MCM Consulting Group, Inc.

DRAFT
Mercer County 2018
Hazard Mitigation Plan

Mercer County Department of Public Safety

Certification of Annual Review Meetings

YEAR	DATE OF MEETING	PUBLIC OUTREACH ADDRESSED?*	SIGNATURE
2018			
2019			
2020			
2021			
2022			

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

Record of Changes

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

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

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1. Introduction

1.1. Background

The Mercer County Board of Commissioners, in response to the Disaster Mitigation Act of 2000 (DMA 2000), organized a countywide hazard mitigation planning effort to prepare, adopt and implement a multi-jurisdictional hazard mitigation plan (HMP) for Mercer County and all forty-eight Mercer County municipalities. The Mercer County Department of Public Safety was charged by the Mercer County Board of Commissioners to prepare the 2017 HMP. The 2012 HMP has been utilized and maintained during the 5-year life cycle.

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

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

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

1.2. Purpose

The purpose of the Mercer County Hazard Mitigation Plan (HMP) is:

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

1.3. Scope

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

A multi-jurisdictional planning approach was utilized for the Mercer County HMP update, thereby eliminating the need for each municipality to develop its own approach to hazard mitigation and its own planning document. Further, this type of planning effort results in a common understanding of the hazard vulnerabilities throughout the county, a comprehensive list of mitigation projects, common mitigation goals and objectives and an evaluation of a broad capabilities assessment examining policies and regulations throughout the county and its municipalities.

1.4. Authority and Reference

Authority for this plan originates from the following federal sources:

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

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

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

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

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

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

- PEMA: *Hazard Mitigation Planning Made Easy!*
- PEMA Mitigation Ideas: *Potential Mitigation Measures by Hazard Type: A Mitigation Planning Tool for Communities*. March 6, 2009
- PEMA: *Standard Operating Guide*. October 18, 2013

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

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

2. Community Profile

2.1. Geography and Environment

Mercer County covers approximately 683 square miles and is situated in northwestern Pennsylvania. The county is bordered by Ohio in the west and by Crawford County to the north, Venango County to the east, Butler County to the southeast, and Lawrence County to the south. Mercer County falls within the Appalachian Plateaus Physiographic Province, precisely in the Northwestern Glaciated Plateau section. The county is the tenth lowest in terms of population within the Commonwealth of Pennsylvania. There is a total of 672 square miles of land and eleven square miles of water.

Mercer County presents a wide range of topographic features. The surface ranges from almost level on plateaus and in valleys, to rolling and hilly in other areas. Elevations in the county range from a high of 1,620 feet southeast of Sandy Lake in Sandy Lake Township to a low of 810 feet where the Shenango River flows out of the county in Shenango Township.

The climate in Mercer County is temperate, being characterized by moderately hot summers and moderately severe winters. A temperature above 100˚ has been recorded on only one occasion, in July, and there is an average of only fifteen days each year with a temperature of 90˚ or above. There is an annual average of about 100 days with freezing temperatures, while a minimum of 20˚ or more below zero is reached nearly every winter. The average amount of snowfall each winter is fifty-two inches.

River and stream valleys dominate the landscape of Mercer County. The major water features are: Crooked Creek, Little Shenango River, Big Run, Otter Creek, Cool Spring Creek, French Creek, Little Neshannock Creek, Little Neshannock Creek (west branch), Wolf Creek, and Sandy Creek.

Mercer County is comprised of eight watersheds:

- Conneaut Outlet
- French Creek
- Little Neshannock Creek
- Little Shenango River
- Neshannock Creek
- Sandy Creek
- Shenango River
- Slippery Rock Creek
- Wolf Creek

2.2. Community Facts

On March 12, 1800 Mercer County was established from portions of Allegheny County and named after Hugh Mercer, a general in the American Revolution. It was attached to Crawford County until February 1804 when it was formally organized. Mercer, the county seat, was laid out in 1803 and incorporated as a borough on March, 28 1814. The core communities in Mercer County are Hermitage, Sharon, Farrell, Grove City, Greenville, and Sharpsville.

The following cities, boroughs and townships are located in Mercer County:

- Cities: Farrell, Hermitage, Sharon
- Boroughs**:** Clark, Fredonia, Greenville, Grove City, Jackson Center, Jamestown, Mercer, New Lebanon, Sandy Lake, Sharpsville, Sheakleyville, Stoneboro, West Middlesex, Wheatland
- Townships**:** Coolspring, Deer Creek, Delaware, East Lackawannock, Fairview, Findley, French Creek, Greene, Hempfield, Jackson, Jefferson, Lackawannock, Lake, Liberty, Mill Creek, New Vernon, Otter Creek, Perry, Pine, Pymatuning, Salem, Sandy Creek, Sandy Lake, Shenango, South Pymatuning, Springfield, Sugar Grove, West Salem, Wilmington, Wolf Creek, Worth

Mercer County's leading industries are education, health, social services, manufacturing, and retail trade. The primary employment providers within Mercer County are displayed below in *Table 1 - Mercer County Top Employers.*

Table 1 - Top Employers

Mercer County Top Employers	
Company	**Industry**
General Electric Company	Electric provider
Sharon Pennsylvania Hospital Co	Healthcare
State Government	Government
F. N. B. Corporation	Financial services
Wal-Mart Corporation	Retail services
UPMC Horizon	Healthcare
George Junior Republic in PA	Residential treatment facility
NLMK Pennsylvania Corp	Carbon and alloy steel supplier
John Maneely Co	Welded steel pipe manufacturer
Grove City College	Education
Source: Pennsylvania Department of Labor & Industry	

The wealth of natural resources found in the county has been instrumental in shaping the diversity of communities within its borders. Agriculture, mining, and the network of rivers have played a large role in the economic development in Mercer County. Mercer County has relied heavily on the agricultural and steel industries. The steel industry, as well as other related manufacturing industries, have provided thousands with employment in the county. In addition, since manufacturing industries were highly

prevalent in this area, it also played a large part in the development of several communities as well as railroads that assisted them in daily activities.

2.3. Population and Demographics

Mercer County recorded a population of 116,638 during the 2010 U.S. Census, ranking the county in the 30th position among Pennsylvania's 67 counties. The population in this county is declining according to the U.S. Census Bureau whom estimated the population to be 112,913 in July of 2016, or -3.2% from the April 1, 2010 population census. The median income of households in Mercer County is $44,156. This is approximately $9,000 less than the national median household income (U.S. Census, 2014).

The populations per municipality are identified in *Table 2 - Municipal Population* below.

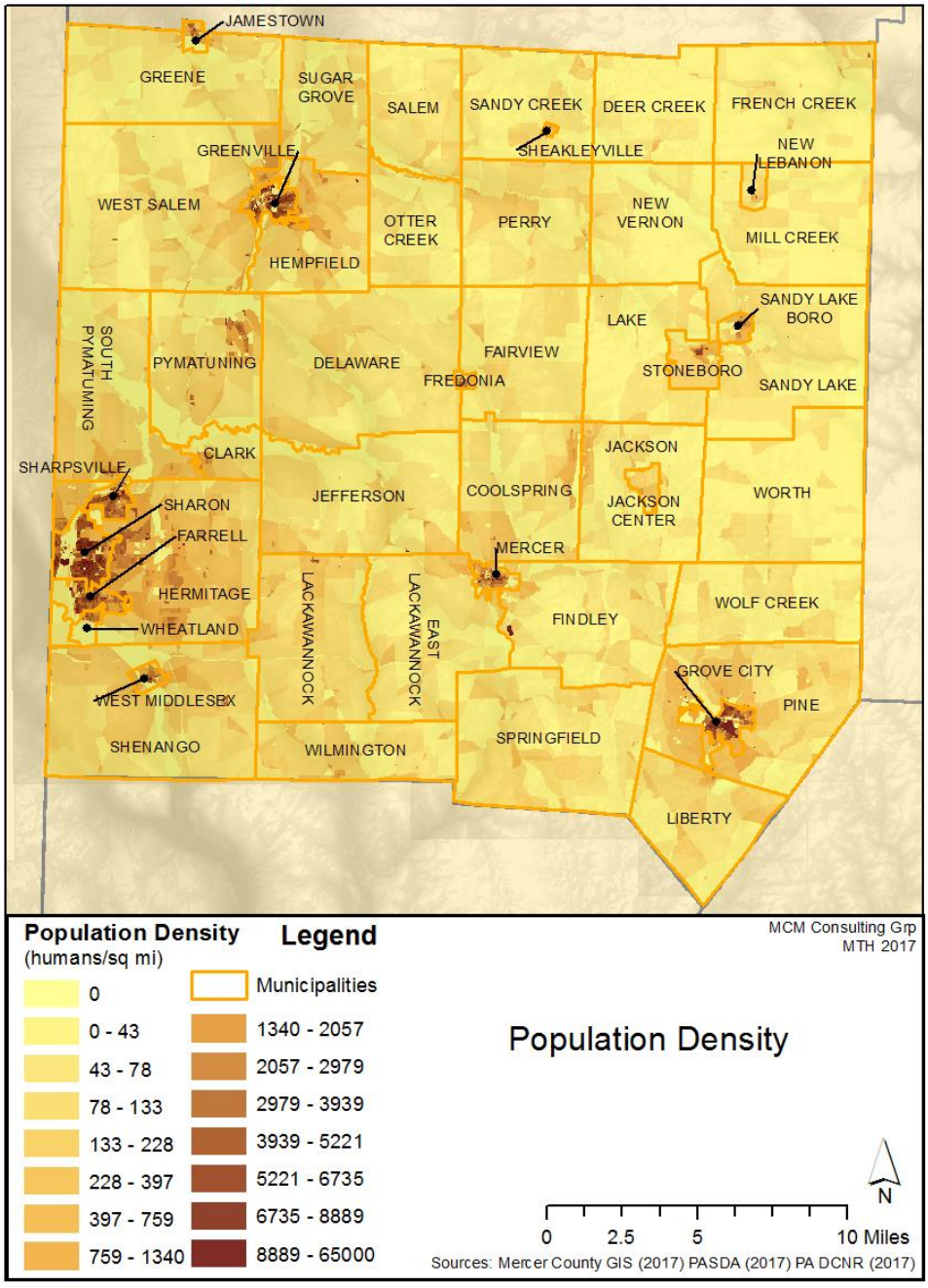
Table 2 - Municipal Population

Mercer County Municipality Populations			
Municipality	**Population**	**Municipality**	**Population**
Clark Borough	640	New Lebanon Borough	188
Coolspring Township	2,278	New Vernon Township	504
Deer Creek Township	502	Otter Creek Township	589
Delaware Township	2,291	Perry Township	1,453
East Lackawannock	1,682	Pine Township	5,150
Fairview Township	1,085	Pymatuning Township	3,281
Farrell City	5,111	Salem Township	754
Findley Township	2,910	Sandy Creek Township	795
Fredonia Borough	502	Sandy Lake Borough	659
French Creek Township	771	Sandy Lake Township	1,226
Greene Township	1,091	Sharon City	14,038
Greenville Borough	5,919	Sharpsville Borough	4,415
Grove City Borough	8,322	Sheakleyville Borough	142
Hempfield Township	3,741	Shenango Township	3,929
Hermitage City	16,220	South Pymatuning Township	2,695
Jackson Center Borough	224	Springfield Township	1,981
Jackson Township	1,273	Stoneboro Borough	1,051
Jamestown Borough	617	Sugar Grove Township	971
Jefferson Township	1,880	West Middlesex Borough	863
Lackawannock Township	2,662	West Salem Township	3,538
Lake Township	780	Wheatland Borough	632
Liberty Township	1,414	Wilmington Township	1,415
Mercer Borough	2,002	Wolf Creek Township	832
Mill Creek Township	721	Worth Township	899
Source: 2010 Census Bureau			

The median age in Mercer County is 43.8 years old (according to the 2010 United States Census Bureau). During the 2010 Census the largest population in Mercer County was 50-59 years old (7.9 percent) with ages 15-19 years old (7.5 percent) coming in at a relatively close second. A total of 51,662 housing units were identified during the 2010

census. In total, 73.6% of homes within Mercer County are 1-unit attached, 9.5% are mobile homes, and the remaining percent are homes that are 2 or more units.

Figure 1 - Population Density Map



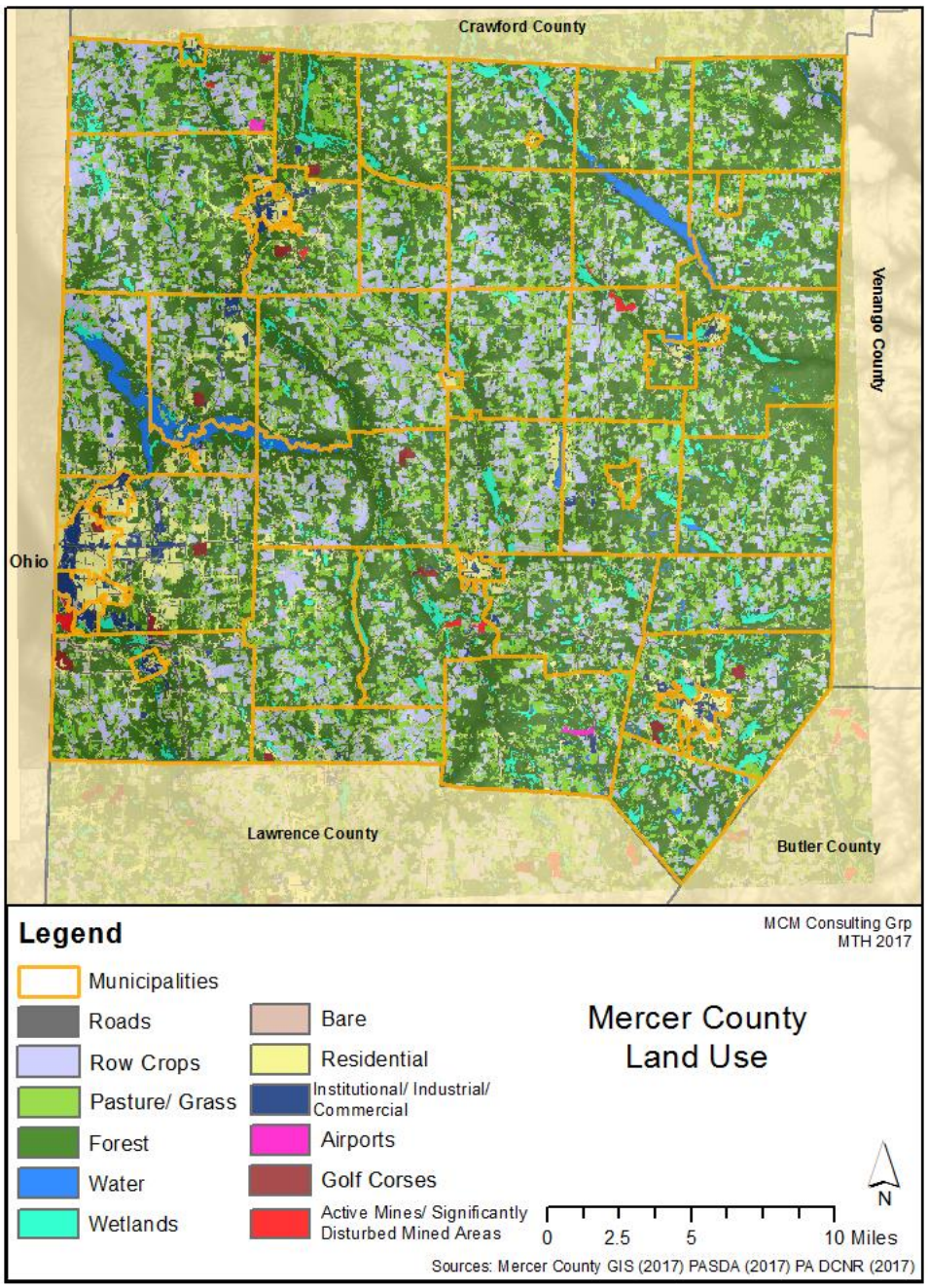
2.4. Land Use and Development

Mercer County is composed of 48 municipalities, which includes:

- 31 townships
- 14 boroughs
- 3 cities

Mercer County is mostly a rural county as about 92% of its total land area is classified as undeveloped (woodland, farms, parks, etc.). Nearly 50% of the total land area is classified as agricultural, with an additional 37% in the forest/woodland category. Less than 10% of the county is classified as either high or low density urban areas. These areas are primarily located at the junctions of the county's original major transportation routes and include the Shenango Valley (Sharon, Farrell/Hermitage), Greenville, Mercer, Grove City, as well as several other small boroughs. Land use within these areas include residential, commercial, industrial, and public and semi-public uses.

Figure 2 - Land Use/Land Cover Map



2.5. Data Sources

- Mercer County Comprehensive Plan
- Mercer County Regional Planning Commission
- United States Census Bureau (2010, 2014)
- United States Department of Agriculture
- Natural Resources Conservation Service
- Pennsylvania State Data Center
- Mercer County Conservation District
- Pennsylvania Department of Environmental Protection
- Mercer County Geographic Information Systems (GIS)
- Pennsylvania Spatial Data Access (PASDA)
- National Oceanic and Atmospheric Administration
- Pennsylvania Department of Conservation and Natural Resources
- Mercer County Today - Summary of Indicators
- Pennsylvania Department of Labor and Industry

Figure 3 - Mercer County Base Map

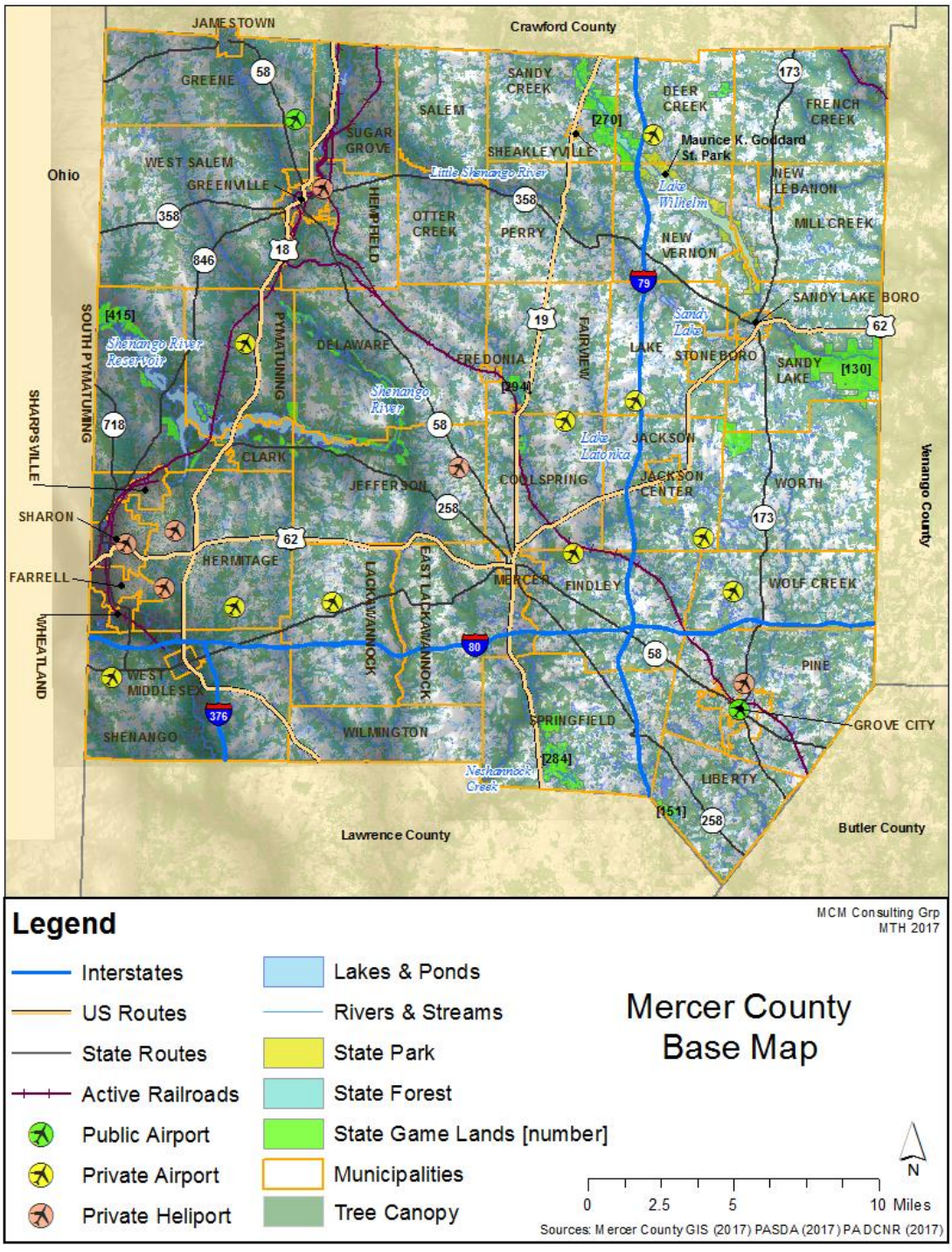


Figure 4 - Land Use/Land Cover Map

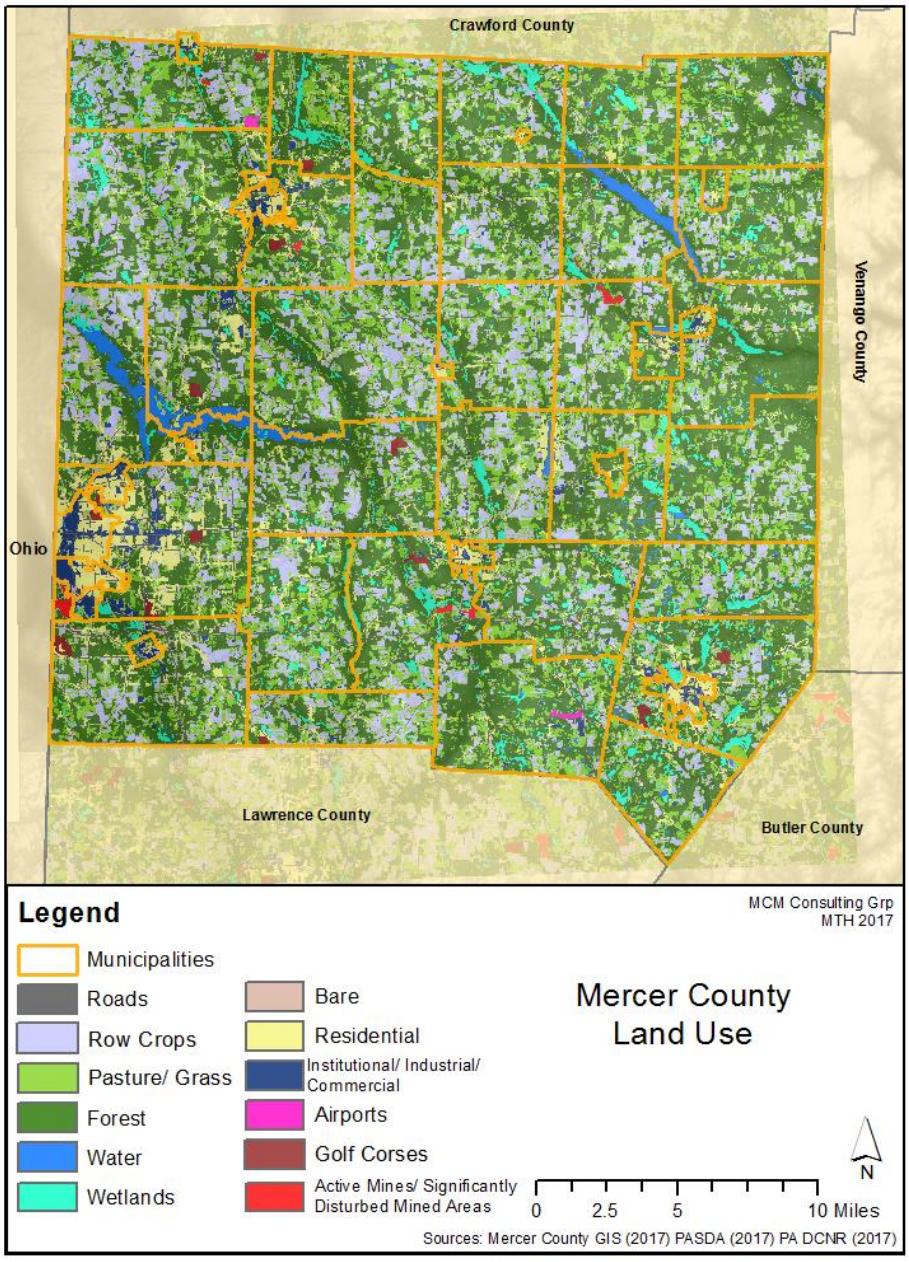


Figure 5 - Recreation Features

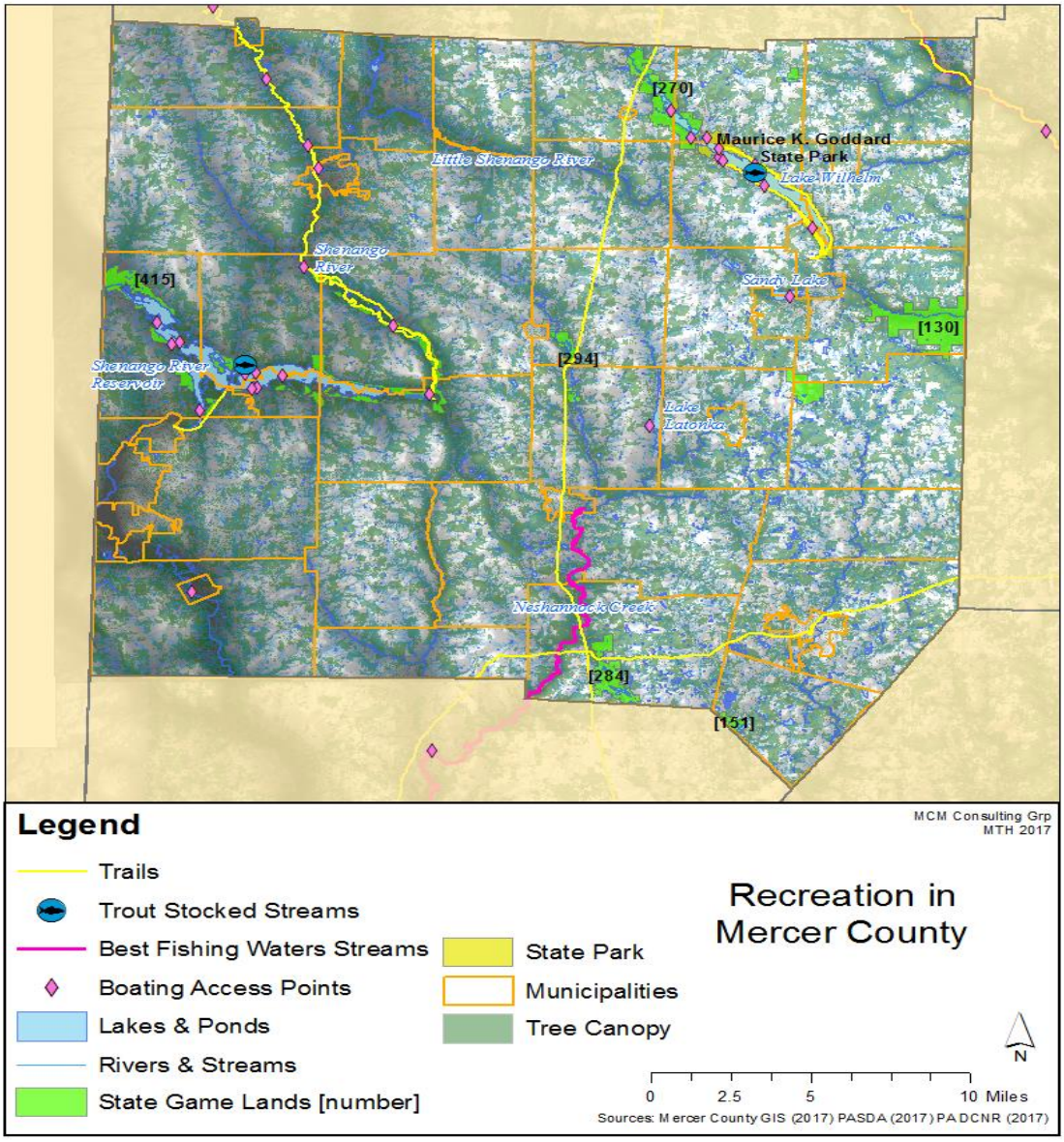
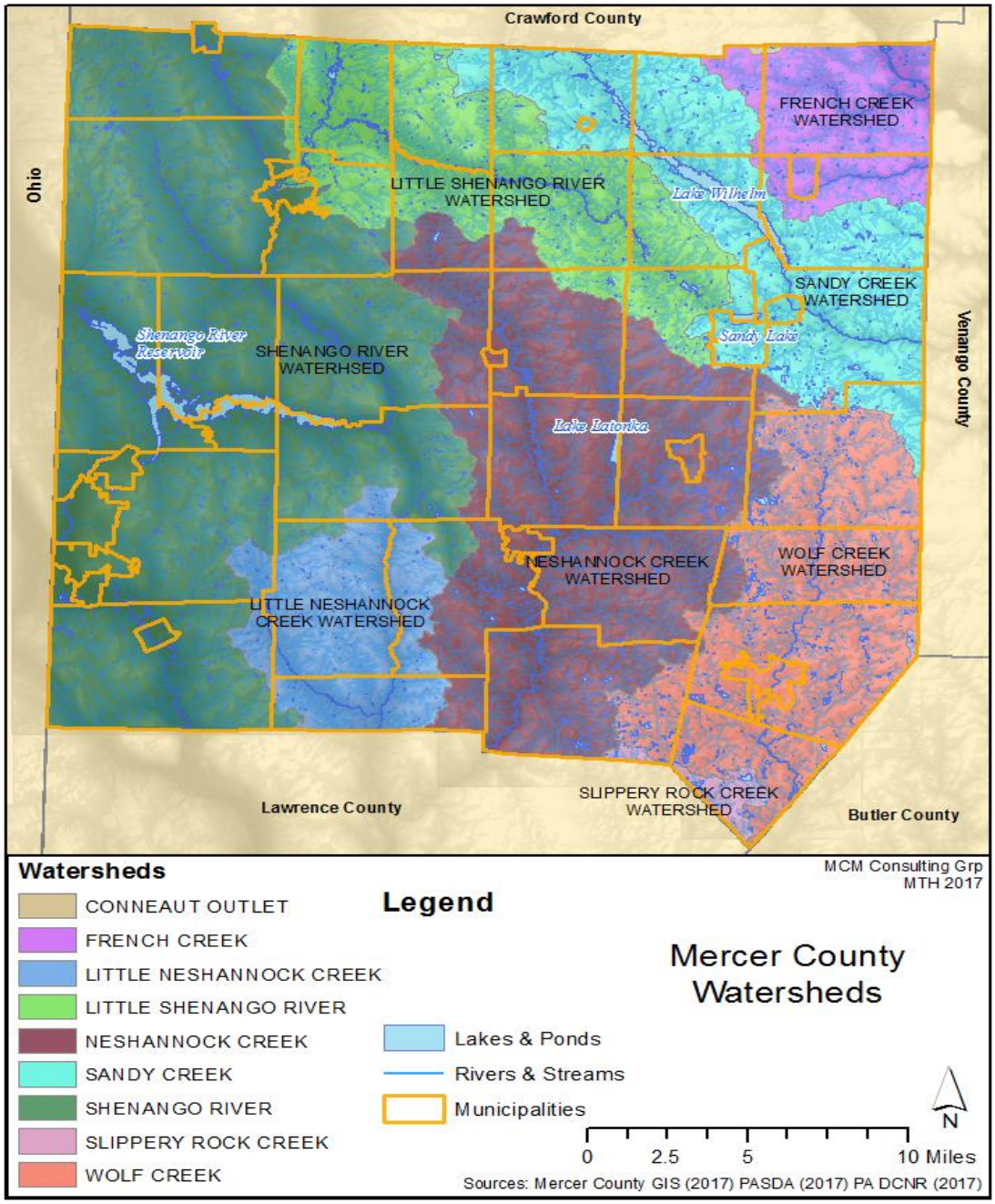


Figure 6 - Hydrologic Features



3. Planning Process

3.1. Update Process and Participation Summary

The Mercer County Hazard Mitigation Plan update began March 13, 2017. The Mercer County Commissioners were able to secure a hazard mitigation grant to start the process. The Mercer County Department of Public Safety was identified as the lead agency for the Mercer County Hazard Mitigation Plan update. The planning process involved a variety of key decision makers and stakeholders within Mercer County. Mercer County immediately determined that the utilization of a contracted consulting agency would be necessary to assist with the plan update process. MCM Consulting Group, Inc. was selected as the contracted consulting agency to complete the update of the hazard mitigation plan. The core hazard mitigation team, which was referred to as the steering committee, included officials from the Mercer County Planning Department, Mercer County Department of Public Safety and MCM Consulting Group, Inc. (MCM).

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

MCM Consulting Group, Inc. assisted the Mercer County Department of Public Safety in coordinating and leading public involvement meetings, local planning team meetings, analysis and the writing of the HMP. The Mercer County Local Planning Team worked closely with MCM in the writing and review of the HMP. MCM conducted project meetings and local planning team meetings throughout the process. Meeting agendas, meeting minutes and sign in sheets were developed and maintained for each meeting conducted by MCM. These documents are detailed in Appendix C of this plan.

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

The HMP planning process consisted of:

- Applying for and receiving a hazard mitigation grant to fund the planning project.
- Announcing the initiative via press releases and postings on the county website.
- Involving elected and appointed county and municipal officials in a series of meetings, training sessions and workshops.
- Identifying capabilities and reviewed the information with the municipalities.
- Identifying hazards.
- Assessment of risk and analyzing vulnerabilities.

- Identifying mitigation strategies, goals and objectives.
- Developing an implementation plan.
- Announcing completion via press releases and postings on the county website.
- Plan adoption at a public meeting of the Mercer County Board of Commissioners.
- Plan submission to FEMA and PEMA.

The 2018 Mercer County HMP was completed September 20, 2017. The 2018 plan follows an outline developed by PEMA which provides a standardized format for all local HMPs in the Commonwealth of Pennsylvania. The 2018 HMP format is consistent with the PEMA recommended format. The 2018 Mercer County HMP has additional hazard profiles that were added to the HMP and these additional profiles increased the subsections in section 4.3 of the HMP.

3.2. The Planning Team

The 2018 Mercer County Hazard Mitigation Plan update was led by the Mercer County Steering Committee. The Mercer County Steering Committee provided guidance and leadership for the overall project. The steering committee assisted MCM Consulting Group, Inc. with dissemination of information and administrative tasks. *Table 3 - Project Team* outlines the individuals that comprised this team.

Table 3 - Project Team

Mercer County Hazard Mitigation Plan Update Project Team		
Name	**Organization**	**Position**
Frank Jannetti	Mercer County Department of Public Safety	Director
John Nicklin	Mercer County Department of Public Safety	Deputy Director
Debbie Hartley	Mercer County Department of Public Safety	Administrative Assistant
Dan Gracenin	Mercer County Planning Department	Director
Michael T. Rearick	MCM Consulting Group, Inc.	Project Manager
Robert Anderson	MCM Consulting Group, Inc.	Planner

In order to represent the county, the Mercer County Steering Committee developed a diversified list of potential Local Planning Team (LPT) members. Members that participated in the 2012 hazard mitigation plan were highly encouraged to join the 2018 team. The steering committee then provided invitations to the prospective members and provided a description of duties to serve on the LPT. The following agencies, departments and organizations were invited to participate in the LPT: Mercer County Commissioners, Mercer County Planning Department, DCNR Bureau of Parks, DCNR Bureau of Forestry, PennDOT, Pennsylvania State Police, Mercer County Conservation District, Pennsylvania Department of Agriculture and all forty-eight municipalities. The invitations for membership of the LPT were disseminated by the Mercer County Department of Public Safety utilizing letters, emails and telephone calls. The LPT worked throughout the process to plan and hold meetings, collect information and conduct public outreach.

The stakeholders listed in *Table 4 - Local Planning Team* served on the 2018 Mercer County Hazard Mitigation Local Planning Team, actively participated in the planning process by attending meetings, completing assessments, surveys and worksheets and/or submitting comments.

Table 4 - Local Planning Team

Mercer County Hazard Mitigation Plan Update Local Planning Team		
Name	**Organization**	**Position**
Jon Laird	City of Farrell	Elected or Appointed Official
Gary Hinkson	City of Hermitage	Elected or Appointed Official
William J. Moder III	City of Hermitage	Elected or Appointed Official
Walter Darraugh	Coolspring Township	Elected or Appointed Official
Terri Liyo	Coolspring Township	Elected or Appointed Official
Pat Campbell	Deer Creek Township	Elected or Appointed Official
Erik A. Dickson	Delaware Township	Elected or Appointed Official
James E. Ammer	East Lackwannock Township	Elected or Appointed Official
Jim Rust	East Lackawannock Township	Elected or Appointed Official
Andrew Tomson	Findley Township	Elected or Appointed Official
Sherian Biggs	French Creek Township	Elected or Appointed Official
Ralph R. Dean	French Creek Township	Elected or Appointed Official
Tim Hartman	French Creek Township	Elected or Appointed Official
Paulette Young	French Creek Township	Elected or Appointed Official
Paul Csonka	Greene Township	Elected or Appointed Official
Donna Kean	Greene Township	Elected or Appointed Official
Brian D. Mazzanti	Greenville Borough	Elected or Appointed Official
Jason Urey	Greenville Borough	Elected or Appointed Official
Vance Oaks	Grove City Borough	Elected or Appointed Official
Gary Hittle	Hempfield Township	Elected or Appointed Official
Todd Hittle	Hempfield Township	Elected or Appointed Official
Dick Baur	Jackson Township	Elected or Appointed Official
Linda Baur	Jackson Township	Elected or Appointed Official
Richard Baur	Jackson Township	Elected or Appointed Official
John K.Cutlpica	Jackson Center Borough	Elected or Appointed Official
Annamarie Geiwitz	Jamestown Township	Elected or Appointed Official
Garth Falknel	Jefferson Township	Elected or Appointed Official
Terry Whalen	Lackawannock Township	Elected or Appointed Official
Deanna Yarnell	Lake Township	Elected or Appointed Official
Brenda Heck	Liberty Township	Elected or Appointed Official
Caroline DaCosta	Mercer Borough	Elected or Appointed Official
John Johnson	Mercer Borough	Elected or Appointed Official
Ross Vernon	Mercer Borough	Elected or Appointed Official
Jay Russell	Mercer County Construction	Private Sector
Lorraine Roberts	Mill Creek Township	Elected or Appointed Official
Teresa Chisholm	New Lebanon Township	Elected or Appointed Official
Carl L Swartz	Otter Creek Township	Elected or Appointed Official
Paulette Young	Otter Creek Township	Elected or Appointed Official

Mercer County Hazard Mitigation Plan Update Local Planning Team		
Name	**Organization**	**Position**
David Myers	PA Department of Agriculture	Director
CPI Mark Hoehn	PA State Police Mercer	Corporal
Darrell Chapman	Penn Dot	Director
Dale Elder	Perry Township	Elected or Appointed Official
Gary King	Perry Township	Elected or Appointed Official
Lloyd L. McGowan	Perry Township	Elected or Appointed Official
Joe Holmes	Pine Township	Elected or Appointed Official
Cheri DiGregorio	Pymatuning Township	Elected or Appointed Official
Michael Dunierueu	Pymatuning Township	Elected or Appointed Official
Edward Robinson	Pymatuning Township	Elected or Appointed Official
Joni Maybee	Salem Township	Elected or Appointed Official
John McCurdy	Salem Township	Elected or Appointed Official
Lloyd L. McGowan	Sandy Creek Township	Elected or Appointed Official
Doug Greenfield	Sandy Lake Township	Elected or Appointed Official
Roni Shillings	Sandy Lake Borough	Elected or Appointed Official
Dennis Winger	Sandy Lake Borough	Elected or Appointed Official
Robert Fisher	City of Sharon	Elected or Appointed Official
Thomas Lally	Sharpsville Borough	Elected or Appointed Official
Tom Lally	Sharpsville Borough	Elected or Appointed Official
Ken Robertson	Sharpsville Township	Elected or Appointed Official
Neil Stallsmith	Sheakleyville Borough	Elected or Appointed Official
Lynnett Beck	Shenango Township	Elected or Appointed Official
Michaelene Harris	South Pymatuning Township	Elected or Appointed Official
David L. Swartz	Springfield Township	Elected or Appointed Official
Laurie McLallen	Stoneboro Borough	Elected or Appointed Official
Kara Michaleski	Sugar Grove Township	Elected or Appointed Official
David L. Carlson	Sugar Grove Township	Elected or Appointed Official
Ron Preston	Westmiddlesex Borough	Elected or Appointed Official
Tanya S. Jackson	West Salem Township	Elected or Appointed Official
William Wingard	West Salem Township	Elected or Appointed Official
Greg Chiappini	Wolf Creek Township	Elected or Appointed Official
Gary Diday	Worth Township	Elected or Appointed Official
Dale Furey	Worth Township	Elected or Appointed Official
Cindy Black	Wilmington Township	Elected or Appointed Official
Dick Wilson	Wilmington Township	Elected or Appointed Official
Kelly Fenton	West Salem Township	Elected or Appointed Official
Terry Thompson	West Salem Township	Elected or Appointed Official

3.3. Meetings and Documentation

Monthly public meetings with local elected officials and the local planning team were held. At each of the public meetings, municipal officials were strongly encouraged to submit hazard mitigation project opportunity forms, complete their respective portions

of the capability assessment and review and eventually adopt the multi-jurisdictional HMP. *Table 5 - HMP Process Timeline* lists the meetings held during the HMP planning process, which organizations and municipalities attended and the topic that was discussed at each meeting. All meeting agendas, sign-in sheets, presentation slides, any other documentation is located in Appendix C.

A final public meeting was held on September 20, 2017 to present the draft plan and invite public comments. The meeting was advertised in the local newspaper and also made available digitally on the Mercer County web site at: www.MCC.Mercer.pa.us/DPS The Mercer County website was used to make a digital copy of the draft hazard mitigation plan available.

The public comment period remained open until October 20, 2017. All public comments were submitted in writing to Frank Jannetti, Director of Public Safety at the Mercer County Department of Public Safety. All public comments have been included in this plan in Appendix C.

Table 5 - HMP Process Timeline

Mercer County HMP Process - Timeline		
Date	**Meeting**	**Description**
03/13/2017	Mercer County Hazard Mitigation Plan (HMP) Kick-Off Meeting	Identified challenges and opportunities as they relate to fulfilling the DMA 2000 requirements. Identified existing studies and information sources relevant to the Hazard Mitigation Plan. Identified stakeholders, including the need to involve local officials.
04/12/2017	Local Planning Team Initial Meeting	Defined hazard mitigation planning and identified roles and responsibilities. Discussed the 2011 hazard mitigation plan and defined a timeline to complete the update.
07/20/2017	Public Meeting	Conducted a public meeting to review the draft risk assessment section of the Mercer County Hazard Mitigation Plan update.
07/25/2017 – 08/01/2017	Meeting with Municipal Officials	Educated county and local elected officials on the hazard mitigation planning process. Presented the findings of the hazard vulnerability analysis and risk assessment. Sought input for mitigation projects throughout the county. Distributed Hazard Mitigation Project Opportunity Forms.
09/20/2017	Mercer County Hazard Mitigation Plan – Draft Plan Review Public Meeting	An update of the hazard mitigation planning process was delivered. The Draft HMP was reviewed with the municipal representatives and public. Attendees were informed about the timeline and their opportunity to review the entire draft plan and provide written comments for inclusion into the plan.

3.4. Public and Stakeholder Participation

Mercer County engaged numerous stakeholders and encouraged public participation during the HMP update process. Advertisements for public meetings were completed utilizing the local newspaper and the Mercer County website. Copies of those advertisements are located in Appendix C. Municipalities and other county entities were invited to participate in various meetings and encouraged to review and update various worksheets and surveys. Copies of all meeting agendas, meeting minutes and sign-in sheets are located in Appendix C. Worksheets and surveys completed by the municipalities and

other stakeholders are located in appendices of this plan update as well. Municipalities were also encouraged to review hazard mitigation related items with other constituents located in the municipality like businesses, academia, private and nonprofit interests.

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

1. **Risk Assessment Hazard Identification and Risk Evaluation Worksheet:** Capitalizes on local knowledge to evaluate the change in the frequency of occurrence, magnitude of impact and/or geographic extent of existing hazards and allows communities to evaluate hazards not previously profiled using the Pennsylvania Standard List of Hazards.
2. **Capability Assessment Survey:** Collects information on local planning, regulatory, administrative, technical, fiscal and political capabilities that can be included in the countywide mitigation strategy.
3. **Municipal Project Opportunity Forms and Mitigation Actions:** Copies of the 2012 mitigation actions that were included in the current HMP were provided to the municipalities for review and amendment. The previous mitigation actions were provided and reviewed at update meetings. New 2018 municipal project opportunity forms are included as well, located in Appendix G**.**

A schedule that provided appropriate opportunities for public comment was utilized during the review and drafting process. Any public comment that was received during public meetings or during the draft review of the plan were documented and included in the plan. Copies of newspaper public meeting notices, website posted public notices and other correspondence are included in Appendix C of this plan.

Mercer County invited all contiguous counties to review the 2018 draft hazard mitigation plan. A letter was sent to the emergency management coordinator in Butler County, Crawford County, Erie County, Lawrence County and Venango County on September 20, 2017. Copies of these letters are included in Appendix C.

3.5. Multi-Jurisdictional Planning

Mercer County used an open, public process to prepare this HMP. Meetings and letters to municipal officials were conducted to inform and educate them about hazard mitigation planning and its local requirements. Municipal officials provided information related to existing codes and ordinances, the risks and impacts of known hazards on local infrastructure and critical facilities and recommendations for related mitigation opportunities. The pinnacle to the municipal involvement process was the adoption of the final plan. *Table 6 - Worksheets, Surveys and Forms Participation* reflects the municipality participation by completing worksheets, surveys and forms.

Table 6 - Worksheets, Surveys and Forms Participation

Municipality Participation in Worksheets, Surveys and Forms			
Municipality	**Capability Assessment Survey**	**Risk Assessment Hazard Identification and Risk Evaluation Worksheet**	**Hazard Mitigation Opportunity Form Review and Updates**
City of Farrell	X	X	X
City of Hermitage	X	X	X
City of Sharon	X	X	
Clark Borough	X	X	
Coolspring Twp.	X	X	None
Deer Creek Twp.	X	X	
Delaware Twp.	X	X	X
East Lackawannock Twp.	X	X	
Fairview Twp.	X	X	None
Findley Twp.	X	X	None
Fredonia Borough	X	X	X
French Creek Twp.	X	X	X
Greene Twp.	X	X	X
Greenville Borough	X	X	X
Grove City Borough	X	X	X
Hempfield Twp.	X	X	X
Jackson Center Borough	X	X	X
Jackson Twp.	X	X	
Jamestown Borough	X	X	
Jefferson Twp.	X	X	
Lackawannock Twp.	X	X	None
Lake Twp.	X	X	X
Liberty Twp.	X	X	None
Mercer Borough	X	X	X
Mill Creek Twp.	X	X	None
New Lebanon Borough	X	X	X
New Vernon Twp.	X	X	
Otter Creek Twp.	X	X	X
Perry Twp.	X	X	X
Pine Twp.	X	X	None
Pymatuning Twp.	X	X	X
Salem Twp.	X	X	X
Sandy Creek Twp.	X	X	X
Sandy Lake Borough	X	X	
Sandy Lake Twp.	X	X	None
Sharpsville Borough	X	X	X
Sheakleyville Borough	X	X	
Shenango Twp.	X	X	X
South Pymatuning Twp.	X	X	X
Springfield Twp.	X	X	X
Stoneboro Borough	X	X	X
Sugar Grove Twp.	X	X	X

Municipality Participation in Worksheets, Surveys and Forms			
Municipality	**Capability Assessment Survey**	**Risk Assessment Hazard Identification and Risk Evaluation Worksheet**	**Hazard Mitigation Opportunity Form Review and Updates**
West Middlesex Borough	**X**	**X**	**X**
West Salem Twp.	**X**	**X**	**None**
Wheatland Borough	**X**	**X**	
Wilmington Twp.	**X**	**X**	**X**
Wolf Creek Twp.	**X**	**X**	**X**
Worth Twp.	**X**	**X**	**X**

Most municipalities within Mercer County have adopted the 2012 Mercer County Hazard Mitigation Plan as the municipal hazard mitigation plan. The Mercer County Local Planning Team goal is to have 100% participation by municipalities in adopting the 2018 Mercer County Hazard Mitigation Plan.

4. Risk Assessment

4.1. Update Process Summary

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

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

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

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

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

The Mercer County Local Planning Team reviewed and assessed the change in risk for all natural and human-caused hazards identified in the 2012 hazard mitigation plan. The mitigation local planning team then identified hazards that were outlined within the Pennsylvania Hazard Mitigation Plan but not included in the 2012 Mercer County Hazard Mitigation Plan that could impact Mercer County. The team utilized the hazard identification and risk evaluation worksheet that was provided by the Pennsylvania Emergency Management Agency to complete these tasks.

The Mercer County Steering Committee met with municipalities and provided guidance on how to complete the municipal hazard identification and risk evaluation worksheets. Forty-eight municipalities returned a completed hazard identification worksheet. This

information was combined with the county information to develop an overall list of hazards that would need to be profiled.

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

4.2. Hazard Identification

4.2.1. Presidential and Gubernatorial Disaster Declarations

Table 7 - Presidential & Gubernatorial Disaster Declarations presents a list of all Presidential and Governor's Disaster Declarations that have affected Mercer County from 1972 through 2017, according to the Pennsylvania Emergency Management Agency.

