UNION COUNTY 2020

HAZARD MITIGATION PLAN UPDATE

PREPARED FOR:

Union County Commissioners
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COUNTY of UNION
PENNSYLVANIA

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Certification of Annual Review Meetings

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

YEAR	DATE OF MEETING	PUBLIC OUTREACH ADDRESSED?*	SIGNATURE
2015	N/A	N/A	To the best knowledge of the Union County HMPT, no HMP progress reports were submitted from municipalities for the period from 2015-2019 although some mitigation actions were accomplished in this period. Progress on actions is discussed in detail in Section 6.1 of this plan.
2016	N/A	N/A	
2017	N/A	N/A	
2018	N/A	N/A	
2019	N/A	N/A	
2020			
2021			
2022			
2023			

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

Record of Changes

DATE	DESCRIPTION OF CHANGE MADE, MITIGATION ACTION COMPLETED, OR PUBLIC OUTREACH PERFORMED	CHANGE MADE BY (PRINT NAME)	CHANGE MADE BY (SIGNATURE)
2015-2019	To the best knowledge of the Union County HMPT, no HMP progress reports were submitted from municipalities for the period from 2015-2019 although some mitigation actions were accomplished in this period. Progress on actions is discussed in detail in Section 6.1 of this plan.	N/A	N/A

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**
CFR	Code of Federal Regulations	NFPA	National Fire Protection Association
CKCOG	Central Keystone Council of Governments	NHC	National Hurricane Center
CRS	Community Ratings System	NIDIS	National Integrated Drought Information System
DCED	Department of Community and Economic Development	NOAA	National Oceanic and Atmospheric Association
DCNR	Department of Conservation and Natural Resources	NWS	National Weather Service
DCNR-BOF	Department of Conservation and Natural Resources-Bureau of Forestry	PEIRS	Pennsylvania Emergency Incident Reporting System
DMA	Disaster Mitigation Act	PA DEP	Pennsylvania Department of Environmental Protection
EOP	Emergency Operations Plan	PaGWIS	Pennsylvania Groundwater Information System
EOC	Emergency Operations Center	PASDA	Pennsylvania Spatial Data Access
EMC	Emergency Management Coordinator	PDM	Pre-Disaster Mitigation Assistance Program
EPA	Environmental Protection Agency	PDSI	Palmer Drought Severity Index
FEMA	Federal Emergency Management Agency	PEMA	Pennsylvania Emergency Management Agency
FIRM	Flood Insurance Rate Map	PennDOT	Pennsylvania Department of Transportation
FMA	Flood Mitigation Assistance Program	RF	Risk Factor
HMGP	Hazard Mitigation Grant Program	SALDO	Subdivision and Land Development Ordinance
HMPT	Hazard Mitigation Planning Team	SEDA-COG	Susquehanna Economic Development Association and Council of Governments
HMPU	Hazard Mitigation Plan Update	SFHA	Special Flood Hazard Area

Table of Acronyms			
ACRONYM	**FULL NAME**	**ACRONYM**	**FULL NAME**
HVA	Hazards Vulnerability Analysis	SOG	Standard Operating Guide
ICC	International Code Council	UCC	Universal Construction Code
IBC	International Building Code	US DOT	United States Department of Transportation
NCDC	National Climatic Data Center	USACE	United States Army Corps of Engineers
NDIS	National Drought Information System	USDA	United States Department of Agriculture
NDMC	National Drought Mitigation Center	USGS	United States Geological Survey
NFIP	National Flood Insurance Program	WYO	Write Your Own

1. Introduction

1.1. Background

This plan is an update of the *Union County 2014 Hazard Vulnerability Assessment and Mitigation Plan Update*. The 2014 plan was updated by Union County Pennsylvania and the 14 jurisdictions within the County and was approved and adopted for implementation in 2015.

Union County is at-risk of damage from a variety of hazards: drought; earthquake; flood, flash flood, and ice jams; hurricane, tropical storm, and nor'easter; landslide; subsidence and sinkhole; tornado and windstorm; wildfire; winter storm; environmental hazards; transportation accidents; and utility interruption. This plan explains a rigorous analysis of the potential impacts of these natural and human-made hazards on people, structures, and infrastructure within Union County and proposes hazard mitigation measures to reduce the risk of a natural or human-made hazard leading to a disaster with property loss, business disruption, or even loss of life.

The emergency management community, citizens, elected officials, and others in Union County recognize the potential impacts of hazards on their community and have developed this plan to mitigate potential damages and reduce future losses. Hazard mitigation actions reduce the potential for loss of life and destruction of property. Mitigation actions are taken in advance of the occurrence of a potential hazard and are essential for breaking the disaster cycle of damage, reconstruction, and repeated damage.

Accordingly, the Union County Hazard Mitigation Planning Team (HMPT), composed of government leaders from Union County, in cooperation with elected officials of the County and its municipalities have prepared this Hazard Mitigation Plan 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 it will also respect the character and needs of the community.

Union County Department of Public Safety (EMA) takes an all-hazards approach to community preparedness, response, recovery and mitigation processes through its day to day operations.

1.2. Purpose

This plan was developed for the purpose of:

- Providing a blueprint for reducing property damage and saving lives from the effects of future natural and human-made hazards in Union County;
- Complying with state and federal legislative requirements for County mitigation in order for the County to be eligible for federal and technical assistance from State and Federal hazard mitigation programs;
- Identifying, introducing, and implementing cost-effective hazard mitigation measures in order to accomplish County goals and objectives and to raise awareness and acceptance of hazard mitigation; and
- Improving community resiliency following a disaster event.

Adoption of this plan ensures that Union County and participating jurisdictions continue to be eligible to apply for and receive certain federal grant funds that are administered by the Commonwealth of Pennsylvania for the Federal Emergency Management Agency (FEMA). This plan complies with the requirements of the Disaster Mitigation Act of 2000 and its implementing regulations published in Title 44 of the Code of Federal Regulations (CFR) Section 201.6.

1.3. Scope

The Union County 2020 Hazard Mitigation Plan Update has been prepared to meet requirements set forth by FEMA and the 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 continually address hazards determined to be of significant risk to the County and/or its local municipalities. Updates will take place following significant disasters or at a minimum, every five years.

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;
- 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 2002.
- FEMA 386-2: *Understanding Your Risks: Identifying Hazards and Estimating Losses*. August 2001.
- FEMA 386-3: *Developing the Mitigation Plan*. April 2003.
- FEMA 386-4: *Bringing the Plan to Life*. August 2003.
- FEMA 386-5: *Using Benefit-Cost Review in Mitigation Planning*. May 2007.
- FEMA 386-6: *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning*. May 2005.
- FEMA 386-7: *Integrating Manmade Hazards into Mitigation Planning*. September 2003.
- FEMA 386-8: *Multijurisdictional Mitigation Planning*. August 2006.
- FEMA 386-9: *Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects*. August 2008.
- FEMA: *Local Mitigation Planning Handbook.* March 2013.
- FEMA: *Local Mitigation Plan Review Guide.* October 2011.
- FEMA: *National Fire Incident Reporting System 5.0: Complete Reference Guide*. January 2008.
- FEMA: *Hazard Mitigation Assistance Unified Guidance*. February 2015.
- FEMA: *Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials*. March 2013
- FEMA: *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards.* January 2013.

The following Pennsylvania Emergency Management Agency (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*. March 2009.
- PEMA: *Pennsylvania's Hazard Mitigation Planning 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*.2007

2. Community Profile

2.1. Geography and Environment

Union County is a rural community in the heart of Pennsylvania. The County consists of four boroughs and ten townships. Lewisburg, a showcase of Federal and Victorian architecture, is the Union County government seat.

Union County is in the Appalachian Region of north central Pennsylvania. The County stretches from the Bald Eagle Mountains in the north to the junction of the East and West Branches of the Susquehanna River in the south. The County encompasses two general topographical areas: the Appalachian Mountains in the west and north and the Susquehanna lowlands in the east and south.

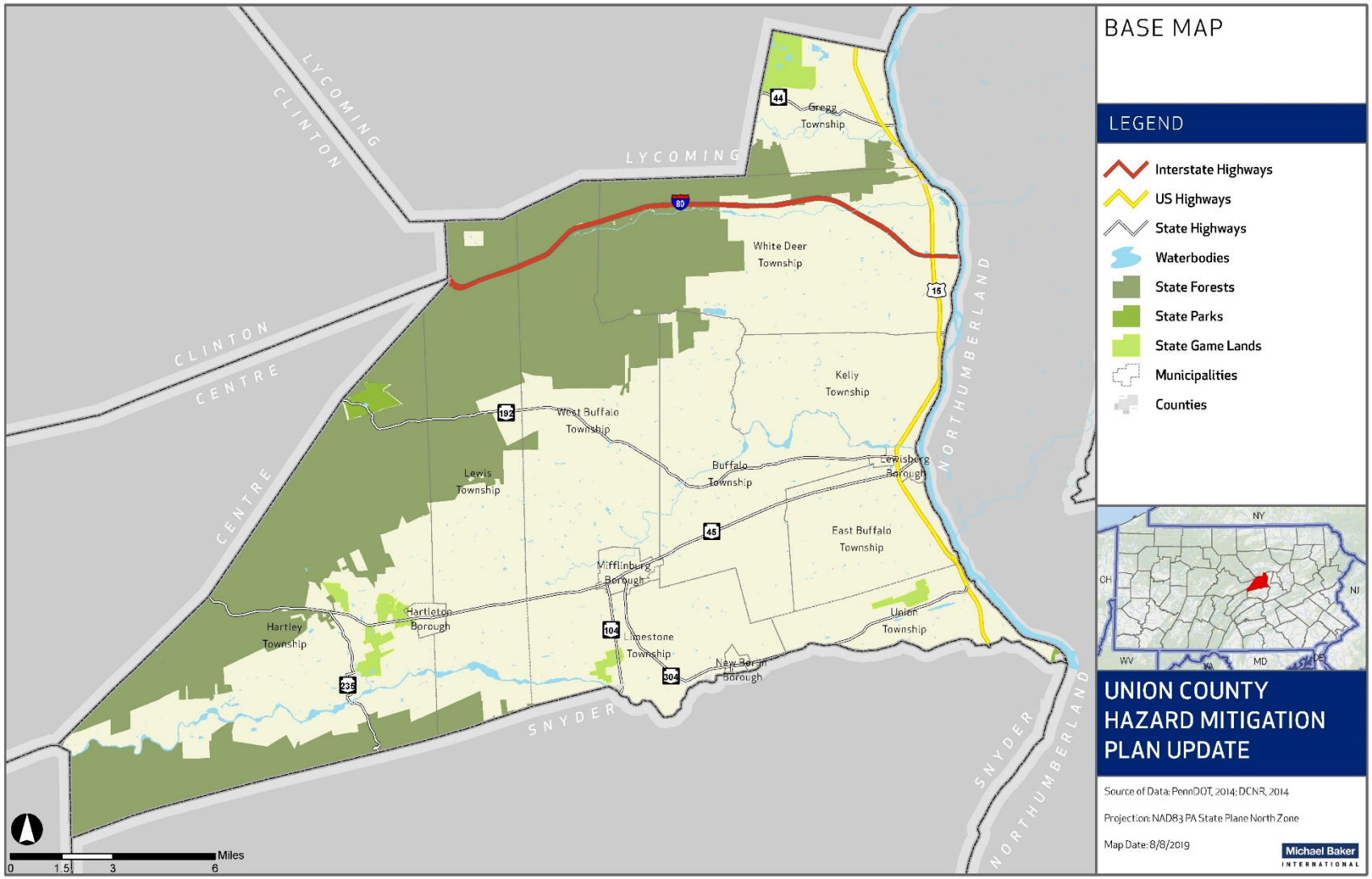
The County covers approximately 318 square miles, or 203,420 acres, and consists mostly of wooded mountains and agricultural land. There are three state parks in the County: R.B. Winter State Park, Sand Bridge State Park, and Shikellamy State Park.

View from Shikellamy State Park in Union County.

Interstate 80 extends east to west through the northern part of the County providing access to Scranton, Wilkes-Barre, and State College. U.S. Highway 15 passes north to south along the eastern edge of the County and provides access to Harrisburg. State Route 45 traverses the center of the County from east to west connecting the Boroughs of Lewisburg, Mifflinburg, and Hartleton. The locations of highways, boroughs, and townships are provided in the map below.

Adjacent counties include Lycoming County to the north, Clinton County to the northwest, Northumberland County to the east, Snyder and Mifflin Counties to the south, and Centre County to the west.

Figure 2.1-1 Base map of Union County



The four boroughs and ten townships that participated in the development of the Union County 2020 Hazard Mitigation Plan Update are:

- **Hartleton Borough** is located between Lewis and Hartley Townships in the western area of the County and covers approximately one square mile. State Route 45 traverses the Borough.

- **Lewisburg Borough** is located along the bank of the West Branch of the Susquehanna River and covers approximately one square mile. The Borough is the seat of government for Union County and is home to Bucknell University.

- **Mifflinburg Borough** is located in Buffalo Valley in the south-central area of Union County and covers about two square miles. Buffalo Creek passes east-west through the Borough and has been the source of previous flooding.

- **New Berlin Borough** is located on Penns Creek, which divides Union and Snyder Counties. The Borough measures less than ½ square mile. The Borough is the site of the original seat of government for Union County.

- **Buffalo Township** is centrally located in the County and is rural in character with a land area of about 30 square miles. The "Great Valley" at the center of the Township is framed by Buffalo Mountain to the north and Shamokin Mountain to the south. Buffalo Creek is the cause of flooding at the eastern tip of the Township where it meets the floodplains of the Susquehanna River. The Township includes the villages of Vicksburg, Cowan, Buffalo Crossroads, and Mazeppa.

- **East Buffalo Township** is located along the west bank of the Susquehanna River and has a land area of approximately 15 square miles. Valleys encompass a major portion of the Township with Shamokin Mountain along the southern boundary.

- **Gregg Township** is the most northern township in the County and is geographically separated from the rest of the County by the White Deer Ridge. The Township has a land area of about 15 square miles. The West Branch of the Susquehanna River forms the Township's eastern boundary. The Great Streams Common Industrial Park is located in the Township along with the Allenwood Federal Correction Complex.

- **Hartley Township** is the most western and rural and of the townships in Union County covering nearly 80 square miles. Mountainous terrain accounts for 73 percent of the land area, and the Bald Eagle State Forest covers 60 percent of the Township. Penns Creek and Laurel Run flow eastward through the Township to the Susquehanna River. The Township includes the villages of Laurelton, Glen Iron, and Weikert.

- **Kelly Township** is located along the west bank of the Susquehanna River and has a land area of approximately 17 square miles. The majority of land in the Township is in agricultural use or woodland. Several areas of the Township are subject to flooding from the Susquehanna River,

Buffalo Creek, and Spruce Run. Lewisburg Federal penitentiary is located along the southern edge of the Township. The Township includes the communities of West Milton and Kelly Crossroads.

- **Lewis Township** is located in the western area of the County and is the third largest Township with a land area of about 39 square miles. Mountainous terrain and forest cover a large portion of the Township. Hartleton Borough is located at the western boundary of the Township. The Township includes the communities of Pleasant Grove, Swengal, and Millmont.

- **Limestone Township** is located south of Mifflinburg Borough and has a land area of approximately 21 square miles. Shamokin Mountain is located along the southern portion of the Township. The Township includes the village of White Springs.

- **Union Township** is the smallest Township in the County with a land area of about 11 square miles. The Township is bordered by the West Branch of the Susquehanna River to the east. Shamokin Mountain forms the Township's northern boundary.

- **West Buffalo Township** is located in the central area of Union County covering about 38 square miles. Mountainous terrain and the Bald Eagle State Forest cover the entire northern portion of the Township and account for nearly 50 percent of the land area. Valleys along the southern portion of the County include agricultural lands, woodlands, and wetlands. The Township includes the community of Forest Hill.

- **White Deer Township** is located in the eastern area of the County along the west bank of the Susquehanna River and is the second largest township with a land area of approximately 46 square miles. Mountainous terrain and state forest cover extend across the western and northern areas of the Township. The Township includes the villages of West Milton, White Deer, and Columbia.

2.2. *Community Facts*

Union County was formed on March 22, 1813, from part of Northumberland County. The County was named in reference to the Federal Union. It has a total area of 318 square miles, of which 316 square miles is land. The County consists of ten townships and four boroughs, which are listed in Section 2.1 above. There are four public school districts throughout the County: Lewisburg Area School District, Mifflinburg Area School District, Milton Area School District, and Warrior Run School District. There is one university, Bucknell University, located in Lewisburg, and one vocational school, the SUN Area Technical Institute, in New Berlin. There is a McCann School of Business and Technology campus and the Central Susquehanna LPN Career Center, both in Lewisburg.

2.3. *Population and Demographics*

According to the U.S. Census, the population of Union County in 2010 was 44,947. The U.S. Census Bureau estimates that in 2017, Union County's population increased to 45,056. The following table provides a distribution of County population by municipality obtained from the U.S. Census Bureau's American Community Survey (ACS). As shown in the table, the population increased by 0.24% between 2010 and 2017, with New Berlin Borough, Limestone Township, East Buffalo Township, and White Deer Township experiencing the greatest population growth during this timeframe.

Union County was incorporated as a County over 200 years ago.

The population of Union County is concentrated in Lewisburg Borough and the surrounding townships in the eastern portion of the County. Population in the County grew from 36,176 in 1990 to 41,624 in 2000, 44,947 in 2010, and 45,056 in 2017 (U.S. Census Bureau, 2017). Between 1990 and 2000, a portion of the increase was due to the opening of Allenwood Federal Correctional Complex in Gregg Township. Excluding the inmate population, Union County has historically experienced a steady increase of between 2,000 to 3,000 persons per decade since 1920. The Union County Planning Department projects that the population will continue to increase at the historical rate in upcoming decades.

Table 2.3-1 Population in Union County by municipality (U.S. Census Bureau, 2017)			
MUNICIPALITY	**2010 POPULATION**	**2017 POPULATION**	**PERCENT CHANGE (%)**
Buffalo Township	3,538	3,624	2.43%
East Buffalo Township	6,414	6,674	4.05%
Gregg Township	4,984	4,748	-4.74%
Hartleton Borough	283	248	-12.37%
Hartley Township	1,820	1,738	-4.51%
Kelly Township	5,491	5,294	-3.59%
Lewis Township	1,480	1,499	1.28%
Lewisburg Borough	5,792	5,753	-0.67%
Limestone Township	1,723	1,934	12.25%
Mifflinburg Borough	3,540	3,533	-0.20%
New Berlin Borough	873	1,024	17.30%
Union Township	1,589	1,370	-13.78%
West Buffalo Township	2,983	3,015	1.07%
White Deer Township	4,437	4,602	3.72%
TOTAL	**44,947**	**45,056**	**0.24%**

The median income of households in Union County is $53,768. This is approximately $4,000 less than the national median household income (U.S. Census Bureau, 2017). Just over ten percent of the Union County population lives in poverty; 12.7% of children under 18 are below the poverty line, compared with 7.4% of people 65 years or older. The median age of the County population is 39.4 years with 17.7% of the population under 18 years of age and 16.8% of the population aged 65 years or older. Approximately 78% of housing units in the County are single-unit structures, 15.1% are multi-unit structures, and 7.1% are mobile homes. The median monthly housing costs are $1,344 for mortgaged home-owners and $474 for non-mortgaged owners. The median rent is $733 per month. The majority, 87.4%, of the County population is White, 6.6% is African-American, 5.7% is Hispanic, and 1.7% is Asian (U.S. Census Bureau, 2017). Based on U.S. Census Bureau, the top five reported ancestries are: American, German, Irish, Italian, and English.

2.4. *Land Use and Development*

Land use in the County is classified as agricultural, commercial, forested, industrial, open space/recreation area, public space, residential, transportation, water, or vacant land. More than 60 percent of the County is forested, including approximately 100 square miles of state forest. Almost 30 percent of Union County's land use is agricultural (Union County, 2017a). Union County relies on the strong agricultural tradition and focuses land use trends on agricultural and woodland conservation (Union County Planning Commission, 2018). Most recently, development has begun to spread along the edges of woodlands, outside of

traditional residential areas. As a result, the County has set up primary and secondary growth areas in order to guide future development and preserve natural spaces. Union County is aiming to shift towards a more sustainable growth rate to match population growth trends. The table below summarizes land use by acres and percentage of the area of the County. Figure 2.4-1 illustrates the existing general land use in the County, and Figure 2.4-2 shows existing zoning districts. Union County's major watersheds are depicted in Figure 2.4-3, of which there are seven.

Table 2.4-1 Distribution of Land Use (Union County GIS, 2019)

LAND USE CATEGORY	ACREAGE	PORTION OF UNION COUNTY
Agricultural	58,596.77	28.74%
Building Lot*	720.42	0.35%
Commercial	2,183.16	1.07%
Forest	123,199.71	60.43%
Industrial/Manufacturing	243.14	0.12%
Miscellaneous/Vacant	170.84	0.08%
Open Space/Recreation	512.12	0.25%
Public/Exempt	1,367.99	0.67%
Residential	11,314.36	5.55%
Transportation	4,191.74	2.06%
Water	1,379.79	0.68%
TOTAL	**203,880.02**	**100.00%**

** This land use category consists of areas of vacant land that have primarily been subdivided for housing developments that have yet to be built upon.*

Figure 2.4-1 **Map of current land use in Union County**

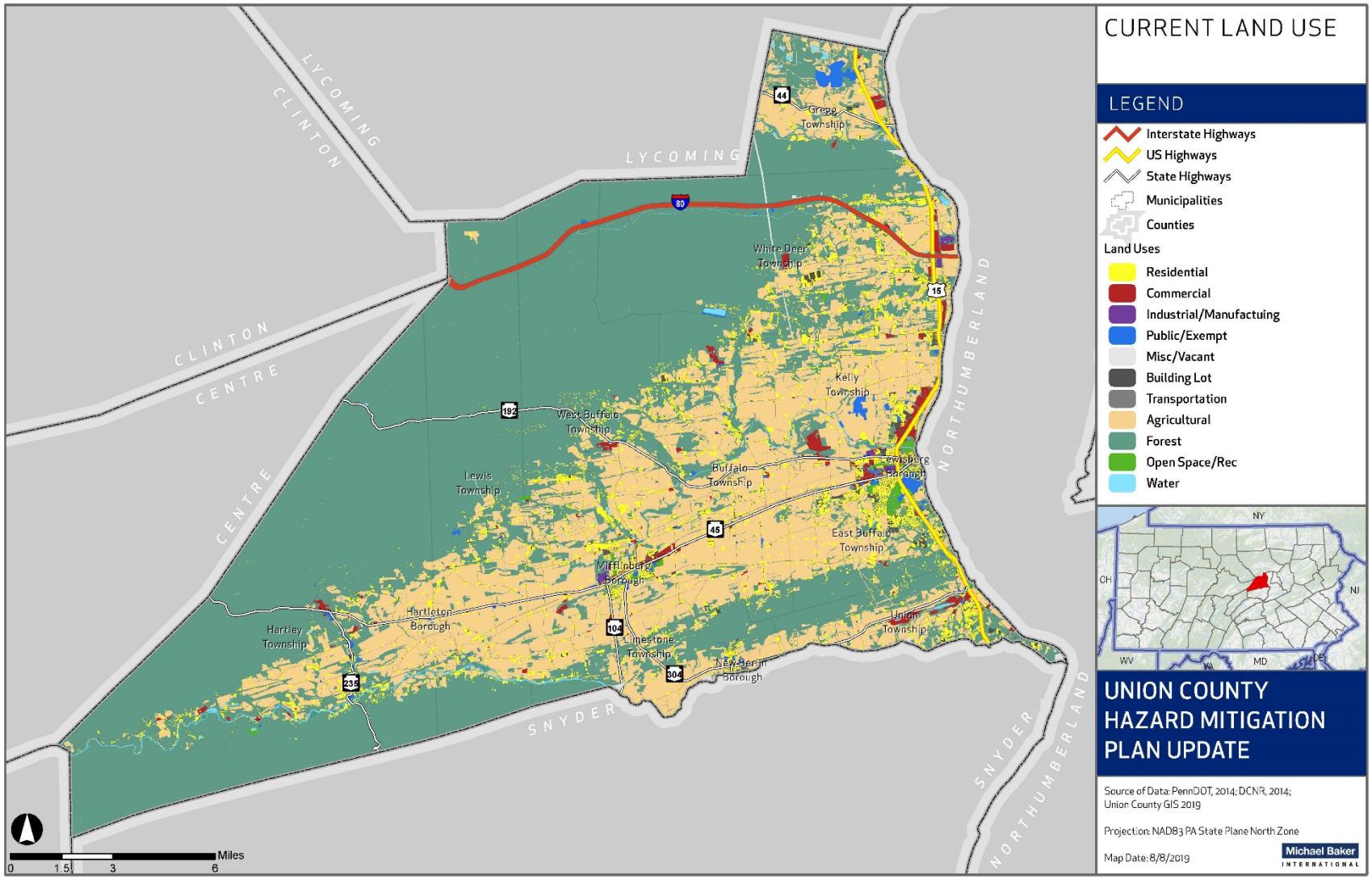


Figure 2.4-2 Map of zoning districts in Union County

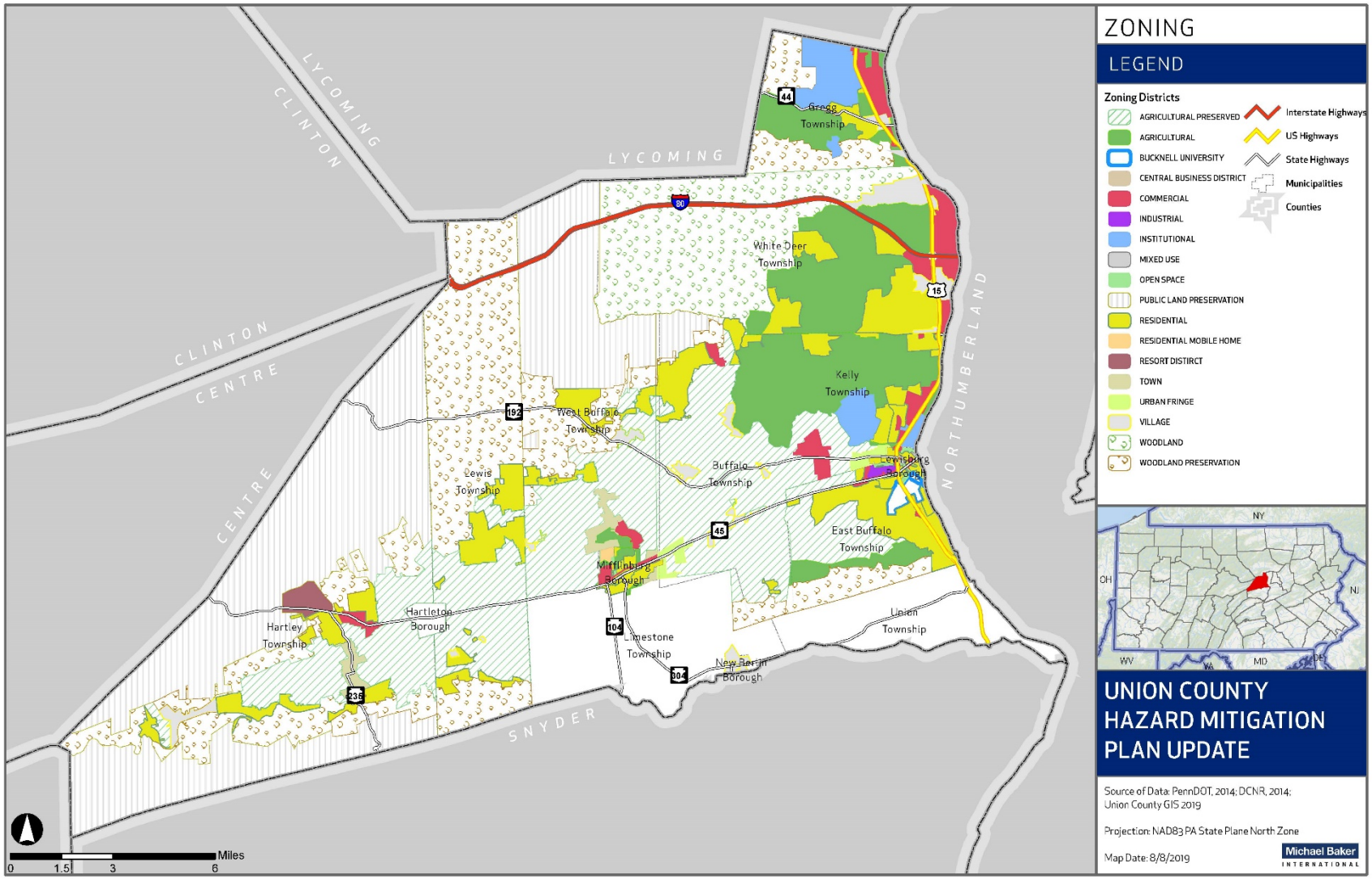
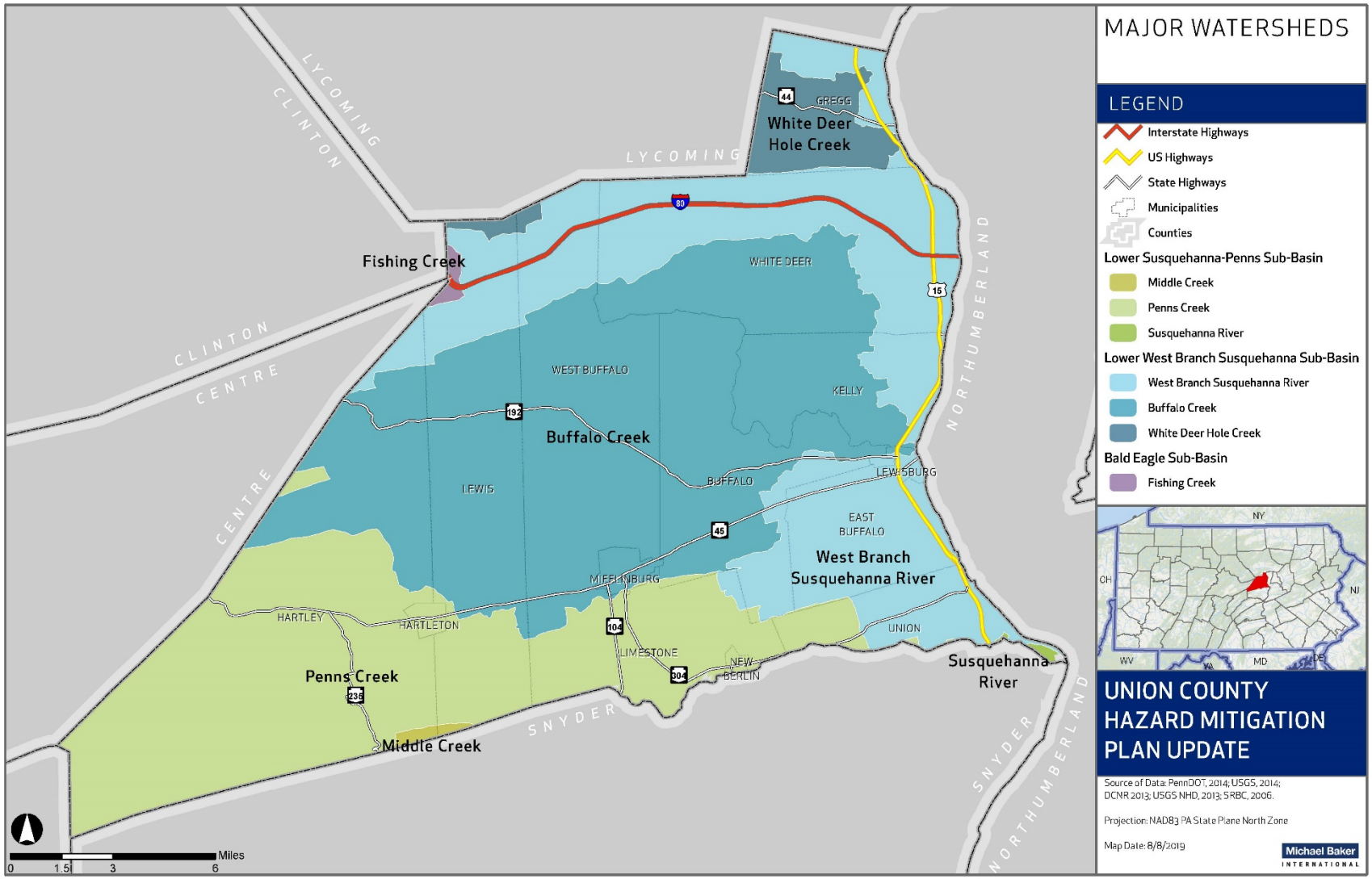


Figure 2.4-3 **Major watersheds in Union County**



With continued, steady population growth, according to U.S. Census Bureau data, the number of housing units in the County is projected to be 19,371 by 2050, which would be a 14 percent increase over the 16,997 housing units identified in the County in the 2010 Census (Union County, 2017b). According to the 2009 Comprehensive Plan for Union County, growth is anticipated to occur primarily in Hartleton Borough with some growth near U.S. Highway 15 in East Buffalo and Kelly Townships on land currently in agricultural or forestry use.

Since the 2014 HMP update, a new Bucknell University housing rule requires many students to live on campus, where previously they were allowed to live off-campus. This new rule reduces the number of students who had contributed to the rental market from an estimated 500 to 200.

New development, primarily residential and agricultural, has steadily occurred in a scattered manner throughout the County. Most residential development occurred in the eastern part of the County, while agricultural development occurred mostly in the southern half of the County. Commercial development has been concentrated near the U.S. Highway 15 and State Route 45 corridors. The majority of residential construction has been focused in Buffalo Township and White Deer Township, while the majority of business, commercial, industrial, institutional, and agricultural construction (83%) occurred in Buffalo Township, East Buffalo Township, Kelly Township, and Lewisburg Borough.

According to a 2017 Housing Study Report produced by the Union County Planning Department, 1,044 new construction permits were issued between 2004 and 2015 Countywide (Union County, 2017b). There was a lull in permits between 2011 and 2015, which aligns with a nationwide housing trend. In 2015, the number of permit applications was around 60. The 2017 Union County Planning Annual Report states there were 91 new homes permitted for construction in 2017 within the county, which is an increase of five from prior year, and the most since 2010. However, in 2018, Union County witnessed a decrease in new homes permitted, down to 63, which is a 31% decrease compared to 2017 (Union County, 2018).

East Buffalo Township and Lewisburg Borough initiated a 13-month long study of the US 15 corridor, the U.S. 15 Smart Transportation Corridor Improvement Plan. The purpose of this study was to develop a comprehensive framework and vision that integrated the analysis of both land use and transportation issues along the 2.5-mile-long corridor. The Plan focused on improving mobility, safety, circulation, and quality of life while making recommendations that balance future traffic capacity demands within the context of existing and future land use conditions, community vision, and multi-modal travel options. The goal of the Plan was to develop efficient, functional concepts and designs for the corridor that are compatible with the Community.

An additional discussion of future land development and how it interacts with hazards is provided in Section 4.4.4.

2.5. *Data Sources and Limitations*

Gathering and analyzing new data about natural hazards and the community was critical to the process of updating the plan. The Union County GIS Department provided the following spatial data sources used in the plan:

- Critical facilities (including Bucknell University, community facilities, county and municipal government buildings, fire companies, EMS, medical facilities, military facilities, municipal buildings, police, public schools, Red Cross, sewer facilities, utilities, and water suppliers)
- Structures
- Bridges
- Building footprints
- Streams and water bodies
- Current land use
- Zoning Districts
- Open Space Areas
- Parks and Recreation
- Parcels
- Municipal boundaries
- Transportation routes, railways, and trails

Union County's Preliminary Flood Insurance Rate Map (FIRM) (issued on September 28, 2018) was downloaded in July 2019 from FEMA's Flood Map Service Center. This data provides flood frequency and elevation information used in the flood hazard risk assessment. Additional base map data was provided by PA Game Commission, PA DCNR, and PennDOT. Also, population data from the 2010 Census and 2017 estimated populations were obtained from the U.S. Census Bureau (2017).

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 Pennsylvania Spatial Data Access (PASDA), which 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, hazard data from the National Centers for Environmental Information (NCEI) database was utilized. NCEI is a division of the US Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). Information on hazard events is compiled by NCEI from data gathered by the National Weather Service (NWS), another division of NOAA. NCEI then presents it on its website in various formats. The data used for this plan came from 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). The database currently contains hazard event data from January 1950 to May 2019. Other federal datasets came from USGS, the National Hurricane Center, and NOAA's Storm Prediction Center.

Hazus is a powerful risk assessment methodology for analyzing potential losses from floods, hurricane winds, and earthquakes. In Hazus, current scientific and engineering knowledge is coupled with the latest GIS technology to produce estimates of hazard-related damage before or after a disaster occurs. Version 4.0 of this software was used to estimate losses for floods in Union County. For more information about the methodology employed to prepare the Hazus model and estimate losses, see **Appendix F**.

This 2020 Hazard Mitigation Plan Update 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. The list of critical facilities was developed in conjunction with the Union County Emergency Management Agency, Union County Planning Department, and Union County GIS Department. Critical facilities have been identified in Union County to include fire stations, police stations, and municipal and county office buildings as well as facilities where a number of people might require special attention or evacuation should an identified natural hazard occur. Table 2.5-1 summarizes the critical facilities in Union County by type and by municipality. For a complete listing of critical facilities, please see **Appendix E**.

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.

Figure 2.5-1 Map of critical facilities in Union County

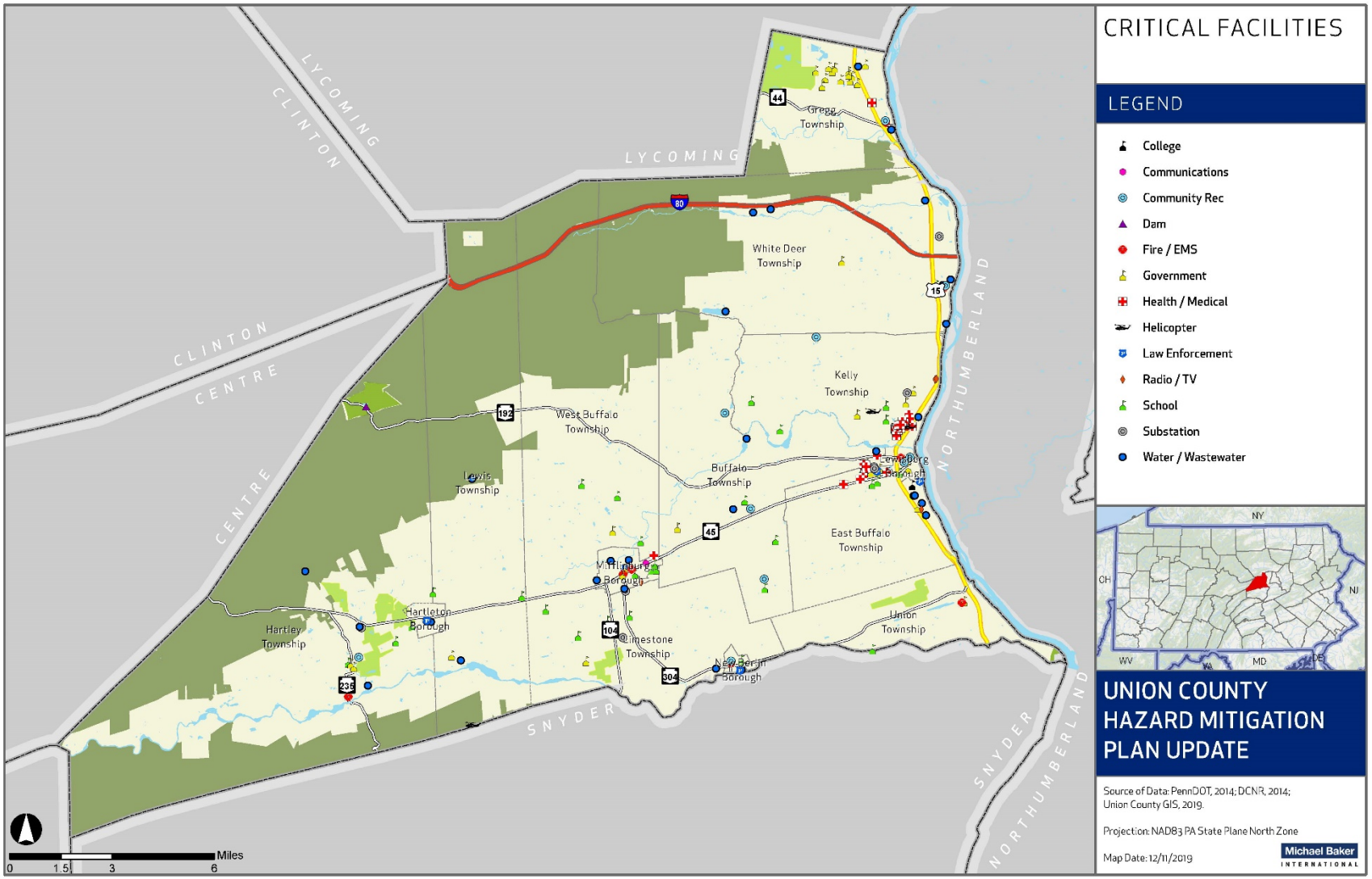


Table 2.5-1 Critical facilities by type in Union County (Union County GIS, 2019).

FACILITY	Buffalo Township	East Buffalo Township	Gregg Township	Hartleton Borough	Hartley Township	Kelly Township	Lewis Township	Lewisburg Borough	Limestone Township	Mifflinburg Borough	New Berlin Borough	Union Township	West Buffalo Township	White Deer Township	TOTAL
American Red Cross Facility	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**1**
College/ University	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Community/ Recreation Center	3	2	1	1	1	1	0	2	0	0	1	0	0	1	**13**
County Government Facility	0	1	0	0	0	1	0	0	0	1	0	0	0	0	**3**
Dam	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
Fire Station/EMS Station	0	0	1	0	1	1	0	1	0	2	1	1	0	1	**9**
Government or Military Facility	0	1	12	0	0	1	0	0	0	0	0	0	0	0	**14**
Health/Medical Facility	3	7	1	0	0	18	0	0	0	0	0	0	1	0	**30**
Helipad/Heliport/ Helispot	0	0	0	0	1	2	0	0	0	0	0	0	0	0	**3**
Information or Communication Facility	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**1**
Law Enforcement	0	1	0	1	0	0	0	0	0	1	1	0	0	0	**4**
Municipal Government Facility	1	1	1	0	2	1	1	1	1	1	0	1	1	1	**13**
National Guard Armory/ Base	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Public Safety Office	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
Radio/TV Broadcast Facility	0	1	0	0	0	2	0	0	0	1	0	0	0	0	**4**

Table 2.5-1 Critical facilities by type in Union County (Union County GIS, 2019).

FACILITY	Buffalo Township	East Buffalo Township	Gregg Township	Hartleton Borough	Hartley Township	Kelly Township	Lewis Township	Lewisburg Borough	Limestone Township	Mifflinburg Borough	New Berlin Borough	Union Township	West Buffalo Township	White Deer Township	TOTAL
School	3	2	0	0	3	4	2	1	4	3	1	1	4	1	**29**
Substation	0	1	0	0	1	1	0	1	1	1	0	0	0	1	**7**
Wastewater Treatment Plant	1	1	1	1	1	1	1	0	0	1	1	0	1	1	**11**
Water Pumping Station	2	1	0	0	1	0	0	0	1	1	0	0	0	3	**9**
Water Supply or Treatment Facility	0	1	0	0	1	0	0	0	0	0	0	0	0	2	**4**
Water System Control Facility	0	0	0	0	0	0	1	0	0	0	0	0	0	1	**2**
Water Tank	0	1	0	0	0	0	0	0	0	1	0	0	0	0	**2**
Water Tower	0	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
Total Critical Facilities in County	**13**	**24**	**18**	**3**	**13**	**33**	**5**	**7**	**7**	**14**	**5**	**3**	**7**	**12**	**164**

3. Planning Process

3.1. Update Process and Participation Summary

This Union County Hazard Mitigation Plan was originally developed in 2003-2005 and adopted in 2005-2006 and then updated and adopted for implementation in 2010 and 2014.

The 2005 plan, 2010 plan, 2014 plan, and this updated 2020 Union County Hazard Mitigation Plan represent the work of citizens, elected and appointed government officials, business leaders, and volunteers of non-profit organizations in developing a blueprint for protecting community assets, preserving the economic viability of the community, and saving lives.

An update to the 2014 plan was initiated in June 2019. Union County engaged in the plan update initiative in 2019, a year early in the five-year plan update cycle, as funding support was available from the Pennsylvania Emergency Management Agency and the Federal Emergency Management Agency. Michael Baker International, a full-service engineering firm that provides hazard mitigation planning guidance and technical support, assisted the County throughout the update process. The Union County 2020 Hazard Mitigation Plan Update was completed in March 2020.

The 2020 Hazard Mitigation Plan Update follows an outline developed by the Pennsylvania Emergency Management Agency in 2013 which provides a standardized format for all local hazard mitigation plans in the Commonwealth of Pennsylvania. The 2020 plan update was led by a Hazard Mitigation Planning Team (HMPT). Each member of the 2014 HMPT as well as other community leaders and stakeholders were invited by Union County's Emergency Management Coordinator to actively participate in updating the plan. Those who accepted the invitation comprise the current Hazard Mitigation Planning Team members, listed further in this section.

The 2020 planning process began with a kickoff meeting with representatives from municipalities, county agencies, non-profit groups, and other stakeholders. All potential participants were mailed an invitation to attend the meeting. In addition, officials of Northumberland, Clinton, Mifflin, Centre, Snyder, and Lycoming Counties were notified via mail and invited to participate in the planning process. While none of these neighboring counties participated in plan development, each is aware of the planning effort as Union County has existing mutual aid agreements with each of these adjacent Counties and works with representatives regularly on updating Emergency Operations Plans.

Contact information was obtained from all meeting attendees and used to create a HMPT mailing list. Section 3.2 provides a discussion of the HMPT as well as a table of members with their corresponding organization(s).

Municipal officials and other stakeholders continued to receive notification regarding all meetings via telephone, letter, email, or some combination. A brief description of each meeting that was held is available in Section 3.3. In addition, detailed meeting minutes describing events of each meeting are available in **Appendix C – Meeting and Other Participation Documentation.**

In order to obtain information from municipalities and other stakeholders, forms and surveys were distributed and collected throughout the planning process. Some of the forms were completed during planning meetings while others were sent via email or were posted to the plan website, www.pennsylvaniahmp.com/union-hmp. These forms were completed and returned in between scheduled meetings. All municipalities were required to have a representative attend at least one meeting and provide pertinent information for the plan update. Table 3.1-1 lists each municipality along with their specific participation and contributions to the planning process. Sign-in sheets for each meeting with individual names are available in **Appendix C – Meeting and Other Participation Documentation** along with all completed forms and surveys. All 14 municipalities participated in the plan update, resulting in 100% participation across the County.

Table 3.1-1 Summary of participation from local municipalities during the 2020 Union County Hazard Mitigation Plan Update.

MUNICIPALITY	MEETING			WORKSHEETS/SURVEYS/FORMS		
	HAZARD MITIGATION PLAN UUPDATE KICK-OFF JUNE 13, 2019	RISK ASSESSMENT AND MITIGATION SOLUTIONS WORKSHOP August 28, 2019	DRAFT PLAN REVIEW MEETING October 8, 2019	RISK ASSESSMENT SURVEY	CAPABILITY ASSESSMENT	MITIGATION ACTION PROGRESS REPORT
Buffalo Township	✓	✓	✓	✓	✓	✓
East Buffalo Township	✓	✓	✓	✓	✓	✓
Gregg Township	✓	✓	✓	✓	✓	
Hartleton Borough				✓	✓	✓
Hartley Township				✓	✓	✓
Kelly Township				✓	✓	✓
Lewis Township	✓	✓		✓	✓	
Lewisburg Borough	✓	✓	✓	✓	✓	
Limestone Township		✓				
Mifflinburg Borough	✓	✓	✓	✓	✓	
New Berlin Borough				✓	✓	✓
Union Township		✓	✓			✓
West Buffalo Township				✓	✓	✓
White Deer Township			✓		✓	✓

3.2. *The Planning Team*

The Hazard Mitigation Planning Team included municipal officials, Union County government representatives, non-profit organizations, and other stakeholders such as regional police departments and regional government councils. The HMPT was organized by the County Emergency Management Coordinator, Michelle Dietrich, with assistance from Michael Baker International Planner, to plan meetings, collect information, and conduct public outreach. All invited stakeholders are listed in **Appendix C**. These individuals were invited to participate in the plan update process.

The stakeholders listed in Table 3.2-1 served on the 2020 countywide HMPT and actively participated in the planning process through attendance at meetings, completion of assessment surveys, and/or submission of comments.

Table 3.2-1 Stakeholders who participated in the planning process.

MUNICIPALITY/ORGANIZATION	PARTICIPANT(S)
Buffalo Township	Jim Emery, Douglas Hovey
East Buffalo Township	Stacey Kifolo, Jim Emery
Gregg Township	Arthur Masser
Hartleton Borough	Thomas Perrin
Hartley Township	Terry Smith
Kelly Township	David Hassenplug
Lewis Township	Wayne Klingman
Lewisburg Borough	Kim Wheeler, Ed Richard, Steven Beattie
Limestone Township	Douglas Orbaker
Mifflinburg Borough	Robert Rowe, Jim Emery
New Berlin Borough	Rebecca Witmer
Union Township	Thomas Reitz
West Buffalo Township	Robert E. Valentine, Jim Emery
White Deer Township	Larry Maynard
Union County Emergency Management Agency	Michelle Dietrich
Union County GIS	Sue Reese, Kevin Hess
Union County Planning	John Del Vecchio
Buffalo Valley Regional Police	Paul Yost
Central Keystone Council of Governments	David Hines, Makenzie Stover, Jim Emery

Table 3.2-1 Stakeholders who participated in the planning process.	
MUNICIPALITY/ORGANIZATION	**PARTICIPANT(S)**
Susquehanna Economic Development Association and Council of Government	Teri Provost
Lewisburg Neighborhoods Corporation	Samantha Pearson

3.3. *Meetings and Documentation*

The following meetings were held during the plan update process. Invitations, agendas, sign-in sheets, and minutes for these meetings are included in **Appendix C**.

June 13, 2019 – Hazard Mitigation Plan Update Kick-Off Meeting held at the Union County Government Center to discuss project scope, schedule, goals, the planning process, participation and engagement, and next steps. Hazards from the 2014 plan were reviewed with the HMPT at the kick-off. During this meeting, county staff, municipal representatives, and interested stakeholders provided vital information on changes in hazard risk and local capabilities to mitigate those risks since the last HMP update. Municipal attendees completed an "Evaluation of Hazards and Risk Form" to identify their jurisdictional risk to each hazard. Capability Assessment Surveys were also completed by municipal attendees.

August 28, 2019 – Risk Assessment and Mitigation Solutions Workshop held at the Union County Government Center to discuss Union County's hazard vulnerability and new hazards to be profiled in the 2020 HMP. Participants discussed progress of mitigation actions from the 2014 Plan Update and identified additional mitigation actions that would help reduce or eliminate potential losses

October 8, 2019 – Draft Plan Review held at the Union County Government Center to update the public about the plan update process and findings. The meeting was advertised in *The Snyder and Union Times* and *The Daily Item*. Copies of the newspaper notice are included in **Appendix C**: **Meeting and Other Participation Documentation.** Attendees were asked to review the entire plan on the County's hazard mitigation plan website www.pennsylvaniahmp.com/union-hmp and provide written comments. No public comments were received regarding the hazard mitigation plan update via the website.

3.4. *Public & Stakeholder Participation*

Each municipality was given multiple opportunities to participate in the plan update process through invitation to meetings, review of risk assessment results and mitigation actions, and an opportunity to comment on a final draft of the 2020 Hazard Mitigation Plan Update. The tools listed below were distributed with meeting invitations, at meetings, and on the plan update website to solicit information, data, and comments from both local municipalities and other key stakeholders in Union County. Responses to these worksheets and surveys are included in **Appendix C: Meeting and Other Participation Documentation**.

- **Capability Assessment Survey:** Collects information on local planning, regulatory, administrative, technical, fiscal, political, and resiliency capabilities that can be included in the plan's Capability Assessment section.

- **Evaluation of Hazards and Risk Form:** Collects information from the HMPT regarding whether there have been changes to the frequency of occurrence, magnitude of impact, or geographic extent of hazards identified in the 2014 plan. In addition, the form asks members of the HMPT to select any additional hazards they believe should be considered for inclusion in the 2020 plan.

- **Mitigation Progress Report:** Because many municipalities had actions or projects in the 2014 plan, they were asked to evaluate the status of projects submitted in the previous planning process, indicating if there had been progress, if a project had been discontinued or completed, and whether each project should be carried over into the 2020 plan.

- **New Mitigation Action Form:** This form was provided to communities that wanted to include a new action in the HMP. The purpose was to collect details about the action, including priority, responsible parties, potential partners, potential funding sources, implementation timeframe, and more.

Community participation and comment was encouraged throughout the planning process, particularly through the project website, www.pennsylvaniahmp.com/union-hmp. This site acted as a repository for the entire planning process, including presentations, agendas, minutes, and worksheets from each meeting as well as promulgating meeting dates, times, and important announcements. The public was also encouraged to provide images and stories on the effects of the identified hazards in their communities on the website. Since June 1, 2019, 95 people visited the project website with a total of 176 pageviews.

Union County posted the 2020 Draft Hazard Mitigation Plan Update on the plan update website (www.pennsylvaniahmp.com/union-hmp) for review and comment on October 11, 2019. In addition, an invitation to the public to review and comment on the draft plan was posted on the home page of the project website. Comments were to be submitted in writing to Michelle Dietrich of the Union County Emergency Management Agency or to Matthew Bodnar of Michael Baker International by mail or email. No comments from the public were received at the final public meeting or in writing, but several members of the HMPT submitted comments and feedback.

4. Risk Assessment

4.1. Update Process Summary

To reduce the potential for damage due to hazards, it is necessary to identify hazards that may affect the County. This risk assessment provides a factual basis for activities proposed by the County in its mitigation strategy. Hazards that may affect Union County are identified and defined in terms of location and geographic extent, magnitude of impact, previous events and likelihood of future occurrence. All information from the previous plan has been included or updated in the 2020 Hazard Mitigation Plan Update, unless otherwise indicated.

The Union County HMPT reviewed the hazards profiled in the 2014 Union County Hazard Mitigation Plan Update during the June 13 Kick-Off Meeting. The HMPT determined that all of the existing hazards should be continued into the plan update and decided that three additional hazards should be profiled in the 2020 plan update: Utility Interruption, Environmental Hazards, and Transportation Accidents. The hazards selected by the HMPT were then reviewed at the August 28 Risk Assessment and Mitigation Solutions Workshop. The municipalities completed an Evaluation of Hazards and Risk Form to indicate their jurisdictional risk to each hazard that would be profiled in the 2020 plan.

Hazard profiles in the 2020 HMP include the following Natural and Human-Made Hazards:

- Drought
- Earthquake
- Flood, Flash Flood, Ice Jam
- Hurricane, Tropical Storm, Nor'easter
- Landslide
- Subsidence, Sinkhole
- Tornado and Windstorm
- Wildfire
- Winter Storm
- Environmental Hazards
- Transportation Accidents
- Utility Interruption

Hazard profiles were then developed in order to define the characteristics of each hazard as it applies to Union County. This process was completed using published information and web sites that address hazards globally, nationally, within Pennsylvania, or specifically within Union County as well as anecdotal information provided by members of the HMPT.

Following hazard identification and profiling, a vulnerability assessment was performed to identify the impact of natural hazard events on people, buildings, infrastructure, and the community. Each natural hazard is discussed in terms of its potential impact on individual communities in Union County, including the types of parcels and critical facilities that may be at risk. The assessment allows the County and its municipalities to focus mitigation efforts on areas most likely to be damaged or most likely to require early response to a hazard event. A vulnerability analysis was performed which identifies structures, critical facilities, or people that may be impacted by hazard events and

describes what those 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

In the past, natural hazards have led to costly disasters in Union County resulting in a Presidential Declaration of Major Disaster or a Gubernatorial Proclamation of Extreme Emergency. 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 4.2.1-1 identifies Presidential Disaster and Emergency Declarations issued between 1955 through 2019 that have affected Union County. There has not been a declaration in Union County since the 2014 plan update. Additional declarations beyond 2019 can be found on the FEMA website at: https://www.fema.gov/disasters/grid/state-tribal-government/44.

Table 4.2.1-1 Presidential Disaster and Emergency Declarations affecting Union County.

DECLARATION NUMBER	DATE	EVENT
3356	October 2012	Proclamation of Emergency – Hurricane Sandy
4030	September 2011	Tropical Storm Lee
3340	September 2011	Proclamation of Emergency – Remnants of Tropical Storm Lee
3235	September 2005	Proclamation of Emergency – Hurricane Katrina
1557	September 2004	Tropical Depression Ivan
3180	March 2003	Proclamation of Emergency – Snowstorm
1298	September 1999	Flooding
1093	January 1996	Flooding
1085	January 1996	Blizzard
1015	March 1994	Winter Storm, Severe Storm
3105	March 1993	Proclamation of Emergency – Blizzard
737	June 1985	Severe Storms, High Winds, Tornadoes
485	September 1975	Severe Storms, Heavy Rains, Flooding

In addition to these Presidentially-declared events, 20 events warranted Gubernatorial Disaster Declarations or Proclamations. Table 4.2.1-2 lists Gubernatorial Disaster Declarations or Proclamations that have been issued for Union County between 1954 and 2019.

Table 4.2.1-2 Gubernatorial Disaster Declarations or Proclamations affecting Union County.

