2022 Multi-Hazard Mitigation Plan

Clark County

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1 Overview

1.1 Introduction

The Clark 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 Clark County Emergency planning team and The Polis Center at Indiana University-Purdue University Indianapolis (IUPUI) originally developed the Clark County MHMP approved in 2016. The MHMP is not a static document but must be updated over time to reflect shifting conditions. This 2022 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 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.

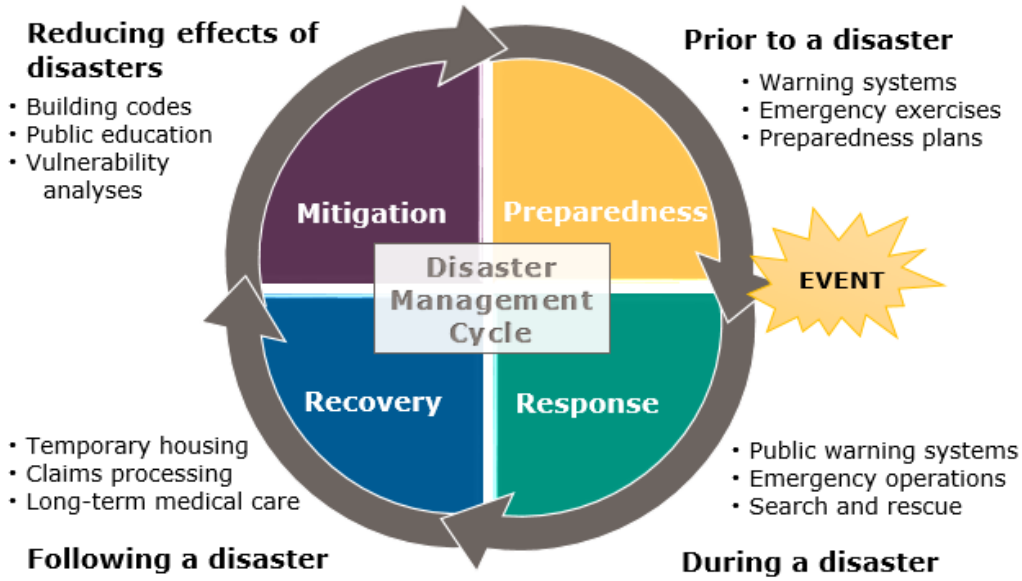

Figure 1. An Integrated Planning Process

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 Clark County MHMP planning team is composed of individuals representing the county and its participating jurisdictions. The Clark 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. Some of the invited parties included representatives from local school corporations, local utility companies, Indiana Department of Natural Resources (IDNR), the local floodplain administrator, town clerks, local fire and police departments, building and planning departments, the coroner, representatives from the chamber of commerce, and many more. A full list, along with a copy of the letter sent out can be found in Appendix A. 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. Clark County Incorporated Jurisdictions Participation

Jurisdiction Name	Jurisdiction Type	2016 Participant	Received Invitation to Participate	2022 Participant
Clark County	County	Yes	Yes	Yes
Borden	Town	Yes	Yes	Yes
Charlestown	City	Yes	Yes	Yes
Clarksville	Town	Yes	Yes	Yes
Jeffersonville	City	Yes	Yes	Yes
Sellersburg	Town	Yes	Yes	Yes
Utica	Town	Yes	Yes	Yes
Borden Henryville School Corporation	School District	No	Yes	Yes
Clarksville Community School Corporation	School District	No	Yes	Yes
Greater Clark County Schools	School District	No	Yes	Yes
Rock Creek Community Academy	School District	No	Yes	Yes
Silver Creek School Corporation	School District	No	Yes	Yes
Jefferson-Clarksville Flood Control District	Flood Control District	No	Yes	Yes

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
Gavan Hebner	Director	Emergency Management Agency	Clark County
Mindi Holmes	Clerk-Treasurer	Borden	Borden
Albert Purcell	Streets Superintendent	Charlestown	Charlestown
Tom Clevidence	Floodplain Administrator	Clarksville	Clarksville
Brian Smith	Safety Manager	Jeffersonville	Jeffersonville
Charlie Smith	Town Manager	Sellersburg	Sellersburg
Richard Clark	Chief	Police Department	Utica
Scott Gardner	School Safety & Transportation	Clarksville Community Schools	Clarksville Community School Corporation
Gary Green	School Safety Specialist	Greater Clark County Schools	Greater Clark County Schools
Sandy Myers	Principal	Silver Creek School Corporation	Silver Creek School Corporation
Mindi Holmes	Coordinator of Personnel	Borden Henryville School Corporation	Borden Henryville School Corporation
Leslie Riley	Assistant Principal	Rock Creek Community Academy	Rock Creek Community Academy
John Buckwalter	Superintendent	Jeff-Clarksville Flood Control District	Jeff-Clarksville Flood Control District

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 Clark County, the name of the EMA director and whether they participated in the process.

Table 3. Surrounding County EMAs Invited

County	Name	Attended
Floyd County, IN	Kent Barrow	No
Jefferson County, IN	Troy D. Morgan	Yes
Scott County, IN	Jeff Fortner	No
Washington County, IN	Desi Alexander	No

2.2 Review of Existing Plans

Clark 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

Author(s)	Year	Title	Description	Where Used
The Polis Center at IUPUI	2016	Multi-Hazard Mitigation Plan – Clark County	Previous Multi-Hazard Mitigation Plan	Sections 1-6
Federal Emergency Management Agency	2012	Flood Insurance Study for Clark County, Indiana and Incorporated Areas	Flood insurance study	Section 4
The Polis Center at IUPUI	2019	2019 State of Indiana Multi-Hazard Mitigation Plan	Indiana state multi-hazard mitigation plan	Section 3
United States Department of Agriculture Natural Resources Conservation Service	2007	Soil Survey of Clark County, Indiana	Soil survey	Section 3

2.3 Planning Process Timeline and Steps

The Clark County planning team met on September 7, 2021, for the MHMP 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 October 28, 2021, 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 December 7, 2021. 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. No members of the public attended 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. In addition, a final copy of the plan will be available online through the county's website.

3 Community Profile

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

3.1 General County Description

Clark County is in southern Indiana and is situated approximately 100 miles south of the capital city of Indianapolis. According to the 2010 US Census, the county has a total area of 372.86 square miles. According to Census Bureau, its population was estimated to be 116,507 in 2019. The City of Jeffersonville is the county seat and the largest incorporated community in the county, containing approximately 41% of the population in 2019. Figure 2 displays a general map of Clark County and its incorporated communities while the Clark County townships and their respective incorporated communities are outlined in

Table 5.

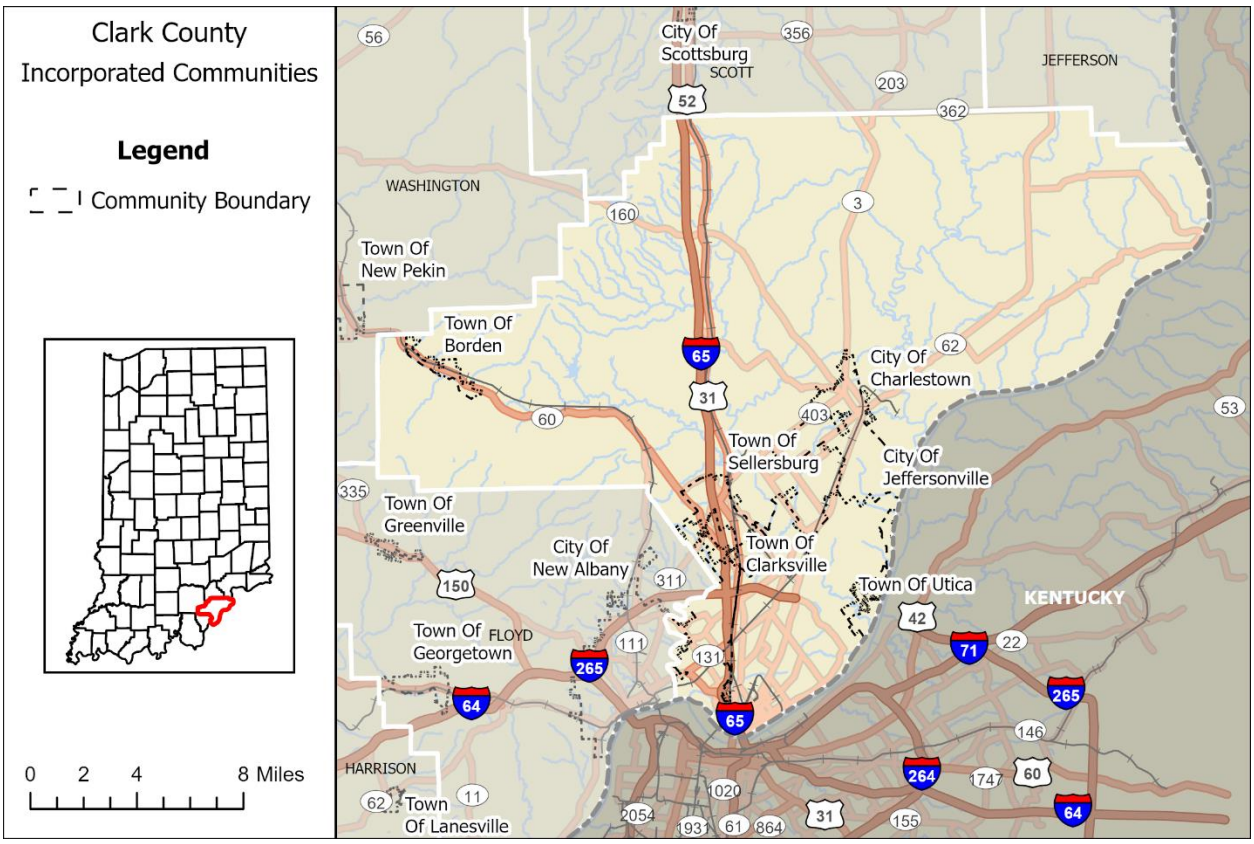

Figure 2. Clark County Incorporated Boundaries

Table 5. Clark County Townships and Incorporated Communities

Township	Communities located in Township
Bethlehem	--
Carr	--
Charlestown	Charlestown
Jeffersonville	Jeffersonville, Clarksville
Monroe	--
Oregon	--
Owen	--
Silver Creek	Sellersburg
Union	--
Utica	Utica
Washington	--
Wood	Borden

3.2 Historical Setting

In February 1801, Clark County was named in honor of George Rogers Clark, who was an American soldier, explorer, territorial governor, and became the highest-ranking American patriot military officer on the northwestern frontier during the American Revolutionary War. Created from Knox County, Clark County is strategically positioned across the Ohio River from Louisville, Kentucky. Clark County is part of the Louisville/Jefferson County, KY-IN Metropolitan Statistical Area. The first county seat was established in Springville in 1801. It was then moved to Jeffersonville, and then to Charlestown from 1802 – 1873. After that, the county seat returned to Jeffersonville.

From the beginning, Clark County relied on the Ohio River for economic prospects, and the county's history, growth, and culture have been closely associated with the development of the river. Howard shipyard, which was founded in 1832 and later sold and became known as Jeffboat, was the largest inland shipbuilder in the United States until it closed in 2018 is in Clark County. However, Clark County has diversified its economic base and continues to expand in new directions.

The county prospered during World War II. The federal government established Indiana Arsenal near Charlestown in 1940 which employed nearly 20,000 people. Following the war, the county experienced significant growth in residential and commercial sectors. The 1956 Interstate Act provided improved access which encouraged additional development activities in the county.

3.3 Physical Characteristics

3.3.1 Climate and Precipitation

The Clark County climate is characteristic of southern Indiana. Winter temperatures can fall below freezing starting as early as December and extending as late as April. Based on National Centers for Environmental Information (NCEI) norms from 1981 to 2010, the average winter minimum temperature is 25.3° F and the average high is 34.3° F. In summer, the average low is 63° F and average high is 74.2° F. Average annual precipitation is 45.6 inches throughout the year. The average winter precipitation is 10.21 inches.

3.3.2 Future Climate Trends

Much like all parts of the world, Indiana is facing more and more challenges as the climate continues to shift. The Indiana Climate Change Impacts Assessment (IN CCIA) from 2018 (https://ag.purdue.edu/indianaclimate/indiana-climate-report) found that the climate in the state is predicted to change within the century. The main findings from this study are listed below:

- Temperatures are projected to rise about 5-6°F by mid-century.
- The number of extremely hot days will rise.
- Extreme cold events will decline.
- The frost-free season will lengthen.

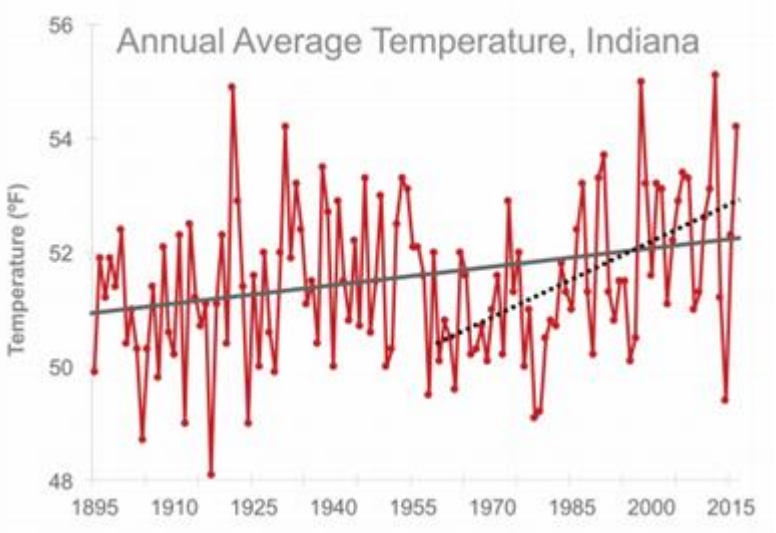

Figure 3. Annual Average Temperature (Widhalm M. H., 2018)

3.3.2.1 Predicted Changes in Temperature

The IN CCIA indicates that Indiana has warmed 1.2°F since 1895 and temperatures will rise by about 5°F to 6°F by mid-century. This has multiple impacts for Indiana, including changes to the timing and length of the frost-free season, and the occurrence of temperature extremes. These shifts will impact air quality, extend the growing season and the allergy season, and create more favorable conditions for some pests and invasive species.

Indiana's growing season is expected to increase by 35 days for the northern part of the state, 33 days for the central part of the state, and 30 days for the southern part of the state (see Figure 4).

Warming temperatures in the winter months will affect the types of plants and pests that can thrive in Indiana and alter the amount of energy needed to heat and cool homes and businesses. Additionally, rising temperatures are likely to reduce soil moisture and lead to drought in Indiana which will further impact and damage crops and crop yields in the future. According to the IN CCIA, corn yields in southern Indiana are projected to decrease approximately 18-19% by 2070. Soybean yields are projected to decrease 9-11% by mid-century.

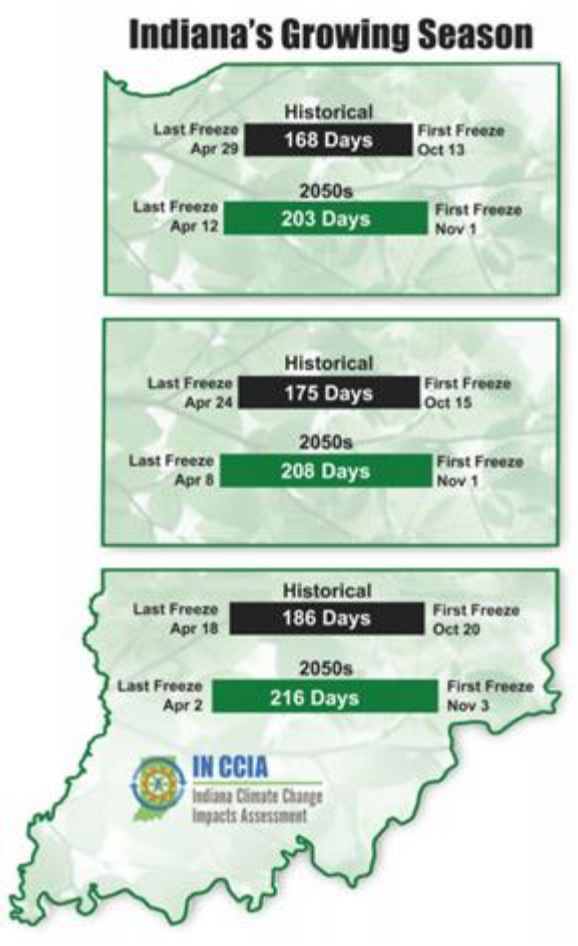

Figure 4. Indiana's Growing Season (Widhalm M. H., 2018)

3.3.2.2 Predicted Changes in Precipitation

Since 1895, average annual precipitation in Indiana has increased by about 15%, or about 4.5 inches, based on a linear trend. This trend is projected to continue, though the type of precipitation and when it falls are changing and will continue to do so.

The southern and west-central regions of the state have observed the largest increases in precipitation, while the east-central and northeast regions observed the smallest. Spring and fall increases were smallest in the north and largest in the south. The opposite was true in summer when increases were larger in the north and west.

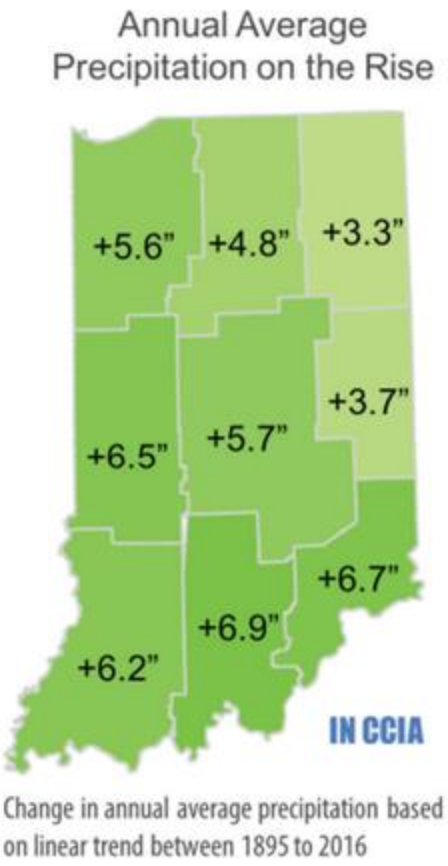

Figure 5. Average Precipitation Increase (Widhalm M. H., 2018)

With Clark County's location in the southeastern portion of the state, predictions show that the county experienced an increase of 6.7 inches of precipitation annually in the past century. With increasing temperatures, it is expected that rain will replace snow in the cold season. Fewer snow days would save municipality and state funding for plowing and salting roadways. However, wetter winters and springs will increase the risk of flooding and combined sewer system overflows, resulting in decreased water quality.

3.3.2.3 Predicted Changes in Extreme Events

Extreme and heavy rainfall events have increased in the past century, and this is expected to continue. These events contribute to soil erosion and nutrient runoff, affecting both water quality and crop productivity.

There is also an indication that the number of tornadoes affecting Indiana may increase, putting more residents and property at risk while increasing response and recovery costs.

3.3.3 Geology and Topography

According to the United States Department of Agriculture Soil Survey of Clark County, the lowest point in Clark County is 390 feet above sea level and the highest point in the county is about 1,020 feet above sea level.

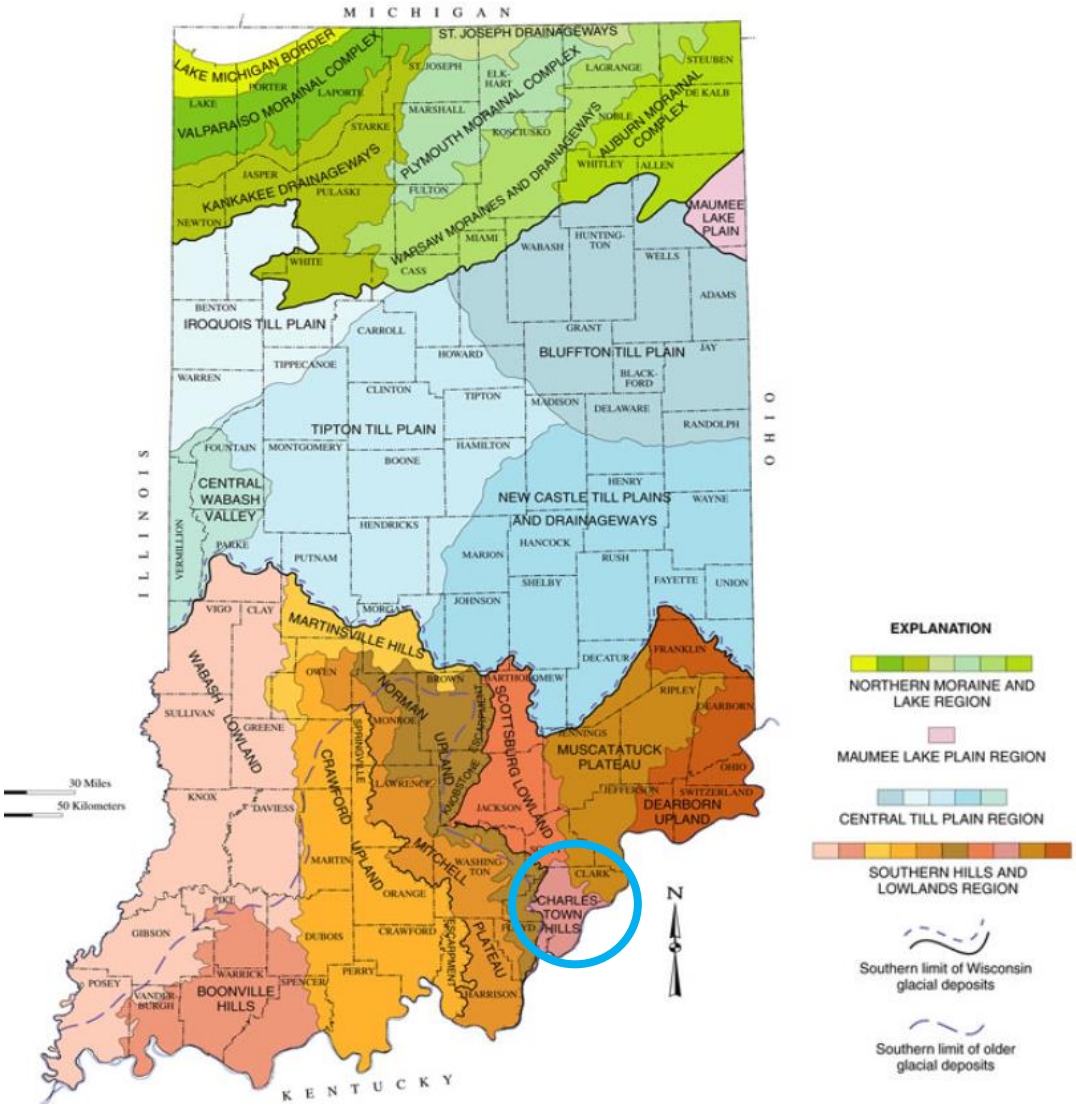

Figure 6. Physiographic Divisions of Indiana (Source: Indiana Geological Survey)

Clark County's topography is dominated by the Charlestown Hills in the central part, Muscatatuck Plateau in the eastern part, and Norman Upland and Mitchell Plateau in the western part of the county. The Charlestown Hills is characterized by bedrock hills of low relief. The Muscatatuck Plateau is defined by broad till-covered uplands entrenched by major valleys. The Norman Upland is marked by bedrock hills of high relief. Mitchell Plateau is characterized

by rolling clay-covered upland of low relief and large areas of karst, entrenched by major valleys.

According to the Indiana Department of Natural Resources, a greater number of Virginia pine and chestnut oaks are found in this region. The Indiana Geological Survey reports that the bedrock in Clark County is primarily Mississippian and Devonian, and made up of shale sandstone, siltstone, limestone, dolostone, and gypsum.

3.3.4 Land Use and Ownership

3.3.4.1 Agriculture

The 2017 U.S. Census of Agriculture reports that there are 483 farms in the county covering 94,020 acres. Of this farming land, 73% is cropland and 27% is classified as "other uses." Figure 7 displays the agricultural areas in Clark County along with confined feeding operations (CFO). CFOs are defined by the Indiana Department of Environmental Management (IDEM) as "the confinement of animals in buildings or lots with less than 50 percent vegetation or ground cover for 45 days or more over a 12-month period" and a certain number of animals, based on the type of animal. These types of operations are regulated at the state level but can also be regulated at the county level in terms of siting through a zoning ordinance. Indiana's focus on CFOs is on effective storage and application of manure and related wastes generating by those CFOs.

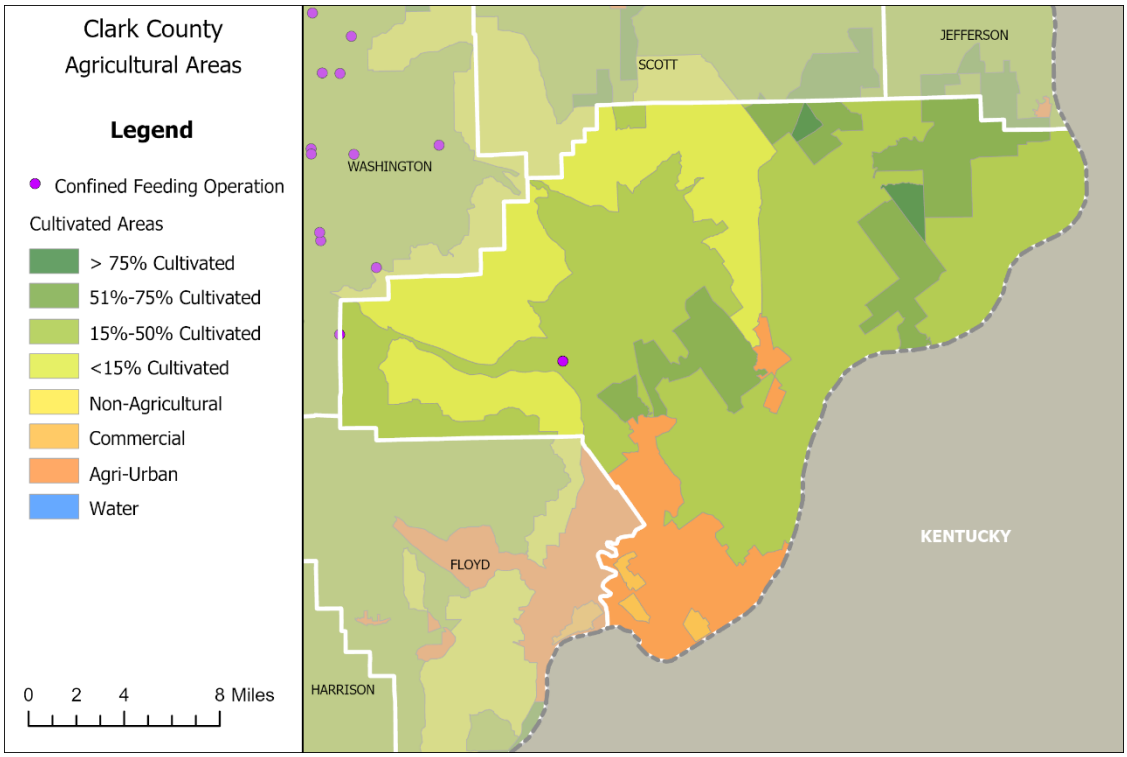

Figure 7. Clark County Agricultural Areas

3.3.4.2 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 can preserve plant and animal species and combat air pollution, land pollution, and water quality issues. Figure 8 depicts managed land in Clark County.

