2020 Multi-Hazard Mitigation Plan

Wells County

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1 Overview

1.1 Introduction

The Wells County Multi-Hazard Mitigation Plan (MHMP) serves as a guide for the county's assessment of hazards, vulnerabilities, and risks and actively incorporates the participation of a wide range of stakeholders and the public in the planning process. This plan aids the county, cities, and towns in preventing, protecting against, responding to, and recovering from disasters that may threaten the community's economic, social, and environmental well-being. This plan documents historical disasters, assesses probabilistic disasters through Hazus-MH and Geographic Information Systems (GIS) analyses, and addresses specific strategies to mitigate the potential impacts of these disasters.

The Wells County Emergency planning team and The Polis Center at Indiana University-Purdue University Indianapolis (IUPUI) originally developed the Wells County MHMP in 2015. The MHMP is not a static document but must be modified to reflect shifting conditions. This 2020 MHMP update represents a collaborative effort to ensure that the planning document accurately reflects changes within the community and addresses each jurisdiction's unique needs.

1.1.1 Disaster Mitigation Act of 2000

With the development of the federal Disaster Mitigation Act of 2000, FEMA requires counties to have an MHMP in order to be eligible for Hazard Mitigation Grant Program (HMGP) funds. All jurisdictions must have in place a multi-hazard mitigation plan and update the plan within a five-year time span. This plan update addresses changes in development, progress in local mitigation efforts, and alterations in priorities. This plan update will remain effective for 5 years from the date of community adoption.

The procedures outlined in the plan are based upon guidance provided by FEMA and are consistent with the requirements and procedures defined in the Disaster Mitigation Act of 2000. The analysis includes three components: 1) profile and analysis of hazard events, 2) inventory of vulnerability assessment of community assets, and 3) development of hazard mitigation strategies.

1.2 Hazard Mitigation

Hazards are events that are potentially dangerous or harmful and are often the root causes of unwanted outcomes. Both natural and human-caused hazards threaten loss of life and property in the county and are included in the plan. As Figure 1 shows, hazard mitigation is a part of the disaster management cycle and is defined as any action taken to eliminate or reduce the long-term risk to human life and property from natural and technological hazards.

Figure 1. An Integrated Planning Process

Hazard mitigation planning and the subsequent implementation of the projects, measures, and policies developed as part of this plan are the primary mechanisms in achieving FEMA's goal of reducing hazards. Local governments have the responsibility to protect the health, safety, and welfare of their citizens. This plan recognizes the importance of mitigation for the following goals:

- Protect public safety and prevent loss of life and injury.
- Reduce harm to existing and future development.
- Prevent damage to a community's unique economic, cultural, and environmental assets.
- Minimize operational downtime and accelerate recovery of government and business after disasters.
- Reduce the costs of disaster response and recovery and the exposure to risk for first responders.
- Help accomplish other community objectives, such as leveraging capital improvements, infrastructure protection, open space preservation, and economic resiliency.

Developing and putting into place long-term strategies that reduce or alleviate loss of life, injuries, and property resulting from natural or human-caused hazards accomplish these goals. These long-term strategies must incorporate a range of community resources including planning, policies, programs, and other activities that can make a community more resistant to disaster.

2 Public Planning Process

2.1 Planning Team

The Wells County MHMP planning team is composed of individuals representing the county and its participating jurisdictions. The Wells County Emergency Management Agency acted as the designated responsible entity and coordinated the development of the planning team. Each community jurisdiction was encouraged to engage in the planning process, and invitations were sent to a wide range of community leaders and involved stakeholders. In order to complete the 10-step process outlined by FEMA in the Local Mitigation Planning Handbook, the planning team participated in a series of surveys and meetings, which are documented in the Appendices. The participation status of each incorporated jurisdiction is summarized in Table 1.

Table 1. Wells County Incorporated Jurisdictions Participation

Jurisdiction Name	Jurisdiction Type	2015 Participant	Received Invitation to Participate	2020 Participant
Wells	County	Yes	Yes	Yes
Bluffton	City	Yes	Yes	Yes
Markle*	Town	Yes	Yes	Yes
Ossian	Town	No	Yes	Yes
Poneto	Town	Yes	Yes	Yes
Uniondale	Town	Yes	Yes	Yes
Vera Cruz	Town	Yes	Yes	Yes
Zanesville	Town	Yes	Yes	Yes
Bluffton-Harrison MSD	School District	No	Yes	Yes
Southern Wells Community Schools	School District	No	Yes	Yes
Northern Wells Community Schools	School District	No	Yes	Yes

**Markle lies in both Wells and Huntington Counties and participated in both plan updates.*

Each chapter of the MHMP was reviewed, revised, and expanded using current information and includes new feedback from taskforce members with an emphasis on updating the goals, objectives, and strategies. The mitigation planning requirements identified in 44 CFR 201.6 call for all incorporated jurisdictions participating in a multi-jurisdictional MHMP to take part in the planning process. Examples of participation include, but are not limited to, attending planning meetings, contributing research, data or other information related to hazards and strategies, and commenting on drafts of the plan. The hazard mitigation planning team members are summarized in Table 2.

Table 2. Hazard Mitigation Planning Team

Name	Title	Organization	Jurisdiction
Rick Velasquez	Director	Wells County EMA	County
Ted Ellis	Mayor	City of Bluffton	Bluffton
Sheila Floton	Town Manager	Town of Vera Cruz	Vera Cruz
Luann Martin	Town Manager	Town of Ossian	Ossian
Steve Darnell	Superintendent	Southern Wells School	Southern Wells Schools
Mike Grant	Town Manager	Town of Markle	Markle
Ginger Butcher	Principal	Northern Wells Schools	Northern Wells Schools
Brad Yates	Superintendent	Bluffton-Harrison MSD	Bluffton-Harrison MSD
John Schuhmacher	President	Zanesville Town Council	Zanesville
Steve Rush	President	Poneto Town Council	Poneto

All members of the planning committee were actively involved in attending meetings, providing available GIS data and historical hazard information, reviewing and providing comments on the draft plans, assisting in the public input process, and coordinating the county's formal adoption of the plan. Appendix A includes the sign-in sheets listing which meetings each team member attended along with the meeting minutes. Surrounding counties are also encouraged to be invited to participate in the planning process. Table 3 lists the counties surrounding Huntington County, the name of the EMA director and whether they participated in the process.

Table 3. Surrounding County EMAs Invited

County	Name	Attended
Adams	John August	Provided Copy of Plan
Allen	Bernie Beier	Provided Copy of Plan
Blackford	Ethan M. Cox	Provided Copy of Plan
Grant	Tom Culley	Provided Copy of Plan
Huntington	Robert Jeffers	Yes
Jay	Ralph L. Frazee / Jessica Ooten	Provided Copy of Plan

2.2 Review of Existing Plans

Wells County and the local communities utilize land use plans, emergency response plans, municipal ordinances, and building codes to direct community development. The planning process incorporated the existing natural hazard mitigation elements from these previous planning efforts. Table 4 lists the plans, studies, reports, and ordinances used in the development of the plan. Additional information related to jurisdiction capabilities is discussed in Chapter 5.

Table 4. Planning Documents Used for MHMP Planning Process

Title	Author(s)	Year	Description	Where Used
Flood Insurance Study Wells County, Indiana and Incorporated Areas	FEMA	2014	Provides flood risk data that promotes informed land use and floodplain development	Section 4.3.1
Wells County Comprehensive Emergency Management Plan	Wells County	2019	Provide Wells County, Indiana, and its political subdivisions with a basis for a systematic approach to the solution of problems caused by the threat or occurrence of disasters.	Section 5
Soil Survey of Wells County, Indiana	United States Department of Agriculture	1992	Soil survey describing the soil variety of Carroll County	Section 3, Physical Characteristics

2.3 Planning Process Timeline and Steps

The Wells County planning team met on February 26th, 2019 for the HMP update kickoff. Prior to the second meeting, the team completed a survey related to the hazard rank and strategy status. The team then met on April 10th, 2019 to discuss survey results. The planning team confirmed the communities' hazard priorities and clarified any conflicting survey results for the county and each community.

The planning team invited the public to a meeting on June 5th, 2019. During this meeting, the overall purpose of the plan was reiterated and public input was sought. The group reviewed a copy of the draft plan and was provided with a presentation on the risk assessment and mitigation strategies. The draft plan was revised based on comments from the planning team and the public following the meetings. Appendix A includes meeting minutes and invitations to participate, and Appendix B includes the published announcement of the meeting.

The county continually works to engage with the public by posting community meetings and training opportunities on the county website as well as on the county's social media resources including Facebook and Twitter. In addition, a final copy of the plan will be available online through the county's website.

3 Community Profile

In order to provide a basic understanding of the characteristics of the community, this section offers a general overview of Wells County including the physical environment, population, and identification of available services.

3.1 General County Description

Wells County is located in northeastern Indiana and is situated approximately 110 miles northeast of the capital city of Indianapolis. According to the 2016 American Community Survey 5-Year estimates, the county covers 370.19 square miles and had a population of 27,836. The City of Bluffton is the county seat and the largest incorporated community in the county, containing approximately 35% of the population in 2016. Figure 2 displays a general map of Wells County and its incorporated communities while the Wells County townships and their respective incorporated communities are outlined in Table 5.

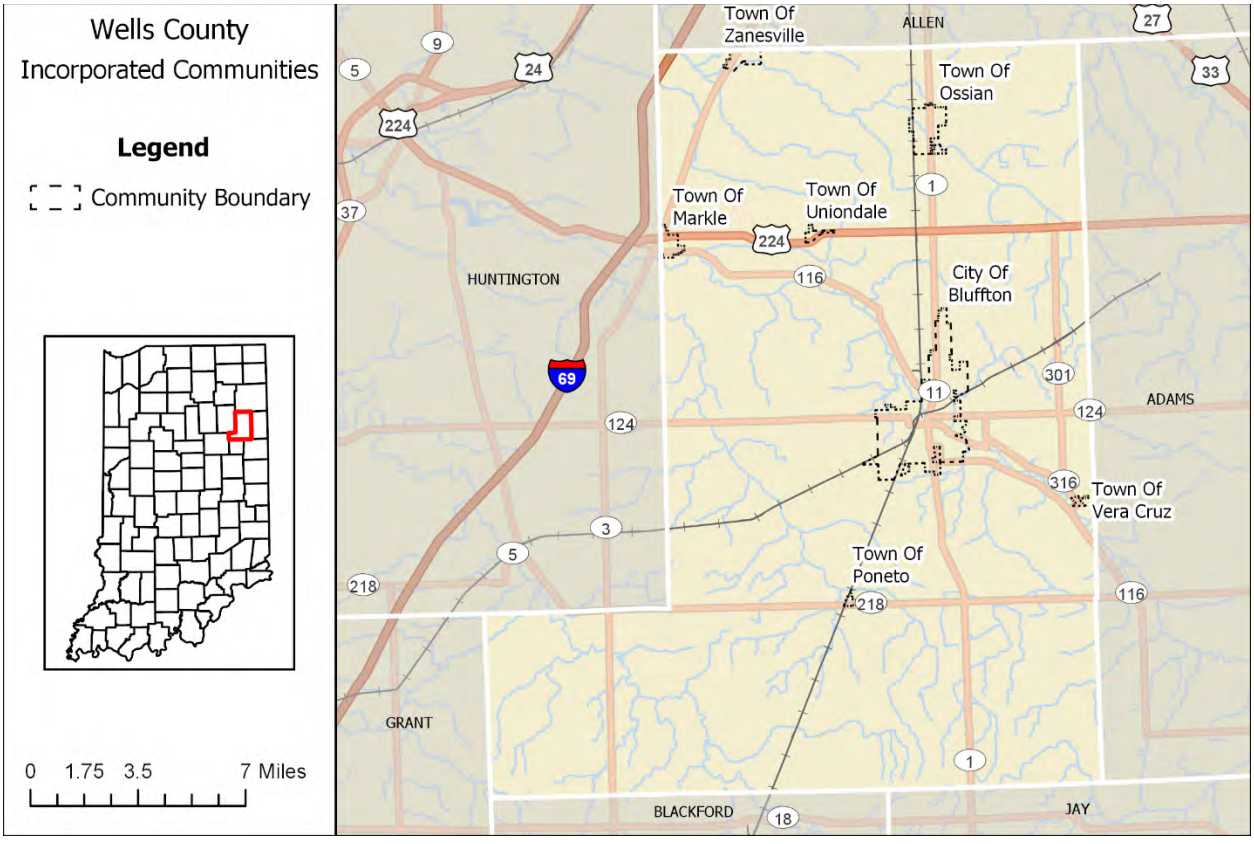

Figure 2. Wells County Incorporated Boundaries

Table 5. Wells County Townships and Incorporated Communities

Township	Communities Located in Township
Chester	-
Harrison	Bluffton (South Half), Poneto (East Quarter), Vera Cruz
Jackson	-
Jefferson	Ossian
Lancaster	Bluffton (North Half)
Liberty	Poneto (West)
Nottingham	-
Rockcreek	Markle (East Half), Uniondale (Southwest Half)
Union	Markel (Northeast Edge), Uniondale (Northeast Half), Zanesville (South Half)

3.2 Historical Setting

The first settlers into Wells County arrived about 1829. In 1834 and 1835 immigration began to rapidly set in. Wells County was created on February 7, 1835 and was organized in 1837. The county was named after Captain William A. Wells. As a young boy, Captain Wells was captured and adopted by the Miami Chief Little Turtle and eventually became a scout for General “Mad Anthony” Wayne. He was killed on August 15, 1812 in the Fort Dearborn Massacre at the outbreak of the War of 1812.

3.3 Physical Characteristics

3.3.1 Climate and Precipitation

The Wells County climate is characteristic of northern Indiana. Winter temperatures can fall below freezing starting in November and extending as late as March. Based on National Climatic Data Center (NCDC) norms from 1981 to 2010, the average winter minimum temperature is 19.4° F and the average high is 34.4° F. In summer, the average low is 62.2° F and average high is 81.9° F. Average annual precipitation is 38.32 inches throughout the year. The average winter precipitation is 6.85 inches.

3.3.2 Geology and Topography

The landscape of Wells County consists of a level surface, broken slightly by sloping landscapes along rivers, creeks, and their tributaries. According to the United States Department of Agriculture Soil Survey of Wells County, the lowest point in Wells County is 772 feet above sea level and the highest point in the county is about 935 feet above sea level.

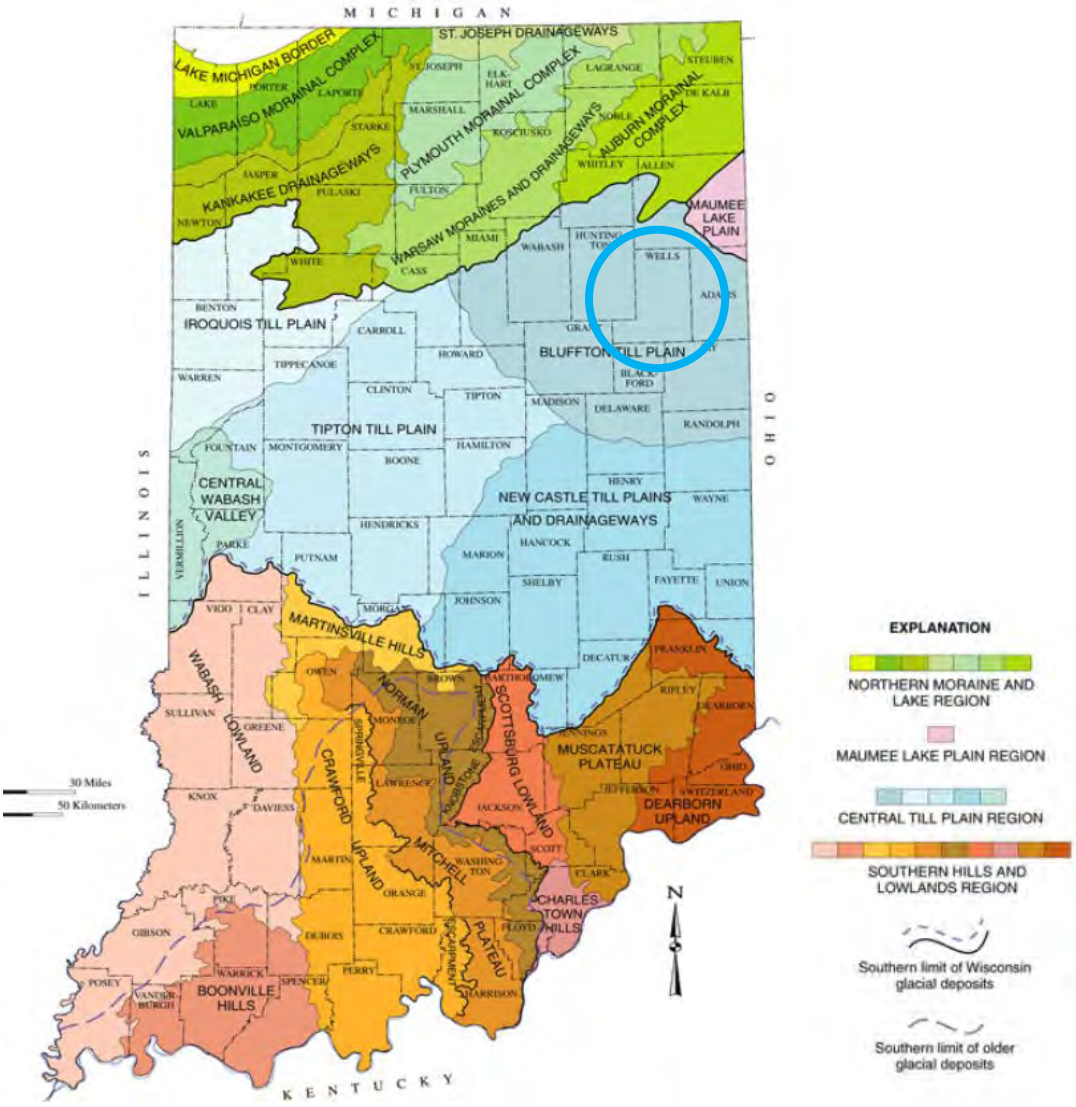

Figure 3. Physiographic Divisions of Indiana (Source: Indiana Geological Survey)

Wells County's topography is dominated by the Bluffton Till Plain topographical unit. The Bluffton Till Plain is characterized by the widespread presence of clayey till, leaving much of the area poorly drained. There are forested, along with minor areas of bog, prairie, fen, marsh and lake communities. According to the Indiana Department of Natural Resources, a greater number of northern wetland species occur in this section than in the others of the region. The Indiana Geological Survey reports that the bedrock in Wells County is primarily Silurian and made up of dolostone, limestone, siltstone, and shale.

3.3.3 Land Use and Ownership

3.3.3.1 Agriculture

The 2012 U.S. Census of Agriculture reports that there are 636 farms in the county covering 200,334 acres. Of this farming land, 94.4% is cropland and 5.6% is classified as "other uses." Figure 4 displays the agricultural areas in Wells County.

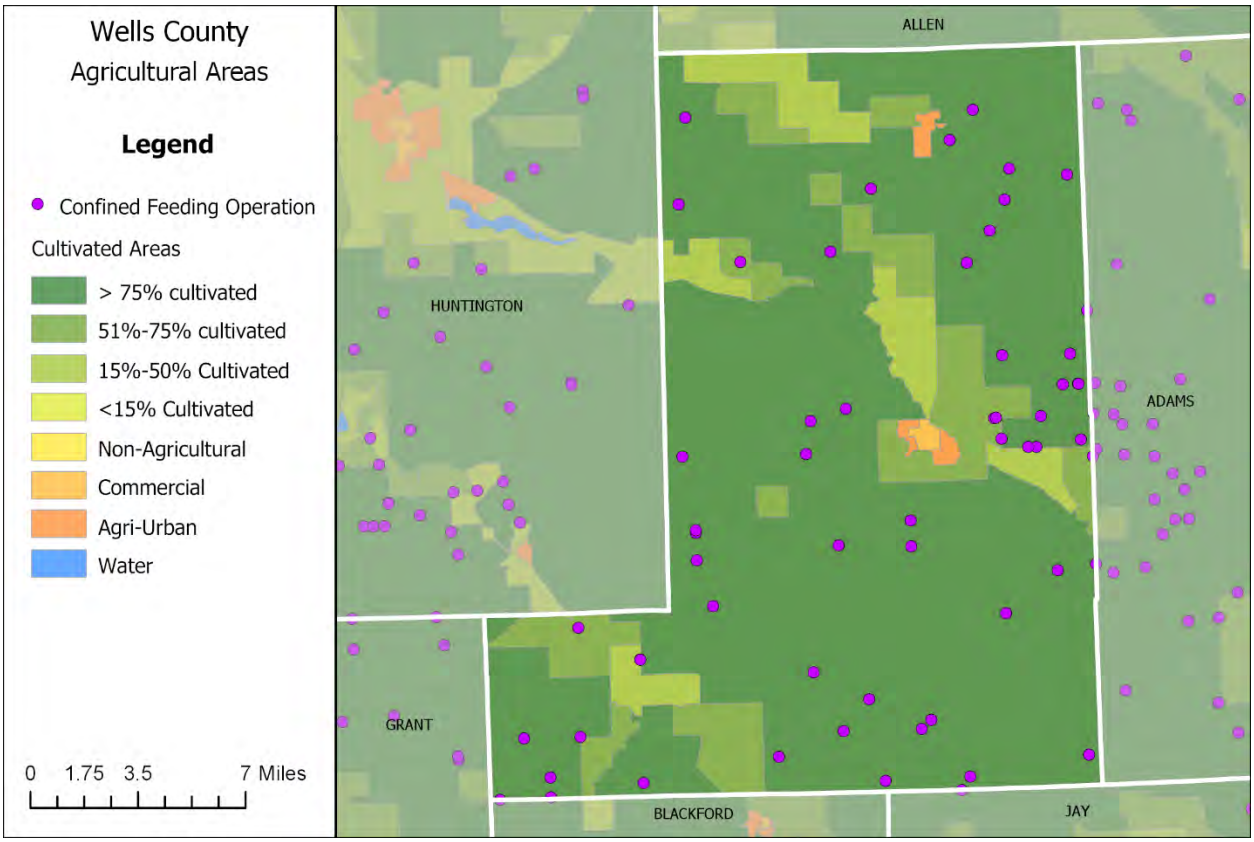

Figure 4. Wells Agricultural Areas

3.3.3.2 Managed Lands

The Indiana Department of Natural Resources (IDNR) maintains an inventory of managed properties. These natural and recreation areas are managed by either the IDNR Fish & Wildlife, IDNR Nature Preserves, federal, local or non-profits and is maintained by the Indiana Natural Heritage Database. By establishing conservation areas and parkland, the county is able to preserve plant and animal species and combat air, land, pollution prevention, and water quality issues. Figure 5 depicts managed land in Wells County.

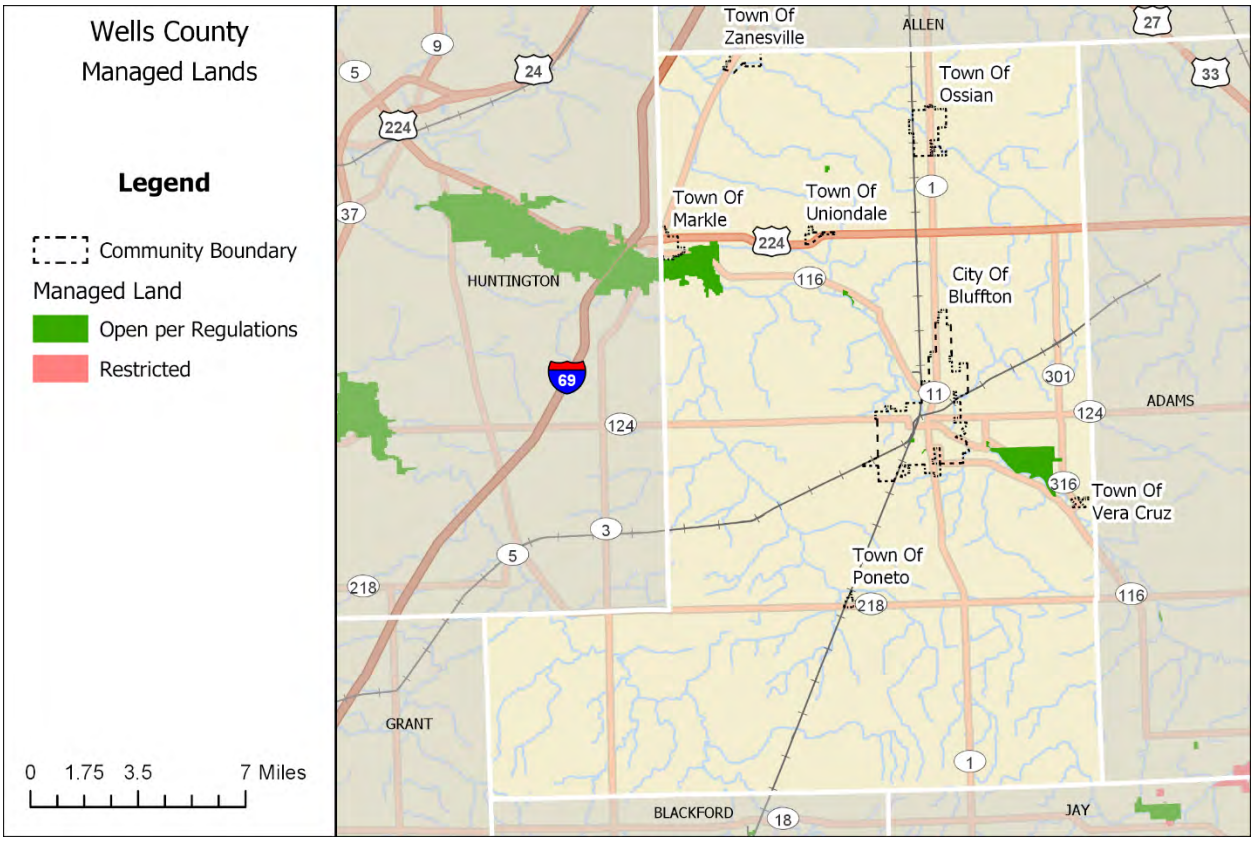

Figure 5. Wells County Managed Lands

3.3.4 Major Waterways and Watersheds

Water resources are vital to the county because they provide enhanced recreational and economic opportunities. Important water resources include surface and groundwater from aquifers, watersheds, lakes, rivers, and wetlands. Water resources provide for riparian habitats, fish, wildlife, household, livestock, recreation, aesthetic, and industrial uses.

3.3.4.1 Watersheds

Wells County is located within three major watersheds: Upper Wabash (HUC 05120101), Salamonie (05120102), and St. Marys (04100004) as shown in Figure 6. The Upper Wabash crosses the center of the county while the Salamonie Watershed covers the south of the county. The Eel Watershed intersects the northwest corner of the county, and the Mississinewa Watershed brushes the southwest corner.

3.3.4.2 Rivers and Streams

The Wells County National Hydrography Dataset (NHD) contains over 459.4 miles of streams and rivers. Major streams and rivers in the county are displayed in Figure 6. The communities of

Bluffton and Vera Cruz were constructed near the banks of the Wabash. According to the Indiana Natural Resources Commission, the Wabash River is navigable throughout the county.

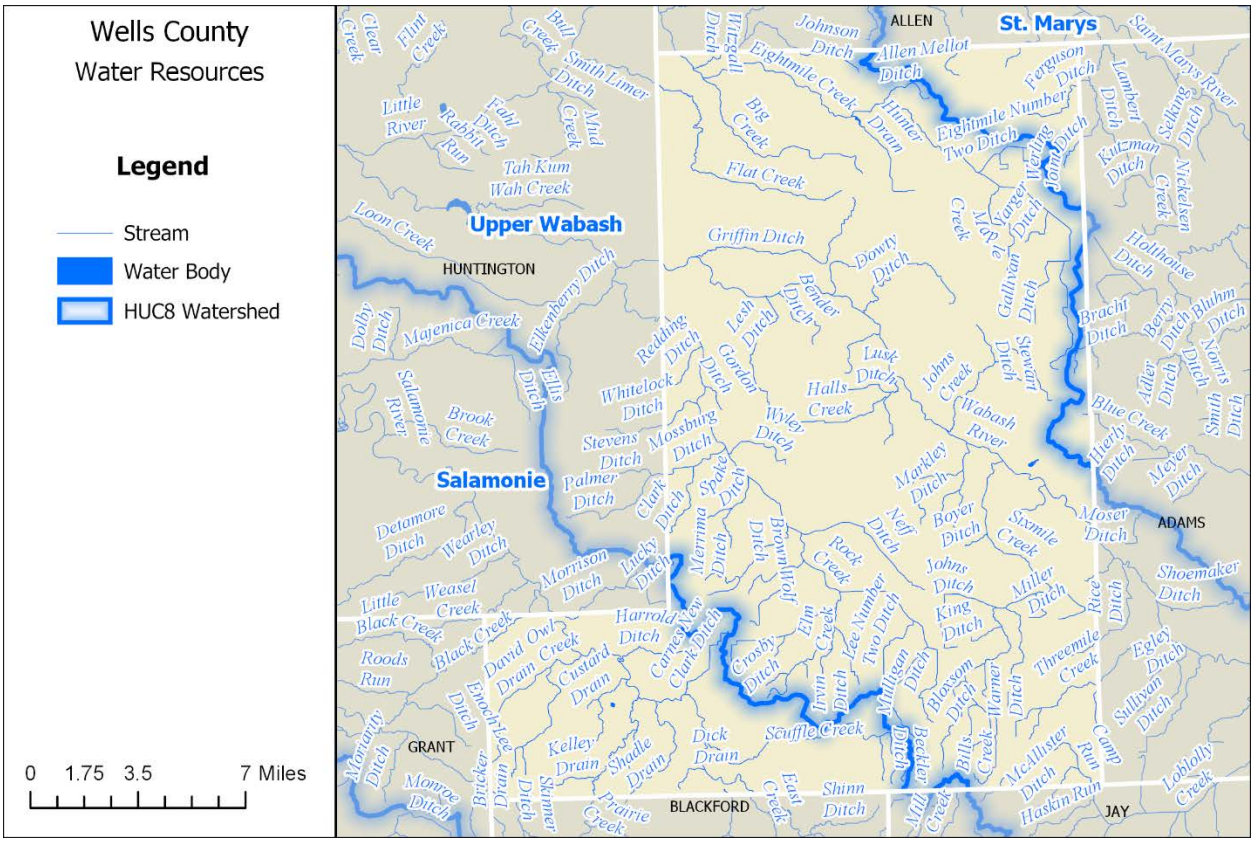

Figure 6. Wells County Water Resources (Water resource data courtesy of IDNR)

3.3.4.3 Lakes and Reservoirs

Lakes provide drinking water and a habitat for a variety of fish and wildlife. Lakes can function as a potential source of transportation and support recreational and commercial fishing industries. The IDNR Department of Fish and Wildlife maintains a list of the lakes in Indiana and the general assembly has established the listing of Public Freshwater Lakes (PFL). The DNR Division of Water regulate these lakes using the Lake Preservation Act (I.C. 14-26-2) and/or Lowering of 10 Acre Lakes Act or "Ditch Act" (I.C. 14-26-5). Wells County does not have any PFLs.

3.3.4.4 Wetlands

The EPA and the Indiana Department of Environmental Management (IDEM) have identified Indiana's wetlands and other aquatic resources as important features to protect and wisely use for the benefit of present and future generations. Wetlands are vital features of the Indiana landscape that provide beneficial services for people and wildlife including: protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters and

maintaining surface water flow during droughts and dry periods. Figure 7 displays the lakes and wetlands in Wells County.

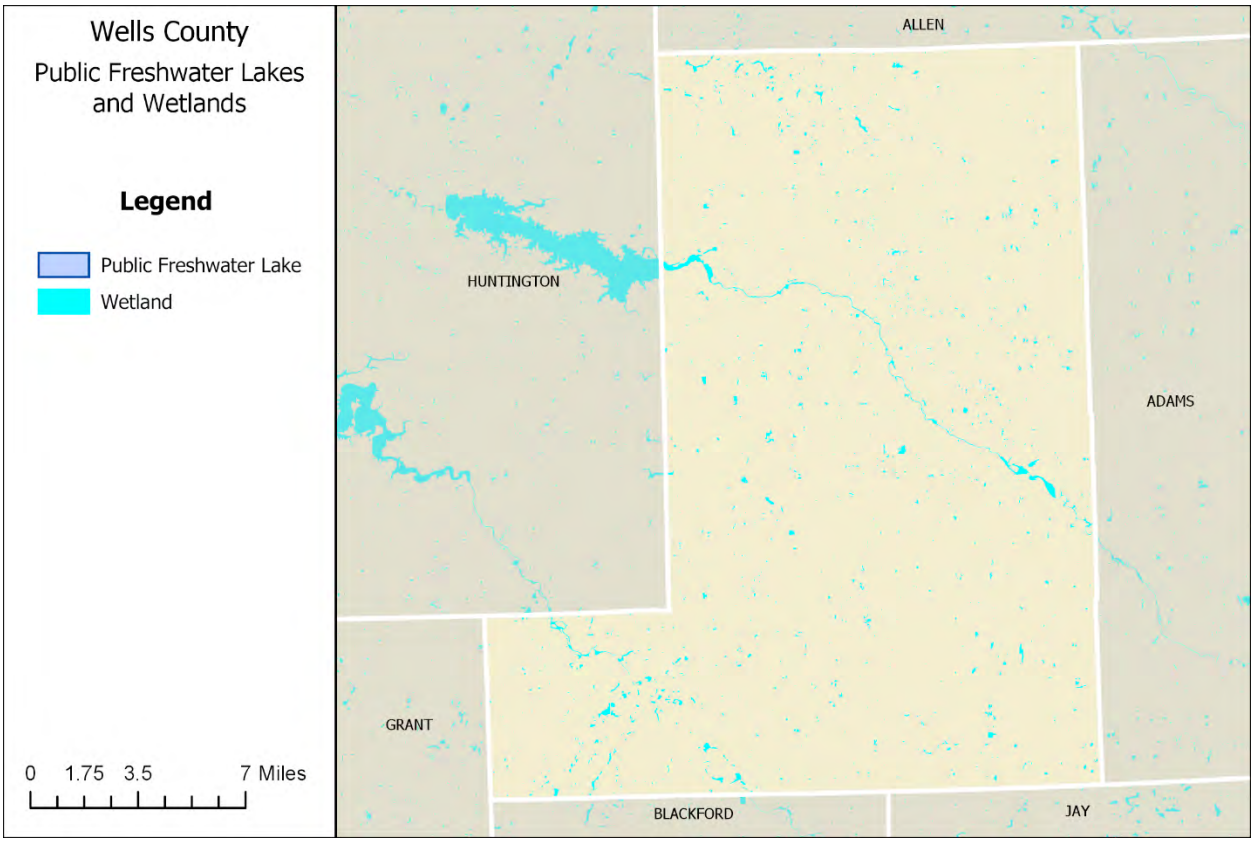

Figure 7. Public Freshwater Lakes and Wetlands (Water resource data courtesy of IDNR)

3.4 People

3.4.1 Population and Demographics

The US Census Bureau determined that Wells County's population was 27,600 in 2000 and 27,636 in 2010. The American Community Survey 5-year estimates that 27,836 people resided in Wells County in 2016. The population increased by almost 1% between 2000 and 2016, as displayed in Figure 8. The population density in 2016 was 75.1 people per square mile.

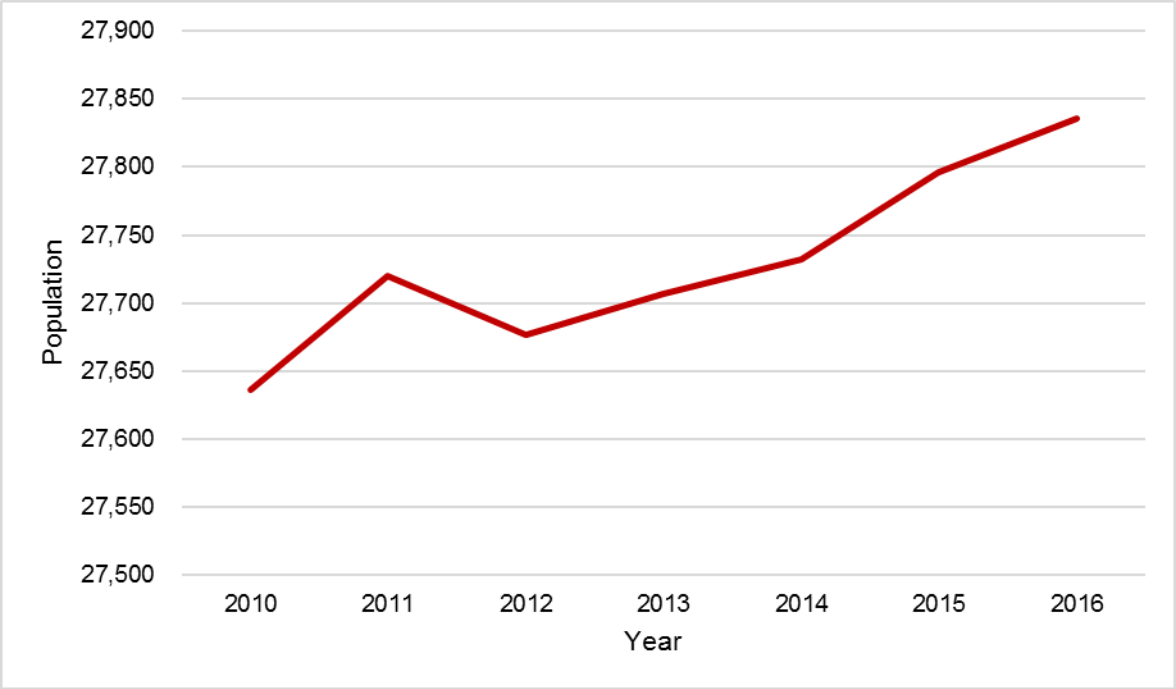

Figure 8. Wells County Yearly Population 2010-2016 (American Community Survey 5-Year Estimates)

The 2016 median age of Wells County is 40.7 compared to the state median of 37.4. The age distribution of Wells County is shown in Figure 9. Of the population age 25 and older, 91.2% have completed a high school education or higher and 17.4% have completed a bachelor's degree or higher.

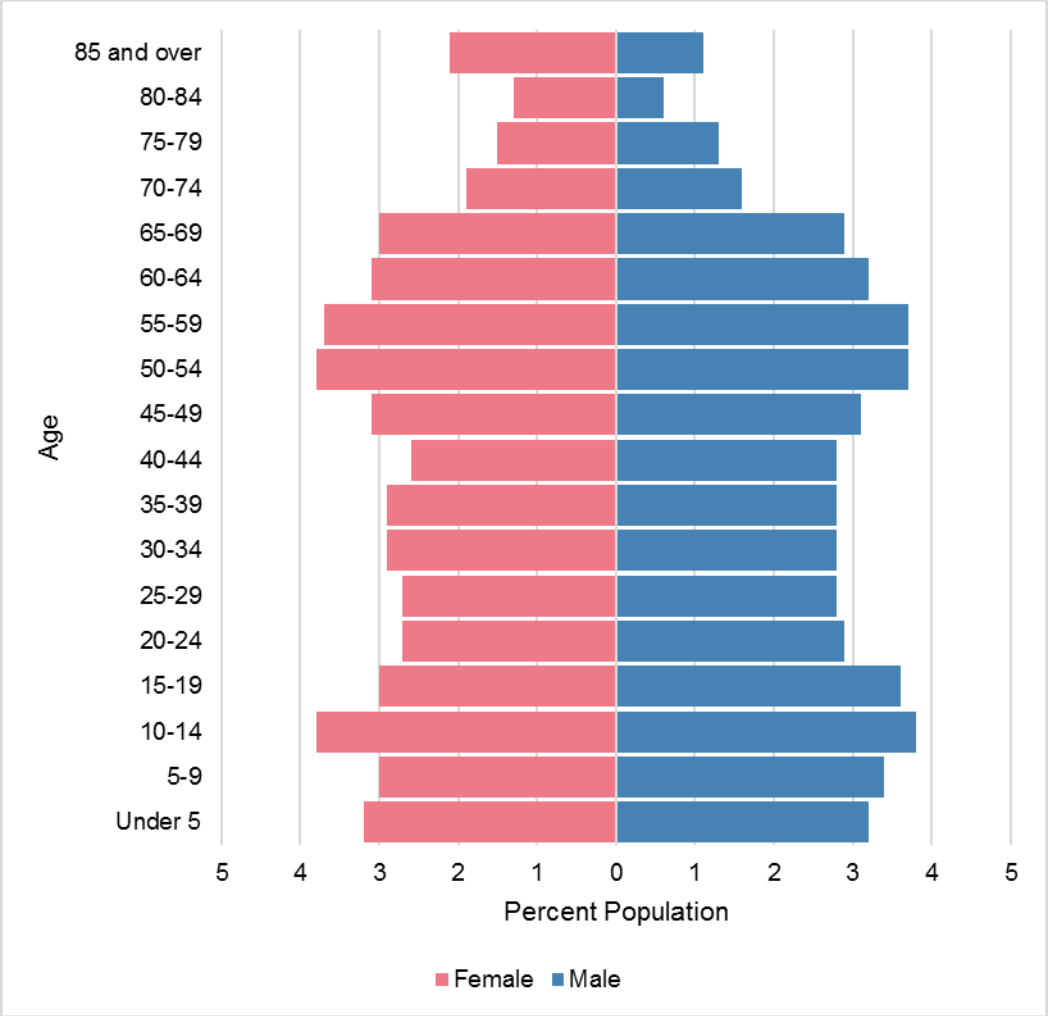

Figure 9. Distribution of Ages in Wells County (American Community Survey 5-Year Estimates)

Some populations may require special attention in mitigation planning because they may suffer more severely from the impacts of disasters. It is important to identify these populations, termed special needs populations, and develop mitigation strategies to help them become more disaster-resilient. Although there are numerous types of vulnerable populations, there are five focus groups, which include the population age 65 and over, population 25 years and over with less than a 9th grade education, population for whom poverty status is determined, population with a disability, and the population 5 years and over that speaks a language other than English at home. In Figure 10, Wells County is compared to the nearby counties, as well as to Indiana, by the percent population of each special needs category within the county/state.