DATE	EVENT
August 2018	Proclamation of Emergency – Severe Storms and Flooding
January 2018	Proclamation of Emergency – Opioid Crisis
January 2018	Proclamation of Emergency – Severe Winter Storm
March 2017	Proclamation of Emergency – Severe Winter Storm

Table 4.2.1-2 Gubernatorial Disaster Declarations or Proclamations affecting Union County.	
DATE	**EVENT**
January 2016	Proclamation of Emergency – Severe Winter Storm
August 2015	Proclamation of Emergency - High Winds, Thunderstorms, Heavy Rain, Tornado, Flooding
January 2015	Proclamation of Emergency – Severe Winter Storm
February 2014	Proclamation of Disaster – Prolonged Severe Winter Weather, Substantial Accumulations of Snow
February 2014	Proclamation of Emergency – Prolonged Severe Winter Weather, Substantial Accumulations of Snow
June 2013	Proclamation of Emergency - High Winds, Thunderstorms, Heavy Rain, Tornado, Flooding
October 2012	Proclamation of Emergency – Hurricane Sandy
August 2012	Proclamation of Emergency - Severe Storms and Flooding (Lee/Irene)
April 2012	Proclamation of Emergency - Spring Winter Storms
January 2011	Proclamation of Emergency - Severe Winter Storm
February 2010	Proclamation of Emergency - Severe Winter Storm
April 2007	Severe 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
July 1999	Drought
September 1995	Drought
November 1980	Drought Emergency
January 1978	Heavy Snow
February 1978	Blizzard
February 1972	Heavy Snow
January 1966	Heavy Snow
September 1955	Drought

Union County has also received Small Business Administration Disaster Assistance during one disaster event that occurred in 1991. A Small Business Administration Disaster Declaration qualifies communities for access to affordable, timely, and accessible financial assistance. Table 4.2.1-3 illustrates the Small Business Administration Disaster Declaration issued for Union County between 1954 and 2019.

Table 4.2.1-3 Small Business Administration Disaster Declarations affecting Union County.	
DATE	**EVENT**
August, 2018	Flooding
July, 1991	Drought

4.2.2. Summary of Hazards

Table 4.2.2-1 summarizes hazards identified in the 2014 Union County Hazard Mitigation Plan Update.

Table 4.2.2-1 Natural hazards identified in the Union County 2014 Mitigation Plan Update.		
HAZARDS		
Drought	Hurricane, Tropical Storm, Nor'easter	Tornado and Windstorm
Earthquake	Landslide	Wildfire
Flood. Flash Flood, and Ice Jam	Subsidence and Sinkhole	Winter Storm

All hazards identified in 2014 plan were included in the 2020 HMP update. The hazards were reviewed by the HMPT at the July 13, 2019 Kick-Off Meeting. Each municipal attendee was provided with an *Evaluation of Hazards and Risk Form* and the PEMA Standard List of Hazards which is a comprehensive list of all hazards to be considered for evaluation in the 2012 plan. This list was obtained primarily from the 2007 Edition of the National Fire Protection Association's *NFPA 1600: Standard on Disaster/Emergency Management and Business Continuity Programs* (NFPA, 2007).

Following review of this hazards list and completion of the *Evaluation of Hazards and Risk Form*, the HMPT determined that three new hazards would be included in the 2020 HMP Update: Utility Interruption, Transportation Accident, and Environmental Hazards. Table 4.2.2-2 contains a complete list of all potential hazards in Union County identified through the risk assessments and planning meetings. Hazard profiles are included in Section 4.3 for each of these hazards.

Table 4.2.2-2 List and description of natural hazards profiled in the 2020 Hazard Mitigation Plan Update.	
HAZARD	**HAZARD DESCRIPTION**
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).
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

Table 4.2.2-2 List and description of natural hazards profiled in the 2020 Hazard Mitigation Plan Update.	
HAZARD	**HAZARD DESCRIPTION**
	products. Hazardous material releases, including in transit and at fixed facilities, may involve the release chemicals, infectious substances, biohazardous waste, and any materials that are explosive, corrosive, flammable, or radioactive.
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. 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).
Hurricane, Tropical Storm, & Nor'easter	Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation storm developing around a low-pressure center in which the winds rotate counter-clockwise (in the Northern Hemisphere) and whose diameter averages 10-30 miles across. While most of Pennsylvania is not directly affected by the devastating impacts cyclonic systems can have on coastal regions, many areas in the state are subject to the primary damaging forces associated with these storms including high-level sustained winds, heavy precipitation, tornadoes, or heavy snow and ice as is the case with nor'easters. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season which extends from June through November (FEMA, 1997). Nor'easters typically develop in the winter months from low-pressure centers between Georgia and New Jersey within 100 miles of the coastline and generally move north or northeastward (NOAA, 2013).
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.
Subsidence and Sinkholes	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. 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 can cause subsidence and sinkhole formations. (FEMA, 1997).
Tornado & Windstorm	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

Table 4.2.2-2 List and description of natural hazards profiled in the 2020 Hazard Mitigation Plan Update.	
HAZARD	**HAZARD DESCRIPTION**
	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 light to severe 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. An average of over 800 tornadoes is reported annually nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 1995). 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 miles across Pennsylvania (FEMA, 2009).
Transportation Accidents	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. 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.
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. • **Fuel or Resource Shortage**; resulting from supply chain breaks or secondary to other hazard events. • **Information Technology Failure**; due to software bugs, viruses, or improper use. • **Ancillary Support Equipment**; electrical generating, transmission, system control, and distribution-system equipment for the energy industry. • **Public Works Failure**; damage to or failure of highways, flood control systems, deep-water ports and harbors, public buildings, bridges, or dams. • **Telecommunications System Failure**; Damage to data transfer, communications, and processing equipment. • **Transmission Facility or Linear Utility Accident**; liquefied natural gas leakages, explosions, or facility problems. • **Major Energy, Power, Utility Failure;** interruptions of generation and distribution, power outages.
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

Table 4.2.2-2 List and description of natural hazards profiled in the 2020 Hazard Mitigation Plan Update.	
HAZARD	**HAZARD DESCRIPTION**
	and in rare instances, spontaneous combustion. Wildfires in Pennsylvania can occur in fields, grass, brush and forests. Ninety-eight percent of wildfires in Pennsylvania are a direct result of people, often caused by debris burns (Department of Conservation and Natural Resources, 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.

4.3. *Hazard Profiles and Vulnerability Analysis*

NATURAL HAZARDS

4.3.1. Drought

4.3.1.1. Location and Extent

Drought is defined as the consequence of a natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length. Droughts are regional climatic events, so they typically impact all communities in a relatively uniform fashion with only minor localized variations in rainfall events. Droughts often occur across county boundaries, affecting large areas of Pennsylvania at the same time. Therefore, a drought would affect all of Union County, with the largest impact being on areas of the County with extensive agriculture uses. As shown in Table 2.4-1 and Figure 2.4-2 in Section 2.4 of this plan, almost 30% of all land in Union County is agricultural.

Locations of droughts nationwide are monitored continuously by the USGS, and the Pennsylvania Department of Environmental Protection monitors conditions throughout the state. Maps showing locations currently experiencing drought conditions are posted on various websites (including http://waterwatch.usgs.gov) and show locations where stream flow is below normal and where drought conditions exist or are emerging. As this plan was being developed between June and October 2019, no locations in Pennsylvania were experiencing a drought.

4.3.1.2. Range of Magnitude

The Pennsylvania Department of Environmental Protection determines drought conditions by monitoring precipitation, stream flows, ground water levels, and the Palmer Drought Severity Index to monitor drought conditions.

The Palmer Drought Severity Index (PDSI) is used to describe abnormally wet to abnormally dry conditions. Zero represents normal rainfall and temperature conditions; drought condition indices are described in the table below.

Table 4.3.1-1 Palmer Drought Severity Index (NDMC, 2009)	
INDEX	**DESCRIPTION OF CONDITIONS**
4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to -0.99	Incipient dry spell
-1.0 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

Data provided by Cornell University shows that drought conditions in the Middle Susquehanna River region of Pennsylvania have resulted in Palmer Drought Severity Index level as low as -6.1. This was during a drought that lasted for two years from 1930 - 1932. In the Union County area, the average Palmer Drought Severity Index level for droughts is -4.0 and the average duration of a drought is 6.1 months.

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. Drought Watches are invoked when three or more drought indicators are present for a county or group of counties. 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 use by five percent in the affected areas. Due to varying conditions, individual water suppliers or municipalities may determine 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 use by 10-15 percent in the affected areas. As with a Drought Watch, varying conditions may cause individual water suppliers or municipalities to determine 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.

The largest impact of drought would be on the County's agricultural land. Agricultural land makes up nearly 60,000 acres and approximately 30% of the County's total land area.

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.
- Loss of water for navigation and recreation.
- Increase in nitrate levels which can have health impacts on pregnant women and children.

4.3.1.3. Past Occurrence

On July 20, 1999, the Governor of Pennsylvania declared a drought emergency in almost all of Pennsylvania including, Union County, following extended dry weather through much of the summer. Precipitation deficits for the months of May through July averaged between five and seven inches. Precipitation departures for the 365-day period ending in mid-July were more than one foot below normal in many places. This is about one-third of total annual normal precipitation in most areas. Streams were empty, wells dried up, and the Susquehanna River hit record low flows. The table below lists periods of drought in the Union County area showing a total of 33 droughts between 1980 and 2017. This was the most current data available when this plan was drafted.

Table 4.3.1-2 Union County Declared Drought Status from 1980 to 2017 (PADEP, 2017).

DATE	DROUGHT STATUS
November 18, 1980 – April 20, 1982	Emergency
April 26, 1985 – December 19, 1985	Watch
July 7, 1988 – August 24, 1988	Watch
August 24, 1988 – December 12, 1988	Warning
March 3, 1989 – May 15, 1989	Watch
June 28, 1991 – July 24, 1991	Warning
July 24, 1991 – April 20, 1992	Emergency
April 20, 1992 – June 23, 1992	Warning
September 1, 1995 – September 20, 1995	Warning
September 20, 1995 – November 8, 1995	Emergency
November 8, 1995 – December 18, 1995	Warning
July 19, 1997 – January 16, 1998	Watch
December 3, 1998 – December 8, 1998	Watch
December 8, 1998 – March 15, 1999	Warning
March 15, 1999 – June 10, 1999	Watch
June 10, 1999 – July 20, 1999	Warning
July 20, 1999 – September 30, 1999	Emergency

Table 4.3.1-2 Union County Declared Drought Status from 1980 to 2017 (PADEP, 2017).	
DATE	**DROUGHT STATUS**
September 30, 1999 – May 5, 2000	Watch
August 8, 2001 – December 5, 2001	Watch
December 5, 2001 – June 14, 2002	Warning
September 5, 2002 – November 7, 2002	Watch
April 11, 2006 – June 30, 2006	Watch
April 11, 2006 – June 30, 2006	Watch
August 6, 2007 – February 15, 2008	Watch
September 16, 2010 – November 10, 2010	Watch
March 24, 2015 – June 17, 2015	Watch
June 17, 2015 – July 10, 2015	Watch
August 2, 2016 – September 6, 2016	Watch
September 6, 2016 – November 3, 2016	Watch
November 3, 2016 – December 16, 2016	Watch
December 16, 2016 – February 14, 2017	Warning
February 14, 2017 – April 6, 2017	Warning
April 6, 2017 – May 16, 2017	Watch

In addition, Cornell University has record of periods of extreme/severe droughts (lasting two or more months) that affected the Middle Susquehanna region of Pennsylvania. These are presented in the table below.

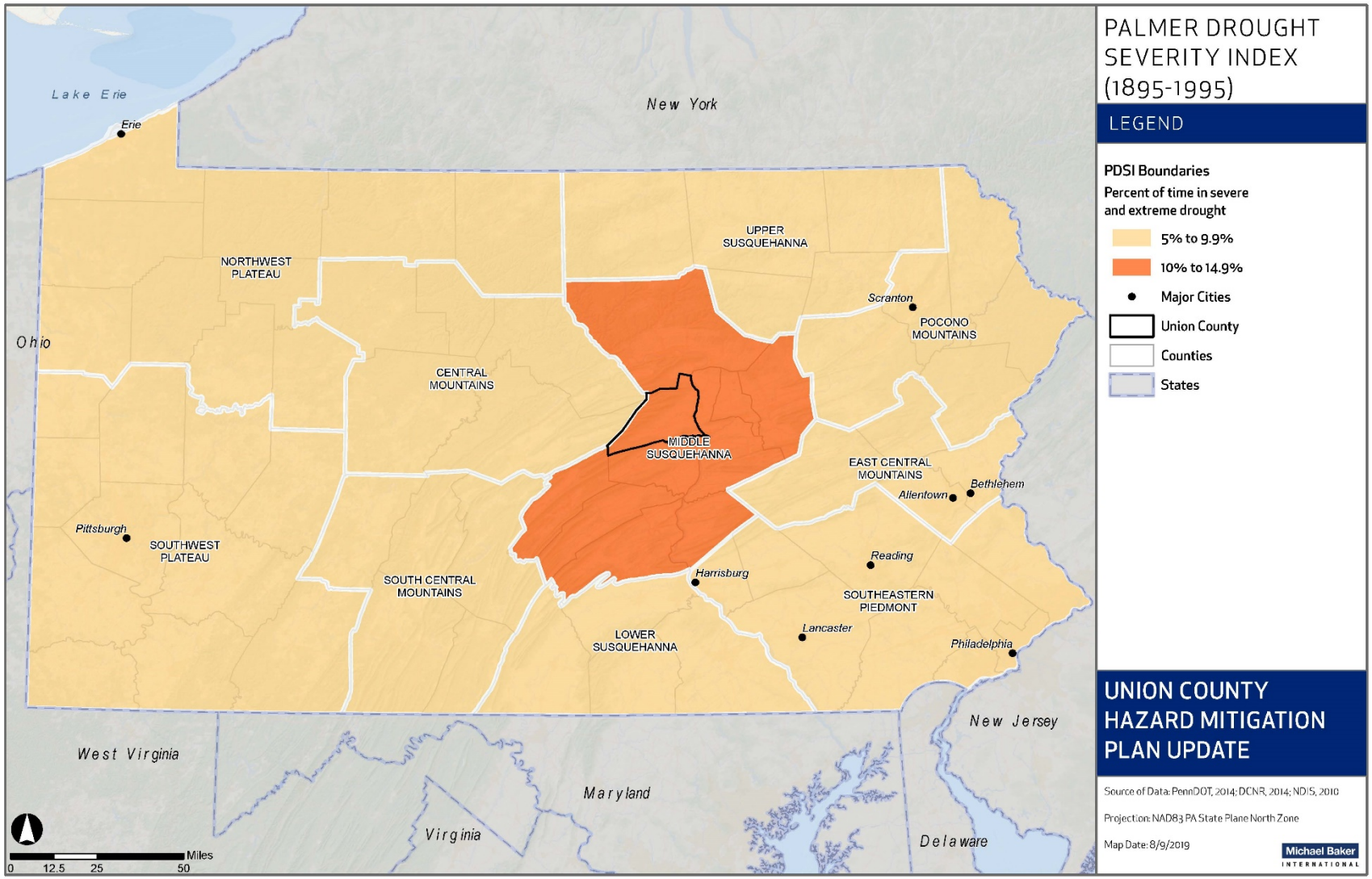
Table 4.3.1-3 Middle Susquehanna Region Drought History (Cornell University, 2019).		
DROUGHT PERIOD	**DURATION OF DROUGHT CONDITIONS**	**LOWEST PALMER DROUGHT SEVERITY INDEX**
11/1895 – 1/1896	3 months	-3.4
9/1900 – 2/1901	6 months	-3.69
11/1909 – 12/1909	2 months	-3.38
9/1930 – 9/1932	25 months	-6.1
11/1939 – 1/1940	3 months	-3.76
10/1941 – 11/1941	2 months	-3.3
11/1953 – 1/1954	3 months	-3.31
10/1963 – 12/1963	3 months	-3.72
9/1964 – 1/1966	17 months	-5.08
6/1966 – 2/1967	9 months	-4.74
12/1980 – 1/1981	2 months	-4.16

Table 4.3.1-3 Middle Susquehanna Region Drought History (Cornell University, 2019).		
DROUGHT PERIOD	**DURATION OF DROUGHT CONDITIONS**	**LOWEST PALMER DROUGHT SEVERITY INDEX**
7/1991 – 2/1992	8 months	-4.18
8/1995 – 9/1995	2 months	-3.58
12/2001 – 2/2002	3 months	-3.48
11/2016 – 2/2017	4 months	-3.76

4.3.1.4. Future Occurrence

It is difficult to forecast the severity and frequency of future drought events. Based on data from 1895 to 1995, Pennsylvania can be divided into ten PDSI areas (see Figure 4.3.1-1). Each of these areas have been assigned a percent of time PDSI values are less than or equal to three, a value equivalent to a drought warning or drought emergency in Pennsylvania. Historically, Union County is under a drought warning or emergency between 10 and 15 percent of the time. This is equivalent to a PDSI value less than or equal to -3. The future occurrence of drought in Union County can be considered *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

Figure 4.3.1-1 Percent of time areas of Pennsylvania have PSDI values <= -3



4.3.1.5. Vulnerability Assessment

A drought in Union County can have significant detrimental effects on the domestic water supply, especially for well-water, agriculture, and water-dependent recreational activities. Economic effects in Union County would include crop loss. No structural damage due to drought is anticipated in Union County.

Negative impacts of drought would be experienced by agricultural interests, and the community would need to reduce its usage of water. Prolonged drought would affect the 574 farms located in Union County, which sold approximately $147,000,000 in agricultural products in 2017 (USDA, 2017a). The major crops in Union County are corn, hay, and soybeans with totals of 17,600, 12,900, and 11,600 respectively (USDA, 2017b). According to the USDA 2017 Census of Agriculture, the majority of sales to date came from livestock sales, totaling $128,700,000 (87%). Crop sales made up the remaining 13%.

Table 4.3.1-4 Number of reported domestic wells in Union County (PaGWIS, 2019).

MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS
Buffalo Township	293
East Buffalo Township	154
Gregg Township	48
Hartleton Borough	12
Hartley Township	280
Kelly Township	132
Lewis Township	128
Lewisburg Borough	1
Limestone Township	152
Mifflinburg Borough	6
New Berlin Borough	0
Union Township	175
West Buffalo Township	244
White Deer Township	374
Total	**2,008**

Union County residents that use private domestic wells are also vulnerable to droughts because their wells can dry up. There are 2,008 domestic wells in Union County, with at least one in every municipality except New Berlin Borough. The table below shows the number of domestic wells per municipality as collected by the Pennsylvania Groundwater Information System (PaGWIS). According to this dataset, residents in White Deer Township are the most vulnerable to water supply issues related to droughts because of the high number of wells that are reported there. It is important to note, however, that the well data collected by PaGWIS relies on voluntary submissions of well record data by well drillers; therefore, it is not a complete database of all domestic wells in the County.

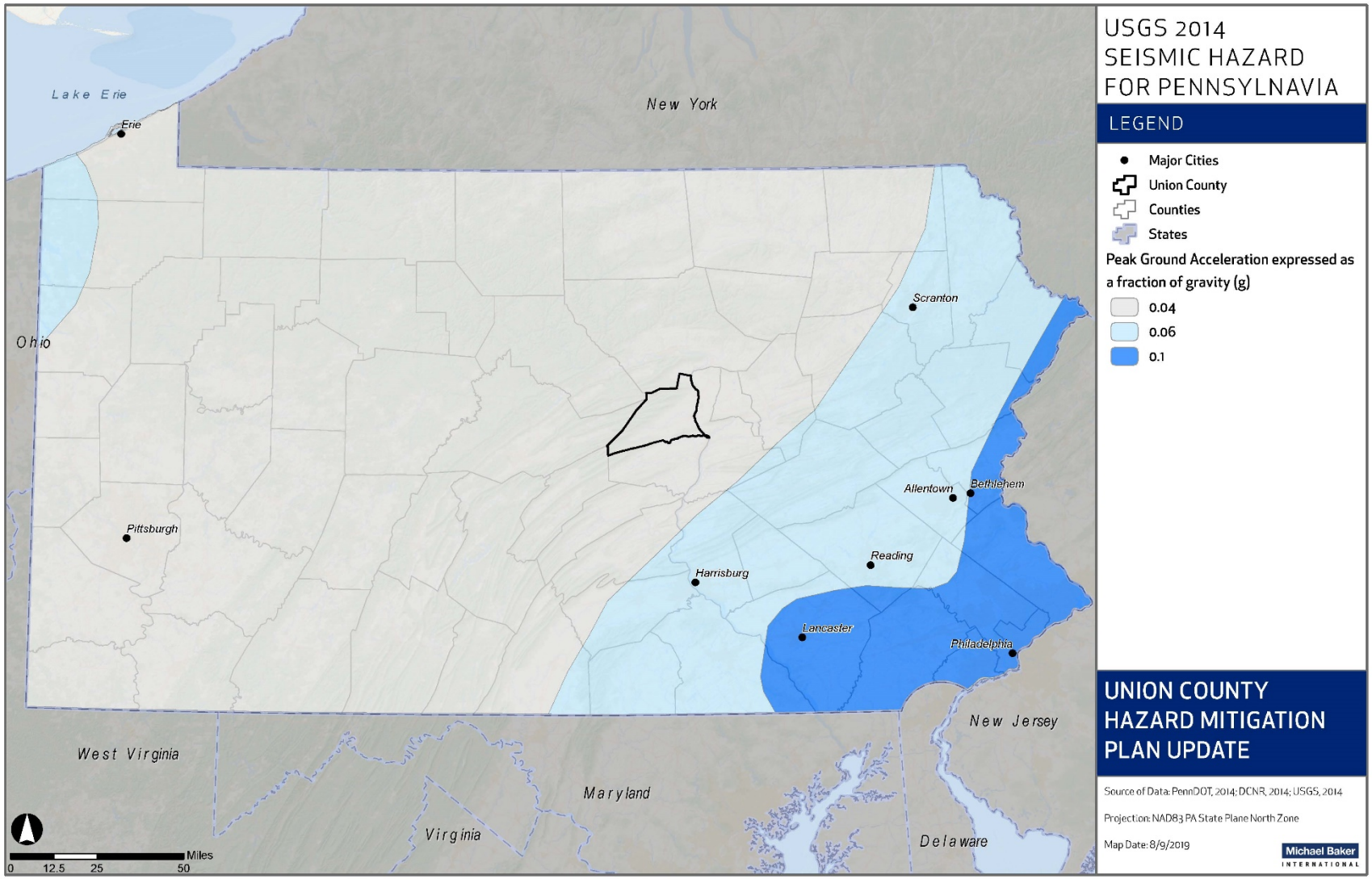
4.3.2. Earthquake

4.3.2.1. Location and Extent

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. The closest plate that might contribute to an earthquake in Union County is the Mid-Atlantic Ridge, which is approximately 2,000 miles to the east of Pennsylvania. An earthquake would affect all of Union County.

Earthquake events in Pennsylvania typically do not impact areas greater than 100 km (62 miles) from the epicenter, and earthquake epicenters in Union County are rare. The area is generally not known for seismicity, and USGS downgraded the probabilistic seismic hazard for much of Pennsylvania in 2014. Figure 4.3.2-1 shows the 2014 earthquake hazard in Pennsylvania and Union County, expressed as the two-percent probability of exceedance in 50 years of peak ground acceleration (g). This map was digitized from the 2014 National Seismic Hazard report. Union County lies in the 0.04 zone, indicating that the hazard is slight. However, earthquakes originating outside Pennsylvania can affect Union County, though they are not expected to cause significant damage. This was the most current data available when updating this plan.

Figure 4.3.2-1 Pennsylvania relative earthquake hazard zones



4.3.2.2. Range of Magnitude

There are several different ways of describing the magnitude of an earthquake. One method measures peak ground acceleration. Peak ground acceleration is the maximum horizontal ground acceleration measured in centimeters per second per second (cm/sec^2). Peak ground acceleration can range from zero for an earthquake that is noticed by very few people to 350, which would be categorized as a catastrophic event. A peak ground acceleration of 10 cm/sec^2 means that the shaking is equivalent to about one percent of the acceleration due to gravity. Generally, ground acceleration must exceed 15 cm/sec^2 for significant damage to occur.

Earthquake magnitude is also often measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. The table below summarizes Richter Scale Magnitudes as they relate to the spatial extent of impacted areas. 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. Therefore, another way of measuring the intensity of an earthquake is the Modified Mercalli Intensity Scale. Measures on this scale range from I, an earthquake that is not generally noticeable, to XII, an earthquake that causes complete destruction. The table below summarizes Modified Mercalli Intensity Scale impacts of earthquake events, measured in terms of earthquake intensity.

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

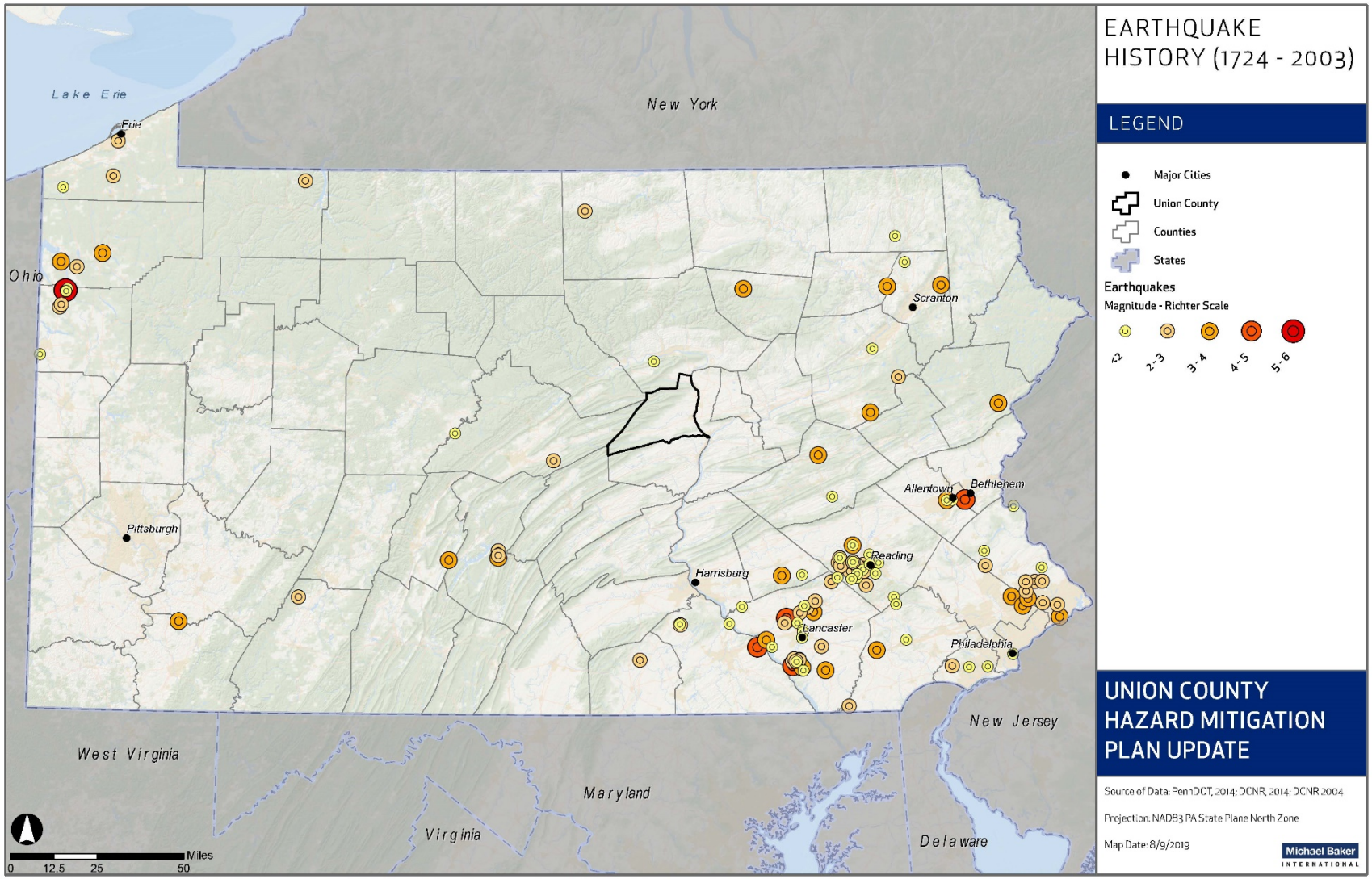
Table 4.3.2-2 Modified Mercalli Intensity Scale with associated impacts.			
SCALE	**INTENSITY**	**DESCRIPTION OF EFFECTS**	**CORRESPONDING RICHTER SCALE MAGNITUDE**
VI	**Strong**	Trees sway; suspended objects swing; objects fall off shelves	<5.4
VII	**Very Strong**	Mild alarm, walls crack, plaster falls	<6.1
VIII	**Destructive**	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged	<6.9
IX	**Ruinous**	Some houses collapse, ground cracks, pipes break open	<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

Recent earthquakes in Pennsylvania have been measured from IV to VI on the Modified Mercalli Intensity Scale. 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 Union County or near the border in an adjacent county, causing mild damage in populated areas.

4.3.2.3. Past Occurrence

According to records maintained by the Pennsylvania Department of Conservation and Natural Resources (DCNR), there have been no earthquakes recorded with epicenters in Union County (Figure 4.3.2-3). However, parts of the county probably experienced some of the shock waves of some minor earthquakes that have occurred around the region shown on Figure 4.3.2-2. It is important to note that some of these events may not have been true earthquakes but instead may have been the result of mine or quarry blasts. On the whole, though, these events have largely been minor events with Richter Scale magnitudes of less than 5.

Figure 4.3.2-2 Union County and Pennsylvania earthquake history



The worst earthquake on record affecting Union County occurred in Erie, PA. It was recorded as a 5.2 magnitude quake in 1998.

4.3.2.4. Future Occurrence

The probability of an earthquake event occurring in Union County is very low. Union County does not sit on any fault lines; therefore, it is reasonable to believe that the County will not experience earthquake damage anytime soon. The future occurrence of earthquakes can be considered *unlikely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

4.3.2.5. Vulnerability Assessment

All structures and infrastructure in Union County are equally at risk of experiencing an earthquake. However, in a mild earthquake of the magnitude typically experienced in Pennsylvania, no structural damage is anticipated. In other cases, damages are expected to be limited, and examples of anticipated damages are broken dishes and windows and toppled file cabinets.

However, for earthquakes, the available history covers a period of less than 300 years, which is a relatively short period of time for an examination of earthquakes. Large earthquakes may only affect a location every several centuries or millennia.

A very large earthquake affecting Union County might cause structural damage in dilapidated structures or structures that do not meet current building codes. Roads and bridges might be damaged and trees and power lines might fall. Thus, the impact of an earthquake might range from negligible to catastrophic. Based on 300 years of experience in Union County, there will most likely be no damage or very slight damage.

Structures identified as potentially at risk of damage due to an earthquake are older structures. All existing buildings have the potential to experience an earthquake. Given no history of damage in Union County due to earthquake, damages are estimated to be limited to the more dilapidated structures and structures with unreinforced masonry. The number of structures that are at least 50 years old is 7,964 (U.S. Census Bureau, 2017).

All future structures will also have the potential to experience an earthquake. However, given that new structures must meet current building codes and given the expected magnitude of earthquakes in the County, no property damages are anticipated.

4.3.3. Flood, Flash Flood, Ice Jam

4.3.3.1. Location and Extent

Flooding is the temporary condition of partial or complete inundation on normally dry land and it is the most frequent and costly of all natural hazards in Pennsylvania. Flooding occurs when excess water from snowmelt or rainfall fills a stream, causing it to overflow onto the stream banks and adjacent floodplains. Floodplains are lowlands adjacent to rivers, streams, and creeks that are subject to recurring floods.

Flash flood conditions can result from a large amount of rainfall over a short time span. Though, a small amount of rain can also 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 impervious surfaces such as large parking lots, paved roadways, or other densely developed areas.

Snow melt combined with heavy rains can cause frozen rivers to swell, which can break the ice layer on top of a river. If this occurs, large chunks can float downstream, piling up in narrow passages and near other obstructions such as bridges and dams causing an **ice jam**. One record of a flood event caused by an ice jam along the Penns Creek in Union County occurred in March 2019.

All of Union County lies within the drainage basin of the Susquehanna River, which is the largest basin on the Atlantic Seaboard of the United States. The Susquehanna River drains directly into the Chesapeake Bay. The County seat, the Borough of Lewisburg, is located along the West Branch of the Susquehanna River at the eastern boundary of Union County.

The various tributary streams and creeks generally flow west to east, from the foothills of the Appalachian Mountains towards the Susquehanna River. Penns Creek and Buffalo Creek are the largest tributaries in the County.

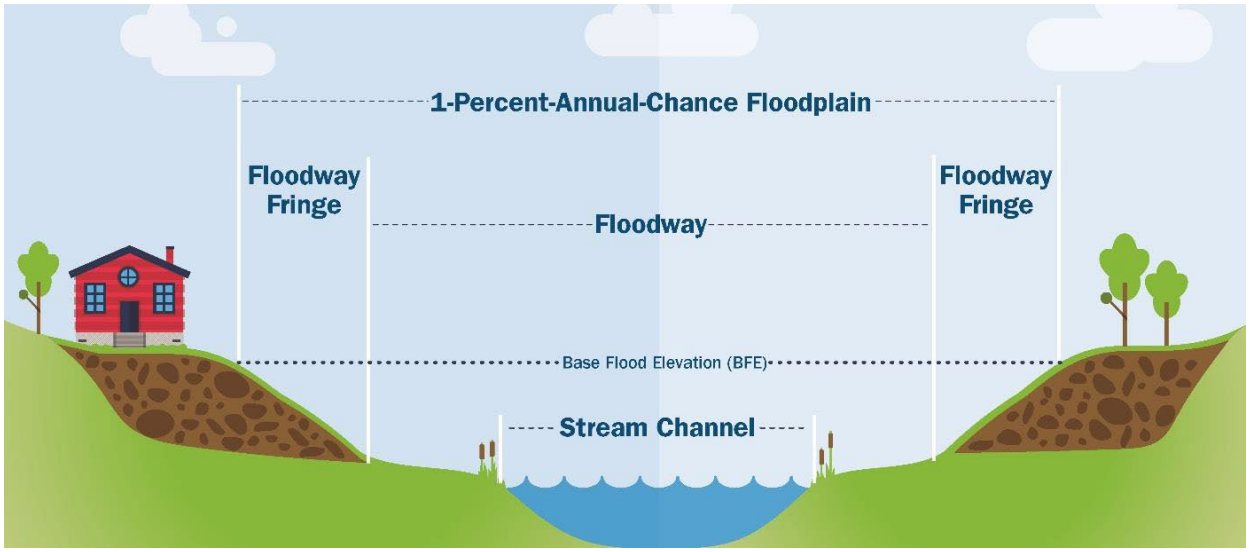
Of the 14 municipalities within Union County, the Borough of Lewisburg has suffered the most severe damage from flooding due to extensive development within the floodplain and its proximity to the Susquehanna River and tributaries.

Table 4.3.3-1 shows which tributaries have the potential to lead to flooding in particular jurisdictions; there is the potential for flooding due to rivers and streams in each jurisdiction in the County except Hartleton Borough.

Table 4.3.3-1 Rivers and Streams by Jurisdiction in Union County						
MUNICIPALITY	RIVERS AND STREAMS					
	WEST BRANCH, SUSQUEHANNA RIVER	LIMESTONE RUN – BULL RUN	BUFFALO CREEK	PENNS CREEK	WHITE DEER CREEK	WHITE DEER HOLE CREEK
Buffalo Township			✓			
East Buffalo Township	✓	✓				
Gregg Township	✓					✓
Hartleton Borough						
Hartley Township				✓		
Kelly Township	✓		✓			
Lewis Township			✓	✓		
Lewisburg Borough	✓	✓	✓			
Limestone Township				✓		
Mifflinburg Borough			✓			
New Berlin Borough				✓		
Union Township	✓			✓		
West Buffalo Township			✓			
White Deer Township	✓				✓	

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 10-percent-annual chance of occurring in a given year is smaller than the floodplain associated with a flood that has a 0.2-percent-annual chance of occurring. The National Flood Insurance Program (NFIP), for which Flood Insurance Rate Maps (FIRM) are published, identifies the risk associated with the 1-percent-annual chance flood. This 1-percent-annual chance flood event is used to delineate the *Special Flood Hazard Area* (SFHA) and to identify *Base Flood Elevations* (BFE). Figure 4.3.3-1 illustrates these terms. The SFHA serves as the primary regulatory boundary used by FEMA and Union County governments when determining risk associated with flooding.

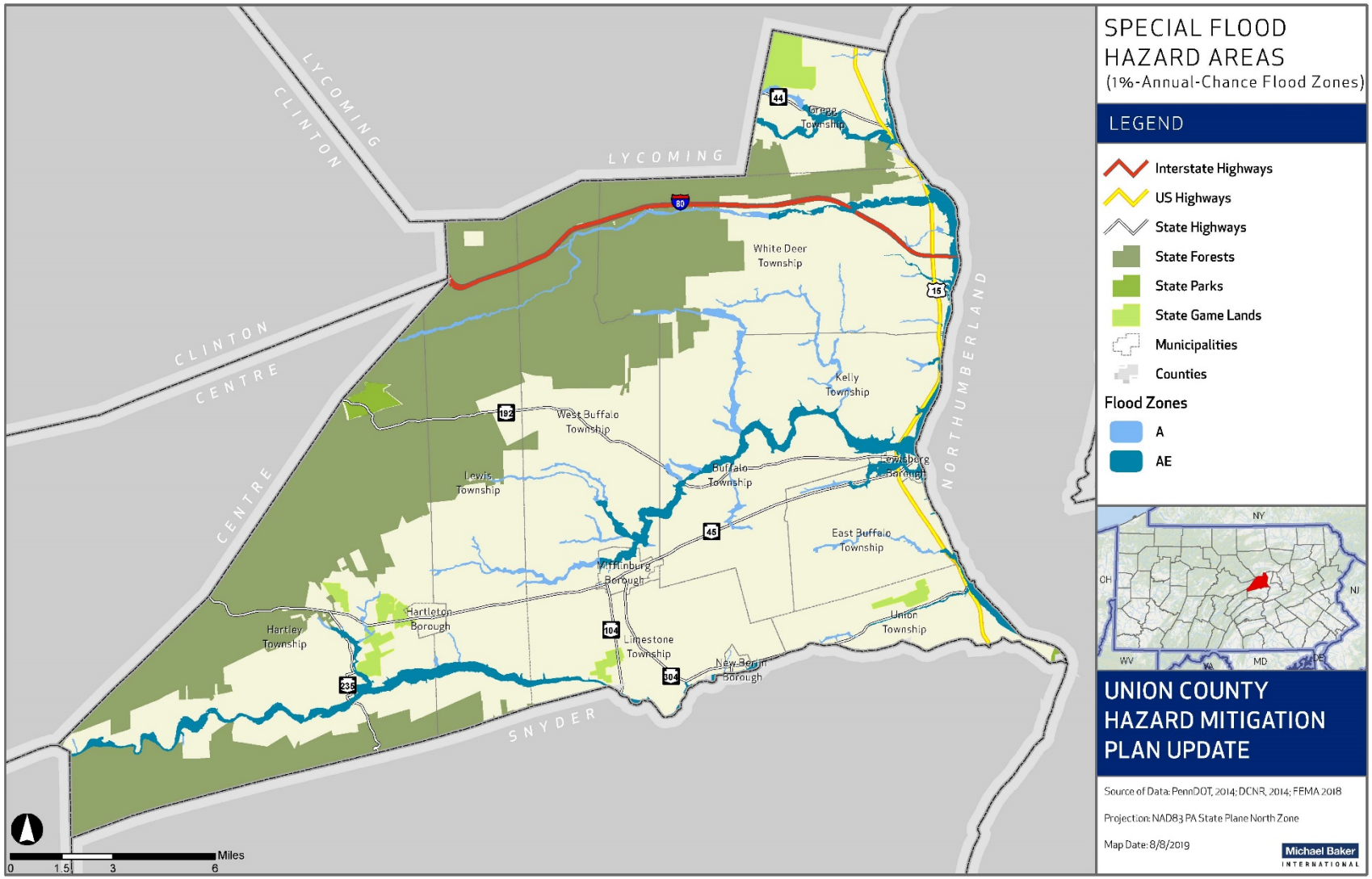
Figure 4.3.3-1 Diagram identifying Special Flood Hazard Area, 1% annual chance (100-Year) floodplain, floodway and flood fringe.



Countywide FIRMs and Flood Insurance Studies (FIS) were published for Union County on September 28, 2007 and map panels in some communities were updated on October 16, 2009. Preliminary FIRMs were issued for Union County on September 28, 2018. This best available data was used throughout this HMP Update. FIRMs and FIS reports for the entire county can be obtained from the FEMA Map Service Center (http://www.msc.fema.gov). These maps and reports can be used to identify the expected spatial extent and elevation of flooding from a 1-percent and 0.2-percent-annual chance event. All but one municipality in the County were determined to have special flood hazard areas. Hartleton Borough does not have any SFHAs. Figure 4.3.3-2 shows the location of watercourses and flood zones in Union County. The location of approximate and detailed (which include BFEs) SFHAs (1-percent-annual chance zones) are shown.

It should also be noted that flooding is not only caused by heavy rain events. Additionally, as described in Section 5.2.1, Union County has five high-hazard dams located within the county and is part of the inundation area for six dams located outside of county boundaries. If any one of these dams were to fail, there could be loss of life and property damage resulting from flooding within the dam inundation areas. Emergency Action Plans are on file at the Union County Public Safety Office for these dams which address procedures and actions to be taken both to prevent and respond to dam failure.

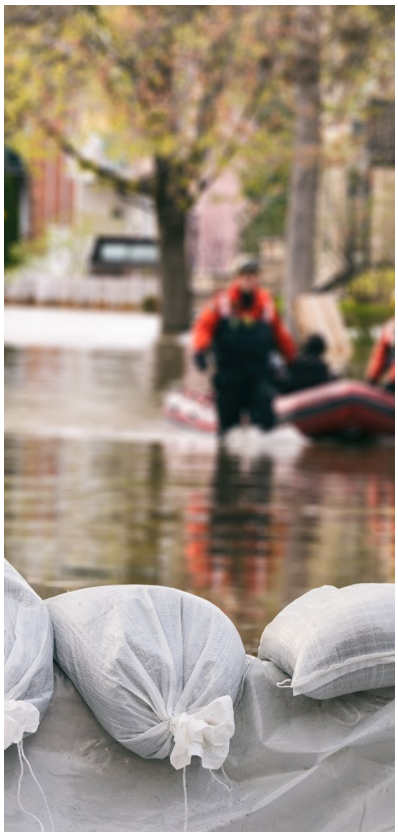
Figure 4.3.3-2 Map showing the location of watercourses and flood zones throughout Union County



4.3.3.2. Range of Magnitude

Flooding in Union County has mainly been caused by heavy rainfall. Some areas have experienced rain events bringing more than three to as many as eight inches of rain to the area within a day. In 2003, Penns Creek was measured at eight feet above flood stage. Flooding in the County can be exacerbated when heavy rain occurs in late winter by accelerating the melting of snow. Flooding can also be exacerbated locally by the presence of impermeable surfaces due to increased development of buildings and pavement or lack of appropriately sized flood water detention basins.

Flooding in Union County can be worsened if the flow of water is obstructed in some way such as by an undersized culvert. This is a potential problem upstream of an abandoned railroad bridge on the Susquehanna River between Union and Northumberland Counties. This culvert has the potential to trap debris and create a dam, which would increase flooding in the Lewisburg Borough and Kelly Township. As this railroad bridge is no longer maintained, there is also the possibility of the bridge deteriorating or even becoming dislodged during a major flood event and contributing to flooding immediately downstream at the Pennsylvania Route 45 Bridge where it could create a blockage. In 2012, the deck of the bridge caught fire due to a power line incident. In 2014, discussions considered converting the unmaintained rail bridge into a rail trail by connecting to a portion of the existing Buffalo Valley Rail Trail (BVRT). Efforts were initially led by the Buffalo Valley Recreation Authority. Since, then, the BVRT is now under the authority of Union County Commissioners. Union County is committed to increasing and promoting trail use and outdoor tourism. Several parties are currently working to identify a solution the abandoned rail bridge and a mitigation action is included in Section 6 of the plan for Union County and Lewisburg Borough to remain involved in the process for developing a solution.



Flooding is the most common and costly natural disaster in Union County, Pennsylvania, and the entire United States.

Hurricanes and Tropical Storms can also contribute to flooding in the County. A worst-case scenario for flooding occurred in June 1972, where Hurricane Agnes resulted in over 18 inches of rain in Shamokin Dam, a borough located just to the south and downstream of Union County. It led to flooding in 80 percent of Lewisburg and three deaths in the County. More recently,

Tropical Storm Lee brought more than 10 inches of rain over the course of 3 days in 2011 and Hurricane Sandy impacted the entire Commonwealth of Pennsylvania in 2012.

Although floods can cause damage to property and loss of life, floods are naturally occurring events that benefit riparian systems. Such benefits include groundwater recharge and the introduction of nutrient rich sediment improving soil fertility. However, the destruction of riparian buffers through development, 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

Union County has a long history of flooding problems. Bordered to the east by the West Branch of the Susquehanna River and traversed by several tributary streams, creeks, and runs, Union County has suffered damage from numerous major floods and localized flash flooding. Table 4.3.3-2 lists flooding events in Union County since 1993. Estimated property damages include every loss to any type of facility (residential, commercial, agricultural, or industrial) and include structure, content, and crop damages.

Table 4.3.3-2 Flood and flash flood events impacting Union County from 1993-2019 (NCDC, 2019). Note that property damage values are estimates based on best available information. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	ESTIMATED TOTAL DAMAGE ($)
01/19/1996	Countywide; no additional details available.	*not provided*
09/13/1996	Mifflinburg; Roads were flooded due to heavy rains across portions of Union County.	*not provided*
12/1/1996	Countywide; no additional details available.	*not provided*
12/13/1996	Countywide; no additional details available.	*not provided*
01/8/1998	Countywide; Heavy rains produced flooding across a large area of central PA over a 3-day period from Jan. 7 through the 10th. Large amounts of moisture moved northeast across the Ohio Valley into the area. The Susquehanna River exceeded flood stage at Bloomsburg and Lewisburg on the 9th and Danville and Harrisburg on the 10th.	*not provided*
02/18/1998	Countywide; Rain of up to 2.5 inches fell across the area overnight, causing flooding of small streams and roads.	*not provided*
04/19/1998	Countywide; A steady soaking rain fell across the region with 24-hour amounts in excess of 2 inches. Storm drains clogged, some roads were closed, small streams topped their banks, and a number of basements were flooded.	*not provided*
1/24/1999	Countywide; no additional details available.	$5,000
08/20/1999	Lewisburg; Six to eight inches of rain fell in 3 hours and caused serious flooding across eastern parts of the country.	$100,000
09/7/1999	Eastern Portion of County; The city of Lewisburg was especially hard hit by the remnants of Hurricane Dennis as up to 8 inches of rain fell in 24 hours, most of it during the early morning hours. Waters rose rapidly in the early morning hours. At least 160 people were displaced from their homes, many of them Bucknell University students. A total of 414 homes were affected by the flooding along with 30 county businesses. Vehicles were floated down the city side streets and 162 were damaged. The campus of Bucknell University also had damage. Other parts of the county from Mifflinburg east to the Susquehanna River had problems. Route 15 was closed due to flooding.	$10,000,000

Table 4.3.3-2 Flood and flash flood events impacting Union County from 1993-2019 (NCDC, 2019). Note that property damage values are estimates based on best available information. "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION	ESTIMATED TOTAL DAMAGE ($)
09/16/1999	Countywide; no additional details available.	$20,000
09/30/1999	Countywide; 2.5 to 3 inches caused poor drainage flooding.	*not provided*
09/24/2001	Lewisburg; Heavy rain caused Bull Run Creek to run out of its banks.	*not provided*
09/23/2003	Countywide; Heavy rainfall caused Penns Creek to exceed its flood stage. The creek exceeded flood stage at 3:15 on Sep. 23 then fell back below flood stage at 8:30 on the 23rd.	*not provided*
12/11/2003	Countywide; Heavy rainfall caused Penns Creek to exceed flood stage. It rose above flood stage around noon on Dec. 11 and fell back below flood stage around 10:00 that night.	*not provided*
08/20/2004	Mifflinburg; Heavy rain brought nearly three inches of rain to Union County during the evening of Aug. 20. Streams and creeks first started to overflow their banks in the Mifflinburg area, flooding roads and making them impassable. County Emergency Management officials reported that many streams throughout the county were out of their banks by midnight, with many roads in the county closed.	*not provided*
08/21/2004	Countywide; Heavy rain brought nearly three inches of rain to Union County during the evening of Aug. 20. While flash flooding ended shortly after midnight on the 21st, high water continued along with flooding into the morning.	*not provided*
09/17/2004	Countywide; no additional details available.	*not provided*
09/18/2004	Countywide; Heavy rain caused the West Branch of the Susquehanna River at Lewisburg to exceed its flood stage. The river rose above flood stage on the 18th and fell back below flood stage on the 20th.	*not provided*
03/29/2005	Countywide; Heavy rain caused Penns Creek to flood. The creek exceeded flood stage on the 29th and fell back below flood stage later that day.	*not provided*
04/02/2005	Countywide; no additional details available.	*not provided*
04/03/2005	Countywide; Heavy rain caused the West Branch of the Susquehanna River at Lewisburg to flood. The river exceeded flood stage on the 3rd and fell back below flood stage on the 4th.	*not provided*
04/03/2005	Countywide; Heavy rain caused the West Branch of the Susquehanna River at Milton to flood. The river exceeded flood stage on the 3rd and fell back below flood stage that same day.	*not provided*
11/29/2005	Countywide; Heavy rain cause Penns Creek to flood. The creek exceeded flood stage on the 29th and fell back below flood stage on the 30th.	*not provided*
06/27/2006	Countywide; Heavy rain associated with a weak tropical storm system caused flash flooding across central PA on June 27th and 28th. Numerous roads were closed due to flood waters, especially in Mifflinburg.	*not provided*
03/05/2008	Lewisburg; Heavy rain caused flooding of Bull Run, and the closure of several roads near Lewisburg. Buffalo Creek also overflowed its banks, causing flooded streets and road closures in Mifflinburg.	*not provided*
07/31/2009	Linntown; Heavy rain caused a mudslide along Route 15.	$5,000
01/25/2010	Linntown; Heavy rain caused rapid rises and flash flooding along many small streams and creeks which eventually spilled over their banks. The flash flooding closed several roads in the towns of Winfield and Lewisburg.	*not provided*
12/01/2010	West Milton; Rainfall amounts between 2 and 4 inches caused widespread flooding. The West Branch Susquehanna River at Milton crested over moderate flood stage at just under 23 ft.	$5,000
03/06/2011	Rutherton; Flooding caused the closure of several roads in Union County, especially in Mifflinburg Borough, Lewis Township, Hartley Township, and Kelly Township.	*not provided*

Table 4.3.3-2 Flood and flash flood events impacting Union County from 1993-2019 (NCDC, 2019). Note that property damage values are estimates based on best available information. "Countywide" indicates several locations in the County were affected.		
DATE	**LOCATION & DESCRIPTION**	**ESTIMATED TOTAL DAMAGE ($)**
03/10/2011	Lewisburg; Flooding closed several roads across Union County. Media reports also indicated some residential flooding in the Lewisburg area near Buffalo Creek, including closed roads, flooded fields, and flooded residential back yards.	*not provided*
09/07/2011	Lewisburg; The West Branch Susquehanna River at Lewisburg and Watsontown crested in moderate flood stage. It crested in major flood stage at Milton. Several roads in Union County were closed due to flooding from creeks and streams, resulting from heavy rainfall from the remnants of Tropical Storm Lee. Flooding severely damaged at least three homes at Bucknell University and some areas were evacuated. A preliminary total of 174 buildings across Union County suffered major damage from this event, with 56 suffering minor damage and a total of 230 structures impacted.	$800,000
09/28/2011	Kelly Point; Heavy rain caused flash flooding county-wide, with many roads closed.	*not provided*
05/08/2013	Linntown; Locally heavy rain caused flash flooding around Lewisburg. Bull Run and Turtle Creek came out of their banks and flooded adjacent roads. The Lewisburg COOP observer recorded 3.25 inches of rain.	*not provided*
05/16/2014	Weikert; Heavy rainfall in excess of 3 inches produced widespread minor flooding throughout the county. The Penns Creek exceeded minor flood stage, impacting areas downstream of the Route 104 bridge. Other affected areas include a nearby campground and a number of secondary roads in the Penns Creek drainage basin.	*not provided*
03/12/2019	An ice jam was reported by the public along Penns Creek upstream from the Route 104 Bridge, and a flood advisory was issued for parts of Union and Snyder Counties.	*not provided*

In addition to the aforementioned past flood events, the NFIP identifies properties that experience frequent flooding and can be used to determine areas of higher risk. These properties are identified through the NFIP when receive more than one payment for flood damages. A **Repetitive Loss** property is a structure that:

(a) Is covered by a contract for flood insurance made available under the NFIP; and

(b) Has incurred flood-related damage on two occasions, in which the cost of the repair, on the average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event; and

(c) At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage. (Please note: Homes are eligible for ICC coverage after first loss, however cost for ICC is part of all policies.)

A **Severe Repetitive Loss** property is a structure that:

(a) Is covered under a contract for flood insurance made available under the NFIP; and

(b) Has incurred flood related damage (i) For which four or more separate claims payments have been made under flood insurance coverage with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or (ii) For which at

least two separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

Table 4.3.3-3 displays repetitive loss properties by jurisdiction and type in Union County. The County has 131 repetitive loss properties and 42 repetitive loss properties that have been mitigated. Lewisburg Borough has the most repetitive loss properties (48) and also the most mitigated repetitive loss properties (35). Of these 143 repetitive loss structures properties in the County, the most are single family homes (95). Table 4.3.3-4 displays severe repetitive loss properties in Union County. There are seven SRL properties in Union County: four in Lewisburg Borough, two in White Deer Township, and one in Union Township.

Lewisburg Borough recognized the problems posed by flooding in the Borough and the impact on repetitive loss structures. The Lewisburg Neighborhood Corporation, a nonprofit organization developed The Elm Street Program, in cooperation with Lewisburg Borough, received a nearly $3 million FEMA grant in 2012 for a project to acquire and demolish ten structures that have flooded repeatedly in central Lewisburg on Sixth Street along Bull Run (Lewisburg, 2016). Demolitions continued through 2014. The space is now home to the Bull Run Greenway, a linear park linking downtown Lewisburg and Bucknell University. The park achieved stream restoration, new recreation opportunities, and ways to manage stormwater. Figure 4.3.3-2 is a picture of the demolitions along Sixth Street during the early stages of the acquisition project.

Figure 4.3.3-3 Photo of acquisition and demolition project of several repetitive loss structures in Lewisburg Borough.

Table 4.3.3-3 Summary of the number and type of Repetitive Loss properties by municipality (PA Emergency Management Agency. October 2018. PA Standard State All-Hazard Mitigation Plan).

MUNICIPALITY	NON-RESIDENTIAL		2-4 FAMILY		SINGLE FAMILY		CONDO		OTHER RESIDENT		TOTAL RL PROPERTIES	TOTAL MITIGATED RL PROP-ERTIES
	Number of Properties	Number of Mitigated Properties	Number of Properties	Number of Mitigated Properties	Number of Properties	Number of Mitigated Properties	Number of Properties	Number of Mitigated Properties	Number of Properties	Number of Mitigated Properties		
Buffalo Township	0	0	0	0	1	0	0	0	0	0	1	0
East Buffalo Township	0	0	0	0	6	0	0	0	0	0	6	0
Gregg Township	0	0	0	0	4	1	0	0	0	0	4	1
Hartleton Borough	1	0	0	0	16	3	0	0	0	0	17	3
Hartley Township	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kelly Township	0	0	0	0	3	0	0	0	0	0	3	0
Lewis Township	0	0	0	0	4	0	0	0	0	0	4	0
Lewisburg Borough	5	2	14	10	27	21	0	0	2	2	48	35
Limestone Township	0	0	0	0	10	2	1	0	0	0	11	2
Mifflinburg Borough	0	0	0	0	2	0	0	0	0	0	2	0
New Berlin Borough	0	0	0	0	2	0	0	0	0	0	2	0
Union Township	9	1	0	0	17	0	1	0	0	0	27	1
West Buffalo Township	0	0	0	0	0	0	0	0	0	0	0	0
White Deer Township	1	0	1	0	3	0	0	0	1	0	6	0
TOTAL	**16**	**3**	**15**	**10**	**95**	**27**	**2**	**0**	**3**	**2**	**131**	**42**

Table 4.3.3-4 Summary of the number and type of Severe Repetitive Loss properties by municipality (PA Emergency Management Agency. October 2018. PA Standard State All-Hazard Mitigation Plan).

MUNICIPALITY	NON-RESIDENTIAL		2-4 FAMILY		SINGLE FAMILY		CONDO		OTHER RESIDENT		TOTAL RL PROP-ERTIES	TOTAL MITIGATED RL PROP-ERTIES
	Number of Properties	Number of Mitigated Properties	Number of Properties	Number of Mitigated Properties	Number of Properties	Number of Mitigated Properties	Number of Properties	Number of Mitigated Properties	Number of Properties	Number of Mitigated Properties		
Buffalo Township	0	0	0	0	0	0	0	0	0	0	0	0
East Buffalo Township	0	0	0	0	0	0	0	0	0	0	0	0
Gregg Township	0	0	0	0	0	0	0	0	0	0	0	0
Hartleton Borough	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hartley Township	0	0	0	0	0	0	0	0	0	0	0	0
Kelly Township	0	0	0	0	0	0	0	0	0	0	0	0
Lewis Township	0	0	0	0	0	0	0	0	0	0	0	0
Lewisburg Borough	0	0	2	2	2	0	0	0	0	0	4	2
Limestone Township	0	0	0	0	0	0	0	0	0	0	0	0
Mifflinburg Borough	0	0	0	0	0	0	0	0	0	0	0	0
New Berlin Borough	0	0	0	0	0	0	0	0	0	0	0	0
Union Township	0	0	0	0	1	0	0	0	0	0	1	0
West Buffalo Township	0	0	0	0	0	0	0	0	0	0	0	0
White Deer Township	0	0	2	0	0	0	0	0	0	0	2	0
TOTAL	**0**	**0**	**4**	**2**	**3**	**0**	**0**	**0**	**0**	**0**	**7**	**2**

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" (FEMA, 2019). For that reason, flood insurance is a critical way for citizens to protect their property against flood loss. Home and business owners can purchase flood insurance through private insurers or through the National Flood Insurance Program.