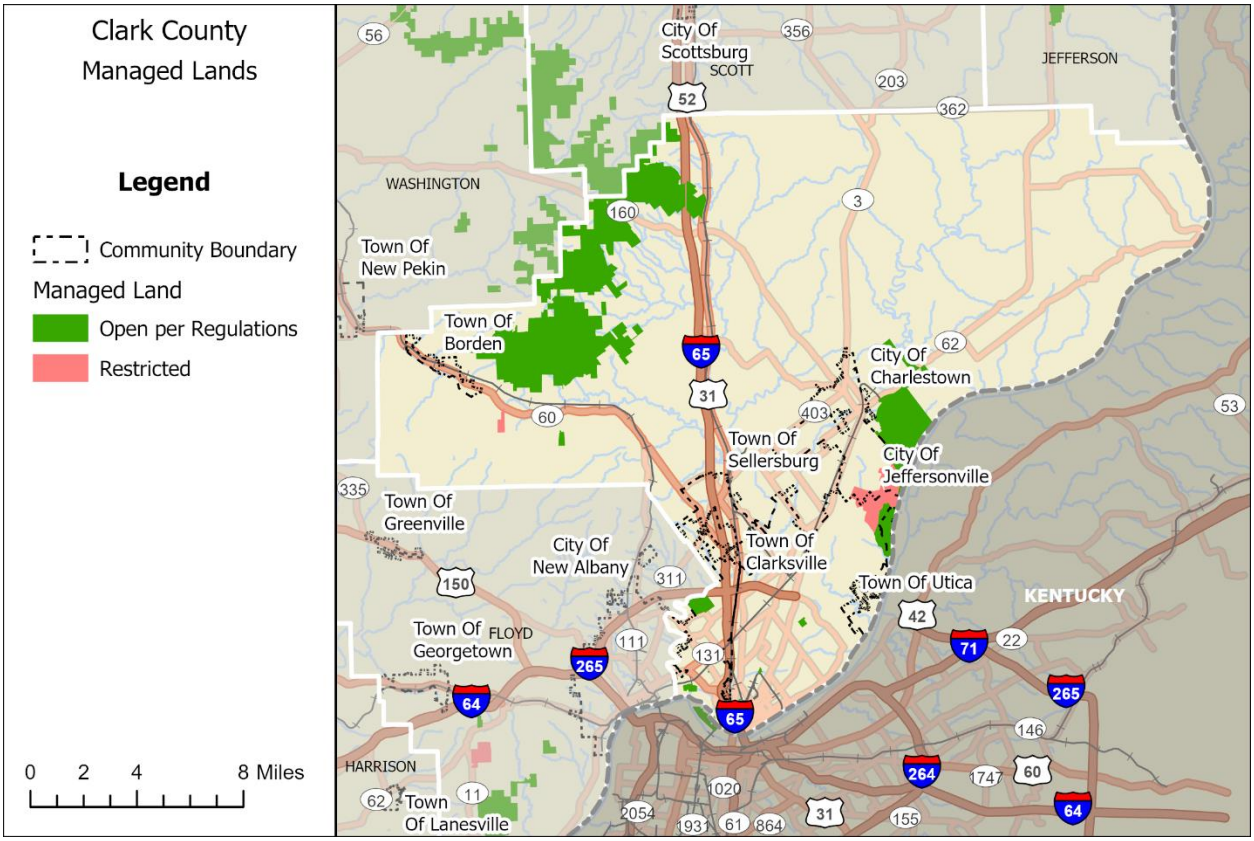

Figure 8. Clark County Managed Lands

3.3.5 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.

3.3.5.1 Watersheds

Clark County is located within three major watersheds: Silver-Little Kentucky, (05140101), Blue-Sinking (05140104), and Muscatatuck (05120207) watersheds as shown in Figure 9. The Silver-Little Kentucky covers the majority portion of the county whereas the Blue-Sinking intersects

with the western part of the county and Muscatatuck intersects with the northern part of the county.

3.3.5.2 Rivers and Streams

The Clark County National Hydrography Dataset (NHD) contains over 384.8 miles of streams and rivers. Major streams and rivers in the county are displayed in Figure 9. The communities of Jeffersonville and Clarksville were constructed near the banks of the Ohio River. According to the Indiana Natural Resources Commission, the Ohio River is navigable throughout the county.

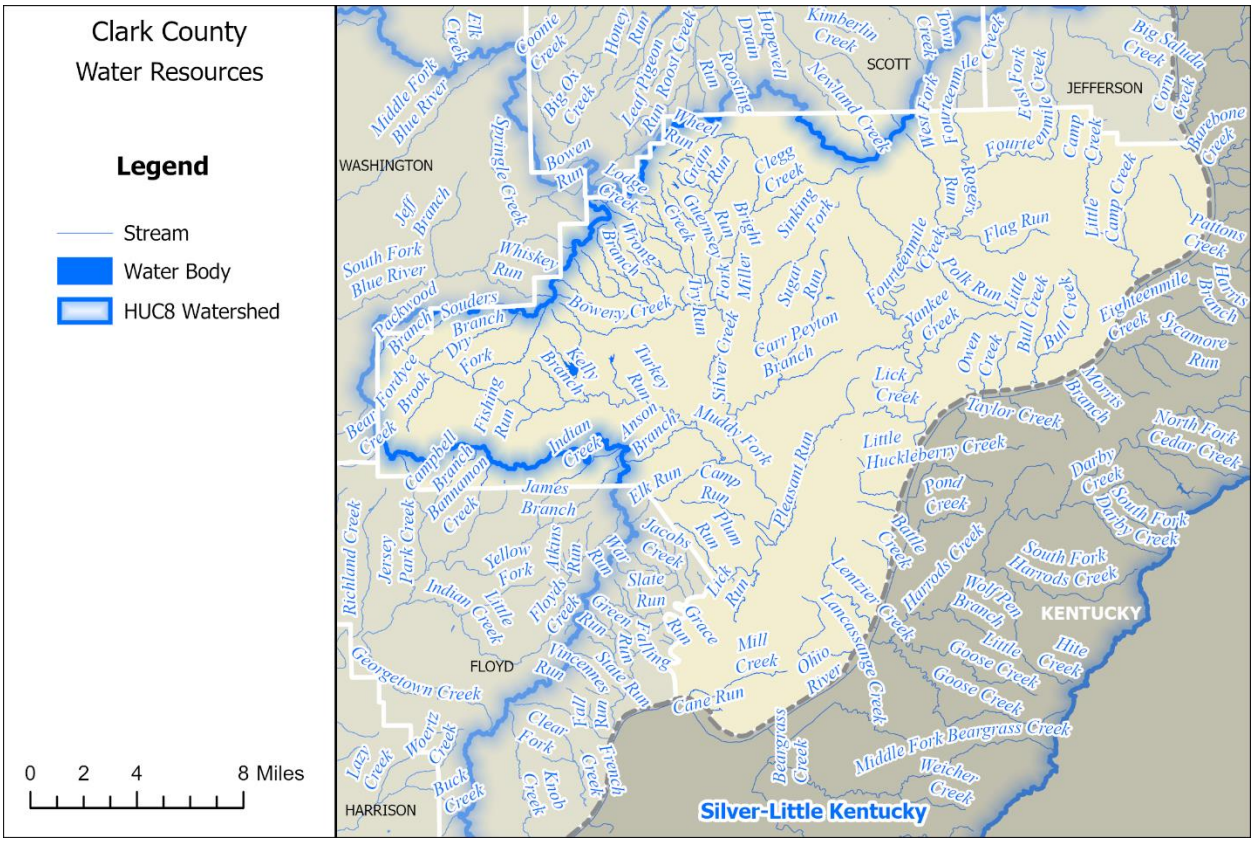

Figure 9. Clark County Water Resources (Water resource data courtesy of IDNR)

3.3.5.3 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 IDNR 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). There are no PFLs in Clark County.

3.3.5.4 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 10 displays the lakes and wetlands in Clark County.

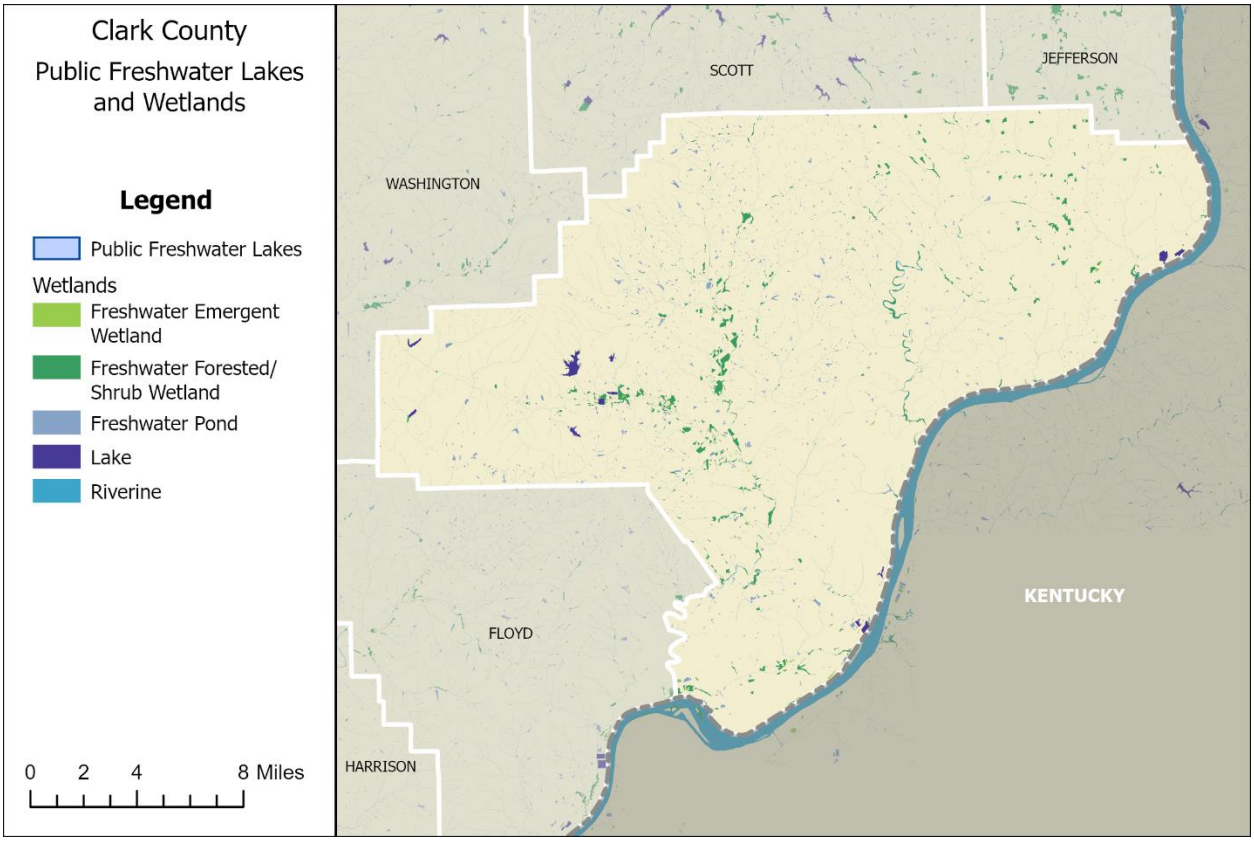

Figure 10. Public Freshwater Lakes and Wetlands (Water resource data courtesy of IDNR)

3.4 People

3.4.1 Population and Demographics

The US Census Bureau determined that Clark County's population was 96,472 in 2000 and 110,232 in 2010. The American Community Survey 5-year estimates that 116,507 people resided in Clark County in 2019. The population increased by 5.69% between 2010 and 2019 as displayed in Figure 11. The population density in 2019 was 312 people per square mile.

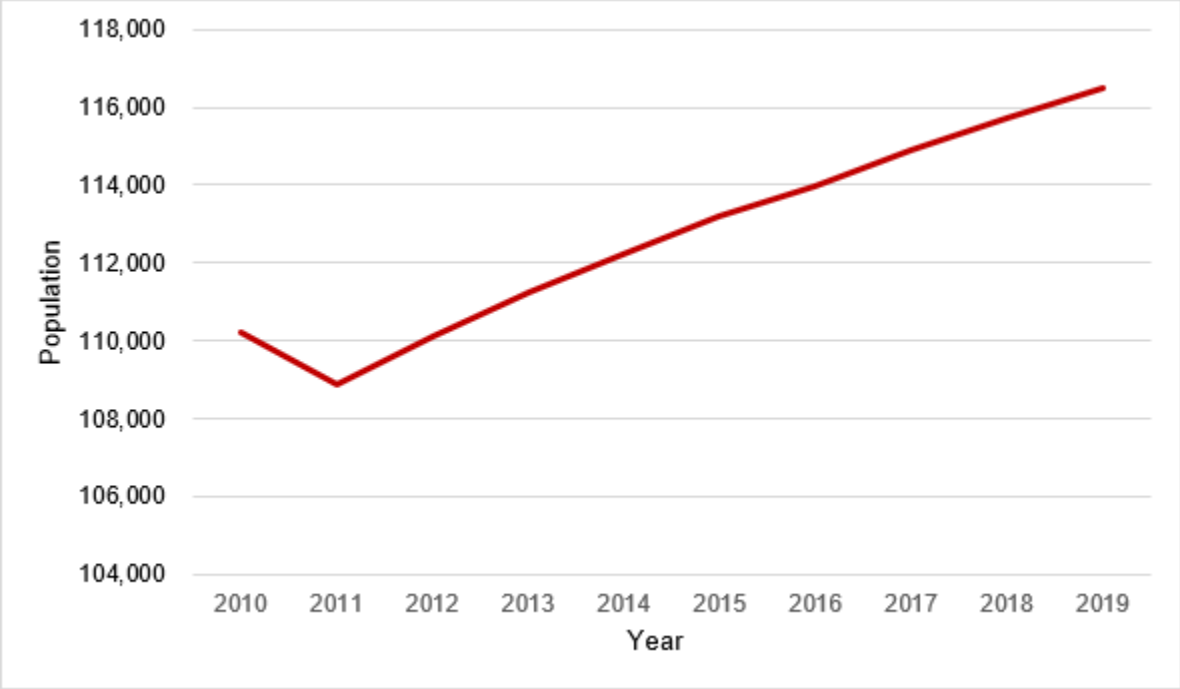

Figure 11. Clark County Yearly Population 2010-2019 (American Community Survey 5-Year Estimates)

The 2019 median age of Clark County is 39.1 compared to the state median of 37.7. The age distribution of Clark County is shown in Figure 9. Of the population age 25 and older, 89.5% have completed a high school education or higher while 21.2% have completed a bachelor's degree or higher.

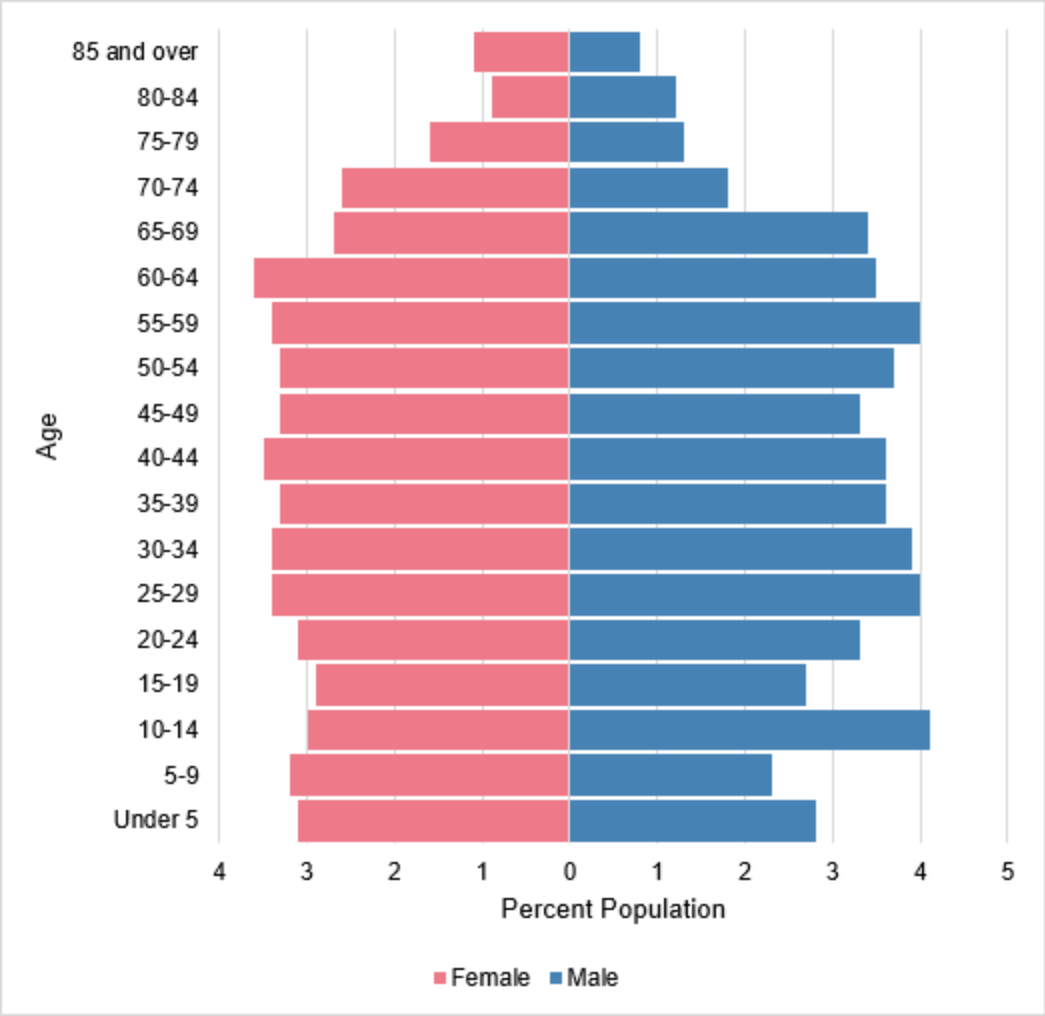

Figure 12. Distribution of Ages in Clark County (2019 American Community Survey 5-Year Estimates)

3.4.1.1 Social Vulnerability and Inequity

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. Figure 13 compares Clark County to its surrounding counties, as well as to Indiana, by the percent population of each special needs category within the county/state.

Compared to the surrounding counties, Clark County has a relatively low percentage of people with disabilities and living in poverty, but a higher percentage of people who speak a language other than English at home.

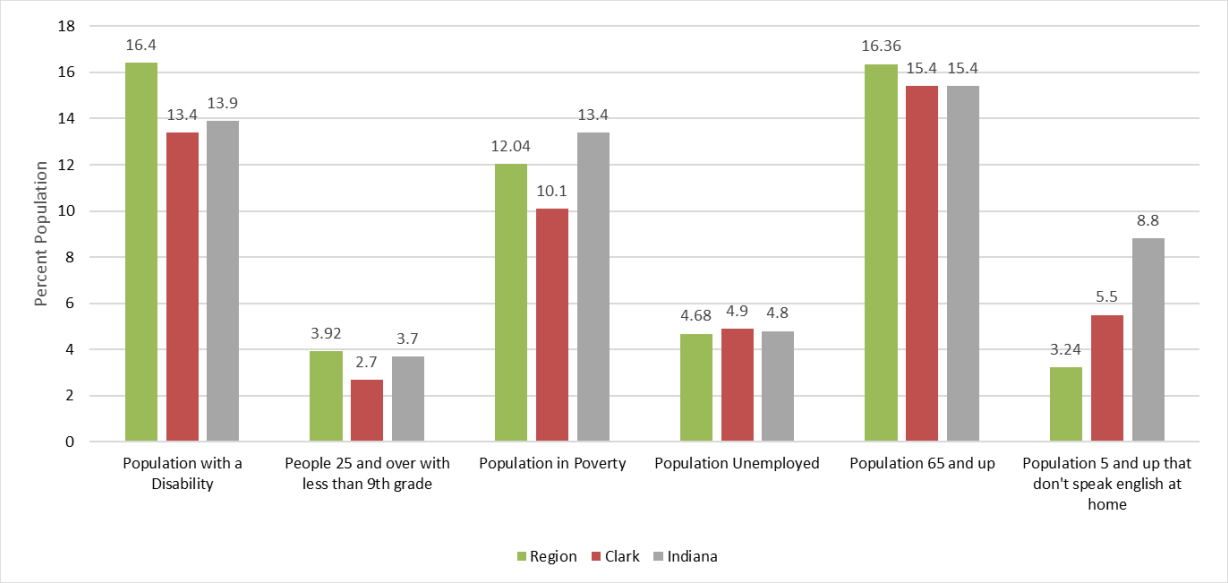

Figure 13. Special Needs Populations (American Community Survey 5-Year Estimates)

Another tool that can be used to better understand the disproportionate risks facing certain residents of Clark County is FEMA's National Risk Index (NRI). The NRI utilizes source data for 18 different natural hazards along with social vulnerability indices and community resiliency rankings. By combining these 3 risk factors, the NRI applies an overall Risk Rating that considers the likelihood and impact of natural disasters, the social vulnerability of the area and the measured community resilience. This ranking is meant to be used to aid communities in better understanding the risk to their populations as well as a tool to help make better policies. More information about FEMA's NRI can be found at https://www.fema.gov/flood-maps/products-tools/national-risk-index.

The overall risk rating for Clark County is shown in Figure 14. In general, the rural areas have a lower NRI than the more urban areas in Clark County. Specifically, the City of Jeffersonville and Town of Clarksville show a Relatively Moderate to Relatively High risk rating while the rest of the county shows a Relatively Low to Very Low risk rating. Figure 15 shows the social vulnerability rank for Clark County. This shows that much of the county has a social vulnerability ranking of very low, relatively low or moderate.

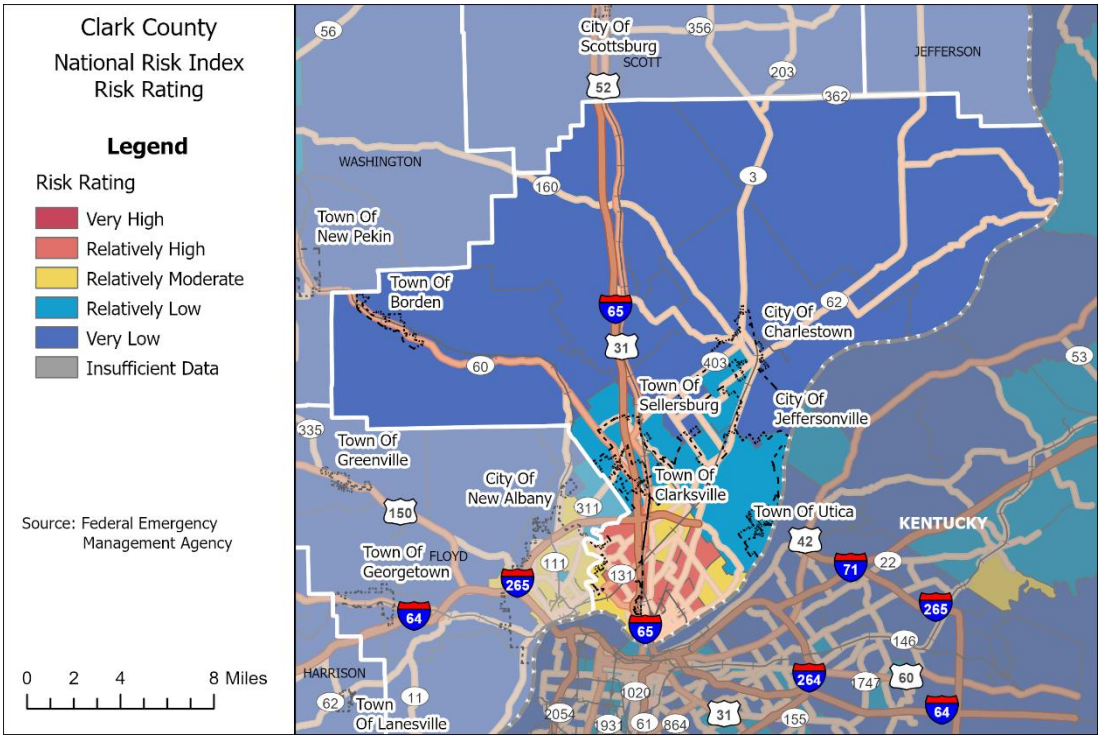

Figure 14. National Risk Index (NRI) Risk Rating

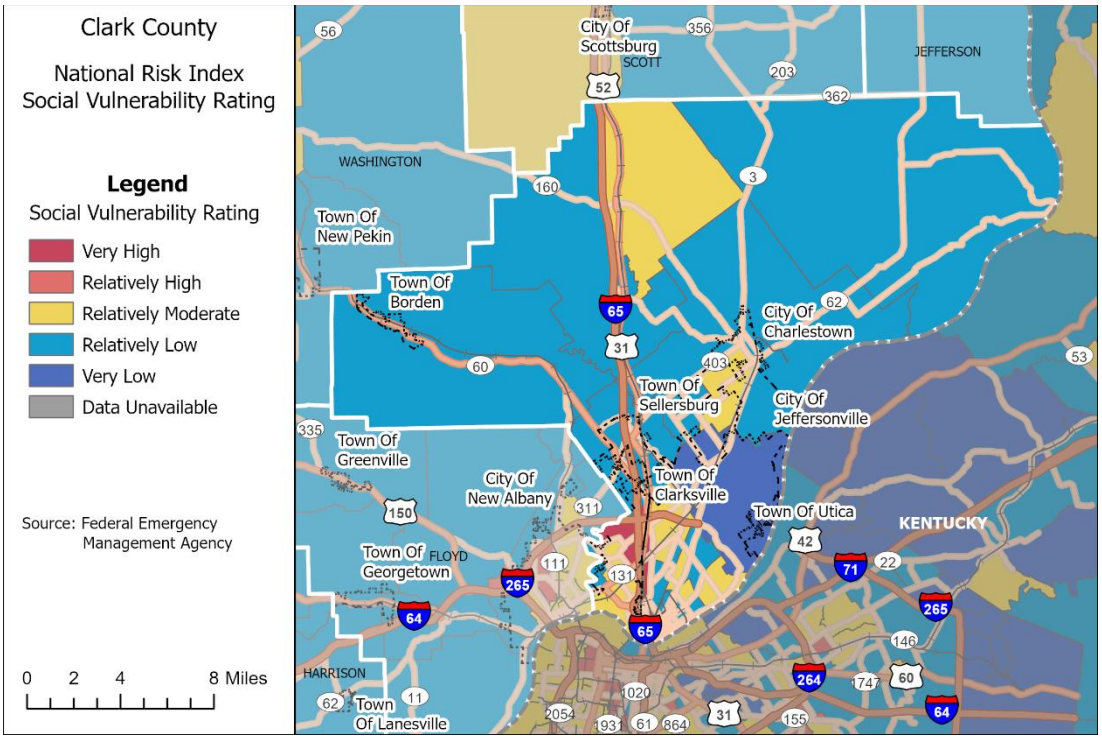

Figure 15. National Risk Index (NRI) Social Vulnerability Rating

3.4.2 Housing

Approximately, 48.1% of Clark County households consist of married-couple families, compared to 48.2% of married-couple households in Indiana. In 2019, the county had an average household size of 2.6 people.