Table 7 - Presidential & Gubernatorial Disaster Declarations

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
June, 1972	Flood (Agnes)	Presidential Disaster Declaration
June 1981	Severe Storms and Flooding	Presidential Declaration
March, 1993	Blizzard	Presidential Emergency Declaration
January, 1994	Severe winter storms	Presidential Disaster Declaration
January, 1996	Flooding	Presidential Disaster Declaration
July, 1996	Flooding	Presidential Disaster Declaration
July, 1999	Drought	Gubernatorial Declaration
September, 1999	Hurricane Floyd	Presidential Disaster Declaration
August 2003	High Winds and Heavy Rain	Gubernatorial Declaration
September, 2003	Hurricane Isabel/Henri	Presidential Disaster Declaration
September, 2005	Hurricane Katrina – to render mutual aid and to receive and house evacuees	Presidential Emergency Declaration
September, 2005	Hurricane Katrina	Gubernatorial Proclamation of Emergency. All 67 Counties
September, 2006	Tropical depression Ernesto	Gubernatorial Proclamation of Emergency. All 67 Counties
February, 2007	Severe winter storm	Gubernatorial Proclamation of Emergency. All 67 Counties
April, 2007	Severe storm	Gubernatorial Proclamation of Emergency. All 67 Counties

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
January, 2011	Severe winter storm	Gubernatorial Proclamation of Emergency. All 67 Counties
August, 2011	Tropical Storm Irene and Lee	Gubernatorial Proclamation of Emergency. All 67 Counties
April, 2012	Spring winter storms	Gubernatorial Proclamation of Emergency. All 67 Counties
October,2012	Hurricane Sandy	Presidential Emergency Declaration
October, 2012	Hurricane Sandy	Gubernatorial Proclamation of Emergency
June, 2013	High Winds, Thunderstorms, Heavy Rain, Tornado and Flooding	Gubernatorial Proclamation of Emergency. All 67 Counties

Source: Pennsylvania Emergency Management Agency and Federal Emergency Management Agency

4.2.2. Summary of Hazards

The Mercer County Local Planning Team (LPT) was provided the Pennsylvania Standard List of Hazards to be considered for evaluation in the 2018 HMP Update. Following a review of the hazards considered in the 2018 HMP and the standard list of hazards, the local planning team decided that the 2018 plan should identify, profile and analyze fifteen (15) hazards. These hazards include all of the hazards profiled in the 2012 Mercer County Hazard Mitigation Plan. The list below contains a description of the hazards that have the potential to impact Mercer County as identified through previous risk assessments, the Mercer County Hazards Vulnerability Analysis and input from those that participated in the 2018 HMP update. Hazard profiles are included in Section 4.3 for each of these hazards.

Identified Natural Hazards

Drought

Drought is a natural climatic condition which occurs in virtually all climates, the consequence of a natural reduction in the amount of precipitation experienced over a long period of time, usually a season or more in length. High temperatures, prolonged winds and low relative humidity can exacerbate the severity of drought. This hazard is of particular concern in Pennsylvania due to the presence of farms as well as water-dependent industries and recreation areas across the Commonwealth. A prolonged drought could severely impact these sectors of the local economy, as well as residents who depend on wells for drinking water and other personal uses. (National Drought Mitigation Center, 2006).

Earthquake

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10-20 miles of the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of underground caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons and disrupt the social and economic functioning of the affected area. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking which is dependent upon amplitude and duration of the earthquake. (FEMA, 1997).

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.

Hurricanes and Tropical Storms

Hurricanes, tropical storms and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counterclockwise (in the Northern Hemisphere) and whose diameter averages 10-30 miles across. 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 and tornados. Areas in southeastern Pennsylvania could be susceptible to storm surge and tidal flooding. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea and Gulf of Mexico during the official Atlantic hurricane season (June through November). (FEMA, 1997).

Invasive Species

An invasive species is a species that is not indigenous to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. These species can be any type of organism: plant, fish,

invertebrate, mammal, bird, disease, or pathogen. Infestations may not necessarily impact human health, but can create a nuisance or agricultural hardships by destroying crops, defoliating populations of native plant and tree species, or interfering with ecological systems (Governor's Invasive Species Council of Pennsylvania, 2009).

Landslide

A landslide is the downward and outward movement of slope-forming soil, rock and vegetation reacting to the force of gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes and changes in groundwater levels. Mudflows, mudslides, rock falls, rockslides and rock topples are all forms of a landslide. Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, developed hillsides and areas recently burned by forest and brush fires. (Delano & Wilshusen, 2001).

Pandemic, Epidemic and Infectious Diseases

A pandemic occurs when infection from of a new strain of a certain disease, to which most humans have no immunity, substantially exceeds the number of expected cases over a given period of time. Such a disease may or may not be transferable between humans and animals. (Martin & Martin-Granel, 2006).

Subsidence, Sinkhole

Subsidence is a natural geologic process that commonly occurs in areas with underlying limestone bedrock and other rock types that are soluble in water. Water passing through naturally occurring fractures dissolves these materials leaving underground voids. Eventually, overburden on top of the voids causes a collapse which can damage structures with low strain tolerances. This collapse can take place slowly over time or quickly in a single event, but in either case. Karst topography describes a landscape that contains characteristic structures such as sinkholes, linear depressions, and caves. In addition to natural processes, human activity such as water, natural gas, and oil extraction can cause subsidence and sinkhole formations. (FEMA, 1997).

Tornado, Wind Storm

A wind storm can occur during severe thunderstorms, winter storms, coastal storms, or tornados. Straight-line winds such as a downburst have the potential to cause wind gusts that exceed 100 miles per hour. Based on 40 years of tornado history and over 100 years of hurricane history, FEMA identifies western and central Pennsylvania as being more susceptible to higher winds than eastern Pennsylvania. (FEMA, 1997). A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornados are most often generated by thunderstorm activity (but sometimes result from hurricanes or tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of high wind velocities and wind-blown debris. According to the National Weather Service, tornado wind speeds can range between 30 to more than 300 miles per hour. They are more likely to occur during the spring and early

summer months of March through June and are most likely to form in the late afternoon and early evening. Most tornados are a few dozen yards wide and touch down briefly, but even small, short-lived tornados can inflict tremendous damage. Destruction ranges from minor to catastrophic depending on the intensity, size and duration of the storm. Structures made of light materials such as mobile homes are most susceptible to damage. Waterspouts are weak tornados that form over warm water and are relatively uncommon in Pennsylvania. Each year, an average of over 800 tornados is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 2002). Based on NOAA Storm Prediction Center Statistics, the number of recorded F3, F4, & F5 tornados between 1950-1998 ranges from <1 to 15 per 3,700 square mile area across Pennsylvania (FEMA, 2009). A water spout is a tornado over a body of water (American Meteorological Society, 2009).

Winter Storm

Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. A winter storm can range from a moderate snowfall or ice event over a period of a few hours to blizzard conditions with wind-driven snow that lasts for several days. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely impair visibility and disrupt transportation. The Commonwealth of Pennsylvania has a long history of severe winter weather. (NOAA, 2009).

Identified Manmade Hazards

Civil Disturbance

Civil disturbance hazards encompass a set of hazards emanating from a wide range of possible events that cause civil disorder, confusion, strife and economic hardship. Civil disturbance hazards include the following:

- Famine; involving a widespread scarcity of food leading to malnutrition and increased mortality (Robson, 1981).
- Economic Collapse, Recession; Very slow or negative growth, for example (Economist, 2009).
- Misinformation; erroneous information spread unintentionally (Makkai, 1970).
- Civil Disturbance, Public Unrest, Mass Hysteria, Riot; group acts of violence against property and individuals, for example (18 U.S.C. § 232, 2008).
- Strike, Labor Dispute; controversies related to the terms and conditions of employment, for example (29 U.S.C. § 113, 2008).

Dam Failure

A dam is a barrier across flowing water that obstructs, directs, or slows down water flow. Dams provide benefits such as flood protection, power generation, drinking water, irrigation and recreation. Failure of these structures results in an uncontrolled release of impounded water. Failures are relatively rare, but immense damage and loss of life is possible in downstream communities when such events occur. Aging infrastructure, hydrologic, hydraulic and geologic characteristics, population growth and design and

maintenance practices should be considered when assessing dam failure hazards. The failure of the South Fork Dam, located in Johnstown, Pennsylvania, was the deadliest dam failure ever experienced in the United States. It took place in 1889 and resulted in the Johnstown Flood which claimed 2,209 lives (FEMA, 1997). Today there are approximately 3,200 dams and reservoirs throughout Pennsylvania (Pennsylvania Department of Environmental Protection, 2009).

Hazardous Materials and Environmental Hazards

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

- Hazardous material releases; at fixed facilities or as such materials are in transit and including toxic chemicals, infectious substances, biohazardous waste and any materials that are explosive, corrosive, flammable, or radioactive (PL 1990-165, § 207(e)).
- Air or Water Pollution; the release of harmful chemical and waste materials into water bodies or the atmosphere, for example (National Institute of Health Sciences, July 2009; Environmental Protection Agency, Natural Disaster PSAs, 2009).
- Superfund Facilities; hazards originating from abandoned hazardous waste sites listed on the National Priorities List (Environmental Protection Agency, National Priorities List, 2009).
- Manure Spills; involving the release of stored or transported agricultural waste, for example (Environmental Protection Agency, Environmental Impacts of…, 1998).
- Product Defect or Contamination; highly flammable or otherwise unsafe consumer products and dangerous foods (Consumer Product Safety Commission, 2003).

Nuclear Incidents

Nuclear accidents generally refer to events involving the release of significant levels of radioactivity or exposure of workers or the general public to radiation (FEMA, 1997). Nuclear accidents/incidents can be placed into three categories: 1) Criticality accidents which involve loss of control of nuclear assemblies or power reactors, 2) Loss-of-coolant accidents which result whenever a reactor coolant system experiences a break or opening large enough so that the coolant inventory in the system cannot be maintained by the normally operating make-up system, and 3) Loss-of-containment accidents which involve the release of radioactivity. The primary concern following such an incident or accident is the extent of radiation, inhalation, and ingestion of radioactive isotopes which can cause acute health effects (e.g. death, burns, severe impairment), chronic health effects (e.g. cancer), and psychological effects. (FEMA, 1997).

Terrorism

Terrorism is use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber-attacks (computer-based); and the use of chemical, biological, nuclear and radiological weapons. (FEMA, 2009).

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. (Research and Innovative Technology Administration, 2009). Traffic congestion in certain circumstances can also be hazardous. Traffic congestion is a condition that occurs when traffic demand approaches or exceeds the available capacity of the road network. This hazard should be carefully evaluated during emergency planning since it is a key factor in timely disaster or hazard response, especially in areas with high population density. (Federal Highway Administration, 2009).

Urban Fire and Explosion

An urban fire involves a structure or property within an urban or developed area. For hazard mitigation purposes, major urban fires involving large buildings and/or multiple properties are of primary concern. The effects of a major urban fire include minor to significant property damage, loss of life, and residential or business displacement. Explosions are extremely rapid releases of energy that usually generate high temperatures and often lead to fires. The risk of severe explosions can be reduced through careful management of flammable and explosive hazardous materials. (FEMA, 1997).

Energy Emergencies and Utility Interruptions

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

- Geomagnetic Storms; including temporary disturbances of the Earth's magnetic field resulting in disruptions of communication, navigation and satellite systems (National Research Council et al., 1986).
- Fuel or Resource Shortage; resulting from supply chain breaks or secondary to other hazard events, for example (Mercer County, PA, 2005).
- Electromagnetic Pulse; originating from an explosion or fluctuating magnetic field and causing damaging current surges in electrical and electronic systems (Institute for Telecommunications Sciences, 1996).
- Information Technology Failure; due to software bugs, viruses, or improper use (Rainer Jr., et al, 1991).
- Ancillary Support Equipment; electrical generating, transmission, system-control and distribution-system equipment for the energy industry (Hirst & Kirby, 1996).

- Public Works Failure; damage to or failure of highways, flood control systems, deep-water ports and harbors, public buildings, bridges, dams, for example (United States Senate Committee on Environment and Public Works, 2009).
- Telecommunications System Failure; Damage to data transfer, communications and processing equipment, for example (FEMA, 1997)
- Transmission Facility or Linear Utility Accident; liquefied natural gas leakages, explosions, facility problems, for example (United States Department of Energy, 2005)
- Major Energy, Power, Utility Failure; interruptions of generation and distribution, power outages, for example (United States Department of Energy, 2000).

4.2.3. Climate Change

Impacts of Climate Change on Identified Hazards

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

The most obvious change is in regard to extreme temperatures. As average atmospheric temperatures rise, extreme high temperatures become more threatening, with record high temperatures outnumbering record low temperatures 2:1 in recent years (Meehl et al., 2009). As climate change intensifies, it is expected that the risk of extreme heat will be amplified whereas the risk of extreme cold will be attenuated. Less immediately apparent, climate change could increase the prevalence of the West Nile Virus (Section 4.3.7). Some studies show increased insect activities during a similar rapid warming event in Earth's history (Curano et al., 2008). Other studies make projections that with the warming temperatures and lower annual precipitation that are expected with climate change, there will be an expansion of the suitable climate for mosquitos and West Nile Virus, potentially increasing the risk that the disease poses (Harrigan et al., 2014).

Climate change is likely to increase the risk of droughts (Section 4.3.1). Higher average temperatures mean that more precipitation will fall as rain rather than snow, snow will melt earlier in the spring, and evaporation and transpiration will increase. Along with the prospect of decreased annual precipitation, the risk of hydrological and agricultural drought is expected to increase (Sheffield & Wood, 2008). Correspondingly this will impact wildfires (Section 4.3.11). Drought is accompanied by drier soils and forests, resulting in an elongated wildfire season and more intense and long-burning wildfires (Pechony & Shindell, 2010). However, the Southwest United States is at a greater risk

of this increased drought and wildfire activity than Mercer County in the Eastern United States.

While it may seem counterintuitive considering the increased risk of drought, there is also an increased risk of flooding associated with climate change (Section 4.3.3). As previously mentioned, warmer temperatures mean more precipitation will fall as rain rather than snow. Combined with the fact that warmer air holds more moisture, the result is heavier and more intense rainfalls, increasing the risk of flooding and dam and levee failures. Similarly, winter storms are expected to become more intense, if possibly less frequent (Section 4.3.12). Climate change is also expected to result in more intense hurricanes and tropical storms (Section 4.3.4). With the rise of atmospheric temperatures, ocean surface temperatures are rising, resulting in warmer and moister conditions where tropical storms develop (Stott et al., 2010). A warmer ocean stores more energy, and is capable of fueling stronger storms. It is projected that the Atlantic hurricane season is elongating, and there will be more category 4 and 5 hurricanes than before (Trenberth, 2010).

Climate change is contributing to the introduction of new invasive species (Section 4.3.5). As maximum and minimum seasonal temperatures change, non-native species are able to establish themselves in previously inhospitable climates where they have a competitive advantage. This may shift the dominance of ecosystems in the favor of non-native species, contributing to species loss and the risk of extinction.

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

4.3. Hazard Profiles

4.3.1. Drought

4.3.1.1 Location and Extent

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

There are three types of drought:

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

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

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

4.3.1.2 Range of Magnitude

The Commonwealth uses five parameters to assess drought conditions:

- Stream flows (compared to benchmark records).
- Precipitation (measured as the departure from normal, thirty year average precipitation).
- Reservoir storage levels in a variety of locations.
- Groundwater elevations in a number of counties (comparing to past month, past year and historic record).
- Soil moisture via the Palmer Drought Index (See *Table 8 - Palmer Drought Severity Index*) - a soil moisture algorithm calibrated for relatively homogeneous regions which measures dryness based on recent precipitation and temperature.

Table 8 - Palmer Drought Severity Index

Severity Category	PDSI
Extremely wet	4.0 or more
Very wet	3.0 to 3.99
Moderately wet	2.0 to 2.99
Slightly wet	1.0 to 1.99
Incipient wet spell	0.5 to 0.99
Near normal	0.49 to -0.49
Incipient dry spell	-0.5 to -0.99
Mild drought	-1.0 to -1.99
Moderate drought	-2.0 to -2.99
Severe drought	-3.0 to -3.99
Extreme drought	-4.0 or less

Table 9 - Drought Preparation Phases (PA DEP)

Phase	General Activity	Actions	Request	Goal
Drought Watch	Early stages of planning and alert for drought possibility	Increased water monitoring, awareness and preparation for response among government agencies, public water suppliers, water users and the public	Voluntary water conservation	Reduce water use by 5%

Phase	General Activity	Actions	Request	Goal
Drought Warning	Coordinate a response to imminent drought conditions and potential water shortages	Reduce shortages - relieve stressed sources, develop new sources if needed	Continue voluntary water conservation, impose mandatory water use restrictions if needed	Reduce water use by 10-15%
Drought Emergency	Management of operations to regulate all available resources and respond to emergency	Support essential and high priority water uses and avoid unnecessary uses	Possible restrictions on all nonessential water uses	Reduce water use by 15%

Local Water Rationing: With the approval of the PA Emergency Management Council, local municipalities may 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 4 PA 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. [PEMA, 409 Plan]

4.3.1.3 Past Occurrence

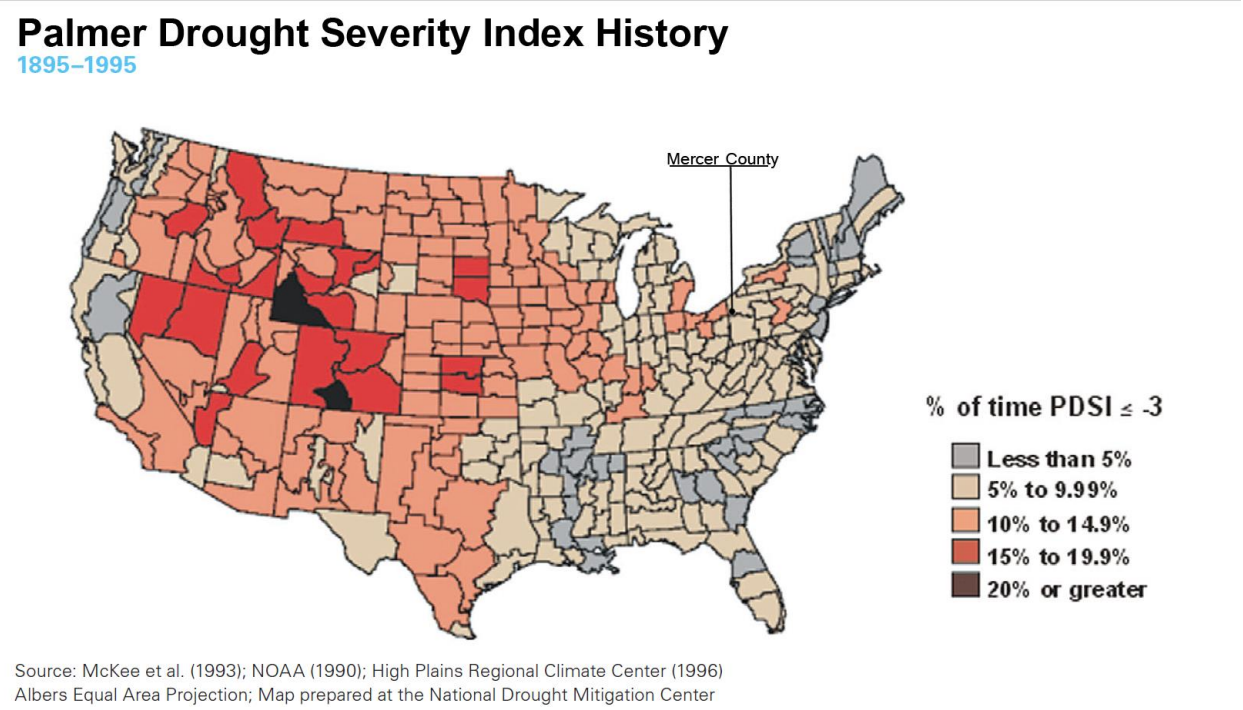
Table 10 - Drought Event History for Mercer County (PA DEP 2017) shows declared drought status for Mercer County from 1980 to 2016 as reported by the Pennsylvania Department of Environmental Protection (PA DEP) and the table also includes past disaster declarations impacting Mercer County due to drought events. *Figure 7 - Palmer Drought Severity Index History* (NOAA, 2016)shows that Mercer County has experienced severe drought (PDSI ≤ -3) between five and ten percent of the time from 1895-1995, which gives a good idea of how often Mercer County has been affected by drought events.

Table 10 - Drought Event History for Mercer County (PA DEP 2017)

Start Date	End Date	Drought Status	Event Duration
7/7/1988	8/24/1988	Watch	5 months, 6 days
8/24/1988	12/12/1988	Warning	
3/3/1989	5/15/1989	Watch	2 months, 12 days
6/28/1991	7/24/1991	Watch	1 year, 2 months, 14 days
7/24/1991	8/16/1991	Warning	
8/16/1991	4/20/1992	Emergency	
4/20/1992	9/11/1992	Warning	
9/1/1995	12/18/1995	Watch	3 months, 17 days
12/3/1998	12/14/1998	Watch	1 year, 5 months, 1 day
12/14/1998	3/15/1999	Warning	

Start Date	End Date	Drought Status	Event Duration
3/15/1999	9/30/1999	Watch	
9/30/1999	2/25/2000	Warning**	
2/25/2000	5/5/2000	Watch	
8/24/2001	5/13/2002	Watch	8 months, 18 days
9/5/2002	6/18/2003	Watch	9 months, 12 days
4/11/2006	6/30/2006	Watch	2 months, 19 days
8/6/2007	9/5/2007	Watch	30 days
10/5/2007	1/11/2008	Watch	3 months, 7 days
11/7/2008	1/26/2009	Watch	2 months, 19 days
9/16/2010	11/10/2010	Warning	3 months, 1 day
11/10/2010	12/17/2010	Watch	
8/5/2011	9/2/2011	Watch	28 days
7/19/2012	8/31/2012	Watch	1 months, 13 days
3/24/2015	7/10/2015	Watch	3 months, 17 days
8/10/2016	11/9/2016	Watch	2 months, 30 days
**Gubernatorial Disaster Declaration			

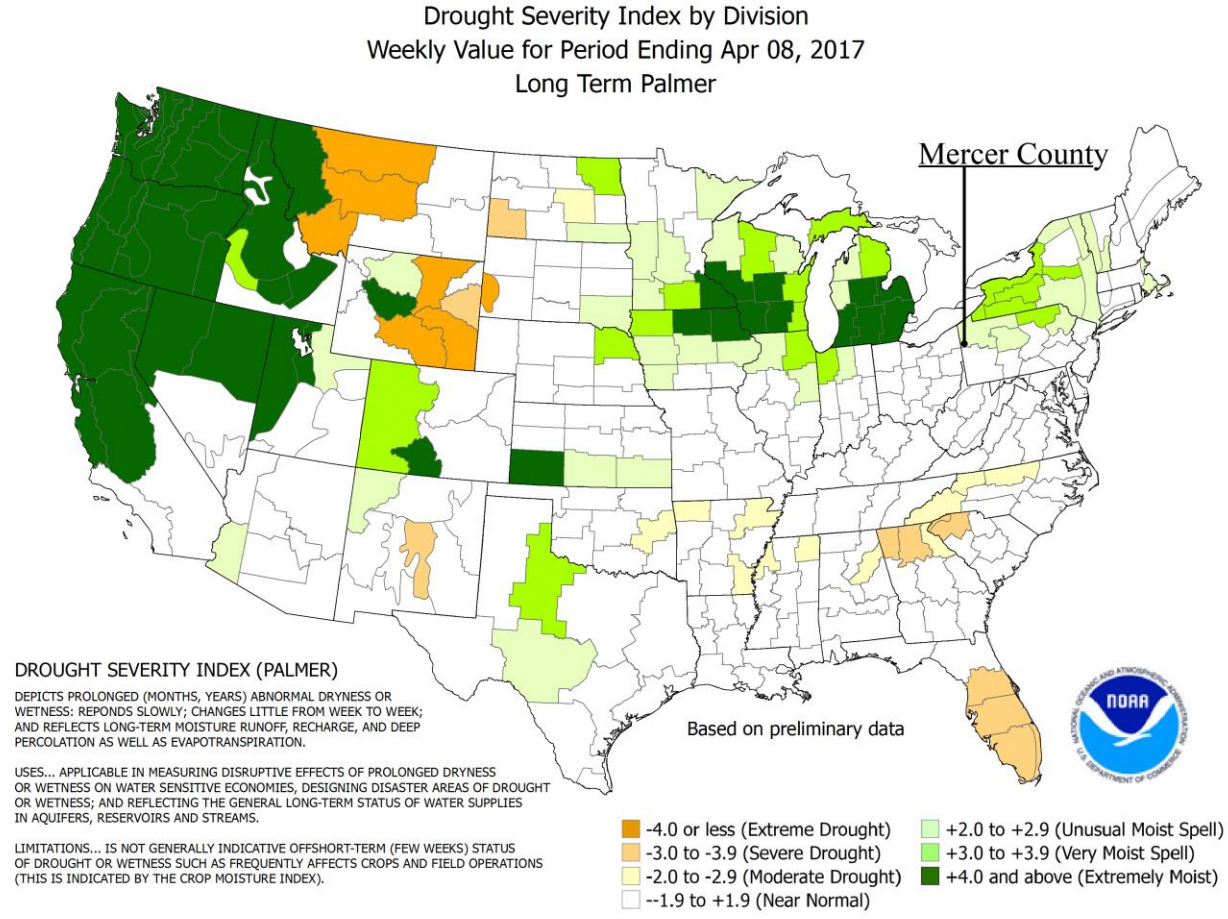
Figure 7 - Palmer Drought Severity Index History (NOAA, 2016)



4.3.1.4 Future Occurrence

It is difficult to forecast the exact severity and frequency of future drought events, and the future of climate change will lead to increased uncertainty and extremity of climate events, suggesting that it is best to be prepared for potentially adverse conditions. Mercer County has experienced severe drought between five and ten percent of the time between 1895 and 1995 (*Figure 7 - Palmer Drought Severity Index History)*, which can be used to make a rough estimate of the future probability of drought in Mercer County, although it does not account for uncertainty introduced by climate change. *Figure 8 - Recent Drought Severity Index* shows a recent Palmer Drought Severity Index reading for the continental United States and as of April 8th, Mercer County and the surrounding region are considered to be in an unusually moist spell, with a PDSI between 2.0 and 2.9.

Figure 8 - Recent Drought Severity Index (NOAA, 2016)



4.3.1.5 Vulnerability Assessment

The most significant losses resulting from drought events are typically found in the agriculture sector. The 1999 Gubernatorial Proclamation was issued in part due to significant crop damage. Preliminary estimates by the Pennsylvania Department of Agriculture indicated possible crop losses across the Commonwealth in excess of $500 million. This estimate did not include a twenty percent decrease in dairy milk production which also resulted in million-dollar losses (NCDC, 2009).

While these were statewide impacts, they illustrate the potential for droughts to severely impair the local economy in more agricultural communities. Mercer County ranks twenty-sixth of the sixty-seven counties in the Commonwealth for agricultural production, totaling $82,650,000 dollars (USDA, 2012). The majority of this production comes from crops, including nursery and greenhouse crops ($47 million). The remaining agricultural production consists of livestock, poultry and their products ($36 million).

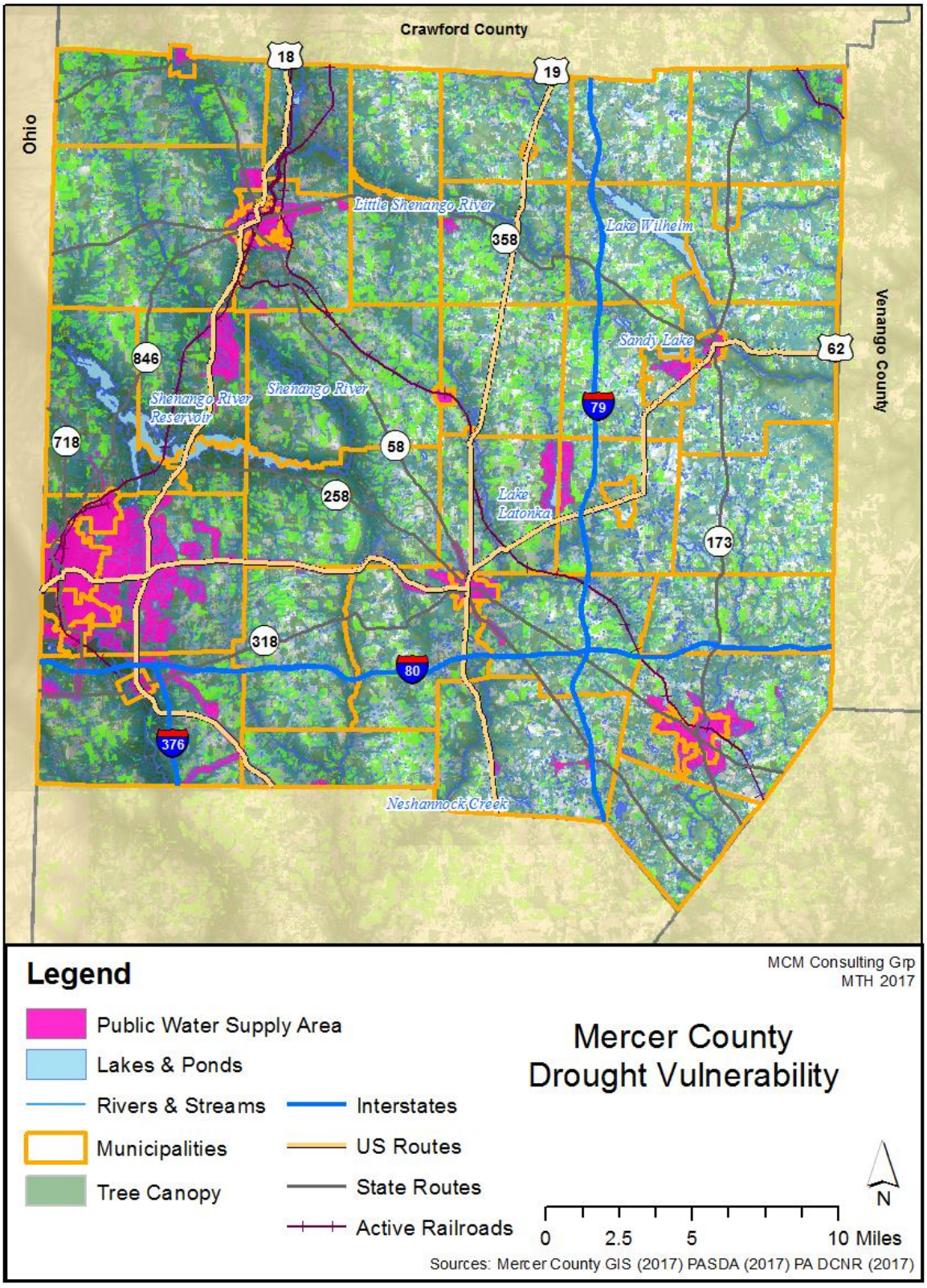
Water supplies are also vulnerable to the effects of drought. Public water service areas cover 7.1% of the county, including the majority of the City of Sharon, City of Farrell, Hermitage City, Sharpsville Borough, Wheatland Borough, West Middlesex Borough, Grove City Borough, Sandy Lake Borough, and Greeneville Borough *(*See *Figure 9 - Drought Vulnerability).* However, the majority of the county relies on wells for their fresh drinking water. Droughts will quickly affect systems that rely on surface supplies, whereas systems with wells are more capable of handling short-term droughts without issue. Longer-term droughts inhibit the recharging of groundwater aquifers which has an impact on well owners. Depending on the severity of the drought, this could cause the well to dry up, rendering the well owner at a loss for useable water, meaning Mercer County residents who use private domestic wells are vulnerable to drought events. *Table 11 - Domestic Wells* shows the number of wells in each municipality in Mercer County. Well data was gathered from the Pennsylvania Groundwater Information System (PaGWIS), which relies on voluntary submissions by well drillers. While this is the best dataset of domestic wells available for Mercer County, it is not comprehensive due to the voluntary nature of the data submission. Not all wells were reported including a location designation.

Table 11 - Domestic Wells (PAGWIS, 2017)

Municipality	Reported Domestic Wells	Municipality	Reported Domestic Wells
CLARK BORO	42	NEW LEBANON BORO	28
COOLSPRING TWP	188	NEW VERNON TWP	89
DEER CREEK TWP	106	OTTER CREEK TWP	84
DELAWARE TWP	341	PERRY TWP	192
EAST LACKAWANNOCK TWP	168	PINE TWP	501
FAIRVIEW TWP	135	PYMATUNING TWP	240
FARRELL CITY	29	SALEM TWP	110
FINDLEY TWP	174	SANDY CREEK TWP	106
FREDONIA BORO	1	SANDY LAKE BORO	13
FRENCH CREEK TWP	113	SANDY LAKE TWP	248

Municipality	Reported Domestic Wells	Municipality	Reported Domestic Wells
GREENE TWP	180	SHARON CITY	48
GREENVILLE BORO	62	SHARPSVILLE BORO	9
GROVE CITY BORO	47	SHEAKLEYVILLE BORO	35
HEMPFIELD TWP	370	SHENANGO TWP	241
HERMITAGE CITY	363	SOUTH PYMATUNING TWP	293
JACKSON CENTER BORO	24	SPRINGFIELD TWP	359
JACKSON TWP	163	STONEBORO BORO	14
JAMESTOWN BORO	21	SUGAR GROVE TWP	124
JEFFERSON TWP	291	WEST MIDDLESEX BORO	21
LACKWANNOCK TWP	136	WEST SALEM TWP	389
LAKE TWP	143	WHEATLAND BORO	56
LIBERTY TWP	192	WILMINGTON TWP	134
MERCER BORO	44	WOLF CREEK TWP	129
MILL CREEK TWP	146	WORTH TWP	204
UNDESIGNATED	80	**TOTAL**	**7226**

Figure 9 - Drought Vulnerability



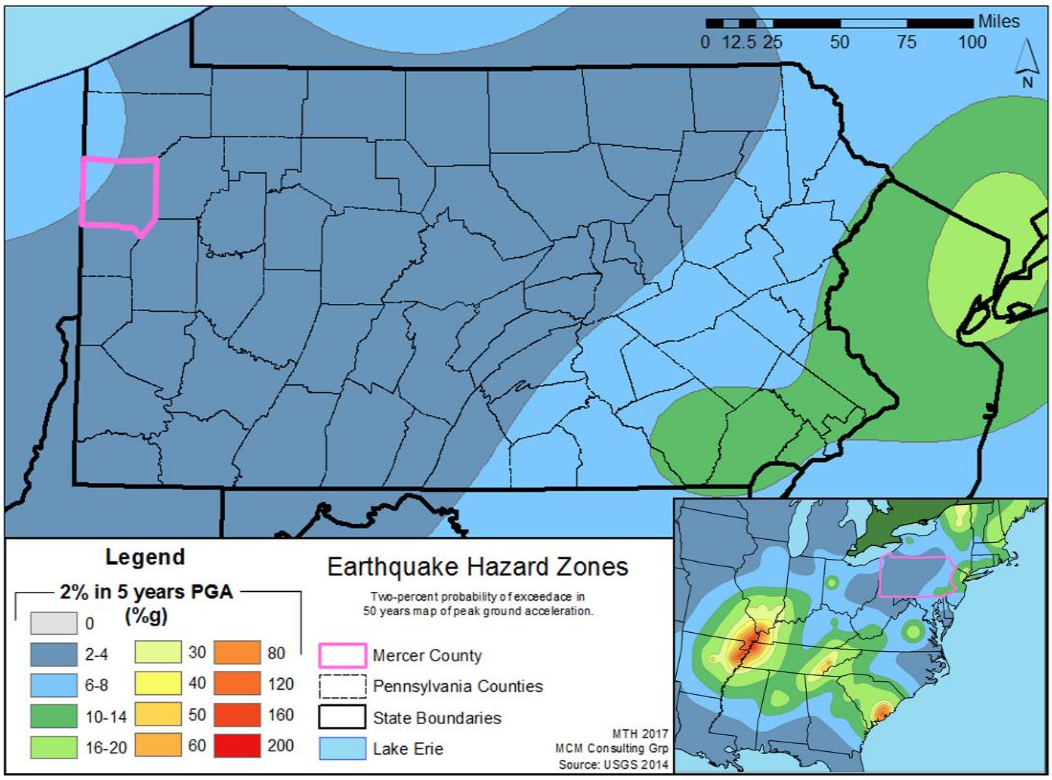
4.3.2. Earthquake

4.3.2.1 Location and Extent

An earthquake is sudden movement of the earth's surface caused by the release of stress accumulated within or along the edge of the earth's tectonic plates, a volcanic eruption, or by a human induced explosion (DCNR, 2007). Earthquake events in Pennsylvania, including Mercer County are usually mild events; impacting areas no greater than 62 miles in diameter from the epicenter. A majority of earthquakes occur along boundaries between tectonic plates, and some earthquakes occur at faults on the interior of plates. Today, Eastern North America, including Mercer County, Pennsylvania, is far from the nearest plate boundary. That plate boundary is the Mid-Atlantic Ridge, and is approximately 2,000 miles to the east.

When the supercontinent of Pangaea broke up about 200 million years ago, the Atlantic Ocean began to form. Since then, many faults have developed. Locating all of the faults would be an idealistic approach to identifying the region's earthquake hazard; however, many of the fault lines in this region have no seismicity associated with them. The best way to determine earthquake history for Mercer County is to conduct a probabilistic earthquake-hazard analysis with the earthquakes that have already happened in and around the county (See *Figure 10 – Earthquake Hazard Zones*).

Figure 10 - Earthquake Hazard Zones



4.3.6.2 Range of Magnitude

Earthquakes result in the propagation of seismic waves, which are detected using seismographs. These seismograph results are measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. *Table 12 – Richter Scale* summarizes Richter Scale Magnitudes as they relate to the spatial extent of impacted areas. The Modified Mercalli Intensity Scale (*Table 13 – Modified Mercalli Intensity Scale*) is an alternative measure of earthquake intensity that is broken down by the impacts of the earthquake event. Earthquakes have many secondary impacts, including disrupting critical facilities, transportation routes, public water supplies and other utilities.

Table 12 - Richter Scale

Richter Magnitude	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.

Table 13 - Modified Mercalli Intensity Scale

Scale	Intensity	Earthquake Effects	Richter Scale Magnitude
I	**Instrumental**	Detected only on seismographs	<4.2
II	**Feeble**	Some people feel it	
III	**Slight**	Felt by people resting; like a truck rumbling by	
IV	**Moderate**	Felt by people walking	
V	**Slightly Strong**	Sleepers awake; church bells ring	<4.8
VI	**Strong**	Trees sway; suspended objects swing; objects fall off shelves	<5.4
VII	**Very Strong**	Mild alarm, walls crack, plaster falls	<6.1
VIII	**Destructive**	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged	<6.9
IX	**Ruinous**	Some houses collapse, ground cracks, pipes break open	
X	**Disastrous**	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread	<7.3
XI	**Very Disastrous**	Most buildings and bridges collapse, roads, railways, pipes and cables destroyed, general triggering of other hazards	<8.1
XII	**Catastrophic**	Total destruction, trees fall, ground rises and falls in waves	>8.1

4.3.2.3 Past Occurrence

In October 1934, an earthquake struck Rochester County, New York; a slight tremor was felt though Warren County to Mercer County. No injuries or damages resulted. In January 1984, earthquakes tremors were felt. The tremors registered 4.0 on the Richter scale. It was felt from Erie to as far as Scranton. It had caused a 4-foot-long by 1/8" wide crack in the side of the Sharon City Hall Building. The strongest recorded earthquake in Pennsylvania is referred to as the Pymatuning Earthquake, and occurred on September 25th 1998. The Pymatuning Earthquake was a magnitude 5.1 on the Richter Scale and originated near the southern end of the Pymatuning Reservoir, just north of Mercer County. Major effects were felt in West Salem Township, Greene Township, and in the Jamestown and Greenville areas. Structural damage was minimal, including reports of objects falling from shelves, and chimneys cracking. The most significant impacts from the Pymatuning Earthquake were hydrologic – approximately 120 domestic wells went dry, and other previously dry wells began to flow again, and some residents reported dirty or sulfur-smelling water. (see *Figure 11 – Pymatuning Earthquake Hydrology*). About 80 of those 120 wells newly dried wells were on a ridge between Jamestown and Greenville, where the water level dropped as much as 100 feet. Areas that experienced an increase in water level saw rises of up to 62 feet in wells located in the valley. A possible explanation of this phenomenon is that the earthquake increased the vertical flow of water through shales beneath the ridge, allowing groundwater to drain from the hilltops into the valleys.

A total of forty-three earthquake events occurred within 100 km of Mercer County between 1724 and 2003, and with a few exceptions (magnitude 5 and 4.3 event), most were minor quakes with Richter magnitudes less than four. Since 2003, there have been fifty-three earthquakes within 100 km of Mercer County, all minor earthquakes with magnitudes ranging between 1.3 and 4 (USGS, 2017). All earthquake events that occurred in the area surrounding Mercer County since 1724 can be seen in *Figure 12 – Earthquake History*.

Figure 11 - Pymatuning Earthquake Hydrology

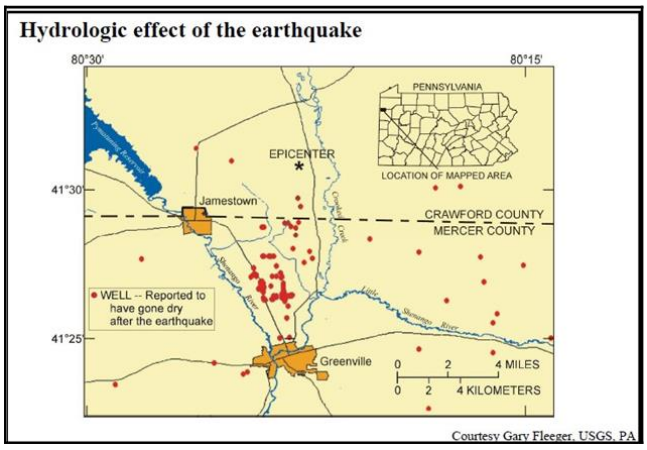
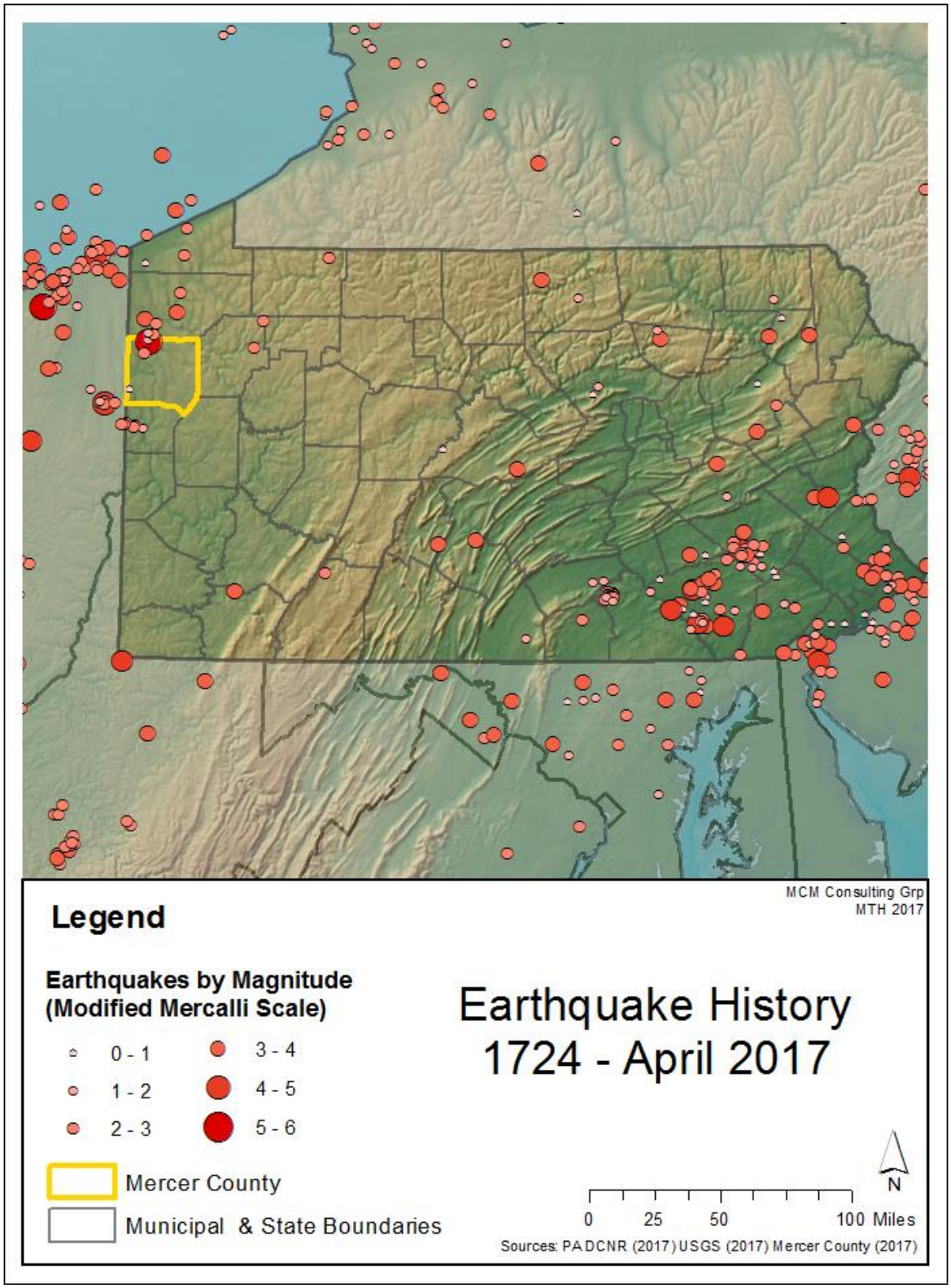


Figure 12 - Earthquake History



4.3.2.4 Future Occurrence

Earthquake activity and intensities are difficult to predict, but a probabilistic analysis of prior earthquakes can assist in gauging the likelihood of future occurrences. *Figure 10 – Earthquake Zones* shows Mercer County in the two lowest non-zero hazard zones for earthquake activity according to the USGS (2014), suggesting a moderately low probability of earthquake occurrence. However, according to the USGS, there has been a recent trend increasing the frequency of magnitude 3 and larger earthquakes in the central and eastern US (*Table 14 – Recent Earthquake Trends*). This uptick in seismicity is considered to be due to fracking activities, and specifically occurs as a result of waste water from the hydraulic fracturing process being injected into the earth (Meyer, 2016). Recent studies have moved towards being able to predict such induced seismicity by looking at uplift after injections, but more work needs to be done to confirm uplift as a reliable indicator of induced seismicity (Shirzaei et al., 2016). As of April 2017, Mercer County has 38 active wells (PA DEP, 2017), and it is important to note that seismicity can occur even after wells become inactive and injections rates decline (Shirzaei et al., 2016).

Table 14 - Recent Earthquake Trends in Central and Eastern United States

Year	Number of M3+ Earthquakes (average per year)
1973-2008	21
2009-2013	99
2014	659
2015	1000+

4.3.2.5 Vulnerability Assessment

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

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

While historically the risk of earthquakes in north western PA is low to moderately low (See *Figure 10 – Earthquake Hazard Zones*), the uptick in seismicity due to hydraulic fracturing increases the likelihood of Mercer County experiencing a damaging earthquake.

4.3.3. Flood, Flash Flood and Ice Jams

4.3.3.1 Location and Extent

Flooding is the temporary condition of partial or complete inundation on normally dry land and it is the most frequent and costly of all hazards in Pennsylvania. Flooding events are generally the result of excessive precipitation. General flooding is typically experienced when precipitation occurs over a given river basin for an extended period of time. Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location. This often occurs along mountain streams and in urban areas where much of the ground is covered by impervious surfaces. Flash floods are the most common type of flooding in Mercer County. 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 then breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams. All forms of flooding can damage infrastructure.

Floodplains are lowlands adjacent to rivers, streams and creeks that are subject to recurring floods. The size of the floodplain is described by the recurrence interval of a given flood. Flood recurrence intervals are explained in more detail in Section 4.3.3.4. However, in assessing the potential spatial extent of flooding, it is important to know that a floodplain associated with a flood that has a 10% chance of occurring in a given year is smaller than the floodplain associated with a flood that has a 0.2% annual chance of occurring. The National Flood Insurance Program (NFIP) publishes digital flood insurance rate maps (DFIRMs). These maps identify the 1% annual chance of flood area. Special Flood Hazard Area (SFHA) and Base Flood Elevations (BFE) are developed from the 1% annual chance flood event, as seen in *Figure 13 - Flooding and Floodplain Diagram*. Structures located in the SFHA have a 26% chance of flooding in a 30-year period. The SFHA serves as the primary regulatory boundary used by FEMA, the Commonwealth of Pennsylvania and Mercer County local governments. Federal floodplain management regulations and mandatory flood insurance purchase requirements apply to the following high risk special flood hazard areas in *Table 15 - Flood Hazard High Risk Zones*. Appendix D of this hazard mitigation plan includes a flooding vulnerability map for each municipality in Mercer County with vulnerable structures and critical facilities identified.

Mercer County is located largely in the Shenango watershed, with eastern parts of the County in the Middle Allegheny-Tionesta, French and Connoquenessing watersheds. Past flooding events have been primarily caused by heavy rains which cause small creeks and streams to overflow their banks, often leading to road closures. Flooding poses a threat to critical facilities, agricultural areas, and those who reside or conduct

business in the floodplain. The most significant hazard exists for facilities in the floodplain that process, use and/or store hazardous materials. A flood could potentially release and transport hazardous materials out of these areas. As the water recedes it would spread the hazardous materials throughout the area. Most flood damage to property and structures located in the floodplain is caused by water exposure to the interior, high velocity water and debris flow.

Figure 13 - Flooding and Floodplain Diagram

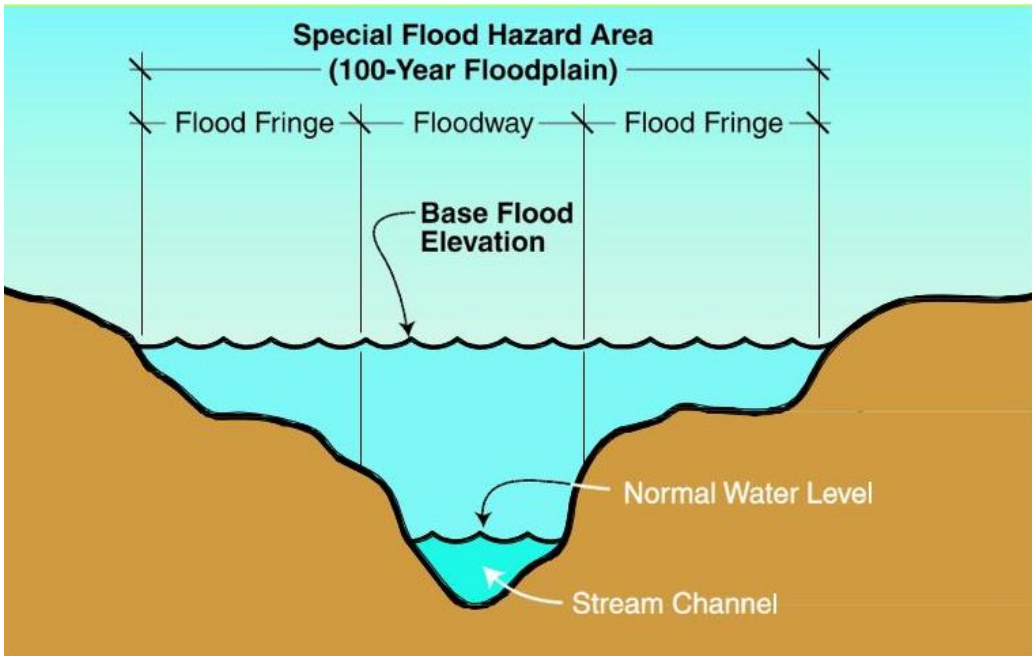


Table 15 - Flood Hazard High Risk Zones (FEMA, 2016)

Zone	Description
A	Areas subject to inundation by the 1% annual chance flood event. Because detailed hydraulic analysis have not been performed, no base flood elevations or flood depths are shown
AE	Areas subject to inundation by the 1% annual chance flood event determined by detailed methods. BFEs are shown within these zones.
AH	Areas subject to inundation by the 1% annual chance shallow flooding (usually areas of ponding) where average depths are 1-3 feet. BFEs derived from detailed hydraulic analysis are shown in this zone.
AO	Areas subject to inundation by the 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are 1-3 feet. Average flood depths derived from detailed hydraulic analysis are shown within this zone.
AR	Areas that result from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide base flood protection.

