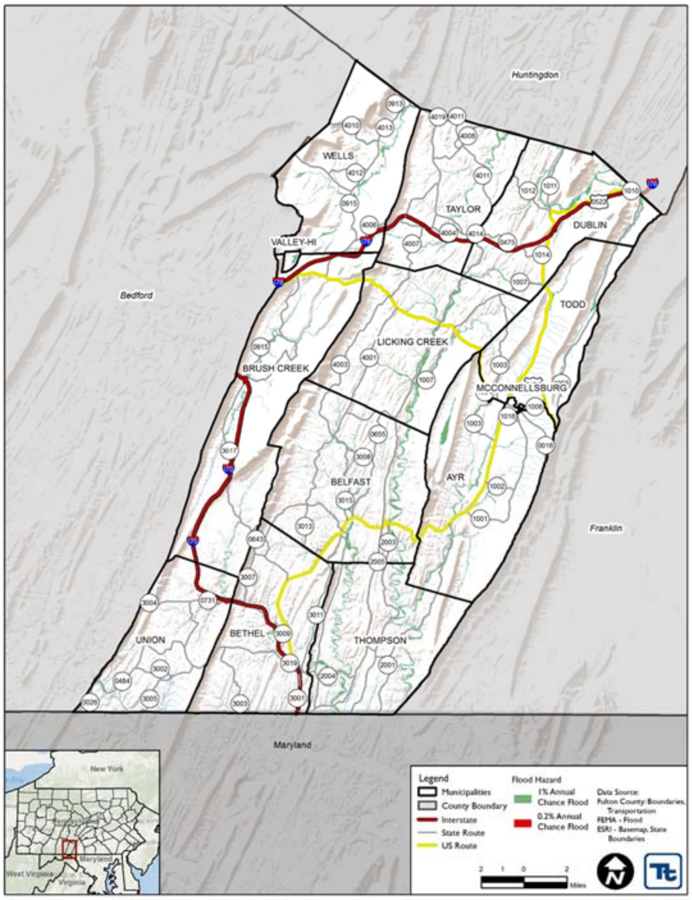
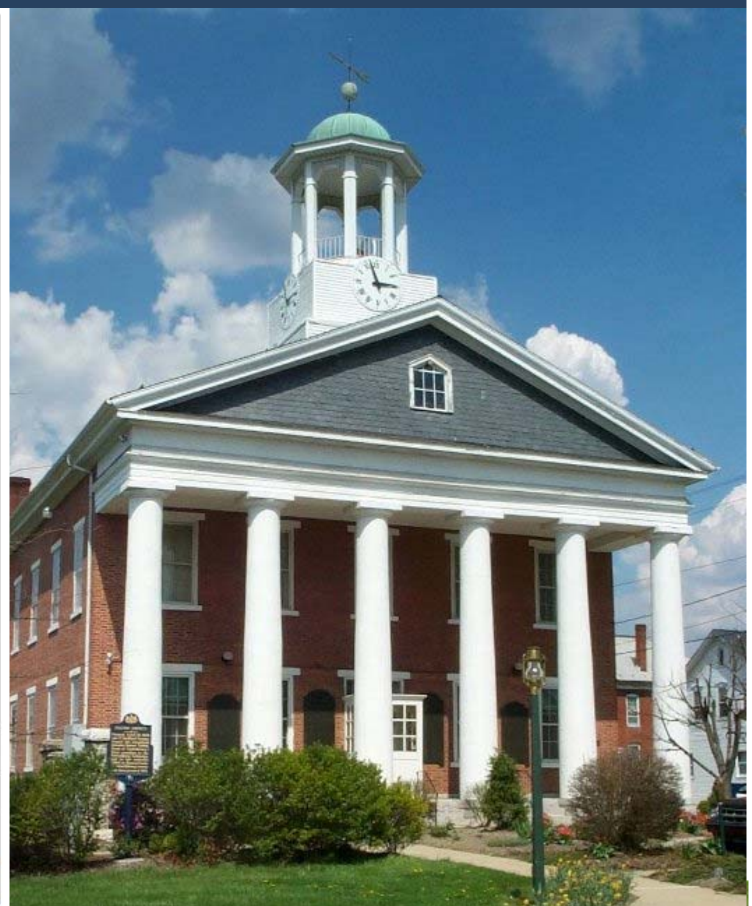
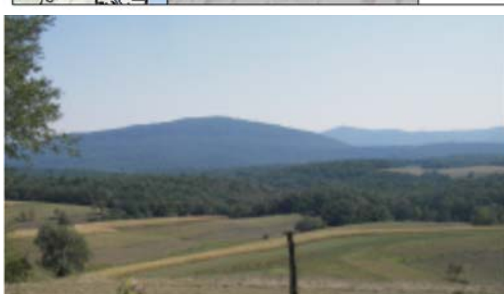
Fulton County
Hazard Mitigation Plan







October 2015

Prepared by:
Tetra Tech, Inc.
2400 Park Drive, Suite I
Harrisburg, PA 17110

EXECUTIVE SUMMARY

The 2015 update to the Fulton County Hazard Mitigation Plan (HMP) was prepared in accordance with the Disaster Mitigation Act of 2000 (DMA 2000). DMA 2000 requires states and local governments to prepare HMPs to remain eligible to receive pre-disaster mitigation grant funds that are made available in the wake of federally declared disasters. Additionally, DMA 2000 effectively improves the disaster planning process by increasing hazard mitigation planning requirements for hazard events and requiring participating municipalities to document their hazard mitigation planning process and identify hazards; potential losses; and mitigation needs, goals, and strategies.

The Fulton County HMP represents the work of citizens, elected and appointed government officials, business leaders, and volunteer and nonprofit groups to protect community assets, preserve the economic viability of the community, and save lives. DMA 2000 regulations require that local plans be formally updated and adopted every 5 years, reassessing their risk and updating their local strategies to manage and mitigate those risks. To comply, Fulton County and inclusive jurisdictions actively participated in the update of the HMP. Once the mitigation plan is completed and approved, the participating jurisdictions will continue to address and implement the findings and recommendations identified in this plan update. Extensive outreach efforts by the Fulton County Planning Commission and Fulton County Emergency Management Agency resulted in full participation from almost all its municipalities. This 2015 version will represent the second update of the County HMP, with the first update having occurred in 2010.

Table ES-1 identifies the municipal governments that actively participated in the plan update process to achieve or maintain their compliance with DMA 2000 requirements.

Table ES-1. Participating Jurisdictions in the 2015 Fulton County HMP Update

Jurisdictions	
Fulton County	McConnellsburg Borough
Ayr Township	Taylor Township
Belfast Township	Thompson Township
Bethel Township	Todd Township
Brush Creek Township	Union Township
Dublin Township	Wells Township
Licking Creek Township	

During the plan update process, Fulton County and its participating municipalities engaged in the following planning process steps:

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

Throughout the planning process, the general public was given the opportunity to comment on the existing HMP and provide suggestions for the updated version. Three public meetings were conducted to give residents an opportunity to provide input on the HMP.

The following hazards were identified by the Steering Committee as presenting the highest risk to the County and its municipalities:

- Flood, flash flood, and ice jams
- Winter storms
- Tornados and wind storms
- Transportation hazards
- Environmental hazards (e.g., hazardous materials spills)
- Drought

This HMP also includes hazard profiles for the following hazards:

- Dam failure
- Radon exposure
- Wildfires
- Landslides
- Subsidence and sinkholes
- Hailstorms
- Earthquakes

To mitigate against the effects of those hazards, the Steering Committee identified the following goals for hazard mitigation over the next 5 years:

1. **Goal 1:** Prevent hazards from impacting the community.
2. **Goal 2:** Protect the people, property, and environment in hazard areas.
3. **Goal 3:** Maintain and enhance emergency services capabilities in the community.
4. **Goal 4:** Protect natural resources within the hazard areas.
5. **Goal 5:** Ensure that stakeholder groups have necessary information to mitigate against hazard impacts.

The individual objectives and actions that will be implemented are discussed in the Mitigation Action Plan in Section 6.4.

Additionally, to monitor implementation of the mitigation plan, the Steering Committee members will meet annually to discuss the status of plan implementation and will prepare a summary report of the plan status and any needed updates. The mitigation evaluation will address changes as new hazard events occur, as the area develops, and as more information is learned about hazards and their impacts. The evaluation will include an assessment of whether the planning process and actions have been effective, whether development or other issues warrant changes to the plan or its priorities, if the communities' goals are being reached, and whether changes are warranted.

To request information or provide comments regarding this plan, please contact the Fulton County Planning Commission:

Mailing Address: Fulton County Planning Commission
219 N. Second St., Suite 102
McConnellsburg, PA 17233

Contact Name: Mary K. Seville, Planning and Mapping Director

E-mail Address: planning@co.fulton.pa.us

Telephone: (717) 485-3717

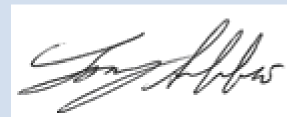
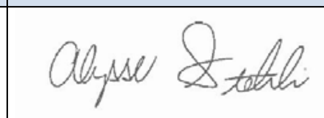
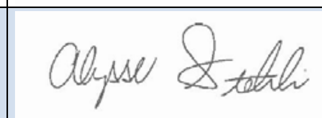
Certification of Annual Review Meetings

The Fulton County Hazard Mitigation Steering Committee has reviewed this Hazard Mitigation Plan. See Section 8 of the Fulton County Hazard Mitigation Plan for further details regarding this form. The Director of the Fulton County Planning Commission hereby certifies the review.

YEAR	DATE OF MEETING	PUBLIC OUTREACH ADDRESSED?*	SIGNATURE
2014/2015	Multiple, from 10/2014 to 6/2015	Yes	Mary K.
2015			
2016			
2017			
2018			
2019			

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

Record of Changes

DATE	DESCRIPTION OF CHANGE MADE, MITIGATION ACTION COMPLETED, OR PUBLIC OUTREACH PERFORMED	CHANGE MADE BY (PRINT NAME)	CHANGE MADE BY (SIGNATURE)
6/15/2015	Reviewed and updated HMP to incorporate information from previous 5 years; added new hazard profiles including radon exposure and information on CAFOs; reprioritized mitigation actions based on PA-STEEL evaluation; revised mitigation action plans; completed other revisions required by FEMA for plan approval.	Tony Subbio (consultant)	
9/11/2015	FEMA notified Fulton County HMP Coordinator that the County received APA designation for its 2015 HMP update.	Alysse Stehli (consultant)	
9/15/2015	Finalized 2015 HMP update with APA designation and update to month of approval.	Alysse Stehli (consultant)	

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

Appendices

ACRONYMS AND DEFINITIONS

This resource identifies the acronyms and abbreviations used in or support the hazard mitigation plan. These are based on documents included in the reference section, with modifications as appropriate to address the Fulton County-specific identifications and requirements.

%	Percent
%g	Percent Acceleration Force of Gravity
ADA	Americans with Disabilities Act
AFO	Animal Feeding Operation
ASFPM	Association of State Floodplain Managers
BCA	Benefit Cost Analysis
BCEGS	Building Code Effectiveness Grading Schedule
BFE	Base Flood Elevation
BMP	Best Management Practice
CAC	Community Assistance Contact
CAFO	Concentrated Animal Feeding Operation
CAV	Community Assistance Visit
CCE	Cornell University Cooperative Extension
CDBG	Community Development Block Grant
CDC	Centers for Disease Control and Prevention
CDMS	Comprehensive Data Management System
CEO	Code Enforcement Officer
CFM	Certified Floodplain Manager
CFR	Code of Federal Regulations
CMI	Crop Moisture Index
CN	Canadian National Rail
CP	Canadian Pacific Rail
CPC	Climate Prediction Center
CRREL	Cold Regions Research and Engineering Laboratory
CRS	Community Rating System
CSX	CSX Transportation
DEM	Digital Elevation Model
DFIRM	Digital Flood Insurance Rate Map
DHS	United States Department of Homeland Security
DIs	Damage Indicators

DIR	Drought Impact Reporter
DMA 2000	Disaster Mitigation Act of 2000
DOD	Degrees of Damage
DOE	Department of Energy
DOF	Depending on Funding
DOH	Department of Health
DPW	Department of Public Works
DR	Disaster Declarations
EAP	Education and Awareness Program
EFS	Enhanced Fujita Scale
EM	Emergency Management
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	U.S. Environmental Protection Agency
ES	Emergency Services
FAA	Federal Aviation Administration
FCCD	Fulton County Conservation District
FD	Fire Department
FEMA	Federal Emergency Management Agency
FIA	Flood Insurance Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FIT	Flood Information Tool
FM	Fuel Moisture
FPA	Floodplain Administrator
FY	Fiscal Year
GBS	General Building Stock
GIS	Geographic Information System
HAZMAT	Hazardous Materials
HAZUS	Hazards U.S.
HAZUS-MH	Hazards U.S. – Multi-Hazard
HMA	Hazard Mitigation Assistance

HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
I	Interstate
ICLR	Institute for Catastrophic Loss Reduction
IPCC	Intergovernmental Panel of Climate Change
ISO	Insurance Services Office, Inc.
IT	Information Technology
kW	Kilowatt
LPR	Local Plans and Regulations
MCEER	Multidisciplinary Center for Earthquake Engineering Research
MGD	Million Gallons per Day
mi	Mile
mph	Miles per Hour
MRCC	Midwest Regional Climate Center
MRP	Mean Return Period
N/A	Not Applicable
NA	Not Available
NA-DM	North America Drought Monitor
NCDC	National Climatic Data Center
NDMC	National Drought Mitigation Center
NEHRP	National Earthquake Hazard Reduction Program
NESEC	Northeast States Emergency Consortium
NESIS	Northeast Snowfall Impact Scale
NFIP	National Flood Insurance Program
NGDC	National Geophysical Data Center
NHC	National Hurricane Center
NID	National Inventory of Dams
NIMS	National Incident Management System
NLCD	National Land Cover Dataset
NOAA	National Oceanic and Atmospheric Administration
NPDP	National Performance of Dams Program
NR	Natural Resources
NRCS	Natural Resource Conservation Service
NS	Norfolk-Southern Rail

NSP	Natural Systems Protection
NSSL	National Severe Storms Library
NWS	National Weather Service
OEM	Office of Emergency Management
OFA	Office for the Aging
PA DCED	Pennsylvania Department of Community and Economic Development
PA DCNR	Pennsylvania Department of Conservation and Natural Resources
PADEP	Pennsylvania Department of Environmental Protection
PD	Police Department
PDM	Pre-Disaster Mitigation Program
PDSI	Palmer Drought Severity Index
PEMA	Pennsylvania Emergency Management Agency
PENNDOT	Pennsylvania Department of Transportation
PGA	Peak Ground Acceleration
PI	Public Information
POD	Point of Distribution
Pop.	Population
PP	Property Protection
PR	Preventative Measures
Q3	Quality 3
RCV	Replacement Cost Value
RFC	Repetitive Flood Claims Grant Program
RLP	Repetitive Loss Property
SDE	Substantial Damage Estimation
SIP	Structure and Infrastructure Project
SP	Structural Flood Control Projects
SPC	Storm Prediction Center
SPI	Standardized Precipitation Index
Sq. Mi.	Square mile
SRL	Severe Repetitive Loss
SWCD	Soil and Water Conservation District
SWOO	Strengths, Weaknesses, Obstacles and Opportunities
TBD	To Be Determined
TRI	Toxic Release Inventory

TSTM	Thunderstorm
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Command
USD	U.S. Dollar
USDA	U.S. Department of Agriculture
USDHS	U.S. Department of Homeland Security
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WSA	Water and Sewer Authority
WUI	Wildland Urban Interface
WWTP	Wastewater Treatment Plant

SECTION 1: INTRODUCTION

This section presents background information, describes the purpose and scope, and lists the authority and references for the 2015 Fulton County Hazard Mitigation Plan (HMP) Update.

1.1 Background

Across the United States, natural and human-caused disasters have led to increasing levels of deaths, injuries, property damage, and interruption of business and government services. The time, money, and efforts to recover from these disasters exhaust resources, diverting attention from important public programs and private agendas.

Fulton County has experienced a significant number of statewide or County-specific gubernatorial and presidential disaster declarations since 1954. The emergency management community, citizens, elected officials, and other stakeholders in Fulton County, Pennsylvania, recognize the impact of disasters on their community and concluded that proactive efforts need to be taken to reduce the impact of natural and human-caused hazards.

"Hazard mitigation" describes actions taken to prevent or reduce the long-term risks to life and property from hazards. Pre-disaster mitigation actions are taken in advance of a hazard event and are essential to breaking the typical disaster cycle of damage, reconstruction, and repeated damage. With careful selection, mitigation actions can be long-term, cost-effective means of reducing the risk of loss.

The Fulton County Hazard Mitigation Steering Committee (Steering Committee)—composed of Fulton County officials, municipal representatives, emergency responders, and business leaders—has updated this Hazard Mitigation Plan (HMP). Through an open-bid process, Fulton County contracted Tetra Tech, Inc. (Tetra Tech), to update the County HMP from 2010.

The HMP update is the result of 8 months of work by the citizens and officials of the County and representatives from Tetra Tech to develop a pre-disaster, multi-hazard mitigation plan that will guide the County toward greater disaster resistance, while respecting the character and needs of the community.

1.2 Purpose

The purpose of this HMP is to minimize the effects that natural, technological, and man-made hazards have on the people, property, environment, and business operations within Fulton County. This document exists to provide the background information and rationale for the mitigation actions that the Steering Committee and municipal representatives have chosen to implement.

The document is governed by the Disaster Mitigation Act of 2000 (DMA 2000) and its implementing regulations (Title 44 Code of Federal Regulations [CFR] §201.6, published February 26, 2002). Local jurisdictions must comply with the DMA 2000 and these regulations to remain eligible for funding and technical assistance from state and federal hazard mitigation programs.

1.3 Scope

The implementation actions within this HMP apply to Fulton County and any municipalities that adopt this HMP as their own. However, only those municipalities that have participated in the plan update process will remain eligible for state and federal hazard mitigation funding through the HMP. For the purpose of this plan update, municipal participation was defined as completion and submission of a Risk Assessment Update Worksheet and Capability Assessment Survey, and attendance by an official municipal representative at a planning or public meeting conducted as part of the planning process.

SECTION 2: County Profile

This section discusses the geography and environment, community facts, population and demographics, land use and development, and critical facilities in Fulton County.

2.1 Geography and Environment

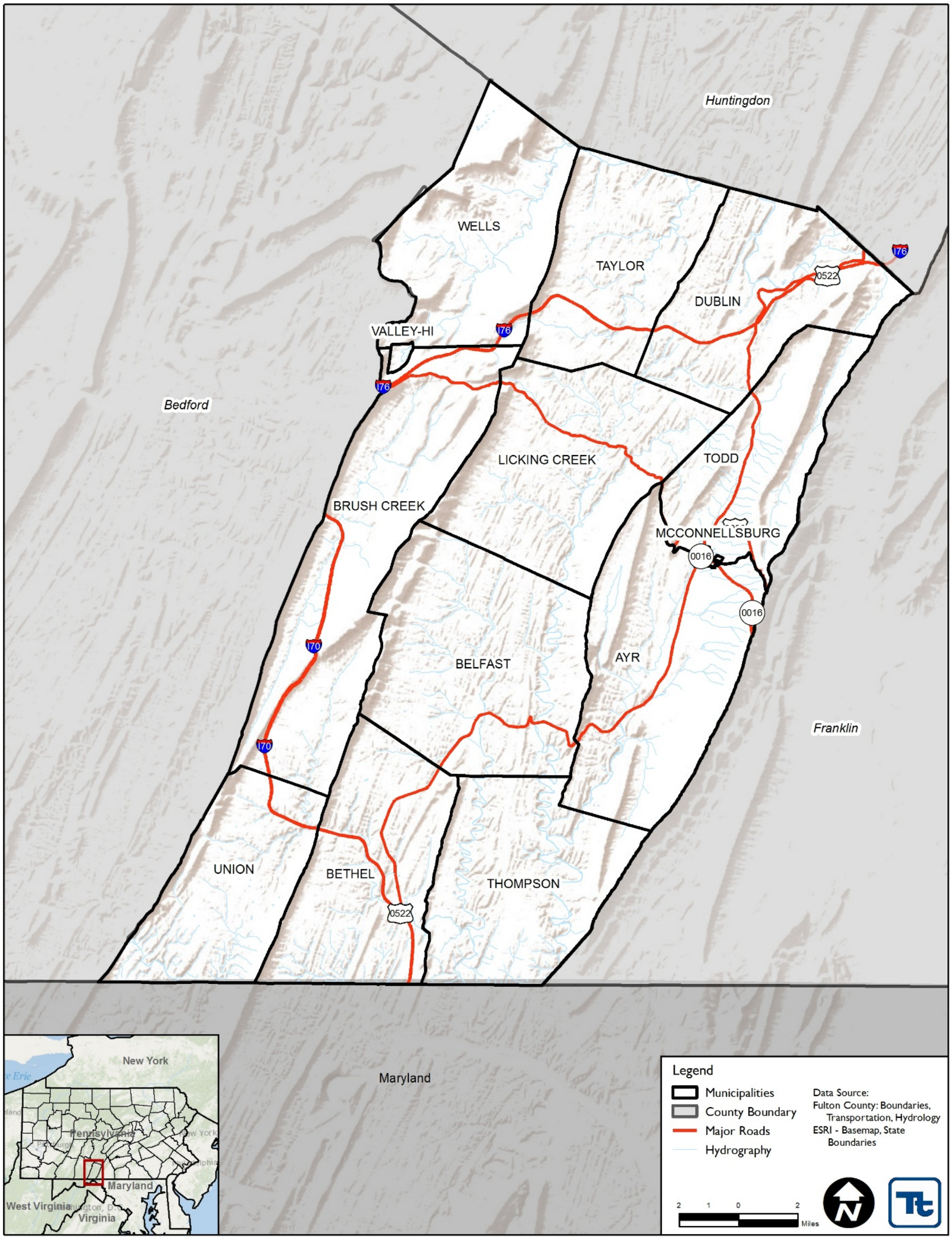
Fulton County is a small rural county located in south-central Pennsylvania. It is bordered to the west by Bedford County, to the north by Huntington County, to the east by Franklin County, and to the south by Maryland. Fulton County covers approximately 437.6 square miles, making it one of the smallest counties in the State of Pennsylvania.

The County is mountainous, with numerous high ridges separating narrow valleys. These valleys are fertile and productive enough to support the primarily rural lifestyle of the County's residents. Over 68 percent of the land area is forestland. Several of the large streams within the County flow southward into Maryland and drain into the Potomac River. The streams in the western and northern part of the County are tributaries of the Juniata River.

Fulton County has an extensive transportation network of roads, with 20 miles each of turnpike and interstate highways, 368.4 miles of State and federal highways, and 231.5 miles of secondary and municipal roads. The major routes are US-522, US-30, PA-16, Interstate (I)-70, and the Pennsylvania Turnpike (I-76).

A base map of Fulton County can be found on Table 2-1.

Figure 2-1. Fulton County Base Map



Source: Fulton County Planning Commission 2014

2.2 Community Facts

Fulton County was created on April 19, 1850, from a portion of Bedford County. It consists of 13 municipalities; specifically, 11 townships and 2 boroughs. The County seat is McConnellsburg, which has a population of 1,073.

The County has a rich historical background dating back to pre-Revolutionary days. Because of its Mason-Dixon Line location, Fulton County was a significant area during the Civil War. Agriculture is the main industry.

2.3 Population and Demographics

Population and demographic data provide baseline information about residents. Changes in demographics or population may be used to identify higher-risk populations. Maintaining up-to-date data on demographics will allow the County to better assess magnitudes of hazards and develop more specific mitigation plans. Baseline demographic information for Fulton County is provided in Table 2-1.

Table 2-1. Demographics

Demographics	2010 Census
Total population	14,845
Male	7,471
Female	7,374
Median age (years)	42
Under 5 years	916
18 years and over	11,823
65 years and over	2,544
Household population	14,723
Group quarters population	122

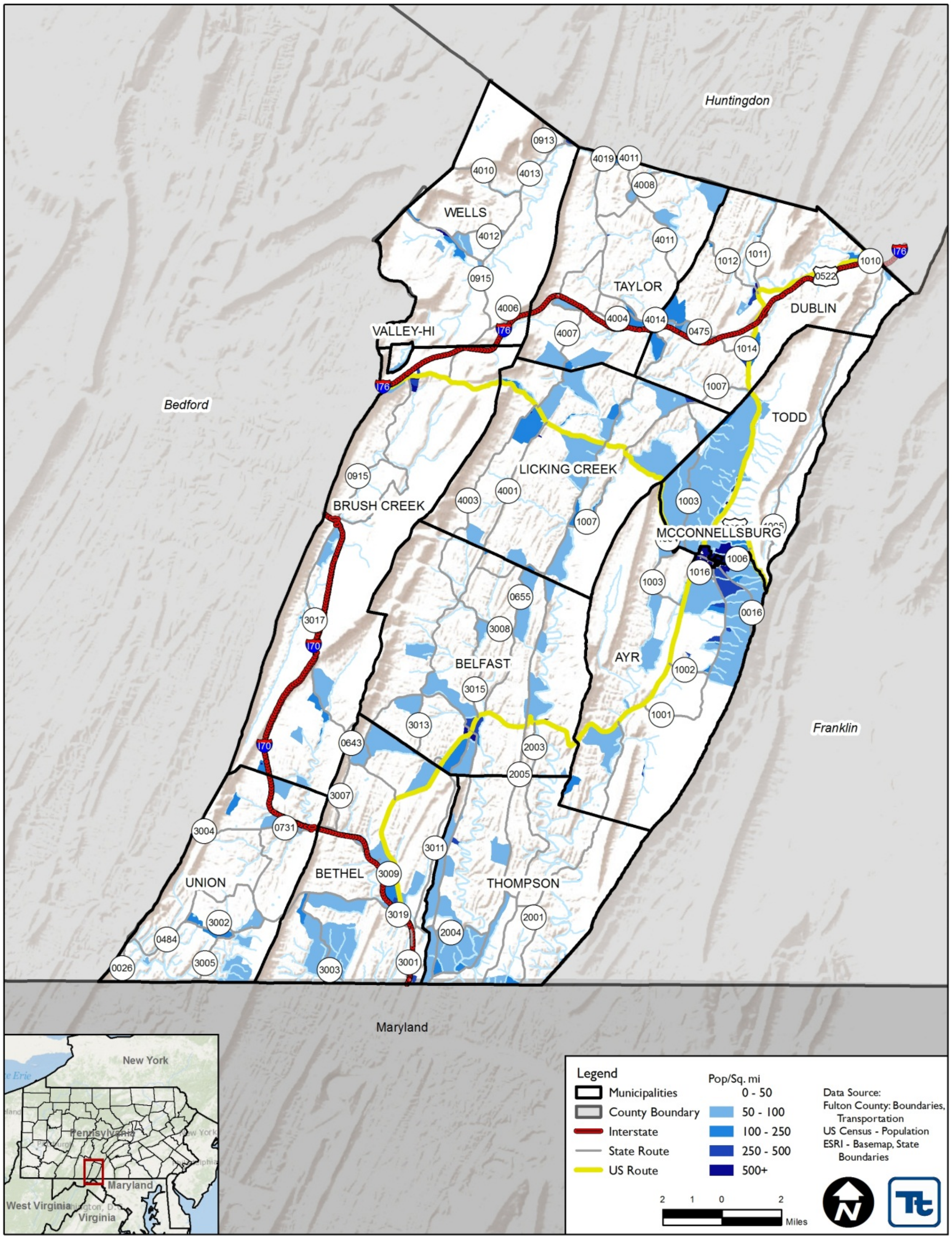
Source: U.S. Census Bureau 2010, General Population and Housing Characteristics, Fulton County

Fulton County has one of the smallest populations in the Commonwealth (14,845). The County is also one of the least densely populated, with a population density of only 33.9 people per square mile (U.S. Census Bureau 2013). A low population density means that people are spread throughout the County rather than clustered in groups. Dispersing information, instructions, and resources to residents in low-density areas is more difficult than in more densely populated areas because individuals are not centralized.

While low-density areas provide challenges to disseminating hazard mitigation information, a low population density also helps prevent hazards from affecting as many people. For examples, diseases may not spread as quickly because citizens are in contact with less people. Similarly, fires are less likely to spread to other structures because of the large distances between them. The magnitude of an event is typically smaller in a less populated area because each event affects fewer people and properties.

Figure 2-2 illustrates population distribution information in Fulton County based on 2010 U.S. Census data.

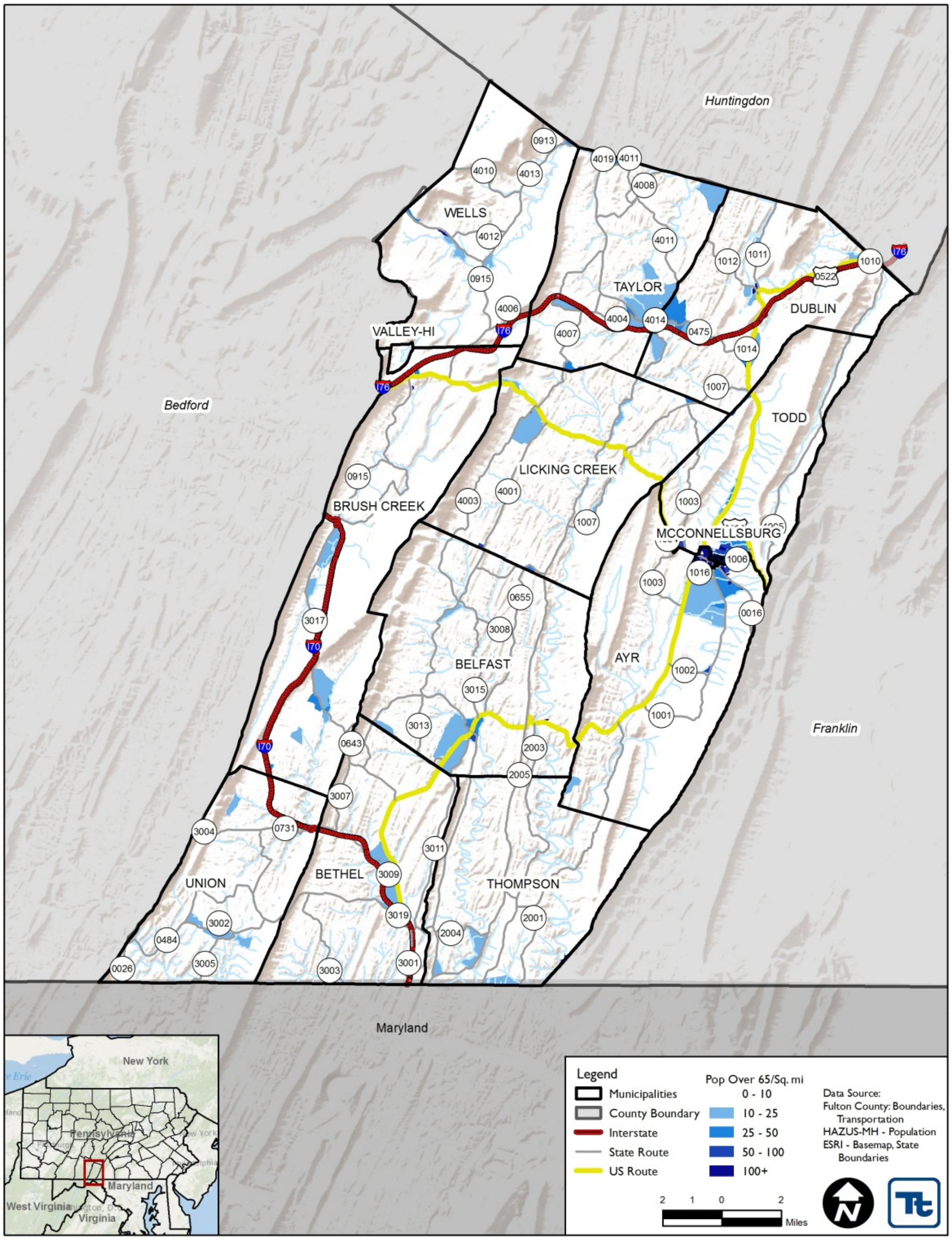
Figure 2-2. Fulton County 2010 Population Distribution



Source: U.S. Census Bureau 2010

Approximately 17 percent of Fulton's population is age 65 or older. These residents may have special needs. For example, many residents in this age bracket may be unable to drive; therefore, special evacuation plans may need to be created for them. They may also have hearing or vision impairments that could make receiving emergency instructions difficult. Both older and younger populations have higher risks for contracting certain diseases. Fulton County's combined under-5-years-of-age and over-65 populations represent approximately 23 percent of its population. Figure 2-3 illustrates population distribution for residents age 65 and older.

Figure 2-3. Fulton County Population Over 65 Years



Source: Hazards U.S. – Multi-Hazard (HAZUS-MH) 2.1

Less than 1 percent of Fulton's population live in group quarters. Group quarters refer to people living in communal settings, which can include inmates in a prison, students in a dorm, or elderly or mentally disabled in group-care homes. Residents living in group quarters are often special needs populations. It is important to ensure that each group-quarter facility has its own emergency plan to account for the unique needs of its residents during a hazard event.

Table 2-2 below provides population estimates for each municipality in Fulton County and for the County as a whole. The population of the entire County is estimated to be 16,573 by the year 2040, which represents a population increase of just over 1,700 people in a 30-year period. While the County will experience an overall slight increase in population, some individual municipalities are expecting to experience population loss. Population loss typically means that some structures may become vacant and infrastructure will age, as little new development (and subsequent infrastructure updates) will be necessary. It is important that Fulton County properly maintain its existing infrastructure and have plans to manage or redevelop vacant properties.

Table 2-2. Population Estimates per Municipality in Fulton County

Municipality Name	2000 Census	2010 Census	2020 Projected	2030 Projected	2040 Projected
Ayr Township	1,982	1,942	1819	1744	1641
Belfast Township	1341	1448	1570	1683	1801
Bethel Township	1420	1508	1605	1696	1791
Brush Creek Township	730	819	907	995	1084
Dublin Township	1277	1264	1333	1356	1405
Licking Creek Township	1532	1703	1846	2005	2155
McConnellsburg Borough	1073	1220	1264	1367	1436
Taylor Township	1237	1118	1104	1030	991
Thompson Township	998	1098	1112	1176	1211
Todd Township	1488	1527	1575	1853	1830
Union Township	634	706	743	800	846
Valley-Hi Borough	20	15	14	12	11
Wells Township	529	477	446	406	371
FULTON	**14,261**	**14,845**	**15,338**	**16,123**	**16,573**

Source: Pennsylvania Department of Environmental Protection (PA DEP) 2012

Less than 1 percent of Fulton's population is not proficient in English. While currently a low percentage, the projected growth through 2040 may indicate an increase in the number of individuals with little to no proficiency in English residing in Fulton County in the future. Subsequently, future hazard mitigation strategies should consider addressing language barriers to ensure that all residents can receive emergency instructions. Table 2-3 summarizes race and ethnicity population information for Fulton County.

Table 2-3. Race and Ethnicity

Race and Ethnicity	2010 Census
One race	14,691
White	14,450
Black or African American	151
American Indian and Alaska Native	28
Asian	19
Pacific Islander	1
Other	42
Two or more races	154
Hispanic or Latino	123

Source: U.S. Census Bureau 2010, Race and Hispanic or Latino Origin Summary File 1 (SF 1), Fulton County 2014

Fulton County has 7,122 residential properties. These properties may be vulnerable to various natural hazards, in particular, flooding and windstorms. Damage to residential properties is not only expensive to repair or rebuild, but also devastating to the displaced residents.

Approximately 15 percent of the County's residential properties are vacant. Vacant buildings are particularly vulnerable to arson and criminal activity. Because vacant properties have not been maintained, many are structurally deficient and at risk of collapsing.

Approximately 23 percent of the County's population rents their home. Renters are more transient than homeowners; therefore, communicating with renters may be more difficult than communicating with homeowners. Similarly, tourists would be a harder population to communicate with during an emergency event. Communication strategies should be developed to ensure that these populations could be given proper notification.

Table 2-4 summarizes housing characters of the residential properties in Fulton County.

Table 2-4. Housing Characteristics

Housing Characteristics	2010 Census
Total housing units	7,122
Owner-occupied housing units	4,617
Renter-occupied housing units	1,397
Vacant housing units	1,108
Median value (dollars)	83,900
Housing units with a mortgage	2,409
Housing units without a mortgage	2,206

Source: U.S. Census Bureau, General Housing Characteristics, Summary File 1 (SF 1), Fulton County

In 2012, the median household income in the County was $47,470, which was lower than the Commonwealth of Pennsylvania's estimated median household income ($52,267). The County's 2012 estimated per capita income of $22,706 was also lower than the Commonwealth's 2012 estimated per capita income of $28,190. Approximately 8 percent of families' incomes in Fulton County were below poverty level and almost 12 percent of its individuals' incomes were below poverty level. Emergency responders may experience challenges in connecting with individuals within this economic bracket for several reasons, including less access to the Internet within these communities. Additionally, many low-income families and individuals may not own vehicles, and therefore could be a more vulnerable population during an evacuation. Table 2-5 summarizes economic characteristics of Fulton County's population.

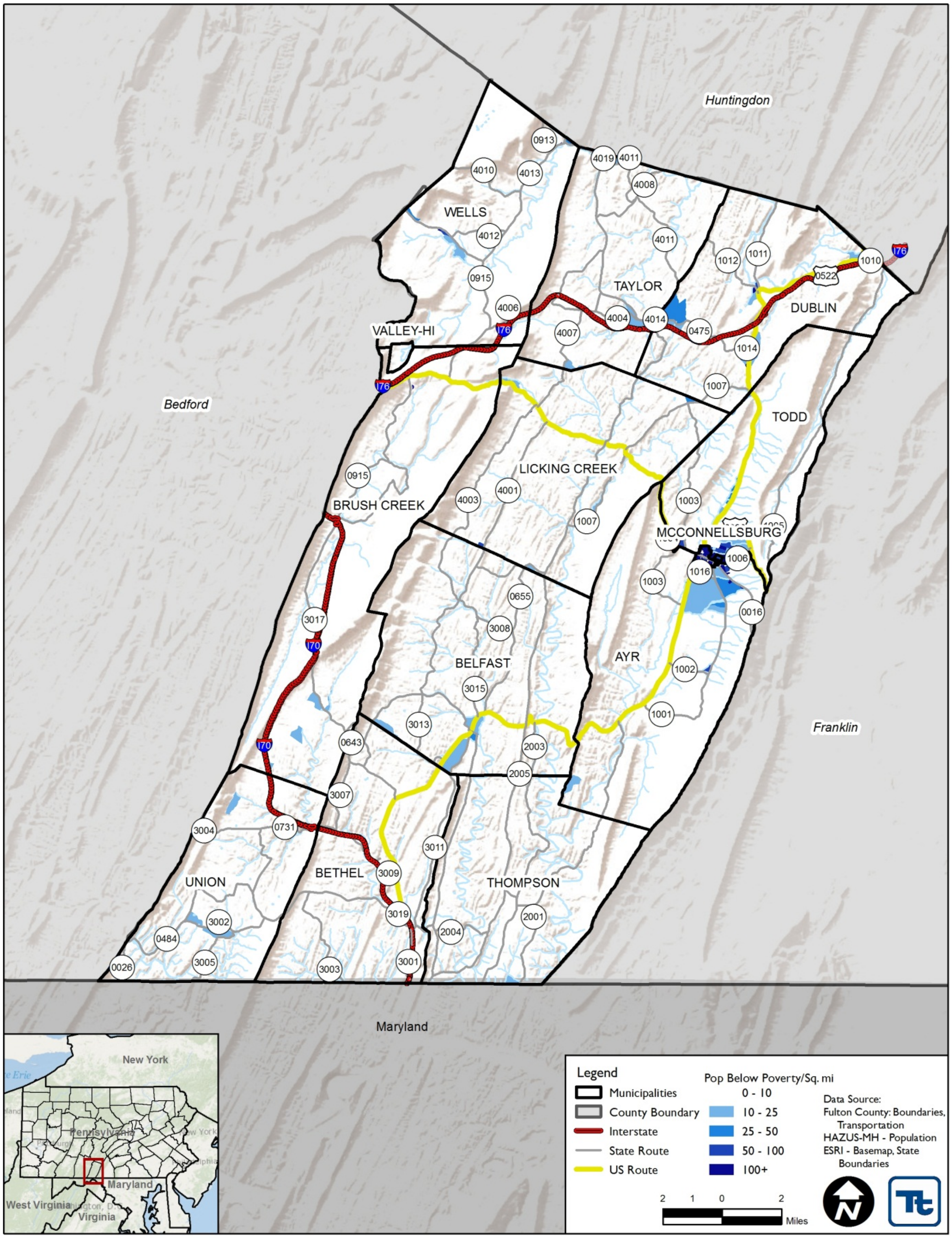
Table 2-5. Economic Characteristics

Economic Characteristics	2010 Census
Median household income in 2012	$47,470
Median family income in 2012	$54,905
Per capita income in 2012	$22,706
Families below poverty level (%)	8
Individuals below poverty level (%)	11.9

Source: U.S. Census Bureau 2012, Selected Economic Characteristics 2012 American Community Survey 5-Year Estimates, Fulton County

Figure 2-4 illustrates population distribution for residents with incomes below the poverty level.

Figure 2-4. Fulton County Population Below the Poverty Level



Source: Hazus-MH 2.1

2.4 Land Use and Development

Fulton County's existing land use patterns are greatly influenced and shaped by surrounding natural features such as mountain ranges, valleys, and waterways. These features have largely determined the location of transportation corridors and development activities, as well as agricultural practices.

A network of high-capacity transportation systems traverses Fulton County. These systems include the Pennsylvania Turnpike, I-70, US Route 30, and US Route 522. In addition, Fulton County is in proximity to the juncture of I-70 and I-68 in Maryland. These transportation systems have greatly contributed to Fulton County's accessibility and land development patterns. Of the County's total land area of 440 square miles, approximately 95 percent is used as farmland and approximately 5 percent is considered developed.

McConnellsburg Borough has remained the population center and the industrial and commercial nucleus of Fulton County. Consequently, a natural pattern of development has occurred as a concentric ring of growth has expanded outward from the Borough into the neighboring rural townships.

Fulton County's commercial and industrial land development patterns are largely influenced by the transportation network and availability of public sewer services. As a result, future growth in the County is expected to occur in five distinct geographic areas: (1) McConnellsburg, (2) Warfordsburg, (3) Hustontown, (4) Ft. Littleton, and (5) Crystal Spring.

Fulton County's future population growth and land use development patterns will be largely influenced by in-migration patterns of people from the east and south. Data gathered from the Internal Revenue Service reveal that Fulton County's greatest population inflows originated in Franklin County, Pennsylvania, and Washington County, Maryland.

Fulton County residents have expressed concern that the County's rural character is being jeopardized as its agricultural lands are slowly being converted to areas of low-density, scattered residential development. While still a concern, residential development growth has slowed since this trend has been noted. From 2000 to 2010, U.S. Census records showed an increase in housing units (4.9 percent) that only slightly outpaced the County's population growth (4.1 percent). This contrast has significantly decreased from the 1990 to 2000 comparison, which showed a housing unit growth of 9.8 percent, as compared to a County population growth of only 4.6 percent.

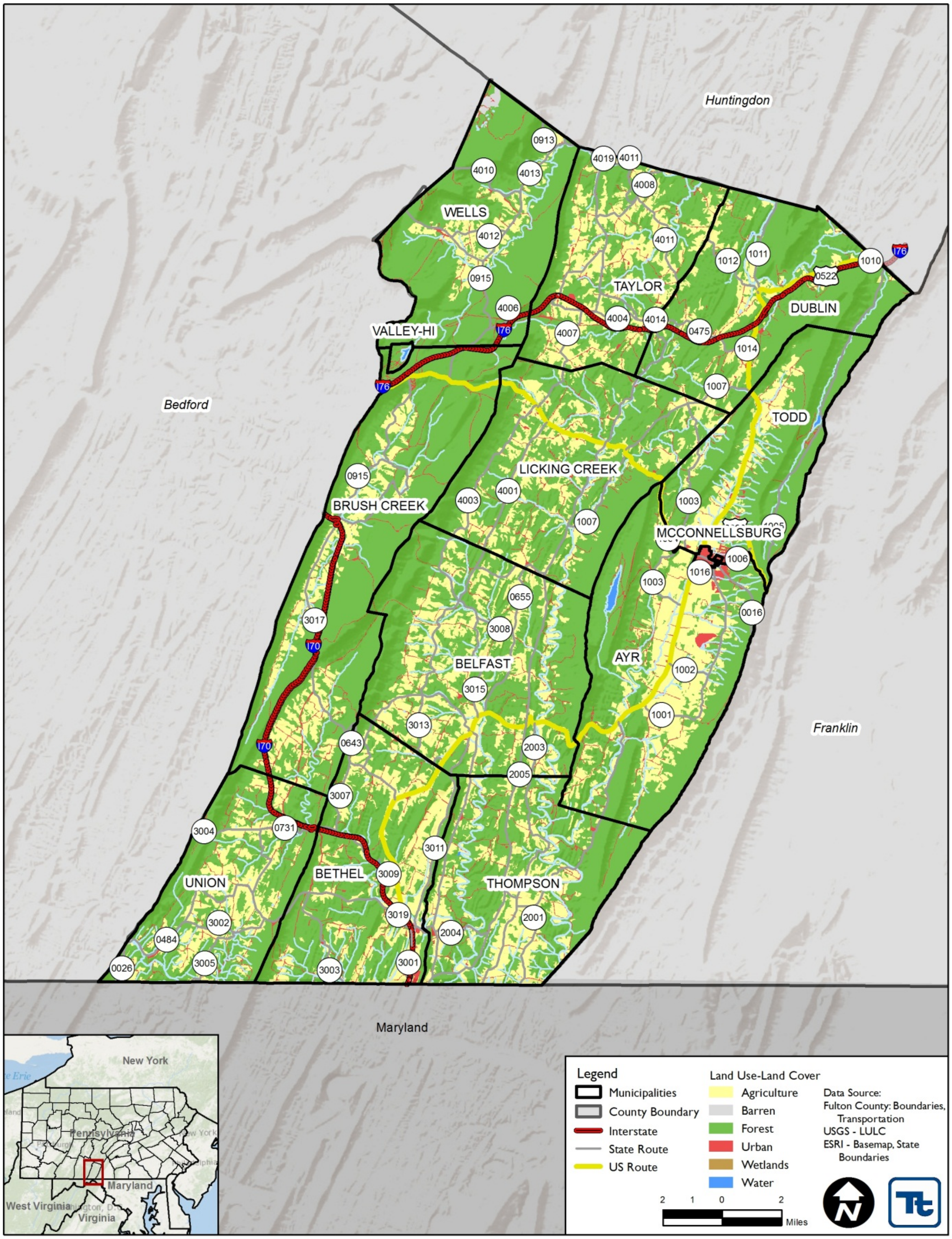
Land use regulations are not prevalent in Fulton County. For example, Fulton County does not have a County zoning ordinance nor a subdivision and land development ordinance. In addition, of the 13 municipalities, only McConnellsburg Borough has adopted a zoning ordinance. Moreover, municipal subdivision and land development ordinances lack the regulations necessary to support the preservation of the County's existing rural character.

Agricultural use of land is in long-term decline. According to the U.S. Department of Agriculture, 18 farms and 5,635 farmland acres were lost between 1987 and 1997. Less than 0.1 of 1 percent (95 acres) of the County's total farmland is enrolled in its agricultural easement program. The primary reason for this low percentage is that very little to no money exists to support this program and the additional purchase of agricultural easements it entails.

Access management is an increasing concern as residential land development patterns continue to develop in a linear fashion along local roadways (e.g., US-522) and each property obtains an individual highway occupancy permit from the Pennsylvania Department of Transportation (PennDOT). Fulton County has developed a growth management survey to help monitor and guide County growth and development in a way that will ensure compliance with overall County land use goals. Figures 2-5 and 2-6 provide visual representations of current County land use and predicted growth patterns.

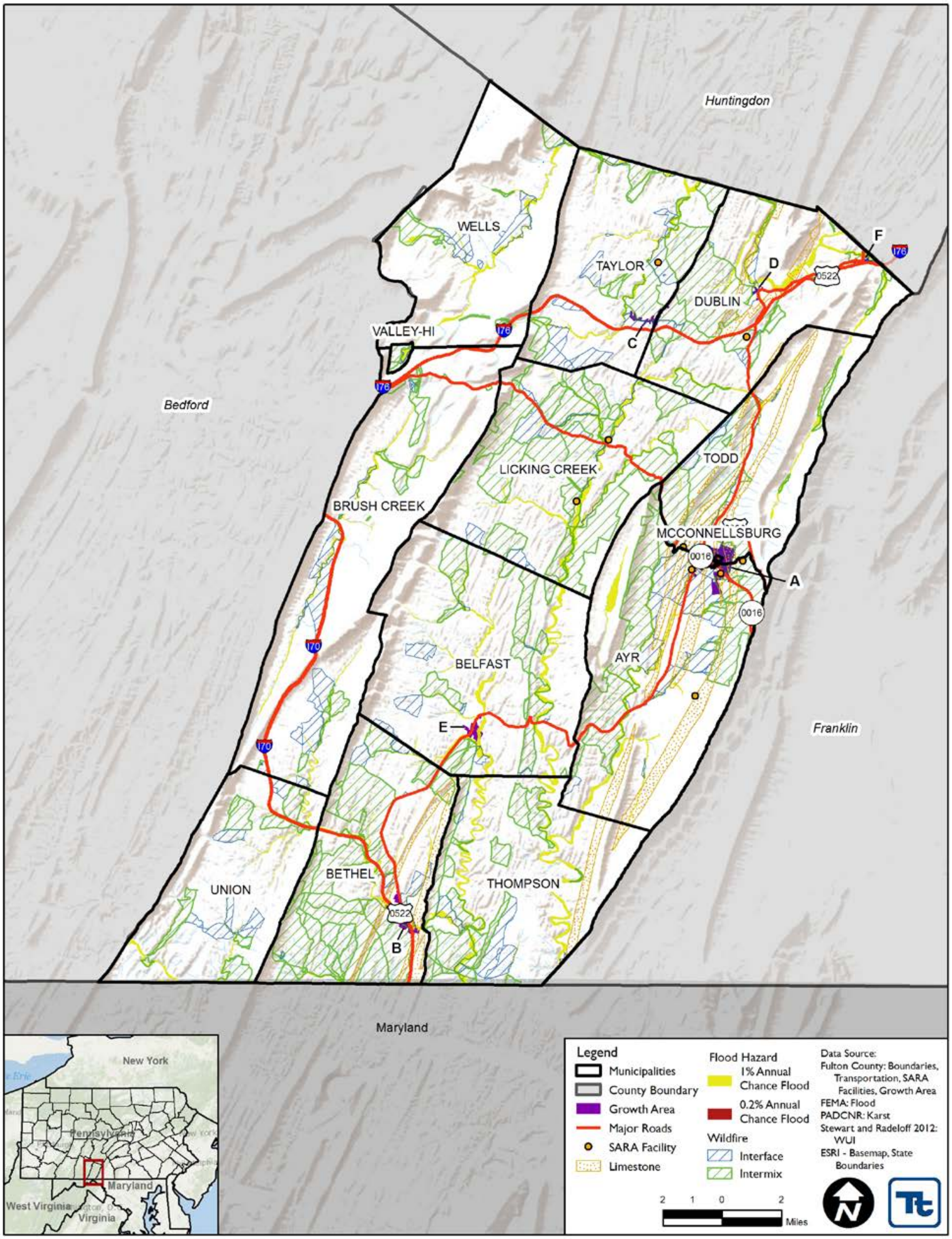
As displayed in Figure 2-6 through Figure 2-12, the County has identified six geographic hazards and growth areas inside its borders. All six of the identified growth areas are located within the Federal Emergency Management Agency (FEMA) flood hazard zone, the high susceptibility/moderate incidence landslide hazard area, and the environmental hazard area. Growth Area A, however, is the only area located within both the 0.25-mile buffer of a major road and 0.10-mile buffer of a Superfund Amendments and Reauthorization Act (SARA) Title III Facility. All of the growth areas, with the exception of Growth Area E, are located in the interface and intermix wildfire hazard area. Growth Areas A, B, and F are located above limestone formations in the subsidence and sinkhole hazard area. The County has noted the location of these hazards in relation to the growth areas to ensure that the planning and development process considers these factors. Additionally, the County intends to (1) discourage development within vulnerable areas, areas with high population density, and the Special Flood Hazard Area (SFHA); or (2) encourage higher regulatory standards at the local level.

Figure 2-5. Fulton County Land Use and Land Cover



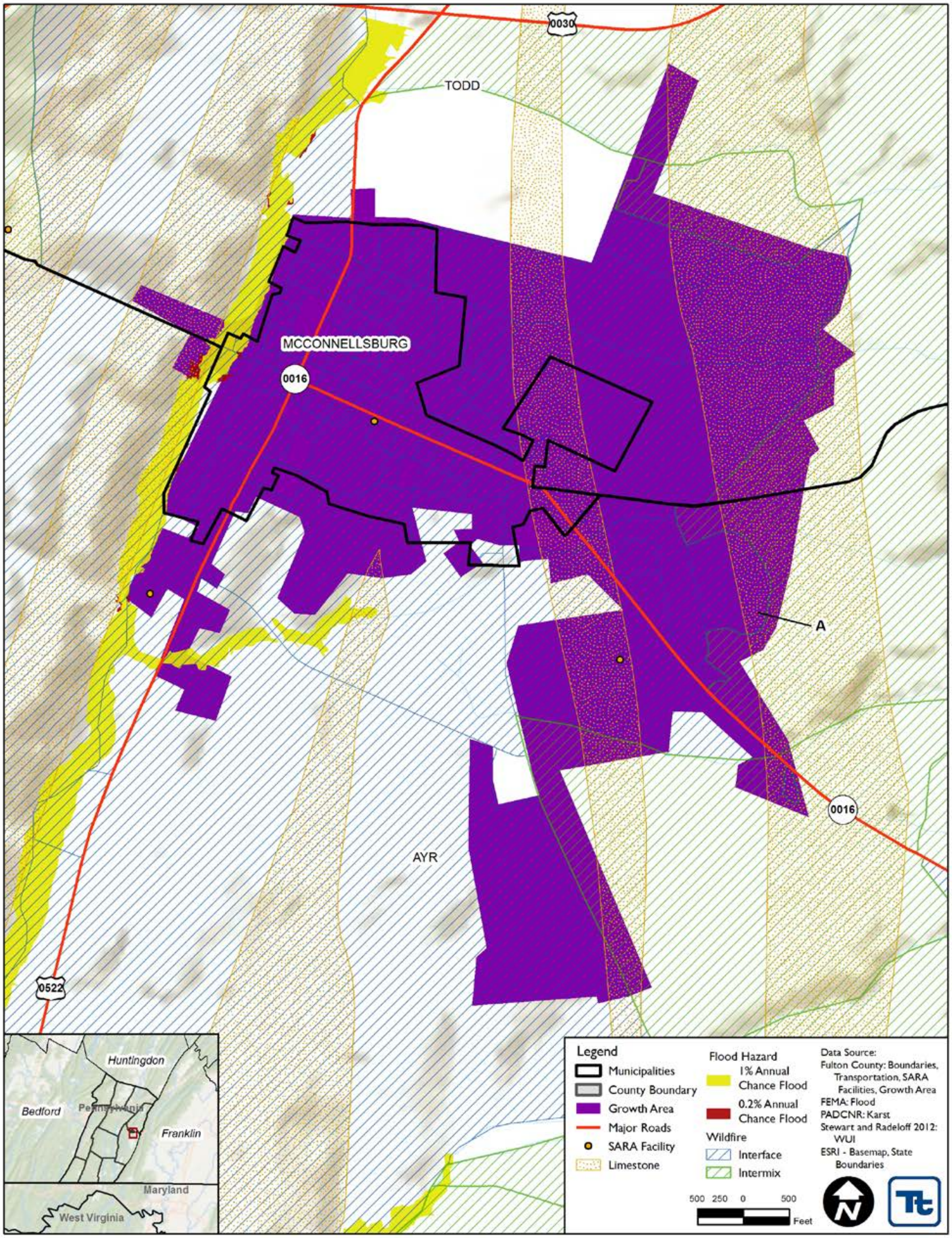
Source: Fulton County Planning Commission 2014

Figure 2-6. Fulton County Growth Area and Hazards



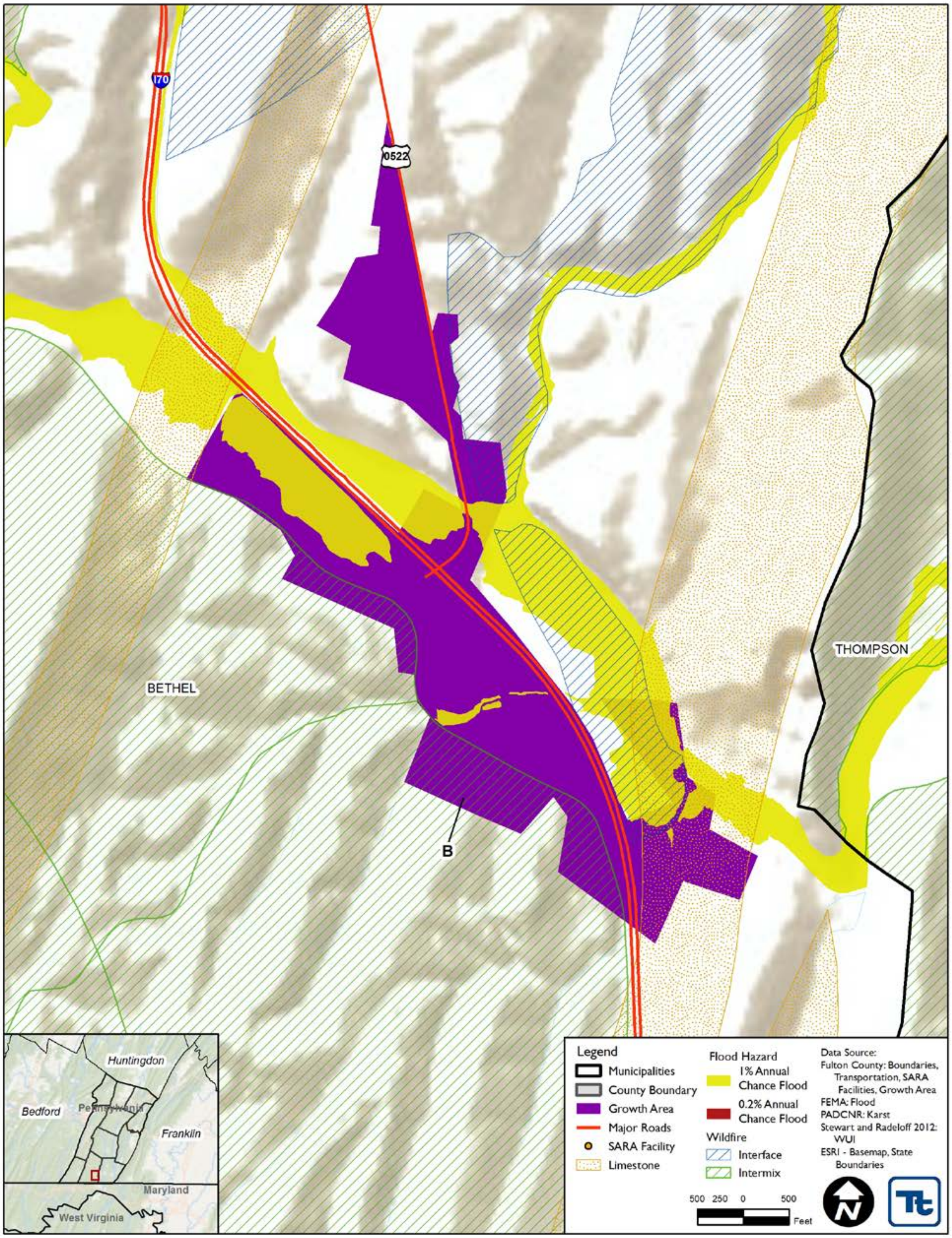
Source: Fulton County Planning Commission 2014

Figure 2-7. Fulton County Growth Area A and Hazards



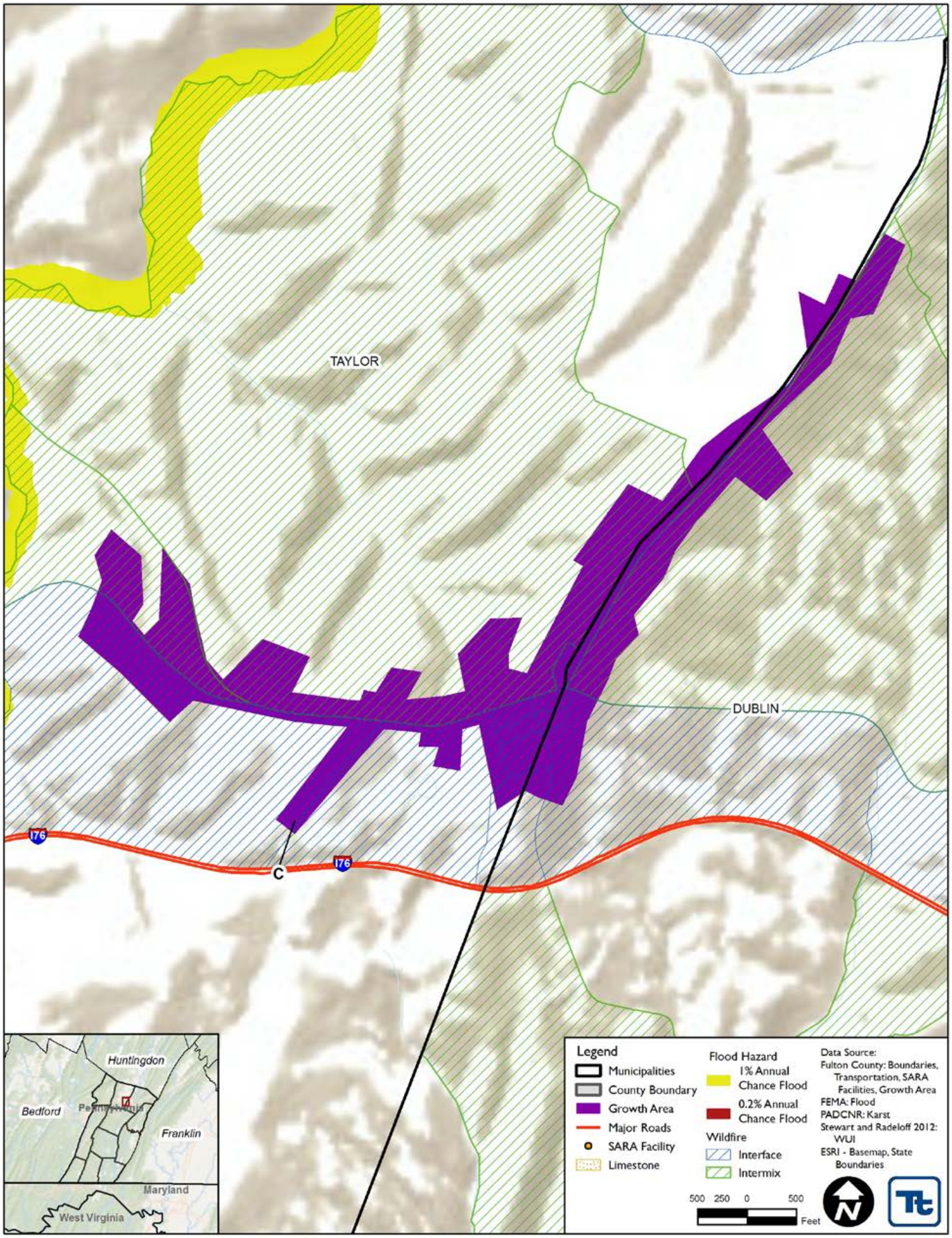
Source: Fulton County Planning Commission 2014

Figure 2-8. Fulton County Growth Area B and Hazards



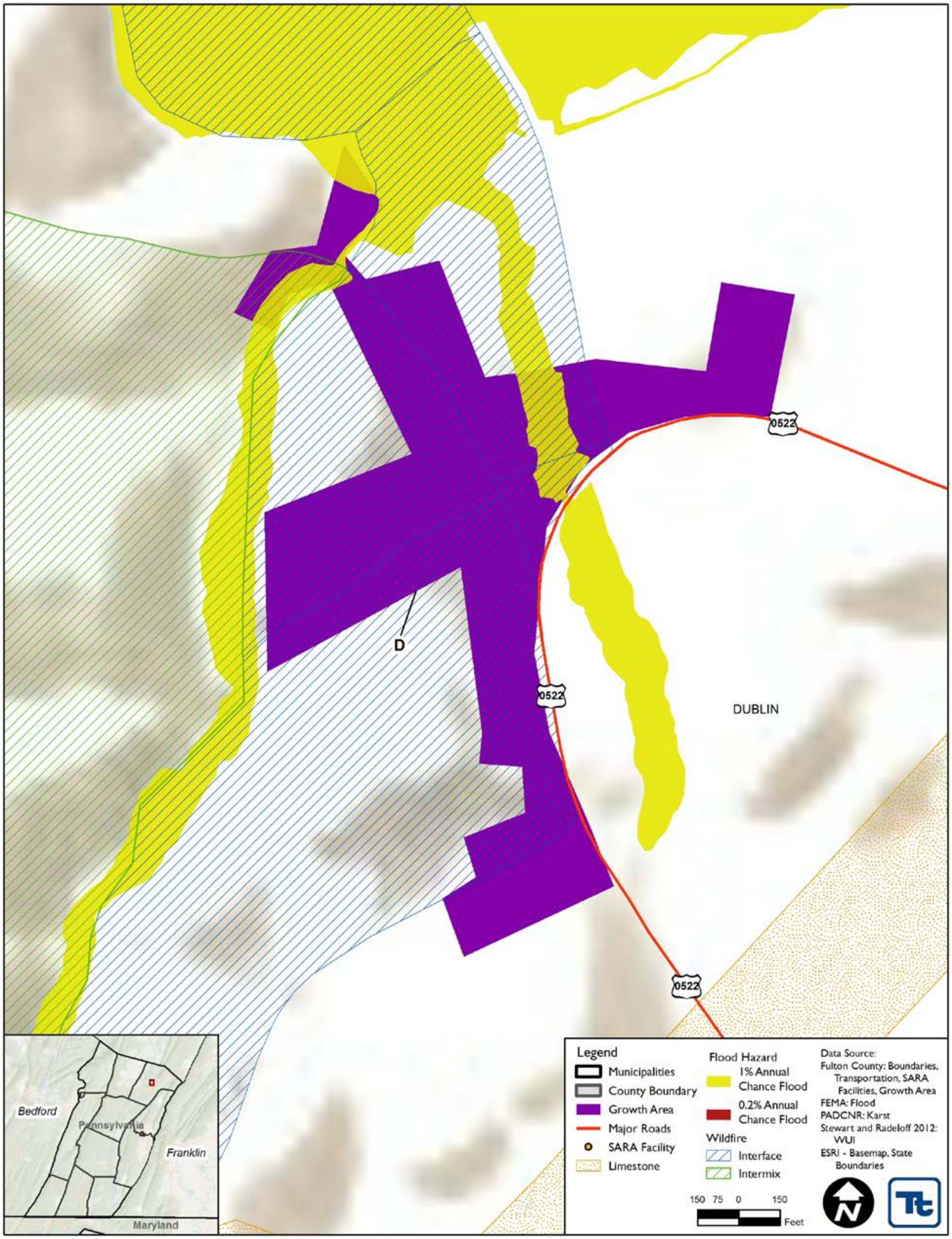
Source: Fulton County Planning Commission 2014

Figure 2-9. Fulton County Growth Area C and Hazards



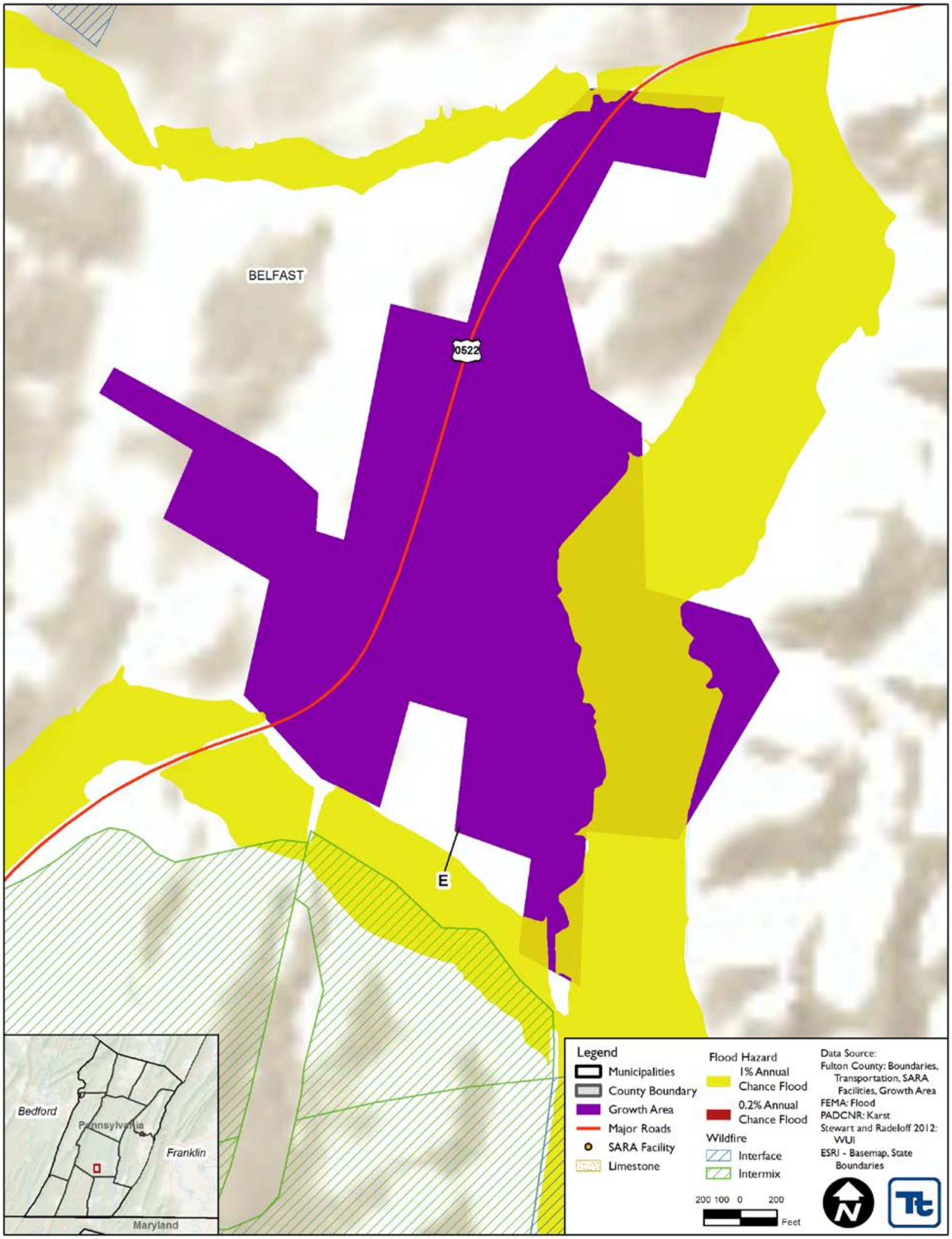
Source: Fulton County Planning Commission 2014

Figure 2-10. Fulton County Growth Area D and Hazards



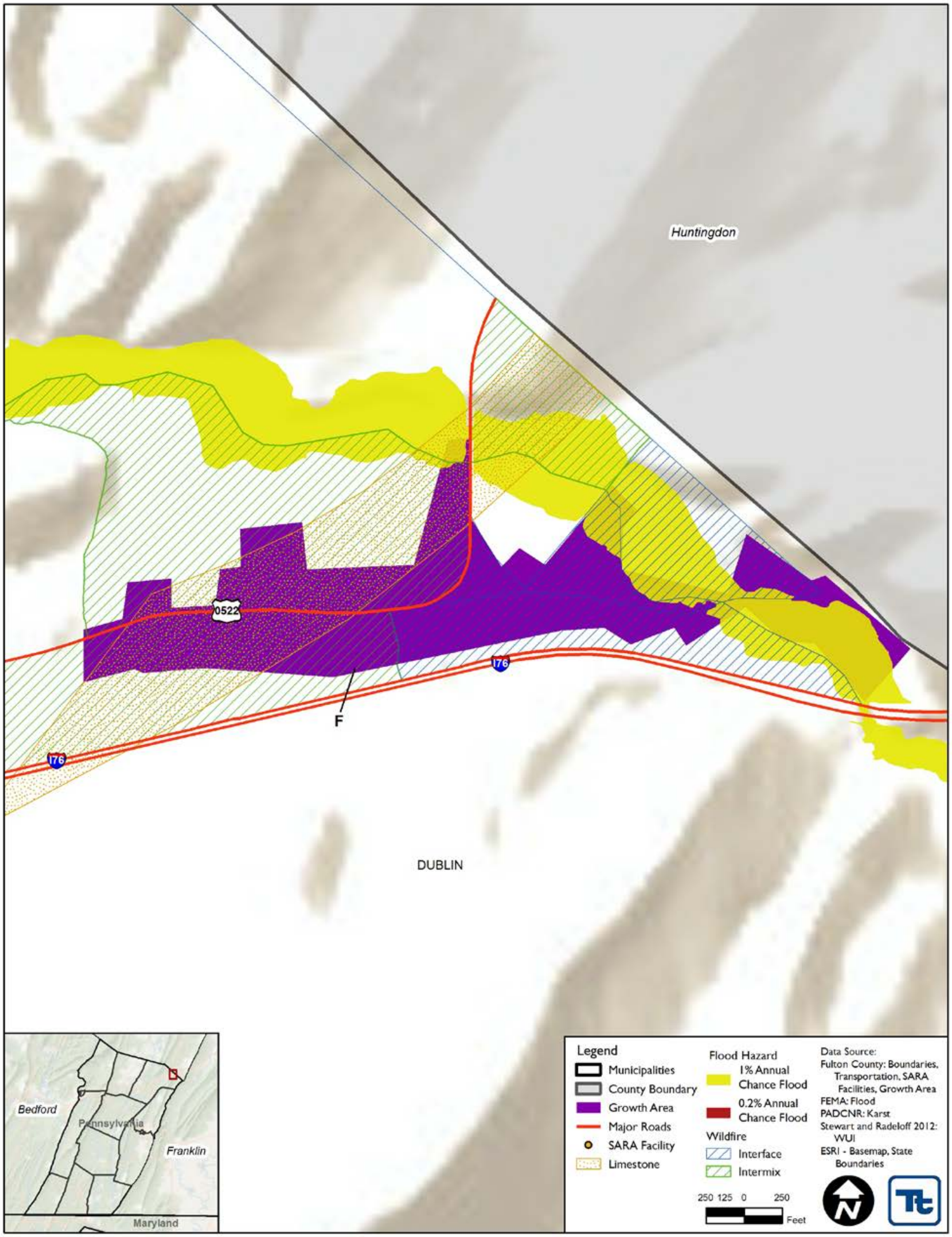
Source: Fulton County Planning Commission 2014

Figure 2-11. Fulton County Growth Area E and Hazards



Source: Fulton County Planning Commission 2014

Figure 2-12. Fulton County Growth Area F and Hazards



Source: Fulton County Planning Commission 2014

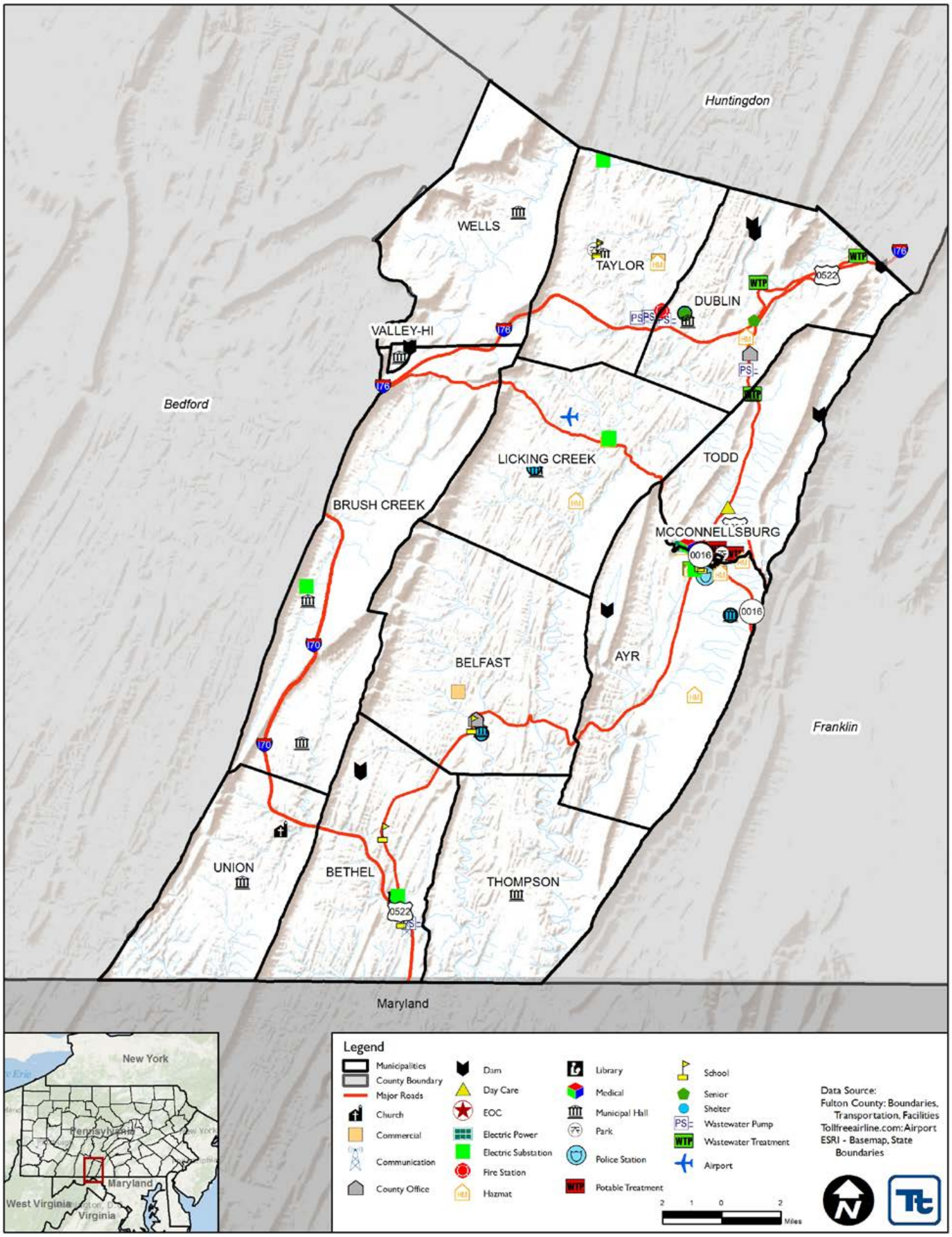
2.5 Critical Facilities

This section describes the critical facilities in Fulton County, including essential facilities, transportation systems, lifeline utility systems, and high-potential loss facilities. Transportation systems include roadways, bridges, tunnels, airways, and waterways. Lifeline utility systems include potable water, wastewater, oil, natural gas, electric power facilities, and emergency communication systems.

> ***Critical facilities*** are those facilities considered critical to the health and welfare of the population and that are especially important following a hazard. As defined for this hazard mitigation plan (HMP), critical facilities include essential facilities, transportation systems, lifeline utility systems, and high-potential loss facilities.
>
> ***Essential facilities*** are a subset of critical facilities that include those facilities that are important to ensure a full recovery following the occurrence of a hazard event. For the County risk assessment, this category was defined to include police, fire, emergency medical services (EMS), schools, shelters, senior accommodations, and medical facilities.

A comprehensive inventory of critical facilities in County was developed from various sources including input from representatives of the Steering Committee, Fulton County, participating municipal departments, and utility companies, as well as HAZUS-MH-provided data. The inventory of critical facilities presented in this section represents the current state of the effort at the time of publication of this HMP and was used for the risk assessment presented in Section 4. Figure 2-13 identifies the critical facilities and their locations within Fulton County.

Figure 2-13. Critical Facilities in Fulton County



Source: Fulton County Planning Commission 2014; Fulton County Emergency Management Agency (EMA)/9-1-1 2015

2.5.1 Essential Facilities

This section provides information on emergency facilities, hospital and medical facilities, shelters, schools, and senior care and living facilities.

2.5.1.1 Emergency Facilities

For the purposes of this plan, emergency facilities include police, fire, and emergency operation centers (EOC). Table 2-6 provides an inventory of these emergency facilities in Fulton County.

Table 2-6. Emergency Facilities in Fulton County

Name	Address	Municipality	Bldg. Type	Backup Power
PSP	500 Fulton Drive	Ayr (T)	PD	Y
Needmore Firehall	8366 Great Cover Road	Belfast (T)	FD	N
Hustontown Firehall	426 N Clear Ridge Road	Dublin (T)	FD	Y
Fulton Co. Services for Children	219 N 2nd Street	McConnellsburg (B)	EOC	Y
McConnellsburg Firehall	112 E Maple Street	McConnellsburg (B)	FD	Y
McConnellsburg Firehall	210 E Maple Street	McConnellsburg (B)	FD	Y

Source: Fulton County Planning Commission 2014
Notes:
B Borough
EOC Emergency Operation Center
FD Fire department
PD Police department
T Township

2.5.1.2 Hospital and Medical Centers

Table 2-7 provides an inventory of hospitals and major medical facilities in Fulton County.

Table 2-7. Hospitals and Medical Centers in Fulton County

Name	Address	Municipality	# Beds	Bldg. Type	Backup Power
Fulton County Medical Center	214 Peach Orchard Road	Todd (T)	N/A	Medical Facility	Y

Source: Fulton County Planning Commission 2014
Notes:
B Borough
T Township

2.5.1.3 Shelters

The County uses a variety of facilities for shelter locations, including schools, municipal halls, churches, and senior centers. The Red Cross has formal shelter agreements with two churches and informal agreements with other local churches; however, the volunteer organization is in the process of developing formal agreements with additional churches.

Due to each shelter location in Fulton County having another, primary use, beds are not kept at each shelter site. The County has 25 cots, which can be distributed on an as needed basis. The American Red Cross also organizes shelters in the County and provides additional resources (cots and blankets) for shelter use. Additionally, in regards to preparing food for displaced residents in a shelter, Southern Fulton Elementary and McConnellsburg Elementary (Central Fulton School District) both cook with gas and Forbes Road School District cooks with electric. Fulton County last activated shelters during Hurricane

Ivan, in September 2004. Hurricane Ivan led to the American Legion shelter being opened and hosting 10 people overnight, plus several Legion employees. The shelter did not need to feed anyone, and it is the largest shelter opened by the County in the past few decades.

Fulton County typically only has need of smaller shelters due to the geographical layout and topography of the County. Most residents choose to shelter in place or with family and friends than seek a formal shelter. Although the County does not typically need a shelter with a large capacity, it still prepares for a potential mass sheltering event. Table 2-8 provides an inventory of shelters in Fulton County. The capacity listing in the table is based off shelter agreements between each site and the American Red Cross.

Table 2-8. Shelters in Fulton County

Name	Address	Municipality	Capacity	Bldg. Type	Backup Power
American Legion	411 N. Fifth Street, McConnellsburg, PA 17233	McConnellsburg (B)	N/A	Shelter/Community Resource	Y
Assembly of God Parsonage	411 N. Fourth Street, McConnellsburg, PA 17233	McConnellsburg (B)	50	Shelter/Church	N
Ayr Township Building	5844 Cito Road, McConnellsburg, PA 17233	Ayr (T)	50	Municipal Hall	N
Belfast Township Building	323 Martin Road, Needmore, PA 17238	Belfast (T)	50	Municipal Hall	N
Bethel Township Building	289 Long Hollow Road, Warfordsburg, PA 17267	Bethel (T)	65	Municipal Hall	N
Calvary Independent Baptist Church	140 McGoverns Lane, McConnellsburg, PA 17233	Todd (T)	85	Shelter/Church	N
Forbes Road School District	159 Red Bird Drive, Waterfall, PA 16689	Taylor (T)	N/A	Shelter/School	Y
Licking Creek Township Building	966 Forrestdale Road, Needmore, PA 17238	Licking Creek (T)	50	Municipal Hall	N
Central Fulton School District Building	151 E. Cherry Street, McConnellsburg, PA 17233	McConnellsburg Borough (B)	225	Shelter/School	Y
Hustontown Senior Center	387 Cole Road, Hustontown, PA 17229	County	75	Shelter/Senior Center	N
McConnellsburg Senior Center	100 Woodside Drive, McConnellsburg, PA 17233	County	80	Shelter/Senior Center	N
Sinoquipe Camp	677 Boy Scout Road, Fort Littleton, PA 17223	Dublin (T)	N/A	Shelter/ Campgrounds	N
Southern Fulton Elementary School	3072 Great Cove Road, Warfordsburg, PA 17267	Bethel (T)	120	Shelter/School	Y (Essentials Only)
Southern Fulton High School	13083 Buck Valley Road, Warfordsburg, PA 17267	Bethel (T)	150	Shelter/School	Y (Essentials Only)
Warfordsburg Senior Center	209 Long Hollow Road, Warfordsburg, PA 17267	County	60	Shelter/Senior Center	N

Source: Fulton County Planning Commission 2014
Notes:
B Borough
T Township

2.5.1.4 Schools

Table 2-9 lists schools in Fulton County. There are no institutions of higher education in the County.

Table 2-9. Schools in Fulton County

Name	Address	Municipality	Bldg. Type	Backup Power
Fulton County Community Christian School	8159 Great Cove Road	Belfast (T)	School	N
Southern Fulton Elementary School	3072 Great Cove Road	Bethel (T)	School	Y (Essentials Only)
Southern Fulton High School	13083 Buck Valley Road	Bethel (T)	School	Y (Essentials Only)
McConnellsburg Elementary School	151 E Cherry Street	McConnellsburg (B)	School	Y
McConnellsburg High School	151 E Cherry Street	McConnellsburg (B)	School	Y
Forbes Road Elementary School	143 Red Bird Drive	Taylor (T)	School	Y (Lights Only)
Forbes Road High School	159 Red Bird Drive	Taylor (T)	School	Y

Source: Fulton County Planning Commission 2014
Notes:
B Borough
T Township

2.5.1.5 Senior Care and Senior Living Facilities

Table 2-10 lists the senior facilities in Fulton County.

Table 2-10. Senior Facilities in Fulton County

Name	Address	Municipality	Capacity	Bldg. Type	Backup Power
McConnellsburg Senior Center	100 Woodside Drive	Ayr (T)	N/A	Senior Center	N
Warfordsburg Senior Center	209 Long Hollow Road	Bethel (T)	N/A	Senior Center	N
Hustontown Senior Center	387 Cole Road	Dublin (T)	N/A	Senior Center	N
Leisure Living Retirement Home	29169 Great Cove Road	Dublin (T)	37 residents	Senior Care	N
Fulton County Medical Center Long-Term Care Facility	214 Peach Orchard Road	Todd (T)	67 beds	Senior Care	Y

Source: Fulton County Planning Commission 2014
Notes:
B Borough
T Township

2.5.2 Transportation Systems

This section presents available inventory data for roadways, airports, railways, and other public transportation systems in Fulton County.

2.5.2.1 Highway, Roadways, and Associated Systems

Fulton County is home to several major roadways, most notably I-70, the Pennsylvania Turnpike I-76, US-522, and US-30. Overall, the County has over 685 miles of roadway. Of the total roadway miles in Fulton County, 38.9 are interstate highways, 24.2 are principal arterials, 48.7 are minor arterials, 44.5 are major collectors, 69 are minor collectors, and 461.5 are local roads (PennDOT Pennsylvania Highway Statistics 2013). Fulton County's bridge infrastructure consists of 181 bridges on State roads and 25 on local roads. The County Highway Department is responsible for maintaining and repairing the County's road and bridge infrastructure.

2.5.2.2 Airports

Airports can fall into two categories: public airports and private airports. Public airports include large commercial airports for major airplane carriers that are open to the public. Private airports are often used for small charter flights and private jests and airplanes. Military airports and restricted land zones are also identified as private airports. Fulton County is home to one private airport, listed in table 2-11. No public airports were identified in Fulton County (PennDOT Bureau of Aviation, online at www.tollfreeairline.com).

Table 2-11. Public and Private Airports in Fulton County

Airport Name	Municipality	Facility Usage
Flying R Airport - PN35	Licking Creek (T)	Private

Source: tollfreeairline.com 2014
Notes:
T Township

Regional airports within the vicinity of Fulton County include the Franklin County Regional Airport and the Bedford County Airport. Slightly farther away but with still-relevant airspace are the Gettysburg Airport, the Hanover Airport, the Mid-Atlantic Soaring Airport, and the Southern Adams County Heliport in Adams County; the Carlisle Airport and the Shippensburg Airport in Cumberland County; the Altoona-Blair County Airport, the Blue Knob Valley Airport, and the Cove Valley Airport in Blair County; Harrisburg International Airport in Dauphin County; and the Somerset County Airport in Somerset County (PennDOT Bureau of Aviation 2014).

2.5.2.3 Railway

No active rail lines were identified in Fulton County (PennDOT Bureau of Rail Freight, Ports, and Waterways 2014).

2.5.2.4 Public Transportation

The Huntingdon-Bedford-Fulton Area Agency on Aging (HBFAAA) maintains a shared ride program, administered by PennDOT and funded by the Pennsylvania Lottery. As implied by the name, HBFAAA provides a public transit service for Huntingdon County, Bedford County, and Fulton County. This program offers a full-fare option to the general public through its demand responsive transit program. Reduced rates are offered to those aged 65 and older and for persons with disabilities. Residents eligible for the Medical Assistance Transportation Program receive free fares, and alternative rates are available for persons aged 60 to 64 or for low-income residents. The service does not offer any fixed routes and only operates on weekdays, not on holidays or weekends (HBFAAA 2014).

County residents may also elect to travel by personal car, taxi, or limousine service. These private companies share their information online and in phone books for interested residents to access.

2.5.3 Lifeline Utility Systems

This section presents potable water, wastewater, and energy resource utility system data. Because of heightened security concerns, local utility lifeline data sufficient to complete the analysis have only partially been obtained. Utility data are included in HAZUS-MH but are not sufficient to support detailed analyses for the County.

2.5.3.1 Potable Water Supply

Public water service is available in all County boroughs and townships. McConnellsburg Borough and the McConnellsburg Water Authority are the principal supply services for residents. Many residents also use well water, and there are almost 2,900 domestic wells in Fulton County (Pennsylvania Groundwater Information System [PaGWIS] 2014). Potable water supply resources in Fulton County are identified in Table 2-12.

Table 2-12. Potable Water Supply in Fulton County

Facility Name	Address	Municipality	Owner	Capacity (gallons/day)	Backup Power
McConnellsburg Borough Municipal Water Authority	965 Lions Park Drive	Todd (T)	McConnellsburg Borough	Permitted 540,000/day	Y
Needmore Water Supply (private/public)	P.O. Box 330 Needmore, PA 17238	Belfast (T) (services Village of Needmore)	Bonnie Gordon	The Needmore water supply does not have any reserve capacity. They currently pump from a spring into a pressure tank and then into the system on an as-needed basis. Currently they pump around 17,000 gallons/day.	N
Wells Tannery Water Authority	P.O. Box 47 Wells Tannery, PA 16691	Wells (T)	Community Owned	N/A	N
Horton Well	Not Provided	Ayr (T)	McConnellsburg Water Authority	Permitted 612,000/day	N/A
Peck Springs	Not Provided	Todd (T)	McConnellsburg Water Authority	Permitted 28,800/day. Daily consumption is around 90,000/day combined on Horton Well & Peck Springs.	N
Secrest Well	Not Provided	Ayr (T)	McConnellsburg Water Authority	Permitted 180,000/day	N
Secrest Springs	Not Provided	Ayr (T)	McConnellsburg Water Authority	Permitted 144,000/day but decreases as the natural flow of the spring does. Daily consumption is approximately 30,000 gal.	N

Source: Fulton County Planning Commission 2014
Notes:
T Township

2.5.3.2 Wastewater Facilities

Public sewer service is available to all local population centers and travel corridors in the County. Fulton County and its municipalities own and operate many of the wastewater collection systems and treatment plans in the County; however, a portion of wastewater generated in Fulton County may be treated by non-County-owned facilities, including those operated by neighboring counties.

Wastewater facilities in Fulton County are identified in Table 2-13.

Table 2-13. Wastewater Facilities in Fulton County

Facility Name	Address	Municipality	Facility Owner	Capacity (thousand gallons/day)	Backup Power
McConnellsburg Sewerage Authority	20789 Great Cove Road	Ayr (T)	Municipal Authority	600	Y
Bethel Township Sewer Authority (P)	283 Pigeon Cove Road	Bethel (T)	Bethel Township	N/A	Y
Burnt Cabins Treatment Plant	269 Croghan Pike	Dublin (T)	Dublin Township	7,000	Y
Fort Littleton Sewer Pump Station (P)	151 Log Cabin Road	Dublin (T)	Dublin Township	N/A	N/A
Fort Littleton Sewer Treatment Plant	330 Sinoquipe Road	Dublin (T)	Dublin Township	16,000	Y
Hustontown Joint Sewer Authority (P)	7919 Waterfall Road	Dublin (T)	Joint Municipal Authority	N/A	N/A
Hustontown Joint Sewer Authority (P)	171 Snyder Lane	Taylor (T)	Joint Municipal Authority	280	Y
Hustontown Joint Sewer Authority (P)	171 Spring Drive	Taylor (T)	Joint Municipal Authority	N/A	N/A
Knobsville Sewer Plant	E. Dutch Corner Road	Todd (T)	Municipal Authority	2,020	Y

Source: Fulton County 2014
Notes:
T Township
P Pump Station
Municipal Authority comprises Ayr Township, Todd Township, and McConnellsburg Borough.
Joint Municipal Authority comprises Dublin Township and Taylor Township.

2.5.3.3 Energy Resources

Electric and gas utilities are deregulated whereby local delivery and supply are purchased separately. Two companies provide gas services to Fulton County residents: UGI Penn Natural Gas and Columbia Gas of Pennsylvania, Inc.

Table 2-14 lists the electric power generating facilities and electric substations in Fulton County.

Table 2-14. Electric Facilities in Fulton County

Facility Name	Address	Municipality	Facility Owner	Backup Power
West Penn Power (S) McConnellsburg	20790 Great Cove Road	Ayr (T)	West Penn Power	N
West Penn Power (S) Warfordsburg	182 Long Hollow Road	Bethel (T)	West Penn Power	N
West Penn Power (S) Emmaville	12122 Old 126	Brush Creek (T)	West Penn Power	N
West Penn Power (S) Possom Hollow	11567 Pleasant Ridge Road	Licking Creek (T)	West Penn Power	N
West Penn Power (S) Mccbrg. Service Ctr.	634 LWW	Todd	West Penn Power	N
Valley Rural Electric (S) Rt. 30	11563 Pleasant Ridge Road	Licking Creek (T)	VRE	N
Valley Rural Electric (S) Harrisonville	9120 Pleasant Ridge Road	Licking Creek (T)	VRE	N
Valley Rural Electric (S) Clear Ridge	3659 N Clear Ridge Road	Taylor (T)	VRE	N
New Enterprise (S)	1039 Waterfall Road	Taylor (T)	New Enterprise	N

Source: Fulton County 2014
Notes:
S Substation
T Township
VRE Valley Rural Electric

2.5.3.4 Communication Resources

Sprint/Embarq is the incumbent local exchange carrier for all of Fulton County based on its presence in the County. They are a provider of local telephone, data, and Internet services for the business community. Residents may also choose to use AT&T, Verizon, or other phone carriers for their needs. Comcast and Verizon are the predominant cable providers. In addition, satellite service is readily available (Fulton County Planning Commission 2014).

Major radio stations licensed in the County include WEEO-FM (103.7 FM) and WWCF (88.7 FM), both licensed in McConnellsburg.

Table 2-15 lists the communication facilities in Fulton County.

Table 2-15. Communication Facilities in Fulton County

Facility Name	Address	Municipality	Facility Owner	Backup Power
Frontier Telephone Company	13369 Buck Valley Road	Bethel (T)	Frontier	Not Provided
Sprint/Embarq	121 S Fourth Street	McConnellsburg (B)	CenturyLink	Not Provided
Fulton Co. 9-1-1 Tower	739 Aughwick Road	Todd (T)	Fulton County	Y

Source: Fulton County 2014

Notes:
B Borough
T Township

2.5.4 High-Potential Loss Facilities

High-potential loss facilities include military installations, dams, levees, nuclear power plants, and hazardous materials (HAZMAT) facilities. No levees, nuclear power plants, or military installations were identified in the County. County HAZMAT facilities and dams are described below.

2.5.4.1 HAZMAT Facilities

Fulton County is home to 10 identified facilities that utilize, ship, or house chemicals considered hazardous. These facilities have been identified under SARA as exceeding the quantity threshold for reporting. These facilities are required to comply with regulations set forth by the federal SARA and follow reporting requirements identified in the Pennsylvania Hazardous Materials Emergency Planning and Response Act (Act 165). The County monitors these reporting requirements, as necessary, to ensure facility safety.

2.5.4.2 Dams

According to the National Inventory of Dams (NID) and the Pennsylvania Department of Environmental Protection (PA DEP), Fulton County has seven dams. A dam is included in the NID if (1) it is a "high" or "significant" hazard potential class dam, (2) it is a "low" hazard potential class dam that exceeds 25 feet in height and 15 acre-feet of storage, or (3) it is a "low" hazard potential class dam that exceeds 50 acre-feet storage and 6 feet height. PA DEP also tracks dams that may not fall into these categories. Of the seven dams identified in the County, three are classified as high, none are significant, and four are classified as low.

Table 2-16 defines the hazard potential classifications, as accepted by the NID Interagency Committee on Dam Safety. PA DEP also designates dams based on potential risk level; this classification is slightly more detailed than that of the NID and is presented in Table 2-17. Table 2-18 lists the dams in Fulton County and identifies their hazard classifications.