3.4.3 Economy and Employment

The 2019 annual per capita personal income in Clark County was $29,062, compared to an Indiana per capita income of $29,777. The median household income is $55,630, which is slightly lower than the state median household income of $56,303. Of the Clark County work force, 16.5% are employed in the manufacturing industry while educational services, and health care and social assistance accounts for 20.7% of industry. The major employers in Clark County are listed in Table 6.

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

Company Name	Location	Employees
Afge Local 1438	Jeffersonville	1,500
Clark Memorial Health	Jeffersonville	1,338
Shoe Sensation Inc	Jeffersonville	700
Directv Authorized Retailer	Jeffersonville	600
Kroger	Jeffersonville	500
National Distributors Leasing	Sellersburg	435
Ivy Tech Community College	Sellersburg	430
American Commercial Barge Line	Jeffersonville	400
Koetter Woodworking Inc	Borden	399
Walmart Supercenter	Clarksville	338

3.4.4 Culture

According to the Indiana Historic Sites and Structures Inventory, Clark County has 12 historic places that appear on the National Register of Historic Places and five historic districts as shown in Figure 16.

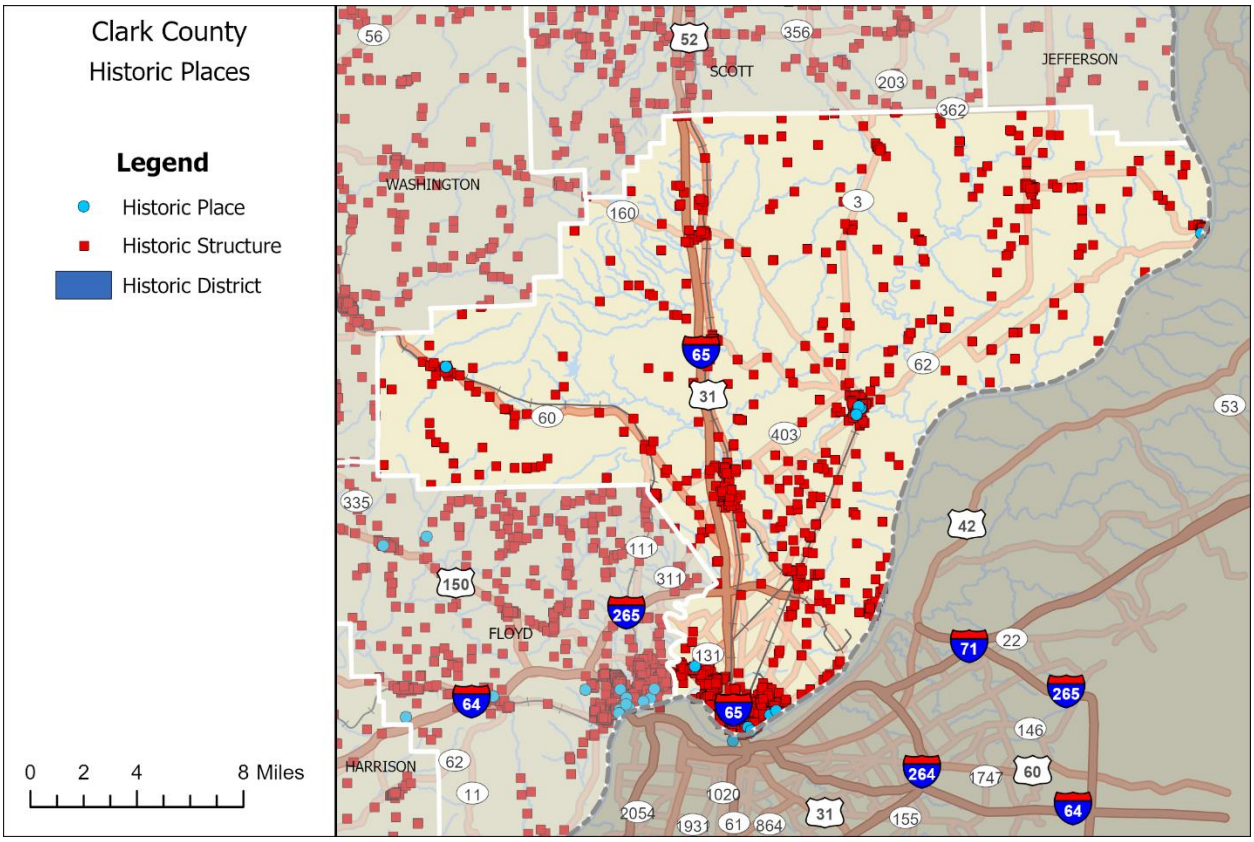

Figure 16. Historic Places in Clark County (Indiana State Historical Architectural and Archaeological Research Database)

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 17 identifies the major transportation features of Clark County.

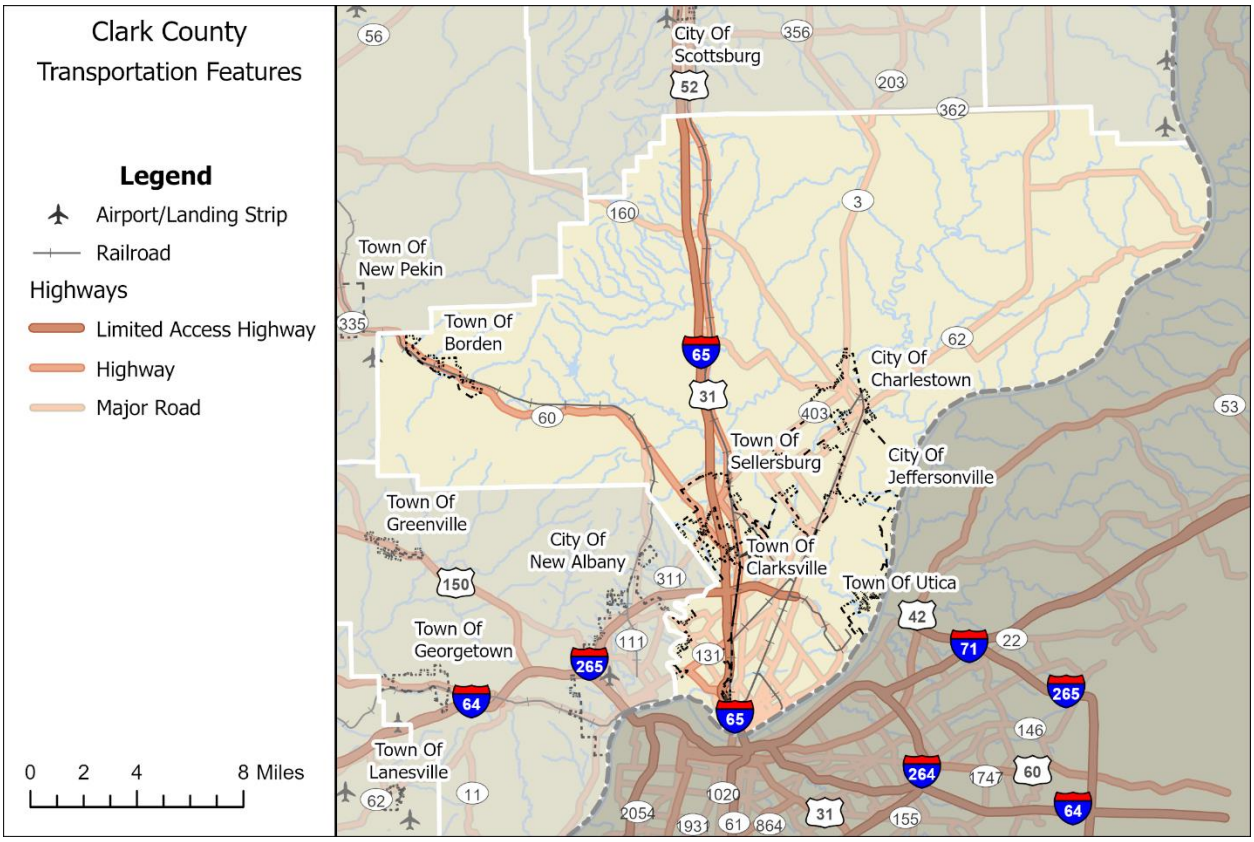

Figure 17. Clark County Major Transportation Features (Indiana Department of Transportation)

Clark County is a major transportation hub with Interstate Highway Access, railroads, and proximity to regional and international airports. The Indiana Department of Transportation (INDOT) Seymour District manages the state transportation resources. Major highways include I-65, I-265, SR-3, SR-60, SR-62, SR-160, SR-265, SR-363, and US-31. The county also has direct access to shipping on the Ohio River with the Port of Indiana-Jeffersonville facility. The Port of Indiana - Jeffersonville is one of three State of Indiana ports that operate as Foreign Trade Zones.

Clark County has three main rail corridors: CSX Railroad, MGR Rail Road, and Southern Indiana (SIND) Railroad. CSX Railway is one of North America's larger Class I freight railroads. The railroad operates approximately 21,000 route miles.

The largest commercial airport is the Clark County Regional Airport. The nearest international air transportation is Louisville International Airport in Louisville, Kentucky. Clark 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 2019 data, 54,397 Clark County residents

work within the county and 23,885 work outside the county. An additional 14,464 people living in other counties commute to Clark County for work. Figure 18 indicates the number of workers 16 and older who commute to or from Clark County for work.

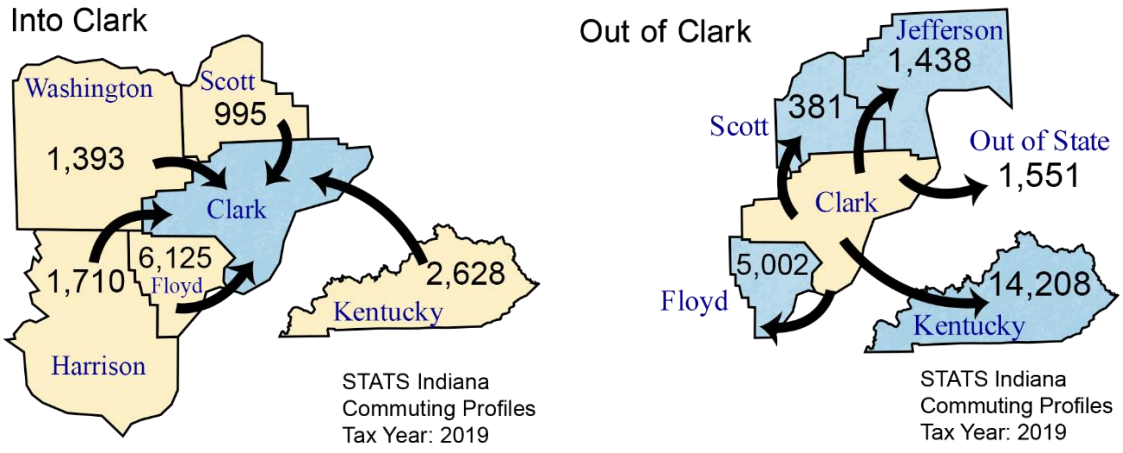

Figure 18. Commuting Patterns (STATS Indiana)

3.5 Building Codes

Indiana does not have hazard-resistant building codes, as shown in Figure 19, although one of the most effective ways to help reduce the impacts of natural disasters is the updating and enforcing of better building codes. Studies show that by increasing the standards for building codes, the overall negative impact of natural disasters can be reduced.

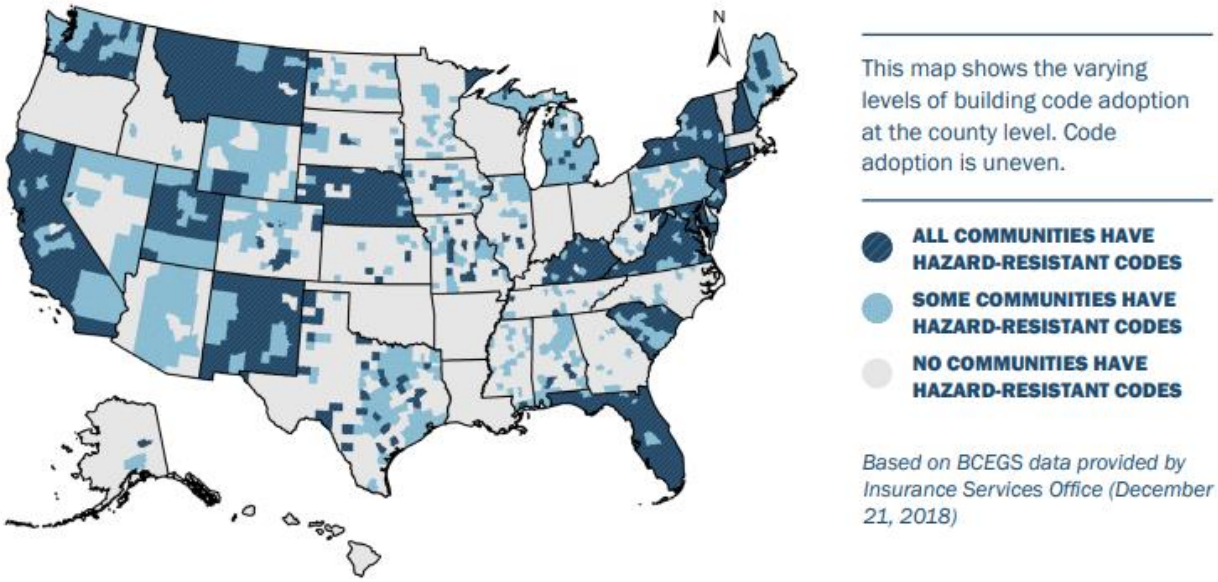

Figure 19. Nationwide Building Code Adoption (Source: FEMA, 2020)

In 2005 the National Institute of Building Sciences developed a landmark study, Mitigation Saves, which revealed that for every $1 spent on hazard mitigation an average of $4 in disaster related costs could be avoided. A 2019 update of this study considered a wider range of hazards and integrated recent research on the social and economic impacts. While the benefits of mitigation vary by hazard, the study showed that on average $13 can be saved for every dollar invested in mitigation. It also examined specific mitigation actions such as building codes. Building codes are designed to establish minimum requirements that ensure life safety. The study reveals that on average building codes have only added about 1% to construction costs relative to 1990 standards. For new construction designed consistent with building codes the study showed that an average of $11 can be saved in disaster repair and recovery costs for every $1 invested. When above code designs are implemented, an average of $4 can be saved for every $1 invested. Additional research, such as the 2020 Building Codes Save study released by FEMA, continue to reveal the value of building codes. According to the FEMA study, over a 20-year period cities and counties with modern building codes would avoid at least $32 billion in losses from natural disasters when compared to jurisdictions without modern building codes.

Florida has made great strides in increasing their standards so that homes in their state are more resistant to hurricane winds and coastal flooding. While hurricanes may not be a concern in Indiana, we do face ever-increasing risks of tornadoes and straight-line wind damage. A study done by the University of Oklahoma was able to identify tornado resistant construction techniques, which would allow homes to withstand winds up to 135 mph. The team studied the aftermath of a 2013 tornado and were able to identify several improvements to the current code that would improve a building's ability to withstand damaging winds at an overall construction cost increase of just 1-2 percent (Doak, 2017).

Figure 20 provides examples of how Greensburg, Kansas and Cedar Rapids, Iowa, have adopted more disaster-resistant building codes to protect their communities from tornadoes and flooding.

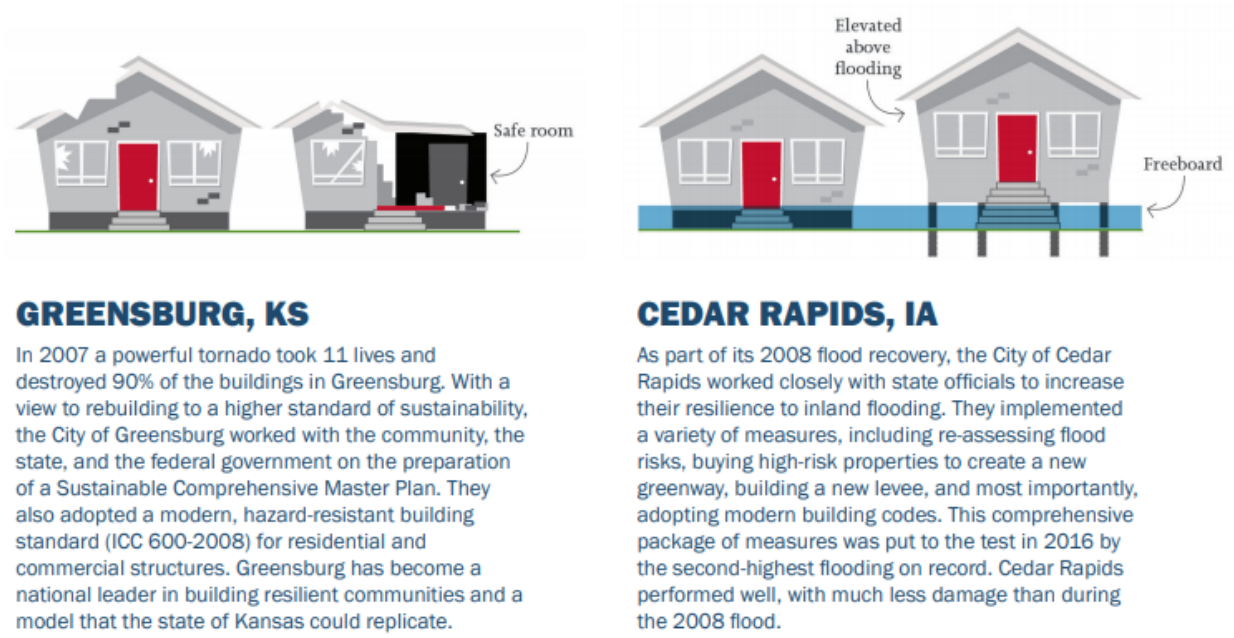

Figure 20. Example of Building Codes (FEMA)

Clark County has experienced 12 tornadoes and 5 high wind events in the last 25 years. The total damages reported from these events was over $58 million and 4 deaths. Clark County has experienced 19 flood events in the last 25 years. The total damages reported from these floods was over $20 million and 1 death.

While more robust building codes cannot guarantee complete safety in the event of a disaster, they can go a long way to protecting the citizens of Clark County.

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 previous Clark County MHMP identified the major hazards to which Clark County is exposed. The following sections present historical data regarding hazard incidents and resultant costs in Clark County.

4.1.2 Historical Hazards

Historical storm event data was compiled from the NCEI. NCEI 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 NCEI data included 424 reported events in Clark County from 1965 through 2020. The counts of these events by category are represented in Figure 21. NCEI reports 181 events in Clark County from 2011 through 2020. These recent events and their counts are reported in Figure 22.

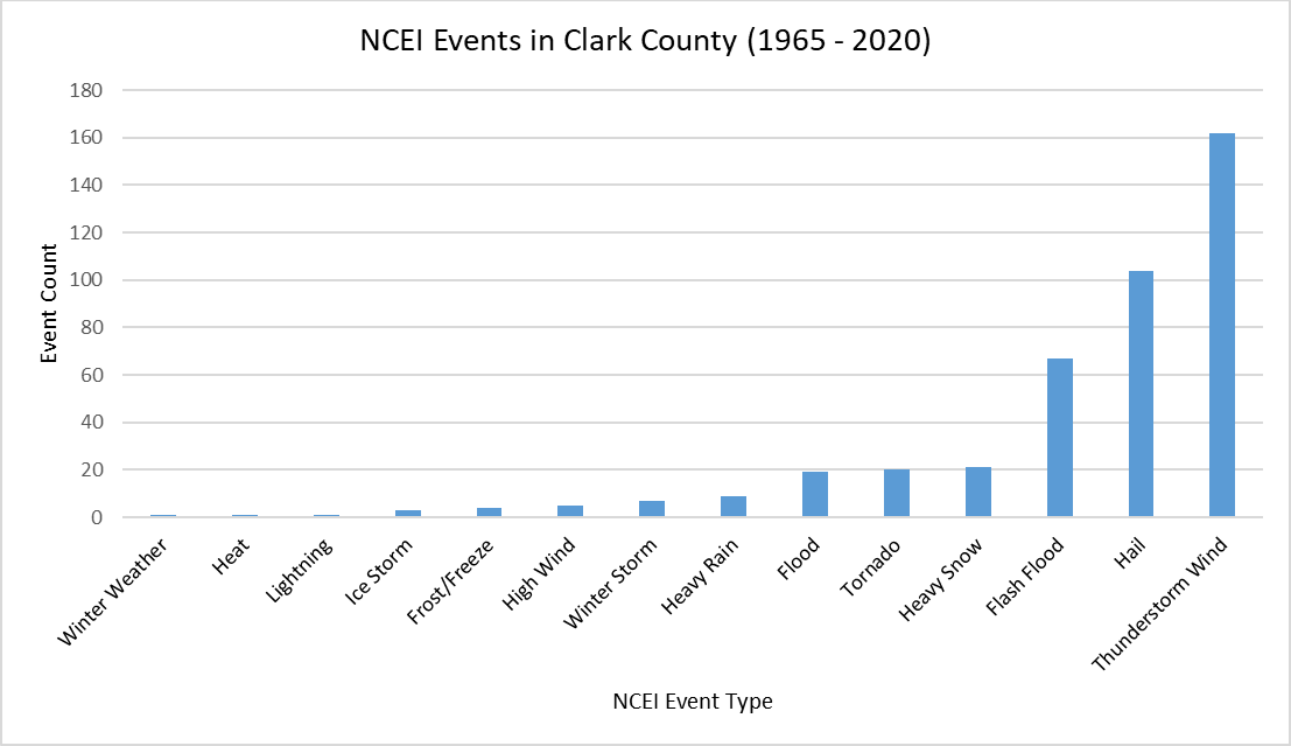

Figure 21. Count of NCEI Events in Clark County (1965-2020)

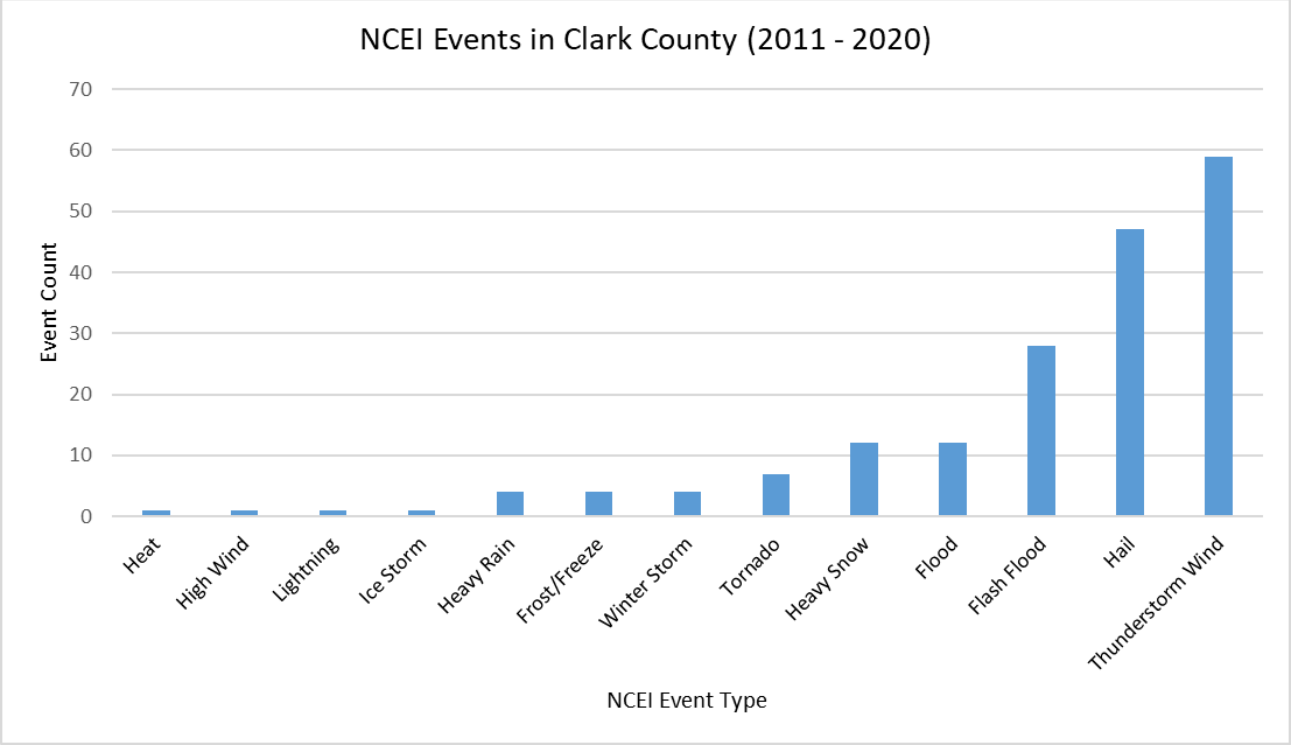

Figure 22. NCEI Events in Clark County (2011 – 2020)

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

4.1.3 FEMA Declared Disasters

Since 2000, FEMA has declared 20 disasters for the state of Indiana. Figure 23 shows the number of disaster declarations by county. Table 7 shows the details of the major disaster declarations, including FEMA hazard mitigation funding and total assistance, for Clark County. Clark County has received federal aid for 9 declared disasters.

