CUMBERLAND COUNTY

HAZARD MITIGATION PLAN UPDATE 2020

Prepared by:

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Approval Date:
12/16/2020

Cumberland County Hazard Mitigation Plan

Certification of Annual Review Meetings

The Cumberland County Hazard Mitigation Steering Committee has reviewed this Hazard Mitigation Plan. The director of the Hazard Mitigation Steering Committee hereby certifies the review.

Year	Date Of Meeting	Public Outreach Addressed?*	Signature
2021			
2022			
2023			
2024			
2025			

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

Cumberland County Hazard Mitigation Plan

Record of Changes

Date	Description Of Change Made, Mitigation Action Completed, Or Public Outreach Performed	Change Made By (Print Name)	Change Made By (Signature)

REMINDER: *Please attach all associated meeting agendas, sign-in sheets, handouts, and minutes.* Revision Summary Table	
Revision Number	**Revision Description**
1	
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1. Introduction

1.1 Background

Across the United States, natural and human-made disasters have led to increasing levels of deaths, injuries, property damage, and interruption of business and government services. The time, money, and effort needed to recover from these disasters exhausts resources, diverting attention from important public programs and private agendas. Since 1972 there have been 20 Presidential Disaster Declarations and five Presidential Emergency Declarations affecting Cumberland County in addition to 36 Gubernatorial Declarations or Proclamations affecting Cumberland County since 1963. The emergency management community, citizens, elected officials, and other stakeholders in Cumberland County, Pennsylvania recognize the impact of disasters on their community and support proactive efforts needed to reduce the impact of natural and human-made hazards.

Hazard mitigation describes sustained actions taken to prevent or minimize long-term risks to life and property from hazards and 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.

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

1.2 Purpose

This Hazard Mitigation Plan was developed for the purpose of:

- Providing a blueprint for reducing property damage and saving lives from the effects of future natural and human-made disasters in Cumberland County;
- Qualifying the County for pre-disaster and post-disaster grant funding;
- Complying with state and federal legislative requirements related to local hazard mitigation planning;
- Demonstrating a firm local commitment to hazard mitigation principles; and
- Improving community resiliency following a disaster event.

1.3 Scope

The Cumberland County 2020 Hazard Mitigation Plan has been prepared to meet requirements set forth by the Federal Emergency Management Agency (FEMA) and Pennsylvania Emergency Management Agency (PEMA) in order for the County to be eligible for funding and technical assistance from state and federal hazard mitigation programs. It will be updated and maintained to address both natural and human-made hazards determined to be of significant

risk to the County and/or its local municipalities. Updates will take place following significant disasters or at a minimum, every five years.

1.4 Authority and References

Authority for this plan originates from the following federal sources:

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

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

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

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

- FEMA 386-1: *Getting Started*. September 2002.
- FEMA 386-2: *Understanding Your Risks: Identifying Hazards and Estimating Losses*. August 2001.
- FEMA 386-3: *Developing the Mitigation Plan*. April 2003.
- FEMA 386-4: *Bringing the Plan to Life*. August 2003.
- FEMA 386-5: *Using Benefit-Cost Review in Mitigation Planning*. May 2007.
- FEMA 386-6: *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning*. May 2005.
- FEMA 386-7: *Integrating Manmade Hazards into Mitigation Planning*. September 2003.
- FEMA 386-8: *Multijurisdictional Mitigation Planning*. August 2006.
- FEMA 386-9: *Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects*. August 2008.
- FEMA. *Local Mitigation Planning Handbook.* March 2013.
- FEMA. *Local Mitigation Plan Review Guide.* October 1, 2011.
- FEMA. *National Fire Incident Reporting System 5.0: Complete Reference Guide*. January, 2008.
- FEMA Hazard Mitigation Assistance Unified Guidance. June 1, 2010.
- FEMA. Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for
- Community Officials. March 1, 2013
- FEMA. Mitigation Ideas. A Resource for Reducing Risk to Natural Hazards. January 2013.

The following 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. Pennsylvania's *Hazard Mitigation Planning Standard Operating Guide*. October 18, 2013.
- 2012 Pennsylvania Threat and Hazard Identification and Risk Assessment. December 2012.

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

- NFPA 1600: *Standard on Disaster/Emergency Management and Business Continuity Programs*. 2007.

Please note that hazard mitigation falls within PEMA's Bureau of Recovery and Mitigation (BORM). PEMA's work is both guided and regulated by additional federal and state guidance, including FEMA's Logistics Capability Assessment Tool; FEMA Comprehensive Preparedness Guidance 101; the Federal Critical Infrastructure Protection Act; the Patriot Act; Department of Homeland Security Directives; Presidential Directives 5 and 8; CFR Titles 10, 29, and 49; and the Pennsylvania State Emergency Operations Plan.

2. Community Profile

2.1 Geography and Environment

Cumberland County covers approximately 550 square miles and is located in the south-central portion of the Commonwealth of Pennsylvania. It lies within the Cumberland Valley, a wide fertile valley between two chains of the Appalachian Mountain Range running from northeast to southwest across eastern and south-central Pennsylvania. From the Borough of Shippensburg in the west to the Susquehanna River in the east, Cumberland County stretches approximately 42 miles across. It is bordered by Blue Mountain and North Mountain to the north, South Mountain to the south, and the Susquehanna River, which separates the eastern edge of the County from the City of Harrisburg. The western edge of the County has no significant natural border. A map of Cumberland County is provided as Figure 2.1-1.

Two major tributaries to the Susquehanna River, Yellow Breeches Creek and Conodoguinet Creek, traverse the County in an approximately west-east direction. A map of major watersheds in the County is provided as Figure 2.1-2. Water bodies make up approximately 0.18 percent of the County's geographic area.

Adjacent counties include Perry County to the north, Dauphin County across the Susquehanna River to the east, Adams and York Counties to the south, and Franklin County, which shares the Borough of Shippensburg, to the west.

Figure 2.1-1: Map of Cumberland County showing municipal boundaries, major roads, water bodies and surrounding counties. This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.

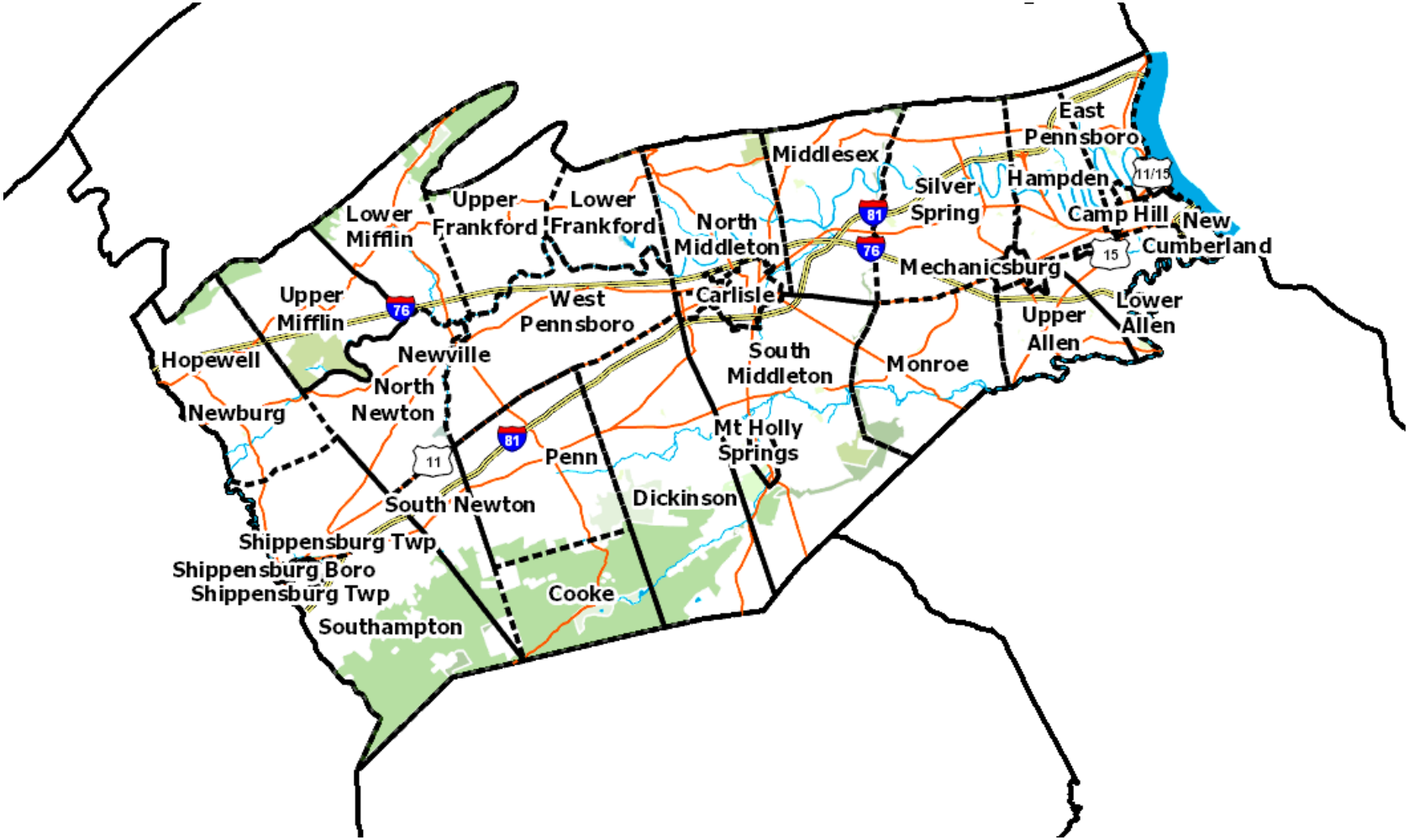
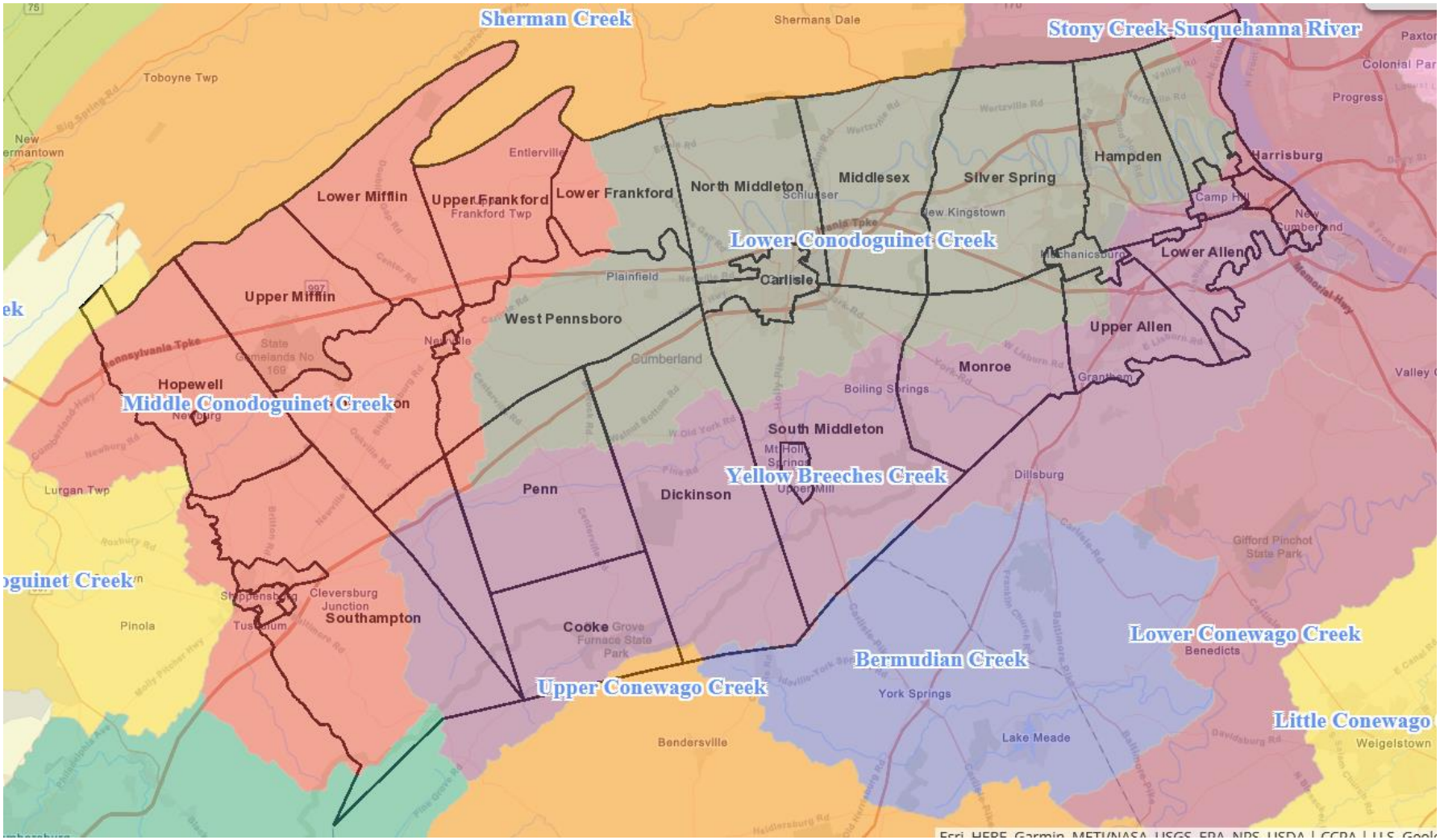


Figure 2.1-2: Major watersheds in Cumberland County. This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.



2.2 Community Facts

Cumberland County was established as a political entity on January 27, 1750 by order of Governor James Hamilton. The County was named in honor of Cumberland, England and at one time covered 35,252 square miles. Other counties were created from the original county territory until its present size was achieved in 1855. Today, the County consists of 22 townships and 11 boroughs which are listed in Table 2.3-1. Several colleges and universities are located in the County, including: Central Pennsylvania College, Dickinson College, Messiah University, Penn State Dickinson School of Law, Shippensburg University, and U.S. Army War College. There are nine public school districts throughout the County.

2.3 Population and Demographics

As of the 2010 Decennial Census, the population of Cumberland County was 235,406. According to the US Census's 2018 Population Estimates Program, Cumberland County's population reached 251,423 people. Population density is highest in the vicinity of Harrisburg (commonly known as the West Shore Area), the Borough of Carlisle (the County seat), and the Borough of Shippensburg. Table 2.3-1 provides a distribution of County population per municipality obtained from the U.S. Census Bureau, Population Estimates Program.

Table 2.3-1: County and Municipal Population in 2010 and Population Estimates from 2011-2018.

Geography	*Census 2010*	*July 1, 2011*	*July 1, 2012*	*July 1, 2013*	*July 1, 2014*	*July 1, 2015*	*July 1, 2016*	*July 1, 2017*	*July 1, 2018*	*% Growth '10-'18*
Cumberland County	235,406	237,101	239,252	241,071	243,301	245,766	247,435	249,238	251,423	6.6%
Camp Hill Borough	7,888	7,876	7,899	7,888	7,888	7,908	7,918	7,916	7,918	0.4%
Carlisle Borough	18,682	18,893	18,946	18,932	18,934	19,136	19,219	19,074	19,196	2.4%
Cooke Township	179	179	179	181	182	183	183	184	184	2.8%
Dickinson Township	5,223	5,244	5,277	5,289	5,301	5,337	5,362	5,385	5,393	3.3%
East Pennsboro Township	20,228	20,497	20,808	21,021	21,273	21,380	21,457	21,390	21,440	4.1%
Hampden Township	28,044	27,978	28,286	28,633	28,921	29,268	29,469	30,020	30,502	9.8%
Hopewell Township	2,329	2,346	2,373	2,373	2,387	2,416	2,440	2,455	2,471	5.8%
Lemoyne Borough	4,553	4,564	4,632	4,624	4,631	4,641	4,642	4,639	4,647	2.0%

Table 2.3-1: County and Municipal Population in 2010 and Population Estimates from 2011-2018.										
Geography	*Census 2010*	*July 1, 2011*	*July 1, 2012*	*July 1, 2013*	*July 1, 2014*	*July 1, 2015*	*July 1, 2016*	*July 1, 2017*	*July 1, 2018*	*% Growth '10-'18*
Lower Allen Township	17,980	17,932	18,116	18,517	18,649	18,950	18,959	19,357	19,453	8.4%
Lower Frankford Township	1,732	1,730	1,733	1,733	1,735	1,771	1,794	1,801	1,817	4.8%
Lower Mifflin Township	1,783	1,781	1,784	1,781	1,784	1,785	1,787	1,784	1,788	0.2%
Mechanicsburg Borough	8,981	8,962	8,985	8,971	8,970	8,989	8,995	8,989	8,992	0.2%
Middlesex Township	7,040	7,123	7,209	7,284	7,296	7,324	7,383	7,421	7,450	5.7%
Monroe Township	5,823	5,872	5,902	5,938	5,977	6,041	6,082	6,117	6,182	6.0%
Mount Holly Springs Borough	2,030	2,034	2,038	2,033	2,035	2,038	2,041	2,041	2,045	0.6%
New Cumberland Borough	7,277	7,269	7,292	7,285	7,281	7,295	7,296	7,299	7,301	0.3%
Newburg Borough	336	336	337	336	336	337	337	335	335	-0.3%
Newville Borough	1,326	1,326	1,333	1,329	1,331	1,334	1,335	1,339	1,347	1.6%
North Middleton Township	11,143	11,216	11,288	11,306	11,360	11,434	11,508	11,575	11,649	4.5%
North Newton Township	2,430	2,448	2,459	2,469	2,482	2,499	2,506	2,507	2,514	3.1%
Penn Township	2,924	2,928	2,947	2,951	2,961	2,968	2,976	2,986	2,998	2.4%
Shippensburg Borough	4,416	4,426	4,438	4,458	4,456	4,467	4,468	4,477	4,490	1.3%
Shippensburg Township	5,429	5,446	5,464	5,461	5,472	5,486	5,491	5,505	5,521	0.8%
Shiremanstown Borough	1,569	1,619	1,622	1,619	1,617	1,621	1,622	1,620	1,621	0.0%
Silver Spring Township	13,657	14,080	14,519	15,078	15,701	16,256	16,872	17,412	17,967	30.8%

Table 2.3-1: County and Municipal Population in 2010 and Population Estimates from 2011-2018.

Geography	*Census 2010*	*July 1, 2011*	*July 1, 2012*	*July 1, 2013*	*July 1, 2014*	*July 1, 2015*	*July 1, 2016*	*July 1, 2017*	*July 1, 2018*	*% Growth '10-'18*
Southampton Township	6,359	6,632	6,672	6,692	6,756	6,817	6,859	6,940	7,035	10.1%
South Middleton Township	14,663	14,760	14,877	14,923	15,056	15,196	15,305	15,341	15,425	4.9%
South Newton Township	1,383	1,403	1,412	1,418	1,421	1,430	1,434	1,434	1,443	4.1%
Upper Allen Township	18,059	18,230	18,410	18,557	19,098	19,389	19,609	19,787	20,158	11.4%
Upper Frankford Township	2,005	2,021	2,028	2,022	2,034	2,044	2,045	2,048	2,063	2.8%
Upper Mifflin Township	1,304	1,315	1,322	1,320	1,331	1,352	1,363	1,377	1,380	5.6%
West Pennsboro Township	5,561	5,571	5,592	5,582	5,580	5,601	5,605	5,612	5,625	1.1%
Wormleysburg Borough	3,070	3,064	3,073	3,067	3,065	3,073	3,073	3,071	3,073	0.1%

Source: Census Bureau Annual Population Estimates.

The U.S. Census Bureau has identified Cumberland County as the fastest growing county in Pennsylvania in 2018. According to the American Community Survey (ACS) estimates, Cumberland County saw a population increase of 16,017 people since the 2010 census. This figure represents a 6.6 percent increase in population. In addition, according to ACS estimates, Silver Spring Township has been ranked as the second fastest growing municipality in the Pennsylvania between 2010 and 2018. Silver Spring has seen its population increase by more than 4,300 residents over eight years to 17,967. The County's rapid growth rate will place additional burden on emergency service providers, critical facilities and infrastructure while potentially making more residents susceptible to hazard events.

Aside from natural population growth, the County's population may temporarily increase during large tourism events especially those operated by Carlisle Events. Carlisle Events hosts some of the largest car, truck and motorcycle collector events in the country, at the Carlisle Fairgrounds in Carlisle Borough and North Middleton Township. The eight specialty shows held between April and October can attract 150,000 to 300,000 visitors to the area. Population values used for Carlisle Borough, North Middleton Township and other surrounding municipalities in the hazard assessments included in this HMP do not directly account for the large volume of people attending such events. However, County law enforcement and emergency responders coordinate with Carlisle Events and municipal partners to maintain an

enhanced state of readiness during these events. Most recently during the COVID-19 pandemic, these events have been cancelled or have been held under guidelines that reduce capacity.

Population density has a strong correlation with hazard vulnerability and loss. For example, more developed areas like the Borough of Carlisle naturally have larger populations and number of structures; therefore they naturally will experience greater loss during hazard events. The population density for Cumberland County and all of the municipalities is shown in table 2.3-2.

Table 2.3-2: 2010 County and Municipal Population Density (US Census).

Municipality	2010 Population	Land Area (Square Miles)	Population Density (Population per square mile)
Cumberland County	**235,406**	**545.5**	**431.5**
Camp Hill Borough	7,888	2.12	3,720.8
Carlisle Borough	18,682	5.5	3,396.7
Cooke Township	179	19.79	9.0
Dickinson Township	5,223	45.81	114.0
East Pennsboro Township	20,228	10.39	1,946.9
Hampden Township	28,044	17.34	1,617.3
Hopewell Township	2,329	27.67	84.2
Lemoyne Borough	4,553	1.61	2,828.0
Lower Allen Township	17,980	10.13	1,774.9
Lower Frankford Township	1,732	14.68	118.0
Lower Mifflin Township	1,783	23.77	75.0
Mechanicsburg Borough	8,981	2.41	3,726.6
Middlesex Township	7,040	25.69	274.0
Monroe Township	5,823	26.09	223.2
Mount Holly Springs Borough	2,030	1.36	1,492.6
Newburg Borough	336	0.18	1,866.7
New Cumberland Borough	7,277	1.67	4,357.5
Newville Borough	1,326	0.42	3,157.1

Table 2.3-2: 2010 County and Municipal Population Density (US Census).			
Municipality	**2010 Population**	**Land Area (Square Miles)**	**Population Density (Population per square mile)**
North Middleton Township	11,143	23.19	480.5
North Newton Township	2,430	22.76	106.8
Penn Township	2,924	29.56	98.9
Shippensburg Borough	4,416	1.31	3,371.0
Shippensburg Township	5,429	2.52	2,154.4
Shiremanstown Borough	1,569	0.3	5,230.0
Silver Spring Township	13,657	32.31	422.7
Southampton Township	6,359	51.43	123.6
South Middleton Township	14,663	48.71	301.0
South Newton Township	1,383	11.32	122.2
Upper Allen Township	18,059	13.2	1,368.1
Upper Frankford Township	2,005	19.43	103.2
Upper Mifflin Township	1,304	21.72	60.0
West Pennsboro Township	5,561	30.23	184.0
Wormleysburg Borough	3,070	0.79	3,886.1

The age of populations can also correlate with vulnerability to hazards. Elderly populations and children may be more susceptible to hazards such as extreme temperature and certain pandemics. Table 2.3-3 depicts 2010 age distribution for the elderly and children; and median age of the population of each Cumberland County municipality.

Table 2.3-3 2010 Age Distribution and Median Age (US Census).										
MUNICIPALITY	**< 5**	**5-9**	**60-64**	**65-69**	**70-74**	**75-79**	**80-84**	**85-89**	**> 90**	**Med Age**
Camp Hill Borough	436	491	509	348	261	259	242	164	96	42.3
Carlisle Borough	1,162	979	1,024	734	565	528	487	411	237	34.1
Cooke Township	5	9	15	13	4	3	0	2	0	45.6
Dickinson Township	246	311	410	268	180	125	81	44	7	45.3
East Pennsboro Township	1,149	1,208	1,293	868	657	520	501	287	123	40.5
Hampden Township	1,618	1,824	1,957	1,342	976	720	589	369	218	42.6
Hopewell Township	183	165	140	89	78	65	37	16	4	37.9
Lemoyne Borough	264	228	282	154	119	94	112	87	39	38.3
Lower Allen Township	727	714	979	689	605	620	711	535	245	41.4
Lower Frankford Township	92	91	114	94	75	38	16	13	7	45.5
Lower Mifflin Township	105	105	115	81	74	34	20	10	1	41.0
Mechanicsburg Borough	512	495	521	394	335	304	204	122	45	39.9
Middlesex Township	311	359	446	316	263	211	179	100	68	43.8
Monroe Township	257	335	475	330	223	148	94	45	22	45.8
Mt. Holly Springs Borough	127	142	121	108	58	52	27	19	7	39.1
New Cumberland Borough	426	415	473	275	205	248	233	137	39	40.7
Newburg Borough	15	29	22	19	9	2	7	5	3	38.3
Newville Borough	96	74	73	59	32	33	25	12	3	36.2
North Middleton Township	659	762	726	537	373	305	229	150	103	41.4
North Newton Township	172	192	122	133	87	65	39	22	3	38.1
Penn Township	167	175	231	121	77	41	52	18	8	41.3
Shippensburg Borough	217	229	170	128	105	117	92	59	38	26.6
Shippensburg Township	69	91	102	71	59	58	61	50	40	20.7

Table 2.3-3 2010 Age Distribution and Median Age (US Census).										
MUNICIPALITY	**< 5**	**5-9**	**60-64**	**65-69**	**70-74**	**75-79**	**80-84**	**85-89**	**> 90**	**Med Age**
Shiremanstown Borough	91	94	85	79	38	58	58	17	12	38.8
Silver Spring Township	727	782	885	704	533	496	331	177	81	43.8
South Middleton Township	736	880	960	844	665	627	436	287	120	45.9
South Newton Township	90	100	73	52	34	35	31	8	11	38.8
Southampton Township	478	469	358	281	236	165	95	41	14	36.5
Upper Allen Township	935	929	1,058	764	649	546	506	339	209	38.2
Upper Frankford Township	112	115	122	114	77	54	25	10	6	42.5
Upper Mifflin Township	68	85	75	60	48	29	15	6	4	41.3
West Pennsboro Township	282	312	398	318	222	189	147	88	67	44.1
Wormleysburg Borough	199	149	140	142	88	80	69	35	21	34.1
COUNTY TOTALS	**12,733**	**13,338**	**14,474**	**10,529**	**8,010**	**6,869**	**5,751**	**3,685**	**1,901**	**40.3**

Note that population information provided throughout the 2020 HMP will utilize data from the 2010 U.S. Census rather than the recent American Community Survey (ACS) estimates. The 2010 Census data represents an actual count of the citizenry while the ACS estimates are based upon a smaller survey sample and therefore have a higher margin of error.

2.4 Land Use and Development

The northern and southern portions of Cumberland County are mountainous and forested with most development occurring in the relatively flat valley between North and South Mountains. The suburbs of Harrisburg extend across the Susquehanna River into the eastern portion of the County. The central and western sections of the County are primarily rural with significant agricultural development.

There are two major (interstate) highways that traverse the County from east to west: I-81 and the Pennsylvania (PA) Turnpike (I-76). Other major highways include I-83, US Routes 11, 15, 11/15, and PA Route 581. The County is part of the Harrisburg metropolitan statistical area and a significant amount of east-west traffic crosses the Susquehanna River on bridges for the three interstate highways. A map of the County is provided in Figure 2.1-1. Additional discussion of future land development is provided in Section 4.5.4.

2.5 Data Sources and Limitations

The Cumberland County HMP uses a variety of data sources, each with its own limitations for usage. Further, the HMP uses the data in a variety of ways to assess the County's vulnerability to hazards and the resulting impacts from those hazards. Data sources and associated limitations are discussed below.

The list of critical facilities provided in Appendix F was developed based on information available from the Cumberland County GIS Department and was confirmed by the Cumberland County Planning Department. Information on the location of hazardous material facilities as well as other data sets was provided by the Cumberland County GIS Department.

Cumberland County maintains a GIS dataset representing the addressed structures. This dataset includes the street address, latitude and longitude coordinates, and other information. A tool was developed that cycled through each municipality in the County, and selected all addressed structures that were within the preliminary FEMA floodplain dataset. When a structure is visible in orthoimagery, the feature is placed on the structure. If no structure is visible, the feature is placed in the center of the tax parcel. For each municipality, records from the Tax Parcels GIS database were selected that contained address points that were within the preliminary FEMA floodplains dataset. The land, building, and total assessed values for these Tax Parcel records were summed to create the values shown in Table 4.5.3-1.

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

vulnerability. The County and municipalities would be capable of producing an even more robust vulnerability assessment in future updates to the HMP by taking two actions. First, the County and municipal building permit and data collection systems should be modified to require and keep on file elevation certificates for all new construction, elevated structures, and other substantial improvements within the 1 percent and 0.2 percent-annual-chance flood hazard areas. Secondly, tax and GIS databases should include information on foundation type, construction type, basement presence, and first-floor elevations for all structures. These recommendations are noted under Goal #1, Action 13 in the Mitigation Action Plan (see Section 6.2).

The countywide Digital Flood Insurance Rate Map (DFIRM), published on March 16, 2009, was used for the 2014 HMP. On April 7, 2015, FEMA held a meeting in Cumberland County to begin a process to update the DFIRMs. FEMA met again with Cumberland County on December 5, 2016 to release a draft version of new DFIRMs for the county. The Preliminary DFIRMs were released to the municipalities on May 14, 2019. After the release, FEMA scheduled a Preliminary Map review and comment meeting on June 26, 2019 for municipal officials. A meeting for the public was also scheduled on November 6, 2019 and the formal public comment period began in early February. As of the writing of this document, the public appeal period has expired and no major appeals were received to the knowledge of Cumberland County As requested by FEMA, these Preliminary DFIRMs were utilized for all mapping and calculations in the 2020 HMP Update.

Traffic crash analysis data was provided by the Pennsylvania Department of Transportation (PENNDOT). Population data from the 2010 Census has been obtained from the U.S. Census Bureau (2019).

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

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

cause loss of life, injuries, significant property damage, and/or disruption to commerce" (NOAA, 2006).

3. Planning Process

3.1 Update Process and Participation Summary

Development of the Cumberland County Hazard Mitigation Plan has undergone several phases. A *Hazards/Vulnerability Analysis* was developed in August 1984 by the Cumberland County Office of Emergency Preparedness in cooperation with PEMA. This report provided an analysis of natural and human-made hazards using criteria including history, vulnerability, maximum threat, and probability of occurrence (Cumberland EOP, 1984). Documented previous events and other information considered still-valid from the 1984 assessment are included in the 2010, 2014 and 2020 HMPs.

The Cumberland County HMSC was first formed in 2004 to construct a plan in order to review hazards that affect the County, assess potential damages from those hazard events, select actions to address the County's vulnerability to such hazards, and develop an implementation-strategy action plan in order to mitigate potential losses. The County HMSC met several times from May 2003 to August 2004; all meetings were open to the public.

An update to the 2004 HMP was initiated in August 2009. With funding support from FEMA, PEMA, the 2010 Hazard Mitigation Plan was completed for submission to PEMA and FEMA on December 7, 2009. Based on comments received from communities, PEMA, and FEMA, revisions were made and the plan was re-submitted to PEMA and FEMA on June 14, 2010.

The 2010 HMP followed the Standard Operating Guide and outline (developed by PEMA in 2009), which provide a standardized format for all local hazard mitigation plans in the Commonwealth of Pennsylvania. As a result, the format of the 2010 HMP contrasted significantly with the previous 2004 version.

The 2014 Hazard Mitigation Plan update began in June 2014 and followed the 2013 Pennsylvania Standard Operating Guide and FEMA's 2013 Local Hazard Mitigation Planning guidance. Use of these guidance documents resulted in additional changes to the formatting of the plan as well as increased emphasis on soliciting other stakeholder participation and on plan integration. In addition to Cumberland County, 33 of 33 local municipalities participated in the 2014 plan update. The 2014 Hazard Mitigation Plan was completed for submission to PEMA on October 21, 2014. Based on comments received from PEMA, revisions were made and the plan was submitted to FEMA on November 5, 2014. All 33 municipalities adopted the final plan.

The County's current plan is a product of the 2020 Hazard Mitigation Plan update. This update was initiated in August 2017 and follows the 2013 Pennsylvania Standard Operating Guide and FEMA's 2013 Local Hazard Mitigation Planning guidance. The Cumberland County Planning Department, Department of Public Safety and Geographic Information System (GIS) Department completed the 2020 Hazard Mitigation Plan Update with consulting assistance from Michael Baker International and members of the HMSC and other stakeholders. The 2020 HMP will utilize Preliminary DFIRMs for all mapping and calculations. In addition to Cumberland County, all 33 local municipalities participated in the 2020 plan update (see Section 3.5). The 2020 Hazard Mitigation Plan was completed for submission to PEMA on October 13, 2020.

Based on comments received from PEMA, revisions were made and the plan was submitted to FEMA on October 19, 2020. The Local Mitigation Plan Review Tool is included as Appendix C.

3.2 The Planning Team

During development of the 2020 Hazard Mitigation Plan Update, the following individuals served as members of the Hazard Mitigation Steering Committee. Those names with an asterisk (*) served on the Executive Committee which met to discuss detailed aspects of the planning process, administrative issues, and consultant coordination.

- * Kirk Stoner, AICP Director of Planning, Cumberland County
- * Steven Hoffman, County Planning Manager/Assistant HMO
- * Justin Smith, County GIS
- * Patrick McKinney, County GIS
- * Justin Shaulis, County Planning Coordinator, Department of Public Safety
- * John Owen, East Pennsboro Township
- * Taylor Griffiths, Carlisle Barracks
- Chris Schultz, American Red Cross
- Mark Malarich, Carlisle Borough
- Jeff, Snyder, Carlisle Borough
- Bradley King, Claremont Nursing
- Robert Kough, Cooke Township
- Daniel Berndt, Dickinson College
- Ashley Zink, Dickinson College
- Larry Barrick, Dickinson Township
- Glenn Kelso, Dickinson Township
- Jacob Crider, Franklin County
- Robert Povlich, Franklin County
- Doug Gochenaur, Hampden Township
- Jason Frank, Lemoyne Borough
- David Holl, Lower Allen Township
- Jim Burkholder, Lower Frankford Township
- Carl Kuhl, Monroe Township
- Jim Collins, Mount Holly Springs Borough
- Troy Russell, Mount Holly Springs Borough
- Jim Benson, New Cumberland Borough
- Harry Kelso, North Middleton Township
- Larry Hinkle, North Newton Township
- Robert Kough, Penn Township
- Theresa Eberly, Silver Spring Township
- Justin Shaulis, South Middleton Township
- Tim Duerr, South Middleton Township
- Allison Earnst, South Middleton Township
- Steven Hoffman, South Newton Township
- Talon Landreth, Southampton Township
- Scott Mack, Southampton Township
- Charles O'Donnell, Southampton Township

- Jenn Boyer, Upper Allen Township
- John Toner, Upper Allen Township
- Wayne Myers, West Pennsboro Township
- Gary Berresford, Wormleysburg Borough

Additionally, the community representatives shown in Table 3.2-1 served on the 2020 countywide planning team and actively participated in the planning process through completion of online surveys, and/or submission of comments. Participants representing multiple jurisdictions are listed more than once. Notable participants include:

- Taylor Griffiths, representing U.S. Army War College/Carlisle Barracks
- Jacob Crider and Robert Povlich representing Franklin County
- Ashley Zink and Daniel Berndt representing Dickinson College.
- Chris Schultz representing the American Red Cross

Table 3.2-1: Municipalities represented by the 2020 HMP and local community representatives from all 33 municipalities who participated in the online survey or planning process.

Municipality	Name	Title
Camp Hill Borough	Chris Miller	Fire Marshal and Code Enforcement Officer
Carlisle Borough	Jeffrey Snyder	Borough Fire Chief / Local Emergency Management Coordinator
Cooke Township	Robert Kough	Local Emergency Management Coordinator
Dickinson Township	Larry Barrick, Jr.	Township Manager
East Pennsboro Township	Erik Owen	Fire Chief/Deputy Local Emergency Management Coordinator
Hampden Township	Keith Metts	Township Manager
Hopewell Township	Kim Myers	Secretary/Treasurer
Lemoyne Borough	Cliff Karlsen	Codes/Zoning Administrator
Lemoyne Borough	Jason Frank	Deputy Emergency Management Coordinator
Lower Allen Township	David Holl	Public Safety Director/Emergency Management Coordinator
Lower Frankford Township	Jim Burkholder	Chairman / Supervisor
Lower Mifflin Township	Brandi Lay	Secretary – Treasurer
Mechanicsburg Borough	Nate Wardle	Emergency Management Coordinator
Mechanicsburg Borough	Roger L. Ciecierski	Borough Manager
Middlesex Township	Edwin Beam	EMA Coordinator
Monroe Township	Carl Kuhl	Supervisor
Monroe Township	Carl Kuhl	Supervisor
Mount Holly Springs Borough	James Collins	Council President
Mount Holly Springs Borough	Troy Russell	Code Enforcement Officer
New Cumberland Borough	James Benson	Fire Chief
Newburg Borough	Ed Chamberlin	Local Emergency Management Coordinator
Newburg Borough	Sara Rhine	Secretary

Table 3.2-1: Municipalities represented by the 2020 HMP and local community representatives from all 33 municipalities who participated in the online survey or planning process.		
Municipality	**Name**	**Title**
Newville Borough	Fred A. Potzer	Borough Manager / Secretary
North Middleton Township	John Epley	Manager
North Newton Township	Larry Hinkle	Emergency Manager
Penn Township	Robert Kough	Local Emergency Management Coordinator
Shippensburg Borough	David Lindenmuth	Local Emergency Management Coordinator
Shippensburg Township	David Lindenmuth	Local Emergency Management Coordinator
Shippensburg Township	Linda Asper	Township Supervisor
Shiremanstown Borough	Janna Colechio	Borough Secretary
Silver Spring Township	Theresa Eberly	Township Manager
South Middleton	Kurt Uhler	Director of Public Works
South Middleton Township	Timothy Duerr	Director of Community Development / Planning Director / Zoning Officer
South Middleton Township	Ronald Hamilton	Emergency Services Administrator
South Middleton Township	Bryan Gembusia	Township Supervisor
South Newton Township	Steven Hoffman	Chairman, Zoning Hearing Board
Southampton Township	Jerry Swope	Zoning/Codes Officer & Emergency Management Coordinator
Southampton Township	Scott J. Mack	Supervisor
Upper Allen Township	Jennifer Boyer	Community Development Director
Upper Frankford Township	Dawn Grove	Secretary/Treasurer/Emergency Management Coordinator
Upper Mifflin Township	Bob Shively	Local Emergency Management Coordinator
West Pennsboro Township	Wayne E. Myers	Local Emergency Management Coordinator
Wormleysburg Borough	Gary Berresford	Borough Manager

Invitations to participate in the planning process were also sent to many other stakeholder groups in an effort to assemble a well-rounded planning team. However, not all invitees chose to participate. The stakeholders invited are listed in Table 3.2-2 and detailed in Appendix D.

Table 3.2-2: Stakeholder organizations invited to participate in the 2019 planning process.	
Organization	**Organization**
Cumberland County Conservation District	American Red Cross
Pennsylvania DCNR	Department of Homeland Security
Governor's Office of Homeland Security	LionTide Security
Mission Critical Partners	PA Department of Labor and Industry
PA Department of Human Services	Pa Fish and Boat Commission
Perry County 911	Perry County LEPC
Pennsylvania State Police	Susquehanna River Basin Commission
Big Spring School District	Capital Area Intermediate Unit

Table 3.2-2: Stakeholder organizations invited to participate in the 2019 planning process.	
Organization	**Organization**
Camp Hill School District	Carlisle Area School District
Central Penn College	Cumberland Perry Vo-Tech
Cumberland Valley School District	Dickinson College
East Pennsboro Area School District	Mechanicsburg Area School District
Safe Schools / MG Tactical	Shippensburg Area School District
Shippensburg University	South Middleton School District
West Shore School District	Yellow Breeches Watershed Association
York County	Franklin County
Adams County	Dauphin County

3.3 Meetings and Documentation

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

Table 3.3-1: Stakeholder organizations invited to participate in the 2019 planning process.			
Date	**Organization**	**Attendance**	**Purpose**
4/16/2018	Local Emergency Management Coordinator (LEMC	10	Purpose of the HMP, Steering Committee contact information and volunteers to assist with the HMP update.
5/10/2018	Local Emergency Planning Committee (LEPC)	6	Purpose of the HMP, Steering Committee contact information and volunteers to assist with the HMP update. Hazard Mitigation Project listing.
10/15/2018	Local Emergency Management Coordinator	20	Purpose of the HMP, Steering Committee contact information and volunteers to assist with the HMP update.
10/25/2018	HMP Executive Committee	9	List of hazards, review of task list, project schedule and agenda for the Hazard Mitigation Steering Committee Meeting.
12/4/2018	HMP Steering Committee	44	Introduction and purpose, planning process, HMP schedule and municipal participation requirements. Evaluation of Hazards worksheet. Introduction of online survey.
1/30/2019	HMP Executive Committee	8	Plan progress and schedule. Date and agenda for the next Hazard Mitigation Steering Committee meeting
2/5/2019	HMP Steering Committee	37	Provide an update, review of scope, summary of online survey results and future participation opportunities. Review and comment on goals, objectives and action items
6/26/2019	FEMA CCO	61	Representatives from FEMA invited municipal officials to comment on the release of updated DFIRMs.
6/26/2019	HMP Executive Committee	9	Review of project schedule and task list-revised based on FEMA comments.

Table 3.3-1: Stakeholder organizations invited to participate in the 2019 planning process.			
Date	**Organization**	**Attendance**	**Purpose**
11/6/2019	Cumberland County Planning Department	105	FEMA answered questions posed by residents of Cumberland County with regard to the Preliminary DFIRM release.
9/17/2020	HMP Executive Committee	26	Final review of HMP and Distribution of HMP Plan website for review. Final Review of Goals, Objectives and Action Items.
9/24/2020	Cumberland County Planning Department	8	Public Meeting to review the Draft HMP.

September 24, 2020: A virtual public planning session was held on September 24, 2020, to review the Draft HMP. A public notice announcing this meeting was published in *The Sentinel* one week in advance of the event and was also posted to the project website. In addition, an email invitation was sent directly to municipal partners and posted on several social media pages. Attendees were also informed of the opportunity to review the entire draft HMP and provide comments via the project website, https://www.ccpa.net/DocumentCenter/View/36503/2020-DRAFT-Cumberland-County-HMP-August-Update.

3.4 Public Participation

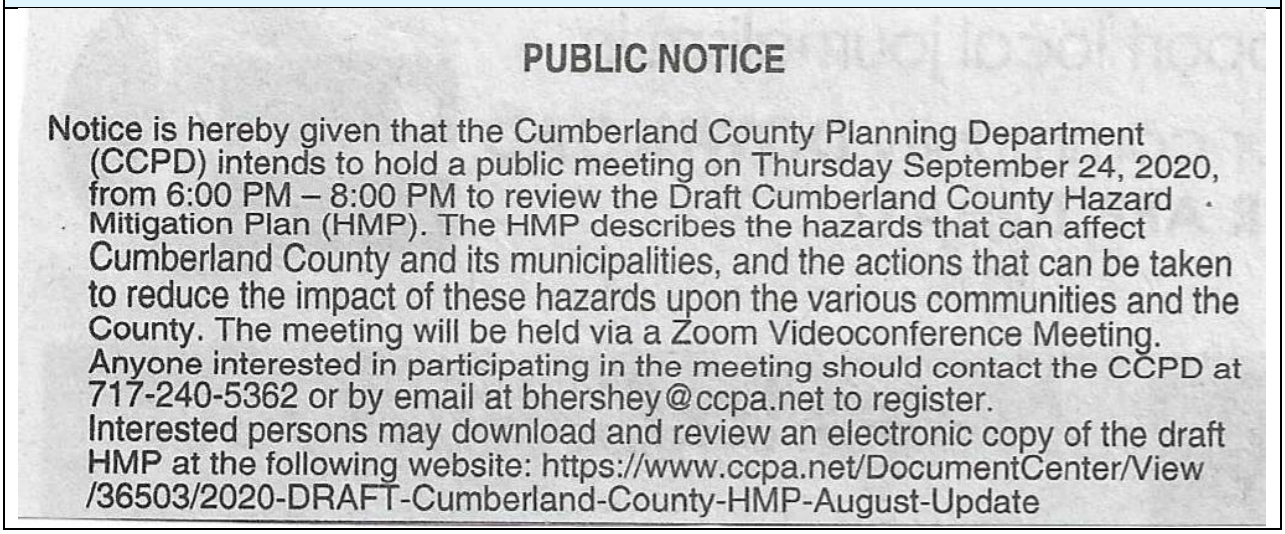
One of the goals of the 2020 HMP was to gather more input from the public. An online survey was designed for the general public and included as part of the 2020 HMP. This survey was designed to gain information regarding hazards from Cumberland County residents. A link to this survey was distributed via social media and via email to all of the municipalities and stakeholders. 179 residents of Cumberland County completed the survey which can be reviewed in Appendix D. The results are noted throughout the 2020 HMP and used to refine outreach efforts and evaluate the hazards profiled in the 2020 HMP. Some of the key results include:

- 96.7% of the respondents either own property or live in the county. 88.8% of the respondents own their residence.
- 86% of the respondents have lived in the county for more than 5 years.
- 64.25% of the respondents are not aware of the Hazard Mitigation Plan.
- Only 5.6% of the respondents live in a designated floodplain area and 8.4% are not sure if they live in a floodplain.
- In the event of a natural disaster, only 7.3% of the respondents get their information from the newspaper. Most people get disaster information from the internet, text alerts and television.

Public comment was encouraged throughout the planning process. A newspaper notice was published in *The Sentinel* on September 10, 2020, to notify the citizens of Cumberland County of the planning session held on September 24, 2020 and the draft plan review. The notice was also posted to the project website. A copy of this notice is shown in Figure 3.4-1. Additionally,

notification of the HMP update sent to representatives from neighboring counties is included in Appendix D.

Figure 3.4-1: Notice of September 24, 2020, planning session published in *The Sentinel* (also posted on the project website).



PUBLIC NOTICE

Notice is hereby given that the Cumberland County Planning Department (CCPD) intends to hold a public meeting on Thursday September 24, 2020, from 6:00 PM – 8:00 PM to review the Draft Cumberland County Hazard Mitigation Plan (HMP). The HMP describes the hazards that can affect Cumberland County and its municipalities, and the actions that can be taken to reduce the impact of these hazards upon the various communities and the County. The meeting will be held via a Zoom Videoconference Meeting. Anyone interested in participating in the meeting should contact the CCPD at 717-240-5362 or by email at bhershey@ccpa.net to register. Interested persons may download and review an electronic copy of the draft HMP at the following website: https://www.ccpa.net/DocumentCenter/View/36503/2020-DRAFT-Cumberland-County-HMP-August-Update

3.5 Multi-Jurisdictional Participation

This hazard mitigation plan was developed using a multi-jurisdictional approach. With funding support from PEMA, County level departments had resources such as technical expertise and data which some local jurisdictions lacked. To undertake such a regional planning effort, the County depended on involvement from local municipalities. This involvement was critical to the collection of local knowledge related to hazard events. Local municipalities also have the legal authority to enforce compliance with land use planning and development issues. The County undertook an intensive effort to involve all 22 townships and 11 boroughs in the planning process. In addition, adjacent county representatives, stakeholders, critical facility managers, school districts, conservation groups and others were included in the planning process.

Each municipality was given multiple opportunities to participate in the HMP update process through invitations to meetings, an online survey, review of risk assessment results and mitigation actions, and completion of worksheets and surveys. All participants were also given the opportunity to review and comment on the draft HMP. The six tools listed below were posted to the project website, sent by online survey or distributed via live meetings and email to solicit data, information, and comments from all 33 local municipalities in Cumberland County. Responses to these worksheets and surveys, which were largely received via email, meeting participation and online survey responses are included in Appendix D.

1) ***Evaluation of Identified Hazards and Risk Worksheet***: Requests feedback from municipal officials regarding perceived changes to hazards in terms of frequency of occurrence, magnitude of impact, and/or geographic extent and solicits additional comments as well.

This form was distributed during the first Hazard Mitigation Steering Committee meeting. 24 of the 33 municipalities completed the Identified Hazards and Risk Worksheet. These completed worksheets are available in Appendix D.

2) ***Hazards in Your Community Worksheet***: Identifies the most significant hazards in each municipality in terms of spatial extent, probable impact, probability of future events, and overall significance.

   This worksheet was re-created using an online survey that was completed by 33 out of 33 municipalities. The results of the survey can be reviewed in Appendix D.

3) ***Capability Assessment Survey***: Collects information on municipal planning and regulatory, administrative and technical, fiscal, and education and outreach capabilities that can be included in the countywide mitigation strategy.

   This form was completed by the Cumberland County Planning Department and distributed via email to all 33 municipalities for concurrence. The results are included in Appendix D.

4) ***National Flood Insurance Program (NFIP) Worksheet***: Collects information on each municipality's participation in and continued compliance with the NFIP and identifies areas for improvement that could be potential mitigation actions.

   This form was completed by the Cumberland County Planning Department and distributed via email to all 33 municipalities for concurrence. The results are included in Appendix D.

5) ***Action and Goal Progress Worksheet***: Evaluates previous mitigation goals, objectives, actions, and projects for the purpose of determining whether they should be continued, modified, or removed from updated plan. This worksheet also aims to record progress made on actions contained in the 2014 HMP and to suggest new actions for inclusion in the 2020 plan (Appendix J).

   The 2014 mitigation goals, objectives and action items were discussed during the second HMSC meeting. For the 2020 HMP, the goals, objectives and action items were all modified to improve HMP implementation. The revised goals, objectives, and action items better reflect the day to day activities of implementing agencies and include practical and feasible actions that will more likely be completed. Additionally, the revised goals, objectives, and action items will simplify the annual meetings and associated progress reports required by the HMP. This new layout can be reviewed in Section 6.2.

6) **New Mitigation Action Form:** Requests information for proposed new mitigation actions and flood mitigation projects.

   Requests for new mitigation actions were made throughout the HMP update process. Requests were made at the first two HMSC meetings and via email invitations. See Appendix I.

Figure 3.5-1: Municipal and Stakeholder Meeting for the 2020 HMP Update (Photo courtesy of Cumberland County Planning Department, 2019).

The project website was discussed at the HMSC meetings. The website includes a project schedule with meeting information and other project milestones; and a library with the 2020 surveys, NFIP forms and Capability Assessment. In addition, the website contains the 2014 HMP (The draft 2020 HMP was added on September 1, 2020). The website also contains informational website links including a link to FEMA's *Hazard Mitigation Grant Program* and a link to the *PEMA 2013 Standard Operating Guide*. The website also includes an email for the Cumberland County Planning Department Manager, Steven Hoffman, who is able to answer questions about the 2020 HMP. This website is available at https://www.ccpa.net/926/Hazard-Mitigation-Plan.

A participation matrix is provided in Appendix D, which documents community presence at the meetings, through an online survey described in Section 3.5 and other involvement from each jurisdiction throughout the planning process. In addition to Cumberland County, 33 of 33 local municipalities participated in the 2020 plan update.

Note that part of Shippensburg Borough is in Franklin County. This plan only addresses the risks to Cumberland County residents. Shippensburg Borough should adopt both the Cumberland County and Franklin County Hazard Mitigation Plans.

4. Risk Assessment

4.1 Update Process Summary

This risk assessment provides a factual basis for activities proposed by the County in their mitigation strategy. Hazards that may affect Cumberland County are identified and defined in terms of location, geographic extent, magnitude of impact, previous events and likelihood of future occurrence.

The HMSC and municipal stakeholders identified natural and human-made hazards that have the potential to impact Cumberland County. These parties were invited to complete the *Evaluation of Identified Hazards and Risk* worksheet during an HMSC meeting held on November 4, 2018. Completed worksheets are included in Appendix D. Most respondents indicated "no change" to the risk levels of most hazards profiled in the 2014 HMP, but more than 50% of the responses indicated "increased" risk level for transportation accidents, flood/flash flood/ice jam and subsidence/sinkhole hazards. Further, 84% of the responses indicated "no change" risk level for landslide, levee failure and nuclear incident hazards. Additionally, the worksheet provided the opportunity to comment on whether any hazards not previously profiled in the HMP have the potential to affect the community significantly. Hazards receiving the largest number of responses included invasive species, climate change, extreme temperature and hailstorm. The County has added language throughout the 2020 HMP that discusses climate change and the impacts that climate change will have on other hazards. The County has elected not to add additional hazard profiles to the HMP at this time, in order to focus mitigation efforts on the most pressing issues.

The occurrence of a past hazard event in the County provided an indication of future possible incidence, but the fact that a hazard event has not previously occurred did not exclude the hazard from further investigation. Hazard profiles have been developed in order to define the characteristics of the hazard as it applies to Cumberland County.

Following hazard identification, municipalities were invited to assess the level of risk for each hazard via an online survey that was sent out to municipalities on December 4, 2018. The results of the survey are included in Appendix D; these results also contributed to the development of the Risk Factor Rankings, seen in Table 4.5-2. Per the 2013 Standard Operating Guide, a jurisdictional risk comparison matrix has been added to the 2020 HMP as Table 4.5-3 to indicate whether each municipality's level of risk for each hazard is greater than, less than, or equal to the County's risk factor.

Finally, a vulnerability assessment was performed to identify the impact of natural or human-caused hazard events on people, buildings, infrastructure, and the community. Each natural and human-made hazard is discussed in terms of its potential impact on individual communities in Cumberland County, including the types of structures and critical facilities that may be at risk. The assessment allows the County and its municipalities to focus mitigation efforts on areas most likely to be damaged or most likely to require early response to a hazard event. A vulnerability analysis was performed that identifies structures, critical facilities, or people that may be impacted by hazard events and describes what those events can do to physical, social,

and economic assets. Depending upon data availability and the nature of the hazard, assessment results may include an inventory of vulnerable structures, facilities, or populations.

Section 4.2 provides an updated summary of previous disaster declarations affecting Cumberland County as well as a review of hazards identified as having the potential to impact the County in 2020. Landslide and levee failure, are not profiled in the 2020 HMP. Landslides were not profiled due to a lack of occurrence and loss as a result of landslides. Only one occurrence of a rockslide was recorded in Cumberland County in 2009. No other significant events have been recorded. Levees were not profiled because there are no occurrences of a functioning levee in Cumberland County. The removal of landslides and levee failure is further justified in Appendix D where the 2014 list of hazards are ranked by municipal officials and residents of Cumberland County. A more detailed storyline summary of risk assessments completed for Cumberland County dating back to 1984 and the hazards identified through those efforts is provided in Section 4.2.2. Only the most current and credible sources were used to complete the hazard profiles included in Section 4.3. In some instances, sources providing improved information have superseded those used in the 2004, 2010 and 2014 HMP; see citations and Appendix A for source details.

Results of structure inventory analyses for various hazards may differ from what was previously shown in the 2010 and 2014 HMP. The property values for each municipality were obtained using records from the Cumberland County Tax Assessment office and include assessed values of land, building, and total assessed values shown in Table 4.5.3-1. These differences are a result of more recent structure inventory data and values as noted in Section 2.5.

The 2020 HMP now includes High Hazard Potential Dam (HHPD) information. This information can be found in Appendix G in the Dam Failure Profile. Data from the Pennsylvania Dam Safety data was used for this profile.

Other additions to the risk assessment in 2020 include photographs illustrating past hazard events in Cumberland County, a discussion of environmental impacts caused by relevant hazards, supplemental mapping, and additional tables to indicate the number of structures and critical facilities vulnerable to each hazard.

4.2 Hazard Identification

4.2.1. Table of Presidential Disaster Declarations

Presidential Disaster and Emergency Declarations are issued when it has been determined that state and local governments need assistance in responding to a disaster event. Table 4.2-1 identifies Presidential Disaster and Emergency Declarations issued between 1955 and 2020 that have affected Cumberland County as listed on the FEMA website at: https://www.fema.gov/disasters/grid/state-tribal-government/44?field_disaster_type_term_tid_1=All.

Table 4.2-2 lists Gubernatorial Disaster Declarations or Proclamations that have been issued for Cumberland County between 1954 and 2020 as noted on the PEMA website at: https://www.pema.pa.gov/Pages/Governors-Proclamations.aspx. Both Presidential and Gubernatorial actions provide preliminary information on previous hazard events.

Table 4.2-1: Presidential Disaster and Emergency Declarations affecting Cumberland County (FEMA, 2020)		
Declaration Number	**Date**	**Event**
4506	March 30, 2020	Covid-19 Pandemic
4267	January 2016	Severe Winter Storm
3356*	October-November, 2012	Hurricane Sandy
3340*	September-October, 2011	Remnants of Tropical Storm Lee
4030	September-October, 2011	Tropical Storm Lee
1898	February, 2010	Severe Winter Storms and Snowstorms
1649	June, 2006	Severe Storms, Flooding, Mudslides
3235*	September, 2005	Hurricane Katrina Evacuee Assistance
1557	September, 2004	Tropical Depression Ivan
1497	September, 2003	Tropical Storms Henri & Isabel
3180*	February, 2003	Severe Winter Storm
1294	September, 1999	Hurricane Floyd
1138	September, 1996	Hurricane Fran
1085	January, 1996	Severe Winter Storm
1093	January, 1996	Flooding
1015	January, 1994	Severe Winter Storm
3105*	March, 1993	Severe Winter Storm
523	October, 1976	Severe Storms, Flooding
485	September, 1975	Hurricane Eloise
340	June, 1972	Hurricane Agnes
* Presidential Emergency Declaration		

Table 4.2-2: Gubernatorial Disaster Declarations or Proclamations affecting Cumberland County (PEMA, 2020)	
Date	**Event**
June 2020	COVID-19 Pandemic (Renewal)
May 2020	Civil Disturbance
May 2020	Opioid Crisis (Renewal)
March 2020	COVID-19 Pandemic
February 2020	Opioid Crisis (Renewal)
December 2019	Opioid Crisis (Renewal)
September 2019	Opioid Crisis (Renewal)
June 2019	Opioid Crisis (Renewal)
March 2019	Opioid Crisis (Renewal)
January 2019	Severe Winter Storm
September 2018	Opioid Crisis (Renewal)
August 2018	Potential Flooding
June 2018	Opioid Crisis (Renewal)
April 2018	Opioid Crisis (Renewal)
January 2018	Opioid Crisis

Table 4.2-2: Gubernatorial Disaster Declarations or Proclamations affecting Cumberland County (PEMA, 2020)	
Date	**Event**
March 2017	Severe Winter Storm
January 2016	Severe Winter Storm
August 2015	Severe Storms and Flooding
January 2015	Severe Winter Storm
September 2014	Public Safety Threat (State Police Ambush)
February 2014	Prolonged Severe Winter Weather
January-February 2014	Winter Fuel Delivery (Extreme Cold)
May 2013	Dauphin County Bridge (Transportation Accident)
April 2012	Severe Winter Storm
January 2011	Severe Winter Storm
April 2007	Severe Winter Storm
February 2007	Winter Fuel Delivery (Extreme Cold)
September 2006	Tropical Depression Ernesto
February 2003	Severe Winter Storm
February 2002	Drought
July 1999	Drought
July 1991	Drought
November 1980	Drought
February 1978	Severe Winter Storm
January 1978	Severe Winter Storm
September 1963	Drought

Since 1955, declarations have been issued for various hazard events including hurricanes or tropical storms, severe summer and winter storms, flooding, and drought. A unique Presidential Emergency Declaration was issued in September 2005. Through Emergency Declaration 3235, President George W. Bush declared that a state of emergency existed in the Commonwealth of Pennsylvania and ordered federal aid to supplement Commonwealth and local response efforts to help people evacuated from their homes due to Hurricane Katrina. All counties within the Commonwealth, including Cumberland County, were indirectly affected by Hurricane Katrina as a result of evacuee assistance.

In May 2013 a unique Gubernatorial Disaster was declared when a tanker truck carrying about 7,500 gallons of diesel fuel overturned on the ramp and highway bridge that carries two lanes of traffic over Interstate Route 81 North to US Route 22/322 westbound in Dauphin County. The massive fire that resulted caused damage to the surface of the bridge and also to the highway bridge above the scene of the fire. The disaster resulted in closure of Interstate 81 and US Route 22/322 westbound during the demolition and replacement of damaged components, causing a severe disruption to transportation in the Capitol Region, including Cumberland County. Additionally, on September 12, 2014, two state troopers were shot at the PA State Police Barracks in Blooming Grove Township, triggering a statewide manhunt for the suspect

and a Gubernatorial Disaster Declaration to assist with law enforcement resource deployment (PEMA, 2018).

At the time of the writing of this document, current disaster declarations have been issued for the COVID-19 pandemic and a state proclamation regarding civil disobedience. While civil disobedience has not impacted Cumberland County, a disaster declaration for the COVID-19 pandemic is still in effect for Pennsylvania, including Cumberland County which has had over 1,000 case of COVID-19 and 69 deaths (PA Department of Health, July, 2020).

4.2.2. Summary of Hazards

As discussed in the Risk Assessment Update Process Summary (Section 4.1), the HMSC and municipalities were invited in 2018 to complete the *Evaluation of Identified Hazards and Risk* worksheet during a HMSC meeting held at the County Planning Office. The respondents provided feedback on perceived changes to the level of risk for each hazard profiled in 2014, suggested hazards that were not previously profiled but have the potential to affect the community significantly and provided feedback regarding hazards profiled in the 2014 HMP that are not profiled in the 2020 HMP due to lack of occurrence or if the hazard is profiled and mitigated in other existing plans. After evaluation of these forms, the Standard List of Hazards from the SOG, and the 2018 Standard State All-Hazard Mitigation Plan, the HMSC determined that Cumberland County's 2020 HMP would identify, profile, and analyze the following hazards in the 2020 HMP. Table 4.2-3 contains a complete list of the profiled hazards and their descriptions.

Table 4.2-3: List of hazards profiled in the 2020 HMP with associated descriptions.

Profiled Hazards	Description
Natural	
Drought	Drought is a natural climatic condition which occurs in virtually all climates, the consequence of a natural reduction in the amount of precipitation experienced over a long period of time, usually a season or more in length. High temperatures, prolonged winds, and low relative humidity can exacerbate the severity of drought. This hazard is of particular concern in Pennsylvania due to the presence of farms as well as water-dependent industries and recreation areas across the Commonwealth. A prolonged drought could severely impact these sectors of the local economy, as well as residents who depend on wells for drinking water and other personal uses (National Drought Mitigation Center, 2006).
Earthquake	An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10-20 miles of the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of underground caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons, and disrupt the social and economic functioning of the affected area. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking which is dependent upon amplitude and duration of the earthquake (FEMA, 1997).