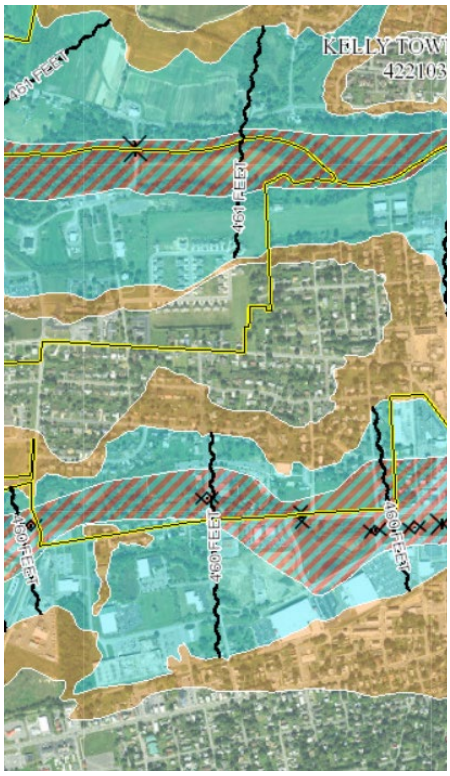
Congress established the NFIP in 1968 to help control the growing cost of federal disaster relief. The NFIP, administrated through FEMA, offers federally-backed flood insurance at discounted rates when communities adopt and enforce effective floodplain management ordinances to reduce future flood losses based on flood maps. The NFIP is based on voluntary participation of communities but is required in order for communities to receive federal disaster relief funding.

Table 4.3.3-5 lists the Union County municipalities participating in the NFIP.

The minimum floodplain management requirements to be a community in good standing in the NFIP include:

- Review and permit all development in the Special Flood Hazard Area (SFHA);
- Elevate new and substantially improved residential structures above the Base Flood Elevation;
- Elevate or dry floodproof 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, communities are eligible to participate in the NFIP's Community Rating System (CRS). Under the CRS, policyholders can receive premium discounts of five- to 45-percent as their cities and towns adopt more comprehensive flood mitigation measures. Currently, only Lewisburg Borough participates in CRS in Union County.



Union County's flood zones are viewable on FEMA's National Flood Hazard Layer: www.fema.gov/national-flood-hazard-layer-nfhl

Table 4.3.3-5 Union County Municipal Participation in the National Flood Insurance Program.				
COMMUNITY	**PARTICIPATION STATUS**	**CID**	**INITIAL FIRM IDENTIFIED**	**CURRENT EFFECTIVE MAP DATE**
Buffalo Township	PARTICIPATING	421237	04/01/1977	10/16/2009
East Buffalo Township	PARTICIPATING	421011	02/02/1977	10/16/2009
Gregg Township	PARTICIPATING	420830	09/28/1979	09/28/2007
Hartleton Borough	NOT PARTICIPATING (NO SFHAs)	422528	09/28/2007	09/28/2007
Hartley Township	PARTICIPATING	422102	03/04/1988	09/28/2007
Kelly Township	PARTICIPATING	422103	03/01/1977	10/16/2009
Lewis Township	PARTICIPATING	422104	09/30/1987	09/28/2007
Lewisburg Borough	PARTICIPATING	420831	02/02/1977	10/16/2009
Limestone Township	PARTICIPATING	422105	03/04/1988	09/28/2007
Mifflinburg Borough	PARTICIPATING	420832	03/04/1988	09/28/2007
New Berlin Borough	PARTICIPATING	420833	04/30/1986	09/28/2007
Union Township	PARTICIPATING	420834	08/01/1979	09/28/2007
West Buffalo Township	PARTICIPATING	422106	09/30/1987	09/28/2007
White Deer Township	PARTICIPATING	421034	09/28/1979	09/28/2007

4.3.3.4. Future Occurrence

Approximately 6.3 percent of the County has been determined by flood studies conducted by FEMA for the development of Flood Insurance Rate Maps (FIRMs) to be within a flood-prone area; the majority of this area has at least a 1-percent chance of flooding in any given year while 1 percent of the County is in an area with a 0.2-percent chance of flooding in any given year. In this plan, the term "Special Flood Hazard Area" is used rather than floodplain to clarify that the area under consideration is identified on the FIRMs as having at least a 1-percent chance of flooding in any given year. Historically, the area with a 1-percent chance of flooding in any given year has been called the "100-year floodplain" or the "base flood" and the area with a 0.2-percent chance of flooding in any given year has been called the "500-year floodplain." As these terms can be misleading by suggesting that there will be a flood only every 100 or 500 years respectively, FEMA is moving away from this terminology, and they are not used in this plan. The 1- and 0.2 percent-annual-chance-floods are delineated on a community's FIRM. Areas subject to 2 percent- and 10 percent-annual-chance-events are not shown on FIRMs, however, water surface elevations associated with these events are included in the flood source profiles contained in the Flood Insurance Study Report. The most recent Flood Insurance Study for each county in Pennsylvania is available from the FEMA Map Service Center (http://www.msc.fema.gov)

Table 4.3.3-6 shows a range of flood recurrence intervals and associated probabilities of occurrence.

Table 4.3.3-6 Recurrence intervals and associated probabilities of occurrence (FEMA, 2007).	
RECURRENCE INTERVAL	**CHANCE OF OCCURRENCE IN ANY GIVEN YEAR (%)**
10 year	10
50 year	2

100 year	1
500 year	0.2

In Union County, flooding occurs commonly and can occur during any season. Within the flood-susceptible areas of Union County, it is expected that the character of flooding will remain essentially unchanged from what has been experienced for many years. However, some increase in the severity and frequency of flooding may result due to planned or recent development within the floodplains of the various county streams, as well as a future conditions and increased intensity and frequency of rain events. Therefore, the future occurrence of floods in Union County can be characterized as *highly likely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

4.3.3.5. Vulnerability Assessment

Flooding can lead to property loss as well as to loss of life. Flooding damages structures, including homes and businesses, vehicles, and infrastructure, including roadways. People who are surrounded by flood waters may at some point require evacuation, placing their lives and the lives of rescuers in danger. Flooding can disrupt the operation of businesses and schools. Recovery from flood damages can be time consuming and costly.

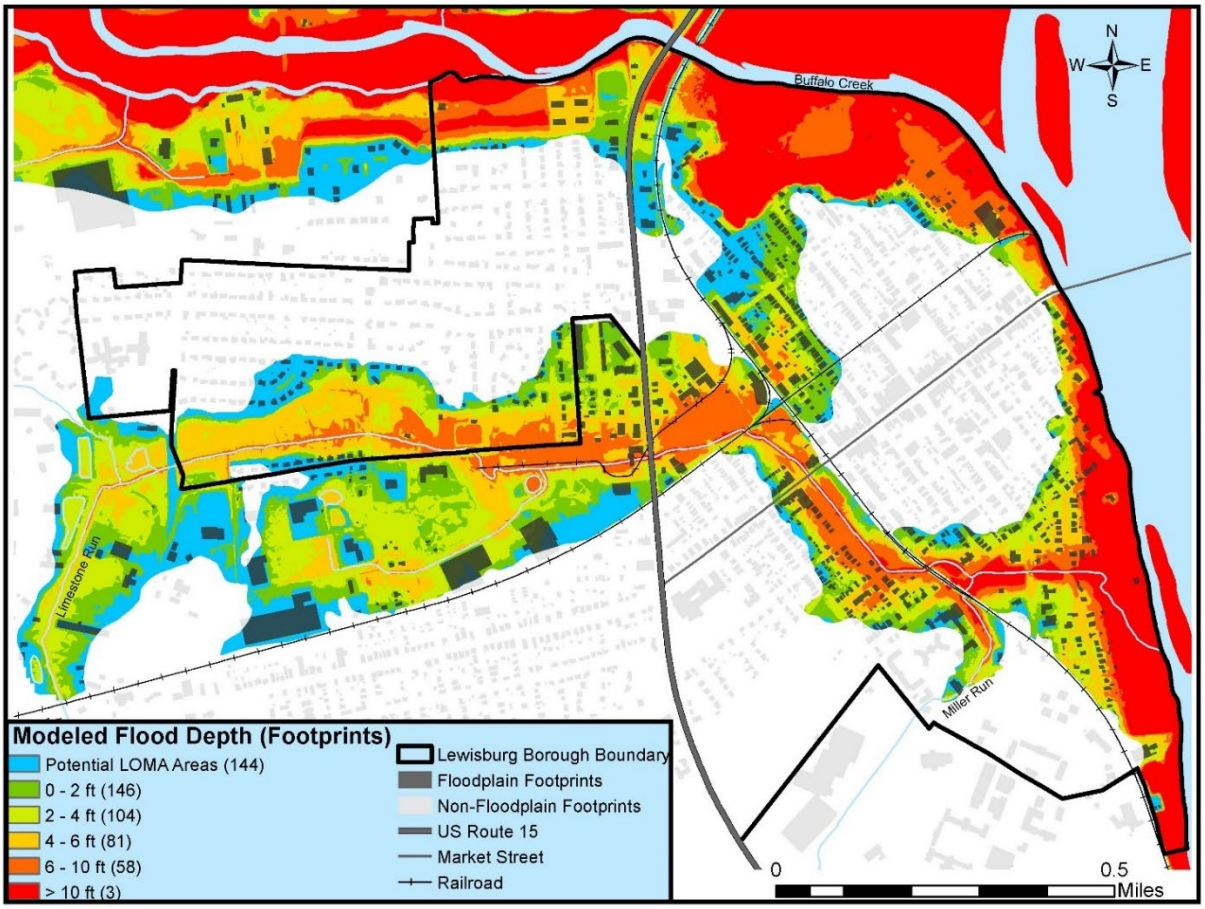
Flood vulnerability is described in terms of what community assets, structures, and infrastructure are situated in locations where flooding is anticipated. For purposes of assessing vulnerability, this plan focuses on those that are located in the SFHA. Please note that while other floods are possible, information about the extent and depths for the flood frequencies likely to be seen in this floodplain are available for all municipalities countywide, thus providing a consistent basis for analysis. Flood vulnerability maps for each applicable local municipality, showing the SFHA, addressable structures, critical facilities and transportation routes within it, are included in **Appendix D**. These maps were created using FEMA Countywide data from the current effective FIRMS.

Table 4.3.3-7 displays the 2010 population per municipality that lives within the SFHA. Lewisburg Borough has the most people living in the SFHA (1,580) and the largest percentage of people living in the SFHA (27.3%).

In an effort to communicate flood risk, the Borough of Lewisburg worked with the Lewisburg Neighborhoods Corporation (LNC) and Bucknell University in 2016 to conduct further spatial analyses of the Lewisburg SFHA. The research modeled categories of flood depth to determine how many properties would be affected by a 100-year flood and to what degree they would be impacted, since not all property owners are exposed to the same flood risk exposure. It was determined that 536 structures are at risk during a 100-year flood, with over half prone to more than 2 feet of flooding above the BFE. However, using updated elevation data provided by PASDA, around 144 structures that were previously reported by FEMA to be in the floodplain, were identified as having no flood depth by this GIS model (see figure below). These structures are located mostly around the intersection of Route 15 and Route 192 and along Meadow Lane and Terrace Drive. Lewisburg Neighbors Corporation hoped to inform residents of mitigation options to lower insurance costs and FEMA's Letter of Map Change (LOMC) options. Additionally, this effort identified that 536 structures located within the SFHA accounted for 30% of the

tax-base of Lewisburg Borough (Lewisburg Neighbors Corporation, 2016). The Borough continues to look at ways to increase tax revenue by developing properties outside of the floodplain.

Figure 4.3.3-4 Elevation analysis conducted by Lewisburg Neighbors Corporation and Bucknell University to better understand Lewisburg's flood risk (Lewisburg Neighbors Corporation, 2016.)



Some structures and infrastructure in each participating jurisdiction, except Hartleton Borough, are at risk of flood damage. Table 4.3.3-7 also displays the total number of structures and critical facilities located within the SFHA. Approximately 11% of all addressable structures (3,114 structures) in Union County are located in the SFHA and are most vulnerable to flood losses. Lewisburg Borough also has the most structures located in the SFHA (754) and is therefore most vulnerable to the 1%-annual-chance flood event. Only three municipalities in Union County have 5% or less of their structures located in the SFHA: Hartleton Borough, Mifflinburg Borough, and New Berlin Borough.

Table 4.3.3-8 shows the number of structures in each municipality located in the SFHA by land use type. The land use type displaying the greatest vulnerability to flood, flash flood, and ice jam hazards is residential. Of the 3,114 structures in Union County located in the SFHA, more than 80% are residential properties.

The Hassenplug Bridge in Union County, constructed in 1825, is one of the oldest wooden covered bridges in the entire Country.

In 2019, there were 447 NFIP policies in force. A total of 1,030 NFIP claims for flood damages have been made since 1978 for these structures. Cumulative NFIP payments for flood damages have exceeded $12.5 million.

Historic resources including landmark buildings, historic structures and sites, commercial and residential districts, rural resources, archaeological and cultural sites, and the historic environment can be impacted by disaster events. There are 232 historic resources identified by Union County, 124 of which are located in the flood zone. Currently, Union County has 19 entries on the National Registrar of Historic Places (NRHP), including 12 buildings, five structures, and two districts. Seven entries on the NRHP are within the SFHA including: Hassenplug Bridge in Mifflinburg Borough, Factory Covered Bridge in White Deer Township, Millmont Red Bridge in Hartley Township, Hayes Bridge in West Buffalo Township, the Lewisburg Historic District, the Spangler Farm in Limestone Township, and the Packwood House in Lewisburg Borough. The districts listed on the NRHP are Lewisburg Historic District and Mifflinburg Historic District. In a Pennsylvania River Town Historic District Survey and

Assessment prepared by the Pennsylvania State Historic Preservation Office in July 2017, Lewisburg Historic District ranked number ten on a list of top 25 historic districts most exposed to flood risk, based on various metrics including floodplain exposure. The table below shows the number of historical buildings, district, and structures contained in each municipality throughout the County (this includes places both listed and note listed on the NRHP).

Some historic and cultural resources also have unique vulnerabilities to hazard events. Depending on the resource, vulnerability to certain hazards may be greater and/or less than that of other assets in the County. For example, historic paper documents may not be impacted by an earthquake or severe winter storms, but historic properties have the potential to be more significantly impacted by these events than newer structures constructed to comply with modern building codes and development regulations. Similarly, flooding may have a more significant impact on a historic property than other properties, but there may be less of an impact on historic sites such as monuments or cemeteries.

Table 4.3.3-7 Number of Flood-Prone Historical Sites by Municipality

COMMUNITY	Buildings	Districts	Structures	Total
Buffalo Township	1	0	10	**11**
East Buffalo Township	6	0	10	**16**
Gregg Township	4	0	6	**10**
Hartleton Borough	0	0	0	**0**
Hartley Township	1	1	10	**12**
Kelly Township	1	0	11	**12**
Lewis Township	1	0	4	**5**
Lewisburg Borough	18	2	2	**22**
Limestone Township	1	0	0	**1**
Mifflinburg Borough	0	0	3	**3**
New Berlin Borough	0	0	0	**0**
Union Township	12	1	1	**14**
West Buffalo Township	0	0	8	**8**
White Deer Township	2	0	8	**10**
TOTAL	**47**	**4**	**73**	**124**

Table 4.3.3-8 Community Flood Vulnerability for Union County									
Municipality	**Total Structures in Municipality**	**Structures in SFHA**	**Percent of Structures in SFHA**	**Total Critical Facilities in Municipality**	**Total Critical Facilities in SFHA**	**Percent Critical Facilities in SFHA**	**Total 2010 Population**	**2010 Population in SFHA***	**Percent Population in SFHA**
Buffalo Township	3,190	335	10.5%	13	2	15.4%	3,499	328	9.4%
East Buffalo Township	3,396	170	5.0%	24	7	29.2%	6,417	111	1.7%
Gregg Township	850	123	14.5%	18	1	5.5%	4,984	70	1.4%
Hartleton Borough	228	0	0.0%	3	0	0.0%	283	0	0.0%
Hartley Township	2,443	313	12.8%	13	2	15.4%	1,820	137	7.5%
Kelly Township	2,337	172	7.4%	33	1	3.0%	5,491	158	2.9%
Lewis Township	1,570	82	5.2%	5	0	0.0%	1,480	75	5.1%
Lewisburg Borough	2,126	754	35.5%	7	3	42.9%	5,792	1,580	27.3%
Limestone Township	1,679	131	7.8%	7	0	0.0%	1,725	32	1.9%
Mifflinburg Borough	2,367	69	2.9%	14	1	7.1%	3,540	175	4.9%
New Berlin Borough	635	28	4.4%	5	0	0.0%	873	37	4.2%
Union Township	1,368	137	10.0%	3	0	0.0%	1,584	35	2.2%
West Buffalo Township	2,521	161	6.4%	7	1	14.3%	3,022	178	5.9%
White Deer Township	3,721	639	17.2%	12	4	33.3%	4,437	451	10.2%
TOTAL	**28,431**	**3,114**	**11.0%**	**164**	**22**	**13.4%**	**44,947**	**3,367**	**7.5%**
**Calculated by selecting the 2010 census block centroids that intersect the SFHAs in order to provide an approximation of populations living near the SFHA.*									

Table 4.3.3-9 Structures in the SFHA by Generalized Land Use Type										
Municipality	**Agricultural**	**Building Lot**	**Commercial**	**Forest**	**Industrial**	**Open Space**	**Public**	**Residential**	**Transportation**	**Grand Total**
Buffalo Township	136	80	154	156	14	4	35	2,605	6	3,190
East Buffalo Township	62	188	171	104	20	24	111	2,714	2	3,396
Gregg Township	37	6	71	21	2	0	50	662	1	850
Hartleton Borough	13	2	13	0	0	0	6	194	0	228
Hartley Township	80	4	92	287	0	16	56	1,904	4	2,443
Kelly Township	86	64	178	30	0	0	147	1,828	4	2,337
Lewis Township	88	7	33	166	0	2	36	1,233	5	1,570
Lewisburg Borough	1	3	279	26	1	10	88	1,707	11	2,126
Limestone Township	125	25	33	123	0	0	19	1,352	2	1,679
Mifflinburg Borough	8	15	165	27	28	19	43	2,054	8	2,367
New Berlin Borough	0	6	22	1	5	8	36	555	2	635
Union Township	34	22	66	74	2	0	13	1,154	3	1,368
West Buffalo Township	121	37	70	234	1	1	29	2,025	3	2,521
White Deer Township	109	22	102	217	2	16	44	3,200	9	3,721
TOTAL	**900**	**481**	**1,449**	**1,466**	**75**	**100**	**713**	**23,187**	**60**	**28,431**

A number of critical facilities are located in flood-prone areas. These include fire stations, police stations, and municipal buildings. Some facilities including American Red Cross and medical facilities that may also require special attention during times of flooding for evacuation purposes are also located in flood-prone areas. Table 4.3.3-7 also shows the number of critical facilities located in the SFHA. Out of 164 critical facilities identified throughout Union County, 22 are located in the 1%-annual-chance floodplain. Kelly Township has the most critical facilities located in the 1%-annual-chance floodplain with 33. Table 4.3.3-9 highlights several critical public facilities located in the SFHA.

Table 4.3.3-10 Public Facilities in Special Flood Hazard Areas.

FACILITY	MUNICIPALITY
New Berlin Borough Police Department	Borough of New Berlin
East Buffalo Township Municipal Building	Township of East Buffalo
Electric Substation	Borough of Lewisburg
Municipal Sewer Authority	Township of Kelly
Buffalo Valley Regional Police Department	Township of East Buffalo
Municipal Building	Township of Hartley
Area High School	Township of Kelly
Federal Correctional Complex	Township of Gregg

While Evangelical Community Hospital is not located in a Special Flood Hazard Area, flooding may cause difficulty in reaching the hospital as Buffalo Creek may lead to flooding on access routes, U.S. Highway 15 and Hospital Drive.

Additional information on flood vulnerability and losses in Union County, including the 1%-annual-chance flood event results from Hazus, FEMA's loss estimation software, is provided in Section 4.4.3: Potential Loss Estimates.

Hurricanes, tropical storms, and nor'easters are regional events that can impact areas as large as hundreds or thousands of miles across through the life the storm. Therefore, all communities within Union County are equally subject to the impacts of hurricanes, tropical storms, and nor'easters that track through or near the region

4.3.4. Hurricane, Tropical Storm, Nor'easter

4.3.4.1. Location and Extent

Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise. Tropical storms impacting Union County develop in tropical or sub-tropical waters found in the Atlantic Ocean, Gulf of Mexico, or Caribbean Sea. Cyclones with maximum sustained winds of less than 39 miles per hour are called tropical depressions. A tropical storm is a cyclone with maximum sustained winds between 39-74 mph. These storms sometimes develop into hurricanes with wind speeds in excess of 74 mph. Although Union County is located over 100 miles inland from the Atlantic Coast, tropical storms and hurricanes can track inland causing heavy rainfall and strong winds.

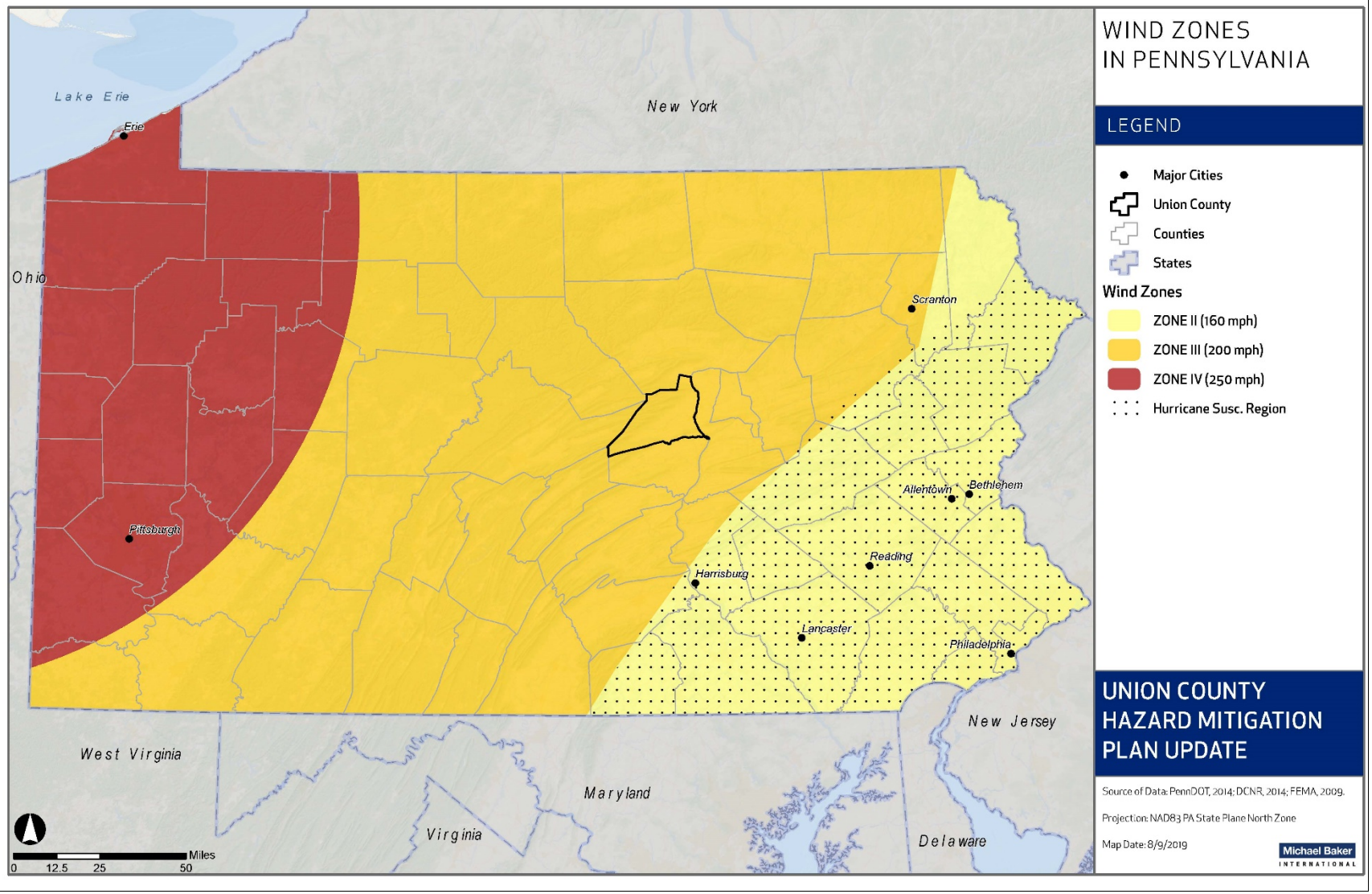
Nor'easters are extra-tropical storms which typically develop from low-pressure centers off the Atlantic Coast during the winter months. Extra-tropical is a term used to describe a hurricane or tropical storm with a cyclone that has lost its 'tropical' characteristics. While an extra-tropical storm denotes a change in weather pattern and how the storm is gathering energy, it may still have northeast winds that are tropical storm or hurricane force. Nor'easters can also produce heavy precipitation in the form of rain, snow, or ice.

Hurricanes, tropical storms, and nor'easters are regional events that can impact areas as large as hundreds or thousands of miles across through the life the storm. Therefore, all communities within Union County are equally subject to the impacts of hurricanes, tropical storms, and nor'easters that track through or near the region. Areas in Union County which are subject to flooding, wind, and winter storm damage are particularly vulnerable in these situations.

The map below shows wind speed zones developed by the American Society of Civil Engineers. This information is based on 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities.

Union County falls within Zone III, meaning design wind speeds for shelters and critical facilities should be able to withstand a three second gust of up to 200 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event.

Figure 4.3.4-1 Design wind speeds for community shelters across the United States (PennDOT, 2014; DCNR, 2014; FEMA, 2009).



4.3.4.2. Range of Magnitude

The impacts associated with hurricanes and tropical storms are primarily wind damage and flooding. It is not uncommon for tornadoes to develop during these events. Historical tropical storm and hurricane events have brought intense rainfall that can lead to damaging floods, and northeast winds, which, when combined with waterlogged soils can cause trees and utility poles to fall. Nor'easters can also bring damaging rain and wind but because they often occur during the winter months, they bring the additional threat of snow and ice associated with winter storms. Heavy snow can cause roof collapse in older homes, and ice presents a threat of slipping and tree branch collapse. More information on the range of magnitude of winter storms can be found in Section 4.3.9.2.

The impact tropical storm or hurricane events have on an area is typically measured in terms of wind speed. Expected damage from hurricane force winds is measured using the Saffir-Simpson Scale. The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential (characteristic of tropical storms and hurricanes), which are combined to estimate potential damage. The table below lists Saffir-Simpson Scale categories with associated wind speeds and expected damages. Categories 3, 4, and 5 are classified as "major" hurricanes. While major hurricanes comprise only 20 of all tropical cyclones making landfall, they account for over 70 percent of the damage in the United States. The intensity of a storm is also impacted by its orientation, location of landfall, and speed. The likelihood of these damages occurring in Union County is assessed in Section 4.3.4.4, Future Occurrence.

Table 4.3.4-1 Saffir-Simpson Scale categories with associated wind speeds and damages (NHC, 2019).

STORM CATEGORY	WIND SPEED (mph)	DESCRIPTION OF DAMAGES
1	74-95	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-129	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	130-156	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	>157	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

It is important to recognize the potential for flooding events during hurricanes, tropical storms, and nor'easters; the risk assessment and associated impact for these events is included Section 4.3.4. Wind impacts in Union County generally include downed trees and utility poles, which can spark widespread utility interruptions. Wind impacts are particularly an issue for mobile homes and other manufactured housing; these structures are often not well-anchored and are highly susceptible to wind damage in a hurricane, tropical storm, or nor'easter.

The worst-case scenario for a hurricane, tropical storm, or nor'easter event in Union County was Hurricane Agnes, which struck the Susquehanna Valley in June 1972 and caused over 16 inches in rain. The Susquehanna River reached a depth of 34.23 feet. The Borough of Lewisburg was particularly impacted by the hurricane. Water covered sections of Routes 15 and 45 and three people died during evacuations.

4.3.4.3. Past Occurrence

The National Oceanic and Atmospheric Administration's Coastal Services Center maintains records of all coastal storms occurring in the United States since the 1850s. The following table lists all coastal storms having centers of circulation to pass through or within 30 nautical miles of Union County. Typically, when these storms reach Union County, they have lost their hurricane speed winds, so structural damage is usually not as bad as coastal communities may experience.

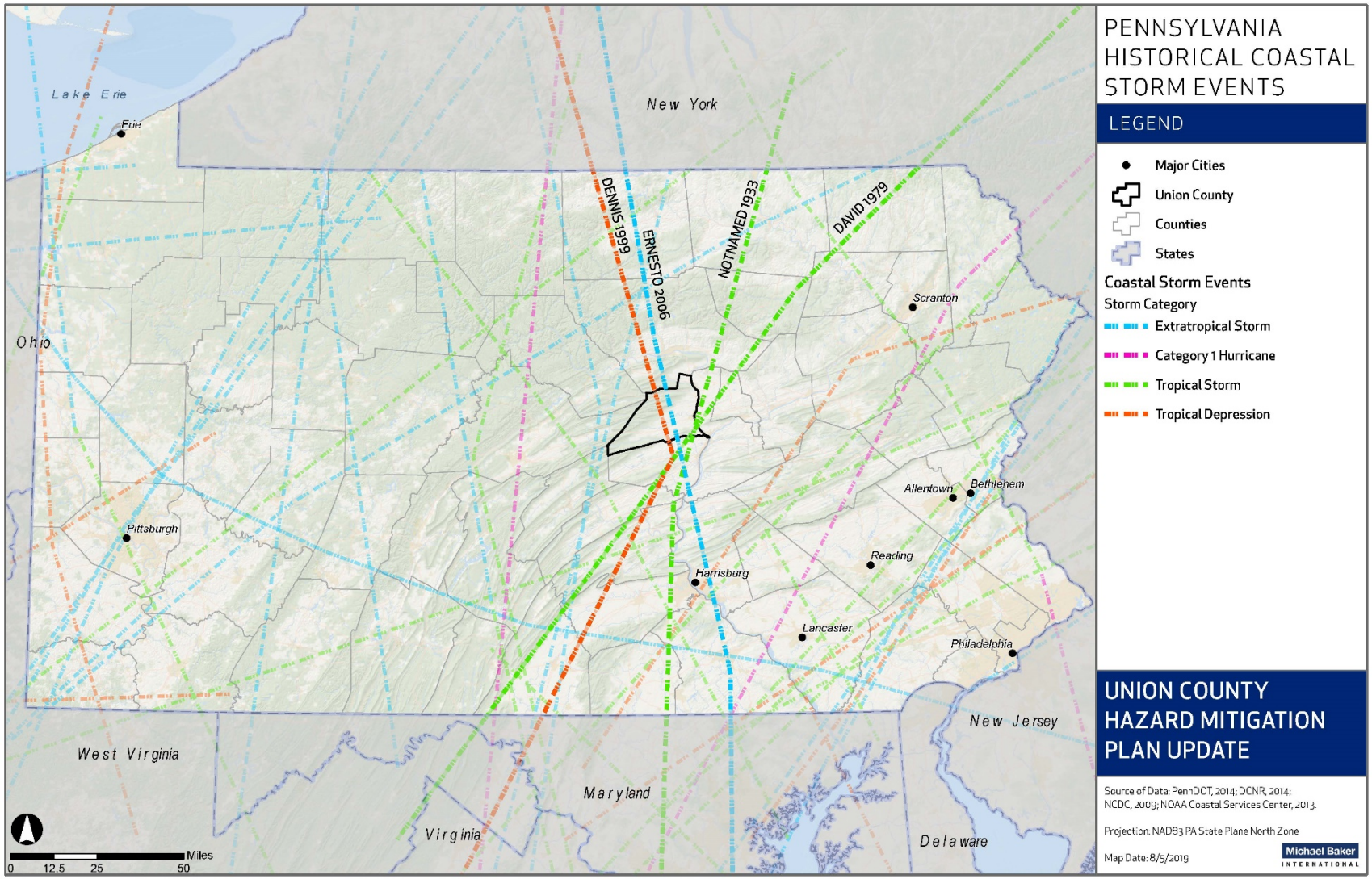
Table 4.3.4-2 Previous tropical storm events with centers of circulation within 30 nautical miles of Union County.

YEAR	EVENT	STRENGTH IN/NEAR UNION COUNTY
2006	Ernesto	Hurricane
1999	Dennis	Hurricane
1994	Beryl	Tropical Storm
1992	Danielle	Tropical Storm
1979	David	Hurricane
1979	Frederic	Hurricane
1959	Gracie	Hurricane
1955	Connie	Hurricane
1954	Hazel	Hurricane

The next map shows the tracking of some of these storm events in or near Union County. It is important to note that a number of hurricane and tropical storm events have impacted the County without tracking through or near it; these storm events include Hurricane Sandy (2012), Tropical Storm Lee (2011), Hurricane Irene (2011), Hurricane Katrina (2005), and Tropical Depression Ivan (2004). Each of these storm events resulted in a Presidential Disaster Declaration. Most recently, Tropical Storm Lee and Hurricane Irene caused significant damage throughout the county. The storms occurred just two weeks apart, which added to post disaster complications. Tropical Storm Lee had an average rainfall of ten inches of rain over three days, and the Susquehanna River rose one foot every half-hour during September 7th and 8th (The Daily Item, 2016). In addition, Hurricane Agnes (1972) did not track in or near Union County but resulted in significant flooding in the Borough of Lewisburg as described in Section 4.3.4.2 above. These examples indicate that Union County is vulnerable to damage from flooding and heavy winds when hurricanes and

tropical storms come near the region. The following map highlights storms that have tracked through Union County while also showing the storms that have tracked through the remaining parts of Pennsylvania. The NOAA NCEI database does not track nor'easters as a separate weather event; they are tracked as high wind, heavy snow, and/or coastal flooding events, so a complete listing is not available. However, other sources provide record that some of the winter storms listed in Section 4.3.9.3 were nor'easters. For instance, a nor'easter affected much of Pennsylvania and several other states between Washington, D.C. and Boston, Massachusetts from January 6-8, 1996, resulting in Presidential Disaster Declaration 1085. Blizzard conditions included heavy snow, strong winds, and very cold temperatures (NWS, 1996). About a week later, unseasonably high temperatures and rainfall melted the thick snowpack left by the Nor'easter and resulted in Presidential Disaster Declaration 1093 for flooding (NCEI, 2014). More recently, there was a nor'easter that took place on October 29, 2011 and brought 3-9" of snow accumulation with 10-12" of accumulation in higher elevations. The heavy, wet snow brought tree and utility damage, causing half a million power outages state-wide (NCEI, 2014).

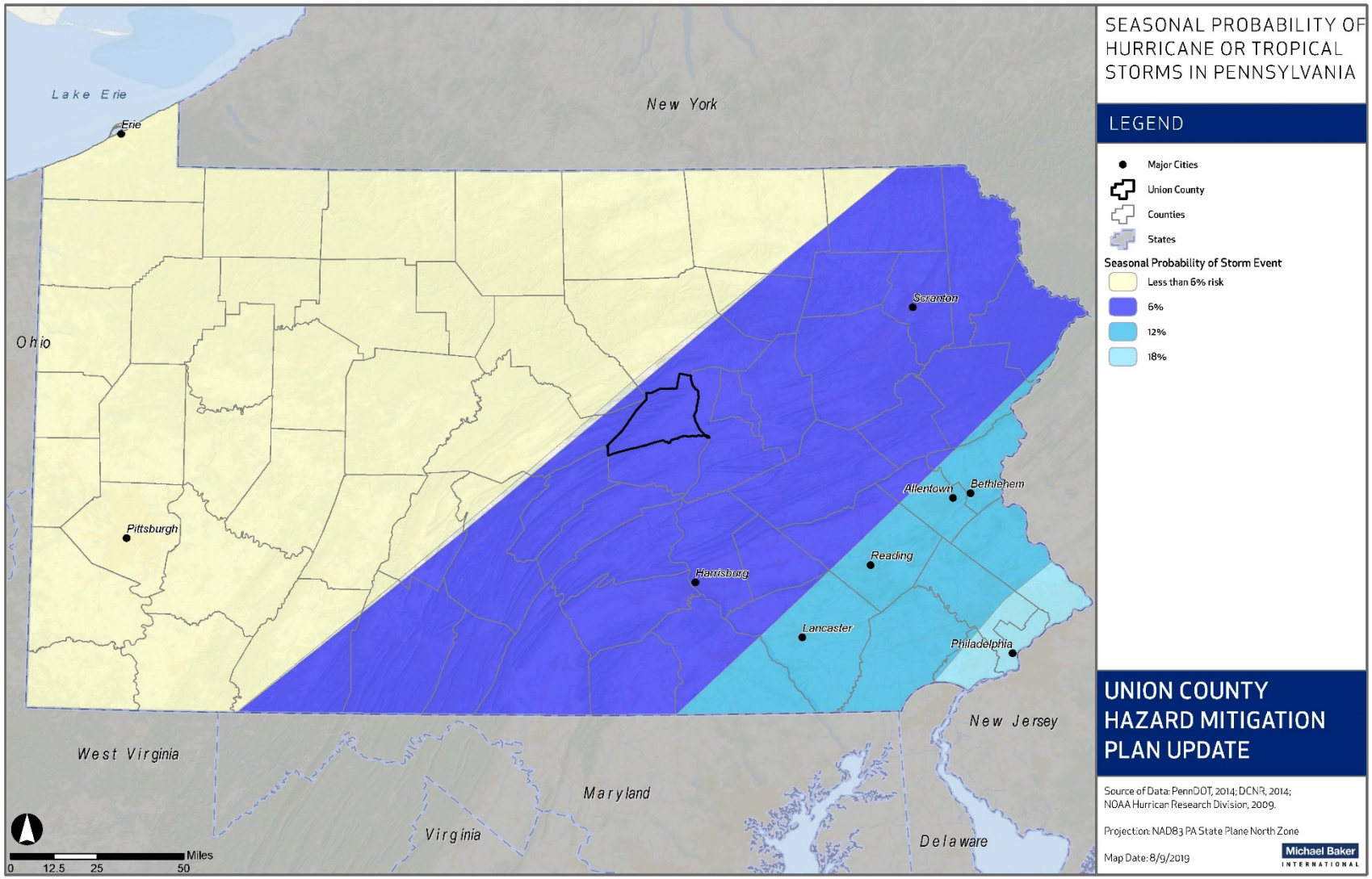
Figure 4.3.4-2 Historical coastal storm events tracking in or near Union County



4.3.4.4. Future Occurrence

Although hurricanes, tropical storms, and nor'easters can cause flood events consistent with 1 percent- and 0.2 percent- level frequency, their probability of occurrence is measured relative to wind speed. The National Oceanic and Atmospheric Administration Hurricane Research Division published the map included as Figure 4.3.4-3 showing the chance that a tropical storm or hurricane will affect a given area during the entire Atlantic hurricane season spanning from June to November. Note that this figure does not provide information on the probability of various storm intensities. However, based on historical data between 1944 and 1999, this map reveals there is approximately a six percent chance of experiencing a tropical storm or hurricane event between June and November of any given year in the County. This translates to a future occurrence of *possible*, as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1). It is difficult to assign a probability to the future occurrence of nor'easters in Union County; however, the storms are possible in the county. Although Union County is not likely to experience the severe high winds faced in more coastal communities during a nor'easter, the county is subject to heavy snow, ice, and blizzard conditions.

Figure 4.3.4-3 Seasonal probability of a hurricane of tropical storm affecting Union County



4.3.4.5. Vulnerability Assessment

A vulnerability assessment for hurricanes, tropical storms, and nor'easters focuses on the impacts of flooding and severe wind. Therefore, the assessment for flood-related vulnerability is addressed in Section 4.3.3.5. In addition, mobile/manufactured homes are vulnerable to hurricanes, tropical storms, and nor'easters. Section 4.3.7.5 discusses vulnerability to wind damage and includes Table 4.3.7-4 which shows the number of mobile homes per community. The County is also vulnerable to severe winter weather impacts caused by nor'easters which are evaluated in 4.3.9.5.

4.3.5. Landslide

4.3.5.1. Location and Extent

A landslide is a natural geologic process that has played a large part in shaping the landscape of Pennsylvania. Landslide is a general term for mass movement of soil, rock, or a combination of materials down a slope.

The USGS identifies Union County as falling into a *Combo-High* zone of landslide susceptibility and incidence (Figure 4.3.5-1). This means that these areas have a high susceptibility to landslides with a moderate incidence of occurrence.

A slope greater than 7% (approximately around 15 degrees) needs special considerations for building roads according to common engineering practice, and a slope of 15% (approximately around 25 degrees) is generally unstable and highly sensitive to surface changes. Slopes greater than 25% are very unstable. Steep slopes are particularly prevalent in Hartley and Lewis Townships as shown in the table below. The map shown below portrays the locations of areas with slopes between 15 and 25 percent and greater than or equal to 25 percent.

Table 4.3.5-1 Percent of Area with Steep Slopes

MUNICIPALITY	AREA WITH SLOPES OF 25% OR GREATER	AREAS WITH SLOPES BETWEEN 15% AND 25%
Buffalo Township	0.2%	0.2%
East Buffalo Township	0.5%	0.6%
Gregg Township	1.1%	0.4%
Hartleton Borough	0.8%	7.3%
Hartley Township	0.2%	0.0%
Kelly Township	0.1%	0.3%
Lewis Township	0.4%	0.0%
Lewisburg Borough	0.0%	0.0%
Limestone Township	0.2%	0.0%
Mifflinburg Borough	0.9%	31.2%
New Berlin Borough	0.6%	15.1%
Union Township	1.2%	0.0%
West Buffalo Township	0.5%	0.0%
White Deer Township	0.4%	0.1%

Figure 4.3.5-1 Map of general landslide hazard areas and municipalities in Union County

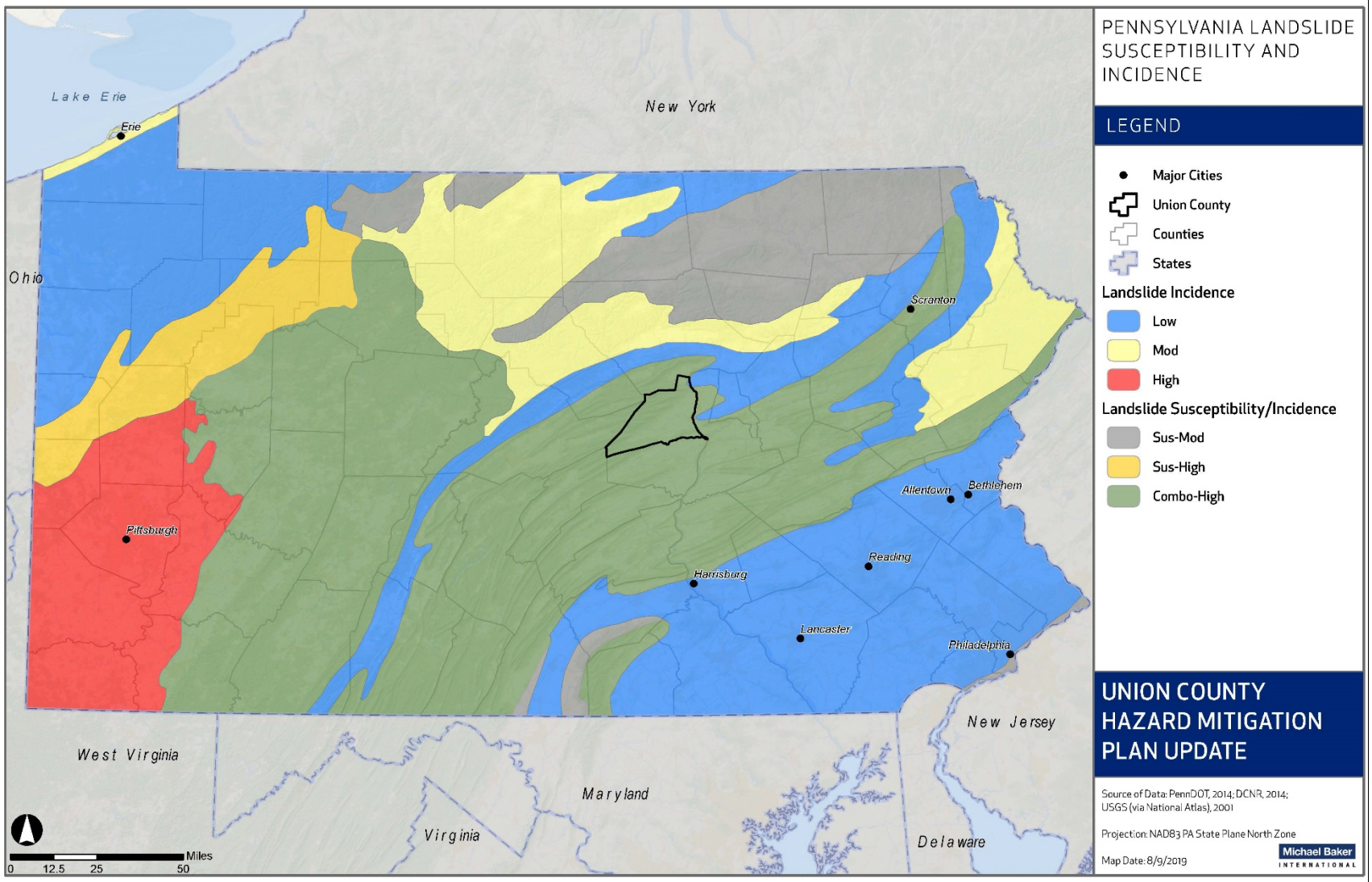
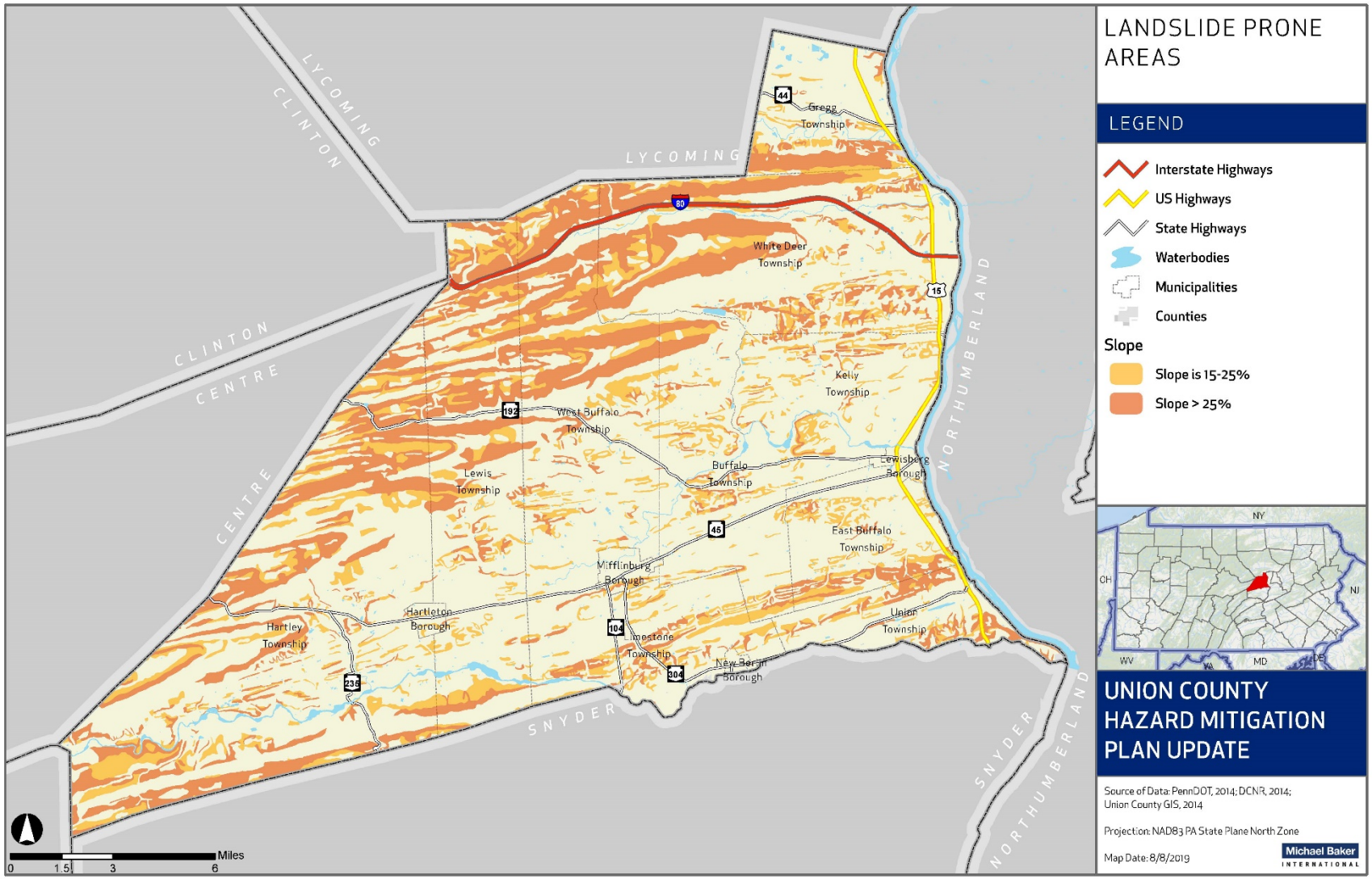


Figure 4.3.5-2 Steep slope locations in Union County



4.3.5.2. Range of Magnitude

Landslide velocity can vary from rapid to slow, and the amount of material moving in a landslide can range from a relatively small amount to a large amount. Landslides can include falling, sliding, or flowing of rocks and soil or a combination of these different types of motion.

The impact of landslides on the environment depends on the size and specific location of the event. In general, impacts include:

- Changes to topography
- Damage or destruction of vegetation
- Potential diversion or blockage of water in the vicinity of streams, rivers, etc.
- Increased sediment runoff both during and after event

Landslides in Union County have reportedly involved a small amount of rocks tumbling down a hillside; here, a small amount means an amount sufficient to fill the shoulder of a road for a linear distance of about 10 feet with rock, but not enough to block the entire roadway. A possible worst-case scenario could occur in Union County if a landslide occurred along one of the major interstates. The landslide could cause damage to vehicles and the roadway and injuries to people. In addition, the landslide would have secondary effects caused by shutting down the roadway.

4.3.5.3. Past Occurrence

A comprehensive inventory of landslides events in Pennsylvania does not exist. The NCDC database captures landslides as they occur in conjunction with severe storms; the NCDC database does not report any landslides in Union County. However, representatives of the Union County Emergency Management Agency identified two incidents of falling rock that have occurred within the past 25 years. One incident occurred along U.S. Highway 15 and the other along State Route 45, although it was unclear the year in which these events happened.

4.3.5.4. Future Occurrence

Given that no damage due to landslide has been recorded in Union County, the future occurrence of landslides can be considered *unlikely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1). However, there is the possibility of some rock falling from a steep slope, given that this occurred twice in the past 25 years. These events are not expected to be small, and cause little to no damage.

4.3.5.5. Vulnerability Assessment

A landslide might cause a structure to collapse or might cause minor damages such as broken windows. A landslide might cause a roadway to be temporarily blocked. Approximately 11 percent of structures in Union County are located on steep slopes that pose a risk of damage due to landslide. There are 5 critical facilities located in steep slope areas.

The table below summarizes the number of existing buildings and critical facilities in the County that are located in areas with steep slopes and may, therefore, experience damages should a landslide occur.

Table 4.3.5-2 Landslide Vulnerability for Union County

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN STEEP SLOPE AREAS	PERCENT OF STRUCTURES IN STEEP SLOPE AREAS	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN STEEP SLOPE AREAS	PERCENT CRITICAL FACILITIES IN STEEP SLOPE AREAS
Buffalo Township	3,190	408	12.8%	13	0	0.0%
East Buffalo Township	3,396	319	9.4%	24	1	2.2%
Gregg Township	850	87	10.2%	18	0	0.0%
Hartleton Borough	228	13	5.7%	3	0	0.0%
Hartley Township	2,443	247	10.1%	13	1	3.0%
Kelly Township	2,337	306	13.1%	33	1	1.5%
Lewis Township	1,570	190	12.1%	5	0	0.0%
Lewisburg Borough	2,126	9	0.4%	7	1	2.9%
Limestone Township	1,679	286	17.0%	7	0	0.0%
Mifflinburg Borough	2,367	202	8.5%	14	1	2.4%
New Berlin Borough	635	8	1.3%	5	0	0.0%
Union Township	1,368	256	18.7%	3	0	0.0%
West Buffalo Township	2,521	289	11.5%	7	0	0.0%
White Deer Township	3,721	555	14.9%	12	0	0.0%
TOTAL	**28,431**	**3,175**	**11.2%**	**164**	**5**	**3.0%**

**Calculated by selecting the 2010 census block centroids that intersect the SFHAs. Is an approximation of populations living near the SFHA.*

The table below shows the number of structures in each municipality located in areas susceptible to landslide by land use type. The land use type displaying the greatest vulnerability to landslide hazards is residential.

Existing infrastructure at risk of damage or closure due to landslide or rock fall are four segments of busy roadways including:

- State Route 45 in Hartley Township, which experiences an average of 1,600 trips per day
- U.S. Highway 15 in Kelly Township, which experiences an average of 25,000 trips per day
- U.S. Highway 15 in White Deer Township, which experiences an average of 20,000 trips per day
- U.S. Highway 15 in Union Township, which experiences an average of 18,000 trips per day (PennDOT, 2019)

Table 4.3.5-3 Structures in Steep Slope Areas by Generalized Land Use Type (Union County GIS Department, 2019) *

	BUFFALO TWP	EAST BUFFALO TWP	GREGG TWP	HARTLETON BORO	HARTLEY TWP	KELLY TWP	LEWIS TWP	LEWISBURG BORO	LIMESTONE TWP	MIFFLINBURG BORO	NEW BERLIN BORO	UNION TWP	WEST BUFFALO TWP	WHITE DEER TWP	TOTAL
Agricultural	15	4	0	2	11	19	16	0	20	1	0	3	11	7	109
Building Lot	0	21	0	0	0	8	0	0	13	5	2	7	2	4	62
Commercial	4	6	1	0	25	10	1	0	0	0	0	2	2	5	56
Forest	36	39	8	0	34	13	28	4	31	15	0	23	31	50	312
Industrial / Manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Open Space / Recreational	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Public / Exempt	3	7	1	0	5	9	7	5	1	10	0	2	1	13	64
Residential	349	242	77	11	172	247	138	0	220	171	6	218	242	473	2,566
Transportation	1	0	0	0	0	0	0	0	1	0	0	1	0	1	4
TOTAL	**408**	**319**	**87**	**13**	**247**	**306**	**190**	**9**	**286**	**202**	**8**	**256**	**289**	**555**	**3,175**

**Generalized land use type derived from detailed structure categories in County GIS data. Aggregated by generalized category for ease of discussion in report.*

4.3.6. Subsidence and Sinkhole

4.3.6.1. Location and Extent

In Pennsylvania, research has shown that subsidence may occur, but will not necessarily occur, in areas underlain by carbonate bedrock. Figure 4.3.6-1 shows that the eastern portion of Union County is underlain by carbonate bedrock (i.e., limestone). However, according to the HMPT, no locations in Union County are known to have a history of subsidence despite the possibility of subsidence due to the carbonate bedrock.

Subsidence and the appearance of sinkholes in Pennsylvania are also often due to subsurface mining. The Pennsylvania Department of Environmental Protection has a Mine Subsidence program and provides information about the risk of subsidence by zip code. As part of this planning process, all Union County zip codes were identified and examined for occurrences of mine subsidence. No occurrences of mine subsidence were identified in Union County zip codes.

4.3.6.2. Range of Magnitude

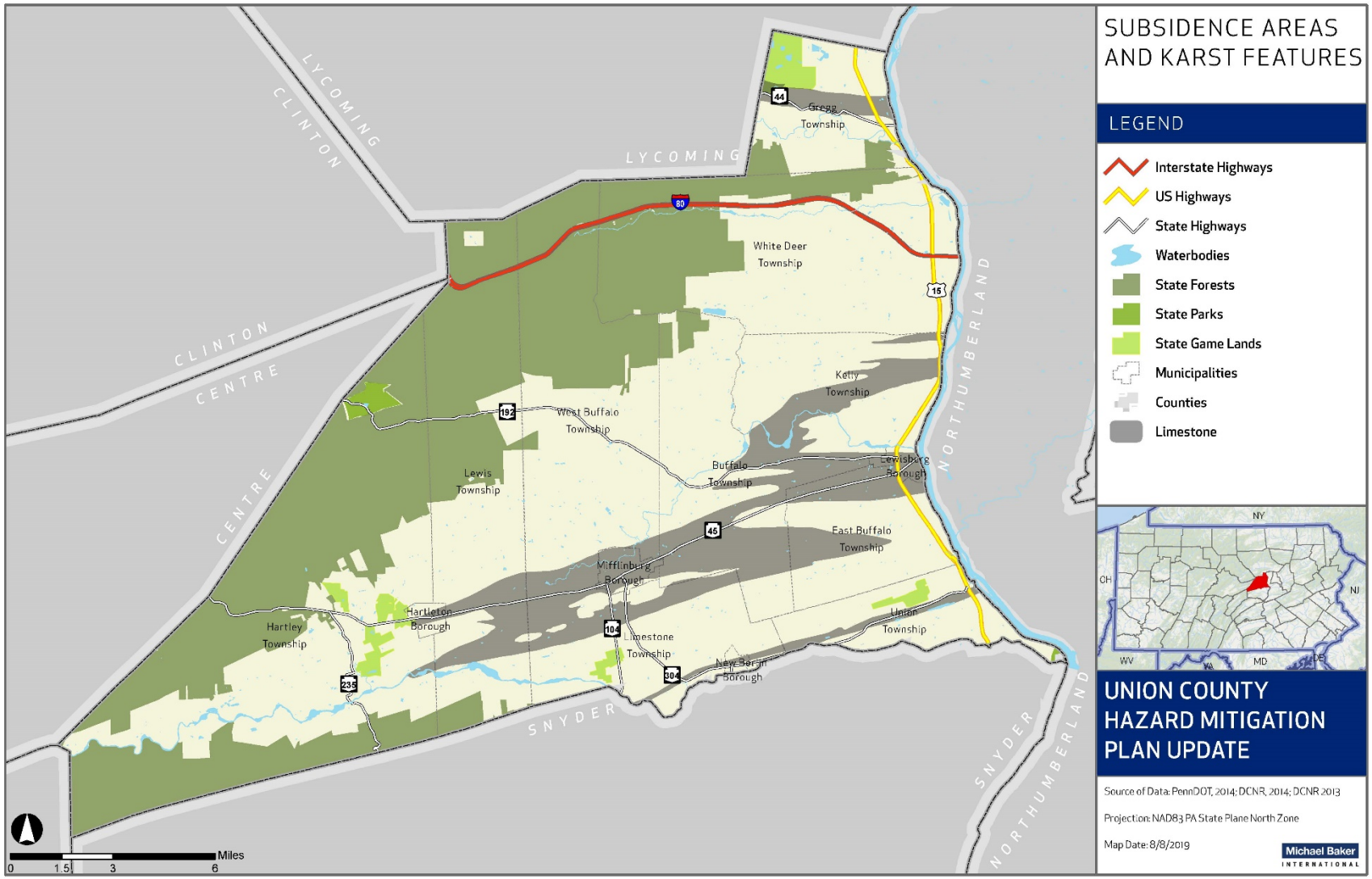
The magnitude of land subsidence and sinkholes in Union County is minimal as there are no known occurrences of land subsidence. However, experience in Pennsylvania shows that subsidence may cause from a fraction of an inch to several feet of sagging of the surface of the earth and may occur within minutes or over several years.