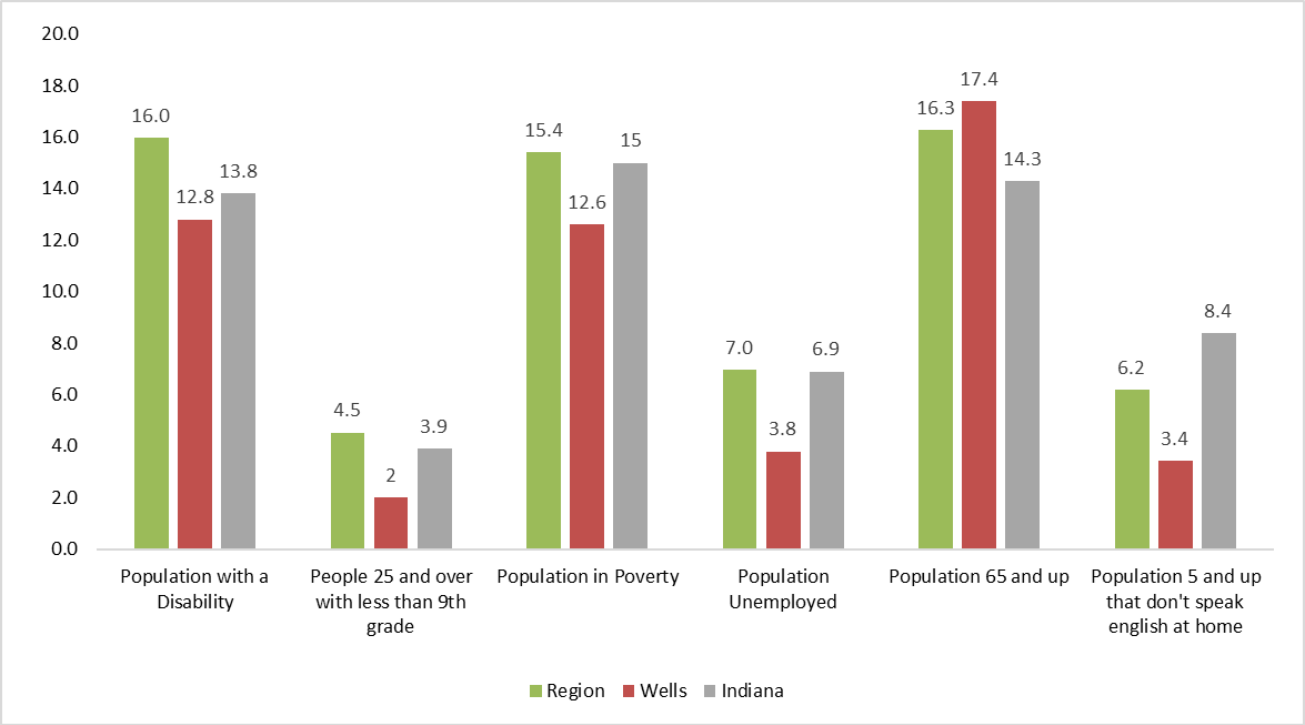

Figure 10. Vulnerable Populations (American Community Survey 5-Year Estimates)

Compared to the surrounding counties, Wells County has a relatively low percentage of people with disabilities and a low percentage of people living in poverty. Wells County contains a significantly lower percentage of people 25 and over with less than a 9th grade education as well as a lower percentage of unemployed population.

3.4.2 Housing

Approximately, 70.6% of Wells County households consist of families, compared to 65.8% of people in Indiana living with families. In 2016, the county had an average household size of 2.6 people.

3.4.3 Economy and Employment

The 2016 annual per capita personal income in Wells County was $24,544, compared to an Indiana per capita income of $26,117. The median household income is $51,568, which is lower than the state median household income of $50,433.

Of the Wells County work force, 24% are employed in the manufacturing industry while educational services, health care, and social assistance accounts for 17.9% of industry. The major employers in Wells County are listed in Table 6.

Table 6. Major Employers in Wells County (HoosierData Business Lookup)

Company Name
Peyton's Northern Distribution
Kroger Distribution Center
Ti Automotive
Bluffton Motor Works Llc
Pretzels Inc
Novae
Walmart Supercenter
American Axle & Mfg Inc
Johnson Controls Inc
Bcs Industries

3.4.4 Culture

According to the Indiana Historic Sites and Structures Inventory, Wells County has four historic places that appear on the National Register of Historic Places and one historic district as shown in Figure 11.

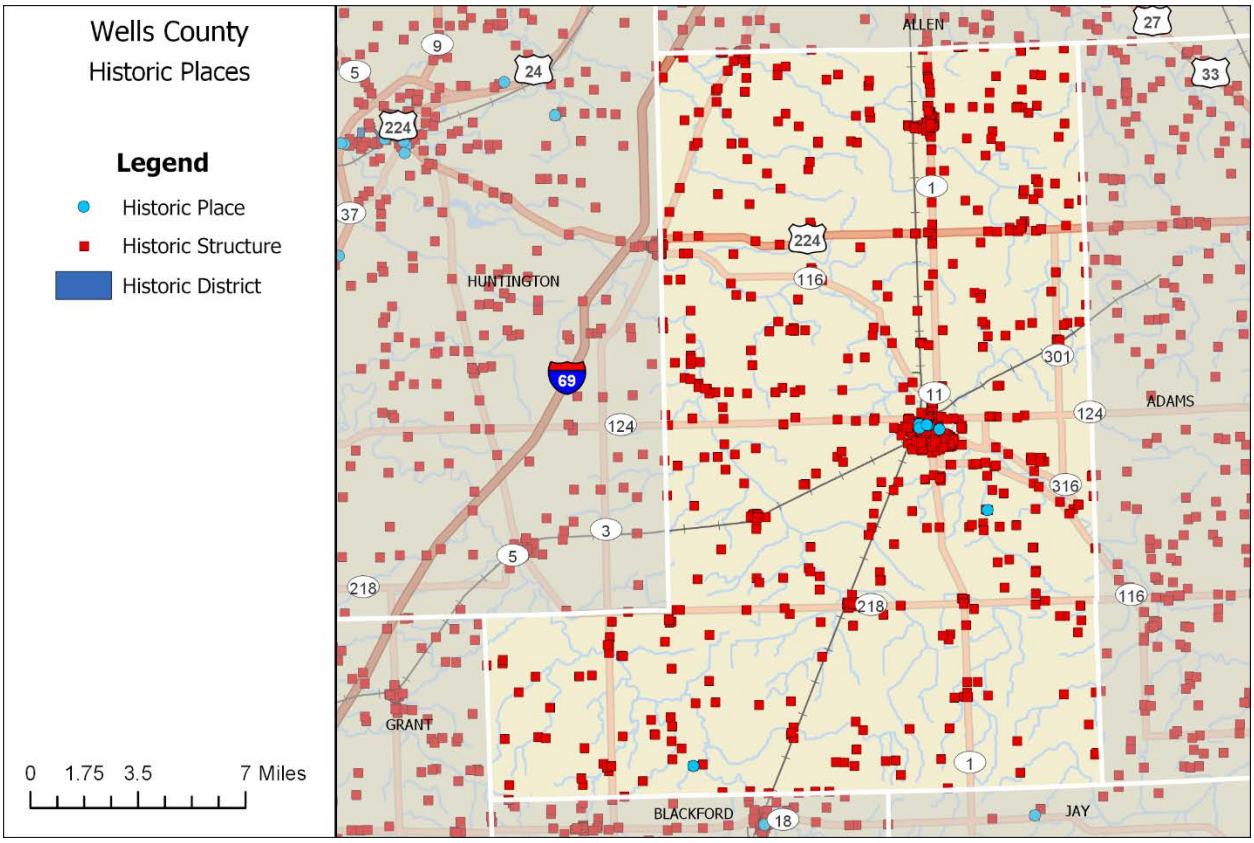

Figure 11. Historic Places in Wells County (Indiana State Historical Architectural and Archaeological Research Database)

3.4.5 Transportation and Commuting Patterns

The county transportation system is composed of roads, highways, airports, public transit, railroads, and trails, designed to serve all residents, businesses, industries and tourists. Figure 12 identifies the major transportation features of Wells County.

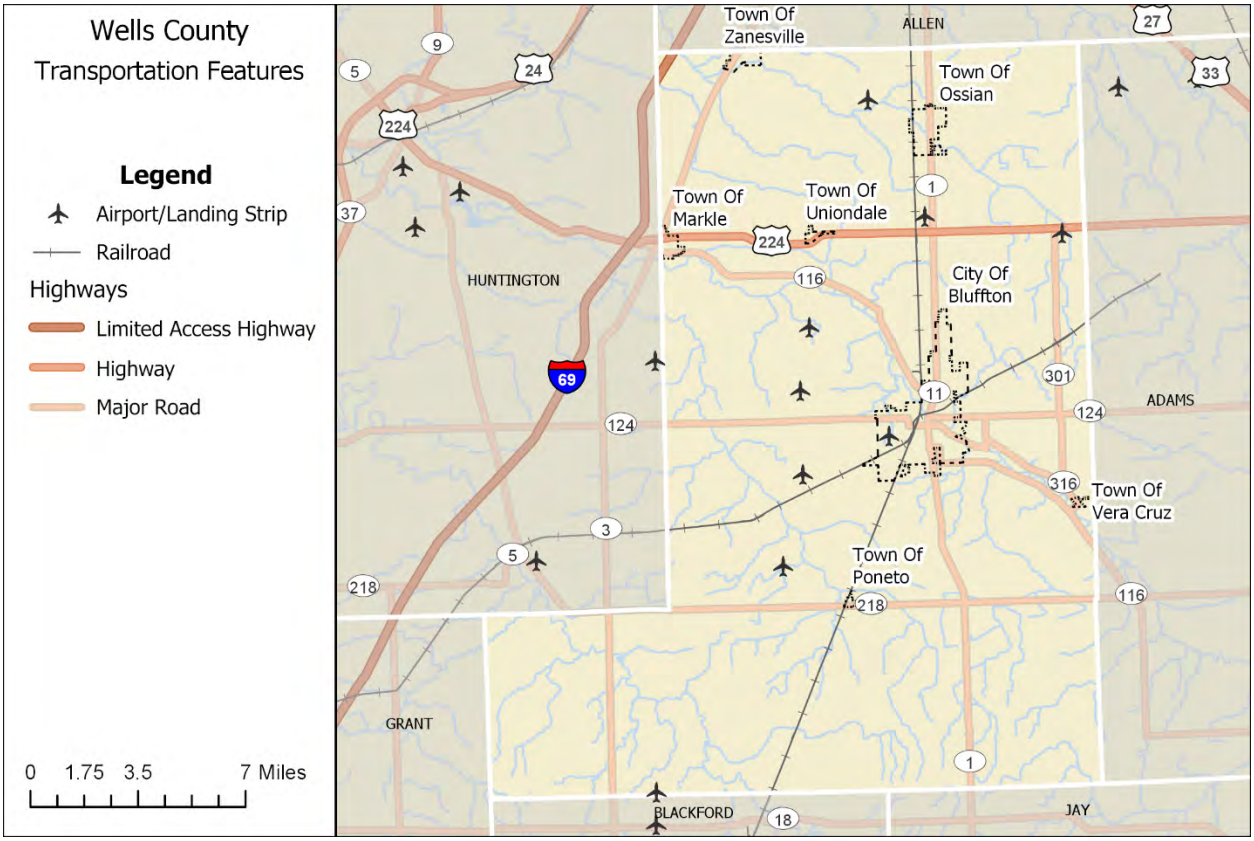

Figure 12. Wells County Major Transportation Features (Indiana Department of Transportation)

The Indiana Department of Transportation (INDOT) Fort Wayne District manages the state transportation resources. Of the 1,097 miles of road in the county, 179 are State Roads, 780 are county and 100 are under the authority of local jurisdictions. The county contains five miles of roads on state-managed land.

Wells County has two main rail corridors: Norfolk Southern Rail Road and Wabash Central Railroad. Norfolk Southern Railway is one of North America's larger Class I railroads and a subsidiary of Norfolk Southern Corp. The railroad operates 20,000 route miles in 22 states and crosses through the City of Bluffton.

The nearest international air transportation is Fort Wayne International Airport in the neighboring county. Wells County also has multiple small and privately owned airfields that can provide air access during a disaster.

Commuting Patterns

County-to-county commuting patterns provide a gauge of the economical connectivity of neighboring communities. According to STATS Indiana 2016 data, 14,192 Wells County residents work within the county and 4,733 work outside the county. An additional 2,673 people living in other counties commute to Wells County for work. Figure 13 indicates the number of workers 16 and older who commute to or from Wells County for work.

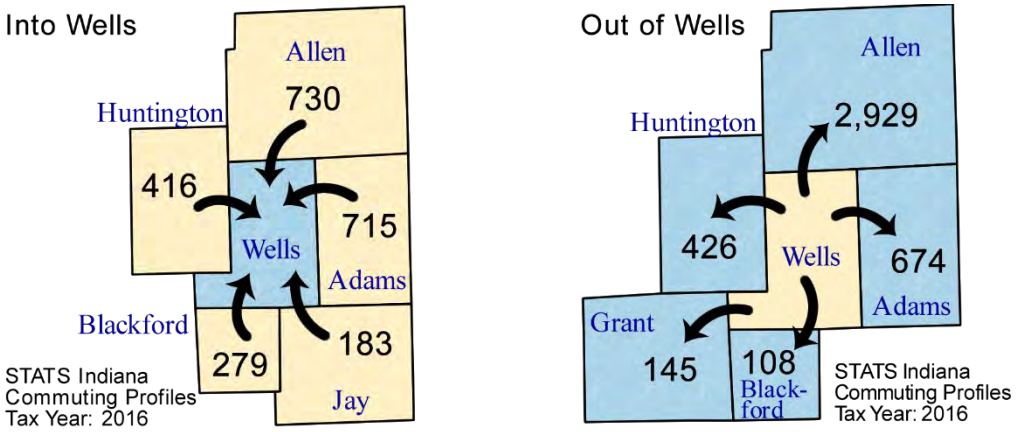

Figure 13. Commuting Patterns (STATS Indiana)

4 Risk Assessment

The goal of mitigation is to reduce the future impacts of a hazard including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation practices must be based on sound risk assessment. A risk assessment involves quantifying the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people. A risk assessment consists of three components: hazard identification, vulnerability analysis, and risk analysis.

4.1 Hazard Identification/Records

4.1.1 Existing Plans

Identifying and prioritizing the hazards the community is exposed to are the first steps before conducting a risk assessment. The 2015 Wells County MHMP identified the major hazards to which Wells County is exposed. The following sections present historical data regarding hazard incidents and resultant costs in Wells County.

4.1.2 Historical Hazards

Historical storm event data was compiled from the NCDC. NCDC records are estimates of damage reported to the National Weather Service (NWS) from various local, state, and federal sources. It should be noted that these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to given weather events.

The NCDC data included 258 reported events in Wells County from 1965 through 2018. The counts of these events by category is represented in Figure 14.

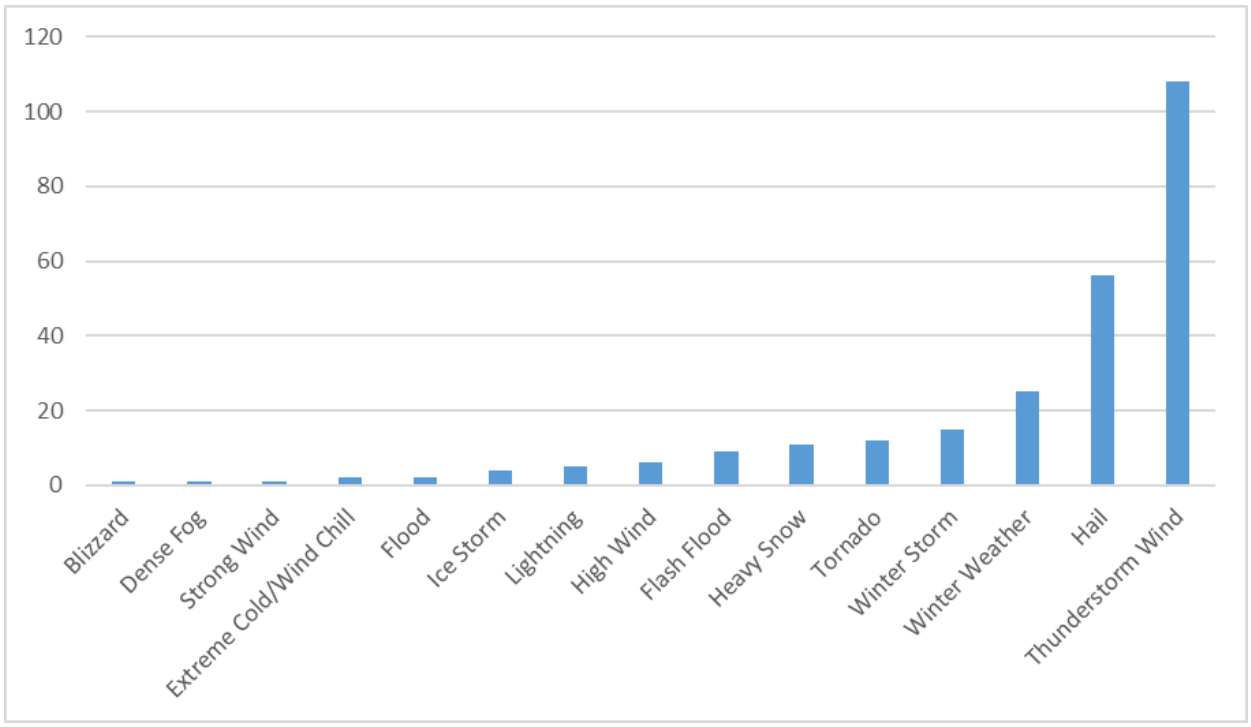

Figure 14. Count of NCDC Events in Wells County (1965-October 2018)

NCDC reports 37 events since the adoption of the Wells County 2015 plan. These recent events and their counts are reported in Figure 15.

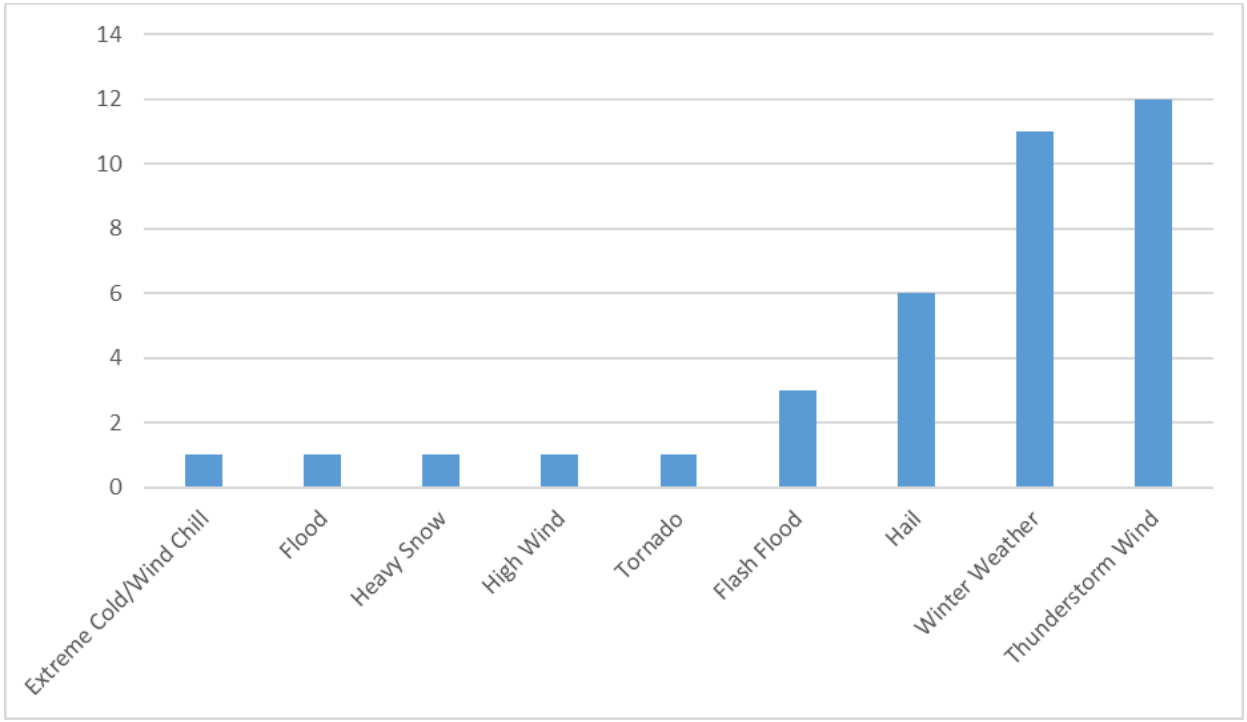

Figure 15. NCDC Events in Wells County since Previous MHMP (2015- October 2018)

A table listing all events and their injury, death, and property loss statistics are included in Appendix C.

4.1.3 FEMA Declared Disasters

During the past ten years, FEMA has declared 9 disasters for the state of Indiana. The following map shows the number disasters by county in the state since January 2008. Wells County has not received a disaster declaration since 2008.

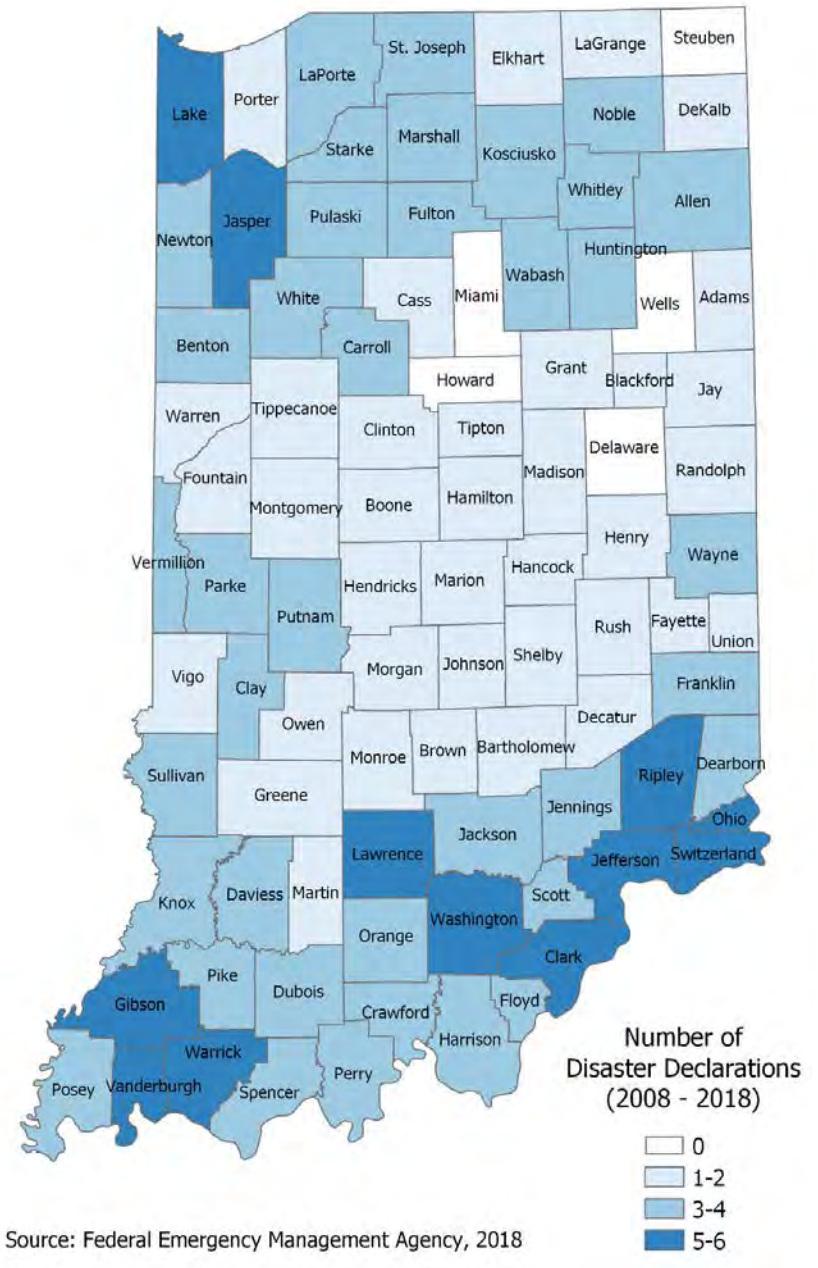

Figure 16. Disaster Declarations for Indiana

4.1.4 Other Disaster Relief

In addition to potential state funding, homeowners and businesses can be eligible for low-interest and long-term loans through the U.S. Small Business Administration (SBA). SBA was created in 1953 as an independent agency of the federal government to aid, counsel, assist, and protect the interests of small business concerns. The program also provides low-interest, long-term disaster loans to businesses of all sizes, private nonprofit organizations, homeowners, and renters following a declared disaster. The loans can also provide resources for homeowner associations, planned unit developments, co-ops, condominiums, and other common-interest developments. SBA disaster loans can be used to repair or replace the following items damaged or destroyed in a declared disaster: real estate, personal property, machinery and equipment, and inventory and business assets.

Through the disaster loan program, SBA provides loan data, including FEMA and SBA disaster numbers, type (business or home), year, and various reporting amounts on the verified and approved amount of real estate and contents. Table 7 outlines the SBA data for the county.

Table 7. SBA Declaration Data for Wells County

Year	FEMA Declaration	SBA Disaster Number	Community	Total Number Zip Codes Declared	Type	Total Verified Loss	Total Approved Loan Amount
2015	-	IN-00055	Bluffton	1	Home	$7,102	$7,200
2015	-	IN-00055	Liberty Center	1	Home	$83,498	$0

4.1.5 Hazard Ranking

The Calculated Priority Rating Index (CPRI) is a process that evaluates the probability, consequence, warning time, and duration of a hazard in order to develop a hazard priority rank. The committee drew on the natural probability and impact ranked in the county's previous MHMP, the most recent CPRI assessment, community input from the hazard risk and probability survey in which communities were provided NCDC data summaries and the previous CPRI scores, and discussion from meeting two when developing a consensus on the hazard priority for the county for the purposes of this plan.

The following formula and table provide information on the weighted factors considered when determining a CPRI score for each hazard.

CPRI Risk Factor Score = [(Probability*.45) + (Consequence*.30) + (Warning Time*.15) + (Duration*.10)]

Table 8. Summary of Calculated Priority Risk Index (CPRI) Categories and Risk Levels

CPRI Category	DEGREE OF RISK			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	Extremely rare with no documented history of occurrences or events. Annual probability of less than 0.001	1	45%
	Possible	Rare occurrences with at least one documented or anecdotal historic event. Annual probability that is between 0.01 and 0.001.	2	
	Likely	Occasional occurrences with at least two or more documented historic events. Annual probability that is between 0.1 and 0.01.	3	
	Highly Likely	Frequent events with a well-documented history of occurrence. Annual probability that is greater than 0.1.	4	
Consequence	Negligible	Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). Injuries or illnesses are treatable with first aid and there are no deaths. Negligible quality of life lost. Shutdown of critical facilities for less than 24 hours.	1	30%
	Limited	Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). Injuries or illnesses do not result in permanent disability and there are no deaths. Moderate quality of life lost. Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and at least one death. Shut down of critical facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and multiple deaths. Shut down of critical facilities for more than 1 month.	4	
Warning Time	Less than 6 hours		4	15%
	6 to 12 hours		3	
	12 to 24 hours		2	
	More than 24 hours		1	
Duration	Less than 6 hours		1	10%
	Less than 24 hours		2	
	Less than one week		3	
	More than one week		4	

- **Probability** – a guide to predict how often a random event will occur. Annual probabilities are expressed between 0.001 or less (low) up to 1 (high). An annual probability of 1 predicts that a natural hazard will occur at least once per year.
- **Consequence/Impact** – indicates the impact to a community through potential fatalities, injuries, property losses, and/or losses of services. The vulnerability

assessment gives information that is helpful in making this determination for each community.

- **Warning Time** – plays a factor in the ability to prepare for a potential disaster and to warn the public. The assumption is that more warning time allows for more emergency preparations and public information.
- **Duration** – relates to the span of time local, state, and/or federal assistance will be necessary to prepare, respond, and recover from a potential disaster event.

Table 9 displays the county's CPRI results for each hazard and their resultant rank.

Table 9. Calculated Priority Risk Index for Wells County

Natural Hazards	Probability	Consequence	Warning Time	Duration	Risk Factor
Tornado	4- Highly Likely	3 – Critical	4 - < 6 hours	4 - >1 week	**3.70**
Flash Flood	4- Highly Likely	2 – Limited	4 - < 6 hours	3 - < 1 week	**3.30**
Summer Storm	4- Highly Likely	2 – Limited	3 - 6-12 hours	2 - < 24 hours	**3.05**
Flood	3 – Likely	2 – Limited	4 - < 6 hours	3 - < 1 week	**2.85**
Winter Storm	3 – Likely	3 – Critical	2 – 12-24 hours	3 - < 1 week	**2.85**
Harmful Organism	2 – Possible	3 – Critical	3 - 6-12 hours	4 - >1 week	**2.65**
Hazmat Spill	2 – Possible	2 – Limited	4 - < 6 hours	4 - >1 week	**2.50**
Levee Failure	1 – Unlikely	4 – Catastrophic	4 - < 6 hours	2 - < 24 hours	**2.45**
Dam Failure	2 – Possible	2 – Limited	4 - < 6 hours	2 - < 24 hours	**2.30**
Ground Failure	2 – Possible	1 – Negligible	4 - < 6 hours	4 - >1 week	**2.20**
Earthquake	1 – Unlikely	2 – Limited	4 - < 6 hours	4 - >1 week	**2.05**
Extreme Temperature	2 – Possible	2 – Limited	1 - 24+ hours	4 - >1 week	**2.05**
Drought	2 – Possible	2 – Limited	1 - 24+ hours	4 - >1 week	**2.05**
Wild Fire	1 – Unlikely	2 – Limited	4 - < 6 hours	2 - < 24 hours	**1.85**

The ranking methodology in the previous Wells County plan differs from the current methodology. The previous plan marked Tornado, Flood, Winter Weather (snow & ice), and Hazardous Materials Release as Severe hazard risks. The only noticeable change in the current hazard rank is in the elevation of rank for Summer Storms. The county previously ranked summer storms as a high probability and did so again. The difference can be found in the ranking of consequence, which was rated to be limited in the update process where as previously it was ranked as having minimal consequence.

4.1.6 Hazard Risk Assessment by Jurisdiction

The risk assessments identify the characteristics and potential consequences of a disaster, how much of the community could be affected by a disaster, and the impact on community assets. While some hazards are widespread and will impact communities similarly (e.g., winter storms), others are localized, leaving certain communities at greater risk than others (e.g., flash flooding, exposure to a particular high-risk dam). The following table illustrates each community's risk to

flooding/flash flooding, dam/levee failure, hazardous materials incidents, and ground failure and are highlighted within the risk assessment.

Table 10. Localized Hazards for Incorporated Jurisdictions

	Flooding	Flash Flooding	Dam Failure	Levee Failure	Hazardous Incident	Ground Failure
Bluffton	Possible	Highly Likely	Unlikely	Unlikely	Likely	Unlikely
Markle	Unlikely	Highly Likely	Unlikely	Unlikely	Likely	Unlikely
Ossian	Possible	Highly Likely	Unlikely	Unlikely	Likely	Unlikely
Poneto	Unlikely	Highly Likely	Unlikely	Unlikely	Possible	Unlikely
Uniondale	Unlikely	Highly Likely	Unlikely	Unlikely	Likely	Unlikely
Vera Cruz	Likely	Highly Likely	Unlikely	Unlikely	Possible	Unlikely
Zanesville	Highly Likely	Highly Likely	Possible	Unlikely	Possible	Unlikely

4.2 Vulnerability Assessment

4.2.1 Asset Inventory

The vulnerability assessment builds upon the previously developed hazard information by identifying the community assets and development trends. Determining the hazard rank is pertinent to determining the area of vulnerability. The county infrastructure and facilities inventories are a critical part of understanding the vulnerability at risk of exposure to a hazard event.

The assets presented in the analysis results are broken into two main groupings, Facilities Inventory and Building Inventory. The facilities inventory is reviewed and updated by the county before the analysis begins. The building inventory is created by the analysis team using assessor data combined with either parcel centroids or building footprints depending on what was provided by the county. The creation and update process for these two asset groups are described below.

4.2.1.1 Facilities Inventory

Of the approximately 15 facility categories, five are essential: schools, police and fire stations, medical facilities and emergency operation center(s). The remaining facilities are referred to as critical and include a variety of facility types that are critical to the everyday operations of the county. The local planning team updates these critical facilities using the previous plan GIS data as the starting point. The facilities and their counts for the county are listed in Table 11. At the beginning of the planning process these facilities were reviewed by the planning team and

updates were provided as needed to the analysis team. These updated facilities are provided to the county as well as being maintained in a statewide database by The Polis Center.

Table 11. Localized Hazards for Incorporated Jurisdictions

Facility Type	Number of Facilities
Care Facilities	14
Emergency Operations Centers	1
Fire Stations	8
Police Stations	4
Schools	17

4.2.1.2 Building Inventory

In 2018, Microsoft released 125 million building footprints for the United States that were generated from imagery using machine learning (https://github.com/Microsoft/USBuildingFootprints). This data is licensed through the Open Data Commons Open Database License. The Polis Center extracted the building footprints for the state of Indiana and created point centroids of each building. Each building centroid was then joined spatially to the state's land parcels provided by the Indiana Geographic Information Office on April 12, 2018 via IndianaMAP. This process provided the parcel identifier for each building and was then linked to the statewide Real Property Tax Assessment Data provided by the Indiana Department of Local Government and Finance (IDLGF) from April 2018, also available via IndianaMAP. Indiana counties annually submit an extract of property appraisal data to the IDLGF that contains detailed building information such as square footage, construction type, year built, foundation type, and building replacement cost. The IDLGF data allows Polis to identify the occupancy class of each building based on the parcel within which it is located. Approximately 1% of the buildings were not located in a parcel and were not included. Table 12 provides the number of parcels and their total improvement value from the IDLGF dataset, organized by occupancy class, along with the number of Bing buildings located within those parcels.

NOTE: The assessor records often do not include nontaxable parcels and associated building improvements therefore, the total number of buildings and the building replacement costs for government, religious/non-profit, and education may be underestimated.

Table 12. Building Counts and Estimated Replacement Costs for Wells County

Occupancy Code	Count	Replacement Cost
Residential	8,940	$1,799,105,088
Commercial	515	$1,034,069,337
Industrial	94	$895,697,196

Agriculture	1,570	$620,286,843
Religious	156	$496,137,682
Government	92	$132,453,739
Education	15	$443,486,457
Total	**11,382**	**$5,421,236,342**

4.2.2 Hazus-MH

The initial Multi-Hazard Mitigation Plan (MHMP) for Wells County, Indiana was submitted to FEMA and approved in 2015. Existing Hazus-MH technology was used in the development of the vulnerability assessment for flooding and earthquakes.

It is important to note that Hazus-MH does not a substitute for detailed engineering studies. Rather, it serves as a planning aid for communities interested in assessing their risk to flood, earthquake, and hurricane-related hazards. This documentation does not provide full details on the processes and procedures completed in the development of this project.

4.2.3 Future Development

Recent or proposed development, especially in Special Flood Hazard Areas (SFHAs), must be carefully evaluated to ensure that no adverse impacts occur as a result. Development, whether it is a 100-lot subdivision or a single lot big box commercial outlet, can result in large amounts of fill and other material being deposited in flood storage areas or other vulnerable locations.

As the county's population shifts and develops, the residential and urban areas may extend further into the county, placing more pressure on existing transportation and utility infrastructure while increasing the rate of farmland conversion. Wells County addresses specific mitigation strategies in Chapter 5 to alleviate such issues.

Because Wells County is vulnerable to a variety of natural and technological threats, the county government, in partnership with the state government, is committed to preparing for the management of these type of events for better emergency management and county response.

According to the Indiana Department of Local Government Finance, 380 of Wells County's parcels have experienced some sort of construction since 2010. Of those, 106 are located within either the special flood hazard areas, the tornado path area or the toxic plume area, identified in sections, 4.1, 4.4, and 4.8 of this plan. While these new constructions might have increased the vulnerability of the county to those hazards, they are only a small portion (28%) of the recent years' development.

4.3 Hazard Profiles

The following hazard profiles outline the hazard risk exposure for the county. The hazard is first described and then reviewed in the historical context of the county. In many cases, an analysis subsequently follows the hazard context that analyzes the facility and building inventory risk.

4.3.1 Flash Flood and Riverine Flood

4.3.1.1 Hazard Definition for Flooding

Flooding is a significant natural hazard throughout the US. The type, magnitude, and severity of flooding are functions of the amount and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry of the catchment, and flow dynamics and conditions in and along the river channel. Floods in Wells County can be classified as one of two types: flash floods or riverine floods, which are both common in Indiana.

Flash floods generally occur in the upper parts of drainage basins and are generally characterized by periods of intense rainfall over a short duration. These floods arise with very little warning and often result in locally-intense damage and, sometimes, loss of life due to the high energy of the flowing water. Flood waters can snap trees, topple buildings, and easily move large boulders or other structures. Six inches of rushing water can upend a person, while another 18 inches might carry off a car. Generally, flash floods cause damage over relatively localized areas, but they can be quite severe in the areas in which they occur. Urban flooding is a type of flash flood. Urban flooding involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Flash floods can occur at any time of the year in Indiana, but they are most common in the spring and summer months.

Riverine floods refer to floods on large rivers at locations with large upstream catchments. Riverine floods are typically associated with precipitation events that are of relatively long duration and occur over large areas. Flooding on small tributary streams may be limited, but the contribution of increased runoff may result in a large flood downstream. The lag time between precipitation and time of the flood peak is much longer for riverine floods than for flash floods, generally providing ample warning for people to move to safe locations and, to some extent, secure property against damage. Riverine flooding on the large rivers of Indiana generally occurs during either the spring or summer.

4.3.1.2 Flood History in Wells County

Wells County has experienced a total of 11 flooding & flash flooding events since 1998. Since 2015 there have been 3 reported incidents of flash flooding and 1 report of flooding. In July of 2011, a summer storm resulted in in some fast flowing water over State Route 3 just north of the Wells & Blackford county line. In June of 2015 Flash Flooding caused SR-124 to become

impassable near Adams St. Additionally, numerous side streets in Bluffton were reported as covered in 5 or more inches of water. A few days later, more water fell causing many streams, rivers, and creeks to overflow countywide. The county reported many road closures. In July of 2015 many fields and roadways were reported as having standing and flowing water. SR-1 was flooded and impassable just south of Ossian. That same event caused floodwaters to overtop SR-1, SR-116, and SR-124.

At meeting 2, the Wells County Planning team answered a mitigation strategy work sheet to help identify problem areas in the county for each hazard type. Most of the team identified two main sources of flooding in the county to be from winter snow melts in the spring and riverine flooding from the Wabash & Salamonie Rivers. Several participants suggested improving the county and community drainage systems as a way to reduce impacts of flooding. Buyouts for structures in the floodplain was another idea echoed by many who answered the Mitigation Strategy Worksheets. Another suggestion was to continue to prevent structures from being built within the floodplain as a way to mitigate against future impacts of flooding. These survey answers can be found in Appendix F.

4.3.1.3 Geographic Location for Flooding

Most river flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Severe thunderstorms may cause flooding during the summer or fall, but tend to be localized. According to the Wells County Flood Insurance Study (FIS), major flooding in the county primarily occurs along the Wabash River, the Salamonie River and their tributaries.

Flash floods, brief heavy flows in small streams or normally dry creek beds, also occur within the county. Flash flooding is typically characterized by high-velocity water, often carrying large amounts of debris. Urban flooding involves the overflow of storm drain systems and is typically the result of inadequate drainage following heavy rainfall or rapid snowmelt.

4.3.1.4 Hazard Extent for Flooding

The Special Flood Hazard Areas (SFHA) are defined as the areas that will be inundated by the flood event having a 1% chance of being equaled or exceeded in any given year. The 1% annual chance flood is also referred to as the base flood or 100-year flood. The SFHAs in Wells County are identified in Figure 17.

Figure 17. Special Flood Hazard Areas (SFHA) in Wells County

NFIP Analysis

If a structure is located in a high-risk area, the 1% annual chance flood hazard, and the owner has a mortgage, they are required to purchase flood insurance through a federally regulated or insured lender. Flood insurance is not federally required in moderate- to low-risk areas, but it is still a good idea. The National Flood Insurance Program (NFIP) is a program in which, if a community enforces a floodplain management ordinance, the federal government will make flood insurance available in order to protect against flood loss.

Since the NFIP plays such a vital role in mitigating flood risk, understanding the status of hazard maps and reported losses occurring can provide insight on new strategies to mitigate the impacts and losses of future events. The communities in Wells County that participate in the NFIP, their NFIP number, current effective map date, and program entry date are provided in Table 13.

Table 13. NFIP Participation and Mapping Dates

NFIP Community	NFIP Number	Effective Map Date	Join Date
Wells County	180288#	10/16/2014	06/01/1983
Town of Markel	1080457A	NSFHA	11/07/1991
Town of Ossian	180290#	10/16/2014 (M)	05/25/1978

NFIP Community	NFIP Number	Effective Map Date	Join Date
Town of Poneto	180291#	NSFHA	05/25/1978
Town of Uniondale	180292#	NSFHA	05/25/1978
Town of Vera Cruz	180293A	10/16/2014 (M)	04/01/1988
Town of Zanesville	180573#	10/16/2014	09/26/2016

* (M) = No Elevation Determined, (NSFHA) = No Special Flood Hazard Area

FEMA provides annual funding through the National Flood Insurance Fund (NFIF) to reduce the risk of flood damage to existing buildings and infrastructure. These grants include Flood Mitigation Assistance (FMA), Repetitive Flood Claims (RFC), and the Severe Repetitive Loss (SRC) program. The long-term goal is to significantly reduce or eliminate claims under the NFIP through mitigation activities.

FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the National Flood Insurance Program (NFIP), which has suffered flood loss damage on two occasions during a 10-year period that ends on the date of the second loss, in which the cost to repair the flood damage is 25% of the market value of the structure at the time of each flood loss.

The Indiana State NFIP Coordinator and FEMA Region V were contacted to determine the location of repetitive loss structures. FEMA Region V reported 2 single-family structure in Wells County and 1 single-family structure Bluffton that were reported as repetitive loss. There were no severe repetitive loss structures reported for Wells County. Table 14 documents the Wells County NFIP claims data as of 12/31/2018.

Table 14. NFIP Claims Data for Wells County

Community	Number of Policies	Value of Insurance Claims/Pmts	Total Num. Losses Submitted	Num. Repetitive Losses	Repetitive Losses in Dollars
Wells County	31	$6,066,800	11	2	$88,436
Bluffton	21	$7,720,100	16	1	$31,054
Ossian	11	$2,475,000	-	-	-
Vera Cruz	2	$490,000	8	-	-

To help understand flood risk, the total structures in the SFHA are compared to the total number of policies in the community. This is based on approximate building locations, and therefore should not be used as an absolute comparison. However, this information may be used to target further mitigation through further engagement with the NFIP. In addition, this may be a tool to help understand if there would be an interest in becoming involved in a discount program with the Community Rating System (CRS). Table 15 provides a comparison of number of buildings in the 1% flood probability boundary to the number of policies, and then provides a percent of insured structures represented by those policies. The last column in the table provides an estimate of the exposure that is insured.

Table 15. Comparison of Estimated Building Exposure to Insured Buildings

Community	Buildings in 100 Year Floodplain[1]	Exposure of Buildings in Floodplain	Number of Policies	Value of Insurance Claims/ Pmts	Approximate Percent of Buildings Insured	Approximate Percent of Exposure Insured
Wells County	54	$9,388,216	31	$6,066,800	57%	65%
Bluffton	13	$23,387,921	21	$7,720,100	> 100%	33%
Ossian	10	$5,194,909	11	$2,475,000	> 100%	48%
Vera Cruz	10	$3,534,946	2	$490,000	20%	14%

4.3.1.5 Risk Identification for Flood Hazard

In Meeting #2, the planning team determined that the probabilities of flooding is likely with limited consequences, whereas flash flooding is highly likely to occur with limited consequences. Flooding and Flash flooding both have a warning time of less than 6 hours. Flooding and Flash flooding's duration was determined more than 1 week. The calculated CPRI for flooding is 2.85, while the CPRI for flash flooding is 3.30.