Table 2-16. NID Dam Hazard Potential Classifications

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, and Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable. One or more expected	Yes (but not necessary for this classification)

Table 2-17. Pennsylvania Dam Classification Definitions

Size Category		
Category	Impoundment Storage (Acre feet)	Dam Height
A	Equal to or greater than 50,000	Equal to or greater than 100
B	Less than 50,000 but greater than 1,000	Less than 100 but greater than 40
C	Equal to or less than 1,000	Equal to or less than 40

Hazard Potential Category		
Category	**Population at Risk**	**Economic Loss**
1	Substantial (Numerous homes or small businesses or a large business or school)	Excessive such as extensive residential, commercial, or agricultural damage, or substantial public inconvenience.
2	Few (A small number of homes or small businesses)	Appreciable such as limited residential, commercial, or agricultural damage, or moderate public inconvenience.
3	None expected (no permanent structures for human habitation or employment)	Significant damage to private or public property and short duration public inconvenience such as damage to storage facilities or loss of critical stream crossings.
4	None expected (no permanent structures for human habitation or employment)	Minimal damage to private or public property and no significant public inconvenience

Source: Commonwealth of Pennsylvania, Date Unknown

Table 2-18. Dams in Fulton County

Dam Name	Municipality	Stream	Type	PA DEP Classification	NID Classification	Permittee	EAP
High-Hazard Dams							
Meadow Grounds	Ayr Township	Roaring Run	Earth	B-1	High	PA Fish and Boat Commission	Y
Cowan's Gap	Dublin Township	Little Aughwick Creek	Earth	B-1	High	DCNR – Bureau of State Parks	Y
Valley-Hi Eagle Lake	Valley-Hi Borough	Oregon Creek	Earth	C-1	High	Valley-Hi Development Association, Inc.	Y
Other Dams							
Camp Sinoquipe Lake	Dublin Township	Plum Run	Earth	C-4	Low	Boy Scouts of America	NR
Grewe Upper	Bethel Township	Mellot Run	Earth	C-4	Low	Josef Grewe	N/A
Grewe Lower	Bethel Township	Mellot Run	Earth	C-4	Low	Josef Grewe	N/A
Burnt Cabins Mill Pond	Dublin Township	S Br Little Aughwick Creek	Earth	C-4	Low	Greg and Dawn Harnish	N/A

Source: NID 2007
Notes:
(1) Information from the National Inventory of Dams
Br Branch
DCNR Department of Conservation and Natural Resources
EAP Emergency Action Plan
NR Not Required
PA DEP Pennsylvania Department of Environmental Protection

2.5.5 Other Facilities

Table 2-19 lists other critical facilities identified by the County.

Table 2-19. Other Facilities in Fulton County

Name	Address	Municipality	Bldg. Type	Backup Power
Ayr Township Building	5844 Cito Road	Ayr (T)	Municipal	N

Name	Address	Municipality	Bldg. Type	Backup Power
			Hall	
JLG Industries	1 JLG Drive	Ayr (T)	Commercial	Y
Belfast Township Building	323 Martin Road	Belfast (T)	Municipal Hall	N
District Judge 39-04-03	8328 Great Cove Road	Belfast (T)	County Office	N
Mellott Wood Preserving	1398 Sawmill Road	Belfast (T)	Commercial	N
Bethel Township Building	289 Long Hollow Road	Bethel (T)	Municipal Hall	N
Brush Creek Township Bldg	117 Layton Road	Brush Creek (T)	Municipal Hall	N
Brush Creek Township Polling Place	11594 Old 126	Brush Creek (T)	Municipal Hall	N
District Judge 39-04-01	27952 Great Cove Road	Dublin (T)	County Office	N
Dublin Township Building	8776 Waterfall Road	Dublin (T)	Municipal Hall	N
Licking Creek Township Building	966 Forrestdale Road	Licking Creek (T)	Municipal Hall	N
District Judge 39-04-02	208 N 2Nd Street	McConnellsburg (B)	County Office	N
Fulton County Courthouse	201 N 2Nd Street	McConnellsburg (B)	County Office	N
Fulton County Library	223 N 1Street Street	McConnellsburg (B)	Library	N
Fulton County Sheriff	201 N 2Nd Street	McConnellsburg (B)	County Office	N
Fulton House - McConnellsburg Borough Office	112 Lincoln Way E	McConnellsburg (B)	Municipal Hall	N
Neighborhood Services Building	116 W Market Street	McConnellsburg (B)	County Office	Y
Forbes Road Lions Club Park	5871 N Hess Road	Taylor (T)	Park	N
Huston Hollow Farms	2994 S Madden Road	Taylor (T)	Commercial	Not Provided
Taylor Township Building	4421 Waterfall Road	Taylor (T)	Municipal Hall	N
New Thompson Township Building	187 Gem Bridge Road	Thompson (T)	Municipal Hall	N
Center For Families Day Care	22438 Great Cove Road	Todd (T)	Day Care	N
Lions Club Park	583 Lions Park Drive	Todd (T)	Park	N
Todd Township Building	2998 E Dutch Corner Road	Todd (T)	Municipal Hall	Y
Union Township Building	6093 Buck Valley Road	Union (T)	Municipal Hall	N
Valley-Hi Borough Building	1911 Valley-Hi Road	Valley Hi (B)	Municipal Hall	N
Wells Township Shed	891 Enid Road	Wells (T)	Municipal Hall	N

Source: Fulton County Planning Commission 2014
Notes:
B Borough
T Township

SECTION 3: PLANNING PROCESS

A successful planning process builds partnerships and brings together members representing government agencies, the public, and other stakeholders to reach consensus on the ways the community will prepare for and respond to hazards that are most likely to occur. Applying a comprehensive and transparent process adds validity to the Hazard Mitigation Plan (HMP). Participants involved in the HMP planning process gained a better understanding of the problems or issues and helped devise solutions and actions for the community. The result is a revised set of common community values and widespread support for directing financial, technical, and human resources to agreed-upon actions.

The planning process was an integral part of updating the Fulton County HMP. This section describes the planning process used to update the HMP, with participation from 12 of the County's municipalities. Specifically, this section describes the HMP update process and participation, hazard mitigation Steering Committee, meetings and documentation, public and stakeholder participation, multi-jurisdictional planning, and existing planning mechanisms implemented during the HMP update process. Additional details about the process for updating each section of this HMP are included at the beginning of those sections.

3.1 UPDATE PROCESS AND PARTICIPATION SUMMARY

In accordance with the Disaster Mitigation Act of 2000 (DMA 2000) requirements, this plan documents the following topics:

- Planning process
- Hazard identification
- Risk assessment
- Mitigation strategy: goals, actions, and projects
- Formal adoption by the participating jurisdictions
- Pennsylvania Emergency Management Agency (PEMA) and Federal Emergency Management Agency (FEMA) approval

The PEMA All-Hazard Mitigation Planning Standard Operating Guide provides the standard planning process used in Pennsylvania to create and update HMPs (including this HMP) and is cited in Appendix A, under Authorities and References. Hazard vulnerabilities and the risk assessment are described in Section 4 (Risk Assessment), and the mitigation strategy is described in Section 6 (Mitigation Strategy) of this HMP.

Public participation and planning meetings served as the main forums for gathering information to update the HMP. The Steering Committee and Tetra Tech, Inc. (Tetra Tech) were afforded access to the information in relevant and approved plans, policies, and procedures for Fulton County. Opportunities for public participation included attending public meetings, completing written surveys, and reviewing and commenting on the existing plan and other documents. Meetings, surveys, and teleconferences were used to gather input from County, municipal, and other stakeholders including members of the general public, to develop all sections of the HMP. Through this process, the County was able to establish a comprehensive approach to reducing the effects of hazards on the County and its municipalities.

3.2 THE HAZARD MITIGATION STEERING COMMITTEE

The County's Steering Committee consisted of the following members:

- Mary K. Seville, Fulton County Planning Commission
- Ruth Strait, Fulton County Emergency Management Agency (EMA)/9-1-1
- Irvin Dasher, Fulton County Commissioner
- Jeremy Fletcher, Fulton County Planning Commission
- Paul Johnston, Fulton County Chamber of Commerce and Tourism
- Seleen Shives, Fulton County Conservation District
- Denise Grissinger, Ayr Township
- Marlin Harr, Ayr Township
- Donna Welsh, Ayr Township
- John Keefer, Belfast Township
- Paula Shives, Belfast Township
- Donna Lynch, Bethel Township
- Ray E. Powell, Bethel Township
- Delmas Bard, Brush Creek Township
- Helen Layton, Brush Creek Township
- Jeff Croft, Dublin Township
- Dixie Henry, Dublin Township
- LuAnne Keebaugh, Licking Creek Township
- Ed Swope, Licking Creek Township
- Rick Buterbaugh, McConnellsburg Borough
- Jack Fields, McConnellsburg Borough
- Monica Mellott, Taylor Township
- Murray Romig, Taylor Township
- Gene Mellott, Thompson Township
- Eric Reckner, Thompson Township
- Marcie Mellott, Todd Township
- Stanley Mellott, Todd Township
- Carolyn Wills, Union Township
- Randy Wills, Union Township
- Karole S. Barton, Wells Township
- Carl Duane Souders, Wells Township
- Jeff Black, Hustontown Fire 57
- Deb Buterbaugh, American Red Cross
- Jason Sharpe, JLG Industries
- Kriste Shoop, Fulton County Medical Center
- Kim Slee, Fulton County Medical Center

Mary K. Seville served as chair of the Steering Committee.

The Steering Committee acknowledged that one of the most important steps in developing a comprehensive HMP was identifying hazards that specifically affect Fulton County and assessing their likelihood of occurrence, along with the potential damage to the people, property, and environment of the County. The Steering Committee chose to focus on an all-hazards approach as opposed to narrowing the focus to natural disasters only.

3.3 MEETINGS AND DOCUMENTATION

Table 3-1 lists the meetings that the County Steering Committee held during the update process of the Fulton County HMP.

Table 3-1. Public and Planning Meetings

Date	Description of Meeting
October 9, 2014	Kick-off meeting with Steering Committee members, including five-year plan review
October 13, 2014	Explanation of HMP Project Update at the 92nd Annual Convention of the Fulton County Association of Township Officials
January 13, 2015	Steering Committee meeting to review hazard profiles and risk assessment results
January 27, 2015	Public meeting to review updated risk assessment
February 17, 2015	Mitigation Solutions Workshop to identify potential mitigation goals, objectives, and actions
March 31, 2015	Mitigation Strategy Review public meeting to review mitigation goals, objectives, actions, and current plan status with municipal representatives, stakeholders, and residents.
April 29, 2015	Steering Committee meeting to review the status of the HMP update
April 29, 2015	Approve the draft HMP for formal review
June 4, 2015	Public meeting to review the draft
September 22, 2015	HMP adoption by County Commissioners

Fulton County contractor Tetra Tech followed up each meeting with meeting notes that documented all discussion, decisions, and unmet needs identified during the meetings. The meeting minutes were shared among the Steering Committee, contractors, and attendees of the meeting. Documentation from all meetings can be found in Appendix C. County residents were informed of public meetings through various sources, including newspapers and announcements on the County HMP website (http://www.fultonhmp.com/). Throughout the course of the project, Fulton County received 53 hits on the project website. During the public risk assessment meeting, seven County residents attended the meeting to learn more about the HMP update. Additionally, three County residents attended the Mitigation Solutions Workshop and one resident attended the Mitigation Strategy Review Meeting. County residents actively engaged in the plan update process by providing supporting documentation for hazard profiles and by offering suggestions to hazard profile data and mitigation actions. Supporting documentation provided by County residents is included in Appendix E.

The Steering Committee partnered with Tetra Tech to aid in the update of the HMP. The contractors assisted the County in drafting planning documents, preparing meeting materials, and facilitating meetings. The Steering Committee reviewed any documentation produced by Tetra Tech, provided validation, and acted as an advocate for the HMP update. Comments received from the public were incorporated into the HMP.

3.4 PUBLIC AND STAKEHOLDER PARTICIPATION

To maximize the effectiveness of the HMP, the Steering Committee fostered continual public and stakeholder engagement. Public input was encouraged and collected through a variety of methods. Three worksheets/surveys – specifically, the Hazard/Risk Identification Survey, Capabilities Assessment Survey, and Mitigation Strategy 5-Year Plan Review Worksheet (Mitigation Review Worksheet) – were sent to each municipality in Fulton County. Of the 13 municipalities surveyed in Fulton County, 12 returned a worksheet/survey so that their input could be reviewed and incorporated into the updated HMP.

Local, State, and federal agencies; neighboring jurisdictions (i.e., Bedford, Huntingdon, and Franklin Counties); local businesses; community leaders; educators; and other relevant private and nonprofit groups that had a vested interest in the development of the updated HMP were given the opportunity to participate in the planning process by attending a planning or public meeting or by offering comments on the project website. Invitations to participate in meetings were sent to all municipalities, adjacent counties, major industries, and other relevant stakeholders identified by the County. Appendix C includes copies of invitation letters and lists of individuals to whom invitations were sent. Surveys were sent to all municipalities, with 12 of the 13 municipalities' representatives attending at least one of these meetings. Also in attendance at these meetings were representatives of various other stakeholder groups, including the following:

- Fulton County Commissioners
- Fulton County Conservation District
- Fulton County Chamber of Commerce and Tourism
- Fulton County Medical Center
- PEMA
- Pennsylvania Department of Transportation (PennDOT)
- Pennsylvania State Police (PSP)
- Hustontown Fire 57
- American Red Cross
- JLG Industries
- Bedford County

Through public notices published in the local newspaper and other various local media outlets, the above groups and the general public were invited to review the HMP on the County HMP website and to send comments to the Fulton County Planning Commission or to Tetra Tech. In addition, public meetings were held during the planning process as listed in Table 3-1 in Section 3.3, "Meetings and Documentation." A public notice inviting the general public to review and comment on the HMP, as well as to attend the meeting itself, preceded each of these meetings. Copies of the actual public notices are found in Appendix C, immediately following the copy of materials used at the respective meetings. Copies of the public notices for public meetings and the opening of the public comment period are shown on Figure 3-1. These notices were published on January 15, 2015, February 5, 2015, March 19, 2015, and May 7, 2015, respectively.

Figure 3-1. Public Notices

PUBLIC MEETING NOTICE

Fulton County and its municipalities are updating the Fulton County Hazard Mitigation Plan (HMP). The HMP is designed to make our community more resistant to losses from natural and man-made disasters, and to enable the county and municipalities to be eligible for federal funding for qualifying mitigation projects. There will be a public meeting to review the updated risk assessment at the Fulton County Planning Office in the lower level of the Services for Children Building, 219 North Second Street, McConnellsburg, PA, from 6:30 to 8:00 p.m. on January 27, 2015. All interested parties are invited to attend and provide comments on the risk assessment, which is "Draft Documents for Review" page at www.fultonhmp.com. For more information, contact Mary K. Seville of the Fulton County Planning Commission at 717-485-3717.

1-15-2t

PUBLIC MEETING NOTICE

Fulton County and its municipalities are updating the Fulton County Hazard Mitigation Plan (HMP). The HMP is designed to make our community more resistant to losses from natural and man-made disasters, and to enable the county and municipalities to be eligible for federal funding for qualifying mitigation projects. There will be a public meeting to identify possible actions to reduce our communities' vulnerability to hazards from 6:30 to 8 p.m. on Tuesday, February 17, 2015. The meeting will be held in the EOC Conference Room, located in the lower level of the Services for Children Building at 219 N. Second Street in McConnellsburg. All interested parties are invited to attend and provide input. For more information, contact Mary K. Seville of the Fulton County Planning Commission at 717-485-3717.

2-5-2t

PUBLIC MEETING NOTICE

Fulton County and its municipalities are updating the Fulton County Hazard Mitigation Plan (HMP). The HMP is designed to make our community more resistant to losses from natural and man-made disasters, and to enable the county and municipalities to be eligible for federal funding for qualifying mitigation projects. There will be a public meeting to review the updated set of mitigation goals, objectives and actions to be included in the revised HMP from 6:30 p.m. to 8 p.m. on Tuesday, March 31, 2015.

The meeting will be held in the EOC Conference Room, located in the lower level of the Services for Children building at 219 North Second Street in McConnellsburg. All interested parties are invited to attend and provide input. For more information, contact Mary K. Seville of the Fulton County Planning Commission at 717-485-3717.

3-19-2t

PUBLIC COMMENT PERIOD AND PUBLIC DRAFT REVIEW MEETING

Fulton County and its municipalities are completing the update of the Fulton County Hazard Mitigation Plan (HMP). The HMP is designed to make our community more resistant to losses from natural and man-made disasters, and to enable the county and municipalities to be eligible for federal funding for qualifying mitigation projects. The draft HMP can be found at www.fultonhmp.com, and will be available for public review from May 4 – June 4, 2015. There will be a public meeting to review the draft HMP and collect feedback from 6:30 to 8 p.m. on June 4, 2015. The meeting will be held in the EOC Conference Room, located in the lower level of the Services for Children Building at 219 N. Second Street in McConnellsburg. All interested parties are invited to attend and provide input. For more information, contact Mary K. Seville of the Fulton County Planning Commission at 717-485-3717.

5-7-2t

Section 3.5, entitled "Multi-jurisdictional Planning," includes Table 3-2, showing overall municipal participation in the planning process.

As illustrated, the Steering Committee felt that jurisdictional and stakeholder participation was critical to the process. The Steering Committee met regularly to review the status of the HMP, the HMP itself, and strategies to involve the public. Because this particular HMP was an update, the Steering Committee felt it was critical to allow adequate time for stakeholders to review each section individually. The Steering Committee also individually contacted various municipalities to elicit feedback on the various sections of the HMP.

3.5 MULTI-JURISDICTIONAL PLANNING

Fulton County took a multi-jurisdictional approach to preparing its HMP, so that the HMP will apply to the County and all participating municipalities. The County was able to provide resources (e.g., funding, data, geographic information system [GIS], etc.) to which the municipalities may not have had access. However, the County was dependent on the municipal buy-in, because the municipalities have the legal authority to enforce compliance of land use planning and development issues. The County, together with Tetra Tech, undertook an intensive effort to involve all 13 municipalities in the update process, although only 12 municipalities participated.

Each municipality was given the opportunity to participate in this process. Municipal officials and representatives were invited to attend Steering Committee meetings, sent a copy of the existing HMP for comment, and asked to review and prioritize the mitigation actions. Municipal participation culminated in formal adoption of the HMP; copies of municipal adoption resolutions are found in Appendix G. Table 3-2 reflects the municipalities that met the planning participation requirements that applied to this HMP.

Table 3-2. Planning Participation Requirements

Municipality	Risk Assessment Survey Received	Capabilities Assessment Survey Received	Mitigation Review Worksheet Received	Attended Meeting(s)	Adopted 2015 Plan	2015 Plan Adoption Date
Fulton County	-	X	X	X	X	09/22/15
Ayr Township	X	X	X	X		
Belfast Township	X	X	X	X		
Bethel Township	X	X	X	X		
Brush Creek Township	X	X	X	X		
Dublin Township	X	X	X	X		
Licking Creek Township	X	X	X	X		
McConnellsburg Borough	X	X	X	X		
Taylor Township	X	X	X	X		
Thompson Township	X	X	X	X		
Todd Township	X	X	X	X		
Union Township	X	X	X	X		
Valley-Hi Borough	-	-	-	-		
Wells Township	X	X	X	X		

3.6 EXISTING PLANNING MECHANISMS

The planning process also allowed for the review and incorporation, if appropriate, of existing plans, studies, reports, and other information that aid in the mitigation of hazards across the County. Section 7 of this HMP provides additional information regarding the integration of existing and future County and municipal processes with hazard mitigation, specifically as they concern administrative, budgetary, and regulatory processes and plans; funding sources; and partnerships. Fulton County will use existing plans and programs to implement the decided-upon hazard mitigation actions. Based on the capability assessments of the participating municipalities, the County will continue to plan and implement programs to reduce the effects of hazards on people, places, and the environment. This updated HMP builds upon the momentum developed through previous related planning efforts and mitigation programs, and recommends implementing actions, where possible.

4.1 METHODOLOGY AND TOOLS

This section describes the methodology and tools used to support the risk assessment process.

Methodology

The risk assessment process used for this Hazard Mitigation Plan (HMP) update is consistent with the process and steps presented in the Federal Emergency Management Agency (FEMA) 386-2, State and Local Mitigation Planning How-to-Guide, Understanding Your Risks – Identifying Hazards and Estimating Losses (FEMA 2001). This process identifies and profiles the hazards of concern and assesses the vulnerability of assets (population, structures, critical facilities, and the economy) at risk in the community. A risk assessment provides a foundation for the community's decision makers to evaluate mitigation measures that can help reduce the impacts of a hazard when one occurs (mitigation measures are described in Section 5.4). The following steps describe the risk assessment process:

Step 1: The first step of the risk assessment process is to identify the hazards of concern. FEMA's current regulations only require an evaluation of natural hazards. Natural hazards are natural events that threaten lives, property, and other assets. Often, locations of natural hazards can be predicted where they tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area.

Step 2: The next step of the risk assessment is to prepare a profile for each hazard of concern. These profiles assist communities in evaluating and comparing the hazards that can impact their area. Each type of hazard has unique characteristics that vary from event to event. That is, the impacts associated with a specific hazard can vary depending on the magnitude and location of each event (a hazard event is a specific, uninterrupted occurrence of a particular type of hazard). Further, the probability of occurrence of a hazard in a given location impacts the priority assigned to that hazard. Finally, each hazard will impact different communities in different ways, based on geography, local development, population distribution, age of buildings, and mitigation measures already implemented.

Steps 3 and 4: To understand risk, a community must evaluate its assets and determine which assets are exposed or vulnerable to the identified hazards of concern. Hazard profile information combined with data regarding population, demographics, general building stock, and critical facilities at risk, prepares the community to develop risk scenarios and estimate potential damages and losses for each hazard. Critical facilities in Fulton County are presented in Section 2.6.

Tools

To address Disaster Mitigation Act of 2000 (DMA 2000) requirements and better understand potential vulnerability and losses associated with hazards of concern, Fulton County used standardized tools combined with local, state, and federal data and expertise to conduct the risk assessment. The County provided multiple GIS layers to aid in the completion of the risk assessment. The County's critical facilities layer allowed for an updated inventory to be used in the HAZUS-MH damage estimates. The County also provided a GIS layer of the location of buildings; this allowed for a more accurate hazard exposure analysis. Tools used by the County to support the risk assessment are described below.

Hazards U.S. – Multi-Hazard (HAZUS-MH)

In 1997, FEMA developed a standardized model for estimating losses caused by earthquakes, known as Hazards U.S. (HAZUS). HAZUS was developed in response to the need for more effective national-, state-, and community-level planning and the need to identify areas that face the highest risk and potential for loss. HAZUS was expanded into a multi-hazard methodology (HAZUS-MH) with new models for estimating potential losses from wind (hurricanes) and flood (riverine and coastal) hazards. HAZUS-MH is a Geographic Information System (GIS)-based software tool that applies engineering and scientific risk calculations that have been developed by hazard and information technology experts to provide defensible damage and loss estimates. These methodologies are accepted by FEMA and provide a consistent framework for assessing risk across a variety of hazards. The GIS framework also supports the evaluation of hazards and assessment of inventory and loss estimates for these hazards.

HAZUS-MH uses GIS technology to produce detailed maps and analytical reports that estimate a community's direct physical damage to building stock, critical facilities, transportation systems, and utilities. To generate this information, HAZUS-MH uses default HAZUS-MH-provided data for inventory, vulnerability, and hazards; this default data can be supplemented with local data to provide a more refined analysis. Damage reports can include induced damage (such as inundation, fire, and threats posed by hazardous materials and debris) and direct economic and social losses (such as casualties, shelter requirements, and economic impact) depending on the hazard and available local data. HAZUS-MH's open data architecture can be used to manage community GIS data in a central location. The use of this software also promotes consistency of current and future data output, and standardization of data collection and storage. The guidance "Using HAZUS-MH for Risk Assessment: How-to Guide" (FEMA 433) was relied upon to support the application of HAZUS-MH for this risk assessment and plan (FEMA 2014). More information on HAZUS-MH is available at http://www.fema.gov/plan/prevent/hazus/index.shtm.

In general, probabilistic analyses were performed to develop estimates of long-term average losses (annualized losses) for the earthquake and tornado/windstorm hazards, as well as an expected/estimated distribution of losses (mean return period losses) for the earthquake; flood, flash flood, and ice jam; and tornado and windstorm hazards. The probabilistic hazard generates estimates of damage and loss for specified return periods. For annualized losses, HAZUS-MH 2.1 calculates the maximum potential annual dollar loss resulting from various return periods averaged on a per-year basis. It is the summation of all HAZUS-supplied return periods (e.g., 10, 50, 100, 200, 500) multiplied by the return period probability (as a weighted calculation). In summary, the estimated cost of a hazard (earthquake; flood; and tornado/windstorm hazards) each year is calculated.

The following custom methodologies in HAZUS-MH 2.1 were used to assess potential exposure and losses associated with hazards of concern for Fulton County:

- Inventory: The default demographic data in HAZUS-MH 2.1, based on the 2000 U.S. Census, was used for the potential loss analysis (such as for sheltering and injuries). However, 2010 U.S. Census data were used to estimate hazard exposure at the municipal level.

  The default building inventory in HAZUS-MH 2.1 was used for Fulton County. The occupancy classes available in HAZUS-MH 2.1 were condensed into categories (residential, commercial, industrial, agricultural, religious, government, and educational) to facilitate the analysis and the presentation of results. Residential loss estimates address both multi-family and single-family dwellings.

  An updated critical facility inventory was also developed and incorporated into HAZUS-MH replacing the default essential facility (police, fire, schools, etc.) and utility inventories. The critical facility inventory (essential facilities, utilities, transportation features, and user-defined facilities) was updated for the earthquake, flood, and tornado/windstorm hazard models. This comprehensive inventory was developed by gathering input from numerous sources including Fulton County GIS, participating municipalities, and the Steering Committee.

The “user-defined facilities” category includes all assets that Fulton County plan participants deemed critical to include in the inventory and that do not fit within a pre-defined HAZUS-MH facility category. These facilities include shelters, senior care facilities, and municipality-owned buildings.

- Earthquake: HAZUS-MH 2.1 was used to evaluate Fulton County’s risk to a seismic hazard. A probabilistic assessment was performed to analyze the earthquake hazard losses (annualized losses and 500-year mean return period [MRP] losses). The probabilistic method uses historic earthquake information regarding inferred faults, locations, and magnitudes, and computes the probable ground shaking levels that may be experienced during a recurrence period by Census tract.

  The National Earthquake Hazard Reduction Program (NEHRP) developed five soil classifications that impact the severity of an earthquake, ranging from A to E. Soil classified as A represents hard rock that reduces ground motions from an earthquake, and E represents soft soils that amplify and magnify ground shaking and increase building damage and losses. NEHRP soil classifications were not available for Fulton County at the time of this analysis. Soils were estimated as NEHRP soil Type D across Fulton County as a conservative approach to this risk assessment. Groundwater was set at a depth of 5 feet (default setting). Damages and losses due to liquefaction, landslide, or surface fault rupture were not included in this analysis.

- Flood: The 1-percent annual chance flood event was examined to evaluate Fulton County’s risk and vulnerability to the riverine flood hazard. This flood event is generally considered by planners and evaluated under federal programs such as the National Flood Insurance Program (NFIP).

  The Fulton County FEMA Digital Flood Insurance Rate Maps (DFIRM) were used to evaluate exposure and determine potential future losses (FEMA 2011). The 1-percent annual chance flood depth grid was incorporated into HAZUS to estimate potential losses for the County (Pennsylvania Spatial Data Clearinghouse 2010). According to FEMA Region III, the 2010 depth grid is based on the data used to develop the 2010 DFIRMs.

  To further enhance the risk assessment, FEMA Region III provided the total exposure in the floodplain (TEIF) for Fulton County. These data include best available information including the 2010 Census geography and 2012 RS Means Evaluations. These data are used in lieu of the average annualized loss study information.

- Tornado and Windstorm: A HAZUS-MH 2.1 probabilistic analysis was performed to analyze the wind hazard losses for Fulton County. The probabilistic hurricane hazard activates a database of thousands of potential storms with tracks and intensities reflecting the full spectrum of Atlantic hurricanes observed since 1886, and then identifies those storms with tracks associated with the Planning Area. HAZUS-MH contains data on historic hurricane events and wind speeds. It also includes surface roughness and vegetation (tree coverage) maps for the area. Surface roughness and vegetation data support the modeling of wind force across various types of land surfaces. Annualized losses and the 100- and 500-year MRPs were examined for the tornado/windstorm hazard. Default demographic and updated building and critical facility inventories in HAZUS-MH 2.1 were used for the analysis.

- Other Hazards: GIS tools including HAZUS-MH were used to evaluate other hazards (such as wildfire, landslide, etc.) as feasible. For many of the hazards evaluated in this risk assessment, historic data are not adequate to model future losses at this time. However, HAZUS-MH can map hazard areas and calculate exposures if geographic information hazard location and inventory data are available. For some other hazards of concern, areas and inventory susceptible to specific hazards were mapped and exposure was evaluated to help guide mitigation efforts (mitigation efforts are discussed further in Section 6.4). For other hazards, a qualitative analysis was conducted using the best available data and professional judgment.

For this risk assessment, the loss estimates, exposure assessments, and hazard-specific vulnerability evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their affects on the built environment. Uncertainties also result from the following:

1) Approximations and simplifications necessary to conduct such a study
2) Incomplete or dated inventory, demographic, or economic parameter data
3) The unique nature, geographic extent, and severity of each hazard
4) Mitigation measures already employed by the participating municipalities and the amount of advance notice residents have to prepare for a specific hazard event

These factors can result in a range of uncertainty in loss estimates, possibly by a factor of 2 or more. Therefore, potential exposure and loss estimates are approximate. These results do not predict precise results and should be used to understand relative risk. Over the long term, Fulton County will collect additional data to assist in developing refined estimates of vulnerabilities to natural and non-natural hazards.

4.2 Hazard Identification

In identifying hazards that pose significant risk to Fulton County, the Steering Committee reviewed additional information and historical records from a wide range of sources, and identified the following hazards for consideration and profiling from the original 2010 plan:

Natural Hazards

- Drought
- Earthquake
- Flood
- Hailstorm
- Subsidence and Sinkhole
- Severe Windstorm
- Severe Winter Storm
- Wildfire

Non-Natural Hazards

- Environmental Hazards
- Transportation Accidents

As part of the plan update process, the Steering Committee reviewed the hazards of concern detailed in the 2010 plan as well as those identified in the State HMP, and considered the historical occurrence of events in Fulton County, as well as events occurring after completion of the 2010 plan. This review of historical events included an evaluation of all emergency and disaster declarations in the Commonwealth, with a focus on those in which Fulton County was designated for federal assistance.

Further, all jurisdictions participating in the plan update process were provided a "Hazard Identification/ Evaluation of Risk" worksheet to help identify those hazards—natural and non-natural—that each community believed posed significant risk to Fulton County, including any that may not have been considered in either the 2010 plan or the State HMP. Completed worksheets submitted by the municipalities are included in Appendix D.

Based on all available information and input from the municipalities, the Steering Committee selected the following natural and non-natural hazards for consideration in this plan update:

Natural Hazards

- Drought
- Earthquake
- Flood, Flash Flood, and Ice Jam
- Hailstorm
- Landslide
- Radon Exposure
- Subsidence and Sinkhole
- Tornado and Windstorm
- Wildfire
- Winter Storm

Non-Natural Hazards

- Dam Failure
- Environmental Hazards
- Transportation Accidents

These hazards have been profiled individually in Section 4.3 of this plan.

4.3.1 Dam Failure

This section provides a profile and vulnerability assessment of the dam failure hazard for Fulton County. A dam is an artificial barrier that has the ability to store water, wastewater, or liquid-borne materials for many reasons (flood control, human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, or pollution control). Many dams fulfill a combination of these stated functions (Association of State Dam Safety Officials 2013). They are an important resource in the United States.

Man-made dams can be classified according to the type of construction material used, the methods used in construction, the slope or cross-section of the dam, the way the dam resists the forces of the water pressure behind it, the means used for controlling seepage, and, occasionally, according to the purpose of the dam. The materials used for construction of dams include earth, rock, tailings from mining or milling, concrete, masonry, steel, timber, miscellaneous materials (plastic or rubber), and any combination of these materials (Association of State Dam Safety Officials 2013).

More than a third of the country's dams are 50 or more years old. Approximately 14,000 of those dams pose a significant hazard to life and property if failure occurs. About 2,000 unsafe dams are located throughout the United States, in almost every state.

Dams typically fail when spillway capacity is inadequate and excess flow overtops the dam, or when internal erosion (piping) through the dam or foundation occurs. Complete failure occurs if internal erosion or overtopping results in a complete structural breach, releasing a high-velocity wall of debris-filled waters that rush downstream, damaging or destroying anything in its path (Federal Emergency Management Agency [FEMA] 1996).

Dam failures can result from one or a combination of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam
- Deliberate acts of sabotage
- Structural failure of materials used in dam construction
- Movement or failure of the foundation supporting the dam
- Settling and cracking of concrete or embankment dams
- Piping and internal erosion of soil in embankment dams
- Inadequate maintenance and upkeep (FEMA 2013a)

Regulatory Oversight for Dams

The potential for catastrophic flooding caused by dam failures led to the enactment of the National Dam Safety Act (Public Law 92-367). The National Dam Safety Program (NDSP) has been used for 30 years to protect Americans from dam failure. The NDSP is a partnership between the states, federal agencies, and other stakeholders that encourages individual and community responsibility for dam safety. Under FEMA's leadership, state assistance funds have allowed all participating states to improve their programs through increased inspections, emergency action planning, and the purchase of needed equipment. FEMA has also expanded existing and initiated new training programs. Grant assistance from FEMA provides support for improvement of dam safety programs that regulate most of the dams in the United States (FEMA 2013a).

Pennsylvania Department of Environmental Protection

The Pennsylvania Department of Environmental Protection (PADEP) holds responsibility for dam safety. Hazard Potential Category 1 dams are those "where its failure could result in significant loss of life, excessive economic losses, and significant public inconvenience." Hazard Potential Category 2 dams are those "where its failure could result in the loss of a few lives, appreciable property damage, and short-duration public inconvenience" (PADEP 2009). Owners of dams classified as Hazard Categories 1 or 2 ("high-hazard" dams) are required to create an Emergency Action Plan (EAP) that describes the dam, the inundation area if the dam were to catastrophically fail, and procedures for responding to the dam failure (such as notification to the vulnerable population). Fulton County receives copies of the EAPs and inundation maps for high hazard dams whose failure could impact local residents; however, the County currently only has access to paper copies (not digital ones) of the EAPs and inundation maps.

U.S. Army Corps of Engineers Dam Safety Program

The U.S. Army Corps of Engineers (USACE) is responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. USACE has inventoried dams and has surveyed each state's and federal agency's capabilities, practices, and regulations regarding design, construction, operation, and maintenance of the dams. USACE has also developed guidelines for inspection and evaluation of dam safety (USACE 1997). The USACE National Inventory of Dams (NID) provides the most recent inspection dates for four of the Fulton County dams. These are as follows:

- Camp Sinoquipe Lake Dam: August 14, 2008
- Cowans Gap Dam: August 11, 2011
- Meadow Grounds Dam: April 9, 2012
- Valley-Hi Eagle Lake Dam: April 9, 2012

Federal Energy Regulatory Commission Dam Safety Program

The Federal Energy Regulatory Commission (FERC) has the largest dam safety program in the United States. FERC cooperates with a large number of federal and state agencies to ensure and promote dam safety and, more recently, homeland security. A total of 3,036 dams are part of regulated hydroelectric projects and are included in the FERC program. Two-thirds of these are more than 50 years old. Concern about their safety and integrity grows as dams age, making oversight and regular inspection especially important (FERC 2011). FERC staff inspects hydroelectric projects on an unscheduled basis to investigate the following:

- Potential dam safety problems
- Complaints about constructing and operating a project
- Safety concerns related to natural disasters
- Issues concerning compliance with the terms and conditions of a license (FERC 2011)

Every 5 years, an independent consulting engineer, approved by FERC, must inspect and evaluate projects with dams higher than 32.8 feet (10 meters) or with a total storage capacity of more than 2,000 acre-feet (FERC 2011).

FERC monitors and evaluates seismic research in geographic areas where there are concerns about seismic activity. This information is applied in investigating and performing structural analyses of hydroelectric projects in these areas. FERC staff also evaluates the effects of potential and actual large floods on the safety of dams. FERC staff visits dams and licensed projects during and after floods, assesses the extent of damage, and directs any studies or remedial measures the licensee must undertake. FERC's *Engineering Guidelines for the Evaluation of Hydropower Projects* guides the FERC engineering staff and licensees in evaluating dam safety. The publication is frequently revised to reflect current information and methodologies (FERC 2011).

FERC requires licensees to prepare EAPs and conducts training sessions on developing and testing these plans. The plans outline an early warning system in the event of an actual or potential sudden release of water from a dam failure. The plans include operational procedures that may be implemented during regulatory measures, such as reducing reservoir levels and downstream flows, as well as procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that all applicable parties are informed of the proper procedures in emergencies (FERC 2011).

4.3.1.1 Location and Extent

A total of seven dams are located throughout Fulton County, shown on Figure 4.3.1-1. The vast majority of these dams pose little risk; however, there are three Hazard Category 1 "high-hazard" dams that require EAPs. Table 4.3.1-1 lists dam classification definitions. Table 4.3.1-2 provides a complete list of dams in Fulton County; dams with the "high-hazard" dams listed first.

Table 4.3.1-1. Dam Classification Definitions

Size Category		
Category	**Impoundment Storage (Acre feet)**	**Dam Height (Feet)**
A	Equal to or greater than 50,000	Equal to or greater than 100
B	Less than 50,000 but greater than 1,000	Less than 100 but greater than 40
C	Equal to or less than 1,000	Equal to or less than 40
Hazard Potential Category		
Category	**Population at Risk**	**Economic Loss**
1	Substantial (Numerous homes or small businesses or a large business or school)	Excessive such as extensive residential, commercial, or agricultural damage, or substantial public inconvenience.
2	Few (A small number of homes or small businesses)	Appreciable such as limited residential, commercial, or agricultural damage, or moderate public inconvenience.
3	None expected (no permanent structures for human habitation or employment)	Significant damage to private or public property and short-duration public inconvenience such as damage to storage facilities or loss of critical stream crossings.
4	None expected (no permanent structures for human habitation or employment)	Minimal damage to private or public property and no significant public inconvenience

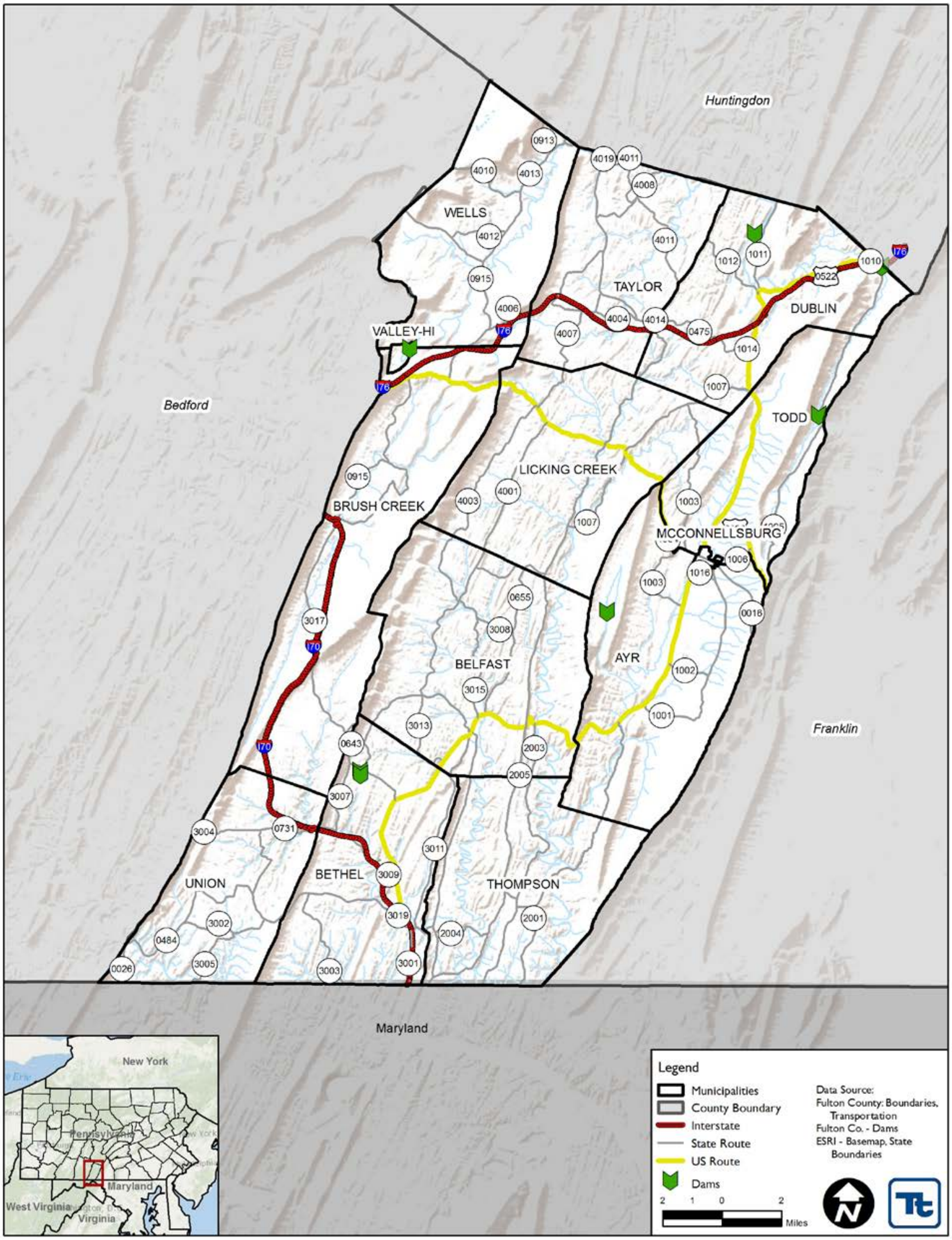
Source: Commonwealth of Pennsylvania, Date Unknown

Table 4.3.1-2. Dams in Fulton County

Dam Name	Municipality	Stream	Type	Class	Permittee
High-Hazard Dams					
Meadow Grounds	Ayr Township	Roaring Run	Earth	B-1	PA Fish and Boat Commission
Cowan's Gap	Todd Township	Little Aughwick Creek	Earth	B-1	DCNR – Bureau of State Parks
Valley-Hi Eagle Lake	Valley-Hi Borough	Oregon Creek	Earth	C-1	Valley-Hi Development Association, Inc.
Other Dams					
Camp Sinoquipe Lake	Dublin Township	Plum Run	Earth	C-4	Boy Scouts of America
Grewe Upper	Bethel Township	Mellot Run	Earth	C-4	Josef Grewe
Grewe Lower	Bethel Township	Mellot Run	Earth	C-4	Josef Grewe
Burnt Cabins Mill Pond	Dublin Township	S Br Little Aughwick Creek	Earth	C-4	Greg and Dawn Harnish

Source: PADEP Dam Safety 2013

Figure 4.3.1-1. Dams in Fulton County



Source: Fulton County

4.3.1.2 Range of Magnitude

The extent or magnitude of a dam failure event can be measured in terms of the classification of the dam. FEMA has three classification levels of dams: low, significant, and high. The classification levels build on each other. The hazard potential classification system should be used with the understanding that the failure of any dam or water-retaining structure could represent a danger to downstream life and property (FEMA 2004). Each of FEMA's dam classification levels is described below.

- Low hazard potential dams are those where failure or misoperation would result in no probable loss of human life and low economic or environmental losses. Losses are principally limited to the owner's property.
- Significant hazard potential dams are those where failure or misoperation would result in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas.
- High hazard potential dams are those where failure or misoperation will probably cause loss of human life.

USACE developed the classification system shown in Table 4.3.1-3 for the hazard potential of dam failures. The USACE hazard rating systems is based only on the potential consequences of a dam failure; it does not take into account the probability of failures.

Table 4.3.1-3. U.S. Army Corps of Engineers Hazard Potential Classification

Hazard Category[a]	Direct Loss of Life[b]	Lifeline Losses[c]	Property Losses[d]	Environmental Losses[e]
Low	None (rural location, no permanent structures for human habitation)	No disruption of services (cosmetic or rapidly repairable damage)	Private agricultural lands, equipment, and isolated buildings	Minimal incremental damage
Significant	Rural location, only transient or day-use facilities	Disruption of essential facilities and access	Major public and private facilities	Major mitigation required
High	Certain (one or more) extensive residential, commercial, or industrial development	Disruption of essential facilities and access	Extensive public and private facilities	Extensive mitigation cost or impossible to mitigate

a. Categories are assigned to overall projects, not individual structures at a project.

b. Loss-of-life potential is based on inundation mapping of area downstream of the project. Analysis of loss-of-life potential should take into account the population at risk, time of flood wave travel, and warning time.

c. Lifeline losses include indirect threats to life caused by the interruption of lifeline services from project failure or operational disruption; for example, loss of critical medical facilities or access to them.

d. Property losses include damage to project facilities and downstream property and indirect impact from loss of project services, such as impact from loss of a dam and navigation pool, or impact from loss of water or power supply.

e. Environmental impact downstream caused by the incremental flood wave produced by the project failure, beyond what would normally be expected for the magnitude flood event under which the failure occurs.

Source: USACE 1995

The worst-case scenario dam failure would be the sudden catastrophic failure of the Cowan's Gap dam, which could threaten the population in the inundation zone as well as any individuals using the lake for recreation. The Meadow Grounds dam has been drained and is currently waiting for structural improvements and repairs. Once the surrounding waterways have been refilled, the sudden catastrophic failure of the Meadow Grounds dam would also be considered a worst-case scenario. The most likely dam failure would be the failure of a small earthen dam along a minor stream, and would not threaten any lives or property.

4.3.1.3 Past Occurrence

No dam failures or incidents have been recorded in Fulton County (ASDSO 2010; NPDP 2014).

4.3.1.4 Future Occurrence

The likelihood of a dam failure in Fulton County is difficult to predict. Dam failure events are infrequent and usually coincide with events that cause them, such as earthquakes, landslides, and excessive rainfall and snowmelt. However, the risk of such an event increases for each dam as the dam's age increases or frequency of maintenance decreases.

"Residual risk" is associated with dams, which is the risk that remains after safeguards have been implemented. The residual risk for dams is associated with events beyond those that the facility was designed to withstand. However, the probability of any type of dam failure is low in today's dam safety regulatory and oversight environment.

Based on the Risk Factor Methodology Probability Criteria and providing that regular maintenance and inspections of the dams in Fulton County are performed, dam failures are considered unlikely. (Section 4.4 provides further defines this criterion.)

4.3.1.5 Vulnerability Assessment

The dam failure hazard is of significance to Fulton County because there are seven dams across Fulton County, three of which are classified as high hazard by the PADEP. The direct and indirect losses associated with dam failures include injury and loss of life, damage to structures and infrastructure, agricultural losses, utility failure (power outages), and stress on community resources.

The entire population residing within a dam failure inundation zone is considered exposed and vulnerable. Of the population exposed, the most vulnerable include the economically disadvantaged and the population over the age of 65. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on the net economic impact to their family. The population over the age of 65 is also highly vulnerable because they are more likely to seek or need medical attention that may not be available because of isolation during a flood event, and they may have more difficulty evacuating.

The EAPs associated with the Fulton County high-hazard dams provide information concerning the estimated number of homes and residents vulnerable to a dam failure.

Table 4.3.1-4. Vulnerable Populations in a Dam Inundation Zone

Dam Name	Vulnerable Structures/Homes	Vulnerable Residents
Meadow Grounds Dam	65 Homes	163 Residents
Cowans Gap Dam	57 Permanent Inhabited Structures	N/A
Valley-Hi Dam	7 Homes	20 Residents

Source: Meadow Grounds EAP 2012, Cowans Gap EAP 2008, Valley-Hi EAP 2010
Note: The Cowans Gap Dam inundation area does not impact any hospitals, schools, or nursing homes. Fort Littleton Bible Church is located in the inundation area for Fort Littleton.
The Valley-Hi Dam inundation area does not impact any businesses, hospitals, nursing homes, or daycares.

There is often limited warning time for dam failure. These events are frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, which limits their predictability and compounds the hazard. Populations without adequate warning of the event are highly vulnerable to this hazard.

All buildings and infrastructure located in the dam failure inundation zone are considered exposed and vulnerable. Property located closest to the dam inundation zone has the greatest potential to experience the largest, most destructive surge of water. All transportation infrastructure within the dam failure inundation zone is vulnerable to damage. Damage to this infrastructure could cut off evacuation routes, limit emergency access, and create isolation issues. Utilities such as overhead power, cable, and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation zones.

4.3.2 Drought

This section provides a profile and vulnerability assessment of the drought hazard in Fulton County. Drought is a period characterized by long durations of below normal precipitation. Drought conditions occur in virtually all climatic zones, yet characteristics of drought vary significantly from one region to another, relative to normal precipitation within respective regions. Drought can affect agriculture, water supply, aquatic ecology, wildlife, and plant life. Drought is a temporary irregularity in typical weather patterns and differs from aridity, which reflects low rainfall within a specific region and is a permanent feature of the climate of that area.

Drought can be defined or grouped in four categories:

- Meteorological drought is a measure of departure of precipitation from normal, defined solely by reference to relative degree of dryness. Because of climatic differences, dryness considered a drought at one location of the country may not be considered drought at another location.
- Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, and other parameters. Agricultural drought occurs when not enough water is available for a particular crop to grow at a particular time. Agricultural drought is defined in terms of soil moisture deficiencies relative to water demands of plant life, primarily crops.
- Hydrological drought is associated with below normal surface or subsurface water supply resulting from periods of precipitation shortfalls (including snowfall). Hydrological drought is related to effects of precipitation shortfalls on stream flows and water levels in reservoirs, lakes, and groundwater.
- Socioeconomic drought is associated with supply and demand of an economic good, with elements of meteorological, hydrological, and agricultural drought. This differs from the aforementioned types of drought because its occurrence depends on supply and demand to identify or classify droughts. Supplies of many economic goods such as water, silage, food grains, fish, and hydroelectric power depend on weather. Socioeconomic drought occurs when demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply (National Drought Mitigation Center ([NDMC] 2012).

Drought can affect many sectors of an economy and can reach beyond an area undergoing physical drought. Because water is essential for producing goods and providing services, drought can reduce crop yield, increase fire hazard, lower water levels, and damage wildlife and fish habitat. Further consequences of these impacts include reductions in crop yields, rangeland, and forest productivity that may lower incomes of farmers and agribusinesses; increase prices of food and timber; increase unemployment; reduce tax revenues as expenditures decline; increase crime, foreclosures, and migration; and exhaust disaster relief funds. The many impacts of drought can be categorized as economic, environmental, or social.

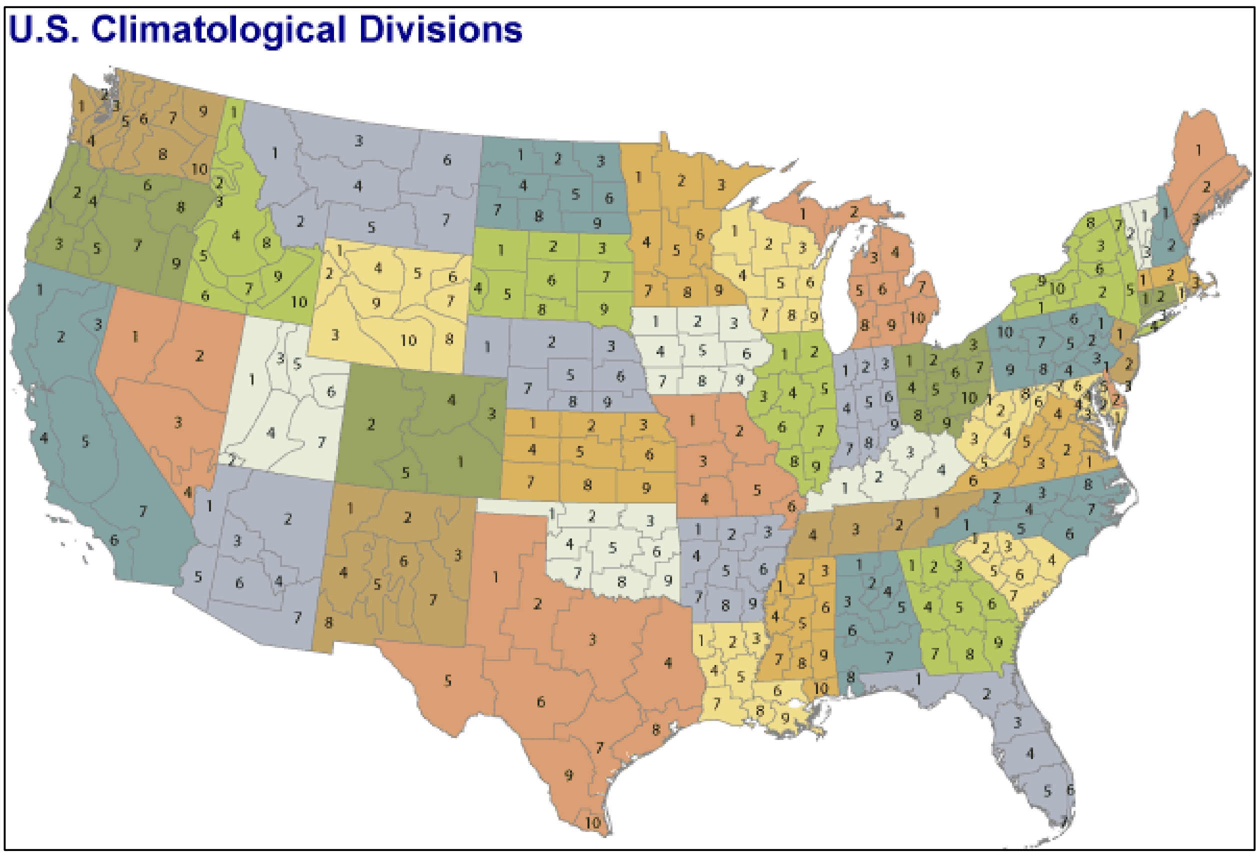
4.3.2.1 Location and Extent

Droughts are regional in scope and may affect the entirety of Fulton County rather than only individual municipalities within the County. Droughts may also concurrently affect counties near Fulton County, or even the entire State. Generally, areas along waterways will indicate drought conditions later than areas away from waterways.

Climate divisions are regions within a state that are climatically homogenous. The National Oceanic and Atmospheric Administration (NOAA) has divided the United States into 359 climate divisions. The boundaries of these divisions typically coincide with county boundaries, except in the western United States where they are based largely on drainage basins (CPC 2005).

According to NOAA, Pennsylvania includes 10 climate divisions: Pocono Mountains, East Central Mountains, Southeastern Piedmont, Lower Susquehanna, Middle Susquehanna, Upper Susquehanna, Central Mountains, South Central Mountains, Southwest Plateau, and Northwest Plateau Climate Division (National Climatic Data Center [NCDC] 2012). Figure 4.3.2-1 shows the climate divisions throughout the United States, and Figure 4.3.2-2 shows the climate divisions of Pennsylvania. Fulton County is within the South Central Mountains climate division.

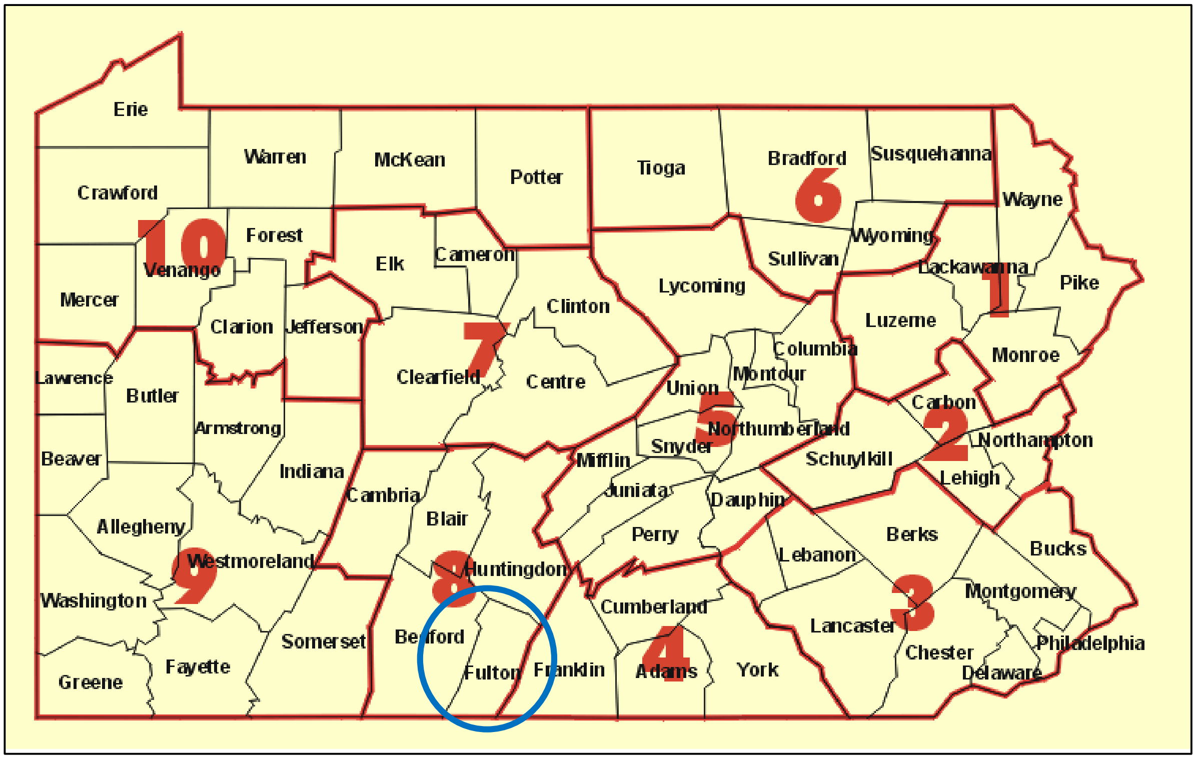
Figure 4.3.2-1. Climate Divisions in the United States



Source: NCDC 2012

Note: Climate division names vary from state to state. The climate divisions for Pennsylvania are:
1 = Pocono Mountains; 2 = East Central Mountains; 3 = Southeastern Piedmont; 4 = Lower Susquehanna; 5 = Middle Susquehanna; 6 = Upper Susquehanna; 7 = Central Mountains; 8 = South Central Mountains; 9 = Southwest Plateau; 10 = Northwest Plateau

Figure 4.3.2-2 Climate Divisions of Pennsylvania



Source: CPC 2005

Note: Highlight added.

The climate divisions for Pennsylvania are:

1 = Pocono Mountains; 2 = East Central Mountains; 3 = Southeastern Piedmont; 4 = Lower Susquehanna; 5 = Middle Susquehanna; 6 = Upper Susquehanna; 7 = Central Mountains; 8 = South Central Mountains; 9 = Southwest Plateau; 10 = Northwest Plateau

Particularly at locations where citizens rely on wells for drinking water, water supplies are vulnerable to effects of drought and thus can impact the severity of a drought. Residents depending on well water can more easily handle short-term droughts without major inconveniences than can populations that rely on surface water. However, longer-term droughts inhibit groundwater aquifers from recharging and can thus extend the problems of well owners for an indeterminate amount of time—Fulton County residents who depend on private domestic wells have this greater “hidden vulnerability” to droughts. According to the County Comprehensive Plan, the average daily water withdrawal in 2004 was 7,143 gallons per day, with water use ranging from 5,000 gallons per day in November to 9,000 gallons per day in June.

Table 4.3.2-1 lists the number of reported domestic wells within each municipality of Fulton County. The well data were obtained from the Pennsylvania Groundwater Information System (PaGWIS). PaGWIS is maintained by PA DCNR and 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. It is, however, the most complete dataset of domestic wells available.

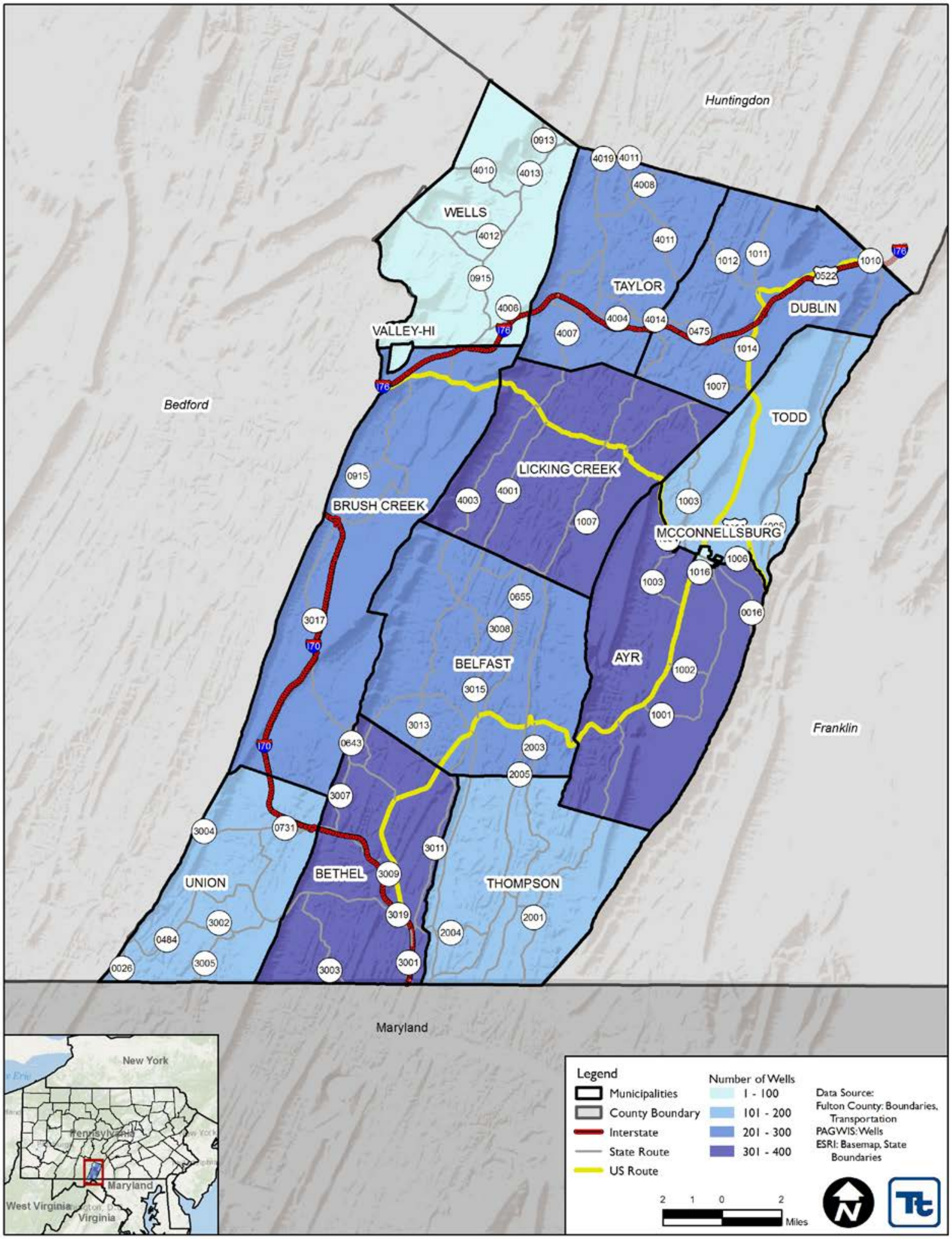
Table 4.3.2-1. Domestic Wells in Fulton County

Municipality	Number of Reported Domestic Wells
Ayr Township	379
Belfast Township	283
Bethel Township	368
Brush Creek Township	231
Dublin Township	262
Licking Creek Township	352
McConnellsburg Borough	54
Taylor Township	256
Thompson Township	200
Todd Township	183
Union Township	191
Valley-Hi Township	2
Wells Township	99
Unknown/Not Specified	29
Fulton County	**2,889**

Source: PAGWIS 2014

Figure 4.3.2-3 shows well counts by municipality within Fulton County.

Figure 4.3.2-3. Fulton County Domestic Well Counts by Municipality



Source: PAGWIS

In addition to domestic wells in the County, residents may also receive their water from municipal water providers. The McConnellsburg Water Authority is the primary supplier for public potable water. Each local water supply provider has sufficient capacity to meet customer demands, as indicated in Section 2.5.3.1. The table below provides additional information on potable water supply in Fulton County.

Table 4.3.2-2. Potable Water Supply in Fulton County

Facility Name	Service Area	Service Demand	Water Sources	Reserve Supplies
McConnellsburg Borough Municipal Water Authority	McConnellsburg Borough, Ayr Township, Todd Township	900 customers per day, and projected water needs of 320,000 gallons per day	Three wells and six springs	500,000 gallon reservoir; 200,000 gallon reservoir; and 300,000 gallon reservoir
Needmore Water Supply (private/public)	Village of Needmore (Belfast Township)	106 customers per day, and projected water needs of 18,000 gallons per day	2,000 gallon above-ground enclosed building near the Gordon Spring	No reserve capacity available. Water is pumped on an as-needed basis
Wells Tannery Water Authority	Village of Wells Tannery (Wells Township)	100-120 customers per day	One spring	96,000 gallon underground reservoir

Source: Fulton County Comprehensive Plan 2007

4.3.2.2 Range of Magnitude

Effects of droughts vary depending on their severity, timing, duration, and location. Some droughts may exert their greatest impact on agriculture, while others may have stronger effects on water supply or recreational activities. Droughts can adversely affect the following significantly:

- 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
- Water for forests and for fighting forest fires
- Water for navigation and recreation.

Pennsylvania Department of Environmental Protection (PADEP) and Pennsylvania Emergency Management Agency (PEMA) manage water supply droughts in Pennsylvania according to the following four conditions of drought defined in the Commonwealth of Pennsylvania 2013 Standard Hazard Mitigation Plan (PA HMP):

- Drought Watch: A period to alert government agencies, public water suppliers, water users, and the public regarding potential for future drought-related problems. The focus is on increased monitoring, awareness, and preparation for response in the event that conditions worsen. A request for voluntary water conservation is issued. The objective of voluntary water conservation measures during a drought watch is to reduce water use by 5 percent within the affected areas. Because of varying conditions, individual water suppliers or municipalities may ask for more stringent conservation actions.

- Drought Warning: This is a drought stage involving 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 need to impose mandatory water use restrictions. The objective of voluntary water conservation measures during a drought warning is to reduce overall water use by 10 to 15 percent within the affected areas. Because of varying conditions, individual water suppliers or municipalities may ask for more stringent conservation actions.
- Drought Emergency: During this drought stage, water management entities marshal all available resources to respond to actual emergency conditions, avoid depletion of water sources, ensure at least minimum water supplies to protect public health and safety, support essential and high-priority water uses, and avoid unnecessary economic dislocations. If deemed necessary and if ordered by the Governor during this stage, imposition of mandatory restrictions on nonessential water usage could occur as provided for in 4 *Pa. Code* Chapter 119. Objectives of water use restrictions (mandatory or voluntary) and other conservation measures during a drought emergency are to reduce consumptive water use within the affected areas by 15 percent, and to reduce total use to the extent necessary to preserve public water system supplies, avoid or mitigate local or area shortages, and ensure equitable sharing of limited supplies.
- Local Water Rationing: This fourth condition of drought is not defined as a drought stage. Local municipalities may, with the approval of the Pennsylvania Emergency Management Council, implement local water rationing to share a rapidly dwindling or severely depleted water supply within designated water supply service areas. These individual water rationing plans, authorized through provisions of 4 *Pa. Code* Chapter 120, 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 practices, procedures are specified for granting variances in consideration of individual hardships and economic dislocations (PEMA 2013).

Pennsylvania uses five parameters to assess drought conditions: precipitation deficits, stream flows, reservoir storage levels, groundwater levels, and a measure of soil moisture. These are described in detail below.

- Precipitation Deficits: As rainfall provides the basis for both groundwater and surface water resources, precipitation deficits are the earliest indicators of a potential drought. The National Weather Service (NWS) records "normal" monthly precipitation data for each county in Pennsylvania. These figures are generated from long-term monthly and decennial averages of precipitation, and are updated at the end of each decade based on the most recent 30 years. Monthly totals less than normal values represent precipitation deficits, which are then converted to percentages of the normal values. Table 4.3.2-3 lists the drought conditions (defined in the PA HMP and noted above) that are indicated by various precipitation deficit percentages (PEMA 2013).

Table 4.3.2-3. Precipitation Deficit Drought Indicators for Pennsylvania

Duration of Deficit Accumulation (months)	Drought Watch (deficit as percent of normal precipitation)	Drought Warning (deficit as percent of normal precipitation)	Drought Emergency (deficit as percent of normal precipitation)
3	25	35	45
4	20	30	40
5	20	30	40

Duration of Deficit Accumulation (months)	Drought Watch (deficit as percent of normal precipitation)	Drought Warning (deficit as percent of normal precipitation)	Drought Emergency (deficit as percent of normal precipitation)
6	20	30	40
7	18.5	28.5	38.5
8	17.5	27.5	37.5
9	16.5	26.5	36.5
10	15	25	35
11	15	25	35
12	15	25	35

Source: PEMA 2010

Table 4.3.2-4 lists normal monthly and annual precipitation from 1981 to 2010 at the two NOAA weather stations closest to Fulton County (the County operates no weather stations). These data from the NOAA weather stations are available through the National Climatic Data Center (NCDC), which compiles monthly and annual normal total precipitation (inches) data retrieved from both National Weather Service Cooperative Network (COOP) and Principal Observation (First-Order) locations throughout the United States.

Table 4.3.2-4. Normal Monthly and Annual Precipitation (total in inches) from 1981 to 2010 at NOAA Weather Stations Closest to Fulton County

Station Name	January	February	March	April	May	June	July	August	September	October	November	December	ANNUAL
Everett	2.58	2.39	3.22	3.81	4.01	3.61	3.54	3.11	3.41	2.94	3.20	2.80	38.62
Saxton 1 W	2.61	2.46	3.40	3.48	4.00	3.60	3.86	3.13	3.45	3.03	3.46	2.88	39.36

Source: NCDC 2014

- Stream Flows: Stream flows, which typically lag up to 2 months behind precipitation normals in signaling a drought, offer the second earliest indication of drought conditions. PADEP uses 73 U.S. Geological Survey (USGS)-maintained stream gauges throughout the State as its drought monitoring network, computing 30-day average stream flow values for each stream gauge based on the entire period of record for each gauge. For example, the Tonoloway Creek gauge near Needmore has data records as far back as October 1965 from which the long-term, 30-day average, or normal, flows are now determined. Drought status is determined from stream flows based on exceedances rather than percentages. The various stages of drought watch, warning, and emergency conditions are indicated, respectively, by 75-, 90-, and 95-percent exceedances of

30-day average flows (PEMA 2013). Detailed descriptions of these data collection methods appear in the PA HMP.

- Reservoir Storage Levels: Water level storage in several large public water supply reservoirs is another indicator that PADEP uses for drought monitoring. Depending on total quantity of storage and length of the refill period for the various reservoirs, PADEP uses varying percentages of storage drawdown to indicate the three drought stages for each reservoir (PEMA 2013).
- Groundwater Levels: Groundwater levels can be an indicator of a developing drought, although low readings may lag up to 3 months behind drought-indicative precipitation readings. This lag occurs because storage of nearly 80 trillion gallons of groundwater throughout the Commonwealth disguises precipitation deficits for many months before significant lack of groundwater recharge becomes noticeable (PEMA 2013).

  USGS also maintains groundwater monitoring wells in each county throughout the Commonwealth. Groundwater measurements taken from these wells at exceedances of 75, 90, and 95 percent are used to indicate drought watch, warning, and emergency statuses, respectively. Within the USGS well network, the 30-day average depth-to-groundwater readings are analyzed in relation to long-term, 30-day averages based on the period of record for each county well (PEMA 2013).
- Soil Moisture: NOAA's Palmer Drought Severity Index (PDSI) provides soil moisture information for evaluating the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather. The tool is frequently used to indicate availability of irrigation water supplies, reservoir levels, range conditions, amount of stock water, and forest fire potential. Although notably ineffective for monitoring short-term drought, the PDSI is effective for determining long-term droughts, and as such is most frequently used to delineate disaster areas (CPC 2005).

Table 4.3.2-5 lists PDSI classifications. The PDSI uses 0 to reflect normal status, and negative numbers indicate droughts. For example, 0 is no drought, -2 is moderate drought, and -4 is extreme drought. Positive numbers signify excess precipitation (NDMC 2013).

Table 4.3.2-5. Palmer Drought Severity Index (PDSI) Classifications

Severity Category	PDSI Value	Drought Status
Extremely wet	4.0 or more	None
Very wet	3.0 to 3.99	None
Moderately wet	2.0 to 2.99	None
Slightly wet	1.0 to 1.99	None
Incipient wet spell	0.5 to 0.99	None
Near normal	0.49 to -0.49	None
Incipient dry spell	-0.5 to -0.99	None
Mild drought	-1.0 to -1.99	None
Moderate drought	-2.0 to -2.99	Watch
Severe drought	-3.0 to -3.99	Warning
Extreme drought	-4.0 or less	Emergency

Source: NDMC 2013; PEMA 2013

Availability and management of water supply are discussed in the 2009 Pennsylvania State Water Plan, a joint effort by the Statewide Water Resources Committee and PADEP. In 2009, the PADEP Secretary approved an updated State Water Plan to guide management of the State's water resources over a 15-year planning horizon. As a functional planning tool for all Pennsylvania municipalities, counties, and regional planning partnerships, the State Water Plan profiles drought and resource constraints and encourages implementation of new technology and use policies to facilitate reduced water uses and resource demands at critical peak times. The Plan provides inventories of water availability, as well as an assessment of current and future water use demands and trends. It also offers strategies for improving management of water resources and waterway corridors that aim to reduce damages from extreme drought and flooding conditions (PADEP 2009).

4.3.2.3 Past Occurrence

Historical information has been drawn from many sources regarding previous occurrences and losses associated with drought events throughout Pennsylvania and Fulton County. Because so many sources were reviewed for the purpose of developing this plan, loss and impact information pertaining to many events could vary depending on the source. Therefore, accuracy of cited monetary values is based only on the available information identified during research for this plan.

According to NOAA's NCDC storm events database, Fulton County underwent four drought events between January 1, 1950, and August 31, 2014—October 1997, December 1998, July 1999, and August 1999. No statewide crop or property losses were reported because of the droughts; statewide losses would have included damages in other counties.

Since 1930, the Commonwealth of Pennsylvania has undergone 10 significant droughts. Since 1955, the Commonwealth has undergone 12 drought events that resulted in a Governor's proclamation or a Federal Emergency Management Agency (FEMA)-declared disaster or emergency. Fulton County was included in three of these events, and full details are available in PEMA's Pennsylvania Disaster History list. In addition to these events, PADEP indicated that Fulton County has undergone 13 drought-watch declarations, 7 drought-warning declarations, and 4 drought-emergency declarations between November 1980 and August 2012 (PEMA 2013).

According to FEMA, between 1954 and 2014, Pennsylvania underwent one drought-related disaster (DR) or emergency (EM) classified as one or a combination of the following disaster types: drought or water shortage. Because these disaster types generally cover a wide region of the Commonwealth, this single disaster may have impacted many counties. However, not all counties were included in the disaster declaration. FEMA, PEMA, and other sources indicate that Fulton County has not been declared a disaster area as a result of a drought-related event (FEMA 2014).

Based on all sources researched, drought events between 1895 and 2013 that have affected Fulton County are identified in Table 4.3.2-6. But not all sources have been identified or researched, and therefore Table 4.3.2-6 may not include all events that have occurred throughout the County.

Table 4.3.2-6. Past Occurrences of Drought Events from 1895 to 2013

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts / PDSI Value	Source(s)
November 1980 – April 1982	Drought Emergency	N/A	N/A	Not listed	PADEP
July – September 1965	Drought	DR-206	N/A	-3.68 in 8/1965	NRCC
April – December 1985	Drought Watch	N/A	N/A	Not listed	PADEP
July – August 1988	Drought Watch	N/A	N/A	Not listed	PADEP
August – December 1988	Drought Warning	N/A	N/A	Not listed	PADEP
March – May 1989	Drought Watch	N/A	N/A	Not listed	PADEP
June – July 1991	Drought Warning	N/A	N/A	Not listed	PADEP
July 1991	Drought	N/A	Yes	Governor Robert P. Casey – Governor's Proclamation	PEMA
July 1991 – April 1992	Drought Emergency	N/A	N/A	Not listed	PADEP
April – September 1992	Drought Warning	N/A	N/A	Not listed	PADEP
September – December 1995	Drought Watch	N/A	N/A	Not listed	PADEP
July – November 1997	Drought Watch	N/A	N/A	Not listed	PADEP
October 1997	Drought	N/A	N/A	No losses identified.	NCDC
December 1998	Drought	N/A	N/A	No losses identified.	NCDC
December 1998	Drought Watch	N/A	N/A	Not listed	PADEP
January – March 1999	Drought Warning	N/A	N/A	Not listed	PADEP
March – June 1999	Drought Watch	N/A	N/A	Not listed	PADEP
June – July 1999	Drought Warning	N/A	N/A	Not listed	PADEP
July 1999	Drought	N/A	Yes	Governor Tom Ridge – Governor's Proclamation, Individual Assistance, Hazard Mitigation Grant Program – Amended to include all 67 counties for an agricultural disaster	PEMA
July – September 1999	Drought Emergency	N/A	N/A	Not listed	PADEP

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts / PDSI Value	Source(s)
July 1999	Drought	N/A	N/A	No losses identified.	NCDC
August 1999	Drought	N/A	N/A	No losses identified.	NCDC
September 1999 – May 2000	Drought Watch	N/A	N/A	Not listed	PADEP
August – December 2001	Drought Watch	N/A	N/A	Not listed	PADEP
December 2001 – February 2002	Drought Warning	N/A	N/A	Not listed	PADEP
February 2002	Drought and Water Shortage	N/A	Yes	Governor Mark S. Schweiker – Governor's Proclamation	PEMA
February – November 2002	Drought Emergency	N/A	N/A	Not listed	PADEP
November – December 2002	Drought Watch	N/A	N/A	Not listed	PADEP
April – June 2006	Drought Watch	N/A	N/A	Not listed	PADEP
August 2007 – January 2008	Drought Watch	N/A	N/A	Not listed	PADEP
September – November 2010	Drought Warning	N/A	N/A	Not listed	PADEP
August – September 2011	Drought Watch	N/A	N/A	Not listed	PADEP

Sources: NRCC 2012, PEMA 2014, NCDC 2014, PADEP 2012.

Notes:

FEMA	Federal Emergency Management Agency
N/A	Not applicable
NCDC	National Climatic Data Center
NRCC	Northeast Regional Climate Center
PADEP	Pennsylvania Department of Environmental Protection
PDSI	Palmer Drought Severity Index
PEMA	Pennsylvania Emergency Management Agency

Table 4.3.2-7 lists the crop loss insurance payments on claims from Fulton County caused by drought events since 1948.

Table 4.3.2-7. Crop Loss Insurance Claims Due to Drought, 1948 to 2013

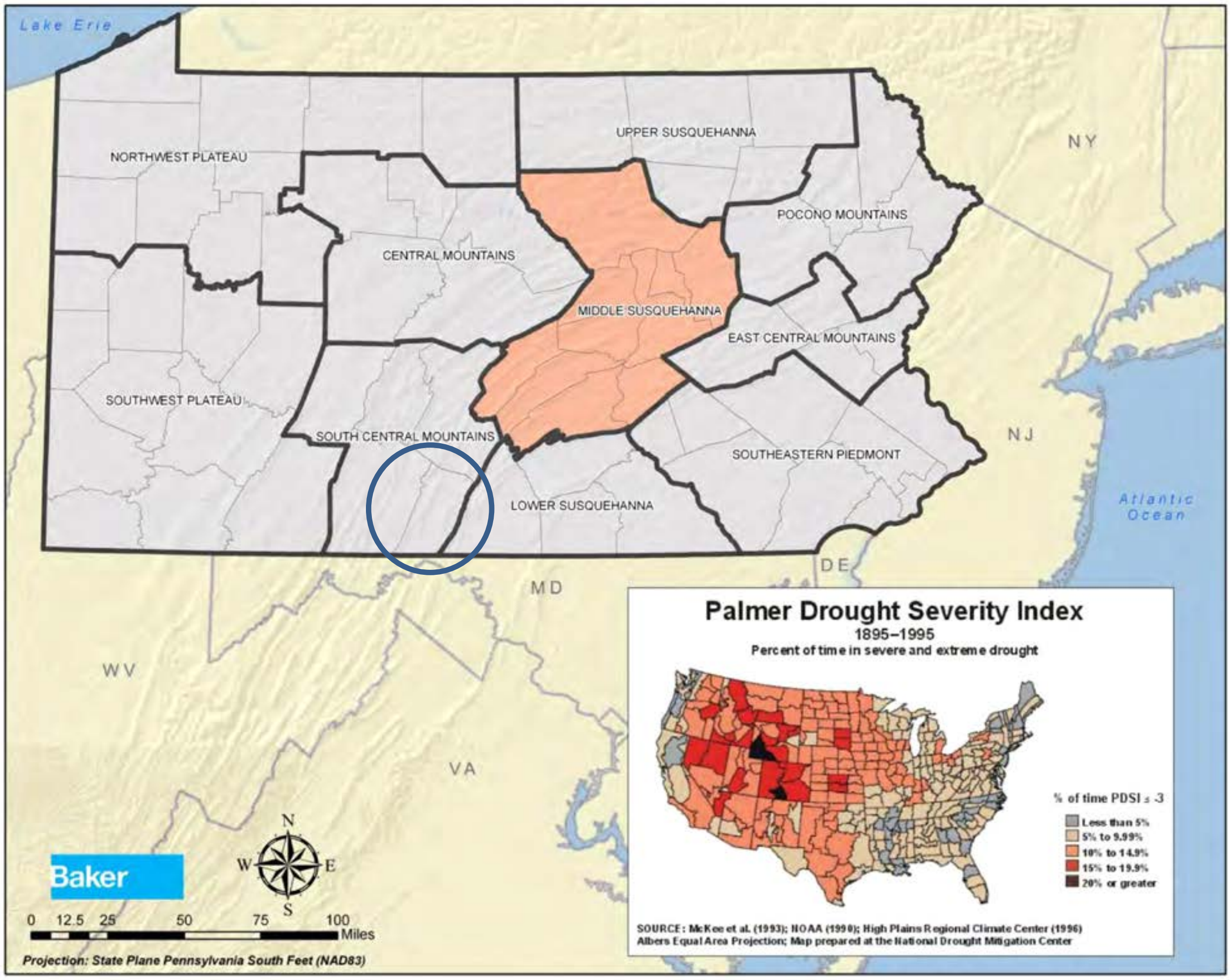
Crop Year	Total Claims	Crop Year	Total Claims
1948 - 1988	$0	2001	$0
1989	$0	2002	$0
1990	$0	2003	$0
1991	$0	2004	$0
1992	$0	2005	$0
1993	$0	2006	$0
1994	$0	2007	$0
1995	$0	2008	$0
1996	$0	2009	$0
1997	$0	2010	$540,298
1998	$0	2011	$779,921
1999	$0	2012	$70,963
2000	$0	2013	$24,513

Source: U.S. Department of Agriculture (USDA) 2013

4.3.2.4 Future Occurrence

Frequency of droughts is difficult to forecast. Based on national annual data from 1895 to 1995, Fulton County underwent severe or extreme drought conditions less than 5 percent of the time (illustrated on Figure 4.3.2-4). Based on national annual data from 1895 to July 2013, the South Central Mountains (climate division 8), in which Fulton County is located, had its lowest PDSI when it reached -7.13 in January 1931. This climate division has been in severe or extreme drought during approximately 7.7 percent of the 119 years on record (Northeast Regional Climate Center [NRCC] 2013). Future occurrences of drought events are considered likely, as defined by the Risk Factor Methodology probability criteria (described in Section 4.4).

Figure 4.3.2-4. Palmer Drought Severity Index for Pennsylvania (1895 to 1995)



Source: PEMA 2013 (highlight added)

4.3.2.5 Vulnerability Assessment

To understand risk, a community must evaluate assets exposed and vulnerable within the identified hazard area. For the drought hazard, all of Fulton County has been identified as the hazard area. Therefore, all assets (population, structures, critical facilities, and lifelines) described in the County Profile (Section 2) are vulnerable to a drought. This section evaluates and estimates potential impacts of the drought hazard on Fulton County in the following subsections:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impacts on (1) life, health, and safety; (2) general building stock; (3) critical facilities; (4) economy; and (5) future growth and development
- Effects of climate change on vulnerability
- Further data collections that will assist in understanding this hazard over time.

4.3.2.5.1 Overview of Vulnerability

Fulton County is vulnerable to drought. Assets at particular risk include any open land or structures along the wildland/urban interface (WUI) that could become vulnerable to the wildfire hazard caused by extended periods of low rain and high heat, usually associated with drought. In addition, water supply resources could be impacted by extended periods of low rain. Finally, vulnerable populations could be particularly susceptible to the drought hazard and cascading impacts because of age, health conditions, and limited ability to mobilize to shelter, cooling, and medical resources.

4.3.2.5.2 Data and Methodology

At the time this Plan was updated, insufficient data were available to model long-term potential impacts of a drought on Fulton County. Over time, additional data will be collected to allow better analysis of this hazard. Preliminary assessments based on available data are provided below.

4.3.2.5.3 Impact on Life, Health, and Safety

Drought conditions can cause a shortage of water available for human consumption and can reduce local firefighting capabilities. Social impacts of a drought include mental and physical stress, public safety threats (increased threat from forest/grass fires), health threats, conflicts among water users, reduced quality of life, and inequities in distribution of impacts and disaster relief. The infirm, young, and elderly are particularly susceptible to drought and extreme temperatures, sometimes associated with drought conditions, due to their age, health conditions, and limited ability to mobilize to shelters, cooling, and medical resources. Impacts on the economy and environment may have social implications as well (New York State Disaster Preparedness Commission [NYSDPC] 2011). For the purposes of this Plan, the entire population of the County is considered vulnerable to drought events.

4.3.2.5.4 Impact on General Building Stock and Critical Facilities

A drought is not expected to directly affect any structures, and all are expected to be operational during a drought event. However, droughts contribute to conditions conducive to wildfires. Risk to life and property is greatest in regions where forested areas adjoin urbanized areas (high-density residential, commercial, and industrial), also known as the WUI. Therefore, all assets in and adjacent to the WUI zone—including population, structures, critical facilities, lifelines, and businesses—are considered vulnerable to wildfire. Section 4.3.12 of this HMP addresses the wildfire hazard in Fulton County.

4.3.2.5.5 Impact on the Economy

A prolonged drought can exert serious direct and indirect economic impacts on a community or across the County. A summary of impacts on the economy is presented in Table 4.3.2-8.

Table 4.3.2-8. Impacts on the Economy

Losses to Agricultural Producers	Losses to Livestock Producers	Losses of Timber Production
Annual and perennial crop losses	Reduced productivity of rangeland	Wildland fires
Damage to crop quality	Reduced milk production	Tree disease
Income loss for farmers due to reduced crop yields	Forced reduction of foundation stock	Insect infestation
Reduced productivity of cropland (wind erosion, long-term loss of organic matter, etc.)	High cost/unavailability of water for livestock	Impaired productivity of forest land
Insect infestation	Cost of new or supplemental water resource development (wells, dams, pipelines)	Direct loss of trees, especially young ones
Plant disease	High cost/unavailability of feed for livestock	**Losses to Transportation Industry**
Wildlife damage to crops	Increased feed transportation costs	Loss from impaired navigability of streams, rivers, and canals
Increased irrigation costs	High livestock mortality rates	**Decline in food production/disrupted food supply**
Cost of new or supplemental water resource development (wells, dams, pipelines)	Disruption of reproduction cycles (delayed breeding, more miscarriages)	Increase in food prices
Losses of Fishery Production	Decreased stock weights	Increased importation of food (higher costs)
Damage to fish habitat	Increased predation	**Losses to Water Suppliers**
Loss of fish and other aquatic organisms due to decreased flows	Grass fires	Revenue shortfalls and/or windfall profits
Losses to Recreation and Tourism Industry	**Energy-related Effects**	Cost of water transport or transfer
Loss to manufacturers and sellers of recreational equipment	Increased energy demand and reduced supply because of drought-related power curtailments	Cost of new or supplemental water resource development
Losses related to curtailed activities: hunting and fishing, bird watching, boating, etc.	Costs to energy industry and consumers associated with substituting more expensive fuels (oil) for hydroelectric power	

Source: NYSDPC 2011

Loss estimates are based on lost agricultural revenues statewide. Table 4.3.2-9 below enumerates the County's farmland acreage exposure to the drought hazard, as well as the annual market value of all agricultural products sold, as documented in the 2012 USDA Census of Agriculture. If the County would lose its agricultural yield due to drought, total losses could amount to nearly $53 million. Table 4.3.2-10 details the potential losses associated with County livestock by providing livestock totals for the County and their associated market value. Livestock, poultry, and associated products have a potential loss value of almost $40,000 (USDA 2012).

Table 4.3.2-9. Estimated County Losses Relating to Agricultural Production

Impacted Farmland Acreage	Market Value Of All Agricultural Products
112,210	$52,975,000

Source: USDA 2012

Table 4.3.2-10. Estimated County Losses Relating to Agricultural Production

Livestock and Poultry	Inventory	Market Value Of All Livestock, Poultry, and Their Products
Cattle and Calves	18,344	**$39,882,000**
Hogs and Pigs	35,311	
Sheep and Lambs	1,773	
Layers	1,850	
Total	**57,278**	

Source: USDA 2012
Note: Market value of livestock and poultry is only provided by total value and not available by category.

4.3.2.5.6 Impact on the Environment

As summarized in the PA HMP, environmental impacts of drought include:

- Hydrologic effects – lower water levels in reservoirs, lakes, and ponds; reduced streamflow; loss of wetlands; estuarine impacts; groundwater depletion and land subsidence; effects on water quality such as increases in salt concentration and water temperature
- Damage to animal species – lack of feed and drinking water; disease; loss of biodiversity; migration or concentration; and reduction and degradation of fish and wildlife habitat
- Damage to plant communities – loss of biodiversity; loss of trees from urban landscapes and wooded conservation areas
- Increased number and severity of fires
- Reduced soil quality
- Air quality effects – dust and pollutants
- Loss of quality in landscape through loss in plants and plant diversity
- Increase in nitrate levels, which can negatively affect health of pregnant women and children (PEMA 2013).

4.3.2.5.7 Future Growth and Development

Areas targeted for potential future growth and development within the next 5 to 10 years have been identified across the County (further discussed in Section 2.4 of this HMP). Exposure of any new development and new residents to the drought hazard is anticipated.

4.3.2.5.8 Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by type, frequency, and intensity of weather events. Both globally and at the local level, climate change can alter prevalence and severity of weather extremes such as droughts. While predicting changes in drought events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating effects of future climate change on human health, society, and the environment (U.S. Environmental Protection Agency [EPA] 2006).

PADEP was directed by the Climate Change Act (Act 70 of 2008) to initiate a study of potential impacts of global climate change on the Commonwealth. The June 2009 Pennsylvania Climate Impact Assessment's main findings indicate that Pennsylvania is very likely to undergo increased temperatures in the 21st century. Increases in temperature will likely lead to increased evapotranspiration, and thus an increase in soil-moisture-related droughts throughout late spring and early fall. Pennsylvania's precipitation climate is projected to become more extreme in the future, with longer dry periods and greater intensity of precipitation. Most models project an increase in the maximum number of consecutive dry days in a year, a drought indicator (Shortle et al. 2009).

Future improvements in modeling smaller-scale climatic processes can be expected and will lead to improved understanding of how the changing climate will alter temperature, precipitation, storm frequency, and intensity in Pennsylvania. Understanding this information can help provide better indications of future drought events (Shortle et al. 2009).

4.3.3 Earthquake

An earthquake is the sudden movement of the Earth's surface caused by the release of stress accumulated within or along the edge of the Earth's tectonic plates, a volcanic eruption, or by a manmade explosion (Federal Emergency Management Agency [FEMA] 2001; Shedlock and Pakiser 1997). Most earthquakes occur at the boundaries where the Earth's tectonic plates meet (faults); less than 10 percent of earthquakes occur within plate interiors. As plates continue to move and plate boundaries change geologically over time, weakened boundary regions become part of the interiors of the plates. These zones of weakness within the continents can cause earthquakes, which are a response to stresses that originate at the edges of the plate or in the deeper crust (Shedlock and Pakiser 1997).

According to the U.S. Geological Survey (USGS) Earthquake Hazards Program, an earthquake hazard is any disruption associated with an earthquake that may affect residents' normal activities. This category includes surface faulting, ground motion (shaking), landslides, liquefaction, tectonic deformation, tsunamis, and seiches. Each of these terms is defined below:

- Surface faulting: Displacement that reaches the earth's surface during a slip along a fault. Commonly occurs with shallow earthquakes — those with an epicenter of less than 20 kilometers.
- Ground motion (shaking): The movement of the earth's surface from earthquakes or explosions. Ground motion or shaking is produced by waves that are generated by a sudden slip on a fault or sudden pressure at the explosive source and that travel through the Earth and along its surface.
- Landslide: A movement of surface material down a slope.
- Liquefaction: A process by which water-saturated sediment temporarily loses strength and acts as a fluid, like the wet sand near the water at the beach. Earthquake shaking can cause this effect.
- Tectonic Deformation: A change in the original shape of a material caused by stress and strain.
- Tsunami: A sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major sub-marine slides, or exploding volcanic islands.
- Seiche: The sloshing of a closed body of water, such as a lake or bay, from earthquake shaking (USGS 2012a).

Ground shaking is the primary cause of earthquake damage to man-made structures. Damage can be increased when soft soils amplify ground shaking. Soils influence damage in different ways. One way is that soft soils amplify the motion of earthquake waves, producing greater ground shaking and increasing the stresses on built structures on the land surface. Another way that soil can cause damage is that loose, wet, sandy soils may lose strength and flow as a fluid when shaken, causing foundations and underground structures to shift and break (Stanford 2003).

The National Earthquake Hazard Reduction Program (NEHRP) developed five soil classifications defined by their shear-wave velocity that alters the severity of an earthquake. The soil classification system categories soil ranging from A to E; each class is presented in Table 4.3.3-1. Class A soils represent hard rock that reduces ground motion from an earthquake, and Class E soils represent soft soils that amplify and magnify ground shaking and increase building damage and losses.

Table 4.3.3-1. NEHRP Soil Classifications

Soil Classification	Description
A	Hard rock
B	Rock
C	Very dense soil and soft rock
D	Stiff soils
E	Soft soils

Source: FEMA 2013

The following sections discuss the location and extent, range of magnitude, previous occurrence, future occurrence, and vulnerability assessment associated with the earthquake hazard for Fulton County.

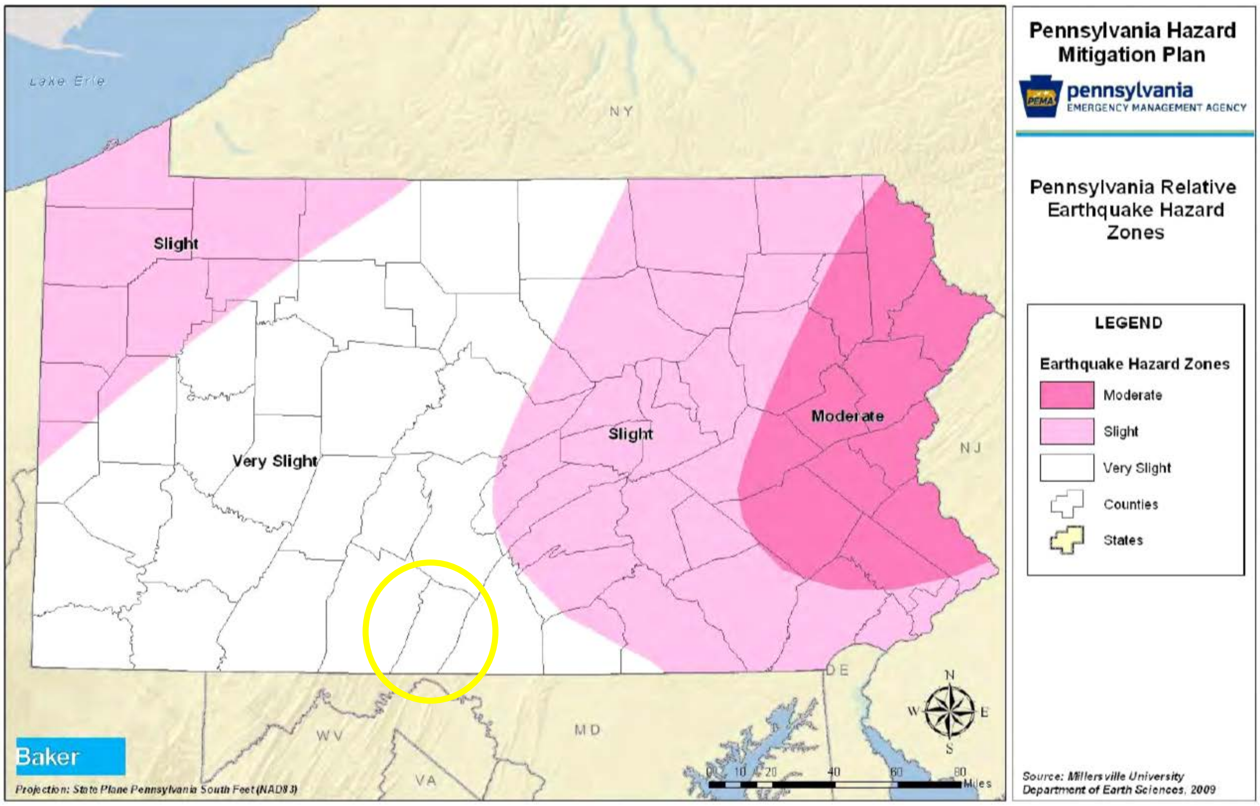
4.3.3.1 Location and Extent

The focal depth and the geographic position of the epicenter of an earthquake commonly determines its location. The focal depth of an earthquake is the depth from the Earth's surface to the region where an earthquake's energy originates (the focus or hypocenter). The epicenter of an earthquake is the point on the Earth's surface directly above the hypocenter. Earthquakes usually occur without warning, and their effects can be felt in areas at great distances from the epicenter.

According to the Pennsylvania Bureau of Topographic and Geologic Survey, when events occur in the Commonwealth, their impact area is very small (less than 100 kilometers [km] in diameter). The most seismically active region in the Commonwealth is in southeastern Pennsylvania in the area of Lancaster County (Pennsylvania Emergency Management Agency [PEMA] 2013). Areas of Pennsylvania, including Fulton County, may be subject to the effects of earthquakes with epicenters outside the Commonwealth.

Pennsylvania has three earthquake hazard area zones: very slight, slight, and moderate (shown in Figure 4.3.3-1) (PEMA 2013). Fulton County falls into the "very slight" zone, along with other municipalities and counties located within 100 km from a historical epicenter. Minor earthquake damage is expected in this zone.