4.3.3.2 Range of Magnitude

Several factors determine the severity of floods, including rainfall intensity and duration, topography, ground cover and rate of snowmelt. Water runoff is greater in areas with steep slopes and little to no vegetative ground cover. The mountainous terrain of Mercer County can cause more severe floods as runoff reaches receiving water bodies more rapidly over steep terrain. Urbanization typically results in the replacement of vegetative ground cover with impermeable surfaces like asphalt and concrete, increasing the volume of surface runoff and stormwater, particularly in areas with poorly planned stormwater drainage systems. A large amount of rainfall over a short time span can cause flash floods. Additionally, small amounts of rain can cause floods in locations where the soil is frozen, saturated from a previous wet period, or if the area is rife with impermeable surfaces such as large parking lots, paved roadways and other developed areas. The county occasionally experiences intense rainfall from tropical storms in late summer and early fall which can potentially cause flooding as well.

In winter months, local flooding could be exacerbated by ice jams in rivers. Ice jam floods occur on rivers that are totally or partially frozen. A rise in stream level will break up a totally frozen river and create ice flows that can pile up on channel obstructions such as shallow riffles, log jams, or bridge piers. The jammed ice creates a dam across the channel over which the water and ice mixture continues to flow, allowing for more jamming to occur.

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

Severe flooding also comes with many secondary effects that could have long lasting impacts on the population, economy and infrastructure of Mercer County. Power failures are the most common secondary effect associated with flooding. Coupled with a shortage of critical services and supplies, power failures could cause a public health emergency. Critical infrastructure, such as sewage and water treatment facilities, can be severely damaged, having a significant effect on public health. High flood waters can cause sewage systems to fail and overflow, contaminating groundwater and drinking water. Flooding also has the potential to trigger other hazards, such as landslides, hazardous material spills and dam failures.

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

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

4.3.3.3 Past Occurrence

Mercer County has experienced numerous flooding, flash flooding and ice jam flooding events in the past. The flooding and flash flooding was caused by a variety of heavy storms, tropical storms, ice jams and other issues. A summary of flood event history for Mercer County is found in *Table 16 – Flood Event History 1970-2016*. Most recently, a thunderstorm dropped two to four inches of rain within 24 hours on October 20th 2016, resulting in flash floods. An estimated $12,000 of damages was reported in Mercer County primarily around Sharpsville and Transfer, and Colt Road near route 18 was reported to be washed out. Historically, the Shenango River has had numerous significant flooding events, most dramatically on March 23rd1913, when the Shenango River reached a record 18.6 feet, causing one death and an estimated two million dollars in damages. Other significant historical floods of the Shenango River occurred in:

-1936 at 13.38 feet
-1937 at 13.58 feet
-1942 at 13.46 feet
-1946 at 14.26 feet
-1950 at 13.64 feet
-1952 at 15.45 feet
-1954 at 16.00 feet

One of the most destructive flooding events in recent history in Mercer County occurred throughout July and August of 2003, when several storms deposited over seven inches of rain within a six-hour period. A presidential declaration was made, and Mercer County received ~$370,000 for individual assistance. Thirty-six of forty-eight municipalities applied for public assistance for ~$935,000. Full descriptions of each event past 1996 can be found on the National Oceanic and Atmospheric Administration's National Centers for Environmental Information Storm Events Database (NCEI, 2017).

Table 16 -Flood Event History 1970-2016

Location	Date	Type	Death	Injury	Total Damage (USD)
Countywide	4/2/1970	Flood	NR	NR	NR
Countywide	6/21/1972	Flood	NR	NR	NR
Countywide	6/28/1983	Flood	NR	NR	NR
Susquehanna	3/29/1993	Flood	NR	NR	$0
Mercer	8/27/1993	Flood	NR	NR	$0
Countywide	4/12/1994	Flash Flood	NR	NR	$5,000

Location	Date	Type	Death	In-jury	Total Damage (USD)
Countywide	8/13/1994	Flash Flood	NR	NR	$500,000
Grove City	6/10/1995	Flash Flood	NR	NR	$10,000
Countywide	7/15/1995	Flash Flood	NR	NR	$0
Sharon	7/25/1995	Flash Flood	NR	NR	$0
Sharon	8/15/1995	Flash Flood	NR	NR	$0
MERCER	1/19/1996	Flash Flood	0	0	$5,000
MERCER	5/11/1996	Flash Flood	0	0	$0
STONEBORO	6/22/1996	Flash Flood	0	0	$5,000
MILLEDGEVILLE	7/19/1996	Flash Flood	0	0	$10,000
MERCER	8/8/1996	Flash Flood	0	0	$0
SANDY LAKE	9/28/1996	Flash Flood	0	0	$3,000
GREENVILLE	6/12/1997	Flash Flood	0	0	$0
GREENVILLE	6/25/1997	Flash Flood	0	0	$0
SHARON	6/30/1997	Flash Flood	0	0	$8,000
SHARON	8/16/1997	Flash Flood	0	0	$0
COUNTYWIDE	4/16/1998	Flash Flood	0	0	$5,000
GREENVILLE	1/24/1999	Flash Flood	0	0	$0
SOUTH PORTION	7/28/1999	Flash Flood	0	0	$20,000
COUNTYWIDE	4/8/2000	Flash Flood	0	0	$5,000
COUNTYWIDE	8/2/2000	Flash Flood	0	0	$25,000
NEW LEBANON	4/15/2002	Flash Flood	0	0	$5,000
STONEBORO	5/13/2002	Flash Flood	0	0	$0
SHARON	8/16/2002	Flash Flood	0	0	$250,000
MERCER	7/4/2003	Flash Flood	0	0	$20,000
GROVE CITY, SHARON & GREENVILLE	7/6/2003	Flash Flood	0	0	$25,000
GREENVILLE, SHARON, SHARPSVILLE	7/21/2003	Flash Flood	0	0	$10,000
SHARON & WEST MIDDLESEX	7/22/2003	Flash Flood	0	0	$0
WEST MIDDLESEX	7/23/2003	Flash Flood	0	0	$0
SHARON	7/24/2003	Flash Flood	0	0	$0
SHENANGO	7/27/2003	Flash Flood	0	0	$0
FARRELL	8/4/2003	Flash Flood	0	0	$0
GREENVILLE	8/5/2003	Flash Flood	0	0	$0
STONEBORO	8/8/2003	Flash Flood	0	0	$0
MERCER	8/9/2003	Flash Flood	0	0	$10,000
SHARON	8/29/2003	Flash Flood	0	0	$0
GREENVILLE	5/22/2004	Flash Flood	0	0	$2,000
MERCER (ZONE)	5/23/2004	Flood	0	0	$1,000

Location	Date	Type	Death	In-jury	Total Damage (USD)
MERCER (ZONE)	7/18/2004	Flood	0	0	$0
MERCER (ZONE)	8/28/2004	Flood	0	0	$0
MERCER (ZONE)	9/8/2004	Flood	0	0	$200,000
MERCER (ZONE)	9/17/2004	Flood	0	0	$66,000
SHARON	6/10/2005	Flash Flood	0	0	$0
SHARON	6/28/2005	Flash Flood	0	0	$0
GREENVILLE	7/16/2005	Flash Flood	0	0	$30,000
JAMESTOWN	7/27/2006	Flash Flood	0	0	$0
GREENVILLE	7/31/2006	Flash Flood	0	0	$0
SANDY LAKE & NEW LEBANON	8/29/2006	Flash Flood	0	0	$0
MERCER	3/15/2007	Flood	0	0	$0
GREENVILLE, MERCER	3/27/2007	Flash Flood	0	0	$0
SALEM	2/11/2009	Flood	0	0	$25,000
TRANSFER	2/28/2011	Flood	0	0	$75,000
MILBURN	8/19/2011	Flood	0	0	$50,000
SHARON	5/7/2012	Flash Flood	0	0	$25,000
COOL SPG	7/10/2013	Flash Flood	0	0	$25,000
MERCER, HENLEIN, GREENVILLE	6/18/2014	Flood	0	0	$20,000
HENLEIN	8/21/2014	Flash Flood	0	0	$75,000
FARRELL, JAMESTOWN, GREENVILLE MUNI ARPT	5/31/2015	Flood	0	0	$0
GROVE CITY ARPT	6/14/2015	Flash Flood	0	0	$5,000
GROVE CITY	6/15/2015	Flash Flood	0	0	$2,000
CLARK	6/16/2016	Flood	0	0	$5,000
TRANSFER & SHARPSVILLE	10/20/2016	Flash Flood	0	0	$12,000

The National Flood Insurance Program identifies properties that frequently experience flooding. *Repetitive loss properties* are structures insured under the NFIP which have had at least two paid flood losses of more than $1,000 over any ten-year period since 1978. A property is considered a *severe repetitive loss property* either when there are at least four losses each exceeding $5,000 or when there are two or more losses where the building payments exceed the property value. As of January 2017, there are eight repetitive loss properties and one severe repetitive loss property in Mercer County

Ten municipalities in Mercer County do not participate in the NFIP: Clark, Deer Creek, Fairview, Lake, New Vernon and Salem Townships, as well as Jackson Center, New

Lebanon, Sheakleyville and Wheatland Boroughs. Information on each participating municipality is located in *Table 17 – Municipal NFIP Policies*.

Table 17 – Municipal NFIP Policies

Municipality	Community Number	Losses	Active Contracts
Coolspring Township	421863	1	5
Delaware Twp	422283	0	0
East Lackawanna Twp	421864	0	1
Farrell City	420673	2	1
Findley Twp	421866	0	1
Fredonia Boro	422477	3	1
French Creek Twp	421867	3	10
Greene Twp	422478	1	0
Greenville Boro	420674	6	19
Grove City Boro	420675	3	18
Hempfield Twp	421868	4	4
Hermitage City	421862	17	15
Jackson Twp	422480	1	2
Jamestown Boro	422481	1	2
Jefferson Twp	421869	0	1
Lackawannock Twp	422482	0	0
Liberty Twp	421870	0	1
Mercer Boro	420676	4	5
Mill Creek Twp	421871	3	2
Otter Creek Twp	422486	1	1
Perry Twp	422487	0	3
Pine Twp	422284	0	3
Pymatuning Twp	422285	6	3
Sandy Creek Twp	421873	0	0
Sandy Lake Boro	420677	0	17
Sandy Lake Twp	421874	0	0
Sharon City	420678	33	12
Sharpsville Boro	420682	0	1
Shenango Twp	421875	4	3
South Pymatuning Twp	421876	1	2
Springfield Twp	421877	0	2
Stoneboro Boro	420679	19	4
Sugar Grove Twp	422489	0	2
West Middlesex Boro	420680	0	3
West Salem Twp	422490	3	4
Wilmington Twp	421878	0	0
Wolf Creek Twp	422491	0	0
Worth Twp	422492	0	1

Table 18 - Repetitive and Severe Repetitive Loss Properties (FEMA, 2017)

Community Name	Community Number	Building Payments	Contents Payment	Total Payments	Average Payment	Losses	Properties
French Creek Twp	421867	$5,642	$0	$5,642	$2,821	2	1
Hermitage City	421862	$5,057	$0	$5,057	$1,686	3	1
Mercer Boro	420676	$31,615	$0	$31,615	$15,807	2	1
Mill Creek Twp	421871	$24,797	$1,197	$25,994	$12,997	2	1
Pymatuning Twp	422285	$33,114	$8,184	$41,298	$10,325	4	2
Sharon City	420678	$185,892	$160,559	$346,451	$24,746	14	2
Stoneboro Boro	420679	$36,535	$20,103	$56,638	$7,080	8	1
West Salem Township	422490	$27,314	$0	$27,314	$13,657	2	1

4.3.3.4 Future Occurrence

Table 19 - Flood Probability Summary (FEMA)

Flood Recurrence Intervals	Annual Chance of Occurrence
10-year	10.00%
50-year	2.00%
100-year	1.00%
500-year	0.20%

Flooding is a frequent problem throughout Pennsylvania. Mercer County will certainly be impacted by flooding events in the future - Mercer County experiences some degree of flooding annually. The threat of flooding is compounded in the late winter and early spring months, as melting snow can overflow streams, creeks and tributaries, increasing the amount of groundwater, clogging stormwater culverts and bridge openings. The NFIP recognizes the 1%-annual-chance flood, also known as the base flood or 100-year flood, as the standard for identifying properties subject to federal flood insurance purchase requirements. A 1%-annual-chance flood is a flood which has a 1% chance of occurring over a given year, or is likely once every 100 years. The digital flood insurance rate maps (DFIRMs) are used to identify areas subject to the 1% annual-chance flooding. A property's vulnerability to a flood is dependent upon its location in the floodplain. Properties along the banks of a waterway are the most vulnerable. The property within the floodplain is broken into sections depending on its distance from the waterway. The 10-year flood zone is the area that has a 10 percent chance of being flooded every year. However, this label does not mean that this area can-not flood more than once every 10 years. It just designates the probability of a flood of this magnitude every year. Further away from this area is the 50-year flood-plain. This area includes all of the 10-year floodplain plus additional property. The probability of a flood of this magnitude occurring during a one-year period is two percent. A summary of flood probability is shown in *Table 19 - Flood Probability Summary*.

4.3.3.5 Vulnerability Assessment

Mercer County is vulnerable to flooding events. Flooding puts the entire population at some level of risk, whether through the flooding of homes, businesses, places of employment, or the road, sewer and water infrastructure. *Table 21 - Structures Vulnerable to Flooding* identifies how many structures and critical facilities located in the special flood hazard area by municipality using county GIS data. Critical facilities are facilities that if damaged would present an immediate threat to life, public health and safety. Appendix D of this hazard mitigation plan includes a flooding vulnerability map for each municipality in Mercer County with vulnerable structures and critical facilities identified. A list of critical facilities located in the special flood hazard area is shown in *Table 20 – Critical Facilities Vulnerable to Flooding*. Flash flooding has been common in Mercer County, and can occur anywhere conditions are right. Some of the most damaging floods in Mercer County have been flash floods.

Table 20 - Critical Facilities Vulnerable to Flooding (Mercer County GIS, 2017)

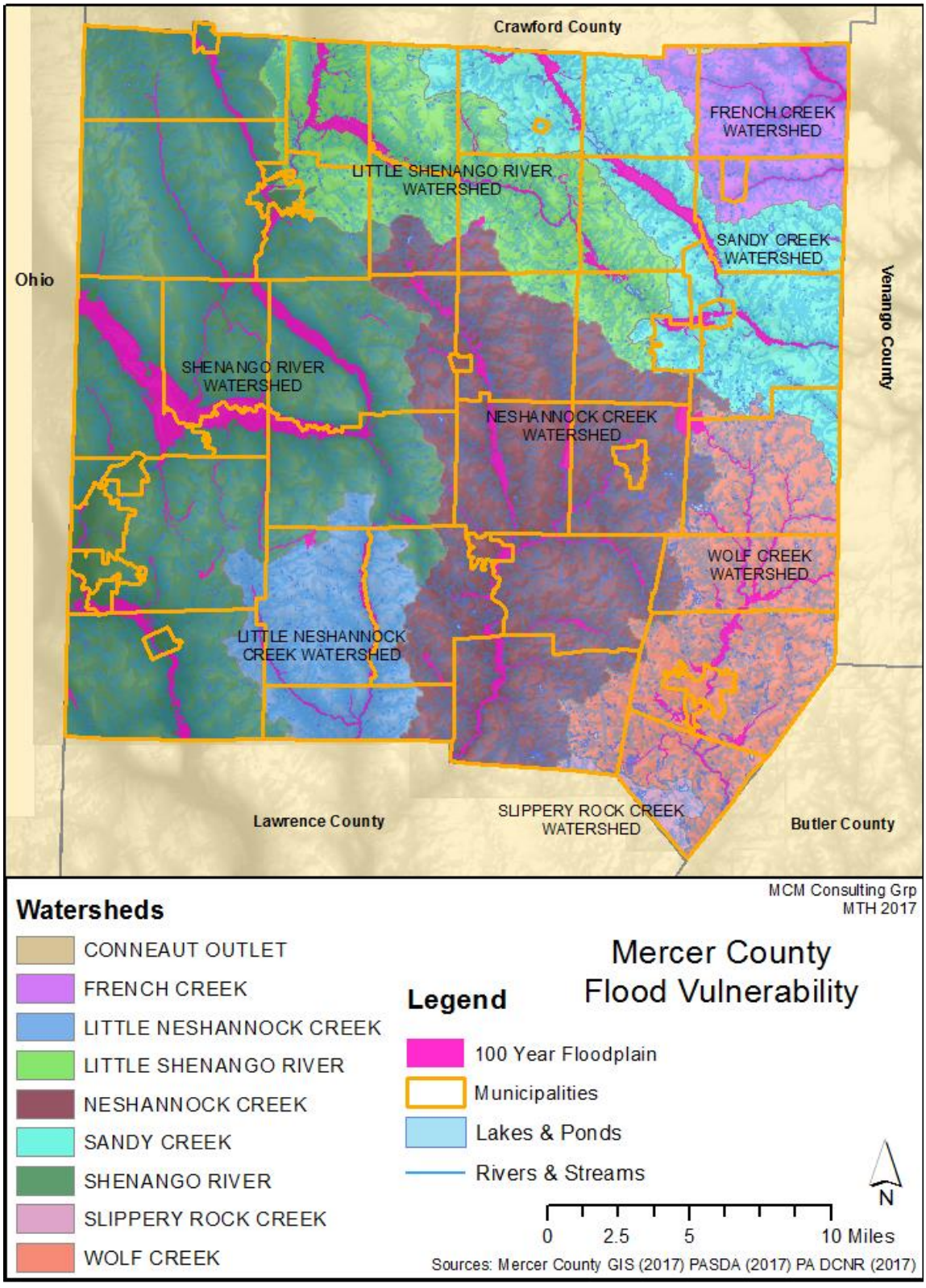
Type	Name	Address	Municipality
Fire Department	Sandy Lake Fire-Rescue	P.O. Box 684, 3297 N. Main St, Sandy Lake, PA, 16145	Sandy Lake Boro
Fire Department	Stoneboro Volunteer Fire Company	P.O. Box 576, Linden St, Stoneboro, PA 16153	Sandy Lake Boro
Police Department	Sandy Lake Police Department	P.O. Box 104, Main Street, Sandy Lake, PA 16145	Sandy Lake Boro
SARA Title III Facility	Greenville Sewage Treatment Plant	183 HAMBURG ROAD, Greenville, PA 16125	Hempfield Twp
SARA Title III Facility	Greenville Water Treatment Plant	45 S WATER STREET, Greenville, PA 16125	Greenville Boro
SARA Title III Facility	Mercer Borough Sewer Plant	Fish for Fun Street, Mercer, PA 16137	Mercer Boro

Table 21 - Structures Vulnerable to Flooding (Mercer County GIS, 2017)

Municipality	Addressable Structures in SFHA	Municipality	Addressable Structures in SFHA
Clark Boro	0	New Lebanon Boro	6
Coolspring Twp	100	New Vernon Twp	0
Deer Creek Twp	0	Otter Creek Twp	11
Delaware Twp	17	Perry Twp	37
East Lackawannock Twp	11	Pine Twp	93
Fairview Twp	3	Pymatuning Twp	63
Farrell City	3	Salem Twp	0
Findley Twp	77	Sandy Creek Twp	2
Fredonia Boro	7	Sandy Lake Twp	4
French Creek Twp	69	Sandy Lake Boro	70

Municipality	Addressable Structures in SFHA	Municipality	Addressable Structures in SFHA
Greene Twp	5	Sharon City	107
Greenville Boro	172	Sharpsville Boro	3
Grove City Boro	111	Sheakleyville Boro	0
Hempfield Twp	63	Shenango Twp	14
Hermitage City	212	South Pymatuning	45
Jackson Twp	21	Springfield Twp	55
Jackson Center Boro	1	Stoneboro Boro	93
Jamestown Boro	7	Sugar Grove Twp	26
Jefferson Twp	33	West Middlesex Boro	2
Lackawannock Twp	62	West Salem Twp	19
Lake Twp	3	Wheatland Boro	10
Liberty Twp	13	Wilmington Twp	14
Mercer Boro	69	Wolf Creek Twp	31
Mill Creek Twp	6	Worth Twp	13
		Total	**1783**

Figure 14 - Flooding Vulnerability



4.3.4. Invasive Species

4.3.4.1 Location and Extent

An invasive species is a species that is not indigenous to a given ecosystem and that, when introduced to a non-native environment, tends to thrive. The spread of an invasive species often alters ecosystems, which can cause environmental and economic harm and pose a threat to human health. The phenomena of invasive species is due to human activity. Human society is globalized, and people have the capability to traverse the globe at rates unparalleled in the history of the Earth. Either intentionally or unintentionally, other species may accompany people when they travel, introducing the stowaway species to a novel ecosystem. In a foreign ecosystem, a transported species may thrive, potentially restructuring the ecosystem and threatening its health. Common pathways for invasive species introduction to Pennsylvania include (PA DOA, 2010):

- Contamination of internationally traded products
- Hull fouling
- Ship ballast water release
- Discarded live fish bait
- Intentional release
- Escape from cultivation
- Movement of soil, compost, wood, vehicles or other materials and equipment
- Unregulated sale of organisms
- Smuggling activities
- Hobby trading or specimen trading

Invasive species threats are typically divided into two main subsets:

Aquatic Invasive Species (AIS) are nonnative, invertebrates, fishes, aquatic plants, and microbes that threaten the diversity or abundance of native species, the ecological stability of the infested waters, human health and safety, or commercial, agriculture, or recreational activities dependent on such waters.

Terrestrial Invasive Species (TIS) are nonnative plants, vertebrates, arthropods, or pathogens that complete their lifecycle on land whose introduction does or is likely to cause economic or environmental harm or harm to human health.

The location and extent of invasive threats is dependent on the preferred habitat of the species, as well as the species' ease of movement and establishment. *Table 22 – Mercer Invasive Species* lists invasive species that have been found in Mercer County.

4.3.4.2 Range of Magnitude

Some invasive species are not considered agricultural pests and do not harm humans. Other invasive species can have many negative impacts and cause significant changes in the composition of ecosystems. For example, the Emerald Ash Borer has a 99% mortality rate for any ash tree it infects. Didymo, an aggressive form of algae not yet found in Mercer County, can clog waterways and smother native aquatic plants and animals.

The aggressive nature of many invasive species can cause significant reductions in biodiversity by crowding out native species. This can affect the health of individual host organisms as well as the overall well-being of the affected ecosystem. An example of a

possible worst-case scenario for invasive species is the presence of the Emerald Ash Borer in Mercer County. There is a high mortality rate for trees associated with the Emerald Ash Borer and hardwood forests in the county are in danger due to this invasive species. Degradation of forest health cascades into other problems. Among other benefits, forests prevent soil degradation and erosion, protect watersheds, and sequester carbon from the atmosphere. Forests have a key role in hydrologic systems, so losing a forest amplifies the effects of erosion and flooding. Forest degradation also has adverse economic effects, impacting such activities as logging, tourism, and other production activities dependent on lumber.

The magnitude of an invasive species threat is generally amplified when the ecosystem or host species is already stressed, such as in times of drought. The already weakened state of the native ecosystem causes it to more easily succumb to an infestation.

4.3.8.3 Past Occurrence

Invasive species have been entering Pennsylvania since the arrival of European settlers. *Table 22 – Mercer Invasive Species* lists all invasive species that are established in Mercer County that pose a threat. Some invasive species such as the Emerald Ash Borer, Japanese Beetle, and Japanese Knotweed are also widespread in the region surrounding Mercer County. While Mercer County can work towards mitigating the negative impacts of such widespread species, controlling the spread of the species can be difficult. For some species such as Japanese Stiltgrass, the Asian Long-horned Beetle or the Chestnut Gall Wasp, Mercer County is on the edge of the species range, meaning control efforts taken in the county can help limit the propagation of the threat even beyond the county (*Table 23 – Vulnerable Species*). While all species listed here are not native to Mercer County, those species highlighted in yellow pose a larger ecological threat than others (see 4.3.5.5. Vulnerability Assessment for additional discussion).

Table 22 - Mercer Invasive Species

Invasive Species Found In Mercer County	
Scientific Name	**Common Name**
Aquatic Animals	
Cipangopaludina chinensis; Bellamya chinensis	Chinese Mysterysnail
Corbicula fluminea	Asiatic Clam
Dreissena polymorpha	Zebra Mussel
Aquatic Plants	
Hydrocharis morsus-ranae	Common Frogbit
Myriophyllum spicatum	Eurasian Water-milfoil
Nasturtium officinale	Watercress
Nelumbo lutea	American Water Lotus
Persicaria hydropiper	Marshpepper Knotweed, Smartweed
Potamogeton crispus	Curly-leaf Pondweed
Diseases	

Invasive Species Found In Mercer County	
Scientific Name	**Common Name**
Cryptococcus fagisuga & Neonectria (N.)	Beech Bark Disease Complex
Siroccocus clavigignenti-juglandaceearum (Hypocreales: Nectriaceae)	Butternut Canker
Diaporthales: Cryphonectriaceae	Chestnut Blight
Cronartium ribicola	White Pine Blister Rust
Neonectria faginata	Neonectria canker
Insects	
Coleptera: Cuculionidae	Pine Shot Beetle
Hymenoptera: Cynipidae	Chestnut Gall Wasp
Coleptera: Buprestidae	Emerald Ash Borer
Lepidoptera: Lymantriidae	Gypsy Moth
Coleoptera: Scarabaeidae	Japanese Beetle
Hymenoptera: Tenthredinidae	Pear Sawfly
Coleoptera: Curculionidae	Strawberry Root Weevil
Halyomorpha halys	brown marmorated stink bug
Callidiellum rufipenne	Japanese cedar longhorn beetle
Choristoneura conflictana	large aspen tortrix
Plants	
Acorus calamus	Sweetflag, Calamus
Agrostis stolonifera	Creeping Bentgrass
Alliaria petiolata	Garlic Mustard
Berberis thunbergii	Japanese Barberry
Hesperis matronalis	Dame's Rocket
Iris pseudacorus	Yellow Iris
Lonicera morrowii	Morrow's Honeysuckle
Lysimachia nummularia	Creeping Jenny
Myosotis scorpioides	True Forget-me-not
Phalaris arundinacea	Reed Canary Grass
Reynoutria japonica	Japanese Knotweed
Ranunculus repens	Creeping Buttercup
Rosa multiflora	Multiflora Rose
Rumex crispus	Curly Dock
Solanum dulcamara	Climbing Nightshade
Vinca minor	Lesser Periwinkle
Acer platanoides	Norway maple
Lolium perenne	perennial ryegrass
Lysimachia nummularia	creeping yellow loosestrife, creeping Jenney

Invasive Species Found In Mercer County	
Scientific Name	**Common Name**
Lotus corniculatus	birdsfoot trefoil
Mentha spicata	spearmint
Poa trivialis	roughstalk bluegrass
Sonchus arvensis	perennial sowthistle
Persicaria maculosa	ladysthumb
Solanum dulcamara	bittersweet nightshade
Lythrum salicaria	purple loosestrife
Elaeagnus umbellata	autumn olive
Cerastium fontanum ssp. vulgare	big chickweed
Echinochloa crus-galli	barnyardgrass
Salix fragilis	crack willow
Agrostis gigantea	redtop
Salix alba	white willow
Frangula alnus	glossy buckthorn
Phalaris arundinacea	reed canarygrass
Phragmites australis ssp. australis	European common reed
Chelidonium majus	greater celandine
Epilobium hirsutum	hairy willowherb
Cirsium arvense	Canada thistle
Centaurea stoebe ssp. micranthos	spotted knapweed
Lonicera japonica	Japanese honeysuckle
Pastinaca sativa	wild parsnip
Centaurea jacea	brown knapweed
Hesperis matronalis	dames rocket
Bromus tectorum	cheatgrass
Holcus lanatus	common velvetgrass
Hemerocallis fulva	tawny daylily
Viburnum opulus	European cranberrybush
Celastrus spp.	bittersweets
Vinca spp.	periwinkle
Lonicera spp.	bush honeysuckles (exotic)

4.3.4.4 Future Occurrence

According to PISC (the Pennsylvania Invasive Species Council), the probability of future occurrence for invasive species threats is growing due to the increasing volume of trans-

ported goods, increasing efficiency and speed of transportation, and expanding international trade agreements. Expanded global trade has created opportunities for many organisms to be transported to and establish themselves in new counties and regions. Climate change is contributing to the introduction of new invasive species. As maximum and minimum seasonal temperatures change, pests are able to establish themselves in previously inhospitable climates. This also gives introduced species an earlier start and increases the magnitude of their growth, possibly shifting the dominance of ecosystems in the favor of nonnative species.

In order to combat the increase in future occurrences, the PISC (a collaboration of state agencies, public organizations and federal agencies) released the Invasive Species Management Plan in April of 2010. The plan outlines the Commonwealth's goals for managing the spread of nonnative invasive species and creates a framework for responding to threats through research, action, and public outreach and communication. More information can be found at invasivespeciescouncil.com.

There are several invasive species that are found Mercer County but have not yet been detected inside the county (see *Table 23 – Vulnerable Species*). Especially in cases like this, control efforts, heightened awareness, and public outreach and education can help prevent an invasive species from becoming established. Once a species is established, it is much more difficult to eradicate it from an ecosystem meaning prevention is very important. For a more inclusive list of invasive plants found in Pennsylvania and a list of invasive plants on the Pennsylvania watch list, see the referenced PA DCNR publication "DCNR Invasive Plants" (PA DCNR, 2016). Species highlighted in yellow pose were identified as priority species for prevention (see 4.3.5.5. Vulnerability Assessment for more additional discussion).

Table 23 - Vulnerable Species

Threatening Invasive Species Found Near Mercer County	
Scientific Name	**Common Name**
Aquatic Animals	
Cyprinus carpio	Common Carp
Orconectes rusticus	Rusty Crayfish
Diseases	
Discula destructiva	Dogwood Anthracnose
Geosmithia morbida & Pityophthorus juglandis	Thousand Cankers Disease
Hemiptera: Diaspididae	Elongate Hemlock Scale
Ophiostoma ulmi & Ophiostoma novo-ulmi	Dutch Elm Disease
Insects	
Anoplophora glabripennis	Asian long-horned beetle
Coleoptera: Chrysomelidae	Imported Willow Leaf Beetle
Coleoptera: Curculionidae	European Bark Beetle
Fenusa pusilla	Birch Leafminer

Threatening Invasive Species Found Near Mercer County	
Scientific Name	**Common Name**
Hemiptera: Adelgidae	Hemlock Woolly Adelgid
Hemiptera: Diaspididae	Oystershell Scale
Hymenoptera: Cynipidae	Chestnut Gall Wasp
Hymenoptera: Diprionidae	European Pine Sawfly
Hymenoptera: Tenthredinidae	Pear Sawfly
Otiorhynchus ovatus	Strawberry Root Weevil
Otiorhynchus sulcatus	Black Vine Weevil
Pinus sylvestris, P. nigra, P. pinaster	Sirex Woodwasp
Thysanoptera: Thripidae	Pear Thrips
Aquatic Plants	
Cabomba caroliniana	Carolina Fanwort, Fanwort
Epilobium hirsutum	Great Hairy Willowherb
Hydrilla verticillata	Hydrilla
Najas minor	Brittle Naiad
Nitellopsis obtusa	Starry Stonewort
Veronica anagallis-aquatica	Water Speedwell
Plants	
Ajuga reptans	Carpet-bugle
Butomus umbellatus	Flowering-rush
Cardamine impatiens	Touch-me-not Bittercress
Cirsium arvense	Canada Thistle; Creeping Thistle
Dipsacus fullonum	Fuller's Teasel
Microstegium vimineum	Japanese Stiltgrass, Nepalese Browntop
Securigera varia	Common Crown-vetch
Sedum acre	Gold moss
Tussilago farfara	Colt's foot
Celastrus orbiculatus	Oriental Bittersweet

4.3.4.5 Vulnerability Assessment

Mercer County's vulnerability to invasion depends on the species in question. Human activity and mobility are ever increasing, and combined with the prospects of climate change, invasive species are becoming increasingly threatening. Invasive species can have adverse economic effects by impacting agriculture and logging activities. Natural forest ecosystems provide clean water, recreational opportunities, habitat for native wildlife, and places to enjoy the tranquility and transcendence of nature. The balance of forest ecosystems and forest health are vulnerable to invasive species threats.

An interesting facet of the invasive species problem in Pennsylvania is that deer do not eat many invasive plants, giving invasives a competitive advantage over the native species that fall prey to deer. As such, the management of deer populations in Mercer County has a significant impact on the vulnerability of an ecosystem to invasive species, where overpopulation of deer favors invasive species.

There are five primary components to managing invasive plants:

Prioritize: Public use areas such as state parks and other healthy forest ecosystems should be prioritized over developed and private areas. Locations with lower densities of invasive plants are often easier to control and should be given quick attention. Locations where humans are disturbing the landscape opens up niche space, and often times the aggressive invasive species move in faster than native species. Such locations include: road work, ditch/ culvert work, logging activities, stream improvement/stabilization and bridge work. Some plants pose a higher risk than others - members of the DCNR Forestry Bureau and the Mercer County Conservation District identified priority species for management in Mercer County. Those priority species are highlighted in yellow in *Table 22 – Mercer Invasive Species* and *Table 23 – Vulnerable Species*. Notable species that are established in Mercer County that are a priority to manage include: Multi-flora rose, Bush honeysuckle and Japanese barberry.

Invasive species are easiest to control before they become widespread and established in an area, and for that reason, management should prioritize management of species that are listed as priorities in *Table 23- Vulnerable Species*. Public outreach and education is important for these species in order to improve identification and prevention of invasion. Oriental Bittersweet is a high priority for prevention, as it is highly aggressive, difficult to eradicate and when it invades an area, it kills trees by wrapping around the trunk and strangling them to death. Another high priority for prevention is Japanese Stiltgrass, which is also aggressive and fast moving, forming a thick mat that nothing else can grow through. It is also quite shade tolerant, so it can take over the understory of forests. The Asian Long-horned Beetle first attacks red maple trees, followed by many other hardwoods by boring half inch holes through the trees, weakening them structurally and causing limbs to break off, ultimately killing trees. Mercer County has many red and sugar maple trees, so if the Asian Long-horned Beetle ever became established in the County, it could spread quickly and have a devastating impact.

Locate: Detailed locations should be recorded for invasive plants so sites can be easily relocated, treated and monitored.

Delineate: The scale and extent of the infestation should be recorded and mapped so that the progress of the infestation can be monitored.

Control: Methods of control depend on the specific infestation, but the most common approaches are mechanical (cutting and hand-pulling) and chemical (herbicide treatments).

Monitor: Identified sites should be monitored and revisited as often as several times in a growing season (depending on the location / species). Monitoring can allow for early detection of spreading infestations. Most importantly, it prevents a relapse towards full-blown infestation.

4.3.5. Pandemic and Infectious Disease

4.3.5.1 Location and Extent

Pandemic & Epidemic

Pandemic is a widespread outbreak of infectious disease that impacts an extensive region, potentially spanning continents and having global impacts. An epidemic also refers to an outbreak of a rapidly spreading infectious disease, but is more regional and less widespread than a pandemic. The spread of a disease depends on the mode of transmission of the disease, how contagious it is, and the amount of contact between infected and non-infected persons. In the event of a pandemic occurring in the eastern United States, the entirety of Mercer County would likely be affected. Strains of influenza, or the flu have caused epidemics and pandemics, and they commonly attack the respiratory tract in humans. Influenza pandemic planning began in response to the H5N1 (avian) flu outbreak in Asia, Africa, Europe, the Pacific, and the Near East in the late 1990s and early 2000s. Avian flu did not reach pandemic proportions in the United States, but the county began planning for flu outbreaks. The PA Department of Health Influenza Pandemic Response Plan states that "an influenza pandemic is inevitable and will probably give little warning" (PA Department of Health, 2005). For this reason, influenza is a primary concern regarding pandemic and infectious disease in Mercer County.

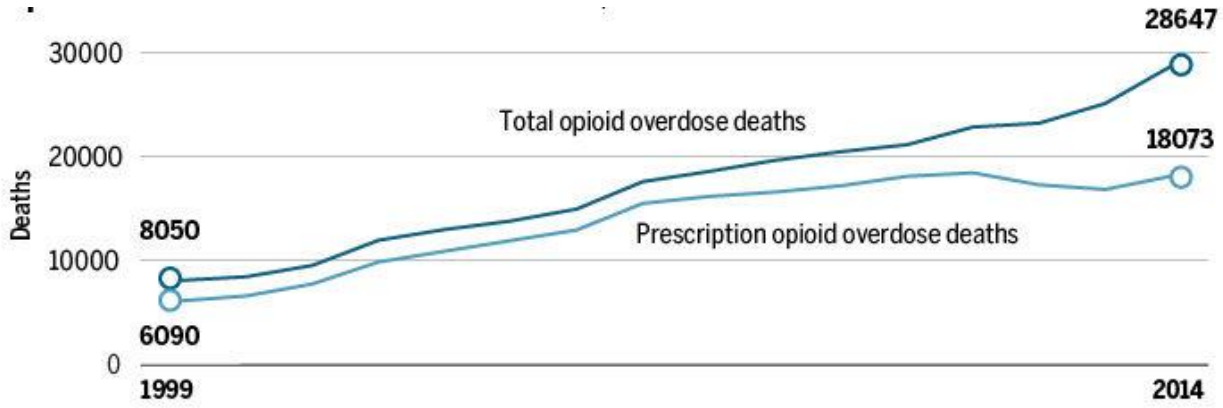
Infectious Disease

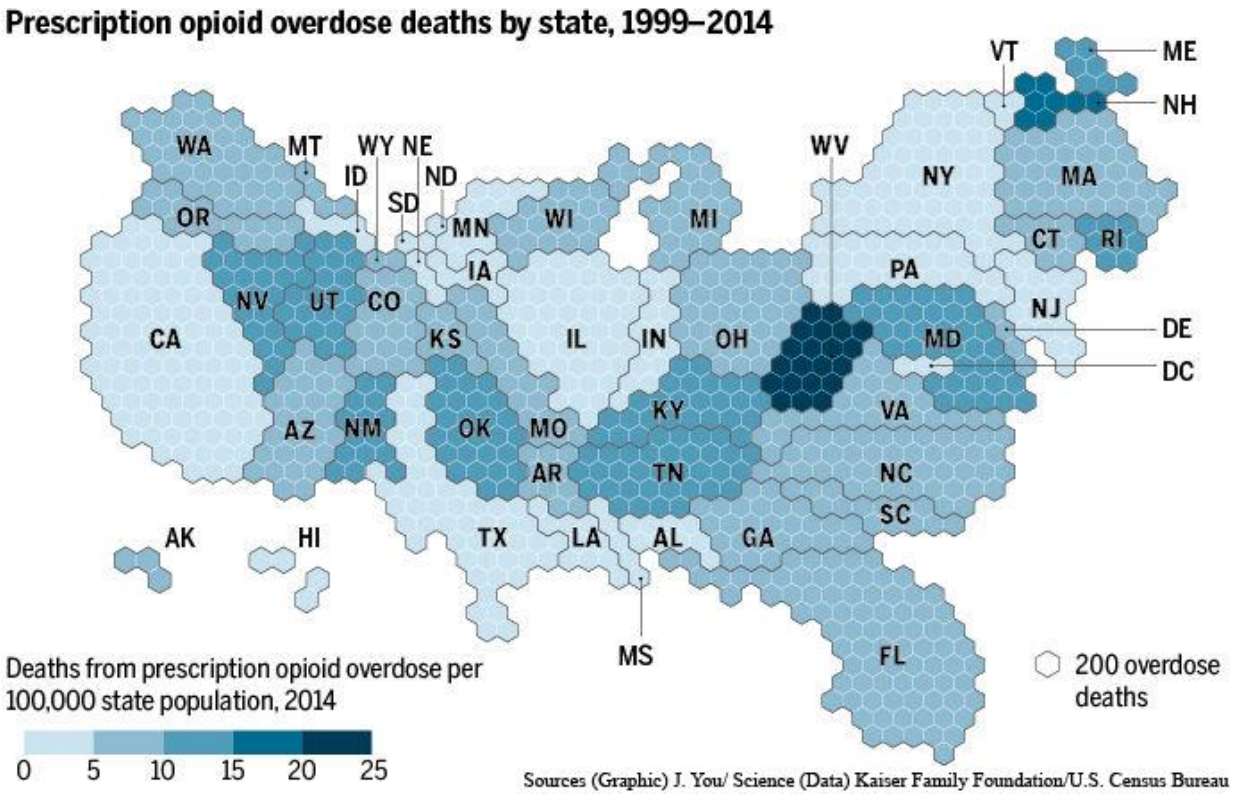
West Nile Virus has been detected in all sixty-seven counties in the Commonwealth at least once in the past ten years, making it a hazard to Mercer County. The disease is commonly spread by ticks or insects such as the mosquito. West Nile causes headaches, high fever, neck stiffness, disorientation, tremors, convulsions, muscle weakness, paralysis, and death in its most serious form. Blacklegged ticks in Mercer County can also spread Lyme disease, a bacterial disease with symptoms including fever, headaches and a characteristic skin rash (erythema migrans). Untreated, Lyme disease can spread to joints, the heart and the nervous system (CDC, 2016).

Opioid Epidemic

While not always thought of as an infectious disease, the Commonwealth and Country at large have been experiencing an epidemic of opioid addiction and abuse, resulting in increasing numbers of overdose deaths from both prescribed (e.g. fentanyl) and illicit (e.g. heroine) opioids (see *Figure 15 – US Opioid Deaths*). Overdose deaths from opioids occur when a large dose slows breathing, which can be especially likely when opioids are combined with alcohol or antianxiety drugs. While generally prescribed with good intentions, opioids can often be over-prescribed, resulting in addiction due to their highly addictive nature.

Figure 15 - US Opioid Deaths 1999-2014 (Science, 2016)





4.3.5.2 Range of Magnitude

Pandemic

Advancements in medical technologies have greatly reduced the number of deaths caused by influenza over time. In the early 1900s, flu pandemics could cause tens of millions of deaths, while the 2009 Swine Flu caused fewer than 20,000 deaths world-wide, and many people infected with Swine Flu in 2009 have recovered without needing medical treatment. However, the modern flu viruses are still quite dangerous. About seventy percent of those who were hospitalized with the 2009 H1N1 flu virus in the

United States belonged to a high-risk group (CDC, 2009). High risk populations for influenza include children, the elderly, pregnant women, and patients with reduced immune system capability. Such high-risk populations are discussed in more detail in Section 4.3.5.5.

Infectious Disease

West Nile Virus originated in regions of East Africa around 1937 but spread globally. In 2012, West Nile Virus caused 286 deaths in the United States. Most West Nile infections in humans are subclinical, causing no symptoms. Approximately twenty percent of infections cause symptoms and less than one percent of cases result in severe neurological disease or death. Symptoms typically appear between two and fifteen days after infection and there is currently no vaccine for West Nile Virus. Person to person transmission of West Nile is less prevalent than person to person transmission of influenza.

Each year since 2005, there are consistently well over 3,000 cases of Lyme disease in Pennsylvania, with 6,470 confirmed cases in 2014 (CDC, 2016). While most cases of Lyme disease can be treated with a few weeks of antibiotic use, undetected Lyme disease can seriously damage a body's musculoskeletal and nervous system, sometimes resulting in death.

Opioid Epidemic

In 2015, 3,383 overdose deaths were reported in Pennsylvania, compared to 2014, when there were 2,742 overdose deaths in PA – an increase of 23.4 percent (DEA, 2015). Pennsylvania ranked 8th in the country for overdose deaths in 2014 at 21.9 deaths per 100,000 people (DEA, 2015).

4.3.5.3 Past Occurrence

Pandemic & Epidemic

Table 24 - Past Influenza Outbreaks and Pandemics

Year/Time Frame	Common Name	Virus Type	Geographic Origin
1889	Russian flu	H2N2 or H3N8	Russia
1918-1920	Spanish flu	H1N1	Germany, Britain, France and the United States
1957-1958	Asian flu	H2N2	China
1968-1969	Hong Kong flu	H3N2	Hong Kong
1976	Swine flu	H1N1	Fort Dix, United States
2006-2008	Avian (Bird) Flu	H5N1	India
2007	Equine flu	H3N8	Australia
2009	Swine Flu	H1N1	Mexico

Influenza outbreaks of Spanish Flu, Asian flu, Hong Kong Flu and Swine Flu caused deaths in the United States and are considered pandemics. The 1918-1920 Spanish Flu claimed 50 million lives worldwide and 500,000 in the United States with 350,000 cases in Pennsylvania. The Asian flu caused about 1.5-2 million deaths worldwide with 70,000 deaths in the United States, peaking between September 1957 and March 1958. Approximately fifteen percent of the population of Pennsylvania was affected by Asian flu.

The first cases of the Hong Kong Flu in the U.S. were detected in September of 1968 with deaths peaking between December, 1968 and January, 1969 (Global Security, 2009). The most recent flu outbreak to impact Mercer County was the 2009 outbreak of Swine flu. There were 10,940 cases reported in Pennsylvania resulting in 78 deaths. Mercer County had sixty-three confirmed cases and no reported deaths (PA DOH, 2010).

Infectious Disease

West Nile Virus was first detected in Pennsylvania in the year 2000. The most annual reported cases of West Nile occurred in 2003, with 237 infected Pennsylvanians resulting in nine deaths. Since then, a comprehensive network has been developed in Pennsylvania to detect West Nile Virus, including trapping mosquitoes, collecting dead birds and monitoring horses, people, and in past years, sentinel chickens. West Nile Virus was detected in 41 of 67 counties in the Commonwealth in 2016, with 16 human cases (PA West Nile Virus Control Program, 2016). West Nile Virus has been detected in Mercer County in five out of the last sixteen years (2002, 2003, 2006, 2012, and 2013) with a total of six human cases- one in 2002 and five in 2003.

Cases of Lyme disease are consistently reported in Mercer County, and are summarized in *Table 25 – Lyme Disease Reported Cases*.

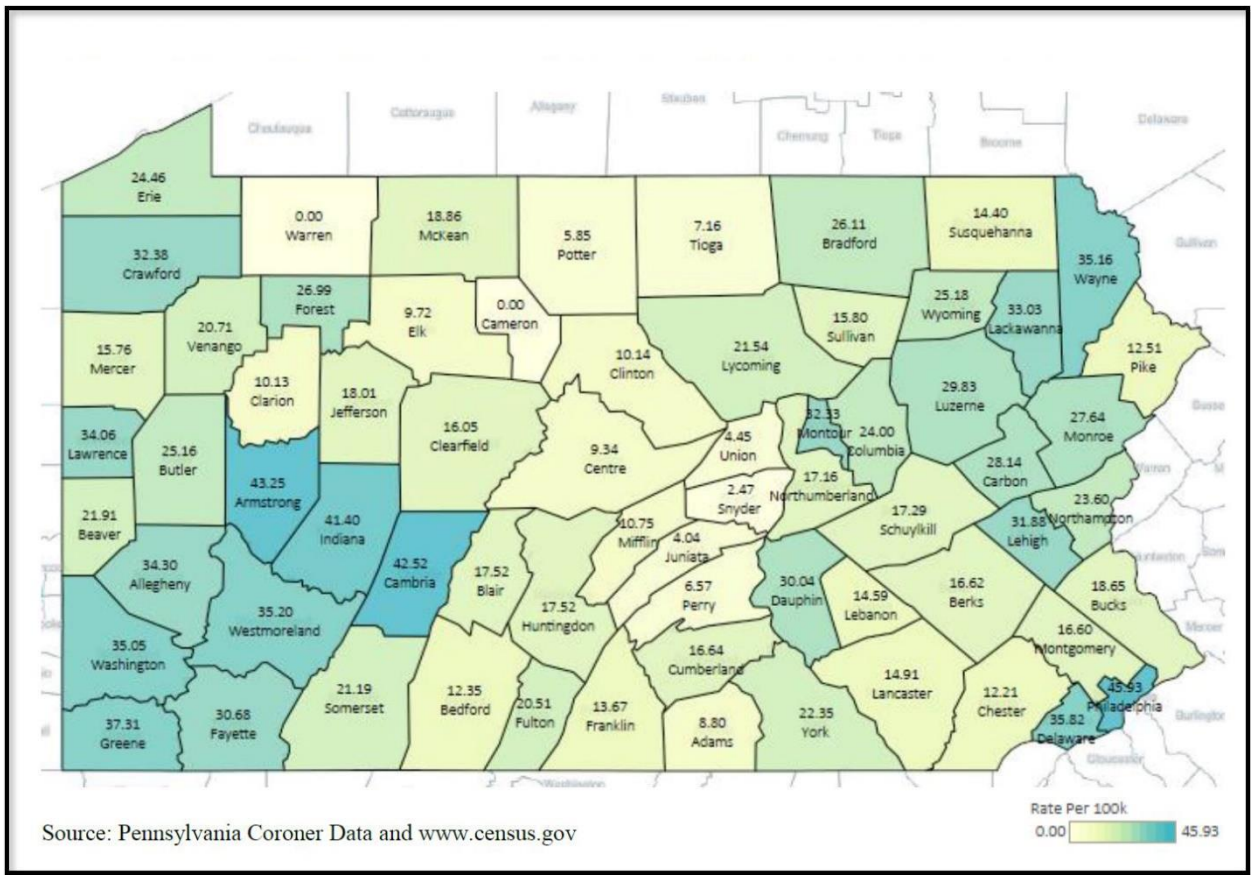
Table 25 - Lyme Disease Reported Cases (CDC, 2016)

Year	Number of Cases
2000	3
2001	13
2002	13
2003	7
2004	3
2005	3
2006	1
2007	3
2008	2
2009	2
2010	3
2011	6
2012	10
2013	9
2014	27

Opioid Epidemic

For the year of 2015, Mercer County had 15.76 overdose deaths per 100,000 people, with eighteen recorded overdose deaths occurring in the county (see *Figure 16 – PA Opioid Overdose Deaths 2015*), compared to 2014, where the County had 23.5 overdose deaths per 100,000 people (DEA, 2015).

