystone Grant Program
- Local Government Capital Projects Loan Program
- Land Use Planning and Technical Assistance Program
- Pennsylvania Heritage Areas Program
- Pennsylvania Recreational Trails Program
- Shared Municipal Services
- Technical Assistance Program

Federal programs which may provide financial support for mitigation activities include, but are not limited to:

- Community Development Block Grants (CDBG)
- Disaster Housing Program
- Emergency Conservation Program
- Emergency Management Performance Grants (EMPG)
- Emergency Watershed Protection Program
- Hazard Mitigation Grant Program (HMGP)
- Flood Mitigation Assistance Program
- Non-insured Crop Disaster Assistance Program
- Pre-Disaster Mitigation Program
- Repetitive Flood Claims Program (RFC)
- Section 108 Loan Guarantee Programs
- Severe Repetitive Loss Grant Program (SRL)
- Weatherization Assistance Program

5.2.6 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" (3) to adopt policies and programs that reduce hazard vulnerabilities. Of the 22 municipalities that responded, scores ranged from 0-3 with an average score of 1.8.

5.2.7 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 the mechanisms that could enhance or further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as either "limited," "moderate" or "high." Table 5.2-2 summarizes the results of the self-assessment survey as a percentage of responses received. For example, 68% of communities who

responded indicated their community had high community resiliency capabilities related to hazard, natural disasters, risks, mitigation activities, overcoming disasters.

Table 5.2-2: Summary of self-assessment capability responses expressed as a percentage of responses received.

CAPABILITY CATEGORY	LIMITED	MODERATE	HIGH
Planning & Regulatory	21%	58%	21%
Administrative & Technical	42%	42%	16%
Fiscal	47%	32%	21%
Political	58%	26%	16%
Community Resiliency	16%	16%	68%

5.2.8 Existing Limitations

As mentioned, there are no communities in McKean County participating in the NFIP Community Rating System. However, 20 of the 22 municipalities in the County have been designated as floodprone. Community participation in this program can provide premium reductions for properties located outside of Special Flood Hazard Areas of up to 10 percent and reductions for properties located in Special Flood Hazard Areas of up to 45 percent. These discounts can be obtained by undertaking public information, mapping and regulations, flood damage reduction and flood preparedness activities (FEMA, 2009). However, it is not common for municipalities across the commonwealth to participate in the community rating system (NCPRPDC, 2019). Additionally, there are no communities in North Central Pennsylvania Regional Development and Planning Commission's six county region that participate in the community rating system (NCPRPDC, 2019).

Based on the capability assessment results and the 2007 County Comprehensive Plan, ten of McKean County's jurisdictions have local land use controls. This means that a full 12 municipalities, all of which are class 2 townships, do not have the kinds of planning and land use controls in place "to guide the amount, location, intensity, and character of future development" (MCPC, 2019). While the County SALDO provides a minimum of regulation, local governments can go farther to use land use regulations to direct development away from hazard-prone areas, however none of our municipalities have advanced SALDOs that could do such.

Numerous roads and intersections exist in the County where flooding issues repeatedly occur. Some of these roads and intersections are state routes. The County and local municipalities face challenges in mitigating flood events on state routes since these roads are owned and maintained by the Commonwealth of Pennsylvania. Local municipalities do not have the authority to independently carry out a mitigation project. In these situations, the Pennsylvania Department of Transportation must decide to undertake the project. Since the Department of Transportation is often most concerned with larger, critical transportation routes, smaller state roads and intersections which significantly affect a local community may not get the attention they need for the Commonwealth to take on a mitigation project.

Finally, limited funding is a critical barrier to the implementation of hazard mitigation activities. The County will need to rely on regional, state and federal partnerships for financial assistance.

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 six goals and nineteen objectives identified in the 2011 HMP; in the 2019 HMPU, there are still six goals and nineteen objectives, but objectives have been added, deleted, and re-arranged in order to associate them with the most appropriate goal. These changes are noted in Table 6.1-1; this table also explains the difference in numbering between 2011 and 2019 objectives. A list of these goals and objectives as well as a review summary based on comments received from stakeholders who participated in the HMP update process is included in Table 6.1-1. These reviews are based on the *5-Year Hazard Mitigation Plan Review Worksheet,* which includes a survey on existing goals and objectives, completed by the HMPT. Municipal officials then provided feedback on the changes to the goals and objectives via the Goals and Objectives Evaluation Form distributed at the Risk Assessment Summary and Mitigation Solutions Workshop. Copies of these evaluations are located in **Appendix B**.

Table 6.1-1: List of Mitigation Strategy Goals and Objectives.

Goal 1: Attempt to reduce the current and future risk of flood damage in McKean County	
1.1. McKean County will attempt to reduce the current and future risk of flood damage in McKean County by directing new development away from high hazard areas by reviewing existing regulations to ensure adequacy in reducing the amount of future development in identified hazard areas.	**Review:** HMSC and community leaders agreed this goal should continue. Wording changes were made to objectives 1.1, 1.2, and 1.3 to reflect progress made in hazard mitigation activities including adopting the UCC, getting new floodplain ordinances, and assisting with local land development regulations. Objective 1.4 has been removed because the County does not have (and has never had) capital improvement plans. The changes necessitated a change in the numbering of objectives. Objectives 1.1 and 1.2 have the same number. Objective 1.2 has been moved to Goal 2 and is objective 2.3 in the 2011 HMPU. Objective 1.5 is now objective 1.3. Objective 1.6 is now objective 1.4. Objective 1.7 is now objective 1.5. Objective 1.8 has been moved to Goal 3 and is numbered 3.1.
1.2. Review all comprehensive plans to ensure that designated growth areas are not in hazard areas.	
1.3. Adoption and enforcement of Statewide Uniform Construction Code.	
1.4. Review all capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas.	
1.5. Evaluate and update existing floodplain ordinances to meet or exceed NFIP standards.	
1.6. Improve the enforcement of existing floodplain regulations.	

Table 6.1-1: List of Mitigation Strategy Goals and Objectives.	
1.7. Recommend that flood insurance policies remain affordable through county and municipal government programs.	
1.8. Evaluate existing shelters to determine adequacy for current and future populations.	
Goal 2: Reduce the potential impact of natural and man-made disasters on public and private property.	
2.1. Encourage participation in the NFIP.	**Review:** The HMSC and community leaders agreed this goal and objectives should continue. The goal has been re-worded slightly to broaden its scope. Objective 2.1 has been changed in light of the fact that all jurisdictions that are floodprone are in the NFIP already.
2.2. Protect McKean County's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.	
Goal 3: Improve upon the protection of the citizens of McKean County from all natural and man-made hazards.	
3.1. Ensure adequate training and resources for emergency organizations and personnel.	**Review:** The HMSC and community leaders agreed this goal and objectives should continue. The goal has been re-worded to broaden its scope. The 2019 HMPU as an added objective under Goal 3, necessitating a change in numbering of objectives. Objective 3.1 is objective 3.2 in the 2019 HMPU; objective 3.2 is now objective 3.3; objective 3.3 is now objective 3.4; and objective 3.4 is now objective 3.5.
3.2. Improve emergency preparedness in McKean County and its municipalities.	
3.3. Improve coordination and communication among disaster response organizations, local, and county governments.	
3.4. Evaluate cost-effective ways of augmenting existing broadcast and communication systems to monitor warning information continuously and to disseminate the appropriate warnings.	
Goal 4: Reduce or redirect the impact of natural disasters (especially floods) away from at-risk population areas.	
4.1. Research possible mitigation projects to reduce flooding, reduce/eliminate sewage leakage and inflow/infiltration problems. Some projects may include reservoirs, levees, floodwalls, diversions, channel modification, and storm sewers	**Review:** The HMSC and community leaders agreed this goal and objectives should continue.
Goal 5: Protect existing natural resources and open space, including parks and wetlands, within the floodplain and watershed to improve their flood control function.	
5.1. Protect McKean County's natural resources through the implementation of cost-effective and technically feasible mitigation projects.	**Review:** The HMSC and community leaders agreed this goal should be re-worded to incorporated hazards other than flood, but felt the objectives should be continued as written.
5.2. Protect McKean County's natural resources through the implementation of recreation planning and stormwater management planning.	
Goal 6: Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating	

Table 6.1-1: List of Mitigation Strategy Goals and Objectives.	
risks due to those hazards.	
6.1. Develop and distribute public awareness materials about natural hazard risks, preparedness, and mitigation.	**Review:** The HMSC and community leaders agreed this goal and objectives should continue. A new objective has been added based on feedback from the municipalities asking for assistance interpreting DFIRM data. This has been added as objective 6.3
6.2. Target owners of properties within identified hazard areas for additional outreach regarding mitigation and disaster preparedness.	

Actions provide more detailed descriptions of specific work tasks to help the County and its municipalities achieve prescribed goals and objectives. There were 63 actions identified in the 2011 Mitigation Strategy; fifteen of these actions have been partially or entirely completed while another fifteen are continual actions that reduce risk, vulnerability, and losses. A list of these actions as well as a review and summary of their progress based on comments from the HMPT is included in Table 6.1-2. Actions were evaluated by the HMPT with the intent of carrying over any actions that were incomplete but still viable for the next five years. Although most have been carried over, eleven actions have been discontinued and removed from the HMP.

Table 6.1-2: List and review summary of 2011 mitigation actions.	
ACTION	**REVIEW**
1.1.1: Encourage municipal offices to review regulations pertaining to their jurisdiction to make sure that adequate zoning regulations are in place to reduce future development in high hazard areas in their jurisdiction. Planning department to review Subdivision and Land Development Ordinance.	This action is ongoing and is included in the 2019 HMP update. See Action 10.
1.2.1: Planning department and applicable municipal offices to review their comprehensive plans to ensure that designated growth areas are not in high hazard areas identified in this plan.	This action is ongoing and is included in the 2019 HMP update. See Action 9.
1.4.1: Encourage applicable municipal offices to review their capital improvement plans to ensure that programmed infrastructure improvements are not in high hazard areas.	This action has been discontinued because there are no capital improvement plans in the County or municipalities.
1.5.1: Applicable municipalities to review and update their floodplain ordinances to be sure that they are in full compliance with the NFIP.	This action has been completed as of 2016.
1.6.1: For McKean County DES to arrange with PEMA/FEMA/ DCED to hold training sessions with the County and the municipalities on the National Flood Insurance Program (NFIP) requirements.	This action is ongoing. See Action 7
1.6.2: McKean County DES to arrange with PEMA/FEMA/ DCED to hold training for Insurance Companies on the NFIP.	In an effort to maintain a viable, realistic Mitigation Action Plan that can be implemented over a five year period this action was not included in the 2019 HMPU.

