Clearfield County 2022 Hazard Mitigation Plan

Prepared for:

Clearfield County Emergency Management Agency

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Certification of Annual Review Meetings

YEAR	DATE OF MEETING	PUBLIC OUTREACH ADDRESSED? *	SIGNATURE
2022			
2023			
2024			
2025			
2026			

**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)

Table of Contents

Figures

Tables

Executive Summary

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

In 2021, the Clearfield County Emergency Management Agency contracted the services of a consulting agency to revise and update the Clearfield County Hazard Mitigation Plan. The plan was successfully updated in accordance with the requirements set forth by PEMA and FEMA. The updated Clearfield County Hazard Mitigation Plan was adopted by the Clearfield County Commissioners in June, 2022. All municipalities adopted the 2017 Clearfield County Hazard Mitigation Plan as the municipal hazard mitigation plan, and it is anticipated that all participating municipalities will adopt the 2022 Clearfield County Hazard Mitigation Plan Update.

The Clearfield County Commissioners secured a grant to complete the 2022 update to the Clearfield County Hazard Mitigation Plan. MCM Consulting Group, Inc. was hired to assist the county with the update of the plan. The planning kick-off meeting was conducted May 11th, 2021.

The planning process for the 2022 Clearfield County Hazard Mitigation Plan Update consisted of the following:

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

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

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

- Drought
- Earthquake
- Flooding, Flash Flooding, and Ice Jam Flooding
- Hurricane/Tropical Storm
- Invasive Species
- Land Failure and Subsidence
- Pandemic, Epidemic and Infectious Disease
- Radon Exposure
- Tornado/Windstorm
- Wildfire
- Winter Storm/Nor'Easter
- Dam and Levee Failure
- Drowning
- Emergency Services
- Environmental Hazards/Petroleum and Gas Well Incidents
- Opioid Epidemic
- Structure Collapse
- Terrorism/Cyber Attack
- Transportation Accidents/Transportation of Hazardous Materials
- Utility Interruption
- A total of 20 hazards have been identified in the 2022 Clearfield County Hazard Mitigation Plan Update, the same number profiled in the 2017 county hazard mitigation plan.

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

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

- Improve response and recovery capabilities.
- Protect critical infrastructure.

Mitigation actions are specific projects and activities that help achieve goals. A total of thirty-eight actions were developed for this plan update as they pertain to hazards identified by the local planning team. The 2017 Clearfield County Hazard Mitigation Plan consisted of forty-two total actions. The individual objectives and actions that will be implemented are shown in Section 6.4. Each municipality was provided the opportunity to submit new project opportunity forms for this update. A total of fifty-six project opportunity forms were submitted during the 2022 HMP update. Municipalities were asked to indicate the status of the projects submitted in 2017, of which zero indicated any completed projects.

The 2022 Clearfield County Hazard Mitigation Plan Update is the cornerstone to reducing Clearfield County's vulnerability to disasters. It is the commitment to reducing risks from hazards and serves as a guide for decision makers as they commit resources to reducing the effects of hazards. Hazard mitigation is the only phase of emergency management specifically dedicated to breaking the cycle of damage, reconstruction, and repeated damage.

The 2022 Clearfield County Hazard Mitigation Plan Update is a living document that reflects ongoing hazard mitigation activities and requires monitoring, evaluating, and updating to ensure the mitigation actions are implemented. To facilitate the hazard mitigation planning process and adhere to regulatory requirements, the plan will be reviewed annually, and any major revisions will be incorporated into the five-year update.

1. Introduction

1.1. Background

The Clearfield 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 Clearfield County and all 48 municipalities. Clearfield County Emergency Management Agency and Clearfield County Planning Commission were charged by the County Board of Commissioners to prepare the 2022 plan update. The 2017 HMP has been utilized and maintained during the five-year life cycle.

The Clearfield 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 Clearfield County as a sub-grantee. The Clearfield County Commissioners assigned the Clearfield County Emergency Management Agency 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 Clearfield County. This updated HMP will provide another solid foundation for the Clearfield 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 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 this all-hazard mitigation plan (HMP) is:

- Protect life, safety, and property by reducing the potential for future damages and economic losses that result from hazards.
- Qualify for additional grant funding, in both the pre-disaster and the post-disaster environment.

- Speed recovery and redevelopment following future disaster events.
- Demonstrate a firm local commitment to hazard mitigation principles.
- Comply with both state and federal legislative requirements for local hazard mitigation plans.

1.3. Scope

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

A multi-jurisdictional planning approach was utilized for the Clearfield 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 References

Authority for this plan originates from the following federal sources:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C., Section 322, as amended
- Code of Federal Regulations (CFR), Title 44, Parts 201 and 206
- Disaster Mitigation Act of 2000, Public Law 106-390, as amended.
- National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 et seq.
- Authority for this plan originates from the following Commonwealth of Pennsylvania sources:
- Pennsylvania Emergency Management Services Code. Title 35, Pa C.S. Section 101
- Pennsylvania Municipalities Planning Code of 1968, Act 247 as reenacted and amended by Act 170 of 1988.
- Pennsylvania Stormwater Management Act of October 4, 1978. P.L. 864, No. 167

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

- FEMA 386-1: Getting Started. September 2002

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

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

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

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

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

2. Community Profile

2.1. Geography and the Environment

Clearfield County is in the western portion of Pennsylvania to the west of the main ridge of the Allegheny Mountains. Clearfield County is largely a rural county with steep rolling hills and ridge and valley topography. The elevation of the county ranges from a low of 789 feet above sea level where the West Branch of the Susquehanna River exits the county to a high of 2,405 feet located on Chestnut Ridge. Clearfield County is bordered by Elk County and Cameron County to the north, Clinton County and Centre County to the east, Cambria County to the south, and Indiana and Jefferson Counties to the west. The 1,146 square mile county is the third largest county geographically in the Commonwealth of Pennsylvania.

The county is bisected by numerous streams and creeks, including the West Branch of the Susquehanna River. The county also has many municipalities and a large area of state-owned property, including state game lands. *Figure 3 – Clearfield County Basemap* clearly shows Clearfield County and the major roadways and railroads that are located in the county and the municipalities. *Figure 4 – Clearfield County Watersheds* illustrates the major watersheds that are located either totally or partially in Clearfield County. A large portion of the county is in the Upper West Branch Susquehanna Watershed. There are five watersheds that are in Clearfield County.

Clearfield County averages between thirty-four to forty-four inches of rain per year. This is above the United States average of thirty-seven inches of rain each year.

The Köppen-Geiger Climate Areas map classifies Clearfield County and the rest of Pennsylvania as Humid Continental, which can be seen in *Figure 2 – Köppen-Geiger Climate Map*. While the counties of Pennsylvania share many weather similarities, there are also a few unique characteristics to the area.

2.2. Community Facts

Clearfield County was created in 1804 from parts of Huntingdon and Lycoming Counties. The county elected its own commissioners in 1812 and was organized for judicial purposes in 1822. Clearfield was chosen as the county seat in 1805 and incorporated as a borough in 1840. Two of the county's major industries historically were lumber and coal, with coal remaining a prominent industry in the county today. Clearfield County has direct access to major markets in the northeastern and mid-western United States through I-80, which runs east to west across the center of the county.

2.3. Population and Demographics

According to the 2017 Hazard Mitigation Plan, the estimated 2014 population in Clearfield County was 81,472, and the most populous municipality was Sandy Township with 10,640 residents. The county's population decreased by 0.21% from 2010. Similarly, several municipalities in the county have experienced a decline in population, the greatest of which being Karthaus Township (-44.39%), Troutville Borough (-24.28), and Knox Township (-23.65%). While the county as a whole and many of its municipalities have lost population over the past ten years, several communities have experienced growth since 2010. Municipalities that have witnessed the largest growth between 2010 and 2014 include Covington Township (59.13%), Newburg Borough (38.04%), and Irvona Borough (24.42%).

The 2020 population demographics from the United States Census Bureau illustrate continuing trends for Clearfield County. The estimated population for Clearfield County is 80,562 based on 2020 United States Census Bureau. The total change in population for Clearfield County from 2010 to 2020 was a decrease of 1,080 and a percent change of -2.9%. The most populous municipality is still Sandy Township. The municipalities in the county that had the largest percentage of decrease from 2010 to 2020 were Bell Township (-1.00%), Burnside Township (-0.20%), and Coalport Borough (-0.18%). The municipalities that had the highest percentage of increase for the period from 2010 to 2020 were Ferguson Township (0.19%), Sandy Township (0.10%), and Girard Township (0.06%). *Table 1 – Population Change in Clearfield County* illustrates the trends and data from United States Census Bureau. These figures are based off data from the United States Census Bureau in 2020. *Figure 5 – Clearfield County Population Density* illustrates the average population density values per census track in the various municipalities of Clearfield County.

Table 1 – Population Change in Clearfield County

Population Change in Clearfield County							
Municipality	**2010 Population**	**2014 Estimated Population**	**Percent Change (%) (2010-2014)**	**2019 Estimated Population**	**Percent Change (%) (2014-2019)**	**2020 Population**	**Percent Change (%) (2010-2020)**
Clearfield County	**81,642**	**81,472**	**-0.21**	**79,908**	**-1.92**	**80,562**	**-1.32**
Beccaria Township	1,782	1,844	3.48	1,739	-5.69	1,774	-0.45
Bell Township	760	717	-5.66	753	5.02	687	-9.60

Population Change in Clearfield County							
Municipality	**2010 Population**	**2014 Estimated Population**	**Percent Change (%) (2010-2014)**	**2019 Estimated Population**	**Percent Change (%) (2014-2019)**	**2020 Population**	**Percent Change (%) (2010-2020)**
Bigler Township	1,289	1,181	-8.38	1,192	0.93	1,238	-3.96
Bloom Township	414	408	-1.45	328	-19.61	382	-7.73
Boggs Township	1,751	1,533	-12.45	1,911	24.66	1,662	-5.08
Bradford Township	3,034	3,030	-0.13	2,987	-1.42	2,841	-6.36
Brady Township	2,000	2,093	4.65	2,288	9.31	1,936	-3.20
Brisbin Borough	411	333	-18.98	358	7.51	422	2.68
Burnside Borough	234	258	10.26	176	-31.78	188	-19.66
Burnside Township	1,076	1,018	-5.39	1,078	5.89	1,055	-1.95
Chest Township	515	519	0.78	481	-7.32	511	-0.78
Chester Hill Borough	883	981	11.10	779	-20.59	821	-7.02
Clearfield Borough	6,215	6,143	-1.16	5,921	-3.62	5,962	-4.07
Coalport Borough	523	536	2.49	443	-17.35	425	-18.74
Cooper Township	2,731	2,699	-1.17	2,635	-2.37	2,594	-5.02
Covington Township	526	837	59.13	488	-41.70	494	-6.08
Curwensville Borough	2,542	2,493	-1.93	2,314	-7.18	2,567	0.98
Decatur Township	4,548	4,651	2.26	4,678	0.58	4,558	0.22

Population Change in Clearfield County							
Municipality	**2010 Population**	**2014 Estimated Population**	**Percent Change (%) (2010-2014)**	**2019 Estimated Population**	**Percent Change (%) (2014-2019)**	**2020 Population**	**Percent Change (%) (2010-2020)**
City of Dubois	7,794	7,718	-0.96	7,462	-3.32	7,510	-3.64
Ferguson Township	444	465	473	546	17.42	544	22.52
Girard Township	534	525	-1.69	526	0.19	568	6.37
Glen Hope Borough	142	150	5.63	138	-8.00	127	-10.56
Goshen Township	435	507	16.55	463	-8.68	390	-10.34
Graham Township	1,383	1,459	5.50	1,435	-1.64	1,331	-3.76
Grampian Borough	356	412	15.73	406	-1.47	361	1.40
Greenwood Township	372	361	-2.96	362	0.28	366	-1.61
Gulich Township	1,235	1,181	-4.37	1,173	-0.67	1,200	-2.83
Houtzdale Borough	797	817	2.51	747	-8.56	764	-4.14
Huston Township	1,468	1,294	-11.85	1,247	-3.63	1,260	-14.17
Irvona Borough	647	805	24.42	665	-17.39	549	-15.15
Jordan Township	461	563	22.13	427	-24.16	476	3.25
Karthaus Township	811	451	-44.39	654	45.01	824	1.60
Knox Township	647	494	-23.65	552	11.74	597	-7.73
Lawrence Township	7,681	7,603	-1.02	7,562	-0.54	7,500	-2.36

Population Change in Clearfield County							
Municipality	**2010 Population**	**2014 Estimated Population**	**Percent Change (%) (2010-2014)**	**2019 Estimated Population**	**Percent Change (%) (2014-2019)**	**2020 Population**	**Percent Change (%) (2010-2020)**
Mahaffey Borough	368	351	-4.62	363	3.42	329	-10.6
Morris Township	2,938	2,927	-0.37	2,870	-1.95	2,777	-5.48
New Washington Borough	59	66	11.86	39	-40.91	50	-15.25
Newburg Borough	92	127	38.04	66	-48.03	82	-10.87
Osceola Mills Borough	1,141	1,255	9.99	1,115	-11.15	1,045	-8.41
Penn Township	1,264	1,218	-3.64	1,237	1.56	1,200	-5.06
Pike Township	2,311	2,277	-1.47	2,408	5.75	2,298	-0.56
Pine Township	60	62	3.33	58	-6.45	60	0
Ramey Borough	451	491	8.87	413	-15.89	436	-3.33
Sandy Township	10,625	10,640	0.14	10,523	-1.09	11,848	11.51
Troutville Borough	243	184	-24.28	227	23.37	230	-5.35
Union Township	892	857	-3.92	841	-1.87	886	-0.67
Wallaceton Borough	313	336	7.35	271	-19.34	297	-5.11
Westover Borough	390	377	-3.33	364	-3.45	361	-7.44
Woodward Township	3,992	4,096	2.61	4,111	0.37	4,137	3.63
Source: United States Census Bureau (2021), 2020 Census Data							

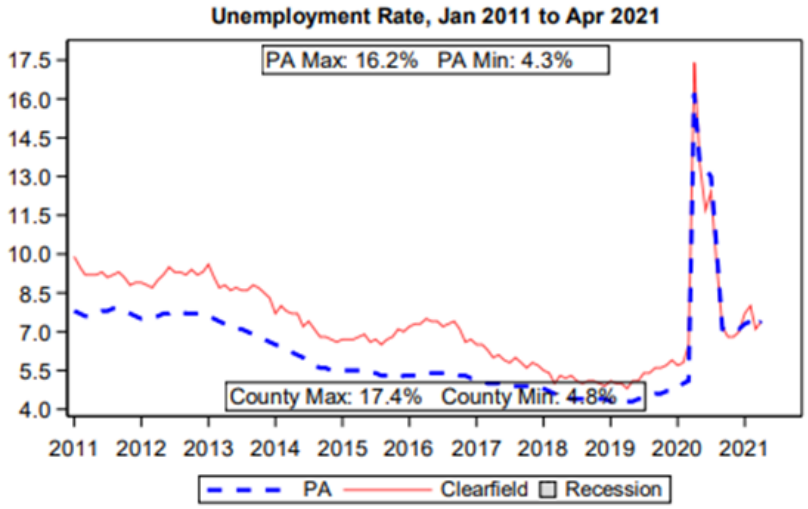
There are approximately 39,357 housing unit in Clearfield County, Pennsylvania. Of these housing units, there are an estimated 31,248 households within the county. The owner-occupied housing rate of Clearfield County is 76.8% of the structures. The median value of the owner-occupied housing units in Clearfield County from 2015 to 2019 is $96,100.00. The median monthly owner's costs for a structure with a mortgage was $1,017.00 and the median monthly owner's costs for a structure without a mortgage was $436.00. The median gross rent for rental properties in Clearfield County is $666.00 and the total number of building permits issued in 2020 was fifty-nine.

The racial makeup of the county is 95.1% White, 3.0% Black or African American, 0.2% American Indian and Alaska Native, 0.6% Asian, 3.1% Hispanic or Latino, and 0.9% two or more races. The median age of Clearfield County is 45.7 years of age, which is higher than the median age of the United States at 38.5 years of age. The percentage of Clearfield County under the age of 5 years old is 4.7%, between the ages of 18 and 64 years old is 74.3%. and aged 65 years old and older is 21%.

The median household income for households in Clearfield County is $49,015 and the poverty rate of Clearfield County is 13.7% of the total population. The poverty rate for the Commonwealth of Pennsylvania as a whole is 11.4%. There are approximately 6,105 veterans in Clearfield County. The median veteran income in Clearfield County as of 2019 was $31,556.00. The veteran unemployment rate in Clearfield County was approximately 9.8%.

The Covid-19 Pandemic caused a large portion of the United States, Pennsylvania, and Clearfield County to face unemployment and interruptions in employment. Based off of Pennsylvania Department of Labor and Industry data, there was a large spike in unemployment both across the Commonwealth and Clearfield County. At the height of the Covid-19 Pandemic in the spring of 2020, the unemployment rate for Clearfield County hit 17.4% of the working population of the county. That is higher than the peak unemployment percentage for Pennsylvania, which peaked at 16.2% of the working population of the entire state. *Figure 1 – Unemployment Rate Jan. 2011 to Apr. 2021* illustrates the trend and large spike in unemployment. The current unemployment rate for Clearfield County is 7.4% and roughly accounts for 2,600 working age adults (ages 16 to 65). The total estimated workforce for Clearfield County is 35,200 working age adults (ages 16 to 65).

Figure 1 - Unemployment Rate Jan. 2011 to Apr. 2021



The top ten employers in Clearfield County are a mix of private and public employers and a list of the employers can be found in *Table 2 – Top 10 Employers by Employment in fourth quarter of 2020*. A list of the quarterly census of employment wages and the industries that make up that employment can be found in *Table 3 – Quarterly Census of Employment and Wages, 2020 Annual Averages*.

Table 2 - Top 10 Employers by Employment in fourth quarter of 2020

Top 10 Employers in Clearfield County (Q1 2021) (PA DLI)	
Employer Rank:	**Employer Name:**
1	Wal-Mart Associates, Inc.
2	DuBois Regional Medical Center
3	State Government
4	Cen-Clear Child Services, Inc.
5	DuBois Area School District
6	Clearfield Area School District
7	Christ the King Manor
8	Penn Highlands Healthcare
9	Clearfield Hospital
10	Fayette Resources Incorporated

The top employers' data was obtained through the Pennsylvania Department of Labor and Industry, Center for Workforce Information and Analysis. This data only provided a list of employers, their ranking, and North American Industry Classification System (NAICS)

descriptions. *Table 3 – Quarterly Census of Employment and Wages, 2020 Annual Averages* only calls out how many locations per NAICS description and total number of employees.

Table 3 - Quarterly Census of Employment and Wages, 2020 Annual Averages

Quarterly Census of Employment and Wages, 2020 Annual Averages (PA DLI)					
NAICS	**Description**	**Number of Locations**	**Number of Employees**	**Employment Percentage**	**Average Wages**
11	Agriculture, Forestry, Fishing, and Hunting	17	39	0.1%	$24,317.00
21	Mining, Quarrying, and Oil & Gas	36	395	1.4%	$65,743.00
22	Utilities	32	281	1.0%	$66,620.00
23	Construction	144	671	2.4%	$47,887.00
31-33	Manufacturing	108	2,650	9.4%	$46,525.00
42	Wholesale Trade	55	609	2.2%	$51,415.00
44-45	Retail Trade	306	4,253	15.0%	$27,825.00
48-49	Transportation and Warehousing	207	2,858	10.1%	$46,822.00
51	Information	22	182	0.6%	$42,323.00
52	Finance and Insurance	73	651	2.3%	$58,740.00
53	Real Estate, Rental, and Leasing	43	204	0.7%	$30,544.00
54	Professional and Technical Services	115	905	3.2%	$50,024.00
55	Management of Companies and Enterprises	17	498	1.8%	$66,603.00
56	Administrative and Waste Services	58	831	2.9%	$41,226.00
61	Educational Services	43	1,884	6.7%	$46,964.00
62	Healthcare and Social Assistance	375	6,316	22.3%	$52,856.00
71	Arts, Entertainment, and Recreation	23	99	0.3%	$26,693.00
72	Accommodation and Food Services	167	1,958	6.9%	$14,941.00

Quarterly Census of Employment and Wages, 2020 Annual Averages (PA DLI)					
NAICS	**Description**	**Number of Locations**	**Number of Employees**	**Employment Percentage**	**Average Wages**
81	Other Services (Except Public Administration)	197	1,298	4.6%	$28,639.00
92	Public Administration	81	1,730	6.1%	$66,092.00
-	**Total, All Industries**	**2,119**	**28,312**	**100.0%**	**$43,835.00**
NAICS (North American Industry Classification System)					

There are a few major transportation routes within the county that would be capable of handling a large amount of heavy truck traffic. The county is bisected by Interstate 80, and it is this highway that allows for quick travel across the county. There are two major state highways, State Route 219, and State Route 322. State route 219 runs from Ebensburg, Pennsylvania to Mount Jewett, Pennsylvania and runs along the western side of Clearfield County. State Route 322 runs east to west through the county and provides a secondary travel route in case of closure on Interstate 80. There are other traffic routes that are capable of handling large amounts of traffic, but they are not major travel or transportation routes in the county.

There are three hospitals in Clearfield County, and these are: Penn Highlands – Clearfield Hospital, Penn Highlands – Dubois Hospital, and Penn Highlands – Dubois Hospital (East Campus). There are also thirty-nine paid and volunteer fire departments in Clearfield County which service the large number of municipalities. Along with the fire departments, there are thirteen police departments, and this number includes both local police departments and state police barracks in Clearfield County.

2.4. Land Use and Development

Clearfield County's population grew by 6.8% in the 1990's, twice the rate of the Commonwealth of Pennsylvania as a whole. Townships experiencing the most growth in this decade were Woodward Township, Pine Township, Karthaus Township, Goshen township, and Bradford Township. Between 2000 and 2010, the county's population decreased by 2.1% and it continued to decrease by 0.21% between 2010 and 2014.

Clearfield County has approximately 738,600 acres of total land area and a population per square mile of 71.3 persons based on 2010 data estimates. Clearfield County is rural in character with approximately 90% of the county landscape undeveloped. The amount of undeveloped land in the county has decreased over the past fifty years due to a decrease in active agriculture and mining, which are both considered as development from a land use classification perspective.

The amount of land in residential use increased by six times over the same period. *Figure 6 – Clearfield County Land Cover* illustrates the different land use categories around the county.

Coal mining is still an active industry in Clearfield County. In 2002, the county had the highest number of bituminous surface mine operators, employees, and active mine sites in Pennsylvania. Clay, sandstone, and shale are also mined in Clearfield County. In addition, gas extraction has become a significant activity in Clearfield County, and the discovery of the large volume of natural gas in the Marcellus Shale. The Marcellus Shale unit underlies the entire county and has accounted for an increase in drilling activity in the area. Marcellus Shale drilling began to grow in Clearfield County in 2009, with the peak amount of drilling activity occurring between 2011 and 2012.

An analysis of land use and development potential was conducted as a part of the 2006 update to the Clearfield County Comprehensive Plan. This analysis included consideration of limiting factors such as environmental sensitivity, unsuitable soils, steep slopes, and state-owned land. Consideration was given to the location of existing infrastructure, as well as possible future infrastructure expansions. Even with the additional development in these areas, the county will most likely remain nearly 80% rural. As a result of this analysis, the following future growth areas are identified in the Clearfield County Comprehensive Plan:

- City of Dubois, Sandy Township, and Huston Township areas
- Clearfield Borough and Lawrence Township areas
- Areas adjacent to Philipsburg borough and Decatur Township
- Curwensville Borough and Pike Township areas
- Woodland and Bradford Townships
- Kylertown and Cooper Township along State Route 53
- Karthaus Township in the CCEDC Industrial Park

The northern parts of the county are dominated by forestlands, while agricultural areas are scattered through the remainder of the county. The largest concentrations of residential development are in the City of Dubois, Clearfield Borough, Lawrence Township, and Sandy Township.

Voters in the City of DuBois and Sandy Township said yes to the consolidation referendum at the November 2, 2021, election. This petition to consolidate the two municipalities into a new third-class city needs certified to the Commonwealth by November 22, 2021.

2.5. Data Sources

The following data sources were used during the update process:

- United States Census Bureau.
- National Climatic Data Center (NCDC).

- National Oceanic and Atmospheric Administration (NOAA).
- Pennsylvania Department of Conservation and Natural Resources (PA DCNR).
- Pennsylvania Department of Labor and Industry (PA DLI)
- Pennsylvania Groundwater Information System (PaGWIS).
- Pennsylvania Emergency Incident Reporting System.
- Pennsylvania Emergency Management Agency (PEMA).

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

In order to assess the vulnerability of different jurisdictions to the hazards, data on past occurrences of damaging weather events was compiled. A large number of natural-hazard events were gathered from the National Climatic Data Center (NCDC) database. The NCDC is a division of the United States Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). Information on hazard events is compiled by the NCDC from data gathered by the National Weather Service (NWS), another division of NOAA. The data is then presented by the NCDC as tabular data that can be queried in the United States Storm Events database, which "documents the occurrences of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce" (NOAA, 2006). The classification of storm events in the database is based off of data collected from around the United States and the Commonwealth of Pennsylvania, so the data may not be filed under the correct storm category due to user input error. The reason for this data issue results from some storm events falling under multiple categories, including but not limited to winter storm, ice storm, tornado, hurricane / tropical storm, flooding, and flash flooding. Many of the events listed in the United States Storm Events database can fall under multiple of these categories. In an effort to include a comprehensive list of prior storm events for Clearfield County, search queries with multiple storm classifications were conducted for each hazard.

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

This hazard mitigation plan evaluates the vulnerability of the county's critical infrastructure facilities. For the purposes of this plan, critical infrastructure facilities are those entities that are

essential to the health, welfare, and safety of the community. This includes but is not limited to airports, emergency medical service (EMS) stations, communication facilities and towers, day care centers and preschools, fire departments, hospitals and medical facilities, police departments, schools, and senior living facilities. The locations of these facilities were provided by the Clearfield County GIS Department.

Geographic Information Systems (GIS) Data

GIS data was utilized in risk assessment, estimation of loss and the development of map products for the hazard mitigation plan update. A foundation of data was available from the Clearfield County GIS Department. Some of the utilized data was downloaded from the Pennsylvania Spatial Data Access (PASDA). A large portion of the plan utilizes census data from the United States Census Bureau, but the 2020 census data collection and dissemination was disrupted due to the Covid-19 Pandemic in 2020 and 2021. The 2020 census was delayed, and the information received during the census was spread out due to social distancing and the limiting of census takers going door to door to gather information. A large effort was made in 2020 to increase awareness of completing the census online, but the information for the 2020 Census at large has not been published at the time of this writing.

The Clearfield County GIS Department provided the following layers for use in the development of hazard profiles and hazard profile mapping for the 2022 Hazard Mitigation Plan Update:

- County Address Points
- Road Centerlines
- Communication Towers
- Clearfield County Boundary
- EMS Locations
- Fire Department Locations
- Hospitals
- Hydrology Centerlines
- Hydrology Polylines
- Hydrology Polygons
- Clearfield County Municipalities
- Police Departments
- Preschools
- School Buildings and Education Facilities
- Senior Living Facilities

The following GIS Data layers were developed for use in the 2022 Hazard Mitigation Plan Update:

- Earthquake Vulnerability Areas
- Mobile Home Vulnerability Data
- Tornado Paths within Clearfield County
- Clearfield County Unconventional Oil and Gas Wells
- Clearfield County Conventional Oil and Gas Wells
- Clearfield County Levee Centerlines and Levee Protection Areas
- Clearfield County Public Water Supply Areas

The loss estimations were completed as part of a the HAZUS scenario processing and represent FEMA depth grids and the general building information from FEMA's general building stock. The following maps provide information about Clearfield County and include a base map and other specific features of the county.

Figure 2 - Köppen-Geiger Climate Map

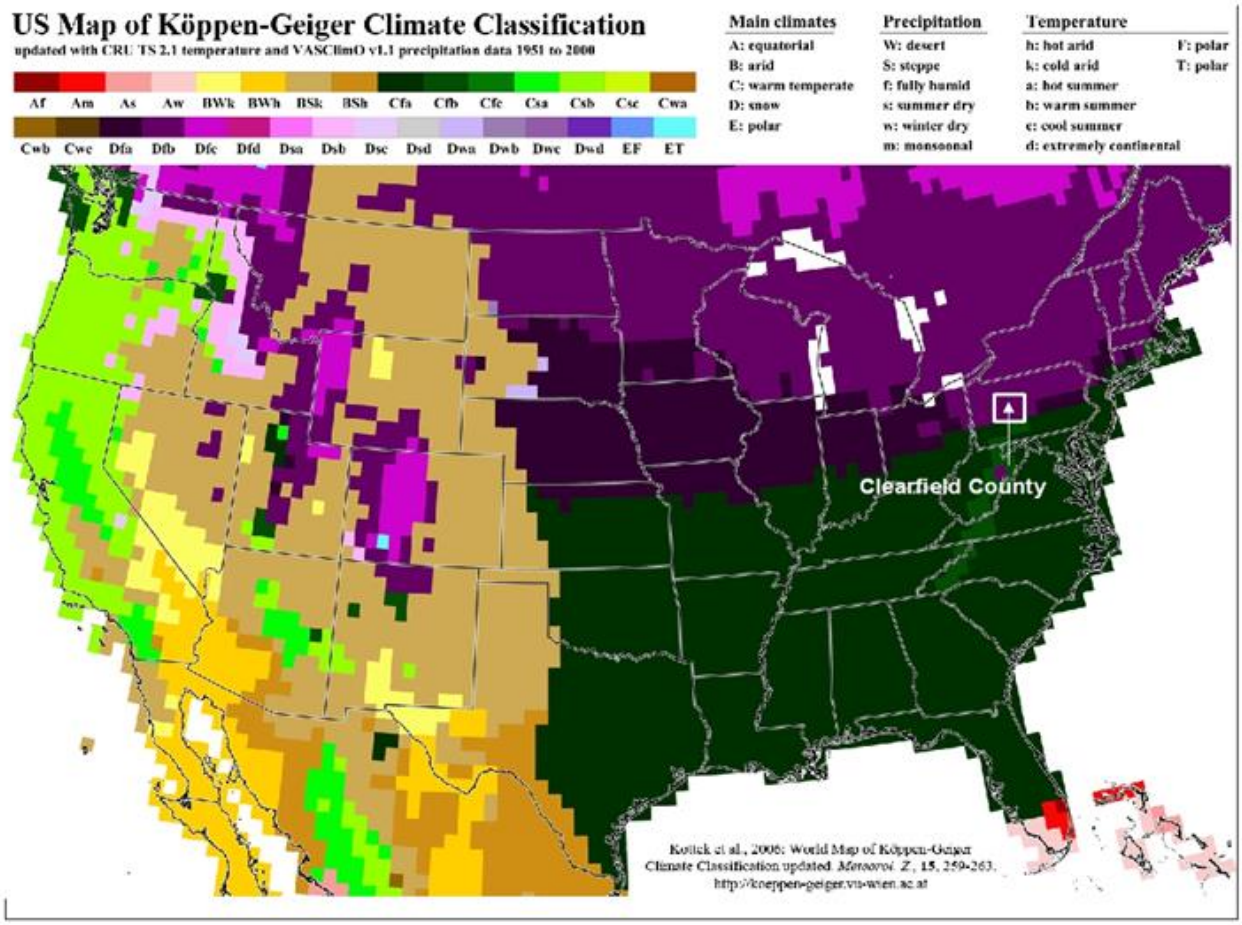
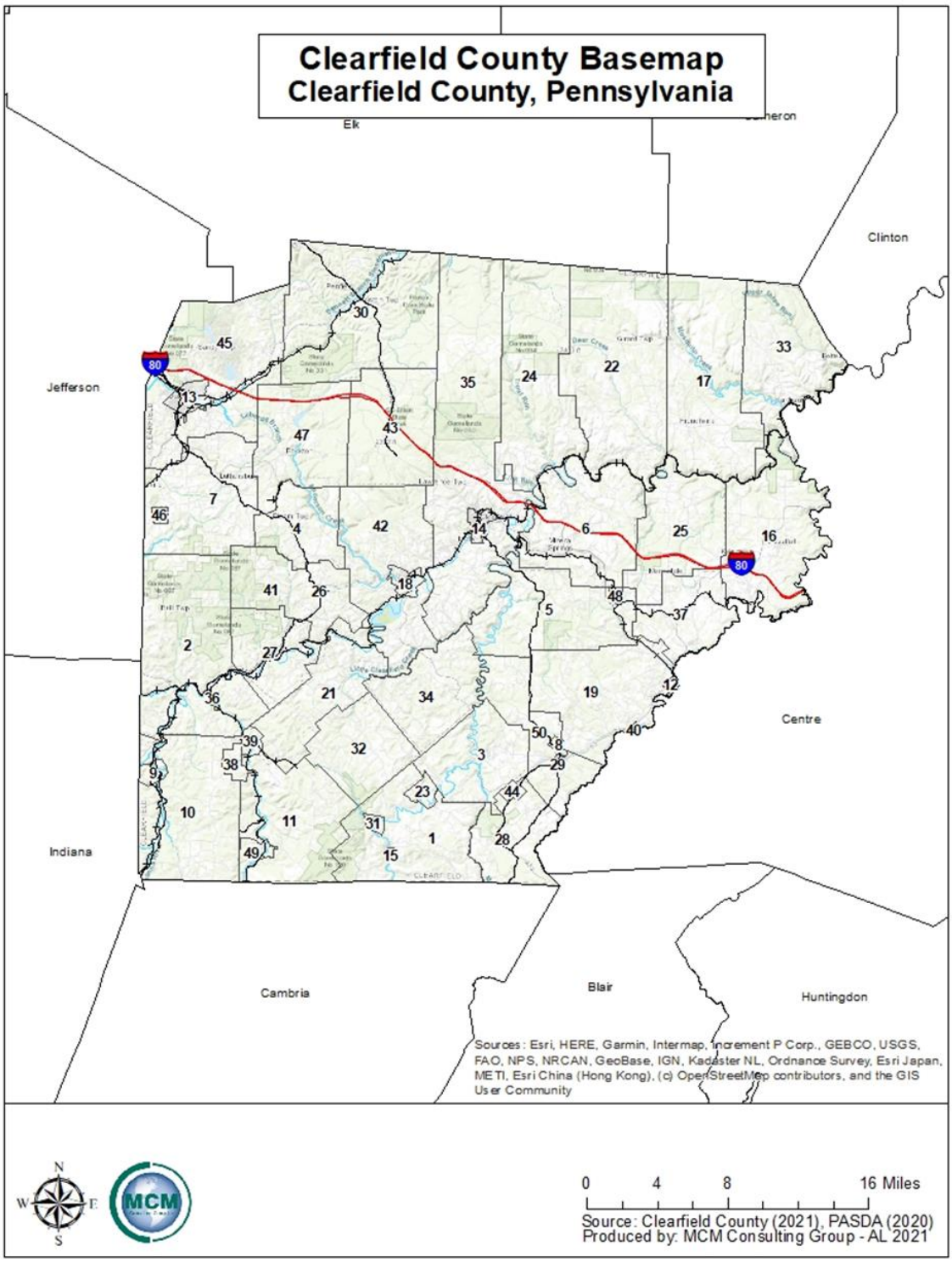


Figure 3 - Clearfield County Base Map



Clearfield County Basemap Legend and Municipality List
Clearfield County, Pennsylvania

Legend

- Clearfield County Boundary
- Adjacent Counties
- Clearfield County Municipalities
- Interstate 80
- Clearfield County State Routes (153, 219, 253)
- Clearfield County Active Railroads
- Clearfield County Large Streams

Municipalities:

1. Beccaria Township
2. Bell Township
3. Bigler Township
4. Bloom Township
5. Boggs Township
6. Bradford Township
7. Brady Township
8. Brisbin Borough
9. Burnside Borough
10. Burnside Township
11. Chest Township
12. Chester Hill Borough
13. City of Dubois
14. Clearfield Borough
15. Coalport Borough
16. Cooper Township
17. Covington Township
18. Curwensville Borough
19. Decatur Township
20. Falls Creek Borough
21. Ferguson Township
22. Girard Township
23. Glen Hope Borough
24. Goshen Township
25. Graham Township
26. Grampian Township
27. Greenwood Township
28. Gulich Township
29. Houtzdale Borough
30. Huston Township
31. Irvona Borough
32. Jordan Township
33. Karthaus Township
34. Knox Township
35. Lawrence Township
36. Mahaffey Borough
37. Morris Township
38. New Washington Borough
39. Newburg Borough
40. Osceola Mills Borough
41. Penn Township
42. Pike Township
43. Pine Township
44. Ramey Borough
45. Sandy Township
46. Troutville Borough
47. Union Township
48. Wallaceton Borough
49. Westover Borough
50. Woodward Township

Source: Clearfield County (2021), PASDA (2020)
Produced by: MCM Consulting Group - AL 2021

Figure 4 - Clearfield County Watersheds

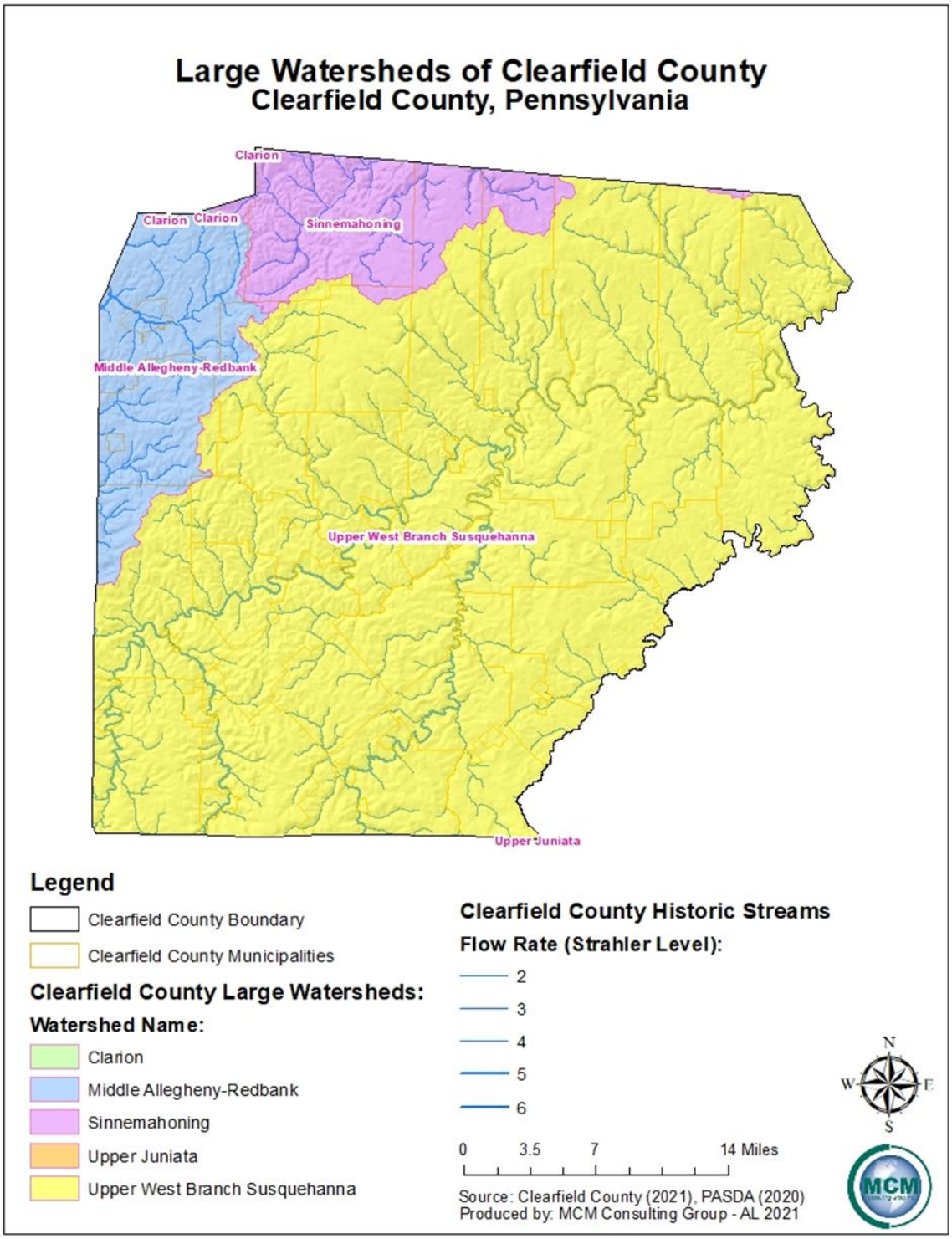


Figure 5 - Clearfield County Population Density

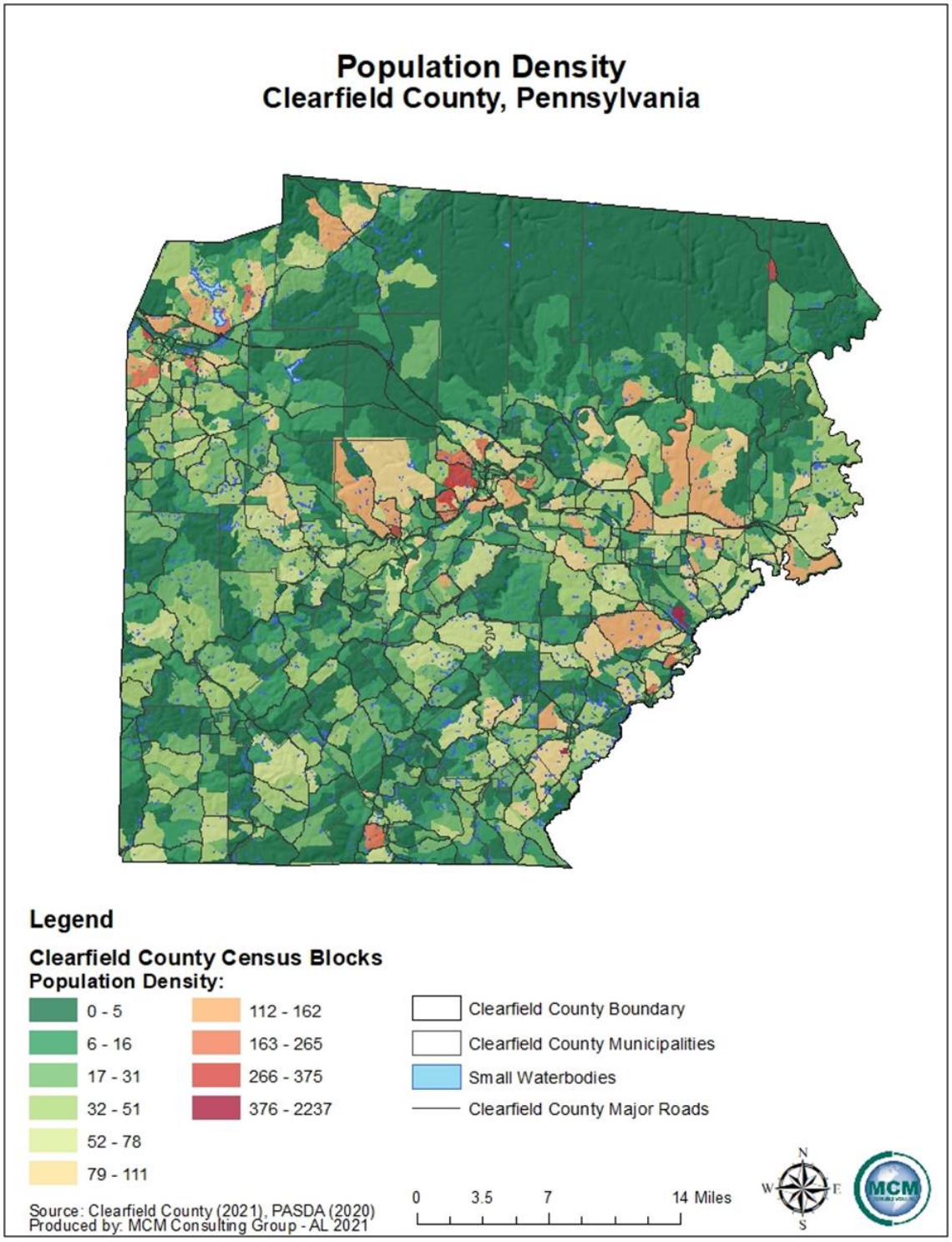
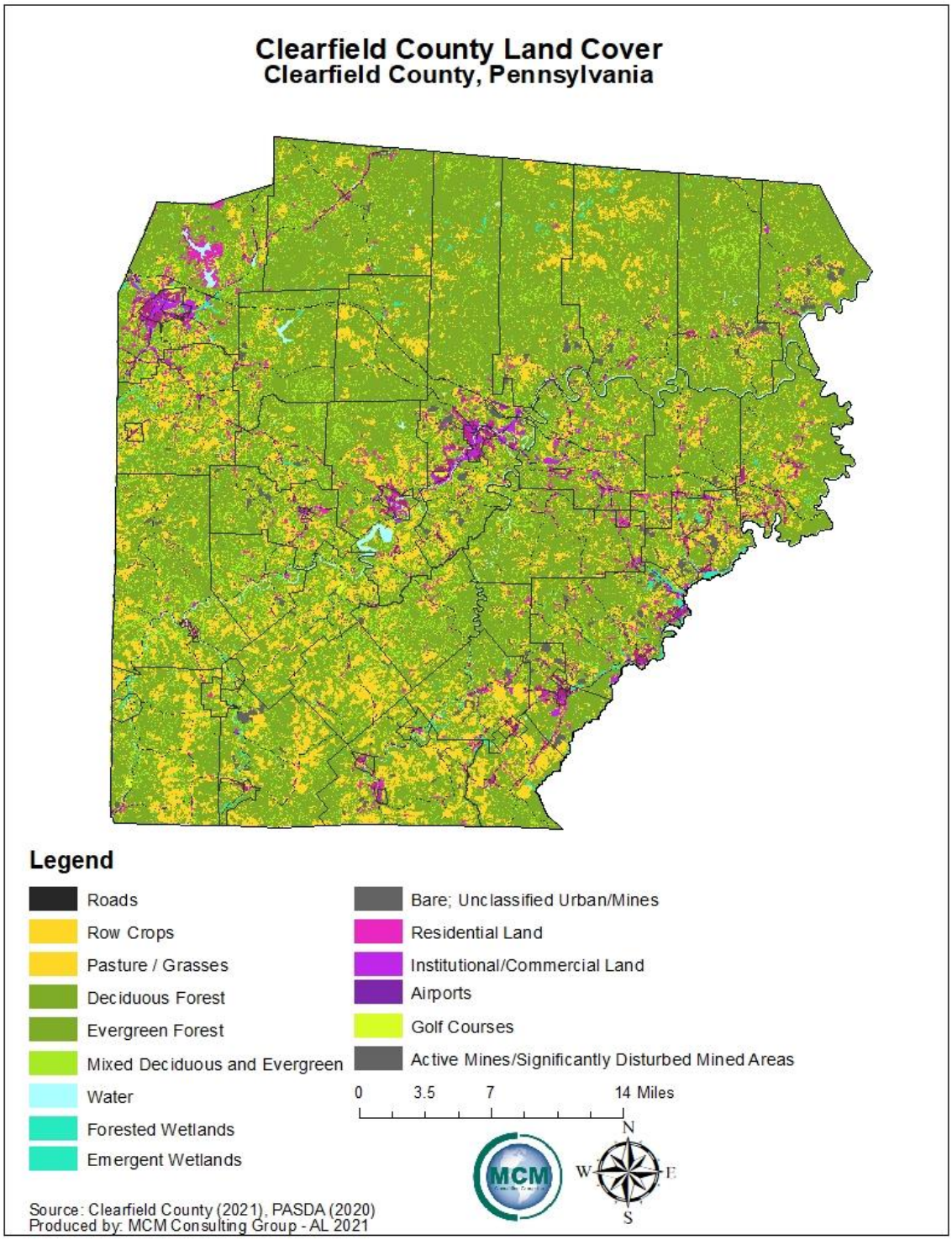


Figure 6 - Clearfield County Land Cover



3. Planning Process

3.1. Update Process and Participation Summary

The Clearfield County Hazard Mitigation Plan update began May 11, 2021. The Clearfield County Commissioners were able to secure a hazard mitigation grant to start the process. The Clearfield County Emergency Management Agency was identified as the lead agency for the Clearfield County Hazard Mitigation Plan update. The planning process involved a variety of key decision makers and stakeholders within Clearfield County. Clearfield 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 Clearfield County Emergency Management Agency, Clearfield County Commissioners, and MCM Consulting Group, Inc. (MCM).

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

MCM Consulting Group, Inc. assisted Clearfield County Emergency Management Agency in coordinating and leading public involvement meetings, local planning team meetings, analysis, and the writing of the updated HMP. The Clearfield County Local Planning Team (LPT) worked closely with MCM in the writing and review of the HMP. MCM conducted project meetings and local planning team meetings throughout the process. Meeting agenda, 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 Clearfield 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. Clearfield County will continue to work with all local municipalities to collect local hazard mitigation project opportunities.

The HMP planning process consisted of:

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

The 2022 Clearfield County HMP was completed February 1, 2022. The 2022 plan follows an outline developed by PEMA which provides a standardized format for all local HMPs in the Commonwealth of Pennsylvania. The 2022 HMP is consistent with the PEMA recommended format. The 2022 Clearfield 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 2022 Clearfield County Hazard Mitigation Plan update was led by the Clearfield County Steering Committee. The Clearfield 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 4 – Steering Committee* outlines the individuals that comprised this team.

Table 4 - Steering Committee

Clearfield County Hazard Mitigation Plan Update Steering Committee		
Name	**Organization**	**Position**
John Sobel	Clearfield County	Commissioner
Antonio “Tony” Scotto	Clearfield County	Commissioner
Scott Mignot	Clearfield EMA	Director
Steven Smith	Clearfield EMA	Deputy Coordinator

In order to represent the county, the Clearfield County Steering Committee developed a diversified list of potential local planning team (LPT) members. Members that participated in the 2017 hazard mitigation plan were highly encouraged to join the 2022 team. The steering committee then provided invitations to the prospective members and provided a description of

duties to serve on the LPT. The invitations for members of the LPT were disseminated by the Clearfield County Emergency Management Agency utilizing letters, email, and telephone calls. The LPT worked throughout the process to plan and hold meetings, collect information, and conduct public outreach.

Agencies that participated in the planning process included Clearfield County EMA, Clearfield County Commissioners, Clearfield County Conservation District, Clearfield County GIS Department, Clearfield County Planning Commission, and those municipalities listed in *Table 5 – Local Planning Team.*

The stakeholders listed in *Table 5 – Local Planning Team* served on the 2022 Clearfield 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 5 - Local Planning Team

Clearfield County Hazard Mitigation Plan Local Planning Team		
Name	**Organization**	**Position**
Scott Mignot	Clearfield EMA	Emergency Management Director
Steven Smith	Clearfield EMA	Deputy Director of EMA
Cindy Marshall	Clearfield EMA	Admin Assistant – County EMA
John Sobel	Clearfield County	County Commissioner
Antonio “Tony” Scotto	Clearfield County	County Commissioner
Jody Brennan	Clearfield County Planner	Planning Commission Director
Kelly Williams	Clearfield County Conservation District	Watershed Specialist
John Kaskan	Clearfield County GIS	GIS Director
Nicole Parris	Bell Township	Township Secretary
Doug Atkins	Bigler Township	Township Supervisor
Kim Caldwell	Bigler Township	Township Secretary
Philbert Myers	Bigler Township	Township Supervisor
Shelia Doane	Bloom Township/Troutville Borough	Township Secretary
Joe Lonjin	Boggs Township	Township Supervisor
Charles Muth	Brady Township	Township Supervisor
Jason Sunderland	Burnside Borough/Burnside Township/Chest Township/Westover Borough	Township Supervisor
Terry Bratton	Chester Hill Borough	Local EMA

Clearfield County Hazard Mitigation Plan Local Planning Team		
Name	**Organization**	**Position**
Leslie Stott	Clearfield Borough	Borough Manager
Bernice Yedlosky	Cooper Township	Township Secretary
Leslie Stott	Clearfield Borough	Borough Manager
Lori Hess	Covington Township	Township Secretary
Scott Farrell	DuBois City	Local EMA
Joe Mitchell	DuBois City	Redevelopment Authority Director
Scott Blackburn	Ferguson Township	Township Secretary
Donald Sheeder	Ferguson Township	Township Secretary
Kaia Kyler	Girard Township	Township Secretary
Charles Livergood	Girard Township	Township Supervisor
Jerry Dotts	Glen Hope Borough	Council Member
Cathy Youcheff	Goshen Township/Graham Township	Township Secretary
Jeff Williams	Graham Township	Township Supervisor
Betty Jo Sutika	Grampian Borough	Township Secretary
William Waterloo	Grampian Borough	Council Member
Janice Bush	Houtzdale Borough	Borough Secretary
Izen Lingenfelter	Houtzdale Borough	Mayor
Wendy Stonehouse	Huston Township	Township Secretary
Amber Diehl	Irvona Borough	Borough Secretary
Roger Kritzer	Jordan Township	Township Supervisor
Debra Finkbeiner	Lawrence Township	Code Enforcement Officer
Barbara Shaffer	Lawrence Township	Township Secretary
Sally Long	Mahaffey Borough	Borough Secretary
James Williams	Morris Township	Township Supervisor
Diann Turner	Osceola Mills/Chester Hill Borough	Township Secretary
Nicholas Selner	Penn Township/Grampian Borough	Local EMA
David Johnson	Pine Township	Township Supervisor
Larry Bickel	Sandy Township	Local EMA
Shawn Arbaugh	Treasure Lake	Treasure Lake Property Owners Association Manager
Jason Valentine	Union Township	Local EMA
Bob Baker	Woodward Township	Township Supervisor
Kim Caldwell	Woodward Township	Township Secretary
Rick Kasubick	Woodward Township	Township Supervisor
Paul Leskovensky	Woodward Township	Township Supervisor

Clearfield County Hazard Mitigation Plan Local Planning Team		
Name	**Organization**	**Position**
Abigail Caldwell	Woodward Township	Township Supervisor

3.3. Meetings and Documentation

Meetings with local elected officials and the local planning team were held as needed. At each of the meetings, municipal officials were strongly encouraged to submit hazard mitigation project opportunity forms, complete their respective portions of the capability assessment, review and eventually adopt the multi-jurisdictional HMP. *Table 6 – HMP Process Timeline* lists the meetings held during the HMP planning process, which organizations and municipalities attended and the topic that was discussed at each meeting. All meeting agendas, sign-in sheets, presentation slides, and other documentation is in Appendix C.

The draft plan was made available for public review on December 20, 2021. The draft was advertised on Clearfield County's social media page and was made available digitally on the Clearfield County website at: www.clearfield911.com. The public was then instructed to participate in an online poll to leave comments. There were no public comments received for the 2022 hazard mitigation plan update.

The public comment period remained open until January 19, 2022. All public comments were submitted via an online survey or in writing to Scott Mignot at the Clearfield County Emergency Management Agency. All public comments have been included in this plan in Appendix C.

Table 6 - HMP Process Timeline

Clearfield County HMP Process Timeline		
Date	**Meeting**	**Description**
05/11/2021	Clearfield 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. Presentation on hazard identification and capability assessment worksheets.
05/11/2021	Municipal kick-off meeting	Defined hazard mitigation planning and identified roles and responsibilities. Discussed the 2017 hazard mitigation plan and defined a timeline to complete the 2022 update.

Clearfield County HMP Process Timeline		
Date	**Meeting**	**Description**
06/09/2021	Local Planning Team meeting	Complete the hazard identification worksheet and the capabilities assessment survey.
06/17/2021	Local Planning Team meeting – Selection of Hazards	Discussed hazards profiled in the previous plan and select hazards for the 2022 hazard mitigation plan.
07/07/2021	Local Planning Team Meeting – Risk Factor Assessment and Mitigation Strategy	Determined a risk factor score for each of the selected hazards in the 2022 update. A municipal comparison document was then sent to all municipalities in Clearfield County for their input.
08/05/2021	Meetings 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. Distributed review worksheets from the 2017 HMP.
08/06/2021	Meetings 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. Distributed review worksheets from the 2017 HMP.
09/23/2021	Risk Factor Assessment public comment	Present the findings of risk assessment section.
09/23/2021	Local Planning Team meeting – Mitigation Strategy	Finalize the 2022 goals, objectives, and actions for mitigation strategy development. The LPT also reviewed all mitigation actions from the 2017 plan and finalized new actions for the plan update.
12/07/2021	Local Planning Team – Draft Plan review	Draft plan review and comments through December 17, 2021.

Clearfield County HMP Process Timeline		
Date	**Meeting**	**Description**
12/20/2021	Clearfield County Hazard Mitigation Plan – Draft Plan public review	The draft HMP was made available for all members of the public to review. All were invited to submit any comments via an online survey or provide comments to Clearfield County.

3.4. Public and Stakeholder Participation

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

The tools listed below were distributed with meeting invitations, provided directly to municipalities for completion and return to the Clearfield County Emergency Management Agency 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 Clearfield County Emergency Management Agency.

1. **Risk Assessment Hazard Identification and Risk Evaluation Worksheet:** Capitalizes on local knowledge to evaluate the change in the frequency of occurrence, magnitude, or impact and/or geographic extent of existing hazards and allows communities to evaluate hazards not previously profiled using the Pennsylvania Standard List of Hazards.
2. **Capability Assessment Survey:** Collects information on local planning, regulatory, administrative, technical, fiscal, and political capabilities that can be included in the countywide mitigation strategy.
3. **Municipal Project Opportunity Forms and Mitigation Actions:** Copies of the 2017 mitigation opportunity forms that were included in the current HMP were provided to the municipalities for review and amendment. These opportunities are in Appendix G. The previous mitigation actions were provided and reviewed at update meetings. New 2022 municipal project opportunity forms are included as well, located in Appendix G.

To capture public input, the Clearfield County LPT provided an on-line survey. Members of the public were also encouraged to contact Clearfield County Emergency Management Agency or

MCM Consulting Group, Inc. with any comments or questions regarding this update. Any public comment that was received during public meetings or during the draft review of the plan were documented and included in the plan. Copies of newspaper public meeting notices, website posted public notices, and other correspondence are included in Appendix C of this plan.

Clearfield County invited all contiguous counties to review the 2022 draft hazard mitigation plan. A letter was sent to the emergency management coordinators in Blair, Cambria, Cameron, Centre, Clinton, Elk, Indiana, and Jefferson counties in Pennsylvania on December 21, 2021. No contiguous counties completed the review of the 2022 draft hazard mitigation plan, or returned comments on the document.

3.5. Multi-Jurisdictional Planning

Clearfield County used an open, public process to prepare this HMP. Meetings and letters to municipal officials were conducted to inform and educate them about hazard mitigation planning and its local requirements. Municipal officials provided information related to existing codes and ordinances, the risk and impacts of known hazards on local infrastructure and critical facilities and recommendations for related mitigation opportunities. The pinnacle to the municipal involvement process was the adoption of the final plan. *Table 7 – Worksheets, Surveys, and Forms Participation* reflects the municipalities participation by completing worksheets, surveys, and forms. Forty of forty-nine municipalities completed at least some document in support of this hazard mitigation plan update and at least one meeting. Beccaria Township, Burnside Borough, Chest Township, Coalport Borough, Greenwood Township, New Washington Borough, Newburg Borough, Wallaceton Borough, and Westover Borough did not complete any of the forms outlined in the table below.

Table 7 - Worksheets, Surveys, and Forms Participation

Clearfield County HMP Worksheets, Surveys, and Forms Participation				
Municipality	**Capability Assessment Survey**	**Risk Assessment Hazard Identification and Risk Evaluation Worksheet**	**NFIP Forms**	**Hazard Mitigation Opportunity Form Review and Updates**
Beccaria Township				
Bell Township	X	X	X	
Bigler Township	X	X	X	
Bloom Township	X	X	X	X
Boggs Township	X	X	X	
Bradford Township	X	X	X	X
Brady Township	X	X	X	
Brisbin Borough	X	X	X	

Clearfield County HMP Worksheets, Surveys, and Forms Participation				
Municipality	**Capability Assessment Survey**	**Risk Assessment Hazard Identification and Risk Evaluation Worksheet**	**NFIP Forms**	**Hazard Mitigation Opportunity Form Review and Updates**
Burnside Borough				
Burnside Township	X	X	X	
Chest Township				
Chester Hill Borough	X	X	X	
Clearfield Borough	X	X	X	X
Coalport Borough				
Cooper Township	X	X	X	X
Covington Township	X	X	X	
Curwensville Borough	X	X	X	
Decatur Township	X	X	X	X
DuBois City	X	X	X	
Ferguson Township	X	X	X	X
Girard Township	X	X	X	
Glen Hope Borough	X	X	X	
Goshen Township	X	X	X	
Graham Township	X	X	X	
Grampian Borough	X	X	X	X
Greenwood Township				
Gulich Township	X	X	X	
Houtzdale Borough	X	X	X	
Huston Township	X	X	X	X
Irvona Borough	X	X	X	
Jordan Township	X	X	X	
Karthaus Township	X	X	X	
Knox Township	X	X	X	
Lawrence Township	X	X		X
Mahaffey Borough	X	X	X	
Morris Township	X	X	X	X
New Washington Borough				
Newburg Borough				

Clearfield County HMP Worksheets, Surveys, and Forms Participation				
Municipality	**Capability Assessment Survey**	**Risk Assessment Hazard Identification and Risk Evaluation Worksheet**	**NFIP Forms**	**Hazard Mitigation Opportunity Form Review and Updates**
Osceola Mills Borough	X	X	X	
Penn Township	X	X	X	
Pike Township	X	X	X	
Pine Township	X	X	X	X
Ramey Borough	X	X	X	X
Sandy Township	X	X	X	
Troutville Borough	X	X	X	X
Union Township	X	X		
Wallaceton Borough				
Westover Borough				
Woodward Township	X	X	X	

In March of 2020, Clearfield County, Pennsylvania, and the rest of the world experienced restrictions on gatherings due to COVID-19. Because of the on-going pandemic, public meetings were unable to be held as normal during the hazard mitigation planning process. Hybrid meetings were held so that those unable or unwilling to attend an in-person planning meeting were able to still attend virtually. Members of the public were encouraged to submit any questions or comments about the project to Clearfield County Emergency Management Agency or MCM Consulting Group, Inc. Additionally, all Clearfield County residents were encouraged to complete an online community preparedness survey; to both engage community members, and to measure preparedness levels.

All forty-nine municipalities within Clearfield County adopted the 2017 Clearfield County Hazard Mitigation Plan as the municipal hazard mitigation plan. The goal of the Clearfield County Local Planning Team is to have 100 percent participation by municipalities in adopting the 2022 Clearfield County Hazard Mitigation Plan. With forty municipalities participating in the planning process, the participation percentage for this hazard mitigation planning period is approximately 81.63 percent.

4. Risk Assessment

4.1. Update Process Summary

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

A risk assessment evaluates threats associated with a specific hazard and is defined by probability and frequency of occurrence, magnitude, severity, exposure, and consequences. The Clearfield County risk assessment provides in-depth knowledge of the hazards and vulnerabilities that affect Clearfield 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 Clearfield County Emergency Operations Plan (EOP), local EOPs and other public and private emergency management plans.

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

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

The Clearfield County Local Planning Team reviewed and assessed the change in risk for all natural and human-caused hazards identified in the 2017 hazard mitigation plan. The mitigation planning team then identified hazards that were outlined within the Pennsylvania Hazard Mitigation Plan but not included in the 2017 Clearfield County Hazard Mitigation Plan that could impact Clearfield County. The team utilized the hazard identification and risk evaluation worksheet that was provided by the Pennsylvania Emergency Management Agency.

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

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

4.2. Hazard Identification

4.2.1. Presidential and Gubernatorial Disaster Declarations

Table 8 – Presidential & Gubernatorial Disaster Declaration contains a list of all Presidential and Gubernatorial disaster declarations that have affected Clearfield County and it's municipalities from 1955 through 2021, according to the Pennsylvania Emergency Management Agency.

Table 8 - Presidential and Gubernatorial Disaster Declarations and Proclamations

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
September, 1955	Drought	Gubernatorial Declaration
January, 1966	Heavy snow	Gubernatorial Declaration
February, 1972	Heavy snow	Gubernatorial Declaration
June, 1972	Flood (Agnes)	Presidential Disaster Declaration
February, 1974	Truckers' strike	Gubernatorial Declaration
September, 1975	Severe storms, heavy rains, flooding	Presidential Disaster Declaration
January, 1978	Heavy snow	Gubernatorial Declaration
February, 1978	Blizzard	Gubernatorial Declaration
March, 1993	Blizzard	Presidential Emergency Declaration
January, 1994	Severe winter storms	Presidential Disaster Declaration
September, 1995	Drought	Gubernatorial Declaration

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
January, 1996	Severe winter storms	Presidential Disaster Declaration
January, 1996	Flooding	Presidential Disaster Declaration
July, 1999	Drought	Gubernatorial Declaration
September, 1999	Hurricane Floyd	Presidential Disaster Declaration
December, 1999	Drought	Gubernatorial Declaration
September, 2003	Hurricane Isabel/Henri	Presidential Disaster Declaration
September, 2004	Tropical Depression Ivan	Presidential Disaster Declaration
September, 2005	Hurricane Katrina	Gubernatorial Proclamation of Emergency
September, 2006	Tropical depression Ernesto	Gubernatorial Proclamation of Emergency
February, 2007	Severe winter storm	Gubernatorial Proclamation of Emergency
February, 2007	Waive the regulations regarding hours-of-service limitations for drivers of commercial vehicles	Gubernatorial Proclamation of Emergency
April, 2007	Severe storm	Gubernatorial Declaration
April, 2007	Severe winter storm	Gubernatorial Proclamation of Emergency
February, 2010	Severe winter storm	Gubernatorial Proclamation of Emergency
October, 2010	Hurricane Sandy	Presidential Emergency Declaration
January, 2011	Severe winter storm	Gubernatorial Proclamation of Emergency
September, 2011	Severe storms and flooding (Lee/Irene)	Gubernatorial Proclamation of Emergency
April, 2012	Spring, winter storms	Gubernatorial Proclamation of Emergency
October, 2012	Hurricane Sandy	Gubernatorial Proclamation of Emergency
June, 2013	High winds, thunderstorms, heavy rain, tornado, flooding	Gubernatorial Proclamation of Emergency
January, 2014	Extended prolonged cold	Gubernatorial Proclamation of Emergency

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
January, 2014	Driver hours waived due to prolonged and continued Severe winter weather	Gubernatorial Proclamation of Emergency
February, 2014	Severe winter weather	Gubernatorial Proclamation of Emergency
March, 2017	Severe winter storm	County and Municipal Declarations
July, 2017	Flash flooding	County and Municipal Declarations
January, 2018	Opioid crisis	Gubernatorial Proclamation of Emergency
March, 2020	COVID-19	Presidential Disaster Declaration
Source: Pennsylvania Emergency Management Agency and FEMA		

4.2.2. Summary of Hazards

The Clearfield County Local Planning Team (LPT) was provided the Pennsylvania Standard List of Hazards to be considered for evaluation in the 2022 HMP Update. Following a review of the hazards considered in the 2017 HMP and the standard list of hazards, the local planning team decided that the 2022 plan should identify, profile, and analyze twenty-one profiled hazards.

These twenty-one hazards include all of the hazards profiled in the 2017 plan. The list below contains the twenty-one hazards that have the potential to impact Clearfield County as identified through previous risk assessments, the Clearfield County Hazard Vulnerability Analysis and input from those who participated in the 2022 HMP update. Hazard profiles are included in Section 4.3 for each of these hazards.

Identified Natural Hazards

Drought

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

Earthquake

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10 to 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 people 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).

Flooding, Flash Flooding and Ice Jam Flooding

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

Hurricane/Tropical Storm/Nor'easter

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 300 miles across with the average eye being 20-40 miles across. Potential threats from hurricanes include powerful winds, heavy rainfall, storm surges, coastal and inland flooding, rip currents, tornadoes, and landslides. The Atlantic hurricane season runs from June 1 to November 30.

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, environmental, or human harm. These species can be any type of organism: plant, fish, invertebrate, mammal, bird, disease, or pathogen.

Land Failure, Subsidence

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

extraction can cause subsidence and sinkhole formations. (FEMA, 1997). Sinkholes can also be caused by abandoned mined land.

Pandemic, Epidemic and Infectious Diseases

A pandemic is a global outbreak of disease that occurs when a new virus emerges in the human population, spreading easily in a sustained manner, and causing serious illness. An epidemic describes a smaller scale infectious outbreak, within a region or population, that emerges at a disproportionate rate. Infectious disease outbreaks may be widely dispersed geographically, impact large numbers of the population, and could arrive in waves lasting several months at a time.

Radon Exposure

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

Tornadoes, Windstorm

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

Wildfire

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

Winter Storm

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

Identified Human Caused Hazards

Civil Disturbance/Criminal Activity

A civil disturbance is defined by FEMA as a civil unrest activity (such as a demonstration, riot, or strike) that disrupts a community and requires intervention to maintain public safety. Criminal activity is an act committed in violation of law that can lead to imprisonment.

Dam Failure

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

Emergency Services

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

Environmental Hazards

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).

Opioid Epidemic

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

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

Terrorism/Cyber Attack

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

Transportation Accidents and Transportation of Hazardous Materials

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

The Department of Homeland Security defines a hazardous materials release as "The improper leak, spillage, discharge, or disposal of hazardous materials or substances (such as explosives, toxic chemicals, and radioactive materials) poses a significant threat to human health and safety, campus property, and the surrounding environment."

Utility Interruption

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

- Geomagnetic Storms; including temporary disturbances of the Earth's magnetic field resulting in disruptions of communication, navigation, and satellite systems (National Research Council et al., 1986).
- Fuel or Resource Shortage; resulting from supply chain breaks or secondary to other hazard events, for example.
- Electromagnetic Pulse; originating from an explosion or fluctuating magnetic field and causing damaging current surges in electrical and electronic systems (Institute for Telecommunications Sciences, 1996).
- Information Technology Failure; due to software bugs, viruses, or improper use (Rainer Jr., et al, 1991).
- Ancillary Support Equipment; electrical generating, transmission, system-control, and distribution-system equipment for the energy industry (Hirst & Kirby, 1996).
- Public Works Failure; damage to or failure of highways, flood control systems, deep-water ports and harbors, public buildings, bridges, dams, for example (Unit-ed States Senate Committee on Environment and Public Works, 2009).
- Telecommunications System Failure; Damage to data transfer, communications, and processing equipment, for example (FEMA, 1997).
- Transmission Facility or Linear Utility Accident; liquefied natural gas leakages, explosions, facility problems, for example (United States Department of Energy, 2005).
- Major Energy, Power, Utility Failure; interruptions of generation and distribution, power outages, for example (United States Department of Energy, 2000).

4.2.3. Climate Change

Impacts of Climate Change on Identified Hazards

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

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

Climate change is likely to increase the risk of droughts (Section 4.3.1). Higher average temperatures mean that more precipitation will fall as rain rather than snow, snow will melt earlier in the spring, and evaporation and transpiration will increase. Along with the prospect of decreased annual precipitation, the risk of hydrological and agricultural drought is expected to increase (Sheffield & Wood, 2008). Correspondingly this will impact wildfires. Drought is accompanied by drier soils and forests, resulting in an elongated wildfire season and more intense and long-burning wildfires (Pechony & Shindell, 2010). However, the Southwest United States is at a greater risk of this increased drought and wildfire activity than Clearfield 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 4.3.9). Climate change is also expected to result in more intense hurricanes and tropical storms. With the rise of atmospheric temperatures, ocean surface temperatures are rising, resulting in warmer and more moist conditions where tropical storms develop (Stott et al., 2010). A warmer ocean stores more energy and is capable of fueling stronger storms. It is projected that the Atlantic hurricane season is elongating, and there will be more category 4 and 5 hurricanes than before (Trenberth, 2010).

Climate change is contributing to the introduction of new invasive species (Section 4.3.4). 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 experience 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 Clearfield County, impacts are not restricted to the county and are often more widespread. The spatial extent of the impacted area can range from localized areas in Pennsylvania to the entire Mid-Atlantic region. There are three types of droughts.

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

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

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

Leaving areas with little moisture, droughts are often one of the leading contributing factors to wildfires.

Droughts can have adverse effects on farms and other water-dependent industries. This can result in a local economic loss. Areas extensive agriculture uses are particularly vulnerable to drought; 60,957 acres of Clearfield County, or roughly 8.25% of the 738,600 total land acreage, are held in farms (United States Department of Agriculture [USDA], 2017 Census). Acreage for farming has decreased by 12% (36 fewer farms) since the 2012 USDA Census and 177 farm owners are new and beginning enterprisers.

