4.4 HAZARD VULNERABILITY SUMMARY

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

4.4.1 Methodology

A risk assessment is a process that involves measuring the potential loss of life, personal injury, economic losses, and property damage resulting from identified hazards. It allows planning personnel to address and reduce hazard impacts and emergency management personnel to establish early response priorities by identifying potential hazards and vulnerable assets. Results of the risk assessment are used in subsequent mitigation planning processes, including determining and prioritizing mitigation actions that reduce each jurisdiction's risk to a specified hazard. Past, present, and future conditions must be evaluated to assess risk most accurately for the county and each jurisdiction. The process focuses on the following elements:

- **Hazard Identification** – Using all available information to determine the types of hazards that might affect a jurisdiction
- **Profile Each Hazard** – Understanding each hazard in terms of:
  - Location – geographic area most affected by the hazard
  - Extent – severity of each hazard
  - Range of magnitude
  - Previous occurrences and losses
  - Probability of future hazard events
- **Vulnerability Assessment**
  - Exposure identification – Estimating the total number of assets in the jurisdiction that are likely to experience a hazard event if it occurs by overlaying hazard maps with the asset inventories.
  - Vulnerability identification and loss estimation – Assessing the impact of hazard events on the people, property, environment, economy, and lands of the region, including estimates of the cost of potential damage or cost that can be avoided by mitigation.

The following summarizes the asset inventories, methodology, and tools used to support the risk assessment process.

Asset Inventories

Fulton County assets were identified to assess potential exposure and loss associated with the hazards of concern. For the Hazard Mitigation Plan (HMP) update, Fulton County assessed the vulnerability of the following types of assets: population, buildings and critical facilities/infrastructure, and the environment. Some assets are more vulnerable because of their physical characteristics or socioeconomic uses. To protect individual privacy and the security of critical facilities, information on properties assessed is presented in aggregate without details about specific individual personal or public properties.

Population

As discussed in Section 2, County Profile, research has shown that some populations are at greater risk from hazard events because of decreased resources or physical abilities. For the purposes of this planning process, vulnerable populations in Fulton County include children, elderly, low-income, and non-English speakers.

The 2010 U.S. Census block data layers were used to estimate exposure and potential impacts to the general population. The 2010 U.S. Census demographic data available in the Federal Emergency Management Agency's (FEMA) Hazards U.S.-Multi-Hazard (HAZUS-MH) v4.2 model was used to estimate potential impacts to the elderly (over 65 years of age) and populations with income below the poverty threshold. The 2012-2016

American Community Survey (ACS) was utilized to examine population data for residents who are non-English speaking.

U.S. Census blocks do not follow the boundaries of the hazard areas, possibly leading to gross overestimates or underestimates of exposed populations from use of centroids or intersects of Census blocks with these zones. Limitations of these analyses are recognized, and thus the results are used only to provide a general estimate.

Buildings

The default general building stock data in HAZUS-MH v4.2 (based on the 2010 U.S. Census and RSMeans 2016 valuations) was used for the HAZUS-MH v4.2 analysis and hazard exposure analysis at the municipal level. The building inventory was used to estimate losses to the county's total replacement cost value from a hazard event. Replacement cost value is the current cost of returning an asset to its pre-damaged condition using present-day cost of labor and materials. Total replacement cost value consists of both the structural cost to replace a building and the estimated value of the contents of a building. The occupancy classes available in HAZUS-MH v4.2 were condensed into the following categories to facilitate the analysis and the presentation of results: residential, commercial, industrial, agricultural, religious, governmental, and educational. Residential loss estimates address both multi-family and single-family dwellings. To estimate the number of structures in the county exposed to the hazard areas, Fulton County's spatial building footprint layer was utilized. Building footprints with their centroid in a hazard area were totaled to estimate exposure.

The HAZUS-MH v4.2 Census blocks do not follow the boundaries of the hazard areas, possibly leading to gross overestimates or underestimates of exposed building stock from use of centroids or intersects of Census blocks with these zones. Limitations of these analyses are recognized, and thus the results are used only to provide a general estimate.

Critical Facilities

The critical facility inventory, which includes essential facilities, utilities, transportation features, and user-defined facilities as outlined in Section 2, was updated beginning with all Geographic Information System (GIS) data provided by the Fulton County Planning and Mapping Department. To protect privacy and the security of assets, information is presented in aggregate, without details about specific individual properties or facilities. The default inventory in HAZUS-MH v4.2 was updated with the critical facility inventory generated for this plan.

New Development

McConnellsburg Borough has remained the population, industrial, and commercial center of Fulton County resulting in a growth that has expanded from the borough into the neighboring rural townships. Growth is expected to occur in five distinct geographic areas due to the transportation network and availability of public sewer services. The five areas include McConnellsburg, Warfordsburg, Hustontown, Fort Littleton, and Crystal Spring (Fulton County 2015). The 2018 ACS estimates that Fulton County has seen construction of 40 housing units from 2014 to 2018 (ACS 2018).

In addition to anticipated sporadic residential development, Fulton County has over 140 acres available in six designated growth areas. All six of the identified growth areas are located within the FEMA flood hazard zone, the high susceptibility/moderate incidence landslide hazard area, and/or the environmental hazard area. The county has noted the location of these hazard areas in relation to the growth areas to ensure that the planning and development process considers these factors. The county intends to discourage development within vulnerable areas, areas with high population density, and the Special Flood Hazard Area (SFHA); or encourage higher regulatory standards at the local level. Section 4.4.4 below provides more details about the growth hazard areas.

Methodology

To address the requirements of the Disaster Mitigation Act of 2000 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. Three different levels of analysis described below were used depending on the data available for each hazard:

1. **Historical Occurrences and Qualitative Analysis** – This analysis includes an examination of historical impacts to understand potential impacts of future events of similar size. In addition, potential impacts and losses are discussed qualitatively using best-available data and professional judgment.
2. **Exposure Assessment** – This analysis involves overlaying available spatial hazard layers, or hazards with defined extent and locations, with assets in GIS to determine which assets are located in the impact area of the hazard. The analysis highlights which assets might be affected by the hazard. If the center of each asset is located in the hazard area, it is deemed exposed and potentially vulnerable to the hazard.
3. **Loss estimation** – The FEMA HAZUS modeling software was used to estimate potential losses for the following hazards: flood, earthquake, and hurricane (wind). In addition, an examination of historical impacts and an exposure assessment was conducted for these spatially-delineated hazards.

The risk assessment analytical data are summarized in Table 4.4-1.