Land subsidence and sinkholes can affect the movement of surface water as well as of groundwater and can lead to contamination of water. Land subsidence and sinkholes may lead to damage of roads or utility lines.

According to the Pennsylvania Department of Environmental Protection, structural damages due to subsidence range from slight damage requiring cosmetic repairs to severe damage requiring foundation replacement or other high cost repairs.

A worst-case scenario for subsidence and sinkholes would be if a sinkhole occurred under a critical facility such as a hospital. Not only could structural damage occur to the building, but there could also be injuries to people as well. In addition, part of the facility would have to be closed in order to repair the structural damage, and this would reduce the hospital's capacity and ability to treat people with other illnesses and injuries.

Figure 4.3.6-1 Locations with subsidence potential in Union County



4.3.6.3. Past Occurrence

The Pennsylvania Department of Conservation and Natural Resources maintains an online *Sinkhole Inventory Database* of sinkholes throughout the Commonwealth. No occurrence of subsidence or sinkholes has been reported for Union County. In September 2018, a local news source in Union County reported on a sinkhole at a residential property in East Buffalo Township. This occurrence was the only instance of sinkholes reported by media outlets in Union County.

4.3.6.4. Future Occurrence

Because there are few known occurrences of subsidence or sinkholes in the County, the probability of land subsidence occurring in Union County is estimated to be less than one percent per year. It can be considered *unlikely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

4.3.6.5. Vulnerability Assessment

Almost 12 percent of Union County is part of the Keyser-Tonoloway Geologic Formation, which means that it is underlain with limestone and may be prone to subsidence. The table below shows the percentage of land, though not necessarily developed land, in each participating jurisdiction that has the potential for land subsidence based upon geologic characteristics.

Land subsidence may occur within minutes or over the course of several years!

Table 4.3.6-1 Percent of Area Susceptible to Subsidence	
MUNICIPALITY	**PERCENT OF AREA SUSCEPTIBLE TO SUBSIDENCE**
Buffalo Township	35.5%
East Buffalo Township	33.3%
Gregg Township	15.1%
Hartleton Borough	30.7%
Hartley Township	0.3%
Kelly Township	25.9%
Lewis Township	10.3%
Lewisburg Borough	86.3%
Limestone Township	24.9%
Mifflinburg Borough	92.1%
New Berlin Borough	26.1%
Union Township	12.4%
West Buffalo Township	5.7%
White Deer Township	0.0%
TOTAL	**14.1%**

Because there is a limited history of land subsidence in Union County, no impacts to structures or infrastructure are anticipated. However, existing structures potentially at risk of damage due to land subsidence are in the eastern part of the County. There are 9,625 structures on land underlain with limestone. These structures are mostly located in Hartleton, Lewisburg, and Mifflinburg Boroughs as shown in the table below.

Table 4.3.6-2 Subsidence Vulnerability for Union County						
MUNICIPALITY	**TOTAL STRUCTURES IN MUNICIPALITY**	**STRUCTURES UNDERLAIN BY LIMESTONE**	**PERCENT OF STRUCTURES UNDERLAIN BY LIMESTONE**	**TOTAL CRITICAL FACILITIES IN MUNICIPALITY**	**TOTAL CRITICAL FACILITIES STRUCTURES UNDERLAIN BY LIMESTONE**	**PERCENT CRITICAL FACILITIES STRUCTURES UNDERLAIN BY LIMESTONE**
Buffalo Township	3,190	1,149	36.0%	13	7	53.8%
East Buffalo Township	3,396	1,864	54.9%	24	18	75.0%
Gregg Township	850	168	19.8%	18	1	5.6%
Hartleton Borough	228	171	75.0%	3	2	66.7%
Hartley Township	2,443	18	0.7%	13	0	0.0%

Table 4.3.6-2 Subsidence Vulnerability for Union County

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES UNDERLAIN BY LIMESTONE	PERCENT OF STRUCTURES UNDERLAIN BY LIMESTONE	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES STRUCTURES UNDERLAIN BY LIMESTONE	PERCENT CRITICAL FACILITIES STRUCTURES UNDERLAIN BY LIMESTONE
Kelly Township	2,337	486	20.8%	33	1	3.0%
Lewis Township	1,570	502	32.0%	5	3	60.0%
Lewisburg Borough	2,126	2,051	96.5%	7	7	100.0%
Limestone Township	1,679	380	22.6%	7	4	57.1%
Mifflinburg Borough	2,367	2,270	95.9%	14	11	78.6%
New Berlin Borough	635	100	15.7%	5	3	60.0%
Union Township	1,368	155	11.3%	3	0	0.0%
West Buffalo Township	2,521	311	12.3%	7	3	42.9%
White Deer Township	3,721	0	0.0%	12	0	0.0%
TOTAL	**28,431**	**9,625**	**33.9%**	**164**	**60**	**36.6%**

The table below shows the number of structures in each municipality located in areas susceptible to subsidence and sinkhole by land use type. The land use type displaying the greatest vulnerability to subsidence and sinkhole hazards is residential.

Table 4.3.6-3 Structures underlain by limestone bedrock, and susceptible to naturally-occurring subsidence*

Land Use Type	BUFFALO TWP	EAST BUFFALO TWP	GREGG TWP	HARTLETON BORO	HARTLEY TWP	KELLY TWP	LEWIS TWP	LEWISBURG BORO	LIMESTONE TWP	MIFFLINBURG BORO	NEW BERLIN BORO	UNION TWP	WEST BUFFALO TWP	WHITE DEER TWP	TOTAL
Agricultural	59	24	9	2	1	16	34	0	37	6	0	1	20	0	209
Building Lot	37	111	4	2	0	0	2	3	1	13	1	0	34	0	208
Commercial	101	137	1	13	0	30	7	266	24	163	3	25	15	0	785
Forest	11	11	1	0	0	2	5	23	14	25	0	2	2	0	96
Industrial / Manufacturing	3	20	0	0	0	0	0	1	0	28	1	1	1	0	55
Open Space / Recreational	0	12	0	0	0	0	0	6	0	19	0	0	0	0	37
Public / Exempt	19	88	1	5	1	10	15	87	10	40	13	1	13	0	303
Residential	918	1459	152	149	16	424	437	1654	294	1968	81	124	226	0	7902
Transportation	1	2	0	0	0	4	2	11	0	8	1	1	0	0	30
TOTAL	**1,149**	**1,864**	**168**	**171**	**18**	**486**	**502**	**2,051**	**380**	**2,270**	**100**	**155**	**311**	**0**	**9,625**

60 critical facilities have been identified in areas with the potential for land subsidence. A selection of critical facilities such as county and municipal buildings, institutions, and utilities are identified in table below. A full list of critical facilities vulnerable to subsidence or sinkholes can be found in **Appendix E.**

Table 4.3.6-1 Critical Facilities in Areas with Potential for Subsidence or Sinkholes.
SELECT CRITICAL FACILITIES
Bucknell University
Hartleton Borough Wastewater Plant
Lewisburg Borough Equipment Center
Lewisburg Borough Offices/Reading RR Station
Lewisburg Borough Police Station/Reading RR Station
(Lewisburg) William Cameron Engine Company
Mifflinburg Area Water Treatment Plant
Mifflinburg Borough Building
Mifflinburg Borough Garage
Mifflinburg Borough Offices
Mifflinburg Borough Police Station
Mifflinburg Hose Company
Mifflinburg Wastewater Treatment Plant
(New Berlin) New Berlin Fire Company
Buffalo Township Municipal Building
Buffalo Township Municipal Sewer Authority
East Buffalo Township Municipal Offices
(East Buffalo Township) Buffalo Valley Regional Police Department
(East Buffalo Township) Pennsylvania Department of Transportation
East Buffalo Township Police Station
Lewis Township Municipal Authority
Lewis Township Municipal Building
Union County Community Services Building
Union County Courthouse
Union County Government Center
Union Township Fire Company

4.3.7.Tornado and Windstorm

4.3.7.1. Location and Extent

Tornadoes and potentially damaging high winds occur throughout Pennsylvania. Tornados and high winds may be experienced at any location in Union County.

A tornado, a violently rotating funnel-like vortex, is an extraordinary feature of severe thunderstorms. A condensation funnel does not need to reach to the ground for a tornado to be present; a debris cloud beneath a thunderstorm is all that is needed to confirm the presence of a tornado, even in the total absence of a funnel. While the extent of tornado damage is usually localized, the extreme winds of this vortex can be among the most destructive on earth when they move through populated, developed areas.

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. May to August is the most likely time for tornadoes to occur in Pennsylvania. Tornado movement is characterized in two ways: direction and speed of the spinning winds and forward movement of the tornado/storm track. Rotational wind speeds of the vortex can range from 100 mph to more than 250 mph. In addition, the speed of forward motion can be zero to 45 or 50 mph. Therefore, some estimates place the maximum velocity (combination of ground speed, wind speed, and upper winds) of tornadoes at about 300 mph.

One tornado and three windstorm events have been recorded between January - September 2019 in Union County.

Photo source: Robert Inglis/The Daily Item

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 often accompany tornadoes and are caused by the movement of air from areas of higher pressure to areas of lower pressure – the greater the difference in pressure, the stronger the winds. Wind storms are generally defined as sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration.

The enhanced Fujita Tornado Scale (or the ⁻EF-Scale) classifies U.S. tornadoes into six intensity categories, named EF0 to EF5, based upon the estimated maximum winds occurring within the funnel. The EF-

Scale has subsequently become the definitive metric for estimating wind speeds within tornadoes based upon the damage done to buildings and structures.

4.3.7.2. Range of Magnitude

Since 2007 an Enhanced Fujita Scale (EF Scale) has been used in the United States to describe the magnitude of tornadoes. Prior to 2007, the Fujita Scale was commonly used to describe magnitude. This scale is based on new information about the relationship between wind speed given in miles per hour (mph) and corresponding damages. The EF Scale categorized tornadoes from EF0 to EF5 with EF0 being the most commonly occurring type of tornado. The most damaging and deadliest tornado recorded in Union County was a category 3 or EF3 tornado. The following table shows the relationship between the Fujita and the Enhanced Fujita Scales.

Table 4.3.7-1 Enhanced Fujita Scale (EF-Scale) categories with associated wind speeds

FUJITA SCALE		ENHANCED FUJITA SCALE	
F NUMBER	**3-SECOND GUST (MPH)**	**EF NUMBER**	**3-SECOND GUST (MPH)**
0	45–78	0	65–85
1	79–117	1	86–110
2	118–161	2	111–135
3	162–209	3	136–165
4	210–261	4	166–200
5	262–317	5	OVER 200

The types of damages that can be expected with each category of tornado are described in the table below.

Table 4.3.7-2 Expected Tornado Damages.

F OR EF SCALE	EXAMPLES OF POSSIBLE DAMAGE
0	Light damage. Some damage to chimneys; broken tree branches; shallow-rooted trees pushed over; damage to sign boards.
1	Moderate damage. Surface peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
2	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
3	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.

Table 4.3.7-2 Expected Tornado Damages.	
F OR EF SCALE	**EXAMPLES OF POSSIBLE DAMAGE**
4	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
5	Catastrophic damage. Well-built houses swept completely away, leaving only the slab foundations.

While tornado winds rotate, high winds that move in a straight line can also be damaging. High winds are defined as sustained wind speeds of 40 mph or greater lasting for one hour or more, or winds of 58 mph or greater for any duration.

Figure 4.3.4-1 in the Hurricane, Tropical Storm, and Nor'easter hazard profile shows wind speed zones developed by the American Society of Civil Engineers based on information including 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities. Union County falls within Zone III, meaning design wind speeds for shelters and critical facilities should be able to withstand a three-second gust of up to 200 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. Therefore, these structures should be able to withstand speeds experienced in an EF4 or EF5 tornado.

4.3.7.3. Past Occurrence

The deadliest tornado recorded in Union County was an F3 in May 1985 when two people were killed and 20 were injured. Many houses and farm buildings were demolished. At one farm that was destroyed, nearly three dozen cows were killed. This was a worst-case scenario for tornadoes in Union County. Two F0 tornadoes occurred on the same day in 1997. Tornadoes with an F1 magnitude occurred in 1998 and in 2001. In July 2009, an F0 tornado touched down on the north side of interstate 80 and moved southeast for approximately one mile. The tornado crossed interstate 80 before lifting near White Deer Township. Damage was minimal with about 10 trees and branches blown down or uprooted. There were also EF1 tornadoes in 2011, 2015, and 2019. The most recent tornado uprooted many trees along its path and destroyed one barn, unroofing several others. The next table summarizes previous tornado events in Union County.

Table 4.3.7-3 Previous tornado events between 1950 and 2019 in Union County (NCEI, 2019).					
LOCATION	**DATE**	**ESTIMATED LENGTH**	**ESTIMATED WIDTH**	**MAGNITUDE**	**ESTIMATED PROPERTY DAMAGE ($)**
Countywide	05/31/1985	4.00 miles	910 yards	F3	25,000,000
Lewisburg	07/18/1997	1.00 miles	440 yards	F0	not given
Lewisburg	07/18/1997	2.30 miles	100 yards	F0	not given
New Columbia	09/27/1998	2.50 miles	400 yards	F1	not given
Lewisburg	09/04/2001	2.00 miles	300 yards	F1	60,000
White Deer	07/11/2009	1.00 miles	50 yards	EF0	5,000
Winfield	05/23/2011	0.29 miles	100 yards	EF1	25,000
Dice	08/20/2015	0.19 miles	100 yards	EF1	40,000
Lewisburg	04/14/2019	1.45 miles	150 yards	EF1	100,000

High winds moving in a straight line are the movement of air from areas of higher pressure to areas of lower pressure. As the difference in pressure increases, the strength and speed of the winds increase. As previously mentioned, wind storms are generally defined as having sustained straight-line wind speeds of 40 mph or greater that last for one hour or longer, or winds of 58 mph (i.e. 50 knots) or greater for any duration. Previous high wind events in the County are summarized in the following table.

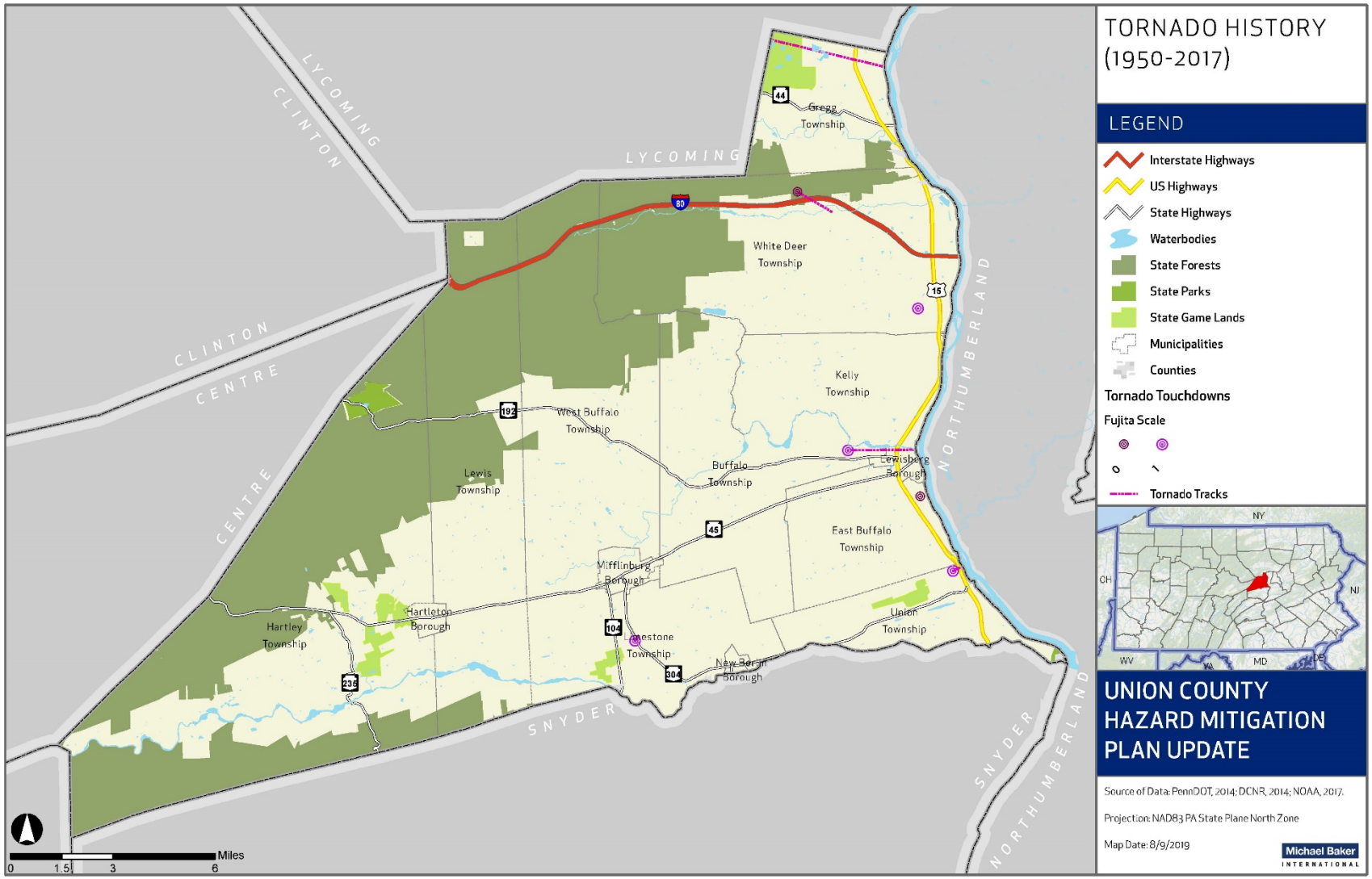
Table 4.3.7-4 Previous windstorm events greater than 50 knots in Union County between 1950 and 2019 (NCEI, 2019).			
LOCATION	**DATE**	**ESTIMATED WIND SPEED (knots)**	**ESTIMATED PROPERTY DAMAGE ($)**
Mifflinburg	11/11/1995	52	not given
New Columbia	11/08/1996	50	not given
Mifflinburg	05/19/1997	51	not given
New Columbia	08/16/1997	51	not given
Lewisburg	05/29/1998	51	not given
Lewisburg	06/02/1998	51	not given
Lewisburg	06/30/1998	51	not given
Mifflinburg	09/07/1998	51	not given
Countywide	09/16/1999	60	not given
Countywide	09/29/1999	60	not given
Allenwood	06/20/2001	50	not given
Mifflinburg	07/17/2001	50	not given
Lewisburg	08/19/2001	50	not given
Countywide	03/09/2002	50	not given
Lewisburg	03/09/2002	50	not given
Mifflinburg	04/28/2002	50	not given

Table 4.3.7-4 Previous windstorm events greater than 50 knots in Union County between 1950 and 2019 (NCEI, 2019).			
LOCATION	**DATE**	**ESTIMATED WIND SPEED (knots)**	**ESTIMATED PROPERTY DAMAGE ($)**
Mifflinburg	06/27/2002	50	not given
Lewisburg	07/23/2002	50	not given
West Milton	07/18/2003	50	not given
Mifflinburg	07/21/2003	50	not given
New Columbia	07/21/2003	50	5,000
Lewisburg	07/21/2003	60	25,000
Lewisburg	07/27/2003	50	not given
Lewisburg	08/16/2003	50	not given
Countywide	11/13/2003	60	not given
Mifflinburg	05/26/2004	50	not given
Forest Hill	06/06/2005	50	not given
Winfield	06/06/2005	50	not given
New Columbia	06/06/2005	70	not given
Mifflinburg	11/6/2005	50	not given
Lewisburg	11/06/2005	50	not given
Mifflinburg	06/22/2006	50	not given
Hartleton	06/22/2006	50	not given
Glen Iron	06/08/2007	50	not given
Mifflinburg	06/19/2007	50	not given
Linntown	06/27/2007	50	not given
Laurelton State Village	08/07/2007	50	not given
New Columbia	06/16/2008	50	not given
Mifflinburg	06/16/2008	50	not given
New Columbia	07/12/2010	50	5,000
Mifflinburg	04/26/2011	50	5,000
Mifflinburg	04/28/2011	65	20,000
Mifflinburg	08/19/2011	50	5,000
Linntown	06/22/2012	50	5,000
Mifflinburg	07/07/2012	50	5,000
White Deer	07/26/2012	50	5,000
Countywide	10/29/2012	50	not given
Mifflinburg	04/19/2013	50	5,000
Mifflinburg	07/07/2013	50	5,000
Lewisburg	07/07/2013	50	5,000
Winfield	06/30/2015	50	2,000
Kelly Crossroads	07/18/2016	52	2,000
New Columbia	07/25/2016	52	4,000
Lewisburg	07/25/2016	52	3,000

Table 4.3.7-4 Previous windstorm events greater than 50 knots in Union County between 1950 and 2019 (NCEI, 2019).			
LOCATION	**DATE**	**ESTIMATED WIND SPEED (knots)**	**ESTIMATED PROPERTY DAMAGE ($)**
Dice	07/25/2016	52	1,000
Cowan	07/25/2016	52	1,000
Lewisburg	07/25/2016	52	1,000
Weikert	07/25/2016	52	4,000
Mazeppa	07/31/2016	52	2,000
Mifflinburg	05/01/2017	52	10,000
Countywide	04/04/2018	52	not given
Mifflinburg	05/15/2018	61	15,000
West Milton	08/07/2018	52	4,000
Countywide	02/24/2019	52	not given
Mifflinburg	04/14/2019	52	3,000
Lewisburg	04/14/2019	52	25,000

The next map shows that tornado activity has occurred throughout the entire county.

Figure 4.3.7-1 Tornadoes that have touched down in Union County



4.3.7.4. Future Occurrence

Nine tornadoes were reported for Union County for the entire 1950–2019 period in NCEI. Therefore, the annual probability of being in the path of a tornado in Union County is relatively minor. While the chance of being hit by a tornado is small, the damage that results when the tornado arrives can be potentially devastating. According to NCDC, there have been over 110 wind events in Union County between 1950 and 2019. The probability of tornadoes and windstorms in Union County can be considered *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

In recent years, there have been increasing numbers of tornadoes and wind storms around Union County in Pennsylvania. An event in April 2019 flattened a section of around 50 trees in Buffalo Township. High winds caused trees to uproot or snap in other areas of the County during this event. While most of the recent wind storms and tornadoes have occurred outside of the county, their proximity contributes to future risk. Because more wind storms have been seen in the central Pennsylvania region, it is possible that an increasing number of tornadoes will be seen in Union County.

4.3.7.5. Vulnerability Assessment

For tornadoes or high winds, aged and dilapidated structures or structures not built to applicable building codes are more susceptible to damage. Mobile homes and campgrounds are especially susceptible to damage due to tornado or high wind. Strong winds can rip roofs off of any dilapidated structures and overturn mobile homes. Past experience with tornadoes in Union County shows that death and injury are indeed possibilities.

Vulnerability to the effects of a tornado or high wind is somewhat dependent upon the age of a structure because as building codes become more stringent, buildings are capable of enduring greater wind forces.

In Union County, high winds occur annually. The most common detrimental effects are interruptions in power supply and communications services due to downed wires and blocked roadways due to downed trees. More information about these impacts can be found in the utility interruption hazard profile in Section 4.3.12.

All structures and infrastructure might be exposed to the effects of a tornado or other high winds. Depending upon the severity of a tornado or high wind, any existing structures might be damaged to some extent. Any future structures might be exposed to tornados or high winds as this hazard does not occur in specific locations. However, future buildings will be somewhat protected from the effects of tornado or high wind as they will meet the most current State building code requirements for bracing and roof design.

Manufactured housing (i.e. mobiles homes or trailers) is particularly vulnerable to high winds and tornadoes. The U.S. Census Bureau defines manufactured homes as “movable dwellings, eight feet or wider and 40 feet or longer, design to be towed on its own chassis, with transportation gear integral to the unit when it leaves the factory, and without need of a permanent foundation (Census, 2010).” They can include multi-wides and expandable manufactured homes but exclude travel trailers, motor homes, and modular housing. Due to their light-weight and often unanchored design, manufactured housing is extremely vulnerable to high winds and will generally sustain the most damage.

The following table displays the number of manufactured housing units per municipality in Union County. Mifflinburg Borough, West Buffalo Township, and White Deer Township are more vulnerable to tornadoes and windstorms as each municipality has over 50 mobile homes.

Table 4.3.7-5 Manufactured housing units per municipality in Union County (Union County GIS Department, 2019).

MUNICIPALITY	NUMBER OF MANUFACTURED HOMES
Buffalo Township	0
East Buffalo Township	4
Gregg Township	34
Hartleton Borough	0
Hartley Township	0
Kelly Township	28
Lewis Township	0
Lewisburg Borough	0
Limestone Township	0
Mifflinburg Borough	122
New Berlin Borough	0
Union Township	0
West Buffalo Township	143
White Deer Township	91
TOTAL	**418**

The ongoing Central Susquehanna Valley Transportation (CSVT) Project could be susceptible to high winds, particularly the new bridge in Union Township due to its high elevation. The CSVT Project is a new four-lane limited access highway, approximately 13 miles long and separated into two sections. The Northern Section connects PA 147 to U.S.15 and the Southern Section connects U.S. 15 to U.S. 11/15. The purpose of this project is to separate trucks and through traffic from local traffic, reduce congestion, accommodate growth, and improve safety. High winds or tornados could cause structural damage to the bridge or increase the risk of transportation accidents. One section of this bridge is designed to only carry truck and tractor trailer traffic. As of the 2020 update to the plan, the project is close to 75% complete with expected completion in 2024. Since the 2014 HMP update, there have been two tornados on record and 16 windstorm events greater than 50 knots in Union County, indicating the project could be impacted by this type of hazard. The National Highway Transportation Safety Administration reports that around 2.5 percent of crashes that lead to fatality are due in part to wind. With increased traffic traveling over the Susquehanna, care should be taken to prevent and respond to wind-related structural or transportation accident risks once the project is complete.

4.3.8. Wildfire

4.3.8.1. Location and Extent

Any small fire in a wooded area, if not quickly detected and suppressed, can spread and become a wildfire that is out of control. Most wildfires are caused by human carelessness, negligence, and ignorance and some are precipitated by lightning strikes.

Wildfires in the Commonwealth of Pennsylvania can occur in fields, grass, and brush as well as in the forest itself. The majority of Union County is forested land surrounded by cropland and pastures. This represents over 100,000 acres.

4.3.8.2. Range of Magnitude

A wildfire destroys personal and real property, valuable timber, forage and inestimable scenic and recreational values. Potential aftermath of wildfires includes severe erosion, silting of stream beds and reservoirs, and flooding due to a loss of ground cover. However, like most natural hazards, there are potential benefits of a wildfire for the natural environment; wildfire can benefit wilderness areas as some plant species thrive in the aftermath of a wildfire.

The severity of a wildfire can be described as the amount of resources it takes to fight the fire as well as the amount of land the fire consumes. 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.

Whereas the extent of a wildfire in some parts of the state can be described by how quickly it will spread, this is not relevant in Union County. Most often, forest or brush fires in Union County are brought under control quickly and do not become wildfires. The worst-case scenario for a wildfire would be similar to the fire that occurred in the 1990s, in which approximately 30 acres of forest burned.

4.3.8.3. Past Occurrence

There were 10 wildfire events in Union County reported to the Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry from 2008-2013. This number does not include wildfires that were not reported to DCNR or that were controlled solely by the volunteer fire departments in the County, but it is the most comprehensive list of wildfire occurrences available for Union County. The following table shows the list of wildfire events reported to the DCNR.

Table 4.3.8-1 List of wildfire events reported in Union County from 2008-2013 (DCNR, 2013).		
YEAR	**MUNICIPALITY**	**AREA (acres)**
2008	Limestone Township	0.5
2008	West Buffalo Township	6.6
2008	White Deer Township	3.5
2009	Hartley Township	0.01
2009	Hartley Township	0.5
2009	Lewis Township	0.5
2009	West Buffalo Township	1.0
2010	Hartley Township	1.0
2012	Buffalo Township	0.5
2012	Gregg Township	4.0
TOTAL		**18.11**

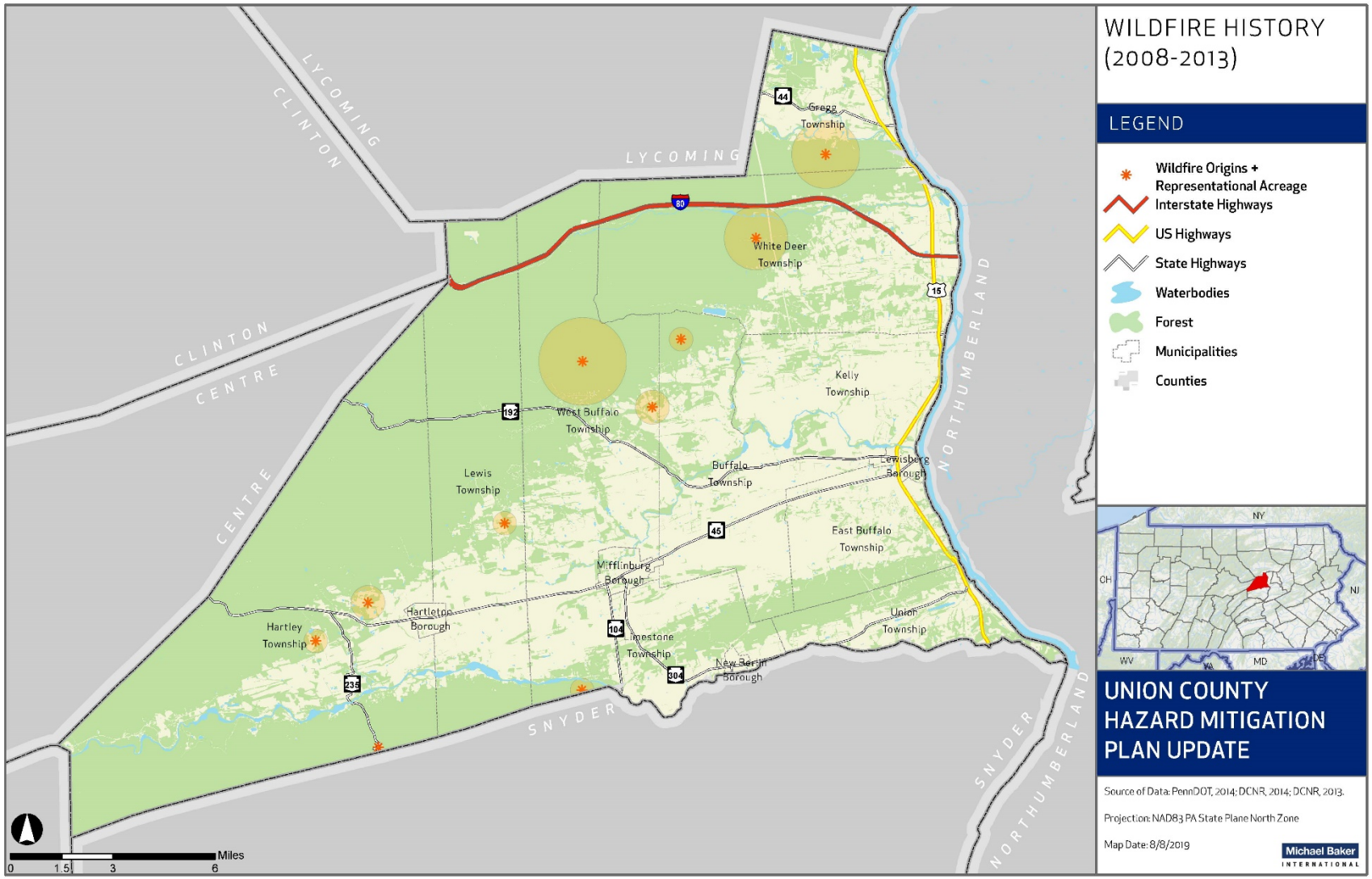
Figure 4.3.8-1 maps the origins of the wildfire events which were reported to the DCNR listed in the table above. It is important to note that this is not an inclusive map of all wildfires, just those with known locations. The map shows that previous occurrences of wildfires have occurred throughout the entire County but in only a few jurisdictions.

From 2013-2018, there were 119 wildfire events in Pennsylvania State Forest District 7 reported to the Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry. District 7 consists of Union County in addition to Centre, Clinton, Mifflin, and Snyder Counties. This number does not include wildfires that were not reported to DCNR or that were controlled solely by the volunteer fire departments in the County, but it is the most current and comprehensive list of wildfire occurrences available for the region surrounding Union County. The following table shows the list of wildfire events reported to the DCNR.

Table 4.3.8-2 List of wildfire events reported in Union County from 2013-2018 (DCNR, 2018).				
YEAR	**TOTAL # OF FIRES**	**TOTAL AREA (ACRES)**	**% TOTAL FIRES**	**%TOTAL AREA (ACRES)**
2013	9	5.5	1.4%	0.3%
2014	28	189.2	3.2%	4.2%
2015	28	44.2	3.4%	1.1%
2016	20	27.6	2.3%	0.2%
2017	14	18.7	2.6%	1.1%
2018	20	38.1	2.9%	2.1%

Notes: % Total Fires and % Total area represent percentages of the entire state of Pennsylvania.

Figure 4.3.8-1 Wildfire origins in Union County between 2008 and 2013



4.3.8.4. Future Occurrence

Ten wildfires were reported in Union County over a five-year period but in total, less than 20 acres of land were burned. Therefore, the probability of a wildfire is estimated to be less than one percent in any given year and can be considered *possible* in any given year as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1). However, the likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response.

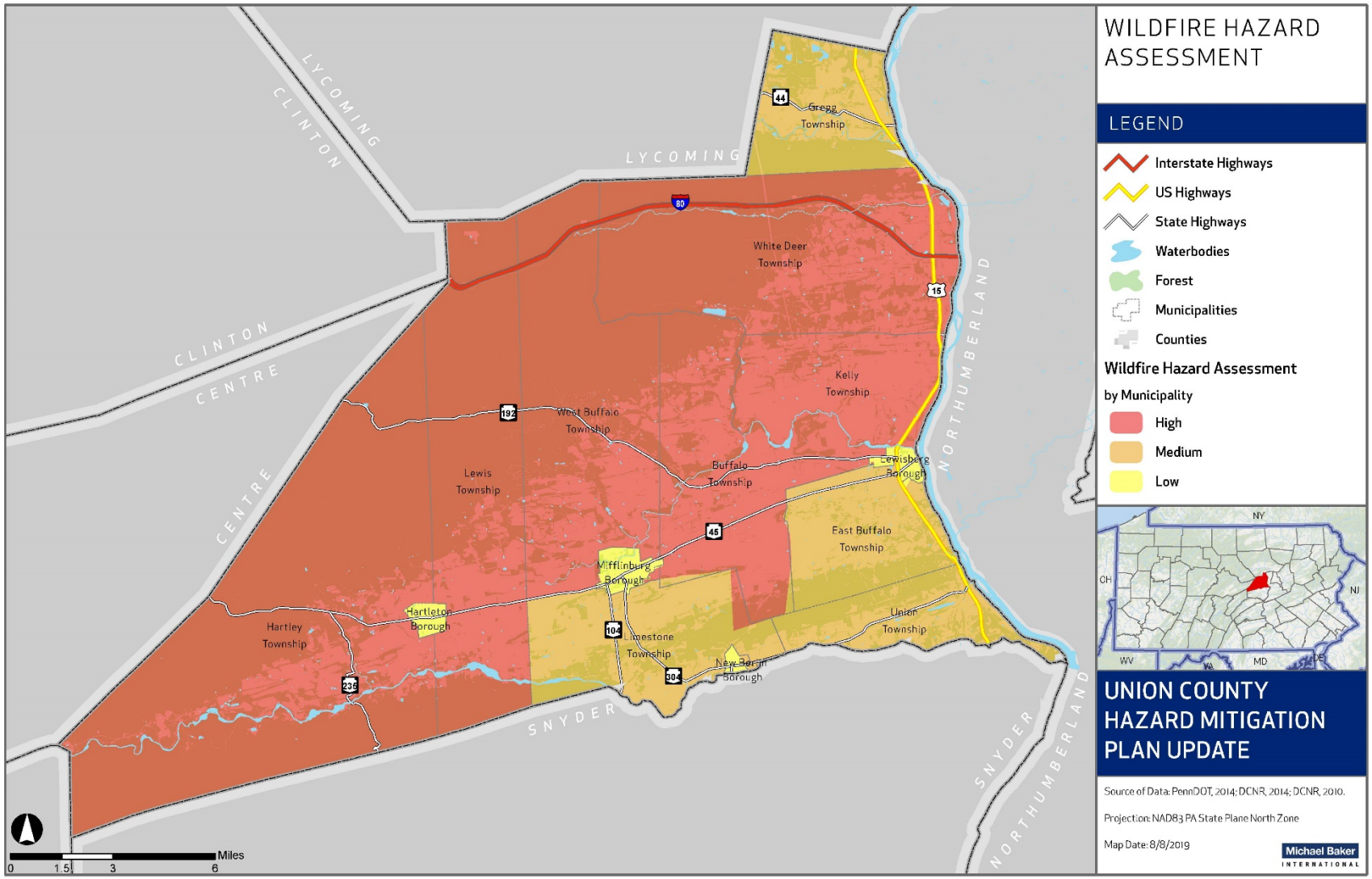
4.3.8.5. Vulnerability Assessment

The Pennsylvania Bureau of Forestry has conducted an independent wildfire hazard risk assessment for the various municipalities across Union 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, six jurisdictions, mostly located in central and western Union County where there are still large tracts of undeveloped land in close proximity to suburban housing developments, have a *high* wildfire rating. Four municipalities within Union County have a *medium* wildfire hazard potential, three of which are in the southern portion of the County, while one is located at the northernmost portion of the county. Four jurisdictions, generally spatially concentrated in the southern part of the County, are considered to have *low* wildfire hazard potential. Table 4.3.8-2 lists the jurisdictions having each wildfire *hazard* rating.

Table 4.3.8-2 List of jurisdictions with each wildfire "hazard" rating.

HIGH HAZARD JURISDICTIONS	MEDIUM HAZARD JURISDICTIONS	LOW HAZARD JURISDICTIONS
Buffalo Township	East Buffalo Township	Hartleton Borough
Hartley Township	Gregg Township	Lewisburg Borough
Kelly Township	Limestone Township	Mifflinburg Borough
Lewis Township	Union Township	New Berlin Borough
West Buffalo Township		
White Deer Township		

Figure 4.3.8-2 Wildfire hazard potential per municipality in Union County



Using this DCNR assessment, the parcels and critical facilities most vulnerable to wildfire hazards are those located within the six high-rated jurisdictions. Table 4.3.8-3 shows the total structures and critical facilities in the high wildfire hazard areas. Please note that 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. All structures in Hartley, Lewis, Limestone, West Buffalo and White Deer Townships have the highest percentage of structures located in high wildfire hazard areas. Table 4.3.8-3 also shows that there are 4 critical facilities vulnerable to wildfire in the County, with the most in Hartley Township. Some of these critical facilities include the Stony Run Reservoir, the Mifflinburg Reservoir, and the New Berlin Pump Station.

Table 4.3.8-3 Wildfire Vulnerability for Union County.

MUNICIPALITY	TOTAL STRUCTURES IN MUNICIPALITY	STRUCTURES IN HIGH WILDFIRE HAZARD AREAS	PERCENT OF STRUCTURES	TOTAL CRITICAL FACILITIES IN MUNICIPALITY	TOTAL CRITICAL FACILITIES IN HIGH WILDFIRE HAZARD AREAS	PERCENT CRITICAL FACILITIES
Buffalo Township	3,190	238	7.5%	13	0	0.0%
East Buffalo Township	3,396	168	4.9%	24	0	0.0%
Gregg Township	850	52	6.1%	18	0	0.0%
Hartleton Borough	228	0	0.0%	3	0	0.0%
Hartley Township	2,443	396	16.2%	13	2	15.4%
Kelly Township	2,337	60	2.6%	33	0	0.0%
Lewis Township	1,570	217	13.8%	5	1	20.0%
Lewisburg Borough	2,126	45	2.1%	7	0	0.0%
Limestone Township	1,679	167	9.9%	7	1	14.3%
Mifflinburg Borough	2,367	50	2.1%	14	0	0.0%
New Berlin Borough	635	8	1.3%	5	0	0.0%
Union Township	1,368	105	7.7%	3	0	0.0%
West Buffalo Township	2,521	342	13.6%	7	0	0.0%
White Deer Township	3,721	323	8.7%	12	0	0.0%
TOTAL	**28,431**	**2,171**	**7.6%**	**164**	**4**	**2.4%**

The following table shows the number of structures in each municipality located in areas susceptible to wildfires by land use type. The land use type displaying the greatest vulnerability to wildfire hazards is residential.

Table 4.3.8-4 Structures in Wildfire High Hazard Areas by Generalized Land Use Type (Union County GIS Department, 2019)*															
Land Use Type	**Buffalo Twp**	**East Buffalo Twp**	**Gregg Twp**	**Hartleton Boro**	**Hartley Twp**	**Kelly Twp**	**Lewis Twp**	**Lewisburg Boro**	**Limestone Twp**	**Mifflinburg Boro**	**New Berlin Boro**	**Union Twp**	**West Buffalo Twp**	**White Deer Twp**	**TOTAL**
Agricultural	4	3	1	0	6	0	3	0	4	0	0	0	1	4	26
Building Lot	0	6	0	0	0	0	0	0	2	1	0	1	1	1	12
Commercial	3	2	7	0	1	4	2	0	0	0	0	1	1	2	23
Forest	156	104	21	0	287	30	166	26	123	27	1	74	234	217	1466
Open Space/ Recreation	0	0	0	0	0	0	0	0	0	1	1	0	0	1	3
Public/ Exempt	1	4		0	3	1	1	4	0	0	0	0	1	1	16
Residential	74	49	23	0	99	25	45	15	38	21	6	29	104	95	623
Transportation	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
TOTAL	**238**	**168**	**52**	**0**	**396**	**60**	**217**	**45**	**167**	**50**	**8**	**105**	**342**	**323**	**2171**

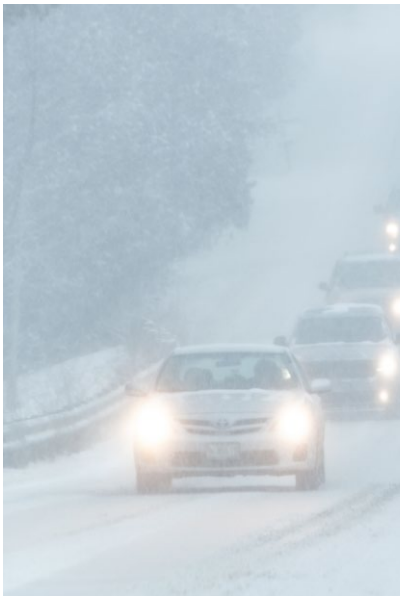
Windshield surveys conducted as part of the process of developing the original Hazard Vulnerability Assessment and Mitigation Plan that was adopted in 2005 revealed that most structures in the Bald Eagle State Forest are used as sporting clubs and not year-round residences. Structures in other forested areas are predominantly single-family residences and vacation homes.

Future structures may be located in forested areas that have the potential to experience wildfire. However, current building codes require the use of roofing materials that have a low potential for burning, and this will reduce the risk of damage due to wildfire for future buildings.

4.3.9. Winter Storm

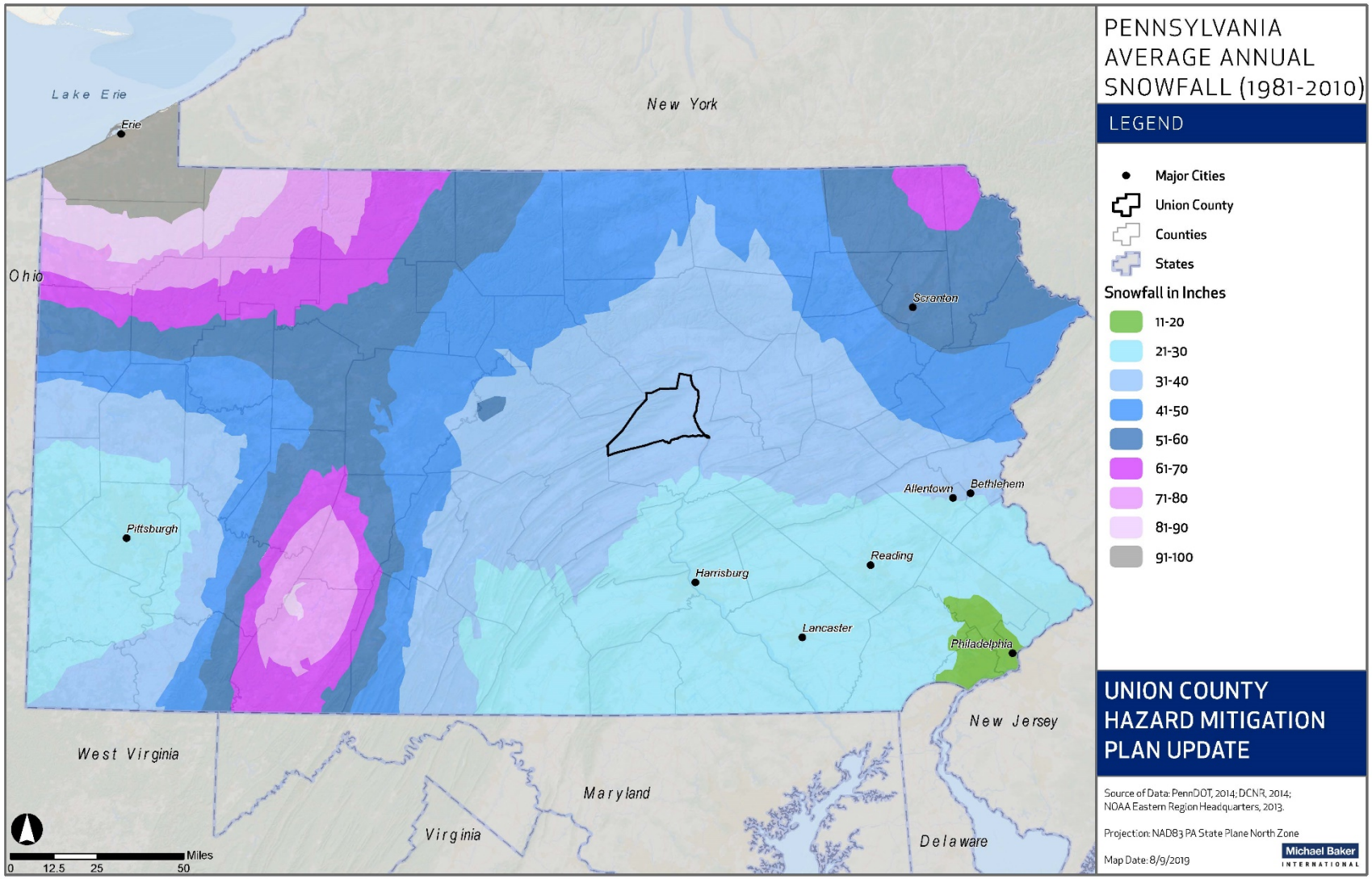
4.3.9.1. Location and Extent

Heavy snow or ice occurs throughout the Commonwealth of Pennsylvania. Every county in the Commonwealth is affected by these storms with the northern and western counties and mountainous regions experiencing these storms more frequently and to a greater extent. Union County experiences all levels of winter storms from ice storms and freezing rain to heavy snow and blizzards. Generally, the average annual snowfall is consistent throughout the County, with the area receiving between 31 and 40 inches of snow annually (see the map below). This was the most current data available at the time of this HMP Update.



Average annual snowfall is consistent throughout the County, with the area receiving between 31 and 40 inches of snow annually.

Figure 4.3.9-1 Mean Annual Snowfall for Pennsylvania and Union County



4.3.9.2. Range of Magnitude

Winter storms consist of cold temperatures, heavy snow or ice and sometimes strong winds. Because winter storms are a regular occurrence in Union County, they are considered hazards only when they result in damage to specific structures and/or overwhelm local capabilities to handle disruptions to traffic, communications, and electric power. The cost of removing snow, repairing damages, especially from ice storms, and the loss to businesses can have a negative economic impact for communities. Winter storms can generate other hazards such as infrastructure disruption (blocked roads and power outages), human-caused hazards (traffic accidents and trapped vehicles), and technological problems (communication system outages and overload). Winter storms can adversely affect roadways, utilities, business activities, and can cause loss of life, frostbite, or freezing.

Winter 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 12-hour period.
- **Sleet Storm:** Sleet is formed when snow falling to the earth partially melts as it passes through a layer of warm air. The precipitation then passes through a cold layer of air and refreezes into solid pellets. Sleet causes surfaces to become slippery, posing hazards to pedestrians and motorists.
- **Ice Storm:** An ice storm occurs when rain freezes upon impact with the ground or other objects such as trees and power lines. Heavy accumulations of ice can bring down trees and topple utility poles, disrupting power and communication for days while crews make the necessary repairs. The icy conditions are also dangerous for pedestrians and vehicular traffic.
- **Blizzard:** According to the National Weather Service, a blizzard is a severe snowstorm that occurs when winds reach 35mph or more. The blowing snow reduces visibility to less the one-quarter of a mile for at least three hours. Storms that meet these criteria are not frequent in Union County; however, storms that produce blizzard-like conditions are a common occurrence.
- **Severe Blizzard:** Wind velocity of 45 mph, 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.

The map above shows that mean annual snowfall in Union County is between 30 and 40 inches. Anecdotal evidence indicates that ice storms in Union County can cause as much as one-half of an inch of ice to build up on trees and utility wires.

A worst-case scenario for winter storms occurred in 1934 when a snowstorm deposited over 33 inches in Central Pennsylvania; sequential storms in 1996 deposited 27 inches and then 24 inches in Union County. A significant ice storm occurred in January 2009 when freezing rain resulted in the accumulation of one-quarter to one-half of an inch of ice on power lines and tree limbs.

4.3.9.3. Past Occurrence

The Commonwealth of Pennsylvania has a long history of winter storms. Winter storms generally occur more than once each year in the County. The NCEI data on past occurrences for winter storm lists events since 1995. These winter storm events are listed in the following table.

Table 4.3.9-1 Previous winter storm events impacting Union County since 1950 (NCEI, 2019).

LOCATION	DATE	TYPE	ESTIMATED PROPERTY DAMAGE ($)
Countywide	01/02/1996	Heavy Snow	N/A
Countywide	01/07/1996	Blizzard	N/A
Countywide	01/12/1996	Heavy Snow	N/A
Countywide	03/07/1996	Heavy Snow	N/A
Countywide	02/13/1997	Winter Storm	N/A
Countywide	03/14/1997	Ice Storm	N/A
Countywide	12/29/1997	Heavy Snow	N/A
Countywide	01/15/1998	Ice Storm	N/A
Countywide	01/22/1998	Ice Storm	N/A
Countywide	02/23/1998	Heavy Snow	N/A
Countywide	01/02/1999	Winter Storm	N/A
Countywide	01/08/1999	Winter Storm	N/A
Countywide	01/14/1999	Winter Storm	N/A
Countywide	03/14/1999	Heavy Snow	N/A
Countywide	01/25/2000	Heavy Snow	N/A
Countywide	01/30/2000	Heavy Snow	N/A
Countywide	02/13/2000	Ice Storm	N/A
Countywide	02/18/2000	Winter Storm	N/A
Countywide	12/13/2000	Winter Storm	N/A
Countywide	12/19/2000	Heavy Snow	N/A
Countywide	03/04/2001	Heavy Snow	$4,000,000
Countywide	01/06/2002	Heavy Snow	N/A
Countywide	12/05/2002	Heavy Snow	N/A
Countywide	12/10/2002	Ice Storm	N/A
Countywide	12/25/2002	Heavy Snow	N/A
Countywide	01/02/2003	Heavy Snow	N/A
Countywide	02/16/2003	Heavy Snow	N/A
Countywide	02/03/2004	Heavy Snow	N/A
Countywide	02/06/2004	Ice Storm	N/A
Countywide	03/16/2004	Heavy Snow	N/A
Countywide	03/19/2004	Heavy Snow	N/A
Countywide	01/05/2005	Winter Storm	N/A
Countywide	02/24/2005	Heavy Snow	N/A
Countywide	03/01/2005	Heavy Snow	N/A
Countywide	12/09/2005	Heavy Snow	N/A

Table 4.3.9-1 Previous winter storm events impacting Union County since 1950 (NCEI, 2019).			
LOCATION	**DATE**	**TYPE**	**ESTIMATED PROPERTY DAMAGE ($)**
Countywide	12/16/2005	Winter Storm	N/A
Countywide	02/13/2007	Winter Storm	N/A
Countywide	03/16/2007	Heavy Snow	N/A
Countywide	02/01/2008	Winter Storm	N/A
Countywide	02/12/2008	Ice Storm	N/A
Countywide	12/19/2008	Winter Storm	N/A
Countywide	01/06/2009	Ice Storm	$2,000,000
Countywide	02/05/2010	Winter Storm	N/A
Countywide	02/09/2010	Winter Storm	N/A
Countywide	02/01/2011	Winter Storm	N/A
Countywide	03/06/2011	Heavy Snow	N/A
Countywide	10/29/2011	Heavy Snow	N/A
Countywide	12/14/2013	Winter Snow	N/A
Countywide	02/04/2014	Winter Storm	N/A
Countywide	02/13/2014	Heavy Snow	N/A
Countywide	11/25/2014	Heavy Snow	N/A
Countywide	12/11/2014	Heavy Snow	N/A
Countywide	01/22/2016	Winter Storm	N/A
Countywide	02/08/2017	Winter Storm	N/A
Countywide	03/13/2017	Winter Storm	N/A
Countywide	11/15/2018	Winter Storm	N/A
Countywide	02/20/2019	Winter Storm	N/A

4.3.9.4. Future Occurrence

Data from NCDC shows that winter storms are a regular occurrence in Union County. So, the probability of the occurrence of a damaging heavy snow or ice storm in Union County in any given year is 100 percent. The future occurrence of winter storms hazard can be considered *highly likely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

Table 4.3.9-3 shows the probability of receiving measurable snowfall by month in Union County. These are based on data collected at the weather stations in Lewisburg and Laurelton, PA. This was the most recent information available during the HMP update process.

Table 4.3.9-2 Probability of Measurable Snowfall in Union County by Snow Station Location (NCEI, 2013).		
MONTH	**PROBABILITY (%)**	
	LEWISBURG	**LAURELTON**
January	100.00%	85.71%

Table 4.3.9-2 Probability of Measurable Snowfall in Union County by Snow Station Location (NCEI, 2013).		
MONTH	**PROBABILITY (%)**	
	LEWISBURG	**LAURELTON**
February	100.00%	64.28%
March	64.70%	64.28%
April	18.75%	15.38%
May	0.00%	0.00%
June	0.00%	0.00%
July	0.00%	0.00%
August	0.00%	0.00%
September	0.00%	0.00%
October	12.50%	0.00%
November	35.29%	33.3%
December	58.82%	61.53%

4.3.9.5. Vulnerability Assessment

Vulnerability to the effects of winter storms on buildings is considered to be somewhat dependent on the age of a building because as building codes become more stringent, buildings are capable of supporting heavier loads and as building age, various factors may deteriorate their structural integrity. Vulnerability also depends upon the type of construction and the degree to which a structure has been maintained.

The most vulnerable structures are those that were poorly built or are dilapidated. The weight of heavy snow or ice may lead to structural collapse or to minor damage. Some shed roofs that protect township and borough road maintenance or firefighting equipment have large span roofs that may collapse under the weight of especially heavy snow or ice although none have collapsed due to recent heavy snow or ice storms.

In Union County, accumulations of snow and/or ice during winter months are expected and normal. The most common detrimental effects of snow and/or ice are not collapsed structures but traffic accidents and interruptions in power supply and communications services.

All structures and infrastructure in Union County are exposed to heavy snow and ice. For this analysis, structures built prior to 1940 are identified as being potentially at risk of being somewhat weakened and more susceptible to damage due to heavy snow or ice. The following table shows the number of housing units in Union County built prior to 1940 according to the US Census Bureau's estimates. Lewisburg Borough, Mifflinburg Borough, and White Deer Township have the most structures of any municipality in the county built prior to 1940 (over 400 each). However, Hartleton Borough has the largest proportion of housing units built prior to 1940 (47%). While the US Census provides estimates for residential structures, the age of non-residential structures is not available.

Table 4.3.9-3 Age of housing units in Union County (U.S. Census, 2017)		
MUNICIPALITY	**NUMBER OF HOUSING UNITS BUILT PRIOR TO 1940**	**PERCENT OF TOTAL HOUSING UNITS**
Buffalo Township	381	23.6%
East Buffalo Township	292	12.9%
Gregg Township	125	26.5%
Hartleton Borough	46	47.4%
Hartley Township	308	22.9%
Kelly Township	201	12.8%
Lewis Township	240	32.0%
Lewisburg Borough	780	34.6%
Limestone Township	118	16.0%
Mifflinburg Borough	557	32.3%
New Berlin Borough	171	41.6%
Union Township	131	18.9%
West Buffalo Township	208	16.6%
White Deer Township	418	20.1%
Total	**3,976**	**23.0%**

All structures and infrastructure in Union County will be exposed to heavy snow and ice. Yet, because all of Union County has adopted and enforced the 2009 International Building Code (IBC) and IRC, building yet to be constructed will be able to withstand the weight of heavy snow or ice.

HUMAN-MADE HAZARDS

4.3.10. Environmental Hazards

4.3.10.1. Location and Extent

The main type of human-made environmental hazard discussed in this plan is hazardous material release through transportation accidents and Toxic Release Sites. Given the rapid increase of truck traffic through downtown areas, the County is primarily concerned with what risk these two hazards might pose to the County.