Table 4.2-3: List of hazards profiled in the 2020 HMP with associated descriptions.	
Profiled Hazards	**Description**
Flood, Flash Flood, & Ice Jam	Flooding is the temporary condition of partial or complete inundation on normally dry land and it is the most frequent and costly of all hazards in Pennsylvania. Flooding events are generally the result of excessive precipitation. General flooding is typically experienced when precipitation occurs over a given river basin for an extended period of time. Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location, often along mountain streams and in urban areas where much of the ground is covered by impervious surfaces. The severity of a flood event is dependent upon a combination of stream and river basin topography and physiography, hydrology, precipitation and weather patterns, present soil moisture conditions, the degree of vegetative clearing as well as the presence of impervious surfaces in and around flood-prone areas. Winter flooding can include ice jams which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams. All forms of flooding can damage infrastructure (USACE, 2007).
Hurricane, Tropical Storm, & Nor'easter	Hurricanes and tropical storms are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise (in the Northern Hemisphere) and whose diameter averages 10-30 miles across. While most of Pennsylvania is not directly affected by the devastating impacts cyclonic systems can have on coastal regions, many areas in the state are subject to the primary damaging forces associated with these storms including high-level sustained winds, heavy precipitation and tornadoes. Areas in southeastern Pennsylvania could be susceptible to storm surge and tidal flooding. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea and Gulf of Mexico during the official Atlantic hurricane season which extends from June through November (FEMA, 1997). Nor'easters are extra-tropical storms which typically develop from low-pressure centers off the Atlantic Coast north of North Carolina during the winter months. Extra-tropical is a term used to describe a hurricane or tropical storm with a cyclone that has lost its 'tropical' characteristics. While an extra-tropical storm denotes a change in weather pattern and how the storm is gathering energy, it may still have northeast winds that are tropical storm or hurricane force. Nor'easters can also produce heavy precipitation in the form of rain, snow, or ice. Although not a concern for Cumberland County, nor'easters may cause coastal flooding and beach erosion.
Pandemic and Infectious Disease	A pandemic occurs when infection from of a new strain of a certain disease, to which most humans have no immunity, substantially exceeds the number of expected cases over a given period of time. Such a disease may or may not be transferable between humans and animals. (Martin & Martin-Granel, 2006).
Subsidence & Sinkholes	Subsidence is a natural geologic process that commonly occurs in areas with underlying limestone bedrock and other rock types that are soluble in water. Water passing through naturally occurring fractures dissolves these materials leaving underground voids. Eventually, overburden on top of the voids causes a collapse which can damage structures with low strain tolerances. This collapse can take place slowly over time or quickly in a single event. Karst topography describes a landscape that contains characteristic structures such as sinkholes, linear depressions and caves. In addition to natural processes, human activity such as water, natural gas and oil extraction can cause subsidence and sinkhole formations. (FEMA, 1997).
Tornado & Windstorm	A wind storm can occur during severe thunderstorms, winter storms, coastal storms, or tornadoes. Straight-line winds such as a downburst have the potential to cause wind gusts that exceed 100 miles per hour. Based on 40 years of tornado history and over 100 years of hurricane history, FEMA identifies western and central Pennsylvania as being more susceptible to higher winds than eastern Pennsylvania. (FEMA, 1997). A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes or tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of high wind velocities and wind-blown debris. According to the National Weather Service,

Table 4.2-3: List of hazards profiled in the 2020 HMP with associated descriptions.	
Profiled Hazards	**Description**
	tornado wind speeds can range between 30 to more than 300 miles per hour. They are more likely to occur during the spring and early summer months of March through June and are most likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touch down briefly, but even small, short-lived tornadoes can inflict tremendous damage. Destruction ranges from minor to catastrophic depending on the intensity, size, and duration of the storm. Structures made of light materials such as mobile homes are most susceptible to damage. Waterspouts are weak tornadoes that form over warm water and are relatively uncommon in Pennsylvania. Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 2002). Based on NOAA Storm Prediction Center Statistics, the number of recorded F3, F4, & F5 tornadoes between 1950-1998 ranges from <1 to 15 per 3,700 square mile area across Pennsylvania (FEMA, 2009). A water spout is a tornado over a body of water (American Meteorological Society, 2009).
Wildfire	A wildfire is a raging, uncontrolled fire that spreads rapidly through vegetative fuels, exposing and possibly consuming structures. Wildfires often begin unnoticed and can spread quickly, creating dense smoke that can be seen for miles. Wildfires can occur at any time of the year, but mostly occur during long, dry hot spells. Any small fire in a wooded area, if not quickly detected and suppressed, can get out of control. Most wildfires are caused by human carelessness, negligence and ignorance. However, some are precipitated by lightning strikes and in rare instances, spontaneous combustion. Wildfires in Pennsylvania can occur in fields, grass, brush and forests. 98 percent of wildfires in Pennsylvania are a direct result of people, often caused by debris burns (DCNR, 2009).
Winter Storm	Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. A winter storm can range from a moderate snowfall or ice event over a period of a few hours to blizzard conditions with wind-driven snow that lasts for several days. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely impair visibility and disrupt transportation. The Commonwealth of Pennsylvania has a long history of severe winter weather. (NOAA, 2009).
Human-Made	
Civil Disturbance	Civil disturbance hazards encompass a set of hazards emanating from a wide range of possible events that cause civil disorder, confusion, strife, and economic hardship. Civil disturbance hazards include the following: • Famine; involving a widespread scarcity of food leading to malnutrition and increased mortality (Robson, 1981). • Economic Collapse, Recession; Very slow or negative growth, for example (Economist, 2009). • Misinformation; erroneous information spread unintentionally (Makkai, 1970). • Civil Disturbance, Public Unrest, Mass Hysteria, Riot; group acts of violence against property and individuals, for example (18 U.S.C. § 232, 2008). • Strike, Labor Dispute; controversies related to the terms and conditions of employment, for example (29 U.S.C. § 113, 2008). In 2018, the DLI Office of Unemployment Compensation listed school strikes and healthcare strikes as two types of labor disputes with the potential to cause civil disturbance hazards in Pennsylvania
Dam Failure	A dam is a barrier across flowing water that obstructs, directs, or slows down water flow. Dams provide benefits such as flood protection, power generation, drinking water, irrigation and recreation. Failure of these structures results in an uncontrolled release of impounded water. Failures are relatively rare, but immense damage and loss of life is possible in downstream communities when such events occur. Aging infrastructure, hydrologic, hydraulic and geologic characteristics, population growth and design and maintenance practices should be considered when assessing dam failure hazards. The failure of the South Fork Dam, located in Johnstown, PA, was the deadliest dam failure ever experienced in the United States. It took place in 1889 and resulted in the Johnstown Flood which claimed 2,209 lives (FEMA, 1997). Today there are approximately 3,200 dams and reservoirs throughout Pennsylvania (PADEP, 2008).

Table 4.2-3: List of hazards profiled in the 2020 HMP with associated descriptions.	
Profiled Hazards	**Description**
Environmental Hazards	Hazardous material releases can contaminate air, water, and soils possibly resulting in death and/or injuries. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events. As previously mentioned, materials can include toxic chemicals, radioactive materials, infectious substances and hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas.
Nuclear Incidents	Nuclear incidents generally refer to events involving the release of significant levels of radioactivity or exposure of workers or the general public to radiation (FEMA, 1997). Nuclear accidents/incidents can be placed into three categories: 1) Criticality accidents which involve loss of control of nuclear assemblies or power reactors, 2) Loss-of-coolant accidents which result whenever a reactor coolant system experiences a break or opening large enough so that the coolant inventory in the system cannot be maintained by the normally operating make-up system, and 3) Loss-of-containment accidents which involve the release of radioactivity. The primary concern following such an incident or accident is the extent of radiation, inhalation, and ingestion of radioactive isotopes which can cause acute health effects (e.g. death, burns, severe impairment), chronic health effects (e.g. cancer), and psychological effects. (FEMA, 1997).
Terrorism	Terrorism is use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber-attacks (computer-based); and the use of chemical, biological, nuclear and radiological weapons (FEMA, 2009). Increasingly, cyber-attacks have become a more pressing concern for governments.
Transportation Accidents	Transportation accidents can result from any form of air, rail, water, or road travel. It is unlikely that small accidents would significantly impact the larger community. However, certain accidents could have secondary regional impacts such as a hazardous materials release or disruption in critical supply/access routes, especially if vital transportation corridors or junctions are present. (Research and Innovative Technology Administration, 2009). Traffic congestion in certain circumstances can also be hazardous. Traffic congestion is a condition that occurs when traffic demand approaches or exceeds the available capacity of the road network. This hazard should be carefully evaluated during emergency planning since it is a key factor in timely disaster or hazard response, especially in areas with high population density. (Federal Highway Administration, 2009).
Urban Fire and Explosion	An urban fire involves a structure or property within an urban or developed area. For hazard mitigation purposes, major urban fires involving large buildings and/or multiple properties are of primary concern. The effects of a major urban fire include minor to significant property damage, loss of life and residential or business displacement. Explosions are extremely rapid releases of energy that usually generate high temperatures and often lead to fires. The risk of severe explosions can be reduced through careful management of flammable and explosive hazardous materials. (FEMA, 1997)

Table 4.2-3: List of hazards profiled in the 2020 HMP with associated descriptions.	
Profiled Hazards	**Description**
Utility Interruption	Utility interruption hazards are hazards that impair the functioning of important utilities in the energy, telecommunications, public works, and information network sectors. Utility interruption hazards include the following: • Geomagnetic Storms; including temporary disturbances of the Earth's magnetic field resulting in disruptions of communication, navigation, and satellite systems (National Research Council et al., 1986). • Fuel or Resource Shortage; resulting from supply chain breaks or secondary to other hazard events, for example (Mercer County, PA, 2005). • Electromagnetic Pulse; originating from an explosion or fluctuating magnetic field and causing damaging current surges in electrical and electronic systems (Institute for Telecommunications Sciences, 1996). • Information Technology Failure; due to software bugs, viruses, or improper use (Rainer Jr., et al, 1991). • Ancillary Support Equipment; electrical generating, transmission, system-control, and distribution-system equipment for the energy industry (Hirst & Kirby, 1996). • Public Works Failure; damage to or failure of highways, flood control systems, deep-water ports and harbors, public buildings, bridges, dams, for example (United States Senate Committee on Environment and Public Works, 2009). • Telecommunications System Failure; Damage to data transfer, communications, and processing equipment, for example (FEMA, 1997) • Transmission Facility or Linear Utility Accident; liquefied natural gas leakages, explosions, facility problems, for example (United States Department of Energy, 2005). • Major Energy, Power, Utility Failure; interruptions of generation and distribution, power outages, for example (United States Department of Energy, 2000). Internet interruptions/internet failures are an increasingly important kind of utility interruption as more of the day-to-day business of the Commonwealth is conducted over the internet.

4.2.3. Climate Change

The HMSC identified climate change as an issue that impacts the frequency and severity of the natural and manmade hazards facing Cumberland County. Climate change is not profiled as a separate hazard in this plan. Rather, the impacts of climate change for pertinent hazards have been included in the future occurrence section of each applicable hazard profile.

Cumberland County has identified climate change as a major issue that can affect the environment, economy, and quality of life for our residents. As an early implementation step of the HMP, Cumberland County has entered the PA Department of Environmental Protection's Climate Action Plan Program in July 2020. Through this program, the County will work with Dickinson College and Shippensburg University to develop a greenhouse gas inventory for the County. Then, the County will form a multidisciplinary climate change task force that will guide the development of a countywide climate action plan including implantation actions aimed at decreasing greenhouse gas emissions for various public, private, and nongovernmental stakeholders in the County.

4.3 Hazard Profiles

NATURAL HAZARDS

4.3.1. Drought

4.3.1.1 Location and Extent

Droughts are regional climatic events, so when these events occur in Cumberland County, impacts are felt across the entire county as well as areas outside county boundaries. The spatial extent for areas of impact can range from south-central Pennsylvania to the entire mid-Atlantic region. Areas with extensive agricultural land use can experience particularly significant impacts. The distribution of agricultural land by municipality in Cumberland County is included in Section 4.3.1.5.

4.3.1.2 Range of Magnitude

Droughts can have varying effects, depending upon what month they occur, severity, duration, and location. Some droughts may have their greatest impact on agriculture and even short-term droughts, when coupled with extreme temperatures, can be devastating. In some instances, droughts can contribute to risk of wildfire. Others may impact water supply or other water use activities such as recreation. Most droughts cause direct impacts to aquatic resources.

Hydrologic drought events result in a reduction of stream flows, reduction of lake/reservoir storage, and reduced groundwater levels. These events have a significant adverse impact 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 Commonwealth uses five parameters to assess drought conditions:

1) Stream flows (compared to benchmark records)
2) Precipitation deficits (measured as the departure from normal, 30-year average precipitation)
3) Reservoir storage levels in a variety of locations (especially three New York City reservoirs in upper Delaware River Basin)
4) Groundwater elevations in each county (comparing to past month, past year and historic record)
5) The Palmer Drought Severity Index – a soil moisture algorithm calibrated for relatively homogeneous regions which measures dryness based on recent precipitation and temperature (see Table 4.3.1-1).

Table 4.3.1-1: Palmer Drought Severity Index (PSDI) classifications (NDMC, 2019).

Severity Category	PSDI Value
Extremely wet	4.0 or more
Very wet	3.0 to 3.99
Moderately wet	2.0 to 2.99
Slightly wet	1.0 to 1.99
Incipient wet spell	0.5 to 0.99
Near normal	0.49 to -0.49

Table 4.3.1-1: Palmer Drought Severity Index (PSDI) classifications (NDMC, 2019).	
Severity Category	**PSDI Value**
Incipient dry spell	-0.5 to -0.99
Mild drought	-1.0 to -1.99
Moderate drought	-2.0 to -2.99
Severe drought	-3.0 to -3.99
Extreme drought	-4.0 or less

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

- Drought Watch: A period to alert government agencies, public water suppliers, water users and the public regarding the potential for future drought-related problems. Drought Watches are invoked when three or more drought indicators are present for the County. The focus is on increased monitoring, awareness, and preparation for response if conditions worsen. A request for voluntary water conservation is made. The objective of voluntary water conservation measures during a drought watch is to reduce water uses by five percent in the affected areas. Due to varying conditions, individual water suppliers or municipalities may ask for more stringent conservation actions.

- Drought Warning: This phase involves a coordinated response to imminent drought conditions and potential water supply shortages through concerted voluntary conservation measures to avoid or reduce shortages, relieve stressed sources, develop new sources, and if possible, forestall the need to impose mandatory water use restrictions. The objective of voluntary water conservation measures during a drought warning is to reduce overall water uses by 10-15 percent in the affected areas. Due to varying conditions, individual water suppliers or municipalities may ask for more stringent conservation actions.

- Drought Emergency: This stage is a phase of concerted management operations to marshal all available resources to respond to actual emergency conditions, to avoid depletion of water sources, to assure at least minimum water supplies to protect public health and safety, to support essential and high priority water uses, and to avoid unnecessary economic dislocations. It is possible during this phase to impose mandatory restrictions on non-essential water uses that are provided in the Pennsylvania Code (Chapter 119), if deemed necessary and if ordered by the Governor of Pennsylvania. The objective of water use restrictions (mandatory or voluntary) and other conservation measures during this phase is to reduce consumptive water use in the affected area by 15 percent, and to reduce total use to the extent necessary to preserve public water system supplies, to avoid or mitigate local or area shortages, and to assure equitable sharing of limited supplies.

- Local Water Rationing: Although not a drought phase, local municipalities may, with the approval of the PA Emergency Management Council, implement local water rationing to share a rapidly dwindling or severely depleted water supply in designated water supply service areas. These individual water rationing plans, authorized through provisions of the Pennsylvania Code (Chapter 120), will require specific limits on individual water

consumption to achieve significant reductions in use. Under both mandatory restrictions imposed by the Commonwealth and local water rationing, procedures are provided for granting of variances to consider individual hardships and economic dislocations.

Environmental impacts of drought include:

- Hydrologic effects – lower water levels in reservoirs, lakes, and ponds; reduced stream flow; loss of wetlands; estuarine impacts; groundwater depletion and land subsidence; effects on water quality such as increases in salt concentration and water temperature
- Damage to animal species – lack of feed and drinking water; disease; loss of biodiversity; migration or concentration; and reduction and degradation of fish and wildlife habitat
- Damage to plant communities – loss of biodiversity; loss of trees from urban landscapes and wooded conservation areas
- Increased number and severity of fires
- Reduced soil quality and erosion issues
- Air quality effects – dust and pollutants
- Loss of quality in landscape
- Loss of water for navigation and recreation
- Increase in nitrate levels which can have health impacts on pregnant women and children.

The worst drought in Cumberland County was the 1980-1983 event described in Section 4.3.1.3.

4.3.1.3 Past Occurrence

Declared drought status for Cumberland County from November 1980 to 2020 is shown in Table 4.3.1-2. Descriptions for drought status categories (i.e., *watch*, *warning,* and *emergency*) are included in Section 4.3.1.2. Between 1930 and 2020, the Commonwealth of Pennsylvania experienced seven significant droughts extending from 1930-1934, 1939-1942, 1953-1955, 1961-1967, 1980-1983, 1991-1992, and 1999-2003. These were considered *emergency* events. The 1980-1983 event resulted in $196,000,000 in damages to crops across the Commonwealth and required the implementation of unusual consumption restraints in Cumberland County. Table 4.2-2 shows that since 1954, there have been five Gubernatorial Declarations or Proclamations issued (1963, 1980, 1991, 1999, and 2002) in response to drought conditions within Cumberland County and other areas of the Commonwealth. Through the 1999 Proclamation of Disaster Emergency, Governor Tom Ridge declared a drought emergency in 55 of the 67 Pennsylvania counties following extended dry weather through much of the summer. Water usage was restricted. Precipitation deficits for many counties for the months of May through July averaged between 5 and 7 inches. Precipitation departures for the 365-day period ending in mid-July were over one foot below normal in many places. This is about one-third of

total annual normal precipitation in most areas. Streams were empty, wells dried up, and the Susquehanna River hit record low flows. Based upon a review of the PA DEP Drought Status Map History, Cumberland County last experienced a drought between September 2016 and May 2017 (PA DEP, 2018). However, the National Integrated Drought Information System (NIDIS) available on drought.gov indicates that a recent drought has occurred in mid/late 2020. The NIDIS includes seven federal agencies (including FEMA) which work collaboratively to support state, tribal, local and private sector approaches to managing drought risks and impacts.

Table 4.3.1-2: Cumberland County Declared Drought Status from 1980 to 2020 (PA DEP, 2018).

Date	Drought Status	Date	Drought Status
Nov 18, 1980 - Apr 20, 1982	Emergency	Jun 10, 1999 - Jun 18, 1999	Warning
Apr 26, 1985 - Jul 29, 1985	Watch	Jun 18, 1999 - July 20, 1999	Warning
Jul 29, 1985 - Oct 22, 1985	Watch	Jul 20, 1999 - Sep 30,1999	Emergency
Oct 22, 1985 - Oct 29, 1985	Watch	Sep 30, 1999 - Dec 16, 1999	Watch
Oct 29, 1985 - Dec 19, 1985	Watch	Dec 16, 1999 - Feb 25,2000	Watch
Jul 7, 1988 - Aug 24, 1988	Watch	Feb 25, 2000 - May 5, 2000	Watch
Aug 24, 1988 - Dec 12, 1988	Watch	Aug 8, 2001 - Aug 24, 2001	Watch
Jun 28, 1991 - Jul 24, 1991	Warning	Aug 24, 2001 - Nov 6, 2001	Watch
Jul 24, 1991 - Aug 16, 1991	Emergency	Nov 6, 2001 - Dec 5, 2001	Warning
Aug 16, 1991 - Sep 13, 1991	Emergency	Dec 5, 2001 - Feb 12, 2002	Warning
Sep 13, 1991 - Oct 21, 1991	Emergency	Feb 12, 2002 - May 13, 2002	Emergency
Oct 21, 1991 - Jan 16, 1992	Warning	May 13, 2002 - Jun 14, 2002	Emergency
Jan 17, 1992 - Apr 20, 1992	Warning	June 14, 2002 - Aug 9, 2002	Emergency
Apr 20, 1992 - Jun 23, 1992	Warning	Aug 9, 2003 - Sep 5, 2002	Emergency
Sep 1, 1995 - Sep 20, 1995	Warning	Sep 5, 2002 - Nov 7, 2002	Emergency
Sep 20, 1995 - Nov 8, 1995	Warning	Nov 7, 2002 - Dec 19, 2002	Emergency
Nov 8, 1995 - Dec 18, 1995	Watch	Dec 19, 2002 - Jan 8, 2003	Watch
Jul 17, 1997 - Oct 27, 1997	Watch	Apr 11, 2006 - Jun 30, 2006	Watch
Oct 27, 1997 - Nov 13, 1997	Watch	Aug 8, 2007 - Sep 5, 2007	Watch
Dec 3, 1998 - Dec 8, 1998	Watch	Sep 5, 2007 - Oct 5, 2007	Watch
Dec 8, 1998 - Dec 14, 1998	Watch	Oct 5, 2007 - Jan 11, 2008	Watch

Table 4.3.1-2: Cumberland County Declared Drought Status from 1980 to 2020 (PA DEP, 2018).			
Date	**Drought Status**	**Date**	**Drought Status**
Dec 14, 1998 - Dec 16, 1998	Warning	Jan 11, 2008 - Feb 15, 2008	Watch
Dec 16, 1998 - Jan 15, 1999	Warning	Sep 16, 2010 - Nov 10, 2010	Watch
Jan 15, 1999 - Mar 15, 1999	Warning	Sept 6, 2016 - May 16, 2017	Watch
Mar 15, 1999 - Jun 10, 1999	Watch		Watch

4.3.1.4 Future Occurrence

It is difficult to forecast the severity and frequency of future drought events in Cumberland County. Central Pennsylvania has averaged 3.4 dry periods (defined as 10 or more consecutive days having less than 0.01 inch of precipitation) per year from 1950 through 1992. Based on historical events, Cumberland County is expected to experience seven to eight drought events per century which reach *emergency* status, with each event typically lasting two to four years. Note that this estimate is based on the occurrence of past events over a short period of time and is not the result of detailed statistical sampling.

Uncertainty regarding the future occurrence of droughts exists due to the potential impacts of climate change (Michael Baker International, 2018). Annual Pennsylvania temperature has increased by 1.8°F over the last century and is expected to warm another 5.4°F by 2050. Greater average temperatures, coupled with a projected increase in days with temperatures above 90°F, may lead to agricultural losses or heat related deaths (PA DEP, 2018). As displayed in Figure 4.3.1-1, Cumberland County average annual temperature values have increased by 0.2° per decade from 1895 to 2018. When averaged over time periods of varying lengths, recent summer temperatures in Cumberland County have ranked among some of the highest recorded. July 2015 to June 2019 was the warmest 48-month period for the entirety of the data record dating back to 1895. Averages for many other recent periods fall within the top 10% for warmest temperatures recorded (NOAA, 2019).

Figure 4.3.1-1: Cumberland County annual temperature averages from 1895-2018 (NOAA, 2019).

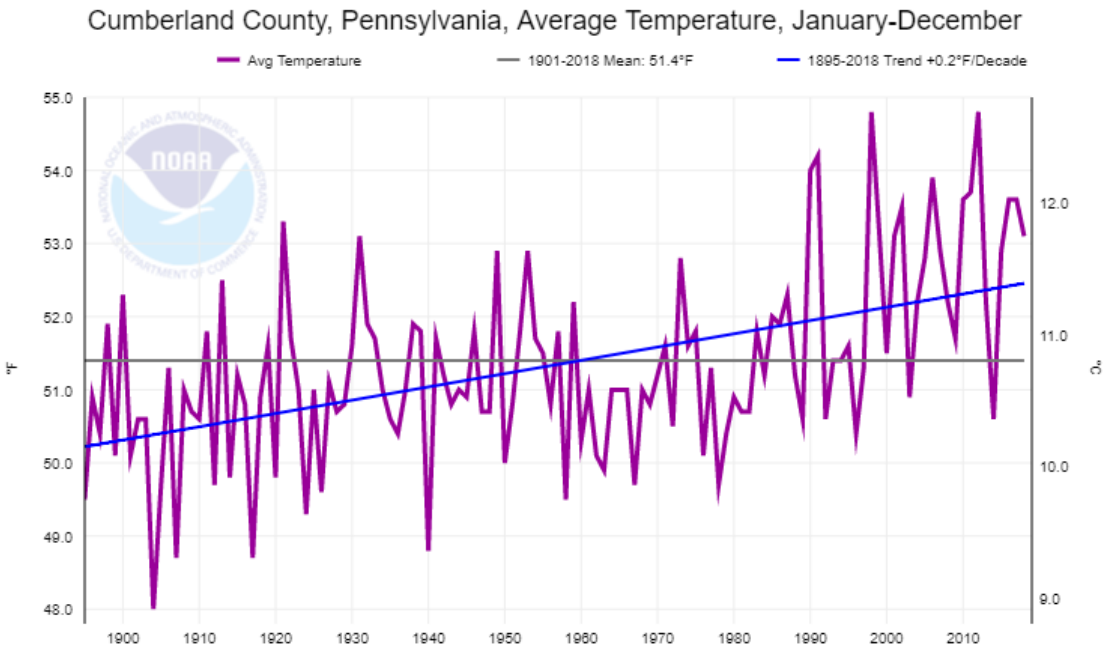
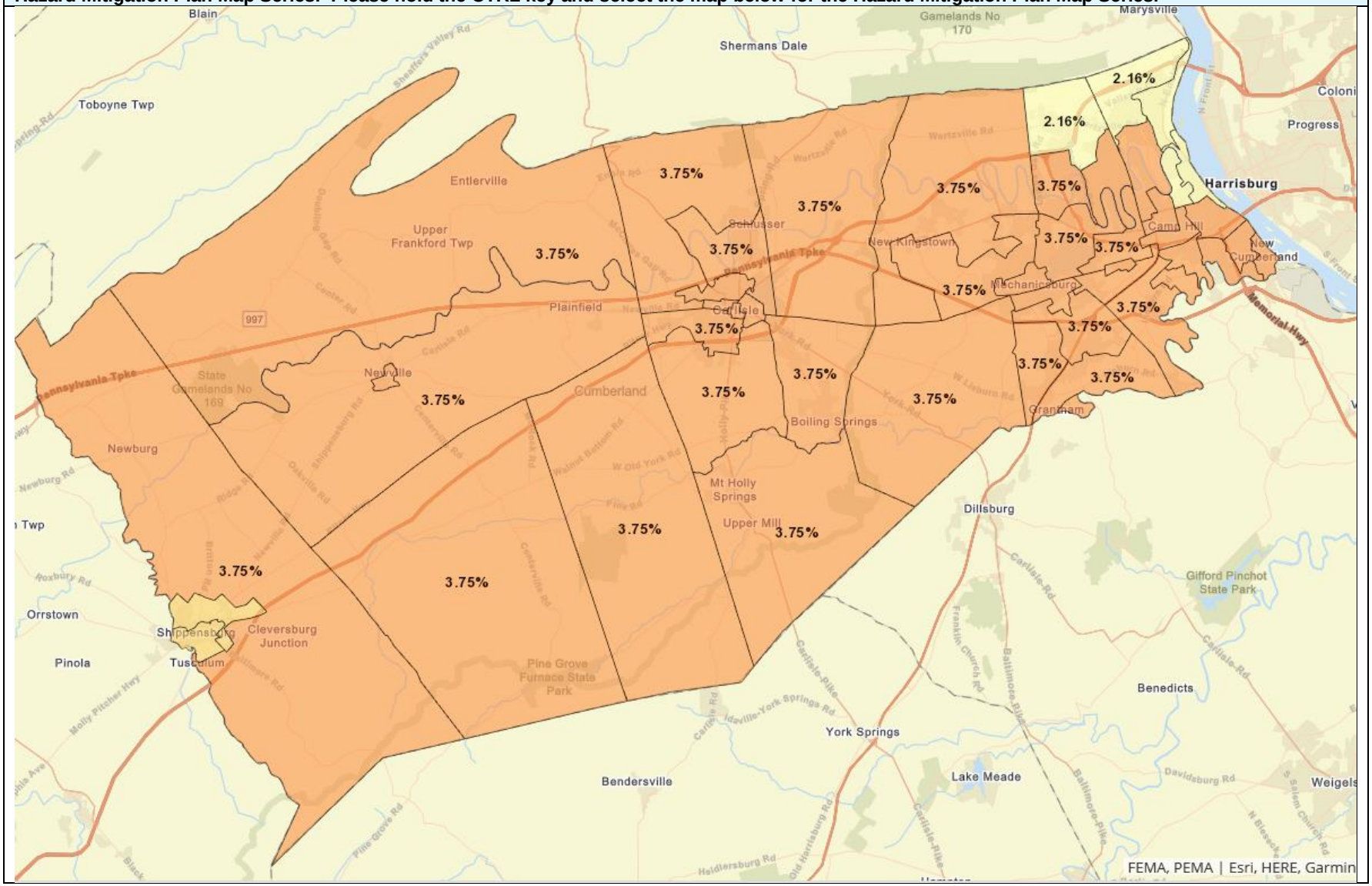


Figure 4.3.1-2 represents drought frequency by U.S. Census Tract for the years 2000-2016. Data from this period shows that the majority of Cumberland County experienced moderate drought conditions or greater 3.75% percent of the time (See Figure 4.3.1-2). Shippensburg and surrounding areas, as well as census tracts in Hampden Township, East Pennsboro and Wormleysburg, observed slightly lower drought frequency. Overall, the probability of future droughts can be considered *moderately likely* according to the Risk Factor Methodology (see Table 4.4-2).

Figure 4.3.1-2: Percent of weeks census tracts have been in moderate drought or greater (FEMA, 2018). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.



4.3.1.5 Vulnerability Assessment

The most significant losses resulting from drought events are typically found in the agriculture sector. The 1999 Gubernatorial Proclamation was issued in part due to significant crop damage. Preliminary estimates by the Department of Agriculture indicated possible crop losses across the Commonwealth in excess of $500 million.

According to the 2017 Census of Agriculture, Cumberland County has 169,654 acres of land in farms, a 10 percent increase since 2012, which produce $219,177,000 in market value of agricultural products sold (USDA, 2017). The agriculture industry has a significant presence in the western portion of the County with products including dairy, meats, fruits, and vegetables. Land O' Lakes Butter in South Middleton Township is a large producer.

With these agricultural assets, drought events can severely impair the local economy with prolonged drought negatively impacting the livelihood of residents within agricultural communities particularly. Figure 4.3.1-3 shows the existing agricultural land based on the 2018 County land use data. Table 4.3.1-3 summarizes the distribution of agricultural land by community using 2018 County land use data. Without mitigation strategies in place, North Newton Township and West Pennsboro Township are most vulnerable to a drought based on the proportion of land within those communities dedicated to agricultural use. According to County land use data, 36.71 percent of land in the County is considered agricultural.

Figure 4.3.1-3: Agricultural Land Use Map (Cumberland County GIS, 2018). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.

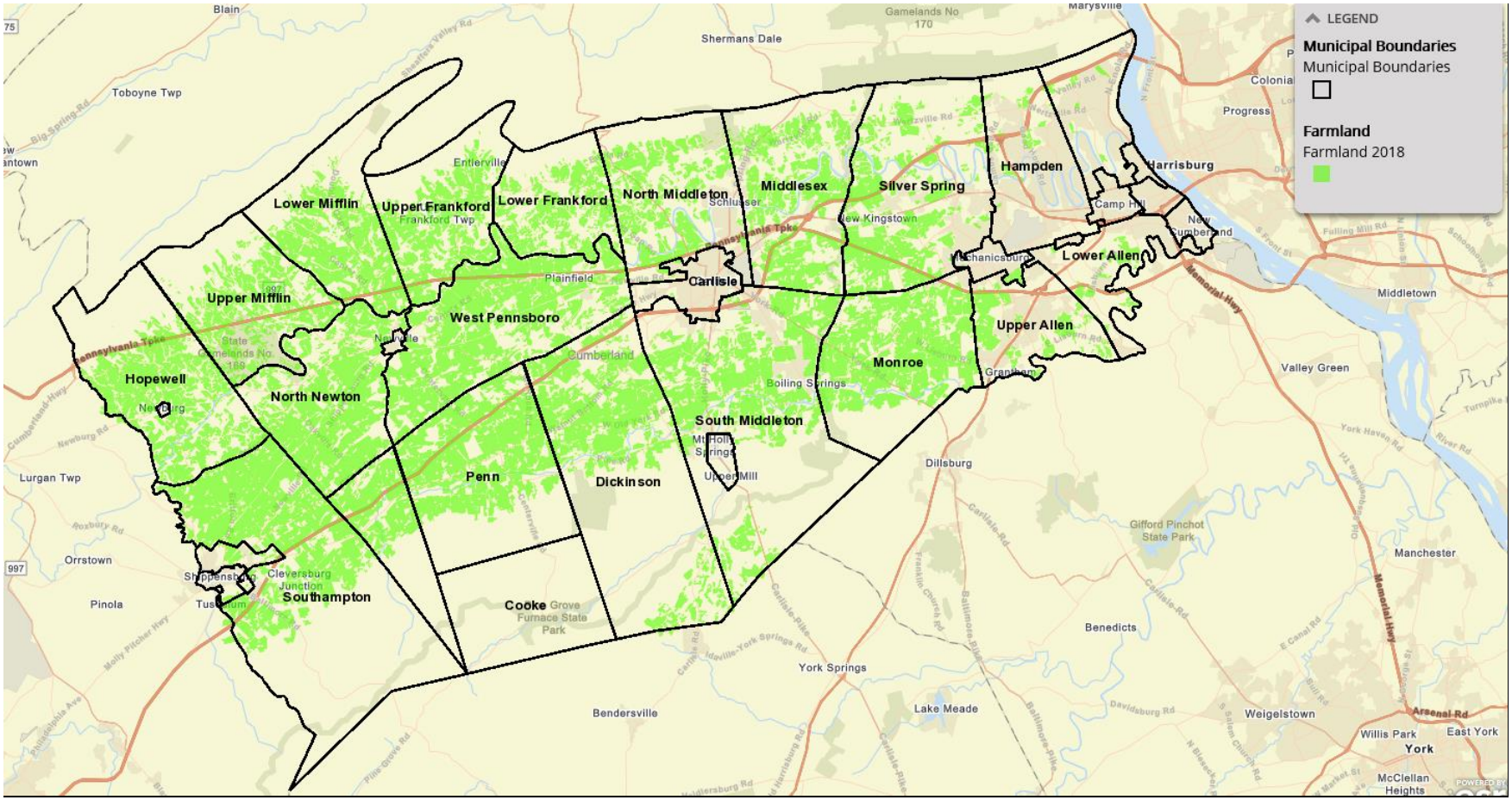


Table 4.3.1-3: Summary of agricultural land by acreage and percent of total land per municipality (Cumberland County GIS, 2019).

Municipality	Agriculture Acres	Total Acres	Percent Agricultural Land
Borough of Camp Hill	0	1,343.4	0.00%
Borough of Carlisle	35.4	3,544.0	1.00%
Township of Cooke	0	12,712.7	0.00%
Township of Dickinson	9,230.5	29,444.9	31.35%
Township of East Pennsboro	239.0	6,966.2	3.43%
Township of Hampden	449.8	11,372.4	3.95%
Township of Hopewell	8,601.3	17,807.6	48.30%
Borough of Lemoyne	0	1,035.3	0.00%
Township of Lower Allen	705.0	6,632.5	10.63%
Township of Lower Frankford	4,173.7	9,597.9	43.49%
Township of Lower Mifflin	6,211.2	15,294.7	40.61%
Borough of Mechanicsburg	178.8	1,541.2	11.60%
Township of Middlesex	6,733.6	16,613.3	40.53%
Township of Monroe	9,277.0	16,842.5	55.08%
Borough of Mount Holly Springs	9.3	929.2	1.01%
Borough of New Cumberland	0	1,084.6	0.00%
Borough of Newburg	7.0	118.1	5.95%
Borough of Newville	0	273.7	0.00%
Township of North Middleton	5,056.4	15,058.7	33.58%
Township of North Newton	9,696.8	14,622.1	66.32%
Township of Penn	9,304.6	18,990.9	49.00%
Borough of Shippensburg	61.5	840.1	7.32%
Township of Shippensburg	364.0	1,616.9	22.51%
Borough of Shiremanstown	0	190.1	0.00%
Township of Silver Spring	6,910.8	20,992.4	32.92%
Township of South Middleton	10,384.3	31,381.5	33.09%
Township of South Newton	2,964.7	7,317.8	40.51%
Township of Southampton	12,735.4	33,010.6	38.58%
Township of Upper Allen	1,823.9	8,535.1	21.37%
Township of Upper Frankford	5,728.7	12,554.2	45.63%
Township of Upper Mifflin	5,743.6	14,146.3	40.60%
Township of West Pennsboro	12,714.3	19,375.0	65.62%
Borough of Wormleysburg	0	511.8	0.00%
TOTAL	129,340.8	352,297.8	36.71%

Those who rely on well water are also vulnerable to drought. Table 4.3.1-4 indicates the number of domestic wells by municipality. 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. Currently, the County does not have access to an accurate data source to observe groundwater levels.

Table 4.3.1-4: Number of active domestic wells by municipality (PaGWIS, 2018).

Municipality	Total No. of Domestic Wells	Municipality	Total No. of Domestic Wells
Borough of Camp Hill	34	Borough of Newville	33
Borough of Carlisle	222	Township of North Middleton	476
Township of Cooke	205	Township of North Newton	454
Township of Dickinson	1,151	Township of Penn	623
Township of East Pennsboro	374	Borough of Shippensburg	8
Township of Hampden	493	Township of Shippensburg	38
Township of Hopewell	562	Borough of Shiremanstown	2
Borough of Lemoyne	4	Township of Silver Spring	947
Township of Lower Allen	292	Township of South Middleton	955
Township of Lower Frankford	272	Township of South Newton	375
Township of Lower Mifflin	262	Township of Southampton	746
Borough of Mechanicsburg	42	Township of Upper Allen	273
Township of Middlesex	636	Township of Upper Frankford	242
Township of Monroe	820	Township of Upper Mifflin	254
Borough of Mount Holly Springs	59	Township of West Pennsboro	975
Borough of New Cumberland	9	Borough of Wormleysburg	6
Borough of Newburg	26	Unknown Municipality	112
TOTAL	**11,982**		

4.3.2. Earthquake

4.3.2.1 Location and Extent

Earthquake events in the Pennsylvania region including Cumberland County are mild. When events occur, they impact very small areas less than 100 kilometers in diameter. Earthquakes originating from outside Pennsylvania, can also impact the Commonwealth, as was the case with a magnitude 5.8 earthquake in Virginia in August 2011.

4.3.2.2 Range of Magnitude

Earthquake magnitude is often measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. Table 4.3.2-1 summarizes Richter Scale magnitudes as they relate to the spatial extent of impacted areas. Based on historical

events, earthquakes in the Pennsylvania region do not exceed magnitudes greater than 6.0. Per the table below, destruction from a 6.0 earthquake centered in Cumberland County would include slight damage to well-designed buildings but major damage to poorly constructed buildings.

Table 4.3.2-1: Richter scale magnitudes and associated earthquake size effects (Michael Baker International, 2018).

Richter Magnitudes	Earthquake Effects
Less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most, slight damage to well-designed buildings; can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas where people live up to about 100 kilometers across.
7.0-7.9	Major earthquake; can cause serious damage over large areas.
8.0 or greater	Great earthquake; can cause serious damage in areas several hundred kilometers across.

The impact an earthquake event has on an area is typically measured in terms of earthquake intensity. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. A detailed description of the Modified Mercalli Intensity Scale is shown in Table 4.3.2-2. The earthquakes that occur in Pennsylvania originate deep within the Earth's crust, not on an active fault. Therefore, little or no damage is expected. No injury or severe damage from earthquake events has been reported in Cumberland County.

Table 4.3.2-2: Modified Mercalli Intensity Scale with associated impacts (Michael Baker International, 2018).

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

Table 4.3.2-2: Modified Mercalli Intensity Scale with associated impacts (Michael Baker International, 2018).			
Scale	**Intensity**	**Description Of Effects**	**Corresponding Richter Scale Magnitude**
XII	**Catastrophic**	Total destruction, trees fall, ground rises and falls in waves	>8.1

Environmental impacts of earthquakes can be numerous, widespread, and devastating, particularly if cascading effects are considered. Some examples are shown below, but are unlikely to occur in Cumberland County:

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

4.3.2.3 Past Occurrence

No earthquake epicenters have been measured in Cumberland County. However, minor tremors or aftershocks have been reported as a result of earthquake events with epicenters in nearby Lancaster County (Cumberland EOP, 1984) and in Virginia in 2011 (PennLive, 2011). Figure 4.3.2-1 shows recorded earthquake events in Pennsylvania between 1724 and 2003. Earthquake events are shown in other areas of Pennsylvania, with a particular concentration of events occurring to the east of Cumberland County between Lancaster and Reading. Two events are shown in nearby York County as well as one event in Adams County. Prior to 1960, an earthquake event occurred on the eastern border of York County which had a magnitude measured greater than four on the Richter Scale. Figure 4.3.2-2 provides an example of damage in Cumberland County caused by the 2011 Virginia earthquake.

Figure 4.3.2-1: Map showing the location of significant earthquake epicenters, earthquake hazard zones and Cumberland County municipal boundaries (USGS, 2018). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.

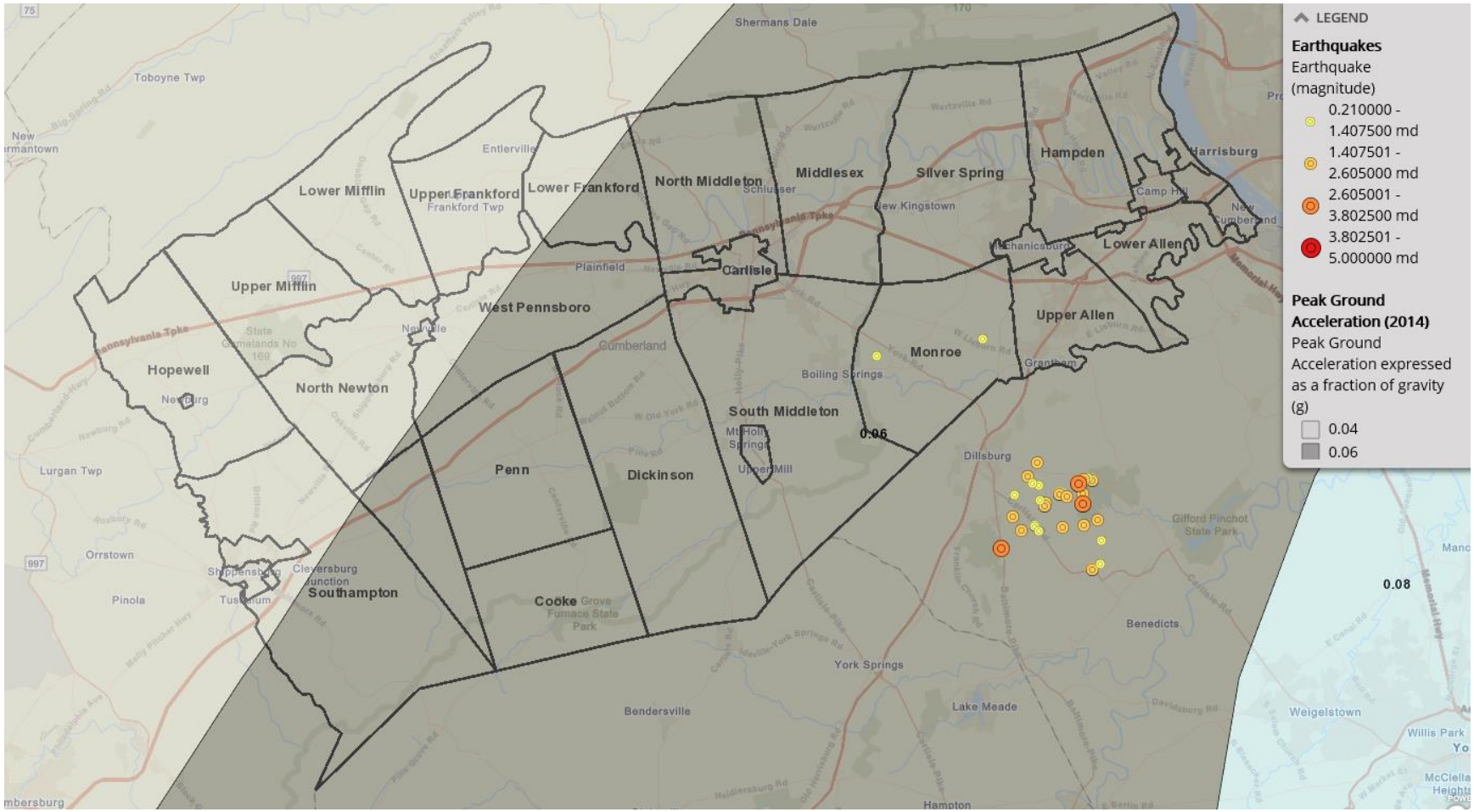


Figure 4.3.2-2: Earthquake damage (collapse of brick chimneys) in Mount Holly Springs, Cumberland County, PA on August 23, 2011 (Photograph courtesy of Jason Malmont/*The Sentinel*, 2014).

4.3.2.4 Future Occurrence

One way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. Peak ground acceleration (PGA) measures the strength of ground movements in this manner. PGA represents the rate in change of motion of the earth's surface during an earthquake as a ratio of the established rate of acceleration due to gravity. As shown in Figure 4.3.2-2, Cumberland County has very low PGA ratios of 0.04 and 0.06. Overall, the probability of future earthquakes can be considered *unlikely* according to the Risk Factor Methodology (see Table 4.4-2).

4.3.2.5 Vulnerability Assessment

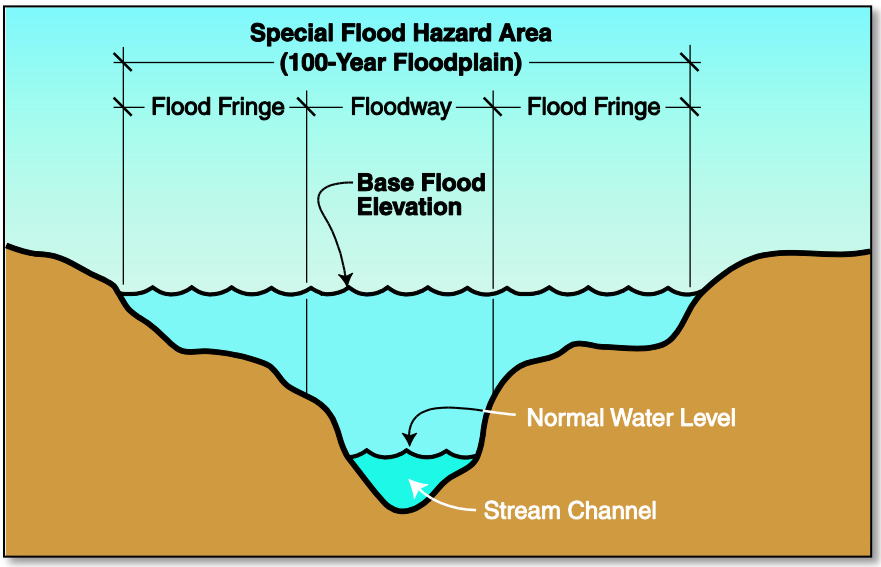
Cumberland County is located in a zone where only minor earthquake damage is expected (Cumberland EOP, 1984), and no damage or casualties have been reported from earthquakes to date. Based on historical events, earthquakes in the Pennsylvania region do not exceed magnitudes greater than 6.0, which could cause slight damage to well-designed buildings but major damage to poorly constructed buildings. While all structures and infrastructure in the County are equally at risk of experiencing an earthquake, older structures are most likely to be damaged. Section 4.3.7.5 provides building age distribution by municipality. According to the limited data available, approximately 18,407 parcels (18 percent of all parcels in the County as of 2019) had primary structures built prior to 1950 (Cumberland County GIS, 2019). Modern structures built in compliance with the Uniform Construction Code will likely be the least vulnerable to earthquake damage. Damages to critical facilities could have the greatest impact to the health and safety of County residents. Earthquakes could also potentially damage roads, bridges, power lines, water lines, gas lines, and other infrastructure in Cumberland County.

4.3.3. Flood, Flash Flood & Ice Jam

4.3.3.1 Location and Extent

Flood sources within Cumberland County include rivers and streams. For inland areas like Central Pennsylvania, excess water from snowmelt or rainfall accumulates and overflows onto stream banks and adjacent floodplains. Floodplains are lowlands, adjacent to rivers, streams and creeks that are subject to recurring floods. The size of the floodplain is described by the recurrence interval of a given flood. Flood recurrence intervals are explained in more detail in Section 4.3.3.4. However, in assessing the potential spatial extent of flooding it is important to know that a floodplain associated with a flood that has a 10 percent chance of occurring in a given year is smaller than the floodplain associated with a flood that has a 0.2 percent-annual-chance of occurring. The National Flood Insurance Program (NFIP), for which Flood Insurance Rate Maps (FIRMs) are published, identifies the 1 percent-annual-chance flood which is used to delineate the *Special Flood Hazard Area* (SFHA) and identify *Base Flood Elevations*. Figure 4.3.3-1 illustrates these terms. The Special Flood Hazard Area serves as the primary regulatory boundary used by FEMA, the Commonwealth of Pennsylvania, and Cumberland County local governments.

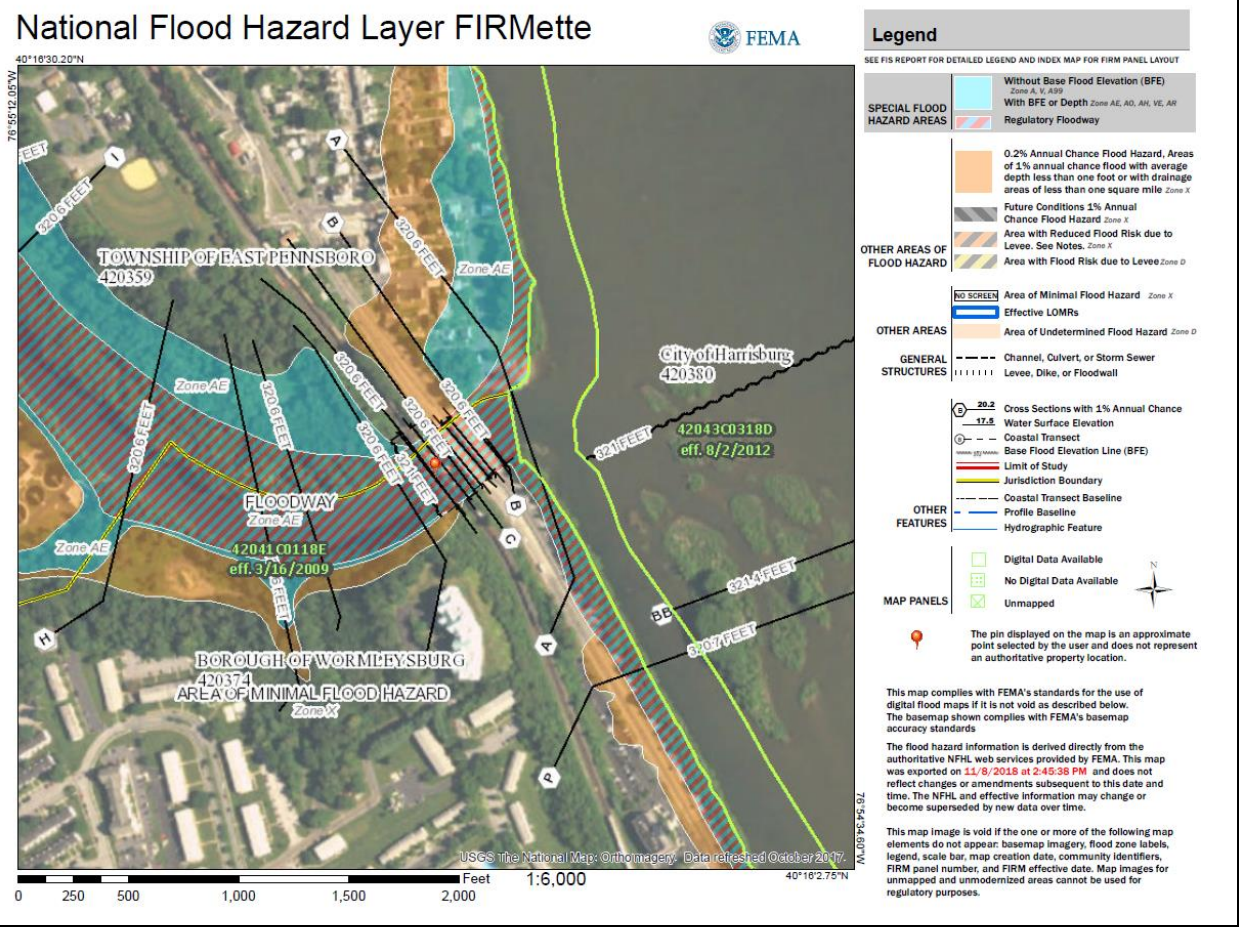
Figure 4.3.3-1: Diagram identifying Special Flood Hazard Area, 1 percent-annual-chance (100-Year) floodplain, floodway and flood fringe (Michael Baker International, 2018).



Countywide digital flood insurance rate maps (DFIRM's) were published for Cumberland County on March 16, 2009. All communities within the County are now shown on a single set of countywide DFIRM's. Previous FIRMs and Flood Boundary and Floodway Maps (FBFM) were digitized to produce a DFIRM that is compatible with Geographic Information Systems. Prior to the publication of this digital data, flood hazard information from FEMA was available through paper FIRMs and Q3 data. Additionally, FEMA recently updated its Map Service Center to provide National Flood Hazard Layer-dynamic maps that have increased the accessibility and

customization of DFIRM viewing. An example of the mapping products published is shown in Figure 4.3.3-2. DFIRMs for the entire county can be obtained from the FEMA Map Service Center (http://www.msc.fema.gov). These maps can be used to identify the expected spatial extent of flooding from a 1 percent- and 0.2 percent-annual-chance event.

Figure 4.3.3-2: Most recent approved FIRM for a portion of the Borough of Wormleysburg, Cumberland County to serve as an example (FEMA, 2009). Remaining FIRM's for Cumberland County can be found at http://www.msc.fema.gov.



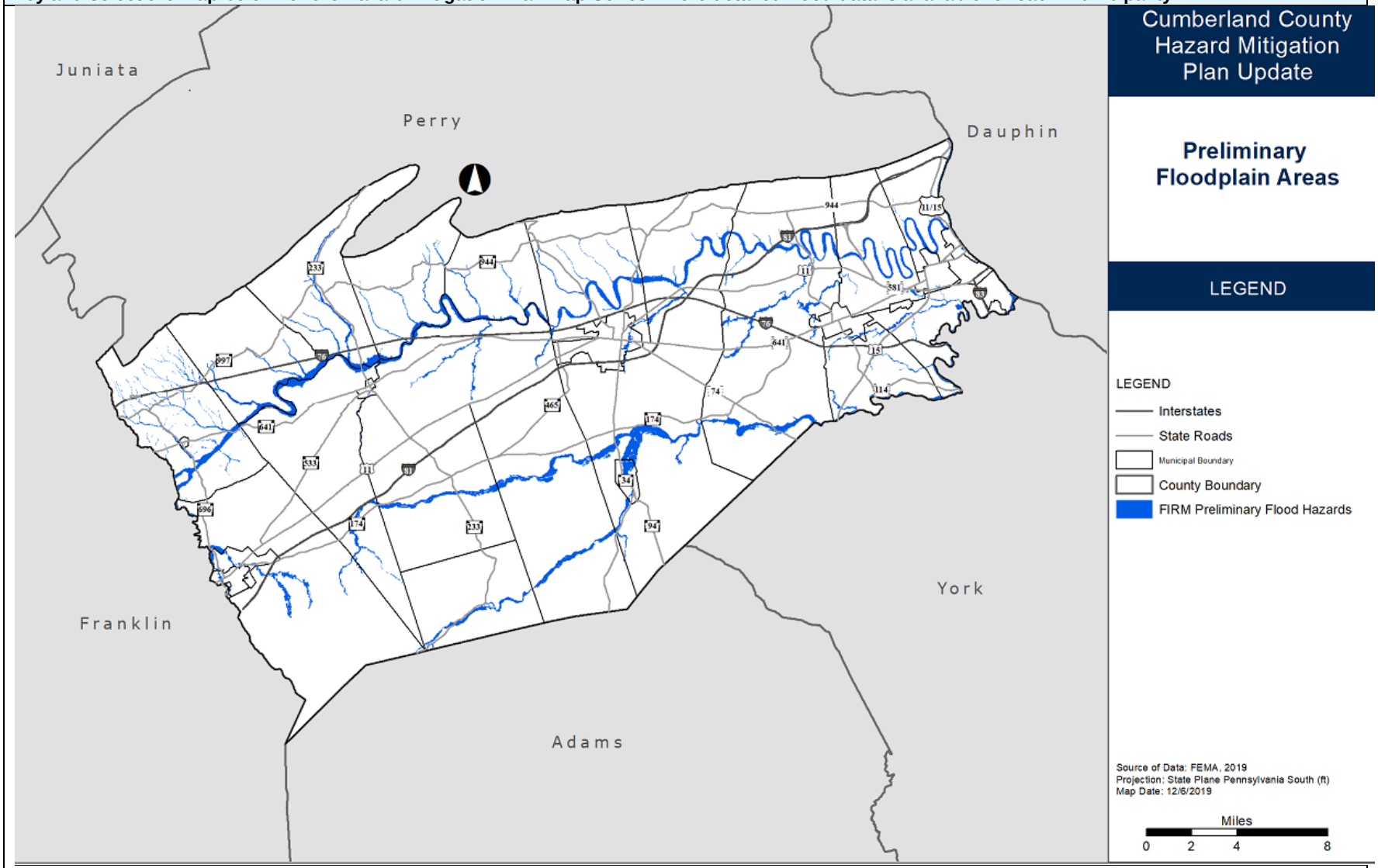
The DFIRMs published in 2009 are in the process of being updated by FEMA and reviewed by Cumberland County and its municipalities. Preliminary FIRMs were released by FEMA in 2019 and were used in this plan to determine flood risks. The effective date for the maps to be finalized will be six months after FEMA issues the Letter of Final Determination (LFD), which is anticipated at some point in 2021. Changes to the formerly published maps will impact County NFIP policies as existing properties may be added or removed from the 1 percent- and 0.2 percent-annual-chance-event floodplains.

Flood sources identified in the most recent DFIRMs include: Conodoguinet Creek, Dogwood Run, Green Ridge Run, Gum Run, Hogestown Run, Letort Spring Run, Long Pine Run, Middle Spring Creek, Middle Spring Creek Tributary, Mountain Creek, Navy Ship Parts Control Center

Drainage Channel, Old Town Run, Potteiger Run, Susquehanna River, Taggerts Run, Trindle Spring Run, Trout Run, Wertz Run, Yellow Breeches Creek and Yellow Breeches Creek Northern Split. Figure 4.3.3-4 shows the location of watercourses in Cumberland County and the location of the Preliminary FEMA Floodplains. Flood events caused by ice jams are limited primarily to the Susquehanna River and Conodoguinet Creek.

Figure 4.3.3-3: Ice jam forming in East Pennsboro Township (Photograph courtesy of East Pennsboro Township).

Figure 4.3.3-4: 2019 Preliminary SFHA Map (FEMA, 2019). This image is a link to the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series where detailed flood data is available for each municipality.



4.3.3.2 Range of Magnitude

Floods are considered hazards when people and property are affected. Injuries and deaths can occur when people are swept away by flood currents or when bacteria and disease are spread by moving or stagnant floodwaters. Most property damage results from inundation by sediment-filled water. A large amount of rainfall over a short time span can result in flash flood conditions. Small amounts of rain can result in floods in locations where the soil is frozen or saturated from a previous wet period or if the rain is concentrated in an area of impermeable surfaces such as large parking lots, paved roadways, or other impervious developed areas. Conditions can be exacerbated by obstructions, which prevent normal flow through the waterway, such as fallen trees. During the 2020 update process, HMSC members noted that when a tree falls and obstructs a bridge (as illustrated in Figure 4.3.3-5), then the bridge owner is responsible for removal. However, if a tree obstructs a waterway where there is no bridge, then the property owner is responsible for removal.

Figure 4.3.3-5: Obstruction of a bridge with debris in East Pennsboro Township (Photograph courtesy of East Pennsboro Township).

Several factors determine the severity of floods, including rainfall intensity and duration, topography, ground cover, and rate of snowmelt. Water runoff is greater in areas with steep slopes and little or no vegetative ground cover. The County has sloping terrain, especially near the South and Blue Mountains, which can contribute to more severe floods as runoff reaches receiving water bodies more rapidly over steep terrain. Also, urbanization typically results in the replacement of vegetative ground cover with asphalt and concrete, increasing the volume of surface runoff and stormwater, particularly in areas with poorly planned stormwater drainage systems. If mismanaged, this runoff can accumulate quickly and create hazardous conditions. Stormwater is a particularly harmful aspect of flooding because it may contain and transport chemicals such as fertilizers or pesticides that are found in agricultural runoff, bacteria from livestock and pet waste, oil from parking lots and roadways, and other pollutants. These contaminants may infiltrate drinking water supply or swimming areas. When flushed into surface water, fertilizers can cause algal blooms which degrade living conditions for fish and other organisms. Furthermore, polluted stormwater runoff is often transported through a municipal separate storm sewer system (MS4) and then discharged into a local water body, untreated. Municipal communities have been encouraged to develop a comprehensive planning approach to manage stormwater and reduce this pollution source (U.S. EPA, 2019).

Additionally, stormwater-caused erosion, and the resulting deposition of sediment, can alter stream channels and further endanger aquatic life (DEP, 2017). In parts of Cumberland County where development has occurred on karst topography, stormwater has the potential to exacerbate the formation of karst features (see Section 4.3.6) by rapidly removing soil from groundwater drainage conduits (Kochanov, 2015).