Table 7. FEMA-Declared Disasters and Emergencies for Clark County (2000-2021)

Disaster Number	Date of Incident	Date of Declaration	Disaster Description	Type of Assistance
DR-1520-IN	5/25/2004 – 6/25/2004	6/3/2004	Severe Storms, Tornadoes, and Flooding	IH, IA, PA, HMGP
DR-1542-IN	7/3/2004 – 7/18/2004	9/1/2004	Severe Storms, Tornadoes, and Flooding	PA, HMGP
DR-1573-IN	1/1/2005 – 2/11/2005	1/21/2005	Severe Winter Storms, and Flooding	IH, IA, HMGP
DR-1795-IN	9/12/2008 – 10/6/2008	9/23/2008	Severe Storms, and Flooding	IH, IA, PA, HMGP
DR-1828-IN	1/26/2009 – 1/28/2009	3/5/2009	Severe Winter Storm	PA, HMGP
DR-1997-IN	4/19/2011 – 6/26/2011	6/23/2011	Severe Storms, Tornadoes, and Straight-line Winds	PA, HMGP
DR-4058-IN	2/29/2012 – 3/3/2012	3/9/2012	Severe Storms, Straight-line Winds, and Tornadoes	IH, PA, HMGP
DR-4363-IN	2/14/2018 – 3/4/2018	5/4/2018	Severe Storms, and Flooding	IH, PA, HMGP
DR-4515-IN	1/20/2020 - Present	4/3/2020	COVID-19 Pandemic	IH, PA

Table key:

- PA – Public Assistance Program
- IA – Individual Assistance Program
- IH – Individual and Household Assistance Program
- HMGP – Hazard Mitigation Grant Program

Figure 24 provides a breakdown of the public assistance to Clark County.

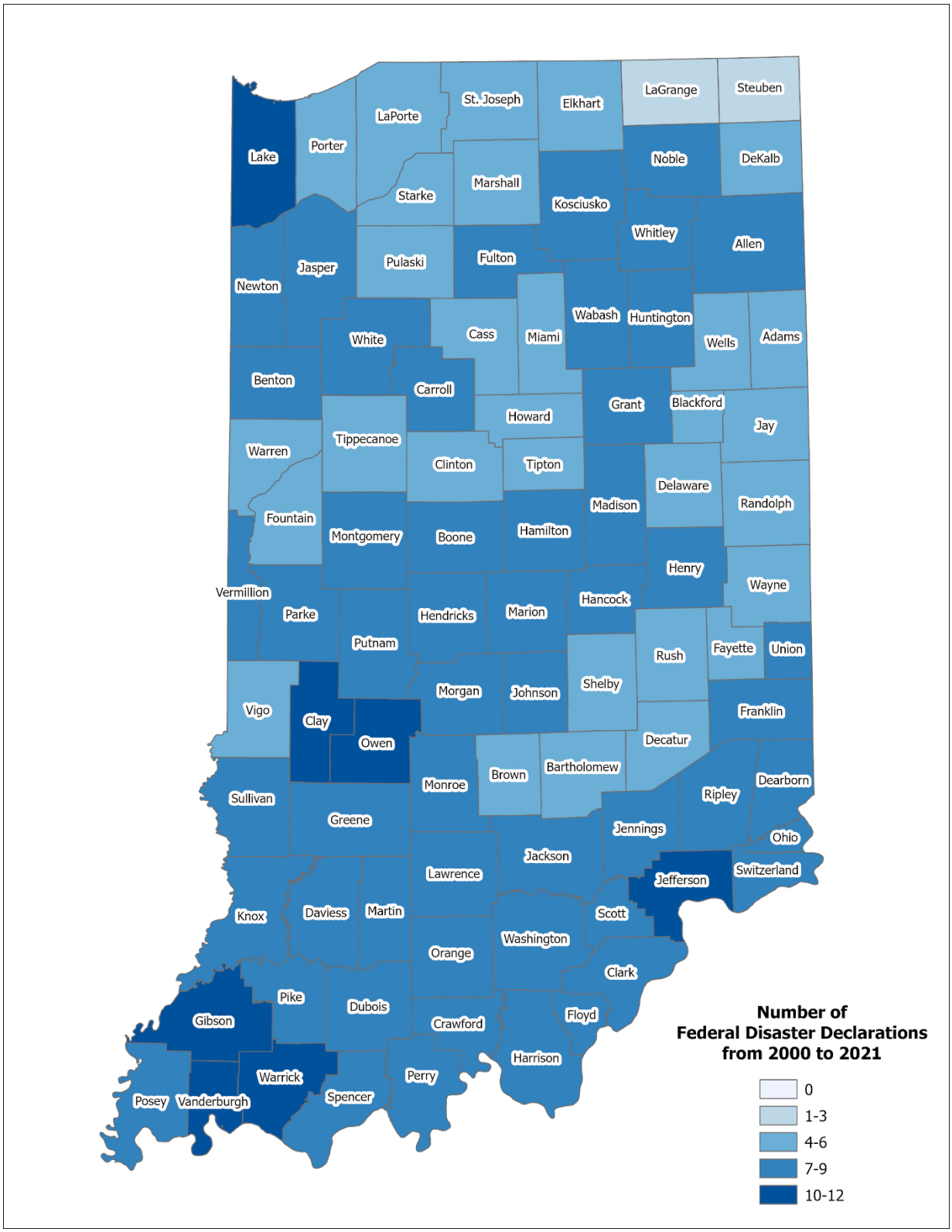

Figure 23. Disaster Declarations for Indiana

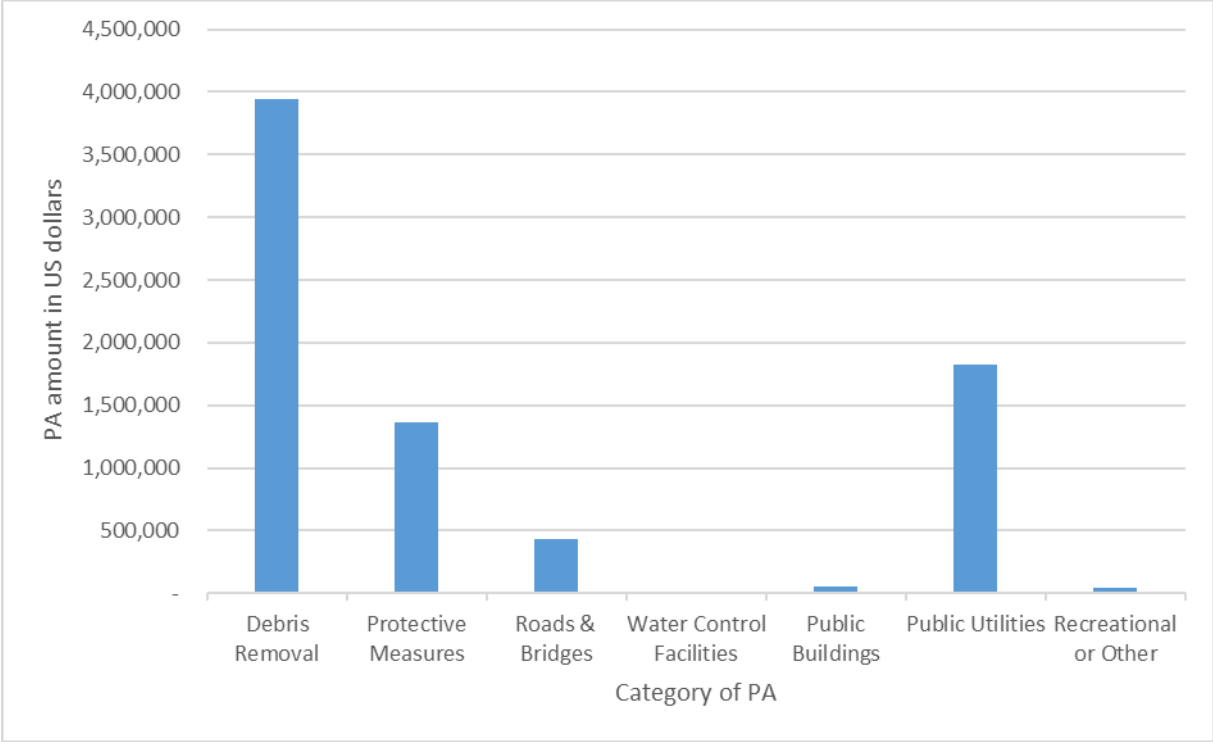

Figure 24. Indiana Disaster Public Assistance for Clark County (2008-2018)

The type of payments following a disaster help with ranking the severity of disasters and a guide to developing mitigation activities and projects. Highway departments have claimed significant damages from flooding and fluvial erosion, and rural electrical cooperatives have historically been vulnerable to ice storms and high winds.

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 8 outlines the SBA data for the county.

Table 8. SBA Declaration Data for Clark County

Year	FEMA Declaration	SBA Disaster Number	Community	Total Number Zip Codes Declared	Type	Total Verified Loss	Total Approved Loan Amount
2004	1520	IN-L0162	Borden, Charlestown, Henryville, Jeffersonville, Memphis	5	Home	$766,529	$394,000
2004	1520	IN-L0162	Borden	2	Business	$206,693	$133,800
2005	1573	IN-00001	Sellersburg	1	Home	$13,374	$10,000
2007	-	IN-00009	Charlestown, Clarksville, Jeffersonville, Sellersburg	4	Home	$505,940	$420,500
2008	1795	IN-00026	Borden, Charlestown, Clarksville, Jeffersonville, Memphis, Sellersburg, Underwood	7	Home	$498,494	$238,800
2008	1795	IN-00026	Clarksville, Jeffersonville, Sellersburg	3	Business	$55,380	$74,100
2010	-	IN-00031	Clarksville, Jeffersonville	2	Home	$583,125	$422,700
2010	-	IN-00031	Clarksville, Jeffersonville, Sellersburg	3	Business	$730,650	$221,200
2012	4058	IN-00041	Borden, Henryville, Marysville, Memphis, Nabb, Otisco, Pekin, Underwood	8	Home	$7,766,846	$2,540,100
2012	4058	IN-00041	Henryville, Marysville, Otisco, Underwood	4	Business	$1,356,359	$143,600
2015	-	IN-00055	Underwood	1	Home	$7,465	$7,500
2018	4363	IN-00062	Charlestown, Clarksville, Jeffersonville, Nabb, Utica	4	Home	$2,290,010	$905,000
2018	-	KY-00066	Charlestown, Jeffersonville	2	Home	$513,914	$89,300

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 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 NCEI 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 9. 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 10 displays the county's CPRI results for each hazard and their resultant rank.

Table 10. Calculated Priority Risk Index for Clark County

Natural Hazards	Probability	Consequence	Warning Time	Duration	Risk Factor
Tornadoes	4 - Highly Likely	4 - Catastrophic	4 - <6 hours	4 - >1 week	4
Hazmat Incident	4 - Highly Likely	4 - Catastrophic	4 - <6 hours	4 - >1 week	4
Flash Flooding	4 - Highly Likely	3 - Critical	4 - <6 hours	3 - <1 week	3.6
Flooding	4 - Highly Likely	3 - Critical	4 - <6 hours	3 - <1 week	3.6
Summer Storms	4 - Highly Likely	3 - Critical	3 - 6-12 hours	2 - <24 hours	3.35
Earthquake	2 - Possible	4 - Catastrophic	4 - <6 hours	4 - >1 week	3.1
Winter Storm	4 - Highly Likely	2 - Limited	2 - 12-24 hours	3 - <1 week	3
Ground Failure	3 - Likely	2 - Limited	4 - <6 hours	4 - >1 week	2.95
Extreme Temperatures	4 - Highly Likely	2 - Limited	1 - >24 hours	4 - >1 week	2.95
Dam Failure	2 - Possible	4 - Catastrophic	4 - <6 hours	2 - <24 hours	2.9
Levee Failure	2 - Possible	4 - Catastrophic	4 - <6 hours	2 - <24 hours	2.9
Wildfire	3 - Likely	2 - Limited	4 - <6 hours	2 - <24 hours	2.75
Harmful Organisms	2 - Possible	3 - Critical	3 - 6-12 hours	4 - >1 week	2.65
Drought	3 - Likely	2 - Limited	1 - >24 hours	4 - >1 week	2.5

The ranking methodology in the previous Clark County plan differs from the current methodology. The previous plan marked Flood, Flash Flooding, Winter Storm, Tornado, and Severe Thunderstorm as severe hazard risks. The only noticeable change in the current hazard rank is in the elevation of rank for Hazmat Incident. The county previously ranked the consequence from a hazmat incident storms as catastrophic and did so again. The difference can be found in the ranking of probability, which was rated to be highly likely in the update process whereas previously it was ranked as likely.

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 11. Localized Hazards for Incorporated Jurisdictions

	Flooding	Flash Flooding	Dam Failure	Levee Failure	Hazardous Incident	Ground Failure
Clark County	Highly Likely	Highly Likely	Possible	Possible	Highly Likely	Likely
Borden	Highly Likely	Highly Likely	Likely	Likely	Likely	Possible
Charlestown	Unlikely	Highly Likely	Unlikely	Unlikely	Likely	Possible
Clarksville	Highly Likely	Highly Likely	Unlikely	Unlikely	Highly Likely	Possible
Jeffersonville	Highly Likely	Highly Likely	Possible	Possible	Likely	Possible
Sellersburg	Unlikely	Highly Likely	Unlikely	Unlikely	Highly Likely	Possible
Utica	Highly Likely	Highly Likely	Unlikely	Unlikely	Highly Likely	Possible
Borden Henryville School Corporation	Highly Likely	Highly Likely	Likely	Likely	Highly Likely	Likely
Clarksville Community School Corporation	Unlikely	Highly Likely	Unlikely	Unlikely	Highly Likely	Possible
Greater Clark County Schools	Highly Likely	Highly Likely	Unlikely	Unlikely	Highly Likely	Possible
Rock Creek Community Academy	Unlikely	Highly Likely	Unlikely	Unlikely	Highly Likely	Possible
Silver Creek School Corporation	Highly Likely	Highly Likely	Unlikely	Unlikely	Highly Likely	Possible
Jeff-Clarksville Flood Control District	Highly Likely	Highly Likely	Possible	Possible	Likely	Possible

In addition to participation from each incorporated jurisdiction within Clark County, and several of the unincorporated areas, all five county school corporations participated in the plan update process. Their facilities are spread across all of Clark County and as such, representatives from

each school corporation ranked their overall vulnerability to hazards on a county basis. The schools that are within the 100-year flood boundary or the Fluvial Erosion Hazard (FHE) area are mapped in section 4.3 of this plan. Any hypothetical hazard boundaries created for the risk analysis are mapped in sections 4.3.2 through 4.3.11. As part of the comprehensive risk analysis, essential and critical facilities are examined and mapped if they fall within the hypothetical boundary. School facilities for county school corporations are mapped under the hazard if applicable. In general, the school facilities face the same vulnerability to hazards as Clark County.

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 12. 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 12. Localized Hazards for Incorporated Jurisdictions

Facility Type	Number of Facilities
Care Facilities	183
Emergency Operations Centers	2
Fire Stations	27
Police Stations	12
Schools	66

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) and in 2021, Microsoft released an updated nationwide dataset. 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 in March 2021. 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 Finance (IDLGF) from late 2020. 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 13 provides the summary of building counts & replacement costs joined to the IDLGF data for Clark County summarized by occupancy type. 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 13. Building Counts and Estimated Replacement Costs for Clark County

Occupancy Code	Count	Replacement Cost
Residential	39,235	$7,809,357,126
Commercial	1,993	$9,796,102,195
Industrial	171	$2,649,827,846
Agriculture	2,929	$721,301,000
Religious	499	$1,737,777,602
Government	337	$1,316,738,107
Education	20	$87,496,155
Total	**45,184**	**$24,118,600,032**

4.2.2 Hazus-MH

Potential impacts from flooding and earthquake hazards were quantified using FEMA's Hazus-MH Risk Assessment tool (https://www.fema.gov/hazus) and other forms of Geographic Information Systems (GIS) analysis that leveraged this data.

It is important to note that Hazus-MH is 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 Past and 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. Clark County addresses specific mitigation strategies in Chapter 5 to alleviate such issues.

Because Clark 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, 3,955 of Clark County's parcels have experience some sort of construction since 2015. Of those, 281 or 7.1% are located within the special flood hazard areas (see section 4.3.1). While this construction might have increased the vulnerability of the county to floods, these are only a small portion (7%) of the recent development. Other analyses revealed that 72 or 1.82% are in the tornado path area (see section 4.3.4) and 1,261 or 31.88% in the toxic plume area (see section 4.3.8).

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 Clark 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 Stream Gauges

The USGS, in cooperation with many state agencies and local utility and surveyor offices, help maintain stream gages, which provide the capability to obtain estimates of the amount of water flowing in streams and rivers. IDNR and IDEM use the stream gage 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 gages in the county are shown in Figure 25.

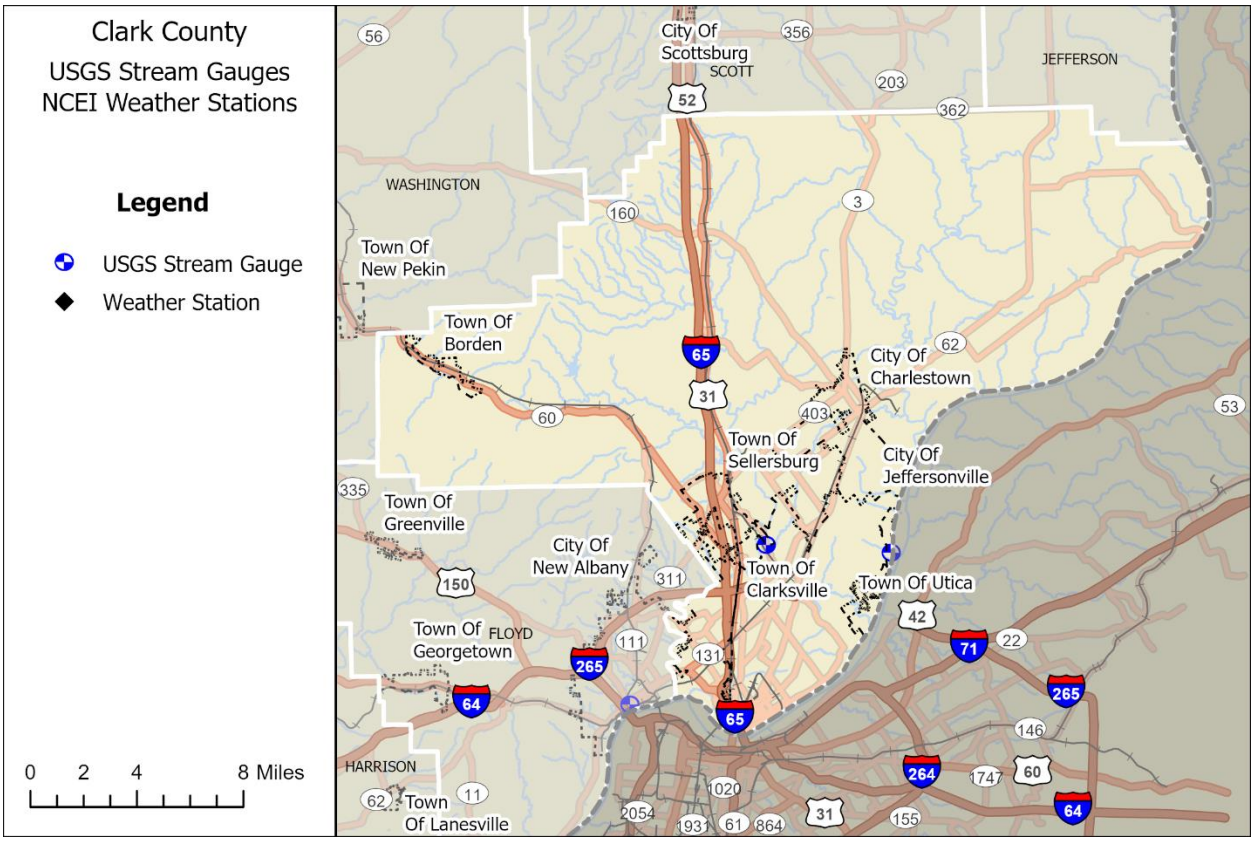

Figure 25. USGS Stream Gages and NCEI Weather Stations

4.3.1.3 Flood History in Clark County

Clark County has experienced a total of 86 flooding events since 1996. Since 2015 there have been 21 reported incidents of flash flooding and 9 reports of flooding.

The flooding incidents occurred in April 2015, July 2015, January 2016, April 2017, February 2018, July 2018, and July 2020. During the July 2015 flood, several inches of rain had fallen overnight flooding a portion of tunnel. The Clark County Emergency Manager reported the drowning of a 67-year-old male who reportedly drove through a flooded roadway. The property damage from this event was estimated at $20,000. High water was reported on St. Joe Road in Sellersburg during the February 2018 flood. State Road 60 was impassable due to flooding during the July 2020 flood event. This is a typical flood spot in the county.

The flash flooding incidents occurred in April 2015, June 2015, July 2015, April 2017, February 2018, and May 2020. During the April 2015 flash flood, one to three inches of rain fell across the county. The public reported numerous flooded cars due to heavy rainfall. The property damage from this event was estimated at $40,000. During the February 2018 flash flood, water rescues were reported by local media at North Indiana Avenue in Sellersburg. According to the NCEI database, the property damage due to this event was $50,000. Additional details for NCEI events are included in Appendix C.

At meeting 2, the Clark County Planning team answered a mitigation strategy worksheet to help identify problem areas in the county for each hazard type. A representative from the Town of Clarksville stated that backwater from the Ohio river flowing into several tributaries and failure of flapper gates to seal the levee penetrations as the main reason of flooding. The team also stated that poor planning of I-65, US-31, and railroads through the center of watersheds, and under capacity of storm infrastructures exacerbate flooding problems in the county. Additionally, several team members also stated that heavy rainfall within a short duration of time as one of the main reasons for flash flood. These survey answers can be found in Appendix F.

4.3.1.4 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 Clark County Flood Insurance Study (FIS), major flooding in the county primarily occurs along the Ohio River, Silver Creek, Muddy Fork, and Lancassange Creek.

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.

4.3.1.5 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 Clark County are identified in Figure 26.

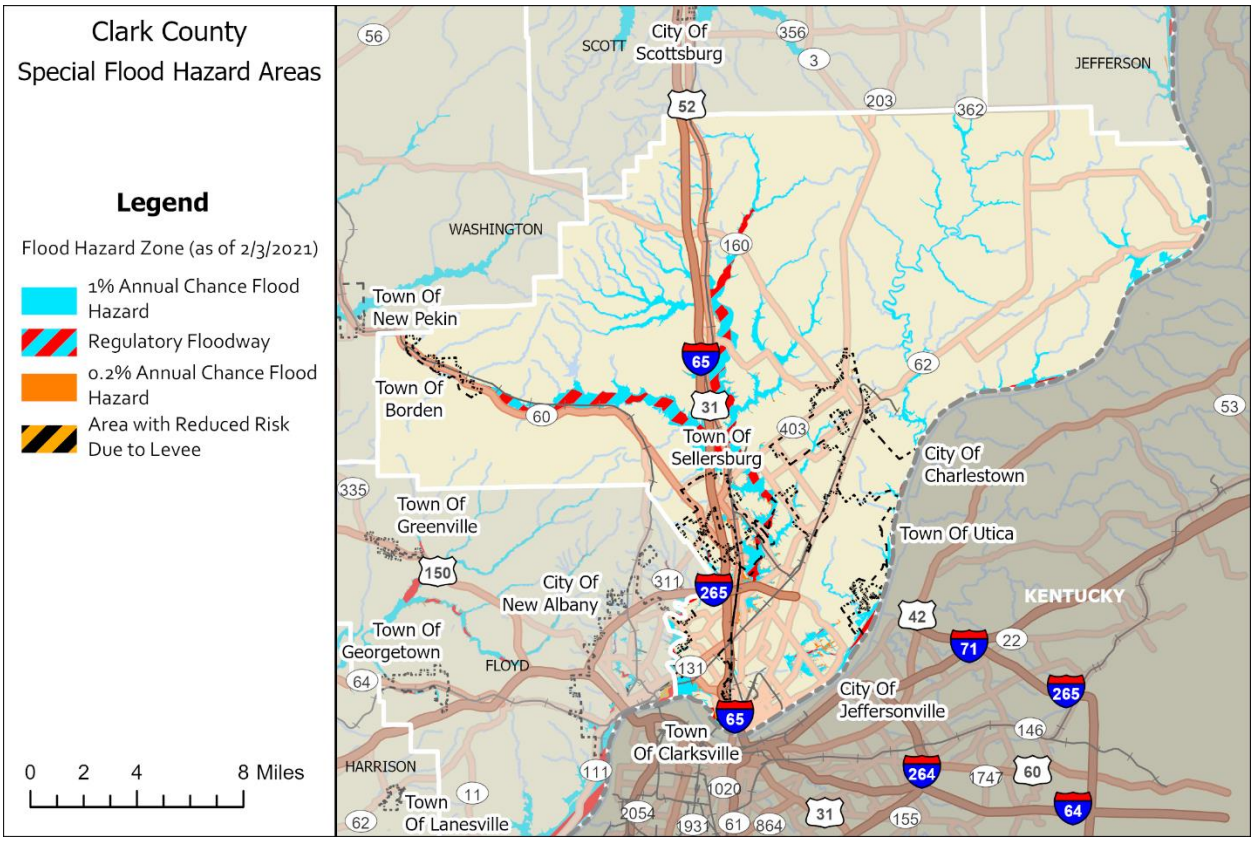

Figure 26. Special Flood Hazard Areas (SFHA) in Clark County

NFIP Analysis

If a structure is 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 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 Clark County that participate in the NFIP, their NFIP number, current effective map date, and program entry date are provided in Table 14.

Table 14. NFIP Participation and Mapping Dates

NFIP Community	NFIP Number	Effective Map Date	Join Date
Clark County	180426	9/2/11	5/1/10
Borden	180464	04/16/14	04/16/14
Charlestown	180025	04/16/14	11/15/79
Clarksville	180026	04/16/14	08/03/81
Jeffersonville	180027	04/16/14	08/01/79
Sellersburg	180028	04/16/14	08/01/80
Utica	180487	04/16/14	02/12/82

FEMA provides annual funding through the National Flood Insurance Fund (NFIF) to reduce the risk of flood damage to existing buildings and infrastructure. This grant is the Flood Mitigation Assistance (FMA). 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 23 repetitive loss structures in Jeffersonville, 9 in Utica, 1 each in Clarksville and Borden, 2 each in Charlestown and Sellersburg, and 36 in unincorporated Clark County.

Table 15 documents the Clark County NFIP claims data as of 8/1/2022.