Figure 16 - PA Opioid Overdose Deaths 2015 (DEA, 2016)



4.3.5.4 Future Occurrence

Pandemic & Epidemic

The precise timing of pandemic influenza is uncertain, but occurrences are most likely when the Influenza Type A virus makes a dramatic change, or antigenic shift, that results in a new or "novel" virus to which the population has no immunity. The emergence of a novel virus is the first step towards pandemic, and based on historical events, is expected to occur every eleven to forty-one years.

Infectious Disease

Instances of West Nile Virus have been decreasing due to extensive planning and eradication efforts, however the prospect of climate change could increase the prevalence of the virus. Some studies show increased insect activities during a similar rapid warming event in Earth's history (Curano et al., 2008). Other studies make projections that with the warming temperatures and lower annual precipitation that are expected with climate change, there will be an expansion of the suitable climate for mosquitos and West Nile Virus, increasing the risk that the disease poses (Harrigan et al., 2014). Lyme disease is expected to continue its consistent prevalence in Mercer County.

Opioid Epidemic

According to recent research, in states where medical marijuana has been permitted, overdose deaths from opioids have decreased about twenty-five percent, and the effect was even stronger five to six years after medical marijuana was allowed (Bachhuber et al., 2014). In those states where medical marijuana is permitted, each physician prescribed an average of 1826 fewer doses of pain medication each year (Bradford & Bradford, 2016), suggesting that medical marijuana could help prevent patients from ever being exposed to addicting opioids (Miller, 2016).

Rather than reduce pain, in some cases high doses of opioid painkillers can actually increase pain due to a phenomenon known as opioid-induced hyperalgesia (OIH). However, it is difficult to know how much of an influence OIH has on the opioid epidemic. Some researchers think that OIH could be increasing patients' pain and in turn, increasing their dosages and dependence on opioid drugs, suggesting that patients should work with lower dosages of opioids (Servick, 2016). However, other researchers are unsure of the importance of OIH for opioid users (Servick, 2016).

In the event of an opioid overdose, death can sometimes be prevented with the use of the drug naloxone. Emergency medical responders have access to the treatment, and as of 2015, naloxone is available without a prescription in Pennsylvania.

4.3.5.5 Vulnerability Assessment

Pandemic & Epidemic

Certain groups are at higher risk of infectious disease infection, including people sixty-five years and older, children younger than five years, pregnant women, and people with certain chronic medical conditions. Such conditions include but are not limited to diabetes, heart disease, asthma, and kidney disease. Schools, convalescent centers, and other institutions serving those younger than five years old and older than sixty-five are locations that are conducive to faster transmission of influenza. More generally, areas with higher population densities and places where people gather can be hotspots where influenza can spread more rapidly. *Figure 17 - Pandemic & Infectious Disease Vulnerability* shows the population density according to 2010 census data and locations of schools, daycares and health care facilities, shedding light on areas where the disease may more readily spread. The highest concentration of elevated-transmission risk locations in the county (schools, retirement homes and senior centers) is found in Sharon City. Mercer County has a Pandemic committee, as well as flu clinics which both help respond to infectious disease outbreaks.

Persons who spend time in wooded areas are most at risk for contracting Lyme disease via tick bite. The application of tick repellent with DEET or permethrin is highly recommended. Residents should conduct thorough tick checks after spending time in woodland areas and keep on the lookout for the characteristic "bulls-eye" rash indicative of a tick bite infected with Lyme disease.

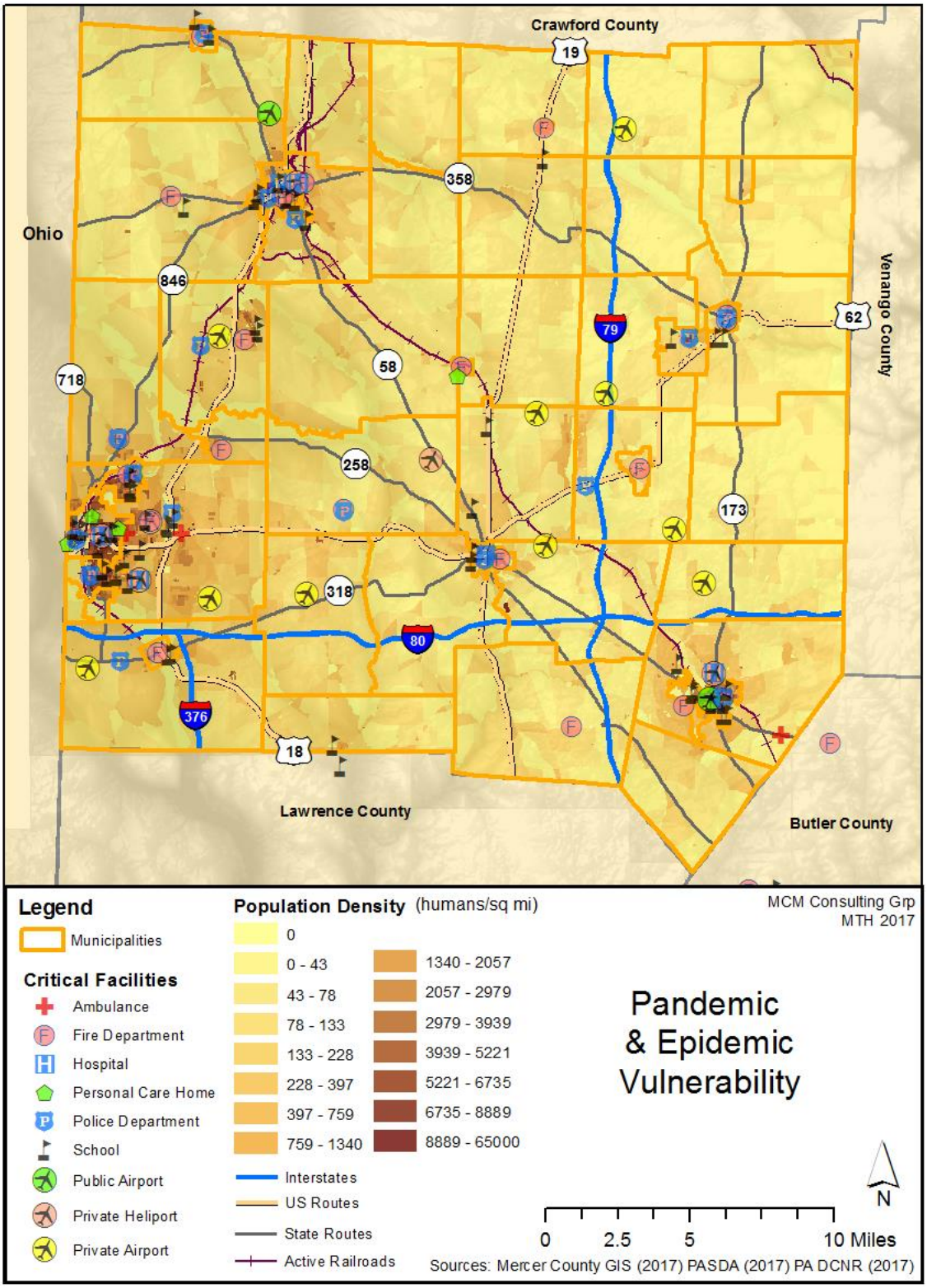
Opioid Epidemic

Deaths from prescription opioid drugs like oxycodone, hydrocodone, and methadone have increased by more than four-fold since 1999. In light of this epidemic, Mercer County formed a committee to combat the problem that opioids pose to residents. While Mercer County is below the statewide average for opioid overdose deaths, the problem

is present and can still be devastating. The CDC offers a list of suggested actions and precautions that can be taken to prevent overdose deaths:

- Improve opioid prescribing to reduce exposure to opioids, prevent abuse, and stop addiction.
- Expand access to evidence-based substance abuse treatment, such as medication-assisted treatment, for people already struggling with opioid addiction.
- Expand access and use of naloxone- a safe antidote to reverse opioid overdose.
- Promote the use of state prescription drug monitoring programs, which give health care providers information to improve patient safety and prevent abuse.
- Implement and strengthen state strategies that help prevent high-risk prescribing and prevent opioid overdose.
- Improve detection of the trends of illegal opioid use by working with state and local public health agencies, medical examiners and coroners, and law enforcement.

Figure 17 - Pandemic & Infectious Disease Vulnerability



4.3.6. Subsidence & Landslide

4.3.5.1 Location and Extent

Subsidence refers to gradual caving in, sinking or collapse of an area of land. Many areas of Pennsylvania have bedrock conditions that lend themselves to subsidence events. Carbonate rock like limestone and dolomite is easily eroded and dissolved by water, so if an area has carbonate bedrock, that area is susceptible to subsidence because groundwater may erode and dissolve the carbonate rock, leading to the creation of caves, swales, sinkholes and other forms of subsidence. These types of features are generally referred to as karst topography. Mercer County does not have a significant amount of naturally occurring karst topography – the main threat of subsidence in the County comes from abandoned coal mines. Areas with coal or other mineral deposits which use deep mining techniques may become susceptible to subsidence. Poor engineering practices used at the time of withdrawal or progressive degradation in geological stability can increase the risk of subsidence.

Landslides are described as downward and outward movement of slope-forming soil, rock and vegetation reactive to the force of gravity. Rockfalls, rockslides, rock topples, block glides, debris flows, mudflows and mudslides are all forms of landslides. Natural causes of landslides include heavy rain, rapid snow melt, erosion, earthquakes and changes in groundwater levels. Landslides occur most frequently in areas with moderate to steep slopes and high precipitation, and most often slope failures happen during or after periods of sustained above average precipitation or snowmelt events. Human activity can increase the likelihood of landslides by reducing vegetation cover, altering the natural slope gradient or increasing the soil water content. One location where this type of human activity is common are areas that were excavated along highways and other roadways.

4.3.5.2 Range and Magnitude

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

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

The worst-case scenario in Mercer County would result from long-term subsidence or sinkhole formation from abandoned coal mines that were not recognized and mitigation measures were not implemented. In this case fractures or complete collapse of building foundations and roadways may result. It is important to locate.

Landslides can cause damage to utilities as well as transportation routes, resulting in road closure or travel delays. Fortunately, deaths and injuries due to landslides are rare

in Pennsylvania. Most reported deaths due to landslides have occurred when rockfalls or other slides along highways have involved vehicles. Storm-induced debris flows can also sometimes cause death and injury. As residential and recreational development increases on and near steep mountain slopes, the hazard from these rapid events will also increase. Most Pennsylvania landslides are moderate to slow moving and damage property rather than people.

The Pennsylvania Department of Transportation and large municipalities incur substantial costs due to landslide damage and to extra construction costs for new roads in known landslide-prone areas. A 1991 estimate showed an average of $10 million per year is spent on landslide repair contracts across the Commonwealth and a similar amount is spent on mitigation costs for grading projects. A number of highway sites in Pennsylvania are in need of permanent repair at estimated costs of $300,000 to $2 million each (DCNR, 2010).

4.3.5.3 Past Occurrence

The DCNR provides an online Sinkhole Inventory Database, which lists a total of 2,665 identified natural karst topographic features in Pennsylvania as of 2009. None of these reported features are located in Mercer County or the surrounding counties (DCNR, 2009). Mercer County contains fourteen active coal mines and the Abandoned Mined Land Inventory has a recorded forty-two problem mines in Mercer County. Due to abandoned mines, the Shenango Valley area as well as the Findley Township area have been experiencing effects of subsidence in the last 10-15 years. Notably, in 2002 there were two occurrences of abandoned mine caused subsidence along Barkeyville Road in Pine Township causing repeated damage to sections of public roadways.

There are no major landslides on record for Mercer County.

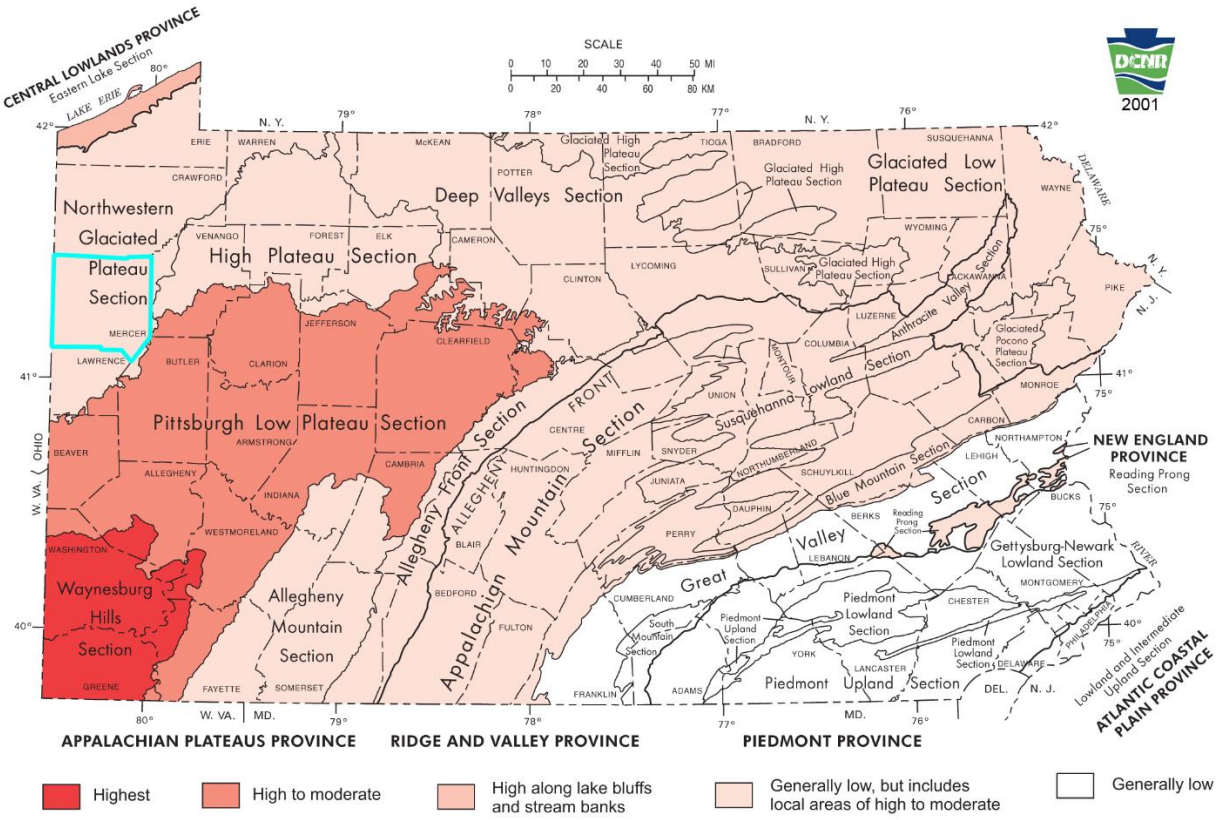
4.3.5.4 Future Occurrence

Based on the number of abandoned mined sites in Mercer County, the annual occurrence of subsidence and sinkhole events in the county where mining occurred is considered likely. *Figure 19 – Abandoned Mine Land* shows data as of July 2017 from the PA DEP and the Abandoned Mine Land Inventory System and helps shed light on areas in the County that have undergone past mining, as well as where reclamation action has been taken. It's important to note that most reclamation actions do not necessarily pertain directly to the threat of subsidence, but can involve actions such as reclaiming land where old mining buildings were, dealing with acid mine drainage, or closing off openings to old mine shafts. As abandoned mines age, they are more likely to fail and result in subsidence due to the aging timber supports in the mine shafts, and increasing weight and pressure placed upon them from newly constructed buildings and traffic movement.

Based on historical events, landslides are not a serious risk for most land in Mercer County, but some locations are prone to the possibility. *Figure 18 – Landslide Susceptibility* shows the relative threat that landslides pose to regions in Pennsylvania. Mercer County falls entirely within the zone of "generally low, but includes local areas of high to moderate" susceptibility. Areas of steep slopes associated with the banks of major watercourses in the county could collapse under heavy rainfall to produce a localized landslide. In addition, steep slopes without vegetation around the many roadcuts

throughout the County are also at-risk areas for landslides. Mismanaged intense development in steeply sloped areas could increase the frequency of occurrence.

Figure 18 - Landslide Susceptibility



4.3.5.5 Vulnerability Assessment

The majority of Mercer County is not particularly vulnerable to landslides. However, transportation routes throughout the county located at the base or crest of cliffs should be considered vulnerable to this hazard. A well-documented database of these locations is not available at this time. Landslides are often precipitated by other natural hazards such as earthquakes or floods, and a serious landslide can cause millions of dollars in damages. Continued enforcement of floodplain management and proper road and building construction helps to mitigate the threat of landslides. Floodplain management is important where mining has occurred within close proximity to watercourses and associated flat-lying areas. Surface water may permeate into areas that still have open fractures and the build-up of surface water in fractures could lead to unexpected flood events.

Abandoned mine sites are susceptible to subsidence events, and most mining activity in Mercer County has occurred in the Eastern, South Eastern portion of the County with some exceptions. Mine Subsidence Insurance is available through the Pennsylvania Department of Environmental Protection (PA DEP). If citizens are aware of areas of Mercer County which have been mined, the PA DEP Mine Subsidence Insurance department can be contacted at 1-800-922-1678 to have a site-specific request conducted.

The Abandoned Mine Land Inventory System describes vulnerable areas with two different levels of vulnerability. AML Problem Areas encompass the entire area where past mining occurred as well as the adjoining areas. AML High Hazard Areas are the specific locations most impacted by past mining efforts – the High Hazard Area is a subset of the AML Problem Areas. There are four critical facilities within an AML Problem Area within Mercer County, three of which are in the High Hazard Area (see *Table 26 – AML Subsidence Vulnerable Critical Facilities*). *Table 26 – AML Subsidence Vulnerable Critical Facilities* summarizes all addressable structures found within the AML impacted regions within Mercer County. Municipalities that are not listed did not contain any vulnerable addressable structures. *Figure 19 – Subsidence Vulnerability Abandoned Mine Land* shows the locations of the AML sites and abandoned mines, as well as current coal mining operations.

Table 26 - AML Subsidence Vulnerable Critical Facilities

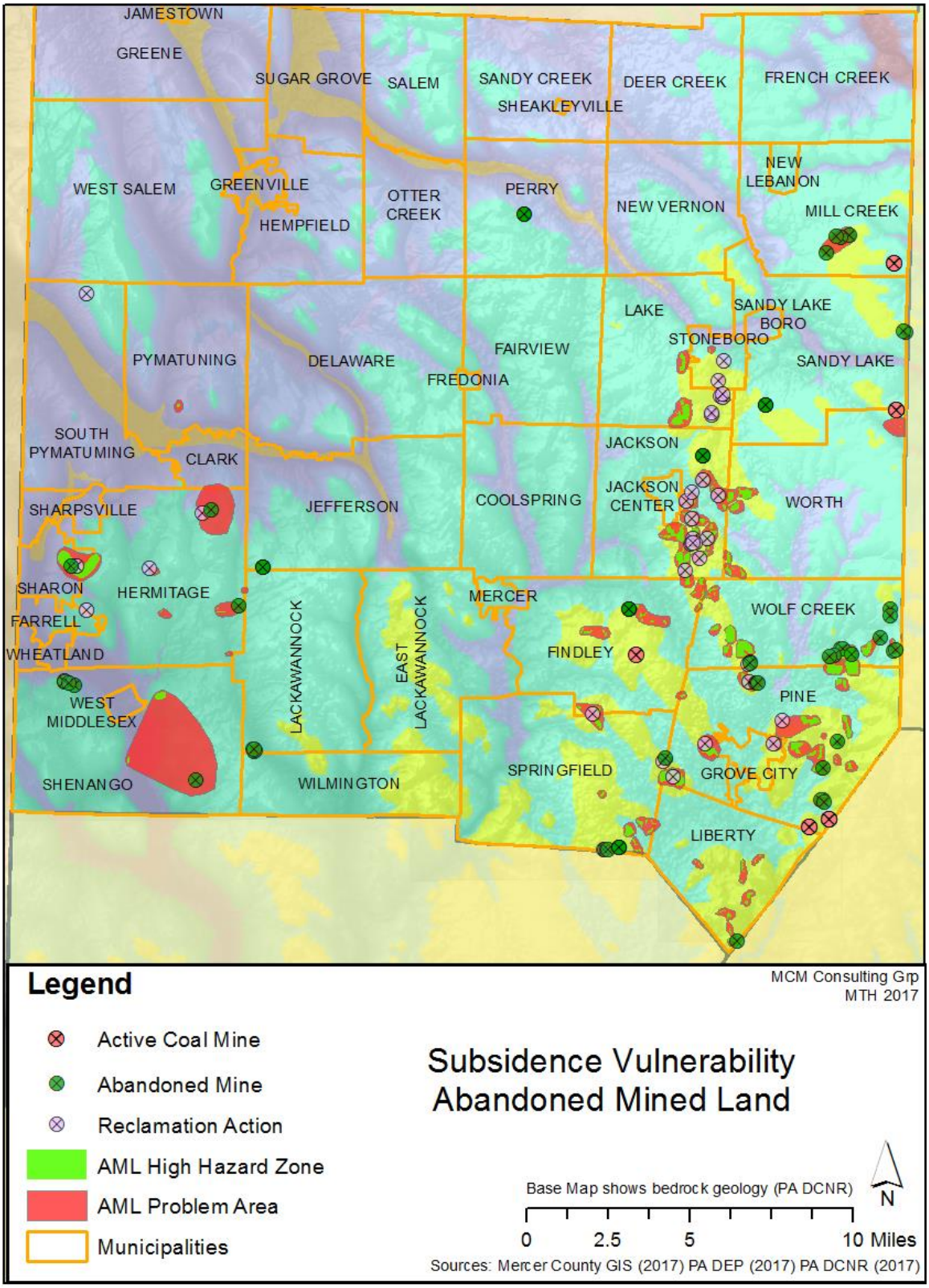
AML Site Type	Type	Name	Municipality	Address
High Hazard Area	Ambulance	McGonigle Ambulance	Hermitage City	1090 E. State Street, Sharon
AML Problem Area	Personal Care Home	Juniper Village	Sharon	1330 Kimberly Drive, Sharon
High Hazard Area	School	Sharon Case Ave. Elementary	Sharon	36 Case Ave., Sharon
High Hazard Area	School	Sharon City High School	Sharon	1129 E. State Street, Sharon

Table 27 - AML Subsidence Vulnerable Addressable Structures

Municipality	AML Problem Area	AML High Hazard Area
Clark	5	0
Findley	143	2
Grove City	322	17
Hermitage City	1101	398
Jackson Center	1	0
Jackson	121	34
Lackawannock	19	0
Lake	70	8
Liberty	29	4
Mill Creek	4	0
Pine	451	45
Pymatuning	9	0
Sandy Lake Twp	3	0
Sharon	1727	912
Shenango	728	18
Springfield	48	10

Municipality	AML Problem Area	AML High Hazard Area
Stoneboro	28	0
Wolf Creek	113	42
Worth	35	5
Total	**4957**	**1495**

Figure 19 - Subsidence Vulnerability Abandoned Mine Land



4.3.7. Tornados, Windstorms & Hurricane

4.3.7.1 Location and Extent

Tornados & Windstorms

Tornados occur in the Commonwealth most frequently during the spring and summer months and are most likely at the warmest times of the day. In the past 67 years, records show that 826 tornados have been reported in all 67 counties in Pennsylvania during the period of 1950- January 2017 (NOAA NCEI, 2017). The National Weather Service estimates the Commonwealth will experience ten tornados annually. According to the National Centers for Environmental Information (NCEI, formerly NCDC), wind speeds in tornados range from values below that of hurricane speeds to more than 300 miles per hour. The NCEI continues by reporting that, "the maximum winds in tornados are often confined to extremely small areas and vary tremendously over short distances." This is the reason that one house will be completely demolished by a tornado and the house next to it might be untouched. The width of tornados can vary greatly, from 100 feet wide to over a mile, and the forward motion of tornados can range from speeds between 0 and 50 miles per hour.

Windstorms may be caused by thunderstorms, hurricanes and tornados, but the most frequent cause of windstorms in Western Pennsylvania are thunderstorms. Straight-line winds and windstorms are experienced on a more regional scale. While such winds usually also accompany tornados, straight-line winds are caused by the movement of air from areas of high pressure to low pressure. Windstorms are generally defined with sustained wind speeds of 40 mph or greater, lasting for at least one hour, or simply winds of 58 mph or greater for any duration. A microburst is a very-localized column of sinking air, capable of producing damaging opposing and straight-line winds at the surface. A wind shear is usually found when a violent weather front is moving through; wind speeds have been recorded up to 100 mph. Wind shear is defined as a difference in wind speed and direction over a relatively short distance in the atmosphere.

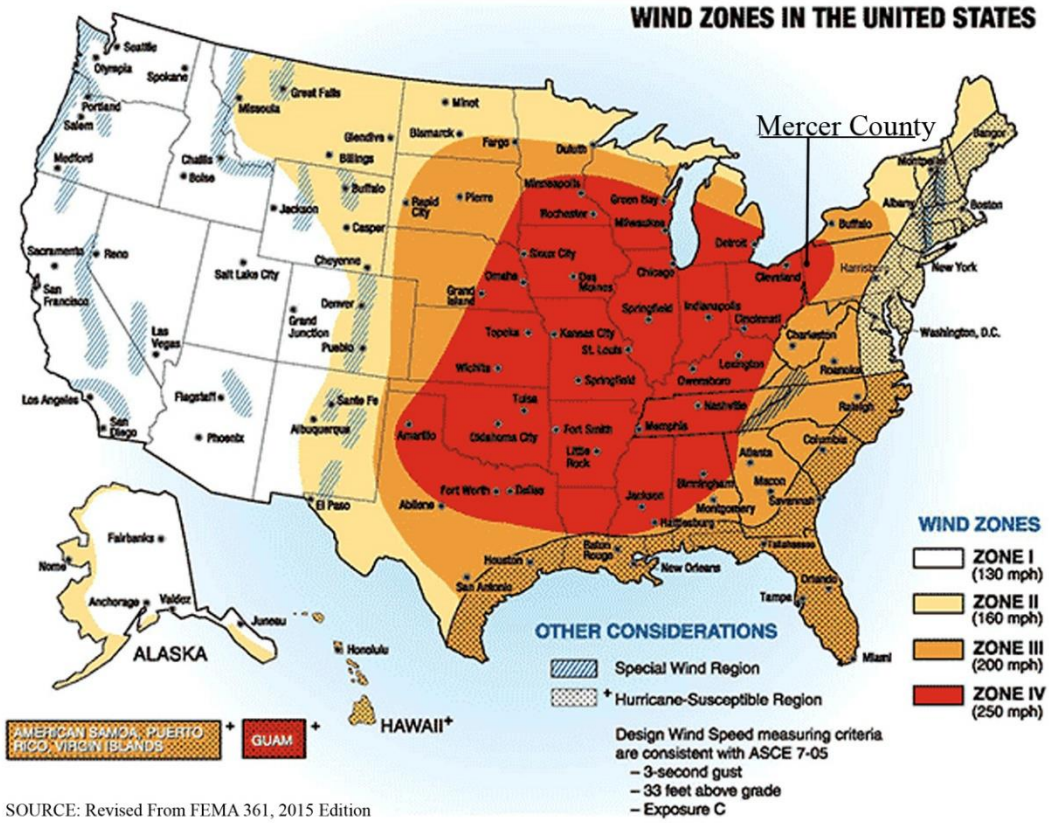
Figure 20 - Microburst

The air moves downward until at ground level. It then spreads outward in all directions.

Hurricanes

Tropical depressions are cyclones with maximum sustained winds of less than 39 miles per hour (mph). The system becomes a tropical storm when the maximum sustained winds reach between 39-74 mph. When wind speeds exceed 74 mph, the system is considered a hurricane. Tropical storms impacting Mercer County develop in tropical or sub-tropical waters found in the Atlantic Ocean, Gulf of Mexico, or Caribbean Sea. While Mercer County is located over 300 miles from the Atlantic Coast, tropical storms can track inland causing heavy rainfall and strong winds, however Mercer County is located outside the high-risk regions for hurricanes and it is unlikely that a hurricane would track through Mercer County (see *Figure 21 – Wind Zones*).

Figure 21 - Wind Zones



4.3.7.2 Range of Magnitude

Tornado & Windstorm

Each year, tornados account for $1.1 billion in damages and cause over 80 deaths nationally. 2011 was the second worst year on record for deadly tornados, the worst being 1936. The number of tornado reports has increased by 14% since 1950. While the extent of tornado damage is usually localized, the vortex of extreme wind associated with a tornado can result in some of the most destructive forces on Earth.

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

Damages and deaths can be especially significant when tornados move through populated, developed areas. The destruction caused by tornados ranges from light to inconceivable depending on the intensity, size and duration of the storm. Typically, tornados cause the greatest damages to structures of light construction. The Enhanced Fujita Scale, also known as the "EF-Scale," measures tornado strength and associated damages. The EF-Scale is an update to the earlier Fujita Scale, also known as the "F-Scale," that was published in 1971. It classifies United States tornados into six intensity categories, based upon the estimated maximum winds occurring within the wind vortex, as shown in *(Table 28 – Enhanced Fujita Scale)*. Since its implementation by the National Weather Service in 2007, the EF-Scale has become the definitive metric for estimating wind speeds within tornados based upon damage to buildings and structures. Previously recorded tornadoes are reported with the older F-Scale values, but *Table 28 – Enhanced Fujita Scale* shows F-Scale categories with corresponding EF-Scale wind speeds.

Figure 21 – Wind Zones described the wind speed zones developed by the American Society of Civil Engineers based on tornado and hurricane historical events. These wind speed zones are intended to guide the design and evaluation of the structural integrity of shelters and critical facilities. Because Mercer County falls within Zone IV, design wind speeds for shelters and critical facilities should be able to withstand a 3-second gust of up to 250 mph, regardless of whether the gust is the result of a tornado, coastal storm, or windstorm event. Therefore, these structures should be able to withstand the wind speeds experienced in an EF5 tornado event.

Tornados can have varying secondary effects. The most common is power failure. The severe wind can dismantle power sources and cause significant structural damage. Hazardous material spills can occur if a tornado comes near a holding tank, or the spill stems from a traffic accident caused by high winds.

Windstorms of all types have caused the following problems within Mercer County:

- Power failures lasting 4 hours or longer

- Loss of communication networks lasting 4 hours or more
- Residents requiring evacuation or provision of supplies or temporary shelter
- Severe crop loss and or damage

Table 28 - Enhanced Fujita Scale

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

Hurricane

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 (*Table 29– 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, but not a threat to inland locations like Mercer County). 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

Table 29 - Saffir-Simpson Scale

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

States. While hurricanes can cause high winds and associated impacts, it is also important to recognize the potential for flooding events during hurricanes and tropical storms; the risk assessment and associated impact for flooding events is included Section 4.3.3.

4.3.10.3 Past Occurrence

Tornados

Mercer County has experienced twenty-three tornados since 1950. The last one occurred in 2015 (NCEI, 2017). On May 31st 1985, multiple tornadoes tracked through Mercer County, two F5 and an F4, causing upwards of 65 fatalities, 700 injuries, 1,000 homes to be destroyed and hundreds of millions of dollars in property damage. In Mercer County, these tornadoes primarily affected Wheatland Borough, the City of Hermitage, and Lackawannock Township. In November 2002, multiple tornadoes struck Mercer County, primarily impacting Clark Borough, South Pymatuning Township and Delaware Township. *Table 30 – Tornado History* and *Figure 30 - Tornado History & Vulnerability* summarize previous tornados recorded in Mercer County.

Table 30 - Tornado History 1950-2016 (NCEI, 2017)

Location	Date	Magnitude	Fatalities	Injuries	Property Damage (USD)
WHEATLAND	5/31/2015	EF0	0	0	$ 20,000
GREENFIELD	7/8/2014	EF1	0	0	$ 75,000
SHENANGO	6/6/2010	EF0	0	0	$ 100,000
MERCER	5/1/2007	EF0	0	0	$ 20,000
NEW LEBANON	7/21/2003	F0	0	0	$ 15,000
SHARPSVILLE	11/10/2002	F2	1	19	$ 1,000,000
SHARON	4/28/2002	F0	0	0	$ 150,000
MERCER	4/28/2002	F1	0	0	$ 750,000

Location	Date	Magnitude	Fatalities	Injuries	Property Damage (USD)
MERCER CO.	9/21/1992	F0	0	0	$ 25,000
MERCER CO.	10/3/1986	F2	0	0	$ 25,000
MERCER CO.	5/31/1985	F4	0	5	$ 250,000
MERCER CO.	5/31/1985	F5	16	125	$ 250,000
MERCER CO.	5/31/1985	F5	18	310	$ 250,000
MERCER CO.	8/2/1980	F1	0	1	$ 25,000
MERCER CO.	5/13/1978		0	0	$ -
MERCER CO.	9/24/1977		0	0	$ 250,000
MERCER CO.	8/8/1977		0	1	$ -
MERCER CO.	5/2/1972	F3	0	0	$ 25,000
MERCER CO.	6/15/1964	F2	0	4	$ 250,000
MERCER CO.	9/30/1954	F2	0	0	$ 25,000
MERCER CO.	6/1/1954	F2	0	3	$ 2,500
		Totals	**35**	**468**	**$3,507,500**

Windstorm

Mercer County has experienced many severe wind events aside from hurricanes and tornados. Most often these are the result of intense thunderstorms, the strongest of which caused tree to fall, damaging power lines and causing power outages for upwards of four days in some areas. From 1950 to December 2016, there are nearly 200 recorded severe wind events causing a total of ~$5.3 million dollars in property damage. (NOAA NCEI, 2017).

Hurricane

Table 31 – History of Coastal Storms lists all coastal storms that have impacted Mercer County from 1970 to October 2016. Although impacts of tropical storms are commonly felt in the Commonwealth, it is rare that a hurricane would track through Mercer County.

Table 31 – History of Coastal Storms Impacting Mercer County (NCEI, 2016)

Year	Name
1972	Tropical Storm Agnes
1999	Hurricane Floyd
2003	Tropical Storm Henri
2003	Tropical Storm Isabel
2004	Tropical Depression Ivan
2005	Hurricane Katrina
2006	Tropical Depression Ernesto
2008	Hurricane Ike
2011	Hurricane Irene
2011	Tropical Storm Lee
2012	Hurricane Sandy

4.3.7.4 Future Occurrence

Tornado & Windstorm

It is likely for a disastrous tornado to hit Mercer County again. While the chance of being hit by a tornado is somewhat small, the damage that results when the tornado arrives can be devastating. An EF5 tornado with a 0.019 percent annual probability of occurring can carry wind velocities of 200 mph, resulting in a force of more than 100 pounds per square foot of surface area. This is a "wind load" that exceeds the design limits of most buildings.

Based on tornado activity information for Pennsylvania between [#data] 1950 and 2016, most of Mercer County lies within an area that has experienced six to fifteen EF4 or EF5 tornados per 3,700 square miles. There is an estimated 1.3% to 3.4% chance that the planning area will be affected by a Category EF4 or EF5 tornado each year. Additionally, based on historic patterns, tornados are unlikely to remain on the ground for long distances, especially in areas of the county with hilly terrain. However, the high historical number of windstorms with winds over 50 knots indicates that annual chance of a windstorm is higher.

According to FEMA (*Table 32 – Annual Probability of Wind Speeds)*, there is high probability (92%) each year that Mercer County will experience winds of 45-77 mph, however there is under a 10% chance of winds of 78-118 mph.

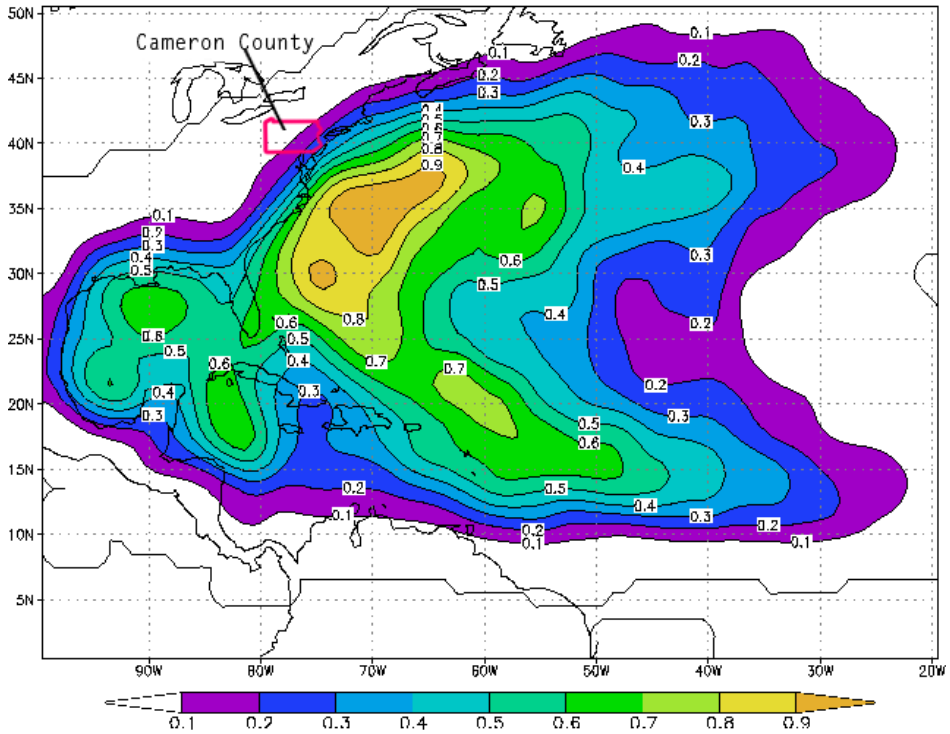
Table 32 - Annual Probability of Wind Speeds (FEMA, 2000)

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

Hurricane

Although hurricanes and tropical storms can cause flood events consistent with 100 and 500-year flood levels, the probability of the occurrence of hurricanes and tropical storms is measured relative to wind speed. *Table 32 – Annual Probability of Wind Speeds* shows the annual probability of winds that reach the strength of tropical storms and hurricanes in Mercer County and the surrounding areas based on a sample period of 6 years. NOAA's Hurricane Research Division estimates that Mercer County will experience impacts from a named tropical storm or hurricane with a probability of less than 10% annually.

Figure 22 - Mean Occurrence of Named Storms 1944-1997



Average number of tropical storms and hurricanes that affect the area throughout the hurricane season. The data used was from 1944 to 1997 and counted hits when a storm or hurricane was within ~100 miles (165km).

Source:NOAA Hurricane Research Division 2015

Climate change is causing atmospheric temperatures to rise, which corresponds to a rise in ocean surface temperatures, resulting in warmer and moister conditions where tropical storms develop (Stott et al., 2010). Warmer oceans store more energy, and are capable of fueling stronger storms and it is projected that Atlantic hurricanes will become more intense and produce more precipitation as ocean surface temperatures rise (Trenberth, 2010). There are expected to be more category 4 and 5 hurricanes in the Atlantic, and the hurricane season may be elongating. Mercer County can be affected by Atlantic coastal storms, so the county should be prepared to deal with impacts of coastal storms more frequently in the future.

4.3.7.5 Vulnerability Assessment

Tornado & Windstorm

Tornados can occur at any time of the year, though they're more likely during peak months, which are during the summer for the northern part of the United States. Tornados are most likely to occur between 3 P.M and 9 P.M. but have been known to occur at all hours of the day or night. Factors that impact the amount of damage caused by a tornado are the strength of the tornado, the time of day and the area of impact. Usually such distinct funnel clouds are localized phenomena impacting a small area, however, the high winds of tornados make them one of the most destructive natural hazards.

There can be many secondary impacts of tornados and windstorms, including transportation accidents, hazardous material spills, flooding, and power outages. A proper warning system is vital for the public to be informed of what to do and where to go. Because of the abundance of forested areas in Mercer, numerous hikers and hunters visit Mercer County annually. In the event of a tornado or severe storm, these tourists and hunters have limited emergency notification measures.

Dangers that accompany thunderstorms which can produce tornados:

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

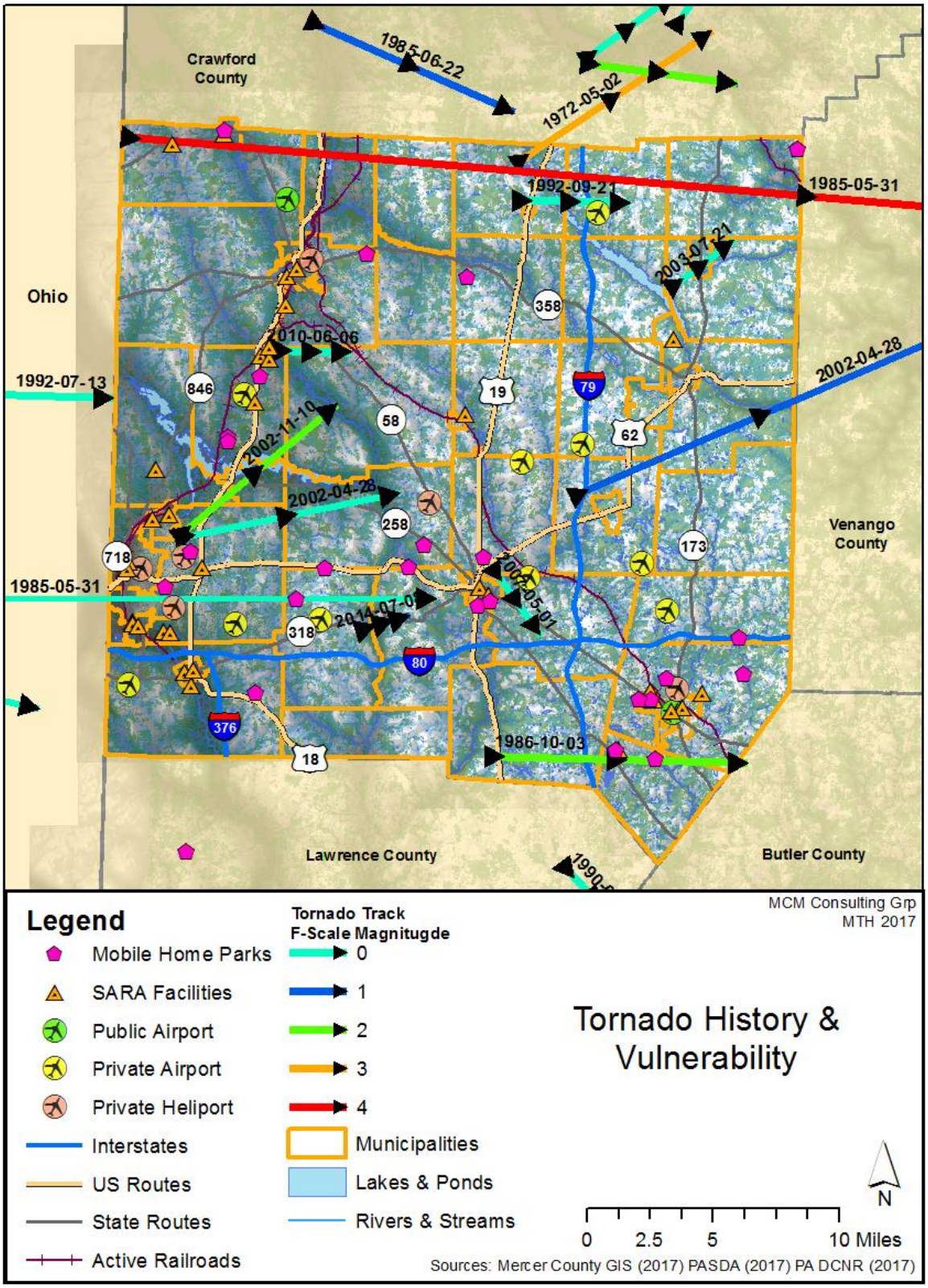
Critical facilities are highly vulnerable to high wind storms. While many severe storms can cause exterior damage to structures, tornados can also completely destroy structures, along with their surrounding infrastructure, abruptly halting operations. Severe storms and their secondary effects often accompanying tornados and can be just as threatening to the critical facilities within the county. Many critical facilities are particularly vulnerable to power outages which can leave facilities functionless, potentially crippling infrastructure supporting the population of the county. With a storm's ability to destroy structures, citizens and their possessions are often left at the will of the storm. The elderly and disabled people are vitally at risk when faced with tornados. Without assistance to evacuate, they may be unable to prepare themselves or their homes and other possessions to safely weather the storm.

The local economy can also be crippled by tornados and windstorms and their secondary effects when buildings and supporting infrastructure are destroyed in the storm. Power outages can create work stoppages while transportation accidents and road closings can limit the transportation of goods and services. Additionally, flooding cannot be discounted as it can destroy the physical structures, merchandise and equipment essential for business operation. In the case of hazardous material spills caused by windstorms, the local environment can also be negatively impacted, requiring extensive clean-up and mitigation efforts.

Hurricane

While Mercer County is located somewhat distally from the Atlantic coast, hurricanes and tropical storms tracking nearby can still cause high winds and heavy rains. A vulnerability assessment for hurricanes and tropical storms focuses on the impacts of flooding and severe wind. The assessment for flood-related vulnerability is addressed in Section 4.3.3.

Figure 23 - Tornado History & Vulnerability



4.3.8. Winter Storms

4.3.8.1 Location and Extent

There are an average of thirty five winter weather events in Pennsylvania each year and such winter storms are regional events, so each county in Pennsylvania shares these hazards. However, the northern tier, western counties and mountainous regions (including parts of Mercer County) generally experience storms more frequently and with a greater severity due to lake effects. Within Mercer County there are variations in the average amount of snowfall that is received throughout the county because of proximity to Lake Erie and terrain differences; higher elevations experience greater snowfalls than lower-lying areas.

On occasion Mercer County can be affected by a Nor'easter, depending on its track. A Nor'easter is a storm characterized by a central low-pressure area that deepens dramatically as it moves northward along the U.S. East Coast. The name came from the strong northeast winds that precede and accompany the storm as it passes over New England. Nor'easters are notorious for producing heavy snow in the Central and Northeastern Mountains (including the Poconos), but typically make lighter snow (or even no snow) for counties in the west. Nor'easters will ordinarily produce a heavy, wet snow. There is usually a fairly consistent demarcation between rain, mixed precipitation, and snow which moves along with the storm and generally parallel to the track of the surface low. The demarcation typically pivots with the storm as the track changes direction. The mixed precipitation and rainfall are generated when warmer marine air is pulled into the storm. The heaviest snow in a Nor'easter falls to the north and west of the track of the surface low (NWS).

4.3.8.2 Range of Magnitude

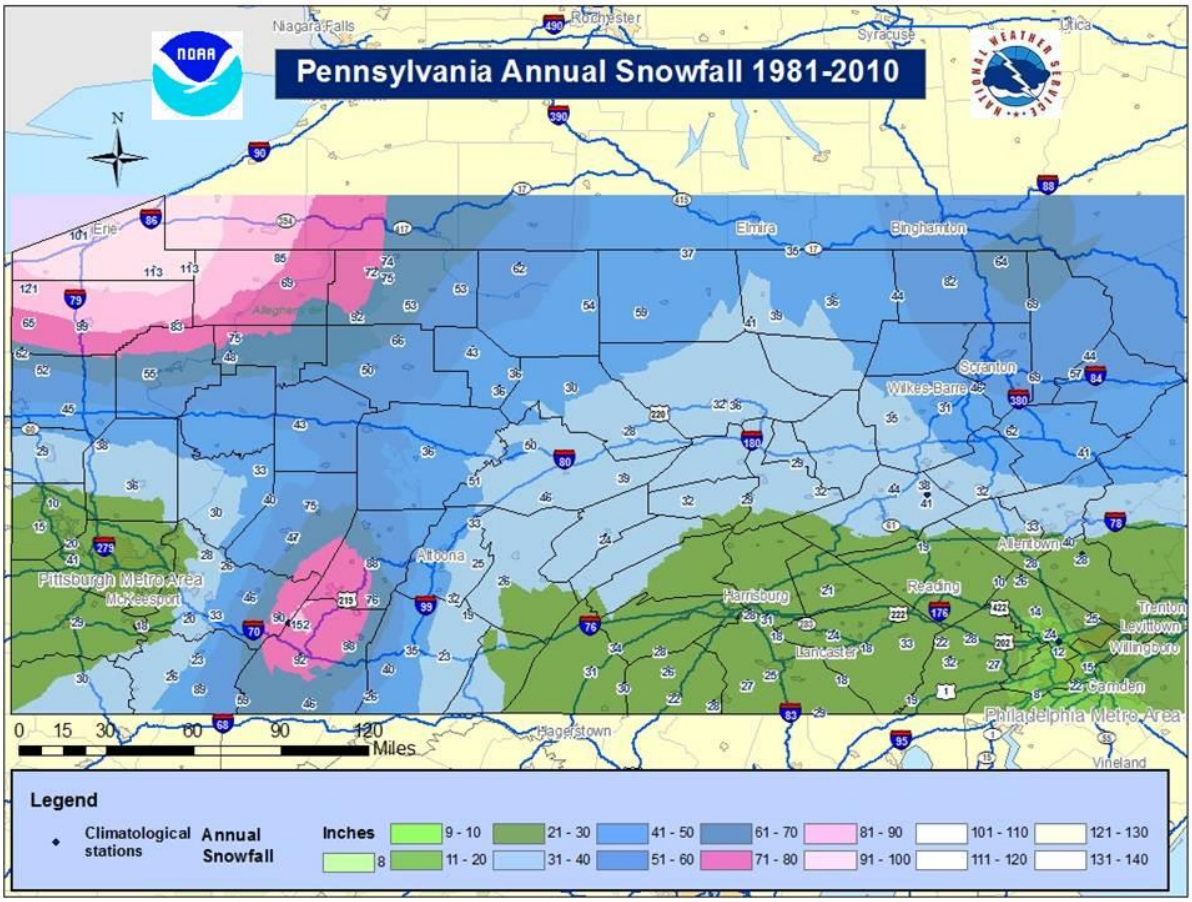
Winter storms consist of cold temperatures, heavy snow or ice and sometimes strong winds. Descriptions of types of winter storms can be found in *Table 33 – Winter Weather Events*. In severe cases, secondary effects of winter storms involve flooding, disruption to traffic, EMS response capabilities, communications, electric power and other utilities. Power outages can be caused by large amounts of snow or ice weighing on and breaking power lines. Especially in rural areas, loss of electric power can result in a loss of heat for residential customers, potentially posing a threat to human life.

Long cold spells can cause rivers and lakes to freeze over. A subsequent thaw and rise in the water level then breaks the ice into large chunks and can result in ice jams when the ice begins to flow. The ice jams can act as a dam and result in flooding. Environmental impacts often include damage to shrubbery and trees due to heavy snow loading, ice build-up and/or high winds which can break limbs or even bring down large trees. While gradual melting of snow and ice provides excellent groundwater recharge, high temperatures following a heavy snowfall can cause rapid surface water runoff and severe flooding. *Figure 24 – Pennsylvania Annual Snowfall* shows mean annual snowfall in Mercer County to be between 30 and 70 inches.