A recent, heavy rainfall event in Cumberland County created hazardous conditions related to stormwater. In July 2018, the Borough of Newville received 9.8 inches of rain over the course of five days, including 3.3 inches in one hour. The Borough's stormwater system was overwhelmed, resulting in damage to a retaining wall, the closure of downtown streets and the declaration of a state of emergency by Mayor Randy Finkey (Gitt, 2018). Figure 4.3.3-6 illustrates the damage to a retaining wall caused by stormwater overflow.

Cumberland County partnered with Stormwater PA and Alliance for the Chesapeake Bay to launch a website designed as an educational resource for dealing with stormwater issues. The site provides information on specific watersheds and outlines techniques that can be implemented by a variety of entities to mitigate the negative impacts of stormwater. The site can be accessed here: http://stormwaterpa.org/cumberland-county.html.

Figure 4.3.3-6: Damage to a retaining wall caused by excess stormwater in Newville, PA (Photograph courtesy of Wes Peterson, *The Sentinel*, 2018).

In Central Pennsylvania, including Cumberland County, there are seasonal differences in how floods are caused. In the winter and early spring (February to April), major flooding has occurred as a result of heavy rainfall on snowpack throughout contributing watersheds. Winter floods also have resulted from runoff of intense rainfall on frozen ground, and local flooding has been exacerbated by ice jams in rivers, streams and creeks (i.e., especially the Susquehanna River and Conodoguinet Creek).

Summer floods have occurred from intense rainfall on previously saturated soils. Summer thunderstorms deposit large quantities of rainfall over a short period of time that can result in flash flood events. In addition, as detailed in Section 4.3.4, the County occasionally experiences intense rainfall from tropical storms in late summer and early fall. Tropical Storm Agnes in 1972 created the worst flooding conditions on record for Cumberland County.

The most severe flooding in Central Pennsylvania has been associated with the Susquehanna River Basin, which drains directly into the Chesapeake Bay and is the largest river basin on the U.S. Atlantic Coast. Cumberland County lies within the Lower Susquehanna River Basin, which means that it is subject to heavy precipitation events that may occur outside of the County in the upper reaches of the Basin.

Floods are naturally occurring events that benefit riparian systems which have not been disrupted by human actions. Such benefits include groundwater recharge and the introduction of nutrient rich sediment, which improves soil fertility. However, the destruction of riparian buffers, changes to land-use and land cover throughout a watershed, and introduction of chemical or biological contaminants which often accompany human presence cause environmental harm

when floods occur. Hazardous material facilities are potential sources of contamination during flood events as well. These facilities are discussed in Section 4.3.12; however, it is important to note that there are eleven SARA facilities in the 1 percent-annual-chance floodplain (Cumberland County GIS, 2019). Other environmental impacts of flooding include: water-borne diseases, suffocation of tree species non-tolerant to excess water, heavy siltation, damage or loss of crops, and drowning of both humans and animals.

4.3.3.3 Past Occurrence

Cumberland County has a long history of flooding events. Bordered to the east by the Susquehanna River and traversed by two of its tributaries, Yellow Breeches Creek and Conodoguinet Creek, the County has suffered damage from numerous major floods and localized flash flooding. Figure 4.3.3-7 shows flooding in New Cumberland.

Figure 4.3.3-7: Flooding in New Cumberland, PA (Photograph courtesy of Cumberland County Department of Public Safety).

Twelve of the 18 Presidential Disaster and Emergency Declarations affecting Cumberland County have been in response to hazard events related to flooding (see Table 4.2-1) in the area. Frequent flooding occurs at the confluence of Yellow Breeches Creek and the Susquehanna River in the Borough of New Cumberland, and at the Conodoguinet Creek in Hogestown. Flooding events, including those associated with Disaster Declarations, are listed in Table 4.3.3-1. Other information on previous flood events and historical losses can be found in Section 2.3 of the Cumberland County Flood Insurance Study report produced with the 2019 Preliminary FIRMs.

Table 4.3.3-1: Flood and flash flood events impacting Cumberland County from 1936-2014 (SHELDUS, 2013, NCEI, 2018, NOAA Hydrograph of Conodoguinet Creek & community surveys). Note that property damage values are estimates based on best available information. "Countywide" indicates that several locations in the County were affected.

Date	Location & Description	Estimated Property Damage ($)
3/1936	Countywide	5,724,000
4/2/1970	Countywide; Severe Thunderstorm	20,034
6/1972	Countywide; Tropical Storm Agnes	40,725,000
6/28/1973	Countywide; Severe Thunderstorm	15,152
9/1975	Countywide; Hurricane	1,515,152
10/1976	Countywide	*not provided*
1/24/1979	Countywide; Severe Thunderstorm	15,152
2/23/1979	Countywide; Severe Thunderstorm	15,152
2/2/1982	Countywide	1,515
3/14/1986	Countywide	14,706
9/12/1987	Countywide	12,500
11/28/1993	Countywide	*not provided*
8/25/1994	Countywide; Thunderstorms with very heavy rain produced significant poor drainage flooding throughout the County.	*not provided*
1/20/1995	Countywide	*not provided*
6/30/1995	Countywide; Heavy rain caused basement flooding within Cumberland County.	*not provided*
7/6/1995	Countywide; Severe thunderstorms throughout the County. Trees were uprooted in Mechanicsburg and within nearby Upper Allen Township. Eastern Cumberland County experienced three inches of rain within in an hour. The heavy rain caused flooding of basements and streets and created sinkholes in Mechanicsburg.	*not provided*
1/19/1996	Countywide; One flood-related death occurred in Cumberland County resulting from a vehicular accident involving a 32-year old male near Middlesex.	352,000
9/6/1996	Western Areas of the County; Newville had 9.8 inches of rain. One flood-related death resulting from a vehicular accident involving a 26-year old woman.	*not provided*
9/13/1996	Western areas of the County	*not provided*
12/13/1996	Countywide	*not provided*
9/11/1997	Countywide	*not provided*
11/7/1997	Western areas of the County	*not provided*
1/8/1998	Countywide	*not provided*
3/21/1998	Countywide	*not provided*
9/6/1999	Eastern Areas of the County; Streets and underpasses were flooded in Shiremanstown and other eastern areas as heavy rain from Tropical Storm Dennis.	10,000
9/16/1999	Countywide	15,000
7/30/2000	Northeast Areas of the County; Heavy rains caused mud and water to flow into a couple of homes near an area under road construction.	*not provided*
9/1/2000	Mechanicsburg; Eight homes and one apartment were flooded in East Pennsboro Township.	50,000
1/3/2003	Rising waters on Conodoguinet Creek at Hogestown caused the river gauge to reach its flood stage of 8 feet briefly between 8 and 9 pm.	*not provided*
3/20/2003	Rainfall of over 1 inch caused the Yellow Breeches Creek at Camp Hill to exceed its flood stage of 7 feet. Minor flooding was reported, with several roads closed along the	*not provided*

Table 4.3.3-1: Flood and flash flood events impacting Cumberland County from 1936-2014 (SHELDUS, 2013, NCEI, 2018, NOAA Hydrograph of Conodoguinet Creek & community surveys). Note that property damage values are estimates based on best available information. "Countywide" indicates that several locations in the County were affected.

Date	Location & Description	Estimated Property Damage ($)
	creek in the Carlisle area.	
3/21/2003	Rainfall of over 1 inch caused the Conodoguinet Creek at Hogestown to exceed its flood stage of 8 feet. Minor flooding of low lying areas was reported.	*not provided*
6/7/2003	Heavy rainfall caused Yellow Breeches Creek at Camp Hill to exceed its flood stage of 7 feet.	*not provided*
6/8/2003	Heavy rainfall caused Conodoguinet Creek at Hogestown to reach flood Stage of 8 feet.	*not provided*
6/21/2003	Boiling Springs; Heavy rains caused rapid rises in streams and closed several roads in southern Cumberland County near the town of Boiling Springs. Lerew Road, Petersburg Road and Mount Zion Road, all directly adjacent to Old Town Run and Lerew Creek, were closed.	*not provided*
9/23/2003	Heavy rainfall caused Yellow Breeches Creek at Camp Hill to exceed its flood stage of 7 feet.	*not provided*
12/11/2003	Heavy rainfall caused the Conodoguinet Creek at Hogestown to exceed flood stage.	*not provided*
12/11/2003	Heavy rainfall caused Yellow Breeches Creek at Camp Hill to exceed flood stage.	*not provided*
8/1/2004	Shiremanstown; Heavy rain caused flash flooding along Yellow Breeches Creek in Cumberland County. Several homes were isolated by flood waters, accessible only by boat. One road was also flooded and impassable.	*not provided*
8/1/2004	Heavy rain caused flooding along Yellow Breeches Creek at Camp Hill.	*not provided*
9/17/2004	Countywide; As a result of this excessive rainfall from Hurricane Ivan and antecedent heavy rainfall from the remnants of Hurricane Frances one week earlier, widespread flooding occurred throughout central Pennsylvania from 9/17/2004 through 9/20/2004. Flood levels at many locations ranked in the top 5 for all flood events, with many river forecast points cresting above levels reached in the January 1996, flood. Moderate to major flooding was experienced on the larger tributaries of the Susquehanna River. The widespread flooding closed hundreds of roads and bridges across central Pennsylvania, causing a significant adverse impact on commerce and transportation for several days. Preliminary monetary estimates of flood damage from the remnants of Ivan across the state were over 260 million dollars.	1,515,152
9/18/2004	Heavy rain caused the Conodoguinet Creek at Hogestown to exceed its flood stage of 8 feet.	*not provided*
9/18/2004	Heavy rain caused the Yellow Breeches Creek at Camp Hill to exceed its flood stage of 7 feet.	*not provided*
9/28/2004	Heavy rain caused the Yellow Breeches Creek at Camp Hill to exceed its flood stage of 7 feet.	*not provided*
9/28/2004	Countywide; The remnants of Hurricane Jeanne moved northeast along the east slopes of the Appalachians during Tuesday, September 28th, eventually moving off the mid-Atlantic Coast by early Tuesday evening. However, a large plume of tropical moisture to the northwest of the system produced widespread heavy rainfall across south central Pennsylvania during Tuesday, with rainfall amounts of 2 to 4 inches. This rainfall, combined with excessively wet soil and swollen rivers from the remnants of 2 antecedent tropical systems, produced mainly minor flooding across portions of south central Pennsylvania, with several road closures and some basement flooding reported.	*not provided*
9/29/2004	Heavy rain caused the Conodoguinet Creek at Hogestown to exceed its flood stage of 8 feet.	*not provided*
9/29/2004	Heavy rain and local runoff caused the Yellow Breeches Creek at Camp Hill to exceed its flood stage of 7 feet.	*not provided*
3/28/2008	Countywide; A low pressure system combined with abundant low level moisture drawn from the Gulf of Mexico and western Atlantic Ocean produced very heavy rainfall across the lower Susquehanna Valley. As a result of the heavy rainfall, numerous streams overflowed their banks onto adjacent roadways, resulting in road closures.	*not provided*

Table 4.3.3-1: Flood and flash flood events impacting Cumberland County from 1936-2014 (SHELDUS, 2013, NCEI, 2018, NOAA Hydrograph of Conodoguinet Creek & community surveys). Note that property damage values are estimates based on best available information. "Countywide" indicates that several locations in the County were affected.

Date	Location & Description	Estimated Property Damage ($)
3/28/2005	Heavy rain caused Yellow Breeches Creek at Camp Hill to flood.	*not provided*
3/29/2005	Heavy rain caused Conodoguinet Creek at Hogestown to flood.	*not provided*
3/30/2005	Heavy rain caused the Susquehanna River at Harrisburg to flood, exceeding 17 ft. flood stage.	*not provided*
4/2/2005	Countywide; Widespread heavy rainfall across the lower Susquehanna Valley. Average rainfall amounts of 1 to 3 inches occurred during this time. This heavy rainfall led to numerous road closures as smaller streams and creeks overflowed their banks during Saturday afternoon and evening.	*not provided*
4/2/2005	Heavy rain caused Yellow Breeches Creek at Camp Hill to flood.	*not provided*
4/3/2005	Heavy rain caused Conodoguinet Creek at Hogestown to flood.	*not provided*
4/3/2005	Heavy rain caused the Susquehanna River at Harrisburg to flood.	*not provided*
6/27/2006	Countywide; Heavy rain associated with a stalled frontal boundary, interacting with the remnants of a weak tropical system, caused flash flooding throughout central and eastern Pennsylvania from June 27 through June 28. While flash flooding ended on the 28th, flood waters continued in some locations until July 1st. In Cumberland County, numerous roads and bridges were closed due to flood waters. 30 homes were evacuated on Betham Hollow Road due to access road washing out. Flooding was also extensive in Silver Spring Township. Heavy rain caused the Conodoguinet Creek at Hogestown and Yellow Breeches Creek at Camp Hill to flood.	*not provided*
11/16/2006	Shiremanstown; Heavy rain caused flash flooding in Cumberland County. Cedar Run overflowed its banks and flooded roads in Lower Allen Township. Roads were also closed in Monroe Township due to Yellow Breeches Creek overflowing its banks.	*not provided*
5/10/2007	Carlisle; Heavy rain from strong thunderstorms produced flash flooding across portions of the Lower Susquehanna Valley. Flooded intersections and closed roads due to rapid rises of area creeks and streams just north of Carlisle. County Emergency Manager reported a water rescue in Silver Spring Township around 8 pm. Rainfall reports of as much as 3.5 inches of rain in a 3 hour period were received in Carlisle.	*not provided*
7/29/2007	Carlisle; Thunderstorms with torrential rain produced flash flooding across Cumberland County. Numerous roads were flooded and closed throughout the county, along with a number of reports of flooded urban intersections.	*not provided*
5/28/2009	Newburg; Thunderstorms produced heavy rain and flash flooding in northern portions of Cumberland County. Roads were closed in Upper and Lower Mifflin Township. In the vicinity of Doubling Gap Creek, several roads were also closed.	*not provided*
7/2009	North Middleton; two flash flooding events.	*not provided*
7/23/2009	Gettysburg; Heavy rain caused flash flooding just north of Carlisle in North Middleton Township. Three to five feet of water inundated several homes along Echo Road. Water was over the top of resident mailboxes in some areas. Several municipal roads were also closed due to the flooding.	$100,000
7/23/2009	Newburg; Heavy rain produced flash flooding along the Pennsylvania Turnpike near Newville.	*not provided*
7/23/2009	Mechanicsburg; Heavy rain produced flash flooding just southeast of Mechanicsburg in Upper Allen Township. Several residents were evacuated from flooded homes. The flash flooding persisted late into the evening and transitioned into countywide flooding.	$100,000
7/24/2009	Eberleys Mill; Heavy rain caused Yellow Breeches Creek at Camp Hill to exceed flood stage. Moderate flooding was reported along Creekwood Drive in the Allendale section of Camp Hill, where reports of several flooded vehicles were received. Also, Cedar Cliff Drive was inundated by flood waters from the Creek.	$10,000
8/19/2009	Sheperdstown; Heavy rain caused flash flooding along a small stream tributary of the Yellow Breeches Creek. The high water covered a bridge along Hertzler Road in Upper	*not provided*

Table 4.3.3-1: Flood and flash flood events impacting Cumberland County from 1936-2014 (SHELDUS, 2013, NCEI, 2018, NOAA Hydrograph of Conodoguinet Creek & community surveys). Note that property damage values are estimates based on best available information. "Countywide" indicates that several locations in the County were affected.

Date	Location & Description	Estimated Property Damage ($)
	Allen Township. The flash flooding transitioned into areal county flooding, which persisted until midnight.	
1/25/2010	Mechanicsburg; Heavy rain caused widespread areal flooding of low lying urban and poor drainage areas. The Williams Grove Mobile Home Park was evacuated due to flooding at the Williams Grove Water Treatment Plant in Mechanicsburg. A number of roads were closed including Blosserville Road at the Conodoguinet Creek Bridge on the border of West Pennsboro and Upper Frankford Townships. Creek Road was closed between Route 74 and Kuhn Road in Monroe Township.	*not provided*
8/12/2010	Mount Holly Springs; Heavy thunderstorm rains produced flash flooding in Mount Holly Springs. Several municipal streets and underpasses were flooded.	$5,000
3/10/2011	Plainfield; Heavy rain brought flooding and closed numerous roads. Flood waters also caused the mandatory evacuation of the Williams Grove Mobile Home Park. This included 81 mobile homes, where 250 persons were displaced.	*not provided*
3/10/2011	New Cumberland; Yellow Breeches Creek experienced moderate flooding. A number of homes in the Green Lane Farms development are affected by high water. Cedar Cliff Drive on the left bank upstream from the bridge was inundated. Creekwood Drive had several feet of water on it, and water was approaching homes.	*not provided*
3/10/2011	New Kingston; The Conodoguinet Creek near Hogestown experienced a moderate flood. Some residences in the vicinity of Erb's Bridge Road, Prowell Road, Stone Spring Lane, and Oyster Mill Road were flooded.	*not provided*
4/16/2011	Carlisle Springs; Flash flooding resulted in 12 water rescues of people in cars on flooded roads at several locations. Cedar Run was reported out of banks and flooding Old Gettysburg Road near Shiremanstown.	*not provided*
4/16/2011	Lisburn; Yellow Breeches Creek near Camp Hill crested above moderate flood stage. Numerous homes along the entire length of Yellow Breeches Creek are affected by high water levels in both York and Cumberland Counties.	*not provided*
4/28/2011	Camp Hill; Several road closures and water rescues were reported in and around New Cumberland. Widespread flooding in Lower Allen Township. Cedar Run out of its banks flooding Old Gettysburg Road. Cars reported flooded, two homes and a business also flooded.	*not provided*
4/28/2011	Lisburn; Yellow Breeches Creek near Camp Hill crested above moderate flood stage. A number of homes along the entire length of Yellow Breeches Creek are affected by high water.	*not provided*
7/8/2011	Carlisle; Torrential thunderstorm rainfall produced localized flash flooding in Carlisle.	*not provided*
9/7/2011	Plainfield; Yellow Breeches Creek near Camp Hill crested at moderate flood stage. The Conodoguinet Creek near Hogestown crested at moderate flood stage. Many roads in the county were closed due to flooding from creeks and streams. Flooding was reported along the Susquehanna River in the Wormleysburg area. A portion of Bridge Street in New Cumberland was underwater and residents in that area evacuated. The street was closed, and Olde Towne Beverage was underwater. The Borough of New Cumberland was under state of emergency. A preliminary total of 160 structures suffered major damage, and 100 suffered minor damage with a total of 448 structures impacted.	$1,000,000
9/28/2011	Mount Holly Springs; Heavy rain produced flash flooding, resulting in two structure collapses and many roads being flooded.	*not provided*
5/29/2012	Shippensburg; A line of intense heavy thunderstorm rains caused flash flooding across much of the County. Carlisle reported 2.3 inches of rainfall in a short period of time. Flooded roads were reported in Camp Hill, Carlisle, Shippensburg and Southampton Townships. A water rescue was reported on Hummel Avenue in Camp Hill. Two cars were rescued from flood waters in Carlisle.	*not provided*
8/14/2012	Hunters Run; Torrential thunderstorm rains of 1-2 inches in less than an hour produced numerous reports of flash flooding across the eastern half of Cumberland County. Flash flooding closed SR42 near Mt. Holly Springs, South Front and Market Streets in	*not provided*

Table 4.3.3-1: Flood and flash flood events impacting Cumberland County from 1936-2014 (SHELDUS, 2013, NCEI, 2018, NOAA Hydrograph of Conodoguinet Creek & community surveys). Note that property damage values are estimates based on best available information. "Countywide" indicates that several locations in the County were affected.

Date	Location & Description	Estimated Property Damage ($)
	Lemoyne, SR 11 in Silver Springs Township and the 400 block of Front Street in Hampden Township.	
8/26/2012	Shippensburg; Torrential thunderstorm rains produced localized flash flooding in and around the Shippensburg area. Several roads were closed and impassable at times including Walnut Bottom Road.	*not provided*
10/29/2012	Newburg; Generally minor flooding, with 1 flooded road and several flooded basements reported.	*not provided*
10/10/2013	Newburg; Excessive rainfall between 5-10 inches produced widespread significant flooding. Road closures were experienced near Boiling Springs and Mt. Holly Springs. Moderate river flooding occurred on the Yellow Breeches Creek in Camp Hill. Minor river flooding was observed on the Conodoguinet Creek at Hogestown.	*not provided*
5/16/2014	Newburg; Heavy rainfall of 2 to 4 inches produced widespread flooding. A vehicle was stranded on Walnut Bottom Road near Carlisle. The Conodoguinet Creek at Hogestown and Yellow Breeches Creek near Camp Hill exceeded minor flood stage, impacting low-lying areas in the Green Lane Farms Development, a mobile home park near Williams Grove, Erb's Bridge Road, Prowell Road, Stone Spring Lane and Oyster Mill Road.	*not provided*
7/27/2014	Heberlig; Heavy rain produced flash flooding and closed several roads across the county. High water forced several road closures from the west shore area to the Market Street bridge and Lemoyne.	*not provided*
6/8/2015	Countywide; Heavy rain (over 4 inches in 2 hours) brought flash flooding to the area. A family was evacuated from a home in the 600 block of Shippensburg Road (Route 533) in North Newton Township. Flooding was reported at the Laughlin Mill in Newville. Flash flooding was also reported in the Orrstown area and in Shippensburg.	*not provided*
6/23/2015	Plainfield; Reportedly, 1 foot of water flowed onto the parking lot of businesses at the intersection of Clay, North Bedford and North Hanover Streets in Carlisle. Two vehicles were stranded in the high waters, and one person was rescued by boat.	*not provided*
8/4/2017	Countywide; Heavy rainfall caused the flooding of numerous roads across the western portion of Cumberland County. A water rescue occurred at Clay and Hanover Streets in Carlisle.	*not provided*
4/17/2018	Conodoguinet Creek near Hogestown crests at 8.06 feet	*Not provided*
7/26/2018	Conodoguinet Creek near Hogestown crests at 10.10 feet	*Not provided*
9/11/2018	Conodoguinet Creek near Hogestown crests at 9.12 feet	*Not provided*
5/11/2020	Conodoguinet Creek near Hogestown crests at 8.70 feet (preliminary value, subject to change)	*Not provided*

There are no known significant flood events in Cumberland County which can be attributed directly to an ice jam. However, the presence of river ice has compounded the impact of certain winter flood events, such as the January 1996 flood. The January 1996 event was the result of very rapid snowmelt punctuated by short, but intense rainfall and compounded by ice movement and jamming along the Susquehanna River. The Susquehanna River rose nearly 13 feet in two hours on the evening of January 19, 1996 in Harrisburg. This was the fastest rate of rise on the Susquehanna River ever recorded at Harrisburg in more than 100 years of record-keeping and was partly due to ice jams (NOAA – NWS, 1998). The event resulted in the collapse of portions of the pedestrian and bikeway Walnut Street Bridge which connected the eastern and western Shores of the Susquehanna River. High floodwaters and significant ice flow lifted two spans of the bridge off their foundations and carried them downstream.

The National Flood Insurance Program identifies Repetitive Loss (RL) and Severe Repetitive Loss (SRL) properties. The following definition of RL and SRL properties from the Hazard Mitigation Assistance (HMA) Guidance from February 2015 reflects changes made in the Biggert-Waters Flood Insurance Reform Act of 2012.

A **Repetitive Loss (RL)** The National Flood Insurance Program (NFIP) defines a Repetitive Loss property as any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

The Hazard Mitigation Assistance program defines Repetitive Loss as having incurred flood-related damage on 2 occasions, in which the cost of the repair, on the average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event; and, at the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

A **Severe Repetitive Loss (SRL)** property is a structure that:

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

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

Tables 4.3.3-2 and 4.3.3-3 show the number and type of Repetitive Loss and Severe Repetitive Loss properties in Cumberland County, respectively. Note that only communities with Repetitive Loss and Severe Repetitive Loss properties are shown. Based on input from the Pennsylvania Department of Community and Economic Development, an assumption is made that *non-residential* type is anything other than “residential” including, but not necessarily limited to “commercial” building types. Also, *ASSMD Condo* type refers to a situation where an individual owns the structure, or portion of the structure, but not any of the land. As of September 2018, there were 155 Repetitive Loss buildings in Cumberland County, 112 of which are identified as *single family*. Most of these properties are located in the Borough of New Cumberland, East Pennsboro Township, and the Borough of Camp Hill. Only ten of these properties have been mitigated. In addition, there are seven Severe Repetitive Loss properties in Cumberland County. Table 4.3.3-4 shows the number of NFIP claims since 1978.

Total and mitigated Repetitive Loss properties in Cumberland County (PEMA, January 2018; Commonwealth of PA 2013 State Standards All-Hazard Mitigation Plan; PEMA mitigated properties tracking, July 2017)												
Municipality	**2-4 Family**		**Assmd Condo**		**Non-Residential**		**Other Residential**		**Single Family**		**Total**	
	Total	**Mit.**	**Total**	**Mit.**	**Total**	**Mit.**	**Total**	**Mit.**	**Total**	**Mit.**	**Total**	**Mit.**
Borough of Camp Hill	0	0	0	0	0	0	0	0	14	0	14	0
Borough of Carlisle	0	0	0	0	0	0	0	0	1	0	1	0
Township of Dickinson	0	0	0	0	1	0	0	0	0	0	1	0
Township of East Pennsboro	0	0	0	0	0	0	0	0	24	2	24	2
Township of Hampden	0	0	0	0	1	1	0	0	9	0	10	1
Township of Lower Allen	0	0	0	0	0	0	0	0	10	2	10	2
Township of Lower Frankford	0	0	0	0	0	0	0	0	1	0	1	0
Borough of Mechanicsburg	0	0	0	0	0	0	0	0	1	1	1	1
Township of Monroe	0	0	0	0	0	0	2	0	3	0	5	0
Borough of New Cumberland	13	0	0	0	17	0	3	0	27	0	60	0
Township of North Middleton	0	0	0	0	0	0	0	0	1	0	1	0
Township of Silver Spring	0	0	0	0	0	0	0	0	5	4	5	4
Township of South Middleton	0	0	0	0	0	0	0	0	3	0	3	0
Township of South Newton	0	0	0	0	0	0	0	0	1	0	1	0
Township of Upper Allen	0	0	0	0	0	0	0	0	5	0	5	0
Township of Upper Frankford	0	0	0	0	0	0	0	0	2	0	2	0
Borough of Wormleysburg	2	0	1	0	3	0	1	0	5	0	11	0
TOTAL	**15**	**0**	**1**	**0**	**22**	**1**	**6**	**0**	**112**	**9**	**155**	**10**

Table 4.3.3-3: Total and mitigated Severe Repetitive Loss properties in Cumberland County (PEMA, January 2018; Commonwealth of PA 2013 State Standards All-Hazard Mitigation Plan; PEMA mitigated properties tracking, July 2017)

County	2-4 Family		Assmd Condo		Non-Residential		Other Residential		Single Family		Total	
	Total	Mit.	Total	Mit.	Total	Mit.	Total	Mit.	Total	Mit.	Total	Mit.
Borough of Camp Hill	0	0	0	0	0	0	0	0	1	0	1	0
Township of East Pennsboro	0	0	0	0	0	0	0	0	1	0	1	0
Township of Lower Allen	0	0	0	0	0	0	0	0	1	0	1	0
Township of Monroe	0	0	0	0	0	0	0	0	1	0	1	0
Borough of New Cumberland	1	0	0	0	0	0	0	0	0	0	1	0
Township of Upper Frankford	0	0	0	0	0	0	0	0	1	0	1	0
Borough of Wormleysburg	0	0	0	0	0	0	1	0	0	0	1	0
TOTAL	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**5**	**0**	**7**	**0**

Table 4.3.3-4: NFIP claims since 1978 (FEMA Community Information System, October 2019).			
Community	**Number Of Claims Paid**	**Total Paid Claims**	**Substantial Damage Closed Paid Losses**
Borough of Camp Hill	72	$1,756,895	3
Borough of Carlisle	19	$134,339	1
Township of Cooke	0	$0	0
Township of Dickinson	3	$8,214	0
Township of East Pennsboro	128	$1,643,419	3
Township of Hampden	164	$969,783	1
Township of Hopewell	1	$19,320	0
Borough of Lemoyne	9	$18,303	1
Township of Lower Allen	86	$1,274,188	4
Township of Lower Frankford	7	$87,329	0
Township of Lower Mifflin	0	$0	0
Borough of Mechanicsburg	39	$145,774	1
Township of Middlesex	3	$7,373	1
Township of Monroe	73	$669,351	4
Borough of Mount Holly Springs	11	$34,462	0
Borough of New Cumberland	254	$4,629,771	22
Borough of Newburg	N/A	N/A	N/A
Borough of Newville	3	$55,532	1
Township of North Middleton	15	$106,101	0
Township of North Newton	2	$23,816	0
Township of Penn	1	$467	0
Township of Shippensburg	1	$2,543	0
Borough of Shippensburg	4	$4,939	0
Borough of Shiremanstown	1	$3,424	0
Township of Silver Spring	42	$296,514	1
Township of South Middleton	27	$208,564	12
Township of South Newton	7	$38,167	1
Township of Southampton	9	$212,569	0
Township of Upper Allen	34	$154,463	0
Township of Upper Frankford	27	$397,776	11
Township of Upper Mifflin	2	$3,863	0
Township of West Pennsboro	1	$975	0
Borough of Wormleysburg	82	$2,747,419	2
TOTAL	**1,127**	**$ 15,655,653**	**59**

4.3.3.4 Future Occurrence

In Cumberland County, flooding occurs commonly and can take place during any season of the year. Every two to three years, serious flooding occurs along one or more of Pennsylvania's major rivers or streams and it is not unusual for such events to happen several years in succession. Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and related probability of occurrence. Historical records are used to determine the probability of occurrence (percent chance) for a flood of specific extent to occur.

The NFIP recognizes the 1 percent-annual-chance flood, also known as the *base flood*, as the standard for identifying properties subject to federal flood insurance purchase requirements. A 1 percent-annual-chance flood is a flood which has a 1 percent chance of occurring in a given year. Preliminary versions of updated DFIRMs which are to be finalized in 2021, were used to analyze risk in this plan and can be used to identify areas subject to the 1 percent- and 0.2 percent-annual-chance flooding. Areas subject to 2 percent- and 10 percent-annual-chance events are not shown on maps; however, water surface elevations associated with these events are included in the flood source profiles contained in the Flood Insurance Study Report.

Recent precipitation trends in PA, linked to a changing climate, may lead to an increased likelihood of flooding events. Pennsylvania has displayed a 10% increase in annual precipitation, with many specific locations within the state experiencing a 20% increase. 2018 was the wettest year on record for Pennsylvania and several other Northeast Region states, with the 2018-19 winter (Dec 1-Feb 28) bringing 128% of normal, seasonal precipitation to the region (NOAA, 2019). The amount of precipitation associated with heavy rain events in the Northeast region of the United States has increased by 70% from 1958 to 2010 (DEP, 2018). When comparing the number of heavy precipitation days between 1950-1959 and 2005-2014, the city of Harrisburg had the 7th greatest increase (283%) among all US cites (Climate Central, 2015). The overall increase in precipitation and intensification of individual storm events are likely to be some of the most relevant impacts of climate change that will be felt in Cumberland County.

The increase in flooding caused by abnormally high precipitation in 2018 contributed to $125 million in Pennsylvania infrastructure damage (DEP, 2018). With increased precipitation, urbanization and land development associated with population growth can compound flooding issues if stormwater is not managed properly. The DCNR Bureau of Facility Design & Construction anticipates, and has plans to mitigate, a likely increase in the overtopping of roadways by flood waters. The Bureau also expects to reassess and potentially adjust stormwater systems to increase future capacity (DCNR, 2018).

More frequent stormwater events such as those that occurred in 2018 may impact roads, businesses and other infrastructure in Cumberland County and the surrounding region. County municipalities in the Census-defined urbanized area are required by the Environmental Protection Agency to secure a municipal separate storm sewer system (MS4) permit for discharge of urban stormwater. The permit requires the municipalities to identify stormwater

impacts on flooding and water quality and develop best management practices (BMPs) that address those issues.

All of the municipalities from Carlisle east to the Susquehanna River, except for Mt. Holly Springs, are required to have a MS4 permit. These municipalities have developed plans to reduce the impacts of stormwater and flooding. Many have implemented stormwater fees levied upon all property types that provide a dedicated funding stream to implement the BMPs identified in their MS4 permit documents. The combination of strategic BMPs and an identified funding source will enable municipalities to decrease the impacts of flooding and stormwater on roads, businesses and infrastructure in the future.

While rural municipalities, those west of Carlisle to the county border, are not subjected to a federal permit for stormwater discharge, they have adopted a county-developed stormwater management plan and associated ordinance. Those municipalities require the submission of a stormwater management plan for subdivision and land development activities. Much like the MS4 permit, those plans require developers to implement BMPs that reduce the volume and rate of stormwater emanating from projects which in turn reduces the negative impacts of stormwater on businesses, roads, and other infrastructure in those rural municipalities.

Expected increases in temperature throughout the Northeast region of the U.S. may benefit the agricultural industry by lengthening the growing season. However, excess moisture and precipitation are currently the leading causes of crop loss in the region (Wolfe et al., 2017). Greater annual rainfall could compound these issues. Increased heavy precipitation, which can erode soil and worsen water quality, also poses a serious threat to this important industry (U.S. GCRP, 2018).

As a part of the Hazard Mitigation Plan update process, representatives of County municipalities were asked to identify whether the frequency, magnitude, or extent of each hazard has increased, decreased, or not changed since the 2014 version of the Plan. The survey was entitled Evaluation of Identified Hazards and Risk. A significant portion of respondents observed that flood and flash flood risks had increased. Some referenced the abnormally high precipitation totals of 2018, while others connected heightened flood impacts to climate change or an increase in heavy rainfall events. Overall, the probability of future floods can be considered *highly likely* according to the Risk Factor Methodology (see Table 4.4-2).

4.3.3.5 Vulnerability Assessment

Cumberland County is vulnerable to flooding that causes loss of lives, property damage, and road closures. For purposes of assessing vulnerability, the County focused on community assets that are located in the 1 percent-annual-chance floodplain. While greater and smaller floods are possible, information about the extent and depths for this floodplain is available for all municipalities countywide, thus providing a consistent basis for analysis. Figure 4.3.3-3 shows the 1 percent-annual-chance preliminary floodplain provided by FEMA in 2019.

Cumberland County GIS has assembled hazard areas and performed a threat analysis for the 2020 Hazard Mitigation Plan update. The previous 2014 Plan used structures as the primary analysis for hazard impacts. Cumberland County GIS does not maintain a structures layer, nor

is there an layer available for analysis that is accurate and routinely updated. Therefore, the primary analysis of hazard impacts utilized addressed units during the 2020 Plan update, a GIS dataset that is maintained by the County. This dataset includes the street address, latitude and longitude coordinates, and additional information about a given property. A tool was developed that cycled through each municipality within the County and selected all addressed structures that were within the preliminary FEMA floodplain dataset. When a structure is visible in the orthoimagery, the feature is placed on the structure. If no structure is visible in the orthoimagery, the feature is placed in the center of the tax parcel (Cumberland County GIS, 2019). It is important to note that addressed units account for more residences, as there can be many apartment units in a single building, whereas structures count more buildings on farm, commercial, and industrial properties (Cumberland County GIS, 2019).

Using this methodology, it was determined that 1,545 out of 109,584 (1.41%) of addressed units in the County are located within the preliminary SFHA with 1,317 (85 percent) of the units designated as residential (Table 4.3.3-5). A total of 5,493 mobile homes were identified within the County, with 292 (5.3%) located within the preliminary SFHA. Table 4.3.3-5 reveals that Hampden Township, Mount Holly Springs Borough, and Monroe Township each contain over 150 structures that are vulnerable to the impacts of a 1 percent-annual-chance flood. Hampden Township in particular has experienced stormwater challenges and continuous land development issues related to flooding, and currently has152 structures located in the preliminary SFHA. Monroe Township and Mount Holly Springs Borough have more mobile homes within the 1 percent-annual-chance floodplain than any other municipalities contributing to 34.5 percent and 15 percent, respectively, of all mobile homes in the County in the preliminary SFHA. These structures are particularly vulnerable to the impacts of flooding events.

Table 4.3.3-5: Number of total addressed units and mobile homes both in and out of the 1 percent-annual-chance floodplain, by municipality (Cumberland County GIS, 2019).

Municipality	Total Structures \ Addressed Units	Structures \ Addressed Units In Preliminary SFHA	Percent Of Total Units In Preliminary SFHA	Mobile Homes	Mobile Homes In SFHA	Percent Of Mobile Homes In SFHA
Borough of Camp Hill	3,730	12	0.32%	0	0	N/A
Borough of Carlisle	8,817	124	1.41%	15	0	0.0%
Township of Cooke	391	9	2.30%	4	0	0.0%
Township of Dickinson	2,268	20	0.88%	184	1	0.5%
Township of East Pennsboro	9,285	74	0.80%	61	2	3.3%
Township of Hampden	13,644	152	1.11%	513	2	0.4%
Township of Hopewell	904	8	0.88%	64	1	1.6%
Borough of Lemoyne	2,158	0	0.00%	0	0	N/A
Township of Lower Allen	8,008	70	0.87%	60	0	0.0%
Township of Lower Frankford	734	8	1.09%	172	1	0.6%
Township of Lower Mifflin	771	43	5.58%	244	38	15.6%
Borough of Mechanicsburg	4,622	2	0.04%	1	0	0.0%
Township of Middlesex	3,092	16	0.52%	767	6	0.8%
Township of Monroe	2,576	162	6.29%	172	101	58.7%
Borough of Mount Holly Springs	909	172	18.92%	112	44	39.3%
Borough of New Cumberland	3,359	118	3.51%	0	0	N/A
Borough of Newburg	138	0	0.00%	0	0	N/A
Borough of Newville	764	1	0.13%	13	0	0.0%
Township of North Middleton	5,287	30	0.57%	495	3	0.6%
Township of North Newton	967	3	0.31%	57	0	0.0%
Township of Penn	1,194	4	0.34%	94	1	1.1%
Borough of Shippensburg	1,827	59	3.23%	4	0	0.0%
Township of Shippensburg	1,315	58	4.41%	282	41	14.5%
Borough of Shiremanstown	796	0	0.00%	0	0	N/A
Township of Silver Spring	8,045	56	0.70%	391	1	0.3%
Township of South Middleton	6,845	95	1.39%	433	4	0.9%
Township of South Newton	525	25	4.76%	22	4	18.2%
Township of Southampton	2,932	90	3.07%	461	31	6.7%
Township of Upper Allen	8,199	45	0.55%	124	0	0.0%
Township of Upper Frankford	1,034	25	2.42%	409	9	2.2%
Township of Upper Mifflin	559	1	0.18%	89	0	0.0%
Township of West Pennsboro	2,311	13	0.56%	250	2	0.8%
Borough of Wormleysburg	1,578	50	3.17%	0	0	N/A
TOTAL	**109,584**	**1,545**	**1.41%**	**5,493**	**292**	**5.3%**

Table 4.3.3-6: Addressed units in the SFHA by Generalized Parcel Type (Cumberland County GIS, 2019).								
Municipality	**Total Addressed Units**	**Total Non-Residential Addressed Units**	**Non-Residential Units Within Preliminary SFHA**	**Percent Non-Residential Units Within Preliminary SFHA**	**Total Residential Addressed Units**	**Residential Units Within Preliminary SFHA**	**Percent Residential Units Within Preliminary SFHA**	**Total Addressed Units Within Preliminary SFHA**
Borough of Camp Hill	3,730	334	0	0.0%	3,396	12	0.4%	12
Borough of Carlisle	8,817	1221	20	1.6%	7,596	104	1.4%	124
Township of Cooke	391	20	2	10.0%	371	7	1.9%	9
Township of Dickinson	2,268	77	2	2.6%	2,191	18	0.8%	20
Township of East Pennsboro	9,285	492	6	1.2%	8,793	68	0.8%	74
Township of Hampden	13,644	922	11	1.2%	12,722	141	1.1%	152
Township of Hopewell	904	34	1	2.9%	870	7	0.8%	8
Borough of Lemoyne	2,158	320	0	0.0%	1,838	0	0.0%	0
Township of Lower Allen	8,008	817	14	1.7%	7,191	56	0.8%	70
Township of Lower Frankford	734	18	0	0.0%	716	8	1.1%	8
Township of Lower Mifflin	771	31	1	3.2%	740	42	5.7%	43
Borough of Mechanicsburg	4,622	622	1	0.2%	4,000	1	0.0%	2
Township of Middlesex	3,092	222	3	1.4%	2,870	13	0.5%	16
Township of Monroe	2,576	89	10	11.2%	2,487	152	6.1%	162
Borough of Mount Holly Springs	909	100	21	21.0%	809	151	18.7%	172
Borough of New Cumberland	3,359	262	36	13.7%	3,097	82	2.6%	118
Borough of Newburg	138	10	0	0.0%	128	0	0.0%	0
Borough of Newville	764	151	0	0.0%	613	1	0.2%	1
Township of North Middleton	5,287	363	2	0.6%	4,924	28	0.6%	30
Township of North Newton	967	87	1	1.1%	880	2	0.2%	3
Township of Penn	1,194	48	0	0.0%	1,146	4	0.3%	4
Borough of Shippensburg	1,827	294	34	11.6%	1,533	25	1.6%	59
Township of Shippensburg	1,315	162	3	1.9%	1,153	55	4.8%	58

Table 4.3.3-6: Addressed units in the SFHA by Generalized Parcel Type (Cumberland County GIS, 2019).								
Municipality	**Total Addressed Units**	**Total Non-Residential Addressed Units**	**Non-Residential Units Within Preliminary SFHA**	**Percent Non-Residential Units Within Preliminary SFHA**	**Total Residential Addressed Units**	**Residential Units Within Preliminary SFHA**	**Percent Residential Units Within Preliminary SFHA**	**Total Addressed Units Within Preliminary SFHA**
Borough of Shiremanstown	796	78	0	0.0%	718	0	0.0%	0
Township of Silver Spring	8,045	443	6	1.4%	7,602	50	0.7%	56
Township of South Middleton	6,845	420	17	4.0%	6,425	78	1.2%	95
Township of South Newton	525	31	2	6.5%	494	23	4.7%	25
Township of Southampton	2,932	98	7	7.1%	2,834	83	2.9%	90
Township of Upper Allen	8,199	372	7	1.9%	7,827	38	0.5%	45
Township of Upper Frankford	1,034	32	2	6.3%	1,002	23	2.3%	25
Township of Upper Mifflin	559	21	0	0.0%	538	1	0.2%	1
Township of West Pennsboro	2,311	100	2	2.0%	2,211	11	0.5%	13
Borough of Wormleysburg	1,578	170	17	10.0%	1,408	33	2.3%	50
TOTAL	**109,584**	**8,461**	**228**	**2.7%**	**101,123**	**1,317**	**1.3%**	**1,545**

There are eleven SARA facilities located in the 1 percent-annual-chance floodplain (see Appendix F). Communities where these facilities are located and communities downstream are vulnerable to hazardous material contamination during significant flooding events.

A total of 578 critical facilities were identified in Cumberland County. Of these, 16 are located in the SFHA (2.8%). Details are provided in Table 4.3.3-7.

Past occurrence shows that flooding events of varying extents take place annually. These events have caused loss of life, repetitive inundation of roads, and significant dollar losses (see Section 4.3.3 and Section 4.4.3). A majority of the Repetitive Loss structures within the County are located in the Borough of New Cumberland, East Pennsboro Township, and the Borough of Camp Hill. These communities are particularly vulnerable to repeated flood damages and ensuing flood insurance claims.

When considering the population in the SFHA, the greatest number of at-risk residents live in Mount Holly Springs (approximately 398 residents in SFHA), Monroe Township (approximately 362 residents in the SFHA), Hampden Township (approximately 324 residents in SFHA), and Shippensburg Township (approximately 311 residents in SFHA). In all, there are approximately 3,217 (1.4 percent) residents of Cumberland County living within the SFHA. This data is detailed in Table 4.3.3-8.

Table 4.3.3-7: Critical Facilities in the SFHA in Cumberland County (Cumberland County GIS, 2019).			
Community	**Total Critical Facilities In Municipality**	**Total Critical Facilities In SFHA**	**Percent Critical Facilities In SFHA**
Borough of Camp Hill	16	0	0.0%
Borough of Carlisle	60	0	0.0%
Township of Cooke	2	0	0.0%
Township of Dickinson	13	0	0.0%
Township of East Pennsboro	35	0	0.0%
Township of Hampden	58	1	1.7%
Township of Hopewell	10	0	0.0%
Borough of Lemoyne	13	0	0.0%
Township of Lower Allen	41	1	2.4%
Township of Lower Frankford	1	0	0.0%
Township of Lower Mifflin	4	0	0.0%
Borough of Mechanicsburg	27	0	0.0%
Township of Middlesex	37	1	2.7%
Township of Monroe	10	2	20.0%
Borough of Mount Holly Springs	11	3	27.3%
Borough of New Cumberland	12	0	0.0%
Borough of Newburg	1	0	0.0%
Borough of Newville	8	0	0.0%
Township of North Middleton	24	1	4.2%
Township of North Newton	11	0	0.0%
Township of Penn	10	1	10.0%
Township of Shippensburg	13	2	15.4%
Borough of Shippensburg	10	0	0.0%
Borough of Shiremanstown	6	0	0.0%
Township of Silver Spring	44	0	0.0%
Township of South Middleton	40	3	7.5%
Township of South Newton	4	0	0.0%
Township of Southampton	18	0	0.0%
Township of Upper Allen	19	1	5.3%
Township of Upper Frankford	5	0	0.0%
Township of Upper Mifflin	2	0	0.0%
Township of West Pennsboro	11	0	0.0%
Borough of Wormleysburg	2	0	0.0%
TOTAL	**578**	**16**	**2.8%**

Table 4.3.3-8: Population in the SFHA in Cumberland County (U.S. Census Bureau, 2010).			
Community	**Total 2010 Population**	**2010 Population In SFHA***	**Percent Population In SFHA**
Borough of Camp Hill	7,888	30	0.4%
Borough of Carlisle	18,682	171	0.9%
Township of Cooke	179	19	10.6%
Township of Dickinson	5,223	38	0.7%
Township of East Pennsboro	20,228	163	0.8%
Township of Hampden	28,044	324	1.2%
Township of Hopewell	2,329	19	0.8%
Borough of Lemoyne	4,553	0	0.0%
Township of Lower Allen	17,980	102	0.6%
Township of Lower Frankford	1,732	20	1.2%
Township of Lower Mifflin	1,783	88	4.9%
Borough of Mechanicsburg	8,981	3	0.0%
Township of Middlesex	7,040	34	0.5%
Township of Monroe	5,823	362	6.2%
Borough of Mount Holly Springs	2,030	398	19.6%
Borough of New Cumberland	336	223	3.1%
Borough of Newburg	7,277	0	0.0%
Borough of Newville	1,326	3	0.2%
Township of North Middleton	11,143	56	0.5%
Township of North Newton	2,430	6	0.2%
Township of Penn	2,924	11	0.4%
Township of Shippensburg	4,416	80	1.8%
Borough of Shippensburg	5,429	311	5.7%
Borough of Shiremanstown	1,569	0	0.0%
Township of Silver Spring	13,657	90	0.7%
Township of South Middleton	14,663	190	1.3%
Township of South Newton	1,383	61	4.4%
Township of Southampton	6,359	172	2.7%
Township of Upper Allen	18,059	83	0.5%
Township of Upper Frankford	2,005	52	2.6%
Township of Upper Mifflin	1,304	3	0.2%
Township of West Pennsboro	5,561	31	0.6%
Borough of Wormleysburg	3,070	74	2.4%
TOTAL	**235,406**	**3,217**	**1.4%**

**Calculated by selecting address points that intersect the SFHAs and applying the average persons per address point for the corresponding census block group. This is an approximation of populations living within the SFHA.*

4.3.4. Hurricane, Tropical Storm, & Nor'easter

4.3.4.1 Location and Extent

Tropical storms impacting Cumberland County develop in tropical or sub-tropical waters found in the Atlantic Ocean, Gulf of Mexico, or Caribbean Sea. Cyclones with maximum sustained winds of less than 39 miles per hour (mph) are called tropical depressions. A tropical storm is a cyclone with maximum sustained winds between 39-74 mph. These storms sometimes develop into hurricanes with wind speeds in excess of 74 mph. While Cumberland County is located over 150 miles from the Atlantic Coast, tropical storms and hurricanes can track inland causing heavy rainfall and winds.

Nor'easters are extra-tropical storms which typically develop from low-pressure centers off the Atlantic Coast north of North Carolina during the winter months. Extra-tropical is a term used to describe a hurricane or tropical storm with a cyclone that has lost its 'tropical' characteristics. While an extra-tropical storm denotes a change in weather pattern and how the storm is gathering energy, it may still have northeast winds that are tropical storm or hurricane force. Nor'easters can also produce heavy precipitation in the form of rain, snow, or ice. Although not a concern for Cumberland County, nor'easters may cause coastal flooding and beach erosion.

Hurricanes, tropical storms, and nor'easters are regional events that can impact very large areas hundreds to thousands of miles across over the life of the storm. Therefore, all communities within Cumberland County are equally subject to the impacts of these storms. Areas subject to flooding, wind, and winter storm damage are particularly vulnerable.

4.3.4.2 Range of Magnitude

The impacts associated with hurricanes, tropical storms, and nor'easters are primarily wind damage and flooding, as well as winter weather impacts from nor'easters. It is not uncommon for tornadoes to develop during these events. Historical tropical storm and hurricane events have brought intense rainfall, sometimes leading to damaging floods, as well as northeast winds, which, combined with waterlogged soils, can cause trees and utility poles to fall, as illustrated in Figure 4.3.4-1.

Figure 4.3.4-1: Hurricane Irene damage to a residence in Lower Allen Township, Cumberland County, PA on August 28, 2011 (Photograph courtesy of Lower Allen Township, 2014).

The impact tropical storm or hurricane events have on an area is typically measured in terms of wind speed. Expected damage from hurricane force winds is measured using the Saffir-Simpson Scale. The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential (characteristic of tropical storms and hurricanes, but not a threat to Cumberland County), which are combined to estimate potential damage. Table 4.3.4-1 lists Saffir-Simpson Scale categories with associated wind speeds and expected damages. Categories 3, 4, and 5 are classified as “major” hurricanes. While major hurricanes comprise only 20 percent of all tropical cyclones making landfall, they account for over 70 percent of the damage in the United States.

Table 4.3.4-1: Saffir-Simpson Scale categories with associated wind speeds and damages (NHC, 2009).

Storm Category	Wind Speed (Mph)	Description Of Damages
1	74-95	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-129	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted,

Table 4.3.4-1: Saffir-Simpson Scale categories with associated wind speeds and damages (NHC, 2009).		
Storm Category	**Wind Speed (Mph)**	**Description Of Damages**
		blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	130-156	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	>156	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

The likelihood of these damages occurring in Cumberland County is assessed in Section 4.3.4.4. It is important to recognize the potential for the cascading effects of flooding during these storm events; the risk assessment for flood-related damages is discussed in Section 4.3.3. Environmental impacts associated with hurricanes and tropical storms are consistent with the impacts described for flooding in Section 4.3.3.2 and tornadoes and windstorms in Section 4.3.7.2. The impact of severe winter weather which sometimes occurs during nor'easter events is discussed in Section 4.3.9.2.

In 2011, Tropical Storm Lee brought up to 9 inches of rain to parts of Cumberland County resulting in widespread flooding (Ginter, 2011). Residents in certain flood prone areas, such as Silver Spring Township near the Conodoguinet Creek, temporarily evacuated to higher ground (Gregg, 2011). The worst hurricane or tropical storm event in Cumberland County was Hurricane Agnes in 1972, described in Section 4.3.4.3. The worst nor'easter event in Cumberland County occurred from January 6-8, 1996, resulting in Presidential Disaster Declaration 1085. Blizzard conditions including heavy snow, strong winds, and very cold temperatures caused $635,000 in property damage in Cumberland County (NWS, 1996 and NCEI, 2018). About a week later, unseasonably high temperatures and rainfall melted the thick snowpack left by the nor'easter and resulted in Presidential Disaster Declaration 1093 for flooding (USGS, 1996).

4.3.4.3 Past Occurrence

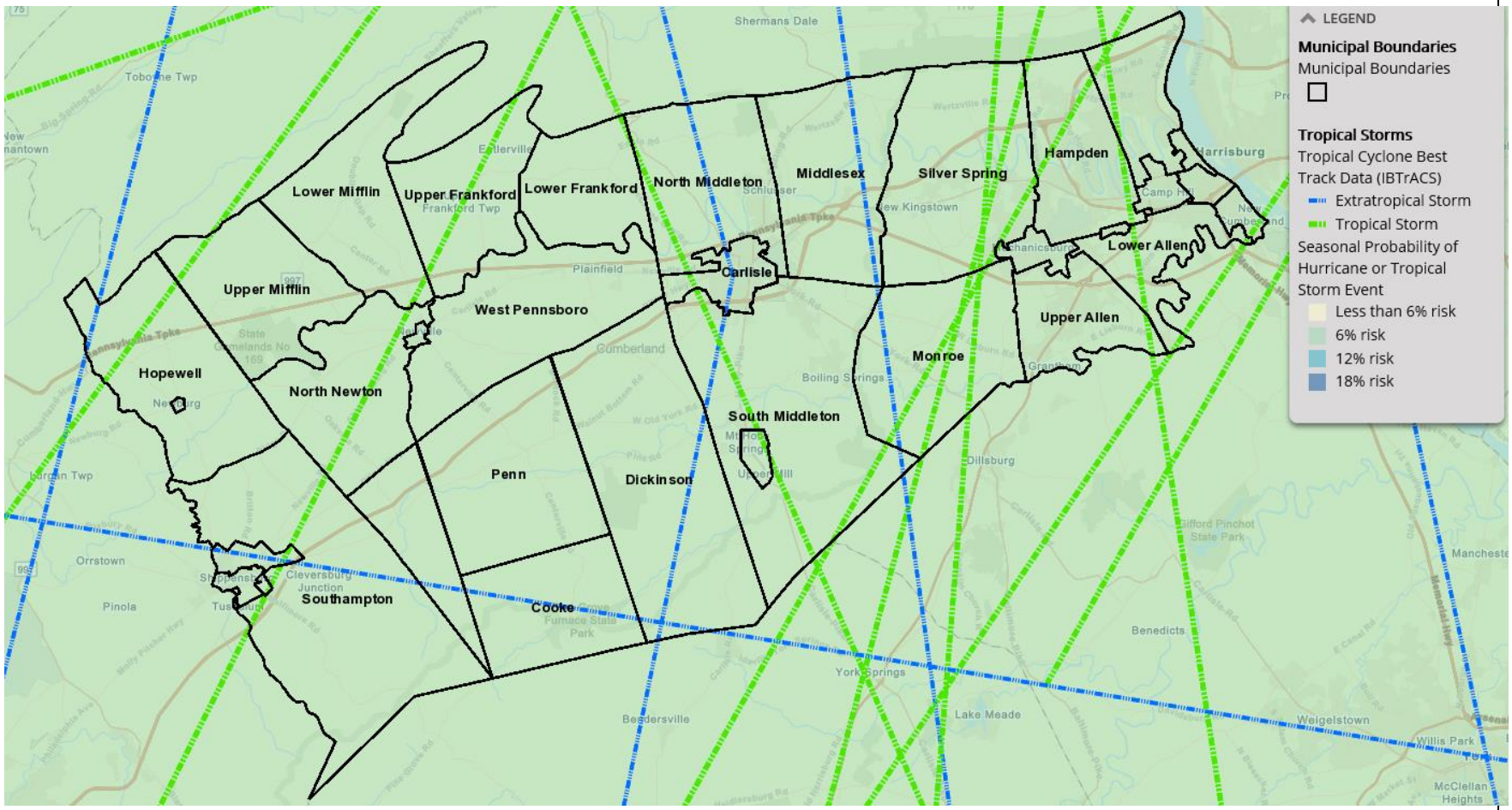
Previous tropical storm and hurricane events that have impacted Cumberland County are listed in Table 4.3.4-2; example damage can be seen in Figure 4.3.4-2 and Figure 4.3.4-3. With the exception of Tropical Storm Beryl, Presidential or Gubernatorial Disaster Declarations were issued for all of these events. No hurricanes or tropical storms have impacted the County since 2012. Storms with centers of circulation passing through or near Cumberland County are shown in Figure 4.3.4-4.

Table 4.3.4-2: Previous tropical storm events significantly affecting Cumberland County (NCEI, 2018).	
Year	**Event**
1972	Tropical Storm Agnes
1975	Hurricane Eloise
1994	Tropical Storm Beryl
1996	Hurricane Fran
1999	Hurricane Dennis
1999	Hurricane Floyd
2003	Tropical Storm Henri
2003	Tropical Storm Isabel
2004	Tropical Depression Ivan
2006	Tropical Depression Ernesto
2011	Tropical Storm Lee
2012	Hurricane Sandy

Figure 4.3.4-2: Flood damage to the Reading G&H Branch at Carlisle Junction (Cumberland County, PA), due to Hurricane Agnes (Photograph courtesy of Michael Bupp/*The Sentinel*, courtesy of the Cumberland County Historical Society, 2018).

Figure 4.3.4-3: Flooding at the intersection of Front and Market streets in Enola (East Pennsboro Township), Cumberland County, PA on September 9, 2011, due to Tropical Storm Lee (Photograph courtesy of East Pennsboro Township, 2014).

Figure 4.3.4-4: Pennsylvania Historical Coastal Storm Events and seasonal probability of future events (NOAA, 2018). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.



Of the storms listed in Table 4.3.4-2, Tropical Storm Agnes was the most devastating event the County experienced. Agnes made landfall in Florida as a minimal hurricane. However, it combined with a non-tropical low over the Mid-Atlantic Region to produce rainfall amounts of up to 19 inches in some locations. Table 4.3.4-3 provides a breakdown of the damages by municipality and flood source, some of which are centered in adjacent York County but were included in the database as affecting Cumberland County.

Table 4.3.4-3: Distribution of flood damages by municipality and flood source from Tropical Storm Agnes (SHELDUS, 2013).

Municipality	Flood Source	Damages ($)
Enola	Susquehanna River	2,212,000
Carlisle Borough	Letort Spring Run	5,151,000
Camp Hill Borough	Conodoguinet Creek	14,833,000
Shippensburg Borough	Middle Spring Creek	854,000
Wormleysburg Borough	Susquehanna River	4,588,000
New Cumberland Borough	Susquehanna River	9,092,000
Goldsboro Borough (York County)	Susquehanna River	1,712,000
Lemoyne Borough	Susquehanna River	708,000
Dillsburg Borough (York County)	Dogwood Run	614,000
Mount Holly Springs Borough	Mountain Creek	639,000
Huntsdale	Yellow Breeches Creek	49,000
Boiling Springs	Yellow Breeches Creek	219,000
Upper Allen Township (Grantham)	Yellow Breeches Creek	54,000

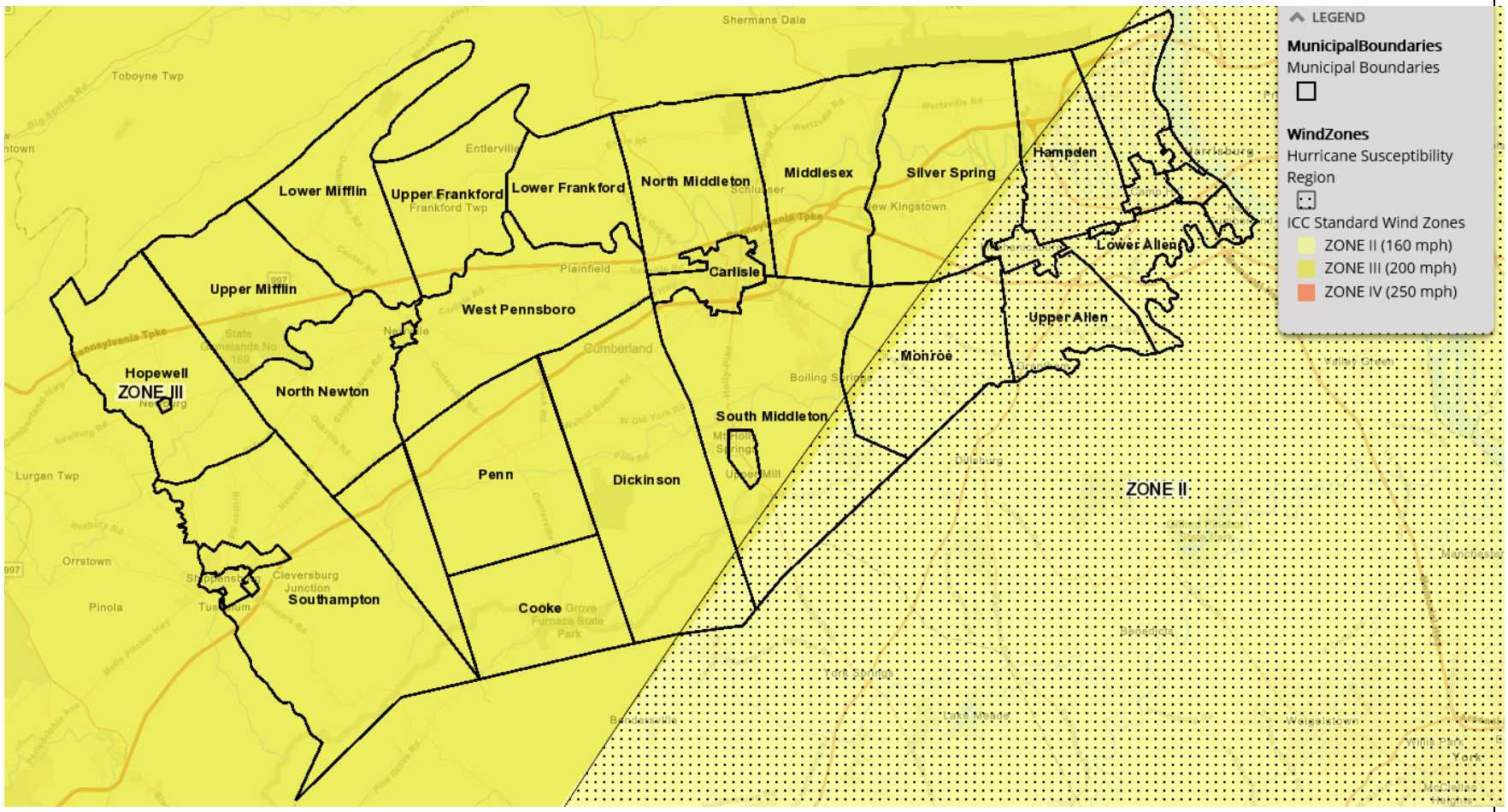
The NOAA NCEI database does not track nor'easters as a separate weather event; they are tracked as high wind, heavy snow, and/or coastal flooding events. However, other sources provide record that some of the winter storms listed in Section 4.3.9.3 were nor'easters. For instance, a severe nor'easter affected areas from North Carolina to Maine starting on January 4, 1994 and immobilized millions of people. The nor'easter brought icy rain and very heavy snow, which drifted up to three feet deep, closed major highways, and brought down power lines, resulting in Presidential Major Disaster Declaration 1015 (DeCourcy Hinds, 1994). Another nor'easter starting on October 29, 2011, brought 6-10" of heavy, wet snow across Cumberland County. Because trees were still covered in leaves, the weight of the snow on the leaves brought down many trees and power lines. High winds followed the storm, causing more trees and power lines to fall, leaving thousands of Cumberland County residents without power for days (Cumberland County DPS, 2011). Across the Northeast, a state of emergency was declared in New Jersey, Massachusetts, Connecticut, and some counties in New York, and at least three million customers lost power (Barnard and Nir, 2011). In March 2017 Winter Storm Stella, a nor'easter, resulted in over a foot of snow in parts of Cumberland County and many snow related cancellations (Miller, 2017). The worst nor'easter event recorded in Cumberland County occurred in January 1996 and is described in Section 4.3.4.2.