Table 15. NFIP Claims Data for Clark County

	Borden	Charlestown	Clarksville	Jeffersonville	Sellersburg	Utica	Uninc. Clark County
Number of Policies	4	6	53	598	44	76	116
Value of Insurance Claims/ Payments	$835,300	$803,600	$11,527,000	$110,330,700	$8,154,300	$13,187,000	$21,323,000
Repetitive Loss Properties	1	2	1	23	2	9	36
Total Losses	2	5	2	102	7	28	136

	Borden	Charlestown	Clarksville	Jeffersonville	Sellersburg	Utica	Uninc. Clark County
Total Building Payments	$6,480	$88,579	$26,996	$1,573,521	$98,361	$711,016	$2,794,343
Total Contents Payments	$0	$28,488	$0	$252,469	$64,800	$63,890	$557,128
Single Family	1	2	1	18	1	9	32
Two-Four Family	0	0	0	2	0	0	0
Non-Residential Business	0	0	0	1	0	0	2
Other Residential	0	0	0	2	0	0	0
Other Non-Residential	0	0	0	0	1	0	2

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 16 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 16. 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
Clark County	462	$180,232,850.29	116	$21,323,000	25.11%	11.83%
Borden	4	$12,192,925.25	4	$835,300	100%	6.85%
Charlestown	23	$17,782,377.41	6	$803,600	26.09%	4.52%
Clarksville	197	$83,081,464.95	53	$11,527,000	26.9%	13.87%

[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.

Jeffersonville	960	$536,683,627.24	598	$110,330,700	62.29%	20.56%
Sellersburg	148	$105,646,245.75	44	$8,154,300	29.73%	7.72%
Utica	171	$38,621,054.91	76	$13,187,000	44.44%	34.14%

4.3.1.6 Risk Identification for Flood Hazard

In Meeting #2, the planning team determined that the probabilities of flooding and flash flooding is highly likely with critical consequences. Flooding and flash flooding both have a warning time of less than 6 hours. Flooding and flash flooding's duration was determined to be more than 1 week. The calculated CPRI for both flooding and flash flooding is 3.6.

4.3.1.7 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.

4.3.1.8 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 Clark 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 Clark County. The UDFs were defined by intersecting the Hazus-MH generated flood depth grid with the Clark 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 SFHAs would damage 1,965 buildings county-wide at a cost of almost $372 million. In the modeled scenario, the unincorporated areas of Clark County contained 462 damaged buildings at a cost of almost $63 million. The town or city with the most damage was Jeffersonville, with 960 buildings damaged at a cost of over $197 million. The total estimated numbers and cost of damaged buildings by community are given in Table 17 and

Table 18. Figure 27 depicts the Clark County buildings that fall within the SFHA. Figure 28 through Figure 33 display community maps of buildings that fall within the SFHA.

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

	Clark County	Borden	Charlestown	Clarksville	Jeffersonville	Sellersburg	Utica
Agricultural	55	-	-	3	4	2	2
Commercial	21	-	8	27	51	35	8
Educational	-	-	-	-	1	-	-
Government	4	1	2	9	8	3	4
Industrial	1	-	-	2	9	3	-
Religious	4	1	1	7	8	1	2

Residential	377	2	12	149	879	104	155
Total	**462**	**4**	**23**	**197**	**960**	**148**	**171**

Table 18. Estimated Cost of Buildings Damaged by Community and Occupancy Class

	Clark County	Borden	Charlestown	Clarksville	Jeffersonville	Sellersburg	Utica
Agricultural	$6,099,777	-	-	$650,177	$375,825	$170,272	$657,131
Commercial	$4,296,873	-	$5,678,302	$14,762,623	$56,437,112	$22,177,080	$1,341,720
Educational	-	-	-	-	-	-	-
Government	$18,703,752	$1,111,029	$349,340	$7,151,590	$18,689,951	$1,280,454	$3,103,529
Industrial	$672,330	-	-	$6,824,930	$33,872,504	$4,408,901	-
Religious	$4,386,288	$579,171	-	$1,693,738	$2,375,764	$1,005,748	$353,542
Residential	$28,776,084	$87,643	$816,737	$10,196,202	$85,481,516	$10,203,493	$16,801,905
Total	**$62,935,106**	**$1,777,844**	**$6,844,381**	**$41,279,262**	**$197,232,675**	**$39,245,949**	**$22,257,829**

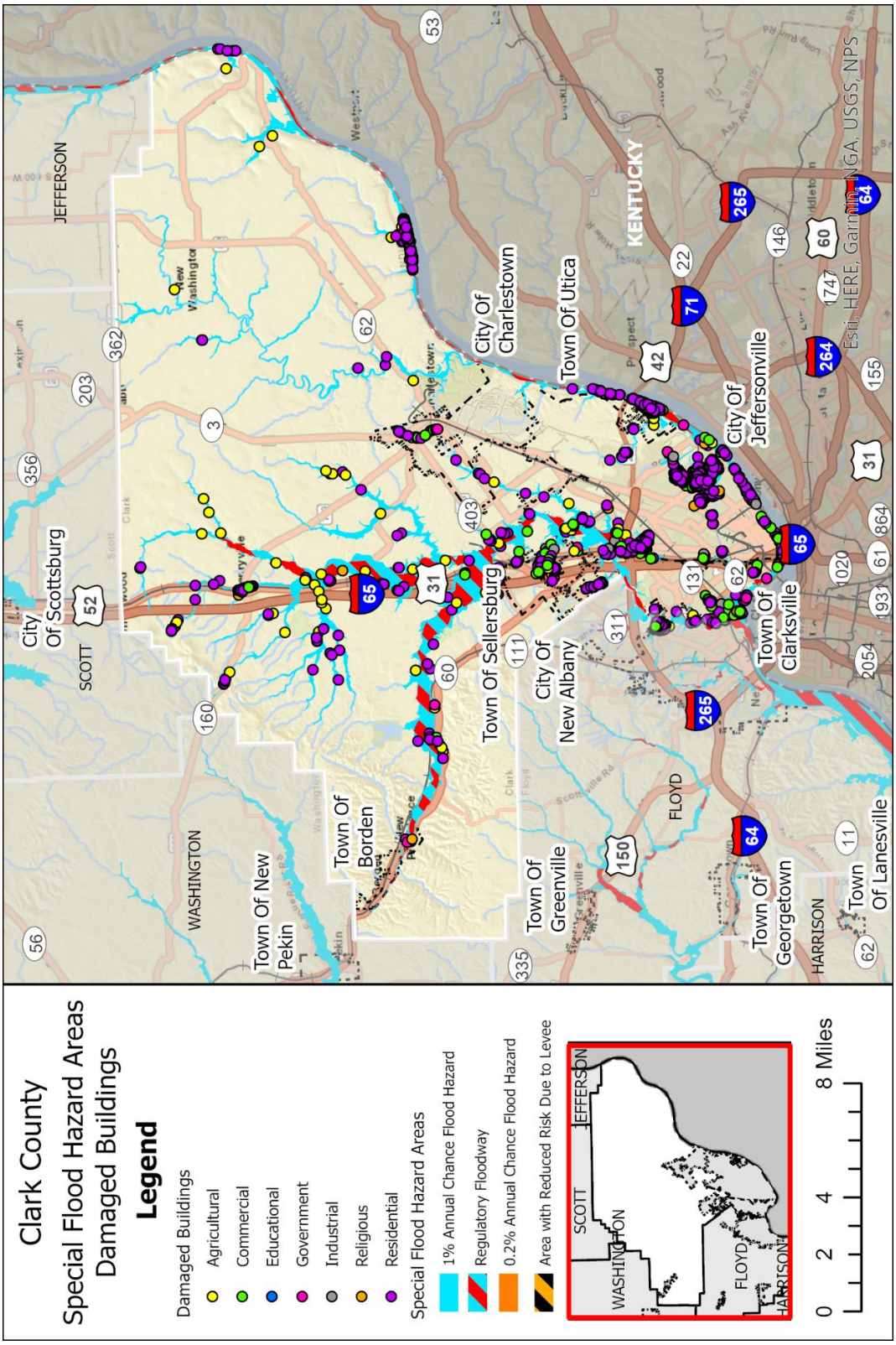

Figure 27. Estimated Buildings Damaged in SFHA

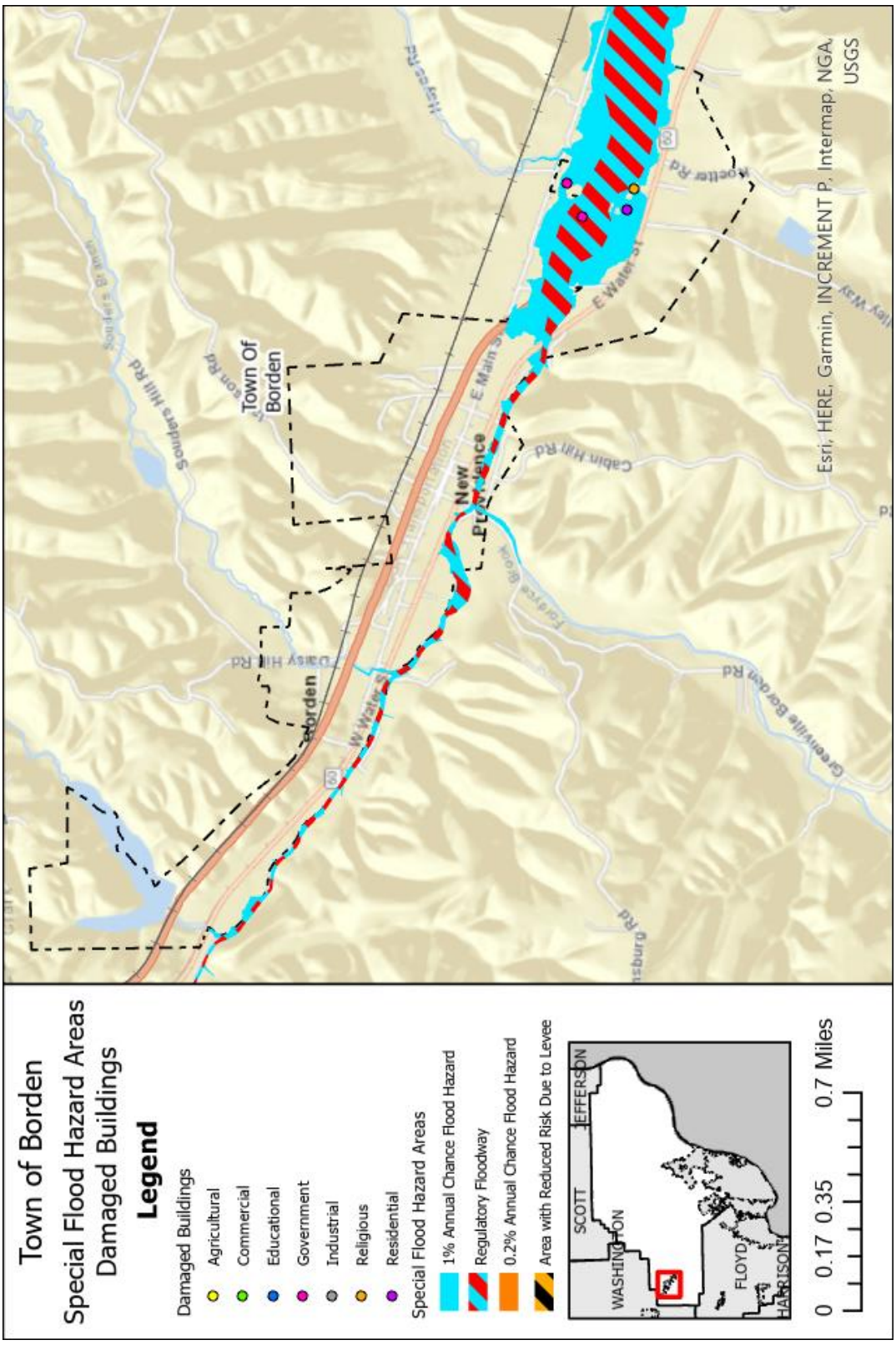

Figure 28. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code (Borden)

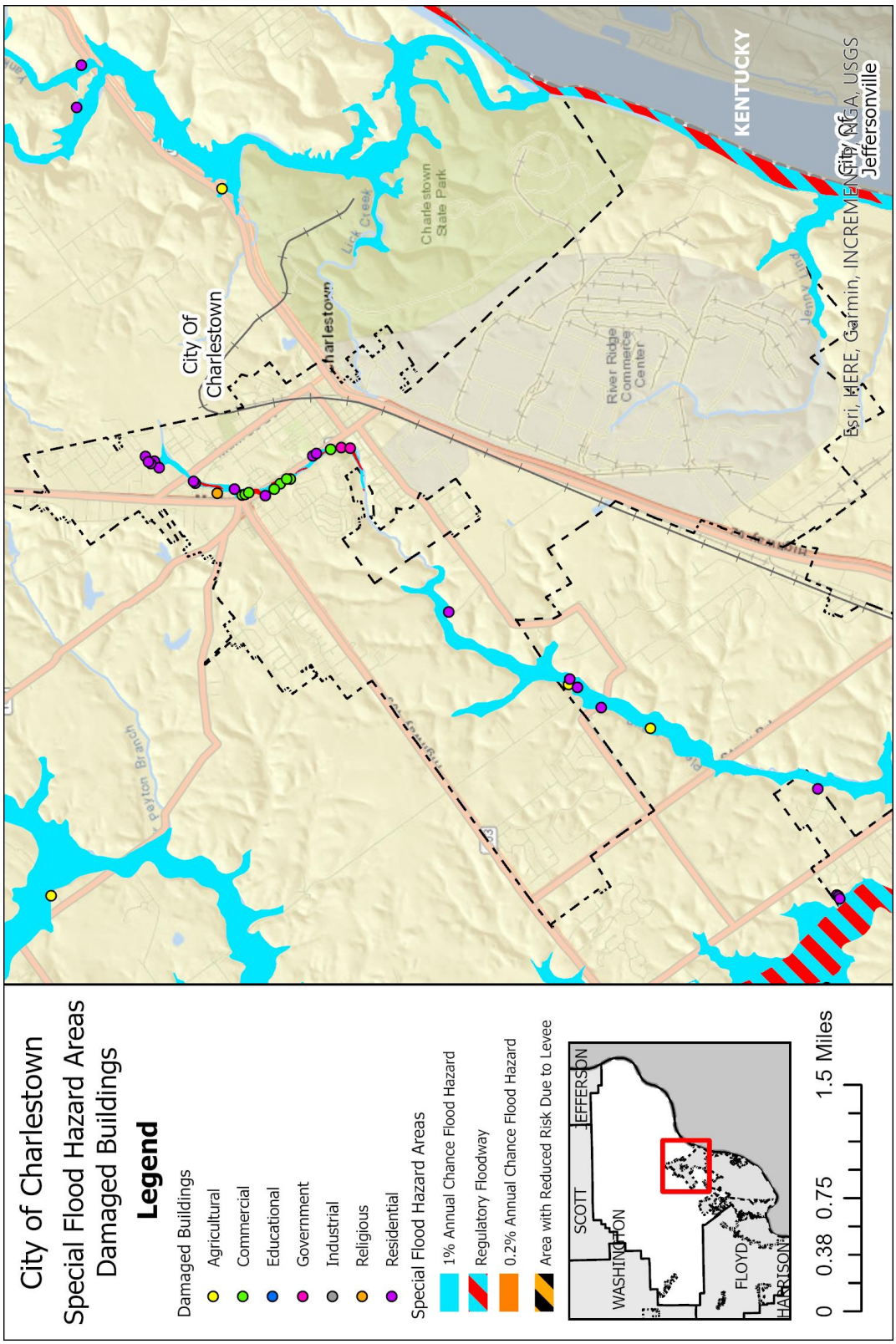

Figure 29. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code (Charlestown)

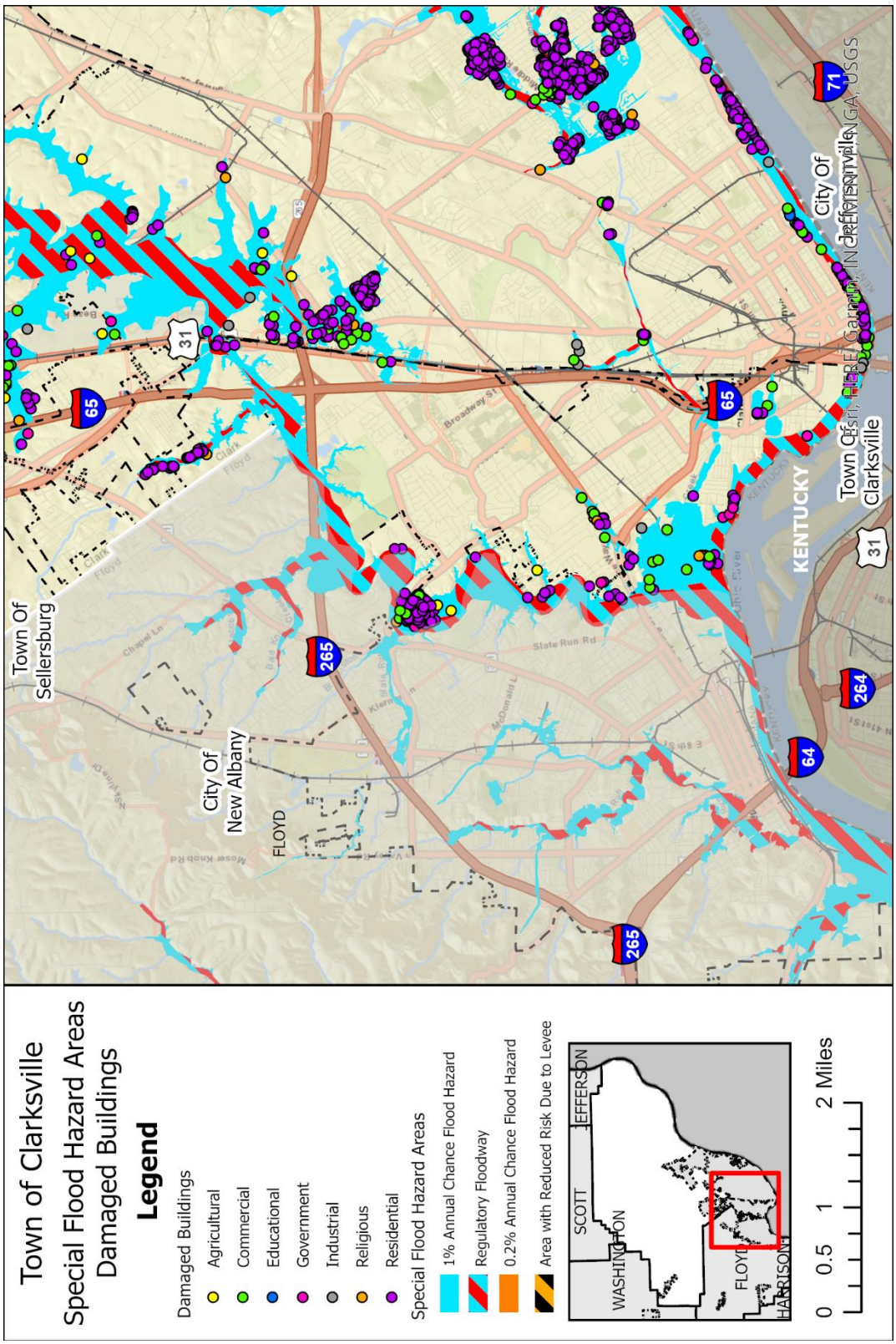

Figure 30. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code (Clarksville)

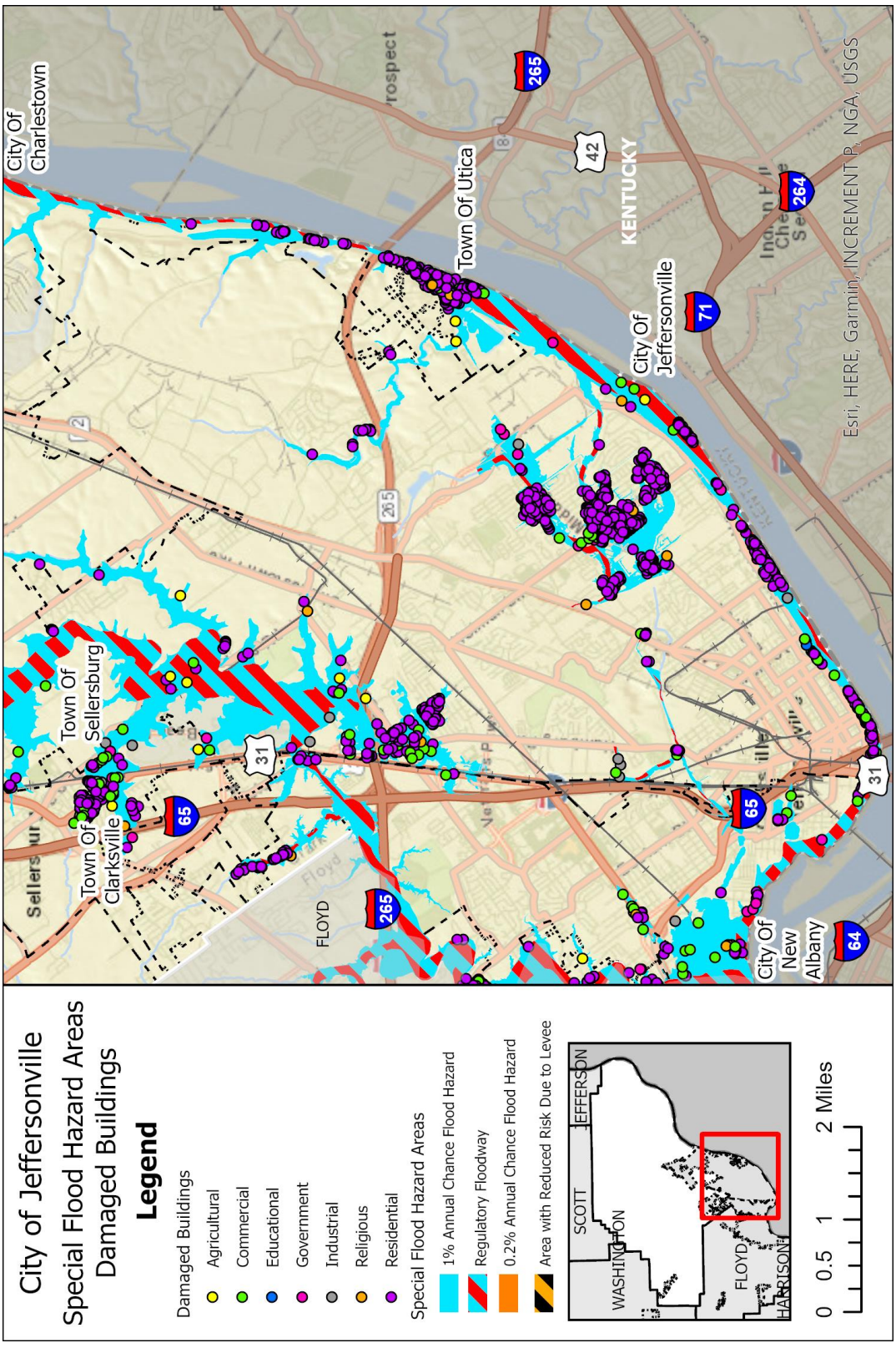

Figure 31. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code (Jeffersonville)

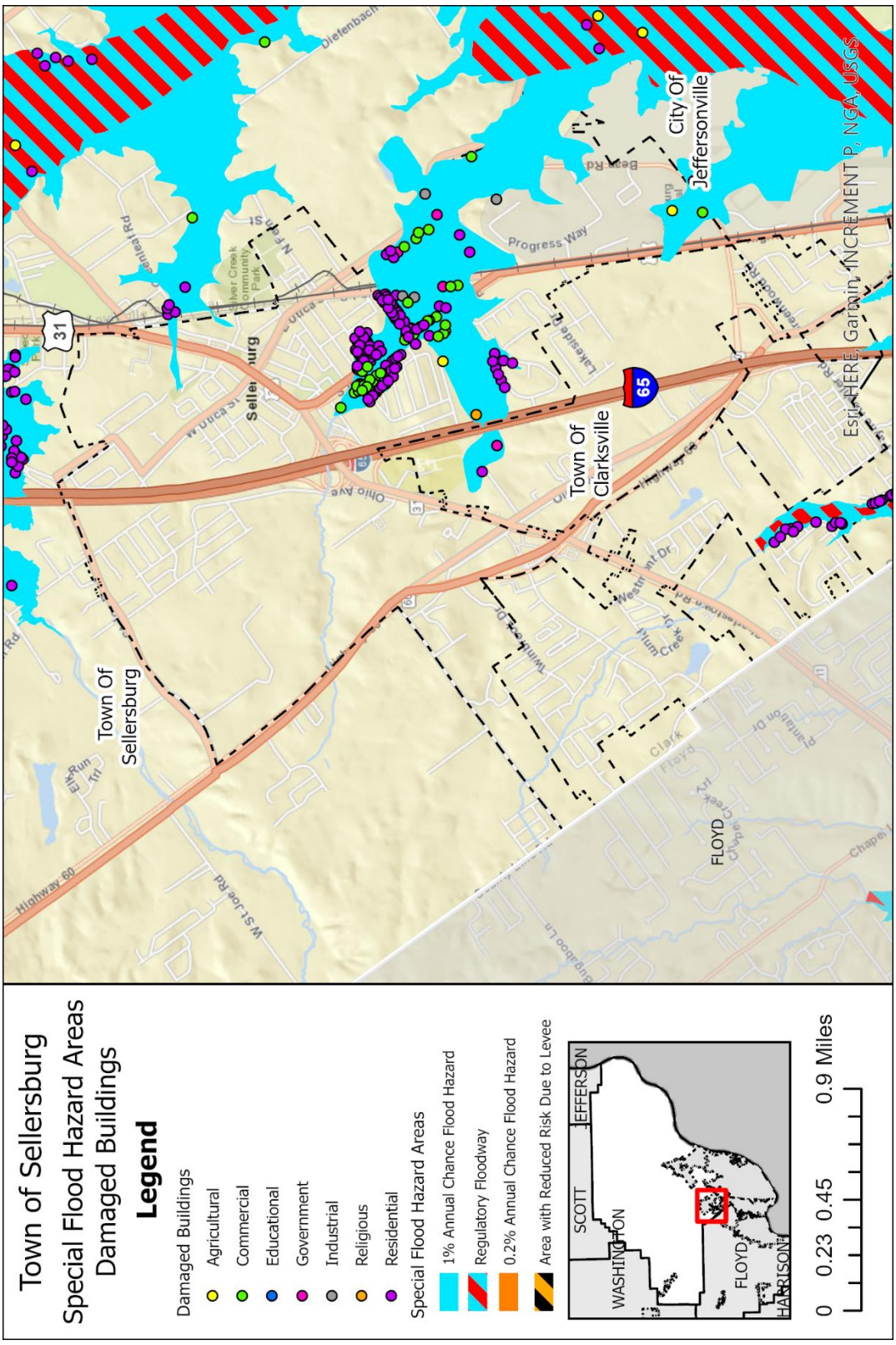

Figure 32. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code (Sellersburg)

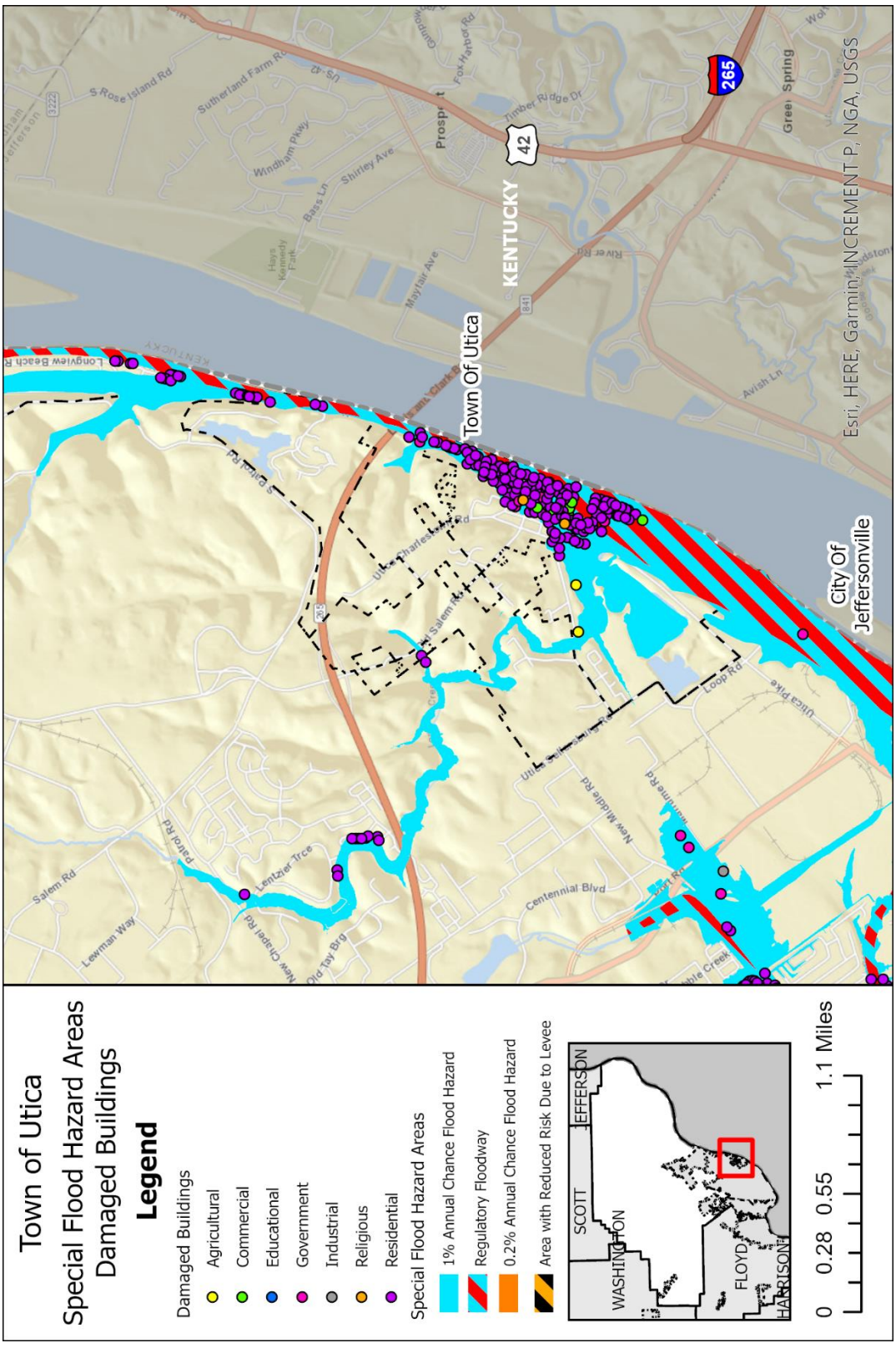

Figure 33. Estimated Buildings Damaged in SFHA, Displayed by Occupancy Code (Utica)

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 figure. In Clark County, two police stations, one fire station, six care facilities, and two schools are located within the 1% annual chance flood.