Figure 4.3.3-1. Pennsylvania Earthquake Hazard Zones

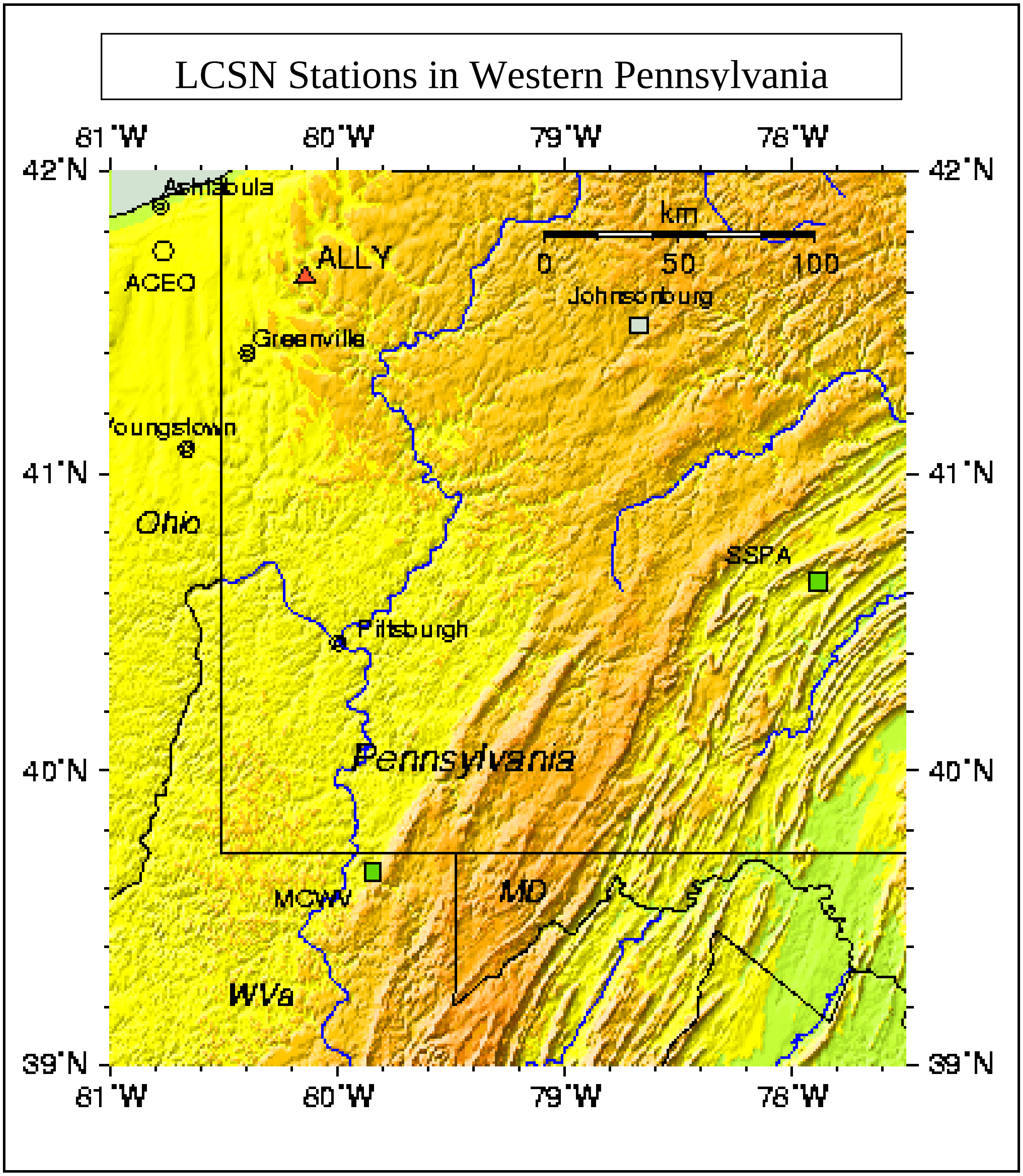


Source: PEMA 2013

Note: The yellow oval on the map illustrates the location of Fulton County.

The Lamont-Doherty Cooperative Seismographic Network (LCSN) monitors earthquakes that occur primarily in the northeastern United States. The goal of the project is to compile a complete earthquake catalog for this region, to assess the earthquake hazards, and to study the causes of the earthquakes in the region. The LCSN operates 40 seismographic stations in the following seven states: Connecticut, Delaware, Maryland, New Jersey, New York, Pennsylvania, and Vermont. Figure 4.3.3-2 shows the locations of seismographic stations in western Pennsylvania. The network is composed of broadband and short-period seismographic stations (LCSN 2012).

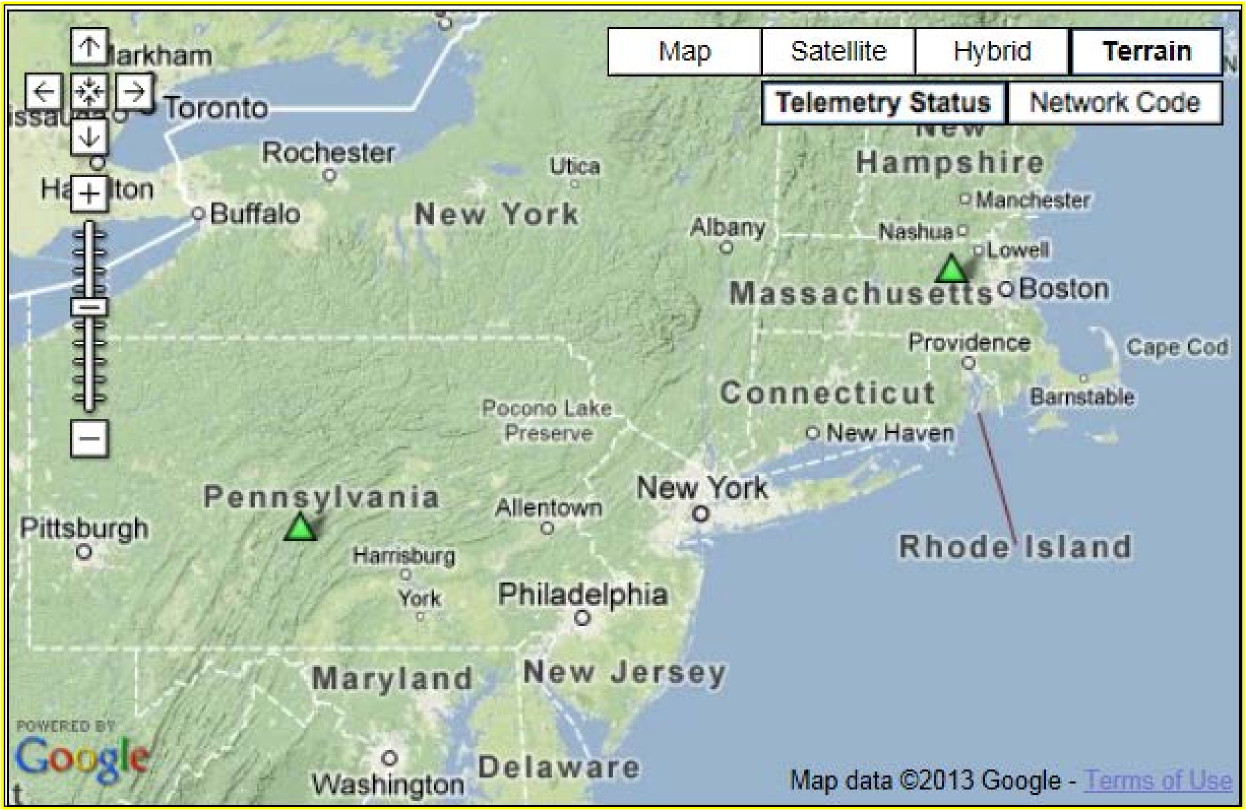
Figure 4.3.3-2. Lamont-Doherty Seismic Stations Locations in Western Pennsylvania



Source: LCSN 2006

In addition to the Lamont-Doherty Seismic Stations, USGS operates a global network of seismic stations to monitor seismic activity. While no seismic stations are located in Fulton County, nearby stations are positioned in State College, Pennsylvania. Figure 4.3.3-3 shows its location.

Figure 4.3.3-3. USGS Seismic Stations

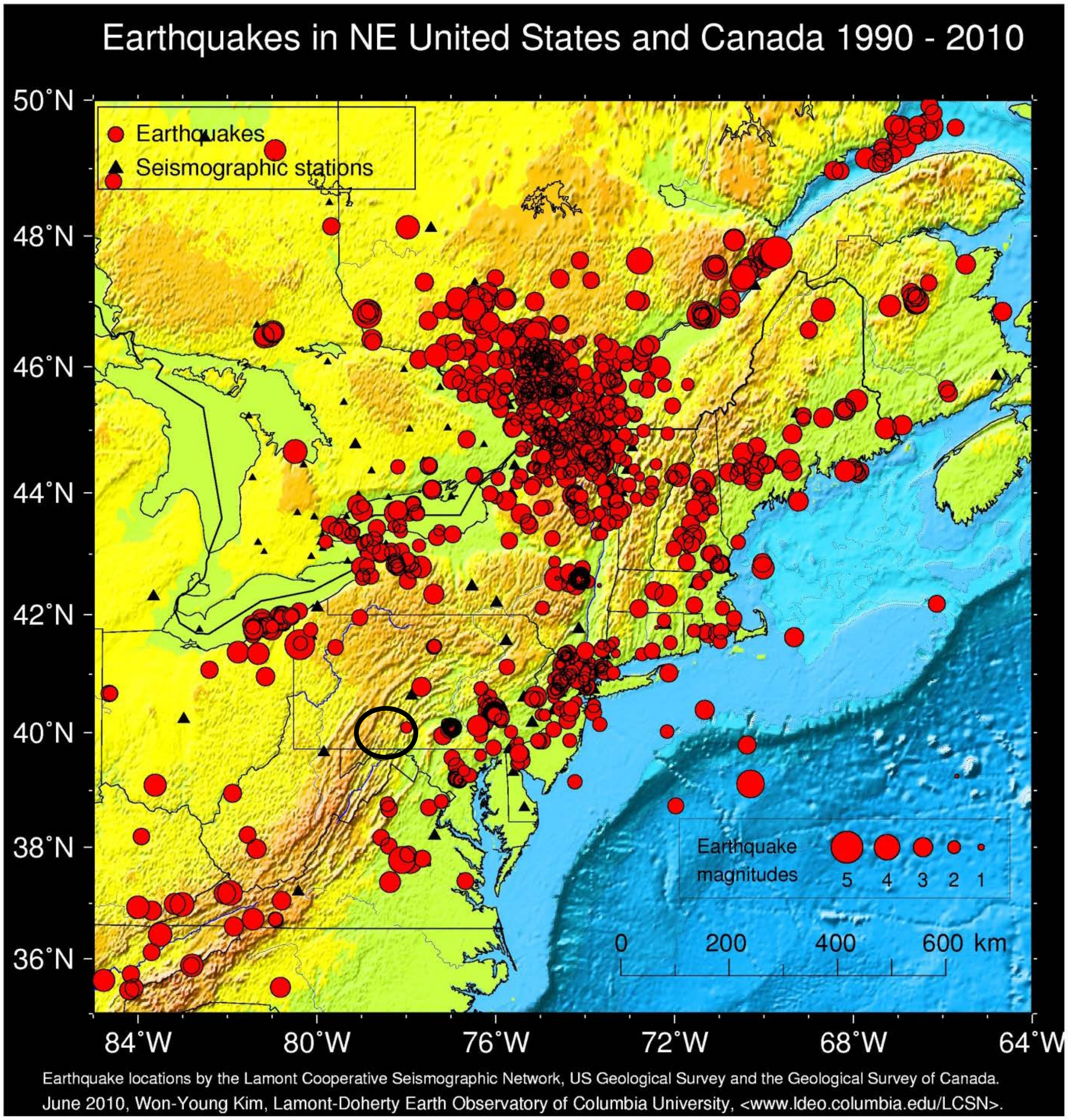


Source: USGS 2012
Note: Seismic station locations are indicated by the green triangles.

USGS provides the website *Did You Feel It?* (http://earthquake.usgs.gov/earthquakes/dyfi/) for citizens to report earthquake experiences and to share information regarding the earthquake and its effects. The website is intended to gather citizens' experiences during an earthquake and incorporate the information into detailed maps for illustrating shaking intensity and damage assessments (USGS 2014).

Earthquakes above a magnitude 5.0 have the potential for causing damage near their epicenters, and larger-magnitude earthquakes have the potential for causing damage over larger, wider areas. Earthquakes in Pennsylvania appear to be centered in the southeastern portion and northwestern corner of the Commonwealth. Figure 4.3.3-4 illustrates earthquake activity in the northeast United States from 1990 to 2010, with Fulton County circled in black. A discussion of previous occurrences of earthquakes in Fulton County is presented in the Previous Occurrence section (Section 4.3.3.3) of this profile.

Figure 4.3.3-4. Earthquake Epicenters in the Northeast 1990 – 2010



Source: LCSN 2010

4.3.3.2 Range of Magnitude

Seismic waves are the vibrations from earthquakes that travel through the Earth and are recorded on instruments called seismographs. The magnitude or extent of an earthquake is a given value of the earthquake size, or amplitude of the seismic waves, as measured by a seismograph. The Richter magnitude scale (Richter scale) was developed in 1932 as a mathematical device to compare the sizes of earthquakes. The Richter scale is the most widely known scale that measures the magnitude of earthquakes. It has no upper limit and is not used to express damage. An earthquake in a densely populated area that results in many deaths and considerable damage may have the same magnitude and shock in a remote area that did not experience any damage. Table 4.3.3-2 shows the Richter scale magnitudes and the corresponding earthquake effects for each magnitude. The worst-case earthquake in Fulton County would likely result in trees swaying, objects falling off walls, cracked walls, and falling plaster.

Table 4.3.3-2. Richter Scale Magnitudes

Richter Magnitude	Earthquake Effects
2.5 or less	Usually not felt, but can be recorded by seismograph
2.5 to 5.4	Often felt, but causes only minor damage
5.5 to 6.0	Slight damage to buildings and other structures
6.1 to 6.9	May cause a lot of damage in very populated areas
7.0 to 7.9	Major earthquake; serious damage
8.0 or greater	Great earthquake; can destroy communities near the epicenter

Source: PEMA 2013

The intensity of an earthquake is based on the observed effects of ground shaking on people, buildings, and natural features, and varies with location. The Modified Mercalli Intensity (MMI) scale expresses the intensity of an earthquake and is a subjective measure that describes the strength of a shock felt at a particular location. The MMI scale expresses the intensity of an earthquake's effects in a given locality in values ranging from I to XII. A detailed description of the MMI scale is shown in Table 4.3.3-3. The earthquakes that occur in Pennsylvania originate deep within the Earth's crust, and not on an active fault. No injury or severe damage from earthquake events has been reported in Fulton County.

Table 4.3.3-3. Modified Mercalli Intensity Scale with Associated Impacts

Scale	Intensity	Description Of Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only on seismographs	<4.2
II	Feeble	Some people feel it	
III	Slight	Felt by people resting; feels 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 are damaged	<6.9
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	
X	Disastrous	Ground cracks profusely; many buildings are destroyed; liquefaction and landslides are widespread	<7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes, and cables are destroyed; general triggering of other hazards	<8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	>8.1

Source: PEMA 2013

Environmental impacts of earthquakes can be numerous, widespread, and devastating, particularly if indirect impacts are taken into account. The examples listed below but are unlikely to occur in Fulton County:

- Induced tsunamis and flooding or landslides and avalanches
- Poor water quality
- Damage to vegetation
- Breakage in sewage or toxic material containments
- Secondary impacts, including train derailments and spillage of hazardous materials and utility interruption.

Seismic hazards are often expressed in terms of Peak Ground Acceleration (PGA) and Spectral Acceleration (SA). USGS defines PGA and SA as the following: "PGA is what is experienced by a particle on the ground. Spectral Acceleration (SA) is approximately what is experienced by a building, as modeled by a particle mass on a massless vertical rod having the same natural period of vibration as the building" (USGS 2012). Both PGA and SA can be measured in *g* (the acceleration caused by gravity) or expressed as a percent acceleration force of gravity (%g). PGA and SA hazard maps provide insight into location-specific vulnerabilities (New York State Disaster Preparedness Commission [NYSDPC] 2011).

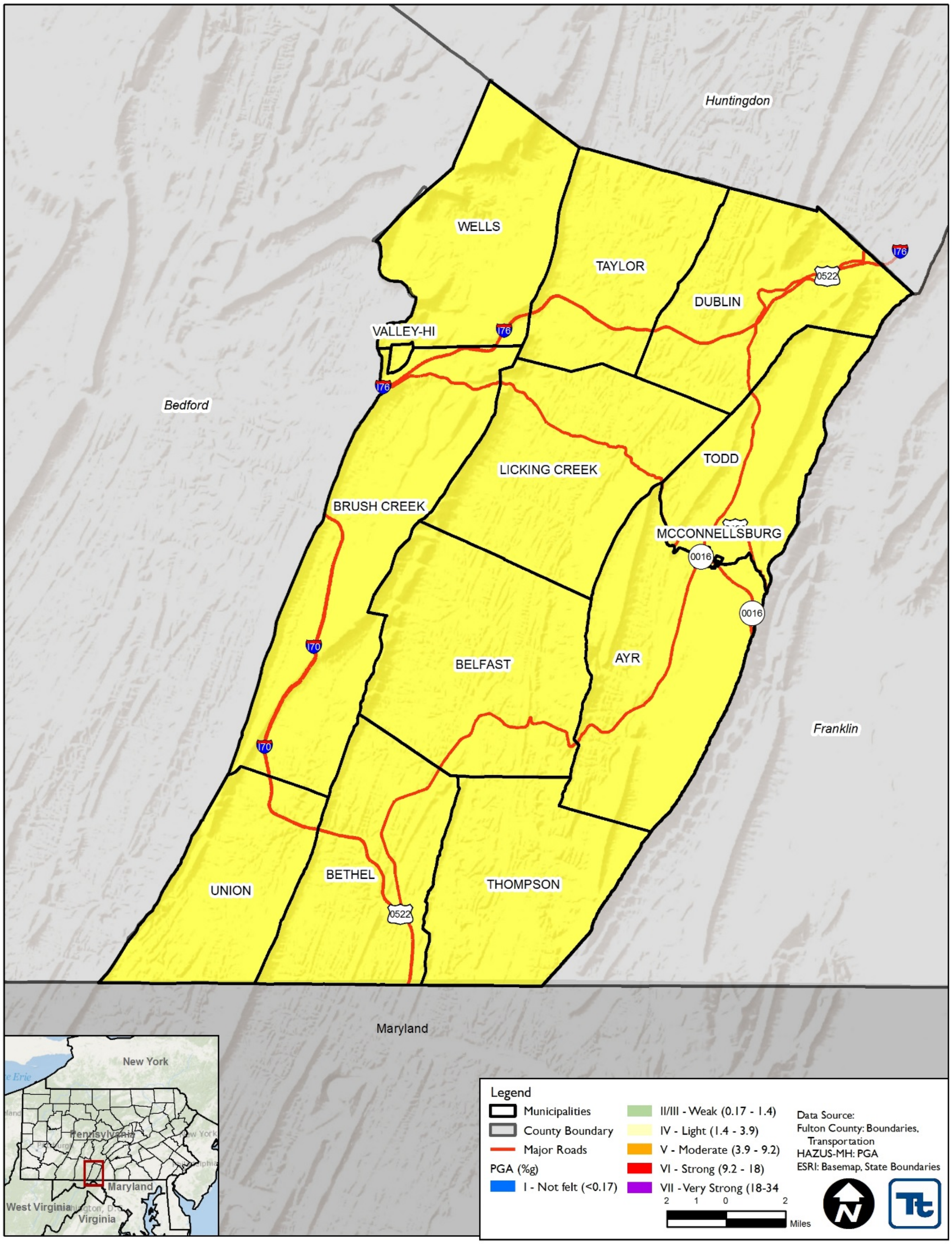
PGA is a common earthquake measurement that shows three things: (1) the geographic area affected, (2) the probability of an earthquake of each given level of severity, and (3) the strength of ground movement (severity) expressed in terms of percent of acceleration force of gravity (%g). In other words, PGA expresses the severity of an earthquake and is a measure of how hard the earth shakes (or accelerates) in a given geographic area (NYSDPC 2011).

National maps of earthquake shaking hazards have been produced since 1948. These maps provide information essential to creating and updating the seismic design requirements for building codes, insurance rate structures, earthquake loss studies, retrofit priorities, and land use planning used in the United States. Scientists frequently revise these maps to reflect new information and knowledge. Buildings, bridges, highways, and utilities built to meet modern seismic design requirements are typically able to withstand earthquakes better, with less damage and disruption. After thoroughly reviewing the studies, professional organizations of engineers update the seismic-risk maps and seismic design requirements contained in building codes (Brown and others 2001).

A probabilistic assessment was conducted for the 500-year mean return period (MRP) through a Level 1 analysis in FEMA's Hazards U.S. Multi-Hazard (HAZUS-MH) version 2.1 to analyze the earthquake hazard for Fulton County. The HAZUS analysis evaluates the statistical likelihood that a specific event will occur and the consequences of that event. A 500-year MRP event is an earthquake with a 0.2 percent chance that the mapped ground motion levels (PGA) will be exceeded in any given year. Communities with higher earthquake risks can also choose to run a 100-year MRP or a 2,500-year MRP; however, these analyses were not run for Fulton County due to the low likelihood of such an event. A 100-year MRP event is an earthquake with a 1-percent chance that the mapped ground motion levels (PGA) will be exceeded in any given year. For a 2,500-year MRP (the worst-case scenario), there is a 0.04-percent chance the mapped PGA will be exceeded in any given year.

Figure 4.3.3-5 illustrates the geographic distribution of PGA (%*g*) across Fulton County for the 500-year MRP event. The estimated potential losses estimated by HAZUS-MH for the MRP and the associated PGA are discussed in the Vulnerability Assessment section (Section 4.3.3.5) of this profile.

Figure 4.3.3-5. Peak Ground Acceleration Modified Mercalli Scale in Fulton County for a 500-Year MRP Earthquake Event

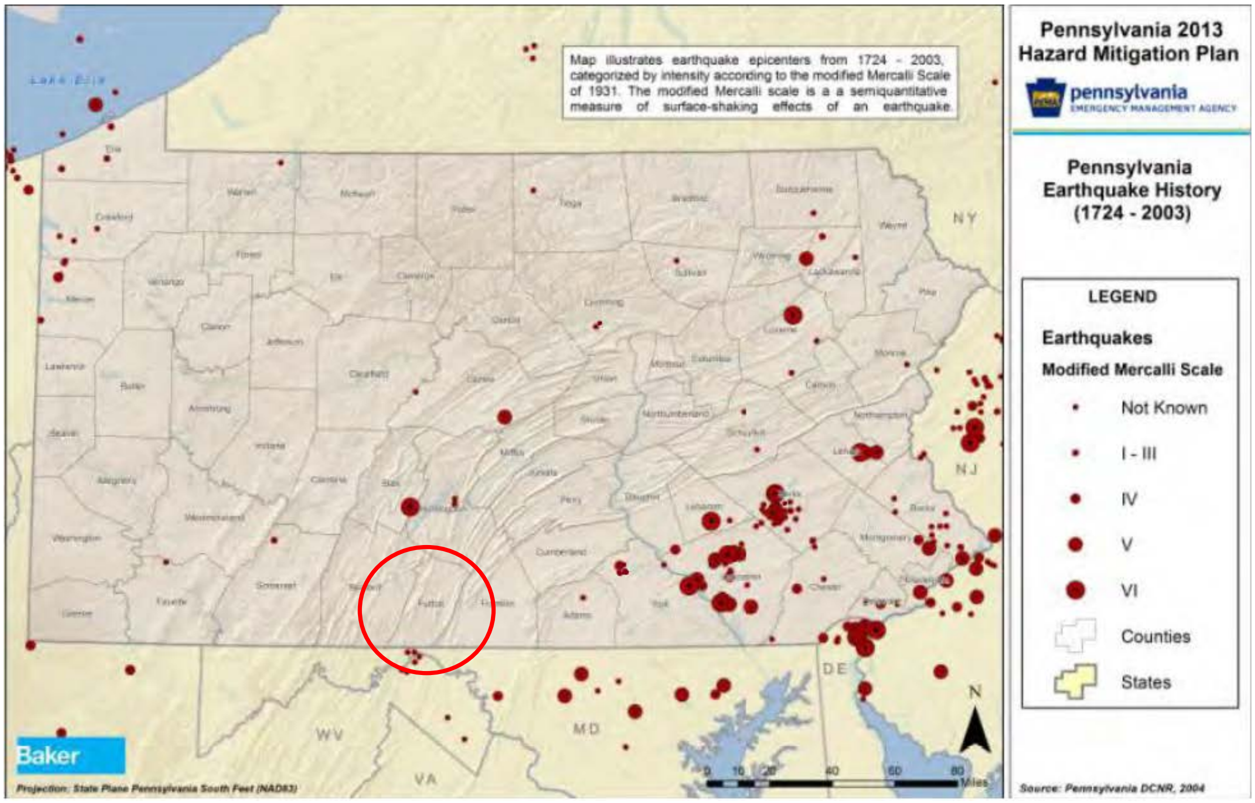


Source: HAZUS-MH 2.1
Note: The peak ground acceleration for the 500-year MRP is 2.4%*g*.

4.3.3.3 Past Occurrence

The historical record for earthquakes goes back approximately 200 years. In Pennsylvania, about 48 earthquakes have caused light damage since the Colonial period. Nearly half of these events had out-of-state epicenters (PEMA 2013; USGS 2014). A map of earthquake epicenters in Pennsylvania from 1724 to 2003 is shown in Figure 4.3.3-6, updated with events from 2003 to January 2014. No damages were reported in Fulton County.

Figure 4.3.3-6. Earthquake Epicenters in Pennsylvania



Source: PEMA 2013
Note: Red circle has been added to the map to indicate the location of Fulton County.

The Pennsylvania Department of Conservation and Natural Resources (PA DCNR) indicated that there have been no recorded earthquake epicenters in Fulton County between 1724 and December 1, 2014. However, there were epicenters in Blair, Huntingdon, and Adams Counties. On July 15, 1938, the epicenter of a 3.3 magnitude earthquake was in Blair County. On February 13, 1964, Huntingdon County experienced three earthquake events with a 3.3 magnitude. Adams County also experienced a more recent earthquake of a 2.8 magnitude on May 26, 1994 (PA DCNR 2014).

Earthquakes whose epicenters fall outside of Pennsylvania can also affect Fulton County. Historically, large earthquakes in eastern North America have occurred in three regions: (1) Mississippi Valley near the Town of New Madrid, Missouri; (2) St. Lawrence Valley region of Quebec, Canada; and (3) Charleston, South Carolina. In February 1925, one of the region's largest earthquakes on record occurred with its epicenter in a region of Quebec with a magnitude near 7.0. If a similar-magnitude earthquake were to occur in the western part of the Quebec region, some moderate damage might be expected in one or more counties of Pennsylvania's northern tier. An earthquake with an estimated magnitude of about 7.5 occurred on August

31, 1886, in Charleston, South Carolina. The earthquake was felt in most of Pennsylvania. Since then, an earthquake with a magnitude of 5.8 occurred in Louisa County, Virginia; it was felt throughout Pennsylvania, causing evacuations, minor damage, and emergency infrastructure inspections (PEMA 2013).

Other earthquakes have occurred in east coast areas, including eastern Massachusetts, southeastern New York, and northern New Jersey. Moderate earthquakes were experienced in southeastern New York and northern New Jersey and were felt in eastern Pennsylvania. If an earthquake of magnitude 6.0 or greater were to occur in this area, damage would likely result in easternmost counties of Pennsylvania, but not in Fulton County.

4.3.3.4 Future Occurrence

An earthquake's severity can be expressed by considering the rate in change of motion of the earth's surface during a seismic event as a percent of the normal rate of acceleration caused by gravity (*g*), which is called the Peak Horizontal Ground Acceleration (PHGA). In general, ground acceleration must exceed 15 percent of *g* for significant damage to occur, although soil conditions at local sites are extremely important in controlling how much damage will occur as a consequence of a given amount of ground acceleration. According to PEMA, the highest seismic hazard in the State exists in southeastern Pennsylvania, where PHGA values range from 10 to 14 percent and there is a 90-percent probability that maximum horizontal acceleration in rock of 10 percent of gravity will not be exceeded in a 50-year period (PEMA 2010).

Based on available historical data, the future occurrence of earthquake events can be considered *unlikely* as defined by the Risk Factor Methodology probability criteria (refer to Section 4.4 of this plan).

4.3.3.5 Vulnerability Assessment

To understand risk, a community must evaluate which assets are exposed or vulnerable in the identified hazard area. The entire County has been identified as the exposed hazard area for the earthquake hazard. Therefore, all assets in Fulton County (population, structures, critical facilities, and lifelines) described in the County Profile (Section 2), are vulnerable. The following section provides an evaluation and estimation of the potential impact of the earthquake hazard on Fulton County, including the following:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, safety, and health of residents; (2) general building stock; (3) critical facilities; (4) economy; (5) environment; and (6) future growth and development
- Effect of climate change on vulnerability
- Further data collections that will assist understanding of this hazard over time

4.3.3.5.1 Overview of Vulnerability

Earthquakes usually occur without warning and can be felt in areas a great distance from their point of origin. The extent of damage depends on the density of the population and building and infrastructure construction in the area shaken by the quake. Some areas may be more vulnerable than others based on soil type, the age of the buildings, and building codes in place. Compounding the potential for damage – historically, Building Officials Code Administration (BOCA) used in the northeastern United States were developed to address local concerns including heavy snow loads and wind; seismic requirements for design criteria are not as stringent compared with the West Coast's reliance on the more seismically-focused Uniform Building Code. As such, a smaller earthquake in the northeast can cause more structural damage than if it occurred out west.

The entire population and general building stock inventory of the County are at risk of being damaged or experiencing losses as a result of impacts of an earthquake. Potential losses associated with earth shaking were calculated for Fulton County for the 500-year MRP. A summary of the data and methodology used for this assessment is presented below, followed by the impacts on population, existing structures, critical facilities, and the economy within Fulton County.

4.3.3.5.2 Data and Methodology

A probabilistic assessment was conducted for the 500-year MRP in HAZUS-MH 2.1 to analyze the earthquake hazard and provide a range of loss estimates for Fulton County. The probabilistic method uses historical earthquake information from historical earthquakes and inferred faults, locations, and magnitudes, and computes the probable ground-shaking levels that may be experienced during a recurrence period by Census tract. According to the New York City Area Consortium for Earthquake Loss Mitigation (NYCEM), probabilistic estimates are best for urban planning, land use, zoning, and seismic building code regulations (NYCEM 2003). The default assumption is a magnitude-7.0 earthquake for all return periods.

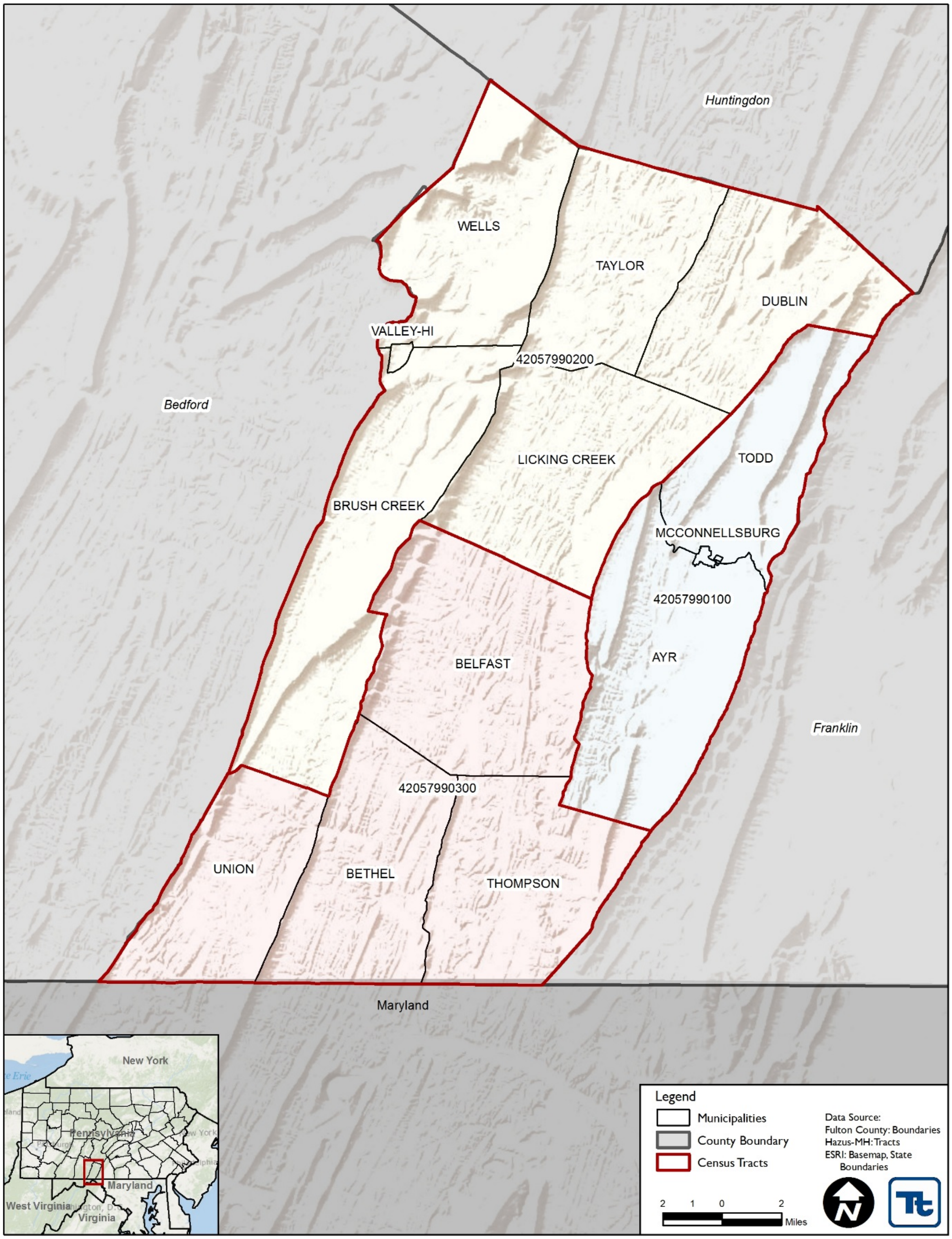
In addition to the probabilistic scenarios mentioned, an annualized loss run was conducted in HAZUS 2.1 to estimate the annualized general building stock dollar losses for Fulton County. The annualized loss methodology combines the estimated losses associated with ground shaking for the 500-year return period, which are based on values from the USGS seismic probabilistic curves. Annualized losses are useful for mitigation planning because they provide a baseline that can be used to compare (1) the risk of one hazard across multiple jurisdictions, and (2) the degree of risk of all hazards for each participating jurisdiction.

As noted in the HAZUS-MH Earthquake User Manual, "Uncertainties are inherent in any loss estimation methodology. They arise in part from incomplete scientific knowledge concerning earthquakes and their effects upon buildings and facilities. They also result from the approximations and simplifications that are necessary for comprehensive analyses. Incomplete or inaccurate inventories of the built environment, demographics, and economic parameters add to the uncertainty. These factors can result in a range of uncertainly in loss estimates produced by the HAZUS Earthquake Model, possibly at best a factor of two or more." However, HAZUS potential loss estimates are acceptable for the purposes of this Hazard Mitigation Plan (HMP).

The occupancy classes available in HAZUS-MH 2.1 were condensed into the following categories to facilitate the analysis and the presentation of results: residential, commercial, industrial, agricultural, religious, government, and educational. Residential loss estimates address both multi-family and single-family dwellings. Impacts to critical facilities and utilities were also evaluated.

All exposure and loss estimates discussed in the assessment below are for Fulton County. HAZUS-MH v2.1 generates results at the Census-tract level. The boundaries of the Census tracts are not always coincident with the town and village boundaries in Fulton County. The results in the tables below are presented for the Census tracts with the associated towns and villages listed for each tract. Figure 4.3.3-7 shows the spatial relationship between the Census tracts and the town and village boundaries.

Figure 4.3.3-7. HAZUS-MH Census Tracts in Fulton County



Source: HAZUS-MH 2.1

4.3.3.5.3 Impact on Life, Health, and Safety

Overall, the entire population of Fulton County is exposed to the earthquake hazard event. According to the 2010 U.S. Census, Fulton County had a population of 14,845 people. The impact of earthquakes on life, health, and safety depends on the severity of the event. Risks to public safety and loss of life from an earthquake in Fulton County are minimal, with higher risk occurring in buildings as a result of damage to the structure, or people walking below building ornamentation and chimneys that may be shaken loose and fall as a result of the quake.

Populations considered most vulnerable are located in the built environment, particularly near unreinforced masonry construction. In addition, the vulnerable population includes the elderly (persons over the age of 65) and individuals living below the Census poverty threshold. These socially vulnerable populations are most susceptible, based on a number of factors including their physical and financial ability to react or respond during a hazard, and the location and construction quality of their housing.

Residents may be displaced or require temporary to long-term sheltering as a result of the event. The number of people requiring shelter is generally less than the number displaced, as some displaced persons use hotels or stay with family or friends after a disaster event. HAZUS-MH 2.1 does not estimate any displaced persons or population that may require short-term sheltering as a result of the 500-year event. Table 4.3.3-4 summaries the estimated sheltering needs for Fulton County.

Table 4.3.3-4. Summary of Estimated Sheltering Needs for Fulton County

Scenario	Displaced Households	Persons Seeking Short-Term Shelter
500-Year Earthquake	0	0

Source: HAZUS-MH 2.1

There is a strong correlation between structural building damage and the number of injuries and casualties from an earthquake event (NYCEM 2003). Furthermore, the time of day also exposes different sectors of the community to the hazard. For example, HAZUS considers the residential occupancy at its maximum at 2:00 a.m.; educational, commercial, and industrial sectors maximum occupancy to be 2:00 p.m.; and peak commute time to be 5:00 p.m. Whether affected directly or indirectly, the entire population will have to deal with the consequences of earthquakes to some degree. Business interruption could keep people from working, road closures could isolate populations, and loss of functions of utilities could affect populations that suffered no direct damage from an event itself. HAZUS-MH 2.1 estimates there will be no injuries or casualties in Fulton County as a result of the 500-year event.

4.3.3.5.4 Impact on General Building Stock

After the population exposed to the earthquake hazard has been considered, the value of general building stock exposed to and damaged by the 500-year MRP earthquake events was evaluated. In addition, annualized losses were calculated using HAZUS-MH 2.1. The entire study area's general building stock is considered at risk and exposed to this hazard.

The HAZUS-MH 2.1 model estimates the value of the exposed building stock and the loss (in terms of damage to the exposed stock). The County Profile section of this HMP (Section 2) presents statistics on the replacement value for general building stock data (structure and contents).

A probabilistic model was run for this plan to estimate annualized dollar losses for Fulton County using HAZUS-MH 2.1. Annualized losses are useful for mitigation planning because they provide a baseline that can be used to compare (1) the risk of one hazard across multiple jurisdictions, and (2) the degree of risk of all hazards for each participating jurisdiction. Please note that annualized loss does not predict what losses will occur in any particular year. The estimated annualized losses are approximately $5,117 per year (building and contents) for the County.

According to NYCEM, where earthquake risks and mitigation were evaluated in the New York, New Jersey, and Connecticut region, most damage and loss caused by an earthquake are directly or indirectly the result of ground shaking (NYCEM 2003). NYCEM indicates there is a strong correlation between PGA and the damage a building might experience. The HAZUS-MH model is based on the best available earthquake science and aligns with these statements. HAZUS-MH 2.1 methodology and model were used to analyze the earthquake hazard for the general building stock for Fulton County. Figure 4.3.3-5 earlier in this profile illustrates the geographic distribution of PGA (*g*) across the County for the 500-year MRP events.

In addition, according to NYCEM (NYCEM 2003), a building's construction determines how well it can withstand the force of an earthquake. The NYCEM report indicates that un-reinforced masonry buildings are most at risk during an earthquake because the walls are prone to collapse outward, whereas steel and wood buildings absorb more of the earthquake's energy. Additional attributes that contribute to a building's capability to withstand an earthquake's force include its age, number of stories, and quality of construction. HAZUS-MH considers building construction and the age of buildings as part of the analysis. The default building ages and building types already incorporated into the inventory were used because the default general building stock was used for this HAZUS-MH analysis.

Potential building damage was evaluated by HAZUS-MH 2.1 across the following damage categories: none, slight, moderate, extensive, and complete. Table 4.3.3-5 provides definitions of these categories of damage for a light wood-framed building; definitions for other building types are included in the HAZUS-MH technical manual documentation. General building stock damage for these damage categories by occupancy class and building type on a County-wide basis is summarized for the 500-year event in Table 4.3.3-6.

Table 4.3.3-5. Example of Structural Damage State Definitions for a Light Wood-Framed Building

Damage Category	Description
Slight	Small plaster or gypsum-board cracks at corners of door and window openings and wall-ceiling intersections; small cracks in masonry chimneys and masonry veneer.
Moderate	Large plaster or gypsum-board cracks at corners of door and window openings; small diagonal cracks across shear wall panels exhibited by small cracks in stucco and gypsum wall panels; large cracks in brick chimneys; toppling of tall masonry chimneys.
Extensive	Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates or slippage of structure over foundations; partial collapse of room-over-garage or other soft-story configurations.
Complete	Structure may have large permanent lateral displacement, may collapse, or be in imminent danger of collapse because of the cripple wall failure or the failure of the lateral load resisting system; some structures may slip and fall off the foundations; large foundation cracks.

Source: FEMA 2012

HAZUS-MH 2.1 estimates a negligible amount of damage to Fulton County's general building stock as a result of a 100-year MRP event. Table 4.3.3-6 summarizes the damage estimated for 500-year MRP earthquake event. Damage loss estimates include structural and non-structural damage to the building and loss of contents.

Table 4.3.3-6. Estimated Building Value (Building and Contents) Damaged by the 500-Year MRP Earthquake Event

Municipality	Estimated Total Damages*		Percent of Total Building and Contents RV**	Estimated Residential Damage	Estimated Commercial Damage
	Annualized Loss	500-Year			
42057990100 – Ayr (T), Todd (T), McConnellsburg (V)	$2,019	$157,891	<1%	$114,258	$22,079
42057990200 – Brush Creek (T), Dublin (T), Licking Creek (T), Taylor (T), Valley-Hi (V), Wells (T)	$1,594	$134,177	<1%	$117,958	$8,900
42057990300 – Belfast (T), Bethel (T), Thompson (T), Union (T)	$1,504	$128,480	<1%	$112,129	$9,457
Fulton County (Total)	**$5,117**	**$420,548**	**<1%**	**$344,345**	**$40,436**

Source: HAZUS-MH 2.1
Notes:
RV Replacement Value
T Town
V Village
*Total amount is sum of damages for all occupancy classes (residential, commercial, industrial, agricultural, educational, religious, and government).
**Total replacement value (building and contents) for the County is greater than $1.45 billion.

It is estimated that there would be approximately $420,000 in damages to buildings in the County during a 500-year earthquake event. This amount includes structural damage, non-structural damage, and loss of contents, representing less than 1 percent of the total replacement value for general building stock in Fulton County (Total replacement value is greater than $1.45 billion for the County.) Residential and commercial buildings account for most of the damage for earthquake events. Earthquakes can cause secondary hazard events such as fires. No fires are anticipated as a result of the 500-year MRP event.

4.3.3.5.5 Impact on Critical Facilities

After considering the general building stock exposed to, and damaged by, 500-year MRP earthquake events, critical facilities were evaluated. All critical facilities (essential facilities, transportation systems, lifeline utility systems, high-potential loss facilities, and user-defined facilities) in Fulton County are considered exposed and vulnerable to the earthquake hazard. The Critical Facilities subsection of this HMP in Section 2 (County Profile) includes a complete inventory of critical facilities in Fulton County.

HAZUS-MH 2.1 estimates the probability that critical facilities may sustain damage as a result of 500-year MRP earthquake event. Additionally, HAZUS-MH estimates percent functionality for each facility days after the event. Table 4.3.3-7 lists the percent probability of critical facilities sustaining the damage category as defined by the column heading and percent functionality after the event for the 500-year MRP earthquake events.

Table 4.3.3-7. Estimated Damage and Loss of Functionality for Critical Facilities and Utilities in Fulton County for the 500-Year MRP Earthquake Event

Name	Percent Probability of Sustaining Damage					Percent Functionality			
	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7	Day 30	Day 90
Critical Facilities									
Emergency Operations Center	97.1	2.2	<1	<1	0	97	99	100	100
Medical	97.1	2.2	<1	<1	0	97	99	100	100
Police	97.1	2.2	<1	<1	0	97	99	100	100
Fire	97.1	2.2	<1	<1	0	97	99	100	100
Schools	97.1	2.2	<1	<1	0	97	99	100	100

Source: HAZUS-MH 2.1

4.3.3.5.6 Impact on Economy

Earthquakes also have impacts on the economy, affecting loss of business function, damage to inventory, relocation costs, wage loss, and rental loss caused by the repair or replacement of buildings. A HAZUS-MH analysis estimates the total economic loss associated with each earthquake scenario, which includes building- and lifeline-related losses (such as transportation and utility losses) based on the available inventory (facility or geographic information system [GIS] point data only). Direct building losses are the estimated costs to repair or replace the damage caused to the building. These losses are reported in the Impact on General Building Stock section discussed earlier. Lifeline-related losses include the direct repair cost to transportation and utility systems and are reported in terms of the probability of reaching or exceeding a specified level of damage when subjected to a given level of ground motion. Additionally, economic loss includes business interruption losses associated with the inability to operate a business as a result of the damage sustained during the earthquake as well as temporary living expenses for those displaced. These losses are discussed below.

It is significant to note that, for the 500-year event, HAZUS-MH 2.1 estimates the County will incur approximately $190,000 in income losses (wage, rental, relocation, and capital-related losses) in addition to the 500–year event structural, non-structural, and content building stock losses ($420,000).

Utility damage results are not considered to be significant as a result of the 500-year event. All utilities evaluated in the risk assessment will be nearly 100-percent functional day one after the event.

The HAZUS-MH analysis conducted did not compute any damage estimates for roadway segments. However, it is assumed these features may experience damage as a result of ground failure and regional transportation and distribution of these materials will be interrupted as a result of an earthquake event. According to HAZUS-MH 2.1 Earthquake User Manual, losses to the community that result from damages to lifelines can be much greater than the cost of repair (FEMA 2012).

Earthquake events can significantly damage road bridges. These bridges are important because they often provide the only access to certain neighborhoods. Because softer soils can generally follow floodplain boundaries, bridges that cross watercourses should be considered vulnerable. A key factor in the degree of vulnerability will be the age of the facility, which will help indicate the standards the facility was built to achieve.

HAZUS-MH 2.1 Earthquake User's Manual also estimates the volume of debris that may be generated as a result of an earthquake event to enable the study region to prepare and rapidly and efficiently manage debris removal and disposal. Debris estimates are divided into two categories: (1) reinforced concrete and steel that require special equipment to break up before it can be transported, and (2) brick, wood, and other debris that can be loaded directly onto trucks with bulldozers (FEMA 2012).

HAZUS-MH 2.1 estimates more than 600,000 tons of debris will be generated for the 500-year MRP event. Table 4.3.3-8 summaries the estimated debris generated by the 500-year MRP earthquake event.

Table 4.3.3-8. Estimated Debris Generated by the 500-year MRP Earthquake Event

Municipality	500-Year	
	Brick/Wood (K tons)	Concrete/Steel (K tons)
42057990100 – Ayr (T), Todd (T), McConnellsburg (V)	184	42
42057990200 – Brush Creek (T), Dublin (T), Licking Creek (T), Taylor (T), Valley-Hi (V), Wells (T)	169	31
42057990300 – Belfast (T), Bethel (T), Thompson (T), Union (T)	150	27
Fulton County (Total)	**503**	**100**

Source: HAZUS-MH 2.1
Notes:
K 1,000
T Town
V Village

4.3.3.5.7 Impact on the Environment

Earthquakes can lead to numerous, widespread, and devastating environmental impacts. These impacts may include but are not limited to:

- Induced flooding or landslides
- Poor water quality
- Damage to vegetation
- Breakage in sewage or toxic material containments

Secondary impacts can include train derailments, roadway damages, spillage of hazardous materials and utility interruption.

4.3.3.5.8 Future Growth and Development

As discussed in Section 2.4 of this HMP, areas targeted for future growth and development have been identified across the County. It is anticipated that the human exposure and vulnerability to earthquake impacts in newly developed areas will be similar to those that currently exist within the County. Current building codes require seismic provisions that should render new construction less vulnerable to seismic impacts than older, existing construction that may have been built to lower construction standards.

4.3.3.5.9 Effect of Climate Change on Vulnerability

The impacts of global climate change on earthquake probability are unknown. Some scientists say that melting glaciers could induce tectonic activity. As ice melts and water runs off, tremendous amounts of weight are shifted on the Earth's crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity according to research into prehistoric earthquakes and volcanic activity. National Aeronautics and Space Administration (NASA) and USGS scientists found that retreating glaciers in southern Alaska might be opening the way for future earthquakes (NASA 2004).

Secondary impacts of earthquakes could be magnified by climate change. Soils saturated by repetitive storms could experience liquefaction during seismic activity as a result of the increased saturation. Dams storing increased volumes of water as a result of changes in the hydrograph could fail during seismic events. There are currently no models available to estimate these impacts.

4.3.3.5.10 Additional Data and Next Steps

Ground shaking is the primary cause of earthquake damage to man-made structures, and soft soils amplify ground shaking. One contributor to the site amplification is the velocity the rock or soil transmits shear waves (S-waves). The National Earthquake Hazards Reduction Program (NEHRP) developed five soil classifications defined by their shear-wave velocity that alter the severity of an earthquake. The soil classification system ranges from A to E, where A represents hard rock that reduces ground motions from an earthquake and E represents soft soils that amplify and magnify ground shaking and increase building damage and losses. When this soil information becomes available, it may be incorporated into HAZUS-MH to further refine the County's vulnerability assessment.

Additional data to further refine the County's vulnerability assessment include (1) updated demographic data to update the default data in HAZUS-MH; and (2) updated building data to update the default data in HAZUS-MH. The County can identify non-reinforced masonry critical facilities and privately owned buildings (residences) using local knowledge and pictometry and orthophotos. These buildings may not withstand earthquakes of certain magnitudes and plans to provide emergency response/recovery efforts for these properties can be set in place. Further mitigation actions include training of County and municipal personnel to provide post-hazard-event rapid visual damage assessments, increase of County and local debris management and logistic capabilities, and revised regulations to prevent additional construction of non-reinforced masonry buildings.

4.3.4 Environmental Hazard

This section provides a profile and vulnerability assessment for the environmental hazard profile for Fulton County. Hazards in this profile include releases of hazardous materials (HazMat) and explosions.

Fulton County is home to 10 identified facilities that utilize, ship, or house chemicals considered hazardous. These facilities have been identified under the Superfund Amendment and Reauthorization Act (SARA) as exceeding the quantity threshold for reporting.

Product release into the local environment can be generated from a fixed facility or at any location along a route of travel, and may be the result of carelessness, technical failure, external incidents, or an intentional act against the facility or container. Volatility of products being stored or transported, along with potential impact on a local community, may increase the risk of intentional acts against a facility or transport vehicle. Release of certain products considered HazMat can immediately and adversely impact the general population, ranging from the inconvenience of evacuations to personal injury and even death. Moreover, any release can compromise the local environment through contamination of soil, groundwater, or local flora and fauna.

For the purposes of this HMP update, explosions are included under the environmental hazard profile, as all reported and confirmed explosions have resulted from loss of containment of a HazMat, thus creating the explosion. According to the National Fire Protection Association (NFPA), the definition of explosion is “the sudden conversion of potential energy (chemical or mechanical) into kinetic energy with the production and release of gases under pressure, or the release of gas under pressure. These high-pressure gases then do mechanical work such as moving, changing, or shattering nearby materials” (NFPA 1998). This pairing of the two hazards is a natural process—once the explosion occurs, the product released is always considered a HazMat.

Additionally, Concentrated Animal Feeding Operations (CAFO) will be discussed under this hazard profile. CAFOs have been identified as a priority concern by multiple County residents and municipalities, due to their prevalence in Fulton County. While Animal Feeding Operations (AFOs) provide a valuable resource to the livestock industry and contribute to overall affordability of animal products for consumption, they also contribute to negative environmental and human health impacts. According to the Environmental Protection Agency (EPA), AFOs consist of facilities that keep and raise animals in confined situations, thus congregating animals, feed, manure and urine, dead animals, and overall production operations on a small land area. Operations are considered to be an AFO if the animals are confined at least 45 days in a 12-month period and if there’s no grass or other vegetation in the confinement area during the normal growing season. CAFOs are AFOs that meet certain EPA criteria (regarding number of animals and pollutants/waste management dispersal), and they consist of about 15 percent of all AFOs. Although CAFOs can augment the severity of a number of natural and non-natural hazards, this area is being highlighted under the Environmental Hazards profile, as the CAFOs’ greatest impacts connect to the higher quantity of pollutants and waste produced by the animals.

4.3.4.1 Location and Extent

The U.S. Department of Transportation (DOT) categorizes HazMat into the following nine classes based on chemical characteristics producing the risk:

- Class 1: Explosives
- Class 2: Gases
- Class 3: Flammable liquids
- Class 4: Flammable solids
- Class 5: Oxidizers and organic pesticides

- Class 6: Poisons and etiologic materials
- Class 7: Radioactive materials
- Class 8: Corrosives
- Class 9: Miscellaneous.

Based on past occurrences, HazMat releases within Fulton County have been accidental and have not been considered terrorist or criminal acts. While past occurrences have not been deemed intentional, an intentional release of any of these products in large quantity would pose a threat to the local population, economy, and environment resulting in lost revenue, injuries, and deaths.

Fulton County is home to 686.8 miles of roadways, including 38.9 miles of interstate highway, 24 miles of principal arterials, 48.7 miles of minor arterials, and over 450 miles of local roads. With just over 685 miles of roadways linking more-populated areas with rural communities, the grid work of roadways facilitates free movement of HazMat throughout the region. The County's mountainous terrain increases its vulnerability to HazMat accidents.

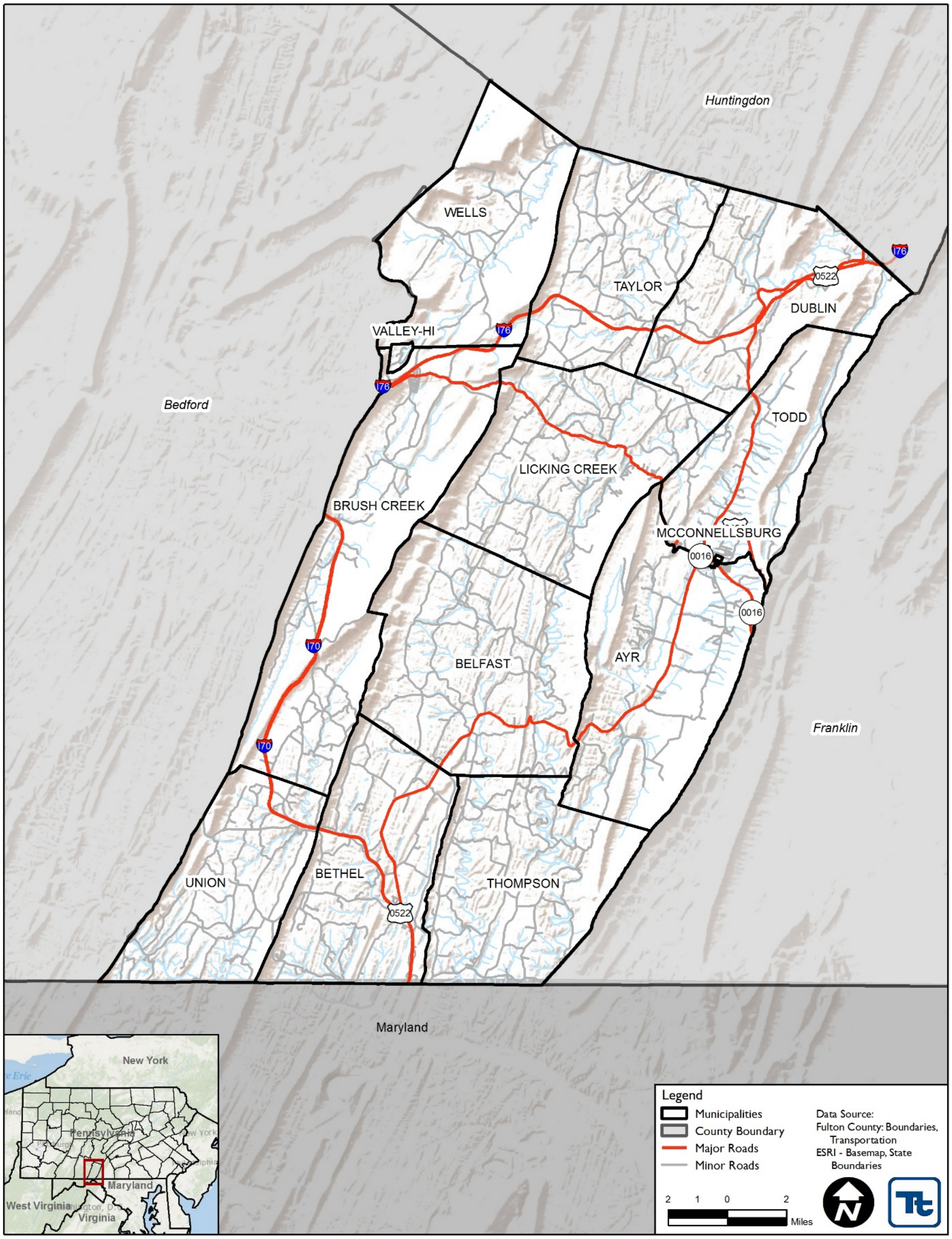
While permitted, identified hazardous substance travel routes are not maintained by the County or regional planning entities. The primary roadways in Fulton County are listed as follows (and shown in red on Figure 4.3.4-1):

- Pennsylvania Turnpike (I-76)
- Interstate 70 (I-70)
- U.S. Highway 522 (US-522)
- U.S. Highway 30 (US-30)
- PA State Highway 16 (PA-16).

In addition to the major routes of transportation, each fixed facility identified within Fulton County poses a potential threat to the surrounding community.

The U.S. Environmental Protection Agency (EPA) tracks management of over 650 toxic chemicals that pose a threat to human health and the environment through the Toxic Release Inventory (TRI). Facilities in certain industries that use or house these chemicals in an amount over a certain specified level must submit annual reports on how each chemical is managed through recycling, energy recovery, treatment, and releases to the environment. A "release" of a chemical means that it is emitted to the air or water, or placed in some type of land disposal. The EPA publishes all TRI data in a publicly-accessible database in Envirofacts. In 2013, two TRI facilities in Fulton County reported to EPA. Fulton County TRI releases consist of only 0.01% of total TRI releases/transfers in Pennsylvania.

Figure 4.3.4-1. Major Roadways Used to Transport Hazardous Materials in Fulton County



Source: Fulton County 2014

Fulton County is home to approximately 15 CAFOS of varying sizes, and there are plans in place for several more to be constructed. The CAFOs are of varying sizes and most contain either turkeys or pigs. Fulton County is home to a greater number of pig CAFOs than turkey CAFOs. No one jurisdiction in the County is noteworthy for being home to more CAFOs than another.

Per EPA regulations, an AFO must meet certain thresholds to be considered a CAFO. CAFOs can be divided by size categories into large, medium, and small. A large CAFO confines a minimum of the number of animals listed in the table below. A medium CAFO confines the number of animals in the range listed in the table below, and also (1) has a manmade ditch or pipe to carry manure or wastewater to surface water or (2) the animals come into contact with surface water that passes through the area where they are confined. A permitting authority may choose to designate a medium-sized facility as a CAFO if found to be a significant contributor of pollutants. A small CAFO confines fewer than the number of animals listed below and has been designated as a CAFO by the permitting authority if is a significant source of pollutants.

Table 4.3.4-1. Regulatory Thresholds to Define Large, Medium, and Small CAFOs

Animal Sector	Size Thresholds (Number of Animals)		
	Large CAFO	**Medium CAFO***	**Small CAFO****
Cattle or Cow/Calf Pairs	1,000 or more	300-999	Less than 300
Mature Dairy Cattle	700 or more	200-699	Less than 200
Veal Calves	1,000 or more	300-699	Less than 300
Swine (weighing over 55 pounds)	2,500 or more	750-2,499	Less than 750
Swine (weighing less than 55 pounds)	10,000 or more	3,000-9,999	Less than 3,000
Horses	500 or more	150-499	Less than 150
Sheep or Lambs	10,000 or more	3,000-9,999	Less than 3,000
Turkeys	55,00 or more	16,500-54,999	Less than 16,500
Laying Hens or Broilers (Liquid Manure Handling Systems)	30,000 or more	9,000-29,999	Less than 9,000
Chickens Other than Laying Hens (Other than a Liquid Manure Handling System)	125,000 or more	37,500-124,999	Less than 37,500
Ducks (Other than a Liquid Manure Handling System)	30,000 or more	10,000-29,999	Less than 10,000
Ducks (Liquid Manure Handling System)	5,000 or more	1,500-4,999	Less than 1,500
* Must also meet one of two "method of discharge" criteria to be defined as a CAFO, or may be designated. ** Never a CAFO by regulatory definition, but may be designated on a case-by-case basis.			

Source: EPA, 2015

4.3.4.2 Range of Magnitude

Environmental hazard incidents within Fulton County could range from minor petroleum spills to large, facility-based incidents that could lead to loss of life, property, environment, and economy. Additionally, the range of explosion-related incidents within the County could vary from a small incident that affects a residential structure or smaller commercial building, to a catastrophic failure leading to loss of life, significant property damage, and negative impacts on the economy. Severity of an incident varies with type of material released and 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 persist over a long time (e.g., nuclear radiation), resulting in far-reaching effects on people and the environment.

A HazMat release, whether accidental or intentional, can be exacerbated or mitigated by specific circumstances surrounding the event. Exacerbating conditions are characteristics that can enhance or magnify effects of a hazard. Mitigating conditions, on the other hand, are characteristics of the target and its physical environment that can reduce effects of a hazard. These conditions include:

- Weather conditions – affect how the hazard develops.
- Micro-meteorological effects of buildings and terrain – alter dispersion of materials.
- Shielding in the form of sheltering-in-place – protects people and property from harmful effects.
- Non-compliance with applicable codes (e.g., fire and building codes) and maintenance failures (e.g., fire protection and containment features) – can substantially increase damage to the facility and to surrounding buildings.
- Geographic location of HazMat site – if occurring within a Special Flood Hazard Area (SFHA), a materials release could cause larger-scale water contamination during a flood incident, or a flood incident could compromise production and storage of hazardous chemicals. Stormwaters and floodwaters can also move toxic chemicals swiftly across great distances.

Although most recognized for their pollutant contributions, CAFOs can increase the impacts of a hazard event for a variety of hazards, including public health, security, flooding, fire, transportation accidents, and drought. For this reason, CAFO operations require careful management and supervision. As noted above, CAFOs have been highlighted in the Environmental Hazards profile due to their direct connection with environmentally hazardous events; however, all potential impacts will be noted.

The EPA monitors CAFO sites for pollutant control as improperly managed manure and wastewater can negatively impact the environment and public health. This monitoring occurs via the delegation of federal authority to the Pennsylvania Department of Environmental Protection (PA DEP), which in turn delegates its authority of monitoring CAFO sites to the Pennsylvania State Conservation Commission (PA SCC). The PA SCC delegates its authority to local-level county conservation districts so that monitoring and enforcement can occur on a local level. While monitoring at federal, state, and local levels is designed to be as comprehensive as possible, not all information is available to be tracked due to voluntary report statuses, lack of sufficient resources, and competing governmental priorities. The incomplete records for CAFO sites leads to increased resident concern about the impact of pollutant control for CAFOs on County residents, air quality, land/soil quality, and water quality. Residents have also expressed concern about the voluntary nature of most reporting mechanisms regarding CAFOs, particularly with concern to the management and transport of animal waste and manure. The EPA has also documented this area of weakness. Additionally, while farming operations are required to develop Manure Management Plans, these plans do not need to be kept on file by local-level conservation districts. Although farming operations must provide these plans to enforcement officers upon request, the lack of regular reports and immediate access decreases accountability and lessens the ability of independent confirmation.

Manure and wastewater have the potential to introduce nitrogen and phosphorus, organic matter, sediments, pathogens, heavy metals, hormones, and ammonia to the environment. Potential impacts from any of these pollutants can include excess nutrients in the water (e.g., nitrogen and phosphorus), leading to low levels of dissolved oxygen and fish kills; decomposing organic matter that can contribute to toxic algal blooms; degraded water resources; respiratory problems in workers and local residents; and increased chance of illness through the exposure of wastes and pathogens in drinking water.

Regarding the increased potential for illness, several scientific publications and institutions (including Science Daily, the Johns Hopkins School of Public Health, and the National Institute of Health) have noted that exposure to CAFO and manure fertilizers may increase the frequency of Methicillin-Resistant

Staphylococcus Aureus (MRSA). MRSA is caused by strains of bacteria that have developed resistance to more widely-used antibiotics. Staphylococcus (Staph) is a common bacteria on the human body; however, if an antibiotic-resistant strain of Staph enters the human body, it may be resistant to methicillin, amoxicillin, penicillin, oxacillin, and other common medical treatments. Insect-borne diseases also present a greater threat of infection to residents, necessitating CAFO facilities to consider animal care in addition to manure management.

Another potential hazard from CAFOs concerns animal mortality management. Increased animal mortality can contaminate the water table, soil, and air. If animals in a CAFO were to become infected with a highly infectious and fatal virus that leads to a large loss of animals in a short period of time (e.g., a pig CAFO becoming infected with Porcine Epidemic Diarrhea Virus [PEDv]), the facility may have difficulty in adequately disposing of all the animal remains.

While CAFO operations have come under increasing regulations in the past few years to decrease their potential environmental and public health impacts, one area which is still under-regulated is transportation accidents. Manure and animal waste from CAFOs is frequently transported to and from the facility without significant oversight. Were an accident to occur, this could lead to a HazMat incident in the County or in neighboring counties. HazMat incidents could also occur through other forms of manure spills, such as while pumping manure, while removing animal waste from a manure pit, or while applying manure in the field.

The other hazards that could be magnified by a CAFO have been described, with potential impacts, in the list below.

- **Security** – As with other environmental hazards, events can either be accidental or deliberate in nature. While most environmental events in the County would be accidental, CAFO sites should still consider the possibility of deliberate incidents. If a CAFO does not maintain appropriate security measures, it could become a potential terrorist target due to the wide scope and impact from a HazMat incident.
- **Flooding** – A CAFO located near a river or body of water, particularly one with a tendency to flood during storm events, can increase the chance of freshwater and stormwater contamination. The EPA notes that many AFOs currently lack sufficient stormwater management guards. If a local river floods into a CAFO's land, animal waste and manure may enter the stream and ultimately, contaminate local drinking water.
- **Fire** – Animal waste contains a higher rate of methane and may be a fire hazard if not adequately controlled for. Additionally, if an unrelated wildfire were to occur, the need for animal evacuation could create transportation difficulties.
- **Drought** – Due to the large number of animals maintained in a CAFO, such facilities require a significant amount of drinking water. This could lead to potential exacerbation of water resource management problems during a drought. Additionally, residents have noted concern about the potential for well water contamination should wastewater and other animal waste not be sufficiently regulated.

The worst-case scenario would be a large, uncontrolled release of a toxic gas within a major urban area. In Fulton County, this could take the form of an accident and major rupture of a tanker hauling a toxic or flammable gas in or near McConnellsburg Borough. While little physical property damage is likely from this type of event, potential for injury and death to residents and visitors up to 0.25 mile from the scene is significant. This event would likely overwhelm the medical care capacity within the County, and possibly the region. The population vulnerable to such a release includes the 1,220 people in McConnellsburg Borough alone. Other municipalities are vulnerable to HazMat releases along US 522 and other routes. In addition, an event such as this would likely close County offices, causing a major disruption to government operations. The most likely scenario would be a transportation accident resulting in a rupture of a truck's fuel tank, spilling a small quantity of diesel fuel onto the roadway.

4.3.4.3 Past Occurrence

Fulton County is approximately 2 hours away, by road, from both Baltimore, MD, and Harrisburg, PA. The County's relative proximity to these more urban areas could eventually lead to an increase in transportation of HazMat via road or air. These transportation routes, combined with the fixed-site facilities and end users of HazMat, could be locations of frequent chemical and petroleum-product release incidents throughout the County, with several deemed as serious events.

The County has undergone HazMat release accidents at facilities and along roadways. Most incidents have involved spills of petroleum products (22 incidents between January 2004 and 2008 alone) or release of natural gas or propane (one since January 2003); these incidents have easily been contained. At least one chemical spill of an unknown substance was documented in Thompson Township in 2007, and one call for an abandoned explosive detonation cord was made in Bethel Township in 2004. Fulton County has an annual contract with EP&S of Vermont, based out Harrisburg, for cleanup of larger HazMat incidents (previously, the County contracted with Cumberland County's Special Hazards Operation Team [SHOT]). Local records do not indicate any HazMat release accidents or explosions since 2010. However, these statistics may not be comprehensive. The reporting requirements from the State changed in 2007, allowing State agencies to categorize incidents as something other than "Hazardous Materials." For instance, a vehicle collision resulting in a spill of petroleum products (e.g., gasoline, motor oil) may be reported as a vehicle accident instead of a HazMat release. In the case of an explosion, the explosive event may not be the primary incident. Rather, the incidents may be based on events that led up to an explosion.

Fulton County also tracks releases of chemicals into air, water, or land disposal units. This information is then published by EPA. In 2013, Fulton County disposed of a total of 9,057 pounds of toxic chemicals, with disposal of 3,445 pounds on site (through air) and 5,612 pounds off site. The top five TRI chemicals released by air included certain glycol ethers (61 percent), manganese (17 percent), ethylene glycol (16 percent), creosote (6 percent) and nickel (0 percent). The top TRI chemicals released off site consisted of manganese (81 percent), nickel (13 percent), and zinc compounds (6 percent). The amount of 2013 TRI releases increased from the 2012 disposal amount of 7,029 pounds and the 2011 disposal amount of 8,093 pounds.

The County has documented in Table 4.3.4-2 several instances of manure-related HazMat incidents or spills whose frequency may have been exacerbated by the presence of local CAFOs. Additionally, an incident may not be identified as being connected to or worsened by a nearby CAFO because of voluntary report standards and because this issue is not always noted in the media.

Table 4.3.4-2. Fulton County Manure-related HazMat Incidents

Date	Location	Impacts
March 2002	Brush Creek Tributary	Manure spill of over 770,000 gallons from a concrete pit under a pig farm occurred in Crystal Spring.
July 2004	Buck Hollow Road/Big Cove Tannery	Manure and pollutant spill from a dairy farm resulted in dead fish at hatchery in area of Big Cove Tannery. Manure contaminated an unnamed tributary to Esther Run.
October 2007	Big Cove Creek	Manure spill of over 200,000 gallons from a dairy farm occurred just north of McConnellsburg.
November 2009	Big Cove Creek	Manure spill occurred at a dairy farm, with an estimated tens of thousands of gallons spilled. Slurry manure flowed about 1,500 feet from the manure storage pit into Big Cove Creek. The Pennsylvania Fish and Boat Commission documented over 1,000 dead fish in a segment of the stream less than a mile long.

4.3.4.4 Future Occurrence

Because of the wide scope of definition of environmental hazards, ranging from a small spill to a large release of a highly volatile or toxic HazMat, incidents can and will happen at any time. Additionally, the County is home to 10 SARA facilities. Although these facilities follow applicable safety and health regulations and best practices, proximities of the facilities to population centers is a concern for the County.

HazMats are also transported along I-70, I-76, US 522, US 30, and PA 16. Transportation of HazMat on highways involves tanker trucks or trailers; not surprisingly, trucks are responsible for the greatest number of HazMat incidents. At several points, these transportation routes cross streams within the watersheds that are part of the County's domestic water supply.

As with other environmental hazards, the wide scope and ability for CAFOs to impact environmental releases or other hazard incidents means that an event could occur at any time. This event is difficult to predict as many factors contribute to an event occurrence. Additionally, smaller incidents may occur and not be reported, or they may be labeled as a different type of hazard event. Fulton County is investigating ways to better document CAFO-related environmental events due to local interest in the subject.

While HazMat release incidents in Fulton County have occurred in the past, they are generally considered difficult to predict. Smaller incidents, such as fuel spills, will affect the County many times each year, most likely during refilling of home heating oil tanks, and may not be reported. Although the County does not anticipate severe releases on any regular basis, possibility of this should not be discounted. Based on Risk Factor Methodology Probability Criteria, the likelihood of future occurrences within Fulton County remains at likely.

4.3.4.5 Vulnerability Assessment

To understand risk, a community must evaluate the assets exposed or vulnerable within the identified hazard area. To assess effects of and risk from environmental hazards, locations of SARA Title III facilities and major roadways are examined. The following sections evaluate and estimate potential impacts in Fulton County presenting specifically:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on (1) life, health, and safety; (2) general building stock, critical facilities, and the economy; and (3) future growth and development.

4.3.4.5.1 Overview of Vulnerability

Facilities that produce, use, or ship HazMat within the Commonwealth of Pennsylvania are required to comply with regulations set forth within the federal SARA and the Emergency Planning and Community Right to Know Act (EPCRA), and the Commonwealth of Pennsylvania reporting requirements under the Hazardous Materials Emergency Planning and Response Act (Act 165). The County has 10 SARA Title III facilities.

As stated above, the major roadways in the County include two interstates (I-70 and I-76), two U.S. Highways (US-522 and US-30), and State Highway PA-16. Accidents on these roadways can result in HazMat spills that can contaminate and impact the surrounding populations and environment.

4.3.4.5.2 Data and Methodology

To determine potential impact on the County, a 0.25-mile buffer was placed around the identified major roadways, and the designated vulnerability radius of each SARA Type III facility was used to define the hazard area. Populations and features of the built environment within these areas may be directly or indirectly affected by a potential environmental hazard. The hazard area was overlaid upon the 2010 U.S. Census population data in Geographic Information System GIS (U.S. Census 2010). Census blocks do not follow these boundaries; blocks with their centroid in the hazard area were determined to be affected.

The vulnerability radius for each hazard facility is:

- JLG Industries (Ayr Twp) – 0.1 mile
- Century Link Inc. (McConnellsburg) – 0.1 mile.

4.3.4.5.3 Impact on Life, Health, and Safety

Environmental hazards have the greatest impact on the residential population in Fulton County. The majority of incidents reported in the County are related to (1) petroleum spills, which may be the result of motor vehicle incidents; and (2) releases of natural gases or propane.

Table 4.3.4-3. Estimated Fulton County Population Vulnerable to Environmental Hazard Areas

Municipality	Total Population	Population within ¼ mile of major roadways	% Population	Population within vulnerability radii of SARA Facility	% Population
Ayr, Township of	1,942	1,283	66.1%	51	2.6%
Belfast, Township of	1,448	582	40.2%	0	0%
Bethel, Township of	1,508	1,004	66.6%	0	0%
Brush Creek, Township of	819	535	65.3%	0	0%
Dublin, Township of	1,264	1,027	81.3%	0	0%
Licking Creek, Township of	1,703	907	53.3%	0	0%
McConnellsburg, Borough of	1,220	1,220	100%	247	20.3%
Taylor, Township of	1,118	306	27.4%	0	0%
Thompson, Township of	1,098	0	0%	0	0%
Todd, Township of	1,527	1,237	81%	0	0%
Union, Township of	706	221	31.3%	0	0%
Valley-Hi, Borough of	15	0	0%	0	0%
Wells, Township of	477	25	5.2%	0	0%
Fulton County (Total)	**14,845**	**8,347**	**56.2%**	**298**	**2%**

Source: U.S. Census 2010, Fulton County 2014

Notes:

% Percent
SARA Superfund Amendments and Reauthorization Act

4.3.4.5.4 Impact on General Building Stock, Critical Facilities, and Economy

While buildings and critical facilities may be present within the hazard area, estimating direct damage to these structures and facilities would be difficult. However, damages to the surrounding environment can result in indirect impacts, such as temporary loss of function due to hazard response or damage in the area.

Economic loss from environmental hazards and explosion incidents ranges from non-recordable to losses exceeding millions of dollars. The impact on the local economy from a single incident is almost impossible to measure because of complexities of predicting losses of work, revenue, and future business.

4.3.4.5.5 Impact on the Environment

As discussed above, environmental hazards and explosion incidents can profoundly affect the surrounding environment. Contamination of soil, and surface water and groundwater supplies, can result in many direct impacts on surrounding populations and ecosystems. Local flora and fauna within hazard areas are also at risk.

4.3.4.5.6 Future Growth and Development

As discussed in Section 2.4, areas targeted for future growth and development have been identified across the County. Any areas of growth could be impacted by environmental hazards if within identified hazard areas. The County intends to discourage development within vulnerable areas and the SFHA, or to encourage higher regulatory standards on the local level.

4.3.5 Flood, Flash Flood, Ice Jam

This section provides a profile and vulnerability assessment for the flood hazard for Fulton County. Floods are one of the most common natural hazards in the United States and are the most prevalent type of natural disaster occurring in Pennsylvania. Pennsylvania has more miles of streams than any other state and leads the United States in flood-related losses. Over 94 percent of the State's municipalities have been designated as flood-prone areas. Both seasonal and flash floods have been causes of millions of dollars in annual property damages, loss of lives, and disruption of economic activities (Pennsylvania Emergency Management Agency [PEMA] 2013).

The Federal Emergency Management Agency's (FEMA) definition of flooding is "a general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land area or of two or more properties from the overflow of inland or tidal waters or the rapid accumulation of runoff of surface waters from any source" (FEMA 2008).

Most floods fall into three categories: riverine, coastal, and shallow (FEMA 2005). Other types of floods may include ice-jam floods, flash floods, stormwater floods, alluvial fan floods, dam failure floods, and floods associated with local drainage or high groundwater (as indicated in the previous flood definition). For the purpose of this Plan and as deemed appropriate by the Steering Committee, riverine, flash, ice-jam, and stormwater flooding are the main flood types of concern for Fulton County. These types of floods are further discussed below.

Riverine Floods

Riverine floods are the most common flood type and occur along a channel. Channels are defined features on the ground that carry water through and out of a watershed. They may be called rivers, creeks, streams, or ditches. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas. These floods usually occur after heavy rains, heavy thunderstorms, or snowmelt, and can be slow or fast-rising, and generally develop over a period of hours to days (FEMA 2005, FEMA 2008, Illinois Association for Floodplain and Stormwater Management 2006).

Flash Floods

According to the National Weather Service (NWS), flash floods are a rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within 6 hours of the causative event (e.g., intense rainfall, dam failure, or ice jam) (NWS 2009).

Flash floods can occur very quickly and with very little warning. This type of flood can be deadly because it produces rapid rises in water levels and has devastating flow velocities. Urban areas are more susceptible to flash floods because a high percentage of the surface area is impervious (PEMA 2013).

The actual time may vary in different parts of the country. Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters (NWS 2009). A flash flood can have a dangerous wall of roaring water that carries rocks, mud, and other debris, and can sweep away most things in its path. Flash floods usually result from intense storms dropping large amounts of rain within a brief period with little or no warning, and can reach their peak within only a few minutes. They normally occur in the summer during the thunderstorm season. The most severe flooding conditions usually occur when direct rainfall is augmented by snowmelt. If the soil is saturated or frozen, stream flow may increase because of inability of the soil to absorb additional precipitation (FEMA 2008).

Ice-Jam Floods

An ice jam is an accumulation of ice that acts as a natural dam and restricts flow of a body of water. Ice jams occur when warm temperatures and heavy rains cause rapid snow melt. The melting snow, combined with the heavy rain, causes frozen rivers to swell. The rising water breaks the ice layers into large chunks, which float downstream and often pile up near narrow passages and obstructions (bridges and dams). Ice jams may build up to a thickness great enough to raise the water level and cause flooding (NESEC Date Unknown, U.S. Army Corps of Engineers [USACE] 2002).

Ice jams are of two different types: freeze-up and breakup. Freeze-up jams occur in the early to mid-winter when floating ice may slow or stop due to a change in water slope as it reaches an obstruction to movement. Breakup jams occur during periods of thaw, generally in late winter and early spring. The ice cover breakup is usually associated with a rapid increase in runoff and corresponding river discharge caused by a heavy rainfall, snowmelt, or warmer temperatures (USACE 2002).

Dam Failure Floods

A dam is an artificial barrier that can impound water, waste water, or any liquid-borne material for the purpose of storage or control of water (FEMA 2010). Dams are man-made structures built across a stream or river that impound water and reduce flow downstream (FEMA 2003). They are built for purposes of power production, agriculture, water supply, recreation, and flood protection. Dam failure is any malfunction or abnormality outside of the design that adversely affects a dam's primary function of impounding water (FEMA 2011). Dams can fail for one or a combination of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam (inadequate spillway capacity)
- Prolonged periods of rainfall and flooding
- Deliberate acts of sabotage (terrorism)
- Structural failure of materials used in dam construction
- Movement and/or failure of the foundation supporting the dam
- Settlement and cracking of concrete or embankment dams
- Piping and internal erosion of soil in embankment dams
- Inadequate or negligent operation, maintenance, and upkeep
- Failure of upstream dams on the same waterway
- Earthquake (liquefaction/landslides) (FEMA 2010).

Flooding can occur when a dam fails or breaks, producing effects similar to flash floods. Areas most susceptible to effects of floods are low-lying areas near water or downstream from a dam (FEMA 2011).

Flooding caused by dam failure is addressed in Section 4.3.1 of this Plan.

4.3.5.1 Location and Extent

Flooding in Pennsylvania is typically associated with abnormally high and intense rainfall amounts. It can also be caused by sudden snowmelt, landslides, or dam failures. In Pennsylvania, flooding usually occurs in the summer; however, flooding has occurred during the winter months as well.

Floodplains are found in lowland areas adjacent to rivers, streams, creeks, lakes, or other bodies of water that become inundated during a flood. The size of a floodplain is described by the recurrence interval of a given flood. A 1-percent annual chance floodplain is smaller than the floodplain associated with a flood that has a 0.2-percent annual chance of occurring (PEMA 2013). Floodplain maps for each Fulton County jurisdiction are available at the end of this profile and in Appendix F. These maps show the location of both the 1-percent chance annual floodplain and the 0.2-percent chance annual floodplain.

Flooding is the most significant natural hazard in Fulton County. The Potomac River is less than 2 miles away from the County's most southern border, and the County is home to numerous small creeks and tributaries. Fulton County has two lakes of mentionable size – Cowans Gap Lake and Meadow Grounds Lake.

Additionally, about one-third of the County's streams flow into the Juniata River, which is a subbasin of the Susquehanna River Basin. The Juniata subbasin encompasses a 3,406-square-mile area and includes Huntingdon and Blair Counties, and portions of Somerset, Bedford, Franklin, Perry, Juniata, Snyder, Mifflin, Centre, Cambria, and Fulton Counties. The other two-thirds of Fulton County's streams flow into the Potomac River Basin. The Potomac drainage area includes 14,679 square miles in the four states of Maryland, Pennsylvania, Virginia, and West Virginia, as well as in the District of Columbia. Fulton County lies in the Conococheague/Antietam subbasin of the Potomac River. A very small portion of the County is also within the Wills Creek/Evitts Creek/Town Creek subbasin.

In accordance with the 1978 Pennsylvania Stormwater Management Act (Act 167), counties are required to prepare stormwater management plans on a watershed-by-watershed basis that provide for improved management of stormwater impacts associated with development of land. In December 2008, Fulton County developed and implemented Phase I of the Act 167 County-Wide Plan Stormwater Management Plan. This phase of the plan includes the Scope of Study – Establishing procedures used to prepare the Plan. These procedures are determined by an overall survey of:

- Specific watershed characteristics and hydrologic conditions
- Stormwater-related problems and significant obstructions
- Alternative measures for control
- Goals, objectives, solution strategies, and estimated costs for Phase 2 of the plan.

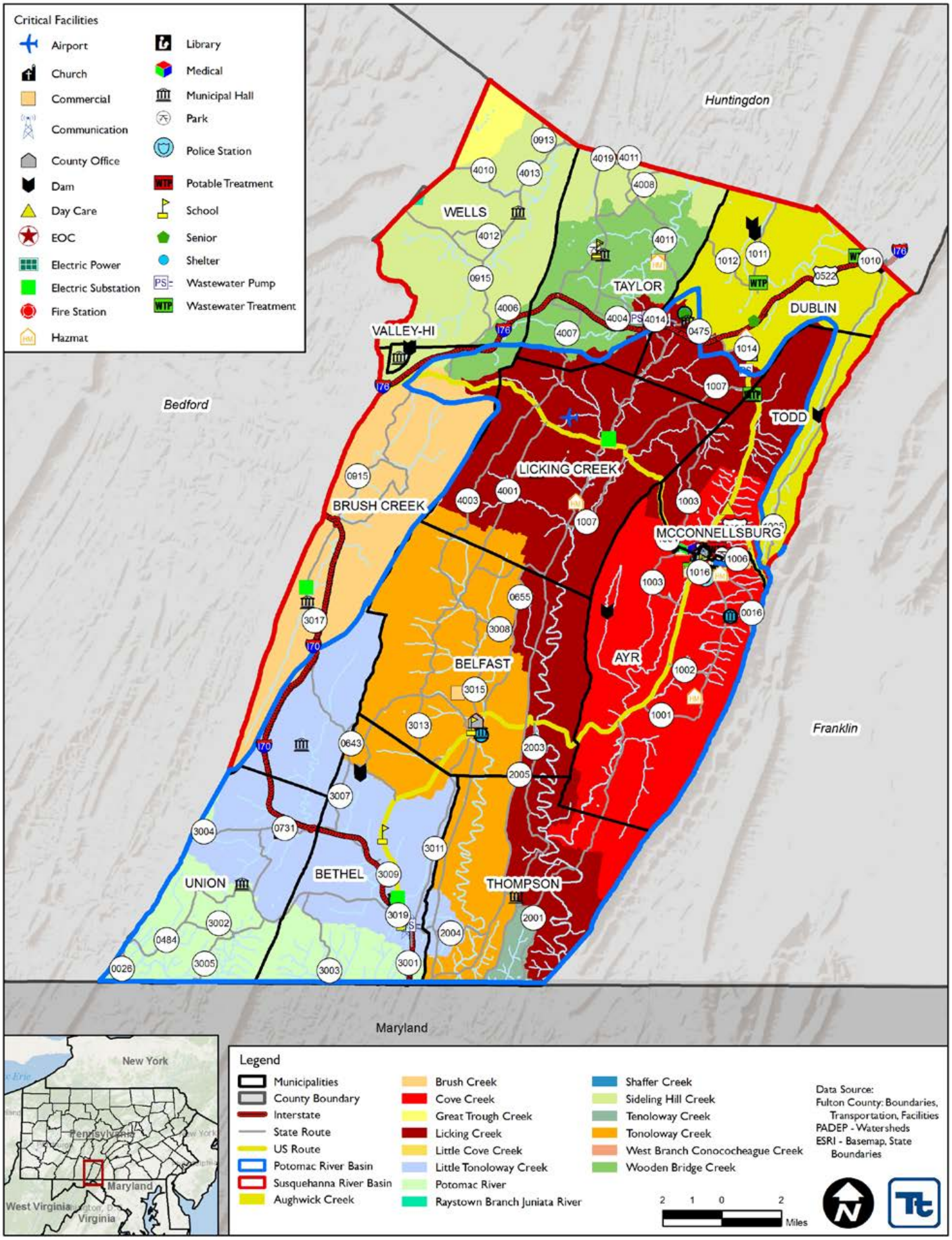
In June 2010, Fulton County published Phase II of the Act 167 County-Wide Plan Stormwater Management Plan. The Phase II Stormwater Management Plan includes stormwater runoff modeling for each watershed in Fulton County. The Plan identifies the following PADEP-designated watersheds and associated streams for which Act 167 studies were prepared (Table 4.3.5-1).

Table 4.3.5-1. PADEP-Designated Watersheds Identified in Act 167 County Stormwater Management Plan

Susquehanna River Watershed	Potomac River Watershed
Aughwick Creek	Licking Creek
Wooden Bridge Creek	Little Tonoloway Creek
Sideling Hill Creek	Tonoloway Creek
Bush Creek	Cove Creek
Great Trough Creek	Potomac River

Source: Fulton County Act 167 Plan, 2010

Figure 4.3.5-1. PADEP-Designated Watersheds with Critical Facilities



Source: PADEP, Fulton County

The modeling in Phase II was used to develop mitigation strategies and recommended actions to address runoff and subsequent flooding in these watersheds. Sampling activities were designed to support the tasks of establishing an additional riparian buffer in existing developed areas, strengthening floodplain management regulations, limiting the disturbance/compaction of topsoil, limiting the amount of impervious cover/alternative site design, and revising municipal ordinances.

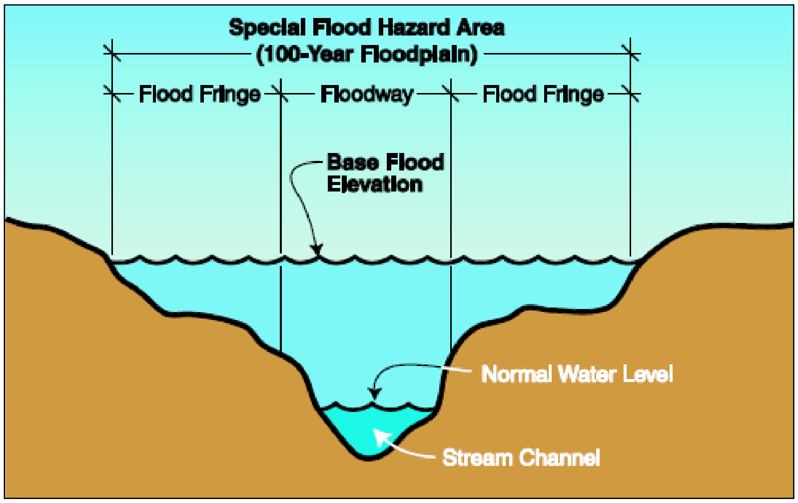
FEMA Regulatory Flood Zones

According to FEMA, flood hazard areas are defined as areas on a map shown to be inundated by a flood of a given magnitude. These areas are determined by use of statistical analyses of records of river flow, storm tides, and rainfall; information obtained through consultation with the community; floodplain topographic surveys; and hydrologic and hydraulic analyses. Flood hazard areas are delineated on FEMA's Flood Insurance Rate Maps (FIRM), which are official maps of a community on which the Federal Insurance and Mitigation Administration has delineated both Special Flood Hazard Areas (SFHA) and the risk premium zones applicable to the community. These maps identify the SFHAs, the location of a specific property in relation to the SFHA, the base flood elevation (BFE) (1-percent annual chance) at a specific site, the magnitude of a flood hazard within a specific area, undeveloped coastal barriers where flood insurance is not available, and regulatory floodways and floodplain boundaries (1-percent and 0.2-percent annual chance floodplain boundaries) (FEMA 2003, 2005, 2008). Fulton County's FIRMs can be accessed via the FEMA Flood Map Service Center online (https://msc.fema.gov/portal).

The land area covered by the floodwaters of the base flood is the SFHA on a FIRM. It is the area where the National Flood Insurance Program's (NFIP) floodplain management regulations must be enforced and the area where mandatory purchase of flood insurance applies. This regulatory boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities because many communities have maps showing the extent of the base flood and likely depths that will occur.

The 1-percent annual chance flood is referred to as the base flood. As defined by NFIP, the BFE on a FIRM is the elevation of a base flood event, or a flood which has a 1-percent chance of occurring in any given year. The BFE describes the exact elevation of the water that will result from a given discharge level, which is one of the most important factors used in estimating potential damage within a given area. A structure within a 1-percent annual chance floodplain has a 26-percent chance of undergoing flood damage during the term of a 30-year mortgage. The 1-percent annual chance flood is a regulatory standard used by federal agencies and most states to administer floodplain management programs. The 1-percent annual chance flood is used by NFIP as the basis for insurance requirements nationwide. FIRMs also depict 0.2-percent annual chance flood designations (FEMA 2003). Figure 4.3.5-2 depicts the special flood hazard area, the base flood elevation, the flood fringe, and the floodway areas of a floodplain for the 1-percent annual chance flood.

Figure 4.3.5-2. Floodplain Illustration



Source: PEMA 2013

The SFHA serves as the primary regulatory boundary used by FEMA and Pennsylvania. Digitized Flood Insurance Rate Maps (DFIRM), FIRMs, and other flood hazard information can be referenced to identify the expected spatial extent of flooding from a 1-percent annual chance event and 0.2-percent annual chance event.

At the time this Plan was written, the February 2011 DFIRMs were considered the best available, and were used for the risk analysis. Figure 4.3.5-3 illustrates the NFIP flood zones in Fulton County.

While the FIRMs provide a creditable source to document extent and location of the flood hazard, accuracy of data reflected on these maps has limitations. Notably, FIRMs are based on existing hydrological conditions at the time of map preparation. FIRMs are not set up to account for possible changes in hydrology over time.

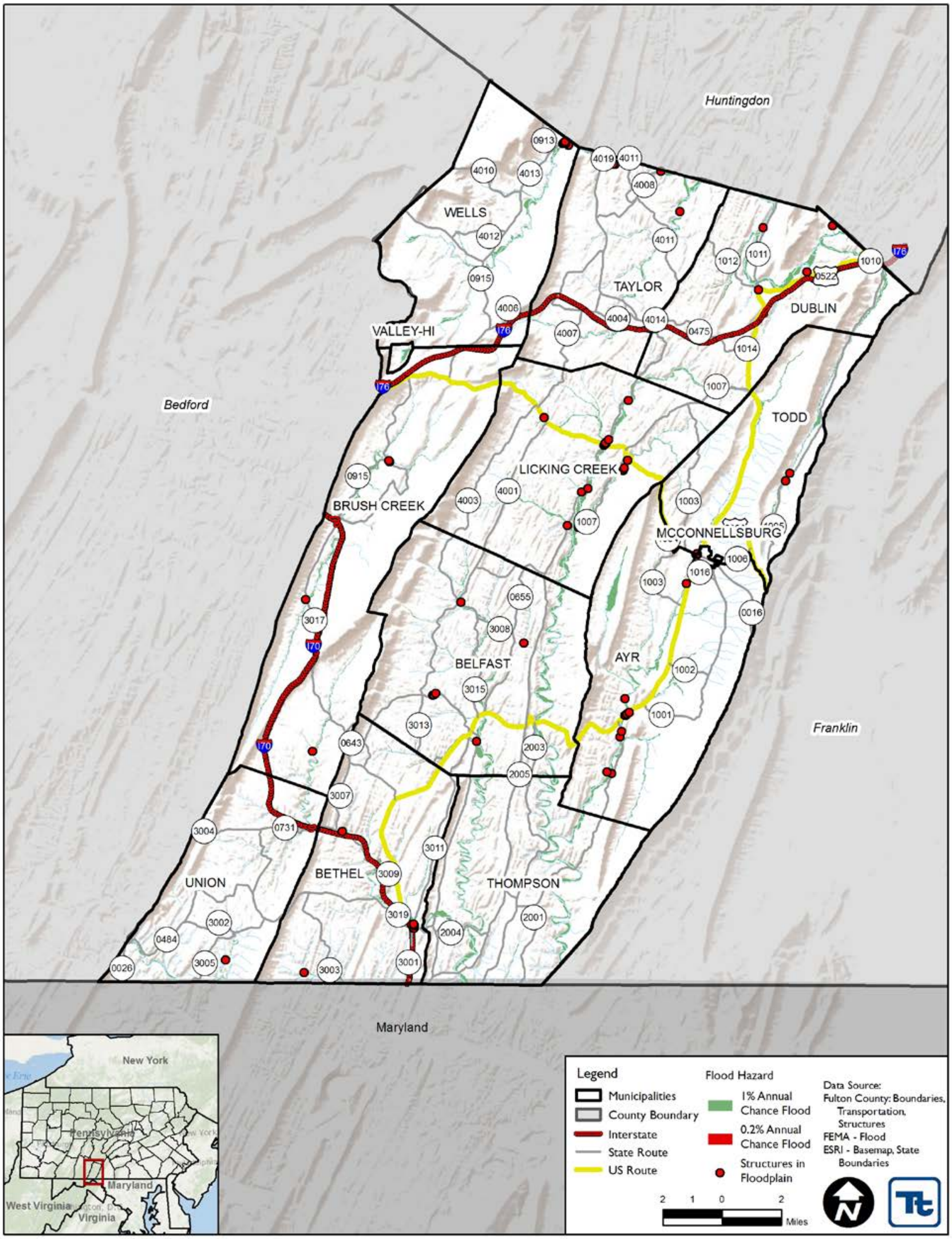
Flood Insurance Study

In addition to FIRM and DFIRMs, FEMA also provides Flood Insurance Studies (FIS) of entire counties and individual jurisdictions. These studies aid in administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. They are narrative reports of countywide flood hazards, including descriptions of flood areas studied and engineered methods used, principal flood problems, flood protection measures, and graphic profiles of flood sources (FEMA 2008). The countywide FIS for Fulton County was last completed in February 2011, at the same time as the DFIRM revisions.

Ice-Jam Hazard Areas

Ice jams are common in northeastern United States, and the State of Pennsylvania is not an exception. The Ice Jam Database, maintained by the Ice Engineering Group at the USACE Cold Regions Research and Engineering Laboratory (CRREL), currently consists of over 19,000 records from across the United States. According to the USACE-CRREL, the 9th Congressional District (which includes Fulton County) underwent 149 historical ice-jam events between 1780 and 2013. The Tonoloway Creek, the only waterway in Fulton County in which the U.S. Geological Survey (USGS) maintains a stream gage (gage number 01613050), has undergone three recorded ice jam events. This district ranks as one of the districts with the highest number of ice-jam events in the State, second only to 5th Congressional District, which has undergone 414 ice jam events (USACE 2013). Historical events are further mentioned in the "Past Occurrence" section of this hazard profile.

Figure 4.3.5-3. NFIP Floodplains in Fulton County



Source: FEMA, Fulton County

4.3.5.2 Range of Magnitude

Both localized and widespread floods are considered hazards when people and property are affected. Injuries and deaths can occur when people are swept away by flood currents, or 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 period of time can result in flash floods. Small amounts of rain can cause flooding in areas with frozen soil or saturated soils from a previous event, or if the rain is concentrated in areas with impervious surfaces (PEMA 2013).

Several factors determine severity of floods, including 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. Many areas in Pennsylvania have relatively steep slopes that promote quick surface water runoff. Most storms track from west to east; however, some originate in the Great Lakes or the Atlantic Ocean (PEMA 2013).

Rainfall in Pennsylvania is about average for the eastern United States. Amounts of precipitation can be divided into the following six categories:

- Very light rain – precipitation rate of <0.01 inch per hour
- Light rain – precipitation rate between 0.01 inch and 0.04 inch per hour
- Moderate rain – precipitation rate between 0.04 inch and 0.16 inch per hour
- Heavy rain – precipitation rate between 0.16 inch and 0.63 inch per hour
- Very heavy rain – precipitation rate between 0.63 inch and 2 inches per hour
- Extreme rain – precipitation rate greater than 2 inches per hour (PEMA 2013).

Severity of a flood depends not only on the amount of water that accumulates within a period of time, but also on the land's ability to manage this water. One element is the size of rivers and streams in an area; but an equally important factor is the land's absorbency. When it rains, soil acts as a sponge. When the land is saturated or frozen, infiltration into the ground slows, and any more water that accumulates must flow as runoff (Harris 2001).