Table 6.1-2: List and review summary of 2011 mitigation actions.	
ACTION	**REVIEW**
1.7.1: County DES to arrange with PEMA/FEMA to conduct training on the Community Rating System (CRS) to municipalities.	This action had been reworded and combined with another action. See Action 7
1.8.1: Ensure that all shelters within McKean County have adequate emergency power resources. Work with the McKean-Potter Counties Chapter of the American Red Cross towards upgrading all shelter resources.	This action is ongoing and is included in the 2019 HMPU. See Action 19.
1.8.2: Develop adequate emergency shelter and evacuation plans for animals (domestic pets and livestock) by establishing a committee representative of all areas of the County that will include veterinarians, pet store owners, the Humane Society, animal shelters and other interested parties to work on animal-specific evacuation and sheltering needs.	This action is in progress and has been carried over to the 2019 HMPU. See Action 20.
2.1.1: County DES and PEMA to conduct outreach efforts to educate municipalities about the NFIP and its requirements.	This action has been reworded and combined with another action. See action 7.
2.1.2: County to obtain updated information on the number of NFIP policyholders in McKean County and its municipalities from PEMA and FEMA.	In an effort to maintain a viable, realistic Mitigation Action Plan that can be implemented over a five year period this action was not included in the 2019 HMPU.
2.2.1: DES to work with municipalities to collect updated information of the number and location of all repetitive loss properties throughout the county and the municipalities in order to plan future mitigation activities.	This action is in progress and has been carried over to the 2019 HMPU but has been modified and reworded. See Action 8.
2.2.2: County to work with North Central Planning Commission to develop a database of existing hazards in the GIS system of information on all repetitive loss properties including maps to be used in future mitigation activities.	This action is ongoing but has been edited to reflect McKean County's development of a GIS staff/department. See Action 12.
2.2.3: When funds become available for hazard mitigation projects, the county recommends that the municipalities hold a series of public meetings with the owners of repetitive loss properties in high risk areas. These meetings will also be used to identify high-risk properties in the unincorporated areas of the County and to determine potential participation in future acquisition and relocation projects.	This action has been edited and combined with another action. See Action 8.
3.1.1: McKean County CERT Trainers to teach Community Emergency Response Team (CERT) classes to interested citizens in McKean County to assist first responders at specified emergencies throughout the county. Additional trainers need to attend future Train-the-Trainer Courses.	This action has not been completed and has been discontinued because of lack of interest in the CERT program.

Table 6.1-2: List and review summary of 2011 mitigation actions.	
ACTION	**REVIEW**
3.1.2: EMA Office to work with the McKean County Fire Association, McKean County EMS and the Sheriff's Department to increase the number of trained citizen emergency responders by meeting with groups of potential volunteers to attempt to increase the number of trained responders for all County Fire Departments, Emergency Medical Services, Law Enforcement, etc. All areas of McKean County will benefit.	This action is ongoing but has been edited and reworded. See Action 22.
3.1.3: EMA Office to conduct annual tabletop and functional disaster exercises with local law enforcement, emergency managers, county and local officials, and other disaster response agencies. Types of exercises to include: Flood Exercise, Weapons of Mass Destruction Exercise, Hazardous Materials Spill Exercise, Weather Exercise and Bio-Terrorism Exercise.	This action has been removed.
3.1.4: EMA Office to provide information about local, regional, state, and federal training opportunities to fire departments, EMS, ambulance services, and other emergency responders. Develop a list of training opportunities that are available and to distribute the list to all local emergency responders. Will benefit all areas of McKean County.	This action is ongoing and is included in the 2019 HMPU update however it was updated and reworded. See Action 21.
3.1.5: Continue to conduct National Weather Service Storm Spotter classes by partnering with the National Weather Service to provide training to people throughout McKean County on Storm Spotting in the areas of Flooding, High Winds, and Basic I and II.	This action is ongoing and has been reworded; it is included in the 2019 HMPU update. See Action 16.
3.2.1: Review the existing McKean County Emergency Operations Plan (EOP) and update where necessary based on the recommendations of the McKean County Hazard Mitigation Plan. Include participation from all municipalities in the update process by ensuring that their EOPs are reviewed and updated annually.	This action is ongoing and is included in the 2019 HMPU. See Action 25.
3.2.2: McKean County to obtain two emergency service rescue vehicles to respond to emergencies within the county.	This action has been completed and is not included in the 2019 HMPU.
3.3.1: Expand the mission and membership of the McKean County Local Emergency Planning Committee (LEPC) to act as a countywide disaster task force by expanding their mission to include other disaster planning and response activities.	In an effort to maintain a viable, realistic Mitigation Action Plan that can be implemented over a five year period this action was not included in the 2019 HMPU. The LEPC has determined that this action is outside their scope.
3.4.1: Set and keep a schedule to update the Communications Center equipment and furniture.	This action is completed on an as-needed basis and is outside the scope of the HMP, so it is not in the 2019 HMPU.
3.4.2: Research the possibility of installing Emergency Alert Warning Sirens and equipment to reach all populated areas throughout the County.	This action has been reworded and edited. See action 14.

Table 6.1-2: List and review summary of 2011 mitigation actions.	
ACTION	**REVIEW**
3.4.3: Continue to distribute NOAA Weather Radios to McKean County municipalities, schools, hospitals, nursing homes, day care centers, and SARA facilities.	This action is ongoing but has been edited and reworded. See Action 14.
4.1.1: Continue to review Hazard Mitigation Questionnaires and post-disaster reviews submitted by the municipalities.	This action has been discontinued because of changes in the HMP plan maintenance procedures. It is not in the 2019 HMPU.
4.1.2: Continue to produce and submit Hazard Mitigation Project Opportunity Forms for high-risk structures/areas (especially post-disaster).	This action is ongoing but has been consolidated with related actions for the 2019 HMPU. See Action 8.
5.1.1: Work with DEP, conservation agencies, park and recreation organizations, wildlife groups and other appropriate agencies to collect information of the number and location of natural resource areas throughout the county.	This action has been completed and is not included in the 2019 HMPU.
5.1.2: County to develop a database in existing GIS system of all natural resource areas including maps to be used in future mitigation activities.	This action has been reworded and combined with another action. See action 12.
5.1.3: When funds become available for mitigation projects, the county plans to hold meetings to identify high-risk properties in the county and to determine potential participation in future acquisition and relocation projects.	This action is ongoing but has been consolidated with related actions for the 2019 HMPU update. See Action 8.
5.2.1: Planning Department to consider updating and implementing a County Recreation plan and Storm Water Management Plan for Potato Creek/Marvin Creek Watershed within the next five years.	This action has been completed and is not included in the 2019 HMPU.
5.2.2: PennDOT to investigate the possibility of wetland protection of additional acreage in McKean County.	In an effort to maintain a viable, realistic Mitigation Action Plan that can be implemented over a five year period this action was not included in the 2019 HMPU.
5.2.3: County to work with DEP, conservation agencies, etc., to research avenues for restoring degraded natural resources and open space to improve their flood control functions.	This action has been edited. See action 2
6.1.1: Create a “How To” Mitigation display for use at public events that would include information and pictures like that contained in FEMA’s publications: Retrofitting for Homeowners Guide, Elevating Your Flood prone Home, Elevating Residential Structures, and Information on the NFIP.	This action is in progress but has been modified to make it more feasible. It is included in the 2019 HMPU. See Action 17.

Table 6.1-2: List and review summary of 2011 mitigation actions.	
ACTION	**REVIEW**
6.1.2: Work with the McKean County Cooperative Extension Service to develop Animals in Disaster Displays that will be used at 4-H Clubs, Agricultural Fair, in Veterinarians Offices and other places that animal owners may gather. The display will have information about preparing and making a disaster plan and a disaster supply kit for animals. They will encourage animal owners to decide ahead of time where animals will be sheltered and to familiarize them with the County's Emergency Operations Plan Animals in Disaster Annex.	This action is ongoing and is included in the 2019 HMPU. See Action 20.
6.1.3**:** To meet with and encourage county businesses to develop a Business Continuity Plan. Raising the awareness level of WHY it is important to have a Business Continuity Plan, how to develop a plan and encouraging businesses to make sure that their plan fits in with the County's plan. Creating and using a display appropriate for use at local Chamber of Commerce meetings and activities, civic group gatherings, and other business-related gatherings.	This action is ongoing and is included in the 2019 HMPU. See Action 29.
6.1.4: Create displays for children's programs that teach safety. Examples of information to be used would be similar to that on the FEMA for Kids CD and/or the Sparky Fire Safety Program. McKean County to seek funding to purchase a trailer to utilize for conducting community training on fire safety and other relevant trainings.	This action was edited and combined with another action. See action 15.
6.1.5: Continue to utilize the media for the distribution and publication of hazard information by sending news releases and public service series to local newspapers, radio and TV stations about pre-disaster information. Designed to reach all areas of McKean County.	This action was edited and reworded. See actions 17 & 18.
6.1.6: Continue to work with non-governmental organizations to promote mitigation education and awareness by creating public speaking series on hazard related topics such as types of natural disasters and risks, how to develop a family disaster plan and disaster supply kit, sheltering in place, how to develop a business continuity plan, simple types of mitigation projects for homeowners and businesses, etc. These speaking engagements will be offered to boys and girls clubs, scouting organizations, family centers, civic groups such as Rotary and Kiwanis Clubs, the Chamber of Commerce, Church and interfaith groups, etc.	This action is in progress and has been carried over to the 2019 HMPU. See Action 15.
6.1.7: Ensure that the Red Cross citizen’s disaster course is held on a frequent basis. The American Red Cross will hold a variety of courses, including: Adult and Child CPR, Basic First Aid, Introduction to Disaster Services, Mass Care, Shelter Operations and others at the Red Cross Office and at other locations throughout the County.	This action is under the jurisdiction of the Potter-McKean County Red Cross and not this HMPU. It has been removed from the 2019 HMPU.