Table 33 - Winter Weather Events

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

Figure 24 - Pennsylvania Annual Snowfall 1981-2010 (NOAA-NWSFO).



4.3.8.3 Past Occurrence

Winter storms occur on the average of five times a year in Mercer County. Mercer County experienced major winter storms in 1950, 1977, 1978, 1982, 1983, 1993, 1994, 1996, and 1998. The severe winter of 1977, with its extreme temperatures, heavy snow and strong winds coupled with fuel shortages, caused extreme hardship in Mercer County. Motorists were stranded on I-80 and some secondary roads; household fuel oil suppliers and food stocks ran out and re-supply was impaired by drifting snow. Heavy snow and drifting closed many roads, some for more than three days. Municipal and state road crews could not keep up with drifting snow and required supplemental equipment and manpower from the private sector.

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

In February of 2015, Pennsylvania experienced an intense cold spell when many low temperatures records were broken. A low temperature of -27°F was recorded near Jackson Center. All other recorded winter weather events in Mercer County from 1960-2017 are summarized in *Table 34 - Severe Winter Weather Occurrences*.

Table 34 - Severe Winter Weather Occurrences

Date	Type	Death	Injury	Estimated Damage (USD)
2/18/1960	Heavy Snow	NR	NR	NR
3/3/1960	Heavy Snow	NR	NR	NR
12/1/1960	Heavy Snow	0	0	NR
12/11/1960	Heavy Snow	NR	NR	NR
2/3/1961	Heavy Snow	NR	NR	NR
3/6/1962	Heavy Snow	0	0	NR
12/6/1962	Heavy Snow	0	0	NR
12/10/1962	Heavy Snow	0	0	NR
12/29/1962	Heavy Snow	0	0	NR
1/12/1964	Heavy Snow	0	0	NR
3/10/194	Ice Storm	0	0	NR
1/23/1965	Ice Storm	0	0	NR
1/30/1966	Heavy Snow/Blizzard	NR	NR	NR
11/12/1968	Heavy Snow	0	NR	NR
12/5/1968	Heavy Snow	NR	0	NR
12/25/1969	Heavy Snow	0	0	NR
1/26/1971	Heavy Snow	NR	0	NR
1/27/1971	Heavy Snow	0	0	NR
2/13/1971	Ice Storm	0	0	NR
2/17/1971	Ice Storm	0	0	NR
4/6/1971	Heavy Snow	0	0	NR

Date	Type	Death	Injury	Estimated Damage (USD)
11/25/1971	Heavy Snow	0	0	NR
2/18/1972	Heavy Snow	0	0	NR
11/30/1974	Heavy Snow	0	NR	NR
1/28/1977	Heavy Snow/Blizzard	NR	0	NR
1/20/1978	Heavy Snow	0	0	NR
1/26/1978	Heavy Snow	0	0	NR
1/7/1979	Ice Storm	NR	NR	NR
12/10/1992	Heavy Snow	0	0	NR
2/12/1993	Heavy Snow	0	0	NR
2/16/1993	Heavy Snow	0	0	$0
3/13/1993	Heavy Snow	0	0	$50,000,000
10/31/1993	Heavy Snow	0	0	$5,000
1/4/1994	Heavy Snow	0	185	$5,000,000
1/17/1994	Heavy Snow	0	0	$500,000
3/2/1994	Heavy Snow/Blizzard/Avalanche	0	1	$5,000,000
11/23/1994	Heavy Snow	0	0	$0
1/4/1995	Heavy Snow	0	0	$0
1/7/1995	Ice	0	0	$0
2/15/1995	Ice	0	0	$0
12/19/1995	Heavy Snow	0	0	$0
1/2/1996	Heavy Snow	0	0	$0
1/6/1996	Heavy Snow	0	0	$0
3/6/1999	Heavy Snow	0	0	$0
11/22/2000	Heavy Snow	0	0	$0
12/25/2002	Heavy Snow	0	0	$0
1/11/2003	Heavy Snow	0	0	$0
12/6/2003	Heavy Snow	0	0	$0
1/14/2004	Heavy Snow	0	0	$0
3/16/2004	Heavy Snow	0	0	$0
12/20/2004	Heavy Snow	0	100	$650,000
1/22/2005	Heavy Snow	0	0	$0
3/1/2005	Heavy Snow	0	0	$0
4/3/2005	Heavy Snow	0	0	$0
2/13/2007	Heavy Snow	0	0	$0
1/1/2008	Heavy Snow	0	0	$0
11/20/2008	Heavy Snow	0	0	$0
1/9/2009	Heavy Snow	0	0	$0
1/16/2009	Extreme Cold/wind Chill	0	0	$0
1/17/2009	Heavy Snow	0	0	$0
1/7/2010	Heavy Snow	0	0	$0
2/5/2010	Heavy Snow	0	0	$0
12/5/2010	Heavy Snow	0	0	$0
12/13/2010	Heavy Snow	0	0	$0

Date	Type	Death	Injury	Estimated Damage (USD)
3/10/2011	Heavy Snow	0	0	$0
12/26/2012	Heavy Snow	0	0	$0
11/26/2013	Heavy Snow	0	0	$0
1/5/2014	Extreme Cold/wind Chill	0	0	$0
1/27/2014	Extreme Cold/wind Chill	0	0	$0
2/1/2015	Heavy Snow	0	0	$0
2/14/2015	Extreme Cold/wind Chill	0	0	$0
2/19/2015	Extreme Cold/wind Chill	0	0	$0
2/24/2015	Extreme Cold/wind Chill	0	0	$0
2/15/2016	Heavy Snow	0	0	$0
11/13/1997	Ice Storm	0	0	$3,000
2/4/1998	Ice Storm	0	0	$0
1/2/1999	Winter Storm	0	0	$0
1/8/1999	Winter Storm	0	0	$0
1/13/1999	Winter Storm	0	0	$0
2/17/2000	Winter Storm	0	0	$0
12/13/2000	Winter Storm	0	0	$0
3/25/2002	Winter Storm	0	0	$0
2/3/2004	Ice Storm	0	0	$0
2/6/2004	Ice Storm	0	0	$0
1/5/2005	Ice Storm	0	0	$20,000
1/11/2005	Ice Storm	0	0	$5,000
12/15/2005	Ice Storm	0	0	$0
12/13/2007	Ice Storm	0	0	$0
2/1/2008	Winter Storm	0	0	$10,000
2/12/2008	Winter Storm	0	0	$0
3/7/2008	Winter Storm	0	0	$0
10/28/2008	Winter Weather	0	0	$0
12/18/2008	County Wide Winter Weather	0	0	$0
1/6/2009	Winter Storm & Ice - School Bus Accident	0	0	$0
1/27/2009	Winter Storm	0	0	$0
12/13/2009	Winter Weather	0	0	$0
2/9/2010	Winter Storm	0	0	$0
1/31/2011	Ice Storm	0	0	$0
2/1/2011	Ice Storm	0	0	$0
3/10/2011	Winter Storm Watch	0	0	$0
2/25/2012	Winter Weather	0	0	$0
2/4/2014	Winter Storm	0	0	$0
11/22/2014	Winter Weather	0	0	$0
12/2/2014	Winter Weather	0	0	$0
12/9/2016	Winter Weather	0	0	$0

Date	Type	Death	Injury	Estimated Damage (USD)
12/11/2016	Winter Weather	0	0	$0
12/29/2016	Winter Weather	0	0	$0
3/13/2017	Winter Storm Stella, Grove City Medical Center	0	0	$0

4.3.8.4 Future Occurrence

The prospect of climate change suggests that in general, future severe winter events will be attenuated as temperatures rise, however there is a lot of uncertainty in terms of what the future brings. Winters in 2000 and 2001 were mild and led to spring-like thunderstorms during the winter months rather than snow storms. Such thunderstorms can be followed by cold fronts and winter storms resulting in temperature drops of 50˚F in a few short hours.

Winter storms are a regular, annual occurrence in Mercer County and should be considered highly likely. Approximately thirty-five winter storm events occur across Pennsylvania and about five in Mercer County annually.

4.3.8.5 Vulnerability Assessment

Due to lake effect from Lake Erie, locations more northern in the county (closer to Erie) generally experience greater snowfall than the southern reaches of Mercer County. Winter storms are a frequent event in the county. Detrimental impacts of severe winter storms are mitigated by salting, plowing and snow removal by PennDOT and local municipalities. Icy and snow-covered roads often result in increases in traffic incidents. Swift response to utility outages during winter storms is another significant way to mitigate damages. Residents of the mountainous and more rural areas of the county may be more susceptible during severe storms, especially when emergency medical assistance is required due to the location's potential for isolation. There are rural areas which are susceptible to isolation due to winter storms. Residents in outlying areas often find it beneficial to keep an emergency food and fuel stock in the event of isolation or utility interruption during a winter storm.

Even for communities that are prepared to respond to winter storms, severe events involving snow accumulations that exceed six or more inches in a twelve-hour period can cause a large number of traffic accidents, strand motorists due to snow drifts, interrupt power supply and communications, and cause the failure of inadequately designed and/or maintained roof systems. Similar to the vulnerability assessment discussion for tornados and severe wind, vulnerability to the effects of winter storms on buildings is dependent on the age of the building, construction material used and condition of the structure. Unfortunately, no comprehensive database of these variables could be identified for Mercer County.

4.3.9. Dam Failure

Dam Failure will be addressed in Appendix I.

4.3.10. Energy Emergency

4.3.10.1 Location and Extent

Energy emergencies come in the form of fuel shortages, electricity blackouts and utility interruptions and impair important utilities such as heating and cooling, telecommunications, and information network sectors. Energy interruptions can be caused by severe solar storms, regional or national fuel or resource shortages, an electromagnetic pulse, public works failure, transmission facility accidents, and other major utility failures. Mercer County has utility service for electric, water, fuel and telecommunications, all of which can experience interruptions for many different reasons.

Often, utility interruptions are a secondary impact of other hazards such as severe thunderstorms, windstorms, tornadoes, winter storms and even traffic accidents. Heat waves may also result in rolling blackouts causing electric to not be available for an extended period of time. All municipalities within the county have a probability of experiencing a utility interruption.

Solar flares are concentrated releases of magnetic energy that emanate from sunspots, and can last for minutes or hours. Solar flares can also cause coronal mass ejections (CME) from the outer solar atmosphere which are large clouds of plasma and magnetic field which induce geomagnetic currents when they reach the surface of Earth. A combination of these events can be referred to as solar storms or solar weather. Solar weather only impacts Earth when it occurs on the side of the sun that is actively facing Earth. A severe solar storm can have a geographically wide-ranging impact that can last for days or weeks (NASA, 2016). Most significantly, a severe solar storm has the potential to disrupt power grids, resulting is rolling blackouts.

Minor solar flares have no negative impacts on Earth thanks to the protection afforded by Earth's magnetic field and atmosphere. In fact, minor solar flares cause beautiful visual displays known as the Northern Lights or Aurora Borealis. However, severe solar storms can cause an electromagnetic pulse (EMP) that is able to break through Earth's magnetic field and send current to Earth's surface, inducing geomagnetic currents. Geomagnetic ally induced currents (GICs) impact the electrical grid and can cause transformers to burn and fail, potentially knocking out wide swatches of electricity infrastructure resulting in blackouts (Phillips, 2009).

4.3.10.2 Range of Magnitude

At a minimum, energy emergencies can cause short term disruption in the daily operation of business, government, healthcare, and private citizens. A loss of energy and other utility services can have numerous impacts including, losing perishable foods and medicines, loss of functionality at health care and emergency medical facilities, limited water distribution capabilities, losing heating and air conditioning, losing telecommunication

and internet services, basement flooding (sump pump failure), and lack of lighting. Energy emergencies can be most troubling when temperatures are at extremes due to the loss of heating or cooling capabilities and the added hazard that extreme heat and extreme cold present. Fuel shortages can result in increased cost of automotive gasoline, long lines at gas stations, disruptions in freight traffic, and shortage of heating fuels. On a small scale, these hazards can be a nuisance, but impacts can be devastating when an energy emergency has a large scope and impacts wide areas and a large population. Severe energy emergencies are often regional or national events.

4.3.10.3 Past Occurrence

The OPEC oil embargo of 1973 – 1974 caused fuel shortages and long lines at gasoline pumps nationwide. Government actions were taken to ensure that fuels and power were available for emergency and priority users. Between 1976 and 1977 there was a rapid increase in fuel prices accompanied by a severe winter resulting in a similar if less extreme fuel shortage. Those two events as well as the national gasoline shortage in 1979 emphasized the vulnerability of all residents in Mercer County to energy emergencies.

Minor power outages are an annual occurrence. Table 35 - Utility Interruptions show events reported to the Knowledge Center from 2007 until June 2017. Significant recent events include May 16th 2013 when power was lost at the hospital in Farrell City. On September 15th 2008, there were over 180,000 people without power in the Pittsburgh area due Hurricane Ike wind gusts that ranged from 60 mph to more than 70 mph. In Mercer County, Penn Power reported that 27,000 residents were without power in Mercer County on September 15, 2008 and over 19,000 residents were still without power the following day. Tony Zucco, Penn Power's Mercer County manager stated that it was the worse power outage that he has seen in 32 years. Depending on where residents were located, power was out for 2-4 days. In spite of the downed lines, shattered trees, and property damage, there were no storm-related injuries reported by the Mercer County hospitals.

Another significant power outage occurred in May of 2009 where over 2,000 Mercer County residents were without power. West Salem Township in Mercer County received numerous calls about power outages and trees being down. According to Mercer County EMA, most calls came from the City of Hermitage. There were no reports of injuries or severe property damage. One isolated power outage caused a basement to flood and in another outage, a fallen tree collapsed a roof of a shed.

Table 35 - Utility Interruptions

Description	Location	Date	Duration
NATURAL GAS LEAK	Mercer County	1/22/2017	50 min
No water Mercer Boro	Mercer Borough	1/17/2017	5 hrs, 28 min
Power Outage	Hermitage City	12/22/2016	25 min
Gas Leak Greenville Horizon (EXTERNAL)	Farrell City	10/13/2016	1 day
WATER MAIN BREAK	Shenango Township	8/14/2016	3 hrs
Water Main Break	Mercer County	7/23/2016	15 hrs, 33 min
Power Failure	Farrell City	6/24/2016	2 hrs, 47 min

Description	Location	Date	Duration
Worker Electrocuted	Grove City Borough	3/15/2016	1 hr
POWER OUTAGE	Coolspring Township	2/18/2016	1 day
Do Not Drink Advisory-Reynolds Area	Pymatuning Township	3/20/2015	14 hrs, 26 min
BWA Mercer County	Jefferson Township	1/16/2015	1 day
BWA Mercer County	Hempfield Township	10/10/2014	1 hr, 38 min
BOIL WATER ADVISORY - Mercer County	Fredonia Borough	10/6/2014	20 hrs, 12 min
Boil Water Advisory	Fredonia Borough	9/23/2014	2 hrs, 40 min
911 outage Mercer County 932 exchange	Mercer County	7/22/2014	1 hr, 36 min
GAS WELL LEAK	Mercer County	4/6/2014	1 hr, 5 min
HIGH TENSION ELE WIRES DOWN	Hempfield Township	3/12/2014	1 hr, 15 min
BOIL WATER ADVISORY - Mercer Co.	Wilmington Township	8/15/2013	40 min
Hospital Power Outage - UPMC Horizon	Farrell City	5/16/2013	19 hrs
9-1-1 outage	Mercer County	7/27/2011	5 hrs, 37 min
Main Water Line Leak	Mercer Borough	2/28/2011	3 hrs, 11 min
Water Outage	Stoneboro Borough	9/25/2010	4 hrs, 15 min
Water Outage	East Lackawannock Township	7/27/2010	19 hrs, 30 min
911 trunk problem	Mercer County	7/20/2010	6 hrs, 27 min
POWER OUTAGE	East Lackawannock Township	7/8/2010	1 hr, 29 min
power outage	Mercer County	3/13/2010	1 hr, 7 min
Water Outage	Pymatuning Township	2/26/2010	3 hrs, 34 min
Water Shortage	Stoneboro Borough	9/7/2009	2 hrs, 1 min
Water Main Break - Greenville	Greenville Borough	1/24/2009	5 hrs, 45 min
power outage Sharon	Sharon City	10/31/2008	18 hrs, 55 min
Phone Outage	Sandy Lake Township	9/17/2008	8 hrs, 27 min
Electrocution	Delaware Township	9/16/2008	5 hrs, 56 min
Wireless 911 Down	Mercer County	5/31/2008	2 hrs, 19 min
Grove City Drinking Water Advisory	Grove City Borough	3/17/2008	17 hrs, 12 min
Natural Gas Outage	Hermitage City	1/14/2008	17 hrs, 28 min
Water Main Break	Stoneboro Borough	1/5/2008	1 hr, 39 min
Water Boil Caution	Greenville Borough	11/7/2007	22 hrs, 7 min
PSP-MERCER Phone Lines Down	Jackson Township	11/6/2007	14 hrs, 47 min
Water Main Break	Hermitage City	9/10/2007	4 hrs, 2 min
Water Main Break	Sharon City	8/16/2007	8 hrs, 4 min
Water Main Break	Greenville Borough	5/12/2007	17 hrs, 38 min

Description	Location	Date	Duration
Explosion at Power Substation	Sharpsville Borough	3/23/2007	4 hrs, 6 min
MVA W/ POWER LINES DOWN	Hermitage City	3/16/2007	6 hrs, 23 min

From August 28 to September 4 of 1859, two severe solar storms resulted in widespread auroral displays in North and South America, Europe, Asia, Australia, and as far south as Hawaii and Cuba (Baker et al., 2008). The event is known as the Carrington Event, and resulted in the widespread disruption of telegraph lines, even setting fire to some telegraph offices (Phillips, 2014). The Carrington Event is estimated to be one of the strongest recorded geomagnetic storm events.

In March of 1989, a severe geomagnetic storm caused a widespread blackout (occurring within 90 seconds) in northeastern Canada's Hydro-Quebec power grid, resulting in millions being without electricity for 9 hours (Baker et al., 2008). Currents from this event are estimated to be ten times less than those induced in the May 1921 event.

On May 14 of 1921, a geomagnetic storm produced ground currents that are estimated to be half as strong as the Carrington event, but ten times stronger than the 1989 event.

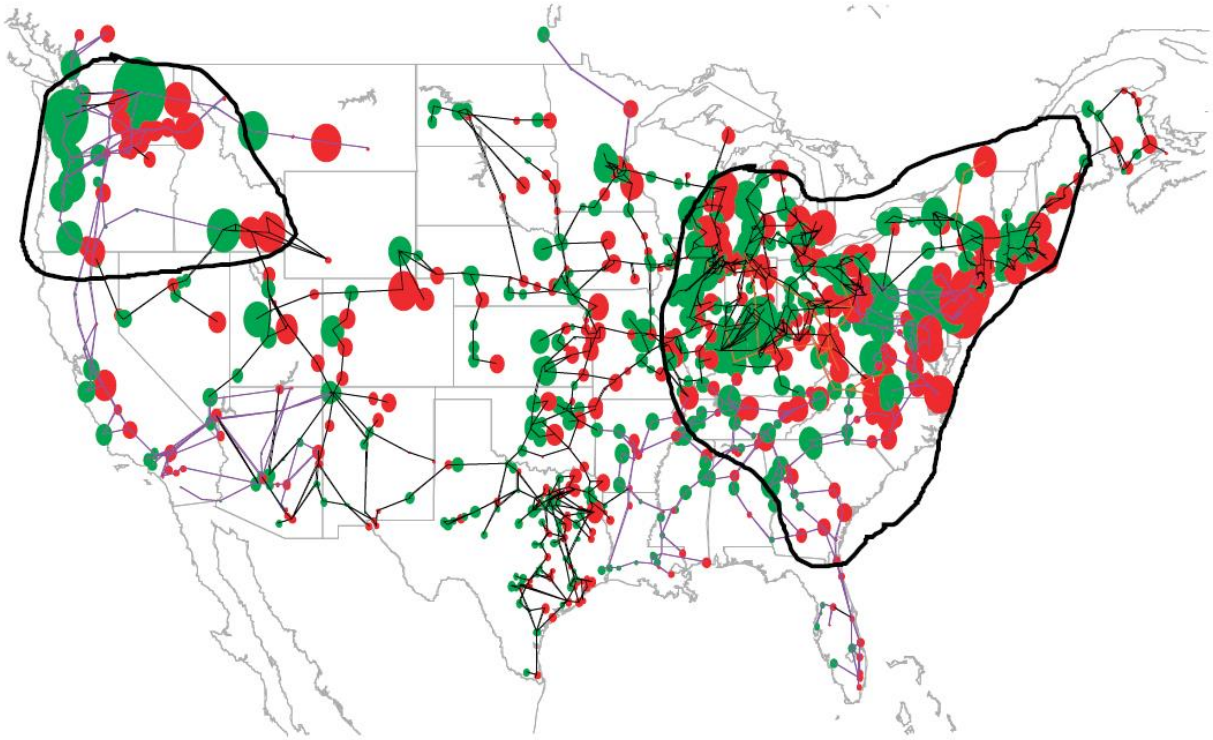
In July of 2012, a powerful solar storm produced an intense coronal mass ejection, estimated to be possibly stronger than the Carrington Event (Baker et al., 2013). Fortunately, due to the position of the event and the location of Earth in its orbit, the event missed Earth by as little as a week (Phillips, 2014). The STEREO-A spacecraft was however was in the line of fire, and was able to record valuable data on the event (Baker et al., 2013).

4.3.10.4 Future Occurrence

Minor, short-term outage events may occur several times a year for any given area in Mercer County, while major, widespread and long-term events may take place once every few years. Energy Emergencies are most often caused by severe weather events, therefore, citizens should prepare for them during severe storms.

It is estimated that the probability of occurrence in the next ten years of an extreme space weather event at the scale of the Carrington Event is twelve percent (Riley, 2012). If a solar storm on the scale of the 1921 event impacted our modern electricity infrastructure, it could permanently damage an estimated 350 transformers, and cause blackouts for 130 million people (*Figure 25 – Potential Electricity Grid Failure*) (Baker et al., 2008).

Figure 25- Potential Electricity Grid Failure



Scenario showing effects of a 4800 nT/min geomagnetic field disturbance at 50° geomagnetic latitude scenario. The regions outlined are susceptible to system collapse due to the effects of the GIC disturbance; the impacts would be of unprecedented scale and involve populations in excess of 130 million. SOURCE: J. Kappenman, Metatech Corp., "The Future: Solutions or Vulnerabilities?," presentation to the space weather workshop, May 23, 2008.

4.3.10.5 Vulnerability Assessment

All municipalities in Mercer County are vulnerable to energy emergencies. Critical facilities such as emergency medical facilities, retirement homes and senior centers are particularly vulnerable to power outages. While back-up generators are often used at these facilities, loss of electricity accompanied by temperature extremes can be dangerous for elderly and other high-risk populations. Appendix E provides a list of critical facilities located in Mercer County.

Extreme temperatures can disrupt fuel and electricity supplies, with extreme cold weather triggering a higher demand for heating oil and natural gas as well as causing low gas pressure, and extreme hot weather possibly overloading electrical grids resulting in blackouts. There are two natural gas pump stations in Mercer County, one owned by the Tennessee Gas Pipeline and the other Columbia Gas. Of the two, Tennessee Gas provides the majority of the required natural gas in Mercer County.

Pennsylvania Power and Lighting recently implemented a new dispatch communications system called Mobile Operations Management (MOM). This system links every Pennsylvania Power and Lighting crew to a central emergency response coordination center.

This technology has reduced average outage times in Pennsylvania from an average of 108 minutes between 2004 and 2008 to 71 minutes in 2009.

The National Oceanic and Atmospheric Administration (NOAA) monitors solar activity from the Space Weather Prediction Center (SWPC), and is able to alert power grid operators of the impending geomagnetic storm so they may make efforts to protect the grid from GICs (Baker et al., 2008). Events such as the 1989 Hydro-Quebec blackout have illuminated the hazard that solar storms pose to electricity infrastructure, however modern power grids are more vulnerable than ever. Power grids have become increasingly interconnected, improving efficiency in many ways, but also making them more vulnerable to wide ranging rolling failures as illustrated in *Figure 25 - Potential Electricity Grid Failure* (Baker et al., 2008).

Geomagnetic storms can cause permanent damage to transformers that could result in much longer restoration times than experienced in the 1989 Hydro-Quebec outage. Transformer damage occurs when GICs cause excessive internal heating resulting in melting and burning of many large-amperage copper windings and leads. Such damage cannot be repaired, and the damaged transformer must be replaced. Transformers are extremely large and heavy apparatuses, and replacement can be a long process, suggesting that efforts should be taken to protect resident transformers from GICs. A workshop held by the Committee on the Societal and Economic Impacts of Severe Space Weather Events offered solutions to mitigating negative impacts of GICs, suggesting that supplemental transformer neutral ground resistors should be installed because they are relatively inexpensive, have low engineering trade-offs, and can produce 60-70 percent reduction of GIC levels during severe solar storms (Baker et al., 2008).

The Department of Homeland Security (DHS) has a Solar Storm Mitigation effort, which "aims to provide owners and operators of the electricity grid with advanced and actionable information about anticipated GCI current levels in the event of a solar storm" (US GAO, 2017). According to the DHS, when provided with accurate solar storm warnings, utility operators can "make operational decisions to mitigate the impacts from solar storms. This can range from canceling maintenance work to temporarily shutting down vulnerable grid components and preventing permanent damage" (DHS, 2015).

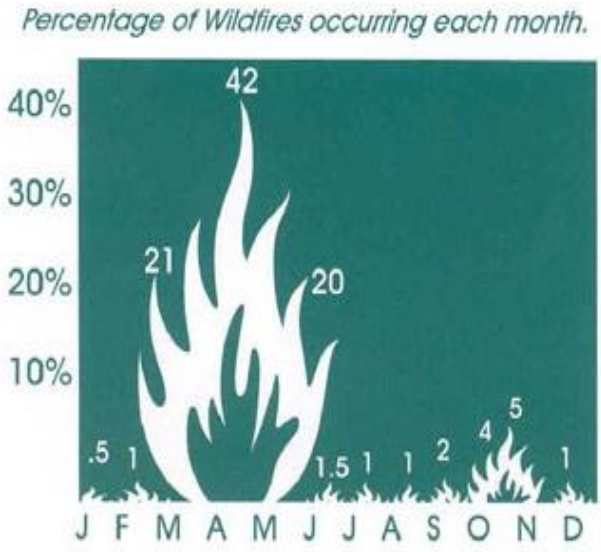
4.3.11. Fire Hazard

4.3.11.1 Location and Extent

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

off of vegetative fuels. Wildfires are most prevalent under prolonged dry and hot spells, or generally drought conditions. The greatest potential for wildfires (83% of all PA wildfires) occur in the spring months of March, April, and May, and the autumn months of October and November. In the spring, bare trees allow sunlight to reach the forest floor, drying fallen leaves and other ground debris and increasing wildfire vulnerability. In the fall, the surplus of dried leaves are fuel for fires. *Figure 26 – Seasonal Wildfire Percentage* shows the wildfire percentage occurrence during each month occurring in Pennsylvania.

Figure 26– Seasonal Wildfire Percentage (PA DCNR, 2017)



4.3.11.2 Range of Magnitude

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

The United States Forest Service utilizes the Forest Fire Assessment System to classify the dangers of wildfire. *Table 36 - Wildland Fire Assessment System* identifies each threat classification and provides a description of the level.

Table 36 - Wildland Fire Assessment System

Rank	Description
Low (L)	Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.

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

4.3.11.3 Past Occurrences

Between 2007 and May of 2017, there were 284 wildfires reported to the Knowledge Center. These reported fires are primarily urban fires, and wildfires in natural lands may be reported less frequently and thus could be under-represented here. This list should be treated as a sample of fire history in Mercer County and not an all-inclusive database.

The McCandless Ford Dealership in Mercer Borough was burned to the ground in April of 1992. A valve broke off of a propane truck that was undergoing repairs causing propane to leak. Efforts were made to shut off all ignition sources, and the surrounding residents, schools and businesses were evacuated. Despite mitigation efforts, the propane ignited and burned for more than five hours, however and there were no injuries.

In recent years, the number of prescribed burns in Pennsylvania have been increasing. This corresponds to an embrace of the need for fire in many natural ecosystems and management strategies for reducing vulnerability to wildfires. *Table 37 – PA Prescribed Burns (PA DCNR, 2017)* shows prescribed burn data for Pennsylvania from 2010 to 2015.

Table 37 - PA Prescribed Burns (PA DCNR, 2017)

Year	All Agencies and Organizations - Number of Prescribed Fires	All Agencies and Organizations - Number of Prescribed Fire Acres	DCNR - Number of Prescribed Fires	DCNR - Number of Prescribed Fire Acres
2010	56	2737	12	186
2011	70	6301	11	189
2012	96	4133	10	208
2013	142	8058	35	866
2014	161	7094	26	338
2015	244	14553	47	1317

Table 38 - Wildfire Occurrence 2007-2017 (Knowledge Center™, 2017)

Description	Jurisdiction	Start Time	Duration (hrs:min)
GARAGE FIRE	Mercer County	4/28/2017 5:21	1:56
Motor Vehicle Fire	Mercer County	4/26/2017 15:39	3:22
Residential Structure Fire	Jefferson Township	4/24/2017 3:49	1:23
Residential Structure Fire	Sharon City	4/20/2017 2:29	2:02
Barn Fire	Salem Township	4/16/2017 7:51	2:26
Mobile Home Fire	Fairview Township	3/25/2017 21:56	1:28
Residential Structure Fire	Farrell City	3/25/2017 21:52	2:56
House Fire	Mercer County	3/24/2017 3:56	1:57
House Fire	Shenango Township	3/20/2017 11:43	5:39
Commercial Fire	Hempfield Township	3/14/2017 15:16	7:59
Structure Fire	Wilmington Township	3/12/2017 13:24	2:20
Working Barn Fire	Shenango Township	3/6/2017 16:00	2:21
Structure Fire	Greenville Borough	3/5/2017 16:33	2:51
Structure Fire	West Salem Township	2/26/2017 12:47	1:45
Residential Structure Fire	Lackawannock Township	2/17/2017 23:46	2:15
Mobile3 Home Fire	Pymatuning Township	2/13/2017 10:47	2:07
Vacant House Fire	Sharon City	2/12/2017 3:16	2:39
Residential Structure Fire	Hermitage City	1/31/2017 2:41	3:22
Structure Fire	Greenville Borough	1/23/2017 16:16	1:54
commercial structure fire	Mercer County	1/21/2017 5:44	5:13
Residential Structure Fire	Hempfield Township	12/30/2016 22:20	3:27
Barn Fire	Fairview Township	12/15/2016 19:43	4:27
Working Residential House Fire	Farrell City	12/15/2016 6:22	7:33
Working Church Fire	Wheatland Borough	12/11/2016 22:40	1:21
Working Barn Fire	New Vernon Township	12/9/2016 1:50	10:24
Working Structure Fire	Sharon City	12/8/2016 19:16	1:36
Residential Structure Fire	Perry Township	12/8/2016 0:16	2:16
Motor Vehicle Fire	Mercer County	12/4/2016 21:56	1:35

Description	Jurisdiction	Start Time	Duration (hrs:min)
tractor trailer accident	Mercer County	12/2/2016 18:47	0:59
commercial fire	Mercer County	11/29/2016 23:29	0:00
Residential Structure Fire	East Lackawannock Township	11/14/2016 1:24	6:51
Residential Structure Fire	Hempfield Township	11/13/2016 23:18	8:58
Residential Structure Fire	Sharon City	11/12/2016 21:52	0:31
Working Structure Fire	East Lackawannock Township	11/9/2016 13:42	3:45
Mobile Home Fire on Roadway	Lackawannock Township	11/6/2016 12:42	1:02
Mobile home Fire	Mercer County	10/31/2016 2:10	4:11
Structure Fire	Mercer County	10/29/2016 7:53	2:36
Vacant Structure Fire	Sharon City	10/16/2016 22:50	1:15
Residential Structure Fire	Greenville Borough	10/14/2016 1:41	1:20
Residential Structure Fire	Sharon City	10/5/2016 4:39	1:35
Structure Fire	Grove City Borough	9/17/2016 8:36	3:40
Residential Structure Fire	Sharon City	9/13/2016 14:38	1:13
Commercial Fire-Elderly Housing	West Salem Township	8/16/2016 7:40	0:39
Nursing Home Fire	Pine Township	7/24/2016 16:03	1:30
Brush Fire	Mill Creek Township	7/17/2016 17:30	1:47
Working Residential Structure Fire	Sharon City	6/30/2016 4:25	1:22
Commercial Fire Alarm/Motor Fire	Hermitage City	6/27/2016 4:30	0:32
Working Residential Structure Fire	Farrell City	6/27/2016 4:00	6:36
Working Apartment Fire	Pymatuning Township	6/10/2016 17:37	1:52
Large Brush Fire	New Vernon Township	6/3/2016 18:41	1:26
Structure Fire	Sharon City	5/28/2016 3:35	1:03
Working Barn Fire	Lackawannock Township	5/23/2016 15:22	2:05
Working Residential Chimney Fire	Jackson Township	5/4/2016 0:27	1:32
Large brush fire	Sandy Lake Township	4/18/2016 12:27	10:48
Tires on fire	Mill Creek Township	3/1/2016 14:57	0:43
Residential Structure Fire - Rekindle	Sharon City	2/20/2016 21:29	1:17
Residential Structure Fire	Sharon City	2/20/2016 15:45	1:49
Commercial Fire -School	Mercer Borough	1/28/2016 10:16	0:45
Structure Fire	Sharon City	1/21/2016 21:58	0:51
TT FIRE	Findley Township	1/10/2016 8:56	1:14
Fire in Apartment Building	Hermitage City	12/20/2015 20:43	1:44
Residential Structure Fire	Springfield Township	12/7/2015 16:16	5:49
Residential Structure Fire	Coolspring Township	11/29/2015 19:50	2:12
COMMERCIAL FIRE-NURSING HOME	Pine Township	11/22/2015 20:35	0:36

Description	Jurisdiction	Start Time	Duration (hrs:min)
Mobile Home Fire	Pine Township	11/17/2015 5:09	1:07
Residential Structure Fire	Sharon City	11/10/2015 1:31	1:11
GARBAGE TRUCK FIRE-ROAD CLOSURE	Farrell City	10/28/2015 5:27	6:26
COMMERCIAL FIRE	Greene Township	10/28/2015 5:39	1:19
Residential Structure Fire	West Salem Township	10/27/2015 15:00	1:04
Residential Garage Fire	Perry Township	10/23/2015 19:06	0:50
Residential Structure Fire	Sharon City	10/20/2015 13:17	3:30
Residential House Fire	Mercer County	10/6/2015 13:09	3:14
Commercial Structure Fire	Greenville Borough	9/28/2015 23:31	0:52
Residential Structure Fire	Farrell City	9/22/2015 23:08	2:08
Commercial Structure Fire	West Middlesex Borough	9/16/2015 15:16	1:44
Commercial Structural Fire	Greenville Borough	9/14/2015 12:28	10:39
Structure Fire	Sharpsville Borough	8/27/2015 13:27	1:10
COMMERCIAL FIRE	Hempfield Township	8/21/2015 5:15	1:34
STRUCTURE FIRE	Mercer County	8/16/2015 4:15	4:35
HOUSE FIRE POSS ENTRAPMENT	Sharon City	8/10/2015 23:30	2:51
Residential Structure Fire	Fairview Township	8/9/2015 15:03	2:22
WORKING HOUSE FIRE	Hermitage City	8/2/2015 19:40	2:53
Commercial Fire	Shenango Township	7/20/2015 1:57	1:40
Residential Structure Fire	Jackson Township	7/16/2015 1:36	2:09
Commercial Fire	Hermitage City	6/13/2015 18:00	1:54
Residential Structure Fire	Sharon City	6/1/2015 1:23	2:39
Vacant House Fire	Sharon City	5/20/2015 2:34	1:30
Working House Fire	Sharon City	5/13/2015 14:25	0:26
Commercial Garage Fire	Fairview Township	5/10/2015 17:28	2:31
Abandoned Residential Structure Fire	Salem Township	4/19/2015 18:36	1:30
fire alarm /elementary school /	Mercer County	4/1/2015 13:15	0:16
Working Structure fire	Shenango Township	3/18/2015 12:57	2:38
Residential Structure Fire	Farrell City	3/8/2015 15:36	3:28
Silo Fire	Pymatuning Township	3/7/2015 11:15	10:34
Residential Garage Fire	Hempfield Township	3/7/2015 16:19	3:59
Commercial Structure Fire	Hermitage City	3/3/2015 20:55	2:08
Residential Structure Fire	Hermitage City	3/2/2015 16:14	3:47
House Fire w/Road Closure	Jackson Township	2/5/2015 3:56	2:49
Commercial Fire Combined Tactical	Greene Township	2/4/2015 21:59	0:51
Commercial Fire	Sharon City	1/23/2015 22:35	1:39
Townhouse Fire	Sharpsville Borough	1/19/2015 16:49	4:13
Residential Structure and Garage Fire	East Lackawannock Township	1/17/2015 21:35	12:39
Structure Fire Probst Rd	Mercer County	12/24/2014 21:05	2:09

Description	Jurisdiction	Start Time	Duration (hrs:min)
Working 2nd alarm Structure Fire	Grove City Borough	12/24/2014 18:58	2:18
APARTMENT FIRE	Wheatland Borough	12/4/2014 0:58	3:06
Barn Fire	Hermitage City	9/24/2014 14:15	1:39
Working Structure Fire	Grove City Borough	9/24/2014 12:41	1:12
penn tech aluminium com-mercial fire	Sugar Grove Township	9/7/2014 19:35	5:47
Gas Well Fire	Shenango Township	9/6/2014 5:43	3:08
Gas Well Explosion Pew Road	Mercer County	8/15/2014 20:33	2:28
COMMERCIAL FIRE	Farrell City	8/13/2014 3:59	7:34
Tractor Trailer Fire	Hermitage City	6/3/2014 18:35	14:02
Residential Structure Fire	Lackawannock Township	5/8/2014 18:17	3:59
FIREFIGHTER INJURY-Mercer Co	Hermitage City	5/3/2014 13:15	21:16
Smoke in Building	Greene Township	5/1/2014 17:06	0:15
Commercial Fire	Mercer County	4/11/2014 17:50	10:33
commercial fire	Mercer County	3/29/2014 21:38	5:30
house fire	Mercer County	2/11/2014 7:10	2:28
Smoke in Apt Bldg.	Mercer County	1/13/2014 5:35	2:35
garage fire	Mercer County	1/4/2014 18:49	3:52
commercial structure fire	Mercer County	12/13/2013 0:55	1:20
WORKING STRUCTURE FIRE-SHARON	Sharon City	10/3/2013 21:44	4:00
COMMERCIAL FIRE	Mercer County	9/10/2013 5:54	5:08
FIREFIGHTER INJURY	Pine Township	6/2/2013 13:30	0:37
COMMERCIAL FIRE HARDWARE STORE SAND LAKE	Mercer County	4/24/2013 13:37	6:34
Commercial Fire w/ Explosion	Mercer County	4/22/2013 7:46	0:46
Barn fire Greene Twp	Greene Township	4/8/2013 14:06	1:46
brush fire	Mercer County	4/7/2013 15:52	1:13
Commercial Fire	Mercer County	4/6/2013 11:51	1:05
commercial structure fire	Sharon City	3/30/2013 16:19	0:58
Structure Fire	Sharon City	3/28/2013 21:07	1:11
Structure Fire-Hermitage	Mercer County	2/8/2013 23:59	7:41
Apartment Fire	Mercer County	1/31/2013 14:24	1:26
residential house fire	Mercer County	1/24/2013 3:55	11:08
APARTMENT FIRE	Hermitage City	1/10/2013 21:19	1:40
commercial fire	Grove City Borough	12/22/2012 21:50	5:25
commercial fire	Hermitage City	12/22/2012 20:58	1:38
Apt Complex Fire	Pine Township	8/29/2012 16:53	0:58
Structure Fire Delaware Twp	Delaware Township	7/3/2012 13:31	2:30
Structure Fire Pine Twp	Pine Township	7/3/2012 13:28	1:50
magnesium fire	East Lackawannock Township	4/5/2012 1:06	1:24

Description	Jurisdiction	Start Time	Duration (hrs:min)
MVF/ROAD CLOSURE	East Lackawannock Township	2/25/2012 22:10	1:36
STRUCTURE FIRE W/ ENTRAPMENT	Springfield Township	2/13/2012 21:24	3:53
gas well fire	Greene Township	2/3/2012 5:30	2:10
Smoke in Elderly High Rise	Pine Township	1/17/2012 8:59	0:56
House Fire	Farrell City	11/24/2011 1:46	3:21
Commercial Fire @ Tear Gas Manufacture	Greene Township	11/15/2011 8:23	5:46
Commercial Fire	Hermitage City	11/8/2011 1:15	6:49
Commercial Fire	Hermitage City	8/15/2011 20:16	1:57
Fire in Elderly Housing building	Pine Township	7/10/2011 9:50	0:55
Com Fire	Grove City Borough	7/5/2011 12:40	6:02
Structure Fire	Sharon City	6/16/2011 18:58	2:02
commercial structure fire	Hempfield Township	5/25/2011 22:29	2:16
COMMERCIAL FIRE	Shenango Township	4/13/2011 4:46	9:33
COMERCIAL FIRE	Pine Township	4/11/2011 10:16	3:32
COMMERCIAL FIRE	Jackson Township	4/11/2011 6:02	4:13
COMMERCIAL FIRE/NURSING HOME	Hermitage City	3/27/2011 3:14	0:21
commercial fire	Sharon City	3/4/2011 22:48	0:06
apt building fire	Sharon City	3/4/2011 19:46	1:14
Commercial Fire-Assisted Living	Hermitage City	2/25/2011 7:45	2:05
Working Structure with entrapment	Jefferson Township	12/31/2010 20:06	6:23
Working House Fire	Farrell City	12/5/2010 23:11	7:43
COM FIRE	Jefferson Township	11/28/2010 1:41	4:15
Structure Fire	Pine Township	11/23/2010 15:23	2:00
Commercial Structure Fire w/entrapment	Mercer Borough	11/15/2010 23:03	2:46
Commercial Structure Fire	Hermitage City	10/30/2010 16:40	2:15
Apt house fire	Grove City Borough	10/26/2010 10:47	0:39
vehicle fire	Shenango Township	10/4/2010 21:21	3:13
Residential Structure Fire	Fairview Township	4/7/2010 19:33	3:10
Commercial Structure Fire	Grove City Borough	3/6/2010 14:34	3:35
Elderly High Rise Apt Fire	Sharpsville Borough	3/5/2010 16:48	1:40
Commercial Fire	Jackson Township	2/28/2010 2:07	0:42
w middlesex school fire	West Middlesex Borough	2/23/2010 20:56	3:02
Commercial Structure Fire	Pine Township	2/10/2010 22:58	1:04
Working Structure Fire	Lackawannock Township	12/16/2009 21:07	1:28
church parsonage fire	Pine Township	12/6/2009 9:02	4:24
Structure Fire Sharon City	Sharon City	11/16/2009 22:48	3:00
Structure Fire	Sharon City	11/12/2009 13:18	0:56

Description	Jurisdiction	Start Time	Duration (hrs:min)
Working House Fire	Mercer Borough	11/12/2009 9:16	3:54
Commercial Fire	Perry Township	9/6/2009 0:00	11:25
Structure Fire	Sharon City	8/31/2009 7:45	9:57
Structure Fire	Sharon City	7/22/2009 20:39	3:39
structure fire	Hermitage City	7/4/2009 22:49	20:05
Structure Fire	Pine Township	6/1/2009 12:56	1:21
Structure Fire	Springfield Township	5/4/2009 13:14	5:01
Commercial Fire Senior Housing	Greenville Borough	4/27/2009 19:54	1:51
House Fire	Hempfield Township	4/13/2009 22:15	0:57
house fire w/ reported entrapment	Farrell City	4/10/2009 21:08	5:44
structure fire	Greene Township	4/9/2009 23:32	6:56
structure fire	Mercer Borough	4/9/2009 18:57	5:51
Structure Fire	East Lackawannock Township	4/8/2009 16:14	1:47
Residential Structure Fire	Greenville Borough	3/23/2009 0:32	3:13
structure fire	Findley Township	3/2/2009 9:23	1:31
Residential Structure Fire	Farrell City	2/18/2009 22:39	1:30
Structure Fire	Farrell City	2/10/2009 18:08	4:19
Working Structure Fire	Pine Township	1/16/2009 19:36	2:30
Structure fire /trucking company /garage	Wheatland Borough	12/27/2008 18:56	3:52
Commercial Fire - Nursing Home	Sharon City	12/6/2008 17:44	0:20
meadow rd. house fire	Springfield Township	12/5/2008 3:12	4:30
House Fire-S Pymatuning	South Pymatuning Township	11/25/2008 11:42	2:40
Garage Fire	Grove City Borough	11/20/2008 23:12	3:52
House Fire-Finley Twp	Findley Township	11/11/2008 11:10	3:19
Mutual Aid-Venango Co	Mercer County	10/29/2008 12:54	3:13
House fire-Sharon	Sharon City	10/29/2008 9:20	0:37
COMMERCIAL STRUCTURE FIRE-WALMART	Pine Township	10/25/2008 11:35	0:53
residential house fire	Sandy Lake Borough	10/24/2008 0:35	5:59
Greenville metals explosion	Pymatuning Township	10/22/2008 2:01	1:38
Sharon house fire	Sharon City	10/17/2008 2:44	3:48
Thiel College Academic Bldg. Fire	Greenville Borough	10/5/2008 17:40	1:23
House Fire-Farrell	Farrell City	10/2/2008 15:14	2:36
House Fire Hempfield TWP	Hempfield Township	9/12/2008 22:09	3:09
Structure fire-Hempfield Twp	Hempfield Township	9/6/2008 11:54	1:16
Residential Structure Fire	Greenville Borough	9/2/2008 16:19	0:14
Residential Structure Fire	Otter Creek Township	9/2/2008 15:55	6:29
LUMBER YARD FIRE	Hempfield Township	8/26/2008 19:29	3:37

Description	Jurisdiction	Start Time	Duration (hrs:min)
apartment fire	Hermitage City	8/14/2008 19:35	1:26
Commercial Structure Fire	Hermitage City	8/12/2008 16:34	2:53
Nursing Home Fire	Sharon City	7/11/2008 22:02	0:15
HOUSE FIRE	Farrell City	7/11/2008 1:05	1:10
I79 TRACTOR TRAILER FIRE	Findley Township	7/11/2008 1:53	21:49
Fatal Mobile Home Fire	Pymatuning Township	7/9/2008 8:13	5:02
Mobile Home Fire	Pymatuning Township	7/6/2008 4:04	0:04
garage fire	Sharon City	7/3/2008 2:33	4:19
FORRESTER RD HOUSE FIRE	Fairview Township	6/29/2008 0:00	12:43
Structure Fire Locust St-SR	Sharpsville Borough	5/31/2008 2:51	20:59
House Fire	Findley Township	4/29/2008 18:08	3:34
Barn Fire	Lackawannock Township	4/27/2008 15:16	2:19
House Fire	Sharon City	4/17/2008 19:15	1:28
House Fire	Greenville Borough	4/15/2008 13:58	3:29
Trailer Fire Pine Twp	Pine Township	3/27/2008 16:53	1:52
Kitchen Fire Farrell	Farrell City	3/27/2008 16:43	2:04
Tomeo farms fire	Mercer Borough	3/17/2008 3:35	7:55
Mercer High School	Mercer Borough	3/5/2008 10:45	1:10
line of duty death	Pine Township	3/4/2008 21:33	10:43
garden ave structure fire	Grove City Borough	2/29/2008 7:09	7:56
House Fire	South Pymatuning Township	2/4/2008 3:36	4:10
market st house fire	Mercer Borough	2/3/2008 17:01	2:28
Barn Fire-Lackawannock Twp	Lackawannock Township	1/26/2008 15:25	9:02
House Fire	Greenville Borough	1/14/2008 16:39	3:40
Commercial Fire	Grove City Borough	1/4/2008 20:40	0:17
Commercial Fire High Rise Apartments	Grove City Borough	1/3/2008 10:11	1:11
COMMERCIAL STRUCTURE FIRE	Sandy Lake Borough	12/15/2007 2:56	5:05
Structure Fire Sharon	Sharon City	12/14/2007 21:25	2:43
Fire John 23rd	Hermitage City	12/11/2007 9:44	5:29
house fire	Farrell City	11/27/2007 7:45	5:27
House Fire	Sharpsville Borough	11/19/2007 18:41	4:52
Structure Fire Sharon	Sharon City	10/31/2007 22:16	3:27
Dryer Fire ITV-JC	Jackson Township	10/31/2007 20:03	1:34
commercial fire	Sharon City	10/16/2007 17:29	0:31
Structure Fire-Hermitage	Hermitage City	9/30/2007 11:42	2:59
House Fire	Perry Township	9/28/2007 16:24	0:14
Structure Fire	West Middlesex Borough	9/23/2007 10:02	7:36
Apartment Complex Fire	Hermitage City	9/18/2007 16:59	2:35
House Fire	Sharon City	9/17/2007 22:45	7:50
Perry Hwy Structure Fire	Coolspring Township	8/31/2007 22:25	3:07
Tractor Trailer Fire I80	Wolf Creek Township	8/10/2007 6:57	6:52

Description	Jurisdiction	Start Time	Duration (hrs:min)
Arby's Commercial Fire	Pine Township	8/3/2007 20:02	1:44
Holiday Inn Commercial Fire	Springfield Township	8/3/2007 19:54	1:24
House Fire	Shenango Township	7/21/2007 20:16	19:11
Commercial Fire	Findley Township	6/30/2007 0:55	1:31
High Rise Fire	Sharon City	6/14/2007 13:03	0:49
Truck Propane fire	Farrell City	6/14/2007 11:01	1:01
Commercial Structure Fire - 84 Lumber	Hermitage City	6/11/2007 18:07	3:59
Barn Fire w/ 1000 gallon pro-pane tank	Wilmington Township	6/11/2007 15:50	3:49
House Fire	Sharon City	6/10/2007 21:45	9:02
Commercial Structure Fire	Hempfield Township	6/10/2007 20:32	0:33
Barn Fire	West Salem Township	6/1/2007 19:50	2:53
School Fire	West Middlesex Borough	5/21/2007 19:51	19:12
BARN FIRE	West Salem Township	5/13/2007 0:00	15:57
Bus Fire	Springfield Township	4/25/2007 21:37	3:53
COMMERCIAL FIRE	Pine Township	4/23/2007 21:18	0:00
Perry Hwy Structure Fire	Springfield Township	4/23/2007 13:02	2:33
Steister Rd house fire	Jefferson Township	4/11/2007 9:51	2:20
House Fire	Greene Township	4/6/2007 17:42	2:56
BARN FIRE	Deer Creek Township	4/3/2007 15:27	3:00
Residential House Fire	South Pymatuning Township	3/27/2007 16:10	2:03
Commercial Fire Hosses	Springfield Township	3/14/2007 21:09	1:01
Mobile Home Fire	South Pymatuning Township	3/7/2007 3:40	4:02
Zinc Commercial Fire	Wheatland Borough	3/1/2007 19:06	1:21
House Fire	East Lackawannock Township	2/27/2007 5:47	8:04
W Connelly Blvd Structure Fire	Sharon City	2/23/2007 15:02	5:30
House Fire	Shenango Township	2/6/2007 19:37	4:03
House Fire	Sharon City	2/4/2007 17:26	0:59
Mobile Home Fire	Lackawannock Township	2/3/2007 16:07	2:16

4.3.11.4 Future Occurrence

Annual occurrences of urban and wildfires in Mercer County are expected. Urban fires are most often a result of human errors, outdated wiring or occasionally arson. The occurrence of large scale and intensity wildfires is somewhat unpredictable and highly dependent on environmental conditions and human response. Weather conditions play a major role in the occurrence of wildfires, so in the event of dry drought conditions, wildfire caution should be heightened. Any fire without the quick response or attention

of fire-fighters, forestry personnel, or visitors to the forest, has the potential to become a wildfire.