Table 19. Flood - Damaged Essential Facilities

Facility Type	Facility Name	Address	City
Police Station	Clark County Sheriff Boat Dock	-	Jeffersonville
Police Station	Utica Police Department	107 4th St	Jeffersonville
Fire Station	Jeffersonville Fire Department Station 5	2006 Allison Ln	Jeffersonville
Care	Allison Lane Animal Hospital	1660 Allison Ln	Jeffersonville
Care	Childplace Suspension Alternative	2420 10th St	Jeffersonville
Care	DMD Reynolds	809 Indiana Ave	Sellersburg
Care	Kentuckiana Radiology	858 Penn St	Sellersburg
Care	Medical Imaging	830 Penn St	Sellersburg
Care	Physicians Primary Care	1804 10th St	Jeffersonville
School	Greater Clark Schools Child Place Suspension	2420 10th St	Jeffersonville
School	Kids Connection	805 Indiana Ave	Sellersburg

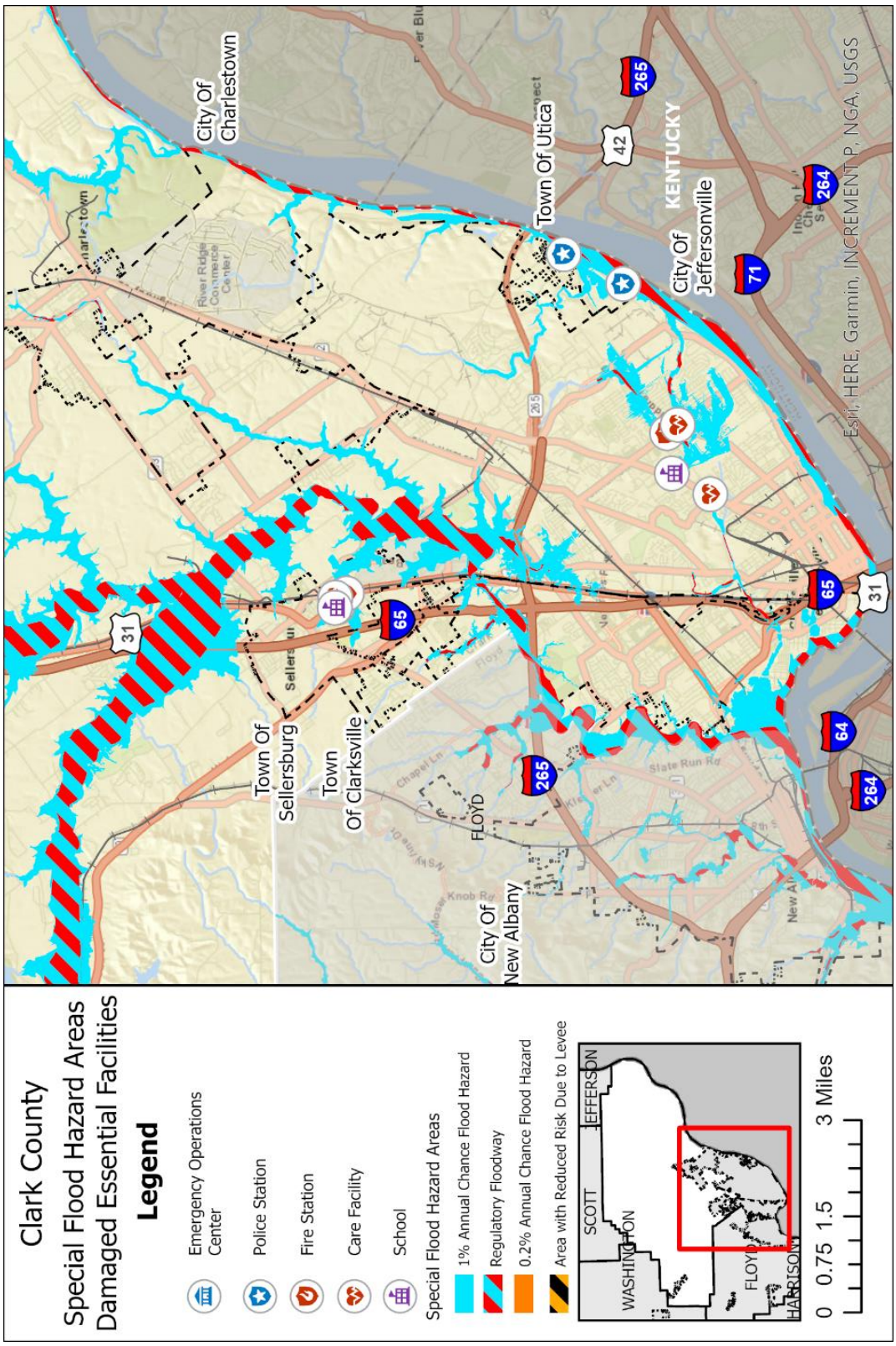

Figure 34. Flood Damaged Essential Facilities, Clark County

4.3.1.9 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 most of the 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 35 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 comparison of the buildings located in the SFHA and the DNR best available data are listed in Table 20.

Table 20. Estimated Number of Buildings Located in the SFHA and Best Available data by Occupancy Class

	FEMA SFHA	DNR Best Available
Agricultural	66	63
Commercial	150	160
Educational	1	1
Government	31	33
Industrial	15	15
Religious	24	25
Residential	1,678	1,754
Total	**1,965**	**2,051**

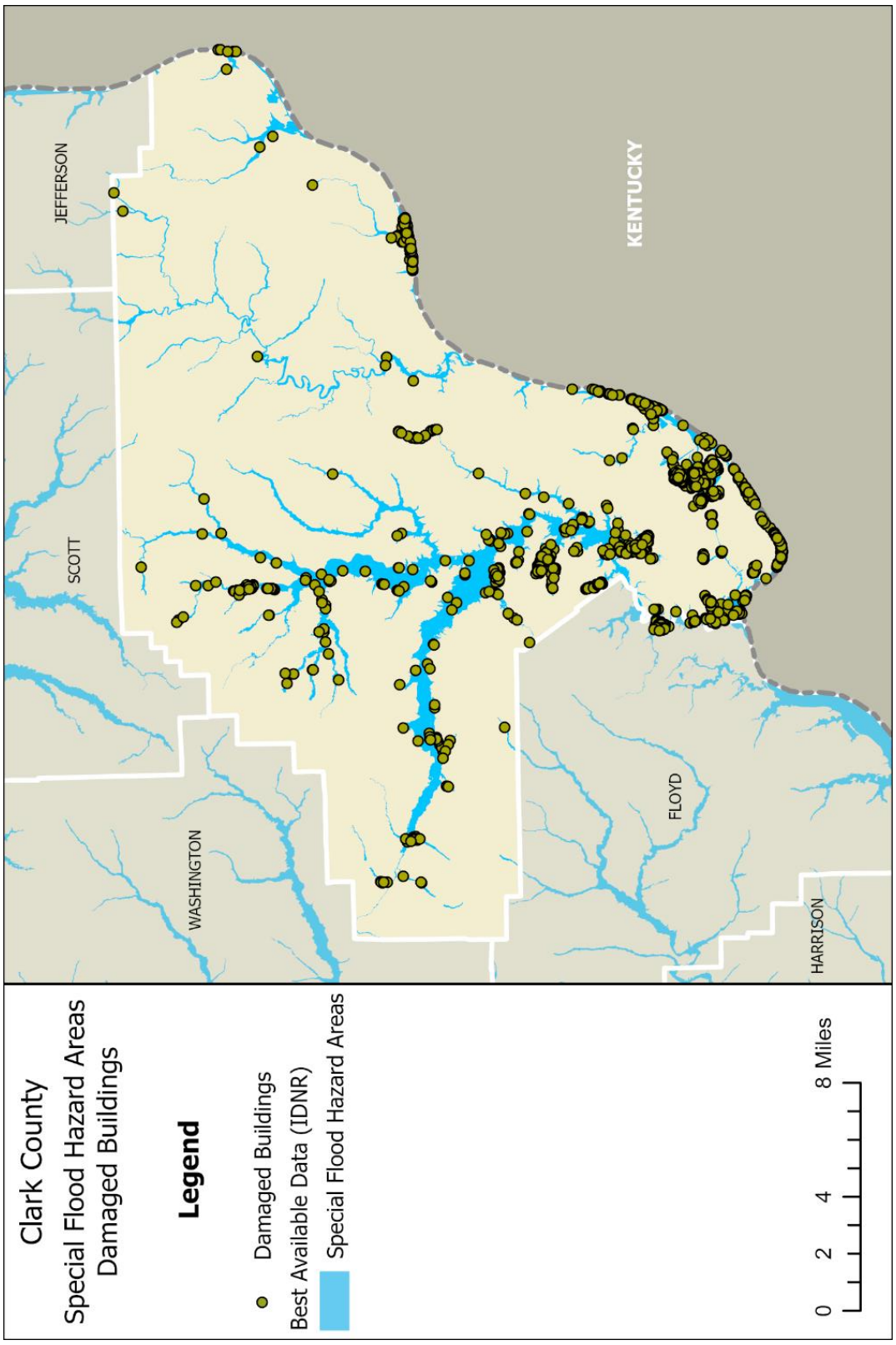

Figure 35. Estimated Buildings Damaged in IDNR Best Available Data

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 because of wastewater spills due to flooding or power failures.

Water Main Breaks – Surges in water pressure because 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 21 and Table 22 list earthquake magnitudes and their corresponding intensities.

Table 21. Abbreviated Modified Mercalli Intensity Scale

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 22. 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 Clark 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 47 earthquakes, M3.0 or greater, have occurred in Indiana since 1817. The last such event in Indiana was a M3.8 centered northeast of Montezuma on June 17, 2021.

Most of the 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.

4.3.2.3 Geographic Location for Earthquake

Clark County occupies a region susceptible to two earthquake threats: the threat of an earthquake along the New Madrid or the Wabash Valley Fault Systems. 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.

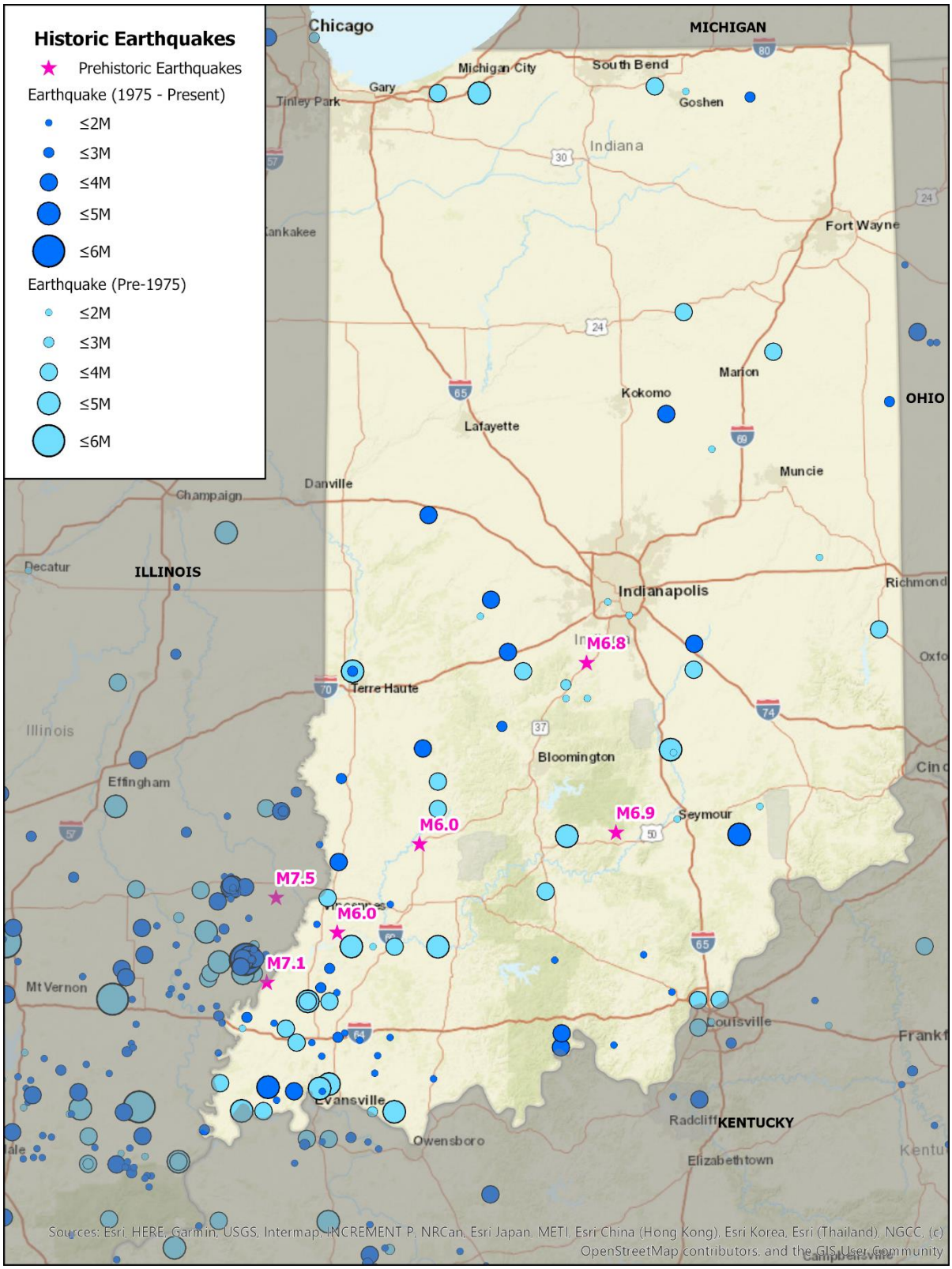

Figure 36. Indiana Earthquake Epicenters Map

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. Clark County has significant areas with soils ranking as moderate to high potential for liquefaction. Some areas in northwest and west-central part of the county ranked low in probability.

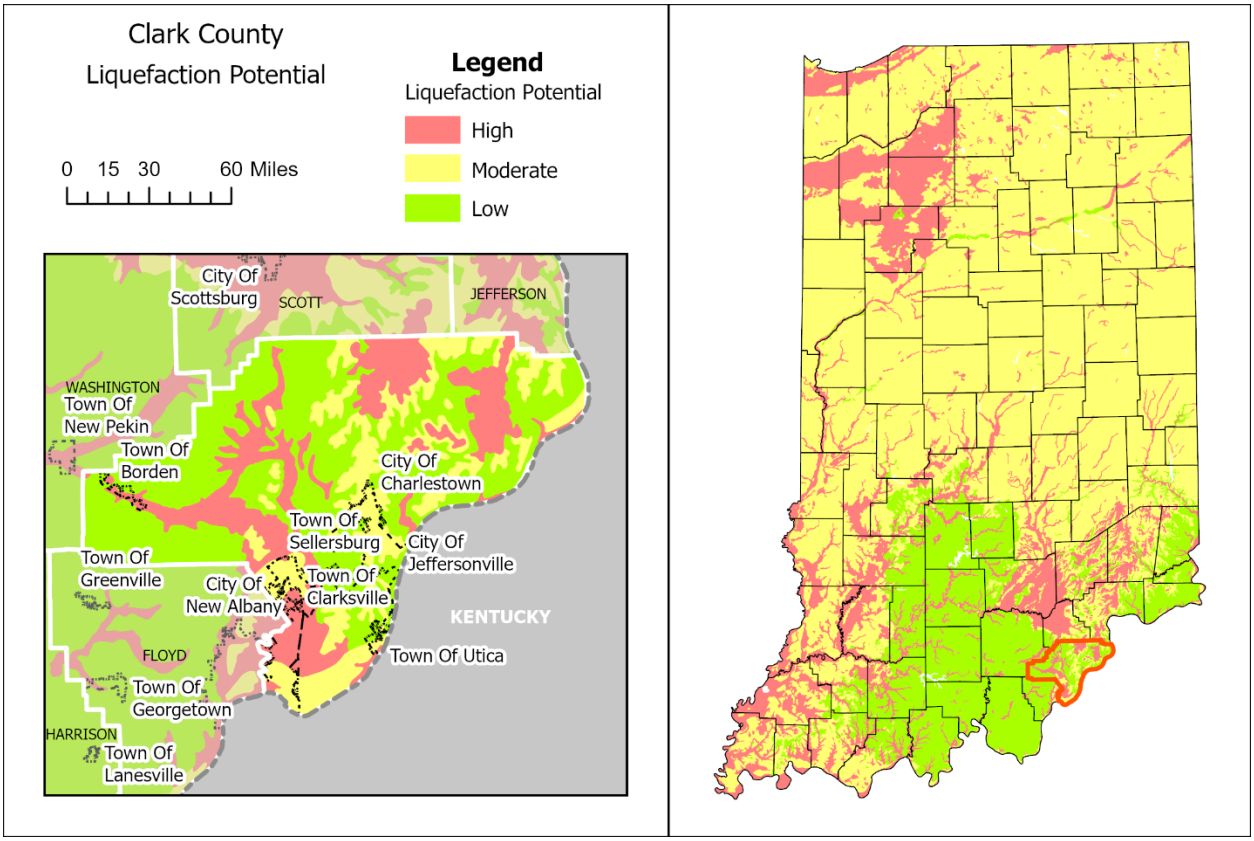

Figure 37. NEHRP State of Indiana Liquefaction Potential

4.3.2.5 Risk Identification for Earthquake

In Meeting #2, the planning team determined that the probability of an earthquake as possible with catastrophic results. Earthquakes were determined to have a warning time of less than six hours with a duration greater than 1 week. The calculated CPRI for earthquakes in Clark County is 3.1.

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.

The Hazus-MH Earthquake Analysis model estimates damages and losses to buildings, lifelines, and essential facilities from deterministic and probabilistic scenarios.

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 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 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.

Table 23, Building Damage Summary by Earthquake Event, displays damages for all three scenarios run by Hazus-MH. In addition to the dollar amount of building losses, the table displays the number of buildings damaged and to what extent. Figure 38 through Figure 40 display the Earthquake Scenarios total building losses for each scenario broken down by census tract.

Table 23. Building Damage Summary by Earthquake Event

Scenario	Total Loss in Dollars	Moderate	Extensive	Complete
New Madrid (M7.6)	10,680,000	32	2	-
Wabash Valley (M7.3)	63,960,000	143	8	-
Probabilistic (500-Year)	36,780,000	84	4	-