Table 4.4-1. Summary of Risk Assessment Analyses

Hazard	Data Analyzed			
	Population	General Building Stock	Critical Facilities	Environment
Dam Failure	Q	Q	Q	Q
Drought	Q	Q	Q	Q
Earthquake	H	H	H	Q
Environmental Hazard	E	E	E	Q
Flood, Flash Flood, Ice Jam	E, H	E, H	E	Q
Hailstorm	Q	Q	Q	Q
Landslide	E	E	E	Q
Radon Exposure	Q	Q	Q	Q
Subsidence/Sinkhole	E	E	E	Q
Tornado, Windstorm	Q	H	H	Q
Transportation Accident	Q	Q	Q	Q
Wildfire	E	E	E	Q
Winter Storm	Q	Q	Q	Q

Notes: E – Exposure analysis; H – HAZUS analysis; Q – Qualitative analysis

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. or 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 the multi-hazard (MH) methodology HAZUS-MH with new models for estimating potential losses from wind (hurricanes) and flood (riverine and coastal) hazards. HAZUS-MH is a GIS-based software tool that applies engineering and scientific risk calculations, which 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 potential for physical damage to building stock, critical facilities, transportation systems, and utility systems. To generate this information, HAZUS-MH uses default HAZUS-MH-provided data for inventory, vulnerability, and hazards, which can be supplemented with local data to provide a more refined analysis. Damage reports can include induced damage (e.g., inundation, fire, threats posed by hazardous materials and debris) and direct economic and social losses (e.g., 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 data output now and in the future and standardization of data collection and storage. More information on HAZUS-MH is available at http://www.fema.gov/hazus.

In general, probabilistic analyses were performed to develop expected/estimated distribution of losses (mean return period [MRP] losses) for the flood, wind, and seismic hazards. The probabilistic model generates estimated damages and losses for specified return periods (e.g., 100- and 500-year). For annualized losses, HAZUS-MH 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 each year is calculated. HAZUS-MH analysis levels are described in Table 4.4-2.

Table 4.4-2. Summary of HAZUS-MH Analysis Levels

HAZUS-MH Analysis Levels	
Basic	A basic estimate of earthquake, flood, and hurricane wind losses is produced based on national databases and expert-based analysis parameters included in the HAZUS software.
Advanced	More accurate loss estimates are produced by including detailed information on local hazard conditions and/or by replacing the national default inventories with more accurate local inventories of buildings, essential facilities, and other infrastructure.

Source: FEMA 2019

Earthquake

A probabilistic assessment was conducted for Fulton County for the 500-year MRPs through a Level 2 analysis in HAZUS-MH v4.2 to analyze the earthquake hazard and provide a range of loss estimates. The probabilistic method uses information from historical earthquakes and inferred faults, locations, and magnitudes and computes the probable ground shaking levels that might be experienced during a recurrence period by Census tract.

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 uncertainty in loss estimates produced by the HAZUS Earthquake Model, possibly at best by a factor of two or more (FEMA 2015f).

However, HAZUS potential loss estimates are acceptable for the purposes of this HMP.

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 at which the rock or soil transmits shear

waves (S-waves). The National Earthquake Hazard Reductions Program (NEHRP) has developed five soil classifications defined by their shear-wave velocity that impact 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.

NEHRP soil classifications were not available for Fulton County at the time of this analysis. Damages and losses due to liquefaction, landslide, or surface fault rupture were not included in this analysis.

In addition to the probabilistic scenarios cited, an annualized loss run was conducted to estimate annualized general building stock dollar losses and the impact on critical facilities in the county for the 500-year MRP earthquake event.

Environmental Hazard

To determine potential impact on Fulton County, a 0.25-mile buffer was placed around the identified major roadways and rail lines, and the designated vulnerability radius of each of the county's 11 Superfund Amendments and Reauthorization Act (SARA) Title III planning facilities was used to define the hazard area. The primary roadways in Fulton County are listed as follows:

- 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)

Populations and features of the built environment within these areas might be directly or indirectly affected by a potential environmental hazard. The hazard area was overlaid upon the 2010 U.S. Census population data in GIS (U.S. Census 2010).

The vulnerability radius for each hazard facility is determined by the Fulton County Local Emergency Planning Committee, and each radius is shown in Appendix I.

Flood, Flash Flood, Ice Jam

The 1- and 0.2-percent annual chance flood events were examined to evaluate Fulton County's flood risk. These flood events are generally those considered by planners and evaluated under federal programs such as the National Flood Insurance Program.

The effective Fulton County FEMA Digital Flood Insurance Rate Maps (DFIRM) (dated February 18, 2011) were used to evaluate exposure. The FEMA Risk Map 1-percent annual chance flood depth grid, dated February 2011, was incorporated into HAZUS-MH v4.2 to estimate potential losses for the county. The depth grid was integrated into HAZUS-MH, and the model was run to estimate potential losses at the Census block level using the HAZUS-MH v4.2 default building inventory for the 1-percent annual chance flood event.

DFIRM flood boundaries, default general building stock inventory, updated critical facility inventories, and 2010 U.S. Census population data were used to estimate exposure to the 1-percent annual chance flood events. A HAZUS-MH v4.2 riverine flood analysis was performed. The updated critical facility inventories were incorporated into HAZUS-MH v4.2, replacing the default essential facility (police, fire, schools, etc.) and utility inventories. The HAZUS-MH v4.2 riverine flood model was run to estimate potential losses in Fulton County

for the 1-percent and 0.2-percent annual chance flood event. HAZUS-MH v4.2 calculated the estimated potential losses to the population (default 2010 U.S. Census data) and potential damages to the general building stock and critical facility inventories based on the depth grid generated and the default HAZUS-MH v4.2 damage functions in the flood model.

Landslide

Unlike the flood, wind, and earthquake hazards, no standard loss estimation models or methodologies have been established for the landslide hazard.

Vulnerability to ground failure hazards is a function of location, soil type, geology, type of human activity, use, and frequency of events. 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 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 2018).

To estimate Fulton County's vulnerability, a 2010 Steep Slope Landslide GIS layer from the National Land Trust was used to coarsely define the general landslide susceptible area. For the purposes of this assessment, steep slope areas with a slope angle greater than 25 percent are considered the hazard zone. Therefore, 17.5 percent (or 76.9 square miles) of Fulton County is located within the landslide hazard area. The future occurrence of landslides can be considered *unlikely* as defined by the Risk Factor Methodology probability criteria (further discussed in Section 4.4.2 below).