Hazardous Material Release

Hazardous material (HAZMAT) releases in the form of leaks, spills, discharge, or improper disposal pose a threat to the natural environment, built environment, and to public safety. Hazardous material release through the diffusion of harmful materials, explosives, toxic chemicals, and radioactive materials can result in injury to humans and wildlife, contamination to air, water, and soils, and property damage. There are increasingly large numbers of chemicals, oils, radioactive materials, and other hazardous substances spilled as the result of highway, rail, and waterway accidents, storage tank leakage, pipeline break, and/or other accidents. On occasion, these events become a major disaster and force people to evacuate and/or lose their homes and businesses.

Transportation of hazardous materials on highways via tankers or trailers accounts for the greatest number of hazardous materials release incidents in Pennsylvania (FEMA, 1997). According to the U.S. DOT's Office of Operations and the U.S. Census Bureau, it is estimated that 11 percent of all freight transported by trucks is hazardous material. A number of major highways can be used in Union County for the transport of hazardous materials including I-80, US-15, PA-44, PA-45, PA-104, PA-192, PA-235, and PA-304. Union County has over 600 linear miles of roadway according to PennDOT's 2018 Pennsylvania Highway Statistics Report (PennDOT, 2018). Many of these roads are used to transport hazardous materials. Additionally, many cross rivers and streams and travel through downtown and residential areas, increasing the potential to pollute surface water and groundwater and cause harm to life and property.

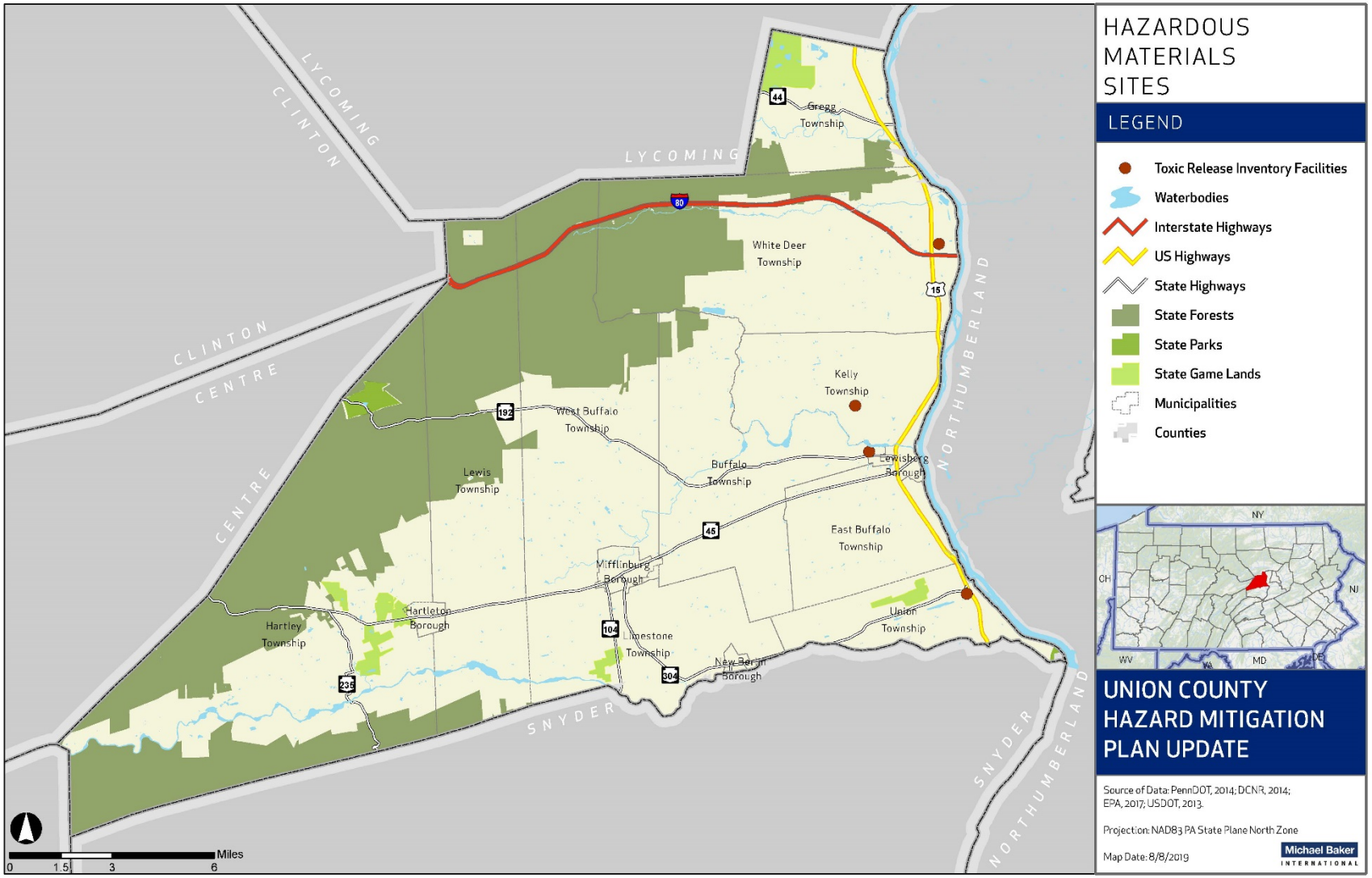
Potential also exists for hazardous material release incidents to occur along rail lines and pipelines. Large spills can result from collisions or derailments of train cars. Several railroad accidents have occurred in Pennsylvania involving hazardous materials (NTSB, 2018), though none in Union County. Union County has around 15 miles of railroad throughout the County, mainly used for moving freight. Pipelines that transport hazardous liquids and flammable substances

can corrode, be damaged during excavation, incorrectly operated, or damaged by other natural or human-made forces leading to a hazardous materials release incident.

Fixed-site facilities that use, manufacture, or store hazardous materials in Pennsylvania pose significant risk to public health and the environment and 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). These statutes require that all owners or operators of facilities that manufacture, produce, use, import, export, store, supply, or distribute any extremely hazardous substance, as defined by the EPA, at or above the threshold planning quantity, report to the county where the facility is located and the Commonwealth. These facilities are subject to the requirement of assisting the Local Emergency Planning Committee (LEPC) in developing an Off-site Emergency Response Plan.

The EPA also tracks key information about chemicals handled by industrial facilities through its Toxics Release Inventory (TRI) database. Facilities which employ ten or more full-time employees, and which manufacture or process 25,000 pounds or more, or otherwise use 10,000 pounds or more, of any SARA Section 313-listed toxic chemical in the course of a calendar year are required to report TRI information to the EPA, the federal enforcement agency for SARA Title III, and PEMA. As of 2019, there were 3,849 facilities on EPA's TRI, five of which are located in Union County. See the map below of TRI facility locations.

Figure 4.3.10-1 Locations of hazardous materials facilities in Union County



4.3.10.2. 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. As previously mentioned, 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 mitigating or exacerbating 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, 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.

11% of all freight transported by trucks is hazardous material.

The severity of the incident is dependent not only on the circumstances described above, but also on 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.

A worst-case scenario event of a hazardous material release would be if a release occurred in the most populous jurisdictions, the Borough of Lewisburg and the Townships of East Buffalo and Kelly. A hazardous material release would likely cause the evacuation of city residents, visitors, and employees. The Borough of Lewisburg in particular is at a

higher risk of hazard materials releases and transportation accidents as a result of increased truck and tractor trailer traffic through downtown on Market Street (PA Route 45). Truck traffic has increased through the downtown business district beginning the summer of 2017 as a result of detours from the Duke Street Reconstruction Project in Northumberland and the Central Susquehanna Valley Thruway project. The Borough recently hired a local engineering firm to study the impacts of increased truck traffic on noise pollution, compaction rates, frequency and severity of vehicle and pedestrian accidents, and the economy. The purpose of the Market Street Corridor Traffic Study is to assess public safety, public health, environmental, and transportation concerns along the corridor as a result of the increased traffic. This study was in progress at the time of this HMP Update, and the Borough anticipates that the final report will be completed in late 2019.

4.3.10.3. Past Occurrence

According to the Pipeline and Hazardous Materials Safety Administration, 165,053 hazardous material release incidents have been reported during transportation (including in-transit, loading, and unloading) in the United States since 2010. Pennsylvania alone can account for 8,092 of those incidents, with damages exceeding $31 Million, 68 hospitalizations, and one fatality (PHMSA, 2019). Specific information regarding incident reports by year can be found on the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration website.

Since the passage of SARA, Title III facilities that produce, use, or store hazardous chemicals must notify the public through the county emergency dispatch center and PEMA if an accidental release of a hazardous substance meets or exceeds a designated reportable quantity and affects or has the potential to affect persons and/or the environment outside the plant. SARA Title III and Pennsylvania Act 165 also require a written follow-up report to PEMA and the County. These written follow-up reports include any known or anticipated health risks associated with the release and actions to be taken to mitigate potential future incidents. In addition, Section 204(a) (10) of Act 165 requires PEMA to staff and operate a 24-hour State Emergency Operations Center (SEOC) to provide effective emergency response coordination. The US EPA TRI reports that over 2,400 pounds of chemicals (including lead, lead compounds, manganese compounds, and zin compounds) were released from facilities located in Union County in 2017.

4.3.10.4. Future Occurrence

While many hazardous material release incidents have occurred in Pennsylvania in the past, not many have specifically happened in Union County. Hazardous material release incidents are generally considered difficult to predict. An occurrence is largely dependent upon the accidental or intentional actions of a person or group. The future occurrence of hazardous materials release incidents in Union County can be characterized as *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

Shifting traffic patterns and the presence of a multitude of hazardous materials in transit through the County warrants the need for development of increased response capability. It is difficult to predict when and where environmental hazards will arise as they are often related to equipment failure and human error. Adequate monitoring through the DEP will reduce the likelihood of potential impacts to the community and to the environment.

4.3.10.5. Vulnerability Assessment

The vulnerability of a community and the environment to a spill or release of an extremely hazardous substance at a facility or from a transportation accident depends on many variables. These include: the specific chemical, the extent of the spill or release, the proximity of waterways, and the number of people residing in a radius from the facility or accident location that can reasonably be expected to be adversely affected.

Furthermore, the vulnerability of a community and the environment to a hazardous material release from a transportation incident is directly related to several specific variables; namely the mode and class of transportation. Each mode is further subject to several categories of hazard. Each mode of transportation (truck/highway, aircraft, rail, watercraft, or pipeline) has separate and distinct factors affecting the vulnerability. 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.

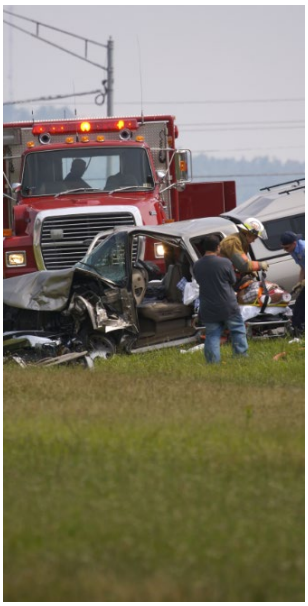
4.3.11. Transportation Accidents

4.3.11.1. Location and Extent

For this analysis a transportation accident is defined as an incident involving highway or rail travel. Accidents involving hazardous materials are considered in more detail in Section 4.3.10. Within Union County, there are over 603 linear miles of roadway and 197 state and local bridges (SEDA-COG, 2016). Six of these bridges (3.0%) are classified as structurally deficient by PennDOT. I-80 is a key freight route, which traverses the northern part of the county from east to west. In 2018, PennDOT statistics indicated over 1.3 million daily vehicle miles traveled within Union County (PennDOT, 2018). There is one railroad that operates within Union County, the Union County Industrial Railroad. This freight railroad runs adjacent to the Susquehanna River and U.S. 15. There is potential for major accidents on any of these roads, bridges or railways. Major transportation corridors are more vulnerable to transportation accidents, especially in areas where the daily traffic counts are greatest.

4.3.11.2. Range of Magnitude

At a minimum, transportation accidents can result in damage to the vehicles and minor injuries to passengers and drivers. At worst, significant transportation accidents can result in death or serious injury or extensive property loss or damage coupled with business interruptions and hours of congestion. Road and railway accidents in particular have the potential to result in hazardous materials releases if the vehicle involved in an accident is hauling hazardous materials. The expected impacts of transportation accidents are amplified by the fact that there is often little warning of accidents. Accidents involving railroads could also have significant impacts on Union County. The worst-case scenario for a transportation accident impacting Union County would be a road or rail accident which results in a hazardous materials spill in a densely populated area, such as in Lewisburg near downtown or Bucknell University. Such an event would constitute an immediate health hazard to the borough and university population and require an evacuation of campus.



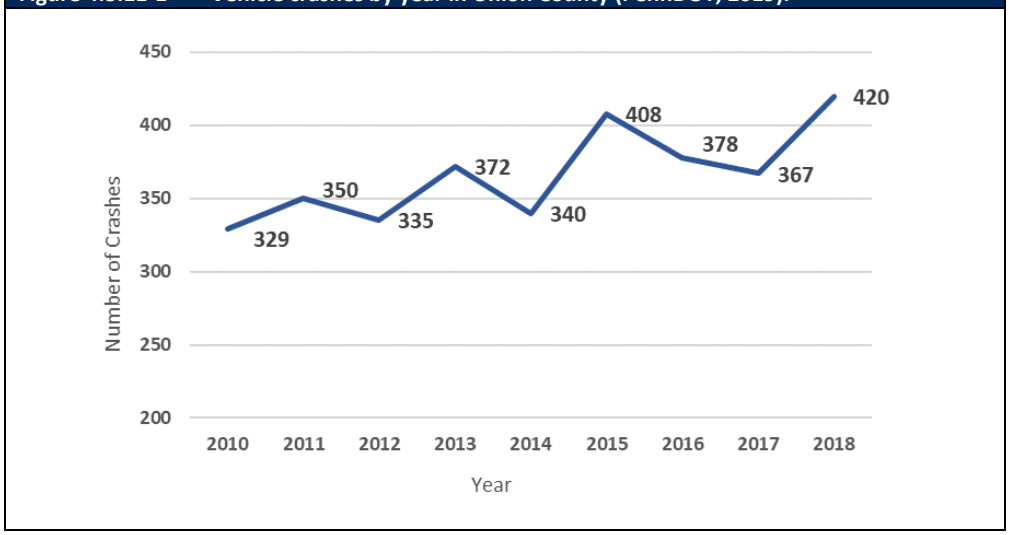
About 41% of motor vehicle accidents are caused by collision with a fixed object.

4.3.11.3. Past Occurrence

The most common transportation accidents in Union County are highway accidents involving automobiles and small trucks. According to the Pennsylvania Department of Transportation, large trucks make up about 7% of vehicle accidents in Union County. About 41% of motor vehicle accidents are caused by collision with a fixed object. About 24% of motor vehicle accidents are due to environmental factors, like wet or obstructed roadways. Between 1998 and 2019, there were 7,343 motor vehicle accidents recorded by the Pennsylvania Department of Transportation. From these accidents, there were 133 fatalities.

The greatest roadway transportation concerns involve I-80, and U.S.15, and State Route 45 since these routes have the highest annual average traffic counts in the County. Additionally, there is a temporal aspect to highway transportation accidents; in the spring and early summer, when construction and narrowed lanes are commonplace, the incidence of large-scale transportation accidents increases. Similarly, rush hour periods will see much higher volume of traffic than other times of the day depending on the location. Vehicle crashes continues to be a risk throughout the County. Pennsylvania Department of Transportation statistics for reportable vehicle accidents in Union County are shown in the map below. Total number of crashes per year has fluctuated over the past ten years, peaking at 420 in 2018, as shown in the following graph.

Figure 4.3.11-1 Vehicle crashes by year in Union County (PennDOT, 2019).



4.3.11.4. Future Occurrence

The population in Union County has only slightly increased over the past 10 years. However, truck traffic has increased a result of detours from the Duke Street Reconstruction Project in Northumberland and the Central Susquehanna Valley Thruway project. The trucking industry is also expected to continue to grow, which will increase the number of long-haul trucks operating in the County on a daily basis. Transportation incidents could potentially increase slightly over the next five years without proper mitigation strategies in place.

Hazardous material release incidents through transportation accidents are generally considered difficult to predict. There is the possibility that increasing freight transportation could increase the number of hazardous material release incidents (See Section 4.3.10).

Rail-related transportation accidents are not as likely to impact the County because of their lower frequency, but they are still possible. Based on this and past occurrences, the future occurrence of transportation accidents Union County can be considered highly likely as defined by the Risk Factor methodology probability criteria (see Table 4.4-1).

4.3.11.5. Vulnerability Assessment

A transportation-related incident can occur on any stretch of road in Union County. However, severe accidents are more likely on the County's highways, 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. Because of the widespread transportation network in Union County, a large number of structures are exposed to the threat of transportation accidents. Table 3.3.16-3 shows the structures in transportation accident hazard zones for highways in Union County. The tables below show the number of structures and critical facilities within these hazard areas.

White Deer Township (829) and East Buffalo Township (707) have the highest number of structures located within 0.25 miles of a major highway. Kelly Township has the most critical facilities within 0.25 miles of a major highway (15), while White Deer Township has the highest proportion of critical facilities within 0.25 miles of a major highway, at 58%. As populations grow, the number of housing units and other structures near major highways will likely rise, therefore increasing vulnerability.

Table 4.3.11-1 Structures vulnerable to transportation accidents in Union County

MUNICIPALITY	TOTAL STRUCTURES	TOTAL STRUCTURES WITHIN 0.25 MILES OF MAJOR HIGHWAY	PERCENT STRUCTURES WITHIN 0.25 MILES OF MAJOR HIGHWAY
Buffalo Township	3,190	0	0%
East Buffalo Township	3,396	707	21%
Gregg Township	850	380	45%
Hartleton Borough	228	0	0%
Hartley Township	2,443	0	0%
Kelly Township	2,337	420	18%
Lewis Township	1,570	4	0%
Lewisburg Borough	2,126	611	29%
Limestone Township	1,679	0	0%
Mifflinburg Borough	2,367	0	0%
New Berlin Borough	635	0	0%
Union Township	1,368	301	22%
West Buffalo Township	2,521	7	0%
White Deer Township	3,721	829	22%
Total	**28,448**	**3,261**	**11%**

Table 4.3.11-2 Critical facilities vulnerable to transportation accidents in Union County.

MUNICIPALITY	TOTAL CRITICAL FACILITIES	CRITICAL FACILITIES WITHIN 0.25 MILES OF MAJOR HIGHWAY	PERCENT CRITICAL FACILITIES WITHIN 0.25 MILES OF MAJOR HIGHWAY
Buffalo Township	13	0	0%
East Buffalo Township	24	6	25%
Gregg Township	18	9	50%
Hartleton Borough	3	0	0%
Hartley Township	13	0	0%
Kelly Township	33	15	45%
Lewis Township	5	0	0%
Lewisburg Borough	7	3	43%
Limestone Township	7	0	0%
Mifflinburg Borough	14	0	0%
New Berlin Borough	5	0	0%
Union Township	3	0	0%
West Buffalo Township	7	0	0%
White Deer Township	12	7	58%
Total	**164**	**40**	**24%**

As mentioned in Section 4.3.7.5, transportation accidents could be caused by high winds, cross winds, or tornados. The new Central Susquehanna Valley Transportation Project, a new 4-mile bridge being installed across the Susquehanna (see Section 4.2.1) and other bridges throughout Union County are particularly susceptible to strong cross winds. Precipitation, fog, pavement temperature, flying debris during storm events, and wind speed could all impact roadway conditions and operational conditions of vehicles while crossing bridges like the CSVT Project, leading to increased risk of transportation accident.

4.3.12. Utility Interruption

4.3.12.1. Location and Extent

Utility interruption is defined as the loss of incoming electricity, steam, gas, and outgoing water, typically caused by damage from natural hazards like fire or windstorm. Utility interruptions are seen across Pennsylvania, with greater rates of interruption seen during storm seasons. Interruption in Union County can be seen at any type of property; residential, commercial, or institutional.

Most severe power failures or outages are regional events. With the loss of power, electrical-powered equipment and systems will not be operational. Examples may include:

- Lighting
- HVAC and ancillary support equipment
- Communication systems (public address systems, telephone, computer servers, and peripherals)
- Ventilation systems
- Fire and security systems
- Refrigerators
- Sterilizers
- Trash compactors
- Office equipment
- Medical equipment

This can cause food spoilage, loss of heat or air conditioning, basement flooding (sump pump failure), lack of light, loss of water (well pump failure), lack of phone service, or lack of internet service. While is most often a short-term nuisance rather than a catastrophic hazard, utility interruptions can cause challenges for communications and response, particularly in more rural areas of the county. At a minimum, power outages can cause short term disruption in the orderly functioning of business, government, and private citizen functioning and activities. A worst-case scenario for utility interruption in Union County would involve a power outage during the winter snow or ice storm. Downed trees and wires from the heavy ice formation could cause power outages throughout the entirety of the County for prolonged periods of time. Rural areas of the county are more vulnerable to experiencing prolonged outages.

4.3.12.2. Range of Magnitude

Utility interruptions in Union County focus primarily on power failures, which are often a secondary impact of another hazard event. For example, severe thunderstorms or winter storms could bring down power lines and cause widespread disruptions in electricity service. Strong heat waves may result in

rolling blackouts where power may not be available for an extended period of time. Local outages may be caused by traffic accidents or wind damage. Utility interruptions and power failures can take place throughout the County. Communities are more vulnerable to this if utility lines are aboveground. Moving them underground is one way to mitigate the risk of interruptions.

Piping for gas delivery is typically located underground and is less susceptible to utility interruption. However, hazards like floods and earthquakes pose risk to underground piping. Additionally, as the infrastructure is underground, it can take much longer to remedy a gas utility interruption. This type of utility interruption is especially dangerous, as a break in natural gas pipelines can lead to fires and/or explosions.

Water utility interruption can occur for both inflow and outflow services. This means that water interruption can result in the inability to bring in new water, in addition to the inability to drain used water (i.e. flushing the toilet). Water utility interruption can occur for several reasons. If the water treatment system is impacted by flooding, there may be resulting flooding throughout the rest of the system. Additionally, water interruption can be caused by loss of electricity to the water treatment system.

Table 4.3.12-1 Utility providers in Union County.

TYPE OF UTILITY	COMPANY	SERVICE AREA
Electric	Citizens' Electric Company	Lewisburg Borough, Buffalo Township, East Buffalo Township, Kelly Township, and West Buffalo Township
	PPL Electric Utilities	Much of Eastern Pennsylvania
	Penelec- First Energy Corporation	Pennsylvania, Ohio, New Jersey, West Virginia, and Maryland
	Mifflinburg Borough – American Municipal Power (Ohio)	Mifflinburg Borough
Natural Gas	UGI Penn Natural Gas	Marcellus/Utica Shale Region in Pennsylvania
	National Fuel Gas Company	Pennsylvania and New York
	People's Gas	Pennsylvania, West Virginia, and Kentucky
Water	Pennsylvania American Water Company	16 states nationwide, including Pennsylvania
	Kelly Township Municipal Authority	Kelly Township
	Mifflinburg Borough	Mifflinburg Borough
	Lewisburg Area Joint Sewer Authority	Lewisburg Borough, East Buffalo Township, and Buffalo Township
	White Deer Township Municipal Authority	Northeast Union County
	Gregg Township Municipal Authority	Northeast Union County
	Buffalo Township Sewage Treatment Facility in Mazeppa	Buffalo Crossroads, Mazeppa, and Vicksburg
	New Berlin Municipal Authority	New Berlin Borough

4.3.12.3. Past Occurrence

Utility interruptions are largely minor, routine events; however, the impacts may be felt more strongly and for longer periods of time in rural areas. In Union County, minor power outages occur several times per year. They are most often associated with winter storms and wind storms. No complete/comprehensive list of utility interruptions exist for the county.

4.3.12.4. Future Occurrence

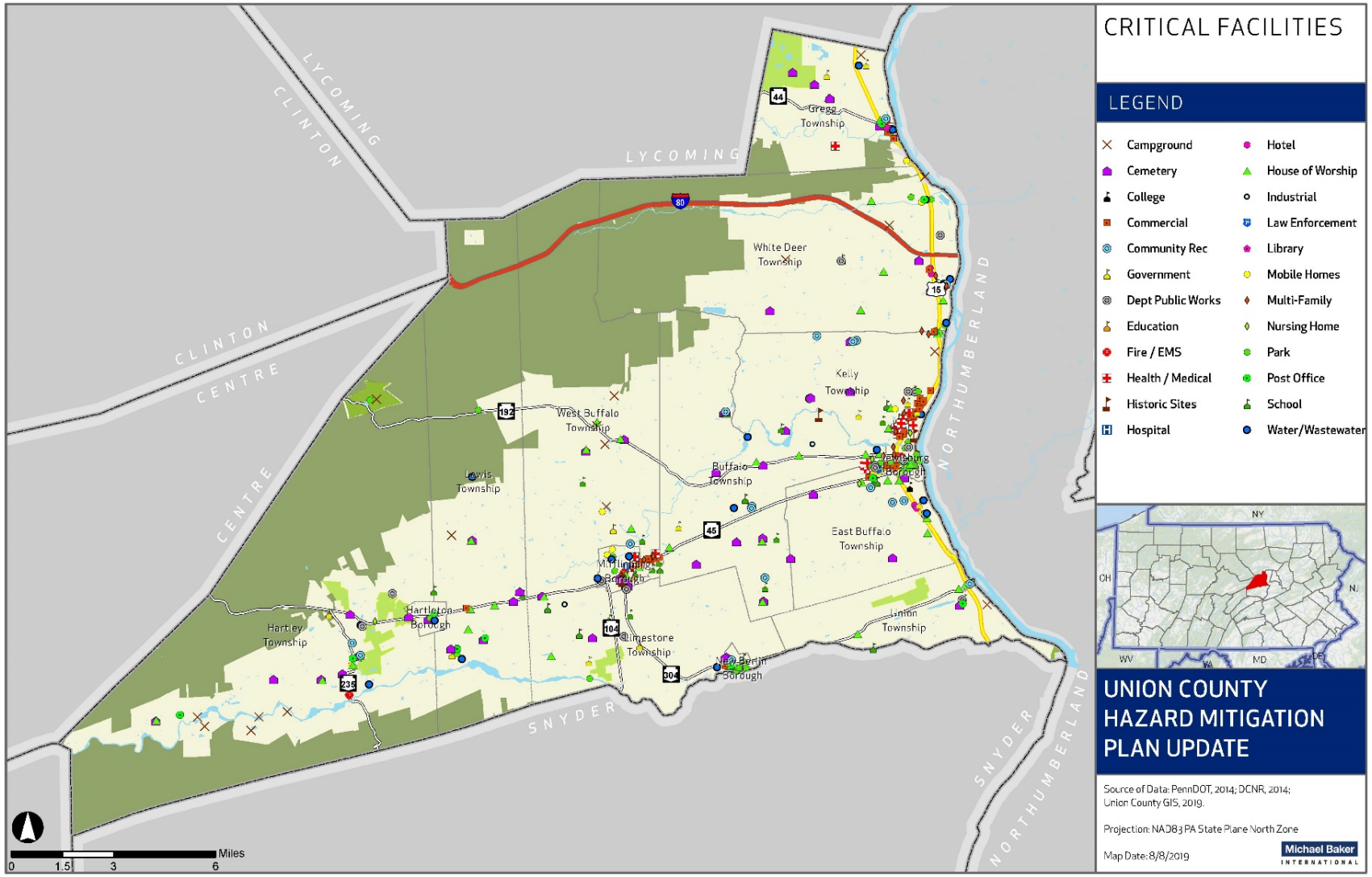
Minor power failure (i.e. short outage events) may occur several times a year for any given area in the County, while major (i.e. widespread, long outage) events take place once every few years. Power failures are often occurrences during severe weather and therefore, should be expected during those events. Therefore, the future occurrence of utility interruptions in Union County can be considered highly likely as defined by the Risk Factor methodology probability criteria (see Table 4.4-1). These interruptions should be anticipated, and first responders should be prepared during severe weather events.

4.3.12.5. Vulnerability Assessment

Emergency medical facilities, including 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. The following map shows the location of critical facilities in Union County. In total, there are 164 critical facilities identified by the County. These include emergency services, educational facilities, and utility services. It is important to prioritize utility protection at critical facilities in order to protect vulnerable populations in the event of severe weather. Conservation and improved technology have resulted in more efficient use of energy sources. The increasing use of alternative fuel supplies, such as kerosene heaters, wood burning stoves, coal burners, etc., has also decreased our vulnerability to future shortages. However, severe weather extremes, transportation accidents, labor strikes, or nationwide shortages could cause significant energy shortage problems. Vulnerability may also depend on the utility provider. If utility lines are upgraded and buried in certain areas of the County, such as in areas with concentration of new development, these areas could potentially be at lower risk to experiencing power outages as a result of downed power lines. Less populated municipalities such as Lewis Township, New Berlin Borough, and Hartleton Borough face increased vulnerability to utility interruption as a result of winter storms or high winds due to isolation, access issues, and longer emergency response times.

Rural areas of the county are more vulnerable to experiencing prolonged outages.

Figure 4.3.12-1 Map of critical facilities in Union County



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 nine hazards profiled in the 2014 Hazard Mitigation Plan Update and the three new human-made hazards hazard being profiled in the 2020 HMP Update: Environmental Hazards, Transportation Accidents, and Utility Interruption. 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 4.4.1-1. 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 4.4.1-1 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 4.4.1-1 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 4.4.2-1 lists the Risk Factor calculated for each of the 12 hazards identified in the 2020 HMP Update. 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 4.4.2-1 Ranking of hazard types based on Risk Factor methodology.

HAZARD RISK	NATURAL HAZARD	RISK ASSESSMENT CATEGORY					RISK FACTOR
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	Flood, Flash Flood, Ice Jam	4	3	3	3	3	3.3
	Utility Interruption	4	2	3	3	2	2.9
	Winter Storm	4	2	3	1	3	2.8
	Hurricane, Tropical Storm, Nor'easter	2	3	3	1	4	2.6
MODERATE	Tornado, Windstorm	3	2	2	4	1	2.4
	Environmental Hazards	3	2	1	4	2	2.3
	Transportation Accidents	4	1	1	4	1	2.2
	Landslide	1	3	2	4	1	2.1
	Subsidence and Sinkhole	1	3	2	4	1	2.1
LOW	Drought	1	1	4	1	4	1.9
	Wildfire	1	2	2	2	3	1.8
	Earthquake	1	1	2	4	1	1.5

Based on these results, there are four *high* risk hazards, five *moderate* risk hazards and three *low* risk hazards in Union County. Mitigation actions were developed for all high, moderate, and low risk hazards (see Section 6.4). Below is a summary of updates made to Risk Factors for each hazard during the 2020 planning process:

- **Flood, Flash Flood, and Ice Jam:** Warning time was increased from 2 to 3, and as a result the Risk Factor increased from 3.2 to 3.3. This decision was made since recent flash flood events have been very unpredictable.
- **Utility Interruption:** This was a new hazard for the 2020 HMP Update. The HPT determined that it was a high-risk hazard due to the high probability, large spatial extent, and lack of warning time. Additionally, many rural areas in the county that are likely to experience utility interruption during a storm event can be difficult for emergency responders to access and creates communication challenges. The Risk Factor for this hazard is 2.9.

- **Winter Storm:** Warning time was decreased from 4 to 1, since winter storms are typically forecasted well in advance. This reduced the overall Risk Factor from 3.1 to 2.8.
- **Hurricane, Tropical Storm, Nor'easter:** The HMPT determined that potential impact of Hurricane, Tropical Storm, and Nor'easter was higher than depicted in the 2014 HMP. It was discussed that severe flooding in the county is often synonymous with a hurricane or tropical storm. As a result of increasing the impact was increased from 2 to 3, which increased the overall Risk Factor from 2.3 to 2.6.
- **Tornado, Windstorm:** The probability of this hazard was increased from 2 to 3 due the increased frequency of tornado and windstorm events since the 2014 HMP Update. This increased the overall Risk Factor from 2.1 to 2.4.
- **Environmental Hazards:** This was a new hazard for the 2020 HMP Update. The HMPT determined that it was a medium-risk hazard due to its high probability, moderate impact, and lack of warning time. The Risk Factor for this hazard is 2.3.
- **Transportation Accidents:** This was a new hazard for the 2020 HMP Update. The HMPT determined that it was a medium-risk hazard due to the high probability and lack of warning time. The Risk Factor for this hazard is 2.2.
- **Landslide:** Based on the results of the Risk Assessment, the HMPT determined that the potential impact and spatial extent of this hazard was greater than depicted in the 2014 HMP. As a result, the impact was increased from 1 to 3 and spatial extent was increased from 1 to 2, increasing the overall Risk Factor from 1.3 to 2.1.
- **Subsidence Sinkhole:** Based on the results of the Risk Assessment, the HMPT determined that the potential impact and spatial extent of this hazard was greater than depicted in the 2014 HMP. As a result, the impact was increased from 1 to 3 and spatial extent was increased from 1 to 2, increasing the overall risk factor from 1.3 to 2.1.
- **Drought:** Due to the lack of drought events and increased precipitation over the past five years, the HMPT determined that the probability of drought should be reduced from 2 to 1. As a result, the overall Risk Factor decreased from 2.2 to 1.9.
- **Wildfire:** Due to the lack of wildfire events and increased precipitation over the past five years, the HMPT determined that the probability of drought should be reduced from 2 to 1. As a result, the overall Risk Factor decreased from 2.1 to 1.8.
- **Earthquake:** The Risk Factor for this hazard remained the same at 1.5.

A risk assessment result for the entire county does not mean that each municipality is at the same amount of risk to each hazard. Municipalities completed a *Hazard Risk Assessment Survey* to during the 2014 planning process evaluate their jurisdictional risk to each hazard. Results from these surveys were reassessed by the HMPT, and the update risk assessment was used to complete Table 4.4.2-2 which shows the different municipalities in Union County and whether their risk is greater than (>), less than (<), or equal to (=) the risk factor assigned to the County as a whole.

Table 4.4.2-2 Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk												
JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR											
	Flood, Flash Flood, Ice Jam	Utility Interruption	Winter Storm	Hurricane, Tropical	Tornado and Windstorm	Environmental Hazards	Transportation Accidents	Landslide	Subsidence and Sinkhole	Drought	Wildfire	Earthquake
	3.3	2.9	2.8	2.6	2.4	2.3	2.2	2.1	2.1	1.9	1.8	1.5
Buffalo Township	=	>	=	=	=	=	=	=	>	=	>	=
East Buffalo Township	=	=	=	=	=	>	>	>	>	=	=	=
Gregg Township	<	=	=	=	=	=	=	>	>	=	=	=
Hartleton Borough	<	=	>	>	=	=	=	=	>	<	<	=
Hartley Township	>	>	=	=	=	=	=	=	=	=	>	=
Kelly Township	=	=	<	>	=	=	=	=	>	=	>	=
Lewis Township	=	>	=	=	=	=	=	>	=	=	>	=
Lewisburg Borough	>	=	>	=	=	>	>	=	=	<	<	=
Limestone Township	=	=	=	=	=	=	=	=	=	=	=	=
Mifflinburg Borough	<	=	=	=	=	=	=	=	=	<	<	=
New Berlin Borough	<	=	>	=	=	=	=	=	>	<	<	=
Union Township	>	=	<	=	=	=	=	=	>	=	=	=
West Buffalo Township	<	>	<	=	=	>	>	>	=	<	>	=
White Deer 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, wildfires, and winter storms. Estimates provided in this section are based on Hazus, version 4.0, 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.

This plan employed an enhanced Hazus analysis for floods. As opposed to basic analysis using only default data, enhanced analysis incorporates some kind of more recent, up-to-date, or specific data for inclusion in the hazard models. The enhanced data incorporated into this plan update include:

- Updated demographic data from the 2010 Census;
- Updated essential facilities data from the County and other sources; and
- A user-delineated 100-year depth grid derived for Union County from the preliminary FIRM data and the 3.2 ft. statewide LiDAR dataset from DCNR.

Using these datasets in Hazus, total building-related losses from a 1%-annual-chance flood in Union County are estimated to equal $177 million. Residential occupancies make up 60% of the total estimated building-related losses. Figure 4.4.3-1 shows a distribution of building-related losses by census block across Union County. Damages would be most significant in and near Lewisburg. Total economic loss, including replacement value, content loss, functional loss and displacement cost, from a countywide 1%-annual-chance flood are estimated to equal $176 million. In this scenario, an expected 365 buildings would be moderately damaged, an increase from the 2014 Hazus model. In addition, an estimated 1,205 households would be displaced, and 2,034 people would require shelter. Essential facilities would largely remain undamaged in this scenario, but one school and one police station are estimated to have at least moderate damage and would experience some loss of use. For more details on the Hazus methodology used and additional results reports, see **Appendix F**.

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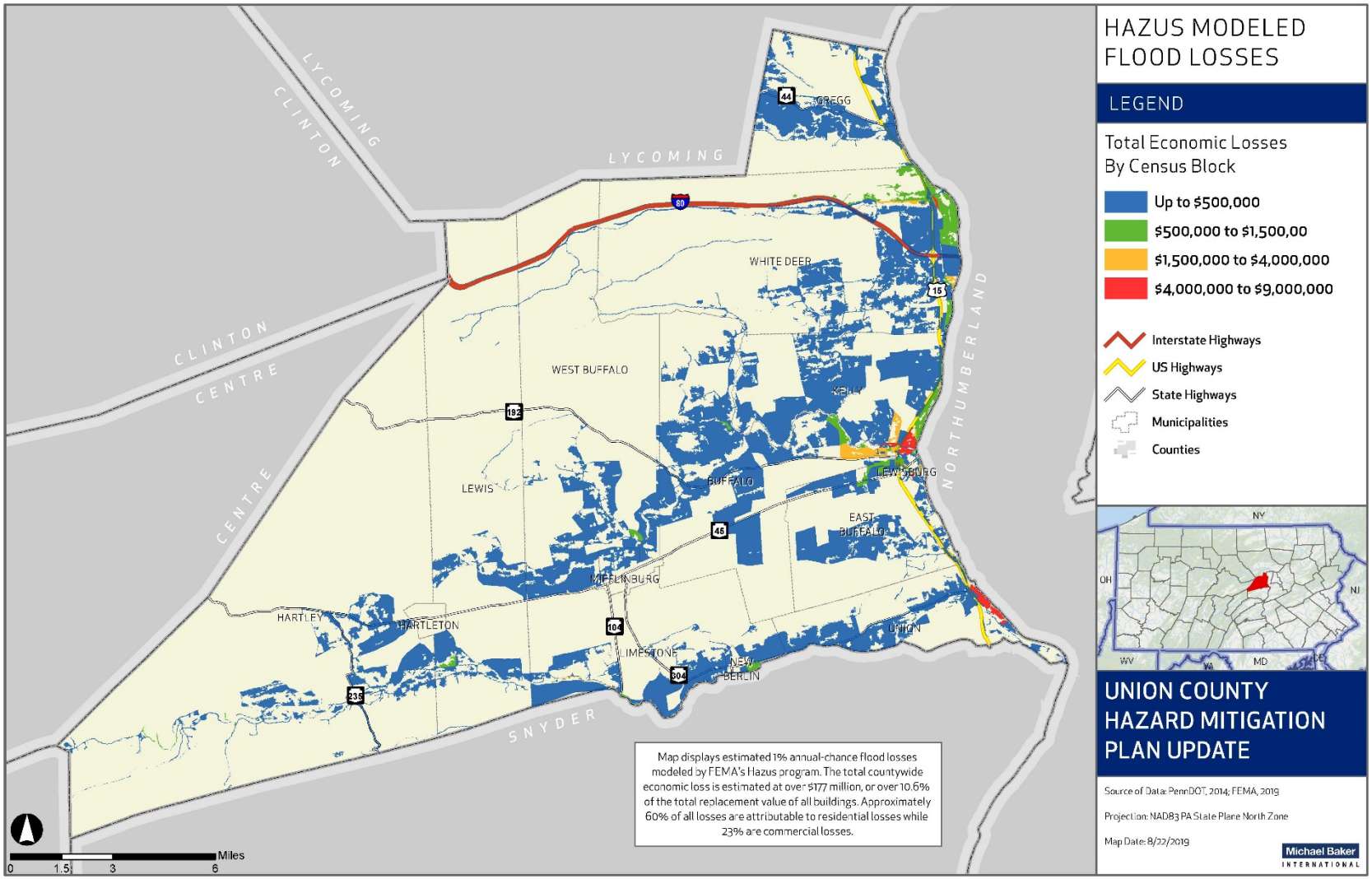
Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale.

Figure 4.4.3-1 **Distribution by census block of the potential total economic loss expected from a 1%-annual-chance flood in Union County (FEMA, 2019).**



For the remaining hazards where loss estimates could be determined, loss estimates are generalized based on the historical impact of the hazard. For droughts, the losses are largely agricultural; as a result, losses are expected to be some portion of Union County's $147 million in agricultural production, depending on the magnitude of the event. The USDA Risk Management Agency has a database of historical crop losses (of insured crops). Table 4.4.3-1 shows insured crop losses that were reported as a result of drought.

Table 4.4.3-1 Crop losses in Union County resulting from drought (USDA, 2019).

YEAR	CROP	ESTIMATED LOSSES
1993	All Other Crops	$78
1995	All Other Crops	$2,444
1995	All Other Crops	$770
1998	All Other Crops	$303
1999	Fresh Market Sweet Corn	$1,771
2001	All Other Crops	$872
2001	All Other Crops	$713
2002	Fresh Market Sweet Corn	$1,816
2002	All Other Crops	$23,456
2002	All Other Crops	$8,315
2002	All Other Crops	$3,249
2002	All Other Crops	$57,877
2005	All Other Crops	$2,836
2005	All Other Crops	$1,044
2006	All Other Crops	$536
2007	All Other Crops	$38,491
2007	All Other Crops	$2,224
2007	All Other Crops	$7,503
2008	All Other Crops	$51,306
2008	All Other Crops	$3,125
2009	All Other Crops	$35,150
2010	Corn	$13,086
2010	Corn	$12,458
2010	Corn	$24,615
2010	Soybeans	$4,583
2010	All Other Crops	$28,630
2011	Corn	$28,423
2011	Corn	$338
2011	Soybeans	$9,857
2012	Corn	$2,138
2013	Wheat	$4,258
2013	Corn	$16,326
2013	Corn	$68
2013	Soybeans	$2,942
2014	Corn	$13,125
2014	Corn	$5,253
2015	Corn	$509

Table 4.4.3-1 Crop losses in Union County resulting from drought (USDA, 2019).		
YEAR	**CROP**	**ESTIMATED LOSSES**
2015	Corn	$6,834
2015	Corn	$16,349
2016	Corn	$4,686
2016	Corn	$77,775
2016	Corn	$35,691
2016	Soybeans	$13,908
Total		**$565,731**

Losses associated with particular natural hazard events are sometimes reported to the NCEI with the event. The reporting time frame is 1950-2019. 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. Several deaths and millions of dollars' worth of property damage have been caused by floods, flash floods, or ice jams in Union County. Previous flood events listed in Table 4.3.3-2 have caused an estimated $11 million worth of property damage throughout the County. Approximately ninety percent ($10,000,000) of these losses were caused by remnants of Hurricane Dennis in 1999. It is important to note that loss estimates are not available for many of the previous flood events which have occurred in the County. Historical loss estimates are available for only seven of the 36 events listed in Table 4.3.3-2. Therefore, it is likely that $11 million is a minimum estimate of historical flood losses.

Additionally, as discussed in Section 4.3.3.5 there are 447 structures in Union County insured under the NFIP. A total of 1,030 NFIP claims for flood damages have been made since 1978 for these structures. Cumulative NFIP payments for flood damages have exceeded $12.5 million.

The NCEI database did not list any losses for tornado events in Union County; however, losses are reported for a number of windstorm events totaling $95,000. For winter storm events, there were two events with reported losses ranging from $2 million to $4 million per event. A high percentage of losses from winter storms are usually in the form of repairs to damaged utility poles, wires, and other infrastructure.

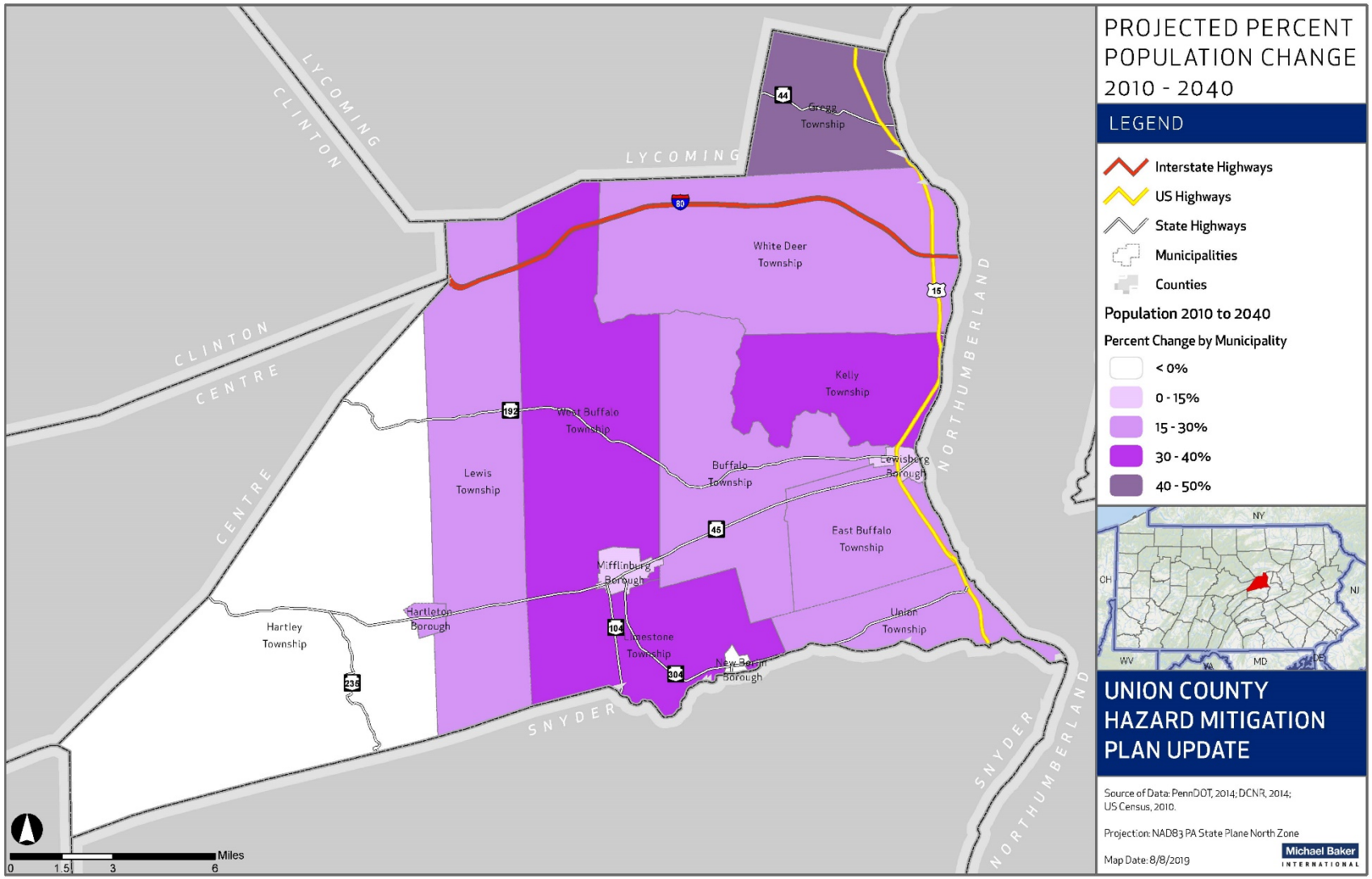
4.4.4. Future Development and Vulnerability

Risk and vulnerability to natural 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. Union 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 housing stock are main indicators of vulnerability change in Union County. As discussed in Section 2.3, the total population of Union County is estimated to have increased by 0.24 percent from 2010-2017, indicating the overall population of the County has generally stayed the same. Seven municipalities increased in population while seven decreased in population during this time period (see Table 2.3-1). Areas of higher density, in the larger municipalities and growing municipalities, face increased vulnerability and increased exposed structures with most hazard events. Increases in population results in increased vulnerability to hazards such as wildfires, floods, and winter storms as more people will be impacted.

If the population of Union County is projected out to 2040, it shows population growth in the eastern and central sections of the County while the most western section remains largely the same. Figure 4.4.4-1 shows projected population change in Union County between 2010 and 2040 based on US Census population projections.

Figure 4.4.4-1 Projected Percent Population Change in Union County



Current zoning and development regulations allow future development to occur within the Special Flood Hazard Area; this suggests that there is potential for additional loss due to flooding in the future. Special Flood Hazard Area development regulations relate to the base flood elevation, which is the estimated level of flooding that has a 1-percent chance of being equaled or exceeded in any given year. Because Special Flood Hazard Area or floodplain development regulations specify that residential structures must be elevated to or above the base flood elevation and commercial structures must either be elevated or flood-proofed to or above this level, the degree to which future structures are exposed to flood damages should be minimal. However, calculations of base flood elevations are based on models that rely upon data about previous flood events; should future floods be greater than those experienced in the past, the base flood elevation may not provide sufficient protection.

In addition, remote and sparsely populated municipalities also face higher vulnerability to hazards because they do not have as easy access to care facilities or response personnel. For instance, the less populated municipalities such as Lewis Township, New Berlin Borough, and Hartleton Borough face increased vulnerability to winter storms due to isolation, access issues, and longer emergency response times.

Over sixteen percent of Union County's population is over the age of 65. 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. Officials may consider partnering with human services organizations to specifically plan for this vulnerable population.

The aging housing stock in Union County is another source of current and future vulnerability in many hazard events. As discussed in Section 4.3.9.5, many homes in the County were built before 1940. Union County can experience gusts of wind up to 200 miles per hour during windstorms, tornadoes, hurricane, tropical storms, or nor'easters. The structure of these older houses may be more at risk of destruction under these strong wind conditions. 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. Forty-seven percent of the housing units in Hartleton Borough were built before 1940, making it most vulnerable to the risks from these hazards. Lewisburg Borough also has a large percent of housing units built before 1940 (more than 40%).

On December 31, 2009 Union County adopted a Comprehensive Plan titled *Cultivating Community: A Plan for Union County's Future*. The Vision Statements in the plan include: "Protecting precious natural resources and agriculture;" "Supporting sustainable economic growth and viable towns;" and "Promoting its unique town and country lifestyle." The Comprehensive Plan also has a Sustainability Principle to "Focus new development in and around established communities." 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.

On June 21, 2017, Union County Planning Department released a Union County Housing Study report which analyzed both qualitative and quantitative data to provide a guide for Union County. The report includes key findings such as an increasing number of households, conclusions such as the existing housing stock in the County being relatively well-suited for current demographic composition, and recommendations such as creating a housing policy that accommodates both emerging demographics and existing residents.

5. Capability Assessment

5.1. Update Process Summary

The purpose of the Capability Assessment is to identify strengths and weaknesses that will affect the ability of the County and participating jurisdictions to implement mitigation actions. Capabilities include a variety of regulations, existing planning mechanisms, and administrative capabilities provided through established agencies or authorities.

Based on the above-identified vulnerability analysis, Union County can assess its current resources and begin to address the legal, regulatory, administrative, financial and other capabilities which it currently has at its disposal to address the potential hazards which make the County and its local municipalities vulnerable.

Union County has a number of resources it can access to implement hazard mitigation initiatives including emergency response measures, local planning and regulatory tools, administrative assistance and technical expertise, financial 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 most important resources which provide the basis for addressing hazard potential and mitigation are the emergency services manpower, equipment, fiscal, and other resources available within Union County communities. At the County level, the Union County Union County Emergency Management Agency provides the leadership and resources coordinate, respond, and provide logistical support to address hazard incidents.

The 2014 Union County Hazard Vulnerability Assessment and Mitigation Plan Update identified the suite of resources available in the County to support hazard mitigation, including regulatory, planning, and administrative resources. It also indicated the presence of local plans, ordinances, and codes in applicable municipalities. Finally, the 2014 Capability Assessment specified local, state, and federal resources available for mitigation efforts.

For the 2020 plan, the HMPT updated the 2014 Capability Assessment by distributing a *Capability Assessment Survey* to all 14 municipalities and summarizing responses. In addition, the HMPT provided additional input into the 2020 Capability Assessment through feedback at meetings. The HMPT also provided input on a *National Flood Insurance Program (NFIP) Worksheet* where the municipalities provided comments on how they implemented the NFIP in their communities.

The 2020 Capability Assessment provides an updated inventory of the most critical local planning and regulatory tools available within each municipality, a summary of the fiscal and technical capabilities available through programs and organizations outside of the County, and provides an opportunity to discuss any plan integration opportunities with the hazard mitigation plan. It also identifies emergency management capabilities and the processes used for implementation of the National Flood Insurance Program.

While the capability assessment serves as a good instrument for identifying local capabilities, it also provides a means for recognizing gaps and weaknesses that can be resolved through future mitigation actions. The results of this assessment lend critical information for developing an effective mitigation strategy.

5.2. *Capability Assessment Findings*

5.2.1. Planning and Regulatory Capability

Table 5.2.1-1 summarizes the regulatory tools used in Union County and participating jurisdictions. These regulations support the goals of this hazard mitigation plan and provide opportunities for further mitigating the potentially negative effects of natural hazards through regulation.

Table 5.2.1-1 Regulatory Capabilities

JURISDICTION	COMPREHENSIVE PLAN	ZONING ORDINANCES	SUBDIVISION REGULATIONS	FLOODPLAIN MANAGEMENT REGULATIONS	STORMWATER MANAGEMENT REGULATIONS	BUILDING CODES	HISTORIC PRESERVATION ORDINANCE
Union County	✓	N/A	✓	✓	✓	N/A	
Buffalo Township	✓	✓	✓	✓	✓	✓	
East Buffalo Township	✓	✓	✓	✓	✓	✓	
Gregg Township	✓	✓	✓	✓	✓	✓	
Hartleton Borough			✓		✓	✓	
Hartley Township	✓	✓	✓	✓	✓	✓	
Kelly Township	✓	✓	✓	✓	✓	✓	
Lewis Township		✓	✓	✓	✓	✓	
Lewisburg Borough	✓	✓	✓	✓	✓	✓	✓
Limestone Township	✓		✓	✓	✓	✓	
Mifflinburg Borough	✓	✓	✓	✓	✓	✓	
New Berlin Borough	✓	✓	✓	✓	✓	✓	
Union Township	✓		✓	✓	✓	✓	
West Buffalo Township	✓	✓	✓	✓	✓	✓	
White Deer Township	✓	✓	✓	✓	✓	✓	

5.2.1.1. Plans and Regulations

The **Union County Comprehensive Plan** was completed and adopted on December 31, 2009. A comprehensive plan is a policy document identifying community goals and objectives for future growth and development. All municipalities and Union County have adopted a municipal comprehensive plan except for Lewis Township and Hartleton Borough. Gregg Township adopted the Lycoming U.S. 15 South Comprehensive Plan.

A zoning ordinance specifies the types of development that can occur in particular locations. All municipalities other than Hartleton Borough, Limestone Township, and Union Township have adopted zoning ordinances.

Subdivision regulations further specify how development can occur. Union County and all 14 municipalities have adopted Subdivision Regulations. Hartleton Borough, New Berlin Borough, Hartley Township, Lewis Township, Limestone Township, and West Buffalo Township have adopted the Union County Subdivision and Land Development Ordinance. Other jurisdictions have adopted their own subdivision ordinances.

Stormwater management regulations provide for the conveyance of stormwater to decrease flooding. Union County adopted Act 167 stormwater management plans for Buffalo Creek (1999), Bull Run (adopted 1994 and updated 2004), Fishing Creek / Cedar Run (1996), White Deer Creek (2004) and the West Branch of the Susquehanna River (2004). All municipalities in Union County have adopted regulations for stormwater management.

Adoption and enforcement of **building codes** ensure that both residential and commercial structures are safe. Every municipality in Union County has adopted the 2009 International Code Council (ICC) Family of Model Codes including the 2009 International Residential Code (IRC).

A local **historic district ordinance** enables a community to regulate development in a specific, designated area of historic significance. Lewisburg Borough has adopted a historic district ordinance and has a Historic District Architectural Review Board.

A variety of planning mechanisms are used in Union County and participating jurisdictions. Other plans can support the goals of this hazard mitigation plan and provide opportunities for integrating actions that will mitigate the potentially negative effects of natural hazards with actions designed to achieve other goals.

Other plans address specific human-made or biological hazards. Because the following plans have been developed and adopted in Union County, the technological, human-made or biological hazards that they cover are not exhaustively addressed in this plan to avoid duplication of effort:

- **Integrated Contingency Plan**, March 2007, addresses terrorism and civil unrest and examines a range of scenarios that may occur at the Federal Penitentiary in Union County. The plan identifies necessary supplies, personnel, and equipment for managing disturbances.
- **Emergency Procedures Plans** have been developed for each School District in Union County to address a variety of scenarios caused by accidents or willful acts.
- Each hazardous materials facility has a **Hazardous Material Response Plan** which is updated annually. These plans are a supplement to Union County's emergency operations plan.
- **Union County Nuclear / Radiological Incident Plan,** 2008, addresses the potential for nuclear facility accidents.

- **Emergency Action Plans** have been prepared for high hazard dams located in Union County as well as those for which the inundation area includes part of Union County. Each Emergency Action Plan addresses ways to safeguard lives and reduce property damage within the inundation area; procedures for effective dam surveillance; procedures for prompt notification of emergency management officials; warning and evacuation procedures; and emergency response actions that will be taken in the event of potential or imminent failure of the dam. Plans have been prepared, reviewed by Union County officials, and are on file at the Union County Public Safety Office for:
    - Dams located in Union County:
        - Halfway Dam
        - Poe Valley Dam
        - Spruce Run Dam
        - Stoney Run Dam
        - White Deer Reservoir Dam
    - Dams for which part of the inundation area is in Union County:
        - Albin-Bush Dam
        - Curwan Dam
        - Curwensville Lake Dam
        - Foster Sayers Dam
        - George B Stevenson Dam – note that the Emergency Action Plan for this dam is currently undergoing a review and update by PEMA officials, state police, health officials, and other emergency management personnel as of September 2014.
        - Lake Chillisque Dam
- **Union County Pandemic Plan**, August 2009, addresses the threat of widespread influenza.
- **Union County Environmental Plans and Policies** identifies steep slopes as slopes greater than 15 percent and requires engineering review for roads on slopes greater than seven percent, as steep slopes can be unstable.