Table 6.1-2: List and review summary of 2011 mitigation actions.	
ACTION	**REVIEW**
6.1.8: Update the county website to provide hazard related information that is easily accessible. The County website once implemented can provide information about disaster preparedness and related activities. The plan is to expand and update the website as needed and as appropriate in a timely manner to benefit all County residents.	This action has been edited and reworded. See action 18.
6.1.9: Continue to work with the McKean County school districts to promote hazard mitigation education and awareness, provide information on emergency alert systems and discuss ways to better integrate mitigation into the curriculum such as science, math and other subjects.	This action has been edited and reworded. See Action 22.
6.2.1: Continue working with representatives from NFIP to hold local course on the National Flood Insurance Program (NFIP) for realtors, bankers, insurers and property owners to be attended from all areas of McKean County.	This action has been modified and combined with other similar actions for its inclusion in the 2019 HMPU. See Action 7.
6.2.2: Establish all-hazard resource centers to be located in the County Courthouse, Chamber of Commerce, municipalities, local libraries and senior centers. The centers will act as a repository for information on local hazard identification, preparedness, and mitigation strategies for use by citizens, realtors, and lenders. Centers would display information about the National Flood Insurance Program, Flood Insurance Rate Maps, books about mitigation for homeowners, the Are You Ready guide, Protecting Building Utilities from Flood Damage, Seeking Shelter from the Storm Books, etc.	This action has been edited and reworded. See Action 17.
6.2.3: Distribute brochures to county property owners or renters within the 100-year floodplain (now referred to as the 1%-annual-chance floodplain) regarding potential flood hazards. The content of the brochures may include the following information: the local flood hazard, flood safety, flood insurance information, property protection measures, the natural and beneficial functions of the local floodplain, a map of the local flood hazard area, information about NOAA Weather radios used for local weather warnings, floodplain development permit requirements and substantial improvement/damage requirements.	In an effort to maintain a viable, realistic Mitigation Action Plan that can be implemented over a five year period this action was not included in the 2019 HMPU

6.2 Mitigation Goals and Objectives

Based on results of the goals and objectives evaluation exercise and input from the HMPT, a list of six goals and nineteen corresponding objectives was developed. Table 6.2-1 details the mitigation goals and objectives established for the 2019 HMPU.

Table 6.2-1: List of Mitigation Strategy Goals and Objectives.	
GOAL 1	***Attempt to reduce the current and future risk of flood damage in McKean County.***
Objective 1.1	*McKean County will attempt to reduce the current and future risk of flood damage in McKean County by encouraging municipalities to direct new development away from high hazard areas by reviewing existing regulations to ensure adequacy in reducing the amount of future development in identified hazard areas.*
Objective 1.2	*Review county comprehensive plan to ensure that designated growth areas are not in hazard areas.*
Objective 1.3	*Continue to leverage state Department of Community and Economic Development assistance in updating municipal floodplain ordinances that meet or exceed NFIP standards.*
Objective 1.4	*Improve the enforcement of existing floodplain regulations.*
Objective 1.5	*Municipalities identify and digitally map storm sewer systems to facilitate routine maintenance.*
Objective 1.6	*Municipalities maintain a running database of roadside ditch excavation and regular maintenance.*
GOAL 2	***Reduce the potential impact and losses stemming from natural and human-made disasters on public and private property.***
Objective 2.1	*Encourage continued participation in the NFIP.*
Objective 2.2	*Protect McKean County's most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and technically feasible mitigation projects.*
Objective 2.3	*Support continued enforcement of the Uniform Construction Code in all jurisdictions.*
Objective 2.4	*Review existing zoning regulations and recommend municipalities that do not currently have zoning to adopt zoning.*
GOAL 3	***Improve upon the protection of the citizens of McKean County from all natural and human-made hazards before, during, and after events.***
Objective 3.1	*Evaluate existing shelters to determine adequacy for current and future populations.*
Objective 3.2	*Promote adequate training and resources for emergency organizations and personnel.*
Objective 3.3	*Improve emergency preparedness in McKean County and its municipalities.*
Objective 3.4	*Improve coordination and communication among disaster response organizations, local, and county governments.*
Objective 3.5	*Evaluate cost-effective ways of augmenting existing broadcast and communication systems to enable better response, monitor warning information continuously and to disseminate the appropriate warnings.*
GOAL 4	***Reduce or redirect the impact of natural disasters (especially floods) away from critical facilities***
Objective 4.1	*Research possible mitigation projects to reduce flooding, reduce/eliminate sewage leakage and inflow/infiltration problems. Some projects may include reservoirs, levees, floodwalls, diversions, channel modification, and storm sewers.*
GOAL 5	***Protect existing natural resources and open space, including parks and wetlands, to help prevent natural and human-made disasters.***
Objective 5.1	*Protect McKean County's natural resources through the implementation of cost-effective and technically feasible mitigation projects.*
Objective 5.2	*Protect McKean County's natural resources through the implementation and, where appropriate, enforcement, of recreation planning and stormwater management planning.*

Table 6.2-1: List of Mitigation Strategy Goals and Objectives.	
GOAL 6	***Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.***
Objective 6.1	*Develop and distribute public awareness materials about natural hazard risks, preparedness, and mitigation.*
Objective 6.2	*Target owners of properties within identified hazard areas for additional outreach regarding mitigation and disaster preparedness.*
Objective 6.3	*Assist municipalities in interpreting floodplain maps and materials, and in identifying the SFHAs on the ground.*

6.3 Identification and Analysis of Mitigation Techniques

McKean County used former mitigation actions identified in previous HMP's to identify mitigation techniques and develop mitigation actions. Simultaneously, like the rest of this plan, local experts on the HMPT, that have lived and worked in McKean County for the majority, if not all, of their lives used the past mitigation actions and their institutional knowledge to develop our current 30 actions that address hazards and risks that plague all of our 22 communities. There are four categories of mitigation actions which McKean County considered in developing its Mitigation Action Plan. Those categories include:

- **Public Education and Awareness:** These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Although this type of mitigation reduces risk less directly than structural projects or regulation, it is an important foundation. A greater understanding and awareness of hazards and risk among local officials, stakeholders, and the public is more likely to lead to direct actions.
- **Natural Systems Protection:** These are actions that minimize damage and losses and also preserve or restore the functions of natural systems.
- **Structural & Infrastructure Projects:** These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.
- **Plans & Regulations:** These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.

Table 6.3-1 provides a matrix identifying the mitigation techniques used for the moderate and high risk hazards in the County. The specific actions associated with these techniques are included in Table 6.4-1.

Table 6.3-1: Mitigation techniques used for moderate and high risk hazards in McKean County.				
HAZARD	MITIGATION TECHNIQUE			
	PUBLIC EDUCATION AND AWARENESS	NATURAL SYSTEMS PROTECTION	STRUCTURAL & INFRASTRUCTURE PROJECTS	PLANS & REGULATIONS
Wildfire	X	X	X	X
Winter Storm	X			X
Floods, Flash Floods, & Ice Jams	X	X	X	X
Invasive Species	X	X	X	X
Utility Interruptions	X	X	X	X
Dam Failures	X	X	X	X
Drought	X	X	X	X
Tornadoes & Windstorms	X	X	X	X
Urban Fire & Explosion	X	X	X	X

6.4 Mitigation Action Plan

Following the Risk Assessment stage of the HMP update process, the Risk Assessment Review and Mitigation Solutions Workshop was held on August 29, 2019 to develop a framework for the Mitigation Action Plan. Following the goals and objectives review and evaluation during the Mitigation Workshop, the group went over Mitigation Techniques using PEMA's *Mitigation Ideas* document. Municipal representatives were informed that they needed to have at least one hazard-related mitigation action for each municipality. However, due to such poor public and municipal attendance, the HMPU decided to have broad and widely applicable mitigation actions that would be applicable for the majority, if not all, of the municipalities. Following this, the HMPU took the 57 actions from the 2011 HMP and determined, based on the Evaluation of Identified Hazards and Risks form and the Capability Assessment Survey form, which actions were completed, which were not completed, which were potentially feasible, and which were not feasible. Lastly, addressing the most commonly determined and all-encompassing hazards and risks, the HMPU drafted, edited, reworded, combined, or deleted the former 57 actions and drafted our new 30 actions. Next, using GIS and location based actions (i.e. Action 1: Presence or absence of critical infrastructure in the floodplain), the HMPU drafted a table in which we would recommend a municipality participate in actions that we felt were relevant to each individual municipality based on their infrastructure, location, known hazards and risks, etc. Following this, 2 members of the HMPT, Gerard Rettger and Sean McLaughlin, met with all 22

municipalities again, to present our mitigation actions and determine if the municipalities would prefer to participate or wished to not participate in all 30 individual actions.

Table 6.4-1 lists all the mitigation actions for the 2019 HMPU. At least one mitigation action was established for each moderate and high-risk hazard in McKean County, but more than one action is identified for several hazards. Each jurisdiction has at least one action. Each mitigation action is intended to address one or more of the goals and objectives identified in Section 6.2. Actions 7 will contribute to continued compliance with and participation in the NFIP.