Public safety is an issue in terms of consumable water not being available, as well as water for fire protection and emergency services.

4.3.1.2 Range of Magnitude

Over 60% of the annual precipitation of 43.5 inches is during the spring/summer. Average snowfall for the county is 43 inches; average rainfall is 42 inches. Rural farming areas of Clearfield County are most at risk when a drought occurs. A drought can create a significant financial burden (especially to families as 97% of Clearfield County farms are family-owned and run) Approximately 74% of the county farmland use is devoted to crop cultivation and 26% to

livestock and poultry. (U.S. Census of Agriculture, 2017). Wildfires are often the most severe secondary effect associated with drought. Wildfires can devastate wooded and agriculture areas, threatening natural resources, structures near high wildfire loads, and farm production facilities. Prolonged drought conditions can have a lasting impact on the economy and can cause major ecological changes, such as increases in scrub growth, flash flooding and soil erosion.

Table 9 - Drought Preparation Phases shows the FEMA-defined levels of drought severity along with suggested actions, requests, and goals. Drought can cause municipalities to enforce water rationing and distribution.

Table 9 - Drought Preparation Phases

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

Local Water Rationing: Although not a drought phase, local municipalities may, with the approval of the Pennsylvania Emergency Management Council, implement local water rationing to share a rapidly dwindling or severely depleted water supply in designated water supply service areas. These individual water rationing plans, authorized through provisions of 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.

Long-term water shortages during severe drought conditions can have a significant impact on agribusiness, public utilities, and other industries reliant on water for production services.

Clearfield County also has a growing agritourism business that would be threatened by long-term drought.

The commonwealth uses five parameters to assess drought conditions.

- Stream flows (compared to benchmark records)
- Precipitation (measured as the departure from normal, thirty-year average precipitation)
- Reservoir storage levels in a variety of locations such as three New York City reservoirs in the upper Delaware River Basin.
- Groundwater elevations in a number of counties (comparing to past month, past year and historic record)
- Soil moisture via the Palmer Drought Index (See *Table 10 – Palmer Drought Severity Index*) - a soil moisture algorithm calibrated for relatively homogeneous regions which measures dryness based on recent precipitation and temperature.

Table 10 - Palmer Drought Severity Index

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

Palmer Drought Severity Index	
Severity Category	**PDSI**
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

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

The effects of a drought can be far-reaching in both the economic and environmental realms.

Economic impacts include the reduced productivity of aquatic resources, mandatory water use restrictions, well failures, cutbacks in industrial production, agricultural losses, and limited recreational opportunities. Environmental impacts of drought include the following:

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

4.3.1.3 Past Occurrence

The Department of Environmental Protection (PA DEP) maintains the most comprehensive data on drought occurrences across the commonwealth. Descriptions of drought status categories (i.e., watch, warning, and emergency) are included in the "Range of Magnitude" section above. The declared drought status from 1980 to 2021 is shown in *Table 11 - Past Drought Events in Clearfield County (PA DEP, 2021)*.

The National Oceanic and Atmospheric Administration (NOAA) has archived records showing extreme droughts for the commonwealth in 1931 and a prolonged event in the 1960s; see *Figure 7 - Pennsylvania Palmer Drought Index 1900-1999*.

Based on the county's more recent disaster history and other drought occurrence data, the worst drought event in Clearfield County occurred in the summer of 1999. Extended dry weather spurred Governor Ridge to declare a drought emergency in fifty-five counties, including Clearfield. During this event, precipitation deficits for that summer averaged 5 to 7 inches; the Susquehanna River hit record low flows, streams were empty, and wells dried up. Crop damages indicated losses of over $500 million statewide, and crop losses totaled 70% to 100%. There were also additional losses from the decline of milk production due to the drought (National Climatic Data Center [NCDC], 2011). Additionally, during this event, the state asked municipal and private water suppliers to cut local water use.

Figure 7 - Pennsylvania Palmer Drought Index - 1900-1999

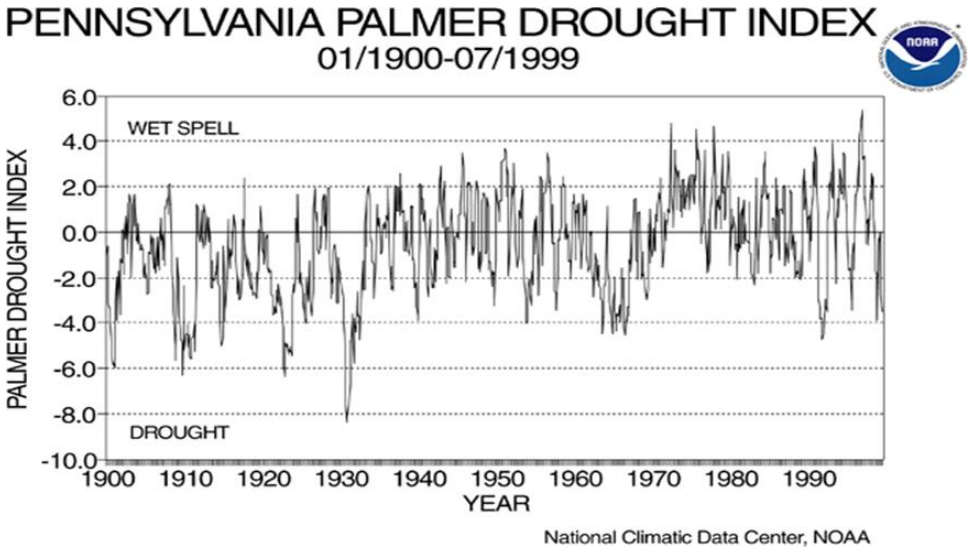


Table 11 - Past Drought Events in Clearfield County (PA DEP, 2021)

Start Date	End Date	Drought Status	Event Duration
Sept 1955		Emergency**	
11/18/1980	04/20/1982	Emergency	2 years 5 months 3 days
04/26/1985	10/22/1985	Watch	5 months 26 days
10/22/1985	12/19/1985	Emergency	1 month 28 days
07/07/1988	08/24/1988	Emergency	1 month 24 days
08/24/1988	12/12/1988	Warning	3 months 18 days
03/03/1989	05/15/1989	Watch	2 months 12 days
06/28/1991	07/24/1991	Warning	26 days
07/24/1991	04/20/1992	Emergency	8 months 27 days
04/20/1992	09/11/1992	Warning	4 months 22 days
09/01/1995	09/20/1995	Warning	19 days
09/20/1995	11/08/1995	Emergency**	I month 19 days
11/08/1995	12/18/1995	Warning	1 month 10 days
07/17/1997	11/13/1997	Watch	3 months 28 days
12/03/1998	12/16/1998	Warning	13 days
12/16/1998	03/15/1999	Emergency	2 months 27 days
06/10/1999	07/20/1999	Warning	1 month 10 days
07/20/1999	09/30/1999	Emergency**	2 months 10 days
09/30/1999	02/25/2000	Warning	4 months 26 days
02/25/2000	05/05/2000	Watch	2 months 10 days
08/24/2001	05/13/2002	Watch	8 months 20 days
04/11/2006	06/30/2006	Watch	2 months 20 days
08/06/2007	02/15/2008	Watch	6 months 9 days
11/07/2008	01/26/2009	Watch	2 months 20 days
09/16/2010	11/10/2010	Watch	1 month 26 days
08/05/2011	09/02/2011	Watch	28 days
08/02/2016	11/03/2016	Watch	3 months 1 day
08/21/2020	02/04/2021	Watch	5 months, 14 days
**Gubernatorial Disaster Declaration			

4.3.1.4 Future Occurrence

It is difficult to forecast the exact severity and frequency of future drought events. Future climate change will lead to increased uncertainty and extremity of climate events, suggesting that it is best to be prepared for potentially adverse conditions. As Clearfield County has experienced severe drought between 5% - 10% of the time between 1895 and 1995 (*Figure 8 - Palmer Drought Severity Index* – a 100-year data collection), the report can be used to make a rough estimate of the future probability of drought in Clearfield County, although it does not account for changes introduced by climate change. Drought conditions are expected to become more severe with climate change, as evaporation and transpiration will increase with higher temperatures (Sheffield & Wood, 2008; EPA, 2016).

Figure 8 - Palmer Drought Severity Index

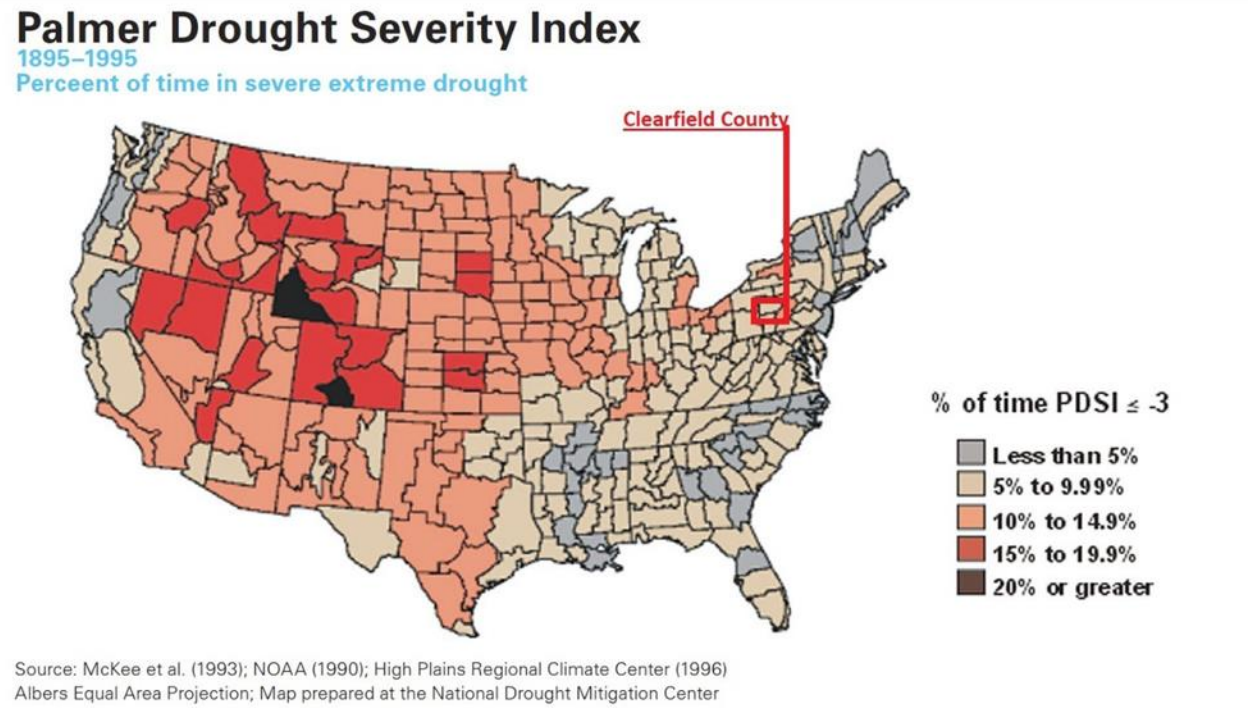
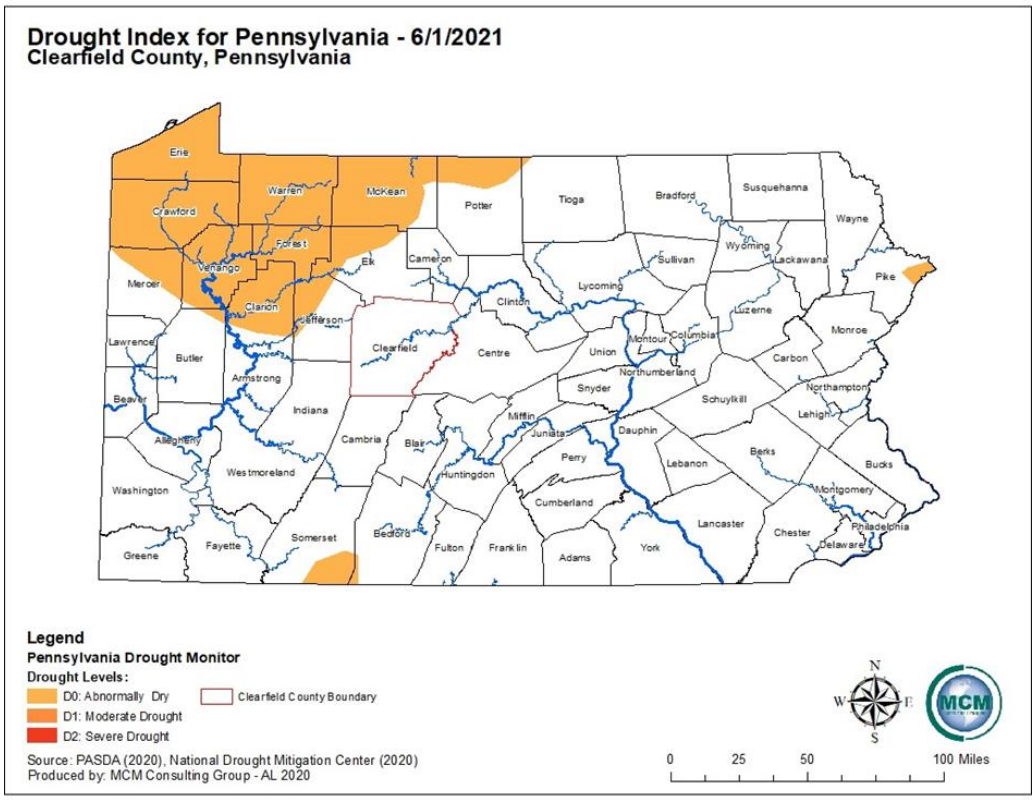


Figure 9 - Current Drought Index for Pennsylvania below shows that Clearfield County is currently in normal conditions. The last of the 2020 Drought Watches was lifted in February 2021, though Clearfield County was among the last three counties to have the designation removed.

Figure 9 - Current Drought Index for Pennsylvania



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

4.3.1.5 Vulnerability Assessment

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

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

Wildfire is the most severe secondary effect associated with drought. Wildfires can devastate wooded and agricultural areas, threatening natural resources and farm production facilities. Prolonged drought conditions can cause major ecological changes, such as increases in scrub growth, flash flooding, and soil erosion.

Droughts can have adverse effects on farms and other water-dependent industries. This can result in a local economic loss. The 2017 U.S. Census of Agriculture lists nearly 61,000 acres of prime agricultural land in Clearfield County and there are multiple recreational sites across the county dependent on consistent water sources and replenishment. From a societal perspective, public safety is an issue in terms of consumable water not being available, as well as water for fire protection and emergency services.

The most significant losses resulting from drought events are typically found in the agriculture and aquaculture sectors. The 1999 Gubernatorial Proclamation was issued in large 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 20% 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. The 2017 Census of Agriculture reports there were 497 farms in Clearfield County, at an average size of 123 acres. Clearfield County ranks 47th of sixty-seven counties in the commonwealth for agricultural production, totaling over

$28 million annually (USDA, 2017). Agricultural production from crops, including nursery and greenhouse crops, accounts for more than $7 million in commerce annually. Production from livestock, poultry, and their products accounts for $21 million annually.

A map of properties with tillable agricultural land use, forestry, and other land in the county vulnerable to drought is shown below at *Figure 10 - Drought-Vulnerable Land-Cover and Public Water Supply*.

Public or municipal water supplies are also vulnerable to the effects of drought because supply sources include rivers, reservoirs, and groundwater. Public water service areas cover only some of the land area in the county, as depicted in *Figures 10* and *11 – Drought-Vulnerable Land-Cover and Public Water Supply and Domestic Well Locations - Clearfield County*. The majority of the county relies on domestic wells for their fresh drinking water. Residents or water authorities that use private domestic wells are more vulnerable to droughts because their drinking water can literally dry up. There is a total of 2,412 domestic water wells in the county. It is

important to note that the well data was obtained from the Pennsylvania Groundwater Information System (PaGWIS). PaGWIS relies on voluntary submissions of well record data by well drillers; as a result, it is not a complete database of all domestic wells in the county. This is the most complete dataset of domestic wells available.

Through 2017, the USGS conducted many baseline water quality studies throughout Pennsylvania, but one for Clearfield County is not yet completed. The studies comprise a useful reference to get a general sense of the water quality and challenges associated with domestic water wells in the commonwealth. Competitive grants for the studies are available through the USGS Water Use Data and Research Program via www.grants.gov.

The EPA has provided a guide published in October 2017 for water utilities to aid in drought response and recovery. The guide outlines what goes into a good drought response plan, how to manage water supply and demand during a drought, best practices for communication and partnerships with other local utilities and provides case studies to discuss examples of drought management practices (EPA, 2017). The guide may be found here:

https://www.epa.gov/sites/production/files/2017-10/documents/drought_guide_final_508compliant_october2017.pdf.

Figure 10 - Drought Vulnerable Land-Cover and Public Water Supply

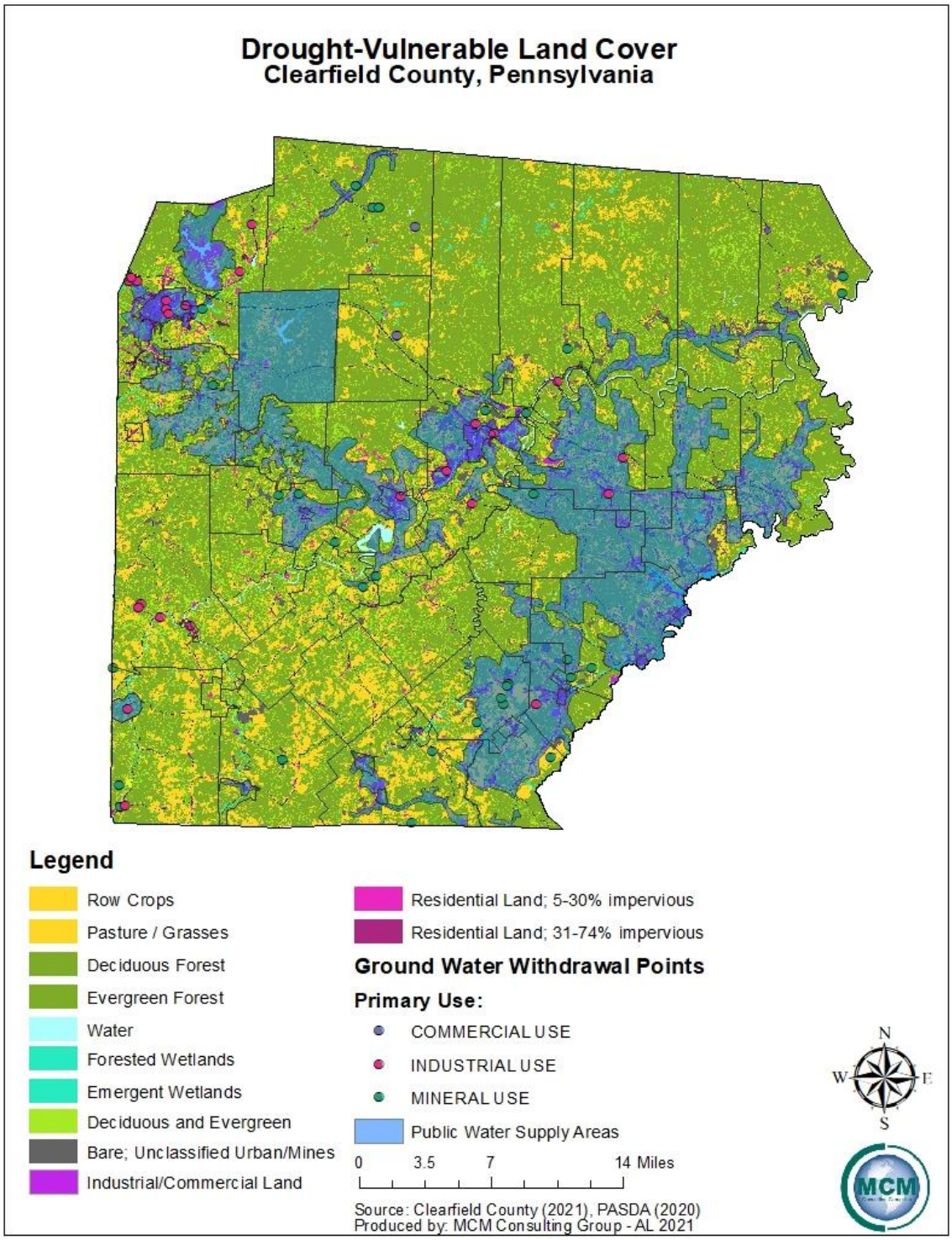
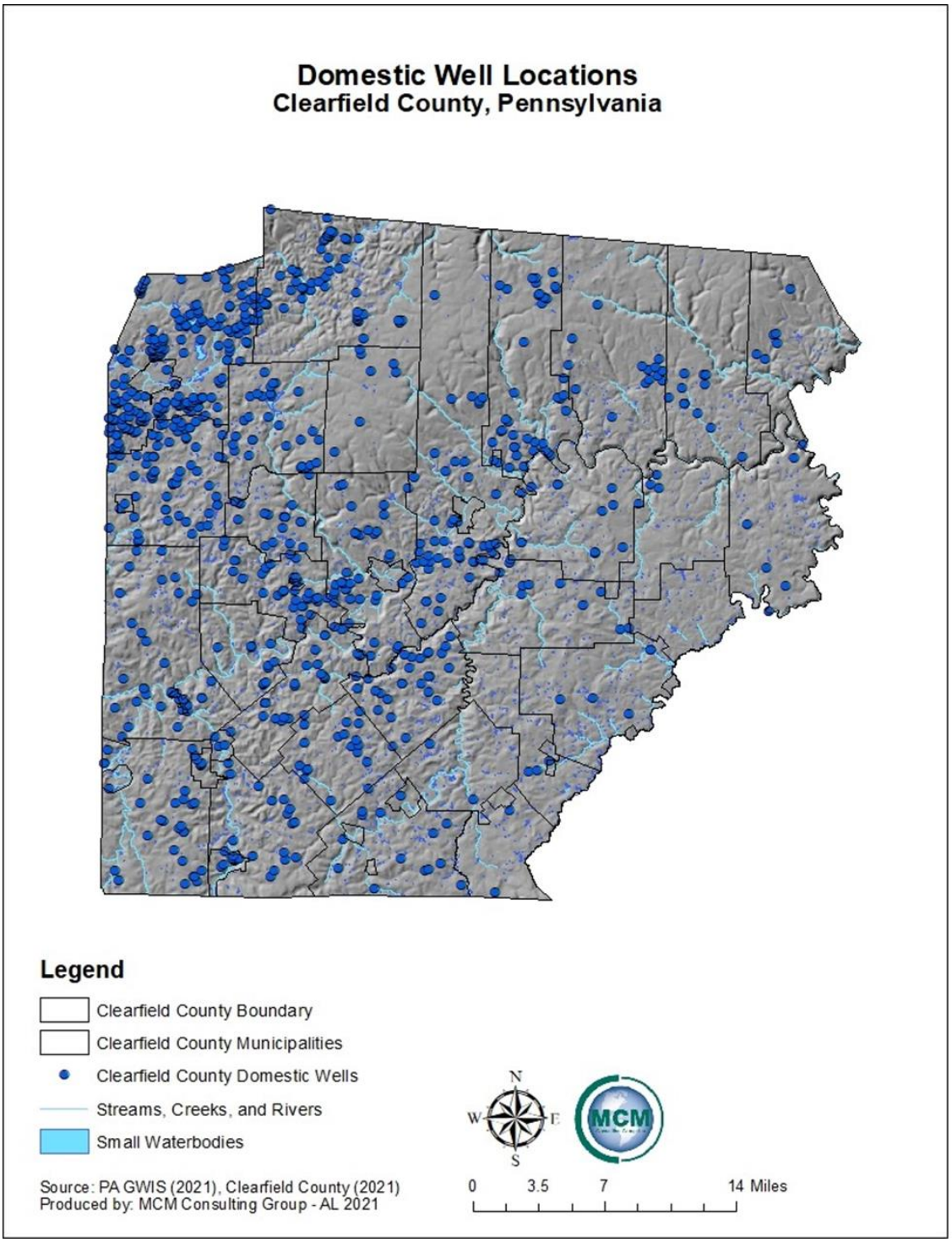


Figure 11 - Domestic Well Locations - Clearfield County

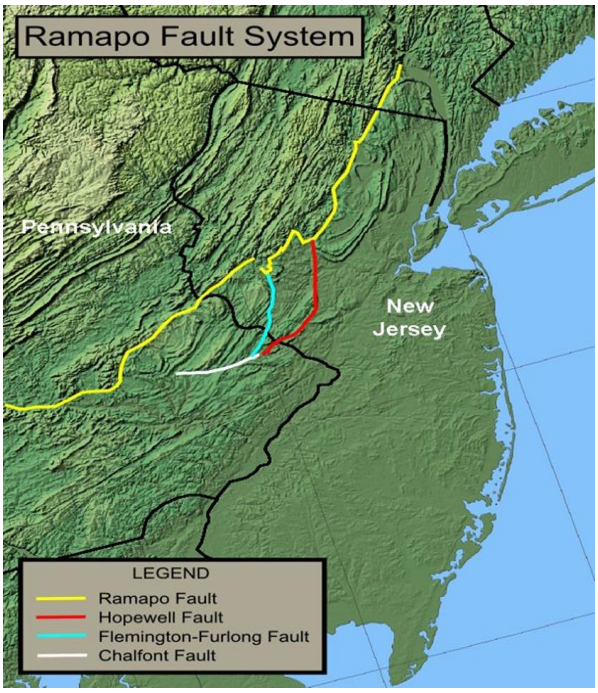


4.3.2. Earthquake

4.3.2.1 Location and Extent

An earthquake is sudden movement of the earth's surface caused by the release of stress accumulated within or along the edge off the earth's tectonic plates, a volcanic eruption, or by a human induced explosion (DCNR, 2007). Earthquake events in Pennsylvania, including Clearfield 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 Clearfield County, Pennsylvania, is far from the nearest plate boundary. That plate boundary is the Mid-Atlantic Ridge and is approximately 2,000 miles to the east, under the Atlantic Ocean. The Ramapo Fault System runs through New York, New Jersey, and eastern Pennsylvania (See *Figure 12 - Ramapo Fault System*). This fault system is associated with some small earthquakes, and it is thought unlikely to produce significant disruption.

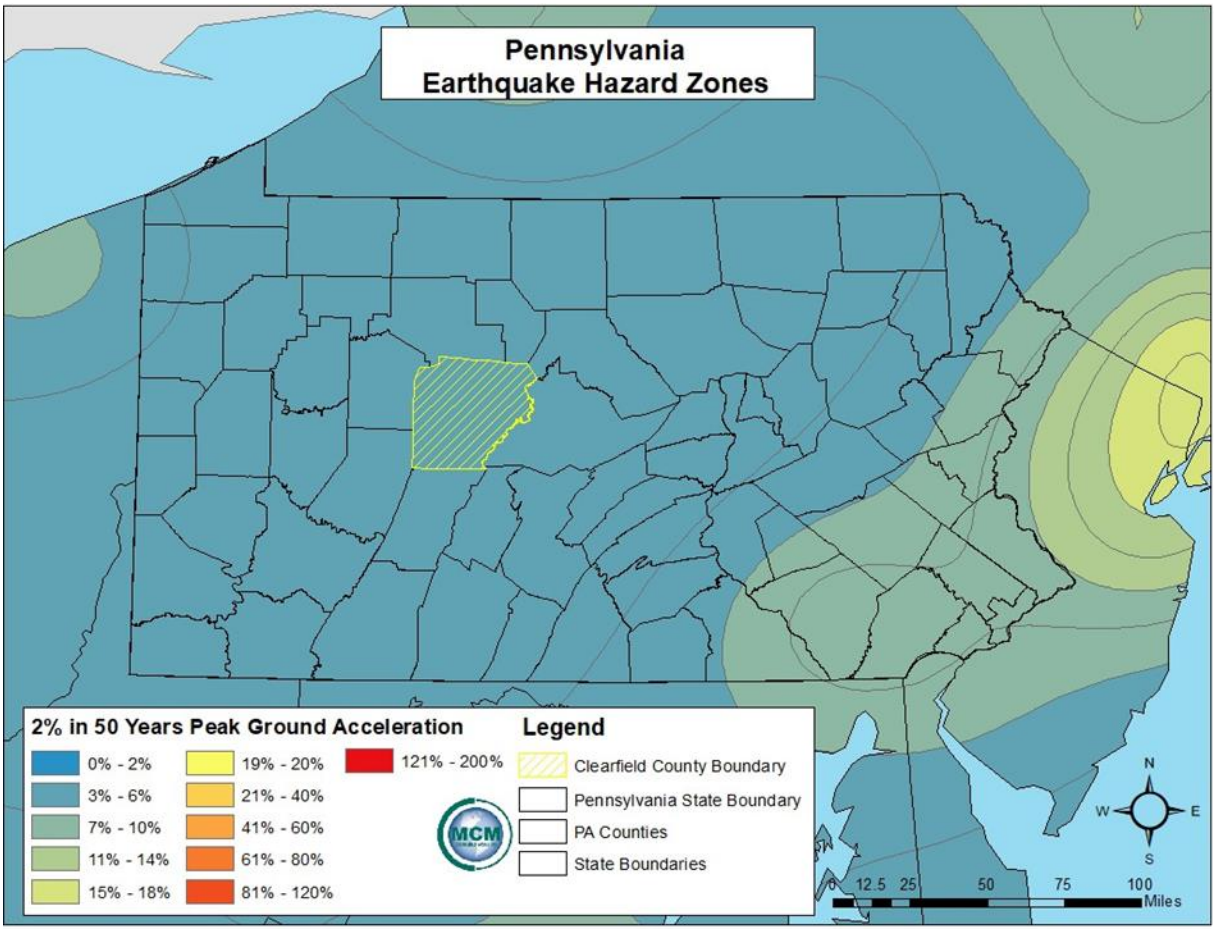
Figure 12 - Ramapo Fault System



When the supercontinent of Pangaea broke apart about 200 million years ago, the Atlantic Ocean began to form. Since then, many faults have developed. Locating all 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 Clearfield County is to conduct a probabilistic earthquake-hazard analysis with the earthquakes that have already happened in and around the county. (See *Figure 13 -*

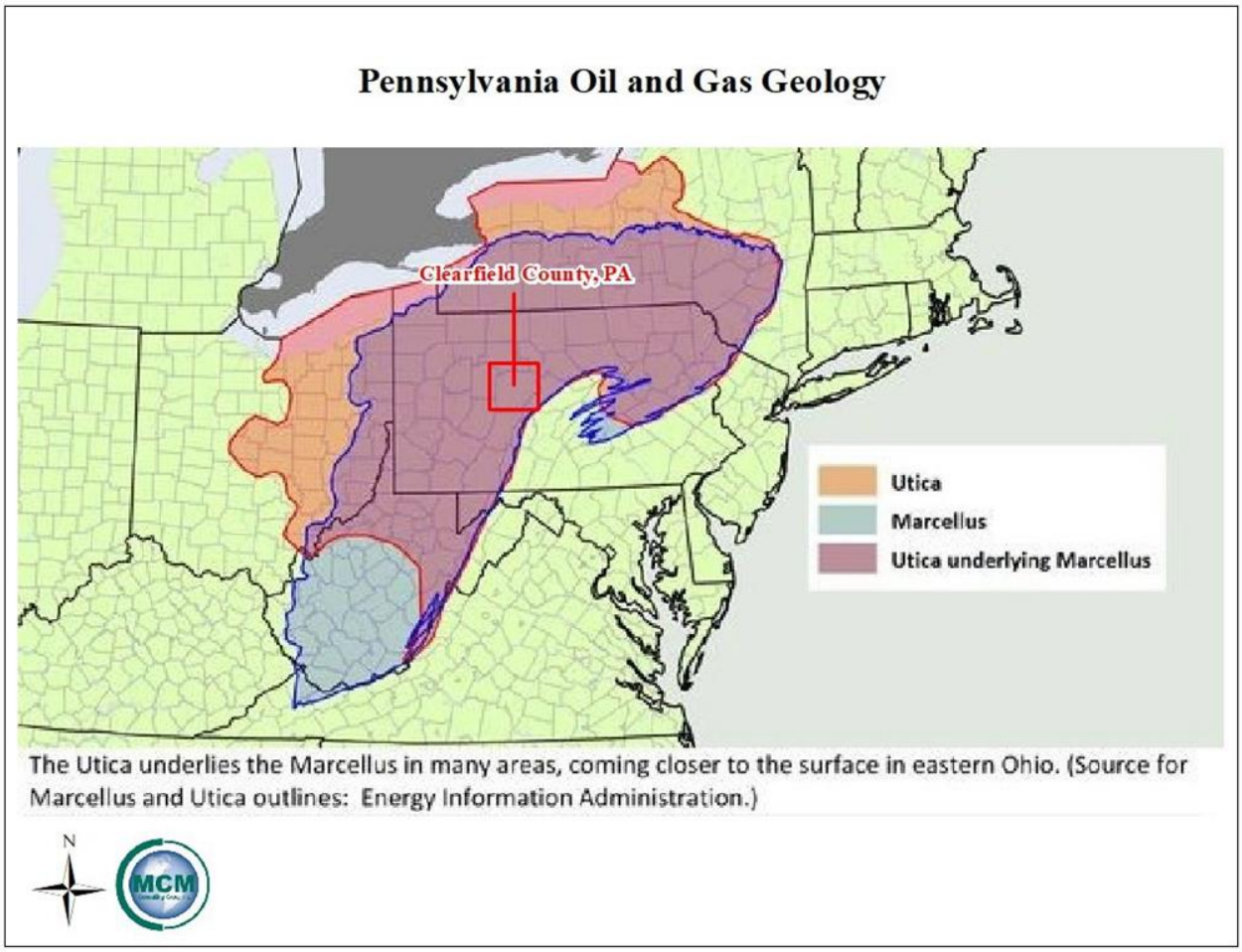
Pennsylvania Earthquake Hazard Zones). Nevertheless, the United States Geological Survey (USGS) indicates that Clearfield County has a low earthquake risk, and no historical earthquake events have occurred.

Figure 13 - Pennsylvania Earthquake Hazard Zones



Natural gas extraction of the Marcellus/Utica Shale formation (see *Figure 14 - Pennsylvania Oil and Gas Geology*) has occurred in many regions of the commonwealth. Hydraulic fracturing, or fracking, is used to extract the gas, and the process is thought to lead to an increase in seismic activity (Meyer, 2016).

Figure 14 - Pennsylvania Oil and Gas Geology



However, fracking does not appear to be linked to the increased rate of magnitude three and larger earthquakes (USGS 2014). In recent years, permits for extraction of the natural gas and oil in the commonwealth have been issued by the Pennsylvania Department of Environmental Protection, but no records of requested permits for gas extraction or injection wells were found for Clearfield County at the writing of this plan.

4.3.2.2 Range of Magnitude

Earthquakes result in the propagation of seismic waves, which are detected using seismographs. These seismograph results are measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. *Table 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 scaled by the impacts of the earthquake event. Earthquakes have

many secondary impacts, including disrupting critical facilities, transportation routes, public water supplies and other utilities.

Table 12 - Richter Scale

Richter Scale	
Richter Magnitude	**Earthquake Effects**
Less than 3.5	Not generally 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

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

Modified Mercalli Intensity Scale			
Scale	**Intensity**	**Earthquake Effects**	**Richter Scale Magnitude**
VII	**Very Strong**	Mild alarm, walls crack, plaster falls.	<6.1
VIII	**Destructive**	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged.	<6.9
IX	**Ruinous**	Some houses collapse, ground cracks, pipes break open.	<6.9
X	**Disastrous**	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread.	<7.3
XI	**Very Disastrous**	Most buildings and bridges collapse, roads, railways, pipes, and cables destroyed, general triggering of other hazards.	<8.1
XII	**Catastrophic**	Total destruction, trees fall, ground rises and falls in waves.	>8.1

4.3.2.3 Past Occurrence

According to USGS, no known earthquakes have had an epicenter within Clearfield County since 1724, before which local seismology cannot be known. However, several seismic events that occurred outside the county boundary may have been felt in the region.

On August 23, 2011, a 5.9 earthquake occurred in Virginia, and a 2.2 earthquake shook Reading, Pennsylvania (Berks County), on July 19, 2019. Further, a 3.4 earthquake struck Mifflintown (Juniata County) on June 13, 2019, and Bolivar (Westmoreland County) experienced a 2.9 event on October 6, 2020. Parts of the county may have experienced some of the shock waves from these minor earthquakes and others that have occurred around the region, most notably New Jersey. The strongest recorded earthquake in Pennsylvania history (5.2) occurred on September 25, 1998 in northwestern Pennsylvania and is known as the Pymatuning Earthquake for its epicenter near Pymatuning Lake. The effects of the earthquake were felt across the commonwealth and were blamed for many wells in the epicentral region drying up, while new springs and old wells began to flow. A three-month date range revealed 120 dry household-supply wells on the ridge of Jamestown and Greenville, Pennsylvania. Declines of up to 100 feet

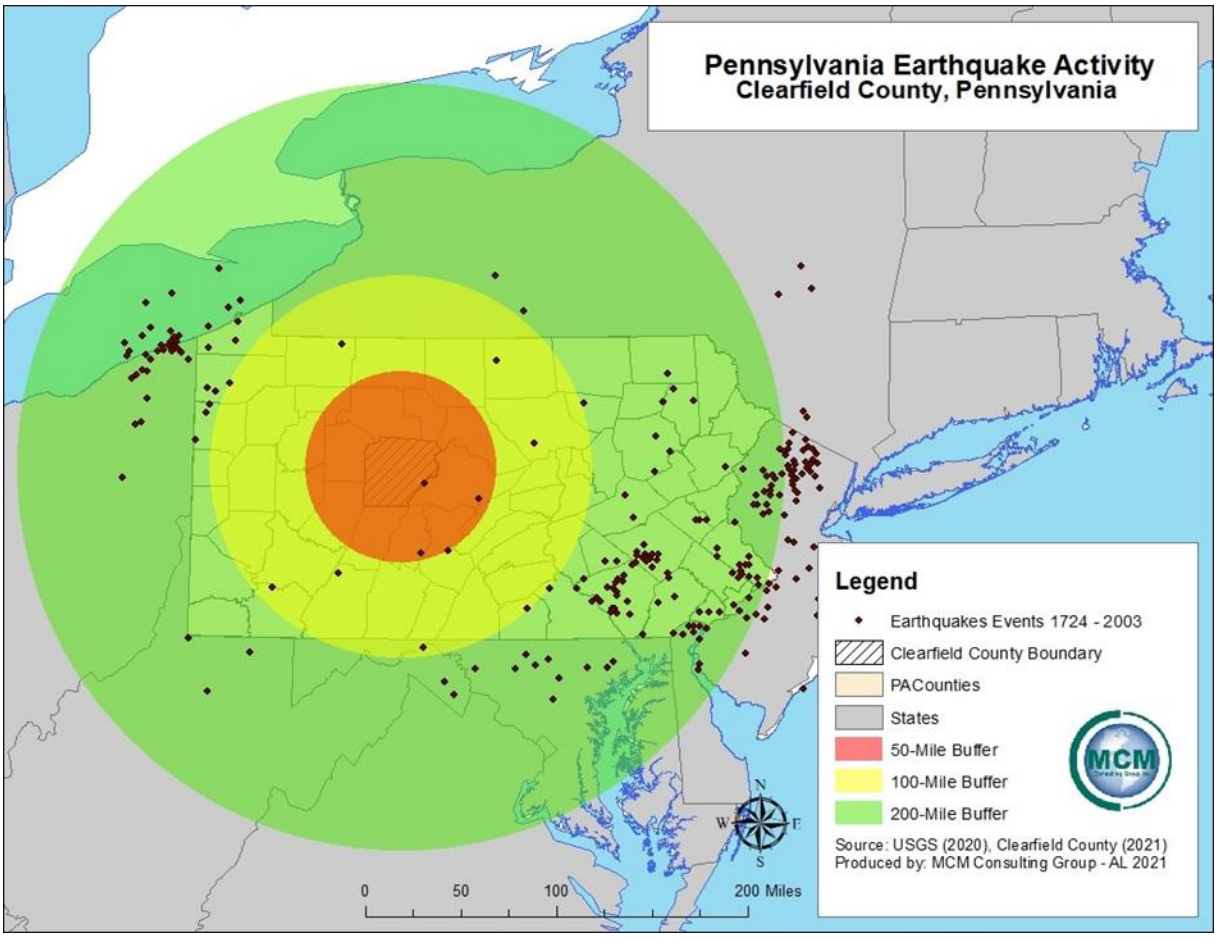
were observed on a ridge where at least eighty of the wells resided. The degree of the damage varied. Some of the wells lost all power or could barely hold their yields and some of the water in wells turned black or began to smell of sulfur.

The most likely cause of the wells drying was because of the increase in hydraulic conductivity or "fracking" of shale rock under this area caused by the earthquake. The quake affected the existing faults and created new faults in the shale.

This created more permeability for the water to leak down from the hilltops on the ridge down to the valleys following the contours of the Meadville shale.

Because the effects of large earthquakes can be felt hundreds of miles away, the historical earthquake epicenters near Clearfield County are shown below at *Figure 15 – Pennsylvania Earthquake Activity*. A wider depiction of earthquake occurrences in the northeastern United States may be found here: https://earthquake.usgs.gov/earthquakes/map/?extent=14.26438,-141.32813&extent=56.51102,-48.60352

Figure 15 – Pennsylvania Earthquake Activity



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 13 – Pennsylvania Earthquake Hazard Zones* in 4.3.2.1 shows that Clearfield County is in a low hazard zone for earthquake activity according to the USGS (2014), suggesting a low probability of earthquake occurrence. However, according to the USGS, there has been a recent trend increasing the frequency of magnitude three and larger earthquakes in the central and eastern U.S. (*Table 14 - Recent Earthquake Trends in Central and Eastern United States*). This uptick in seismicity is due to hydraulic fracturing activities, and specifically occurs as a result of wastewater from the fracking process being injected into the earth (Meyer, 2016). Recent studies have moved towards being

able to predict such induced seismicity by looking at uplift after injections, but more work needs to be done to confirm uplift as a reliable indicator of induced seismicity (Shirzei et al., 2016). It is important to note that seismicity can occur even after wells become inactive and injection rates decline (Shirzaei et al., 2016).

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

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

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

Earthquake Trends in Northeastern U.S. ***(USGS, 2020)***	
Year	**Number of Magnitude 3+ Earthquakes**
2015	0
2016	3

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

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 Clearfield County, this could include surface faulting, ground shaking, landslides, liquefaction, dried up or rejuvenated water wells, tectonic deformation, and seiches (sloshing of a closed body of water from earthquake shaking).

Earthquakes usually occur without warning and can impact areas a great distance from their

point of origin (epicenter). Ground shaking is the greatest risk to building damage within Clearfield County. Risk to public safety and loss of life from an earthquake is dependent upon the severity and proximity of the event. Injury or death to those inside buildings, or people walking below building ornamentation and chimneys is a higher risk to Clearfield County's general public during an earthquake. Infrastructure is more at risk on the east coast than the west coast because its buildings are older.

4.3.3. Flood, Flash Flood, and Ice Jam

4.3.3.1 Location and Extent

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

degree of vegetative clearing, and the presence of impervious cover must also be considered when determining the severity of a flood or flood event.

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

Floodplains are lowlands adjacent to rivers, streams, and creeks that are subject to recurring floods. The size of the floodplain is described by the recurrence interval of a given flood. 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 16 – Flooding and Floodplain Diagram*. Structures located within the SFHA have a 26% chance of flooding in a thirty-year period. The SFHA serves as the primary regulatory boundary used by FEMA, the Commonwealth of Pennsylvania, and the Clearfield County local government. Federal floodplain management regulations and mandatory flood insurance purchase requirements apply to the following high-risk special flood hazard areas in

Table 15 – Flood Hazard High Risk Zones. Appendix D of this hazard mitigation plan includes a flooding vulnerability map for each municipality in Clearfield County with vulnerable structures and critical infrastructure facilities identified using the most current DFIRM data for Clearfield County.

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

Figure 16 – Flooding and Floodplain Diagram

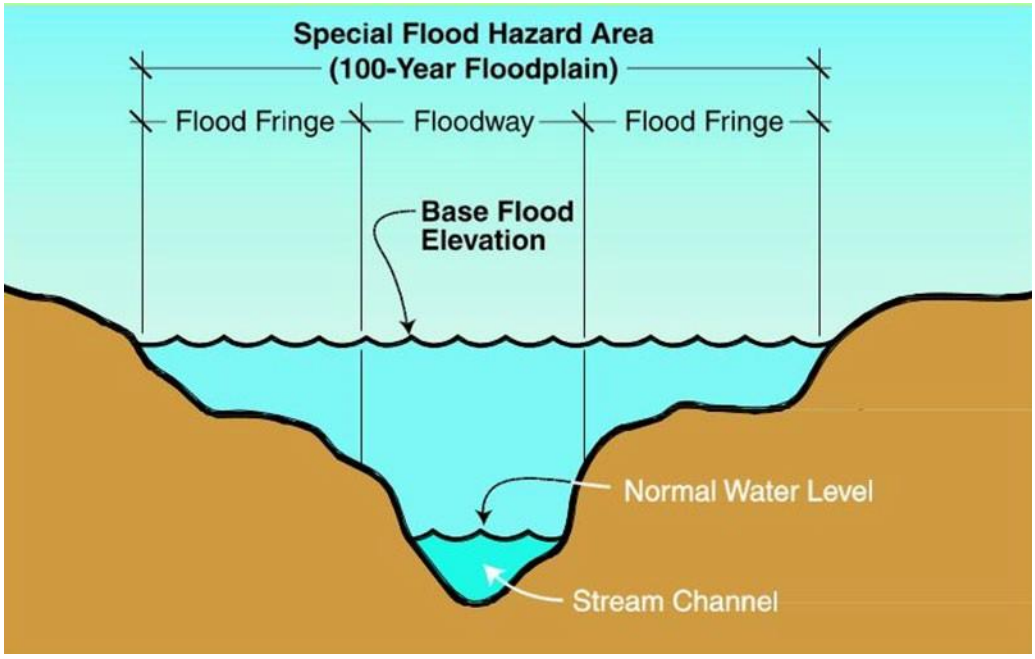


Table 15 - Flood Hazard High Risk Zones

Flood Hazard High Risk Zones *(FEMA, 2017)*	
Zone	**Description**
A	Areas subject to inundation by the 1% annual chance flood event. Because detailed hydraulic analysis has not been performed, no base flood elevations or flood depths are shown
AE	Areas subject to inundation by the 1% annual chance flood event determined by detailed methods. BFEs are shown within these zones.

4.3.3.2 Range of Magnitude

The West Branch Susquehanna River Basin has caused significant flooding in Clearfield County, specifically on the following streams, creeks, and their tributaries:

- West Branch Susquehanna River
  - Clearfield Creek
  - Chest Creek
  - Sandy Lick Creek

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

Urbanization typically results in the replacement of vegetative ground cover with impermeable surfaces like asphalt and concrete, increasing the volume of surface runoff and stormwater, particularly in areas with poorly planned stormwater drainage systems. A large amount of rainfall over a short time span can cause flash flood events. Additionally, small amounts of rain can cause floods in locations where the soil is still frozen, saturated from a previous wet period, or if the area is largely covered in impermeable surfaces such as parking lots, paved roadways, and other developed areas. The county occasionally experiences intense rainfall from a tropical storm in late summer and early fall, which can potentially cause flooding as well.

Severe flooding can cause injuries and death and can have long-term impacts on the health and safety of citizens. Severe flooding can also result in significant property damage, potentially disrupting the regular function of functional needs 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 functional 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 the flood water releases and/or transports hazardous materials.

The most severe flooding in Central Pennsylvania has been associated with the Susquehanna River Basin. The greatest magnitude of county wide flooding impacts was reported as a result of Hurricane Agnes in 1972. Hurricane Agnes deposited a large amount of rain on Ohio, western Pennsylvania, northern West Virginia, and southwestern New York, with an average of 8 ½ inches of rain reported over most areas. This large amount of rain contributed to widespread and record setting flooding across the Commonwealth of Pennsylvania. Pennsylvania had an estimated $2.1 billion in damage and 48 deaths. In localized impact in Clearfield County, one of the costliest flood events occurred at Penn Traffic Riverside, where it was reported that there were 300 tons of ruined merchandise and damage exceeded $1,000,000.00 (Dubois Area Historical Society, 2016). In portions of the West Branch Susquehanna River above the borough of Clearfield, rainfall exceeded eight inches as a result if Agnes. The maximum flood of record along Sandy Lick Creek occurred in June 1972 after three days of torrential rainfall. The worst flooding occurred in the City of Dubois, when all lowland areas were submerged and residences, businesses, industries, utilities, communication facilities, highways, and railroads were damaged from floodwaters (FEMA, 2011).

Flash floods can occur very quickly and with little warning. Flash floods can also be deadly because of the rapid rise in water levels and devastating flow velocities. The more developed areas in the county can be easily susceptible to flash floods because of the significant presence of impervious surfaces, such as streets, sidewalks, parking lots, and driveways.

Severe flooding also causes secondary effects that could have long lasting impacts on the population, economy, and infrastructure within Clearfield 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 fail, causing sewage overflows and the contaminating of groundwater and drinking water. Flooding also has the potential to trigger other hazards, such as landslides, hazardous material spills, and dam failures.

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

Estimation of potential loss is completed through FEMA's HAZUS software, A level two HAZUS scenario was performed for the entirety of Clearfield County and there were no failed reaches within the scenario. The FEMA reports generated by the software at the end of the scenario were utilized to estimate the amount of damage and loss from a flood. The total building loss for a 100-year flood based on a HAZUS level two scenario is displayed in *Table 16 – HAZUS Building Economic Loss Figures*. The total business interruption values occurring from a proposed 100-year flood based on FEMA HAZUS data is illustrated in *Table 17 – HAZUS Business Interruption Economic Loss Figures*. *Figure 17 – Loss by Occupancy Type* illustrates the breakdown of economic losses by either residential, commercial, industrial, or other use type.

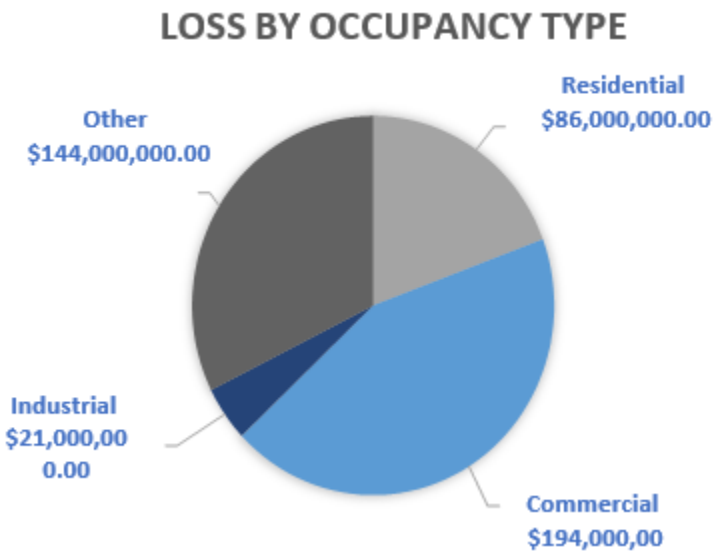
Table 16 - HAZUS Building Loss Figures

HAZUS Building Economic Loss Figures (HAZUS 2021)					
	Residential	**Commercial**	**Industrial**	**Other**	**Total**
Building:	$37,650,000.00	$14,550,000.00	$4,780,000.00	$2,490,000.00	$59,470,000.00
Content:	$17,670,000.00	$47,250,000.00	$12,010,000.00	$14,460,000.00	$91,390,000.00
Inventory:	$0.00	$1,320,000.00	$2,130,000.00	$40,000.00	$3,490,000.00
Subtotal:	**$55,330,000.00**	**$63,110,000.00**	**$18,920,000.00**	**$16,990,000.00**	**$154,350,000.00**

Table 17 - HAZUS Business Interruption Economic Loss Figures

HAZUS business Interruption Economic Loss Figures (HAZUS 2021)					
	Residential	**Commercial**	**Industrial**	**Other**	**Total**
Income:	$2,200,000.00	$46,620,000.00	$540,000.00	$7,170,000.00	$56,520,000.00
Relocation:	$15,220,000.00	$15,010,000.00	$490,000.00	$4,540,000.00	$35,270,000.00
Rental Income:	$7,640,000.00	$10,500,000.00	$110,000.00	$500,000.00	$18,740,000.00
Wage:	$5,200,000.00	$58,640,000.00	$660,000.00	$114,740,000.00	$179,230,000.00
Subtotal:	**$30,270,000.00**	**$130,770,000.00**	**$1,790,000.00**	**$126,940,000.00**	**$289,770,000.00**

Figure 17 - Loss by Occupancy Type



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

4.3.3.3 Past Occurrence

Clearfield County has experienced numerous flooding, flash flooding, and ice jam events in the past. The flooding and flash flooding were caused by a variety of heavy storms, tropical storms, and other issues. A summary of flood event history for Clearfield County from January 1996 to May 2021 is found in *Table 18 – Past Flood and Flash Flood Events*. Details of each event can be found in NOAA's National Center for Environmental Information (NCEI) database. Additional data was also acquired by examining Clearfield County's Knowledge Center information from 2013 to 2021.

Table 18 - Past Flood and Flash Flood Events

Past Flood and Flash Flood Events (NCEI NOAA)			
Event Location	**Event Date**	**Event Type**	**Property Damage Estimate**
Clearfield County (entire county)	01/19/1996	Flood	$0*
Clearfield County (entire county)	01/19/1996	Flash Flood	$0*
Coalport Borough	02/20/1996	Flash Flood	$0*
Clearfield County (entire county)	07/19/1996	Flash Flood	$0*
Bradford Township	08/08/1996	Flash Flood	$0*
Morris Township	09/06/1996	Flash Flood	$0*
Clearfield County (entire county)	02/05/1997	Flash Flood	$0*
Clearfield County (entire county)	06/18/1997	Flash Flood	$0*
Clearfield County (entire county)	11/07/1997	Flash Flood	$0*
Clearfield County (entire county)	04/26/1998	Flash Flood	$0*
Clearfield County (North)	07/31/2000	Flash Flood	$0*
City of Dubois	08/02/2000	Flash Flood	$10,000.00*
City of Dubois	05/12/2002	Flash Flood	$0*
Curwensville Borough	06/27/2002	Flash Flood	$0*
City of Dubois	07/27/2003	Flash Flood	$150,000.00*
Chester Hill Borough	08/09/2003	Flash Flood	$10,000.00

Past Flood and Flash Flood Events (NCEI NOAA)			
Event Location	**Event Date**	**Event Type**	**Property Damage Estimate**
Clearfield County (entire county)	11/19/2003	Flood	$0*
Clearfield County (entire county)	11/19/2003	Flash Flood	$0*
Clearfield County (entire county)	01/05/2004	Flood	$0*
City of Dubois	05/18/2004	Flash Flood	$0*
Clearfield County (entire county)	05/21/2004	Flood	$0*
Mahaffey Township	05/21/2004	Flash Flood	$200,000.00*
Clearfield County (entire county)	09/08/2004	Flood	$0*
Clearfield County (entire county)	09/17/2004	Flood	$0*
Mahaffey Township	06/25/2006	Flash Flood	$0*
Clearfield County (entire county)	11/16/2006	Flash Flood	$0*
Clearfield County (entire county)	06/02/2007	Flash Flood	$0*
Clearfield County (entire county)	03/04/2008	Flood	$0*
City of Dubois	01/25/2010	Flood	$0*
Clearfield County (entire county)	03/13/2010	Flood	$0*
Clearfield County (entire county)	09/30/2010	Flood	$0*
Lawrence Township	02/18/2011	Flash Flood	$0*
Clearfield County (entire county)	03/09/2011	Flash Flood	$0*
Mahaffey Township	09/10/2011	Flash Flood	$0*
Huston Township	12/01/2010	Flood	$0*
City of Dubois	06/27/2013	Flood	$200,000.00*
Sandy Township	06/27/2013	Flash Flood	$3,000,000.00*

Past Flood and Flash Flood Events (NCEI NOAA)			
Event Location	**Event Date**	**Event Type**	**Property Damage Estimate**
Mahaffey Township	07/10/2013	Flash Flood	$0*
Sandy Township	05/21/2014	Flash Flood	$0*
Goshen Township	07/18/2015	Flash Flood	$0*
Goshen Township	06/02/2016	Flash Flood	$0*
Clearfield County (North)	05/29/2017	Flash Flood	$0*
Morris Township	05/29/2017	Flash Flood	$0*
Coalport Borough	07/14/2017	Flash Flood	$0*
Clearfield County (entire county)	01/13/2018	Flood	$0*
Glen Hope Borough	09/10/2018	Flood	$0*
Morris Township	10/02/2018	Flash Flood	$0*
Sandy Township	10/02/2018	Flash Flood	$0*
Clearfield County (entire county)	10/02/2018	Flash Flood	$0*
Chester Hill Borough	03/29/2020	Flood	$0*
		Total:	**$3,570,000.00***
*Property Damage Values are estimated and are not exact figures. Data from NCEI and Knowledge Center			

The National Flood Insurance Program (NFIP) identifies properties that frequently experience flooding. Repetitive loss properties are structures insured under the NFIP which have had at least two paid flood losses of more than $1,000 over any ten-year period since 1978. The hazard mitigation assistance (HMA) definition of a repetitive loss property is a structure covered by a contract for flood insurance made available under the NFIP that has incurred flood-related damage on two occasions, in which the cost of repair, on average, equaled or exceeded 25% of the market value of the structure at the time of each such flood event; and at the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage. *Table 19 – Repetitive Loss Properties* illustrates the communities that have repetitive loss properties, the total building payments, the contents payments, and the number of losses and properties. There are seventy-one repetitive loss properties in Clearfield County. *Table 20 – Summary of type of Repetitive Loss Properties by Municipality* illustrates the use type and the location of said properties in Clearfield County.

A property is considered a severe repetitive loss property either when there are at least four losses each exceeding $5,000 or when there are two or more losses where the building payments exceed the property value. *Table 21 – Severe Repetitive Loss Properties* illustrates the communities within Clearfield County that have severe repetitive loss properties, the total building payments, the contents payments, and the number of losses and properties. The data used in the table is based on data provided by PEMA.

Most municipalities in Clearfield County participate in the NFIP. Information of each participating municipality can be found in *Table 22 – Municipal NFIP Policies & Vulnerability*.

Table 19 - Repetitive Loss Properties

Repetitive Loss Properties (PEMA)						
Community Name	**Community Number**	**Cumulative Building Payment**	**Cumulative Contents Payment**	**Sum of Total Paid**	**Losses**	**Properties**
Beccaria Township	421512	$49,294.18	$6,909.83	$56,204.01	6	2
Bell Township	421513	$30,946.37	$10,862.40	$41,808.77	4	2
Burnside Township	421515	$4,329.52	$218.99	$4,548.51	5	2
Chester Hill Borough	420299	$90,258.01	$15,867.60	$106,125.61	4	2
City of Dubois	420303	$1,162,804.95	$19,411.94	$1,182,216.89	72	33
Clearfield Borough	420300	$35,423.73	$401.90	$35,825.63	11	3
Coalport Borough	420301	$183,258.29	$85,644.25	$268,902.25	22	8
Curwensville Borough	420302	$12,226.64	$0.00	$12,226.64	4	2
Huston Township	421525	$84,087.15	$11,100.24	$95,187.39	6	2
Irvona Borough	420308	$47,686.59	$15,089.28	$62,775.87	5	1
Lawrence Township	421528	$124,921.22	$0.00	$124,921.22	4	2

Repetitive Loss Properties (PEMA)						
Community Name	**Community Number**	**Cumulative Building Payment**	**Cumulative Contents Payment**	**Sum of Total Paid**	**Losses**	**Properties**
Mahaffey Borough	420310	$47,723.32	$1,409.34	$49,132.66	7	3
Sandy Township	421191	$71,066.22	$0.00	$71,066.22	12	5
Westover Borough	420317	$50,698.02	$0.00	$50,698.02	6	3
	Total:	**$2,013,568.48**	**$172,372.06**	**$2,185,940.54**	**170**	**71**

Table 20 - Summary of Type of Repetitive Loss Properties by Municipality

Summary of Type of Repetitive Loss Properties by Municipality					
Municipality	**Type**				
	Non-Residential	**2-4 Family**	**Single Family**	**Condo**	**Other Residential**
Beccaria Township	0	0	2	0	0
Bell Township	0	0	1	1	0
Burnside Township	0	0	1	1	0
Chester Hill Borough	0	0	2	0	0
Clearfield Borough	0	0	3	0	0
City of Dubois	14	5	13	0	1
Coalport Borough	2	0	6	0	0
Curwensville Borough	2	0	0	0	0
Huston Township	0	0	2	0	0
Irvona Borough	0	0	1	0	0
Lawrence Township	0	1	0	0	1
Mahaffey Borough	0	0	3	0	0
Sandy Township	0	0	5	0	0
Westover Borough	0	0	3	0	0

Table 21 - Severe Repetitive Loss Properties

Severe Repetitive Loss Properties (PEMA)						
Community Name	**Community Number**	**Cumulative Building Payments**	**Cumulative Contents Payments**	**Sum of Total Paid**	**Losses**	**Properties**
City of Dubois	420303	$9,249.54	$0.00	$9,249.54	2	1
Irvona Borough	420308	$47,686.59	$15,089.28	$62,775.87	5	1
Westover Borough	420317	$11,832.29	$0.00	$11,832.29	2	1
	Total:	**$68,768.42**	**$15,089.28**	**$73,201.70**	**2**	**1**

Table 22 - Municipal NFIP Policies & Vulnerability

Municipal NFIP Policies (PEMA 2020)					
Community Name	**Community Number**	**Contract Count**	**Policy Count**	**Total Coverage**	**Premium and Policy Fee**
Beccaria Township	421512	7	7	$332,500.00	$4,239.00
Bell Township	421513	5	5	$211,200.00	$3,162.00
Bigler Township	421514	7	7	$706,200.00	$5,461.00
Bradford Township	422245	25	25	$3,867,600.00	$19,806.00
Brady Township	421517	2	2	$92,000.00	$940.00
Brisbin Borough	420297	1	1	$50,000.00	$610.00
Burnside Borough	420298	5	5	$543,700.00	$4,351.00
Burnside Township	421518	5	5	$251,700.00	$3,035.00
Chester Hill Borough	420299	9	9	$1,333,600.00	$4,288.00
City of Dubois	420303	93	93	$17,450,700.00	$146,629.00
Clearfield Borough	420300	10	10	$1,759,300.00	$12,930.00

Municipal NFIP Policies (PEMA 2020)					
Community Name	**Community Number**	**Contract Count**	**Policy Count**	**Total Coverage**	**Premium and Policy Fee**
Coalport Borough	420301	13	13	$829,800.00	$11,277.00
Curwensville Borough	420302	11	11	$1,256,900.00	$9,247.00
Ferguson Township	420260	21	21	$5,440,500.00	$20,906.00
Girard Township	421363	12	12	$2,855,000.00	$8,015.00
Goshen Township	422382	5	5	$521,500.00	$3,167.00
Grampian Borough	420306	3	3	$665,000.00	$1,560.00
Greenwood Township	421523	1	1	$84,000.00	$1,015.00
Gulich Township	421524	1	1	$280,000.00	$378.00
Houtzdale Borough	420307	4	4	$227,500.00	$2,745.00
Huston Township	421525	16	16	$1,752,800.00	$11,352.00
Irvona Borough	420308	6	6	$445,900.00	$3,282.00
Karthaus Township	421526	2	2	$211,500.00	$981.00
Lawrence Township	421528	68	68	$7,841,600.00	$60,878.00
Mahaffey Borough	420310	2	2	$87,300.00	$1,268.00
Morris Township	421529	2	2	$90,900.00	$1,007.00
New Washington Borough	420312	1	1	$210,000.00	$378.00
Newburg Borough	422405	1	1	$90,200.00	$1,110.00
Osceola Mills Borough	420313	5	5	$708,500.00	$3,364.00
Penn Township	421530	3	3	$529,700.00	$1,465.00
Sandy Township	421191	36	36	$5,547,400.00	$28,821.00

Municipal NFIP Policies (PEMA 2020)					
Community Name	**Community Number**	**Contract Count**	**Policy Count**	**Total Coverage**	**Premium and Policy Fee**
Westover Borough	420317	3	3	$276,000.00	$1,864.00
Woodward Township	421532	2	2	$154,500.00	$1,826.00
	Total:	**387**	**387**	**$54,132,200.00**	**$381,354.00**

4.3.3.4 Future Occurrence

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

A property's vulnerability to a flood is dependent upon its location in the floodplain. Properties along the banks of a waterway are the most vulnerable. The property within the floodplain is broken into sections depending on its distance from the waterway. The ten-year flood zone has a 10% chance of being flooded every year. However, this label does not mean that this area cannot flood more than once every ten years. This label simply designates the probability of a flood of this magnitude every year. Further away from this area is the fifty-year floodplain. This area includes all of the ten-year floodplain plus additional property. The probability of a flood of this magnitude occurring during a one-year period is 2%. A summary of flood probability is shown in *Table 23 – Flood Probability Summary*.

Table 23 - Flood Probability Summary

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%

4.3.3.5 Vulnerability Assessment

River and Stream Flooding:

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

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

While the regulatory one-hundred-year floodplain is defined by the NFIP and FEMA as a useful tool to estimate flooding vulnerability, it is important to note that it is not always completely accurate.

Table 24 – Structures by Municipality illustrates the number of residential structures and commercial structures that are located within each municipality in Clearfield County. This list is not comprehensive but provides an approximate value of site structure address points.

Table 25 – Expected Damage to Essential Facilities (HAZUS) illustrates the estimated damage levels to certain essential facilities based on classifications in the HAZUS General Building Stock. There are two facilities that are estimated to be at least moderately damaged by a 100-year

flooding event in the HAZUS Level Two scenario that was completed for Clearfield County. Of those facilities, one of those will experience a loss of use due to the 100-year flood event. That facility is a school and would result in the relocation of students for educational purposes while cleanup efforts from this scenario are carried out. With this potential scenario in mind, contingency plans should be made to relocate school resources in case this scenario proves true, and if such plans do not exist, the planning should begin. This information is also presented in Appendix F of this Hazard Mitigation Plan.

Table 26 - County Structures Within Special Flood Hazard Area shows the number of site structure address points within the Special Flood Hazard Area as well as the critical infrastructure facilities and functional needs facilities. This information was compiled using the Special Flood Hazard Area and GIS data provided by the Clearfield County GIS Department.

Table 27 – Critical Infrastructure and Functional Needs Additional Information illustrates the additional information including name, the municipality, and the type of facility for each critical infrastructure and functional needs facilities that falls within the Special Flood Hazard Area for Clearfield County. This information was compiled using Clearfield County's GIS Information with the assistance of the Clearfield County GIS Department.

Table 24 - Structure by Municipality

Municipality	Number of Structures
Beccaria Township	957
Bell Township	752
Bigler Township	701
Bloom Township	252
Boggs Township	921
Bradford Township	1,511
Brady Township	958
Brisbin Borough	202
Burnside Borough	124
Burnside Township	620
Chest Township	322
Chester Hill Borough	372
City of DuBois	3,688
Clearfield Borough	2,946
Coalport Borough	227
Cooper Township	1,410
Covington Township	471
Curwensville Borough	1,150
Decatur Township	1,561
Falls Creek Borough	24

Municipality	Number of Structures
Ferguson Township	317
Girard Township	570
Glen Hope Borough	70
Goshen Township	427
Graham Township	700
Grampian Borough	181
Greenwood Township	267
Gulich Township	691
Houtzdale Borough	414
Huston Township	1,125
Irvona Borough	285
Jordan Township	304
Karthaus Township	411
Knox Township	362
Lawrence Township	3,731
Mahaffey Borough	171
Morris Township	1,460
New Washington Borough	46
Newburg Borough	55
Osceola Mills Borough	528
Penn Township	651
Pike Township	1,122
Pine Township	171
Ramey Borough	238
Sandy Township	5,438
Troutville Borough	102
Union Township	562
Wallaceton Borough	135
Westover Borough	191
Woodward Township	900
TOTAL	**40,794**

Table 25 - Expected Damage to Essential Facilities (HAZUS)

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

Fire Stations	40	1	0	0
Hospitals	3	0	0	0
Police Stations	9	0	0	0
Schools	40	1	0	1

Table 26 - County Structures Within Special Flood Hazard Area

County Structures Within Special Flood Hazard Area			
Municipality	**Site Structure Address Points Within Flood Area**	**Critical Infrastructure Within Flood Area**	**Functional Needs within Flood Area**
Beccaria Township	25	0	0
Bell Township	35	0	0
Bigler Township	18	0	0
Bloom Township	0	0	0
Boggs Township	13	0	0
Bradford Township	8	0	0
Brady Township	3	0	0
Brisbin Borough	1	0	0
Burnside Borough	40	0	0
Burnside Township	24	0	0
Chest Township	2	0	0
Chester Hill Borough	53	0	0
Clearfield Borough	66	0	0
Coalport Borough	46	0	0
Cooper Township	1	0	0
Covington Township	2	0	0
Curwensville Borough	52	0	0
Decatur Township	27	0	0
City of Dubois	434	2	4
Ferguson Township	2	0	0
Girard Township	7	0	0
Glen Hope Borough	1	0	0
Goshen Township	22	0	0
Graham Township	9	0	0
Grampian Borough	2	0	0
Greenwood Township	10	0	0
Gulich Township	3	0	0
Houtzdale Borough	20	0	0
Huston Township	123	0	0

County Structures Within Special Flood Hazard Area			
Municipality	**Site Structure Address Points Within Flood Area**	**Critical Infrastructure Within Flood Area**	**Functional Needs within Flood Area**
Irvona Borough	40	0	0
Jordan Township	1	0	0
Karthaus Township	30	0	0
Know Township	4	0	0
Lawrence Township	371	0	0
Mahaffey Borough	15	0	0
Morris Township	4	0	0
New Washington Borough	0	0	0
Newburg Borough	3	0	0
Osceola Mills Borough	27	0	0
Penn Township	0	0	0
Pike Township	21	0	0
Pine Township	0	0	0
Ramey Borough	0	0	0
Sandy Township	103	0	0
Troutville Borough	0	0	0
Union Township	8	0	0
Wallaceton Borough	0	0	0
Westover Borough	34	0	0
Woodward Township	16	0	0
Total:	**1,726**	**2**	**4**

Table 27 - Critical Infrastructure and Functional Needs Additional Information

Critical Infrastructure and Functional Needs Additional Information in Special Flood Hazard Area		
Type of Facility:	**Facility Name:**	**Municipality:**
Critical Infrastructure		
EMS Stations	Amserv / Du-San Ambulance	City of Dubois
	Dubois EMS	City of Dubois
Functional Needs Facilities		
Preschools	Cenclear Preschool	City of Dubois
	Dubois YMCA	City of Dubois
Schools	Dubois Middle School	City of Dubois

Critical Infrastructure and Functional Needs Additional Information in Special Flood Hazard Area		
Type of Facility:	**Facility Name:**	**Municipality:**
	New Story School	City of Dubois

Flash Flooding:

Flash flooding is a common occurrence in Clearfield County and can occur anywhere in the county. A large portion of flash flooding occurs in populated areas that have increased impervious ground cover. During the risk assessment process, numerous resources were utilized to determine flash flooding locations in Clearfield County. Municipalities were asked to identify locations within the municipality that were prone to frequent flash flooding. The National Climatic Data Center was also queried to determine flash flood vulnerable areas. This data is reflected in *Table 18 – Past Flood and Flash Flood Events* above.

Locations that are identified as vulnerable to flash flooding in Clearfield County include:

- Goshen Township
- Mahaffey Borough
- Morris Township
- Sandy Township
- City of Dubois
- Coalport Borough

The costliest flood in recent history was a flash flood that occurred in Sandy Township on June 27, 2013, incurring an estimated damage total of $3,000,000.00.

Although the above locations were identified as the most vulnerable areas in Clearfield County, they are not the only locations that are vulnerable to flash flooding. The Clearfield County Hazard Mitigation Team will continue to work with municipalities to identify vulnerable flash flooding locations and identify vulnerable functional needs populations and critical facilities.

Ice Jam Flooding:

Ice jam flooding has affected Clearfield County in the past. Areas along the West Branch of the Susquehanna River are the most vulnerable. The affected areas would see an increase in erosion to riverbanks and loss of vulnerable land.