4.311.5 Vulnerability

The size and impact of a wildfire depends on its location, climate conditions and the response of firefighters. If the right conditions exist, these factors may often mitigate the effects of wildfires, however during a drought, wildfires can be devastating. Wildfires are most common in the spring (March–May) and fall (October–November) months. During spring and fall months, the lack of leaves on the trees allows the sunlight to heat and dry the existing leaves on the ground, increasing the risk of forest fires. Firefighters and other first responders can encounter life threatening situations due to forest fires. Traffic accidents during a response and then the impacts of fighting the fire once on scene are examples of the first responder vulnerabilities.

Table 39 - Buildings in High Wildfire Hazard Areas shows the total addressable structures in high wildfire hazard areas, including State Game Lands, State Parks, and State Forests and other areas dense vegetation. No identified critical facilities in Mercer County were found within the defined high wildfire hazard area. Wildfire hazard is defined based on conditions that affect wildfire ignition and/or behavior such as fuel, topography and local weather.

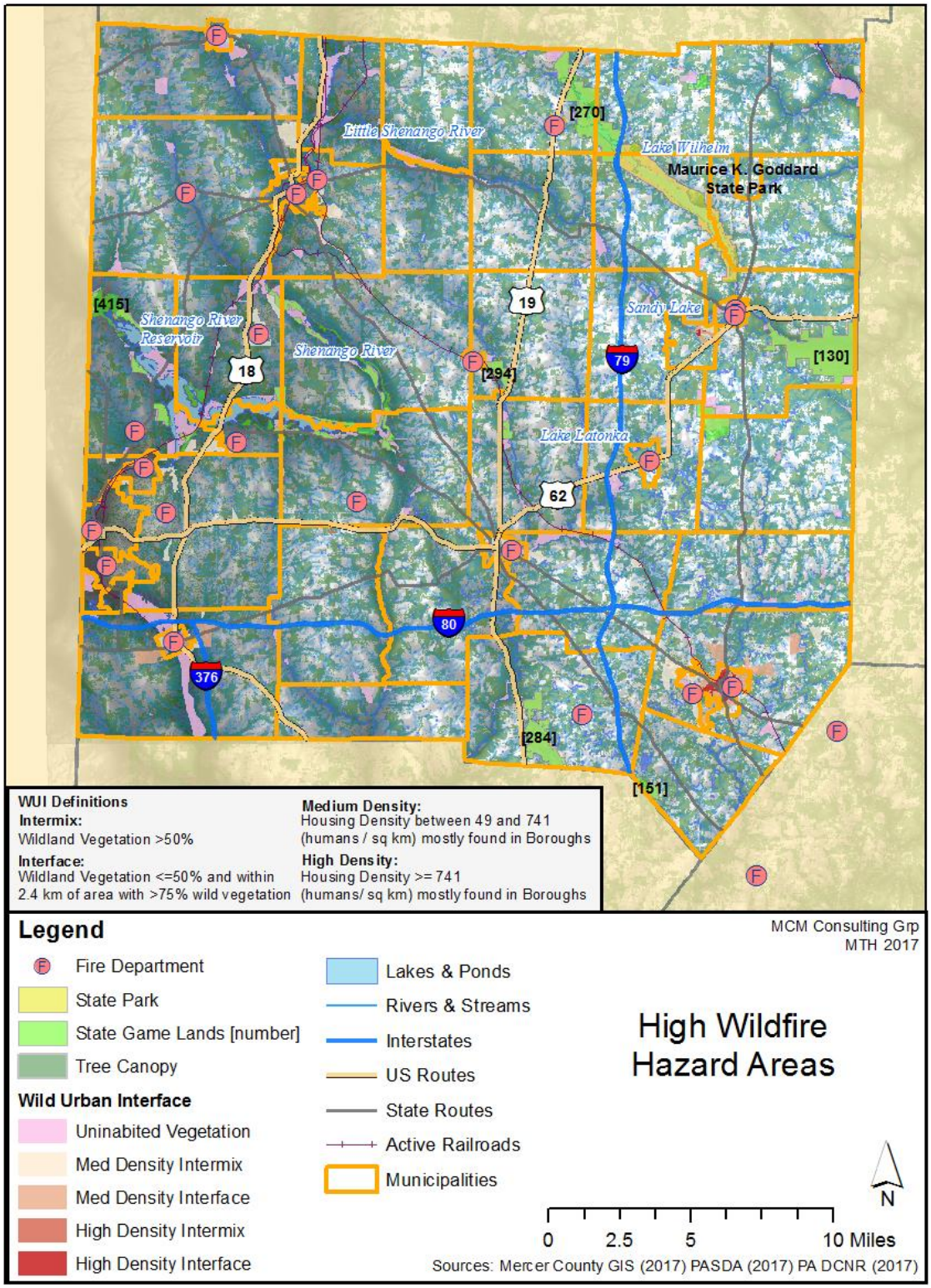
There are 33 fire departments that cover Mercer County and six are located outside of the county. *Table 39* shows which municipalities have fire departments. Each fire department conducts its own schedule of in house training sessions for their members. To assist fire departments throughout the County, a Fire School Training is held twice annually and is conducted by the Mercer County Fire Training Institute, Rescue Expo, and the Emergency Service of Mercer County.

Table 39 - Buildings in High Wildfire Hazard Areas

Municipalities	Vulnerable Buildings	Fire Depts.	Municipalities	Vulnerable Buildings	Fire Depts.
Clark Boro	1	1	New Lebanon Boro	-	-
Coolspring Twp	3	1	New Vernon Twp	23	-
Deer Creek Twp	5	-	Otter Creek Twp	-	-
Delaware Twp	19	-	Perry Twp	1	-
East Lackawannock Twp	11	-	Pine Twp	12	1
Fairview Twp	-	-	Pymatuning Twp	60	1
Farrell City	-	1	Salem Twp	5	-
Findley Twp	8	-	Sandy Creek Twp	2	-
Fredonia Boro	-	1	Sandy Lake Twp	20	-
French Creek Twp	47	-	Sandy Lake Boro	1	1
Greene Twp	29	-	Sharon City	-	1
Greenville Boro	6	1	Sharpsville Boro	-	1

Municipalities	Vulnerable Buildings	Fire Depts.	Municipalities	Vulnerable Buildings	Fire Depts.
Grove City Boro	7	1	Sheakleyville Boro	-	1
Hempfield Twp	1	1	Shenango Twp	18	1
Hermitage City	26	1	South Pymatuning	65	1
Jackson Twp	20	-	Springfield Twp	33	1
Jackson Center Boro	-	1	Stoneboro Boro	-	1
Jamestown Boro	2	1	Sugar Grove Twp	13	-
Jefferson Twp	65	1	West Middlesex Boro	5	1
Lackawannock Twp	8	-	West Salem Twp	12	1
Lake Twp	1	-	Wheatland Boro	-	1
Liberty Twp	1	-	Wilmington Twp	7	-
Mercer Boro	2	1	Wolf Creek Twp	2	-
Mill Creek Twp	4	-	Worth Twp	3	-
			Total	**548**	**27**

Figure 27 - High Wildfire Hazard Areas



4.3.12. Fixed Nuclear Incidents

4.3.12.1 Location and Extent

Nuclear accidents generally refer to events involving the release of significant levels of radioactivity or exposure of workers or the general public to radiation. Nuclear accidents/incidents can be placed into three categories: 1) Criticality accidents which involve loss of control of nuclear assemblies or power reactors, 2) Loss-of-coolant accidents which result whenever a reactor coolant system experiences a break or opening large enough so that the coolant inventory in the system cannot be maintained by the normally operating make-up system and 3) Loss-of-containment accidents which involve the release of radioactivity. The primary concern following such an incident or accident is the extent of radiation, inhalation and ingestion of radioactive isotopes which can cause acute health effects (e.g. death, burns and severe impairment), chronic health effects (e.g. cancer) and psychological effects.

For the purposes of reacting to a fixed nuclear facility emergency, there are two defined emergency planning zones (EPZs) for each nuclear facility. While actual impacts from a nuclear emergency are a result of unique geographic features, the two zones each have a generally defined extent.

Plume Exposure Pathway EPZ: Has a radius of ~10 miles from a reactor site. Predetermined protective action plans are in place and include sheltering, evacuation and the use of potassium iodine where appropriate.

Ingestion Exposure Pathway EPZ: Has a radius of ~50 miles from each reactor site. Predetermined protective action plans are in place and are designed to avoid or reduce dose from potential ingestion of radioactive materials. These actions include a ban of contaminated food and water.

A power reactor facility makes electricity by continuously splitting uranium atoms. Within the Commonwealth of Pennsylvania there are five nuclear power stations. These are:

Beaver Valley Power Station in Beaver County
Limerick Generating Station in Montgomery County
Peach Bottom Atomic Power Station in York County
Susquehanna Steam Electric Station in Luzerne County
Three Mile Island Nuclear Generating Station in Dauphin County.

Mercer County is not within the 10-mile Plume Exposure Pathway for any fixed nuclear facilities, however parts of the county lie within the 50-mile ingestion exposure pathway for two nuclear power plants: The Beaver Valley Power Station in Beaver County Pennsylvania, and the Perry Nuclear Generating Station in Lake County Ohio.

4.3.12.2 Range of Magnitude

In the event of a nuclear disaster, radioactive fallout would be the main danger of an incident within a 50-mile radius. Gamma rays from fallout can cause radiation sickness as a result of physical and chemical changes in the cells of the body. When a person is exposed to a large dose of radiation, the result is often death. Non-lethal doses in varying

degrees would cause radiation sickness among the survivors. Depending on the location of the event, all of Mercer County could be in the Ingestion Exposure Pathway.

There are three categories of nuclear accidents:

Criticality accidents: Involves loss of nuclear assemblies or power reactors.

Loss of coolant accidents: Occurs when a reactor coolant system experiences a break or opening large enough so that the coolant inventory in the system cannot be maintained by the normally operating make-up system.

Loss of containment accidents: Involves the release of radioactivity from materials such as tritium, fission products, plutonium and natural, depleted, or enriched uranium.

The Nuclear Regulatory Commission uses four classification levels for nuclear incidents:

Unusual Event: Events are in process or have occurred which indicate potential degradation in the level of safety of the plant. No release of radioactive material requiring offsite response or monitoring is expected unless further degradation occurs.

Alert: Events are in process or have occurred which involve an actual or potential substantial degradation in the level of safety of the plant. Any releases of radioactive material from the plant are expected to be limited to a small fraction of the EPA Protective Action guides (PAGs).

Site Area Emergency: Involves events in process or which have occurred that result in actual or likely major failures of plant functions needed for protection of the public. Any releases of radioactive material are not expected to exceed the EPA PAGs except near the site boundary.

General emergency: Involves actual or imminent substantial core damage or melting of reactor fuel with the potential for loss of containment integrity. Radioactive releases during a general emergency can reasonably be expected to exceed the EPA PAGs for more than the immediate site area.

After a nuclear incident, the primary concern is the effect on the health of the population near the incident. The duration of primary exposure could range in length from hours to months depending on the proximity to the point of radioactive release. External radiation and inhalation and ingestion of radioactive isotopes can cause acute health effects (e.g. death, severe health impairment), chronic health effects (e.g. cancers) and psychological effects.

Potential environmental impacts specific to the 50-mile Ingestion Exposure Pathway EPZ include the long-term effects of radioactive contamination in the environment and in agricultural products. Mercer County can expect some radioactive contamination in the case of a nuclear incident. This is not a significant concern in terms of external exposure and immediate health risks, but even a small amount of radiation will require the protection of the food chain. Small amounts of radiation ingested over time could lead to future health issues. As a result, in the case of a nuclear incident, foodstuffs, crops, milk, livestock feed and forage, and farm water supplies will need to be protected

from and tested for contamination. Additionally, spills and releases of radiologically active materials from accidents can result in the contamination of soil and public water supplies. Areas underlain by limestone and some types of glacial sediments are particularly susceptible to contamination.

4.3.12.3 Past Occurrence

There has been one nuclear incident above the Alert classification in the United States. In March 1979, a Site Area Emergency event occurred at Three Mile Island - Unit 2. This event is the most serious commercial nuclear accident in United States history. During this incident, equipment malfunctions, design-related problems, and worker errors led to a partial meltdown of the reactor core. The resulting contamination and state of the reactor core led to the development of a ten-year cleanup and scientific effort. Despite the severity of the damage no injuries due to radiation exposure occurred. There were however, significant health effects reported due to the psychological stress on the individuals living in the area.

There have been no major incidents at the Beaver Valley Power Station or the Perry Nuclear Generating Station and Mercer County has not been affected by any fixed nuclear facility incident.

4.3.12.4 Future Occurrence

Mercer County has minimum potential to be affected by a fixed nuclear facility's incident, but the possibility exists due to the proximity of the Beaver Valley and Perry fixed nuclear facilities.

The Three Mile Island incident which occurred in Pennsylvania is the only nuclear power plant General Emergency in the nation. Since the Three Mile Island incident, nuclear power has become increasingly safe and is one of the most heavily regulated industries in the nation. Despite the knowledge gained since then, there is still potential for a similar accident to occur again. The Nuclear Energy Agency of the Organization for Economic Co-Operation and Development notes that studies estimate the chance of protective barriers failing in a modern nuclear facility are less than one in 100,000 per year (Nuclear Energy Agency, 2005).

Across the United States, a number of *Unusual Event* and *Alert* classification level events occur each year at the 100+ nuclear facilities that warrant notification of local emergency managers. Of these, *Alert* emergencies occur least frequently. For example, in 1997, there were forty notifications of *Unusual Events* and three *Alert* events nationwide. Based on historical events, *Site Area Emergency* and *General Emergency* incidents are very rare. The county expects that the future occurrence of a nuclear incident will continue to be relatively unlikely (2.0) as defined by the Risk Factor Methodology probability criteria.

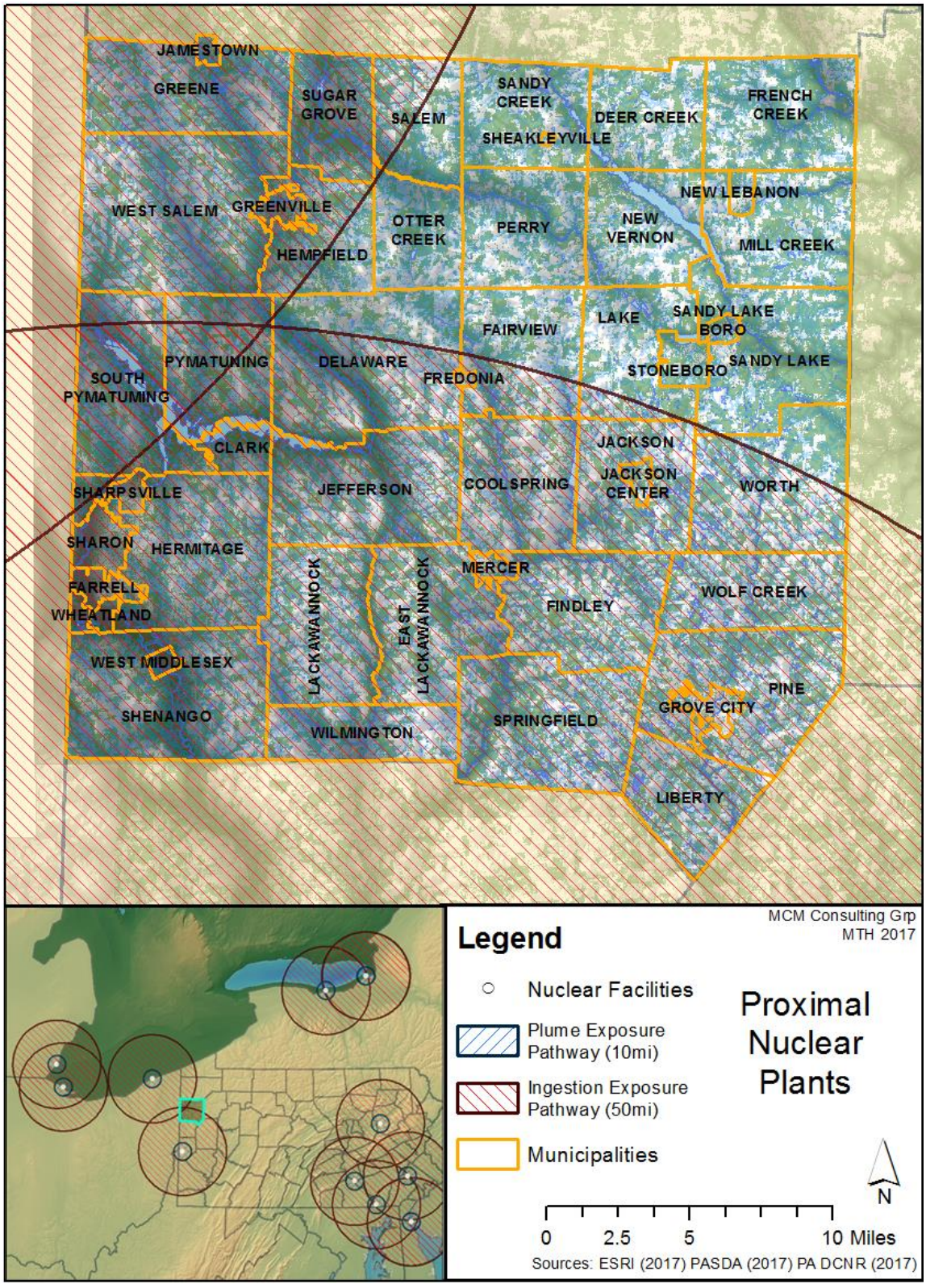
4.3.12.5 Vulnerability Assessment

The county's primary vulnerability to nuclear incidents comes in the form of food, soil, and water contamination. In terms of vulnerable land, the farmland in Mercer County's many farms is vulnerable to radiological contamination in a nuclear incident. In 2012, the market value of all agricultural products of these farms exceeded $82.7 million.

Water contamination is also a concern in nuclear incidents. Public water supplies and the county's estimated 7,226 domestic drinking water wells are both vulnerable to the effects of a nuclear incident.

While unlikely that all agricultural products would be lost in the event of a nuclear incident, the County could expect some portion of that $82.7 million to be lost. Time of year also impacts the vulnerability and losses estimated for a nuclear incident; an incident that occurs during the prime growing and harvesting season will have a larger impact on the county. For example, the incident at Three Mile Island occurred in the off-season; as a result, the Pennsylvania Department of Agriculture estimated that agricultural losses for the entire Commonwealth were less than $1 million.

Figure 28 - Proximal Nuclear Power Plants



4.3.13. Hazardous Materials

4.3.13.1 Location and Extent

Chemicals for industrial use and petroleum products can pose an environmental hazard when such materials are manufactured, extracted, used, stored or transported. Most hazardous materials incidents are unintentional, however hazardous materials could also be released in a criminal or terrorist act. Malicious uses of hazardous materials are covered in *4.3.15 Terrorism*. A release can result in injury or death and may contaminate air, water and/or soils. Hazardous materials incidents can be generally broken down into the subcategories of transportation and fixed facility.

Tanker trucks, tractor trailers and rail cars often are used to transport hazardous materials. When there are transportation incidents involving these type of vehicles, hazardous materials can be released in significant quantities. Major transportation routes through Mercer County include Interstates 79 and 80 and US Routes 18, 19 and 62.

Natural gas pipelines run throughout Mercer County, and are owned by several companies, including: Tennessee Gas Pipeline Company, Natural Fuel Gas Supply Corp, Halcon Field Services LLC, and Douglas Pipeline Company. Natural gas pipelines are often at higher capacity during cold winter months when people are utilizing natural gas more.

In Pennsylvania, facilities that use, manufacture, or store hazardous materials must comply with Title III of the federal Superfund Amendments and Reauthorization Act (SARA), and the Commonwealth's reporting requirements under the Hazardous Materials Emergency Planning and Response Act (1990-165), as amended. There are thirty-five SARA Title III facilities in Mercer County, though it is important to recognize that these facilities are not an exhaustive and comprehensive list of all locations where hazardous material resides in the county. *Figure 29 Hazardous Waste Locations* identifies SARA Title III facilities as well as several other locations that consume, store or release potentially hazardous materials and wastes.

Fixed facilities are also monitored by the Environmental Protection Agency (EPA). The EPA has identified hazardous materials sites, not regulated by SARA Title III, and are known as Toxic Release Inventory (TRI) sites. Facilities which employ ten or more full-time employees and which manufacture or process more than 25,000 pounds (or use more than 10,000 pounds) of any SARA Section 313-listed toxic chemical in the course of a calendar year are required to report TRI information to the EPA, the federal enforcement agency for SARA Title III and PEMA.

Oil and gas extraction facilities can also be sources of hazardous material release. Most wells in the county are active, but there are also many inactive and abandoned wells. *Figure 30 Oil & Gas Well Locations* shows the location of all oil and gas wells in the county along with their proximity to surface waters.

Figure 29 - Hazardous Waste Locations

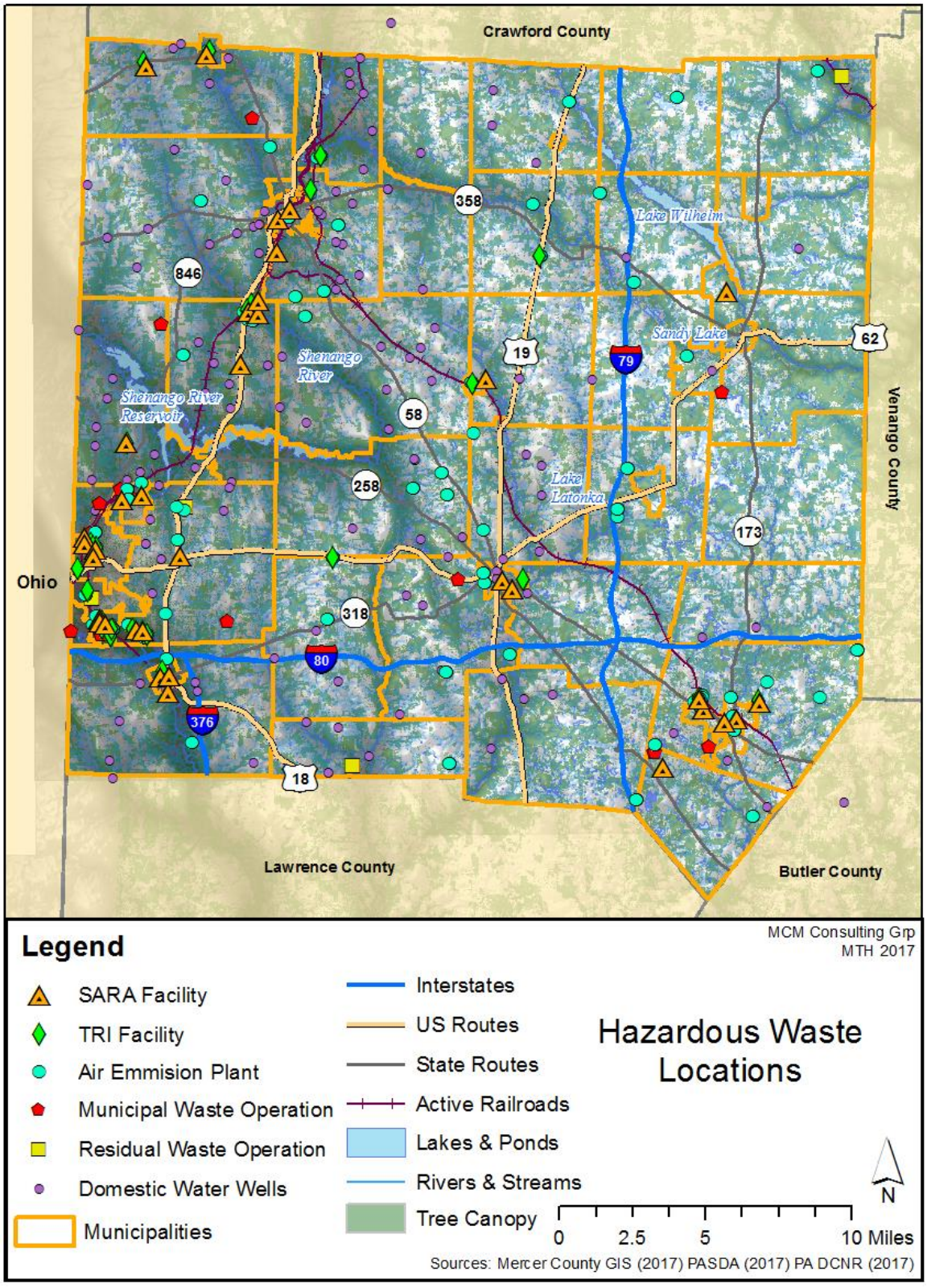
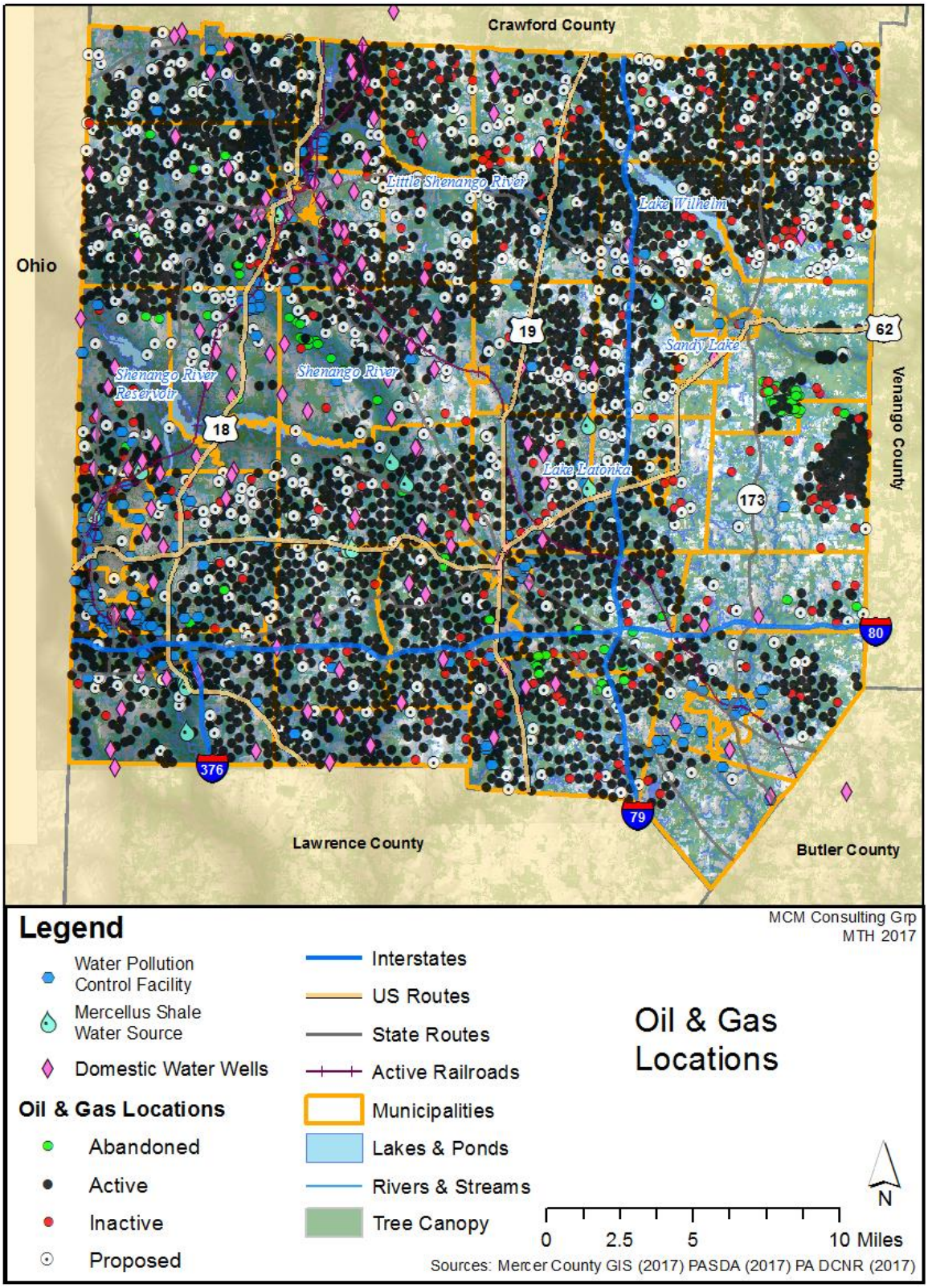


Figure 30 - Oil & Gas Well Locations



4.3.13.2 Range of Magnitude

Hazardous material releases can contaminate air, water and soil, and can possibly cause injuries, poisonings, or deaths. Hazardous materials fall into nine hazard classes:

Class 1 - Explosives

Class 2 - Gases (flammable, non-flammable, non-toxic, and toxic)

Class 3 - Flammable and combustible liquids

Class 4 - Flammable solids (spontaneously combustible materials, and dangerous when wet materials/water-reactive substances)

Class 5 - Oxidizing substance and organic peroxides

Class 6 - Toxic substances and infectious substances

Class 7 - Radioactive materials

Class 8 - Corrosive substances

Class 9 - Miscellaneous hazardous materials/products, substances or organisms.

All nine hazard classes can be found being transported and stored at fixed facilities. Certain conditions can exacerbate release incidents:

- Weather conditions affect how the hazard occurs (e.g. transportation accidents) and develops (dispersion can take place rapidly when transported by water and/ or wind). Release can be a secondary impact of natural hazards such as tornadoes or flooding.
- Micro-meteorological effects of buildings and terrain: alters dispersion of hazardous materials
- Proximity to surface and ground water sources
- Compliance with applicable codes (e.g. building or fire codes) and maintenance failures (e.g. fire protection and containment features) can substantially increase the damage to the facility itself and to surrounding buildings

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

Oil and gas well drilling can have a variety of effects on the environment. Abandoned oil and gas wells, not properly plugged can contaminate groundwater and consequently drinking water wells. Surface waters and soil are sometimes polluted by brine, a salty

wastewater product of oil and gas well drilling, and from oil spills occurring at the drilling site or from a pipeline breach. This can spoil public drinking water supplies and be particularly detrimental to vegetation and aquatic animals, making water safety an important factor in oil and gas extraction (Gregory et al., 2011). In some cases associated with hydraulic fracturing (fracking), methane has been found contaminating drinking water in surrounding areas (Osborn et al., 2011).

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

4.3.13.3 Past Occurrence

As of late 2016, Mercer County has 3,533 active Oil & Gas wells, largely from Marcellus Shale extraction (PA DEP, 2016). The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration holds detailed accounts of hazardous material incident records. Detailed past occurrence of hazardous materials release in Mercer County from highway travel between 1979 and July 2017 have been identified. The PHMSA has one recorded incident involving the rail system which occurred on 3/2/2017 in Sharon near 100 Clark Street. The bottom outlet valve on a tank car was loose, causing Xylenes (UN1307 Class 3) to leak. No fatalities or injuries occurred, but resulting damages cost ~$3,500 to remediate.

No recorded incidents have caused fatalities, however two incidents resulted in injuries. One of these injuries was caused by the most costly incident on record for Mercer County which occurred on 7/24/11 at Duferco in Farrell PA during a delivery of liquid nitrogen (UN1966). The event report details that:

> "The on duty driver completed the delivery and was ready to depressurize the trailer so he could remove the hose. He started to turn vent valve (v-12) when he started hearing sounds he never heard before and suddenly the relief system diverter valve (v-59) came apart. Immediately the contents coming out of v-59 caught fire and the vacuum caps located on the top rear of the trailer (above the cold end of the trailer) and the top front of the trailer were dislodged and fire proceeded to come out of the openings. At the time of the incident the off duty driver exited the tractor to provide assistance to the other driver. At approximately 1859 firefighters from the Farrell fire department arrived on scene and the EMTs arrived on scene a short time later. Both drivers were evaluated by the EMTs at the incident scene and were taken by ambulance to local hospitals for further evaluation. After the incident occurred the air liquid safety manager and St. Mary's mechanic were in phone contact with Farrell fire Chief Joe Santell to assess the situation and provide support until the St. Mary's depot manager and the area safety specialist arrived at the scene. The fire chief was directed to use unmanned hoses and keep water on the customer storage vessel the lh2 trailer and the tractor until the fire in the trailer burned itself out. The fire chief was also directed to shut the customer emergency shut-off button located on the rear corner of the installation fence and one of his firefighters was able to get to the box and push the button. At approximately 0630 (Monday 7/25/11) flames were no longer evident. At approximately 0715 the safety specialist on the scene and the fire department declared the scene secure and air liquid initiated its investigation at approx. 0730."

In total, ~6000 LGA of liquid nitrogen was lost, equivalent to $10,000 worth of the product. The response cost was ~$2,900, and damage to the carrier property totaled ~$900,000.

There are a few reports of gas-well fires in Jefferson and Shenango Townships, and the related company efficiently responded and worked well with emergency responders. On July 24th 2015, an above ground storage tank in Trumbull County, Ohio failed and released 1700 gallons of brine-crude oil mix into a waterway. The release threatened waterways that supply drinking water to Mercer and Lawrence Counties.

The EPA tracks the management of hazardous materials in facilities that handle significant amounts of hazardous materials. There are 27 TRI facilities in Mercer County as of 2015, and they are summarized in *Appendix E - TRI Facilities*. Production-related waste managed is a collective term to refer to how much of a chemical is recycled, combusted for energy recovery, treated for destruction or disposed of or otherwise released on and off site. Details about SARA Title III facilities can be found in *Table xx – SARA Title III Planning Facilities*.

Table xx – SARA Title III Planning Facilities (Mercer County, 2017)

Owner Operator	Facility Name	Municipality
AQUA PENNSYLVANIA INC	Aqua Pennsylvania, Inc - Shenango Division	Sharon City
BOROUGH OF GROVE CITY	GROVE CITY WATER PLANT	Grove City Borough
Borough of Grove City	Water Treatment Plant	Grove City Borough
CCL CONTAINER	CCL CONTAINER AEROSOL DIVISION	Hermitage City
CITY OF FARRELL WPCP	FARRELL WATER POLLUTION CONTROL PLANT	Farrell City
COMBINED SYSTEMS, INC.	COMBINED SYSTEMS, INC.	Greene Township
Dairy Farmers of America, Inc.	Dairy Farmer of America, Inc.	West Middlesex Borough
Dean Dairy Holding Company, LLC	DEAN DAIRY PRODUCTS CO.	South Pymatuning Township
Doug Faber	Salem Tube Inc.	Pymatuning Township
FREDONIA BOROUGH	FREDONIA SEWER PLANT	Fredonia Borough
GENERAL ELECTRIC CO	GE Transportation Grove City Remanufacturing	Grove City Borough
GENERAL ELECTRIC CO	GENERAL ELEC TRANSPORTATION	Grove City Borough
GREENVILLE SANITARY AUTHORITY	GREENVILLE SEWAGE TREATMENT PL	Greenville Borough

Owner Operator	Facility Name	Municipality
GREENVILLE WATER AUTH	GREENVILLE WATER TREATMENT PLT	Greenville Borough
James E. Coates	INTERSTATE CHEMICAL COMPANY INC	Hermitage City
JAMESTOWN BOROUGH	JAMESTOWN BOROUGH SWG TRT PLT	Jamestown Borough
JMC Steel Group	Sharon Tube - Church St Plant	Wheatland Borough
JMC Steel Group	Wheatland Tube Div- Mill St Plant	Sharon City
John Maneely Company	Wheatland Tube Co. - Council	Wheatland Borough
LEE EARNHARDT	BARBER'S CHEMICALS, INC.	Sharpsville Borough
PYMATUNING IND TELEPHONE	PYMATUNING IND TELEPHONE CO	Pymatuning Township
ROY BLACKBURN	REYNOLDS DISPOSAL PLANT	Pymatuning Township
SANDY LAKE Borough	SANDY LAKE WATER PLANT	Sandy Lake Borough
SHENANGO TWP MUN AUTH	SHENANGO TWP MUNICIPAL AUTHORI	Shenango Township
Top Gun Investment Corp II	SHARON COATING LLC	Sharon City
VERIZON-PENNSYLVANIA, INC	MCI - AMSTPA (PAAMSTPA)	Grove City Borough
VERIZON-PENNSYLVANIA, INC	VERIZON GREENVILLE CO (PA58227)	Greenville Borough
VERIZON-PENNSYLVANIA, INC	VERIZON GROVE CITY CO (PA58250)	Grove City Borough
VERIZON-PENNSYLVANIA, INC	VERIZON MERCER CO (PA58229)	Mercer Borough
VERIZON-PENNSYLVANIA, INC	VERIZON SHARON CO (PA58005)	Sharon City
VERIZON-PENNSYLVANIA, INC	VERIZON SHARPSVILLE CDO (PA58010)	Sharpsville Borough
VERIZON-PENNSYLVANIA, INC	VERIZON W MIDDLESEX CO (PA58060)	West Middlesex Borough
Wayne L. McCullough, Jr.	REYNOLDS WATER PLANT	Pymatuning Township
Borough of Mercer	Mercer Borough Sewer Plant	Mercer Borough
Sears & Roebuck Company	Sears Roebuck & Company (Sears #6814)	Hermitage City

4.3.13.4 Future Occurrence

Hazardous material release incidents are generally difficult to predict, but the presence and use of such known dangerous materials warrants preparation for release events.

Emergency response in Mercer County should be prepared to handle the types of hazardous materials housed and used in the SARA Title III facilities, TRI facilities and oil and gas wells that are located in the county. The federal Superfund Amendments and Reauthorization Act (SARA) is also known as the Emergency Planning and Community Right-to-Know Act (EPCRA), and Local Emergency Planning Committees (LEPCs) are designed by EPCRA to ensure that state and local communities are prepared to respond to potential chemical accidents.

4.3.13.5 Vulnerability Assessment

Mercer County conducted a commodity flow study in 2014 which investigated what kinds of hazardous materials are transported through and stored within Mercer County. The study gathered field data on highways and railroads, summarized pipeline data, polled fixed facilities regarding the types of hazardous materials commonly used, produced, acquired or stored at the facility, and compared findings to national and PA wide data. The study contains much relevant information pertaining to hazardous materials in Mercer County. A few notable conclusions from the study include:

- Class 3 Flammables and specifically UN1203 (Gasoline) is the most commonly transported Hazardous Material
- Rail incidents are very low probability as compared to highway incidents.
- The most prevalent roadway for transporting hazardous materials in Mercer County is I79.
- Questioning fixed facilities proved more revealing and comprehensive than conducting field studies.
- Four Extremely Hazardous Materials were found being transported and in fixed facilities in Mercer County: Phenol, Hydrochloric Acid, Sulfuric Acid and Chlorine.

Populations, critical facilities and natural habitats within a quarter mile of major highways and railways are considered to be at risk for hazardous material transportation incidents, and are covered in more detail in section 4.3.19 transportation profile. Additionally, populations, critical facilities and natural habitats within 1.5 miles of SARA Title III and Toxic Release Inventory sites are also vulnerable to hazardous material incidents.

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

Table 40 - Oil Gas & Drinking Water Wells

Municipality	Reported Domestic Water Wells	Oil & Gas Wells			
		Active	Inactive	Abandoned	Proposed
CLARK BORO	42	1	0	0	1
COOLSPRING TWP	188	98	10	0	28
DEER CREEK TWP	106	125	7	0	34
DELAWARE TWP	341	110	9	14	44
EAST LACKAWANNOCK TWP	168	149	7	3	18
FAIRVIEW TWP	135	112	4	0	30
FARRELL CITY	29	13	0	0	3
FINDLEY TWP	174	113	12	10	22
FREDONIA BORO	1	0	0	0	0
FRENCH CREEK TWP	113	175	14	0	45
GREENE TWP	180	150	1	0	39
GREENVILLE BORO	62	5	0	0	1
GROVE CITY BORO	47	0	0	0	0
HEMPFIELD TWP	370	74	3	0	28
HERMITAGE CITY	363	156	12	3	54
JACKSON CENTER BORO	24	0	0	0	1
JACKSON TWP	163	63	4	0	20
JAMESTOWN BORO	21	7	1	0	0
JEFFERSON TWP	291	155	7	1	48
LACKWANNOCK TWP	136	152	5	0	19
LAKE TWP	143	105	4	0	31
LIBERTY TWP	192	15	2	0	4
MERCER BORO	44	2	0	0	0
MILL CREEK TWP	146	102	19	0	33
NEW LEBANON BORO	28	12	0	0	10
NEW VERNON TWP	89	112	7	0	34
OTTER CREEK TWP	84	61	4	0	21
PERRY TWP	192	131	6	0	18
PINE TWP	501	69	5	0	13
PYMATUNING TWP	240	18	1	2	19
SALEM TWP	110	75	14	0	7
SANDY CREEK TWP	106	75	9	0	14
SANDY LAKE BORO	13	0	1	0	0
SANDY LAKE TWP	248	60	12	55	4
SHARON CITY	48	9	0	0	1
SHARPSVILLE BORO	9	2	1	1	0
SHEAKLEYVILLE BORO	35	0	0	0	0
SHENANGO TWP	241	169	3	0	43
SOUTH PYMATUNING TWP	293	63	11	4	18
SPRINGFIELD TWP	359	162	17	0	38
STONEBORO BORO	14	1	1	13	1

Municipality	Reported Domestic Water Wells	Oil & Gas Wells			
		Active	Inactive	Abandoned	Proposed
SUGAR GROVE TWP	124	80	1	0	16
WEST MIDDLESEX BORO	21	4	0	0	0
WEST SALEM TWP	389	307	2	9	78
WHEATLAND BORO	56	6	0	0	0
WILMINGTON TWP	134	80	3	0	7
WOLF CREEK TWP	129	17	8	2	17
WORTH TWP	204	138	18	3	15
UNDESIGNATED	80	0	0	0	0
TOTAL	**7226**	**3533**	**245**	**120**	**877**

4.3.14. Terrorism

4.3.14.1 Location and Extent

Following several serious international and domestic terrorist incidents during the 1990's and early 2000's, citizens across the United States paid increased attention to the potential for deliberate, harmful actions of individuals or groups. The term "terrorism" refers to intentional, criminal, malicious acts. The functional definition of terrorism can be interpreted in many ways. Officially, terrorism is defined in the Code of Federal Regulations as "*...the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.*" (28 CFR §0.85)

The Federal Bureau of Investigation (FBI) further characterizes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization. However, the origin of the terrorist or person causing the hazard is far less relevant to mitigation planning than the hazard itself and its consequences.

Critical facilities are either in the public or private sector that provide essential products and/or services to the general public. Critical facilities are often necessary to preserve the welfare and quality of life in the County, or fulfill important public safety, emergency response, and/or disaster recovery functions. Critical facilities identified in the county are shelters; gas, electric and communication utilities; hospitals and other health care facilities; water and wastewater treatment plants, hazardous waste sites; and schools.

In addition to critical facilities, the county contains at risk populations that should be factored into a vulnerability assessment. These populations include not only the residents and workforce in the County, but also the tourists that visit the area on a daily basis, those that are traveling through the county on any of the interstate or major highways and marginalized groups such as LGBTQ persons and racial minorities. Potential targets for attack include:

- Commercial facilities
- Abortion or Family Planning Clinics and other organizations associated with controversial issues.

- Education facilities
- Events attracting large amounts of people
- Places of worship
- Industrial facilities, especially those utilizing large quantities of hazardous materials
- Transportation Infrastructure
- Historical sites
- Government Facilities

4.3.14.2 Range of Magnitude

Terrorism refers to the use of Weapons of Mass Destruction (WMD) (including, biological, chemical, nuclear, and radiological weapons) arson, incendiary, explosive, armed attacks, industrial sabotage, intentional hazardous materials releases and cyber-terrorism. Within these general categories, however, there are many variations. Particularly in the area of biological and chemical weapons, there are a wide variety of agents and ways for them to be disseminated. Terrorist methods can take many forms, including:

- Active Shooter
- Agri-terrorism
- Arson/incendiary attack
- Armed attack
- Biological agent
- Chemical agent
- Cyber-terrorism
- Conventional bomb or bomb threat
- Hazardous material release (intentional)
- Nuclear bomb
- Radiological agent

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

4.3.14.3 Past Occurrence

Active shooters, as defined by the US Department of Homeland Security, is an individual actively engaged in killing or attempting to kill people in a confined area; in most cases, active shooters use firearm[s] and there is no pattern or method to their selection of

victims. One of the more recent high-profile shootings occurred at the Pulse Nightclub in Orlando, Florida on June 12, 2016 where the LGBTQ community was targeted - 49 people were killed and 53 were wounded. A few other significant active shooter events include those that occurred at Virginia Tech (April 2007), Sandy Hook Elementary School (December 2012), San Bernardino CA (December 2015), an Aurora CO movie theater (July 2012) and a church in Charleston SC (June 2015). A 2014 study by the FBI concluded that there has been a significant recent increase in frequency of active shooter incidents, and the vast majority (154 of 160 shooters between 2000 and 2013) were male (FBI, 2014). Of these 160 incidents, 45.6% took place in commercial environments, 24.3% took place in an educational environment, and the remaining 30.1% took place at other locations such as open spaces, military and other government properties, residential locations, houses of worship, and health care facilities (FBI, 2014). *Figure 31 – Active Shooter Incidents 2000-2013* summarizes the FBI's findings in the study. The only recorded active shooter related incident in Mercer County occurred on April 26th 2016 when a 19-year-old male threatened his mother and himself with a gun and fired a shot into the air before fleeing the scene. Schools were placed on lockdown and after an hour the suspect was apprehended without having directly harmed anybody.

Significant international terrorism incidents in the USA include: the World Trade Center bombing in 1993, the bombing of the Murrow Building in Oklahoma City in 1995, and the September 11th 2001 attack on the World Trade Center. Mercer County has not been directly impacted by any significant international terrorist incidents.

While the largest scale terrorist incidents have largely had international stimulus, many other incidents are caused by home grown actors who may have become radicalized through hate groups either in real life or online, and who may have mental health struggles. Hate groups such as the Ku Klux Klan (KKK), Aryan Nation and, more recently, the Alt-Reich have in one way or another been a part of domestic terrorism in different forms. In 1999 the KKK hosted a rally on the Mercer County Courthouse steps. State Police responded and there are no reported injuries from the incident.

Two high volume interstate highways traverse Mercer County: I-80 runs east-west, and I-79 runs north-south. The sheer number of people traveling on these routes makes them potential targets. Interstate 80 was used by the World Trade Center bombers in 1993 to transport the bomb to the World Trade Center.

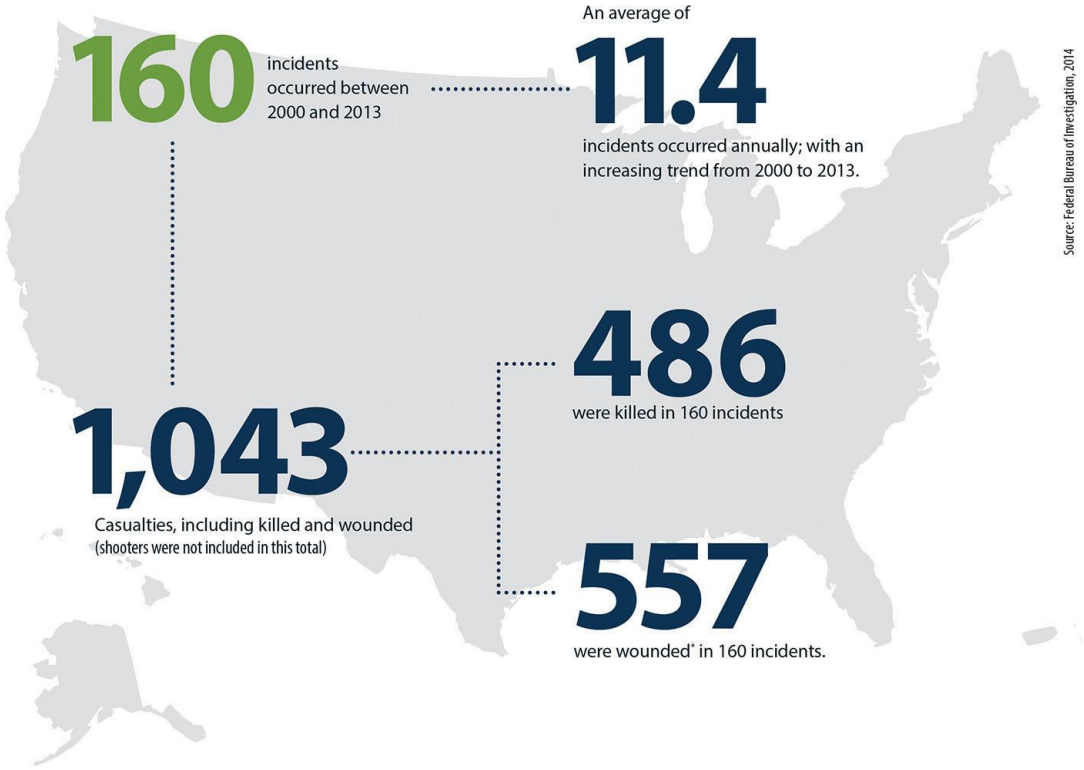
According to Knowledge Center™, the most common terrorist incident experienced by Mercer County are bomb threats. Knowledge Center reports of terrorist activity in Mercer County from 2007 to early 2017 can be found in *Table 41 - Knowledge Center™ Incidents*.