Table 6.4-1: List of 2019 mitigation actions with information including the community or communities affected, action category, hazard addressed, action description, lead agency/department, and general implementation schedule.	
COMMUNITY: Bradford City, Eldred Borough, Eldred Township, Foster, Liberty, Port Allegany, Smethport **ACTION NO: 1**	**ACTION:** Elevate and/or flood-proof critical municipal infrastructure to protect against flood damage.
Category:	Structure & Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Borough Council
Implementation Schedule:	As funding becomes available
Funding Source:	FEMA/HMGP
COMMUNITY: Bradford City, Bradford Township, Eldred Borough, Foster, Keating, Port Allegany, Smethport **ACTION NO: 2**	ACTION: Encourage municipalities and responsible authorities/parties (i.e Flood Control Authorities) to maintain flood control structures along the Allegheny River and tributaries to USACE specifications and standards.
Category:	Structure & Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam, Dam Failures
Lead Agency/Department:	Municipalities
Implementation Schedule:	Continuously
Funding Source:	Local funds, HMGP, FEMA, PEMA
COMMUNITY: All Municipalities	ACTION: Conduct (1) regular stream maintenance and restorations, (2)

Table 6.4-1: List of 2019 mitigation actions with information including the community or communities affected, action category, hazard addressed, action description, lead agency/department, and general implementation schedule.	
ACTION NO: 3	regular maintenance, repair, and replacement of drainage infrastructure, and (3) other various infrastructures along water features to mitigate flooding, erosion, and drainage issues.
Category:	Structure & Infrastructure Projects, Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam, Dam Failures
Lead Agency/Department:	Municipalities; McKean County Conservation District
Implementation Schedule:	Within 5 years
Funding Source:	Municipal funds, Conservation District (if funding/grants become available)
COMMUNITY: Bradford City, Bradford Township, Ceres, Corydon, Eldred Borough, Foster, Hamilton, Hamlin, Kane, Keating, Liberty, Lewis Run, Otto, Port Allegany, Wetmore	**ACTION:** Regularly perform maintenance on rip rap in drainage ditches to attempt to mitigate localized flooding.
ACTION NO: 4	
Category:	Structure & Infrastructure Projects, Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Municipalities, McKean County Conservation District (if funds are available)
Implementation Schedule:	As funding becomes available
Funding Source:	Municipal funds, DEP
COMMUNITY: Norwich	**ACTION:** Elevate Township Road 375 (Crosby Crossroad) to mitigate flooding issues.
ACTION NO: 5	
Category:	Structure & Infrastructure Projects, Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Norwich Township Supervisors
Implementation Schedule:	As funding becomes available

Table 6.4-1: List of 2019 mitigation actions with information including the community or communities affected, action category, hazard addressed, action description, lead agency/department, and general implementation schedule.	
Funding Source:	Township Funds, FEMA
COMMUNITY: All Municipalities **ACTION NO: 6**	**ACTION:** Conduct regular maintenance on roads, culverts, and other infrastructure to mitigate flooding on or near Roadways. In conjunction with Action No. 11, coordinate with Railroad Operators to compile annual lists of railroad maintenance that may result in flooding mitigation on or near railroad lines.
Category:	Structure & Infrastructure Projects, Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam, Transportation Accidents, Environmental Hazards, Invasive Species
Lead Agency/Department:	Conservation District, Railroad Company, PennDOT
Implementation Schedule:	Continuously
Funding Source:	Municipal funds, staff time
COMMUNITY: All Municipalities, except Kane **ACTION NO: 7**	**ACTION:** Arrange with PEMA/FEMA/DCED to hold training sessions with the County and the municipalities on the National Flood Insurance Program (NFIP), its requirements, and the Community Rating System requirements.
Category:	Public Education & Awareness
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	McKean County DES, McKean County Planning Commission
Implementation Schedule:	As needed with program changes
Funding Source:	Staff Time, PEMA, DCED
COMMUNITY: Bradford City, Bradford Township, Ceres, Eldred Borough, Eldred Township, Foster, Hamilton, Hamlin, Keating, Liberty, Lewis Run, Norwich, Otto, Port Allegany, Smethport, Wetmore **ACTION NO: 8**	**ACTION:** Work with PEMA to collect updated information of the number, location, and structural details of repetitive loss properties throughout the county and the municipalities in order to plan future mitigation activities and to target and prioritize at-risk structures, completing Hazard Mitigation opportunity forms and meeting with homeowners about the benefits of mitigating as appropriate. If funding becomes available perform acquisitions, demolitions, relocations, and elevations.
Category:	Structure & Infrastructure Projects, Public Education & Awareness
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam

Table 6.4-1: List of 2019 mitigation actions with information including the community or communities affected, action category, hazard addressed, action description, lead agency/department, and general implementation schedule.	
Lead Agency/Department:	McKean County DES
Implementation Schedule:	Continuously
Funding Source:	Staff Time; PEMA; HMGP
COMMUNITY: All Municipalities **ACTION NO: 9**	**ACTION:** MCPC and applicable municipal offices review comprehensive plans to suggest that designated growth areas are not in high hazard areas identified in this plan.
Category:	Structure & Infrastructure Projects, Plans & Regulations
Hazard(s) Addressed:	Floods, Flash Floods, & Ice Jams, Landslides, Wildfires, Dam Failures
Lead Agency/Department:	McKean County Planning Commission & McKean County GIS
Implementation Schedule:	As comprehensive plans are developed and/or updated
Funding Source:	Staff Time
COMMUNITY: All Municipalities **ACTION NO: 10**	**ACTION:** Encourage municipal offices and the planning commissions to review regulations pertaining to their jurisdiction to make sure that adequate zoning regulations are in place to reduce future development in high hazard area. Planning Commission(s) to review Subdivision and Land Development Ordinance.
Category:	Structure & Infrastructure Projects, Plans & Regulations
Hazard(s) Addressed:	Floods, Flash Floods, & Ice Jams, Landslides, Wildfires, Dam Failures
Lead Agency/Department:	McKean County Planning Commission
Implementation Schedule:	1-2 years and as ordinances are updated
Funding Source:	Staff Time

Table 6.4-1: List of 2019 mitigation actions with information including the community or communities affected, action category, hazard addressed, action description, lead agency/department, and general implementation schedule.	
COMMUNITY: Annin, Bradford City, Bradford Township, Ceres, Eldred Borough, Eldred Township, Foster, Hamilton, Hamlin, Kane Keating, Lafayette, Lewis Run, Liberty, Mt. Jewett, Norwich, Port Allegany, Sergeant, Wetmore **ACTION NO: 11**	**ACTION:** Monitor maintenance of railroads through the county to ensure they are inspected and maintained and prevent transportation accidents and transportation-related hazardous material releases. Catalog and inventory completed and scheduled maintenance of railroads and railroad right of ways with the railroad operators for each calendar year. EMA & GIS departments will attempt to coordinate their findings with the municipalities as it becomes available to us.
Category:	Structure & Infrastructure Projects, Plans & Regulations
Hazard(s) Addressed:	Transportation Accidents, Environmental Hazards, Floods, Flash floods, & Ice Jams
Lead Agency/Department:	Municipalities
Implementation Schedule:	Continuously
Funding Source:	Staff time
COMMUNITY: All Municipalities **ACTION NO: 12**	**ACTION:** Develop a database of existing hazards in GIS. Information can include maps, data, charts, past occurrences, etc. to be used in future mitigation activities. Also, establish computerized database of municipal streets that provides information regarding the condition and maintenance status of roads.
Category:	Structure & Infrastructure Projects, Plans & Regulations, Natural Systems Protections, Public Education & Awareness
Hazard(s) Addressed:	Wildfires, Floods, Flash floods, & Ice Jams, Dam Failures, Utility Interruption, Invasive Species, Transportation Accidents, Environmental Hazards, Landslides, Subsidence & Sinkholes, Urban Fire & Explosion
Lead Agency/Department:	McKean County GIS, McKean County DES
Implementation Schedule:	As funding becomes available
Funding Source:	Staff time, Municipal funds
COMMUNITY: All Municipalities **ACTION NO: 13**	**ACTION:** Conduct commodity flow study to fully understand hazardous materials flows in the county. Using information gathered from this study; enhance local hazardous material response capabilities through training and equipment purchases.
Category:	Plans & Regulations, Public Education & Awareness
Hazard(s) Addressed:	Environmental Hazards, Transportation Accidents

Table 6.4-1: List of 2019 mitigation actions with information including the community or communities affected, action category, hazard addressed, action description, lead agency/department, and general implementation schedule.	
Lead Agency/Department:	McKean County DES/LEPC
Implementation Schedule:	5 years
Funding Source:	DEP/EPA Grants, County Emergency Funds, Staff time
COMMUNITY: All Municipalities, except Kane **ACTION NO: 14**	**ACTION:** Encourage participation in the Ready PA initiative for municipalities and critical facilities.
Category:	Public Education & Awareness
Hazard(s) Addressed:	Earthquakes, Floods, Flash floods, & Ice Jams, Droughts, Landslides, Subsidence & Sinkholes, Tornadoes & Windstorms, Wildfires, Winterstorms, Environmental Hazards, Transportation Accidents, Terrorism, Urban Fire & Explosion, Utility Interruption, Dam Failure
Lead Agency/Department:	McKean County DES; Township Supervisors; Borough & City Councils
Implementation Schedule:	Ongoing
Funding Source:	N/a
COMMUNITY: All Municipalities **ACTION NO: 15**	**ACTION:** Continue to work with non-governmental organizations to promote mitigation education and awareness by creating public speaking series on hazard related topics such as types of natural disasters and risks, how to develop a family disaster plan and disaster supply kit, sheltering in place, how to develop a business continuity plan, simple types of mitigation projects for homeowners and businesses, etc.
Category:	Public Education & Awareness
Hazard(s) Addressed:	Earthquakes, Floods, Flash floods, & Ice Jams, Droughts, Landslides, Subsidence & Sinkholes, Tornadoes & Windstorms, Wildfires, Winterstorms, Environmental Hazards, Transportation Accidents, Terrorism, Urban Fire & Explosion, Utility Interruption, Dam Failure, Disorientation, Invasive Species
Lead Agency/Department:	McKean County DES
Implementation Schedule:	Continuously for next 5 years.
Funding Source:	Staff Time; PEMA
COMMUNITY: All Municipalities **ACTION NO: 16**	**ACTION:** Continue to conduct National Weather Service Skywarn training by partnering with the National Weather Service to provide training to people throughout McKean County on inclement weather events.
Category:	Public Education & Awareness, Natural Systems Protections, Structure & Infrastructure Projects