The Clearfield County Hazard Mitigation Team will continue to work with the municipalities to identify ice jam flooding locations and identify vulnerable functional needs populations and facilities.

4.3.4. Hurricane and Tropical Storm

4.3.4.1 Location and Extent

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

While Clearfield County is located about 300 miles inland of the East Coast of the United States, tropical storms can track inland and cause heavy rainfall and strong winds. Clearfield County is located just inland of the East Coast region, designated by FEMA, as being Hurricane-Susceptible (see *Figure 18 – Pennsylvania Wind Zones*). Clearfield County falls within the wind zone III as shown in *Figure 18 – Pennsylvania Wind Zones*. Zone III for Clearfield suggests that shelters and critical facilities should be able to withstand a three second gust of wind up to 110 mph. Tropical storms and hurricanes are regional and seasonal events that can impact very large areas that are hundreds to thousands of miles across over the life of the storm. Hurricane and tropical storm season are typically around June to November time. All communities within Clearfield County are equally subject to the impacts of hurricanes and tropical storms that track near the county. Areas in Clearfield County which are subject to flooding, wind, and winter storm damage are particularly vulnerable.

4.3.4.2 Range of Magnitude

The impact tropical storm or hurricane events have on an area is typically measured in terms of wind speed. Intense precipitation and wind resulting in flood and wind damage are the most common impacts associated with the coastal storm systems in Pennsylvania. However, it is not uncommon for tornadoes to develop during the events. Flood damage results from intense precipitation and wind, typically from coastal storms, which impact Clearfield County.

Table 28 - Saffir-Simpson Scale

Saffir-Simpson Hurricane Scale		
Category	Wind Speed	
	Miles Per Hour (mph)	Knots (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 Classification		
Tropical Storm	39-73	34-64
Tropical Depression	0-38	0-33

Expected damage from hurricane force winds is measured using the Saffir-Simpson Scale (*Table 28 - Saffir-Simpson Scale*). The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential. Categories three, four, and five are classified as "major" hurricanes, but category one and two storms can contain potential significant storm surge. A category one storm results in very dangerous winds with some damage, while a category two storm results in extremely dangerous winds with extensive damage. However, category three storms result in devastating damage and category four/five storms result in catastrophic damage. While major hurricanes comprise only 20% of all tropical cyclones making landfall, they account for over 70% of the damage in the United States. While hurricanes can cause high winds and associated impacts, it is also important to recognize the potential for flooding events during hurricanes, tropical storms, and nor'easters. In Clearfield County, wind impacts from tropical events include downed trees and utility poles to cause utility interruptions. Wind impacts are an additional issue associated with mobile homes due to structures not being well-anchored. Additionally, these storms can produce high volumes of rainfall in Clearfield County that cause flash flooding initially and then follow with stream and river flooding. The risk assessment and associated impact for flooding events is included Section 4.3.3.5.

4.3.4.3 Past Occurrence

Table 29 - History of Coastal Storms Impacting Clearfield County lists all coastal storms that have impacted Clearfield County from 1952 to 2021. *Figure 19 – Historic Tropical Storms/Hurricanes in Pennsylvania* identifies some past hurricanes that had an inland path through Pennsylvania. As stated, even if a storm did not pass-through Clearfield County, the wind and rain from the storm could have still impacted the county. Hurricane Agnes was a severe coastal storm event in June 1972 that impacted Clearfield County. After making first landfall as a hurricane near Florida, Agnes weakened and exited back into the Atlantic off the North Carolina coast. The storm moved along the coast and made a second landfall near New

York City as a tropical storm and merged with an extra-tropical low-pressure system over Pennsylvania. This brought extremely heavy rains to Pennsylvania that caused major flooding throughout. Pennsylvania incurred $2.8 billion in damages and fifty deaths statewide. However, particularly in Clearfield County, the most significant effects of Hurricane Agnes were due to severe flooding rather than winds. Agnes was only a Category one hurricane but dropped more than fifteen inches of rain in the northeastern United States. Pennsylvania received the greatest amount of flood damage. Other tropical cyclones which did not track through Pennsylvania but caused significant damage to communities in the Commonwealth include Sandy (2012), Lee/Irene (2011), Ivan (2004), Floyd (1999), and Eloise (1975).

Hurricane Irene and Tropical Storm Lee were another event that impacted and caused damage to Clearfield County. Although they are separate events, Hurricane Irene and Tropical Storm Lee together caused significant rainfall to occur in Clearfield County due to how close together the events took place. First, Tropical Storm Lee hit and caused significant flooding in the central and eastern counties of Pennsylvania with wind damage that caused utility outages for one to two days in Clearfield County. Then, Hurricane Irene caused flooding with utility interruptions from five to eight days. Many flooding events occurred in the county during this time.

Table 29 - History of Coastal Storms Impacting Clearfield County

History of Coastal Storms Impacting Clearfield County (HomeFacts, 2018; USGS, 2020)			
Year	**Name**	**Year**	**Name of Costal Storm**
1952	Able	2005	Katrina
1954	Hazel	2006	Ernesto
1955	Diane	2011	Lee
1955	Connie	2011	Irene
1959	Gracie	2012	Sandy
1972	Agnes	2016	Matthew
1979	Frederic	2017	Harvey
1992	Danielle	2017	Irma
1994	Beryl	2017	Nate
1999	Dennis	2018	Florence
1999	Floyd	2020	Isaias
2004	Ivan		

4.3.4.4 Future Occurrence

Although hurricanes and tropical storms can cause flood events consistent with 100- and 500-year flood levels, the probability of occurrence of hurricanes and tropical storms is measured relative to wind speed. One approach to determining the future probability of hurricanes is to

examine the frequency and spatial distribution of past hurricanes which is applied in developing its National Risk Index (NRI). To determine the spatial distribution of hurricane hazard, FEMA calculated the maximum number of hurricane paths overlapping each census tract over the available period of record. *Table 30 - Annual Probability of Wind Speeds* shows the annual probability of winds that reach the strength of tropical storms and hurricanes in Clearfield County and the surrounding areas based on a sample period of forty-six years. According to FEMA, there is a high probability each year that Clearfield County will experience winds from coastal storms that could cause minimal to moderate damages (*Table 27 - Annual Probability of Wind Speeds*). The future probability of a tropical storm or hurricane will be approximately once every five years, or 20% chance annually. The probability of winds exceeding 118 mph is less than 0.1% annually.

Table 30 - Annual Probability of Wind Speeds

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

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

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

related to climate change are the length of hurricane season and the increased frequency of the hurricanes earlier or later than usual hurricane season. There are expected to be more category four and five hurricanes in the Atlantic and the hurricane season may be elongated which may impact Clearfield County.

The relationship between climate change and hurricanes is complex and there are many other factors that affect hurricane development including wind shear and air pollution. Dust from the Sahara Desert that is lifted high in the atmosphere during hot, dry summers can actually inhibit the development of some hurricane formation in the Atlantic. Despite complexity, it is very likely there will be more rainfall associated with these storms. A warmer atmosphere holds more moisture which results in higher rainfall.

4.3.4.5 Vulnerability Assessment

The impacts of climate change are no longer hypothetical concepts set in the future, but rather tangible and hazardous realities. Tropical storms tracking nearby Clearfield County can not only cause high winds but can also cause heavy rains to occur. A vulnerability assessment for hurricanes and tropical storms focusses on the impacts of flooding and severe winds. Flooding associated from hurricanes/tropical storms can occur in areas throughout Clearfield county which can cause great loss and damage to buildings and structures as well. 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 4.3.3.5 and discussion of wind related vulnerability is addressed in Section 4.3.3.5. Due to the impact of the devastating hurricanes and tropical storms, the vulnerability for Clearfield County is high. Two kinds of vulnerable economic losses are direct building loss and business interruption loss. Direct building losses consist of direct damage to any structure. Business interruption losses consist of relocation of employee wage loss, expenses, income loss, etc. Clearfield County is vulnerable when it comes to the loss of buildings and other related items. The total direct building loss amount for Clearfield County adds up to $12,887.00 in total damage due to wind hazards from hurricanes. The total business interruption for Clearfield county adds up to $456 million in total loss due to wind hazards from hurricanes. Therefore, building and business interruption losses in Clearfield County are highly likely.

Figure 18 - Pennsylvania Wind Zones

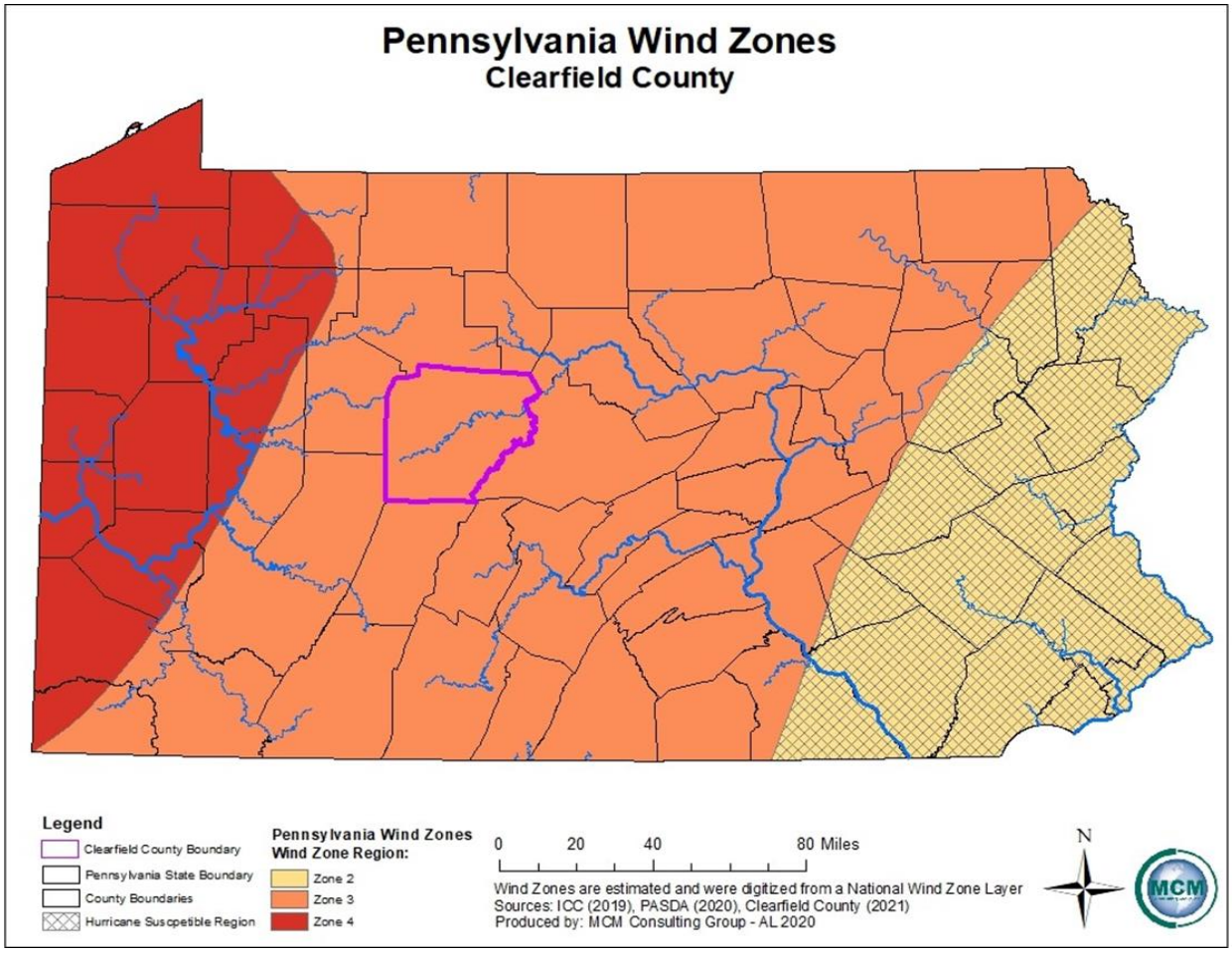
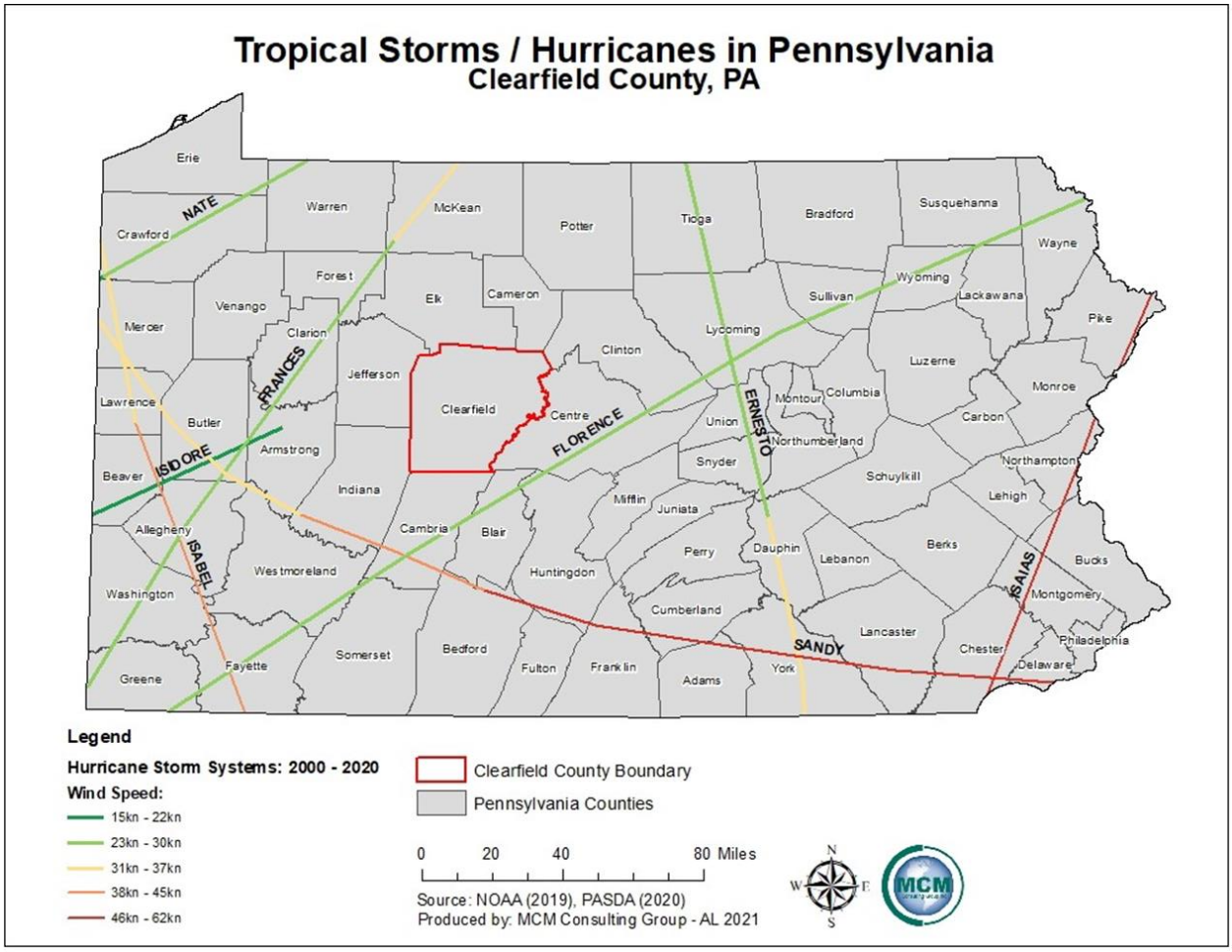


Figure 19 - Historic Tropical Storms/Hurricanes in Pennsylvania



4.3.5. Invasive Species

4.3.5.1 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. Often, an invasive species spreads and reproduces quickly. They are not limited to organisms that come from a foreign country; invasive species can come from a different region in the United States. The main occurrence of invasive species is typically the result of human activity. 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 but are not limited to:

- 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

The Governor's Invasive Species Council of Pennsylvania (PISC), the lead organization for invasive species threats, recognizes two types of invasive species: Aquatic and Terrestrial.

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 instead of in an aquatic environment and whose introduction does or is likely to cause economic/environmental damage or harm to human health.

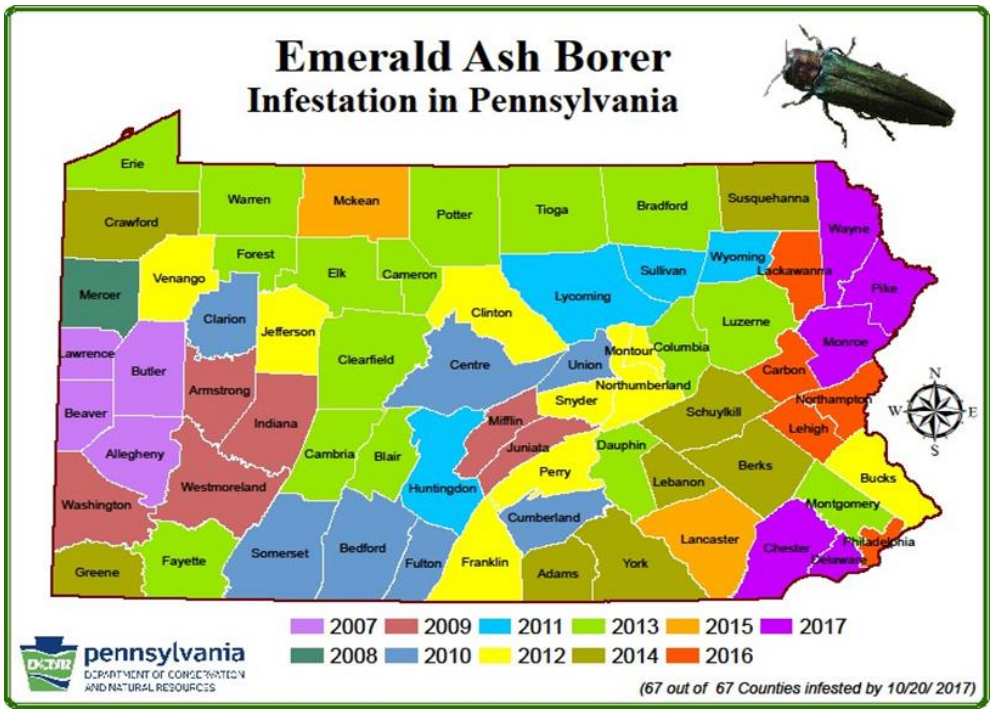
The location and extent of invasive threats is dependent on the preferred habitat of the species, as well as the species' ease of movement and establishment. For example, kudzu vine is an aggressive vascular plant. With wide ecological parameters and ease of spread, the vine is a more

widespread invasive species threat. Other species' spread has been limited by state agency activity, like the spotted lanternfly. First discovered in Berks County in 2014, this Asian plant hopper was placed under a quarantine by the Pennsylvania Department of Agriculture in thirteen counties, which later had an effect on Clearfield County. *Table 28 - Prevalent Invasive Species* lists invasive species that have been found in Clearfield County.

4.3.5.2 Range of Magnitude

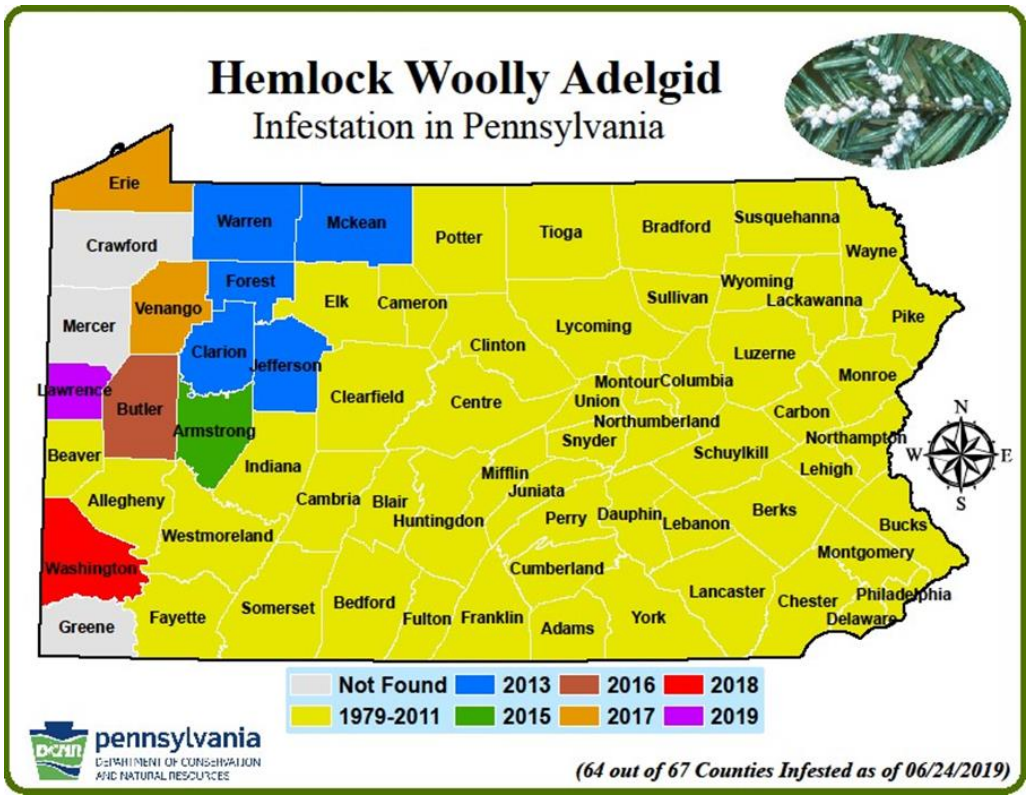
The magnitude of invasive species threats ranges from nuisance to widespread killer. Some invasive species are not considered agricultural pests, and do not harm humans or cause significant ecological problems. For example, Brown Marmorated Stink Bugs are not considered to be an agricultural pest and 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 creates a 99% mortality rate for any ash tree it infects. 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 worst-case scenario for invasive species is the success of the Emerald Ash Borer in Clearfield County and the surrounding region. The Emerald Ash Borer has already become established in Clearfield County (see *Figure 20 - Emerald Ash Borer Infestation in Pennsylvania*) and the surrounding region, and there is a high mortality rate for trees associated with this pest.

Figure 20 - Emerald Ash Borer Infestation in Pennsylvania



Another example of an invasive pest which has a negative impact on the environment is the hemlock woolly adelgid. Hemlock woolly adelgid is a fluid-feeding insect that feeds on hemlock trees throughout eastern North America, including Pennsylvania. The egg sacs of these insects look like the tips of cotton swabs clinging to the undersides of hemlock branches. Hemlock woolly adelgid was introduced from Asia into the Pacific Northwest in 1924. It was most likely introduced into the northeastern United States in the 1950s and it was first discovered in Pennsylvania in 1967. This insect has been damaging hemlock ever since and it is spreading. To date, sixty-four counties in Pennsylvania, including Clearfield County, have been infested with this insect. See *Figure 21 - Hemlock Woolly Adelgid Infestation in Pennsylvania*. Eastern hemlock (Pennsylvania's state tree) and Carolina hemlocks (found further south in the Smoky Mountain sections of the Appalachians) are more susceptible to hemlock woolly adelgid damage than Asian and western hemlock trees due to feeding tolerance and predators that protect the latter species. Hemlock woolly adelgid sucks fluid from the base of hemlock needles. It may also inject toxins into the tree as it feeds, accelerating needle drop and branch dieback. Although some trees die within four years, trees often persist in a weakened state for many years. Hemlocks that have been affected by hemlock woolly adelgid often have a grayish-green appearance (hemlocks naturally have a shiny, dark green color).

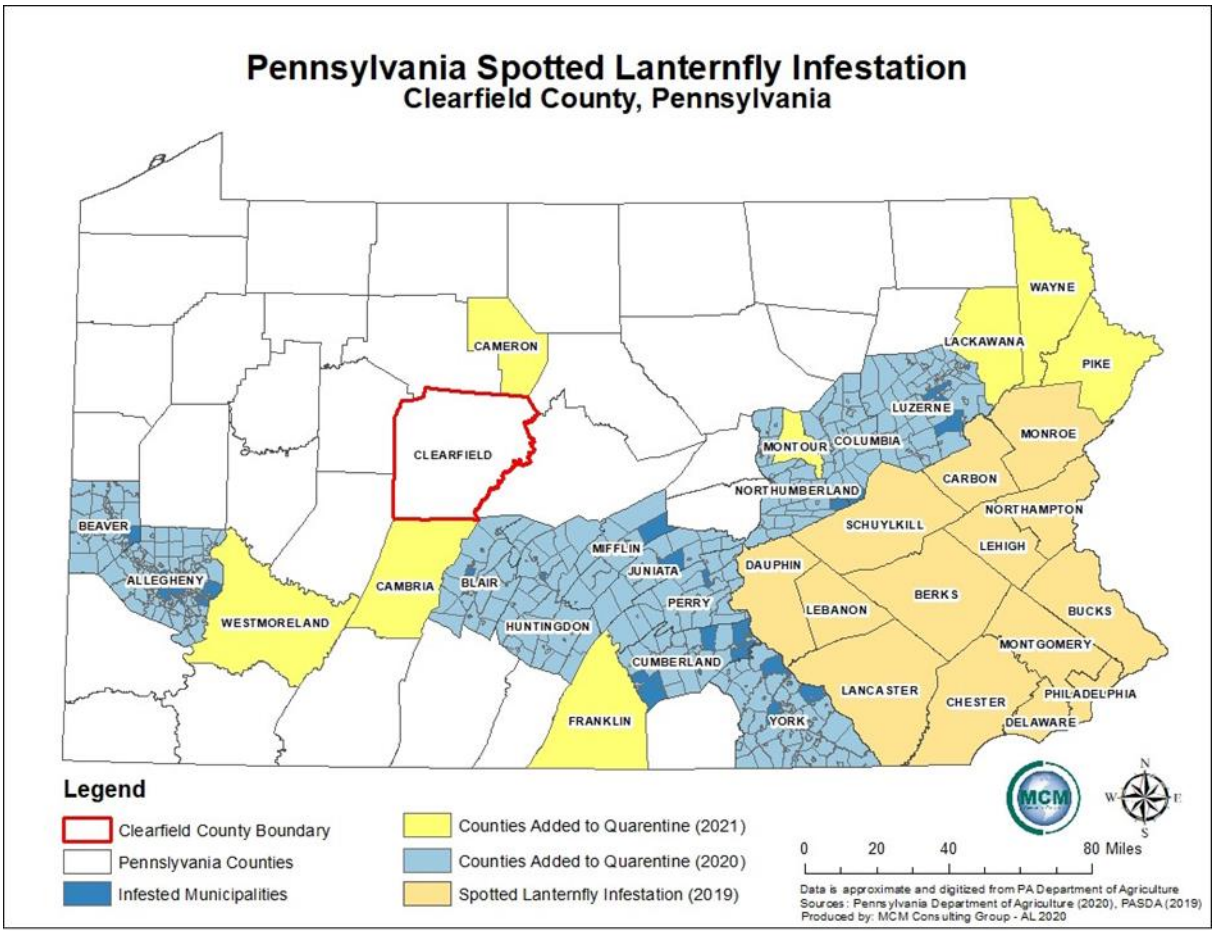
Figure 21 - Hemlock Woolly Adelgid Infestation in Pennsylvania



Another example of an invasive species is the Spotted Lanternfly. The Spotted Lanternfly is a harmful invasive pest with a healthy appetite for our plants and can negatively impact the quality of life and enjoyment of the outdoors. According to the Penn State Extension, the Spotted Lanternfly is a significant threat to Pennsylvania agriculture, landscapes, and natural ecosystems, including grape, tree-fruit, hardwood, and nursery industries, which collectively are worth nearly

$18 billion to the state's economy, outdoor recreation, and biodiversity. The Spotted Lanternfly has not been found in Clearfield County yet but has a high probability of entering the county in the near future. The Spotted Lanternfly is undoubtedly traveling west as the State Department of Agriculture announced on March 3, 2020, that an additional twelve counties in Pennsylvania were added to the quarantine area. As of March 2021, eight more counties have been added to the quarantine list which brings the total of counties up to thirty-four. The additional eight counties include Cambria, Cameron, Franklin, Lackawanna, Montour, Pike, Wayne, and Westmoreland. *Figure 22 – Pennsylvania Spotted Lanternfly Infestation* illustrates the counties in Pennsylvania that are in the quarantine zone for this pest.

Figure 22 - Pennsylvania Spotted Lanternfly Infestation



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 succumb to an infestation more easily. A worst-case example could be the Hemlock Woolly Adelgid causing reduced biodiversity, increased wildfire potential, and thermal harm to small stream cold water fisheries and habitats.

Therefore, there is a wide range of environmental impacts caused by invasive species. The aggressive nature of many invasive species can cause significant reductions in biodiversity by crowding out native species. This can affect the health of individual host organisms as well as the overall well-being of the affected ecosystem. Beyond causing harm to humans, animals, and plants, there are secondary impacts of invasive species that go beyond harm to host species and ecosystems, particularly in the case of invasive species that attack forests. Pennsylvania's forests prevent soil degradation and erosion, protect watersheds, stabilize slopes, and absorb carbon dioxide emission. The key role of forests in the hydrologic system means that if forest land is wiped out, the effects of erosion and flooding would amplify. There is also an impact on agricultural harvests. As a state with strong agricultural population, invasive species remain a hazard for the economic livelihood of the state.

4.3.5.3 Past Occurrence

Invasive species have been entering Pennsylvania since the arrival of European settlers, but not all occurrences required government action. Clearfield County is known for a great number of geographic features. There are various State Game Lands (SGL) within the area which include state game lands SGL 34 with 8,800 acres, SGL 77 with 3,038 acres, SGL 78 with 721 acres, SGL 87 with 14,000 acres, SGL 90 with 3,958 acres, SGL 93 with 4,876 acres, SGL 94 with 2,108 acres, SGL 98 with 1,172 acres, and SGL 120 with 3,426 acres. There is a total of 29,223 acres of State Game Lands in Clearfield County. The Other well-known areas in the county that have forest and lake areas available for species to invade are Bilger's Rock, Curwensville Lake Recreation Area, Moshannon State Forest, Parker Dam State Park, Rock Run Recreation, S.B. Elliot State Park, Quehanna Wild Area, and Wopsononock Natural Area. Due to the vast area of forests, there are many invasive terrestrial species that have been widespread in Clearfield County that are common problems throughout the Commonwealth. Some of the most popular problematic species in Clearfield include:

- Autumn Olive
- Emerald Ash Borer
- Hemlock Woolly Adelgid
- Japanese Barberry
- Japanese Knotweed
- Japanese Stiltgrass
- Tree-Of-Heaven

- Multiflora Rose

Table 31 - Prevalent Invasive Species lists problematic non-native species that are established in Clearfield County. While all species listed here are not native to Clearfield County, those species highlighted in red are considered to pose a more severe ecological threat than some of the others (Rank 1), species highlighted in yellow are considered to pose a significant ecological threat but not considered to spread as easily and aggressively (Rank 2), and species highlighted in green are considered to pose a lesser ecological threat (Rank 3).

Table 31 - Prevalent Invasive Species

Prevalent Invasive Species (EDDMaps, 2021; iMapInvasives, 2021; PA DCNR, 2019)		
Scientific Name	**Common Name**	**Type**
Lonicera spp	Bush Honeysuckle	Plant
Cirsium vulgare	Bull Thistle	Plant
Cirsium arvense	Canada Thistle	Plant
Cyprinus carpio	Common Carp	Animal
Phragmites australis ssp. australis	Common Reed	Plant
Tanacetum vulgare	Common Tansy	Plant
Agrilus planipennis	Emerald Ash Borer	Insect
Alliaria petiolata	Garlic Mustard	Plant
Fallopia sachalinensis	Giant Knotweed	Plant
Lymantria dispar	Gypsy Moth	Insect
Adelges tsugae	Hemlock Woolly Adelgid	Insect
Berberis thunbergii	Japanese Barberry	Plant
Lonicera japonica	Japanese Honeysuckle	Plant
Polygonum cuspidatum	Japanese Knotweed	Plant
Microstegium vimineum	Japanese Stiltgrass	Plant
Lonicera morrowii	Morrow’s Honeysuckle	Plant
Rosa multiflora	Multiflora Rose	Plant
Celastrus orbiculata	Oriental Bittersweet	Plant
Lythrum salicaria	Purple Loosestrife	Plant
Ailanthus altissima	Tree-of-Heaven	Plant
Elaeagnus umbellata	Autumn Olive	Plant
Cryptococcus fagisuga	Beech Bark Disease	Disease
Tussilago farfara	Colt’s-foot	Plant
Hesperis matronalis	Dame”s Rocket	Plant

Prevalent Invasive Species (EDDMaps, 2021; iMapInvasives, 2021; PA DCNR, 2019)		
Scientific Name	**Common Name**	**Type**
Popillia japonica	Japanese Beetle	Insect
Poa pratensis	Kentucky Bluegrass	Plant
Polygonum caespitosum	Oriental Lady's-thumb	Plant
Centaurea stoebe ssp. micranthos	Spotted Knapweed	Plant
Anthoxanthum odoratum	Sweet Vernal Grass	Plant
Myosotis scorpioides	True Forget-me-not	Plant
Cronartium ribicola	White Pine Blister Rust	Disease
Pastinaca sativa	Wild Parsnip	Plant
Halyomorpha halys	Brown Marmorated Stink Bug	Insect
Ophiognomonia clavigignenti-juglandacearum	Butternut Canker	Disease
Hypericum perforatum	Common St. John's-wort	Plant
Holcus lanatus	Common Velvetgrass	Plant
Achillea millefolium	Common Yarrow	Plant
Discula destructiva	Dogwood Anthracnose	Disease
Convolvulus arvensis	Field Bindweed	Plant
Artemisia vulgaris	Mugwort	Plant
Harmonia axyridis	Multicolored Asian Lady Beetle	Insect
Hieracium aurantiacum	Orange Hawkweed	Plant
Rorippa nasturtium-aquaticum	Watercress	Plant
Iris pseudacorus	Yellow Iris	Plant

4.3.5.4 Future Occurrence

According to the Pennsylvania Invasive Species Council (PISC), the probability of future occurrence for invasive species threats is growing due to the increasing volume of transported 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. In 2017, Pennsylvania alone imported over $83 billion in goods from abroad, including agricultural, forestry, and fishery goods that commonly carry unknow pests. Climate change is contributing to the introduction of new invasive species. As maximum and minimum seasonal temperatures change, pests can 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 non-native species. In order to combat the increase in future occurrences, the PISC released the Invasive Species Management Plan in April 2010 and updated the plan in 2017. 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, public outreach, and communication. More information can be found here:

https://www.agriculture.pa.gov/Plants_Land_Water/PlantIndustry/GISC/Pages/default.aspx.

There are several invasive species that are found near Clearfield County but have not yet been detected inside the county (see *Table 32 – Future 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 in the future. Once a species is established, it is more difficult to eradicate from an ecosystem, meaning prevention is very important. The species that are labeled in red are listed as a Rank 1 species, which indicates a severe ecological threat to the environment. Therefore, Asiatic Clam, Eurasian Watermilfoil, Glossy Buckthorn, Goatsrue, Japanese Hops, Jetbead, Mile-A-Minute Vine, Poison Hemlock, and Spotted Lanternfly (Lycorma) are all widespread and highly problematic in nearby counties but have not been reported in Clearfield County (as shown highlighted in red in *Table 32 – Future Vulnerable Species*). The development of appropriate plans will assist the county in reducing the possibility of a future encounter with any of these species. It would be beneficial to the forests of Clearfield County to work toward keeping these species out of the area.

Table 32 - Future Vulnerable Species

Future Vulnerable Species (EDDMaps, 2021; PA DCNR, 2019; iMapInvasives, 2021)		
Scientific Name	**Common Name**	**Type**
Lithobates catesbeianus	American Bullfrog	Animal
Corbicula fluminea	Asiatic Clam	Animal
Centaurea nigra	Black Knapweed	Plant
Brassica nigra	Black Mustard	Plant
Centaurea jacea	Brown Knapweed	Plant
Bromus tectorum L.	Cheatgrass	Plant
Potamogeton crispus L.	Curly-leaved Pondweed	Plant
Linaria dalmatica	Dalmatian Toadflax	Plant
Hedera helix	English Ivy	Plant
Myriophyllum spicatum	Eurasian Watermilfoil	Plant
Frangula alnus	Glossy Buckthorn	Plant
Galega officinalis	Goatsrue	Plant
Humulus japonicus	Japanese Hops	Plant

Future Vulnerable Species (EDDMaps, 2021; PA DCNR, 2019; iMapInvasives, 2021)		
Scientific Name	**Common Name**	**Type**
Rhodotypos scandens	Jetbead	Plant
Pristiphora erichsonii	Larch Sawfly	Insect
Euphorbia esula	Leafy Spurge	Plant
Persicaria perfoliata	Mile-A-Minute Vine	Plant
Carduus nutans	Musk Thistle	Plant
Conium maculatum	Poison Hemlock	Plant
Ligustrum spp.	Privet	Plant
Phalaris arundinacea	Reed Canary Grass	Plant
Cytisus scoparius L.	Scotch Broom	Plant
Lycroma delicatula	Spotted Lanternfly (Lycorma)	Insect
Salix alba	White Willow	Plant
Euonymus fortunei	Winter Creeper	Plant

4.3.5.5 Vulnerability Assessment

Clearfield County's vulnerability to invasion depends on the species in question. Human activity and mobility are ever increasing, and combined with the prospect 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. While there is significant acreage of wetlands, waterways, state parks, and game lands in Clearfield County where forest managers can impact invasive species, private lands can provide refuge for invasive species if landowners are unaware of or apathetic towards the threat.

Since there are large swatches of public land in Clearfield County, there is a risk of future damage from invasive species that are present in the area. With about 738,600 acres of total land in Clearfield County, there is vulnerability to various land sites and waterways. If an invasive species were to invade the popular terrestrial areas or waterways in Clearfield, great devastation would occur. The invasion from an invasive species could cause damage to the scenic and natural resources needed in the county. Additionally, tourism for the county is vulnerable to the invasive species as well and would be affected if the parks were destroyed. Therefore, a great amount of land and native wildlife within Clearfield County are at risk with the presence of invasive species.

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

The Governor's Invasive Species Council of Pennsylvania (PISC) has identified over 100 species threats that are or could potentially become significant in Pennsylvania. Of these threats, county and municipal leaders believe that the most significant are invasive forest pests like the Emerald Ash Borer and Hemlock Woolly Adelgid, and plants like the Tree-of-Heaven which all have been identified red in *Table 31 - Prevalent Invasive Species* for priority species in Clearfield County.

Due to the past experiences with invasive plants in the county, there are five primary components which help with managing invasive plants to lower vulnerability:

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 areas around road work, ditch/culvert work, logging activities, stream improvement/stabilization and bridge work. Some species pose a higher risk than others - invasive species are easiest to control before they become widespread and established in an area, and for that reason, species that are less widespread should be prioritized for management.

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 full-blown infestation.

It is best to act before a species can become established in the county, so forest management such as park rangers should be aware of invasive species found nearby Clearfield County but not yet present in the county (priority species in *Table 32 – Future Vulnerable Species*). Public outreach and education are important for these species to improve identification and prevention of

invasion. Without action, due to the instances and extent of the current infestations, it is reasonable to project that the county's vulnerability will increase.

4.3.6. Pandemic and Infectious Disease

4.3.6.1 Location and Extent

Pandemic & Epidemic

An epidemic is when an infectious disease spreads more quickly than experts expected. It is characterized by very widespread growth or extent that spreads quickly and affects many individuals at the same time. When an epidemic occurs, it typically impacts a larger area than an outbreak would. The rise and decline in epidemic prevalence of an infectious disease is dependent on the transfer of an effective dose of the infectious agent from an infected individual to a susceptible one. After an epidemic has subsided, the affected host population contains a small proportion of susceptible individuals for which reintroduction of the infection will not result in a new epidemic. Therefore, the host population develops an immunity to the epidemic disease, which is termed as herd immunity.

A pandemic is a disease outbreak that spreads across countries or continents, which affects the population of an extensive area. Extensive regions that could potentially be affected are several countries or even continents at a time. When a pandemic is present, the event usually affects more people and takes more lives than an epidemic typically would. Pandemics are further described as an extensive epidemic. Generally, pandemic diseases cause sudden illness in all age groups on a global scale. Pandemics are continuous events in third-world countries but do not affect the United States as frequently. A pandemic is measured and defined by the spreading of a disease rather than the fatalities associated with it. There are various characteristics of a pandemic outbreak, such as large, rapid scale spread, overload of healthcare systems, inadequate medical supplies, disruption of economy/society, and medical supply shortages. While a pandemic may be characterized as a type of epidemic, an epidemic is not a type of pandemic. Pandemics travel more effectively than epidemics.

Each year, different strains of influenza are labeled as potential pandemic threats. Pandemics happen when novel (new) viruses emerge and can infect people easily and spread efficiently and are sustained from person to person. In the event of a pandemic taking place in the eastern United States, the entirety of Clearfield County would likely be impacted. Strains of influenza, or the flu, are highly contagious as 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 country began planning for flu outbreaks.

On March 11, 2020, the World Health Organization (WHO) characterized the outbreak of a coronavirus disease as a pandemic. Before the official pandemic announcement, on February 11, 2020, WHO announced an official name for the disease of “coronavirus disease 2019”, abbreviated COVID-19. The ‘CO’ stands for ‘corona’, ‘VI’ for virus, and ‘D’ for ‘disease’. The

word ‘corona’ means crown which refers to the appearance that coronaviruses get from the spike proteins sticking out of them. The virus mostly attacks the respiratory tract in humans but can cause further medical issues if the patient was previously considered high risk or immunocompromised. COVID-19 most often causes respiratory symptoms that can feel much like a cold, a flu, or pneumonia, but COVID-19 can also harm other parts of the body. Both the upper respiratory tract, such as sinuses, nose, and throat, and lower respiratory tract, such as windpipe and lungs, are initially infected as a result of the disease. Lungs are typically the first targeted organ in the body for COVID-19. Other organs that could be infected by COVID-19 are the heart, brain, liver and gastrointestinal. Coronaviruses are common in humans and many different species of animals including camels, cattle, cats, and bats. The disease is believed to have started in Wuhan Province, China in late 2019 and spread around the globe. The original source of viral transmission to human remains unclear, as does whether the virus became pathogenic before or after the spillover event. The intermediate animal that passed the virus from bats to people has not been identified, however, researchers believe it to be a wild species that is sold as food in the wet markets within Wuhan at the Huanan Seafood Market. The overall origin of the virus remains uncertain during the writing of this plan. However, as the WHO digs into the origin of the COVID-19 pandemic, more clues and evidence leading to the origination of the virus is becoming clearer due to the research and scientific technology available in today’s medical fields. Public health officials say it is critical to determine the identification of the origin of the pandemic to take steps to avert future outbreaks and pandemics. Future prevention may take many years for completion. Currently, researchers of the WHO believe it to be a zoonotic disease with origination from an animal reservoir rather than bioterrorism or laboratory accident. As of May 20, 2021, there have been multiple documented variants of COVID-19 identified in the United States. Information about the characteristics of these variants is rapidly emerging.

Scientists are working to learn more about how easily variants spread, whether they could cause more severe illness, and whether currently authorized vaccines will protect people against them. Viruses constantly change through mutation, and new variants of a virus are expected to occur. Researchers are still monitoring multiple variants but there are currently five notable variants in the United States. The five variants include: B.1.1.7 variant detected in the US in December 2020, B.1.351 variant detected in the US end of January 2021, P.1 variant also detected in January 2021, and lastly B.1.427 and B.1.429 variants which were detected in February 2021. The B1.1.7 variant is currently the most common variant across the country. However, these variants seem to spread more easily and quickly than other variants, which may lead to more cases of COVID-19.

Infectious Disease

Infectious diseases are illnesses caused by pathogenic organisms such bacteria, viruses, fungi, or parasites. There are various types of bacterial organisms that live on and within the human system but are considered harmless due to the normal flora present. Organisms become harmful

and cause disease when under certain conditions. The causes of infectious diseases vary. The sources of infectious disease occur from contaminated food or waterways, infected animals/livestock, infection from biological vectors such as mosquitoes, etc. Infectious diseases include influenza, rabies, Middle East Respiratory Syndrome (MERS), West Nile virus, Lyme Disease, Zika virus, and Ebola virus.

West Nile virus is contracted through a mosquito bite and is aided by warm temperatures and wet climates conducive to mosquito breeding, with most cases occurring between April and October. West Nile virus is a vector-borne disease. This means an animal, usually an insect or a tick, transmits parasitic microorganisms to people and animals, and therefore, the diseases they cause. The disease causes headaches, high fever, neck stiffness, disorientation, tremors, convulsions, muscle weakness, paralysis, and death in its most serious form.

The Zika virus is another infectious disease that is spread by mosquito bites, and it is related to West Nile virus. Zika virus can also be spread through sexual intercourse, blood transfusion, or passed from mother to child in the womb. The virus was first identified in 1947, but largely came to the attention of the United States in 2015 when there was an outbreak of Zika in Brazil. The direct illness caused by Zika can include fever, red eyes, joint pain, headache, and a rash, or sometimes no symptoms at all. Zika is problematic for pregnant mothers as the virus can result in microcephaly or cause other problems for brain development. For adults, the virus can be linked to increased incidence of Guillain-Barré syndrome.

Lyme Disease, spread by the bite of infected blacklegged ticks, is a bacterial disease with symptoms including fever, headaches, and characteristic skin rash. Untreated, Lyme Disease can spread to joints, the heart, and the nervous system. To prevent the disease, it is recommended to use insect repellent, remove ticks promptly, apply pesticides, and reduce tick habitat.

Pandemic and infectious disease events cover a wide geographical area and can affect large populations, potentially including the entire population of the Commonwealth. The exact size and extent of an infected population is dependent upon how easily the illness is spread, the mode of transmission, and the amount of contact between infected and uninfected individuals. The transmission rates of pandemic illnesses are often higher in denser areas where there are large concentrations of people. The transmission rate of infectious disease will depend on the mode of transmission of a given illness. Pandemic events can also occur after other natural disasters, particularly floods, when there is the potential for bacteria to grow and contaminate.

4.3.6.2 Range of Magnitude

Pandemic & Epidemic

Public health emergencies typically occur on a regional basis. The magnitude of pandemic or

infectious disease threat in the Commonwealth will range significantly depending on the aggressiveness of the virus in question, factors within the community that are impacted (medical care access, population density, etc.), and the ease of transmission. For example, the West Nile virus has less than 80% of cases that are clinically asymptomatic. Therefore, approximately 20% of the cases result in mild infection, as known as West Nile fever. However, there is a small percentage of cases that will result in severe neurological disease and even death.

Pandemic influenza has a higher transmission rate from person-to-person compared to the West Nile virus disease. However, advances in medical technologies have greatly reduced the number of deaths caused by the influenza over time. In the early 1900s, flu pandemics could cause tens of millions of deaths, while the 2009 Novel H1N1, known as swine flu, caused fewer than 20,000 deaths world-wide, and many people infected with swine flu in 2009 recovered without needing medical treatment. However, the modern flu viruses are still quite dangerous. About 70% of those who were hospitalized during the 2009 H1N1 flu virus in the United States belonged to a high-risk group. However, with the COVID-19 pandemic, the transmission rates are much higher than any previous outbreaks related to other members of the coronavirus family such as SARS-CoV and MERS-CoV. In the past 100 years, the globe did not face a microbial pandemic similar in scale to the COVID-19 pandemic. The worldwide transmission of COVID-19 from human to human has spread like wildfire. As of June 15, 2021, the current worldwide data includes 176 million COVID-19 cases with more than 3.81 million patient deaths. The United States has the most cases and India is next with rapid increases in case numbers. It is difficult to make a projection of the final outcome with the COVID-19 pandemic. Of the six global outbreaks of viral infections, three were caused by coronaviruses (SARS, MERS, and COVID-19), of which COVID-19 is characterized by the most efficient and aggressive transmission.

High risk populations for disease/illness include children, the elderly, pregnant women, and patients with reduced immune system capability. Advancements in medical technology help in the treatment ad understanding of current and future pandemics. The wireless thermometer gun has become increasingly popular and beneficial to the COVID-19 pandemic by giving opportunity to measure individual’s body temperatures without being in close contact.

Additionally, the wireless thermometer gun assists with pinpointing individuals that may be COVID infected if the individual has a fever, which helps reduce spread of the disease. This important medical equipment is being used as checkpoints during the pandemic at various public destinations such as hospitals, nursing home facilities, airports, etc. Other advances in medical technology instruments for COVID-19 include vaccination advancements (such as new mRNA vaccines which have been seen with the Pfizer, Moderna, and Johnson & Johnson vaccines), virus DNA sequencing, and molecular testing techniques for COVID-19 diagnosis.

Therefore, with advancements made during pandemics, such as the COVID-19 pandemic, the global effects of various outbreaks have drastically declined over the past century. While there are limited secondary hazards related to public health emergencies, an outbreak can cause a variety of general secondary effects. Civil disorder is the most likely secondary hazard to result from a public health emergency. Additional potential secondary effects could include: a shortage of medical supplies and personnel; hoarding of household paper and cleaning supplies; school, business, and government closings; government restrictions on travel; low attendance at places of employment; and, slowed productivity.

The seasonal flu is still present throughout the country during a pandemic. A pandemic illness is not identical to a seasonal flu, as explained in *Table 33 – Pandemic and Seasonal Flu Differences*. The seasonal flu is less of a concern than what a pandemic potentially is. Predictability and regularity are factors into the reasoning behind a lower level of concern when dealing with seasonal flu. However, a pandemic is considered to be more severe than seasonal flu.

Table 33 - Pandemic and Seasonal Flu Differences

Pandemic and Seasonal Flu Differences		
	Seasonal Flu	**Pandemic**
What is it?	Influenza (flu) is a contagious respiratory illness caused by flu A and B viruses that infect the human respiratory tract.	A flu pandemic is a global outbreak of a new flu A virus in people that is very different from current and recently circulating seasonal flu A viruses.
Occurrence?	Epidemics of seasonal flu happen every year. Fall and winter are the most common times for flu in the United States.	Flu pandemics happen rarely. Five have happened within the last 100 years.
Transmission?	Flu viruses are thought to spread mainly from person to person through droplets made when someone with flu coughs, sneezes, or talks near a person (within 6 feet).	Pandemic flu viruses spread in the same way as seasonal flu, but a pandemic virus is likely to infect more people because fewer people have immunity to the pandemic flu virus.
Vaccination?	Seasonal flu vaccines are made each year to vaccinate people against the seasonal flu. Typically, only one dose is needed.	Although the U.S. government maintains a limited stockpile of pre-pandemic flu vaccines, this inventory may not be widely available in the early stages of a pandemic. Two doses of pandemic flu vaccine are likely to will

Pandemic and Seasonal Flu Differences		
	Seasonal Flu	**Pandemic**
		be needed.
High Risk Group?	Young children, people sixty-five years and older, pregnant women, and the immunocompromised are more likely to have serious flu complications.	In some past pandemics, healthy and young adults, along with the immunocompromised and elderly were at high risk for developing severe flu complications.
Source: (CDC, 2009)		

The World Health Organization (WHO) developed an alert system to help inform the world about the seriousness of a pandemic. The alert system has six phases, with Phase 1 being the lowest risk and Phase 6 being the greatest risk of pandemic. The phases were developed in 1999, but then revised in 2005 and 2009 to provide a global framework and aid countries in pandemic preparedness and response planning. These phases of alert systems were used during the COVID-19 pandemic. The time after the first pandemic wave has been elaborated into post peak and post pandemic periods. These phases are listed below in *Table 34 - Pandemic Influenza Phases*.

Table 34 - Pandemic Influenza Phases

Pandemic Influenza Phases	
Phase	**Characteristics**
Phase 1	No animal influenza virus circulating among animals has been reported to cause infection in humans.
Phase 2	An animal influenza virus circulating in domesticated or wild animals is known to have caused infection in humans and is therefore considered a specific potential pandemic threat.
Phase 3	An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks.
Phase 4	Human-to-human transmission (H2H) of an animal or human-animal influenza virus able to sustain community-level outbreaks has been verified.
Phase 5	The same identified virus has caused sustained community level outbreaks in two or more countries in one WHO region.
Phase 6	The pandemic phase is characterized by community level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in

Pandemic Influenza Phases	
Phase	**Characteristics**
	Phase 5. Designation of this phase will indicate that a global pandemic is under way.
Post-Peak Period	Levels of pandemic influenza in most countries with adequate surveillance have dropped below peak levels.
Possible New Wave	Level of pandemic influenza activity in most countries with adequate surveillance rising again.
Post-Pandemic Period	Levels of influence activity have returned to the levels seen for seasonal influenza in most countries with adequate surveillance.
Source: (WHO, 2009)	

4.3.6.3 Past Occurrence

Pandemic & Epidemic

Several pandemic influenza outbreaks have occurred over the past 100 years that not only affected Clearfield County but the United States as a whole. *Table 35 - Past Pandemic Events* in the United States illustrates the various past pandemic events that have occurred since the late 1800's. The worst recorded pandemic was the Spanish Flu, due to the amount of infection spread that was present in the world. The two most recent pandemics that have occurred in Clearfield County and the United States are the swine flu/Novel H1N1 and COVID-19 pandemics, with COVID-19 being the most current and having the highest transmission rates yet.

Spanish Flu

Prior to the COVID-19 world-wide pandemic, the 1918 influenza (Spanish Flu) pandemic was classified as the "Mother of all Pandemics". An estimated 1/3 of the world's population was infected and had clinically apparent illnesses during the 1918 - 1919 influenza pandemic. Pennsylvania was one of the most affected states in the country because influenza tends to strike cities very hard. The Spanish Flu claimed 500,000 lives in the United States, which included Clearfield County. There is a lack of data which provides exact numbers of deaths experienced in Clearfield County from the Spanish Flu, however, a total of 60,000 deaths occurred in

Pennsylvania from. There were approximately 47,000 reported cases and 12,000 deaths in Philadelphia in just over four weeks. In the first six months, there were about 16,000 deaths and half a million cases of the Spanish Flu in Philadelphia. The 60,000 deaths in the Commonwealth would also include Clearfield County's deaths, but the exact number is uncertain. The factors of high populations, crowded places, and unhygienic conditions is what caused higher deaths and cases across Pennsylvania. Therefore, Clearfield County was drastically affected by the Spanish Flu Pandemic.

Swine Flu/H1N1

Clearfield County was impacted by the H1N1 virus during 2009. The Pennsylvania Department of Health set up clinics throughout the county to administer vaccines. There is a lack of data for determining the exact cases and deaths from swine flu in Clearfield County. However, Pennsylvania, as a total, had 10,940 cases and 78 deaths from this pandemic. Within the total cases and deaths of Pennsylvania, Clearfield County's numbers were included although exact numbers are uncertain.

COVID-19

This is an on-going pandemic at the time of the writing of this plan, so credible websites are used to provide the most up-to-date statistics. As of June 2021, Pennsylvania had an estimated 1.21 million total cases and 27,543 deaths related to the COVID-19 pandemic occurred in the United States. The first cases in Pennsylvania were reported on March 6, 2020, in Delaware and Wayne counties. The first confirmed case of COVID-19 in Clearfield County was on March 24th, 2020. As numbers increased around the state, Clearfield County remained isolated, and the numbers were not significant. Prior to July 4th, 2020, there were only seventy-four cases in the entire county with twenty-eight of those cases being in DuBois. At the end of July 2020, there were a total of 136 cases, with most coming from DuBois. By the end of August 2020, there were 227 cases in the county and the first COVID-19 death was marked on August 2nd, 2020, which was a nursing home resident. September 2020 was the first significant month due to a COVID outbreak at the DuBois Nursing Home located in Clearfield County. Cases in that area increased by forty-five cases in just a few weeks. There was a total of five deaths in September 2020 for Clearfield County. COVID-19 had an even more significant impact on Clearfield County at the end of November 2020, the number of cases jumped up to 1,693 with five new deaths reported and in December 2020 and January 2021, the county saw its worst COVID crisis. By the end of December 2020, Clearfield County had 4,023 total cases with 1,418 added just in December. As of June 2021, Clearfield County alone has recorded 8,635 cases and 150 deaths. Also, as of June

2021, Clearfield County has a daily new case rate of 3.2% per 100,000, an infection rate of 0.59%, a positive test rate of 2.4%, and a vaccinated rate of 41.0%. All municipalities in Clearfield County indicated an increase in the pandemic section of the risk factor assessment municipal comparison. The cases and deaths in Clearfield County are still increasing. Therefore, exact numbers of deaths and cases are constantly changing. As of June 2021, Pennsylvania was in vaccination Phase 2, which included any individual in Pennsylvania age twelve or older. Phase 1A included long-term care facility residents, health care personnel, individuals of ages 65 or older, and high-risk individuals. Phase 1B included educational workers, U.S. Postal Service workers, manufacturing workers, and public transit workers. The Phase 1C included food service workers, construction workers, legal services, any government worker, public safety personnel, and more. As of June 2021, between the three approved vaccines of Pfizer, Moderna, and Johnson & Johnson (newly approved vaccine) there were 6.01 million fully vaccinated people in Pennsylvania alone.

With Clearfield County specifically, at a total of 32,500 (41.0%) individuals have been partially vaccinated which indicates that the person has received at least one COVID- 19 vaccine but has not yet received the necessary number of vaccines at the recommended time intervals to be fully covered. At present, all COVID vaccines under EUA require two dosages.
Therefore, the individual partially covered has only received one dose in the two-dose series. Meanwhile 28,944 (36.5%) individuals in Clearfield County have been fully vaccinated which indicates that the person has received the necessary number of COVID vaccines at the recommended time in intervals. To see more updated information, follow here: https://www.health.pa.gov/topics/disease/coronavirus/Pages/Cases.aspx.

Table 35 - Past Pandemic Events in the United States

Past Pandemic Events in the United States	
Year(s)	**Common Name**
1889	Russian Flu
1918	Spanish Flu/H1N1
1957	Asian Flu/H2N2
1968	Hong Kong Flu/H3N2
2009	Swine flu/Novel H1NI

Past Pandemic Events in the United States	
Year(s)	**Common Name**
2020	COVID-19
Sources: (WHO & CDC, 2020)	

Infectious Disease

Not only has Clearfield County experienced past pandemic events, but the county has also experienced past infectious disease events. The two major infectious disease events experienced across Clearfield County and Pennsylvania as a whole are the West Nile Virus and Lyme Disease. Due to large rural and wooded areas within the county, these infectious diseases thrive in Clearfield County. Both diseases are transmitted by the biological vector of an insect which is found throughout the county.

West Nile Virus

West Nile virus reached the United States in 1999 and a year later was detected in Pennsylvania when mosquito pools, dead birds, and/or horses in nineteen counties tested positive for the virus. Clearfield is one of the counties in which the virus is found. A comprehensive network has been developed in Pennsylvania that includes trapping mosquitoes, collecting dead birds, and monitoring horses, people and, in past years, sentinel chickens. Although West Nile Virus positive cases are few in Clearfield County, 2018 had the most positive cases in Clearfield County since 2015. Over the past five years, no human has tested positive for West Nile Virus in Clearfield County. *Table 36 - West Nile Virus Control Program in Clearfield County Since 2015* outlines the West Nile Virus within Clearfield County from 2015 to 2020.

Table 36 - West Nile Virus Control Program in Clearfield County since 2015

West Nile Virus Control Program in Clearfield County Since 2015				
Year	**Total Positives**	**Human Positives**	**Mosquito Positives**	**Bird Positives**
2020	1	0	1	0
2019	1	0	1	0
2018	12	0	3	8
2017	0	0	0	0
2016	0	0	0	0
2015	1	0	1	0
Source: (PA Department of Environmental Protection, 2020)				

Lyme Disease

Lyme Disease has been present in the United States and Clearfield County for many years. More wooded areas, such as Clearfield County, have higher cases due to ticks being the main biological vector. Lyme disease is found in all sixty-seven counties within Pennsylvania.

Clearfield County has an overall approximated 2,946 confirmed cases of Lyme disease. Clearfield County as a whole has very high positive numbers for Lyme Disease in the county, especially over the past couple of years. It is possible that numbers have risen dramatically due to lack of testing in previous years. Clearfield County experienced the highest number of positive cases in 2018 at 348 cases. Lyme disease case counts are alarming and consistently rising over the past several years. It should be noted that information represented for each county may vary with respect to the resources they have to devote to investigation of Lyme cases. It should also be noted that these figures represent a rough estimate of the Lyme disease burden in Clearfield County. *Table 37 - Lyme Disease Data for Clearfield County* outlines the Lyme Disease within Clearfield County since 2013 to 2018. Data after 2018 was not available for this report.

Table 37 - Lyme Disease Data for Clearfield County

Lyme Disease Data for Clearfield County	
Year	**Total Positives**
2018	221
2017	323
2016	348
2015	276
2014	273
2013	308
Source: (PA Department of Environmental Protection, 2018)	

4.3.6.4 Future Occurrence

Pandemic & Epidemic

The probability of a widespread pandemic public health emergency is every ten years or less with varying degrees of severity. Minor outbreaks of less serious communicable disease, such as influenza, occur much more frequently. Exact timing of pandemic influenza outbreaks is unpredictable, and complete avoidance of the events is nearly impossible. Therefore, future occurrences of pandemics and infectious disease are unclear. Future pandemics may also emerge from other diseases, especially invasive pathogens for which Clearfield County and Pennsylvania as a whole lack natural immunity which adds to the uncertainty of future occurrences. With the

current COVID-19 pandemic, the future of the disease is still unknown due to the novelty of the virus. Recently, the three approved COVID-19 vaccines of Pfizer, Moderna, and Johnson & Johnson have been offered to millions of Americans across the country, including Clearfield County. The approval of the vaccines gives hope for the future of the COVID-19 pandemic. The vaccination rollout will help COVID-19 transition from a pandemic to an endemic phase in the near future. However, researchers believe that COVID-19 will be similar to the influenza virus that re-emerges every year in a slightly different form due to mutation events.

Infectious Disease

Pandemic future occurrences have several unknown circumstances; however, future infectious disease occurrences are likely to occur. Infectious diseases such as West Nile Virus, Influenza, and Lyme Disease have been present in Clearfield County for many years and are expected to continue.

West Nile Virus

The best defense against West Nile virus in the future is to remove mosquito breeding locations – stagnant water sources. Another defensive measure to prevent insect bites is wearing shoes, socks, long pants, and a long-sleeved shirt when outdoors for long periods of time, or when mosquitoes are most active. Also, mosquito repellent can be used whenever people are outside.

Influenza

It is estimated that 5% - 25% of Pennsylvanians get the flu each year, and 120 - 2,000 die from complications of influenza. The CDC recommends that everyone six months and older get a flu vaccine every season to prevent future cases from rising. People who are at a high risk of serious flu illness should take flu antiviral drugs as soon as they get sick.

Lyme Disease

Lyme disease is best combated using insect repellent, removing ticks promptly, applying pesticides, and reducing tick habitat to decrease the number of future cases from occurring. Once a person realizes they have been bitten by a tick, they should seek medical attention, as undetected Lyme Disease can seriously damage a body's musculoskeletal and nervous systems or result in death.

4.3.6.5 Vulnerability Assessment

Clearfield County is considered to be a higher vulnerability county in regard to the COVID-19 disease and pandemic is considered to be a higher vulnerable county. However, it is extremely difficult to predict a pandemic or an epidemic. The severity of the next pandemic cannot be predicted, but modeling studies suggest the impact of a pandemic on the United States could be substantial. In the absence of any control measures (vaccination or drugs), it is estimated that a

"medium-level" pandemic could cause 89,000 - 207,000 deaths, 314,000 - 734,000 hospitalizations, 18 - 42 million outpatient visits, and another 20 - 47 million sick people in the United States. Between 15% - 35% of the U.S. population could be affected by a pandemic, and the economic impact could range between $71.3 - $166.5 billion. This data for the current COVID-19 pandemic has fluctuated widely, however, at the time of the writing of this plan, was on pace for greater than a "medium level" pandemic. The COVID-19 pandemic has severely affected populations over the age of sixty-five, especially those in nursing homes – disproportionately. It has also severely affected different races disproportionately, e.g., non-Hispanic American Indian and Black people. The CDC reports that long-standing systemic health and social inequities have put some members of racial and ethnic minority groups at increased risk of getting COVID-19 or experiencing severe illness, regardless of age.

Elderly individuals, children and immune deficient individuals are most vulnerable to disease. Nursing facilities, personal care facilities, daycares, schools, and hospitals are considered more vulnerable since there are normally groups of these functional-needs population present at the facilities. The spread of disease has increased due to the vulnerability and density of these populations. Congregate living facilities, including correctional institutions and dormitories would also be at an increased risk due to the difficulties in adhering to the social distancing required to help stop the spread of a pandemic. During the COVID-19 pandemic, nursing homes and personal care homes in Pennsylvania suffered staggering numbers of cases and deaths and several county jails and state correctional institutions reported wide community spread.

Specifically, in Clearfield County, nursing and personal care homes facilitates were critically affected by COVID-19. A total of nine facilities in the county have had COVID-19 cases, four of which are long-term care facilities. With this number of infected facilities, about 538 cases were reported among the elderly residents and 135 cases were reported among the employees within these facilities. A total seventy deaths have occurred in these vulnerable individuals of elderly and facility employees. The four major long-term care facilities in Clearfield County are: Christ The King Manor with seventy resident cases, twenty-three resident deaths, and sixty-six employee cases, DuBois Nursing Home with sixty-seven resident cases, nineteen resident deaths, and sixty-one employee cases, Mountain Laurel Healthcare and Rehabilitation Center with 114 resident cases, seventeen resident deaths, and fifty-three employee cases, and Ridgeview Healthcare and Rehabilitation Center with twenty-seven resident cases, unknown resident deaths, and fifteen employee cases.

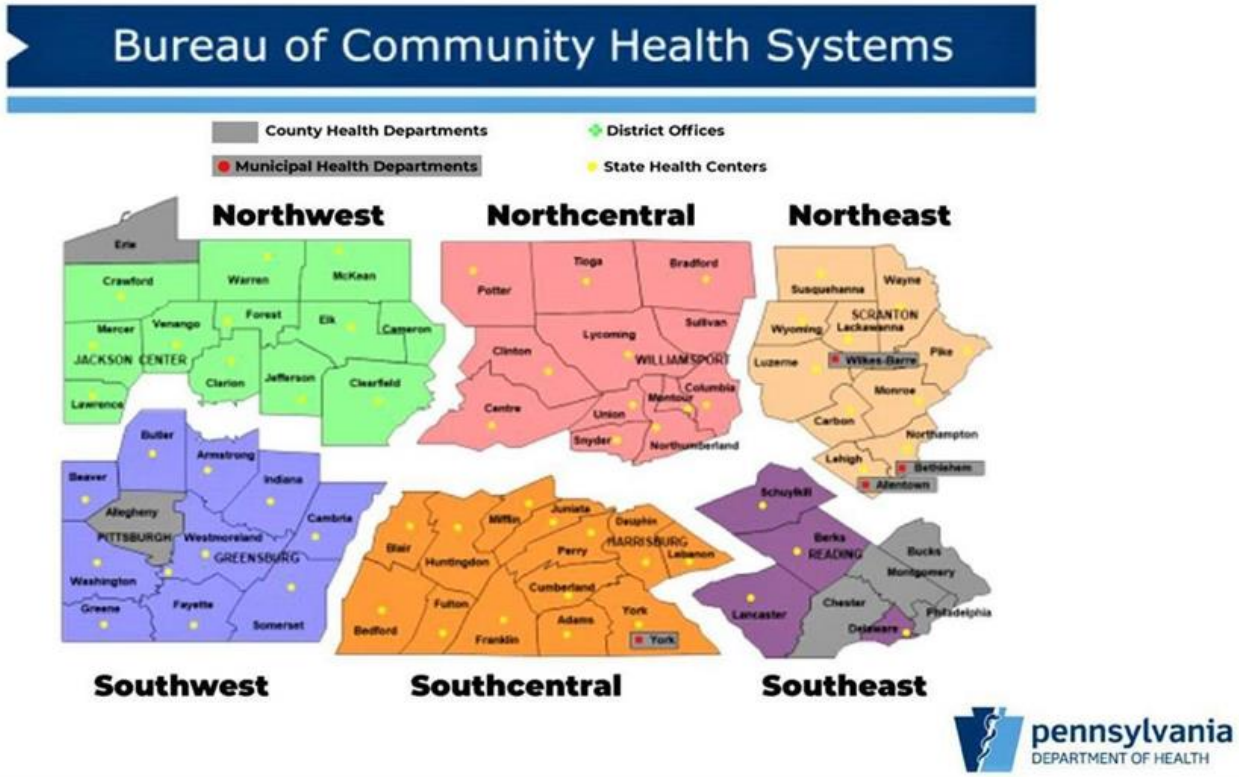
Health-care workers and those working in direct-care situations (such as correctional institutions or those who cannot social distance due to their jobs) are more likely to be exposed to a pandemic disease. Those that work outdoors for extended periods of time in warm months may be more vulnerable to West Nile, Lyme Disease or the Zika virus.

The number of hospitals and beds present in a county can affect the vulnerability impact on the county as well. The number of hospitals within the county and number of beds within the hospital determines the amount of care vulnerable and sick patients will receive in times of need. The vulnerable individuals will need access to hospitals and medical procedures as well. If sick and vulnerable patients are higher in number than beds available, the vulnerability rates within the county will rise. Within Clearfield County, the top major hospitals within the county contain numerous beds along with various medical and emergency centers. Penn Highlands Clearfield has fifty beds, UPMC Altoona has 380 beds, Penn Highlands Dubois has 216 beds, and Mount Nittany Medical Center has 260 beds. It is important to plan preparedness activities that will permit a prompt and effective public health response.

During a public health emergency, the PA DOH may open emergency medicine centers called points of dispensing (PODs) to ensure that medicine, supplies, vaccines, and information reach Pennsylvania residents during a public health emergency. An open POD is where the general public goes to receive free emergency medicine and supplies from public health officials, while a closed POD provides free emergency medicine and supplies to a specific community, like a university, including faculty, staff, and students. Dispensing of medications/vaccines is a core function of the Strategic National Stockpile's Mass Dispensing of Medical Countermeasures Plan.

PODs are coordinated with county emergency managers by the PA DOH with the six regional healthcare districts (see *Figure 23 - Pennsylvania Department of Health Districts*). Clearfield County is in the northwest district. At the time of the writing of this plan, POD planning for mass vaccinations against COVID-19 was occurring and hundreds of locations were offering the vaccinations of Pfizer, Moderna, and Johnson & Johnson.

Figure 23 - Pennsylvania Department of Health Districts



Source: (PA DOH, 2019)

4.3.7. Radon Exposure

4.3.7.1 Location and Extent

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

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

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

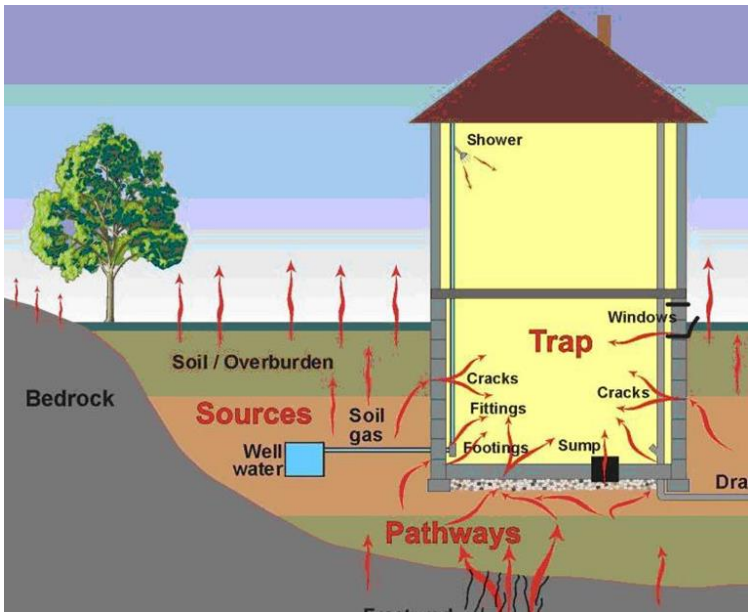
There are several factors that contribute to higher radon levels in soil gas:

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

The following three sources of radon in houses are now recognized (see *Figure 24 - Sketch of Radon Entry Points into a House* below):

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

Figure 24 - Sketch of Radon Entry Points into a House



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

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

The second factor listed above is most likely the cause of high radon levels in Clearfield County. The majority of Clearfield County has high radon level test results. The areas and test results are shown in more detail in the past occurrence section.