Riverine and Flash Floods

In the case of riverine or flash flooding, once a river reaches flood stage, the flood extent or severity categories used by the National Weather Service (NWS) include minor flooding, moderate flooding, and major flooding. Each category has a definition based on property damage and public threat:

- Minor Flooding – minimal or no property damage, but possibly some public threat or inconvenience.
- Moderate Flooding – some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.
- Major Flooding – extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations are necessary (NWS 2011).

Fulton County's worst flood was associated with Hurricane Agnes in 1972. The County underwent widespread flooding and flash flooding. The damage was so severe that the County was declared a major disaster area in June 1972. Specific information on damages due to Agnes were unavailable for this update. Another significant flooding scenario mirrors the January 1995 flooding. Several inches of rain poured down on several inches of snow that had already fallen. Many homes reported basement and first-floor flooding. Some homes were severely damaged, one of which could not be repaired. Several businesses were damaged as well. A local car dealership had most of its inventory of vehicles floating down the creek. The County Commissioners filed a Declaration of Disaster for this incident. As a result, municipalities and homeowners gained assistance through low-interest loans offered by FEMA.

4.3.5.3 Past Occurrence

Many sources provided historical information regarding previous occurrences and losses associated with flooding events throughout the State of Pennsylvania and Fulton County. With so many sources reviewed for the purpose of this Hazard Mitigation Plan (HMP), loss and impact information regarding many events could vary depending on the source. Therefore, accuracy of monetary figures discussed is based only on available information identified during research for this HMP.

According to the National Oceanic and Atmospheric Administration's National Climatic Data Center (NOAA NCDC) storm event database, Fulton County underwent 14 flood events between January 1, 1950, and December 1, 2014 (the dates for which data are available). Total property damages as a result of these flood events were estimated at $15,000,000. This total also includes damages to other counties.

Between 1954 and 2013, the State of Pennsylvania underwent 55 FEMA-declared flood-related disasters (DR) or emergencies (EM) classified as one or a combination of the following disaster types: severe storms, mudslides, flash flooding, tropical storms, tropical depressions, high winds, and rains. Typically, these disasters cover a wide region of the State; therefore, they may have impacted many counties. However, not all counties were included in the disaster declarations (FEMA 2013). Fulton County was included in 7 of the 55 declarations, as listed in Table 4.3.5-2.

Based on all sources researched, known flooding events that have affected Fulton County and its municipalities, resulting in property damages, are listed in Table 4.3.5-2. No injuries or fatalities caused by flooding have been recorded in Fulton County. With flood documentation for the State of Pennsylvania so extensive, not all sources have been identified or researched. Therefore, Table 4.3.5-2 may not include all events that have occurred throughout the County.

Table 4.3.5-2. Flooding Events between 1950 and 2014 in Fulton County

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
6/23/1972	Hurricane/Flood	DR-340	Y	Hurricane Agnes. Eligible for individual and public assistance.
7/1974	Flash Flood	N/A	Y	Ft. Littleton Scout Camp
9/26/1975	Flood	DR-485	Y	Eligible for individual and public assistance
1/19/2006-2/1/2006	Flood	DR-1093	Y	Eligible for individual and public assistance
1/19/1996	Flash Flood	N/A	N/A	Countywide impact.
1/19/1996	Flood	N/A	N/A	Regional impact.
6/20/1996	Flash Flood	N/A	N/A	Road flooding occurred along Route 522 about 5 miles south of McConnellsburg.
7/19/1996	Flash Flood	N/A	N/A	Countywide impact.
8/14/1996	Flash Flood	N/A	N/A	Heavy rains flooded the road south of Harrisonville.
9/06/1996	Flash Flood	N/A	N/A	Northern parts of Fulton County were hit with heavy rains from the remnants of Hurricane Fran.
9/13/1996	Flash Flood	N/A	N/A	Thunderstorms dropped up to 8 inches of rain in 4 hours in McConnelsburg, flooding roads across the county. Fifty new and 20 used cars were swept away from Fulton Motors in McConnellsburg. Two homes were destroyed and 80 were damaged.
7/02/1997	Flash Flood	N/A	N/A	Heavy rains flooded roads and small streams in McConnellsburg. A car dealer moved cars to prevent damage.
11/07/1997	Flash Flood	N/A	N/A	Regional impact.
5/01/2003	Flash Flood	N/A	N/A	15,000 in property damage. Heavy rainfall of between 3 and 6 inches within 2 hours produced Flash Flooding in southern Fulton County. Most of the flooding occurred between the towns of Needmore and Big Cove. Portions of Route 522, Barnett's Run Road, Hess Road, and Gem Bridge road were closed due to flooding. A significant amount of culvert and road damage occurred on Gem Bridge Road. Between 30 and 35 loads of shale and 150 tons of rock were hauled in for repair to roadways. A mudslide along Route 655 near Quarry Hill required extensive cleanup. One family briefly evacuated their home due to rising water in the yard and basement.
9/2004	Flood	N/A	Y	Tropical Depression Ivan. Governor Edward G. Rendell; AS OF 10/19/04 - Presidential - Major Disaster (Individual Assistance and Public Assistance)

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
9/08/2004	Flood	N/A	N/A	Regional impact.
9/9/2004	Flood	N/A	N/A	4½ inches of rainfall at the northern tier of the County to 8 inches in Buck Valley, resulting in road closures, fallen branches, and sporadic telephone interruptions. Roads impacted included SR 484, SR 2004, SR 4008, US 522.
9/17/2004	Flood	N/A	N/A	Regional impact.
9/28/2004	Flood	N/A	N/A	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 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 two antecedent tropical systems, produced mainly minor flooding across portions of south central Pennsylvania, with several road closures and some basement flooding reported.
9/17/2004-10/1/2004	Hurricane/Flood	DR-1557	Y	Pennsylvania Tropical Depression Ivan. Eligible for individual and public assistance
8/29/2005-10/1/2005	Hurricane/Flood	EM-3235	Y	Pennsylvania Hurricane Katrina Evacuation. Eligible for public assistance.
6/2006	Flood	N/A	Y	Governor Edward G. Rendell; Presidential - Major Disaster for Individual Assistance, Public Assistance and Hazard Mitigation
3/5/2008	Flood	N/A	N/A	Heavy rain and flooding caused several road closures: - PA 655 N & S of US 30 - Licking Creek Township - Thompson Township - Todd Township Water rescue activated. Area impacted was in Dublin Township.
5/23/2009	Flood	N/A	N/A	Severe weather/flooding—vehicle with two occupants stranded. Area impacted was in Belfast Township and included Pleasant Ridge Rd. (RT 655) 1 mile off Great Cove Rd. (RT 522).
1/25/2010	Flood	N/A	N/A	Heavy rain caused flooding and closed several roads in the county. Route 522 North (Great Cove Road) between Route 30 and Hustontown was closed, along with Route 655. Dublin Mills Road and Witter Road in Taylor Township were also closed.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
3/13/2010	Flood	N/A	N/A	Heavy rainfall between 1 and 3 inches combined with snow melt to produce areal flooding. The flooding closed a portion of Dublin Mills Road along Sideling Hill Creek in the far northern part of the county near the Fulton Huntingdon line.
8/26/2011	Hurricane/Flood	N/A	N/A	Governor’s Proclamation for Hurricane Irene. Applicable to entire state (i.e., no specific counties designated).
9/3/2011-10/15/2011	Hurricane/Flood	EM-3340	Y	Remnants of Tropical Storm Lee. Eligible for public assistance
10/26/2012	Hurricane/Flood	N/A	N/A	Governor’s Proclamation for Hurricane Sandy. Applicable to entire state (i.e., no specific counties designated).
10/26/2012-11/8/2012	Hurricane/Flood	EM-3356/DR-4099	Y	Hurricane Sandy. Eligible for public assistance

Sources: NOAA-NCDC 2010; NOAA-NCDC 2014; PEMA 2010; FEMA 2010Notes:

Monetary figures within this table were U.S. Dollar (USD) figures calculated during or within the approximate time of the event. If such an event would occur in the present day, monetary losses would be considerably higher in USDs as a result of increased U.S. Inflation Rates.

DR	Federal Disaster Declaration
EM	Federal Emergency Declaration
FEMA	Federal Emergency Management Agency
NCDC	National Climate Data Center
NOAA	National Oceanic Atmospheric Administration
SHELDUS	Spatial Hazard Events and Losses Database for the U.S

Based on review of the CRREL database, Table 4.3.5-3 lists the ice-jam events that have occurred in or near the County between 1780 and 2013. Events listed below that occurred outside of the County were included because they were close enough to the County borders to cause possible flooding impacts on Fulton County. Information regarding losses associated with these reported ice jams was limited.

Table 4.3.5-3. Ice-Jam Events in Fulton County between 1780 and 2013

City (Additional Geographic Identifier)	River	Jam Date	Water Year	Gage Number	Impact
Inside Fulton County					
Needmore (Belfast Township)	Tonoloway Creek	1/5/1990	1990	01613050	Maximum annual gage height of 4.49 feet due to an ice jam reported at USGS gage Tonoloway Creek near Needmore, at 0745 hours on January 5, 1990. Estimated average daily discharge 20 cfs.
Needmore (Belfast Township)	Tonoloway Creek	2/2/1981	1981	01613050	Ice jam reported on February 2, 1982 (average daily discharge 20 cfs compared to 0.7 cfs previous day) and February 11, 1982 (average daily discharge 61 cfs compared to 2.5 cfs previous day) at USGS gage Tonoloway Creek near Needmore. No stages given. Maximum annual gage height of 6.38 feet due to ice jam reported on February 20, with average daily discharge of 181 cfs (compared to 23 cfs previous day).
Needmore (Belfast Township)	Tonoloway Creek	2/13/1971	1971	01613050	The estimated water discharge was 100 cfs. Maximum gage height was 7.37 feet.
Outside Fulton County					
Gapsville (Bedford County)	Brush Creek	2/27/1936	1936	1561000	USGS did not record a gage height on Feb. 27, 1936, on Brush Creek at Gapsville, PA, due to backwater from ice.
Sylvan (Franklin County)	Licking Creek	1/15/40	1940	1613500	Maximum annual gage height of 8.60 feet, affected by backwater from ice, reported at USGS gage Licking Creek near Sylvan, on January 15, 1940.
Three Springs (Huntingdon County)	Aughwick Creek	2/24/1979	1979	1564500	No stage reported, average daily discharge 1340 cfs (140 cfs previous day).
Three Springs (Huntingdon County)	Aughwick Creek	1/22/1959	1959	1564500	Maximum annual gage height of 11.4 feet, affected by backwater from ice, reported at USGS gage Aughwick Creek near Three Springs, on January 22, 1959. Bankfull stage 6 feet. Discharge not determined; maximum for year.

City (Additional Geographic Identifier)	River	Jam Date	Water Year	Gage Number	Impact
Orbisonia (Huntingdon County)	Aughwick Creek	2/28/1935	1935	1564000	USGS recorded a gage height of 9.2 feet on Feb. 28, 1935 on Augwick Creek near Orbisonia, PA, due to backwater from ice.

Source: CRREL 2013

Notes:

Although events were reported for Fulton County, information pertaining to every event was not easily ascertainable; therefore this table may not represent all ice jams in the County.

cfs Cubic feet per second
CRREL Cold Regions Research and Engineering Laboratory
USGS U.S. Geological Survey

National Flood Insurance Program

According to FEMA's 2002 National Flood Insurance Program (NFIP): Program Description, the U.S. Congress established the NFIP with passage of the National Flood Insurance Act of 1968. NFIP is a federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for compliance with state and community floodplain management regulations that reduce future flood damages. NFIP collects and stores a vast quantity of information regarding insured structures, including number and locations of flood insurance policies, number of claims per insured property, dollar value of each claim and aggregate value of claims, repetitive flood loss properties, etc. Use of NFIP data strongly indicates locations of flood events, along with use of other indicators (NYSDPC 2008).

Participation in the NFIP is based on an agreement between communities and the Federal Government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction and substantial improvements within floodplains, the Federal Government will make flood insurance available within the community as a financial protection against flood losses. This insurance is designed to provide an insurance alternative to disaster assistance to reduce escalating costs of repairing damage to buildings and their contents caused by floods (FEMA 2005).

The three components of the NFIP are flood insurance, floodplain management, and flood hazard mapping. Nearly 20,000 communities across the United States and its territories participate in the NFIP by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these communities. Community participation in the NFIP is voluntary. Flood damage is reduced by nearly $1 billion each year via implementation by communities of sound floodplain management requirements. Additionally, buildings constructed in compliance with NFIP building standards undergo approximately 80 percent less flood damage annually than those not built in compliance.

4.3.5.4 Future Occurrence

Given the history of flood events that have impacted Fulton County, future flooding events of varying degrees are likely to occur. The fact that the elements required for flooding exist and that major flooding has occurred throughout the County in the past suggests that many people and properties are at risk from the flood hazard in the future.

A structure within a 1-percent annual chance floodplain has a 26-percent chance of undergoing flood damage during the term of a 30-year mortgage. As noted, Figure 4.3.5-3 illustrates the FEMA DFIRM 1-percent annual chance flood zones for Fulton County.

In Section 4.4, the identified hazards of concern for Fulton County were ranked for relative risk. Probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records, NFIP data, and the Pennsylvania State Hazard Mitigation Plan, the probability of occurrence of flood events in Fulton County is considered highly likely (100-percent annual probability). Section 4.4 includes further information on PEMA's risk factor methodology.

Annual flooding is anticipated in Fulton County. Some of the flooding events may induce secondary hazards such as water quality and supply concerns, infrastructure damage, deterioration and failure, utility failures, power outages, transportation delays/accidents/inconveniences, and public health and safety concerns.

4.3.5.5 Vulnerability Assessment

To understand risk, a community must evaluate the assets exposed or vulnerable within the identified hazard area. For the flood hazard, the 1-percent annual chance event (100-year) is examined. The following sections evaluate and estimate potential impact of flooding in Fulton County presenting specifically:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on (1) life, health, and safety; (2) general building stock; (3) critical facilities; (4) the economy; and (5) future growth and development
- Effects of climate change on vulnerability
- Further data collections that will assist in understanding this hazard over time.

4.3.5.5.1 Overview of Vulnerability

Flood is a significant concern for Fulton County. To assess vulnerability, potential losses were calculated for the County for 1-percent annual chance (100-year) mean return period (MRP) flood events. The flood hazard exposure and loss estimate analysis is presented below.

4.3.5.5.2 Data and Methodology

The 1-percent annual chance flood event was examined to evaluate Fulton County's risk from and vulnerability to the flood hazard. The polygons representing the 1-percent annual chance event from the Digital Flood Insurance Rate Map (DFIRM) dated February 2011 were used to estimate exposure. The 1-percent annual chance flood depth grid, dated April 2010, available from the Pennsylvania Spatial Data Clearinghouse, was incorporated into HAZUS to estimate potential losses for the County. According to FEMA Region III, the 2010 depth grid is based on the data used to develop the 2010 DFIRM.

The version of the HAZUS-MH model (version 2.1) used for Fulton County's vulnerability assessment uses 2000 U.S. Census demographic data. These data were not updated for this analysis due to technical unavailability; however, the 2010 U.S. Census data were used to estimate population exposure in order to provide the best available output. Figure 4.3.5-3 illustrates the flood boundaries used for this vulnerability assessment.

4.3.5.5.3 Impact on Life, Health, and Safety

Impacts of flooding on life, health, and safety depend on several factors including severity of the event and whether or not adequate warning time is provided to residents. Assumedly, the population living in or near floodplain areas that could be impacted by a flood would be exposed. However, exposure should not be limited only to those who reside within a defined hazard zone, but everyone who may be affected by the effects of a hazard event (e.g., people are at risk while traveling in flooded areas, or their access to emergency services is compromised during an event). The degree of that impact varies and is not strictly measurable.

Table 4.3.5-4 lists the estimated population located within the 1-percent annual chance flood zone by municipality. To estimate the population exposed to the 1-percent flood event, the FEMA DFIRM floodplain boundaries were overlaid upon the 2010 U.S. Census population data in Geographic Information Systems (GIS) (U.S. Census 2010). Census blocks do not follow the boundaries of the floodplain, and gross overestimate or underestimate of the population exposed can occur from use of centroids or intersects of the Census block with flood zones. The limitations of these analyses are recognized, and as such the results are used only to provide a general estimate.

The 2010 Census blocks with their centroids within the flood boundaries were used to calculate the estimated population exposed to this hazard. Use of this approach resulted in an estimate of 346 people within the 1-percent annual chance floodplain, or 2.3 percent of the total County population.

Table 4.3.5-4. Estimated Fulton County Population Vulnerable to the 1-Percent Flood Hazard (2010 Census)

Municipality	Total Population	1-Percent Annual Chance Event	
		Population in SFHA	Percent Population in Boundary
Ayr, Township of	1,942	33	1.7%
Belfast, Township of	1,448	87	6%
Bethel, Township of	1,508	33	2.2%
Brush Creek, Township of	819	0	0%
Dublin, Township of	1,264	34	2.7%
Licking Creek, Township of	1,703	89	5.2%
McConnellsburg, Borough of	1,220	0	0%
Taylor, Township of	1,118	19	1.7%
Thompson, Township of	1,098	23	2.1%
Todd, Township of	1,527	6	0.4%
Union, Township of	706	0	0%
Valley-Hi, Borough of	15	8	53.3%
Wells, Township of	477	14	2.9%
Fulton County (Total)	**14,845**	**346**	**2.3%**

Sources: U.S. Census 2010, FEMA 2011
Note:
SFHA Special Flood Hazard Area

Of the population exposed, the most vulnerable include the economically disadvantaged and the population over the age of 65. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on the net economic impact on their families.

The population over the age of 65 is also more vulnerable because they are more likely to seek or need medical attention that may not be available because of isolation during a flood event, and they may have more difficulty evacuating.

Using 2000 U.S. Census data, HAZUS-MH 2.1 estimates potential sheltering needs based on a 1-percent chance flood event. For the 1-percent flood event, HAZUS-MH 2.1 estimates 614 households will be displaced, and 37 people will seek short-term sheltering, representing approximately 0.3 percent of the Fulton County population seeking short-term shelter. These statistics, by municipality, are listed in Table 4.3.5-5. The estimated displaced population and number of persons seeking short-term sheltering differs from the number of persons exposed to the 1-percent annual chance flood (Table 4.3.5-4), because the displaced population numbers take into consideration that not all residents will be significantly impacted enough to be displaced or to require short-term sheltering during a flood event.

Table 4.3.5-5. Estimated Population Displaced or Seeking Short-Term Shelter from the 1-Percent Annual Chance Flood Event

Municipality	Total Population (2000 U.S. Census)	1-Percent Annual Chance Event	
		Displaced Households	Persons Seeking Short-Term Sheltering
Ayr, Township of	1,982	74	3
Belfast, Township of	1,341	92	6
Bethel, Township of	1,420	34	0
Brush Creek, Township of	730	38	2
Dublin, Township of	1,277	72	7
Licking Creek, Township of	1,532	106	12
McConnellsburg, Borough of	1,073	8	0
Taylor, Township of	1,237	51	2
Thompson, Township of	998	72	3
Todd, Township of	1,488	22	0
Union, Township of	634	12	0
Valley-Hi, Borough of	20	1	0
Wells, Township of	529	32	2
Fulton County (Total)	**14,261**	**614**	**37**

Source: HAZUS-MH 2.1

Note:
The population displaced and seeking shelter was calculated using 2000 U.S. Census data (HAZUS-MH 2.1 default demographic data).

Total number of injuries and casualties resulting from typical riverine flooding is generally limited because of advance weather forecasting, blockades, and warnings. Therefore, injuries and deaths generally are not anticipated if proper warning occurs and precautions are in place. Warning time for flash flooding is often limited. Flash flood events are frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, which limits their predictability and compounds the hazard. Populations without adequate warning of the event are highly vulnerable to this hazard. Ongoing mitigation efforts should help to avoid the most likely cause of injury—persons trying to cross flooded roadways or channels. Mitigation action items addressing this issue are included in Section 6 (Mitigation Strategies) of this Plan.

4.3.5.5.4 Impact on General Building Stock

After consideration of the population exposed and vulnerable to the flood hazard, the built environment was evaluated. Exposure in the flood zone includes those buildings within the flood zone. Potential damage is the modeled loss that could occur to the exposed inventory, including structural and content value.

Total land area within the 1-percent annual chance flood zones was calculated for each municipality and designated growth area, as listed in Tables 4.3.5-6 and 4.3.5-7 below.

Table 4.3.5-6. Total Land Area Within the 1-Percent Annual Chance Flood Zone (Acres)

Municipality	Total Area (acres)	1% Flood Event	
		A-Zone Area Exposed (acres)	Percentage of Total Land in A-Zone
Ayr, Township of	29,781	2,528	8.5%
Belfast, Township of	32,094	3,370	10.5%
Bethel, Township of	23,728	1,351	5.7%
Brush Creek, Township of	34,750	1,707	4.9%
Dublin, Township of	23,641	2,489	10.5%
Licking Creek, Township of	28,584	2,830	9.9%
McConnellsburg, Borough of	230	6	2.6%
Taylor, Township of	20,893	1,627	7.8%
Thompson, Township of	24,286	3,523	14.5%
Todd, Township of	18,538	927	5%
Union, Township of	19,520	942	4.8%
Valley-Hi, Borough of	364	97	26.7%
Wells, Township of	23,924	1,321	5.5%
Fulton County (Total)	**280,334**	**22,718**	**8.1%**

Source: FEMA 2011

Notes:
The area represented includes the area of inclusive water bodies.
% Percent

Table 4.3.5-7. Total Land Area Within the 1-Percent Annual Chance Flood Zone (Acres)

Municipality	Total Area (acres)	1% Flood Event	
		A-Zone Area Exposed (acres)	Percentage of Total Land in A-Zone
Growth Area A	810	17	2.1%
Growth Area B	292	105	35.9%
Growth Area C	175	0	0.0%
Growth Area D	38	5	14.3%
Growth Area E	156	55	35.4%
Growth Area F	75	25	33.1%

Municipality	Total Area (acres)	1% Flood Event	
		A-Zone Area Exposed (acres)	Percentage of Total Land in A-Zone
Fulton County (Total)	**1,546**	**207**	**13.4%**

Source: FEMA 2011

Notes:
The area represented includes the area of inclusive water bodies.
% Percent

Similar to the population, the building stock data are presented by census block. To estimate the value of building stock exposed to the 1-percent flood event, the FEMA DFIRM floodplain boundaries were overlaid upon the HAZUS-MH building stock data in GIS. Using the default general building stock, the replacement cost values of the Census blocks with their centroids in the floodplain were totaled. Approximately $30.9 million worth of building/contents are exposed to the 1-percent annual chance flood in Fulton County. This represents approximately 2.7 percent of the County's total general building stock replacement value inventory ($1.45 billion).

To estimate the number of structures exposed to the FEMA DFIRM floodplain boundary, the County's point spatial layer of structures was overlaid by the 1-percent flood event boundary. In total, 90 structures, or 1.1% of the building stock, would be exposed to the hazard. The building stock exposure per municipality is presented in Table 4.3.5-8, and the number of exposed structures per watershed is presented in Table 4.3.5-9.

Potential damage estimated to the general building stock inventory associated with the 1-percent annual chance flood exceeds $16 million. Building stock potential loss estimates per municipality are listed in Table 4.3.5-10.

Table 4.3.5-8. Estimated General Building Stock Exposure to the 1-Percent Annual Chance Flood Event

Municipality	Total Number of Buildings*	Total RCV*	1% Annual Chance Flood Boundary			
			Number of Buildings*	% of Total	RCV*	% of Total
Ayr, Township of	1,031	$195,220,000	13	1.3%	$1,757,000	<1%
Belfast, Township of	719	$131,145,000	6	<1%	$10,152,000	7.7%
Bethel, Township of	831	$137,141,000	9	1.1%	$1,160,000	<1%
Brush Creek, Township of	495	$57,987,000	4	<1%	$1,331,000	2.3%
Dublin, Township of	712	$120,662,000	7	<1%	$2,134,000	1.8%
Licking Creek, Township of	843	$139,248,000	19	2.3%	$6,003,000	4.3%
McConnellsburg, Borough of	534	$187,274,000	4	<1%	$1,972,000	1.1%
Taylor, Township of	649	$92,843,000	15	2.3%	$2,356,000	2.5%
Thompson, Township of	554	$81,390,000	0	0%	$0	0%
Todd, Township of	847	$214,635,000	2	<1%	$2,324,000	1.1%
Union, Township of	405	$55,339,000	1	<1%	$0	0%
Valley-Hi, Borough of	29	$3,339,000	0	0%	$0	0%
Wells, Township of	286	$38,725,000	10	3.5%	$1,661,000	4.3%
Fulton County (Total)	**7,995**	**$1,454,948,000**	**90**	**1.1%**	**$30,850,000**	**2.12%**

Source: HAZUS-MH v2.1; FEMA 2011

Notes:

* Based on the HAZUS-MH v2.1 default general building stock inventory.
% Percent
RCV Replacement cost value (structure and contents)

Table 4.3.5-9. Estimated General Building Stock Exposure to the 1-Percent Annual Chance Flood Event

Watershed	Total Number of Buildings*	1% Annual Chance Flood Boundary	
		Number of Buildings*	% of Total
Aughwick Creek	487	9	1.8%
Brush Creek	341	3	<1%
Cove Creek	2158	17	<1%
Great Trough Creek	5	0	0%
Licking Creek	1770	20	1.1%
Little Cove Creek	0	0	0%
Little Tonoloway Creek	891	9	1.0%
Potomac River	443	2	<1%
Raystown Branch Juniata River	0	0	0%
Shaffer Creek	0	0	0%
Sideling Hill Creek	475	24	5.1%
Tenoloway Creek	59	0	0%
Tonoloway Creek	996	5	<1%
West Branch Conococheague Creek	1	0	0%
Wood Bridge Creek	369	1	<1%
Fulton County (Total)	**7,995**	**90**	**1.1%**

Source: Fulton County; FEMA 2011

Table 4.3.5-10. Estimated General Building Stock Potential Loss to the 1-Percent Annual Chance Flood Event

Municipality	Total RCV	1% Annual Chance Flood Boundary	
		Loss	% of Total
Ayr, Township of	$195,220,000	$859,000	<1%
Belfast, Township of	$131,145,000	$2,033,000	1.6%
Bethel, Township of	$137,141,000	$1,455,000	1.1%
Brush Creek, Township of	$57,987,000	$533,000	<1%
Dublin, Township of	$120,662,000	$1,625,000	1.3%
Licking Creek, Township of	$139,248,000	$2,640,000	1.9%

Municipality	Total RCV	1% Annual Chance Flood Boundary	
		Loss	% of Total
McConnellsburg, Borough of	$187,274,000	$216,000	1.2%
Taylor, Township of	$92,843,000	$1,349,000	1.5%
Thompson, Township of	$81,390,000	$2,599,000	3.2%
Todd, Township of	$214,635,000	$3,149,000	1.5%
Union, Township of	$55,339,000	$131,000	<1%
Valley-Hi, Borough of	$3,339,000	$2,000	<1%
Wells, Township of	$38,725,000	$333,000	<1%
Fulton County (Total)	**$1,454,948,000**	**$16,924,000**	**1.2%**

Source: HAZUS-MH v2.1

Notes:

% Percent
RCV Replacement cost value

As discussed in the Methodology section, Fulton County's current spatial data do not support a HAZUS-MH general building stock update. To further enhance the risk assessment, FEMA Region III provided the total exposure in the floodplain (TEIF) for Fulton County. This data utilizes best available data including the 2010 Census geography and 2012 RS Means valuations. This data is used in lieu of the average annualized loss study. This data indicates the total exposure in the floodplain for Fulton County is $30,850,000.00.

In addition to total building stock modeling, individual data available regarding flood policies, claims, repetitive loss properties (RLP), and severe repetitive loss (SRL) properties were analyzed. According to section 1361A of the National Flood Insurance Act (NFIA), as amended, 42 *United States Code* (U.S.C.) 4102a, a SRL property is defined as a residential property covered by an NFIP flood insurance policy, and can claim at least one of the following:

- Has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000
- For which at least two separate claims payments (building payments only) have been made, with the cumulative amount of the building portion of such claims exceeding the market value of the building.

A RLP is defined by FEMA as an NFIP-insured structure that incurred flood-related damage on two occasions, and for which the cost of repair equaled or exceeded 25 percent of the market value of the structure at the time of each such flood.

For both of the above, at least two of the referenced claims must have occurred within a 10-year period, and minimally 10 days must have intervened between the two claims. Fulton County has no RLP or SRL properties (whether residential or commercial/industrial), per FEMA documentation.

Table 4.3.5-11 summaries the NFIP policies and claims for Fulton County.

Table 4.3.5-11. NFIP Policies, Claims, and Repetitive Loss Statistics

Municipality	# Policies (1)	# Claims (Losses) (1)	# Repetitive Loss Properties (1)	Total Loss Payments (2)
Ayr, Township of	9	0	0	$0.00
Belfast, Township of	4	0	0	$0.00
Bethel, Township of	4	0	0	$0.00
Brush Creek, Township of	4	0	0	$0.00
Dublin, Township of	3	0	0	$0.00
Licking Creek, Township of	12	6	0	$125,426.76
McConnellsburg, Borough of	1	0	0	$0.00
Taylor, Township of	4	4	0	$109,305.67
Thompson, Township of	1	0	0	$0.00
Todd, Township of	1	0	0	$0.00
Union, Township of	0	0	0	$0.00
Valley-Hi, Borough of	0	0	0	$0.00
Wells, Township of	4	4	0	$47,759.83
Fulton County (Total)	47	14	0	$282,492.26

Source: FEMA 2014

Notes:

(1) Policies, claims, repetitive loss, and severe repetitive loss statistics provided by FEMA, and are current as of 8/31/14. Total number of repetitive loss properties includes the severe repetitive loss properties. The number of claims represents claims closed by 8/31/14.

(2) Total building and content loss information was collected from the claims file provided by FEMA.

4.3.5.5.5 Impact on Critical Facilities

In addition to considering general building stock at risk, the risk of flood to critical facilities, utilities, and user-defined facilities was evaluated. HAZUS-MH was used to estimate the flood loss potential to critical facilities exposed to the flood risk. Using depth/damage function curves, HAZUS estimates the percent of damage to the building and contents of critical facilities. Table 4.3.5-12 lists the critical facilities and utilities within the FEMA flood zones, and the percent damage HAZUS-MH 2.1 estimates to the facility as a result of a 1-percent annual chance event. The facilities' names are listed as they appear in the County's database; they may be truncated. No hazardous materials facilities are located in the floodplain.

In cases where short-term functionality is impacted by a hazard, other facilities of neighboring municipalities may need to increase support response functions during a disaster event. Mitigation planning should consider means to reduce impacts on critical facilities and ensure that sufficient emergency and school services remain functional when a significant event occurs. Actions addressing shared services agreements are included in Section 6 (Mitigation Strategy) of this Plan.

Table 4.3.5-12 Critical Facilities Within the 1-Percent Annual Chance Flood Boundary and Estimated Potential Damage

Name	Municipality	Type	Exposure 1% Event	Potential Loss from 1% Flood Event Percent Structure Damage
Bethel Township Sewer Authority	Bethel, Township of	Wastewater Pump	X	10
Flying R Airport	Licking Creek, Township of	Airport	X	-
Valley Rural Electric	Licking Creek, Township of	Electric Substation	X	6
Valley Rural Electric	Taylor, Township of	Electric Substation	X	2

Sources: HAZUS-MH 2.1, Fulton County 2014

Note:
x Facility within the DFIRM boundary.

4.3.5.5.6 Impact on the Economy

For impact on the economy, estimated losses from a flood event are considered. Losses include but are not limited to general building stock damages, agricultural losses, business interruption, and impacts on tourism and tax base of Fulton County. Damages to general building stock can be quantified by use of HAZUS-MH as discussed above. Other economic components such as loss of facility use, functional downtime, and social economic factors are less susceptible to measurement with a high degree of certainty. For the purposes of this analysis, general building stock damages are further discussed in reference to impacts on the economy of Fulton County.

Flooding can cause extensive damage to public utilities and disruptions to delivery of services. Loss of power and communications may occur, and drinking water and wastewater treatment facilities may be temporarily out of operation. Flooded streets and road blocks make it difficult for emergency vehicles to respond to calls for service. Floodwaters can wash out sections of roadway and bridges.

Direct building losses are the estimated costs to repair or replace damage caused to buildings. The potential damage estimated to the general building stock inventory associated with the 1-percent flood is approximately $16.9 million, which represents 2.1 percent of the County's overall total general building stock inventory. These dollar value losses to the County's total building inventory replacement value, in addition to damages to roadways and infrastructure, would greatly impact the local economy.

HAZUS-MH estimates the amount of debris generated from a 1-percent flood event. The model breaks down debris into three categories because of the different types of equipment needed to handle debris: (1) finishes (dry wall, insulation, etc.), (2) structural (wood, brick, etc.), and (3) foundations (concrete slab and block, rebar, etc.). Table 4.3.5-13 summarizes the debris HAZUS-MH 2.1 estimates to result from a 1-percent flood event.

Table 4.3.5-2. Estimated Debris Generated from the 1-Percent Flood Event

Municipality	1% Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Ayr, Township of	116	76	16	24
Belfast, Township of	244	110	65	69
Bethel, Township of	86	44	19	23
Brush Creek, Township of	71	37	15	20
Dublin, Township of	186	94	41	52
Licking Creek, Township of	243	133	47	64
McConnellsburg, Borough of	6	6	0	0
Taylor, Township of	140	84	24	32
Thompson, Township of	526	171	193	162
Todd, Township of	22	13	3	6
Union, Township of	35	14	10	11
Valley-Hi, Borough of	1	1	0	1
Wells, Township of	61	36	11	15
Fulton County (Total)	1738	817	443	479

Source: HAZUS-MH 2.1

4.3.5.5.7 Future Growth and Development

As discussed in Section 2.4, areas targeted for future growth and development have been identified across the County. Any areas of growth could be impacted by the flood hazard if within identified hazard areas. The County intends to discourage development in vulnerable areas or to encourage higher regulatory standards on the local level.

4.3.5.5.8 Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by the type, frequency, and intensity of weather events. Both globally and at the local scale, climate change can alter the prevalence and severity of extremes such as flood events. While predicting changes of flood events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society, and the environment (U.S. Environmental Protection Agency [EPA] 2006).

Pennsylvania's Department of Environmental Protection (PADEP) was directed by the Climate Change Act (Act 70 of 2008) to initiate a study of potential impacts of global climate change on the Commonwealth. The June 2009 Pennsylvania Climate Impact Assessment's main findings indicate that Pennsylvania is very likely to undergo increased temperatures in the 21st century. An increase in variability of temperature and precipitation may lead to increased frequency and/or severity of storm events. Summer floods and general stream flow variability are projected to increase due to increased variability in precipitation. Even with the anticipated increase in winter precipitation as rain rather than snow, increased winter temperatures and a reduced snowpack may decrease rain-on-snow events and thus major flooding events in Pennsylvania. This conclusion, however, remains speculative until further studies can validate it. Future improvements in modeling smaller-scale climatic processes are expected, and will lead to improved understanding of how the changing climate will alter temperature, precipitation, storms, and flood events in Pennsylvania (Shortle et al. 2009).

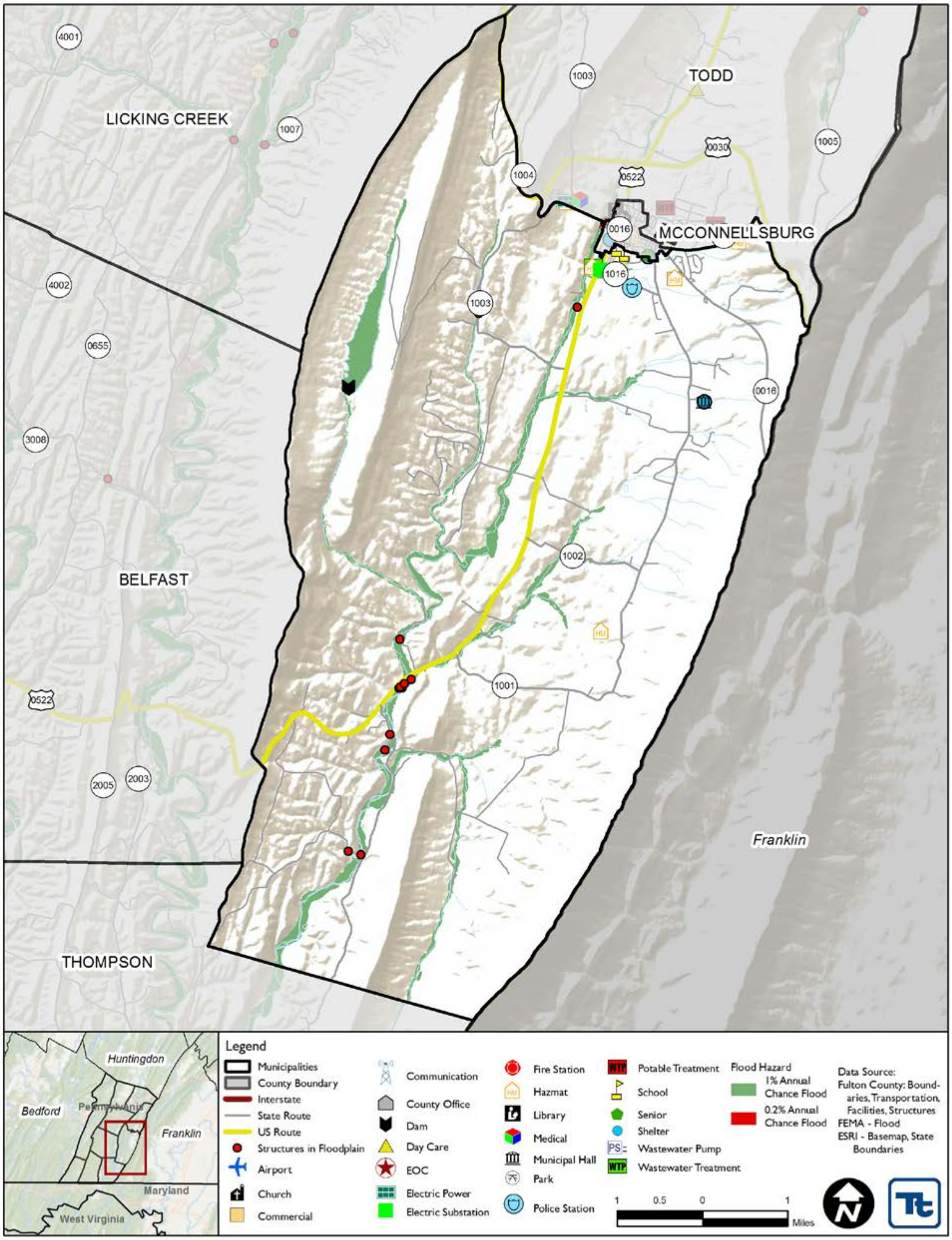
4.3.5.5.9 Additional Data and Next Steps

A HAZUS-MH riverine flood analysis for Fulton County was based on the most current and best available data, including critical facility inventories and FEMA DFIRM. For future plan updates, more accurate exposure and loss estimates can be produced by replacing the national default demographic inventory in the HAZUS-MH model with 2010 U.S. Census data when these data become available, updating the default general building stock inventory in HAZUS-MH, and conducting the loss estimates at the structure level.

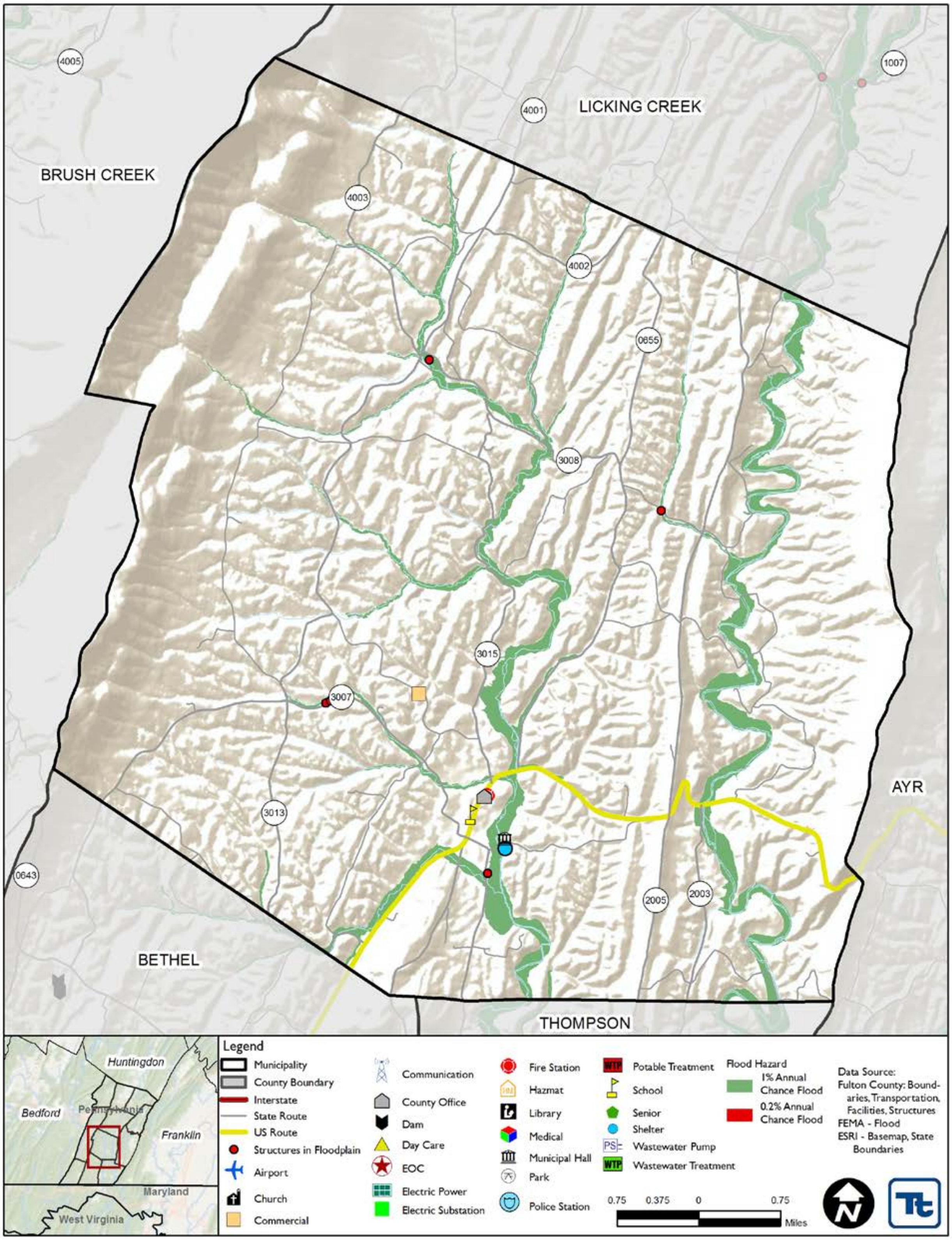
According to FEMA Region 3, Fulton County is part of an ongoing Risk MAP project involving new regulatory mapping, as well as development of non-regulatory products, delivery of which is to occur in March 2015.

Section 6 (Mitigation Strategy) of this Plan includes discussions of specific mitigation actions addressing improved data collection, and further vulnerability analysis.

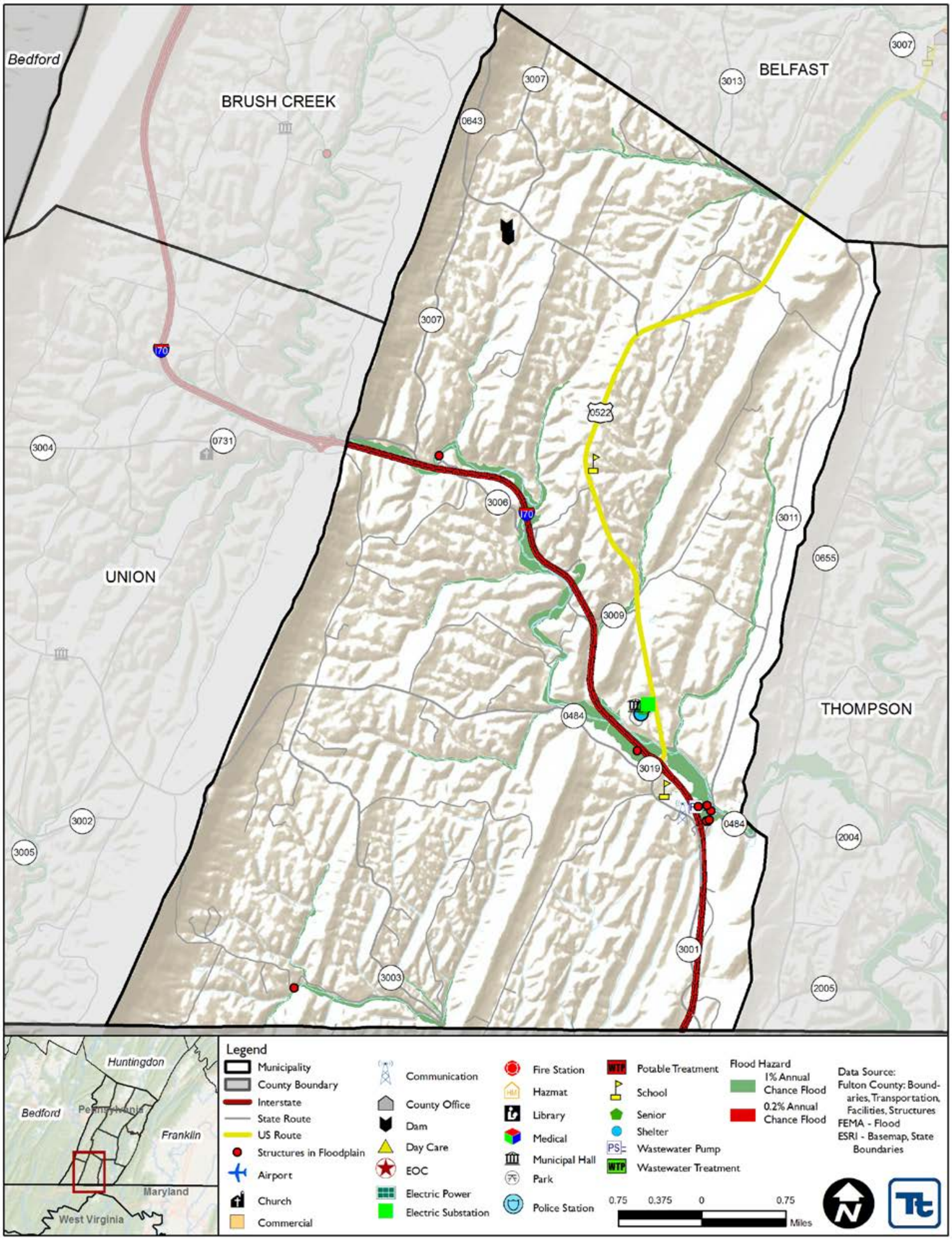
Ayr Township



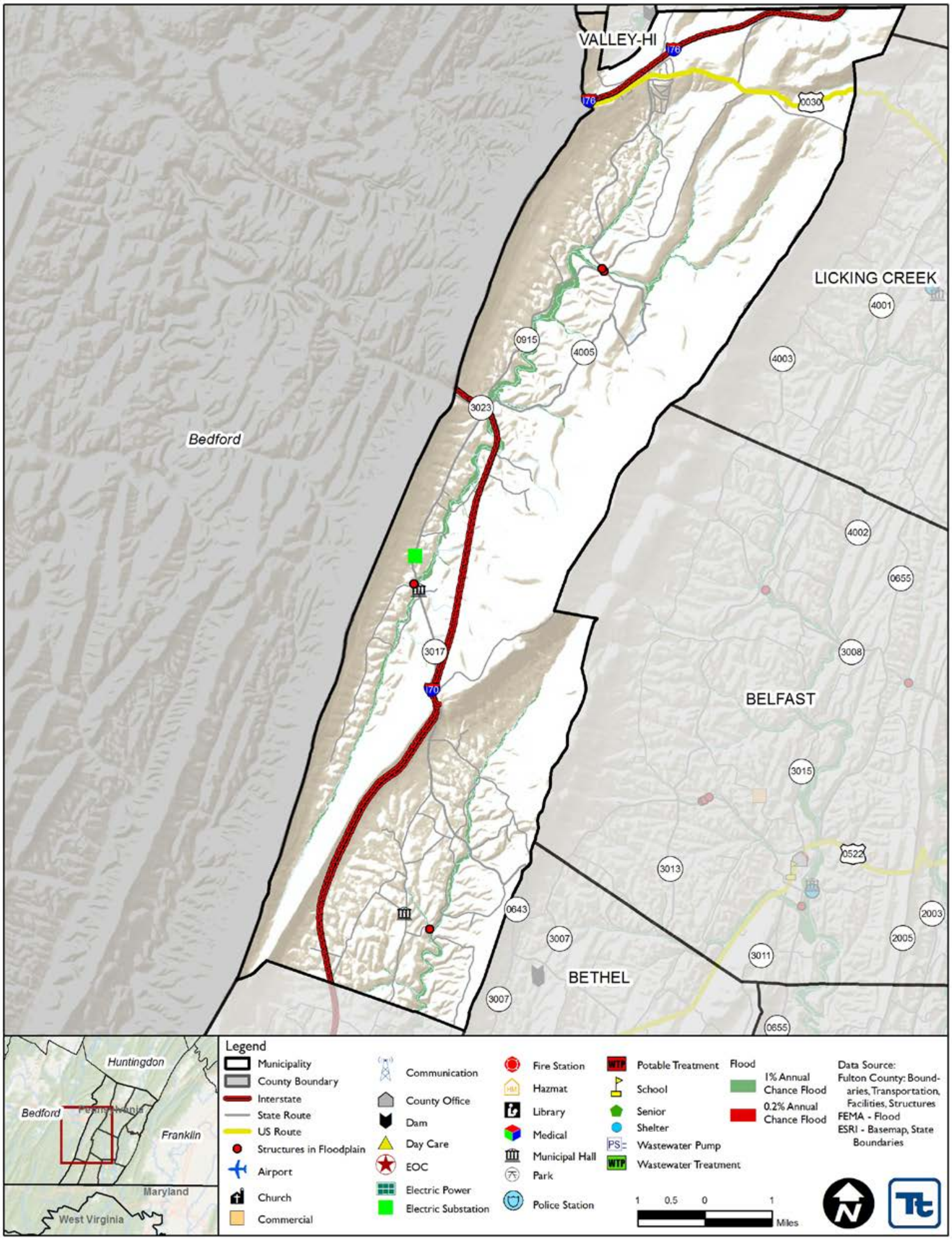
Belfast Township



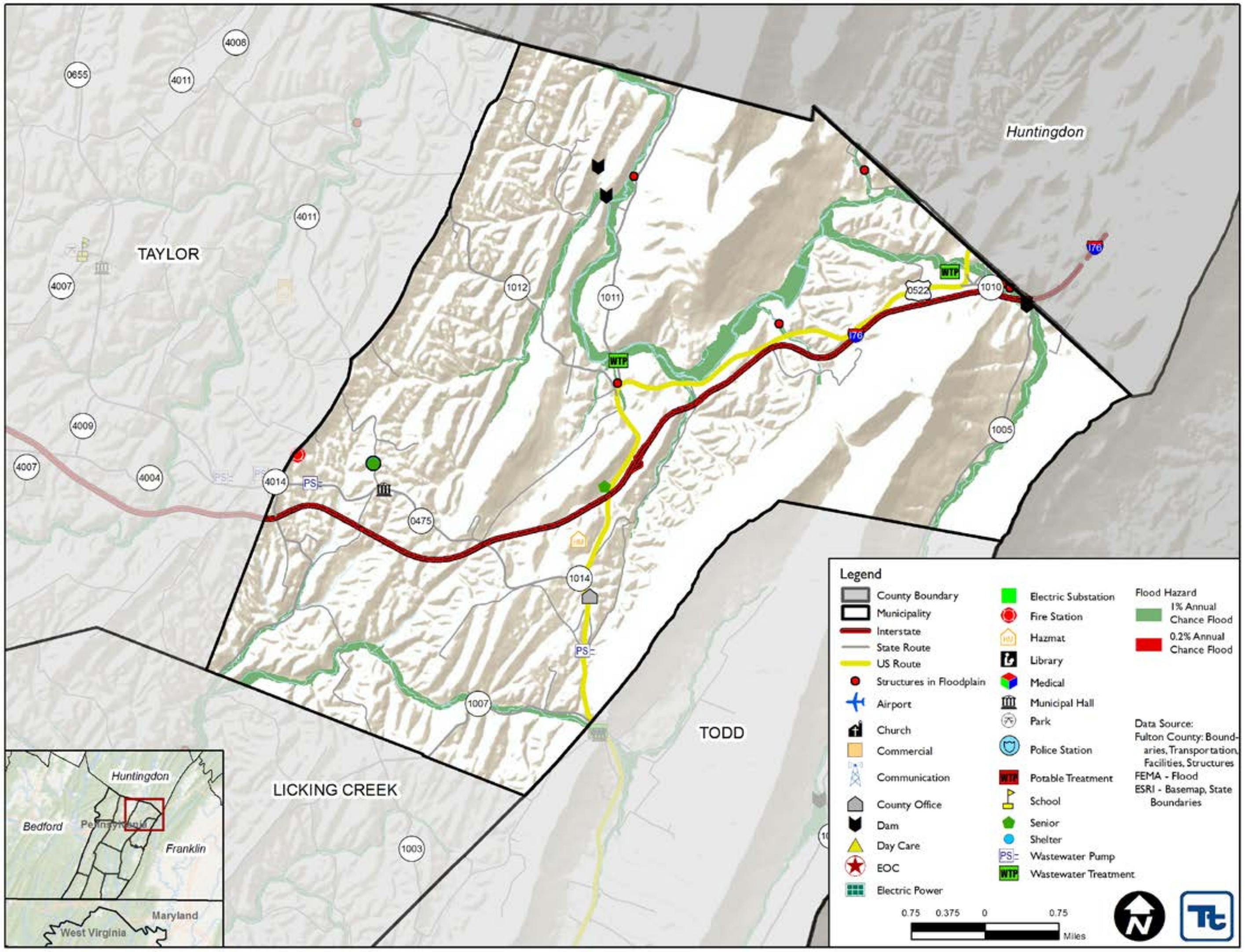
Bethel Township



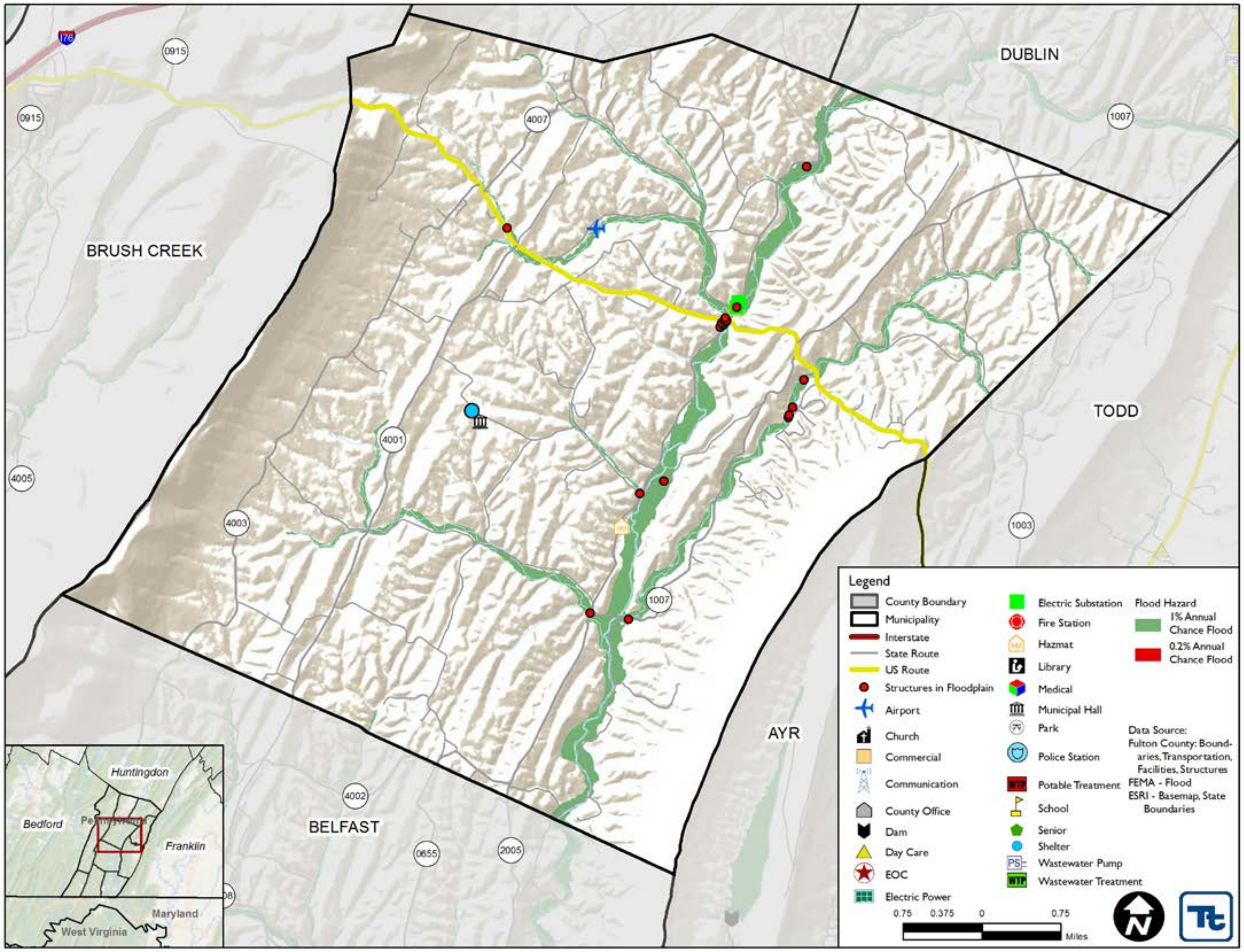
Brush Creek Township



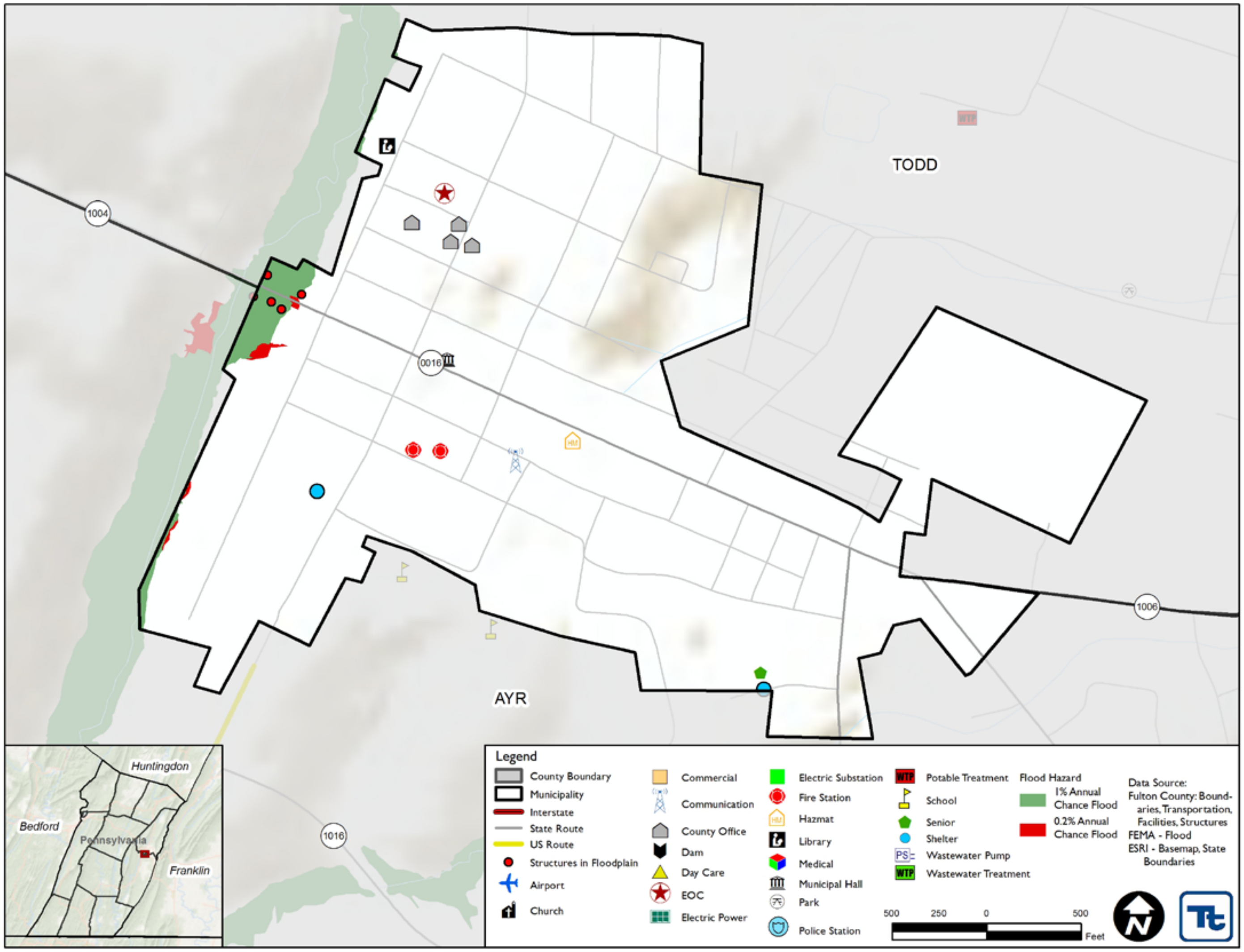
Dublin Township



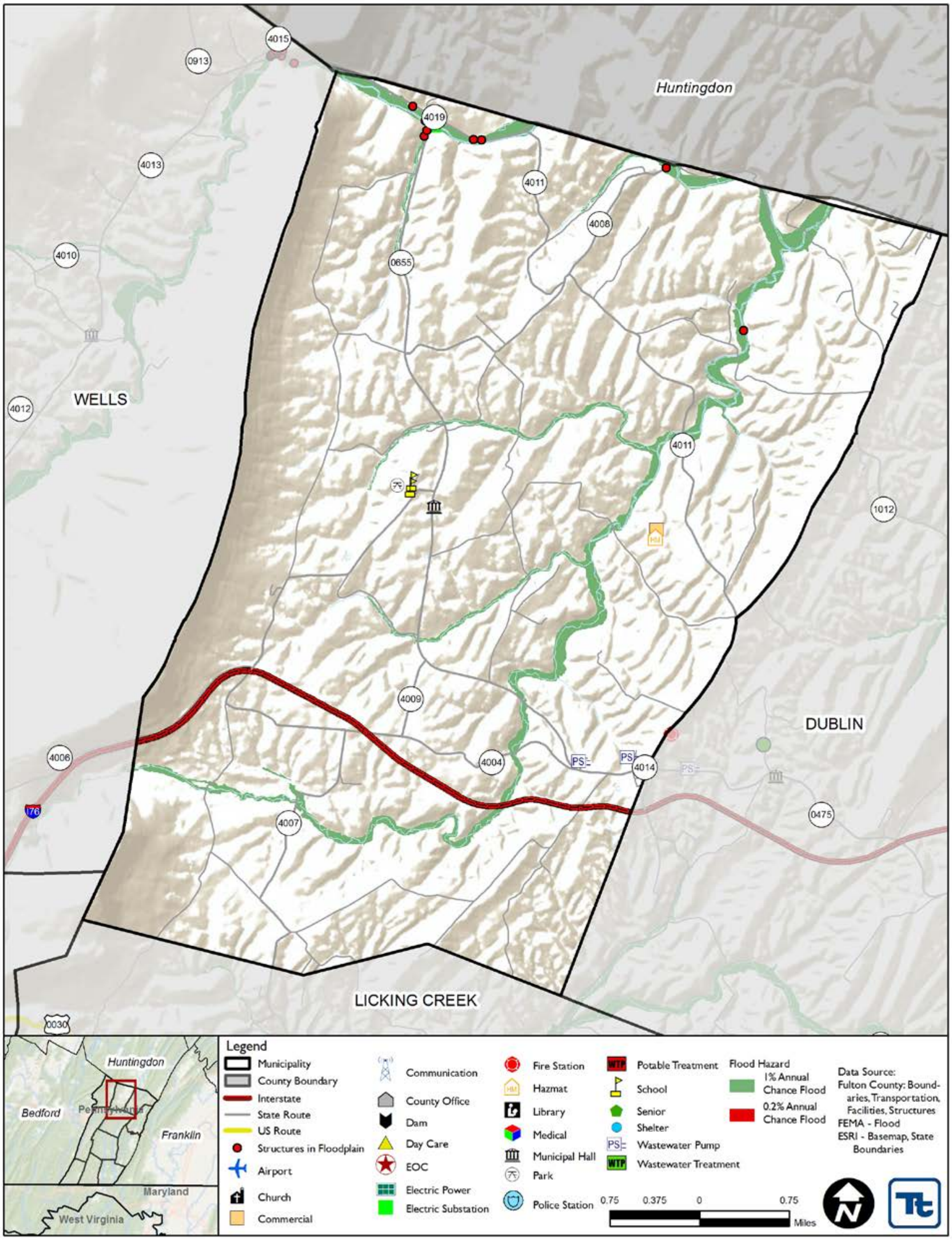
Licking Creek Township



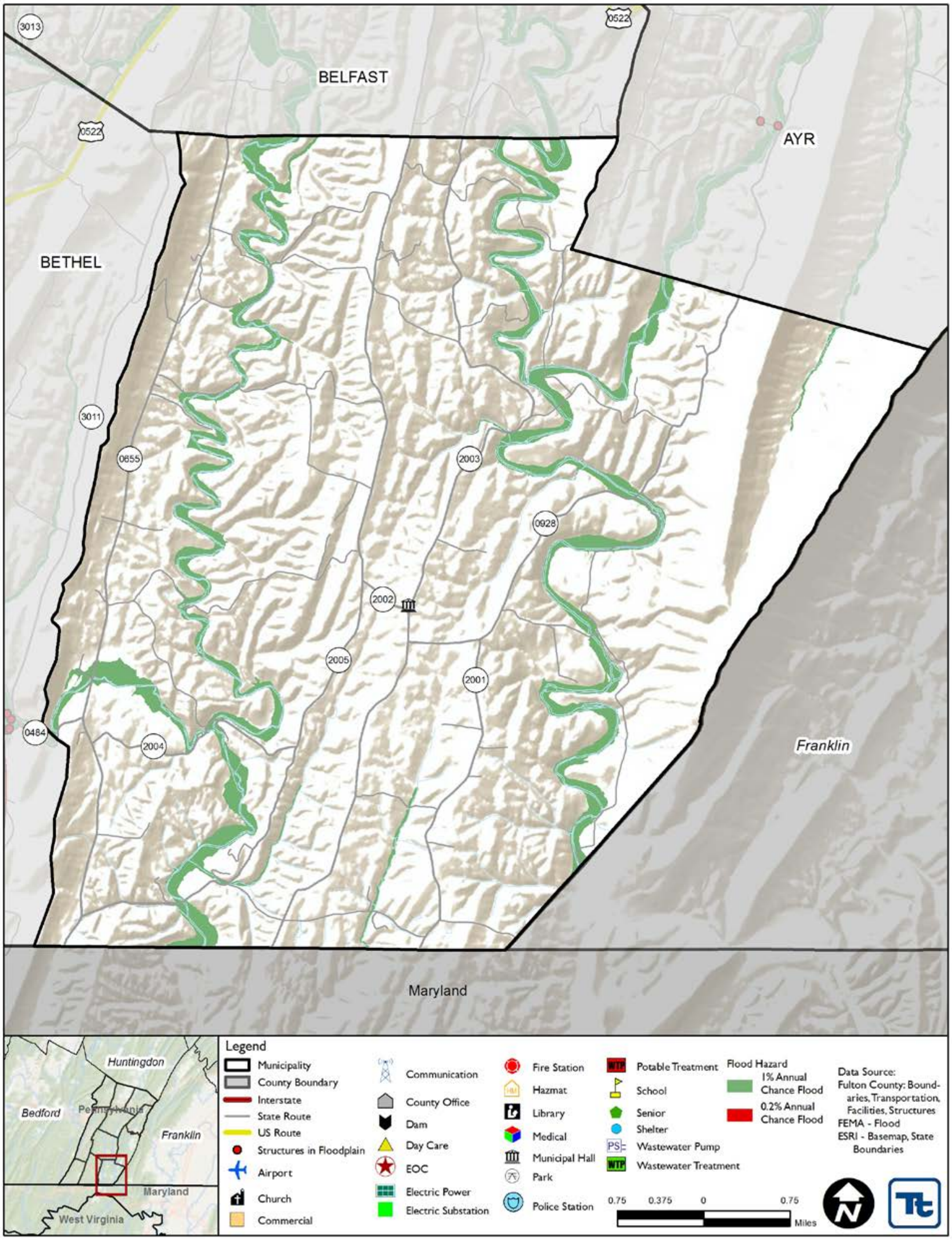
McConnellsburg Borough



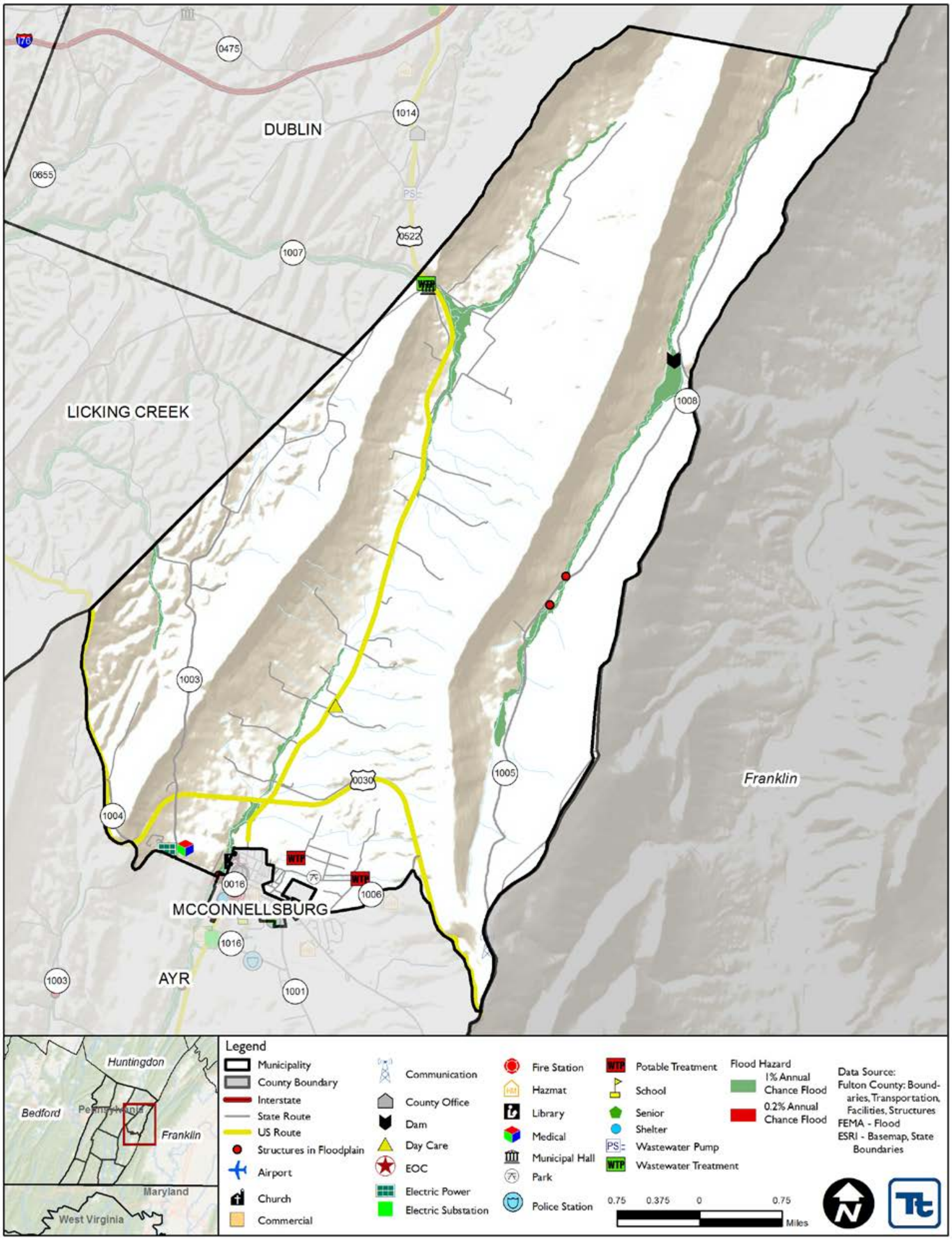
Taylor Township



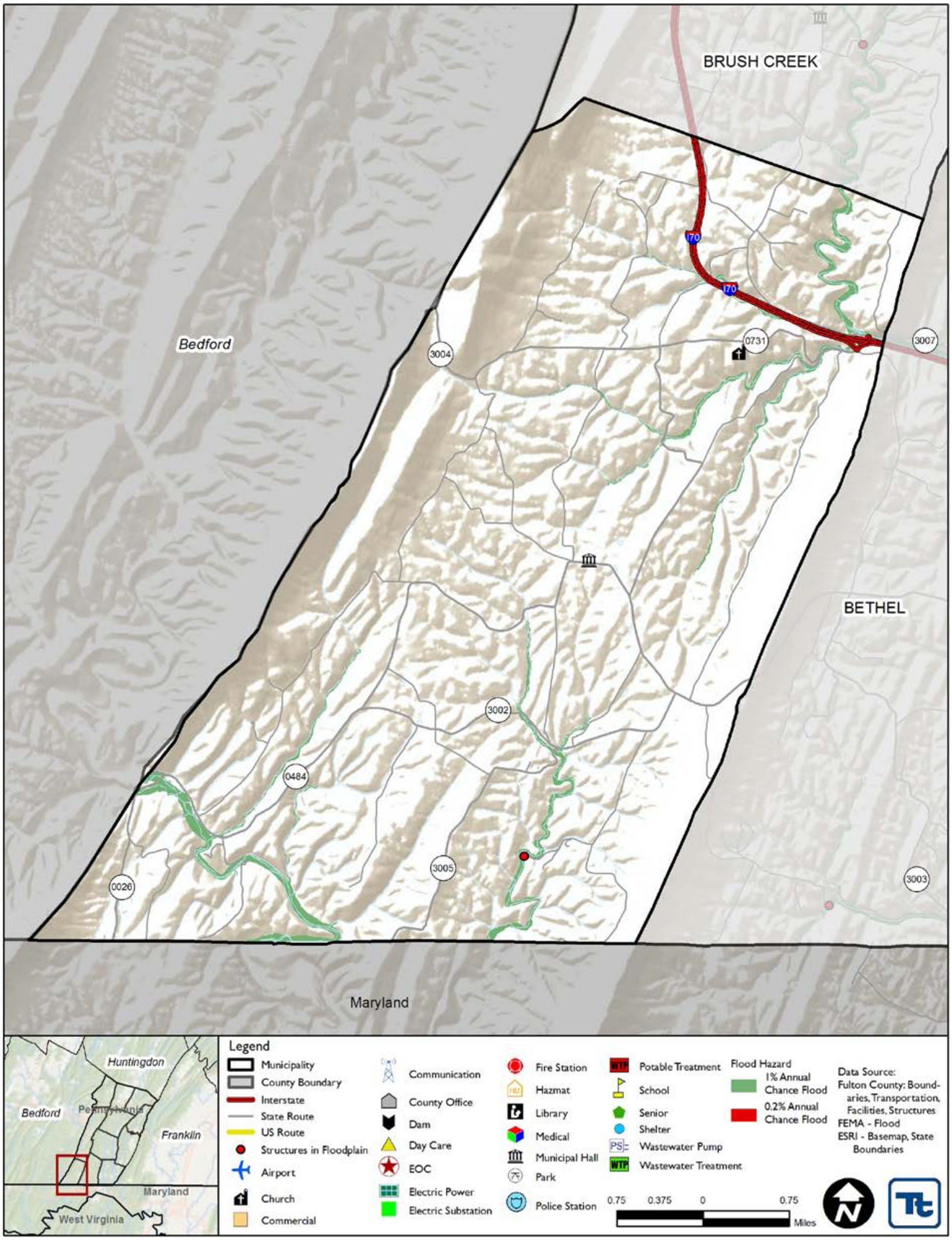
Thompson Township



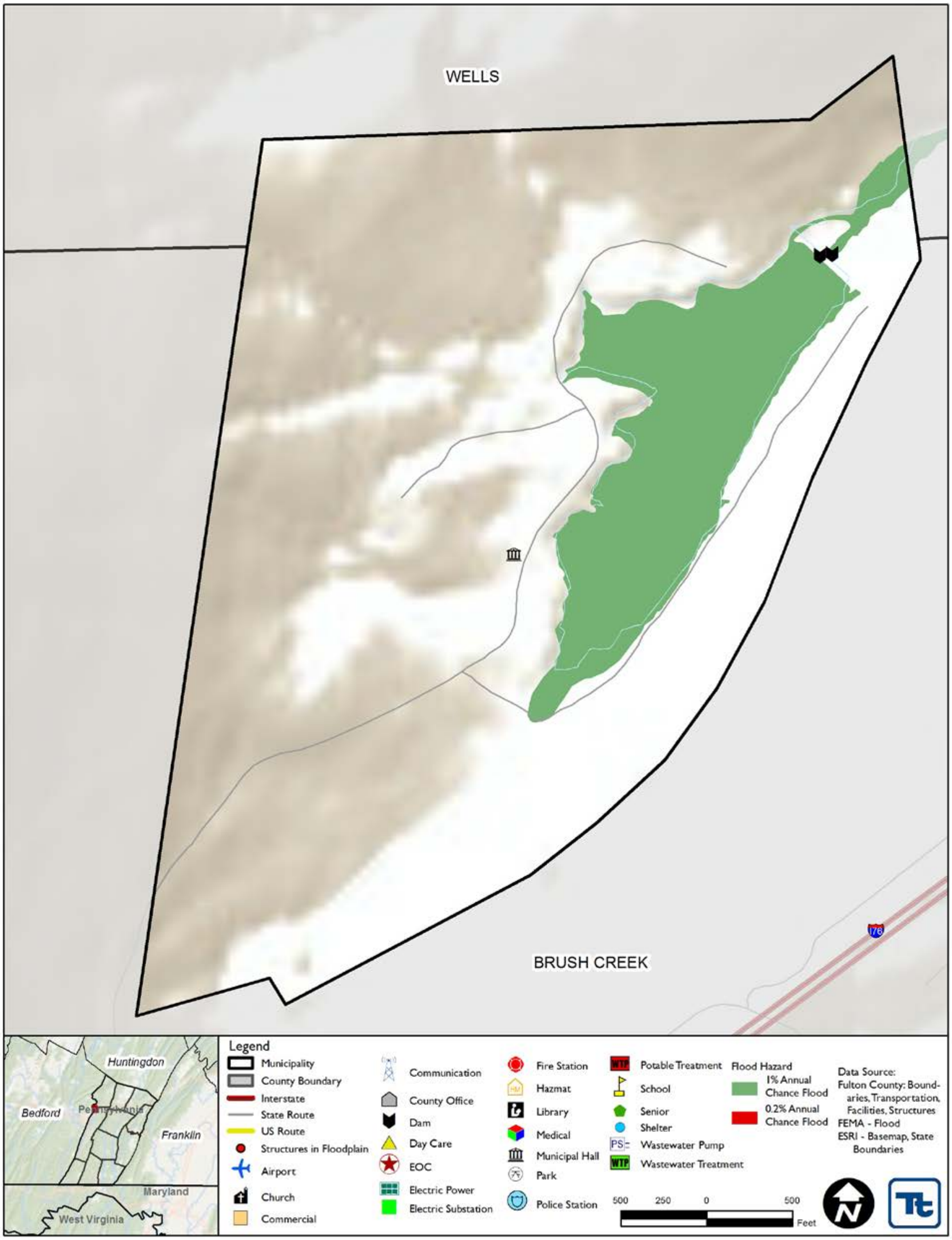
Todd Township



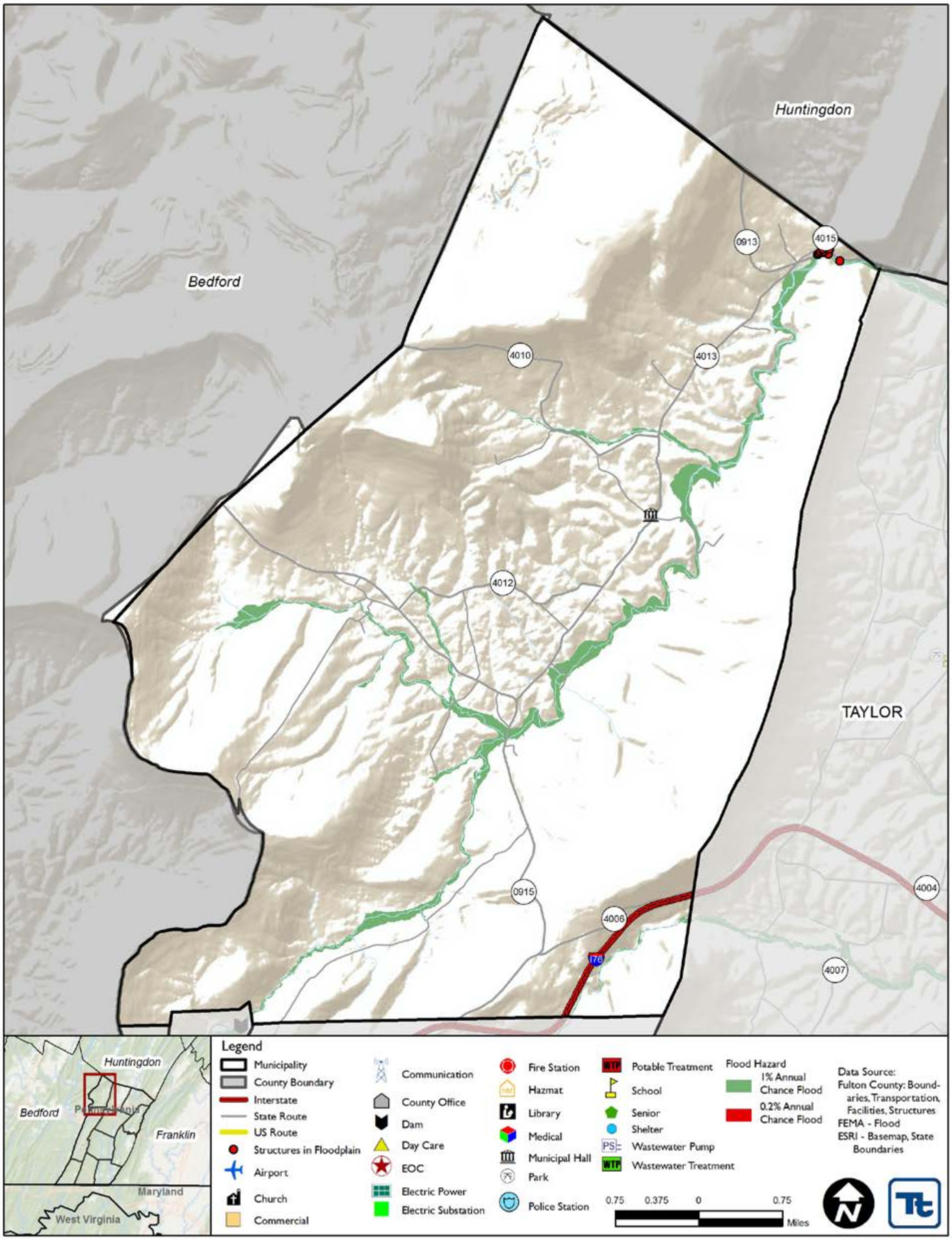
Union Township



Valley-Hi Borough



Wells Township

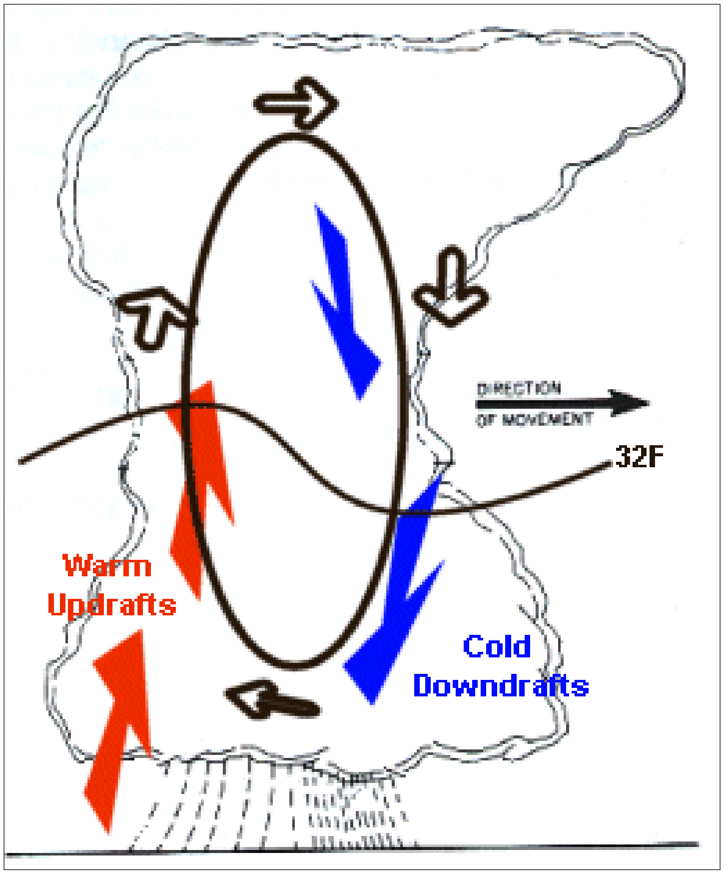


4.3.6 Hailstorm

Hail forms inside a thunderstorm where there are strong updrafts of warm air and downdrafts of cold water. If a water droplet is picked up by the updrafts, it can be carried well above the freezing level. Water droplets freeze when temperatures reach 32°F or colder. As the frozen droplet begins to fall, it may thaw as it moves into warmer air toward the bottom of the thunderstorm. However, the droplet may be picked up again by another updraft, carried back into the cold air, and re-freeze. The frozen droplet adds another layer of ice with each trip above and below the freezing level. The frozen droplet, with many layers of ice, falls to the ground as hail. Most hail is small and typically less than 2 inches in diameter (NWS 2010). Figure 4.3.6-1 illustrates the process that occurs in hail formulation.

The size of hailstones is a direct function of the size and severity of the storm. The higher the temperatures at the earth's surface, the greater the strength of the updrafts, and the greater the amount of time the hailstones are suspended, giving them more time to increase in size. Damage to crops and vehicles is typically the most significant impact of hailstorms.

Figure 4.3.6-1. Hail Formation

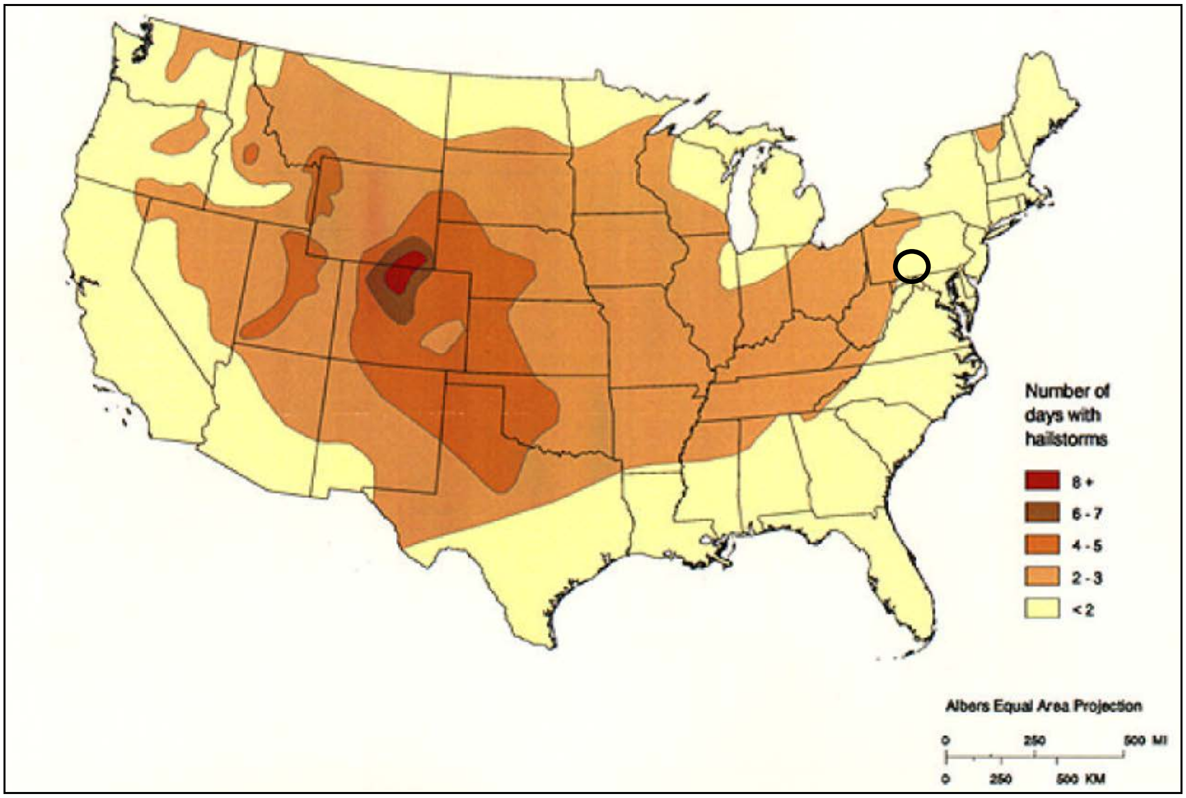


Source: NOAA 2012
°F degrees Fahrenheit

4.3.6.1 Location and Extent

Hail causes nearly $2 billion in crop and property damages, on average, each year in the U.S. Hail occurs most frequently in states within the southern and central plains; however, hail damage is possible throughout the entire U.S. because hail accompanies thunderstorms (Federal Alliance for Safe Homes 2006). Figure 4.3.6-9 indicates that Fulton County undergoes fewer than two hailstorms a year, on average.

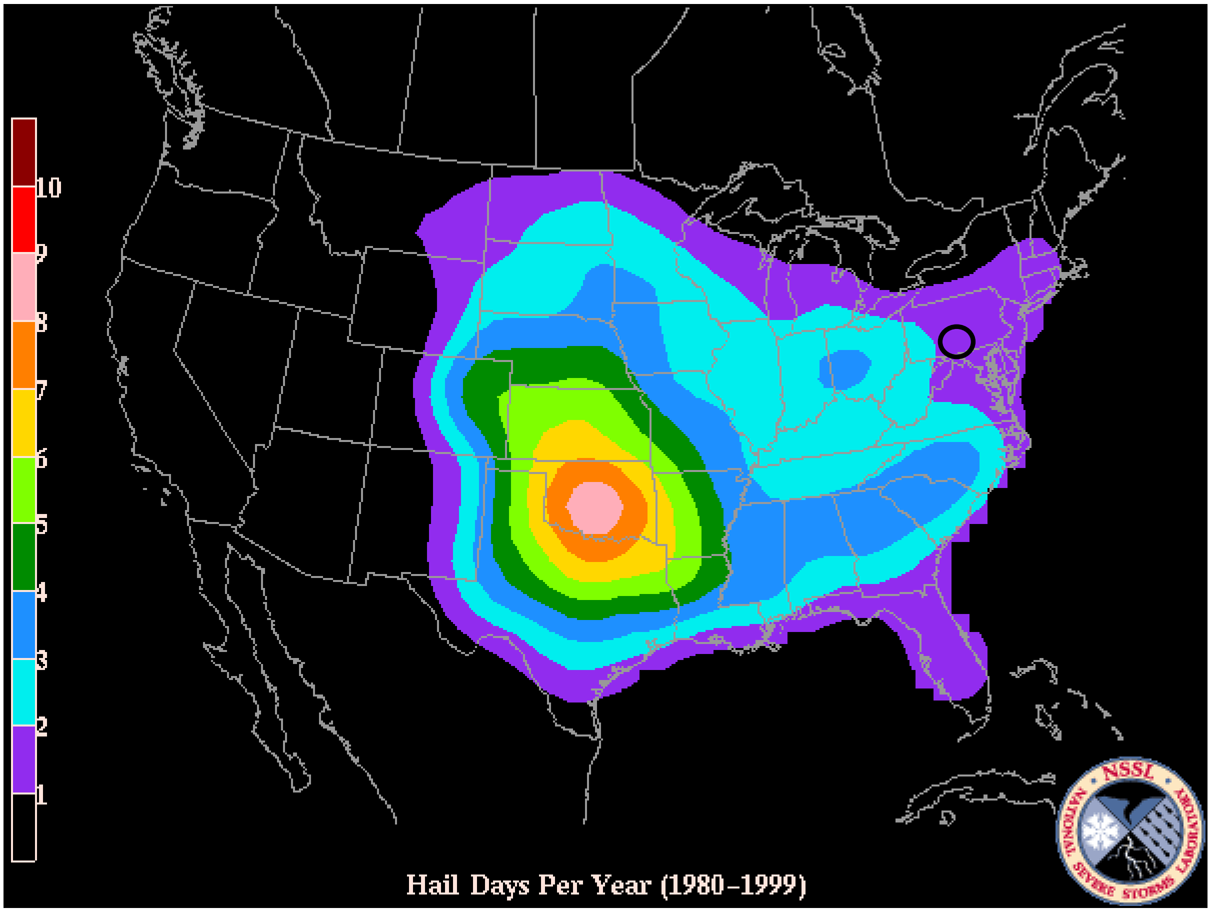
Figure 4.3.6-2. Annual Frequency of Hailstorms in the U.S.



Source: Federal Emergency Management Agency (FEMA) 1996
Note: The black oval indicates the approximate location of Fulton County.

The National Oceanic and Atmospheric Administration's (NOAA) National Severe Storms Laboratory (NSSL) started a project to estimate the likelihood of severe weather hazards in the U.S. "Severe thunderstorms" were defined in the U.S. as having one or more of the following characteristics: associated tornados, gusts at least 58 miles per hour (mph), or hail at least 0.75 inch in diameter. Figure 4.3.6-3 illustrates the average number of days per year of hail events within 25 miles of any point. In Fulton County, the figure shows an average of 1 to 2 days per year of events with hail at least 0.75-inch diameter.

Figure 4.3.6-3. Total Annual Threat of Hail Events (0.75-inch diameter or greater) in the U.S., 1980 to 1999.



Source: National Severe Storms Laboratory (NSSL) 2003

Note: The mean number of days per year with one or more events within 25 miles of a point is shown here. The fill interval for hail days is 0.2, with the purple starting at 0.2 day. The fill interval is 1 for the non-hail threats, with the purple starting at 1. For the significant (violent) threat, it is 5 days per century (millennium) Range of Magnitude. The black oval indicates the approximate location of Fulton County.

4.3.6.2 Range of Magnitude

Hail can vary in size from less than an inch to several inches in diameter and can cause significant damage to crops and property. Damage depends on the size, duration, and intensity of hail precipitation. Those who do not seek shelter could face serious injury. Automobiles and aircraft are particularly susceptible to damage. Effects of other hazards associated with thunderstorms (strong winds, intense precipitation, and lightning) often occur concurrently because hail precipitation usually occurs during thunderstorms.

Based on reports from the National Climatic Data Center (NCDC) and County residents, the worst-case scenario for a hailstorm in Fulton County would be a storm that dropped softball-sized hail (the largest observed in the County) throughout the county. This hail would cause widespread damages to property and crops.

Hail can be produced during many different types of storms. Typically, hail occurs with thunderstorms. The size of hail is estimated by comparing it with a known object. During most hailstorms, hail is produced in a variety of sizes, and only the very largest hail stones pose serious risk to people who are exposed. Table 4.3.6-1 shows the various sizes of hail via comparisons to real-world objects.

Table 4.3.6-1. Hail Size

Size	Inches in Diameter
Pea	0.25 inch
Marble/mothball	0.50 inch
Dime/Penny	0.75 inch
Nickel	0.875 inch
Quarter	1.0 inch
Ping-Pong Ball	1.5 inches
Golf Ball	1.75 inches
Tennis Ball	2.5 inches
Baseball	2.75 inches
Tea Cup	3.0 inches
Grapefruit	4.0 inches
Softball	4.5 inches

Source: National Oceanic and Atmospheric Administration (NOAA) 2012

4.3.6.3 Past Occurrence

Hailstorms can occur as a routine part of severe weather in Fulton County and the potential for hail storms exists throughout the county, with a few minor incidents occurring each year. Fulton County has a low potential for significant hail events, based on previous records.

The Commonwealth of Pennsylvania 2013 All-Hazard Mitigation Plan (PA HMP) states that approximately 96 percent of hailstorm events throughout the commonwealth have occurred during the months of April, May, June, July, August, and September. Moreover, approximately 87 percent of historical hailstorm events have occurred during the afternoon (noon to 5 p.m.) or evening (5 p.m. to 9 p.m.) hours. Both of these two preceding statements are consistent with historical hailstorm reports from Fulton County.

According to the U.S. Department of Agriculture (USDA) Risk Management Agency, hailstorm events within Fulton County between 1948 and 2013 have resulted in $48,750 in crop insurance claims. The significant amount of crop loss came from only two years of hail events – 2011 and 2013. In 2011, the county experienced $5,351 in loss claims, and in 2013, the county claimed $43,399 in losses (USDA 2014). Pennsylvania has never received a federal disaster declaration because of a hail event. In the Pennsylvania Disaster History events list maintained by PEMA, Pennsylvania has experienced only three noteworthy hail events, none of which affected Fulton County. Only two of these events were eligible for Small Business Administration (SBA) Economic Injury benefits, while the third was not eligible for any recovery actions.

The NOAA-NCDC Storm Events database contains references to hail as a reported storm incident in Fulton County from 1950 to August 31, 2014, as shown in Table 4.3.6-2 below. The database indicates that 11 separate reports were issued throughout the county from 1950 to 2014. Some reports specified different times of day or different localities regarding the same storm. According to these reports, Fulton

County has undergone hail ranging in size from 0.75 inch to 2.75 inches in diameter, with no reported deaths, injuries, or property or crop damages.