4.3.4.4 Future Occurrence

Table 4.3.4-4 includes wind speeds for all types of storms and is not specific to cyclonic winds. In Cumberland County and surrounding areas, the annual probability for winds that equal the strength of tropical storms (over 39 mph) is over 90 percent. The probability for winds at category 1 or 2 hurricane strength (78-118 mph) is greater than eight percent in any given year. Using Table 4.3.4-1, these wind speeds correspond to *minimal* or *moderate* expected damages. The annual probability of winds exceeding 118 mph is less than 0.1 percent. The National Oceanic and Atmospheric Administration Hurricane Research Division provided the data for the map included as Figure 4.3.4-4 showing the chance that a tropical storm or hurricane will affect a given area during the entire Atlantic hurricane season spanning from June to November. Note that this figure does not provide information on the probability of various storm intensities. However, this map reveals that there is a six percent chance of Cumberland County experiencing a tropical storm or hurricane event between June and November of any given year.

Hurricanes, tropical storms and nor'easters may be impacted by a changing climate. The National Climate Assessment released in 2018 suggests that North Atlantic hurricane activity has increased since the 1980's. An index of potential hurricane destructiveness suggests an increase over the past 30 years (Shortle et al. 2015). 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.
Tropical cyclone intensities are expected to increase with warming, as both theory and models suggest an increase in intensity with a warmer atmosphere (Michael Baker International, 2018)/ Furthermore, heavy rainfall produced by tropical cyclones appears to be increasing, including record precipitation from Hurricane Harvey in 2017. These changes may lead to greater threats to human safety and infrastructure in Cumberland County (U.S. GRCP, 2018). Figure 4.3.4-5 shows International Building Code wind zones for Cumberland County and Pennsylvania. These zones specify the minimum windspeed a building must be capable of withstanding in order to meet the requirements of shelter design. Most of the County falls in Zone III (200 mph) with a small eastern portion within Zone II (160 mph). Overall, the probability of future hurricanes, tropical storms, and nor'easters can be considered *highly likely* according to the Risk Factor Methodology (see Table 4.4-2).

Figure 4.3.4-5: Design wind speeds for community shelters in Pennsylvania (International Code Council, 2015; FEMA, 2015). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.



4.3.4.5 Vulnerability Assessment

Cumberland County is vulnerable to the impact of flooding and severe wind caused by hurricanes, tropical storms, and nor'easters. Flood vulnerability is addressed in Section 4.3.3.5 and vulnerability to wind damage is addressed in Section 4.3.8.5. The County is also vulnerable to severe winter weather impacts caused by nor'easters which are evaluated in Section 4.3.10.5.

4.3.5. Pandemic

4.3.5.1 Location and Extent

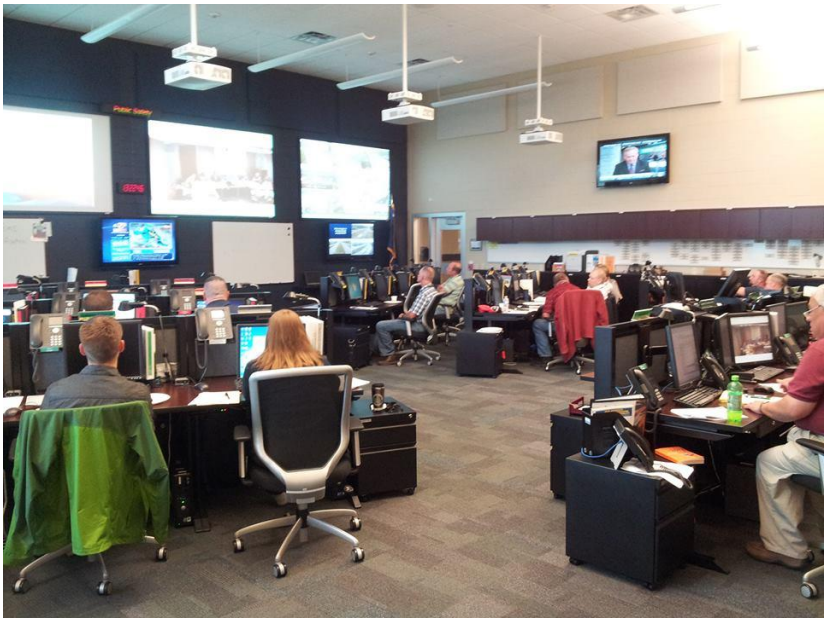
Pandemic is defined as a disease affecting or attacking the population of an extensive region, including several countries, and/or continent(s). It is further described as extensively epidemic. Generally, pandemic diseases cause sudden, pervasive illness in all age groups on a global scale. Infectious diseases are also highly virulent, and can be spread person-to-person.

Pandemic and infectious disease events cover a wide geographical area and can affect large populations, potentially including the entire population of Cumberland County and beyond. 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 water.

The COVID-19 pandemic has resulted in an emergency declaration that was issued in March of 2020 and was ongoing in July of 2020. In Cumberland County the virus has infected over 1,000 residents and led to 69 deaths as of July 2020 (PA Department of Health, July 2020). At the time of this writing the southeast and southwest parts of Pennsylvania were the most impacted by COVID-19 and statewide incidence and hospitalization rates were on the rise as the state progressed in reopening businesses and public services.

Prior to COVID-19 Cumberland County's primary pandemic focus was on influenza and the Department of Public Safety staff continues to participate in preparedness exercises (Figure 4.3.5-1). Pandemic influenza 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. H5N1 did not reach pandemic proportions in the United States, but Pennsylvania and local departments of health began actively planning for an occurrence of an influenza pandemic. As stated in the Pennsylvania Department of Health (DOH) Influenza Pandemic Response Plan, "an influenza pandemic is inevitable and will probably give little warning" (PA DOH, 2005). Influenza, also known as "the flu", is a contagious disease that is caused by the influenza virus and most commonly attacks the respiratory tract in humans. Influenza is considered to have pandemic potential if it is novel, meaning that people have no immunity to it, virulent, meaning that it causes deaths in normally healthy individuals, and easily transmittable from person-to-person.

Figure 4.3.5-1: Thirty-three members of the Cumberland County Emergency Operations Center participated in the pandemic flu virtual table top exercise on May 20, 2014 (Photograph courtesy of Nick Smallwood/FEMA, 2014).



4.3.5.2 Range of Magnitude

The pandemic or infectious disease threat in Cumberland County will range significantly depending on the aggressiveness of the virus in question and the ease of transmission.

COVID-19 is transmitted from person to person, yet more research is needed to fully determine the range of magnitude for the virus given its novelty. In Cumberland County, the virus has a low incidence rate with only 1,004 cases confirmed for an estimated 2019 population of over 250,000 (PA Department of Health, July 2020, US Census Bureau 2019).. Statewide 101,408 cases have been confirmed with 7,079 deaths for an estimated population of 12.8 million (PA Department of Health, July 2020, US Census Bureau 2019).

While more research is needed on the demographics of COVID-19 infection and death, current data shows that older residents with pre-existing health conditions may be more susceptible to death from the virus. In Pennsylvania, COVID-19 occurrences have been evenly spread across the 20-69 demographic with fewer cases occurring in the under 20 age group. However, over 90% of the COVID-19 deaths have occurred in the 60+ age categories (PA Department of Health, July 2020).

Pandemic influenza is fairly easily transmitted from person-to-person but advances in medical technologies have greatly reduced the number of deaths it causes. In terms of lives lost, the impact various pandemic influenza outbreaks have had globally over the last century has declined. The severity of illness from the 2009 H1N1 influenza flu virus varied as expected with any influenza pandemic. The gravest cases occurring mainly among those considered at high risk: children, the elderly, pregnant women, and chronic disease patients with reduced immune system capacity. Most people infected with H1N1 in 2009 recovered without needing medical

treatment, and this flu strain is now included in flu shots. According to the CDC, about 70% of those who were hospitalized with the 2009 H1N1 flu virus in the United States belonged to a high-risk group (CDC, 2009). This pattern is expected to continue with future novel flu strains.

The magnitude of a pandemic may be exacerbated by the fact that outbreaks would occur across Pennsylvania, limiting the ability to transfer assistance from one jurisdiction to another. Additionally, effective preventative and therapeutic measures, including vaccines and other medications, will likely be in short supply or will not be available.

There are no true environmental impacts in pandemic disease outbreaks, but there are significant economic and social costs beyond the possibility of deaths. Widespread illness may increase the likelihood of shortages of personnel to perform essential community services. In addition, high rates of illness and worker absenteeism would occur within the business community, and these contribute to social and economic disruption. Business closures or stay at home orders may result in job loss and increased unemployment claims. Social and economic disruptions could be temporary but may be amplified in today's closely interrelated and interdependent systems of trade and commerce. Social disruption may be greatest when rates of absenteeism impair essential services, such as power, transportation, and communications.

While the COVID-19 pandemic has yet to run its course, the 1918 Spanish flu pandemic remains the worst-case pandemic event on record. While mortality figures were probably under-reported, in the first month of the pandemic alone, 8,000 Pennsylvanians died from the flu or its complications (US DHHS, 2010).

4.3.5.3 Past Occurrence

The United States Department of Health and Human Services estimates that influenza pandemics have occurred for at least 300 years at unpredictable intervals. There have been several pandemic outbreaks over the past 100 years, with the most recent occurring in 2020. A list of events worldwide is shown in Table 4.3.5-1.

Table 4.3.5-1: List of previous significant outbreaks over the past century (PA DOH, CDC, 2020).

DATE	PANDEMIC NAME/SUBTYPE	WORLDWIDE DEATHS (APPROXIMATE)
1918-1920	Spanish Flu / H1N1	50 million
1957-1958	Asian Flu / H2N2	1-3 million
1968-1969	Hong Kong Flu / H3N2	1 million
2009 - 2010	Swine Flu / A/H1N1	25,174
2020	Corona Virus / COVID 19	476,911*

** This Figure was from July 2020. COVID-19 is an ongoing event and the worldwide deaths figure will change.*

Deaths occurred in the United States as a result of the Corona Virus, Spanish Flu, Asian flu, and Hong Kong Flu outbreaks. The Spanish Flu claimed 500,000 lives in the United States, and there were 350,000 cases in Pennsylvania. Most deaths resulting from the Asian flu occurred between September 1957 and March 1958. There were about 70,000 deaths in the United States and approximately 15% of the population of Pennsylvania was affected. The first cases

of the Hong Kong Flu in the U.S. were detected in September of 1968 with deaths peaking between December, 1968 and January, 1969 (Global Security, 2009). In the 2009/2010 season, when H1N1 was a primary concern, there were 431 confirmed flu cases in Cumberland County (PA DOH, 2014). The 2017-2018 flu season was one of the most impactful of the last decade in Pennsylvania. Within Cumberland County, reported flu cases spiked from 1,040 cases in 2015-2016 and 2,421 cases in 2016-2017, up to 3,217 cases in 2017-2018. This represents a 2017-2018 flu incidence rate of approximately 13.66 cases per 1,000 residents. As of June, 2020, the Corona Virus (COVID 19) claimed 122,985 deaths in the United States.

Figure 4.3.5-2: Residents reacted to the stay at home order issued by Governor Tom Wolfe as a response to COVID-19 pandemic. Shelves throughout the region were stripped of necessary supplies such as hand sanitizers, household cleaners, paper towels and toilet tissue (Cumberland County Planning Department 2020).

4.3.5.4 Future Occurrence

Future occurrences of pandemic influenza are unclear. Instances of the West Nile virus have been generally decreasing due to aggressive planning and eradication efforts. Prevention against the Zika virus, like mosquito control and insect repellent, has also increased, leading to less cases. The future of COVID-19 is uncertain as vaccines have yet to be developed and the actual rate of infection still undetermined. Climate change may influence diseases spread through mosquitos (See Figure 4.3.5-3)(Michael Baker International, 2018). The precise timing of pandemic influenza is uncertain, but occurrences are most likely when the Influenza Type A virus makes a dramatic change, or antigenic shift, that results in a new or “novel” virus to which the population has no immunity. This emergence of a novel virus is the first step toward a pandemic.

Figure 4.3.5-3: The yearly activity of the Asian Tiger Mosquito has increased, prolonging human exposure to vector-borne diseases (PA DCNR, 2018).

Future pandemics may also emerge from other diseases, especially invasive pathogens that Pennsylvanians do not have natural immunity to. However, looking at the number of historical incidences of pandemic-potential diseases, the probability of future pandemic events can be considered *moderately likely* according to the Risk Factor Methodology (see Table 4.4-2).

4.3.5.5 Vulnerability Assessment

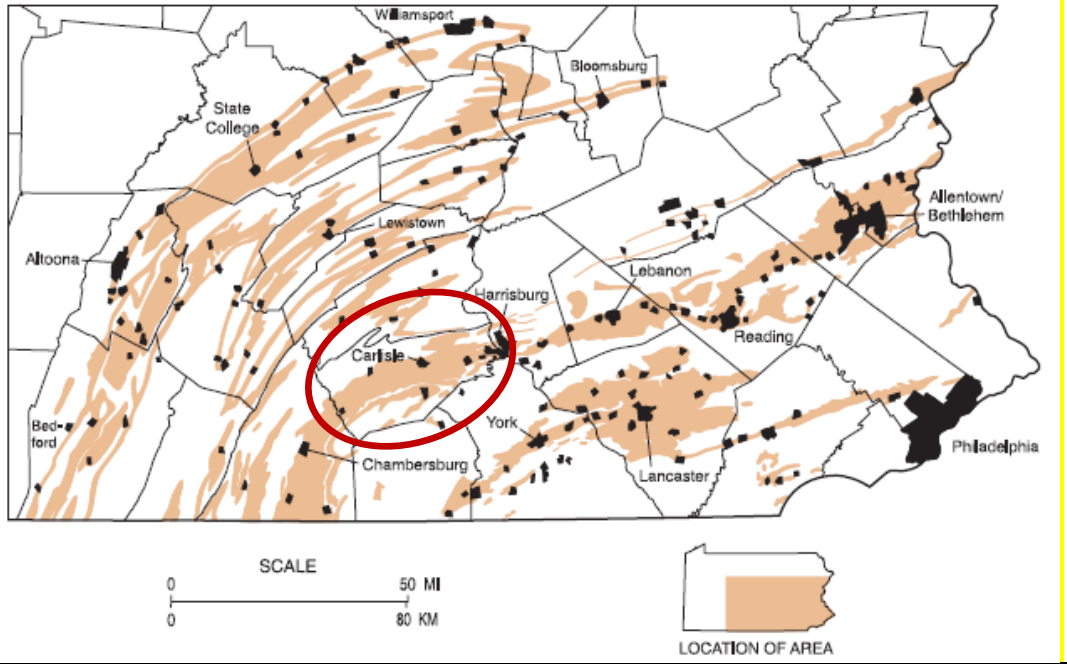
In general, jurisdictions that are more densely populated are more vulnerable to disease threats when the disease is directly spread from human to human, but every jurisdiction in Cumberland County has some vulnerability to pandemic and infectious disease threats. Certain population groups are at higher risk of pandemic infection. This population group includes people 65 years and older, children younger than 5 years old, pregnant women and people of any age with certain chronic medical conditions. Schools, colleges, convalescent centers, and other institutions serving those younger than 5 years old and older than 65 years old, are locations conducive to faster transmission infections disease since populations identified as being at high risk are concentrated at these facilities or because of a large number of people living in close quarters. The highest concentration of schools, retirement homes and senior centers is found in Carlisle Borough and West Shore areas (Appendix F).

4.3.6. Subsidence & Sinkholes

4.3.6.1 Location and Extent

Subsidence potential in Cumberland County is primarily associated with the dissolution of carbonate bedrock such as limestone and dolomite by water. Water passing through naturally occurring fractures and bedding planes dissolves the bedrock leaving voids below the surface. Eventually, overburden on top of the voids collapse, leaving surface depressions resulting in karst topography. Characteristics structures associated with karst topography include sinkholes, linear depressions and caves. 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. Abrupt or long-term changes in the ground surface may also occur following sub-surface fluid extraction (e.g. natural gas, water, oil, etc.). Figure 4.3.6-1 shows that much of Cumberland County lies in an area of Pennsylvania where limestone, dolomite, or both are present near ground surface, thus making it more susceptible to natural sinkhole development. The map includes locations of larger towns and cities that are adjacent to these areas underlain by carbonate bedrock.

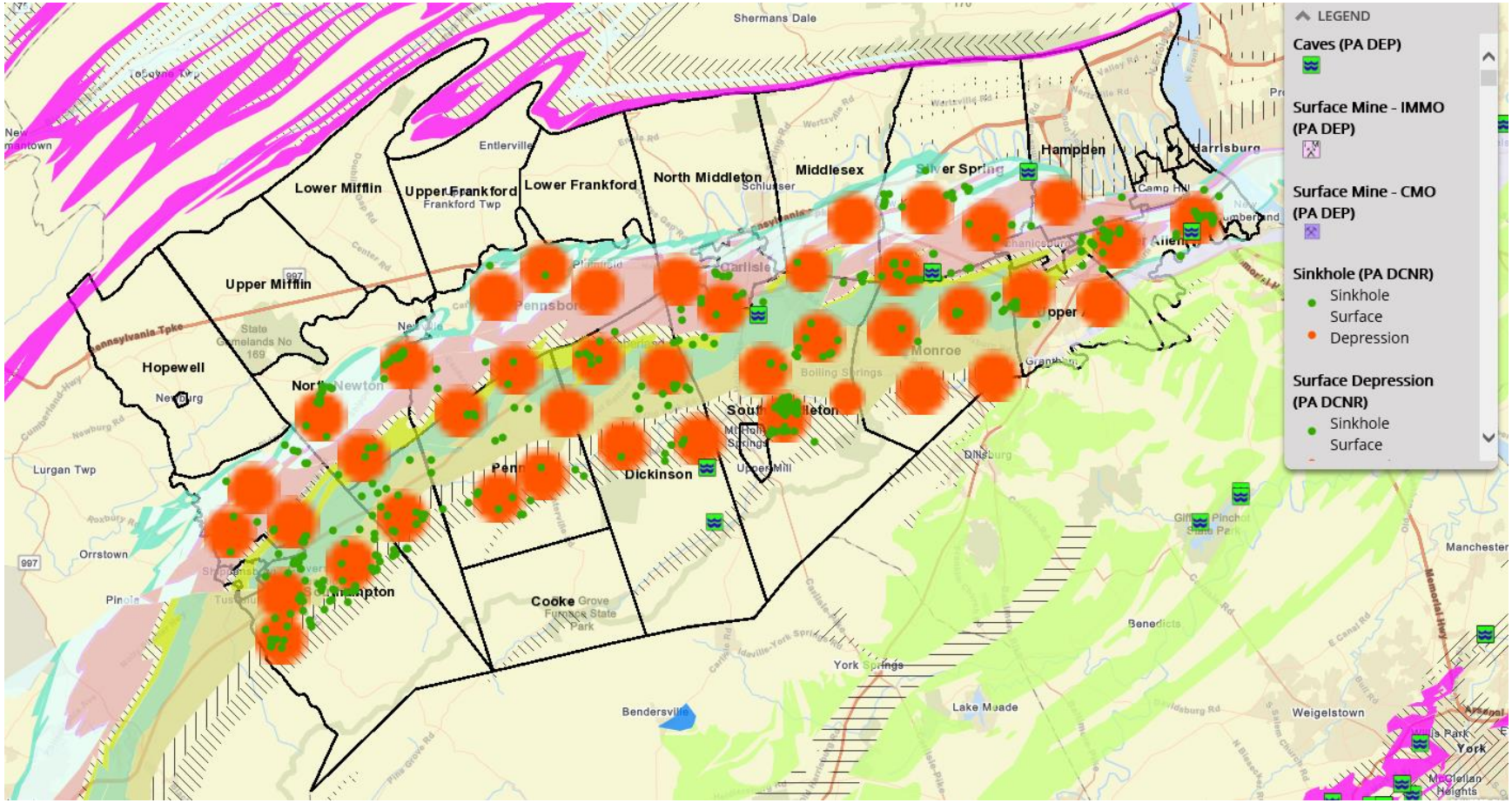
Figure 4.3.6-1: Map of areas in eastern and central Pennsylvania susceptible to subsidence based on the presence of underlying carbonate rock formations with urban areas shown in black (Kochanov, 1999).



Due to the nature of geology in the region, karst features typically occur along southwest-to-northeast deposits of limestone. These are located along an approximately 10-mile wide band that passes through the center of the County, roughly parallel to the counties' northern and southern borders. The deposits are predominantly Ordovician- and Cambrian-period layers, exposed at the surface through folding, faulting and long-term erosion.

The Pennsylvania Geological Survey maintains a partial inventory of karst features, as shown on Figure 4.3.6-2, for Cumberland County. Mapped karst features include sinkholes, surface mines, and surface depressions. There is wide variation in the size of karst features, and fewer karst features have been mapped in the existing urban areas of the County. However, this is likely a result of development activities that disguise, cover, or fill existing karst features rather than an absence of the features themselves.

Figure 4.3.6-2: Karst features and underlying carbonate rock formations in Cumberland County (PA DEP, Date not provided; PA DCNR, Date not provided). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.



4.3.6.2 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 their proximity to development ultimately determines the magnitude of damage incurred. Based on the geologic formations underlying much of Cumberland County, subsidence and sinkhole events may occur gradually or abruptly. Events could result in minor elevation changes or deep, gaping holes in the ground surface, as illustrated in Figure 4.3.6-3. Subsidence and sinkhole events can cause severe damage in urban environments, although gradual events can be addressed before significant damage occurs. If long-term subsidence or sinkhole formation is not recognized and mitigation measures are not implemented, fractures or complete collapse of building foundations and roadways may result. General recommendations have been published for site investigations prior to construction of buildings due to the potential for karst subsidence (Root, 1978). These recommendations vary depending on the rock type immediately underlying soil cover and include thorough geotechnical investigations to identify un-collapsed karst features and potential excavation to solid rock prior to construction.

Although underground drainage systems form naturally over time in karst regions, discrete rainfall events, ineffective stormwater infrastructure and land development can exacerbate the negative impacts of subsidence. Heavy rainfall can cause a buildup of stormwater when development reduces the surface area available for infiltration. If directed toward underground karstic drains, the accumulated stormwater can flush the soil that fills the drains, resulting in collapse of the overlying land surface (Kochanov, 2015). This rapid formation of sinkholes can cause extensive property damage. The potential for increased precipitation from extreme rainfall events caused by a changing climate could lead to the formation of more sinkholes from the flushing of karstic drains.

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

Figure 4.3.6-3: Sinkhole along a Cumberland County Roadway (Photograph courtesy of Cumberland County Department of Public Safety).

The presence of sinkholes can result in increased potential for groundwater contamination from contaminants such as sewage, fertilizers, herbicides, pesticides, or industrial products. Due to their porous nature, sinkholes are sometimes used as instruments for enhancing groundwater recharge. However, if hazardous materials are spilled at a recharge point, groundwater can quickly be contaminated due to the lack of soil substrate which normally would slow migrating contaminants. Vegetation is usually damaged during abrupt subsidence events. However, regrowth takes place over time.

4.3.6.3 Past Occurrence

Cumberland County does not have a record of a significant subsidence-based disaster. Table 4.3.6-1 shows the number of karst features per municipality including caves, sinkholes, surface depressions, and surface mines. Surface depressions comprise 12,857 of the 13,253 total karst features in the County.

Table 4.3.6-1: Number of karst features per municipality in Cumberland County (Cumberland County GIS, July 2019).

Municipality	Caves	Sinkholes	Surface Depressions	Surface Mines	Total
Borough of Camp Hill			28		28
Borough of Carlisle		8	144		152
Township of Cooke					0
Township of Dickinson		24	1,681	2	1,707
Township of East Pennsboro			1		1
Township of Hampden	1	3	133		137
Township of Hopewell				7	7
Borough of Lemoyne		1	5		6
Township of Lower Allen		34	444	1	479
Township of Lower Frankford				2	2
Township of Lower Mifflin				1	1
Borough of Mechanicsburg		1	149		150
Township of Middlesex		4	257	3	264
Township of Monroe		15	1,193	2	1,210
Borough of Mount Holly Springs			3		3
Borough of New Cumberland		1	25		26
Borough of Newburg					0
Borough of Newville					0
Township of North Middleton			55	3	58
Township of North Newton		28	461	9	498
Township of Penn			1,279	1	1,280
Borough of Shippensburg	3		44		47
Township of Shippensburg		3	77		80
Borough of Shiremanstown	4	2	19		25
Township of Silver Spring	1	33	1,100	4	1,138
Township of South Middleton		73	1,294	1	1,368
Township of South Newton		18	538		556
Township of Southampton	2	75	2,399	3	2,479
Township of Upper Allen		14	600		614
Township of Upper Frankford				1	1
Township of Upper Mifflin				2	2
Township of West		6	928		934

Table 4.3.6-1: Number of karst features per municipality in Cumberland County (Cumberland County GIS, July 2019).					
Municipality	**Caves**	**Sinkholes**	**Surface Depressions**	**Surface Mines**	**Total**
Pennsboro					
Wormleysburg					0
TOTAL	**11**	**343**	**12,857**	**42**	**13,253**
**Note that grey spaces represent values of zero.*					

4.3.6.4 Future Occurrence

Based on geological conditions and the presence of previously formed sinkholes, subsidence events are likely to occur in the future for the areas of Cumberland County underlain by carbonate rock. Overall, the probability of future subsidence events can be considered *moderately likely* according to the Risk Factor Methodology (see Table 4.4-2).

Recent stormwater and precipitation events in Cumberland County and the surrounding region (as documented in Section 4.3.3.4) have the likelihood of increasing karst events such as sinkholes and subsidence. The Pennsylvania DEP (2020) website includes a list of typical activities that can lead to sinkholes:

- Decline of water levels
- Disturbance of the soil
- Point source of water
- Concentration of water flow
- Water impoundments
- Heavy loads on the surface

Major development activity in Cumberland County is required to prepare a stormwater management plan that outlines the volume and rate of stormwater emanating from a development site for both pre and post construction conditions. Stormwater management plans typically consider the prevalent karst geology found in the region and require best management practices that decrease the risk of sinkholes due to stormwater discharge.

4.3.6.5 Vulnerability Assessment

As shown in Figure 4.3.6-2, the central band of the County is most vulnerable to the effects of subsidence events. Local roads need annual repair and damage to gas lines, telephone and electrical entry road facilities could occur in highly populated areas (Cumberland EOP, 1984). Southampton, Dickinson, South Middleton, Penn, Monroe, and Silver Spring Townships have the most recorded karst features (see Table 4.3.6-1).

Table 4.3.6-2 lists the number of addressed units and critical facilities that intersect karst geology in each municipality. This does not mean that a recorded karst feature such as a sinkhole or surface depression exists in proximity to a structure, but that their formation and resulting damage are possible due to underlying, soluble rock units. Table 4.3.6-3 categorizes the structures as residential or non-residential. There are 64,525 total addressed units that

intersect karst geology, with the greatest number in the Borough of Carlisle (8,817), Hampden Township (7,867), Lower Allen Township (6,079), Silver Spring Township (5,731), the Borough of Mechanicsburg (4,622), and South Middleton Township (4,589). Over 95 percent of structures intersect with karst geology in the Borough of Carlisle, West Pennsboro Township, the Borough of Newville, Shippensburg Township, the Borough of Mechanicsburg, the Borough of Shiremanstown, and the Borough of Shippensburg. The Borough of Carlisle has the highest number of critical facilities that intersect karst geology, with a total of 60.

Table 4.3.6-2: Addressed Units Intersecting Karst Geology in Cumberland County (Cumberland County GIS, 2018).

Municipality	Total Addressed Units	Addressed Units Intersecting Karst Geology	Percent of Addressed Units Intersecting Karst Geology	Total Critical Facilities in Municipality	Total Critical Facilities Intersecting Karst Geology	Percent of Critical Facilities Intersecting Karst Geology
Borough of Camp Hill	3,730	2,122	56.9%	16	11	68.8%
Borough of Carlisle	8,817	8,817	100.0%	60	60	100.0%
Township of Cooke	391	70	17.9%	2	1	50.0%
Township of Dickinson	2,268	1,335	58.9%	13	7	53.8%
Township of East Pennsboro	9,285	1,330	14.3%	35	10	28.6%
Township of Hampden	13,644	7,867	57.7%	58	46	79.3%
Township of Hopewell	904	0	0.0%	10	0	0.0%
Borough of Lemoyne	2,158	1,279	59.3%	13	11	84.6%
Township of Lower Allen	8,008	6,079	75.9%	41	38	92.7%
Township of Lower Frankford	734	5	0.7%	1	0	0.0%
Township of Lower Mifflin	771	0	0.0%	4	0	0.0%
Borough of Mechanicsburg	4,622	4,622	100.0%	27	27	100.0%
Township of Middlesex	3,092	1,434	46.4%	37	28	75.7%
Township of Monroe	2,576	1,529	59.4%	10	2	20.0%
Borough of Mount Holly Springs	909	845	93.0%	11	11	100.0%
Borough of New Cumberland	3,359	2,052	61.1%	12	6	50.0%
Borough of Newburg	138	0	0.0%	1	0	0.0%
Borough of Newville	764	753	98.6%	8	8	100.0%
Township of North Middleton	5,287	1,155	21.8%	24	12	50.0%
Township of North Newton	967	415	42.9%	11	7	63.6%
Township of Penn	1,194	575	48.2%	10	4	40.0%
Borough of Shippensburg	1,827	1,826	99.9%	13	13	100.0%
Township of Shippensburg	1,315	1,269	96.5%	10	10	100.0%

Table 4.3.6-2: Addressed Units Intersecting Karst Geology in Cumberland County (Cumberland County GIS, 2018).

Municipality	Total Addressed Units	Addressed Units Intersecting Karst Geology	Percent of Addressed Units Intersecting Karst Geology	Total Critical Facilities in Municipality	Total Critical Facilities Intersecting Karst Geology	Percent of Critical Facilities Intersecting Karst Geology
Borough of Shiremanstown	796	796	100.0%	6	6	100.0%
Township of Silver Spring	8,045	5,731	71.2%	44	37	84.1%
Township of South Middleton	6,845	4,589	67.0%	40	30	75.0%
Township of South Newton	525	165	31.4%	4	0	0.0%
Township of Southampton	2,932	1,849	63.1%	18	13	72.2%
Township of Upper Allen	8,199	2,995	36.5%	19	7	36.8%
Township of Upper Frankford	1,034	0	0.0%	5	0	0.0%
Township of Upper Mifflin	559	0	0.0%	2	0	0.0%
Township of West Pennsboro	2,311	2,196	95.0%	11	7	63.6%
Borough of Wormleysburg	1,578	825	52.3%	2	0	0.0%
TOTAL	**109,584**	**64,525**	**58.9%**	**578**	**412**	**71.3%**

Table 4.3.6-3: Parcel Type for Addressed Units Intersecting Karst Geology (Cumberland County GIS, 2018).								
Municipality	**Total Addressed Units**	**Total Non-Residential Addressed Units**	**Non-Residential Units Intersecting Karst Geology**	**Percent of Non-Residential Units Intersecting Karst Geology**	**Total Residential Addressed Units**	**Residential Units Intersecting Karst Geology**	**Percent of Residential Units Intersecting Karst Geology**	**Total Addressed Units Intersecting Karst Geology**
Borough of Camp Hill	3,730	334	242	72.5%	3,396	1,880	55.4%	2,122
Borough of Carlisle	8,817	1,221	1,221	100.0%	7,596	7,596	100.0%	8,817
Township of Cooke	391	20	12	60.0%	371	58	15.6%	70
Township of Dickinson	2,268	77	51	66.2%	2,191	1,284	58.6%	1,335
Township of East Pennsboro	9,285	492	119	24.2%	8,793	1,211	13.8%	1,330
Township of Hampden	13,644	922	777	84.3%	12,722	7,090	55.7%	7,867
Township of Hopewell	904	34	0	0.0%	870	0	0.0%	0
Borough of Lemoyne	2,158	320	196	61.3%	1,838	1,083	58.9%	1,279
Township of Lower Allen	8,008	817	758	92.8%	7,191	5,321	74.0%	6,079
Township of Lower Frankford	734	18	0	0.0%	716	5	0.7%	5
Township of Lower Mifflin	771	31	0	0.0%	740	0	0.0%	0
Borough of Mechanicsburg	4,622	622	622	100.0%	4,000	4,000	100.0%	4,622
Township of Middlesex	3,092	222	184	82.9%	2,870	1,250	43.6%	1,434
Township of Monroe	2,576	89	52	58.4%	2,487	1,477	59.4%	1,529
Borough of Mount Holly Springs	909	100	99	99.0%	809	746	92.2%	845
Borough of New Cumberland	3,359	262	121	46.2%	3,097	1,931	62.4%	2,052
Borough of Newburg	138	10	0	0.0%	128	0	0.0%	0
Borough of Newville	764	151	150	99.3%	613	603	98.4%	753
Township of North Middleton	5,287	363	213	58.7%	4,924	942	19.1%	1,155
Township of North	967	87	35	40.2%	880	380	43.2%	415

Table 4.3.6-3: Parcel Type for Addressed Units Intersecting Karst Geology (Cumberland County GIS, 2018).								
Municipality	**Total Addressed Units**	**Total Non-Residential Addressed Units**	**Non-Residential Units Intersecting Karst Geology**	**Percent of Non-Residential Units Intersecting Karst Geology**	**Total Residential Addressed Units**	**Residential Units Intersecting Karst Geology**	**Percent of Residential Units Intersecting Karst Geology**	**Total Addressed Units Intersecting Karst Geology**
Newton								
Township of Penn	1,194	48	25	52.1%	1,146	550	48.0%	575
Borough of Shippensburg	1,827	294	294	100.0%	1,533	1,532	99.9%	1,826
Township of Shippensburg	1,315	162	156	96.3%	1,153	1,113	96.5%	1,269
Borough of Shiremanstown	796	78	78	100.0%	718	718	100.0%	796
Township of Silver Spring	8,045	443	392	88.5%	7,602	5,339	70.2%	5,731
Township of South Middleton	6,845	420	337	80.2%	6,425	4,252	66.2%	4,589
Township of South Newton	525	31	7	22.6%	494	158	32.0%	165
Township of Southampton	2,932	98	58	59.2%	2,834	1,791	63.2%	1,849
Township of Upper Allen	8,199	372	209	56.2%	7,827	2,786	35.6%	2,995
Township of Upper Frankford	1,034	32	0	0.0%	1,002	0	0.0%	0
Township of Upper Mifflin	559	21	0	0.0%	538	0	0.0%	0
Township of West Pennsboro	2,311	100	91	91.0%	2,211	2,105	95.2%	2,196
Borough of Wormleysburg	1,578	170	83	48.8%	1,408	742	52.7%	825
TOTAL	**109,584**	8,461	6,582	77.8%	101,123	57,943	57.3%	64,525

4.3.7. Tornado & Windstorm

4.3.7.1 Location and Extent

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

The enhanced Fujita Tornado Scale (or the EF-Scale) classifies U.S. tornadoes into six intensity categories, named EF0 to EF5, based upon the estimated maximum winds occurring within the funnel. The EF-Scale has subsequently become the definitive metric for estimating wind speeds within tornadoes based upon the damage done to buildings and structures.

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

Straight-line winds and windstorms are experienced on a more region-wide scale. Severe thunderstorms may result in conditions favorable to the formation of numerous or long-lived tornadoes which may travel over extended distances. While such winds usually accompany tornadoes, straight-lined winds are caused by the movement of air from areas of higher pressure to areas of lower pressure. Stronger winds are the result of greater differences in pressure. Windstorms are generally defined with sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration.

Figure 4.3.7-1: Straight line wind damage at WG Rice Elementary School in South Middleton Township, Cumberland County, PA in July 2000 (Photograph courtesy of Cumberland County, 2014).

4.3.7.2 Range of Magnitude

Each year, about 1,200 tornadoes are reported in the United States but only about 2% of those are categorized as violent storms. While damage varies from year to year, tornadoes typically cause around 80 deaths and 1,500 injuries nationally (National Geographic, 2019). In 2017, three separate tornado outbreaks each caused over $1 billion in damage (NOAA, 2018). Previous events in Cumberland County are estimated to have caused approximately $1,210,000 in total damages (see Table 4.3.7-2). While the extent of tornado damage is usually localized, the vortex of extreme wind associated with a tornado can result in some of the most destructive forces on Earth. Rotational wind speeds can range from 100 mph to more than 250 mph. In addition, the speed of forward motion can range from 0 to 50 mph. Therefore, some estimates place the maximum velocity (combination of ground speed, wind speed and upper winds) of tornadoes at about 300 mph. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. The most violent tornadoes have rotating winds of 250 miles per hour or more and can cause extreme destruction and turning normally harmless objects into deadly missiles. Wind speeds from the strongest recorded tornado in Cumberland County did not exceed 206 mph (see 4/3/1961 event in Table 4.3.7-2).

Damages and deaths can be especially significant when tornadoes move through populated, developed areas. The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size and duration of the storm. Typically, tornadoes cause the greatest damages to structures of light construction such as mobile homes. The Enhanced Fujita Scale, also known as the “EF-Scale,” measures tornado strength and associated

damages. The EF-Scale is an update to the earlier Fujita Scale, also known as the "F-Scale," that was published in 1971. It classifies United States tornadoes into six intensity categories, as shown in Table 4.3.7-1, based upon the estimated maximum winds occurring within the wind vortex. Since its implementation by the National Weather Service in 2007, the EF-Scale has become the definitive metric for estimating wind speeds within tornadoes based upon damage to buildings and structures. F-Scale categories with corresponding EF-Scale wind speeds are provided in Table 4.3.7-1 since previous tornado occurrences listed in Table 4.3.7-2 are based on the F-Scale.

Table 4.3.7-1: Enhanced Fujita Scale (EF-Scale) categories with associated wind speeds and description of damages (FEMA, 2012; Michael Baker International, 2018).

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

Figure 4.3.4-5 shows wind speed zones developed by the American Society of Civil Engineers based on information including 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities. Cumberland County falls within Zone II and Zone III, meaning design wind speeds for shelters and critical facilities should be able to withstand a 3-second gust of up to 200 mph, regardless of

whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. Therefore, these structures should be able to withstand speeds experienced in an EF4 tornado. Since tornado events are typically localized, environmental impacts are rarely widespread. The impacts of windstorms on the environment typically take 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. Hazardous material facilities should meet design requirements for the wind zones identified in Figure 4.3.8-2 in order to prevent release of hazardous materials into the environment. A potential worst-case scenario could be a tornado that results in loss of life and significant property damage resulting in the release of hazardous materials into the surrounding environment.

4.3.7.3 Past Occurrence

Tornadoes have occurred in all seasons and all regions of Pennsylvania, including Cumberland County. The northern, western and southeastern portions of the Commonwealth have been struck more frequently. One of the deadliest tornadoes in Pennsylvania occurred during a May, 1985 storm which killed six people, injured 60, and destroyed campers, manufactured homes, homes and businesses across Lycoming, Union and Northumberland Counties. While this event did not occur in Cumberland County, it took place only about 60 miles to the north. Between 1854 and 1979, there were six official tornadoes within Cumberland County (Cumberland EOP, 1984). A list of tornado events that have occurred in Cumberland County between 1961 and 2020 is shown in Table 4.3.7-2 with an associated F-Scale magnitude (see Table 4.3.7-1 for corresponding EF-Scale magnitude). Note that tornado events have not occurred since 2018. Photographs of local wind damage are provided in Figure 4.3.7-3 and Figure 4.3.7-4, and a map showing the approximate location for many of these events is included in Figure 4.3.7-5.

Table 4.3.7-2: Previous tornado and funnel cloud events in Cumberland County (NCEI, 2018).

Location	Date	Estimated Length	Estimated Width	Magnitude (F-Scale)	Estimated Property Damage ($)
Countywide	4/16/1961	*not provided*	*not provided*	F3	250,000
Countywide	6/3/1964	*not provided*	*not provided*	F1	25,000
Countywide	3/21/1976	3 miles	70 yards	F0	0
Countywide	3/21/1976	5 miles	90 yards	F1	25,000
Countywide	7/31/1985	3 miles	20 yards	F1	250,000
Countywide	4/9/1991	3 miles	20 yards	F0	250,000
Countywide	4/9/1991	0 miles	20 yards	F1	250,000
Shippensburg	7/30/1996	3 miles	50 yards	F1	0
Carlisle Springs	6/21/2000	0 miles	30 yards	F0	0
Lemoyne	8/4/2004	1 mile	75 yards	F0	20,000
Newville	8/4/2004	3 miles	125 yards	F1	50,000
Oakville	9/17/2004	2 miles	50 yards	F1	0
Mechanicsburg	8/31/2005	2 miles	100 yards	F1	0
Wormleysburg	9/28/2006	3 miles	100 yards	F1	75,000

Table 4.3.7-2: Previous tornado and funnel cloud events in Cumberland County (NCEI, 2018).

Location	Date	Estimated Length	Estimated Width	Magnitude (F-Scale)	Estimated Property Damage ($)
Mechanicsburg	6/13/2007	-	-	Funnel Cloud	0
Wertzville	5/26/2011	2.64 miles	100 yards	F1	15,000
Summerdale	5/15/2018	0.08 miles	40 yards	F1	3,000

Figure 4.3.7-2: Tornado in Carlisle Borough, Cumberland County, PA on May 26, 2011 (Photograph courtesy of *The Sentinel*, 2014).

There are hundreds of high wind events recorded in Cumberland County since 1950. In 1979, the County experienced straight-line winds from a thunderstorm in excess of 90 mph. This storm caused severe tree and related property damage to the population center in the eastern portion of the County. A list of events that have occurred since 2005 is shown in Table 4.3.7-3. Windstorm events may be the result of thunderstorms, hurricanes, tropical storms, winter storms, or nor'easters.

Figure 4.3.7-3: Damage caused by high winds in Cumberland County, PA (Photograph courtesy of Cumberland County Department of Public Safety).

Figure 4.3.7-4: Historical tornado touchdown events from 1950 – 2017, and tornado touchdown events by census tract from 1986 – 2016 (FEMA, 2018). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.

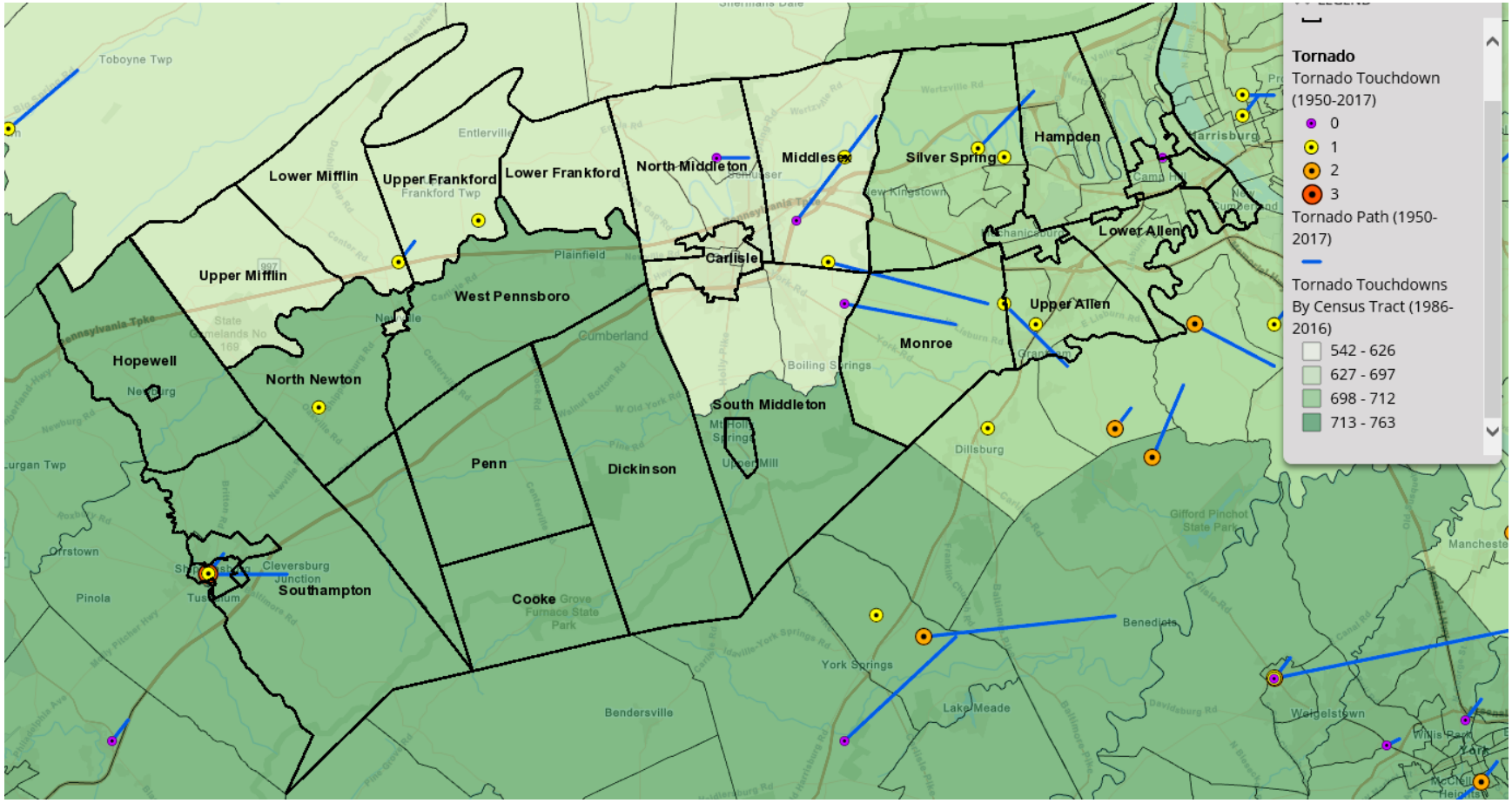


Table 4.3.7-3: Previous windstorm events in Cumberland County (NCEI, 2018 & community surveys).			
Location	**Date**	**Estimated Wind Speed (Knots)**	**Estimated Property Damage ($)**
Enola	6/9/2005	50	*not provided*
Doubling Gap	6/9/2005	50	*not provided*
Shippensburg	6/13/2005	60	*not provided*
Camp Hill	7/19/2005	50	*not provided*
Carlisle	8/14/2005	50	*not provided*
Carlisle	6/22/2006	50	*not provided*
Countywide	7/4/2006	50	*not provided*
Countywide	12/1/2006	45	*not provided*
Countywide	2/5/2007	*not provided*	*not provided*
Countywide	2/5/2007	*not provided*	*not provided*
Shippensburg	6/8/2007	50	*not provided*
Bonny Brook	6/13/2007	50	*not provided*
Newburg	6/19/2007	50	*not provided*
Williams Grove	6/19/2007	50	*not provided*
Shiremanstown	6/19/2007	62	*not provided*
Newville	7/28/2007	50	*not provided*
Oakville	8/9/2007	50	*not provided*
Carlisle	8/25/2007	50	125,000
Enola	8/25/2007	50	*not provided*
Countywide	12/23/2007	50	*not provided*
Bloserville	6/29/2008	50	*not provided*
Mount Holly Springs	6/29/2008	50	*not provided*
Barnitz	7/23/2008	50	*not provided*
Newville	8/2/2008	50	*not provided*
Shiremanstown	8/7/2008	52	*not provided*
Countywide	12/31/2008	50	10,000
Countywide	2/12/2009	50	50,000
North Middleton	8/21/2009	68	*not provided*
Williams Grove	4/16/2010	50	*not provided*
Carlisle	5/14/2010	50	*5,000*
Middlesex	6/4/2010	50	*25,000*
Greason	6/4/2010	50	*5,000*
Newville	6/12/2010	50	*5,000*
New Cumberland	6/16/2010	52	*not provided*
Carlisle	6/24/2010	50	5,000
Allen	6/24/2010	50	5,000
New Cumberland	7/12/2010	50	5,000
Shippensburg	7/25/2010	50	5,000
Carlisle	8/16/2010	50	5,000

Table 4.3.7-3: Previous windstorm events in Cumberland County (NCEI, 2018 & community surveys).			
Location	**Date**	**Estimated Wind Speed (Knots)**	**Estimated Property Damage ($)**
Boiling Springs	9/22/2010	50	5,000
Shippensburg	9/22/2010	50	5,000
Lees Crossroads	5/26/2011	50	5,000
Carlisle	5/26/2011	56	5,000
Enblass	5/26/2011	50	5,000
Mechanicsburg	5/26/2011	50	5,000
Cedar Cliff Manor	5/26/2011	50	5,000
Mechanicsburg	5/26/2011	52	*not given*
Shippensburg	5/27/2011	50	5,000
New Kingstown	5/27/2011	50	5,000
Countywide	6/9/2011	50	5,000
Greason	7/7/2011	50	*not given*
Carlisle Springs	7/7/2011	50	*not given*
Springville	8/1/2011	60	5,000
West Hill	8/1/2011	50	5,000
Carlisle	5/27/2012	50	5,000
Mechanicsburg	5/27/2012	50	5,000
New Cumberland	5/27/2012	50	5,000
Newville	5/29/2012	50	5,000
Greason	5/29/2012	50	5,000
Cedar Cliff Manor	6/1/2012	50	5,000
Toland	6/29/2012	50	*not given*
Newburg	7/5/2012	50	5,000
Walnut Bottom	7/5/2012	50	5,000
Middlesex	7/18/2012	50	1,000
Gettysburg Junction	7/18/2012	50	5,000
Cedar Cliff Manor	7/31/2012	50	2,500
Wertzville	8/4/2012	50	5,000
Plainfield	8/26/2012	50	5,000
Doubling Gap	8/26/2012	50	5,000
Countywide	10/29/2012	50	*not given*
Walnut Bottom	6/13/2013	50	5,000
Carlisle	6/25/2013	50	5,000
Countywide	9/11/2013	50	2,000
Shiremanstown	6/3/2014	56	1,000
Countywide	7/8/2014	50-70	10,000
Countywide	7/27/2014	50-56	4,000
Plainfield	8/21/2014	50	500
Shippensburg	5/16/2015	50	1,000

Table 4.3.7-3: Previous windstorm events in Cumberland County (NCEI, 2018 & community surveys).			
Location	**Date**	**Estimated Wind Speed (Knots)**	**Estimated Property Damage ($)**
Mechanicsburg	5/31/2015	50	2,500
Middlesex	6/8/2015	50	1,500
Mount Holly Springs	6/20/2015	50	500
Carlisle	7/9/2015	50	5,000
Countywide	4/3/2016	52	5,000
Hockersville	6/21/2016	52	2,000
Eberleys Mill	8/16/2016	52	2,000
Cedar Cliff Manor	10/30/2016	52	8,000
Countywide	2/12/2017	43	*not given, one fatality*
Countywide	6/23/2017	52	5,000
Cedar Cliff Manor	7/19/2017	52	4,000
Countywide	8/4/2017	52	12,000
Countywide	3/2/2018	52	*not given*
Countywide	4/4/2018	52	*not given*
Bonny Brook	5/15/2018	52-65	54,000

4.3.7.4 Future Occurrence

Climate Data Center, the Commonwealth of Pennsylvania has an annual average of 16 tornadoes, 0.5 of which are EF-3 or higher (NCDC, 2019). While the chance of being hit by a tornado is small, the damage that results when the tornado arrives is devastating. An F4 tornado can carry wind velocities of 200 mph, resulting in a force of more than 100 pounds per square foot of surface area. This is a “wind load” that exceeds the design limits of most buildings. Refer to Figure 4.3.4-5 for specific International Building Code requirements for wind shelters in the County.

The tornado season extent is also increasing with an earlier start of the high activity season. With increases in air temperature and moisture under climate change there is higher risk of extreme convection and favorable tornado conditions (possible increase in frequency and intensity), however, this remains uncertain as confidence in past trends is low. Climate models project conditions conducive to an increase in frequency and intensity of severe thunderstorms, tornados, hail and wind, but confidence is low (Michael Baker International, 2018). Because windstorm events are more common and there is probable increased threat of severe convective storms due to the effects of climate change, the overall probability of future tornado and windstorm events can be considered *highly likely* according to the Risk Factor Methodology (see Table 4.4-2).

4.3.7.5 Vulnerability Assessment

While the frequency of windstorms and minor tornadoes is expected to remain relatively constant, vulnerability increases in more densely developed areas. Since high wind events may affect the entire County, it is important to identify specific critical facilities and assets that are

most vulnerable to the hazard. Due to their light-weight and often unanchored design, mobile homes are extremely vulnerable to high winds. Table 4.3.7-4 lists the number of these structures in each municipality. Note that while this table discusses the number of mobile home structures, Table 4.4.3-1 in the Hazard Vulnerability Summary is related to mobile home and mobile home park parcels in order to provide assessed values.

Table 4.3.7-4: Number of mobile homes per municipality in Cumberland County, PA (Cumberland County GIS, October 30, 2019).

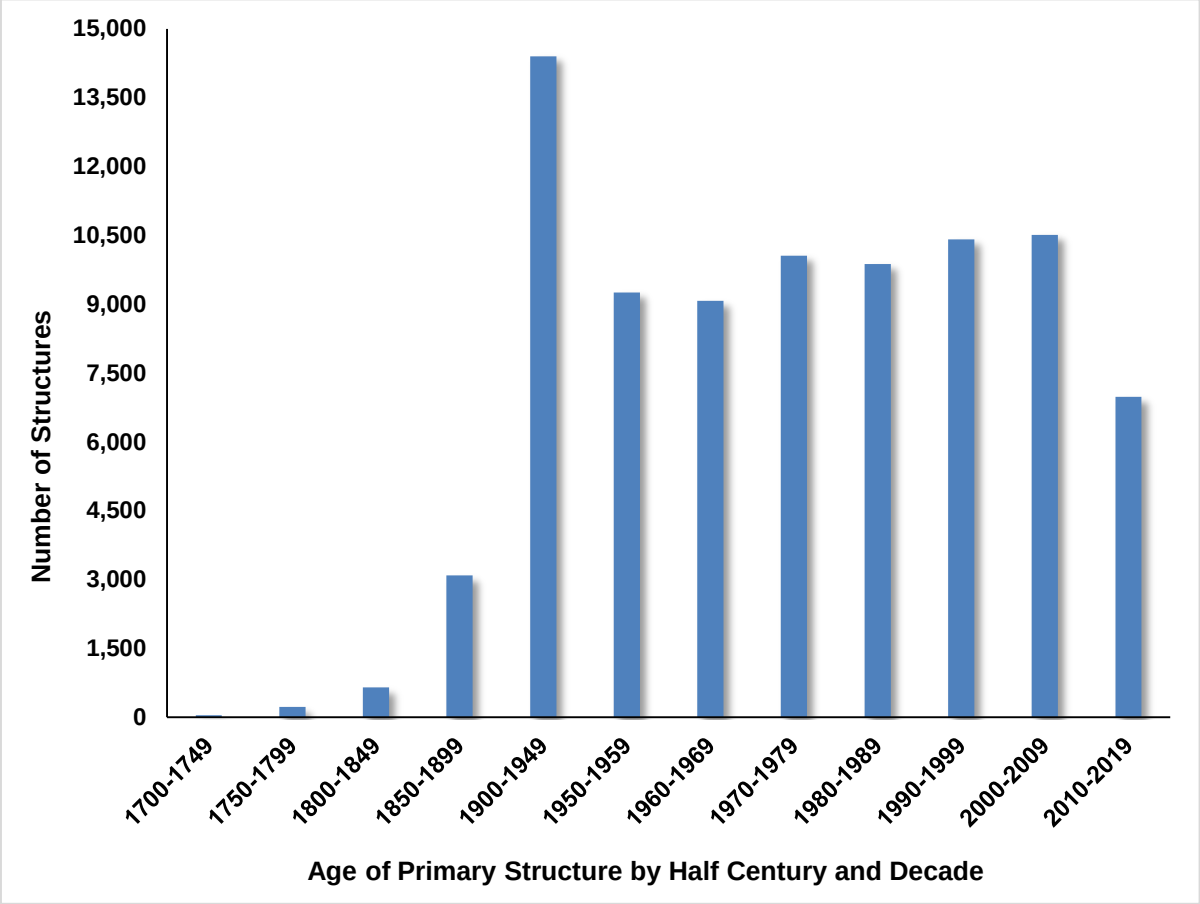
Municipality	Number of Total Addressed Units	Number of Mobile Homes	Percent of Total Addressed Units that are Mobile Homes
Borough of Camp Hill	3,730	0	0.0%
Borough of Carlisle	8,817	8	0.2%
Township of Cooke	391	0	1.0%
Township of Dickinson	2,268	81	8.1%
Township of East Pennsboro	9,285	15	0.7%
Township of Hampden	13,644	459	3.8%
Township of Hopewell	904	25	7.1%
Borough of Lemoyne	2,158	0	0.0%
Township of Lower Allen	8,008	70	0.7%
Township of Lower Frankford	734	112	23.4%
Township of Lower Mifflin	771	176	31.6%
Borough of Mechanicsburg	4,622	0	0.0%
Township of Middlesex	3,092	623	24.8%
Township of Monroe	2,576	127	6.7%
Borough of Mount Holly Springs	909	91	12.3%
Borough of New Cumberland	3,359	0	0.0%
Borough of Newburg	138	1	0.0%
Borough of Newville	764	1	1.7%
Township of North Middleton	5,287	333	9.4%
Township of North Newton	967	11	5.9%
Township of Penn	1,194	18	7.9%
Borough of Shippensburg	1,827	2	0.2%
Township of Shippensburg	1,315	249	21.4%
Borough of Shiremanstown	796	0	0.0%
Township of Silver Spring	8,045	307	4.9%
Township of South Middleton	6,845	307	6.3%
Township of South Newton	525	4	4.2%
Township of Southampton	2,932	258	15.7%
Township of Upper Allen	8,199	116	1.5%
Township of Upper Frankford	1,034	196	39.6%
Township of Upper Mifflin	559	15	15.9%
Township of West Pennsboro	2,311	182	10.8%
Borough of Wormleysburg	1,578	0	0.0%
TOTAL	**3,787**	**109,584**	**3.46%**

Based on the number of mobile homes in each community, Middlesex Township, Hampden Township, and North Middleton Township are at greatest risk from high winds and tornadoes. In terms of the impact of these events on the percentage of total addressed units in a given municipality, Upper Frankford Township (39.6 percent), Lower Mifflin Township (31.6 percent), and Middlesex Township (24.8 percent) are most vulnerable. The total number of mobile homes decreased from 4,974 in 2014 to 3,787 in 2019, and the total percentage of addressed units that are mobile homes decreased to 3.46%.

Additional evaluation criteria include building age and building codes that may have been in effect at the time of construction, type of construction and condition of the structure (i.e., how well the structure has been maintained). With the exception of building age, this information is not available for structures countywide. However, parcel data includes *year-built* information. As illustrated in Figure 4.3.7-7, a total of 18,407 parcels, approximately 22 percent of all parcels in the County (as of 2019), had primary structures built prior to 1950. The parcel data also contains 17,307 structures that have an unknown construction date, which were omitted from Table 4.3.7-7. Note that 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 tornadoes and severe wind.

Pennsylvania's statewide building code, known as the Uniform Construction Code (UCC), has been enforced since 2004. Regulations are derived from codes issued by the International Code Council (ICC), including the International Building Code (IBC). As ICC codes are revised, the UCC reviews and adopts the periodic changes. Any construction permits sought after October 1, 2018 require adherence to the 2015 International Codes issued by the ICC. All Cumberland County municipalities chose to opt-in to the UCC in 2004, which means that each is responsible for enforcing UCC codes within their jurisdiction

Figure 4.3.7-5: Distribution of the age of primary structures per parcel identified in the County parcel database as *main-building* built in each decade between 1700 to September 2019. Note that structures built in the 1700s through 1949 are summed by half century, not decade.