4.3.7.2 Range of Magnitude

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

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

Table 38 - Radon Risk for Smokers and Nonsmokers shows the relationship between various radon levels, probability of lung cancer, comparable risks from other hazards, and action

thresholds. As seen in *Table 38 - Radon Risk for Smokers and Nonsmokers* below, a smoker exposed to radon has a much higher risk of lung cancer.

Table 38 - Radon Risk for Smokers and Nonsmokers

RADON LEVEL (pCi/L)	IF 1,000 PEOPLE WERE EXPOSED TO THIS LEVEL OVER A LIFETIME…*	RISK OF CANCER FROM RADON EXPOSURE COMPARES TO...***	ACTION THRESHOLD
SMOKERS			
20	About 260 people could get lung cancer	250 times the risk of drowning	Fix Structure
10	About 150 people could get lung cancer	200 times the risk of dying in a home fire	
8	About 120 people could get lung cancer	30 times the risk of dying in a fall	
4	About 62 people could get lung cancer	5 times the risk of dying in a car crash	
2	About 32 people could get lung cancer	6 times the risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 20 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	About 3 people could get lung cancer	(Average outdoor radon level)	
NON-SMOKERS			
20	About 36 people could get lung cancer	35 times the risk of drowning	Fix Structure
10	About 18 people could get lung cancer	20 times the risk of dying in a home fire	
8	About 15 people could get lung cancer	4 times the risk of dying in a fall	
4	About 7 people could get lung cancer	The risk of dying in a car crash	
2	About 4 people could get lung cancer	The risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L

RADON LEVEL (pCi/L)	IF 1,000 PEOPLE WERE EXPOSED TO THIS LEVEL OVER A LIFETIME…*	RISK OF CANCER FROM RADON EXPOSURE COMPARES TO...***	ACTION THRESHOLD
1.3	About 2 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	-	(Average outdoor radon level)	
*Note: Risk may be lower for former smokers * Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003). ** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.*			

4.3.7.3 Past Occurrence

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

The Pennsylvania Department of Environmental Protection (PA DEP) provides information for homeowners about how to test for radon in their homes, and when they receive a test result over 4 pCi/L, the PA DEP Bureau of Radiation Protection works to help homeowners repair the home and mitigate the hazard. The DEP has estimated that the national average indoor radon concentration is 1.3 pCi/L and the level for action is 4.0 pCi/L; however, they have estimated that the average indoor concentration in Pennsylvania basements is about 7.1 pCi/L and 3.6 pCi/L on the first floor. The PA DEP records all the tests they receive and categorize them in a searchable database by zip code. There are currently 2,174 zip codes in Pennsylvania, but the zip code radon test data only covers for 986 zip codes. The missing zip codes that report in the data base as “N/A” for insufficient data either had fewer than thirty test results or no test results at all. *Table 39 - Radon Level Test Results in Clearfield County* shows a total of thirteen zip codes in Clearfield County where tests were reported to the PA DEP to report their findings; those with no available data were not included in the table. The highest average radon level was reported from the 15724-zip code, part of which is located in the south-eastern corner of the county, with an average reading of 15.3 pCi/L within location of the basement. Most reporting zip codes in Clearfield County have average basement Radon levels significantly above the suggested EPA action level of 4 pCi/L. The average basement reading for reporting zip codes in the county is

10.3 pCi/L, and the average first floor reading is 5.2 pCi/L.

Table 39 - Radon Level Test Results in Clearfield County

Radon Level Test Results (PA DEP, 2020)				
Zip Code	**Location**	**Number of Tests**	**Max Result pCi/L**	**Average Result pCi/L**
15724	Basement	53	160.0	15.3
	First Floor	N/A	N/A	N/A
15801	Basement	3575	299.3	11.3
	First Floor	245	48.6	5.3
15824	Basement	265	71.0	8.4
	First Floor	N/A	N/A	N/A
15840	Basement	100	71.9	8.9
	First Floor	N/A	N/A	N/A
15856	Basement	36	123.6	9.9
	First Floor	N/A	N/A	N/A
16666	Basement	65	38.6	5.9
	First Floor	N/A	N/A	N/A
16830	Basement	587	108.0	6.6
	First Floor	80	276.0	6.4
16833	Basement	133	165.0	13.7
	First Floor	38	52.3	6.0
16838	Basement	55	54.6	11.5
	First Floor	N/A	N/A	N/A
16858	Basement	105	60.0	10.3
	First Floor	N/A	N/A	N/A
16866	Basement	468	504.0	9.5
	First Floor	76	25.9	3.1
16878	Basement	45	106.1	12.5
	First Floor	N/A	N/A	N/A
16881	Basement	41	41.7	9.7
	First Floor	N/A	N/A	N/A

4.3.7.4 Future Occurrence

Radon exposure is inevitable given the geologic and geomorphic conditions in Clearfield County. The EPA and USGS have mapped radon potential in the US to help target resources and assist local governments in determining if radon-resistant features are applicable for new construction. The designations are broken down in three zones and are assigned by county, as shown in *Figure 25 – Pennsylvania County Radon Levels*. Each zone reflects the average short-term measurement of radon that can be expected in a building without radon controls. Clearfield County is located within Zone 1 with counties of high potential for radon which indicate great likelihood of occurrence in the future.

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

Due to the great likelihood of future occurrence, the level of radon daughters should be monitored. Radon daughters are the concentration of decay products of radon in the uranium chain. Fortunately, the presence of radon daughters can be monitored through the means as radon gas. *Table 40 - Suggested Actions and Time Frame for Exposure to Radon Daughters* provides suggested actions and time frames for varying levels of exposure to radon daughters.

Table 40 - Suggested Actions and Time Frame for Exposure to Radon Daughters

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

Suggested Actions and Timeframe for Exposure to Radon Daughters		
Exposure Level*	Suggested Action**	Timeframe for Plan
0.02 to 0.1 WL	Residents should undertake temporary and/or permanent remedial action to lower levels below 0.02 WL. Higher exposure levels require action to be taken in a shorter period of time.	4 to 15 months

*Assumes continuous 24-hour exposure in living area.
**Home testing should be conducted at the end of the indicated time frame to determine if remedial action has reduced the exposure levels of the radon daughters below the indicated value. If remedial action has not been successful, residents should be aware of the risks associated with continuous exposure at the indicated levels.
***Work levels of exposure to radon daughters.

4.3.7.5 Vulnerability Assessment

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

Clearfield County is in the EPA Radon Hazard Zone 1, meaning there is a high risk of radon exposure. Smokers can be up to ten times more vulnerable to lung cancer from high levels of radon depending on the level of radon they are exposed to. Additionally, older homes that have crawl spaces or unfinished basements are more vulnerable to having high radon levels. Average basement radon levels for homes who reported their results to the PA DEP are often found to be above the EPA action level of 4 piC/L. *Figure 26 – Radon Regional Levels* shows the best available data from the EPA about the percentage of homes with radon levels at or above the EPA action level. The EPA estimates that an average radon mitigation system costs approximately $1,200.00. The PA DEP Bureau of Radiation Protection provide short- and long-term tests to determine radon levels, as well as information on how to mitigate high levels of radon in a building. The 2018 PA HMP estimates that there are 33,236 vulnerable buildings in Clearfield County that are in areas with high radon test results, and the cost to mitigate the most impacted of those buildings (an estimated 20% of them or 6,647 buildings) would be $7,976,640.00.

Figure 25 - Pennsylvania County Radon Levels

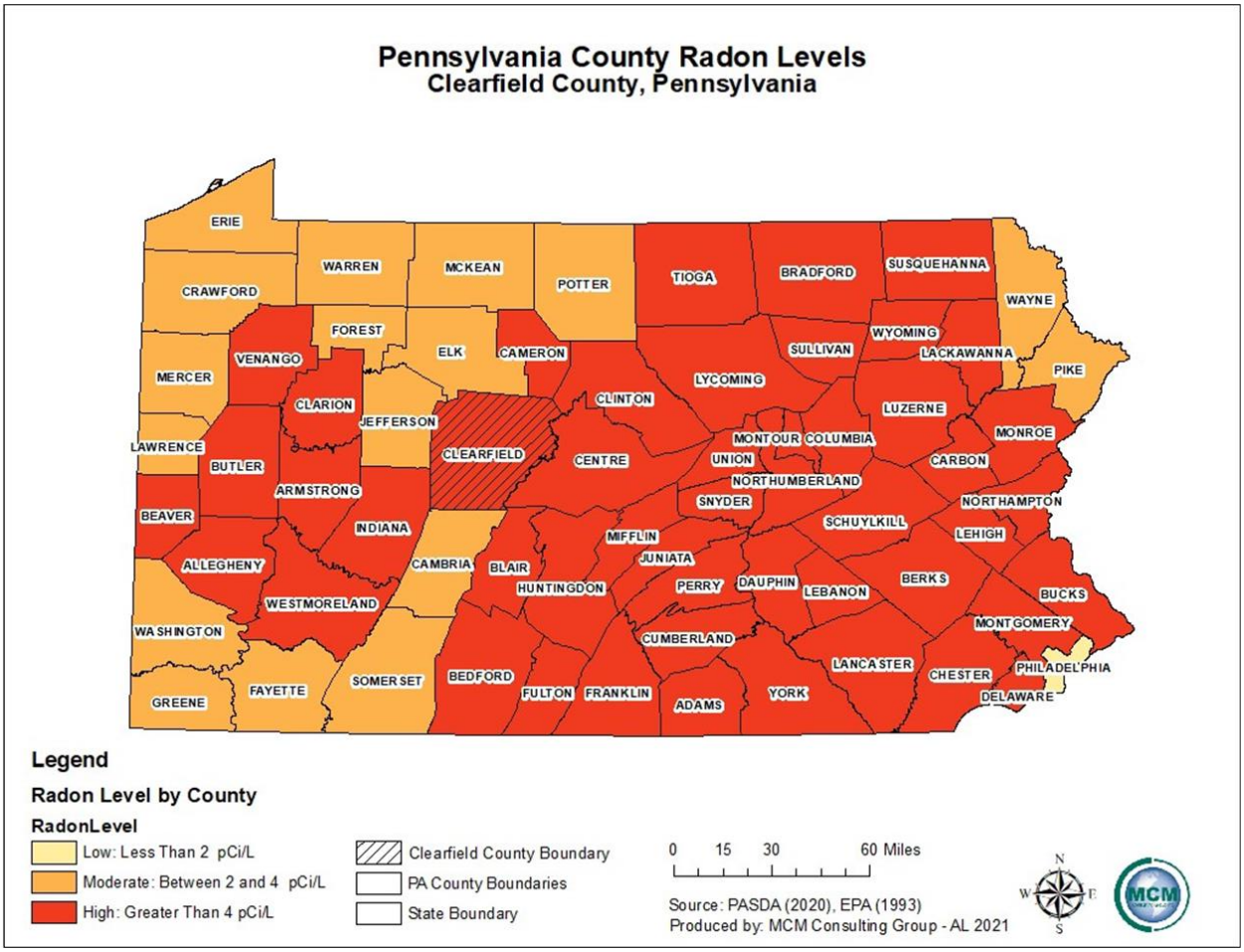
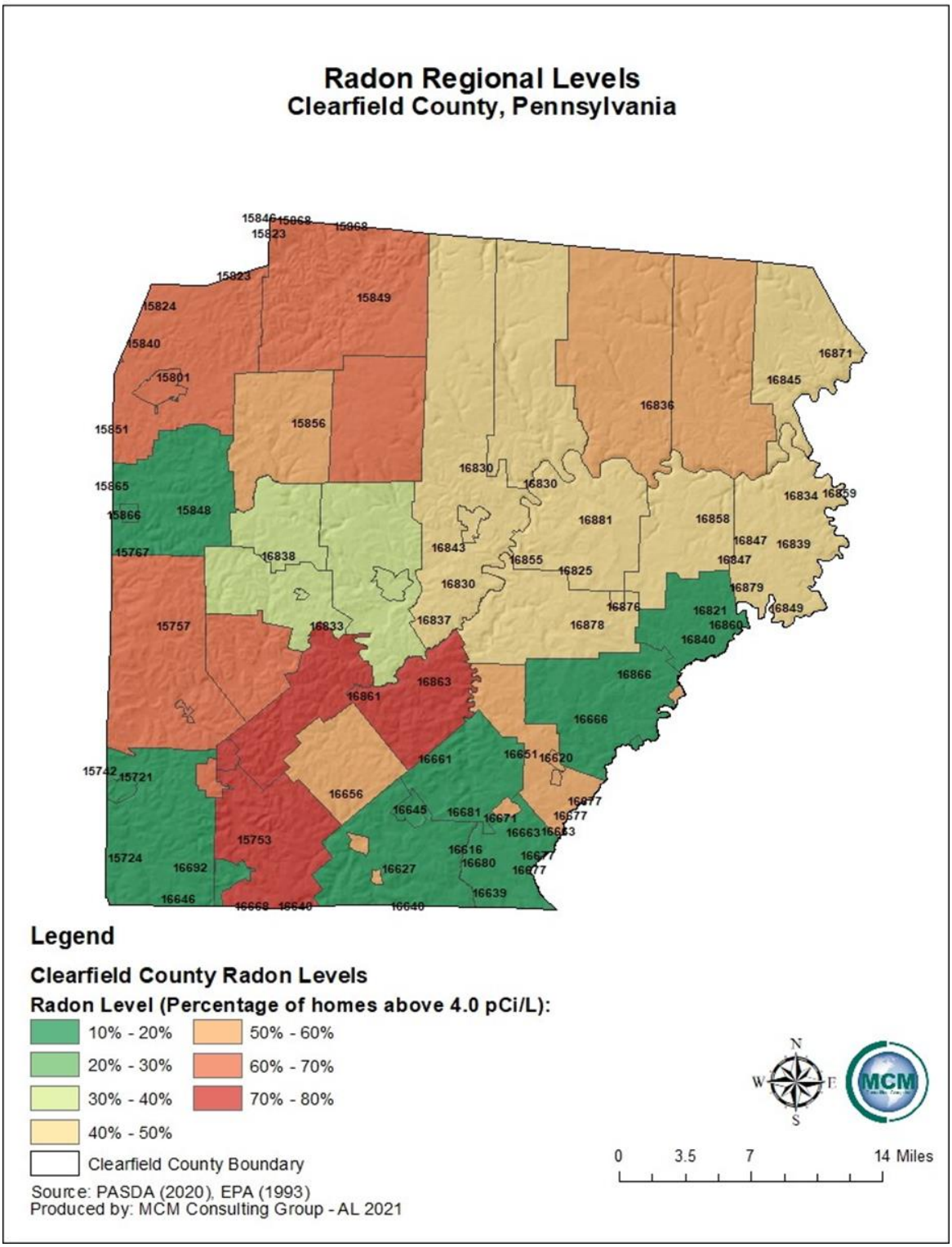


Figure 26 - Radon Regional Levels



4.3.8. Subsidence and Land Failure

4.3.8.1 Location and Extent

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

Mining activity is concentrated in the southwestern region of the state. Because sub-surface (i.e. underground) extraction of materials such as oil, gas, coal, metal ores (i.e. copper, iron, and zinc), clay, shale, limestone, or water result in slow-moving of abrupt shifts in the ground surface, these areas have a higher potential to be impacted by sinkholes and subsidence.

Sinkholes often develop where the cover above a mine is thin. Sinkhole development normally occurs where the interval to the ground surface is less than three to five times the thickness of the extracted seam and the maximum interval is up to ten times the thickness of the extracted seam. In western Pennsylvania, most sinkholes develop where the soil and rock above a mine are less than fifty feet thick.

Areas which are underlain by coal or other minerals which are extracted through deep mining techniques may become susceptible to subsidence. This can be exacerbated by poor engineering practices at the time of withdrawal or progressive degradation in geological stability. Areas of Pennsylvania that have underlying mines are subject to subsidence and constitute a potential threat to the people living and working in those regions and areas. *Figure 27 – Abandoned Mined sites in Clearfield County* illustrates the abandoned mine sites throughout the county and their locations in municipalities. *Figure 28 – Pennsylvania Sinkhole Risk* shows a smaller scale overview of Pennsylvania's subsidence risk.

Human activity can also result in subsidence or sinkhole events. Leaking water pipes or structures that convey storm-water runoff may result in areas of subsidence as the water dissolves substantial amounts of rock over time. Poorly managed stormwater can be an

exacerbating factor in subsidence events. In some cases, construction, land grading, or earthmoving activities that cause changes in stormwater flow can trigger sinkhole events.

4.3.8.2 Range of Magnitude

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

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

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

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

4.3.8.3 Past Occurrence

There is no comprehensive list of mine subsidence events in Clearfield County. The PA DCNR provides an online sinkhole inventory database, which lists a total of 3,619 identified sinkholes in Pennsylvania as of 2013. Note that this inventory has not been updated since the 2013 SSAHMP. However, none of these listed sinkholes have been identified in Clearfield County. The fact that no sinkholes were identified does not necessarily mean there are no sinkholes or historical subsidence hazards in Clearfield County. Additionally, PA DEP staff indicated that small sinkholes occur several times per week and cause limited damage; many of these are related to failing infrastructure like water main breaks or collapsed pipes.

4.3.8.4 Future Occurrence

There is currently no reliable information regarding the probability of future occurrences of mine subsidence. One way of estimating probability of future occurrence would be to project the historical trends into the future, but there is no comprehensive documentation of previous occurrences for mine subsidence events in Clearfield County. PA DEP indicates that mine subsidence events are constant, though they vary in intensity and damage. Based on the geological conditions and current mining activity in Clearfield County, the annual occurrence of subsidence and sinkhole events in the county where mining occurs is considered to be likely.

Although precise location of future occurrences is difficult to predict due to the site-specific conditions that contribute to sinkhole development, there are several signs that can signal potential development. The signs include:

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

4.3.8.5 Vulnerability Assessment

Clearfield County faces the potential of mine subsidence in all the areas of the county that have been mined. A mined area may be differentially prone to subsidence based on its geology and depth of coal seam, but reliable information about the different locations of varying depths of coal seam is not available. Geologists agree that all areas that are mind are prone to subsidence; therefore, the coal mined areas are shown as vulnerable to mine subsidence. Most of the mining that has occurred in Clearfield County was strip mining, leaving these abandoned mine sites susceptible to subsidence events. This is illustrated in *Figure 27 – Abandoned Mined Sites in Clearfield County*. The frequency of subsidence incidences occurring in the county is expected to remain low. However, considering past mining activity that occurred in the county, subsidence cannot be ruled out as a potential hazard. The number of active and abandoned coal mines in Clearfield County is 1,303 mines. Clearfield County is the third most mine populated county right behind Jefferson County with 1,393 mines and Somerset County with 1,694 mines.

Careful planning is the least-costly and most effective method for reducing vulnerability to subsidence hazards. Municipalities could minimize the potential for sinkhole development through proper maintenance and updating of water utility lines. The Surface Mining Control and Reclamation Act of 1977 imposes land use controls on active mines. This law requires an evaluation of whether subsidence could occur and cause material damage or diminution of use of structures or renewable resource lands. If there is potential for damage, a plan to prevent or mitigate the damage is required.

Table 41 – Infrastructure within 500 Yards of Abandoned Mine Polygons illustrates the different infrastructure items that are within a vulnerability zone of 500-yards of the abandoned mine inventory locations within Clearfield County. The abandoned mine inventory locations can be broken down into nine categories. These categories are AMD Ground Saturation, Coal Deep Mine, Coal Surface Mine, Entry Point / Opening, Impacted Water Source, Refuse Pile, Settling Basin, Spoil Area, and Subsidence Area. These categories can also be found symbolized by color in *Figure 27 – Abandoned Mined Sites in Clearfield County*. Based on information in the table below, there were nineteen critical infrastructure or functional needs facilities located within the 500-yard buffer zone around abandoned mine locations. These structures include but are not limited to EMS stations, fire departments, hospitals, and police departments for critical infrastructure and preschools and schools for functional needs.

Table 41 - Infrastructure within 500 Yards of Abandoned Mine Polygons

Infrastructure within 500-Yards of Abandoned Mine Areas		
Infrastructure Type:	**Name:**	**Subsurface Type:**
Critical Infrastructure		
EMS Stations	Houtzdale / Ramey EMS	Subsidence Area
Fire Departments	BJW Fire Company - Bigler	Coal Surface Mine
	BJW Fire Company - Woodland	Subsidence Area
	Glen Richey Fire Company	Coal Surface Mine
	Glendale Volunteer Fire Department	Refuse Pile
	Houtzdale Fire Company	Subsidence Area
	Lecontes Mills Fire Company	Entry Point / Opening
	Wallaceton Fire Company	Spoil Area
	West Sandy Fire Company	Subsidence Area
Hospitals	Penn Highlands Dubois	Subsidence Area
Police Departments	Decatur Township Police Department	Coal Surface Mine
	Pennsylvania State Police - Woodland	Coal Surface Mine
	Bigler Township Police Department	Coal Surface Mine
Functional Needs		
Preschools	Cenclear Preschool	Coal Surface Mine
	Coalport Child and Family Center	Spoil Area
Schools	Philipsburg-Osceola Middle School	Subsidence Area
	Clearfield Elementary School	Spoil Area
	Clearfield Alliance Christian School	Spoil Area
	Clearfield County Career & Technology Center	Spoil Area

Figure 27 - Abandoned Mined Sites in Clearfield County

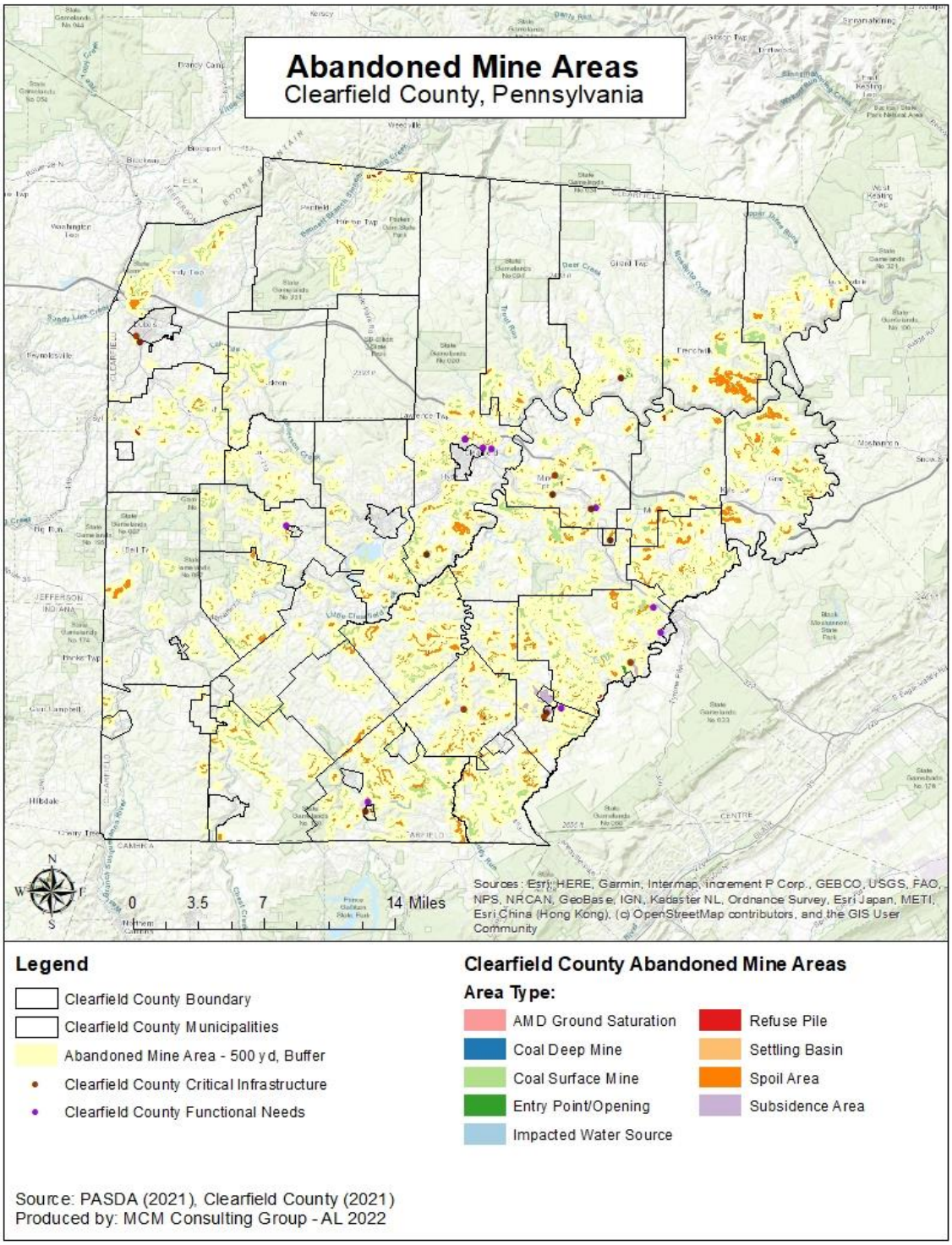
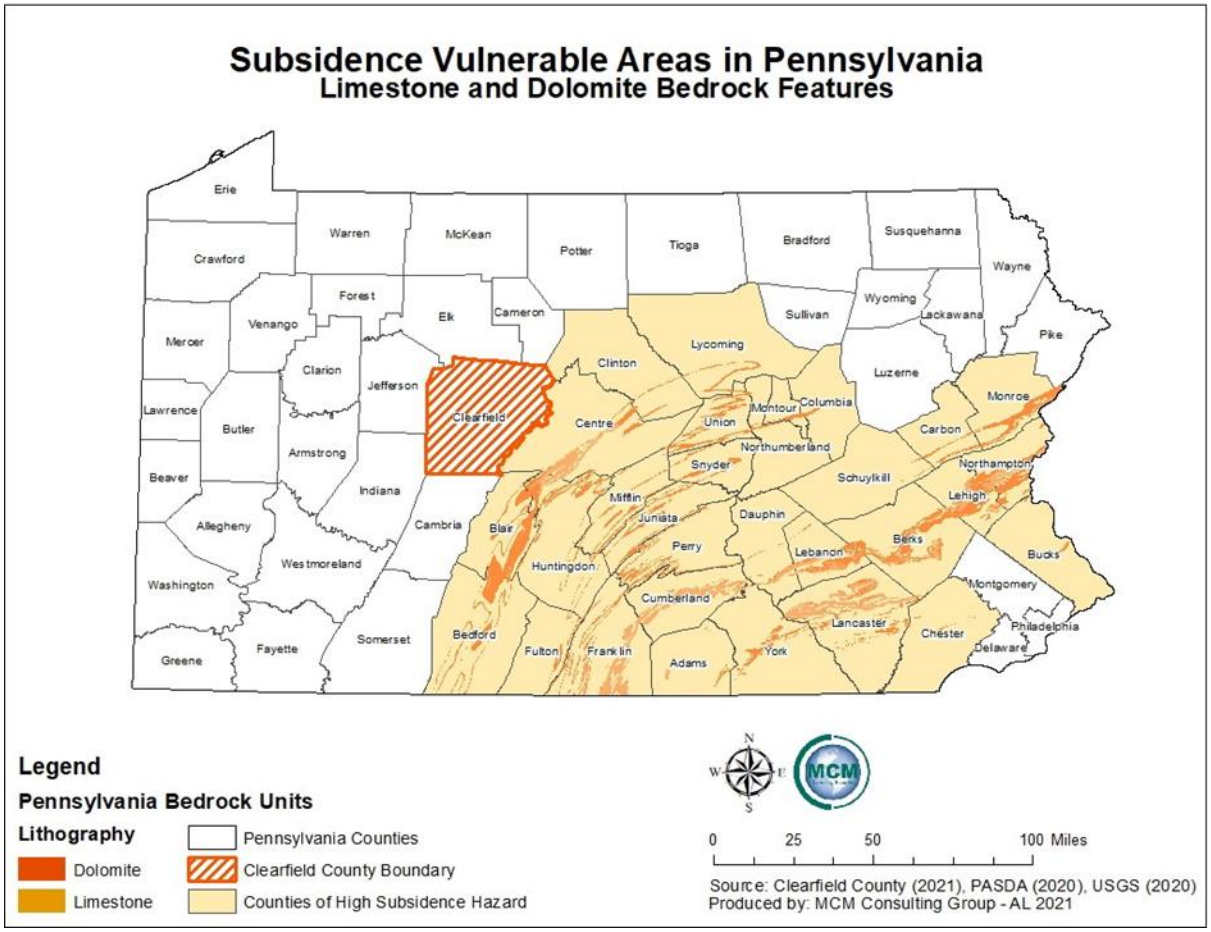


Figure 28 - Pennsylvania Sinkhole Risk



4.3.9. Tornado and Windstorm

4.3.9.1 Location and Extent

Tornadoes and windstorms can occur throughout Clearfield County, though incidents are usually localized. Severe thunderstorms may result in conditions favorable for the formation of numerous or long-lived tornadoes. Tornadoes are nature's most violent storm and can cause fatalities and devastation to neighborhoods within the county. Tornadoes can occur at any time during the day or night but are most frequent during late afternoon into early evening, the warmest hours of the day, and most likely during the spring and early summer months of March through June. Tornado movement is characterized in two ways: direction/speed of spinning winds and forward movement of the tornado, also known as the storm track. The rotational wind speeds can range from 100 to more than 250 mph. The speed of forward motion can range from 0 mph to 50 mph. On estimate, the maximum velocity of tornadoes is about 300 mph. Forward motion of the tornado path can be a few to several hundred miles in length. Widths of tornados vary from less than 100 feet to more than a mile wide. The National Centers for Environmental Information (NCEI) reports that, "the maximum winds in tornadoes are often confined to extremely small areas and vary tremendously over short distances", which explains why one house may be completely demolished by a tornado and a neighboring house could be untouched. Some tornadoes never touch the ground and are short lived, while others may touch the ground several times. There are two main types of tornadoes: supercell and non-supercell. Supercell tornadoes are the most common and often the most dangerous type of tornado. A rotating updraft is key to the development of a supercell and eventually a tornado. Once the updraft is rotating and being fed by warm air flowing in, the tornado is formed. The other type of tornado is categorized as non-supercell, which is not as common. One type of non-supercell tornado is the "Quasi-Linear Convective Systems" (QLCS). The QLCS tornadoes typically arise during the late night or early morning hours. These types of tornadoes are weaker and more short-lived compared to super cell thunderstorms. However, the QLCS are more difficult to detect effectively. Another type of non-supercell tornado is a landspout. These tornadoes are narrow and rope-like funnels that form when the thunderstorm cloud is still growing with no rotating updraft which causes the spinning motion to appear near the ground more. Waterspouts are similar non-supercell tornadoes to the landspout but not likely to be found within Clearfield County.

Windstorms are experienced on a region-wide scale. Windstorms may be caused by thunderstorms, hurricanes, and tornadoes, but the most frequent cause of windstorms in Pennsylvania is thunderstorms. Windstorms are defined as sustained wind speeds of 40 mph or greater, lasting for at least one hour, or winds of 58 mph or greater lasting for any duration. There are a wide variety of windstorm events that can take place in Clearfield County: Straight-line wind, downdraft, macroburst, microburst, downburst, gust front, and derecho. Straight-line winds are the most common wind event. A downdraft is a small-scale column of air that rapidly

sinks toward the ground. A macroburst is the outward burst of strong winds that are near or at the surface with horizontal dimensions greater than 2 1/2 miles. Macroburst winds may begin over a smaller area and then spread out to an even wider area, sometimes producing damage similar to a tornado. On the other hand, microbursts are smaller outward bursts of strong winds near or at the surface. Microbursts are less than 2 1/2 miles in horizontal dimension and are typically short-lived winds that last a maximum of ten minutes, with windspeeds reaching up to 100 mph.

Microburst events can be wet or dry. Wet microbursts are typically associated with heavy precipitation at the surface. Dry microbursts do not have precipitation associated with them and are commonly found in the western portion of the United States. Clearfield County is more likely to experience a wet microburst instead of a dry microburst event. A downburst is typically used to describe the macro and microbursts. A gust front is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. The gust fronts are characterized by wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Derecho is a long-lived windstorm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho contains various downbursts and microbursts. If the wind damage is more than 240 miles and includes wind gusts of at least 58 mph, the event would then be classified as a derecho.

4.3.9.2 Range of Magnitude

Each year, tornadoes account for $1.1 billion in damages and cause over eighty deaths nationally. Thus far, 2011 was the second worst year on record for deadly tornadoes, 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. The damage caused by a tornado is a result of the high-wind velocity and windblown debris, also accompanied by lightning or large hail. The most violent tornadoes have rotating winds of 250 mph or more and are capable of causing extreme destruction and turning normally harmless objects into deadly projectiles.

Damages and deaths can be especially significant when tornadoes move through populated, developed areas. The destruction caused by tornadoes ranges from minor to severe depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damages to structures of light weight construction such as mobile homes. The Enhanced Fujita Scale, also known as the “EF-Scale”, measures tornado strength and associated damages. The EF-Scale is an update to the earlier Fujita Scale, also known as the “F-Scale”, that was published in 1971. These scales classify U.S. tornadoes into six intensity categories based upon the estimated maximum winds occurring within the wind vortex (*Table 43 - Enhanced Fujita Scale).* Although F Scale has been used for many years, this scale has limitations associated with it. Limitations of the F-Scale include lack of damage indicators (DI), no account of construction quality and variability, and no definitive correlation between damage and wind speeds. The limitation is what led to a more accurate scaling method of the EF- Scale. The EF-Scale became effective on February 1st,

2007. Since its implementation by the National Weather Service in 2007, the EF-Scale has become the definitive metric for estimating wind speeds within tornadoes based upon damage to buildings and structures. Previously recorded tornadoes are reported with the older F-Scale values, but *Table 39 - Enhanced Fujita Scale* shows F-Scale categories with corresponding EF-Scale wind speeds.

Figure 29 - Pennsylvania Wind Zones identifies wind speed zones across the state. The figure identifies wind speeds that could occur across the state to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities. The majority of Pennsylvania falls within Zone III, meaning that design wind speeds for shelters and critical facilities should be able to withstand a three-second gust of up to 200 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm incident. The western portion of the state falls within the Zone IV which indicates shelters can withstand up to 250 mph winds, while the eastern side falls within the Zone II where shelters can withstand up to only 160 mph. *Table 42 - Wind Zones and Counties Affected in Pennsylvania* identifies which county is located in specific wind zones throughout Pennsylvania. As shown on *Figure 29* and *Table 42*, Clearfield County is situated in Wind Zone III.

Table 42 - Wind Zones and Counties Affected in Pennsylvania

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

Since Clearfield County falls within Zone III, shelters and critical facilities should be designed to withstand up to 200 mph winds, regardless of whether the gust is the result of a tornado, coastal storm, or windstorm event. Additionally, these structures should be able to withstand the wind speeds experienced in an EF4 tornado event. While it is difficult to pinpoint the exact locations

at the greatest risk of a tornado, the southeast, southwest, and northwest sectors of the Commonwealth are more prone to tornadoes.

Tornadoes/windstorms of all types have caused the following problems within Clearfield County:

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

Table 43 - Enhanced Fujita Scale

Enhanced Fujita Scale (NWS, 2007)			
EF-Scale Number	**Wind Speed (MPH)**	**F-Scale Number**	**Description of Potential Damage**
EF0	65–85	F0-F1	**Minor damage**: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
EF1	86-110	F1	**Moderate damage**: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111–135	F1-F2	**Considerable damage**: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136–165	F2-F3	**Severe damage**: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.

Enhanced Fujita Scale (NWS, 2007)			
EF-Scale Number	**Wind Speed (MPH)**	**F-Scale Number**	**Description of Potential Damage**
EF4	166–200	F3	**Devastating damage**: Well-constructed houses and whole frame houses completely leveled; cars thrown, and small projectiles generated.
EF5	>200	F3-F6	**Extreme damage**: Strong frame houses leveled off foundations and swept away; automobile-sized projectiles fly through the air in excess of 100 m (300 ft.); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.

Most of the tornadoes that have struck Clearfield County have occurred in the northwest and southwest parts of the county. Historically, tornadoes have occurred countywide in Lawrence Township, New Washington Borough, Irvona Borough, and Luthersburg. In 1985, a total of twenty-three confirmed tornadoes touched down across Eastern Ohio, Southwestern New York, and Central/Western Pennsylvania. This outbreak remains the worst in recorded history for this area. Of these twenty-three tornadoes, eight were of violent intensity (F4 or F5) with estimated wind speeds over 200 mph. The tornado in this string of storms that affected Clearfield County, which is identified in *Table 44 – Clearfield County Tornado History*, occurred in Huston Township area. According to the National Weather Service in State College, PA, this tornado had the widest and longest path of all twenty-three to occur in 1985.

4.3.9.3 Past Occurrence

Clearfield County has experienced eight tornado events since 1954 and twenty-two wind incidents since 1997 (see *Table 44 – Clearfield County Tornado History* and *Table 45 – Clearfield County High Wind History*). Numerous sources provide information in regard to past occurrences and losses associated with tornadoes/windstorms in Clearfield County and the Commonwealth as a whole. Due to the number of sources available with information, specific number of events and losses could vary slightly in number. Tornado data was only present until 2009 while windstorm data was only available until 2019 even though more recent events could have possibly occurred. Historically, the county has experienced both severe windstorms and tornadoes.

The most recent tornado impact on Tyler, Clearfield County occurred August 9th, 2009, when an EF1 was reported within the county. The tornado was 1.25 miles in length and had a width of

about 150 yards. The EF1 tornado damage was near Tyler in northern Clearfield County that had a maximum wind speed of between 95 and 100 mph. The tornado touched down just north of Scattertown in Elk County and moved south crossing into Clearfield County, before lifting about one-half mile south of Tyler. One home in Tyler sustained minor damage with about two dozen trees knocked down in the tornado path. The total damage from this tornado event resulted in $10,000.00 for Clearfield County. The most dangerous tornado event to human safety and most damaging tornado event was an F4 on May 31st, 1985, that caused a total of $25 million in damages. The starting path of this tornado event started on the western side of Clearfield County and moved east and ended its path on the eastern side of Clearfield County. The tornado moved one mile south of Penfield to seven miles north of Lock Haven. Ten houses were destroyed or damaged. About 88,000 trees were destroyed in Pennsylvania State Forest Land. The variety of past tornado events in Clearfield County range from are F0/EF0 through F4/EF4 levels.

The most recent wind incident in Clearfield County occurred on February 24th, 2019, when a 52-mph magnitude wind event was reported. The very gusty west-northwest winds developed across central Pennsylvania, as low pressure intensified over the Great Lakes and dragged a cold front across the area. The non-thunderstorm wind gusts near 60 mph were observed across Clearfield County from February 24th to the 25th in 2019. A tree fell onto a porch in Osceola Mills. Additionally, there were scattered power outages and downed trees across the county due to this windstorm event. The most damaging wind incident to affect Clearfield County was on February 2nd, 2009, with a 50-mph wind event which was reported to have caused $50,000.00 in damages. These damaging non-thunderstorm wind gusts between 50 and 60 mph were recorded across central Pennsylvania following the passage of a strong cold front. The high winds produced significant damage across the region, toppling numerous trees and wires. Several homes and other building structures also sustained moderate to major damage. The Public Utility Commission reported that utility crews restored power to over 400,000 customers. Allegheny Powers said that this power outage event was the largest in the company's history. Overall, the estimated property damage sustained throughout central Pennsylvania was nearly one million dollars which $50,000.00 was just in Clearfield County.

See *Table 44 – Clearfield County Tornado History*, *Table 45 - Clearfield County High Wind History*, and *Figure 30 - Past Tornado Occurrences in Clearfield County* below for reference to the past tornado and wind occurrence events and data within the county.

Table 44 - Clearfield County Tornado History

Clearfield County Tornado History (NOAA NCEI, 2021)					
Location	**Date**	**Magnitude (F/EF Scale)**	**Deaths**	**Injuries**	**Property Damage**
Clearfield County	04/27/1954	F1	-	-	$250.00

Clearfield County Tornado History (NOAA NCEI, 2021)					
Location	**Date**	**Magnitude (F/EF Scale)**	**Deaths**	**Injuries**	**Property Damage**
Clearfield County	07/11/1976	-	-	-	$0.00
Clearfield County	05/31/1985	F4	-	-	$25,000,000.00
St. Lawrence	09/26/1994	F2	-	-	$50,000.00
New Washington	07/19/2996	F1	-	-	$0.00
Irvona	06/02/1998	F0	-	-	$0.00
Luthersburg	08/16/2001	F1	-	-	$5,000.00
Tyler	08/09/2009	EF1	-	-	$10,000.00
Totals	**-**	**-**	**-**	**-**	**$25,065,000.00**

Table 45 - Clearfield County High Wind History

Clearfield County High Wind History (NOAA NCEI, 2021)				
Location	**Date**	**Mag. (knots)**	**Injuries**	**Property Damage**
Clearfield County	02/27/1997	30 kts	-	$0.00
Clearfield County	03/01/1997	50 kts	-	$0.00
Clearfield County	11/10/1998	51 kts	-	$0.00
Clearfield County	09/29/1999	60 kts	-	$0.00
Clearfield County	01/10/2000	50 kts	-	$0.00
Clearfield County	12/12/2000	-	-	$13,900.00
Clearfield County	02/10/2001	-	-	$5,550.00
Clearfield County	12/14/2001	60 kts	-	$0.00
Clearfield County	02/01/2002	63 kts	-	$0.00
Clearfield County	03/09/2002	50 kts	-	$0.00
Clearfield County	11/13/2003	60 kts	-	$0.00
Clearfield County	12/01/2004	60 kts	-	$0.00
Clearfield County	12/23/2004	60 kts	-	$0.00
Clearfield County	02/17/2006	52 kts	-	$0.00
Clearfield County	12/01/2006	45 kts	-	$0.00
Clearfield County	01/30/2008	50 kts	-	$0.00
Clearfield County	05/11/2008	50 kts	-	$0.00

Clearfield County High Wind History (NOAA NCEI, 2021)				
Location	**Date**	**Mag. (knots)**	**Injuries**	**Property Damage**
Clearfield County	09/14/2008	60 kts	-	$0.00
Clearfield County	02/12/2009	50 kts	-	$50,000.00
Clearfield County	10/29/2012	52 kts	-	$0.00
Clearfield County	04/04/2018	52 kts	-	$0.00
Clearfield County	02/24/2019	52 kts	-	$0.00
Total	**-**	**-**	**-**	**$69,450.00**

4.3.9.4 Future Occurrence

In the United States, tornado activity has increased in variability with a general decrease in the number of days a year with activity but an increase in the number of tornadoes on those days (increase in tornado outbreaks). The future probability of a disastrous tornado occurring in Clearfield County is ranked as possible. According to the National Weather Service, the Commonwealth of Pennsylvania has an annual average of ten tornadoes with two related deaths. While the chance of being hit by a tornado in Clearfield County is small, the damage that results when the tornado arrives can be devastating. An EF-5 tornado, with a 0.019% annual probability of occurring, can carry wind velocities of 200 mph, resulting in a force of more than 100 pounds per square foot of surface area. This is a "wind load" that exceeds the design limits of most buildings. As the county's population continues to grow and as residential and commercial construction continues, the number of people and properties will be greatly affected by tornadoes and windstorms as they increase accordingly.

Based on historic patterns, tornadoes are unlikely to remain on the ground for long distances, especially in areas of the county with hilly terrain. However, the high historical number of windstorms with winds at or over 50 knots indicates that the annual chance of a windstorm in the county is higher. The tornado season has been lengthening, with the season starting earlier than it has historically. Pennsylvania had, for example, a record number of tornadoes in April and May 2019 compared to any other April or May on record. Climate change is causing temperatures and air moisture to increase, and it is thought that these changes could result in an increase in frequency and intensity of tornadoes and severe windstorms; however, there is somewhat low confidence in these conclusions and there is still much uncertainty. Therefore, the number of future tornado/windstorm events could potentially increase due to many factors.

Based on historical incidents, there are three zones in Pennsylvania that can either experience less than one, one to four, and five to ten of EF2 or above tornadoes per 3,700 square miles. Communities in Clearfield County, as shown in the *Figure 31 - Tornado Activity in Clearfield*

County below, are expected to have one to four tornadoes annually as a future occurrence. The approximation of one to four tornadoes annually assists with determining the rate of future tornado occurrences within Clearfield County. Future tornadoes will be similar to those that affected the county in past events.

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

4.3.9.5 Vulnerability Assessment

Tornadoes can occur at any time of the year, though they are more likely during peak months, which are during the summer for the northern part of the United States, such as Pennsylvania. While the frequency of windstorms and minor tornadoes is expected to remain relatively constant, vulnerability increases in more densely developed areas. Factors that impact the amount of damage caused by a tornado 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 tornadoes make them one of the most destructive natural hazards. There can be many secondary impacts of tornadoes 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.

Dangers that accompany thunderstorms associated with tornadoes which increase the vulnerability of Clearfield County:

- 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 millions in damages annually to property and crops.

The economy of Clearfield County is highly vulnerable to tornadoes. While there may be limited impact on the financial and commercial systems of the economy, these storms and the damage they result in can disrupt business for long term. The local economy is vulnerable due to the possibility of being crippled by tornadoes 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 closures can limit the transportation of goods and services. Additionally, flooding cannot be discounted as it can destroy physical structures, merchandise, and equipment essential for business operation.

Clearfield's environment is also vulnerable to tornado events. However, since tornado events are typically localized, environmental impacts are rarely widespread. The impact of windstorms on the environment typically takes place over a larger area. In either case, where these events occur, severe damage to plant species is likely. This includes uprooting or total destruction of trees and an increased threat of wildfire in areas where dead trees are not removed. Most notably, hazardous materials spills can pollute ground water systems and vegetation. In the case of hazardous material spills caused by the event, the local environment can also be negatively impacted which requires extensive clean-up and mitigation efforts. Clearfield County is considered a rural county that has a great amount of tourism that occurs due to the vast mountains and hills present. Not only is this environment of the mountains at risk, but the hikers and hunters within the area are as well. Consequently, in the event of a tornado or severe storm, these tourists have limited emergency notification measures which result in high vulnerability. A storm potentially has the ability to destroy structures, citizens, and their possessions that are often left at the will of the storm. The elderly, disabled, special needs, and non-English speaking residents are at risk when faced with tornadoes. Without assistance to evacuate or difficulty understanding public information, they may be unable to prepare themselves or their homes and other possessions to safely endure the storm.

Since high wind events may affect the entire county, it is important to identify specific critical facilities and assets that are most vulnerable to this hazard. Critical facilities are highly vulnerable to high windstorms and tornado events. While many severe storms can cause exterior damage to structures, tornadoes can also completely destroy structures, along with their surrounding infrastructure and abruptly halting operations. Tornadoes are often accompanied by severe storms which can be threatening to critical facilities within the county. Many secondary effects from these disasters can jeopardize the operation of these critical facilities as well. Critical facilities are particularly vulnerable to power outages which can leave facilities functionless, potentially crippling infrastructure supporting the population of the county. Due to their lightweight and often unanchored design, commercial trailers and mobile homes are also extremely vulnerable to high winds/tornadoes and will generally sustain the most damage. These structures represent a reasonable percentage of the occupied structures within the county. The majority of the mobile homes are found in Lawrence Township and Sandy Township, which makes these two municipalities more vulnerable to tornado events than others. Locations and numbers of mobile home parcels in Clearfield County can be found in *Table 46 – Vulnerable Mobile Home Parcels in Clearfield County*. While clearly an estimate, this enables the county to take a preliminary look at which jurisdictions are more vulnerable to mobile home damage.

Table 46 - Vulnerable Mobile Home Parcels in Clearfield County

Vulnerable Mobile Home Parcels in Clearfield County (Clearfield County GIS, 2021)	
Municipality	**Number of Mobile Homes Parcels**
Brady Township	60

Vulnerable Mobile Home Parcels in Clearfield County (Clearfield County GIS, 2021)	
Municipality	**Number of Mobile Homes Parcels**
Chester Hill Borough	14
Decatur Township	38
Lawrence Township	103
Sandy Township	136
Total	**351**

Figure 29 - Pennsylvania Wind Zones

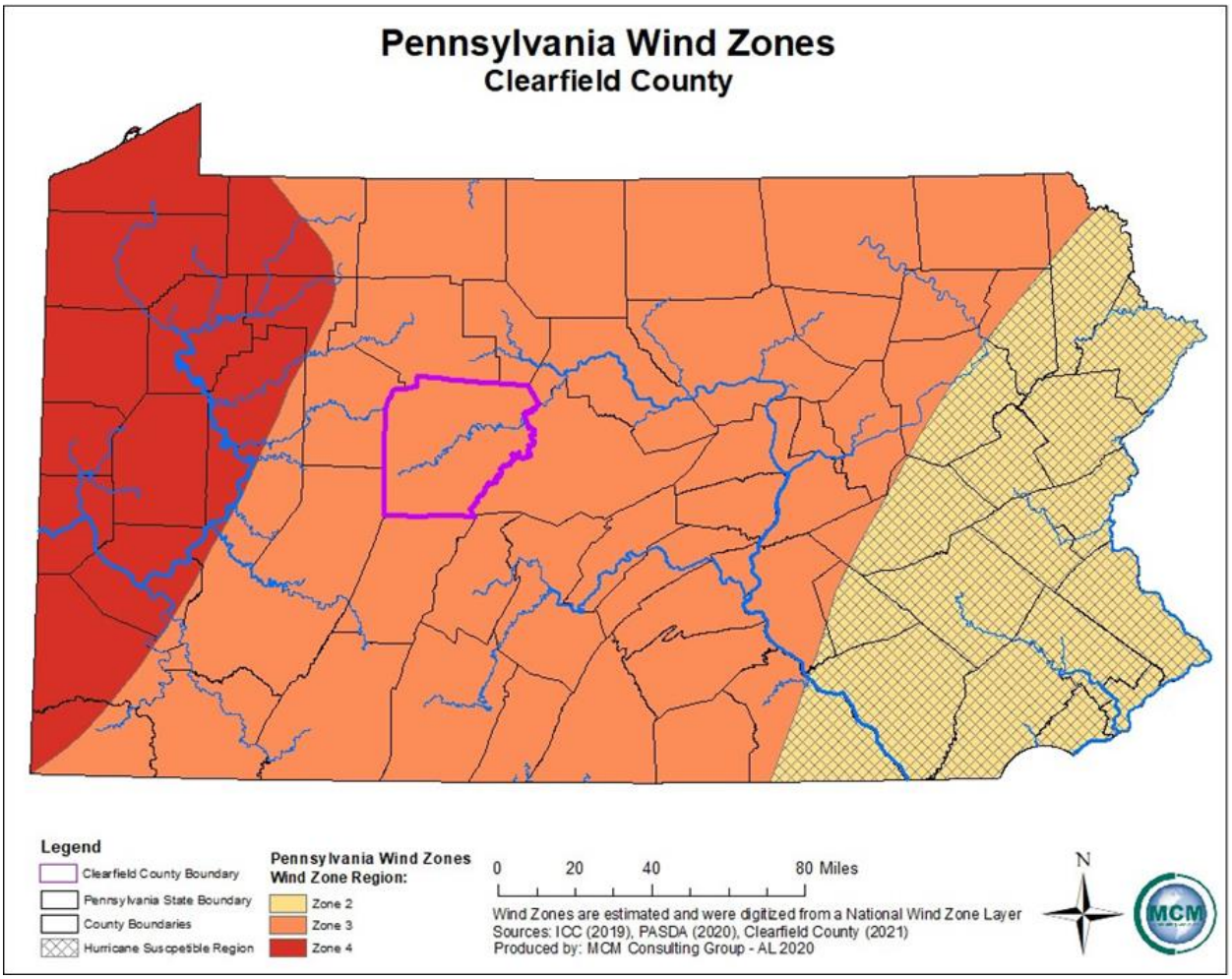


Figure 30 - Past Tornado Occurrences in Clearfield County

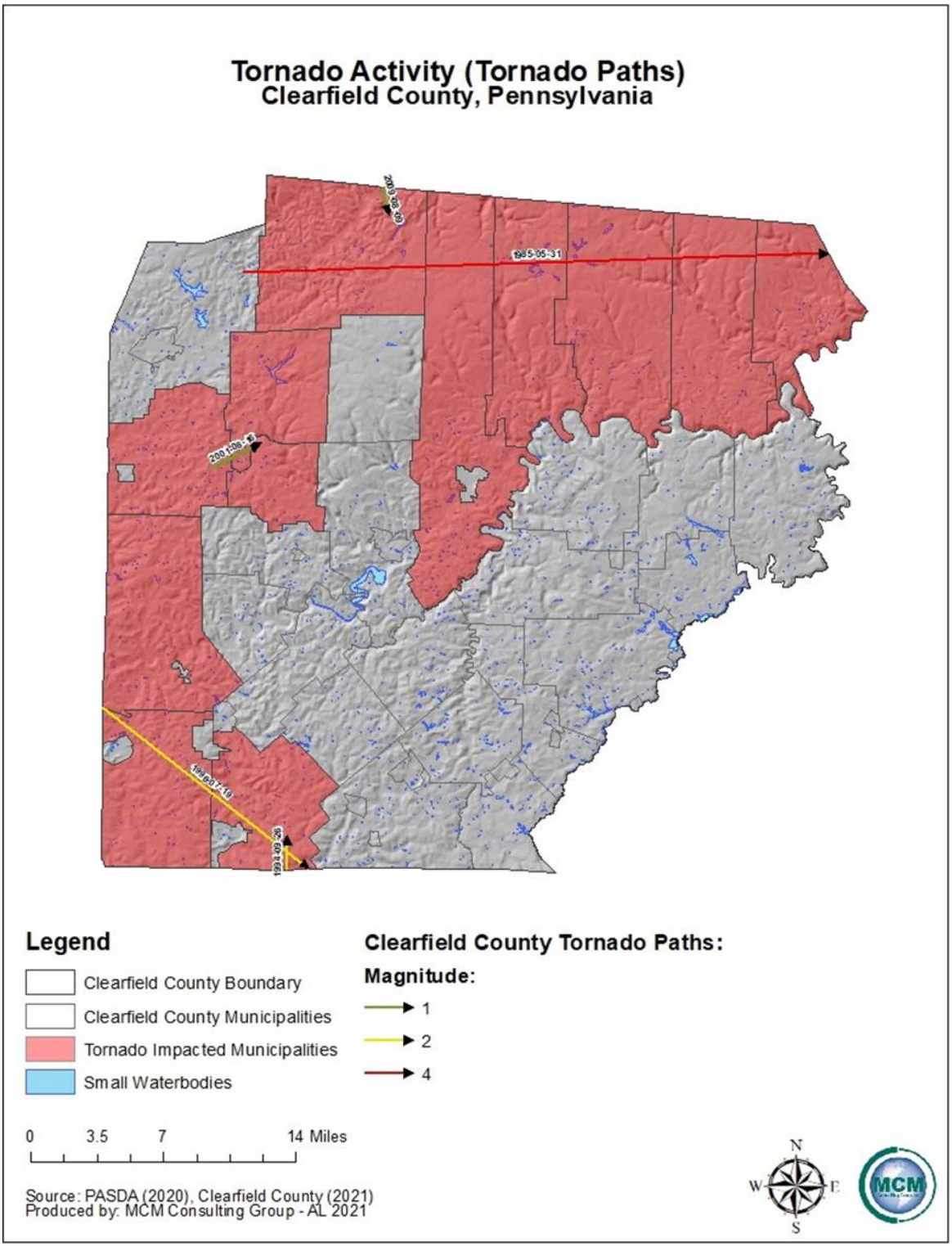
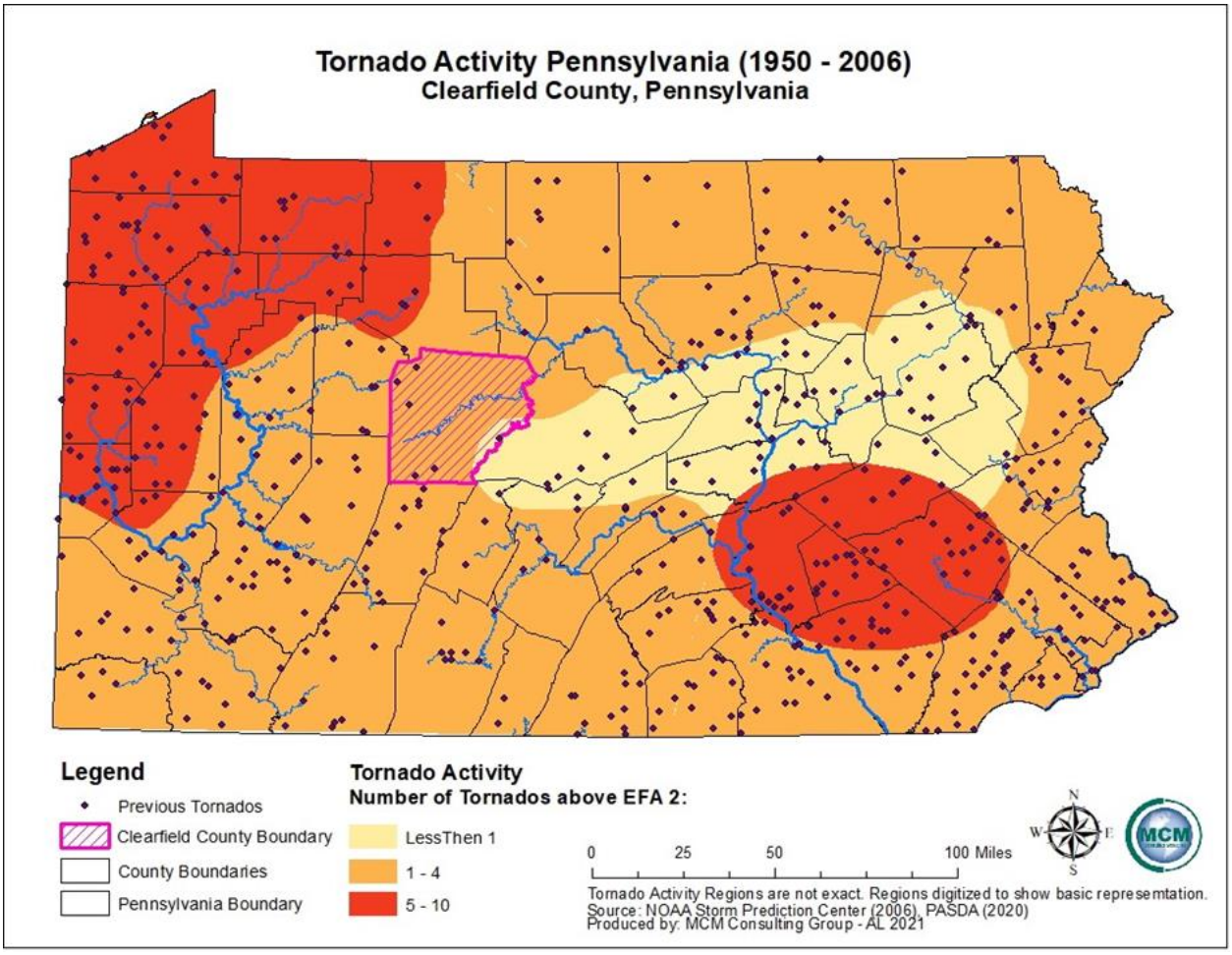


Figure 31 - Tornado Activity in Clearfield County



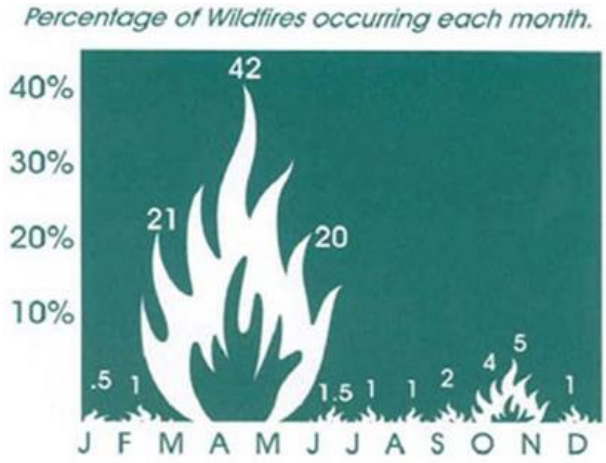
4.3.10. Wildfire

4.3.10.1 Location and Extent

Most wildfires are caused by human carelessness, negligence, and ignorance. However, some are precipitated by lightning strikes and in rare instance, spontaneous combustion. Lightning-caused wildfires in Pennsylvania are also relatively rare. The Pennsylvania Department of Conservation and Natural Resources (PA DCNR) reports that 98% of wildfires are caused by people.

Wildfires can take place in less developed or completely undeveloped areas, spreading rapidly through vegetative fuels. This type of fire can occur any time of the year, but most occur in the spring and fall months. The greatest potential for wildfires is in the spring months of March, April, and May, and the autumn months of October and November; 83% of all Pennsylvania wildfires occur in these two time periods. In the spring, bare trees allow sunlight to reach the forest floor, drying fallen leaves and other ground debris. In the fall, dried leaves are also fuel for fires. *Figure 32 – Seasonal Wildfire Percentage* shows the wildfire percentage occurrence during each month occurring in Pennsylvania. Any small fire, if not quickly detected and suppressed, can get out of control. Wildfires in Pennsylvania can occur in open fields, grass, dense brush, and forests.

Figure 32 - Seasonal Wildfire Percentage



The majority of Clearfield County's land cover is forest and the potential geographic extent of wildfires in the county is quite large. Under dry conditions or droughts, wildfires have the potential to burn forests as wells as croplands. Clearfield County is part of the Moshannon State Forest District, PA DCNR District 9, which covers more than 190,000 acres in Clearfield, Elk and Centre counties.

4.3.10.2 Range and Magnitude

Wildfire events can range from small fires that can be managed by local firefighters to large fires impacting many acres of land. Large events may require evacuation from one or more communities and necessitate regional or national firefighting support. The impact of a severe wildfire can be devastating. A wildfire has the potential to kill people, livestock, fish, and wildlife. Wildfires can destroy property, valuable timber, forage, and recreational and scenic values.

In addition to the risk wildfires pose to the general public and property owners, the safety of firefighters is also a concern. Although loss of life among firefighters in wildfires does not occur often in Pennsylvania, it is always a risk. More common firefighting injuries include falls, sprains, abrasions, or heat-related injuries such as dehydration. Response to wildfires also exposes emergency responders to the risk of motor vehicle accidents and can place them in remote areas away from the communities that they are chartered to protect.

Significant potential environmental impacts from wildfires include severe erosion, silting of stream beds and reservoirs, and flooding due to ground-cover loss following a fire event.

Wildfires can also have a positive environmental impact in that they burn dead trees, leaves, and grasses to allow more open spaces for new vegetation to grow and receive sunlight.

The United States Forest Services utilizes the Forest Fire Assessment System to classify the dangers of a wildfire. *Table 47 – Wildland Fire Assessment System* identifies each threat classification and provides a description of the level.

Table 47 - Wildland Fire Assessment System

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

Wildland Fire Assessment System *(U.S. Forest Service)*	
Rank	**Description**
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.

4.3.10.3 Past Occurrence

Between 2000 and 2020, there was a total of 1,478 wildfire events reported to the PA DCNR Bureau of Forestry for District 9. The largest number of wildfire events for any year was recorded back-to-back in years 2005-2006 when there was a total of 120 wildfire events each year which burned a total of 631.9 acres. 2006 recorded the highest number of acres burned at 467.4. The math indicates a history of a high number of wildfires per year, but small ones. *Table 48 – List of Wildfire Events for District 9*, lists DCNR's record of wildfires in its library. News

reports noted a large brush fire in April 2021 to which 10 fire companies and two DCNR air tankers were dispatched to Cooper Township. In May 2018, a wildfire destroyed a mobile home and two sheds in Boggs Township.

Table 48 - List of Wildfire Events for District 9

Number of Wildfire Events for District 9 (PA DCNR, 2021)		
Year	**Number of Wildfire Events**	**Number of Acres in Wildfire Events**
2000	105	146.6
2001	110	765.5
2002	80	138.9
2003	62	60.3
2004	37	57.6
2005	120	164.5
2006	120	467.4
2007	84	99.3
2008	72	352.1
2009	93	398.0
2010	90	116.7
2011	34	53.6
2012	72	106.3
2013	52	56.1
2014	70	219.2
2015	51	97.9
2016	68	104.9
2017	33	84.8
2018	45	101.1
2019	20	39.6
2020	60	61.5
Total:	**1,478**	**3,691.9**

In Clearfield County, 2020 was a very active year for wildfires, although the damaged acreage was average. See *Table 49 - Clearfield County Wildfire Stats, 2017-2020* (DCNR District Forester Joe Polaski, August 2021).

Table 49 - Clearfield County Wildfire Stats, 2017 – 2020

Clearfield County Wildfire Stats
2017 - 2020

Year	Number of Fires	Total Acreage	Average Size	Max Size
2017	27	71	3	33
2018	39	64	2	17
2019	15	37	2	14
2020	57	62	1	8

In recent years, the number of prescribed burns in Pennsylvania has been increasing. This corresponds to an embrace of the need for fire in many natural ecosystems and management strategies for reducing vulnerability to wildfire; it also improves hunting opportunities in the Commonwealth of Pennsylvania. In June of 2021, there were numerous prescribed burns in state-owned game lands. The Pennsylvania Game Commission Prescribed Burn Map may be found here:

https://pagame.maps.arcgis.com/apps/webappviewer/index.html?id=d7ab50bde980460fab22de6316ec73ca

Table 50 – 2020 Wildfire Acreage Loss lists the causes of wildfire acreage loss in District 9 in 2020; the number of fires by cause and acres burned are also listed for each category. Far and away, the leading cause of wildfire is debris burning.

Table 50 - 2020 Wildfire Acreage Loss

Wildfire Acreage Loss		
Cause:	**Number of wildfires:**	**Acres burned:**
Campfire	71	42.2
Children	17	18.4
Debris Burning	866	1,050.1
Equipment Use	125	164.1
Fireworks	27	10.8
Incendiary	152	1,011.4
Lightning	8	8.0
Miscellaneous	103	242.1
Power Line	73	93.9
Railroad	43	372.7
Smoking	15	15.1
Structure	7	4.4

4.3.10.4 Future Occurrence

Between 2000 and 2020, 80,589 acres of state forest have burned in Pennsylvania and at least 3,691.6 acres of land have burned in District 9. Previous events indicate that wildfire events will continue to occur yearly. Weather conditions like drought can increase the likelihood of wildfires occurring. Any fire, without the quick response of fire fighters, forestry personnel, or visitors to the forest, has the potential to become a wildfire.

The probability of a wildfire occurring in Clearfield County is highly likely in any given year, especially given the fact that debris burning is the leading cause of wildfires (see *Table 46 – 2020 Wildfire Acreage Loss*) and burning is a common allowable method of eliminating certain types of landowner and household debris. However, the likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response.

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

4.3.10.5 Vulnerability Assessment

The size and impact of a wildfire depends on its location, climatic 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.

Uneducated and inattentive debris burners are a constant concern and consistent vulnerability (see *Table 50 - 2020 Wildfire Acreage Loss*). Firefighters and other first responders can encounter life-threatening situations due to forest fires and wildfires. Traffic accidents during a response and the impacts of fighting the fire once on scene are examples of first responder vulnerabilities.

The Wildland Urban Interface (WUI) was nationally mapped by a United States Department of Agriculture Forest Service effort in 2015 that used data from 1990-2010 to develop a robust dataset that related housing density and vegetative density. The dataset provides a way to identify locations where larger numbers of humans are living in or near natural areas that could be at risk in the event of a wildfire. The WUI defines two types of communities – interface and intermix. Intermix refers to areas where housing and wildland vegetation intermingle, and

interface refers to areas where housing is in the vicinity of a large area of dense wildland vegetation. The WUI was the fastest-growing land use type in the United States between 1990 and 2010. Factors behind the growth include population shifts, expansion of cities into the wildlands, and the expansion of new vegetation growth. The primary cause has been the migration of people, not vegetation growth.

Pennsylvania is among the states with the largest WUI and the most housing units in a WUI designated area. Pennsylvanians desire the proximity of natural beauty in their daily lives, and the growth of the WUI housing noted above illustrates this. *Figure 33 – Wildland Urban Interface* shows the extent of Clearfield County and the critical infrastructure facilities, functional needs facilities, and fire stations. A wildfire hazard is defined by conditions that affect wildfire ignition and/or behavior such as fuel, topography, and local weather. The many addressable structures in the Wildland Urban Interface and intermix zones are broken up by assessed parcel use codes. *Table 51 – Buildings in Wildfire Hazard Areas* shows the total Clearfield County addressable structures and critical facilities that are located in, near, adjacent to or among state game lands, state parks, state forests, local parks, and other locations designated by the Wildland Urban Interface. Wildfire hazard is defined based on conditions that affect wildfire ignition and/or behavior such as fuel, topography, and local weather. Cells in the chart that have a zero numerical entry had zero structures within the specified area.

There are forty-two fire departments that serve Clearfield County, a list of which can be seen in *Table 58* of the Emergency Services profile. Each fire department conducts its own schedule of in-house training sessions for its members. Fire department locations can be seen in *Figure 34 – Fire Station Locations*.