Table 4.3.6-2. History of Hailstorms in Fulton County, 1950 to 2014

Date	Diameter (inches)	Location	Property Damage	Crop Damage
5/16/1988	1	Countywide	0	0
7/10/1995	1	Town Hill	0	0
6/4/1996	0.75	Big Cove Tannery	0	0
7/30/1996	1.75	Gracey	0	0
7/14/2000	1.75	Big Cove Tannery	$2,000	0
5/26/2002	2.75	Buck Vly	0	0
5/26/2002	1.5	Needmore	0	0
6/13/2007	0.75	Akersville	0	0
5/26/2011	2	Dickeys Mountain	0	0
6/29/2012	1.75	Sideling Hill	0	0
6/29/2012	1	Sideling Hill	0	0
6/24/2013	1.75	Cito	0	0
6/24/2013	1.75	Webster Mill	0	0
8/7/2013	1	Burnt Cabin's Strip	0	0

Source: NCDC, 2014

Notes: Information regarding municipal event occurrences prior to 1992 was unavailable through NCDC or other researched means

Events occurring on the same date in the same municipality were recorded as separate events based on hail diameter

Personal narratives from County residents and local officials report that the worst-case scenario in the County occurred on May 26, 2011. While this event is noted in the NCDC database, the database does not list some of the property damage reported by residents; this damage led to a minimum of $100,000 worth of repairs. Thompson Township, in particular, was severely impacted. County residents stated that they had never witnessed anything like this before and reported hailstones as large as softballs. The images below demonstrate the size of the hailstones and the severe impact of the storm on residents.

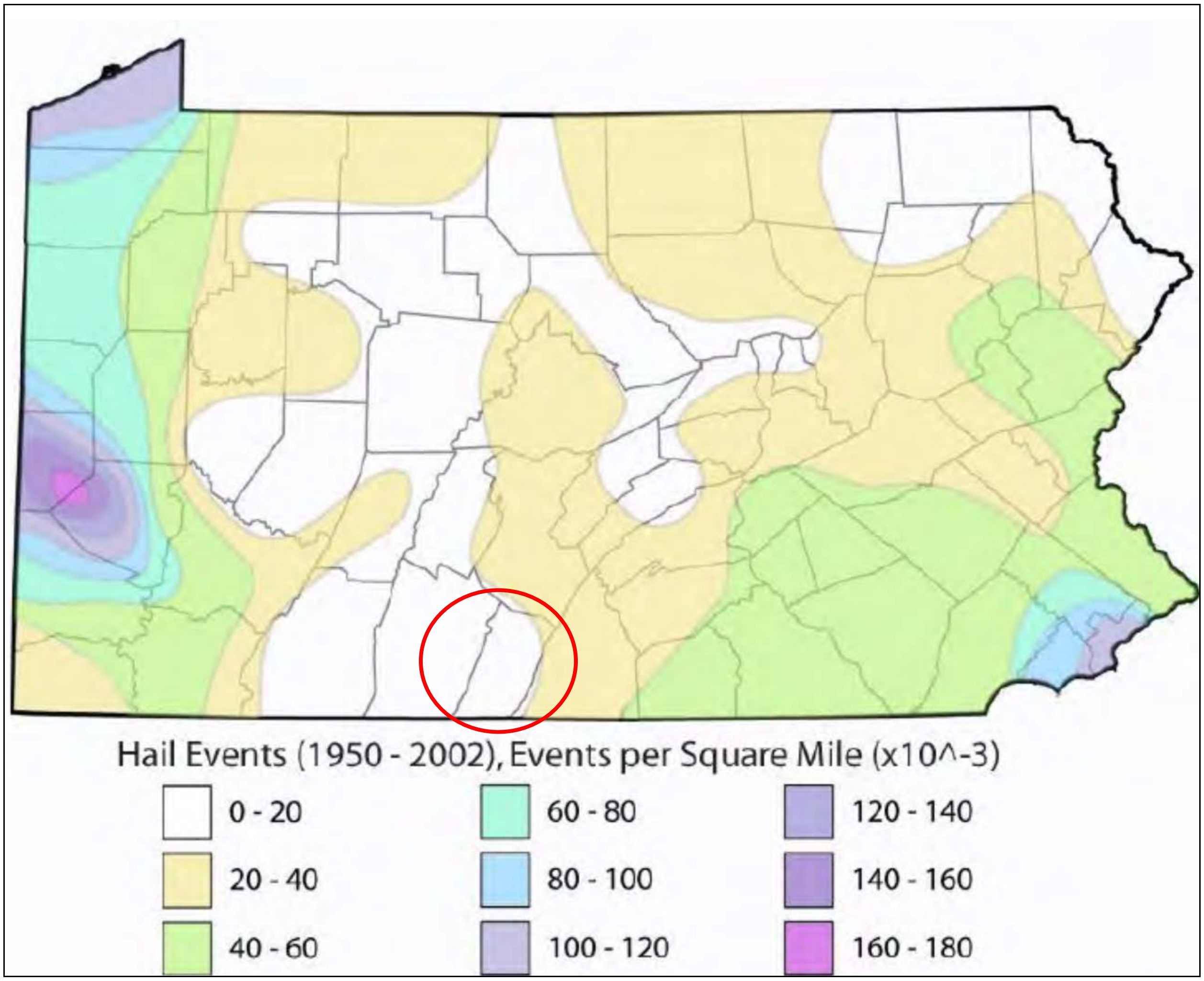

Source: Fulton County, 2011

Source: Fulton County, 2011

4.3.6.4 Future Occurrence

It is not possible to predict formation of a hailstorm with more than a few days' lead time. The past occurrences described above, however, indicate that hailstorm events in Fulton County probably will occur every year throughout the months of May until September. Encompassing events state-wide between 1950 and 2002, Figure 4.3.6-4 below shows the number of hail events per square mile across Pennsylvania. Based on these historical data, the most northeast tip of the can expect to undergo a higher number of hailstorm events than will other areas of the county. Fulton County as a whole has undergone significantly fewer hailstorms per square mile than other areas in south-central Pennsylvania.

Figure 4.3.6-4. Hail Events Per Square Mile in Pennsylvania



Source: Pennsylvania Emergency Management Agency (PEMA) 2013
Note: The red oval indicates the location of Fulton County.

Future occurrences of hailstorms can be considered *likely* as defined by the Risk Factor Methodology probability criteria (refer to Section 4.4).

4.3.6.5 Vulnerability Assessment

To understand risk, a community must identify and assess exposed or vulnerable assets within the hazard area identified. Regarding hail events, the entire county has been identified as the hazard area. Therefore, all assets in Fulton County (population, structures, critical facilities, and lifelines), as described in the County Profile (Section 2), are vulnerable. The following sections evaluate and estimate potential effects of hailstorms on the county, discussing:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impacts on: (1) life, health, and safety of residents; (2) general building stock; (3) critical facilities; (4) economy; and (5) future growth and development

- Effect of climate change on vulnerability
- Further data collections that will assist in understanding this hazard over time.

4.3.6.5.1 Overview of Vulnerability

The entire county, including all critical infrastructure, is vulnerable to the effects of hail, as the storm cells that produce this hazard can develop over any part of the region. The area of damage caused by these storms is relatively small because a single storm does not cause widespread devastation, but a storm may cause damage within a focused area.

Hail can cause serious damage to automobiles, aircraft, skylights, livestock, and crops. Areas of the county with large amounts of farmland and high agricultural yields are more likely to be affected by hailstorm hazards.

4.3.6.5.2 Data and Methodology

National weather databases, the PA HMP, the USDA Census of Agriculture, and local resources were referenced to collect and analyze data regarding hazard impacts on Fulton County.

4.3.6.5.3 Impact on Life, Health, and Safety

The entire population of the county is considered exposed to the hail hazard. People outdoors (for example, pursuing recreational activities and farming) are considered most vulnerable to the hazard because they ordinarily would receive little to no warning, and shelter may not be available to them. Moving to a lower risk location decreases a person's vulnerability.

4.3.6.5.4 Impact on General Building Stock, Critical Facilities, and the Economy

Hailstorms primarily affect agricultural products. The facilities most vulnerable to hailstorm threats are food- and agriculture-related — food producers and food manufacturers. These facilities are present within both urban and rural areas and would be directly or indirectly affected by a hailstorm event. According to the PA HMP, Fulton County does not have a food/agricultural state facility within its borders. (Note: Lancaster County has with 17 state food/agricultural facilities, the most of any Pennsylvania county.)

As discussed earlier in the Past Occurrence subsection, Fulton County has experienced relatively minimal historical hailstorm property damage and slightly more significant crop damage ($2,000 in property damage claims from only one event and $48,750 in USDA crop damage claims from two events). However, given the unpredictability of hailstorms, significant property and crop damage is possible during any hailstorm event. Jurisdictional loss estimation stems from lost agricultural revenues throughout the county. The USDA Census of Agriculture enumerates farmland acreage by county, as well as the annual market value of all agricultural products sold by county, from year 2012. If a hailstorm would eliminate the entire agricultural yield in Fulton County, total losses on the County's 112,210 acres of farmland could reach $52,975,000.

4.3.6.5.5 Future Growth and Development

Areas targeted for potential future growth and development within the next 5 to 10 years have been identified across the county. Refer to Section 2.4 in this HMP. Exposure of any new development and new residents to the hailstorm hazard is expected.

4.3.6.5.6 Effect of Climate Change on Vulnerability

The definition of “climate” is not restricted to average temperature and precipitation, but also includes type, frequency, and intensity of weather events. On both global and local scales, climate change could alter the prevalence and severity of extremes such as hailstorms. While predicting changes of storm events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating effects of future climate change on human health, society, and the environment (U.S. Environmental Protection Agency [EPA] 2006).

Pennsylvania’s Department of Environmental Protection was directed by the Climate Change Act (Act 70 of 2008) to initiate a study of potential impacts of global climate change on the commonwealth. The June 2009 Pennsylvania Climate Impact Assessment’s main findings indicate likelihood that Pennsylvania will undergo increased temperatures in the 21st century. An increase in variability of temperature and precipitation may well lead to increased frequency and severity of hailstorm events. Future improvements in modeling smaller-scale climatic processes such as thunderstorms and associated hailstorms can be expected and will lead to improved understanding of how the changing climate will alter storms, such as hailstorm events, in Pennsylvania (Shortle et al. 2009).

4.3.6.5.7 Additional Data and Next Steps

The assessment above identifies vulnerable populations and potential structural and economic losses associated with this hazard of concern. Collection of additional and actual loss data specific to the plan participants will further enhance Fulton County’s vulnerability assessment.

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4.3.7 Landslide

This section provides a profile and vulnerability assessment for the landslide hazard. A landslide is described in the Commonwealth of Pennsylvania 2013 Standard All-Hazard Mitigation Plan (PA HMP) as the downward and outward movement of slope-forming soil, rock, and vegetation reacting to the force of gravity. Materials can move up to 120 miles per hour (mph) or more; slides can last a few seconds or a few minutes, or can be gradual, slower movements over several hours or days. There are several different types of landslides, including:

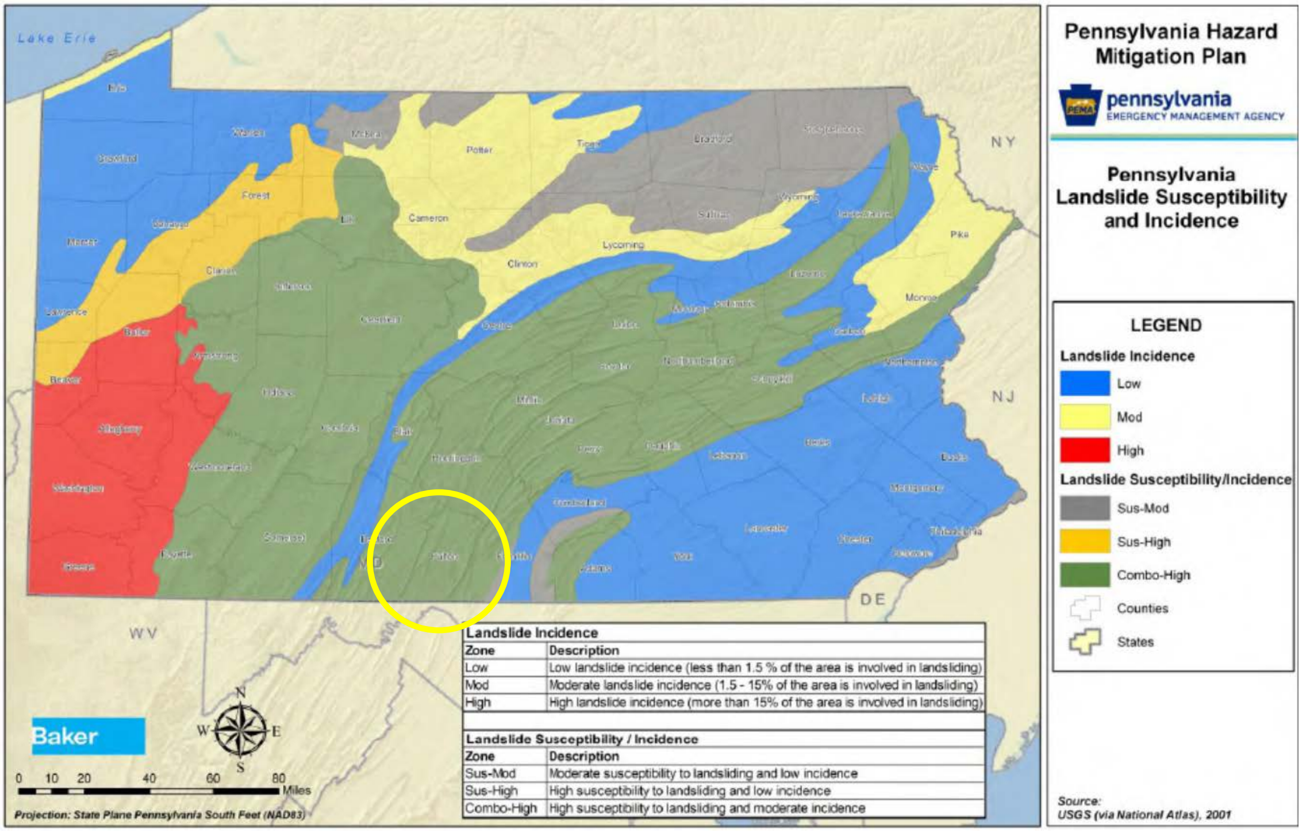
- *Rock Falls* are when a mass detaches from a steep slope or cliff and descends by free fall, bounding, or rolling.
- *Rock Topples* occur when a mass tilts or rotates forward as a unit.
- *Slides* are when a mass displaces on one or more recognizable surfaces, which may be curved or planar.
- *Flows* are when a mass moves downslope with a fluid motion. A significant amount of water may or may not be part of the mass (PEMA 2013).

Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes through construction or erosion, earthquakes, and changes in groundwater levels. Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, developed hillsides, and areas recently burned by forest and brush fires (Delano and Wilshusen 2001). Human activities that contribute to slope failure include altering the natural slope gradient, increasing soil water content, and removing vegetation cover.

4.3.7.1 Location and Extent

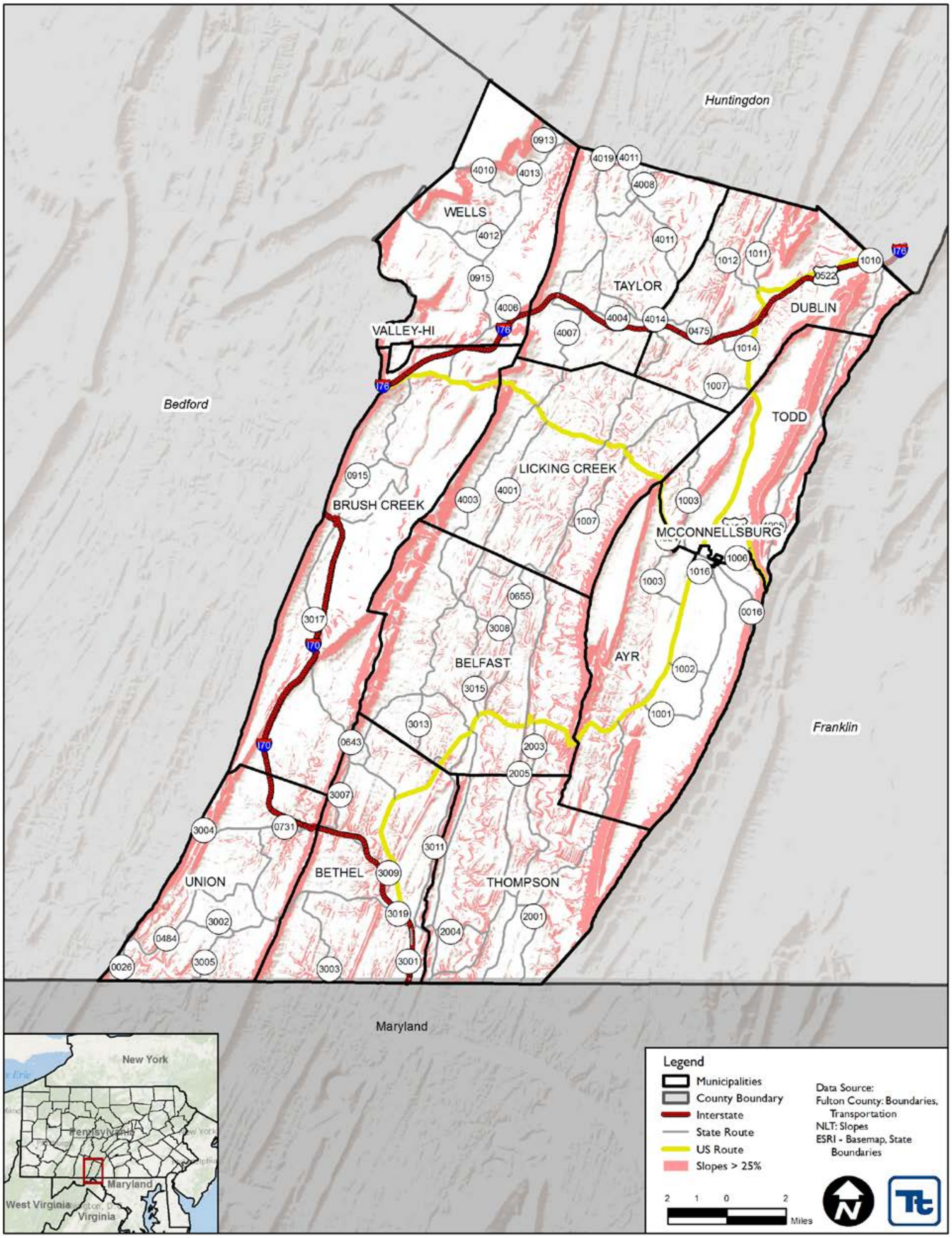
According to the 2013 PA HMP, landslides have occurred in many parts of Pennsylvania but are most abundant and troublesome in much of the western and north-central portions of the state and adjacent states. Rockfalls and other slope failures can occur in areas of Fulton County with moderate to steep slopes. Areas experiencing erosion, decline in vegetation cover, and earthquakes are also susceptible to landslides. Figure 4.3.7-1 shows areas of low, moderate, and high landslide susceptibility as identified by the U.S. Geological Survey (USGS). Fulton County ranks as having a high susceptibility and a moderate number of incidents. Figure 4.3.7-2 shows areas of in Fulton County located on 25% or greater slopes, as generated by the Natural Lands Trust (2010). Almost every municipality in the County has at least some slopes with 25% or greater steepness, meaning that most of the County has the potential for a landslide to occur.

Figure 4.3.7-1. U.S. Geological Survey. Landslide Incidence and Susceptibility.



Source: PEMA 2013
Note: Highlight added.

Figure 4.3.7-2. Natural Lands Trust. Slopes Greater than 25%.



Source: Natural Lands Trust 2010

4.3.7.2 Range of Magnitude

Landslides damage transportation routes, utilities, and buildings. They can also create travel delays and other side effects. Fortunately, deaths and injuries caused by landslides are rare in Pennsylvania, and most landslides in the state are moderate to slow moving, damaging things rather than people. Almost all of the known deaths caused by landslides have occurred when rockfalls or other slides along highways have involved vehicles. Storm-induced debris flows are the only other type of landslide likely to cause death and injuries. The hazards from these events will also increase as residential and recreational development increases on and near steep mountain slopes.

The worst-case scenario for a landslide in Fulton County would be an event similar to one in Beaver County in 1942 (PEMA 2013). In that event, 150 cubic yards of rock fell from a highway cut onto a bus. Twenty-two people were killed and four others were injured. The most likely landslide would be in an unpopulated area and likely would not even be detected.

4.3.7.3 Past Occurrence

Outside of impacts to important transportation routes, the history of landslides is not documented as completely (if at all) as other hazards, primarily because landslides are not always seen, and therefore historical landslide occurrences in Fulton County are not well known. The National Climatic Data Center does not have any records of landslides in the county (NOAA-NCDC 2013). County representatives noted a believed occurrence several years ago, which was shared with them through PADEP; however, no corresponding documentation could be located. No deaths, serious injury, or property damages have been reported from landslides in local records.

Pennsylvania has no history of federally declared disasters as a result of landslides. One federally declared disaster included mudslides, in June 2006. Fulton County was not included in that declaration. PEMA also only notes one disaster incident including mudslides, in April 2005, which does not include Fulton County. This event was eligible for individual assistance, public assistance, and hazard mitigation.

4.3.7.4 Future Occurrence

Mismanaged, intense development in steeply sloped areas could increase the frequency of landslides in Fulton County. Building and road construction are contributing development factors to landslides, as they can often undermine or steepen otherwise stable soil.

Any events that do occur would take place in steeply sloped areas that do not feature extensive land development or many structures. Increased deforestation and soil disturbances caused by development on sloped areas further increase these risks. As timbering and development of sloped land continue, the risk of significant landslides increases.

Based on available historical data, the future occurrence of landslides can be considered *unlikely* as defined by the Risk Factor Methodology probability criteria (refer to Section 4.4).

4.3.7.5 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the hazard area identified. The following section discusses the potential impact of the landslide hazard on Fulton County, including:

- Overview of vulnerability
- Data and methodology used for the evaluation

- Impact on (1) life, (2) health and safety, (3) general building stock, (4) critical facilities, economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Additional data and next steps

4.3.7.5.1 Overview of Vulnerability

Vulnerability to ground failure hazards is a function of location, soil type, geology, type of human activity, use, and frequency of events. The effects of landslides on people and structures can be reduced by total avoidance of hazard areas or by restricting, prohibiting, or imposing conditions on hazard-zone activity. Local governments can reduce the effects of landslides through land use policies and regulations. Individuals can reduce their exposure to hazards by educating themselves on the past hazard history of the site and by making inquiries to planning and engineering departments of local governments (National Atlas 2007).

Overall, the entire county is vulnerable to this hazard, as the county is located in the high susceptibility/moderate incidence hazard area. Areas located on slopes of 25% or greater were determined to be at a greater risk of the landslide hazard. Further information regarding these hazard areas is described below.

4.3.7.5.2 Data and Methodology

Unlike the flood, wind, and earthquake hazards, there are no standard loss estimation models for the landslide hazard. In an attempt to estimate Fulton County's vulnerability, the Geology — Landslide Incidence and Susceptibility geographic information system (GIS) layer from the National Atlas was used to coarsely define the general landslide susceptible area ("approximate hazard area") (Figure 4.3.7-1). The limitations of this analysis are recognized and are used only to provide a general estimate. Over time, additional data will be collected to allow better analysis for this hazard. Available information and a preliminary assessment are provided below.

According to Radbruch-Hall and others, the Landslide Incidence and Susceptibility GIS layer from National Atlas:

> "….was prepared by evaluating formations or groups of formations shown on the geologic map of the United States (King and Beikman, 1974) and classifying them as having high, medium, or low landslide incidence (number of landslides) and being of high, medium, or low susceptibility to landsliding. Thus, those map units or parts of units with more than 15 percent of their area involved in landsliding were classified as having high incidence; those with 1.5 to 15 percent of their area involved in landsliding, as having medium incidence; and those with less than 1.5 percent of their area involved, as having low incidence. This classification scheme was modified where particular lithofacies are known to have variable landslide incidence or susceptibility. In continental glaciated areas, additional data were used to identify surficial deposits that are susceptible to slope movement. Susceptibility to landsliding was defined as the probable degree of response of the areal rocks and soils to natural or artificial cutting or loading of slopes or to anomalously high precipitation. High, medium, and low susceptibility are delimited by the same percentages used in classifying the incidence of landsliding. For example, it was estimated that a rock or soil unit characterized by high landslide susceptibility would respond to widespread artificial cutting by some movement in 15 percent or more of the affected area. We did not evaluate the effect of earthquakes on slope stability, although

> many catastrophic landslides have been generated by ground shaking during earthquakes. Areas susceptible to ground failure under static conditions would probably also be susceptible to failure during earthquakes" (Radbruch-Hall 1982).

The Natural Lands Trust generated a GIS layer displaying areas with slopes greater than 25% for the Central Appalachian Forest Ecoregion using the U.S. Geological Survey's National Elevation Dataset (Figure 4.3.7-2). This layer was used to determine the county's vulnerability to steep slopes.

4.3.7.5.3 Impact on Life, Health and Safety

As discussed above, all of the county is located in the high susceptibility/moderate incidence hazard area. Therefore, the entire county's population (U.S. Census 2010 population of 14,845) could be impacted by a landslide event. Potential landslide events have the ability to cause direct and indirect (impact to buildings) damage to the county's population.

To estimate the population located on slopes greater than 25%, the hazard area boundaries were overlaid upon the 2010 Census population data (U.S. Census 2010). The Census blocks with their center (centroid) within the boundary of the steep slope hazard areas were used to calculate the estimated population considered exposed to this hazard. The Census blocks do not align exactly with the hazard areas and, therefore, these estimates should be considered for planning purposes only. Table 4.3.7-1 summarizes the population exposed by municipality (U.S. Census 2010). Specifically, the population located downslope of the landslide hazard areas are particularly vulnerable to this hazard. Due to the nature of Census block data, it is difficult to determine demographics of populations vulnerable to mass movements of geological material. Using this approach, 1,760 people, or 11.9% of the population, are exposed to the steep slopes hazard.

Table 4.3.7-1. Estimated Fulton County Population Vulnerable to the Steep Slope Hazard

Municipality	Total Population	Population in Hazard Area	Percent Population in Hazard Area
Ayr, Township of	1,942	49	2.5%
Belfast, Township of	1,448	293	20.2%
Bethel, Township of	1,508	260	17.2%
Brush Creek, Township of	819	36	4.4%
Dublin, Township of	1,264	201	15.9%
Licking Creek, Township of	1,703	117	6.9%
McConnellsburg, Borough of	1,220	0	0%
Taylor, Township of	1,118	57	5.1%
Thompson, Township of	1,098	197	19.9%
Todd, Township of	1,527	438	28.7%
Union, Township of	706	25	3.5%
Valley-Hi, Borough of	15	0	0%
Wells, Township of	477	87	18.2%
Fulton County (Total)	**14,845**	**1,760**	**11.9%**

Sources: U.S. Census 2010; Natural Lands Trust 2010

4.3.7.5.4 Impact on General Building Stock

The entire county is located in the high susceptibility/moderate incidence landslide hazard area; therefore its entire building stock is vulnerable to the hazard. Direct building losses are the estimated costs to repair or replace the damage caused to the building. The estimated replacement value of general building stock located in landslide susceptible areas is greater than $1.45 billion.

Similar to the population, the building stock data are presented by census block. To estimate the value of building stock exposed to steep slopes, the hazard area boundaries were overlaid upon the HAZUS-MH building stock data in GIS. Using the default general building stock, the replacement cost values of the Census blocks with their centroids in the hazard area were totaled. Approximately $158 million worth of building/contents are located on steep slopes in Fulton County. This represents approximately 10.9% of the County's total general building stock replacement value inventory ($1.45 billion).

To estimate the number of structures exposed to the hazard boundary, the County's point spatial layer of structures was overlaid by the layer. In total, 106 structures, or 1.3% of the building stock, would be exposed to the hazard. The building stock exposure per municipality is presented in Table 4.3.7-2.

Table 4.3.7-2. Estimated General Building Stock Exposure to the Steep Slope Hazard

Municipality	Total Number of Buildings	Total RCV*	Number of Buildings*	% of Total	RCV*	% of Total
Ayr, Township of	1,031	$195,220,000	30	2.9%	$3,842,000	2.0%
Belfast, Township of	719	$131,145,000	11	1.5%	$27,990,000	21.3%
Bethel, Township of	831	$137,141,000	16	1.9%	$25,823,000	18.8%
Brush Creek, Township of	495	$57,987,000	3	<1%	$1,735,000	3.0%
Dublin, Township of	712	$120,662,000	4	<1%	$7,267,000	6.0%
Licking Creek, Township of	843	$139,248,000	17	2.0%	$9,421,000	6.8%
McConnellsburg, Borough of	534	$187,274,000	0	0%	$0	0.0%
Taylor, Township of	649	$92,843,000	2	<1%	$3,703,000	4.0%
Thompson, Township of	554	$81,390,000	13	2.3%	$11,470,000	14.1%
Todd, Township of	847	$214,635,000	8	<1%	$54,056,000	25.2%
Union, Township of	405	$55,339,000	2	<1%	$4,741,000	8.6%
Valley-Hi, Borough of	29	$3,339,000	0	0%	$0	0.0%
Wells, Township of	286	$38,725,000	0	0%	$8,521,000	22.0%
Fulton County (Total)	**7,995**	**$1,454,948,000**	**106**	**1.3%**	**$158,569,000**	**10.9%**

Source: HAZUS-MH v2.1; Natural Lands Trust 2010; Fulton County
Notes:
* Based on the HAZUS-MH v2.1 default general building stock inventory.
% Percent
RCV Replacement cost value (structure and contents)

4.3.7.5.5 Critical Facilities and the Economy

As discussed above, all of the county, including its critical facilities, is located within the high susceptibility/moderate incidence landslide hazard area. There are no critical facilities located on slopes of 25% or greater.

A landslide's impact on the economy and estimated dollar losses are difficult to measure. As stated earlier, landslides can impose direct and indirect impacts on society. Direct costs include the actual damage sustained by buildings, property, and infrastructure. Indirect costs, such as cleanup costs, business interruption, loss of tax revenues, reduced property values, and loss of productivity, are difficult to measure. Additionally, ground failure threatens transportation corridors, fuel and energy conduits, and communication lines (USGS 2003). Losses to the county's total building inventory replacement value would affect the local tax base and economy.

4.3.7.5.6 Future Growth and Development

Areas targeted for potential future growth and development in the next 5 to 10 years have been identified across Fulton County. Refer to Section 2.4 of this HMP. It is anticipated that new development within the high incidence or high susceptibility/moderate incidence landslide hazard areas identified will be exposed to these risks.

4.3.7.5.7 Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by the type, frequency, and intensity of weather events. Both globally and at the local scale, climate change has the potential to alter the prevalence and severity of extremes such as severe storms, including those that may bring intense or prolonged precipitation (U.S. Environmental Protection Agency [EPA] 2006). An increase in rainfall intensity and duration will saturate the soil and potentially erode the local landscape and impair slope stability, leading to an increase of landslide events in Fulton County.

While predicting changes in these types of events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society, and the environment (EPA 2006). The potential effects of climate change on the county's vulnerability to landslide events shall need to be considered as a greater understanding of regional climate change impacts develop.

4.3.7.5.8 Additional Data and Next Steps

More detailed landslide susceptibility zones can be generated so that communities can more specifically identify high hazard areas. A pilot study was conducted for Schenectady County, New York, as described in the 2011 Draft New York State Hazard Mitigation Plan, to develop higher-resolution landslide susceptibility zones. The methodology included using the Natural Resource Conservation Services (NRCS) Digital Soil Survey soil units and their associated properties, including the American Association of State Highway and Transportation Officials (AASHTO) rating, liquid limit, hydrologic group, percentage of silt and clay, erosion potential, and slope, derived from high-resolution digital elevation models. Obtaining historical damages to buildings and infrastructure incurred from landslides will also help with loss estimates and future modeling efforts, given a margin of uncertainty. Furthermore, research on rainfall thresholds for forecasting landslide potential may also be an option for Fulton County.

4.3.8 Radon Exposure

Radon is a natural gas that one cannot see, smell, or taste. It is a noble gas that originates from natural radioactive decay of uranium and thorium. It is a large component of the natural radiation to which humans are exposed, and can pose a serious threat to public health when it accumulates in poorly ventilated residential and occupation settings. According to the U.S. Environmental Protection Agency (EPA), radon causes an estimated approximately 21,000 lung cancer deaths per year, second only to smoking as the leading cause of lung cancer (EPA 402-R-03-003: EPA Assessment 2003). An estimated 40 percent of the homes in Pennsylvania are believed to have elevated radon levels (Pennsylvania Department of Environmental Protection [PADEP] 2009). This section provides a profile and vulnerability assessment of the radon exposure hazard.

4.3.8.1 Location and Extent

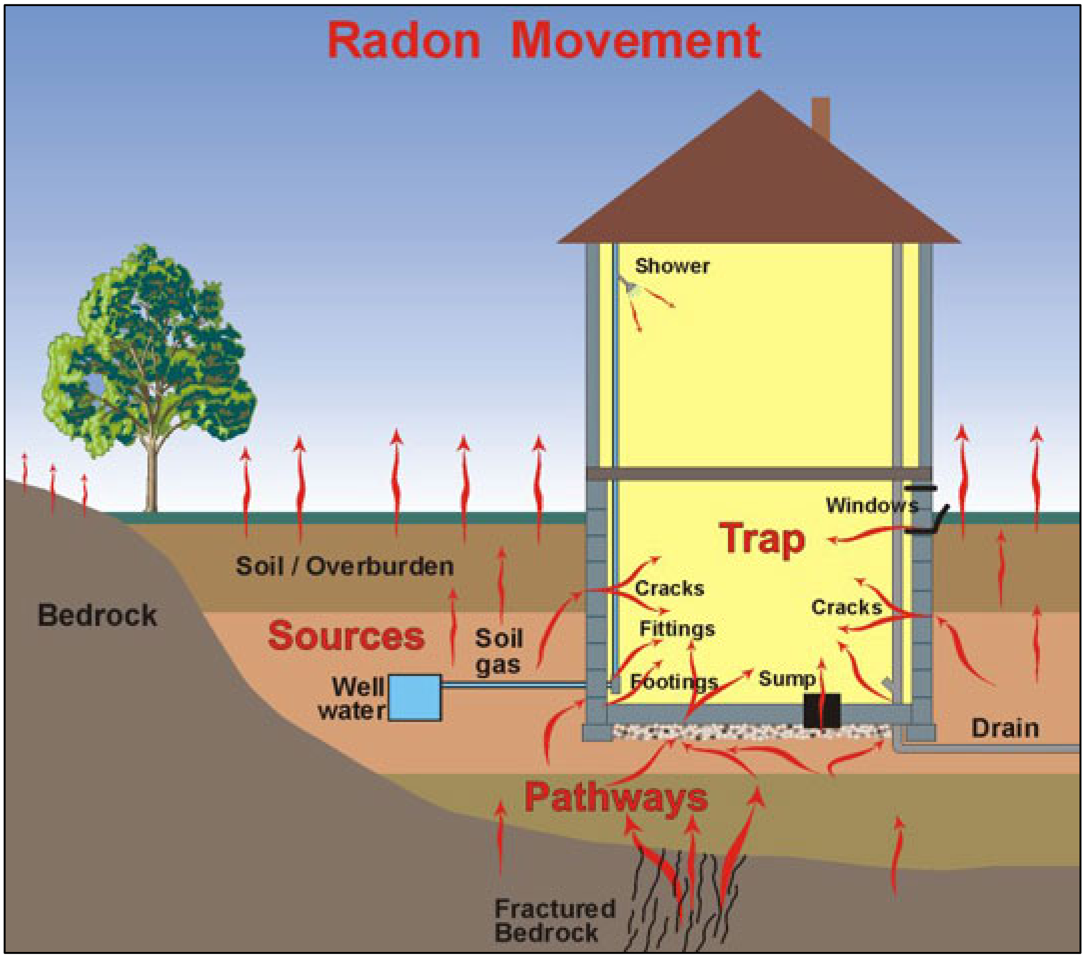
Radioactivity caused by airborne radon has been recognized for many years as an important component in the natural background radioactivity exposure of humans. Not until the 1980s were the wide geographic distribution of elevated radon levels in houses and the possibility of extremely high radon concentrations in houses recognized. In 1984, routine monitoring of employees leaving the Limerick nuclear power plant near Reading, PA, showed that readings from one employee frequently exceeded expected radiation levels, yet only natural, nonfission-product radioactivity was detected on him. Radon levels in his home were detected around 2,500 picoCuries per liter (pCi/L), much higher than the 4 pCi/L guideline set by EPA or even the 67 pCi/L limit for uranium miners. As a result of this event, the Reading Prong section of Pennsylvania where this person lived became the focus of the first large-scale radon scare in the world.

Radon (Rn-222), which has a half-life of 3.8 days, is a widespread hazard. The distribution of radon correlates with the distribution of radium (Ra-226), its immediate radioactive parent, and with uranium, its original ancestor. Because of the short half-life of radon, the distance radon atoms travel from their parent before they decay is generally limited to extents of feet or tens of feet. Three sources of radon in houses are now recognized:

- Radon in soil air that flows into the house.
- Radon dissolved in water from private wells and exsolved during water usage; this source is rarely a problem in Pennsylvania.
- Radon emanating from uranium-rich building materials (such as concrete blocks or gypsum wallboard); this source also is not known to be a problem in Pennsylvania (PEMA 2013).

Figure 4.3.8-1 illustrates radon entry points into a home.

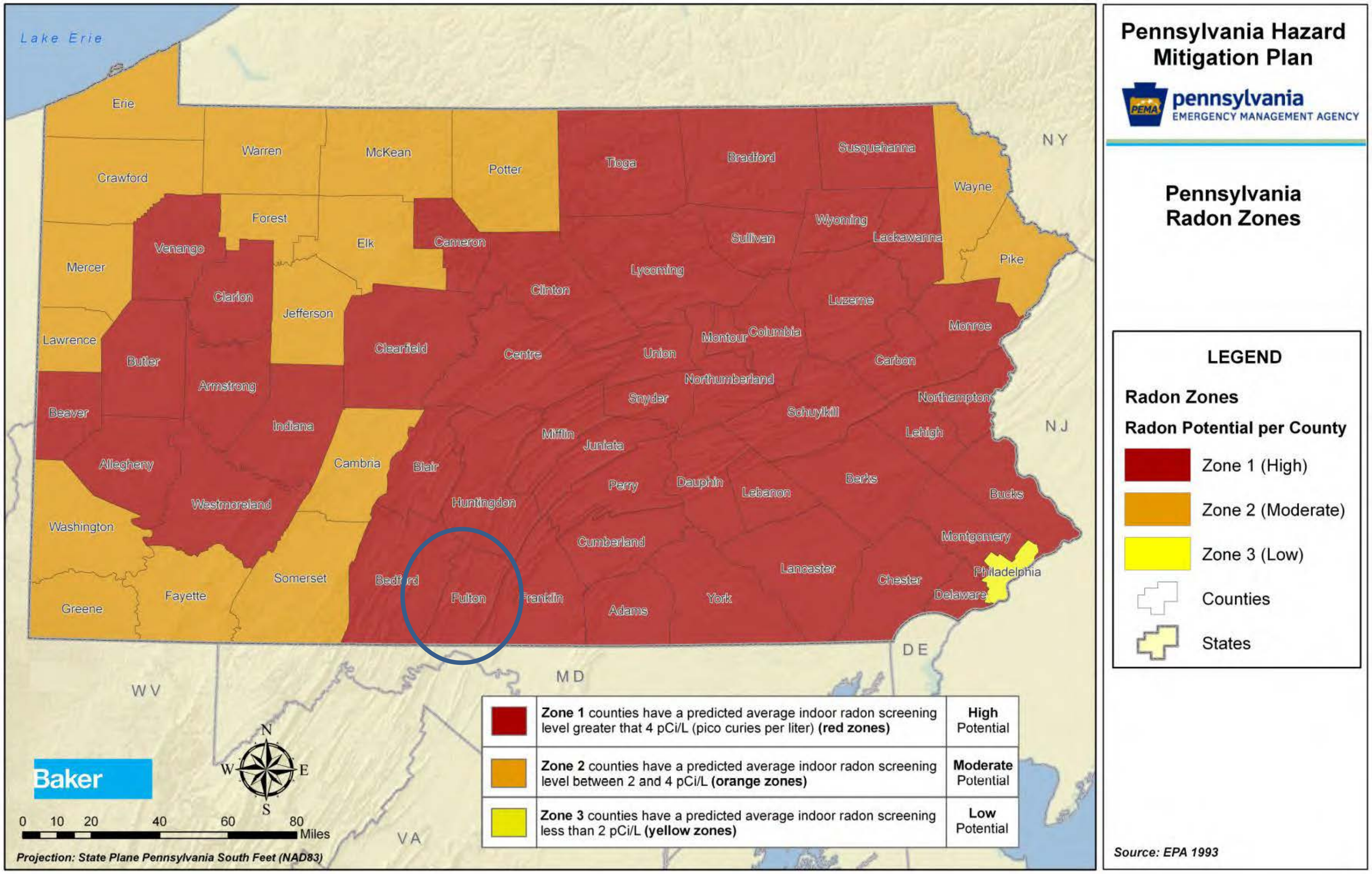
Figure 4.3.8-1. Sketch of Radon Entry Points into a House



Sources: PEMA 2010, Arizona Geological Survey 2006

Each county in Pennsylvania is classified as having a low, moderate, or high radon hazard potential. A majority of counties across the commonwealth, particularly counties in eastern Pennsylvania, have a high hazard potential. Western Pennsylvania counties, however, are not completely immune from the threat of radon, as high potential for radon exposure exists within nine western counties. The average indoor radon screening level within high-exposure counties exceeds 4 pCi/L. Fulton County is in Zone 1 – High Radon Potential, as noted on Figure 4.3.8-2 below.

Figure 4.3.8-2. Radon Hazard Zones in Pennsylvania



Sources: PEMA 2013, EPA 1993 (blue highlight added)

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

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

Areas where houses have high levels of radon can be divided into three groups in terms of uranium content in rock and soil:

- <u>Areas of very elevated uranium content (above 50 parts per million [ppm]) around uranium deposits and prospects</u>: Although very high levels of radon can occur in these areas, the hazard normally is restricted to within a few hundred feet of the deposit. In Pennsylvania, these localities occupy an insignificant area.
- <u>Areas of common rocks having higher than average uranium content (5 to 50 ppm)</u>: In Pennsylvania, these rock types include granitic and felsic alkali igneous rocks and black shales. High uranium values in rock or soil and high radon levels in houses in the Reading Prong are associated with Precambrian granitic gneisses commonly containing 10 to 20 ppm uranium, but locally containing more than 500 ppm uranium. Elevated uranium occurs in black shales of the Devonian Marcellus Formation and possibly the Ordovician Martinsburg Formation in Pennsylvania. High radon values are locally present in areas underlain by these formations.
- <u>Areas of soil or bedrock that have normal uranium content but properties that promote high radon levels in houses</u>: This group is incompletely understood at present. Relatively high soil permeability can lead to high radon concentrations, the clearest example being houses built on glacial eskers. Limestone-dolomite soils also appear to be predisposed for high radon levels in houses, perhaps because of the deep clay-rich residuum where radium is concentrated by weathering on iron oxide or clay surfaces, coupled with moderate porosity and permeability. The importance of carbonate soils is indicated by exceedance of 4 pCi/L in 93 percent of a sample of houses built on limestone-dolomite soils near State College, Centre County, and exceedance of 20 pCi/L in 21 percent of that sample of houses, even though uranium levels in the underlying bedrock are all within the normal range of 0.5 to 5 ppm (PEMA 2013).

According to the state plan, radon tends to exist as a gas or as a dissolved atomic component in groundwater. The most problematic source of radon in houses in Pennsylvania is radon in soil gas that flows into the house. Even a small rate of soil gas inflow can lead to elevated radon concentrations in a house. The state plan indicates that current data on abundance and distribution of radon in Pennsylvania homes are incomplete and biased, but the plan identifies general patterns (PEMA 2010).

4.3.8.2 Range of Magnitude

Exposure to radon is the second leading cause of lung cancer after smoking. It is the number one cause of lung cancer among non-smokers. As stated earlier, radon is responsible for about 21,000 lung cancer deaths every year, approximately 2,900 of which occur among people who have never smoked. Lung cancer is the only known effect on human health from exposure to radon in air and, thus far, no evidence indicates that children are at greater risk of lung cancer than are adults (EPA 2010). The main hazard is actually from the radon daughter products (polonium-218, lead-214, bismuth-214), which may become attached to lung tissue and induce lung cancer by their radioactive decay. Table 4.3.8-1 lists for smokers and nonsmokers: (1) cancer risks from exposure to radon at various levels, (2) comparisons of lung cancer risks from radon exposure to comparable cancer risks from other hazards, and (3) action thresholds.

Table 4.3.8-1. Radon Risk for Smokers and Non-Smokers

<table>
<tr><th>Radon Level (picoCuries per liter [pCi/L])</th><th>Cancer Rate per 1,000 People with Lifetime Exposure</th><th>Comparative Cancer Risk of Radon Exposure</th><th>ACTION THRESHOLD</th></tr>
<tr><td colspan="4">SMOKERS</td></tr>
<tr><td>20</td><td>About 260 people could get lung cancer</td><td>250 times the risk of drowning</td><td rowspan="4">Fix Structure</td></tr>
<tr><td>10</td><td>About 150 people could get lung cancer</td><td>200 times the risk of dying in a home fire</td></tr>
<tr><td>8</td><td>About 120 people could get lung cancer</td><td>30 times the risk of dying in a fall</td></tr>
<tr><td>4</td><td>About 62 people could get lung cancer</td><td>5 times the risk of dying in a car crash</td></tr>
<tr><td>2</td><td>About 32 people could get lung cancer</td><td>6 times the risk of dying from poison</td><td>Consider fixing structure between 2 and 4 pCi/L</td></tr>
<tr><td>1.3</td><td>About 20 people could get lung cancer</td><td>(Average indoor radon level)</td><td rowspan="2">Reducing radon levels below 2 pCi/L is difficult</td></tr>
<tr><td>0.4</td><td>About 3 people could get lung cancer</td><td>(Average outdoor radon level)</td></tr>
<tr><td colspan="4">NONSMOKERS</td></tr>
<tr><td>20</td><td>About 36 people could get lung cancer</td><td>35 times the risk of drowning</td><td rowspan="4">Fix Structure</td></tr>
<tr><td>10</td><td>About 18 people could get lung cancer</td><td>20 times the risk of dying in a home fire</td></tr>
<tr><td>8</td><td>About 15 people could get lung cancer</td><td>4 times the risk of dying in a fall</td></tr>
<tr><td>4</td><td>About 7 people could get lung cancer</td><td>The risk of dying in a car crash</td></tr>
<tr><td>2</td><td>About 4 people could get lung cancer</td><td>The risk of dying from poison</td><td>Consider fixing structure between 2 and 4 pCi/L</td></tr>
<tr><td>1.3</td><td>About 2 people could get lung cancer</td><td>(Average indoor radon level)</td><td rowspan="2">Reducing radon levels below 2pCi/L is difficult</td></tr>
<tr><td>0.4</td><td>-</td><td>(Average outdoor radon level)</td></tr>
</table>

Radon Level (picoCuries per liter [pCi/L])	Cancer Rate per 1,000 People with Lifetime Exposure	Comparative Cancer Risk of Radon Exposure	ACTION THRESHOLD
Note: Risk may be lower for former smokers. * Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003). ** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.			

Source: EPA 2010

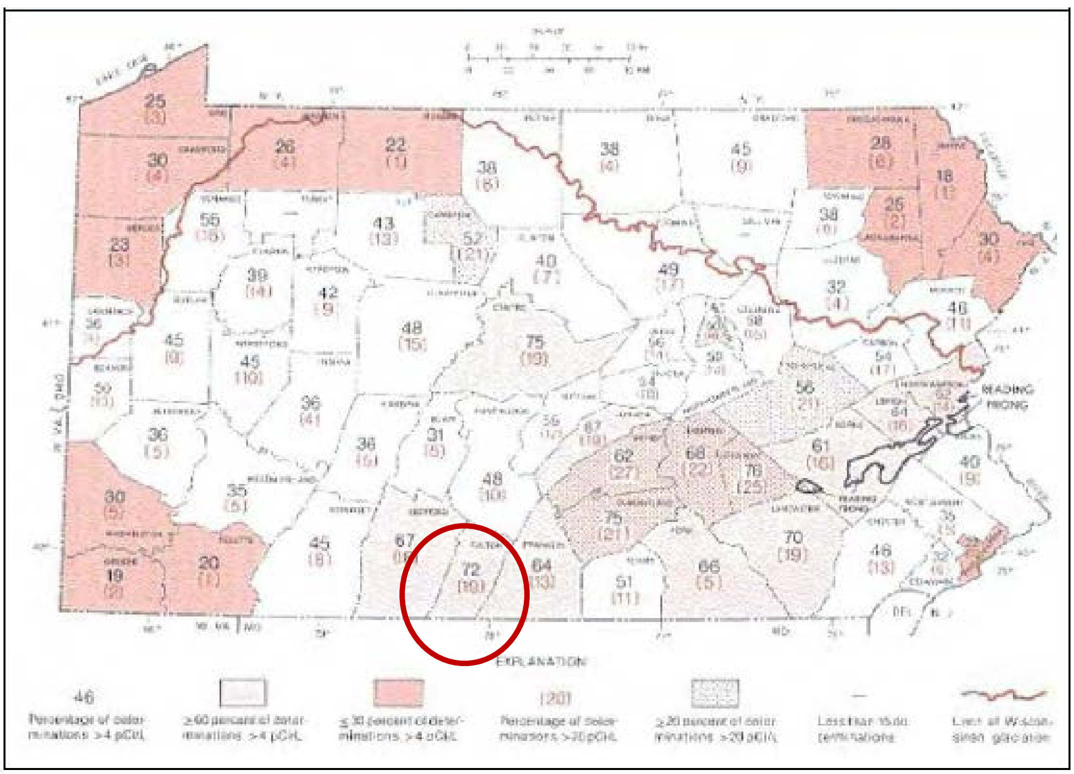
According to EPA, the average radon concentration in the indoor air of U.S. homes is about 1.3 pCi/L. EPA recommends that homes be fixed if the radon level is 4 pCi/L or more. However, EPA also recommends that Americans consider fixing their home if radon levels are between 2 and 4 pCi/L because there is no known safe level of exposure to radon. As listed in Table 4.3.8-1, a smoker exposed to radon has a much higher risk of lung cancer.

The worst-case scenario for radon exposure would be a large area of tightly sealed homes inducing high levels of exposure to residents over a prolonged period of time, without awareness of this by the residents. This worst-case scenario exposure then could lead to a large number of people contracting cancer attributed to the radon exposure (PEMA 2010). The most likely scenario is a single household exposed to a very low concentration of radon, with no adverse health effects.

4.3.8.3 Past Occurrence

Current data on abundance and distribution of radon in Pennsylvania houses are considered incomplete and potentially biased, but some general patterns are evident (see Figure 4.3.8-3).

Figure 4.3.8-3. Percentage of Pennsylvania Homes with Radon Levels Exceeding 4 pCi/L



Source: PEMA 2013 (red highlight added)

Values exceeding the EPA's guideline of 4 pCi/L occur in all regions of the Commonwealth. For Fulton County, in particular, the average indoor radon level is over 8.7 pCi/L (PADEP 2015). EPA data and readings only note that Fulton County exceeds 4 pCi/L for indoor radon levels (EPA 2015).

PADEP Bureau of Radiation Protection provides information for homeowners on how to test for radon in their houses. If results of a test reported to the Bureau exceed 4 pCi/L, the Bureau works to help the homeowner repair the house so as to mitigate high radon levels. The total number of tests reported to the Bureau since 1990 and test results by zip code are accessible on the Bureau's website. However, to best approximate the average for an area, this information is provided only if more than 30 tests within that area were reported.

Within Fulton County, only one zip code had results from sufficient tests reported to the Bureau to allow the Bureau to report the findings, as shown in Table 4.3.8-2 (PADEP does not publish results unless a zip code has had at least 30 tests conducted). An average result of 8.7 pCi/L and a maximum result of 40.8 pCi/L were obtained within McConnellsburg. PADEP only publishes the aveage and maximum results for a zip code; it does not offer a range of results for a zip code, municipality, or region. The PADEP Radon Division recommends that ***all*** homeowners test for radon, regardless of test results within their respective zip codes. Despite a low average text result within a zip code, many homes in that zip code may have elevated radon levels.

Table 4.3.8-2. Radon Level Tests and Results by Fulton County Zip Codes

ZIP Code	Location	Area in Home	Number of Tests	Maximum Result (pCi/L)	Average Result (pCi/L)
15536	Crystal Spring	Basement	Insufficient Data	Insufficient Data	Insufficient Data
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
16689	Waterfall	Basement	Insufficient Data	Insufficient Data	Insufficient Data
16691	Wells Tannery	No Data Available for This Zip Code			
17212	Big Cove Tannery	Basement	Insufficient Data	Insufficient Data	Insufficient Data
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
17215	Burnt Cabins	Basement	Insufficient Data	Insufficient Data	Insufficient Data
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
17223	Fort Littleton	Basement	Insufficient Data	Insufficient Data	Insufficient Data
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
17228	Harrisonville	Basement	Insufficient Data	Insufficient Data	Insufficient Data
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
17229	Hustontown	Basement	Insufficient Data	Insufficient Data	Insufficient Data
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
17233	McConnellsburg	Basement	61	40.8	8.7
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
17238	Needmore	Basement	Insufficient Data	Insufficient Data	Insufficient Data
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
17267	Warfordsburg	Basement	Insufficient Data	Insufficient Data	Insufficient Data
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data

Source: PADEP 2014

4.3.8.4 Future Occurrence

Radon exposure is inevitable given present soil, geologic, and geomorphic factors across Pennsylvania. Residents who live in developments within areas where radon levels previously have been found significantly high will continue to be more susceptible to exposure. However, new incidents of concentrated exposure may occur with future development or deterioration of older structures. Exposure can be limited by conducting proper testing within both existing and future developments, and implementing appropriate mitigation measures (PEMA 2013). As part of a 2014 push, EPA's "Test, Fix, Save a Life" radon action campaign strives to highlight radon testing and mitigation as a simple and affordable step to significantly reduce risk for lung cancer. Through this initiative, the "Test, Fix, Save a Life" mantra specifies activities and facts for the public regarding radon poisoning, as indicated below:

- Test: All homes with or without basements should be tested for radon. Affordable do-it-yourself radon test kits are available online and at home improvement and hardware stores, or you can hire a qualified radon tester.
- Fix: EPA recommends taking action to fix radon levels at or above 4 pCi/L and contacting a qualified radon-reduction contractor. In most cases, a system with a vent pipe and fan is used to reduce radon. Addressing high radon levels often costs the same as other minor home repairs.
- Save a Life: 21,000 Americans die from radon-related lung cancer each year. By decreasing elevated levels in your home, you can help prevent lung cancer while creating a healthier home for you and your family (EPA 2014).

Future occurrences of radon exposure can be considered *likely* as defined by the Risk Factor Methodology probability criteria (refer to Section 4.4).

4.3.8.5 Vulnerability Assessment

To understand risk, a community must evaluate assets exposed or vulnerable within the identified hazard area. The following section discusses potential impacts of the radon exposure hazard on Fulton County, including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impacts on (1) life, health, and safety; (2) general building stock and critical facilities; (3) the economy; (4) the environment; and (5) future growth and development
- Further data collections that will assist in understanding this hazard over time.

4.3.8.5.1 Overview of Vulnerability

Radon exposure is of particular concern in Fulton County because of the County's location within a High Potential (Level 1) EPA Radon Zone. While structural factors (such as building construction and engineered mitigation measures) can influence the level of radon exposure, all residents and structures within Fulton County are vulnerable to radon exposure.

4.3.8.5.2 Data and Methodology

The 2010 U.S. Census data and the HAZUS-MH building inventory for Fulton County were referenced to support an evaluation of assets exposed to this hazard and potential impacts associated with this hazard. Per the 2013 Pennsylvania State Hazard Mitigation Plan, an average radon mitigation system cost of $1,200 was applied to 20 percent of the building stock to evaluate economic vulnerability (PEMA 2013).

4.3.8.5.3 Impact on Life, Health, and Safety

For the purposes of this plan, the entire population of the County is assumed exposed to risk of radon exposure. Radon is responsible for approximately 21,000 lung cancer deaths every year, approximately 2,900 of which occur among people who have never smoked. Lung cancer is the only known effect on human health from exposure to radon in air, and thus far, no evidence indicates that children are at greater risk of lung cancer than are adults (EPA 2010).

Per Figure 4.3.8-3 (see Section 4.3.8.3), 72 percent of homes in Fulton County have measured radon levels exceeding 4 pCi/L. Excess human cancer risk posed by radon exposure at this elevated level is identified in Table 4.3.8-1.

4.3.8.5.4 Impact on General Building Stock and Critical Facilities

While the entire general building stock and critical facility inventory in the County is exposed to radon, radon does not result in direct damage to structures and facilities. Rather, engineering methods installed to mitigate human exposure to radon in structures results in economic costs described in the following subsection.

4.3.8.5.5 Impact on the Economy

EPA has concluded that an average radon mitigation system costs $1,200. EPA also states that current state surveys indicate one home in five with elevated radon levels. By use of this information, radon loss estimation is factored by assuming that 20 percent of the residential buildings within High Potential (Level 1) counties have elevated radon levels, and each would require a radon mitigation system installed at the EPA estimated average of $1,200 (PEMA 2013). Within Fulton County, therefore, based on this information, estimated radon mitigation costs for residential structures could exceed $1.6 million. However, per Figure 4.3.8-3, 72 percent of households in the County have measured basement level average radon levels exceeding 4 pCi/L, indicating that the estimated cost of radon mitigation may be higher than the estimate based on the above-cited information from EPA, whereby only 20 percent of structures are considered for mitigation.

4.3.8.5.6 Impact on the Environment

Radon exposure exerts minimal environmental impacts. Because of the relatively short half-life of radon, it tends to affect only living and breathing organisms such as humans or pets that are routinely within contained areas (basement or house) where the gas is released (PEMA 2013).

4.3.8.5.7 Future Growth and Development

Because the entirety of Fulton County has been determined at risk for the radon exposure hazard, any new development will be exposed to this risk. Measures to reduce human exposure to radon in structures are readily available and can be incorporated during new construction at significantly lower cost and greater effectiveness than cost and effectiveness of retrofitting existing structures to implement these measures.

4.3.8.5.8 Additional Data and Next Steps

The assessment above identifies human health and economic losses associated with this hazard of concern; however, these estimates are based on national epidemiological statistics and generalized estimates of costs to mitigate structures in Fulton County. Because specific structural conditions affect human exposure to radon, direct radon measurements within facilities are necessary to properly assess the level of health risk and indicate need for mitigation measures. Furthermore, EPA recommends consideration of radon exposure risk and installation of mitigation measures as appropriate during all new construction.

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Per Figure 4.3.8-3 (see Section 4.3.8.3), 72 percent of homes in Fulton County have measured radon levels exceeding 4 pCi/L. Excess human cancer risk posed by radon exposure at this elevated level is identified in Table 4.3.8-1.

4.3.8.5.4 Impact on General Building Stock and Critical Facilities

While the entire general building stock and critical facility inventory in the County is exposed to radon, radon does not result in direct damage to structures and facilities. Rather, engineering methods installed to mitigate human exposure to radon in structures results in economic costs described in the following subsection.

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The assessment above identifies human health and economic losses associated with this hazard of concern; however, these estimates are based on national epidemiological statistics and generalized estimates of costs to mitigate structures in Fulton County. Because specific structural conditions affect human exposure to radon, direct radon measurements within facilities are necessary to properly assess the level of health risk and indicate need for mitigation measures. Furthermore, EPA recommends consideration of radon exposure risk and installation of mitigation measures as appropriate during all new construction.

4.3.9 Subsidence/Sinkhole

This section provides a profile and vulnerability assessment for the subsidence/sinkhole hazard for Fulton County. Subsidence/sinkholes may be natural or related to underground mining activities. The predominant cause of subsidence and sinkholes in Fulton County is its underlying carbonite bedrock composition, which can include limestone and dolomite. Although underground mining is not the primary cause of sinkholes or subsidence in the County, this does not indicate that subsidence/sinkholes will not occur in the future because of mining activity. Thus, information will be presented to highlight this hazard cause and its potential impacts. Although underground mining is not considered a geologic hazard, it will be treated as such in this document, due to its relation with the potential for subsidence events.

Land subsidence can be defined as the sudden sinking or gradual downward settling of the earth's surface with little or no horizontal motion, owing to the subsurface movement of earth materials (U.S. Geological Survey [USGS] 2007). Subsidence often occurs through the loss of subsurface support due to mining or in Karst terrain, which may result from a number of natural and human-caused occurrences. Karst is a distinctive topography in which the landscape is largely shaped by the dissolving action of water on carbonate bedrock (usually limestone, dolomite, or marble).

Karst features are defined as pockets of limestone or dolomite bedrock located within more stable geological formations that could cause subsidence or sinkholes. The density of karst features ranges from 0 to 600 features per square mile, with wide variations in size. Fewer karst features have been mapped in existing urban areas; however, this is likely a result of development activities that disguise, cover, or fill existing features rather than an absence of the features themselves (Pennsylvania Emergency Management Agency [PEMA] 2013).

Sinkholes are a natural and common geologic feature in areas with underlying limestone, carbonate rock, salt beds, or other rocks that are soluble in water. Over periods of time measured in thousands of years, the carbonate bedrock can be dissolved through acidic rainwater moving in fractures or cracks in the bedrock. This creates larger openings in the rock through which water and overlying soil materials will travel. Over time, the deposited soils compromise the strength of the bedrock, until it is unable to support the land surface above, causing a collapse or sinkhole. In this example the sinkhole occurs naturally, but in other cases the root causes of a sinkhole are anthropogenic, especially those that involve changes to the water balance of an area including over-withdrawal of groundwater, diverting surface water from a large area and concentrating it in a single point, artificially creating ponds of surface water, and drilling new water wells. These actions can also serve to accelerate the natural processes of bedrock degradation, which can have a direct impact on sinkhole creation.

Both natural and man-made sinkholes can occur without warning. Specific signs that a sinkhole is forming include slumping or falling fence posts, trees, or foundations; sudden formation of small ponds; wilting vegetation; discolored well water; and/or structural cracks in walls and floors. Sinkholes can form into steep-walled holes to bowl- or cone-shaped depressions. When sinkholes occur in developed areas, they can cause severe property damage, injury, and loss of life; disruption of utilities; and damage to roadways. In urban and suburban areas, sinkholes can destroy highways and buildings.

Two common causes of subsidence in Pennsylvania are (1) dissolution of carbonate rock such as limestone or dolomite, and (2) mining activity. Water passing through naturally-occurring fractures and bedding planes dissolves bedrock, leaving voids below the surface. Eventually, overburden on top of the voids collapses, leaving surface depressions resulting in karst topography. Characteristic features associated with karst topography include sinkholes, linear depressions, and caves. Often, subsurface 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 (PEMA 2013).

The following sections discuss the location and extent, range of magnitude, previous occurrence, future occurrence, and vulnerability assessment associated with the earthquake hazard for Fulton County.

4.3.9.1 Location and Extent

Approximately 4.02 percent of Fulton County (17.6 square miles) is underlain by carbonate bedrock. Fulton County has a very low susceptibility to sinkholes and subsidence attributable to abandoned mines; however, this does not mean such an event cannot occur. Figure 4.3.9-4 shows the approximate location of abandoned mine land problem areas created by past coal mining; information is based on a subset of data contained in the Office of Surface Mining (OSM) Abandoned Mine Land Inventory. In addition, detailed maps of abandoned mines are available for 13 mines in Fulton County through the National Mine Map Repository (NMMR), maintained by the OSM. The NMMR contains over 134,000 maps from the 1860s to the present day, providing information for both surface and underground mines throughout the United States. The Pennsylvania State University (Penn State) Libraries also maintain a database with information from the 1998 Index of Abandoned Mine Maps in Pennsylvania. This index contains eight mine maps for Fulton County.

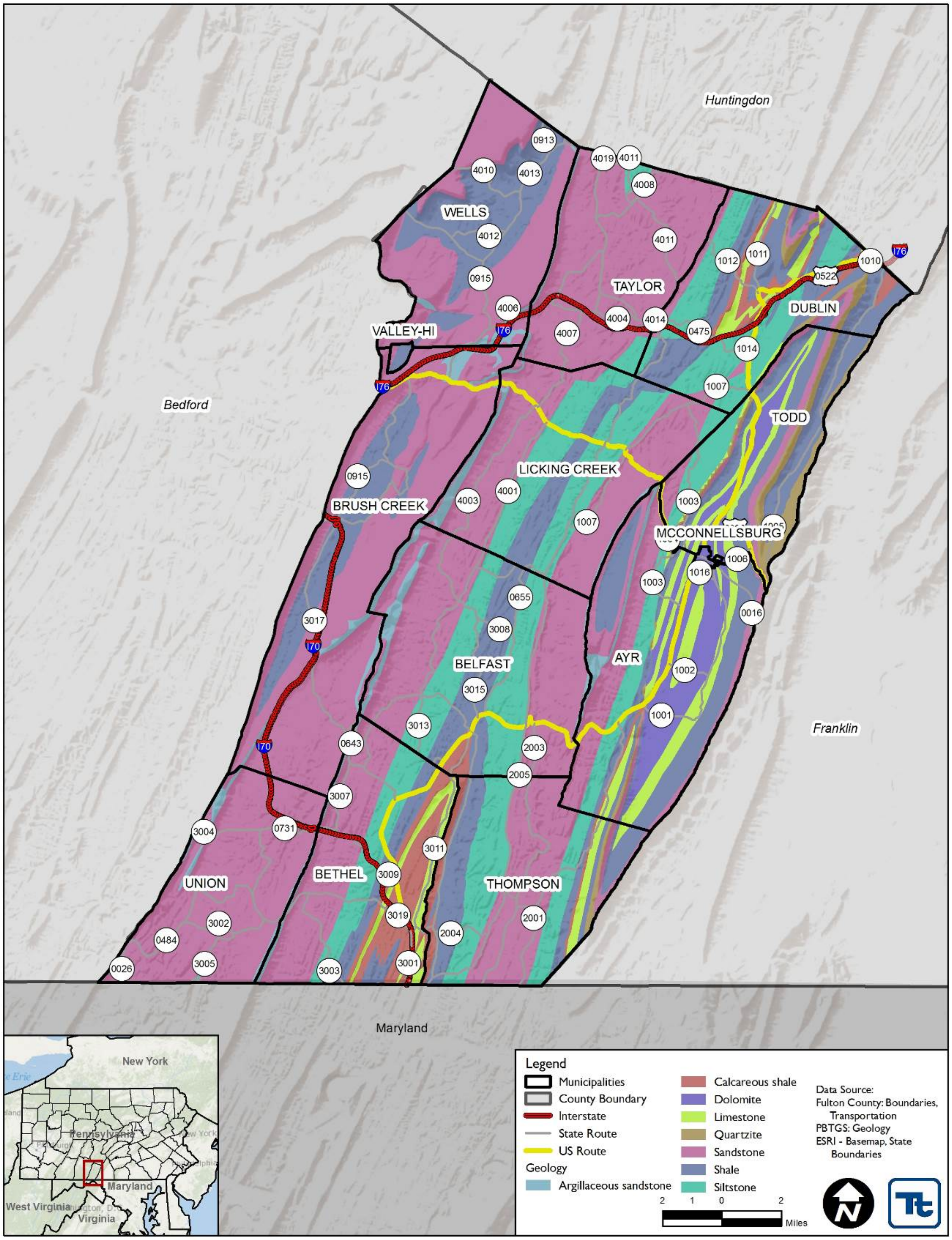
Figure 4.3.9-1 illustrates the bedrock geology of Fulton County. Figure 4.3.9-2 highlights the areas of Pennsylvania subject to natural subsidence caused by the presence of limestone bedrock and Figure 4.3.9-3 more specifically illustrates the limestone bedrock across Fulton County.

The following municipalities have identified near-surface limestone:

- Ayr Township
- Bethel Township
- Dublin Township
- McConnellsburg Borough
- Thompson Township
- Todd Township

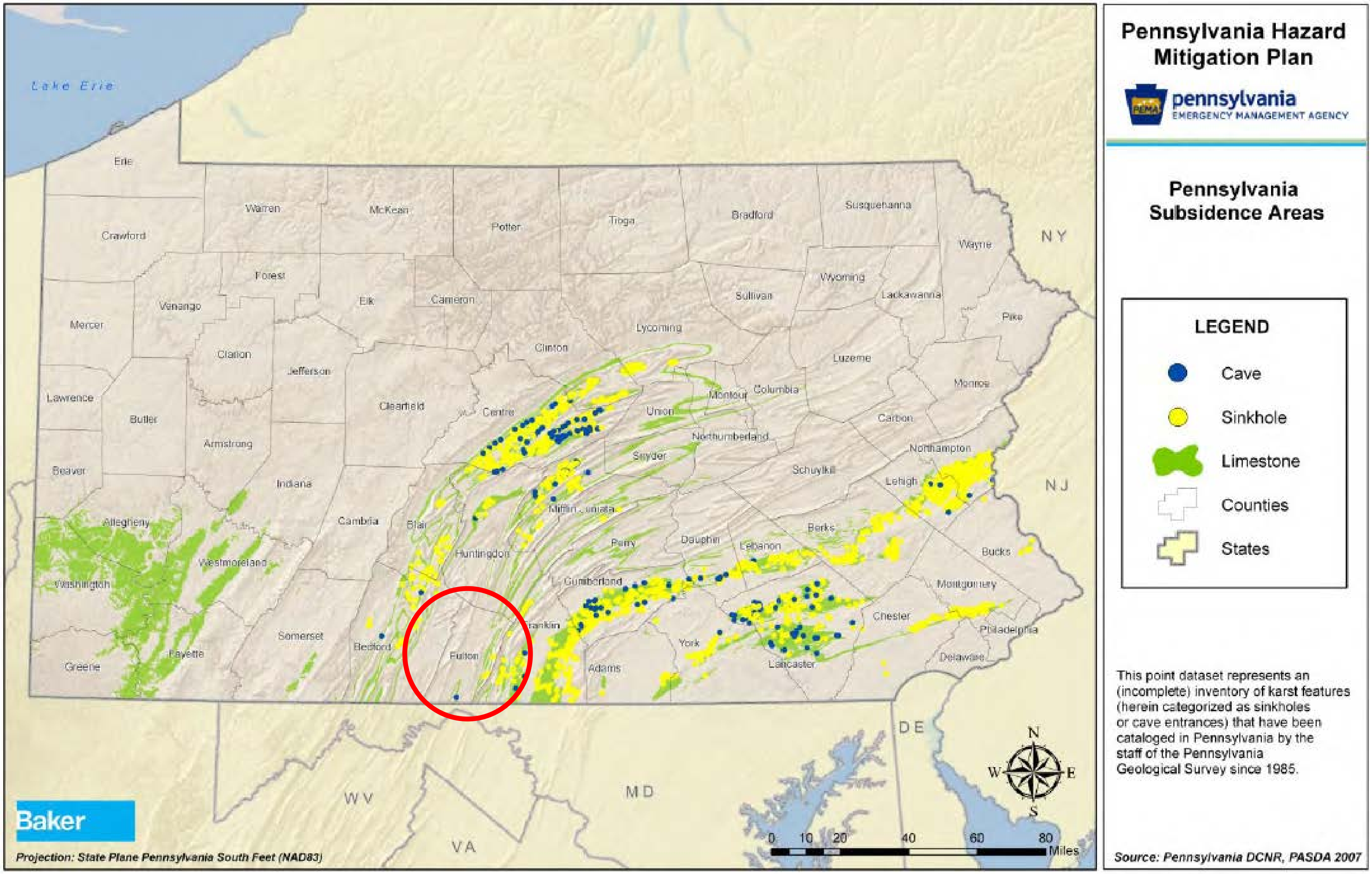
Fulton County has a very low susceptibility to sinkholes and subsidence attributable to abandoned mines; however, this does not mean such an event cannot occur. Figure 4.3.9-4 shows the approximate location of abandoned mine land problem areas created by past coal mining; information is based on a subset of data contained in the Office of Surface Mining (OSM) Abandoned Mine Land Inventory. In addition, detailed maps of abandoned mines are available for 13 mines in Fulton County through the National Mine Map Repository (NMMR), maintained by the OSM. The NMMR contains over 134,000 maps from the 1860s to the present day, providing information for both surface and underground mines throughout the United States. The Pennsylvania State University (Penn State) Libraries also maintain a database with information from the 1998 Index of Abandoned Mine Maps in Pennsylvania. This index contains eight mine maps for Fulton County.

Figure 4.3.9-1. Fulton County Geology



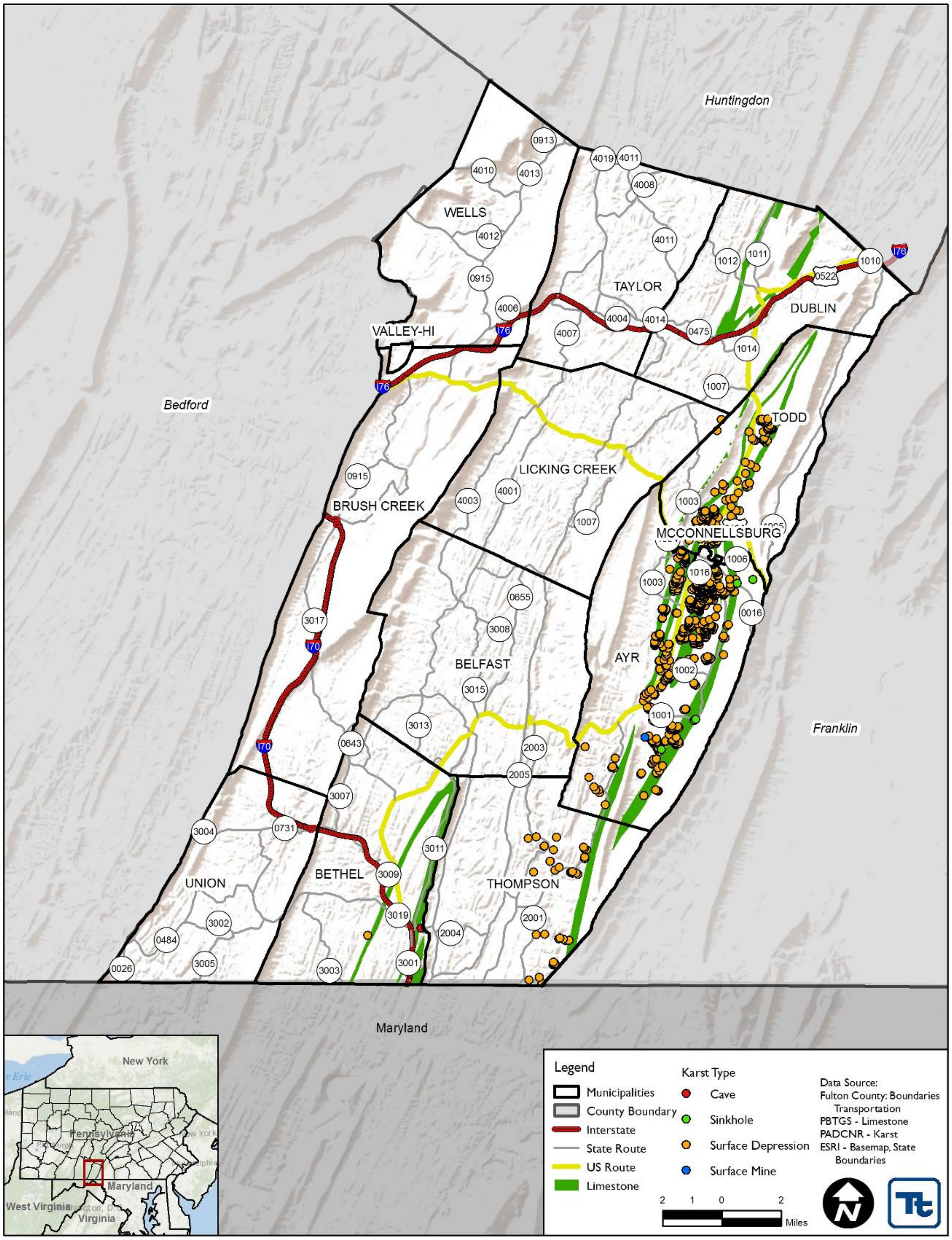
Source: Pennsylvania Bureau of Topographic and Geologic Survey 2001
Note: The numbers shown in circles on the map are local roadway designations.

Figure 4.3.9-2. Areas of Pennsylvania Subject to Natural Subsidence Due to the Presence of Limestone Bedrock



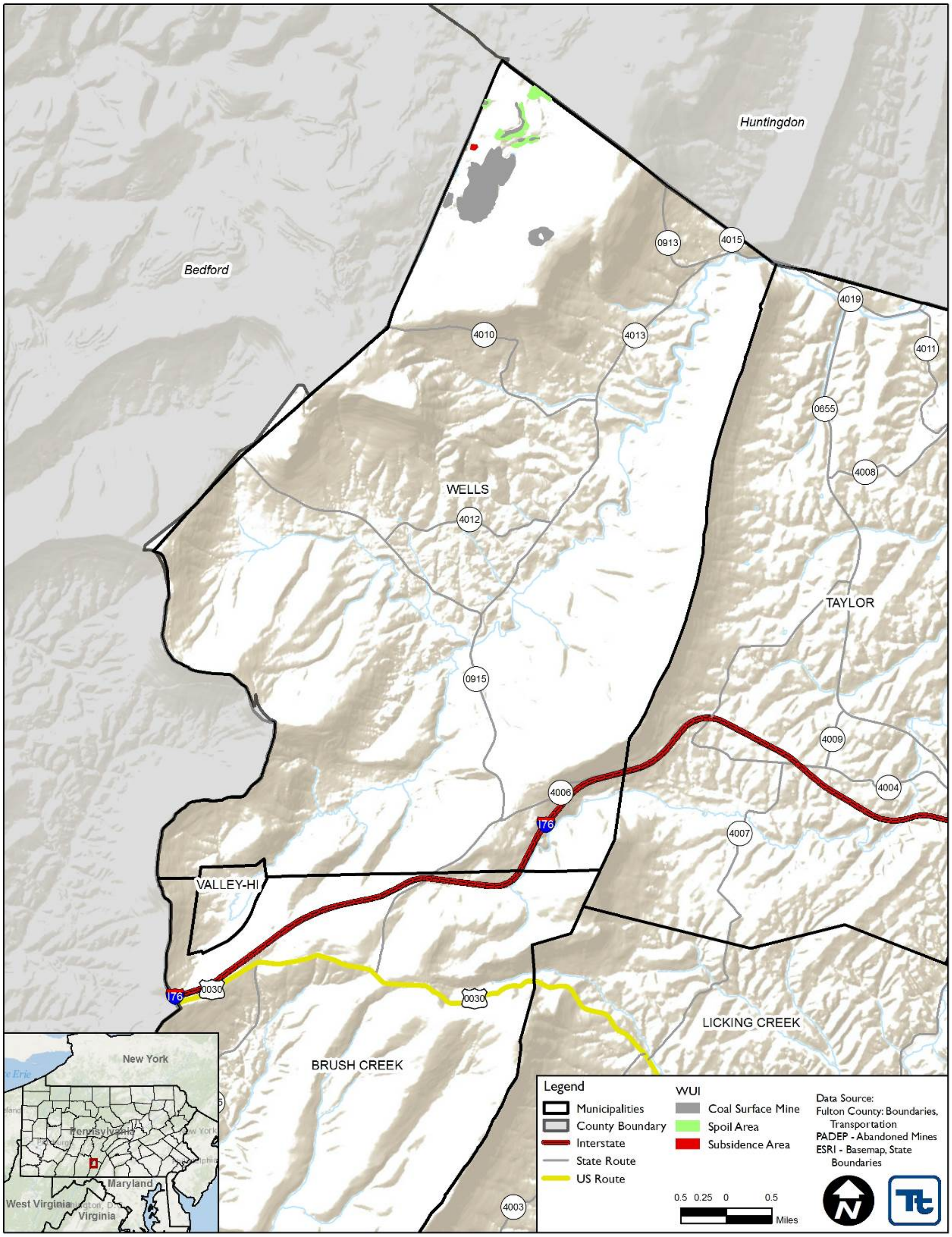
Source: PEMA 2013 (highlight added)

Figure 4.3.9-3. Fulton County Limestone Bedrock Geology



Source: Pennsylvania Bureau of Topographic and Geologic Survey 2001; PA Department of Conservation and Natural Resources 2014

Figure 4.3.9-4. Abandoned Mines in Fulton County



Source: Pennsylvania Department of Environmental Protection (PADEP) 2014
Note: Red areas indicate abandoned mines that have been identified as subsidence areas.
Map extent is decreased to show areas with abandoned mines.

While fewer karst features have been mapped in existing urban areas, human activity can often be the cause of a subsidence area or sinkhole. Leaking water pipes or structures that convey stormwater runoff may also result in areas of subsidence as the water dissolves substantial amounts of rock over time. In some cases, construction, land grading, or earthmoving activities that cause changes in stormwater flow can trigger sinkhole events. Subsidence or sinkhole events may occur in the presence of mining activity, especially in areas where the cover of a mine is thin, or in areas where bedrock is not necessarily conducive to their formation. In their article titled "Sinkholes are Bad," authors Piggott and Eynon indicated that sinkhole development normally occurs where the interval to the ground surface is less than three to five times the thickness of the extracted seam and the maximum interval is up to ten times the thickness of the extracted seam. Subsurface (i.e., underground) extraction of materials such as oil, gas, coal, metal ores (i.e., copper, iron, and zinc), clay, shale, limestone, or water may result in slow-moving or abrupt shifts in the ground surface (Piggott and Eynon 1978).

4.3.9.2 Range of Magnitude

Based on the geologic formations underlying parts of Fulton 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. 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.

Sinkholes also may have negative effects on local groundwater. Groundwater in limestone and other similar carbonate rock formations can be easily polluted, because water moves readily from the Earth's surface down through solution cavities and fractures, thus undergoing very little filtration. Contaminants such as sewage, fertilizers, herbicides, pesticides, or industrial products are of concern.

The worst-case scenario for sinkholes in Fulton County would be a series of large sinkholes opening in Ayr Township. Long swaths of the township have near-surface limestone, making it vulnerable to sinkholes. This series of sinkholes could close roads, cause power outages, prevent the delivery of emergency services, cause injuries or death to the Township's residents, and could cost up to nearly $27 million in property damage.

4.3.9.3 Past Occurrence

The Pennsylvania Department of Conservation and Natural Resources (PA DCNR) Interactive Map shows four sinkhole instances and dozens of surface depressions in Fulton County (PA DCNR Date Unknown). Pennsylvania Department of Transportation (PennDOT) District 9 records do not include any sinkholes; however, a suggested solution on remediating pyritic rock found near Interstate 99 during construction in April 2006, recommends that any pyritic rock repository should avoid the Buffalo Run and Waddle Creek watersheds due to the greater prevalence of limestone formations there.

Because large-scale or fast-moving land subsidence events can trigger landslides, landslides can be an indication of a potentially greater or secondary hazard. Fulton County has noted only one potential (i.e., non-documented) landslide occurrence in recent years. More information on this hazard event is available in Section 4.3.7.

4.3.9.4 Future Occurrence

Although sinkhole occurrence will continue to be a possibility in Fulton County, the probability of a sinkhole or subsidence event is difficult to predict due to the low number of previous events. Areas to monitor for future sinkhole and subsidence events include Ayr Township, Bethel Township, Dublin Township, McConnellsburg Borough, Thompson Township, and Todd Township due to their geologic bedrock. Additionally, the area around the abandoned mines in Wells Township should also be monitored for potential events.

Potential losses caused by sinkhole formation are difficult to calculate for all existing buildings, critical facilities, and infrastructure, as the hazard area covers so much of the County. However, the future occurrence of subsidence areas and sinkholes is considered likely as defined by the Risk Factor Methodology probability criteria (further discussed in Section 4.4).

4.3.9.5 Vulnerability Assessment

To understand risk, a community must evaluate the assets that are exposed or vulnerable in the identified hazard area. This section discusses the potential impact of the subsidence and sinkhole hazard on Fulton County in the following subsections:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on (1) life, health and safety, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effects of climate change on vulnerability

4.3.9.5.1 Overview of Vulnerability

Approximately 4.02 percent of Fulton County (17.6 square miles) is underlain by carbonate bedrock. For the purposes of this planning effort, the area underlain by limestone bedrock is considered exposed to this hazard. Table 4.3.9-1 summarizes the municipalities vulnerable to sinkholes/subsidence events based on the presence of limestone bedrock and/or abandoned mines.

Table 4.3.9-1. Municipalities Vulnerable to Sinkholes/Subsidence Events.

Municipality	Carbonate Rock	Abandoned Mine	Abandoned Mine noted as 'Subsidence Area'
Ayr, Township of	X		
Belfast, Township of			
Bethel, Township of	X		
Brush Creek, Township of			
Dublin, Township of	X		
Licking Creek, Township of			
McConnellsburg, Borough of	X		
Taylor, Township of			
Thompson, Township of	X		
Todd, Township of	X		
Union, Township of			
Valley-Hi, Borough of			
Wells, Township of		X	X

Source: Pennsylvania Bureau of Topographic and Geologic Survey 2001; PADEP 2014

4.3.9.5.2 Data and Methodology

Unlike the flood, wind, and earthquake hazards, no standard loss estimation models or methodologies exist for the subsidence/sinkhole hazard. To estimate the County's vulnerability, the portion of the region underlain by limestone bedrock is considered exposed to natural subsidence. To determine the assets that are exposed to this hazard, available and appropriate bedrock geology spatial data generated by the Pennsylvania Bureau of Topographic and Geologic Survey were overlaid upon the hazard area. The limitations of this analysis are recognized and are only used to provide a general estimate. Over time, additional data will be collected to allow better analysis for this hazard. Available information and a preliminary assessment are provided in the sections below.

4.3.9.5.3 Impact on Life, Health, and Safety

To estimate the population exposed to the hazard, the approximate hazard area (limestone bedrock) was overlaid upon the 2010 U.S. Census population data. The Census blocks with their center (centroid) within the boundary were used to calculate the estimated population exposed to this hazard. Table 4.3.9-2 summarizes the Fulton County population exposed to this hazard by municipality (U.S. Census 2010).

Table 4.3.9-2. Estimated Population Located over Limestone Bedrock (U.S. Census 2010)

Municipality	Total U.S. Census 2010 Pop.	Estimated Population Exposed	Percent of Total
Ayr, Township of	1,942	1,409	72.6%
Belfast, Township of	1,448	0	0%
Bethel, Township of	1,508	567	37.6%
Brush Creek, Township of	819	0	0%
Dublin, Township of	1,264	536	42.4%
Licking Creek, Township of	1,703	0	0%
McConnellsburg, Borough of	1,220	65	5.3%

Municipality	Total U.S. Census 2010 Pop.	Estimated Population Exposed	Percent of Total
Taylor, Township of	1,118	0	0%
Thompson, Township of	1,098	162	14.8%
Todd, Township of	1,527	1,362	89.2%
Union, Township of	706	0	0%
Valley-Hi, Borough of	15	0	0%
Wells, Township of	477	0	0%
Fulton County (Total)	**14,845**	**4,101**	27.6%

Source: U.S. Census 2010; Pennsylvania Bureau of Topographic and Geologic Survey 2001

4.3.9.5.4 Impact on General Building Stock

As noted above, no standard loss estimation models exist for the subsidence/sinkhole hazard. In general, the built environment located on limestone is exposed to this hazard. In an attempt to estimate the general building stock vulnerable to this hazard, the associated building replacement values (buildings and contents) were determined for the identified Census blocks within the approximate hazard area. The County provided spatial layer for building structures was also used to determine the number of structures located within the hazard area. Table 4.3.9-3 lists the replacement cost value (RCV) (structure and contents) of general building stock (GBS) and number of structures exposed to this hazard.

Table4.3.9-3. Estimated General Building Stock Located over Limestone Bedrock

Municipality	Total GBS RCV	Estimated GBS RCV Exposed	Percent of Total	Total Number of Structures	Number of Structures in Hazard Area	Percent of Total
Ayr, Township of	$195,220,000	$147,377,000	75.5%	1,091	278	25.5%
Belfast, Township of	$131,145,000	$0	0%	719	0	0%
Bethel, Township of	$137,141,000	$59,751,000	43.6%	831	79	9.5%
Brush Creek, Township of	$57,987,000	$0	0%	495	0	0%
Dublin, Township of	$120,662,000	$58,659,000	48.6%	712	47	6.6%
Licking Creek, Township of	$139,248,000	$0	0%	843	0	0%
McConnellsburg, Borough of	$187,274,000	$23,319,000	12.5%	534	21	3.9%
Taylor, Township of	$92,843,000	$0	0%	649	0	0%
Thompson, Township of	$81,390,000	$11,202,000	13.8%	554	4	<1%
Todd, Township of	$214,635,000	$129,703,000	60.4%	847	246	29%
Union, Township of	$55,339,000	$0	0%	405	0	0%
Valley-Hi, Borough of	$3,339,000	$0	0%	29	0	0%
Wells, Township of	$38,725,000	$0	0%	286	0	0%
Fulton County (Total)	**$1,454,948,000**	**$430,011,000**	**29.6%**	**7,995**	**675**	**8.4%**

Source: HAZUS-MH v2.1; Pennsylvania Bureau of Topographic and Geologic Survey 2001; Fulton County 2014
Notes: GBS General Building Stock RCV Replacement Cost Value

4.3.9.5.5 Impact on Critical Facilities

A number of critical facilities and utility assets are located in the hazard area, and are also exposed to subsidence/sinkholes. Table 4.3.9-4 summarizes the number of critical facilities identified by the County Hazard Mitigation Plan (HMP) participants that are located within the identified hazard area.

Table 4.3.9-4. Number of Critical Facilities Located in the Identified Hazard Area (Limestone Bedrock)

Facility Type	Number Exposed
Commercial	1
Electric Power	1
Hazardous Materials	3
Medical Facility	1
Municipal Hall	1
Shelter	4

4.3.9.5.6 Impact on the Economy

Subsidence and sinkholes can also severely impact roads and infrastructure. As noted earlier, limestone formations underlie greater than 4.04 percent of the County. Major roadways that serve the County include two Interstate highways (I-70 and I-76), U.S. Highways 22 and 30, and State Highway 16 (PA-16). Portions of each of these roadways are located in the identified subsidence/sinkhole hazard area. It is not possible to estimate potential future economic losses caused by subsidence/sinkhole events at this time.

4.3.9.5.7 Future Growth and Development

Areas targeted for potential future growth and development in the next 5 to 10 years have been identified across the County at the municipal level and are described in Section 2.4 of this Plan. Any new development within the identified hazard areas are anticipated to be exposed to risks associated with the subsidence and sinkhole hazard.

4.3.9.5.8 Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by the type, frequency, and intensity of weather events. Both globally and at the local level, climate change has the potential to alter the prevalence and severity of weather extremes (U.S. Environmental Protection Agency [EPA] 2006).

Climate change factors such as an extended growing season, higher temperatures, and the possibility of more intense and less frequent summer rainfall, may lead to changes in water resource availability. As stated earlier in this profile, changes to the water balance of an area including over-withdrawal of groundwater, diverting surface water from a large area and concentrating it in a single point, artificially creating ponds of surface water, and drilling new water wells will cause sinkholes. These actions can also serve to accelerate the natural processes of bedrock degradation, which can have a direct impact on sinkhole creation.

The potential effects of climate change on Fulton County's vulnerability to subsidence/sinkhole events will need to be considered as more information develops regarding regional climate change impacts.

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4.3.10 Tornado, Windstorm

This section provides a profile and vulnerability assessment for the tornado and windstorm hazard. The wind hazard includes various types of wind events, including windstorms and tornadoes, which are defined below.

Wind is air moving from high to low pressure. It is the rough horizontal movement of air (as opposed to an air current) caused by uneven heating of the Earth's surface. It occurs at all scales, from local breezes generated by heating of land surfaces and lasting tens of minutes, to global winds resulting from solar heating of the Earth (Federal Emergency Management Agency [FEMA] 1997). There are different types of damaging winds: straight-line winds, downdrafts, downbursts, microbursts, gust fronts, derecho, bow echoes, and hook echoes. Each wind type is described below:

- **Straight-line wind** is a term used to define any thunderstorm wind that is not associated with rotation. Straight-line winds are the movement of air from areas of higher pressure to areas of lower pressure – the greater the difference in pressure, the stronger the winds. It is used mainly to differentiate from tornadic winds.
- **Downdrafts** are a small-scale column of air that rapidly sinks toward the ground and usually results in a downburst.
- **Downbursts** are a strong downdraft with horizontal dimensions larger than 2.5 miles, resulting in an outward burst or damaging winds on or near the ground. They are usually associated with thunderstorms, but can occur with rain storms too weak to produce thunder.
- **Microbursts** are a small, concentrated downburst that produces an outward burst of damaging winds near the surface. They are typically short-lived, lasting only 5 to 10 minutes, with maximum wind speeds of up to 168 miles per hour (mph).
- A **gust front** is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. They are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm (National Severe Storms Laboratory [NSSL] Date Unknown).
- A **derecho** is a widespread and long-lived windstorm associated with thunderstorms that are often curved (Johns and others 2011). The two major influences on the atmospheric circulation are the differential heating between the equator and the poles, and the rotation of the planet (FEMA 1997).
- **Bow echoes** are radar echoes that are linear but bent outward in a bow shape. Damaging straight-line winds often occur near the center of a bow echo (crest). Bow echoes can be more than 300 kilometers long, last for several hours, and produce extensive swaths of wind damage at the ground (NSSL Date Unknown).
- **Hook echoes** are radar echoes that are the most recognized and well-known radar signature for tornadic supercells. This "hook-like" feature occurs when the strong counter-clockwise winds circling the mesocyclone (rotating updraft) are strong enough to wrap precipitation around the rain-free updraft area of the storm (Provic 2013).

High winds, other than tornadoes, are experienced in all parts of the United States. Areas that experience the highest wind speeds are coastal regions from Texas to Maine and the Alaskan coast; however, exposed mountain areas experience winds at least as high as those along the coast (FEMA 1997; Robinson 2013). Wind begins with differences in air pressures. It is rough horizontal movement of air caused by uneven heating of the Earth's surface. Wind occurs at all scales, from local breezes lasting a few minutes to global winds resulting from solar heating of the Earth. Effects from high winds can include downed trees and power lines, and damaged roofs and windows. Table 4.3.10-1 describes wind classifications used by the National Weather Service (NWS).

Table 4.3.10-1. NWS Wind Descriptions

Descriptive Term	Sustained Wind Speed (mph)
Strong, dangerous, or damaging	≥40
Very windy	30-40
Windy	20-30
Breezy, brisk, or blustery	15-25
None	5-15 or 10-20
Light, or light and variable wind	0-5

Source: NWS 2010
mph Miles per hour

Extreme windstorm events are associated with extra-tropical and tropical cyclones, winter cyclones, severe thunderstorms, and accompanying mesoscale offspring such as tornadoes and downbursts. Winds vary from 0 mph at ground level to 200 mph in the upper atmospheric jet stream at 6 to 8 miles above the Earth's surface (FEMA 1997).

A type of windstorm that is experienced often during rapidly-moving thunderstorms is a derecho. A derecho is a long-lived windstorm that is associated with a rapidly moving squall line of thunderstorms. It produces straight-line winds gusts of at least 58 mph and often has isolated gusts exceeding 75 mph. As a result, trees generally fall and debris is blown in one direction. To be considered a derecho, these conditions must continue along a path of at least 240 miles. Derechos are more common in the Great Lakes and Midwest regions of the United States, though, on occasion, can persist into the mid-Atlantic and northeast United States (Office of the New Jersey State Climatologist [ONJSC] Rutgers University 2013).

Tornadoes are nature's most violent storms and can cause fatalities and devastate neighborhoods in seconds. A tornado appears as a rotating, funnel-shaped cloud that extends from a thunderstorm to the ground with whirling winds that can reach 250 mph. Damage paths can be greater than 1 mile wide and 50 miles long. Tornadoes typically develop from either a severe thunderstorm or hurricane as cool air rapidly overrides a layer of warm air. Tornadoes typically move at speeds between 30 and 125 mph and can generate internal winds exceeding 300 mph. The lifespan of a tornado rarely is longer than 30 minutes (FEMA 1997). High wind velocity and wind-blown debris, along with lightning or hail, result in the damage caused by tornadoes. Destruction caused by tornadoes depends on the size, intensity, and duration of the storm. Tornadoes cause the greatest damage to structures that are light, such as residential and mobile homes, and tend to remain localized during impact (Northern Virginia Regional Commission [NVRC] 2006).

The following sections discuss the location and extent, range of magnitude, previous occurrence, future occurrence, and vulnerability assessment associated with the wind and tornado hazard for Fulton County.

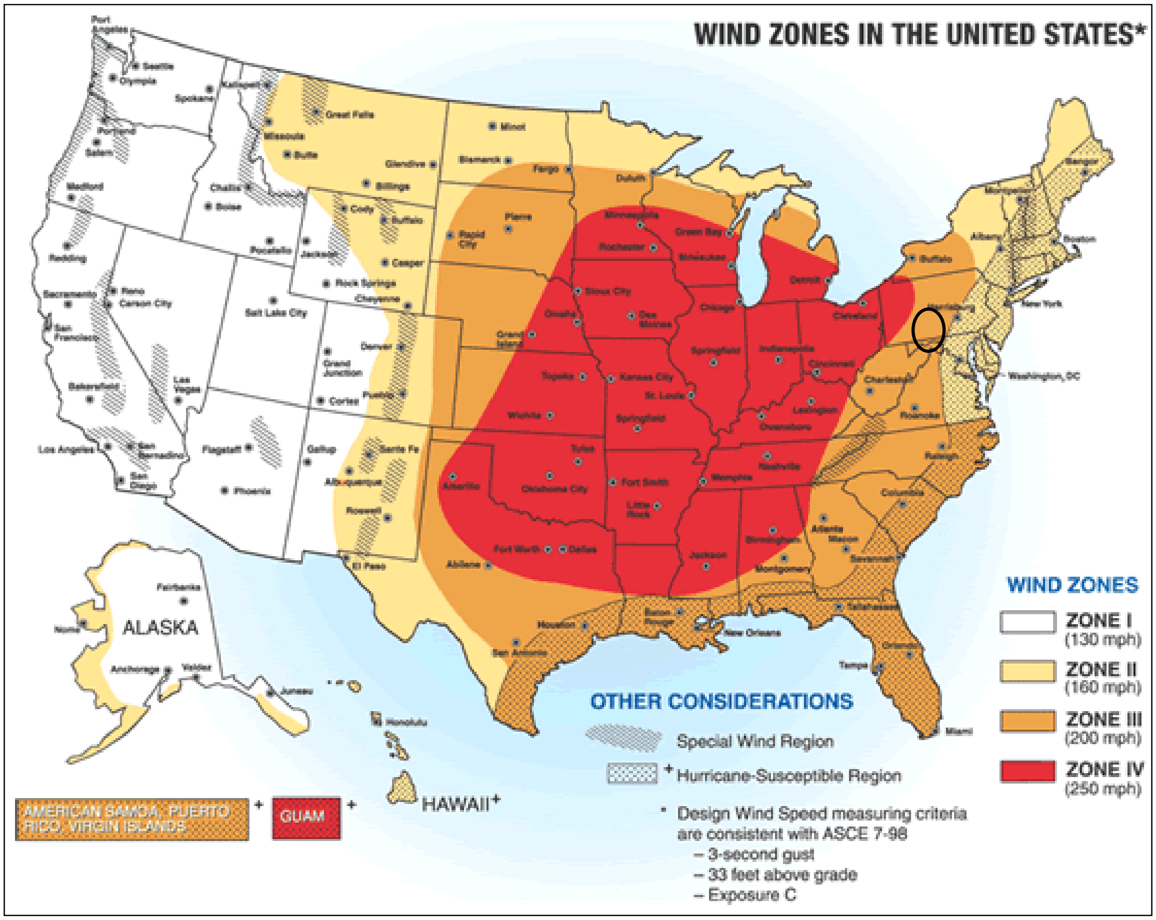
4.3.10.1 Location and Extent

Tornadoes and windstorms can occur throughout Pennsylvania. Tornadoes are usually localized; however, severe thunderstorms can result in conditions favorable to the formation of numerous or long-lived tornadoes. Straight-line winds and windstorms are experienced on a region-wide scale (Pennsylvania Emergency Management Agency [PEMA] 2013).