4.3.8. Wildfire

4.3.8.1 Location and Extent

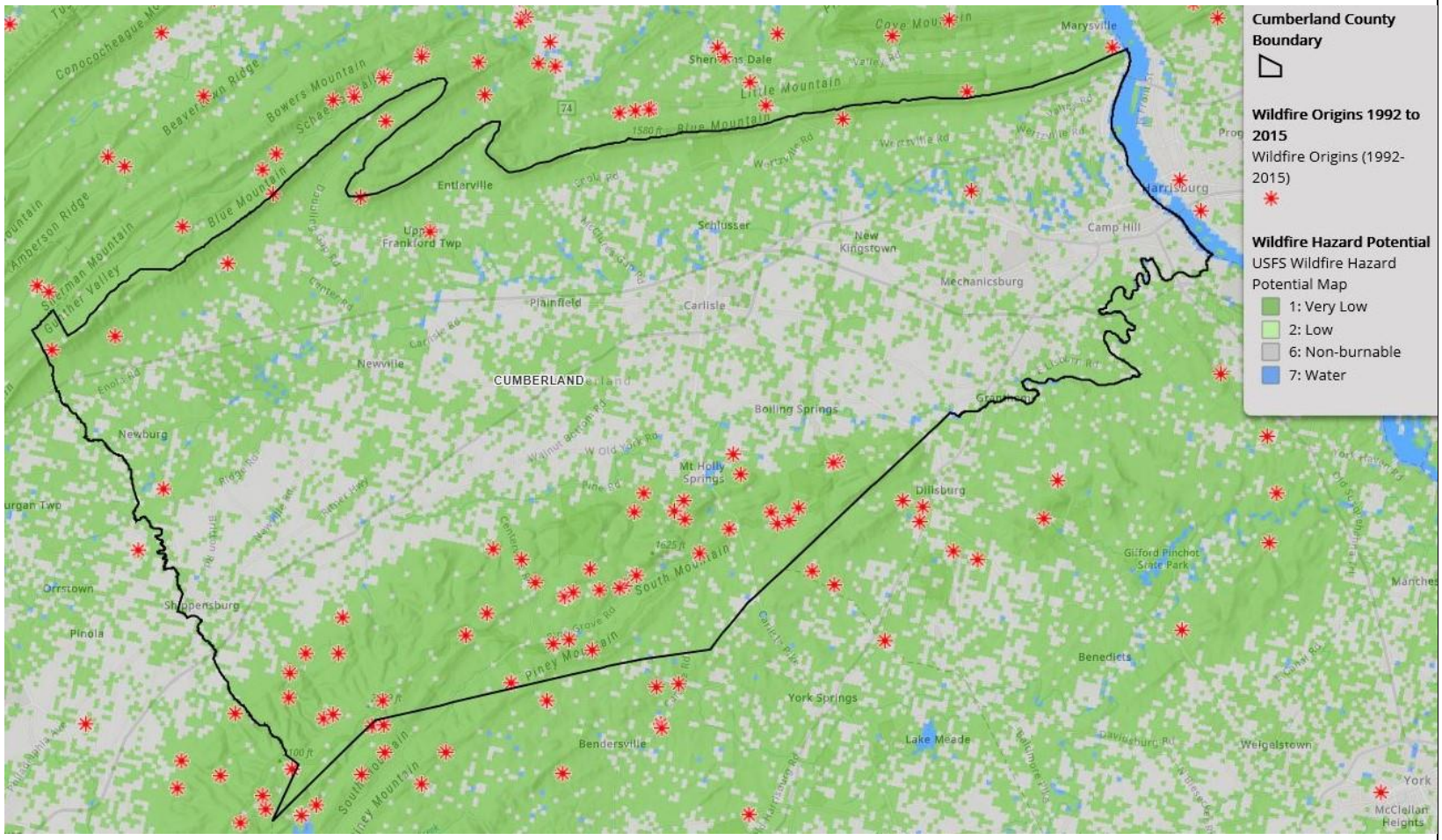
Wildfires take place in less developed or completely undeveloped areas, spreading rapidly through vegetative fuels. They can occur any time of the year, but mostly occur during long, dry hot spells. Any small fire, if not quickly detected and suppressed, can get out of control. Most wildfires are caused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

Wildfires in Pennsylvania can occur in open fields, grass, dense brush and forests. Much of the western half of Cumberland County consists of forested areas surrounded by cropland and pastures. Under dry conditions or droughts, wildfires have the potential to burn forests as well as croplands. The greatest potential for wildfires is in the spring months of March, April and May, and the autumn months of October and November. 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. Approximately 98 percent of wildfires in Pennsylvania are caused by

people, often by debris burns (PA DCNR – BOF, 2019). Several fires have started in a person's backyard and traveled through dead grasses and weeds into bordering woodlands.

Portions of the Michaux (District 1) and Tuscarora (District 3) State Forests are located in Cumberland County. These forests, as well as several State Gameland areas, are of particular concern for wildfire events due to the large area of expanded woodland. Figure 4.3.8-1 shows the specific location and cause of the previous wildfire events from 1992-2015 identified in Section 4.3.8.3.

Figure 4.3.8-1: Map of wildfire origin and wildfire hazard zones in Cumberland County from 1992-2015 (U.S. Forest Service, 2018). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.



4.3.8.2 Range of Magnitude

Wildfire events can range from small fires that can be managed by local firefighters to large fires impacting many acres of land. Large events may require evacuation from one or more communities and necessitate regional or national firefighting support. An example of a local wildfire is provided in Figure 4.3.8-2.

Figure 4.3.8-2: A 100-acre wildfire in Tuscarora State Forest near Newburg, Cumberland County, PA in the fall of 2016 (Joshua Vaughn/*The Sentinel*, 2016).

The impact of a severe wildfire can be devastating. While some fires are not human-caused and are part of natural succession processes, a wildfire can kill people, livestock, fish and wildlife. They often destroy property, valuable timber, forage and recreational and scenic values.

Vegetation loss is often a concern, but it typically is not a serious impact since natural re-growth occurs with time. The most significant environmental impact is the potential for severe erosion, silting of stream beds and reservoirs, and flooding due to ground-cover loss following a fire event. Wildfires also have a positive environmental impact in that they burn dead trees, leaves, and grasses to allow more open spaces for new and different types of vegetation to grow and receive sunlight. Another positive effect of a wildfire is that it stimulates the growth of new shoots on trees and shrubs and its heat can open pine cones and other seed pods. As shown in Table 4.3.9-1, the most extensive wildfire reported to the PA DCNR from 1999 to 2015 affected 55 acres in Cooke Township in 2006.

4.3.8.3 Past Occurrence

There have been 50 wildfire events reported to the PA DCNR in the County since 1999 (See Table 4.3.8-1). Information on wildfire events occurring on private land is not available. An example of a local wildfire not reported to the PA DCNR is shown in Figure 4.3.8-3.

Table 4.3.8-1: List of wildfire events reported in Cumberland County from 1999-2015 (USFS, 2017).

Year	Municipality	Area (Acres)
2015	Township of South Middleton	0.1
2015	Township of Penn	1
2015	Township of Hopewell	1.5
2014	Township of South Middleton	30
2014	Township of Middlesex	0.75
2014	Township of Upper Mifflin	0.25
2014	Township of Upper Frankford	0.25
2013	Township of Silver Spring	1.5
2012	Township of Upper Frankford	0.25
2012	Township of Southampton	0.5
2011	Township of Southampton	0.01
2009	Township of Cooke	0.7
2009	Township of Cooke	0.4
2009	Township of Southampton	1.5
2008	Township of Cooke	9
2008	Township of Penn	5
2008	Township of South Middleton	0.4
2007	Township of Cooke	9.8
2007	Township of Cooke	5
2007	Township of Cooke	1.5
2007	Township of Dickinson	1.5
2007	Township of Lower Mifflin	0.3
2007	Township of Cooke	0.1
2006	Township of Cooke	55

Table 4.3.8-1: List of wildfire events reported in Cumberland County from 1999-2015 (USFS, 2017).		
Year	**Municipality**	**Area (Acres)**
2006	Township of Dickinson	12
2006	Township of Southampton	7
2006	Township of Dickinson	1
2006	Township of Southampton	1
2006	Township of Southampton	0.8
2006	Township of South Middleton	0.3
2006	Township of Dickinson	0.25
2006	Township of Dickinson	0.1
2006	Township of Dickinson	0.1
2006	Township of Southampton	0.1
2005	Township of Dickinson	23
2005	Township of Cooke	16
2005	Township of Southampton	7.5
2005	Township of Hopewell	4.3
2005	Township of South Middleton	2
2005	Township of South Middleton	1.5
2005	Township of South Middleton	0.1
2003	Township of South Middleton	3
2002	Township of Dickinson	30
2002	Township of Dickinson	0.4
2002	Township of Hopewell	0.01
2002	Township of South Middleton	4.5
2002	Township of South Middleton	3.5
2002	Township of Cooke	4
2001	Township of Monroe	1
1999	Township of Monroe	15

Figure 4.3.8-3: Wildfire on the mountain north of Bella Vista Drive in East Pennsboro Township, Cumberland County, PA in 2010 (Photograph courtesy of Cumberland County, 2014).

Wildfire information obtained from the U.S. Forest Service is aggregated by state forest. Table 4.3.8-2 shows acreage burned in Michaux and Tuscarora State Forests between 1995 and 2015, some of which includes areas outside of Cumberland County. During this time frame, 255.6 acres burned in Michaux State Forest while 9.11 acres burned in Tuscarora State Forest.

The U.S. Forest Service data found in Tables 4.3.8-1 and 4.3.8-2 is only available through 2015. Additional research conducted on the National Oceanographic and Atmospheric Administration (NOAA) Storm Events Database has revealed that no wildfires were reported in Cumberland County from January 1, 2016 through November 10, 2020.

Table 4.3.8-2: Acres burned due to wildfires in Michaux and Tuscarora State Forests from 1999 to 2015 (USFS, 2017; PA DCNR, 2017).		
Year	**State Forest**	**Area Burned (Acres)**
2015	Michaux	1.1
	Tuscarora	1.5
2014	Michaux	30
	Tuscarora	1.25
2013	Michaux	0
	Tuscarora	1.5
2012	Michaux	0.5
	Tuscarora	0.25
2011	Michaux	0.01
	Tuscarora	0
2010	Michaux	0
	Tuscarora	0
2009	Michaux	2.6
	Tuscarora	0
2008	Michaux	14.4
	Tuscarora	0
2007	Michaux	17.9
	Tuscarora	0.3
2006	Michaux	77.65
	Tuscarora	0
2005	Michaux	50.1
	Tuscarora	4.3
2004	Michaux	0
	Tuscarora	0
2003	Michaux	3
	Tuscarora	0
2002	Michaux	42.4
	Tuscarora	0.01
2001	Michaux	1
	Tuscarora	0
2000	Michaux	0
	Tuscarora	0
1999	Michaux	15
	Tuscarora	0

4.3.8.4 Future Occurrence

Previous events indicate that annual wildfire occurrences in the County are expected. Weather conditions like drought can increase the likelihood of wildfires occurring. Prolonged periods of drought caused by climate change can potentially increase the length of the wildfire season and provide a more favorable climate for ignition. The increased temperatures and associated decrease in soil moisture, connected to anthropogenic greenhouse gas emission could create conditions more conducive to wildfires (Wehner et al., 2017). Currently, wildfire occurrences in Pennsylvania are concentrated in the spring and fall but changing weather patterns may extend the wildfire season. The PA DCNR Bureau of Forestry plans to mitigate wildfire risks through changes to the structure and composition of Pennsylvania's forests (PA DCNR, 2018). Any fire, without the quick response or attention of fire-fighters, forestry personnel, or visitors to the forest, has the potential to become a wildfire.

There is virtually a 100 percent chance of a forest fire of some size occurring in any given year within Cumberland County. However, the likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response. Furthermore, the impacts of climate change are likely to increase the probability of future wildfires. Prolonged periods of drought caused by climate change can potentially increase the length of the wildfire season and provide a more favorable climate for ignition. The key factors in wildfire occurrence are temperature, soil moisture, relative humidity, wind speed, and vegetation (fuel). Decreases in the surface soil moisture due to enhanced evaporation under a warmer climate is likely (Wehner et al. 2017) and could contribute to more dry conditions conducive to wildfire especially in the summer and fall (Michael Baker International, 2018). Overall, the probability of future wildfires can be considered *moderately likely* according to the Risk Factor Methodology (see Table 4.5-2).

It is important to note that most wildfires in Pennsylvania are human-caused. As a result, the occurrence of future wildfire events will strongly depend on patterns of human activity. Events are more likely to occur in wildfire-prone areas experiencing new or additional development. Wildfires may also be more likely after invasive species infestations or high wind events. These events would add additional potential fuel load to fire-prone locations.

4.3.8.5 Vulnerability Assessment

Using structure inventory data provided by the County, Table 4.3.8-3 shows there are 276 structures scattered throughout the Michaux and Tuscarora State Forests in Cumberland County spreading throughout six municipalities. Of these municipalities, Cooke Township is most vulnerable, with nearly 76 percent of its structures located within forested areas. It is worth noting that 92 percent of Cooke Township is state land (e.g., State Forest and Pine Grove Furnace Park). It is likely that many of these structures are used for recreation and not as year-round residences.

Table 4.3.8-3: Number of structures in the Michaux and Tuscarora State Forests per municipality (Cumberland County GIS, 2018).			
Municipality	**Total Addressed Units in Municipality**	**Structures Addressed Units in State Forest**	**Percent Of Addressed Units in State Forest**
Borough of Camp Hill	3,730	0	0.00%
Borough of Carlisle	8,817	0	0.00%
Township of Cooke	391	210	53.71%
Township of Dickinson	2,268	38	1.68%
Township of East Pennsboro	9,285	0	0.00%
Township of Hampden	13,644	0	0.00%
Township of Hopewell	904	0	0.00%
Borough of Lemoyne	2,158	0	0.00%
Township of Lower Allen	8,008	0	0.00%
Township of Lower Frankford	734	0	0.00%
Township of Lower Mifflin	771	24	3.11%
Borough of Mechanicsburg	4,622	0	0.00%
Township of Middlesex	3,092	0	0.00%
Township of Monroe	2,576	0	0.00%
Borough of Mount Holly Springs	909	0	0.00%
Borough of New Cumberland	3,359	0	0.00%
Borough of Newburg	138	0	0.00%
Borough of Newville	764	0	0.00%
Township of North Middleton	5,287	0	0.00%
Township of North Newton	967	0	0.00%
Township of Penn	1,194	0	0.00%
Borough of Shippensburg	1,827	0	0.00%
Township of Shippensburg	1,315	0	0.00%
Borough of Shiremanstown	796	0	0.00%
Township of Silver Spring	8,045	0	0.00%
Township of South Middleton	6,845	1	0.01%
Township of South Newton	525	0	0.00%
Township of Southampton	2,932	2	0.07%
Township of Upper Allen	8,199	0	0.00%
Township of Upper Frankford	1,034	0	0.00%
Township of Upper Mifflin	559	1	0.18%
Township of West Pennsboro	2,311	0	0.00%
Borough of Wormleysburg	1,578	0	0.00%
TOTAL	**109,584**	**276**	**0.25%**

There are no critical facilities in Cumberland County located within a state forest.

Additionally, Cumberland County does not have any career fire departments. The 29 fire companies in the County are staffed by volunteers. However, there are several fire companies that have paid staff on duty for 24 hours and 7 days a week to report to calls and drive fire apparatus. Cumberland County has seen an increase in municipalities utilizing their public works and other municipal employees to support fire company staffing in recent years (Cumberland County Department of Public Safety, October 24, 2019, personal communication).

4.3.9. Winter Storm

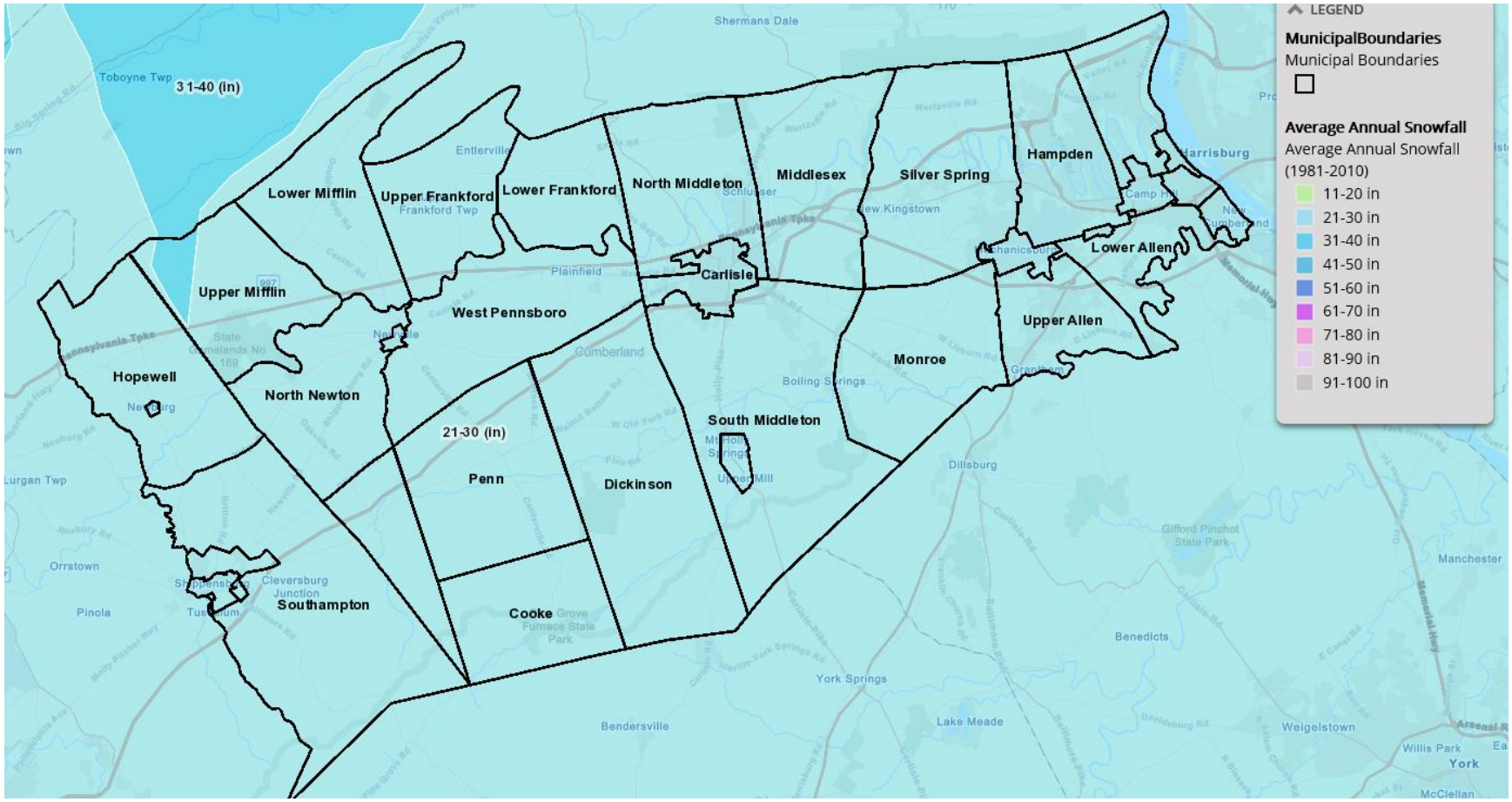
4.3.9.1 Location and Extent

Winter storms are regional events which affect Cumberland County, adjacent counties, other areas of the Commonwealth, or even the larger northeastern U.S. Region. Winter storms for Cumberland County include blizzards and/or heavy snowfall, hail, heavy precipitation or ice storms, and temperature extremes. Snowstorms occur approximately five times per year. These storms are more prevalent in the northern and western regions of Pennsylvania and include ice and high wind.

Winter storms begin as low-pressure systems that move through Pennsylvania either following the jet stream or developing as extra-tropical cyclonic weather systems over the Atlantic Ocean called nor'easters. The effects of these storms can sometimes last for weeks, bringing several inches or even feet of snow and ice and cold temperatures.

Cumberland County averages 21 to 30 inches of snow annually, as shown in Figure 4.3.9-1. Winter storms deliver significant snowfall to the County on a regular basis and several examples are described and illustrated in Section 4.3.9.

Figure 4.3.9-1: Pennsylvania Average Annual Snowfall from 1981 – 2010 (NOAA, 2013). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.



4.3.9.2 Range of Magnitude

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

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

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

Any of the above events can result in the closing of secondary roads, particularly in rural locations, loss of utility services and depletion of oil heating supplies. Environmental impacts often include damaged 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. An indirect effect of winter storms is the treatment of roadway surfaces with salt, chemicals, and other de-icing materials which can impair adjacent surface and ground waters. Another important secondary impact for winter storms is building or structure collapses caused by the weight of the snow from a single large storm or from a significant accumulation over time. Winter storms have a positive environmental impact as well; gradual melting of snow and ice provides excellent groundwater recharge. However, abrupt high temperatures following a heavy snowfall can cause rapid surface water runoff and severe flooding. The worst winter storms, in early 1994, are described in Section 4.3.9.3.

4.3.9.3 Past Occurrence

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

The first of these devastating winter storms occurred in early January 1994 with record snowfall depths in excess of 33 inches across southwest and south-central portions of the Commonwealth, including Cumberland County, strong winds and sleet/freezing rains. Numerous storm-related power outages were reported and as many as 600,000 residents were without electricity, in some cases for several days at a time. A ravaging ice storm followed, affecting the southeastern portion of the Commonwealth, which closed major arterial roads and downed trees and power lines. Utility crews from a five-state area were called to assist in power restoration repairs. Officials from PP&L stated that this was the worst winter storm in the history of the company with related damage-repair costs exceeding $5,000,000.

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

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

During January and February 1994, Pennsylvania experienced at least 17 regional or statewide winter storms. In January 1996, another series of severe winter storms with 27- and 24-inch accumulated snow depths was followed by 50 to 60-degree temperatures resulting in rapid melting and flooding (see Table 4.3.3-1). In January 2016, Winter Storm Jonas, pictured in Figure 4.3.9-2, brought heavy snow to Pennsylvania, with a record 30.2 inches measured in Harrisburg by the National Weather Service (Kiner, 2016). Furthermore, the worst winter storm on record to occur in Cumberland County occurred on January 1, 1996 where 37.7 inches of snow fell over a three-day period (NCEI, 2018).

Figure 4.3.9-2: Unplowed roads in Central PA after Winter Storm Jonas on Sunday January 14, 2016 (Photograph courtesy of *Michael Bupp*/*The Sentinel*, 2016).

Six of the 19 Presidential Disaster and Emergency Declarations affecting Cumberland have been in response to hazard events related to winter storms (see Table 4.2-1). In addition to the events described above, other winter storm events, including those associated with Disaster Declarations, are listed in Table 4.3.9-1. A photograph of one of the events is provided as Figure 4.3.9-3.

Table 4.3.9-1: Previous winter storm events impacting Cumberland County (NCEI, 2018; Cumberland EOP, 1984). Only significant events are shown prior to 2003, while all events since 2003 are listed.			
Location	**Date**	**Type**	**Property Damage ($)**
Statewide	January 1966	Winter Storm	*not provided*
Statewide	February 1972	Major Winter Storm	*not provided*
Statewide	January 1978	Winter Storm	*not provided*
Statewide	1977	Major Winter Storm	*not provided*
Statewide	February 1978	Major Winter Storm	*not provided*
Statewide	1981	Major Winter Storm	*not provided*
Statewide	1981	Major Winter Storm	*not provided*
Several Counties	1/6/1994	Record Snowfall	988,000
Statewide	1/7/1996	Blizzard	635,000
Several Counties	3/4/2001	Heavy Snow	150,000
Several Counties	2/6/2003	Heavy Snow	*not provided*
Statewide	2/16/2003	Heavy Snow	263,000
Several Counties	12/5/2003	Heavy Snow	*not provided*
Several Counties	2/6/2004	Ice Storm	*not provided*
Several Counties	3/19/2004	Heavy Snow	*not provided*
Several Counties	2/24/2005	Heavy Snow	*not provided*
Statewide	3/1/2005	Heavy Snow	*not provided*
Statewide	12/9/2005	Heavy Snow	*not provided*
Statewide	12/16/2005	Winter Storm	*not provided*
Several Counties	2/12/2006	Heavy Snow	*not provided*
Several Counties	2/13/2007	Winter Storm	*not provided*
Several Counties	3/16/2007	Heavy Snow	*not provided*
Several Counties	12/13/2007	Winter Storm	*not provided*
Several Counties	12/15/2007	Winter Storm	*not provided*
Several Counties	2/1/2008	Winter Storm	*not provided*
Several Counties	2/12/2008	Ice Storm	*not provided*
Statewide	1/6/2009	Ice Storm	*not provided*
Statewide	1/27/2009	Winter Storm	*not provided*
Countywide	12/19/2009	Winter Storm	*not provided*
Countywide	02/05/2010	Winter Storm	*not provided*
Countywide	02/09/2010	Winter Storm	*not provided*
Countywide	02/01/2011	Winter Storm	*not provided*
Countywide	02/21/2011	Heavy Snow	*not provided*
Countywide	10/29/2011	Heavy Snow	*not provided*
Countywide	12/14/2013	Winter Storm	*not provided*
Countywide	02/04/2014	Winter Storm	*not provided*
Countywide	02/13/2014	Heavy Snow	*not provided*
Several Counties	11/25/2014	Heavy Snow	*not provided*
Several Counties	1/22/2016	Winter Storm	*not provided*

Table 4.3.9-1: Previous winter storm events impacting Cumberland County (NCEI, 2018; Cumberland EOP, 1984). Only significant events are shown prior to 2003, while all events since 2003 are listed.

Location	Date	Type	Property Damage ($)
Several Counties	3/13/2017	Winter Storm	*not provided*
Several Counties	2/17/2018	Winter Storm	*not provided*
Several Counties	3/20/2018	Winter Storm	*not provided*
Several Counties	11/15/2019	Winter Storm	*not provided*
Several Counties	2/11/2019	Winter Storm	*not provided*
Several Counties	2/20/2019	Winter Storm	*not provided*

Figure 4.3.9-3: Snow plow in South Middleton Township, Cumberland County, PA on December 14, 2013 (Photograph courtesy of Curt Werner/*The Sentinel*, 2014).

4.3.9.4 Future Occurrence

Winter storms are a regular, annual occurrence in Cumberland County. Approximately 35 winter storms occur across Pennsylvania and about five occur in Cumberland County annually. Table 4.3.9-2 shows the snow depths expected for 10 percent-, 4 percent-, 2 percent- and 1 percent-annual-chance snowfalls over a 1-day, 2-day and 3-day period in Cumberland County. These depths are based on data collected at the weather station in Carlisle, PA between 1894 and 1980. Data was available for 73 years of this 86-year time period, however, additional data collection would improve statistical calculation of annual probabilities. Overall, the probability of future winter storms can be considered *highly likely* according to the Risk Factor Methodology (see Table 4.4-2).

Table 4.3.9-2: Extreme snowfall amounts measured in inches for 10 percent, 4 percent, 2 percent and 1 percent-annual probability of occurrence storms in Cumberland County (NCDC, 2007; NCEI, 2018).					
Time Frame	**Annual Probability of Occurrence**				**Observed Max**
	10 percent	**4 percent**	**2 percent**	**1 percent**	
1-Day	15.4	18.7	21.1	23.5	30.0
2-Day	18.6	22.9	26.0	29.1	36.9
3-Day	19.7	24.2	27.4	30.6	37.7

4.3.9.5 Vulnerability Assessment

Since winter storms have become a regular occurrence in Cumberland County, as well as other counties throughout the Commonwealth, strategies have been developed to respond to these events. Snow removal and utility repair equipment is present to respond to typical events. The use of auxiliary heat and electricity supplies such as wood burning stoves, kerosene heaters and gasoline power generators reduces the impact winter storm events have on individuals who have this equipment available. Locations lacking adequate equipment to protect against cold temperatures or significant snow and ice are more vulnerable to winter storm events. Although warming shelters are a municipal responsibility in Cumberland County, some municipalities have pre-identified warming shelters that may include a municipal building, fire company, or a local church. These warming shelters are opened on an as needed basis, in coordination with the municipal Emergency Management Coordinator. In the event that additional capacity is needed or that a municipality does not have an identified warming shelter, a request would be made to the Cumberland County Department of Public Safety and forwarded to the American Red Cross, which would then work with PEMA to resolve (Cumberland County Department of Public Safety, personal communication, October 24, 2019). Even for communities that are prepared to respond to winter storms, severe events involving snow accumulations that exceed six or more inches in a 12-hour period can cause many traffic accidents, interrupt power supply and communications, and cause the failure of inadequately designed and/or maintained roof systems.

Similar to the vulnerability assessment discussion for tornadoes and severe wind, vulnerability to the effects of winter storms on buildings is dependent on the age of the building type, construction material used and condition of the structure. As mentioned previously, Figure 4.3.7-7 demonstrates that approximately 23 percent of structures in Cumberland County were built prior to 1950. 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. Based on the information available, all communities in Cumberland County are essentially equally vulnerable to the direct impacts of winter storms.

HUMAN-MADE OR TECHNOLOGICAL HAZARDS

4.3.10. Civil Disturbance

4.3.10.1 Location and Extent

The scale and scope of civil disturbance events varies widely. However, government facilities, local landmarks, prisons, and universities are common sites where crowds and mobs may

gather. There are two prisons within Cumberland County; the Cumberland County Prison in the Borough of Carlisle and the White Hill State Prison in Lower Allen Township. The Tresslercare Wilderness School, a juvenile correction facility, is located in South Middleton Township. College and universities in the County include Central Pennsylvania College, Dickinson College, Messiah College, Penn State Dickinson School of Law, Shippensburg University and U.S. Army War College.

4.3.10.2 Range of Magnitude

Civil disturbances can take the form of small gatherings or large groups blocking or impeding access to a building, or disrupting normal activities by generating noise and intimidating people, as illustrated in Figure 4.3.11-1. They can range from a peaceful sit-in to a full scale riot, in which a mob burns or otherwise destroys property and terrorizes individuals. Even in its more passive forms, a group that blocks roadways, sidewalks, or buildings interferes with public order. There are two types of large gatherings typically associated with civil disturbances: a crowd and a mob. A crowd may be defined as a casual, temporary collection of people without a strong, cohesive relationship. Crowds can be classified into four categories (Juniata County, PA MJHMP, 2008):

- Casual Crowd: A casual crowd is merely a group of people who happen to be in the same place at the same time. Violent conduct does not occur.
- Cohesive Crowd: A cohesive crowd consists of members who are involved in some type of unified behavior. Members of this group are involved in some type of common activity, such as worshipping, dancing, or watching a sporting event. Although they may have intense internal discipline, they require substantial provocation to arouse to action.
- Expressive Crowd: An expressive crowd is one held together by a common commitment or purpose. Although they may not be formally organized, they are assembled as an expression of common sentiment or frustration. Members wish to be seen as a formidable influence. One of the best examples of this type is a group assembled to protest.
- Aggressive Crowd: An aggressive crowd is comprised of individuals who have assembled for a specific purpose. This crowd often has leaders who attempt to arouse the members or motivate them to action. Members are noisy and threatening and will taunt authorities. They may be more impulsive and emotional, and require only minimal stimulation to arouse violence. Examples of this type of crowd could include demonstrators and strikers, though not all demonstrators and strikers are aggressive.

Figure 4.3.10-1: A State Police trooper stood between Ku Klux Klan members and the crowd during a rally on the steps of the Cumberland County Courthouse on September 23, 2000 (Photograph courtesy of *The Sentinel*, 2014).

A mob can be defined as a large disorderly crowd or throng. Mobs are usually emotional, loud, tumultuous, violent and lawless. Similar to crowds, mobs have different levels of commitment and can be classified into four categories (Juniata County, PA MJHMP, 2008):

- Aggressive Mob: An aggressive mob is one that attacks, riots and terrorizes. The object of violence may be a person, property, or both. An aggressive mob is distinguished from an aggressive crowd only by lawless activity. Examples of aggressive mobs are the inmate mobs in prisons and jails, mobs that act out their frustrations after political defeat, or violent mobs at political protests or rallies.
- Escape Mob: An escape mob is attempting to flee from something such as a fire, bomb, flood, or other catastrophe. Members of escape mobs are generally difficult to control can be characterized by unreasonable terror.
- Acquisitive Mob: An acquisitive mob is one motivated by a desire to acquire something. Riots caused by other factors often turn into looting sprees. This mob exploits a lack of control by authorities in safeguarding property.
- Expressive Mob: An expressive mob is one that expresses fervor or revelry following some sporting event, religious activity, or celebration. Members experience a release of pent up emotions in highly charged situations.

The worst civil disturbance event on record in Cumberland County, a prison riot, is described in Section 4.3.11.3.

4.3.10.3 Past Occurrence

In the spring and summer of 2020, hundreds of peaceful residents gathered at the square in Carlisle to show support for George Floyd. The protest called attention to victims that are unfairly targeted and profiled by law enforcement. Nationally, several of these gatherings were evolving into aggressive and acquisitive mobs that included loitering and theft. During this time period, the Cumberland County Emergency Operations Center worked weekends to prepare for a potential acquisitive or aggressive Mob. The group that gathered in Carlisle remained peaceful.

Figure 4.3.10-2: Hundreds gather at the square in Carlisle on June 6, 2020 to show support for George Floyd and call attention to targeting by authorities (Photograph courtesy of *The Sentinel*, 2020).

There was a riot at the White Hill State Correction Prison in 1989. The event actually consisted of two aggressive mob uprisings, the second taking place the day after the first.

4.3.10.4 Future Occurrence

Minor civil disturbances may occur in Cumberland County, but it is not possible to accurately predict the probability of future occurrence for civil disturbance events over the long-term. Overall, the probability of future civil disturbances can be considered *unlikely* according to the Risk Factor Methodology (see Table 4.4-1).

It may be possible to recognize the potential for an event to occur in the near-term. For example, an upcoming significant sporting event at one of the colleges or universities in the County may result in gathering of large crowds. Local law enforcement should anticipate these types of events and be prepared to handle a crowd so that peaceful gatherings are prevented from turning into unruly public disturbances.

4.3.10.5 Vulnerability Assessment

In general, Cumberland County is not particularly vulnerable to civil disturbance events. Most civil disturbance events, should they occur, would have minimal impact. Sites previously identified in Section 4.3.10.1 are locations where such events are more likely to occur and therefore should be considered more vulnerable. Adequate law enforcement at these locations minimizes the chances of a small assembly of people turning into a significant disturbance. In addition, Cumberland County has instituted a permitting process to use county facilities for public gatherings which enables an assessment of the potential for civil disturbance.

4.3.11. Dam Failure

Due to data sensitivity, the Dam Failure profile can be found in *Appendix G.*

4.3.12. Environmental Hazard – Hazardous Materials Release

4.3.12.1 Location and Extent

Environmental hazards in Cumberland County focus mainly on hazardous material releases which can occur wherever hazardous materials are manufactured, used, stored, or transported. Such releases usually occur at fixed site facilities or along transportation routes. Interstates 81, 76, and 83, U.S. Routes 11, 15, 11/15 and PA Route 581 are considered major transportation routes in Cumberland County. There are several points where these transportation routes cross streams within the watershed that serves as a part of the County's domestic water supply, which increases the potential negative impact of transportation-related releases of hazardous materials (HAZMAT). A 2009 Hazardous Materials Commodity Flow Study, completed for the Cumberland County Department of Public Safety, revealed that there are approximately 1,000 motor vehicle movements of HAZMAT per day, 25% of which were observed in the I-81 corridor. 102 HAZMAT shipments occur via rail each day. When road and rail HAZMAT shipments were analyzed together, the study showed that Flammable and Combustible Liquids is the most common type of hazardous material to be shipped within or through the County. Additionally, several facilities in the County store significant amounts of ethanol to be blended into motor fuels. Recommendations from the Commodity Flow Study included distributing information to municipal planners, preparing emergency responders for transportation-related HAZMAT releases including incidents involving extreme temperatures, and training and equipping responders to fight flammable liquid fires involving polar liquids (Cocciardi and Associates, Inc., 2009).

Transportation of hazardous materials on highways involves tanker trucks or trailers. Unsurprisingly, large trucks are responsible for the greatest number of hazard material release incidents, as illustrated in Figure 4.3.12.1. Hazardous material releases from rail transport are also of concern due to collisions and derailments that result in large spills. Severe rail events have reportedly occurred in the Enola and Lemoyne rail yards. The aforementioned HAZMAT Commodity Flow Study predicts that approximately 25 road and rail transportation-related HAZMAT releases are likely to occur each year. In addition to risks posed by road and rail corridors, roughly 30 miles of the Mariner East II natural gas pipeline, installed by Sunoco, pass through Cumberland County. The pipeline presents the possibility for a leak of hazardous materials.

Figure 4.3.12-1: A truck driver spilled about 20 gallons of sulfuric acid along Interstate 81 in Penn Township, Cumberland County, PA on July 16, 2004 (Photograph courtesy of Jason Minick/*The Sentinel*, 2004).

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

Key information about the chemicals handled by manufacturing or processing facilities is contained in the U.S. Environmental Protection Agency's (EPA) Toxic Release Inventory (TRI) database. Facilities that employ 10 or more full-time employees and which manufacture or process 25,000 pounds or more, or otherwise use 10,000 pounds or more, of any SARA Section 313-listed toxic chemical in the course of a calendar year are required to report TRI information to the EPA, the federal enforcement agency for SARA Title III, and PEMA. Additional hazardous materials are contained at the military installations within and surrounding Cumberland County (e.g., Carlisle Barracks U.S. Army Garrison).

4.3.12.2 Range of Magnitude

Hazardous material releases can contaminate air, water and soils, possibly resulting in death and/or injuries. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary or cascading events. Hazardous materials can include toxic chemicals, radioactive materials,

infectious substances and hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas.

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

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

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

- Hydrologic effects – surface and groundwater contamination
- Other effects on water quality such as changes in water temperature
- Damage to streams, lakes, ponds, estuaries, and wetland ecosystems
- Air quality effects – pollutants, smoke, and dust
- Loss of quality in landscape
- Reduced soil quality
- Damage to plant communities – loss of biodiversity; damage to vegetation
- Damage to animal species – animal fatalities; degradation of wildlife and aquatic habitat; pollution of drinking water for wildlife; loss of biodiversity; disease

A worst-case hazardous material release could involve the contamination of public drinking water supplies and local waterways.

4.3.12.3 Past Occurrence

Since the passage of SARA, Title III facilities which produce, use, or store hazardous chemicals must notify the public through the county emergency dispatch center and PEMA if an accidental release of a hazardous substance meets or exceeds a designated reportable quantity, and affects or has the potential to affect persons and/or the environment outside the plant. SARA, Title III and Pennsylvania Act 165 also require a written follow-up report to PEMA and the

County. These written follow-up reports include any known or anticipated health risks associated with the release and actions to be taken to mitigate potential future incidents. In addition, Section 204(a)(10) of Act 165 requires PEMA to staff and operate a 24-hour State Emergency Operations Center (SEOC) to provide effective emergency response coordination. The *Pennsylvania's Hazardous Material Emergency Planning and Response Act 1990-165: 2011 Annual Report* states that there were 41 hazardous material/petroleum incidents in Cumberland County reported to the SEOC in 2011 (PEMA, 2011). Total hazardous materials incidents in Cumberland County from 2013-2017 are displayed in Table 4.3.12-1. It can be seen that the number of hazardous material/petroleum incidents in Cumberland County reported to PEMA decreased to 28 incidents in 2017 (PEMA – KC, 2018).

Table 4.3.12-1: Number of Hazardous materials incidents from 2013-2017 (PEMA-KC, 2018)

2013 Incidents	2014 Incidents	2015 Incidents	2016 Incidents	2017 Incidents
16	28	34	31	28

The U.S. EPA Toxic Release Inventory (TRI) reports that 72,221 pounds of chemicals were released on-site at facilities located in Cumberland County in 2017, and there were total offsite transfers of 127,201 pounds (EPA, 2017). Table 4.3.12-2 lists the release of these chemicals by company. Many of these companies have or are federally listed SARA Title III facilities. Other prior year TRI information can be found on the EPA Toxic Release Inventory Database website.

Table 4.3.12-2: Summary of 2017 Toxic Release Inventory data in Cumberland County (U.S. EPA, 2019).

Company	Chemicals Released	Municipality
ADM Animal Nutrition, Inc.	Copper, Manganese, & Zinc Compounds	Borough of Camp Hill
ADM Milling Company	Chlorine	Borough of Camp Hill
AmesAmsted Rail Co INC	CopperManganese	Borough of Camp Hill
Atlas Roofing Corporation	Diisocyanates	Borough of Camp Hill
Carlisle Syntec, Inc.	Antimony Compounds, Diisocyanates, Polycyclic Aromatic Compounds, Thiram, Toluene, Xylene, Zinc Compounds	Borough of Carlisle
Dairy Farmers of America/Mechanicsburg	Nitrate Compounds, Nitric Acid	Borough of Mechanicsburg
Frog Switch & Manufacturing Company	Chromium, Lead, Manganese, Molybdenum Trioxide, Nickel Compounds	Borough of Carlisle
JLG Industries Inc. Shippensburg Facility	Ethylene Glycol, Zinc Compounds	Township of Shippensburg
Land O' Lakes	Nitrate Compounds, Nitric Acid	Township of South Middleton
Land O' Lakes Purina Feed, LLC-Harrisburg	Manganese, Copper, & Zinc Compounds	Borough of Camp Hill
Nestle Purina Petcare Company	Manganese Compounds, Propylene, Zinc Compounds	Township of Hampden
PPG Industries Carlisle Plant Works 6Pennsy Supply Inc. Silver	Lead CompoundsBenzo (G,H,I) Perylene, Polycyclic Aromatic	Borough of CarlisleTownship of

Table 4.3.12-2: Summary of 2017 Toxic Release Inventory data in Cumberland County (U.S. EPA, 2019).		
Company	**Chemicals Released**	**Municipality**
Spring Facility	Compounds	Silver Spring
Safety-Kleen Systems	Ethylene Glycol, Lead, Polycyclic Aromatic Compounds, Benzo(G,H,I) Perylene, Methanol	Township of Silver Spring
Schrieber Foods, Inc.	Nitric Acid, Nitrate Compounds	Township of Shippensburg
Skyline Steel, LLC- Camp Hill	Manganese, Nickel, Lead	Borough of Camp Hill
The Ames Cos Inc.	Glycol ethers, Lead, Manganese, Nickel	Borough of Camp Hill
Vitro Flat Glass LLC Carlisle Plant	Ammonia, Lead compounds, Zinc compounds	Borough of Carlisle
World Energy Harrisburg LLC	Methanol	Borough of Camp Hill

In 2018, across the Commonwealth, there were 927 highway related hazardous material incidents totaling $1,240,900 in damages and 19 railway related incidents totaling $65,740 in damages (PHMSA, 2019). Other prior year incident information for Pennsylvania can be found on the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration website. On May 6, 2017, 160,000 gallons of mud used to lubricate the horizontal drilling process related to the installation of the Mariner East II Pipeline leaked through natural fractures in the ground and reached the surface, forcing Sunoco to temporarily halt the drilling process (PA DEP, 2019)

4.3.12.4 Future Occurrence

While many hazardous material release incidents have occurred in Cumberland County in the past, they are generally considered difficult to predict. An occurrence is largely dependent upon the accidental or intentional actions of a person or group. Intentional acts are addressed under Section 4.3.14. In some instances, hazardous material releases can result in associated cascading hazards. For example, a tanker truck accident could result in a hazardous material release which could result in a fire or explosion on the roadway. Likewise, a tornado or a fire at a factory could result in accidental hazardous material release. Overall, the probability of future hazardous material release incidents can be considered *highly likely* according to the Risk Factor Methodology (see Table 4.4-2).

4.3.12.5 Vulnerability Assessment

Transportation carriers must have response plans in place to address accidents, otherwise the local emergency response team will step in to secure and restore the area, as illustrated in Figure 4.3.12-3. Quick response minimizes the volume and concentration of hazardous materials that disperse through air, water and soil. In the event of an accidental or intentional release, the size and type of chemical released would be critical determinants of the effects on nearby residents and the environment.

Figure 4.3.12-3: A firefighter worked to contain diesel fuel spilling from the fuel tank of a truck after an accident in Lower Allen Township, Cumberland County, PA on December 30, 2005 (Photograph courtesy of Jason Minick/*The Sentinel*, 2014).

All PA counties must retain the services of a hazardous materials response team or employ their own per PEMA requirements. Cumberland County employs its own hazardous material response team that can be deployed to the site of a chemical spill. The team is prepared for a variety of hazard events, including a spill on county railways. Additionally, first responders receive hazardous response training from a variety of entities including the Pennsylvania State Fire Marshall and PEMA. Figure 4.3.12-4 displays an Emergency Management employee for Cumberland County displaying Special Hazards Operations Team equipment at Carlisle Fire and Rescue (Vaughn, 2015).

Figure 4.3.12-4: Mike Taylor, Emergency Management for Cumberland County, presents the Special Hazards Operations Team equipment (Photograph courtesy of Joshua Vaughn/*The Sentinel*, 2015).

Water treatment facilities and water suppliers are particularly vulnerable to hazardous material releases and also face the potential for cascade failures. Expansion of the Mechanicsburg Fuel Terminal to provide increased storage for ethanol products has increased vulnerability to residents of Silver Spring Township. Potential risk is increased not only by the fixed facility itself, but also rail and truck transport to and from the facility. Lightning damaged a heating oil tank at the facility in July 2013, resulting in the evacuation of about 300 people from their homes. In June 2018, a fire started at the facility while gasoline was being transferred from one pipe to another. The fire was contained within an hour, and the small gasoline leak that resulted was contained in the facility (Gitt, 2018).

Tables 4.3.12-3 through 4.3.12-6 provide data related to structures and critical facilities vulnerable to hazardous materials incidents at fixed facilities and in transit. The municipalities with the greatest number of the 91,569 structures within 1.5 miles of a SARA facility are Hampden Township (13,628), the Borough of Carlisle (8,817), and Silver Spring Township (8,028). The municipalities with the greatest number of the 578 critical facilities within 1.5 miles of a SARA facility are the Borough of Carlisle (60) and Hampden Township (58). The vast majority (83,990) of the 91,569 structures within 1.5 miles of a SARA facility are residential. The municipalities with the greatest number of structures vulnerable to hazardous materials incidents in transit are the Borough of Carlisle, Hampden Township, Lower Allen Township, and East Pennsboro Township due to being within 0.25 mile of major roads (Interstates, United States Highways, and Pennsylvania Highways) or rail lines. The municipalities with the greatest number of critical facilities vulnerable to hazardous materials incidents in transit are Hampden

Township, the Borough of Carlisle, and Lower Allen Township. The vast majority (72,246) of the 80,130 addressed units vulnerable to hazardous materials releases in transit are residential.

Table 4.3.12-3: Addressed Units and Critical Facilities Vulnerable to Hazardous Materials Incidents-Fixed Facility Incidents for Cumberland County (Cumberland County GIS, 2019).

Municipality	Total Addressed Units	Addressed Units Within 1.5 mi of SARA Facilities	Percent of Addressed Units Within 1.5 mi of SARA Facilities	Total Critical Facilities in Municipality	Total Critical Facilities within 1.5 mi of SARA Facilities	Percent of Critical Facilities within 1.5 mi of SARA Facilities
Borough of Camp Hill	3,730	3,730	100.0%	16	16	100.0%
Borough of Carlisle	8,817	8,817	100.0%	60	60	100.0%
Township of Cooke	391	0	0.0%	2	0	0.0%
Township of Dickinson	2,268	2,182	96.2%	13	13	100.0%
Township of East Pennsboro	9,285	5,906	63.6%	35	25	71.4%
Township of Hampden	13,644	13,628	99.9%	58	58	100.0%
Township of Hopewell	904	101	11.2%	10	4	40.0%
Borough of Lemoyne	2,158	2,158	100.0%	13	13	100.0%
Township of Lower Allen	8,008	7,625	95.2%	41	40	97.6%
Township of Lower Frankford	734	10	1.4%	1	0	0.0%
Township of Lower Mifflin	771	154	20.0%	4	0	0.0%
Borough of Mechanicsburg	4,622	4,622	100.0%	27	27	100.0%
Township of Middlesex	3,092	3,092	100.0%	37	37	100.0%
Township of Monroe	2,576	2,388	92.7%	10	9	90.0%
Borough of Mount Holly Springs	909	909	100.0%	11	11	100.0%
Borough of New Cumberland	3,359	2,237	66.6%	12	2	16.7%
Borough of Newburg	138	0	0.0%	1	0	0.0%
Borough of Newville	764	764	100.0%	8	8	100.0%
Township of North Middleton	5,287	5,104	96.5%	24	24	100.0%
Township of North Newton	967	389	40.2%	11	5	45.5%
Township of Penn	1,194	189	15.8%	10	5	50.0%
Borough of Shippensburg	1,827	1,827	100.0%	13	13	100.0%
Township of Shippensburg	1,315	1,315	100.0%	10	10	100.0%
Borough of Shiremanstown	796	796	100.0%	6	6	100.0%
Township of Silver Spring	8,045	8,028	99.8%	44	44	100.0%
Township of South	6,845	6,845	100.0%	40	40	100.0%

Table 4.3.12-3: Addressed Units and Critical Facilities Vulnerable to Hazardous Materials Incidents-Fixed Facility Incidents for Cumberland County (Cumberland County GIS, 2019).						
Municipality	**Total Addressed Units**	**Addressed Units Within 1.5 mi of SARA Facilities**	**Percent of Addressed Units Within 1.5 mi of SARA Facilities**	**Total Critical Facilities in Municipality**	**Total Critical Facilities within 1.5 mi of SARA Facilities**	**Percent of Critical Facilities within 1.5 mi of SARA Facilities**
Middleton						
Township of South Newton	525	0	0.0%	4	0	0.0%
Township of Southampton	2,932	1,656	56.5%	18	6	33.3%
Township of Upper Allen	8,199	4,628	56.4%	19	12	63.2%
Township of Upper Frankford	1,034	21	2.0%	5	1	20.0%
Township of Upper Mifflin	559	4	0.7%	2	0	0.0%
Township of West Pennsboro	2,311	866	37.5%	11	7	63.6%
Borough of Wormleysburg	1,578	1,578	100.0%	2	2	100.0%
TOTAL	**109,584**	**91,569**	**83.6%**	**578**	**498**	**86.2%**

Table 4.3.12-4: Structures Vulnerable to Hazardous Materials Releases at Fixed Facilities by Parcel Type (Cumberland County GIS, 2019).								
Municipality	**Total Addressed Units**	**Total Non-Residential Addressed Units**	**Non-Residential Addressed Units Within SARA Risk Radii**	**Percent Non-Residential Units Within SARA Risk Radii**	**Total Residential Addressed Units**	**Residential Addressed Units Within SARA Risk Radii**	**Percent Residential Units Within SARA Risk Radii**	**Total Addressed Units Within SARA Risk Radii**
Borough of Camp Hill	3,730	334	334	100.0%	3,396	3,396	100.0%	3,730
Borough of Carlisle	8,817	1,221	1,221	100.0%	7,596	7,596	100.0%	8,817
Township of Cooke	391	20	0	0.0%	371	0	0.0%	0
Township of Dickinson	2,268	77	75	97.4%	2,191	2,107	96.2%	2,182
Township of East Pennsboro	9,285	492	366	74.4%	8,793	5,540	63.0%	5,906
Township of Hampden	13,644	922	922	100.0%	12,722	12,706	99.9%	13,628
Township of Hopewell	904	34	10	29.4%	870	91	10.5%	101
Borough of Lemoyne	2,158	320	320	100.0%	1,838	1,838	100.0%	2,158
Township of Lower Allen	8,008	817	803	98.3%	7,191	6,822	94.9%	7,625
Township of Lower Frankford	734	18	0	0.0%	716	10	1.4%	10
Township of Lower Mifflin	771	31	7	22.6%	740	147	19.9%	154
Borough of Mechanicsburg	4,622	622	622	100.0%	4,000	4,000	100.0%	4,622
Township of Middlesex	3,092	222	222	100.0%	2,870	2,870	100.0%	3,092
Township of Monroe	2,576	89	79	88.8%	2,487	2,309	92.8%	2,388
Borough of Mount Holly Springs	909	100	100	100.0%	809	809	100.0%	909
Borough of New Cumberland	3,359	262	64	24.4%	3,097	2,173	70.2%	2,237
Borough of Newburg	138	10	0	0.0%	128	0	0.0%	0
Borough of Newville	764	151	151	100.0%	613	613	100.0%	764
Township of North Middleton	5,287	363	358	98.6%	4,924	4,746	96.4%	5,104

Table 4.3.12-4: Structures Vulnerable to Hazardous Materials Releases at Fixed Facilities by Parcel Type (Cumberland County GIS, 2019).								
Municipality	**Total Addressed Units**	**Total Non-Residential Addressed Units**	**Non-Residential Addressed Units Within SARA Risk Radii**	**Percent Non-Residential Units Within SARA Risk Radii**	**Total Residential Addressed Units**	**Residential Addressed Units Within SARA Risk Radii**	**Percent Residential Units Within SARA Risk Radii**	**Total Addressed Units Within SARA Risk Radii**
Township of North Newton	967	87	35	40.2%	880	354	40.2%	389
Township of Penn	1,194	48	11	22.9%	1,146	178	15.5%	189
Borough of Shippensburg	1,827	294	294	100.0%	1,533	1,533	100.0%	1,827
Township of Shippensburg	1,315	162	162	100.0%	1,153	1,153	100.0%	1,315
Borough of Shiremanstown	796	78	78	100.0%	718	718	100.0%	796
Township of Silver Spring	8,045	443	443	100.0%	7,602	7,585	99.8%	8,028
Township of South Middleton	6,845	420	420	100.0%	6,425	6,425	100.0%	6,845
Township of South Newton	525	31	0	0.0%	494	0	0.0%	0
Township of Southampton	2,932	98	40	40.8%	2,834	1,616	57.0%	1,656
Township of Upper Allen	8,199	372	227	61.0%	7,827	4,401	56.2%	4,628
Township of Upper Frankford	1,034	32	3	9.4%	1,002	18	1.8%	21
Township of Upper Mifflin	559	21	0	0.0%	538	4	0.7%	4
Township of West Pennsboro	2,311	100	42	42.0%	2,211	824	37.3%	866
Borough of Wormleysburg	1,578	170	170	100.0%	1,408	1,408	100.0%	1,578
TOTAL	**109,584**	**8,461**	**7,579**	**89.6%**	**101,123**	**83,990**	**83.1%**	**91,569**

Table 4.3.12-5: Addressed units and Critical Facilities Vulnerable to Hazardous Materials Incidents in Transit for Cumberland County (Cumberland County GIS, 2019).

Municipality	Total Addressed Units	Structures Addressed Units Within 0.25 mi of Major Roads	Percent of Units Within 0.25 mi of Major Roads	Structures Addressed Units Within 0.25 mi of rail lines	Percent of Units within 0.25 mi of rail lines	Total Critical Facilities in Municipality	Critical Facilities within 0.25 mi of Major Roads	Critical Facilities within 0.25 mi of Major Roads	Total Critical Facilities within 0.25 mi of rail lines	Percent Critical Facilities within 0.25 mi of rail lines
Borough of Camp Hill	3,730	3,523	94.5%	713	19.1%	16	16	100.0%	4	25.0%
Borough of Carlisle	8,817	8,170	92.7%	2,871	32.6%	60	56	93.3%	14	23.3%
Township of Cooke	391	240	61.4%	0	0.0%	2	2	100.0%	0	0.0%
Township of Dickinson	2,268	1,288	56.8%	628	27.7%	13	4	30.8%	1	7.7%
Township of East Pennsboro	9,285	6,528	70.3%	1,836	19.8%	35	31	88.6%	15	42.9%
Township of Hampden	13,644	8,393	61.5%	1,346	9.9%	58	41	70.7%	33	56.9%
Township of Hopewell	904	490	54.2%	0	0.0%	10	5	50.0%	0	0.0%
Borough of Lemoyne	2,158	2,065	95.7%	1,715	79.5%	13	13	100.0%	12	92.3%
Township of Lower Allen	8,008	6,551	81.8%	2,073	25.9%	41	37	90.2%	21	51.2%
Township of Lower Frankford	734	206	28.1%	0	0.0%	1	0	0.0%	0	0.0%
Township of Lower Mifflin	771	436	56.6%	0	0.0%	4	4	100.0%	0	0.0%
Borough of Mechanicsburg	4,622	4,206	91.0%	2,893	62.6%	27	23	85.2%	20	74.1%
Township of Middlesex	3,092	1,673	54.1%	120	3.9%	37	27	73.0%	9	24.3%
Township of Monroe	2,576	1,615	62.7%	278	10.8%	10	7	70.0%	2	20.0%
Borough of Mount Holly Springs	909	784	86.3%	576	63.4%	11	11	100.0%	5	45.5%
Borough of New Cumberland	3,359	3,160	94.1%	1,029	30.6%	12	12	100.0%	7	58.3%
Borough of Newburg	138	138	100.0%	0	0.0%	1	1	100.0%	0	0.0%
Borough of Newville	764	764	100.0%	0	0.0%	8	8	100.0%	0	0.0%
Township of North Middleton	5,287	2,924	55.3%	407	7.7%	24	20	83.3%	5	20.8%
Township of North Newton	967	733	75.8%	15	1.6%	11	10	90.9%	1	9.1%
Township of Penn	1,194	750	62.8%	176	14.7%	10	5	50.0%	2	20.0%

Table 4.3.12-5: Addressed units and Critical Facilities Vulnerable to Hazardous Materials Incidents in Transit for Cumberland County (Cumberland County GIS, 2019).

Municipality	Total Addressed Units	Structures Addressed Units Within 0.25 mi of Major Roads	Percent of Units Within 0.25 mi of Major Roads	Structures Addressed Units Within 0.25 mi of rail lines	Percent of Units within 0.25 mi of rail lines	Total Critical Facilities in Municipality	Critical Facilities within 0.25 mi of Major Roads	Critical Facilities within 0.25 mi of Major Roads	Total Critical Facilities within 0.25 mi of rail lines	Percent Critical Facilities within 0.25 mi of rail lines
Borough of Shippensburg	1,827	1,777	97.3%	854	46.7%	13	12	92.3%	7	53.9%
Township of Shippensburg	1,315	1,155	87.8%	167	12.7%	10	7	70.0%	2	20.0%
Borough of Shiremanstown	796	796	100.0%	681	85.6%	6	6	100.0%	6	100.0%
Township of Silver Spring	8,045	4,479	55.7%	1,012	12.6%	44	27	61.4%	12	27.3%
Township of South Middleton	6,845	4,170	60.9%	504	7.4%	40	32	80.0%	6	15.0%
Township of South Newton	525	378	72.0%	225	42.9%	4	3	75.0%	3	75.0%
Township of Southampton	2,932	1,988	67.8%	445	15.2%	18	10	55.6%	3	16.7%
Township of Upper Allen	8,199	5,029	61.3%	362	4.4%	19	17	89.5%	2	10.5%
Township of Upper Frankford	1,034	468	45.3%	0	0.0%	5	4	80.0%	0	0.0%
Township of Upper Mifflin	559	373	66.7%	0	0.0%	2	1	50.0%	0	0.0%
Township of West Pennsboro	2,311	1,205	52.1%	0	0.0%	11	5	45.5%	0	0.0%
Borough of Wormleysburg	1,578	1,215	77.0%	1,140	72.2%	2	2	100.0%	2	100.0%
TOTAL	**109,584**	**77,670**	**70.9%**	**22,066**	**20.1%**	**578**	**459**	**79.4%**	**194**	**33.6%**

Table 4.3.12-6: Addressed Units Vulnerable to Hazardous Materials Releases in Transit by (0.25 mi from Highway or Rail) by Generalized Structure Type (Cumberland County GIS, 2019).

Municipality	Total Addressed Units	Total Non-Residential Addressed Units	Non-Residential Addressed Units Vulnerable to HAZMAT by Transit	Percent Non-Residential Units Vulnerable to HAZMAT by Transit	Total Residential Addressed Units	Residential Addressed Units Vulnerable to HAZMAT by Transit	Percent Residential Units Vulnerable to HAZMAT by Transit	Total Addressed Units Vulnerable to HAZMAT by Transit
Borough of Camp Hill	3,730	338	337	99.7%	3,396	3,190	93.9%	3,527
Borough of Carlisle	8,817	1,221	1,208	98.9%	7,600	6,994	92.0%	8,202
Township of Cooke	391	20	17	85.0%	371	223	60.1%	240
Township of Dickinson	2,268	77	53	68.8%	2,202	1,321	60.0%	1,374
Township of East Pennsboro	9,285	493	427	86.6%	8,803	6,140	69.7%	6,567
Township of Hampden	13,644	922	875	94.9%	12,756	8,014	62.8%	8,889
Township of Hopewell	904	35	23	65.7%	871	468	53.7%	491
Borough of Lemoyne	2,158	320	320	100.0%	1,839	1,759	95.6%	2,079
Township of Lower Allen	8,008	820	769	93.8%	7,308	5,966	81.6%	6,735
Township of Lower Frankford	734	18	7	38.9%	716	199	27.8%	206
Township of Lower Mifflin	771	32	24	75.0%	742	414	55.8%	438
Borough of Mechanicsburg	4,622	622	621	99.8%	4,005	3,610	90.1%	4,231
Township of Middlesex	3,092	222	199	89.6%	2,902	1,519	52.3%	1,718
Township of Monroe	2,576	89	79	88.8%	2,509	1,584	63.1%	1,663
Borough of Mount Holly Springs	909	100	100	100.0%	811	783	96.5%	883
Borough of New Cumberland	3,359	262	260	99.2%	3,097	2,923	94.4%	3,183
Borough of Newburg	138	10	10	100.0%	128	128	100.0%	138
Borough of Newville	764	151	151	100.0%	613	613	100.0%	764
Township of North Middleton	5,287	363	316	87.1%	4,942	2,630	53.2%	2,946
Township of North Newton	967	88	75	85.2%	881	660	74.9%	735
Township of Penn	1,194	48	34	70.8%	1,147	727	63.4%	761

Table 4.3.12-6: Addressed Units Vulnerable to Hazardous Materials Releases in Transit by (0.25 mi from Highway or Rail) by Generalized Structure Type (Cumberland County GIS, 2019).