Table 51 - Buildings in Wildfire Hazard Areas

Buildings in Wildfire Hazard Areas						
Municipality	Wildland Urban Interface			Wildland Urban Intermix		
	High Density	Medium Density	Low Density	High Density	Medium Density	Low Density
Beccaria Township	18	227	88	0	69	404
Bell Township	39	35	17	74	37	150
Bigler Township	29	171	50	0	26	297
Bloom Township	1	1	9	0	0	89
Boggs Township	0	103	27	0	181	531
Bradford Township	20	336	152	0	78	759
Brady Township	12	45	131	0	3	410
Brisbin Borough	14	145	0	0	21	19
Burnside Borough	0	75	0	0	0	32
Burnside Township	0	45	44	0	34	191

Buildings in Wildfire Hazard Areas						
Municipality	Wildland Urban Interface			Wildland Urban Intermix		
	High Density	Medium Density	Low Density	High Density	Medium Density	Low Density
Chest Township	0	3	34	0	0	73
Chester Hill Borough	135	191	5	0	29	0
Clearfield Borough	520	151	0	0	41	0
Coalport Borough	85	111	0	0	8	18
Cooper Township	12	442	81	0	219	439
Covington Township	0	50	33	0	5	238
Curwensville Borough	300	556	9	0	245	16
Decatur Township	30	417	110	0	293	434
City of Dubois	2,369	1,062	10	9	19	27
Ferguson Township	1	11	33	0	4	77
Girard Township	0	11	15	1	37	254
Glen Hope Borough	0	22	12	0	0	28
Goshen Township	0	17	5	0	20	183
Graham Township	0	46	50	0	25	401
Grampian Borough	20	120	7	0	27	0
Greenwood Township	0	19	9	0	6	87
Gulich Township	0	143	64	0	91	300
Houtzdale Borough	138	231	3	0	4	1
Huston Township	56	84	32	0	133	587
Irvona Borough	82	110	8	0	58	22
Jordan Township	1	5	13	0	2	152
Karthaus Township	20	98	0	0	43	134
Knox Township	2	9	4	0	14	162
Lawrence Township	387	951	421	0	351	805
Mahaffey Borough	4	101	5	6	39	13
Morris Township	29	436	136	0	334	444
New Washington Borough	0	4	0	0	0	29
Newburg Borough	0	13	2	0	8	28
Osceola Mills Borough	348	165	0	0	8	0
Penn Township	4	106	69	0	29	330
Pike Township	5	193	230	0	73	324
Pine Township	0	0	4	0	14	38
Ramey Borough	5	171	13	0	0	47
Sandy Township	360	1,781	369	1	1,355	1,241

Buildings in Wildfire Hazard Areas						
Municipality	**Wildland Urban Interface**			**Wildland Urban Intermix**		
	High Density	**Medium Density**	**Low Density**	**High Density**	**Medium Density**	**Low Density**
Troutville Borough	4	60	37	0	0	0
Union Township	5	53	61	0	28	275
Wallaceton Borough	0	68	7	0	22	35
Westover Borough	7	95	19	0	19	41
Woodward Township	3	272	91	3	153	268
Totals:	**5,065**	**9,561**	**2,519**	**94**	**4,205**	**10,433**

Figure 33 - Wildland Urban Interface

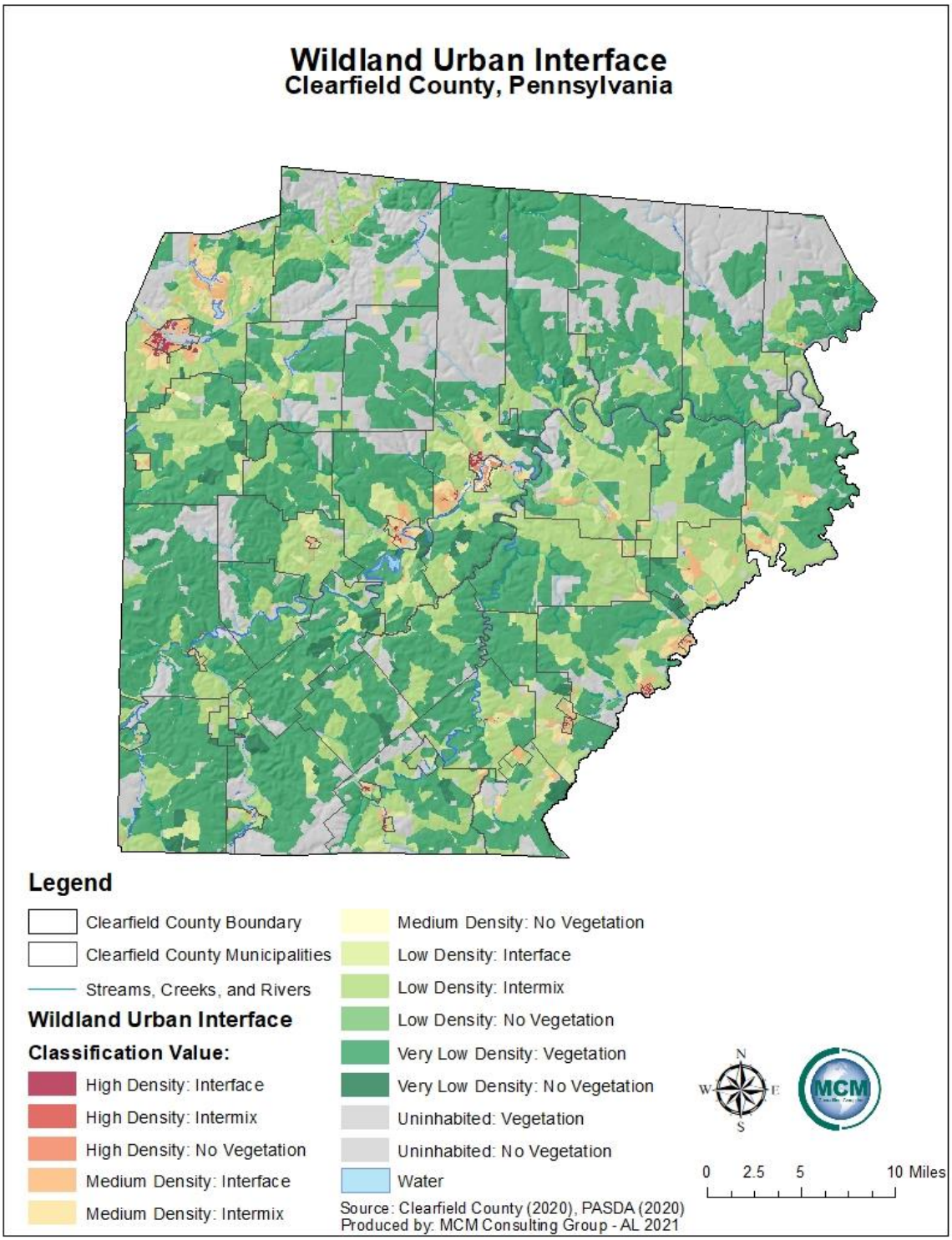
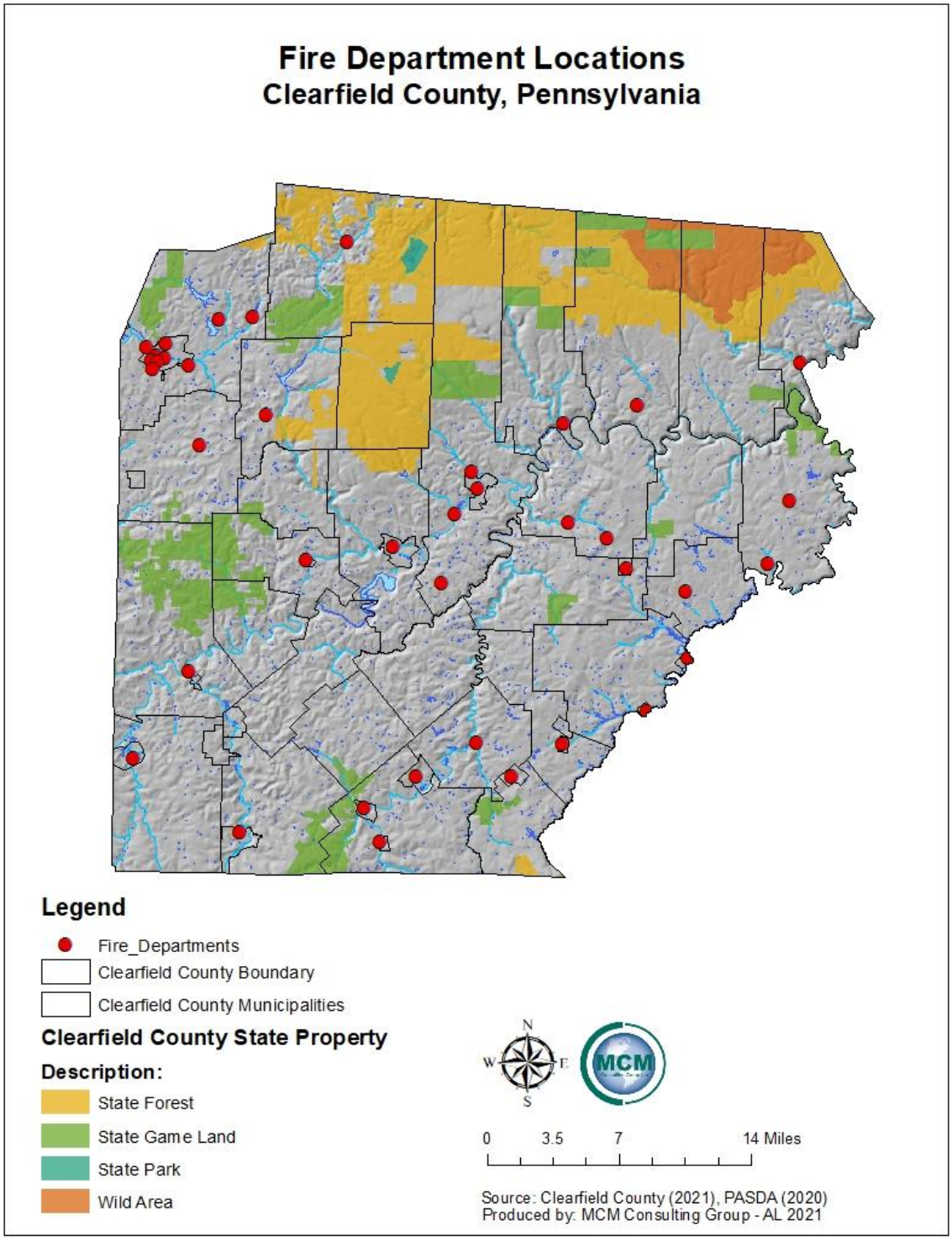


Figure 34 - Fire Station Locations



4.3.11. Winter Storm

4.3.11.1 Location and Extent

There is an average of thirty-five winter weather events that impact Pennsylvania each year. In Clearfield County specifically, on average, winter weather events occur three times a year. Such winter storms are regional events, so each county in Pennsylvania shares these hazards. The northern, western counties and mountainous regions generally experience storms more frequently and with a greater severity due to lake effects and geographic influence. The extent of a severe winter storm can be classified by meteorological measurements and by evaluating the societal impacts.

On occasion, Clearfield 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 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 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).

4.3.11.2 Range of Magnitude

Winter storms and Nor’easters are usually countywide hazards. 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 52 - Winter Weather Events Descriptions*. Clearfield County typically experiences several winter storm-related events each year. Snow fall is generally from late November to early April, with the greatest monthly amounts occurring in December and January. Winter storms have caused power failures, loss of communications networks, road closings, disruption of EMS/fire response capabilities, and loss of water supplies throughout the county. Power outages, sometimes caused by large amounts of snow or ice weighing on and breaking power lines, can result in a loss of heat for residential customers, potentially posing a threat to human life.

Table 52 - Winter Weather Events Descriptions

Winter Weather Event Descriptions (NWS, 2009)	
Weather Event	**Classification/Description**
Heavy Snowstorm	Accumulations of 4 inches or more in a 6-hour period, or 6 inches or more in a 12-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.

NOAA's National Centers for Environmental Information (NCEI) has produced the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern 2/3 of the United States. The RSI ranks snowstorm impacts on a scale from one to five, similar to the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes. However, RSI differs from these others because population is included. The RSI is based on spatial extent of the storm, the amount of snowfall, and the combination of these elements with population. Including population information ties the index to societal impacts. The RSI is an evolution of the Northeast Snowfall Impact Scale (NESIS), which NCEI, then NCDC, produced. *Table 53 – NOAA's RSI Scale Categories* show the RSI categories 1 – 5 with their related description. The United States, as a whole, is divided into six easternmost climate regions which include Northern Rockies, Upper Midwest, Northeast, Ohio Valley, South, and Southeast. Clearfield County, along with the Commonwealth, are located within the Northeast portion of the six.

Table 53 - NOAA's RSI Scale Categories

NOAA's RSI Scale Categories (NOAA & NCDC, 2011)		
Category	**RSI Value**	**Description**
1	1-3	Notable
2	3-6	Significant

NOAA's RSI Scale Categories (NOAA & NCDC, 2011)		
Category	**RSI Value**	**Description**
3	6-10	Major
4	10-18	Crippling
5	18.0+	Extreme

Clearfield County and its municipalities are susceptible to the entire range of severe weather events, from heavy snowstorms to severe blizzards. The worst-case scenario would be a series of multiple, severe blizzards causing major disruptions to utilities and transportation and limiting the effectiveness of emergency response activities.

Long cold spells can cause rivers and lakes to freeze over. A subsequent thaw and rise in the water level can break the ice into large chunks and result in ice jams when the ice begins to flow. 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 35 - Pennsylvania Annual Snowfall 1981-2010* shows average annual snowfall in Clearfield County to be anywhere between from 31 and 70 inches. Three of the Presidential Disaster and Emergency Declarations affecting Clearfield have been in response to hazard events related to winter storms. *Table 54 – Monthly Snowfall* shows the average monthly snowfall for Clearfield County, Pennsylvania in a given year (2020).

Table 54 - Monthly Snowfall

Monthly Snowfall Average(NOAA, 2020)	
Month	**Clearfield County**
January	18.8"
February	18.0"
March	8.2"
April	2.4"
May	0.1"
June	0.0"
July	0.0"
August	0.0"
September	0.0"

Monthly Snowfall Average(NOAA, 2020)	
Month	**Clearfield County**
October	0.8”
November	2.9”
December	11.8”
Annual	63.0”

4.3.11.3 Past Occurrence

Due to the number of sources of winter storm event data available, loss and impact information for these events may vary depending on the source. All data present in this profile occurred from the year 1993 to present. Although more events could have occurred in the county, the data source provided intermittent reporting of certain events. According to NOAA-NCEI, Clearfield County had sixty reported winter storm weather events.

The first winter storm of the 2013-2014 winter storm season began on November 26, 2013, two days before Thanksgiving. Precipitation began as snow and then turned to sleet and freezing rain, during the daytime hours of November 27th. Ice accumulations were measured between ¼ and ½ inch. Increased holiday travel led to multiple traffic accidents and road closures, and fallen trees disrupted power to residents across the commonwealth.

Another significant winter storm struck Clearfield County in February 2014. The precipitation consisted of rain, freezing rain, heavy snow, and sleet. The storm lasted several days, as it moved from the Ohio Valley to the Mid-Atlantic. Precipitation conditions caused accumulation totals to differ between jurisdictions, with the most severe conditions occurring eastward. Freezing rain produced dangerous road conditions which contributed to roadway accidents. One incident caused a fatality and closed portions of Interstate 76 for more than 12 hours. Over 850,000 customers, statewide, lost power due to storm conditions, and Governor Tom Corbett declared disaster emergencies in multiple Pennsylvania counties.

In early February of 2017, blizzard conditions developed across the Northern eastern states. The worst conditions did not occur within the commonwealth, but Clearfield County was among the hardest hit jurisdictions in Pennsylvania. Local snowfall accumulations were observed up to 1 foot, and an out-of-state fatality was reported. A list of additional Clearfield County winter storms, and other related events, is outlined in *Table 55 - Clearfield County Winter Storm History*.

A severe winter event in the county’s history and the commonwealth as a whole was in the winter of 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. One of these devastating winter storms occurred in early January 1994 with record snowfall depths in many areas of the commonwealth, strong winds and sleet/freezing rains. Numerous storm-related power outages were reported and as many as 600,000 residents were without electricity, and in some cases for several days at a time. A ravaging ice storm followed which closed major arterial roads and downed many trees and power lines. Utility crews from a five-state area were called to assist in power restoration repairs. Officials from PPL Corporation stated that this was the worst winter storm in the history of the company. Serious and sporadic power supply outages continued through mid-January in many locations due to record cold temperatures. The entire Pennsylvania-New Jersey-Maryland grid and its partners in the District of Columbia, New York and Virginia experienced 15 - 30 minute rolling blackouts, threatening the lives of people and the safety of the facilities in which they resided. Power and fuel shortages affecting Pennsylvania and the East Coast power grid system required the Governor to recommend power conservation measures be taken by all commercial, residential, and industrial power consumers. The record cold conditions (with temperatures as low as -31˚F) resulted in numerous water-main breaks and interruptions of service to thousands of municipal and city water customers throughout the Commonwealth. The extreme cold in conjunction with accumulations of frozen precipitation resulted in acute shortages of road salt. Trucks were dispatched to haul salt from New York to expedite deliveries to Pennsylvania Department of Transportation storage sites. The year prior, the country's so-called "Storm of the Century" clobbered the east coast. See *Figure 36 - Storm of the Century Total Storm Snowfall*.

On March 12–14, 1993, a massive storm system bore down on nearly half of the U.S. population. Causing approximately $5.5 billion in damages ($9.9 billion in 2020 dollars), America's "Storm of the Century", as it would become known, swept from the deep south all the way up the East Coast. With a central pressure usually found in category three hurricanes, the storm spawned tornadoes and left coastal flooding, crippling snow, and bone-chilling cold in its wake. Of the more than 250 weather and climate events with damages exceeding $1 billion since 1980, this storm remains the country's most costly winter storm to date.

Table 55 - Clearfield County Winter Weather History

Clearfield County Winter Weather History (NOAA NCEI, 2021)		
Location	**Date**	**Type**
Clearfield County	03/07/1996	Heavy Snow
Clearfield County	11/28/1996	Heavy Snow
Clearfield County	02/13/1997	Winter Storm
Clearfield County	03/14/1997	Ice Storm

Clearfield County Winter Weather History (NOAA NCEI, 2021)		
Location	**Date**	**Type**
Clearfield County	11/14/1997	Heavy Snow
Clearfield County	01/15/1998	Ice Storm
Clearfield County	02/23/1998	Heavy Snow
Clearfield County	01/02/1999	Winter Storm
Clearfield County	01/08/1999	Winter Storm
Clearfield County	01/14/1999	Winter Storm
Clearfield County	03/04/1999	Heavy Snow
Clearfield County	02/18/2000	Winter Storm
Clearfield County	12/13/2000	Winter Storm
Clearfield County	03/04/2001	Heavy Snow
Clearfield County	01/06/2002	Heavy Snow
Clearfield County	12/05/2002	Heavy Snow
Clearfield County	12/10/2002	Ice Storm
Clearfield County	12/13/2002	Heavy Snow
Clearfield County	12/25/2002	Heavy Snow
Clearfield County	01/02/2003	Heavy Snow
Clearfield County	02/16/2003	Heavy Snow
Clearfield County	12/05/2003	Heavy Snow
Clearfield County	12/14/2003	Heavy Snow
Clearfield County	01/14/2004	Heavy Snow
Clearfield County	01/27/2004	Heavy Snow
Clearfield County	02/03/2004	Heavy Snow
Clearfield County	02/06/2004	Ice Storm
Clearfield County	03/16/2004	Heavy Snow
Clearfield County	01/05/2005	Winter Storm
Clearfield County	01/22/2005	Winter Storm
Clearfield County	10/25/2005	Heavy Snow
Clearfield County	12/09/2005	Heavy Snow
Clearfield County	12/16/2005	Winter Storm
Clearfield County	02/13/2007	Heavy Snow
Clearfield County	03/16/2007	Heavy Snow
Clearfield County	12/15/2007	Winter Storm
Clearfield County	02/01/2008	Winter Storm
Clearfield County	02/29/2008	Heavy Snow
Clearfield County	12/11/2008	Winter Storm
Clearfield County	12/19/2008	Winter Storm

Clearfield County Winter Weather History (NOAA NCEI, 2021)		
Location	**Date**	**Type**
Clearfield County	01/06/2009	Ice Storm
Clearfield County	01/10/2009	Winter Storm
Clearfield County	01/27/2009	Winter Storm
Clearfield County	02/05/2010	Winter Storm
Clearfield County	02/09/2010	Winter Storm
Clearfield County	10/29/2011	Heavy Snow
Clearfield County	04/22/2012	Heavy Snow
Clearfield County	12/26/2012	Winter Storm
Clearfield County	11/26/2013	Winter Storm
Clearfield County	12/14/2013	Winter Storm
Clearfield County	02/04/2014	Winter Storm
Clearfield County	02/15/2016	Winter Storm
Clearfield County	02/09/2017	Winter Storm
Clearfield County	02/09/2017	Winter Storm
Clearfield County	01/19/2019	Winter Storm
Clearfield County	12/16/2020	Winter Storm
Clearfield County	02/15/2021	Winter Storm

4.3.11.4 Future Occurrence

There is a high probability of winter weather and winter storms occurring in Clearfield County, with expected annual events across most of the commonwealth. The county is located in an area with the chance of equaling or exceeding total snow depths of 30 - 71 inches. An analysis of the past occurrences indicates that this trend will continue annually in the future. Meanwhile, climate change is expected to bring changes to the future of winter storms impacting Pennsylvania.

Climate scientists believe that extreme winter storms are expected to occur more frequently – there have been about twice as many extreme snow events in the United States in the latter half of the 20th century than in the first half. This uptick is caused, in part, by higher-than-normal ocean surface temperatures that result in an increased source of moisture for storms that develop over the Atlantic Ocean. Conditions for severe winter storms are particularly heightened in the eastern United States due to changes in atmospheric circulation patterns caused by higher temperatures and melting Arctic sea ice. Winters in 2000 and 2001 were mild in Pennsylvania and led to spring-like thunderstorms during the winter months rather than snowstorms. Such thunderstorms can be followed by cold fronts and winter storms resulting in temperature drops of 50˚F in a few short hours. Even though average temperatures are expected to be higher overall and there are expected to be fewer extreme cold days, those that do occur are expected to reach

record-setting low temperatures more frequently. Winter storms are a regular, annual occurrence in Clearfield County and should be considered highly likely. Approximately thirty-five winter storm events occur across Pennsylvania annually and about three are estimated to impact Clearfield County each year.

4.3.11.5 Vulnerability Assessment

Due to the frequency of winter weather events in Clearfield County, winter storm hazards are a concern. Based on the information available, all communities in Clearfield County are, essentially, equally vulnerable to the direct impacts of winter storms. Residents of the more rural areas of the county may be more susceptible to the vulnerability of delayed emergency medical assistance. Additionally, residents of the mountainous areas of the county may also be more susceptible during severe storms, especially when medical assistance is needed.

Because of the frequency of winter storms, there have been various developed strategies to respond to these events. Snow removal and utility repair equipment is available to respond to typical events. The use of auxiliary heat and electrical supplies such as wood burning stoves, kerosene heaters and gasoline power generators reduces the vulnerability of humans to extreme cold temperatures commonly associated with winter storms but can increase their vulnerability to other hazards. People residing in structures lacking adequate equipment to protect against cold temperatures or significant snow and ice are more vulnerable to winter storm events. Even for communities that are prepared to respond to winter storms, severe events involving snow accumulations that exceed six or more inches in a twelve-hour period can cause a large number of traffic accidents, interrupt power supply and communications, and cause the failure of inadequately designed and/or maintained roof systems. This weather has had the ability to close businesses, close schools and block and damage roadways throughout the county. The main transportation routes in the county (Interstate 80, U.S. Routes 119 and 219, and State Routes 36, 53, 153, 253, 255, 286, 4410, 453, 729, 830, 865, 879, 969, 970) are normally opened immediately for emergency traffic, but secondary roads can remain impassable for days. Most residents and travelers in Clearfield County are aware of winter weather announcements and avoid travel when under a winter storm watch.

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 also dependent on the age and type of the building, construction material used, and condition of the structure. Additional information on construction type and building codes enforced at time of construction would allow a more thorough assessment of the vulnerability of structures to winter storm impacts such as severe

wind and heavy snow loading. With Clearfield County specifically, data of housing units has been compiled from 1939 to present time. As shown in *Table 56 - Year Housing Units Built in Clearfield County*, a plurality of the housing units in Clearfield County were built prior to 1939, with a total of 11,639 houses built during that period (29.6% of houses in Clearfield County).

Since the majority of houses in Clearfield County were not built recently, there is a high degree of vulnerability, as aged structures may have reduced structural integrity. Hence, while there is an increase material liability for the structures themselves, the wellbeing of residents/families who live inside may also be at greater risk.

Table 56 -Year Housing Units Built in Clearfield County

Year Housing Units Built in Clearfield County (US Census, 2020)		
Year	**Number of Housing Units Built**	**Percent of Housing Units Built**
1939 or earlier	11,639	29.6%
1940 – 1949	3,989	10.1%
1950 – 1958	3,809	9.7%
1960 – 1969	2,931	7.4%
1970 – 1979	5,576	14.2%
1980 – 1989	3,156	8.0%
1990 – 1999	4,648	11.8%
2010 - 2013	253	0.6%
2014 or later	708	1.8%
Total	**39,351**	**100%**

Figure 35 - Pennsylvania Annual Snowfall 1981 – 2010

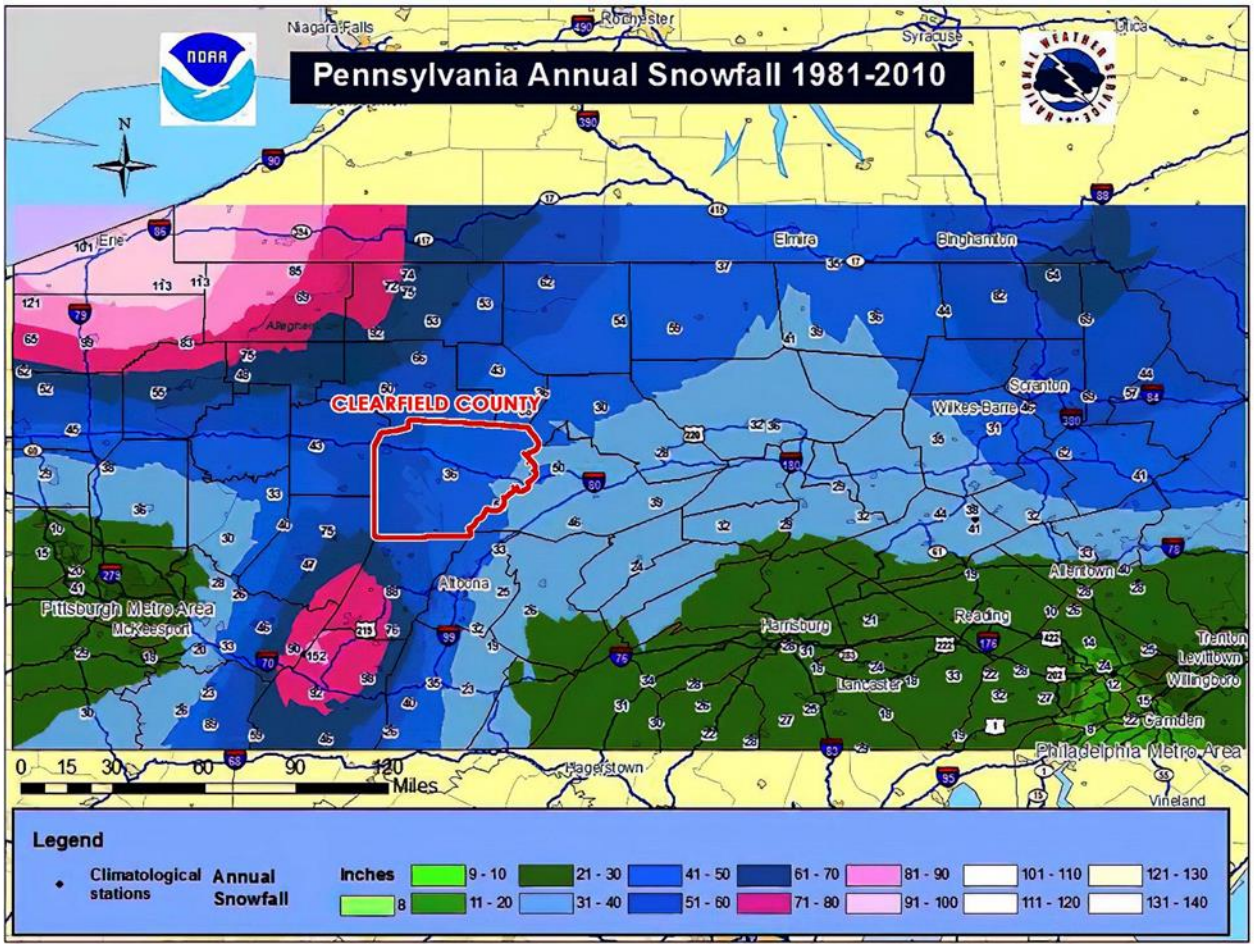
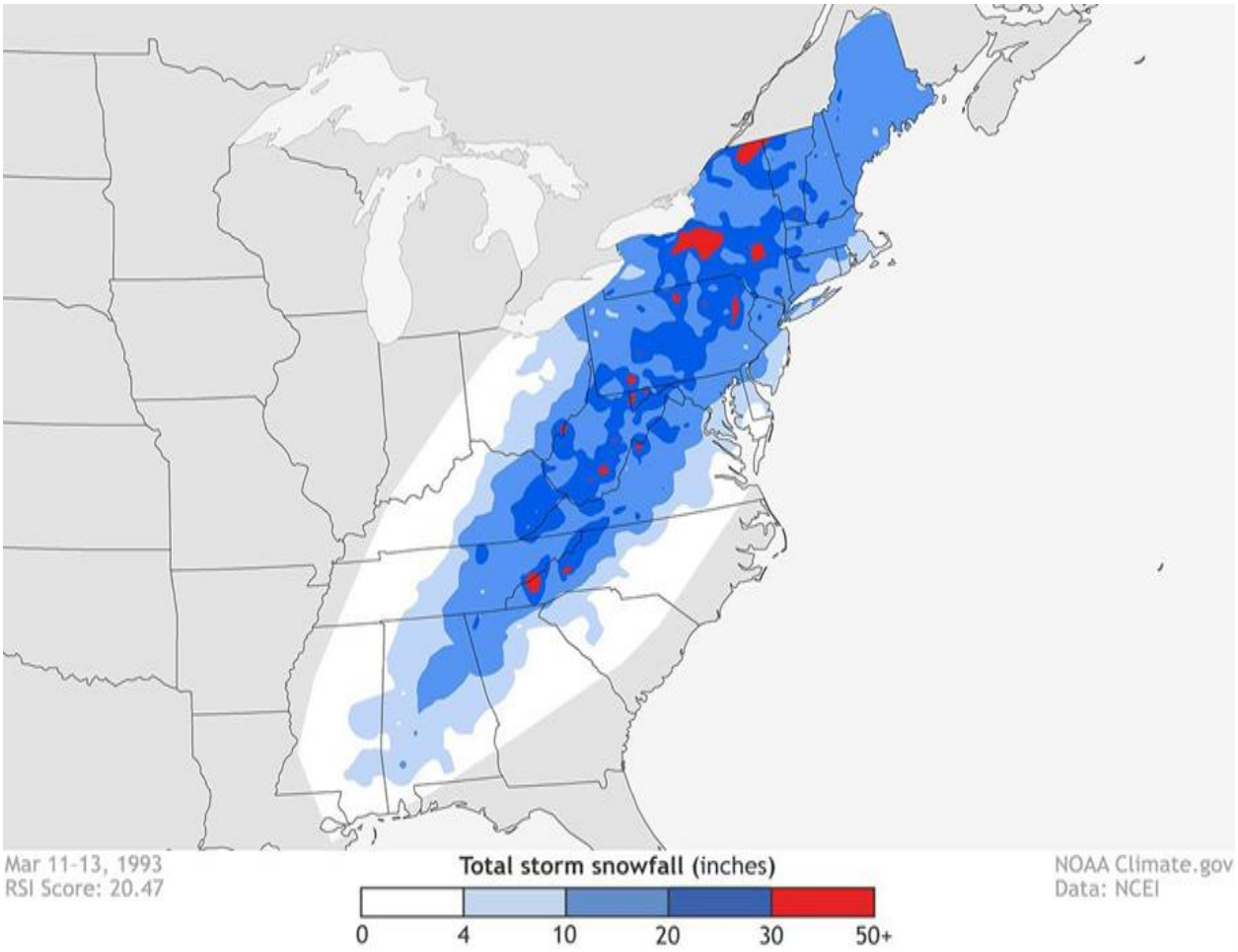


Figure 36 - Storm of the Century Total Storm Snowfall



4.3.12. Emergency Services

4.3.12.1 Location and Extent

Clearfield County Department of Public Safety provides 911 services to the County of Clearfield, Pennsylvania. The county encompasses approximately 1,154 square miles and has a population of over 83,000. Clearfield County 911 answers calls for and dispatches responders to an average of 60,000 emergency and non-emergency incidents per year. There is a staff of twenty-five dispatchers with an average of five on duty at all times. An administrative staff of six people provide support services such as quality assurance, training, radio maintenance, and database administration.

Clearfield County subdivisions, e.g., townships, boroughs, and cities, have assignment of services for their municipalities. Fire, emergency medical services (EMS), and law enforcement service agencies are defined per municipality in the county. In addition to the local services, the county hosts numerous specialized teams. These county-wide special response teams provide specialty services which include hazardous material incident response, SWAT, technical rescue, swift water rescue, animal rescue, and ATV search teams. Regional and state-wide services are also available.

Clearfield County's thirty-one volunteer fire departments are typically the first line of defense between life and death in the county's communities. Fire department volunteers remain on call twenty-four hours per day, seven days each week, and need to be prepared for a similar commitment level as a full-time firefighter with only a portion of the training. Fire companies are the only ones available to meet public safety needs in rural areas because there is not always an emergency medical team available in the vicinity at all times.

Clearfield County's eleven EMS stations are most easily recognized when emergency vehicles or helicopters are seen responding to emergency incidents. Emergency medical services, more commonly known as EMS, are a system that provides emergency medical care. Once activated by an incident that causes serious illness or injury, the focus of EMS is emergency medical care of the patient(s).

Most areas are served by volunteers instead of career personnel, which adds to the response time due to volunteer availability. Volunteers provide emergency services above and beyond their regular means of financial support and time constraints. Agencies often struggle with the availability of personnel depending on the time of day and skills/resources needed. The number of responders in general has decreased due to issues with funding and retention of personnel.

Additionally, the time and expense of training required for emergency service personnel (volunteers and paid) is another factor in the decreasing number of volunteers. The initial training for fire, EMS, and law enforcement can take several months to complete. For those in emergency medical services, there is a regular schedule of continued education to maintain

certification. In the fire service, after the initial training, there are specialty courses which are recommended, but not required. For law enforcement, skills such as firearms proficiency must be maintained, and updates to new laws and regulations continue throughout the officer's career.

4.3.12.2 Range of Magnitude

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

Two fundamental topics are the financial and economic variables that drive emergency service systems. These systems typically generate revenue through tax subsidies, memberships, direct sales, diversification into other lines of business, grants, or fundraising. They spend most of these revenues on direct and indirect labor, and benefits. The remaining dollars go into infrastructure, fuel, medical supplies, insurances, fleet maintenance, dispatch, and other essential items. The remaining amount is used for recapitalization or fund balance development. Replacing and properly equipping an emergency response vehicle can cost up to and over $1 million.

4.3.12.3 Past Occurrences

There are no official records kept on shortages to emergency services. However, there has been a decrease in the number of new volunteers in the fire service. Most agencies are private organizations that lack local funding and exist based on tax dollars, fund raising, and donations received from their community. The time demand for fund raising adds to the demands on the availability of volunteers. Past practices are not sustaining the needed funds or manpower.

Without financial support from the communities, services may not be able to remain in operation to serve the same communities they have served for decades. Recruitment and personnel retention are key to success.

A shortage of emergency services in Clearfield County, could create a potential for a severe shortage in response to a disaster in the county. Statistics show a large number of past fire, EMS, and law enforcement events. *Table 57 – Past Fire, EMS, and Police Call Statistics for Clearfield County* show the previous call statistics in the county as early as year 2012 until 2017 (data unavailable after the year 2017). Call statistics were not available for year 2020 or 2021. If there is a lack of emergency services available in the county, high numbers of calls for emergency incidents could create issues with response.

Table 57 - Past Fire, EMS, and Police Call Statistics for Clearfield County

Past Fire, EMS, and Police Call Statistics for Clearfield County			
Year	Total Number of Past Call Statistics		
	Fire	EMS	Police
2019	3,396	14,101	27,367
2018	3,501	15,616	30,083
2017	3,671	13,982	26,622
2016	2,177	14,655	28,344
2015	1,877	14,416	27,367
2014	1,767	13,850	25,754
2013	1,935	12,813	25,933
2012	2,022	12,357	29,861

4.3.12.4 Future Occurrence

Volunteerism is a significant component of the fire services in Clearfield County. Most, if not all, members of the various community fire departments in the county are volunteers. A common problem with volunteerism in the fire services and emergency medical services is recruitment and retention of volunteers to keep both agencies staffed. A decline in volunteerism has been seen within these services. With fewer volunteers to perform the tasks associated with fire and rescue operations, it is imperative for services to facilitate fundraising. Operational needs are impacted if there are fewer volunteers to raise funds. Without fundraising and community support these fire departments and volunteer EMS agencies will experience broader challenges. Municipalities can help offset some of the financial burdens to their local fire company by imposing a fire tax on its citizens.

Volunteerism and overall emergency services are low due to volunteers facing many challenges. Most volunteers must address their own needs by providing for family and, in many cases, are part of a two-income family. Limitation of time is another challenge many volunteers face because of number of hours required to become certified as a first responder. Training is essential to provide for the general knowledge and safety of volunteers. With the limitation of time, many people find it personally challenging to dedicate time to a volunteer position. Volunteers are becoming less reliable. Many current volunteers are getting older and becoming unable to perform at the same levels they once were.

Initially, fire departments were started to handle fires. Fire departments now preform many tasks other than fighting fire. Over time as other emergencies occurred, communities called upon the volunteer fire departments to handle various hazards such as vehicle accidents, commercial

accidents, flooded basements, wire/trees down, trench rescue, hazardous material spills, traffic control, and sometime event standbys to support other agencies or events.

4.3.12.5 Vulnerability Assessment

The likelihood that EMS agencies and fire services will fail is a concern for all Clearfield County communities. Law enforcement agencies also have been experiencing personnel shortages. The perception of law enforcement in society changes as events occur. A negative perception of law enforcement can discourage individuals from pursuing such a career. Becoming a law enforcement officer requires a commitment of time and finances for training at local, state, or federal levels. The selection of law enforcement officers includes not only physical and mental aptitudes, but also a comprehensive physiological screening.

If any current public service agency fails to provide enough personnel to perform their required duties, then those duties must be provided for by another service agency that may be many miles away. This can make people and property vulnerable due to increased response times. Many communities in Pennsylvania have already experienced the closure of services.

It is recommended that each municipality assess their own vulnerabilities by maintaining and building relationships with their local providers to begin to plan accordingly for if a local service were to shut down its operation. The statistics, response times, and all times associated with units dispatched are easily obtainable from the county 911 center. Consolidation of services is not a new concept for addressing the closure of services. Municipalities must weigh all the pros and cons for consolidation of emergency services with neighboring communities. In addition, continued support, and efforts to inform legislature could all prove to be paramount in assuring these services remain in operation into the future. At the time of the writing of this plan, a number of bills has been introduced in both the House of Representatives and the Senate as a result of a two-year study initiated by Senate Resolution 6 (SR6). The final report can be found here: http://pehsc.org/wp-content/uploads/2014/05/SR-6-REPORT-FINAL.pdf.

Emergency response agencies that currently provide services within Clearfield County are identified in the following tables, *Table 58 – Clearfield County Fire Departments* identifies the municipalities served. All fire departments in Clearfield County are volunteer. *Table 59 – Clearfield County EMS Agencies* identifies each emergency medical service agency and the municipalities served. *Table 60 – Clearfield County Law Enforcement Agencies* identifies each police department to include the municipalities served. *Figure 37 – Emergency Services Facilities* shows the geographical layout of the first responder services within Clearfield County.

Table 58 - Clearfield County Fire Departments

Clearfield County Fire Departments		
Station name	**Department Number**	**Location**
Adrian Sandy Fire Company	Station 38	DuBois
BJW Fire Company	Station 16	Woodland
Brady Township Fire Company	Station 30	Luthersburg
Chester Hill Hose Company	Station 14	Philipsburg
Clearfield Fire Company #1	Station 1	Clearfield
Columbia Fire Company	Station 22	Osceola Mills
Community Fire Company - Mahaffey	Station 29	Mahaffey
DuBois City Fire Department	Stations 71, 72, 73, 74, 75	DuBois
Fourth Ward Hose Company	Station 74	DuBois
Glen Hope Fire Company	Station 26	Glen Hope
Glendale Fire Department		Coalport
Goshen Township Fire Company	Station 44	Shawville
Grampian-Penn-Bloom Fire Company	Station 9	Grampian
Grassflat Fire Company	Station 19	Grassflat
Houtzdale Fire Company	Station 23	Houtzdale
Hyde Fire Company	Station 6	Hyde
Irvona Fire Company	Station 27	Irvona
Karthaus Fire Company	Station 20	Karthaus
Lawrence Township Fire Company #1	Station 5	Clearfield
LeContes Mills Fire Company	Station 21	LeContes Mills
Madera Fire Company	Station 25	Madera
Morris Township Fire Company	Station 17	Morrisdale
Oklahoma Fire Company	Station 37	DuBois
Penfield Fire Company	Station 41	Penfield
Ramey Fire Company	Station 24	Ramey
Rescue, Hose & Ladder Company	Station 8	Curwensville
Treasure Lake Fire Company	Station 35	DuBois
Union Township Fire Co.	Station 40	Rockton
Wallaceton Fire Company	Station 15	Wallaceton
Westover Fire Company	Station 45	Westover
Winburne Fire Company	Station 18	Winburne

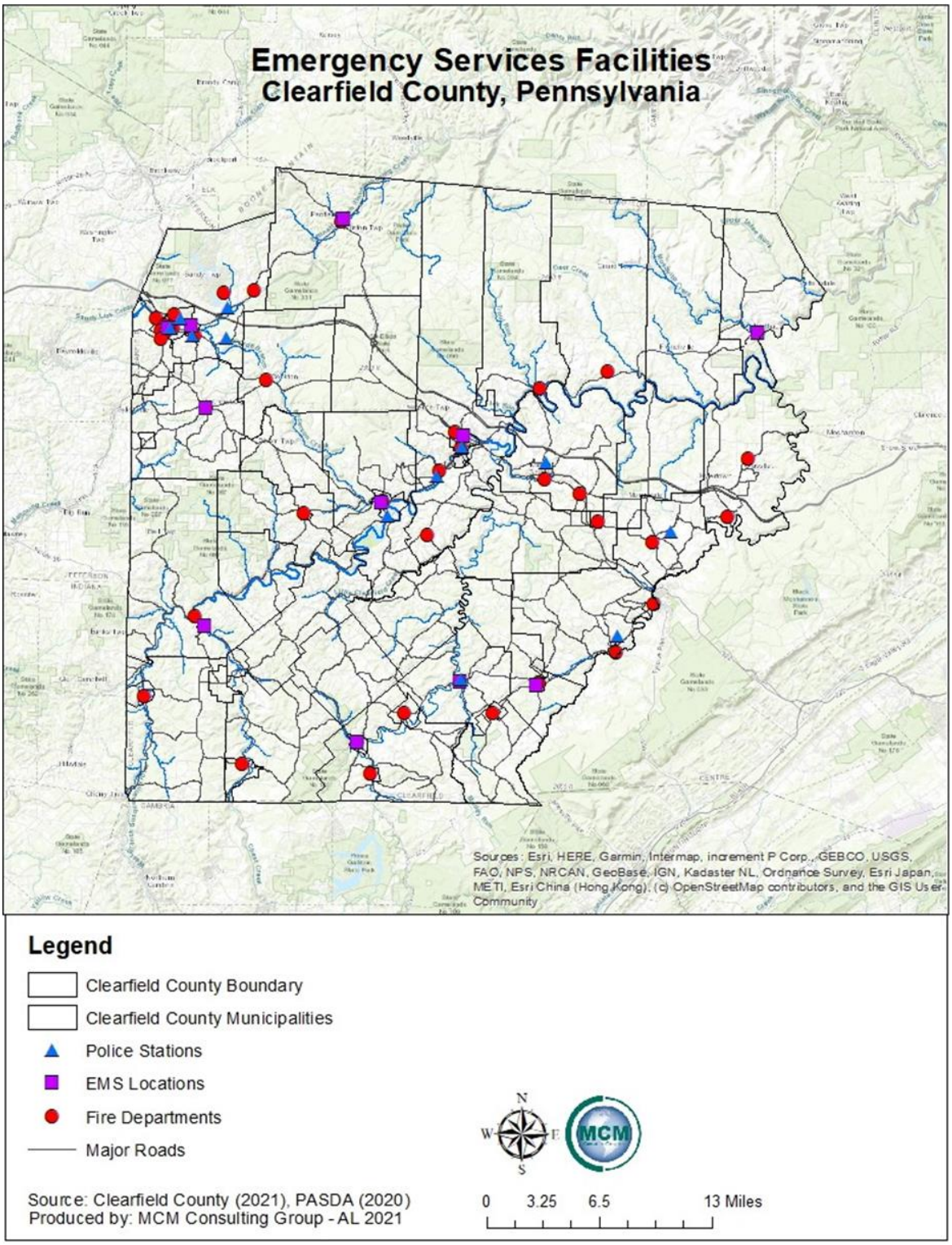
Table 59 - Clearfield County EMS Agencies

Clearfield County EMS Agencies		
Station name	**Department Number**	**Location**
Bennetts Valley	Station 41	Penfield
Brady Township Ambulance	Station 30	Luthersburg
Clearfield EMS	Station 1	Clearfield
Curwensville EMS	Station 8	Curwensville
DuBois EMS	Station 42	DuBois
DuSan/Amserv Ambulance	Station 43	DuBois
Houtzdale-Ramey Ambulance	Station 47	Houtzdale
Irvona Ambulance Service	Station 27	Irvona
Karthaus Ambulance Service	Station 20	Karthaus
Madera Ambulance Service	Station 25	Madera
Mahaffey Ambulance Service	Station 29	Mahaffey

Table 60 - Clearfield County Law Enforcement Agencies

Clearfield County Police Departments	
Station name	**Location**
Bigler Township	Bigler
Clearfield Borough	Clearfield
Clearfield County Sheriff	Clearfield
Curwensville Borough	Curwensville
Decatur Township	Osceola Mills
DuBois City	DuBois
Penn State DuBois Campus Police	DuBois
Lawrence Township	Hyde
Morris-Cooper Regional	Allport
Pennsylvania State Police-DuBois	Falls Creek
Pennsylvania State Police-Woodland	Bradford
Sandy Township	DuBois
Treasure Lake Security	DuBois

Figure 37 - Emergency Services Facilities



4.3.13. Dam and Levee Failure

4.3.13.1 Location and Extent

Dams

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

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

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

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

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

The National Inventory of Dams (NID) is a registry that captures information about structures that are greater than or equal to 25 feet in height or that impound 50-acre-feet or more of water (an acre-foot is equal to 325,851 gallons of water); it includes structures above 6 feet in height where failure would potentially cause damage downstream. The dams are classified in terms of hazard potential as “High”, “Significant”, or “Low”, with high-hazard dams requiring emergency actions plans (EAPS). There are seventeen high and low-hazard dams located in Clearfield County that are both publicly and privately owned and are registered with the USACE in the NID. There are also three dams with a hazard classification of “significant”. There are ten dams within the county that are high-hazard and require an emergency action plan. *Table 62 – Clearfield County Dam Inventory* illustrates the dams located in Clearfield County. *Table 61 – High-Hazard Dams Municipal Summary* summarizes the high-hazard dams in Clearfield County by municipality. The municipalities not listed do not have high-hazard dams. *Table 63 – Dam*

Name and Purpose lists the dams located in Clearfield County and their purpose code and the description of the purpose based on Pennsylvania DEP codes.

Table 61 - High-Hazard Dams Municipality Summary

High-Hazard Dams – Municipal Summary (PA DEP)	
Municipality	**Number of High-Hazard Dams**
Huston Township	1
Lawrence Township	2
Pike Township	2
Sandy Township	4
Union Township	1
Total:	**10**

Table 62 - Clearfield County Dam Inventory

Clearfield County Dams (NID 2021)							
Dam Name	**River**	**Owner Name**	**Year Completed**	**Dam Height (feet)**	**Drainage Area (acres)**	**Hazard**	**EAP**
Anderson Creek	Anderson Creek	City of Dubois	1903	42	26.5	H	Y
Curwensville Dam	West Branch Susquehanna River	CENAB	1965	131	365	H	Y
Galion Bay	TR Gravel Lick Run	Treasure Lake Property Owners Assoc, Inc.	1971	37	4.4	H	Y
Gravel Lick	Gravel Lick Run	Treasure Lake Property Owners Assoc, Inc.	1974	75	1.32	H	Y
Helvetia	Stump Creek	Andy &George Kovalchick	1921	15	3	L	NR

Clearfield County Dams (NID 2021)							
Dam Name	**River**	**Owner Name**	**Year Completed**	**Dam Height (feet)**	**Drainage Area (acres)**	**Hazard**	**EAP**
Hockenberry Run	Hockenberry Run	Irvona Municipal Authority	1980	25	1.1	L	NR
Janesville	Little Muddy Run	Gulich Township	-	12	7.6	L	NR
Juniata Lake	Juniata Run	City of Dubois	1934	10	1.1	S	N
Lake Rene	TR Narrows Creek	Treasure Lake Property Owners Assoc, Inc.	1955	82	4.4	H	Y
Lake Sabula	Sandy Lick Creek	Sabula Outing Club	1870	22	3.6	S	Y
Little Flipper Lake	TR Treasure Lake	Treasure Lake Property Owners Assoc, Inc.	1986	17	0.31	S	N
Montgomery	Montgomery Creek	Clearfield Municipal Authority	1960	71	10.8	H	Y
Moose Creek Reservoir	Moose Creek	Clearfield Municipal Authority	1910	31	6.4	H	Y
Morrisdale Mine	Emigh Run	Dorothy Hess Sullivan	1919	12	4.7	L	NR
Parker	Laurel Run	DCNR	1935	25	17.9	H	Y
Pike Township	Bear Run	Pike Township Municipal Authority	1975	42	3.9	L	NR
Ramey	Beaver Run	Jim Fry	-	17	0.434	L	NR
Settling Pond NO. 1		Penfield Collieries LLC.	-	25		L	NR

Clearfield County Dams (NID 2021)							
Dam Name	**River**	**Owner Name**	**Year Completed**	**Dam Height (feet)**	**Drainage Area (acres)**	**Hazard**	**EAP**
Shaggers Inn Waterfowl	TR Little Medix Run	DCNR	1989	17	0.42	H	Y
Wolf Creek	Wolf run	Treasure Lake Property Owners Assoc, Inc.	1971	34	4.4	H	Y

Table 63 - Dam Name and Purpose

Clearfield County Dams and Purposes (PA DEP 2019 & NID 2021)		
Dam Name	**Purpose Code**	**Purpose Code Description**
Anderson Creek	S	Public Water Supply
Curwensville Dam	CSOR	Flood Control, Public Water Supply, Farm Pond, and Recreation
Galion Bay	R	Recreation
Gravel Lick	R	Recreation
Helvetia	R	Recreation
Hockenberry Run	R	Recreation
Janesville	R	Recreation
Juniata Lake	R	Recreation
Lake Rene	R	Recreation
Lake Sabula	R	Recreation
Little Flipper Lake	R	Recreation
Montgomery	S	Public Water Supply
Moose Creek Reservoir	S	Public Water Supply
Morrisdale Mine	R	Recreation
Parker	R	Recreation
Pike Township	S	Public Water Supply
Ramey	R	Recreation

Clearfield County Dams and Purposes (PA DEP 2019 & NID 2021)		
Dam Name	**Purpose Code**	**Purpose Code Description**
Settling Pond No. 1	O	Farm Pond
Shaggers Inn Waterfowl	R	Recreation
Wolf Creek	R	Recreation

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

Levees

Levee failures have the potential to place large numbers of people and properties at risk. Unlike dams, levees are built parallel to a river or another body of water to protect the population and structures behind it from risks of damage during a flooding event. Levees do not serve a purpose beyond flood protection, unlike dams, which can server to store water or generate energy in addition to protecting areas from flooding. The National Levee Database (NLD), like its counterpart of the National Inventory of Dams (NID), is maintained by the USACE and tracks levees across the United States. Clearfield County is home to twenty-one levees, which are detailed in *Table 64 – Clearfield County Levee Inventory*.

Table 64 - Clearfield County Levee Inventory

Clearfield County Levee Inventory (National Levee Database, 2021)				
Levee Name	**Flood Source**	**Levee Type**	**Levee Bank Side**	**Levee Length**
Cherry Tree - West Branch	Susquehanna River	Earthen Mainline	Right descending bank	0.313
DuBois, PA - Right Bank McCracken Run DS	McCracken Run	Mainline	Right descending bank	0
DuBois, PA - Right Bank	McCracken Run	Mainline	Right descending bank	0

Clearfield County Levee Inventory (National Levee Database, 2021)				
Levee Name	**Flood Source**	**Levee Type**	**Levee Bank Side**	**Levee Length**
McCracken Run US				
Irvona - Clearfield Creek/Witmer Run - Left Bank	Clearfield Creek	Earthen Mainline	Left descending bank	0.325
Irvona - Clearfield Creek/Witmer Run - Left Bank	Clearfield Creek	Earthen Mainline	Left descending bank	0.038
Irvona - Clearfield Creek/Witmer Run - Left Bank	Clearfield Creek	Earthen Mainline	Left descending bank	0.068
Irvona - Clearfield Creek/Witmer Run - Left Bank	Clearfield Creek	Earthen Mainline	Left descending bank	0.033
Irvona - Clearfield Creek/Witmer Run - Left Bank	Clearfield Creek	Earthen Mainline	Left descending bank	0.003
Irvona - Clearfield Creek/Witmer Run - Left Bank	Clearfield Creek	Earthen Mainline	Left descending bank	0.005
Irvona - Clearfield Creek/Witmer Run - Right Bank	Clearfield Creek	Earthen Mainline	Left descending bank	0.117
Irvona - Clearfield Creek/Witmer Run - Right Bank	Clearfield Creek	Earthen Mainline	Right descending bank	0.329
Irvona-Clearfield Creek Levee (Downstream)	Clearfield Creek	Earthen	Left descending bank	0
Irvona-Clearfield Creek Levee (Downstream)	Clearfield Creek	Earthen	Left descending bank	0

Clearfield County Levee Inventory (National Levee Database, 2021)				
Levee Name	**Flood Source**	**Levee Type**	**Levee Bank Side**	**Levee Length**
Philipsburg - Left Bank	Moshannon Creek	Earthen Mainline	Left descending bank	0.0162
Philipsburg - Left Bank	Moshannon Creek	Earthen Mainline	Left descending bank	0.0746
Philipsburg - Left Bank	Moshannon Creek	Earthen Mainline	Left descending bank	0.009
Philipsburg - Left Bank	Moshannon Creek	Earthen Mainline	Left descending bank	0.009
Philipsburg - Right Bank	Moshannon Creek	Earthen Mainline	Right descending bank	0.045
Philipsburg - Right Bank	Moshannon Creek	Earthen Mainline	Right descending bank	0.096
Philipsburg - Right Bank	Moshannon Creek	Earthen Mainline	Right descending bank	0.121
Westover - Chest Creek Levee		Earthen Mainline		0.243

4.3.13.2 Range of Magnitude

Dams

Dam failures can pose a serious threat to communities located downstream from major dams. The impact of a dam failure is dependent on the volume of water by the dam and the amount of population or assets located downstream. Catastrophic failures are characterized by the sudden, rapid, and uncontrolled release of impounded water from a dammed impoundment or water body. *Figure 38 – Clearfield County Dams* shows the location of dams within Clearfield County.

Levees

Levee failures can be caused by a number of factors, and they can also cause catastrophic effects. Damage to the area beyond a levee, if it fails, could be more significant than if the levee was not present. Levees are designed to provide a specific level of protection, so flooding events could overtop the levees if these events exceeded the levee specifications. Additionally, levees can also fail if they are allowed to deteriorate or decay. Regular maintenance of levees is critical. *Figure 39 – Clearfield County Levee Locations* illustrates areas protected by the Clearfield County levee systems.

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

4.3.13.3 Past Occurrence

Dams

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

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

Levees

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

4.3.13.4 Future Occurrence

Dams

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

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

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

The construction, operation, maintenance, and abandonment of dams is reviewed and monitored by the PA DEP Division of Dam Safety. Dams are evaluated based on categories such as slope stability, undermining seepage, and spillway adequacy.

Levees

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

4.3.13.5 Vulnerability Assessment

Property and populations located downstream form any dams are vulnerable to dam failures. The Pennsylvania Code ((§105.91 Classification of dams and reservoirs) classifies both dams by size and the amount of loss of life and economic loss expected in a failure event. *Table 65 – Dam Classification* displays the dam classification guide for the Commonwealth of Pennsylvania.

Although the size of a dam may result in varying impacts, the hazard potential classification of category one dams is a more important reference indicator, since that will indicate the level of potential substantial loss of life and excessive economic loss.

Table 65 - Dam Classification

Dam Classification (PA CODE 1980)		
Dam Size Classification		
Class	Impoundment Storage (Acre-Feet)	Dam Height (Feet)
A	Equal to or greater than	Equal to or greater than 100
B	Less than 50,000 but greater than 1,000	Less than 100 but greater than 40
C	Equal to or less than 1,000	Equal to or less than 40
Dam Damage Classification		

Dam Classification (PA CODE 1980)		
Category	Loss of Life	Economic Loss
1	Substantial	Excessive
2	Few	Appreciable
3	None Expected	Minimal

Dams

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

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

Of the ten high hazard dams, the Curwensville Dam has the largest drainage area with a total drainage area of 365 acres. The dams that were constructed most recently are the Little Flipper Lake Dam and the Shaggers Inn Waterfowl Dam, which were constructed in 1986 and 1989, respectively. The dam that is the oldest in the county is the Lake Sabula Dam, which was constructed in 1870. The dam with the highest height in the county is the Curwensville Dam with a height of 131 feet. The largest owner of dams in Clearfield County is the Treasure Lake Property Owners Assoc, Inc. which owns a total of five dams. The dams owned by the Treasure Lake Property Owners Assoc, Inc. are the Galion Bay Dam, the Gravel Lick Dam, the Lake Rene Dam, the Little Flipper Lake Dam, and the Wolf Creek Dam. A majority of these dams are located around the Treasure Lake private residence development in the northwest portion of the county. The dams in Clearfield County are owned by a mix of private and public owners and vary in height and drainage areas. The county dams are also distributed relatively evenly throughout the county and municipalities, with an even mix of high and low hazard dams in the municipalities.

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

Dam failures can occur as the result of cascading impacts from events such as seismic events, wildfires, and strong thunderstorms. A potential cascading event could be a large earthquake that causes dam failure or could be increased water in the dam reservoir that leads to an overtopping incident at High-Hazard Potential Dams. Cascading events must be reviewed for an accurate assessment of vulnerability to be made for dam failure. Clearfield County is relatively safe from cascading impacts, as it does not sit on any major fault lines, wildfires are moderately uncommon, and storms rarely produced a strong enough effect to cause dam failure events.

Dam failures would also cause major social impacts from the failure of High-Hazard Potential Dams. The inundation area for a dam failure of one of these locations would be significant. Digitized inundation areas were not available at the time of this plan, but critical infrastructure and functional needs facilities could be impacted by a dam failure event. The United States Army Corp of Engineers (USACE) is developing a new interface for the National Inventory of Dams (NID) to review inundation areas for dams maintained by the USACE, but this interface was not available at the time of this writing.

A failure at a High-Hazard Potential Dam can cause impacts to a large amount of municipalities in a multijurisdictional way. A failure at an HHPD Dam would cause impacts at every municipality that is downstream of that location, whether they are in Clearfield County or not. At the time of this writing, there are no usable inundation GIS layers or easily accessible sources to determine exact sizes of populations at risk from High-Hazard Potential Dams. Once this information is available, it can be included in future amendments to this hazard mitigation plan or can be used for future updates.

Levees

Each section of the levee system in Clearfield County is a different length and guards a different area and different structures. *Table 66 – Number of Vulnerable Structures within Leveed Areas* illustrates the total number of addressable structures, and any critical infrastructure or functional needs facilities located within the leveed areas. As seen in *Table 66 – Number of Vulnerable Structures within Leveed Areas*, there are two critical infrastructure buildings in leveed areas around the county. The critical infrastructure in the Irvona section is an EMS station and the critical infrastructure point within the Philipsburg section is a fire department. These locations will experience some type of damage, but most likely would not result in a loss of use. There will be a monetary impact as well as damage, but without exact scenarios relating to levee failure, those values are difficult to calculate. Further information can be seen in the map series listed below. There will also be monetary value related to damage to homes and businesses that might lie within the leveed areas.

Table 66 - Number of Vulnerable Structures within Leveed Areas

Structures within Leveed Areas			
Levee Area Name	**Addressable Structures**	**Critical Infrastructure**	**Functional Needs Facilities**
Dubois, PA – Right Bank McCracken Run DS	0	0	0
Dubois, PA – Right Bank McCracken Run US	2	0	0
Irvona – Clearfield Creek/Witmer Run – Left Bank	60	1	0
Irvona – Clearfield Creek/Witmer Run – Right Bank	1	0	0
Irvona – Clearfield Creek Levee (Downstream) One	2	0	0
Irvona – Clearfield Creek Levee (Downstream) Two	5	0	0
Philipsburg Protected Area - Levee	31	1	0
Westover – Chest Creek Levee	28	0	0

Figure 38 - Clearfield County Dams

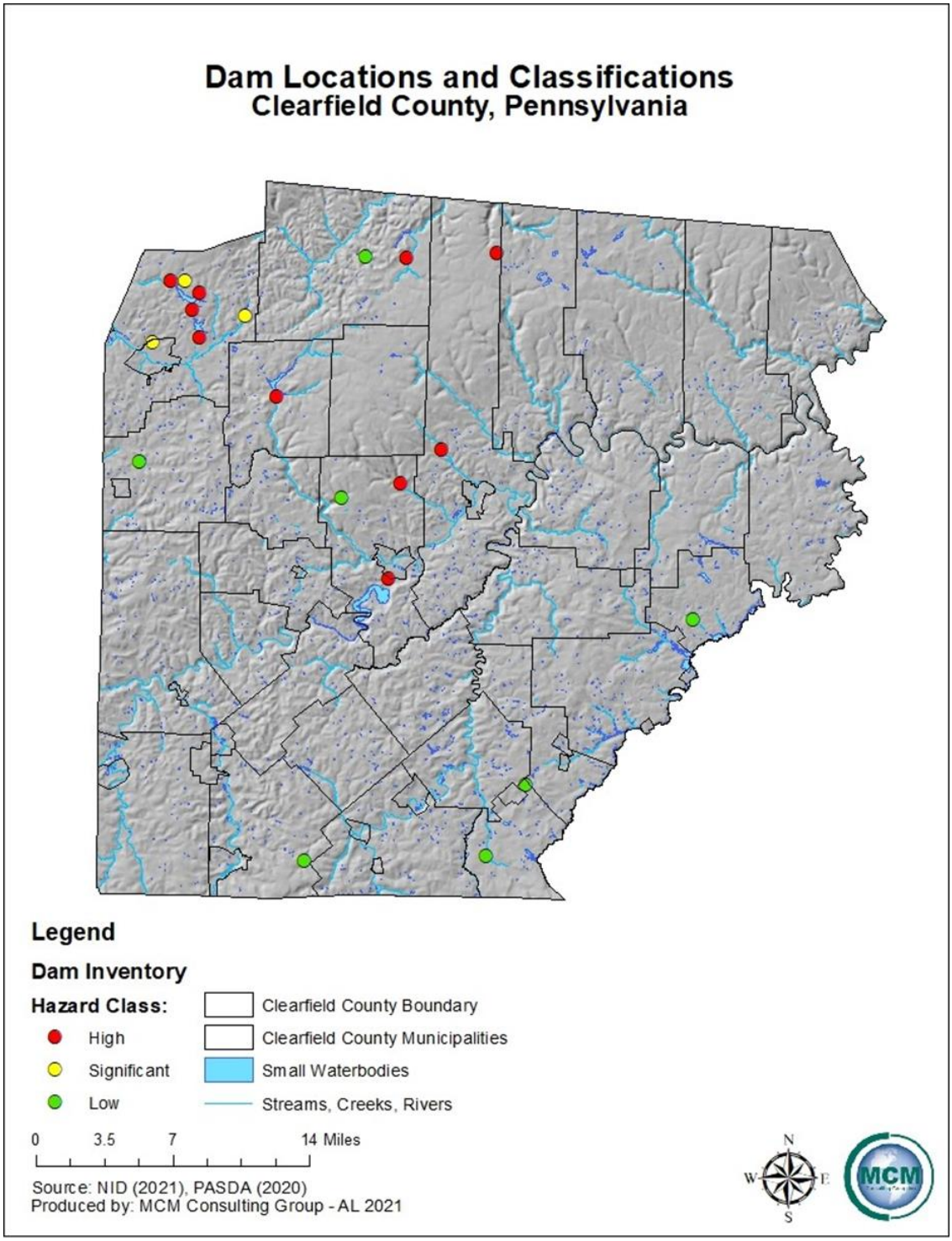
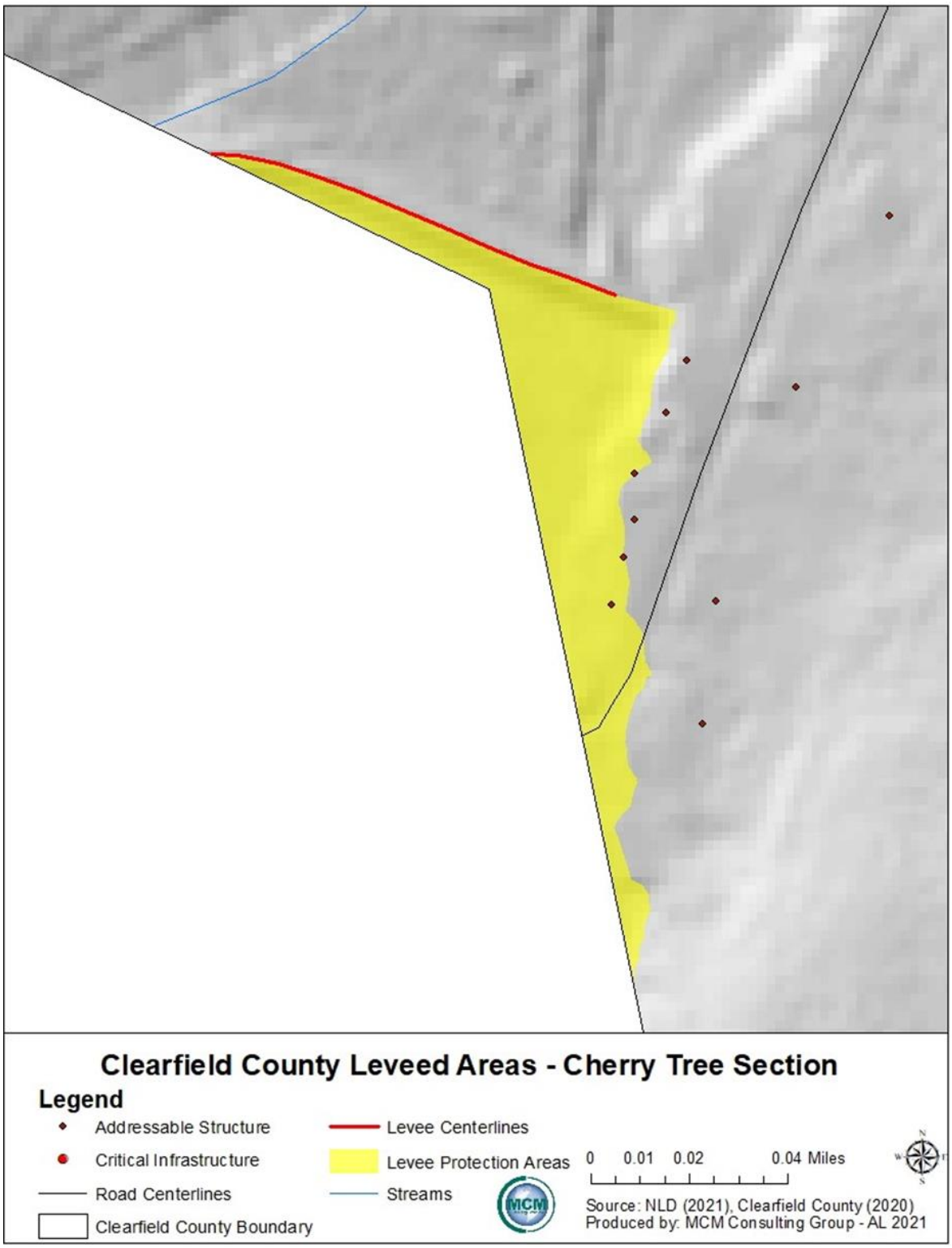
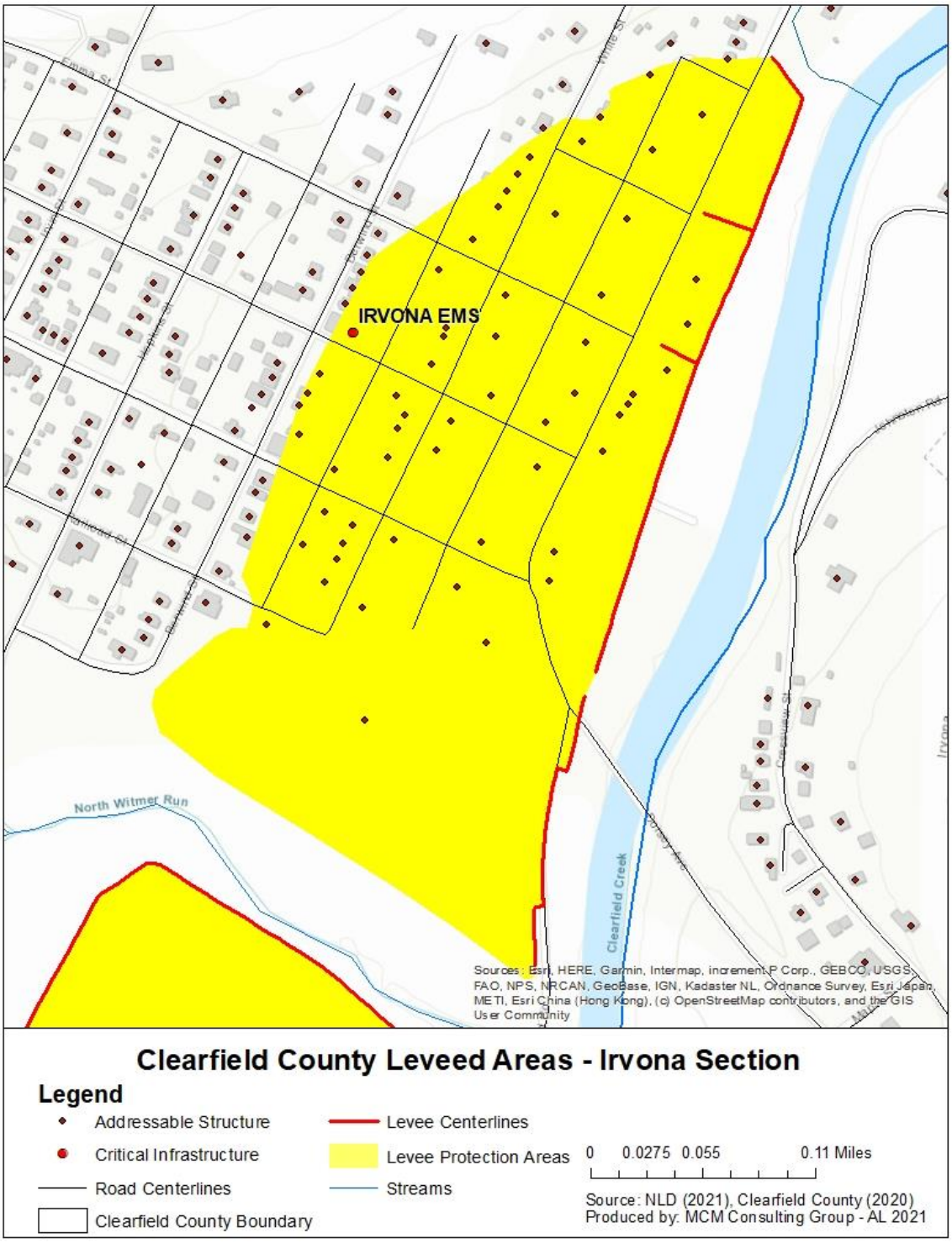
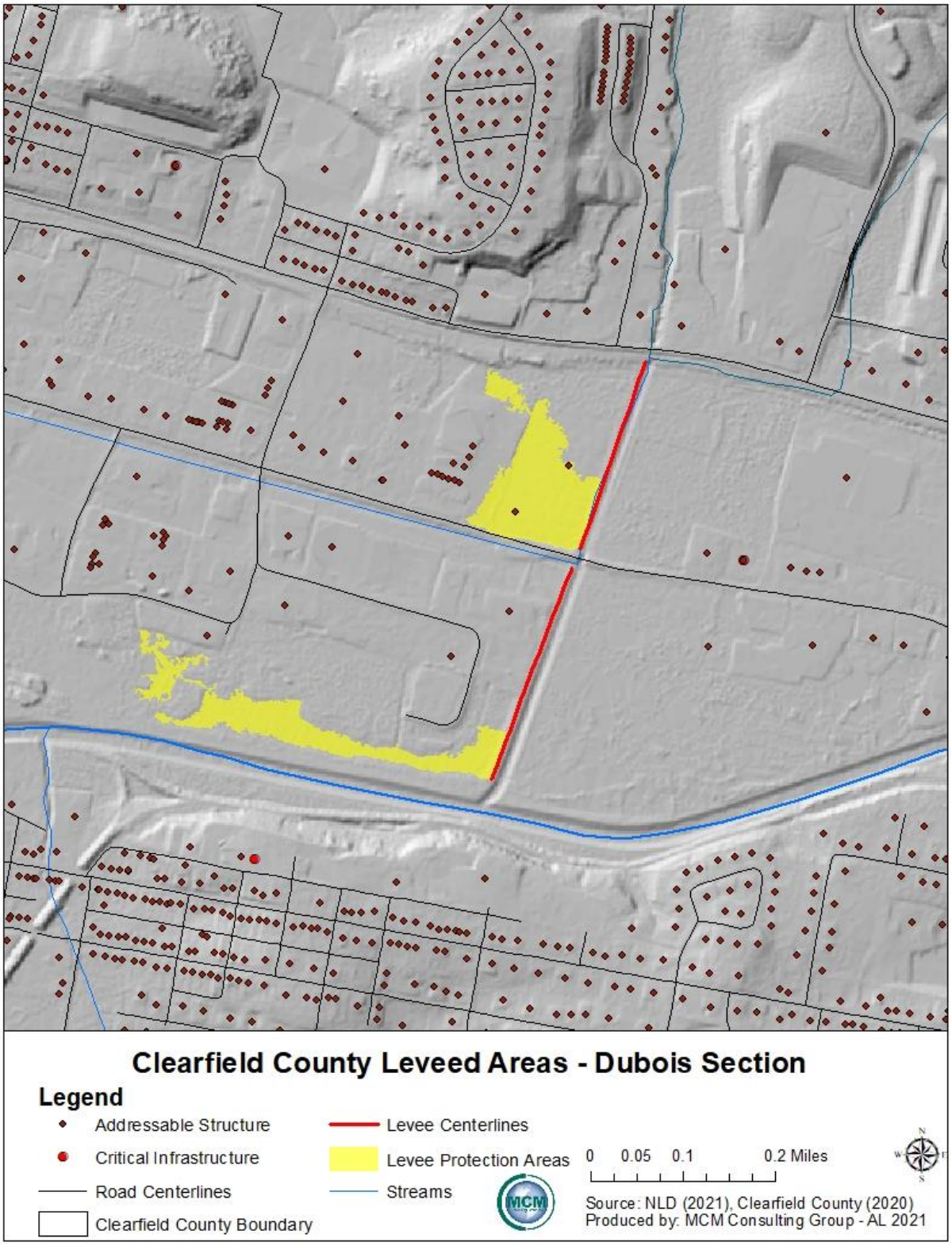


Figure 39 - Clearfield County Levee Locations




IRVONA EMS
North Witmer Run
Clearfield Creek
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Clearfield County Leveed Areas - Irvona Section
Legend
Addressable Structure
Critical Infrastructure
Road Centerlines
Clearfield County Boundary
Levee Centerlines
Levee Protection Areas
Streams
0 0.0275 0.055 0.11 Miles
Source: NLD (2021), Clearfield County (2020)
Produced by: MCM Consulting Group - AL 2021


Clearfield County Leveed Areas - Dubois Section
Legend
Addressable Structure
Critical Infrastructure
Road Centerlines
Clearfield County Boundary
Levee Centerlines
Levee Protection Areas
Streams
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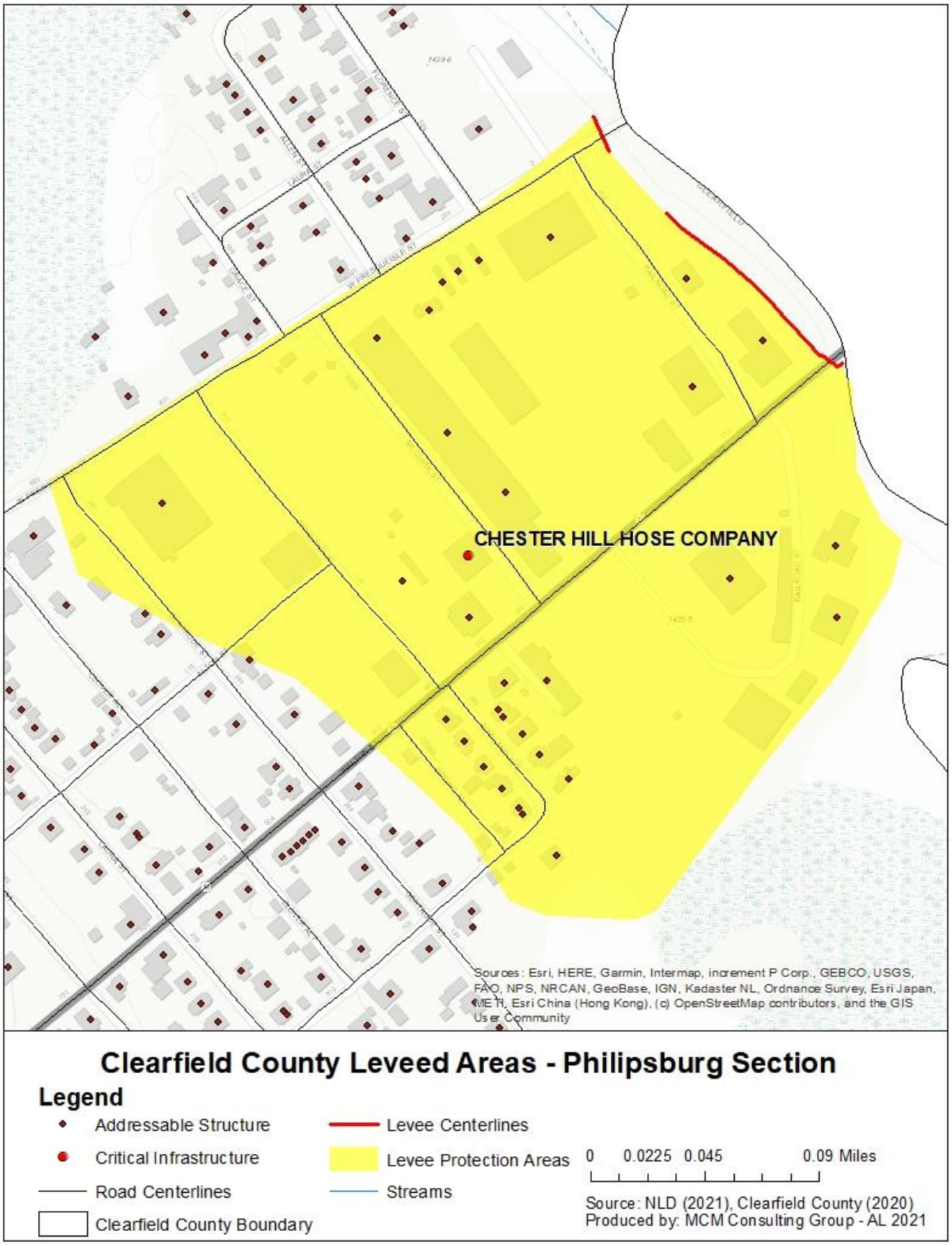
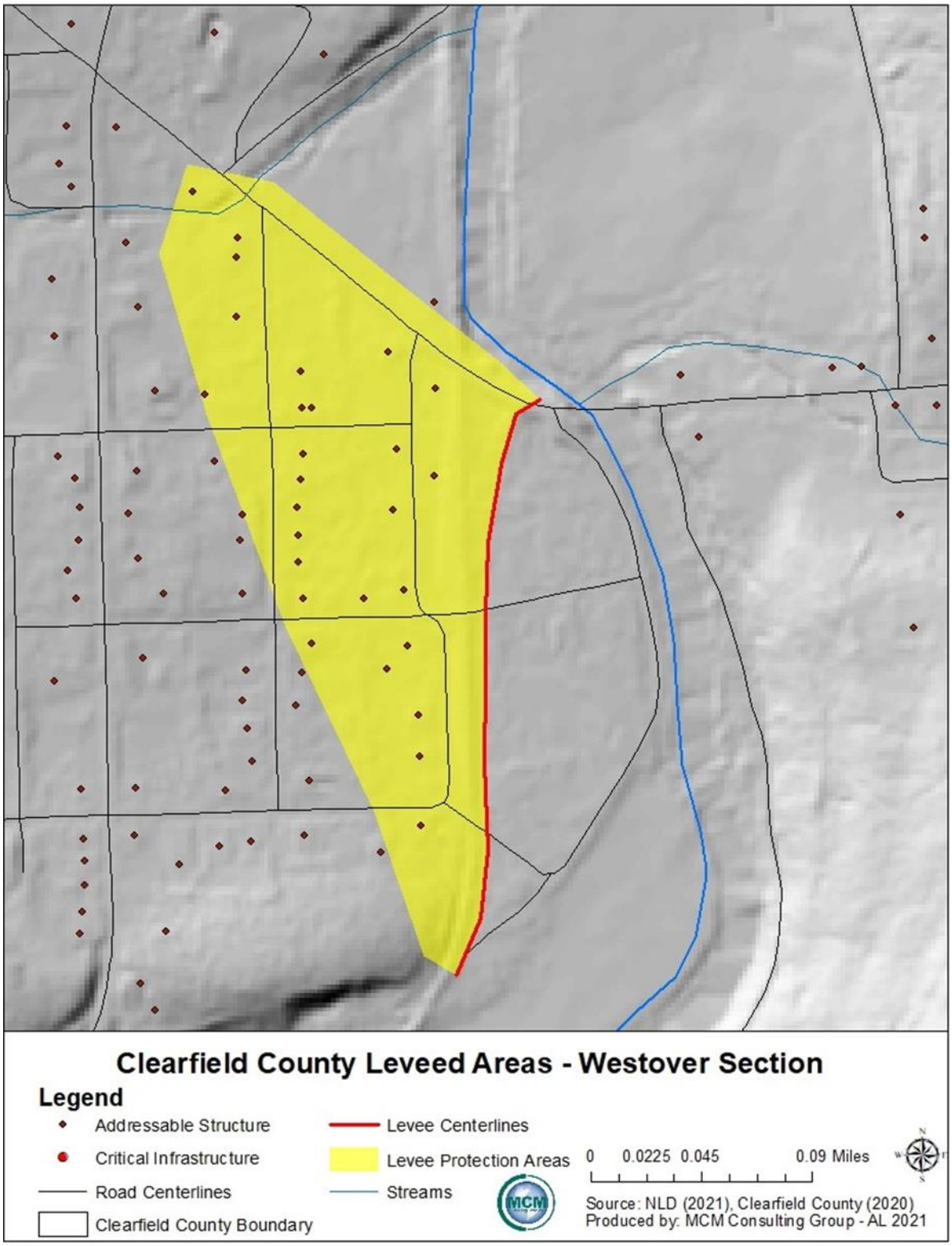
Source: NLD (2021), Clearfield County (2020)
Produced by: MCM Consulting Group - AL 2021


CHESTER HILL HOSE COMPANY
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Clearfield County Leveed Areas - Philipsburg Section
Legend
Addressable Structure
Critical Infrastructure
Road Centerlines
Clearfield County Boundary
Levee Centerlines
Levee Protection Areas
Streams
0 0.0225 0.045 0.09 Miles
Source: NLD (2021), Clearfield County (2020)
Produced by: MCM Consulting Group - AL 2021


Clearfield County Leveed Areas - Westover Section
Legend
Addressable Structure
Critical Infrastructure
Road Centerlines
Clearfield County Boundary
Levee Centerlines
Levee Protection Areas
Streams
0 0.0225 0.045 0.09 Miles
Source: NLD (2021), Clearfield County (2020)
Produced by: MCM Consulting Group - AL 2021

4.3.14. Drowning

4.3.14.1 Location and Extent

Drowning accidents can be categorized as unintentional, suicide, homicide, or undetermined depending on the circumstances (PA DOH, 2015). Unintentional drowning can be a significant hazard in communities with numerous water bodies (e.g., ponds, lakes, rivers) and extensive outdoor recreational activity. In addition, drowning accidents can occur in swimming pools at private residences as above ground pools such as "kiddie pools" and inflatable pools become more popular. Clearfield County has been and continues to grow in popularity as a tourist destination. Water related recreational opportunities such as camping, fishing, kayaking, boating, and swimming are popular among visitors.