Table 6.4-1: List of 2019 mitigation actions with information including the community or communities affected, action category, hazard addressed, action description, lead agency/department, and general implementation schedule.	
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam, Tornado and Windstorm, Winterstorms
Lead Agency/Department:	McKean County DES
Implementation Schedule:	Continuously for next 5 years.
Funding Source:	National Weather Service
COMMUNITY: All Municipalities **ACTION NO: 17**	**ACTION:** Maintain information and pamphlets on social media, in print media, and in public places with information and pictures that support and enhance education on risk, mitigation and preparedness, and distribute this information to municipalities when the opportunity arises. Simultaneously, continue to utilize the media for the distribution and publication of hazard information by sending news releases and public service announcements to local newspapers, radio stations, and social media about pre-disaster information. Lastly, conduct community outreach that encourages precautions and preventive measures while also educating the public about various kinds of hazards.
Category:	Public Education & Awareness
Hazard(s) Addressed:	Earthquakes, Floods, Flash floods, & Ice Jams, Droughts, Landslides, Subsidence & Sinkholes, Tornadoes & Windstorms, Wildfires, Winterstorms, Environmental Hazards, Transportation Accidents, Terrorism, Urban Fire & Explosion, Utility Interruption, Dam Failure, Disorientation, Invasive Species
Lead Agency/Department:	McKean County DES
Implementation Schedule:	Continuously for next 5 years
Funding Source:	County; PEMA; FEMA; staff time
COMMUNITY: All Municipalities **ACTION NO: 18**	**ACTION:** Update the county website to provide hazard related information that is easily accessible and may be expanded and updated as needed and appropriate to benefit all County residents.
Category:	Public Education & Awareness
Hazard(s) Addressed:	Earthquakes, Floods, Flash floods, & Ice Jams, Droughts, Landslides, Subsidence & Sinkholes, Tornadoes & Windstorms, Wildfires, Winterstorms, Environmental Hazards, Transportation Accidents, Terrorism, Urban Fire & Explosion, Utility Interruption, Dam Failure, Disorientation, Invasive Species
Lead Agency/Department:	McKean County DES; McKean County Information Technology Department; McKean County GIS
Implementation Schedule:	Continuously for life of plan
Funding Source:	Staff Time

Table 6.4-1: List of 2019 mitigation actions with information including the community or communities affected, action category, hazard addressed, action description, lead agency/department, and general implementation schedule.	
COMMUNITY: Annin, Bradford City, Eldred Borough, Foster, Hamilton, Lafayette, Mt. Jewett, Otto, Port Allegany, Sergeant, Smethport, Wetmore	**ACTION:** Promote all shelters within McKean County have adequate emergency power resources. Work with the McKean-Potter Counties Chapter of the American Red Cross towards upgrading all shelter resources.
ACTION NO: 19	
Category:	Public Education & Awareness, Plans & Regulations
Hazard(s) Addressed:	Earthquakes, Floods, Flash floods, & Ice Jams, Droughts, Landslides, Subsidence & Sinkholes, Tornadoes & Windstorms, Wildfires, Winterstorms, Environmental Hazards, Transportation Accidents, Terrorism, Urban Fire & Explosion, Utility Interruption, Dam Failure,
Lead Agency/Department:	McKean County DES, McKean-Potter Red Cross
Implementation Schedule:	Every 2-3 years
Funding Source:	FEMA/HMGP; PEMA
COMMUNITY: All Municipalities	**ACTION:** Develop emergency shelter and evacuation plans for animals (domestic pets and livestock) by establishing a committee of representative of all areas of the County that will include veterinarians, pet store owners, the Humane Society, animal shelters and other interested parties to work on animal-specific evacuation and sheltering needs. Simultaneously, work with CART to develop Animals in Disaster Displays that will be used at 4-H Clubs, Agricultural Fair, in Veterinarians Offices and other places that animal owners may gather. The display will have information about preparing and making a disaster plan and a disaster supply kit for animals.
ACTION NO: 20	
Category:	Public Education & Awareness
Hazard(s) Addressed:	Earthquakes, Floods, Flash floods, & Ice Jams, Droughts, Landslides, Subsidence & Sinkholes, Tornadoes & Windstorms, Wildfires, Winterstorms, Environmental Hazards, Transportation Accidents, Terrorism, Urban Fire & Explosion, Utility Interruption, Dam Failure
Lead Agency/Department:	McKean County DES, CART, SART
Implementation Schedule:	Within 5 years
Funding Source:	CART, SART
COMMUNITY: All Municipalities	**ACTION:** Provide information about local, regional, state, and federal training opportunities to fire departments, EMS, law enforcement, and other emergency responders. Develop a list of training opportunities that are available and to distribute the list to all local emergency responders.
ACTION NO: 21	
Category:	Public Education & Awareness

Table 6.4-1: List of 2019 mitigation actions with information including the community or communities affected, action category, hazard addressed, action description, lead agency/department, and general implementation schedule.	
Hazard(s) Addressed:	Earthquakes, Floods, Flash floods, & Ice Jams, Droughts, Landslides, Subsidence & Sinkholes, Tornadoes & Windstorms, Wildfires, Winterstorms, Environmental Hazards, Transportation Accidents, Terrorism, Urban Fire & Explosion, Utility Interruption, Dam Failure, Disorientation, Invasive Species
Lead Agency/Department:	McKean County DES
Implementation Schedule:	Ongoing
Funding Source:	Staff Time; PEMA
COMMUNITY: All Municipalities **ACTION NO: 22**	**ACTION:** Encourage local elected officials to implement recruitment and retention initiatives to mitigate the loss of first responders. This includes reliance and utilization of the Seneca Highlands IU9 Career and Technical Center, Senate Resolution 6, and other various programs.
Category:	Public Education & Awareness
Hazard(s) Addressed:	Earthquakes, Floods, Flash floods, & Ice Jams, Droughts, Landslides, Subsidence & Sinkholes, Tornadoes & Windstorms, Wildfires, Winterstorms, Environmental Hazards, Transportation Accidents, Terrorism, Urban Fire & Explosion, Utility Interruption, Dam Failure, Disorientation, Invasive Species
Lead Agency/Department:	McKean County DES
Implementation Schedule:	As funding becomes available
Funding Source:	FEMA; PEMA; Pennsylvania State Fire Commissioners
COMMUNITY: All Municipalities **ACTION NO: 23**	**ACTION:** Implement curriculum at the Seneca Highlands Career and Technical Center Essential Services Program pertaining to hazard mitigation education and awareness, provide information on emergency alert systems and discuss ways to better integrate mitigation into the curriculum.
Category:	Public Education & Awareness
Hazard(s) Addressed:	Earthquakes, Floods, Flash floods, & Ice Jams, Droughts, Landslides, Subsidence & Sinkholes, Tornadoes & Windstorms, Wildfires, Winterstorms, Environmental Hazards, Transportation Accidents, Terrorism, Urban Fire & Explosion, Utility Interruption, Dam Failure, Disorientation, Invasive Species
Lead Agency/Department:	McKean County DES; Seneca Highlands Intermediate Unit 9
Implementation Schedule:	Continuously for next 5 years.
Funding Source:	Staff Time
COMMUNITY: All Municipalities **ACTION NO: 24**	**ACTION:** Enhance emergency communication options available to municipalities to enhance telecommunication capabilities to aid in mitigation, response, and recovery from hazards.

Table 6.4-1: List of 2019 mitigation actions with information including the community or communities affected, action category, hazard addressed, action description, lead agency/department, and general implementation schedule.	
Category:	Public Education & Awareness
Hazard(s) Addressed:	Earthquakes, Floods, Flash floods, & Ice Jams, Droughts, Landslides, Subsidence & Sinkholes, Tornadoes & Windstorms, Wildfires, Winterstorms, Environmental Hazards, Transportation Accidents, Terrorism, Urban Fire & Explosion, Utility Interruption, Dam Failure, Disorientation, Invasive Species
Lead Agency/Department:	McKean County DES, Municipality EMC
Implementation Schedule:	Continuous
Funding Source:	Staff time
COMMUNITY: All Municipalities **ACTION NO: 25**	**ACTION:** Review the existing McKean County Emergency Operations Plan (EOP) and update where necessary based on the recommendations of the McKean County Hazard Mitigation Plan. Include participation from all municipalities in the update process by ensuring that their EOPs are reviewed and updated annually and/or biannually.
Category:	Plans & Regulations
Hazard(s) Addressed:	Earthquakes, Floods, Flash floods, & Ice Jams, Droughts, Landslides, Subsidence & Sinkholes, Tornadoes & Windstorms, Wildfires, Winterstorms, Environmental Hazards, Transportation Accidents, Terrorism, Urban Fire & Explosion, Utility Interruption, Dam Failure, Disorientation, Invasive Species
Lead Agency/Department:	McKean County DES
Implementation Schedule:	Ongoing as EOPs are up for review and update.
Funding Source:	Staff Time
COMMUNITY: Bradford City, Eldred Borough, Eldred Township, Foster, Hamlin, Kane, Lafayette, Lewis Run, Mt. Jewett, Port Allegany, Smethport **ACTION NO: 26**	**ACTION:** Maintain & replace water systems to ensure fire protection capabilities and potable drinking water for residents.
Category:	Structure & Infrastructure Projects, Natural Systems Protections
Hazard(s) Addressed:	Urban Fire and Explosion, Drought, Transportation Accidents
Lead Agency/Department:	Municipal Water Authorities
Implementation Schedule:	5-10 years
Funding Source:	PennVest, Grants, Water Service Fees, Municipal funds

Table 6.4-1: List of 2019 mitigation actions with information including the community or communities affected, action category, hazard addressed, action description, lead agency/department, and general implementation schedule.	
COMMUNITY: All Municipalities **ACTION NO: 27**	**ACTION:** Develop a county-wide plan that addresses storm damage response and institutes debris and detritus removal procedures.
Category:	Plans & Regulations
Hazard(s) Addressed:	Tornadoes & Windstorm, Flood, Flash Flood, and Ice Jam, Transportation Accidents, Winterstorms, Landslides, Dam Failures, Environmental Hazards
Lead Agency/Department:	McKean County GIS, Township EMCs
Implementation Schedule:	Within 5 years
Funding Source:	PEMA; Staff time
COMMUNITY: Bradford City, Bradford Township, Foster, Keating, Smethport **ACTION NO: 28**	**ACTION:** Enhance the ability of refineries to notify of an emergency that requires the public to take action.
Category:	Public Education & Awareness
Hazard(s) Addressed:	Environmental Hazards, Urban Fire & Explosion
Lead Agency/Department:	Township Supervisors, Borough & City Councils
Implementation Schedule:	Within 5 years
Funding Source:	PEMA
COMMUNITY: Annin, Bradford City, Bradford Township, Corydon, Eldred Borough, Eldred Township, Foster, Hamilton, Keating, Lafayette, Lewis Run, Liberty, Mt. Jewett, Otto, Port Allegany, Sergeant, Smethport, Wetmore **ACTION NO: 29**	**ACTION:** Meet with and encourage county businesses to develop a Business Continuity Plan. Raise the awareness level of WHY it is important to have a Business Continuity Plan, HOW to develop a plan, and encourage businesses to make sure that their plan fits in with the County's plan. Creating and using a display appropriate for use at local Chamber of Commerce meetings and activities, civic group events, and other business-related gatherings.
Category:	Public Education & Awareness