[1] The count and exposure of buildings in the floodplain reported in this table is based on an account of all structures in the floodplain that were represented in the county property assessment data.

4.3.1.6 Vulnerability Analysis for Flash Flooding

Flash flooding could affect any location within this jurisdiction; therefore, the entire county's population and buildings are vulnerable to a flash flood. These structures can expect the same impacts as discussed in a riverine flood. Wells County reported 2 flash flood incidents in since the last plan update, both taking place in 2015. The first occurred in June of 2015 where several streets in the City of Bluffton were covered with 5 or more inches of water. SR-124 was reported as being impassable near Adams Street. The next reported event occurred in July of 2015 with several fields reported as flooded along with State roads 1,116 and 124. State road 1 was reported as impassable south of the town of Ossian.

4.3.1.7 Hazus-MH Analysis Using 100 Year (1% chance) Flood Boundary

Hazus-MH was used to estimate the damages incurred for a 1% annual chance flood event in Wells County using the SFHA and a 10-meter DEM (digital elevation model) to create a flood depth grid. Hazus-MH was then used to perform a user-defined facility (UDF) analysis of Wells County. The UDFs were defined by intersecting the Hazus-MH generated flood depth grid with the Wells County building inventory. These data were then analyzed to determine the depth of water at the location of each building point and then related to depth damage curves to determine the building losses for each structure.

Hazus-MH estimates the estimated 100-year flood would damage 85 buildings countywide at a cost of $6.5 million. In the modeled scenario, the unincorporated areas of Wells County contained the most damaged buildings but the town or city with the most damage was Bluffton, with 13 buildings damaged at a cost of almost $3.1 million. The total estimated numbers and cost of damaged buildings by community are given in Table 16 and Table 17. Figure 18 depicts the Wells County buildings that fall within the SFHA. Figure 19 through Figure 22 display community maps of buildings that fall within the SFHA.

Table 16. Estimated Number of Buildings Damaged by Community and Occupancy Class

Community	Total Buildings Damaged	Building Occupancy Class						
		Agr.	Comm.	Educ.	Govt.	Ind.	Rel.	Res.
Wells County Unincorporated	47	16	-	-	-	-	-	31
Bluffton	13	1	3	-	4	-	-	5
Markle	3	-	-	-	-	-	-	3
Ossian	10	-	2	-	1	-	-	7
Vera Cruz	10	-	-	-	4	-	-	6
Zanesville	2	-	-	-	-	-	-	2
Total	**85**	**17**	**5**	**-**	**9**	**-**	**-**	**54**

Table 17. Estimated Cost of Buildings Damaged by Community and Occupancy Class

Community	Cost Buildings Damaged	Building Occupancy Class						
		Agr.	Comm.	Educ.	Govt.	Ind.	Rel.	Res.
Wells County Unincorporated	**$1,662,646**	$176,888	-	-	-	-	-	$1,485,758
Bluffton	**$3,109,320**	$46,103	$2,599,443	-	$316,265	-	-	$147,509
Markle	**$209,897**	-	-	-	-	-	-	$209,897
Ossian	**$811,985**	-	$268,656	-	$134,114	-	-	$409,215
Vera Cruz	**$471,594**	-	-	-	$198,808	-	-	$272,787
Zanesville	**$201,153**	-	-	-	-	-	-	$201,153
Total	**$6,466,596**	**$222,991**	**$2,868,099**	**$0**	**$649,187**	**$0**	**$0**	**$2,726,319**

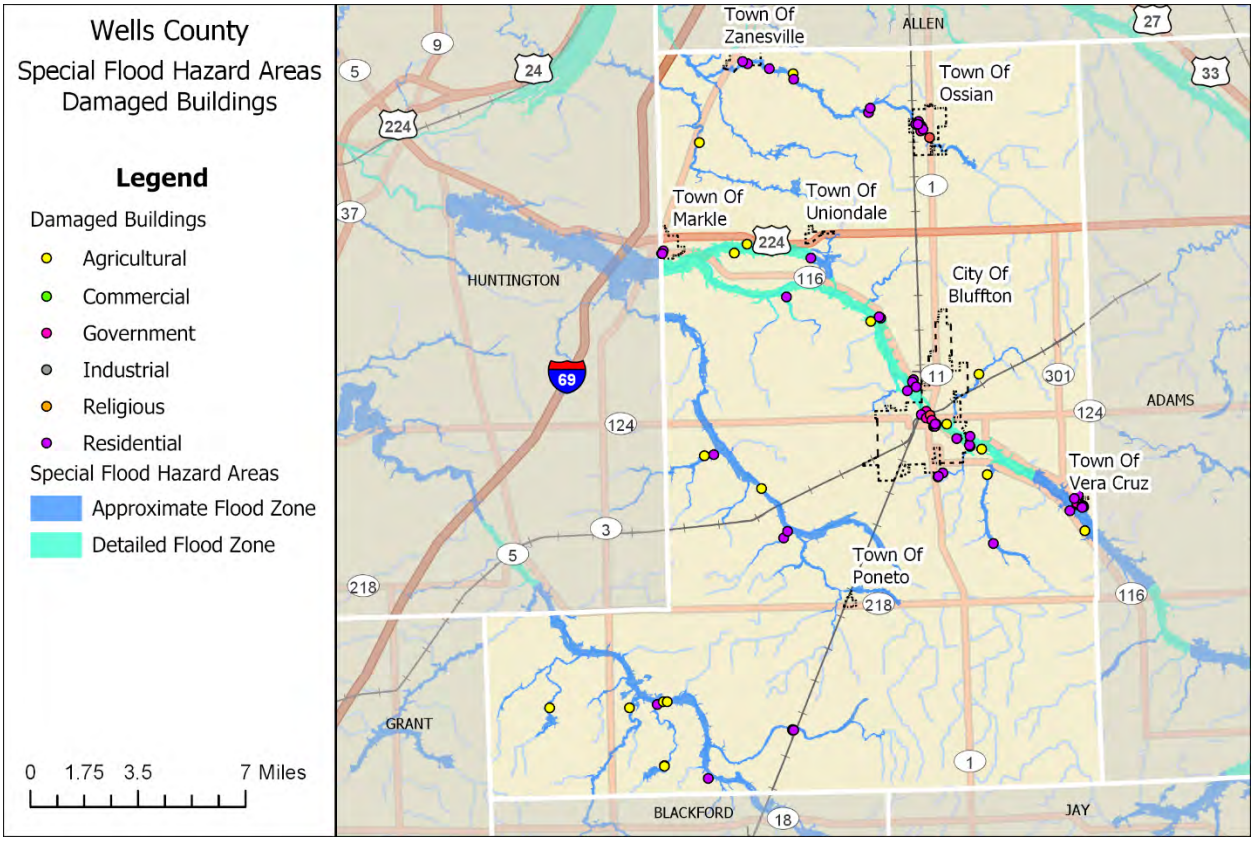

Figure 18. Estimated Buildings Damaged in SFHA

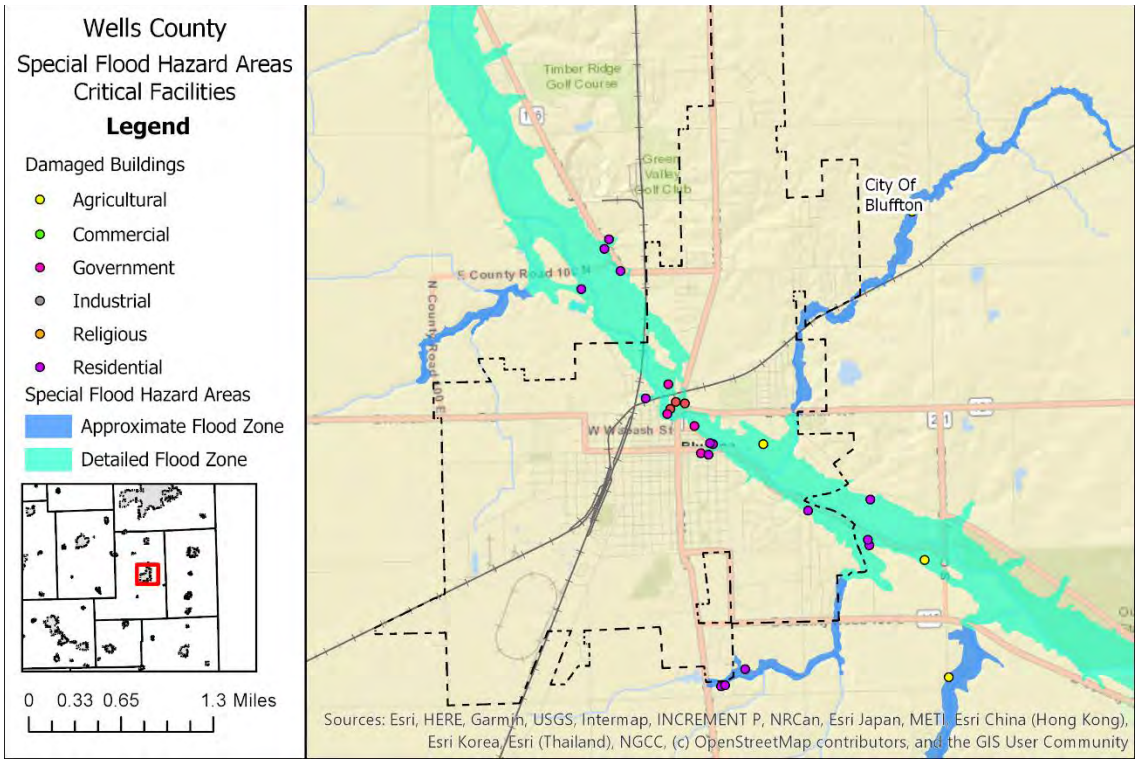

Figure 19. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code

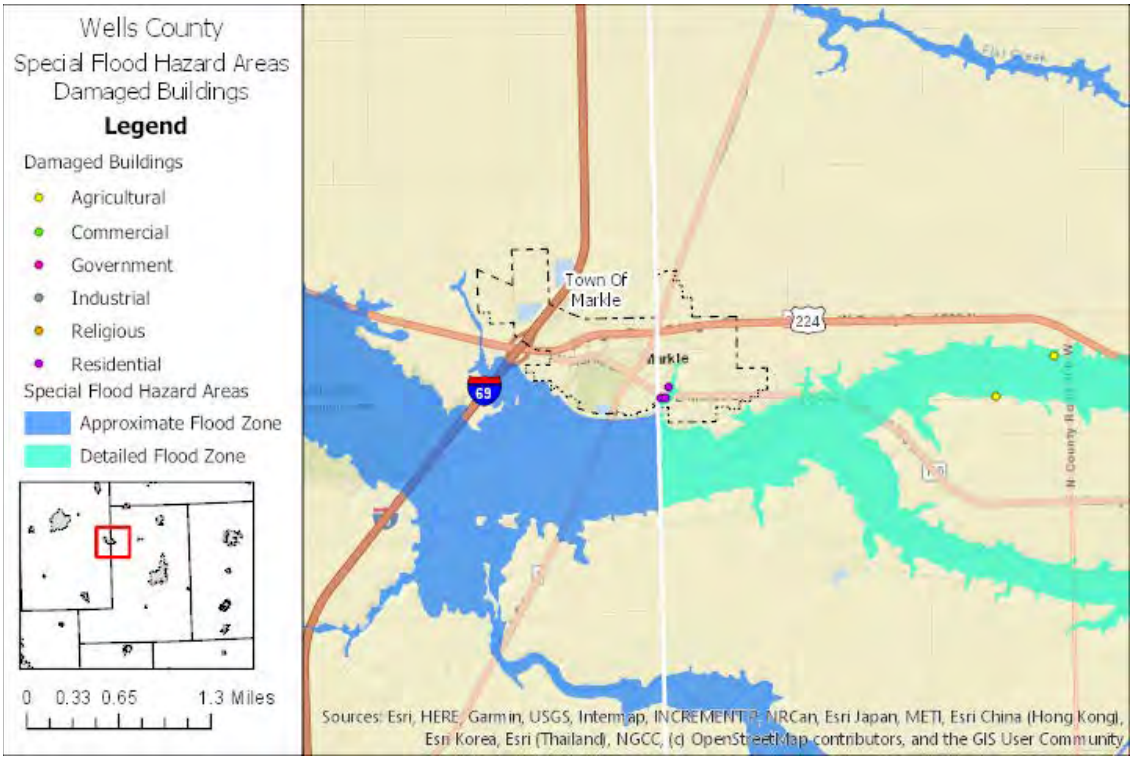

Figure 20. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code

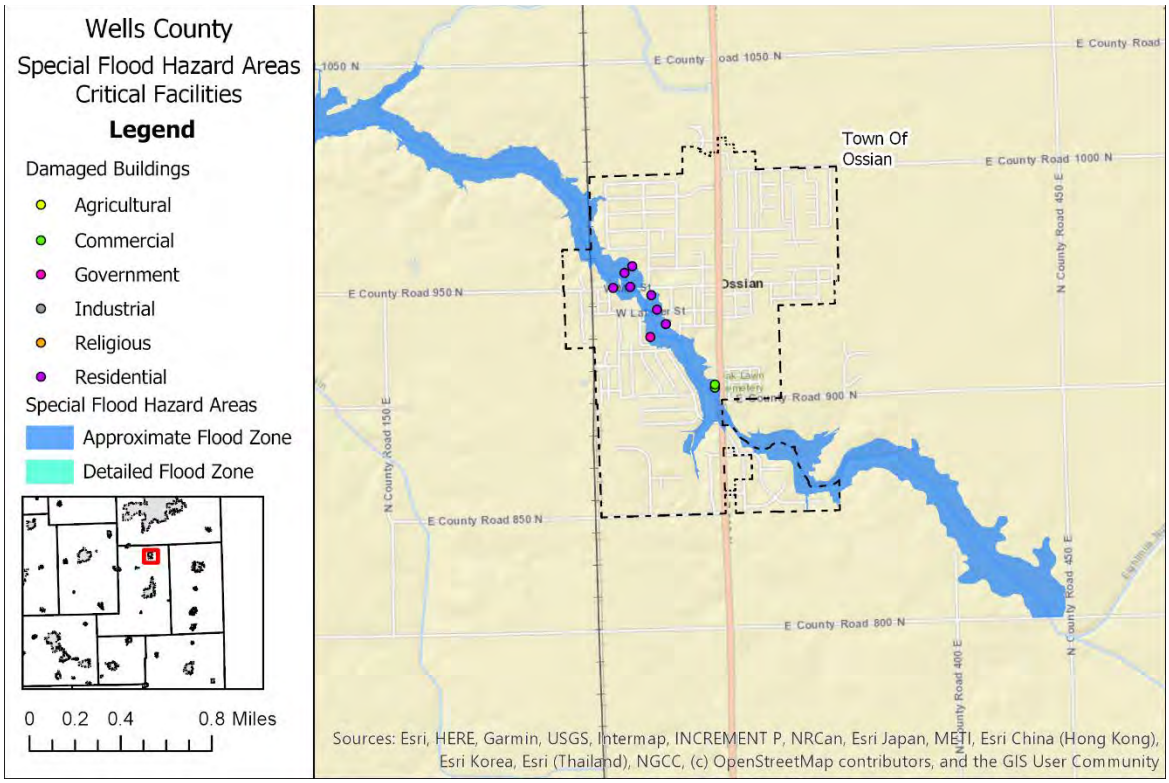

Figure 21. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code

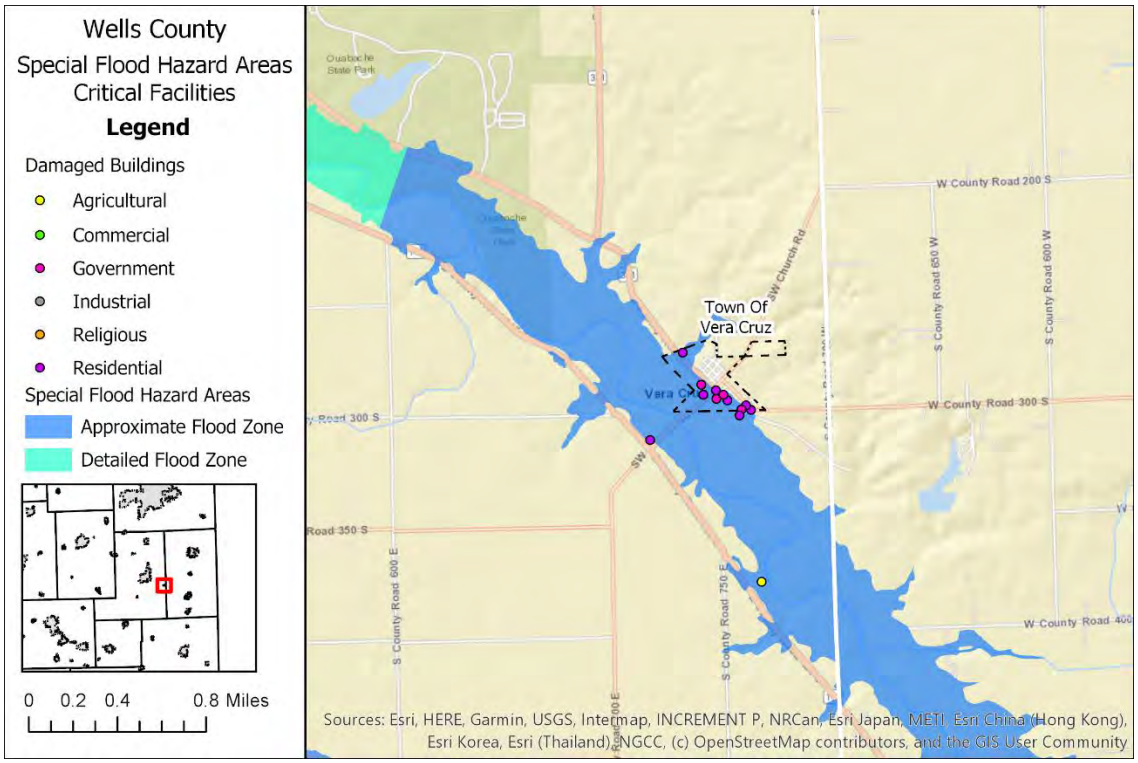

Figure 22. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code

Overlay Analysis of Essential Facilities

Essential and other critical facilities can become damaged during the 1% annual chance flood. Damages to these types of facilities can severely impact the ability of the community to respond and recover from disasters. Damaged facilities located within towns or cities have been mapped in the following figures. In Wells County, no essential were modeled as having sustained damaged in the 1% annual chance flood. A few critical facilities were modeled as being impacted within Bluffton. These have been mapped in Appendix E.

4.3.1.8 IDNR Best Available Data Layer

The IDNR's Division of Water created a dataset for Indiana that incorporates the detailed-level floodplain data in the FEMA FIRMs and enhanced it with a lower level, but still quality, floodplain data for the majority of all streams in the state known as the "best available" floodplain layer. FEMA's dataset remains the official dataset of the NFIP, the "best available" layer assists in floodplain management applications and determining limits of jurisdiction for the Indiana Flood Control Act. The map in Figure 23 was created using the best available data layer from IDNR along with the county's building inventory. To show the possible buildings affected in the best available layer, only the buildings within the flood boundary have been mapped. A total of 90 buildings were mapped within IDNR's Best Available Data layer. This is more than the 85 that were mapped as in the flood plain according to the DFIRM.

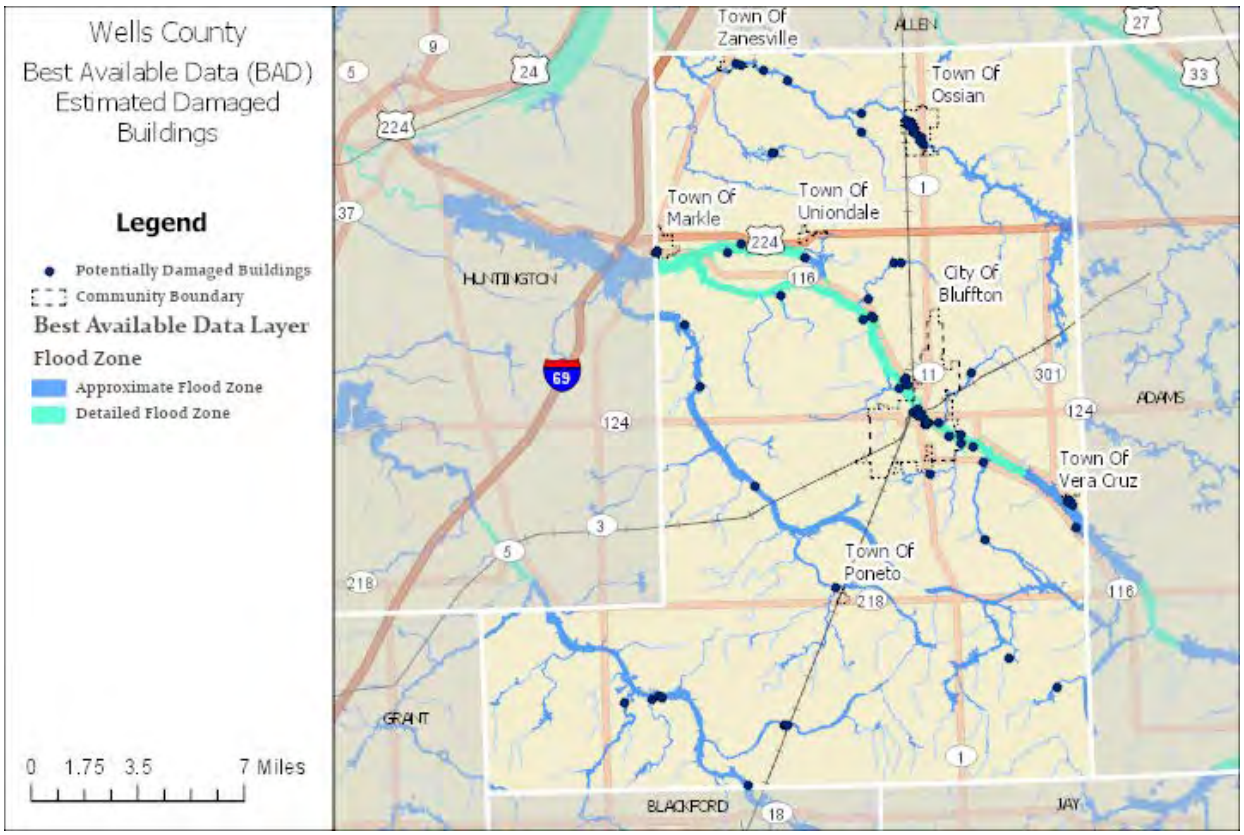

Figure 23. IDNR Best Available Data Layer Potential Building Losses

4.3.1.9 Stream Gauges

The USGS, in cooperation with many state agencies and local utility and surveyor offices, help maintain stream gauges, which provide the capability to obtain estimates of the amount of water flowing in streams and rivers. IDNR and IDEM use the stream gauge data for water quantity and quality measurements. Local public safety officials use the data at these sites, along with the resources from the NWS, to determine emergency management needs during periods of heavy rainfall. The location of stream gauges in the county are shown in Figure 24.

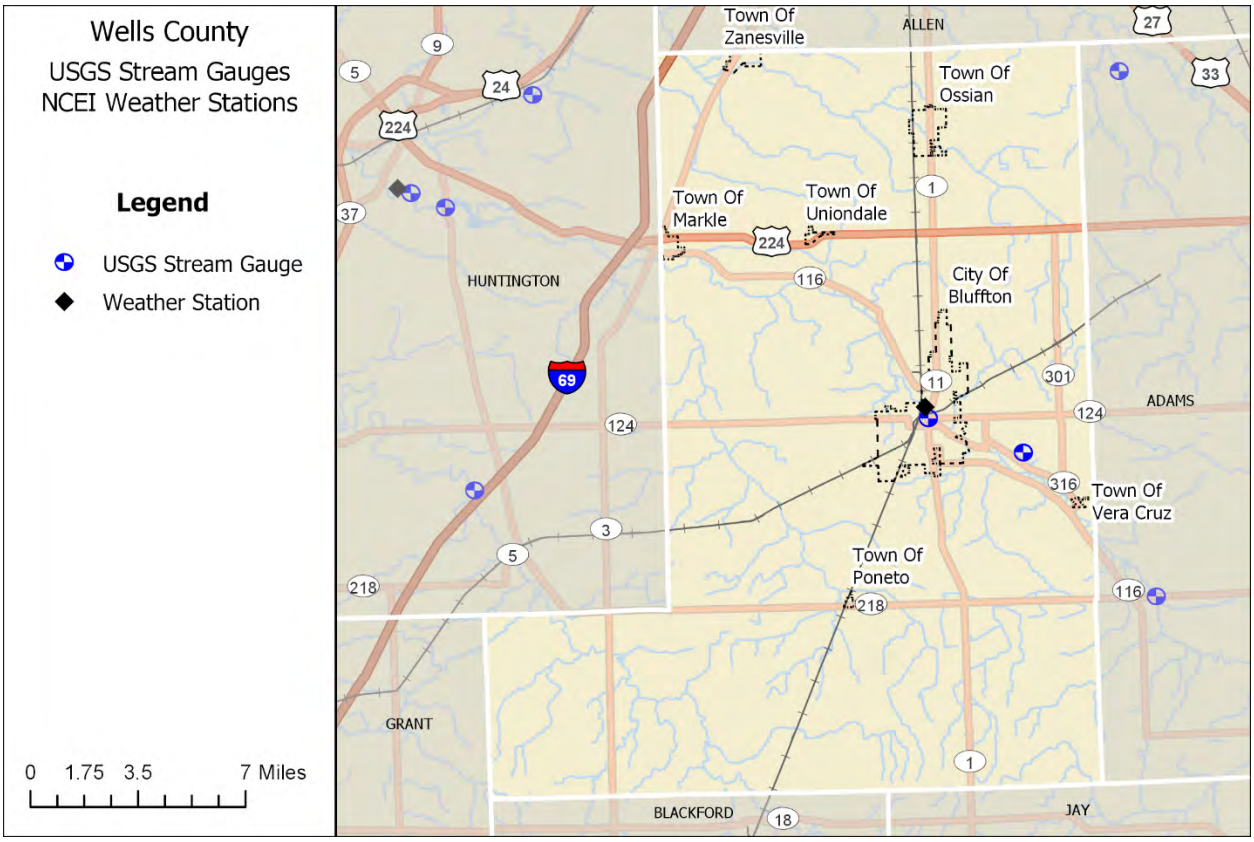

Figure 24. USGS Stream Gauges and NCDC Weather Stations

4.3.1.10 Community Development Trends and Future Vulnerability

Controlling floodplain development is the key to reducing flood-related damages. Areas with recent development within the county may be more vulnerable to drainage issues. Storm drains and sewer systems are usually most susceptible. Damage to these can cause the backup of water, sewage, and debris into homes and basements, causing structural and mechanical damage as well as creating public health hazards and unsanitary conditions.

Another key strategy in natural hazard mitigation is the conversion of frequently-flooded land to wetlands. Wetlands promote human well-being in many ways including improvements to water purification, increased water supply, climate regulation, flood regulation, and opportunities for recreation and tourism. According to a report by the US EPA, a one-acre wetland can store approximately three-acre feet of water, which is equal to one million gallons. Furthermore, trees and other wetland vegetation slow the speed of flood waters, ultimately lowering flood heights and naturally mitigating potential flood-related destruction.

Flash flooding could affect any location within this jurisdiction; therefore, the entire county's population and buildings are vulnerable to a flash flood. These structures can expect the same impacts as discussed in a riverine flood.

4.3.1.11 Relationship to other Hazards

Severe storms and blizzards – Summer storms lead to logjams, and snowmelt can contribute to flooding and, under the right circumstances, flash flooding.

Dam Failure – Flood events can compromise the structural integrity of dams.

Public Health – Public health can be affected as a result of wastewater spills due to flooding or power failures.

Water Main Breaks – Surges in water pressure as a result of water pumps starting after power outages can lead to water main breaks.

4.3.2 Earthquake

4.3.2.1 Hazard Definition for Earthquake

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free, causing the ground to shake. Ninety-five percent of earthquakes occur at the plate boundaries; however, some earthquakes occur in the middle of plates, as is the case for seismic zones in the Midwestern US.

Ground shaking and tremors from strong earthquakes can collapse buildings and bridges; disrupt gas, electric, and communication (e.g. phone, cable, Internet) services; and sometimes trigger landslides, flash floods, and fires. Buildings with foundations resting on unconsolidated landfill and other unstable soil and trailers or homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths, injuries, and extensive property damage.

Magnitude, which is determined from measurements on seismographs, measures the energy released at the source of the earthquake. Intensity measures the strength of shaking produced by the earthquake at a certain location and is determined from effects on people, human structures, and the natural environment. Table 18 and Table 19 list earthquake magnitudes and their corresponding intensities.

Table 18. Abbreviated Modified Mercalli Intensity Scale

Mercalli Intensity	Description
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.

III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Table 19. Earthquake Magnitude vs. Modified Mercalli Intensity Scale

Earthquake Magnitude	Typical Maximum Modified Mercalli Intensity
1.0 - 3.0	I
3.0 - 3.9	II - III
4.0 - 4.9	IV - V
5.0 - 5.9	VI - VII
6.0 - 6.9	VII - IX
7.0 and higher	VIII or higher

4.3.2.2 Earthquake History in Wells County

The most seismically active area in the Central US is referred to as the New Madrid Seismic Zone. Scientists have learned that the New Madrid fault system may not be the only fault system in the central US capable of producing damaging earthquakes. The Wabash Valley Fault System in Indiana shows evidence of large earthquakes in its geologic history, and there may be other currently unidentified faults that could produce strong earthquakes.

At least 44 earthquakes, M3.0 or greater, have occurred in Indiana since 1817. The last such event in Indiana was a M3.1 centered just north of Vincennes on May 10, 2010. A M3.8 earthquake occurred near Kokomo in December later that same year with approximately 10,390 individuals submitting felt reports to the USGS.

The majority of seismic activity in Indiana occurs in the southwestern region of the state. Earthquakes originate just across the boundary in Illinois and can be felt in Indiana.

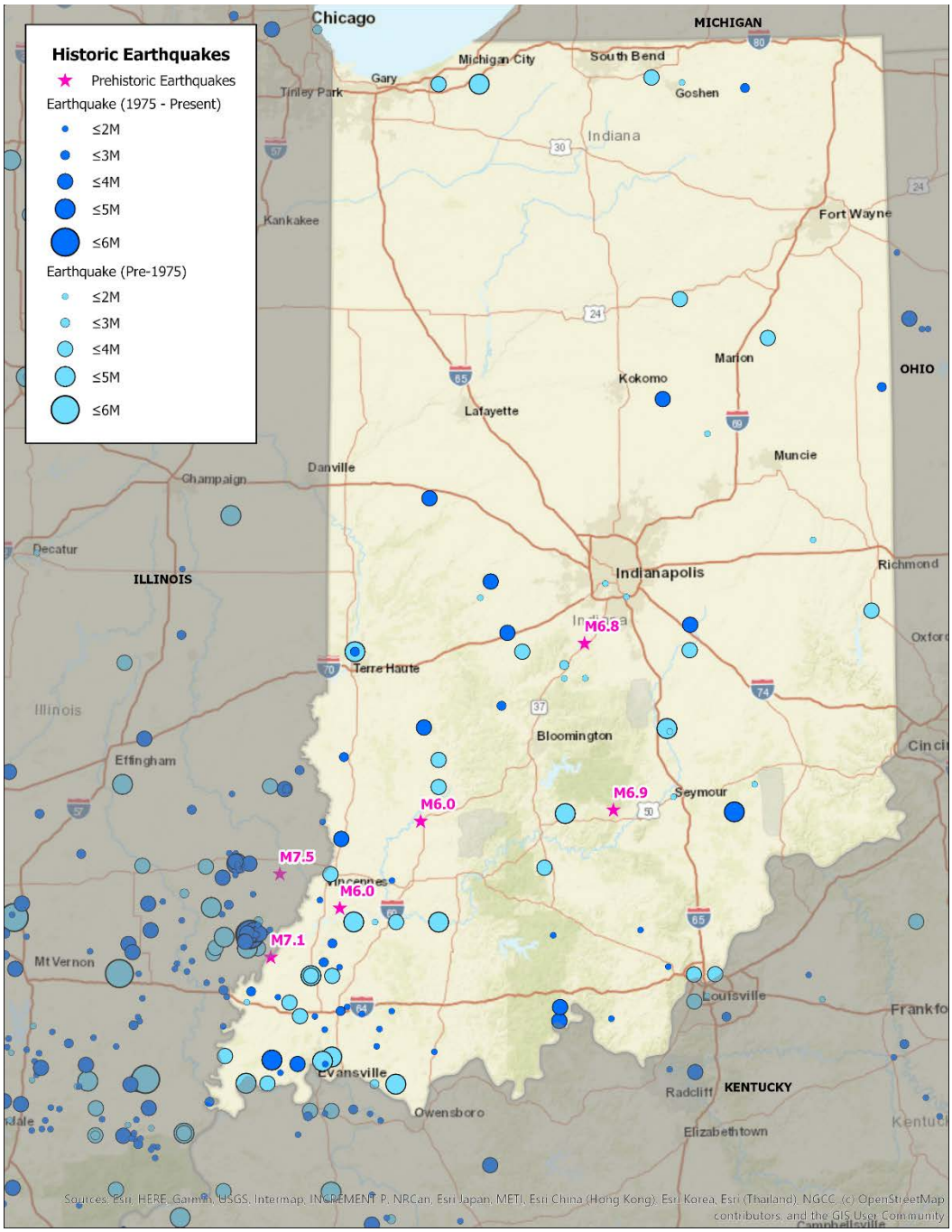

Figure 25. Indiana Earthquake Epicenters Map

4.3.2.3 Geographic Location for Earthquake

Wells County occupies a region susceptible to two earthquake threats: the threat of an earthquake along the Wabash Valley Fault System and the threat of an event near Anna in Shelby County Ohio. Return periods for large earthquakes within the New Madrid System are estimated to be 500 years. Moderate quakes between magnitude 5.5 and 6.0 can recur within

approximately 150 years or less. The Wabash Valley Fault System is a sleeper that threatens the southwest quadrant of the state and may generate an earthquake large enough to cause damage as far north and east as Central Michigan.

4.3.2.4 Hazard Extent for Earthquake

The extent of the earthquake is countywide. One of the most critical sources of information that is required for accurate assessment of earthquake risk is soils data. A National Earthquake Hazards Reduction Program (NEHRP) compliant soils map was used for the analysis which was provided by IGS. The map identifies the soils most susceptible to failure and ranks their liquefaction potential. Wells County is primarily made up of soils ranking as moderate potential for liquefaction. There are some bands of high potential running from the northwest to southeast across the county.

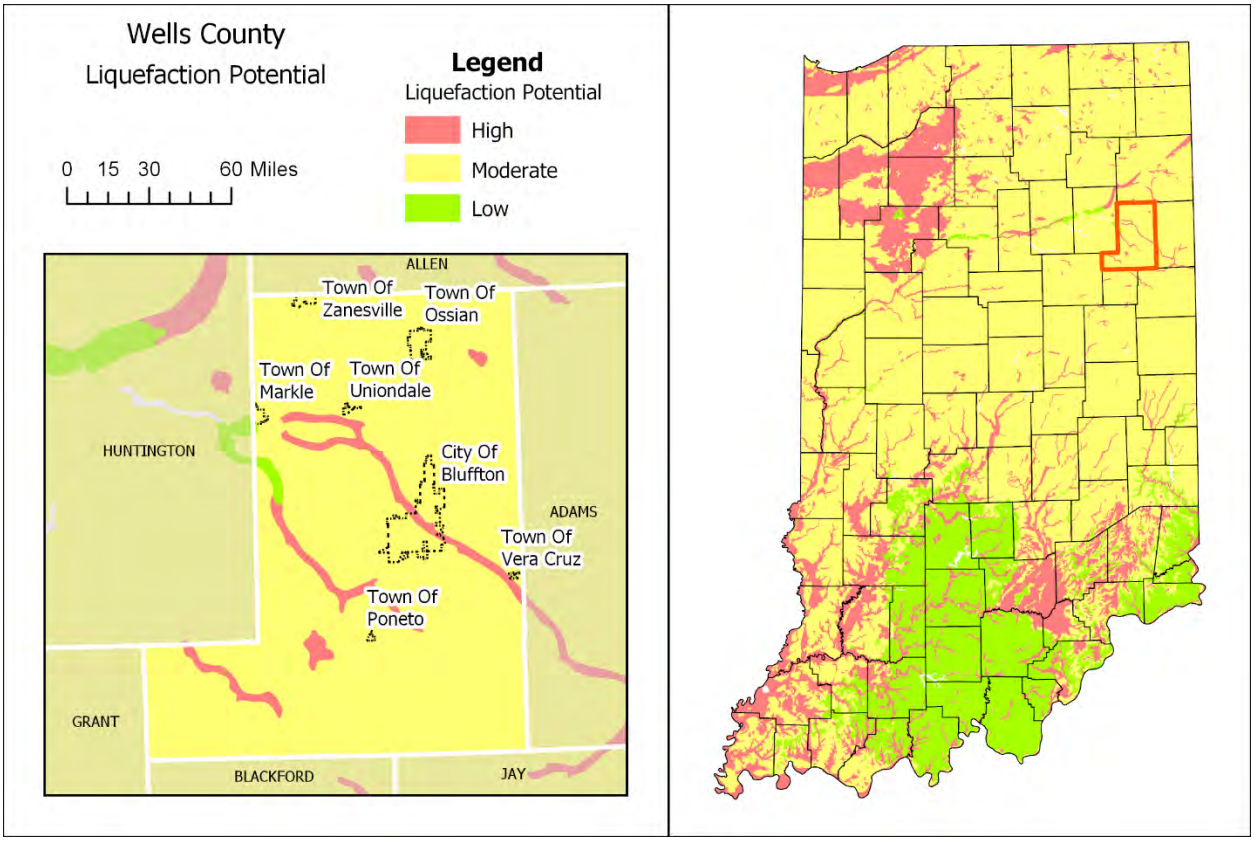

Figure 26. NEHRP State of Indiana Liquefaction Potential

4.3.2.5 Risk Identification for Earthquake

In Meeting #2, the planning team determined that the probability of an earthquake as unlikely with limited results. Earthquakes were determined to have a warning time of less than six hours with a duration more than 1 week. The calculated CPRI for earthquakes in Wells County is 2.05.

4.3.2.6 Vulnerability Analysis for Earthquake

During an earthquake, the types of infrastructure that could be impacted include roadways, runways, utility lines and pipes, railroads, and bridges. Because an extensive inventory of the infrastructure is not available to this plan, it is important to emphasize that any number of these structures could become damaged in the event of an earthquake. The impacts to these structures include broken, failed, or impassable roadways and runways; broken or failed utility lines, such as loss of power or gas to a community; and railway failure from broken or impassable tracks. Bridges also could fail or become impassable, causing traffic risks, and ports could be damaged, which would limit the shipment of goods. Typical scenarios are described to gauge the anticipated impacts of earthquakes in the county in terms of numbers and types of buildings and infrastructure.

Hazus-MH for Earthquake Analysis model estimates damages and loss of buildings, lifelines, and essential facilities from Deterministic and probabilistic scenarios.

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake.

The building damage total loss amount is developed by the building inventory attributes inputs. Depending on the material of construction, type of foundation, year of construction the expense in rebuilding the expense will be affected.

Three events were modeled. The first scenario is the New Madrid Scenario. This event represents a large-magnitude, high-impact regional event situated in the Mississippi Valley region approximately 100 miles from the southwestern corner of the state. The magnitude of this event (M7.6) approximates the size of the largest of the three earthquakes in the 1811-1812 New Madrid sequence. The second scenario is the Wabash Valley Scenario. This event represents a ‘worst case’ scenario of a large-magnitude (M7.3) event occurring along the Wabash Valley fault system, just outside the state of Indiana in southeastern Illinois. The model uses a liquefaction data map in order to account for the local soil conditions for estimating ground motion and liquefaction. The third scenario is a 500-year probabilistic scenario, which seeks to represent the cumulative hazard facing each area of the state based on a probabilistic likelihood of ground shaking associated with all of the sources that could potentially affect a given area. In principle, this analysis evaluates the average impacts of a multitude of possible earthquake sources with a magnitude that would be typical of that expected for a 500-year return.

The Building Damage Summary by Earthquake Event table displays damages for all three scenarios run by Hazus-MH. Table 20 displays building loss amounts for all four scenarios. In

addition to the dollar amount of losses, the table displays the number of buildings damaged and to what extent. Figure 27 thru Figure 29 display the Earthquake Scenarios total losses for each scenario broken down by census tract.