Subsidence/Sinkhole

There is no standard loss estimation model available for the mine subsidence hazard. To determine the assets that are exposed to this hazard, available and appropriate spatial data delineating the extent of Pennsylvanian rock and anthracite fields (Pennsylvania Bureau of Topographic and Geologic Survey 2015) were overlaid upon the asset data (population, buildings, critical facilities). The assets with centers located in the hazard area are reported as exposed and potentially vulnerable to mine subsidence events. Approximately 17.7 percent of Fulton County (77.58 square miles) is underlain by carbonate bedrock. For the purposes of this planning effort, the area underlain by carbonate (limestone) bedrock is considered exposed to this hazard. 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. The limitations of this analysis are recognized and are only used to provide a general estimate of exposure

Tornado and Windstorm

A HAZUS-MH v4.2 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 that have tracks and intensities reflecting the full spectrum of Atlantic hurricanes observed since 1886 and identifies those with tracks associated with Fulton County. HAZUS-MH v4.2 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 the modeling of wind force across various types of land surfaces. Annualized losses and the 100-year and 500-year MRPs were examined for the wind/severe storm hazard. Default demographic and general building stock data in HAZUS-MH v4.2 and the updated critical facility inventories were used for the analysis.

There is currently a FEMA-acknowledged issue with importing user-defined facilities in HAZUS-MH v4.2; however, 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 buildings are at greater risk than others because of their proximity to falling hazards or their manner of construction.

Wildfire

The Wildland-Urban Interface (Interface and Intermix) obtained through the SILVIS Laboratory, Department of Forest Ecology and Management, University of Wisconsin–Madison, was referenced to delineate wildfire hazard areas. The University of Wisconsin – Madison wildland fire hazard areas are based on the 2010 Census and 2006 National Land Cover Dataset and the Protected Areas Database. For this risk assessment, the high-, medium-, and low-density interface areas were combined and used as the "Interface" hazard area, and the high-, medium-, and low-density intermix areas were combined and used as the "Intermix" hazard areas.

The asset data (population, building stock, and critical facilities) presented in Section 2, County Profile, was used to support an evaluation of assets exposed and the potential impacts and losses associated with this hazard. Available and 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.

Winter Storm

All asset inventories (population, building stock, and critical facilities) in Fulton County are exposed and vulnerable to the winter storm hazard. In Fulton County, winter storms are a concern because of frequency, associated direct and indirect costs, delays caused by the storms, and impacts on people and facilities of the region. In Section 2, County Profile, this HMP provides population statistics regarding 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).

Given professional knowledge and the currently available information, the potential loss to building stock from this hazard is often considered to be overestimated because of varying factors (building structure type, age, load distribution, building codes in place, etc.). Therefore, the building stock exposure and information presented in Section 4.3.13 (Winter Storm hazard profile) should be used as estimates only for planning purposes with the knowledge that the associated losses for severe winter storm events vary greatly.

Full functionality of critical facilities such as those used by police, fire, and medical services personnel is essential for response during and after a winter storm event. These critical facility structures are largely constructed of concrete and masonry; therefore, these should undergo only minimal structural damage from severe winter storm events.

Qualitative Analyses

For many of the hazards evaluated in this risk assessment, historical data are not adequate to model future losses at this time. Where GIS data were not available, a qualitative analysis was conducted for the following hazards using the best-available data and professional judgment. Multiple federal, state, and academic sources were used to evaluate these hazards:

- Dam Failure
- Drought
- Hailstorm
- Radon Exposure
- Transportation Accident

Limitations

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 effects on the built environment. Uncertainties also result from the following:

- Approximations and simplifications necessary to conduct such a study
- Incomplete or dated inventory, demographic, or economic parameter data
- The unique nature, geographic extent, and severity of each hazard
- Mitigation measures already employed by the participating municipalities
- 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 two 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 update and refine existing inventories used to assist in estimating potential losses.

Potential economic loss is based on the present value of the general building stock utilizing best-available data. The county acknowledges significant impacts could occur to critical facilities and infrastructure as a result of these hazard events, causing great economic loss. However, monetized damage estimates to critical facilities and infrastructure and economic impacts were not quantified and require more detailed loss analyses. In addition, economic impacts to industries such as tourism and the real-estate market were not analyzed.

4.4.2 Ranking Results

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 manage risk effectively and efficiently.

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 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 below:

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 (PEMA 2013).

Table 4.4-3 identifies the five risk assessment categories, the criteria and associated risk level indices used to quantify their risk, and the suggested weighting factor (weight value) applied to each risk assessment category. Table 4.4-4 shows the five risk assessment categories' values for each of Fulton County's hazards and each hazard's RF.

Table 4.4-3. 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	1	10%
	12 TO 24 HRS	SELF-DEFINED	2	
	6 TO 12 HRS	SELF-DEFINED	3	
	LESS THAN 6 HRS	SELF-DEFINED	4	
DURATION *How long does the hazard event usually last?*	LESS THAN 6 HRS	SELF-DEFINED	1	10%
	LESS THAN 24 HRS	SELF-DEFINED	2	
	LESS THAN 1 WEEK	SELF-DEFINED	3	
	MORE THAN 1 WEEK	SELF-DEFINED	4	

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

Source: PEMA 2013

Table 4.4-4. Risk Ranking for Fulton County

HAZARD RISK	HAZARDS	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	Flood, Flash Flood, and Ice Jam	3	4	4	3	4	3.6
	Winter Storm	4	3	4	1	4	3.4
	Transportation Accidents	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
	Earthquake	2	1	4	4	1	2.2
	Tornado Wind	4	1	1	4	1	2.2
	Subsidence/Sinkhole	3	1	1	4	4	2.2
	Radon Exposure	4	1	1	3	1	2.1
LOW	Wildfire	3	1	1	4	1	1.9
	Hailstorm	2	1	2	3	1	1.7
	Landslide	1	1	1	4	4	1.6

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

A risk assessment result for the entire county does not mean that each municipality is at the same amount of risk to each hazard. Table 4.4-5 lists the different municipalities in Fulton County and whether they believe their risk is greater than (>), less than (<), or equal to (=) the RF assigned to the county as a whole. Municipal officials' responses were then reviewed and updated (as appropriate) by the Steering Committee.

Table 4.4-5. Jurisdictional Risk by Municipality

Municipality	Dam Failures	Drought	Earthquake	Environmental Hazards	Flooding/Flash Flood/Ice Jam	Hailstorm	Landslide	Radon Exposure	Subsidence/Sinkholes	Tornado/Windstorm	Transportation Accidents	Wildfire	Winter storm
	2.3	2.5	2.2	2.6	3.6	1.7	1.6	2.1	2.2	2.2	2.8	1.9	3.4
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	=	=	=	=	<	=	=	=	=	=	>	>	=

4.4.3 Potential Loss Estimates

Potential loss estimates for hazard events help a community understand the monetary value of what might be at stake during a hazard event. Estimates are considered *potential* in that they generally represent losses that could occur in a countywide hazard scenario. Localized events could yield lower losses, while regional events could yield higher losses.