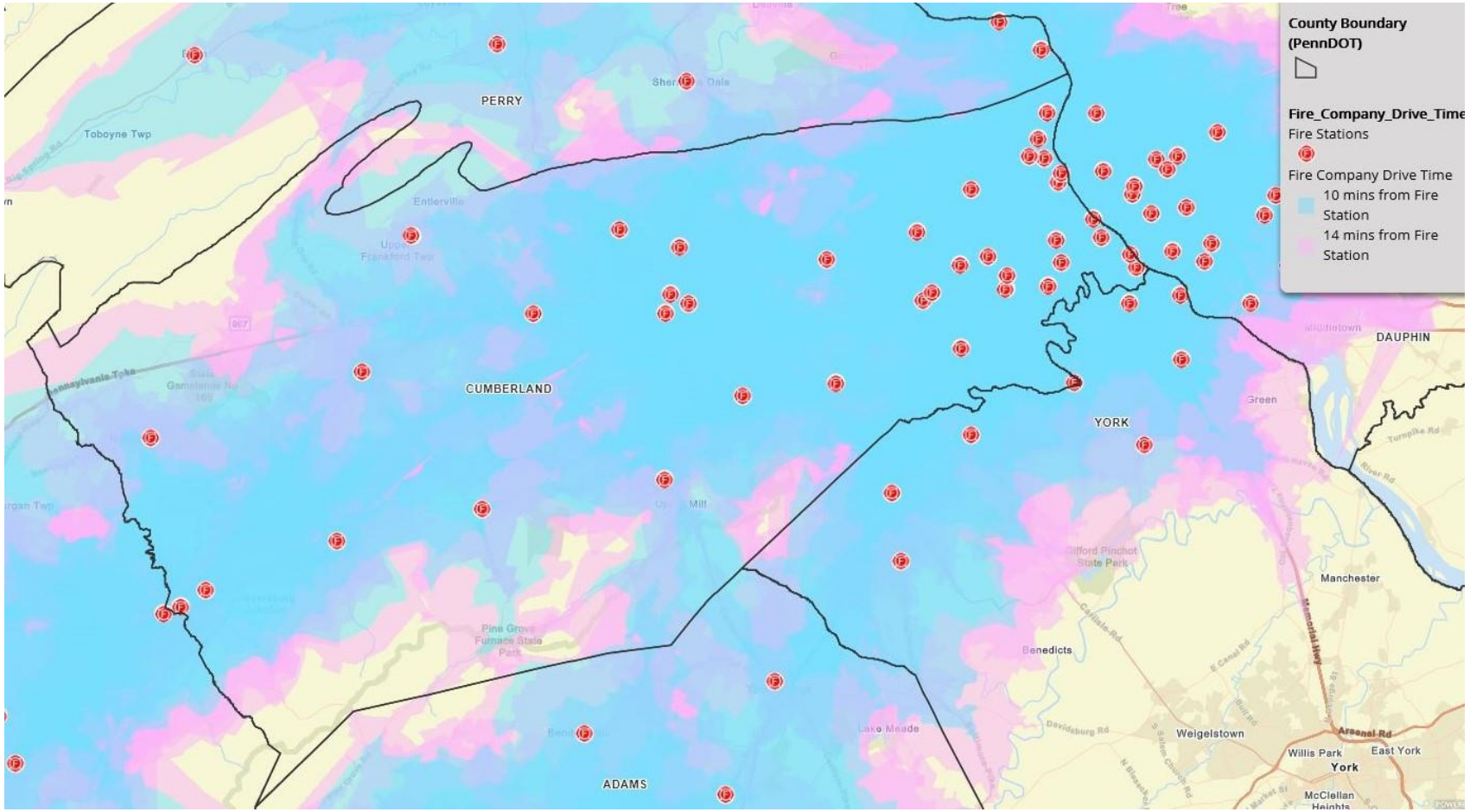
Municipality	Total Addressed Units	Total Non-Residential Addressed Units	Non-Residential Addressed Units Vulnerable to HAZMAT by Transit	Percent Non-Residential Units Vulnerable to HAZMAT by Transit	Total Residential Addressed Units	Residential Addressed Units Vulnerable to HAZMAT by Transit	Percent Residential Units Vulnerable to HAZMAT by Transit	Total Addressed Units Vulnerable to HAZMAT by Transit
Borough of Shippensburg	1,827	294	294	100.0%	1,533	1,507	98.3%	1,801
Township of Shippensburg	1,315	162	143	88.3%	1,176	1,078	91.7%	1,221
Borough of Shiremanstown	796	78	78	100.0%	718	718	100.0%	796
Township of Silver Spring	8,045	444	390	87.8%	7,753	4,604	59.4%	4,994
Township of South Middleton	6,845	423	383	90.5%	6,465	4,022	62.2%	4,405
Township of South Newton	525	31	27	87.1%	494	352	71.3%	379
Township of Southampton	2,932	100	66	66.0%	2,964	2,242	75.6%	2,308
Township of Upper Allen	8,199	372	324	87.1%	7,947	4,823	60.7%	5,147
Township of Upper Frankford	1,034	32	22	68.8%	1,002	446	44.5%	468
Township of Upper Mifflin	559	21	14	66.7%	538	359	66.7%	373
Township of West Pennsboro	2,311	100	78	78.0%	2,217	1,129	50.9%	1,207
Borough of Wormleysburg	1,578	170	160	94.1%	1,408	1,101	78.2%	1,261
TOTAL	**109,584**	**8,478**	**7,884**	**93.0%**	**101,854**	**72,246**	**70.9%**	**80,130**

Figure 4.3.12-5 depicts areas that are vulnerable to hazmat releases within the County by transit due to their distance from emergency response capability. Cumberland County has a total of 107,664 addressed units within 10 minutes of a fire station, 1,684 addressed units within 14 minutes of a fire station, and 236 addressed units that are greater than 14 minutes from a fire station (Cumberland County GIS, 2019). There is a very small percentage of addressed units outside of the emergency response coverage area, and 10- and 14-minute coverage is adequate, based on the 2020 National Fire Protection Association (NFPA) emergency staffing and response times (Table 4.3.12-7).

Table 4.3.12-7: NFPA 1720 Emergency Staffing and Response Time Standards (NFPA, 2020)

Demand Zone	Demographics	Minimum Staff to Respond	Response Time (Minutes)	Meets Objective (%)
Urban Area	>1,000 people/mi^2	15	9	90
Suburban Area	500-1,000 people/mi^2	10	10	80
Rural Area	<500 people/mi^2	6	14	80
Remote Area	Travel distance ≥ 8 mi	4	Directly dependent on travel distance	90
Special Risks	Determined by Authority Having Jurisdiction (AHJ)	Determined by AHJ based on risk	Determined by AHJ	90

Figure 4.3.12-5: Areas of Cumberland County that are vulnerable to HAZMAT releases by transit based on fire service response time (South Central Task Force, 2019). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.



4.3.13. Nuclear Incident

Due to data sensitivity issues, the nuclear incident hazard is profiled in Appendix G.

4.3.14. Terrorism

4.3.14.1 Location and Extent

The Federal Bureau of Investigation (FBI) characterizes terrorism as either domestic or international. International terrorism is defined as violent, criminal acts committed by individuals and/or groups who are inspired by, or associated with, designated foreign terrorist organizations or nations. Domestic terrorism is defined as violent, criminal acts committed by individuals and/or groups to further ideology goals stemming from domestic influences, such as those of a political, religious, social, racial or environmental nature.

Terrorist tactics continue to evolve and seek sophisticated means of attack, including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous material releases; and cyberterrorism. Within these general categories, however, there are many variations - particularly in the area of biological and chemical weapons.

Terrorism can take many forms:

- Agroterrorism,
- Arson/incendiary attack,
- Armed attack,
- Biological agent,
- Chemical agent,
- Cyberterrorism,
- Conventional bomb,
- Intentional hazardous materials or radiological releases, or
- Nuclear bombs.

An important consideration in evaluating terrorism hazards is the existence of facilities, landmarks, or other buildings of international, national, or regional importance. While Cumberland County has many notable landmarks from a local historic perspective, there are no sites which are considered significant landmarks in terms of national or international importance. However, the Pennsylvania state capital located to the east of the County across the Susquehanna River and Gettysburg National Military Park located to the south in Adams County are potential terrorist targets.

Nonetheless, terrorism can take many forms and terrorists have a wide range of personal, political, or cultural agendas. Therefore, there is no location that is not a potential terrorist target. Two types of terrorist activity are particularly relevant to Cumberland County: agroterrorism and intentional hazardous material releases. Agroterrorism is the direct, intentional, generally covert contamination of food supplies or introduction of pests and/or disease agents to crops and livestock. Cumberland County is semi-rural with about 36.71 percent of its land area dedicated to agriculture in 2019.

There are also a number of SARA Title III facilities and major transportation routes that traverse the County; making intentional hazardous material releases a potential threat to citizens and the environment. This hazard is addressed in Section 4.3.13. Critical facilities including police

stations, hospitals, fire stations, schools, wastewater treatment plants, water supply facilities, may be potential terrorist targets. A complete list of these facilities is included in Appendix F. The County has also identified the following potential terrorist targets within and outside of county boundaries, including areas which may be targets due to the gathering of large crowds:

- Army Barracks and War College (North Middleton Township)
- Navy Support Facility (Hampden Township)
- Cumberland York Area Local Defense Group (CYALDG)
- Letterkenny Army Depot (Franklin County)
- Three Mile Island Nuclear Power Plant (see Section 4.3.14)
- Old Carlisle Fairgrounds – *Carlisle Events* (Carlisle Borough & North Middleton Township)
- Ken Millen Stadium (Carlisle Borough)
- East Pennsboro School District (East Pennsboro Township)
- West Shore Stadium (Lower Allen Township)
- Cumberland Valley High School Stadium (Silver Spring Township)
- Boiling Springs High School (South Middleton Township)
- Big Spring School District (West Pennsboro Township)
- Messiah College (Upper Allen Township)
- Dickinson College Stadium (Borough of Carlisle)
- Norfolk-Southern Enola Yard

In addition, all bridges and railways (discussed in Section 4.3.17) across the County are considered potential targets. Middlesex Township experienced a suspected bomb incident in 2005 at the Pilot Truck stop located on Harrisburg Pike (Route 11). A suitcase was detonated by bomb team experts after it was believed to contain explosives. While it was later found not to be a bomb, the incident was a learning experience and served as a live exercise. Response to the incident was adequate, an important finding since the intersection of I-81 and I-76 is located within the Township.

4.3.14.2 Range of Magnitude

The severity of terrorist incidents depends upon the method of attack, the proximity of the attack to people, animals, or other assets and the duration of exposure to the incident or attack device. For example, chemical agents are poisonous gases, liquids or solids that have rapid or quick toxic effects on people, animals, or plants. Many chemical agents can cause serious injuries or death. In this case, severity of injuries depends on the type and amount of the chemical agent used and the duration of exposure.

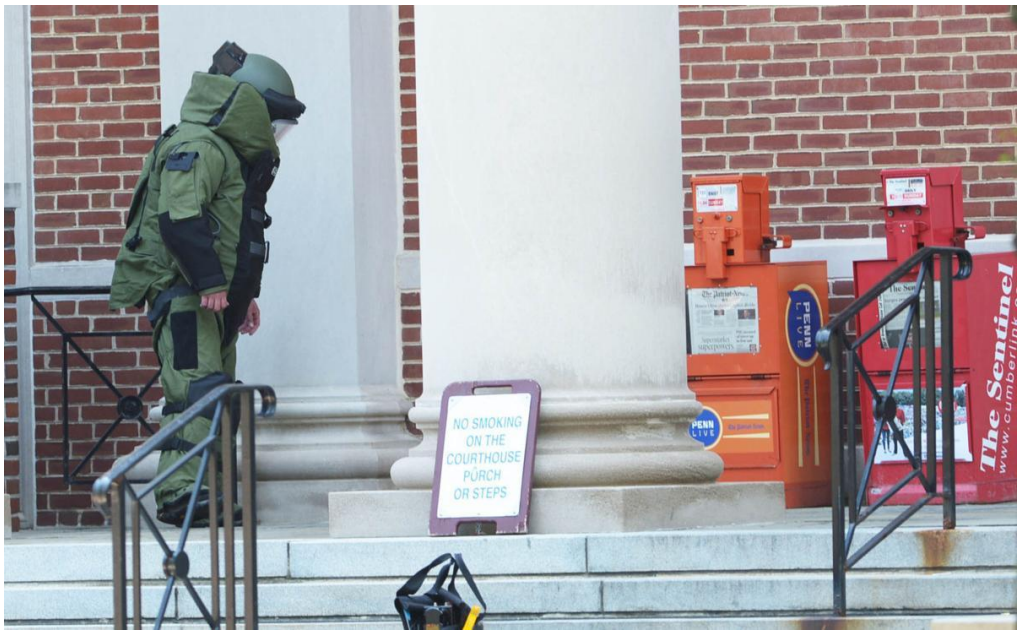
Biological agents are organisms or toxins that have illness-producing effects on people, livestock and crops. Some biological agents cannot be easily detected and may take time to develop. Therefore, it can be difficult to know that a biological attack has occurred until victims display symptoms. Those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

In Cumberland County past events have consisted of bomb threats, as described in Section 4.3.16.3.

4.3.14.3 Past Occurrence

Cumberland County experiences terrorist incidents annually. In 2002, 13 terrorist incidents (i.e., bomb threats) were reported while in 36 incidents were reported in 2001. More recently, 18 incidents were reported in 2008 while 21 were reported in 2007 (PEMA 2007 & 2008). Specific details regarding these incidents are not available. A photograph of a bomb scare response at the county courthouse is provided in Figure 4.3.16-1.

Figure 4.3.14-1: here was a bomb scare at the Cumberland County Courthouse on June 9, 2015 (Photograph courtesy of Michael Bupp/*The Sentinel*, 2015).



4.3.14.4 Future Occurrence

Based on historical events, Cumberland County can expect to experience several terrorist incidents each year. Note that this estimate is based on the occurrence of past events over a short period of time and is not the result of detailed statistical sampling. Although previous events have not resulted in what are considered significant terrorist attacks, the severity of a future incident cannot be predicted with a sufficient level of certainty. Overall, the probability of future significant terrorist incidents can be considered *unlikely* according to the Risk Factor Methodology (see Table 4.4-1).

4.3.14.5 Vulnerability Assessment

Since the probability of terrorism occurring cannot be quantified in the same way as that of many natural hazards, it is not possible to assess vulnerability in terms of likelihood of occurrence. Instead, vulnerability is assessed in terms of specific assets. By identifying potentially at-risk terrorist targets in a community, planning efforts can be put in place to reduce the risk of attack. All communities in Cumberland County are vulnerable on some level, directly or indirectly, to a terrorist attack. However, communities where the previously mentioned

potential targets are located should be considered more vulnerable. Site-specific assessments should be based on the relative importance of a particular site to the surrounding community or population, threats that are known to exist and vulnerabilities including:

- Inherent vulnerability:
  - Visibility – How aware is the public of the existence of the facility?
  - Utility – How valuable might the place be in meeting the objectives of a potential terrorist?
  - Accessibility – How accessible is the place to the public?
  - Asset mobility – is the asset's location fixed or mobile?
  - Presence of hazardous materials – Are flammable, explosive, biological, chemical and/or radiological materials present on site? If so, are they well secured?
  - Potential for collateral damage – What are the potential consequences for the surrounding area if the asset is attacked or damaged?
  - Occupancy – What is the potential for mass casualties based on the maximum number of individuals on site at a given time?
- Tactical vulnerability:
  - *Site Perimeter*
    - Site planning and Landscape Design – Is the facility designed with security in mind – both site-specific and with regard to adjacent land uses?
    - Parking Security – Are vehicle access and parking managed in a way that separates vehicles and structures?
  - *Building Envelope*
    - Structural Engineering – Is the building's envelope designed to be blast-resistant? Does it provide collective protection against chemical, biological and radiological contaminants?
  - *Facility Interior*
    - Architectural and Interior Space Planning – Does security screening cover all public and private areas?
    - Mechanical Engineering – Are utilities and HVAC systems protected and/or backed up with redundant systems?
    - Electrical Engineering – Are emergency power and telecommunications available? Are alarm systems operational? Is lightning sufficient?
    - Fire Protection Engineering – Are the building's water supply and fire suppression systems adequate, code-compliant and protected? Are on-site personnel trained appropriately? Are local first responders aware of the nature of the operations at the facility?
    - Electronic and Organized Security – Are systems and personnel in place to monitor and protect the facility?

4.3.15. Transportation Accidents

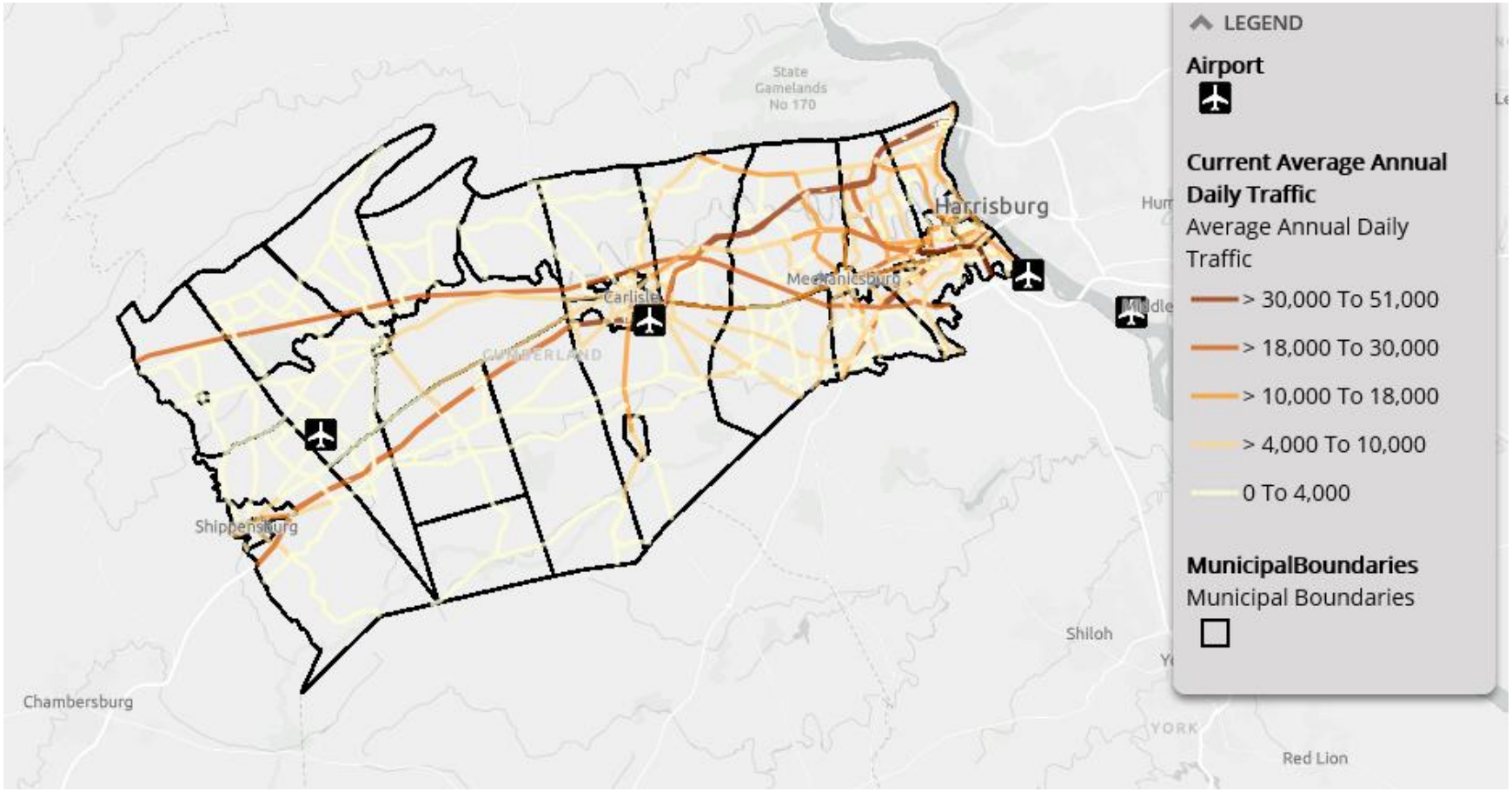
4.3.15.1 Location and Extent

For the purposes of this plan, transportation accidents are defined as incidents involving highway, rail, and air travel. Within Cumberland County, there are over 1900 miles of roads, 440 bridges and approximately 270 miles of railways. Key freight routes include I-81, I-76, I-83, PA 581 and PA 34/94. The Norfolk Southern Railroad runs along the entire eastern border of the Borough of New Cumberland. There is a potential for major accidents on any of these roads, bridges or railways.

The County has three private airports; Carlisle Business Airport, Shippensburg Regional Airport and Newville Regional Airfield. There are no public airports in Cumberland County, but there is a considerable amount of commercial air traffic from two airports located outside of the County; Harrisburg International Airport in Dauphin County and Capital City Airport in York County. Commercial air traffic flyovers not only bother residents with noise, but they also present the possibility of injury, damage to structures and fire, if an aircraft were to crash. A five-mile radius around each airport can be considered a high-risk area since most aviation incidents occur near landing or take-off sites. While Harrisburg International Airport is the largest airport in the area, it is greater than five miles away from the County.

Highway traffic volumes and transportation infrastructure are illustrated on Figure 4.3.15-1.

Figure 4.3.15-1: Cumberland County highway traffic volume (PennDOT, 2018 – 2019). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.



4.3.15.2 Range of Magnitude

At a minimum, transportation accidents can result in damage to the vehicles and minor injuries to passengers and drivers. At worst, significant transportation accidents can result in death or serious injury or extensive property loss or damage coupled with business interruptions and hours of congestion. Most air incidents are non-fatal and cause minor injuries or property damage. Most motor vehicle crashes are non-fatal in Pennsylvania, but PennDOT estimates that every hour nineteen 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 a greater number of overall crashes occur in October, November and December (PennDOT, 2017). In addition to endangering passengers and damaging property, road and railway accidents have the potential to result in hazardous materials releases depending on the vehicle(s) involved in an accident. The expected impacts of transportation accidents are amplified by the limited warning associated with these events.

The environmental impacts of transportation accidents can vary greatly. In the case of a simple motor vehicle crash, train derailment, or aviation accident, the environmental impact is minimal. However, if the accident involves any type of vehicle moving chemicals or other hazardous materials, the impact will be considerably larger and may include an explosion or the release of potentially hazardous material. An example of this type of worst-case scenario is described in Section 4.2.1 and resulted in closure of Interstate 81 and U.S. Route 22/322 westbound during the repair of two damaged bridges, causing a severe disruption to transportation in Cumberland County and the rest of the Capitol Region in 2013. For a complete discussion of the environmental impacts of hazardous materials releases, see Section 4.3.12.

4.3.15.3 Past Occurrence

Total crashes increased in 2015 and in 2016, and by 10.5% from 2014 to 2016. In 2017, there was a decrease in total crashes. Table 4.3.15-1 displays trends in crashes and fatalities in the County from 2014-2018, with 2018 being the most recent year for which statistics are available.

Table 4.3.15-1: Five-year trend of vehicular crashes in Cumberland County from 2014 – 2018 (PennDOT, 2018).

	2014	2015	2016	2017	2018
Total Crashes	2,393	2,633	2,644	2,520	2,605
Fatal Crashes	25	13	28	26	22
Pedestrian Fatal Crashes	1	2	3	1	5

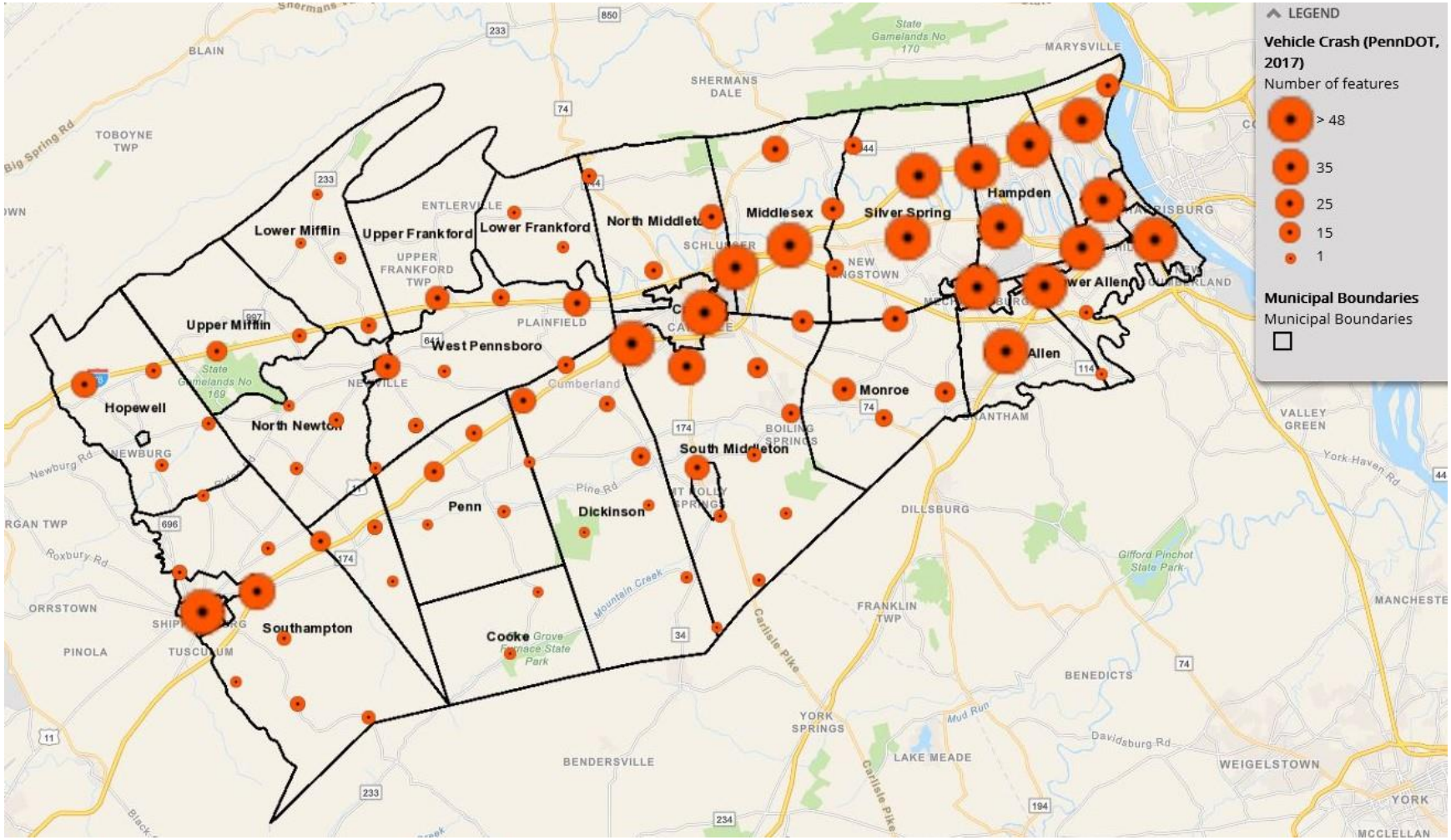
Based on previous events, the following intersections and corridors in Cumberland County have been identified by the Harrisburg Area Transportation Study (HATS) for safety initiatives in order to reduce fatalities, major injuries and economic loss to society (HATS, 2016):

- Intersections:
    - Trindle Rd & Locust Point Rd in Silver Spring Twp./Monroe Twp.

- Corridors:
  - Camp Hill Borough
    - Route 11 (Cumberland Blvd) from Country Club Rd to Walnut St
  - Hampden Twp.
    - Rt 944 (Wertzville Rd) from Good Hope Rd to I-81 Ramps
  - Silver Spring Twp.
    - Rt 944 (Wertzville Rd) from Sample Bridge Rd to Hunter Dr
    - Rt 114 (Conodoguinet Pkwy) from Old Willow Mill Rd to North Bend Dr
  - Monroe Twp.
    - Lisburn Rd from Williams Grove Rd to Cope Dr
  - Carlisle Borough
    - High St from Mooreland Av to Spruce St
    - S Hanover St from High St to Noble Blvd.
    - N Hanover St from High St to Penn St
  - Mt Holly Springs Borough
    - Baltimore Av from Lakeside Dr to Freedom Dr
  - North Newton Borough
    - Shippensburg Rd from Oakville Rd to Willis Rd
  - Shippensburg Borough
    - King St from Morris St to Prince St

PennDOT has identified roads across the County which commonly experienced traffic crash incidents in 2017 (see Figure 4.3.15-3).

Figure 4.3.15-3: Cumberland County crash analysis map (PennDOT, 2017). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.



Commercial and school related bus accidents are also a concern. For example, a charter bus veered off the Pennsylvania Turnpike near Carlisle and struck a tree on March 9, 2013, killing the driver and one passenger (Malmont and Cress, 2013). On February 9, 2016 a school bus transporting middle and high school students from the Cumberland Valley School District collided with a car after failing to stop at a stop sign. One passenger in the car was killed, three were transported to local hospitals and no serious injuries were reported among the students on the bus (Austin, 2016).

Two plane crashes occurred within the Borough of New Cumberland in 1983 and 1984, both in highly populated areas. One occurred beside an active playground. The other accident involved a crash into a residential property, killing both the pilot and an occupant of the house and threatening several others. A Cessna plane crashed in a residential area on Forge Road near the intersection with West Hunter Road in South Middleton Township on March 24, 2014, but only the pilot was injured (Carr, 2014). A photograph of this event is shown in Figure 4.3.15-4. All other plane crashes of past years have occurred in mountainous terrain and resulted in death or injury to occupants of the aircraft only.

Figure 4.3.15-4: A Cessna plane crashed in a residential area on Forge Road near the intersection with West Hunter Road in South Middleton Township, Cumberland County, PA on March 24, 2014 (Photograph courtesy of Curt Werner/*The Sentinel*, 2014).

Rail accidents are also a potential concern for residents of Cumberland County. For example, a freight train struck a tractor-trailer hauling a 135-foot-long concrete bridge span at the Brandtsville Crossing in Monroe Township on September 12, 2013 (Croley, 2013). The crash and train derailment did not cause fatalities but resulted in significant property damage as well as closure of both lanes of York Road for more than 24 hours (Croley, 2013). A photograph of this event is provided in Figure 4.3.15-5.

Figure 4.3.15-5: A freight train struck a tractor-trailer hauling a 135-foot-long concrete bridge span at the Brandtsville Crossing in Monroe Township, Cumberland County, PA on September 12, 2013 (Photograph courtesy of *The Sentinel*, 2014).

4.3.15.4 Future Occurrence

The number of transportation related accidents is expected to increase with growing populations and increased traffic volumes. Over the first half of the 2010-2020 decade, Cumberland County's population grew faster than any other county in the state of Pennsylvania. The 2010 population was 235,406, and is projected to increase to 251,836, a 6.97% increase, by 2020 (HATS, 2017). Transportation and warehousing contribute significantly to the County's economy and employment. In 2015, this sector accounted for 12.41% of overall employment. Daily vehicle miles traveled (DVMT) decreased throughout the state following the financial crisis and economic recession of 2007-2009, but Cumberland County's travel demand has nearly returned to pre-recession levels. This increase has outpaced Pennsylvania's increase in DVMT (HATS 2017). As of 2017, Cumberland County ranked third among Pennsylvania counties in truck vehicle miles traveled. It is anticipated that by 2030, over 121,000 long haul trucks will operate daily in the County, 109,000 of which will be traveling through the region without making a pickup or delivery (HATS, 2010). The increase in population and the growth of the transportation and warehousing economic sector will put greater demand on the county's roadways, and will likely result in the continued occurrence of transportation accidents.

Figure 4.3.15-3 displays total vehicle crashes for major roads throughout Cumberland County during 2017. Accidents were concentrated in the Borough of Carlisle and in eastern municipalities including Hampden Township, and the Boroughs of Camp Hill, Lemoyne, and Mechanicsburg. The map provides a basis for estimating the number of future traffic crash incidents at specific points on given roads across the County. Crashes are likely to continue or increase without mitigation.

The average rate of aviation accidents nationwide was 3.45 accidents per 100,000 flight hours for 2016, the most recent year data is available (FAA, 2018). Therefore, the likelihood of an aviation incident in the County is considered low. Information on previous railway accidents is insufficient to assess the probability of future occurrence.

A 70% increase in the amount of rainfall associated with extreme events was measured in Pennsylvania from 1958-2010 (PA DEP, 2018). This aspect of climate change could increase the risk of flooding to transportation corridors in the County. PennDOT recently initiated an Extreme Weather Vulnerability Study, in part to examine the potential impacts of an increase in extreme weather events on state-owned roads and bridges in three sample counties: Lycoming, Allegheny and Delaware. Representative Concentration Pathway (RCP) 8.5, often described as the "business as usual" climate change model, was applied to project flooding inundation of state-owned roadways and bridges. Results showed many locations that could be newly subjected to flooding in the future due to increases in heavy rainfall (PennDOT, 2017). Although Cumberland County was not included in this projection, all regions in Pennsylvania are likely to experience increases in extreme rainfall which will more frequently inundate important roads and railways.

As part of the Evaluation of Identified Hazards and Risk, many municipality representatives observed that traffic on the Interstate Highways passing through the County has increased, and that this would magnify the risks associated with transportation accidents. Some of the respondents connected increases in traffic to the growth of the warehouse and distribution industry.

Overall, the probability of future transportation accidents can be considered *highly likely* according to the Risk Factor Methodology (see Table 4.4-2).

4.3.15.5 Vulnerability Assessment

A transportation related accident can occur on any stretch of road or railway in Cumberland County. However, severe accidents are more likely along major highways such as I-81, I-76, I-83, U.S. Routes 11, 15, 11/15 and PA Route 581 which experience heavier traffic volumes including heavy freight vehicles. The Borough of Shippensburg, Shippensburg Township, and Southampton Township have all indicated that truck and rail traffic is increasing in the area. The age and condition of bridges is another important risk factor to consider in the analysis of transportation accident vulnerability. PennDOT determined that 51 of Cumberland County's bridges, around 10%, are considered to be in poor condition and in need of repairs (PennDOT, 2019).

Table 4.3.15-2 lists total addressed units data extracted on November 18, 2019, and critical facilities within 0.25 mile of major roads which includes, interstates, United States highways, and Pennsylvania highways, and rail lines within 5 miles of an airport, which does not include heliports. Carlisle Borough is most vulnerable to transportation accidents with a significant number of addressed units within 0.25 mile of a major highway and within 0.25 mile of a rail line, and contains the most addressed units within 5 miles of an airport. Carlisle Borough also has the most critical facilities within 0.25 mile of a major road and within 5 miles of an airport.

Table 4.3.15-2: Addressed units and critical facilities within 0.25 mi of major roads (interstates, US highways, state highways) and rail lines and within 5 miles of an airport (Cumberland County GIS, 2019).

Municipality	Total Addressed Units	Structures Addressed Units Within 0.25 mi of Major Roads	Percent of Units Within 0.25 mi of Major Roads	Structures Addressed Units Within 0.25 mi of rail lines	Percent of Units within 0.25 mi of rail lines	Structures Addressed Units Within 5 mi of Airport/	Percent of Units Within 5 mi of Airport	Total Critical Facilities in Municipality	Critical Facilities within 0.25 mi of Major Roads	Percent Critical Facilities within 0.25 mi of Major Roads	Total Critical Facilities within 0.25 mi of rail lines	Percent Critical Facilities within 0.25 mi of rail lines	Critical Facilities within 5 mi of Airport/	Percent of Critical Facilities within 5 mi of Airport
Borough of Camp Hill	3,735	3,528	94.46 %	713	19.09 %	3,538	94.73%	16	16	100.00%	4	25.00%	16	100.00%
Borough of Carlisle	8,824	8,177	92.67 %	2,872	32.55 %	8,824	100.00 %	60	56	93.33%	14	23.33%	60	100.00%
Township of Cooke	391	240	61.38 %	0	0.00 %	0	0.00%	2	2	100.00%	0	0.00%	0	0.00%
Township of Dickinson	2,281	1,290	56.55 %	630	27.62 %	384	16.83%	13	4	30.77%	1	7.69%	5	38.46 %
Township of East Pennsboro	9,300	6,540	70.32 %	1,837	19.75 %	758	8.15%	35	31	88.57%	15	42.86%	8	22.86 %
Township of Hampden	13,694	8,430	61.56 %	1,346	9.83 %	69	0.50%	58	41	70.69%	33	56.90%	4	6.90%
Township of Hopewell	908	492	54.19 %	0	0.00 %	381	41.96%	10	5	50.00%	0	0.00%	6	60.00 %
Borough of Lemoyne	2,159	2,066	95.69 %	1,716	79.48 %	2,159	100.00 %	13	13	100.00%	12	92.31%	13	100.00%
Township of Lower Allen	8,129	6,671	82.06 %	2,174	26.74 %	5,104	62.79%	41	37	90.24%	21	51.22%	29	70.73 %
Township of Lower Frankford	735	206	28.03 %	0	0.00 %	13	1.77%	1	0	0.00%	0	0.00%	0	0.00%
Township of Lower Mifflin	774	438	56.59 %	0	0.00 %	0	0.00%	4	4	100.00%	0	0.00%	0	0.00%
Borough of Mechanicsburg	4,627	4,211	91.01 %	2,893	62.52 %	0	0.00%	27	23	85.19%	20	74.07%	0	0.00%
Township of Middlesex	3,139	1,710	54.48 %	122	3.89 %	1,760	56.07%	37	27	72.97%	9	24.32%	32	86.49 %

Table 4.3.15-2: Addressed units and critical facilities within 0.25 mi of major roads (interstates, US highways, state highways) and rail lines and within 5 miles of an airport (Cumberland County GIS, 2019).

Municipality	Total Addressed Units	Structures Addressed Units Within 0.25 mi of Major Roads	Percent of Units Within 0.25 mi of Major Roads	Structures Addressed Units Within 0.25 mi of rail lines	Percent of Units within 0.25 mi of rail lines	Structures Addressed Units Within 5 mi of Airport/	Percent of Units Within 5 mi of Airport	Total Critical Facilities in Municipality	Critical Facilities within 0.25 mi of Major Roads	Percent Critical Facilities within 0.25 mi of Major Roads	Total Critical Facilities within 0.25 mi of rail lines	Percent Critical Facilities within 0.25 mi of rail lines	Critical Facilities within 5 mi of Airport/	Percent of Critical Facilities within 5 mi of Airport
Township of Monroe	2,600	1,631	62.73 %	278	10.69 %	544	20.92%	10	7	70.00%	2	20.00%	4	40.00 %
Borough of Mount Holly Springs	911	786	86.28 %	578	63.45 %	518	56.86%	11	11	100.00%	5	45.45%	5	45.45 %
Borough of New Cumberland	3,359	3,160	94.08 %	1,029	30.63 %	3,359	100.00 %	12	12	100.00%	7	58.33%	12	100.0 0%
Borough of Newburg	138	138	100.0 0%	0	0.00 %	0	0.00%	1	1	100.00%	0	0.00%	0	0.00%
Borough of Newville	764	764	100.0 0%	0	0.00 %	483	63.22%	8	8	100.00%	0	0.00%	4	50.00 %
Township of North Middleton	5,317	2,948	55.44 %	407	7.65 %	4,944	92.98%	24	20	83.33%	5	20.83%	23	95.83 %
Township of North Newton	969	735	75.85 %	15	1.55 %	851	87.82%	11	10	90.91%	1	9.09%	8	72.73 %
Township of Penn	1,195	751	62.85 %	176	14.73 %	223	18.66%	10	5	50.00%	2	20.00%	1	10.00 %
Borough of Shippensburg	1,827	1,777	97.26 %	854	46.74 %	197	10.78%	13	12	92.31%	7	53.85%	3	23.08 %
Township of Shippensburg	1,340	1,176	87.76 %	172	12.84 %	465	34.70%	10	7	70.00%	2	20.00%	6	60.00 %
Borough of Shiremanstown	796	796	100.0 0%	681	85.55 %	0	0.00%	6	6	100.00%	6	100.00 %	0	0.00%
Township of Silver Spring	8,232	4,574	55.56 %	1,014	12.32 %	328	3.98%	44	27	61.36%	12	27.27%	1	2.27%
Township of South Middleton	6,902	4,204	60.91 %	511	7.40 %	6,139	88.95%	40	32	80.00%	6	15.00%	37	92.50 %

Table 4.3.15-2: Addressed units and critical facilities within 0.25 mi of major roads (interstates, US highways, state highways) and rail lines and within 5 miles of an airport (Cumberland County GIS, 2019).

Municipality	Total Addressed Units	Structures Addressed Units Within 0.25 mi of Major Roads	Percent of Units Within 0.25 mi of Major Roads	Structures Addressed Units Within 0.25 mi of rail lines	Percent of Units within 0.25 mi of rail lines	Structures Addressed Units Within 5 mi of Airport/	Percent of Units Within 5 mi of Airport	Total Critical Facilities in Municipality	Critical Facilities within 0.25 mi of Major Roads	Percent Critical Facilities within 0.25 mi of Major Roads	Total Critical Facilities within 0.25 mi of rail lines	Percent Critical Facilities within 0.25 mi of rail lines	Critical Facilities within 5 mi of Airport/	Percent of Critical Facilities within 5 mi of Airport
Township of South Newton	526	378	71.86 %	225	42.78 %	523	99.43%	4	3	75.00%	3	75.00%	4	100.0 0%
Township of Southampton	3,081	2,135	69.30 %	445	14.44 %	1,890	61.34%	18	10	55.56%	3	16.67%	16	88.89 %
Township of Upper Allen	8,334	5,128	61.53 %	395	4.74 %	0	0.00%	19	17	89.47%	2	10.53%	0	0.00%
Township of Upper Frankford	1,034	468	45.26 %	0	0.00 %	0	0.00%	5	4	80.00%	0	0.00%	0	0.00%
Township of Upper Mifflin	559	373	66.73 %	0	0.00 %	57	10.20%	2	1	50.00%	0	0.00%	0	0.00%
Township of West Pennsboro	2,317	1,207	52.09 %	0	0.00 %	638	27.54%	11	5	45.45%	0	0.00%	2	18.18 %
Borough of Wormleysburg	1,578	1,215	77.00 %	1,140	72.24 %	1,436	91.00%	2	2	100.00%	2	100.00 %	2	100.0 0%
TOTAL	**110,475**	**78,343**	**70.91 %**	**22,223**	**20.12 %**	**45,585**	**41.26%**	**578**	**459**	**79.41%**	**194**	**33.56%**	**301**	**52.08 %**

Approximately 151,275 people in Cumberland County live within five miles of at least one airport in or adjacent to Cumberland County. Population totals within these high-risk areas are listed in Table 4.3.15-3. Data from the 2010 U.S. Census was used to populate the table instead of recent American Community Survey estimates, because it is more reliable and accurate. In addition, New Cumberland Borough and East Pennsboro Township are located beneath routine flight paths for Harrisburg International and Capital City airports.

Table 4.3.15-3: Population within 5-miles of airports located in and adjacent to Cumberland County (Cumberland County GIS, October 2019; U.S. Census, 2010).

Municipality	Total Population (2010 Census)	Population within 5 miles of airport	Percent of Population within 5 miles of airport
Borough of Camp Hill	7,888	7,397	93.78%
Borough of Carlisle	18,682	18,682	100.0%
Township of Cooke	179	0	0.0%
Township of Dickinson	5,223	971	18.59%
Township of East Pennsboro	20,228	1,538	7.60%
Township of Hampden	28,044	62	0.22%
Township of Hopewell	2,329	978	41.99%
Borough of Lemoyne	4,553	4,553	100.0%
Township of Lower Allen	17,980	12,547	69.78%
Township of Lower Frankford	1,732	29	1.67%
Township of Lower Mifflin	1,783	0	0.0%
Borough of Mechanicsburg	8,981	0	0.0%
Township of Middlesex	7,040	3,937	55.92%
Township of Monroe	5,823	1,311	22.51%
Borough of Mount Holly Springs	2,030	1,178	58.03%
Borough of New Cumberland	7,277	7,277	100.0%
Borough of Newburg	7,277	0	0.0%
Borough of Newville	1,326	879	66.29%
Township of North Middleton	11,143	10,232	91.82%
Township of North Newton	2,430	2,134	87.82%
Township of Penn	2,924	570	19.49%
Township of Shippensburg	5,429	2,617	48.20%
Borough of Shippensburg	4,416	447	10.12%
Borough of Shiremanstown	1,569	0	0.0%
Township of Silver Spring	13,657	702	5.14%
Township of South Middleton	14,663	12,771	87.10%
Township of South Newton	1,383	1,358	98.19%
Township of Southampton	6,359	3,880	61.02%
Township of Upper Allen	18,059	0	0.0%
Township of Upper Frankford	2,005	0	0.0%

Table 4.3.15-3: Population within 5-miles of airports located in and adjacent to Cumberland County (Cumberland County GIS, October 2019; U.S. Census, 2010).			
Municipality	**Total Population (2010 Census)**	**Population within 5 miles of airport**	**Percent of Population within 5 miles of airport**
Township of Upper Mifflin	1,304	94	7.21%
Township of West Pennsboro	5,561	1,421	25.55%
Borough of Wormleysburg	3,070	2,794	91.01%
TOTAL	**202,494**	**100,359**	**49.56%**

Table 4.3.15-4 identifies the number of addressed residential and non-residential units vulnerable to aviation incidents due to being located within 5 miles of an airport. The vast majority of these structures are residential (41,192 of 45,569).

Table 4.3.15-4: Structures Vulnerable to Aviation Incidents by Generalized Structure Type (Cumberland County GIS, 2019).								
Municipality	**Total Addressed Units in Municipality**	**Total Non-Residential Addressed Units**	**Non-Residential Units Within 5-mi of Airports**	**Percent of Non-Residential Units Within 5-mi of Airports**	**Total Residential Addressed Units**	**Residential Addressed Units Within 5-mi of Airports**	**Percent Residential Units Within 5-mi of Airports**	**Total Addressed Units Within 5-mi of Airports**
Borough of Camp Hill	3,734	338	338	100.0%	3,396	3,199	94.20%	3,537
Borough of Carlisle	8,822	1,221	1,221	100.0%	7,601	7,601	100.0%	8,822
Township of Cooke	391	20	0	0.0%	371	0	0.00%	0
Township of Dickinson	2,281	78	14	17.95%	2,203	370	16.80%	384
Township of East Pennsboro	9,297	494	101	20.45%	8,803	657	7.46%	758
Township of Hampden	13,684	923	37	4.01%	12,761	32	0.25%	69
Township of Hopewell	908	37	18	48.65%	871	363	41.68%	381
Borough of Lemoyne	2,159	321	321	100.0%	1,838	1,838	100.0%	2,159
Township of Lower Allen	8,128	820	473	57.68%	7,308	4,632	63.38%	5,105
Township of Lower Frankford	735	18	0	0.00%	717	13	1.81%	13
Township of Lower Mifflin	774	32	0	0.00%	742	0	0.00%	0
Borough of Mechanicsburg	4,627	622	0	0.00%	4,005	0	0.00%	0
Township of Middlesex	3,133	222	198	89.19%	2,911	1,556	53.45%	1,754
Township of Monroe	2,599	89	9	10.11%	2,510	535	21.31%	544
Borough of Mount Holly Springs	911	100	63	63.0%	811	455	56.10%	518
Borough of New Cumberland	3,359	262	262	100.0%	3,097	3,097	100.0%	3,359
Borough of Newburg	138	10	0	00.0%	128	0	0.00%	0
Borough of Newville	764	151	71	47.02%	613	412	67.21%	483
Township of North Middleton	5,316	363	350	96.42%	4,953	4,593	92.73%	4,943
Township of North Newton	969	88	83	94.32%	881	768	87.17%	851
Township of Penn	1,195	48	8	16.67%	1,147	215	18.74%	223
Borough of Shippensburg	1,827	294	19	6.46%	1,533	178	11.61%	197

Table 4.3.15-4: Structures Vulnerable to Aviation Incidents by Generalized Structure Type (Cumberland County GIS, 2019).								
Municipality	**Total Addressed Units in Municipality**	**Total Non-Residential Addressed Units**	**Non-Residential Units Within 5-mi of Airports**	**Percent of Non-Residential Units Within 5-mi of Airports**	**Total Residential Addressed Units**	**Residential Addressed Units Within 5-mi of Airports**	**Percent Residential Units Within 5-mi of Airports**	**Total Addressed Units Within 5-mi of Airports**
Township of Shippensburg	1,340	162	79	48.77%	1,178	386	32.77%	465
Borough of Shiremanstown	796	79	0	0.0%	717	0	0.00%	0
Township of Silver Spring	8,227	444	12	2.70%	7,783	316	4.06%	328
Township of South Middleton	6,896	424	405	95.52%	6,472	5,728	88.50%	6,133
Township of South Newton	526	31	31	100.0%	495	492	99.39%	523
Township of Southampton	3,079	100	72	72.00%	2,979	1,817	60.99%	1,889
Township of Upper Allen	8,331	372	0	0.00%	7,959	0	0.00%	0
Township of Upper Frankford	1,034	32	0	0.00%	1,002	0	0.00%	0
Township of Upper Mifflin	559	21	4	19.05%	538	53	9.85%	57
Township of West Pennsboro	2,317	100	22	22.00%	2,217	616	27.79%	638
Borough of Wormleysburg	1,578	170	166	97.65%	1,408	1,270	90.20%	1,436
TOTAL	**108,856**	**8,486**	**4,377**	**51.58%**	**101,948**	**41,192**	**40.40%**	**45,569**

4.3.16. Urban Fire and Explosions

4.3.16.1 Location and Extent

Significant urban fires and explosions are limited to more densely populated areas that contain large and/or multiple buildings. Such fires may start in a single structure but have the potential to spread to nearby buildings or throughout a large building if adequate fire control measures are not in place. An example of a local urban fire is provided in Figure 4.3.16-1.

Figure 4.3.16-1: Fire at Pitt and High streets in the Borough of Carlisle, Cumberland County, PA (Photograph courtesy of Cumberland County, 2014).

4.3.16.2 Range of Magnitude

The impact of urban fire and explosion events vary based on the size of the incident and the population and structure density of where it occurs. Severe urban fires and explosions result in extensive damage to residential, commercial and/or public property. Lives may be lost and people are often displaced for several months to years depending on the magnitude of the event. There may be environmental impacts related to hazardous materials when a fire event or explosion releases dangerous materials.

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

The secondary effects of urban fire and explosion events relate to the ability of public, private, and non-profit entities to provide post-incident relief. Human services agencies (community support programs, health and medical services, public assistance programs and social services) can be affected by urban fire and explosion events as well. Effects may consist of physical

damage to facilities and equipment, disruption of emergency communications, loss of health and medical facilities and supplies, and an overwhelming load of victims who are suffering from the effects of the urban fire or explosion, including loss of their home or place of business. A potential worst-case scenario could involve an urban fire or explosion affecting critical facilities, numerous attached residences, or a large employer.

4.3.16.3 Past Occurrence

Cumberland County experiences a number of urban fires every year, most of which are small and affect one to a few structures (See Table 4.3.16-1). However, a list of previous significant urban fires is included in Table 4.3.16-1, and a photograph of one event is provided in Figure 4.3.16-2. Cumberland County has not experienced any explosions since 2013 (See Table 4.3.16-1).

Table 4.3.16-1: Urban Fire and Explosion Events in Cumberland County: 2013 – 2018 (PEMA – KC, 2018)

	2013	2014	2015	2016	2017	2018
Structure Fires	3	6	12	25	31	4
Vehicle Fires	1	3	2	2	0	0
Explosions	0	0	0	0	0	0

Table 4.3.16-2: List of previous significant urban fire events in Cumberland County (Cumberland County DPS, 2019).

Date	Location	Agency Action
September 2018	Hampden Township (Apartment Complex)	Red Cross assisted with relocation of 14 persons
June 2018	Hampden Township (Zenith Energy Fuel Terminal)	None
May 2012	Borough of Carlisle (Leer Corporation)	None
May 2011	Carlisle Waste Water Treatment Plant	None
September 2009	Mechanicsburg Borough (4 row house fire at Market & Allen Streets)	None
July 2009	York (block of row houses on Chestnut Street)	Small Business Administration Loans made available
May 2007	Shippensburg Borough (King Street)	None
November 2001	Borough of Lemoyne (Market Street)	Small Business Administration Loan applied for, but not accepted
December 1999	Borough of Carlisle	Small Business Administration Loan received
February 1999	Borough of Lemoyne (West Shore Farmer's Market)	Small Business Administration Loan received
December 1993	Borough of Carlisle	Small Business Administration Loan received

Table 4.3.16-2: List of previous significant urban fire events in Cumberland County (Cumberland County DPS, 2019).		
Date	**Location**	**Agency Action**
	(Bartolli's Warehouse)	

Figure 4.3.16-2: Fire at a fuel tank site in Cumberland County, PA (Photograph courtesy of Cumberland County Department of Public Safety).

4.3.16.4 Future Occurrence

Based on historical events, Cumberland County is expected to experience three to four significant urban fire events per decade. Note that this estimate is based on the occurrence of past events over a short period of time and is not the result of detailed statistical sampling. The probability of future significant urban fires can be considered *possible* according to the Risk Factor Methodology (see Table 4.4-2).

4.3.16.5 Vulnerability Assessment

Areas where large buildings are located or development is densely spaced should be considered more vulnerable to urban fire events. In order to adequately assess vulnerability to urban fires, detailed information on the design specifications, specifically fires codes, used for construction of individual buildings is required. All 33 municipalities have adopted the Uniform Construction Code which assures buildings are designed to address structure fire hazards. However, these regulations will only affect new construction, as well as additions and renovations to existing structures. Older buildings that do not meet the criteria established in modern fire codes continue to remain vulnerable.

In a response to the Evaluation of Identified Hazards and Risk, David Lindenmuth, a Local Emergency Coordinator from the Shippensburg area, mentioned a decrease in active volunteer firefighters. He identified this as a potential factor impacting the County's fire and traffic accident mitigation. As discussed in Section 4.3.8.5, Cumberland County does not have any career fire departments. The 29 fire companies in the County are staffed by volunteers. However, there are several fire companies that have paid staff on duty for 24 hours and 7 days a week to report to calls and drive fire apparatus. Cumberland County has seen an increase in municipalities utilizing their public works and other municipal employees to support fire company staffing in recent years (Cumberland County Department of Public Safety, October 24, 2019, personal communication).

4.3.17. Utility Interruption

4.3.17.1 Location and Extent

Utility interruptions and power failures can take place anywhere in the County. Utility interruptions in Cumberland County focus primarily on power failures which are often a cascading impact of another hazard event. For example, severe thunderstorms or winter storms could bring down power lines and cause widespread disruptions in electricity service. Strong heat waves may result in rolling blackouts where power may not be available for an extended period of time. Local outages may be caused by traffic accidents or wind damage.

During the 2014 HMP update, South Middleton Township's Local Emergency Management Coordinator, Ron Hamilton, stated that power companies in the area will not do preventative maintenance (tree trimming) but will only respond after a tree has damaged a power line. In many municipalities, street trees are a requirement for developers even when overhead power lines are present. It was suggested by members of the HMSC that municipalities should consider eliminating this requirement or revising it to account for proper placement and species of trees, which could reduce the potential for power line damage. For example, Lower Allen Township already regulates street tree species in their subdivision and land development ordinances and cite the requirement that only trees which will not interfere with overhead lines may be planted (Ecode360, 2014). As of 2019, this is still a relevant issue faced by the County, and due to its value, it was left in this updated version of the Plan.

4.3.17.2 Range of Magnitude

Most severe power failures or outages are regional events. A loss of electricity can have numerous impacts including, but not limited to food spoilage, loss of heat or air conditioning, basement flooding (i.e., sump pump failure), lack of indoor lighting, loss of water supply (i.e.,

well pump failure) and lack of phone or internet service. These issues are often more of a nuisance than a hazard but can cause damage or harm depending on the population affected and the severity of the outage.

4.3.17.3 Past Occurrence

Minor power outages occur annually. One significant outage occurred on December 16, 2007. Approximately 75,000 Pennsylvania Power and Lighting customers were without power across south-central Pennsylvania due to heavy icing. Some customers were without power for up to three days. Another significant outage was caused by Winter Storms Riley and Quinn which occurred successively on March 1 and March 7, 2018. High winds, up to 60 mph gusts for Riley, and heavy snow resulted in downed trees and power lines around the state. Combined totals in Pennsylvania customers that experienced electrical outages due to the two storms totaled over 1.4 million. Most customers had power restored by March 5, but Winter Storm Riley complicated restoration efforts for some, who were without electricity until March 13 (PUC, 2019). A photograph from a power outage in 2011 is provided in Figure 4.3.17-1.

Figure 4.3.17-1: A telephone pole was leaning at the intersection of Bernheisel Bridge Road and Sherwood Drive in Middlesex Township, Cumberland County, PA on May 28, 2011 following a storm that caused power outages for thousands of county residents (Photograph courtesy of Jason Malmont/*The Sentinel*, 2014).

4.3.17.4 Future Occurrence

Minor power failure events (i.e., short outage) may occur several times a year for any given area in the County, while major (i.e., widespread, long outage) events typically take place once every few years. Power failures are likely occurrences during severe weather and therefore should be expected during those events. Furthermore, research by the National Oceanic and Atmospheric Administration (NOAA) suggests that climate change may cause more extreme storms, like the March 2018 nor'easters, to occur in Pennsylvania (NOAA SCEC, 2018). Aging infrastructure also adds to the risk of potential utility interruptions. Population growth, urbanization and climate change can put strain on existing assets used to deliver utilities (Michael Baker International, 2018). Overall, the probability of future utility interruption events can be considered *highly likely* according to the Risk Factor Methodology (see Table 4.4-2).

4.3.17.5 Vulnerability Assessment

Emergency medical facilities, including retirement homes and senior centers are particularly vulnerable to power outages. While back-up power generators are often used at these facilities, loss of electricity may result in hot or cold temperatures for which elderly populations are particularly vulnerable. Appendix F provides a list of where those facilities are located in Cumberland County. Some municipalities have identified evacuation shelters in case of loss of heat or air conditioning. If a municipality does not have an identified warming or cooling shelter, a request would be made to the Cumberland County Department of Public Safety and forwarded to the American Red Cross, which would then work with PEMA to resolve (Cumberland County Department of Public Safety, personal communication, November 1, 2019).

PP&L and First Energy (Penelec and Met-Ed) utilize online portals to provide residents with estimates for outage times. Results for outage times are reported in real-time. In addition, PP&L and First Energy (Penelec and Met-Ed) have online portals and emergency phone numbers, so that 9-1-1 may report life safety issues and receive updated information. Adams Electric in the

County does not have these capabilities; however, they do provide publicly advertised phone numbers (Cumberland County Department of Public Safety, personal communication, November 5, 2019).

4.4 Cascading Hazards

Cascading hazards are hazard events that occur as a direct or indirect result of an initial hazard event. Many of the hazards profiled in the 2020 HMP have the potential to cascade and cause the occurrence of another hazard. For example, a traffic accident on a major roadway could cause a hazardous material spill that when ignited creates a wildfire. Tornados and hurricanes could cause wide-spread utility interruptions, transportation accidents and flooding. Thus, the direct impacts of hazards should be considered in addition to the indirect impacts that may be caused from the cascading effects of an initial event.

The following table analyzes the cascading effects of the hazards profiled in this plan. The hazards are evaluated with one another in Table 4.4-1 and rated on a scale from 0 (will not create cascading effect) – 4 (likely to create cascading effect) based upon the likelihood of creating a cascading effect. Occurrences of hazards with a high total score are the most likely to trigger another cascading hazard.

Table 4.4-1: Cascading Hazard Analysis.

Hazard	Civil Disturbance	Dam Failure	Drought	Earthquake	Environmental Hazard	Flood, Flash Flood, Ice Jam	Hurricane, Tropical Storm, Nor'easter	Nuclear Incident	Pandemic	Subsidence, Sinkhole	Terrorism	Tornado, Wind Storm	Transportation Accident	Urban Fire and Explosion	Utility Interruption	Wildfire	Winter Storm	TOTAL
Civil Disturbance	n/a	0	0	0	1	0	0	0	0	0	3	0	2	3	1	0	0	**10**
Dam Failure	0	n/a	0	0	2	2	0	1	0	1	0	0	2	1	3	0	0	**12**
Drought	0	0	n/a	0	0	0	0	0	1	0	0	0	0	1	0	2	0	**4**
Earthquake	0	2	0	n/a	3	0	0	1	0	0	0	0	2	3	3	0	0	**14**
Environmental Hazard	0	0	0	0	n/a	0	0	1	0	0	0	0	2	3	1	0	0	**7**
Flood, Flash Flood, Ice Jam	0	2	0	0	2	n/a	0	1	0	1	0	0	3	0	4	0	0	**13**
Hurricane, Tropical Storm, Nor'easter	0	2	0	0	2	4	n/a	1	0	0	0	3	3	0	4	0	4	**23**
Nuclear Incident	2	0	0	0	4	0	0	n/a	0	0	1	0	3	3	2	1	0	**16**
Pandemic	1	0	0	0	1	0	0	0	n/a	0	1	0	1	0	0	0	0	**4**
Subsidence, Sinkhole	0	1	0	0	1	0	0	1	0	n/a	0	0	2	1	1	0	0	**7**
Terrorism	4	2	0	0	2	0	0	2	0	0	n/a	0	3	3	3	0	0	**19**
Tornado, Wind Storm	0	1	0	0	3	0	0	1	0	0	0	n/a	3	2	3	0	0	**13**
Transportation Accident	1	0	0	0	4	0	0	2	0	0	1	0	n/a	3	2	2	0	**15**
Urban Fire and Explosion	1	0	0	0	2	0	0	1	0	0	1	0	1	n/a	2	0	0	**8**

Table 4.4-1: Cascading Hazard Analysis.

Hazard	Civil Disturbance	Dam Failure	Drought	Earthquake	Environmental Hazard	Flood, Flash Flood, Ice Jam	Hurricane, Tropical Storm, Nor'easter	Nuclear Incident	Pandemic	Subsidence, Sinkhole	Terrorism	Tornado, Wind Storm	Transportation Accident	Urban Fire and Explosion	Utility Interruption	Wildfire	Winter Storm	TOTAL
Utility Interruption	2	0	0	0	1	0	0	1	0	0	2	0	2	2	n/a	0	0	**10**
Wildfire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	n/a	0	**1**
Winter Storm	0	1	0	0	1	3	0	0	0	0	0	0	4	2	4	0	n/a	**15**
TOTAL	**11**	**11**	**0**	**0**	**29**	**9**	**0**	**13**	**1**	**2**	**9**	**3**	**33**	**27**	**34**	**5**	**4**	

0 HAZARD WILL NOT CREATE A CASCADING IMPACT
1 VERY SMALL CHANCE OF CASCADING IMPACTS.
2 POSSIBLE CHANCE OF CASCADING IMPACTS
3 SIGNIFICANT CHANCE OF CASCADING IMPACTS
4 LIKEY WILL CREATE CASCADING IMPACTS

4.5 Hazard Vulnerability Summary

4.5.1. Methodology

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

Risk Factor values were obtained by assigning varying degrees of risk to five categories for each of the hazards profiled in the 2020 HMP. Those categories include: *probability*, *impact*, *spatial extent*, *warning time* and *duration*. Each degree of risk was assigned a value ranging from 1 to 4. The weighting factor agreed upon by the planning team is shown in Table 4.5-1.

All 33 municipalities completed an online survey to obtain risk values. Some of the hazards do not apply to every municipality and were selected as not applicable (N/A). All of the input, including N/A, was utilized to determine an average risk value for each category within each hazard. To calculate the RF value for a given hazard, the assigned risk value for each category was multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the example equation:

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

Table 4.5-1 summarizes each of the five categories used for calculating a RF for each hazard. According to the weighting scheme applied, the highest possible RF value is 4.0.

Table 4.5-1: Summary of Risk Factor approach used to rank hazard risk.