Table 6.4-1: List of 2019 mitigation actions with information including the community or communities affected, action category, hazard addressed, action description, lead agency/department, and general implementation schedule.	
Hazard(s) Addressed:	Earthquakes, Floods, Flash floods, & Ice Jams, Droughts, Landslides, Subsidence & Sinkholes, Tornadoes & Windstorms, Wildfires, Winterstorms, Environmental Hazards, Transportation Accidents, Terrorism, Urban Fire & Explosion, Utility Interruption, Dam Failure, Invasive Species
Lead Agency/Department:	McKean County DES; McKean County Economic Development Office
Implementation Schedule:	Within 5 years
Funding Source:	Staff Time
COMMUNITY: All Municipalities **ACTION NO: 30**	**ACTION:** Encourage municipalities to work in coordination with the McKean County Conservation District (MCCD) and their Invasive Plant Management Program (APIPMA). Also, encourage municipalities to take advantage of the trainings and programs hosted by the MCCD.
Category:	Plans & Regulations, Natural Systems Protections, Public Education & Awareness
Hazard(s) Addressed:	Invasive Species,
Lead Agency/Department:	Municipalities, DCNR, Municipal Supervisors, McKean County Conservation District (if funds become available)
Implementation Schedule:	Continuously
Funding Source:	Municipal funds, DCNR grants, grants from McKean County Conservation District (if funds/grants become available)

Table 6.4-1 lists 30 mitigation actions, many of which will require substantial time commitments from staff at the County and local municipalities. Those that participated in the development of the 2019 HMP believe that these actions are attainable and can be implemented over the next five-year cycle. While all activities will be pursued over the next five years, the reality of limited time and resources requires the identification of high-priority mitigation actions. Prioritization allows the individuals and organizations involved to focus their energies and ensure progress on mitigation activities.

Mitigation actions were evaluated using the seven criteria which frame the *PASTEEL* method. These feasibility criteria include:

- **Political:** Does the action have public and political support?
- **Administrative:** Is there adequate staffing and funding available to implement the action in a timely manner?
- **Social:** Will the action be acceptable by the community or will it cause any one segment of the population to be treated unfairly?
- **Technical:** How effective will the action be in avoiding or reducing future losses?

- **Economic:** What are the costs and benefits of the action and does it contribute to community economic goals?
- **Environmental:** Will the action provide environmental benefits and will it comply with local, state and federal environmental regulations?
- **Legal:** Does the community have the authority to implement the proposed measure?

The *PASTEEL* method use political, administrative, social, technical, economic, environmental and legal considerations as a basis means of evaluating which of the identified actions should be considered most critical. Economic considerations are particularly important in weighing the costs versus benefits of implementing one action prior to another.

FEMA mitigation planning requirements indicate that any prioritization system used shall include a special emphasis on the extent to which benefits are maximized according to a cost-benefit review of the proposed projects. To do this in an efficient manner that is consistent with FEMA's guidance on using cost-benefit review in mitigation planning, the *PASTEEL* method was adapted to include a higher weighting for two elements of the *economic* feasibility factor – Benefits of Action and Costs of Action. This method incorporates concepts similar to those described in Method C of FEMA 386-5: Using Benefit Cost Review in Mitigation Planning (FEMA, 2007).

Those participating in the 2019 HMPU process provided comments which allowed for the prioritization of the mitigation actions listed in Table 6.4-1 using the seven *PASTEEL* criteria. In order to evaluate and prioritize the mitigation actions, *favorable* and *less favorable* factors were identified for each action. Table 6.4-2 summarizes the evaluation methodology and provides the results of this evaluation for all seventy-one mitigation actions. The first results column includes a summary of the feasibility factors, placing equal weight on all factors. The second results column reflects feasibility scores with benefits and costs weighted more heavily; and therefore, given greater priority. A weighting factor of three was used for each benefit and cost element. Therefore, a "+" benefit factor rating equals three pluses and a "-" benefit factor rating equals three minuses in the total prioritization score.

Figure 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

MITIGATION ACTIONS		*PA STEEL* CRITERIA CONSIDERATIONS (+) *Favorable* (-) *Less favorable* (N) *Not Applicable*																							
		P Political			**A** Administrative			**S** Social		**T** Technical			**E** Economic				**E** Environmental					**L** Legal				
NO.	**NAME**	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	**Benefit of Action (x3)**	**Cost of Action (x3)**	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**SUMMARY (EQUAL WEIGHTING)**	**SUMMARY (BENEFITS & COSTS PRIORITIZED)**
1	Elevate and/or flood-proof critical municipal infrastructure to protect against flood damage.	+	+	+	-	-	+	+	+	+	+	N	+	+	N	-	+	N	+	+	+	+	+	-	16+ 4- N3	20+ 4- N3
2	Encourage municipalities and responsible authorities/parties (i.e Flood Control Authorities) to maintain flood control structures along the Allegheny River and tributaries to USACE specifications and standards	+	+	+	-	-	-	+	-	+	+	-	+	+	+	-	+	N	N	+	+	+	+	-	14+ 7- N2	18+ 7- N2
3	Conduct (1) regular stream maintenance and restorations, (2) regular maintenance, repair, and replacement of drainage infrastructure, and (3) other various infrastructures along water features to mitigate	+	+	+	+	+	+	+	N	+	-	N	+	+	N	+	-	N	N	+	+	+	+	+	16+ 2- N5	20+ 2- N5

Figure 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

MITIGATION ACTIONS		*PA STEEL* CRITERIA CONSIDERATIONS (+) *Favorable* (-) *Less favorable* (N) *Not Applicable*																							
		P Political			**A** Administrative			**S** Social		**T** Technical			**E** Economic				**E** Environmental					**L** Legal				
NO.	**NAME**	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	**Benefit of Action (x3)**	**Cost of Action (x3)**	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**SUMMARY (EQUAL WEIGHTING)**	**SUMMARY (BENEFITS & COSTS PRIORITIZED)**
	flooding, erosion, and drainage issues..																								
4	Regularly perform maintenance on rip rap in drainage ditches to attempt to mitigate localized flooding.	+	+	+	+	+	+	+	N	+	+	N	+	+	N	-	+	N	N	+	N	N	+	+	15+ 1- N7	17+ 1- N7
5	Elevate Township Road 375 (Crosby Crossroad) to mitigate flooding issues.	+	+	+	-	-	-	+	N	+	+	N	+	-	+	-	N	N	N	N	N	N	+	N	9+ 5- N9	11+ 7- N9
6	Conduct regular maintenance on roads, culverts, and other infrastructure to mitigate flooding on or near Roadways. In conjunction with Action No. 11, coordinate with Railroad Operators to compile annual lists of railroad maintenance that may result in flooding mitigation on or near railroad lines.	+	+	+	-	+	+	+	N	+	-	N	+	+	+	-	N	N	N	N	N	N	+	N	11+ 3- N9	14+ 3+ N9
7	Arrange with PEMA/FEMA/DCED to hold training sessions with the	+	+	+	+	+	+	+	+	+	N	+	+	+	N	N	+	N	N	+	+	+	+	N	17+ 0- N6	21+ 0- N6

Figure 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

MITIGATION ACTIONS		*PA STEEL* CRITERIA CONSIDERATIONS (+) *Favorable* (-) *Less favorable* (N) *Not Applicable*																							
		P Political			**A** Administrative			**S** Social		**T** Technical			**E** Economic				**E** Environmental						**L** Legal				
NO.	**NAME**	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	**Benefit of Action (x3)**	**Cost of Action (x3)**	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**SUMMARY (EQUAL WEIGHTING)**	**SUMMARY (BENEFITS & COSTS PRIORITIZED)**
	County and the municipalities on the National Flood Insurance Program (NFIP), its requirements, and the Community Rating System requirements																								
8	Work with PEMA to collect updated information of the number, location, and structural details of repetitive loss properties throughout the county and the municipalities in order to plan future mitigation activities and to target and prioritize at-risk structures, completing Hazard Mitigation opportunity forms and meeting with homeowners about the benefits of mitigating as appropriate. If funding becomes available perform acquisitions, demolitions, relocations, and elevations..	N	+	N	N	N	N	N	+	+	N	N	+	+	N	N	N	N	N	N	+	+	+		8+ 0- N15	12+ 0- N15

Figure 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

MITIGATION ACTIONS		*PA STEEL* CRITERIA CONSIDERATIONS (+) *Favorable* (-) *Less favorable* (N) *Not Applicable*																							
		P Political			**A** Administrative			**S** Social		**T** Technical			**E** Economic				**E** Environmental					**L** Legal				
NO.	**NAME**	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	**Benefit of Action (x3)**	**Cost of Action (x3)**	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**SUMMARY (EQUAL WEIGHTING)**	**SUMMARY (BENEFITS & COSTS PRIORITIZED)**
9	MCPC and applicable municipal offices review comprehensive plans to suggest that designated growth areas are not in high hazard areas identified in this plan.	+	+	+	-	+	N	+	N	+	+	N	+	+	+	-	N	N	N	+	+	N	+	N	13+ 2- N8	17+ 2- N8
10	Encourage municipal offices and the planning commissions to review regulations pertaining to their jurisdiction to make sure that adequate zoning regulations are in place to reduce future development in high hazard area. Planning Commission(s) to review Subdivision and Land Development Ordinance..	+	+	N	-	-	N	+	+	+	N	+	+	+	+	-	+	+	+	+	+	+	+	N	16+ 3- N4	20+ 3- N4
11	Monitor maintenance of railroads through the county to ensure they are inspected and maintained and prevent transportation accidents and transportation-related	+	+	+	-	-	-	+	+	+	+	N	+	+	+	N	+	N	+	+	+	-	-	N	14+ 5- N4	18+ 5- N4