Table 20. Building Damage Summary by Earthquake Event

Scenario	Total Loss in Dollars	Moderate	Extensive	Complete
New Madrid, KY M7.6	0.60	3	0	0
Wabash Valley 7.3	2.44	10	1	0
Probabilistic 500 Year	2.15	7	0	0

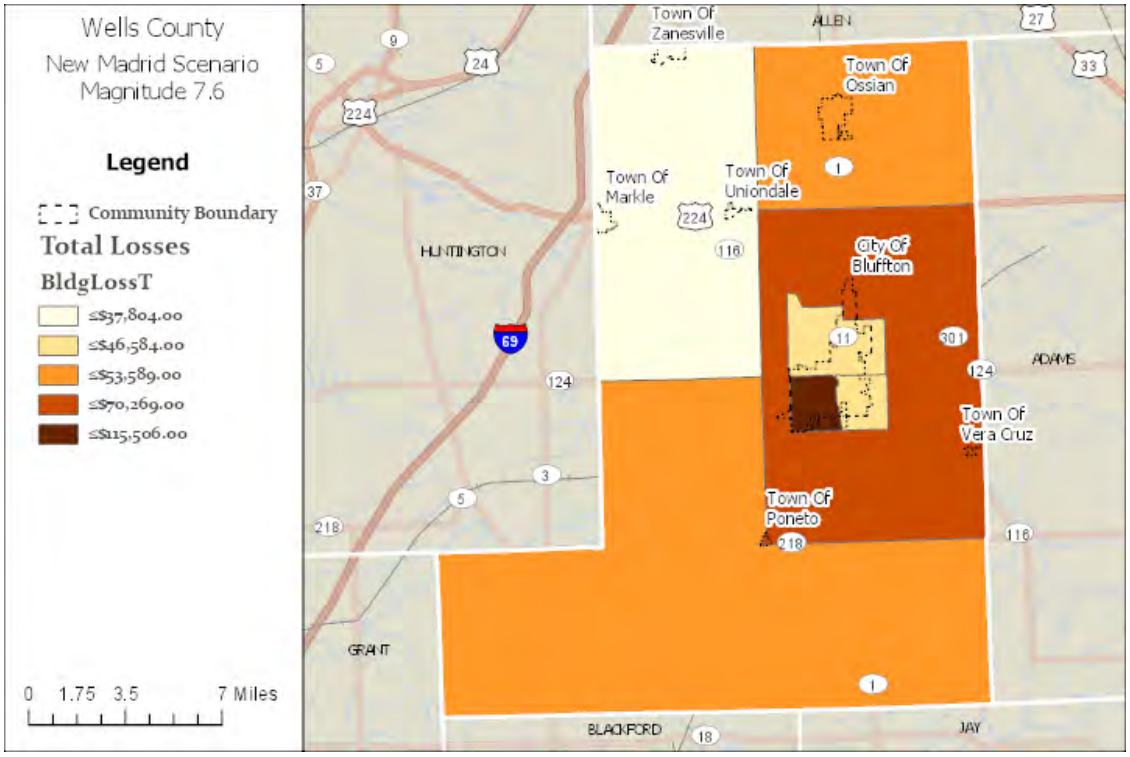

Figure 27. Earthquake Scenarios for Wells County

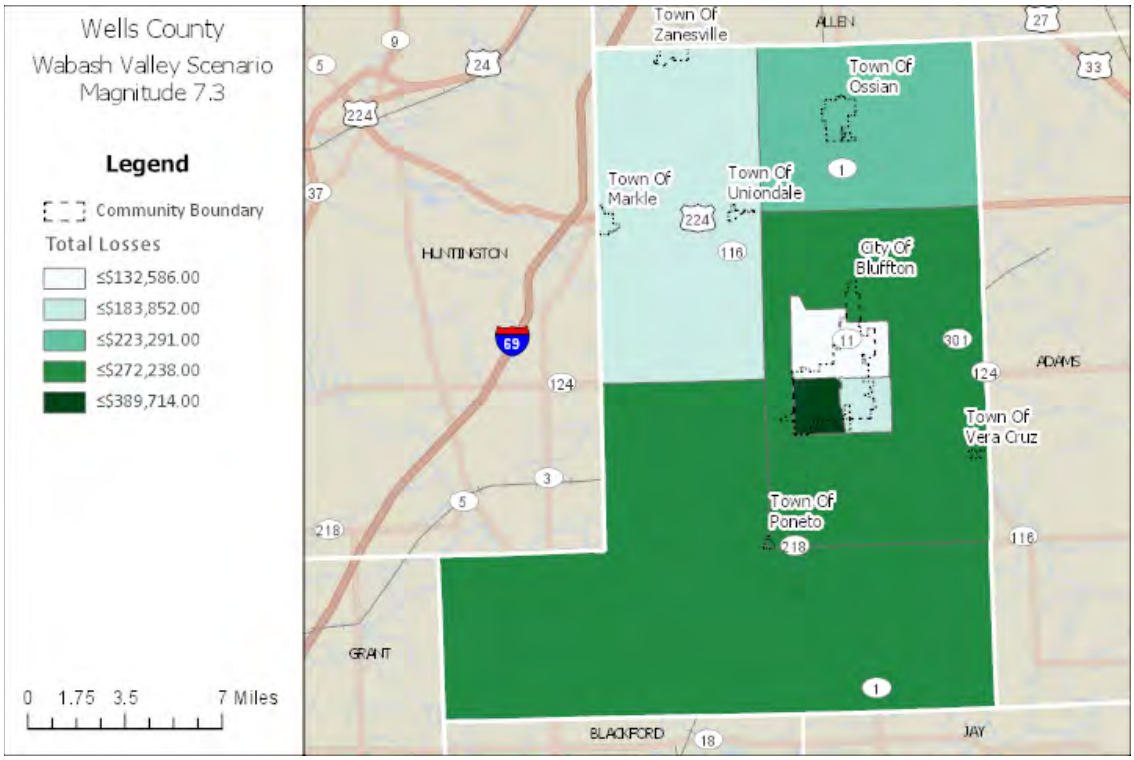

Figure 28. Earthquake Scenarios for Wells County

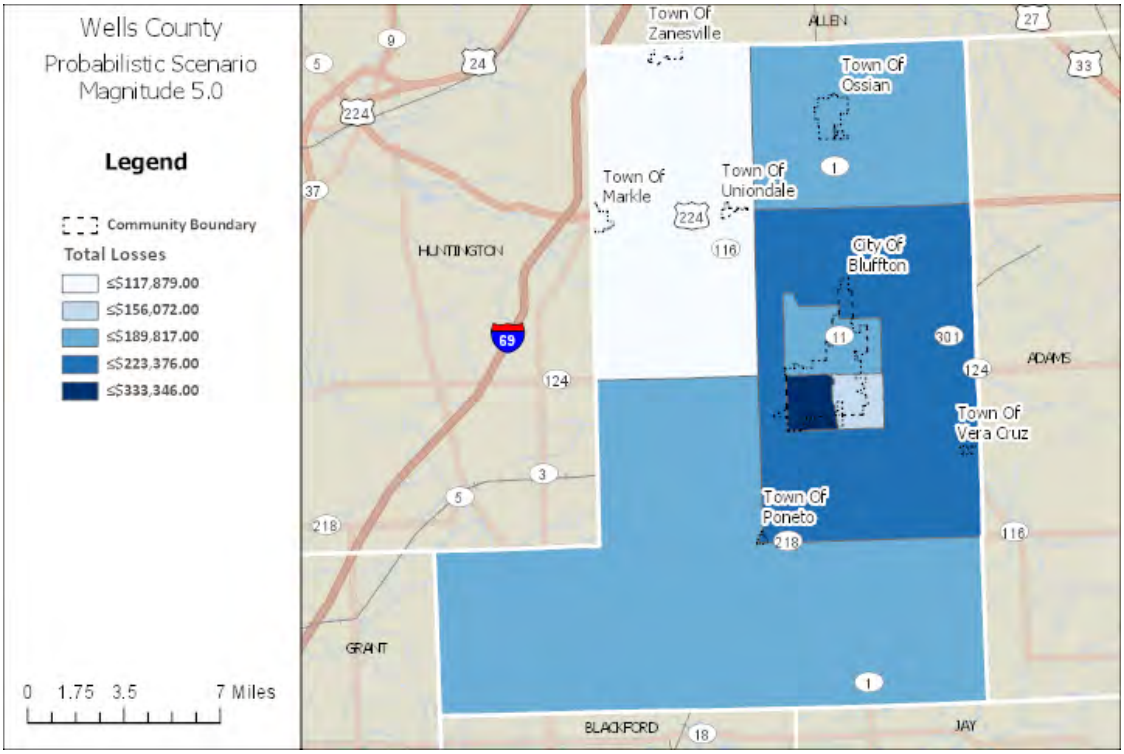

Figure 29. Earthquake Scenarios for Wells County

4.3.2.7 Community Development Trends and Future Vulnerability

Community development will occur outside of the low-lying areas in floodplains with a water table within five feet of grade that is susceptible to liquefaction. New construction, especially critical facilities, will accommodate earthquake mitigation design standards.

The possibility of the occurrence of a catastrophic earthquake in the central and eastern United States is real as evidenced by history and described through this section. The impacts of significant earthquakes affect large area, terminating public services and systems needed to aid the suffering and displaced. These impaired systems are interrelated in the hardest struck zones. Power lines, water and sanitary lines, and public communications may be lost; highway, railways, rivers, and ports may not allow transportation to the affected region. Furthermore, essential facilities such as fire and police departments and hospitals, may be disrupted if not previously improved to resist earthquakes.

As with hurricanes, mass relocation may be necessary, but the residents who are suffering from the earthquake can neither leave the heavily impacted areas nor receive aid or even communication in the aftermath of a significant event.

4.3.2.8 Relationship to other Hazards

Ground Failure- According to the National Academies of Sciences Engineering Medicine, the major cause of earthquake damage is ground failure. Some ground failures induced by earthquake are the result of liquefaction of saturated sands and silts, the weakening of sensitive clays, or by the crumbling and breaking away of soil and rock on steep slopes. Ground failure has been known to cause buildings to collapse and to severely hinder communication and transportation systems.

Utility Failure- Earthquakes frequently damage utilities, particularly underground facilities and older storage tanks, but nearly every utility can be vulnerable to the shaking that earthquakes induce. Seismic damage to buried utilities are often influenced by ground conditions and subsurface strain distribution. Since utilities are typically part of a larger network system, damages to key locations in a network can potentially set off a chain reaction that affects significant portions of the utility system as a whole. Earthquake damage to utilities can also potentially create secondary hazards such as fires or hazmat situations since some utilities may handle volatile or flammable substances.

4.3.3 Ground Failure

4.3.3.1 Hazard Definition for Ground Failure

Indiana has three types of ground failure. Ground failure is a general reference to landslides, fluvial erosion, and subsidence to include karst sinkholes, and underground coal mine collapse.

Landslides

Landslides are a serious geologic hazard common to almost every state in the US. It is estimated that, nationally, they cause up to $2 billion in damages and from 25 to 50 deaths annually. Globally, landslides cause billions of dollars in damage and thousands of deaths and injuries each year.

The term landslide is a general designation for a variety of downslope movements of earth materials. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. The main causes of landslides include:

- Significant ground vibration
- Slope failure due to excessive downward movement, gravity
- Groundwater table changes (often due to heavy rains)

Preventive and remedial measures include modifying the landscape of a slope, controlling the groundwater, constructing tie backs, spreading rock nets, etc. The expansion of urban and recreational development into hillside areas has resulted in an increasing number of properties subject to damage as a result of landslides. Landslides commonly occur in connection with other major natural disasters such as earthquakes, wildfires, and floods.

Karst

Southern Indiana has a network of underground caves formed by what is known as karst landscape. According to the Indiana Geological Survey, karst topography is a distinctive type of landscape largely shaped by the dissolving action of groundwater on carbonate bedrock, usually limestone. This geological process, which will take thousands of years, is characterized by unique features such as sinkholes, fissures, caves, disappearing streams, springs, rolling topography, and underground drainage systems. Structures built above a karst formation could potentially be subject to land subsidence and collapse into a resulting sinkhole.

Wells County has no Karst areas.

Underground Coal Mines

According to the Indiana Geological Survey's GIS Atlas, there are areas of underground coal mines which could lead to ground failure. Roof failure has always been a major concern in underground coal mining. The majority of underground mines in southwest Indiana are older mines since abandoned and thus susceptible to collapse.

Wells County has no underground coal mines.

Fluvial Erosion

Streams naturally migrate (change course and move laterally) over time, this movement is called a Fluvial Erosion Hazard (FEH). The rate and intensity of movement is dependent upon many factors including drainage area, geology, and human actions. FEH represents a significant concern in areas where human development and infrastructure, are established in close proximity to natural waterways. In mild cases, this may be seen as the gradual loss of a farm field or the undermining of a fence row when gradual channel migration consumes private land. In more severe cases, the FEH risk may threaten properties and/or structures to the degree that they become uninhabitable or even lost to natural channel processes. All streams in Wells County were listed as “non-mobile.”

4.3.3.2 Ground Failure History in Wells County

The planning team did not identify any major ground failure events including landslide and land subsidence events.

4.3.3.3 Geographic Location for Ground Failure

The terrain of Wells County is primarily flat, thus the entire county is at equal risk for ground failure.

4.3.3.4 Hazard Extent for Ground Failure

The extent of the ground failure hazard is closely related to development near the regions that are at risk. The extent will vary within these areas depending on the potential of elevation change, as well as the size of the underground structure. The hazard extent of ground failure is related to various concentrated areas as shown on the maps.

4.3.3.5 Risk Identification for Ground Failure

In Meeting #2, the planning team determined that the probability of ground failure is possible with negligible consequences. The warning time for ground failure is less than 6 hours with a duration of greater than 1 week. The calculated CPRI for ground failure is 2.20.

4.3.3.6 Vulnerability Analysis for Ground Failure

The terrain of Wells County is largely smooth except for slopes around rivers or creeks. The US Geological Survey’s Landslide Overview Map of the Conterminous United States shows two large zones in south-central Indiana as having moderate susceptibility for landslides, but with low incidence of landslides. In contrast, the majority of northern Indiana has a very low (less than 1.5% of the area involved) incidence of landslides and only the northwest is shown as having a moderate level of susceptibility. Areas in the southwest and to the east are more likely to fail because of a landslide.

As seen in USGS Landslide Overview Map figure, Wells County predominantly lies in the low landslide incidence zone.

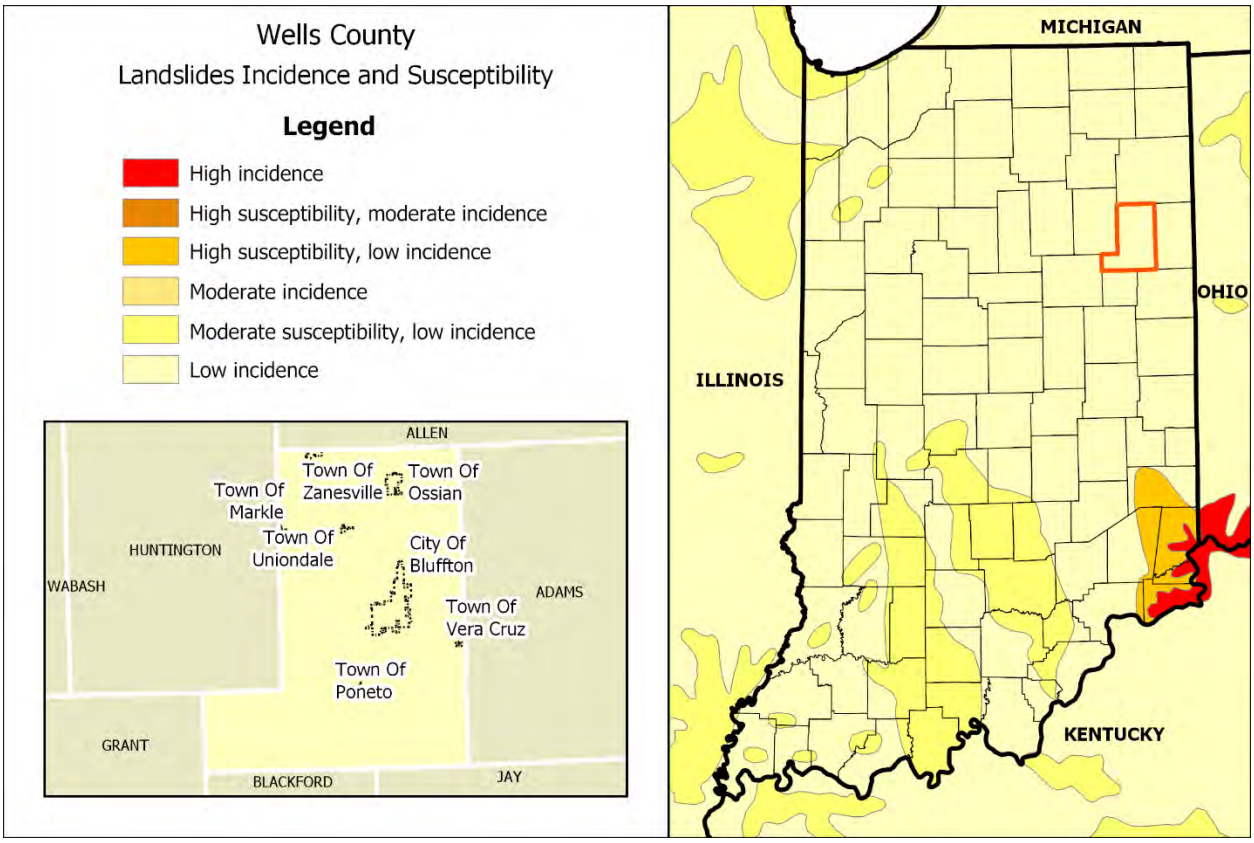

Figure 30. USGS Landslide Overview Map

4.3.3.7 Community Development and Future Vulnerability

All future communities, buildings, and infrastructure will remain vulnerable to ground failure in the areas of Wells County where underground mine features exist, where the structures are located near streams and rivers, and in areas of significant elevation change. In areas with higher levels of population, the vulnerability is greater than in open areas with no infrastructure demands. Abandoned underground mine subsidence may affect several locations within the county; therefore, buildings and infrastructure are vulnerable to subsidence. Continued development will occur in many of these areas. Currently, Wells County reviews new developments for compliance with the local zoning ordinance. Newly planned construction should be reviewed with the historical mining maps to minimize potential subsidence structural damage.

4.3.3.8 Relationship to other Hazards

Flooding – Flooding is typically the leading cause to ground failure, particularly along streams. Ground failure and flooding combine to impact property and infrastructure such as roads and bridges.

4.3.4 Summer Storms and Tornadoes

4.3.4.1 Hazard Definition for Summer Storm

Thunderstorms

Severe thunderstorms are defined as thunderstorms with one or more of the following characteristics: strong winds, large damaging hail, or frequent lightning. Severe thunderstorms most frequently occur in Indiana during the spring and summer but can occur any month of the year at any time of day. A severe thunderstorm's impacts can be localized or widespread in nature. The National Oceanic and Atmospheric Administration's National Weather Service classifies a thunderstorm as severe when it meets one or more of the following criteria:

- Hail with a one-inch diameter or higher
- Wind speeds equal to or greater than 58 miles an hour
- Thunderstorms that produce a tornado

The National Weather Service does not consider lightning frequency a criterion for issuing a severe thunderstorm warning; however, frequent and dangerous lightning is considered a severe weather hazard. The NOAA consistently ranks lightning as one the top weather killers in the United States.

Lightning

Lightning is caused by the discharge of electricity between clouds or between clouds and the surface of the earth. In a thunderstorm there is a rapid gathering of particles of moisture into clouds and forming of large drops of rain. This gathers electric potential until the surface of the cloud (or the enlarged water particles) is insufficient to carry the charge, and a discharge takes place, producing a brilliant flash of light. The power of the electrical charge and intense heat associated with lightning can electrocute on contact, split trees, ignite fires, and cause electrical failures. Most lightning casualties occur in the summer months, during the afternoon and early evening.

Hail

Hail is a product of a severe thunderstorm. Hail consists of layered ice particles which are developed when strong updrafts within the storm carry water droplets above the freezing level. They remain suspended and continue to grow larger, until their weight can no longer be supported by the winds. The NWS uses the following descriptions when estimating hail sizes:

pea size is ¼ inch, marble size is ½ inch, dime size is ¾ inch, quarter size is 1 inch, golf ball size is 1 ¾ inches, and baseball size is 2 ¾ inches. Individuals who serve as volunteer "storm spotters" for the NWS are located throughout the state, and are instructed to report hail dime size (¾ inch) or greater. Hailstorms can occur throughout the year; however, the months of maximum hailstorm frequency are typically between May and August. Although hailstorms rarely cause injury or loss of life, they can cause significant damage to property, particularly roofs and vehicles.

Windstorms

Windstorms can and do occur in all months of the year; however, the most severe windstorms usually occur during severe thunderstorms in the warm months. Associated with strong thunderstorms, downbursts are severe localized downdrafts from a thunderstorm or rain shower. This outflow of cool or colder air can create damaging winds at or near the surface. Downburst winds can potentially cause as much damage as a small tornado and are often confused with tornadoes due to the extensive damage that they inflict. As these downburst winds spread out, they are frequently referred to as straight-line winds. Straight-line winds can cause major structural and tree damage over a relatively large area.

Summer storms, including thunderstorms, hailstorms, and windstorms affect Wells County on an annual basis. Thunderstorms are the most common summer hazardous event in the county, occurring primarily during the months of May through August, with the severest storms most likely to occur from mid-May through mid-July. Typically, thunderstorms are locally produced by cumulonimbus clouds, are always attended by lightning, and are often accompanied by strong wind gusts, heavy rain, and sometimes hail and tornadoes.

4.3.4.2 Hazard Definition for Tornado

The Glossary of Meteorology defines a tornado as a violently rotating column of air with wind speeds between 40-300 mph, in contact with the ground, either pendant from a cumuliform cloud or underneath a cumuliform cloud, and often (but not always) visible as a funnel cloud. They develop under three scenarios: (1) along a squall line; (2) in connection with thunderstorm squall lines during hot, humid weather; and (3) in the outer portion of a tropical cyclone. Funnel clouds are rotating columns of air not in contact with the ground; however, the column of air can reach the ground very quickly and become a tornado.

Since 2007, tornado strength in the United States is ranked based on the Enhanced Fujita scale (EF scale), replacing the Fujita scale introduced in 1971. The EF scale uses similar principles to the Fujita scale, with six categories from 0-5, based on wind estimates and damage caused by the tornado. The EF Scale is used extensively by the NWS in investigating tornadoes (all tornadoes are now assigned an EF Scale number), and by engineers in correlating damage to buildings and techniques with different wind speeds caused by tornadoes.

Tornado damage curves for the Fujita Scale are shown in the following table. The approximate width of the damage and minimum percent damage provide a better understanding of the capabilities of the tornado funnels as the sizes increase.

Table 21. Tornado Path Widths and Damage

Enhanced Fujita Scale	Path Width (feet)	Maximum Expected Damage
EF5	3,000	100%
EF4	2,400	100%
EF3	1,800	80%
EF2	1,200	50%
EF1	600	10%
EF0	300	0%

4.3.4.3 Summer Storm and Tornado History in Wells County

Summer Storm

The history of summer storms in Wells County was determined by analyzing the hail, high wind, lightning, strong wind, and thunderstorm wind events for the county in the NCDC database. From 1966 to 2010 there were 122 summer storm-related reports. Since 2010 there have been 57 summer storm-related reports, not including reports of tornados. None of these events reported injuries or deaths, but some did result in property damage costs. In October of 2010, a severe thunderstorm hit Wells County destroying a barn with several animals inside. In July of 2014 a line of severe summer storms crossed the Midwest, impacting Wells County. Reports indicated that several trees were blown down between Bluffton & Kingsland and one tree was reported as impacting county road 500N. March 2017 the county was impacted by a low-pressure system which created high winds. Many trees and power lines came down, damaging cars and some homes. In July of 2018 a summer storm hit the county and damaged crops and some homes. Additional NCDC events and details about their associated impacts can be found in Appendix C. Figure 31 displays the locations for historic hail and wind events in the county.

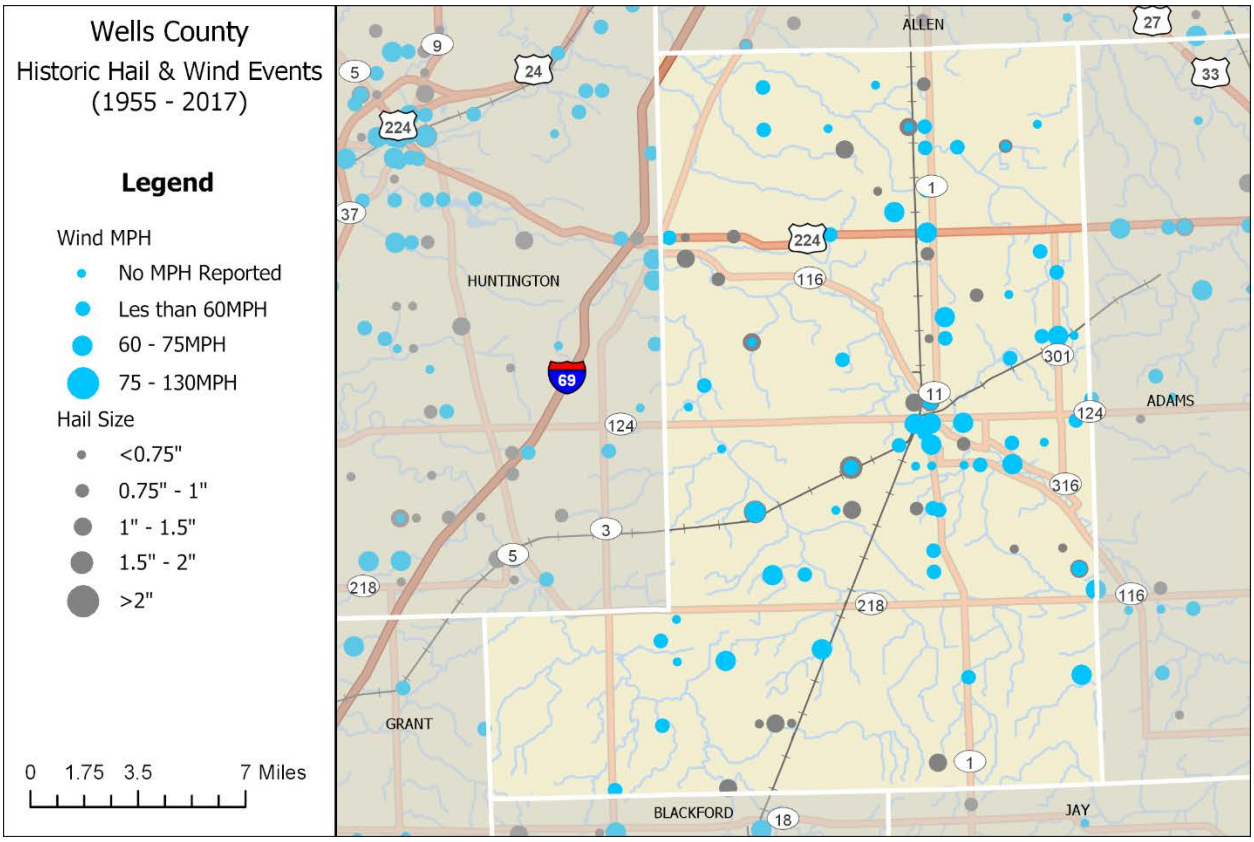

Figure 31. Wells County Historic Hail and Wind Events

Tornado

According to the NCDC there have been 15 occurrences of tornadoes within Wells County from 1967 to 2010. Since 2010 there has only been one which occurred in August of 2016. The National Weather Service reported this tornado as an EF-0 which impacted the southwest portion of the county. Reports indicate that damages were minimal but many tree branches were snapped. Wells County NCDC recorded tornadoes are identified in Table 22. Additional details for NCDC events are included in Appendix C. Figure 32 displays historical tornadoes for Wells County.

*Table 22. Wells County Tornadoes**

Location or County	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Wells County	10-6-1955	F1	0	0	2.5K	0
Wells County	6-24-1956	F2	0	0	2.5K	0
Wells County	3-6-1961	F1	0	0	25K	0
Wells County	4-11-1965	F4	1	38	25M	0
Wells County	12-21-1967	F2	0	2	25K	0
Wells County	4-3-1974	F2	0	0	2.5M	0

Location or County	Date	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Wells County	4-3-1974	F1	0	0	0K	0
Wells County	3-16-1982	F1	0	0	250K	0
Wells County	7-12-1986	F1	0	0	2.5K	0
Wells County	6-8-1990	F0	0	0	.25K	0
Poneto	7-2-1994	F0	0	0	50K	0
PONETO	6-11-1998	F1	0	0	150K	
PETROLEUM	11-10-2002	F0	0	0	5K	
LIBERTY CENTER	4-4-2003	F1	0	0	50K	
MC NATTS	8-24-2016	EF0	0	0	0.00K	0.00K

* NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event.

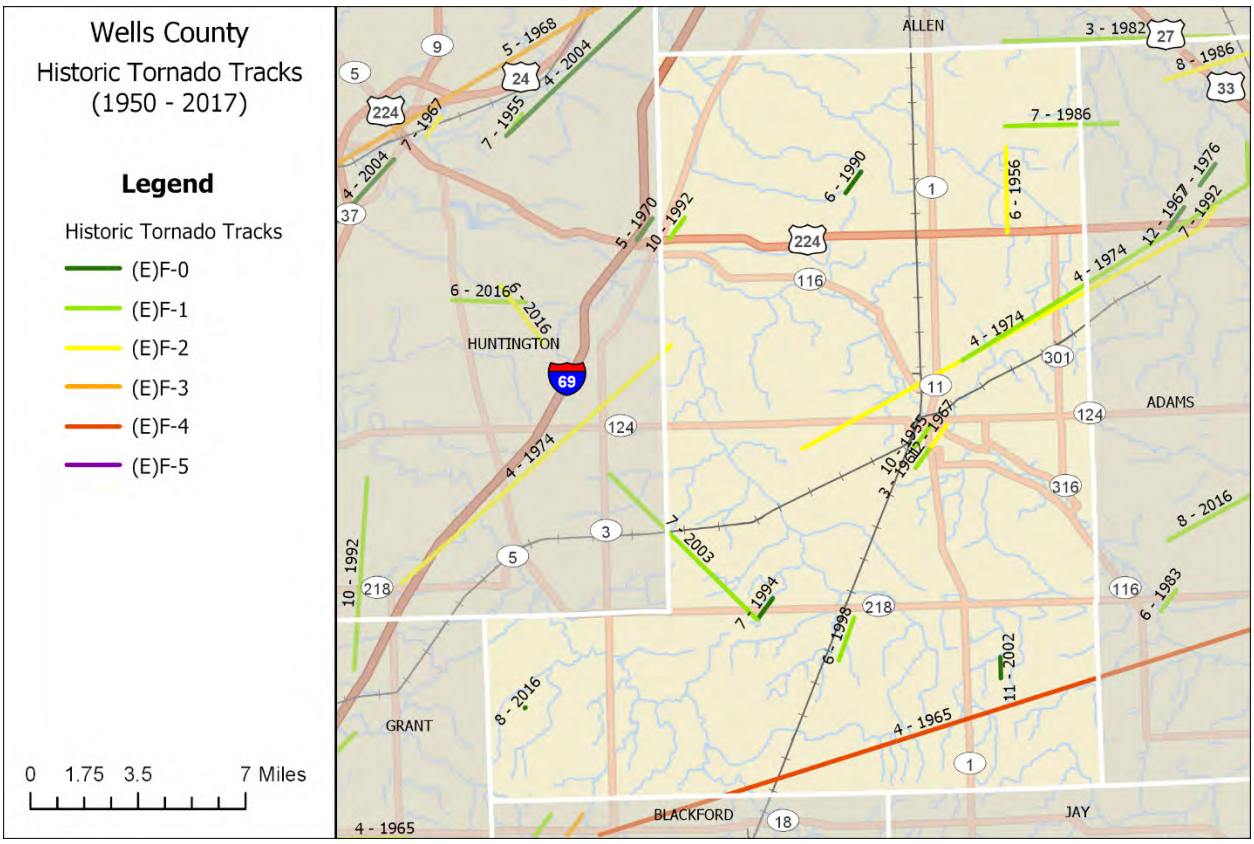

Figure 32. Historical Tornado Tracks and Touchdowns for Wells County

4.3.4.4 Geographic Location for Summer Storm and Tornado

The entire county has the same risk for occurrence of summer storms and tornadoes. They can occur at any location within the county.

4.3.4.5 Hazard Extent for Summer Storm and Tornado

The extent of the summer storm and tornado hazards vary both in terms of the extent of the path of the event and the wind speed.

4.3.4.6 Risk Identification for Summer Storm and Tornado

In Meeting #2, the planning team determined that the probability of a summer storm is highly likely with limited consequences. The warning time for a summer storm is 6 to 12 hours with a duration of less than 24 hours. The calculated CPRI for summer storm is 3.05. The planning team ranked the tornado hazard as highly likely with critical consequences. The warning time for a tornado is less than 6 hours with a duration of more than 1 week. The calculated CPRI for a tornado is 3.70.

4.3.4.7 Vulnerability Analysis for Summer Storm and Tornado

During a tornado the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is equally vulnerable, it is important to emphasize that any number of these items could become damaged during a tornado. The impacts to these items include broken, failed, or impassable roadways, broken or failed utility lines (e.g. loss of power or gas to community), and railway failure from broken or impassable railways. Bridges could fail or become impassable causing risk to traffic.

All facilities are vulnerable to severe thunderstorms. These facilities will encounter many of the same impacts as any other building within the jurisdiction including structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, fires caused by lightning, and loss of building functionality, such as a damaged police station would no longer be able to serve the community.

During a severe thunderstorm, the types of infrastructure that could be impacted include roadways, utility lines and pipes, railroads, and bridges. Since the county's entire infrastructure is equally vulnerable, it is important to emphasize that any number of these structures could become damaged during a severe thunderstorm. The impacts to these structures include impassable roadways, broken or failed utility lines, causing loss of power or gas to the community, or railway failure from broken or impassable tracks. Additionally, bridges could fail or become impassable, causing risks to traffic.

GIS Tornado Analysis

The following analysis completed for the plan update utilizes an example scenario to gauge the anticipated impacts of tornadoes in the county in terms of numbers and types of buildings and infrastructure.

GIS overlay modeling was used to determine the potential impacts of an EF-4 tornado. The analysis used a hypothetical tornado path that runs for 16 miles through the northern half of the county. This scenario includes impacts to the major employers of the county. The selected widths were modeled after a recreation of the Fujita-Scale guidelines based on conceptual wind speeds, path widths, and path lengths. There is no guarantee that every tornado will fit exactly into one of these six categories. Figure 33 depicts tornado damage curves as well as path widths.

Table 23. Tornado Path Widths and Damage Curves

Fujita Scale	Path Width (feet)	Maximum Expected Damage
EF-5	3000	100%
EF-4	2400	100%
EF-3	1800	80%
EF-2	1200	50%
EF-1	600	10%
EF-0	300	0%

Within any given tornado path there are degrees of damage. The most intense damage occurs within the center of the damage path with a decreasing amount of damage away from the center of the path. This natural process was modeled in GIS by adding damage zones around the tornado path.

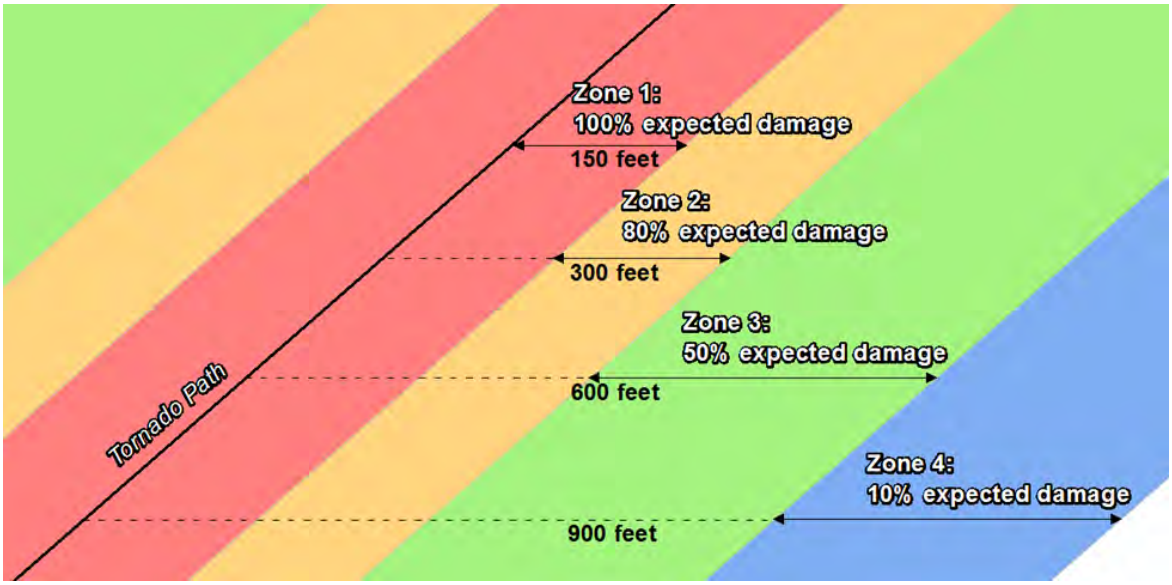

Figure 33. EF-4 Tornado Analysis, Using GIS Buffers

Table 24. EF-4 Tornado Zones and Damage Curves

Fujita Scale	Zone	Buffer (feet)	Damage Curve
EF-4	4	900-1200	10%
EF-4	3	600-900	50%
EF-4	2	300-600	80%
EF-4	1	0-300	100%

The results of the analysis are depicted in and Table 26. The GIS analysis estimates that 1,575 buildings will be damaged. The estimated building losses are $315.5 million. The building losses are an estimate of building replacement costs multiplied by the percentages of damage. The overlay was performed against the Building Inventory created at an earlier stage using the Assessor data in combination with Parcel records. NOTE: The assessor records often do not include nontaxable parcels and associated building improvements therefore, the total number of buildings and the building replacement costs for government, religious/non-profit, and education may be underestimated.

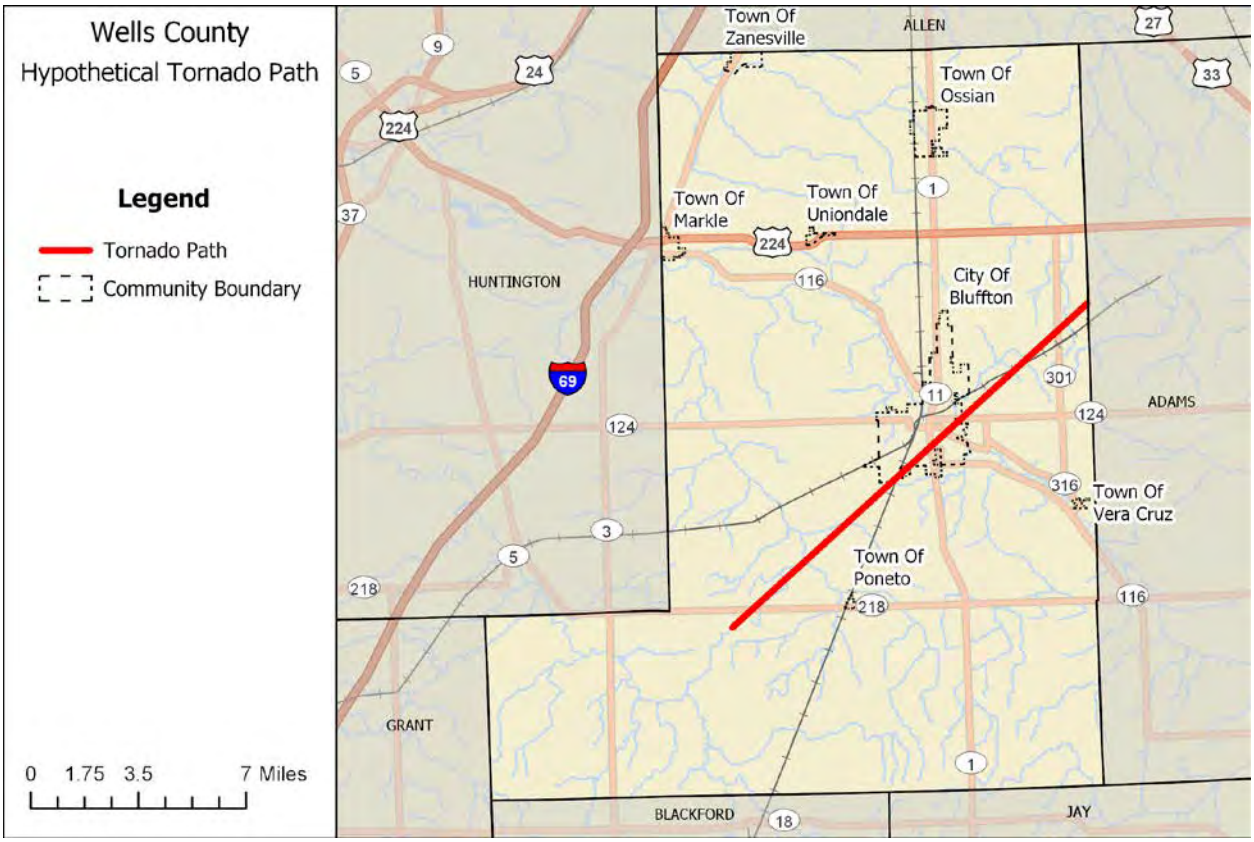

Figure 34. Modeled F4 Tornado Damage Hypothetical Path

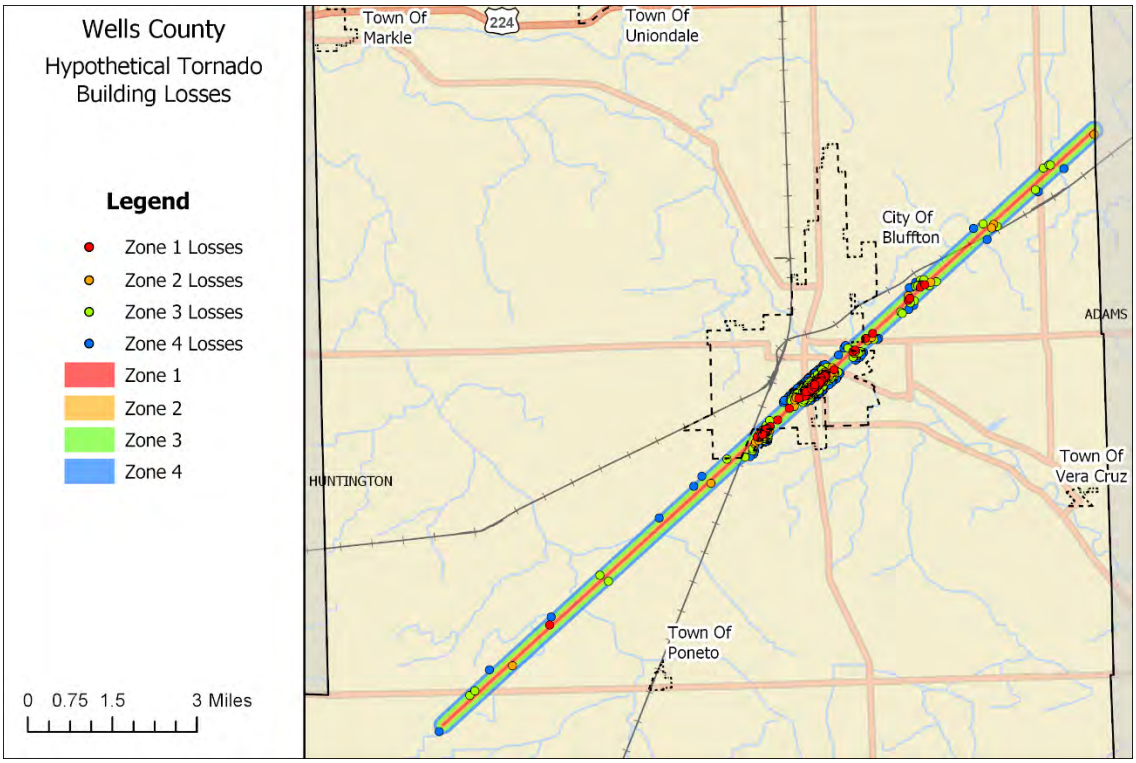

Figure 35. Tornado Path with Damaged Buildings

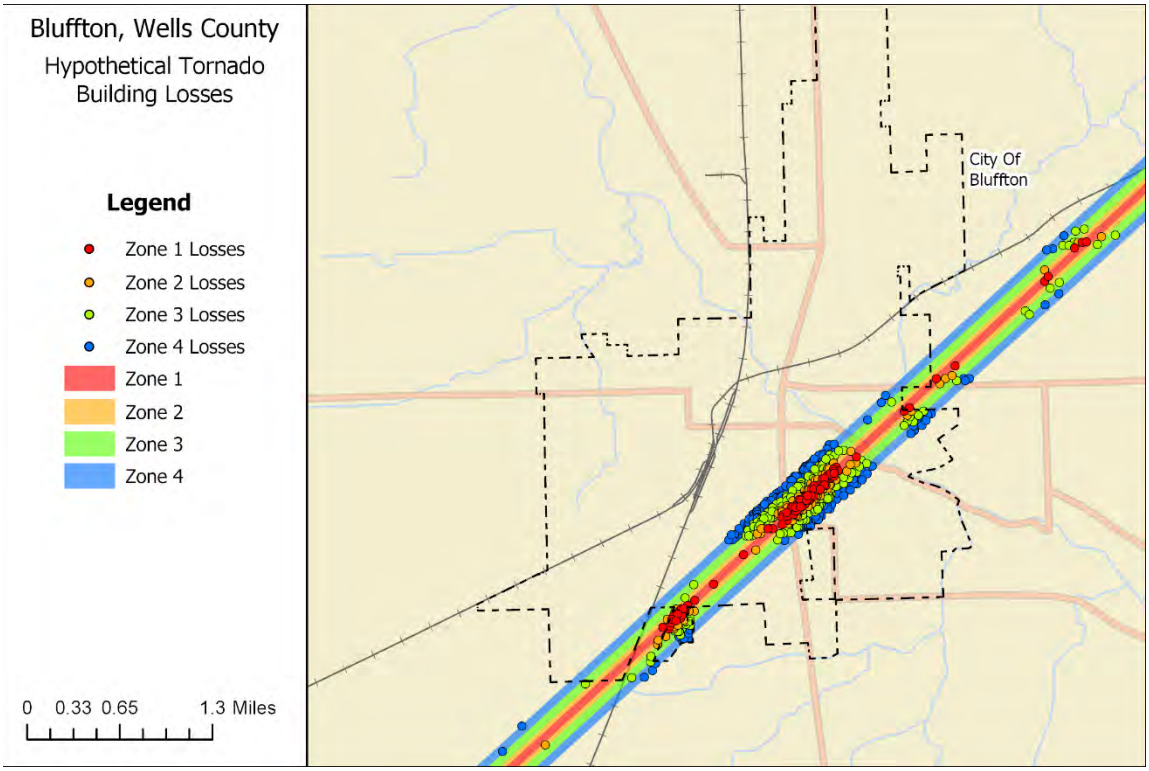

Figure 36. Tornado Path: Wells County Zoomed In

Table 25. Estimated Building Losses by Occupancy Type

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	92	82	174	202
Commercial	4	4	11	3
Industrial	0	0	0	2
Agriculture	3	4	8	8
Religious	1	0	2	2
Government	0	3	4	1
Education	0	0	0	0
Total	**100**	**93**	**199**	218

Table 26. Estimated Losses by Zone

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$14,778,471	$9,593,603	$13,415,658	$3,063,771
Commercial	$22,374,552	$4,171,744	$5,594,670	$781,860
Industrial	$0	$0	$0	$1,359,049
Agriculture	$544,343	$571,691	$722,528	$196,036
Religious	$175,189	$0	$13,717,857	$574,841
Government	$0	$6,091,721	$4,454,676	$79,933
Education	$0	$0	$0	$0
Total	**$37,872,554**	**$20,428,759**	**$37,905,388**	**$6,055,491**

Facility and Infrastructure Damage

The essential facilities damaged in the hypothetical tornado path are shown in Figure 37. Critical facilities damaged in the hypothetical path can be found in Appendix E.