The 102 miles of the West Branch of the Susquehanna River that meanders through the county is a concern for drowning hazards. Chest Creek is a common drowning location concern, too. *Figure 40 – Drowning Hazard Areas* illustrates the locations in Clearfield County where drownings could potentially occur.

4.3.14.2 Range of Magnitude

By definition, drowning generally results in death. However, non-fatal drownings can cause brain damage that may result in long-term disabilities including memory problems, learning disabilities, and loss of basic nervous system functions. In a typical year, counties in Pennsylvania can range from having zero to a hundred drowning incidents, depending on factors such as the physical environment (access to water) and a combination of social and cultural issues (wanting to learn how to swim, interest in recreational water-related activities, alcohol).

Drowning rates are particularly high for children between ages one and 14 and the leading cause of death for children between the ages of 1 and 4 (Centers for Disease Control, 2019).

Near-drowning occurs when a person is unable to breathe under water for a significant period. Symptoms following rescue may include breathing problems, vomiting, confusion, or unconsciousness. Occasionally symptoms may not appear until up to six hours following the event.

4.3.14.3 Past Occurrence

In April 2018, a high school senior died from drowning in Clearfield Creek after drinking with friends (PennLive). In 2013, an 18-year- old from Clearfield Borough drowned in the West Branch of the Susquehanna River in Bradford Township. This was the first drowning incident at the location in over a decade (Manning, 2013). Another drowning event occurred in Gulich Township in 2012 in a pond in Camp Wopsononock (Nexstar, 2012). And in 2000, a boy from a Clearfield County youth home drowned at the Jamesville Dam Recreation Area in New York,

after which involuntary manslaughter charges were filed and dropped against three of the Clearfield County youth camp's workers (Pittsburgh Post-Gazette).

Since July 20, 2008, the following drowning or potential for drowning incidents have occurred within Clearfield County, shown in *Table 67 – Drownings or Potential for Drownings in Clearfield County*. These events were outlined on CORVENA (formerly Knowledge Center™). Incidents that had a potential for drowning were included to provide a better understanding of the risk of the hazard.

Table 67 - Drownings or Potential for Drownings in Clearfield County

Drownings or Potential for Drownings in Clearfield County			
Drowning or Potential	**Date**	**Location**	**Event**
Potential	07/20/2008	Girard Township	Water rescue
Potential	08/30/2008	Bradford Township	Water rescue
Potential	09/12/2009	Sandy Township	Water rescue
Potential	07/19/2010	Sandy Township	Sunken boat
Potential	07/04/2011	Graham Township	Nine missing in river
Potential	01/26/2012	Curwensville Borough	Vehicle in river
Potential	06/30/2012	Greenwood Township	Missing person on river
DROWNING	07/07/2012	Gulich Township	Camp Wopsononock
Potential	07/28/2012	Sandy Township	Boat sunk in marina
Potential	08/06/2012	Clearfield Borough	Person missing/possibly on the river
Potential	01/21/2013	Pike Township	Water rescue
DROWNING	08/04/2013	Bradford Township	Susquehanna River
Potential	08/04/2013	Goshen Township	Water rescue
Potential	03/22/2014	Clearfield Borough	Car in the river
Potential	05/17/2014	Clearfield Borough	Water rescue
Potential	05/21/2014	Clearfield Borough	Water rescue
Potential	05/30/2014	Karthaus Township	Water rescue
Potential	05/23/2015	Clearfield County	Search for lost canoers
Potential	10/21/2016	Clearfield County	Swift Water Task Force activation
Potential	03/12/2017	Clearfield Borough	Male threatening suicide by drowning
Potential	05/04/2017	Lawrence Township	Water rescue/search and rescue
Potential	05/29/2017	Clearfield Borough	Water rescue
DROWNING	04/07/2018	Clearfield County	Clearfield Creek

Drownings or Potential for Drownings in Clearfield County			
Drowning or Potential	**Date**	**Location**	**Event**
Potential	05/18/2019	Clearfield City	Water rescue
Potential	08/17/2019	Limestone Township	Swimmer in distress

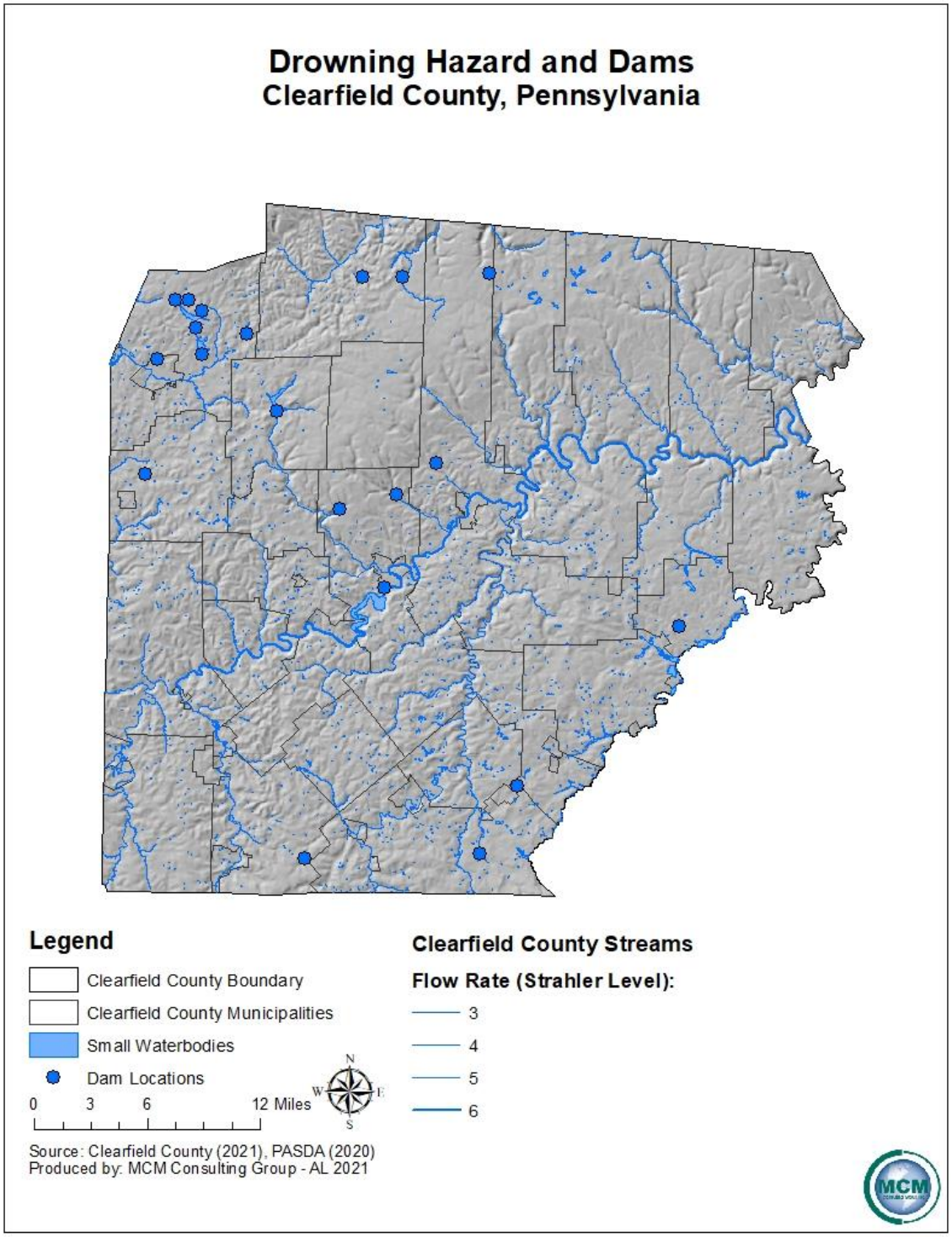
4.3.14.4 Future Occurrence

During the warm summer months, as activities such as swimming, kayaking, boating, and fishing increase, so does the likelihood of drowning. Based on past occurrence, Clearfield County can expect to experience one drowning every two to three years.

4.3.14.5 Vulnerability Assessment

As tourism continues to increase in the county and the number of visitors grows, drowning is likely to continue without mitigation actions in place. The sheer number of miles of the West Branch of the Susquehanna River that carry the river through the county is an indicator of vulnerability. Municipalities that border Moshannon State Forest or have popular swimming locations are more vulnerable to drownings as their residents have easiest access to the water bodies. Residents from other municipalities and from outside the county also frequent those recreation areas.

Figure 40 - Drowning Hazard Areas



4.3.15. Environmental Hazards/Petroleum and Gas Well Incidents

4.3.15.1 Location and Extent

Environmental hazards in Clearfield County mostly consist of hazardous materials release and petroleum/gas well incidents. Clearfield County ranks #22 in the state for Barrel of Oil Equivalent (BOE) produce with a total of 4,747 wells in the county. These types of hazards are created by human activities/industries and can result in injury or death to humans or damage to property.

Hazardous Material Release

A hazardous material release can pose threats to the natural environment, the built environment, and public safety through the diffusion of harmful substances, materials, or products. Hazardous materials fall into the following categories: flammable and combustible materials, compressed gases, explosive and blasting agents, radioactive materials, oxidizing materials, poisons, and corrosive liquids. Most hazardous materials incidents are generally unintentional and are associated with transportation accidents or accidents at fixed facilities. However, hazardous materials can be released as a criminal or terrorist act. Regardless of how a release happens, the result can be injury or death, and contamination to the air, water, and/or soil.

Facilities that use, manufacture, or store hazardous materials in Pennsylvania must comply with both Title III of the federal Superfund Amendments and Reauthorization Act (SARA), also known as the Emergency Planning and Community Right-to-Know Act (EPCRA), and the reporting requirements under the Hazardous Materials Emergency Planning and Response Act (1990-165) as amended for the commonwealth. Communities are kept abreast of the presence and release of chemicals at individual facilities with the community right-to know reporting requirements. The EPCRA was designed to ensure that state and local communities are prepared to respond to potential chemical accidents through local emergency planning committees (LEPCs). LEPCs are charged with developing emergency response plans for SARA Title III facilities; these plans cover the location and extent of hazardous materials; establish evacuation plans, response procedures, and methods to reduce the magnitude of a materials release; and establish methods and schedules for training and exercises.

There are 186 facilities classified as using or storing extremely hazardous substances as defined by the EPA under SARA Title III in Clearfield County. The vulnerable facilities' routes along roadways are shown in *Figure 41 - SARA Tier II Facilities in Vulnerability Zone*.

There are increasingly large numbers of chemicals, oils, radioactive materials, and other hazardous substances spilled as the result of highway, rail, and waterway accidents. Transportation of hazardous materials along highways poses the greatest risk of release to Clearfield County. Releases from rail transport are also a concern. On occasion, these events become a major disaster and force people to evacuate and/or lose their homes and businesses.

The most traveled routes in the county include Interstate 80, US Route 119, US Route 219, US Route 322, PA Route 36, PA Route 53, PA Route 153, PA Route 253, PA Route 255, PA Route

286, PA Route 410, PA Route 453, PA Route 729, PA Route 830, PA Route 865, PA Route 879, PA Route 969, and PA Route 970. Interstate 80 and US Route 322 are the most traveled by vehicles transporting hazardous materials. These major roads pass through the more populous areas of Clearfield County. Similarly, rail lines pass through cities, boroughs and along major waterways where larger numbers of people could be vulnerable should a hazardous materials accident occur.

Pipelines also transport hazardous liquids and flammable substances such as natural gas. Incidents can occur when pipes corrode, are damaged during excavation, are incorrectly operated, or damaged by other forces. Pipelines transporting natural gas compose most of the total pipeline miles in the Commonwealth. Pennsylvania has 9,935 miles of active natural gas transmission pipelines and 3,089 miles of active liquid pipelines. Of the liquid pipeline mileage, 1,148 miles carry highly volatile liquids.

Petroleum and Gas Well Incidents

More than 350,000 oil and gas wells have been drilled in Pennsylvania since the first commercial oil well was developed in 1859. PA DEP differentiates between conventional and unconventional oil and gas wells. Conventional wells are the traditional vertical wells, while unconventional wells are typically horizontally drilled wells commonly associated with the Marcellus Shale. There are active and abandoned oil/gas wells in fifty-five of Pennsylvania's sixty-seven counties with the majority of activity occurring in the western portion of the Commonwealth, including Clearfield County. Clearfield County itself has thirty-two abandoned oil/gas wells, 4,150 active oil/gas wells, and sixteen inactive oil and gas wells. *Figure 42 – Active Oil and Gas Wells in Clearfield County*, *Figure 43 – Conventional Oil and Gas Wells in Clearfield County*, *Figure 44 – Unconventional Oil and Gas Wells in Clearfield County* show the active, conventional, and unconventional wells present in Clearfield County.

Private water supplies such as domestic drinking water wells in the vicinity of oil and gas wells are at risk of contamination from brine and other pollutants including methane which can pose a fire hazard. Private drinking water is largely unregulated and therefore the existing data is largely incomplete and/or inaccurate.

4.3.15.2 Range of Magnitude

Hazardous Material Release

Dispersion of hazardous material release can take place rapidly when transported by water and wind. However, often accidental release occurs as a result of human carelessness, intentional acts, or natural hazards. Whether its accidental or intentional, there are several potentially

exacerbating circumstances that will affect the severity or impact of a hazardous materials release. Some of these conditions, or characteristics that can enhance or magnify the effects of a hazardous materials release, include the following:

- Weather conditions: Affect how the hazard occurs and develops.
- Micro-meteorological effects of buildings and terrain: Alters dispersion of hazardous materials.
- Non-compliance with applicable codes (e.g., building or fire codes) and maintenance failures (e.g., fire protection and containment features): Can substantially increase the damage to the facility itself and to surrounding buildings.

The severity of any given hazardous materials incident is dependent not only on the circumstances described above, but also with the type of materials released and the distance and related response time for emergency response teams. Areas within close proximity to a release are generally at a greater risk, yet depending on the agent, a release can travel great distances or remain present in the environment for a long period of time resulting in extensive impacts on people and the environment. A worst-case scenario event of a hazardous material release would be if a release occurred in the most populous jurisdiction, the City of DuBois. A hazardous material release would likely cause the evacuation of city residents, visitors, and employees.

Any type of drilling can cause stray methane gas in the subsurface; under certain conditions, to migrate to private water supply wells and ultimately into a building. This migration, if left unmitigated, can build up to explosive concentrations. A proper well vent allows methane to vent to the atmosphere rather than build up to explosive levels. The risk of an explosion from stray methane varies from location to location based on site-specific conditions.

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 the intensity of the flame and the abundant fuel source. The potential impacts of oil and natural gas wells range in magnitude and extent to water, land, and air.

Petroleum and Gas Well Incidents

As is the case with hazardous material release, a variety of potential hazards exist with oil and gas extraction. Abandoned oil and gas wells that are not properly plugged can contaminate groundwater and consequently domestic 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.

Methane can leak into domestic drinking wells and pose fire and explosion hazards. In addition, natural gas well fires can 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. When methane gas from unplugged gas wells seeps into underground coal mines, miners are at risk of asphyxiation and are subject to impacts of explosion. The worst-case scenario for an oil or gas well incident would be if there was a discharge of pollutant material like frac fluid into the waterways of Clearfield County. This is particularly an issue in the southern and central portion of the county, where there are higher numbers of reported domestic water wells and a greater amount of reliance on these wells for potable water supply.

The impacts of oil and gas wells range in magnitude and extent. There are several potential impacts, including those on water, land, and air. Common accidents involving gas well sites include “blowouts”, which are an explosion or failure of the rig, as well as the potential for chemical contamination.

4.3.15.3 Past Occurrence

Table 68 - Hazardous Materials Released in Clearfield County lists the various material releases and spills in Clearfield County. The majority of incidents in the past have involved fuel spill problems along the highways, such as Interstate 80, or leaks from a fixed source. Most of these are the result of leaks that have limited impact on people and the environment. Yearly the number of hazardous materials being produced, stored, and transported continues to increase. The data for past occurrences with hazardous materials released is from the past five years starting from the year 2016 to current year of 2021.

Table 68 - Hazardous Materials Released in Clearfield County

Hazardous Materials Released in Clearfield County		
Date	**Municipality**	**Event**
01/09/2016	Clearfield County	Hazardous Materials – Meth Lab
03/11/2016	Lawrence Township	Hazardous Materials – Fuel Spill
04/29/2016	Clearfield County	Hazardous Materials – Disabled Vehicle with Oil
06/02/2016	Clearfield County	Hazardous Materials – House Explosion with
06/03/2016	Clearfield County	Hazardous Materials – Three Outdoor Heating Oil
06/07/2016	Clearfield County	Hazardous Materials – Fuel Tanks Overturned in
06/15/2016	DuBois City	Hazardous Materials – HazMat Spill
06/20/2016	Clearfield County	Hazardous Materials – Accident with Fuel Spill
08/02/2016	Clearfield County	Hazardous Materials – Fuel Spill

Hazardous Materials Released in Clearfield County		
Date	**Municipality**	**Event**
08/21/2016	Clearfield County	Hazardous Materials – Oil Spill into Creek
09/15/2016	Clearfield County	Hazardous Materials – Fuel Spill into River
09/17/2016	Clearfield Borough	Hazardous Materials – Meth Lab with Road Closure
09/18/2016	Greenwood Township	Hazardous Materials – Fuel Spill with Road Closure
09/19/2016	Clearfield County	Hazardous Materials – Tractor Trailer Roll Over
09/28/2016	Sandy Township	Hazardous Materials – Active Gas Leak
09/29/2016	Clearfield Borough	Hazardous Materials – Chemical Spill
03/28/2017	Clearfield County	Hazardous Materials – 50 Gallon Raw Asphalt Spill
04/06/2017	Houtzdale Borough	Hazardous Materials - Flammable Liquid & Solids
05/17/2017	Clearfield County	Hazardous Materials – Hazardous Materials Spill
05/22/2017	Sandy Township	Hazardous Materials – Fuel Leak
06/09/2017	Sandy Township	Hazardous Materials – Fuel Spill in Lake
06/27/2017	Clearfield County	Hazardous Materials – Propane Pipeline Hazard
07/08/2017	DuBois City	Hazardous Materials - Flammable Liquid & Solids
08/12/2017	Cooper Township	Hazardous Materials – Diesel Fuel Spill/Truck Crash
08/28/2017	Clearfield County	Hazardous Materials – Oil Container Leak
10/16/2017	Clearfield County	Hazardous Materials – Fuel Spill MM 97 on I-80
10/19/2017	Graham Township	Hazardous Materials - Flammable Liquid & Solids
11/16/2017	Covington Township	Hazardous Materials – Flammable Liquid & Solids
11/16/2017	Sandy Township	Hazardous Materials – Fuel Spill
12/22/2017	DuBois City	Hazardous Materials – Formaldehyde Spill at
12/22/2017	Bradford Township	Hazardous Materials – Fuel Spill
01/16/2018	Lawrence Township	Hazardous Materials – Diesel Spill
02/07/2018	Clearfield County	Hazardous Materials – MVA/Fuel Spill
02/12/2018	Sandy Township	Hazardous Materials – Flammable Liquid & Solids
05/10/2018	Bradford Township	Hazardous Materials – Motor Oil Spill
05/12/2018	Bradford Township	Hazardous Materials – Flammable Liquids & Solids
07/24/2018	Lawrence Township	Hazardous Materials – MVA with Fuel Spill
08/01/2018	Curwensville Borough	Hazardous Materials – Fuel Spill with Water/Sewage
08/03/2018	Clearfield County	Hazardous Materials – Fuel Spill
09/11/2018	Clearfield County	Hazardous Materials – Fuel Oil Spill

Hazardous Materials Released in Clearfield County		
Date	**Municipality**	**Event**
09/14/2018	Clearfield County	Hazardous Materials – Fuel Spill
10/18/2018	Bradford Township	Hazardous Materials – Fuel Spill
10/19/2018	Clearfield County	Hazardous Materials – Propane Tank Flaring
11/06/2018	Clearfield County	Hazardous Materials – Fuel Leak
12/26/2018	Clearfield County	Hazardous Materials – Fuel Spill
01/05/2019	Clearfield County	Hazardous Materials – Fuel Spill into Storm Drain
02/21/2019	Clearfield County	Hazardous Materials – MVA with Fuel Spill
03/21/2019	Clearfield County	Hazardous Materials – Fuel Oil Spill
05/03/2019	Clearfield County	Hazardous Materials – Fuel Spill on I-80
05/05/2019	Clearfield Borough	Hazardous Materials – Liquefied Natural Gas
05/08/2019	Bradford Township	Hazardous Materials – Active Fuel Leak
07/14/2019	Clearfield County	Hazardous Materials – Gasoline Spill
08/22/2019	Lawrence Township	Hazardous Materials - Fuel Leak (Spill)
12/29/2019	Clearfield Borough	Hazardous Materials – Fuel Sheen on River
06/05/2020	Cooper Township	Hazardous Materials – Fuel Spill
05/10/2021	Pine Township	Hazardous Materials – Fuel Spill

Clearfield County utilizes the reporting tool Corvena™ to track events related to environmental or hazardous material events. Reports to 911 of hazardous materials spills, to include Marcellus Shale drilling and pipeline emergencies, are tracked on Corvena™.

4.3.15.4 Future Occurrence

Future occurrence of an environmental hazard occurring in Clearfield County is likely, however it is difficult to predict when and where environmental hazards will arise as they are often related to equipment failure and/or human error. Traffic accidents involving hazardous materials can be caused by many different factors, such as weather conditions or drivers' error. As natural gas drilling and pipeline activities continue to grow in Clearfield County, the inherent dangers persist. The natural gas production has increased dramatically in Pennsylvania since 2008. This has resulted in an increase to energy security, due to less dependence on fossil fuels from other parts of the world.

Adequate monitoring through the Department of Environment Protection (DEP) will reduce the likelihood of potential impacts to the community and the environment. Risk associated with conventional oil and gas drilling is expected to remain moderate, with some of the highest risk

emerging from old conventional wells that are not properly mapped or whose caps and protective features have begun to deteriorate.

4.3.15.5 Vulnerability Assessment

There are many miles of roadways within Clearfield County, including interstate I-80, of which most are owned and maintained by PennDOT. Interstate I-80 is a major route that traverses the Commonwealth of Pennsylvania and travels the entire way through the United States. Various materials and substances, to include hazardous materials are transported over the interstate highway and other highways throughout the county. Therefore, the various highways and roadways in Clearfield County are vulnerable to hazardous material releases. The railway network also is vulnerable to hazardous materials incidents. Jurisdictions where one or more TRI (EPA's Toxic Release Inventory) fixed facilities are in operation should be considered vulnerable to a release of hazardous material(s). These releases could be the result of severe weather conditions, power outages, acts of criminal activities or terrorism, and/or human error.

The vulnerability of a community and the environment to a spill or release of an extremely hazardous substance at a facility or from a transportation accident depends on many variables. These include: the specific chemical, the extent of the spill or release, the proximity of waterways, and the number of people residing in a radius from the facility of accident location that can reasonably be expected to be adversely affected. Furthermore, the vulnerability of a community and the environment to a hazardous material release from a transportation incident is directly related to several variables: mostly the mode and class of transportation. Each mode is further subject to several categories of hazard. Each mode of transportation (truck/highway, aircraft, rail, watercraft, or pipeline) has separate and distinct factors affecting the vulnerability.

All communities in Clearfield County are vulnerable, on some level, to environmental hazards resulting from oil and gas well activity; to include drilling, pipeline construction, and distribution. Clearfield County has a vulnerable population of 26,463 residents, 13,138 vulnerable buildings with $2,519,120.00 value of exposed buildings, and a building value percentage of 33%. Clearfield County has previously taken steps to protect residents and reduce the county's overall vulnerability to oil/gas well drilling emergencies, with the development of procedures for handling emergencies at well sites. Individual gas well drilling operators should have an emergency response plan for their wells in place, however, the county's plan can substitute in an emergency. The Well Control Emergency Plan defines a well control emergency as uncontrolled flow of oil, gas, condensate, brine, sand, gravel, rock, and/or steam from a wellbore. The emergency plan lists procedures on how to deal with a blowout or control incident with or without fire, environmental release, injury on a rig, or other miscellaneous incidents.

Figure 41 - SARA Tier II Facilities in Vulnerability Zones

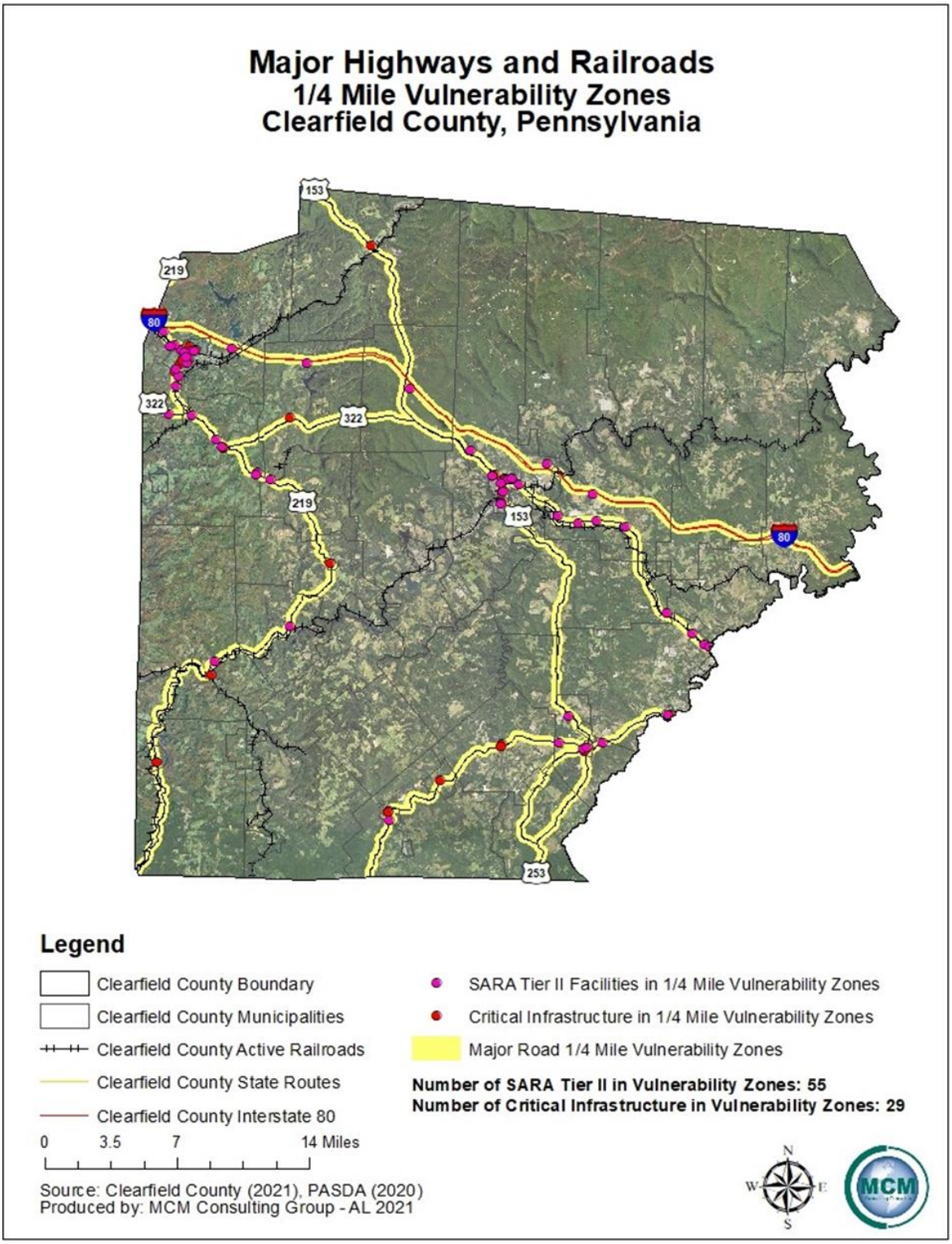


Figure 42 - Active Oil and Gas Wells in Clearfield County

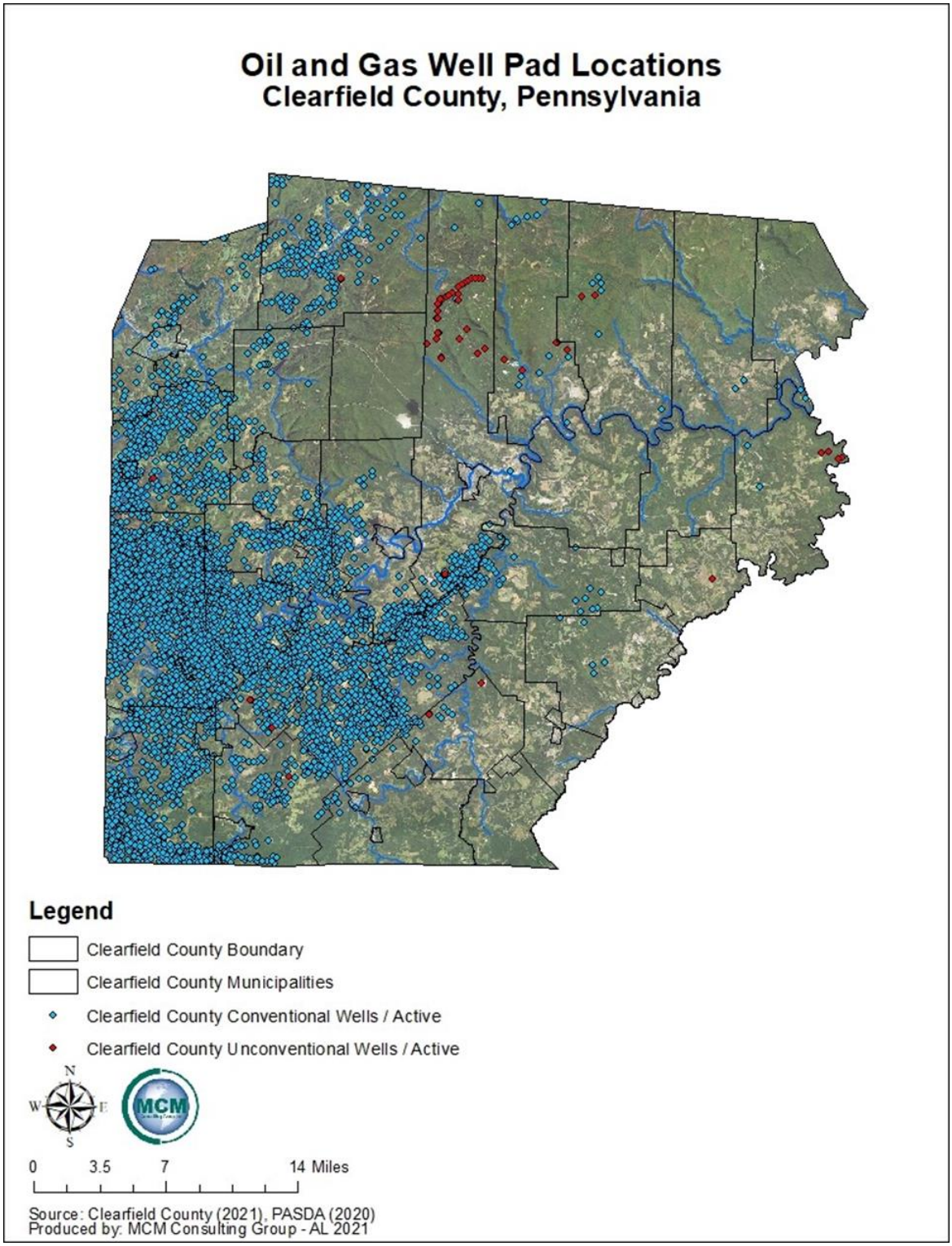


Figure 43 - Conventional Oil and Gas Wells in Clearfield County

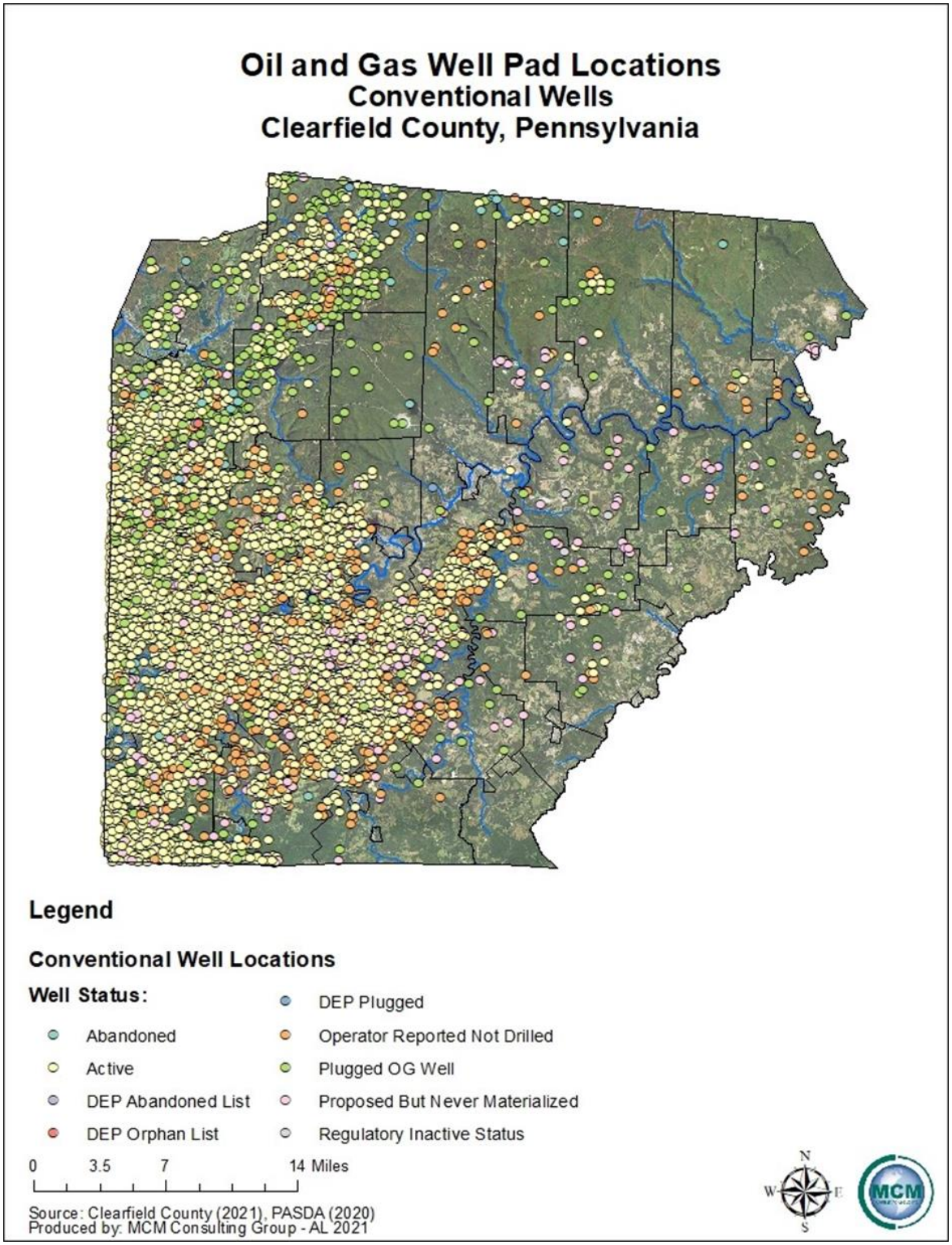
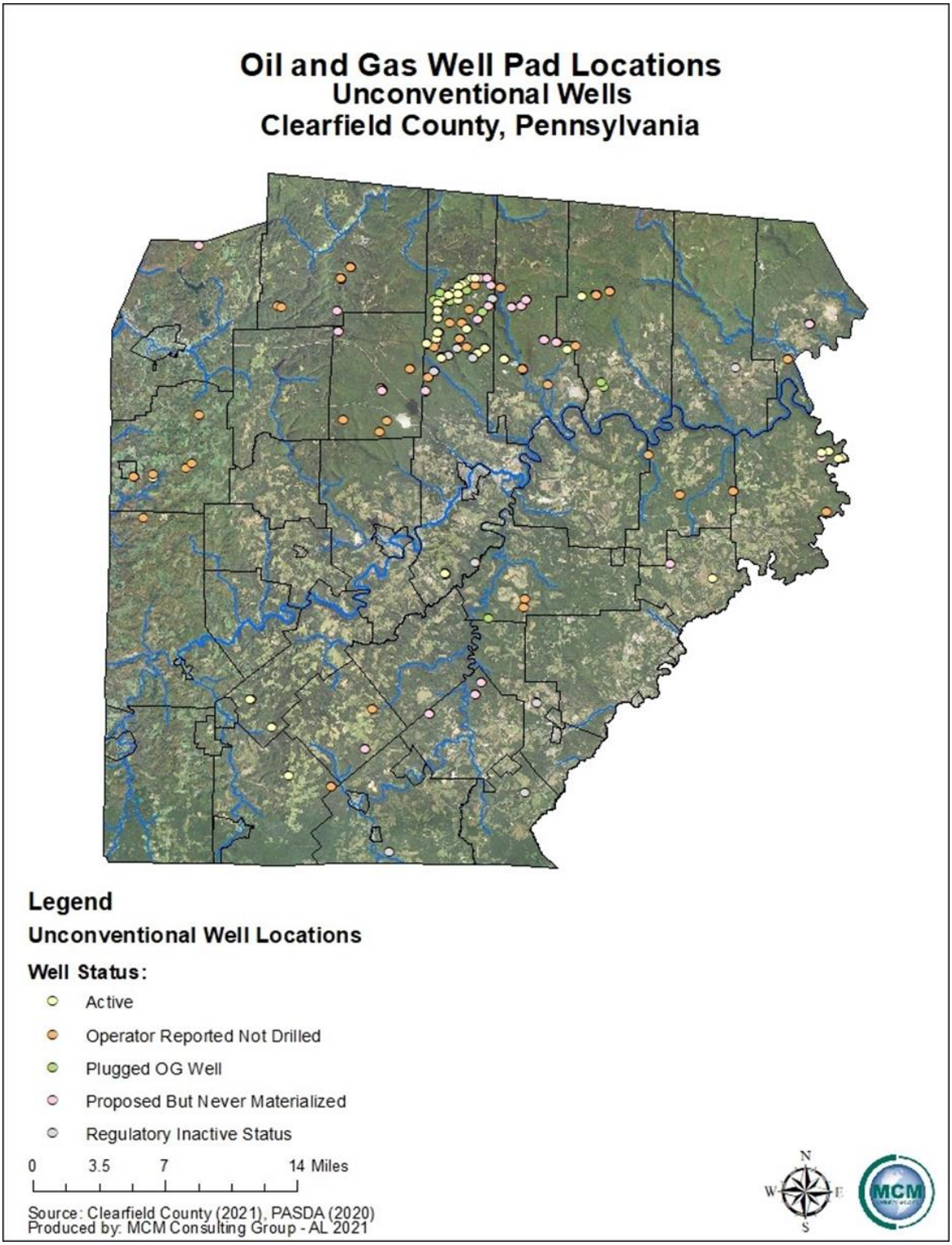


Figure 44 - Unconventional Oil and Gas Wells in Clearfield County



4.3.16. Opioid Epidemic

4.3.16.1 Location and Extent

Pennsylvania and the United States at large have been experiencing an epidemic of opioid drug abuse. According to the Pennsylvania Department of Health, the opioid overdose epidemic is the worst public health crisis in Pennsylvania. It affects Pennsylvanians across the state, from big cities to rural communities.

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

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

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

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

While other addictive substances such as methamphetamines and alcohol can also be detrimental to the health of individuals in Clearfield County, this profile focuses on opioid drugs and the

opioid epidemic. The opioid crisis was declared to be a public health emergency on October 26, 2017. While the declaration provides validation for the scope and severity of the problem, it was not accompanied by any release of funding for mitigating actions. On January 10, 2018, Governor Tom Wolf declared the opioid epidemic to be a statewide public health disaster emergency for Pennsylvania. The declaration is intended to enhance response and increase access to treatment.

4.3.16.2 Range of Magnitude

Opioid addiction can lead to overdose, which can be fatal. The most dangerous side effect of an opioid overdose is depressed breathing. The lack of oxygen to the brain causes permanent brain damage, leading to organ failure, and eventually death. Signs and symptoms include respiratory depression, drowsiness, disorientation, pinpoint pupils, and clammy skin. Opioid addiction can also be passed from mother to child in the womb. This condition, known as neonatal abstinence syndrome, has increased five-fold, according to the National Institute on Drug Abuse (NIDA). This results in an estimated 22,000 babies in the United States born with this condition. First responders such as paramedics, police officers, and firefighters are also affected by the opioid addiction crisis. First responders face exposure risk due to an increase of crisis, consuming time and resources, particularly to synthetic fentanyl. Two to three milligrams of fentanyl cause an induced respiratory depression, arrest, and possibly death to occur. Since fentanyl is indistinguishable from several other narcotics and powdered substances, first responders must take extra precaution when dealing with calls related to drug abuse. A worst-case scenario with the opioid epidemic in Clearfield County would be a high number of overdoses between residents and/or first responders in the city of DuBois.

According to the Center for Disease Control and Prevention (CDC), more than 192 Americans die every day from an opioid overdose. In 2019, a total of 4,377 deaths related to opioid use occurred in Pennsylvania. The average age of opioid user who overdosed in 2019 was thirty-six. From February 2019 to February 2020, there has been a 40.9% increase across the commonwealth of Pennsylvania. This indicates that there has been a significant increase in opioid overdoses in Pennsylvania. Out of the fifty states, nineteen states have had a significant increase in opioid overdoses with Pennsylvania being one of the states. Heroin and fentanyl are the two drugs most often found in overdose deaths, and they are considered to be highly available and nearly ubiquitous in Pennsylvania.

4.3.16.3 Past Occurrence

In 2020, there was an estimated total of 81,000 drug-related overdose deaths in the United States. This number is the highest number of overdose death ever recorded in a 12-month period, according to the recent provisional date from the CDC. Clearfield County experienced a total of sixty-seven drug related deaths from 2015 – 2020. There was a total of thirteen overdose deaths

in 2015, eleven deaths in 2016, seven deaths in 2017, twenty-one deaths in 2018, nine deaths in 2019, and six deaths in 2020. The most common age groups for opioid abuse in Clearfield County are the ages between 25 – 44 years old. In Clearfield County opioid use is higher among males than females, and among white more than any other race. The most commonly used opioids in Clearfield County are fentanyl, heroin, cocaine, benzodiazepines, and Rx opioids. *Table 69 – Drugs Present in 2020 Pennsylvania Overdose Deaths* shows the percentages of individual drugs present in overdose deaths in 2020 incidents. *Figure 45 – Opioid Overdose Deaths in Pennsylvania 2020* and *Figure 46 – Opioid Overdose Deaths in Pennsylvania 2019* illustrate the amount of overdose deaths in each county in the years of 2020 and 2019.

Table 69 - Drugs Present in 2020 Pennsylvania Overdose Deaths

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

4.3.16.4 Future Occurrence

Future occurrences of opioid addiction and overdose are unclear as the state moves forward with overdose prevention initiatives through the use of Naloxone, alternative pain treatments, improvement of tools for families and first responders, and expansion of treatment access. The Wolf administration has taken approaches to help with prevention of mass future occurrences from happening across the Commonwealth. To help prevent future drug abuse and protect individual health among communities in Pennsylvania, the Pennsylvania's Prescription Drug Monitoring Program (PA PDMP) collects information on all filled prescriptions for controlled substances. This information helps health care providers safely prescribe controlled substances and helps patients get correct treatment. The PA PDMP also has drug take-back boxes located in the counties for an easy, convenient location where anyone can dispose of their unused, expired, or unwanted prescriptions to help lower potential future drug overuse. In Clearfield County, there are seven drug take-back boxes located throughout the county. The drug take-back box locations include DuBois City Police Department, Sandy Township Police Department,

Curwensville Police Department, Lawrence Township Police Department, Clearfield County Courthouse, Clearfield Borough Police Department, and State Police - Troop C/Clearfield. These locations help reduce future occurrences of the opioid epidemic from occurring.

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

Opioid drugs have been a problematic and addictive solution for patients to deal with pain. Employing alternative approaches to pain management could prevent patients from ever being introduced to addictive opioids, especially considering the most common overdose drugs in Clearfield County have been prescription opioids. A possible alternative pain treatment comes from hemp extracted cannabidiol, or CBD. Unlike THC (the psychoactive constituent of cannabis), CBD is non-psychoactive and does not have the same intoxicating effect as THC; however, CBD can provide relief from pain, inflammation, anxiety, and even psychosis. CBD is legal without a prescription throughout the United States of America.

4.3.16.5 Vulnerability Assessment

Opioid overdoses have resulted in many tragic deaths in Pennsylvania and many people have been affected by the epidemic through the loss of either a family member, a close friend, or member of their community. Opioid addiction is a direct detriment to the personal well-being of addicts, a burden to their families and communities, and a strain to the emergency response system that cares for overdose victims. In general, jurisdictions that are more densely populated are more vulnerable to opioid addiction threats as access to the drugs increases. However, rural

communities in general experience larger per-capita opioid-related deaths. Jurisdictional losses in the opioid addiction crisis stem from lost wages, productivity, and resources rather than losses to buildings or land. Many counties across the Commonwealth, including Clearfield County, have seen an increase of time and resources devoted to the opioid epidemic as overdose and response increase.

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

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

Additionally, first responders and medical personnel are also vulnerable to secondary effects of the opioid crisis. Fentanyl and related substances are hazardous materials which cause the

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

Figure 45 - Opioid Overdose Deaths in Pennsylvania 2020

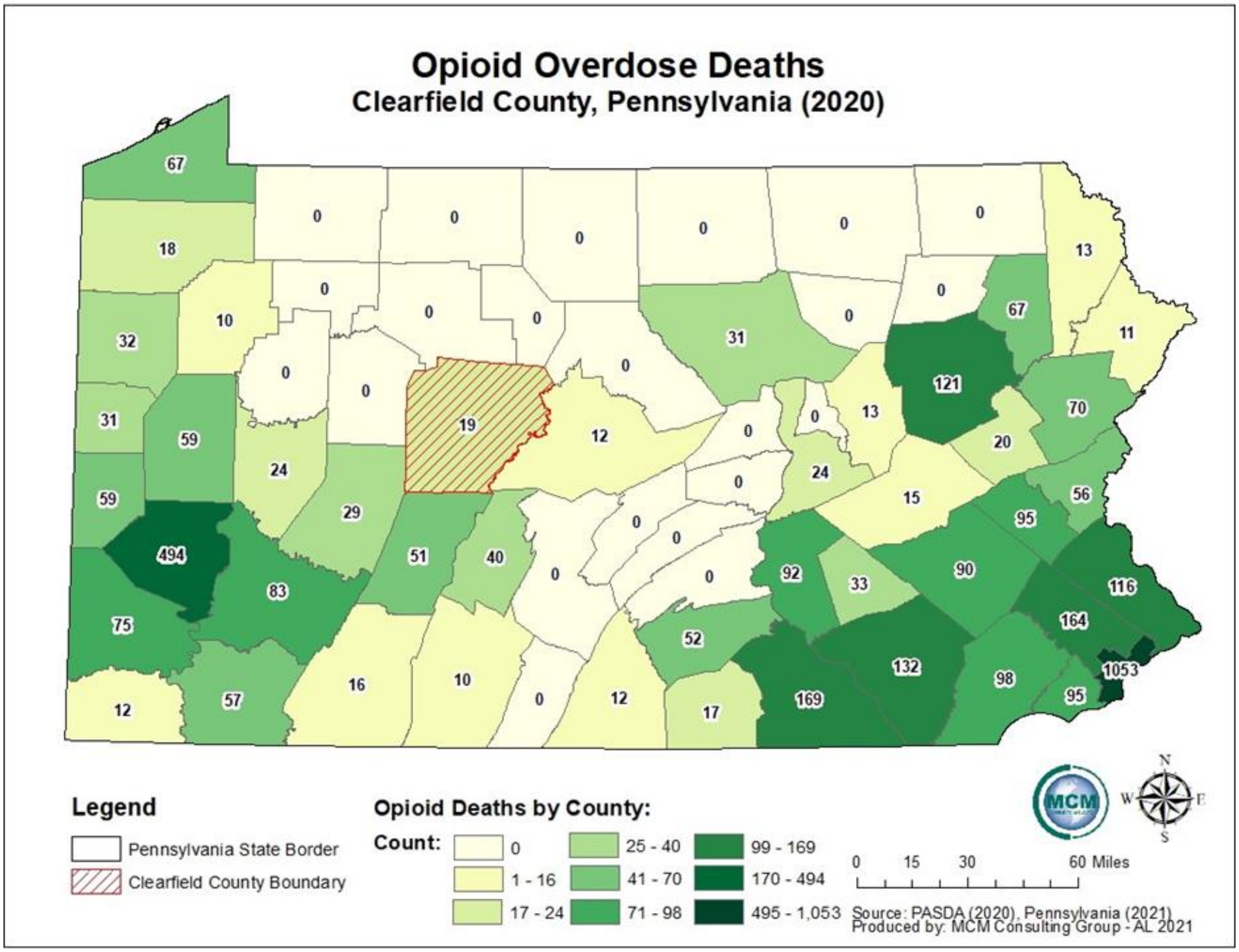
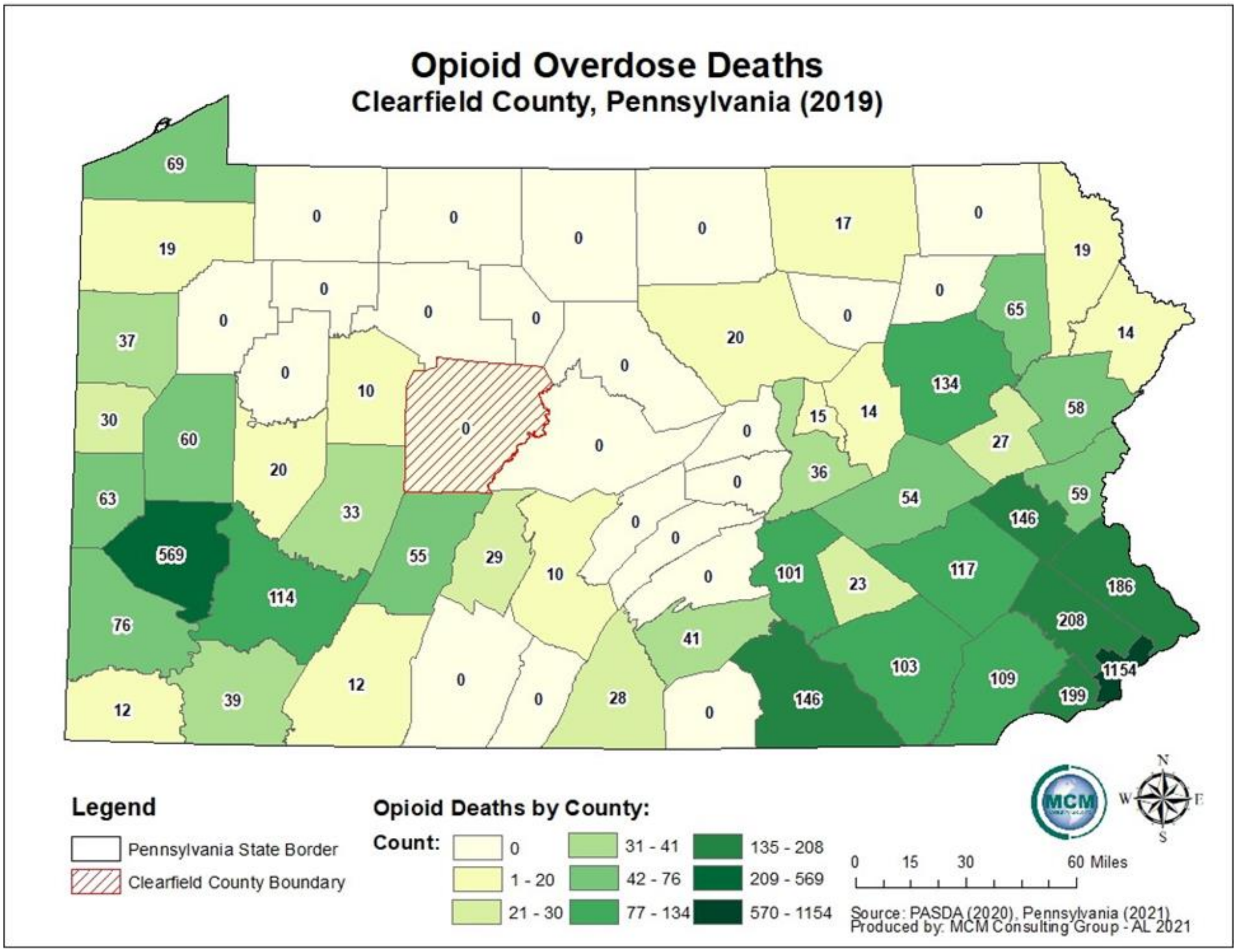


Figure 46 - Opioid Overdose Deaths in Pennsylvania 2019



4.3.17. Structure Collapse

4.3.17.1 Location and Extent

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

Adherence to modern building codes can lower a building's risk to collapse. Building codes – developed by the International Code Council in partnership with FEMA and other federal, state, local, and private authorities – specify the minimum legal design and construction requirements for structural integrity, construction materials, and fire protection (FEMA, 2014). Most buildings constructed after 1961 in Clearfield County were built under modern building codes as adopted in the Pennsylvania Uniform Construction Code.; however, a large percentage of occupied housing units in Clearfield County were built before 1960.

Bridges serve to connect both large and small roadways and communities throughout the county. Whether they span another roadway or a body of water, bridges are a crucial part of every transportation system. The Pennsylvania Department of Transportation (PennDOT) reports that Pennsylvania has the third-largest number of bridges in the country and the average age of bridges owned by the commonwealth is over 50 years. Many of Pennsylvania's bridge structures are in need of repair. Inspection and maintenance are necessary to observe and mitigate the extent of the disrepair, especially on older structures. Aging culverts are of particular concern in Clearfield County. As discussed in Section 4.3.3, not only would the collapse of a culvert result in damaged infrastructure, but it would also cause localized flooding. Culverts that are too small to accommodate the increased flow of water during a storm event could also cause flooding and may be more susceptible to collapse. The location of culverts throughout the county can be seen in *Figure 48 - Culvert and Bridge Crossing Locations in Clearfield County*.

4.3.17.2 Range of Magnitude

There are different effects of a collapse, depending on the type and cause of the collapse and the type of structure that collapses. A building collapsing in on itself will likely result in a debris field which is dense but has a small footprint. However, if a building collapses in an outward direction, the debris field will be more widely scattered (University of Michigan, 2011). Both of these types of collapses can cause injury to and endanger the lives of those inside or near to the structure and can result in damages to nearby property, especially if the collapse causes a large amount of debris near a populated area. Though occupied buildings are less likely to collapse since they are generally maintained, more risk of death or injury would be likely with the sudden collapse of an occupied building.

Disrepair can critically affect the integrity of the bridge structure. The level of disrepair depends on how much of the structure is damaged and how critical that portion of the structure is to the safety of drivers. Some structures only need deck replacement or a new superstructure, while others have substructure problems and should be entirely replaced.

A worst-case scenario for a bridge or culvert structure collapse is for a high traffic bridge to collapse during rush hour causing many deaths and injuries. A worst-case scenario for a building collapse would be for an occupied building to collapse in a dense population area causing injuries and possible death to those in the building as well as those around it.

4.3.17.3 Past Occurrence

In 2020, there was an estimated total of 81,000 drug-related overdose deaths in the United States. Although no specific incidents of bridge, culvert, or structure collapse were identified during the HMP Update, attendees of various Local Planning Team meetings throughout the update process noted that residential properties in the county are collapsing or being declared unlivable.

4.3.17.4 Future Occurrence

Structures and buildings can collapse due to deterioration of bridge-critical load bearing and structural integrity, but external occurrences can also impact bridges and buildings. With the third-largest number of bridges in the nation, the American Road and Transportation Builders Association (ARTBA, 2019) says Pennsylvania also has the second-largest number of bridges classified as in poor condition (identified as structurally deficient in the 2017 HMP).

Consequently, the entire state has seen an increased focus on prevention of structure collapse. The 3,770 bridges listed in poor condition were down in 2019 from the 4,969 structurally deficient bridges ARTBA found in its 2014 report. And the state identified 11,758 bridges in need of repairs in 2019, down from 13,298 in need of repairs in 2014. Additionally, within Clearfield County, there are 456 bridges, 74 of which (down from 104 in the 2017 HMP) are classified as in poor condition (PennDOT, 2021). Clearfield County will continue to face deteriorating structures in the future if all of these bridge deficiencies are not addressed.

There is a growing risk associated with aging culverts throughout the county. The Clearfield County Conservation District has been surveying culverts throughout the county, particularly with respect to their impacts on wildlife. However, while in the field, Conservation District staff has noticed that many culverts are in need of repair and feature issues such as rusting and collapsing pipes, perched outlets, and crumbling rock walls. *Figure 47 - Collapsing Culvert Rock Wall in Clearfield County*, taken by a Clearfield County Conservation District employee, depicts a culvert in need of repair. There have not been many notable issues with building structural integrity in Clearfield County, but without proper maintenance and code enforcement, this risk can grow. The future occurrence of building and structure collapse can be considered possible.

4.3.17.5 Vulnerability Assessment

The most vulnerable areas of the county are those with the highest concentration of deteriorating structures. Structures can either collapse into themselves or in an outward direction depending on the cause of the collapse. Construction activities, earthquakes, and subsidence can lead to a structure collapsing in on itself. Weather related hazards, including snowfall and wind, and terrorism can cause a building to collapse in an outward direction (University of Michigan, 2011). Since the HMPC determined that Clearfield County was not at great risk to earthquakes or terrorism, the greatest risk for collapse is from subsidence and land failure, as well as the cascading effects on structures, especially those with lower pre-existing structural integrity, by construction activities, from heavy snowfall during winter storms, from an imbalance of water forces on either side of a structural wall, and from high winds during storms.

In Clearfield County, the majority of bridges – over 80% are owned and maintained by the state; the rest are owned and maintained by the county or local municipalities. PennDOT defines the following bridge terminology for the operational status of bridges:

- Open – bridge is open to the traveling public;
- Closed – bridge is closed to vehicular traffic (barriers and signs put in place); pedestrian traffic may or may not be allowed;
- Posted – bridge is open, but signs have been placed stating a weight limit of any vehicle that may travel across the bridge;
- Temp – bridge has temporary supports and/or restrictions in place; and
- U/CON – bridge is closed due to construction.

Additionally, PennDOT defines poor condition as an indication of the bridge's overall status in terms of structural soundness and ability to service the traveling public. If a bridge is marked as in poor condition, that indicates that the bridge has deterioration to one or more of its major components (PennDOT, 2018). Bridge inspections are rated by a numbering system and a rating of 4 or below indicates a bridge is in poor condition:

- 9 = Excellent;
- 8 = Very good;
- 7 = Good, some minor problems noted;
- 6 = Satisfactory, structural elements showing minor deterioration;
- 5 = Fair, primary structural elements are sound but showing minor cracks and signs of deterioration;
- 4 = Poor, deterioration of primary structural elements has advanced;
- 3 = Serious, deterioration has seriously affected the primary structural components;
- 2 = Critical, deterioration of primary structural components has advanced and bridge will be closely monitored, or closed, until corrective action can be taken;

- 1 = Imminent failure, major deterioration in critical structural components; bridge is closed but corrective action may put the bridge back into light service; and
- 0 = Failed, bridge is out of service and beyond corrective action.

Table 70 - Snapshot of Bridge Structure Deterioration in Clearfield County shows the numbers and conditions of bridges owned by the state, county, and local municipalities. Countywide, over 16 percent of the bridges are considered to be in poor condition. Poor-condition bridges are often still safe for vehicles to cross but will need work in the near future.

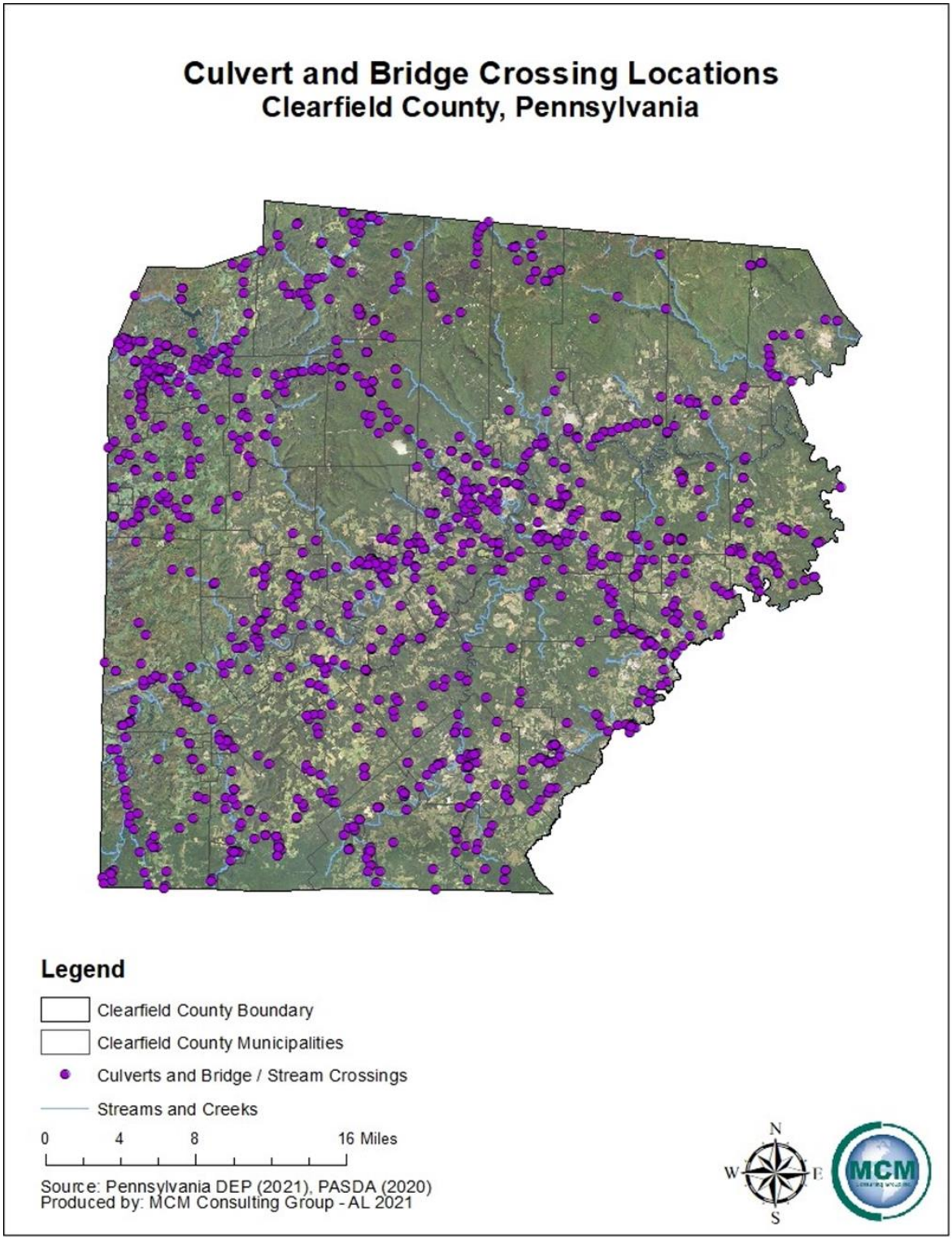
Table 70 - Snapshot of Bridge Structure Deterioration in Clearfield County

Owner	Total Structures	Good Condition	Fair Condition	Poor Condition
State Owned	385	136	207	42
County and Locally Owned	71	11	28	32
Total:	**456**	**104**	**235**	**74**
Source: PennDOT, 2021				

More information on these bridges may be found on PennDOT's interactive map here: https://gis.penndot.gov/paprojects/BridgeConditionsMap.aspx.