Windstorms

Figure 4.3.10-1 illustrates the ways in which the frequency and strength of windstorms affect the United States and the general location of the most wind activity. This figure is based on 40 years of tornado history and 100 years of hurricane history collected by FEMA. States located in Wind Zone IV have experienced the greatest number of tornadoes and the strongest tornadoes (NVRC 2006). Fulton County is located in Wind Zone III with speeds up to 200 miles per hour. Table 4.3.10-2 describes the areas within the various wind zones of the United States.

Figure 4.3.10-1. Wind Zones in the United States



Source: FEMA 2010
Note: The black oval indicates the approximate location of Fulton County.

Table 4.3.10-2. Wind Zones in the United States

Wind Zones	Areas Affected
Zone I (130 mph)	All of Washington, Oregon, California, Idaho, Utah, and Arizona. Western parts of Montana, Wyoming, Colorado, and New Mexico. Most of Alaska, except the east and south coastlines.
Zone II (160 mph)	Eastern parts of Montana, Wyoming, Colorado, and New Mexico. Most of North Dakota. Northern parts of Minnesota, Wisconsin, and Michigan. Western parts of South Dakota, Nebraska, and Texas. All New England States. Eastern parts of New York, Pennsylvania, Maryland, and Virginia. Washington DC.

Wind Zones	Areas Affected
Zone III (200 mph)	Areas of Minnesota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, Texas, Louisiana, Mississippi, Alabama, Georgia, Tennessee, Kentucky, Pennsylvania, New York, Michigan, and Wisconsin. Most or all of Florida, Georgia, South Carolina, North Carolina, Virginia, and West Virginia. All of American Samoa, Puerto Rico, and Virgin Islands.
Zone IV (250 mph)	Mid United States ,including all of Iowa, Missouri, Arkansas, Illinois, Indiana, and Ohio and parts of adjoining states of Minnesota, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Louisiana, Mississippi, Alabama, Georgia, Tennessee, Kentucky, Pennsylvania, Michigan, and Wisconsin. Guam.
Special Wind Region	Isolated areas in the following states: Washington, Oregon, California, Idaho, Utah, Arizona, Montana, Wyoming, Colorado, and New Mexico. The borders between Vermont and New Hampshire; between New York, Massachusetts, and Connecticut; between Tennessee and North Carolina.
Hurricane Susceptible Region	Southern United States coastline from Gulf Coast of Texas eastward to include entire State of Florida. East coastline from Maine to Florida, including all of Massachusetts, Connecticut, Rhode Island, Delaware, and Washington DC. All of Hawaii, Guam, American Samoa, Puerto Rico, and Virgin Islands.

Source: FEMA 2010
Notes:
mph Miles per hour

Tornadoes

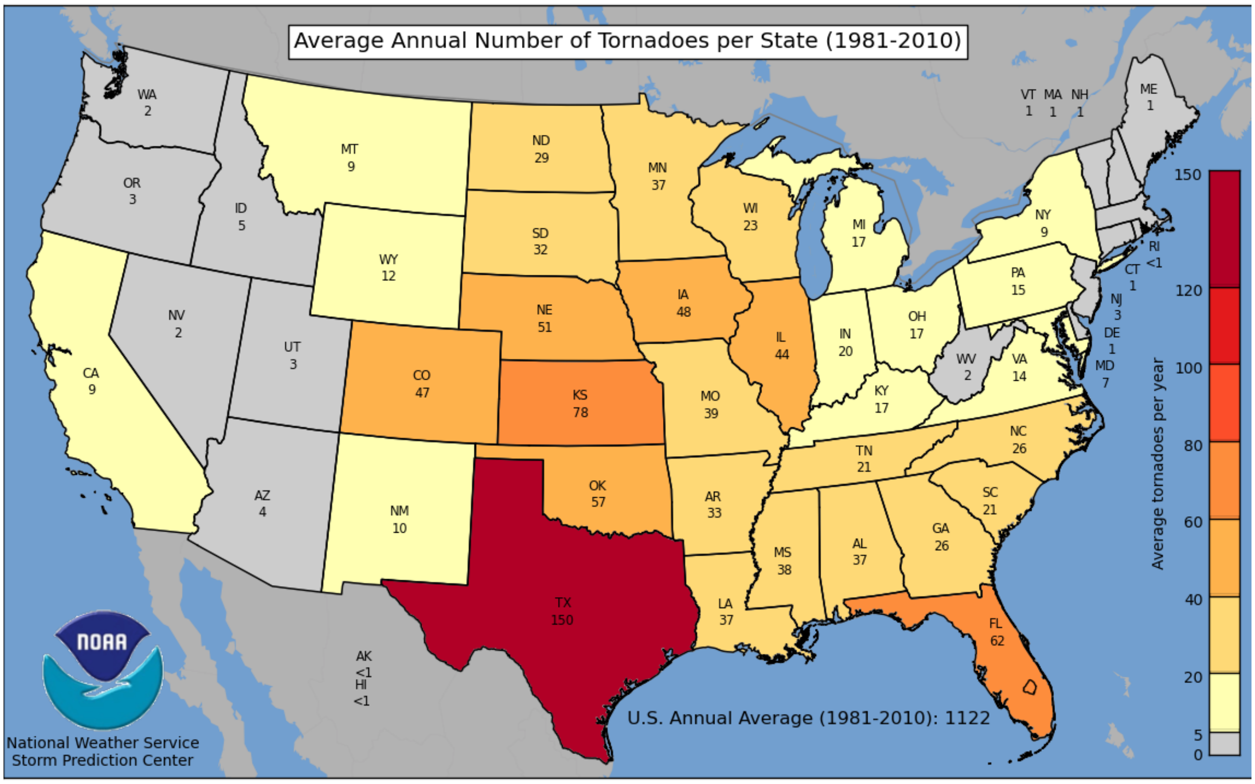
The United States experiences more tornadoes than any other country. In a typical year, approximately 1,000 tornadoes affect the United States. The peak of the U.S. tornado season is April through June, with the highest concentration of tornadoes in the central United States, although tornadoes can occur at any time of year (NWS 2011). Tornadoes tend to strike in the afternoons and evening, the warmest hours of the day, with approximately 80 percent of all tornadoes striking between noon and 9:00 p.m. (PEMA 2013).

Tornado movement is characterized in two ways: direction and speed of the spinning winds, and forward movement of the tornado and storm track. Rotational wind speeds of the vortex can range from 100 mph to more than 250 mph. In addition, the speed of forward motion can be 0 to 45 or 50 mph. Therefore, some estimates place the maximum velocity (combination of ground speed, wind speed, and upper winds) of tornadoes at about 300 mph. 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 they generally range in size from less than 100 feet to more than a mile in width. Some tornadoes never touch the ground and are short-lived, while others may touch the ground several times.

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.

Figure 4.3.10-2 shows the annual average number of tornadoes between 1981 and 2010 (Storm Prediction Center [SPC] 2012). The Commonwealth of Pennsylvania experienced an average of 15 tornado events annually between 1981 and 2010.

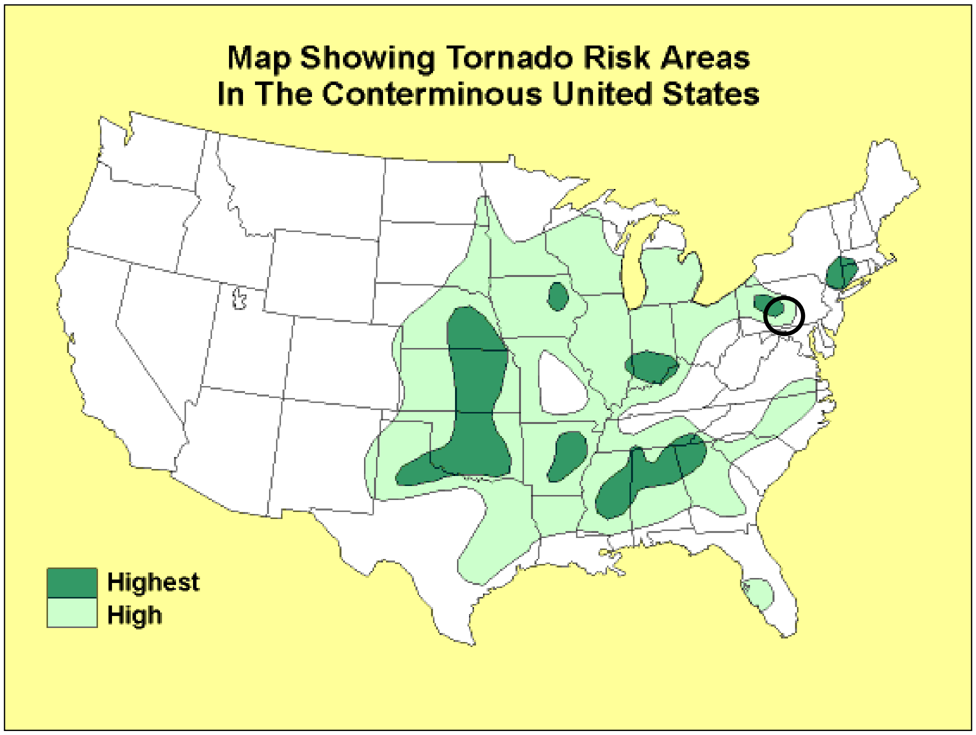
Figure 4.3.10-2. Annual Average Number of Tornadoes in the United States, 1981 to 2010



Source: SPC 2012

Figure 4.3.10-3 indicates that a large portion of Pennsylvania is at high risk for tornadoes; with a portion considered to be at the highest risk. According to this graphic, Fulton County has a relatively high risk for tornado. Details regarding historical tornado events are discussed in the Past Occurrences section (Section 4.3.10.3) of this profile.

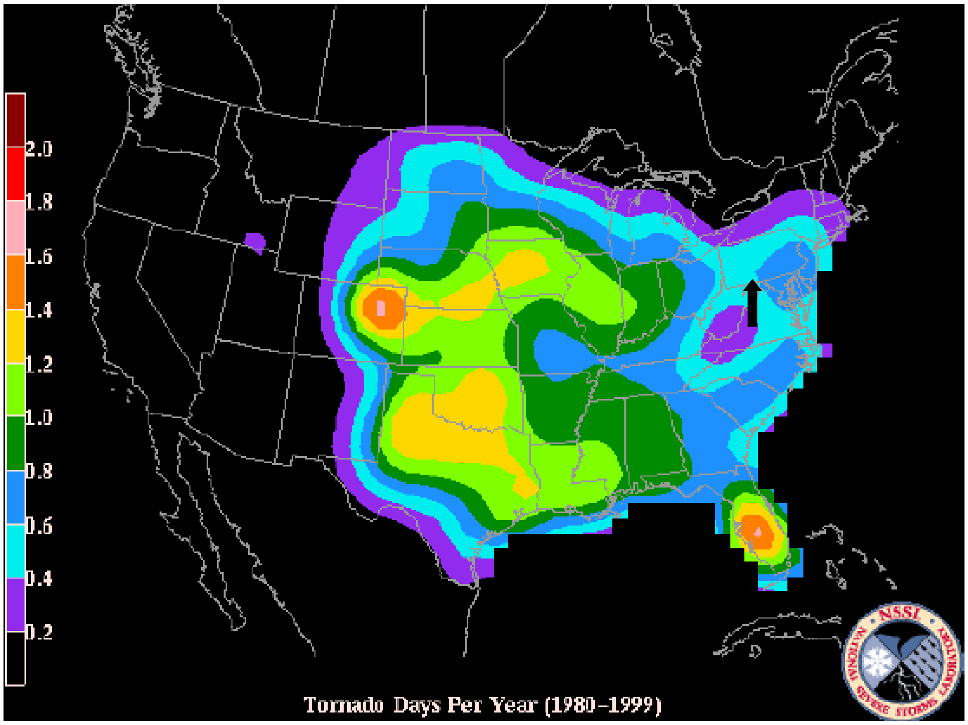
Figure 4.3.10-3. Tornado Risk in the United States



Source: American Red Cross 2010
Note: The black circle indicates the general location of Fulton County.

A study from the National Oceanic and Atmospheric Administration's (NOAA) NSSL provided estimates of the long-term threat from tornadoes. The NSSL used historical data to estimate the daily probability of tornado occurrences across the United States, no matter the magnitude of the tornado. Figure 4.3.10-4 shows the estimates prepared by the NSSL. In Pennsylvania, it is estimated that the probability that a tornado will occur is 0.2 to 0.8 day per year. In Fulton County, it is estimated that the probability of a tornado occurring is 0.4 to 0.6 day per year (NSSL 2003).

Figure 4.3.10-4. Total Annual Threat of Tornado Events in the United States, 1980-1999



Source: NSSL 2003

Notes: The mean number of days per year with one or more events within 25 miles of a point is shown here. The fill interval for tornadoes is 0.2, with the purple starting at 0.2 days. For the non-tornadic threats, the fill interval is 1, with the purple starting at 1. For the significant (violent) threats, it is 5 days per century (millennium).
The black arrow indicates the general location of Fulton County.

4.3.10.2 Range of Magnitude

Windstorms are generally defined as sustained wind speeds of 40 mph or greater, lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. A tornado's magnitude is classified using the Enhanced Fujita Scale, which is further discussed below.

The magnitude or severity of a tornado was originally categorized using the Fujita Scale (F-Scale) or the Pearson Fujita Scale introduced in 1971, based on a relationship between the Beaufort Wind Scales (B-Scales) (measure of wind intensity) and the Mach number scale (measure of relative speed). It is used to rate the intensity of a tornado by examining the damage caused by the tornado after it has passed over a man-made structure (Tornado Project Date Unknown). The F-Scale categorizes each tornado by intensity and area. The scale is divided into six categories, F0 (Gale) to F5 (Incredible) (Edwards 2013).

Although the F-Scale has been in use for more than 30 years, the scale has limitations. The primary limitations are a lack of damage indicators, no account of construction quality and variability, and no definitive correlation between damage and wind speed. These limitations have led to the inconsistent rating of tornadoes and, in some cases, an overestimate of tornado wind speeds. The limitations listed above led to the development of the Enhanced Fujita Scale (EF Scale). The Texas Tech University Wind Science and Engineering (WISE) Center, along with a forum of nationally renowned meteorologists and wind engineers from across the country, developed the EF Scale (WISE 2004).

The EF Scale became operational on February 1, 2007. It is used to assign tornadoes a rating based on estimated wind speeds and related damage. When tornado-related damage is surveyed, it is compared with a list of Damage Indicators (DI) and Degrees of Damage (DOD), which help better estimate the range of wind speeds produced by the tornado. From that, a rating is assigned, similar to that of the F-Scale, with six categories from EF0 to EF5, representing increasing degrees of damage. The EF Scale was revised from the original F-Scale to reflect better examinations of tornado damage surveys. This new scale has to do with how most structures are designed (NWS 2007). Table 4.3.10-3 displays each of its six categories of the EF Scale.

Table 4.3.10-3. Enhanced Fujita Damage Scale

EF-Scale Number	Intensity Phrase	Wind Speed (mph)	Type of Damage Done
EF0	Light tornado	65–85	Light damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	Moderate tornado	86-110	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	Significant tornado	111-135	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	Severe tornado	136-165	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	Devastating tornado	166-200	Devastating damage. Well-constructed houses and whole-frame houses completely leveled; cars thrown, and small missiles generated.
EF5	Incredible tornado	>200	Incredible damage. Strong-frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); high-rise buildings have significant structural deformation; incredible phenomena will occur.

Source: NWS 2007
Notes:
mph Miles per hour

The EF Scale takes into account more variables than the original F-Scale did in assigning a wind speed rating to a tornado. The EF Scale incorporates 28 DIs, such as building type, structures, and trees. There are eight DODs for each damage indicator, ranging from the beginning of visible damage to complete destruction of the damage indicator. Table 4.3.10-4 lists the 28 DIs. A description is provided for each one of these indicators of the typical construction for that category. Each DOD in every category is assigned an expected estimate of wind speed, a lower bound of wind speed, and an upper bound of wind speed.

Table 4.3.10-4. EF Scale Damage Indicators

Number	Damage Indicator	Abbreviation	Number	Damage Indicator	Abbreviation
1	Small barns, farm outbuildings	SBO	15	School - 1-story elementary (interior or exterior halls)	ES
2	One- or two-family residences	FR12	16	School - junior or senior high school	JHSH
3	Single-wide mobile home	MHSW	17	Low-rise (1-4 story) building	LRB
4	Double-wide mobile home	MHDW	18	Mid-rise (5-20 story) building	MRB
5	Apartment, condominium, townhouse (3 stories or less)	ACT	19	High-rise (over 20 stories)	HRB
6	Motel	M	20	Institutional building (hospital, government. or university)	IB
7	Masonry apartment or motel	MAM	21	Metal building system	MBS
8	Small retail building (fast food)	SRB	22	Service station canopy	SSC
9	Small professional (doctor office, branch bank)	SPB	23	Warehouse (tilt-up walls or heavy timber)	WHB
10	Strip mall	SM	24	Transmission line tower	TLT
11	Large shopping mall	LSM	25	Free-standing tower	FST
12	Large, isolated ("big box") retail building	LIRB	26	Free-standing pole (light, flag, luminary)	FSP
13	Automobile showroom	ASR	27	Tree - hardwood	TH
14	Automotive service building	ASB	28	Tree - softwood	TS

Source: SPC Date Unknown

Since the EF Scale went into effect in February 2007, previous occurrences and losses associated with historical tornado events, described in the Past Occurrences section of this hazard profile (Section 4.3.10.3), are classified based on the former Fujita Scale. Events after February 2007 are classified based on the Enhance Fujita Scale.

The most severe tornado to hit Fulton County was an F1 on September 17, 2004. It was 40 yards wide and left a path 0.5 mile long. No deaths or injuries were reported, nor were any financial property damages associated with the event (National Climatic Data Center [NCDC] 2014).

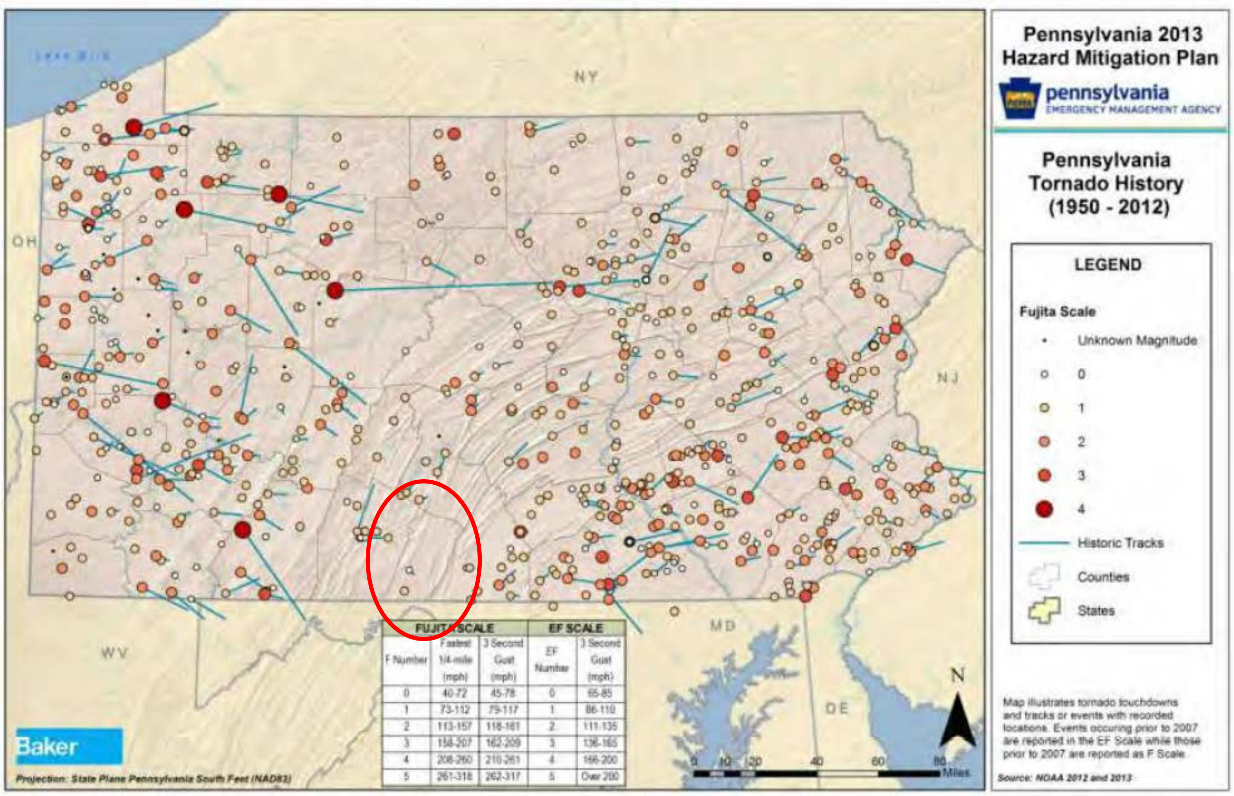
4.3.10.3 Past Occurrence

Many sources provided historical information regarding previous occurrences and losses associated with tornado and windstorm events throughout the Commonwealth of Pennsylvania and Fulton County. With so many sources reviewed for this plan, loss and impact information for many events could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this Hazard Mitigation Plan (HMP).

According to NOAA's National Climatic Data Center (NCDC) storm events database, Fulton County experienced 60 tornado and windstorm events between August 1, 1950, and August 31, 2014. These events include funnel clouds, high winds, strong winds, thunderstorm winds, and tornadoes. Total property damages, as a result of these tornado and windstorm events, were estimated at just over $82,000. This total also includes damages to other counties.

Figure 4.3.10-5 shows the tornadoes that have occurred across Pennsylvania from 1950 to 2012 (PEMA 2013).

Figure 4.3.10-5. Pennsylvania Tornado History



Source: PEMA 2013
Note: Fulton County is indicated by the red oval.

According to NOAA's NCDC, there were two recorded tornadoes in Fulton County between 1950 and 2014. These tornadoes included one with an intensity of F0 and one with an intensity of F1. The most severe tornado to hit Fulton County was an F1 on September 17, 2004. It was 0.5 mile long and 40 yards wide. No deaths or injuries were reported, nor were any financial property damages associated with the event. The tornado touched down about 3.5 miles east of McKees Gap, along Route 731, for about 1-2 minutes (NCDC 2014).

Between 1954 and 2014, the Commonwealth of Pennsylvania experienced 27 federally-declared windstorm or tornado-related disasters (DR) or emergencies (EM) classified as one or a combination of the following disaster types: hurricane, tropical storm, tropical depression, severe storms, flash flooding, flooding, and high winds. Generally, these disasters cover a wide region of the State; therefore, they may have affected many counties. However, not all counties were included in the disaster declarations. Fulton County was included in one of these declared disasters (FEMA 2014). There have been four gubernatorial disaster declarations in Pennsylvania caused by tornadoes or high winds. Fulton County was included in none of them. Additionally, the Pennsylvania Disaster History list, maintained by PEMA, identifies 11 wind events and 11 tornados that have impacted the State. Fulton County was not identified as impacted in any of these events; however, it could be included under the high winds in April 1975, which had a statewide impact (PEMA 2013).

Based on all sources researched, select significant windstorms (those with damages of at least $100,000), and tornado events that have affected Fulton County and its municipalities between 1954 and 2014 are identified in Table 4.3.10-5. With tornado and windstorm documentation for the Commonwealth of Pennsylvania being so extensive, not all sources have been identified or researched. Therefore, Table 4.3.10-5 may not include all events that have occurred throughout Fulton County.

Table 4.3.10-5. Tornado and Windstorm Events in Fulton County, 1954 to 2014

Dates of Event	Event Type	Location	Magnitude	Losses / Impacts
April 1975	High Winds	Statewide	N/A	No other details provided.
9/26/1975	Pennsylvania Severe Storms, Heavy Rains, Flooding	Countywide	N/A	DR-485
7/11/1976	Thunderstorm Wind	Fulton County	78 Kts.	High winds accompanying thunderstorms brought down trees and tree limbs, blew off portions of house and barn roofs, and blew over sheds and a house trailer demolishing them. The highest gust reported was 63 mph at Chambersburg. Heavy rain caused roadway and basement flooding and caused some basement walls to cave in. The rain and wind combined to flatten some crops and knock some fruit off trees. There were numerous lightning strikes on trees, houses, barns and other buildings, causing damage and starting fires. These fires destroyed five barns with equipment and 50 chickens lost. Lightning also struck and killed a total of seven cattle and two dogs in three separate locations. The lightning and wind combined to cause power outages to thousands of residents. There were also several automobile accidents caused by the weather conditions.
7/21/1983	Thunderstorm Wind	Fulton County	0 Kts.	No additional storm narrative provided.
7/12/1985	Thunderstorm Wind	Fulton County	0 Kts.	No additional storm narrative provided.
6/13/1987	Thunderstorm Wind	Fulton County	0 Kts.	Thunderstorm winds downed trees and dime-size hail fell in Fort Littleton.
05/16/1988	Thunderstorm Wind	Fulton County	0 Kts.	Thunderstorms brought down trees and dropped 0.5-inch hail near Needmore. Thunderstorms also dropped 0.75-1-inch hail near McConnellsburg.
7/30//1988	Thunderstorm Wind	Fulton County	0 Kts.	No additional storm narrative provided.
8/15/1988	Thunderstorm Wind	Fulton County	0 Kts.	No additional storm narrative provided.
7/26/1989	Thunderstorm Wind	Fulton County	50 Kts.	Thunderstorm wind gusts downed trees and power lines at Town Hill Mountain, south of Emmaville.
4/9/1991	Thunderstorm Wind	Fulton County	50 Kts.	Thunderstorm wind gusts collapsed a barn near Hustontown, killing 17 head of cattle. In the Needmore area, a mobile home was torn apart by the wind gusts, but a woman inside sustained only minor injuries. Near Needmore, a large cement block garage was destroyed when a roof was lifted off, and the walls collapsed. In McConnellsburg, trees were blown down and power was out. One large tree came down on a house and destroyed the bathroom. This event is listed three times in the NOAA-NCDC database.

Dates of Event	Event Type	Location	Magnitude	Losses / Impacts
5/6/1991	Thunderstorm Wind	Fulton County	50 Kts.	About 12 trees were downed by thunderstorm wind gusts between 2:30 and 2:45 p.m. .
9/10/1992	Thunderstorm Wind	Fulton County	50 Kts.	Thunderstorm wind gusts downed utility lines.
4/15/1994	Thunderstorm Wind	Enid	50 Kts.	Trees down.
6/2/1995	Thunderstorm Wind	Needmore	50 Kts.	Winds downed trees in the Needmore area. One tree fell on a mobile home.
7/6/1995	Thunderstorm Wind	Warfordsburg	50 Kts.	A few trees were blown down just north of the Maryland border on Route 3001 south of Wardsfordburg.
7/15/1995	Thunderstorm Wind	McConnellsburg	50 Kts.	Winds took down power lines near McConnellsburg.
7/17/1995	Thunderstorm Wind	Hineman	50 Kts.	Trees were taken down in Hineman and Clearville.
7/17/1995	Thunderstorm Wind	Clearville	50 Kts.	Trees were taken down in Hineman and Clearville.
7/27/1995	Thunderstorm Wind	Tollgate Ridge	50 Kts.	A roof was blown off a shed and several trees were taken down just north of the Maryland border on Route 928.
8/5/1995	Thunderstorm Wind	Needmore	50 Kts.	Winds snapped a number of trees over the higher elevations west of Needmore.
11/11/1995	Thunderstorm Wind	Fulton County	50 Kts.	Winds took down trees and power lines around McConnellsburg and other areas across the county.
11/11/1995	Thunderstorm Wind	Clearfield	50 Kts.	Winds took down trees and power lines around McConnellsburg and other areas across the county.
7/19/1996	Tornado	Needmore	F0	The tornado had a length of 2 miles and a width of 50 yards. An automobile and van were heavily damaged by a fallen tree.
7/30/1996	Thunderstorm Wind	Wells Tannery	50 Kts.	A downburst damaged trees in the Wells Tannery area.
5/31/1998	Thunderstorm Wind	Warfordsburg	51 Kts.	Trees and limbs down 1S of Warfordsburg.
6/16/1998	Thunderstorm Wind	McConnellsburg	51 Kts.	Thunderstorm winds blew parts of a roof off the milking parlor and took down some trees at the county fairgrounds.
6/30/1998	Thunderstorm Wind	Wells Tannery	51 Kts.	Trees down on Route 915 east of Wells Tannery.
7/21/1998	Thunderstorm Wind	Amaranth	51 Kts.	A tree was blown onto Interstate 70.
8/14/1998	Thunderstorm Wind	Harrisonville	51 Kts.	A number of trees were uprooted.
9/29/1999	High Wind	Fulton County	60 Kts.	No additional storm narrative provided.

Dates of Event	Event Type	Location	Magnitude	Losses / Impacts
1/4/2000	High Wind	Fulton County	50 Kts.	No additional storm narrative provided.
6/12/2001	Thunderstorm Wind	McConnellsburg	50 Kts.	Several trees were reported down along Route 522 near McConnellsburg.
6/20/2001	Thunderstorm Wind	Knobsville	50 Kts.	Large tree limbs were down in Knobsville.
8/19/2001	Thunderstorm Wind	Sideling Hill	50 Kts.	Trees were down along Route 643 near Sideling Hill.
3/9/2002	High Wind	Fulton County	50 Kts.	No additional storm narrative provided.
5/1/2003	Thunderstorm Wind	Warfordsburg	70 Kts.	Four roofs were torn off out-buildings and sheds in the Warfordsburg area, specifically on Pigeon Cove Road.
7/6/2003	Thunderstorm Wind	Cove Mills	50 Kts.	Trees and power lines were reported down on Buck Valley Road in Bethel Township.
8/26/2003	Thunderstorm Wind	Waterfall	50 Kts.	Trees reported down in Waterfall.
11/13/2003	High Wind	Fulton County	60 Kts.	A strong cold front swept across central Pennsylvania during the early morning hours of November 13th, 2003. Strong winds behind the cold front intensified as low pressure deepened north of the region. Reports of trees and wires down were common across all of central Pennsylvania. Earliest damage reports began around 5 AM EST on the morning of the 13th, with the final high wind damage reports coming in around 17:00 EST. High wind speeds were mainly estimated based on reported damage. In addition to trees and wires being downed in the warned counties, additional damage reports included: A 71 mph wind gust was reported in Lancaster, Lancaster County at 5:28 AM EST, a barn blown over in Cambria County 5 miles east of Prince Gallitzin State Park at 13:15 EST, a roof blown off a home in Johnstown Pennsylvania at 12:00 EST, and three separate reports of roofs off homes in Franklin County. In addition, a roof of a state office building was damaged in Clearfield county, a vehicle repair facility in Snyder county was damaged, and a vacant building collapsed in Bedford county. Across all of Pennsylvania, more than 80,000 persons were without power from the high winds. One fatality occurred in Centre County, where a tree fell on a truck and killed the driver. Two other fatalities occurred in Perry County when a car struck a tree which had fallen across Route 233 in Madison Township.

Dates of Event	Event Type	Location	Magnitude	Losses / Impacts
5/7/2004	Thunderstorm Wind	Waterfall	50 Kts.	Trees reported down in Waterfall.
9/8/2004	Thunderstorm Wind	McConnellsburg	50 Kts.	Trees and wires were knocked down by thunderstorm winds near Crystal Spring.
9/17/2004	Strong Wind	Fulton County	45 Kts.	No additional storm narrative provided.
9/17/2004	Tornado	McConnellsburg	F1	The tornado touched down for a half mile and maintained a width of 40 yards.
6/6/2005	Thunderstorm Wind	Wells Tannery	50 Kts.	Thunderstorm winds knocked down several trees near Wells Tannery, along State Routes 4012 and 4013.
6/6/2005	Thunderstorm Wind	Needmore	50 Kts.	Thunderstorm winds knocked down trees along Route 522 1 mile south of Needmore.
7/5/2005	Thunderstorm Wind	McConnellsburg	50 Kts.	Thunderstorm winds knocked down several trees throughout Fulton County.
12/1/2006	High Wind	Fulton County	45 Kts.	High winds behind a strong cold front knocked down trees throughout the county. Much of the damage occurred in the McConnellsburg area.
6/8/2007	Thunderstorm Wind	McConnellsburg	50 Kts.	Thunderstorm winds knocked down numerous trees and power lines.
2/12/2009	High Wind	Fulton County	50 Kts.	Non-thunderstorm wind gusts between 50 and 60 mph toppled numerous trees and power lines across Fulton County. The high winds caused sporadic power outages to approximately less than 100 Allegheny Power customers.
6/2/2009	Thunderstorm Wind	Knobsville	50 Kts.	A severe thunderstorm snapped off about 30 trees near Cowans Gap State Park near the Fulton/Franklin County border.
7/29/2009	Thunderstorm Wind	Dickey’s Mountain	60 Kts.	Thunderstorm winds estimated near 70 mph tore a portion of a metal roof from a large barn and knocked down several trees in Dickeys Mountain.
5/2/2010	Thunderstorm Wind	Dickey’s Mountain	50 Kts.	Thunderstorm winds estimated near 60 mph toppled several trees on Creek Road just north of Route 928.
5/26/2011	Thunderstorm Wind	Cove Mills	50 Kts.	Thunderstorm winds estimated near 60 mph produced structural damage near Cove Mills.
5/26/2011	Thunderstorm Wind	Cove Mills	50 Kts.	Thunderstorm winds estimated near 60 mph knocked down numerous trees and utility wires in several communities surrounding Cove Mills.
6/1/2012	Thunderstorm Wind	Needmore	50 Kts.	Thunderstorm winds estimated near 60 mph knocked down trees and utility wires in Needmore.

Dates of Event	Event Type	Location	Magnitude	Losses / Impacts
6/29/2012	Thunderstorm Wind	Needmore	50 Kts.	Thunderstorm winds estimated near 60 mph knocked down trees in Needmore.
10/29/2012	High Wind	Fulton County	50 Kts.	High winds knocked down several trees with widespread power outages reported Countywide.
11/1/2013	Thunderstorm Wind	Dott	50 Kts.	A line of heavy showers with estimated winds near 60 mph knocked down trees and wires in Thompson Township near Needmore.

Source: PEMA Disaster History List 2010; FEMA 2014; NOAA-NCDC 2010; NOAA-NCDC 2014

Notes:

(1) Monetary figures within this table were U.S. Dollar (USD) figures calculated during or within the approximate time of the event. If such an event would occur in the present day, monetary losses would be considerably higher in USDs as a result of increased U.S. Inflation Rates.

FEMA Federal Emergency Management Agency
K Thousand ($)
Kts. Knots
M Million ($)
mph Miles per hour
NCDC National Climatic Data Center
NOAA National Oceanic Atmospheric Administration
PEMA Pennsylvania Emergency Management Agency

4.3.10.4 Future Occurrence

In Section 4.4, the hazards of concern identified for Fulton County were ranked according to relative risk. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. The probability of occurrence for severe tornado and windstorm events in Fulton County is considered *likely* (between 10 and 100 percent annual probability) as defined by the Risk Factor Methodology probability criteria (Section 4.4).

Fulton County experiences strong winds on a frequent basis, and when those winds strike, they can result in significant property damage, downed trees, and utility outages. It can be reasonably assumed that future tornadoes will be similar in nature to those that have affected Fulton County in the past. It is estimated that Fulton County will continue to experience direct and indirect impacts of windstorms and tornadoes annually that may induce secondary hazards such as infrastructure deterioration or failure; utility failures; power outages; water quality and supply concerns; and transportation delays, accidents and inconveniences.

4.3.10.5 Vulnerability Assessment

To understand risk, a community must evaluate which assets are exposed or vulnerable in the identified hazard area. The entire County has been identified as the hazard area for tornado and other windstorm events. Therefore, all assets in the County (population, structures, critical facilities, and lifelines), as described in the County Profile (Section 2), are vulnerable. The following text evaluates and estimates the potential impact of strong winds on the County, including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, safety and health of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development

4.3.10.5.1 Overview of Vulnerability

The high winds and air speeds of a severe windstorm event, including winds in a tornado, can result in power outages, disruptions to transportation corridors and equipment, loss of workplace access, significant property damage, injuries and loss of life, and the need to shelter and care for individuals affected by the events. A large amount of damage can be inflicted by trees, branches, and other objects that fall onto power lines, buildings, roads, vehicles, and in some cases, people. The risk assessment for tornadoes and windstorms evaluates available data for a range of storms included in this hazard category.

The entire inventory of the County is at risk of being damaged or lost through the impacts of tornadoes and windstorms. Certain areas, infrastructure, and types of building are at greater risk than others because of their proximity to falling hazards or their manner of construction. Potential losses associated with high wind events were calculated for the County for two probabilistic hurricane events: the 100-year and 500-year mean return period (MRP) hurricane events. The impacts on population, existing structures, critical facilities, and the economy are presented below, after a summary of the data and methodology used. Although the estimate is based on a hurricane event, the data can also be used to estimate potential damage from other windstorm events.

4.3.10.5.2 Data and Methodology

After historical data had been reviewed, the Hazards U.S.—Multi-Hazard (HAZUS-MH) methodology and model were used to analyze windstorms for Fulton County. Data used to assess this hazard include data available in the HAZUS-MH 2.1 wind model and professional knowledge.

HAZUS-MH contains data on historical hurricane events and wind speeds. It also includes surface roughness and vegetation (tree coverage) maps for the area. Surface roughness and vegetation data support modeling of wind force across various types of land surfaces. Hurricane and inventory data available in HAZUS-MH were used to evaluate potential losses from the 100- and 500-year MRP events (severe wind impacts). Other than updated data for the general building stock and critical facility inventories, the default data in HAZUS-MH 2.1 were the best available for use in this evaluation.

4.3.10.5.3 Impact on Life, Health, and Safety

The impact of a tornado or windstorm on life, health, and safety depends on several factors, including the severity of the event and whether adequate warning time was provided to residents. It is assumed that the entire County's population (U.S. Census 2010 population of 14,845 people) is exposed to this hazard.

Residents may be displaced or require temporary to long-term sheltering. In addition, downed trees, damaged buildings, and debris carried by high winds can lead to injury or loss of life. Socially vulnerable populations are most susceptible, based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. HAZUS-MH estimates there will be zero people displaced and zero people who may require temporary shelter as a result of the 100- and 500-year MRP events.

Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions based on the major economic impact to their family and may not have funds to evacuate. The population over the age of 65 is also more vulnerable and, physically, they may have more difficulty evacuating. The elderly are considered most vulnerable because they require extra time or outside assistance during evacuations and are more likely to seek or need medical attention that may not be available due to isolation during a storm event. Section 2 presents the statistical information regarding these populations in the County.

4.3.10.5.4 Impact on General Building Stock

After the population exposed to the tornado or windstorm hazard has been considered, the general building stock replacement value exposed to and damaged by 100- and 500-year MRP events was examined. Wind-only impacts are reported based on the probabilistic hurricane runs in HAZUS-MH 2.1. Potential damage is the modeled loss that could occur to the exposed inventory, including damage to structural and content value based on the wind-only impacts associated with a hurricane (using the methodology described in Section 4.4). Although the estimate is based on a hurricane event, the data can also be used to estimate potential damage from other windstorm events.

It is assumed that the entire County's general building stock is exposed to the severe storm wind hazard (greater than $886 million - structure only). Expected building damage was evaluated by HAZUS across the following wind damage categories: no damage/very minor damage, minor damage, moderate damage, severe damage, and total destruction.

Table 4.3.7-6 summarizes the definitions of the damage categories.

Table 4.3.7-6. Description of Damage Categories

Qualitative Damage Description	Roof Cover Failure	Window Door Failures	Roof Deck	Missile Impacts on Walls	Roof Structure Failure	Wall Structure Failure
No Damage or Very Minor Damage Little of no visible damage from the outside. No broken windows, or failed roof deck. Minimal loss of roof over, with no or very limited water penetration.	≤ 2%	No	No	No	No	No
Minor Damage Maximum of one broken window, door, or garage door. Moderate roof cover loss that can be covered to prevent additional water entering the building. Marks or dents on walls requiring painting or patching for repair.	> 2% and ≤ 15%	One window, door, or garage door failure	No	< 5 Impacts	No	No
Moderate Damage Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water.	> 15% and ≤ 50%	> the larger of 20% & 3 and ≤ 50%	1 to 3 Panels	Typically 5 to 10 Impacts	No	No
Severe Damage Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water.	> 50%	> one and ≤ the larger of 20% & 3	> 3 and ≤ 25%	Typically 10 to 20 Impacts	No	No
Destruction Complete roof failure or failure of wall frame. Loss of more than 50 percent of roof sheathing.	Typically > 50%	> 50%	> 25%	Typically > 20 Impacts	Yes	Yes

Source: FEMA 2013

As noted earlier in the profile, HAZUS estimates the 100-year MRP peak gust wind speeds for Fulton County to be 49 to 54 mph, which equates to a *Tropical Storm*. As depicted in Table 4.3.7-7, HAZUS-MH 2.1 estimates $679 in structure damages, for both residential and commercial buildings, across the County for the 100-year MRP event. Residential buildings comprise the majority of the building inventory and are estimated to experience all of the damage.

HAZUS estimates the 500-year MRP peak gust wind speeds for Fulton County to range from 70 to 71 mph. This wind speed equates to a *Tropical Storm* and approximately $637,000 in damages to the general building stock (structure only). This amount is less than 1 percent of the County's building inventory. The residential buildings are estimated to experience the majority of the damage. Table 4.3.7-7 summarizes the building value (structure only) damage estimated for the 100- and 500-year MRP wind-only events by occupancy class.

Table 4.3.7-7. Estimated Building Replacement Value (Structure Only) Damaged by the 100-Year and 500-Year Mean Return Period Winds for All Occupancy Classes

Municipality	Total Building Replacement Value (Structure Only)	Total Building Damage (All Occupancies)		Residential Buildings		Commercial Buildings	
		100-Year	500-Year	100-Year	500-Year	100-Year	500-Year
		Probable Loss	Probable Loss	Probable Loss	Probable Loss	Probable Loss	Probable Loss
Ayr, Township of	$120,037,000	$73	$100,791	$73	$98,651	$0	$489
Belfast, Township of	$81,245,000	$0	$72,225	$0	$70,679	$0	$727
Bethel, Township of	$85,155,000	$0	$67,225	$0	$65,570	$0	$964
Brush Creek, Township of	$36,519,000	$25	$24,205	$25	$23,787	$0	$147
Dublin, Township of	$76,065,000	$42	$44,797	$42	$43,713	$0	$520
Licking Creek, Township of	$88,439,000	$71	$57,963	$71	$56,831	$0	$765
McConnellsburg, Borough of	$105,857,000	$0	$49,266	$0	$44,236	$0	$3,514
Taylor, Township of	$57,166,000	$75	$41,458	$75	$40,308	$0	$475
Thompson, Township of	$53,055,000	$0	$49,806	$0	$49,499	$0	$161
Todd, Township of	$120,000,000	$356	$77,403	$356	$73,022	$0	$1,368
Union, Township of	$36,017,000	$0	$33,858	$0	$33,607	$0	$81
Valley-Hi, Borough of	$2,226,000	$0	$1,333	$0	$1,333	$0	$0
Wells, Township of	$24,556,000	$36	$16,508	$36	$16,186	$0	$145
Fulton County (Total)	**$886,337,000**	**$679**	**$636,838**	**$679**	**$617,421**	**$0**	**$9,355**

Source: HAZUS-MH 2.1

Because of differences in building construction, residential structures are generally more susceptible to wind damage than are commercial and industrial structures. Wood and masonry buildings in general, regardless of their occupancy class, tend to experience more damage than concrete or steel buildings. The damage counts include buildings damaged at all severity levels from minor damage to total destruction. Total dollar damage reflects the overall impact to buildings at an aggregate level.

Of the more than $886 million in total residential replacement value (structure) for the entire County, an estimated $679 in residential building damage can be anticipated for the 100-year event and over $617,000 in residential building damage can be anticipated for the 500-year event. Residential building damage accounts for 97 percent of total damages for the 500-year wind-only event. This information illustrates residential structures are the most vulnerable to the wind hazard.

Annualized losses were also examined for Fulton County. A total of $5,844 is estimated as the annualized loss for the entire County. Please note that annualized loss does not predict which losses will occur in any particular year.

4.3.10.5.5 Impact on Critical Facilities

HAZUS-MH estimates the probability that critical facilities (medical facilities, fire/emergency medical services, police, Emergency Operation Centers, schools, and user-defined facilities such as shelters and municipal buildings) may sustain damage as a result of 100-year and 500-year MRP wind-only events. Additionally, HAZUS-MH estimates the loss of use for each facility in number of days. HAZUS-MH estimates that there will be no structural losses to critical facilities in Fulton County; and continuity of operations at these facilities will not be interrupted (loss of use is estimated to be 0 days) as a result of a 100-year MRP event. For the 500-year event, HAZUS-MH estimates a less than 2 percent chance that there will be minor to moderate damage to critical facilities in Fulton County; continuity of operations at these facilities will not be interrupted.

At this time, HAZUS-MH 2.1 does not estimate losses to transportation lifelines and utilities as part of the hurricane model. Transportation lifelines are not considered particularly vulnerable to the wind hazard; they are more vulnerable to cascading effects such as flooding, and falling debris. Impacts to transportation lifelines affect both short-term (evacuation activities) and long-term (day-to-day commuting) transportation needs.

Utility structures could suffer damage associated with falling tree limbs or other debris. These impacts can result in the loss of power, which can impair business operations and can affect heating or cooling provision to citizens (including the young and elderly, who are particularly vulnerable to temperature-related health impacts).

4.3.10.5.6 Impact on Economy

Severe storms also affect the economy, including loss of business function (for example, to tourism and recreation), damage to inventory, relocation costs, wage loss, and rental loss from repair or replacement of buildings. HAZUS-MH estimates the total economic loss associated with each storm scenario (direct building losses and business interruption losses). Direct building losses are the estimated costs to repair or replace the damage caused to the building. These losses are reported in the "Impact on General Building Stock" section discussed earlier. Business interruption losses are the losses associated with the inability to operate a business because of the wind damage sustained during the storm or the temporary living expenses for those displaced from their home because of the event.

HAZUS-MH estimates negligible business interruption losses for Fulton County for the 100-year MRP event (<$100). HAZUS-MH estimates $2,653 in business interruption losses for Fulton County for the 500-year MRP wind only event, which includes loss of income, relocation costs, rental costs, and lost wages.

HAZUS-MH 2.1 also estimates the amount of debris that may be produced a result of the 100- and 500-year MRP wind events. Table 4.3.7.8 estimates the debris produced for Fulton County during a wind event. This estimate is likely conservative; it may be higher if multiple impacts occur or if it occurs in conjunction with rain or other hazards, because the estimated debris production does not include flooding. According to the HAZUS-MH Hurricane User Manual:

> "The Eligible Tree Debris columns provide estimates of the weight and volume of downed trees that would likely be collected and disposed at public expense. As discussed in Chapter 12 of the HAZUS-MH Hurricane Model Technical Manual, the eligible tree debris estimates produced by the Hurricane Model tend to underestimate reported volumes of debris brought to landfills for a number of events that have occurred over the past several years. This indicates that that there may be other sources of vegetative and non-vegetative debris that are not currently being modeled in HAZUS. For landfill estimation purposes, it is recommended that the HAZUS debris volume estimate be treated as an approximate lower bound. Based on actual reported debris volumes, it is recommended that the HAZUS results be multiplied by three to obtain an approximate upper bound estimate. It is also important to note that the Hurricane Model assumes a bulking factor of 10 cubic yards per ton of tree debris. If the debris is chipped prior to transport or disposal, a bulking factor of 4 is recommended. Thus, for chipped debris, the eligible tree debris volume should be multiplied by 0.4." (FEMA 2013)

Table 4.3.7-8. Debris Production for 100- and 500-Year Mean Return Period Hurricane-Related Winds

	Brick and Wood (tons)		Concrete and Steel (tons)		Tree (tons)		Eligible Tree Volume (cubic yards)	
Municipality	**100 Year**	**500 Year**	**100 Year**	**500 Year**	**100 Year**	**500 Year**	**100 Year**	**500 Year**
Ayr, Township of	0	2	0	0	0	504	0	290
Belfast, Township of	0	0	0	0	0	499	0	246
Bethel, Township of	0	1	0	0	0	332	0	156
Brush Creek, Township of	0	0	0	0	2	306	2.86	169
Dublin, Township of	0	0	0	0	0	232	0	158
Licking Creek, Township of	0	0	0	0	0	338	0	163
McConnellsburg, Borough of	0	2	0	0	0	0	0	0
Taylor, Township of	0	0	0	0	0	650	0	299
Thompson, Township of	0	0	0	0	0	245	0	124
Todd, Township of	0	2	0	0	79	252	15.77	238
Union, Township of	0	0	0	0	0	194	0	87
Valley-Hi, Borough of	0	0	0	0	0	0	0	0
Wells, Township of	0	0	0	0	0	175	0	109
Fulton County (Total)	**0**	**7**	**0**	**0**	**81**	**3,727**	**19.6**	**2,040**

Source: HAZUS-MH 2.1

4.3.10.5.7 Future Growth and Development

As discussed and illustrated in Section 2.4, areas targeted for future growth and development have been identified across Fulton County. Any areas of growth could be affected by the tornado and windstorm hazard because the entire County is exposed and vulnerable to the wind hazard, particularly when associated with severe storms.

4.3.11 Transportation Accident

Transportation hazards include hazardous materials in transit, vehicular accidents, aviation accidents, at-grade railroad crossings, and roadways vulnerable to floods. In 2012, the National Transportation Safety Board (NTSB) reported 35,531 transportation-related fatalities. Of those 35,531 fatalities, 33,561 were highway incidents, 803 were rail incidents, 449 were aviation incidents, 12 were pipeline incidents, and 706 were marine incidents (NTSB 2012).

A transportation hazard may be defined as a condition created by movement of anything by common carrier. Transportation hazards can be divided into two categories: hazards created by the material being transported, and hazards created by the transportation medium. Transportation systems available in Fulton County include roadways and one airport; the County does not maintain any rail lines. A major road accident in the County is probable; however, aviation accidents are unlikely and rail accidents are not possible. All County systems and supporting transportation resources provide services locally, regionally, and nationally.

- Vehicular Accidents: A vehicular accident is a road traffic incident that usually involves one vehicle colliding with another vehicle or other road user, such as an animal or a stationary roadside object. A vehicular accident may result in injury, property damage, or possible fatalities. Many factors contribute to vehicular accidents, including equipment failure, poor road conditions, weather, traffic volume, and driver behavior.

- Aviation Accidents: According to the International Civil Aviation Organization, an aviation accident is an occurrence during operation of an aircraft between the time a person boards the aircraft with intent to fly to a destination to the time the person has disembarked the aircraft. Three different situations qualify as an aviation accident: a person is fatally or seriously injured; the aircraft sustains damage or structural failure; or the aircraft is missing or inaccessible. An aviation incident is an occurrence, other than an accident, associated with operation of an aircraft that affects or could affect the safety of operation (International Civil Aviation Organization 2001). Although Fulton County is home to only one private airport, limiting the probability of aviation accidents, airport accidents and incidents have the potential to occur while the plane is over County airspace.

- Hazardous Materials (HAZMAT) in Transit: A HAZMAT is defined as a substance or material determined capable of posing an unreasonable risk to health, safety, or property when transported. "Unreasonable risk" covers a broad range of health, fire, and environmental considerations. HAZMATs come in various forms that can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. HAZMAT substances include explosives, flammable solids, substances that become dangerous when wet, oxidizing substances, and toxic liquids. An accident involving a vehicle carrying HAZMAT becomes a HAZMAT incident if the HAZMAT leaks, is involved in a fire, or if potential for release, fire, or other hazard exists. Hazards can occur during production, storage, transportation, use, or disposal (Campbell Date Unknown, FEMA 2006).

- Railway Accidents: Railway accidents involve one or more trains. Although Fulton County does not maintain any rail stations or rail lines, residents may choose to travel by rail from another county.

Transportation accidents described here include incidents involving road, air, and rail travel. HAZMAT conveyance during transportation is an additional transportation threat to Fulton County. Volatility of products transported, along with potential impact on a local community, may increase risk of intentional acts against a transport vehicle. Release of certain products considered HAZMAT can cause immediate and adverse impacts on the general population, ranging from the inconvenience of evacuations to personal injury and even death. Additional effects of a release of HAZMAT from transportation accidents are addressed in the Environmental Hazard profile (Section 4.3.16). County residents have indicated concern over the potential for transportation accidents involving animal waste and other biological hazardous materials related to the transport, feeding, and associated care for animals in a Concentrated Animal Feeding Operation (CAFO), as there are multiple CAFO facilities in Fulton County. The potential impacts and associated concerns with CAFO facilities, including transportation accidents, are described in more detail in Section 4.3.4: Environmental Hazards.

4.3.11.1 Location and Extent

Vehicular Accidents

Major roadways in Fulton County include I-70, the Pennsylvania Turnpike – I-76, U.S.-522, and U.S.-30. Fulton County has more than 685 miles of roadways, divided as listed in Table 4.3.11-1, and illustrated on Figure 4.3.11-1 on the following page.

Table 4.3.11-1. Fulton County Transportation Network

Category	Miles
Interstate Highway	38.9
Freeways/Expressways	0.0
Principal Arterials	24.2
Minor Arterials	48.7
Major Collectors	44.5
Minor Collectors	69.0
Local Roads	461.5
Total	**686.8**

Source: Pennsylvania Department of Transportation (PennDOT), Pennsylvania Highway Statistics, 2013 Highway Data

Transportation accidents can occur at any point along these roadways, with many occurring at the intersection of two or more roadways.

In response to the collapse of the I-35W Bridge in Minneapolis in August 2007, PennDOT assessed the structural integrity of all bridges in the Commonwealth. Table 4.3.11-2 lists the total number of bridges in Fulton County, as well as the number of those that are structurally deficient (in parentheses). Each structurally deficient bridge poses a risk for transportation accidents.

Table 4.3.11-2. Bridges in Fulton County

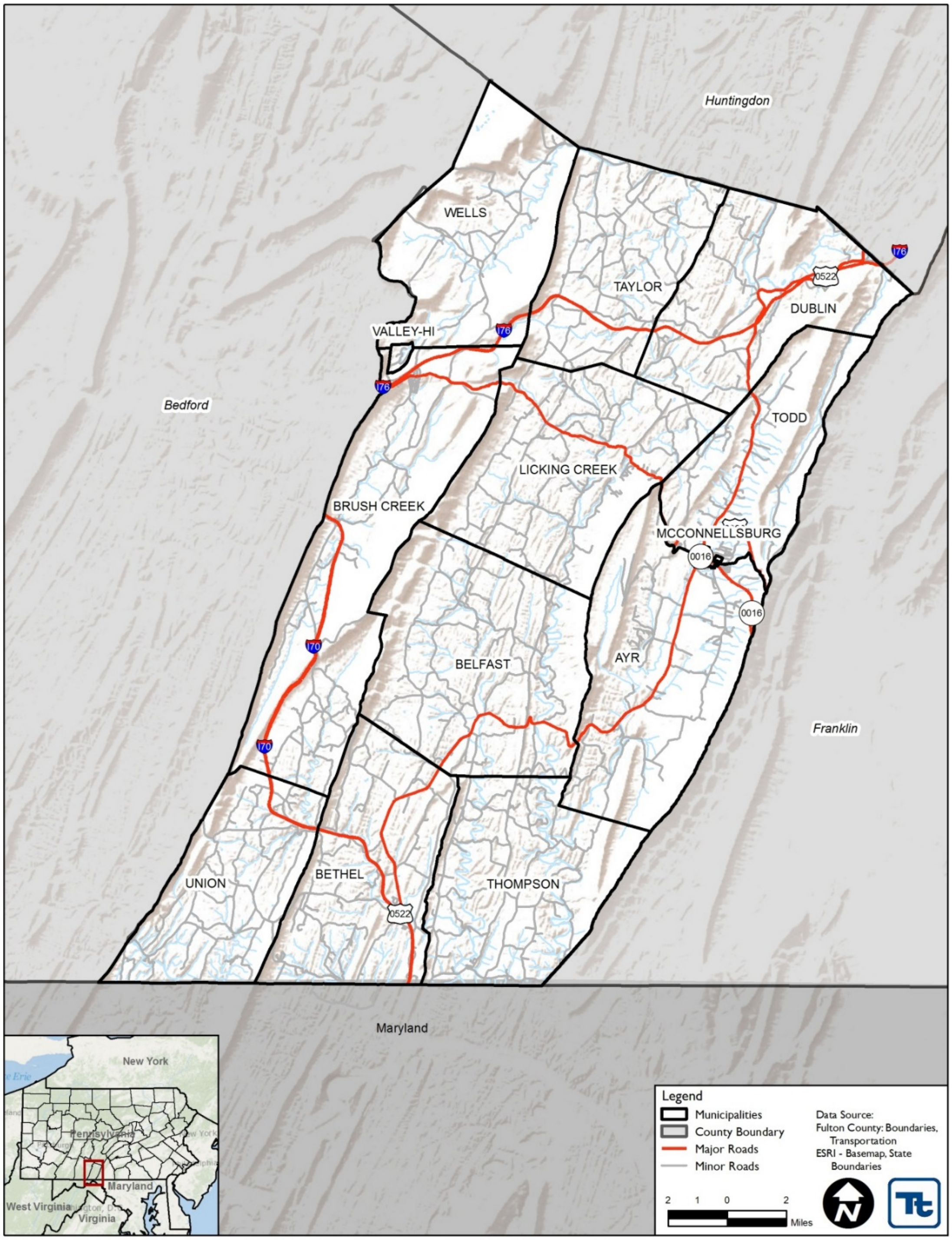
On State Roads	On Local Roads
181(27)	25 (10)

Source: PennDOT 2013

As of September 2014, 6,363 structurally deficient bridges were present throughout Pennsylvania (PennDOT 2013). PennDOT has plans in place to rebuild more than 600 of these bridges during and beyond 2014. No data regarding the schedule to repair or rebuild Fulton County's structurally deficient bridges were available.

There is no warning time for vehicular accidents. Factors contributing to these accidents are typically associated with the driver, vehicle, and the environment. Factors associated with the driver include error, speeding, experience, and blood-alcohol level. Factors associated with the vehicle include type, condition, and center of gravity. Environmental factors include quality of the infrastructure, weather, and obstacles. The majority of vehicular accidents are attributed to the driver. Vehicular accidents can severely affect those directly involved, as well as others not directly involved. Other effects may include severe traffic delays, lost sales to businesses, delayed commodity shipments, and increased insurance costs (Cova and Conger 2003).

Figure 4.3.11-1. Major Roadways in Fulton County



Source: Fulton County, 2014

Railway Accidents

Pennsylvania offers freight, passenger, and commuter rail systems. The Pennsylvania Bureau of Rail Freight, Ports, and Waterways cites in its 2035 Intercity Passenger and Freight Rail Plan that the freight rail network totals 5,095 miles of track with over 60 railroads, making Pennsylvania the fifth-largest rail network in the nation and the state with the greatest number of railroads. Three railroad systems offer Pennsylvania passenger service—Southeastern Pennsylvania Transportation Authority (SEPTA – Rapid Transit, Trolley and Light Rail, and Commuter Rail); the Port Authority of Allegheny County (PAAC – Light Rail); and Amtrak (Intercity Passenger Rail). Amtrak is the only rail service that crosses the entire State.

Although Fulton County does not host any rail lines, residents may still be involved in rail accidents if they choose to ride a train from a station in another county.

Rail accidents generally fit into one of three categories (PEMA 2013):

- Derailment – the train leaves the rails
- Collision – a train strikes another train or a vehicle
- Other – including objects on the rails, fires, or explosions.

Aviation Accidents

Fulton County has only one airport within its limits, and this airport, Flying R Airport – PN35, is privately owned and operated. Although Fulton County does not maintain any public airports, several Pennsylvania counties near Fulton do. The most notable are the Franklin County Regional Airport and the Bedford County Airport. Farther away are the Gettysburg Airport, the Hanover Airport, the Mid-Atlantic Soaring Airport, and the Southern Adams County Heliport in Adams County; the Carlisle Airport and the Shippensburg Airport in Cumberland County; the Altoona-Blair County Airport, the Blue Knob Valley Airport, and the Cove Valley Airport in Blair County; and the Somerset County Airport in Somerset County. In addition, the Harrisburg International Airport is a little less than 70 miles from McConnellsburg, PA. This airport may have associated air traffic patterns in the skies above Fulton County that could lead to problems in flight and a crash within the County.

Approximately 80 percent of all aviation accidents occur shortly before or during take-off and landing. Reportedly, most of these accidents are caused by human error. Mid-flight accidents are rare but not unheard of. A survey of 1,843 plane crashes between 1950 and 2006 showed that 53 percent were the result of pilot (human) error, 21 percent were caused by mechanical failure, 11 percent were caused by weather, 8 percent were attributed to other human error (lack of communication or improper maintenance), 6 percent were caused by sabotage and terrorism, and 1 percent resulted from other causes (Krasner 2009).

Aviation accidents are often devastating incidents that may result in serious injuries or fatalities. The Federal Aviation Administration (FAA) and the National Transportation Safety Board (NTSB) are the agencies responsible for monitoring air travel and investigating accidents. Some of the most common causes of aviation accidents occur as a result of violations of FAA and NTSB regulations. Some other causes of accidents include, but are not limited to:

- Pilot or flight crew errors – Pilot error is the number one cause of aviation accidents and accounts for the highest number of fatalities. Pilots have the responsibility to transport passengers safely from one place to another and follow the FAA and NTSB regulations to better ensure passenger safety. If a pilot or flight crew makes an error, an accident may occur.

- Faulty equipment – Faulty aircraft equipment or mechanical features is another common cause of aviation accidents.
- Aircraft design flaws – The manufacturer of an aircraft is responsible for an aviation accident if the structural design is flawed and results in an accident.
- Failure to properly fuel or maintain the aircraft – If any regulations and safety standards set by the FAA or NTSB are violated, an accident may occur.
- Negligence of Federal Air Traffic Controllers – Failure of air traffic controllers to properly monitor the airways is another cause of aviation accidents (*Aviation Law News* Date Unknown).

4.3.11.2 Range of Magnitude

Roadway accidents in Fulton County range from minor crashes to more serious incidents that involve injuries or fatalities, or result in release of HAZMAT (see Section 4.3.16). Information for this plan regarding fatalities associated with automobile crashes (Table 4.3.11-3), fatalities of pedestrians involved in transportation incidents (Table 4.3.11-4), and fatalities by person/crash type in Fulton County (Table 4.3.11-5) was drawn from the National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS).

Table 4.3.11-3. Fatalities from Automobile Crashes

Timeline	Pennsylvania	Fulton County
2008	1,468	6
2009	1,256	1
2010	1,324	8
2011	1,286	5
2012	1,310	4
Total:	**6,644**	**24**

Table 4.3.11-4. Fatalities of Pedestrians

Timeline	Pennsylvania	Fulton County
2008	137	0
2009	134	0
2010	145	0
2011	147	0
2012	163	0
Total:	**726**	**0**

Table 4.3.11-5. Fatalities by Person/Crash Type in Fulton County

Fatality Type	2008	2009	2010	2011	2012
Total Fatalities (All Crashes):	**6**	**1**	**8**	**5**	**4**
(1) Alcohol-Impaired Driving Fatalities	2	0	1	1	2
(2) Single Vehicle Crash Fatalities	4	1	5	4	4
(3) Large Truck Involved Crash Fatalities	0	0	1	0	0
(4) Speeding Involved Crash Fatalities	2	0	4	1	3
(5) Rollover Involved Crash Fatalities	4	0	2	1	4
(6) Roadway Departure Involved Crash Fatalities	5	1	7	4	4
(7) Intersection (or Intersection Related) Crash Fatalities	0	0	0	1	0
Passenger Car Occupant Fatalities	2	1	3	2	4
Light Truck Occupant Fatalities	3	0	4	3	0
Motorcyclist Fatalities	1	0	0	0	0

Source: NHTSA FARS 2014

Rail accidents can vary widely in terms of injuries, fatalities, property damage, and interruption of service, depending on the nature and severity of the accident. Again, while these types of accidents are not possible within the County itself, local residents may still be involved in rail accidents.

Aircraft accidents can vary from a single-engine aircraft having a “hard landing” and causing damage to the aircraft, to a crash of a small turboprop or jet aircraft, to a crash of a large jet aircraft (such as a Boeing 727). Other aircraft accidents could include helicopter or experimental aircraft crashes. Aviation accidents also can involve radio-controlled or drone aircraft devices, many of which are experimental and not subject to defined regulatory oversight, potentially complicating issues with and for the public that could arise if one of these devices crashes.

The worst-case transportation accident within the County would be overturn of a tractor trailer carrying an extremely hazardous substance (see Section 4.3.16) resulting in a massive release of its cargo on a major roadway. This incident would block traffic on Fulton County’s major transportation routes, and could threaten the health and safety of individuals on the roadways and in surrounding neighborhoods. In addition, a release could necessitate closure of critical facilities in the County. The most likely transportation accident in the County would involve a single vehicle hitting an object and sustaining minimal damage.

4.3.11.3 Past Occurrence

Major accidents (such as multi-vehicle accidents, those that close roads or bridges, or those involving school buses) are reported by Fulton County to PennDOT. Table 4.3.11-6 summarizes these accidents from 2008 to 2012. While this table lists accidents reported to the counties and Commonwealth, significantly more minor accidents are not reported. The number in parentheses indicates the percentage of crashes that year within the County, as compared to the Commonwealth.

Table 4.3.11-6. Summary of Major Accidents in Fulton County, 2008 to 2012

Year	Vehicle Accidents	Railroad Incidents	Aircraft Accidents
2008	320 (0.3%)	0	0
2009	329 (0.3%)	0	0
2010	267 (0.2%)	0	0
2011	279 (0.2%)	0	0
2012	281 (0.2%)	0	0
Total	**1,476**	**0**	**0**

Source: PennDOT, 2012 Pennsylvania Crash Facts and Statistics Report

Table 4.3.11-7 summarizes significant transportation accidents in Fulton County from 2006 through 2009. The NTSB does not note any significant accidents within the County.

Table 4.3.11-7. Significant Accidents in Fulton County, 2004 to 2009

Date(s) of Event	Event Type	Description	Location
6/20/2006	Vehicular Accident	Commercial truck hauling 42,000 pounds (lbs) of solid chocolate overturned, blocking two lanes; U.S. Department of Agriculture (USDA) called.	Brush Creek Township
9/30/2006	Vehicular Accident	Single tractor trailer (T/T) overturned onto median; 1 east-bound (EB) lane closed.	Wells Township
11/8/2006	Vehicular Accident	Single T/T accident; minor fuel spill; no injuries reported.	Brush Creek Township
11/29/2006	Vehicular Accident	Single T/T accident; approx 75 gallons (gal) diesel fuel spilled (sprayed and collected); no injuries reported.	Dublin Township
12/7/2006	Vehicular Accident	Single T/T accident; approx 50-100 gal diesel fuel spilled; minor injury.	Wells Township
1/10/2007	Vehicular Accident	Jackknifed T/T on Sideling Hill utility pole blocking all lanes.	Dublin Township
2/13/2007	Vehicular Accident	Commercial U.S. mail truck struck median: severe damage to power unit, minor injuries, and approx 10 gal fuel spilled.	Taylor Township
5/17/2007	Vehicular Accident	Single-vehicle accident in construction zone, no injuries reported.	Taylor Township
7/24/2007	Vehicular Accident	Multi-vehicle accident involving T/T; no injuries or spills reported; one lane of I 70 EB closed.	Brush Creek Township

Date(s) of Event	Event Type	Description	Location
8/6/2007	Vehicular Accident	Commercial truck overturned blocking 2 EB lanes and 1 west-bound (WB) lane of PA Turnpike causing second vehicle accident on WB lanes. Confirmed 1 gal of diesel spilled; unconfirmed amount approx 29 gal spilled.	Taylor Township
8/9/2007	Vehicular Accident	Milk truck overturned; 4000 gal load spilled.	Bethel Township
9/13/2007	Vehicular Accident	T/T swerved into closed lane of construction striking occupied T/T (construction equipment)	Taylor Township
9/23/2007	Vehicular Accident	Single vehicle accident involving jersey barrier, resulting in multiple rolls and extensive injuries.	Brush Creek Township
10/30/2007	Vehicular Accident	Multi T/T accident, entrapment, blocking EB/WB left lanes of PA Turnpike. Approx 85-160 gal of diesel fuel spilled.	Brush Creek Township
11/22/2007	Vehicular Accident	Vehicle struck utility pole; downed wires and pole. Incident involved entrapment.	Todd Township/ McConnellsburg
11/29/2007	Vehicular Accident	T/T struck center median resulting in two injuries. FedEx truck ruptured saddle tanks when it drove through accident. Damage to reefer portion of T/T carrying frozen beef. USDA contacted.	Dublin Township
1/17/2008	Vehicular Accident	Automobile/school bus accident resulting in overturned school bus.	Thompson Township
1/17/2008	Vehicular Accident	Automobile/smaller-sized school bus accident resulting in overturned school bus. Ambulance swerved off road while responding.	Ayr Township/ McConnellsburg
5/22/2008	Vehicular Accident	Driving under influence (DUI) resulting in vehicle striking Pennsylvania State Police (PSP) car.	Dublin Township
8/18/2008	Vehicular Accident	T/T overturned on ramp entering Plaza. Produce load spill; no major incidents. EB ramp closure.	Taylor Township
11/2/2008	Vehicular Accident	Overturned vehicle in EB lane of PA Turnpike.	Dublin Township
11/17/2008	Vehicular Accident	T/T struck deer resulting in unknown quantity diesel fuel spill.	Taylor Township
11/25/2008	Vehicular Accident	Multi-vehicle accident (MVA) (molasses tanker and pick-up truck) with approx 140 gal of diesel fuel spilled.	Ayr Township
5/28/2009	Vehicular Accident	Hustontown Fire Company tanker involved in accident while responding to call.	Taylor Township
7/26/2013	Vehicular Accident	Tractor Trailer Fire on I-70W	Not listed
10/15/2013	Road Closure	Road Closure on I-70W. Details not provided.	Bethel Township
12/1/2013	Road Closure	Road Closure on I-70E. Details not provided.	Brush Creek Township
3/23/2014	Vehicular Accident	Vehicular Crash on I-70MD	Not listed
7/23/2014	Road Closure	Road Closure on I-70W. Details not provided.	Brush Creek Township
8/10/2014	Road Closure	Road Closure on US-30. Details not provided.	Todd Township
10/21/2014	Partial Road Closure	Partial Road Closure on I-70E. Details not provided.	Union Township

Source: Knowledge Center report (incidents from 2013 to 2014); NTSB; Fulton County HMP 2010 (incidents from 2004-2009)

4.3.11.4 Future Occurrence

Transportation hazards are impossible to predict accurately; however, areas prone to these hazards can be located, quantified through analysis of historical records, and plotted on county-wide and municipality base maps. Certain characteristics that together cause these hazards or increase vulnerability to these hazards can be identified, and areas that may be prone are identifiable.

Assuming that transportation accidents are as likely to occur in the future as they have occurred in the past, and based on the available data, Fulton County can expect the following each year:

- Approximately 295 major vehicle accidents. (The actual number of vehicle accidents in Fulton County may be much higher; however, this figure is based on vehicle accidents captured from PennDOT.)
- Zero aircraft incidents
- Zero railroad incidents

Based on the Risk Factor Methodology Probability Criteria, the probability of a transportation accident in the categories listed above is considered to be *highly likely* (see Table 4.4-1).

4.3.11.5 Vulnerability Assessment

The entire County has been identified as the hazard area for transportation accidents. The following text evaluates and estimates potential impacts of transportation hazards on Fulton County, including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impacts, including those on life, safety, and health; general building stock; critical facilities; the economy; and future growth and development
- Further data collections that will assist in understanding this hazard over time.

4.3.11.5.1 Overview of Vulnerability

Transportation systems available in the County rely on use of its roadways. Hazards associated with transportation can be natural hazards that affect the roadway, the material being transported, or hazards pertaining to the transportation medium itself.

Multiple major roadways (interstates and other major highways) within the County are used by residents and commuters, and these are means for transporting all types of materials, including HAZMAT. A major accident on any of these major roadways is possible and could affect the County minimally to severely.

4.3.11.5.2 Data and Methodology

Regarding this hazard, data were obtained from the County, local officials, and federal data sources. In addition, the Planning Committee has identified roadways within the County that are vulnerable to other natural hazards (flood).

4.3.11.5.3 Impact on Life, Health, and Safety

Transportation hazards could lead to potential losses in categories of human health and life, property, and natural resources. Vehicular accidents, flooded roadways, and other roadway impairments may result in injury or death to drivers and passengers on the road, the public in the immediate vicinity, and emergency services personnel. The number of people exposed depends on population density, whether exposure occurs during day or night, and proportions of the population located indoors and outdoors.

The County and its municipalities are prepared to manage and respond to transportation hazards.

4.3.11.5.4 Impact on General Building Stock, Critical Facilities, Economy and Future Development

Because of insufficient data, a full loss estimate was not completed for the transportation hazard. Loss of roadway use and public transportation services would affect thousands of commuters, employment, day-to-day operations within the County, and delivery of critical municipal and emergency services. Disruption of one or more of these modes of transportation can lead to congestion of another, and affect both the County and the region as a whole. As discussed in Section 2.4, areas targeted for future growth and development have been identified across the County. Increased development in the County and region will lead to increased road traffic.

4.3.11.5.5 Additional Data and Next Steps

Based on limited data regarding the probability and potential impact of this hazard, a quantitative loss estimate was not completed for this HMP. Over time, the County can work with appropriate agencies to collect additional data to support mitigation planning, consideration of potential risks, and prioritization of mitigation measures for this hazard.

It is recognized that the County must compile and maintain data regarding specific concerns and past losses from this hazard. These data should include specific information regarding damage or loss of life, property, or infrastructure; and any data pertaining to potential or actual cost and logistics of responding to an event caused by this hazard (locations of road closures, map detours, traffic counts, durations of closures and detours; and costs to respond). These data will be included in future revisions of the HMP, and can be used to support future mitigation grant efforts (benefit cost analysis).

Studying traffic and potential transportation accident patterns could provide information on vulnerability of specific road segments and nearby populations. Increased understanding of the types of HAZMAT transported through the Planning Area will also support mitigation efforts. Maintaining a record of these frequently transported materials can facilitate development of preparatory measures to respond to a release. Predicting costs to respond to a release, remediate the environment, or repair damaged infrastructure would be useful for developing mitigation options.

4.3.12 Wildfire

This section provides a profile of and vulnerability assessment for the wildfire hazard. A wildfire is an uncontrolled fire spreading 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. A wildland fire is a wildfire in an area where development is essentially nonexistent, except for roads, railroads, power lines, and similar facilities. A wildland-urban interface (WUI) fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

Wildfires can occur at any time of the year, but are most likely in Fulton County during a drought, and can occur in fields, grass, and brush as well as in the forest itself. Under dry conditions or drought, wildfires have the potential to burn forests as well as croplands. Any small fire in a wooded area, if not quickly detected and suppressed, has the potential to burn 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.

4.3.12.1 Location and Extent

According to 2011 land use/land cover data, almost 7 percent of the land in the County is developed, greater than 70 percent is forested, and almost 5 percent is agricultural (Agricultural and Rangeland) (Table 4.3.12-1) (U.S. Geological Survey [USGS] 2011). As shown in Figure 4.3.12-1, developed areas are located adjacent to forests and farmlands. Both vegetation and structures serve as fuel for wildfire events.

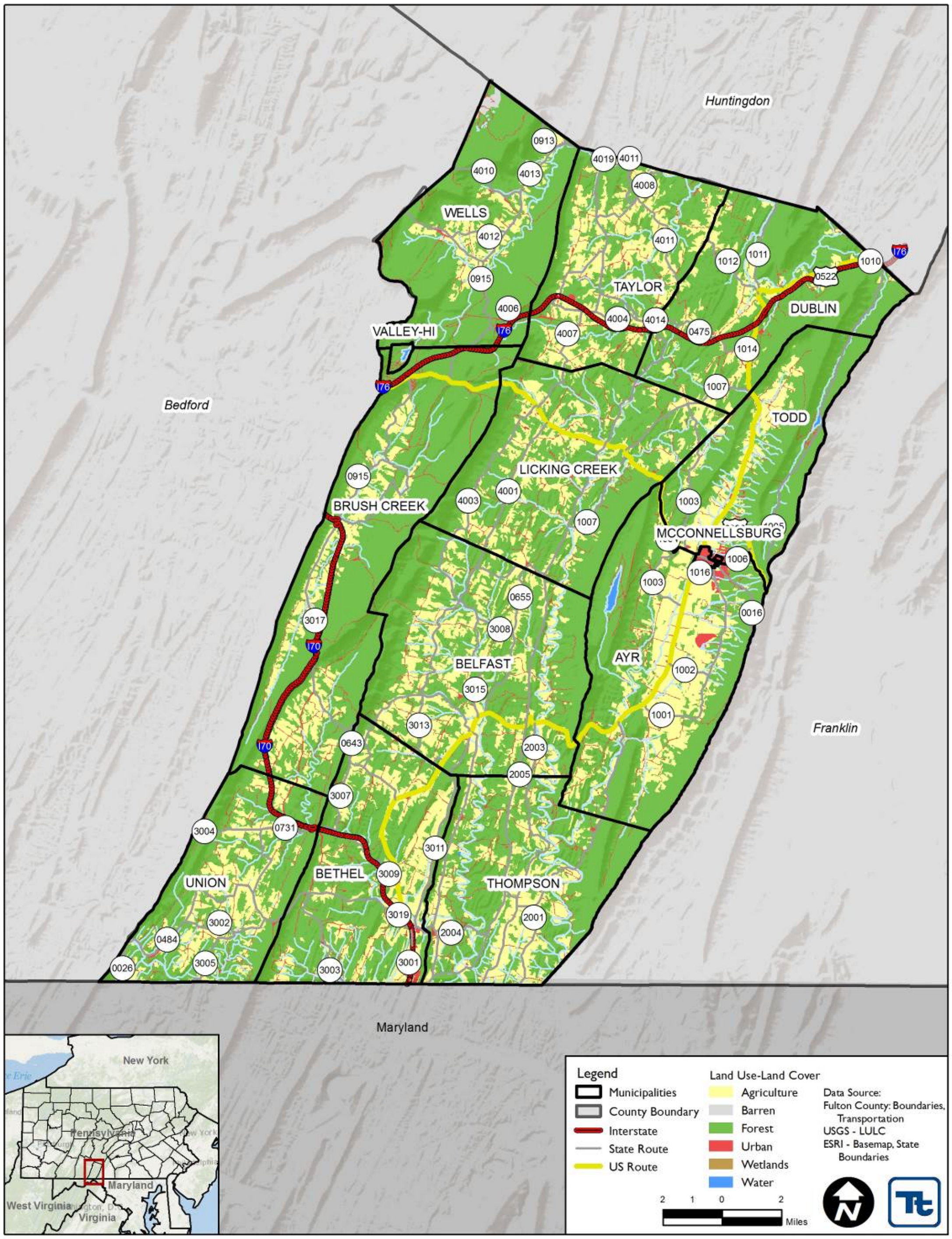
Table 4.3.12-1. Land Use Summary for Fulton County

Land Use Category	Total Area (square miles)	Percent of Total
Agricultural	20.7	4.7%
Barren Land	0.4	0.1%
Forest	307.6	70.2%
Rangeland	78.1	17.8%
Urban Built Up	30.3	6.9%
Water	0.79	0.2%
Wetland	0.04	0.01%
Total	**438.02**	**100%**

Source: USGS 2011

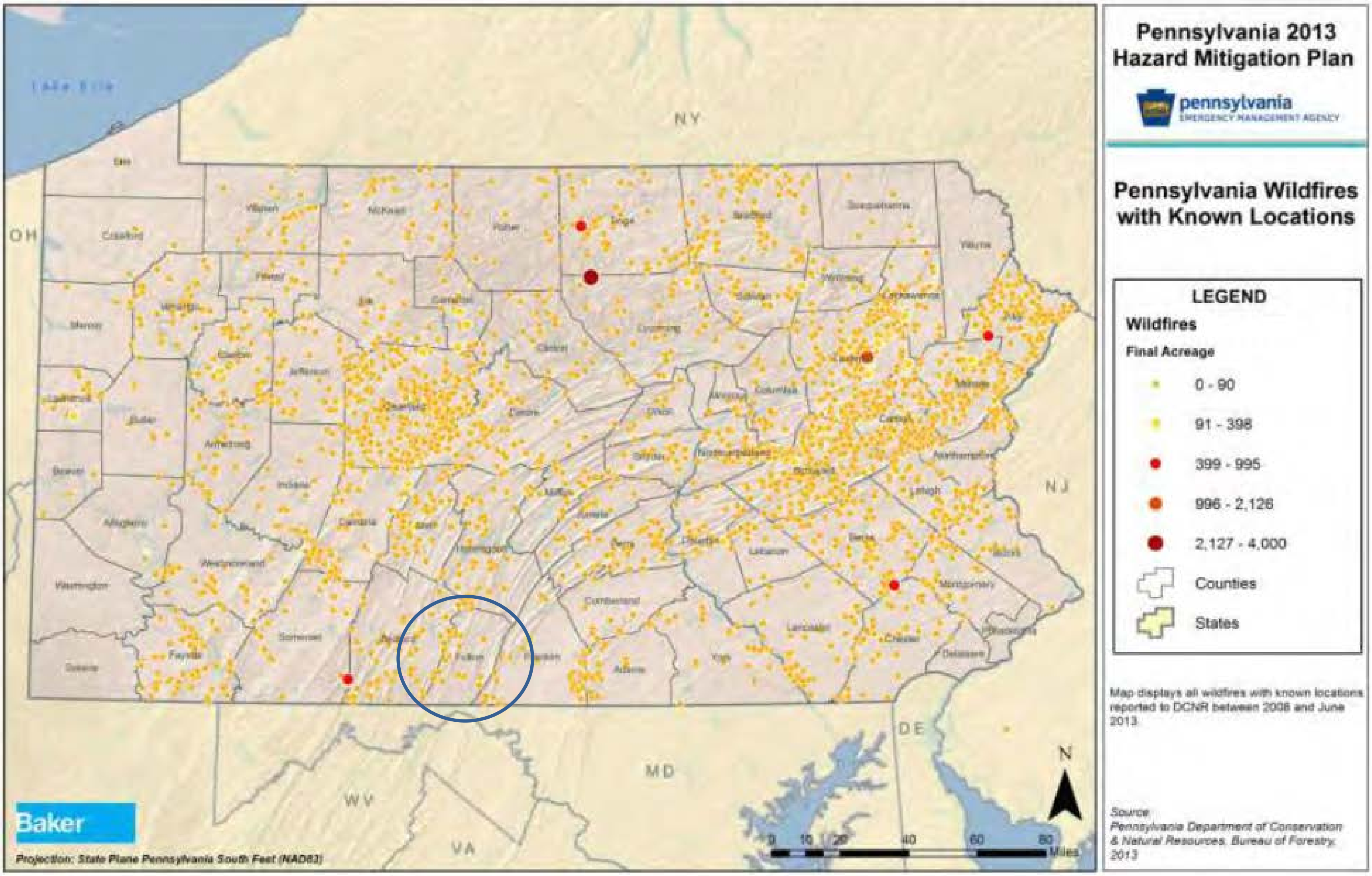
Figure 4.3.12-2 shows the locations of wildfires throughout Pennsylvania that the Pennsylvania Department of Conversation and Natural Resources (PA DCNR), Bureau of Forestry (BOF) responded to from 2002 to June 2013. Wildfires are known to be an underreported event. Many wildfires occur every year and are suppressed by volunteer fire departments without any response or assistance from BOF. Therefore, these locally controlled blazes may not be represented in BOF records.

Figure 4.3.12-1. Land Cover in Fulton County



Source: USGS – National Land Cover Database (NLCD) 2011

Figure 4.3.12-2. Location of Wildfire Events responded to by BOF from 2002-2013



Source: PEMA 2013
Note: Blue circle was added to highlight Fulton County's location within Pennsylvania.

Several tools are available to estimate fire potential location and extent, including (but not limited to) the Wildland/Urban Interface, Wildland Fire Assessment System and PA DCNR Priority Landscape Analysis. These tools are discussed in further detail below.

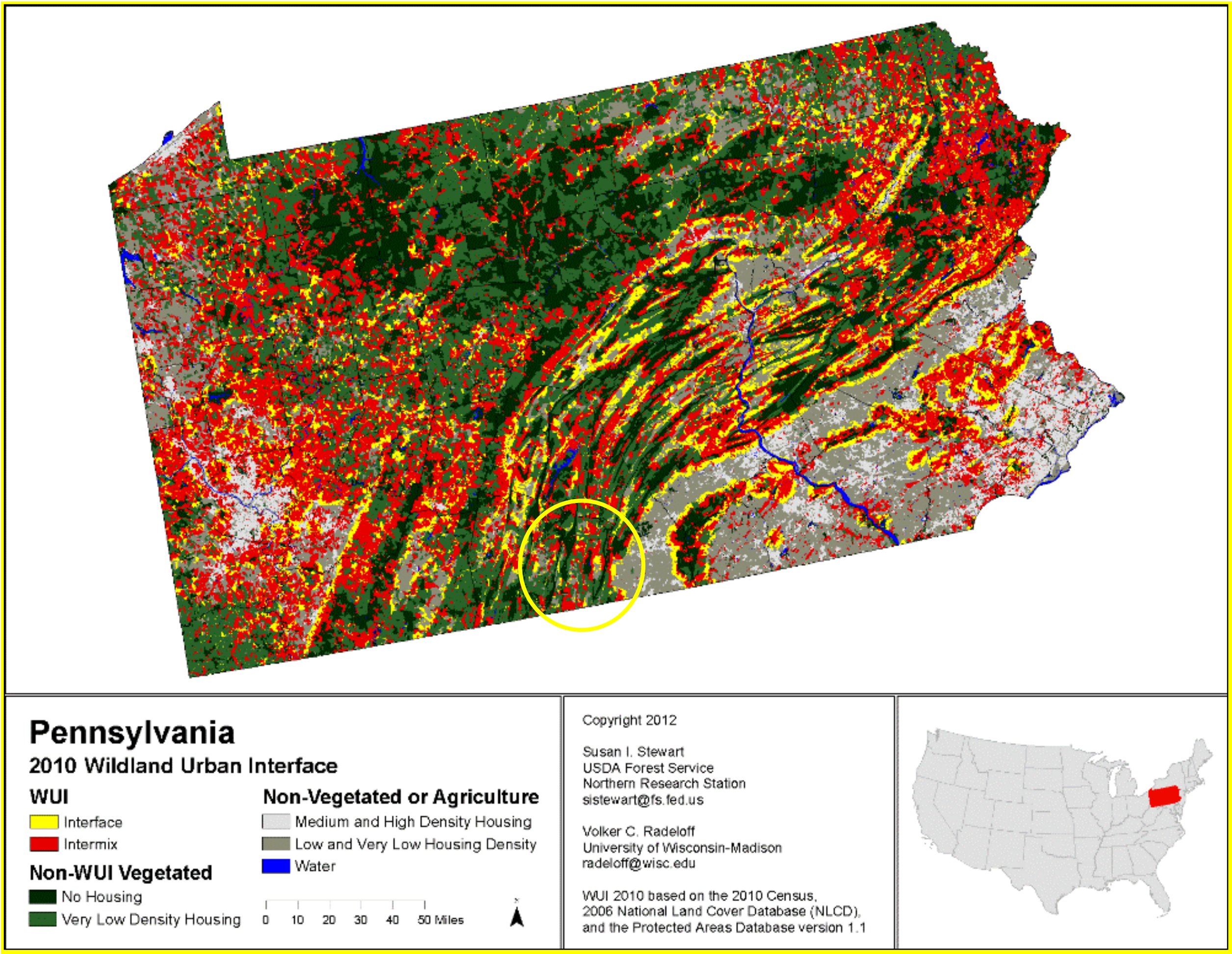
Wildland/Urban Interface (WUI)

The WUI is the area where houses and wildland vegetation coincide. The WUI is divided into two categories: intermix and interface. Intermix WUI are areas where housing and vegetation "intermingle." Intermix areas have more than one house per 40 acres and have more than 50 percent vegetation. Interface WUI are areas with housing in the vicinity of contiguous wildland vegetation. Interface areas have more than one house per 40 acres, have less than 50 percent vegetation, and are within 1.5 miles of an area larger than 1,235 acres that is more than 75 percent vegetated (University of Wisconsin Date Unknown).

The California Fire Alliance determined that areas within 1.5 miles of wildland vegetation are the approximate distance that firebrands can be carried from a wildland fire to the roof of a house. Therefore, even structures not located within the forest are at risk from wildfire. This buffer distance, along with housing density and vegetation type, were used to define the WUI (University of Wisconsin Date Unknown).

Concentrations of WUI can be seen along the east coast of the United States including the area around Pittsburgh, Pennsylvania, and the eastern half of Pennsylvania. Fulton County is identified as having many areas of very low-density housing or no housing due to the large amount of forested area. Areas where recreation and tourism dominate are also places where WUI is common (Stewart and others 2004). Figure 4.3.12-3 depicts the WUI for Pennsylvania in 2010, and Figure 4.3.12-4 illustrates the WUI for Fulton County. Concentrations of WUI areas greater than 50 percent are classified as WUI (intermix or interface) in the County.

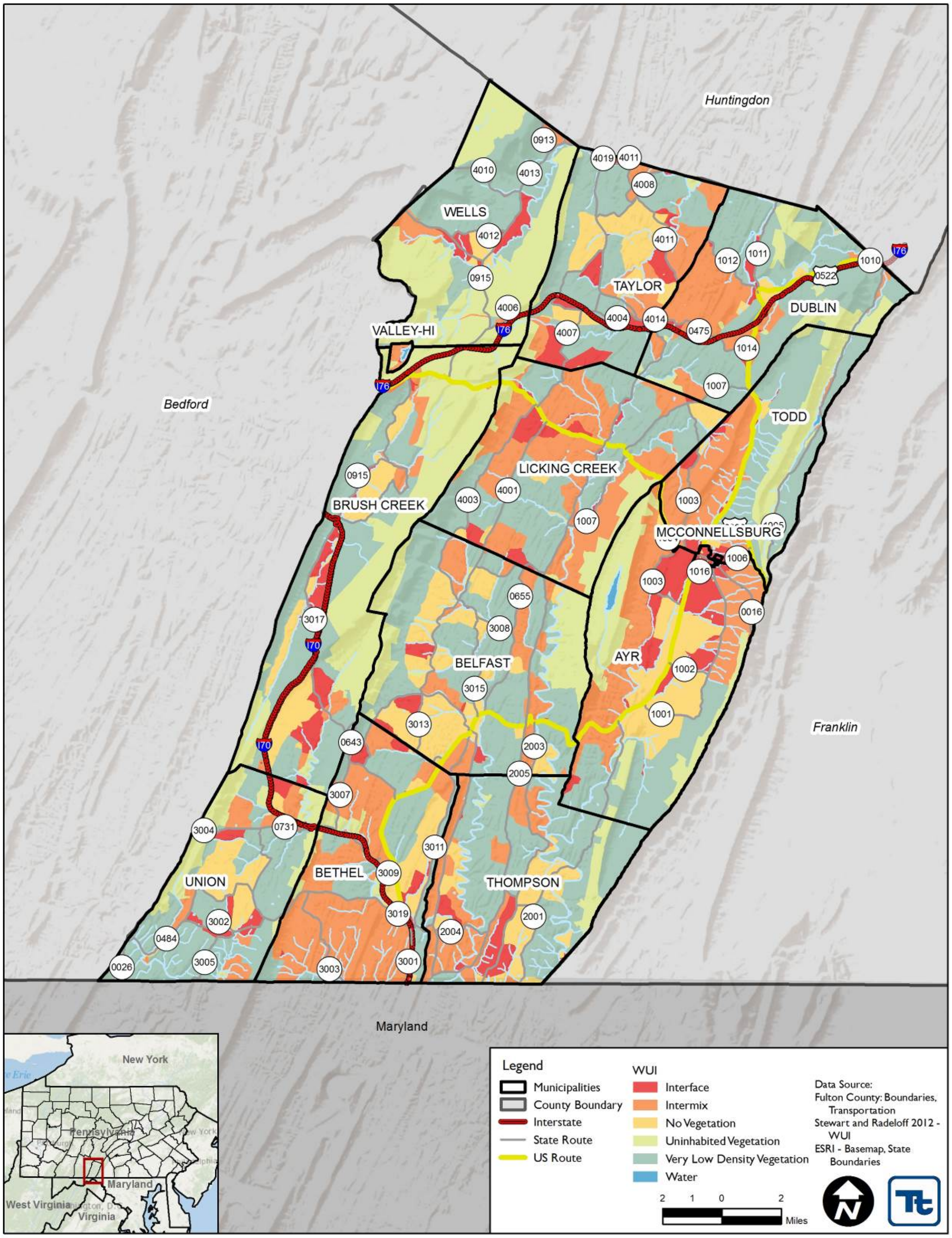
Figure 4.3.12-3. 2010 WUI for Pennsylvania



Source: Stewart 2012

Note: Yellow circle highlights Fulton County's location within Pennsylvania.

Figure 4.3.12-4. WUI for Fulton County



Source: Stewart and Radeloff 2012

Wildland Fire Assessment System (WFAS)

The Wildland Fire Assessment System (WFAS) is an Internet-based information system maintained at the National Interagency Fire Center (NIFC) in Boise, Idaho, that provides a national view of weather and fire potential, including national fires danger, weather maps and satellite-derived "Greenness" maps (U.S. Forestry Service [USFS] 2007). Each day during the fire season, national maps of selected fire weather and fire danger components of the National Fire Danger Rating System (NFDRS) are produced by the WFAS (WFAS 2012). The Fire Danger Rating level, described in Table 4.3.12-2 below, takes into account current and antecedent weather, fuel types, and both live and dead fuel moisture. The adjective class rating is a method of normalizing rating classes across different fuel models, indexes, and station locations. It is based primarily on a fuel model cataloged for the station, the fire danger index selected to reflect staffing levels, and climatological class breakpoints. Local station managers provide this information to USFS (USFS 2012).

Table 4.3.12-1. Fire Danger Rating and Color Code

Fire Danger Rating and Color Code	Description
Low (L) (Dark Green)	Fuels do not ignite readily from small firebrands, although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering and burning in irregular fingers. There is little danger of spotting.
Moderate (M) (Light Green or Blue)	Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
High (H) (Yellow)	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly, and short-distance spotting is common. High-intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while they are small.
Very High (VH) (Orange)	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.
Extreme (E) (Red)	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash (trunks, branches, and tree tops) or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks until the weather changes or the fuel supply lessens.

Source: USFS 2012

Pennsylvania Department of Conservation and Natural Resources (PA DCNR) Priority Landscape Analysis

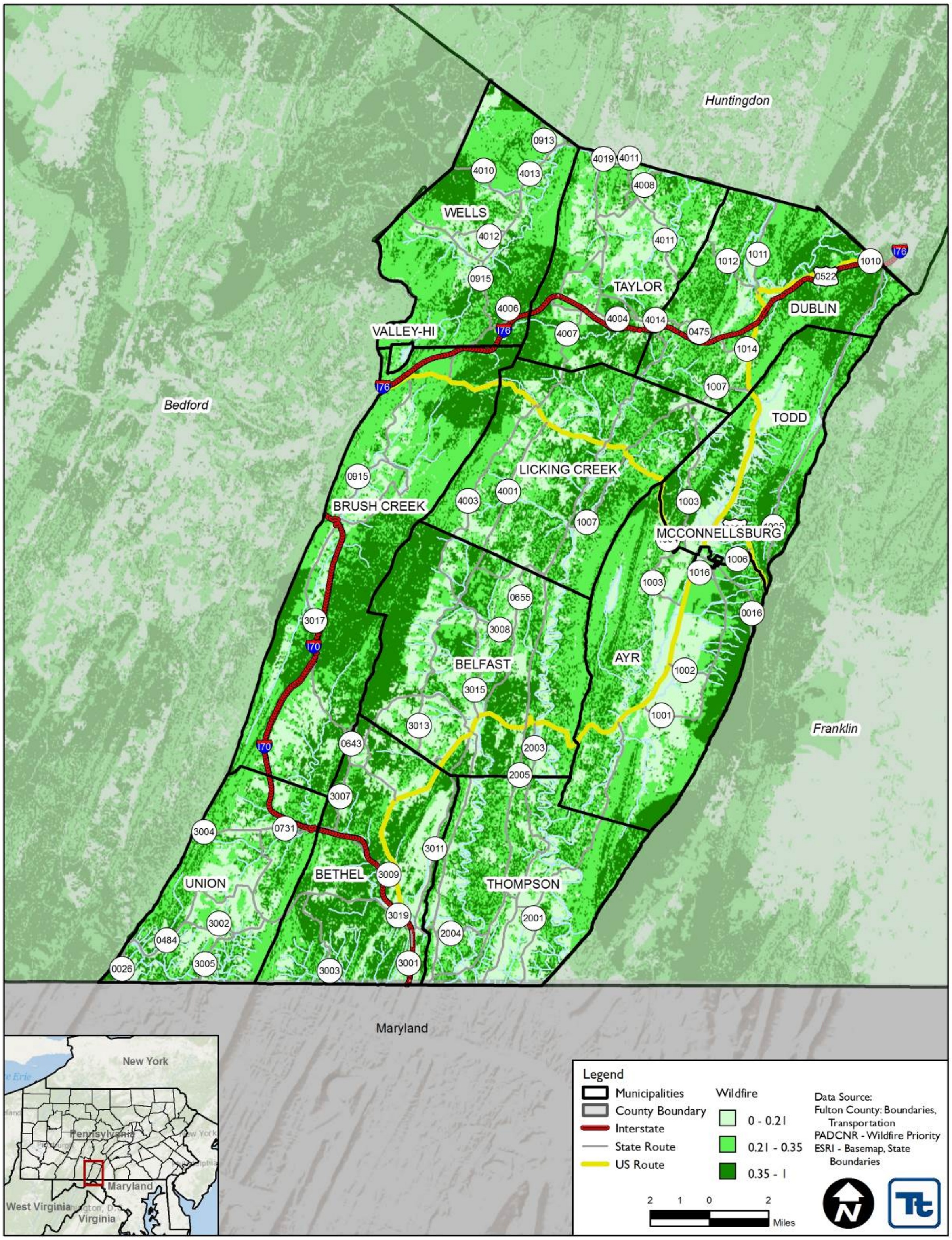
The PA DCNR conducted a wildfire priority landscape analysis identifying areas where wildland fires are predicted to occur and become problematic. The areas are classified into high, medium, and low categories. The high classification is defined as an area prone to extreme fire behavior, with the potential to cause extensive property damage, or that could threaten the safety of the Commonwealth's citizens. The following five datasets were used for this analysis:

- 2002 WUI
- 2006 LANDFIRE
- 2002 – 2008 Pennsylvania Wildfire Point Origin Occurrences
- Percent Slope
- 2009 Local Assessment of Values, Risks, Hazards.