Table 41 - Knowledge Center™ Incidents

Description	Location	Date
BOMB THREAT	Springfield Township	12/21/2016
BOMB THREAT-School	Greenville Borough	12/6/2016
Bomb Threat	Farrell City	11/13/2016
Suicidal Male w/ gun School Lockdown	East Lackawannock Township	4/26/2016
Bomb Threat	Hempfield Township	4/13/2016
School Bomb threat	Greenville Borough	4/13/2016

Description	Location	Date
Bomb Threat	West Salem Township	2/24/2016
Bomb Threat	Mercer Co.	1/26/2016
Bomb Threat	Greenville Borough	1/21/2016
Bomb Threat	Hempfield Township	12/12/2015
Bomb Threat	Hermitage City	10/14/2014
Hermitage Walmart Bomb Threat	Hermitage City	8/11/2014
SCHOOL BOMB THREAT	Mercer Borough	5/29/2014
BOMB THREAT	Farrell City	5/23/2014
BOMB THREAT	Mercer Co.	4/25/2014
School Bomb Threat	Sharon City	4/17/2014
SCHOOL BOMB THREAT	Mercer Borough	3/13/2014
School Bomb Threat	Sharon City	1/16/2014
Suspicious Package	Mercer Co.	1/14/2014
School Bomb Threat	Mercer Borough	11/1/2013
BOMB THREAT MERCER HIGH SCHOOL	Mercer Co.	10/29/2013
Bomb Threat Mercer County Courthouse	Mercer Co.	10/28/2013
Bomb Threat	Mercer Co.	3/28/2013
Barricaded Subj	Farrell City	2/27/2012
Bomb Threat	Mercer Borough	12/20/2011
BOMB THREAT	Pymatuning Township	8/11/2010
Bomb Threat	Jamestown Borough	4/26/2010
BOMB THREAT	Hermitage City	5/27/2009
school bomb threat	Sharon City	10/29/2008
Bomb Threat-Sharon	Sharon City	10/25/2008
Bomb Threat Mercer Courthouse	Mercer Borough	7/9/2008
career center bomb threat	Coolspring Township	4/22/2008
bomb threat mercer career center	Coolspring Township	4/9/2008
Bomb Threat	Hermitage City	10/4/2007
bomb threat	West Middlesex Borough	9/27/2007
Bomb Threat Sharon Hospital	Sharon City	7/13/2007
Susp activity-Lakeview Middle School	Sandy Lake Township	4/18/2007
Lakeview Bomb Threat	Sandy Lake Township	4/11/2007
SUSPICIOUS AIRCRAFT	West Middlesex Borough	3/15/2007

Figure 31 - Active Shooter Incidents 2000-2013



4.3.14.4 Future Occurrence

The likelihood of Mercer County being a primary target for a major international terrorist attack is somewhat small. More likely terrorist activity in Mercer County are bomb threats or incidents at schools. The Local Planning Team gave this hazard a risk factor of 2.6.

4.3.14.5 Vulnerability Assessment

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

All communities in Mercer County are vulnerable on some level, directly or indirectly, to a terrorist attack. However, communities where critical facilities are located should be considered more vulnerable. Site-specific assessments should be based on the relative importance of a particular site to the surrounding community or population, threats that are known to exist, and vulnerabilities, including:

Inherent vulnerability:

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

Tactical vulnerability:

Site Perimeter:

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

Building Envelope:

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

Facility Interior:

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

4.3.15. Transportation Accidents

4.3.15.1 Location and Extent

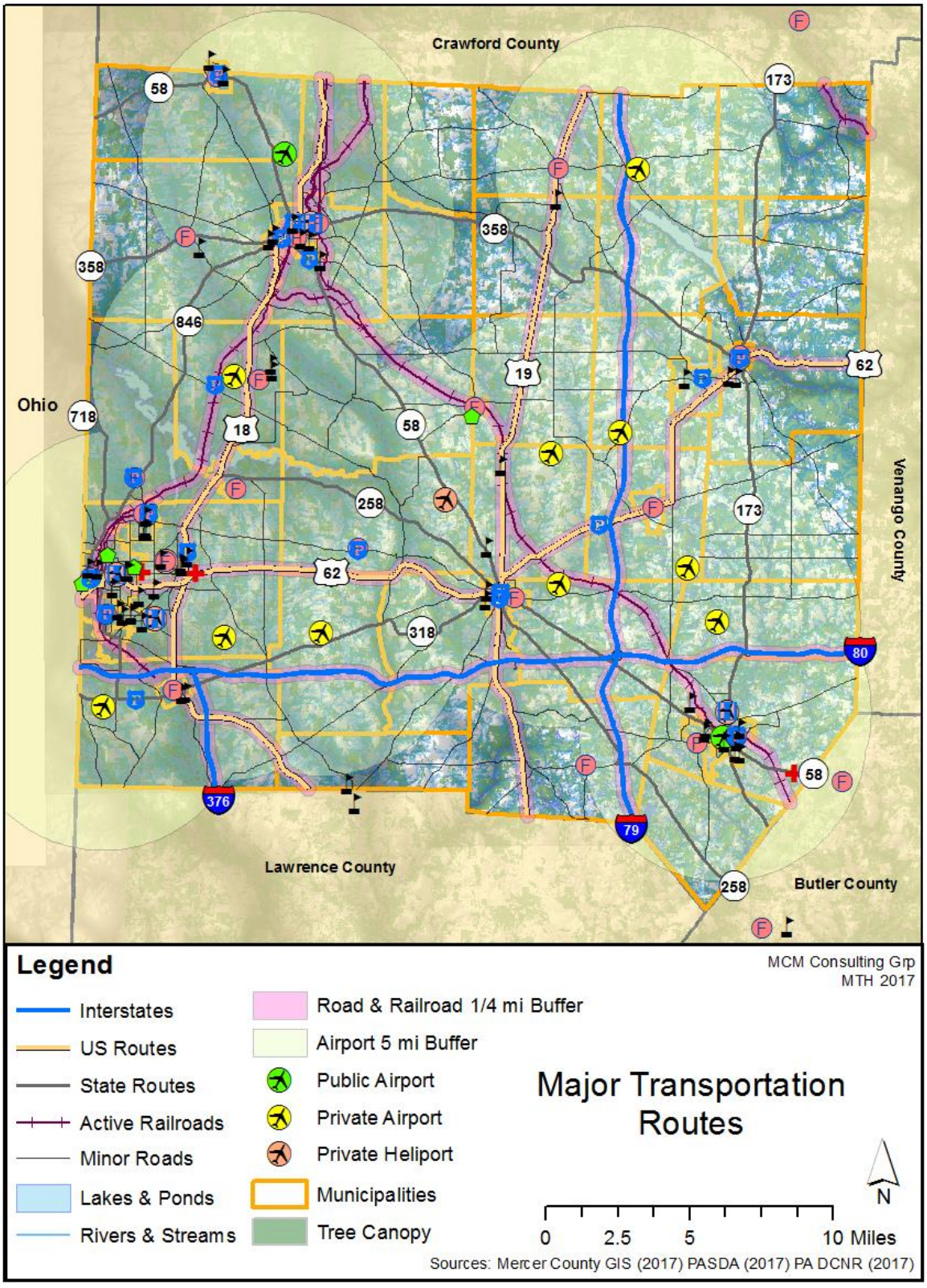
There are a total of almost 2,300 miles of developed roads in Mercer County with state and US highways contributing about 350 miles. Significant transportation routes such as Interstates 79, 80 and 376, US Routes 18, 19 and 62, as well as State Routes 58, 173, 258, 358 and 846. *Figure 32 – Major Transportation Routes* shows the major transportation systems in Mercer County.

Notable rail lines that run through Mercer County include the Bessemer and Lake Erie Railroad Main Line and the North Stratford Railroad Meadville Line. Mercer County has two public use airports, the Greenville Municipal Airport and the Grove City Airport, ten private airports, and six heliports. For more details see Table 42 - Airports.

Table 42 - Airports

Name	Address	Ownership	Usage
Greenville Muni Airport - 4G1	Greenville, PA 16125	Public	Airport
Grove City Airport - 29D	123 W Main St Po Box 110 , Grove City, PA 16127	Public	Airport
Flying M Ranch Airport - 4PN0	152 Old School Rd , Grove City, PA 16127	Private	Airport
Sagulla Airport - PN31	Rd 1, Jackson Center, PA 16133	Private	Airport
Still Meadow Farm Airport - 8PS2	285 Poole Road , Mercer, PA 16137	Private	Airport
Ferrell Field Airport - 00PN	753 Airport Road , Mercer, PA 16137	Private	Airport
Nelsons Run Airport - 39PN	Rr 5, Box 5404 , Mercer, PA 16137	Private	Airport
Hermitage Airport - PA22	2578 Frampton Rd , West Middlesex, PA 16159	Private	Airport
Lackawannock Airport - PN99	Rd 1, Box 1258 , Mercer, PA 16137	Private	Airport
Fletcher Airport - 0PN0	Rd 1, Box 1096 , Hadley, PA 16130	Private	Airport
Napodano Airport - 1PN1	Rd 1 , Transfer, PA 16154	Private	Airport
West Middlesex Airport - PA21	3685 Hubbard-Middlesex Road , West Middlesex, PA 16159	Private	Airport
Shenango Valley Medical Center Heliport - PS41	2200 Memorial Drive , Farrell, PA 16121	Private	Heliport
Horizon Hospital System, Greenville Heliport - PA46	110 N Main St , Greenville, PA 16125	Private	Heliport
Grove City Medical Ctr Heliport - PA57	631 North Broad Street Extension , Grove City, PA 16127	Private	Heliport
Hermitage Central Fire Station Heliport - 1PS1	2511 Highland Road , Hermitage, PA 16148	Private	Heliport
Station 219 Heliport - PN27	1211 Greenville Mercer Rd , Mercer, PA 16137	Private	Heliport
Sharon General Hospital Heliport - PA94	740 E State Street , Sharon, PA 16146	Private	Heliport

Figure 32 - Major Transportation Routes



4.3.15.2 Range and Magnitude

Transportation accidents can result in death or serious injury and extensive property loss or damage. In the United States, over 37,000 people die in road crashes annually (ASIRT, 2017). Inclement weather and higher traffic volume and speed increase the risk for automobile accidents. Road and railway accidents in particular have a potential to result in hazardous material releases. Accidents involving hazardous materials can pose an environmental hazard and potentially contaminate the air, water and or soil. Hazardous material release is covered in more detail in *Section 4.3.10 Hazardous Materials*.

Aviation incidents most often occur near landing or take-off sites; a five-mile radius around each airport in Mercer County is considered high-risk areas.

4.3.15.3 Past Occurrence

The most serious transportation concerns in Mercer County involve Interstates 79, 80 and 376. *Table 43 - Transportation Incidents* shows the accidents that were reported to the Mercer County 9-1-1 as entered into the Mercer County Knowledge Center™ database between February 2007 and May 2017. *Table 44 – PennDOT Mercer County Crash Report* shows crash statistics recorded by the Pennsylvania Department of Transportation between 2007 and 2016.

The City of Sharon has had four railcar derailments involving hazardous materials, with one of the four caused by leakage. Sandy Lake has had two railcar derailments of coal car coppers.

There have been severable notable aviation related incidents in Mercer County. There were two small aircraft incidents in Shenango Township, one in 1982 and the other in 1983, where two persons were injured in each event. In November 1992, two small private planes collided in mid-air over Osgood, northeast of the Greenville Airport. The incident resulted in four deaths and wreckage scattered in a one-mile diameter area. In 1995, a pilot crashed into the frozen Shenango Reservoir – the incident is believed to be suicidal. In 1998, a small plane crashed while approaching Greenville Airport, killing the pilot. In July 1999, a small aircraft crashed in the Shenango Reservoir, causing two deaths. In the fall of 1999, one man was killed during a solo training flight near the Greenville Airport.

Table 43 - Transportation Incidents

Description	Location	Date
Private single engine crashed in a field	Findley Township	8/23/2005
Private single engine accident	New Vernon Township	8/24/2005
TRAIN VS CAR MVA	Fredonia Borough	2/2/2007
SCHOOL BUS ACCIDENT	Worth Township	2/2/2007
1 mm I80	Shenango Township	2/16/2007
School bus accident	Pymatuning Township	2/22/2007
Multiple Car Accident I80	Shenango Township	3/4/2007
Motor Vehicle Accident	Jefferson Township	3/27/2007
Officer Injured	Mercer Borough	4/6/2007
Multi Vehicle Accident	East Lackawannock Township	4/6/2007

Description	Location	Date
ATV ACCIDENT	Wolf Creek Township	4/21/2007
I80/60 MVA fuel Spill	Shenango Township	5/2/2007
Motor Vehicle Crash Methodist Rd	Hempfield Township	5/3/2007
Motor Vehicle Crash-Fatal Lamor Rd	Hermitage City	5/8/2007
MVA W/ ENTRAPMENT, FUEL TRUCK	Pymatuning Township	5/9/2007
motor vehicle accident	Salem Township	5/13/2007
Motor Vehicle Accident	Jackson Township	5/22/2007
TT Rollover	Sharon City	5/29/2007
ATV Accident	Sandy Creek Township	6/3/2007
Road Closure	Greenville Borough	6/5/2007
Motor Vehicle Accident fatal	Shenango Township	6/15/2007
Plane Crash	Greene Township	7/13/2007
S.R. 58 Closed	Pine Township	8/3/2007
MVE with explosion	West Salem Township	8/17/2007
Tractor Trailer MVA	Shenango Township	8/22/2007
West Salem Crash with entrapment	West Salem Township	8/29/2007
MV Crash with entrapment	Findley Township	9/20/2007
MV Crash Hempfield Twp	Hempfield Township	9/21/2007
MVA W/ Entrapment	East Lackawannock Township	9/23/2007
Motor Vehicle Crash - West Salem	West Salem Township	9/30/2007
MVA W/ Entrapment	Springfield Township	10/2/2007
MV Accident Hermitage	Hermitage City	10/3/2007
Motor Vehicle Crash-Fatal I79/I80	Findley Township	10/15/2007
MV Crash with entrapment	Jefferson Township	10/17/2007
School Bus Accident	Lackawannock Township	10/18/2007
MV Crash School Bus	Hermitage City	10/22/2007
Airplane Crash	Greene Township	11/2/2007
MVA car vs bld	Sharon City	11/4/2007
MVA Involving a Police Car	Greenville Borough	11/10/2007
MV Crash w/ Entrapment	Otter Creek Township	12/3/2007
MVA - with Hazmat I79 north	Findley Township	12/11/2007
MVA I 79	Deer Creek Township	12/11/2007
MOTOR VEHICLE CRASH FATAL	West Salem Township	12/15/2007
MVA - Entrapment	Shenango Township	12/17/2007
Tractor Trailer I79	Findley Township	1/4/2008
MVA w/ Entrapment	Pymatuning Township	1/4/2008
MVA Involving Police Car	Pymatuning Township	1/7/2008
MVA Involving School Bus	Pymatuning Township	1/7/2008
Sharon mercer rd. closure	East Lackawannock Township	1/7/2008
MVA Involving Police Cruiser	Lackawannock Township	1/8/2008
MVA W/Entrapment & Fatality	East Lackawannock Township	1/22/2008
MVA W/ Entrapment	Coolspring Township	1/28/2008
Car vs PennDOT Plow Truck MVA	Hempfield Township	2/1/2008
MV Crash Entrapment RT58	Jefferson Township	2/4/2008
School Bus Crash-Pymatuning Twp	Pymatuning Township	2/12/2008

Description	Location	Date
Motor Vehicle Accident I-80 Closed	East Lackawannock Township	2/13/2008
car vs bus	Hermitage City	2/22/2008
School Bus Accident	Farrell City	3/10/2008
MVI car vs train	Sharon City	4/5/2008
MVA Multiple injuries-Hermitage	Hermitage City	5/31/2008
MVA Fatal-Pymatuning Twp	Pymatuning Township	6/15/2008
Train Accident	Hempfield Township	6/23/2008
Motor Vehicle Crash Injuries	Jackson Township	6/29/2008
Motor Vehicle Crash with Injury	Shenango Township	6/29/2008
VEHICLE ACCIDENT WITH ROAD CLOSURES	West Salem Township	7/6/2008
Plane Crash-GC Airport	Springfield Township	7/16/2008
Motor Vehicle Accident with Fire	Shenango Township	7/17/2008
poss airplane crash	Pine Township	7/28/2008
Motor Vehicle Accident	South Pymatuning Township	8/4/2008
Vehicle Crash-E Lack	East Lackawannock Township	8/5/2008
MVC with injury and Structure Fire	Findley Township	8/6/2008
I80 22 mm MVA	Pine Township	8/14/2008
MVC Entrapment-Pine Twp	Pine Township	8/15/2008
MVC with multiple injury-JE Twp	Jefferson Township	8/17/2008
MVC with injury -Py Twp	Pymatuning Township	8/17/2008
Perry hwy mva	Springfield Township	8/18/2008
e Jamestown rd. mva	Greene Township	8/25/2008
Motor cycle accident...I80	East Lackawannock Township	9/3/2008
MVC with Entrapment -Wolf Creek Twp	Wolf Creek Township	9/3/2008
CAR IN WATER-GOLDEN RUN-SHENANGO	Clark Borough	9/25/2008
Road Closed/ Gas Leak-Springfield Twp	Springfield Township	10/2/2008
MV Accident with injury	East Lackawannock Township	11/1/2008
Truck wedged under RR bridge	Hempfield Township	11/12/2008
Motor Vehicle Crash with injury	Hempfield Township	11/13/2008
new castle rd. accident	Shenango Township	11/14/2008
Accident with entrapment	West Salem Township	12/5/2008
ROAD CLOSURE / MVA	East Lackawannock Township	12/6/2008
Motor Vehicle Accident w/ School Bus	Hermitage City	12/6/2008
MVA Heavy entrapment	Greene Township	12/19/2008
school bus accident	Coolspring Township	1/6/2009
ambulance accident	Lackawannock Township	2/3/2009
School Bus Accident	Greenville Borough	2/4/2009
Motor Vehicle Crash with Fuel leak	East Lackawannock Township	2/27/2009
Motor Vehicle Crash poss fatal	Lackawannock Township	2/28/2009
Minor Derailment-Carlton	French Creek Township	3/11/2009
Motor Vehicle Crash with entrapment	Wolf Creek Township	3/19/2009

Description	Location	Date
truck accident	Shenango Township	3/29/2009
MVA Car into creek with fire	Fairview Township	6/19/2009
Accident with Heavy Entrapment	Pine Township	6/29/2009
MVA Fatal	Sandy Lake Borough	8/31/2009
MVA US 62 entrapment	Hermitage City	9/17/2009
motor vehicle accident	Jackson Township	10/30/2009
MOTOR VEHICLE CRASH WITH ENTRAPMENT	East Lackawannock Township	11/6/2009
MVC Fatal 19 I80	Findley Township	11/17/2009
motor vehicle accident	East Lackawannock Township	12/7/2009
MVA w/Road Closure	Grove City Borough	12/15/2009
school bus accident	West Salem Township	1/6/2010
MVA	Grove City Borough	1/28/2010
MVA W/ENTRAPMENT FATAL	Clark Borough	3/15/2010
Road Closure	Sharon City	4/14/2010
School bus accident with injuries	Sharon City	4/29/2010
Fire Apparatus Crash-Hempfield Twp	Hempfield Township	6/25/2010
Tree On Vehicle entrapment	Springfield Township	7/17/2010
MCI MVA West Salem Twp	West Salem Township	8/29/2010
MV Crash w/entrapment	Sandy Creek Township	9/18/2010
MV Crash with entrapment	Hermitage City	10/24/2010
Multiple accidents I 80		12/6/2010
school bus accident		12/15/2010
closing 173 at i80 interchange	Pine Township	12/15/2010
Vehicle Accident Inv School Bus w/Injury	Sandy Lake Township	1/6/2011
road closure	Shenango Township	3/15/2011
Tractor Trailer Accident I80	Lackawannock Township	4/27/2011
MVI Entrapment/ 1 FF Injured	Shenango Township	5/6/2011
Motor Vehicle Crash with Milk Spill	Perry Township	5/14/2011
MVC W/ENTRAPMENT	Mercer Borough	5/26/2011
MV Crash w/ Entrapment	Pine Township	6/16/2011
MVC with entrapment	Springfield Township	6/26/2011
MVC with entrapment	Jackson Township	7/21/2011
MVA W/ ENTRAPMENT-DOUBLE FATALITY	Springfield Township	8/26/2011
MVA-MOTORCYCLE	Jefferson Township	8/27/2011
MVA-EJECTION X2	Pine Township	8/27/2011
MVA-CAR VS PED	Hempfield Township	8/28/2011
Accident Involving School Bus	Hempfield Township	11/4/2011
FATAL VEHICLE ACCIDENT	Coolspring Township	2/18/2012
MVA WITH FUEL LEAK / ROAD CLOSURE	Sugar Grove Township	2/24/2012
MVA W/ ENTRAPMENT ROAD CLOSURE	Greene Township	2/25/2012
MULTIPLE VEHICLE PILE UP I79	Deer Creek Township	2/25/2012
MVA with entrapment	Springfield Township	3/5/2012

Description	Location	Date
School Bus/MC Crash	Grove City Borough	3/7/2012
TT Accident w/ Injuries and Fuel Leak	New Vernon Township	3/22/2012
MVA WITH INJ AND FUEL SPILL	Sugar Grove Township	3/23/2012
MVU	West Salem Township	4/21/2012
MVA WITH INJ / ROAD CLOSURE	Shenango Township	5/17/2012
Crash with entrapment	Springfield Township	5/24/2012
MVA	East Lackawannock Township	7/7/2012
Vehicle Accident w/ Ejection-PD Pursuit	Springfield Township	7/16/2012
Motorcycle Accident	Springfield Township	8/24/2012
VEh into apt bld w/ nat gas leak	Hermitage City	9/6/2012
Tractor Trailor Accident	Findley Township	11/5/2012
MVA with Road Closure	Pine Township	11/9/2012
Vehicle Accident w/Entrapment	Otter Creek Township	11/12/2012
Motor Vehicle Crash with Injuries	Delaware Township	12/6/2012
Train Derailment		1/4/2013
TT VS CAR W/ ENTRAPMENT	Perry Township	1/10/2013
Wires down, I376, Entrapment	Shenango Township	1/11/2013
MVC involving Police Veh	Greenville Borough	1/25/2013
Rescue Call Wolf Creek	Wolf Creek Township	1/29/2013
I 79 MVA WITH FUEL LEAK		2/10/2013
Train Derailment		3/10/2013
i80 incident		3/21/2013
MVC with entrapment/Rollover	Pymatuning Township	3/30/2013
VEHICLE ACCIDENT	Mercer Township	4/9/2013
interstate 80 closed exit 24-29		4/10/2013
MVC with Entrapment	Jefferson Township	4/25/2013
MOTOR VEHICLE ACCIDENT INVOL POLICE	West Salem Township	5/3/2013
Vehicle Accident-TT on Side		5/11/2013
TT Rollover		5/23/2013
MVC I79 SB/ SR 358	New Vernon Township	7/12/2013
ROAD CLOSURE I-79 N	Deer Creek Township	8/19/2013
ROAD CLOSURE I-79 N	Deer Creek Township	8/19/2013
MVA		9/14/2013
Vehicle Accident w/ Injuries		9/29/2013
Vehicle Acc w/ Entrapment		9/29/2013
VEHICLE ACCIDENT-ENTRAPMENT	East Lackawannock Township	10/29/2013
Milk Tanker Rolled over	South Pymatuning Township	11/9/2013
MVA with Fatality I-79 SB MM 119	Findley Township	11/24/2013
vehicle accident involving ambulance		11/26/2013
Vehicle Accident w/Entrapment		12/17/2013
ROAD CLOSURE - I-80 - Mercer County	Lackawannock Township	1/17/2014
Motor vehicle accident/fatal		1/24/2014
Accident with injury City Emergency Vehicle	Sharon City	1/29/2014
Road Closure I-80 EB Exit 4	East Lackawannock Township	2/16/2014

Description	Location	Date
MVI WITH SCHOOL BUS		2/17/2014
Motor vehicle accident		2/27/2014
vehicle accident		3/15/2014
Motor Vehicle Accident		3/20/2014
Vehicle Accident	Wheatland Borough	5/5/2014
motor vehicle accident		5/20/2014
Plane Crash GC Airport		7/25/2014
TRACTOR TRAILOR ACCIDENT	East Lackawannock Township	8/11/2014
CAR VS BUGGY MOTOR VEH ACCID	East Lackawannock Township	8/19/2014
I 80 West Road Closure	Findley Township	8/19/2014
ROAD CLOSURE - Butler County	Mercer Township	10/13/2014
School Bus Accident	Sandy Creek Township	1/5/2015
Multiple MVA I80		1/9/2015
Multi vehicle accident w/road closure	Shenango Township	2/4/2015
Road Closure-TT Rollover	Hempfield Township	4/3/2015
MVC w/ entrapment	Pymatuning Township	5/1/2015
Officer involved motor vehicle accident	Pymatuning Township	5/2/2015
Truck vs Train accident w/injury	Delaware Township	5/10/2015
Motor Vehicle Accident with Entrapment	Delaware Township	7/15/2015
Vehicle Accident with Road Closure	Farrell City	7/16/2015
Accident involving golf cart	Shenango Township	8/9/2015
Motor Vehicle Accident with Injuries	Deer Creek Township	9/5/2015
Fatal Vehicle Accident w/Fire	New Vernon Township	9/21/2015
Vehicle Accident w/Road Closure	Sharon City	9/24/2015
TT ROLLOVER	East Lackawannock Township	9/29/2015
Vehicle Accident w/Ejection	East Lackawannock Township	10/1/2015
ROAD CLOSURE - Mercer Co	Greenville Borough	10/3/2015
MVC parade float vs Ped	Mercer Borough	10/14/2015
Vehicle Accident with Entrapment	West Salem Township	10/16/2015
Vehicle Accident w/Injuries	Hermitage City	10/16/2015
Tractor Trailer Accident w/Fuel Spill	Sharon City	10/19/2015
VEHICLE CRASH WITH ENTRAPMENT	Lackawannock Township	11/13/2015
Motor vehicle accident	Shenango Township	11/17/2015
Motor Vehicle Crash with Injury	Stoneboro Borough	11/18/2015
Vehicle Accident w/Entrapment	Findley Township	11/18/2015
Motor Vehicle Accident with Entrapment	Pine Township	11/27/2015
Motor Vehicle accident		12/1/2015
Road Closure	West Salem Township	12/4/2015
Vehicle Accident w/Entrapment	Findley Township	12/11/2015
Multiple Vehicle Accident	New Vernon Township	12/18/2015
MVA W/ Partial Lane Restriction		1/17/2016
ROAD CLOSURE - Mercer County	Shenango Township	2/10/2016
Multi Vehicle Accident I-80	East Lackawannock Township	2/12/2016

Description	Location	Date
Vehicle Accident w/Ejection I-79	Deer Creek Township	2/13/2016
MVA-Multiple vehicle	Pine Township	2/13/2016
MVC with injury/School Bus	Sharon City	2/17/2016
MVA with entrapment	Coolspring Township	2/29/2016
Tanker Overturned w/Entrapment	Findley Township	3/7/2016
Vehicle Accident w/Ejection	Sugar Grove Township	3/17/2016
I 80 Closure	Grove City Borough	5/27/2016
ROAD CLOSURE - Mercer County	Fairview Township	6/8/2016
Motor Vehicle Accident involving PD	Hermitage City	7/30/2016
Motor vehicle accident w/Entrapment	East Lackawannock Township	8/3/2016
Motor Veh Accident w/ Entrapment	South Pymatuning Township	9/10/2016
Vehicle Accident Involving Ambulance	Hermitage City	9/11/2016
Road Closure	Lackawannock Township	9/30/2016
MVA Tractor Trailer Rollover	Shenango Township	10/3/2016
Motor Vehicle Fire	Wolf Creek Township	10/5/2016
Plane down		10/28/2016
MOTORCYCLE ACCIDENT		10/29/2016
Motor Vehicle Crash Entrapment	Findley Township	10/30/2016
MOTOR VEHICLE ACCIDENT	Lackawannock Township	11/17/2016
Road Closure/Tractor Trailer Fire	Shenango Township	12/15/2016
ACCIDENT / POWER OUTAGE	Liberty Township	12/18/2016
Motor Vehicle Crash w/Entrapment	Delaware Township	12/23/2016
Road Closure	Lackawannock Township	1/5/2017
oil spill		1/8/2017
Road Closure due to Accident	West Middlesex Borough	2/10/2017
Road Closure due to Vehicle Accident	Sugar Grove Township	2/12/2017
Motor Vehicle Accident		2/14/2017
Motor Vehicle Accident 24 i 80		2/28/2017
MOTOR VEHICLE ACCIDENT	Shenango Township	3/2/2017
Road Closure	West Middlesex Borough	3/9/2017
Motor Veh Accident Sandy creek Twp		4/21/2017
Motor vehicle acc w/ entrap and fire	East Lackawannock Township	4/24/2017
MVC w/entrapment	Hempfield Township	5/3/2017
ROAD CLOSURE	Jackson Township	5/4/2017

Table 44 - PennDOT Mercer County Crash Report

Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Interstate	184	169	133	166	152	172	153	152	187	196	1664
State Road	1127	1063	983	1023	1110	1059	1043	1003	1048	1074	10533
Local Road	269	241	245	238	247	227	245	215	216	228	2371
Hazardous Truck	1	3	1	0	0	2	1	1	1	2	12

Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
School Bus	5	10	6	12	9	3	5	8	8	9	75
Alcohol Related	153	133	115	122	129	134	113	106	104	99	1208
Pedestrian	27	16	15	18	23	17	9	17	14	14	170
Fatal	21	24	15	13	19	15	23	14	12	15	171
Railroad	1	2	0	1	1	0	0	1	1	1	8
Total Incidents	**1398**	**1305**	**1229**	**1261**	**1358**	**1280**	**1288**	**1218**	**1264**	**1302**	**12903**

4.3.15.4 Future Occurrence

Automobile accidents occur frequently, and typically occur more frequently than a rail or aviation accident. Interstates I79, I80 and I376 are the most traveled roadways in Mercer County, followed by US Routes 18, 19 and 62. These roadways are also the most traveled by heavy freight vehicles which can often carry hazardous materials.

The average rate of aviation accidents occur at a rate of one per 1.2 million flights; with the chances of dying in a plane crash at 1 in 11 million. Therefore, the likelihood of an aviation incident in Mercer County is considered low, however past events show that they are not impossible. While they are infrequent, railroad accidents have a greater likelihood of affecting larger areas of population and/or the environment.

The probability of transportation accidents is characterized as highly likely as defined by the Risk Factor Methodology probability criteria. An overall risk factor of 2.7 has been determined by the local planning team using this methodology.

4.3.15.5 Vulnerability Assessment

The combination of high traffic volume and severe winter weather in the county increase the chances of traffic accidents occurring. Vulnerability for highway accidents falls within a ¼ mile of Interstate and US highways. Like highway incidents, rail incidents can impact populations living near rail lines. Vulnerability for rail incidents fall within a ¼ mile of the rail line. This includes populations in Wheatland, Farrell, Sharon, Sharpsville, Greenville, Grove City as well as numerous less populated areas (see *Figure 32 – Major Transportation Routes* for more).

Each public use airport in Mercer County is located in a relatively rural area, and there is not a large population located in the path of their runways. Grove City Airport hosts Skydiving which results in increased air traffic and possible complications. The departure lanes of both Youngstown and Pittsburgh airports track through Mercer County, resulting in increased air traffic in the county.

Table 45 - Transportation Accident Vulnerability

Municipality	Within 1/4 mi of major Roads & Railways		Within 5 mi of an Airport	
	Addressable Structures	Critical Facilities	Addressable Structures	Critical Facilities
Clark Boro	44	0	471	1
Coolspring Twp	774	1	2223	2
Deer Creek Twp	70	0	1167	0
Delaware Twp	132	0	2497	1
East Lackawannock Twp	537	0	1642	0
Fairview Twp	259	0	1268	1
Farrell City	372	1	3404	8
Findley Twp	458	0	2262	0
Fredonia Boro	333	1	445	1
French Creek Twp	129	0	400	0
Greene Twp	0	0	1134	0
Greenville Boro	2259	8	3439	11
Grove City Boro	1382	6	3462	12
Hempfield Twp	1133	5	3099	6
Hermitage City	2609	7	10620	13
Jackson Twp	341	1	1460	1
Jackson Center Boro	168	1	208	1
Jamestown Boro	0	0	421	5
Jefferson Twp	453	0	2251	2
Lackawannock Twp	417	0	2498	0
Lake Twp	199	0	1071	0
Liberty Twp	0	0	1294	1
Mercer Boro	825	5	1401	7
Mill Creek Twp	0	0	216	0
New Lebanon Boro	0	0	183	0
New Vernon Twp	261	0	924	0
Otter Creek Twp	0	0	575	0
Perry Twp	318	1	1069	1
Pine Twp	281	2	3986	6
Pymatuning Twp	948	3	2721	7
Salem Twp	0	0	518	0
Sandy Creek Twp	273	0	855	0
Sandy Lake Twp	277	5	492	5
Sandy Lake Boro	423	0	268	0

Municipality	Within 1/4 mi of major Roads & Railways		Within 5 mi of an Airport	
	Addressable Structures	Critical Facilities	Addressable Structures	Critical Facilities
Sharon City	4414	11	9044	16
Sharpsville Boro	1336	5	2700	8
Sheakleyville Boro	136	1	137	1
Shenango Twp	1177	0	3790	2
South Pymatuning	358	0	2481	3
Springfield Twp	618	0	1087	1
Stoneboro Boro	302	0	1040	2
Sugar Grove Twp	448	0	1106	0
West Middlesex Boro	494	4	679	5
West Salem Twp	449	1	3040	3
Wheatland Boro	79	2	611	2
Wilmington Twp	170	0	551	0
Wolf Creek Twp	181	0	1029	0
Worth Twp	0	0	918	0
Total	**25837**	**71**	**88157**	**135**

4.4. Hazard Vulnerability Summary

4.4.1. Methodology

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

RF values were obtained by assigning varying degrees of risk to five categories for each of the hazards profiled in the HMP update. Those categories include *probability*, *impact*, *spatial extent*, *warning time and duration*. Each degree of risk was assigned a value ranging from one to four. The weighting factor agreed upon by the planning team is shown in *Table 46 - Risk Factor Approach Summary*. To calculate the RF value for a given hazard, the assigned risk value for each category was multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the following example equation:

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

Table 46 - Risk Factor Approach Summary summarizes each of the five categories used for calculating a RF for each hazard. According to the weighting scheme applied, the highest possible RF value is 4.0.

Table 46 - Risk Factor Approach Summary

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

4.4.2. Ranking Results

Using the methodology described in Section 4.4.1, *Table 47 - Risk Factor Assessment* lists the risk factor calculated for each of the nineteen potential hazards identified in the 2018 HMP. *It should be noted that the flooding, flash flooding, ice jam flooding, tornado hazard and windstorm hazard were ranked individually instead of together*. 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 47 - Risk Factor Assessment

Mercer County Hazard Ranking Based on RF Methodology.							
HAZARD RISK	HAZARD NATURAL OR HUMAN-CAUSED	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		PROBABILITY	ECONOMIC IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	Winter Storm	4	2	4	1	3	3
	Invasive Species	4	2	3	4	1	2.9
	Pandemic, Epidemic and Infectious Disease	4	1	4	1	4	2.8
	Transportation Accidents	4	2	2	4	1	2.7
	Windstorm	4	2	2	4	1	2.7
	Terrorism	4	2	1	4	2	2.6
	Energy Emergencies	1	3	4	4	1	2.5
	Hazardous Materials	3	2	2	4	2	2.5
	Dam Failure	1	3	3	4	3	2.5
MODERATE	Flood (100 Year Flood)	1	3	3	2	4	2.4
	Fire Hazard	4	1	1	4	1	2.2
	Droughts and Water Supply Deficiency	2	1	4	1	4	2.2
	Tornado	3	2	1	4	1	2.2
	Flash Flood	4	1	1	4	1	2.2
	Fixed Nuclear Facility	1	2	3	3	2	2
LOW	Hurricane/Tropical Storm	1	1	3	1	2	1.5
	Earthquakes	1	1	2	4	1	1.5
	Subsidence & Landslides	2	1	1	1	1	1.3
	Ice Jam Flood	1	1	1	2	1	1.1

Based on these results, there are nine (9) *high* risk hazards, six (6) *moderate* risk hazards and four (4) *low* risk hazards in Mercer County. Mitigation actions were developed for all high, moderate and low risk hazards (see Section 6.4). The threat posed to life and property for moderate and high-risk hazards is considered significant enough to

warrant the need for establishing hazard-specific mitigation actions. Mitigation actions related to future public outreach and emergency service activities are identified to address low risk hazard events.

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 flooding, tornado and windstorms. Estimates provided in this section are based on HAZUS-MH, version 3.2, geospatial analysis, and previous events. Estimates are considered *potential* in that they generally represent losses that could occur in a countywide hazard scenario. In events that are localized, losses may be lower, while regional events could yield higher losses.

Potential loss estimates have four basic components, including:

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

Flooding Loss Estimation:

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

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

Using HAZUS-MH, total building-related losses from a 1%-annual-chance flood in Mercer County are estimated to equal $515,060,000. Residential occupancies make up 18.39% of the total estimated building-related losses. Total economic loss, including replacement value, content loss, functional loss and displacement cost, from a countywide 1%-annual-chance flood are estimated to equal $519,220,000. The local planning team reviewed these results and determined the results were low. Additional HAZUS analysis will be conducted during the next five year cycle with local data.

4.4.4. Future Development and Vulnerability

The total population in Mercer County decreased one percent between 1990 and 2000 from 121,018 to 120,293. There are 28 municipalities within the county that have seen population decreases in the period between 2000 and 2010 with an overall county population loss of 3.0%, as seen in Table 14 - 2000-2010 Population Change. At the same time, Hermitage City, Sharon City, Grove City Borough, Farrell City, Pine Township, Greenville Borough, and Sharpsville Borough have (and will continue to have) the highest population densities in the county, meaning that hazard vulnerability and loss estimates will be relatively higher in those municipalities. The only municipalities that had a significant increase (above 8%) in population from 2000 to 2010 were Findley Township, Lake Township, Liberty Township, Mill Creek Township, Wilmington Township, Wolf Creek Township, and Worth Township. Overall, Mercer County's hazard vulnerability and loss estimates should remain constant or decrease over the next five years.

Table 48 - 2000-2010 Population Change

Population Change in Mercer County from 2000-2010			
Municipality	**2000 Population**	**2010 Population**	**Percent of Change**
Clark Borough	633	640	1.1%
Coolspring Township	2,287	2,278	-0.4%
Deer Creek Township	465	502	8.0%
Delaware Township	2,159	2,291	6.1%
East Lackawannock Township	1,701	1,682	-1.1%
Fairview Township	1,036	1,085	4.7%
Farrell City	6,050	5,111	-15.5%
Findley Township	2,305	2,910	26.2%
Fredonia Township	652	502	-23.0%
French Creek Township	764	771	0.9%
Greene Township	1,153	1,091	-5.4%
Greenville Borough	6,380	5,919	-7.2%
Grove City Borough	8,024	8,322	3.7%
Hempfield Township	4,004	3,741	-6.6%
Hermitage City	16,157	16,220	0.4%
Jackson Center Borough	1,206	224	1.4%

Population Change in Mercer County from 2000-2010			
Municipality	**2000 Population**	**2010 Population**	**Percent of Change**
Jackson Township	221	1,273	5.6%
Jamestown Borough	636	617	-3.0%
Jefferson Township	2,416	1,880	-22.0%
Lackawannock Township	2,561	2,662	3.9%
Lake Township	706	780	10.5%
Liberty Township	1,276	1,414	10.8%
Mercer Borough	2,391	2,002	-16.3%
Mill Creek Township	630	721	12.8%
New Lebanon Borough	205	188	-8.3%
New Vernon Township	524	504	-3.8%
Otter Creek Township	611	589	-3.6%
Perry Township	1,471	1,453	-1.2%
Pine Township	4,493	5,150	14.6%
Pymatuning Township	3,782	3,281	-13.2%
Salem Township	769	754	-2.0%
Sandy Creek Township	848	795	-6.3%
Sandy Lake Borough	743	659	-11.3%
Sandy Lake Township	1,243	1,226	-1.8%
Sharon City	16,328	14,038	-14.0%
Sharpsville Borough	4,500	4,415	-1.9%
Sheakleyville Borough	164	142	-13.4%
Shenango Township	4,037	3,929	-2.7%
South Pymatuning Township	2,857	2,695	-5.7%
Springfield Township	1,972	1,981	0.5%
Stoneboro Borough	1,104	1,051	-4.8%
Sugar Grove Township	909	971	6.8%

Population Change in Mercer County from 2000-2010			
Municipality	**2000 Population**	**2010 Population**	**Percent of Change**
West Middlesex Borough	929	863	-7.1%
West Salem Township	3,565	3,538	-0.8%
Wheatland Borough	748	632	-15.5%
Wilmington Township	1,105	1,415	28.1%
Wolf Creek Township	729	832	14.1%
Worth Township	830	899	8.3%
TOTAL	120,293	116,638	-3.0%

5. Capability Assessment

5.1. Update Process Summary

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

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

Throughout the planning process, the mitigation local planning team considered the county's forty-eight municipalities. Pennsylvania municipalities have their own governing bodies, pass and enforce their own ordinances and regulations, purchase equipment and manage their own resources, including critical infrastructure. These capability assessments, therefore, consider the various characteristics and capabilities of municipalities under study. Additionally, NFPA 1600 recommends that a corrective action program be established to address shortfalls and provide mechanisms to manage the capabilities improvement process.

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

Mercer 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, fiscal capabilities and participation in local, regional, state and federal programs. The presence of these resources enables community resiliency through actions taken before, during and after a hazardous event. While the capability assessment serves as a good instrument for identifying local capabilities, it also provides a means for recognizing gaps and weaknesses that can be resolved through future mitigation actions. The results of this assessment lend critical information for developing an effective mitigation strategy.

5.2. Capability Assessment Findings

All participating municipalities completed and submitted a capability assessment survey. The results of the survey were collected, aggregated and analyzed.

5.2.1. Planning and Regulatory Capability

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

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

Building Codes

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

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

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

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

The municipalities in Mercer County adhere to the standards of the Pennsylvania Uniform Construction Code (Act 45). All municipalities, except for one, have opted in on building code enforcement.

Zoning Ordinance

Article VI of the Municipalities Planning Code (MPC) authorizes municipalities to prepare and enact zoning to regulate land use. Its regulations can apply to: the permitted use of land; the height and bulk of structures; the percentage of a lot that may be occupied by buildings and other impervious surfaces; yard setbacks; the density of development; the height and size of signs; the parking regulations. A zoning ordinance has two parts, including the zoning map that delineates zoning districts and the text that sets forth the regulations that apply to each district. Of the forty-eight municipalities that reside in Mercer County, thirty (63%) indicated that they have a zoning ordinance.

Subdivision Ordinance

Subdivision and land development ordinances include regulations to control the layout of streets, the planning of lots and the provision of utilities and other site improvements. The objectives of a subdivision and land development ordinance are to: coordinate street patterns; assure adequate utilities and other improvements are provided in a manner that will not pollute streams, wells and/or soils; reduce traffic congestion; and provide sound design standards as a guide to developers, the elected officials, planning commissions and other municipal officials. Article V of the Municipality Planning Code authorizes municipalities to prepare and enact a subdivision and land development ordinance. Subdivision and land development ordinances provide for the division and improvement of land. To date, twelve of the municipalities in Mercer County have developed their own subdivision ordinance. The remaining thirty-six municipalities have adopted the countywide plan.

Storm-water Management Plan/Stormwater Ordinance

The proper management of storm-water runoff can improve conditions and decrease the chance of flooding. Pennsylvania's Storm Water Management Act (Act 167) confers on counties the responsibility for development of watershed plans. The Act specifies that counties must complete their watershed storm-water plans within two years following the promulgation of these guidelines by the DEP, which may grant an extension of time to any county for the preparation and adoption of plans. Counties must prepare the watershed plans in consultation with municipalities and residents. This is to be accom-

plished through the establishment of a watershed plan advisory committee. The counties must also establish a mechanism to periodically review and revise watershed plans so they are current. Plan revisions must be done every five years or sooner, if necessary.

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

There are eight watersheds in Mercer County. Mercer County and other local municipalities have general (non-Act 167 compliant) storm-water management regulations as part of either the county or local subdivision and land development plan. Of the 48 municipalities within Mercer County, forty have a storm-water management plan and eight do not or were unsure when responding to the capability assessment.

Comprehensive Plan

A comprehensive plan is a policy document that states objectives and guides the future growth and physical development of a municipality. The comprehensive plan is a blueprint for housing, transportation, community facilities, utilities and land use. It examines how the past led to the present and charts the community's future path. The Pennsylvania Municipalities Planning Code (MPC Act 247 of 1968, as reauthorized and amended) requires counties to prepare and maintain a county comprehensive plan. In addition, the MPC requires counties to update the comprehensive plan every 10 years.

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

Mercer County has a county comprehensive plan that was adopted on April 27, 2006 and is an update to the 1995-1996 Comprehensive Plan.

Article III of the Municipality Planning Code (MPC) enables municipalities to prepare a comprehensive plan; however, development of a comprehensive plan is voluntary. All municipalities in Mercer County have adopted the Mercer County Comprehensive Plan as the municipal plan. No municipalities have independent plans.

Capital Improvements Plan

The capital improvements plan is a multi-year policy guide that identifies needed capital projects and is used to coordinate the financing and timing of public improvements.

Capital improvements relate to streets, storm-water systems, water distribution, sewage treatment and other major public facilities. A capital improvements plan should be prepared by the respective county's planning department and should include a capital budget. This budget identifies the highest priority projects recommended for funding in the next annual budget. The capital improvements plan is dynamic and can be tailored to specific circumstances. There are no municipalities within Mercer County that have an identified capital improvement plan.

Participation in the National Flood Insurance Program (NFIP)

Floodplain management is the operation of programs or activities that may consist of both corrective and preventive measures for reducing flood damage, including but not limited to such things as emergency preparedness plans, flood control works and flood plain management regulations. The Pennsylvania Floodplain Management Act (Act 166) requires every municipality identified by the Federal Emergency Management Agency (FEMA) to participate in the National Flood Insurance Program (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.

The Pennsylvania DCED provides communities, based on their CFR, Title 44, Section 60.3 level of regulations, with a suggested ordinance document to assist municipalities in meeting the minimum requirements of the NFIP along with the Pennsylvania Flood Plain Management Act (Act 166). These suggested or model ordinances contain provisions that are more restrictive than state and federal requirements. Suggested provisions include, but are not limited to:

1. Prohibiting manufactured homes in the floodway.
2. Prohibiting manufactured homes within the area measured 50 feet landward from the top-of bank of any watercourse within a special flood hazard area.
3. Special requirements for recreational vehicles within the special flood hazard area.
4. Special requirement for accessory structures.
5. Prohibiting new construction and development within the area measured 50 feet landward from the top-of bank of any watercourse within a special flood hazard area.
6. Providing the county conservation district an opportunity to review and comment on all applications and plans for any proposed construction or development in any identified floodplain area.

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

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

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

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

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

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

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

ensure the timely and successful adoption of an updated floodplain management ordinance by reviewing and providing feedback on existing and draft ordinances.

Of the municipalities who completed the capability assessment, only four indicated that they do not participate in the NFIP. Currently, no municipalities have completed or started to complete the CRS program. Additional research will be conducted on the CRS program and mitigation actions will be developed in support of the CRS.

5.2.2. Administrative and Technical Capability

There are fourteen boroughs, thirty-one townships, and three cities within Mercer County. Each of these municipalities conducts its daily operations and provides various community services according to local needs and limitations. Some of these municipalities have formed cooperative agreements and work jointly with their neighboring municipalities to provide services such as police protection, fire and emergency response, infrastructure maintenance and water supply management. Others choose to operate on their own. Municipalities vary in staff size, resource availability, fiscal status, service provision, constituent population, overall size and vulnerability to the profiled hazards.

County Planning Department

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

Municipal Engineer

A municipal engineer performs duties as directed in the areas of construction, reconstruction, maintenance and repair of streets, roads, pavements, sanitary sewers, bridges, culverts and other engineering work. The municipal engineer prepares plans, specifications and estimates of the work undertaken by the township. Each municipality within Mercer County employs or subcontracts a municipal engineer. Also in place is the Mercer County Engineer's Office which is responsible for the design, construction, and inspection of county owned infrastructure.

Personnel Skilled in GIS or FEMA HAZUS Software

A geographic information system (GIS) is an integrated, computer-based system designed to capture, store, edit, analyze and display geographic information. Some examples of uses for GIS technology in local government are: land records management, land

use planning, infrastructure management and natural resources planning. A GIS automates existing operations such as map production and maintenance, saving a great deal of time and money. The GIS also includes information about map features such as the capacity of a municipal water supply or the acres of public land. GIS is utilized by a majority of the Mercer County Departments and Offices. Mercer County GIS data is managed, maintained and developed by the Mercer County GIS Department. There are no employees that have completed Basic HAZUS-MH.

Emergency Management Coordinator

Emergency Management is a comprehensive, integrated program of mitigation, preparedness, response and recovery for emergencies/disasters of any kind. No public or private entity is immune to disasters and no single segment of society can meet the complex needs of a major emergency or disaster on its own.

A municipal emergency management coordinator is responsible for emergency management – preparedness, response, recovery and mitigation within the respective authority having jurisdiction (AHJ). The responsibilities of the emergency management coordinator are outlined in PA Title 35 §7503:

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

Title 35 requires Mercer County and its municipalities to have an emergency management coordinator.

The Mercer County Department of Public Safety coordinates countywide emergency management efforts. Currently, forty-one out of forty-eight municipalities in Mercer County have an appointed Emergency Management Coordinator (EMC).

The Emergency Management Services Code (PA Title 35) requires that all municipalities in the Commonwealth have a local emergency operations plan (EOP) which is updated every two years. Some municipalities are past the two-year review cycle or are currently in the process of updating their municipal plan. Each municipality is required to adopt the countywide EOP. Mercer County is currently in the process of updating their EOP using "Previstar", a web-based emergency preparedness and response program. The last update to the countywide EOP was made in 2012.

Political Capability

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

The capability assessment survey was used to capture information on each jurisdiction's political capability. Survey respondents were asked to identify examples of political capability, such as guiding development away from hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (i.e. building codes, floodplain management ordinances, etc.). These examples were used to guide respondents in scoring their community on a scale of "unwilling" (0) to "very willing" (5) to adopt policies and programs that reduce hazard vulnerabilities. Of the municipalities that responded, none of the municipalities completed this section with a numerical response.