Figure 47 - Collapsing Culvert Rock Wall in Clearfield County

Figure 48 - Culvert and Bridge Crossing Locations in Clearfield County



4.3.18. Terrorism and Cyber Terrorism

4.3.18.1 Location and Extent

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

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

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

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 hospitals and health care facilities, schools, childcare centers, fire stations, police departments, municipal buildings, and hazardous waste facilities. In addition to critical facilities, the county contains at risk populations that should be factored into a vulnerability assessment. These populations include not only the residents and workforce in the county, but also the tourists that visit the area on a daily basis, those that are traveling through the county on any major highway and marginalized groups such as LGBTQ persons and racial minorities.

Potential targets include:

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

4.3.18.2 Range of Magnitude

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

Terrorist methods can take many forms including:

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

Active assailant incidents and threats can disrupt the learning atmosphere in schools, interfere with worship services, cause traffic to be re-routed, and use taxpayer assets from deploying police, EMS and/or fire units. Clearfield County has six school districts (public schools K through 12th grade) that include Clearfield Area School District, Curwensville Area School District, DuBois Area School District, Harmony Area School District, Moshannon Valley School

District, West Branch Area School District, several private schools, and the following institutions of higher learning: Penn State-DuBois; Clearfield County Career and Technology Center; and DuBois Business College.

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

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

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

4.3.18.3 Past Occurrence

Terrorism

There have been no physical terrorist attacks in Clearfield County, to date.

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

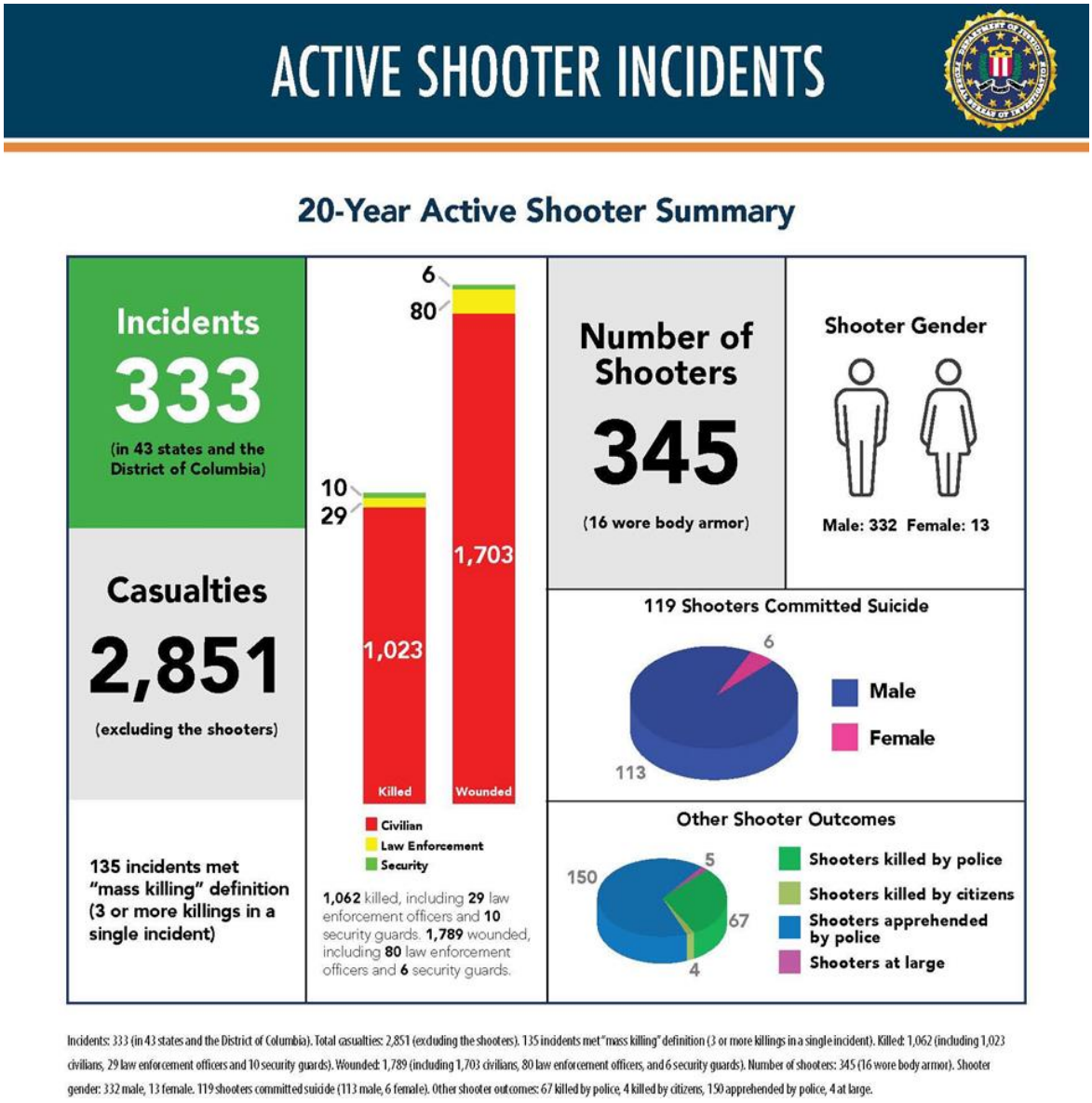
While the largest scale terrorist incidents have often had international stimuli, many other incidents are caused by home grown actors who may have become radicalized through hat groups either in real life or via the internet, and who may struggle with mental health issues. Hate groups such as the Ku Klux Klan (KKK), Aryan Nation, and more recently, the Alt-Right, Antifa, Proud Boys, plus conspiracy theorist believers/promoters such as QAnon, have been part of domestic terrorism in different forms. Supporters of former President Donald Trump from one or more of these groups stormed the United States Capitol on January 6, 2021, to disrupt the certification of the 2020 presidential election, resulting in five deaths and evacuation of Congress.

Active Shooters

An active assailant (shooter), as defined by the U.S. Department of Homeland Security, is an individual actively engaged in killing or attempting to kill people in a confined area, in most cases, active shooters use firearms and there is not necessarily a pattern or method to their selection of victims. Throughout the year in 2020, there were a total of twenty-eight mass shooting incidents in the United States according to the FBI. Often these shooters are HVEs. Two significant events have occurred in Pennsylvania in recent history: one occurred on October 27, 2018, where eleven people were killed by a gunman in the Pittsburgh neighborhood of Squirrel Hill; the gunman was a homegrown violent extremist and attacked the congregation of the Tree of Life Synagogue in a shooting that targeted the Jewish population and was fueled by the gunman's anti-Semitic, anti-immigrant, and anti-refugee sentiments. Another event occurred in January of 2019, where a gunman killed two people and permanently injured one inside P.J. Harrigan's bar in State College and later killed a homeowner and himself.

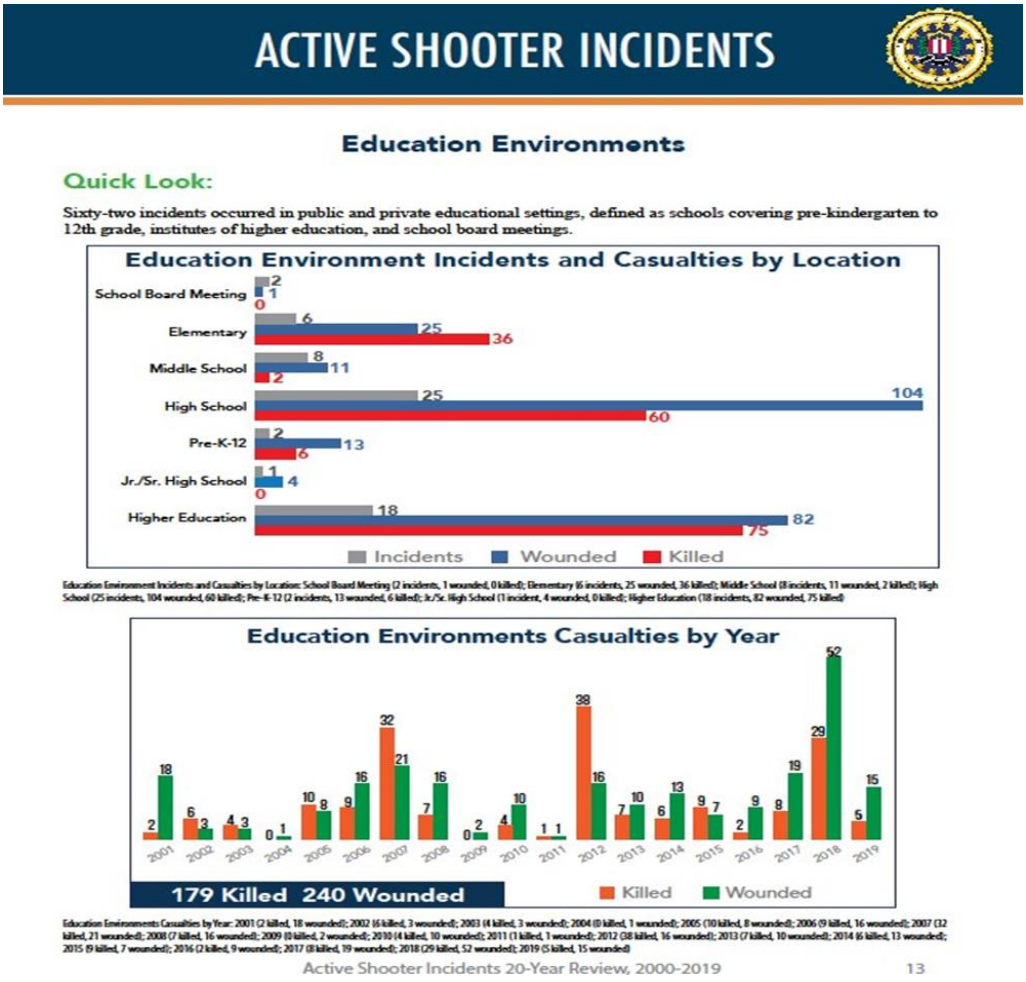
Other active shooter events in the United States in recent years include Virginia Tech (April 2007), Sandy Hook Elementary School (December 2012), San Bernardino, California (December 2015), an Aurora, Colorado movie theater (July 2012) a church in Charleston, South Carolina (June 2015). An Active Shooter Incidents 20-Year Review by the FBI concluded that there has been a significant recent increase in frequency of active shooter incidents, and that the vast majority of shooters were male. The report documents data from all the incidents, including location: commercial environments; educational environments; open spaces; military and other government properties; residential locations; houses of worship; and health care facilities (FBI, 2021). *Figure 49 – Active Shooter Incidents – 20 Year Active Shooter Summary* is one page from the report that illustrates a numerical breakdown of shooting events for those 20 years. *Figure 50 – Education Environments* shows two more summary pages from the report that detail active shooter statistics in educational environments.

Figure 49 - Active Shooter Incidents - 20 Year Active Shooter Summary (FBI, 2021)



Incidents: 333 (in 43 states and the District of Columbia). Total casualties: 2,851 (excluding the shooters). 135 incidents met "mass killing" definition (3 or more killings in a single incident). Killed: 1,062 (including 1,023 civilians, 29 law enforcement officers and 10 security guards). Wounded: 1,789 (including 1,703 civilians, 80 law enforcement officers, and 6 security guards). Number of shooters: 345 (16 wore body armor). Shooter gender: 332 male, 13 female. 119 shooters committed suicide (113 male, 6 female). Other shooter outcomes: 67 killed by police, 4 killed by citizens, 150 apprehended by police, 4 at large.

Figure 50 - Education Environments



The complete report may be found here:

https://www.fbi.gov/file-repository/active-shooter- incidents-20-year-review-2000-2019-060121.pdf/view.

Cyber-Threats

On January 9, 2021, Clearfield County was the target of a cybercriminal attack, and its computer network was infected with ransomware. An unauthorized party obtained access to county servers in late October 2020 and on January 25, 2021, the county received confirmation that the cybercriminals had accessed certain files that were stored within the county's computer environment and contained personal information. On February 12, 2021, the forensic investigation confirmed that some of the personal information stored on the county's network was made available on the cybercriminal's website.

The incident required the county to conduct a thorough and lengthy review of the potentially impacted data in order to determine who, and what information, was involved. In addition to launching an internal investigation into the incident, the county launched a review of its existing policies and procedures and will implement additional safeguards to protect data, as needed.

The attack followed by a year a similar breach in the City of DuBois' computer systems. The hackers requested 10 bitcoins as ransom for returning the city's data; the ransom was not paid, and systems were eventually returned to normal operations – with more security.

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

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

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

4.3.18.4 Future Occurrence

The likelihood of Clearfield County being a primary target for a major international terrorist attack is small and unlikely. More likely terrorist activity in Clearfield County includes bomb threats or other incidents at schools. Clearfield County has six school districts consisting of sixteen public schools. Several private schools and colleges/universities are also located in Clearfield County.

4.3.18.5 Vulnerability Assessment

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

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

Acronis, a global technology company that develops on-premises and cloud software for backup, disaster recovery, and secure file sync and share and data access, issues an annual threat scape report on cybercrime. Entitled *The Acronis Cyberthreats Report*, it contains an in- depth review of the current threat landscape and projections for the coming year. Based on the protection and security challenges that were amplified by the shift to remote work during the COVID-19 pandemic, Acronis warns 2021 will bring aggressive cybercrime activities as criminals pivot their attacks from data encryption to data exfiltration and "will be the year of extortion."

The major points illustrated in the report are as follows:

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

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

The probability of terrorist activity is more difficult to quantify than some other hazards. Instead of considering the likelihood of occurrence, vulnerability is assessed in terms of specific assets. By identifying potentially at-risk terrorist targets in communities, planning efforts can be put in place to reduce the risk of attack. Planning should work towards identifying potentially at-risk

critical infrastructure and functional needs facilities in the community, prioritizing those assets and locations, and identifying their vulnerabilities relative to known potential threats.

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

Clearfield County's IT Director worked around the clock in response to the January 2021 cyber incident, and the county asked for the public's patience as business continuity measures were implemented. Clearfield County hired Appalachia Tech to do an extensive review on all of the county's systems, which is charged with providing the county recommendations on how certain aspects of IT security can be improved. One part of the recovery process, said the company, is training employees on safe computer practices.

4.3.19. Transportation Accidents

4.3.19.1 Location and Extent

Transportation accidents are defined as accidents involving highway, air, and rail travel. These incidents are collectively the costliest of all hazards in the Commonwealth in terms of lives lost, injuries, and economic losses. The sheer amount of roadway couples with the high volume of traffic creates the potential for serious accidents along the roads and bridges. In Clearfield County along there are over 1,900 miles of roads and 454 bridges. There are 104 bridges that are classified as structurally deficient by PennDOT. Major transportation routes in Clearfield County include I-80, US Route 322, US Route 119, and US Route 219. Routes 119 and 219 run north-south through the county, while Route 322 runs east-east through the county. State routes are also present in the county including these majors routes of State Route 36, State Route 53, State Route 153, State Route 255, State Route 879, and State Route 970. *Figure 51 – Major Transportation Routes* shows the major transportation systems in Clearfield County.

Clearfield County has two airports located within, the DuBois Regional Airport and the Clearfield-Lawrence Township Airport. Both of these airports offer commercial and general aviation services. The DuBois Regional Airport is located off of exit 90 on Interstate 80 with access to State Route 830. They offer flights through Silver Airways to Johnstown and Washington Dulles International Airports. DuBois Regional Airport has a Foreign Trade Zone (FTZ). The FTZ gives the airport an advantage in duty exemption, duty deferral, inverted tariff, and logistics benefit. The DuBois Regional Airport services Clearfield County but is located in Jefferson County. There are major air traffic routes for the northern portion of the country that passes over Clearfield County as well. There exists a potential extent for air transportation accidents to occur due to the number of commercial air traffic that flyovers the county every day. However, a five- mile radius around each airport can be considered a high-risk area since most aviation incidents occur near take-off and landing sites as displayed in *Figure 52 – Airports and Vulnerability Zones*.

There is about 200 miles of railroad track in Clearfield County. There are two railroad companies that operate within Clearfield County, including the Buffalo and Pittsburgh Railroad (BPRR) and R.J. Corman Railroad/Pennsylvania Lines (RJCP). BPRR is a 368-mile regional freight railroad company that is owned and operated by Genesee & Wyoming, Inc. (G&W). RJCP is a short-line railroad company that has an office in Clearfield, PA and has rail on site. RJCP is located from the northeast to southeast and the BPRR is located in the northwest. With the ability of these two railroads for interchanging with other companies, goods can be transported virtually anywhere via rail from Clearfield County. Rail transportation accidents are generally classified as one of the three types:

- Derailment – an accident on a railway in which a train leaves the rails

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

Rail transportations is divided into two major categories: freight and passenger. Each category can be subdivided according to carrier type: major carrier and local/regional carriers. Rail accidents can occur anywhere along the 200 miles of rail located in Clearfield County.

4.3.19.2 Range of Magnitude

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

Railway and roadway accidents in particular have the potential to result in hazardous materials release. Railroad accidents occur with less frequency than highway accidents. However, when these types of incidents occur, they often cause extensive property damage and have the potential to cause serious injuries or deaths. Aviation incidents most often occur near landing or take-off sites; a five-mile radius around each airport in Clearfield County is considered high-risk areas.

The worst-case scenario for a transportation accident impacting the county would be a road accident which results in a hazardous material spill in DuBois City, which is a densely populated area. Such an event would constitute an immediate health hazard to the population and require evacuation.

4.3.19.3 Past Occurrence

Vehicle crashes continues to be a risk throughout Clearfield County. The most serious transportation concerns in Clearfield County involve I-80. *Table 71 – Transportation Accidents in Clearfield County* depicts accidents that were reported to the Clearfield County 9-1-1 as they were entered into the Clearfield County Knowledge Center™ database between the span of five years of 2016 to May 2021. Minor railway and aircraft accidents have resulted in a number of deaths throughout the county. However, there has never been any major past occurrences in Clearfield County like there was in Somerset County with Flight 93 during the September 11th attacks. Lawrence County has had the most road closures within the county.

Table 71 - Transportation Accidents in Clearfield County

Transportation Accidents in Clearfield County		
Date	**Location**	**Description**
01/09/2016	Lawrence Township	Road Closure of I-80 West
02/09/2016	Newburg Borough	Vehicle Accident
02/14/2016	Brady Township	Vehicle Accident
02/24/2016	Bradford Township	I-80 EB Bridge Damage
04/08/2016	Pine Township	Vehicle Accident
04/11/2016	Clearfield County	MVA involving Police Car
04/12/2016	Clearfield County	MVA Involving Fire Police Personnel
04/14/2016	DuBois City	Vehicle Accident
05/08/2016	Lawrence Township	Tractor Trailer Accident with Road Closure
05/09/2016	Clearfield County	Vehicle Accident
06/29/2016	Bradford Township	Vehicle Crash
07/07/2016	Clearfield County	Vehicle into a Lake
07/13/2016	Sandy Township	Police Involved MVA with Road Closure
07/25/2016	Clearfield County	Tractor Trailer Rollover One Lane Blocked
07/26/2016	Clearfield County	MVA with Fatality
07/31/2016	Clearfield County	Vehicle Accident
08/03/2016	Clearfield Borough	Water Main Break with Road Closure
08/08/2016	Clearfield County	Tractor Trailer Roll Over with Injury
08/26/2016	Union Township	Vehicle Accident
09/27/2016	Graham Township	Vehicle Accident
09/28/2016	Sandy Township	Vehicle Accident
10/02/2016	Clearfield County	Road closure with MVA both WB and EB
10/20/2016	Lawrence Township	Jackknifed Tractor Trailer I-80 West with Road Closure
10/28/2016	Clearfield County	Road Closure
11/08/2016	Cooper Township	Vehicle Accident
12/02/2016	Clearfield County	Tractor Trailer Rollover I-80 East at MM 103.5 with Fuel Spill
12/29/2016	Clearfield County	MVA Vehicle Rollover
01/17/2017	Clearfield County	Traffic Accident
01/19/2017	Clearfield County	Vehicle into a House with Gas Leak
01/30/2017	Union Township	Vehicle Accident with Road Closure
01/31/2017	Cooper Township	Vehicle Accident
02/08/2017	Clearfield County	Vehicle Accident with Injury and Highway

Transportation Accidents in Clearfield County		
Date	**Location**	**Description**
		Closure
02/09/2017	Clearfield County	SR 879 Northbound Closed
02/09/2017	Clearfield County	I-80 EB and WB Closed at MM 120
02/09/2017	Clearfield County	Road Closure
03/16/2017	Lawrence Township	MVA I-80 Fuel Spill and Road Closed
05/10/2017	Cooper Township	MVA
05/11/2017	Clearfield County	50 Gallon Fuel Spill on I-80 East
06/04/2017	Clearfield County	Vehicle Crash
06/14/2017	Clearfield County	MVA with Road Closure
07/06/2017	Penn Township	Vehicle Accident
07/18/2017	Pine Township	MVA with Entrapment and I-80 Road Closure
08/10/2017	Graham Township	Vehicle Accident
09/22/2017	Sandy Township	Vehicle Accident
09/30/2017	Bradford Township	Vehicle Accident
10/14/2017	Bradford Township	MVA with Road Closure
10/23/2017	Huston Township	Vehicle Accident
10/23/2017	Clearfield County	Motor Vehicle Accident
10/27/2017	Decatur Township	Vehicle Accident
11/13/2017	Clearfield County	MVA with Entrapment and I-80 East Road Closure
11/20/2017	Lawrence Township	Vehicle Accident
11/29/2017	Sandy Township	Vehicle Accident
12/13/2017	Union Township	Road Closure
12/14/2017	Sandy Township	Road Closure
12/25/2017	Bradford Township	PennDOT Truck Crash
03/07/2018	Brady Township	MVA with Entrapment
03/11/2018	Clearfield County	Vehicle Pursuit
03/12/2018	Clearfield County	Road Closure to Tractor Trailers
03/13/2018	Morris Township	Barricaded Subject with Road Closure
04/04/2018	Clearfield Borough	Road Closure
04/04/2018	Pine Township	I-80 WB Closed from MM 101 to MM 120
04/04/2018	Union Township	Vehicle Accident
04/26/2018	Cooper Township	Vehicle Accident
04/26/2018	Beccaria Township	Aircraft Incident
06/08/2018	Clearfield County	Vehicle Accident with Road Closure

Transportation Accidents in Clearfield County		
Date	**Location**	**Description**
06/27/2018	Lawrence Township	MVA with Hazmat and Road Closure
07/02/2018	Clearfield County	Motor Vehicle Accident on Interstate
07/08/2018	Clearfield County	Ambulance Accident with No Injuries
07/11/2018	Lawrence Township	MVA SR879 with Road Closure
07/12/2018	DuBois City	MVA with Road Closure SR 219 NB
07/16/2018	Clearfield County	Closure of I-80 WB at MM 106
07/17/2018	Cooper Township	Vehicle Fire with Road Closure MM 137.5 I-80
07/18/2018	Sandy Township	Road Closure with Vehicle Accident
08/23/2018	Lawrence Township	Vehicle Accident
10/14/2018	Pike Township	Motorcycle Accident with Road Closure
10/20/2018	Penn Township	Road Closure
10/23/2018	Huston Township	Vehicle Accident
10/27/2018	Pine Township	Vehicle Accident
10/27/2018	Sandy Township	Vehicle Accident Double Fatality
10/27/2018	Sandy Township	Road Closure
11/10/2018	Bradford Township	Road Closure
11/10/2018	Lawrence Township	Vehicle Accident
11/10/2018	Union Township	Vehicle Accident with Entrapment
11/15/2018	Lawrence Township	Vehicle Accident with Fuel Spill
11/15/2018	Pine Township	Road Closure
11/24/2018	Graham Township	No Injury Accident with Road Closure
12/23/2018	Clearfield County	Motor Vehicle Accident – Multiple PTS
12/23/2018	Sandy Township	Tractor Trailer Crash
12/29/2018	Clearfield County	MVA Fatal
01/03/2019	Bradford Township	Vehicle Accident
01/18/2019	Clearfield County	Crash – Two Tractor Trailers
01/27/2019	Bradford Township	PennDOT Truck in a Minor Crash
01/29/2019	Clearfield County	I-80 Closed MVA 108 East
02/12/2019	Bradford Township	Road Closure
03/04/2019	Huston Township	School Bus Accident
03/17/2019	Clearfield County	Accident with Fatality and Road Closure
03/19/2019	Clearfield County	Tractor Trailer Crash
04/01/2019	Pine Township	MVA with Road Closure I-80
04/09/2019	Lawrence Township	MVA 119 I-80 WB – Road Closure
04/11/2019	Clearfield County	Traffic Accident Involving School Bus

Transportation Accidents in Clearfield County		
Date	**Location**	**Description**
04/19/2019	Sandy Township	Road Closure
05/06/2019	Bradford Township	Tractor Trailer Overturned
05/11/2019	Clearfield County	Police Pursuit with MVA
06/21/2019	Bradford Township	Road Closure
07/16/2019	Sandy Township	Tractor Trailer Rollover with Entrapment
07/30/2019	Lawrence Township	MVA Vehicle into Structure
09/26/2019	Beccaria Township	Fatal MVA with Oil Spill
10/01/2019	Decatur Township	Road Closure (Route 322)
10/09/2019	DuBois City	MVA
10/26/2019	Pine Township	Road Closure I-80 West
11/12/2019	Clearfield County	MVA with Road Closure
11/21/2019	Clearfield County	School Bus Accident
12/17/2019	Decatur Township	Road Closure (US-322)
01/01/2020	Clearfield County	Motor Vehicle Accident with Road Closure
01/18/2020	Clearfield County	MVA Involving Ambulance
02/02/2020	Clearfield County	Tractor Trailer Accident with Fuel Spill
02/02/2020	Huston Township	MVA with Road Closure
02/07/2020	Pine Township	Vehicle Accident I-80 MM 113
02/13/2020	Sandy Township	Vehicle Accident
02/13/2020	Clearfield County	Multiple Vehicle Accidents with I-80 Road Closure
02/16/2020	Pine Township	Vehicle Accident with Fire and Road Closure
02/29/2020	Clearfield County	Multiple Vehicle Accident
02/29/2020	Pine Township	Motor Vehicle Accident
03/07/2020	Clearfield County	Motor Vehicle Accident
04/07/2020	Bradford Township	MVA Rollover with Road Closure I-80
04/17/2020	Bradford Township	Road Closure
04/30/2020	Clearfield County	Tractor Trailer Rollover
05/03/2020	Clearfield County	Commercial Vehicle Fire
07/06/2020	Cooper Township	Vehicle Rollover Blocking the Road
07/10/2020	Pine Township	Motor Vehicle Accident with Road Closure
08/18/2020	Lawrence Township	Road Closure
08/19/2020	Cooper Township	Road Closure

Transportation Accidents in Clearfield County		
Date	**Location**	**Description**
09/02/2020	Cooper Township	Vehicle Fire
12/16/2020	Graham Township	Road Closure
12/17/2020	Clearfield County	Snowstorm with Multiple Vehicles
12/20/2020	Pine Township	Road Closure
02/02/2021	Lawrence Township	Road Closure
02/15/2021	Cooper Township	Vehicle Accident/Road Closure
04/01/2021	Lawrence Township	Vehicle Struck a Railroad Bridge
04/02/2021	Clearfield Borough	Road Closure
05/17/2021	Clearfield County	Train Derailment

Table 72 – PennDOT Crash Report for Clearfield County shows crash statistics recorded by the Pennsylvania Department of Transportation between 2010 and 2020. Reports for 2021 were not available at the time of this report. The year 2010 had the most total crashes in Clearfield County while 2020 had the least total cashes. The number of total crashes has declined over the span of ten years between 2010 and 2020 in the county. The year 2013 had the most winter condition related crashes compared to the other years which indicates that weather plays a major contributing factor on crashes experienced in the county. The most train with vehicle crashes occurred in 2011 with a total of two crashes that had happened in the county.

Table 72 - PennDOT Crash Report for Clearfield County

PennDOT Crash Report for Clearfield County								
Year	**Vehicle accidents for Clearfield County**				**Alcohol Related Crashes**	**Winter Condition Crashes**	**Heavy Truck Crashes**	**Train and Trolley with MVA**
	Total	**Fatal Accidents**	**Injury Crashes**	**Pedestrian Fatalities**				
2010	959	24	42	3	10 3	167	95	0
2011	928	11	35	0	82	192	119	2
2012	956	20	35	0	10 1	142	79	0
2013	940	15	40	2	77	245	91	0
2014	840	14	54	0	82	194	101	1
2015	801	20	25	3	54	154	93	0
2016	838	9	45	1	57	141	97	0
2017	821	16	40	2	59	133	97	0
2018	835	18	63	0	52	176	89	0

PennDOT Crash Report for Clearfield County								
Year	Vehicle accidents for Clearfield County				Alcohol Related Crashes	Winter Condition Crashes	Heavy Truck Crashes	Train and Trolley with MVA
	Total	Fatal Accidents	Injury Crashes	Pedestrian Fatalities				
2019	747	10	55	0	57	68	96	0
2020	718	15	48	1	54	112	110	0

4.3.19.4 Future Occurrence

Clearfield County's population has slightly decreased over the last decade so it can be assumed that local traffic has decreased slightly as well. However, with the increasing volume of goods and trucking through the county, transportation accidents will continue to occur routinely. I-180 is the most traveled roadway in Clearfield County, and is also the most traveled by heavy freight vehicles which can often carry hazardous materials. Hazardous material release through transportation accidents is difficult to predict but can be assumed to happen in future events as well. Automobile accidents occur frequently, and typically occur more frequently than a rail or aviation accident. In the case of highway accidents, PennDOT has taken great strides to reduce the number of highway transportation accidents through programs such as the Pennsylvania Highway Safety Corridor. In this program, PennDOT designates sections of highway where traffic citation fines are doubled in the hope that higher fines will deter unsafe diving and reduce accidents. Transportation accidents are impossible to predict accurately; however, areas prone to these hazards can be located, quantified through analysis of historical records, and plotted on countywide and municipal base maps.

4.3.19.5 Vulnerability Assessment

A transportation accident can occur anywhere in Clearfield County. However, severe accidents are more likely to occur on the county's major highways due to the heavier traffic volumes which make highways such as I-80 extremely vulnerable. The vulnerability for accidents on either highway, railway, or aviation, are directly related to the population and traffic density within the county. The vulnerability increases if there are hazardous materials involved. Hazards associated with causing transportation accidents can be natural hazards that affect the environment such as winter storms or heavy rains causing slippery roadways or mud slides; to windstorms or tornadoes that cause high-profile vehicles or train cars to be toppled over. Another major vulnerability asset that occurs in Clearfield County is when traffic is detoured off I-80 because roads in the county are not equipped for the increased traffic volumes coming off of the interstate and this causes potential accidents to occur. Loss of roadway use, and public transportation services would affect commuters, employment, delivery of critical municipal and emergency services, and day-to-day operations within the county.

With highway accidents, there is an added vulnerability that stems from the age and upkeep of bridges throughout the county. Unrepaired deficient bridges may be more likely to break, thus leading to highway transportation damages or deaths. Clearfield County has a percent total of 19.1% to 25% of bridges that are considered to be deficient which increases the vulnerability of transportation accidents of happening.

Studying traffic and potential transportation accident patterns could provide information on vulnerability of specific road segments and nearby populations. Increased understanding of the types of hazardous materials transported through the county will also support mitigation efforts. Maintaining a record of these frequently transported materials can facilitate development of preparatory measures for response to a release. *Figure 53 – Average Daily Traffic on Major Highway Vulnerability* identifies all major highways and railroads within Clearfield County.

Figure 51 - Major Transportation Routes

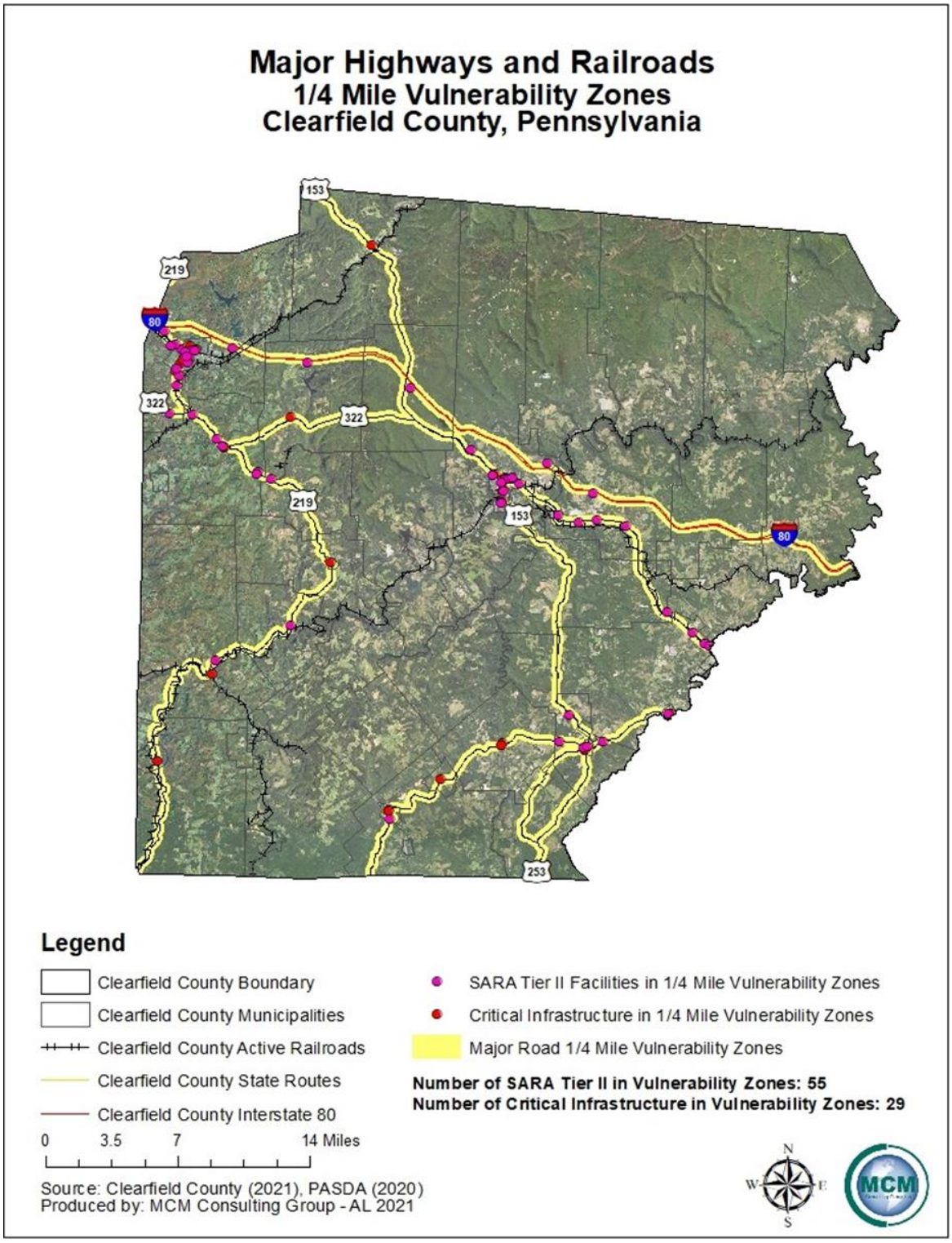


Figure 52 - Airports and Vulnerability Zones

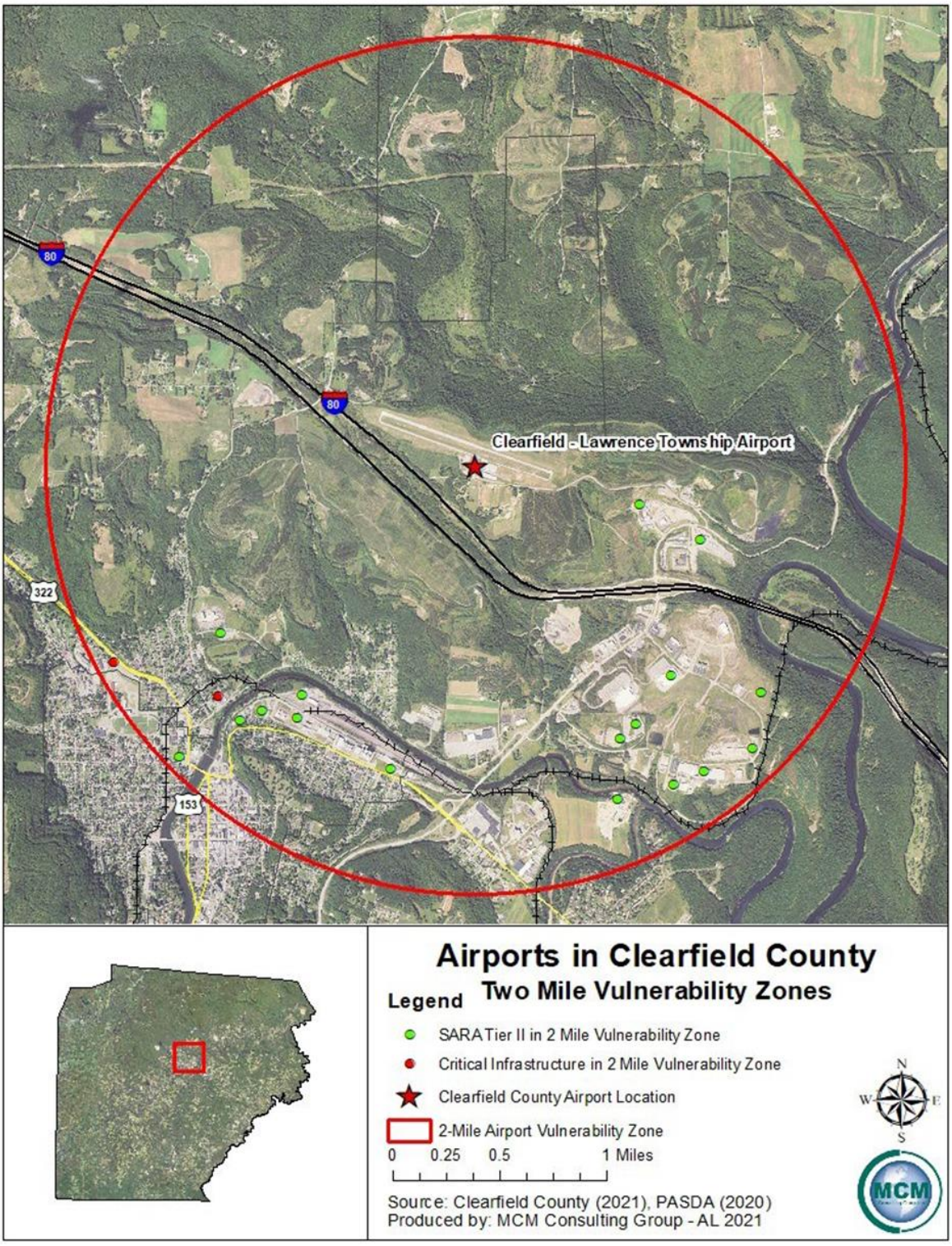
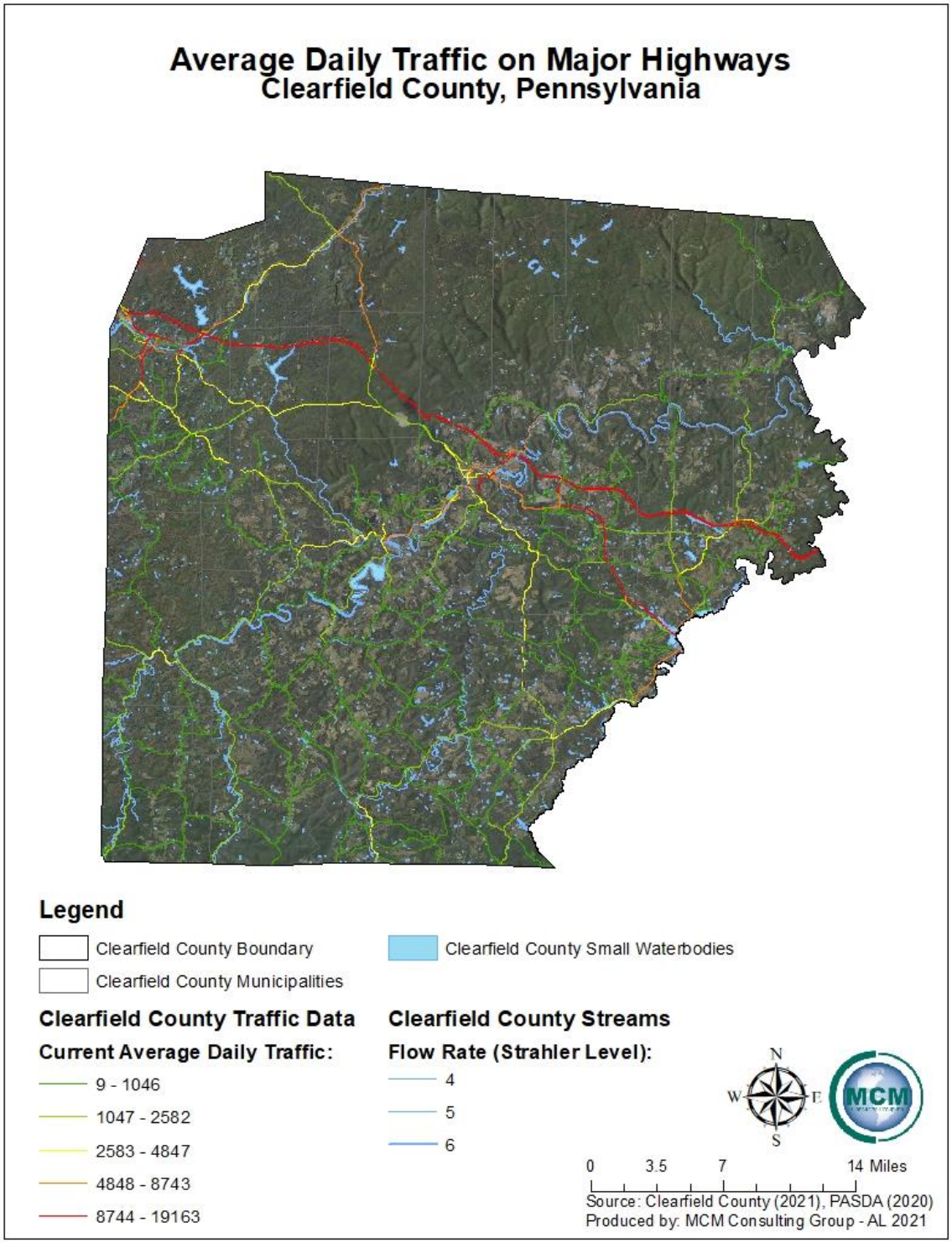


Figure 53 – Average Daily Traffic on Major Highway Vulnerability



4.3.20. Utility Interruption

4.3.20.1 Location and Extent

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

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

The lists of utility providers in Clearfield County is shown in *Table 73 – Clearfield County Utility Providers*.

Table 73 - Clearfield County Utility Providers

Clearfield County Utility Providers	
Utility Type	**Name of Utility Provider**
Electricity	Penelec (First Energy) United Electric Cooperative, Inc.
Telephone/9-1-1/Wireless	Atlantic Broadband AT&T T-Mobile Verizon Viasat
Natural Gas	PGPipeline, LLC UGI Central Pennsylvania

Clearfield County Utility Providers	
Utility Type	**Name of Utility Provider**
Water	Brady Township Water Association Burnside Borough Water System Clearfield Municipal Authority Cooper Township Municipal Authority Dubois Water Department Grampian Pennsylvania Municipal Authority Houtzdale Municipal Authority Huston Township Municipal Authority Irvona Municipal Authority Pennsylvania American Water Pike Township Municipal Authority Union Township Municipal Authority Westover Municipal Authority

4.3.20.2 Range of Magnitude

Utility interruptions do not typically lead to large-scale problems by themselves. Typically, human casualties are not a direct result from outages. Many utility interruptions occur during storms or other severe weather events, and they can have secondary consequences. Some typical secondary effects from a power outage could be a delay in emergency response services from poor communications or a lack of potable drinking water.

Electricity:

Interruptions or power failures could have the following impacts:

- Public safety concerns
- Food spoilage
- Loss of heating or air conditioning
- Basement flooding due to sump pump failure
- Loss of indoor lighting
- Loss of internet service
- Flashing traffic signals
- Stopped and stalled elevators
- Interrupted retail sales

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

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

Fuel:

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

Telecommunications:

Interruptions to telecommunications systems include impacts to the 911 capabilities of a region, telephone, and internet service. The greatest risk in losing this utility to interruption is the risk of an emergency not being able to be reported to a public safety answering point (PSAP). Extensive loss of telephone and internet service can be detrimental to government, businesses, and to residents. With much of the country now dependent on wireless networks, signal interruptions can cause a serious issue for people who are utilizing wireless telecommunications for work. There are also concerns regarding safety and internet security due to an increased number of people working over wireless networks. This interruption can be detrimental for the American workforce.

4.3.20.3 Past Occurrence

Minor utility interruptions occur annually in Clearfield County and occur most often in conjunction with winter weather and/or windstorms. Clearfield County utilizes a database system called CORVENA (formerly Knowledge Center™) to track incidents within the county. *Table 74 – Utility Interruptions in Clearfield County* illustrates the number of interruptions to electric, natural gas, telecommunications, and water services from entries into the database.

Table 74 -Utility Interruptions in Clearfield County

Utility Interruptions in Clearfield County (*CORVENA*)		
Date	**Event Type**	**Municipality**
02/01/2008	Phone Outage	Glen Hope Borough
02/05/2008	Power Outage	Sandy Township

Utility Interruptions in Clearfield County (*CORVENA*)		
Date	**Event Type**	**Municipality**
04/02/2008	Phone Outage	City of Dubois
04/15/2008	Phone Outage	Sandy Township
05/05/2008	Phone Outage	Bigler Township
05/17/2008	Water Main Break	Union Township
06/14/2008	Phone Outage	Clearfield County (entire county)
06/16/2008	Phone Outage	Clearfield County (entire county)
06/21/2008	Water Line Break	Bradford Township
08/11/2008	Phone Outage	Union Township
08/21/2008	Low Water Warning	Girard Township
08/22/2008	Low Water Warning	Jordan Township
08/24/2008	Water Line Break	Curwensville Borough
09/15/2008	Power Outage	City of Dubois
09/15/2008	9-1-1 Phone Outage	Clearfield County (entire county)
10/24/2008	Planned Power Outage	Lawrence Township
12/08/2008	Power Outage	City of Dubois
01/17/2009	9-1-1 Dispatch Outage	Clearfield County (entire county)
02/12/2009	Wireless Phone Outage	Clearfield County (entire county)
04/20/2009	Power Outage	Brady Township
05/12.2009	Planned Power Outage	Lawrence Township
05/13/2009	Planned Power Outage	Coalport Borough
06/11/2009	9-1-1 Phone Outage	Lawrence Township
06/22/2009	Power Outage	Sandy Township
06/27/2009	Phone Outage	Clearfield County (entire county)
07/31/2009	Power Outage	Curwensville Borough
08/01/2009	Boil Water Advisory	Huston Township
10/21/2009	Phone Outage	Ferguson Township
10/28/2009	Wireless Phone Outage	Clearfield County (entire county)
12/22/2009	Heating Loss	Lawrence Township
03/17/2010	Sewage Service Issue	Sandy Township
04/21/2010	Water Outage	City of Dubois
06/14/2010	Gas Leak	Brady Township
07/22/2010	Tower Communication Damage	Pike Township
08/25/2010	Phone Outage	Bigler Township
09/02/2010	Low Water Warning	Goshen Township
09/15/2010	Phone Outage	Bigler Township
11/17/2010	Power Outage	Pine Township
05/17/2011	Power Outage	Lawrence Township

Utility Interruptions in Clearfield County (*CORVENA*)		
Date	**Event Type**	**Municipality**
06/09/2011	9-1-1 Phone Outage	Clearfield County (entire county)
07/27/2011	Power Outage	Lawrence Township
08/19/2011	Wireless Phone Outage	Clearfield County (entire county)
10/04/2011	Contaminated Well	Girard Township
11/29/2011	Power Outage	Clearfield County (entire county)
12/09/2011	Water Main Break	City of Dubois
12/21/2011	Communication Failure	Clearfield County (entire county)
02/08/2012	Gas Line Break	Clearfield Borough
02/25/2012	Gas Leak	City of Dubois
03/16/2012	Utility Pole Fire	Lawrence Township
03/24/2012	Downed Power Line	Brady Township
04/27/2012	Gas Leak	Lawrence Township
06/21/2012	Gas Line Break	Clearfield Borough
07/06/2012	Power Outage	Clearfield Borough
07/17/2012	Power Outage	Pine Township
08/14/2012	Water Line Break	Bradford Township
12/19/2012	Phone Outage	Lawrence Township
12/22/2012	Power Outage	Lawrence Township
01/31/2013	Power Outage	Clearfield County (entire county)
01/31/2013	Phone Outage	Clearfield County (entire county)
04/09/2013	9-1-1 Dispatch Outage	Clearfield County (entire county)
05/29/2013	Gas Leak	Clearfield County (entire county)
07/03/2013	Phone Outage	Clearfield County (entire county)
11/07/2013	Radio Outage	Clearfield County (entire county)
02/28/2014	Power Outage	Decatur Township
04/02/2014	Boil Water Advisory	Clearfield County (entire county)
04/28/2014	Water Line Break	Clearfield County (entire county)
04/28/2014	Boil Water Advisory	Clearfield County (entire county)
02/26/2015	Boil Water Advisory	Boggs Township
11/10/2015	Water Main Break	Clearfield County (entire county)
11/26/2015	Radio Outage	Clearfield County (entire county)
09/07/2016	Boil Water Advisory	Lawrence Township
05/03/2017	Power Outage	Curwensville Borough
05/11/2017	Phone Outage	Clearfield County (entire county)
12/01/2017	Wireless Phone Outage	Clearfield County (entire county)
01/02/2018	Water Main Break	Cooper Township
06/04/2018	Gas Leak	Lawrence Township

Utility Interruptions in Clearfield County (*CORVENA*)		
Date	**Event Type**	**Municipality**
09/05/2018	Gas Leak	Brady Township
02/04/2019	9-1-1 Dispatch Outage	Clearfield County (entire county)
02/17/2019	Water Main Break	Irvona Borough
03/24/2019	Phone Outage	Clearfield County (entire county)
08/05/2019	Power Outage	Clearfield Borough
10/01/2019	9-1-1 Dispatch Outage	Clearfield County (entire county)
05/01/2020	Power Outage	Sandy Township

The Pennsylvania Public Utility Commission tracks the reliability of electric distribution companies (EDC) and outages. *Table 75 – 2018 Winter Storms Riley and Quinn Power Outages by EDC* compares the customers affected by power outage in Pennsylvania during these storm events to statistics from Nika from 2014 and Sandy from 2012. Some of the EDCs were not impacted by Winter Storm Quinn. PP&L customers experienced power outages for a duration of eight days with Winter Storm Quinn and Winter Storm Riley, whereas during Sandy in 2012, the duration was nine days. Nika in 2014 had a duration of just over three days.

Table 75 - 2018 Winter Storm Riley and Quinn Power Outages

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

4.3.20.4 Future Occurrence

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

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

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

4.3.20.5 Vulnerability Assessment

Resources such as electricity, communications, gas, and water supply are critical to ensure the health, safety, and general welfare of the citizenry. *Figure 54 – Clearfield County Utilities* illustrates the approximate locations of service lines and pipelines throughout Clearfield County.

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

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

Electricity:

Severe weather is one of the largest causes of power loss. The electric power grid infrastructure can be damaged by snow, ice, high winds, lightning, flooding, falling tree limbs, and vehicle

accidents involving utility poles. Small animals can also cause minor power outages by climbing along the lines and shorting out the system.

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

Water:

Water distribution can be affected in three ways:

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

Well contamination or water shortages due to drought could pose a high vulnerability to local water distribution.

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

Gas and Liquid Pipelines:

Interruptions to natural gas distribution lines could be affected by:

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

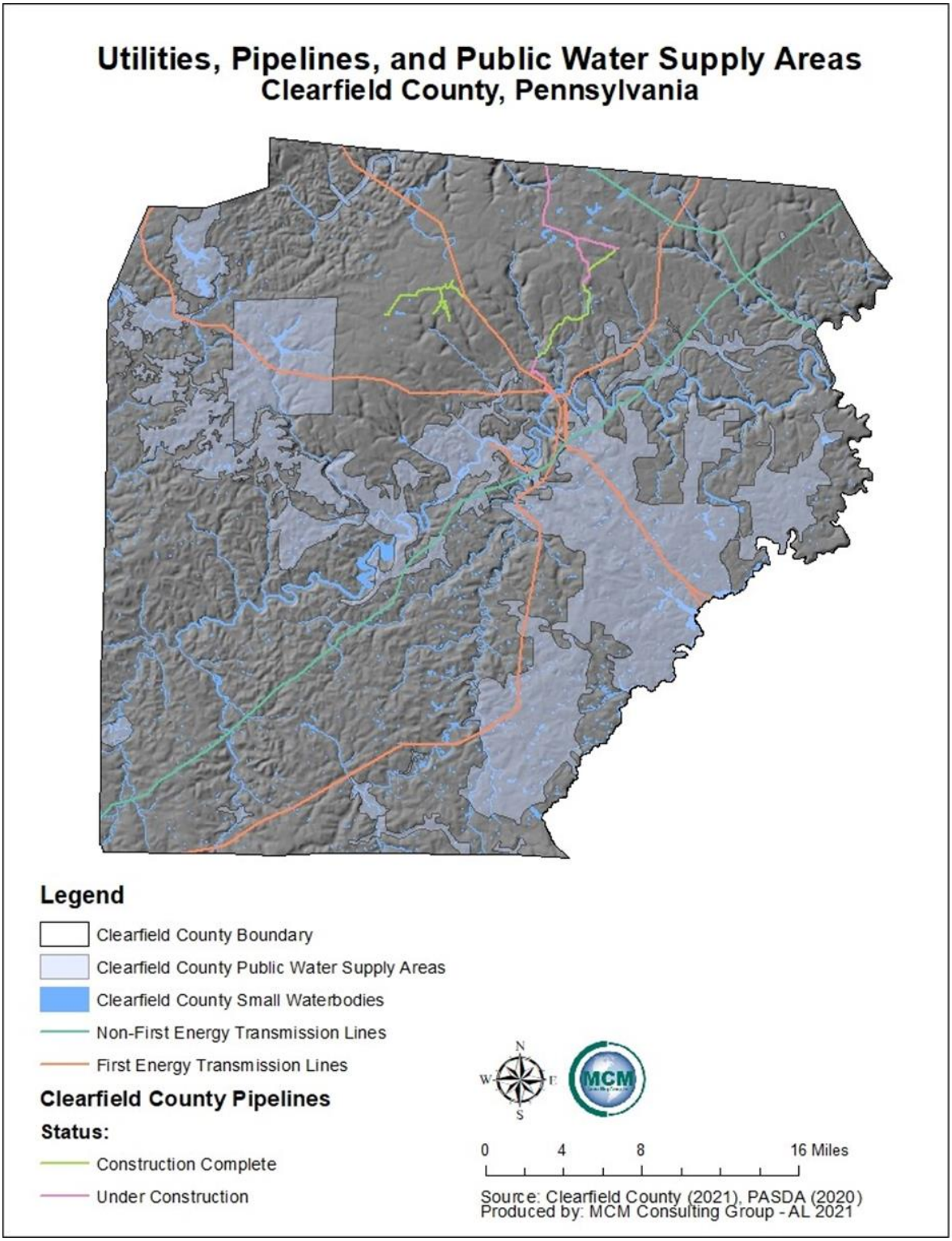
Communications:

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

No data regarding economic impacts from utility interruptions in Clearfield County are available. However, utility interruptions can cause economic impacts stemming from lost income, spoiled

food and other goods, costs to the owners or operators of the utility facilities, and costs to government and community service groups.

Figure 54 - Clearfield County Utilities



4.4. Hazard Vulnerability Summary

4.4.1. Methodology

Ranking hazards helps communities set goals and priorities for mitigation based on their vulnerabilities. A risk factor (RF) is a tool used to measure the degree of risk for identified hazards in a particular planning area. The RF can also assist local community officials in ranking and prioritizing hazards that pose the most significant threat to a planning area based on a variety of factors deemed important by the planning team and other stakeholders involved in the hazard mitigation planning process. The RF system relies mainly on historical data, local knowledge, 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 76 - 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 75 - 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 76 - 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	

Summary of Risk Factor Approach Used to Rank Hazard Risk.				
RISK ASSESSMENT CATEGORY	**DEGREE OF RISK**			**WEIGHT VALUE**
	LEVEL	**CRITERIA**	**INDEX**	
	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	

Summary of Risk Factor Approach Used to Rank Hazard Risk.					
RISK ASSESSMENT CATEGORY	**DEGREE OF RISK**				**WEIGHT VALUE**
	LEVEL	**CRITERIA**		**INDEX**	
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 77 - Risk Factor Assessment* lists the Risk Factor calculated for each of the twenty-five potential hazards identified in the 2022 HMP. Hazards identified as high risk have risk factors greater than 2.5. Risk Factors ranging from 2.0 to 2.4 were deemed moderate risk hazards. Hazards with Risk Factors 1.9 and less are considered low risk.

Table 77 - Risk Factor Assessment

Clearfield County Hazard Ranking Based on RF Methodology.							
HAZARD RISK	**HAZARD NATURAL(N) OR MANMADE(M)**	**RISK ASSESSMENT CATEGORY**					**RISK FACTOR (RF)**
		PROBABILITY	**ECONOMIC IMPACT**	**SPATIAL EXTENT**	**WARNING TIME**	**DURATION**	
HIGH	Environmental Hazards (N)	4	3	4	4	3	3.6
	Flooding (N)	4	3	3	4	4	3.5
	Flash Flooding (N)	4	3	3	4	4	3.5
	Opioid Epidemic (M)	4	3	4	1	4	3.4
	Drought (N)	4	3	4	1	4	3.4
	Windstorm (N)	4	3	3	4	3	3.4

Clearfield County Hazard Ranking Based on RF Methodology.							
HAZARD RISK	HAZARD NATURAL(N) OR MANMADE(M)	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		PROBABILITY	ECONOMIC IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
	Emergency Services (M)	4	3	4	1	4	3.4
	Subsidence, Land Failure (N)	3	3	3	4	4	3.2
	Dam and Levee Failure (M)	2	4	2	4	4	3
	Transportation Accidents (M)	4	3	1	4	2	2.9
	Hurricane, Tropical Storm, Nor' easter (N)	3	3	4	1	2	2.9
	Pandemic (N)	2	3	4	1	4	2.8
	Drowning (M)	4	3	1	4	1	2.8
	Invasive Species (N)	3	2	4	1	4	2.8
	Utility Interruption (M)	4	1	3	4	2	2.7
	Tornado (N)	2	3	2	4	4	2.7
	Cyber Terrorism (M)	2	3	2	3	3	2.6
MODERATE	Winter Storm (N)	4	1	3	1	2	2.4
	Wildfire (N)	4	1	1	4	2	2.3
	Structure Collapse (M)	2	2	2	4	3	2.3
	Terrorism (M)	2	3	1	4	1	2.2
	Earthquake (N)	2	1	3	4	3	2.2
	Ice Jam Flooding (N)	2	2	2	2	3	2.1
LOW	Petroleum and Gas Well Incidents (M)	2	1	1	4	4	1.9
	Radon Exposure (N)	2	1	2	1	4	1.8

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

A risk assessment result for the entire county does not mean that each municipality is at the same amount of risk to each hazard. *Table 78 - Countywide Risk Factor by Hazard* shows the different

municipalities in Clearfield County and whether their risk is greater than (>), less than (<), or equal to (=) the risk factor assigned to the county as a whole. This table was developed by the consultant based on the findings in the hazard profiles located in sections 4.3.1 through 4.3.20.

Table 78 - Countywide Risk Factor by Hazard

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Environmental Hazards (M)	Flooding (N)	Flash Flooding (N)	Opioid Epidemic	Drought (N)	Windstorm (N)	Emergency Services (M)	Subsidence, Land Failures	Dam and Levee Failures
	3.6	**3.5**	**3.5**	**3.4**	**3.4**	**3.4**	**3.4**	**3.2**	**3**
Beccaria Township	=	=	=	=	=	=	=	=	=
Bell Township	=	=	=	=	=	=	=	=	=
Bigler Township	=	=	=	=	=	=	=	=	=
Bloom Township	<	<	<	=	=	=	=	=	<
Boggs Township	=	=	=	=	=	=	=	=	=
Bradford Township	=	=	=	=	=	=	=	=	=
Brady Township	=	<	<	=	=	=	=	=	<
Brisbin Borough	=	=	=	=	=	=	=	=	=
Burnside Borough	=	=	=	=	=	=	=	=	=
Burnside Township	=	=	=	=	=	=	=	=	=
Chest Township	=	=	=	=	=	=	=	=	=
Chester Hill Borough	<	=	=	=	=	=	=	=	=
City of DuBois	>	=	=	<	=	=	>	>	=
Clearfield Borough	=	=	=	>	=	=	=	=	=
Coalport Borough	=	=	=	=	=	=	=	=	=
Cooper Township	=	=	=	=	=	=	=	=	=
Covington Township	=	=	=	=	=	=	=	=	=
Curwensville Borough	=	=	=	=	=	=	=	=	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Environmental Hazards (M)	Flooding (N)	Flash Flooding (N)	Opioid Epidemic	Drought (N)	Windstorm (N)	Emergency Services (M)	Subsidence, Land Failures	Dam and Levee Failures
	3.6	**3.5**	**3.5**	**3.4**	**3.4**	**3.4**	**3.4**	**3.2**	**3**
Decatur Township	=	=	=	=	=	=	=	=	=
Falls Creek Borough	=	=	=	=	=	=	=	=	=
Ferguson Township	<	<	=	<	=	=	=	<	<
Girard Township	=	>	>	>	=	<	=	=	>
Glen Hope Borough	=	=	=	=	=	=	=	=	=
Goshen Township	=	=	=	=	=	=	=	=	=
Graham Township	=	=	=	=	=	=	=	=	=
Grampian Borough	=	=	=	=	=	=	=	=	=
Greenwood Township	=	=	=	=	=	=	=	=	=
Gulich Township	=	=	=	=	=	=	=	=	=
Houtzdale Borough	=	=	=	=	=	=	=	=	=
Huston Township	=	=	=	=	=	=	=	=	=
Irvona Borough	=	=	=	=	=	=	=	=	=
Jordan Township	=	=	=	=	=	=	=	=	<
Karthaus Township	=	=	=	=	=	=	=	=	=
Knox Township	=	=	=	=	=	=	=	=	=
Lawrence Township	=	=	=	=	=	=	=	=	=
Mahaffey Borough	=	=	=	=	=	=	=	=	=
Morris Township	=	=	=	=	=	=	=	=	=
New Washington Borough	=	=	=	=	=	=	=	=	=
Newburg Borough	=	=	=	=	=	=	=	=	=
Osceola Mills Borough	=	=	=	=	=	=	=	=	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Environmental Hazards (M)	Flooding (N)	Flash Flooding (N)	Opioid Epidemic	Drought (N)	Windstorm (N)	Emergency Services (M)	Subsidence, Land Failures	Dam and Levee Failures
	3.6	**3.5**	**3.5**	**3.4**	**3.4**	**3.4**	**3.4**	**3.2**	**3**
Penn Township	=	=	=	=	=	=	=	=	=
Pike Township	=	=	=	=	=	=	=	=	=
Pine Township	=	<	<	=	=	=	=	<	<
Ramey Borough	=	=	=	=	=	=	=	=	=
Sandy Township	>	>	>	>	=	=	>	=	<
Troutville Borough	<	<	=	=	=	=	<	<	<
Union Township	=	=	=	=	=	=	=	=	=
Wallaceton Borough	=	=	=	=	=	=	=	=	=
Westover Borough	=	=	=	=	=	=	=	=	=
Woodward Township	=	=	=	=	=	=	=	=	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk								
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR								
JURISDICTION	Transportation Accidents (M)	Hurricane, Tropical Storm, Nor' easter (N)	Pandemic (N)	Drowning (M)	Invasive Species	Utility Interruption (M)	Tornado (N)	Cyber Terrorism (M)
	2.0	**2.9**	**2.8**	**2.8**	**2.8**	**2.7**	**2.7**	**2.6**
Beccaria Township	=	=	=	=	=	=	=	=
Bell Township	=	=	=	=	=	=	=	=
Bigler Township	=	=	=	=	=	=	=	=
Bloom Township	=	>	=	<	=	=	=	<
Boggs Township	=	=	=	=	=	=	=	=
Bradford Township	=	=	>	=	=	>	=	=
Brady Township	=	=	=	<	=	=	=	=
Brisbin Borough	=	=	=	=	=	=	=	=
Burnside Borough	=	=	=	=	=	=	=	=
Burnside Township	=	=	=	=	=	=	=	=
Chest Township	=	=	=	=	=	=	=	=
Chester Hill Borough	=	=	=	=	=	=	=	=
City of DuBois	>	=	=	>	>	<	=	<
Clearfield Borough	=	=	=	=	=	=	=	=
Coalport Borough	=	=	=	=	=	=	=	=
Cooper Township	=	=	=	=	=	=	=	=
Covington Township	=	=	=	=	=	=	=	=
Curwensville Borough	=	=	=	=	=	=	=	=
Decatur Township	=	=	=	=	=	=	=	=
Falls Creek Borough	=	=	=	=	=	=	=	=
Ferguson Township	<	<	<	<	<	=	=	<
Girard Township	>	=	=	<	<	<	>	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk								
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR								
JURISDICTION	Transportation Accidents (M)	Hurricane, Tropical Storm, Nor' easter (N)	Pandemic (N)	Drowning (M)	Invasive Species	Utility Interruption (M)	Tornado (N)	Cyber Terrorism (M)
	2.0	**2.9**	**2.8**	**2.8**	**2.8**	**2.7**	**2.7**	**2.6**
Glen Hope Borough	=	=	=	=	=	=	=	=
Goshen Township	=	=	=	=	<	<	=	=
Graham Township	=	=	=	=	<	=	=	=
Grampian Borough	=	=	=	=	=	=	=	=
Greenwood Township	=	=	=	=	=	=	=	=
Gulich Township	=	=	=	=	=	=	=	=
Houtzdale Borough	=	=	=	=	=	=	=	=
Houston Township	=	=	=	=	=	=	=	=
Irvona Borough	=	=	=	=	=	=	=	=
Jordan Township	=	=	=	=	=	=	=	=
Karthaus Township	=	=	=	=	=	=	=	=
Knox Township	=	=	=	=	=	=	=	=
Lawrence Township	=	=	=	=	=	=	=	=
Mahaffey Borough	=	=	=	=	=	=	=	=
Morris Township	=	=	=	=	=	=	=	=
New Washington Borough	=	=	=	=	=	=	=	=
Newburg Borough	=	=	=	=	=	=	=	=
Osceola Mills Borough	=	=	=	=	=	=	=	=
Penn Township	=	=	=	=	=	=	=	=
Pike Township	=	=	=	=	=	=	=	=
Pine Township	=	=	>	<	>	=	=	>
Ramey Borough	=	=	=	=	=	=	=	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk								
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR								
JURISDICTION	Transportation Accidents (M)	Hurricane, Tropical Storm, Nor' easter (N)	Pandemic (N)	Drowning (M)	Invasive Species	Utility Interruption (M)	Tornado (N)	Cyber Terrorism (M)
	2.0	**2.9**	**2.8**	**2.8**	**2.8**	**2.7**	**2.7**	**2.6**
Sandy Township	>	=	>	=	>	=	=	>
Troutville Borough	>	=	=	<	>	>	=	<
Union Township	=	=	=	=	=	=	=	=
Wallaceton Borough	=	=	=	=	=	=	=	=
Westover Borough	=	=	=	=	=	=	=	=
Woodward Township	=	=	=	=	=	=	=	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk								
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR								
JURISDICTION	Winter Storm (N)	Wildfire (N)	Structural Collapse (M)	Terrorism (M)	Earthquake (N)	Ice Jam Flooding (M)	Petroleum and Gas Well Incidents (H)	Radon Exposure (N)
	3.6	**3.5**	**3.5**	**3.4**	**3.4**	**3.4**	**3.4**	**3.2**
Beccaria Township	=	=	=	=	=	=	=	=
Bell Township	=	=	=	=	=	=	=	=
Bigler Township	**=**	**=**	**=**	**=**	**=**	**=**	**=**	**=**
Bloom Township	>	=	<	<	=	<	>	>
Boggs Township	=	=	=	=	=	=	=	=
Bradford Township	**>**	**=**	**=**	**=**	**=**	**=**	**>**	**=**
Brady Township	=	=	=	=	=	<	>	=
Brisbin Borough	=	=	=	=	=	=	=	=
Burnside Borough	=	=	=	=	=	=	=	=
Burnside Township	=	=	=	=	=	=	=	=
Chest Township	=	=	=	=	=	=	=	=
Chester Hill Borough	=	>	=	=	=	=	<	=
City of DuBois	**=**	**>**	**<**	**<**	**=**	**>**	**>**	**=**
Clearfield Borough	=	=	>	=	=	=	=	=
Coalport Borough	=	=	=	=	=	=	=	=
Cooper Township	=	=	=	=	=	=	=	=
Covington Township	**=**	**=**	**=**	**=**	**=**	**=**	**=**	**=**
Curwensville Borough	=	=	=	=	=	=	=	=
Decatur Township	=	=	=	=	=	=	=	=
Falls Creek Borough	=	=	=	=	=	=	=	=
Ferguson Township	**=**	**<**	**=**	**<**	**<**	**<**	**<**	**<**
Girard Township	>	>	>	<	=	<	<	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk								
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR								
JURISDICTION	Winter Storm (N)	Wildfire (N)	Structural Collapse (M)	Terrorism (M)	Earthquake (N)	Ice Jam Flooding (M)	Petroleum and Gas Well Incidents (H)	Radon Exposure (N)
	3.6	**3.5**	**3.5**	**3.4**	**3.4**	**3.4**	**3.4**	**3.2**
Glen Hope Borough	=	=	=	=	=	=	=	=
Goshen Township	=	=	=	=	=	=	<	=
Graham Township	=	=	=	=	=	=	<	=
Grampian Borough	=	=	=	=	=	=	=	=
Greenwood Township	=	=	=	=	=	=	=	=
Gulich Township	=	=	=	=	=	=	=	=
Houtzdale Borough	=	=	=	=	=	=	=	=
Huston Township	=	=	=	=	=	=	=	=
Irvona Borough	=	=	=	=	=	=	=	=
Jordan Township	>	=	=	=	=	<	=	=
Karthaus Township	=	=	=	=	=	=	=	=
Knox Township	=	=	=	=	=	=	=	=
Lawrence Township	=	=	=	=	=	=	=	=
Mahaffey Borough	=	=	=	=	=	=	=	=
Morris Township	=	=	=	=	=	=	=	=
New Washington Borough	=	=	=	=	=	=	=	=
Newburg Borough	=	=	=	=	=	=	=	=
Osceola Mills Borough	=	=	=	=	=	=	=	=
Penn Township	=	=	=	=	=	=	=	=
Pike Township	=	=	=	=	=	=	=	=
Pine Township	=	=	=	>	=	>	=	>
Ramey Borough	=	=	=	=	=	=	=	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk								
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR								
JURISDICTION	Winter Storm (N)	Wildfire (N)	Structural Collapse (M)	Terrorism (M)	Earthquake (N)	Ice Jam Flooding (M)	Petroleum and Gas Well Incidents (H)	Radon Exposure (N)
	3.6	**3.5**	**3.5**	**3.4**	**3.4**	**3.4**	**3.4**	**3.2**
Sandy Township	=	>	=	>	=	=	=	=
Troutville Borough	>	<	=	<	=	<	>	=
Union Township	=	=	=	=	=	=	=	=
Wallaceton Borough	=	=	=	=	=	=	=	=
Westover Borough	=	=	=	=	=	=	=	=
Woodward Township	=	=	=	=	=	=	=	=

4.4.3. Potential Loss Estimates

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

Potential loss estimates have four basic components, including:

- Replacement Value: Current cost of returning an asset to its pre-damaged condition, using present-day cost of labor and materials.
- Content Loss: Value of building's contents, typically measured as a percentage of the building replacement value.
- Functional Loss: The value of a building's use or function that would be lost if it were damaged or closed.