RISK ASSESSMENT CATEGORY	DEGREE OF RISK			WEIGHT VALUE
	LEVEL	CRITERIA	INDEX	
PROBABILITY *What is the likelihood of a hazard event occurring in a given year?*	**UNLIKELY**	LESS THAN 1% ANNUAL PROBABILITY	**1**	**30%**
	POSSIBLE	BETWEEN 1% & 49.9% ANNUAL PROBABILITY	**2**	
	LIKELY	BETWEEN 50% & 90% ANNUAL PROBABILITY	**3**	
	HIGHLY LIKELY	GREATER THAN 90% ANNUAL PROBABILTY	**4**	
IMPACT *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	**MINOR**	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	**1**	**30%**
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	**2**	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK.	**3**	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.	**4**	
SPATIAL EXTENT *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	**NEGLIGIBLE**	LESS THAN 1% OF AREA AFFECTED	**1**	**20%**
	SMALL	BETWEEN 1 & 10.9% OF AREA AFFECTED	**2**	
	MODERATE	BETWEEN 11 & 25% OF AREA AFFECTED	**3**	
	LARGE	GREATER THAN 25% OF AREA AFFECTED	**4**	
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	**MORE THAN 24 HRS**	SELF-DEFINED	**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	**1**	**10%**
	LESS THAN 24 HRS	SELF-DEFINED	**2**	
	LESS THAN 1 WEEK	SELF-DEFINED	**3**	
	MORE THAN 1 WEEK	SELF-DEFINED	**4**	

(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)

(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)

4.5.2. Ranking Results

Using the methodology described in Section 4.5-1, Table 4.5-2 lists the Risk Factor calculated for each of the seventeen potential hazards identified in the 2020 HMP. Hazards identified as

high risk have risk factors greater than 2.0. Risk Factors ranging from 1.5 to 2.0 were deemed *moderate* risk hazards. Hazards with Risk Factors less than 1.5 are considered *low* risk.

Table 4.5-2: Ranking results by hazard for Cumberland County using the Risk Factor methodology.

Hazard	Risk Assessment Category					Risk Factor (RF)
Natural(N) Or Human-Made(M)	Probability	Impact	Spatial Extent	Warning Time	Duration	
Winter Storm (N)	3.4	1.9	3.3	2	2.8	**2.7**
Transportation Accident (M)	3.1	1.8	2.1	3.6	1.4	**2.4**
Hurricane, Tropical Storm, Nor'easter (N)	2.5	1.8	2.8	1.7	2.8	**2.3**
Utility Interruption (M)	2.7	1.6	2.4	3.4	1.9	**2.3**
Tornado, Wind Storm (N)	2.3	1.8	2.2	2.9	2.3	**2.2**
Flood, Flash Flood, Ice Jam (N)	2.5	1.7	2	2.4	2.8	**2.2**
Environmental Hazard (M)	2.1	1.7	2.2	2.7	2.4	**2.1**
Subsidence, Sinkhole (N)	2.5	1.4	1.7	2.9	2.3	**2.0**
Drought (N)	2	1.3	2.4	1.1	3.7	**2.0**
Pandemic (N)	1.2	1.4	1.9	1.5	2.4	**1.6**
Terrorism (M)	1.2	1.3	1.4	2.9	1.9	**1.5**
Wildfire (N)	1.7	1	1.3	2.6	1.3	**1.5**
Nuclear Incident (M)	1	1.3	1.9	2	1.9	**1.5**
Earthquake (N)	1	1.1	1.9	2.5	1.8	**1.4**
Urban Fire and Explosion (M)	1.7	1	1	2.4	1.1	**1.4**
Civil Disturbance (M)	1.3	1	1.2	2.3	1.1	**1.3**
Dam Failure (M)	0.6	0.8	0.7	0.9	1.1	**0.8**

Based on these results, there are seven *high* risk hazards, six *moderate* risk hazards and four *low* risk hazards in Cumberland 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 (i.e., urban fire and explosion, earthquake, civil disturbance and dam failure).

Per the 2013 Standard Operating Guide, a jurisdictional risk comparison matrix has been completed as Table 4.4-3 to indicate whether each municipality's level of risk for each hazard is greater than (>), less than (<), or equal to (=) the county risk factor. This exercise was completed via the online hazard survey completed by all 33 municipalities.

Table 4.5-3: Jurisdictional Risk Comparison Matrix																	
Jurisdiction	**Identified Hazard and Corresponding Countywide Risk Factor**																
	Winter Storm (N)	**Transportation Accident (M)**	**Hurricane, Tropical Storm, Nor'easter (N)**	**Utility Interruption (M)**	**Tornado, Wind Storm (N)**	**Flood, Flash Flood, Ice Jam (N)**	**Environmental Hazard (M)**	**Subsidence, Sinkhole (N)**	**Drought (N)**	**Pandemic (N)**	**Terrorism (M)**	**Wildfire (N)**	**Nuclear Incident (M)**	**Earthquake (N)**	**Urban Fire and Explosion (M)**	**Civil Disturbance (M)**	**Dam Failure (M)**
Cumberland County	**2.7**	**2.4**	**2.3**	**2.3**	**2.2**	**2.2**	**2.1**	**2**	**2**	**1.6**	**1.5**	**1.5**	**1.5**	**1.4**	**1.4**	**1.3**	**0.8**
Borough of Camp Hill	>	<	>	<	>	>	<	>	<	>	>	<	>	>	>	>	n/a
Borough of Carlisle	<	>	<	<	<	<	>	<	<	<	>	<	>	>	>	>	n/a
Township of Cooke	>	<	=	>	>	<	<	<	<	>	n/a	>	n/a	n/a	n/a	<	>
Township of Dickinson	<	<	>	<	>	>	>	>	<	<	>	>	<	<	<	<	>
Township of East Pennsboro	>	>	>	>	>	<	<	>	<	<	<	>	<	>	>	<	n/a
Township of Hampden	=	<	<	=	=	>	>	<	>	>	>	<	>	>	>	>	n/a
Township of Hopewell	<	<	<	<	<	<	<	n/a	<	n/a	<	<	<	n/a	n/a	n/a	n/a
Borough of Lemoyne	<	=	>	<	>	<	>	>	<	<	<	n/a	<	<	>	<	n/a
Township of Lower Allen	>	>	>	>	>	>	>	>	>	>	>	<	>	>	>	>	>
Township of Lower Frankford	>	<	>	<	>	>	>	>	>	>	=	>	>	>	<	=	>

Table 4.5-3: Jurisdictional Risk Comparison Matrix																	
Jurisdiction	**Identified Hazard and Corresponding Countywide Risk Factor**																
	Winter Storm (N)	**Transportation Accident (M)**	**Hurricane, Tropical Storm, Nor'easter (N)**	**Utility Interruption (M)**	**Tornado, Wind Storm (N)**	**Flood, Flash Flood, Ice Jam (N)**	**Environmental Hazard (M)**	**Subsidence, Sinkhole (N)**	**Drought (N)**	**Pandemic (N)**	**Terrorism (M)**	**Wildfire (N)**	**Nuclear Incident (M)**	**Earthquake (N)**	**Urban Fire and Explosion (M)**	**Civil Disturbance (M)**	**Dam Failure (M)**
Cumberland County	**2.7**	**2.4**	**2.3**	**2.3**	**2.2**	**2.2**	**2.1**	**2**	**2**	**1.6**	**1.5**	**1.5**	**1.5**	**1.4**	**1.4**	**1.3**	**0.8**
Township of Lower Mifflin	<	=	<	>	<	<	<	n/a	>	<	<	>	n/a	n/a	=	<	>
Borough of Mechanicsburg	=	>	=	<	>	>	>	>	<	>	>	<	>	>	>	<	n/a
Township of Middlesex	>	>	<	<	<	<	=	<	<	>	=	=	<	<	<	>	>
Township of Monroe	>	<	<	>	<	<	<	<	<	<	=	>	<	<	<	<	n/a
Borough of Mount Holly Springs	>	>	>	>	>	>	>	>	>	<	>	>	>	>	>	>	>
Borough of New Cumberland	>	<	<	>	<	<	<	<	<	<	>	<	>	<	<	<	>
Borough of Newburg	<	<	<	<	<	<	<	<	<	<	<	<	<	<	>	<	<
Borough of Newville	>	>	>	>	>	>	>	>	>	n/a	<	<	n/a	>	>	>	>
Township of North Middleton	<	<	<	<	<	>	<	<	<	<	<	<	<	<	>	<	<

Table 4.5-3: Jurisdictional Risk Comparison Matrix																	
Jurisdiction	**Identified Hazard and Corresponding Countywide Risk Factor**																
	Winter Storm (N)	**Transportation Accident (M)**	**Hurricane, Tropical Storm, Nor'easter (N)**	**Utility Interruption (M)**	**Tornado, Wind Storm (N)**	**Flood, Flash Flood, Ice Jam (N)**	**Environmental Hazard (M)**	**Subsidence, Sinkhole (N)**	**Drought (N)**	**Pandemic (N)**	**Terrorism (M)**	**Wildfire (N)**	**Nuclear Incident (M)**	**Earthquake (N)**	**Urban Fire and Explosion (M)**	**Civil Disturbance (M)**	**Dam Failure (M)**
Cumberland County	**2.7**	**2.4**	**2.3**	**2.3**	**2.2**	**2.2**	**2.1**	**2**	**2**	**1.6**	**1.5**	**1.5**	**1.5**	**1.4**	**1.4**	**1.3**	**0.8**
Township of North Newton	=	<	>	>	<	<	<	<	>	>	<	>	>	>	<	>	>
Township of Penn	<	<	<	<	<	>	<	<	<	<	<	>	n/a	<	n/a	<	n/a
Borough of Shippensburg	>	<	>	>	>	<	<	<	<	>	>	<	>	>	<	=	n/a
Township of Shippensburg	>	>	>	>	=	<	>	<	>	>	<	<	>	>	=	>	n/a
Borough of Shiremanstown	>	>	>	>	<	<	>	>	>	<	<	<	>	<	>	<	n/a
Township of Silver Spring	>	>	>	<	>	>	>	>	<	>	>	<	>	n/a	<	<	n/a
Township of South Middleton	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>
Township of South Newton	<	<	>	=	=	>	=	<	>	=	>	>	>	>	n/a	>	>
Township of Southampton	<	=	<	=	=	>	>	>	>	>	>	>	<	>	>	>	>
Township of Upper Allen	>	<	<	>	<	>	<	>	=	>	>	<	>	>	n/a	=	n/a

Table 4.5-3: Jurisdictional Risk Comparison Matrix																	
Jurisdiction	**Identified Hazard and Corresponding Countywide Risk Factor**																
	Winter Storm (N)	**Transportation Accident (M)**	**Hurricane, Tropical Storm, Nor'easter (N)**	**Utility Interruption (M)**	**Tornado, Wind Storm (N)**	**Flood, Flash Flood, Ice Jam (N)**	**Environmental Hazard (M)**	**Subsidence, Sinkhole (N)**	**Drought (N)**	**Pandemic (N)**	**Terrorism (M)**	**Wildfire (N)**	**Nuclear Incident (M)**	**Earthquake (N)**	**Urban Fire and Explosion (M)**	**Civil Disturbance (M)**	**Dam Failure (M)**
Cumberland County	**2.7**	**2.4**	**2.3**	**2.3**	**2.2**	**2.2**	**2.1**	**2**	**2**	**1.6**	**1.5**	**1.5**	**1.5**	**1.4**	**1.4**	**1.3**	**0.8**
Township of Upper Frankford	<	<	<	<	<	<	<	<	>	n/a	n/a	>	n/a	n/a	<	<	n/a
Township of Upper Mifflin	>	=	>	>	>	>	>	>	>	>	>	>	>	>	n/a	>	>
Township of West Pennsboro	<	<	<	<	<	<	<	<	>	<	<	<	n/a	<	n/a	>	>
Borough of Wormleysburg	<	<	<	<	<	>	<	<	<	<	>	>	>	>	>	>	n/a

4.5.3. Potential Loss Estimates

Based on available data, general loss estimates were established for flood, winter storm, tornado and wind storm events. The potential losses incurred by hurricanes and tropical storms are associated with the impacts of flooding and high wind. Estimates provided in this section are based on previous events, cumulative assessed values for property located in high risk areas, and geospatial analysis. As discussed in Section 2.5, the structures dataset used to assess vulnerability throughout this section are based on the Cumberland County Tax Assessment assessed property and structure values.

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.

Potential loss estimates provided in the 2020 HMP update are based on parcel values provided in the county tax assessment database. The reported values are representative of replacement value alone and an estimate of content loss which was set at 75% of building value. Functional loss and displacement cost are not included.

Flood

Cumberland County maintains a GIS dataset representing addressed structures. This dataset includes the street address, latitude and longitude coordinates, and other information. A tool was developed that cycled through each municipality in the County, and selected all addressed structures that were within the preliminary FEMA floodplain dataset. When a structure is visible in orthoimagery, the feature is placed on the structure. If no structure is visible, the feature is placed in the center of the tax parcel. For each municipality, records from the Tax Parcels GIS database were selected that contained Address Points that were within the preliminary FEMA floodplains dataset. The land, building, and total assessed values for these Tax Parcel records were summed to create the values shown in Table 4.5.3-1.

Table 4.5.3-1 – Potential Flooding Loss Estimates

Municipality	Total Assessed Land Value in the SFHA	Total Assessed Building Value in the SFHA	Estimated Content Loss Value (75% of Building Assessment)	Total Assessed Value in the SFHA
Camp Hill Borough	$883,400.00	$3,033,200.00	$2,274,900.00	$6,191,500.00
Carlisle Borough	$11,598,200.00	$107,791,800.00	$80,843,850.00	$200,233,850.00
Cooke Township	$0.00	$643,000.00	$482,250.00	$1,125,250.00

Table 4.5.3-1 – Potential Flooding Loss Estimates				
Municipality	**Total Assessed Land Value in the SFHA**	**Total Assessed Building Value in the SFHA**	**Estimated Content Loss Value (75% of Building Assessment)**	**Total Assessed Value in the SFHA**
Dickinson Township	$1,239,900.00	$1,959,600.00	$1,469,700.00	$4,669,200.00
East Pennsboro Township	$7,991,500.00	$7,183,000.00	$5,387,250.00	$20,561,750.00
Hampden Township	$9,556,500.00	$18,915,000.00	$14,186,250.00	$42,657,750.00
Hopewell Township	$607,300.00	$673,700.00	$505,275.00	$1,786,275.00
Lower Allen Township	$19,889,400.00	$19,611,400.00	$14,708,550.00	$54,209,350.00
Lower Frankford Township	$255,100.00	$393,500.00	$295,125.00	$943,725.00
Lower Mifflin Township	$1,219,200.00	$1,103,200.00	$827,400.00	$3,149,800.00
Mechanicsburg Borough	$1,526,300.00	$5,000.00	$3,750.00	$1,535,050.00
Middlesex Township	$4,469,400.00	$8,925,500.00	$6,694,125.00	$20,089,025.00
Monroe Township	$4,734,700.00	$13,718,900.00	$10,289,175.00	$28,742,775.00
Mt. Holly Springs Borough	$4,057,400.00	$10,772,200.00	$8,079,150.00	$22,908,750.00
New Cumberland Borough	$3,710,600.00	$12,519,400.00	$9,389,550.00	$25,619,550.00
Newville Borough	$30,000.00	$75,000.00	$56,250.00	$161,250.00
North Middleton Township	$7,808,700.00	$96,067,400.00	$72,050,550.00	$175,926,650.00
North Newton Township	$157,400.00	$301,700.00	$226,275.00	$685,375.00
Penn Township	$189,700.00	$390,800.00	$293,100.00	$873,600.00
Shippensburg Borough	$3,426,700.00	$14,523,300.00	$10,892,475.00	$28,842,475.00
Shippensburg Township	$1,046,900.00	$1,873,000.00	$1,404,750.00	$4,324,650.00
Silver Spring Township	$3,389,200.00	$5,678,000.00	$4,258,500.00	$13,325,700.00
South Middleton Township	$7,077,300.00	$12,055,700.00	$9,041,775.00	$28,174,775.00
South Newton Township	$1,073,400.00	$2,202,200.00	$1,651,650.00	$4,927,250.00

Table 4.5.3-1 – Potential Flooding Loss Estimates				
Municipality	**Total Assessed Land Value in the SFHA**	**Total Assessed Building Value in the SFHA**	**Estimated Content Loss Value (75% of Building Assessment)**	**Total Assessed Value in the SFHA**
Southampton Township	$4,418,200.00	$7,332,900.00	$5,499,675.00	$17,250,775.00
Upper Allen Township	$2,296,400.00	$6,508,500.00	$4,881,375.00	$13,686,275.00
Upper Frankford Township	$704,800.00	$432,600.00	$324,450.00	$1,461,850.00
Upper Mifflin Township	$91,900.00	$79,500.00	$59,625.00	$231,025.00
West Pennsboro Township	$1,321,400.00	$1,676,900.00	$1,257,675.00	$4,255,975.00
Wormleysburg Borough	$2,412,900.00	$6,558,200.00	$4,918,650.00	$13,889,750.00
Cumberland County	**$107,183,800.00**	**$363,004,100.00**	**$272,253,075.00**	**$742,440,975.00**

Using this method, buildings with an assessed value of $363,004,100.00 could be subject to damage, 58% of which includes residential structures. Contents valued at $272,253,075.00 would likewise be subject to loss to create a total potential economic loss of over $742 million for from a countywide 1 percent-annual-chance flood. Actual losses will vary upon the severity and location of flooding events. This analysis is used to show the illustrative damages that could be sustained by the 1 percent-annual-chance flood to assist in local hazard mitigation planning efforts.

Tornado, Windstorm

Since 1960, tornado events in Cumberland County are estimated to have caused $1,210,000 in damages. Accurate loss estimates for previous general windstorms are currently not available. A significant portion of dollar losses from windstorms and tornadoes are often a result of damage to mobile homes. These structures are typically made of lightweight materials. Without adequate anchoring, they are particularly vulnerable to high winds. Table 4.5.3-2 shows the distribution by municipality of cumulative assessed value for mobile home and mobile home park parcels. Note that Table 4.3.8-4 in the Tornado and Windstorm profile is related to mobile home structures rather than parcels.

Table 4.5.3-2: Mobile homes parcel value per jurisdiction (Cumberland County GIS, 2020)

Municipality	Mobile Homes	Assessed Land Value	Assessed Building Value	Total Assessed Value
Camp Hill	0	$0	$0	$0
Carlisle Borough	15	$112,500	$397,200	$509,700
Cooke Township	4	$239,700	$352,500	$592,200
Dickinson Township	184	$7,963,400	$7,301,500	$15,264,900
East Pennsboro Township	61	$2,368,200	$3,383,500	$5,751,700
Hampden Township	513	$15,165,700	$6,871,000	$22,036,700
Hopewell Township	64	$4,126,300	$4,469,800	$8,596,100
Lemoyne Borough	0	$0	$0	$0
Lower Allen Township	60	$1,065,800	$1,495,900	$2,561,700
Lower Frankford Twp	172	$5,880,800	$7,853,900	$13,734,700
Lower Mifflin Twp	244	$6,693,500	$5,653,000	$12,346,500
Mechanicsburg Borough	1	$0	$0	$0
Middlesex Township	767	$11,360,600	$13,997,500	$25,358,100
Monroe Township	172	$2,741,300	$3,318,600	$6,059,900
Mt Holly Springs Boro	112	$2,324,500	$1,970,700	$4,295,200
New Cumberland Borough	0	$0	$0	$0
Newburg Borough	0	$0	$0	$0
Newville Borough	13	$357,200	$562,500	$919,700
North Middleton Twp	495	$9,421,700	$18,124,400	$27,546,100
North Newton Township	57	$3,365,000	$3,817,300	$7,182,300
Penn Township	94	$4,921,300	$4,700,600	$9,621,900
Shippensburg Township	282	$2,227,200	$3,406,100	$5,633,300
Shippensburg Borough	4	$115,700	$156,700	$272,400
Shiremanstown Borough	0	$0	$0	$0
Silver Spring Twp	391	$9,051,400	$12,409,000	$21,460,400
South Middleton Twp	433	$17,811,600	$16,909,600	$34,721,200

Table 4.5.3-2: Mobile homes parcel value per jurisdiction (Cumberland County GIS, 2020)				
Municipality	**Mobile Homes**	**Assessed Land Value**	**Assessed Building Value**	**Total Assessed Value**
South Newton Township	22	$1,455,100	$1,475,400	$2,930,500
Southampton Township	461	$29,770,000	$24,017,700	$53,787,700
Upper Allen Township	124	$7,936,000	$12,631,400	$20,567,400
Upper Frankford Twp	409	$8,177,500	$8,398,000	$16,575,500
Upper Mifflin Twp	89	$4,837,700	$6,192,400	$11,030,100
West Pennsboro Twp	250	$8,638,800	$8,115,900	$16,754,700
Wormleysburg Borough	0	$0	$0	$0
Cumberland County	**5,493**	**$168,128,500**	**$177,982,100**	**$346,110,600**

4.5.4. Future Development and Vulnerability

Total population in Cumberland County is estimated to increase 6.6 percent between 2010 and 2018 from 235,406 to 251,423, respectively. However, this increase is not equally distributed across the County. Populations increased in some municipalities, but declined in others (see Table 2.3-1). Countywide populations are expected to continue increasing in the future.

Figure 4.5.4-1 (in conjunction with Table 2.3-1) shows that the eastern part of Cumberland County will sustain the largest growth in the future while Figure 4.5.4-2 shows the vacant parcels where new development may occur in the future. Note that municipalities in western Cumberland County such Cooke and Upper Frankford Townships show a high percentage of growth, however, those areas are experiencing low numeric growth. See Table 2.3-1 for more information. The combination of available, infrastructure, transportation options, housing choice, and economic opportunity in eastern Cumberland County make this area particularly attractive for new development as well as redevelopment of existing parcels of land.

The Cumberland County Planning Department conducts an annual building permit survey that tracks both proposed and constructed development in the County. Final subdivision and land development plans submitted to the County Planning Department show proposed residential units and commercial/industrial facilities that will be constructed in the future.

Table 4.5.4-1 shows the proposed development in Cumberland County since the preparation of the last plan. Between 2014 and 2019, 314 commercial/industrial units and 7,871 residential units were proposed for construction. Many of these proposals have been constructed while others have not progressed from the plan submission stage. While the progress of every proposed development is beyond the scope of this plan, this table is useful in showing where future growth will occur.

Municipalities located from Carlisle to the east will support future development in the County. Silver Spring, Hampden, South Middleton and Lower Allen Townships account for over 47% of the total proposed nonresidential development in the County from 2014-2019. On the

residential side, over 7,800 new units were proposed between 2014-2019 with Upper Allen, Hampden, Lower Allen, and Silver Spring Townships leading the way by accommodating nearly or over 1,000 new units each. High growth municipalities such as Silver Spring, Hampden, Upper Allen, Lower Allen, and South Middleton have high numbers of proposed residential and commercial/industrial development.

The western part of Cumberland County has not experienced rapid growth nor is such growth projected in the future. This area of the County lacks public infrastructure needed to accommodate future growth but has the prime agriculture soils that support the agriculture industry. The County's farmland preservation efforts center upon western Cumberland County and do not promote new development in that area.

Increases in developed areas likewise drive vulnerability to the hazards profiled in this plan. Awareness and proactive planning can help to make sure that new development occurs in locations and according to standards that improve resilience to the impacts of natural and manmade hazards.

Table 4.5.4-1: Proposed Development 2014-2019

Municipality	Proposed Commercial / Industrial Units 2014-2019	Proposed Residential Units 2014-2019
Borough of Camp Hill	6	4
Borough of Carlisle	21	411
Township of Cooke	0	1
Township of Dickinson	5	8
Township of East Pennsboro	15	62
Township of Hampden	43	1453
Township of Hopewell	3	20
Borough of Lemoyne	5	3
Township of Lower Allen	29	1180
Township of Lower Frankford	0	6
Township of Lower Mifflin	1	7
Borough of Mechanicsburg	7	330
Township of Middlesex	20	65
Township of Monroe	3	186

Table 4.5.4-1: Proposed Development 2014-2019		
Municipality	**Proposed Commercial / Industrial Units 2014-2019**	**Proposed Residential Units 2014-2019**
Borough of Mount Holly Springs	2	5
Borough of New Cumberland	1	2
Borough of Newburg	0	0
Borough of Newville	0	0
Township of North Middleton	10	204
Township of North Newton	5	5
Township of Penn	5	3
Borough of Shippensburg	4	1
Township of Shippensburg	10	2
Borough of Shiremanstown	0	7
Township of Silver Spring	49	1170
Township of South Middleton	29	519
Township of South Newton	0	4
Township of Southampton	9	211
Township of Upper Allen	19	1921
Township of Upper Frankford	0	44
Township of Upper Mifflin	5	3
Township of West Pennsboro	8	32
Borough of Wormleysburg	0	2
TOTAL	**314**	**7,871**

Figure 4.5.4-1: Projected percent population change for municipalities in Cumberland County from 2010 to 2040. This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.

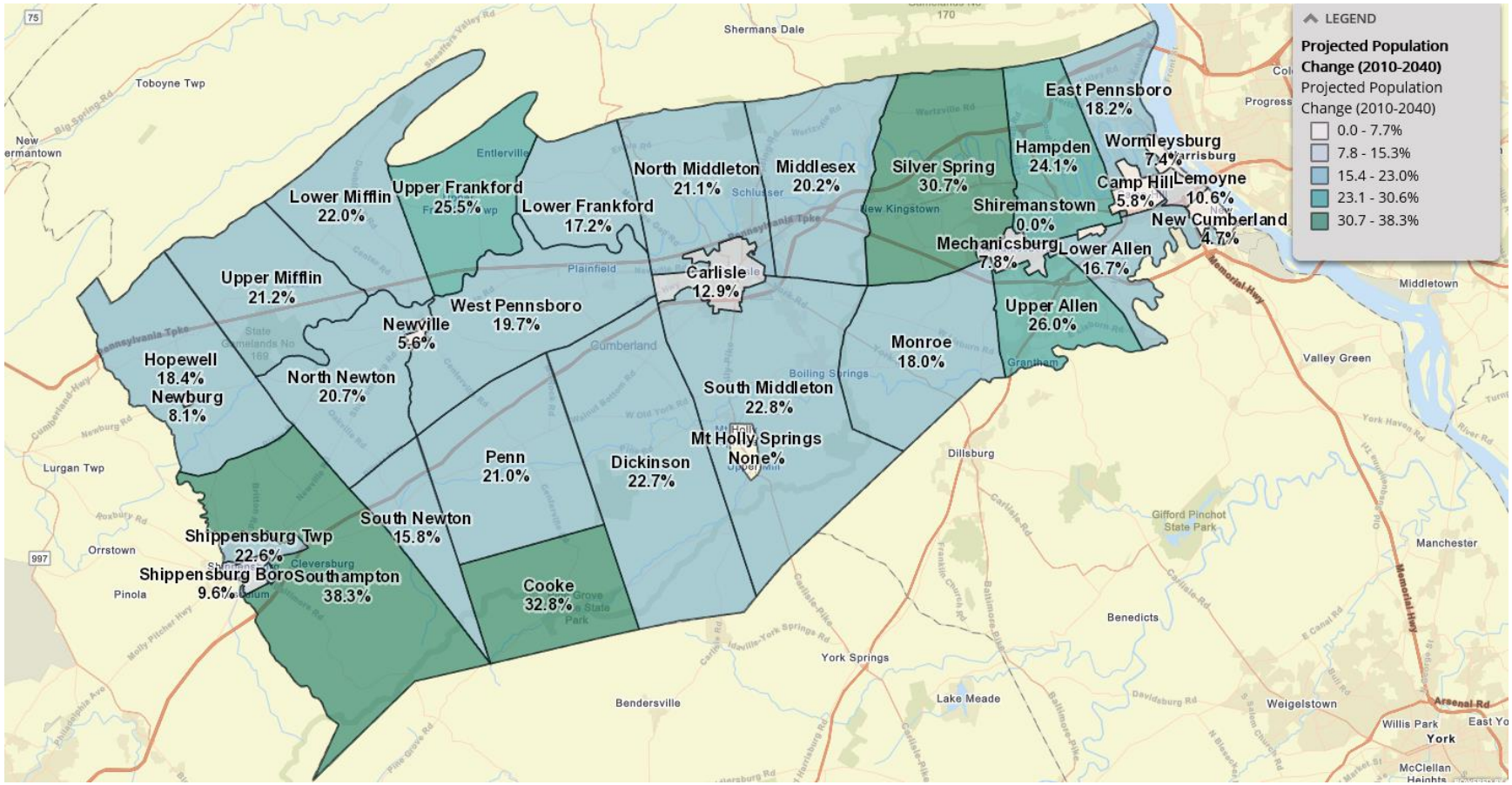
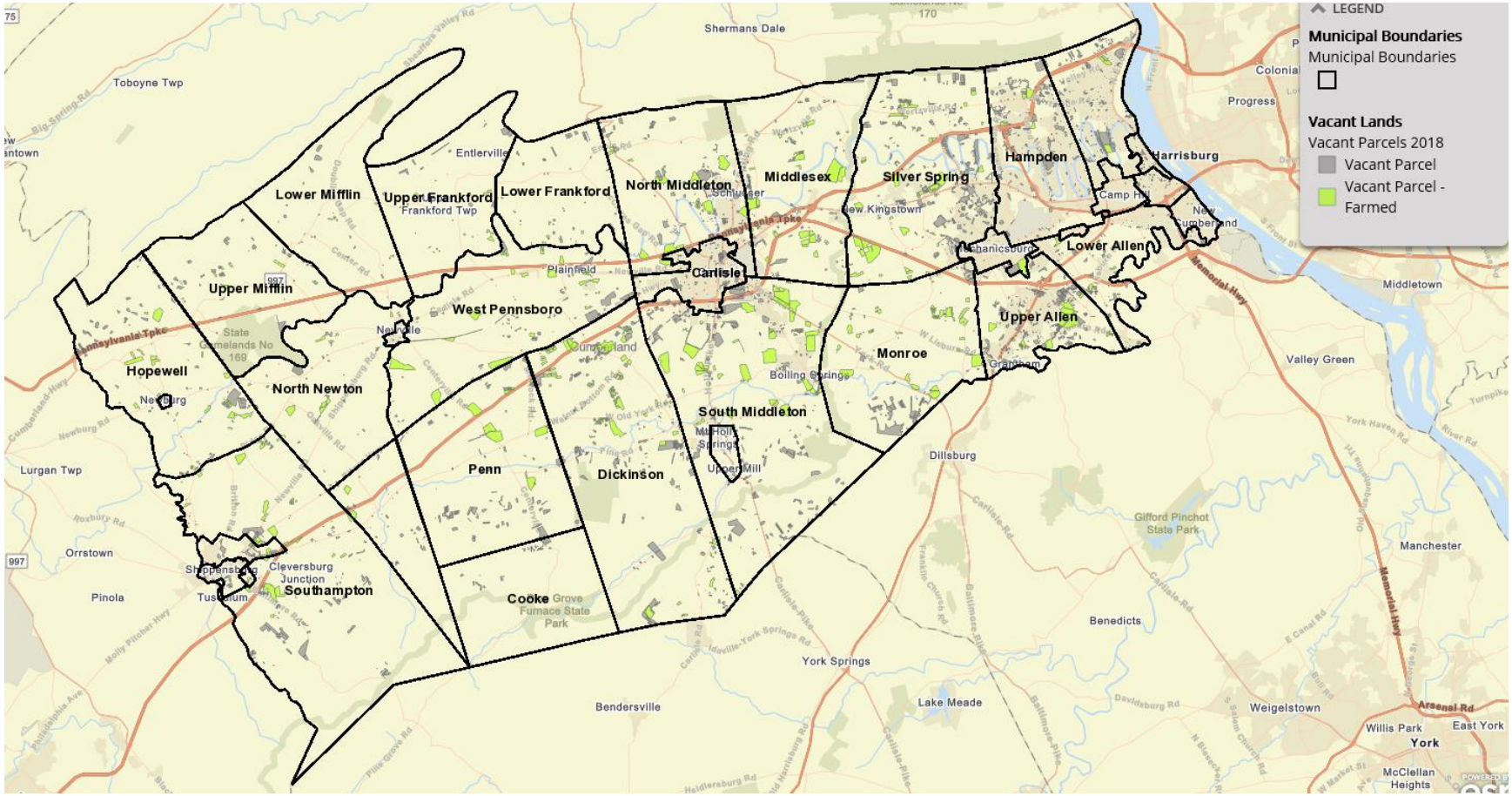


Figure 4.5.4-2: Vacant Land Analysis (Cumberland County GIS, 2019). This image is a screen capture from the CCPA Hazard Mitigation Plan Map Series. Please hold the CTRL key and select the map below for the Hazard Mitigation Plan Map Series.



5. Capability Assessment

5.1 Update Process Summary

Cumberland 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 hazard event.

The 2014 HMP identified the presence of local plans, ordinances and codes in each municipality. It also specified local, state and federal resources available for mitigation efforts. Through responses to the *Capability Assessment Survey* distributed to all municipalities and input from the HMSC, the 2014 HMP provided an updated inventory of the most critical local planning tools available within each municipality and a summary of the fiscal and technical capabilities available through programs and organizations outside of the County. It also identified emergency management capabilities and the processes used for implementation of the National Flood Insurance Program.

The capability assessment information was updated for the 2020 HMP through the *Capability Assessment Survey* and the new *NFIP Worksheet* (included in Appendix D). Note that the 2020 capability assessment has been organized to match the outline provided in PEMA's 2013 Standard Operating Guide and FEMA's 2013 Local Mitigation Planning Guidance.

Because Cumberland County acts as a central repository for much information related to local capabilities, County officials were able to knowledgably provide all information not already populated using FEMA's Community Information System. Municipal officials were then invited via email, and phone call to review and comment on the *Capability Assessment Survey* and the *NFIP Worksheet* as completed by County officials. Corrections and additions provided were incorporated into the attached versions of the worksheets.

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

5.2 Capability Assessment Findings

5.2.1. Planning and Regulatory Capability

5.2.1.1 Local Plans and Ordinances

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

Table 5.2-1: Summary of planning tools adopted by each municipality in Cumberland County (Cumberland County Planning Department and Cumberland County Department of Public Safety, 2019).

Community	Comprehensive Plan	Building Code (UCC)	Floodplain Ordinance – NFIP Participant	Subdivision & Land Development Ordinance	Zoning Ordinance	EOP
Borough of Camp Hill	Yes	Yes	Yes	Yes	Yes	Yes
Borough of Carlisle	Yes	Yes	Yes	Yes	Yes	Yes
Township of Cooke	Yes	Yes	Yes	Yes	No	Yes
Township of Dickinson	Yes	Yes	Yes	Yes	Yes	Yes
Township of East Pennsboro	Yes	Yes	Yes	Yes	Yes	Yes
Township of Hampden	Yes	Yes	Yes	Yes	Yes	Yes
Township of Hopewell	Yes	Yes	Yes	Yes	Yes	Yes
Borough of Lemoyne	Yes	Yes	Yes	Yes	Yes	Yes
Township of Lower Allen	Yes	Yes	Yes	Yes	Yes	Yes
Township of Lower Frankford	Yes	Yes	Yes	Yes	Yes	Yes
Township of Lower Mifflin	Yes	Yes	Yes	Yes	Yes	Yes
Borough of Mechanicsburg	Yes	Yes	Yes	Yes	Yes	Yes
Township of Middlesex	Yes	Yes	Yes	Yes	Yes	Yes
Township of Monroe	Yes	Yes	Yes	Yes	Yes	Yes
Borough of Mount Holly Springs	Yes	Yes	Yes	Yes	Yes	Yes
Borough of New Cumberland	Yes	Yes	Yes	Yes	Yes	Yes
Borough of Newburg	No	Yes	Yes	Yes	Yes	Yes
Borough of Newville	Yes	Yes	Yes	Yes	Yes	Yes
Township of North Middleton	Yes	Yes	Yes	Yes	Yes	Yes
Township of North Newton	Yes	Yes	Yes	Yes	Yes	Yes
Township of Penn	Yes	Yes	Yes	Yes	Yes	Yes
Township of Shippensburg	Yes	Yes	Yes	Yes	Yes	Yes
Borough of Shippensburg	Yes	Yes	Yes	Yes	Yes	Yes
Borough of Shiremanstown	Yes	Yes	Yes	Yes	Yes	Yes
Township of Silver Spring	Yes	Yes	Yes	Yes	Yes	Yes
Township of South Middleton	Yes	Yes	Yes	Yes	Yes	Yes
Township of South Newton	Yes	Yes	Yes	Yes	Yes	Yes
Township of Southampton	Yes	Yes	Yes	Yes	Yes	Yes
Township of Upper Allen	Yes	Yes	Yes	Yes	Yes	Yes
Township of Upper Frankford	Yes	Yes	Yes	Yes	No	Yes
Township of Upper Mifflin	Yes	Yes	Yes	Yes	No	Yes
Township of West Pennsboro	Yes	Yes	Yes	Yes	Yes	Yes
Borough of Wormleysburg	Yes	Yes	Yes	Yes	Yes	Yes

Local comprehensive plans provide a vision for the physical design and development of a community, and the principles in comprehensive plans are typically implemented through zoning

ordinances, subdivision regulations, and capital improvement programs. Integrating hazard mitigation into the comprehensive plan helps to guide the community's development in a way that does not lead to increased hazard vulnerability and can encourage whole community, 'smart and safe' growth. The existing countywide Comprehensive Plan for Cumberland County was developed in 2017. In addition, all but one municipality (the Borough of Newburg) have adopted local Comprehensive Plans.

Building codes regulate construction standards for new construction and substantially renovated buildings. Standards can be adopted that require resistant or resilient building design practices to address hazard impacts common to a given community. In 2003, the Commonwealth of Pennsylvania implemented Act 45 of 1999, the Uniform Construction Code (UCC), a comprehensive building code that establishes minimum regulations for most new construction, including additions and renovations to existing structures. All 33 municipalities in Cumberland County have since adopted the UCC. The 2015 International Codes issued by the International Code Council is currently in use under the UCC. Since all municipalities in Cumberland County have adopted the UCC, they are required to administer and enforce the 2015 building code regulations, using their own employees or via certified third party agencies, for all building permits submitted on or after October 1, 2018.

Through administration of floodplain ordinances, municipalities can ensure that all new construction or substantial improvements to existing structures located in the floodplain are flood-proofed, dry-proofed, or built above anticipated flood elevations. Floodplain ordinances may also prohibit development in certain areas altogether. The NFIP establishes minimum ordinance requirements which must be met in order for that community to participate in the program. However, a community is permitted and in fact, encouraged, to adopt standards which exceed NFIP requirements. Through participation in the NFIP, all municipalities within the County have a floodplain ordinance in place. For more information on floodplain management and participation in the NFIP in Cumberland County, see Section 5.2.1.2.

Subdivision and land development ordinances are intended to regulate the development of housing, commercial, industrial or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Within these ordinances, guidelines on how land will be divided, the placement and size of roads and the location of infrastructure can reduce exposure of development to hazard events. All jurisdictions within Cumberland County have adopted and enforce a subdivision and land development ordinance.

Zoning ordinances allow for local communities to regulate the use of land in order to protect the interest and safety of the general public. Zoning ordinances can be designed to address unique conditions or concerns within a given community. They may be used to create buffers between structures and high-risk areas, limit the type or density of development and/or require land development to consider specific hazard vulnerabilities. All but three jurisdictions within Cumberland County have adopted and enforce a zoning ordinance.

Numerous other plans and organizations are also in place at the municipal and county level for topics such as open space management, Act 167 stormwater management, natural resources protection, capital improvements, economic development, historic preservation, and farmland

preservation. Details are provided on the *Capability Assessment Survey* included in Appendix D.

5.2.1.2 Participation in the National Flood Insurance Program (NFIP)

All municipalities in Cumberland County are participants in the NFIP. Community participation in the NFIP allows for property owners to obtain flood insurance. Flood insurance provides a means for homeowners, renters and business owners to financially protect themselves. This capability greatly improves resilience after a flood hazard event by allowing residents to repair and rebuild. Table 5.2-2 provides a comparison of Cumberland County municipalities with the number of flood insurance policies and coverage in 2014 versus 2018 that exist in that municipality.

Table 5.2-2: NFIP policies and coverage (FEMA Community Information System, 2014 vs. 2018)

Community	Number Of NFIP Policies 2014 / 2018 +/-percent change	Total Coverage ($) 2014 / 2018 +/-percent change
Borough of Camp Hill	34 / 24 -29%	$7,812,400.00 / $5,518,900.00 -29%
Borough of Carlisle	111 /98 -12%	$18,635,000.00 / $22,894,000.00 +23%
Township of Cooke	N/A	N/A
Township of Dickinson	26 / 23 -12%	$4,100,200.00 / $3,848,600.00 -6%
Township of East Pennsboro	102 / 87 -15%	$18,351,900.00 / $18,089,100.00 -1%
Township of Hampden	186 / 162 -13%	$35,707,100.00 / $33,648,700.00 -6%
Township of Hopewell	5 / 2 -60%	$668,400.00 / $465,000.00 -30%
Borough of Lemoyne	8 / 4 -50%	$1,256,000.00 / $392,000.00 -69%
Township of Lower Allen	73 / 57 -22%	$13,852,100.00 / $13,790,000 -.44%
Township of Lower Frankford	7 / 8 + 14%	$1,266,200.00 / $1,561,700.00 +23%
Township of Lower Mifflin	6 / 4 -33%	$1,222,000.00 / $894,200.00 -27%
Borough of Mechanicsburg	21 / 9 -57%	$3,746,600.00 / $2,023,400.00 -46%
Township of Middlesex	19 / 14 -26%	$2,913,600.00 / $2,605,000.00 -11%
Township of Monroe	63 / 47 -25%	$10,474,500.00 / $9,573,300.00 -9%
Borough of Mount Holly Springs	67 / 53 -21%	$8,308,800.00 / $6,621,500.00 -20%
Borough of New Cumberland	115 /75 -35%	$17,138,400.00 / $11,928,700.00 -33%
Borough of Newburg	1 / 1	$82,000.00 / $90,200.00 +10%
Borough of Newville	1 / 1	$80,000.00 / $10,000.00 -88%
Township of North Middleton	58 / 41 -29%	$11,178,100.00 / $8,421,000.00 -25%
Township of North Newton	3 / 2	$703,000.00 / $353,000.00 -33%
Township of Penn	4 /4	$854,800.00 / $830,500.00 -3%
Township of Shippensburg	29 / 12 -59%	$4,902,100.00 / $5,580,300.00 + 13%
Borough of Shippensburg	13 / 22 +69%	$4,387,100.00 / $4,432,800.00 +1%
Borough of Shiremanstown	7 / 2 -71%	$1,551,800.00 / $700,000.00 -55%
Township of Silver Spring	54 / 44 -19%	$10,053,300.00 / $9,325,400.00 -7%
Township of South Middleton	75 / 56 -25	$14,627,900.00 / $10,735,600.00 -27%
Township of South Newton	7 / 4 -43%	$1,110,400.00 / $677,000.00 -39%

Table 5.2-2: NFIP policies and coverage (FEMA Community Information System, 2014 vs. 2018)		
Community	**Number Of NFIP Policies** **2014 / 2018 +/-percent change**	**Total Coverage ($)** **2014 / 2018 +/-percent change**
Township of Southampton	34 / 35 +3%	$5,189,200.00 / $4,758,500.00 -8%
Township of Upper Allen	57 / 50 -12	$11,409,100.00 / $10,830,900.00 -5%
Township of Upper Frankford	11 / 5 -55%	$779,500.00 /$649,700.00 -17%
Township of Upper Mifflin	1 / 1	$200,000.00 / $200,000.00
Township of West Pennsboro	9 / 10 =+11%	$1,454,500.00 / $2,034,400.00 +40%
Borough of Wormleysburg	107 / 81 -24%	$17,718,600.00 / $17,116,800.00 -3%

The NFIP program is managed by local municipalities participating in the program through ordinance adoption and floodplain regulation while the County provides an oversight and coordination role. Similarly, permitting processes needed for building construction and development in the floodplain are implemented at the municipal level through various ordinances (e.g. zoning, subdivision/land development and floodplain ordinances). All compliance and enforcement mechanisms are instituted through municipal codes and enforced by local zoning officers. The only Certified Floodplain Managers among municipal Floodplain Administrators/NFIP Coordinators in the county are staff of East Pennsboro and Lower Allen townships. Municipal floodplain regulations for all 33 municipalities in the county meet or exceed the FEMA minimal standards as developed by the Pennsylvania Department of Community and Economic Development (DCED). Freeboard requirements exceed FEMA requirements in Dickinson Township, Lower Mifflin Township, Shippensburg Township, and South Middleton Township.

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. As mentioned above, the Pennsylvania DCED provides communities, based on their 44 CFR 60.3 level of regulations, with a suggested ordinance document to assist municipalities in meeting the minimum requirements of the NFIP and the Pennsylvania Flood Plain Management Act (Act 166). Act 166 mandates municipal participation in and compliance with the NFIP. It also establishes higher regulatory standards for hazardous materials and high risk land uses. As new DFIRMs are published, the Pennsylvania State NFIP Coordinator at DCED works with communities to ensure the timely and successful adoption of an updated floodplain management ordinance by reviewing and providing feedback on existing and draft ordinances. In addition, DCED provides guidance and technical support through Community Assistance Contacts (CAC) and Community Assistance Visits (CAV).

The release of the preliminary countywide Digital Flood Insurance Rate Map on May 14, 2019 greatly enhanced mitigation capabilities as they relate to identifying flood hazards. The digital flood hazard information provided by FEMA is based on engineering studies and detailed elevations. This is a significant improvement to the previously effective Flood Insurance Rate Maps some of which did not include detailed studies. Residents and municipal officials are

provided with mapping assistance from the Cumberland County GIS Department, Cumberland County Planning Department and the Cumberland County Department of Public Safety upon request. Upon adoption, all of the municipalities in Cumberland County will have detailed elevations and floodplains. There are no communities in Cumberland County participating in the NFIP Community Rating System (FEMA CIS, 2018).

There are a few existing limitations to flood mitigation in Cumberland County. As mentioned, there are no communities in Cumberland County participating in the NFIP Community Rating System (CRS). Participation in the CRS system has been discussed at various county meetings. The administrative burden combined with limited municipal resources has prevented movement within this program. At the same time, though, all municipalities in the County are flood prone. Community participation in this program can provide premium reductions for properties located outside of Special Flood Hazard Areas of up to 10 percent and reductions for properties located in Special Flood Hazard Areas of up to 45 percent. These discounts can be obtained by undertaking public information, mapping and regulations, flood damage reduction and flood preparedness activities (FEMA, 2019).

Also, numerous roads and intersections where flooding issues repeatedly occur were identified in Section 4.3.3.3. Some of these roads and intersections are state routes. The County and local municipalities face challenges in mitigating flood events on state routes since these roads are owned and maintained by the Commonwealth of Pennsylvania. Local municipalities do not have the authority to independently carry out a mitigation project. In these situations, the Pennsylvania Department of Transportation must decide to undertake the project. Since the Department of Transportation is often most concerned with larger, critical transportation routes, smaller state roads and intersections which significantly affect a local community may not get the attention they need for the Commonwealth to take on a mitigation project.

5.2.1.3 Emergency Management

The Cumberland County Department of Public Safety coordinates countywide emergency management efforts. Each municipality has a designated local emergency management coordinator who possesses a unique knowledge of the impact hazard events have on their community. A significant amount of information used to develop this plan was obtained from the emergency management coordinators as well as County staff. The Emergency Management Services Code (PA Title 35) requires that all municipalities in the Commonwealth have a Local Emergency Operations Plan (EOP) which is updated every two years. As of October 2019, all municipalities in Cumberland County have or are in the process of updating their local EOP. A countywide EOP also exists and is dated August 1, 2019. Municipalities are not required to sign on to the County EOP, because county staff prefers to keep municipal emergency management coordinators actively engaged at a more local level.

Additionally, Cumberland County has a Continuity of Operations Plan in place, although no municipalities have adopted a Continuity of Operations Plan. Carlisle Borough, South Middleton Township, and North Middleton Township are the only municipalities in Cumberland County with Disaster Recovery Plans.

In addition to local emergency management efforts, the South Central Task Force (SCTF) is a regional all-hazards emergency preparedness task force for eight counties in South Central Pennsylvania. The task force encompasses Adams, Cumberland, Dauphin, Franklin, Lancaster, Lebanon, Perry and York Counties. SCTF's preparedness activities address planning, prevention and response. It enhances regional coordination capabilities in case of incidents that exceed the capabilities of a single county or jurisdiction. Emphasis is also placed on collaborating with the private sector to endure the security and resilience of privately owned businesses and infrastructure, especially those critical to countywide public health and operational continuity such as the energy, telecommunications, food processing and transportation sectors. Though SCTF is an all-hazards group, it began as a counter-terrorism organization and maintains an extensive training program to mitigate the threat of terrorism for local emergency response entities as well as for the private sector.

5.2.2. Administrative and Technical Capability

Administrative capability is described by an adequacy of departmental and personnel resources for the implementation of mitigation-related activities. Technical capability relates to an adequacy of knowledge and technical expertise of local government employees or the ability to contract outside resources for this expertise in order to effectively execute mitigation activities. Common examples of skill sets and technical personnel needed for hazard mitigation include: planners with knowledge of land development/management practices, engineers or professionals trained in construction practices related to buildings and/or infrastructure (e.g. building inspectors), planners or engineers with an understanding of natural and/or human caused hazards, emergency managers, floodplain managers, land surveyors, scientists familiar with hazards in the community, staff with the education or expertise to assess community vulnerability to hazards, personnel skilled in geographic information systems, resource development staff or grant writers, and fiscal staff to handle complex grant application processes.

Based on the 2019 *Capability Assessment Survey* results, municipalities in Cumberland County have adequate administrative and technical staff needed to conduct hazard mitigation-activities. However, there seems to be a common lack of personnel for land surveying and scientific work related to community hazards. This result is not necessarily surprising since these tasks would typically be contracted to outside providers. Many communities have personnel skilled in geographic information systems. The County GIS Department is also able to provide these services. Additionally, County staff members are experienced with grant writing and are able to assist municipalities upon request. All municipalities in the County have an identified emergency management coordinator, some of whom are responsible for more than one jurisdiction. The only Certified Floodplain Managers among municipal Floodplain Administrators/NFIP Coordinators in the county are staff of East Pennsboro and Lower Allen townships.

Local organizations that could act as partners for future mitigation activities include the Capital Region COG (formerly West Shore COG) and the Western Cumberland COG, non-profit environmental organizations such as the Susquehanna River Basin Commission, local watershed associations, LeTort Regional Authority, business development organizations such

as the Chamber of Commerce and Rotary Club, and historical or cultural agencies such as the Cumberland County Historical Society.

State and multi-agency programs in Pennsylvania which can provide technical assistance for mitigation activities include, but are not limited to:

- Pennsylvania Bureau of Labor & Industry
- Pennsylvania Construction Codes Academy
- Pennsylvania Department of Community and Economic Development
- Pennsylvania Department of Conservation and Natural Resources
- Pennsylvania Department of Environmental Protection
- Pennsylvania Department of General Services
- Pennsylvania Department of Transportation
- Pennsylvania Emergency Management Agency
- Pennsylvania Housing Finance Agency
- Pennsylvania Insurance Department
- Pennsylvania Silver Jackets (volunteer-based)
- Pennsylvania State System of Higher Education
- Pennsylvania Treasury
- ReadyPA multi-agency outreach program

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

- Army Corp of Engineers
- Department of Agriculture
- Department of Housing and Urban Development
- Department of the Interior
- Economic Development Administration
- Emergency Management Institute
- Environmental Protection Agency
- Federal Emergency Management Agency
- General Services Administration
- Geological Survey
- Office of Infrastructure Protection
- National Oceanic and Atmospheric Administration
- National Weather Service
- Small Business Administration

Additional details on these state and federal technical assistance programs can be found in the *Pennsylvania 2018 Standard State All-Hazard Mitigation Plan*.

5.2.3. Financial Capability

The decision and capacity to implement mitigation-related activities is often strongly dependent on the presence of local financial resources. While some mitigation actions are less costly than

others, it is important that money is available locally to implement policies and projects. Financial resources are particularly important if communities are trying to take advantage of state or federal mitigation grant funding opportunities that require local-match contributions. Most municipalities within the County perceive financial capability to be limited.

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

- Water and sewer fees (municipal authorities);
- Stormwater utility fees (Hampden Township, Carlisle Borough, others currently considering);
- Development impact fees; and
- General obligation, revenue, and/or special tax bonds (for example through the County Industrial Development Authority).

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

- Commonwealth Financing Authority (CFA)/DCED H2O PA High Hazard Unsafe Dam Projects
- CFA/DCED H2O PA Water Supply, Sanitary Sewer and Storm Water Projects
- CFA/DCED PA Small Water and Sewer
- Community Conservation Partnerships Program (C2P2) Community Recreation and Conservation Program
- DCED Business Financing
- DCED Flood Mitigation Program
- DCED H2O Flood Control Projects
- DCED Keystone Communities
- DCED Local Government Capital Project Loan Program
- DCED Municipal Assistance Program
- DEP Growing Greener Program
- Pennsylvania Infrastructure Investment Authority (PENNVEST)
- Pennsylvania Redevelopment Assistance Capital Program (RACP)

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

- Department of Commerce (DOC)/Economic Development Authority (EDA) Construction Grant Program
- Department of Energy Weatherization Assistance Program
- Department of Homeland Security Grant Program (HSGP)
- Department of Transportation/Federal Highway Administration Emergency Relief Program
- DOC/EDA Planning Grants
- DOC/EDA Revolving Loan Fund
- DOC/EDA Technical Assistance Grants

- 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 (IHPUG)
- 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
- Housing and Urban Development (HUD) 5-H Homeownership Program
- HUD Community Development Block Grants (CDBG)
- HUD Disaster Housing Assistance Program
- HUD/Federal Housing Administration (FHA) Title 1 Home Repair Loan Program
- HUD/FHA Section 203(h) Mortgage Insurance for Disaster Victims
- HUD/FHA Section 203(k) Rehabilitation Mortgage Insurance Program
- HUD Partnership for Advancing Technology in Housing
- HUD Section 108 Loan Guarantee Programs
- Internal Revenue Service Casualty Loss-Special Disaster Provisions
- National Oceanic and Atmosphere Administration (NOAA) StormReady Program
- Natural Resources Conservation Service (NRCS) easement programs
- Small Business Administration Disaster Loan Programs
- United States Army Corps of Engineers (USACE) General Investigation (GI)
- 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)
- United States Department of Agriculture (USDA)/Farm Service Agency (FSA) Emergency Conservation Program
- USDA/FSA Emergency Farm Loans
- USDA Non-insured Crop Disaster Assistance Program (NAP)
- USDA/NRCS Emergency Watershed Protection Program
- USDA Repair and Rehabilitation Loan
- USDA/Rural Housing Service (RHS) Community Facilities Loans and Grants
- USDA/RHS Rural Rental Loans
- USDA/RHS Section 502 Single-Family Housing Direct and Guaranteed Loans
- USDA/RHS Section 504 Repair Loans and Grants

- USDA/RHS Self-Help Housing Loans
- USDA/Risk Management Agency Federal Multi-Peril Crop Insurance
- USDA/Rural Business Service Business and Industrial Loans
- USDA Watershed Protection and Flood Prevention Program

Additional details on these state and federal financial resources can be found in the *Pennsylvania 2013 Standard State All-Hazard Mitigation Plan*.

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

5.2.4. Education and Outreach

Cumberland County is very active with education and outreach related to hazard mitigation and emergency management. Department of Public Safety staff participates in natural disaster or safety related school programs. Staff from the Public Safety and Planning departments as well as the County Cooperative Extension, provide ongoing public education programs such as responsible water use, fire safety, household preparedness, and environmental education. The Public Safety Department and the South Central Task Force have a public-private partnership to address terrorism. Finally, local citizen groups or non-profit organizations in Cumberland County focused on environmental protection (LeTort Regional Authority, Clean Air Board of Central PA, various watershed protection groups, etc.) assist with education.

There are a few existing limitations to education and outreach capabilities in Cumberland County. As of 2019, White Rock Acres Development in Monroe Township is the only community in Cumberland County which established a Community Wildfire Protection Plan and participates in the *Firewise* program. However, there are numerous communities identified as vulnerable to wildfire hazards. The Pennsylvania Firewise Community Program assists planned and existing communities in implementing management practices which reduce the risk of wildfire events. Firewise communities are those that avoid potential fire emergencies by addressing and correcting fire hazards and preparing for the threat of a wildfire event (DCNR – BOF, 2019). Improved participation in this program would reduce the loss of lives, property and resources to wildfires by building and maintaining communities using practices that are compatible with their natural surroundings.

Similarly, only Cumberland County and Carlisle Barracks currently participate in the *StormReady* program, although all of the municipalities would benefit from participation. Dickinson College and Mechanicsburg Borough are *StormReady* Supporters. Furthermore, none of the municipalities in Cumberland County have adopted a Continuity of Operations Plan, and only three currently have a Disaster Recovery Plan in place.

5.2.5. Plan Integration

During the planning process of the 2014 and the 2020 HMP, all municipalities were required through plan adoption to review existing zoning ordinances, floodplain ordinances, land-use ordinances and building codes to incorporate findings of the HMP and evaluate whether local planning tools adequately addressed risk assessment results (2014 Action 30 and 2020 Actions

56-59). Based on the results of these evaluations, communities could, as feasible and appropriate, revise existing local planning and regulatory tools to address local vulnerability to the high and moderate risk hazards identified in this plan.

Integrating hazard mitigation into the comprehensive plan helps to guide the community's development in a way that does not lead to increased hazard vulnerability. For instance, future development can be guided away from areas with known hazards, and design standards to withstand potential hazards can be created for new or improved construction. Furthermore, comprehensive plans promote sound land use and regional cooperation among local governments to address planning issues. These plans serve as the official policy guide for influencing the location, type and extent of future development by establishing the basis for decision-making and review processes on zoning matters, subdivision and land development, land uses, public facilities and housing needs over time.

The existing countywide Comprehensive Plan for Cumberland County was adopted in 2017. In addition, all but one municipality (the Borough of Newburg) have adopted local comprehensive plans. County governments are required by law to adopt a comprehensive plan, while local municipalities may do so at their option. Table 5.2-3 shows several Actions from the 2020 Hazard Mitigation Plan that considers strategies found in the 2017 Cumberland County Comprehensive Plan. The 2017 Comprehensive Plan was referenced for the 2020 HMP Action items. Future comprehensive plan updates and improvements will continue to consider HMP findings.

Table 5.2-3: Cumberland County 2017 Comprehensive Plan and 2020 HMP Strategies and Action Items.

Planning Theme	2017 Cumberland County Comprehensive Plan Strategies	2020 Hazard Mitigation Plan Action Item
Natural Resource Protection	Conserve Page 8, Objective 4 Strategy A: Partner with FEMA to update floodplain maps and studies on a regular basis.	Goal 1, Action Item 11: Assist all municipalities in updating floodplain management regulations that meet or exceed minimum standards in the NFIP.
HMP Implementation	Conserve Page 8, Objective 4, Strategey C: Maintain and implement the Cumberland County HMP	Goal 3, Action Item 60: Conduct annual HMP meetings to review implementation progress
Education and Outreach	Conserve Page 8, Objective 5, Strategy A: Conduct educational workshops and training	Goal 3, Action Item 58: Provide technical assistance/training to municipal EMCs/FPMs who have no or limited experience with floodplains
Growth and Development	Grow Page 9, Objective 2, Strategy B: Encourage innovative planning techniques and incentives that direct development away from important environmental features.	Goal 1, Action Item 11: Assist all municipalities in updating floodplain management regulations that meet or exceed minimum standards in the NFIP.

Table 5.2-3: Cumberland County 2017 Comprehensive Plan and 2020 HMP Strategies and Action Items.		
Planning Theme	**2017 Cumberland County Comprehensive Plan Strategies**	**2020 Hazard Mitigation Plan Action Item**
Emergency Operations Center	Grow Page 18, Objective 2, Strategy B: Maintain the County Emergency Operations Center	Goal 2, Action Item 53: Continue implementation of an early warning or alert systems that utilize cloud-based (IPAWS, Wireless Emergency Alerts) communications technologies to distribute information to the public during emergencies.
Hazardous Material Response	Grow Page 18, Objective 2, Strategy C: Respond and mitigate the impact of hazardous materials release and other community risk incidents	Goal 1, Action Item 28: Maintain emergency hazardous materials response capabilities via certified team and continue to offer training to first responders.
Emergency Services Staff Training	Grow Page 19, Objective 2, Strategy D: Train emergency first responders and special teams.	Goal 2, Action Item 52: Continue to participate in the South Central Task Force activities, including training and planning activities.
Transportation Improvement	Connect Page 6, Objective 4, Strategy A: Identify transportation projects throughout Cumberland County for inclusion on the HATS Regional Transportation Plan and Transportation Improvement Plan.	Goal 1, Action Item 38: Identify and pursue funding for transportation projects through participation in the Harrisburg Area Transportation Study's highway, bridge and railway planning initiatives.
Federal Coordination	Connect Page 10, Objective 1, Strategy B: Encourage regular coordination with federal and state agencies.	Goal 3, Action Item 60: Conduct annual HMP meetings to review implementation progress.

As discussed in Section 4.3.17.1 of the HMP, Lower Allen Township provides an example of how subdivision and land development ordinances can be developed to mitigate hazards - in this case utility interruption. Section 192-58 of the Lower Allen Township ordinance regulates landscape design and cites that only trees that will not interfere with overhead lines may be planted (ecode360, 2019).

6. Mitigation Strategy

6.1 Update Process Summary

The mitigation techniques for Cumberland County were revised in the 2014 HMP per FEMA's Local Mitigation Handbook (March 2013) and PEMA's Standard Operating Guide (October 2013) (see Section 6.3). Table 6.1-1 includes a list of the goals and objectives provided in the 2014 HMP. The goals, objectives and actions in the 2020 HMP have been completely re-formatted to better reflect actual visions, implementation steps and measurable actions. The 2020 goals, objectives and actions are summarized in Table 6.2-1.

The following definitions based on FEMA's *State and Local Mitigation Planning How-To Guide* were used:

- *Goals* are general guidelines that explain the Commonwealth would like to achieve. They are usually broad policy-type statements, long term, and represent global visions.
- *Objectives* define specific and measureable strategies or implementation steps that must be implemented in order to attain identified goals.
- *Mitigation Actions* are more specific than objectives, and have identified responsible parties, timeframes, and potential funding sources. They are the specific actions to achieve goals and objectives.