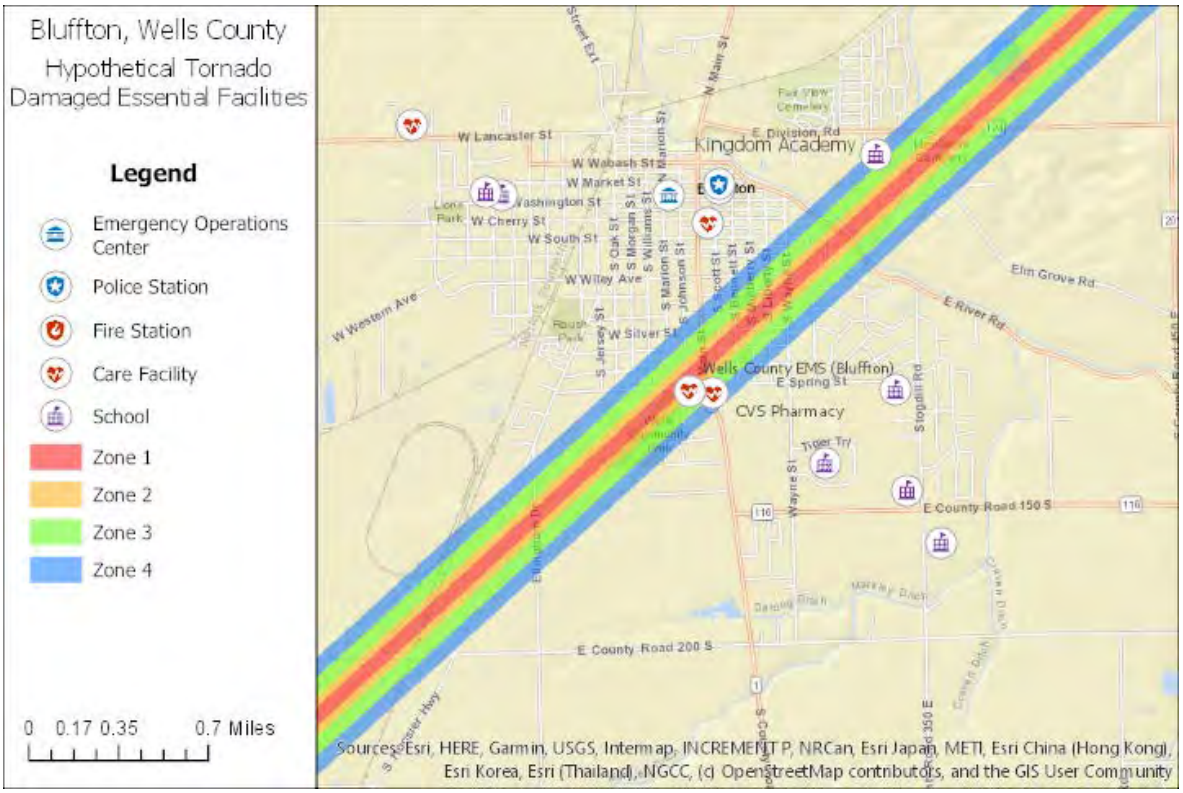

Figure 37. Hypothetical Damages to Essential Facilities, Wells County

4.3.4.8 Community Development Trends and Future Vulnerability

The entire population and buildings have been identified as at risk because summer storms and tornadoes can occur anywhere within the state of Indiana at any time of the day. Furthermore, any future development in terms of new construction within the county will be at risk. The building exposure for Wells County is included in Table 12. All critical facilities in the county and communities within the county are at risk. Preparing for severe storms will be enhanced if officials sponsor a wide range of programs and initiatives to address the overall safety of county residents. New structures need to be built with more sturdy construction, and those structures already in place need to be hardened to lessen the potential impacts of severe weather. Community warning sirens to provide warnings of approaching storms are also vital to preventing the loss of property and ensuring the safety of Wells County residents.

Team Identified Vulnerability & Potential Strategy

The planning team answered a series of surveys and worksheets to help better identify hazards and potential solutions to those problems. Participants indicated that increasing the coverage of warning sirens countywide, would be a viable solution to help mitigate against tornadoes. Many also stated that continuing and expanding the distribution of weather radios would help to keep Wells County residents informed on severe weather and tornado events.

4.3.4.9 Relationship to other Hazards

Flooding – Thunderstorms with heavy amounts of rainfall can cause localized flooding, which can impact property and infrastructure such as roads.

Public Health – Public health can be impacted as a result of wastewater spills due to flooding.

Wildland Fire – Lighting strikes may ignite a wildland fire. Windstorms that result in downed timber increase the fuel load in a forest that may increase the risk of wildfire.

Structural Fire – Lighting strikes may ignite a structural fire.

4.3.5 Drought

4.3.5.1 Hazard Definition for Drought

The meteorological condition that creates a drought is below normal rainfall. However, excessive heat can lead to increased evaporation, which will enhance drought conditions. Droughts can occur in any month. Drought differs from normal arid conditions found in low rainfall areas. Drought is the consequence of a reduction in the amount of precipitation over an undetermined length of time (usually a growing season or more).

The Palmer Drought Severity Index (PDSI), developed by W.C. Palmer in 1965, is a soil moisture algorithm utilized by most federal and state government agencies to trigger drought relief programs and responses. The objective of the PDSI is to provide standardized measurements of moisture, so that comparisons can be made between locations and periods of time—usually months. The PDSI is designed so that a -4.0 in Indiana has the same meaning in terms of the moisture departure from a climatological normal as a -4.0 does in South Carolina.

The U.S. Drought Monitor (USDM) provides a national assessment on drought conditions in the United States. The following table is a reference from the classification scheme provided by the USDM, and the correlation between PDSI and the category, descriptions, and possible impacts associated with those level events. This classification is often used to refer to the severity of droughts for statistical purposes. The USDM provides weekly data for each county, noting the percent of land cover in the condition of the drought category identified below.

Table 27. USDM Index

Category	Description	Possible Impacts	Palmer Drought Severity Index
D0	Abnormally Dry	Going into drought: -short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits	-1.0 to -1.9
D1	Moderate Drought	-Some damage to crops, pastures -Streams, reservoirs, or wells low, some water shortages developing or imminent -Voluntary water-use restrictions requested	-2.0 to -2.9
D2	Severe Drought	-Crop or pasture losses likely -Water shortages common -Water restrictions imposed	-3.0 to -3.9
D3	Extreme Drought	-Major crop/pasture losses -Widespread water shortages or restrictions	-4.0 to -4.9
D4	Exceptional Drought	-Exceptional and widespread crop/pasture losses -Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less

In the past decade, the US has continued to consistently experience drought events with economic impacts greater than $1 billion; FEMA estimates that the nation's average annual drought loss is $6 billion to $8 billion. For Indiana alone, the National Drought Mitigation Center reported hundreds of drought impacts in the past decade ranging from water shortage warnings to reduced crop yields and wild fires.

4.3.5.2 Drought History in Wells County

Since the last MHMP, the National Drought Mitigation Center and the Indiana Drought Monitor have recorded several incidences of drought in Wells County.

Wells County experienced a period of drought from the beginning of November through mid-November of 2010 with 100% of the county at category D1. In July of 2011, 100% of the county was designated at a category D1 and received a drought disaster declaration from the USDA. Like most of Indiana, Wells County was impacted by the 2012 drought. At the peak of the drought, late July to early August, around 25% of the county was at a category D3 with the remainder of the county at a category D2. Wells County was one of many counties eligible for SBA loans as a result of this drought. The national drought mitigation center's (NDMC) Drought Impact Reporter reported that hay was in short supply and many pastures in Wells County were barren. Since the 2012 drought, Wells County has not seen any significant droughts on the same scale.

4.3.5.3 Geographic Location for Drought

Droughts are regional in nature. All areas of the county are vulnerable to the risk of drought.

4.3.5.4 Hazard Extent for Drought

Droughts can be widespread or localized events. The extent of the droughts varies both in terms of the extent of the heat and the range of precipitation.

4.3.5.5 Risk Identification for Drought

In Meeting #2, the planning team determined that the probability of a drought is possible with limited consequences. The warning time for a drought is at least 24 hours with a duration of more than 1 week. The calculated CPRI for drought is 2.05.

4.3.5.6 Vulnerability Analysis for Drought

Drought impacts, as described in the drought history previously, are a distributed threat across the entire jurisdiction; therefore, the county is vulnerable to this hazard and can expect the same impacts within the affected area.

4.3.5.7 Community Development Trends and Future Vulnerability

Drought impacts, as described in the drought history section, are a threat across the entire jurisdiction; therefore, the county is vulnerable to this hazard and can expect varying impacts within the affected area. Future development will remain vulnerable to drought events. Typically, some urban and rural areas are more susceptible than others. Excessive demands for water in populated urban areas place a limit on water resources. In rural areas, crops and livestock may suffer from extended periods of drought.

4.3.5.8 Relationship to other Hazards

Wildfires – A drought situation can significantly increase the risk of wildfire.

Extreme Temperatures – A drought situation can significantly increase with long periods of high temperatures.

4.3.6 Winter Storms: Blizzards, Ice Storms, Snowstorms

4.3.6.1 Hazard Definition for Winter Storm

Severe winter weather consists of various forms of precipitation and strong weather conditions. This may include one or more of the following: freezing rain, sleet, heavy snow, blizzards, icy roadways, extreme low temperatures, and strong winds. These conditions can cause human-health risks such as frostbite, hypothermia, and death.

Ice Storms

Ice or sleet, even in the smallest quantities, can result in hazardous driving conditions and can be a significant cause of property damage. Sleet can be easily identified as frozen raindrops. Sleet does not stick to trees and wires. The most damaging winter storms in Indiana have been ice storms. Ice storms are the result of cold rain that freezes on contact with objects having a

temperature below freezing. Ice storms occur when moisture-laden gulf air converges with the northern jet stream, causing strong winds and heavy precipitation. This precipitation takes the form of freezing rain, coating power lines, communication lines, and trees with heavy ice. The winds then will cause the overburdened limbs and cables to snap, leaving large sectors of the population without power, heat, or communication. Falling trees and limbs also can cause building damage during an ice storm. In the past few decades, numerous ice-storm events have occurred in Indiana.

Snowstorms

Significant snowstorms are characterized by the rapid accumulation of snow, often accompanied by high winds, cold temperatures, and low visibility. A blizzard is categorized as a snowstorm with winds of 35 miles an hour or greater and/or visibility of less than one-quarter mile for three or more hours. The strong winds during a blizzard blow about falling and already existing snow, creating poor visibility and impassable roadways. Blizzards have the potential to result in property damage.

Indiana has been struck repeatedly by blizzards. Blizzard conditions not only cause power outages and loss of communication, potentially for days, but can also make transportation difficult. The blowing of snow can reduce visibility to less than one-quarter mile, and the resulting disorientation makes even travel by foot dangerous, if not deadly.

Damages from blizzards can range from significant snow removal costs to human and livestock deaths. Because of the blinding potential of heavy snowstorms, drivers are also at risk of collisions with snowplows or other road traffic. Stranded drivers can make uninformed decisions, such as leaving the car to walk in conditions that put them at risk. Drivers and homeowners without emergency plans and kits are vulnerable to the life-threatening effects of heavy snow storms such as power outages, cold weather, and inability to travel, communicate, obtain goods or reach their destinations. Heavy snow loads can cause structural damage, particularly in areas where there are no building codes or for residents living in manufactured home parks.

4.3.6.2 Winter Storm History in Wells County

The NCDC database identified 39 winter storm, heavy snow, ice storm, winter weather, or blizzard events for Wells County since 2010. In December of 2013 light to moderate amounts of snow caused an accumulation of 5-9 inches of snow in Wells County. Numerous reports of slid offs and accidents came in from area roadways. In January of 2015 abought of extreme cold moved through the area closing schools and business county wide. The lowest temperatures reached with wind chill was between negative 20 and negative 30 below zero. In March of that same year, a winter ice storm affected the area. Light freezing rain coated area roadways closing local schools and causing numerous accidents. An Alberta Clipper produced brief heavy snows in late February of 2018. Wells County produced 4-6 inches of snow that caused

accidents and school closings countywide. Additional details for NCDC events are included in Appendix C.

4.3.6.3 Geographic Location for Winter Storm

Severe winter storms are regional in nature. Most of the NCDC data is calculated regionally or in some cases statewide.

4.3.6.4 Hazard Extent for Winter Storm

The extent of the historical winter storms varies in terms of storm location, temperature, and ice or snowfall. A severe winter storm can occur anywhere in the jurisdiction.

4.3.6.5 Risk Identification for Winter Storm

In Meeting #2, the planning team determined that the potential for a winter storm is highly likely with critical consequences. The warning time for a winter storm is 6-12 hours with a duration of less than 1 week. The calculated CPRI for a winter storm is 3.45.

4.3.6.6 Vulnerability Analysis for Winter Storm

Winter storm impacts are equally distributed across the entire jurisdiction; therefore, the entire county is vulnerable to a winter storm and can expect the same impacts within the affected area. A table of the building exposure in terms of types and numbers of buildings for the entire county is listed in Table 10. The impacts to the general buildings within the county are similar to the damages expected to the critical facilities. These include loss of gas or electricity from broken or damaged utility lines, damaged or impassable roads and railways, broken water pipes, and roof collapse from heavy snow.

During a winter storm, the types of infrastructure that could be impacted include essential and critical facilities, roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is equally vulnerable it is important to emphasize that any number of these items could become damaged during a winter storm. Potential impacts include broken gas and/or electricity lines or damaged utility lines, damaged or impassable roads and railways, and broken water pipes.

4.3.6.7 Community Development Trends and Future Vulnerability

Any new development within the county will remain vulnerable to these events. Because the winter storm events are regional in nature, future development will be equally impacted across the county.

4.3.6.8 Relationship to other Hazards

Flooding - Melting from heavy snows can cause localized flooding which can impact property and infrastructure such as roads.

Wildland or Structural Fire - Heavy storms that result in large amounts of downed timber can result in an increase of dead or dying trees left standing, thus providing an increased fuel load for a wildfire. There is an additional risk of increased frequency of structural fires during heavy snow events, primarily due to utility disruptions and the use of alternative heating methods by residents.

Public Safety - Drivers stranded in snowstorms may make uninformed decisions that can put them at risk; residents who are unprepared or vulnerable may not be able to obtain goods or reach their destinations. EMS providers may be slowed by road conditions to respond to emergencies. Ice storms may result in power outages due to downed power lines, putting people at risk for cold temperature exposure and reducing the ability to spread emergency messages to the public via television, radio or computer.

4.3.7 Extreme Temperatures

4.3.7.1 Hazard Definition for Extreme Temperatures

Extreme Cold

What constitutes an extreme cold event and its effects varies by region across the US. In areas unaccustomed to winter weather, near freezing temperatures are considered “extreme cold.” Extreme cold temperatures are typically characterized by the ambient air temperature dropping to approximately zero degrees Fahrenheit or below.

Exposure to cold temperatures—indoors or outdoors—can lead to serious or life-threatening health problems, including hypothermia, cold stress, frostbite or freezing of the exposed extremities, such as fingers, toes, nose, and earlobes. Certain populations—such as seniors age 65 or older, infants and young children under five years of age, individuals who are homeless or stranded, or those who live in a home that is poorly insulated (such as mobile homes) — or without heat are at greater risk to the effects of extreme cold.

The magnitude of extreme cold temperatures is generally measured through the Wind Chill Temperature (WCT) Index. WCT are the temperatures felt outside and is based on the rate of heat loss from exposed skin by the effects of wind and cold. As the wind increases, the body is cooled at a faster rate causing the skin’s temperature to drop.

In 2001, the NWS implemented a new WCT Index, designed to more accurately calculate how cold air feels on human skin. The index, shown in Figure 38, includes a frostbite indicator, showing points where temperature, wind speed, and exposure time will produce frostbite in humans.

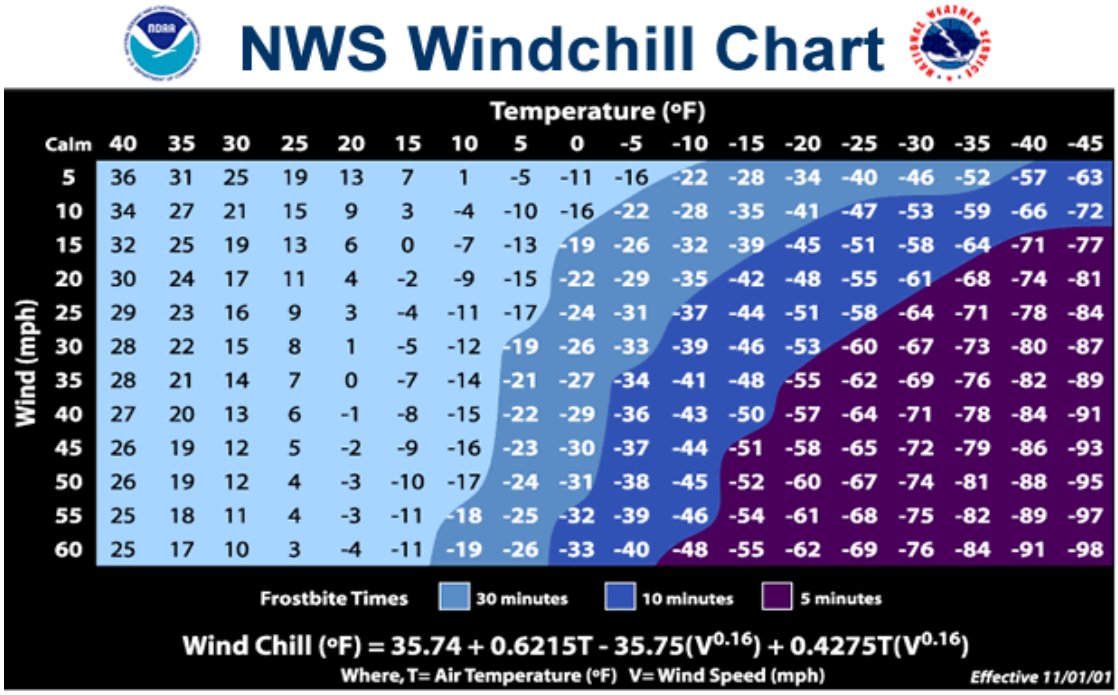

Figure 38. NWS Wind Chill Temperature Index

Extreme Heat

Human beings need to maintain a constant body temperature if they are to stay healthy. Working in high temperatures induces heat stress when more heat is absorbed into the body than can be dissipated out. Heat illness such as prickly heat, fainting from heat exhaustion, or heat cramps are visible signs that people are working in unbearable heat. In the most severe cases, the body temperature control system breaks down altogether and body temperature rises rapidly. This is a heat stroke, which can be fatal. The NWS issues a heat advisory when, during a 24-hour period, the temperature ranges from 105°F to 114°F during the day, and remains at or above 80°F at night.

Heat is the leading weather-related killer in the United States, even though most heat-related deaths are preventable through outreach and intervention. According to the National Oceanic and Atmospheric Administration, the summer of 2016 was one of the five hottest on record dating to the late 19th century.

Unusually hot summer temperatures have become more frequent across the contiguous 48 states in recent decades (see the High and Low Temperatures indicator), and extreme heat events (heat waves) are expected to become longer, more frequent, and more intense in the future. As a result, the risk of heat-related deaths and illness is also expected to increase. Temperatures that hover 10 degrees Fahrenheit or more above the average high temperature for a region, and last for several weeks, constitute an extreme heat event (EHE). An extended period of extreme heat of three or more consecutive days is typically referred to as a heat

wave. Most summers see EHEs in one or more parts east of the Rocky Mountains. They tend to combine both high temperatures and high humidity; although some of the worst heat waves have been catastrophically dry.

Heat alert procedures are based primarily on Heat Index Values. The Heat Index—given in degrees Fahrenheit—is often referred to as the apparent temperature and is a measure of how hot it really feels when the relative humidity is factored with the actual air temperature. The National Weather Service Heat Index Chart can be seen in Figure 39.

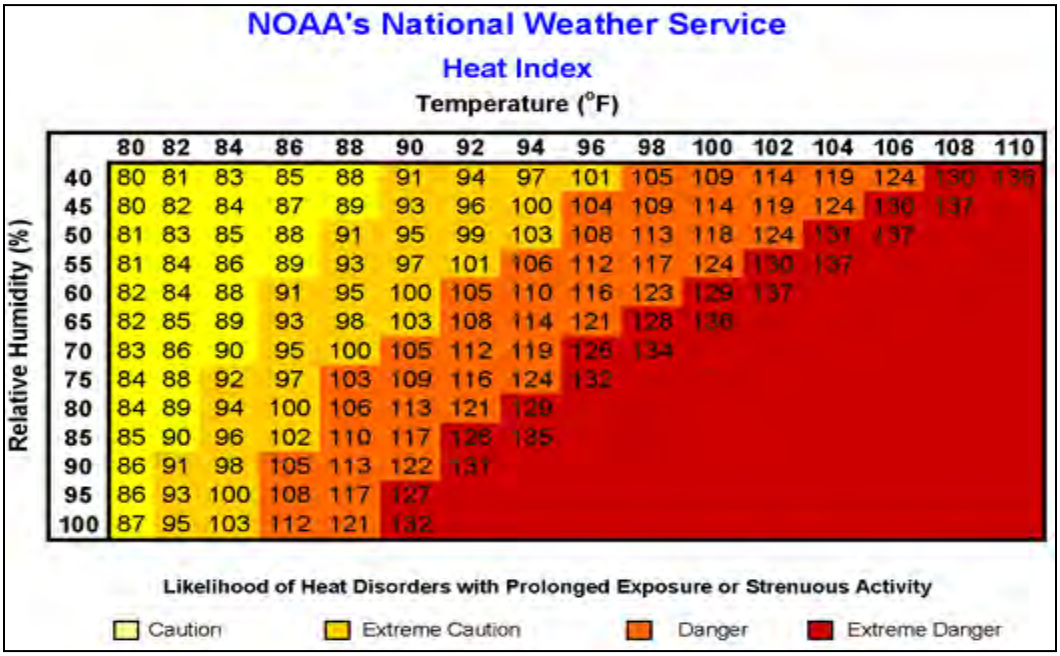

Figure 39. National Weather Service Heat Index
Source: Office of Atmospheric Programs. (2006). Excessive Heat Events Guidebook. Unites States Environmental Protection Agency. Washington, D.C.

4.3.7.2 Extreme Temperature History in Wells County

The NCDC reported two occurrences of extreme temperatures in Wells County since 2010. Both records were extreme cold. The two recent extreme cold events occurred in January 2014 and January 2015 respectively. The 2014 event resulted in deadly wind chill values between 30 and 45 degrees below zero, and in Wells County strong winds caused significant snow drifting, leaving roads impassable in areas. There were numerous reports of accidents due to slick roadways and many businesses and schools were closed. A similar event occurred a year later in 2015 when wind chill temperatures ranged between 20 to 30 degrees below zero. There were numerous school closings and delays, but no reported injuries or property damage.

4.3.7.3 Geographic Location for Extreme Temperature

Extreme temperatures are regional in nature. All areas of the Wells County are vulnerable to the risk of extreme cold or extreme heat.

4.3.7.4 Hazard Extent for Extreme Temperature

Extreme temperatures are normally widespread events.

4.3.7.5 Risk Identification for Extreme Temperature

In Meeting #2, the planning team determined that the probability of an extreme temperature hazard is possible with limited consequences. Extreme temperatures were determined to have a warning time of more than 24 hours with a duration less than one week. The calculated CPRI for extreme temperatures in Wells County is 2.05.

4.3.7.6 Vulnerability Analysis for Extreme Temperature

Extreme temperature impacts are an equally distributed threat across the entire jurisdiction; therefore, the county is vulnerable to this hazard and can expect the same impacts within the affected area. According to FEMA, approximately 175 Americans die each year from extreme heat.

Prolonged exposure to extreme heat may lead to serious health problems, including heat stroke, heat exhaustion, or sunburn. Certain populations — such as seniors age 65 and over, infants and young children under five years of age, pregnant women, the homeless or poor, the obese, and people with mental illnesses, disabilities, and chronic diseases — are at greater risk to the effects of extreme heat and extreme cold. Depending on severity, duration, and location these populations may not have ready access to cooling or warming centers.

4.3.7.7 Community Development Trends and Future Vulnerability

Because extreme temperatures are regional in nature, future development will be impacted across the county. Although urban and rural areas are equally vulnerable to this hazard, those living in urban areas may have a greater risk from the effects of a prolonged heat wave. The atmospheric conditions that create extreme heat tend to trap pollutants in urban areas, adding contaminated air to the excessively hot temperatures and creating increased health problems. Furthermore, asphalt and concrete store heat longer, gradually releasing it at night and producing high nighttime temperatures. This phenomenon is known as the “urban heat island effect.” Local officials should address extreme temperature hazards by educating the public on steps to take before and during the event and locations of cooling and warming centers.

4.3.7.8 Relationship to other Hazards

Drought and Wildfire - Dry, hot conditions can reduce the protective moisture of woodlands and increase the risk of wildfire.

Public Safety - Anyone exposed to extreme heat can develop heat exhaustion and heat stroke. The elderly, children and those who engage in outdoor work or recreation may be most susceptible to the danger of extreme heat.

4.3.8 Hazardous Material Release

4.3.8.1 Hazard Description for Hazardous Material Release

The State of Indiana has numerous active transportation lines that run through many of its counties. Active railways transport harmful and volatile substances between our borders every day. The transportation of chemicals and substances along interstate routes is commonplace in Indiana. The rural areas of Indiana have considerable agricultural commerce, creating a demand for fertilizers, herbicides, and pesticides to be transported along rural roads. Finally, Indiana is bordered by two major rivers and Lake Michigan. Barges transport chemicals and substances along these waterways daily. These factors increase the chance of hazardous material releases and spills throughout the State of Indiana.

The release or spill of certain substances can cause an explosion. Explosions result from the ignition of volatile products such as petroleum products, natural and other flammable gases, hazardous materials and chemicals, dust, and bombs. An explosion potentially can cause death, injury, and property damage. In addition, a fire routinely follows an explosion, which may cause further damage and inhibit emergency response. Emergency response may require fire, safety and law enforcement, search and rescue, and hazardous materials units.

4.3.8.2 Hazardous Incident History in Wells County

Wells County has not experienced a significantly large-scale hazardous material incident at a fixed site or during transport resulting in multiple deaths or serious injuries, although there have been many minor releases that have put local firefighters, hazardous materials teams, emergency management, and local law enforcement into action to try to stabilize these incidents and prevent or lessen harm to Wells County residents.

4.3.8.3 Geographic Location for Hazardous Material Release

The hazardous material hazards are countywide and are primarily associated with the transport of materials via highway, railroad, and/or river barge.

4.3.8.4 Hazard Extent for Hazardous Material Release

The extent of the hazardous material (referred to as hazmat) hazard varies in terms of the quantity of material being transported as well as the specific content of the container. Hazardous material impacts are an equally distributed threat across the entire jurisdiction; therefore the entire county is vulnerable to a hazardous material release and can expect the same impacts within the affected area. The main concern during a release or spill is the

population affected. This plan will therefore consider all buildings located within the county as vulnerable.

4.3.8.5 Risk Identification for Hazardous Material Release

In Meeting #2, the planning team determined that the probability of a hazardous materials release was possible with limited consequences. Hazardous materials releases were determined to have a warning time of less than six hours with a duration longer than 1 week. The calculated CPRI for earthquakes in Wells County is 2.50.

4.3.8.6 Vulnerability Analysis for Hazardous Materials Release

The hazardous material release hazards are countywide and primarily are associated with the transport of materials by highway and/or railroad. During a hazardous material release, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads and bridges. The release or spill of certain substances can cause an explosion. Explosions result from the ignition of volatile products such as petroleum products, natural and other flammable gases, hazardous materials/chemicals, dust, and bombs. An explosion potentially can cause death, injury, and property damage. In addition, a fire routinely follows an explosion, which may cause further damage and inhibit emergency response.

4.3.8.7 GIS Hazmat Analysis

The U.S. EPA's ALOHA (Areal Locations of Hazardous Atmospheres) model was utilized to assess the area of impact for an anhydrous ammonia release at the Norfolk Southern railroad tracks at Wiley Ave located on the southwestern portion of the City of Bluffton.

ALOHA generates a threat zone area where a hazard (such as toxicity or thermal radiation) has exceeded a user-specified Level of Concern (LOC). ALOHA will display up to three threat zones overlaid on a single picture. Through the development of Acute Exposure Guideline Levels (AEGLs) are exposure guidelines designed to help responders deal with emergencies involving chemical spills or other catastrophic events where members of the general public are exposed to a hazardous airborne chemical.

AEGLs are intended to describe the health effects on humans due to once-in-a-lifetime or rare exposure to airborne chemicals. The National Advisory Committee for AEGLs is developing these guidelines to help both national and local authorities, as well as private companies, deal with emergencies involving spills or other catastrophic exposures.

- **Zone 1 (AEGL 1):** Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure

- **Zone 2 (AEGL 2):** Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape
- **Zone 3 (AEGL 3):** Above this airborne concentration of a substance, it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

As the substance moves away from the source, the level of substance concentration decreases. Each color-coded area depicts a level of concentration measured in parts per million (ppm). Figure 40 is an illustration of the toxic threat plume footprint as determined by ALOHA.

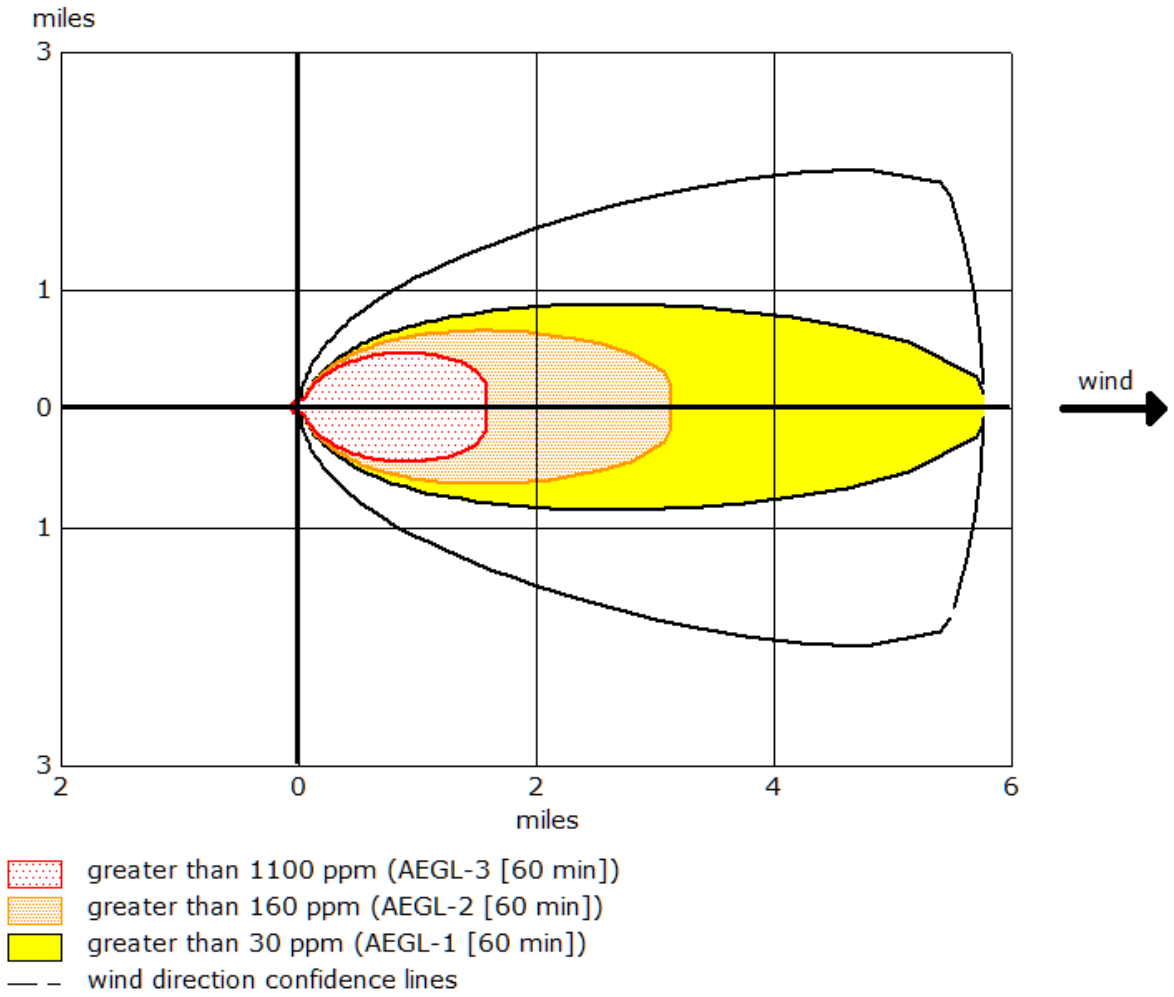

Figure 40. Toxic Threat Plume Footprint Generated by ALOHA

For this scenario, moderate atmospheric and climatic conditions with a slight breeze from the west were assumed, and the ALOHA atmospheric modeling parameters were based on the

actual conditions at the location when the model was run including wind speed of 7 mph. The temperature was 78°F with 75% humidity and clear skies.

This modeled release was based on a leak from 2.5 feet-diameter hole in the tank. According to the ALOHA parameters, approximately 1,040 pounds of material would be released per minute. Figure 41 shows the location of the release.

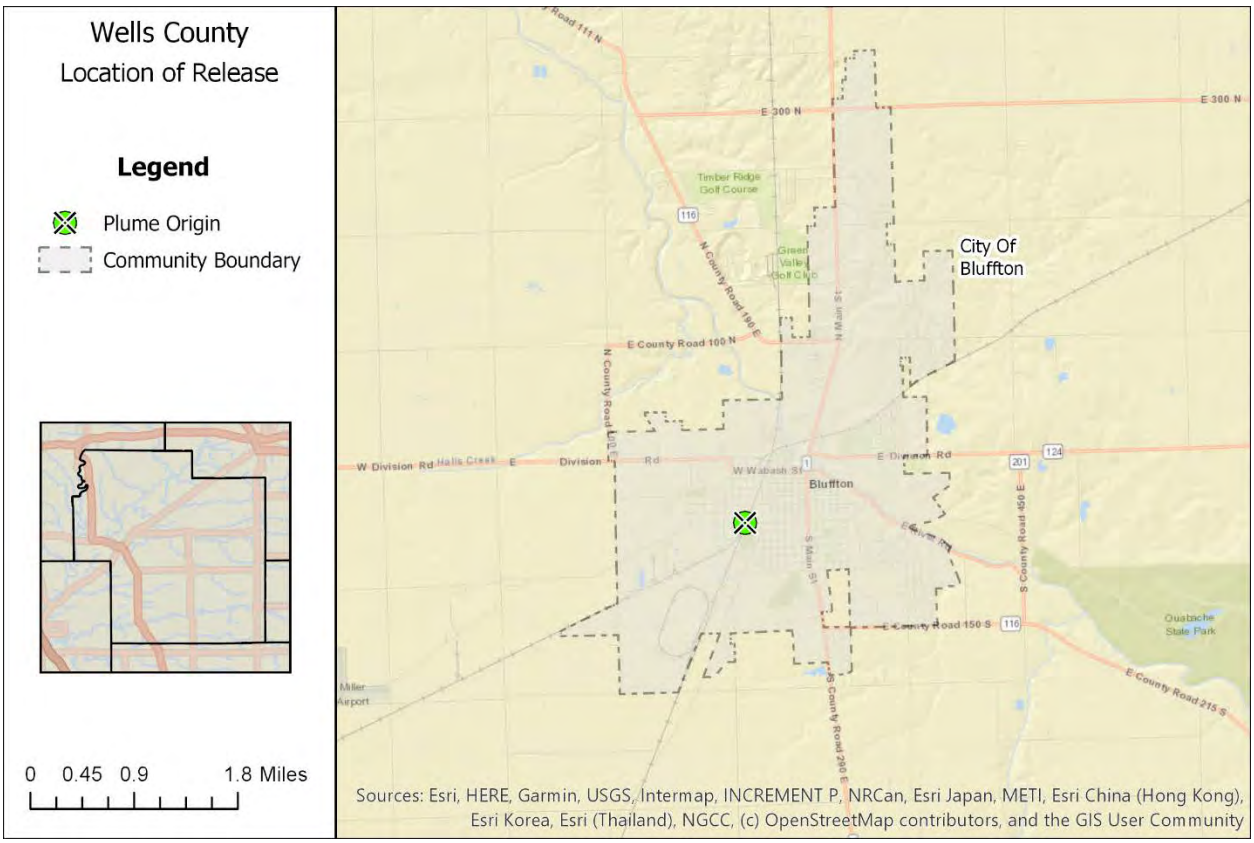

Figure 41. Location of Release

The Wells County Building Inventory was added to ArcMap and overlaid with the threat zone footprint. The Building Inventory was then intersected with each of the three footprint areas to classify each point based upon the plume footprint in which it is located. Figure 42 depicts the Wells County Building Inventory after the intersect process.

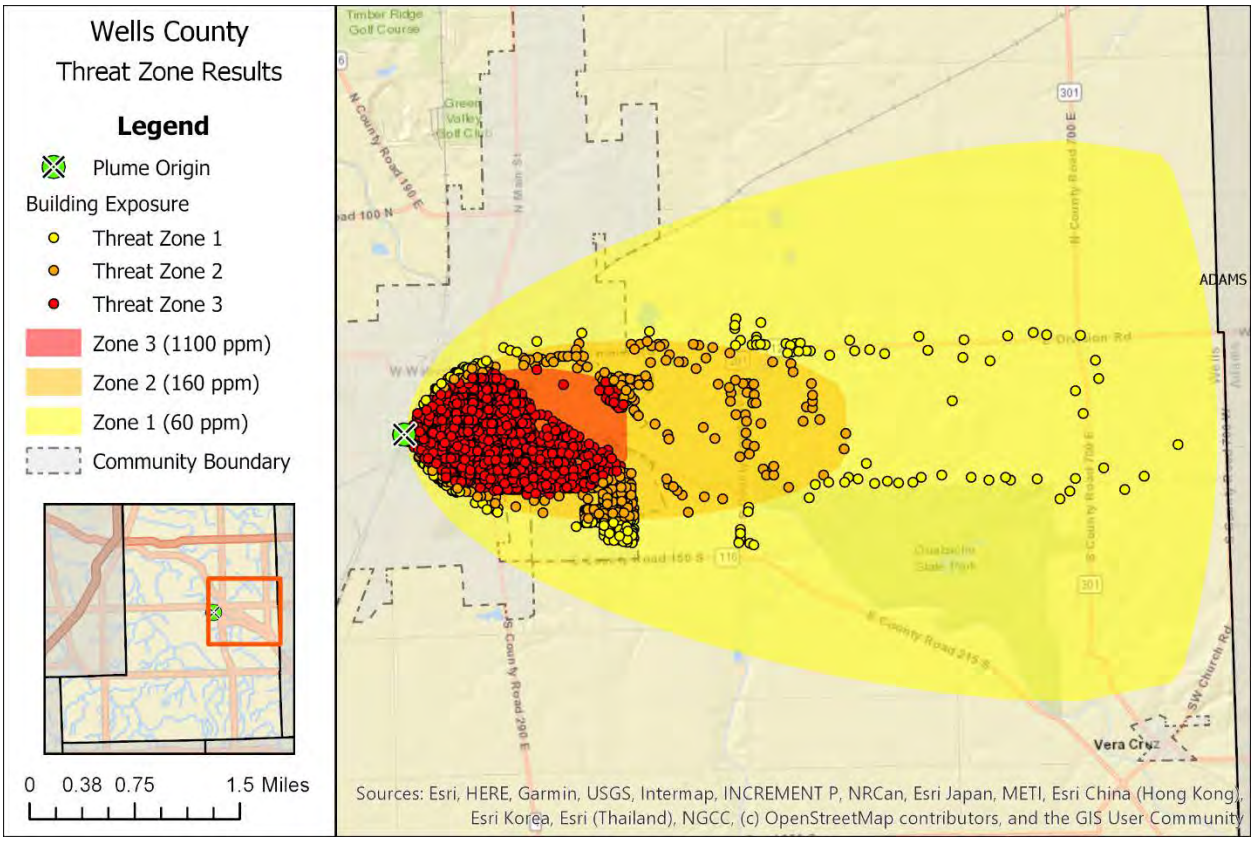

Figure 42. Location of Release and Building Inventory by Threat Zone

The results of the analysis against the Building Inventory counts are depicted in Table 28.