The data utilized to conduct the vulnerability assessment came from a variety of sources as noted throughout each hazard profile and Appendix A. As summarized in the Methodology subsection the 2010 U.S. Census demographic data, HAZUS-MH v4.2 default building inventory and its associated replacement cost value of the structures and contents, and the comprehensive critical facility inventory update in HAZUS-MH v4.2 were used for Fulton County.

Potential loss estimates provided in Section 4.3, Hazard Profiles, were either based on historical losses, current-condition losses, and/or predictive losses by performing spatial analyses in GIS and hazard probabilistic modeling. In summary, HAZUS-MH v4.2 was used to estimate potential losses for the earthquake, flood, and hurricane (tornado, windstorm). For many of the hazards evaluated, historical data are not adequate to model future losses at this time. For these 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). Spatial analyses were conducted to assess potential exposure for hazards of concern with delineated hazard areas: environmental hazards; flood, flash flood, and ice jam; landslide; subsidence and sinkhole; and

wildfire. Where GIS data are not available for some hazards, a qualitative analysis was conducted using the best-available data and professional judgment.

4.4.4 Future Development and Vulnerability

Risk and vulnerability to natural and human-caused hazard events are not static. Risk will increase or decrease as counties and municipalities see changes in land use and development, as well as changes in population. Population change (in terms of total and demographics) and the age of the housing stock continue to be the main indicators of vulnerability change in Fulton County.

Fulton County experienced a 2.59-percent increase in population from 2000 to 2017, as summarized in Section 2 of this HMP. According to the U.S. Census for Population Projections, the population in Fulton County is projected to increase over the coming decades. The range of projected change in population varies from a 26.67 percent population decrease in Valley-Hi Borough to a 32.36 increase in population in Brush Creek Township (U.S. Census 2018).

Continued analysis of the age structure in Fulton County will provide deeper understanding of future vulnerability to at-risk populations. Approximately 17.1 percent of Fulton County's population is age 65 or older (ACS 2017). As these residents continue to age in the county, they might have increased access and functional needs. For example, many residents in this age bracket might be unable to drive; therefore, development of special evacuation plans for them will be necessary. They might also have hearing or vision impairments that could hinder their reception of emergency instructions. Both older and younger populations are at higher risks for contracting certain diseases. Fulton County's combined under-5-years-of-age and over-65 populations constitute approximately 23.2 percent of its population (ACS 2017).

Approximately 0.8 percent of Fulton County's population lives in group quarters, which are communal settings that can include inmates in a prison, students in a dorm, or elderly or mentally disabled in group-care homes. Many residents living in group quarters have special needs. It is important to ensure that each group-quarter facility has an emergency plan to account for the unique needs of its residents during a hazard event.

Less than 1 percent of Fulton County's population is not proficient in English. Future hazard mitigation strategies should consider addressing language barriers to ensure that all residents can receive emergency instructions.

In addition, remote and sparsely-populated municipalities face higher vulnerability to hazards because they do not have as easy access to care facilities or response personnel. For instance, sparsely-populated municipalities such as Wells Township face increased vulnerability to tornadoes, windstorms, and winter storms due to isolation, access issues, and longer emergency response times.

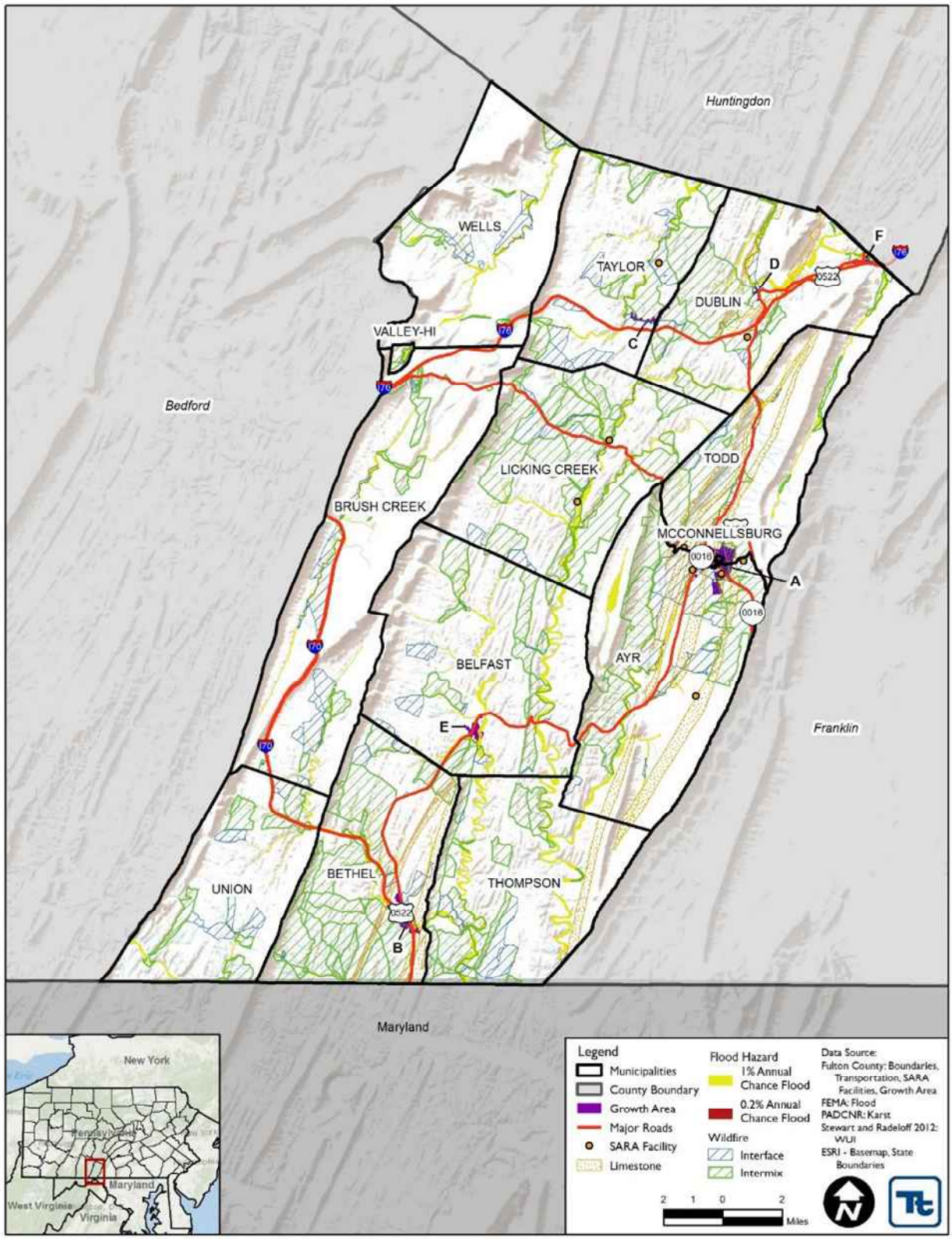
The aging housing stock in Fulton County is another source of current and future vulnerability in many hazard events. According to the Alleghenies Ahead Joint Comprehensive Plan (Alleghenies 2018), 7,112 structures in Fulton County were built earlier than 1939 (19.8 percent of the building stock). As discussed throughout Section 4, Risk Assessment, Fulton County can experience strong gusts of wind during windstorms, tornadoes, hurricanes, tropical storms, or Nor'easters. The structure of these older houses can cause them to be at greater risk of destruction under these strong wind conditions. These structures might also be at risk during flooding and winter storm events if the materials are either not strong enough to withstand the pressure or weight of the precipitation or are liable to leak, causing further risk of destruction to the house.