The Pennsylvania Emergency Management Services Code, Title 35, requires all political jurisdictions in the Commonwealth to have an Emergency Operations Plan (EOP), an Emergency Management Coordinator (EMC), and an Emergency Operations Center (EOC). The County **Emergency Operations Plan** is reviewed annually. Each borough and township in Union County also has an Emergency Operations Plan that is reviewed bi-annually. Emergency Operations Plans identify the actions necessary to protect lives and safety in the immediate aftermath of a damaging natural or human-made hazard. Emergency Operations Plans address the response capabilities of fire, police, and emergency medical services personnel and include information about search and rescue operations, emergency power generation and communications, provision of emergency shelters, and locations of special needs populations.

The County has developed a **Disaster Response Plan** to identify actions that will be necessary in the aftermath of a disaster to guide the physical, social, environmental, and economic recovery and reconstruction process after a disaster. The plan addresses provision of temporary shelter, debris disposal, and assessment of damage, restoration of utility services, reconstruction priorities, and opportunities for financial assistance.

In 2017, East Buffalo Township contracted for a Bridge **Capital Improvement Program** for all bridge structures under 20 feet in length and other large pipes or culverts that are not included in biennial safety inspections. The inspections and resulting report for the seven applicable structures was intended to provide a proactive approach to identifying and prioritizing projects to maintain, replace, improve or upgrade infrastructure and to assist with budgeting.

Union County conducts **Preliminary Damage Assessments (PDA)** which enable FEMA, state, and local partners to determine the magnitude of damage and impact of disasters. Local officials, as part of a PDA Team will compile details including the disaster-related damages and estimated costs incurred. These details are then shared with state and federal partners to determine whether or not federal assistance in the form of FEMA Individual Assistance, Public Assistance, or other federal programs may be necessary. PEMA and Union County both have PDA forms available for use after a disaster:

- Form "PEMA-DAP-19" will help local officials prepare a list of locations damaged as a direct result of a disaster. This listing includes a brief description of the damage and an estimate of the cost to repair to pre-disaster conditions. This form is submitted to the County.
- The County will then collect and combine like-damages from each municipality affected by an event using Form "PEMA-DAP-17". The County will send this summary of assessments to their PEMA area office.
- Union County tailored Form "PEMA-DAP-19" to the needs of their municipalities in the form of a windshield survey which will help local officials to in making more accurate estimates and determinations of damage.

All forms described above can be found in **Appendix G**. Furthermore, Union County Emergency Management will be conducting damage assessment trainings for local officials. After officials have taken these trainings, they will be able to conduct preliminary damage assessments in a timely and accurate manner to ensure communities are getting the support they need after a disaster.

At the time this plan was updated, a Debris Management Plan and Recovery Plan were being developed or reviewed. A debris management plan is a written document that establishes procedures and guidelines for managing disaster debris in a coordinated, environmentally-responsible, and cost-effective manner.

5.2.1.2. Participation in the National Flood Insurance Program

The Pennsylvania Floodplain Management Act (Act 166 of 1978) requires every municipality identified by the Federal Emergency Management Agency (FEMA) to participate in the NFIP and permits all municipalities to adopt floodplain management regulations. It is in the interest of all property owners in the floodplain to keep development and land usage within the scope of the floodplain regulations for their

community. This helps keep insurance rates low and makes sure that the risk of flood damage is not increased by property development.

Of the municipalities in Union County, 13 of 14 participate in the NFIP. Table 5.2.1-2 shows whether the municipality is participating in NFIP, the number of policies they have, whether the municipality is in good standing, and when they entered the NFIP. Hartleton Borough has never participated in the NFIP and flood studies have never identified a flood hazard area in Hartleton Borough (FEMA, 2014a).

Table 5.2.1-2 NFIP Participation in Union County (FEMA CIS 2019).

MUNICIPALITY	DATE ENTERED THE NFIP	# POLICIES	IS THE COMMUNITY IN GOOD STANDING?
Buffalo Township	4/1/1977	46	Yes
East Buffalo Township	2/2/1977	39	Yes
Gregg Township	9/28/1979	13	Yes
Hartleton Borough	Not Participating		
Hartley Township	3/4/1988	37	Yes
Kelly Township	3/1/1977	25	Yes
Lewis Township	9/30/1987	7	Yes
Lewisburg Borough	2/2/1977	157	Yes
Limestone Township	3/4/1988	22	Yes
Mifflinburg Borough	3/4/1988	9	Yes
New Berlin Borough	4/30/1986	0	Yes
Union Township	8/1/1979	21	Yes
West Buffalo Township	09/60/1987	10	Yes
White Deer Township	9/28/1979	61	Yes

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

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

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

- Reduce flood losses
- Reduce damage to property

- Protect public health and safety
- Prevent increases in flood damage from new construction
- Reduce the risk of erosion damage
- Protect natural and beneficial floodplain functions
- Facilitate accurate insurance rating
- Promote the awareness of flood insurance

There are 10 CRS classes that provide varied reduction in insurance premiums. Class 1 requires the most credit points and gives the largest premium reduction; Class 10 receives no premium reduction. CRS premium discounts on flood insurance range from 5 percent for Class 9 communities up to 45 percent for Class 1 communities. The CRS recognizes 18 creditable activities that are organized under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness.

Lewisburg Borough (CRS Class 8) is the only municipality participating in this program. Lewisburg Borough has received CRS points for the following: elevation certificates, map information, outreach projects, hazard disclosure, and open space preservation.

The HMPT used FEMA's NFIP Worksheet to understand local implementation of the NFIP. At the beginning of the planning process, HMPT members were asked to complete a NFIP worksheet and review existing NFIP information from the 2014 HMP update to verify its accuracy and currency. Results of this exercise and discussions held at HMPT meetings showed that municipalities engage in the NFIP in several ways. East Buffalo Township's ordinance exceeds FEMA and State minimum requirements by requiring elevation certifications, freeboard of 1.5' over base flood elevation, prohibits hazardous materials, prohibits development in flood way unless offset, regulates flood mitigation, requires flood proofed structures, and requires buildings/structures to be anchored. All development requires a zoning permit that is reviewed by the zoning office and/or the township engineer and other state and federal agencies, as needed. In Gregg Township, the SFHA is identified as an environmentally sensitive area where no units may be built, and the ordinance requires 18 inches of freeboard for both residential and non-residential structures. It also requires anchoring of mobile homes. Lewisburg Borough mainly implements the NFIP through its zoning ordinance. Development applications are reviewed with respect to the NFIP through zoning review, engineering review, and CRS requirements. SFHA concerns are noted in the application review process. Lewisburg Borough's ordinance exceeds FEMA and State minimums by regulating additional structures and exceeding review requirements. Limestone Township implements the NFIP through its building code administered by a third-party entity. Mifflinburg Borough administers the NFIP through permit review, inspections, and collection of elevation certificates; its ordinance meets FEMA and the State's minimum requirements. New Berlin Borough indicates that floodplain management is an auxiliary function, and NFIP administration is limited to letters being sent to homeowners. Its floodplain management ordinance meets FEMA and State minimum requirements, as those of do Union Township, West Buffalo Township, and Buffalo Township. Buffalo Township also noted that its Zoning Officer is responsible for NFIP administration, including floodplain ordinance enforcement, maintaining copies of FIRMs for public viewing, reviewing LOMAs, maintaining a record of approved LOMCs, and coordinating with surveyors,

property owners, and banks as needed. The Zoning Officer for Hartley Township and Lewis Township administers the zoning ordinance, floodplain ordinance, and other local requirements that must be met before obtaining a building permit. As previously noted, Hartleton Borough has never participated in the NFIP, and flood studies have never identified a flood hazard area in Hartleton Borough. Central Keystone Council of Governments (CKCOG) also plays a significant role in local implementation of the NFIP. CKCOG oversees Building Code Enforcement for all communities in Union County and administers the NFIP for the Borough of Lewisburg and the Townships of East Buffalo, Kelly, West Buffalo, and White Deer. CKCOG acts as Zoning Administrator for these municipalities, providing technical support and NFIP administration through respective municipal zoning and floodplain management ordinances.

For communities that participate in the NFIP, substantial damage determinations are required by local floodplain management ordinances. These rules must be in place for residents of a community to purchase flood insurance through the NFIP. The decision about a structure being "substantially damaged" is made at the local government level, generally by a building official or floodplain manager. Substantial damage applies to a structure in the SFHA for which the total cost of repairs is 50 percent or more of the structure's market value before the disaster occurred, regardless of the cause of damage. This percentage could vary among jurisdictions but must not be below NFIP standards. Preliminary damage assessments conducted by Union County after a disaster (as discussed in Section 5.2.1.1) can be used when making substantial damage determinations. If a building within the floodplain is determined to be substantially damaged after a disaster, it will need to be brought into compliance through methods such as elevating the structure and floodproofing utilities. This should be monitored by the local community in order to stay in compliance with the NFIP.

5.2.2. Administrative and Technical Capability

A variety of administrative capabilities are established in Union County and its jurisdictions. These capabilities can support the implementation of mitigation actions that are proposed in this plan. These capabilities are:

- In addition to meeting NFIP regulatory requirements, Lewisburg Borough participates in the **Community Rating System**, as discussed above. This program is managed by FEMA and can result in reduced flood insurance premiums for residents and business owners due to the additional efforts made by administrators in a participating jurisdiction to reduce flood damages. The goals of CRS are reduction of flood losses, accurate insurance ratings, and increased awareness of the benefits of flood insurance. NFIP insurance premiums in Lewisburg are slightly reduced as it has completed many of the activities designated by CRS for realizing these goals.

- Lewisburg Borough also developed a **Flood Impact Task Force**. The purpose of the committee is to educate homeowners on the NFIP, work to increase the municipality's CRS rating, and develop a local grant program. An initial presentation was given to community members in April 2014. Most recently a presentation was given to homeowners discussing the resources that

available to learn about flooding and insurance information. FEMA's flood maps and local flood map viewers were discussed.

- **Agricultural Land Preservation Program** assists landowners in placing an Agricultural Conservation Easement on property so that it will remain in agricultural or open space use in perpetuity.

- **Main Street Programs** in Lewisburg and Mifflinburg Boroughs have developed comprehensive strategies to promote the revitalization of traditional business districts with the support of the National Trust for Historic Preservation. The authorities are the Lewisburg Downtown Partnership and the Mifflinburg Heritage and Revitalization Association.

- **Union County Economic Development** provides economic development planning in the County.

- **Union County Conservation District** in cooperation with the Pennsylvania Department of Environmental Protection reviews permit applications pertaining to agricultural activities, minor road crossings, intake and outfall structures, stream bank rehabilitation, and gravel bar removal and can issue permits under the Pennsylvania Dam Safety and Waterway Management Code. The District investigates complaints pertaining to illegal stream encroachments. The District is also responsible for administering the Erosion and Sedimentation Pollution Control Program, to conduct site inspections, sponsor educational programs, and investigate complaints related to commercial or agricultural activities.

- **Susquehanna River Basin Commission** is authorized by the Congress of the United States to guide the conservation, development, and administration of water resources in the Susquehanna River Basin.

- **Buffalo Creek Watershed Alliance** focuses on improvement of water quality and restoration of riparian buffers and wildlife habitat and enhanced protection against flood damages in the Buffalo Creek Watershed.

- **Central Keystone Council of Governments** provides building permit review for all 14 jurisdictions in Union County as well as enforcement of zoning and of sanitary wastewater management.

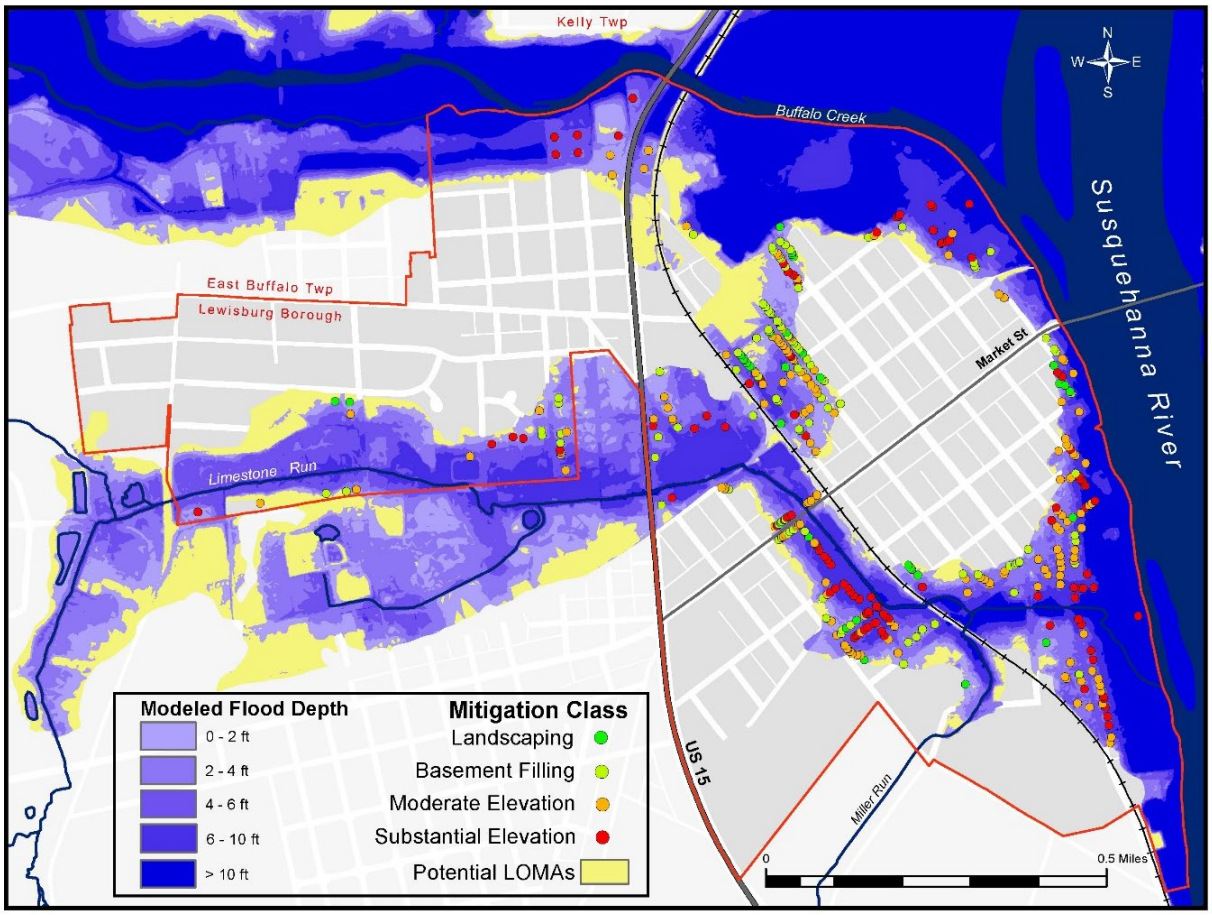
- **Susquehanna Economic Development Association and Council of Governments (SEDA-COG)** is a regional authority that augments local capabilities for economic development and transportation planning.
    - SEDA-COG regularly updates the Comprehensive Economic Development Strategy, the Transportation Improvement Program, and the Long Range Transportation Plan for Union and surrounding counties.

  - SEDA-COG has established two Keystone Opportunity Zones, land with special tax incentives to induce development in Union County; these are the Mifflinburg Industrial Park and the 170-acre Great Streams Commons, which is a mixed-use business park with housing and commercial development.
  - SEDA-COG has adopted *Valley Vision 2020: A Plan for Pennsylvania's Heartland*, which established environmental conservation and recreation goals.

- A partnership led by the **Northcentral Pennsylvania Conservancy** and state agencies, county conservation districts, nonprofit organizations, and willing landowners have joined forces to tackle the challenge of bringing Turtle Creek Watershed in Union County back to health while maintaining a working agricultural landscape. They have focused a sustained investment on this waterway as part of a larger effort within Pennsylvania's Northcentral region. The DEP developed an online story map to tell the story of the partnership's restoration efforts so what they have learned can help others improve their local waterways too.

- **Lewisburg Neighborhoods Corporatio**n exists to promote cooperative efforts between neighborhood residents, the university community and Lewisburg Borough to improve civic engagement, safety, communications, image, streetscapes, and historic preservation while balancing environmental and economic issues. As mentioned in the Flood Hazard Profile (Section 4.3.3.5), LNC recently organized an effort to analyze updated BFE data to better inform residents of their direct exposure to the 100-year flood. After determining that some homes originally mapped on FEMA's FIRM, may actually be above the BFE, they began working on outreach efforts to inform citizens of flood insurance impacts and the significance of being mapped in versus mapped out of a floodplain. LNC should be considered as a potential project partner to help Lewisburg Borough in carrying out determined mitigation actions. In the figure below, LNC has determined potential mitigation efforts in Lewisburg based on modeled flood depth. For example, homes within an area that could potentially be inundated with over ten feet of water might consider a substantial elevation project. Structures that may only be impacted by two feet could consider different landscape techniques to minimize the risk of standing water.

Figure 5.2.2-1 Suggested mitigation actions based on flood depth during a 100-year flood storm event. Produced by Lewisburg Neighborhoods Corporation, in partnership with Bucknell University, 2016.



Union County, Lewisburg and Mifflinburg Boroughs, and East Buffalo, Gregg, and Lewis Townships have all reported having planners on staff through the *Capability Assessment* to assist with the implementation of mitigation actions. Union County administers a comprehensive GIS database for the entire County, and the Union County GIS Department provides mapping and development data retrieval capabilities. Additionally, East Buffalo, Gregg, and Lewis Townships and Lewisburg and Mifflinburg Boroughs reported having a GIS specialist or staff member with GIS knowledge on staff.

5.2.3. Financial Capability

A critical key to the implementation of any plan is the financial resources to accomplish the priority projects identified. The implementation of mitigation actions requires time and fiscal 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 the *Capability Assessment Survey* results received, most municipalities within the County perceive fiscal capability to be limited; however, four communities listed their capability to be moderate to high.

Support for mitigation planning actions is provided by the Commonwealth of Pennsylvania and the Federal Government. Programs that complement Union County mitigation planning initiatives are:

- Pennsylvania administered programs including:
    - **Local Government Capital Projects Loan Program**, which provides low-interest loans for purchasing equipment.
    - **Shared Municipal Services**, which provides grant funds to promote cooperation among municipalities.
    - **Land Use Planning and Technical Assistance Program**, which provides grant funds for the preparation of community comprehensive plans and ordinances to implement them.
    - **Floodplain Land Use Assistance Program**, which provides grants and technical assistance to improve management of floodplain lands.
    - **Community Revitalization Program**, which provides grant funds to support local initiatives that promote social and economic diversity to ensure a productive tax base and good quality of life.
- Federal Government programs including the:
    - **Hazard Mitigation Assistance Programs**, which provide grants for cost-effective mitigation projects either in the absence of a disaster or after a disaster declaration has occurred:
        - Pre-Disaster Mitigation Assistance Program (PDM)
        - Flood Mitigation Assistance Program (FMA)
        - Hazard Mitigation Grant Program (HMGP)
    - **Community Development Block Grants**, which provides funds to address a wide range of community development needs.
    - **Small Communities Program Fund**, which supports water quality infrastructure projects.
    - **Weatherization Assistance Program**, which enables low-income households to make their homes more energy-efficient.
    - **Firewise Communities** Program, which involves homeowners and community leaders in protecting structures from fire damage.

East Buffalo Township and Lewisburg Borough both reported on their *Capability Assessment Survey* that they had high fiscal capability. Gregg Township, Lewis Township, and Mifflinburg Borough reported moderate fiscal capability while all other municipalities who completed the survey reported limited capabilities.

5.2.4. Education and Outreach

Education and outreach programs and methods are used to implement mitigation activities and communicate hazard-related information. Examples include fire safety programs that fire departments deliver to students at local schools; participation in community programs, such as Firewise Communities Certification or StormReady Certification; and activities conducted as part of hazard awareness campaigns, such as Hurricane Preparedness Week. Some communities have their own public information or communications office to handle outreach initiatives. Union County, East Buffalo Township, Gregg

Township, and Lewisburg Borough reported on their *Capability Assessment Survey* that they had moderate education and outreach capability, while both Lewis Township and Mifflinburg Borough reported having limited education and outreach capability. All other municipalities who completed the survey reported limited capabilities.

Reported education and outreach activities in Union County are summarized as follows:

- Union County disseminates critical information via the Swift911™ Mass Notification and Incident Management System. This system is designed to contact specific people or areas in the event of an emergency or for sharing important information. The Union County Emergency Management Agency will use this system to alert citizens of information regarding their safety, or the safety of their property. The system can make thousands of calls, send thousands of text messages and emails per minute to convey vital information. These messages may include information on floods, fires, water emergencies, evacuation orders, and weather emergencies. Residents can download an app or register a cellular phone number online.
- Union County maintains StormReady Certification. In the past, Lewisburg Borough and West Buffalo Township have participated in StormReady.
- Lewisburg Borough also conducts annual flood outreach efforts as part of the CRS program including notices, postings, the internet, walk-ins, and public meetings.
- Buffalo Township, Lewis Township, Lewisburg Borough, and New Berlin Borough have local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, or access and functional needs populations. One example is the Lewisburg Borough Flood Impact Task Force described in Section 5.2.2 above.
- Union County Emergency Management Agency staff also conducts public outreach throughout the year to share hazard preparedness and safety information. Staff attends various PEMA and FEMA trainings and events. Staff also works with residents one-on-one on an as-needed basis to answer questions about mitigation projects and grants.

5.2.5. Plan Integration

Plan integration ensures that hazard mitigation planning is woven into each municipality's planning and regulatory documents. These include the plans, policies, codes, and programs that guide land use and development. Effective integration of hazard mitigation occurs when the planning framework fosters development that does not increase risks from known hazards or leads to redevelopment that reduces risk from known hazards (FEMA, 2013).

As mentioned above, Union County adopted its Comprehensive Plan in December 2009. The plan includes a sustainability principle to focus new development in and around established communities. The plan also includes a sustainability principle to limit the impacts of new development on community services including police, fire, and EMS. The plan recognizes that flooding is a hazard in the County as well as in the entire Susquehanna River Basin and identifies floodplains on its Growth Management Strategy Map. It discusses the importance of protecting natural features such as wetlands which have an important role in absorbing floodwater. In addition, the plan excludes floodplains and steep slopes over 15% in its calculation of growth areas for the County. The Union County Planning Department recognizes the

importance of plan integration and will develop more ways to integrate this Hazard Vulnerability Assessment and Mitigation Plan Update into the next update of the Union County Comprehensive Plan.

The Union County Planning Department has also developed a County Greenway and Open Space Plan. The plan's goals are to preserve high-quality open space, establish and expand greenway and multi-modal trail systems, increase riparian buffers, improve access and connection to the Susquehanna River, conserve the county's natural resources, and facilitate healthy lifestyles. The purpose of the plan is to establish specific priorities for conserving open spaces such as farms, forests, community parks and waterbodies and for creating future greenway corridors.

Based on the capability assessment results and information from the Union County Emergency Management Agency, all of Union County's jurisdictions have some forms of local land use controls. As will be discussed in Section 6.1, upon review of the 2014 mitigation actions, it was determined that several municipalities completed mitigation actions that achieve plan integration by furthering hazard mitigation goals through land development regulations.

Some other land use tools in municipalities have not been updated recently. As municipalities work to update comprehensive plans and land use ordinances, local governments can go further to use land use regulations to direct development away from hazard-prone areas.

A barrier to plan integration is often the lack of resources to accomplish activities that plan integration requires. Several municipalities noted on the *Capability Assessment Surveys* that lack of financial resources precludes development of some planning tools. The Self-Assessment portion of the survey provided each municipality an opportunity 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 5.2.5-1 summarizes the results of the self-assessment survey as a percentage of responses received. With available resources being limited and stretched into the foreseeable future, plan integration is extremely relevant and will help leverage existing resources to the maximum extent possible.

Table 5.2.5-1 Summary of self-assessment capability responses expressed as a percentage of responses received.

CAPABILITY CATEGORY	LIMITED	MODERATE	HIGH
Planning & Regulatory	50%	50%	0%
Administrative & Technical	0%	66%	33%
Financial	16%	50%	33%
Community Political	50%	50%	0%
Education & Outreach	33%	66%	0%

6. Mitigation Strategy

6.1. *Update Process Summary*

Goals are long-term aspirations about the resiliency of the community given the potential effects of hazards. Objectives are measurable strategies that the Union County community has determined will be necessary to move closer to attaining each goal. Actions are the tasks that are proposed for realizing each objective.

There were 11 goals and 22 objectives identified in the 2014 Union County Hazard Vulnerability Assessment and Mitigation Plan Update. Goals and objectives were presented to the HMPT during the June 13, 2019 kick-off meeting. The HMPT review of the goals and objectives is included in Table 6.1-1. Several goals and objectives were modified slightly based on the results of the updated risk assessment.

Table 6.1-1 List and review summary of 2014 mitigation strategy goals and objectives.

Goal 1: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to floods, flash floods, and ice jams.	
Objective 1.1: Protect existing structures in the Special Flood Hazard Area.	**Review:** The HMPT agreed that this goal should be continued. Objectives 1.1 through 1.4 have been continued into the 2020 plan. However, Objectives 1.2, 1.3, and 1.4 should be edited to enhance clarity.
Objective 1.2: Promote the continuing purchase of flood insurance by property owners in flood hazard areas.	
Objective 1.3: Develop a comprehensive approach for reducing the possibility of damage and loss of function to critical facilities located in the Special Flood Hazard Area.	
Objective 1.4: Continue to monitor progress on development of an approach for reducing the possibility of damage due to dislodgement of the abandoned railroad bridge in Lewisburg Borough.	
Goal 2: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to winter storms.	
Objective 2.1: Develop a comprehensive approach to reducing the possibility of damage and loss of function to identified vulnerable buildings and critical facilities, due to the effects of winter storms.	**Review:** The HMPT agreed that this goal should be continued. Objectives 2.1 and 2.2 have been continued into the 2020 plan. However, Objective 2.1 should be edited to enhance clarity.
Objective 2.2: Protect future development from damage due to snow or ice through continued enforcement of building codes.	
Goal 3: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to tornado or windstorms.	

Table 6.1-1 List and review summary of 2014 mitigation strategy goals and objectives.	
Objective 3.1: Protect future development from damage from tornados or windstorms through continued enforcement of building codes.	**Review:** The HMPT agreed that this goal should be continued. Objective 3.1 has been continued into the 2020 plan.
Goal 4: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to wildfire.	
Objective 4.1: Develop a comprehensive approach for reducing the possibility of injury and loss of life due to the exposure of structures to wildfires in forested areas.	**Review:** The HMPT agreed this goal should continue into the 2020 plan. The three objectives will also be continued into the 2020 plan. All objectives will be edited to enhance clarity.
Objective 4.2: Develop a comprehensive approach to reducing the possibility of damage and loss of function to critical facilities in municipalities vulnerable to wildfires.	
Objective 4.3: Develop a comprehensive approach to reducing the possibility of damage and loss due to the exposure of vacation and year-round residential structures in all municipalities that have structures in forested areas, with special attention to those with the highest number of structures.	
Goal 5: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to earthquake.	
Objective 5.1: Develop a comprehensive approach to reducing the possibility of damage and loss of function to identified older buildings to the effects of earthquakes.	**Review:** The HMPT agreed this goal and objective should continue into the 2020 plan. However, Objective 5.1 should be edited to enhance clarity.
Goal 6: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to subsidence or sinkholes.	
Objective 6.1: Work with the Pennsylvania Department of Environmental Protection and the Department of Conservation and Natural Resources to be aware of any locations within the County that may be identified as having the potential for land subsidence.	**Review:** The HMPT agreed that this goal and objective should be continued into the 2020 plan. However, Objective 6.1 should be edited to enhance clarity.

Table 6.1-1 List and review summary of 2014 mitigation strategy goals and objectives.	
Goal 7: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to landslide.	
Objective 7.1: Develop a comprehensive approach to reducing the possibility of damage and loss due to future rock falls and related land failures along identified high hazard areas along Routes 15 and 45 in Hartley, Kelly, White Deer, and Union Townships.	**Review:** The HMPT agreed this goal and objective should continue into the 2020 plan.
Goal 8: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to drought.	
Objective 8.1: Promote water conservation measures and awareness.	**Review:** The HMPT agreed this goal and objective should continue into the 2020 plan.
Goal 9: Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to hurricanes, tropical storms, and nor'easters.	
Objective 9.1: Protect future development from damage from hurricanes, tropical storms, or nor'easters through continued enforcement of building codes.	**Review:** The HMPT agreed this goal and objective should continue into the 2020 plan.
Goal 10: Promote disaster-resistant features in future residential, commercial, institutional, and industrial development.	
Objective 10.1: Encourage and facilitate the adoption of the newest building codes that will provide protection for new construction and substantial renovations from the effects of identified hazards.	**Review:** The HMPT agreed this goal and three objectives should continue into the 2020 plan. As new goals and objectives will be added to address the new manmade hazards profiled in this plan update, this goal will become number 13 and the objectives will be numbered 13.1 through 13.3.
Objective 10.2: Encourage and facilitate the development or revision of comprehensive plans and zoning ordinances to limit development in high hazard areas.	
Objective 10.3: Continue to provide consistent enforcement of ordinances and codes.	
Goal 11: Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.	
Objective 11.1: Promote disaster resistance within the business community.	**Review:** The HMPT agreed this goal and four objectives should continue into the 2020 plan. Objective 11.2 should be edited to include potential manmade hazards. As new goals and objectives will be added to address the new human-made hazards profiled in this plan update, this goal will become number 14 and the objectives will be numbered 14.1 through 14.4.
Objective 11.2: Develop an effective public awareness program about potential natural hazards.	
Objective 11.3: Promote partnerships between the municipalities and the County to continue to develop a County-wide approach to identifying and implementing mitigation actions.	
Objective 11.4: Provide public education to increase awareness of hazards and opportunities for mitigation.	

Through the original planning process in 2005, a Steering Committee and citizens of Union County also adopted principles for guiding the development of the mitigation plan that were used during the initial

planning process and again during the plan updates in 2010 and 2014. These mitigation planning principles are being continued into the Union County 2020 Hazard Mitigation Plan Update. These mitigation planning principles are:

- Mitigation actions must support the rich historic, recreational, and agricultural assets of the community.
- Mitigation actions must protect the natural environment.
- Mitigation actions must promote economic development through measures that are consistent with floodplain management development regulations and building codes.
- Mitigation actions must protect people and property, the functioning of local government, and the local economy from the negative effects of hazards.
- The County will cooperate with state agencies to identify critical facilities and infrastructure that are potentially at risk of damage due to natural hazards and will undertake feasible and cost-effective measures to minimize future losses.
- The County will support scientific study of natural hazards and the improvement of data about hazards.
- The County supports enhancing public safety during hazard events, identifying natural hazards, increasing awareness of natural hazards, and taking actions to avoid or minimize damages.
- The County recognizes that the benefits of hazard mitigation planning and actions are the enhanced health, safety, and welfare of the general population.

Actions provide more detailed descriptions of specific work tasks to help the County and its municipalities achieve the goals and objectives. There were 40 actions identified in the 2014 Union County Hazard Vulnerability Assessment and Mitigation Plan. Each municipality and the County were provided with a *Mitigation Action Progress Report Form* which included the list of its actions include from the 2014 plan. Communities were asked to use the worksheet to indicate whether each action was "completed," "canceled," "deferred," or is "ongoing." The communities were also asked to include notes and comments on the actions indicating what was accomplished during the reporting period, if any obstacles were encountered, and for actions that were not completed whether they are still relevant.

The majority of existing mitigation actions have been carried over into the 2020 Hazard Mitigation Plan as they are continuous actions or actions that were not completed, but that the County or municipalities would like to continue into the 2020 Hazard Mitigation Plan Update so that they can work to complete them over the next five years (i.e. "deferred actions"). A list of these actions as well as a review and summary of their progress based on comments received from stakeholders involved in the plan update process is included in Table 6.1-2. Actions were evaluated by the HMPT and municipal officials with the intent of producing a usable mitigation action plan in 2020 with actions and projects that could be completed over the next five years. This evaluation included a cost-benefit review and prioritization exercise, which is described in more detail in Section 6.4. **Appendix C** contains a summary of responses provided by municipalities to the *Mitigation Action Progress Report Form.*

Table 6.1-2 List and review summary of 2014 mitigation actions.

ACTION	COMMUNITY(IES)	REVIEW
1. Continue efforts to acquire repetitive flood claim and severe repetitive loss properties in Union County.	Union County	The County indicated that this project is ongoing. The action should be revised to also include efforts to elevate these properties. Therefore, this action is being continued into the 2020 plan. See action #1 in Table 6.4-1.
2. Invite State NFIP Coordinator to schedule a Community Assistance Visit to ensure continued compliance with NFIP regulations.	Union County	The County indicated that this project is being deferred. Therefore, it is being continued into the 2020 plan. See action #2 in Table 6.4-1.
3. Sponsor a workshop about costs and benefits of purchasing and maintaining flood insurance for any interested community residents and business owners.	Union County	The County indicated that this project is being deferred. Therefore, it is being continued into the 2020 plan. See action #3 in Table 6.4-1.
4. Initiate meeting with providers of electric power to examine the cost and potential sources of funding for burying power lines.	Union County	The County indicated that this project is being deferred. Therefore, it is being continued into the 2020 plan. This action also now also addresses utility interruption. See action #4 in Table 6.4-1.
5. Initiate a meeting of land developers and contractors to determine the cost of burying power and communications lines in new subdivisions.	Union County	The County indicated that this project is ongoing and the Planning Department is responsible for this action. Therefore, it is being continued into the 2020 plan. This action also now also addresses utility interruption. See action #5 in Table 6.4-1.
6. Provide information to schools, prisons, and nursing homes about the Great California Shake-Out and encourage participation in this educational program about surviving the immediate effects of an earthquake.	Union County	The County indicated that this project is being deferred. Therefore, it is being continued into the 2020 plan. See action #6 in Table 6.4-1.
7. Provide education for residents about water-saving landscaping techniques.	Union County	The County indicated that this project is ongoing. Therefore, it is being continued into the 2020 plan. See action #7 in Table 6.4-1.

Table 6.1-2 List and review summary of 2014 mitigation actions.

ACTION	COMMUNITY(IES)	REVIEW
8. Turn one or more rooms in each school and public building into safe rooms providing safe, temporary shelter during a tornado, windstorm, hurricane, tropical storm, or nor'easter.	Union County	The County indicated that this project is ongoing. Therefore, it is being continued into the 2020 plan. Union Township indicated that their Fire Company and Township Municipal Building officially serve as temporary storage and shelter facilities. See action #8 in Table 6.4-1.
9. Provide workshops for farmers regarding livestock management and crop survival during times of drought.	Union County	The County indicated that this project is ongoing. Therefore, it is being continued into the 2020 plan. See action #9 in Table 6.4-1.
10. Proceed with a project to improve storm water drainage in West Milton area of Kelly Township near U.S. Highway 15 and railroad tracks.	Kelly Township	The HMPT reviewed the mitigation action on behalf of the community and determined that the action should be continued into the 2020 plan. See action #10 in Table 6.4-1.
11. Continue to participate in meetings and discussions regarding development of a solution to the abandoned railroad bridge in Lewisburg.	Union County, Lewisburg Borough	The HMPT reviewed this action and the bridge is now part of a proposed rail trail. However, the HMPT still has concerns about the structural integrity of the existing bridge. This action should be continued into the 2020 plan, but will be revised to reflect the updated status of the project. See action #11 in Table 6.4.1.
12. Provide information to residents and business owners to examine the interior of structures to identify objects that may fall in the event of an earthquake (e.g., tall file cabinets, water heaters). Include information about anchoring.	Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMPT reviewed this action. It was determined to be either deferred or ongoing for 12 municipalities and Union County. Union Township and New Berlin indicated that this action is cancelled. The communities will be removed from the list of communities. Otherwise, the project will be included in the 2020 plan. See action #12 in Table 6.4-1.

Table 6.1-2 List and review summary of 2014 mitigation actions.		
ACTION	**COMMUNITY(IES)**	**REVIEW**
13. Provide training for each County and municipal building inspector so that building code enforcement is consistent throughout the County.	Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMPT reviewed this action and determined it was ongoing for all 14 municipalities and Union County. The County indicated that the Code Enforcement Department handles continuing education efforts and the municipalities indicated that code enforcement is provided by the Central Keystone Council of Governments (CK-COG). The project will be included in the 2020 plan. See action #13 in Table 6.4-1.
14. Develop a program to do non-structural retrofit for earthquake safety in each public building (e.g., anchor file cabinets, secure clocks on walls).	Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMPT reviewed this action and determined it was either deferred or ongoing for 13 municipalities and Union County. Union Township indicated that this action is cancelled. The Township will be removed from the list of communities. Otherwise, it is being continued into the 2020 plan. See action #14 in Table 6.4-1.
15. Examine feasibility of jurisdictions besides Lewisburg Borough to participate in the Community Rating System.	Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMPT reviewed this action and determined it was either deferred or ongoing for ten municipalities and Union County. Union Township does not to participate in the program, and has cancelled this action. The action should be revised to reflect this. Otherwise, it is being continued into the 2020 plan. See action #15 in Table 6.4-1.
16. Institute a program to inspect public buildings including storage facilities and lift station housing to identify structural defects that may lead to collapse due to heavy snow or ice.	Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMPT reviewed this action and determined it was either deferred or ongoing for 13 municipalities and Union County. Union Township has indicated that it will cancel this action due to limited Township resources. Otherwise, the project will be included in the 2020 plan. See action #16 in Table 6.4-1.

Table 6.1-2 List and review summary of 2014 mitigation actions.		
ACTION	**COMMUNITY(IES)**	**REVIEW**
17. Include publicity about the benefits of mitigation actions in a public relations program.	Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMPT reviewed this action and determined it was either deferred or ongoing for all 14 municipalities and Union County. Union Township indicated that this action can be accomplished through the Township website as appropriate. The project will be included in the 2020 plan. See action #17 in Table 6.4-1.
18. Attend NFIP training workshops offered in Pennsylvania for local officials and encourage local officials to become Certified Floodplain Managers.	Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The County, municipalities, and HMPT reviewed this action and determined it was either deferred or ongoing for 13 municipalities and Union County. The action is being continued into the 2020 plan. See action #18 in Table 6.4-1.
19. Develop language for potential inclusion in subdivision regulations requiring new power and communications (telephone, cable television) lines to be buried.	Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, New Berlin Borough, West Buffalo Township, White Deer Township	The municipalities, and HMPT reviewed this action and determined that it was either deferred or ongoing for 11 municipalities. This action also now also addresses utility interruption. The action is being continued into the 2020 plan. See action #19 in Table 6.4-1.

Table 6.1-2 List and review summary of 2014 mitigation actions.

ACTION	COMMUNITY(IES)	REVIEW
20. Examine the benefit of increasing the current 1.5-foot freeboard requirement in local flood damage prevention ordinances so that structures are protected to a level greater than the established base flood elevation.	Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for ten municipalities. Due to the nature of the existing structures in the floodplain, Union Township indicated that this action is cancelled. For the remaining nine municipalities, this action is continued into the 2020 plan. See action #20 in Table 6.4-1.
21. Examine the possibility of amending/developing local zoning ordinances to direct new development away from areas underlain with carbonate bedrock.	Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for 12 municipalities. The action will be included in the 2020 plan. See action #21 in Table 6.4-1. Union Township indicated that this is not an issue in their township, and will not be included under this action in the 2020 plan.
22. Continue efforts to acquire, demolish, elevate, and floodproof structures in the Special Flood Hazard Area.	Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for 12 municipalities. The project will be included in the 2020 plan. See action #22 in Table 6.4-1. Union Township determined that this action is cancelled and will not be listed under this action in the 2020 plan.

Table 6.1-2 List and review summary of 2014 mitigation actions.		
ACTION	**COMMUNITY(IES)**	**REVIEW**
23. Work with Township and Borough officials to increase awareness among residents and business owners about NFIP insurance.	Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for 13 municipalities. New Berlin Borough indicated that it sent letters and flyers about flood insurance and federal flood workshops to residents with properties bordering Tan Run. The project will be included in the 2020 plan. See action #23 in Table 6.4-1.
24. Develop language for potential inclusion in zoning regulations allowing higher density cluster development to limit the location of future development in Special Flood Hazard Areas.	Buffalo Township, East Buffalo Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for 11 municipalities. Union Township indicated that this action is cancelled, and the Township will not be included under this action. Otherwise, the project will be included in the 2020 plan. See action #24 in Table 6.4-1.
25. Develop language for potential inclusion in flood damage prevention ordinances extending elevation and flood-proofing requirements to structures in the area just beyond the Special Flood Hazard Area that has been shown by FEMA to have a 0.2-percent chance of flooding in any given year.	Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for 12 municipalities. The project will be included in the 2020 plan. See action #25 in Table 6.4-1. Union Township indicated that this action is cancelled.

Table 6.1-2 List and review summary of 2014 mitigation actions.

ACTION	COMMUNITY(IES)	REVIEW
26. Conduct systematic examination of structures in Special Flood Hazard Area to identify potential violations such as unvented enclosures below base flood elevation.	Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for 13 municipalities. The project will be included in the 2020 plan. See action #26 in Table 6.4-1.
27. Obtain first floor elevations for all structures in identified Special Flood Hazard Areas (including "pre-FIRM" structure built before flood insurance rates maps were developed for the County).	Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for 13 municipalities. The project will be included in the 2020 plan. See action #27 in Table 6.4-1.
28. Review paper/electronic files relating to development in Special Flood Hazard Areas to ensure that elevation certificates have been saved.	Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for 12 municipalities. Therefore, the project will be included in the 2020 plan. See action #28 in Table 6.4-1. However, Union Township indicated that this action is cancelled, and the Township will no longer be listed under this action.
29. Continue to discuss flood mitigation options with property owners.	Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for 13 municipalities. New Berlin indicated that flood mitigation workshop flyers were sent to homeowners along Tan Run. Additionally, Borough staff and the conversation district visited a property owner in the area to discuss flood mitigation options. Therefore, the project will be included in the 2020 plan. See action #29 in Table 6.4-1.

Table 6.1-2 List and review summary of 2014 mitigation actions.		
ACTION	**COMMUNITY(IES)**	**REVIEW**
30. Maintain regular contact with Pennsylvania Department of Conservation and Natural Resources to ensure that County information about the potential for landslides is current.	Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for 13 municipalities. Union Township cancelled this action due to limited resources. Otherwise, the project will be included in the 2020 plan. See action #30 in Table 6.4-1.
31. Develop language for potential inclusion in subdivision regulations requiring grading permits to minimize the potential for landslides.	Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for 13 municipalities. Union Township indicated that they completed this action. This language is covered in their Subdivision and Land Development Ordinance. Otherwise, the project will be included in the 2020 plan. See action #31 in Table 6.4-1.
32. Educate citizens and business owners about removing flammable vegetation or combustible materials from the immediate vicinity of buildings in wooded areas.	Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, White Deer Township	The municipalities and HMPT reviewed this action and determined it was either deferred or ongoing for all 14 municipalities. The project will be included in the 2020 plan. See action #32 in Table 6.4-1.
33. Clear debris and trees from streams.	Gregg Township	The HMPT reviewed the mitigation action on behalf of the community and determined that the action should be continued into the 2020 plan. See action #33 in Table 6.4-1.

Table 6.1-2 List and review summary of 2014 mitigation actions.

ACTION	COMMUNITY(IES)	REVIEW
34. Increase CRS level.	Lewisburg Borough	Lewisburg Borough reviewed this action and indicated that this project is ongoing as the Borough continues to upgrade work to upgrade its CRS class. The action should be continued into the 2020 plan. See action #34 in Table 6.4-1.
35. Acquire and demolish one additional home along 6th Street.	Lewisburg Borough	Lewisburg Borough indicated that this action is complete.
36. Increase the number of rain gardens in the Borough to accommodate storm water filtration.	Lewisburg Borough	Lewisburg Borough indicated that this action is ongoing. However, the Borough will revise this action to include any type of green storm water infrastructure solution, and not specifically rain gardens. This action will be revised and continued into the 2020 plan. See action #35 in Table 6.4-1.
37. Improve NFIP reporting to residents and businesses.	Lewisburg Borough	The HMPT reviewed the mitigation action on behalf of the community and determined that the action should be continued into the 2020 plan. See action #36 in Table 6.4-1.

Table 6.1-2 List and review summary of 2014 mitigation actions.		
ACTION	**COMMUNITY(IES)**	**REVIEW**
38. Update the Emergency Operations Plan for Lewisburg Borough.	Lewisburg Borough	The HMPT reviewed the mitigation action on behalf of the community and determined that the action should be continued into the 2020 plan. See action #37 in Table 6.4-1.
39. Install rip rap culvert improvements to mitigate flooding along Tag Run.	Union County, New Berlin Borough	New Berlin indicated that it recently made improvements along Tan Run, including implementing a wider culvert at the Walnut and High Street section. Additionally, another bridge rehabilitation project is scheduled to start in spring or summer of 2020, which will include a wider culvert to improve flow in the Liberty Street Bridge area. Next phases of future projects will include wider channels and possible headwalls or rip rap, and dates for those projects are to be determined. The Borough attended grant workshops, and inquiries have been made regarding grant money for rip rap culvert along some additional portions of Tan Run. Therefore, it was determined that the action should be continued into the 2020 plan. See action #38 in Table. 6.4-1.
40. Replace culvert under River Road to mitigate flooding.	Union County, East Buffalo Township	The HMPT reviewed the mitigation action on behalf of the communities and determined that the action should be continued into the 2020 plan. See action #39 in Table 6.4-1.

Table 6.1-2 above indicates that progress has been made on a number of mitigation actions since the 2014 plan as well as some mitigation actions which were not identified in the 2014 plan. Union Township addressed adding language requiring grading permits to minimize potential for landslides in the Township's Subdivision and Land Development Ordinance. To address the effects of floods and flash

floods, Lewisburg Borough acquired and demolished one additional home along 6th Street since 2014. Since 2010, the Borough had worked to acquire and demolish nine other repetitive loss properties in the SFHA. Additionally, Mifflinburg Borough recently implemented tornado early warning systems in response to a recent increase in recent tornado events and is working to educate the public about these systems.

Limestone Township implemented infrastructure improvements to alleviate the effects of flooding. This was accomplished prior to the 2014 HMP Update. The Township continues to complete road projects aimed at protecting highways from erosion. Figure 6.1-1 shows an example of this infrastructure protection.

Figure 6.1-1 **Photo of roadway flood mitigation project completed in Limestone Township (Photo courtesy of Limestone Township, 2014).**

Other municipalities completed mitigation activities between the 2010 and 2014 HMP Updates that aimed to further hazard mitigation goals through land development regulations, as discussed in Section 5.2.5. For example, East Buffalo Township added new language in its subdivision and land development ordinance to require that new power and communications lines be buried. East Buffalo Township, along with Lewisburg Borough, increased their 1.5-foot freeboard requirement in local flood damage prevention ordinances to better protect new structures from the effects of floods and flash floods. Finally, Gregg Township developed new language in its zoning regulations to allow higher density cluster development to limit the location of future development in Special Flood Hazard Areas.

6.2. *Mitigation Goals and Objectives*

Based on results of the review of the mitigation goals and objectives established in 2014, a new set of goals and objectives was adopted in 2020. Tables 6.1-1 explains how several of the existing goals and objectives were revised. Three goals and six objectives were added to the 2020 plan to address the new hazards profiled in this update: Environmental Hazards, Transportation Accidents, and Utility Interruption. Table 6.2-1 shows the mitigation goals and objectives established for the 2020 plan. There are 14 goals and 28 objectives identified.

Table 6.2-1 List of 2020 mitigation strategy goals and objectives.

GOAL 1	**Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to floods, flash floods, and ice jams.**
Objective 1.1	Protect existing structures in the Special Flood Hazard Area.
Objective 1.2	Promote the continual purchase of flood insurance by property owners in flood hazard areas.
Objective 1.3	Develop a comprehensive approach for reducing the possibility of damage to and loss of function at critical facilities located in the Special Flood Hazard Area.
Objective 1.4	Continue to monitor progress on developing an approach to reducing the possibility of damage due to dislodgement of the abandoned railroad bridge in Lewisburg Borough.
GOAL 2	**Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to winter storms.**
Objective 2.1	Develop a comprehensive approach to reducing the possibility of damage to and loss of function at identified vulnerable buildings and critical facilities due to winter storms.
Objective 2.2	Protect future development from damage due to snow or ice through continued enforcement of building codes.
GOAL 3	**Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to tornado or windstorms.**
Objective 3.1	Protect future development from damage from tornados or windstorms through continued enforcement of building codes.
GOAL 4	**Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to wildfire.**
Objective 4.1	Develop a comprehensive approach for reducing the possibility of injury and loss of life due to the exposure of structures in forested areas to wildfires.
Objective 4.2	Develop a comprehensive approach to reducing the possibility of damage to and loss of function at critical facilities in municipalities vulnerable to wildfires.
Objective 4.3	Develop a comprehensive approach to reducing the possibility of damage and loss due to the exposure of vacation and year-round residential structures to wildfire in all municipalities with structures in forested areas, with special attention to municipalities with the most structures.
GOAL 5	**Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to earthquake.**
Objective 5.1	Develop a comprehensive approach to reducing the possibility of damage to and loss of function at identified older buildings to the effects of earthquakes.
GOAL 6	**Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to subsidence or sinkholes.**

Table 6.2-1	List of 2020 mitigation strategy goals and objectives.
Objective 6.1	Work with the Pennsylvania Department of Environmental Protection and the Department of Conservation and Natural Resources for awareness of any locations within the County that may be identified as having the potential for land subsidence.
GOAL 7	**Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to landslide.**
Objective 7.1	Develop a comprehensive approach to reducing the possibility of damage and loss due to future rock falls and related land failures along identified high hazard areas along Routes 15 and 45 in Hartley, Kelly, White Deer, and Union Townships.
GOAL 8	**Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to drought.**
Objective 8.1	Promote water conservation measures and awareness.
GOAL 9	**Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to hurricanes, tropical storms, or nor'easters.**
Objective 9.1	Protect future development from damage from hurricanes, tropical storms, or nor'easters through continued enforcement of building codes.
GOAL 10	**Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to environmental hazards.**
Objective 10.1	Protect existing structures and future development from damage or loss due to environmental hazards through enforcement of land use controls and building codes.
Objective 10.2	Provide public outreach and education regarding vulnerability to environmental hazards affecting Union County and strategies to mitigate risk.
GOAL 11	**Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to transportation accidents.**
Objective 11.1	Promote partnerships between the municipalities and the County to develop a comprehensive approach to reducing the possibility of loss of life due to transportation accidents.
GOAL 12	**Reduce possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to utility interruption.**
Objective 12.1	Protect existing structures by promoting retrofitting techniques for more resilient utility services.
Objective 12.2	Protect future development from damage from utility interruption through continued enforcement of building codes.
Objective 12.3	Promote partnerships between the municipalities, the County, and power companies to develop and implement a comprehensive approach to reducing the possibility of damage and loss due to utility interruption.
GOAL 13	**Promote disaster-resistant features in future residential, commercial, institutional, and industrial development.**
Objective 13.1	Encourage and facilitate the adoption of the newest building codes that will provide protection for new construction and substantial renovations from the effects of identified hazards.
Objective 13.2	Encourage and facilitate the development or revision of comprehensive plans and zoning ordinances to limit development in high hazard areas.
Objective 13.3	Continue to provide consistent enforcement of ordinances and codes.
GOAL 14	**Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.**
Objective 14.1	Promote disaster resistance within the business community.
Objective 14.2	Develop an effective public awareness program for potential natural and manmade hazards.

Table 6.2-1	List of 2020 mitigation strategy goals and objectives.
Objective 14.3	Promote partnerships between the municipalities and the County to continue to develop a County-wide approach to identifying and implementing mitigation actions.
Objective 14.4	Provide public education to increase awareness of hazards and opportunities for mitigation

6.3. *Identification and Analysis of Mitigation Techniques*

The mitigation strategy in the updated Hazard Vulnerability Assessment and Mitigation Plan Update should include analysis of a comprehensive range of specific techniques or actions. FEMA, through the March 2013 Local Mitigation Handbook, and PEMA, through the October 2013 Standard Operating Guide (SOG), identify four categories of hazard mitigation techniques.

- **Local plans and regulations:** Government authorities, policies, or codes that influence the way land and buildings are developed and built. Examples include, but are not limited to: comprehensive plans, subdivision regulations, building codes and enforcement, and NFIP and CRS.
- **Structure and infrastructure**: Modifying existing structures and infrastructure or constructing new structures to reduce hazard vulnerability. Examples include, but are not limited to: acquisition and elevation of structures in flood prone areas, utility undergrounding, structural retrofits, floodwalls and retaining walls, detention and retention structures, and culverts.
- **Natural systems protection:** Actions that minimize damage and losses and also preserve or restore the functions of natural systems. Examples include, but are not limited to: sediment and erosion control, stream corridor restoration, forest management, conservation easements, and wetland restoration and preservation.
- **Education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate the hazards, and may also include participation in national programs. Examples include, but are not limited to: radio or television spots, websites with maps and information, provide information and training, NFIP outreach, StormReady, and Firewise Communities.

The HMPT reviewed the four types of mitigation techniques and examples of actions at the Risk Assessment and Mitigation Solutions Workshop. Table 6.3-1 provides a matrix identifying the mitigation techniques used for each hazard 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 the hazards in Union County.

HAZARD	MITIGATION TECHNIQUE			
	LOCAL PLANS AND REGULATIONS	EDUCATION AND AWARENESS PROGRAMS	NATURAL SYSTEMS PROTECTION	STRUCTURAL AND INFRASTRUCTURE PROJECTS
Drought	✓	✓		
Earthquake	✓	✓		
Environmental Hazards	✓	✓		✓
Flood, Flash Flood, Ice Jam	✓	✓	✓	✓
Hurricane, Tropical Storm, Nor'easter	✓	✓	✓	✓
Landslide	✓	✓		
Subsidence and Sinkhole	✓	✓		
Tornado and Windstorm	✓	✓		✓
Transportation Accidents	✓	✓		✓
Utility Interruption	✓	✓		✓
Wildfire	✓	✓		
Winter Storm	✓	✓		✓

6.4. *Mitigation Action Plan*

A kick-off meeting for the 2020 Union County Hazard Mitigation Plan Update was held on June 13, 2019 to develop a framework for the plan. The goals and objectives were presented during this meeting. During the Risk Assessment and Mitigation Solutions Workshop on August 28, 2019, Mitigation Techniques were discussed using FEMA's *Mitigation Ideas* document. During the workshop, municipalities were provided with their *Mitigation Action Progress Report Form* which listed their projects from the 2014 plan. As described in Section 6.1 above, the municipalities were asked to review whether each project was completed, canceled, deferred, or is ongoing. Completed or canceled actions were not carried over to the 2020 Action Plan. In addition, many of the actions proposed by the previous version of the mitigation plan are again proposed for implementation.

Copies of the *Mitigation Action Progress Report Form* for each municipality can be found in **Appendix C**. In addition, participants were given *Mitigation Action Forms* to provide any new actions or projects to be included in the plan update. Meeting participants who were not affiliated with a municipality were provided with *New Mitigation Action Forms* to include new mitigation actions in the 2020 plan if they so wished.

The HMPT reviewed the 2014 actions submitted by municipalities that did not turn in one of the above action/project forms and determined that the projects were still viable and should be continued into the 2019 Hazard Vulnerability Assessment and Mitigation Plan Update. Additionally, several new actions were developed by the HMPT based on the 2020 risk assessment and assigned to municipalities based on relevance.

The final list of 55 mitigation actions is contained in Table 6.4-1. This table provides an overview of the strategy that will be utilized in order to implement each of the 55 proposed mitigation actions. For each action listed in Table 6.4-1, the associated strategy identifies the agency or job title that will be responsible for initiating the work and potential sources of funding for the work. Each strategy also indicates when the action will happen.

These 55 actions were also prioritized for implementation, as shown in Table 6.4-2. This prioritization exercise involved a cost-benefit review and an evaluation of criteria such as effectiveness, efficiency, an action's ability to address multiple hazards and/or high-risk hazards, and potential impacts on critical infrastructure and/or communications infrastructure.

At least one mitigation action was established for each hazard in Union County. More than one action is identified for several hazards. Every participating jurisdiction has at least one mitigation action. Each mitigation action is intended to address one or more of the goals and objectives identified in Section 6.2. Actions 2, 3, 15, 18, 20, 23, 25, 26, 34, and 36 address continued compliance and improved participation in the NFIP. The priority level and feasibility of each action follows in separate tables.