Table 28. Estimated Exposure for all Threat Zones

	Number of Buildings within the Hazmat Plume		
Occupancy	AEGL 3 (most severe)	AEGL 2	AEGL 1 (least severe)
Agriculture	1	19	19
Commercial	117	41	13
Education	0	3	1
Government	29	10	3
Industrial	2	3	0
Religious	29	7	2
Residential	1,340	281	152
Total	**1,518**	**364**	**190**

Table 28 summarizes the replacement costs of buildings within each threat zone. Values represent only those portions of each zone that are not occupied by other zones.

Table 29. Estimated Replacement Cost for all Threat Zones

	Replacement Cost of Buildings within the Hazmat Plume		
Occupancy	AEGL 3 (most severe)	AEGL 2	AEGL 1 (least severe)
Agriculture	$184,413	$7,291,587	$6,964,251
Commercial	$118,458,029	$51,349,789	$23,292,124
Education	$0	$66,598,449	$12,677,200
Government	$48,991,811	$11,235,334	$1,938,420
Industrial	$2,343,370	$71,173,268	$0
Religious	$58,437,238	$9,698,531	$1,976,796
Residential	$256,859,416	$52,180,709	$28,588,290
Total	**$485,274,277**	**$7,291,587**	**$75,437,081**

Essential Facilities

All facilities affected by the plume have been mapped and labeled in Figure 43. Table 29 lists all affected essential facilities. Appendix E contains a map and list of critical facilities that fall in the plume.

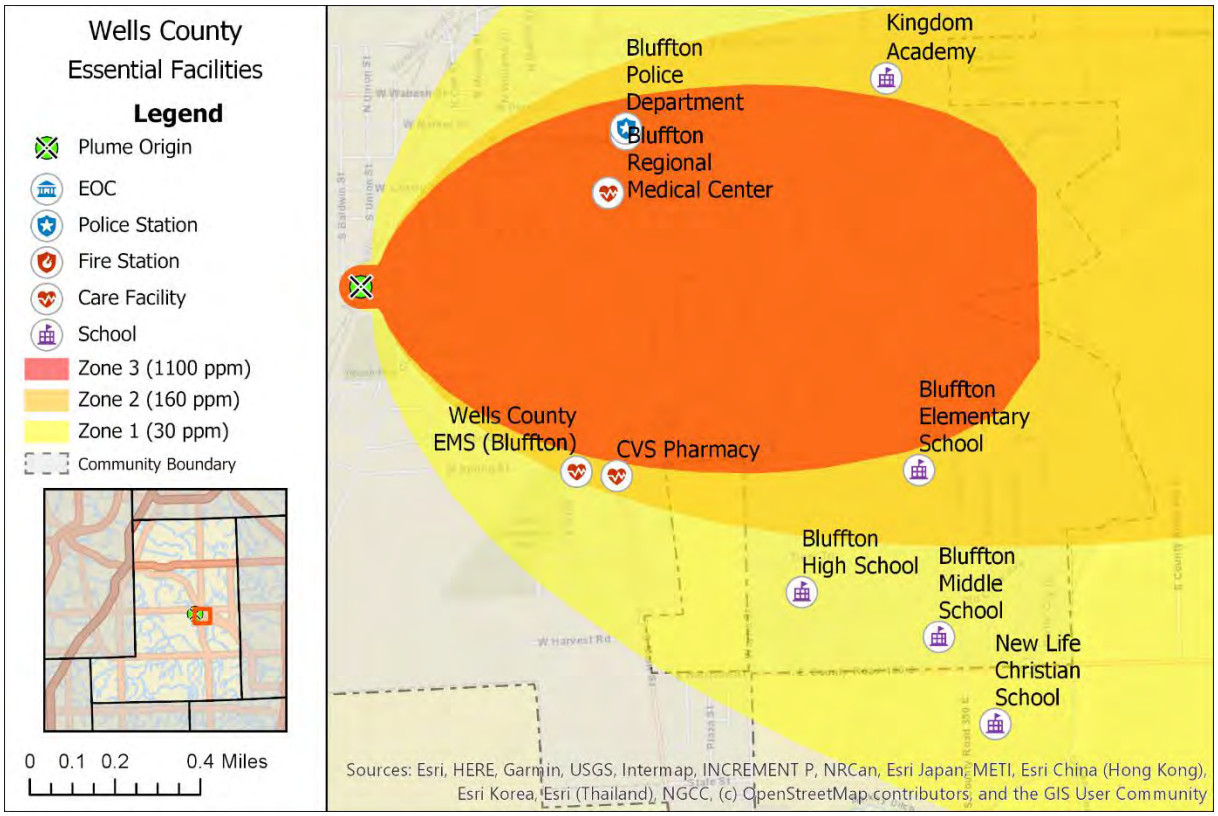

Figure 43. Essential Facilities Located in Threat Zone

4.3.8.8 Community Development Trends and Future Vulnerability

Because the hazardous material hazard events may occur anywhere within the county, future development will be impacted, especially development along major roadways. The major transportation routes and the industries located in Wells County pose a threat of dangerous chemicals and hazardous materials release.

4.3.8.9 Relationship to other Hazards

Flood- Hazmat incidents are likely when flood incidents occur. Hazardous material storage containers can become compromised due to flooding.

4.3.9 Dam and Levee Failure

4.3.9.1 Hazard Definition for Dam and Levee Failure

Dams are structures that retain or detain water behind a large barrier. When full or partially full, the difference in elevation between the water above the dam and below creates large amounts of potential energy, creating the potential for failure. The same potential exists for levees when they serve their purpose, which is to confine flood waters within the channel area of a river and exclude that water from land or communities land-ward of the levee. Dams and levees can fail due to either 1) water heights or flows above the capacity for which the structure was designed; or 2) deficiencies in the structure such that it cannot hold back the potential energy of the water. If a dam or levee fails, issues of primary concern include loss of human life/injury, downstream property damage, lifeline disruption (of concern would be transportation routes and utility lines required to maintain or protect life), and environmental damage.

Many communities view both dams and levees as permanent and infinitely safe structures. This sense of security may well be false, leading to significantly increased risks. Both downstream of dams and on floodplains protected by levees, security leads to new construction, added infrastructure, and increased population over time. Levees in particular are built to hold back flood waters only up to some maximum level, often the 100-year (1% annual probability) flood event. When that maximum is exceeded by more than the design safety margin, the levee will be overtopped or otherwise fail, inundating communities in the land previously protected by that levee. It has been suggested that climate change, land-use shifts, and some forms of river engineering may be increasing the magnitude of large floods and the frequency of levee failure situations.

In addition to failure that results from extreme floods above the design capacity, levees and dams can fail due to structural deficiencies. Both dams and levees require constant monitoring and regular maintenance to assure their integrity. Many structures across the U.S. have been under-funded or otherwise neglected, leading to an eventual day of reckoning in the form

either of realization that the structure is unsafe or, sometimes, an actual failure. The threat of dam or levee failure may require substantial commitment of time, personnel, and resources. Since dams and levees deteriorate with age, minor issues become larger compounding problems, and the risk of failure increases.

Low-Head Dams

Another type of dam low-head, or in-channel, dams can present a safety hazard to the public because of their ability to trap victims in a submerged hydraulic jump formed just downstream from the dam. Recent deaths and injuries around these structures in the state, have brought the attention of this issue to the surface for local, state and federal officials. Current initiatives led by the Indiana Silver Jackets—a multi-agency coalition that leverages efforts to address natural hazards—have focused on the identification of these dams statewide, as well as various efforts to notify the public on their dangers.

Non-Levee Embankments

Along with accredited levees regulated by federal agencies, there are also what are referred to as Non-Levee Embankments (NLE), which typically parallel to the direction of natural flow. An embankment is an artificial mound of soil or broken rock that supports railroads, highways, airfields, and large industrial sites in low areas, or impounds water. NLEs are often highways or railroads built on fill in low lying areas and thus tend to impose lateral constraints on flood flows, and typically contain the following characteristics:

- NLEs are elevated linear features adjacent to waterways and within the floodplain.
- They are typically man-made and include agricultural embankments built by landowners and road and railroad embankments banks.
- They are levee-like structures, but are not certified or engineered to provide flood protection.

The National Committee on Levee Safety estimates that the location and reliability status of 85% of the nation's NLEs are unknown. In Indiana, majority of NLEs are unidentified and are typically not maintained. NLEs impose lateral constraints on flood flows, reducing the floodplain storage capacity and increasing the flood velocity. As a result, downstream flooding and the potential for stream erosion can increase. As such, NLE's can give a false sense of security and protection to the people residing near NLEs. For these reasons, it is extremely important to map where these features are located.

Living with levees is a shared responsibility. While levees are in operation, maintaining levee systems are the levee sponsor responsibility. Local officials are adopting protocols and procedures for ensuring public safety and participation in the NFIP.

4.3.9.2 Dam and Levee Failure History in Wells County

According to the Wells County Hazard Analysis, there are no records or local knowledge of any dam or certified levee failure in the county.

4.3.9.3 Geographic Location for Dam and Levee Failure

A review of the IDNR dam database revealed 3 state regulated dams located in Wells County. Table 32 summarizes the dam information and Figure 48 maps the dams on a county level. High hazard and in channel dams are individually mapped in the vulnerability section. A review of the Army Corp of Engineers (USACE) and Indiana Department of Natural Resources' data identified no certified levees in the county. However, one structure has historically been referred to as both a dam and a levee just south of the community of Markle. The levee/dam is not accredited and as such the DRIM does not recognize any area of Markle as being protected by a levee. There are, however, 91 non-levee embankments in the county that could be of concern to the planning team. They are mapped in Figure 45.

Table 30. Indiana Department of Natural Resources Dam Inventory

Dam Name	Hazard Rank	EAP?
Decker Lake Dam	Low	No
Kunkle Lake Dam	Significant	No
Moser Lake Dam	Low	No

*According to IDNR, this is not a state regulated dam but it is federally regulated.

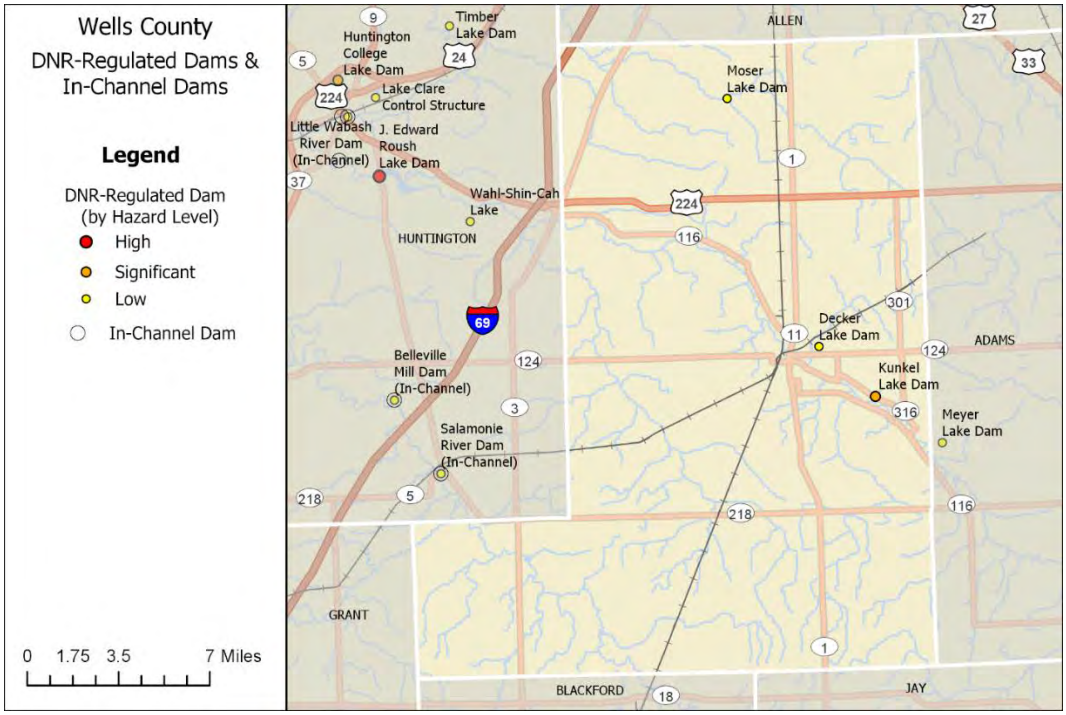

Figure 44. Wells County DNR Regulated Dams with Hazard Classification

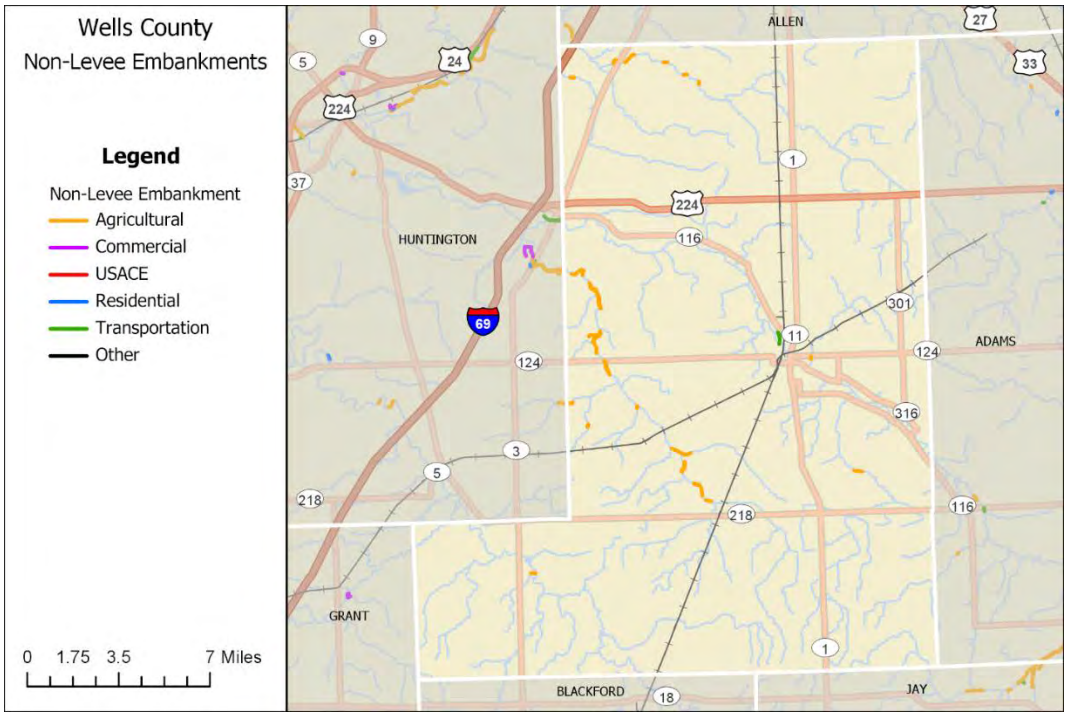

Figure 45. Wells County Non-Levee Embankments

4.3.9.4 Hazard Extent for Dam and Levee Failure

When dams are assigned the low (L) hazard potential classification, it means that failure or incorrect operation of the dam will result in no human life losses and no economic or environmental losses. Losses are principally limited to the owner's property. Dams assigned the significant (S) hazard classification are those dams in which failure or incorrect operation results in no probable loss of human life; however it can cause economic loss, environment damage, and disruption of lifeline facilities. Dams classified as significant hazard potential dams are often located in predominantly rural or agricultural areas, but could be located in populated areas with a significant amount of infrastructure. Dams assigned the high (H) hazard potential classification are those dams in which failure or incorrect operation has the highest risk to cause loss of human life and significant damage to buildings and infrastructure.

According to IDNR and the National Inventory of Dams, one dam was classified as high hazard, and was recorded as having an Emergency Action Plan (EAP). An EAP is not required by the State of Indiana but is strongly recommended in the 2003 Indiana Dam Safety & Inspection Manual.

Accurate mapping of the risks of flooding behind levees depends on knowing the condition and level of protection the levees actually provide. FEMA and the U.S. Army Corps of Engineers are working together to make sure that flood hazard maps clearly reflect the flood protection capabilities of levees, and that the maps accurately represent the flood risks posed to areas

situated behind them. Levee owners—usually states, communities, or in some cases private individuals or organizations—are responsible for ensuring that the levees they own are maintained according to their design. In order for a dam or levee to be considered a creditable flood protection structure on FEMA's flood maps, levee owners must provide documentation to prove the levee meets design, operation, and maintenance standards for protection against the one-percent-annual-chance flood.

4.3.9.5 Risk Identification for Dam and Levee Failure

In Meeting #2, the planning team determined that the probability of dam failure is possible with limited consequences while levee failure is unlikely with catastrophic consequences. The warning time for dam or levee failure is less than 6 hours with a duration of less than 24 hours. The calculated CPRI for dam failure is 2.30 and levee failure is 2.45.

4.3.9.6 Vulnerability Analysis for Dam and Levee Failure

The only significant ranked dam in the county is the Kunkle Lake Dam located in the eastern portion of the county. Based on preliminary analysis of vulnerable facilities in approximate dam failure inundation zone, no critical facilities would be affected by a dam failure. The dam does lie just upstream of State Road 316. Figure 46 shows the Kunkle Lake Dam and nearby building points for reference.

Figure 46. Wells County Significant Hazard Dams, Kunkle Lake Dam

The extent of potential levee failure varies across the county. In order to be considered creditable flood protection structures on FEMA's flood maps, levee owners must provide documentation to prove the levee meets design, operation, and maintenance standards for protection against the "one-percent-annual chance" flood. If this accreditation is maintained, portions that would be mapped as Special Flood Hazard Area appear on a FIRM map as Zone X, protected by levee. A review of the USACE and FEMA data identified no certified levee segments in Wells County. As mentioned previously, Wells County has several Non-Levee Embankments that were mapped as part of a state wide project. While these NLEs cannot be regulated, they none the less can affect the flow of flood waters. Wells County showed no significant NLEs near major areas of population or essential facilities.

4.3.9.7 Community Development Trends and Future Vulnerability

The county recognizes the importance of maintaining its future assets, infrastructure, and residents. Inundation maps can highlight the areas of greatest vulnerability in each community. The Wells County Planning Commission reviews new development for compliance with the local zoning ordinance.

4.3.9.8 Relationship to Other Hazards

Flooding – Flooding is typically the leading cause of dam or levee failure incidents.

Drought – Property owners living around dams may have problems accessing boating equipment during times of drought.

4.3.10 Wildfire

4.3.10.1 Hazard Definition for Wildfire

The hazard extent of wildfires is greatest in the heavily forested areas of southern Indiana. The IDNR Division of Forestry assumes responsibility for approximately 7.3 million acres of forest and associated wild lands, including state and privately-owned lands. Indiana’s wildfire seasons occur primarily in the spring—when the leaf litter on the ground dries out and before young herbaceous plants start to grow and cover the ground (green up)—and in the fall—after the leaves come down and before they are wetted down by the first heavy snow. During these times, especially when weather conditions are warm, windy, and with low humidity, cured vegetation is particularly susceptible to burning. When combined, fuel, weather, and topography, present an unpredictable danger to unwary civilians and firefighters in the path of a wildfire. Human action can not only intervene to stop the spread of wildfires, but can also mitigate their onset and effects. Forest and grassland areas can be cleared of dry fuel to prevent fires from starting and can be burned proactively to prevent uncontrolled burning.

4.3.10.2 Wildfire History in Wells County

There have been no recently recorded wildfires or damages from wildfires reported in Wells County.

4.3.10.3 Geographic Location for Wildfire

Wildfires can affect any area of the county that may be experiencing a drought.

4.3.10.4 Hazard Extent for Wildfire

Wildfires can be widespread or localized events.

4.3.10.5 Risk Identification for Wildfire

In Meeting #2, the planning team determined that the probability of a wildfire is unlikely with limited consequences. The warning time for a wildfire is less than 6 hours with a duration of less than 24 hours. The calculated CPRI for wildfire is 1.85.

4.3.10.6 Vulnerability Analysis for Wildfire

Residential, commercial and recreational areas are all vulnerable to wildfires. Areas of concentrated vegetation such as national parks or forests can be exceptionally vulnerable to wildfire.

4.3.10.7 Community Development Trends and Future Vulnerability

Because wildfire hazard events may occur anywhere within the county, future development will be impacted. Major future development areas will be supplied with water distribution, including hydrants for fire protection.

4.3.10.8 Relationship to other Hazards

Flooding and Erosion – Wildfires can completely eliminate vegetation and pose an increased risk to flooding and erosion effects.

Drought and Extreme Heat – Dry, hot conditions can reduce the protective moisture of woodlands and increase the risk of wildfire.

Hazardous Material Release – Storage tanks carrying chemicals including chlorine, anhydrous ammonia, and fuel tanks located at farms pose an increased risk to wildfire ignition.

4.3.11 Infectious Agents or Harmful Organisms

4.3.11.1 Hazard Definition for Infectious Agents or Harmful Organisms

The spread of harmful organisms and infectious agents are occasionally overlooked, potential natural hazards that can be exacerbated following other natural disasters. This hazard can include invasive species, such as the Emerald ash borer, or vector-borne diseases, such as West Nile fever.

Emerald Ash Borer

The Emerald ash borer (EAB), Agrilus planipennis, is an exotic beetle thought to have arrived in the United States by 2002 and was discovered near Detroit, Michigan. Indiana was one of the next states recognized to have the beetle, having been discovered in northern Indiana in 2004. The adult beetles do not pose harm to the ash trees, as they nibble on ash foliage. The immature, or larvae stage, feed on the inner bark of the ash trees, disrupting its ability to transport nutrients and water. The EAB is responsible for killing millions of ash trees in North America. It has cost municipalities, property owners, nursery owners, and forest industries millions of dollars.

Vector-Borne Illness

Vector-borne diseases are caused by infectious microorganisms that are transmitted to people via living organisms including blood-sucking arthropods such as mosquitos, ticks, fleas, and spiders. Natural disasters, particularly meteorological events such as cyclones, hurricanes, and flooding, can influence transmission of vector-borne disease. The crowding of infected and vulnerable hosts, a debilitated public health infrastructure, and disruptions of ongoing control processes are risk factors for transmission of vector-borne disease. The Indiana State Department of Health (ISDH) identifies sleeping sickness (Eastern equine encephalitis virus), La Crosse encephalitis (La Crosse virus), St. Louis encephalitis (St. Louis encephalitis virus), West Nile fever (West Nile virus), and dengue fever (dengue virus), as mosquito-borne diseases that Hoosiers should take steps to protect themselves against.

The health department has also reported more than 200 cases of tick-borne illness in Indiana in 2016 alone. The ISDH highlighted Lyme disease, Rocky Mountain spotted fever, and Erlichiosis as tick-borne diseases particularly prevalent in Indiana. Over the past few years, Indiana has experienced a rise in tick-borne Lyme disease. There were approximately 100 confirmed cases of Lyme disease in 2014, but only 26 cases in 2006. Increased summer tick populations frequently follow mild winters, and back-to-back mild winters can cause a notable surge in tick numbers, along with the diseases they carry. In June of 2017, a young Indiana girl died after contracting Rocky Mountain spotted fever from a tick bite. Recently, a new tick-transmitted virus has made headlines through the state. The Centers for Disease Control confirmed two cases of Heartland virus in Indiana. Both infected patients survived.

4.3.11.2 Infectious Agents or Harmful Organisms History in Wells County

Emerald Ash Borer

EAB has been detected in Wells County, Indiana. As of 2017, the entire state of Indiana lies within the Federal quarantine boundaries and Wells County lies within the state-quarantined area.

Vector-Borne Illness

Mosquitoes carrying West Nile (WNV) virus have been found in Wells County every year since 2013. In 2012, the CDC reported at least one case of a human carrying WNV. Most people who get infected with West Nile virus will have either no symptoms or mild symptoms, but a few individuals may contract a more severe form of the disease.

4.3.11.3 Geographic Location for Infectious Agents or Harmful Organisms

Emerald Ash Borers are most commonly found in forested areas but can also negatively impact neighborhoods or any other areas that have trees.

Mosquitos are drawn to areas of standing water and are commonly most active at dusk and dawn; however, all areas are affected by mosquito populations.

4.3.11.4 Hazard Extent for Infectious Agents or Harmful Organisms

An exposure analysis identifies the existing and future assets located in identified hazard areas. The areas with reported identification of the EAB in Wells County are identified in Figure 47 with magenta dots. The points shown are collected from DNR annual surveys and from the DNR Division of Entomology and Plant Pathology field staff. According to the Department of Natural Resources, a live larva must be collected from an ash tree and identified by a trained specialist in order to confirm the presence of EAB at the marked location. There may be more locations with EAB that have not been identified.

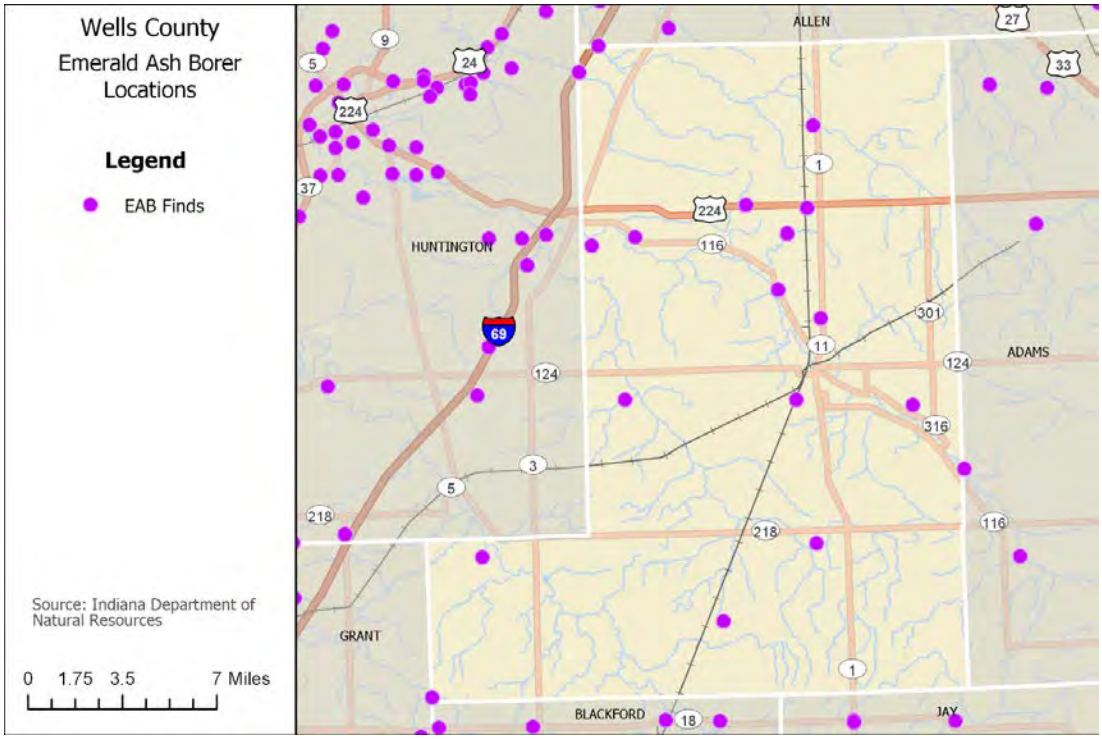

Figure 47. Emerald Ash Borer in Wells County (Map courtesy of IDNR)

4.3.11.5 Risk Identification for Infectious Agents or Harmful Organisms

In Meeting #2, the planning team determined that the probability of an infectious agent or harmful organism hazard as possible with critical consequences. The warning time for an infectious agent or harmful organism hazard is about 6 to 12 hours with a duration of less than 1 week. The calculated CPRI for harmful organisms is 2.65.

4.3.11.6 Vulnerability Analysis for Infectious Agents or Harmful Organisms Hazard

All communities can be potentially at risk for an epidemic and experience increased risk during hazards the cause displacement, contamination of the water supply, and/or deprivation of essential utilities, or when residents are not exposed to educational resources outlining preventive steps.

4.3.11.7 Community Development Trends and Future Vulnerability

Future development will remain vulnerable to these events. EABs have killed millions of ash trees in Indiana, Michigan, Illinois, Ohio, and Ontario and will continue to do so until the insects are effectively contained or eliminated or a strain of more resistant trees is developed.

According to the National Institute of Allergy and Infectious Diseases, tick-borne illnesses will continue to remain a problem as people build homes in wilderness areas where ticks and their animal hosts live; however, urban environments can also host ticks and the pathogens they can transmit.

Eliminating areas of standing water may help diminish the disease-carrying mosquito population by removing or treating stagnant bodies of water areas that serve as mosquitos' breeding grounds.

4.3.11.8 Relationship to other Hazards

The risk for infectious disease transmission is primarily associated with displacement and the characteristics of the displaced population, the proximity of sterile water and function restrooms, the nutritional status of the displaced, the level of immunity to vaccine-preventable infections, and the availability of access to healthcare services.

Flooding – Increased risk of vector-borne diseases. EAB-damaged trees may pose a risk for increased logjam events. In the aftermath of flooding, a plethora of standing water combined with a possibly weakened health infrastructure and an interruption of ongoing control programs increases the risk factors for vector-borne disease transmission. While initial flooding may wash away existing mosquito-breeding sites, standing water caused by heavy rainfall or overflow of rivers can create new breeding sites.

Earthquake – In the aftermath of earthquakes, some populations have experienced infection outbreaks associated with increased exposure to airborne dust from landslides.

Tornadoes – Natural disasters like tornadoes, which impact communities on a large-scale and cause displacement, have been associated with an increased risk in disease.

Utility Failure – Power outages and the disruption of water treatment and supply plants can affect the proper functioning of health facilities and has also been linked with an increase in diarrheal illness.

5 Mitigation Goals and Strategies

The goal of mitigation is to protect lives and build disaster-resistant communities through minimizing disruptions to local and regional economies, reducing the future impacts of hazards including property damage, and supporting best use practices for public and private funds spent on recovery assistance. This chapter discusses the general mitigation vision and mitigation goals to reduce or avoid long-term vulnerabilities to the hazards identified in the proceeding chapter. Successful mitigation actions and projects are based on well-constructed risk assessments, which are provided in Chapter 4.

5.1 Community Capability Assessment

The capability assessment identifies current activities used to mitigate hazards. The capability assessment identifies the policies, regulations, procedures, programs, and projects that contribute to the lessening of disaster damages. The assessment also provides an evaluation of county capabilities to determine whether the activities may be improved to more effectively reduce the impact of future hazards. The following sections highlight the existing plans and mitigation capabilities within all of the communities.

5.1.1 Planning and Regulatory

Planning and regulatory capabilities include the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. In the following subsection, the team details the NFIP program and local plans, codes, and ordinances in place that serve to make the county more resilient to disasters.

5.1.1.1 National Flood Insurance Program (NFIP)

According to FEMA, the NFIP is a federal program created by Congress to mitigate future flood losses nationwide through community-enforced building and zoning ordinances and to allow access to affordable, federally-backed flood insurance protection for property owners. Providing an insurance alternative to disaster assistance, the NFIP is designed to alleviate the escalating costs of repairing flood damage to buildings and their contents. If communities participate in the NFIP through adopting and enforcing a floodplain management ordinance to reduce future flood risks to new construction in SFHAs, the federal government has agreed to make flood insurance available within the community as a financial protection against flood losses. In order to remain eligible for future mitigation funds, NFIP communities must adopt either their own MHMP or participate in the development of a multi-jurisdictional MHMP.

Wells County, the City of Bluffton, and the Towns of Ossian, and Vera Cruz participate in the NFIP. The total number of policies, written premiums in-force, and coverage of insurance in-force are identified in the following table.

Table 31. NFIP Policies and Coverage

NFIP Community	Total Number of Policies	Insurance In-force whole	Written Premium in-force
Wells County	31	$6,066,800	$16,213
City of Bluffton	21	$7,720,100	$15,834
Town of Ossian	11	$2,475,000	$4,567
Town of Vera Cruz	2	$490,000	$2,865

In order to assure coverage is available for all policy holders, the county and its NFIP communities will assure the continued compliance of the state floodway and NFIP requirements.

The Indiana Flood Control Act grants the IDNR regulatory control over floodway areas in any state waterway (streams less than 1 square mile in drainage area). Within the Flood Control Act, the General Assembly created a permitting program. Two of the fundamental provisions of the Act's regulatory programs consist of the following:

1. An abode or place of residence may not be constructed or placed within a floodway.
2. Any structure, obstruction, deposit, or excavation within a floodway must receive written approval from the Director of the Department of Natural Resources for the work before beginning construction.

The DNR is the Cooperating Technical Partner for the FEMA Floodplain Mapping program and provides floodway site determinations upon request. The DNR performs both the Community Assistance Call (CAC) and Community Assistance Visit (CAV) for the NFIP program. The CAV and CAC serve as each NFIP communities' assurance that the community is adequately enforcing its floodplain management regulations and prices opportunities for technical assistance by the DNR on behalf of FEMA.

The NFIP's Community Rating System (CRS) recognizes and encourages community floodplain management activities that exceed the minimum NFIP standards. Depending upon the level of participation, flood insurance premium rates for policyholders can be reduced. Besides the benefit of reduced insurance rates, CRS floodplain management activities enhance public safety, reduce damages to property and public infrastructure, avoid economic disruption and losses, reduce human suffering, and protect the environment. Technical assistance on designing and implementing some activities is available at no charge. Participating in the CRS provides an incentive to maintaining and improving a community's floodplain management program over the years. Wells County is an active participant in the CRS, the county and communities of Bluffton, Ossian, and Vera Cruz all participate. Bluffton & Vera Cruz receive 15% discounts on policies within the SFHA and Ossian receives a 10% discount.

5.1.1.2 Plans and Ordinances

Wells County and its incorporated communities have a number of plans and ordinances in place to ensure the safety of residents and the effective operation of communities. These include the Soil Survey of Wells County and the Wells County Comprehensive Plan. Information was collected through surveys with plan team representatives of the county, cities, and towns. The results of these surveys can be found in Appendix F. The review of this information was used to inform the development of mitigation strategies for the 2017 plan update.

Table 32. Jurisdictions Planning Mechanisms (The floodplain ordinance date is based upon the currently effective map date provided by the FEMA status book report for Communities Participating in the National Flood Program.)

Capabilities	Wells County	Bluffton	Markle	Ossian	Poneto	Uniondale	Vera Cruz	Zanesville
Planning								
Comprehensive Plan	County 2014							
Capital Improvements Plan	2015	Yes	2016	Yes	No	No	County	County
Economic Development Plan	County 2018							
Emergency Operations Plan	2019							
Transportation Plan	2019	Yes	-	Yes	Yes	County	County	County
Watershed Plan	Lower Salamonie (2014)/Upper Wabash (2016)							
Resilience Report	2012							
Ordinances								
Zoning Ordinance	Yes (APC)	Yes (APC)	Yes (Town/Huntington)	Yes (APC)	Yes (APC)	County	Yes	County
Building Codes/ Ordinance	Yes	Yes (APC)	Yes (Huntington)	Yes (APC)	Yes (APC)	County	Yes	County
Floodplain Ordinance	Yes (APC) 2014	Yes (APC)	Yes (Town, Wells & Huntington)	Yes (APC)	Yes (APC)	County	Yes	County
Storm Water Ordinance	Yes	No	Yes (Town/Huntington)	Yes (County)	No	County	No	County
Erosion Ordinance	State Erosion Control Rule 5 (327 IAC 15-5)							

Many of these plans or policies can help implement the goals, objectives and strategies in Wells County's MHMP. The Wells County Emergency Management Director is responsible for meeting within each jurisdiction yearly throughout the next five years. During these meetings, the local

Emergency Management Director will review all Local Planning Mechanisms and collaborate with the Cities and Towns to ensure the MHMP is becoming as integrated into local plans as possible. These Local Planning Mechanisms are meant to work cooperatively together in order to ensure the health, safety, and welfare of Wells County and its corresponding jurisdictions. Although only one of the planning mechanisms has been updated since the initial hazard mitigation plan was adopted city, town, and county officials will integrate related plans with hazard mitigation goals, objectives, and strategies when feasible and appropriate.

5.2 General Mitigation Goals

In Section 4.0 of this plan, the risk assessment identified a number of natural hazards that Wells County experiences. The MHMP planning team members understand that although hazards cannot be eliminated altogether, Wells County can work toward building disaster-resistant communities. Following are a list of goals, objectives, and actions identified in the previous Wells County MHMP. These goals remain valid and represent long-term, broad visions of the overall vision the county would like to achieve for mitigation. The objectives are strategies and steps that will assist the communities in attaining the listed goals.

Goal 1: Lessen the impacts of hazards to new and existing infrastructure

- Objective (a): Retrofit critical facilities and structures with structural design practices and equipment that will withstand natural disasters and offer weather-proofing.
- Objective (b): Equip public facilities and communities to guard against damage caused by secondary effects of hazards.
- Objective (c): Minimize the amount of infrastructure exposed to hazards.
- Objective (d): Evaluate and strengthen the communication and transportation abilities of emergency services throughout the community.
- Objective (e): Improve emergency sheltering in the community.

Goal 2: Create new or revise existing plans/maps for the community

- Objective (a): Support compliance with the NFIP.
- Objective (b): Review and update existing, or create new, community plans and ordinances to support hazard mitigation.
- Objective (c): Conduct new studies/research to profile hazards and follow up with mitigation strategies.

Goal 3: Develop long-term strategies to educate community residents on the hazards affecting their county

- Objective (a): Raise public awareness on hazard mitigation.
- Objective (b): Improve education and training of emergency personnel and public officials.

5.3 Mitigation Actions and Projects

Upon completion of the risk assessment and development of the goals and objectives, the planning committee was provided a list of the six mitigation measure categories from the FEMA State and Local Mitigation Planning How to Guides. The types of mitigation actions are listed as follows:

- **Prevention**: Government, administrative, or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**: Actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from the hazard area. Examples include acquisition, elevation, structural retrofits, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness**: Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- **Natural Resource Protection**: Actions that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Emergency Services**: Actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
- **Structural Projects**: Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

Implementation of the mitigation plan is critical to the overall success of the mitigation planning process. The first step is to decide, based upon many factors, which action will be undertaken first. In order to pursue the top priority first, an analysis and prioritization of the actions is important. The plan team assessed the status and priority of the existing strategies using the FEMA mitigation evaluation criteria using the STAPLE + E criteria. Table 33 lists the factors to consider in the analysis and prioritization of actions. Some actions may occur before the top priority due to financial, engineering, environmental, permitting, and site control issues. Public awareness and input of these mitigation actions can increase knowledge to capitalize on funding opportunities and monitoring the progress of an action.

Table 33. STAPLE+E Criteria

Criteria	Description
S – Social	Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.
T – Technical	Mitigation actions are technically most effective if they provide a long-term reduction of losses and have minimal secondary adverse impacts.
A – Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
P – Political	Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support for the action.
L – Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
E – Economic	Budget constraints can significantly deter the implementation of mitigation actions. It is important to evaluate whether an action is cost-effective, as determined by a cost benefit review, and possible to fund.
E – Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, comply with federal, state, and local environmental regulations, and are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Understanding the dynamics of STAPLE + E lead to the project's success. Developing questions evolving around the evaluation criteria, similar to those outlined below, help the team prioritize the projects.

Social:

- Will the proposed action adversely affect one segment of the population?
- Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?

Technical:

- How effective is the action in avoiding or reducing future losses?
- Will it create more problems than it solves?
- Does it solve the problem or only a symptom?
- Does the mitigation strategy address continued compliance with the NFIP?

Administrative:

- Does the jurisdiction have the capability (staff, technical experts, and/or funding) to implement the action, or can it be readily obtained?
- Can the community provide the necessary maintenance?
- Can it be accomplished in a timely manner?

Political:

- Is there political support to implement and maintain this action?
- Is there a local champion willing to help see the action to completion?
- Is there enough public support to ensure the success of the action?
- How can the mitigation objectives be accomplished at the lowest cost to the public?

Legal:

- Does the community have the authority to implement the proposed action?
- Are the proper laws, ordinances, and resolution in place to implement the action?
- Are there any potential legal consequences?
- Is there any potential community liability?
- Is the action likely to be challenged by those who may be negatively affected?
- Does the mitigation strategy address continued compliance with the NFIP?

Economic:

- Are there currently sources of funds that can be used to implement the action?
- What benefits will the action provide?
- Does the cost seem reasonable for the size of the problem and likely benefits?
- What burden will be placed on the tax base or local economy to implement this action?
- Does the action contribute to other community economic goals such as capital improvements or economic development?
- What proposed actions should be considered but be “tabled” for implementation until outside sources of funding are available?

Environmental:

- How will this action affect the environment (land, water, endangered species)?
- Will this action comply with local, state, and federal environmental laws and regulations?
- Is the action consistent with community environmental goals?

5.3.1 Hazard Mitigation Actions

Wells County and its included municipalities share a common Hazard Mitigation plan and worked closely to develop it. These communities work together with their city councils and the Wells County Emergency Management Director to insure that the hazards and mitigation

actions included in this plan are accurate and addressed in their jurisdictions. The jurisdictions responsible for each action consist of the following:

- Wells County
- Bluffton
- Markle

Table 34 lists all mitigation actions for Wells County and its jurisdictions. Each of these mitigation action charts detail the hazard, the mitigation action to address the identified hazard, its current stage of implementation, the timeframe for implementation going forward, the jurisdictions who have identified they will work to implement the action, the responsible parties to carry through with implementation, and comments on how the plan will be implemented through existing planning mechanisms and funding to make implementation happen.

Additionally, the Wells County planning team assigned the mitigation actions priority rankings for implementation (1=High Priority; 2= Moderate Priority; 3= Low Priority). Mitigation actions given a “high” priority ranking will ideally be implemented within 5 years of the MHMP plan adoption date. Mitigation actions ranked as a “medium” priority may be addressed within 5-10 years from the MHMP plan adoption date, and “low” priority mitigation actions may take over 10 years before action completion. Although higher ranking priorities may constitute a greater county concern than lower ranking priorities, the availability of funds may cause some mitigation actions to take longer to implement.

All of the mitigation actions identified in the 2014 Wells County Hazard Mitigation Plan have been carried over into the 2020 plan based on the advisement of the Wells County Emergency Management Director and the consensus of the steering committee. Not all of the 2015 mitigation actions have been fully completed, and they are identified in the 2020 plan to reflect their ongoing implementation.

The status designations include the following:

- **Identified** – actions are in the preliminary stages and have not yet started
- **Complete** – the action is complete
- **Ongoing** – actions require continuing application
- **In Progress** – actions are currently being acted upon
- **Deferred** – no progress has been made
- **Deleted** – the action is no longer relevant

The mitigation action types encompass the following areas:

- **Prevention** – expand mapping, loss-prevention programs, buyouts, regulations

- **Property Protection** – identify vulnerable areas and populations, retrofit vulnerable buildings, structural improvement
- **Public Education** – information sessions, presentations, disclosure, website information, brochures, educational resources, and hazard awareness
- **Natural Resource Protection** – conservation, erosion control, stream corridor restoration, wetland restoration, resource management
- **Emergency Services** – emergency alerts, evacuation plans, expand emergency operations
- **Structural Improvement** – acquisitions and elevations of structures in flood prone areas, structural retrofits, retaining walls, retention structures, culverts, and safe rooms.

5.3.2 Mitigation Actions by Community

This is a multi-jurisdictional plan that covers Wells County and the communities of BLANK. The Wells County risks and mitigation activities identified in this plan also incorporate the concerns and needs of townships and other entities participating in this plan.