While any development increases the risk of damage and loss to natural hazards, a number of factors indicate that this increase in risk is low and mitigated by existing federal, state, county, and local regulations, policies, and programs. A total of 11 municipalities in Fulton County have adopted subdivision regulations, and two municipalities have adopted local zoning regulations. The Fulton County Planning and Mapping Department

reviews and reports on subdivisions, land developments, comprehensive plans, and municipal land use ordinance amendments. This broad range of planning review services is separated into two areas of activity: subdivision and land development reviews, and community planning reviews. Most types of reviews are presented to the commission for its consideration at a public meeting prior to them being forwarded on to the respective municipalities and/or applicants.

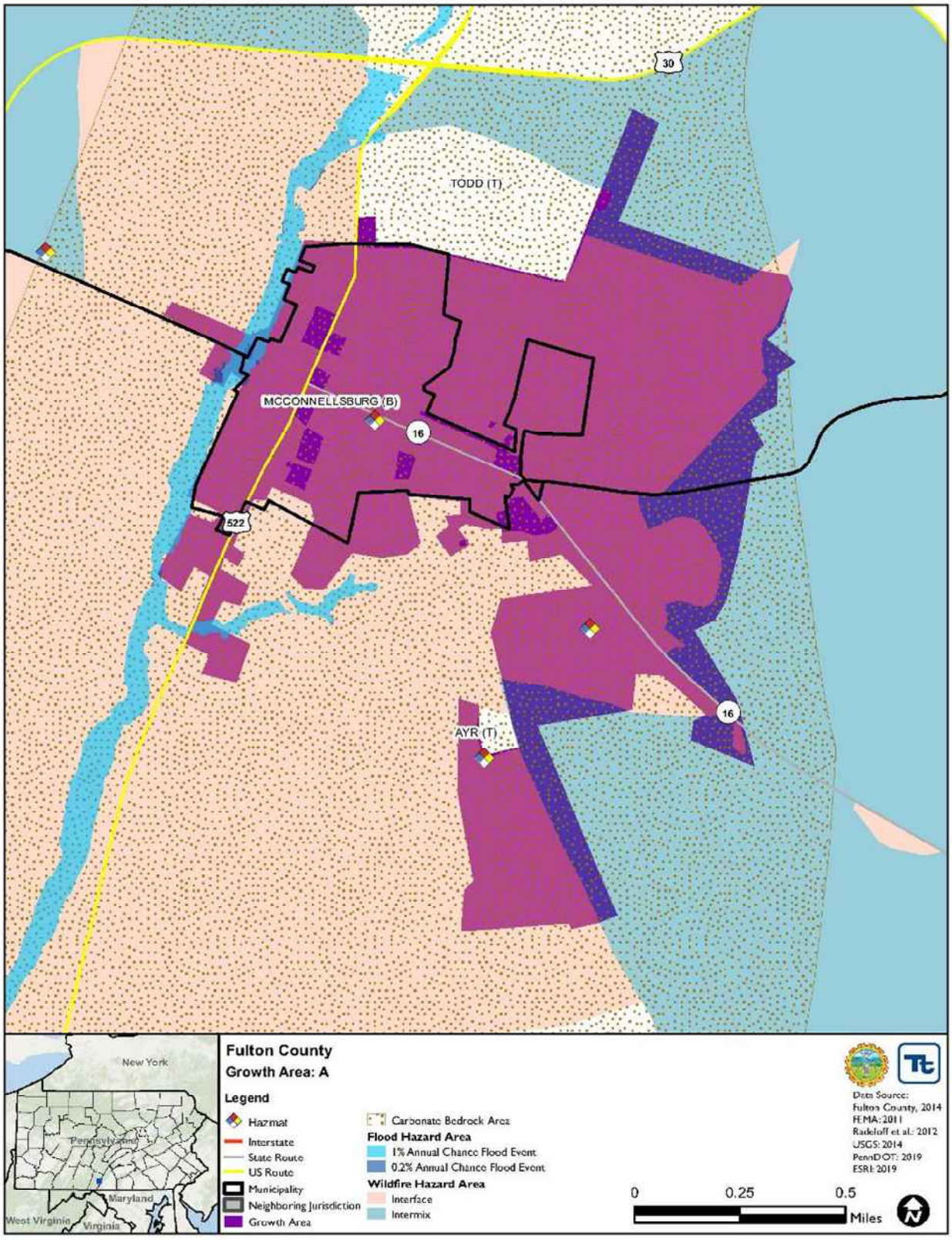
Fulton County and its municipalities identified areas of potential new urban growth. According the Alleghenies Ahead Joint Comprehensive Plan (Alleghenies 2018), Fulton County is in the process of working with landowners to leverage the Interstate 70 corridor and attract new business and development in Warfordsburg. Fulton County has also already initiated leveraging state grants for improvements and revitalization to downtown McConnellsburg. As urban growth is planned, it should be compared with identified hazard areas to determine hazard vulnerability. In Fulton County's 2015 HMP, six geographic hazards and growth areas were identified as A-F and are mapped below. All the growth areas, except Growth Area E, are in the interface and intermix wildfire hazard area. Growth Area A is the only area located within both the 0.25-mile buffer of a major road and 0.10-mile buffer of a SARA Title III Facility. Growth Areas A, B, and F are located above limestone formations in the subsidence and sinkhole hazard area. Figure 4.4-1 through Figure 4.4-7 show the Fulton County growth areas.