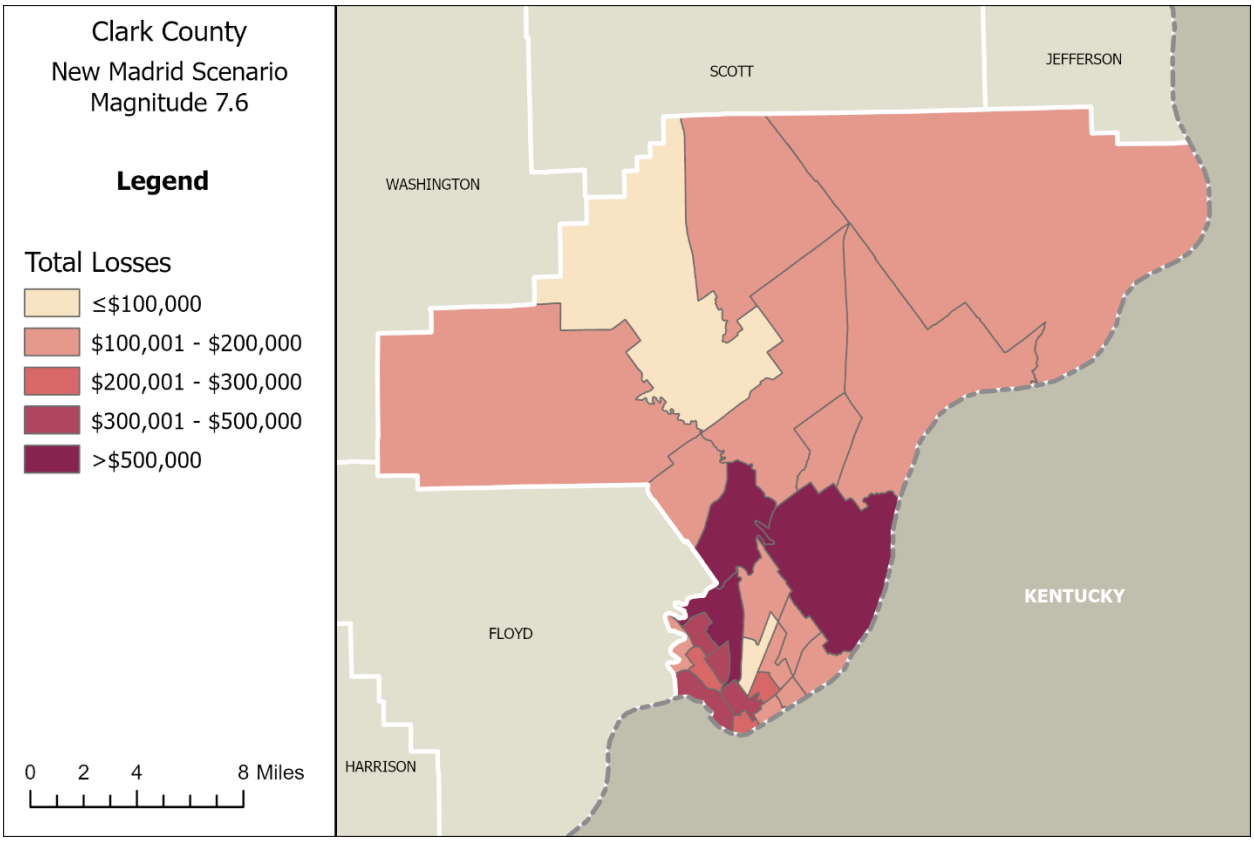

Figure 38. New Madrid Earthquake Scenario – Total Building Losses

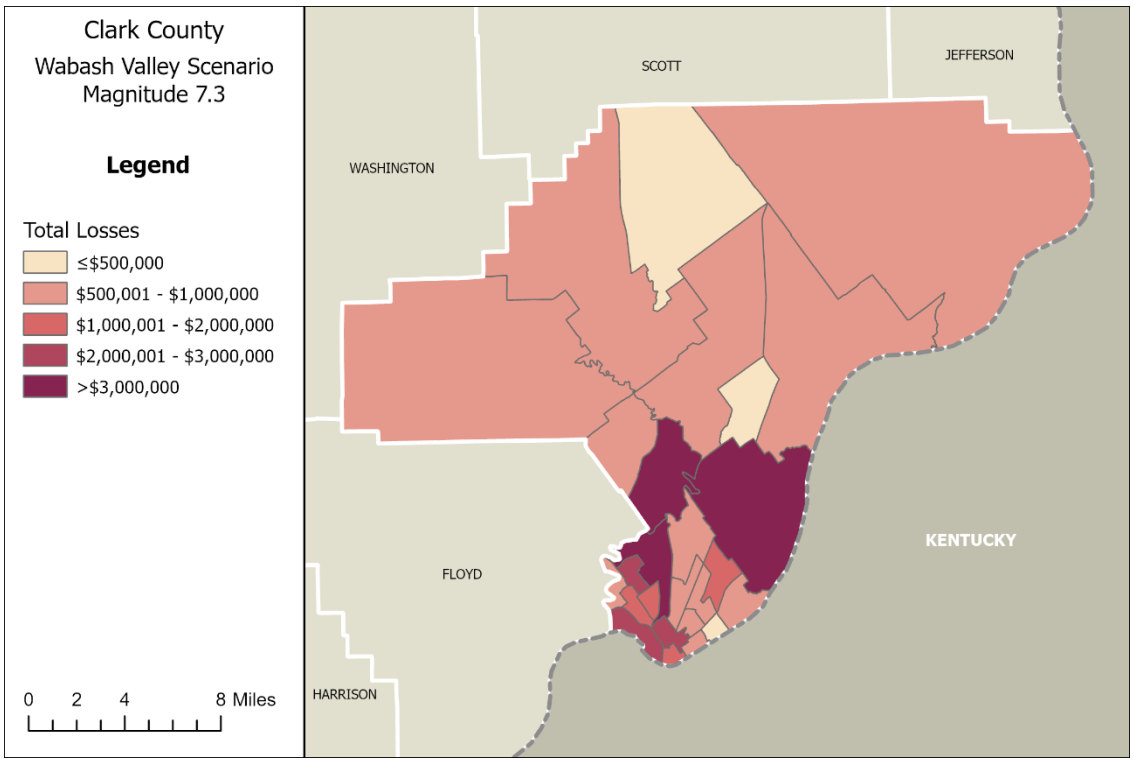

Figure 39. Wabash Valley Earthquake Scenario – Total Building Losses

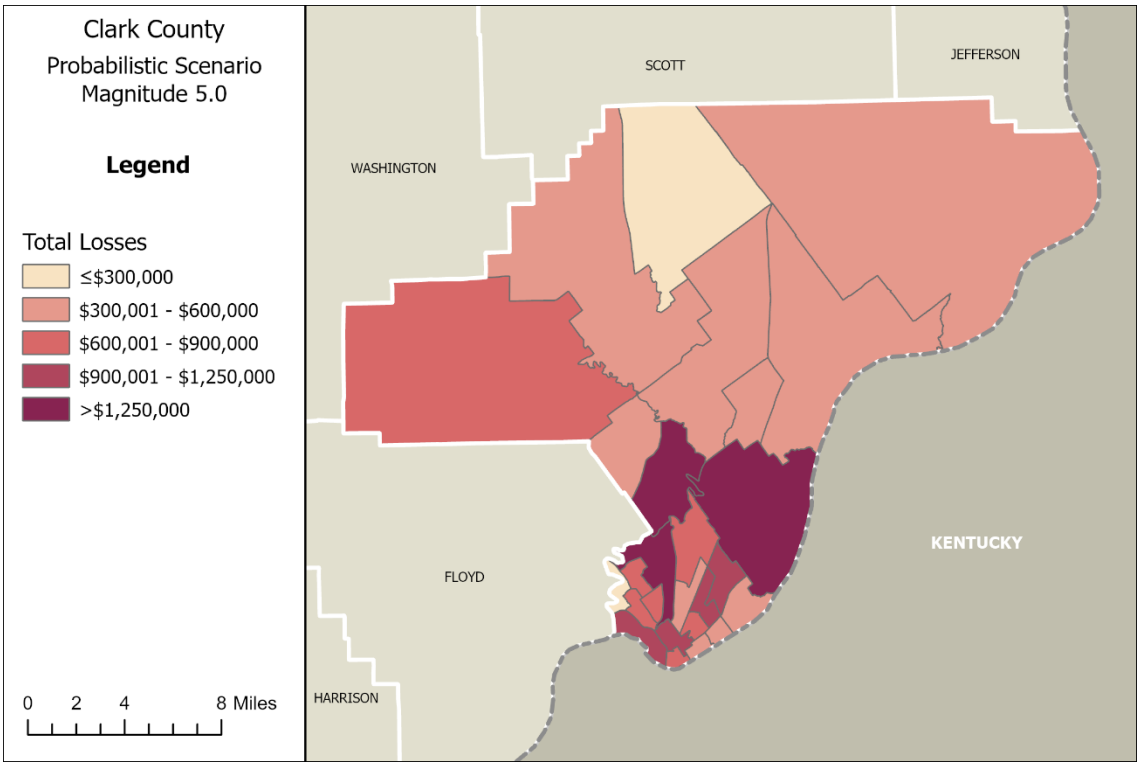

Figure 40. 500-Year Probabilistic Earthquake Scenario – Total Building Losses

Building losses account for only a portion of the total economic impact that could be realized from the modeled scenarios. Additional building related impacts could include lost wages, rental income, and other elements of business interruption; damages to building contents, social impacts.

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 earthquake 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. 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 from 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 the natural physical interaction of groundwater with its bedrock, forming what is known as karst landscape. According to the Indiana Geological & Water Survey, karst topography is a distinctive type of landscape largely shaped by the dissolving action of groundwater, which is naturally acidic, on carbonate bedrock, which in this area is mostly limestone. This geological process, which takes 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.

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. Most underground mines in southwest Indiana are older mines since abandoned and thus susceptible to collapse.

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 near 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.

4.3.3.2 Ground Failure History in Clark 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 geographic location for ground failure varies depending on the type of ground failure. Karst areas for Clark County are mapped in Figure 41.

A 2015 study by the Indiana Geological & Water Survey determined the probability of sinkhole formation throughout southern Indiana. Their analysis is based on the density of known sinkholes, as well as several geologic, topographic, and hydrologic variables that indicate the future vulnerability to sinkhole formation. Figure 42 shows the results of this study, showing that areas with the highest probability of sinkhole development generally occur throughout central southern Indiana, with less chance of sinkhole occurrence toward the eastern and western parts of southern Indiana.

Underground coal mines in Indiana are illustrated in Figure 43. There are no underground coal mines located in Clark County.

Figure 44 highlights streams found to be “actively migrating” which can indicate an increased FEH risk. There are no actively migrating streams in Clark County.

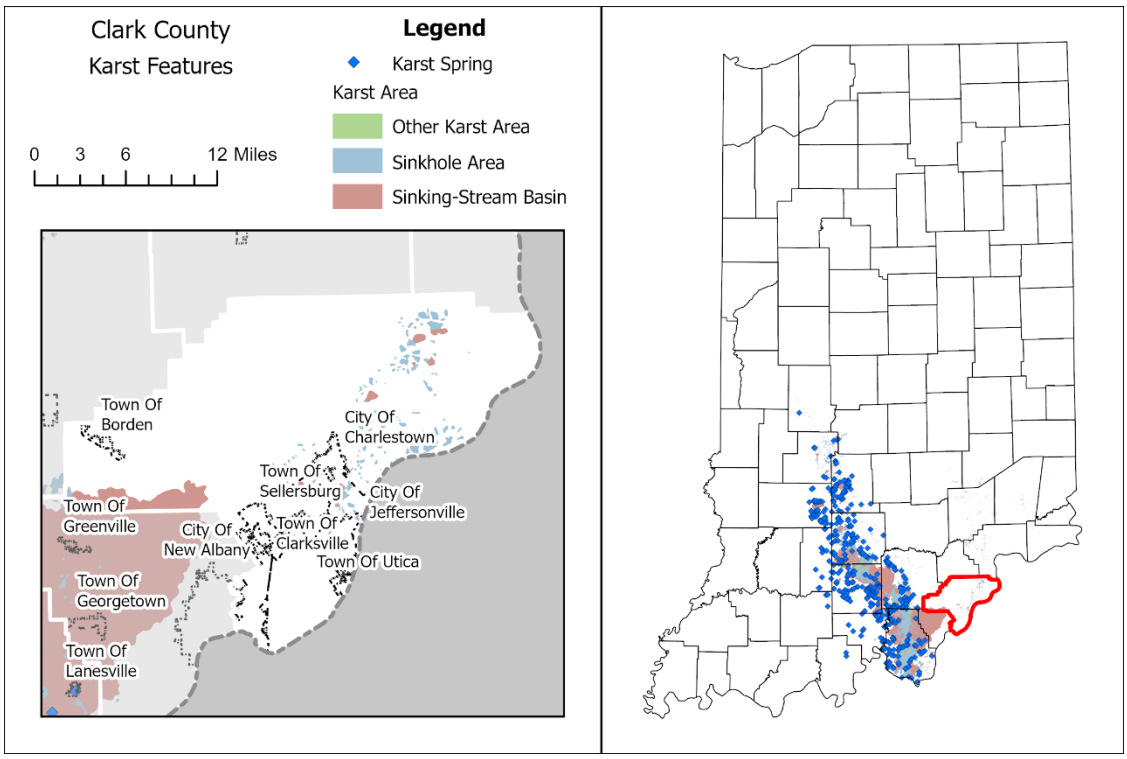

Figure 41. Clark County Karst Features

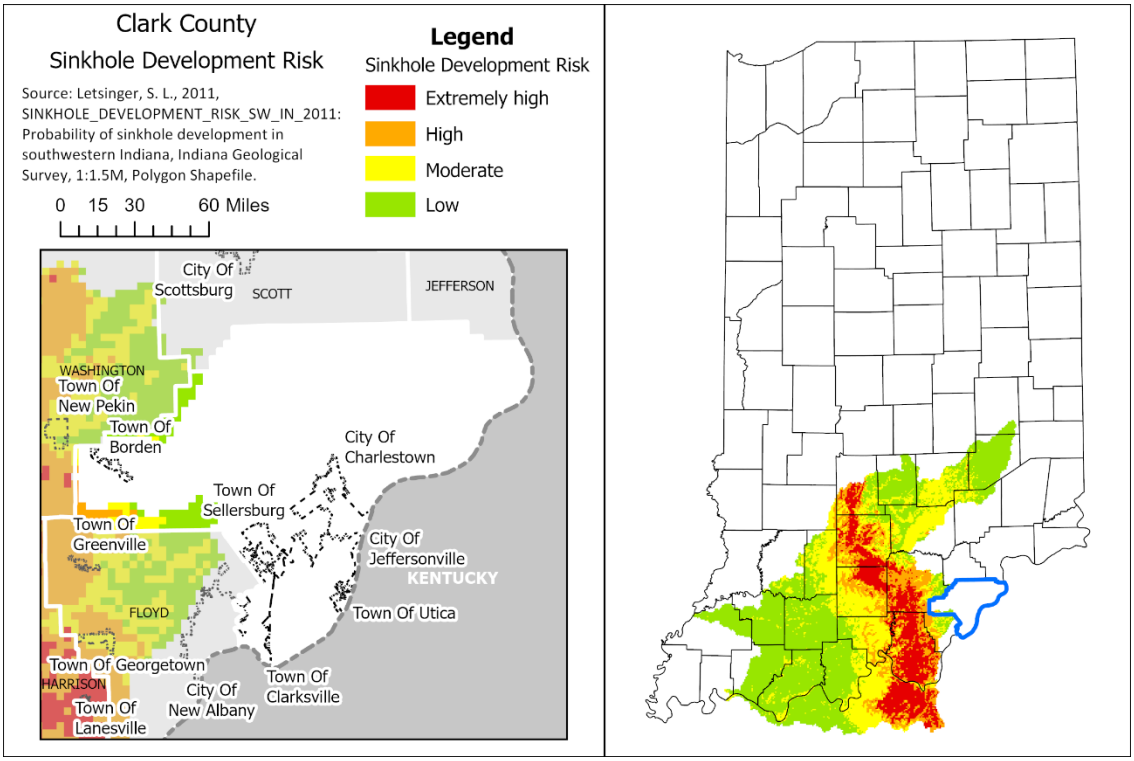

Figure 42. Risk of Sinkhole Development

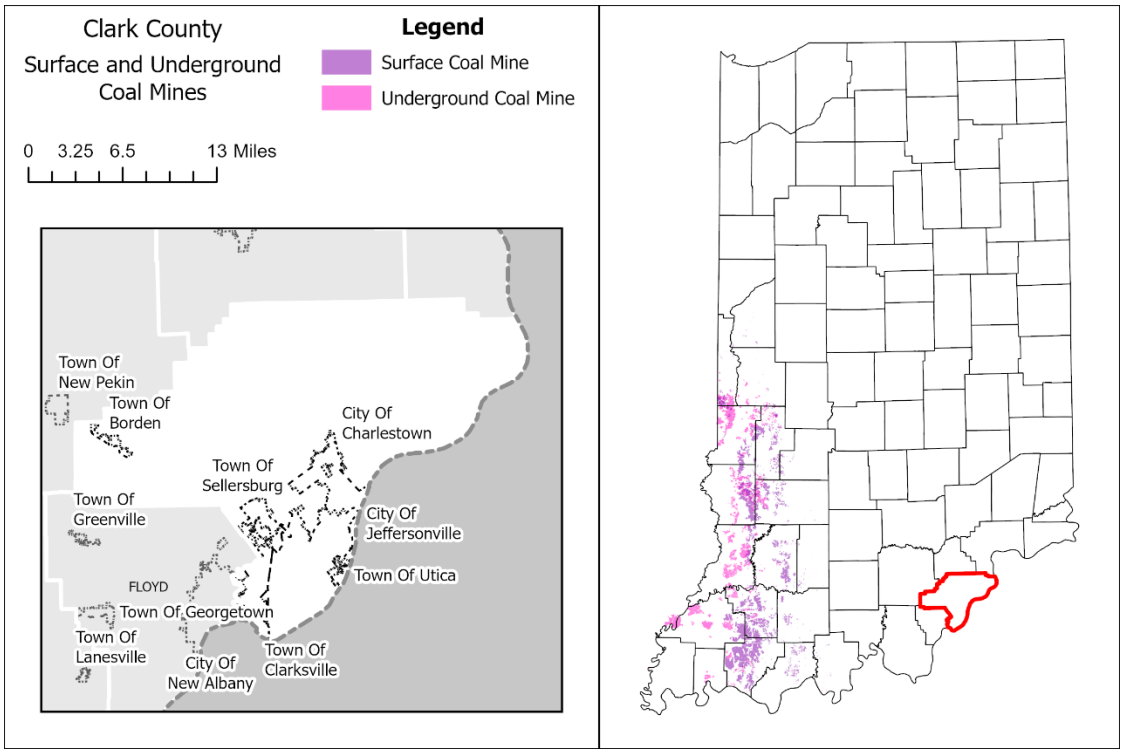

Figure 43. Surface and Underground Coal Mines

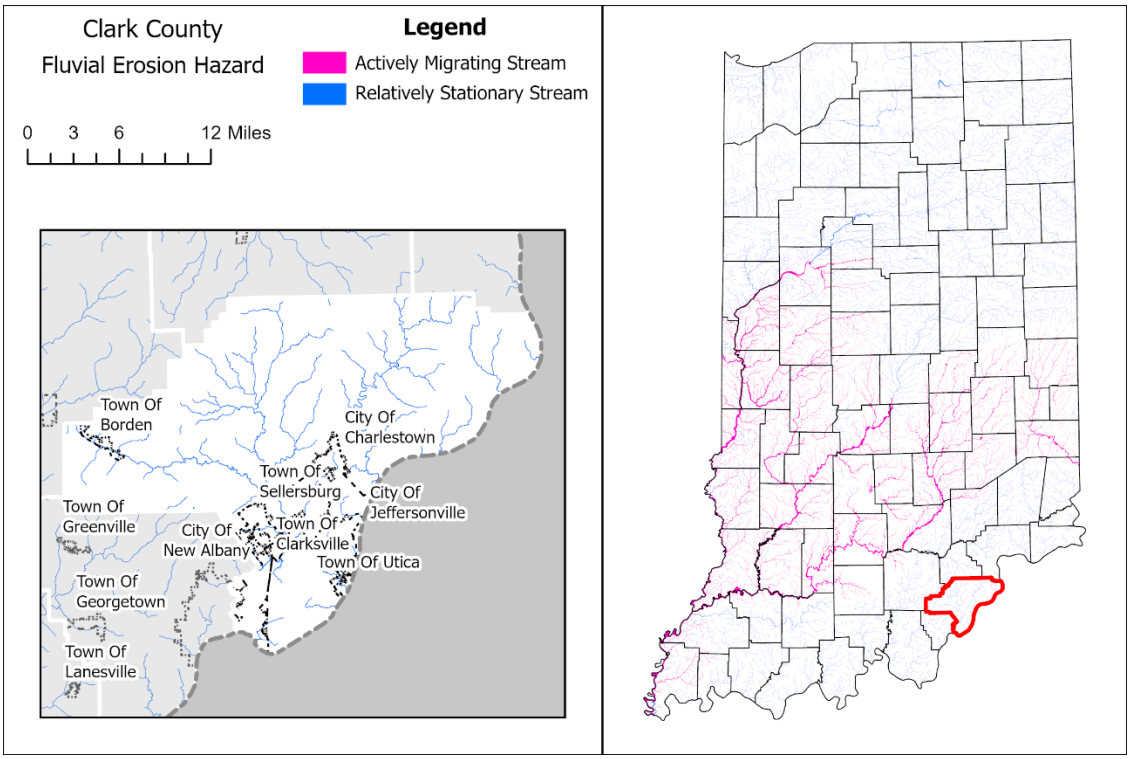

Figure 44. Clark County FEH Risk

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 likely with limited consequences. The warning time for ground failure is less than 6 hours with a duration of more than 1 week. The calculated CPRI for ground failure is 2.95.

4.3.3.6 Vulnerability Analysis for Ground Failure

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.

As seen in USGS Landslide Overview Map figure, Clark County predominantly lies in the low landslide incidence zone. However, areas in the west around the Town of Borden have moderate susceptibility with low incidence to landslides.

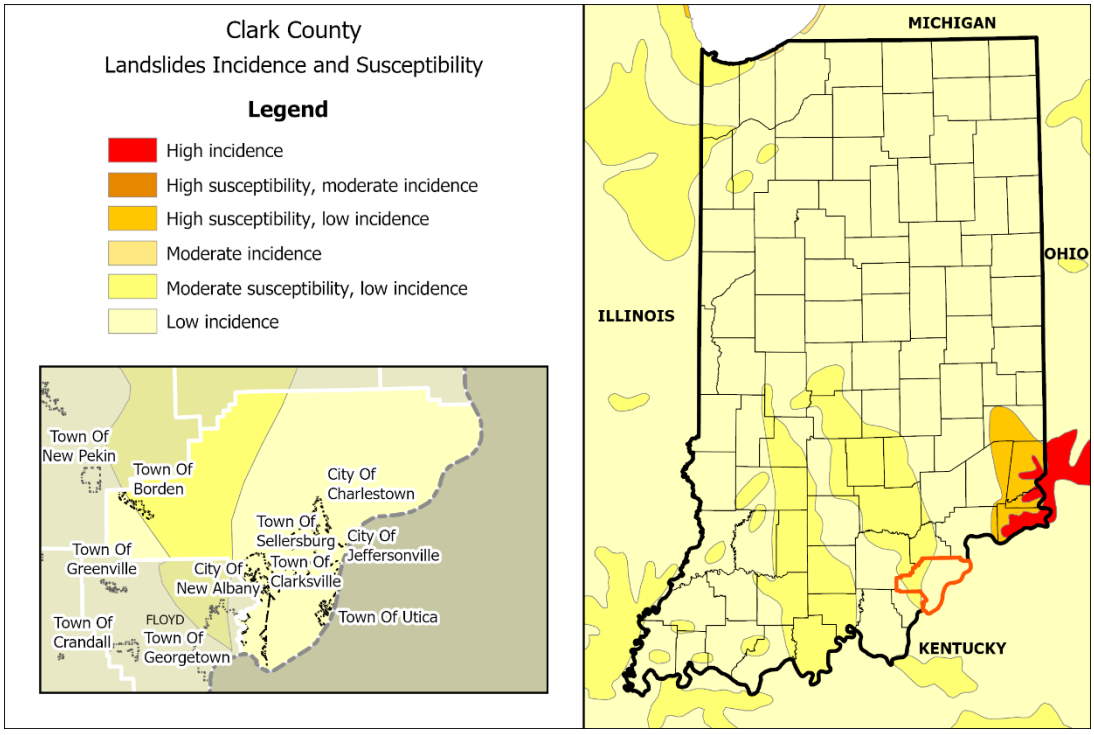

Figure 45. USGS Landslide Overview Map

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 Clark County 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. Continued development will occur in many of these areas. Currently, Clark County reviews new developments for compliance with the local zoning ordinance. Newly planned construction should be reviewed 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 Clark 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 24. 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 Clark County

Summer Storm

The history of summer storms in Clark County was determined by analyzing the hail, high wind, lightning, strong wind, and thunderstorm wind events for the county in the NCEI database. From 1966 to 2011 there were 172 summer storm-related reports. Since 2011 there have been 100 summer storm-related reports, not including reports of tornados. None of these events have any reported injuries or deaths but did result in property damage costs. A thunderstorm wind event occurred in Town of Borden in March of 2017 resulting in a reported $150,000 in property damage. An NWS Storm Survey team concluded that intermittent pockets of straight-line winds occurred along a 10-mile path across portions of Clark County. A roof was removed from an abandoned building in Borden. Winds blew out glass and a screen covered porch off the back of a house at Deam Lake near Borden. The sporadic damage continued east along and near Indiana 60 past Bennettsville, where a tree was toppled onto the roof of a house. Peak wind speeds were estimated between 60 and 80 mph. In April 2020 Thunderstorm winds caused damages in Hibernia, an unincorporated community in Owen Township. The strong winds removed half the roof of a newer large barn/home in addition to damaging multiple trees. Total estimated damage from this event was $50,000. Additional NCEI events and details about their associated impacts can be found in Appendix C. Figure 46 displays the locations for historic hail and wind events in the county.

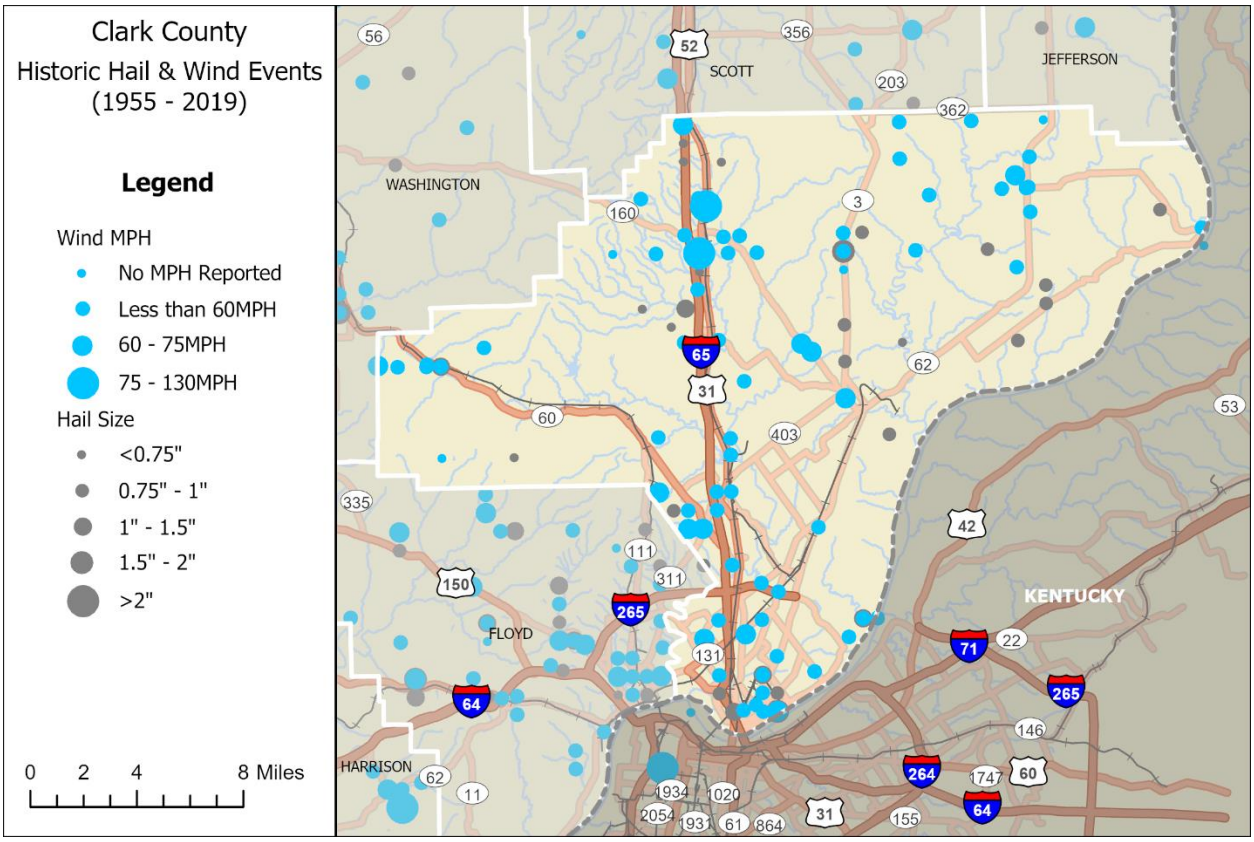

Figure 46. Clark County Historic Hail and Wind Events

Tornado

According to the NCEI, there have been 13 occurrences of tornadoes within Clark County from 1990 to 2015. Since 2015, there has only been 1 occurrence in Clark County in March of 2017. The 2017 tornado was rated at an EF1 and caused damages in the Town of Borden and surrounding areas. The tornado touched down in the backyard of a home about a quarter mile west from the caution light on Indiana Highway 60 and uprooted trees and caused roof damage to the home. The tornado moved along Muddy Fork and snapped or uprooted numerous trees. Then the tornado crossed Indiana Highway 60 where it was witnessed by people in the Buckboard Diner. Next, the tornado removed the roof of the older building next to the cafe and a garage behind the cafe. It threw its debris into a small church and removed some of its roof. Clark County NCEI recorded tornadoes are identified in Table 25. Additional details for NCEI events are included in Appendix C. Figure 47 displays historical tornadoes for Clark County.

*Table 25. Clark County Tornadoes**

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Clark	6/2/1990	Tornado	F3	-	4	250K	-
Clark	6/2/1990	Tornado	F3	-	-	2.5M	-
Clark	5/27/2004	Tornado	F2	-	-	1M	-
Clark	5/30/2004	Tornado	F1	-	-	500K	-
Clark	10/18/2007	Tornado	EF3	-	-	1.00M	10.00K
Clark	1/29/2008	Tornado	EF1	1	-	50.00K	-
Clark	9/20/2009	Tornado	EF1	-	-	10.00K	-
Clark	2/28/2011	Tornado	EF0	-	-	5.00K	-
Clark	4/19/2011	Tornado	EF1	-	-	-	-
Clark	4/19/2011	Tornado	EF0	-	-	-	-
Clark	1/17/2012	Tornado	EF0	-	-	20.00K	-
Clark	3/2/2012	Tornado	EF4	1	-	55.00M	-
Clark	3/2/2012	Tornado	EF1	-	-	300.00K	-
Clark	3/1/2017	Tornado	EF1	-	-	200.00K	-

* NCEI 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.