Table 34. Mitigation Actions

#	Hazards Addressed	Mitigation Action Type	Goals & Objectives Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
1	Flood	Property Protection	Goal 2; Objective a	Zanesville to participate in NFIP	Zanesville	Complete	High	Local Authorities		2015 MHMP
2	Flood, Thunderstorm, Dam/Levee Failure	Property Protection	Goal 2; Objective a	Participate in the CRS	Wells County, Bluffton, Markle, Ossian, Poneto, Uniondale, Vera Cruz, Zanesville	Complete	High			2015 MHMP
3	Flood, Winter Storm	Structural Projects	Goal 1; Objective c	Repair exposed water line north of sewage treatment plant (damaged as result of fluvial erosion)	Ossian	Complete	Medium	INDOT, IDHS, Silver Jackets	IDHS, OCRA	2015 MHMP
4	Flood	Property Protection	Goal 1; Objective c	Fabricate hoppers donated from a local casting company to make large sand reservoirs for bagging sandbags	Wells County, Bluffton, Markle, Ossian, Poneto, Uniondale, Vera Cruz, Zanesville	Complete	Medium	FEMA, Adams County		2015 MHMP
5	Flood,	Prevention	Goal 1; Objective c	Post flood gates in flood prone areas for community residents to maintain safe distances	Wells County	Identified	High	Highway Dept., City of Bluffton	INDTO, PDM	2015 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals & Objectives Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
6	Flood	Structural Project	Goal 1; Objective d	Bridge encroachment over Route 1 to provide direct transportation in flood event. Improve bridges located at 300N and 300W, and restructure the Main Street bridge which is already weakened and vulnerable to encroaching water pressure.	Bluffton	Identified	High	County Highway Dept., INDOT	IDHS, PDM	2015 MHMP
7	Flood	Property Protection	Goal 1; Objective c	Provide protective measures for sewage treatment plant	Ossian	Identified	High	Town of Ossian	PDM, Local Funds	2015 MHMP
8	Flood	Property Protection	Goal 1; Objective c	Mobile home park removal along Eight Mile Creek	Wells County, Zanesville	Identified	High	Building Code Department, Planning Commission	FEMA	2015 MHMP
9	Flood	Prevention	Goal 1; Objective c	Elevate utilities of or add generators to businesses that frequently flood on the NE side of Bluffton	Bluffton	Identified	High	Building Code Department		2015 MHMP
10	Flood	Property Protection	Goal 1; Objective c	Acquire potential buyouts of business properties on Main Street that were damaged in 2003 & 2015 flood	Bluffton	Identified	Medium	Floodplain Administrator	PDM, Local Funds	2015 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals & Objectives Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
11	Flood, Fire, Hazmat	Structural Improvement	Goal 1; Objective c	Mitigate frequent flooding in area near Keystone (old 1000 S and 200W) with improved culvert or detention basin	Wells County	Identified	Low	EMA, Public Works	FEMA	2015 MHMP
12	Drought	Natural Resource Protection	Goal 2, Objective b	Propose a water use ordinance to prioritize or control water usage during drought conditions, particularly for emergency situations like fire fighting	Wells County, Bluffton, Markle, Ossian, Poneto, Uniondale, Vera Cruz, Zanesville	Identified	Low	Each town's Fire Dept.	Local Funds	2015 MHMP
13	Flood	Structural Projects	Goal 1; Objective c	Relocate Town Hall out of floodplain	Vera Cruz	Identified	Low	Town of Vera Cruz	FEMA	2015 MHMP
14	Flood, Flash Flood	Structural Projects	Goal 1; Objective c	Upsize culverts; 850N at Sr 1 & Woodcreek Dr.	Ossian	Identified	Medium	Town of Ossian	PDM	2020 MHMP
15	Summer Storms, Tornado	Emergency Services	Goal 1: Objective e	Install safe rooms in local schools, Southern Wells County & Northern Wells County Schools	Wells County	Identified	Medium	Southern Wells Community Schools, Northern Wells Community Schools, EMA, IDHS	PDM	2020 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals & Objectives Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
16	Flooding	Prevention	Goal 2; Objective c	Investigate Flooding problems near Liberty Center	Wells County	Identified	Medium	EMA	PDM	2020 MHMP
17	Flood, Thunderstorm, Extreme Temp, Winter Storm, Tornado, Fire, Drought, Earthquake, Dam/Levee Failure, Hazmat	Prevention	Goal 2; Objective c	Obtain better data (historical and projected) on the impacts of disasters to re-evaluate and more accurately quantify the vulnerability to humans and the economy	Wells County, Bluffton, Markle, Ossian, Poneto, Uniondale, Vera Cruz, Zanesville	In Progress	High	EMA, Surveyor	PDM	2015 MHMP
18	Flood, Thunderstorm, Extreme Temp, Winter Storm, Tornado, Fire, Earthquake, Dam/Levee Failure	Property Prevention	Goal 2; Objective c	Perform a needs assessment for back-up generators at critical facilities to prioritize the order in which generators will be purchased. Establish a plan to purchase these generators	Wells County, Bluffton, Markle, Ossian, Poneto, Uniondale, Vera Cruz, Zanesville	In Progress	High	EMA	PDM	2015 MHMP
19	Flood	Prevention	Goal 1; Objective c	Increase size of storm sewer to improve drainage	Wells County, Bluffton, Markle, Ossian, Poneto, Uniondale, Vera Cruz, Zanesville	In Progress	High	Public Works, Highway Dept, Drainage Board	FEMA	2015 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals & Objectives Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
20	Flood	Natural Resource Protection	Goal 1; Objective c	Remove log jams on Eight Mile Creek	Wells County, Zanesville	In Progress	High	Public Works	Local Funds	2015 MHMP
21	Flood	Property Protection	Goal 1; Objective c	Flood insurance outreach on Eight Mile Creek located along N 300W 90	Wells County, Zanesville	In Progress	High	Building Code Department, Planning Commission	FEMA	2015 MHMP
22	Flood	Structural Projects	Goal 1; Objective c	Complete culvert improvements along SR 201	Wells County	In Progress	Medium	Public Works, INDOT, County Highway	Local Funding, IDHS, OCRA	2015 MHMP
23	Flood	Structural Projects	Goal 1; Objective c	Upsize culvert on SR 218 east of Poneto	Poneto	In Progress	Medium	Public Works	Local Funding, IDHS, OCRA	2015 MHMP
24	Hazmat	Structural Projects	Goal 1; Objective c	Connect Adams Street & Hoosier Highway	Wells County	In Progress	High	County Hwy, INDOT	INDOT	2020 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals & Objectives Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
25	Flood, Flash Flood, Hazmat	Structural Projects	Goal 1; Objective c	County Home Road & CR 450 East Realignment. Redirecting potentially hazardous materials being transported away from Six-Mile Creek.	Wells County	In Progress	High	County Hwy, INDOT	INDOT	2020 MHMP
26	Hazmat	Emergency Services	Goal 3, Objective b	Continue to develop/improve the Wells County Hazardous Materials Response Plan	Wells County	On Going	Medium	LEPC	PDM, Local Funds	2015 MHMP
27	Flood	Emergency Services	Goal 3, Objective b	Continue annual hands-on ice rescue scenario practices for the County Ice Rescue Team	Wells County, Bluffton, Markle, Ossian, Poneto, Uniondale, Vera Cruz, Zanesville	On Going	Medium	Town of Ossian Fire Dept., Town of Bluffton Fire Dept., Liberty Township Fire Dept.	Local Funds	2015 MHMP
28	Flood, Fire, Hazmat	Emergency Services	Goal 2, Objective b	Develop emergency response plan for ethanol plant	Wells County	On Going	Medium	EMA	Local Funding	2015 MHMP
29	Flood, Flash Flood	Structural Projects	Goal 1; Objective c	Work on roads and bridges subject to river and flash flooding	Wells County	On Going	High	County Hwy	Local Funds, INDOT	2020 MHMP

#	Hazards Addressed	Mitigation Action Type	Goals & Objectives Met	Mitigation Action	Jurisdictions Covered	Status	Priority	Responsible Agency	Potential Funding Source	Source
30	Flood, Thunderstorm, Extreme Temp, Winter Storm, Tornado, Fire, Drought, Earthquake, Dam/Levee Failure, Hazmat	Public Education	Goal 3, Objective a	Provide a public awareness community out-reach exercise where all local emergency responders & volunteers promote fire safety, cold weather safety, severe weather safety (Alert radios), and general health and safety	Wells County, Bluffton, Markle, Ossian, Poneto, Uniondale, Vera Cruz, Zanesville	On Going	Medium	EMA, Local Fire Dept.	Local Funds, IDHS	2015 MHMP

6 Chapter 6 – Plan Maintenance and Implementation

6.1 Implementation and Maintenance

The Wells County MHMP is intended to serve as a guide for dealing with the impact of both current and future hazards for all people and institutions within the jurisdiction. As such it is not a static document but must be modified to reflect changing conditions if it is to be an effective plan. The goals, objectives and mitigation strategies will serve as the action plan. Even though individual strategies have a responsible party assigned to it to ensure implementation, overall responsibility, oversight, and general monitoring of the action plan has been assigned to the Wells County Emergency Management Director.

Goals identified by the county will be addressed by the County Commission and the Town and City Councils will be responsible for implementing their corresponding strategies.

It will be the community's responsibility to gather a Local Task Force to update the Multi-Hazard Mitigation Plan on a routine basis. Every year, the County Emergency Management Director will call a meeting to review the plan, mitigation strategies and the estimated costs attached to each strategy. All participating parties of the original Local Task Force and cities will be invited to this meeting. Responsible parties will report on the status of their projects. It will be the responsibility of the committee to evaluate the plan to determine whether:

- Goals and objectives are relevant.
- Risks have changed.
- Resources are adequate or appropriate.
- The plan as written has implementation problems or issues.
- Strategies have happened as expected.
- Partners participating in the plan need to change (new and old).
- Strategies are effective.
- Any changes have taken place that may affect priorities.
- Any strategies should be changed.

In addition to the information generated at the Local Task Force (LEPC and CEMP) meetings, the County Emergency Management Director will also annually evaluate the Multi-Hazard Mitigation Plan and update the plan in the event of a hazardous occurrence. After the fourth annual update meeting, the Wells County Emergency Management Director will finalize a new Local Task Force to begin the required five-year update process. This will be accomplished in coordination with Wells County jurisdictions and the entire Multi-Hazard Mitigation Plan shall be updated and submitted to FEMA for approval (within 5 years of plan adoption). These revisions will include public participation by requiring a public hearing and published notice in addition to multiple Local Task Force meetings to make detailed updates to the plan.

Public participation for updates is as critical as in the initial plan. Public participation methods that were used in the initial writing will be duplicated for any future update processes – direct mailing list of interested parties, public meetings, press releases, surveys, questionnaires, and resolutions of participation and involvement. Additional methods of getting public input and involvement are encouraged, such as placing copies of the plan in the Wells County Emergency Management Director's office and the offices of the participating incorporated communities in addition to placing the plan on the Wells County and social media websites. Furthermore, jurisdictions will be encouraged to place a notice on their websites stating the plan is available for review at the city offices. Notifications of these methods could be placed in chamber newsletters and local newspapers. Committee responsibilities will be the same as with updates.

Chapters 5 focuses on mitigation strategies for natural hazards and jurisdiction-specific mitigation strategies for both natural and man-made/technological hazards. The Multi-Hazard Mitigation Plan proposes a number of strategies, some of which will require outside funding in order to implement. If outside funding is not available, the strategy will be set aside until sources of funding can be identified. In these situations, Wells County and cities will also consider other funding options such as the county's/cities'/towns' general funds, bonding and other sources. Based on the availability of funds and the risk assessment of that hazard, the county will determine which strategies should be continued and which should be set aside. Consequently, the action plan and the risk assessment serves as a guide to spending priorities but will be adjusted annually to reflect current needs and financial resources.

The last step requires an evaluation of the strategies identified in the goals and policies framework, selecting preferred strategies based on the risk assessment, prioritizing the strategy list, identifying who is responsible for carrying out the strategy, and the timeframe and costs of strategy completion. Wells County and its jurisdictions have incorporated the preferred strategies including identification of the responsible party to implement, the timeframe and the cost of the activity with the goals and policies framework.

6.2 Local Plan Integration

The Hazard Mitigation Planning Team and the Local Task Force members shall recognize this document as an important planning tool for their communities and will recommend its use as a reference as their communities complete other related plans. The county Emergency Management Director will contact the Wells County Community Development Executive Director and the City of Wells Department of Development & Redevelopment Director to ensure they will use this plan as they update their Comprehensive Plan as well as any other relevant community ordinances such as zoning, floodplain, capital improvement plans, etc. The county Emergency Management Director shall also contact the head of other departments as they work other stand-alone plans that might relate to this one or its strategies such as those for park and recreation, sustainability, etc. As each planning mechanism is updated, the Local

Task Force will reevaluate the status of the mitigation strategies and determine whether any changes in them is needed.

The Emergency Management Advisory Council (EMAC) will continue to serve as the advisory body that provides general supervision and control over the emergency management and the disaster programs for the county and its multiple jurisdictions. The quarterly meetings will continue to be available to the public and other mitigation team members through the EMAC and other mitigation projects avenues such as RiskMAP.

6.3 Adoption, Implementation and Maintenance

6.3.1 County Adoption

One of the first steps in implementing the plan is to make sure that it is officially adopted in a public hearing. The task force and public provided comment on the draft plan. The task force reviewed comments, modifications were made and a final draft was sent to FEMA for review, comment and approval. After FEMA approved the plan, the county board adopted the plan. A public hearing was held to obtain any additional comments that the public or others wished to make. A copy of the county and the community jurisdictions resolutions to adopt are located in Appendix G.

6.3.2 City and Town Adoption

The Multi-Hazard Mitigation Plan for Wells County is a multijurisdictional plan. All communities in the county – towns and cities – were involved in the various stages of the planning process and a mitigation strategies have been identified for each jurisdiction. Each of Wells County's cities and towns passed resolutions to participate in the county plan. Following official adoption of the plan by the county each city and township was notified. Each chose whether or not to adopt the plan as well. Each were encouraged to adopt enabling them to apply for HMGP funds independently not under the umbrella of the county. Copies of the city and towns resolutions choosing to adopt the plan are in Appendix G.

6.3.3 Implementation and Maintenance Guidelines.

The Wells County Multi-Hazard Mitigation Plan is intended to serve as a guide/reference to mitigate the impact of both current and future hazards for all county residents and institutions. As such, it is not a static document but must be modified to reflect changing conditions if it is to be an effective plan. The goals, objectives and mitigation strategies will serve as a work or action plan. Individual strategies have a party assigned to it to help ensure implementation, oversight and general monitoring of the action plan; however, oversight has been assigned to the County Emergency Manager. The following guidelines will help implement the goals, objectives and strategies of the plan. An implementation committee will be used to assist in this

process. The existing task force, the planning commission, other appropriate county committee, or any other group of stakeholders could serve as the implementation committee to review implementation opportunities identified in the plan. Implementation of strategies should be a collaborative effort of the participating jurisdictions. This committee should operate by group consensus and create recommendations for implementation to bring forward to the proper governing entity for consideration. Guidelines for the committee include:

1. Commitment to the plan and overall mitigation vision.
2. Protect sensitive information.
3. Take inventory of strategies in progress.
4. Determine strategies that no longer are needed or new strategies that have emerged.
5. Set priorities. Assign responsibilities to complete.
6. Seek funding.
7. Meet minimum bi-annually – one meeting to set the course of action and a second to monitor progress.
8. Report to all respective boards for action.
9. Advisory capacity.

Assigning strategies and implementation activities in this plan to certain entities does not guarantee completion. The strategies and activities addressed in this plan will be addressed as funding and other resources become available and approval by the responsible jurisdiction takes place.

The County Emergency Manager has the overall responsibility of tracking the progress of mitigation strategies. The County Emergency Manager will request updates from responsible agencies and cities on their mitigation actions after each disaster and at least annual to coincide with plan evaluation. Post disaster monitoring will evaluate the effectiveness of mitigation actions that have been completed and determine implementation of planned strategies. Monitoring may lead to developing a project that may be funded by FEMA's Hazard Mitigation Assistance Programs.

6.3.3.1 Continued Public Involvement

Annual reviews to change the plan will be led by the County Emergency Manager using the implementation committee. It will be their responsibility to review the plan and mitigation. FEMA strongly encourages annual reviews of the planning documents on the anniversary of the plan approval. Responsible parties and the implementation committee will report on the status of their projects. Committee responsibility will be to evaluate the plan to determine whether:

- Goals, objectives and strategies are relevant.
- Risks that have changed including the nature, magnitude, and/or type of risks.

- Resources are adequate or appropriate.
- The plan as written has any implementation problems or issues.
- Deadlines are being met as expected.
- Partners participating in the plan are appropriate.
- Strategies are effective.
- New developments affecting priorities.
- Strategies that should be changed.

Updates every five years are led by the County Emergency Management Agency Director in coordination with incorporated communities to complete a rewrite for submitting to FEMA. A task force, similar to the one created to complete the plan, will be formed and used in the planning process to rewrite the plan. These revisions will include public participation by requiring a public hearing and published notice. Future updates should address potential dollar losses to vulnerable structures identified. Any major changes in the plan may include additional public meetings besides just a public hearing.

Public participation for updates is as critical as in the initial plan. Public participation methods that were used in the initial writing should be duplicated for any updates – direct mailing list of interested parties, public meetings, press releases, surveys, questionnaires, and resolutions of participation and involvement. Additional methods of getting the public input and involvement are encouraged such as placing copies of the plan in public libraries for public comment or placing the plan on county and city websites. Notifications of these methods could be placed in newsletters and the local newspapers. Committee responsibilities will be the same with updates as the original plan.

The action plan proposes a number of strategies, some of which will require outside funding to implement. If outside funding is not available, the strategy may be set aside until sources of funding can be identified or modified to work within the funding restrictions. In these situations, the county and entities will also consider other funding options such as the county's general fund, bonding and other sources. Based on the availability of funds and the risk assessment of the hazard, the county will determine which strategies should they continue to work on and which should be set aside. Consequently, the action plan and the risk assessment serves as a guide to spending priorities but will be adjusted annually to reflect current needs and financial resources. It is not a legal binding document.

Updates require an evaluation of the strategies identified in the goals and policies framework, selecting preferred strategies based on the risk assessment, prioritizing the strategy list, identifying who is responsible for carrying out the strategy, and the timeframe and costs of strategy completion. Wells County has incorporated the preferred strategies including identification of the responsible party to implement, the timeframe and the cost of the activity in the plan framework.

This plan will be integrated into other county plans such as the County Comprehensive Plan, the County Water Plan, the County Transportation Plan, and all Emergency Operations Plans. Chapter one can serve as an executive summary to be attached to those plans as necessary. The County Board encourages jurisdictions to address hazards in their comprehensive plans, land use regulations, zoning ordinances, capital improvement and/or building codes by including some of the mitigation strategies in their plans. Many of the plans or policies can include strategies from the Hazard Mitigation Plan. They are meant to blend and complement each other so that strategies are duplicated and occur in different plans as appropriate.

Bibliography & Quick Reference

References are separated from the county specific resources. The Quick Reference is a guide to the federal & state programs discussed within the plan.

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U.S. Environmental Protection Agency. “Tire Fires: Extinguishing Tire Fires.” 3.epa.gov/epawaste.

U.S. Fire Administration. “Fire Prevention and Public Education.” www.usfa.fema.gov/statistics.

U.S. Fish and Wildlife Service: Endangered Species. “Indiana: County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species.” www.fws.gov/midwest/endangered/lists/indiana-cty.html.

United States Geological Society. Landslide Map of the Conterminous United States. https://landslides.usgs.gov/hazards/nationalmap/legend.php

United States Geological Society. USGS Definition of “Streamgage.” https://water.usgs.gov/nsip/definition9.html

United States Geological Society. “Earthquake Hazards Program.” http://earthquake.usgs.gov/learn/glossary/?termID=105.

United States Government Accountability Office. “Budgeting for Disasters: Approaches to Budgeting for Disasters in Selected States. “U.S. GAO, Mar. 2015. www.gao.gov/assets/670/669277.pdf.

Watson, John T., Michelle Gayer, Marie A. Connolly. “Epidemics after Natural Disasters.” National Center for Biotechnology Information. Emerging Infectious Diseases. Jan. 2007. ncbi.nlm.nih.gov/pmc/articles/PMC2725828.

County Specific Resources

Wells County Genealogy and History: http://genealogytrails.com/ind/wells/

Wells County History: http://sites.rootsweb.com/~inwells/history.html

Quick Reference State & Federal Programs

State Resources

All Agency, Indiana Drainage Handbook: http://www.in.gov/dnr/water/4893.htm

DNR, NFIP and Floodplain management resources: floodmaps.in.gov

DNR, lake and river construction regulations: http://www.in.gov/dnr/water/4963.htm

DNR authority under the Flood Control Act is further described: 312 IAC 10: Floodplain Management

DNR, LARE resource: “LARE Project Reports.” http://www.in.gov/dnr/fishwild/3303.htm

DNR, SHAARD: “SHAARD Database.” http://www.in.gov/dnr/historic/4505.htm

DNR, State historical county survey: http://www.in.gov/dnr/historic/2824.htm

DNR, Invasive Species, Gypsy Moth and EAB: http://www.in.gov/dnr/3123.htm to report, call: (317) 232-412

Evaluating Earthquake Losses due to Ground Failure and Identifying their Relative Contribution can be accessed through the following link: http://www.iitk.ac.in/nicee/wcee/article/13_3156.pdf.

IDEM, State Rule 5, Land Management: http://www.in.gov/idem/permits/water/wastewater/wetwthr/storm/rule5.html

IDEM, Meth Cleanup Information: http://www.in.gov/idem/health/2385.htm

IDNR, Water Shortage Plan: https://www.in.gov/dnr/water/files/watshplan.pdf

Indiana State Police, Meth Resources: https://socratadata.iot.in.gov/Government/ISP-Meth-Lab-Locations-Map/ktyc-iiu7

Indiana State Department of Health, HIV Outbreak: http://www.in.gov/isdh/files/2015_County_Profiles.pdf

INDOT, Traffic Wise, Real-time traffic Conditions: http://pws.trafficwise.org/pws/

INDOT, Preservation Initiative: http://www.in.gov/indot/3371.htm

Purdue, Invasive Species, EAB Resources: https://extension.entm.purdue.edu/EAB/

Federal Resources

EPA, Local Emergency Planning Committees: https://www.epa.gov/epcra/energize-your-local-emergency-planning-committees-lepc

EPA, Excessive Heat Events Guidebook: https://www.epa.gov/heat-islands/excessive-heat-events-guidebook

ESRI Map: https://www.arcgis.com/apps/PublicInformation/index.html?appid=4ae7c683b9574856a3d3b7f75162b3f4

Extreme Heat: https://www3.epa.gov/climatechange/pdfs/print_heat-deaths-2014.pdf

FEMA Training Guide: https://training.fema.gov/emiweb/is/is393a/is393.a-lesson4.pdf

FEMA, Commuter Emergency Plans: http://www.fema.gov/media-library/assets/documents/90370

FEMA, Safe Room Guidance: https://www.fema.gov/media-library/assets/documents/3140

FEMA, Local Mitigation Planning Handbook: https://www.fema.gov/media-library/assets/documents/31598

US Fish and Wildlife, endangered and threatened species:
https://www.fws.gov/midwest/endangered/saving/outreach.html

US Fish and Wildlife, Bat Children Resources:

https://www.fws.gov/midwest/endangered/mammals/inba/curriculum/InbaKidsCavesOhMy.pdf

USGS, FIM maps: http://water.usgs.gov/osw/flood_inundation/

USGS, NHD Data: https://nhd.usgs.gov/data.html

US Fish and Wildlife, Endangered and Threatened Species:
https://www.fws.gov/midwest/endangered/saving/outreach.html

Tornado Buffers: http://www.spc.noaa.gov/faq/tornado/ef-scale.html

Indiana State Department of Health County Profiles: http://www.in.gov/isdh/files/2015_County_Profiles.pdf

Appendix A: Multi-Hazard Mitigation Planning Team Meeting Documentation

Hazard Mitigation Plan Update Meeting Number: Wells County Date: 2/26/19

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Rick Velasquez	EMA Director	Wells	rvelasquez@wellscountyin.org	40-mi	
Robert Jeffers	Director, EMA	Huntington Co	robert.jeffers@huntington.in.us		
Butch Williams	Dep Dir. EMA	Huntington Co	butch.williams@huntington.in.us	40 mi.	
Susie Gentis	Wells Co. Area Plan	Wells	wcape@wellscounty.org	0	
Shawn Stafford	Eng Mngr/Valero	Wells	shawn.stafford@valero.com	—	
CHUCK King	County Council	WELLS	CKing@adamswells.com	—	
Josh Cotton	Hwy Super	Wells	josh.cotton@wellscounty.org	~	
Nate Rumschlag	Engineer-County	Wells	chengineer@wellscounty.org	—	
Mike Grant	Town of Markle	Town of Markle	PublicWorks@Markleindiana.com	—	
DON CRAIG	FIRE CHIEF	WELLS BLUFFTON	DON.CRAIG@BLUFFTONINDIANA.GOV		
TED SMITH	BUILDING COMMISSIONER	CITY OF BLUFFTON	BUILDING@CI.BLUFFTON.IN.US		
Susan Poper	Dir of Operations Bluffton Hospital	Wells	susan.poper@blufftonregional.com		
Jarrod Hahn	Wells Co. Surveyor	Wells	Surveyor@wellscounty.org		.5 hr
WAYNE GROVE	Wells EMA	Wells	WAYNE.GROVE@WELLSCOUNTY.ORG	~	
TED ELLIS	MAYOR	BLUFFTON	MAYOR@CI.BLUFFTON.IN.US	—	0.5 hr
Randy Steele	chief Deputy	wells	chiefdeputy@wellscountysheriff.com		
Scott Holliday	Sheriff	Wells Co	sheriff@wellscountysheriff.com		
Kyle Randall	Chief of Police	Bluffton	kyle.randall@blufftonindiana.gov		

Rick Piepenbrink wellscountyems Rpiepe@wellscountyems.org 2 miles 1 Hour

Hazard Mitigation Plan Update Meeting Number: Date: 4-10-19

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
WAYNE GROVE	EMA ADMIN.	Wells	W.		∅
DON CRAIG	FIRE CHIEF	WELLS		1	
Bill Horan	Purdue Extension/ Natural Resources	Wells	horan@purdue.edu		
Scott Blazak	Safety Manager		Scott.blazak@ Pretzels-INC.COM		
Steve DARNELL	Superintendent	Southern Wells Community Schools	SDARNELL@SWRAIDERS.COM	10	2 HRS
Mike Lautzenheiser	APC Director GIS / Flood	WELLS	GIS@wellscounty.org		2 Hrs
Nate Ramella	Engineer	Wells	cengineer@wellscounty.org	1	2 hr
Ray Johnson	County attorney	Wells Co	royrjohnson@adamswells.com	∅	1 hr
CHUCK KING	COUNTY COUNCIL	COUNTY WELLS	CKING@ADAMSWELLS.COM	∅	
Betsy Collier	Transportation Program Manager	Wells Co. Council on Aging	wcatpm@coolsky.com	1	
Steve Day	Wells County Solid Waste Mgr	Wells County Solid Waste District	Steve.Day@Wellscounty.org	1	
GENE VALOVICH	HAM OPERATOR	WELLS COUNTY AMATURE RADIO CLUB	KD9AKA@ADAMSWELLS.COM	0	
Jarrod Hahn	Wells Co. Surveyor	Wells County	Surveyor@wellscounty.org	0	
Jackie Borozan	Disaster Program Specialist	District 3	jackie-borozan@redcross.org	50	∅

Hazard Mitigation Plan Update Meeting Number:

Date: 4-10-19

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
David Lefforge	Resource Specialist Indiana State Dept of Ag		dlefforge@isda.in.gov	4	
BLAKE Gaecher	CO. Commissioner	WELLS Co.	ZERO PALDAMSWELLS COM	5	
Susan Paper	Director of Operations Bluffton Regional	Wells	susan.paper@blufftonregional.com	2	½ HR
Brad Paper not present	Dir of Biomed BRMC	Wells	brad.paper@blufftonregional.com	0	½ HR
TED ELLIS	MAYOR	CITY OF BLUFFTON	mayor@ci.bluffton.in.us	0	0.5 hr
Pastor Neil Ainslie	Service Rep Salvation Army EDS	Wells Co.	sciencepastor neil@gmail.com	1	0
RUSSELL AINSLIE	2ND VOLUNTEER ARMY EDT	WELLS CO	RAINSLIE@GMAIL.COM	10	
Hilarie Gaskill	Wells Co. Coroner	Wells	hgaskill@wellscounty.org	1	
Kevin Gooch	Chester Twp Fire Dept	Wells	kevingooch46792@gmail.com	24	
Ginger Butcher	Principal & Safety Specialist @ NWCS	Northern Wells Community Schools	ginger.butcher@nwcs.k12.in.us	5	1
Kyle Randall	Chief of Police	Bluffton	kyle.randall@blufftonindiana.gov		
Rick Velasquez	EMA Director	Wells Co	rvelasquez@wellscounty.org	0	

Hazard Mitigation Plan Update Meeting Number: Date:

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
RICK PIEPENBRINK	C.E.O EMS		RICKE@WELLSCOUNTYEMS.ORG	2.0	1.5 HR
Betsy Collier	TPM - WOW	Wells Co.	wawtpm@coolsky.com	—	—
Kyle Randall	Chief	Bluffton	kyle.randall@bluffton.in.gov		1
PHILIP KURUT	POLICE OFFICER SRO	BLUFFTON	phil.kurut@bluffton.in.gov	—	—
CHUCK KING	County Council	BLUFFTON	CKING@ADAMSWELLS.COM	1.0	1 HR
Justin Moen	Valero Renewables/Plant manager	Bluffton/Wells Co	Justin.Moen@Valero.com	10	1 HR
Sheila Flotow	VC President	Vera Cruz	peeweesros@yahoo.com	8	
Michelle Ripple	Merit coord	Vera Cruz	mlripple@hotmail.com	8	
Steve DARNELL	Supt - Schools	Southern Wells	sdarnell@swraiders.com	20	1 hr
Jim Oswalt	County Council	District 1	jimoswalt@osvoltrealty.com	14	—
BLAKE GEIBER	Commissioner	Wells Co	[illegible]@ADAMSWELLS.COM	8	
Luann Martin	town manager	Ossian	townmanager@ossian.com	9mi	

Hazard Mitigation Plan Update Meeting Number: 3 Date: **6/5/2019**

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Rick Velasquez	EMA Director	Wells Co.	rvelasquez@wellscounty.org	0	
Wing Lyons	EMA Wells	Wells Co			
Jarrad Hahn	Wells County Surveyor	Wells Co.	surveyor@wellscounty.org	1	3 hrs
BRAD Peper	BZMC LEPC	BLUFFTON WELLS	brad.peper@bluffton.zetnet.com	.5	8hrs
Michael Lautzenheiser	APC Director	WELLS CO.	GIS@wellscounty.org	0	-
Roy Johnson	Co attorney	Wells Co	royr johnson@adamswells.com	0	-
DON CRAIG	FIRE CHIEF	BLUFFTON	DON.CRAIG@BLUFFTON.GOV	0	-
Nate Rumschlag	co. Engineer	Wells Co.	chengineer@wellsCounty.org	0.5	1
Ginger Butcher	Safety Specialist @ NWCS	Northern Wells Comm. Schools	ginger.butcher@nwcs.k12.in.us	3	-

Individual MHMP Meetings

Figure 48 School District Meeting

Hazard Mitigation Plan Update Meeting Number: Date: 6/12/2019

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Dr. Brad Yates	BHMSD Supt.	BHMSD Wells County	byates@bhmsd.org	n/a	1 hr
Mr. Gary Schwartz	Head of Maintenance BHMSD	BHMSD Wells County	gschwartz@bhmsd.org	n/a	30 min
Mrs. Stacy Morrison	Director of School Safety BHMSD	BHMSD Wells County	smorrison@bhmsd.org	n/a	1 hr

Figure 49 Vera Cruz Meeting

Hazard Mitigation Plan Update Meeting Number: Date: 6/17/2019

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Sheila Flatow	President Town Board	Vera Cruz	townofveracruz@adamswells.com or peeweesr09@yahoo.com	14	3 hrs
MALVAA EROVER	Vice President Town Board	Vera Cruz	townofveracruz@adamswells.com	14	3hrs

Figure 50 Zanesville Meeting

Hazard Mitigation Plan Update Meeting Number: ZANESVILLE Date: July 2, 2019

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Julie Christian	Clerk/Treasurer	Zanesville	julie71359@gmail.com	1	3 hours
John Schuhmacher	President Council	Zanesville	jonleschuhmacher@gmail.com	1	3 hours
Rick Velasquez	EMA Director	Wells Co.	rvelasquez@wellscounty.org	20	3 hrs
Wayne Grove	Deputy Director	Wells Co	wgrove@wellscounty.org	20	3 hrs

Figure 51 Uniondale & Poneto Meeting

Hazard Mitigation Plan Update Meeting Number: Date:

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Erin Kreigh	Pres. Town Council	Uniondale	townofuniondale@gmail.com		2.0
Mary E Smith	Vice Pres Town Council	Poneto	[illegible]		2.0
Steve Rush	Pres Town Council	Poneto	SkRush@citz.net.com		2.0
[illegible] Velasquez	EMA Director	EMA Wells Co	[illegible]@wellscounty.org	20mi	8.0
Wayne Grove	Deputy Director	EMA Wells Co	waynegrove@wellscounty.org	20mi	6.0

Meeting Minutes for Uniondale, Poneto, and Zanesville Town person for each town:

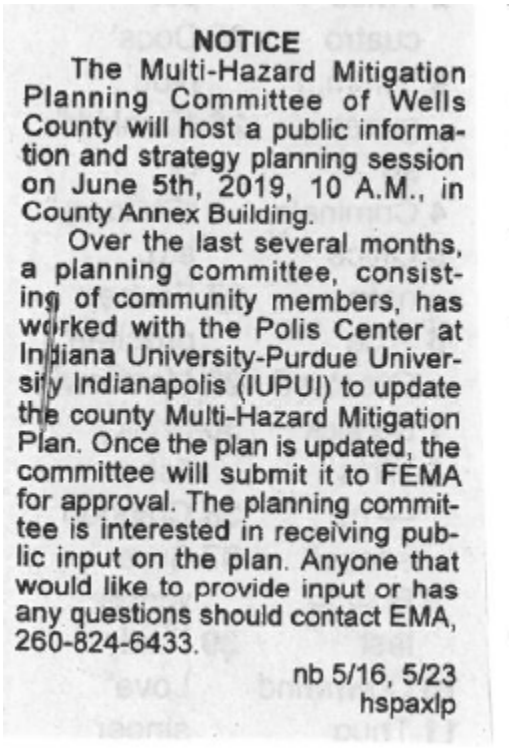
For each town Flooding is always an issue, not so much shelters from storms, whether it is summer or winter storms, Each Community have churches as shelters. In winter winds at times come from the east northeast causing drifts along north and south roads. Pending the direction of the winds.

Uniondale: the focus was on the small area of flooding. The issue is a drain going under north main street going north out of Uniondale, the tile has mostly collapsed and fast hard rains coming down to fast caused the flooding issues. That tile will be replaced this summer

Poneto: Being that Poneto has three districts ,one south one center and then to the north, Flooding coming from the south side of town draining into the middle when rain falls fast how drains and tiles can be replaced or made larger. For Poneto Steve Rush will be retiring at the end of 2019, they have 3 people that will be running for Town manager

Zanesville: Stoney Creek was an issue until the determined that fallen trees had created log jams around bends or curves along the creek. Log jams have been cleared and water flows better, more freely throughout. Still a concern but not as much.

Appendix B: Public Notices in the Local Media



NOTICE

The Multi-Hazard Mitigation Planning Committee of Wells County will host a public information and strategy planning session on June 5th, 2019, 10 A.M., in County Annex Building.

Over the last several months, a planning committee, consisting of community members, has worked with the Polis Center at Indiana University-Purdue University Indianapolis (IUPUI) to update the county Multi-Hazard Mitigation Plan. Once the plan is updated, the committee will submit it to FEMA for approval. The planning committee is interested in receiving public input on the plan. Anyone that would like to provide input or has any questions should contact EMA, 260-824-6433.

nb 5/16, 5/23
hspaxlp

Appendix C: Historical Hazards from NCDC since 2010

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
Wells County	January 6,2014	Extreme Cold/Wind Chill	0	0	0	0	0.00K	0.00K	Temperatures dropped into the single digits and teens below zero as arctic air filtered in behind a powerful winter storm that dropped more than a foot of heavy snow on the region. Strong westerly winds, with gusts between 30 and 40 mph, created deadly wind chills and significant blowing and drifting snow. Dangerous winds chills between 30 and 45 degrees below zero were common. The extremely cold temperatures and significant blowing snow kept many north-south roads impassable or restricted to single lanes. There were numerous reports of accidents and slide-offs across the region due to the slick roadways, with many businesses and schools closed each day.
Wells County	January 8,2015	Extreme Cold/Wind Chill	0	0	0	0	0.00K	0.00K	Wind chills during the morning and early afternoon hours of January 8th ranged between 20 below zero and 30 below zero. This dangerous cold led to numerous school closings and delays across the region.
MC NATTS	July 24,2011	Flash Flood	0	0	0	0	0.00K	0.00K	Law enforcement officials reported water flowing over State Route 3, just north of the Wells and Blackford county line.
BLUFFTON MILLER ARPT	June 13,2015	Flash Flood	0	0	0	0	0.00K	0.00K	SR-124 impassable near Adams St. with two to three feet of water over the road. In addition, numerous side streets in Bluffton are covered with 5 or more inches of water.
OSSIAN	July 13,2015	Flash Flood	0	0	0	0	0.00K	0.00K	Fields and roadways have standing and flowing water over them. State Road 1 flooded and impassible south of Ossian.
BLUFFTON	July 13,2015	Flash Flood	0	0	0	0	0.00K	0.00K	Water over State Road 1 at State Road 116 and State Road 124.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
CRAIGVILLE	June 15,2015	Flood	0	0	0	0	0.00K	0.00K	Several inches of rain fell across the county, causing high water in many spots as river, creek and streams attempted to handle all the rainfall. Road closures were reported across portions of the county.
KEYSTONE	November 14,2011	Hail	0	0	0	0	0.00K	0.00K	
BLUFFTON	May 25,2011	Hail	0	0	0	0	0.00K	0.00K	
LIBERTY CENTER	April 30,2012	Hail	0	0	0	0	0.00K	0.00K	
BLUFFTON	April 30,2012	Hail	0	0	0	0	0.00K	0.00K	
BLUFFTON	April 30,2012	Hail	0	0	0	0	0.00K	0.00K	
BLUFFTON	July 1,2012	Hail	0	0	0	0	0.00K	0.00K	
BLUFFTON	July 1,2012	Hail	0	0	0	0	0.00K	0.00K	
BLUFFTON	July 1,2012	Hail	0	0	0	0	0.00K	0.00K	
UNIONDALE	July 26,2014	Hail	0	0	0	0	0.00K	0.00K	A trained spotter reported hail to the size of a half dollar.
UNIONDALE	July 26,2014	Hail	0	0	0	0	0.00K	0.00K	A trained spotter reported hail to the size of ping pong balls.
VERA CRUZ	July 26,2014	Hail	0	0	0	0	0.00K	0.00K	A trained spotter reported golf ball size hail.
BLUFFTON	July 26,2014	Hail	0	0	0	0	0.00K	0.00K	The public reported hail to the size of hen eggs.
VERA CRUZ	October 7,2014	Hail	0	0	0	0	0.00K	0.00K	
VERA CRUZ	September 4,2015	Hail	0	0	0	0	0.00K	0.00K	
BLUFFTON	March 27,2016	Hail	0	0	0	0	0.00K	0.00K	Picture received from a trained spotter of golf ball size hail in the Bluffton area.
KINGSLAND	March 27,2016	Hail	0	0	0	0	0.00K	0.00K	
KINGSLAND	March 27,2016	Hail	0	0	0	0	0.00K	0.00K	
TOCSIN	March 27,2016	Hail	0	0	0	0	0.00K	0.00K	
BLUFFTON	July 7,2017	Hail	0	0	0	0	0.00K	0.00K	

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
BLUFFTON	May 5,2010	Hail	0	0	0	0	0.00K	0.00K	Local law enforcement officials reported hail ranging from nickel to quarter size.
LIBERTY CENTER	June 4,2011	Hail	0	0	0	0	0.00K	0.00K	
UNIONDALE	May 23,2011	Hail	0	0	0	0	0.00K	0.00K	
Wells County	February 25,2011	Heavy Snow	0	0	0	0	0.00K	0.00K	Moderate to heavy snow developed during the early morning hours of February 25th and continued through approximately 9:00 am ET that morning. Snowfall rates near an inch per hour were reported. Snowfall totals across Wells County were generally between 4 and 6 inches. The heavy snow resulted in accidents and slide-offs across the region, along with school delays and closures.
Wells County	March 5,2013	Heavy Snow	0	0	0	0	0.00K	0.00K	Snow overspread the area during the afternoon hours of March 5th and became heavy at times during the evening and early overnight hours. Total snow accumulations across the county generally ranged between 7 and 11 inches. There was a report of 8.8 inches in Ossian. The intensity of the heavy snow and sub-freezing surface temperatures allowed the snow to accumulate on roadways. This resulted in hazardous travel conditions across the region with numerous school closings the morning of March 6th.
Wells County	March 24,2013	Heavy Snow	0	0	0	0	0.00K	0.00K	Heavy wet snow overspread the area during the evening hours of March 24th before tapering off late the next morning. Total snow accumulations across the county generally ranged between 7 and 11 inches. The intensity of the heavy snow, gusty winds, and reduced visibilities resulted in hazardous travel conditions across the region. Numerous school closings were reported the morning of March 25th, along with a few slide-offs and accidents.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
Wells County	February 1,2015	Heavy Snow	0	0	0	0	0.00K	0.00K	Light snow developed during the late evening hours of January 31st and became heavy at times February 1st into early February 2nd. Rain mixed in with the snow during the morning and early afternoon hours of February 1st which limited snow accumulations so
Wells County	March 8,2017	High Wind	0	0	0	0	0.00K	0.00K	Reports of trees and power lines down which resulted in some damage to cars and some structural damage of houses.
KINGSLAND	April 19,2011	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Local broadcast media reported a shed flattened and a barn roof destroyed in the town of Greenwood. In addition, a machinery building suffered roof damage and a shed was blown onto a pick-up truck.
LIBERTY CENTER	May 25,2011	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter measured a 62 mph wind gust. Several limbs and larger branches were down in the area of the wind gust, some blocking roads.
LIBERTY CENTER	September 7,2012	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Law enforcement officials reported power lines down.
ROCKFORD	August 4,2012	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Law enforcement officials reported a large tree was blown down across the road near Rockford. In addition, large tree limbs were reported down on County Road 450 East and 100 North.
LIBERTY CENTER	June 29,2012	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter reported trees and power lines down.
BLUFFTON	June 29,2012	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter estimated wind gusts to 58 mph with trees observed blown down in the area.
BLUFFTON	June 12,2013	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter reported a large tree blown down on the west side of Bluffton.
BLUFFTON	November 17,2013	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter reported a 59 mph wind gust.
VERA CRUZ	November 17,2013	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter reported wind gusts to 63 mph along with power outages.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
UNIONDALE	November 17,2013	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A mesonet station recorded a wind gust to 64 mph.
MURRAY	July 1,2014	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Trees were blown down between Bluffton and Kingsland. A tree was also reported down on 500 North east of State Route 1.
CRAIGVILLE	May 30,2015	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	The public reported a large and healthy eight inch diameter tree limb was blown down.
TOCSIN	May 30,2015	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	The public reported a large tree limb, approximately one foot in diameter, was blown down.
MT ZION	June 12,2015	Thunderstorm Wind	0	0	0	0			Large, healthy tree across the driveway.
OSSIAN	June 18,2015	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Forty foot pine tree uprooted across the road. Took down power lines.
MT ZION	June 12,2015	Thunderstorm Wind	0	0	0	0			Large, healthy tree across the driveway.
BLUFFTON	June 23,2016	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	The public reported a barn was destroyed with trees also damaged on the south side of Bluffton.
VERA CRUZ	June 20,2016	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter measured a 58 mph wind gust.
MURRAY	November 18,2016	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A mesonet site recorded a 60 mph wind gust.
BLUFFTON	November 18,2016	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter measured a 74 mph wind gust using a handheld anemometer.
UNIONDALE	June 4,2017	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A large tree limb was reported blown down.
CRAIGVILLE	July 20,2018	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter reported a 13 inch diameter tree blown down with several large tree branches also down.
TOCSIN	July 20,2018	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter reported damage to roof shingles on a home near County Road 700 N and 600 E, as well as nearby crop damage.
BLUFFTON	May 5,2010	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	In addition to the hail, law enforcement officials reported a tree was blown down in Bluffton.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
BLUFFTON	June 23,2010	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Widespread trees down and power outages across town.
PONETO	October 26,2010	Thunderstorm Wind	0	0	0	0	100.00K	0.00K	A barn was destroyed, which contained three horses. Two of the horses were rescued, with the third being killed from the weight of the barn. Debris was pushed to the adjacent rail road tracks to the east.
VERA CRUZ	October 26,2010	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A local newspaper reported a barn roof was removed and lifted over a house.
BLUFFTON	October 26,2010	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Law enforcement officials reported the roof of a barn being ripped off on County Road 100 West.
BLUFFTON	October 26,2010	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter reported an 18 inch tree limb being blown down onto the porch of a house.
BLUFFTON	June 18,2010	Thunderstorm Wind	0	0	0	0	5.00K	0.00K	A large tree limb was reported down on Marion Street, just north of Central Avenue. The limb fell onto a power line, knocking out power to the area.
BLUFFTON	June 18,2010	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A local newspaper reported a tree was down and blocking the road on County Road 300 South, just east of Indiana 1.
BLUFFTON	June 23,2010	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	Tree down at intersection of 400 N and 100 E.
OSSIAN	August 7,2011	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter recorded a 67 mph wind gust.
KINGSLAND	August 7,2011	Thunderstorm Wind	0	0	0	0	0.00K	0.00K	A trained spotter recorded a 67 mph wind gust.
MC NATTS	August 24,2016	Tornado	0	0	0	0	0.00K	0.00K	A NWS storm survey was conducted along with eyewitness reports indicating that a funnel cloud briefly made contact with the ground on County Road West 900 South, one half mile east of South 1100 West. A few tree branches were snapped, the metal siding of