There were 4 goals and 22 objectives identified in the 2014 Cumberland County Hazard Mitigation Plan. A list of these goals and objectives is included in Table 6.1-1. The proposed changes in the 2020 HMP were based on responses received from communities to the *Action and Goal Progress Worksheet* and comments received from county officials. Municipal officials were invited to provide feedback on the proposed 2020 goals and objectives via live meeting announcement, email, webinar announcement, and phone call. Appendix D includes a summary of responses to the *Action and Goal Progress Worksheet*. The 2020 HMP goals, objectives and action items are all linked in the same table and each hazard is specifically identified on table 6.2-1.

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

Goal	Objective(s)
Goal 1: Reduce potential injury/death and damage to existing community assets due to the following hazards: dam failures, droughts, flooding, environmental hazards or hazardous material releases, nuclear incidents, pandemic incidents, power failures, subsidence and sinkholes, transportation	**Objective 1A:** Complete Emergency Action Plans for all high hazard dams in the County.
	Objective 1B: Improve the use of water conservation and burn ban restrictions during drought emergencies.
	Objective 1C: Address identified data limitations regarding lack of detailed information about individual structures located within areas susceptible to any of the listed hazards.
	Objective 1D: Identify critical facilities and at-risk populations, assess their vulnerability, and develop a comprehensive approach to reducing potential damages/injuries to critical facilities/populations.
	Objective 1E: Identify and evaluate strategies for repetitive-loss properties.
	Objective 1F: Provide public outreach/education regarding strategies (e.g. flood-proofing) for property owners in the 100-year floodplain.
	Objective 1G: Evaluate potential contamination of drinking water sources along transportation corridors.

Table 6.1-1: List of 2014 mitigation strategy goals and objectives.	
Goal	**Objective(s)**
accidents, terrorism, urban fires, wildfires, windstorms and tornadoes, and winter storms.	**Objective 1H:** Reduce outage time during significant power failures.
	Objective 1I: Improve identification of areas prone to significant subsidence events.
	Objective 1J: Enhance public awareness of the potential impacts of subsidence hazards.
	Objective 1K: Enhance planning efforts to account for increased railway traffic throughout the County.
	Objective 1L: Improve understanding and identification of structures vulnerable to significant urban fires.
	Objective 1M: Evaluate communities that require warning systems and storm shelters.
Goal 2: Promote disaster-resistant future development.	**Objective 2A:** Assess the adequacy of municipal zoning/land-use/floodplain ordinances and building-code implementation.
	Objective 2B: Encourage and facilitate the development or revision of comprehensive plans and zoning/land-use/floodplain ordinances to limit development in high-hazard areas.
	Objective 2C: Provide adequate and consistent enforcement of ordinances and codes within and between jurisdictions.
Goal 3: Promote hazard mitigation as a public value in recognition of its importance to the health, safety and welfare of the population.	**Objective 3A:** Provide public education to increase awareness of hazards and opportunities for mitigation.
	Objective 3B: Promote partnerships between the municipalities and the County to continue to develop a County-wide approach to identifying and implementing mitigation actions.
	Objective 3C: Continue the promotion of disaster resistance in the business community via the hazard mitigation planning initiative.
Goal 4: Improve response and recovery capabilities.	**Objective 4A:** Improve adequacy, efficiency, and planning efforts for response measures needed in the event of a significant hazard.
	Objective 4B: Increase awareness by residents (i.e., through public outreach/education) of actions to take during an emergency.
	Objective 4C: Enhance response capability of County and municipal fire, police and emergency medical services personnel to special populations.

Actions provide more detailed descriptions of specific work tasks to help the County and its municipalities achieve prescribed goals and objectives. There were 31 actions identified in the 2014 Cumberland County Hazard Mitigation Plan. Members of the HMSC met annually to review the actions. In 2018, the HMSC shifted its focus to begin working on the 2020 Updated HMP. A list of these actions as well as a review and summary of their progress is included in Table 6.1-2.

Table 6.1-2: List of 2014 Mitigation Action items and Review.		
Action Number	**Action Item**	**Review**
1	Participate in the development and continued update of Emergency Action Plans.	• The Municipal plan is updated every 2 years. The Department of Public Safety monitors municipalities that are out of compliance. • County plan was updated in 2017.

Table 6.1-2: List of 2014 Mitigation Action items and Review.		
Action Number	**Action Item**	**Review**
2	Form a drought emergency working group to resolve water conservation enforcement issues.	In lieu of forming a separate, duplicative group, the Planning Department participated in SRBC stakeholder meetings focused on water quantity and quality in the region.
3	Issue countywide "advisory" burn bans.	None issued. The Department of Public Safety issued red flag warnings during dry periods.
4	Update and provide more detail to the countywide downstream users inventory.	We received notices from end users and summary information is kept on file with the Department of Public Safety.
5	Explore ways for the MS4 communities in Cumberland County to consolidate efforts to meet MS4 requirements.	The Planning Department coordinated efforts of the MS4 communities in the county to achieve efficient permit compliance.
6	Encourage municipalities to incorporate well-head protection provisions into municipal subdivision and land development ordinances.	South Middleton Township updated its wellhead protection district in response to a proposed gas station. The County Planning Department recommended approval of the amendment.
7	Acquire more detailed structure information.	In 2017, Cumberland County GIS developed maps to indicate structures that will be impacted during various flood stages.
8	Develop Flood Intensity Indicators document.	In 2017, Cumberland County GIS developed maps to indicate structures that will be impacted during various flood stages. The Department of Public Safety in Carlisle has a National Weather Service certified weather station that will help to predict flood intensity.
9	Expand the role of the County's Local Emergency Planning Committee from hazardous materials planning role to an all-hazards planning role.	All hazards information is discussed during LEPC meetings as appropriate and relevant.
10	Continue participation in the Interagency Working Group.	The Department of Public Safety continued participation with IWG.
11	Develop flood mitigation project proposals which are eligible for state and federal mitigation grant funding programs.	The Planning Department distributed materials to municipal partners regarding available funding for projects listed in the HMP. Municipalities chose not to pursue funding.
12	Perform public outreach activities that promote reduction in the number of Repetitive Loss structures.	The Planning Department distributed a list of RLP and SRLP to municipalities for review and potential buyout consideration.
13	Identify properties in the community at high risk of flooding for purposes of property protection.	No action taken.
14	Participate in the NOAA National Weather Service Ice Observer Program.	No action taken.
15	Update Annex E regularly and coordinate with state and federal counterparts on radiological emergency response.	• Federally evaluated TMI exercise in 2017 with no deficiencies noted. • March 2017 – Emergency Action Level binders distributed to risk municipalities.

Table 6.1-2: List of 2014 Mitigation Action items and Review.		
Action Number	**Action Item**	**Review**
16	Provide assistance as requested in the development of Annex A.	No activity from the state on Annex A to date.
17	Identify point of dispensing sites.	Three sites identified and communicated with Department of Health and coordinated with the various regions of the county.
18	Implement full disclosure of sinkhole hazards.	The Planning Department reviewed 180 subdivision and land development plans in 2016. The Planning Department staff offered sinkhole related comments as appropriate.
19	Begin inventorying future "significant" sinkhole events.	None noted.
20	Participate in the South-Central Task Force.	The Department of Public Safety continues participating in the Task Force through multiple meetings per month.
21	Coordinate with state and federal agencies on potential mitigation actions for terrorist activities.	• The Department of Public Safety coordinated with PA Criminal Intelligence Center • The Department of Public Safety coordinated locally with the Carlisle Barracks intelligence officer.
22	Expand participation in the StormReady Program.	• Renewed county participation in 2015. • Carlisle Barracks and Dickinson College are certified in the StormReady Program.
23	Develop a countywide Traffic Management Plan.	• County GIS has applied unique intersection numbers to all intersections in the County to assist and coordinate traffic management efforts. • Countywide Traffic Management SOPs have been developed. • Regional 8-county traffic incident management guidelines have been developed with PennDOT and the PA Turnpike.
24	Develop a countywide Railway Management Plan.	DPS offered training to first responders for crude oil unit trains from 2015-present.
25	Identify tax-exempt properties and update missing structural information.	No action taken.
26	Assist with coordination between County residents and utility companies on critical outage events.	• The Department of Public Safety provides outage reporting portals and has identified critical facilities to be on the priority restoration list. • Provided social media outreach during outage events.
27	Expand participation in the Firewise Program.	No action taken.
28	Participate in winter storm exercises.	The Department of Public Safety conducted 2 winter storm exercises in 2016. Both exercises were statewide.
29	Coordinate with the Pennsylvania Department of Transportation on winter storm response.	The Department of Public Safety coordinated with the County Manager during winter partnership meetings.

Table 6.1-2: List of 2014 Mitigation Action items and Review.		
Action Number	**Action Item**	**Review**
30	Review and update existing ordinances and other regulatory or planning mechanisms with respect to findings included in the 2014 HMP.	• The Planning Department Integrated floodplain management provisions into Mt. Holly Springs Borough ordinance. • The Planning Department is Partnering with FEMA on the RISKMap project and distributing information to municipal partners.
31	Update Geographic Information Systems data for all critical or vulnerable facilities and distribute maps of facility locations.	• All public safety layers are currently mapped (including hydrants, hospital, healthcare, schools, mass care centers, etc). • In 2016 the Cumberland County GIS Department updated layers based upon data in the Notification and Resource Manual (NARM).

6.2 Mitigation Goals and Objectives

The 2014 goals and objectives have been revised for the 2020 HMP and included in Table 6.2-1. The new format includes identification of specific hazards within at least one objective. Further, the 2020 actions are measurable, achievable and focus on activities that will likely see implementation versus lofty, unfeasible initiatives that are not likely to occur. At least one action item was established for each hazard in Cumberland County. More than one action is identified for several hazards. Each mitigation action is intended to address one or more of the goals and objectives. Each community has at least one mitigation action in the 2020 Mitigation Strategy. Mitigation projects were also added to the list of action items and included in Appendix I. Table 6.2-1 shows the mitigation goals, objectives and action items established for the 2020 HMP. Appendix J includes a summary of responses to the *Action and Goal Progress Worksheet*.

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
Develop advanced preparations for potential civil disturbance incidents.	1. Evaluate requests to use county facilities for public gatherings and coordinate with law enforcement as needed to secure events.	Cumberland County, All municipalities	• Structure and Infrastructure • Education and Awareness	Cumberland County Department of Public Safety	County staff time.
	2. Partner with Lower Allen Township, the PSP, and the Camp Hill Prison to keep emergency response plans current.	Cumberland County, Lower Allen, Upper Allen, Mechanicsburg, Shiremanstown, Hampden, Camp Hill, Lemoyne, York County	• Local Plans and Regulations • Education and Awareness	Cumberland County Department of Public Safety	County staff time.
Reduce the impacts of drought through capital investments and enhanced planning.	3. Support municipal efforts to fund investments in water and stormwater collection and delivery systems.	Cumberland County, All municipalities	• Natural Systems Protection • Education and Awareness	Cumberland County Planning Department	County staff time.
	4. Integrate green infrastructure concepts into municipal zoning and subdivision ordinances.	Cumberland County, All municipalities	• Local Plans and Regulations • Structure and Infrastructure • Natural Systems Protection • Education and Awareness	Cumberland County Planning Department	TBD, depending upon extent of update.
	5. Develop a water supply study in coordination with the Susquehanna River Basin Commission and county municipalities.	Cumberland County, All municipalities	• Local Plans and Regulations • Structure and Infrastructure	Cumberland County Planning Department	$50K-$100K

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
			• Education and Awareness		
Decrease ongoing exposure to dam failure and improve emergency preparedness.	6. Monitor and track new development in inundation areas	Cumberland County and local municipalities downstream of high-hazard dams, including South Middleton, North Middleton, Cook, Lower Frankford, Dickinson, Mount Holly Springs, West Pennsboro, and Monroe	• Education and Awareness • Structure and Infrastructure	Cumberland County Planning Department	County staff time.
	7. Continue to participate in EAP meetings with dam owners. Recommend that dam owners update the Dam Failure Emergency Action Plan.	Cumberland County and local municipalities downstream of high-hazard dams, including South Middleton, North Middleton, Cook, Lower Frankford, Dickinson, Mount Holly Springs, West Pennsboro, and Monroe	• Education and Awareness • Local Plans and Regulations	Cumberland County Department of Public Safety	County staff time.
Protect property from flooding events through proactive planning, improved	8. Host a countywide workshop to encourage participation in the Community Rating System program to reduce NFIP rates.	Cumberland County, All municipalities	• Education and Awareness	Cumberland County Planning Department	County staff time.

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
land use and capital investment.	9. Maintain 100% municipal participation in the NFIP.	Cumberland County, All municipalities	• Local Plans and Regulations • Education and Awareness	Cumberland County Planning Department	TBD, dependent upon level of municipal compliance work.
	10. Conduct outreach to municipalities and owners of RLP and SRLP to inform them of buyout options, elevation and mitigation reconstruction strategies.	Cumberland County, Camp Hill, Carlisle, Cooke, Dickinson, East Pennsboro, Hampden, Hopewell, Lemoyne, Lower Allen, Lower Frankford, Lower Mifflin, Mechanicsburg, Middlesex, Monroe, Mount Holly Springs, New Cumberland, Newburg, Newville, North Middleton, North Newton, Penn, Shippensburg Township, Shippensburg Borough, Shiremanstown, Silver Spring, South Middleton, South Newton, Southampton, Upper Allen, Upper Frankford, Upper Mifflin, West Pennsboro, and Wormleysburg	• Education and Awareness	Cumberland County Planning Department	County staff time.

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
	11. Assist all 33 municipalities in updating floodplain management regulations to meet or exceed the minimum standards required by the NFIP.	Cumberland County, All municipalities	• Local Plans and Regulations • Education and Awareness	Cumberland County Planning Department	$5K-$15 per municipality depending upon level of update.
	12. Monitor and remove debris jams, as applicable, on the Yellow Breeches Creek and Conodoguinet Creek in partnership with municipal and state governments and private property owners.	Cumberland County, All municipalities	• Natural Systems Protection	Cumberland County Planning Department, Municipalities	TBD, depending upon size of jam.
	13. Collect current flood elevation and extent data to support ongoing development of a predictive flood intensity indicator model for the county.	Cumberland County, Camp Hill, Carlisle, Cooke, Dickinson, East Pennsboro, Hampden, Hopewell, Lemoyne, Lower Allen, Lower Frankford, Lower Mifflin, Mechanicsburg, Middlesex, Monroe, Mount Holly Springs, New Cumberland, Newburg, Newville, North Middleton, North Newton, Penn, Shippensburg Township, Shippensburg Borough, Shiremanstown, Silver Spring, South Middleton, South Newton, Southampton, Upper Allen,	• Education and Awareness	Cumberland County Planning Department, Cumberland County GIS Department	County staff time.

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
		Upper Frankford, Upper Mifflin, West Pennsboro, and Wormleysburg			
	14. Collect relevant structure information through the subdivision/land development process and recording processes to assist in determining flooding impacts to structures.	Cumberland County, Camp Hill, Carlisle, Cooke, Dickinson, East Pennsboro, Hampden, Hopewell, Lemoyne, Lower Allen, Lower Frankford, Lower Mifflin, Mechanicsburg, Middlesex, Monroe, Mount Holly Springs, New Cumberland, Newburg, Newville, North Middleton, North Newton, Penn, Shippensburg Township, Shippensburg Borough, Shiremanstown, Silver Spring, South Middleton, South Newton, Southampton, Upper Allen, Upper Frankford, Upper Mifflin, West Pennsboro, and Wormleysburg	• Local Plans and Regulations • Structure and Infrastructure • Education and Awareness	Cumberland County Planning Department, Cumberland County GIS Department	County staff time.
	15. Recommend that municipalities exclude or add foundation inspection requirements for mobile homes in a Special Flood Hazard	Cumberland County	• Local Plans and Regulations • Education	Cumberland County Planning,	County Staff Time

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
	Area.		and Awareness	Municipalities	
	16. Zion Bridge Project, Widen Bridge over the stream and make 2 lanes in Lower Frankford Township	Cumberland County, Lower Frankford	• Structure and Infrastructure	Lower Frankford Township, Cumberland County Planning Department	$387,715.00
	17. Opossum Creek Culvert Project, replacement of culvert into a larger opening to handle flooding. Lower Frankford Township	Cumberland County, Lower Frankford	• Structure and Infrastructure	Lower Frankford Township, Cumberland County Planning Department	$210,939.00
	18. Cloverdale Run Stormwater Drainage Project, replacement of under-sized and deteriorated drainage pipe (110 lf), headwall and inlet. Rich Street and Sharp Street, Newville Borough	Cumberland County, Newville	• Structure and Infrastructure	Newville Borough, Cumberland County Planning Department	$65,775.00
	19. Cloverdale Run Stormwater Drainage Project, installation of new 36” elliptical RCP and headwall, swale cleaning and bank stabilization Broad Street, Newville	Cumberland County, Newville	• Structure and Infrastructure	Newville Borough, Cumberland County	$57,670.00

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
	Borough			Planning Department	
	20. Cloverdale Run Stormwater Drainage Project, demolition and removal of an existing box culvert and new pipe installation Pennsylvania Avenue Box Culvert, Newville Borough	Cumberland County, Newville	• Structure and Infrastructure	Newville Borough, Cumberland County Planning Department	$82,900.00
	21. Cloverdale Run Stormwater Drainage, replacement of box culvert and installation of pipe. Parsonage Street Box Culvert, Newville Borough	Cumberland County, Newville	• Structure and Infrastructure	Newville Borough, Cumberland County Planning Department	$38,900.00
	22. Cloverdale Run Stormwater Drainage, improvement of impoundment basin, headwall improvement and safety fencing. Newville Community Park headwall and retention pond, Newville Borough	Cumberland County, Newville	• Structure and Infrastructure	Newville Borough, Cumberland County Planning Department	$60,000.00
	23. Cloverdale Run Stormwater Drainage, box culvert and pipe installation with 3 stormwater inlets. North Corporation Street Box Culvert, Newville Borough	Cumberland County, Newville	• Structure and Infrastructure	Newville Borough, Cumberland County Planning	$83,100.00

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
				Department	
	24. Cloverdale Run Stormwater Drainage, box culvert replacement, new pipe, debris screen and rip rap. Cove Avenue Box Culvert, Newville Borough	Cumberland County, Newville	• Structure and Infrastructure	Newville Borough, Cumberland County Planning Department	$975,000.00
	25. Flood Inundation Mapping	Cumberland County	• Education and Awareness	Cumberland County GIS Department	TBD
	26. Broad Street Drainage Improvements. Installation of stormwater collection, implementation of BMPs.	Cumberland County, Mechanicsburg	• Structure and Infrastructure	Mechanicsburg Borough, Cumberland County Planning Department	$2,278,410.02
	27. Pine Road Flooding. Property purchase, demolition of house and stormwater control.	Cumberland County, South Middleton	• Structure and Infrastructure	South Middleton Township, Cumberland County Planning Department	$120,000
	28. Sewer Plant Grinder Pump Replacement	Cumberland County,	• Structure and	Mount Holly	$90,000

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
		Mount Holly Springs Borough	Infrastructure	Springs Borough, Cumberland County Planning Department	
Design infrastructure to withstand earthquake events.	29. Conduct seismic analyses for new or rehabilitated transportation infrastructure in the County.	Cumberland County, All municipalities	• Structure and Infrastructure • Education and Awareness	Cumberland County Department of Public Safety, Municipalities	$15K - $20K depending upon bridge.
Prevent and limit the impacts of environmental hazards through proactive planning and training.	30. Maintain emergency hazardous materials response capabilities via certified team and continue to offer training to first responders.	Cumberland County, All municipalities	• Education and Awareness	Cumberland County Department of Public Safety	County staff time.
	31. Maintain and implement the Cumberland County Hazardous Materials Commodity Flow Study.	Cumberland County, All municipalities	• Local Plans and Regulations • Education and Awareness	Cumberland County Department of Public Safety	$10K -$15K per update.
	32. Encourage municipalities to prohibit SARA facilities in wellhead or source water protection areas.	Cumberland County, All municipalities	• Local Plans and Regulations • Structure and Infrastructure • Natural Systems Protection • Education	Cumberland County Department of Public Safety, Cumberland County Planning Department	TBD, depending upon level of update required in municipal ordinances.

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
			and Awareness		
Monitor the decommissioning of TMI and update nuclear incident preparedness accordingly.	33. Meet with TMI officials on a quarterly basis to receive decommissioning updates.	Cumberland County	• Structure and Infrastructure • Education and Awareness	Cumberland County Department of Public Safety	County staff time.
	34. Continue to Participate in radiological emergency response training and exercises.	Cumberland County	• Education and Awareness	Cumberland County Department of Public Safety	County staff time.
Eliminate or slow the spread of pandemic diseases through monitoring, training, and active response.	35. Continue to collaborate with Pa. Dept. of Health for mass distribution of medical countermeasures preparedness efforts.	Cumberland County	• Education and Awareness	Cumberland County Department of Public Safety	County staff time.
	36. Establish a core County team to continue participation in pandemic (including the Coronavirus in 2020) exercises, education, preparedness, and response.	Cumberland County	• Education and Awareness	Cumberland County Department of Public Safety	County staff time.
	37. Monitor mosquito populations and conduct spraying programs to reduce vulnerability to vector borne diseases.	Cumberland County	• Education and Awareness	Cumberland County Planning Department	$200K per year.
Avoid sinkholes through early detection and	38. Inventory sinkhole events as part of HMP GIS system.	Cumberland County, All municipalities	• Natural Systems Protection • Education	Cumberland County GIS Department	County staff time.

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
occurrence monitoring.			and Awareness		
	39. Integrate sinkhole detection requirements into municipal subdivision and development requirements	Cumberland County, Camp Hill, Carlisle, Cooke, Dickinson, East Pennsboro, Hampden, Hopewell, Lemoyne, Lower Allen, Lower Frankford, Lower Mifflin, Mechanicsburg, Middlesex, Monroe, Mount Holly Springs, New Cumberland, North Middleton, North Newton, Penn, Shippensburg Township, Shippensburg Borough, Shiremanstown, Silver Spring, South Middleton, South Newton, Southampton, Upper Allen, Upper Frankford, Upper Mifflin, and West Pennsboro	• Local Plans and Regulations • Education and Awareness	Cumberland County Planning Department	TBD, depending upon level of ordinance update required.
Decrease the number and severity of transportation accidents through long range planning	40. Identify and pursue funding for transportation projects through participation in the Harrisburg Area Transportation Study's highway, bridge, and railway planning initiatives.	Cumberland County, All municipalities	• Structure and Infrastructure • Education and Outreach	Cumberland County Planning Department	County staff time, cost of transportation improvements variable.

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
and capital investment in the transportation system.	41. Implement the Cumberland County Bridge Capital Improvement Plan.	Cumberland County, All municipalities	• Structure and Infrastructure • Local Plans and Regulations	Cumberland County Planning Department	$40M total.
	42. Evaluate using the county's $5 Local Use Fee to support local and regional transportation projects.	Cumberland County, All municipalities	• Structure and Infrastructure • Education and Outreach	Cumberland County Planning Department	$1.2M per year.
Recognize and/or respond to acts of terrorism.	43. Continue to maintain relationships with local, state and federal partners to sustain awareness and/or detection of threat capabilities.	Cumberland County, All municipalities	• Education and Awareness	Cumberland County Department of Public Safety	County staff time.
Proactively prepare residents for tornadoes, hurricanes, and other windstorm events.	44. Maintain StormReady Certification via NWS. Continue to support and encourage municipal participation of the program.	Cumberland County, All municipalities	• Education and Awareness	Cumberland County Department of Public Safety	TBD, depending upon the municipality and work necessary to achieve StormReady status.
Implement urban fire prevention and suppression activities.	45. Continue to support the ARC efforts on installation of residential detectors; Promote residents usage of fire extinguishers.	Cumberland County, All municipalities	• Local Plans and Regulations • Education and Awareness	Cumberland County Department of Public Safety	County staff time, under $20 per detector/extinguinser.
	46. Encourage municipal participation in the NFPA Firewise program.	Cumberland County, All municipalities	• Education and Awareness	Cumberland County Department of Public Safety	TBD, depending upon the municipality and work necessary to achieve Firewise

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
					status.
Minimize and prevent utility disruption through improved development standards and provider coordination.	47. Use municipal subdivision and land development ordinances to protect above ground infrastructure from trees through setbacks and easements.	Cumberland County, All municipalities	• Local Plans and Regulations • Structure and Infrastructure	Cumberland County Planning Department	TBD, depending upon level of update required.
	48. Require underground utilities through municipal subdivision and land development regulations.	Cumberland County, All municipalities	• Local Plans and Regulations • Structure and Infrastructure	Cumberland County Planning Department	TBD, depending upon level of update required.
	49. Coordinate with utility providers to resolve utility issues during outage events.	Cumberland County, All municipalities	• Structure and Infrastructure	Cumberland County Department of Public Safety, Cumberland County Planning Department	County staff time.
Decrease susceptibility to wildfire on South and North Mountain.	50. Promote the NFPA's Firewise Program with appropriate municipalities.	Cumberland County and local municipalities considered at high risk from wildfire hazards including Southampton, South Newton, Cooke, Dickinson, South Middleton, Monroe, Penn,	• Natural Systems Protection • Education and Awareness	Cumberland County Department of Public Safety	County staff time.

Table 6.2-1: Goal #1: Reduce potential injury, death, and damage to community assets due to natural and human hazards threatening Cumberland County.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
		Upper Mifflin, Hopewell, Lower Mifflin, Lower Frankford, North Middleton, Middlesex, Silver Spring, Hampden, East Pennsboro and Dickinson.			
Improve safety during winter storm events through planning activities with municipal and state partners.	51. Continue to Participate in statewide severe storm exercises with PEMA as appropriate.	Cumberland County, All municipalities	• Education and Awareness	Cumberland County Department of Public Safety	County staff time.
	52. Continue to participate in PennDOT Winter Preparedness Stakeholder meetings and maintain partnership.	Cumberland County, All municipalities	• Education and Awareness	Cumberland County Department of Public Safety	County staff time.

Table 6.2-1: Goal #2: Improve hazard awareness and response through communication and coordination with residents, governmental agencies, and other hazard mitigation stakeholders.

Objective	Action Items	Community	Category	Lead Agency /Department	Cost
Enhance emergency management warning and response capabilities and procedures to better protect the public.	53. Continue to work with ARC to identify shelters for short-term evacuation(s).	Cumberland County, All municipalities	• Education and Awareness	Cumberland County Department of Public Safety	County staff time.
	54. Continue to Participate in the South Central Task Force activities, including training and planning activities.	Cumberland County, All municipalities	• Education and Awareness	Cumberland County Department of Public Safety	County staff time.

Table 6.2-1: Goal #2: Improve hazard awareness and response through communication and coordination with residents, governmental agencies, and other hazard mitigation stakeholders.					
Objective	Action Items	Community	Category	Lead Agency /Department	Cost
	55. Continue implementation of an early warning or alert systems that utilize cloud-based (IPAWS, Wireless Emergency Alerts) communications technologies to distribute pertinent information to the public during emergencies.	Cumberland County, All municipalities	• Education and Awareness • Structure and Infrastructure	Cumberland County Department of Public Safety	$50K
Maintain current, relevant data on hazards facing the county.	56. Maintain the Cumberland County Hazard Mitigation GIS story map online.	Cumberland County	• Local Plans and Regulations	Cumberland County GIS Department	County staff time.
	57. Monitor the impacts of climate change on the frequency and severity of hazard impacts in the county.	Cumberland County	• Education and Awareness	Cumberland County Planning Department, Cumberland County Department of Public Safety	$20K-$50K for plan development and additional county staff time.
Coordinate communication among municipal officials on HMP issues.	58. Continue to coordinate quarterly meetings/training with the local emergency management and related officials.	Cumberland County, All municipalities	• Education and Awareness	Cumberland County Department of Public Safety	County staff time.
	59. Provide HMP related agenda items for Municipal Advisory Board meetings	Cumberland County, All municipalities	• Education and Awareness	Cumberland County Department of Public Safety	County staff time.

Table 6.2-1: Goal #3: Improve HMP implementation.					
Objective	Action Items	Community	Category	Lead Agency /Department	Cost

Table 6.2-1: Goal #3: Improve HMP implementation.					
Objective	Action Items	Community	Category	Lead Agency /Department	Cost
Encourage and support implementation of the HMP by municipal partners	60. Provide technical assistance/training to municipal EMCs/FPMs who have no or limited experience with floodplains.	Cumberland County, All municipalities	• Education and Outreach	Cumberland County Planning Department	County staff time.
	61. Assist municipalities to identify and submit grant applications for federal, state, and county programs that support HMP goals, objectives, and actions.	Cumberland County, All municipalities	• Education and Outreach	Cumberland County Planning Department	County staff time.
Monitor HMP implementation and adjust priorities as needed.	62. Conduct annual HMP meetings to review implementation progress.	Cumberland County, All municipalities	• Education and Outreach	Cumberland County Planning Department, Cumberland County Department of Public Safety, Cumberland County GIS Department	County staff time.

6.3 Identification and Analysis of Mitigation Techniques

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

- **Local plans and regulations:** Government authorities, policies, or codes that influence the way land and buildings are developed and built. Examples include, but are not limited to: comprehensive plans, subdivision regulations, building codes and enforcement, and NFIP and CRS.

- **Structure and infrastructure**: Modifying existing structures and infrastructure or constructing new structures to reduce hazard vulnerability. Examples include, but are not limited to: acquisition and elevation of structures in flood prone areas, utility undergrounding, structural retrofits, floodwalls and retaining walls, detention and retention structures, and culverts.

- **Natural systems protection:** Actions that minimize damage and losses and also preserve or restore the functions of natural systems. Examples include, but are not limited to: sediment and erosion control, stream corridor restoration, forest management, conservation easements, and wetland restoration and preservation.

- **Education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate the hazards, and may also include participation in national programs. Examples include, but are not limited to: radio or television spots, websites with maps and information, provide information and training, NFIP outreach, StormReady, and Firewise Communities.

Table 6.2-1 provides a column identifying the mitigation techniques used for each hazard in the County and specific actions associated with these techniques. Mitigation projects are included in the table and in Appendix I.

6.4 Mitigation Action Plan

The 2020 mitigation actions are based on comments received from county officials and responses received from communities to the *Action and Goal Progress Worksheet*. Because Cumberland County acts as a central repository for such information, county officials updated the list of actions by indicating progress made and whether any actions were being added, canceled, or deferred. Municipal officials were then invited to provide feedback on the proposed 2020 actions via live meeting announcement, email, webinar announcement, and phone call. Appendix J includes a summary of responses to the *Action and Goal Progress Worksheet*.

Table 6.2-1 includes 60 mitigation actions established for the 2020 Hazard Mitigation Plan, many of which will require substantial time commitments from staff at the County and local municipalities. Those that participated in the development of the 2020 HMP believe that each of these actions is attainable and could potentially be implemented over the next five-year cycle.

While most of these activities will be pursued over the next five years, the reality of limited time and resources requires the identification of high priority mitigation actions. Prioritization allows the individuals and organizations involved to focus their energies and ensure progress on mitigation activities. Evaluating mitigation actions involves judging each action against certain criteria to determine whether or not it can be executed. The feasibility of each mitigation action was evaluated using the ten evaluation criteria set forth in the Mitigation Action Evaluation methodology in PEMA's October 2013 Standard Operating Guide. The methodology solicits input on whether each action is highly effective or feasible and ineffective or not feasible for the criteria. These criteria are listed below and aid in determining the feasibility of implementing one action over another.

- **Life Safety:** Will the action be effective in promoting public safety?
- **Property Protection:** Will the action be effective in protecting public or private property?
- **Technical:** How effective will the action be in avoiding or reducing future losses?
- **Political:** Does the action have public and political support?
- **Legal:** Does the community have the authority to implement the proposed measure?
- **Environmental:** Will the action provide environmental benefits and will it comply with local, state and federal environmental regulations?
- **Social:** Will the action be acceptable by the community or will it cause any one segment of the population to be treated unfairly?
- **Administrative:** Is there adequate staffing and funding available to implement the action in a timely manner?
- **Local Champion**: Is there local support for the action to help ensure its completion?
- **Other Community Objectives**: Does the action address any current or future community objectives either through municipal planning or community goals?

To evaluate the mitigation actions, each action was identified as highly effective or feasible and ineffective or not feasible using the Mitigation Action Evaluation form. In order to evaluate and prioritize the mitigation actions, participants identified *favorable* and *less favorable* factors for each action. For each criterion, the prioritization methodology assigned a "+" if the action was highly effective or feasible, a "-" if the action was ineffective or not feasible, and a "N" if no benefit could be associated with the suggested action or the action was not applicable to the criteria. Results are included in Table 6.4-1. All actions received scores where their positive factors outweighed their negative factors.

Table 6.4-1: Mitigation Action Feasibility Evaluation.

Mitigation Actions		PA Steel Criteria Considerations (+) Highly Effective or Feasible (-) Ineffective or Not Feasible (N) Neutral or Not Applicable										
No.	**Name**	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	**Total Score**
1	Evaluate requests to use county facilities for public gatherings and coordinate with law enforcement as needed to secure events.	+	N	-	+	+	N	N	+	N	N	4 (+) 1 (-) 5 (N)
2	Partner with Lower Allen Township, the PSP, and the Camp Hill Prison to keep emergency response plans current.	+	+	N	+	+	N	N	+	N	N	5 (+) 0 (-) 5 (N)
3	Support municipal efforts to fund investments in water and stormwater collection and delivery systems.	+	+	N	-	+	+	-	+	N	+	6 (+) 2 (-) 2 (N)
4	Integrate green infrastructure concepts into municipal zoning and subdivision ordinances.	+	+	+	+	+	+	N	+	N	+	8 (+) 0 (-) 2 (N)
5	Develop a water supply study in coordination with the Susquehanna River Basin	+	-	N	+	+	+	N	-	N	+	5 (+) 2 (-) 3 (N)

Table 6.4-1: Mitigation Action Feasibility Evaluation.

Mitigation Actions		PA Steel Criteria Considerations (+) Highly Effective or Feasible (-) Ineffective or Not Feasible (N) Neutral or Not Applicable										
No.	**Name**	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	**Total Score**
	Commission and county municipalities.											
6	Monitor and track new development in inundation areas	+	+	+	+	+	+	N	-	-	N	7 (+) 1 (-) 2 (N)
7	Continue to participate in EAP meetings with dam owners. Recommend that dam owners update the Dam Failure Emergency Action Plan.	+	+	+	+	+	+	+	+	N	N	8 (+) 0 (-) 2 (N)
8	Host a countywide workshop to encourage participation in the Community Rating System program to reduce NFIP rates.	N	+	+	-	+	+	-	-	-	N	4 (+) 4 (-) 2 (N)
9	Maintain 100% municipal participation in the NFIP.	+	+	+	+	+	+	+	+	+	N	9 (+) 0 (-) 1 (N)
10	Conduct outreach to municipalities and owners of RLP and SRLP to inform them of buyout options,	+	+	+	-	+	+	N	-	N	N	5 (+) 2 (-) 3 (N)

Table 6.4-1: Mitigation Action Feasibility Evaluation.												
Mitigation Actions		***PA Steel Criteria Considerations***										
		(+) Highly Effective or Feasible				***(-) Ineffective or Not Feasible***				***(N) Neutral or Not Applicable***		
No.	**Name**	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	**Total Score**
	elevation and mitigation reconstruction strategies.											
11	Assist all 33 municipalities in updating floodplain management regulations to meet or exceed the minimum standards required by the NFIP.	+	+	+	+	+	+	+	+	+	+	10 (+) 0 (-) 0 (N)
12	Monitor and remove debris jams, as applicable, on the Yellow Breeches Creek and Conodoguinet Creek in partnership with municipal and state governments and private property owners.	+	+	N	+	-	+	+	-	-	N	5 (+) 3 (-) 2 (N)
13	Collect current flood elevation and extent data to support ongoing development of a predictive flood intensity indicator model for the county.	+	+	+	+	+	+	+	-	-	N	7 (+) 2 (-) 1 (N)

Table 6.4-1: Mitigation Action Feasibility Evaluation.												
Mitigation Actions		***PA Steel Criteria Considerations***										
		(+) Highly Effective or Feasible ***(-) Ineffective or Not Feasible*** ***(N) Neutral or Not Applicable***										
No.	**Name**	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	**Total Score**
14	Collect relevant structure information through the subdivision/land development process and recording processes to assist in determining flooding impacts to structures.	N	+	N	N	N	N	N	+	N	N	2 (+) 0 (-) 8 (N)
15	Recommend that municipalities exclude or add foundation inspection requirements for mobile homes in a Special Flood Hazard Area.	+	+	N	N	+	N	N	+	-	-	4(+) 2(-) 4(N)
16	Zion Bridge Project, Lower Frankford Township	+	+	+	+	+	+	N	-	+	+	8 (+) 1 (-) 1 (N)
17	Opossum Creek Culvert Project, Lower Frankford Township	+	+	+	+	+	+	N	-	+	+	8 (+) 1 (-) 1 (N)
18	Cloverdale Run Stormwater Drainage Project, Rich Street and Sharp Street, Newville Borough	+	+	+	+	+	+	N	-	+	+	8 (+) 1 (-) 1 (N))
19	Cloverdale Run Stormwater Drainage Project, Broad Street,	+	+	+	+	+	+	N	-	+	+	8 (+) 1 (-)

Table 6.4-1: Mitigation Action Feasibility Evaluation.

Mitigation Actions		PA Steel Criteria Considerations (+) Highly Effective or Feasible (-) Ineffective or Not Feasible (N) Neutral or Not Applicable										
No.	**Name**	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	**Total Score**
	Newville Borough											1 (N)
20	Cloverdale Run Stormwater Drainage Project, Pennsylvania Avenue Box Culvert, Newville Borough	+	+	+	+	+	+	N	-	+	+	8 (+) 1 (-) 1 (N)
21	Cloverdale Run Stormwater Drainage, Parsonage Street Box Culvert, Newville Borough	+	+	+	+	+	+	N	-	+	+	8 (+) 1 (-) 1 (N)
22	Cloverdale Run Stormwater Drainage, Newville Community Park headwall and retention pond, Newville Borough	+	+	+	+	+	+	N	-	+	+	8 (+) 1 (-) 1 (N)
23	Cloverdale Run Stormwater Drainage, North Corporation Street Box Culvert, Newville Borough	+	+	+	+	+	+	N	-	+	+	8 (+) 1 (-) 1 (N)
24	Cloverdale Run Stormwater Drainage, Cove Avenue Box Culvert, Newville Borough	+	+	+	+	+	+	N	-	+	+	8 (+) 1 (-) 1 (N)

Table 6.4-1: Mitigation Action Feasibility Evaluation.

Mitigation Actions		PA Steel Criteria Considerations (+) Highly Effective or Feasible (-) Ineffective or Not Feasible (N) Neutral or Not Applicable										
No.	**Name**	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	**Total Score**
25	Flood Inundation Mapping	+	+	+	N	+	N	N	-	-	N	4 (+) 2 (-) 4 (N)
26	Broad Street Drainage Improvements	+	+	+	+	+	+	N	-	+	+	8 (+) 1 (-) 1 (N)
27	Pine Road Flooding	+	+	+	+	+	+	N	-	+	+	8 (+) 1 (-) 1 (N)
28	Sewer Plant Grinder Pump Replacement	+	+	+	+	+	+	N	+	+	+	9 (+) 0 (-) 1 (N)
29	Conduct seismic analyses for new or rehabilitated transportation infrastructure in the County.	+	-	N	N	+	N	N	+	N	N	3 (+) 1 (-) 6 (N)
30	Maintain emergency hazardous materials response capabilities via certified team and continue to offer training to first responders.	+	+	+	+	+	+	N	+	N	N	7 (+) 0 (-) 3 (N)
31	Maintain and implement the Cumberland County Hazardous Materials Commodity Flow Study.	+	N	N	+	+	+	+	+	+	+	8 (+) 0 (-) 2 (N)

Table 6.4-1: Mitigation Action Feasibility Evaluation.												
Mitigation Actions		***PA Steel Criteria Considerations***										
		(+) Highly Effective or Feasible ***(-) Ineffective or Not Feasible*** ***(N) Neutral or Not Applicable***										
No.	**Name**	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	**Total Score**
32	Encourage municipalities to prohibit SARA facilities in wellhead or source water protection areas.	+	+	+	+	+	+	+	+	N	+	9 (+) 0 (-) 1 (N)
33	Meet with TMI officials on a quarterly basis to receive decommissioning updates.	+	N	N	+	+	+	N	+	N	N	5 (+) 0 (-) 5 (N)
34	Continue to Participate in radiological emergency response training and exercises.	+	N	N	+	+	+	N	+	N	N	5 (+) 0 (-) 5 (N)
35	Continue to collaborate with Pa. Dept. of Health for mass distribution of medical countermeasures preparedness efforts.	+	N	N	+	+	+	N	+	N	N	5 (+) 0 (-) 5 (N)
36	Establish a core County team to continue participation in pandemic (including the Coronavirus in 2020) exercises, education and preparedness.	+	N	+	+	+	N	+	+	N	N	6 (+) 0 (-) 4 (N)

Table 6.4-1: Mitigation Action Feasibility Evaluation.												
Mitigation Actions		***PA Steel Criteria Considerations***										
		(+) Highly Effective or Feasible ***(-) Ineffective or Not Feasible*** ***(N) Neutral or Not Applicable***										
No.	**Name**	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	**Total Score**
37	Monitor mosquito populations and conduct spraying programs to reduce vulnerability to vector borne diseases.	+	+	N	+	+	+	+	+	+	N	8 (+) 0 (-) 2 (N)
38	Inventory sinkhole events as part of HMP GIS system.	+	+	+	+	+	+	N	-	-	N	7 (+) 1 (-) 2 (N)
39	Integrate sinkhole detection requirements into municipal subdivision and development requirements	+	+	+	+	+	+	-	-	-	+	6 (+) 2 (-) 3 (N)
40	Identify and pursue funding for transportation projects through participation in the Harrisburg Area Transportation Study's highway, bridge, and railway planning initiatives.	+	N	+	+	+	N	+	+	+	+	8 (+) 0 (-) 2 (N)
41	Implement the Cumberland County Bridge Capital Improvement Plan.	+	N	+	+	+	N	+	+	+	+	8 (+) 0 (-) 2 (N)

Table 6.4-1: Mitigation Action Feasibility Evaluation.												
Mitigation Actions		***PA Steel Criteria Considerations***										
		(+) Highly Effective or Feasible ***(-) Ineffective or Not Feasible*** ***(N) Neutral or Not Applicable***										
No.	**Name**	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	**Total Score**
42	Evaluate using the county's $5 Local Use Fee to support local and regional transportation projects.	+	N	+	+	+	N	+	+	+	+	8 (+) 0 (-) 2 (N)
43	Continue to maintain relationships with local, state and federal partners to sustain awareness and/or detection of threat capabilities.	+	N	N	+	+	N	N	+	N	N	4 (+) 0 (-) 6 (N)
44	Maintain StormReady Certification via NWS. Continue to support and encourage municipal participation of the program.	+	N	+	-	+	N	N	-	-	N	3 (+) 3 (-) 4 (N)
45	Continue to support the ARC efforts on installation of residential detectors; Promote residents usage of fire extinguishers.	+	+	+	+	+	N	+	+	+	N	8 (+) 0 (-) 2 (N)
46	Encourage municipal participation in the NFPA Firewise program.	+	+	+	-	+	+	N	-	-	N	5 (+) 3 (-) 2 (N)

Table 6.4-1: Mitigation Action Feasibility Evaluation.												
Mitigation Actions		***PA Steel Criteria Considerations***										
		(+) Highly Effective or Feasible ***(-) Ineffective or Not Feasible*** ***(N) Neutral or Not Applicable***										
No.	**Name**	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	**Total Score**
47	Use municipal subdivision and land development ordinances to protect above ground infrastructure from trees through setbacks and easements.	N	+	+	N	+	N	N	+	N	+	4 (+) 1 (-) 5 (N)
48	Require underground utilities through municipal subdivision and land development regulations.	+	N	+	+	+	N	+	+	N	+	7 (+) 0 (-) 3 (N)
49	Coordinate with utility providers to resolve utility issues during outage events.	+	+	+	+	+	N	+	+	+	N	8 (+) 0 (-) 2 (N)
50	Promote the NFPA's Firewise Program with appropriate municipalities.	+	+	+	-	+	+	N	-	-	N	5 (+) 3 (-) 2 (N)
51	Continue to participate in statewide severe storm exercises with PEMA as appropriate.	+	N	+	+	+	N	+	+	+	N	7 (+) 0 (-) 3 (N)
52	Continue to participate in PennDOT Winter Preparedness Stakeholder meetings and	+	N	N	+	+	N	+	+	+	+	7 (+) 0 (-) 3 (N)

Table 6.4-1: Mitigation Action Feasibility Evaluation.												
Mitigation Actions		***PA Steel Criteria Considerations***										
		(+) Highly Effective or Feasible ***(-) Ineffective or Not Feasible*** ***(N) Neutral or Not Applicable***										
No.	**Name**	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	**Total Score**
	maintain partnership.											
53	Continue to work with ARC to identify shelters for short-term evacuation(s).	+	N	+	+	+	N	+	-	-	N	6 (+) 1 (-) 3 (N)
54	Continue to Participate in the South Central Task Force activities, including training and planning activities.	+	N	+	+	+	N	+	+	+	N	7 (+) 0 (-) 3 (N)
55	Continue implementation of an early warning or alert systems that utilize cloud-based (IPAWS, Wireless Emergency Alerts) communications technologies to distribute pertinent information to the public during emergencies.	+	N	+	N	+	N	+	-	N	N	4 (+) 1 (-) 5 (N)
56	Maintain the Cumberland County Hazard Mitigation GIS story map online.	N	N	N	N	+	N	+	+	N	+	4 (+) 0 (-) 6 (N)
57	Monitor the impacts of climate change on the frequency and severity of hazard impacts in the county.	+	+	+	-	N	+	N	-	-	+	5 (+) 3 (-) 2 (N)
58	Continue to coordinate quarterly meetings/training with the local emergency management and	+	N	N	+	N	N	N	+	+	N	4 (+) 0 (-) 6 (N)

Table 6.4-1: Mitigation Action Feasibility Evaluation.

Mitigation Actions		PA Steel Criteria Considerations (+) Highly Effective or Feasible (-) Ineffective or Not Feasible (N) Neutral or Not Applicable										
No.	**Name**	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	**Total Score**
	related officials.											
59	Provide HMP related agenda items for Municipal Advisory Board meetings	+	N	N	+	N	N	N	+	+	N	4 (+) 0 (-) 6 (N)
60	Provide technical assistance/training to municipal EMCs/FPMs who have no or limited experience with floodplains.	N	+	N	+	N	N	N	-	-	+	3 (+) 2 (-) 5 (N)
61	Assist municipalities to identify and submit grant applications for federal, state, and county programs that support HMP goals, objectives, and actions.	+	+	+	+	N	N	N	+	+	N	6 (+) 0 (-) 4 (N)
62	Conduct annual HMP meetings to review implementation progress.	+	+	+	+	+	N	N	+	+	+	8 (+) 0 (-) 2 (N)

Actions were then compared with one another to determine a ranking or priority. This ranking was determined by applying the Multi-Objective Mitigation Action Prioritization criteria, which use the following weighted, multi-objective mitigation action prioritization criteria. The cost of each Action was considered in the Efficiency (30% of score) category.

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

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

- Low Priority (red): 0 - 1.7
- Medium Priority (yellow): 1.8 - 2.0
- High Priority (green): 2.0 - 3

In order to prioritize the mitigation actions, criteria were applied as shown in Table 6.4-2.

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
1	Evaluate requests to use county facilities for public gatherings and coordinate with law enforcement as needed to secure events.	1	2	1	1	1	1.3
2	Partner with Lower Allen Township, the PSP, and the Camp Hill Prison to keep emergency response plans current.	3	2	1	1	3	2.0
3	Support municipal efforts to fund investments in water and stormwater collection and delivery systems.	2	2	2	3	1	2.0

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
4	Integrate green infrastructure concepts into municipal zoning and subdivision ordinances.	2	1	2	3	1	1.7
5	Develop a water supply study in coordination with the Susquehanna River Basin Commission and county municipalities.	3	3	1	2	1	2.2
6	Monitor and track new development in inundation areas	2	2	1	3	1	1.8
7	Continue to participate in EAP meetings with dam owners. Recommend that dam owners update the Dam Failure Emergency Action Plan.	2	2	3	3	1	2.2

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
8	Host a countywide workshop to encourage participation in the Community Rating System program to reduce NFIP rates.	1	2	1	3	1	1.6
9	Maintain 100% municipal participation in the NFIP.	3	3	1	3	1	2.3
10	Conduct outreach to municipalities and owners of RLP and SRLP to inform them of buyout options, elevation and mitigation reconstruction strategies.	3	3	1	3	1	2.3
11	Assist all 33 municipalities in updating floodplain management regulations to meet or exceed the minimum standards required by the NFIP.	3	3	1	3	1	2.3

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
12	Monitor and remove debris jams, as applicable, on the Yellow Breeches Creek and Conodoguinet Creek in partnership with municipal and state governments and private property owners.	2	2	1	3	1	1.8
13	Collect current flood elevation and extent data to support ongoing development of a predictive flood intensity indicator model for the county.	2	2	2	3	1	2.0
14	Collect relevant structure information through the subdivision/land development process and recording processes to assist in determining flooding impacts to structures.	2	2	2	3	1	2.0
15	Recommend that municipalities exclude or add foundation inspection requirements for mobile homes in a Special Flood Hazard Area.	2	2	2	3	1	2.0

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
16	Zion Bridge Project, Lower Frankford Township	2	2	2	3	1	2.0
17	Opossum Creek Culvert Project, Lower Frankford Township	2	2	2	3	1	2.0
18	Cloverdale Run Stormwater Drainage Project, Rich Street and Sharp Street, Newville Borough	2	2	2	3	1	2.0
19	Cloverdale Run Stormwater Drainage Project, Broad Street, Newville Borough	2	2	2	3	1	2.0

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
20	Cloverdale Run Stormwater Drainage Project, Pennsylvania Avenue Box Culvert, Newville Borough	2	2	2	3	1	2.0
21	Cloverdale Run Stormwater Drainage, Parsonage Street Box Culvert, Newville Borough	2	2	2	3	1	2.0
22	Cloverdale Run Stormwater Drainage, Newville Community Park headwall and retention pond, Newville Borough	2	2	2	3	1	2.0
23	Cloverdale Run Stormwater Drainage, North Corporation Street Box Culvert, Newville Borough	2	2	2	3	1	2.0

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
24	Cloverdale Run Stormwater Drainage, Cove Avenue Box Culvert, Newville Borough	2	2	2	3	1	2.0
25	Flood Inundation Mapping	2	2	2	3	1	2.0
26	Broad Street Drainage Improvements	2	2	2	3	1	2.0
27	Pine Road Flooding	2	2	2	3	1	2.0

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
28	Sewer Plant Grinder Pump Replacement	2	1	1	2	3	1.7
29	Conduct seismic analyses for new or rehabilitated transportation infrastructure in the County.	2	2	2	1	1	1.7
30	Maintain emergency hazardous materials response capabilities via certified team and continue to offer training to first responders.	2	2	2	3	1	2.0
31	Maintain and implement the Cumberland County Hazardous Materials Commodity Flow Study.	2	2	2	3	2	2.2

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
32	Encourage municipalities to prohibit SARA facilities in wellhead or source water protection areas.	3	2	1	3	2	2.2
33	Meet with TMI officials on a quarterly basis to receive decommissioning updates.	1	2	1	2	2	1.6
34	Continue to Participate in radiological emergency response training and exercises.	3	2	2	2	2	2.2
35	Continue to collaborate with Pa. Dept. of Health for mass distribution of medical countermeasures preparedness efforts.	2	2	1	2	1	1.7

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
36	Establish a core County team to continue participation in pandemic (including the Coronavirus in 2020) exercises, education and preparedness.	3	2	1	2	1	1.9
37	Monitor mosquito populations and conduct spraying programs to reduce vulnerability to vector borne diseases.	2	2	1	2	1	1.7
38	Inventory sinkhole events as part of HMP GIS system.	2	2	2	2	1	1.9
39	Integrate sinkhole detection requirements into municipal subdivision and development requirements	2	2	2	2	1	1.9

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
40	Identify and pursue funding for transportation projects through participation in the Harrisburg Area Transportation Study's highway, bridge, and railway planning initiatives.	3	2	3	3	3	2.7
41	Implement the Cumberland County Bridge Capital Improvement Plan.	3	2	2	3	2	2.4
42	Evaluate using the county's $5 Local Use Fee to support local and regional transportation projects.	3	2	3	3	3	2.7
43	Continue to maintain relationships with local, state and federal partners to sustain awareness and/or detection of threat capabilities.	2	2	1	2	2	1.8

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
44	Maintain StormReady Certification via NWS. Continue to support and encourage municipal participation of the program.	2	2	2	3	1	2.0
45	Continue to support the ARC efforts on installation of residential detectors; Promote residents usage of fire extinguishers.	2	2	1	1	1	1.5
46	Encourage municipal participation in the NFPA Firewise program.	2	2	1	2	1	1.7
47	Use municipal subdivision and land development ordinances to protect above ground infrastructure from trees through setbacks and easements.	2	2	2	3	2	2.2

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
48	Require underground utilities through municipal subdivision and land development regulations.	2	2	2	3	3	2.3
49	Coordinate with utility providers to resolve utility issues during outage events.	1	2	1	3	3	1.9
50	Promote the NFPA's Firewise Program with appropriate municipalities.	2	2	1	2	1	1.7
51	Continue to Participate in statewide severe storm exercises with PEMA as appropriate.	2	2	3	3	1	2.2

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
52	Continue to participate in PennDOT Winter Preparedness Stakeholder meetings and maintain partnership.	2	2	1	3	1	1.8
53	Continue to work with ARC to identify shelters for short-term evacuation(s).	3	2	2	2	1	2.1
54	Continue to Participate in the South Central Task Force activities, including training and planning activities.	2	2	3	3	2	2.4
55	Continue implementation of an early warning or alert systems that utilize cloud-based (IPAWS, Wireless Emergency Alerts) communications technologies to distribute pertinent information to the public during emergencies.	3	3	3	3	3	3.0

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
56	Maintain the Cumberland County Hazard Mitigation GIS story map online.	1	2	3	3	1	2.0
57	Monitor the impacts of climate change on the frequency and severity of hazard impacts in the county.	1	2	3	3	1	2.0
58	Continue to coordinate quarterly meetings/training with the local emergency management and related officials.	2	2	3	3	2	2.4
59	Provide HMP related agenda items for Municipal Advisory Board meetings	1	2	2	2	1	1.7

Table 6.4-2: Mitigation Action Prioritization.							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0-1.7 Medium = 1.8-2.0 High = 2.0-3					
No.	Name	Effectiveness (20% weight)	Efficiency (30% weight)	Multi-Hazard Mitigation (20% weight)	Addresses High Risk Hazard (15% weight)	Addresses Communications / Critical Infrastructure (15% weight)	Total Weighted Score
60	Provide technical assistance/training to municipal EMCs/FPMs who have no or limited experience with floodplains.	2	2	1	3	1	1.8
61	Assist municipalities to identify and submit grant applications for federal, state, and county programs that support HMP goals, objectives, and actions.	3	2	2	3	1	2.2
62	Conduct annual HMP meetings to review implementation progress.	1	2	3	3	1	2.0

7. Plan Maintenance

7.1 Update Process Summary

Monitoring, evaluating and updating this plan are critical to maintaining its value and success in Cumberland 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. In order to review and update the 2014 HMP, annual review meetings were held on April 12, 2016 and August 10, 2017. Meetings were also held in 2018 and 2019 to begin updating the HMP for 2020. Meeting documentation is included as Appendix J. The 2020 HMP will be reviewed as deemed necessary by the HMSC during its annual meeting, but no fewer than once every two years.

7.2 Monitoring, Evaluating and Updating the Plan

Municipal officials within Cumberland County recognize that the HMP is not a static document and requires regular review and evaluation. The plan will be monitored for changes in the conditions under which the plan was developed, such as new or revised state laws, major disaster declarations, or availability of funding. Chaired by Kirk Stoner, Director of Planning for the Cumberland County Planning Department, the HMSC established for the 2020 HMP is designated to lead monitoring, evaluation and future update efforts with support and representation from all participating municipalities. The HMSC will coordinate maintenance efforts, but the input needed for effective periodic evaluations will come from community representatives, local emergency management coordinators and planners, the general public and other important stakeholders. The HMSC will oversee the progress made on the implementation of action items identified in the 2020 HMP and modify actions, as needed, to reflect changing conditions. The HMSC will meet annually to discuss specific coordination efforts that may be needed with other stakeholders. Updates to the 2020 HMP will be made as deemed necessary and appropriate. In addition, it will also serve in an advisory capacity to the Cumberland County Board of Commissioners and the Cumberland County Planning Commission.

Each municipality will designate a community representative to monitor mitigation activities and hazard events within their respective communities. The local emergency management coordinator would be suitable for this role. This individual will be asked to work with the HMSC to provide updates on applicable mitigation actions and feedback on changing hazard vulnerabilities within their community.

Periodic evaluations of the 2020 HMP will take place as deemed necessary by the HMSC during its annual meeting, but no fewer than once every two years. Evaluations of the 2020 HMP will not only include an investigation of whether mitigation actions were completed, but also an assessment of how effective those actions were in mitigating losses. A review of the qualitative and quantitative benefits (or avoided losses) of mitigation activities will support this assessment. Results of the evaluation will then be compared to the goals and objectives

established in the plan and decisions will be made regarding whether actions should be discontinued, or modified in any way in light of new developments in the community. Progress will be documented by the HMSC for use in the next HMP update and submitted to the Board of Commissioners.

Upon each HMP evaluation, the HMSC will consider whether applications should be submitted for existing mitigation grant programs. A decision to apply for funding will be based on appropriate eligibility and financial need requirements. The HMSC will also support local and county officials in applying for post-disaster mitigation funds when they are available. All state and federal mitigation funding provided to the County or local municipalities will be reported in subsequent plan updates.

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

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

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

7.3 Continued Public Involvement

As was done during development of the 2020 HMP, the HMSC will involve the public during annual meetings or periodic evaluations of the HMP by providing an opportunity to submit comments. The public will have access to the current HMP through their local municipal office or the Cumberland County Planning Department. Additionally, a copy of the adopted plan will be posted to the County website (http://www.ccpa.net/) for five years so that the public has electronic access to the plan. The website includes an easy-to-access feedback option so that residents, business owners, and others who read the plan will be able to provide a comment about the plan or about the mitigation strategies.

Information on upcoming events related to the HMP, such as annual mitigation plan evaluation meetings or solicitation for comments, will be announced via newsletters, newspapers, mailings or the County website. The public is encouraged to submit comments on the HMP at any time. All comments received will be maintained and considered by the HMSC when updating the HMP.

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

In order to better involve the public in the 2020 plan update, the County Mitigation Officer created an online survey for all residents and stakeholders. Further, the County extended an invitation to many stakeholder groups (see Table 3.2-2). This practice will be carried out in future plan updates as well.

8. Plan Adoption

The Plan was submitted to the Pennsylvania State Hazard Mitigation Officer on October 13, 2020. It was forwarded to FEMA for final review and approval-pending-adoption on October 19, 2020. FEMA granted approval-pending-adoption on December 16, 2020.

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

Cumberland County 2020 Hazard Mitigation Plan

County Adoption Resolution

Resolution No. _____

Cumberland County, Pennsylvania

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

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

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

WHEREAS, the Cumberland County 2020 Hazard Mitigation Plan has been developed by the Cumberland County Department of Planning and the Cumberland County Department of Public Safety in cooperation with other county departments, local municipal officials, and the citizens of Cumberland County, and

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

WHEREAS, the Cumberland County 2020 Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-made hazards that face the County and its municipal governments,

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

- The Cumberland County 2020 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the County, and
- The respective officials and agencies identified in the implementation strategy of the Cumberland County 2020 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2020

ATTEST:

_____

CUMBERLAND COUNTY COMMISSIONERS

By _____

By _____

By _____

Cumberland County 2020 Hazard Mitigation Plan

Municipal Adoption Resolution

Resolution No. _____

<*Borough/Township of Municipality Name*>, Cumberland County, Pennsylvania

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

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

WHEREAS, the <*Borough/Township of Municipality Name*> acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and

WHEREAS, the Cumberland County 2020 Hazard Mitigation Plan has been developed by the Cumberland County Department of Planning and the Cumberland County Department of Public Safety in cooperation with other county departments, and officials and citizens of <*Borough/Township of Municipality Name*>, and

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

WHEREAS, the Cumberland County 2020 Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-made hazards that face the County and its municipal governments,

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

- The Cumberland County 2020 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the <*Borough/Township*>, and
- The respective officials and agencies identified in the implementation strategy of the Cumberland County 2020 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 20__

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

_____ By _____

By _____

By _____

The date each jurisdiction adopted both the 2014 and 2020 plan is listed in Table 8-1.

Table 8-1: Adoption date of the Hazard Mitigation Plan by Cumberland County and local municipalities.

Jurisdiction	2014 HMP Adoption Date	2020 HMP Adoption Date
Cumberland County	10/13/2014	
Borough of Camp Hill	5/13/2015	
Borough of Carlisle	5/14/2015	
Township of Cooke	5/5/2015	
Township of Dickinson	5/18/2015	
Township of East Pennsboro	5/6/2015	
Township of Hampden	4/30/2015	
Township of Hopewell	5/4/2015	
Borough of Lemoyne	6/11/2015	
Township of Lower Allen	5/11/2015	
Township of Lower Frankford	5/5/2015	
Township of Lower Mifflin	4/30/2015	
Borough of Mechanicsburg	5/5/2015	
Township of Middlesex	4/24/2015	
Township of Monroe	5/14/2015	
Borough of Mount Holly Springs	5/11/2015	
Borough of New Cumberland	5/6/2015	
Borough of Newburg	5/4/2015	
Borough of Newville	4/28/2015	
Township of North Middleton	5/7/2015	
Township of North Newton	5/5/2015	
Township of Penn	5/14/2015	
Township of Shippensburg	5/2/2015	
Borough of Shippensburg	6/2/2015	
Borough of Shiremanstown	7/13/2015	
Township of Silver Spring	5/13/2015	
Township of South Middleton	4/30/2015	
Township of South Newton	4/21/2015	
Township of Southampton	4/27/2015	
Township of Upper Allen	5/20/2015	
Township of Upper Frankford	4/27/2015	
Township of Upper Mifflin	5/20/2015	
Township of West Pennsboro	4/27/2015	
Borough of Wormleysburg	5/12/2015	