Figure 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

MITIGATION ACTIONS		*PA STEEL* CRITERIA CONSIDERATIONS (+) *Favorable* (-) *Less favorable* (N) *Not Applicable*																							
		P Political			**A** Administrative			**S** Social		**T** Technical			**E** Economic				**E** Environmental					**L** Legal				
NO.	**NAME**	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	**Benefit of Action (x3)**	**Cost of Action (x3)**	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**SUMMARY (EQUAL WEIGHTING)**	**SUMMARY (BENEFITS & COSTS PRIORITIZED)**
	hazardous material releases. Catalog and inventory completed and scheduled maintenance of railroads and railroad right of ways with the railroad operators for each calendar year. EMA & GIS departments will attempt to coordinate their findings with the municipalities as it becomes available to us..																								
12	Develop a database of existing hazards in GIS. Information can include maps, data, charts, past occurrences, etc. to be used in future mitigation activities. Also, establish computerized database of municipal streets that provides information regarding the condition and maintenance status of roads.	+	+	+	+	-	+	+	N	+	+	N	+	+	N	-	N	N	N	+	N	N	+	N	12+ 2- N9	14+ 2- N9

Figure 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

MITIGATION ACTIONS		*PA STEEL* CRITERIA CONSIDERATIONS (+) *Favorable* (-) *Less favorable* (N) *Not Applicable*																							
		P Political			**A** Administrative			**S** Social		**T** Technical			**E** Economic				**E** Environmental					**L** Legal				
NO.	**NAME**	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	**Benefit of Action (x3)**	**Cost of Action (x3)**	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**SUMMARY (EQUAL WEIGHTING)**	**SUMMARY (BENEFITS & COSTS PRIORITIZED)**
13	Conduct commodity flow study to fully understand hazardous materials flows in the county. Using information gathered from this study; enhance local hazardous material response capabilities through training and equipment purchases.	-	+	N	-	-	N	N	N	+	-	N	+	+	N	+	+	N	+	+	N	+	+	N	10+ 4- N9	14+ 4- N9
14	Encourage participation in the Ready PA initiative for municipalities and critical facilities.	+	+	+	+	+	+	+	N	+	-	N	+	+	N	-	-	N	N	+	N	N	N	N	11+ 3- N9	14+ 3- N9
15	Continue to work with non-governmental organizations to promote mitigation education and awareness by creating public speaking series on hazard related topics such as types of natural disasters and risks, how to develop a family disaster plan and disaster supply kit, sheltering in place, how to develop a business	+	+	+	N	N	N	+	+	N	N	N	+	+	N	-	N	N	N	N	N	+	+	N	9+ 1- N13	13+ 1- N13

Figure 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

MITIGATION ACTIONS		*PA STEEL* CRITERIA CONSIDERATIONS (+) *Favorable* (-) *Less favorable* (N) *Not Applicable*																							
		P Political			**A** Administrative			**S** Social		**T** Technical			**E** Economic				**E** Environmental						**L** Legal				
NO.	**NAME**	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	**Benefit of Action (x3)**	**Cost of Action (x3)**	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**SUMMARY (EQUAL WEIGHTING)**	**SUMMARY (BENEFITS & COSTS PRIORITIZED)**
	continuity plan, simple types of mitigation projects for homeowners and businesses, etc.																								
16	Continue to conduct National Weather Service Skywarn training by partnering with the National Weather Service to provide training to people throughout McKean County on inclement weather events..	+	+	+	+	+	N	+	N	N	N	N	+	+	N	N	N	N	N	N	N	N	+	N	9+ 0- N14	13+ 0- N14
17	Maintain information and pamphlets on social media, in print media, and in public places with information and pictures that support and enhance education on risk, mitigation and preparedness, and distribute this information to municipalities when the opportunity arises. Simultaneously, continue to	+	+	+	+	-	-	+	N	N	N	N	+	+	N	-	N	N	N	N	N	+	+	N	9+ 3- N11	13+ 3- N11

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	utilize the media for the distribution and publication of hazard information by sending news releases and public service announcements to local newspapers, radio stations, and social media about pre-disaster information. Lastly, conduct community outreach that encourages precautions and preventive measures while also educating the public about various kinds of hazards..																								
18	Update the county website to provide hazard related information that is easily accessible and may be expanded and updated as needed and appropriate to benefit all County residents.	+	+	+	-	+	N	+	N	+	+	N	+	+	+	-	N	N	N	N	N	N	+	N	11+ 2- N10	13+ 2- N10

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19	Promote all shelters within McKean County have adequate emergency power resources. Work with the McKean-Potter Counties Chapter of the American Red Cross towards upgrading all shelter resources interested parties to work on animal-specific evacuation and sheltering needs.	+	+	N	N	N	-	+	+	+	+	N	+	+	N	-	N	N	N	+	N	N	N	N	9+ 2- N12	13+ 2- N12
20	Develop emergency shelter and evacuation plans for animals (domestic pets and livestock) by establishing a committee of representative of all areas of the County that will include veterinarians, pet store owners, the Humane Society, animal shelters and other interested parties to work on animal-specific evacuation and sheltering needs. Simultaneously, work with CART to develop	N	+	N	-	-	N	+	+	N	N	N	+	+	N	-	N	N	N	N	N	N	N	N	5+ 3- N15	9+ 3- N15

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MITIGATION ACTIONS		*PA STEEL* CRITERIA CONSIDERATIONS (+) *Favorable* (-) *Less favorable* (N) *Not Applicable*																							
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	Animals in Disaster Displays that will be used at 4-H Clubs, Agricultural Fair, in Veterinarians Offices and other places that animal owners may gather. The display will have information about preparing and making a disaster plan and a disaster supply kit for animals..																								
21	Provide information about local, regional, state, and federal training opportunities to fire departments, EMS, law enforcement, and other emergency responders. Develop a list of training opportunities that are available and to distribute the list to all local emergency responders..	+	+	N	+	+	N	N	+	N	N	+	+	+	N	+	N	N	N	N	N	N	+	N	10+ 0- N13	14+ 0- N13
22	Encourage local elected officials to implement recruitment and retention initiatives to mitigate the loss	+	+	+	-	N	N	+	N	+	+	N	+	+	N	N	N	N	N	N	N	+	N	N	9+ 1- N13	13+ 1- N13

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	of first responders. This includes reliance and utilization of the Seneca Highlands IU9 Career and Technical Center, Senate Resolution 6, and other various programs.number of trained responders for all County Fire Departments, Emergency Medical Services, Law Enforcement, etc.																								
23	Implement curriculum at the Seneca Highlands Career and Technical Center Essential Services Program pertaining to hazard mitigation education and awareness, provide information on emergency alert systems and discuss ways to better integrate mitigation into the curriculum.	+	+	+	-	N	N	+	N	+	+	N	+	+	N	N	N	N	N	N	N	+	N	N	9+ 1- N13	13+ 1- N13
24	Enhance emergency communication options available to municipalities to	+	+	+	N	+	N	+	N	+	+	+	+	+	N	-	N	N	N	N	N	N	N	N	10+ 1- N12	14+ 1- N12

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MITIGATION ACTIONS		*PA STEEL* CRITERIA CONSIDERATIONS (+) *Favorable* (-) *Less favorable* (N) *Not Applicable*																							
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NO.	**NAME**	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	**Benefit of Action (x3)**	**Cost of Action (x3)**	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**SUMMARY (EQUAL WEIGHTING)**	**SUMMARY (BENEFITS & COSTS PRIORITIZED)**
	enhance telecommunication capabilities to aid in mitigation, response, and recovery from hazards.																								
25	Review the existing McKean County Emergency Operations Plan (EOP) and update where necessary based on the recommendations of the McKean County Hazard Mitigation Plan. Include participation from all municipalities in the update process by ensuring that their EOPs are reviewed and updated annually and/or biannually. .McKean County Hazard Mitigation Plan. Include participation from all municipalities in the update process by ensuring that their EOPs are reviewed and updated annually.	+	+	N	+	+	+	N	N	+	N	+	+	+	N	N	N	N	N	N	+	+	+	N	12+ 0- N11	16+ 0- N11

Figure 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

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26	Maintain & replace water systems to ensure fire protection capabilities and potable drinking water for residents, hospitals, nursing homes, day care centers, and SARA facilities.	-	+	+	-	-	-	+	+	+	+	-	+	-	N	-	N	N	N	N	N	N	-	N	7+ 8- N8	9+ 8- N8
27	Develop a county-wide plan that addresses storm damage response and institutes debris and detritus removal procedures..	+	+	+	-	-	+	+	N	+	+	N	+	+	+	-	N	N	N	N	+	+	+	N	13+ 3- N7	17+ 3- N7
28	Enhance the ability of refineries to notify of an emergency that requires the public to take action.	+	+	+	-	-	N	+	+	+	N	N	+	-	N	-	N	N	+	N	N	N	N	N	8+ 1- N11	12+ 1- N11
29	Meet with and encourage county businesses to develop a Business Continuity Plan. Raise the awareness level of WHY it is important to have a Business Continuity Plan, HOW to develop a plan, and encourage businesses to make sure that their plan fits	N	+	N	N	-	N	+	+	N	+	+	+	+	+	N	N	N	N	N	N	+	+	N	10+ 1- N12	14+ 1- N12

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	in with the County's plan. Creating and using a display appropriate for use at local Chamber of Commerce meetings and activities, civic group events, and other business-related gatherings about preparing and making a disaster plan and a disaster supply kit for animals. They will encourage animal owners to decide ahead of time where animals will be sheltered and to familiarize them with the County's Emergency Operations Plan Animals in Disaster Annex.																									
30	Encourage municipalities to work in coordination with the McKean County Conservation District (MCCD) and their Invasive Plant Management Program (APIPMA). Also, encourage municipalities to take advantage of the	+	+	+	-	-	-	+	N	+	-	N	+	+	-	+	-	N	-	+	N	N	+	+	11+ 7- N5	14+ 7- N5

Figure 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

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		P Political			**A** Administrative			**S** Social		**T** Technical			**E** Economic				**E** Environmental					**L** Legal				
NO.	**NAME**	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	**Benefit of Action (x3)**	**Cost of Action (x3)**	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**SUMMARY (EQUAL WEIGHTING)**	**SUMMARY (BENEFITS & COSTS PRIORITIZED)**
	trainings and programs hosted by the MCCD																								

Using cost-benefit weighted prioritization, four actions received greater unfavorable ratings than the other 26 actions, however all 30 actions received greater favorable ratings than unfavorable ratings. The four actions that had the greatest amount of unfavorable ratings include Actions 2, 5, 26, & 30. Action 2 pertains to maintaining flood control structures along the Allegheny river and its tributaries to US Army Corp of Engineer standards; Action 5 involves Norwich Township elevating and flood-proofing a low-lying road and bridge over a tributary of the Allegheny River; Action 26 encourages municipalities and responsible authorities to maintain and replace public water systems to ensure fire protection and to provide potable drinking water to residents; and Action 30 insists that municipalities work with the McKean County Conservation District in order to address our Invasive Species issues. The ratings do not mean that these actions should not be considered. Rather, barriers to implementation may increase their costs (i.e. political, financial, time, etc…) and therefore reduce overall benefits. For example, replacing municipal water supply infrastructure always require permits, coordination with government entities, and expenses to complete the activities which may cause tax increases on locals.