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
Wells County	February 1,2011	Winter Storm	0	0	0	0	0.00K	0.00K	A mixture of heavy snow and sleet developed during the late afternoon hours of February 1st, and quickly changed over to sleet and freezing drizzle in the evening and overnight hours. Precipitation then ended as a period of snow during the morning hours of February 2nd. Sleet amounts in excess of a half inch and snowfall amounts of 2-5 inches were common across the county. This combined with wind gusts of 30 to 50 mph created reduced visibilities and dangerous driving conditions. There were reports of accidents and school closings across the region.
Wells County	December 13,2013	Winter Storm	0	0	0	1	0.00K	0.00K	Snow, moderate at times, overspread the area late December 13th and continued into December 14th. Total snow accumulations across the county ranged between 6 and 8 inches. There were reports of slide-offs and accidents as roads became snow covered and hazardous.
Wells County	January 5,2014	Winter Storm	0	0	0	0	0.00K	0.00K	Moderate to heavy snow developed during the morning hours of January 5th and continued into the early morning hours of January 6th. Total snow accumulations ranged between 9 and 13 inches across the county. Winds picked up and gusted to between 30 and 40 mph by late in the afternoon and evening creating blizzard-like conditions at times. This led to snow emergencies and closings of schools and businesses the next morning as many roads became impassable.
Wells County	February 1,2014	Winter Storm	0	0	0	0	0.00K	0.00K	Rain changed over to heavy snow Saturday evening into early Sunday morning, February 2nd. The snow band was very narrow with accumulations varying greatly over a small area. Total snowfall accumulations generally ranged between 4 and 8 inches, with a report of 6.5 inches in Bluffton. Falling temperatures, accumulation snowfall, and

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
									reduced visibilities created icy roadways and hazardous driving conditions.
Wells County	February 4,2014	Winter Storm	0	0	0	0	0.00K	0.00K	Snow developed during the late afternoon hours of February 4th and became heavy at times that evening into the next morning. Impressive snowfall rates of 1 to 2 inches per hour and reduced visibilities to a quarter of a mile at times created hazardous travel conditions. Numerous schools and businesses were closed on Wednesday, February 5th, due to the heavy snow and poor road conditions. Total snow accumulations across the county generally ranged between 7 and 9 inches.
Wells County	March 12,2014	Winter Storm	0	0	0	0	0.00K	0.00K	Rain changed over to snow during the early morning hours of March 12th, becoming moderate to heavy at times during the remainder of the morning. Wind gusts of 30 to 40 mph, combined with the falling snow, reduced visibilities to less than a quarter of a mile at times. Snowfall totals generally ranged between 4 and 7 inches, heaviest across far northern Wells County. A few accidents and slide-offs were reported across the region due to snow covered and slick roads. Many schools were either closed or delayed.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
Wells County	December 12,2010	Winter Storm	0	0	0	0	0.00K	0.00K	Rain changed to snow during the morning hours of December 12th and continued through the entire day. Snowfall totals generally ranged between 3 and 5 inches across the county. Winds increased Sunday afternoon into Monday morning, with gusts of 25 to 35 mph at times. This, combined with the fallen snow, created widespread blowing and drifting snow that led to numerous car accidents and school closings across the region.
Wells County	February 5,2010	Winter Storm	0	0	0	0	0.00K	0.00K	Light to moderate snow developed during the early afternoon hours of February 5th, and continued into the early morning hours of February 6th. Gusty winds accompanied the snow, with gusts of 40 to 50 mph limiting visibilities. The falling snow and strong winds also led to plenty of blowing and drifting snow, with drifts of 1 to 2 feet. Snowfall totals ranged from 2 to 6 inches across the county, heaviest in the south. There were reports of slide-offs and accidents across the region.
Wells County	February 5,2011	Winter Weather	0	0	0	0	0.00K	0.00K	Moderate to heavy snow overspread the area around daybreak on February 5th, and continued through much of the day. Visibilities were reduced to between a quarter and a half a mile for much of the event, with total snow accumulations of 4-6 inches reported across the county. A CoCoRaHS observer 1 mile southeast of Bluffton reported 5.5 inches of snow. The snow created slick roads which led to slide-offs and accidents.
Wells County	December 26,2012	Winter Weather	0	0	0	0	0.00K	0.00K	Snow fell on December 26th, with total snow accumulations generally ranging between 2 and 5 inches across the county. The falling snow combined with wind gusts in excess of 30 mph reduced visibilities to less than a quarter of a mile at times. Temperatures were in the upper 20s as the snow fell which allowed roads to become snow

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
									covered and slick. This resulted in slide-offs and accidents across the region.
Wells County	December 28,2012	Winter Weather	0	0	0	0	0.00K	0.00K	Snow developed during the evening hours of December 28th and continued into the morning hours of December 29th. Total snow accumulations across the county ranged between 2 and 5 inches, with the highest totals across southern portions of Wells County. Temperatures were in the mid to upper 20s as the snow fell which allowed roads to become snow covered and slick. This resulted in slide-offs and accidents across the region.
Wells County	January 12,2012	Winter Weather	0	0	0	1	0.00K	0.00K	Snow developed during the afternoon hours of January 12th and continued into the first part of January 13th. Total snow amounts across the county were generally near 2 inches. Sustained winds of 15 to 25 mph, with gusts to 30 mph, led to considerable blowing and drifting snow. There were reports of slide-offs and accidents across the region, along with some school delays.
Wells County	January 20,2012	Winter Weather	0	0	0	0	0.00K	0.00K	Snow developed during the early afternoon hours of January 20th and continued into the early morning hours of January 21st. Total snow accumulations across the county ranged between 2 and 5 inches. Temperatures were in the teens as the snow fell which allowed roads to become snow covered and slick. This resulted in slide-offs and accidents across the region.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
Wells County	January 19,2012	Winter Weather	0	0	0	0	0.00K	0.00K	A narrow, quick moving, band of moderate to heavy snow moved through the area on January 19th. Total snow accumulations across the county generally ranged between 1 and 3 inches. Roads quickly became snow covered and slick as temperatures fell into the teens and winds picked up. This led to some blowing snow, with visibilities reduced to around a quarter of a mile at times. Slide-offs and accidents were reported across the region.
Wells County	January 27,2013	Winter Weather	0	0	0	0	0.00K	0.00K	A light mixture of snow, sleet, and freezing rain quickly changed over to all freezing rain during the evening hours of January 27th. Light ice accretions were reported, generally near a tenth of an inch. Secondary roads became slick and hazardous which resulted in a few accidents across northeast Indiana. The freezing rain changed over to rain and drizzle during the early morning hours of January 28th as temperatures warmed above freezing.
Wells County	February 22,2013	Winter Weather	0	0	0	0	0.00K	0.00K	Light snow and sleet overspread the area during the early morning hours of February 22nd before ending as a period of freezing drizzle. Total snow accumulations across the county were generally near 1 inch, with ice accretions less than 0.05 inches. Temperatures in the 20s allowed the light snow and ice to accumulate on area roadways. This led to a few accidents and slide-offs across the region.
Wells County	February 26,2013	Winter Weather	0	0	0	0	0.00K	0.00K	Moderate rain overspread the region on February 26th. Surface temperatures hovered near freezing during the morning hours which allowed the rain to freeze on mainly elevated surfaces. Ice accretions near a tenth of an inch were common on trees, power lines, bridges, and overpasses. This combined with wind gusts to 30 mph aided in downing a few tree limbs. There were also reports

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
									of isolated power outages and accidents across the region.
Wells County	January 1,2014	Winter Weather	0	0	0	0	0.00K	0.00K	Light to at times moderate snow developed during the evening hours of January 1st and continued into January 2nd. Snowfall totals of 4 to 6 inches were reported across the county. Temperatures in the teens allowed for roads to remain snow covered and slick with several accidents and slide-offs reported across the region.
Wells County	February 17,2014	Winter Weather	0	0	0	0	0.00K	0.00K	A quick 2 to 4 inches of snow allowed roads to become snow covered and slick. Wind gusts to 35 mph, combined with periods of heavier snow, created near whiteout conditions at times. Significant blowing and drifting snow also allowed some secondary roads to become impassible. There were school delays and closings on Tuesday, February 18th.
Wells County	January 5,2015	Winter Weather	0	0	0	0	0.00K	0.00K	Light to moderate snow with reduced visibilities accumulated to between 2 and 4 inches late January 5th into early January 6th. Cold temperatures near 10 degrees allowed the snow to accumulate on area roadways which created difficult travel conditions in
Wells County	January 8,2015	Winter Weather	0	0	0	0	0.00K	0.00K	Periods of snow during the late afternoon hours of January 8th into the early morning hours of January 9th only accumulated to around inch. However, wind gusts ranging between 30 and 40 mph in tandem with the falling snow created whiteout conditions at ti

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
Wells County	March 1,2015	Winter Weather	0	0	0	0	0.00K	0.00K	Snow accumulated to between 4 and 6 inches late February 28th through the early afternoon on March 1st. There was a report of 4.5 inches of total snow accumulation in Bluffton. There were a few minor accidents reported across the region due to snow covere
Wells County	March 3,2015	Winter Weather	0	0	0	0	0.00K	0.00K	Periods of Light freezing rain with temperatures in the mid to upper 20s created slick spots on area roads during the morning hours of March 3rd. These icy conditions led to numerous school closings and minor accidents.
Wells County	February 14,2015	Winter Weather	0	0	0	0	0.00K	0.00K	Wind gusts up to 45 mph and snow squalls along and behind an arctic front created near whiteout conditions at times on February 14th. Visibilities were reduced to less than 200 feet in heavier snow showers, with total snow accumulations generally ranging
Wells County	November 21,2015	Winter Weather	0	0	0	0	0.00K	0.00K	Snow overspread the area during the early afternoon hours and became heavy at times before ending in the early evening on November 21st. There were reports of a few accidents and slide-offs across the region due to reduced visibilities and slushy accumula
Wells County	January 12,2016	Winter Weather	0	0	0	0	0.00K	0.00K	Reports of slide-offs and accidents, along with school delays, were common on January 12th due to snow and blowing snow. Snow accumulations across the country generally ranged between 1 and 3 inches. The accumulating snow combined with temperatures fallin
Wells County	December 17,2016	Winter Weather	0	0	0	0	0.00K	0.00K	Numerous accidents were reported across the region on December 17th due to icy roads, especially during the morning hours. A lull in the precipitation and temperatures warming to near freezing led to some improvement during the late morning and afternoon

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
Wells County	December 11,2016	Winter Weather	0	0	0	0	0.00K	0.00K	Light snow developed early on December 11th and became moderate to heavy at times during the day. Some freezing rain mixed in for a time late in the afternoon and evening before precipitation ended early on December 12th. Snowfall totals across the county
Wells County	February 5,2018	Winter Weather	0	0	0	0	0.00K	0.00K	A quick 4 to 6 inches of snow created difficult travel conditions. There were accidents reported across the region, along with several school closings and delays on February 6th.
Wells County	January 24,2018	Winter Weather	0	0	0	0	0.00K	0.00K	Light freezing drizzle with temperatures in the upper 20s created difficult travel conditions. A glaze of ice on roads played a part in numerous accidents across the region.
Wells County	January 7,2010	Winter Weather	0	0	0	0	0.00K	0.00K	Light snow developed around daybreak January 7th and became moderate to heavy during the late morning and early afternoon hours as a clipper system moved through the region. The snow tapered off to just a few lingering snow showers and flurries by late in the afternoon. Total snow accumulations of 4-5 inches were common across the county. The accumulating snow led to a few accidents across the area, along with cancellations of local events.
Wells County	February 9,2010	Winter Weather	0	0	0	0	0.00K	0.00K	Periods of light to moderate snow fell February 9th into early February 10th with snowfall totals ranging between 4 and 6 inches across the county. Winds of 15 to 25 mph allowed for some blowing and drifting of the snow. The accumulating snow and wind led to slide-offs and accidents, with many schools closing across the region.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indr. Deaths	Crop Damage Cost	Property Damage Cost	Description
Wells County	January 11,2011	Winter Weather	0	0	0	0	0.00K	0.00K	A steady light to moderate snow, with visibilities reduced to less than a half of a mile at times, developed around daybreak on Tuesday and continued through much of the day into Tuesday evening. Snowfall totals across the county generally ranged between 4 and 6 inches. Temperatures were cold enough for the snow to stick to area roadways, which led to accidents and slide-offs across the region. The snow and slick roads also caused some school delays and closings.

Appendix D: Essential & Critical Facilities List and Maps

Essential Facilities

Table 35. Medical Care Facilities

Facility Name	Address	City
Bluffton Regional Medical Center	303 S Main ST	Bluffton
Markle Health Care	170 N Tracy ST	Markle
Meadowvale Health & Rehab	1529 W Lancaster ST	Bluffton
Ossian Health & Rehab	215 Davis RD	Ossian
Christian Care Retirement Community	720 E Dustman RD	Bluffton
River Terrace Estates	500 Caylor BLVD	Bluffton
CVS Pharmacy	1203 S Main ST	Bluffton
RediMed Bluffton	1980 N Main ST	Bluffton
Walgreen Pharmacy	1975 N Main ST	Bluffton
Walmart Pharmacy	2100 N Main ST	Bluffton
Wells County EMS (Poneto)	9378 S 300 W	Poneto
Wells County EMS (Ossian)	507 N Jefferson ST	Ossian
Wells County EMS (Markle)	155 W Sparks ST	Markle
Wells County EMS (Bluffton)	140 W Spring St.	Bluffton

Table 36. School Facilities

Facility Name	Address	City
Bluffton Elementary School	1100 E Spring ST	Bluffton
Bluffton Middle School	1500 Stogdill RD	Bluffton
Bluffton High School	1 Tiger Trail	Bluffton
Lancaster Elementary School	275 E Jackson ST	Bluffton
Ossian Elementary School	213 S Jefferson ST	Ossian
Norwell Middle School	1100 E US 224	Ossian
Norwell High School	1100 E US 224	Ossian
Sothern Wells Elementary School	9120 S 300 W	Poneto
Souther Wells Jr. - Sr. High School	9120 S 300 W	Poneto
Bethlehem Lutheran School	7545 N 650 E	Ossian
Bluffton Christian School	1225 W Washington ST	Bluffton
Jericho Advanced Training Center	193 N Main ST	Bluffton
Kingdom Academy	225 Ferguson Park CT	Bluffton
New Life Christian School	1621 S 350 E	Bluffton
Wesleyan Heritage Academy	410 W Cherry ST	Bluffton
Hope Missionary Church Preeschool	429 E Dustman RD	Bluffton
Presbyterian Church Preeschool	215 E Dustman RD	Bluffton

Table 37. Police Stations

Facility Name	Address	City
Bluffton Police Department	204 E Market ST	Bluffton
Ossian Police Department	507 N Jefferson ST	Ossian
Zanesville Police Department	17736 Wayne ST	Zanesville
Markle Police Department	155 W Sparks ST	Markle

Table 38. Fire Stations

Facility Name	Address	City
Bluffton Fire Department	200 E Market ST	Bluffton
Chester Township Volunteer Fire Dep	9378 S 300 W	Poneto
Liberty Township Volunteer Fire Dep	2954 W Market ST	Liberty Center
Markle Volunteer Fire Department	155 W Sparks ST	Markle
Nottingham Township Volunteer Fire Dep	3517 E Market ST	Petroleum
Ossian Volunteer Fire Department	507 N Jefferson ST	Ossian
Poneto Volunteer Fire Department	5996 S Meridian RD	Poneto
Uniondale Volunteer Fire Department	755 W Railroad ST	Uniondale

Table 39. Emergency Operations Center

Facility Name	Address	City
Wells County EMA	223 W Washington St Suite 101	Bluffton

Critical Facilities

Table 40. Airport Facilities

Facility Name	Use	City
Grandlienard-Hogg	Private	Bluffton
K-9 Korner	Private	Ossian
Mayer	Private	Union Dale
Miller	Public	Bluffton
Mossburg	Private	Liberty Center
Skip'S Place	Private	Ossian
The Lazy K	Private	Tocsin
Tucker Farms	Private	Montpelier
Wells County Sheriff'S Dept	Private	Bluffton

Table 41. Communication Facilities

Facility Name	Use	Address	City
-	-	7627 EAST 100 SOUTH	Bluffton
-	TOWER	700 N. Main St.	BLUFFTON
-	-	644 N MAIN STRET	BLUFFTON
-	TOWER	8266 N UNIONDALE	UNIONDALE
-	-	APPROX. 0.6 MI. SOUTHWEST OF	OSSIAN

Facility Name	Use	Address	City
-	-	5756 W 1100 N	-
-	-	APPROX. 7 MI EAST OF CO. RD 400 N	-
-	-	6368 W US Hwy 224	-
-	-	Co Rd 600 N between Co Rd 600 & 700	-
-	-	2459 S SR 301	Bluffton
Siren 1	Siren	-	-
Siren 2	Siren	-	-
Siren 3	Siren	-	-
Siren 4	Siren	-	-
Siren 5	Siren	-	-
Siren 6	Siren	-	-

Table 42. Hazmat Facilities

Facility Name	Chemical Name	Address	City
Almco Steel Prods. Corp.	Chromium Compounds	0059 N. Oak St. Extended	Bluffton
Almco Steel Prods. Corp.	Nickel Compounds	0059 N. Oak St. Extended	Bluffton
Almco Steel Prods. Corp.	Manganese Compounds	0059 N. Oak St. Extended	Bluffton
Energy Control Inc.	"Sulfuric Acid (1994	804 W. Mill St.	Ossian
Franklin Electric Co. Inc.	Methyl Isobutyl Keto	400 E. Spring St.	Bluffton
Franklin Electric Co. Inc.	Toluene	400 E. Spring St.	Bluffton
Franklin Electric Co. Inc.	Chromium	400 E. Spring St.	Bluffton
Franklin Electric Co. Inc.	Manganese	400 E. Spring St.	Bluffton
Franklin Electric Co. Inc.	Nickel	400 E. Spring St.	Bluffton
Franklin Electric Co. Inc.	Copper	400 E. Spring St.	Bluffton
Johnson Controls Inc.	Diethanolamine	2501 E. 850 N.	Ossian
Johnson Controls Inc.	Toluene Diisocyanate	2501 E. 850 N.	Ossian
Sterling Casting Div.	Manganese Compounds	1000 W. Wiley Ave.	Bluffton
Sterling Casting Div.	Diisocyanates	1000 W. Wiley Ave.	Bluffton

Table 43. Potable Water

Facility Name	Address	City
Bluffton Public Water Supply	214 Kemp Rd	Bluffton

Table 44. Waste Water Treatment Plants

Facility Name	Address	City
Bluffton Municipal Stp	702 North Main Street	Bluffton

Facility Name	Address	City
Ossian Municipal Wwtp	507 N Jefferson	Ossian
Poneto Municipal Stp	Nr Intersection Of Main &	Poneto
Uniondale Municipal Stp	County Road 100 W & 550 N	Uniondale

Appendix E: Hazard Maps

Figure 52. Tornado: Damaged Critical Facilities

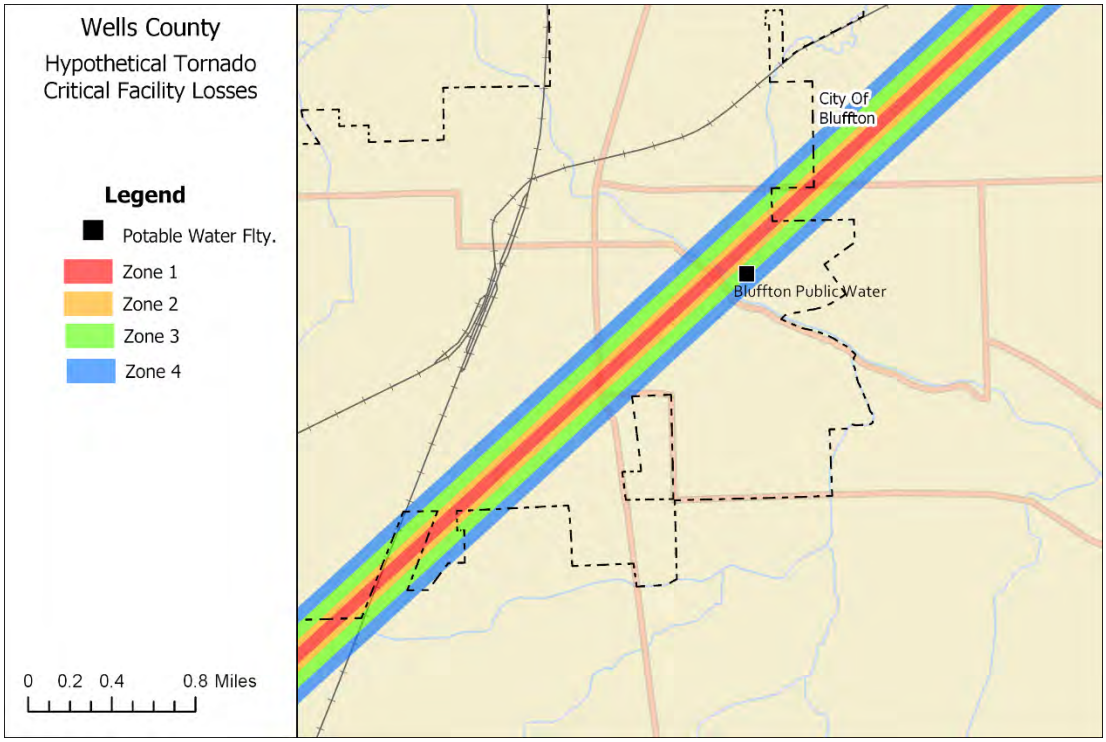


Table 45. Hazmat: Damaged Critical Facilities

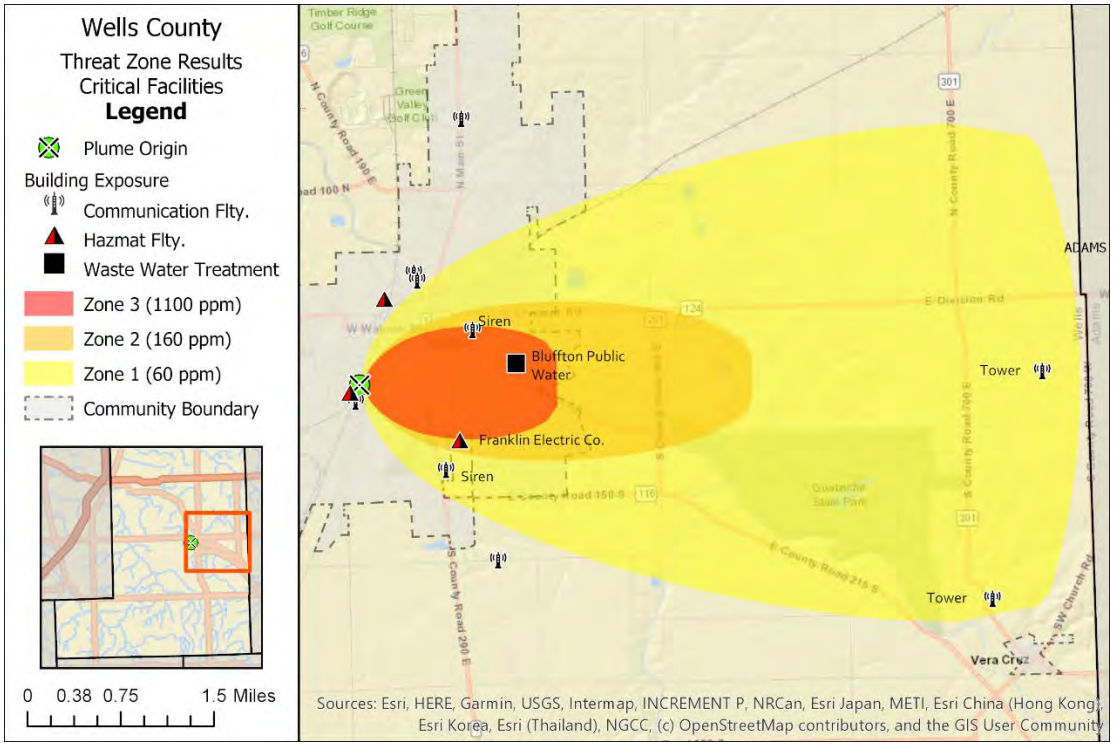
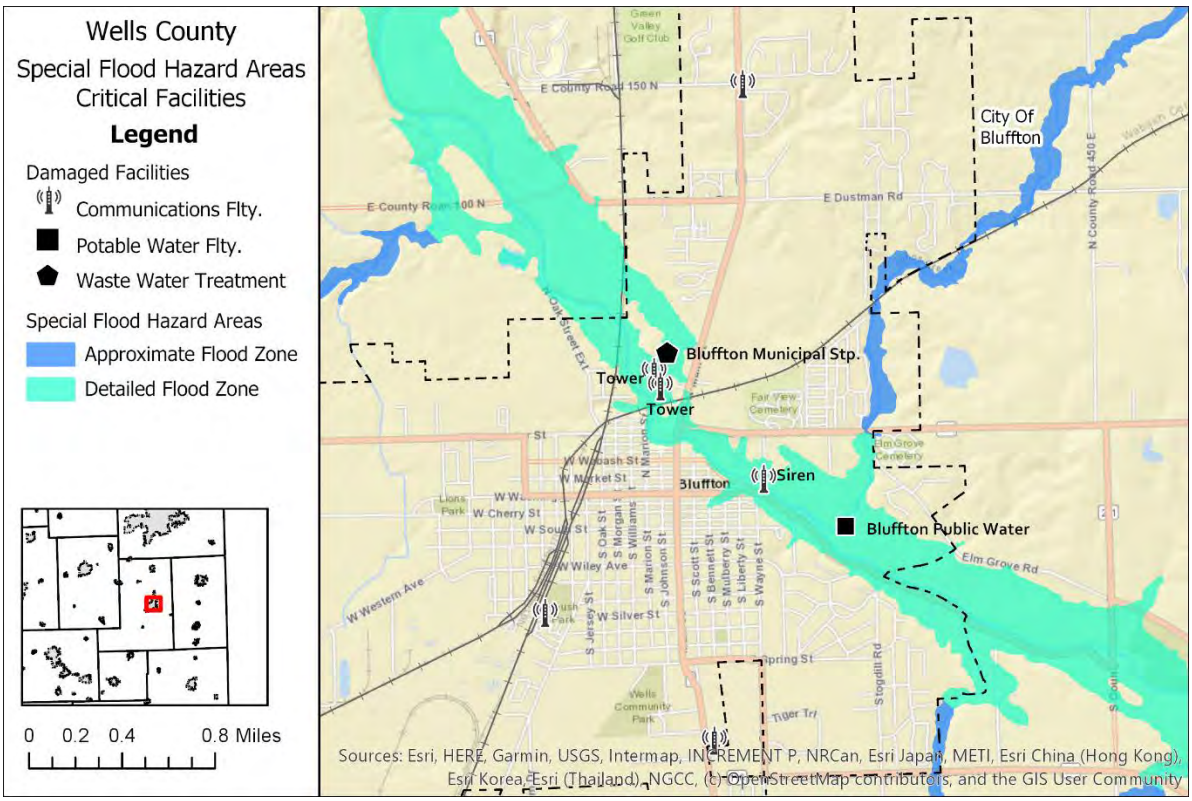


Figure 53 SFHA Damaged Critical Facilities, Bluffton



Appendix F: Community Capability Assessment Results

Figure 54. Hazard Priority Survey Results. Total of 8 Reponses.

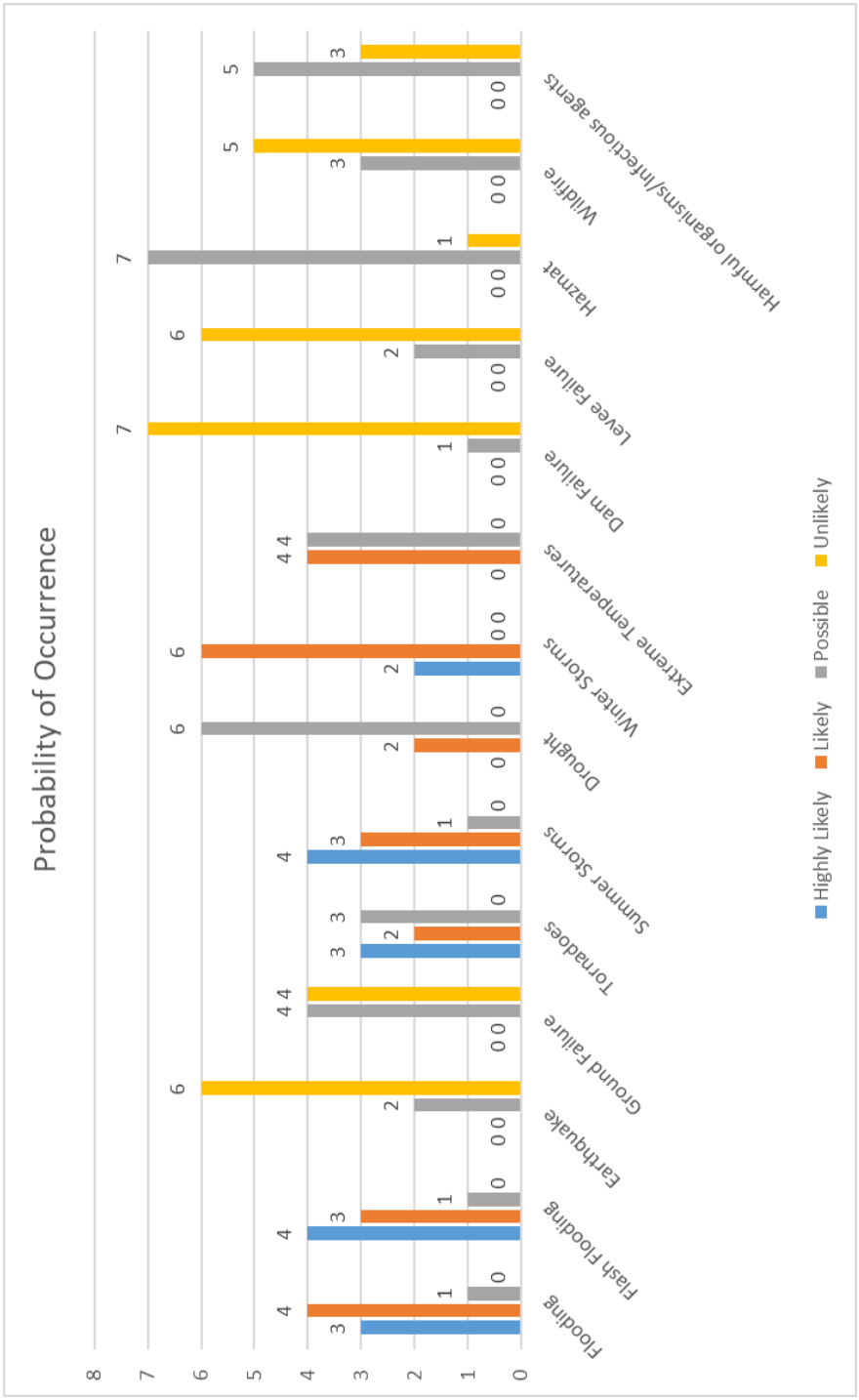
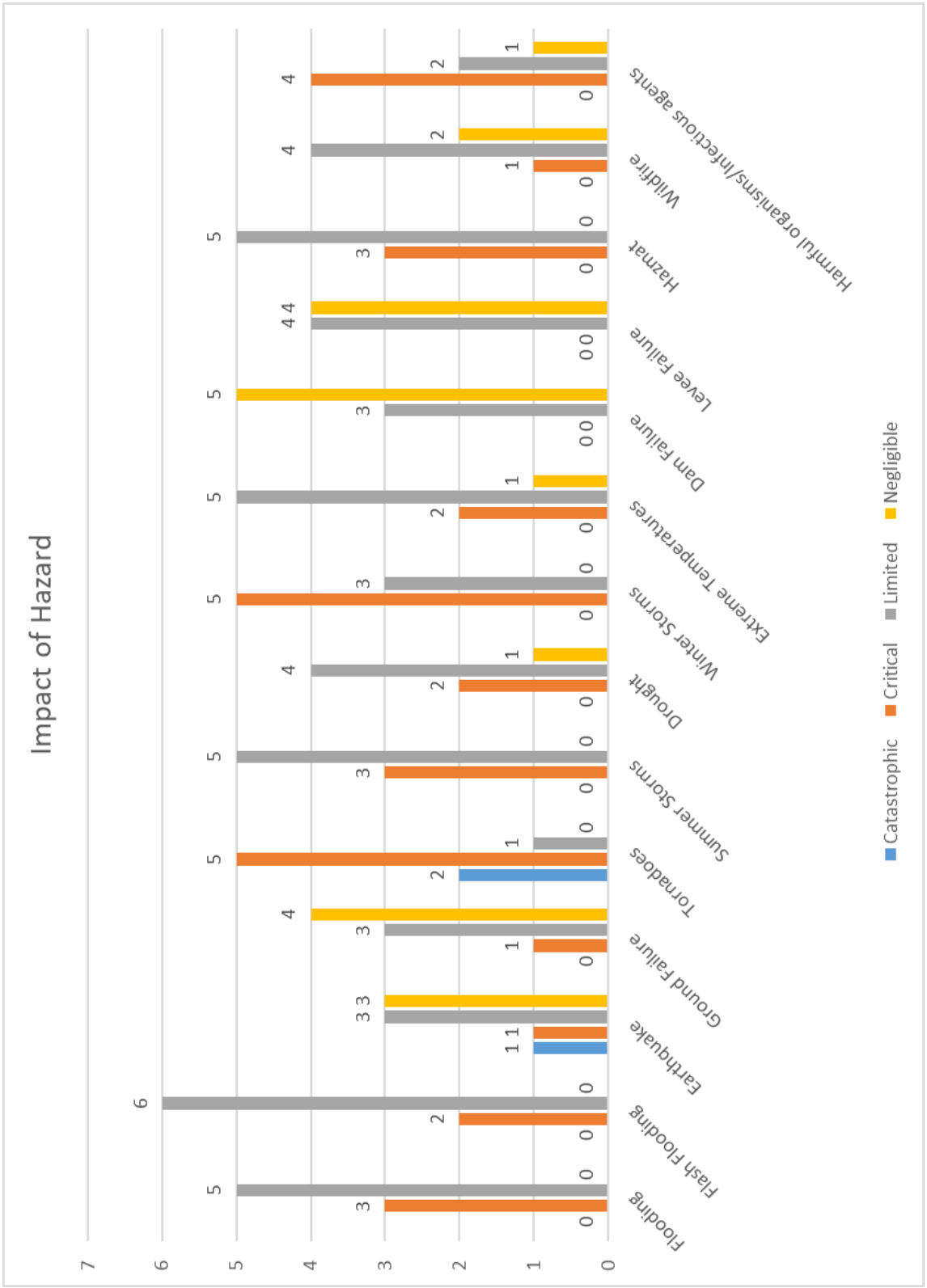


Figure 55. Hazard Priority Rank Survey. Total of 8 Responses.



Funding Resources								
Capabilities	**Wells County**	**Bluffton**	**Markle**	**Ossian**	**Poneto**	**Uniondale**	**Vera Cruz**	**Zanesville**
Capital Improvements Project Funding	-	Yes	Yes	Yes	Yes	No	Yes	No
Authority to Levey Taxes for Specific Purposes	-	Yes	-	No	Yes	No	No	Yes
Fees for water, sewer, gas or electric services	-	Yes	Yes (Water & Sewer)	Yes	Yes	Yes	No	Yes
Impact fees for new development	-	Yes	No	Yes	Yes	No	No	No
Storm Water Utility Fee	-	Yes	No	Yes	No	No	No	Yes
Incur Debt through general obligation bonds and/or special tax bonds	-	Yes	Yes	Yes	No	No	No	Yes
Community Development Block Grant	-	Yes	No	Yes	Yes	No	Yes	No
Staff								
Capabilities	**Wells County**	**Bluffton**	**Markle**	**Ossian**	**Poneto**	**Uniondale**	**Vera Cruz**	**Zanesville**
Chief Building Officer	Yes	Yes	Yes (Huntington)	Yes	No	Yes (County)	Yes	Yes (County)
Floodplain Administrator	Yes	Yes	Yes (Huntington)	Yes	Yes	Yes (County)	Yes	Yes (County)
Emergency Manager	Yes	Yes	Yes (Wells & Huntington)	Yes	Yes	Yes (County)	Yes	Yes (County)
Community Planner	Yes	Yes	-	Yes	Yes	No	Yes	Yes (County)
Civil Engineer	-	Yes	-	Yes	No	Yes (County)	Yes (County)	Yes (County)

GIS Coordinator	Yes	Yes (County)	-	Yes (County)	Yes	Yes (County)	Yes (County)	Yes (County)
Administrative & Planning								
Capabilities	**Wells County**	**Bluffton**	**Markle**	**Ossian**	**Poneto**	**Uniondale**	**Vera Cruz**	**Zanesville**
Planning Commission	Yes (APC)	Yes	Yes	Yes (APC)	Yes (APC)	Yes (APC)	Yes (APC)	Yes (APC)
Mitigation Planning Committee	Yes	Yes (County)	Yes (County)	Yes (County)	Yes (County)	Yes (County)	Yes (County)	Yes (County)
Maintenance Programs to Reduce Risk	Yes	Yes	Yes	Yes	Yes	Yes	Yes (County)	Yes
Mutual Aid Agreements	-	Yes	Yes	Yes	Yes	No	No	Yes (County)
Warning Systems/Services (Ie. Reverse 911, Outdoor Warning Signals)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hazard Data & Information	-	Yes	Yes	Yes	No	Yes (County)	Yes	Yes
Grant Writing	-	Yes	No	Yes	Yes (NIRCC)	Yes	Yes	No
Education & Outreach								
Capabilities	**Wells County**	**Bluffton**	**Markle**	**Ossian**	**Poneto**	**Uniondale**	**Vera Cruz**	**Zanesville**
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	-	Yes	No	Yes	Yes	No	Yes	Yes
Ongoing public education or information program (e.g., responsible water use, fire safety, household	-	Yes	No	Yes	Yes	No	Yes	Yes

preparedness, environmental education)								
Natural disaster or safety related school programs	-	Yes	No	Yes	Yes	No	Yes	Yes
StormReady certification	-	Yes	No	Yes	Yes	No	Yes	Yes
Firewise Communities Certification	-	-	No	No	Yes	No	Yes	No
Public-private partnership initiatives addressing disaster-related issues	-	Yes	No	Yes	Yes	No	Yes	Yes

Appendix G: Adopting Resolutions

RESOLUTION OF THE CITY OF _____

ADOPTION OF THE WELLS COUNTY
MULTI-HAZARD MITIGATION PLAN

WHEREAS the City of _____ has participated in the hazard mitigation planning process as established under the Disaster Mitigation Act of 2000; and

WHEREAS, the Act establishes a framework for the development of a multi-jurisdictional County Hazard Mitigation Plan; and

WHEREAS, the Act as part of the planning process requires public involvement and local coordination among neighboring local units of government and businesses; and

WHEREAS, the Wells County Plan includes a risk assessment including past hazards, hazards that threaten the county, an estimate of structures at risk, a general description of land uses and development trends; and

WHEREAS, the Wells County Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects and costs; and

WHEREAS, the Wells County Plan includes a maintenance or implementation process including plan updates, integration of the plan into other planning documents and how Wells County will maintain public participation and coordination; and

WHEREAS, the Plan has been shared with the Indiana Department of Homeland Security and the Federal Emergency Management Agency for review and comment; and

WHEREAS, the Wells County Multi-Hazard Mitigation Plan will make the county and participating jurisdictions eligible to receive FEMA hazard mitigation assistance grants; and

WHEREAS, Wells County Multi-Hazard Mitigation Plan updates the existing Multi-Hazard Mitigation Plan adopted in _____ (month/year); and

WHEREAS, this is a multi-jurisdictional plan and cities and towns that participated in the planning process may choose to also adopt the county plan.

NOW THEREFORE, BE IT RESOLVED BY WELLS COUNTY, INDIANA, that the City of _____ supports the hazard mitigation planning efforts and wishes to adopt the Wells County Multi-Hazard Mitigation Plan.

This resolution was declared duly passed and adopted and was signed by the _____ and attested by the _____ this _____ day of _____, 20__.

_____

Attest:

_____