The WUI classifies areas where homes and other human development meet or intermingle with undeveloped land. LANDFIRE characterizes the land's vegetation into fuel models that predict various fire behavior intensities. The Pennsylvania wildfire Point Origin Occurrences are records of wildland fire origins that have been reported. Percent slope aids in predicting fire behavior from the terrain. The local assessment of values, risks, and hazards is a municipality-based rating system; this assessment has been made by local wildland fire managers (PA DCNR Date Unknown). Figure 4.3.12-5 illustrates the output for the wildfire priority landscapes model for Fulton County.

The greatest potential for wildfires is in the spring months of March, April, and May, and the autumn months of October and November. These months generally bring clear skies, high winds, low relative humidity, and prolonged periods of dry weather. In the spring, bare trees allow sunlight to reach the forest floor, drying fallen leaves and other ground debris. The same theory applies for the fall; however, the drier conditions are a more crucial factor. People cause most wildfires in Pennsylvania, often by burning debris. Several fires have started in a person's backyard and traveled through dead grasses and weeds into bordering woodlands. According to the Pennsylvania Emergency Management Agency (PEMA) Standard All-Hazard Mitigation Plan, 92 percent of Pennsylvania wildfires burn less than 10 acres and are suppressed within the first burning period (PEMA 2013).

Figure 4.3.12-5. Wildfire Priority Landscapes in Fulton County



Source: PA DCNR Date Unknown

Notes: Low Priority = 0–0.21 (light green); Medium Priority = 0.21–0.35 (medium green); High Priority = 0.35–1 (dark green)

4.3.12.2 Range of Magnitude

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

The largest wildfire in Pennsylvania in recent years burned 10,000 acres in the north-central area of the Commonwealth. This fire was controlled within 1 week. It destroyed five cabins, but there was no loss of life. Several other fires have burned more than 2,000 acres each and again have been controlled within 1 week of the reported start.

Few reported wildfires in Fulton County have burned over 1 acre; most are confined to a smaller area. Because Fulton County's land use is mostly forest or agricultural, very little property damage has occurred due to these fires. The worst wildfire to occur within the County burned 17 acres; data on property damage, injuries, or deaths caused by the fire was not available. The County recognizes that wildfires will continue to occur in Fulton County, and will have more devastating effects as development in or around wildlands increases.

The worst-case scenario for Fulton County is a multiple-acre fire occurring during a period of drought, which could cause the fire to spread rapidly. Severe property damage could occur because much of the County is characterized by a wildland-urban interface.

4.3.12.3 Past Occurrence

In 2013, a total of 632 wildfire incidents (totalingd 1,785 acres burned) across the State were reported to PA DCNR, Bureau of Forestry. The majority of Pennsylvania wildfire incidents in 2013 were due to debris burning (279 incidents), incendiary (155 incidents), or miscellaneous causes (60 incidents). The least number of wildfires were caused by lightning (4 incidents) and smoking (6 incidents), followed by children (15 incidents) and railroad (25 incidents).

The 2013 Pennsylvania Hazard Mitigation Plan (HMP) notes that 18 reported wildfires burned 10.16 acres in Fulton County between 2002 and 2013 (PEMA 2013). Table 4.3.12-3 lists all wildfires recorded by the PA DCNR from 2002 through 2008. No wildfires were recorded in local records or in the National Climatic Data Center (NCDC) Storm Events Database.

Table 4.3.12-2. Reported Wildfires in Fulton County

Date	Location	Cause	Impacts/ Acres Burned
2/13/2002	Brush Creek Twp	Miscellaneous	1.5
3/31/2002	Thompson Twp	Incendiary	1.5
4/18/2002	Ayr Twp	Lightning	0.1
4/19/2002	Belfast Twp	Lightning	2.2

Date	Location	Cause	Impacts/ Acres Burned
4/19/2002	Bethel Twp	Lightning	0.4
5/3/2002	Thompson Twp	Incendiary	0.1
7/23/2002	Todd Twp	Lightning	< 0.1
7/24/2002	Belfast Twp	Lightning	< 0.1
8/14/2002	Taylor Twp	Lightning	< 0.1
4/25/2003	Licking Creek Twp	Debris Burning	0.5
12/3/2003	Wells Twp	Incendiary	0.1
4/7/2004	Todd Twp	Debris Burning	17
11/9/2004	Dublin Twp	Debris Burning	0.2
11/11/2004	Brush Creek Twp	Equipment Use	0.9
4/15/2005	Bethel Twp	Miscellaneous	0.2
4/18/2005	Brush Creek Twp	Incendiary	0.2
4/26/2005	Brush Creek Twp	Debris Burning	0.9
11/7/2005	Belfast Twp	Miscellaneous	1
2/25/2006	Brush Creek Twp	Debris Burning	1.6
3/7/2006	Taylor Twp	Debris Burning	4
3/24/2006	Brush Creek Twp	False Alarm	< 0.1
4/2/2006	Brush Creek Twp	Camp Fire	0.1
4/2/2006	Brush Creek Twp	Incendiary	0.1
12/18/2006	Thompson Twp	Incendiary	1.8

Date	Location	Cause	Impacts/ Acres Burned
4/2/2007	Brush Creek Twp	Miscellaneous	0.3
4/23/2007	Licking Creek Twp	Equipment Use	1.4
6/12/2007	Dublin Twp	Lightning	1
8/16/2007	Dublin Twp	Lightning	< 0.1
10/13/2007	Licking Creek Twp	Miscellaneous	0.1
3/26/2008	Brush Creek Twp	Equipment Use	2
4/2/2008	Wells Twp	Debris Burning	0.8
10/5/2008	Wells Twp	Equipment Use	0.1
10/24/2008	Belfast Twp	Incendiary	0.4

Source: PEMA 2010, PA DCNR 2014
Notes:
Twp Township

4.3.12.4 Future Occurrence

Wildfire experts say that demographic trends in the northeast United States are contributing to increased wildfire risks. Recent census data show more homes being built in rural areas closer to wildland areas. Forested areas are cleared for housing, and fuels in the form of logging slash and understory vegetation remain in proximity to new residences, increasing the potential for wildfires. This trend, along with changing weather patterns and increasingly hot, dry periods throughout the United States, increases wildfire risk in many communities.

Wildfires are likely to affect Fulton County every year. However, the likelihood that one of those fires would attain significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response. Weather conditions, particularly drought, increase the likelihood that wildfires will occur. Based on reported occurrences from the most recent years on record, the County can expect approximately three wildfires each year. The future occurrence of wildfires can therefore be considered *likely* as defined by the Risk Factor Methodology probability criteria (Section 4.4).

It is important to note that 98 percent of wildfires in Pennsylvania are human caused (PEMA 2013). Thus, there is rationale for including this hazard under the summary of human-made hazards. Nonetheless, the critical inference to draw from this statistic is the fact that 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.

4.3.12.5 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed and vulnerable in the identified hazard area. The following text evaluates and estimates the potential impact of the wildfire hazard on the County, including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on (1) life, health and safety; (2) general building stock; (3) critical facilities; (4) economy; and (5) future growth and development
- Effects of climate change on vulnerability
- Further data collections that will assist understanding this hazard over time.

4.3.12.5.1 Overview of Vulnerability

Wildfire hazards can impact significant areas of land, as evidenced by wildfires throughout the United States in recent years. Fire in urban areas has the potential for great damage to infrastructure, loss of life, and strain on lifelines and emergency responders because of the high density of population and structures that can be affected in these areas. Wildfire, however, can spread quickly, become a huge fire complex consisting of thousands of acres, and present greater challenges for allocating resources, defending isolated structures, and coordinating multi-jurisdictional response.

4.3.12.5.2 Data and Methodology

Information regarding the wildfire hazard included input and data from PA DCNR, the University of Wisconsin-Madison, and the Steering Committee. The WUI (interface and intermix) obtained through the SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin-Madison, defines the wildfire hazard area. The asset data (population, building stock, and critical facilities) presented in the County Profile (Section 2) was used to support an evaluation of assets exposed and the potential impacts and losses associated with this hazard. Available and appropriate geographic information system (GIS) data were overlaid on the hazard area to identify what assets are exposed to wildfire. The limitations of this analysis are recognized, and as such the analysis is used only to provide a general estimate.

4.3.12.5.3 Impact on Life, Health, and Safety

As demonstrated by historical wildfire events, potential losses include human health and life of residents and responders. The most vulnerable populations include emergency responders and those within a short distance of the interface between the built environment and the wildland environment.

The County land within the WUI data was overlaid on the 2010 Census population data to estimate the Fulton County population vulnerable to the wildfire hazard (U.S. Census 2010). The census blocks with their center within the hazard area were used to calculate the estimated population exposed to the wildfire hazard. Table 4.3.12-4 summarizes the estimated population exposed by municipality.

Table 4.3.12-3. Estimated Population Located within the WUI in Fulton County

Municipality	U.S. Census 2010 Population	Estimated Population Exposed	Percent of Total
Ayr, Township of	1,942	1,457	75%
Belfast, Township of	1,448	483	33.4%
Bethel, Township of	1,508	1,023	67.8%
Brush Creek, Township of	819	396	48.4%
Dublin, Township of	1,264	947	74.9%
Licking Creek, Township of	1,703	1,259	73.9%
McConnellsburg, Borough of	1,220	1,220	100%
Taylor, Township of	1,118	610	54.6%
Thompson, Township of	1,098	558	50.8%
Todd, Township of	1,527	1,335	87.4%
Union, Township of	706	306	43.3%
Valley-Hi, Borough of	15	15	100%
Wells, Township of	477	232	48.6%
Fulton County (Total)	**14,845**	**9,841**	**66.3%**

Source: U.S. Census 2010
Notes:
WUI Wildland-Urban Interface

4.3.12.5.4 Impact on General Building Stock

The most vulnerable structures to wildfire events are those within the WUI. Buildings constructed of wood or vinyl siding are generally more likely to be damaged by the fire hazard than buildings constructed of brick or concrete. The WUI was overlaid on the default building inventory in Hazards U.S. – Multi-Hazard (HAZUS-MH) to estimate the replacement cost of buildings and on the County provided spatial layer of buildings to estimate number of structures exposed to the wildfire hazard in Fulton County. The replacement cost value (RCV) of the census blocks with their center in the WUI was totaled. Table 4.3.12-5 summarizes the estimated building stock inventory exposed by municipality.

Table 4.3.12-4. Building Stock Replacement Value and Structures Located within the WUI in Fulton County

Municipality	Total GBS RCV	Estimated GBS RCV Exposed	Percent of Total	Total Number of Structures	Number of Structures in Hazard Area	Percent of Total
Ayr, Township of	$195,220,000	$138,075,000	70.7%	1,091	869	79.7%
Belfast, Township of	$131,145,000	$31,720,000	24.2%	719	235	32.7%
Bethel, Township of	$137,141,000	$76,204,000	55.6%	831	556	66.9%
Brush Creek, Township of	$57,987,000	$20,925,000	36.1%	495	234	47.3%
Dublin, Township of	$120,662,000	$74,241,000	61.5%	712	500	70.2%
Licking Creek, Township of	$139,248,000	$98,992,000	71.1%	843	627	74.4%
McConnellsburg, Borough of	$187,274,000	$167,610,000	89.5%	534	513	96.1%
Taylor, Township of	$92,843,000	$54,584,000	58.8%	649	349	53.8%
Thompson, Township of	$81,390,000	$39,497,000	48.5%	554	270	48.7%
Todd, Township of	$214,635,000	$110,927,000	51.7%	847	661	78%
Union, Township of	$55,339,000	$20,818,000	37.6%	405	162	40%
Valley-Hi, Borough of	$3,339,000	$3,339,000	100%	29	28	96.6%
Wells, Township of	$38,725,000	$17,621,000	45.5%	286	152	53.1%
Fulton County (Total)	**$1,454,948,000**	**$854,553,000**	**58.7%**	**7,995**	**5,516**	69%

Source: HAZUS-MH v2.1; Stewart and Radeloff 2012; Fulton County 2014

Notes:

GBS General Building Stock
RCV Replacement cost value
WUI Wildland-Urban Interface

4.3.12.5.5 Impact on Critical Facilities

A number of critical facilities are located in the wildfire hazard area and are also vulnerable to the threat of wildfire. Many of these facilities are the locations for vulnerable populations (schools) and responding agencies to wildfire events (fire and police). Table 4.3.12-6 summarizes the number of critical facilities identified by the County plan participants that are located within the wildfire hazard area.

Table 4.3.12-5. Number of Critical Facilities in the WUI in Fulton County

Facility Type	Number of Facilities in Hazard Area	
	Interface	Intermix
Airport	1	0
Commercial	2	1
Communication	1	0
County Office	0	1
Dam	0	2
Electric Power	0	1
Electric Substation	2	2
Fire Station	2	1
Hazardous Material	4	5
Library	1	0
Medical Facility	1	0
Municipal Hall	1	4
Park	1	0
Police Station	1	0
Potable Treatment Facility	1	1
School	1	0
Senior Facility	1	1
Shelter	25	24
Wastewater Pump	2	3
Wastewater Treatment Facility	1	2

Source: Stewart and Radeloff 2012; Fulton County 2014
Notes:
WUI Wildland-Urban Interface

4.3.12.5.6 Impact on the Economy

Wildfire events can have major economic impacts on a community from the initial loss of structures and the subsequent loss of revenue from destroyed businesses and decreases in tourism. Wildfire can also severely damage roads and infrastructure. Portions of Interstates I-76 and I-70, US Routes US-522 and US-30, and State Route PA-16 run through WUI areas. This factor should be considered for determine evacuation routes for Fulton County residents.

4.3.12.5.7 Future Growth and Development

Areas targeted for potential future growth and development in the next 5 to 10 years have been identified across the County at the municipal level. It is anticipated that any new development and new residents in the WUI will be exposed to the wildfire hazard.

4.3.12.5.8 Effect of Climate Change on Vulnerability

According to USFS, climate change will likely alter the atmospheric patterns that affect fire weather. Changes in fire patterns will, in turn, affect carbon cycling, forest structure, and species composition. Climate change associated with elevated greenhouse gas concentrations may create an atmospheric and fuel environment that is more conducive to large, severe fires (USFS 2011).

Fire interacts with climate and vegetation (fuel) in predictable ways. Understanding the interactions of climate, fire, and vegetation interactions is essential for addressing issues associated with climate change that include:

- Effects on regional circulation and other atmospheric patterns that affect fire weather
- Effects of changing fire regimes on the carbon cycle, forest structure, and species composition, and
- Complications from land-use change, invasive species, and an increasing WUI (USFS 2011)

It is projected that higher summer temperatures will likely increase the high fire risk by 10 to 30-percent. Fire occurrence and area burned could increase across the United States as a result of the increase of lightning activity, the frequency of surface pressure and associated circulation patterns conducive to surface drying, and fire-weather conditions, in general, which are conducive to severe wildfires. Warmer temperatures will also increase the effects of drought and increase the number of days each year with flammable fuels and extending fire seasons and areas burned (USFS 2011).

Pennsylvania's Department of Environmental Protection (PADEP) was directed by the Climate Change Act (Act 70 of 2008) to initiate a study of the potential impacts of global climate change on the Commonwealth. The June 2009 Pennsylvania Climate Impact Assessment's main findings indicate Pennsylvania may be at increased risk for wildfires, but it is unclear how large the increase in risk will be (Shortle and others 2009).

Future changes in fire frequency and severity are difficult to predict. Global and regional climate changes associated with elevated greenhouse gas concentrations could alter large weather patterns, thereby affecting fire-weather conditions that are conducive to extreme fire behavior (USFS 2011).

4.3.12.5.9 Additional Data and Next Steps

As the data and resources become available, a custom building inventory can be generated to capture the construction of structures (such as roofing material, fire detection equipment, and structure age) to further refine the vulnerability analysis. As stated earlier, buildings constructed of wood or vinyl siding are generally more likely to be damaged by the fire hazard than buildings constructed of brick or concrete. The proximity of these building types to the WUI should be identified for further evaluation. Development and availability of these data would permit a more detailed estimate of potential vulnerabilities, including loss of life and potential structural damages.

In locations where homes are at risk for wildfires, the BOF's WUI Guidance Document is available to assist homeowners, community associations, local government, and developers to assess and mitigate the potential dangers of a wildfire. The guidance also provides information for developing an action plan in coordination with local emergency managers. Communities at risk for wildfires can adopt by local ordinance the "International Wildland-Urban Interface Code" of the Uniform Construction Code.

4.3.13 Winter Storm

This section provides a profile and vulnerability assessment for the winter storm hazard for Fulton County. Winter storms occur, on average, approximately five times each year in Pennsylvania. From November through March, the State is exposed to winter storms that move up the Atlantic coast or sweep in from the west. Every county in the Commonwealth is subject to severe winter storms; however, the northern tier, western counties, and mountainous regions tend to experience winter weather more frequently and with greater severity.

Winter storms have the potential to produce more damage than any other severe weather event, including tornadoes. Complications caused by winter storms have the potential to lead to road closures, especially secondary and farm roads; business losses to commercial centers built in outlying areas because of supply interruption and loss of customers; property losses and roof damages from snow and ice loading and fallen trees; utility interruptions; and loss of water supplies. Flooding can result from winter storm events as well.

Most severe winter storm hazards include heavy snow (snowstorms), blizzards, sleet or freezing rain, ice storms, and Nor'easters. Because most extra-tropical cyclones (mid-Atlantic cyclones locally known as Northeasters or Nor'easters) generally take place during the winter weather months, these hazards have also been grouped as a type of severe winter weather storm. Types of severe winter weather events or conditions are further defined below:

- Heavy Snow: According to the National Weather Service (NWS), heavy snow is generally considered to be snowfall accumulating to 4 inches or more in depth in 12 hours or less; or snowfall accumulating to 6 inches or more in depth in 24 hours or less. A snow squall is an intense but limited-duration period of moderate to heavy snowfall, also known as a snowstorm, accompanied by strong, gusty surface winds and possibly lightning (generally moderate to heavy snow showers) (NWS 2009). Snowstorms are complex phenomena involving heavy snow and winds, whose impact can be affected by a great many factors, including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, and occurrence during the course of the day, weekday versus weekend, and time of season (Kocin and Uccellini 2013).

- Blizzard: Blizzards are characterized by low temperatures, wind gusts of 35 miles per hour (mph) or more, and falling and/or blowing snow that reduces visibility to 0.25 mile or less for an extended period of time (3 or more hours) (NWS 2009). A severe blizzard is defined as having a wind velocity of 45 mph, temperatures of 10°F or lower, and a high density of blowing snow with visibility frequently measured in feet over an extended period of time.

- Sleet or Freezing Rain: Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen, partially-melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Freezing rain is rain that falls as a liquid but freezes into glaze upon contact with the ground. Both types of precipitation, even in small accumulations, can cause significant hazards to a community (NWS 2009).

- Ice storm: An ice storm is described as an occasion when damaging volumes of ice are expected to accumulate during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and means of communication. These accumulations of ice make walking and driving extremely dangerous, and can create extreme hazards to motorists and pedestrians (NWS 2009).

- Nor'easter (abbreviation for Northeaster): Nor'easters are named for the strong northeasterly winds that blow in from the Atlantic Ocean ahead of the storm and over coastal areas. They are also referred to as a type of extra-tropical cyclone (mid-latitude storms, or Great Lake storms). A Nor'easter is a macro-scale, extra-tropical storm whose winds come from the northeast, especially in the coastal areas of the northeastern United States and Atlantic Canada. Wind gusts associated with Nor'easters can exceed hurricane forces in intensity. Unlike tropical cyclones that form in the tropics and have warm cores (including tropical depressions, tropical storms, and hurricanes), Nor'easters contain a cold core of low barometric pressure that forms in the mid-latitudes. Their strongest winds are close to the earth's surface and often measure several hundred miles across. Nor'easters may occur at any time of the year but are more common during fall and winter months (September through April) (New York City Office of Emergency Management [NYCOEM] Date Unknown).

Nor'easters can cause heavy snow, rain, gale-force winds, and oversized waves (storm surge) that can cause beach erosion, coastal flooding, structural damage, power outages and unsafe human conditions. If a Nor'easter cyclone stays just offshore, the results are much more devastating than if the cyclone travels up the coast on an inland track. Nor'easters that stay inland are generally weaker and usually cause strong winds and rain. Those that stay offshore can bring heavy snow, blizzards, ice, strong winds, high waves, and severe beach erosion. In these storms, the warmer air is aloft. Precipitation falling from this warm air moves into the colder air at the surface, causing crippling sleet or freezing rain (McNoldy Multi-Community Environmental Storm Observatory [MESO] Date Unknown). While some of the most devastating effects of Nor'easters are experienced in coastal areas (e.g., beach erosion, coastal flooding), the effects on inland areas, like Fulton County, may include heavy snow, strong winds, and blizzards.

4.3.13.1 Location and Extent

Winter storms are regional events, with most events impacting a large area or the entire Commonwealth. In many cases, surrounding states and even the northeast region of the United States are affected by a single winter storm event.

The magnitude or severity of a severe winter storm depends on several factors including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, time of occurrence during the day (e.g., weekday versus weekend), and time of season.

The extent of a severe winter storm can be classified by meteorological measurements and by evaluating its societal impacts. National Oceanic and Atmospheric Administration (NOAA)'s National Climatic Data Center (NCDC) is currently producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two-thirds of the United States. The RSI ranks snowstorm impacts on a scale from 1 to 5. The index is based on the spatial extent of the storm, the amount of snowfall, and the interaction of the extent and snowfall totals with population (based on the 2000 U.S. Census). The NCDC has analyzed and assigned RSI values to over 500 storms since 1900 (NOAA-NCDC 2011). Table 4.3.13-1 presents the five RSI ranking categories.

All of Fulton County is susceptible to winter storms. Based on annual snowfall averages according to the 2013 State Hazard Mitigation Plan (HMP) (Figure 4.3.13-1), Fulton County would most likely experience an average of 30-40 inches for expected snowfall accumulation during the winter season.

Table 4.3.13-1. RSI Ranking Categories

Category	Description	RSI Value
1	Notable	1-3
2	Significant	3-6
3	Major	6-10
4	Crippling	10-18
5	Extreme	18.0+

Source: NOAA-NCDC 2011
Notes:
RSI Regional Snowfall Index

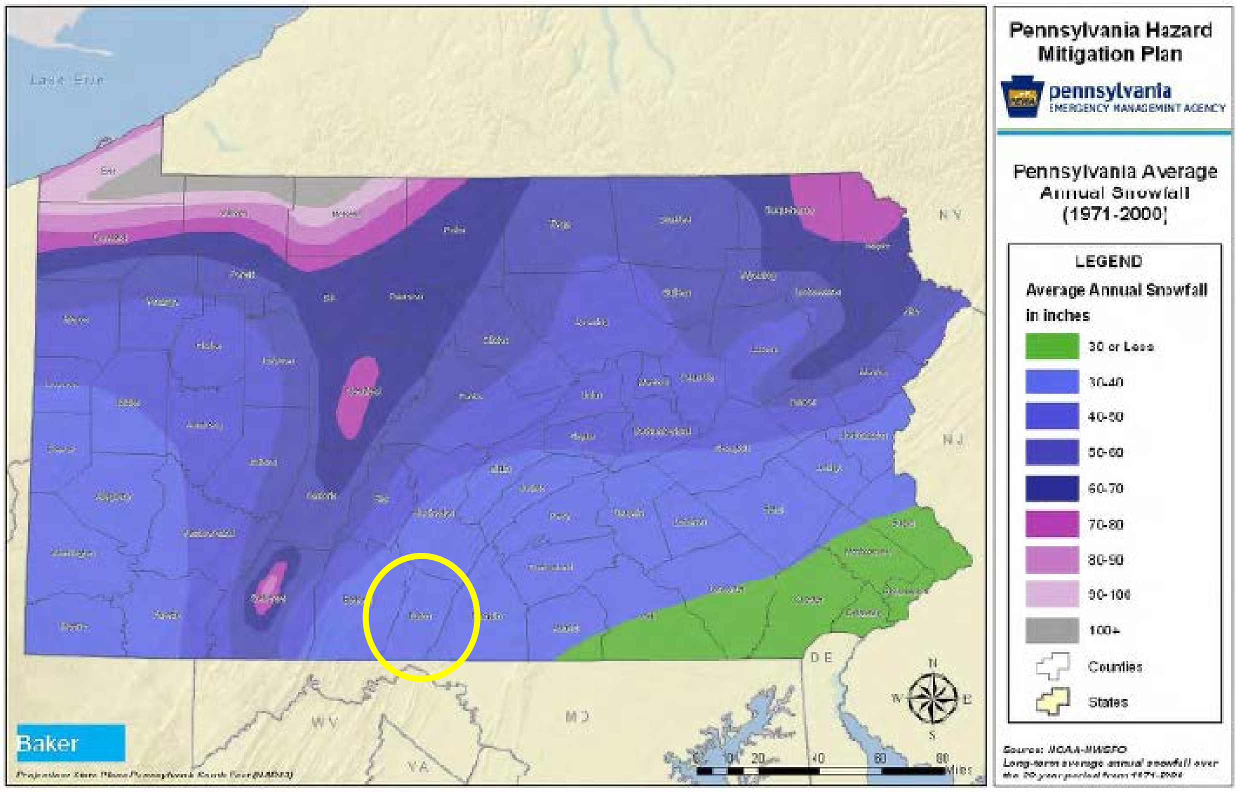
4.3.13.2 Range in Magnitude

A winter storm can adversely affect roadways, utilities, and businesses, and can cause loss of life, frostbite, and freezing conditions. These storms typically fall into one of the following categories, which have been defined in the previous section:

- Heavy snow
- Sleet or freezing rain
- Ice storm
- Blizzard
- Nor'easter

Fulton County typically receives 30-40 inches of snow each year, as shown in Figure 4.3.13-1. The worst winter storm to strike Fulton County occurred in January 1994. Specific snowfall totals for that storm were not available, but snowfall in the southwest portions of Pennsylvania exceeded 30 inches in 1 day. The Pennsylvania Turnpike (I-76) as well as I-70 (a major north-south highway in the County) were closed or shut down because of the snow. The storm brought with it strong winds and sleet/freezing rains. Numerous storm-related power outages were reported, and as many as 600,000 residents throughout Pennsylvania were without electricity, in some cases for several days at a time. The storm caused 185 injuries and approximately $5 million in damages across the State.

Figure 4.3.13-1. Annual Snowfall



Source: Pennsylvania Emergency Management Agency (PEMA) 2013
Note: The yellow oval has been added to highlight the location of Fulton County.

4.3.13.3 Past Occurrence

Many sources provided historical information regarding previous occurrences and losses associated with winter storm events throughout the Commonwealth of Pennsylvania and Fulton County. With so many sources reviewed for the purpose of this Plan, loss and impact information for many events could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this Plan. Monetary figures may also have been calculated for the region as a whole, based on entire storm damage, and include damage from other counties.

According to the NOAA-NCDC storm events database, Fulton County experienced 17 winter storm events between 1950 and August 31, 2014. No property damage, injuries, or fatalities were reported for any of these events.

Between 1954 and 2013, the Federal Emergency Management Agency (FEMA) declared that the Commonwealth of Pennsylvania experienced seven winter storm-related disasters (DR) or emergencies (EM) classified as one or a combination of the following disaster types: severe winter storms, snowstorms, blizzard, winter storm, severe storm, and snowfall. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. However, not all counties were included in the disaster declarations. Of those events, PEMA and other sources indicate that Fulton County has been declared as a disaster area as a result of four of the seven winter storm events (FEMA 2012). Additionally, the Pennsylvania disaster history list maintained by PEMA identifies that Fulton County was impacted by 10 of the 14 winter incidents listed.

Based on all sources researched, known winter storm events that have affected Fulton County (and resulted in injuries, fatalities, and/or damages) are identified in Table 4.3.13-2. Because winter storm documentation for the State of Pennsylvania is so extensive, not all sources have been identified or researched. Therefore, Table 4.3.13-2 may not include all events that have occurred throughout the County.

Table 4.3.13-2. Winter Storm Events in Fulton County, between 1950 and 2014

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
1/1966	Heavy Snow	N/A	Y	Governor William W. Scranton - Governor's Proclamation. Statewide.	PEMA 2010
1/1972	Heavy Snow	N/A	Y	Governor Milton J. Shapp - Governor's Proclamation. Statewide.	PEMA 2010
1/1978	Blizzard	N/A	Y	Governor Milton J. Shapp - Governor's Proclamation. All 67 Counties.	PEMA 2010
2/1978	Blizzard	N/A	Y	Governor Milton J. Shapp - Governor's Proclamation. All 67 Counties.	PEMA 2010
3/1993	Blizzard	N/A	Y	Governor Robert P. Casey - Governor's Proclamation & President's Declaration of Emergency. All 67 Counties.	PEMA 2010
3/13-17/1993	Severe Snow Fall and Winter Storm	EM-3105	Y	Eligible for Public Assistance	FEMA 1993
1/1994	Severe Winter Storms	N/A	Y	Governor Robert P. Casey - Governor's Proclamation & President's Declaration Of Major Disaster. All 67 Counties (Centre County also received SBA - EIDL)	PEMA 2010
1/1996	Severe Winter Storms	N/A	Y	Governor Tom Ridge - Governor's Proclamation & President's Declaration Of Major Disaster.	PEMA 2010
1/4/1994	Heavy Snow	N/A	N/A	185 injuries and $5 million in property damage. Statewide.	NCDC 2010
1/17/1994	Ice	N/A	N/A	$500,000 in property damage. Statewide.	NCDC 2010
1/24/1994	Ice	N/A	N/A	$50,000 in property damage and 62 injuries. Southern Pennsylvania; Central Pennsylvania	NCDC 2010

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
3/2/1994	Heavy Snow/Blizzard	N/A	N/A	$5 million in property damage and one injury. Statewide.	NCDC 2010
3/10/1994	Ice	N/A	N/A	$500,000 in property damage. Multiple counties.	NCDC 2010
1/4/1995	Heavy Snow	N/A	N/A	Western Pennsylvania.	NCDC 2010
1/7/1995	Ice	N/A	N/A	Western Pennsylvania.	NCDC 2010
11/14/1995	Winter Storm	N/A	N/A	Central Pennsylvania.	NCDC 2010
11/29/1995	Snow	N/A	N/A	Southern Pennsylvania.	NCDC 2010
12/19/1995	Winter Storm	N/A	N/A	Central Pennsylvania.	NCDC 2010
1/6-12/1996	Blizzard	DR-1085	Y	Eligible for Public Assistance	FEMA 2010
1/7/1996	Blizzard	N/A	N/A	On January 7, more than 2 feet of snow fell across much of the lower Susquehanna Valley with 12 to 18 inches falling across the central mountains from Johnstown and State College east to Wilkes-Barre. Parts of southern York County had in excess of 3 feet of new snow. The storm was appropriately termed the Blizzard of '96. Snow began falling during the morning of January 7 and continued into the early morning of January 8. Transportation and commerce came to a halt as the cities of south central Pennsylvania were buried under the heavy snow. New snow of 38 inches was reported in southern York County at Glenville. Two feet or more was reported near Harrisburg, Lancaster, Lebanon, and York. The storm had a major impact on commerce across south central Pennsylvania, and was to set the stage for the Great Flood on January 19. Details of the economic impact are included with the summary of the flood.	NCDC 2010

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
1/12/1996	Heavy Snow	N/A	N/A	Central Pennsylvania.	NCDC 2010
12/29/1997	Heavy Snow	N/A	N/A	Central Pennsylvania.	NCDC 2010
1/15/1998	Ice Storm	N/A	N/A	Bedford, Fulton, and Somerset Counties.	NCDC 2010
2/4/1998	Heavy Snow	N/A	N/A	Central Pennsylvania.	NCDC 2010
1/2/1999	Winter Storm	N/A	N/A	Regional impact.	NCDC 2010
1/8/1999	Winter Storm	N/A	N/A	Regional impact.	NCDC 2010
1/14/1999	Winter Storm	N/A	N/A	Regional impact.	NCDC 2010
3/14/1999	Heavy Snow	N/A	N/A	Central Pennsylvania.	NCDC 2010
1/30/2000	Heavy Snow	N/A	N/A	Central Pennsylvania.	NCDC 2010
2/18/2000	Winter Storm	N/A	N/A	Regional impact.	NCDC 2010
12/13/2000	Winter Storm	N/A	N/A	Regional impact.	NCDC 2010

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
3/4/2001	Heavy Snow.	N/A	N/A	$150,000 in property damage. Statewide.	NCDC 2010
1/6/2002	Heavy Snow	N/A	N/A	Central Pennsylvania.	NCDC 2010
10/29/2002	Ice Storm	N/A	N/A	$1 million in property damage. Multiple counties.	NCDC 2010
12/5/2002	Heavy Snow	N/A	N/A	Statewide.	NCDC 2010
12/10/2002	Ice Storm	N/A	N/A	Statewide.	NCDC 2010
12/25/2002	Heavy Snow	N/A	N/A	Statewide.	NCDC 2010
2/2003	Severe Winter Storm	N/A	Y	Governor's Proclamation of Disaster Emergency, Governor Edward G. Rendell; Pres-EM	PEMA 2003
2/14-19/2003	Snow Storm	EM-3180	Y	Eligible for Public Assistance	FEMA 2003
2/16/2003	Heavy Snow	N/A	N/A	Two injuries. Statewide.	NCDC 2010
12/5/2003	Heavy Snow	N/A	N/A	Central Pennsylvania.	NCDC 2010
1/25/2004	Heavy Snow	N/A	N/A	Southwest-Central Pennsylvania.	NCDC 2010

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
2/3/2004	Heavy Snow	N/A	N/A	Central Pennsylvania.	NCDC 2010
2/6/2004	Ice Storm	N/A	N/A	Central Pennsylvania.	NCDC 2010
2/24/2005	Heavy Snow	N/A	N/A	Central Pennsylvania.	NCDC 2010
12/9/2005	Heavy Snow	N/A	N/A	Central Pennsylvania.	NCDC 2010
12/16/2005	Winter Storm	N/A	N/A	Regional impact.	NCDC 2010
2/2007	Severe Winter Storm	N/A	Y	Governor Edward G. Rendell. All 67 counties - Requested to utilize all available resources and personnel as is deemed necessary to cope with the magnitude and severity of this emergency situation.	PEMA 2007
2/13/2007	Winter Storm	N/A	N/A	A major winter storm, the first of the season, struck central Pennsylvania from the early morning hours of February 13 through the afternoon hours of February 14, 2007. In Fulton County, a mix of sleet and freezing rain fell in addition to 6 to 7 inches of snow.	NCDC 2010
4/2007	Severe Winter Storm	N/A	Y	Governor Edward G. Rendell All 67 counties – Requested to utilize all available resources and personnel as is deemed necessary to cope with the magnitude and severity of this emergency situation.	PEMA 2010
2/1/2008	Winter Storm	N/A	N/A	Fulton County emergency management reported over 0.25 inch of ice from freezing rain and sleet.	NCDC 2010

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
1/6/2009	Ice Storm	N/A	N/A	Caused $2,000 in property damage in western Pennsylvania.	NCDC 2010
12/19/2009	Winter Storm	N/A	N/A	Storm total snow accumulations ranged from 10 to 15 inches.	NCDC 2010
2/5/2010	Winter Storm	N/A	N/A	Storm total snow accumulation ranged from 15 to 25 inches.	NCDC 2010
2/9/2010	Winter Storm	N/A	N/A	Storm total snow accumulation ranged from 10 to 20 inches.	NCDC 2010
2/5-11/2010	Severe Winter Storms and Snow Storms	DR-1898	Y	Eligible for Public Assistance	FEMA 2010
2/1/2011	Winter Storm	N/A	N/A	A large winter storm produced periods of snow, sleet and freezing rain over the area. Snow and sleet accumulation was around 1 inch on the February 1, with 0.25 to 0.50 inch of ice on February 2.	NCDC 2014
1/20/2012	Winter Storm	N/A	N/A	Widespread snow and sleet accumulation between 2 and 4 inches and ice accumulation of less than 0.1 inch were observed across the County.	NCDC 2014
12/26/2012	Winter Storm	N/A	N/A	Widespread snow accumulations between 4 and 6 inches were observed across the county. The snow mixed with sleet and freezing rain at times during the afternoon with a light ice accumulation. Precipitation ending as a period of light freezing drizzle.	NCDC 2014

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
12/14/2013	Winter Storm	N/A	N/A	Light snow started in the morning and became heavy at times through the afternoon and evening. Snow changed to sleet and then freezing rain/drizzle with a glaze of ice, topping storm total snow accumulations between 3 and 6 inches. The mixed wintry precipitation adversely impacted travel especially along the Pennsylvania Turnpike and I-70 corridors.	NCDC 2014
2/4/2014	Winter Storm	N/A	N/A	Snow accumulations ranged from 1 to 3 inches. Ice accumulations from sleet and heavy freezing rain averaged between 0.25 and 0.50 inch.	NCDC 2014

Notes:

(1) Monetary figures within this table were U.S. Dollar (USD) figures calculated during or within the approximate time of the event. If such an event would occur in the present day, monetary losses would be considerably higher in USDs as a result of increased U.S. Inflation Rates.

DR	Federal Disaster Declaration
EIDL	Economic Injury Disaster Loan
EM	Federal Emergency Declaration
FEMA	Federal Emergency Management Agency
N/A	Not applicable/available
NCDC	National Climate Data Center
NOAA	National Oceanic Atmospheric Administration
PEMA	Pennsylvania Emergency Management Agency
SBA	Small Business Administration

4.3.13.4 Future Occurrence

Given the history of winter storm events that have impacted Fulton County, it is apparent that future winter storm events of varying degrees will continue to occur. Because the elements required for winter storms exist, and major events have occurred throughout Fulton County in the past, evidence suggests that many people and properties are at risk from the winter storm hazard in the future.

Based on available historical data, the future occurrence of winter storm events can be considered likely as defined by the Risk Factor Methodology probability criteria (further discussed in Section 4.4).

4.3.13.5 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For winter storm events, all of Fulton County has been identified as the hazard area. Therefore, all assets (population, structures, critical facilities and lifelines), as described in the County Profile (Section 2), are vulnerable. The following section includes an evaluation and estimation of the potential impact winter storm events have on the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impacts on life, health, and safety; general building stock; critical facilities; economy; environment; and future growth and development
- Effect of climate change on vulnerability
- Further data collections that will assist understanding this hazard over time

4.3.13.5.1 Overview of Vulnerability

Winter storms are a concern based on the frequency in which Fulton County is affected by winter storms. Additionally, winter storms are of significant concern because of the direct and indirect costs associated with these events, delays caused by the storms, and impacts on the people and facilities of the region.

4.3.13.5.2 Data and Methodology

National weather databases, the 2013 Pennsylvania HMP and local resources were used to collect and analyze severe winter storm impacts on Fulton County. The 2010 U.S. Census data and the Hazards U.S. – Multi-Hazard (HAZUS-MH) building inventory for Fulton County was used to support an evaluation of assets exposed to this hazard and the potential impacts associated with this hazard.

4.3.13.5.3 Impact on Life, Health, and Safety

According to the NOAA National Severe Storms Laboratory (NSSL), winter weather indirectly and deceptively kills hundreds of people in the United States every year, primarily from automobile accidents, overexertion, and exposure. Winter storms are often accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, drifting snow, extreme cold temperatures, and dangerous wind chill. Winter storms are considered deceptive killers because most deaths and other impacts or losses are indirectly related to the storm. People can die in traffic accidents on icy roads, of heart attacks while shoveling snow, or of hypothermia from prolonged exposure to cold.

Heavy snow can immobilize a region and paralyze a city, shutting down air and rail transportation, stopping the flow of supplies, and disrupting medical and emergency services. Accumulations of snow can collapse buildings and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. Storms near the coast can cause coastal flooding and beach erosion as well as sink ships at sea. In the mountains, heavy snow can lead to avalanches (NSSL 2006).

Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces (NSSL 2006).

For the purposes of this Plan, the entire population of Fulton County is considered exposed to winter storm events (U.S. Census 2010). The elderly are considered most susceptible to this hazard because of their increased risk of injuries and death from falls and overexertion and/or hypothermia from exposure while attempting to clear snow and ice. In addition, winter storm events can reduce the ability of these populations to access emergency services. Residents with low incomes may not have access to housing, or their housing may be less able to withstand cold temperatures (e.g., homes with poor insulation and heating supply). The County Profile (Section 2) of this Plan provides population statistics for each participating municipality and a summary of the more vulnerable populations (over the age of 65 and individuals living below the U.S. Census poverty threshold).

4.3.13.5.4 Impact on General Building Stock

The entire general building stock inventory in Fulton County is exposed and vulnerable to the winter storm hazard. In general, structural impacts include damage to roofs and building frames, rather than building content. Current modeling tools are not available to estimate specific losses for this hazard. As an alternate approach, this plan considers percentage damages that could result from winter storm conditions. Table 4.3.13-3 below summarizes percent damages that could result from winter storm conditions on Fulton County's total general building stock (structure only). Given professional knowledge and the currently available information, the potential losses for this hazard are considered to be overestimated; hence, the following figures represent conservative estimates for losses associated with severe winter storm events.

Table 4.3.13-3. General Building Stock Exposure (Structure Only) and Estimated Losses from Winter Storm Events in Fulton County

Municipality	Total GBS (Structure Only)	1% of Total	5% of Total	10% of Total
Ayr, Township of	$120,044,000	$1,200,440	$6,002,200	$12,004,400
Belfast, Township of	$81,248,000	$812,480	$4,062,400	$8,124,800
Bethel, Township of	$85,147,000	$851,470	$4,257,350	$8,514,700
Brush Creek, Township of	$36,517,000	$365,170	$1,825,850	$3,651,700
Dublin, Township of	$76,065,000	$760,650	$3,803,250	$7,606,500
Licking Creek, Township of	$88,452,000	$884,520	$4,422,600	$8,845,200
McConnellsburg, Borough of	$105,854,000	$1,058,540	$5,292,700	$10,585,400
Taylor, Township of	$57,173,000	$571,730	$2,858,650	$5,717,300
Thompson, Township of	$53,068,000	$530,680	$2,653,400	$5,306,800
Todd, Township of	$120,007,000	$1,200,070	$6,000,350	$12,000,700
Union, Township of	$36,014,000	$360,140	$1,800,700	$3,601,400

Municipality	Total GBS (Structure Only)	1% of Total	5% of Total	10% of Total
Valley-Hi, Borough of	$2,225,000	$22,250	$111,250	$222,500
Wells, Township of	$24,556,000	$245,560	$1,227,800	$2,455,600
Fulton County (Total)	**$886,370,000**	**$8,863,700**	**$44,318,500**	**$88,637,000**

Source: HAZUS-MH 2.1

A specific area that is vulnerable to the winter storm hazard is the floodplain. At-risk building stock and infrastructure in floodplains are presented in the flood hazard profile (Section 4.3.5). Generally, losses from flooding associated with winter storms should be less than those associated with a 1-percent or 0.2-percent flood. In summary, snow and ice melt can cause both riverine and urban flooding. Estimated losses caused by riverine flooding in the County are discussed in Section 4.3.5.

4.3.13.5.5 Impact on Critical Facilities

Full functionality of critical facilities such as police, fire, and medical services is essential for response during and after a winter storm event. These critical facility structures are largely constructed of concrete and masonry; therefore, they should only suffer minimal structural damage from severe winter storm events. Because power interruption can occur, backup power is recommended for critical facilities and infrastructure.

4.3.13.5.6 Impact on the Economy

Infrastructure at risk for the winter storm hazard includes roadways that could be damaged by the application of salt, and intermittent freezing and warming conditions that can damage roads over time. The cost of snow and ice removal and repair of roads from the freeze/thaw process can drain local financial resources. The potential secondary impacts from winter storms also impact the local economy including loss of utilities, interruption of transportation corridors, and loss of business function.

4.3.13.5.7 Impact on the Environment

Environmental impacts often include damage to trees and shrubs caused by heavy snow loading, ice build-up, and/or high winds, which can break limbs and down large trees. An indirect effect of winter storms is the threat to roadway surfaces with salt, chemicals, and other de-icing materials that can impair adjacent surface and groundwater (PEMA 2013).

Winter storms have a positive environmental impact; gradual melting of snow and ice provides groundwater recharge. However, abrupt high temperatures following a heavy snowfall can cause accelerated snowmelt, rapid surface water runoff, and severe flooding (PEMA 2013).

4.3.13.5.8 Future Growth and Development

Areas targeted for potential future growth and development in the next 5 to 10 years have been identified across the County at the municipal level, and are further discussed in Section 2.4 of this Plan. For the winter storm hazard, Fulton County in its entirety has been identified as the hazard area. Therefore, any new development will be exposed to such risks.

4.3.13.5.9 Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by the type, frequency, and intensity of weather events. Both globally and at the local level, climate change has the potential to alter the prevalence and severity of weather extremes such as winter storms. While predicting changes in winter storm events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society, and the environment (U.S. Environmental Protection Agency [EPA] 2006).

The climate of Pennsylvania has changed in several ways. Over the past 100 years, annual average temperatures have been rising across the State. Warmer winters have led to a decrease in snow cover and an earlier arrival of spring. Recent analyses based on the Intergovernmental Panel on Climate Change models suggest a decrease in frequency and an increase in intensity of extra-tropical winter cyclones. However, based on the methodology used, some models show no significant change in the storm track whereas others indicate a northward displacement of the storm track in the North Atlantic. For the mid-Atlantic region, there is little indication of a change in storm activity or track over Pennsylvania. An overall increase in winter precipitation is anticipated with a decrease in snow and increase in rain during the winter months. Projections regarding future occurrences of extra-tropical cyclones in Pennsylvania are substantially uncertain. Based on the available information and projections, winter storms are anticipated to continue to affect Pennsylvania in the future. Future improvements in modeling smaller-scale climatic processes can be expected and will lead to improved understanding of the ways the changing climate will alter temperature, precipitation, and storm events in Pennsylvania (Shortle and others 2009).

4.3.13.5.10 Additional Data and Next Steps

The assessment above identifies vulnerable populations and economic losses associated with the winter storm hazard of concern. Historic data on structural losses to general building stock are not adequate to predict specific losses to this inventory; therefore, the percent of damage assumption methodology was applied. This methodology is based on FEMA How-to Series (FEMA 386-2), Understanding Your Risks, Identifying and Estimating Losses (FEMA 2001) and FEMA's Using HAZUS-MH for Risk Assessment (FEMA 433) (FEMA 2004). The collection of additional/actual valuation data for general building stock and critical infrastructure losses would further support future estimates of potential exposure and damage for the general building stock inventory.

4.4 Hazard Risk Ranking

As discussed in Section 4.2, Hazard Identification, a comprehensive range of natural and non-natural hazards that pose significant risk to Fulton County were selected and considered in this plan. However, the communities in Fulton County have differing levels of exposure and vulnerability to each of these hazards. It is important for each community participating in this plan to recognize those hazards that pose the greatest risk to their community and direct their attention and resources accordingly to most effectively and efficiently manage risk.

To this end, a relative hazard risk ranking process was conducted for the County using the Risk Factor (RF) methodology identified in Section 5 and Appendix 9 of Pennsylvania Emergency Management Agency's (PEMA) All-Hazard Planning Standard Operating Guide (PEMA October 2013). The guidance states:

> "The RF approach produces numerical values that allow identified hazards to be ranked against one another (the higher the RF value, the greater the hazard risk). RF values are obtained by assigning varying degrees of risk to five categories for each hazard: *probability, impact, spatial extent, warning time,* and *duration*.
>
> To calculate the RF value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the example equation:

Example Equation

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

> Hazards identified as high risk have RFs greater than or equal to 2.5. RFs ranging from 2.0 to 2.4 are considered moderate risk hazards. Hazards with RFs less than 2.0 are considered low risk."

Table 4.4-1 identifies the five risk assessment categories, the criteria and associated indices used to quantify their risk, and the suggested weighting factor applied to each risk assessment category. Table 4.4-2 shows the categories' values for Fulton County, and each hazard's RF.

Table 4.4-1. Summary of Risk Factor (RF) Approach

Summary of Risk Factor (RF) Approach				
Risk Assessment Category	Degree of Risk			Weight Value
	Level	Criteria	Index	
PROBABILITY *What is the likelihood of a hazard event occurring in a given year?*	UNLIKELY	LESS THAN 1% ANNUAL PROBABILITY	1	30%
	POSSIBLE	BETWEEN 1% & 49.9% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 50% & 90% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	GREATER THAN 90% ANNUAL PROBABILTY	4	
IMPACT *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	MINOR	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	30%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK.	3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.	4	
SPATIAL EXTENT *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	NEGLIGIBLE	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10.9% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 11 & 25% OF AREA AFFECTED	3	
	LARGE	GREATER THAN 25% OF AREA AFFECTED	4	
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	MORE THAN 24 HRS	SELF-DEFINED *(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	1	10%
	12 TO 24 HRS	SELF-DEFINED	2	
	6 TO 12 HRS	SELF-DEFINED	3	
	LESS THAN 6 HRS	SELF-DEFINED	4	
DURATION *How long does the hazard event usually last?*	LESS THAN 6 HRS	SELF-DEFINED *(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	1	10%
	LESS THAN 24 HRS	SELF-DEFINED	2	
	LESS THAN 1 WEEK	SELF-DEFINED	3	
	MORE THAN 1 WEEK	SELF-DEFINED	4	

Source: PEMA All-Hazard Mitigation Planning Standard Operating Guide, October 2013

Table 4.4-2. Risk Ranking for Fulton County

HAZARD RISK	NATURAL HAZARDS	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	**Flood**	4	4	4	3	4	**3.9**
	Winter Storm	4	3	4	1	4	**3.4**
	Tornadoes and Windstorms	4	2	4	3	4	**3.3**
	Transportation Accident	4	2	2	4	2	**2.8**
	Environmental Hazards	3	2	2	4	3	**2.6**
	Drought	3	1	4	1	4	**2.5**
MODERATE	Dam Failure	1	3	2	4	3	2.3
LOW	Radon Exposure	3	1	1	4	1	1.9
	Wildfire	1	2	1	4	2	1.7
	Landslide	1	1	1	4	4	1.6
	Subsidence and Sinkhole	1	1	1	4	4	1.6
	Hailstorm	1	2	1	3	1	1.5
	Earthquake	1	1	1	4	1	1.3

SECTION 5: CAPABILITY ASSESSMENT

The capability assessment evaluates the community's capabilities and resources already in place at the municipal, County, State, and federal levels to reduce hazard risks. The assessment also identifies where improvements can be made to increase disaster resistance in the community.

The first step in organizing hazard mitigation capabilities or resources is to first describe the basic approaches available to reduce hazard risks. According to the 2013 Pennsylvania Emergency Management Agency (PEMA) All-Hazard Mitigation Planning Standard Operating Guide (SOG), the following four general approaches may reduce hazard risks: (1) local plans and regulations, (2) structure and infrastructure, (3) natural systems protection, and (4) education and awareness. A brief description of each (according to the PEMA All-Hazard Mitigation Planning SOG) is provided below:

- **Local Plans and Regulations** – These actions include government authorities, policies, or codes that influence the ways land and buildings are developed and built.
- **Structure and Infrastructure** – These actions involve modifying existing structures and infrastructure or constructing new structures to reduce hazard vulnerability.
- **Natural Systems Protection** – These are actions that minimize damage and losses and also preserve or restore the functions of natural systems.
- **Education and Awareness** – These are actions taken to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them, and may also include participation in national programs.

Capability assessments document the existing resources available to local communities to reduce hazard risks. Resources can be divided into five categories: human, physical, technical, informational, and financial. For each basic capability or approach, one or more of the five resources may be available. A brief description of each resource (according to the PEMA All-Hazard Mitigation Planning SOG) is provided below:

- **Human resources** include local police, fire, ambulance, and emergency management and response personnel; local government services; and electric, gas, and other utility providers that are critical during disasters.
- **Physical resources** include the equipment and vehicles (such as emergency response and recovery equipment and vehicles), public lands, facilities, and buildings available to the community.
- **Technical/technological resources** include early warning systems, weather alert radios, stream-level monitoring gauges, and 9-1-1 communications systems. They also include technical requirements established by law, regulation, or ordinance.
- **Informational resources** include materials about disasters, and hazard mitigation and planning; these are available from a wide variety of sources such as applicable websites, libraries, and state and federal agencies.
- **Financial resources** identify the sources of funding available for hazard mitigation. Most state and federal grant programs require local communities to provide at least part of the necessary

project funding in real dollars or through in-kind services. Local communities need to assess their financial capability and resources to implement hazard mitigation action plans.

During this plan update process, Fulton County and all participating municipalities were surveyed to provide an updated assessment of their mitigation planning capabilities. Each municipality was provided with a Capability Assessment Survey, based on the capability assessment survey provided in Appendix 3 of the October 2013 edition of the PEMA All-Hazard Mitigation Planning SOG. The survey was provided to each of the municipal planning points of contact prior to the municipal kick-off meetings, during the kick-off meetings, and throughout the planning process as needed. Completed capability assessment surveys provided by the municipalities may be found in Appendix D.

This section describes and summarizes the federal, State, County, and local capabilities to address hazard risk in Fulton County.

5.1 Emergency Management

This section describes emergency management capabilities at the County and local levels.

5.1.1 County Capabilities

The Fulton County Emergency Management Agency (EMA)/9-1-1 is a strong County-level emergency management capability and agency that supports Fulton County. The County contracts with the Cumberland County emergency 9-1-1 call center for call dispatch, and Fulton County operates its own emergency operations center (EOC) during emergencies. In addition, the County provides or supports emergency service programs and measures including emergency response, public alert and warning systems, emergency communications systems, hazard event monitoring systems, and public information and outreach programs. Capabilities including the 9-1-1 Center, Emergency Operations Center (EOC), emergency service measures, emergency response planning, public information programs, and geographic information system are described in the sections below.

9-1-1 Center

9-1-1 is the telephone number used to report emergencies. Citizens use the service in the event of the presence or potential for an immediate threat to life or property, and to request response from police, fire, or emergency medical service agencies. Examples include a crime that has just occurred or is in progress, odor or presence of fire, and a sick or injured person who requires treatment and possibly transportation to a hospital emergency department. The 9-1-1 system is capable of accepting calls from hearing or speech-impaired callers using a Telecommunications Device for the Deaf (TDD). Each county in Pennsylvania operates a 9-1-1 Public Safety Answering Point (PSAP). These PSAPs would need to coordinate their efforts in a regional hazard event. Computerized mapping of streets with address information is critical for emergency response purposes. Opportunities exist to streamline the regional 9-1-1 coordination through development of fully integrated, consistent mapping and databases. Fulton County utilizes the Cumberland County 9-1-1 center for their emergency alert needs.

Emergency Operations Center (EOC)

In the event of an impending emergency or disaster, Fulton County would activate their EOC. The purpose of the EOC is to manage an emergency response and coordinate the distribution of resources to a disaster incident. When the EOC is activated and becomes operational, it is staffed with highly trained, experienced personnel that have the authority, flexibility, imagination, and initiative needed to make command and coordination decisions relative to their field of expertise. EOC staffing includes personnel with skills from the disciplines below, in accordance with the National Response Framework (NRF) and State EOP. Each discipline is assigned a coordinating agency and at least one primary and one support agency. In cases where more than one agency has primary jurisdiction over a discipline, a coordinating agency is designated from among them. Where there is only one agency with primary jurisdiction, that agency is also the coordinating agency. EOC disciplines are listed below:

- Transportation
- Firefighting
- Communications
- Public Works and Engineering
- Emergency Management
- Mass Care/Housing and Human Services
- Logistics Management and Resource Support
- Public Health and Medical Services
- Urban Search and Rescue
- Oil and Hazardous Materials Response
- Energy
- Public Safety and Security
- Long-Term Community Recovery and Mitigation
- Agriculture and Natural Resources
- External Affairs

When activated, the EOCs are in constant communication with the 9-1-1 centers to ensure coordination of activities.

The Fulton County EMA/9-1-1 capabilities fall under two categories: emergency service measures and public information programs. These capabilities are described below.

Emergency Service Measures

Emergency service measures protect people during and immediately following a disaster. The County monitors several systems that will disseminate emergency information and warnings. These monitoring systems include: Satellite Emergency Voice Alerting Network (SEVAN), Knowledge Center, Pennsylvania Statewide Telecommunication Alerting and Reporting (PaSTAR), Radio Amateur Civil Emergency Services (RACES), National Oceanic and Atmospheric Administration (NOAA) weather radios, and 800-megahertz (MHz) Statewide radios, which are described below.

- The Satellite Emergency Voice Alerting Network (SEVAN) is the voice component of the satellite warning system. This allows PEMA, Pennsylvania counties, regional offices, and cities to communicate directly in real time regardless of the status of the telephone system. Warning messages are routinely broadcast by PEMA using the system.

- Knowledge Center is a web-based interactive incident management tool that provides emergency managers with the ability to gather large quantities of information related to incidents, and then coordinate that information with the proper agencies. For small-scale events, one or two responder agencies would be contacted. For large-scale events that involve complex, multi-jurisdictional responses, hundreds of agencies from the local, state, federal, non-governmental, and private sector organizations may be contacted. The system allows for seamless communication with neighboring jurisdictions, counties, and the State regarding the types of incidents and emergencies occurring.

- The Pennsylvania Statewide Telecommunication Alerting and Reporting (PaSTAR) Network is a computer network that uses satellite-based technology and the latest computer server and client systems. The system allows data sharing and reporting, and textual and graphics communications to flow unimpaired between users connected to the system. The core of PaSTAR consists of a commercially available computer server and e-mail software packages.

- The Radio Amateur Civil Emergency Services (RACES) is a group of amateur radio operators who donate their services in times of natural disaster or emergency. They provide communication to fire, police, and other agencies that need assistance. Amateur Radio is a newer resource for Fulton County, and is still in the process of being implemented.

- NOAA Weather Radio All Hazards (NWR) is a nationwide network of radio stations broadcasting continuous weather information directly from a nearby National Weather System (NWS) office. NWR broadcasts NWS warnings, watches, forecasts, and other hazard information 24 hours a day. NWR also broadcasts warning and post-event information for all types of hazards, including natural and man-made (such as chemical releases or oil spills) and public safety (such as AMBER alerts or 9-1-1 telephone outages).

- The 800-MHz radio system provides two-way voice and data communications for all Fulton County and State agencies. The primary function of this system is to provide redundant communications between the County and partner agency facilities in the event that the primary means of communication becomes interrupted.

Emergency Response Planning

Emergency Operations Plan

The Fulton County Emergency Operations Plan (EOP) documents the County's emergency preparedness planning. The EOP includes County-specific emergency response procedures during significant emergency events. Fulton County annually reviews and continually updates the EOP as needed. The County's EOP was last updated and adopted in 2012, and the County is currently in the process of updating the EOP to reflect current needs and capabilities.

Mutual Aid Agreements

Fulton County has mutual aid agreements (formal agreements) with the contiguous Pennsylvania counties as a result of the Pennsylvania Intrastate Mutual Assistance Program. Every county in the State participates in this program. Fulton County is also part of a larger county consortium, the South Central Mountain Counterterrorism Task Force (South Central Mountain Task Force), which works together and shares resources during times of emergency. Originally formed in response to the increasing threat of weapons of mass destruction (WMD) and other terroristic activity, the Task Force also provides all-hazards preparedness, mitigation, prevention, response, and recovery services to citizens in its purview. This unprecedented intergovernmental agreement is between the following counties:

- Centre

- Snyder

- Mifflin

- Juniata

- Blair
- Huntingdon
- Bedford
- Fulton

Regional Planning Initiatives

Fulton County also assists in either County or regional planning and preparation for the following:

- Local (Municipal) EOPs
- Medical facilities
- Dams
- Airports
- Pandemic
- Mass casualty/fatality incidents
- Counterterrorism preparedness
- Special events, such as concerts, parades, etc.
- School emergency planning
- Day care, group home, and special needs facilities
- Evacuation and Detour Plan
- Superfund Amendments and Reauthorization Act of 1986 (SARA) – The Local Emergency Planning Committee program is based on the SARA of 1986, Title III. This legislation requires local planning by businesses and response agencies (such as fire departments and hazardous materials teams) whenever hazardous materials are involved. SARA also requires the establishment of a system in each community that informs the citizens of chemicals used, manufactured, and stored locally.
- In cooperation with the American Red Cross, the County has set up designated shelters that may be used during emergencies and disasters.

Public Information Programs

Flood Maps

Flood maps and flood data are accessible to the County through the Planning Commission, as are County and municipality maps and tax maps. Property assessment records are available at the Assessment Office, and deeds are available at the Recorder's Office.

Library Education Tools

Libraries have educational materials available upon request that are used at public speaking events or County meetings, when appropriate. The following educational materials are available, but are not limited to:

- Various types of training videos
- Pennsylvania Emergency Preparedness Guides
- American Red Cross Packets for Flash Flooding, Hurricane, Thunder and Lightning, Tornado, and Winter Storms
- Family Disaster Planning Guides
- Homeland Security Information for Businesses, Family, Individuals, Neighborhoods and Schools
- Pandemic Brochures

South Central Mountain Task Force

Some information about the activities of the South Central Mountain Task Force are provided on the Task Force website (https://members.scmrtf.org/). This information includes meetings and goals for the following:

- Committees
  - Emergency Medical Services Committee
  - Fire, Rescue, Hazardous Materials Committee
  - Health and Medical Committee
  - Information Services Committee
  - Law Enforcement Committee
  - Training and Education Committee
- Teams
  - Incident Management Team
  - Decon Strike Team
  - Emergency Medical Services (EMS) Support Team
  - Critical Incident Stress
  - Management Team

Outreach Projects

Several organizations (both public and private sector) have developed outreach projects, educational tools, and training programs. The County promotes both online and traditional in-person programs to appeal to as wide an audience as possible.

- Utility Public Awareness Campaign - The following utility agencies have available safety information accessible to the public:
  - UGI Penn Natural Gas: http://www.ugi.com/portal/page/portal/UGI/Safety
  - Columbia Gas of Pennsylvania: https://www.columbiagaspa.com/stay-safe
- Are You Ready? – This is an in-depth program for citizen preparedness (individual, family, and community preparedness) that provides a step-by-step approach to disaster preparedness by walking the student through steps to get informed about local emergency plans, identify hazards that affect their area, and develop and maintain an emergency communications plan and disaster

supply kit. Other topics include evacuation, emergency public shelters, animal handling during disasters, and information specific to people with disabilities. The program includes actions that can be taken before, during, and after each hazard type and provides in-depth information on specific hazards such as the following:

- Floods
- Tornadoes
- Hurricanes
- Thunderstorms and lightning
- Winter storms and extreme cold
- Extreme heat
- Earthquakes
- Volcanoes
- Landslide and debris flows (mudslide)
- Tsunamis
- Fires and wildfires
- Hazardous materials incidents
- Household chemical emergencies
- Nuclear power plants
- Terrorism (explosion, biological, chemical, nuclear, and radiological hazards)

- ReadyPA Campaign – Established by the Commonwealth of Pennsylvania, www.readypa.org is a website that aims to prepare the public for times of disaster by providing education on the risks within Pennsylvania, template emergency plans and kits, and information on ways to get involved with community organizations to help others.

- Community Emergency Response Teams (CERT) – CERT provides training to educate citizens about disaster preparedness and instruction in basic disaster response skills, such as fire suppression, medical operations during disasters, light search and rescue, team organization, disaster psychology, and terrorism awareness. The goal of this program is for emergency personnel to train members of neighborhoods, community organizations, or workplaces in basic response skills. If a disastrous event overwhelms or delays the community's professional response, CERT members can assist others by applying the basic response and organizational skills that they learned during training. These skills can help save and sustain lives following a disaster until help arrives. Although the County does not have a current and active CERT, the County is planning to hold trainings and refresher courses for those employees and residents formerly involved in the CERT.

- Citizen Corps Council – The mission of the Citizen Corps is to harness the power of every individual through education, training, and volunteer service to make communities safer, stronger, and better prepared to respond to the threats of terrorism, crime, public health issues, and disasters of all kinds. Although the County does not have a current and active Citizen Corps Council, the County is planning to hold trainings and refresher courses for those employees and residents formerly involved in the Citizen Corps.

- Emergency Management Courses are provided through the County EMA/9-1-1 to local coordinators and elected officials. The following courses are provided: Duties and Responsibilities of the Local Emergency Management Coordinator (LEMC), Elected Officials Seminar, Initial Damage Assessment, Safe Schools Training, National Incident Management System, Work Environment of the LEMC, and numerous Federal Emergency Management Agency (FEMA) Independent Study Courses.

Local Emergency Planning Committee

The Local Emergency Planning Committee (LEPC) works closely with the business industry community to form a safety net around the chemical industry to protect the general population from the possible outcome of hazardous material incidents. The following features of the LEPC demonstrate the capability of the LEPC to support County emergency management and preparedness initiatives.

- The LEPC shall have a minimum of seven members with at least one representative from each of the following groups:
    - Group 1 – Elected Official representing local government within the County
    - Group 2 – Local law enforcement, first aid, health, environmental, hospital, and transportation personnel
    - Group 3 – Firefighting personnel
    - Group 4 – Civil defense and emergency management personnel
    - Group 5 – Broadcast and print media
    - Group 6 – Community groups not affiliated with emergency service groups
    - Group 7 – Owners and operators of facilities subject to the requirements of SARA Title III

- Reporting Facilities – The minimum reporting threshold for which facilities are required to have or prepared a Material Safety Data Sheet is 10,000 pounds of hazardous chemicals. This document provides workers and emergency personnel with procedures for handling or working with hazardous materials in a safe manner. It includes information on the chemicals' physical properties, toxicity, health effects, first aid, reactivity, storage, disposal, protectice equipment, and spill-handling procedures.

- Planning Facilities – The reporting threshold for Extremely Hazardous Substances (as designated under Section 302 of Title III) is 500 pounds or the threshold planning quantity, whichever is lower. Qualifying facilities are subject to additional reports and accident prevention regulations.

- Community Awareness Program – Fulton County provides the following awareness information about LEPC via the County website: http://www.co.fulton.pa.us/lepc.php

Technical Assistance

The County EMA/9-1-1 office can support local, public, and private entities as needed through coordination and provision of information and equipment resources. These include both existing County capabilities and predetermined private and public resources.

Geographic Information Systems

Fulton County Planning Commission, which includes Geographic Information Systems (GIS) functions, has enabled the County EMA/9-1-1 to multiply its force through interactive mapping technologies, and high-resolution aerial photography. These resources allow decision makers and stakeholders to identify, mitigate, respond to, and recover from disasters. These systems act as the common operating picture combining together six general approaches that may reduce hazard risks, should a disaster of significant magnitude occur and photography of an affected area is warranted. A new aerial photography project may be flown to capture the devastation under certain criteria. This would allow for enhanced coordination of response and recovery from major incidents.

Fulton County Conservation District

The Fulton County Conservation District is a local agency that provides conservation-based programs and services to County residents. Specifically, it provides natural resource information, community conservation concerns, and local environmental efforts to residents. The Conservation District maintains a guiding philosophy that local conservation issues should be managed at a local level and by residents who understand the local environment. The Fulton County Conservation District promotes four major program areas:

- Agricultural conservation
- Environmental conservation
- Erosion and sediment pollution control
- Watershed conservation

Specific programs and services offered by the County Conservation District include a no-till drill rental program, the Chesapeake Bay program, a nutrient management program, a farmland preservation program, an electronics drop-off program, education on recycling and potentially hazardous materials, information on water testing, and more. Many of these programs tie into or promote the County's overall preparedness and mitigation goals by seeking to create better informed and engaged residents. The Fulton County Conservation District also supports the municipalities in the County by providing education in understanding floodplain ordinance regulations, reviewing ordinances to ensure compliance with NFIP standards, and assisting municipalities in the enforcement of ordinance regulations, when needed. The Conservation District promotes community preparedness and ultimately hopes to reduce the potential impact of hazard events through outreach and resource management.

5.1.2 Local Capabilities

According to Pennsylvania Title 35 (Emergency Management Services Code), Chapter 7500, the following stipulations apply:

- Each political subdivision of this Commonwealth is directed and authorized to establish a local emergency management organization in accordance with the plan and program of PEMA. Each local organization shall have responsibility for emergency response, and recovery within the territorial limits of the political subdivision within which it is organized and, in addition, shall conduct such services outside of its jurisdictional limits as may be required under this part.

- The governing body of a political subdivision may declare a local disaster emergency upon finding a disaster has occurred or is imminent. The effect of a declaration of a local disaster emergency is to activate the response and recovery aspects of any and all applicable local emergency management plans and to authorize the furnishing of aid and assistance.

- Each local organization of emergency management shall have a coordinator who shall be responsible for the planning, administration, and operation of the local organization.

- Each political subdivision shall adopt an Intergovernmental Cooperation agreement with other political subdivisions to accomplish the following:

    - Prepare, maintain, and keep current a disaster emergency management plan for (1) the prevention and minimization of injury and damage caused by disaster, (2) prompt and effective response to disaster, and (3) disaster emergency relief and recovery consistent with the Pennsylvania Emergency Management Plan.

    - Establish, equip, and staff an EOC (integrated with warning and communication systems) to support government operations in emergencies, and provide other essential facilities and equipment for agencies and activities assigned emergency functions.

    - Provide individual and organizational training programs to ensure prompt, efficient, and effective disaster emergency services.

    - Organize, prepare, and coordinate all locally available manpower, materials, supplies, equipment, facilities, and services necessary for disaster emergency readiness, response, and recovery.

    - Adopt and implement precautionary measures to mitigate the anticipated effects of a disaster. Execute and enforce such rules and orders as the agency shall adopt and promulgate under the authority of this part.

    - Cooperate and coordinate with any public and private agency or entity in achieving any purpose of this part.

    - Have available for inspection at its EOC all emergency management plans, rules, and orders of the Governor and the agency.

    - Provide prompt and accurate information regarding local disaster emergencies to appropriate Commonwealth and local officials and agencies and the general public.

    - Participate in all tests, drills, and exercises—including remedial drills and exercises—scheduled by the agency or by the federal government.

    - Participate in the program of integrated flood warning systems under Section 7313 (6) (relating to powers and duties).

- Direction of disaster emergency management services is the responsibility of the lowest level of government affected. When two or more political subdivisions within a county are affected, the county organization shall exercise responsibility for coordination and support to the area of operations. When two or more counties are involved, coordination shall be provided by PEMA or by area organizations established by PEMA.

- When all appropriate locally available forces and resources are fully committed by the affected political subdivision, assistance from a higher level of government shall be provided.

- Local coordinators of emergency management shall develop mutual aid agreements with adjacent political subdivisions for reciprocal emergency assistance. The agreements shall be consistent with the plans and programs of PEMA.

The local municipalities in Fulton County have the following capabilities:

Mutual Aid Agreements

Fulton County has formal mutual aid agreements with its municipalities. Mutual Aid is covered under Act 93.

Emergency Operations Centers (EOC)

In the event of an impending emergency or disaster, the local EOC may be activated. The purpose of the EOC is to manage the emergency response and coordinate distribution of resources to a disaster incident at the local level.

Emergency Response

Each municipality is responsible for providing emergency response to their municipality consisting of EMS, fire, and police. If a municipality does not have one of these providers in their community, they have mutual aid agreements with an adjacent political subdivision to provide such.

Monitoring Systems

The municipalities may also be equipped with several systems to monitor emergency information and warnings, including RACES, NWS, and Knowledge Center, which have been described previously in Section 5.

Emergency Response Planning

The municipalities may also assist with planning for:

- Municipal EOPs
- Medical facilities
- Dams
- Counterterrorism preparedness
- Special events
- School emergency planning
- Day care, group homes, and special needs facilities
- Evacuation

A summary of existing federal, State, regional, and County programs (regulatory and otherwise) to manage specific hazard risks may be found in the hazard profiles in Section 4 of this plan update. While the risk of certain hazards can be addressed at least partially through mitigation, the risks of other hazards (particularly certain non-natural hazards) are primarily managed through the preparedness and response elements of emergency management, or through other regulatory programs at the federal and State levels.

5.2 Participation in the National Flood Insurance Program

According to FEMA's 2002 National Flood Insurance Program (NFIP): Program Description, the U.S. Congress established the NFIP with the passage of the National Flood Insurance Act of 1968. The NFIP is a federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages.

Participation in the NFIP is based on an agreement between communities and the federal government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction and substantial improvements in floodplains, the federal government will make flood insurance available within the community as a financial protection against flood losses. This insurance is designed to provide an alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods (FEMA 2002).

NFIP-participating communities in Fulton County are required to adopt a Flood Damage Prevention Ordinance (also sometimes called a Floodplain Ordinance), and update this ordinance whenever the regulatory NFIP Flood Insurance Rate Maps (FIRM) are officially updated. Both the Fulton County Planning Commission and the Pennsylvania Department of Community and Economic Development (PA DCED) (State coordinating agency for the NFIP) provide support to municipalities by providing model Flood Damage Prevention Ordinances.

Currently, 12 of the 13 municipalities in Fulton County participate in the NFIP, as Valley-Hi Borough does not currently take an active role with the NFIP. All participating municipalities have adopted a Floodplain Ordinance, and some have adopted a Stormwater Management Ordinance. The municipalities' floodplain administrators enforce the Floodplain Ordinances locally.

NFIP-participating communities in Fulton County are required to make current NFIP FIRMs available to their residents for review, and may provide mapping assistance through their floodplain administrators. Typically this mapping is available at the municipal offices in each community. At the time of this plan update, the Fulton County FEMA Digitized Flood Insurance Rate Maps (DFIRM) (dated February 2011) were used to evaluate exposure and determine potential future losses.

Municipal participation in and compliance with the NFIP is supported at the federal level by FEMA Region III and the Insurance Services Organization (ISO), and at the State level by the Pennsylvania Department of Environmental Protection (PA DEP), PA DCED, and PEMA. Both the County's EMA/9-1-1 and Planning Commission support flood mitigation efforts as well as associated training and public education and awareness programs.

Flood hazard risk management in Fulton County is further supported by the County's Phase II Act 167 Countywide Stormwater Management Plan, which includes stormwater runoff modeling for the Cove Creek and Licking Creek watersheds and suggests ways to address the runoff in those watersheds. In turn, this plan will hopefully continue to reduce the effects of flooding in certain areas of the County. Additional information regarding this Phase II project is found in Section 5.4.2 of this document.

Additional information on the NFIP program and its implementation within the County may be found in the flood hazard profile in Section 4.3.5.

5.3 Community Rating System (CRS)

In the 1990s, the Flood Insurance Administration (FIA) established the Community Rating System (CRS) to encourage local governments to increase their standards for floodplain development. The goal of the program is to encourage communities, through flood insurance rate adjustments, to implement standards above and beyond the minimum required in order to:

- Reduce losses from floods
- Facilitate accurate insurance ratings
- Promote public awareness of the availability of flood insurance

CRS is a voluntary program designed to reward participating jurisdictions for their efforts to create more disaster-resistant communities using the principles of sustainable development and management. By enrolling in CRS, municipalities can leverage greater flood protection while receiving flood insurance discounts.

Currently, no municipalities in Fulton County participate in the CRS. Increased participation will be supported by the County, and will be promoted through the local emergency management coordinators as identified in the updated mitigation strategies.

5.4 Planning and Regulatory Capability

While municipalities in Pennsylvania must comply with the minimum regulatory requirements established under the Pennsylvania Municipal Planning Code, they otherwise have considerable latitude in adopting ordinances, policies, and programs that can support their ability to manage natural and non-natural hazard risk. Specifically, municipalities can manage these risks through comprehensive land use planning, hazard-specific ordinances (for example, flood damage prevention, sinkholes, and steep slopes), zoning, site-plan approval, and building codes.

5.4.1 Fulton County Comprehensive Plan

The Fulton County Comprehensive Plan grew out of a need to analyze and consolidate the numerous detailed and well-developed plans for an overall picture of Fulton County. This plan is a guidance document for furture growth and development in Fulton County. It analyzes the trends, changes, and conditions of the population, economics, housing, environment, infrastructure, and other areas. It then assesses the strengths, weaknesses, opportunities, and threats, and establishes a vision for future growth and formulates goals and strategies to implement that vision.

The purpose of the plan is to guide development and growth in Fulton County while promoting the conservation of farmland and natural resources including streams and floodplains, riparian buffers, wetlands, important natural areas, steep slopes, and woodlands. The plan recommends that new industrial or residential growth should not locate in areas recommended for natural resource or farmland protection. Higher-density residential growth, and industrial and business expansion should take place in the recommended urban areas. The plan identifies goals, policies, and a number of implementation strategies for a variety of topics including land use, housing, natural resources, farmland preservation, economic development, transportation, community utilities (water, wastewater, and stormwater), parks and recreation, and historic preservation.

Although the Pennsylvania Municipalities Planning Code requires that municipal plans be in accord with the County plan, the code provides no measures for ensuring that this occurs. Most municipalities have adopted their own comprehensive plan.

5.4.2 Stormwater Management Planning

In 1978, the Pennsylvania General Assembly passed the Stormwater Management Act (Act 167) of 1978. Act 167 requires counties to prepare stormwater management plans on a watershed-by-watershed basis. The plans must be developed in consultation with the affected municipalities. Standards for control of runoff from new development are a required component of each plan and are based on a detailed hydrologic assessment. A key objective of each plan is to coordinate the stormwater management decisions of the watershed municipalities. Implementation of each plan is through mandatory municipal adoption of ordinance provisions consistent with the plan.

Plans prepared under Act 167 will not resolve all drainage issues. A key goal of the planning process is to maintain existing peak runoff rates throughout a watershed as land development continues to take place. While the planning process does not solve existing flooding problems, it aims to prevent these problems from getting worse. Each municipality is responsible for correcting existing flooding problems.

In 2010, Fulton County published the most recent version of its Countywide Stormwater Management Plan. This plan differs in several ways from the previous Cove Creek Act 167 Stormwater Management Plan to reflect changes in the PA DEP-preferred planning approach. For instance, PA DEP has changed from previously recommending watershed-specific plans to advocating for Countywide plans. Additionally, the previous Cove Creek plan only covered Ayr Township, Thompson Township, Todd Township, and McConnellsburg Borough, whereas the more recent plan encompasses all municipalities.

The Phase II Act 167 Countywide Stormwater Management Plan in Fulton County seeks to address the full range of hydrologic and hydraulic impacts from cumulative land development within a watershed. The long-term goals of the plan include protecting public health, safety, and welfare by understanding the influences of future land development and by recommending measures to control accelerated runoff. The plan also aids every municipality in the County to meet the intent of Act 167 through the following aspects:

- Meet legal water quality requirements under State law, including regulations at 25 PA Code Chapter 93 to protect, maintain, reclaim, and restore the existing and designated uses of the Waters of the Commonwealth.
- Manage accelerated runoff and erosion and sedimentation problems close to their source by regulating activities that cause these problems.
- Preserve the natural drainage systems as much as possible.
- Maintain groundwater recharge to prevent degradation of surface and groundwater quality, and to otherwise protect water resources.
- Maintain existing flows and quality of streams and watercourses.
- Preserve and restore the flood-carrying capacity of streams and prevent scour and erosion of stream banks and streambeds.

- Manage stormwater impacts close to the runoff source, with a minimum of structures and a maximum use of natural processes.

- Provide procedures, performance standards, and design criteria for stormwater planning and management.

- Provide proper operations and maintenance protocols for all temporary and permanent stormwater management facilities and Best Management Practices (BMP) that are constructed and implemented.

- Provide standards that are consistent with the National Pollutant Discharge Elimination System (NPDES) permit requirements.

5.4.3 Natural Resource Planning

Fulton County has contributed to several documents related to natural resource planning. Connections in Our Landscape: The Southern Alleghenies Greenways and Open Space Network Plan serves as a companion document and additional resource to the County Comprehensive Plan, relevant to initiatives and issues related to the region's land-use, parks, recreation, and open-space planning efforts. The Southern Alleghenies Planning and Development Commission developed the plan on behalf of Blair County, Bedford County, Cambria County, Fulton County, Huntingdon County, and Somerset County.

In addition to the Comprehensive Plan and associated documents, Fulton County completed the National Heritage Inventory in 2008. The Natural Heritage Inventory identifies and maps Fulton County's most significant natural places. The study investigates plant and animal species and natural communities that are unique or uncommon in the County; it also explores areas important for general wildlife habitat and scientific study. While the Inventory does not discuss protecting specific natural resource areas, it provides vital information to those County individuals responsible for making decisions affecting Fulton County's natural assets.

5.4.4 Open Space Planning

Fulton County has prepared several plans with the goal of preserving open space in the County for recreational and environmental purposes. These plans include several chapters in the County Joint Comprehensive Plan (2007) and the Connections in Our Landscape (2007) Greenways and Open Space Plan. A greenway is a corridor of open space. The plan identifies regional conservation and cultural, recreational, conservation, and scenic greenways and evaluates ways local ordinances may protect greenways.

The Steering Committee will comment on open space issues identified in these plans during project reviews.

5.4.5 Informational Resources

Fulton County has a variety of informational resources available to the public. Many of the publications discussed previously are available for review by the public on the Fulton County website: http://www.co.fulton.pa.us/. Fulton County also responds to floodplain information requests from the public. The County has sponsored seminars related to stormwater management, floodplain issues, model environmental ordinances, and basic courses in subdivision review and zoning.

Fulton County, along with many of the municipalities, have identified specific mitigation initiatives in this plan update to help build and enhance mitigation-related planning and regulatory capabilities in Fulton County.

5.4.6 Municipal Capabilities

Participating municipalities in this planning effort were provided a capabilities survey. Table 5-1 summarizes the responses of the municipalities based on planning and regulatory capability. Detailed information regarding Fulton County municipalities' planning and regulatory capabilities can be found in the municipal survey responses provided in Appendix D.

Table 5.4-1. Planning and Regulatory Capability

Municipality	Hazard Mitigation Plan	EOP	Disaster Recovery Plan	Evacuation Plan	COOP Plan	NFIP	NFIP – CRS	Floodplain Regulations	Floodplain Mgmt. Plan	Zoning Regulations	Subdivision Regulations	Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)	Open Space Mgmt. Plan	Stormwater Mgmt. Plan/Ordinance	Natural Resource Protection Plan	Capital Improvements Plan	Economic Dev. Plan	Historic Preservation Plan	Farmland Preservation	Building Code	Fire Code	Firewise	Storm Ready	Other
Fulton County	X	X	-	-	X	X	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	X	-
Ayr Township	X	X	-	-	-	X	-	-	-	-	X	-	-	X	-	-	-	-	-	X	-	-	X	X
Belfast Township	X	X	-	-	-	X	-	-	-	-	X	X	X	X	-	-	-	-	-	X	-	-	X	-
Bethel Township	X	X	-	-	-	X	-	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	X	-
Brush Creek Township	X	X	-	-	-	X	-	-	-	-	X	X	-	X	-	-	-	-	X	X	-	-	X	-
Dublin Township	X	X	-	-	-	X	-	-	X	-	X	X	X	X	-	-	-	-	-	X	-	-	X	X
Licking Creek Township	X	X	-	-	X	X	-	X	-	-	X	X	X	X	-	-	-	-	-	X	-	-	X	X
McConnellsburg Borough	X	X	-	-	-	X	-	-	X	X	X	X	X	X	-	-	-	-	-	X	-	-	X	-
Taylor Township	X	X	-	-	-	X	-	-	-	-	X	X	X	X	-	-	-	-	X	X	-	-	X	-
Thompson Township	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	-
Todd Township	X	X	-	-	-	X	-	X	X	-	X	X	X	X	-	-	-	-	-	X	-	-	X	-
Union Township	X	X	-	-	-	X	-	-	-	-	X	X	X	X	-	-	-	-	X	X	-	-	X	-
Valley-Hi Borough																								
Wells Township	X	X	-	-	-	X	-	X	X	X	X	-	-	-	-	-	-	-	-	X	-	-	X	-

Notes:
"X" indicates that the municipality currently has this capability in place.
"-" indicates no capability is currently in place.
Blank space indicates no response was received from the municipality.

5.5 Administrative and Technical Capability

Municipalities are further supported by County, regional, State and federal administrative and technical capabilities. For this hazard mitigation plan (HMP), the majority of support agencies and resources have been identified and referenced throughout this plan update.

It is noted that the County and many of its municipalities have identified specific mitigation initiatives described in this plan update, which will help build and enhance mitigation-related administrative and technical capabilities in Fulton County.

5.5.1 Municipal Capabilities

Participating municipalities in this planning effort were provided with a capabilities survey. Table 5-2 summarizes the responses of the municipalities based on administrative and technical Capability. Detailed information regarding Fulton County municipalities' administration and technical capabilities can be found in the municipal survey responses provided in Appendix D.

Table 5-2. Administrative and Technical Capability

Municipality	Planners (with land use/land development knowledge)	Planners or Engineers (with natural and/or human caused hazards knowledge)	Engineers or Professionals trained in building and/or infrastructure construction practices	Emergency Manager	NFIP Floodplain Administrator	Land Surveyors	Scientists or Staff familiar with the hazards of the community	Personnel skilled in GIS and/or FEMA's HAZUS program	Grant Writers or Fiscal Staff to handle large/complex grants	Staff with expertise or training in Benefit-Cost Analysis	Other
Fulton County	X	-	-	X	-	-	X	X	X	-	-
Ayr Township	-	-	X	-	-	-	-	-	-	-	-
Belfast Township	-	-	X	-	-	-	-	-	-	-	-
Bethel Township	-	-	X	X	-	X	-	-	-	-	-
Brush Creek Township	-	-	X	X	-	X	-	-	-	-	-
Dublin Township	X	X	X	X	X	-	-	-	-	-	-
Licking Creek Township	-	-	X	-	-	-	-	-	-	-	-
McConnellsburg Borough	-	X	X	X	X	-	-	-	-	-	-
Taylor Township	-	-	X	X	-	-	-	-	-	-	-
Thompson Township	X	X	X	X	X	X	X	-	X	X	-
Todd Township	-	-	-	X	-	-	-	-	-	X	-
Union Township	X	-	-	X	-	-	-	-	-	-	-
Valley-Hi Borough											
Wells Township	-	-	-	X	-	-	-	-	-	-	-

Notes:
"X" indicates that the municipality currently has this capability in place.
"-" indicates no capability is currently in place.
Blank space indicates no response was received from the municipality.

5.6 Fiscal Capability

Mitigation projects and initiatives are largely or entirely dependent on available funding. As such, it is critical to identify all available sources of funding at the local, county, regional, state, and federal level to support implementation of the mitigation strategies identified in this plan update.

Jurisdictions fund mitigation projects though existing local budgets, local appropriations (including referendums and bonding), and through myriad federal and state loan and grant programs.

Federal mitigation grant funding (Stafford Act 404 and 406) is available to all communities with a current HMP (this plan); however, most of these grants require a "local share" in the range of 10 to 25 percent of the total grant amount.

5.6.1 Capital Improvement Planning

Capital improvement plans are often recommended by counties to their municipalities, as these plans help identify specific capital projects to be funded and completed according to a defined schedule. Some of these projects involve improvements to facilities and infrastructure that provide hazard mitigation benefits. As such, during this update process, the County and its municipalities have been encouraged to consider the mitigation benefits associated with their known or anticipated capital projects as a way to help prioritize their execution and to develop awareness that mitigation grants may be available to help fund such projects.

5.6.2 Federal Hazard Mitigation Funding Opportunities

Hazard Mitigation Grant Program (HMGP)

The HMGP (Stafford Act 404 and 406) is a post-disaster mitigation program made available to states by FEMA after each federal disaster declaration. The HMGP can provide up to 75 percent funding for hazard mitigation measures and can be used to fund cost-effective projects that will protect public or private property in an area covered by a federal disaster declaration or that will reduce the likely damage from future disasters. Examples of projects include acquisition and demolition of structures in hazard-prone areas, flood proofing, or elevation to reduce future damage, minor structural improvements, and development of state or local standards.

Projects must fit into an overall mitigation strategy for the area identified as part of a local planning effort. All applicants must have a FEMA-approved HMP. Applicants who are eligible for the HMGP include state and local governments, certain nonprofit organizations or institutions that perform essential government services, and Indian tribes and authorized tribal organizations. Individuals or homeowners cannot apply directly for the HMGP; a local government must apply on their behalf. Applications are submitted to PEMA and placed in rank order for available funding and submitted to FEMA for final approval. Eligible projects not selected for funding are placed in an inactive status and may be considered as additional HMGP funding becomes available.

Sections 404 and 406 hazard mitigation funding are two distinct criteria associated with mitigation funding. Participation in FEMA 404 HMGP may cover mitigation activities including raising, removing, relocating, or replacing structures within flood hazard areas. FEMA 406 HMGP is applied to parts of a facility that were actually damaged by a disaster, and the mitigation measures that provide protection from subsequent events.

Flood Mitigation Assistance (FMA) Program

FMA provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. FMA is funded annually; no federal disaster declaration is required. Only NFIP-insured homes and businesses are eligible for mitigation in this program. Funding for FMA is very limited and, as with the HMGP, individuals cannot apply directly for the program. Applications must come from local governments or other eligible organizations.

The federal government cost share for an FMA project is 75 percent. At least 25 percent of the total eligible costs must be provided by a non-federal source and of this 25 percent, no more than half can be provided as in-kind contributions from third parties. At a minimum, a FEMA-approved local HMP is required before a project can be approved. FMA funds are distributed from FEMA to the State. PEMA serves as the grantee and program administrator for FMA.

As of fiscal year 2013, the Severe Repetitive Loss and Repetitive Flood Claims Programs were dismantled and incorporated into the FMA Program. As a result, residential and non-residential properties currently insured with NFIP are eligible to receive FMA funds as long as they meet either the Repetitive Loss Properties (RLP) or Severe Repetitive Loss (SRL) property definitions as described in Section 4.3.5 of this plan.

Pre-Disaster Mitigation (PDM) Program

The PDM program is an annually-funded, nationwide, competitive grant program. No disaster declaration is required. Federal funds will cover 75 percent of a project’s cost up to $3 million. As with the HMGP and FMA, a FEMA-approved local HMP is required to be approved for funding under the PDM program.

5.6.3 Federal Disaster Assistance Programs

Following a disaster, various types of assistance may be made available by local, state, and federal governments. The types and levels of disaster assistance depend on the severity of the damage and the declarations that result from the disaster event. General types of assistance that may be provided, should the President of the United States declare the event a major disaster, include the following:

- Individual Assistance – provides help for homeowners, renters, businesses, and some non-profit entities after disasters occur. This program is largely funded by the U.S. Small Business Administration largely funds this program. For homeowners and renters, those who suffered uninsured or underinsured losses may be eligible for a Home Disaster Loan to repair or replace damaged real estate or personal property. Renters are eligible for loans to cover personal property losses. Individuals may borrow up to $200,000 to repair or replace real estate, $40,000 to cover losses to personal property and an additional 20 percent for mitigation. For businesses, loans may be made to repair or replace disaster damages to property owned by the business, including real estate, machinery and equipment, inventory and supplies. Businesses of any size are eligible. Non-profit organizations such as charities, churches, private universities, etc. are also eligible. An Economic Injury Disaster Loan provides necessary working capital until normal operations resume after a physical disaster. These loans are restricted, by law, to small businesses only.

- Public Assistance – provides cost reimbursement aid to local governments (state, county, local, municipal authorities and school districts) and certain non-profit agencies that were involved in disaster response and recovery programs or that suffered loss or damage to facilities, or property used to deliver government-like services. This program is largely funded by FEMA with both local and state matching contributions required.

5.6.4 Other Potential Funding Sources

Community Development Block Grants (CDBG)

CDBGs are federal funds intended to provide low- and moderate-income households with decent housing, a suitable living environment, and expanded economic opportunities. Eligible activities include community facilities and improvements, roads and infrastructure, housing rehabilitation and preservation, development activities, public services, economic development, planning, and administration. Public improvements may include flood and drainage improvements. In limited instances, and during times of "urgent need" (for example, post disaster) as defined by the CDBG National Objectives, CDBG funding may be used to acquire a property located in a floodplain that was severely damaged by a recent flood, demolish a structure severely damaged by an earthquake, or repair a public facility severely damaged by a hazard event. Fulton County and several of its municipalities have utilized CDBG funding for infrastructure and other necessary improvements to increase County resiliency.

Marcellus Shale Legacy Fund - Act 13 of 2012

Watershed Restoration and Protection Program (WRPP) - Act 13 of 2012 establishes the Marcellus Legacy Fund and allocates funds to the Commonwealth Financing Authority for watershed restoration and protection projects. The overall goal of this program is to restore, and maintain restored stream reaches impaired by the uncontrolled discharge of nonpoint source polluted runoff, and ultimately to remove these streams from the Department of Environmental Protection's Impaired Waters list.

Greenways, Trails and Recreation Program (GTRP) - In addition, Act 13 of 2012 allocates funds to the Commonwealth Financing Authority (the "Authority") for planning, acquisition, development, rehabilitation and repair of greenways, recreational trails, open space, parks and beautification projects. Projects can involve development, rehabilitation and improvements to public parks, recreation areas, greenways, trails, and river conservation.

Flood Mitigation Projects – Finally, Act 13 of 2012 allocates funds to the Commonwealth Financing Authority (the "Authority") for funding Statewide initiatives to assist with flood mitigation projects.

While most of the identified fiscal capabilities are available to all of the municipalities in Fulton County, the extent to which communities have leveraged these funding sources varies widely. It is expected that communities familiar with accessing grant programs will continue to pursue those grant sources, as appropriate.

5.6.5 Municipal Capabilities

Municipalities participating in this planning effort were provided with a capabilities survey. Table 5-3 summarizes the responses of the municipalities based on fiscal capabilities. Copies of the individual municipal responses are found in Appendix D.

Table 5-3. Fiscal Capability

Municipality	Capital Improvements Program	Community Development Block Grants (CDBG)	Special Purpose Taxes	Gas/Electric Utility Fees	Water/Sewer Fees	Stormwater Utility Fees	Development Impact Fees	General Obligation, Revenue, and/or Special Tax Bonds	Partnering Arrangements or Intergovernmental Agreements	Other
Fulton County	-	X	-	-	-	-	-	-	-	-
Ayr Township	-	-	-	-	-	-	-	-	-	-
Belfast Township	-	X	-	-	X	-	-	-	-	X
Bethel Township	-	X	-	-	X	-	-	-	-	-
Brush Creek Township	-	-	-	-	-	-	-	-	-	-
Dublin Township	-	X	-	-	X	-	-	-	-	-
Licking Creek Township	-	X	-	-	-	-	-	-	-	X
McConnellsburg Borough	-	-	-	-	-	-	-	-	-	-
Taylor Township	-	-	-	-	-	-	-	-	-	-
Thompson Township	-	-	-	-	-	-	X	X	X	-
Todd Township	-	X	-	-	X	-	-	X	X	X
Union Township	-	X	-	-	-	-	-	-	-	-
Valley-Hi Borough										
Wells Township	-	-	-	-	-	-	-	-	-	-

Notes:
"X" indicates that the municipality currently has this capability in place.
"-" indicates no capability is currently in place.
Blank space indicates no response was received from the municipality.

Detailed information regarding municipalities' fiscal capabilities can be found in the municipal survey responses provided in Appendix D.

5.7 Political Capability

For a hazard mitigation project, political capability speaks to a jurisdiction's ability, will, and commitment to supporting risk management activities and programs within all aspects of their community's governance. This commitment may be evidenced through the adoption and appropriate enforcement of mitigation-related ordinances and plans (zoning, comprehensive planning, site-plan review, building code, higher regulatory standards), appropriate and critical mitigation-related outreach to vulnerable property owners and the public in general, an appropriate dedication of resources (administrative, technical, fiscal) to implement identified priority mitigation projects/actions, and the integration and coordination of the findings and recommendations of this plan update within other complementary and supportive plans and programs.

Strong political capabilities are built over time; they are not necessarily transferred from one elected official to the next. Communities that have had to repeatedly face hazard events and their impacts tend to be those that build and maintain greater mitigation capabilities, and this is certainly the case with political (including public) will. Through this mitigation planning, update, and implementation process, FEMA and the State are promoting efforts to build political and popular support to improve the management of hazard risk at the local level.

The capability assessment surveys provided to each jurisdiction for completion included an assessment of local political capability, where the respondent was asked to rate their community's political capability to effect and support hazard mitigation on a scale ranging from "5 – Very Willing" to "0 – Unwilling to Adopt Policies/Programs." Completed capability assessment worksheets returned from communities are provided in Appendix D. By its very nature, an assessment of political capabilities tends to be highly subjective, and any such local assessment provided by a community should not necessarily be considered statistically valid or reflective of the opinions of others in the community.

5.7.1 Municipal Capabilities

Participating municipalities in this planning effort were provided with a capabilities survey. Table 5-4 summarizes the responses of the municipalities based on political capability.

Table 5-4. Political Capability

Municipality	Very Willing	Moderate to Very Willing	Moderately Willing	Unwilling to Moderately Willing	Unwilling
Fulton County		X			
Ayr Township	X				
Belfast Township	X				
Bethel Township	X				
Brush Creek Township	X				
Dublin Township	X				
Licking Creek Township			X		
McConnellsburg Borough	X				
Taylor Township			X		
Thompson Township	X				
Todd Township		X			
Union Township			X		
Valley-Hi Borough					
Wells Township			X		

Notes:
"X" indicates the identified municipal political effort currently in place.
Blank space indicates no response was received from the municipality.

Detailed information regarding municipalities' political capabilities can be found in the municipal survey responses provided in Appendix D.

5.8 Self-Assessment

Through the capability assessment surveys, all participating jurisdictions were further asked to provide a self-assessment of their jurisdiction's capability in the areas of Planning and Regulatory Capability, Administrative and Technical Capability, Fiscal Capability, Community Political Capability, and Community Resilience Capability. Respondents evaluated their degree of capability in these areas as "Limited", "Moderate" or "High." Table 5-5 provides the summary results from municipalities that completed capability self-assessment worksheets.

Table 5-5. Capability Self-Assessment Matrix

Municipality	Capability Category				
	Planning and Regulatory Capability	Administrative and Technical Capability	Fiscal Capability	Community Political Capability	Community Resiliency Capability
Fulton County	Moderate	Moderate	Limited	Moderate	Moderate
Ayr Township	Moderate	Moderate	Moderate	Moderate	Moderate
Belfast Township	Limited	Limited	Limited	Limited	Limited
Bethel Township	-	-	-	-	-
Brush Creek Township	-	High	Moderate	Moderate	-
Dublin Township	Moderate	Moderate	Moderate	Moderate	Moderate
Licking Creek Township	Moderate	Moderate	Limited	Limited	Moderate
McConnellsburg Borough	Moderate	Moderate	High	Moderate	Moderate
Taylor Township	Moderate	Moderate	Limited	Moderate	Moderate
Thompson Township	High	High	High	High	High
Todd Township	Moderate	Moderate	Moderate	Moderate	Moderate
Union Township	Limited	Limited	Limited	Limited	Limited
Valley-Hi Borough					
Wells Township	Moderate	Moderate	Limited	Moderate	Moderate

Notes:
"-" indicates no capability is currently in place.
Blank space indicates no response was received from the municipality.