- Displacement Cost: The dollar amount required for relocation of the function (business or service) to another structure following a hazard event.

The parcel data used in this plan includes building values provided in the county tax assessment database. These values are representative of replacement value alone; content loss, functional loss, and displacement cost are not included.

Flooding Loss Estimation:

Flooding is a high-risk natural hazard in Clearfield 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 Clearfield County municipality is outlined in section 4.3.4 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 Clearfield County are estimated to equal $59,470,000. Residential occupancies make up 37.65% 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 $444,120,000.

4.4.4. Future Development and Vulnerability

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

Total population in Clearfield County decreased by only 1.32% percent between 2010 and 2020 from 81,642 to 80,562. The population changes can be seen in *Table 79 - 2010-2020 Population Change*. This overall change reflects a decrease in population in all fifty municipalities based on the 2020 population. Most of the municipalities experienced a population decrease with the exception of Brisbin Borough, Covington Township, Curwensville, Ferguson Township, Girard Township, Grampian Borough, Jordan Township, Karthaus Township, Pine Township, Sandy Township, and Woodward Township. The 2020 population for Clearfield County was 80,562

which is 170 fewer than the 2010 census. There was an overall decrease of 1.3% in population based on the estimate.

Table 79 - 2010-2020 Population Change

2010-2020 Population Change				
Municipality	**2010 Population**	**2014 Population**	**2020 Population**	**Percent of Change (2010-2020)**
Beccaria Township	1,782	1,844	1,774	-0.45
Bell Township	760	717	687	-9.60
Bigler Township	1,289	1,181	1,238	-3.96
Bloom Township	414	408	382	-7.73
Boggs Township	1,751	1,533	1,662	-5.08
Bradford Township	3,034	3,030	2,841	-6.36
Brady Township	2,000	2,093	1,936	-3.20
Brisbin Borough	411	333	422	2.68
Burnside Borough	234	258	188	-19.66
Burnside Township	1,076	1,018	1,055	-1.95
Chest Township	515	519	511	-0.78
Chester Hill Borough	883	981	821	-7.02
City of DuBois	6,215	6,143	5,962	-4.07
Clearfield Borough	523	536	425	-18.74
Coalport Borough	2,731	2,699	2,594	-5.02
Cooper Township	526	837	494	-6.08
Covington Township	2,542	2,493	2,567	0.98
Curwensville Borough	4,548	4,651	4,558	0.22
Decatur Township	7,794	7,718	7,510	-3.64
Falls Creek Borough	44	29	42	-4.55
Ferguson Township	444	465	544	22.52
Girard Township	534	525	568	6.37
Glen Hope Borough	142	150	127	-10.56
Goshen Township	435	507	390	-10.34
Graham Township	1,383	1,459	1,331	-3.76
Grampian Borough	356	412	361	1.40
Greenwood Township	372	361	366	-1.61
Gulich Township	1,235	1,181	1,200	-2.83
Houtzdale Borough	797	817	764	-4.14
Huston Township	1,468	1,294	1,260	-14.17
Irvona Borough	647	805	549	-15.15
Jordan Township	461	563	476	3.25
Karthaus Township	811	451	824	1.6

2010-2020 Population Change				
Municipality	**2010 Population**	**2014 Population**	**2020 Population**	**Percent of Change (2010-2020)**
Knox Township	647	494	597	-7.73
Lawrence Township	7,681	7,603	7,500	-2.36
Mahaffey Borough	368	351	329	-10.6
Morris Township	2,938	2,927	2,777	-5.48
New Washington Borough	59	66	50	-15.25
Newburg Borough	92	127	82	-10.87
Osceola Mills Borough	1,141	1,255	1,045	-8.41
Penn Township	1,264	1,218	1,200	-5.06
Pike Township	2,311	2,277	2,298	-0.56
Pine Township	60	62	60	0
Ramey Borough	451	491	436	-3.33
Sandy Township	10,625	10,640	11,848	11.51
Troutville Borough	243	184	230	-5.35
Union Township	892	857	886	-0.67
Wallaceton Borough	313	336	297	-5.11
Westover Borough	390	377	361	-7.44
Woodward Township	3,992	4,096	4,137	3.63
TOTAL	**81,642**	**81,472**	**80,562**	**-1.32**

Recently, the 2020 census population totals were released for Clearfield County. The 2020 report identified the population in Clearfield County as 80,562. This was a decrease of 170 people, -1.32% since the 2010 census. All estimations since the 2010 census indicate the population in Clearfield County is declining. Burnside Borough experienced the greatest rate of population decline at negative 19.66% growth, closely followed by Clearfield Borough at negative 18.74%, between 2010 and 2020. While the general rate of growth was negative throughout the county, several municipalities witnessed significant population increases. Sandy Township underwent 11.51% growth from a total population increase of 1,223 residents. The most significant rate of increase occurred in Ferguson Township which experienced 22.52% population growth from a total of 100 newly registered residents.

The 2019 census estimate indicates that there are approximately 39,357 housing units in Clearfield County, Pennsylvania. Of those, 76.8% of the structures are owner occupied-housing units. The low county-wide population changes indicate a limited alteration to overall hazard vulnerability. However, certain municipalities, such as Sandy Township and Ferguson Township, experienced significant resident increases and, thus, may be more vulnerable to certain hazards due to

development and residential growth. Although new development is vulnerable to all hazards identified in section 4.3 of this hazard mitigation plan update, increase in vulnerability to transportation accidents, flash flooding and other natural and human caused hazards could potentially occur at any time. The Clearfield County Hazard Mitigation Local Planning Team will conduct annual reviews of this plan and the impacts all hazards have on the county and new development every year and within a time frame after a disaster or major emergency. Action 4.2.6 identifies that municipalities will continue to be engaged to identify and incorporate hazard mitigation opportunity forms to include into the hazard mitigation plan during the next five years. Project opportunities will be developed to decrease any vulnerabilities that are identified.

5. Capability Assessment

5.1. Update Process Summary

The capability assessment is an evaluation of Clearfield 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 Clearfield County officials. These meetings were designed to seek input from the key county and municipal stakeholders on legal, fiscal, technical, and administrative capabilities of all jurisdictions. As such, the capabilities assessment helps guide the implementation of mitigation projects and will help evaluate the effectiveness of existing mitigation measures, policies, plans, practices, and programs.

Throughout the planning process, the mitigation local planning team considered the county's fifty 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.

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

Clearfield 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

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

5.2.1. Planning and Regulatory Capability

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

Municipalities regulate land use via the adoption and enforcement of zoning, subdivision, and land development, building codes, building permits, floodplain management and/or stormwater management ordinances. When effectively prepared and administered, these regulations can lead to an opportunity for hazard mitigation. For example, the National Flood Insurance Program (NFIP) established minimum floodplain management criteria. 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 Clearfield County and municipal legal capabilities to mitigate the profiled hazards. It identifies the county and the municipal existing planning documents and their hazard mitigation potential. Hazard mitigation recommendations are, in part, based on the information contained in the assessment.

Building Codes

Building codes are important in mitigation because they are developed for a region of the country in respect to the hazards that exist in that area. Consequently, structures that are built according to applicable codes are inherently resistant to many hazards, such as 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 Pennsylvania Department of Labor and Industry is responsible for all commercial code enforcement in that municipality; and all residential construction is inspected by independent third-party agencies selected by the owner. The department also has sole jurisdiction for all state-owned buildings no matter where they are located. Historical buildings may be exempt from such inspections and Act 45 provides quasi-exclusion from UCC requirements.

The municipalities in Clearfield County adhere to the standards of the Pennsylvania Uniform Code (Act 45). None of the municipalities in Clearfield County have opted-in on building code enforcement, although all municipalities enforce their own code enforcement.

Zoning Ordinance

Article VI of the Municipalities Planning Code (MPC) authorizes municipalities to prepare and enact zoning to regulate land use. Its regulations can apply to the permitted use of land; the height and bulk of structures; the percentage of a lot that may be occupied by buildings and other impervious surfaces; yard setbacks; the density of development; the height and size of signs; 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. All fifty of the municipalities in Clearfield County have their own zoning regulations.

Subdivision Ordinance

Subdivision and land development ordinances include regulations to control the layout of streets, the planning lots and the provision of utilities and other site improvements. The objectives of subdivision and land development ordinance are to: coordinate street patterns; assure adequate utilities and other improvements are provided in a manner that will not pollute streams, wells and/or soils; reduce traffic congestions; 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. All municipalities in Clearfield County utilize some form of land use and land development regulation. Thirty-one of the county's 50 municipalities are covered under the county's subdivision ordinance.

Stormwater Management Plan/Stormwater Ordinance

The proper management of storm water runoff can improve conditions and decrease the chance of flooding. Pennsylvania's Storm Water Management Act (Act 167) confers on counties the responsibility for development of watershed plans. The Act specifies that counties must complete their watershed storm water plans within two years following the promulgation of these guidelines by the Pennsylvania Department of Environmental Protection (PA DEP), which may grant an extension of time for any county for the preparation and adoption of plans. Counties must prepare the watershed plans in consultation with municipalities and residents. This is to be accomplished through the establishment of a watershed plan advisory committee. The counties must also establish a mechanism to periodically review and revise watershed plans, 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 ordinance depends on the extent of existing and projected land development. The watershed storm water management plan is designed to ais the municipality in setting standards for the land uses it has proposed. Municipalities within rapidly developing watersheds will benefit from the watershed storm water management plan and will use the information for sound land use considerations. A major goal of the watershed plan and the attendant municipal regulations is to prevent future drainage problems and avoid the aggravation of existing problems. All municipalities in Clearfield County have adopted the county's stormwater management plan.

Comprehensive Plan

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

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

Clearfield County last updated its comprehensive plan in 2006; the Clearfield County Department of Planning and Community Development has a goal to begin revisions and updates to the plan in 2022.

Article III of the MPC enables municipalities to prepare a comprehensive plan: however, development of a comprehensive plan is voluntary. Nineteen of the 50 municipalities in Clearfield County have adopted their own comprehensive 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. Clearfield County does not have any capital improvement plans in place but there are planned capital improvements in Curwensville and Huston Township through the 2021 Community Development Block Grant (CDBG) Program.

Participation in the National Flood Insurance Program (NFIP)

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

The Pennsylvania Emergency Management Agency (PEMA) was appointed by legislation in September 2021 to coordinate the Commonwealth NFIP and employ the State NFIP Coordinator. For many years prior, these roles were held by the Pennsylvania Department of Community and

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

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

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

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

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

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

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

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

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

Forty-seven of the forty-nine municipalities of Clearfield County have floodplain regulations in place that meet requirements set forth by 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 nineteen boroughs, thirty townships, and one city within Clearfield County. Each of these municipalities conducts it daily operations and provides various community services

according to local needs and limitations. Some of these municipalities have formed cooperative agreements and work jointly with their neighboring municipalities to provide services such as police protection, fire and emergency response, infrastructure maintenance and water supply management. 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 profile hazards. Technical capability relates to an adequacy of knowledge and technical expertise of local government employees or the ability to contract resources for this expertise in order to effectively execute mitigation activities. Common examples of skill sets, and technical personnel needed for hazard mitigation include: planners with knowledge of land development and management practices, engineers or professionals trained in construction practices related to buildings and/or infrastructure (e.g. building inspectors), planners or engineers with an understanding of natural and/or human caused hazards, emergency managers, floodplain managers, land surveyors, scientists familiar with hazards in the community, staff with education of expertise to assess community vulnerability to hazards, personnel skilled in geographic information systems, resource development staff or grant writers, fiscal staff to handle complex grant application processes.

County Department of Planning and Community Development

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

Municipal Engineer

A municipal engineer performs duties as directed in the areas of construction, reconstruction, maintenance and repair of streets, roads, pavements, sanitary sewers, bridges, culverts, and other engineering work. The municipal engineer prepares plans, specifications and estimates of the work undertaken by the township. Two municipalities in Clearfield County employ a municipal engineer on an as-needed basis. The municipalities that employ a municipal engineer are the City of DuBois and Sandy Township.

Personnel Skilled in GIS or FEMA HAZUS Software

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

Emergency Management Coordinator

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

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

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

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

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

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

Federal Agency Assistance

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

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

State Agency Assistance

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

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

Political Capability

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

The capability assessment survey was used to capture information on each jurisdiction's political capability. Survey respondents were asked to identify examples of political capability, such as guiding development away from hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond

minimum state or federal requirements (i.e., building codes, floodplain management ordinances, etc.). These examples were used to guide respondents in scoring their community on a scale of "unwilling" (0) to "very willing" (5) to adopt policies and programs that reduce hazard vulnerabilities. *Table 80 – Clearfield County Community Political Capability* summarizes the results of political capability.

Table 80 - Clearfield County Community Political Capability

Clearfield County Community Political Capability						
Municipality Name	**Capability Ranking**					
	0	**1**	**2**	**3**	**4**	**5**
Beccaria Township						
Bell Township						
Bigler Township					X	
Bloom Township		X				
Boggs Township			X			
Bradford Township						
Brady Township				X		
Brisbin Borough						
Burnside Borough						
Burnside Township						X
Chest Township						
Chester Hill Borough						
City of DuBois				X		
Clearfield Borough				X		
Coalport Township						
Cooper Township						
Covington Township						
Curwensville Borough						
Decatur Township						
Falls Creek Borough						
Ferguson Township						
Girard Township				X		
Glen Hope Borough						
Goshen Township				X		
Graham Township				X		
Grampian Borough		X				
Greenwood Township						
Gulich Township	X					
Houtzdale Borough						

Clearfield County Community Political Capability						
Municipality Name	Capability Ranking					
	0	1	2	3	4	5
Huston Township				X		
Irvona Borough						X
Jordan Township				X		
Karthaus Township				X		
Knox Township				X	X	
Lawrence Township				X		
Mahaffey Borough						
Morris Township						X
New Washington Borough						
Newburg Borough						
Osceola Mills Borough						
Penn Township		X				
Pike Township						
Pine Township					X	
Ramey Borough						X
Sandy Township						
Troutville Borough				X		
Union Township				X		
Wallaceton Borough						
Westover Borough						
Woodward Township					X	

Self-Assessment

In addition to the inventory and analysis of specific local capabilities, the capability assessment survey required each local jurisdiction to conduct its own self-assessment of its capability to effectively implement hazard mitigation activities. As part of this process, county and municipal officials were encouraged to consider the barriers to implementing proposed mitigation strategies in addition to mechanisms that could enhance of further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as wither "L = Limited", "M = Moderate", or "H = High." *Table 81 – Capability Self-Assessment Matrix* summarizes the results of the self-assessment survey. Thirty-one municipalities returned this section of the assessment completed.

Table 81 - Capability Self-Assessment Matrix

Clearfield County Capability Self-Assessment Matrix				
Municipality Name	**Capability Category**			
	Planning and Regulatory Capability	**Administrative and Technical Capability**	**Fiscal Capability**	**Community Political Capability**
Beccaria Township	Not Completed by Municipality			
Bell Township	L	L	L	L
Bigler Township	Not Completed by Municipality			
Bloom Township	L	L	L	L
Boggs Township	L	L	L	L
Bradford Township	M	M	L	L
Brady Township	M	M	M	M
Brisbin Borough	Not Completed by Municipality			
Burnside Borough	Not Completed by Municipality			
Burnside Township	L	M	L	M
Chest Township	Not Completed by Municipality			
Chester Hill Borough	Not Completed by Municipality			
City of DuBois	H	H	H	H
Clearfield Borough	Not Completed by Municipality			
Coalport Borough	Not Completed by Municipality			
Cooper Township	Not Completed by Municipality			
Covington Township	Not Completed by Municipality			
Curwensville Borough	H	M	L	M
Decatur Township	M	M	M	L
Falls Creek Borough	Not Completed by Municipality			
Ferguson Township	Not Completed by Municipality			
Girard Township	L	L	L	L
Glen Hope Borough	L	M	L	M
Goshen Township	L	L	L	L
Graham Township	L	L	L	L
Grampian Borough	L	M	M	L
Greenwood Township	Not Completed by Municipality			
Gulich Township	L	L	L	L
Houtzdale Borough	L	L	L	L
Huston Township	L	L	L	M
Irvona Borough	M	M	M	M
Jordan Township	L	L	L	L

Clearfield County Capability Self-Assessment Matrix				
Municipality Name	Capability Category			
	Planning and Regulatory Capability	Administrative and Technical Capability	Fiscal Capability	Community Political Capability
Karthaus Township	M	M	M	M
Knox Township	Not Completed by Municipality			
Lawrence Township	H	M	M	M
Mahaffey Borough	L	L	L	L
Morris Township	L	L	L	L
New Washington Borough	Not Completed by Municipality			
Newburg Borough	Not Completed by Municipality			
Osceola Mills Borough	L	L	L	L
Penn Township	M	L	L	L
Pike Township	L	L	L	L
Pine Township	L	L	L	M
Ramey Borough	L	L	L	L
Sandy Township	Not Completed by Municipality			
Troutville Borough	L	L	L	M
Union Township	L	L	L	L
Wallaceton Borough	Not Completed by Municipality			
Westover Borough	Not Completed by Municipality			
Woodward Township	L	L	L	L

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

Existing Limitations

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

5.2.3. Financial Capability

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

State and Federal Grants

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

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

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

- DCED Flood Mitigation Program
- DCED H2O PA Flood Control Projects
- DCED H2O PA High Hazard Unsafe Dam Projects
- DCED H2O PA Water Supply, Sanitary Sewer and Storm Water Projects
- DCED PA Small Water and Sewer
- DCNR Community Conservation Partnerships Program
- DCNR Pennsylvania Heritage Areas Program
- DCNR Pennsylvania Recreational Trails Program
- DCNR Land and Water Conservation Fund

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

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

Capital Improvement Financing

Because most of the capital investments involve the outlay of substantial funds, local governments can seldom pay for these facilities through annual appropriations in the annual operating budget. Therefore, numerous techniques have evolved to enable local government to

pay for capital improvements over a time period exceeding one year. Public finance literature and state laws governing local government fiancé 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. Grant 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 for this may be required.

Municipal Authorities

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

Sewer Authorities

Sewer authorities include multi-purpose authorities with sewer projects. They sell bonds to finance acquisition of existing systems of 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 of 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 us among the principal activities of the local government facilities' financing authorities. An operating water authority issues bonds to purchase existing facilities of to construct, extend, or improve a system. The primary source of revenue is user fees based on metered usage. The cost of construction or extending water supply lines can be funded by special assessments against abutting property owners. Tapping fees also help fund water system capital costs. Water utilities are also directly operated by municipal governments and by privately owned public utilities

regulated by the Pennsylvania Public Utility Commission. The Pennsylvania Department of Environmental Protection has a program to assist with consolidating small water systems to make system upgrades more cost effective.

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

Clearfield County conducts an education and outreach program. The Clearfield County Department of Emergency Management conducts public outreach at public events to update the citizens and visitors of the county on natural and human-caused hazards. The county conservation district also conducts outreach on various activities and projects in the county. Many of these projects are related to or directly impact hazard mitigation projects.

Education activities that directly impact hazard mitigation in Clearfield 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 with Clearfield County.

The county also has several websites that can educate residents about hazard mitigation and risk while also communicating information in the event of a disaster. The Clearfield County GIS Department website has an education and outreach capability, particularly with the county map viewer, which could be updated to include hazard mitigation data. The websites of Clearfield County 911 and the Clearfield County Department of Planning and Community Development also serve as places to post information to educate residents and or distribute alerts in the event of an emergency. The Clearfield County Department of Planning and Community Development currently provides access to planning documents and educational brochures about the benefits of planning and helpful guides. The department also holds monthly meetings that are open to the public, which could serve as another means to conduct outreach and educate the public about hazard mitigation.

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

5.2.5. Plan Integration

Plan integration recognizes that hazard mitigation is most effective when it works in efficient coordination with other plans, regulations, and programs. Plan integration promotes safe, resilient growth, effective management, and an overall reduction of risk by ensuring that the goals and actions established in the Hazard Mitigation Plan are included in comprehensive planning efforts so they can affect future land use and development. Some of the most important areas of planning and regulatory capabilities into which hazard mitigation goals and actions should be integrated include comprehensive plans, the hazard mitigation plans from all surrounding or encompassing areas, emergency operations plans, building codes, floodplain ordinances, subdivision and land development ordinances, stormwater management plans and ordinances, and zoning ordinances. (The April 2021 listing of municipal ordinances and plans can be found in Appendix C.) All these tools provide mechanisms for the implementation of adopted mitigation strategies.

Clearfield County Comprehensive Plan

Overview

Comprehensive plans establish the overall vision, goals, and objectives for a community's growth. Clearfield County's Comprehensive Plan, which was last updated in 2006 and adopted in 2007, establishes countywide goals and objectives, describes environmental and demographic characteristics, identifies potential capital improvement projects, and inventories existing planning initiatives and tools in the county. At the time of the writing of this plan update, a goal of fully updating the comprehensive plan in 2022 was in discussions.

As part of this update process, the HMPC reviewed goals and objectives in the 2006 Comprehensive Plan, identified those that are currently supportive of hazard mitigation goals and principles, and identified opportunities to integrate goals and objectives from the 2017 Hazard Mitigation Plan and 2022 HMP Update into the next update of the comprehensive plan.

There are many goals in the Clearfield County Comprehensive Plan that are supportive of hazard mitigation. Key goals that relate to hazard mitigation are found in all sections of the comprehensive plan, but particularly in the Natural Resources, Land/Use Development, and Community Development, Services, and Utility Facilities Elements. The objective most related to hazard mitigation is to "discourage development in high hazard locations such as floodplains, subsidence, or landslide prone areas." As discussed previously, one of the key tools that can be harnessed to manage development is through zoning and land use regulations.

Recommendations for Continued and Future Integration

As discussed, many of the goals and objectives outlined in the Clearfield County Comprehensive Plan are related to the hazard mitigation risks and goals established in the HMP. Several could be

revised to include updated information from this HMP. Additionally, the comprehensive plan can identify the places of higher vulnerability that are identified in this plan for all the high-risk hazards, and include objectives aimed at reducing the risk to these vulnerable areas. For example, an objective of the comprehensive plan could be to encourage elevation and flood proofing of structures in the Special Flood Hazard Area (SFHA) by seeking Flood Mitigation Assistance (FMA) grants and strictly enforcing floodplain management ordinances in communities like Burnside Borough, which has a large percentage of its population and structures located in the SFHA. Other flood-prone communities, including the City of DuBois, Lawrence Township, Westover Borough, and Newburg Borough, could have similar objectives. Similarly, an objective for communities that are most vulnerable to subsidence and land failure, such as Houtzdale Borough and Brisbin Borough, could be to educate property owners about mine subsidence, associated risks, and actions to take in the event of an emergency. These types of objectives could also be created for medium-risk hazards when appropriate; for example, an objective could be created for Goshen, Covington, and Union townships, which are all at risk to wildfire, to join fire education programs and educate property owners about defensible space and appropriate landscaping techniques.

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

Finally, it is expected there will be some emphasis on Continuity of Operations Plans (COOP) based on lessons learned during and through the COVID-19 pandemic. There may be some opportunities for integration of COOP goals and objectives into the county comprehensive plan update and county and municipal EOPs, e.g.: loss of use of business and government workplaces; employee notification systems; and/or public information campaigns.

2040 Long Range Transportation Plan

Overview

The North Central Regional Planning and Development Commission is the designated Rural Transportation Planning Organization (RTPO) serving Cameron, Clearfield, Elk, Jefferson, McKean, and Potter Counties. The Long-Range Transportation Plan 2040 serves as the official adopted plan for the north central Pennsylvania region and guides the expenditure of transportation dollars for at least a twenty-year period. The plan documents current and future transportation demand and identifies long-term improvements and projects to meet those needs. This plan also informs the Transportation Improvement Program (TIP), which is a regional, fiscally constrained transportation programming document that includes the proposed expenditure of the region’s state and federal transportation funds for a four-year period.

While the Long-Range Transportation Plan does not directly discuss hazard mitigation or resiliency, several of the objectives under Goals 2 and 3 are related to hazard mitigation, including:

- Goal 2: Increase transportation system safety
  - Objective 2.1: Reduce the rates of transportation-related fatalities and injuries
  - Objective 2.4: Implement safety initiatives for all transportation modes
- Goal 3: Increase transportation system security
  - Objective 3.1: Continue to monitor and encourage cooperation of all security related planning guidance from PennDOT, PA State Police, the Transportation Security Administration (TSA), Homeland Security, FEMA, PEMA (911 coordination/regional task force), Local Emergency Planning Committees (LEPCs), and Continuity of Operations Plans (COOP).

The plan is set for adoption in June 2022.

Recommendations for Continued and Future Integration

There are several opportunities to integrate hazard mitigation into the North Central Pennsylvania Regional Planning and Development Commission's Long Range Transportation Plan during the next plan update. The plan could discuss hazards that may potentially impact the county's transportation system, such as extreme weather and other natural hazards. The plan could also inventory vulnerable assets, identify evacuation routes, and discuss the need for redundancy in the transportation network in the event of hazard or hazard event. The goals and objectives highlighted above could also be revised to address additional goals and objectives related to mitigation and added to the next update of the plan. Additionally, hazard mitigation could be discussed in more detail in the environmental mitigation chapter of the plan. Instead of solely discussing mitigation of environmental impacts of transportation projects in this section, this section could also describe how reducing impacts on the environment can mitigate hazards. For example, integrating stormwater management improvements into roadway projects not only reduces pollution in nearby waterways, but it can also alleviate the impacts of floods. Likewise, mitigating hazard impacts will help preserve transportation infrastructure throughout Clearfield County.

6. Mitigation Strategy

6.1. Update Process Summary

Mitigation goals are general guidelines that explain what the county wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results. Mitigation objectives describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date. There were five goals and fifteen objectives identified in the 2017 hazard mitigation plan. The 2022 Clearfield County Hazard Mitigation Plan Update has six goals and eighteen objectives. Objectives have been added and arranged in order to associate them with the most appropriate goal. These changes are noted in *Table 82 – 2017 Mitigation Goals and Objectives Review*. These reviews are based on the five-year hazard mitigation plan review worksheet, which includes a survey on existing goals and objectives completed by the local planning team. Municipal officials then provided feedback on the changes to the goals and objectives via a mitigation strategy update meeting. Copies of these meetings and all documentation associated with the meetings are located in Appendix C.

Actions provide more detailed descriptions of specific work tasks to help the county and its municipalities achieve prescribed goals and objectives. There were forty-two actions identified in the 2017 mitigation strategy. A review of the 2017 mitigation actions was completed by the local planning team. The results of this review are identified in *Table 83 – 2017 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 82 - 2017 Mitigation Goals and Objectives Review

2017 Mitigation Goals and Objectives	
GOAL Objective	**Description**
GOAL 1	**Reduce potential injury or death and damage to existing community assets from all hazards.**
Objective 1.1	Identify and evaluate potential protection measures for critical facilities, structures, and population with the highest relative vulnerability to all hazards that affect Clearfield County.

2017 Mitigation Goals and Objectives	
GOAL Objective	**Description**
Objective 1.2	Provide public outreach and education regarding property owners' vulnerability to all hazards affecting Clearfield County and strategies to mitigate the risks from these hazards.
Objective 1.3	Address identified data limitations regarding lack of detailed information about characteristics of individual structures.
GOAL 2	**Promote disaster-resistance future development.**
Objective 2.1	Encourage and facilitate the development of zoning/land-use ordinances to limit development in high-hazard areas.
Objective 2.2	Encourage and facilitate the adoption of building codes that provide protection for new construction and substantial renovations from the effects of identified hazards.
Objective 2.3	Develop a more comprehensive building permit application that will serve as a tool to prevent building in high-risk areas or require additional measures to be taken when building in a high-risk area.
Objective 2.4	Provide adequate and consistent enforcement of ordinances and codes within and between jurisdictions.
GOAL 3	**Improve emergency warning and response and recovery procedures and capabilities.**
Objective 3.1	Increase awareness by residents (i.e., through public outreach/education) of actions to take during an emergency.

2017 Mitigation Goals and Objectives	
GOAL Objective	**Description**
Objective 3.2	Enhance response capability of County and municipal fire, police, and emergency medical services personnel to special populations.
Objective 3.3	Establish appropriate signage to adequately identify shelters and evacuation routes.
GOAL 4	**Promote hazard mitigation as a public value in recognition of its importance to health, safety, and welfare of the population.**
Objective 4.1	Provide public education to increase awareness of hazards and opportunities for mitigation.
Objective 4.2	Promote partnerships between the municipalities and the County to continue to develop a County-wide approach to identifying and implementing mitigation actions.
Objective 4.3	Continue the promotion of disaster resistance in the business community via the hazard mitigation planning initiative.
GOAL 5	**Protect various resources within Clearfield County from environmental degradation due to the potential hazard of oil and gas wells.**
Objective 5.1	Increase awareness by residents (i.e., through public outreach/education) of potential impacts of environmental degradation.
Objective 5.2	Establish a volunteer citizen watch group to monitor various drilling activities and coordinate communication with DEP.

Table 83 - 2017 Mitigation Actions Review

Clearfield County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2017 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
1.1.1 Identify residents with highest vulnerability to severe weather and provide public education and training opportunities through the StormReady program.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.2 Prioritize critical facilities for potential mitigation projects based on facility type and vulnerability to hazards. Conduct a cost-benefit analysis on the top two facilities to determine the best techniques to reduce risk.	X					The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.3 Obtain funding and implement mitigation projects at high priority critical facilities identified in Action 2.	X					The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.4 Gather additional information about Repetitive Loss Properties and Severe Repetitive Loss Properties, prioritize properties for mitigation, and identify mitigation projects for high-priority sites.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.

Clearfield County Mitigation Actions Review Worksheet							
Existing Mitigation Actions *(2017 HMP)*		***Status***					***Review Comments***
		No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
1.1.5	Implement property protection projects for RL and SRL properties, including acquisition, relocation, and elevation.			X			The LPT decided to add demolition and reconstruction to this action.
1.1.6	Form a Repetitive Flood Loss Committee with a representative from each community with repetitive loss properties to regularly discuss successes, challenges, and lessons learned in available Repetitive Loss data and mitigation projects.	X					The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.7	Conduct outreach and provide education in schools about emergency preparedness, drought warnings, and water-saving techniques.			X			Change to "Continue to…" The LPT decided to change this action to "Continue to conduct outreach…"
1.1.8	Provide property owners with information about weatherizing their homes, potential funding sources for weatherization, drought and fire information, and water-saving techniques.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.

Clearfield County Mitigation Actions Review Worksheet							
Existing Mitigation Actions *(2017 HMP)*		***Status***					***Review Comments***
		No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
1.1.9	Provide education and training to building/zoning code officials to better implement floodplain management and building practices.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.10	Organize a Flood Summit to educate municipal officials on the availability and use of flood insurance rate maps and floodplain management regulations. The Summit will involve conducting a field work exercise by visiting a site located on the floodplain map and taking "in the field" measurement.					X	The LPT decided to discontinue this action as it is no longer relevant.
1.1.11	Conduct a meeting with non-participating communities, the Conservation District, and the Planning Commission to educate them about the NFIP and encourage them join.			X			The LPT decided to change "communities" to "municipalities" in this action.
1.1.12	Continue to hold annual meetings of the hazard mitigation steering committee, update the HMP annually and after disasters, and document meetings and progress.	X					Change SC to LPT. Keep in the plan update. The LPT decided to change "steering committee" to "Local Planning Team".

Clearfield County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2017 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
1.1.13 Reduce potential damage to utilities by coordinating with power companies and municipalities to properly trim vegetation that has the potential to damage power lines and burying power lines whenever possible.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.14 Educate the public and stakeholders about conventional and unconventional oil and gas drilling by partnering with Penn State and Clarion University.					X	The LPT decided to discontinue this action as it is no longer relevant.
1.1.15 Organize a citizen's watch group to coordinate with DEP and monitor water quality.					X	The LPT decided to discontinue this action as it is no longer feasible.
1.1.16 Continue to coordinate with DEP and USACE to monitor Curwensville Lake for dam failure potential.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.17 Designate an individual within the County to review and ensure that the EAP is up-to-date and obtain most current dam inspection report annually.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.

Clearfield County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2017 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
1.1.18 Organize "Clean the Streams" events in the fall and spring to remove debris from streams, pipes, roadways, and residential areas to reduce potential damage to natural resources and limit the potential for water contamination from flooding.			X			The LPT decided to remove "Clean the Streams" from this action and leave the rest as-is.
1.1.19 Develop drought warning signs that can be displayed throughout the community when a drought is declared.					X	The LPT decided to discontinue this action as it is no longer feasible.
1.1.20 Build a storm/sewage complex to address water quality issues within Coalport Borough, Beccaria Township, and Irvona Borough to prevent flooding and potential water borne diseases.					X	The LPT decided to discontinue this action as it is no longer relevant.
1.1.21 Identify hazardous materials sites, including TRI facilities and oil and gas wells, that are in or near flood zones and develop strategies to reduce potential damages.	X					The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.22 Remediate and restore streams and wells that have been contaminated. ~~from oil and gas~~			X			The LPT decided to change this action to "Remediate and

Clearfield County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2017 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
~~wells and other hazardous chemicals.~~						restore streams and wells that have been contaminated."
1.1.23 Issue countywide "Advisory" burn bans and enforce burn bans and water uses that are inappropriate by issuing fines.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.24 Encourage more communities to join the Firewise program.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.25 Incorporate hazard identification criteria into culvert surveys.					X	The LPT decided to discontinue this action as it is no longer relevant.
1.1.26 Continue to survey culverts, identify culverts in need of replacement, and communicate findings to the Clearfield County Department of Emergency Services and the Clearfield County Planning and Community Development Office.					X	The LPT decided to discontinue this action as it is no longer relevant.
1.1.27 Identify funding sources to replace culverts and prioritize culverts in need of replacement.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.28 Replace high-priority culverts.					X	The LPT decided to discontinue this action as it is no longer relevant.

Clearfield County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2017 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
1.1.29 Implement a public emergency alert system, particularly in areas with poor reception and lack of access to cellular and internet service.			X			The LPT decided to reword this action to: "Expand the public emergency alert system. "
1.1.30 Designate new Emergency Shelters in the community.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.31 Obtain and install emergency generators at newly identified Emergency Shelters throughout the county.					X	The LPT decided to discontinue this action as it is no longer relevant.
1.1.32 Review flood emergency response procedures, including evacuation and communication plans.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.33 Educate residents of Water Street and Union Street about emergency response procedures in the event of a flood.					X	The LPT decided to discontinue this action as the action above takes care of this.
1.1.34 Educate residents about stormwater runoff, flood risk, and mine subsidence and actions to take in the event of an emergency.			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.35 Replace storm drains in areas where roads flood.						The LPT decided to include this action in the updated 2022 Clearfield County HMP.

Clearfield County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2017 HMP)*		***Status***				***Review Comments***
		No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
1.1.36	Improve stormwater drainage and reduce soil erosion into Trout Stream by channeling stormwater and repairing headwall at 8th Street and 10th Street.					X	The LPT decided to discontinue this action as it is no longer relevant.
1.1.37	Demolish and remediate hazardous building at 383 First Street.					X	The LPT decided to discontinue this action as it is no longer relevant.
1.1.38	Obtain and install emergency generators at Township and Police facilities.					X	The LPT decided to discontinue this action as it is no longer relevant.
1.1.39	Replace and upgrade stormwater infrastructure at Good Street and Turnpike Avenue					X	The LPT decided to discontinue this action as it is no longer relevant.
1.1.40	Contact the Department of Environmental Protection to request information about undermined areas in the community and provide data to the county for the next HMP Update.	X					The LPT decided to include this action in the updated 2022 Clearfield County HMP.
1.1.41	Incorporate hazard mitigation goals and principles into the Clearfield County Comprehensive Plan Update, such as by integrating HMP			X			The LPT decided to include this action in the updated 2022 Clearfield County HMP.

Clearfield County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2017 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
goals and objectives into the Comprehensive Plan's goals and objectives, revising existing objectives to reflect updated hazard information, and defining specific objectives for areas most vulnerable to high-risk hazards.						
1.1.42 Incorporate hazard mitigation goals and principles into the North Central Pennsylvania Regional Planning and Development Commission's Long Range Transportation Plan, such as by inventorying vulnerable assets, identifying evacuation routes, discussing the need for redundancy in the transportation network, and revising goals and objectives to better address hazard mitigation.		X				The LPT decided to include this action in the updated 2022 Clearfield County HMP.

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 four goals and thirteen corresponding objectives was developed. *Table 84*

– *2022 Goals and Objectives* details the mitigation goals and objectives established for the 2022 Clearfield County Hazard Mitigation Plan.

Table 84 - 2022 Goals and Objectives

2022 Mitigation Goals and Objectives	
GOAL **Objective**	**Description**
GOAL 1	**Reduce potential injury or death and damage to existing community assets from all hazards.**
Objective 1.1	Identify and evaluate potential protection measures for critical facilities, structures, and the population with the highest relative vulnerability to all hazards that affect Clearfield County.
Objective 1.2	Provide public outreach and education regarding property owners' vulnerability to all hazards affecting Clearfield County and strategies to mitigate the risks from these hazards.
Objective 1.3	Complete actions and projects to acquire, elevate, demolish or demolish/reconstruct properties, repetitive loss properties and severe repetitive loss properties.
Objective 1.4	Complete projects to maintain and improve existing infrastructure and community assets and prepare for future infrastructure development across the county.
GOAL 2	**Promote disaster preparedness for future development in Clearfield County.**
Objective 2.1	Encourage and facilitate the development of zoning/land-use ordinances to limit development in high-hazard areas.

2022 Mitigation Goals and Objectives	
GOAL Objective	**Description**
Objective 2.2	Encourage and facilitate the adoption of building codes that provide protection for new construction and substantial renovations from the effects of identified hazards.
Objective 2.3	Provide and educate the benefit of having adequate and consistent enforcement of ordinances and codes within and between jurisdictions.
GOAL 3	**Improve emergency warning, response, and recovery procedures and capabilities in Clearfield County.**
Objective 3.1	Increase awareness by residents (i.e., through public outreach/education) of actions to take during an emergency.
Objective 3.2	Enhance response capability of county and municipal fire, police, and emergency medical services personnel to at-risk populations.
Objective 3.3	Establish appropriate signage to adequately identify shelters and evacuation routes.
GOAL 4	**Promote hazard mitigation as a public value in recognition of its importance to health, safety, and welfare of the population.**
Objective 4.1	Provide public education to increase awareness of hazards and opportunities for mitigation.
Objective 4.2	Continue fostering partnerships between the municipalities and the county to continue to develop a county-wide approach to identifying and implementing mitigation actions.

2022 Mitigation Goals and Objectives	
GOAL Objective	**Description**
Objective 4.3	Continue the promotion of disaster resistance in the business community via the hazard mitigation planning initiative.
Objective 4.4	Continue to work with governmental agencies to further hazard mitigation planning and community resilience.
GOAL 5	**Protect various resources within Clearfield County from environmental degradation due to the potential hazard of oil and gas wells.**
Objective 5.1	Increase awareness by residents (i.e., through public outreach/education) of potential impacts of environmental degradation.
GOAL 6	**Participate in FEMA's High-Hazard Potential Dam Program (HHPD).**
Objective 6.1	Reduce long-term vulnerabilities from eligible high hazard potential dams that pose an unacceptable risk to the public.
Objective 6.2	Educate Clearfield County municipalities, property owners, and businesses about FEMA's HHPD program.
Objective 6.3	Identify, by area, locations in Clearfield County that could potentially be impacted by FEMA's HHPD program.

6.3. Identification and Analysis of Mitigation Techniques

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

- Planning and regulations
- Structure and infrastructure

- Natural systems protection
- Education and awareness

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

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

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

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

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

Structure and infrastructure implementation is a technique that removes or diverts the hazard from 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 85 – 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 86 – 2022 Mitigation Action Plan*.

Table 85 - Mitigation Strategy Technique Matrix

Clearfield County Mitigation Strategy Technique Matrix				
HAZARD	**MITIGATION TECHNIQUE**			
	Local Plans and Regulations	**Structural and Infrastructure**	**Natural Systems Protection**	**Education and Awareness**
Drought	X		X	X
Flooding/Flash Flooding/Ice Jam Flooding	X	X	X	X
Earthquake	X	X		X
Invasive Species	X		X	X
Pandemic and Infectious Disease	X		X	X
Drowning	X			X
Radon Exposure	X	X		X
Tornado/Windstorm	X	X		X
Wildfires	X	X	X	X
Winter Storms	X	X		X
Hurricane/Tropical Storm/Nor' easter	X	X		X
Subsidence/Land Failure	X	X		X
Dam/Levee Failure	X		X	X
Emergency Services	X			X
Environmental Hazards	X	X		X
Opioid Epidemic	X			X
Structure Collapse	X	X		X
Petroleum/Gas Well Incidents	X	X		X
Terrorism/Cyber Terrorism	X			X
Transportation Accidents	X	X		X
Utility Interruptions	X	X		X

6.4. Mitigation Action Plan

The Clearfield County Hazard Mitigation Local Planning Team (LPT) immediately began work on the mitigation strategy section of the 2022 hazard mitigation plan (HMP) update after the risk assessment section was completed. The LPT started this section by reviewing the 2017 HMP mitigation strategy section. A review of the previous goals, objectives, actions, and project opportunities documented in the 2017 HMP was conducted. The next step the LPT completed was the brainstorming of possible new actions based on new identified risks. The LPT compiled all this information for presentations to the municipalities.

MCM Consulting Group, Inc. completed in-person municipal meetings at various time periods to discuss mitigation strategy-related items. During all these meetings, an overview of mitigation strategy was presented, and the municipalities were informed that they needed to have at least one hazard-related mitigation action for their municipality. All municipalities were invited to

attend these meetings. Municipalities that were not able to join conference calls were contacted individually.

The municipalities were notified of draft mitigation actions and encouraged to provide new mitigation actions that could be incorporated into the plan. Municipalities were provided copies of their previously submitted mitigation opportunity forms and asked to determine if the projects were still valid. Municipalities were solicited for new project opportunities as well. All agendas, sign in sheets and other support information from these meetings is included in Appendix C. Mitigation measures for the 2022 Clearfield County HMP are listed in the mitigation action plan. *Table 86 – 2022 Mitigation Action Plan* is the 2022 Clearfield County Mitigation Action Plan. This plan outlines mitigation actions and projects that comprise a strategy for Clearfield County. The action plan includes actions, a benefit and cost prioritization, a schedule for implementation, any funding sources to complete the action, a responsible agency or department and an estimated cost. The Clearfield County Local Planning Team prioritized all mitigation actions during the mitigation strategy update process. Mitigation actions ranked as high priority should be addressed first within each jurisdiction in Clearfield County. However, other actions labeled as medium or low priority should also be considered as funding becomes available. Therefore, the ranking of each action should be considered as a preliminary ranking, which will evolve based on prevailing priorities and discretion of local governments, the public, PEMA, and FEMA as the plan update is implemented. All benefit and cost analysis were completed using the Pennsylvania Emergency Management Agency recommended analysis tool. The completed analysis is located in Appendix H. *Table 86 – 2022 Mitigation Action Plan* is a matrix that identifies the county and/or municipalities responsible for mitigation actions in the new mitigation action plan. *Table 87 - Municipal Hazard Mitigation Actions Checklist* illustrates which mitigation action applies to each municipality and Clearfield County as a whole. *Table 88 – Mitigation Actions by Hazard Mitigated* shows which actions can be tied directly back to individual hazards outlined in the plan.

Table 86 - 2022 Mitigation Action Plan

Clearfield County 2022 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Local Champion
1.1.1	Planning and Regulations	Prioritize critical facilities for potential mitigation projects based on facility type and vulnerability to hazards. Conduct a cost-benefit analysis on the top two facilities to determine the best techniques to reduce risk.	All-Hazards		**X**		2022 - 2026	Local	Clearfield County EMA
1.1.2	Structure and Infrastructure	Obtain funding and implement mitigation projects at high priority critical facilities identified in 1.1.1.	All-Hazards		**X**		2022 - 2026	Local	Clearfield County EMA
1.2.1	Planning and Regulations	Form a Repetitive Flood Loss Committee with a representative from each community with repetitive loss properties to regularly discuss successes, challenges, and lessons learned in available Repetitive Loss data and mitigation projects.	Flooding		**X**		2022 - 2026	Local	Clearfield County EMA
1.2.2	Planning and Regulations	Gather additional information about Repetitive Loss Properties and Severe Repetitive Loss Properties, prioritize properties for mitigation, and identify mitigation projects for high-priority sites.	Flooding		**X**		2022 - 2026	Local	Clearfield County EMA
1.3.1	Planning and Regulations	Implement property protection projects for RL and SRL properties, including acquisition, relocation, demolition, reconstruction, and elevation.	Flooding		**X**		2022 - 2026	Local	Clearfield County EMA
1.3.2	Planning and Regulations	Continue to conduct outreach to private property owners with information about weatherizing their homes, potential funding sources for weatherization, drought, and fire information, and water-saving techniques.	All Hazards		**X**		2022 - 2026	FMA	Clearfield County EMA
1.4.1	Natural Resource Protection	Remediate and restore streams and wells that have been contaminated.	Environmental Hazards	**X**			2022 - 2026	Local	Clearfield County EMA

Clearfield County 2022 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Local Champion
1.4.2	Natural Resource Protection Structure and Infrastructure	Replace storm drains in areas where roads flood.	Flooding Flash Flooding		**X**		2022 - 2026	Local	Clearfield County Municipalities
1.4.3	Natural Resource Protection Planning and Regulations	Identify funding sources to replace culverts and prioritize culverts in need of replacement.	Flooding Flash Flooding	**X**			2022 - 2026	Local	Clearfield County EMA
2.1.1	Planning and Regulations	Identify hazardous materials sites, including TRI facilities and oil and gas wells, that are in or near flood zones and develop strategies to reduce potential damages.	Environmental Hazard Flooding		**X**		2022 - 2026	Local	Clearfield County LEPC
2.2.1	Planning and Regulations	Provide education and training to building/zoning code officials to better implement floodplain management and building practices.	Flooding		**X**		2022 - 2026	FMA	Clearfield County Department of Planning
2.3.1	Planning and Regulations	Provide examples to the public of the benefits of consistent code enforcement in municipalities across the county.	All Hazards		**X**		2022 - 2026	FMA	Clearfield County Department of Planning
3.1.1	Structure and Infrastructure	Expand the public emergency alert system.	All-Hazards			**X**	2022 - 2026	Local	Clearfield County EMA
3.1.2	Planning and Regulations	Continue to coordinate and work with local healthcare coalitions, the Pennsylvania Department of Health, and the Center for Disease Control and Prevention to educate the public on Covid-19 and infectious diseases within Clearfield County.	Pandemic and Infectious Disease		**X**		2022 - 2026	Local	Clearfield County EMA

Clearfield County 2022 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Local Champion
3.2.1	Planning and Regulations	Review flood emergency response procedures, including evacuation and communication plans.	Flooding		**X**		2022 - 2026	Local	Clearfield County EMA
3.2.2	Planning and Regulations	Research the feasibility of an emergency responder retention program, and further training programs to ensure continued emergency response capabilities in Clearfield County.	Emergency Services		**X**		2022 - 2026	Local	Clearfield County Commiss-ioners Clearfield County EMA
3.3.1	Structure and Infrastructure	Designate new Emergency Shelters in the community.	Flooding Hurricane and Tropical Storm Wildfires		**X**		2022 - 2026	Local	Clearfield County EMA Red Cross
3.3.2	Planning and Regulations	Evaluate emergency snow route markers and replace those that are damaged for effective use in winter storms and winter weather events across Clearfield County.	Winter Storms	**X**			2022-2026	Local	PennDOT
4.1.1	Planning and Regulations	Identify residents with highest vulnerability to severe weather and provide public education and training opportunities through the *StormReady* program.	All Hazards			**X**	2022 - 2026	Local	Clearfield County EMA
4.1.2	Planning and Regulations	Educate residents about stormwater runoff, flood risk, and mine subsidence and actions to take in the event of an emergency.	Flash Flooding	**X**			2022 - 2026	Local	Clearfield County EMA
4.1.3	Planning and Regulations	Encourage more communities to join the *FireWise* program.	Wildfire	**X**			2022 - 2026	Local	Clearfield County EMA

Clearfield County 2022 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Local Champion
4.1.4	Natural Resource Protection	Educate the public with information regarding local and regional invasive plants and animals affecting Clearfield County.	Invasive Species	**X**			2022 - 2026	Local	Clearfield County EMA Clearfield County Conserva-tion District
4.2.1	Structure and Infrastructure	Incorporate hazard mitigation goals and principles into the Clearfield County Comprehensive Plan Update, such as by integrating HMP goals and objectives into the Comprehensive Plan's goals and objectives, revising existing objectives to reflect updated hazard information, and defining specific objectives for areas most vulnerable to high-risk hazards.	All Hazards		**X**		2022 - 2026	Local	Clearfield County Planning
4.2.2	Planning and Regulations	Incorporate hazard mitigation goals and principles into the North Central Pennsylvania Regional Planning and Development Commission's Long Range Transportation Plan, such as by inventorying vulnerable assets, identifying evacuation routes, discussing the need for redundancy in the transportation network, and revising goals and objectives to better address hazard mitigation.	All Hazards		**X**		2022 - 2026	Local	Clearfield County Planning
4.2.3	Planning and Regulations	Reduce potential damage to utilities by coordinating with power companies and municipalities to properly trim vegetation that has the potential to damage power lines and burying power lines whenever possible.	All-Hazards		**X**		2022 - 2026	Local	Clearfield County EMA
4.2.4	Planning and Regulations	Conduct a meeting with non-participating municipalities, the Conservation District, and the Planning Commission to educate them about the NFIP and encourage them join.	Flooding		**X**		2022 - 2026	Local	Clearfield County EMA

Clearfield County 2022 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Local Champion
4.2.5	Planning and Regulations	Issue countywide "Advisory" burn bans and enforce burn bans and water uses that are inappropriate by issuing fines.	Wildfire	**X**			2022 - 2026	Local	Clearfield County EMA
4.2.6	Structure and Infrastructure	Continue to hold annual meetings of the Hazard Mitigation Local Planning Team, update the HMP annually and after disasters, and document meetings and progress.	All-Hazards		**X**		2022 - 2026	Local	Clearfield County EMA
4.3.1	Planning and Regulations	Incorporate the local area Chamber of Commerce and private businesses into the hazard mitigation planning process and future local planning teams.	All Hazards			**X**	2022 - 2026	Local	Clearfield County EMA
4.4.1	Planning and Regulations	Continue to coordinate with DEP and USACE to monitor Curwensville Lake for dam failure potential.	Dam Failure		**X**		2022 - 2026	Local	Clearfield County EMA
4.4.2	Planning and Regulations	Contact the Department of Environmental Protection to request information about undermined areas in the community and provide data to the county for the next HMP Update.	All-Hazards		**X**		2022 - 2026	Local	Clearfield County EMA
4.4.3	Planning and Regulations	Designate an individual within the county to review and ensure that the EAP is up to date, obtain most current dam inspection report annually, and work with dam owner to determine status of dam.	Dam Failure	**X**			2022 - 2026	Local	Clearfield County EMA
5.1.1	Local Plans and Regulations	Perform outreach to county property owners or renters within the special flood hazard area regarding potential flood hazards.	Flooding Flash Flooding Ice Jam Flooding		**X**		2022-2026	FMA /HMGP/Local/ EMPG	Clearfield County EMA
6.1.1	Local Plans and Regulations	Work with all appropriate partners to continue evaluating and updating (when possible) dams and their respective Emergency Action Plans.	Dam Failures		**X**		2022-2026	Local /EMPG	Clearfield County EMA

Clearfield County 2022 Mitigation Action Plan									
Action Number	Mitigation Actions			Prioritization			Implementation		
	Category	Description/ Action Items	Hazard Vulnerability	High	Medium	Low	Schedule	Funding	Local Champion
6.1.2	Education and Awareness	Distribute educational pamphlets about the HHPD program.	Dam Failures			**X**	2022-2026	HH PD	Clearfield County EMA
6.1.3	Education and Awareness	Utilize all municipal social media pages to disseminate important information regarding the HHPD program to Clearfield County residents.	Dam Failures			**X**	2022-2026	HH PD	Clearfield County EMA
6.2.1	Local Plans and Regulations	Enhance local mitigation policies and programs that address high-hazard potential dams.	Dam Failures			**X**	2022-2026	HH PD	Clearfield County EMA
6.3.1	Planning and Regulations	Acquire or develop digitized dam inundation polygons in GIS to determine at risk populations for dams designated High-Hazard Potential Dams by FEMA.	Dam Failures			**X**	2022 - 2026	Local	Clearfield County EMA

Funding acronym definitions:

- FMA: Flood Mitigation Assistance Grant Program, administered by the Federal Emergency Management Agency
- HMGP: Hazard Mitigation Grant Program, administered by the Federal Emergency Management Agency
- BRIC: Building Resilient Infrastructure and Communities (BRIC) Program, administered by the Federal Emergency Management Agency
- EMPG: Emergency Management Performance Grant, administered by the Federal Emergency Management Agency
- HSGP: Homeland Security Grant Program, administered by the Federal Emergency Management Agency
- HMEP: Hazardous Material Emergency Planning Grant, administered by the Pennsylvania Emergency Management Agency

- HMRF: Hazardous Material Response Fund, administered by the Pennsylvania Emergency Management Agency
- HMERP: Hazard Mitigation Emergency Response Program by the Pennsylvania Emergency Management Agency
- HHPD: High-hazard potential dam by the Federal Emergency Management Agency

Table 87 - Municipal Hazard Mitigation Actions Checklist

Municipal Hazard Mitigation Actions Checklist										
Municipality	**1.1.1**	**1.1.2**	**1.2.1**	**1.2.2**	**1.3.1**	**1.3.2**	**1.4.1**	**1.4.2**	**1.4.3**	**2.1.1**
Beccaria Township	X	X	X	X	X	X	X	X	X	
Bell Township	X	X	X	X	X	X	X	X	X	X
Bigler Township	X	X				X	X	X	X	
Bloom Township	X	X				X	X	X	X	
Boggs Township	X	X				X	X	X	X	X
Bradford Township	X	X				X	X	X	X	
Brady Township	X	X				X	X	X	X	X
Burnside Borough	X	X				X	X	X	X	X
Burnside Township	X	X	X	X	X	X	X	X	X	X
Chest Township	X	X	X	X	X	X	X	X	X	X
Chester Hill Borough	X	X				X	X	X	X	
Clearfield Borough	X	X				X	X	X	X	
Coalport Borough	X	X	X	X	X	X	X	X	X	
Cooper Township	X	X				X	X	X	X	
Covington Township	X	X				X	X	X	X	
Curwensville Borough	X	X	X	X	X	X	X	X	X	
Decatur Township	X	X				X	X	X	X	
DuBois (City of)	X	X	X	X	X	X	X	X	X	X
Falls Creek Borough	X	X				X	X	X	X	
Ferguson Township	X	X				X	X	X	X	
Girard Township	X	X				X	X	X	X	
Glen Hope Borough	X	X				X	X	X	X	
Goshen Township	X	X				X	X	X	X	
Graham Township	X	X				X	X	X	X	
Grampian Borough	X	X				X	X	X	X	
Greenwood Township	X	X				X	X	X	X	X
Gulich Township	X	X				X	X	X	X	
Houtzdale Borough	X	X				X	X	X	X	

Municipal Hazard Mitigation Actions Checklist										
Municipality	**1.1.1**	**1.1.2**	**1.2.1**	**1.2.2**	**1.3.1**	**1.3.2**	**1.4.1**	**1.4.2**	**1.4.3**	**2.1.1**
Huston Township	X	X	X	X	X	X	X	X	X	X
Irvona Borough	X	X	X	X	X	X	X	X	X	
Jordan Township	X	X				X	X	X	X	
Karthaus Township	X	X				X	X	X	X	
Knox Township	X	X				X	X	X	X	
Lawrence Township	X	X	X	X	X	X	X	X	X	X
Mahaffey Borough	X	X	X	X	X	X	X	X	X	X
Morris Township	X	X				X	X	X	X	
Newburg Borough	X	X				X	X	X	X	X
New Washington Borough	X	X				X	X	X	X	
Osceola Mills Borough	X	X				X	X	X	X	
Penn Township	X	X				X	X	X	X	
Pike Township	X	X				X	X	X	X	X
Pine Township	X	X				X	X	X	X	
Sandy Township	X	X	X	X	X	X	X	X	X	X
Ramey Borough	X	X				X	X	X	X	
Troutville Borough	X	X				X	X	X	X	
Union Township	X	X				X	X	X	X	
Wallaceton Borough	X	X				X	X	X	X	
Westover Borough	X	X	X	X	X	X	X	X	X	X
Woodward Township	X	X				X	X	X	X	
Clearfield County	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**

Municipal Hazard Mitigation Actions Checklist										
Municipality	**2.2.1**	**2.3.1**	**3.1.1**	**3.1.2**	**3.2.1**	**3.2.2**	**3.3.1**	**3.3.2**	**4.1.1**	**4.1.2**
Beccaria Township	X	X	X	X	X	X	X	X	X	X
Bell Township	X	X	X	X	X	X	X	X	X	X
Bigler Township	X	X	X	X	X	X	X	X	X	X
Bloom Township	X	X	X	X	X	X	X	X	X	X
Boggs Township	X	X	X	X	X	X	X	X	X	X
Bradford Township	X	X	X	X	X	X	X	X	X	X
Brady Township	X	X	X	X	X	X	X	X	X	X
Burnside Borough	X	X	X	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**2.2.1**	**2.3.1**	**3.1.1**	**3.1.2**	**3.2.1**	**3.2.2**	**3.3.1**	**3.3.2**	**4.1.1**	**4.1.2**
Burnside Township	X	X	X	X	X	X	X	X	X	X
Chest Township	X	X	X	X	X	X	X	X	X	X
Chester Hill Borough	X	X	X	X	X	X	X	X	X	X
Clearfield Borough	X	X	X	X	X	X	X	X	X	X
Coalport Borough	X	X	X	X	X	X	X	X	X	X
Cooper Township	X	X	X	X	X	X	X	X	X	X
Covington Township	X	X	X	X	X	X	X	X	X	X
Curwensville Borough	X	X	X	X	X	X	X	X	X	X
Decatur Township	X	X	X	X	X	X	X	X	X	X
DuBois (City of)	X	X	X	X	X	X	X	X	X	X
Falls Creek Borough	X	X	X	X	X	X	X	X	X	X
Ferguson Township	X	X	X	X	X	X	X	X	X	X
Girard Township	X	X	X	X	X	X	X	X	X	X
Glen Hope Borough	X	X	X	X	X	X	X	X	X	X
Goshen Township	X	X	X	X	X	X	X	X	X	X
Graham Township	X	X	X	X	X	X	X	X	X	X
Grampian Borough	X	X	X	X	X	X	X	X	X	X
Greenwood Township	X	X	X	X	X	X	X	X	X	X
Gulich Township	X	X	X	X	X	X	X	X	X	X
Houtzdale Borough	X	X	X	X	X	X	X	X	X	X
Huston Township	X	X	X	X	X	X	X	X	X	X
Irvona Borough	X	X	X	X	X	X	X	X	X	X
Jordan Township	X	X	X	X	X	X	X	X	X	X
Karthaus Township	X	X	X	X	X	X	X	X	X	X
Knox Township	X	X	X	X	X	X	X	X	X	X
Lawrence Township	X	X	X	X	X	X	X	X	X	X
Mahaffey Borough	X	X	X	X	X	X	X	X	X	X
Morris Township	X	X	X	X	X	X	X	X	X	X
Newburg Borough	X	X	X	X	X	X	X	X	X	X
New Washington Borough	X	X	X	X	X	X	X	X	X	X
Osceola Mills Borough	X	X	X	X	X	X	X	X	X	X
Penn Township	X	X	X	X	X	X	X	X	X	X
Pike Township	X	X	X	X	X	X	X	X	X	X
Pine Township	X	X	X	X	X	X	X	X	X	X
Sandy Township	X	X	X	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist										
Municipality	**2.2.1**	**2.3.1**	**3.1.1**	**3.1.2**	**3.2.1**	**3.2.2**	**3.3.1**	**3.3.2**	**4.1.1**	**4.1.2**
Ramey Borough	X	X	X	X	X	X	X	X	X	X
Troutville Borough	X	X	X	X	X	X	X	X	X	X
Union Township	X	X	X	X	X	X	X	X	X	X
Wallaceton Borough	X	X	X	X	X	X	X	X	X	X
Westover Borough	X	X	X	X	X	X	X	X	X	X
Woodward Township	X	X	X	X	X	X	X	X	X	X
Clearfield County	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**

Municipal Hazard Mitigation Actions Checklist										
Municipality	**4.1.3**	**4.1.4**	**4.2.1**	**4.2.2**	**4.2.3**	**4.2.4**	**4.2.5**	**4.2.6**	**4.3.1**	**4.4.1**
Beccaria Township	X	X	X	X	X		X	X	X	
Bell Township	X	X	X	X	X		X	X	X	
Bigler Township	X	X	X	X	X		X	X	X	
Bloom Township	X	X	X	X	X	X	X	X	X	
Boggs Township	X	X	X	X	X		X	X	X	
Bradford Township	X	X	X	X	X		X	X	X	
Brady Township	X	X	X	X	X		X	X	X	
Burnside Borough	X	X	X	X	X		X	X	X	
Burnside Township	X	X	X	X	X		X	X	X	
Chest Township	X	X	X	X	X	X	X	X	X	
Chester Hill Borough	X	X	X	X	X		X	X	X	
Clearfield Borough	X	X	X	X	X		X	X	X	
Coalport Borough	X	X	X	X	X		X	X	X	
Cooper Township	X	X	X	X	X	X	X	X	X	
Covington Township	X	X	X	X	X	X	X	X	X	
Curwensville Borough	X	X	X	X	X		X	X	X	X
Decatur Township	X	X	X	X	X	X	X	X	X	
DuBois (City of)	X	X	X	X	X		X	X	X	
Falls Creek Borough	X	X	X	X	X	X	X	X	X	
Ferguson Township	X	X	X	X	X		X	X	X	
Girard Township	X	X	X	X	X		X	X	X	
Glen Hope Borough	X	X	X	X	X	X	X	X	X	
Goshen Township	X	X	X	X	X		X	X	X	

Municipal Hazard Mitigation Actions Checklist										
Municipality	**4.1.3**	**4.1.4**	**4.2.1**	**4.2.2**	**4.2.3**	**4.2.4**	**4.2.5**	**4.2.6**	**4.3.1**	**4.4.1**
Graham Township	X	X	X	X	X	X	X	X	X	
Grampian Borough	X	X	X	X	X		X	X	X	
Greenwood Township	X	X	X	X	X		X	X	X	
Gulich Township	X	X	X	X	X		X	X	X	
Houtzdale Borough	X	X	X	X	X		X	X	X	
Huston Township	X	X	X	X	X		X	X	X	
Irvona Borough	X	X	X	X	X		X	X	X	
Jordan Township	X	X	X	X	X		X	X	X	
Karthaus Township	X	X	X	X	X		X	X	X	
Knox Township	X	X	X	X	X	X	X	X	X	
Lawrence Township	X	X	X	X	X		X	X	X	
Mahaffey Borough	X	X	X	X	X		X	X	X	
Morris Township	X	X	X	X	X		X	X	X	
Newburg Borough	X	X	X	X	X		X	X	X	
New Washington Borough	X	X	X	X	X		X	X	X	
Osceola Mills Borough	X	X	X	X	X		X	X	X	
Penn Township	X	X	X	X	X		X	X	X	
Pike Township	X	X	X	X	X	X	X	X	X	
Pine Township	X	X	X	X	X	X	X	X	X	
Sandy Township	X	X	X	X	X		X	X	X	
Ramey Borough	X	X	X	X	X	X	X	X	X	
Troutville Borough	X	X	X	X	X	X	X	X	X	
Union Township	X	X	X	X	X	X	X	X	X	
Wallaceton Borough	X	X	X	X	X	X	X	X	X	
Westover Borough	X	X	X	X	X		X	X	X	
Woodward Township	X	X	X	X	X		X	X	X	
Clearfield County	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**

Municipal Hazard Mitigation Actions Checklist										
Municipality	**4.4.2**	**4.4.3**	**5.1.1**	**6.1.1**	**6.1.2**	**6.1.3**	**6.2.1**	**6.3.1**		
Beccaria Township			X	X	X	X	X	X		
Bell Township			X	X	X	X	X	X		

Municipal Hazard Mitigation Actions Checklist										
Municipality	**4.4.2**	**4.4.3**	**5.1.1**	**6.1.1**	**6.1.2**	**6.1.3**	**6.2.1**	**6.3.1**		
Bigler Township			X	X	X	X	X	X		
Bloom Township			X	X	X	X	X	X		
Boggs Township			X	X	X	X	X	X		
Bradford Township			X	X	X	X	X	X		
Brady Township			X	X	X	X	X	X		
Burnside Borough			X	X	X	X	X	X		
Burnside Township			X	X	X	X	X	X		
Chest Township			X	X	X	X	X	X		
Chester Hill Borough			X	X	X	X	X	X		
Clearfield Borough			X	X	X	X	X	X		
Coalport Borough			X	X	X	X	X	X		
Cooper Township			X	X	X	X	X	X		
Covington Township			X	X	X	X	X	X		
Curwensville Borough			X	X	X	X	X	X		
Decatur Township			X	X	X	X	X	X		
DuBois (City of)			X	X	X	X	X	X		
Falls Creek Borough			X	X	X	X	X	X		
Ferguson Township			X	X	X	X	X	X		
Girard Township			X	X	X	X	X	X		
Glen Hope Borough			X	X	X	X	X	X		
Goshen Township			X	X	X	X	X	X		
Graham Township			X	X	X	X	X	X		
Grampian Borough			X	X	X	X	X	X		
Greenwood Township			X	X	X	X	X	X		
Gulich Township			X	X	X	X	X	X		
Houtzdale Borough			X	X	X	X	X	X		
Huston Township			X	X	X	X	X	X		
Irvona Borough			X	X	X	X	X	X		
Jordan Township			X	X	X	X	X	X		
Karthaus Township			X	X	X	X	X	X		
Knox Township			X	X	X	X	X	X		
Lawrence Township			X	X	X	X	X	X		
Mahaffey Borough			X	X	X	X	X	X		
Morris Township			X	X	X	X	X	X		
Newburg Borough			X	X	X	X	X	X		
New Washington			X	X	X	X	X	X		

Municipal Hazard Mitigation Actions Checklist										
Municipality	**4.4.2**	**4.4.3**	**5.1.1**	**6.1.1**	**6.1.2**	**6.1.3**	**6.2.1**	**6.3.1**		
Borough										
Osceola Mills Borough			X	X	X	X	X	X		
Penn Township			X	X	X	X	X	X		
Pike Township			X	X	X	X	X	X		
Pine Township			X	X	X	X	X	X		
Sandy Township			X	X	X	X	X	X		
Ramey Borough			X	X	X	X	X	X		
Troutville Borough			X	X	X	X	X	X		
Union Township			X	X	X	X	X	X		
Wallaceton Borough			X	X	X	X	X	X		
Westover Borough			X	X	X	X	X	X		
Woodward Township			X	X	X	X	X	X		
Clearfield County	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		

Table 88 - Mitigation Actions by Hazard Mitigated

Mitigation Actions by Hazards Mitigated	
Hazard	**Action**
Natural Hazards	
Drought	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Earthquake	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Flooding	1.1.1, 1.1.2, 1.2.1, 1.2.2, 1.3.1, 1.3.2, 1.4.2, 1.4.3, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.3.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.6, 4.3.1, 4.4.2, 5.1.1
Flash Flooding	1.1.1, 1.1.2, 1.3.2, 1.4.2, 1.4.3, 2.3.1, 3.1.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2, 5.1.1
Ice Jam Flooding	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2, 5.1.1
Hurricanes / Tropical Storms	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 3.3.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Invasive Species	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.1.4, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Land Failure / Subsidence	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Pandemic / Epidemic / Infectious Disease	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 3.1.2, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2

Mitigation Actions by Hazards Mitigated	
Hazard	**Action**
Radon Exposure	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Tornadoes / Windstorm	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Wildfire	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 3.3.1, 4.1.1, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.5, 4.2.6, 4.3.1, 4.4.2
Winter Storm	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 3.3.2, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Human-Caused Hazards	
Civil Disturbance / Criminal Activity	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Dam Failure / Levee Failure	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.1, 4.4.2, 4.4.3, 6.1.1, 6.1.2, 6.1.3, 6.2.1, 6.3.1
Emergency Services	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 3.2.2, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Environmental Hazards	1.1.1, 1.1.2, 1.3.2, 1.4.1, 2.1.1, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Opioid Epidemic	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Terrorism / Cyber-Attack	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Transportation Accidents	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2
Utility Interruption	1.1.1, 1.1.2, 1.3.2, 2.3.1, 3.1.1, 4.1.1, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.3.1, 4.4.2

7. Plan Maintenance

7.1. Update Process Summary

Monitoring, evaluating, and updating this plan, is critical to maintaining its value and success in Clearfield 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 Clearfield County Hazard Mitigation Plan update establishes a review of the plan within thirty 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 2022 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 Clearfield County is a responsibility of all levels of government (i.e., county, and local), as well as the citizens of the county. The Clearfield 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 of 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 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 Clearfield County Local Planning Team will complete a hazard mitigation progress report to evaluate the status and accuracy of the multi-jurisdictional HMP and record the local planning team's review process. The annual plan review will be distributed to appropriate representatives at both PEMA and FEMA. The following items will be completed during the annual review and reporting process:

- Review the risk assessment section and identify occurrences of hazards within the last year. Identify date, time, damage, fatalities, and other specific information of the events. Also identify any new hazards that have occurred or increased within the county.

- Complete a review and update of capability assessment section. Identify any capability weaknesses.
- Complete a review of the mitigation strategy section. Review the goals and objectives identified in the 2022 HMP and determine if any updates are needed. Provide all mitigation actions and opportunities to the county and municipalities that are applicable. Have all entities complete an action review matrix and document all results in the report. Also, add any new actions that are identified. Complete a review of each mitigation opportunity and identify that status of each opportunity on the opportunity review spreadsheet. All information will be included in the annual review report.

The Clearfield County Department of Emergency Management will maintain a copy of these records and place them in Appendix I of this plan. Clearfield 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 Clearfield Department of Emergency Management will ensure that the 2022 Clearfield County Hazard Mitigation Plan is posted and maintained on the Clearfield County website and will continue to encourage public review and comment on the plan. The Clearfield County website on which the plan will be located at is https://www.clearfield911.com/.

The public will have access to the 2022 HMP through their local municipal office, the Clearfield County Department of Planning, or the Clearfield County Department of Emergency Management. 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 Clearfield County are encouraged to submit their comments to elected officials and/or members of the Clearfield County HMP Local Planning Team. To promote public participation, the Clearfield 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 Clearfield 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 2022 Clearfield 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 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: **2021 HAZUS Reports**

APPENDIX G: **2021 Mitigation Project Opportunities**

APPENDIX H: **2021 Mitigation Action Evaluation & Prioritization**

APPENDIX I: **Annual Review Documentation**

APPENDIX J: **Clearfield County & Municipal Adoption Resolutions**