Figure 4.4-1. Fulton County Growth Areas and Hazards



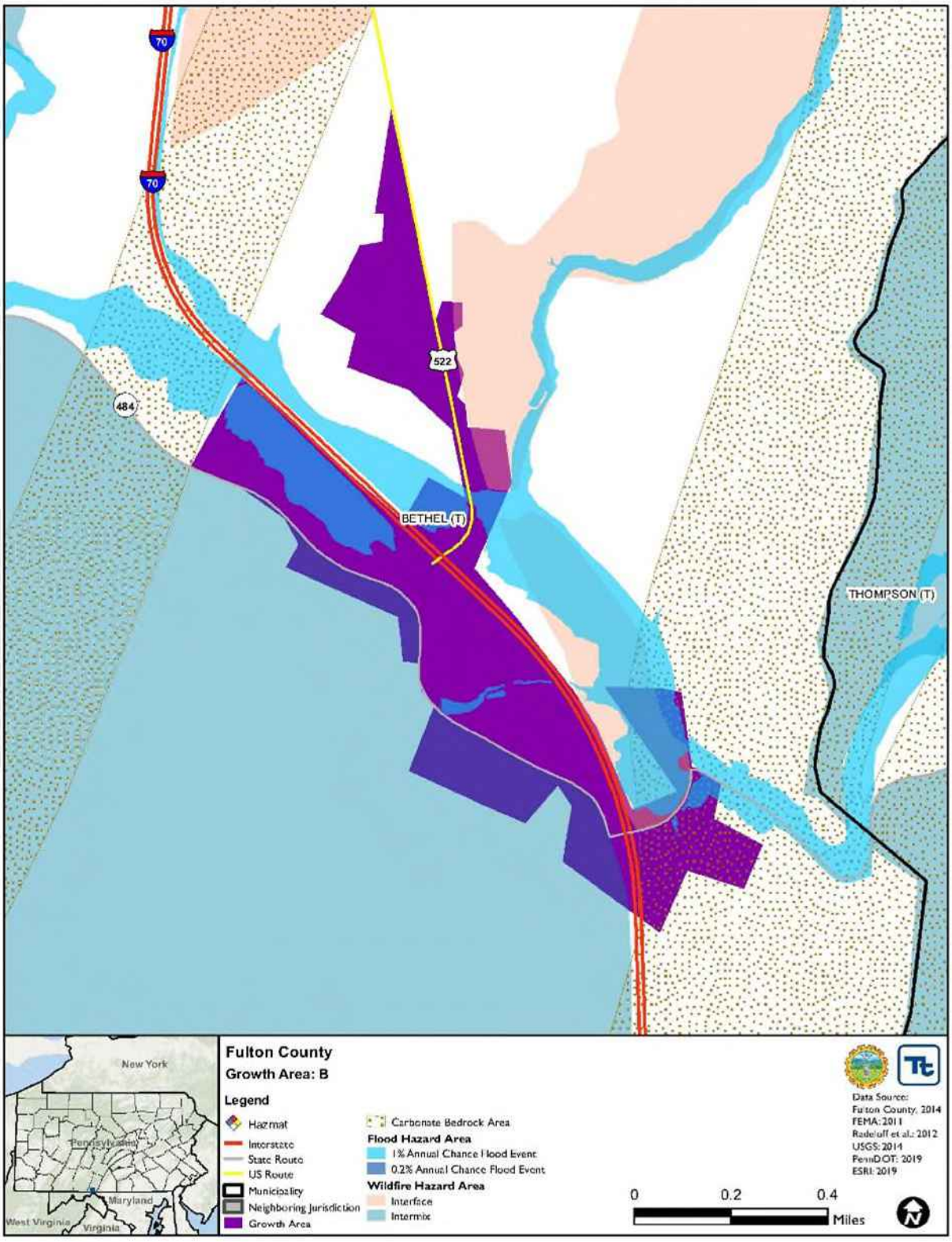
Source: Fulton County Planning Commission 2019

Figure 4.4-2. Fulton County Growth Area A and Hazards



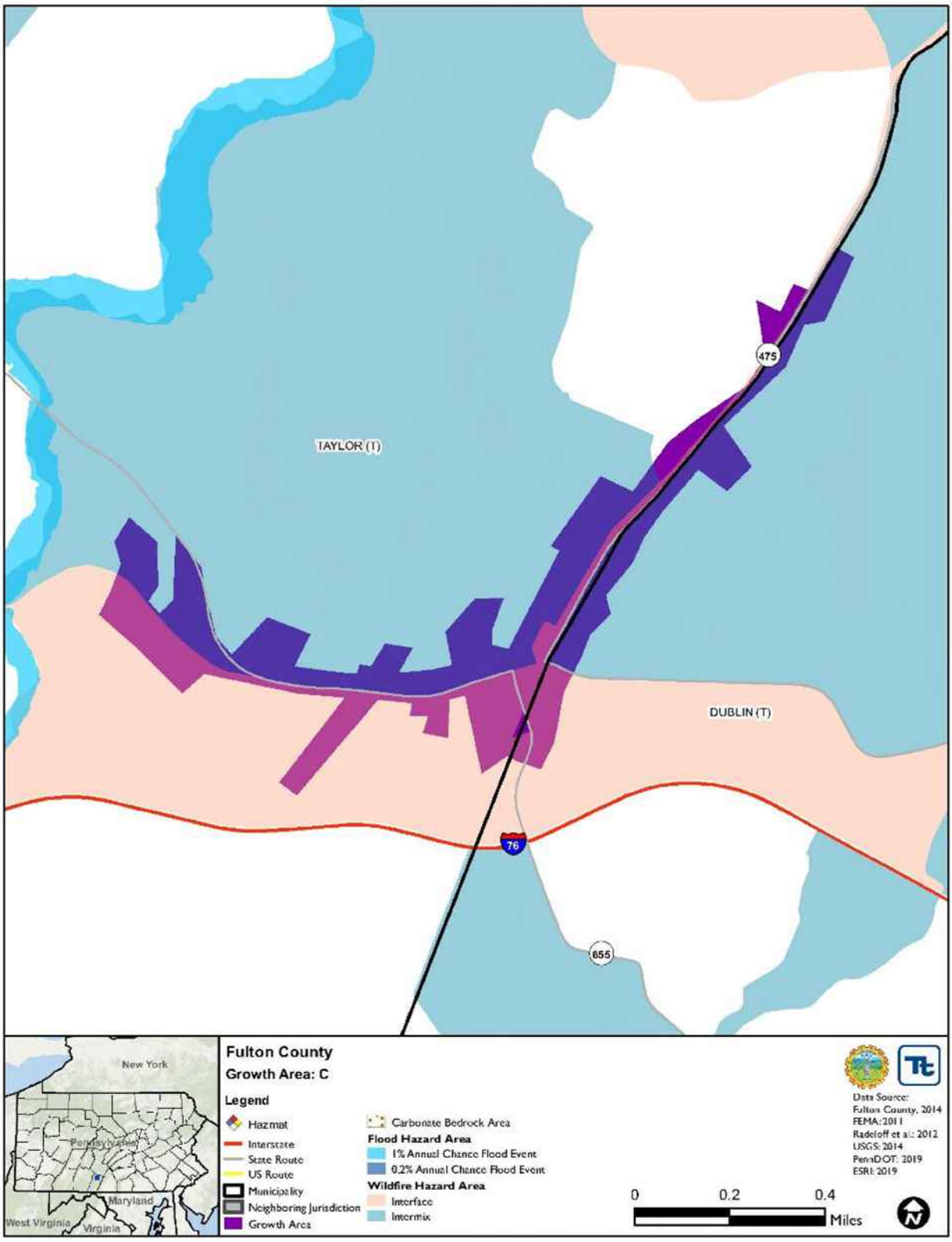
Source: Fulton County Planning Commission 2019