Detailed information regarding the municipalities' capabilities self-assessments can be found in the municipal survey responses provided in Appendix D.

5.9 Capability Assessment Recommendations

It is well recognized that a jurisdiction's ability to effectively manage natural hazard risk is directly related to their level of hazard mitigation capabilities. As such, mitigation strategies developed in coordination with Fulton County's municipalities have a direct effect on establishing new capability functions in the community or strengthening existing capabilities.

Strong political capabilities are built over time; they are not necessarily transferred from one elected official to the next. Communities that have had to repeatedly face hazard events and their impacts tend to be those that build and maintain greater mitigation capabilities, and this is certainly the case with political (including public) will. Through this mitigation planning, update, and implementation process, FEMA and the State are promoting efforts to build political and popular support to improve the management of hazard risk at the local level.

The capability assessment surveys provided to each jurisdiction for completion included an assessment of local political capability, where the respondent was asked to rate their community's political capability to effect and support hazard mitigation on a scale ranging from "5 – Very Willing" to "0 – Unwilling to Adopt Policies/Programs." Completed capability assessment worksheets returned from communities are provided in Appendix D. By its very nature, an assessment of political capabilities tends to be highly subjective, and any such local assessment provided by a community should not necessarily be considered statistically valid or reflective of the opinions of others in the community.

5.7.1 Municipal Capabilities

Participating municipalities in this planning effort were provided with a capabilities survey. Table 5-4 summarizes the responses of the municipalities based on political capability.

Table 5-4. Political Capability

Municipality	Very Willing	Moderate to Very Willing	Moderately Willing	Unwilling to Moderately Willing	Unwilling
Fulton County		X			
Ayr Township	X				
Belfast Township	X				
Bethel Township	X				
Brush Creek Township	X				
Dublin Township	X				
Licking Creek Township			X		
McConnellsburg Borough	X				
Taylor Township			X		
Thompson Township	X				
Todd Township		X			
Union Township			X		
Valley-Hi Borough					
Wells Township			X		

Notes:
"X" indicates the identified municipal political effort currently in place.
Blank space indicates no response was received from the municipality.

Detailed information regarding municipalities' political capabilities can be found in the municipal survey responses provided in Appendix D.

5.8 Self-Assessment

Through the capability assessment surveys, all participating jurisdictions were further asked to provide a self-assessment of their jurisdiction's capability in the areas of Planning and Regulatory Capability, Administrative and Technical Capability, Fiscal Capability, Community Political Capability, and Community Resilience Capability. Respondents evaluated their degree of capability in these areas as "Limited", "Moderate" or "High." Table 5-5 provides the summary results from municipalities that completed capability self-assessment worksheets.

Table 5-5. Capability Self-Assessment Matrix

Municipality	Capability Category				
	Planning and Regulatory Capability	Administrative and Technical Capability	Fiscal Capability	Community Political Capability	Community Resiliency Capability
Fulton County	Moderate	Moderate	Limited	Moderate	Moderate
Ayr Township	Moderate	Moderate	Moderate	Moderate	Moderate
Belfast Township	Limited	Limited	Limited	Limited	Limited
Bethel Township	-	-	-	-	-
Brush Creek Township	-	High	Moderate	Moderate	-
Dublin Township	Moderate	Moderate	Moderate	Moderate	Moderate
Licking Creek Township	Moderate	Moderate	Limited	Limited	Moderate
McConnellsburg Borough	Moderate	Moderate	High	Moderate	Moderate
Taylor Township	Moderate	Moderate	Limited	Moderate	Moderate
Thompson Township	High	High	High	High	High
Todd Township	Moderate	Moderate	Moderate	Moderate	Moderate
Union Township	Limited	Limited	Limited	Limited	Limited
Valley-Hi Borough					
Wells Township	Moderate	Moderate	Limited	Moderate	Moderate

Notes:
"-" indicates no capability is currently in place.
Blank space indicates no response was received from the municipality.

Detailed information regarding the municipalities' capabilities self-assessments can be found in the municipal survey responses provided in Appendix D.

5.9 Capability Assessment Recommendations

It is well recognized that a jurisdiction's ability to effectively manage natural hazard risk is directly related to their level of hazard mitigation capabilities. As such, mitigation strategies developed in coordination with Fulton County's municipalities have a direct effect on establishing new capability functions in the community or strengthening existing capabilities.

SECTION 6: MITIGATION STRATEGY

This section describes the process by which the Fulton County Steering Committee (Steering Committee) will reduce or eliminate potential losses from the natural and non-natural hazards identified in Section 4.2 of this hazard mitigation plan (HMP). The mitigation strategy focuses on existing and potential future mitigation actions to alleviate the effects of hazards on Fulton County's population, economy, and general building stock.

This section provides a summary of the 2015 HMP update process, outlines the mitigation goals and objectives set forth in the 2015 HMP Update, describes the process for identifying and analyzing mitigation techniques, and provides the mitigation action plan.

6.1 Update Process Summary

The goals and objectives listed in the Fulton County HMP were first examined through the dispersal of the Mitigation Strategy 5-Year Plan Review Worksheet (Mitigation Review Worksheet). During this review, the Steering Committee members and the general public were afforded the opportunity to comment on the goals, objectives, and actions that were listed in the existing HMP. In addition, the HMP was posted on the County's project website throughout the course of the plan update (www.fultonhmp.com). All correspondence distributed to the municipalities referenced the website and welcomed comments on the HMP to the Planning Commission or to Tetra Tech, Inc. (Tetra Tech).

The general mitigation planning approach used to develop this plan update is based on the Federal Emergency Management Agency (FEMA) publication, Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies. The document includes the following four steps, which were used to support mitigation planning for this HMP:

1. **Review of Mitigation Goals and Objectives:** Mitigation goals and objectives were examined during the 2015 HMP Mitigation Solutions Workshop, a meeting that was open to and attended by members of the public. The Steering Committee and members of the general public were afforded the opportunity to comment on the goals and objectives that were listed in the existing 2010 HMP through both the Mitigation Solutions Workshop and the Mitigation Review Worksheet. Mitigation goals and objectives were updated or developed using the latest information gathered through the hazard profiles, vulnerability assessments, and risk assessment.

2. **Develop and Update Mitigation Strategies:** Mitigation actions were identified based on the risk assessment, mitigation goals and objectives, existing policies, and input from the Steering Committee and municipal planning partners.

3. **Mitigation Strategy Prioritization and Implementation:** The potential mitigation actions were qualitatively evaluated using the Political, Administrative, Social, Technical, Economic, Environmental, and Legal (PA-STEEL) method, described in more detail in Section 6.4. Mitigation actions were prioritized into three categories: high priority, medium priority, and low priority. High-priority and medium-priority mitigation actions are recommended for implementation before low-priority actions; however, based on County and community-specific needs, cost estimation, and available funding, some low-priority mitigation actions may be addressed first.

4. **Document the Mitigation Planning Process:** The entire mitigation planning process is documented throughout this HMP, particularly in Section 3.

This section summarizes past mitigation goals, past mitigation action status and update of mitigation strategies, and additional past mitigation accomplishments.

6.1.1 Review of the Past Mitigation Goals

The mitigation goals identified in the 2010 version of the HMP are listed below:

1. **Goal 1:** Prevent hazards from impacting the community.
2. **Goal 2:** Protect the people, property, and environment in hazard areas.
3. **Goal 3:** Maintain and enhance emergency services capabilities in the community.
4. **Goal 4:** Protect natural resources within the hazard areas.
5. **Goal 5:** Ensure that stakeholder groups have necessary information to mitigate against hazard impacts.

6.1.2 Past Mitigation Action Status and Update of Mitigation Strategies

In the 2010 Fulton HMP, Fulton County identified 29 actions and initiatives to support an improved understanding of hazard risk and vulnerability and to enhance mitigation capabilities. Progress on the 2010 County-level mitigation actions was evaluated during the 2015 update process.

Fulton County, via various representatives on the Steering Committee, was provided with a Mitigation Review Worksheet identifying all of the County and municipal actions and initiatives from the 2010 plan. The respondents were asked to indicate the status of each action ("No Progress/Unknown," "In Progress/Not Yet Complete," "Continuous," "Completed," or "Discontinued"), and provide review comments on each.

The completed Mitigation Action Plan Review Worksheet is provided in Table 6-1. Projects and initiatives identified as "Complete" and "Discontinued" have been removed from this plan update. Those actions the County has identified as "No Progress/Unknown," "In Progress/Not Yet Complete," or "Continuous" have been carried forward in the updated mitigation strategies identified in Table 6-1.

Table 6-1. Past Mitigation Action Status

Description	Jurisdiction	Status	Review Comments
1.A.1 – Conduct workshops and training for municipal officials on the benefits of land use regulations to protect new and existing structures and infrastructure.	County and All Municipalities	In Progress	• Bethel Township, Dublin Township, and Todd Township noted No Progress/Unknown for this action. • Dublin Township specifically noted that they have not seen any training on this topic. • Fulton County, McConnellsburg Borough, and Thompson Township marked this action as Continuous.
1.B.1 – Create and maintain stormwater management plans for the County's watersheds.	County and All Municipalities	Completed	• This action has been completed by the County (in 2011), Dublin Township, McConnellsburg Borough, Thompson Township, and Todd Township. • Thompson Township noted this action as Continuous to indicate regular maintenance.

Description	Jurisdiction	Status	Review Comments
1.C.1 – Redesign the Timber Ridge Road, Great Cove Road (US-522) intersection to provide adequate sight distance for motorists turning from Timber Ridge Road.	Belfast Township	Completed	• No additional comments noted by Belfast Township. • Fulton County, McConnellsburg Borough, and Thompson Township also marked this action as Completed.
1.C.2 – Lower and slope the road bank at the intersection of Sipes Mill Road (SR-4001) and Palmer Road (T-383) to increase visibility when entering Sipes Mill Road.	Belfast Township	Completed	SR-4001 has been changed to T-379.
1.C.3 – Replace three tiles on Johnstons Drive with one squash tile.	Todd Township	In Progress	Township Engineer is in the process of reviewing and potentially applying for dirt and gravel grant.
1.C.4 – Construct a bridge on Creek Road (T-388) in Licking Creek Township over the creek fording.	Licking Creek Township	No Progress / Unknown	No additional comments noted by municipality or County.
1.C.5 – Replace the road tile on Back Hollow Road in Harrisonville.	Licking Creek Township	Completed	No additional comments noted by municipality or County.
1.C.6 – Increase visibility at the intersection of Great Cove Road (US-522) and Alpine Road.	Bethel Township	No Progress / Unknown	No additional comments noted by municipality or County. Relevant jurisdiction has been updated per road locations in County.
1.C.7 – Increase visibility at the intersection of Great Cove Road (US-522) and Bethel Church Road.	Bethel Township	No Progress / Unknown	No additional comments noted by municipality or County.
1.C.8 – Increase visibility at the intersection of SR-643 and Spring Road.	Bethel Township	No Progress / Unknown	No additional comments noted by municipality or County.
1.C.9 – Increase visibility at the intersection of Stoney Break Road and Black Oak Road.	Bethel Township	No Progress / Unknown	No additional comments noted by municipality or County.
1.C.10 – Increase visibility at the intersection of Buck Valley Road and Mays Chapel Road.	Bethel Township	No Progress / Unknown	No additional comments noted by municipality or County.
2.A.1 – Obtain information on existing and proposed new structures in the areas with the highest relative vulnerability to determine the best property protection methods. The following information should be obtained: • Lowest-floor elevation • Number of stories • Presence of a basement • Market and/or replacement value	County and All Municipalities	In Progress	• Thompson Township has marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown.
2.A.2 – Obtain information for all existing and proposed new structures in the 1% chance floodplain to determine the best property protection methods to promote with individual property owners.	County and All Municipalities	In Progress	• Thompson Township has marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown.

Description	Jurisdiction	Status	Review Comments
2.A.3 – Examine the effects of requiring anchor straps and improved roofing shingles on new and existing manufactured homes and residences of the County.	County and All Municipalities	In Progress	• Thompson Township has marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown.
2.B.1 – Establish a Firewise Program in the County, especially around the Meadow Grounds Lake, Cowans Gap State Park, and Breezewood Park.	County and All Municipalities	In Progress	• Ayr Township and Thompson Township have marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown.
3.A.1 – Identify and apply for funding to enhance the County's radio system.	County and All Municipalities	In Progress	• Thompson Township has marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown.
3.A.2 – Identify and apply for funding to upgrade the County's emergency responders' radio equipment.	County and All Municipalities	In Progress	The County identified the process for funding, and will start in the near future. Wording for update will be changed to indicate that fire departments must apply for funding directly.
3.A.3 – Identify and implement backup communications systems for emergency response organizations.	County and All Municipalities	Discontinued	• Thompson Township has marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown. • The County has determined that this action is no longer relevant to County needs.
3.B.1 – Include hazard mitigation periodically as a topic in the Quarterly Emergency Management Coordinator Training session(s).	County and All Municipalities	Continuous	• The County, McConnellsburg Borough, and Thompson Township have marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown.
3.C.1 – Install dry hydrant locations along PA-655 to assist the Needmore Fire Company.	Belfast Township, Thompson Township	No Progress / Unknown	No additional comments noted by municipalities or the County.
4.A.1 – Protect natural wetlands that may absorb floodwaters.	County and All Municipalities	No Progress / Unknown	No additional comments noted by municipalities or the County.
4.A.2 – Implement programs deemed necessary by the Conservation District.	County and All Municipalities	In Progress	• Thompson Township has marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown.

Description	Jurisdiction	Status	Review Comments
4.B.1 – Coordinate with the conservation and extension offices to provide education and training to emergency responders, managers, and municipal officials.	County and All Municipalities	In Progress	• The County and Thompson Township have marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown.
5.A.1 – Recruit SkyWarn Spotters in the County.	County and All Municipalities	Completed	• Fulton County has marked this action as Completed and noted that a class was given during the StormReady process. • Thompson Township has marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown.
5.A.2 – Encourage major employers and other facilities to participate in the subordinate StormReady programs.	County and All Municipalities	In Progress	• Thompson Township has marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown.
5.B.1 – Seek relevant input from all departments during the pre-impact, impact, and post-impact phases of an emergency.	County and All Municipalities	In Progress	• Thompson Township and Todd Township have marked this action as Continuous. • Todd Township indicated the Fulton County Emergency Management Agency (EMA) maintained this action. • All other municipalities have indicated this action as No Progress/Unknown.
5.C.1 – Identify and fill gaps in information needed to conduct vulnerability analysis in hazard areas.	County and All Municipalities	In Progress	• Fulton County and Thompson Township have marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown.
5.C.2 – Evaluate geographic information system (GIS) and other software packages to find the ideal system for the County's use.	County and All Municipalities	Completed	• The County also noted "Planning/GIS" under additional comments, and noted during the plan update that this project was completed with the GIS and tax assessment records being linked. • Fulton County and Thompson Township have marked this action as Continuous. • All other municipalities have indicated this action as No Progress/Unknown.

Additionally, on February 17, 2015, the Steering Committee hosted a Mitigation Solutions Workshop, which was attended by several County and municipal representatives, along with interested County residents. The purpose of this workshop was to provide another opportunity to review the current goals, objectives, and actions listed in the HMP, and to determine what the revised HMP's goals, objectives, and actions would be. The goals, objectives, and mitigation techniques to be considered in the document were identified. Meeting minutes are provided in Appendix C. The Steering Committee then used the outcomes from the workshop to help identify and prioritize the final mitigation actions included further in this section.

The Steering Committee determined that most of the actions listed in the 2010 version of the HMP would be continued (i.e., deferred) to the current version of the plan. Based on the revised objectives, however, the exact wording of the mitigation actions may have changed.

6.1.3 Additional Past Mitigation Accomplishments

Fulton County and its municipalities are dedicated to mitigation activities and comprehensive all-hazards planning. To that end, the County has engaged and continues to engage in mitigation activities beyond those identified in its 2010 HMP. The County and its municipalities have demonstrated proactive approach, commitment to resiliency, and desire to protect both physical assets and citizens against hazard losses through the following additional accomplishments:

- Fulton County has placed National Oceanic and Atmospheric Administration (NOAA) weather radios in all schools, daycares, and the local hospital.
- The Fulton County EMA supports the hospital's monthly exercises to promote safety and preparedness.
- County and municipal staff attend an annual Pipeline Safety training, and EMA local coordinators attend Pennsylvania Emergency Management Agency (PEMA) quarterly trainings.
- Fulton County has hosted National Incident Management System (NIMS) and damage assessment trainings.
- The Fulton County Conservation District implemented the first annual "Cropland Field Day" two years ago. This activity is coordinated with the Farm Bureau at a local farm, and it focuses on farm safety, road safety, and pesticide information.
- Fulton County Conservation District disseminates a quarterly informational newsletter to municipal officials. EMA/9-1-1 and the Planning Department both routinely provide disaster preparedness and other updates in this newsletter.
- Dublin Township has identified roadways vulnerable to hazard impacts (flooding), including the Tannery Road Bridge and Park Road, and seeks mitigation and infrastructure improvement opportunities to enhance their resiliency.
- Union Township identified I-70/Old 126 Slide as a vulnerable roadway. The Township maintains the dip in the roadway (Old 126) by adding materials on a regular basis.

6.2 Mitigation Goals and Objectives

This section describes the mitigation goals and objectives set forth in the 2015 HMP Update.

6.2.1 2015 Mitigation Goals

The Steering Committee reviewed the 2010 HMP goals during the Mitigation Solutions Workshop to determine their continuing applicability to County mitigation needs. After careful and extensive discussion, the Steering Committee determined that the goals would be carried over to the 2015 update without change in phrasing. The 2015 County HMP goals are in line with State mitigation goals, embody the overarching needs and concerns of the County and participating municipalities, and address both natural and non-natural hazard risk reduction. The 2015 County HMP goals are listed below:

6. **Goal 1:** Prevent hazards from impacting the community.
7. **Goal 2:** Protect the people, property, and environment in hazard areas.
8. **Goal 3:** Maintain and enhance emergency services capabilities in the community.
9. **Goal 4:** Protect natural resources within the hazard areas.
10. **Goal 5:** Ensure that stakeholder groups have necessary information to mitigate against hazard impacts.

6.2.2 2015 Mitigation Objectives

The goals listed above were used to develop relevant objectives. The objectives address in more specific terms the results of the vulnerability assessment and reflect the possible effects that can be mitigated for the identified hazards, as well as existing limitations in data and information. The objectives were originally identified during the 2010 HMP Update but were reviewed by the Steering Committee during the 2015 HMP Update Mitigation Solutions Workshop. After detailed discussion, the Steering Committee determined most of the objectives to still be relevant to County needs and concerns regarding hazard risk reduction. Objectives related to each of the goals are listed below:

1. **Goal 1**
    a. **Objective 1.A:** Work with the municipalities to create and/or update land use regulations (e.g., zoning, subdivision, and land development).
    b. **Objective 1.B:** Address areas of roadways that are vulnerable to hazard impacts.
2. **Goal 2**
    a. **Objective 2.A:** Examine property protection measures and their applicability to the community.
    b. **Objective 2.B:** Identify hazard areas in which property protection measures would be most effective.
3. **Goal 3**
    a. **Objective 3.A:** Ensure adequate communications capabilities among emergency response organizations.
    b. **Objective 3.B:** Continue to train municipal Emergency Management Coordinators, relevant personnel, and interested members of the community on hazard protection, preparedness, and response.
    c. **Objective 3.C:** Ensure adequate water supply to fight urban and wildland fires.
4. **Goal 4**
    a. **Objective 4.A:** Continue working with the Conservation District to ensure that the County's natural resources are protected.
    b. **Objective 4.B:** Maintain environmental education programs that the conservation and extension offices conduct, and perhaps create new ones.
5. **Goal 5**
    a. **Objective 5.A:** Continue StormReady program participation.

b. **Objective 5.B:** Update and maintain the County website with current information from all departments.

6.3 Identification and Analysis of Mitigation Techniques

Concerted efforts were made to ensure that the County and its municipalities developed updated mitigation strategies that included activities and initiatives covering the range of mitigation action types described in recent FEMA planning guidance ("Local Mitigation Planning Handbook," March 2013), including:

1. **Local Plans and Regulations:** These actions include government authorities, policies, or codes that influence the way land and buildings are being developed and built.
2. **Structure and Infrastructure Projects:** These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. These project types could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct man-made structures to reduce the impact of hazards.
3. **Natural Systems Protection:** These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.
4. **Education and Awareness Programs:** These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as the National Flood Insurance Program and Community Rating System, StormReady (NOAA) and Firewise (National Fire Protection Association [NFPA]) Communities.

The participants of the Mitigation Solutions Workshop and the Steering Committee identified actions that relate to the techniques listed above. Table 6-2 identifies which mitigation techniques are applicable for the hazards included in the 2015 HMP.

Table 6-2. Mitigation Technique Matrix

Hazard	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs
Dam Failure	X	X	X	X
Drought	X	X	X	X
Earthquake	X	X	X	X
Environmental Hazards	X	X	X	X
Flood, Flash Flood, and Ice Jam	X	X	X	X
Hailstorm	X	X	X	X
Landslide	X	X	X	X
Radon Exposure	X	X	X	X
Subsidence and Sinkholes	X	X	X	X
Tornados and Windstorms	X	X	X	X
Transportation Accidents	X	X	X	X
Wildfire	X	X	X	X
Winter Storm	X	X	X	X

6.4 Mitigation Action Plan

Representatives from the County and all participating municipalities selected mitigation strategies and initiatives to pursue until the next plan update. These actions also include some actions identified during the 2010 update that are still relevant or in progress. This section describes 2015 mitigation initiatives, mitigation strategy prioritization and implementation, and prioritization of mitigation actions.

6.4.1 2015 Mitigation Initiatives

Table 6-3 summarizes the updated mitigation strategies identified by the County and all participating municipalities, including:

- Mitigation actions for individual and multiple hazards
- Mitigation action type
- Department or agency primarily responsible for project initiation and/or implementation
- Estimated cost for the mitigation action, and identification of known or potential sources of funding
- Implementation schedule
- Implementation priority

Specific mitigation actions were identified to prevent future losses; however, current funding is not identified for all of these actions at present. The County and participating municipalities have limited resources to take on new responsibilities or projects. The implementation of these mitigation actions is dependent on the approval of the local elected governing body and the ability of the jurisdiction to obtain funding from local or outside sources.

In general, mitigation actions ranked as highest priorities will be addressed first. However, medium- or low-priority mitigation actions will be considered for concurrent implementation. Therefore, the ranking levels should be considered as a preliminary ranking, which will evolve based on prevailing priorities and decisions of local governments, the public, PEMA, and FEMA as the plan update is implemented.

Table 6-3. Hazard Mitigation Strategy

Note: Some of the identified mitigation initiatives in Table 6-3 are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in County or municipal priorities. Actions that have been carried over from the 2010 version of the HMP may have been reworded and given a new initiative designation to conform to current needs and procedures.

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
FC-1	Develop and conduct refresher courses and trainings for citizens involved with former County CERT and Citizen Corps. Sample supplemental activities could include website, e-blast, and flyers to advertise opportunities.	N/A	All	3.B, 4.B	County EMA/9-1-1/9-1-1, Municipalities	Medium	Low	FEMA, State, County	OG	M	EAP
FC-2	Begin the process to review and revise existing subdivision and land development regulations to minimize flood risk, subsidence/sinkhole risk, and other hazard risks as appropriate. This effort may be multi-municipal/regional, as interest and priorities allow. County can consider public outreach activities (newsletters, e-blasts, and public presentations) to demonstrate inclusiveness, transparency, and multi-municipal/regional collaboration.	New	Flood, Subsidence/Sinkhole, Dam Failure, Environmental Hazards, Earthquake, Landslide, Transportation Accident	1.A, 2.B	County Planning, County EMA/9-1-1	Medium	Medium	FEMA HMGP, State, County, Municipal	Short Term	H	LPR

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
FC-3	Develop and implement an enhanced all-hazards, public outreach/education/mitigation information program on natural hazard risks and a non-technical explanation of what residents can do in the way of mitigation and preparedness, including flood insurance. This effort would be a multi-media campaign that may range from bill inserts, to flyers, posters, public service announcements, social media, tri-fold brochures, and event booths. Outreach will target vulnerable populations and will be modular in size, scale, and reach.	N/A	All	3.B, 4.B	County Planning, County EMA/9-1-1, Municipalities	Medium	Low	FEMA, State, County	OG	M	EAP
FC-4	Encourage cross-training of existing personnel or utilize County personnel resources, as timing and funding permit, to enhance local administrative and technical ability. Areas for further professional development may include planning expertise, floodplain administration, hazard/risk management, grant writing and funding, and cost/benefit analysis.	N/A	All	3.B, 4.B	County Planning, County EMA/9-1-1, Municipalities	Medium	Low	FEMA, State, County	OG	M	EAP

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
FC-5	Evaluate the need for a voluntary animal waste/manure/fertilizer self-reporting program for farmers, CAFO facilities, and other relevant organizations to utilize so that the County can more accurately estimate the amount of hazardous biological waste transported through the County and so that additional mitigation/safety measures may be implemented, if necessary. This initiative can be completed through the development of educational materials and speakers from the National Fish and Wildlife Foundation, EPA, and Chesapeake Bay Foundation, with a targeted focus to Farm Bureau, Grange, and Conservation Districts.	N/A	Environmental Hazards	2.A, 2.B, 4.A, 5.B	County Planning, County EMA/9-1-1, Fulton County Conservation District	Medium	Medium	FEMA, EPA, State, County	Short Term	M	LPR, NSP
FC-6	Create and maintain a web-based inventory of the County's special needs population to strengthen emergency response and evacuation operations. As part of this effort, the County will disseminate outreach/education materials to explain the benefits of the program, as well as its voluntary and confidential nature. Outreach will be targeted at senior centers, intermediate units, healthcare providers, and faith-based organizations interfacing with these populations.	N/A	All	3.A, 5.B	County Planning, County EMA/9-1-1, County Human Services Administration, County Aging Services	Medium	Medium	FEMA, DHHS, State, County	OG	L	LPR, EAP

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
FC-7	Ensure all applicable private industrial, commercial, and public utility service providers have a current Environmental Emergency Response Plan per the Federal Clean Water Act the Pennsylvania Clean Streams Law (35 P.S. §§691.1-691.1001), the Pennsylvania Solid Waste Management Act, the Pennsylvania Storage Tank Act, the Oil Pollution Act, and regulations promulgated thereunder.	N/A	Environmental Hazards, Flood	2.A	County Planning, County EMA/9-1-1	High	Low	FEMA, EPA, State, County, Municipal	Short Term	H	LPR
FC-8	Strengthen the County's domestic animal health surveillance by familiarizing the Fulton County agricultural community with the list of reportable diseases and conditions related to animal health per the OIE and the Pennsylvania Domestic Animal Act (Act 100 of 1996). Outreach would be targeted at organizations such as the PSU Cooperation Extension service, Grange Halls, CAFOs, feed and farm supply vendors, the Farm Bureau, Rural Electric Cooperatives and other farm cooperatives, and veterinary practices.	N/A	Environmental Hazards	3.B, 5.B	County Planning, County EMA/9-1-1, Fulton County Conservation District	High	Low	County, Municipal	OG	H	EAP
FC-9	Work with the County's agricultural community to develop and implement the CART to strengthen the County's comprehensive emergency management program. Outreach would be targeted at organizations such as the PSU Cooperation Extension service, Grange Halls, CAFOs, feed and farm supply vendors, the Farm Bureau, Rural Electric Cooperatives and other farm cooperatives, and veterinary practices.	N/A	All	3.A	County Planning, County EMA/9-1-1, Fulton County Conservation District	Medium	Medium	State, County	Short Term	L	LPR

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
FC-10	Collaborate with the PA DEP Bureau of Radiation Protection to ensure the State's Radon Awareness Campaign and public service announcements are disseminated throughout Fulton County. This could include collateral and website development/links, County public service announcements, and social media development.	N/A	Radon Exposure	3.B	County Planning, County EMA/9-1-1, PA DEP, Municipalities	Low	Low	FEMA, PA DEP, County	OG	H	EAP
FC-11	Obtain an engineering study to redesign the intersection at Taylor Road and Waterfall Road in Dublin Township. Currently, emergency vehicles have difficulty making the turn at this intersection.	Existing	Transportation Accident	1.B, 2.A, 2.B	Dublin Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-12	Research corrective actions needed to improve the condition of Tannery Road Bridge in Dublin Township, and implement appropriate weight limit controls and other follow-up actions.	Existing	Transportation Accident, Flood	1.B, 2.A, 2.B	Dublin Township, County EMA/9-1-1, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	M	SIP
FC-13	Research corrective action to prevent flooding of Park Road in Dublin Township, and implement, if feasible.	Existing	Transportation Accident, Flood	1.B, 2.A, 2.B	Dublin Township, County EMA/9-1-1, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	M	SIP
FC-14	In Belfast Township, cut the bank back at 278 Black Bear Road to improve sight distance and to allow more space on the road.	Existing	Transportation Accident	1.B, 2.A, 2.B	Belfast Township, County Planning, PennDOT	Medium	Low	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-15	In Union Township, continue to pursue political channels and collaboration with state agencies (e.g., PennDOT) to study and maintain the slide area on T-366 (Old 126).	Existing	Landslide, Subsidence/Sinkholes, Transportation Accidents	1.B, 2.A, 2.B	Union Township, County Planning, County EMA/9-1-1, PennDOT, Fulton County Conservation District, Bethel Township	Medium	Low	County, Township	OG	H	SIP, LPR

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
FC-16	In Ayr Township, identify and implement response to manage stormwater runoff along Route 16, from True Value to Citgo Station.	Existing	Flood, Transportation Accident	1.B, 2.A, 2.B	Ayr Township, PennDOT, County Planning, County EMA/9-1-1, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	M	SIP
FC-17	Conduct workshops and training for municipal officials on the benefits of land use regulations to protect new and existing structures and infrastructure.	New and Existing	All	3.B	County Planning, Municipalities	Medium	Low	FEMA, State, County	OG	M	EAP
FC-18	Conduct, sponsor, or facilitate grant-writing trainings for municipal officials and other relevant personnel.	N/A	All	3.B	County Planning, Municipalities	Medium	Low	State, County	OG	M	EAP
FC-19	Replace three tiles on Johnstons Drive, in Todd Township, with one squash tile.	Existing	Transportation Accident	1.B, 2.A, 2.B	Todd Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	M	SIP
FC-20	Construct a bridge on Creek Road (T-388) in Licking Creek Township over the Creek fording.	New	Flood, Transportation Accident	1.B, 2.A, 2.B	Licking Creek Township, County Planning, PennDOT	Medium	High	FEMA HMGP and PDM, State, County, Township	Short Term	M	SIP
FC-21	Increase visibility at the intersection of Great Cove Road (US-522) and Alpine Road in Bethel Township.	Existing	Transportation Accident	1.B, 2.A, 2.B	Bethel Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-22	Increase visibility at the intersection of Great Cove Road (US-522) and Bethel Church Road in Bethel Township.	Existing	Transportation Accident	1.B, 2.A, 2.B	Bethel Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-23	Increase visibility at the intersection of SR-643 and Spring Road in Bethel Township.	Existing	Transportation Accident	1.B, 2.A, 2.B	Bethel Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-24	Increase visibility at the intersection of Stoney Break Road and Black Oak Road in Bethel Township.	Existing	Transportation Accident	1.B, 2.A, 2.B	Bethel Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
FC-25	Increase visibility at the intersection of Buck Valley Road and Mays Chapel Road in Bethel Township.	Existing	Transportation Accident	1.B, 2.A, 2.B	Bethel Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-26	Comply with floodplain ordinance regulations by continuing to obtain information on existing and proposed new structures in the areas with the highest relative vulnerability to determine the best property protection methods. The following information should be obtained: • Lowest-floor elevation • Number of stories • Presence of a basement • Market and/or replacement value The County and Fulton County Conservation District will support municipalities and provide training/education for floodplain managers, as needed.	New and Existing	All	2.A, 2.B	County Planning, County EMA/9-1-1, Fulton County Conservation District, Municipalities	Medium	Medium	FEMA HMGP PDM, and FMA; State; County; Municipal	OG	L	EAP, SIP
FC-27	Comply with floodplain ordinance regulations by continuing to obtain information for all existing and proposed new structures in the 1% chance floodplain to determine the best property protection methods to promote with individual property owners. The County and Fulton County Conservation District will support municipalities and provide training/education for floodplain managers, as needed.	New and Existing	Flood	2.A, 2.B	County Planning, County EMA/9-1-1, Fulton County Conservation District, Municipalities	Medium	Medium	FEMA HMGP PDM, and FMA; State; County; Municipal	OG	L	EAP, SIP

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
FC-28	Comply with floodplain ordinance and building code regulations by requiring anchor straps and improved roofing shingles on new and existing manufactured homes and residences of the County. The County and Fulton County Conservation District will support municipalities and provide training/education for floodplain managers, as needed.	New and Existing	All	2.A	County Planning, County EMA/9-1-1, Fulton County Conservation District, Municipalities	Medium	Medium	FEMA HMGP and PDM, State, County	Short Term	L	SIP
FC-29	Establish a Firewise Program in the County, especially around the Meadow Grounds Lake, Cowans Gap State Park, and Breezewood Park. Part of this initiative could include visual development of impacted areas, public service announcements, and educational outreach to farmers, hunters, campers, hikers, school children, and homeowners in the Wildland-Urban Interface.	N/A	Wildfire	3.B, 3.C, 4.B	County Planning, County EMA/9-1-1, Individual response organizations (fire departments)	Medium	Low	FEMA HMGP and PDM, State, County, Municipal	Short Term	L	EAP
FC-30	Identify and apply for funding to enhance the County's radio system.	N/A	All	3.A	County Planning, County EMA/9-1-1	Medium	High	FEMA HMGP and PDM, State, County, Municipal	Short Term	M	SIP
FC-31	Identify and apply for funding to upgrade emergency responders' radio equipment.	N/A	All	3.A	Individual response organizations (fire departments)	Medium	High	FEMA, State, County, Municipal	Short Term	L	SIP
FC-32	Install dry hydrant locations along PA-655 to assist the Needmore Fire Company.	New	Wildfire	2.A, 2.B	County Planning, Needmore Fire Company, Belfast Township	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-33	Protect natural wetlands that may absorb floodwaters. The benefits of this action would be described in other collateral developed for related initiatives.	Existing	Flood	4.A, 4.B	Fulton County Conservation District, County Planning, County EMA/9-1-1	High	Medium	FEMA HMGP and PDM, State, County, Municipal	OG	L	NSP

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
FC-34	Implement programs deemed necessary by the Conservation District.	N/A	All	4.A, 4.B	Fulton County Conservation District, County Planning, County EMA/9-1-1	Medium	Medium	FEMA HMGP and PDM (dependent on program), State, County, Municipal	OG	L	NSP
FC-35	Coordinate with the conservation and extension offices to provide education and training to emergency responders, managers, and municipal officials. Topic focuses could include modules from the Emergency Operations Plan, Crisis Communications, volunteer management, and recovery/resilience strategies.	N/A	All	3.B, 4.A, 4.B	Fulton County Conservation District, County Planning, County EMA/9-1-1	Medium	Low	FEMA, State, County, Municipal	OG	L	EAP, NSP
FC-36	Encourage major employers and other facilities to participate in the secondary StormReady programs. Such encouragement could occur through digital and print collateral, personal outreach, and speaking events at local service organizations (e.g., Rotary or Chamber events).	N/A	Flood, Hailstorm, Tornado and Windstorm, Winter Storm	5.A	County Planning, County EMA/9-1-1, Municipalities	Medium	Low	FEMA, State, County, Municipal	OG	L	EAP, LPR
FC-37	Seek relevant input from all departments during the pre-impact, impact, and post-impact phases of an emergency.	N/A	All	3.A, 5.B	County Planning, County EMA/9-1-1, Municipalities	High	Low	County, Municipal	OG	L	EAP, LPR
FC-38	Identify and fill gaps in information needed to conduct vulnerability analysis in hazard areas.	N/A	All	2.B, 5.B	County Planning, County EMA/9-1-1, Municipalities	High	Low	County, Municipal	OG	L	EAP, LPR
FC-39	Evaluate existing road capacity with concern to increased truck and other traffic on local roads, and implement road improvements, as applicable.	Existing	Transportation Accident, Environmental Hazards	1.B, 2.A, 2.B	County Planning, County EMA/9-1-1, Municipalities, PennDOT	Medium	Low	County, Municipal	OG	M	SIP
FC-40	In Thompson Township, upgrade and realign the intersection of Dent Road (T-343) and Timber Ridge Road (S.R. 2005) to allow for the passage of emergency vehicles.	Existing	Transportation Accident	1.B, 2.A, 2.B	Bethel Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
FC-41	In Taylor Township, conduct road improvements on Davis Lane (T-423).	Existing	Transportation Accident	1.B, 2.A, 2.B	Taylor Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-42	In Taylor Township, conduct intersection improvements and cut the bank back at Frick Road and Waterfall Road.	Existing	Transportation Accident	1.B, 2.A, 2.B	Taylor Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-43	In Union Township, conduct intersection improvements at Harmonia Road (S.R. 3002) and Lehman Road (T-308).	Existing	Transportation Accident	1.B, 2.A, 2.B	Union Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-44	In Union Township, conduct intersection improvements at Harmonia Road (S.R. 3002) and Stahle Road (T-314).	Existing	Transportation Accident	1.B, 2.A, 2.B	Union Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-45	In Dublin Township, conduct intersection improvements at Waterfall Road (S.R. 475) and Battle Ridge Road (T-426).	Existing	Transportation Accident	1.B, 2.A, 2.B	Dublin Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-46	In Ayr Township, identify correction actions on Great Cove Road (S.R. 522) by Whipporwill Lane to alleviate transportation accidents and dangerous bus stop conditions to road curve.	Existing	Transportation Accident	1.B, 2.A, 2.B	Ayr Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-47	In Taylor Township, identify and coordinate with PennDOT to implement infrastructure improvements to the two state bridges along 655 between Waterfall Road and Hustontown.	Existing	Transportation Accident, Flood	1.B, 2.A, 2.B	Taylor Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-48	In Thompson Township, replace the corrugated metal culvert carrying West Orchard Road (T-305) over Ditch Run.	Existing	Transportation Accident, Flood	1.B, 2.A, 2.B	Thompson Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals and Objectives Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
FC-49	In Union Township, maintain and upgrade Bridge No. 3 on Zachs Ridge Road (T-330), as needed.	Existing	Transportation Accident, Flood	1.B, 2.A, 2.B	Union Township, County Planning, PennDOT	Medium	Medium	FEMA HMGP and PDM, State, County, Township	Short Term	L	SIP
FC-50	Consider promoting or adopting higher regulatory and zoning standards to manage flood hazard risk, specifically through [examples]: • Support planning board of adjustment variances in cases where appeals are directly tied to compliance with the intent of floodplain regulations (e.g. overall building height; set-backs for inclined walkways). • Develop and adopt a cumulative substantial damage/improvements ordinance	Existing and New	Flood	1.A, 3.B	County Planning, Municipalities	High	Low	County, Municipal, Staff Time	OG	H	LPR
FC-51	Continue to promote future growth and development in the County in areas outside of determined hazard zones, where possible.	New	All	1.A, 3.B	County Planning, County EMA/9-1-1, Municipalities	Low	Low	County, Municipal, Staff Time	OG	H	LPR
FC-52	Request digital copies of Emergency Action Plans (EAPs) and inundation maps when high-hazard dam EAPs are next updated.	Existing	Dam Failure, Flood	3.A, 3.B	County Planning, County EMA/9-1-1	Low	Low	Staff Time	Short Term	H	LPR, EAP

Notes:
* Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.
CAFO = Concentrated Animal Feeding Operation
CART = County Animal Response Team
CERT = Community Emergency Response Team
DHHS = Department of Health and Human Services
FEMA = Federal Emergency Management Agency
OIE = Office of International Epizootics
PA DEP = Pennsylvania Department of Environmental Protection
PennDOT = Pennsylvania Department of Transportation
PSU = Pennsylvania State University

Costs:
Where actual project costs cannot reasonably be established at this time:

Low = < $10,000
Medium = $10,000 to $100,000
High = > $100,000

Potential FEMA HMA Funding Sources:
DOF = Depending on funding.
FMA = Flood Mitigation Assistance Grant Program
HMGP = Hazard Mitigation Grant Program
PDM = Pre-Disaster Mitigation Grant Program
RFC = Repetitive Flood Claims Grant Program
SRL = Severe Repetitive Loss Grant Program

Timeline:
Short Term = 1 to 5 years. Long Term = 5 years or greater. OG = Ongoing program.

Priority:
H = High
M = Medium
L = Low

Mitigation Category:
Education and Awareness Programs (EAP) = These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities.
Local Plans and Regulations (LPR) = These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.
Natural Systems Protection (NSP) = These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.
Structure and Infrastructure Project (SIP) = These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.

6.4.2 Mitigation Strategy Prioritization and Implementation

Section 201.6(c) (3) (iii) of Title 44 Code of Federal Regulations (44 CFR) requires the prioritization of the action plan to emphasize the extent to which benefits are maximized according to a cost/benefit review of the proposed projects and their associated costs. This allows the jurisdictions to select the most cost-effective actions for implementation first, not only to use resources efficiently, but also to make a realistic start toward mitigating risks.

Mitigation benefits are defined as future damages and losses that would be eliminated and/or reduced by implementing the proposed mitigation project, and include physical damage to structures and infrastructure, loss of service or function, and emergency management costs. Particularly for physical ("shovel-in-the-ground") mitigation projects, jurisdictions were encouraged to estimate project costs as well as to identify the anticipated benefits. Where exact project costs and potential benefits were not available, ranges were identified (high, medium, low) for each, allowing a qualitative evaluation of project cost-effectiveness.

The PA-STEEL methodology is defined in Pennsylvania's All-Hazard Planning Standard Operating Guide (October 2013), pages 36-37 and Appendix 12, "Mitigation Strategy Action Evaluation," as the Political, Administrative, Social, Technical, Economic, Environmental, and Legal (PA-STEEL) opportunities and constraints of implementing a particular mitigation action in a jurisdiction. The PA-STEEL method provides a uniform approach for counties and jurisdictions to use to consider, in a systematic way, the best mitigation strategies for their communities. The following provides a brief discussion of each of the PA-STEEL evaluation criteria, excerpted from the FEMA 386 mitigation planning guidance:

- **Political:** Understanding current opinions of community and state political leadership regarding issues related to the environment, economic development, safety, and emergency management will provide valuable insight into the level of political support offered for mitigation activities and programs. Proposed mitigation objectives sometimes fail because of a lack of political acceptability.
- **Administrative:** Under this part of the evaluation criteria, the Hazard Mitigation Working Group examines the anticipated staffing, funding, and maintenance requirements for the mitigation action to determine whether the jurisdiction has the personnel and administrative capabilities necessary to implement the action or whether outside help will be necessary.
- **Social:** The public must support the overall implementation strategy and specific mitigation actions. Therefore, the projects have to be evaluated in terms of community acceptance.
- **Technical:** It is important to determine whether the proposed action is technically feasible, will help to reduce losses in the long term, and has minimal secondary impacts. Here, the Hazard Mitigation Working Group determines whether the alternative action is a whole or partial solution, or not a solution at all.
- **Economic:** Every local, state, and tribal government experiences budget constraints at one time or another. Cost-effective mitigation actions that can be funded in current or upcoming budget cycles are much more likely to be implemented than mitigation actions requiring general obligation bonds or other instruments that would incur long-term debt to a community. States and local communities with tight budgets or budget shortfalls may be more willing to undertake a mitigation initiative if it can be funded, at least in part, by outside sources. "Big ticket" mitigation actions, such as large-scale acquisition and relocation, are often considered for implementation in a post-disaster scenario when additional federal and state funding for mitigation is available. Economic considerations must include the present economic base and projected growth.

- **Environmental:** Impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. In addition, many statutory considerations, such as the National Environmental Policy Act (NEPA), should be counted when using federal funds. Jurisdictions need to evaluate whether, when implementing mitigation actions, the potential negative consequences to environmental assets such as threatened and endangered species, wetlands, and other protected natural resources.
- **Legal:** Without the appropriate legal authority, the action cannot lawfully be undertaken. When considering this criterion, the Hazard Mitigation Working Group determines whether a jurisdiction has the legal authority at the state, tribal, or local level to implement the action, or whether the jurisdiction must pass new laws or regulations. Each level of government operates under a specific source of delegated authority. As a general rule, most local governments operate under enabling legislation that gives them the power to engage in different activities. Jurisdictions should identify the unit of government undertaking the mitigation action, and include an analysis of the inter-relationships between local, regional, state, and federal governments. Legal authority is likely to have a significant role later in the process when the state, tribe, or community determines the ways in which mitigation activities can best be carried out, and the extent to which mitigation policies and programs can be enforced.

Municipal and County-level mitigation actions were evaluated and prioritized primarily using the PA-STEEL methodology. Table 6-4 contains the completed PA-STEEL action evaluation table for the updated mitigation strategies (listed in Table 6-3).

In accordance with the PEMA Standard Operating Guidance (SOG), the mitigation strategy evaluation through the PA-STEEL methodology also summarizes the feasibility factors for each action and summarizes the factors with benefits and costs weighed more heavily and, therefore given greater priority. Using cost-benefit weighted prioritization, mitigation actions were ranked as high-priority, medium-priority, or low-priority actions.

Other factors beyond the PA-STEEL numeric rankings may have to be considered during project prioritization. For example, a project might be assigned a medium priority because of the uncertainty of a funding source. This priority could be changed to high once a funding source has been identified such as a grant.

Table 6-4. Analysis of Mitigation Actions

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	Summary (Equal Weighing)	Summary (Priority Ranking)
FC-1	Develop and conduct refresher courses and trainings for citizens involved with former County Community Emergency Response Team (CERT) and Citizen Corps. Sample supplemental activities could include website, e-blast, and flyers to advertise opportunities.	+	+	+	+	+	-	+	+	+	+	+	+	-	+	+	N	N	N	N	+	+	+	+	17 (+) 2 (-) 4 (N)	19 (+) 4 (-) 4 (N)
FC-2	Begin the process to review and revise existing subdivision and land development regulations to minimize flood risk, subsidence/sinkhole risk, and other hazard risks as appropriate. This effort may be multi-municipal/regional, as interest and priorities allow. County can consider public outreach activities (newsletters, e-blasts, and public presentations) to demonstrate inclusiveness, transparency, and multi-municipal/regional collaboration.	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	N	+	+	+	+	+	+	21 (+) 1 (-) 1 (N)	25 (+) 1 (-) 1 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			**A Admin-istrative**			**S Social**		**T Technical**			**E Economic**				**E Environmental**					**L Legal**				
NO.	**Name**	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**Summary (Equal Weighing)**	**Summary (Priority Ranking)**
FC-3	Develop and implement an enhanced all-hazards, public outreach/education/mitigation information program on natural hazard risks and a non-technical explanation of what residents can do in the way of mitigation and preparedness, including flood insurance. This effort would be a multi-media campaign that may range from bill inserts, to flyers, posters, public service announcements, social media, tri-fold brochures, and event booths. Outreach will target vulnerable populations and will be modular in size, scale, and reach.	+	+	+	+	+	-	+	+	+	+	+	+	-	+	+	N	N	N	N	+	+	+	+	17 (+) 2 (-) 4 (N)	19(+) 4 (-) 4 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**Summary (Equal Weighing)**	**Summary (Priority Ranking)**
FC-4	Encourage cross training of existing personnel or utilize County personnel resources, as timing and funding permit, to enhance local administrative and technical ability. Areas for further professional development may include planning expertise, floodplain administration, hazard/risk management, grant writing and funding, and cost/benefit analysis.	+	-	+	+	+	-	+	+	+	+	+	+	-	+	+	N	N	N	N	+	+	+	+	16 (+) 3 (-) 4 (N)	17 (+) 5 (-) 4 (N)
FC-5	Evaluate the need for a voluntary animal waste/manure/fertilizer self-reporting program for farmers, CAFO facilities, and other relevant organizations to utilize so that the County can more accurately estimate the amount of hazardous biological waste transported through the County and so that additional mitigation/safety measures may be implemented, if necessary. This initiative can be completed	+	+	+	-	N	-	+	+	+	+	+	+	-	N	+	+	N	+	+	+	+	+	+	17 (+) 3 (-) 3 (N)	19 (+) 5 (-) 3 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	Summary (Equal Weighing)	Summary (Priority Ranking)
	through the development of educational materials and speakers from the National Fish and Wildlife Foundation, EPA, and Chesapeake Bay Foundation, with a targeted focus to Farm Bureau, Grange, and Conservation Districts.																									
FC-6	Create and maintain a web-based inventory of the County's special needs population to strengthen emergency response and evacuation operations. As part of this effort, the County will disseminate outreach/education materials to explain the benefits of the program, as well as its voluntary and confidential nature. Outreach will be targeted at senior centers, intermediate units, healthcare providers, and faith-based organizations interfacing with these populations.	+	-	+	+	-	-	+	+	+	+	+	+	-	N	+	N	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)

PA-STEEL CRITERIA CONSIDERATIONS

(+) Favorable (-) Less favorable (N) Not Applicable

Mitigation Action		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal			Results	
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	Summary (Equal Weighing)	Summary (Priority Ranking)
FC-7	Ensure all applicable private industrial, commercial, and public utility service providers have a current Environmental Emergency Response Plan per the Federal Clean Water Act the Pennsylvania Clean Streams Law (35 P.S. §§691.1-691.1001), the Pennsylvania Solid Waste Management Act, the Pennsylvania Storage Tank Act, the Oil Pollution Act and regulations promulgated thereunder.	+	-	+	+	+	N	+	+	+	+	+	+	+	N	+	+	+	+	+	+	+	+	+	20 (+) 1 (-) 2 (N)	24 (+) 1 (-) 2 (N)
FC-8	Strengthen the County's domestic animal health surveillance by familiarizing the Fulton County agricultural community with the list of reportable diseases and conditions related to animal health per the Office of International Epizootics (OIE) and the Pennsylvania Domestic Animal Act (Act 100 of 1996). Outreach would be targeted at	+	-	+	-	+	N	+	+	+	+	+	+	+	N	+	+	+	N	+	+	+	+	+	18 (+) 2 (-) 3 (N)	22 (+) 2 (-) 3 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	Summary (Equal Weighing)	Summary (Priority Ranking)
	organizations such as the PSU Cooperation Extension service, Grange Halls, CAFOs, feed and farm supply vendors, the Farm Bureau, Rural Electric Cooperatives and other farm cooperatives, and veterinary practices.																									
FC-9	Work with the County's agricultural community to develop and implement the County Animal Response Team (CART) to strengthen the County's comprehensive emergency management program. Outreach would be targeted at organizations such as the PSU Cooperation Extension service, Grange Halls, CAFOs, feed and farm supply vendors, the Farm Bureau, Rural Electric Cooperatives and other farm cooperatives, and veterinary practices.	+	-	+	-	-	-	+	+	+	+	+	+	-	N	+	-	+	N	+	+	+	+	+	15 (+) 8 (-) 2 (N)	17 (+) 10 (-) 2 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	Summary (Equal Weighing)	Summary (Priority Ranking)
FC-10	Collaborate with the DEP Bureau of Radiation Protection to ensure the State's Radon Awareness Campaign and public service announcements are disseminated throughout Fulton County. This could include collateral and website development/links, County public service announcements, and social media development.	+	+	+	+	N	N	+	+	+	+	N	+	+	N	+	+	N	N	+	+	+	+	+	17 (+) 0 (-) 6 (N)	21 (+) 0 (-) 6 (N)
FC-11	Obtain an engineering study to redesign the intersection at Taylor Road and Waterfall Road in Dublin Township. Currently, emergency vehicles have difficulty making the turn at this intersection.	+	+	+	-	N	-	+	+	-	+	+	+	-	N	-	N	N	N	N	+	+	+	+	11 (+) 5 (-) 6 (N)	13 (+) 7 (-) 6 (N)
FC-12	Research corrective action needed to improve the condition of Tannery Road Bridge in Dublin Township, and implement, if feasible.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	+	+	N	N	N	+	+	+	+	16 (+) 4 (-) 5 (N)	18 (+) 4 (-) 5 (N)
FC-13	Research corrective action to prevent flooding of Park Road in Dublin Township, and implement, if feasible.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	+	+	N	N	N	+	+	+	+	16 (+) 4 (-) 5 (N)	18 (+) 4 (-) 5 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	Summary (Equal Weighing)	Summary (Priority Ranking)
FC-14	In Belfast Township, cut the bank back at 278 Black Bear Road to improve sight distance.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-15	In Union Township, continue to pursue political channels and collaboration with state agencies (e.g., PennDOT) to study and maintain the slide area on T-366 (Old 126).	+	+	+	+	+	+	+	+	+	N	+	+	+	N	+	+	N	N	+	+	+	+	+	19 (+) 0 (-) 4 (N)	23 (+) 0 (-) 4 (N)
FC-16	In Ayr Township, identify and implement response to manage stormwater runoff along Route 16, from True Value to Citgo Station.	+	+	+	-	N	-	+	+	+	+	+	+	-	N	-	+	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	18 (+) 5 (-) 6 (N)
FC-17	Conduct workshops and training for municipal officials on the benefits of land use regulations to protect new and existing structures and infrastructure.	+	-	+	-	N	-	+	N	+	+	+	+	+	+	+	+	N	N	+	+	+	+	+	16 (+) 3 (-) 4 (N)	20 (+) 5 (-) 4 (N)
FC-18	Conduct, sponsor, or facilitate grant writing trainings for municipal officials and other relevant personnel.	+	-	+	-	N	-	+	N	+	+	+	+	+	+	+	N	N	N	N	+	+	+	+	14 (+) 3 (-) 6 (N)	18 (+) 5 (-) 6 (N)
FC-19	Replace three tiles on Johnstons Drive, in Todd Township, with one squash tile.	+	+	+	+	N	-	+	+	+	+	+	+	-	N	-	+	N	N	N	+	+	+	N	14 (+) 3 (-) 6 (N)	16 (+) 5 (-) 6 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	Summary (Equal Weighing)	Summary (Priority Ranking)
FC-20	Construct a bridge on Creek Road (T-388) in Licking Creek Township over the creek fording.	+	+	+	+	N	-	+	+	+	+	+	+	-	N	-	+	N	N	+	+	+	+	N	15 (+) 3 (-) 5 (N)	17 (+) 5 (-) 5 (N)
FC-21	Increase visibility at the intersection of Great Cove Road (US-522) and Alpine Road in Bethel Township.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-22	Increase visibility at the intersection of Great Cove Road (US-522) and Bethel Church Road in Bethel Township.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-23	Increase visibility at the intersection of SR-643 and Spring Road in Bethel Township.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-24	Increase visibility at the intersection of Stoney Break Road and Black Oak Road in Bethel Township.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-25	Increase visibility at the intersection of Buck Valley Road and Mays Chapel Road in Bethel Township.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	**Name**	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**Summary (Equal Weighing)**	**Summary (Priority Ranking)**
FC-26	Comply with floodplain ordinance regulations by continuing to obtain information on existing and proposed new structures in the areas with the highest relative vulnerability to determine the best property protection methods. The following information should be obtained: • Lowest-floor elevation • Number of stories • Presence of a basement • Market and/or replacement value The County and Fulton County Conservation District will support municipalities and provide training/education for floodplain managers, as needed.	+	+	+	+	N	-	N	+	+	N	N	+	N	N	N	N	N	N	N	+	+	N	N	9 (+) 1 (-) 13 (N)	11 (+) 1 (-) 13 (N)
FC-27	Comply with floodplain ordinance regulations by continuing to obtain information for all existing and proposed new structures in the 1% chance floodplain to determine the best property protection methods	+	+	+	N	N	N	N	N	+	N	N	N	N	N	N	+	+	N	N	+	+	N	N	8 (+) 0 (-) 15 (N)	8 (+) 0 (-) 15 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	Summary (Equal Weighing)	Summary (Priority Ranking)
	to promote with individual property owners. The County and Fulton County Conservation District will support municipalities and provide training/education for floodplain managers, as needed.																									
FC-28	Comply with floodplain ordinance and building code regulations by requiring anchor straps and improved roofing shingles on new and existing manufactured homes and residences of the County. The County and Fulton County Conservation District will support municipalities and provide training/education for floodplain managers, as needed.	-	+	-	-	N	N	+	N	+	+	+	+	N	N	N	N	N	N	N	+	+	+	-	9 (+) 4 (-) 10 (N)	11 (+) 4 (-) 10 (N)
FC-29	Establish a Firewise Program in the County, especially around the Meadow Grounds Lake, Cowans Gap State Park, and Breezewood Park. Part of this initiative could	+	N	+	N	N	N	+	+	+	+	N	+	-	N	N	+	+	N	N	N	N	N	N	9 (+) 1 (-) 13 (N)	11 (+) 3 (-) 13 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**Summary (Equal Weighting)**	**Summary (Priority Ranking)**
	include visual development of impacted areas; public service announcements; and educational outreach to farmers, hunters, campers, hikers, school children, and homeowners in the Wildland-Urban Interface.																									
FC-30	Identify and apply for funding to enhance the County's radio system.	+	+	+	+	+	N	+	+	+	+	+	+	-	N	+	N	N	N	N	+	+	+	N	15 (+) 1 (-) 7 (N)	17 (+) 3 (-) 7 (N)
FC-31	Identify and apply for funding to upgrade emergency responders' radio equipment.	+	+	+	+	-	-	+	N	+	+	+	+	-	N	-	N	N	N	N	+	+	+	N	12 (+) 4 (-) 7 (N)	14 (+) 6 (-) 7 (N)
FC-32	Install dry hydrant locations along PA-655 to assist the Needmore Fire Company.	+	+	+	+	-	-	+	+	+	+	+	+	-	N	-	N	N	N	N	+	+	+	N	13 (+) 4 (-) 6 (N)	15 (+) 6 (-) 6 (N)
FC-33	Protect natural wetlands that may absorb floodwaters. The benefits of this action would be described in other collateral developed for related initiatives.	+	+	+	N	-	-	+	N	+	+	+	+	-	N	-	+	N	N	+	+	+	+	-	13 (+) 5 (-) 5 (N)	15 (+) 7 (-) 5 (N)
FC-34	Implement programs deemed necessary by the Conservation District.	+	+	+	-	-	-	+	N	+	+	+	+	-	N	-	N	N	N	+	+	+	+	-	12 (+) 6 (-) 5 (N)	14 (+) 8 (-) 5 (N)
FC-35	Coordinate with the conservation and extension offices to provide	+	+	N	-	-	-	N	+	+	+	+	+	-	-	-	+	+	+	+	+	+	+	-	14 (+) 7 (-)	16 (+) 9 (-)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	Summary (Equal Weighing)	Summary (Priority Ranking)
	education and training to emergency responders, managers, and municipal officials. Topic focuses could include modules from the Emergency Operations Plan, Crisis Communications, volunteer management, and recovery/resilience strategies.																								2 (N)	2 (N)
FC-36	Encourage major employers and other facilities to participate in the secondary StormReady programs. Such encouragement could occur through digital and print collateral, personal outreach, and speaking events at local service organizations (e.g., Rotary or Chamber events).	+	+	N	-	-	-	+	+	+	+	+	+	-	N	-	N	N	N	N	+	+	+	N	11 (+) 5 (-) 7 (N)	13 (+) 7 (-) 7 (N)
FC-37	Seek relevant input from all departments during the pre-impact, impact, and post-impact phases of an emergency.	+	+	+	-	-	-	+	+	+	+	+	+	-	+	-	N	N	N	+	+	+	+	N	14 (+) 5 (-) 4 (N)	16 (+) 7 (-) 4 (N)
FC-38	Identify and fill gaps in information needed to conduct vulnerability analysis in hazard areas.	+	+	-	-	-	-	-	+	+	+	+	+	-	+	-	N	N	N	+	+	+	+	N	12 (+) 7 (-) 4 (N)	14 (+) 9 (-) 4 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			**A Admin-istrative**			**S Social**		**T Technical**			**E Economic**				**E Environmental**					**L Legal**				
NO.	**Name**	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**Summary (Equal Weighing)**	**Summary (Priority Ranking)**
FC-39	Evaluate existing road capacity with concern to increased truck and other traffic on local roads, and implement road improvements, as applicable.	+	+	+	+	-	-	+	+	-	+	+	+	+	-	-	+	N	N	+	+	+	+	+	16 (+) 5 (-) 2 (N)	20 (+) 5 (-) 2 (N)
FC-40	In Thompson Township, upgrade and realign the intersection of Dent Road (T-343) and Timber Ridge Road (S.R. 2005) to allow for the passage of emergency vehicles.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-41	In Taylor Township, conduct road improvements on Davis Lane (T-423).	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-42	In Taylor Township, conduct intersection improvements and cut the bank back at Frick Road and Waterfall Road.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-43	In Union Township, conduct intersection improvements at Harmonia Road (S.R. 3002) and Lehman Road (T-308).	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-44	In Union Township, conduct intersection improvements at Harmonia Road (S.R. 3002) and Stahle Road (T-314).	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	Summary (Equal Weighing)	Summary (Priority Ranking)
FC-45	In Dublin Township, conduct intersection improvements at Waterfall Road (S.R. 475) and Battle Ridge Road (T-426).	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-46	In Ayr Township, identify correction actions on Great Cove Road (S.R. 522) by Whipporwill Lane to alleviate transportation accidents and dangerous bus stop conditions to road curve.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-47	In Taylor Township, identify and coordinate with PennDOT to implement infrastructure improvements to the two state bridges along 655 between Waterfall Road and Hustontown.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-48	In Thompson Township, replace the corrugated metal culvert carrying West Orchard Road (T-305) over Ditch Run.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)
FC-49	In Union Township, maintain and upgrade Bridge No. 3 on Zachs Ridge Road (T-330), as needed.	+	+	+	-	N	+	+	+	+	+	+	+	-	N	-	-	N	N	N	+	+	+	+	14 (+) 4 (-) 5 (N)	16 (+) 6 (-) 5 (N)

Mitigation Action		PA-STEEL CRITERIA CONSIDERATIONS (+) Favorable (-) Less favorable (N) Not Applicable																							Results	
		P Political			A Admin-istrative			S Social		T Technical			E Economic				E Environmental					L Legal				
NO.	Name	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent with Community Environmental Goals	Consistent with Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge	**Summary (Equal Weighing)**	**Summary (Priority Ranking)**
FC-50	Consider promoting or adopting higher regulatory and zoning standards to manage flood hazard risk, specifically through [examples]: • Support planning board of adjustment variances in cases where appeals are directly tied to compliance with the intent of floodplain regulations (e.g. overall building height; set-backs for inclined walkways). • Develop and adopt a cumulative substantial damage/improvements ordinance	+	+	N	+	N	+	+	+	+	+	+	+	+	N	+	N	N	N	N	+	+	+	+	16 (+) 0 (-) 7 (N)	18 (+) 0 (-) 7 (N)
FC-51	Continue to promote future growth and development in the County in areas outside of determined hazard zones, where possible.	+	+	N	+	N	+	+	+	+	+	+	+	+	N	+	+	N	N	N	+	+	+	+	17 (+) 0 (-) 6 (N)	19 (+) 0 (-) 6 (N)
FC-52	Request digital copies of Emergency Action Plans (EAPs) and inundation maps when high-hazard dam EAPs are next updated.	+	+	N	+	N	+	+	+	+	+	N	+	+	N	+	N	N	N	N	+	+	+	+	15 (+) 0 (-) 8 (N)	17 (+) 0 (-) 8 (N)

Notes:
CAFO = Concentrated Animal Feeding Operation
CART = County Animal Response Team
CERT = Community Emergency Response Team
DHHS = Department of Health and Human Services
FEMA = Federal Emergency Management Agency

OIE = Office of International Epizootics
PA DEP = Pennsylvania Department of Environmental Protection
PennDOT = Pennsylvania Department of Transportation
PSU = Pennsylvania State University

6.4.3 Prioritization of Mitigation Actions

Once the mitigation actions were evaluated, the Steering Committee set about prioritizing them to create an implementation strategy. FEMA mitigation planning requirements indicate that any prioritization system used shall include a special emphasis on the extent to which benefits are maximized according to a cost-benefit review of the proposed projects. Though the PA-STEEL values for each action are somewhat qualitative, all of the actions listed as having an economic impact indicated that that impact would be beneficial to the community. Whether the actions had associated costs or not, those mitigation actions could not be ruled out based on the benefit or cost values in the PA-STEEL evaluation. Implementation of any project will be based on a benefit-cost analysis as described in FEMA 386-5: Using Benefit Cost Review in Mitigation Planning (FEMA 2007). The specific economic benefits and costs will be determined prior to application for funding of the mitigation project.

Participants in the 2015 HMP update process provided comments that allowed for the prioritization of the mitigation actions listed in Table 6-4 using the seven PA-STEEL criteria. To evaluate and prioritize the mitigation actions, the County identified *favorable* and *less favorable* factors for each action. Table 6-4 summarizes the evaluation methodology and provides the results of this evaluation for all 38 mitigation actions in two columns. The first results column includes a summary of the feasibility factors, placing equal weight on all factors. The second results column reflects feasibility scores with benefits and costs weighted more heavily; and therefore, given greater priority. A weighting factor of 3 was used for each benefit and cost element. Therefore, a "+" benefit factor rating equals three pluses and a "-" benefit factor rating equals three minuses in the total prioritization score.

The results of the weighted PA-STEEL matrix were examined to prioritize the mitigation actions. The number of unfavorable ratings was subtracted from the number of favorable ratings to determine each action's score. The average score was 11, with a standard deviation of 5. Actions that received more than 16 points (one standard deviation above the average) were assigned high priority. Actions that received scores of 11 to 16, inclusive, were assigned medium priority. Other actions were assigned low priority.

The actions identified in Table 6-5 are listed in order of priority, with the high-priority actions first. This list of actions is the result of the planning effort led by the Steering Committee and represents what the County and municipalities consider most important. Any actions, including projects, to be implemented will have benefits outweighing their associated costs (i.e., they will have a benefit-cost ratio greater than 1).

Table 6-5. Prioritized Mitigation Actions

Mitigation Action	Score
High Priority	
FC-2: Begin the process to review and revise existing subdivision and land development regulations to minimize flood risk, subsidence/sinkhole risk, and other hazard risks as appropriate. This effort may be multi-municipal/regional, as interest and priorities allow. County can consider public outreach activities (newsletters, e-blasts, and public presentations) to demonstrate inclusiveness, transparency, and multi-municipal/regional collaboration.	24
FC-7: Ensure all applicable private industrial, commercial, and public utility service providers have a current Environmental Emergency Response Plan per the Federal Clean Water Act the Pennsylvania Clean Streams Law (35 P.S. §§691.1-691.1001), the Pennsylvania Solid Waste Management Act, the Pennsylvania Storage Tank Act, the Oil Pollution Act and regulations promulgated thereunder.	23
FC-15: In Union Township, continue to pursue political channels and collaboration with state agencies (e.g., PennDOT) to study and maintain the slide area on T-366 (Old 126).	23
FC-10: Collaborate with the PA DEP Bureau of Radiation Protection to ensure the State's Radon Awareness Campaign and public service announcements are disseminated throughout Fulton County. This could include collateral and website development/links, County public service announcements, and social media development.	21
FC-8: Strengthen the County's domestic animal health surveillance by familiarizing the Fulton County agricultural community with the list of reportable diseases and conditions related to animal health per the Office of International Epizootics (OIE) and the Pennsylvania Domestic Animal Act (Act 100 of 1996). Outreach would be targeted at organizations such as the PSU Cooperation Extension service, Grange Halls, CAFOs, feed and farm supply vendors, the Farm Bureau, Rural Electric Cooperatives and other farm cooperatives, and veterinary practices.	20
FC-51: Continue to promote future growth and development in the County in areas outside of determined hazard zones, where possible.	19
FC-50: Consider promoting or adopting higher regulatory and zoning standards to manage flood hazard risk, specifically through [examples]: • Support planning board of adjustment variances in cases where appeals are directly tied to compliance with the intent of floodplain regulations (e.g. overall building height; set-backs for inclined walkways). • Develop and adopt a cumulative substantial damage/improvements ordinance	18
FC-52: Request digital copies of Emergency Action Plans (EAPs) and inundation maps when high-hazard dam EAPs are next updated.	17
Medium Priority	
FC-3: Develop and implement an enhanced all-hazards, public outreach/education/mitigation information program on natural hazard risks and a non-technical explanation of what residents can do in the way of mitigation and preparedness, including flood insurance. This effort would be a multi-media campaign that may range from bill inserts, to flyers, posters, public service announcements, social media, tri-fold brochures, and event booths. Outreach will target vulnerable populations and will be modular in size, scale, and reach.	15
FC-1: Develop and conduct refresher courses and trainings for citizens involved with former County Community Emergency Response Team (CERT) and Citizen Corps. Sample supplemental activities could include website, e-blast, and flyers to advertise opportunities.	15
FC-17: Conduct workshops and training for municipal officials on the benefits of land use regulations to protect new and existing structures and infrastructure.	15
FC-39: Evaluate existing road capacity with concern to increased truck and other traffic on local roads, and implement road improvements, as applicable.	15
FC-5: Evaluate the need for a voluntary animal waste/manure/fertilizer self-reporting program for farmers, CAFO facilities, and other relevant organizations to utilize so that the	14

Mitigation Action	Score
County can more accurately estimate the amount of hazardous biological waste transported through the County and so that additional mitigation/safety measures may be implemented, if necessary. This initiative can be completed through the development of educational materials and speakers from the National Fish and Wildlife Foundation, EPA, and Chesapeake Bay Foundation, with a targeted focus to Farm Bureau, Grange and Conservation Districts.	
FC-12: Research corrective action needed to improve the condition of Tannery Road Bridge in Dublin Township, and implement, if feasible.	14
FC-13: Research correction action to prevent flooding of Park Road in Dublin Township and implement, if feasible.	14
FC-30: Identify and apply for funding to enhance the County's radio system.	14
FC-16: In Ayr Township, identify and implement response to manage stormwater runoff along Route 16, from True Value to Citgo Station.	13
FC-18: Conduct, sponsor, or facilitate grant writing trainings for municipal officials and other relevant personnel.	13
FC-4: Encourage cross training of existing personnel or utilize County personnel resources, as timing and funding permit, to enhance local administrative and technical ability. Areas for further professional development may include planning expertise, floodplain administration, hazard/risk management, grant writing and funding, and cost/benefit analysis.	12
FC-20: Construct a bridge on Creek Road (T-388) in Licking Creek Township over the creek fording.	12
FC-19: Replace three tiles on Johnstons Drive, in Todd Township, with one squash tile.	11
Low Priority	
FC-14: In Belfast Township, cut the bank back at 278 Black Bear Road to improve sight distance.	10
FC-6: Create and maintain a web-based inventory of the County's special needs population to strengthen emergency response and evacuation operations. As part of this effort, the County will disseminate outreach/education materials to explain the benefits of the program, as well as its voluntary and confidential nature. Outreach will be targeted at senior centers, intermediate units, healthcare providers, and faith-based organizations interfacing with these populations.	10
FC-21: Increase visibility at the intersection of Great Cove Road (US-522) and Alpine Road in Bethel Township.	10
FC-22: Increase visibility at the intersection of Great Cove Road (US-522) and Bethel Church Road in Bethel Township.	10
FC-23: Increase visibility at the intersection of SR-643 and Spring Road in Bethel Township.	10
FC-24: Increase visibility at the intersection of Stoney Break Road and Black Oak Road in Bethel Township.	10
FC-25: Increase visibility at the intersection of Buck Valley Road and Mays Chapel Road in Bethel Township.	10
FC-26: Comply with floodplain ordinance regulations by continuing to obtain information on existing and proposed new structures in the areas with the highest relative vulnerability to determine the best property protection methods. The following information should be obtained: • Lowest-floor elevation • Number of stories • Presence of a basement • Market and/or replacement value The County and Fulton County Conservation District will support municipalities and provide training/education for floodplain managers, as needed.	10

Mitigation Action	Score
FC-40: In Thompson Township, upgrade and realign the intersection of Dent Road (T-343) and Timber Ridge Road (S.R. 2005) to allow for the passage of emergency vehicles.	10
FC-41: In Taylor Township, conduct road improvements on Davis Lane (T-423).	10
FC-42: In Taylor Township, conduct intersection improvements and cut the bank back at Frick Road and Waterfall Road.	10
FC-43: In Union Township, conduct intersection improvements at Harmonia Road (S.R. 3002) and Lehman Road (T-308).	10
FC-44: In Union Township, conduct intersection improvements at Harmonia Road (S.R. 3002) and Stahle Road (T-314).	10
FC-45: In Dublin Township, conduct intersection improvements at Waterfall Road (S.R. 475) and Battle Ridge Road (T-426).	10
FC-46: In Ayr Township, identify correction actions on Great Cove Road (S.R. 522) by Whipporwill Lane to alleviate transportation accidents and dangerous bus stop conditions to road curve.	10
FC-47: In Taylor Township, identify and coordinate with PennDOT to implement infrastructure improvements to the two state bridges along 655 between Waterfall Road and Hustontown.	10
FC-48: In Thompson Township, replace the corrugated metal culvert carrying West Orchard Road (T-305) over Ditch Run.	10
FC-49: In Union Township, maintain and upgrade Bridge No. 3 on Zachs Ridge Road (T-330), as needed.	10
FC-32: Install dry hydrant locations along PA-655 to assist the Needmore Fire Company.	9
FC-37: Seek relevant input from all departments during the pre-impact, impact, and post-impact phases of an emergency.	9
FC-27: Comply with floodplain ordinance regulations by continuing to obtain information for all existing and proposed new structures in the 1% chance floodplain to determine the best property protection methods to promote with individual property owners. The County and Fulton County Conservation District will support municipalities and provide training/education for floodplain managers, as needed.	8
FC-29: Establish a Firewise Program in the County, especially around the Meadow Grounds Lake, Cowans Gap State Park, and Breezewood Park. Part of this initiative could include visual development of impacted areas; public service announcements; and educational outreach to farmers, hunters, campers, hikers, school children, and homeowners in the Wildland-Urban Interface.	8
FC-31: Identify and apply for funding to upgrade emergency responders' radio equipment.	8
FC-33: Protect natural wetlands that may absorb floodwaters. The benefits of this action would be described in other collateral developed for related initiatives.	8
FC-9: Work with the County's agricultural community to develop and implement the County Animal Response Team (CART) to strengthen the County's comprehensive emergency management program. Outreach would be targeted at organizations such as the PSU Cooperation Extension service, Grange Halls, CAFOs, feed and farm supply vendors, the Farm Bureau, Rural Electric Cooperatives and other farm cooperatives, and veterinary practices.	7
FC-28: Comply with floodplain ordinance and building code regulations by requiring anchor straps and improved roofing shingles on new and existing manufactured homes and residences of the County. The County and Fulton County Conservation District will support municipalities and provide training/education for floodplain managers, as needed.	7
FC-11: Obtain an engineering study to redesign the intersection at Taylor Road and Waterfall Road in Dublin Township. Currently, emergency vehicles have difficulty making the turn at this intersection.	6

Mitigation Action	Score
FC-36: Encourage major employers and other facilities to participate in the secondary StormReady programs. Such encouragement could occur through digital and print collateral, personal outreach, and speaking events at local service organizations (e.g., Rotary or Chamber events).	6
FC-34: Implement programs deemed necessary by the Conservation District.	6
FC-35: Coordinate with the conservation and extension offices to provide education and training to emergency responders, managers, and municipal officials. Topic focuses could include modules from the Emergency Operations Plan, Crisis Communications, volunteer management, and recovery/resilience strategies.	5
FC-38: Identify and fill gaps in information needed to conduct vulnerability analysis in hazard areas.	3

After mitigation actions were prioritized, Mitigation Action Worksheets were developed for each project included in the HMP and for each of the actions rated as high- and medium-priority by the Steering Committee.

A blank Mitigation Action Worksheet template is included in Appendix H. The set of completed action worksheets and a table summarizing the worksheets by jurisdiction are presented in Appendix I.

SECTION 7: PLAN MAINTENANCE PROCEDURES

This section describes the system that Fulton County and all participating jurisdictions have established to monitor, evaluate, and update the mitigation plan (Section 7.1); implement the mitigation plan through existing programs (Section 7.2); and solicit continued public involvement for plan maintenance (Section 7.3).

7.1 MONITORING, EVALUATING, AND UPDATING THE PLAN

The Fulton County Steering Committee intends to remain intact as the organization responsible for monitoring, evaluating, and updating this plan. The Fulton County Planning and Mapping Director shall continue to serve as the Hazard Mitigation Plan (HMP) Coordinator for the Steering Committee. Each participating jurisdiction is expected to retain a municipal hazard mitigation representative to support the jurisdiction's input to the monitoring, evaluating, and updating responsibilities identified in this section.

Table 7-1 identifies the members of the Hazard Mitigation Steering Committee as of the date of this plan update.

Table 7-1. Hazard Mitigation Steering Committee

Name	Title	Department / Agency
Mary K. Seville	HMP Coordinator, Hazard Mitigation Steering Committee Coordinator	Fulton County Planning Commission
Jeremy Fletcher	County Representative	Fulton County Planning Commission
Ruth Strait	County Representative	Fulton County EMA/9-1-1
Seleen Shives	County Representative	Fulton County Conservation District
Paul Johnston	County Representative	Fulton County Chamber of Commerce and Tourism
Denise Grissinger	Municipal Representative	Ayr Township
Marlin Harr	Municipal Representative	Ayr Township
Donna Welsh	Municipal Representative	Ayr Township - LEPC
John Keefer	Municipal Representative	Belfast Township
Paula Shives	Municipal Representative	Belfast Township
Ray E. Powell	Municipal Representative	Bethel Township
Donna Lynch	Municipal Representative	Bethel Township
Helen Layton	Municipal Representative	Brush Creek Township
Delmas Bard	Municipal Representative	Brush Creek Township
Jeff Croft	Municipal Representative	Dublin Township
Dixie Henry	Municipal Representative	Dublin Township
LuAnne Keebaugh	Municipal Representative	Licking Creek Township
Ed Swope	Municipal Representative	Licking Creek Township

Name	Title	Department / Agency
Jack Fields	Municipal Representative	McConnellsburg Borough
Rick Buterbaugh	Municipal Representative	McConnellsburg Borough
Murray Romig	Municipal Representative	Taylor Township
Monica Mellott	Municipal Representative	Taylor Township
Eric Reckner	Municipal Representative	Thompson Township
Gene Mellott	Municipal Representative	Thompson Township
Marcie Mellott	Municipal Representative	Todd Township
Stanley Mellott	Municipal Representative	Todd Township
Carolyn Wills	Municipal Representative	Union Township
Randy Wills	Municipal Representative	Union Township
Carl Duane Souders	Municipal Representative	Wells Township
Karole S. Barton	Municipal Representative	Wells Township

Notes:
EMA *Emergency Management Agency*
HMP *Hazard Mitigation Plan*
LEPC *Local Emergency Planning Committee*

Understanding that individual commitments change over time, each jurisdiction and its representatives are responsible for informing the Fulton County HMP Coordinator of any changes in representation by formal letter. The HMP Coordinator will strive to keep the Steering Committee makeup as a uniform representation of planning partners and stakeholders within the planning area. The HMP Coordinator shall maintain the current membership of the Steering Committee on the Fulton County Planning Commission website (http://www.co.fulton.pa.us/planning-commission.php) or in publicly accessible County records.

The following sections describe the monitoring, evaluating, and updating process and protocols for the Fulton County HMP.

7.1.1 Monitoring

The Steering Committee shall be responsible for monitoring progress on, and evaluating the effectiveness of, the HMP, and documenting this progress in a progress report. Prior to Steering Committee progress meetings (detailed below), Steering Committee representatives may collect information from departments, agencies, and organizations involved with the mitigation activities identified in Section 6 of this plan. The representatives will make phone calls and conduct meetings with persons responsible for initiating and/or overseeing the mitigation projects to obtain progress information. Copies of any grant applications filed on behalf of any of the participating jurisdictions shall be provided to the Steering Committee. Further, the representatives shall obtain from their municipal supervisor, mayor, or councilperson any public comments made on the plan, and provide them to the Steering Committee for inclusion in the progress report.

The Steering Committee representatives shall be expected to document the following, as needed and as appropriate:

- Hazard events and losses occurring in their jurisdiction including their nature and extent, and the effects that hazard mitigation actions have had on impacts and losses

- Progress on the implementation of mitigation actions, including efforts to obtain outside funding for mitigation actions
- Any obstacles or impediments to the implementation of actions
- Additional mitigation actions believed to be appropriate and feasible
- Public and stakeholder input and comment on the plan

Local Steering Committee representatives may use the progress reporting forms, Worksheets #1 and #3 in the Federal Emergency Management Agency (FEMA) 386-4 guidance document, to facilitate collection of progress data and information on specific mitigation actions.

7.1.2 Evaluating

The evaluation of the HMP is an assessment of whether the planning process and actions have been effective, whether the plan's goals are being reached, and whether changes are needed. The plan will be evaluated on an annual basis to determine the effectiveness of the programs, and to reflect changes that may affect mitigation priorities or available funding.

The status of the HMP will be discussed and documented at a plan review meeting of the Hazard Mitigation Steering Committee. At least 1 month before the progress plan review meeting, the Fulton County HMP Coordinator will advise Steering Committee members of the meeting date, agenda, and expectations of the members. The Fulton County HMP Coordinator may also distribute additional flood mitigation survey and mitigation project opportunity forms for jurisdictions that may have new information and for jurisdictions that did not participate in the update process.

The Fulton County HMP Coordinator will be responsible for calling and coordinating the progress plan review meeting, and assessing progress toward achieving plan goals and objectives. These evaluations will assess whether:

- Goals and objectives address current and expected conditions
- The nature or magnitude of the risks has changed
- The HMP has been implemented into land use processes on the County and municipal levels
- Current resources are appropriate for implementing the HMP and if different or additional resources are now available
- Actions are cost effective
- Schedules and budgets are feasible
- Implementation problems exist—such as technical, political, legal, or coordination issues with other agencies
- Outcomes have occurred as expected
- Changes in County or municipal resources have impacted plan implementation (for example, funding, personnel, and equipment)
- New agencies, departments, or staff should be included, including other local governments as defined under 44 Code of Federal Regulations (CFR), Section 201.6
- Documentation has been completed for any hazards that occurred during the last year

Specifically, the Steering Committee will review the mitigation goals, objectives, activities, and projects using performance-based indicators, including:

- New agencies/departments created that have authority to implement mitigation actions or are required to meet goals, objectives, and actions
- Project evaluation based on current needs of the mitigation plan
- Project completion regarding progress of proposed or ongoing actions
- Under/over spending regarding proposed mitigation action budgets
- Achievement of the goals and objectives
- Resource allocation to note if resources are required to implement mitigation activities
- Timeframe comments on whether proposed schedules are sufficient to address actions
- Budget notes (in other words, if budget basis should be changed or is sufficient)
- Lead/support agency commitment notes (if there is a lack of commitment on the part of lead or support agencies)
- Resource comments regarding whether resources are available to implement actions
- Feasibility comments regarding whether certain goals, objectives, or actions prove to be unfeasible

Finally, the Steering Committee will evaluate the ways other programs and policies have conflicted or augmented planned or implemented measures, and shall identify policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions (described further under the "Implementation of Mitigation Plan through Existing Programs" subsection presented later in this section). Other programs and policies can include those that address:

- Economic development
- Environmental preservation and permitting
- Historic preservation
- Redevelopment
- Health and/or safety
- Recreation
- Land use/zoning
- Public education and outreach
- Transportation

The Steering Committee may refer to the evaluation forms, Worksheets #2 and #4 in the FEMA 386-4 guidance document to assist in the evaluation process.

The Fulton County HMP Coordinator shall be responsible for preparing an HMP Progress Report, based on the provided local progress reports from each jurisdiction, information presented at the Steering Committee meeting, and other information as appropriate and relevant. These reports will provide data for the 5-year update of this HMP and will assist in pinpointing implementation challenges. By monitoring the implementation of the plan, the Steering Committee will be able to assess which projects are completed, which projects are no longer feasible, and which projects may require additional funding.

This progress report shall apply to all planning partners who have provided input, and as such, shall be developed according to an agreed-upon format and with adequate allowance for input and comment of each planning partner prior to completion and submission to the State Hazard Mitigation Officer. Each planning partner will be responsible for providing this report to its governing body for their review.

During the Steering Committee meeting, the planning partners shall establish a schedule for the draft development, review, comment, amendment, and submission of the HMP progress report to the State Hazard Mitigation Officer.

The plan will also be evaluated and revised following any major disasters, to determine whether the recommended actions remain relevant and appropriate. The risk assessment will also be revisited to see if any changes are necessary based on the pattern of disaster damages or if data listed in the Section 4.3 (Hazard Profiles) of this plan have been collected to facilitate the risk assessment. This is an opportunity to increase the community's disaster resistance and build a better and stronger community.

7.1.3 Updating

Section 44 CFR 201.6.d.3 requires that local hazard mitigation plans be reviewed, revised as appropriate, and resubmitted for approval in order to remain eligible for benefits awarded under the Disaster Mitigation Act of 2000 (DMA 2000). It is the intent of the Fulton County Hazard Mitigation Steering Committee to update this Plan on a 5-year cycle from the date of initial plan adoption.

To facilitate the update process, the Fulton County HMP Coordinator, with support from the Steering Committee, shall hold a meeting 3 years from the date of plan approval to develop and commence with the implementation of a detailed plan update program. The Fulton County HMP Coordinator shall invite representatives from the Pennsylvania Emergency Management Agency (PEMA) to this meeting to provide guidance on plan update procedures. This program shall, at a minimum, establish the parties responsible for managing and completing the plan update effort, features needed to be included in the updated plan, and a detailed timeline with milestones to ensure that the update is completed according to regulatory requirements.

At this meeting, the Steering Committee shall determine the resources needed to complete the update. The Fulton County HMP Coordinator shall be responsible for ensuring that needed resources are secured.

Following each 5-year update of the mitigation plan, the updated plan will be distributed for public comment. After all comments are addressed, the HMP will be revised and distributed to all Steering Committee members, special-purpose district participants, and the Pennsylvania State Hazard Mitigation Officer.

7.2 IMPLEMENTATION OF MITIGATION PLAN THROUGH EXISTING PROGRAMS

The intention of the Steering Committee and participating jurisdictions is to incorporate mitigation planning as an integral component of daily government operations. Steering Committee members will work with local government officials to integrate the newly adopted hazard mitigation goals and actions into the general operations of government and partner organizations. Further, the sample adoption resolution (located in Section 8) includes a resolution item stating the intent of the local governing body to incorporate mitigation planning as an integral component of government and partner operations. By doing so, the Steering Committee anticipates the following:

1) Hazard mitigation planning will be formally recognized as an integral part of overall emergency management efforts.

2) Hazard mitigation planning will be formally recognized as an integral part of land use policies and mechanisms.
3) The HMP, the Comprehensive Plans for Fulton County and its municipalities, and County and municipal Emergency Operations Plans (EOP) will become mutually supportive documents that work in concert to meet the goals and needs of County residents.
4) Duplication of effort can be minimized.

Integration of Mitigation into Ongoing and Future Planning Mechanisms

As noted in Section 6, Fulton County has made a concerted effort to reduce their vulnerability to natural and non-natural hazards in its planning and in its daily operations since the Fulton County HMP was last updated in 2010. In addition to reviewing the HMP and its goals for several years at the Annual Township Convention, the County and its jurisdictions have implemented various programs and projects to reduce the impacts of hazards. These projects, programs, and regulations have reduced risk caused by natural and non-natural hazards and support the goals and objectives of this plan. It is the intent of the County and its participating municipalities to strengthen this focus on mitigation by continuing existing policies, and by further implementing the mitigation policies contained in this plan. Implementation actions will include incorporating the goals of the plan into ongoing planning, zoning, building, and engineering activities. Specifically, the County will urge municipalities to:

- Fund hazard mitigation projects or actions in operating budgets to the extent possible
- Evaluate whether all construction projects meet hazard mitigation goals and objectives
- Use data and maps from this plan as supporting documentation in grant applications
- Ensure local planning board or economic development groups identify hazard areas when assisting new businesses in finding a location
- Look at mitigation actions when allocating funding for the municipal budgets
- Incorporate hazard mitigation actions in daily operations and on all projects
- Include hazard mitigation when updating municipal ordinances
- Identify hazard areas in updates of comprehensive plans to identify land use issues
- Review the hazard mitigation plan prior to land use or zoning changes, and permitting or development decisions

The information on hazard, risk, vulnerability, and mitigation contained in this plan is based on the best science and technology available at the time of the plan's preparation. Additionally, certain plans, including the Act 167 Plan, were incorporated directly into this HMP update. All participating jurisdictions recognize that this information can be invaluable in making decisions under other planning programs, such as comprehensive, capital improvement, and emergency management plans. Existing processes and programs through which the mitigation plan should be implemented are described below.

The plan participants will make every effort to implement the relevant sections and or data contained in the HMP utilizing administrative, budgetary, and regulatory processes as well as partnerships to the maximum extent, as described below.

<u>Administrative</u>

Administrative processes include departmental or organizational work plans, policies, or procedural changes, which could be addressed by the following departments:

- Buildings and Grounds
- Planning/Mapping

- Sheriff
- Emergency Management Agency/9-1-1
- Human Services Administration/Services for Children
- South Central Counties Solid Waste Agency

Additional administrative measures may include the creation of paid or unpaid internships to assist in HMP maintenance. Lastly, a reference to the HMP will be included in the risk reduction section of the Fulton County EOP and in municipal EOPs. Any updated Fulton County Comprehensive Plan will reference the HMP. In return, the County Comprehensive Plan, located on the Fulton County Planning Commission's website, was incorporated into multiple aspects of this HMP. Information from the Comprehensive Plan and other documents was used to formulate the County profile, identify the history of individual hazards, and detail the population projections in Fulton County.

Budgetary

In terms of budgetary processes, the County will review capital budgets and, if funding is available, include a line item for mitigation actions. In addition, the County will maximize mitigation aspects of proposed projects, and will encourage municipalities to do likewise.

Regulatory

Regulatory measures—such as the creation of executive orders, ordinances, and other directives—will be considered to support hazard mitigation in the following areas:

- Comprehensive Planning - Institutionalize hazard mitigation for new construction and land use
- Zoning and Ordinances
- Building Codes - Enforcement of codes or higher standard in hazard areas
- Capital Improvements Plan - Ensure that the person responsible for projects under this plan evaluates whether new construction is in a high-hazard area, flood plain, etc. so the construction is designed to mitigate the risk. Revise requirements for this plan to include hazard mitigation in the design of new construction.
- National Flood Insurance Program – Continue participation in this program and explore participation in Community Rating System Program
- Continue to implement storm water management plans.
- Prior to formal changes (amendments) to master plans, zoning, ordinances, capital improvement plans, or other mechanisms that control development, all above-mentioned plans must be reviewed to ensure they are consistent with the hazard mitigation plan

Funding

The County and its jurisdictions will consider multiple grant sources to fund eligible projects. These opportunities may include, but are not limited to:

- Federal
    - Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation Program (PDM)
    - FEMA Flood Mitigation Assistance Program (FMA)
    - FEMA Hazard Mitigation Grant Program (HMGP-Stafford Act, Section 404)
    - U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant (CDBG)

  - U.S. Department of Agriculture (USDA) -- USDA Community Facilities
  - Appalachian Regional Commission
  - U.S. Economic Development Administration (EDA) Public Works Program
- State
  - Pennsylvania Department of Transportation (PennDOT) Pennsylvania Infrastructure Bank
  - Act 13 Marcellus Shale Legacy Funds -- Flood Mitigation Program

- Nonprofit organizations, foundations, and private sources

Other potential federal funding sources include:

- Stafford Act, Section 406 – Public Assistance Program Mitigation Grants
- Federal Highway Administration
- Catalog of Federal Domestic Assistance
- U.S. Fire Administration – Assistance to Firefighter Grants
- U.S. Small Business Administration Pre and Post-Disaster Mitigation Loans
- U.S. Department of Economic Development Administration Grants
- U.S. Army Corps of Engineers
- U.S. Department of Interior, Bureau of Land Management
- Other sources as yet to be defined

Partnerships

The following opportunities for partnerships will be encouraged to provide a broader support and understanding of hazard mitigation:

Existing Committees and Councils

- Local Government Committees:
  - Fulton County Local Emergency Planning Committee (https://www.co.fulton.pa.us/lepc.php)
  - Fulton County Public Housing Authority (http://www.hud.gov/offices/pih/pha/contacts/states/pa.cfm)
  - Fulton County Conservation District (http://fultoncountyconservationdistrict.org/)

Creative Partnerships for Funding and Incentives

- Public-Private Partnerships including utilities and businesses
- State cooperation
- In-kind resources

Working with other Federal, State, and Local Agencies

- American Red Cross
- U.S. Army Corps of Engineers (USACE)
- Department of Homeland Security (DHS)
- Federal Emergency Management Agency (FEMA)
- National Oceanic and Atmosphere Administration (NOAA)
- National Weather Service (NWS)

- Pennsylvania Department of Transportation (PennDOT)
- Pennsylvania Department of Environmental Protection (PADEP)
- Pennsylvania State Police (PSP)
- Southern Alleghenies Planning and Development Commission
- United States Department of Agriculture (USDA)
- United States Department of Transportation (USDOT)
- United States Geological Service (USGS)
- Watershed Associations

During the plan evaluation process, the Steering Committee will identify additional policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions, and include these findings and recommendations in the HMP Progress Report.

7.3 Continued Public Involvement

Fulton County and participating jurisdictions are committed to the continued involvement of the public in the hazard mitigation process. Therefore, the plan will be posted on the Fulton County Planning Commission's website (http://www.co.fulton.pa.us/planning-county-plans.php), and copies of the plan will be made available for review during normal business hours at the Fulton County Planning Commission's main office. Fulton County will make electronic copies of the plan available for local municipalies for public access.

The Fulton County HMP Coordinator will be responsible for receiving, tracking, and filing public comments regarding this HMP. The public will have an opportunity to comment on the plan at the review meeting for the HMP and during the 5-year plan update. Fulton County will maintain an active link on the Planning Commission website to collect public comments.

The Fulton County HMP Coordinator is responsible for coordinating the plan evaluation portion of the meeting, soliciting feedback, collecting and reviewing the comments, and ensuring their incorporation in the 5-year plan update, as appropriate. Additional meetings may also be held as deemed necessary by the Steering Committee. The purpose of these meetings would be to provide an opportunity for the public to express concerns, opinions, and ideas about the mitigation plan.

The Steering Committee representatives shall be responsible to ensure that:

- Public comment and input on the plan, and hazard mitigation in general, are recorded and addressed, as appropriate. An opportunity to comment on the plan will be provided directly on the project website, and provisions for public comment, in writing, will also be made. All public comments shall be addressed to:

  Hazard Mitigation Plan Steering Committee
  c/o Fulton County Planning Commission
  219 North 2nd Street, Suite 102
  McConnellsburg, PA 17233

- Copies of the latest approved plan are available for review at the municipal buildings along with instructions to facilitate public input and comment on the plan.
- Appropriate links to the Fulton County HMP website (http://fultonhmp.com/) will be maintained. The website will be monitored throughout the course of the HMP update, and a draft copy of the plan will be posted for public comment. Upon conclusion of the update, appropriate links to the County HMP will be maintained on the County Planning Commission website ((http://www.co.fulton.pa.us/planning-county-plans.php).

- Public notices will be made, as appropriate, to inform the public of the availability of the plan, particularly during plan update cycles.

The Fulton County HMP Coordinator shall ensure that:

- Public comment and input on the plan, and hazard mitigation in general, are recorded and addressed, as appropriate
- The Fulton County Planning Commission website is maintained and updated, as appropriate
- All public and stakeholder comments received are documented and maintained
- Copies of the latest approved plan are available for review at the County Planning Commission, along with instructions to facilitate public input and comment on the plan
- Public notices, including media releases, are made, as appropriate, to inform the public of the availability of the plan, particularly during plan update cycles

SECTION 8: PLAN ADOPTION

By adopting the Fulton County Hazard Mitigation Plan (HMP), local governing bodies demonstrate their commitment to fulfill the mitigation goals and objectives outlined in the Plan. Adoption of the Plan by Fulton County and each participating jurisdiction legitimizes the Plan and authorizes responsible agencies to execute their responsibilities.

Each participating jurisdiction will proceed with formal adoption proceedings upon conditional approval of this Plan from the Federal Emergency Management Agency (FEMA), known as Approval Pending Adoption (APA). Each participating jurisdiction understands that a conditional approval of the Plan will be provided for those municipalities that meet the planning requirements with the exception of the adoption requirement, as stated above.

Following adoption or formal action on the Plan, each participating jurisdiction must submit a copy of the resolution or other legal instrument showing formal adoption (acceptance) of the Plan to the Fulton County Hazard Mitigation Coordinator. Fulton County will forward the executed resolutions to the Pennsylvania Emergency Management Agency (PEMA), who will subsequently forward the resolutions to FEMA. Each participating jurisdiction understands that FEMA will transmit acknowledgement of verification of formal Plan adoption and the official approval of the plan to the Hazard Mitigation Coordinator. Resolutions reflecting the formal adoption of this HMP by the County and participating jurisdictions are included in Appendix G of this HMP. A sample resolution to be used by the County and its jurisdictions is provided on the following pages in Section 8.

Fulton County Hazard Mitigation Plan

County Adoption Resolution

Resolution No. ___________________

Fulton County, Pennsylvania

WHEREAS, the municipalities of Fulton 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, Fulton County acknowledges the requirement 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 Fulton County Hazard Mitigation Plan has been developed by the Fulton County Planning Commission and the Fulton County Emergency Management Agency/911 in cooperation with other County departments, local municipal officials, and the citizens of Fulton County, and

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

WHEREAS, the Fulton County 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 Fulton that:

- The 2015 Fulton County 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 2015 Fulton County Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _________ day of ________________, 2015

ATTEST:

____

FULTON COUNTY COMMISSIONERS

By _______________________________

By _______________________________

By _______________________________

Fulton County Hazard Mitigation Plan

Municipal Adoption Resolution

Resolution No. __________________

< *Municipality Name*>, *Fulton County, Pennsylvania*

WHEREAS, the <*Municipality Name*>, Fulton 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 <*Municipality Name*> acknowledges the requirement 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 Fulton County Hazard Mitigation Plan has been developed by the Fulton County Planning Commission and the Fulton County Emergency Management Agency/911 in cooperation with other County departments, and officials and citizens of <*Municipality Name*>, and

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

WHEREAS, the Fulton County 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 <*Municipality Name*>:

- The 2015 Fulton County Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the <*Municipality Name*>, and
- The respective officials and agencies identified in the implementation strategy of the 2015 Fulton County Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _________ day of ________________, 2015

ATTEST: **< *MUNICIPALITY NAME*>**

___________________________ By _______________________________

By _______________________________

By _______________________________