7. Plan Maintenance

7.1 Update Process Summary

Monitoring, evaluating and updating this plan, is critical to maintaining its value and success in McKean 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. The core change is that the 2019 HMPU establishes a review of the plan within 30 days of a disaster event in addition to continuing the 2019 HMP's annual plan evaluation. This HMPU's plan maintenance also defines the municipalities' role in updating and evaluating the plan. Finally, the 2019 HMPU elaborates upon 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

The HMPT established for the 2019 HMPU is designated to administer the plan maintenance processes of monitoring, evaluation and updating with support and representation from all 22 participating municipalities. Tracy Carl, Director of the McKean County Emergency Management Agency, Gerard Rettger Deputy Director of the McKean County Emergency Management Agency, and Bruce Manning retired Director of the McKean County Emergency Management Agency and current hazardous material officer, in coordination with Jeremy Morey, Director of the McKean County Planning Commission, and Sean McLaughlin, McKean County GIS Coordinator, will lead the HMPT in all associated plan maintenance requirements, including annual reviews. The HMPT will coordinate maintenance efforts, but the input needed for effective periodic evaluations will come from community representatives, local emergency management coordinators and planners, the general public and other important stakeholders. The HMPT will oversee the progress made on the implementation of action items identified in the 2019 HMPU and modify actions, as needed, to reflect changing conditions. The HMPT will meet annually on or around the anniversary of plan adoption to discuss specific coordination efforts that may be needed with other stakeholders. In particular, the HMPT will strongly suggest the compilation and inclusion of detailed information on the administration of the NFIP from participating communities. Should a significant disaster occur within the County, the HMPT will reconvene within 30 days of the disaster to review and update the HMPU. Meetings will be summarized in annual reports and progress reports that will be incorporated into the next plan update.

Each municipality will be invited to continually participate and have input on mitigation activities and hazard events within their respective communities. The municipalities and their local emergency management coordinator have been asked to catalog and record mitigation activities that the municipalities do on their own accord, as suggested and encouraged in the mitigation actions aforementioned. These municipal and community representatives will be asked to work with the HMPT to provide updates on applicable mitigation actions and feedback on changing hazard vulnerabilities within their community. The role of the municipal

representatives will be most important when increasing the amount and quality of information on the day-to-day administration of the NFIP.

Upon each HMPU evaluation, the HMPT will consider whether applications should be submitted for existing mitigation grant programs. A decision to apply for funding will be based on appropriate eligibility and financial need requirements. The HMPT will also support local and county officials in applying for post-disaster mitigation funds when they are available. All state and federal mitigation funding provided to the County or local municipalities will be reported in subsequent plan updates. In addition, new plans and programs being developed within the County will be evaluated as to the ability and necessity to incorporate the 2019 HMPU into them.

The 2019 HMPU will be updated every five years, as required by the Disaster Mitigation Act of 2000, or following a disaster event. Future plan updates will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. During the five-year review process, the following questions will be considered as criteria for assessing the effectiveness the McKean County HMPU.

- Has the nature or magnitude of hazards affecting the County changed?
- Are there new hazards that have the potential to impact the County?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the Plan?
- Should additional local resources be committed to address identified hazards?

Issues that arise during monitoring and evaluation which require changes to the risk assessment, mitigation strategy and other components of the plan will be incorporated during future updates.

7.3 Incorporation into Other Planning Mechanisms

Based on the comprehensive nature of this plan, the HMPT believes that this document will be highly useful when updating and developing other planning mechanisms in the County. Specific documents that the HMPT will actively incorporate information from the 2019 HMPU into include:

- McKean County Comprehensive Plan: Section 4.4.4, Future Development and Vulnerability, will provide information for the development of the next County Comprehensive Plan by making available specific risk and vulnerability information for the entire county but more specifically the potential areas of growth.
- McKean County Emergency Operations Plan: The 2019 HMPU will provide information on risk and vulnerability that will be extremely important to consider and incorporate into the next County EOP. Probability and vulnerability can direct emergency management efforts and response.

- McKean County Hazard Vulnerability Analysis: The County EMA's HVA and the County HMPU are mutually beneficial plans that are used together to better understand risk and vulnerability. Just as the existing County HVA was used to supplement the development of this plan, the 2019 HMPU will be used to aid in goal and objective development, hazard identification, and risk assessment in the next County HVA.
- Municipality Local Land Use Regulations: The Hazard Mitigation Plan provides an opportunity to contribute to local land use regulations to steer development away from hazard-prone areas. The Risk Assessment section of this plan also helps identify locations of existing buildings and infrastructure that can be protected from known hazards.
- Act 167 Stormwater Management Plan: This plan is nearly complete. It is expected to contribute to hazard mitigation in the County as it encourages proactive solutions to stormwater management and thus, flood hazards. When it is time for the plan to be updated, the results of the 2019 HMPU vulnerability analysis, particularly for flooding, will be taken into consideration when finalizing this stormwater management plan and any new stormwater management plans.

7.4 Continued Public Involvement

As was done during the development of the 2011 HMPU, the HMPT will involve the public during the evaluation and update of the HMPU through various workshops and meetings. The public will have access to an electronic copy of the current HMPU through their local municipal office, McKean County Emergency Management Agency, the McKean County Planning Commission, or the McKean County GIS office. The EMA will also keep a paper copy of the plan should a citizen not have ready electronic access. Information on upcoming events related to the HMPU or solicitation for comments will be announced via newsletters, newspapers, mailings, and on the County website (http://www.mckeancountypa.org). The HMPT will incorporate all relevant comments during the next update of the HMPU.

8. Plan Adoption

The Plan was submitted to the Pennsylvania State Hazard Mitigation Officer on November 22, 2019. It was forwarded to FEMA for final review and approval-pending-adoption on December 16, 2019. FEMA granted approval-pending-adoption on February 24, 2020. Full approval from FEMA was received on <INSERT DATE HERE>.

This section of the plan includes copies of the local adoption resolutions passed by McKean County and its municipal governments; the completed Local Mitigation Plan Review Crosswalk can be found in **Appendix B**. Adoption resolution templates are provided to assist the County and municipal governments with recommended language for future adoption of the HMP.

McKean County 2019 Hazard Mitigation Plan

County Adoption Resolution

Resolution No. _____

McKean County, Pennsylvania

WHEREAS, the municipalities of McKean County, Pennsylvania are most vulnerable to natural and human-made hazards which may result in loss of life and property, economic hardship, and threats to public health and safety, and

WHEREAS, Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000) requires state and local governments to develop and submit for approval to the President a mitigation plan that outlines processes for identifying their respective natural hazards, risks, and vulnerabilities, and

WHEREAS, McKean County acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and

WHEREAS, the McKean County 2019 Hazard Mitigation Plan has been developed by the McKean County Emergency Management Agency and the McKean County Planning Commission in cooperation with other county departments, local municipal officials, and the citizens of McKean County, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2011 was conducted to develop the McKean County 2019 Hazard Mitigation Plan, and

WHEREAS, the McKean County 2019 Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-made hazards that face the County and its municipal governments,

NOW THEREFORE BE IT RESOLVED by the governing body for the County of McKean that:

- The McKean County 2019 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the County, and
- The respective officials and agencies identified in the implementation strategy of the McKean County 2019 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2020

ATTEST:

_____

MCKEAN COUNTY COMMISSIONERS

By _____

By _____

By _____

McKean County 2019 Hazard Mitigation Plan

Municipal Adoption Resolution

Resolution No. _____
<*Borough/Township of Municipality Name*>, McKean County, Pennsylvania

WHEREAS, the <*Borough/Township of Municipality Name*>, McKean County, Pennsylvania is most vulnerable to natural and human-made hazards which may result in loss of life and property, economic hardship, and threats to public health and safety, and

WHEREAS, Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000) requires state and local governments to develop and submit for approval to the President a mitigation plan that outlines processes for identifying their respective natural hazards, risks, and vulnerabilities, and

WHEREAS, the <*Borough/Township of Municipality Name*> acknowledges the requirements of Section 322 of DMA 2011 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and

WHEREAS, the McKean County 2019 Hazard Mitigation Plan has been developed by the McKean County Emergency Management Agency and the McKean County Planning Commission in cooperation with other county departments, and officials and citizens of <*Borough/Township of Municipality Name*>, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2011 was conducted to develop the McKean County 2019 Hazard Mitigation Plan, and

WHEREAS, the McKean County 2019 Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-made hazards that face the County and its municipal governments,

NOW THEREFORE BE IT RESOLVED by the governing body for the <*Borough/Township of Municipality Name*>:

- The McKean County 2019 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the <*Borough/Township*>, and
- The respective officials and agencies identified in the implementation strategy of the McKean County 2019 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2020

ATTEST: ***<BOROUGH/TOWNSHIP OF MUNICIPALITY NAME>***

_____ By _____

By _____

9. Appendices

Appendix A – Bibliography
Appendix B – Local Plan Review Tool
*Appendix C – Local Municipality Flood Vulnerability Maps****
*** Available upon request*
Appendix D – Critical Facilities
Appendix E – Public Meeting Attendance and Documentation
Appendix F – Dam Failure Hazard Profile (Section 4.3.5)
*Appendix G – HAZUS Results Report (** from 2011 HMP)*
Appendix H – Hazardous Material Facilities