Figure 4.4-3. Fulton County Growth Area B and Hazards



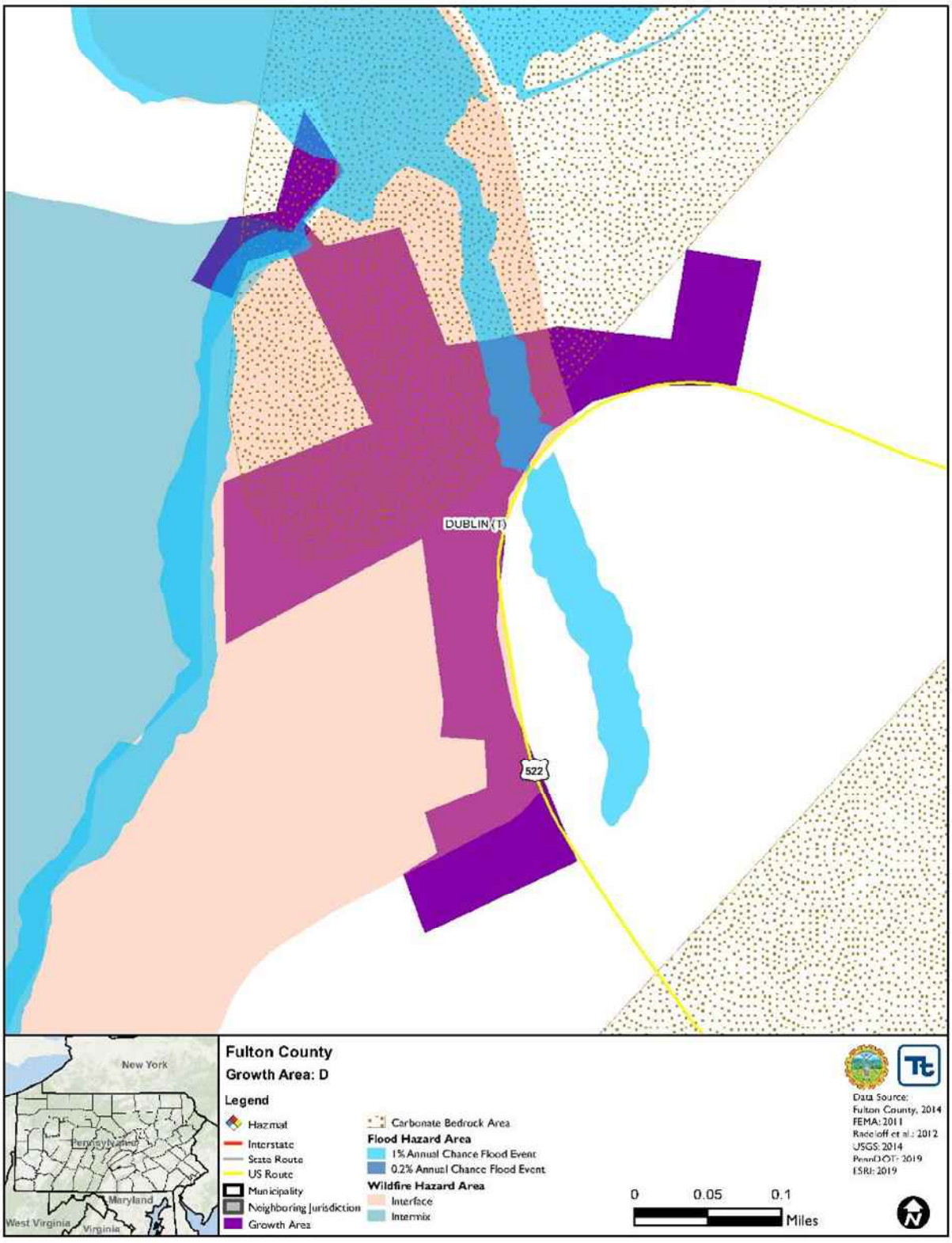
Source: Fulton County Planning Commission 2019