Self-Assessment

In addition to the inventory and analysis of specific local capabilities, the *Capability Assessment Survey* required each local jurisdiction to conduct its own self-assessment of its capability to effectively implement hazard mitigation activities. As part of this process, county and municipal officials were encouraged to consider the barriers to implementing proposed mitigation strategies in addition to the mechanisms that could enhance or further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as either "L = limited" "M = moderate" or "H = high." *Table 49 - Capability Self-Assessment Matrix* summarizes the results of the self-assessment survey. Forty-six out of forty-eight municipalities returned this section of the assessment completed.

Table 49 - Capability Self-Assessment Matrix

Mercer County Capability Self-Assessment Matrix				
Municipality Name	Capability Category			
	Planning and Regulatory Capability	Administrative and Technical Capability	Fiscal Capability	Community Political Capability
Clark Borough	M	M	M	M
Coolspring Township	M	M	M	M
Deer Creek Township	L	M	L	L
Delaware Township	L	L	L	L
East Lackawannock Township	L	L	L	L
Fairview Township	M	M	M	M
Farrell City	H	M	M	M

Mercer County Capability Self-Assessment Matrix				
Municipality Name	**Capability Category**			
	Planning and Regulatory Capability	**Administrative and Technical Capability**	**Fiscal Capability**	**Community Political Capability**
Findley Township	M	M	M	M
Fredonia Borough	L	L	L	L
French Creek Township	L	L	L	L
Greene Township	L	L	L	L
Greenville Borough	H	H	H	H
Grove City Borough	L	L	L	L
Hempfield Township	L	L	L	M
Hermitage City	H	H	M	M
Jackson Center Borough	L	L	L	L
Jackson Township	H	M	M	H
Jamestown Borough	L	L	L	L
Jefferson Township	Not completed by municipality			
Lackawannock Township	L	L`	L	L
Lake Township	L	L	L	L
Liberty Township	L	M	M	M
Mercer Borough	L	M	L	L
Mill Creek Township	L	L	L	L
New Lebanon Borough	Not completed by municipality			
New Vernon Township	L	M	L	M
Otter Creek Township	L	L	L	L
Perry Township	L	L	L	L
Pine Township	Not completed by municipality			
Pymatuning Township	L	H	L	H
Salem Township	L	L	L	L
Sandy Creek Township	L	L	L	L
Sandy Lake Borough	L	L	L	L
Sandy Lake Township	M	M	L	L
Sharon City	M	M	M	M
Sharpsville Borough	M	M	L	M
Sheakleyville Borough	L	L	L	L
Shenango Township	M	L	L	M
South Pymatuning Township	L	L	L	L
Springfield Township	H	H	L	L
Stoneboro Borough	L	M	L	L
Sugar Grove Township	L	L	L	L
West Salem Township	M	M	M	M
West Middlesex Borough	L	L	L	L
Wheatland Borough	L	L	L	L
Wilmington Township	L	L	L	L
Wolf Creek Township	M	L	L	L
Worth Township	L	L	L	L

Existing Limitations

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

5.2.3. Financial Capability

Fiscal capability is significant to the implementation of hazard mitigation activities. Every jurisdiction must operate within the constraints of limited financial resources. The following information pertains to various financial assistance programs relevant to hazard mitigation.

State and Federal Grants

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

Capital Improvement Financing

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

Indebtedness through General Obligation Bonds

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

Municipal Authorities

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

Sewer Authorities

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

Water Authorities

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

Circuit Riding Program (Engineer)

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

5.2.4. Education and Outreach

Mercer County has a limited education and outreach program. The Mercer County Department of Public Safety conducts some public outreach at public events to update the citizens and visitors of the county on natural and human-caused hazards. The county conservation district also conducts outreach on various activities and projects in the

county. Many of these projects are related to or directly impact hazard mitigation projects.

Educational activities that directly impact hazard mitigation in Mercer County predominantly revolve around the first responders. Providing fire, medical and search and rescue training and education enhances the response and recovery capabilities of response agencies in the county. Additional training is always a goal within Mercer County.

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

5.2.5. Plan Integration

There are numerous existing regulatory and planning mechanisms in place at the state, county and municipal level of government which support hazard mitigation planning efforts. These tools include the 2013 Commonwealth of Pennsylvania Standard All-Hazard Mitigation Plan, local floodplain management ordinances, the Mercer County Comprehensive Plan, Mercer County Emergency Operations Plan, local emergency operation plans, local zoning ordinances, local subdivision and land development ordinances.

Information from several of these documents has been incorporated into this plan and mitigation actions have been developed to further integrate these planning mechanisms into the hazard mitigation planning process. In particular, information on identified development constraints and potential future growth areas was incorporated from the Mercer County Comprehensive Plan so that vulnerability pertaining to future development could be established. Floodplain management ordinance information was used to aid in the establishment of local capabilities in addition to participation in The National Flood Insurance Program (NFIP).

The Mercer County Comprehensive Plan, the Mercer County Emergency Operations Plan, and various municipal regulatory tools as identified in the capability assessment section of this plan, require alignment with this updated hazard mitigation plan. The county comprehensive plan has not been updated since 2006. This plan is very limited on the amount of hazard mitigation principals that are incorporated into the plan. Discussions on specific hazard areas within municipalities that may be used for future development must be addressed. Municipalities should also identify mitigation projects that could decrease the impact of hazards in these specific areas in the annual municipal capital improvement plan.

Storm-water management plans have not been implemented in the county and should strongly be considered and encouraged in the future. In the event that these plans are implemented, Mercer County officials will ensure that hazard mitigation data and principals are implemented as appropriate.

Mercer County is a small county with a very limited amount of population and resources to appropriately ensure and implement hazard mitigation principals into all regulatory tools. Mercer County will continue to explore options to further enhance the implementation of these principals utilizing already multi-tasked staff and resources. Mercer

County will review other local and state plans that could be impacted with hazard mitigation principals over the next five-year planning period.

Mercer County Comprehensive Plan

Article III of the Pennsylvania Municipalities Planning code (Act 247 of 1968, as reenacted and amended) requires all Pennsylvania counties (except Philadelphia) to adopt a comprehensive plan and update it at least every 10 years. The Mercer County Commissioners adopted the updated Mercer County Comprehensive Plan in 2006.

The Mercer County Planning Commission is responsible for maintaining and updating the Mercer County Comprehensive Plan and many other regulatory tools. Technical assistance on community planning matters is provided to the Mercer County Board of Commissioners through the Mercer County Planning Commission. The planning commission administers the Mercer County Comprehensive Plan. The planning commission also performs technical reviews of municipal subdivision and land development plans, municipal floodplain ordinances and other community planning and development matters.

Mercer County Emergency Operations Plan

The Pennsylvania Emergency Management Services Code, 35 PA C.S. Sections 7701-7707, as amended, requires each county and municipality to prepare, maintain and keep current an Emergency Operations Plan (EOP). Mercer County Office of Emergency Services is responsible for preparing and maintaining the county's EOP, which applies to both the county and municipal emergency management operations and procedures.

The EOP is reviewed annually. Whenever portions of the plan are implemented in an emergency event or training exercise, a review is performed and changes are made where necessary. These changes are then distributed to the county's municipalities.

The complete risk assessment section, mitigation actions and mitigation project opportunities identified in the Mercer County Hazard Mitigation Plan will assist with decreasing hazard specific risk and vulnerability. Understanding the risks and vulnerability in the county and municipalities will allow for emergency management and other response agencies to better direct planning, response and recovery aspects.

EMA will consider the Mercer County Hazard Mitigation Plan during its biennial review of the county EOP. Recommended changes to the HMP will then be coordinated with the hazard mitigation local planning team.

Plan Interrelationships

Ensuring consistency between these planning mechanisms is critical. In fact, Section 301 (4.1) of the Pennsylvania Municipalities Planning Code requires that comprehensive plans include a discussion of the interrelationships among their various plan components, "which may include an estimate of the environmental, energy conservation, fiscal, economic development and social consequences on the environment."

To that end, Mercer County and its municipalities must ensure that the components of the hazard mitigation plan are integrated into existing community planning mecha-

nisms and are generally consistent with goals, policies and recommended actions. Mercer County and the hazard mitigation planning team will utilize the existing maintenance schedule of each plan to incorporate the goals, policies and recommended actions as each plan is updated.

6. Mitigation Strategy

6.1. Update Process Summary

Mitigation goals are general guidelines that explain what the county wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results. Mitigation objectives describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date. There were six goals and sixteen objectives identified in the 2012 hazard mitigation plan. The 2018 Mercer County Hazard Mitigation Plan Update has six goals and twenty objectives. Objectives have been added and arranged in order to associate them with the most appropriate goal. These changes are noted in *Table 50 – 2012 Mitigation* Goals and Objectives. A list of these goals and objectives as well as a review summary based on comments received from stakeholders who participated in the HMP update process is included in *Table 50 – 2012 Mitigation Goals* and Objectives. These reviews are based on the 5-Year hazard mitigation plan review worksheet, which includes a survey on existing goals and objectives, completed by the local planning team. Municipal officials then provided feedback on the changes to the goals and objectives via a mitigation strategy update meeting. Copies of these meetings and all documentation associated with the meetings are located in Appendix C.

Actions provide more detailed descriptions of specific work tasks to help the county and its municipalities achieve prescribed goals and objectives. There were forty three actions identified in the 2012 mitigation strategy. A review of the 2012 mitigation actions was completed by the local planning team. The results of this review are identified in *Table 51 - 2012 Mitigation Actions Review.* Actions were evaluated by the local planning team with the intent of carrying over any actions that were not started or continuous for the next five years.

Table 50 – 2012 Mitigation Goals and Objectives

Mercer County 2012 Mitigation Goals and Objectives Review Worksheet		
GOAL Objective	**Description**	**Review**
GOAL 1	Attempt to reduce the current and future risk of flood damage in Mercer County	The Mercer County Steering Committee and Local Planning Team reviewed this goal. There has been limited action with this goal and the team has identified that the goal is still valid and supports the overall new risk assessment. This goal will remain in the 2018 hazard mitigation plan update.

Mercer County 2012 Mitigation Goals and Objectives Review Worksheet		
GOAL Objec-tive	**Description**	**Review**
Objective 1.1	Reduce flood damage by directing new development away from high hazard areas by reviewing existing regulations to ensure adequacy in reducing the amount of future development in identified hazard areas	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to remain for the 2018 hazard mitigation plan update. Add the word "flood" to hazard areas.
Objective 1.2	Municipalities to review all comprehensive plans to ensure that designated growth areas are not in hazard areas	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to remain for the 2018 hazard mitigation plan update. Add the word "flood" to hazard areas.
Objective 1.3	Review any capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas without adhering to all applicable state, federal, and local regulations.	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to remain for the 2018 hazard mitigation plan update.
Objective 1.4	Evaluate and update existing floodplain ordinances to meet or exceed the NFIP standards	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to remain for the 2018 hazard mitigation plan update.
Objective 1.5	Improve the enforcement of existing floodplain regulations	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to remain for the 2018 hazard mitigation plan update.
GOAL 2	Reduce the potential impact of natural and man-made disasters on public and private property	The Mercer County Steering Committee and Local Planning Team reviewed this goal. Change man-made to human-caused. This goal will remain in the 2018 hazard mitigation plan update.
Objective 2.1	Encourage participation in the National Flood Insurance Program	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to remain for the 2018 hazard mitigation plan update.

Mercer County 2012 Mitigation Goals and Objectives Review Worksheet		
GOAL Objective	**Description**	**Review**
Objective 2.2	Protect Mercer County's most vulnerable populations (e.g. schools, senior citizens, hospital patients, etc.), buildings, and critical facilities with the purchase of appropriate equipment (e.g. generators, busses, etc.)	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to remain for the 2018 hazard mitigation plan update.
Objective 2.3	To enhance the existing information resources available to Mercer County Department of Public Safety	Remove the word "to". The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to remain for the 2018 hazard mitigation plan update.
GOAL 3	Improve upon the protection of the citizens of Mercer County from all natural and man-made hazards	The Mercer County Steering Committee and Local Planning Team reviewed this goal. Change man-made to human-caused.
Objective 3.1	Ensure adequate training and resources for emergency organizations and personnel for certification	Add "are made available to" and remove the word "for". The committee would like this objective to remain for the 2018 hazard mitigation plan update.
Objective 3.2	Improve emergency preparedness in Mercer County and its municipalities	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to remain for the 2018 hazard mitigation plan update.
Objective 3.3	Evaluate cost-effective ways of augmenting existing broadcast and communication systems to monitor warning information continuously and to disseminate appropriate warnings	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to remain for the 2018 hazard mitigation plan update.
GOAL 4	Reduce or redirect the impact of natural disasters (especially floods) away from at-risk population areas	The Mercer County Steering Committee and Local Planning Team reviewed this goal. Reword this goal to: Reduce or redirect the impact of natural and human-caused disasters away from at risk population areas.

Mercer County 2012 Mitigation Goals and Objectives Review Worksheet		
GOAL Objec-tive	**Description**	**Review**
Objective 4.1	Research and implement mitigation projects to reduce flooding, re-duce/eliminate sewage leakage and inflow/infiltration problems. Projects for review and implementation in-clude reservoirs, levees, floodwalls, diversions, channel modification and storm sewers, as well as, acquisition, elevation and relocation of properties in the floodplain.	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to re-main for the 2018 hazard mitigation plan update.
NEW 4.2	Enact ordinances and plans to de-crease the impact of all hazards	The Mercer County Steering Committee and Local Planning Team identified this as a new objective for the 2018 hazards mitigation plan update.
GOAL 5	Protect existing natural resources and open space, including parks and wetlands, within the floodplain and watershed to improve their flood con-trol function	The Mercer County Steering Committee and Local Planning Team reviewed this goal. There has been limited action with this goal and the team has identified that the goal is still valid and supports the overall new risk assessment. This goal will remain in the 2018 hazard mitigation plan update.
Objective 5.1	Protect Mercer County's natural re-sources through the implementa-tion of cost-effective and technically feasible mitigation projects	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to re-main for the 2018 hazard mitigation plan update.
Objective 5.2	Protect Mercer County's natural re-sources through the implementa-tion of recreation planning and storm water management planning	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to re-main for the 2018 hazard mitigation plan update.
GOAL 6	Protect public health, safety, and wel-fare by increasing the public aware-ness of existing hazards and by fos-tering both individual and public re-sponsibility in mitigating risks due to those hazards	The Mercer County Steering Committee and Local Planning Team reviewed this goal. There has been limited action with this goal and the team has identified that the goal is still valid and supports the overall new risk assessment. This goal will remain in the 2018 hazard mitigation plan update.

Mercer County 2012 Mitigation Goals and Objectives Review Worksheet		
GOAL Objective	**Description**	**Review**
Objective 6.1	Develop and distribute public awareness materials about natural hazard risks, preparedness, and mitigation	Change the word "natural" to "all". The committee would like this objective to remain for the 2018 hazard mitigation plan update.
Objective 6.2	Target owners of properties within identified hazard areas for additional outreach regarding mitigation and disaster preparedness	The Mercer County Steering Committee and Local Planning Team reviewed this objective. The committee would like this objective to remain for the 2018 hazard mitigation plan update.
New Objective 6.3	Identify actions and projects to decrease the impact of invasive species.	The Mercer County Steering Committee and Local Planning Team identified this as a new objective for the 2018 hazards mitigation plan update.
New Objective 6.4	Participate in hazard specific planning committees and organizations to decrease the impact and increase public knowledge of these hazards	The Mercer County Steering Committee and Local Planning Team identified this as a new objective for the 2018 hazards mitigation plan update.

Table 51 – 2012 Mitigation Actions Review

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	**Status**					**Review Comments**
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
1.1.1 Encourage municipal offices to review regulations pertaining to their jurisdiction to make sure that adequate zoning regulations are in place to reduce future development in high hazard areas in their jurisdiction. Planning department to review Subdivision and Land Development Ordinance.			X			The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update.
1.2.1 Planning department and applicable municipal offices to review their comprehensive plans to ensure that designated growth areas are not in high hazard areas identified in this plan.			X			Mercer County Regional Planning Commission and municipal government actions. The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update.
1.2.2 Planning department and applicable municipal offices enact an ordinance to require present and future mobile homes to install tie down anchors.			X			Mercer County Regional Planning Commission and municipal government actions. The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update.

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	**Status**					**Review Comments**
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
1.3.1 Encourage applicable municipal offices to review their capital improvement plans to ensure that programmed infrastructure improvements are not in high-hazard areas.			X			The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update.
1.4.1 Applicable municipalities to review and update their floodplain ordinances to be sure that they are in full compliance with the NFIP.	X					The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update.
1.5.1 For Mercer County DPS to arrange with PEMA/FEMA/DCED to hold training sessions with the County and the municipalities on the NFIP requirements.	X					Remove "for Mercer County DPS to". This action will remain for the 2018 hazard mitigation plan update. This action will remain in the 2018 hazard mitigation plan update.
1.6.1 Review and update all existing ordinances and other regulatory planning mechanisms with respect to findings included in the 2012 HMP.			X			This action will remain in the 2018 hazard mitigation plan update but will be renumbered to action 4.2.2 to align with objective 4.2.
1.7.1 Adopt an Act 167 Stormwater Management Plan	X					This action will remain in the 2018 hazard mitigation plan update but will be renumbered to action 4.2.3 to align with objective 4.2

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
1.8.1 Identify a floodplain manager within the Municipality so that the public could obtain and/or view them by contacting the Secretary			**X**			Most municipalities appoint the zoning officer the floodplain manager. The municipalities appointed a floodplain manager in the last floodplain ordinance updates and adoptions. Renumbered this action to 1.5.2
2.1.1 County DPS and PEMA to conduct outreach efforts to educate municipalities about the NFIP and its requirements			**X**			Remove the County DPS and PEMA designation for this action. The action will remain in the 2018 hazard mitigation plan update.
2.1.2 County to obtain updated information on the number of NFIP policyholders in Mercer County and its municipalities from PEMA and FEMA			**X**			This has been completed during the 2018 hazard mitigation plan update and will remain as a continuous action for the update plan.
2.2.1 DPS to work with municipalities to collect updated information of the number and location of all repetitive loss properties throughout the county and the municipalities in order to plan future mitigation activities			**X**			Update the wording on this action. This action will be continuous as the properties were identified in the 2018 plan update.

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
2.2.2 County to work with the Northwest Planning Commission to develop a database in existing hazard GIS system of information on all repetitive loss properties including maps to be used in future mitigation activities	**x**					No progress has been identified with this action. The action will remain in the 2018 hazard mitigation plan update.
2.3.1 Geographic Information Systems (GIS) are designed to help manage spatial information. More than simple computerized maps, a GIS assigns data to specific locations. The data are then searchable, and spatial relationships can easily be analyzed. Mercer County needs to develop a GIS with the Mercer County DPS having direct access to the data. The logical responsible entities to complete this project would be the County Commissioners and County Planning Commission.		**x**				The action will remain in the 2018 hazard mitigation plan update but will be reworded as follows, "Enhance the GIS with hazard specific data and ensure that all agencies and organizations have direct access to the data."

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
2.3.2 Assist with coordination between county residents and utility companies on critical outage events.			**X**			This action remains continuous and will remain in the 2018 hazard mitigation plan update.
2.4.1 Provide property owners with information how they can obtain and purchase flood insurance from the NFIP.			**X**			Renumber to action 2.1.3. This action will remain in the 2018 hazard mitigation plan update.
3.1.1 DPS to conduct annual tabletop disaster exercises with local law enforcement, emergency managers, county and local officials, and other disaster response agencies. Types of exercises to include: Flood Exercise, Weapons of Mass Destruction Exercise, Hazardous Materials Spill Exercise, Weather Exercise and Biological Terrorism Exercise.			**X**			The Mercer County Department of Public Safety will continue to complete this action over the next 5 year planning cycle. The action will remain in the 2018 hazard mitigation plan update.

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
3.1.2 DPS to work with the Mercer Fire Association, Mercer Hospital EMS and the Sheriff's Department to increase the number of trained citizen emergency responders by meeting with groups of potential volunteers. All areas of Mercer County will benefit.					**X**	The Mercer County Steering Committee and the Local Planning Team reviewed this action. There currently is not a citizens' emergency responders group and there is no future consideration for this. The action is no longer supported and should be removed.
3.1.3 DPS to provide information about local, regional, state, and federal training opportunities to fire departments, EMS, ambulance services, and other emergency responders. Develop a list of training opportunities that are available and distribute the list to all local emergency responders. Will benefit all areas of Mercer County.			**X**			Renumber to action 3.1.2. Update the wording of this action to "Disseminate" and remove the "DPS to provide". Also, remove the last two sentences of the action. Mercer County DPS already completes this on an annual basis. The action will remain continuous.

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
3.1.4 Continue to conduct National Weather Service Storm Spotter classes by partnering with the National Weather Service to provide training to people throughout Mercer County on SKYWARN, all weather preparedness.			**X**			Mercer County DPS coordinates this annually and the action will remain continuous. Renumber to action 3.1.3
3.2.1 Review the existing Mercer County Emergency Operations Plan (EOP) and update when necessary based on the recommendations of the Mercer County Hazard Mitigation Plan. Include participation from all municipalities in the update process by ensuring that their EOPs are reviewed and updated annually.			**X**			This action remains continuous and will remain in the 2018 hazard mitigation plan update.
3.2.2 Mercer County has obtained a mobile command post that can be used for multi-hazard purposes.				**X**		The Mercer County Command Post was purchased by Region 13 with Homeland security funds. The command post is maintained with county funds. Project is complete.
3.2.3 A temporary water supply should be established for persons with no water in the event of a dam failure.	**X**					

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
3.3.1 Develop a plan to update the Communications Center equipment to allow faster more timely warning notifications to mitigate the results of a natural, manmade or technological emergency.				**X**		The initial purchase and implementation has been completed but the county will now maintain all equipment that has been purchased. The action will be reworded to reflect this.
3.3.2 Research the possibility of installing a Notification System to reach all populated areas throughout the County.		**X**				Update the action to state "emergency notification system". The action is in progress but not complete yet. The action will be completed during the next planning period. The action will remain in the 2018 hazard mitigation plan update.
3.3.3 Distribution of NOAA Weather Radios to Mercer County municipalities, schools, hospitals, nursing homes, day care centers, libraries, malls, SARA Facilities to initiate earlier warnings to minimize the impact of an emergency on the community.		**X**				Not all agencies have these. The action will remain in progress but not complete. Grant funding would augment the project. The action will remain in the 2018 hazard mitigation plan update.
4.1.1 Continue to review Hazard Mitigation Questionnaires and post-disaster reviews submitted by the municipalities.			**X**			Update this action to read as follows, "Review post-disaster reviews and annual hazard mitigation plan reviews submitted by the municipalities". This action will carry over to the 2018 hazard mitigation plan.

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
4.1.2 Submit Hazard Mitigation Project Opportunity Forms for acquisition, elevation and relocation of properties in the floodplain and other flood mitigation projects.			**X**			This action will remain in the 2018 hazard mitigation plan as it is a continuous action that is highly supported with the submission of municipal project opportunity forms.
4.2.1 Coordinate with the Pennsylvania Department of Transportation on winter storm response and snow removal			**X**			Currently meet each year in October. This action will remain in the 2018 hazard mitigation plan.
5.1.1 County to develop a database in existing GIS system of all natural resource areas including maps to be used in future mitigation activities.		**X**				This action will remain in the 2018 hazard mitigation plan update. Remove the "County to" portion.
5.1.2 When funds become available for mitigation projects, the county plans to hold meetings to identify high-risk properties in the county and to determine potential participation in future acquisition and relocation projects.		**X**				Mercer County Regional Planning Commission and municipal government actions. Remove the "when funds become available". Meetings should be held regardless of funding opportunities. The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update.

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
5.2.1 Planning Department to continue the development of the County-wide Storm water Management Plan within the next 5 years.						Mercer County Regional Planning Commission and municipal government actions. The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update.
5.2.2 County to work with DEP, conservation agencies, and others, to research avenues for restoring degraded natural resources and open space to improve their flood control functions	**X**					The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update
6.1.1 Use the media for the distribution and publication of hazard information by sending news releases to local newspapers, radio and TV stations about pre-disaster information. Design to reach all areas of Mercer County.			**X**			The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
6.1.2 Work with the American Red Cross to ensure that citizen's disaster classes are held on a frequent basis and that there is not a duplication of services. The American Red Cross holds a variety of courses to educate the public and responders to mitigate the effects of an emergency situation. Some courses offered: CPR, first aid, mass care, shelter ops., etc.			**X**			The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update
6.1.3 Continue to provide public speaking series on hazard related topics which include, how to develop and family disaster plan and disaster supply kit, sheltering in place, development of a business continuity plan, and sheltering in place, how to use 9-1-1. These topics of instruction are offered to the civic groups such as Rotary, Kiwanis, Chamber of Commerce, local churches, and scout groups.			**X**			The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
6.1.4 Update the county website to provide hazard related information that is easily accessible. The County website has information about disaster preparedness and related activities. The plan is to expand and update the website as needed and as appropriate in a timely manner to benefit all County residents.			**X**			The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update
6.1.5 Develop a County Resource Directory, including all municipal equipment that can be updated and accessed via the County website. A central resources directory will expedite mitigation and recovery efforts.		**X**				The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update. Remove the last sentence. Knowledge Center is the current resource management tool
6.2.1 Continue working with representatives from NFIP to hold local course on the National Flood Insurance Program (NFIP) for realtors, bankers, and insurers to be attended from all areas of Mercer County.	**X**					Change the wording to "Work with representatives" The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update

2012 Mercer County Mitigation Actions Review						
Existing Mitigation Actions	***Status***					***Review Comments***
	No Progress / Unknown	**In Progress / Not Yet Com-**	**Continuous**	**Completed**	**Discontinued**	
6.2.2 Educate residents on keeping drainage ditches clear through yearly mailings as well as water and sewer bills as reminders.			**X**			Municipal function. The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update
6.2.3 Educate the public on how to make use of a yard sump to minimize drainage into sewer systems.	**X**					Municipal authority or municipality responsibility. The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update
6.2.4 Educate the public on the damages associated with high winds in combination with loose debris, and standing objects near buildings, such as trees.			**X**			The Mercer County Steering Committee and Local Planning Team have reviewed this action and determined that the action will remain in the 2018 hazard mitigation plan update
6.2.5 Set up a site and identify a place where vaccinations and medical supplies could be distributed				**X**		Completed and will be removed.

6.2. Mitigation Goals and Objectives

Based on results of the goals and objectives evaluation exercise and input from the local planning team, a list of six goals and twenty corresponding objectives was developed. *Table 52 - 2018 Goals and Objectives* details the mitigation goals and objectives established for the 2018 Mercer County Hazard Mitigation Plan.

Table 52 - 2018 Goals and Objectives

Mercer County 2018 Mitigation Goals and Objectives	
GOAL Objective	**Description**
GOAL 1	Attempt to reduce the current and future risk of flood damage in Mercer County
Objective 1.1	Reduce flood damage by directing new development away from high hazard areas by reviewing existing regulations to ensure adequacy in reducing the amount of future development in identified flood hazard areas
Objective 1.2	Municipalities to review all comprehensive plans to ensure that designated growth areas are not in flood hazard areas
Objective 1.3	Review any capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas without adhering to all applicable state, federal, and local regulations.
Objective 1.4	Evaluate and update existing floodplain ordinances to meet or exceed the NFIP standards
Objective 1.5	Improve the enforcement of existing floodplain regulations
GOAL 2	Reduce the potential impact of natural and human-caused hazards.
Objective 2.1	Encourage participation in the National Flood Insurance Program
Objective 2.2	Protect Mercer County's most vulnerable populations (e.g. schools, senior citizens, hospital patients, etc.), buildings, and critical facilities with the purchase of appropriate equipment (e.g. generators, busses, etc.)
Objective 2.3	Enhance the existing information resources available to Mercer County Department of Public Safety
Objective 2.4	Identify actions and projects to decrease the impact of pandemic, epidemic and infectious diseases
GOAL 3	Improve upon the protection of the citizens of Mercer County from all natural and human-caused hazards

Mercer County 2018 Mitigation Goals and Objectives	
GOAL Objective	**Description**
Objective 3.1	Ensure adequate training and resources are made available to emergency organizations and emergency personnel
Objective 3.2	Improve emergency preparedness in Mercer County and its municipalities
Objective 3.3	Evaluate cost-effective ways of augmenting existing broadcast and communication systems to monitor warning information continuously and to disseminate appropriate warnings
GOAL 4	Reduce or redirect the impact of natural disasters and human-caused hazards away from at-risk population areas
Objective 4.1	Research and implement mitigation projects to reduce flooding, reduce/eliminate sewage leakage and inflow/infiltration problems. Projects for review and implementation include reservoirs, levees, floodwalls, diversions, channel modification and storm sewers, as well as, acquisition, elevation and relocation of properties in the floodplain.
Objective 4.2	Enact ordinances and plans to decrease the impact of all hazards
GOAL 5	Protect existing natural resources and open space, including parks and wetlands, within the floodplain and watershed to improve their flood control function
Objective 5.1	Protect Mercer County's natural resources through the implementation of cost-effective and technically feasible mitigation projects
Objective 5.2	Protect Mercer County's natural resources through the implementation of recreation planning and storm water management planning
GOAL 6	Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards

Mercer County 2018 Mitigation Goals and Objectives	
GOAL Objective	**Description**
Objective 6.1	Develop and distribute public awareness materials about all-hazard risks, preparedness, and mitigation
Objective 6.2	Target owners of properties within identified hazard areas for additional outreach regarding mitigation and disaster preparedness
Objective 6.3	Identify actions and projects to decrease the impact of invasive species.
Objective 6.4	Participate in hazard specific planning committees and organizations to decrease the impact and increase public knowledge of these hazards

6.3. Identification and Analysis of Mitigation Techniques

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

- Local plans and regulations
- Structure and infrastructure
- Natural systems protection
- Education and awareness

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

- Comprehensive plans
- Land use ordinances
- Subdivision regulations
- Development review

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

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

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

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

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

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

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

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

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

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

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

Table 53 - Mitigation Strategy Technique Matrix provides a matrix identifying the mitigation techniques used for all low, moderate and high-risk hazards in the county. The specific actions associated with these techniques are included in *Table 54 - 2018 Mitigation Action Plan*.

Table 53 - Mitigation Strategy Technique Matrix

Mercer County Mitigation Strategy Technique Matrix				
HAZARD	**MITIGATION TECHNIQUE**			
	Local Plans and Regulations	**Structural and Infra-structure**	**Natural Systems Protection**	**Education and Awareness**
Drought			X	X
Earthquake	X			X
Flood, Flash Flood, Ice Jam Flooding	X	X	X	X
Invasive Species	X		X	X
Subsidence and Landslide		X		X

HAZARD	MITIGATION TECHNIQUE			
	Local Plans and Regulations	Structural and Infra-structure	Natural Systems Protection	Education and Awareness
Pandemic and Infectious Disease	X		X	X
Tornados and Wind Storms	X	X		X
Winter Storms	X	X		X
Dam Failure	X	X		X
Energy Emergencies	X	X		X
Fire Hazard	X	X		X
Fixed Facility Nuclear	X	X		X
Hazardous Materials	X	X		X
Terrorism	X			X
Transportation Accidents	X	X		X

6.4. Mitigation Action Plan

The Mercer County Hazard Mitigation Local Planning Team (LPT) immediately began work on the mitigation strategy section of the 2018 hazard mitigation plan (HMP) update after the risk assessment section was completed. The LPT started this section by reviewing the 2012 HMP mitigation strategy section. A review of the previous goals, objectives, actions and project opportunities documented in the 2012 HMP was conducted. The next step the LPT completed was the brainstorming of possible new actions based on new identified risks. The LPT compiled all this information for presentations to the municipalities.

The Mercer County Department of Public Safety has been conducting numerous infrastructure enhancement projects over the past 5 years. Administrative staff has been committed to these infrastructure projects. With this commitment by the Mercer County Department of Public Safety Staff, there have been challenges with the completion of actions or projects outlined in the current hazard mitigation plan. The Mercer County Department of Public Safety is committed to making progress during the 2018-2022 planning period. During this period, annual reviews will be completed and reports of all actions and projects will be developed to determine the status.

MCM Consulting Group, Inc. completed municipality meetings at various time periods at the Mercer County Department of Public Safety. During all these meetings, an overview of mitigation strategy was presented and the municipalities were informed that they needed to have at least one hazard-related mitigation action for their municipality. All municipalities were invited to attend these meetings.

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

Mitigation measures for the 2018 Mercer County HMP are listed in the mitigation action plan. *Table 54 - 2018 Mitigation Action Plan* is the 2018 Mercer County Mitigation Action Plan. This plan outlines mitigation actions and projects that comprise a strategy for Mercer County. The action plan includes actions, a benefit and cost prioritization, a schedule for implementation, any funding sources to complete the action and a responsible agency or department. All benefit and cost analysis was completed using the Pennsylvania Emergency Management Agency recommended analysis tool. The completed analysis tool is located in Appendix H.

Table 54 - 2018 Mitigation Action Plan

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
1.1.1	Local Plans and Regulations	Encourage municipal offices to review regulations pertaining to their jurisdiction to make sure that adequate zoning regulations are in place to reduce future development in high hazard areas in their jurisdiction. Planning department to review Subdivision and Land Development Ordinance.	Dam, Flooding, Earthquake, Subsidence, Landslide and Fire	x			Continuous	Staff Time	Mercer County LPT	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
1.2.1	Local Plans and Regulations	Planning department and applicable municipal offices to review their comprehensive plans to ensure that designated growth areas are not in high hazard areas identified in this plan	Dam, Flooding, Earthquake, Subsidence, Landslide and Fire	x			Continuous	Staff Time	Mercer County LPT	
1.2.2	Local Plans and Regulations	Planning department and applicable municipal offices enact an ordinance to require present and future mobile homes to install tie down anchors.	Tornado and Wind		x		Continuous	Staff Time	Mercer County LPT	
1.3.1	Local Plans and Regulations	Encourage applicable municipal offices to review their capital improvement plans to ensure that programmed infrastructure improvements are not in high-hazard areas.	Dam, Flooding, Earthquake, Subsidence, Landslide and Fire	x			Continuous	Staff Time	Mercer County LPT	
1.4.1	Local Plans and Regulations	Applicable municipalities to review and update their floodplain ordinances to be sure that they are in full compliance with the NFIP.	Flooding	x			2018-2022	Staff Time	Mercer County LPT	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
1.5.1	Education and Awareness	Arrange with PEMA/FEMA/DCED to hold training sessions for Mercer County and the municipalities on the NFIP requirements	Flooding	x			2018-2022	Staff Time	Mercer County LPT	
1.5.2	Local Plans and Regulations	Identify a floodplain manager within the municipality so that the public could obtain and/or view floodplain maps	Flooding		x		Continuous	Staff Time	Mercer County LPT	
2.1.1	Education and Awareness	Conduct outreach efforts to educate municipalities about the NFIP and its requirements	Flooding	x			Continuous	Staff Time	Mercer County LPT	
2.1.2	Local Plans and Regulations	Obtain updated information on the number of NFIP policyholders in Mercer County and its municipalities from PEMA and FEMA	Flooding		x		Continuous	Staff Time	Mercer County LPT	
2.1.3	Education and Awareness	Provide property owners with information how they can obtain and purchase flood insurance from the NFIP.	Flooding	x			Continuous	Staff Time	Mercer County LPT	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
2.2.1	Local Plans and Regulations	Conduct research with municipalities to collect updated information of the number and location of all repetitive loss properties throughout the county and the municipalities in order to plan future mitigation activities	Flooding		x		Continuous	Staff Time	Mercer County LPT	
2.2.2	Local Plans and Regulations	The local planning team will work with the Northwest Planning Commission to develop a database in existing hazard GIS system of information on all repetitive loss properties including maps to be used in future mitigation activities	Flooding		x		2018-2022	Staff Time	Mercer County LPT	
2.3.1	Local Plans and Regulations	Enhance the GIS with hazard specific data and ensure that all agencies and organizations have direct access to the data	All Hazards	x			2018-2022	Staff Time	Mercer County LPT	
2.3.2	Local Plans and Regulations	Assist with coordination between county residents and utility companies on critical outage events.	Utility Outages		x		Continuous	Staff Time	Mercer County LPT	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
3.1.1	Local Plans and Regulations	DPS to conduct annual tabletop disaster exercises with local law enforcement, emergency managers, county and local officials, and other disaster response agencies. Types of exercises to include: Flood Exercise, Weapons of Mass Destruction Exercise, Hazardous Materials Spill Exercise, Weather Exercise and Biological Terrorism Exercise.	All Hazards	x			Continuous	Staff Time	Mercer County DPS	
3.1.2	Local Plans and Regulations	DPS to provide information about local, regional, state, and federal training opportunities to fire departments, EMS, ambulance services, and other emergency responders. Develop a list of training opportunities that are available and distribute the list to all local emergency responders.	All Hazards	x			Continuous	Staff Time	Mercer County DPS	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
3.1.3	Local Plans and Regulations	Continue to conduct National Weather Service Storm Spotter classes by partnering with the National Weather Service to provide training to people throughout Mercer County on SKYWARN, all weather preparedness.	Flooding, Wind, Tornado		x		Continuous	Staff Time	Mercer County LPT	
3.2.1	Local Plans and Regulations	Review the existing Mercer County Emergency Operations Plan (EOP) and update when necessary based on the recommendations of the 2018 Mercer County Hazard Mitigation Plan. Include participation from all municipalities in the update process by ensuring that their EOPs are reviewed and updated annually.	All Hazards	x			Continuous	Staff Time	Mercer County LPT	
3.2.2	Local Plans and Regulations	Identify other emergency response equipment and seek funding to purchase the equipment	All Hazards	x			Continuous	Staff Time	Mercer County LPT	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
3.2.3		A temporary water supply should be established for persons with no water in the event of a dam failure or drought	Drought and Dam Failure			x	2018-2022	CDBG, HMGP, Local Tax	Mercer County Municipalities	
3.2.4		Mercer County municipalities will identify any equipment needed to combat a moderate to severe winter storm and submit project opportunities for inclusion in the hazard mitigation plan	Winter Storm		x		2018-2022	CDBG, HMGP, Local Tax	Mercer County Municipalities	
3.3.1		Maintain communications center equipment to allow faster more timely warning notifications to mitigate the results of a natural, manmade or technological emergency.	All Hazards	x			2018-2022	Act 12	Mercer County DPS	
3.3.2		Research the possibility of installing an emergency notification system to reach all populated areas throughout the county	All Hazards	x			2018-2022	Staff Time	Mercer County DPS	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
3.3.3		Distribution of NOAA Weather Radios to Mercer County municipalities, schools, hospitals, nursing homes, day care centers, libraries, malls, SARA Facilities to initiate earlier warnings to minimize the impact of an emergency on the community	All Hazards	x			2018-2022	Funding Needed	Mercer County LPT	
4.1.1	Local Plans and Regulations	Review post-disaster reviews and annual hazard mitigation plan reviews submitted by the municipalities.	All Hazards		x		Continuous	Staff Time	Mercer County LPT	
4.1.2		Submit Hazard Mitigation Project Opportunity Forms for acquisition, elevation and relocation of properties in the floodplain and other flood mitigation projects	Flooding	x			Continuous	Staff Time	Mercer County Municipalities	
4.2.1	Local Plans and Regulations	Coordinate with the Pennsylvania Department of Transportation on winter storm response and snow removal	Winter Storm		x		Continuous	Staff Time	Mercer County LPT	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
4.2.2	Local Plans and Regulations	Review and update all existing ordinances and other regulatory planning mechanisms with respect to findings included in the 2018 hazard mitigation plan update	All Hazards	x			Continuous	Staff Time	Mercer County LPT	
4.2.3	Local Plans and Regulations	Adopt an Act 167 Stormwater Management Plan	Flooding		x		Continuous	Staff Time	Mercer County LPT	
5.1.1	Natural Resource Protection	Develop a database in existing GIS system of all natural resource areas including maps to be used in future mitigation activities.	Flooding, Hazardous Materials	x			2018-2022	Staff Time	Mercer County GIS	
5.1.2	Natural Resource Protection	Conduct meetings to identify high-risk properties in the county and to determine potential participation in future acquisition and relocation projects.	Flooding, Wind, Tornado, Earthquake		x		Continuous	Staff Time	Mercer County Regional Planning Commission	
5.2.1	Natural Resource Protection	Planning commission to continue the development of the county-wide storm water management plan.	Flooding	x			2018-2022	Local Tax	Mercer County Regional Planning Commission	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
5.2.2	Natural Resource Protection	Work with DEP, conservation agencies, and others, to research avenues for restoring degraded natural resources and open space to improve their flood control functions	Flooding		x		2018-2022	Local Tax	Mercer County LPT	
6.1.1	Education and Awareness	Use the media for the distribution and publication of hazard information by sending news releases to local newspapers, radio and TV stations about pre-disaster information.	All Hazards	x			Continuous	Staff Time	Mercer County LPT	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
6.1.2	Education and Awareness	Work with the American Red Cross to ensure that citizen's disaster classes are held on a frequent basis and that there is not a duplication of services. The American Red Cross holds a variety of courses to educate the public and responders to mitigate the effects of an emergency situation. Some courses offered: CPR, first aid, mass care, shelter ops., etc.	All Hazards	x			Continuous	Staff Time	Mercer County LPT	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
6.1.3	Education and Awareness	Continue to provide public speaking series on hazard related topics which include, how to develop and family disaster plan and disaster supply kit, sheltering in place, development of a business continuity plan, and sheltering in place, how to use 9-1-1. These topics of instruction are offered to the civic groups such as Rotary, Kiwanis, Chamber of Commerce, local churches, and scout groups.	All Hazards		x		Continuous	Staff Time	Mercer County LPT	
6.1.4	Education and Awareness	Update the county website to provide hazard related information that is easily accessible. The County website has information about disaster preparedness and related activities. The plan is to expand and update the website as needed and as appropriate in a timely manner to benefit all County residents.	All Hazards		x		Continuous	Staff Time	Mercer County LPT	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
6.1.5	Local Plans and Regulations	Develop a county resource directory, including all municipal equipment that can be updated and accessed via the county website.	All Hazards	x			Continuous	Staff Time	Mercer County LPT	
6.2.1	Education and Awareness	Work with representatives from the NFIP to hold local course on the National Flood Insurance Program (NFIP) for realtors, bankers, and insurers to be attended from all areas of Mercer County.	Flooding		x		Continuous	Staff Time	Mercer County LPT	
6.2.2	Education and Awareness	Educate residents on keeping drainage ditches clear through yearly mailings as well as water and sewer bills as reminders.	Flooding		x		Continuous	Staff Time	Mercer County Municipalities	
6.2.3	Education and Awareness	Educate the public on how to make use of a yard sump to minimize drainage into sewer systems.	Flooding			x	2018-2022	Staff Time	Mercer County Municipalities	

Mercer County 2018 Mitigation Action Plan										
Action Number	Mitigation Actions			Benefit/Cost Prioritization			Implementation			Annual Review Notes
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Responsibility	
6.2.4	Education and Awareness	Educate the public on the damages associated with high winds in combination with loose debris, and standing objects near buildings, such as trees.	Wind and Tornado			x	Continuous	Staff Time	Mercer County Municipalities	
6.3.1	Local Plans and Regulations	Municipalities to identify dead ash trees from the emerald ash borer attack and submit opportunity forms to remove the hazards	Invasive Species		x		Continuous	Staff Time	Mercer County Municipalities	
6.3.2	Education and Awareness	Conduct outreach to public on the invasive species profile data	Invasive Species		x		Continuous	Staff Time	Mercer County LPT	
6.4.1	Education and Awareness	Participate in the pandemic, epidemic and infectious disease planning committees	Pandemic, Epidemic and Infectious Disease		x		Continuous	Staff Time	Mercer County LPT	
6.4.2	Education and Awareness	Encourage participation in the opioid intervention committee and conduct outreach to educate the public on opioid addiction	Pandemic, Epidemic and Infectious Disease		x		Continuous	Staff Time	Mercer County LPT	

Funding acronym definitions:

FMA: Flood Mitigation Assistance Grant Program, administered by the Federal Emergency Management Agency
HMGP: Hazard Mitigation Grant Program, administered by the Federal Emergency Management Agency
PDM: Pre-Disaster Mitigation Grant, administered by the Federal Emergency Management Agency
EMPG: Emergency Management Performance Grant, administered by the Federal Emergency Management Agency
HSGP: Homeland Security Grant Program, administered by the Federal Emergency Management Agency
HMEP: Hazardous Material Emergency Planning Grant, administered by the Pennsylvania Emergency Management Agency
HMRF: Hazardous Material Response Fund, administered by the Pennsylvania Emergency Management Agency

National Flood Insurance Program (NFIP) Related Mitigation Actions

The Federal Emergency Management Agency (FEMA) requires that every participating jurisdiction that either participates in the NFIP or has identified Special Flood Hazard Areas (SFHAs) have at least one specific action in its mitigation action plan that relates to continued compliance with the NFIP. Action numbers 1.1.1; 1.4.1; 1.5.1; 1.5.2; 2.1.1; 2.1.2; 2.1.3; 2.2.1 and 6.2.1comply for Mercer County and all its municipalities.

Evaluate and Prioritize Mitigation Actions

Mitigation Action Evaluation:

Evaluating mitigation actions involves judging each action against certain criteria to determine whether or not it can be executed. The feasibility of each mitigation action is evaluated using the ten evaluation criteria set forth in the Mitigation Action Evaluation methodology as outlined in the Commonwealth of Pennsylvania's All-Hazard Mitigation Planning, Standard Operating Guide. The methodology solicits input on whether each action is highly effective or feasible and ineffective or not feasible for the criteria. These criteria are listed below and aid in determining the feasibility of implementing one action over another.

- Life Safety: Will the action be effective in promoting public safety?
- Property Protection: Will the action be effective in protecting public or private property?
- Technical: How effective will the action be in avoiding or reducing future losses?
- Political: Does the action have public and political support?
- Legal: Does the community have the authority to implement the proposed measure?

- Environmental: Will the action provide environmental benefits and will it comply with local, state and federal environmental regulations?
- Social: Will the action be acceptable by the community or will it cause any one segment of the population to be treated unfairly?
- Administrative: Is there adequate staffing and funding available to implement the action in a timely manner?
- Local Champion: Is there local support for the action to help ensure its completion?
- Other Community Objectives: Does the action address any current or future community objectives either through municipal planning or community goals?

To evaluate the mitigation actions, each action is identified as highly effective or feasible; ineffective or not favorable and no cost or benefit. For each criterion, the prioritization methodology assigns a "+" if the action was highly effective or feasible, a "-" if the action was ineffective or not feasible, and a "N" if no cost or benefit could be associated with the suggested action or the action was not applicable to the criteria.

Mitigation Action Prioritization:

Actions should be compared with one another to determine a ranking or priority by applying the multi-objective mitigation action prioritization criteria. Scores are 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 are assigned for each multi-objective mitigation action prioritization criterion where 1 is a low score and 3 is a high score. Actions are prioritized using the cumulative score assigned to each. Each mitigation action is 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

The cumulative results of the prioritization of mitigation actions is identified in the mitigation action evaluation and prioritization tool. The results for the mitigation action evaluation and prioritization are located in Appendix H of this plan.

7. Plan Maintenance

7.1. Update Process Summary

Monitoring, evaluating and updating this plan, is critical to maintaining its value and success in Mercer County's hazard mitigation efforts. Ensuring effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section explains who will be responsible for maintenance activities and what those responsibilities entail. It also provides a methodology and schedule of maintenance activities including a description of how the public will be involved on a continued basis. The Mercer County HMP Local Planning Team decided to alter the current maintenance procedures. The 2018 HMP update establishes a review of the plan within 90 days of a disaster event in addition to continuing with an annual plan evaluation. This HMP update also defines the municipalities' role in updating and evaluating the plan. Finally, the 2018 HMP Update encourages continued public involvement and how this plan may be integrated into other planning mechanisms in the county.

7.2. Monitoring, Evaluating and Updating the Plan

Hazard mitigation planning in Mercer County is a responsibility of all levels of government (i.e., county and local), as well as the citizens of the county. The Mercer County Local Planning Team will be responsible for maintaining this multi-jurisdictional HMP. The Local Planning Team will meet annually and following each emergency declaration to review the plan. Every municipality that has adopted this plan will also be afforded the opportunity to provide updated information or information specific to hazards encountered during an emergency or disaster. Each review process will ensure that the hazard vulnerability data and risk analysis reflect current conditions of the county, that the capabilities assessment accurately reflects local circumstances and that the hazard mitigation strategies are updated based on the county's damage assessment reports and local mitigation project priorities. The HMP must be updated on a five-year cycle. An updated HMP must be completed and approved by the end of the five-year period. The monitoring, evaluating and updating of the plan every five years will rely heavily on the outcomes of the annual HMP planning team meetings.

The Mercer County Local Planning Team will complete a hazard mitigation progress report to evaluate the status and accuracy of the multi-jurisdictional HMP and record the local planning team's review process. The Mercer County Department of Public Safety will maintain a copy of these records and place them in Appendix I of this plan. Mercer County will continue to work with all municipalities regarding hazard mitigation projects, especially those municipalities that did not submit projects for inclusion in this plan.

7.3. Continued Public Involvement

The Mercer County Department of Public Safety will ensure that the 2018 Mercer County Hazard Mitigation Plan is posted and maintained on the Mercer County website

and will continue to encourage public review and comment on the plan. The Mercer County website that the plan will be located at is as follows: www.mcc.co.mercer.pa.us/dps

The public will have access to the 2018 HMP through their local municipal office, the Mercer County Planning Department, or the Mercer County Department of Public Safety. Information on upcoming events related to the HMP or solicitation for comments will be announced via newsletters, newspapers, mailings, and the county website.

The citizens of Mercer County are encouraged to submit their comments to elected officials and/or members of the Mercer County HMP Local Planning Team. To promote public participation, the Mercer County Local Planning Team will post a public comment form as well as the Hazard Mitigation Project Opportunity Form on the county's website. These forms will offer the public various opportunities to supply their comments and observations. All comments received will be maintained and considered by the Mercer County Hazard Mitigation Planning Team.

8. Plan Adoption

8.1. Resolutions

In accordance with federal and state requirements, the governing bodies of each participating jurisdiction must review and adopt by resolution, the 2018 Mercer County Hazard Mitigation Plan. Copies of the adopting resolutions are included in this plan in Appendix J. FEMA Region III in Philadelphia is the final approval authority for the Hazard Mitigation Plan. PEMA also reviews the plan before submission to FEMA.

9. Appendices

APPENDIX A: References

APPENDIX B: FEMA Local Mitigation Review Tool

APPENDIX C: Meetings and Support Documents

APPENDIX D: Municipal Flood Maps

APPENDIX E: Critical and Special Needs Facilities

APPENDIX F: 2017 HAZUS Reports

APPENDIX G: 2018 Mitigation Project Opportunities

APPENDIX H: 2018 Mitigation Action Evaluation & Prioritization

APPENDIX I: Dam Failure Profile

APPENDIX J: Annual Review Documentation

APPENDIX K: Mercer County & Municipal Adoption Resolutions