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
ACTION NO: 1	**Continue efforts to acquire or elevate repetitive flood claim and severe repetitive loss properties in Union County.**
COMMUNITY: Union County	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Union County Emergency Management Agency
Implementation Schedule:	Annually
Funding Source:	HMGP, PDM, FMA
ACTION NO: 2	**Invite State NFIP Coordinator to schedule a Community Assistance Visit to ensure continued compliance with NFIP regulations.**
COMMUNITY: Union County	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Union County Emergency Management Agency
Implementation Schedule:	3 – 5 years
Funding Source:	County Annual Budget
ACTION NO: 3	**Sponsor a workshop about costs and benefits of purchasing and maintaining flood insurance for any interested community residents and business owners.**
COMMUNITY: Union County	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Union County Emergency Management Agency
Implementation Schedule:	3 – 5 years
Funding Source:	County Annual Budget
ACTION NO: 4	**Initiate meeting with providers of electric power to examine the cost and potential sources of funding for burying power lines.**
COMMUNITY: Union County	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Tornado and Windstorm; Hurricane, Tropical Storm, and Nor'easter; Winter Storm; Utility Interruption
Lead Agency/Department:	Union County Emergency Management Agency
Implementation Schedule:	1 – 2 years

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
Funding Source:	County Annual Budget
ACTION NO: 5	**Initiate a meeting of land developers and contractors to determine the cost of burying power and communications lines in new subdivisions.**
COMMUNITY: Union County	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Tornado and Windstorm; Hurricane, Tropical Storm, and Nor'easter; Winter Storm; Utility Interruption
Lead Agency/Department:	Union County Emergency Management Agency, Union County Planning Commission
Implementation Schedule:	1 – 2 years
Funding Source:	County Annual Budget
ACTION NO: 6	**Provide information to schools, prisons, and nursing homes about the Great California Shake-Out and encourage participation in this educational program about surviving the immediate effects of an earthquake.**
COMMUNITY: Union County	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Earthquake
Lead Agency/Department:	Union County Emergency Management Agency
Implementation Schedule:	Annually
Funding Source:	County Annual Budget
ACTION NO: 7	**Provide education for residents about water-saving landscaping techniques.**
COMMUNITY: Union County	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Drought
Lead Agency/Department:	Union County Emergency Management Agency
Implementation Schedule:	Annually
Funding Source:	County Annual Budget
ACTION NO: 8	**Turn one or more rooms in each school and public building into safe rooms providing safe, temporary shelter during a tornado, windstorm, hurricane, tropical storm, or nor'easter**
COMMUNITY: Union County	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Tornado and Windstorm; Hurricane, Tropical Storm, or Nor'easter

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
Lead Agency/Department:	Union County Emergency Management Agency in cooperation with Superintendents of Lewisburg Area, Mifflinburg Area, and Milton Area School Districts
Implementation Schedule:	1–2 years to begin; 3–5 years to complete
Funding Source:	PDM
ACTION NO: 9	**Provide workshops for farmers regarding livestock management and crop survival during times of drought.**
COMMUNITY: Union County	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Drought
Lead Agency/Department:	Union County Emergency Management Agency
Implementation Schedule:	Annually
Funding Source:	County Annual Budget
ACTION NO: 10	**Proceed with a project to improve storm water drainage in West Milton area of Kelly Township near U.S. Highway 15 and railroad tracks.**
COMMUNITY: Kelly Township	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Kelly Township and SEDA Council of Governments
Implementation Schedule:	2010 – 2013
Funding Source:	HMGP, PDM, FMA
ACTION NO: 11	**Continue to participate in meetings and discussions regarding redeveloping the abandoned railroad bridge as part of a rail trail in Lewisburg.**
COMMUNITY: Union County, Lewisburg Borough	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Union County and Lewisburg Borough (Lewisburg Area Recreation Authority) in cooperation with Northumberland County and Buffalo Valley Recreation Authority (current owners of the Bridge)
Implementation Schedule:	Within 5 years
Funding Source:	HMGP, PDM, FMA
ACTION NO: 12	**Provide information to residents and business owners to examine the interior of structures to identify objects that may fall in the event of an earthquake (e.g., tall file cabinets, water heaters). Include information about anchoring.**

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, West Buffalo Township, and White Deer Township	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Earthquake
Lead Agency/Department:	Union County Emergency Management Agency in conjunction with chiefs of municipal fire departments
Implementation Schedule:	1 – 2 years
Funding Source:	County Annual Budget
ACTION NO: 13	**Provide training for each County and municipal building inspector so that building code enforcement is consistent throughout the County.**
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam; Earthquake; Hurricane, Tropical Storm, and Nor'easter; Tornado and Windstorm; Wildfire; Winter Storm
Lead Agency/Department:	Union County Emergency Management Agency in conjunction with Township or Borough Building Inspectors and Central Keystone Council of Governments
Implementation Schedule:	Every 2 years
Funding Source:	County Annual Budget
ACTION NO: 14	**Develop a program to do non-structural retrofit for earthquake safety in each public building (e.g., anchor file cabinets, secure clocks on walls).**
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, West Buffalo Township, and White Deer Township	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Earthquake
Lead Agency/Department:	Union County Emergency Management Agency in conjunction with Township or Borough Building Inspectors
Implementation Schedule:	1 – 2 years
Funding Source:	County Annual Budget
ACTION NO: 15	**Examine feasibility of jurisdictions to participate in the Community Rating System.**
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Mifflinburg Borough, New Berlin Borough, West Buffalo Township, and White Deer Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
Lead Agency/Department:	Union County Emergency Management Agency in cooperation with Emergency Manager/Director of applicable jurisdictions
Implementation Schedule:	1 – 5 years
Funding Source:	County, Township, and Borough Annual Budgets
ACTION NO: 16	**Institute a program to inspect public buildings including storage facilities and lift station housing to identify structural defects that may lead to collapse due to heavy snow or ice.**
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, West Buffalo Township, and White Deer Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Winter Storm
Lead Agency/Department:	Union County Emergency Management Agency in cooperation with Emergency Manager/Director of applicable jurisdictions
Implementation Schedule:	1 – 2 years
Funding Source:	County, Township, and Borough Annual Budgets
ACTION NO: 17	**Include publicity about the benefits of mitigation actions in a public relations program.**
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	Union County Emergency Management Agency in cooperation with officials of each Borough and Township
Implementation Schedule:	Annually
Funding Source:	Annual County Budget
ACTION NO: 18	**Attend NFIP training workshops offered in Pennsylvania for local officials and encourage local officials to become Certified Floodplain Managers.**
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Township or Borough Zoning Officials
Implementation Schedule:	Every year
Funding Source:	County, Township, and Borough Annual Budgets

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
ACTION NO: 19	**Develop language for potential inclusion in subdivision regulations requiring new power and communications (telephone, cable television) lines to be buried.**
COMMUNITY: Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, New Berlin Borough, West Buffalo Township, and White Deer Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Tornado and Windstorm; Hurricane, Tropical Storm, and Nor'easter; Winter Storm; Utility Interruption
Lead Agency/Department:	Township or Borough Zoning Officials
Implementation Schedule:	3–5 years depending on outcome of meetings with developers and electric companies
Funding Source:	Township and Borough Annual Budgets
ACTION NO: 20	**Examine the benefit of increasing the current 1.5-foot freeboard requirement in local flood damage prevention ordinances so that structures are protected to a level greater than the established base flood elevation.**
COMMUNITY: Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Limestone Township, Mifflinburg Borough, New Berlin Borough, West Buffalo Township, and White Deer Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Township or Borough Zoning Officials
Implementation Schedule:	1 – 2 years
Funding Source:	Township and Borough Annual Budgets; PA Floodplain Land Use Assistance Program
ACTION NO: 21	**Examine the possibility of amending/developing local zoning ordinances to direct new development away from areas underlain with carbonate bedrock.**
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Limestone Township, Mifflinburg Borough, New Berlin Borough, West Buffalo Township, and White Deer Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Subsidence and Sinkhole
Lead Agency/Department:	Township or Borough Zoning Officials
Implementation Schedule:	3 – 5 years
Funding Source:	Township and Borough Annual Budgets
ACTION NO: 22	**Continue efforts to acquire, demolish, elevate, and floodproof structures in the Special Flood Hazard Area.**
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, West Buffalo Township, and White Deer Township	

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Union County Emergency Management Agency in cooperation with Emergency Manager/Director of applicable jurisdictions
Implementation Schedule:	Annually
Funding Source:	HMGP, PDM, FMA
ACTION NO: 23	**Work with township and borough officials to increase awareness among residents and business owners about NFIP insurance.**
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Union County Emergency Management Agency in cooperation with Emergency Manager/Director of applicable jurisdictions
Implementation Schedule:	Annually
Funding Source:	County Annual Budget
ACTION NO: 24	**Develop language for potential inclusion in zoning regulations allowing higher density cluster development to limit the location of future development in Special Flood Hazard Areas.**
COMMUNITY: Buffalo Township, East Buffalo Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, West Buffalo Township, and White Deer Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Township or Borough Zoning Officials
Implementation Schedule:	3 – 5 years
Funding Source:	Township and Borough Annual Budgets; PA Floodplain Land Use Assistance Program
ACTION NO: 25	**Develop language for potential inclusion in flood damage prevention ordinances extending elevation and flood-proofing requirements to structures in the area just beyond the Special Flood Hazard Area that has been shown by FEMA to have a 0.2-percent chance of flooding in any given year.**
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, West Buffalo Township, and White Deer Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
Lead Agency/Department:	Township or Borough Zoning Officials
Implementation Schedule:	3 – 5 years
Funding Source:	Township and Borough Annual Budgets; PA Floodplain Land Use Assistance Program
ACTION NO: 26	**Conduct systematic examination of structures in Special Flood Hazard Area to identify potential violations such as unvented enclosures below base flood elevation.**
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Township or Borough Zoning Officials
Implementation Schedule:	1 – 2 years
Funding Source:	County, Township, and Borough Annual Budgets
ACTION NO: 27	**Obtain first floor elevations for all structures in identified Special Flood Hazard Areas (including "pre-FIRM" structure built before flood insurance rates maps were developed for the County).**
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Township or Borough Zoning Officials
Implementation Schedule:	1 – 5 years
Funding Source:	County, Township, and Borough Annual Budgets
ACTION NO: 28	**Review paper/electronic files relating to development in Special Flood Hazard Areas to ensure that elevation certificates have been saved.**
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, West Buffalo Township, and White Deer Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Township or Borough Zoning Officials
Implementation Schedule:	1 – 2 years
Funding Source:	County, Township, and Borough Annual Budgets

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
ACTION NO: 29	**Continue to discuss flood mitigation options with property owners.**
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Emergency Manager/Director of applicable jurisdictions
Implementation Schedule:	Annually
Funding Source:	Township and Borough Annual Budgets
ACTION NO: 30	**Maintain regular contact with Pennsylvania Department of Conservation and Natural Resources to ensure that County information about the potential for landslides is current.**
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, West Buffalo Township, and White Deer Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Landslide
Lead Agency/Department:	Union County Emergency Management Agency and Township or Borough Building Inspectors
Implementation Schedule:	Annually
Funding Source:	County Annual Budget
ACTION NO: 31	**Develop language for potential inclusion in subdivision regulations requiring grading permits to minimize the potential for landslides**.
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, West Buffalo Township, and White Deer Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Landslide
Lead Agency/Department:	Township or Borough Zoning Officials
Implementation Schedule:	3 – 5 years
Funding Source:	Township and Borough Annual Budgets
ACTION NO: 32	**Educate citizens and business owners about removing flammable vegetation or combustible materials from the immediate vicinity of buildings in wooded areas.**
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Hartleton Borough, Hartley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
Category:	Education and Awareness Program
Hazard(s) Addressed:	Wildfire
Lead Agency/Department:	Union County Emergency Management Agency in conjunction with chiefs of each municipal fire department
Implementation Schedule:	1 – 2 years
Funding Source:	DHS Fire Prevention and Safety Grant Program
ACTION NO: 33	**Clear debris and trees from streams.**
COMMUNITY: Gregg Township	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam; Hurricane, Tropical Storm, and Nor'easter
Lead Agency/Department:	Gregg Township Public Works Department
Implementation Schedule:	Annually
Funding Source:	Township Annual Budgets
ACTION NO: 34	**Increase CRS level.**
COMMUNITY: Lewisburg Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Lewisburg Borough Emergency Management Coordinator
Implementation Schedule:	Within 5 years
Funding Source:	Borough Annual Budgets
ACTION NO: 35	**Increase green storm water infrastructure solutions in the Borough to accommodate storm water filtration.**
COMMUNITY: Lewisburg Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Lewisburg Borough in cooperation with property owners
Implementation Schedule:	2-3 years
Funding Source:	Borough Annual Budgets; HMGP, PDM, FMA
ACTION NO: 36	**Improve NFIP reporting to residents and businesses.**
COMMUNITY: Lewisburg Borough	

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Lewisburg Borough Emergency Management Coordinator
Implementation Schedule:	1-2 years
Funding Source:	Borough Annual Budgets
ACTION NO: 37	**Update the Emergency Operations Plan for Lewisburg Borough.**
COMMUNITY: Lewisburg Borough	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	Lewisburg Borough Emergency Management Coordinator
Implementation Schedule:	1-2 years
Funding Source:	Borough Annual Budgets
ACTION NO: 38	**Install rip rap culvert improvements to mitigate flooding along Tan Run.**
COMMUNITY: Union County, New Berlin Borough	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	New Berlin Borough Emergency Management Coordinator, Borough Public Works Department, and Union County Emergency Management Agency
Implementation Schedule:	2-3 years
Funding Source:	Borough Annual Budgets; HMGP, PDM, FMA
ACTION NO: 39	**Replace culvert under River Road to mitigate flooding.**
COMMUNITY: Union County, East Buffalo Township	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	East Buffalo Township Emergency Management Coordinator, Township Public Works Department, and Union County Emergency Management Agency
Implementation Schedule:	2-3 years
Funding Source:	Township Annual Budgets; HMGP, PDM, FMA
ACTION NO: 40	**Educate the public and stakeholders about hazardous materials sites and releases.**

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Harleton Borough, Harley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Environmental Hazards
Lead Agency/Department:	Union County Emergency Management Agency in conjunction with Township officials
Implementation Schedule:	Annually
Funding Source:	County and Township Annual Budgets
ACTION NO: 41	**Identify hazardous materials sites, including TRI facilities and oil and gas wells, that are in or near flood zones and develop strategies to reduce potential damage.**
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Harleton Borough, Harley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Environmental Hazards; Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Union County Emergency Management Agency in cooperation with Zoning and Building Officials of each Borough and Township
Implementation Schedule:	2-3 years
Funding Source:	County, Township, and Borough Annual Budgets
ACTION NO: 42	**Improve coordination with local municipalities to reduce risk from hazardous material incidents and conduct trainings to prepare for hazardous materials incidents.**
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Harleton Borough, Harley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Environmental Hazards
Lead Agency/Department:	Union County Emergency Management Agency in cooperation with Emergency Manager/Director of each jurisdiction
Implementation Schedule:	Annually
Funding Source:	County Annual Budget, PEMA
ACTION NO: 43	**Plan for and maintain adequate road and debris clearing capabilities.**

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Harleton Borough, Harley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Local Plans and Regulations
Hazard(s) Addressed:	Transportation Accidents
Lead Agency/Department:	Township or Borough Public Works Departments
Implementation Schedule:	Annually
Funding Source:	Township and Borough Annual Budgets
ACTION NO: 44	**Identify and implement traffic safety improvements at high-crash intersections and roadway segments.**
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Harleton Borough, Harley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Transportation Accidents
Lead Agency/Department	Township or Borough Public Works Departments
Implementation Schedule:	Annually
Funding Source:	Township and Borough Annual Budgets, PennDOT, COGs
ACTION NO: 45	**Install uninterruptible power supplies on critical electronic equipment in County facilities to prevent outages during extreme weather events.**
COMMUNITY: Union County	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Utility Interruption
Lead Agency/Department:	Union County Emergency Management Agency
Implementation Schedule:	2-3 years
Funding Source:	County Annual Budget; HMGP, PDM, FMA
ACTION NO: 46	**Provide training to the County and local government damage assessment personnel and train Local Fire Response personnel to have the ability to assist in damage assessment in coordination with Union County Emergency Management Agency.**
COMMUNITY: Union County	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam; Tornado and Windstorm; Hurricane, Tropical Storm, and Nor'easter; Winter Storm; Wildfire

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
Lead Agency/Department:	Union County Emergency Management Agency
Implementation Schedule:	1-2 years
Funding Source:	County Annual Budget
ACTION NO: 47	**Organize a meeting with nursing home facilities to discuss the benefits and need for generators.**
COMMUNITY: Union County	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Union County Emergency Management Agency
Implementation Schedule:	1-2 years
Funding Source:	County Annual Budget
ACTION NO: 48	**Continue to work with PennDOT and emergency managers in neighboring jurisdictions throughout construction of the CSVT project to ensure safety improvements are implemented on the new bridge in the Township.**
COMMUNITY: Union Township	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Tornado and Windstorm; Transportation Accidents
Lead Agency/Department:	Union Township Department of Public Works
Implementation Schedule:	3-5 years
Funding Source:	Township Annual Budget
ACTION NO: 49	**Identify opportunities to upgrade or bury power lines during new development or redevelopment.**
COMMUNITY: Union County, Buffalo Township, East Buffalo Township, Gregg Township, Harleton Borough, Harley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Tornado and Windstorm; Hurricane, Tropical Storm, and Nor'easter; Winter Storm; Utility Interruption
Lead Agency/Department:	Union County Emergency Management Agency in cooperation with Township or Borough Zoning and/or Building Officials
Implementation Schedule:	1-3 years
Funding Source:	County, Township, and Borough Annual Budgets

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
ACTION NO: 50	**Conduct targeted outreach to historic property owners about mitigation techniques and recovery.**
COMMUNITY: Buffalo Township, East Buffalo Township, Gregg Township, Harleton Borough, Harley Township, Kelly Township, Lewis Township, Lewisburg Borough, Limestone Township, Mifflinburg Borough, New Berlin Borough, Union Township, West Buffalo Township, and White Deer Township	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Township or Borough Zoning and/or Building Officials
Implementation Schedule:	1-2 years
Funding Source:	Township and Borough Annual Budgets
ACTION NO: 51	**Work to educate the public about the newly implemented tornado early warning system.**
COMMUNITY: Mifflinburg Borough	
Category:	Education and Awareness Programs
Hazard(s) Addressed:	Tornado and Windstorm
Lead Agency/Department:	Mifflinburg Borough Public Safety
Implementation Schedule:	1-2 years
Funding Source:	Borough Annual Budgets
ACTION NO: 52	**Implement a tornado early warning system and work to educate the public about the system.**
COMMUNITY: New Berlin Borough	
Category:	Structure and Infrastructure Projects
Hazard(s) Addressed:	Tornado and Windstorm
Lead Agency/Department:	New Berlin Borough Emergency Services
Implementation Schedule:	3-5 years
Funding Source:	Township Annual Budgets
ACTION NO: 53	**Continue to develop hazardous materials facility plans for fixed site facilities.**
COMMUNITY: Union County	
Category:	Plans and Regulations
Hazard(s) Addressed:	Environmental Hazards
Lead Agency/Department:	Union County Emergency Management Agency

Table 6.4-1	List of 2020 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.
Implementation Schedule:	Annually
Funding Source:	Facility owners
ACTION NO: 54	**Join the StormReady Program.**
COMMUNITY: Mifflinburg Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	Hurricane, Tropical Storm, Nor'easter; Tornado and Windstorm; Winter Storm; Utility Interruption
Lead Agency/Department:	Mifflinburg Borough Public Safety
Implementation Schedule:	2-3 years
Funding Source:	Borough Annual Budgets
ACTION NO: 55	**Implement stormwater improvements at 5th Street Park**
COMMUNITY: Mifflinburg Borough	
Category:	Structure and Infrastructure Projects, Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam; Tornado and Windstorm; Hurricane, Tropical Storm, and Nor'easter; Winter Storm
Lead Agency/Department:	Mifflinburg Borough Public Safety
Implementation Schedule:	2 years
Funding Source:	Borough Annual Budgets

Table 6.4-1 lists 55 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 2020 plan believe that each of these actions is attainable and can pragmatically be advanced over the next five-year cycle.

While all of these activities will be pursued over the next five years, the reality of limited time and resources requires the identification of the feasibility and priority level of mitigation actions. As a result, the HMPT conducted a prioritization exercise and cost-benefit review of these actions to assist with implementation. Prioritization allows the individuals and organizations involved to focus their energies and ensure progress on mitigation activities.

Evaluating mitigation actions involves judging each action against certain criteria to determine its feasibility and potential impact. Actions evaluated and prioritized by applying the Multi-Objective Mitigation Action Prioritization criteria. For each action, scores were assigned to each criterion using the following weighted, multi-objective mitigation action prioritization criteria.

- **Effectiveness** (weight: 20% of score): The extent to which an action reduces the vulnerability of people and property.
- **Efficiency** (weight: 30% of score): The extent to which time, effort, and cost is well used as a means of reducing vulnerability.
- **Multi-Hazard Mitigation** (weight: 20% of score): The action reduces vulnerability for more than one hazard.
- **Addresses High Risk Hazard** (weight: 15% of score): The action reduces vulnerability for people and property from a hazard(s) identified as high risk.
- **Addresses Critical Communications/Critical Infrastructure** (weight: 15% of score): The action pertains to the maintenance of critical functions and structures such as transportation, supply chain management, data circuits, etc.

Scores of 1, 2, or 3 were assigned for each multi-objective mitigation action prioritization criterion where 1 is a low score and 3 is a high score. Actions were prioritized using the cumulative score assigned to each. Each mitigation action was then given a priority ranking (Low, Medium, and High) based on the following:

- Low Priority: 1.0 – 1.8
- Medium Priority: 1.9 – 2.4
- High Priority: 2.5 – 3.0

Table 6.4-2 presents the cumulative results of the prioritization of mitigation actions. All but seven actions were ranked High or Medium Priority.

Table 6.4-2 Mitigation Action Prioritization.

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
1	Continue efforts to acquire or elevate repetitive flood and severe repetitive loss properties in Union County.	3	2	1.5	3	2	2.25
2	Invite State NFIP Coordinator to schedule a Community Assistance Visit to ensure continued compliance with NFIP regulations.	2	2.5	1.5	3	1.5	2.125
3	Sponsor a workshop about costs and benefits of purchasing and maintaining flood insurance for any interested community residents and business owners.	1.8	2.5	1.5	3	1.5	2.085
4	Initiate meeting with providers of electric power to examine the cost and potential sources of funding for burying power lines.	2.2	2.2	3	2	3	2.45
5	Initiate a meeting of land developers and contractors to determine the cost of burying power and communications lines in new subdivisions.	2.2	2.2	3	2	3	2.45
6	Provide information to schools, prisons, and nursing homes about the Great California Shake-Out and encourage participation in this educational program about surviving the immediate effects of an earthquake.	1.2	2	1.5	1	2.5	1.665
7	Provide education for residents about water-saving landscaping techniques.	1.2	2	1.5	1	2.5	1.665
8	Turn one or more rooms in each school and public building into safe rooms providing safe, temporary shelter during a tornado,. windstorm, hurricane, tropical storm, or nor'easter.	2.1	1.8	3	2	2	2.16
9	Provide workshops for farmers regarding livestock management and crop survival during times of drought.	1.8	2.5	1.5	1	3	2.01
10	Proceed with a project to improve storm water drainage in West Milton area of Kelly Township near U.S. Highway 15 and railroad tracks.	2	2.2	1.5	3	3	2.26

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
11	Continue to participate in meetings and discussions regarding redeveloping the abandoned railroad bridge as part of a rail trail in Lewisburg.	1.5	2	2.5	3	2	2.15
12	Provide information to residents and business owners to examine the interior of structures to identify objects that may fall in the event of an earthquake (e.g., tall file cabinets, water heaters). Include information about anchoring.	1.2	2.2	2.5	1	2	1.85
13	Provide training for each County and municipal building inspector so that building code enforcement is consistent throughout the County.	2	2.5	3	3	2	2.5
14	Develop a program to do non-structural retrofit for earthquake safety in each public building (e.g., anchor file cabinets, secure clocks on walls).	2.3	1.8	2.5	1	2	1.95
15	Examine feasibility of jurisdictions to participate in the Community Rating System.	2.4	2.7	1.5	3	1.5	2.265
16	Institute a program to inspect public buildings including storage facilities and lift station housing to identify structural defects that may lead to collapse due to heavy snow or ice.	2.5	2.5	3	3	2.5	2.675
17	Include publicity about the benefits of mitigation actions in a public relations program.	1.9	2.8	3	3	1.5	2.495
18	Attend NFIP training workshops offered in Pennsylvania for local officials and encourage local officials to become Certified Floodplain Managers.	2	2.8	1.5	3	1.5	2.215
19	Develop language for potential inclusion in subdivision regulations requiring new power and communications (telephone, cable television) lines to be buried.	2.2	2.8	3	3	3	2.78

Table 6.4-2 Mitigation Action Prioritization.

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
20	Examine the benefit of increasing the current 1.5-foot freeboard requirement in local flood damage prevention ordinances so that structures are protected to a level greater than the established base flood elevation.	3	2.8	1.5	3	2	2.49
21	Examine the possibility of amending/developing local zoning ordinances to direct new development away from areas underlain with carbonate bedrock.	2.4	2.8	2.5	1	2	2.27
22	Continue efforts to acquire, demolish, elevate, and floodproof structures in the Special Flood Hazard Area.	2.5	1.8	1.5	3	2	2.09
23	Work with Township and Borough officials to increase awareness among residents and business owners about NFIP insurance.	1.8	2.5	1.5	3	1.5	2.085
24	Develop language for potential inclusion in zoning regulations allowing higher density cluster development to limit the location of future development in Special Flood Hazard Areas.	2.7	2.8	2.5	3	2	2.63
25	Develop language for potential inclusion in flood damage prevention ordinances extending elevation and flood-proofing requirements to structures in the area just beyond the Special Flood Hazard Area that has been shown by FEMA to have a 0.2-percent chance of flooding in any given year.	2.8	2.8	1.5	3	2	2.45
26	Conduct systematic examination of structures in Special Flood Hazard Area to identify potential violations such as unvented enclosures below base flood elevation.	2.4	2.5	1.5	3	2	2.28
27	Obtain first floor elevations for all structures in identified Special Flood Hazard Areas (including “pre-FIRM” structure built before flood insurance rates maps were developed for the County).	2	2	1.5	3	2	2.05

Table 6.4-2 Mitigation Action Prioritization.

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
28	Review paper/electronic files relating to development in Special Flood Hazard Areas to ensure that elevation certificates have been saved.	2	2	1.5	3	2	2.05
29	Continue to discuss flood mitigation options with property owners.	2.4	2.8	1.5	3	2	2.37
30	Maintain regular contact with Pennsylvania Department of Conservation and Natural Resources to ensure that County information about the potential for landslides is current.	1.5	2.2	1.5	1	2.5	1.785
31	Develop language for potential inclusion in subdivision regulations requiring grading permits to minimize the potential for landslides.	2.3	2.6	2.5	1	2.5	2.265
32	Educate citizens and business owners about removing flammable vegetation or combustible materials from the immediate vicinity of buildings in wooded areas.	2.7	2.7	2.5	1	2.8	2.42
33	Clear debris and trees from streams.	2	2.8	2.5	3	2.8	2.61
34	Increase CRS level.	2.5	2.8	1.5	3	2	2.39
35	Increase green storm water infrastructure solutions in the Borough to accommodate storm water filtration.	2	1.8	2.5	3	1.5	2.115
36	Improve NFIP reporting to residents and businesses.	2	2.6	1.5	3	1.5	2.155
37	Update the Emergency Operations Plan for Lewisburg Borough.	3	2	3	3	2.5	2.625
38	Install rip rap culvert improvements to mitigate flooding along Tag Run.	2.5	2	2.5	3	2	2.35
39	Replace culvert under River Road to mitigate flooding.	2.5	2	2.5	3	2	2.35
40	Educate the public and stakeholders about hazardous materials sites and releases.	2	2	1.5	2	1	1.750

Table 6.4-2 Mitigation Action Prioritization.

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
41	Identify hazardous materials sites that are in or near flood zones and develop strategies to reduce potential damage.	2	2	2	3	1.8	2.120
42	Improve coordination with local municipalities to reduce risk from hazardous material incidents and conduct trainings to prepare for hazardous materials incidents.	2	2	1.5	2	1.5	1.825
43	Plan for and maintain adequate road and debris clearing capabilities.	2	2.5	3	2.5	2	2.425
44	Identify and implement traffic safety improvements at high-crash intersections and roadway segments.	2.5	2	1.5	2	2.5	2.075
45	Install uninterruptible power supplies on critical electronic equipment in County facilities to prevent outages during extreme weather events.	3	2.5	3	3	2.5	2.775
46	Provide training to the County and local government staff on conducting preliminary damage assessments.	1.5	2	3	3	1.5	2.175
47	Organize a meeting with nursing home facilities to discuss the benefits and need for generators.	2	2	3	3	2.5	2.425
48	Continue to work with PennDOT and emergency managers in neighboring jurisdictions throughout construction of the CSVT project to ensure safety improvements are implemented on the new bridge in the Township.	1.5	2	2	2	2.5	1.975
49	Identify opportunities to upgrade or bury power lines during new development or redevelopment.	2.5	2	3	3	3	2.600
50	Conduct targeted outreach to historic property owners about mitigation techniques and recovery.	2	2	2	3	2	2.150
51	Work to educate the public about the newly implemented tornado early warning system.	2.5	2.5	1	2	2.5	2.125
52	Implement a tornado early warning system and work to educate the public about the system.	2.5	2	1	2	2.5	1.975

Table 6.4-2 Mitigation Action Prioritization.							
MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	Total Score
53	Continue to develop hazardous materials facility plans for fixed site facilities.	2	2	1	2	2	1.800
54	Join the StormReady Program.	2	2	3	3	2.5	2.425
55	Implement stormwater improvements at 5th Street Park.	2.5	2	2.5	3	2	2.35

7. Plan Maintenance

7.1. Update Process Summary

Monitoring, evaluating, and updating this plan are critical to maintaining its value and success in Union 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.

Union County Emergency Management Agency carries out continued efforts with all municipalities in the County to be aware of the progress on mitigation actions in the plan and opportunities for new mitigation actions. Outreach is conducted semi-annually via phone or email.

The HMPT reviewed the 2014 plan maintenance section and a few minor updates were made. The majority of this section is consistent with the plan maintenance section in the 2014 plan.

7.2. Monitoring, Evaluating and Updating the Plan

As part of the HMPT, the Union County Emergency Management Agency will monitor the progress made on the implementation of the identified action items annually at about the anniversary date of plan adoption. Monitoring will be accomplished by calling or emailing each county or municipal agency that, through adoption of the plan, has assumed the responsibility of implementing one or more mitigation actions.

By monitoring mitigation actions, when the plan is next updated, information about the status of proposed mitigation actions will be readily available. The updated plan will include a section explaining if previously proposed mitigation actions have been implemented, completed, or deferred. The updated plan will identify actions that are no longer appropriate for the community and should be deleted. The updated plan will identify obstacles to implementation that caused proposed actions to be deferred and will recommend strategies for overcoming those obstacles.

The HMPT will not only monitor the implementation of mitigation actions proposed in this plan, but will also monitor actions of participating jurisdictions and surrounding communities that may affect the ability of Union County to withstand the effects of natural hazards or to recover from a disaster in the future. The method for gathering information about actions beyond those proposed in this plan will be informal; as active members of the Union County community, HMPT members will bring their own knowledge of the area to monitoring meetings to provide information about actions of participating jurisdictions as well as of nearby communities.

One month after conducting the annual monitoring of mitigation actions, the Union County Emergency Management Agency will schedule an annual meeting of the HMPT to evaluate the mitigation planning process, implementation of the plan, and conditions in Union County that suggest the need to modify either planning data or planning actions. Participating boroughs and townships will be invited to attend

the evaluation meetings. The evaluation meeting will include a presentation of the results of the monitoring of mitigation actions and will answer the following questions:

- Do mitigation goals and objectives reflect current community concerns as well as the finding of the risk assessment?
- Have conditions in the County changed so that findings of the risk assessment should be updated?
- What hazards have caused damage in the County since the plan was written? Were these anticipated and evaluated in the plan, or should these hazards be added to the plan?
- Have conditions in the County changed so that the magnitude of risk as expressed in this plan has changed?
- Are new sources of data available that will improve the risk assessment?
- Are current resources sufficient for implementing mitigation actions?
- For each mitigation action that has not been completed, what are the obstacles to implementation? What are potential solutions for overcoming these obstacles?
- Is each completed mitigation action effective in reducing risk? What action is required to further reduce the risk addressed by the completed action?
- What mitigation actions should be added to the plan and proposed for implementation?
- Should any proposed mitigation actions be deleted from the plan? What is the rationale for deleting previously proposed actions from the plan?
- Based upon the evaluation, should the plan be updated as soon as possible or should the plan be updated as scheduled five years after it was adopted?

Union County Emergency Management Agency will document the results of the annual evaluation meeting and submit the findings to each borough and township for review within two weeks. Documentation of the annual evaluation meeting will be attached to the Union County paper and electronic copies of this plan within one month. If the HMPT determines that the plan should be updated as soon as possible, the Union County Emergency Management Agency will take action to initiate the plan update.

This plan must be updated within five years and again adopted by the County and participating jurisdictions in order to maintain compliance with the regulations stated in 44 CFR Part 201.6 and ensure eligibility for applying for and receiving certain Federal mitigation grant funds.

Monitoring and evaluation will identify necessary modifications to the plan including changes in mitigation strategies and actions that should be incorporated in the next update. The update will also have more current information about previous occurrences of hazards.

Union County Emergency Management Agency will initiate the process of updating the plan no more than three years after the plan was adopted or immediately upon a determination by the HMPT that the plan should be updated sooner. This will allow approximately one year for securing funding and/or staff for updating the plan and one year for conducting research and writing the updated plan.

7.3. *Continued Public Involvement*

The Union County Emergency Management Agency will provide printed copies of the plan to key Union County offices including the largest public library in the County so that the public has access to printed copies of the plan. A copy of the adopted plan will be posted on the County website for five years so that the public has electronic access to the plan. The website will include an easy-to-access feedback option so that residents, business owners, and others who read the plan will be able to provide a comment about the plan or about the mitigation strategies. Union County Emergency Management Agency will maintain these comments and will provide them to the HMPT for consideration at the annual plan evaluation meetings.

Union County Emergency Management Agency will post notices of annual mitigation plan evaluation meetings using the usual methods for posting meeting announcements in the County to invite the public to participate. In addition to posting announcements on the County website, at least one newspaper press release will be published at the onset of the process of updating the plan inviting public participation.

Union County Emergency Management Agency will document the number of people who participate in the annual meetings and the results of the meeting for inclusion in the plan when it is next updated. In this way, the public will have an opportunity to become involved in the planning process and to influence mitigation planning decisions.

In order to better involve the public in this plan update, Union County extended an invitation to all school districts and to Bucknell University. This practice will be carried out in future plan updates.

Union County Emergency Management Agency will provide a written report and/or make a presentation to the Union County Commissioners to advise them of the status of the plan and of proposed mitigation actions. In this way, the public will have another opportunity to become aware of local mitigation efforts.

8. Plan Adoption

The Plan was submitted to the Pennsylvania State Hazard Mitigation Officer and forwarded to FEMA for final review and approval-pending-adoption on *January 2, 2020*. FEMA granted approval-pending-adoption on *March 19, 2020*. Full approval from FEMA was received after each jurisdiction adopted the plan.

This section of the plan includes copies of the local adoption resolutions passed by Union County and its municipal governments as well as a completed Local Mitigation Plan Review Crosswalk. Adoption resolution templates are provided to assist the County and municipal governments with recommended language for future adoption of the plan.

Union County 2020 Mitigation Plan Update

County Adoption Resolution

Resolution No. _____

Union County, Pennsylvania

WHEREAS, the municipalities of Union County, Pennsylvania are most vulnerable to natural 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, Union 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 Union County 2020 Hazard Mitigation Plan Update has been developed by the Union County Emergency Management Agency in cooperation with other county departments, local municipal officials, and the citizens of Union County, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Union County 2020 Hazard Mitigation Plan Update, and

WHEREAS, the Union County 2020 Hazard Mitigation Plan Update recommends mitigation activities that will reduce losses to life and property affected by natural hazards that face the County and its municipal governments,

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

- The Union County 2020 Hazard Mitigation Plan Update 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 Union County 2020 Hazard Mitigation Plan Update are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2020

ATTEST:

_____

UNION COUNTY COMMISSIONERS

By _____

By _____

By _____

Union County 2020 Hazard Mitigation Plan Update

Municipal Adoption Resolution

Resolution No. _____

<Borough/Township of Municipality Name>, Union County, Pennsylvania

WHEREAS, the *<Borough/Township of Municipality Name>*, Union County, Pennsylvania is most vulnerable to natural 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 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and

WHEREAS, the Union County 2020 Hazard Mitigation Plan Update has been developed by the Union County Emergency Management Agency 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 2000 was conducted to develop the Union County 2020 Hazard Mitigation Plan Update, and

WHEREAS, the Union County 2020 Hazard Mitigation Plan Update recommends mitigation activities that will reduce losses to life and property affected by natural 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 Union County 2020 Hazard Mitigation Plan Update 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 Union County 2020 Hazard Mitigation Plan Update are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2020

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

_____ By _____

By _____

By _____

9. Appendices

Appendix A – Bibliography
Appendix B – Local Mitigation Plan Review Crosswalk
Appendix C – Meeting and Other Participation Documentation
Appendix D – Local Municipality Flood Vulnerability Maps
Appendix E – Critical Facilities
Appendix F – Hazus Reports
Appendix G – Preliminary Damage Assessment Resources

Appendix A Bibliography

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Appendix B Local Mitigation Plan Review Tool

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LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: Union County	**Title of Plan:** Union County Hazard Mitigation Plan Update 2020	**Date of Plan:**
Local Point of Contact:		**Address:**
Title:		
Agency:		
Phone Number:		**E-Mail:**

State Reviewer: Ernie Szabo	**Title:** State Planner	**Date:**

FEMA Reviewer: Matt McCullough	**Title:** Community Planner	**Date:**
Date Received in FEMA Region ***(insert #)***		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

SECTION 1:
REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan** (section and/or page number)	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Pg. 20-25	X	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Appendix C-emailed invitation	X	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Pg. 24-25 & Appendix C	X	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Pg. 15-16 & Appendix A	X	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Pg. 201	X	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Pg. 199-201	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan (section and/or page number)**	**Met**	**Not Met**
ELEMENT A: REQUIRED REVISIONS **A3.) Question:** Were there any public comments received via the website? No public comments were received via the website. Section 3.3, Page 24 has been updated to note this. A6.) **Kudos:** Comprehensive listing of evaluation criteria.			
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Section 4.3 Appendix D	X	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Section 4.3	X	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Section 4.3 & 4.4 Appendix D, E, F	X	
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Pg. 54-62	X	
ELEMENT B: REQUIRED REVISIONS B3.) **Discussion:** How was mapping information provided in Appendix D, HAZUS results Appendix E and Critical Facilities risk matrix in Appendix F, used to engage participating communities and stakeholders in the development of the risk assessment?			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Pg. 141-154	X	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Pg. 145-147 Appendix C		X
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Pg. 169-171	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Pg. 170-191	X	
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Pg. 157-158, 192		X
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Pg. 152-154	X	

ELEMENT C: REQUIRED REVISIONS

C2.) **Required Revision:**
Pg. 414-419: Appendix C has only two NFIP Survey responses from Buffalo Twp and East Buffalo Twp. Please include all other responses from participating communities.
The NFIP section of the Capability Assessment (Section 5.2.1.2, Page 144-147) contains detailed information about how communities implement the NFIP and administer local floodplain ordinances. Early in the planning process, we asked communities to complete NFIP surveys and review information from the 2014 HMP Update to verify whether it was still accurate. We received two updated NFIP Surveys and gathered additional information about NFIP administration at meetings, including regarding the role of Central Keystone Council of Governments (CKCOG) in providing technical assistance, overseeing building code enforcement throughout the county, and serving as Zoning Administrator for several communities.

To address this required revision, we revised Section 5.2.1.2, Page 146-147 to clarify that we requested communities verify existing information in the 2014 HMP, include additional details about NFIP implementation for several communities, and add a description of CKCOG's role in administering the NFIP.

C4.) **Recommended Revision/Discussion:**
Pg. 181- Union Township is not listed under the Action No. 22. Is this omission an oversight or do they not want to be included in this action type? This may affect grant eligibility going forward. Other actions also don't have consensus participation for those with applicable flood risk. Ie….Action 20, 24
We followed up with Union Township Supervisor to communicate the benefit of keeping these actions in the HMP. He confirmed this omission was not an oversight and indicated that Union Township's Council mutually agreed to remove this action as most homes in the flood zone are seasonal. As a result, we kept plan as is.

C5.) **Required Revision:**
Pg. 157- Please include language that state a "cost-benefit review" will be part of the prioritization.
We added language stating that the mitigation action prioritization process included a cost-benefit review on pages 157, 173, and 189.

ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Pg. 9-14, 135-136	X	

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Pg. 158-169	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Pg. 129-131, 154-157, 192-198	X	
ELEMENT D: REQUIRED REVISIONS **Recommended Revision:** For the next plan update, research could be performed using hazard maps overlaid on land use mapping to analyze future risk, as it relates to the current population and housing trends.			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	N/A		
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	N/A		
ELEMENT E: REQUIRED REVISIONS			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			
ELEMENT F: REQUIRED REVISIONS			

SECTION 2:
PLAN ASSESSMENT

INSTRUCTIONS: The purpose of the Plan Assessment is to offer the local community more comprehensive feedback to the community on the quality and utility of the plan in a narrative format. The audience for the Plan Assessment is not only the plan developer/local community planner, but also elected officials, local departments and agencies, and others involved in implementing the Local Mitigation Plan. The Plan Assessment must be completed by FEMA. The Assessment is an opportunity for FEMA to provide feedback and information to the community on: 1) suggested improvements to the Plan; 2) specific sections in the Plan where the community has gone above and beyond minimum requirements; 3) recommendations for plan implementation; and 4) ongoing partnership(s) and information on other FEMA programs, specifically RiskMAP and Hazard Mitigation Assistance programs. The Plan Assessment is divided into two sections:

1. Plan Strengths and Opportunities for Improvement
2. Resources for Implementing Your Approved Plan

Plan Strengths and Opportunities for Improvement is organized according to the plan Elements listed in the Regulation Checklist. Each Element includes a series of italicized bulleted items that are suggested topics for consideration while evaluating plans, but it is not intended to be a comprehensive list. FEMA Mitigation Planners are not required to answer each bullet item, and should use them as a guide to paraphrase their own written assessment (2-3 sentences) of each Element.

The Plan Assessment must not reiterate the required revisions from the Regulation Checklist or be regulatory in nature, and should be open-ended and to provide the community with suggestions for improvements or recommended revisions. The recommended revisions are suggestions for improvement and are not required to be made for the Plan to meet Federal regulatory requirements. The italicized text should be deleted once FEMA has added comments regarding strengths of the plan and potential improvements for future plan revisions. It is recommended that the Plan Assessment be a short synopsis of the overall strengths and weaknesses of the Plan (no longer than two pages), rather than a complete recap section by section.

Resources for Implementing Your Approved Plan provides a place for FEMA to offer information, data sources and general suggestions on the overall plan implementation and maintenance process. Information on other possible sources of assistance including, but not limited to, existing publications, grant funding or training opportunities, can be provided. States may add state and local resources, if available.

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

How does the Plan go above and beyond minimum requirements to document the planning process with respect to:

- *Involvement of stakeholders (elected officials/decision makers, plan implementers, business owners, academic institutions, utility companies, water/sanitation districts, etc.);*
- *Involvement of Planning, Emergency Management, Public Works Departments or other planning agencies (i.e., regional planning councils);*
- *Diverse methods of participation (meetings, surveys, online, etc.); and*
- *Reflective of an open and inclusive public involvement process.*

Element B: Hazard Identification and Risk Assessment

In addition to the requirements listed in the Regulation Checklist, 44 CFR 201.6 Local Mitigation Plans identifies additional elements that should be included as part of a plan's risk assessment. The plan should describe vulnerability in terms of:

1) *A general description of land uses and future development trends within the community so that mitigation options can be considered in future land use decisions;*
2) *The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; and*
3) *A description of potential dollar losses to vulnerable structures, and a description of the methodology used to prepare the estimate.*

How does the Plan go above and beyond minimum requirements to document the Hazard Identification and Risk Assessment with respect to:

- *Use of best available data (flood maps, HAZUS, flood studies) to describe significant hazards;*
- *Communication of risk on people, property, and infrastructure to the public (through tables, charts, maps, photos, etc.);*
- *Incorporation of techniques and methodologies to estimate dollar losses to vulnerable structures;*
- *Incorporation of Risk MAP products (i.e., depth grids, Flood Risk Report, Changes Since Last FIRM, Areas of Mitigation Interest, etc.); and*
- *Identification of any data gaps that can be filled as new data became available.*

Element C: Mitigation Strategy

How does the Plan go above and beyond minimum requirements to document the Mitigation Strategy with respect to:

- *Key problems identified in, and linkages to, the vulnerability assessment;*
- *Serving as a blueprint for reducing potential losses identified in the Hazard Identification and Risk Assessment;*
- *Plan content flow from the risk assessment (problem identification) to goal setting to mitigation action development;*
- *An understanding of mitigation principles (diversity of actions that include structural projects, preventative measures, outreach activities, property protection measures, post-disaster actions, etc);*
- *Specific mitigation actions for each participating jurisdictions that reflects their unique risks and capabilities;*
- *Integration of mitigation actions with existing local authorities, policies, programs, and resources; and*
- *Discussion of existing programs (including the NFIP), plans, and policies that could be used to implement mitigation, as well as document past projects.*

Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)

How does the Plan go above and beyond minimum requirements to document the 5-year Evaluation and Implementation measures with respect to:

- *Status of previously recommended mitigation actions;*
- *Identification of barriers or obstacles to successful implementation or completion of mitigation actions, along with possible solutions for overcoming risk;*
- *Documentation of annual reviews and committee involvement;*
- *Identification of a lead person to take ownership of, and champion the Plan;*
- *Reducing risks from natural hazards and serving as a guide for decisions makers as they commit resources to reducing the effects of natural hazards;*
- *An approach to evaluating future conditions (i.e. socio-economic, environmental, demographic, change in built environment etc.);*
- *Discussion of how changing conditions and opportunities could impact community resilience in the long term; and*
- *Discussion of how the mitigation goals and actions support the long-term community vision for increased resilience.*

B. Resources for Implementing Your Approved Plan

Ideas may be offered on moving the mitigation plan forward and continuing the relationship with key mitigation stakeholders such as the following:

- *What FEMA assistance (funding) programs are available (for example, Hazard Mitigation Assistance (HMA)) to the jurisdiction(s) to assist with implementing the mitigation actions?*
- *What other Federal programs (National Flood Insurance Program (NFIP), Community Rating System (CRS), Risk MAP, etc.) may provide assistance for mitigation activities?*
- *What publications, technical guidance or other resources are available to the jurisdiction(s) relevant to the identified mitigation actions?*
- *Are there upcoming trainings/workshops (Benefit-Cost Analysis (BCA), HMA, etc.) to assist the jurisdictions(s)?*
- *What mitigation actions can be funded by other Federal agencies (for example, U.S. Forest Service, National Oceanic and Atmospheric Administration (NOAA), Environmental Protection Agency (EPA) Smart Growth, Housing and Urban Development (HUD) Sustainable Communities, etc.) and/or state and local agencies?*

Appendix C Meeting and Other Participation Documentation

Due to size, this appendix has not been printed. A digital copy is available on the enclose CD.

This appendix contains the following documentation of the Union County 2020 Hazard Mitigation Plan Update.

Update planning process:

Kickoff Meeting – June 13, 2019

- Invitations (Municipalities)
- Invitations (Stakeholders)
- Agenda
- Presentation
- Sign-In Sheet
- Meeting Minutes

Risk Assessment and Mitigation Solutions Workshop – August 28, 2019

- Invitations
- Website Announcement
- Agenda
- Presentation
- Sign-In Sheet
- Meeting Minutes

Draft Plan Review – October 8, 2019

- Invitations
- Public Notice
- Public Notice Affidavit of Publication
- Website Announcement
- Agenda
- Presentation
- Sign-In Sheet
- Meeting Minutes

Completed Participation Forms

- Capability Assessment Survey
- Hazard-Risk Evaluation Worksheets
- New Mitigation Action Form
- Mitigation Action Progress Form
- NFIP Survey

Other Participation Documentation

- General Comments
- Draft Plan Website Posting

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Appendix D Local Municipality Flood Vulnerability Maps

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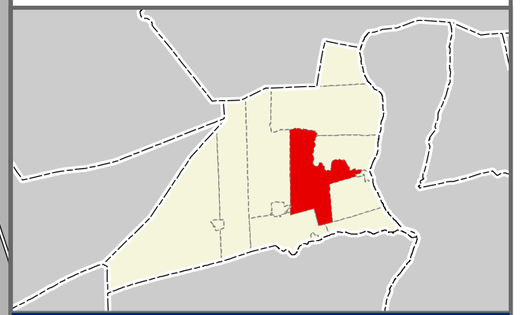
BUFFALO TOWNSHIP COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE



UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

Michael Baker INTERNATIONAL

West Buffalo Township

Kelly Township

Buffalo Township

Lewisburg Borough

East Buffalo Township

Mifflinburg Borough

Union

NORTHUMBERLAND

15

192

45

104

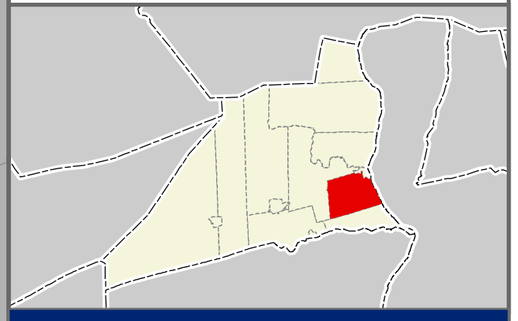
304

0 0.5 1 2 Miles

EAST BUFFALO TOWNSHIP COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE



UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

Michael Baker INTERNATIONAL

Kelly Township

Buffalo Township

Lewisburg Borough

East Buffalo Township

Limestone Township

Union Township

NORTHUMBERLAND

192

45

15

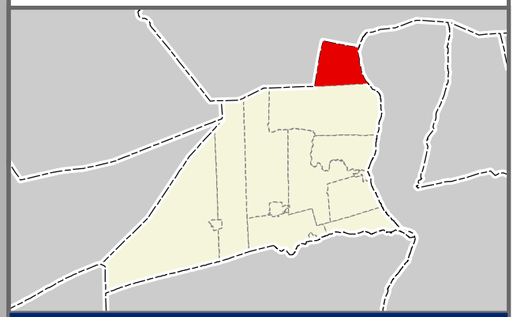
304

0 0.375 0.75 1.5 Miles

GREGG TOWNSHIP COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE



UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

Michael Baker INTERNATIONAL

LYCOMING

NORTHUMBERLAND

Gregg Township

White Deer Township

15

44

80

0 0.375 0.75 1.5 Miles

HARTLETON BOROUGH COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE

UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

Michael Baker INTERNATIONAL

Hartley Township

45

Hartleton Borough

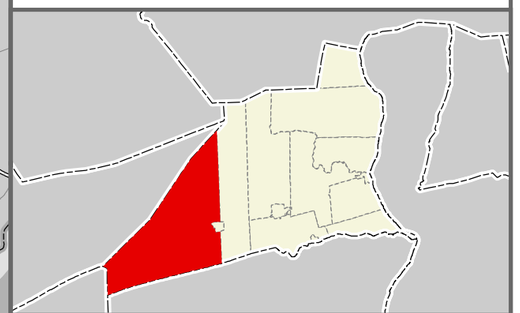
Lewis Township

0 0.125 0.25 0.5 Miles

HARTLEY TOWNSHIP COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE



UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

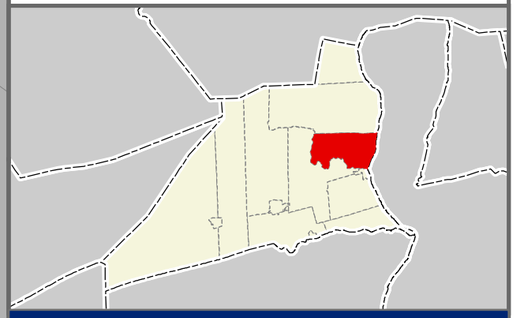
Michael Baker INTERNATIONAL

CLINTON
CENTRE
CENTRE
MIFFLIN
MIFFLIN
SNYDER
Hartley Township
West Buffalo Township
Lewis Township
Mifflinburg Borough
Hartleton Borough
Limestone Township
80
192
45
235
0 1 2 4 Miles

KELLY TOWNSHIP COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE



UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

Michael Baker INTERNATIONAL

White Deer Township

Kelly Township

Buffalo Township

East Buffalo Township

Lewisburg Borough

NORTHUMBERLAND

15

192

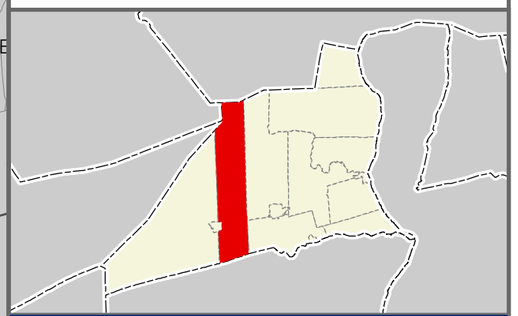
45

0 0.375 0.75 1.5 Miles

LEWIS TOWNSHIP COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE



UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

Michael Baker INTERNATIONAL

LYCOMING
CLINTON
CENTRE
SNYDER
White Deer Township
West Buffalo Township
Buffalo Township
Lewis Township
Mifflinburg Borough
Hartleton Borough
Hartley Township
Limestone Township
New Berlin Borough
80
192
45
Miles
0 1 2 4

LEWISBURG BOROUGH COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE

UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

Michael Baker INTERNATIONAL

Kelly Township

Buffalo Township

East Buffalo Township

Lewisburg Borough

NORTHUMBERLAND

15

192

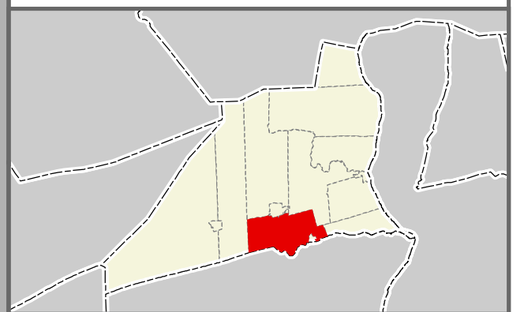
45

0 0.1 0.2 0.4 Miles

LIMESTONE TOWNSHIP COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE



UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

Michael Baker INTERNATIONAL

West Buffalo Township

Buffalo Township

Mifflinburg Borough

Lewis Township

Limestone Township

Union Township

New Berlin Borough

SNYDER

45

104

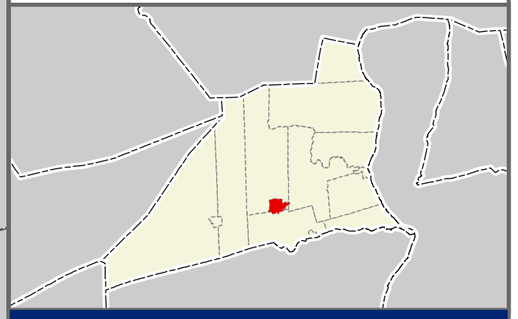
304

0 0.4 0.8 1.6 Miles

MIFFLINBURG BOROUGH COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE



West Buffalo Township

Buffalo Township

Mifflinburg Borough

Limestone Township

45

304

104

Miles

0 0.125 0.25 0.5

UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

Michael Baker INTERNATIONAL

NEW BERLIN BOROUGH COMMUNITY FLOOD VULNERABILITY

Limestone Township

New Berlin Borough

SNYDER

304

204

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE

UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

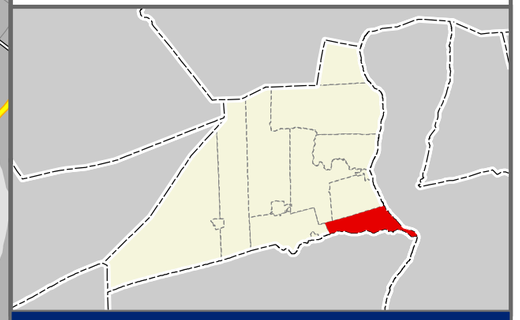
Michael Baker INTERNATIONAL

0 0.05 0.1 0.2 Miles

UNION TOWNSHIP COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE



UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

Michael Baker INTERNATIONAL

East Buffalo Township

Union Township

NORTHUMBERLAND

SNYDER

304

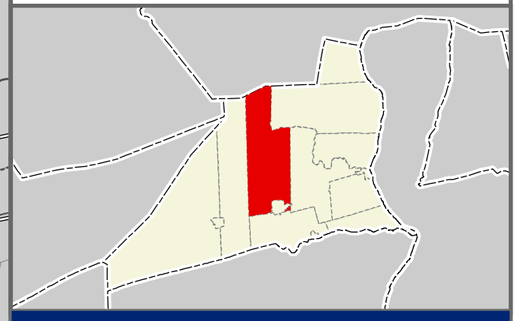
15

0 0.4 0.8 1.6 Miles

WEST BUFFALO TOWNSHIP COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
- Flood Zone AE



UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

Michael Baker INTERNATIONAL

LYCOMING

LYCOMING

CLINTON

CLINTON

CLINTON

CENTRE

CENTRE

80

White Deer Township

Kelly Township

West Buffalo Township

192

Hartley Township

Lewis Township

Buffalo Township

45

East Buf Townsh

Mifflinburg Borough

Miles

0 0.75 1.5 3

WHITE DEER TOWNSHIP COMMUNITY FLOOD VULNERABILITY

LEGEND

- College
- Communications
- Community Rec
- Dam
- Fire / EMS
- Government
- Health / Medical
- Helicopter
- Law Enforcement
- Radio / TV
- School
- Substation
- Water / Wastewater
- Structures in SFHA
- Flood Zone A
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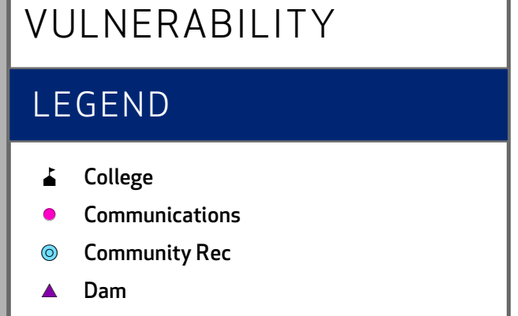

UNION COUNTY HAZARD MITIGATION PLAN UPDATE

Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.

Projection: NAD83 PA State Plane North Zone

Map Date: 12/11/2019

Michael Baker INTERNATIONAL

Gregg Township

LYCOMING

NORTHUMBERLAND

White Deer Township

Kelly Township

West Buffalo Township

44

80

15

0 0.5 1 2 Miles

Appendix E Critical Facilities

This appendix includes an inventory of all critical facilities in Union County, organized by type and municipality, as well as each facility's vulnerability to hazards. Additionally, this appendix contains a map of the critical facilities in Union County. Detailed maps of critical facilities in each municipality are available in Appendix D – Local Municipality Flood Vulnerability Maps.