Figure 4.4-4. Fulton County Growth Area C and Hazards



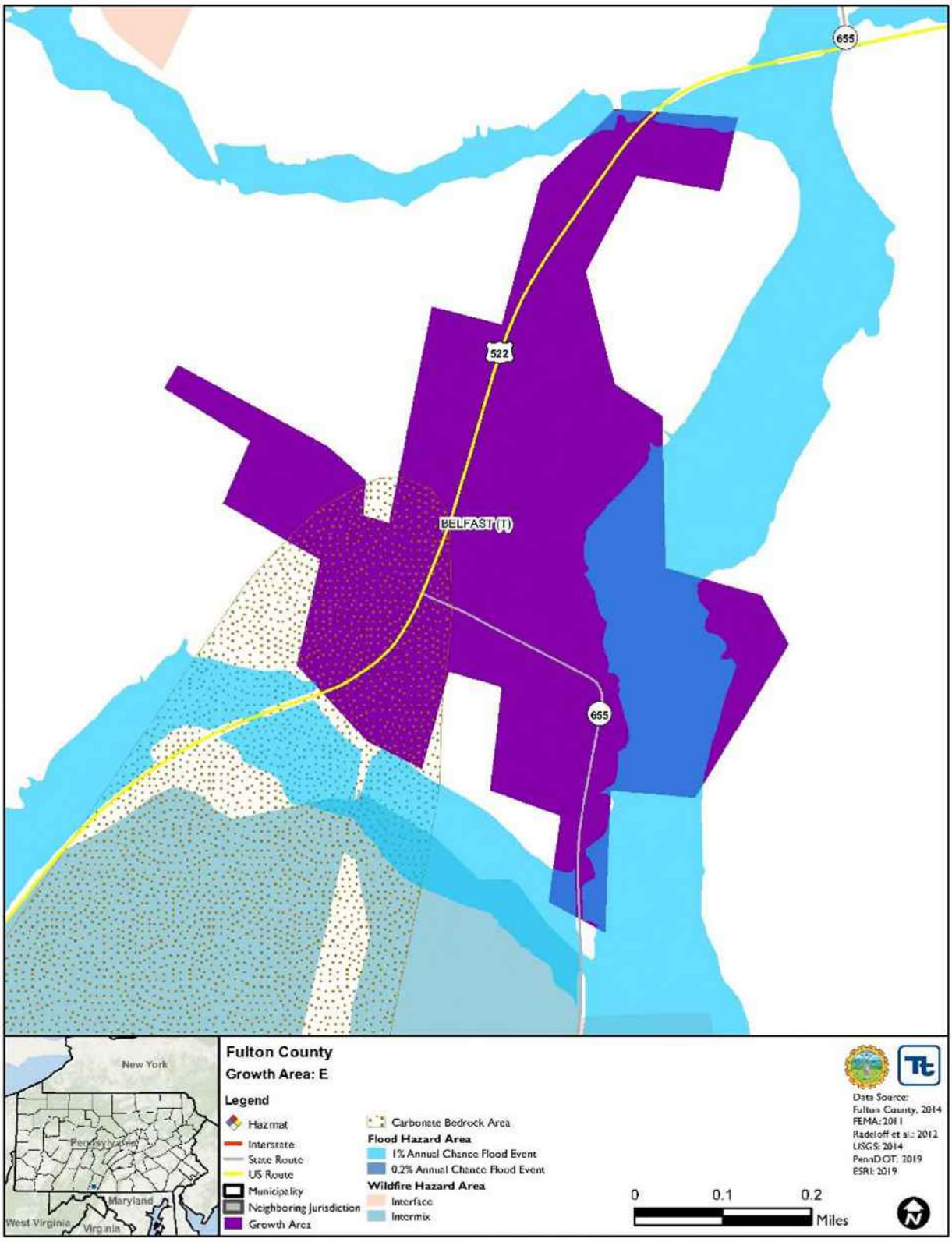
Source: Fulton County Planning Commission 2019

Figure 4.4-5. Fulton County Growth Area D and Hazards



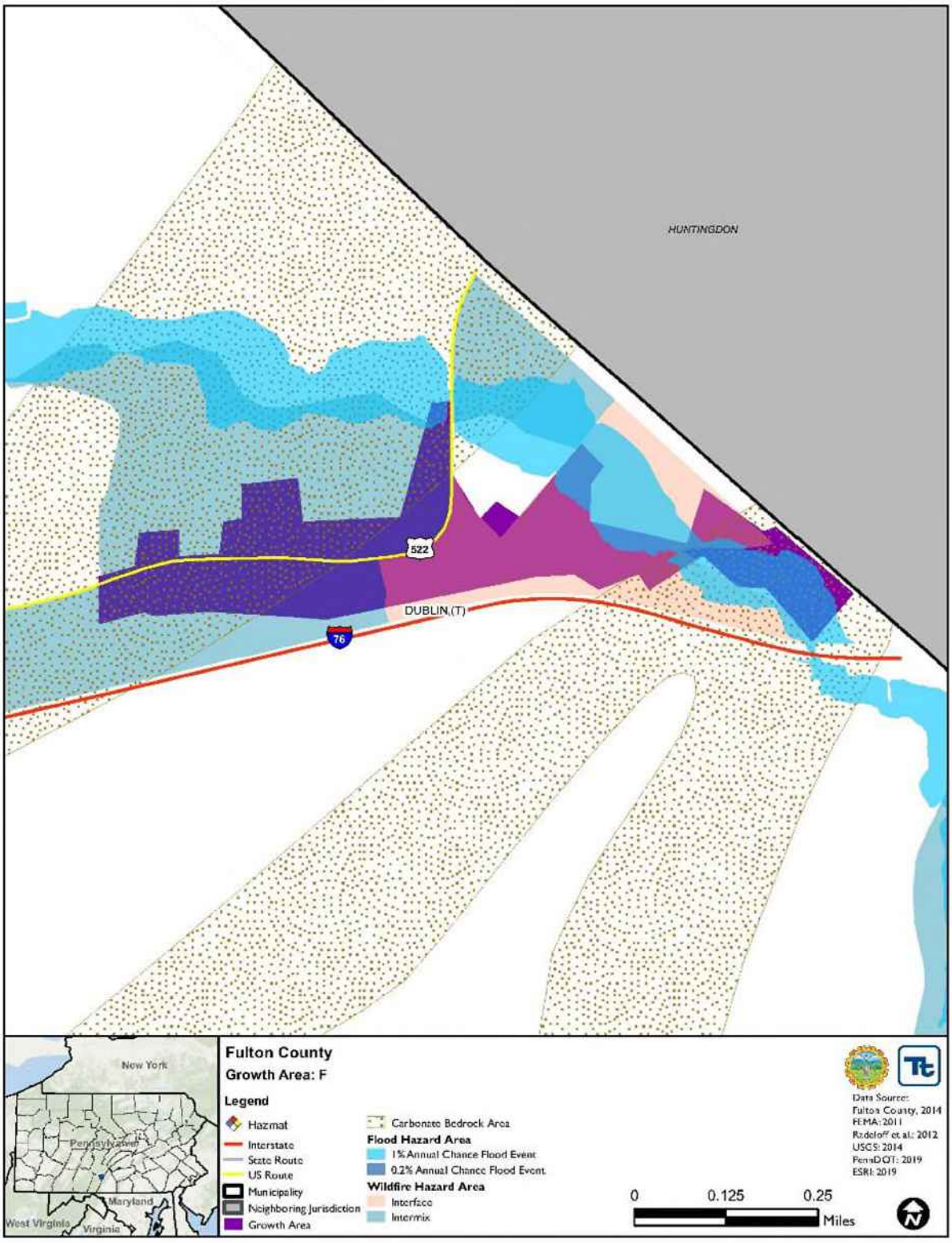
Source: Fulton County Planning Commission 2019

Figure 4.4-6. Fulton County Growth Area E and Hazards



Source: Fulton County Planning Commission 2019

Figure 4.4-7. Fulton County Growth Area F and Hazards



Source: Fulton County Planning Commission 2019