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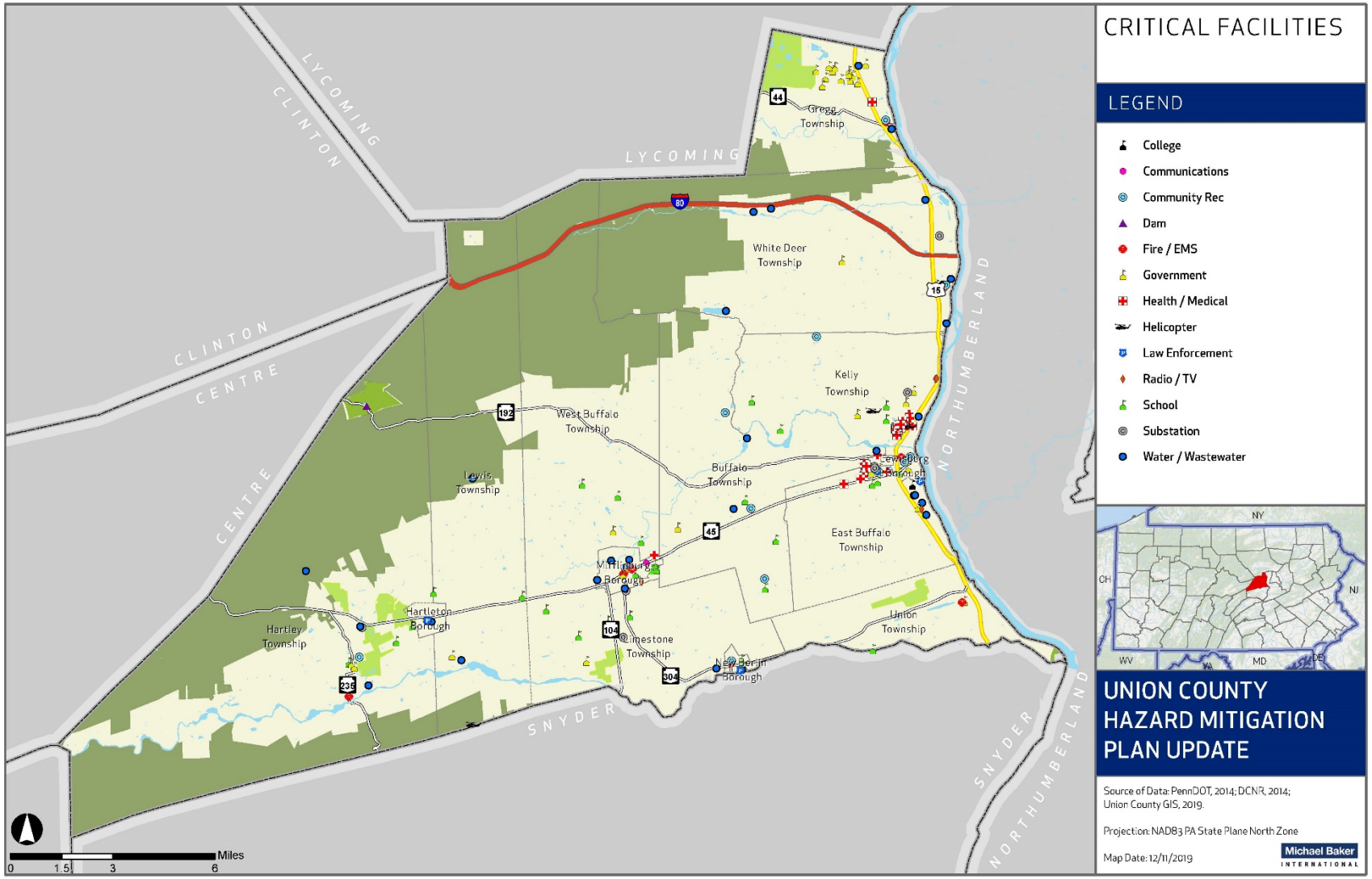
CRITICAL FACILITIES
LEGEND
College
Communications
Community Rec
Dam
Fire / EMS
Government
Health / Medical
Helicopter
Law Enforcement
Radio / TV
School
Substation
Water / Wastewater
LYCOMING
CLINTON
CENTRE
SNYDER
NORTHUMBERLAND
Gregg Township
White Deer Township
Kelly Township
West Buffalo Township
Buffalo Township
Lewis Township
East Buffalo Township
Union Township
Hartley Township
Limestone Township
Hartleton Borough
New Berlin Borough
Lewisburg Borough
Miles
0 1.5 3 6
NY
OH
NJ
WV
MD
DE
UNION COUNTY HAZARD MITIGATION PLAN UPDATE
Source of Data: PennDOT, 2014; DCNR, 2014; Union County GIS, 2019.
Projection: NAD83 PA State Plane North Zone
Map Date: 12/11/2019
Michael Baker INTERNATIONAL

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
American Red Cross Facility	American Red Cross	249 Saint Mary St W	East Buffalo Township			Y			Y	Y
College / University	Bucknell University Campus	701 Moore Ave	East Buffalo Township			Y			Y	
Community / Recreation Center	Buffalo Valley Recreation Authority (Formerly Lara)	220 Brookpark Cir Suite 9	East Buffalo Township			Y			Y	Y
Community / Recreation Center	Youth Center	3150 New Berlin Mountain Rd	Buffalo Township							
Community / Recreation Center	Kelly Crossroads Community Center	1925 Fort Titzell Rd	Kelly Township	Y						
Community / Recreation Center	Area Agency On Aging	116 N 2Nd St	Lewisburg Borough			Y			Y	Y
Community / Recreation Center	New Berlin Social Hall / New Berlin Fire Company	416 Liberty St	New Berlin Borough			Y			Y	
Community / Recreation Center	Donald Heiter Community Center	101 S 5Th St	Lewisburg Borough	Y		Y		Y	Y	Y

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Community / Recreation Center	Hartleton Community Building (Formerly Church)	115 Catherine St	Hartleton Borough			Y			Y	
Community / Recreation Center	Laurel Run Activity Complex Youth Center	49 Ball Park Rd	Hartley Township						Y	
Community / Recreation Center	Warrior Run Area Fire Department Social Hall	196 White Deer Ave	Gregg Township					Y	Y	
Community / Recreation Center	Youth Center/Union County Sorting Center	224 Young Rd	Buffalo Township			Y			Y	
Community / Recreation Center	Mazeppa Community Center	3246 Johnson Mill Rd	Buffalo Township							
Community / Recreation Center	New Columbia Civic Building	224 3Rd St	White Deer Township	Y					Y	Y
Community / Recreation Center	Miller Center For Recreation And Wellness	120 Hardwood Dr	East Buffalo Township	Y		Y			Y	Y

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
County Government Facility	County Building (Former Army Reserve Building)	480 Hefer Rd	Kelly Township						Y	Y
County Government Facility	Mifflinburg Bank Building	343 Chestnut St	Mifflinburg Borough			Y			Y	
County Government Facility	Union County Government Center	155 N 15Th St	East Buffalo Township	Y		Y			Y	Y
Dam	Halfway Dam	17000 Buffalo Rd	Hartley Township						Y	
Fire Station / EMS Station	William Cameron Engine Company	11 Buffalo Rd	Lewisburg Borough	Y		Y		Y	Y	Y
Fire Station / EMS Station	Union County West End Fire Company	3005 State Route 235	Hartley Township						Y	
Fire Station / EMS Station	New Berlin Fire Company #1	415 High St	New Berlin Borough			Y			Y	
Fire Station / EMS Station	Mifflinburg Hose Company	325 Chestnut St	Mifflinburg Borough			Y			Y	
Fire Station / EMS Station	Warrior Run Area Fire Department (Allenwood)	188 White Deer Ave	Gregg Township					Y	Y	

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Fire Station / EMS Station	White Deer Township Fire Department	366 Cemetery St	White Deer Township					Y	Y	Y
Fire Station / EMS Station	Union Township Fire Company	40 Municipal Ln	Union Township						Y	Y
Fire Station / EMS Station	Medic 60	1 Hospital Dr	Kelly Township					Y	Y	Y
Fire Station / EMS Station	Micu 14	104 Chestnut St	Mifflinburg Borough			Y			Y	
Government or Military Facility	Union County Community Services Building	1610 Industrial Blvd	East Buffalo Township	Y		Y			Y	Y
Government or Military Facility	Lewisburg Federal Penitentiary	2400 Robert F Miller Dr	Kelly Township							Y
Government or Military Facility	Allenwood Federal Correctional Institution	Main Access Rd	Gregg Township							
Government or Military Facility	Equalizing Tank	1012 Matthew Brown Rd	Gregg Township					Y	Y	
Government or Military Facility	Fci Warehouse	440 Main Access Rd	Gregg Township					Y	Y	

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Government or Military Facility	US Penitentiary	824 Main Access Rd	Gregg Township							
Government or Military Facility	Federal Correction Institution	1164 Main Access R	Gregg Township							
Government or Military Facility	Fci Power Plant	141 Johnson St	Gregg Township							
Government or Military Facility			Gregg Township						Y	
Government or Military Facility	Fci Trailning Center	226 Main Access Rd	Gregg Township					Y	Y	
Government or Military Facility	Fci, Wit-Sec	1460 Main Access Rd	Gregg Township							
Government or Military Facility			Gregg Township							
Government or Military Facility	Fci Allenwood Unicor Warehouse		Gregg Township					Y	Y	
Government or Military Facility	Low Security Correctional Institution	595 Main Access Rd	Gregg Township							
Health or Medical Facility	Evangelical Community Hospital	1 Hospital Dr	Kelly Township					Y	Y	Y

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Health or Medical Facility	Albright Footcare Center	2330 Reitz Blvd	East Buffalo Township			Y			Y	Y
Health or Medical Facility	Allergy Partners Of Lewisburg	2824 Old Turnpike Rd	East Buffalo Township			Y			Y	Y
Health or Medical Facility	Cancer Care Of Central Pa	75 Medical Park Dr	Kelly Township						Y	Y
Health or Medical Facility	Central Penn Gastroenterology Associates	90 Medical Park Dr	Kelly Township						Y	Y
Health or Medical Facility	Central PA Women's Healthcare Llc	111 Medical Park Dr	Kelly Township						Y	Y
Health or Medical Facility	Geisinger Cardiology	131 Jpm Rd	Kelly Township					Y	Y	Y
Health or Medical Facility	Lewisburg Family Practice Center	131 Jpm Rd	Kelly Township					Y	Y	Y
Health or Medical Facility	North Central Pa Dialysis Clinic	135 Jpm Rd	Kelly Township					Y	Y	Y
Health or Medical Facility	Eye Center Of Central PA	137 Jpm Rd	Kelly Township						Y	Y
Health or Medical Facility	Evan One Day Surgery	210 Jpm Rd	Kelly Township					Y	Y	Y

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Health or Medical Facility	Douglas Spotts, Md Family Medical Care	45 Forestwood Dr	Kelly Township					Y	Y	Y
Health or Medical Facility	Sun Orthopaedic Group	900 Buffalo Rd	Buffalo Township			Y			Y	Y
Health or Medical Facility	Brookpark Family Practice	98 Reitz Blvd	East Buffalo Township			Y			Y	Y
Health or Medical Facility	Limestone Office Building	11 Reitz Blvd	East Buffalo Township			Y			Y	Y
Health or Medical Facility	Brookpark Associates	115 Farley Cir	Buffalo Township			Y			Y	Y
Health or Medical Facility	Susquehanna Valley Imaging	120 Hamm Dr	Kelly Township					Y	Y	
Health or Medical Facility	Medical Park Ent	80 Medical Park Dr	Kelly Township						Y	Y
Health or Medical Facility	PA State Health Center	260 Farley Cir	East Buffalo Township			Y			Y	Y
Health or Medical Facility	Lewisburg Plastic Surgery	135 Walter Dr	Kelly Township					Y	Y	
Health or Medical Facility	Multiple Medical Offices	3 Hospital Dr	Kelly Township					Y	Y	Y
Health or Medical Facility	The Eye Center Of Central Pennsylvania	88 Hardees Dr	West Buffalo Township			Y			Y	

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Health or Medical Facility	Eye Center Of Central PA	66 Enterprise Blvd	Gregg Township			Y		Y	Y	
Health or Medical Facility	Medical Building	25 Lystra Rogers Dr	Kelly Township						Y	Y
Health or Medical Facility	Evangelical Hospice	130 Hospital Dr	Kelly Township					Y	Y	Y
Health or Medical Facility	Dental Office	111 Farley Cir	Buffalo Township			Y			Y	Y
Health or Medical Facility	Dental Office	217 Farley Cir	East Buffalo Township			Y			Y	Y
Health or Medical Facility	Lewisburg Pediatric Dentistry	134 Hospital Dr	Kelly Township						Y	Y
Health or Medical Facility	Dental Divas	222 Jpm Rd	Kelly Township						Y	Y
Health or Medical Facility		112 N 15Th St	East Buffalo Township	Y		Y			Y	Y
Helipad / Heliport / Helispot	Helipad	E Kettle Rd	Hartley Township				Y			
Helipad / Heliport / Helispot	Evangelical Community Hospital Helipad	1 Hospital Dr	Kelly Township					Y	Y	Y

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Helipad / Heliport / Helispot	USP Helipad		Kelly Township							Y
Information or Communication Facility		146 E Chestnut St	Mifflinburg Borough			Y			Y	
Law Enforcement	Mifflinburg Borough Police Station	120 N 3Rd St	Mifflinburg Borough			Y			Y	
Law Enforcement	New Berlin Borough Police Department	700 Water St	New Berlin Borough						Y	
Law Enforcement	Buffalo Valley Regional Police Department	1610 Industrial Blvd, Suite 500	East Buffalo Township	Y		Y			Y	Y
Law Enforcement	Hartleton Police Dept	115 Catherine St	Hartleton Borough			Y			Y	
Municipal Government Facility	Lewisburg Borough Offices/Reading Rr Station	55 S 5Th St	Lewisburg Borough			Y			Y	Y
Municipal Government Facility	Hartley Township Municipal Building	1724 State Route 235	Hartley Township						Y	

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Municipal Government Facility	Hartley Township Municipal Building	1845 State Route 235	Hartley Township	Y					Y	
Municipal Government Facility	Lewis Township Municipal Building	116 Center St	Lewis Township			Y				
Municipal Government Facility	Gregg Township Municipal Building	18084 Russell Rd	Gregg Township						Y	
Municipal Government Facility	Union Township Municipal Building	70 Municipal Ln	Union Township						Y	Y
Municipal Government Facility	Buffalo Township Municipal Building	2115 Strickler Rd	Buffalo Township							
Municipal Government Facility	White Deer Township Municipal Building	2191 Creek Rd	White Deer Township							
Municipal Government Facility	East Buffalo Township Municipal Offices	589 Fairground Rd	East Buffalo Township	Y		Y			Y	Y

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Municipal Government Facility	Mifflinburg Borough Offices	120 N 3Rd St	Mifflinburg Borough			Y			Y	
Municipal Government Facility	West Buffalo Township Muncipal Building	577 Johnstown Rd	West Buffalo Township							
Municipal Government Facility	Kelly Township Municipal Building	551 Zeigler Rd	Kelly Township						Y	
Municipal Government Facility	Limestone Township Municipal Building	3840 Wildwood Rd	Limestone Township							
National Guard Armory / Base	Pennsylvania National Gaurd Armory	4700 Westbranch Hwy	East Buffalo Township					Y	Y	
Public Safety Office	Bucknell Public Safety	580 Snake Rd	Lewisburg Borough		Y	Y				
Radio / TV Broadcast Facility	Radio Tower And Satellite Dishes	395 Stoney Acres Rd	Mifflinburg Borough						Y	
Radio / TV Broadcast Facility		8811 Westbranch Hwy	Kelly Township					Y	Y	

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Radio / TV Broadcast Facility		8811 Westbranch Hwy	Kelly Township		Y			Y	Y	
Radio / TV Broadcast Facility	Wgrc Radio Station Tower	101 Armory Blvd	East Buffalo Township					Y	Y	
School	Donald H Eichhorn Middle School	2057 Wahsington Ave	East Buffalo Township			Y			Y	Y
School	Lewisburg Area High School	815 Market St	Lewisburg Borough			Y		Y	Y	Y
School	Mifflinburg Area Middle School	100 Mabel St	Mifflinburg Borough			Y			Y	
School	Mifflinburg Area Elementary School	115 Shipton St	Mifflinburg Borough			Y			Y	
School	Mifflinburg Area High School	75 Market St	Mifflinburg Borough			Y			Y	
School	Former Laurelton Elementary School	105 Weikert Rd	Hartley Township						Y	
School	Sun Area Career & Technology Center	815 Market St	New Berlin Borough			Y			Y	

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
School	Linntown Elementary School	1951 Washington Ave	East Buffalo Township			Y			Y	Y
School	Kelly Elementary School	325 Hospital Dr	Kelly Township							Y
School	Beaver Run School	662 Young Rd	Buffalo Township			Y			Y	
School	Shady Grove Christian School	124 Turkey Run Rd	Buffalo Township							
School	Amish School House	6400 County Line Rd	Union Township							
School	Green Grove Parochial School	3935 Ridge Rd	Limestone Township			Y			Y	
School	Morning Star Mennonite School	1835 Mensch Rd	Limestone Township			Y			Y	
School	White Springs School	1655 Beaver Rd	Limestone Township			Y				
School	Limestone Valley School	1095 Swengel Rd	Limestone Township			Y			Y	

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
School	Mountain View School	127 Kaiser Run Rd	Lewis Township			Y			Y	
School	Sunnyside School	747 Cold Run Rd	Lewis Township							
School	Bridgeville School	693 Centennial Rd	West Buffalo Township							
School	Buffalo Creek Christian Day School	1035 Green Ridge Rd	West Buffalo Township	Y						
School	Mifflinburg Intermediate School	250 Mable St	West Buffalo Township			Y			Y	
School	East End Perocial School	3534 Pheasant Ridge Rd	Buffalo Township			Y				
School	Red Bank School: Historic One Room School House	805 Red Bank Rd	West Buffalo Township							
School	White Deer Elementary School	631 New Columbia Rd	White Deer Township					Y	Y	Y
School	Hartleton Mennonite School	420 Laurel Rd	Hartley Township						Y	

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
School	Ridge View School	150 Hill School Rd	Kelly Township			Y				
School	Buffalo Valley School House	5806 Col John Kelly Rd	Kelly Township							
School	Mountain Laurel School	47 Pollack Rd	Hartley Township							
School	Lewisburg Area High School	545 Newman Rd	Kelly Township							Y
Substation	Electric Substation	26 Stoney Acres Rd	Mifflinburg Borough						Y	
Substation	Electric Substation	165 Fairground Rd	Hartley Township						Y	
Substation	Electric Substation	1772 Saint Mary St	Lewisburg Borough	Y		Y			Y	Y
Substation	Electric Substation	287 Red Ridge Rd	Limestone Township						Y	
Substation	Electric Substation	856 Jpm Rd	Kelly Township							

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Substation	Electric Substation	1739 Saint Mary St	East Buffalo Township	Y		Y			Y	Y
Substation	Electric Substation	2782 Old Route 15	White Deer Township					Y	Y	Y
Wastewater Treatment Plant	Lewis Township Municipal Authority	1599 Millmont Rd	Lewis Township			Y				
Wastewater Treatment Plant	Mifflinburg Wastewater Treatment Plant	200 Gessner Ln	Mifflinburg Borough			Y			Y	
Wastewater Treatment Plant	Mifflinburg Area Water Treatment Plant	101 Watercress Dr	West Buffalo Township			Y			Y	
Wastewater Treatment Plant	New Berlin Wastewater Treatment Plant	710 Water St	New Berlin Borough						Y	
Wastewater Treatment Plant	Lewisburg Area Joint Sewer Authority	697 River Rd	East Buffalo Township					Y	Y	
Wastewater Treatment Plant	Hartleton Borough Wastewater Plant	128 Catherine St	Hartleton Borough						Y	
Wastewater Treatment Plant	Kelly Township Municipal Sewer Authority	405 Winter Farm Ln	Kelly Township					Y	Y	

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Wastewater Treatment Plant	Gregg Township Municipal Authority	16436 Us Route 15	Gregg Township	Y				Y	Y	
Wastewater Treatment Plant	Buffalo Township Municipal Sewer Authority	2188 Johnson Mill Rd	Buffalo Township							
Wastewater Treatment Plant	Hartley Township Municipal Authority	588 Pick Rd	Hartley Township	Y					Y	
Wastewater Treatment Plant	White Deer Township Sewer Authority	10456 River Rd	White Deer Township							Y
Water Pumping Station	Pump Station	130 Fairground Rd	Hartley Township						Y	
Water Pumping Station	West Milton Pump Station	9135 River Rd	White Deer Township	Y				Y	Y	
Water Pumping Station	New Columbia Pump Station	238 4Th St	White Deer Township						Y	Y
Water Pumping Station	College Park Pump Station	659 Hillcrest Ln	East Buffalo Township					Y	Y	
Water Pumping Station	Pump Station	7979 State Route 304	Limestone Township				Y		Y	
Water Pumping Station	White Deer Village Booster Station	545 White Deer Pike	White Deer Township	Y				Y	Y	Y

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Water Pumping Station	Pump Station	437 Airport Rd	Buffalo Township	Y					Y	Y
Water Pumping Station	Pump Station	N 8Th St	Mifflinburg Borough	Y		Y				
Water Pumping Station	Pump Station	1594 Beaver Run Rd	Buffalo Township	Y		Y			Y	
Water Supply or Treatment Facility	Stony Run Reservoir	3455 Stony Run Rd	Hartley Township		Y		Y			
Water Supply or Treatment Facility	Colonial Park Pump Station	125 River Rd	East Buffalo Township		Y			Y	Y	
Water Supply or Treatment Facility	Pennsylvania American Water Facility	5137 White Deer Pike	White Deer Township					Y	Y	
Water Supply or Treatment Facility	Pennsylvania American Water Facility	5643 White Deer Pike	White Deer Township	Y				Y	Y	
Water System Control Facility	PA American Water, Spruce Run Reservoir	3705 Spruce Run Rd	White Deer Township							
Water System Control Facility	Mifflinburg Reservoir	1900 Old Shingle Rd	Lewis Township				Y			

CRITICAL FACILITY TYPE	NAME	STREET ADDRESS	MUNICIPALITY	VULNERABILITY TO IDENTIFIED HAZARDS						
				NATURAL				HUMAN-MADE		
				FLOOD, FLASH FLOOD, ICE JAM	LANDSLIDE	SUBSIDENCE AND SINKHOLE	WILDFIRE	TRANSPORTATION ACCIDENTS - HIGHWAY	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES IN TRANSIT	ENVIRONMENTAL HAZARDS - HAZMAT RELEASES AT FIXED FACILITIES
Water Tank	Municipal Water Tanks	400 Old Orchard Ln	Mifflinburg Borough		Y				Y	
Water Tank	Water Tank	659 Hillcrest Ln	East Buffalo Township					Y	Y	
Water Tower	Water Tower	18120 Russell Rd	Gregg Township					Y	Y	

Appendix F Hazus Reports

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Hazus-MH: Flood Global Risk Report

Region Name: Union_PA_08212019

Flood Scenario: Union_1percent

Print Date: Wednesday, August 21, 2019

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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

Table of Contents

General Description of the Region

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

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

- Pennsylvania

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

The geographical size of the region is 0 square miles and contains 2,219 census blocks. The region contains over 15 thousand households and has a total population of 44,947 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 16,505 buildings in the region with a total building replacement value (excluding contents) of 4,099 million dollars (2010 dollars). Approximately 91.72% of the buildings (and 76.86% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 16,505 buildings in the region which have an aggregate total replacement value of 4,099 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,150,480	76.9%
Commercial	587,841	14.3%
Industrial	163,395	4.0%
Agricultural	27,284	0.7%
Religion	80,878	2.0%
Government	44,980	1.1%
Education	44,284	1.1%
Total	**4,099,142**	**100.0%**

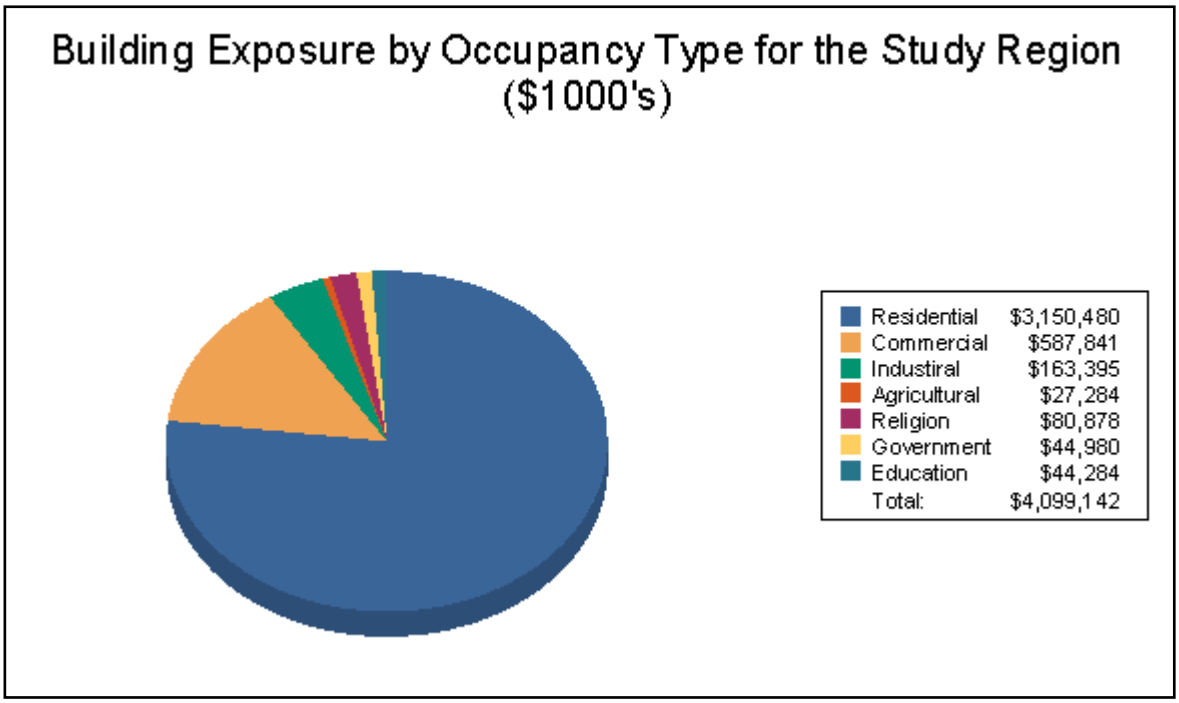
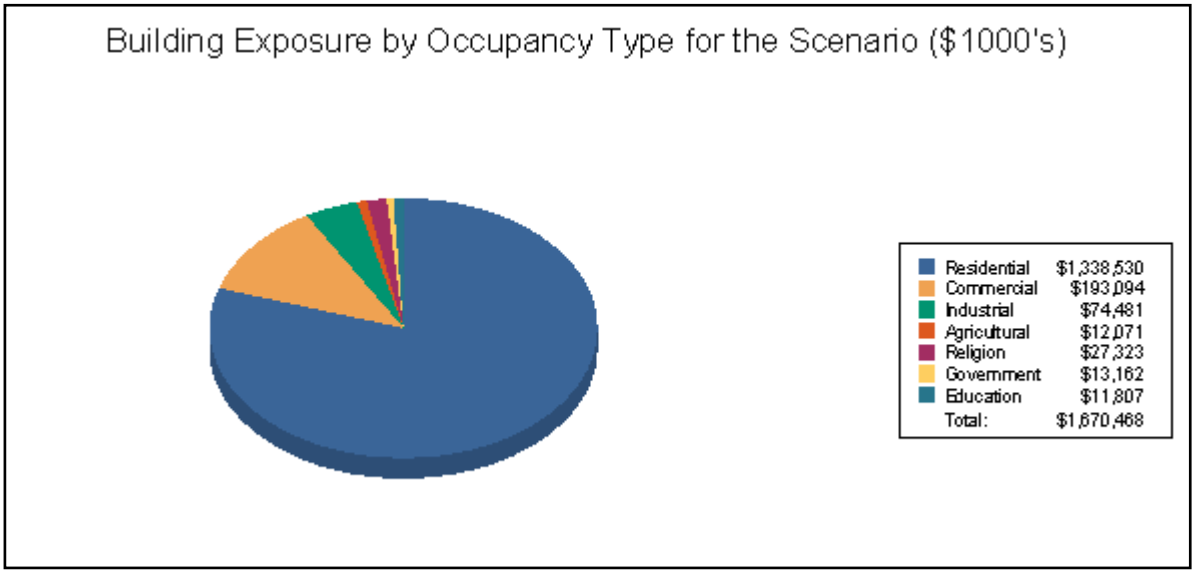


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,338,530	80.1%
Commercial	193,094	11.6%
Industrial	74,481	4.5%
Agricultural	12,071	0.7%
Religion	27,323	1.6%
Government	13,162	0.8%
Education	11,807	0.7%
Total	**1,670,468**	**100.0%**



Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 147 beds.
There are 26 schools, 7 fire stations, 4 police stations and 1 emergency operation center.

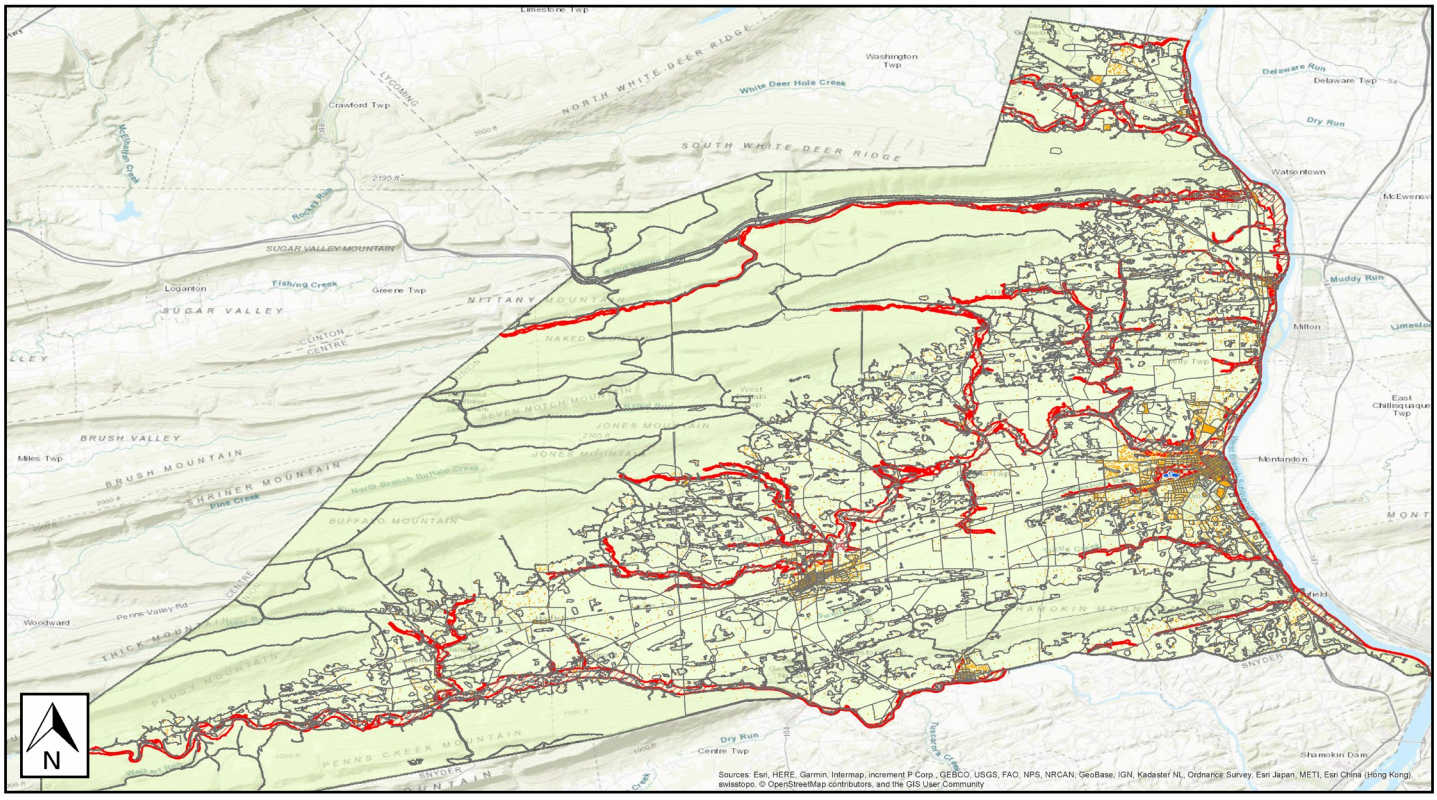
Flood Scenario Parameters

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

Study Region Name:	Union_PA_08212019
Scenario Name:	Union_1percent
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

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



Building Damage

General Building Stock Damage

Hazus estimates that about 365 buildings will be at least moderately damaged. This is over 73% of the total number of buildings in the scenario. There are an estimated 38 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

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

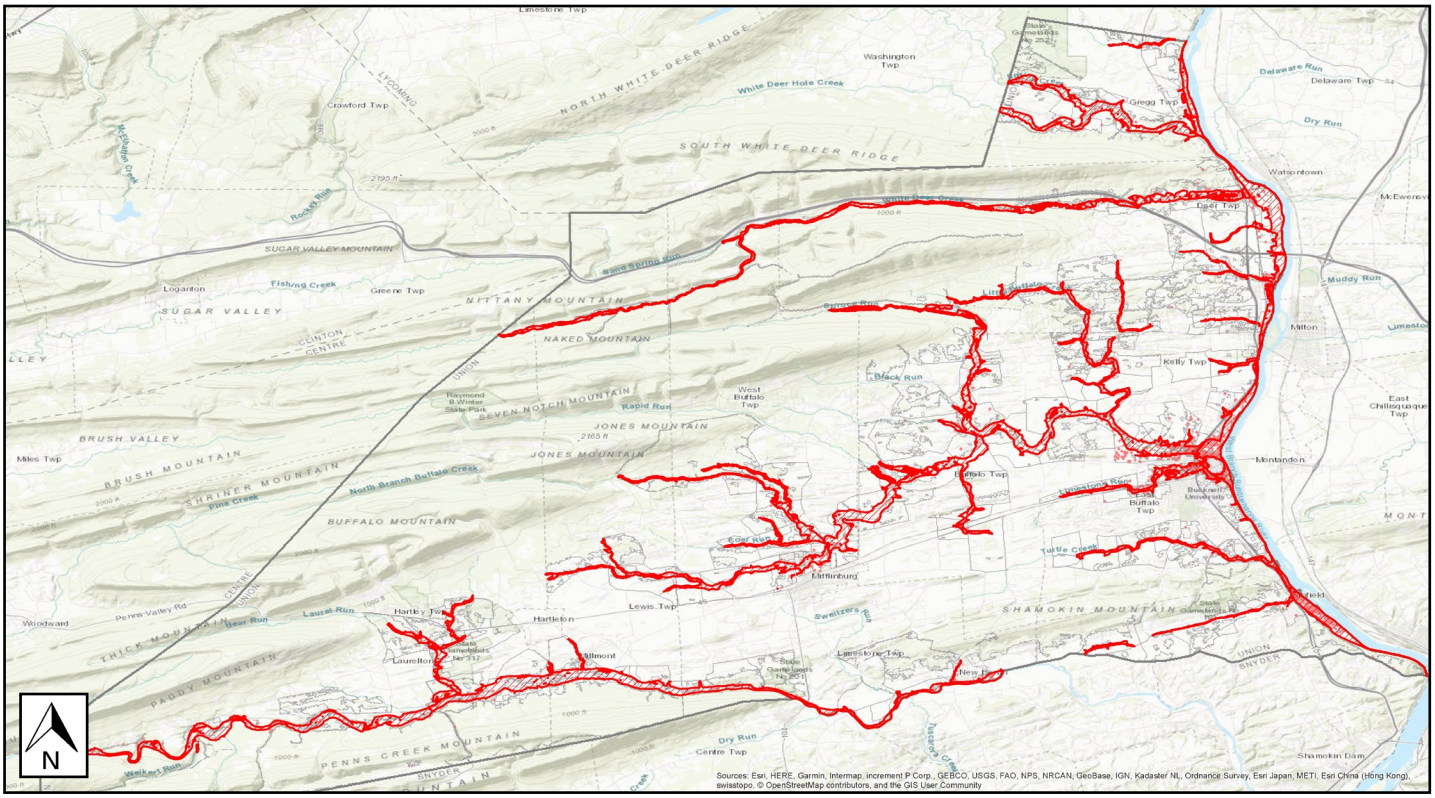


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	1	12.50	6	75.00	1	12.50	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	111	23.67	177	37.74	88	18.76	38	8.10	17	3.62	38	8.10
Total	**112**		**183**		**89**		**38**		**17**		**38**	

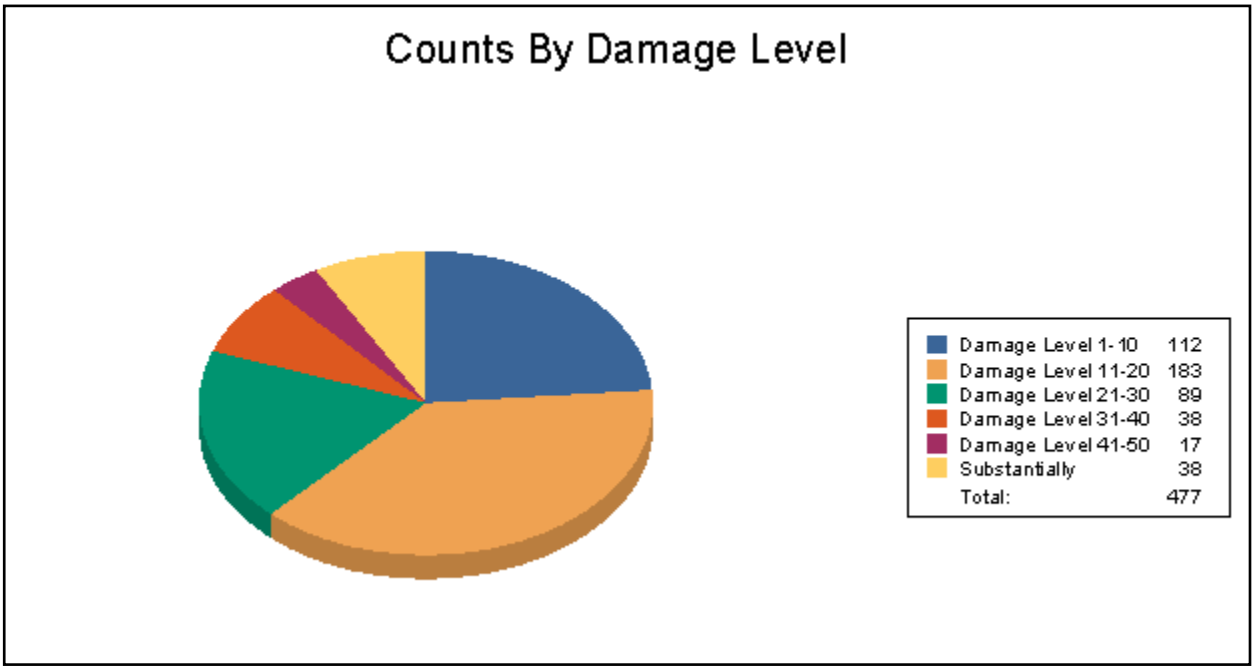


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	2	100
Masonry	30	26	47	41	17	15	9	8	3	3	8	7
Steel	1	17	4	67	1	17	0	0	0	0	0	0
Wood	80	23	131	37	71	20	29	8	14	4	28	8

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 147 hospital beds available for use. On the day of the scenario flood event, the model estimates that 147 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	7	0	0	0
Hospitals	1	0	0	0
Police Stations	4	1	0	1
Schools	26	1	0	1

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

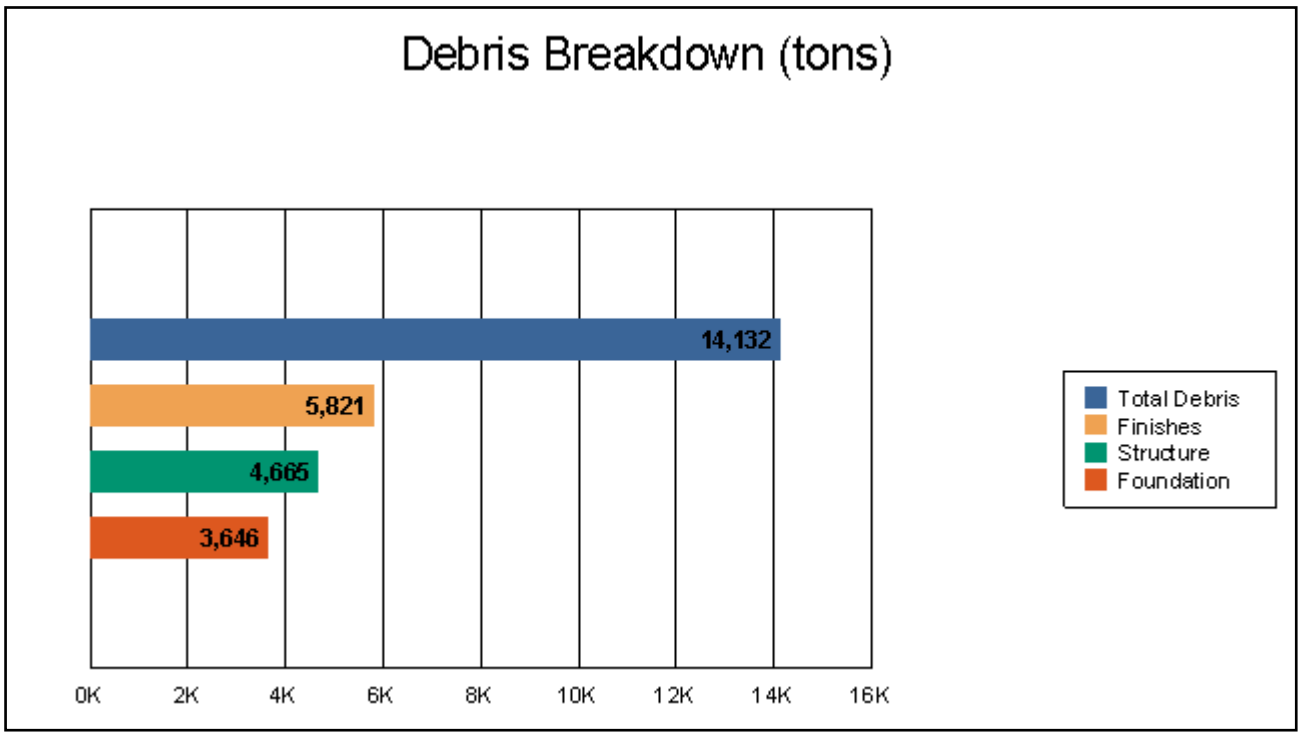
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

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

Induced Flood Damage

Debris Generation

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

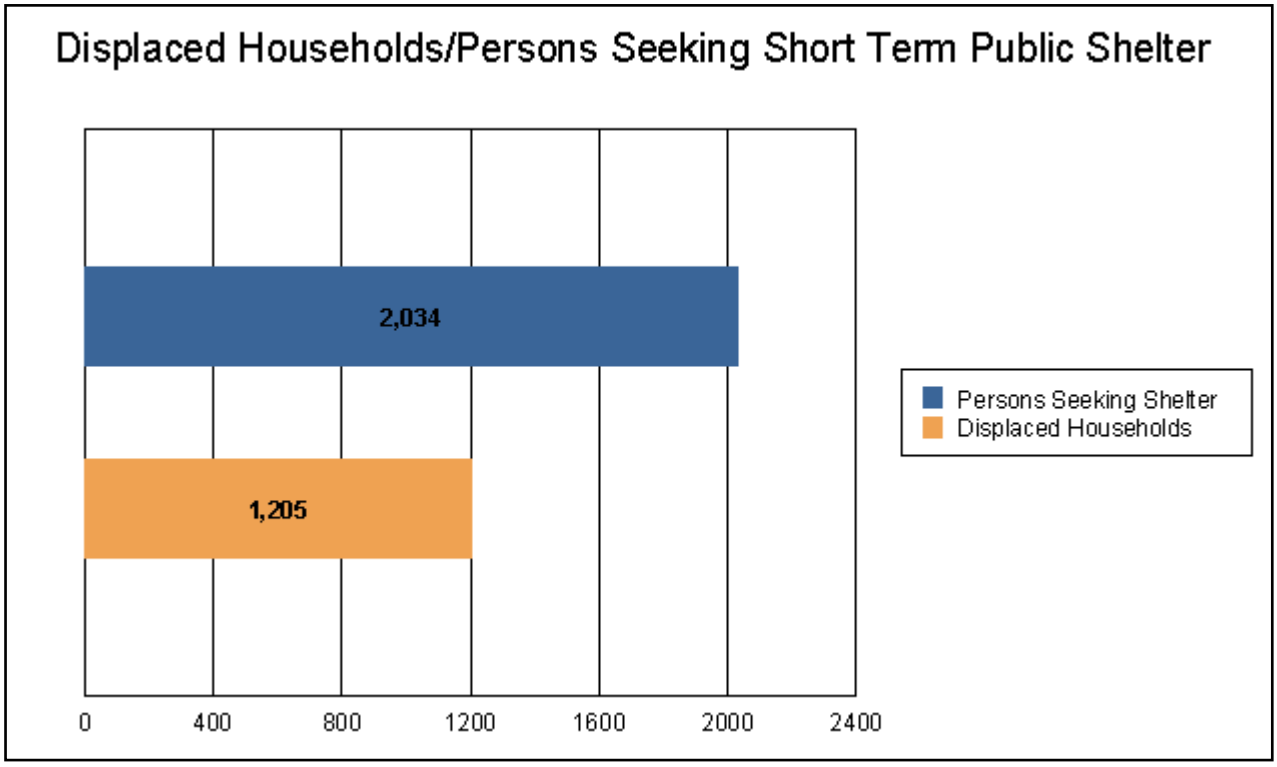


The model estimates that a total of 14,132 tons of debris will be generated. Of the total amount, Finishes comprises 41% of the total, Structure comprises 33% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 565 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1,205 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 2,034 people (out of a total population of 44,947) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 177.78 million dollars, which represents 10.64 % of the total replacement value of the scenario buildings.

Building-Related Losses

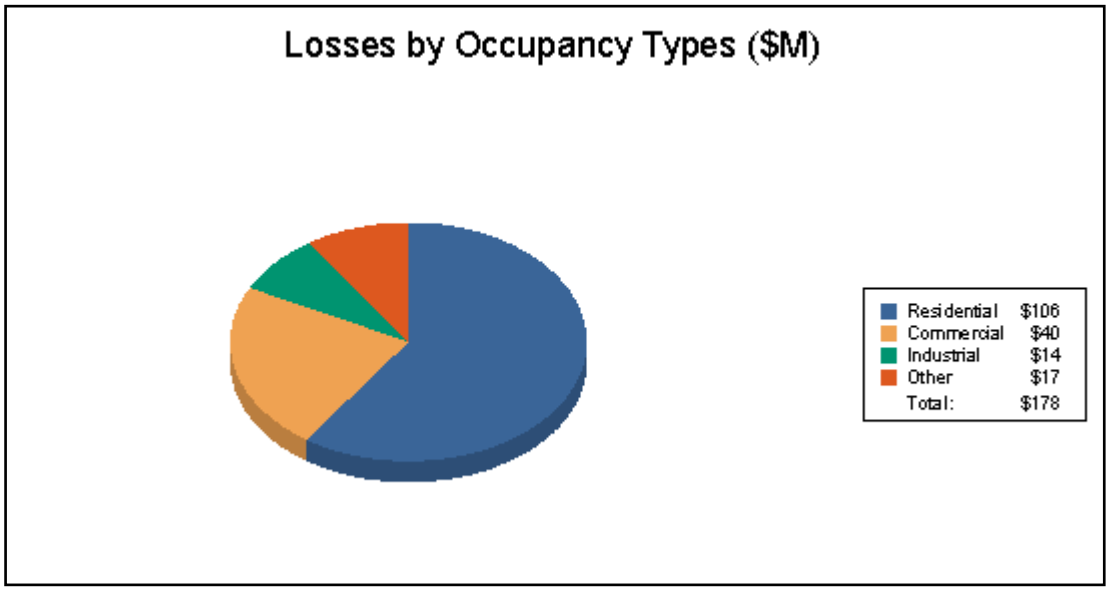
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 176.37 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 59.77% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	66.48	9.25	4.76	2.84	83.32
	Content	39.66	30.08	8.52	13.09	91.34
	Inventory	0.00	0.60	0.95	0.16	1.71
	Subtotal	**106.13**	**39.92**	**14.23**	**16.09**	**176.37**
Business Interruption						
	Income	0.01	0.15	0.00	0.02	0.19
	Relocation	0.05	0.02	0.00	0.01	0.08
	Rental Income	0.04	0.01	0.00	0.00	0.05
	Wage	0.03	0.16	0.00	0.89	1.09
	Subtotal	**0.14**	**0.35**	**0.00**	**0.92**	**1.41**
ALL	**Total**	**106.27**	**40.28**	**14.23**	**17.00**	**177.78**



Appendix A: County Listing for the Region

Pennsylvania

- Union

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Pennsylvania				
Union	44,947	3,150,480	948,662	4,099,142
Total	**44,947**	**3,150,480**	**948,662**	**4,099,142**
Total Study Region	**44,947**	**3,150,480**	**948,662**	**4,099,142**

Appendix G Preliminary Damage Assessment Resources

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WINDSHIELD SURVEY FORM

Municipality: _____

EMC Name: Date/Time:

For Definitions of Reporting Categories, see back of form					
Private Property	Destroyed	Major	Minor	Affected	Inaccessible
Businesses					
Mobile Home					
Multi-Family					
Single Family					

For Definitions of Reporting Categories, see back of form				Directions
Public Property	Destroyed	Affected	Damaged	1) If damage has been sustained by your municipality, document the NUMBER of property types impacted in the appropriate column. 2) DO NOT use this form to document monetary estimates of damage, use number of properties only. 3) If debris removal or emergency protective measures are in place, be sure to complete the appropriate form and circle "Yes" to the questions listed at the bottom of this form. 4) Complete this form and return to Union County EMA within 24 Hours after the passing of the event.
Bridges & Culverts				
Fire / EMS Facility				
Hospital				
Nursing Home				
Other				
Park				
Power Supply				
Public Building (City Hall, Etc.)				
Roads				
Sanitary Sewer				
School				
Sewer Treatment				
Storm Sewer				
Water Control Facility				
Water Supply				
Water Treatment				

Union County
Emergency Management Agency

Phone
570.523.3201
Fax
570.524.8808

ema@unionco.org

Are debris removal activities occurring in the municipality? **YES / NO**

Are emergency protective measures in place in the municipality? **YES / NO**

If **"YES"** is checked for either or both, complete "Protective Action/Debris Removal Form"

Non-Flood Damage Category Definitions

Affected
- Some shingles and/or siding missing
- Ingress / Egress to residence may be hampered
- Dwelling is livable without repairs
- IE: Stone driveway is washed away due to heavy rains

Damaged
- Property is usable, however repairs may be required
- Critical components of the facility are inoperable (pumps, electric, etc.)
- IE: Sewer Treatment is offline due to inoperable pumps

Destroyed
- Property is no longer there
- Property is structurally unsafe
- All major structural systems are damaged and habitation is not possible
- IE: Structures has partially collapsed

Inaccessible
- Unable to access property
- IE: Bridge out leading to property

Major
- Large portions of roof missing
- Structures or property cannot be used until repairs are made
- IE: Roof blown off due to high winds

Minor
- Property is damaged, but usable
- Numerous broken windows
- Minor structural damage
- IE: Roofing shingles blown off due to high winds

Flood Damage Category Definitions

	AFFECTED	MINOR	MAJOR	DESTROYED
HOUSE				
Crawl Space	X			
Basement	Less Than 1’	1’ or more	Extensive Found Damage	
First Floor	2” or less	Up to 2” but not affecting electrical outlets	1’ or more	Physically Destroyed
Slab House	2” or less	Up to 2” but not affecting electrical outlets	1’ or more	Physically Destroyed
Second Floor			X	Physically Destroyed
MOBILE HOME	No water into Belly Board	To Belly Board to 6” on floor	6” or more into mobile home	Physically Destroyed

Quick Guide to Determining Damage Category

Is the Structure usable as it is?

YES

Does it need temporary repairs to be lived in now?

Yes – Minor **No – Affected**

NO

Can it be made useable again with extensive repairs?

Yes – Major **No - Destroyed**

Print Form

PEMA DAP-17

COMMONWEALTH OF PENNSYLVANIA

PENNSYLVANIA EMERGENCY MANAGEMENT AGENCY

PUBLIC ASSISTANCE
PRELIMINARY DAMAGE ASSESSMENT (PDA) - CONSOLIDATED FOR COUNTY

(1) COUNTY _____ (2) DATE _____ PAGE ____ OF ____ PAGES

(3) COUNTY POPULATION _____ (4) COUNTY ANNUAL BUDGET _____ (5) EVENT _____

(6) COUNTY POC (Name/Title) _____ (7) COUNTY POC PHONE # _____ FAX # _____

(8) ASSESSMENT TEAM (Name & Agency) _____ (Name & Agency) _____

APPLICANT OR MUNICIPALITY (9)	A DEBRIS REMOVAL (10)	B EMERG PROTECT MEASURES (11)	C ROADS, BRIDGES (12)	D WATER CONTROL FACILITIES (13	E BUILDINGS & EQUIP (14)	F PUBLIC UTILITIES (15)	G PARKS REC. OTHER (16)	TOTAL ESTIMATED DAMAGE COST (17)	ESTIMATED INSURANCE COVERAGE DOLLARS (18)	NET ESTIMATED UNINSURED DAMAGES (19)
	$	$	$	$	$	$	$	$	$	$
TOTALS	$	$	$	$	$	$	$	$	$	$

ATTACH THE LIST OF DAMAGED SITES, NARRATIVE DESCRIPTION OF DAMAGES, AND FINANCIAL/IMPACT OF DAMAGES (PEMA FORMS DAP-19) FROM THE APPLICANTS

PUBLIC ASSISTANCE

PRELIMINARY DAMAGE ASSESSMENT (PDA) - CONSOLIDATED FOR COUNTY - CONTINUED

(2) COUNTY _____ (2) DATE _____ PAGE ____ OF ____ PAGES

APPLICANT OR MUNICIPALITY (9)	A DEBRIS REMOVAL (10)	B EMERG PROTECT MEASURES (11)	C ROADS, BRIDGES (12)	D WATER CONTROL FACILITIES (13	E BUILDINGS & EQUIP (14)	F PUBLIC UTILITIES (15)	G PARKS REC. OTHER (16)	TOTAL ESTIMATED DAMAGE COST (17)	ESTIMATED INSURANCE COVERAGE DOLLARS (18)	NET ESTIMATED UNINSURED DAMAGES (19)
	$	$	$	$	$	$	$	$	$	$
TOTALS	$	$	$	$	$	$	$	$	$	$

Print Form

PEMA DAP-19

LOCAL DAMAGE ASSESSMENT
LIST OF DAMAGED SITES & SITE ESTIMATES

DISASTER EVENT

MUNICIPALITY/ APPLICANT POPULATION COUNTY DATE / /

MUNICIPALITY/ APPLICANT ADDRESS APPLICANT PHONE

DATE FISCAL YEAR BEGAN / / TOTAL ANNUAL BUDGET= $ UNCOMMITTED BALANCE AS OF / / = $

ANNUAL MAINTENANCE BUDGET= $ UNCOMMITTED BALANCE AS OF / / = $

POC NAME POC PHONE POC FAX POC E-MAIL

POC ADDRESS PDA TEAM MEMBERS

Site #	Location (street address, directions from known point, and if available GPS coordinates - provide municipal/township map)	Damage, Description and Dimensions (give facility name, length-width-depth-sf-sy-cy-tons-number of items, etc.)	Local Estimate of Cost $	Insurance Coverage Y/N $?	Impact of Damage (public health & safety - Essential / critical facilities- population adversely affected	Special Considerations (1) (see bottom of continuation sheet)
1			$	☐ YES ☐ NO		
2			$	☐ YES ☐ NO		
3			$	☐ YES ☐ NO		
4			$	☐ YES ☐ NO		
5			$	☐ YES ☐ NO		
6			$	☐ YES ☐ NO		

Annotate local map to show site numbers above. Use reverse for detailed description of adverse effect on essential / critical facilities such as: Hospitals, Schools, Nursing Homes, Transportation, Communication, Water, Sewer, Emergency vehicle access, and Public Health and Safety

LOCAL DAMAGE ASSESSMENT
LIST OF DAMAGED SITES & SITE ESTIMATES *(CONTINUED)*

DISASTER EVENT _____

MUNICIPALITY/ APPLICANT _____ COUNTY _____ DATE ___/___/___ PAGE ___ OF ___ PAGES

Site #	Location (street address, directions from known point, and if available GPS coordinates - provide municipal/township map)	Damage, Description and Dimensions (give facility name, length-width-depth-sf-sy-cy-tons-number of items, etc.)	Local Estimate of Cost $	Insurance Coverage Y/N $?	Impact of Damage (public health & safety - Essential / critical facilities - population adversely affected	Special Considerations (1) (see bottom of continuation sheet)
7			$	☐ YES ☐ NO		
8			$	☐ YES ☐ NO		
9			$	☐ YES ☐ NO		
10			$	☐ YES ☐ NO		
11			$	☐ YES ☐ NO		
12			$	☐ YES ☐ NO		

Special Considerations - Does the site have potential for: **Hazardous Materials** (HZ) - Unidentified drums, asbestos, transformers with PCBs, oil slick, etc.? **Historical Significance** (HIST) - Site over 50 years old, located in historical district, plaque on building, etc? **Hazard Mitigation** (HM) - Has site been damaged before, are there cost effective mitigation possibilities, etc? **Environmental Issues** (ENV) - Wetlands, endangered species, water supply contamination, sewage spill, etc? **Insurance** (INS) - Is structure or contents insured, in 100-year floodplain?

LOCAL DAMAGE ASSESSMENT
LIST OF DAMAGED SITES & SITE ESTIMATES *(CONTINUED)*

DISASTER EVENT _____

MUNICIPALITY/ APPLICANT _____ COUNTY _____ DATE ___/___/___ PAGE ___ OF ___ PAGES

Site #	Location (street address, directions from known point, and if available GPS coordinates - provide municipal/township map)	Damage, Description and Dimensions (give facility name, length-width-depth-sf-sy-cy-tons-number of items, etc.)	Local Estimate of Cost $	Insurance Coverage Y/N $?	Impact of Damage (public health & safety - Essential / critical facilities - population adversely affected	Special Considerations (1) (see bottom of continuation sheet)
13			$	☐ YES ☐ NO		
14			$	☐ YES ☐ NO		
15			$	☐ YES ☐ NO		
16			$	☐ YES ☐ NO		
17			$	☐ YES ☐ NO		
18			$	☐ YES ☐ NO		

Special Considerations - Does the site have potential for: **Hazardous Materials** (HZ) - Unidentified drums, asbestos, transformers with PCBs, oil slick, etc.? **Historical Significance** (HIST) - Site over 50 years old, located in historical district, plaque on building, etc? **Hazard Mitigation** (HM) - Has site been damaged before, are there cost effective mitigation possibilities, etc? **Environmental Issues** (ENV) - Wetlands, endangered species, water supply contamination, sewage spill, etc? **Insurance** (INS) - Is structure or contents insured, in 100-year floodplain?