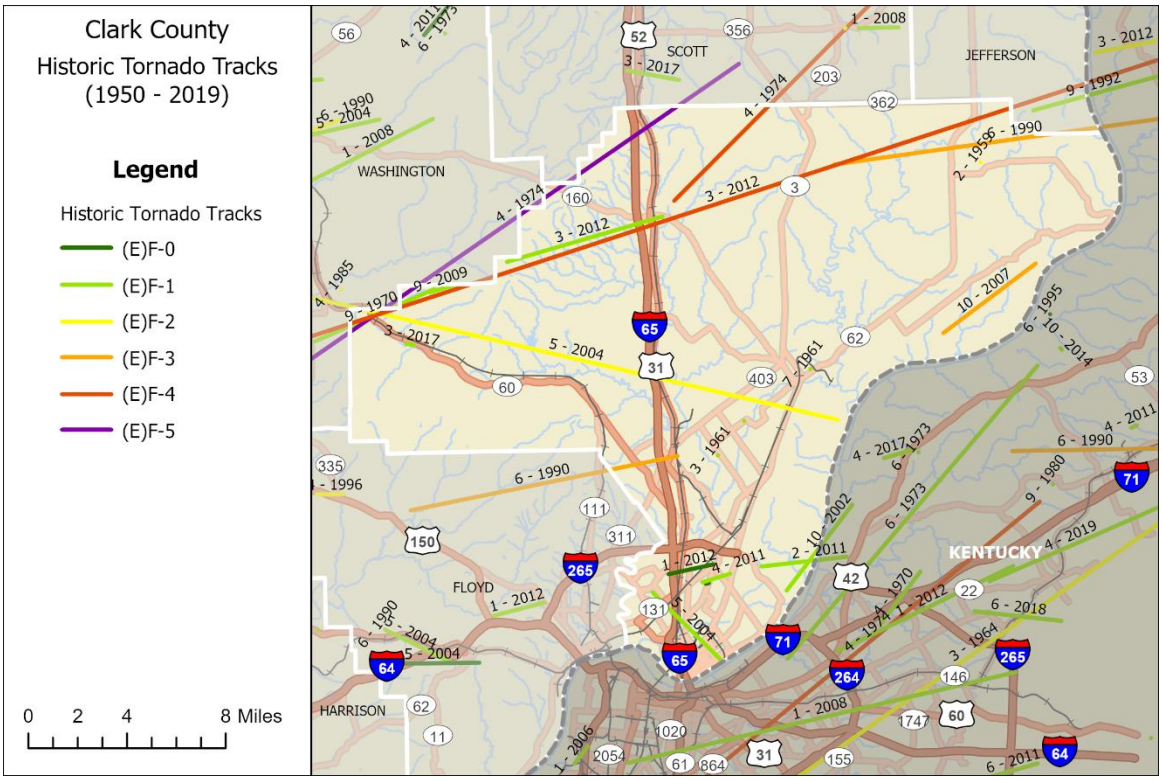

Figure 47. Historical Tornado Tracks and Touchdowns for Clark County

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 critical 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 3.35. The planning team ranked the tornado hazard as highly likely with catastrophic 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 4.

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 10 miles through the county and goes through City of Jeffersonville, and Towns of Clarksville and Utica. 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 48 depicts tornado damage curves as well as path widths.

Table 26. 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.

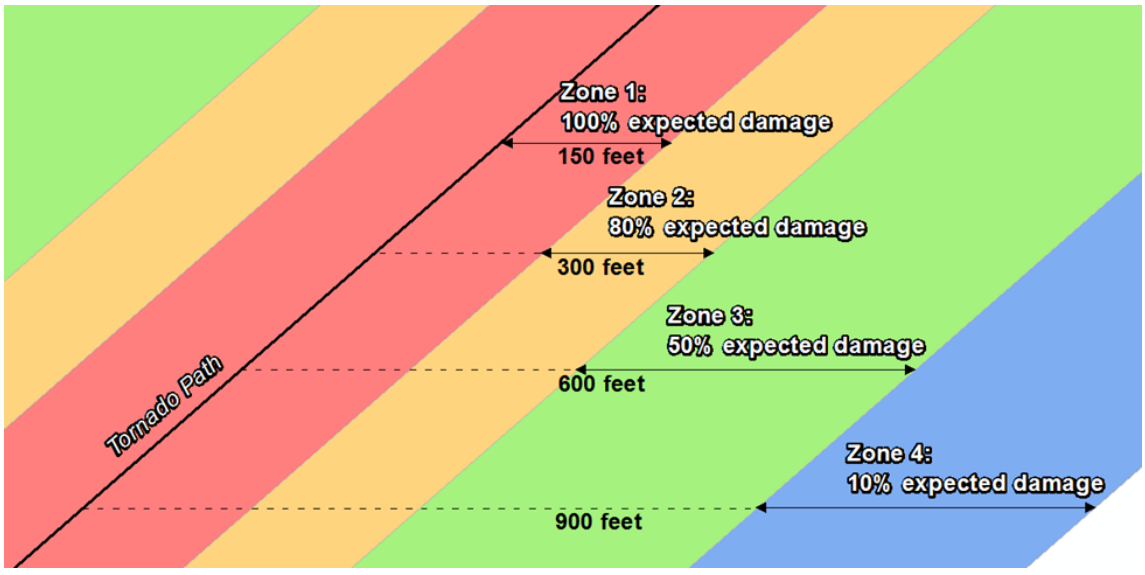

Figure 48. EF-4 Tornado Analysis, Using GIS Buffers

Table 27. 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

Table 28 and Table 29. The GIS analysis estimates that 1,699 buildings will be damaged. The estimated building losses are over $615 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.

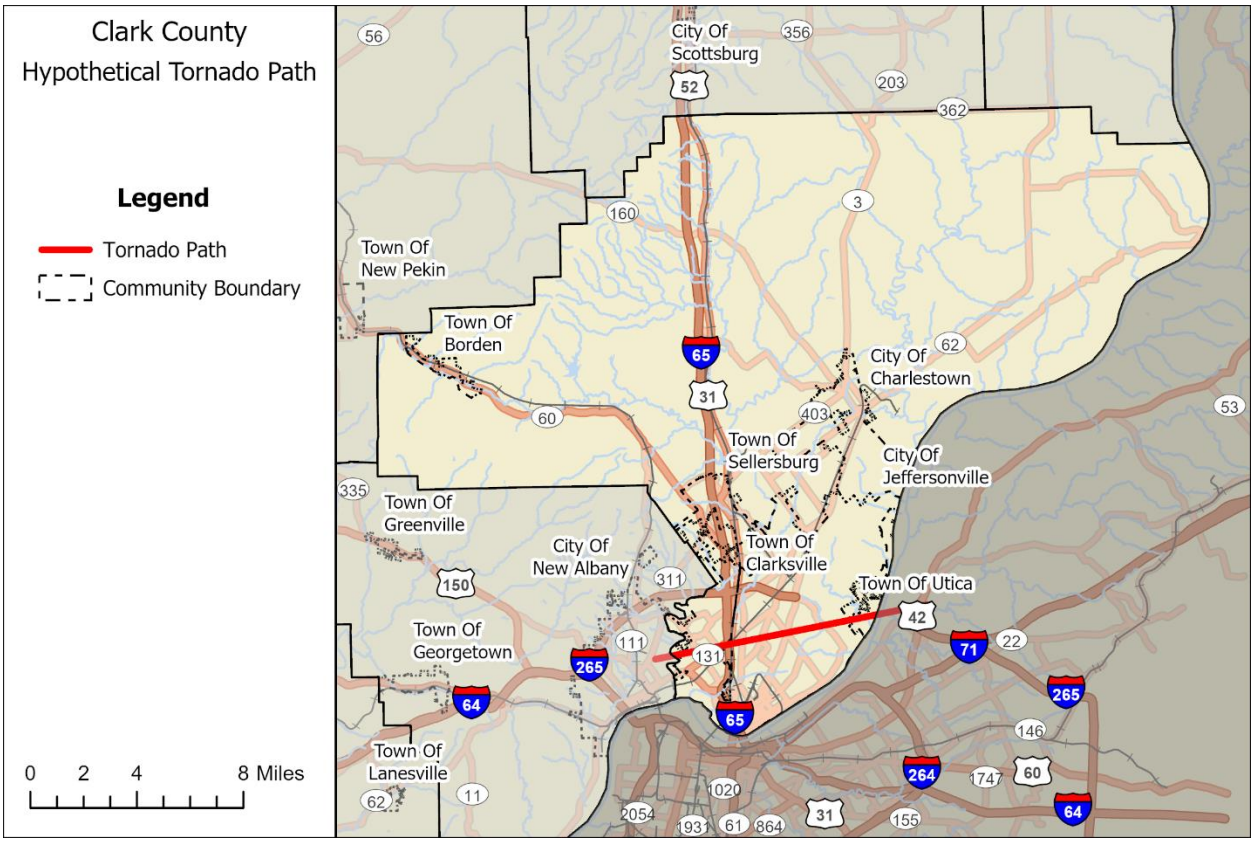

Figure 49. Modeled F4 Tornado Damage Hypothetical Path

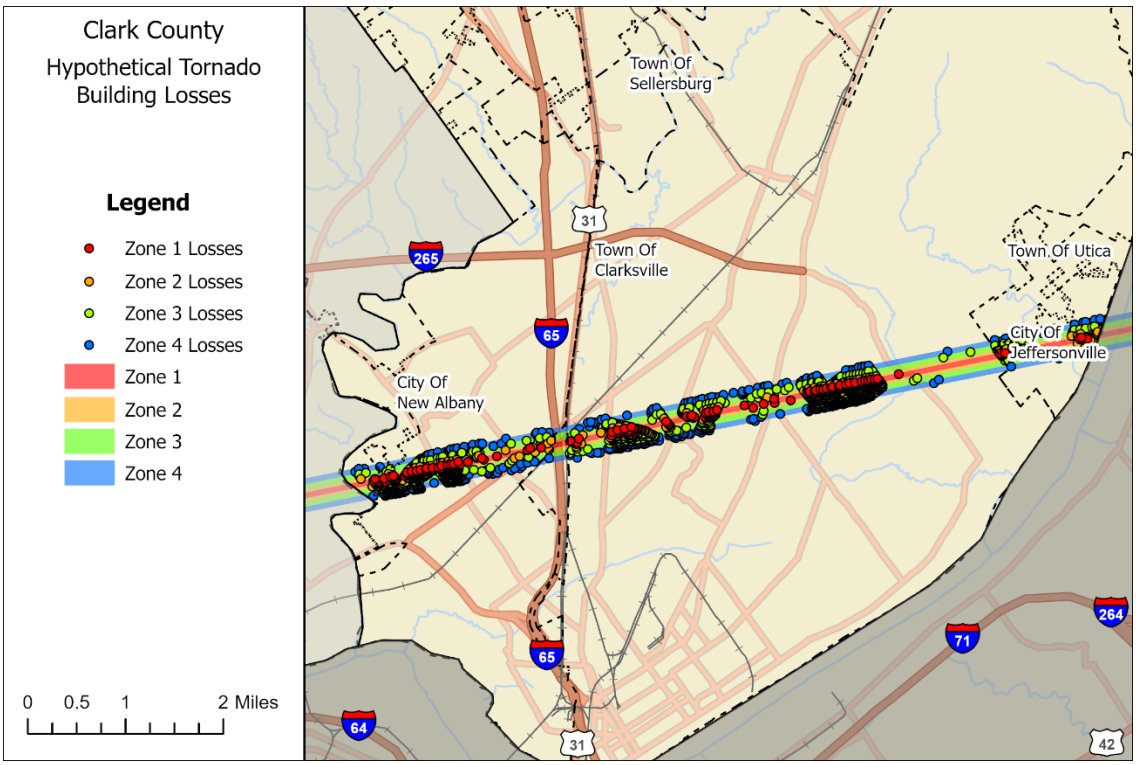

Figure 50. Tornado Path with Damaged Buildings

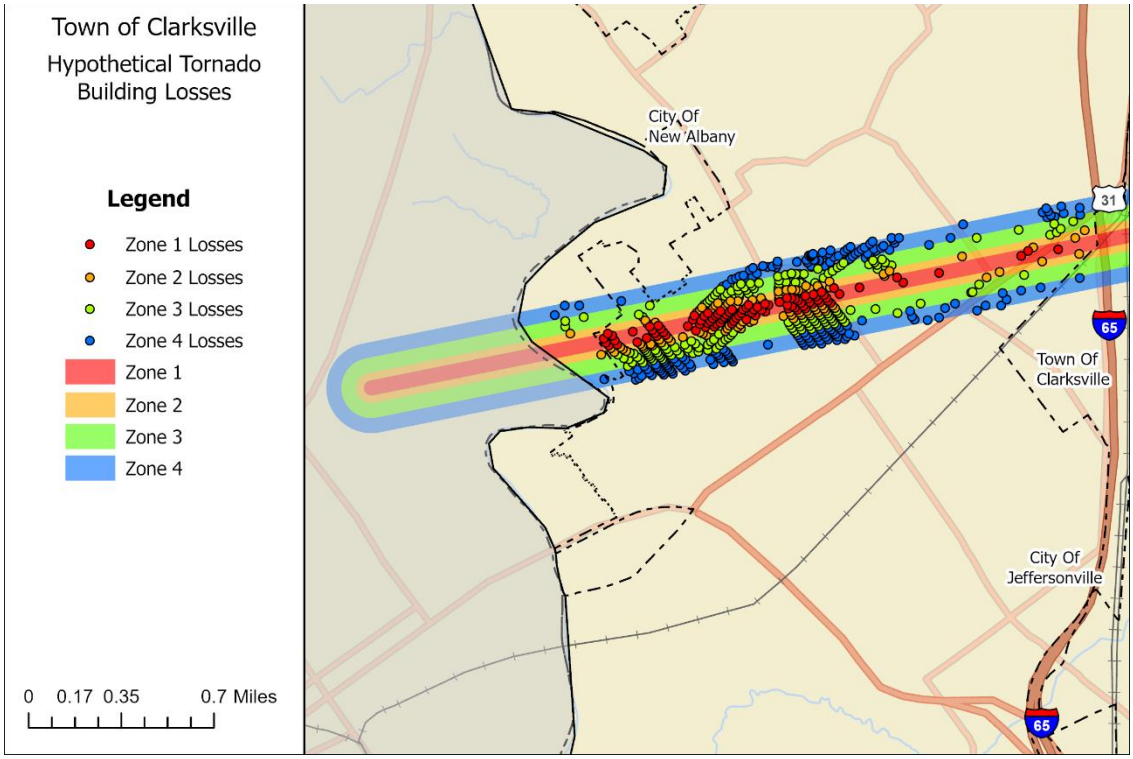

Figure 51. Tornado Path: Town of Clarksville

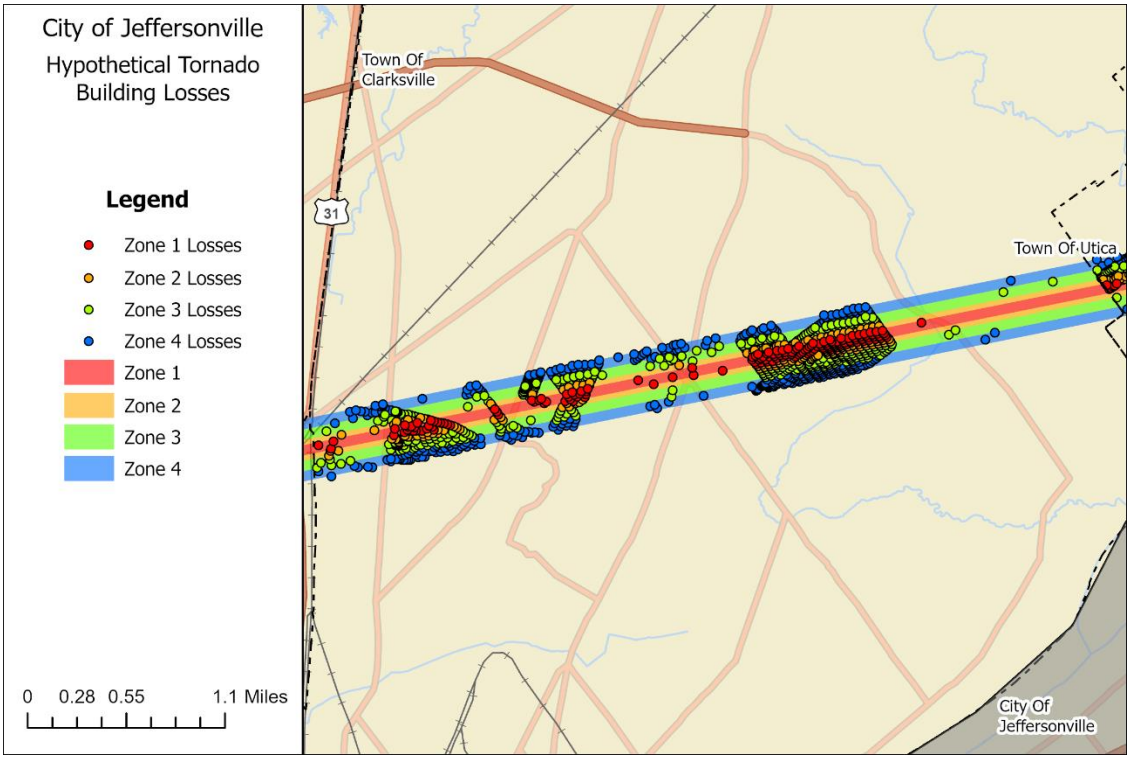

Figure 52. Tornado Path: City of Jeffersonville

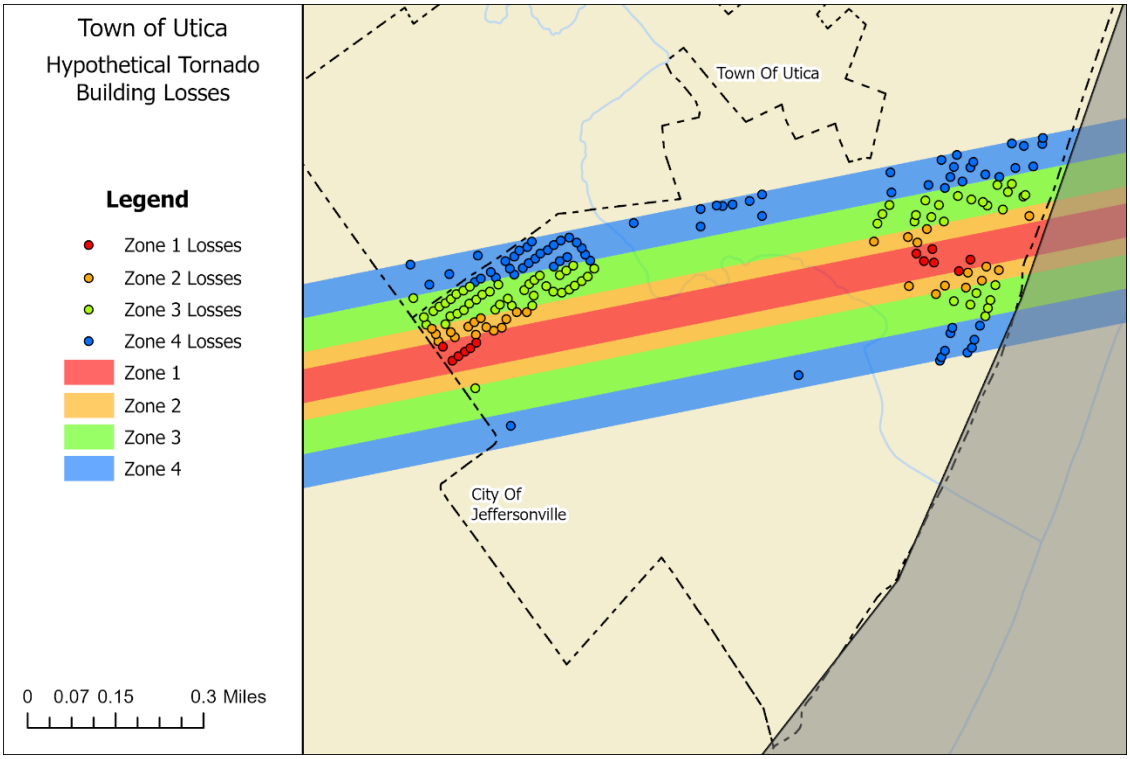

Figure 53. Tornado Path: Town of Utica

Table 28. Estimated Building Losses by Occupancy Type

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	245	260	501	561
Commercial	12	12	34	42
Industrial	2	2	3	3
Agriculture	1	-	-	4
Religious	-	1	3	5
Government	-	2	3	3
Education	-	-	-	-
Total	**260**	**277**	**544**	**618**

Table 29. Estimated Losses by Zone

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$47,786,464	$31,914,434	$74,617,045	$13,097,673
Commercial	$191,768,419	$81,284,550	$119,243,965	$20,339,448
Industrial	$9,887,291	$933,941	$7,780,498	$2,188,915
Agriculture	$100,742	-	-	$89,658
Religious	-	$143,302	$8,652,348	$845,067
Government	-	$294,181	$2,341,898	$1,724,478
Education	-	-	-	-
Total	**$249,542,916**	**$114,570,409**	**$212,635,756**	**$38,285,241**

Facility and Infrastructure Damage

The essential facilities damaged in the hypothetical tornado path are shown in Figure 54 through Figure 56. Critical facilities damaged in the hypothetical path can be found in Appendix E.

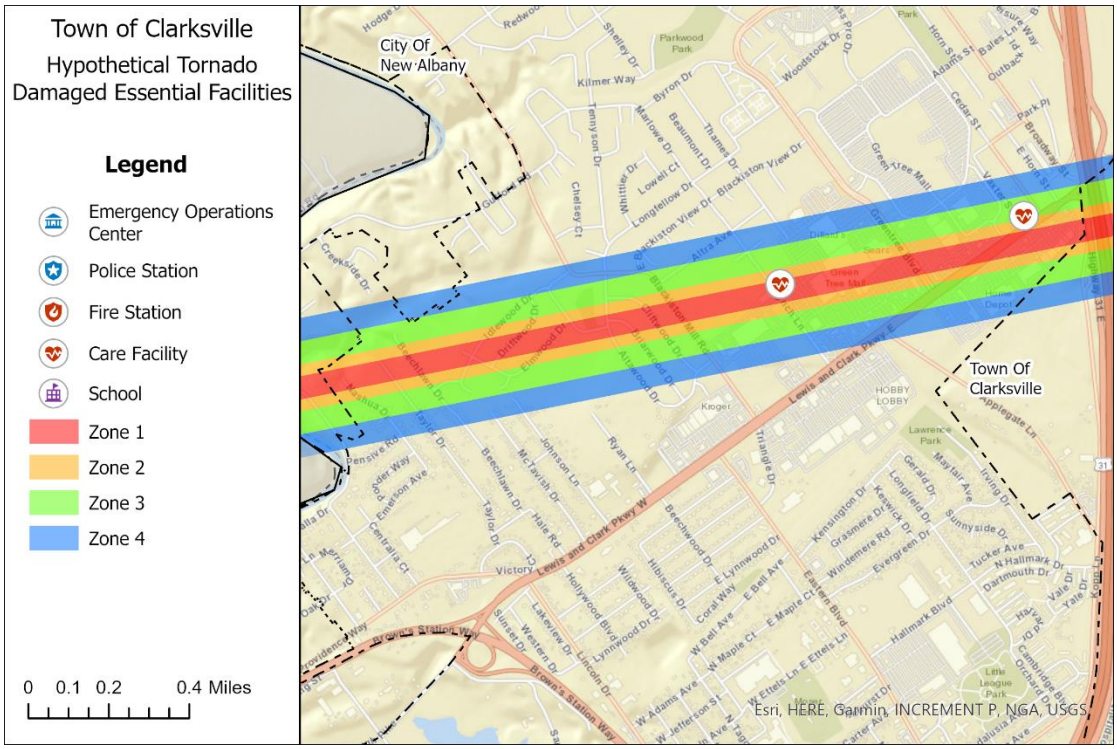

Figure 54. Hypothetical Damages to Essential Facilities, Town of Clarksville

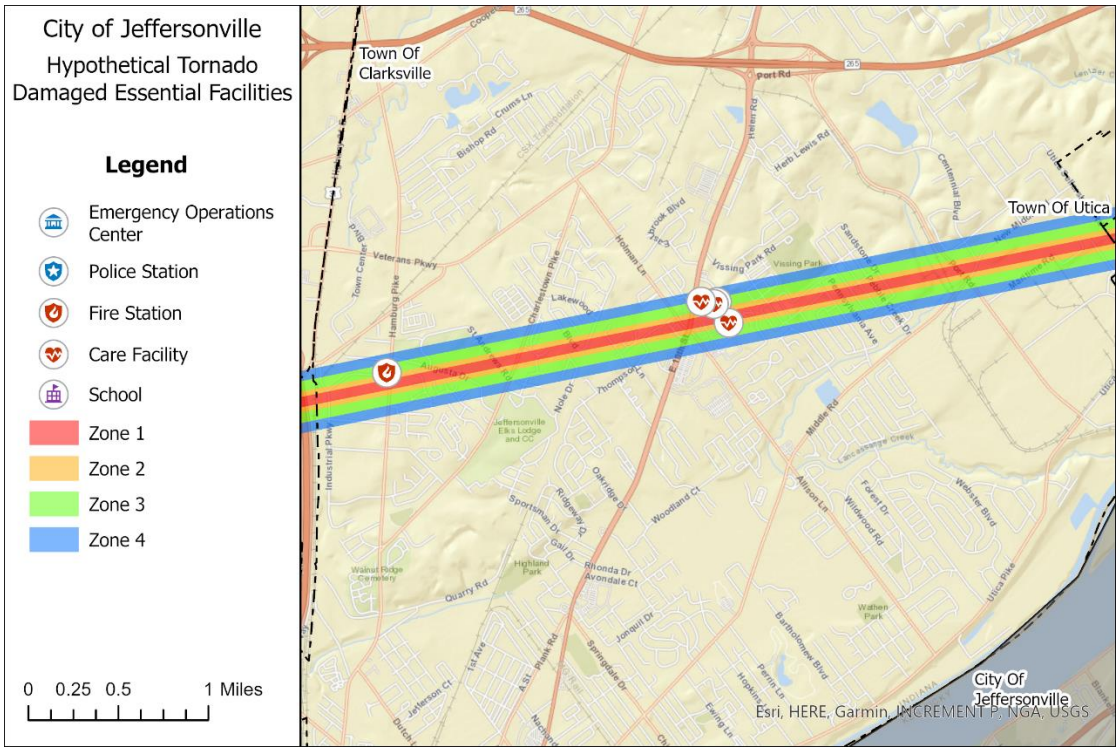

Figure 55. Hypothetical Damages to Essential Facilities, City of Jeffersonville

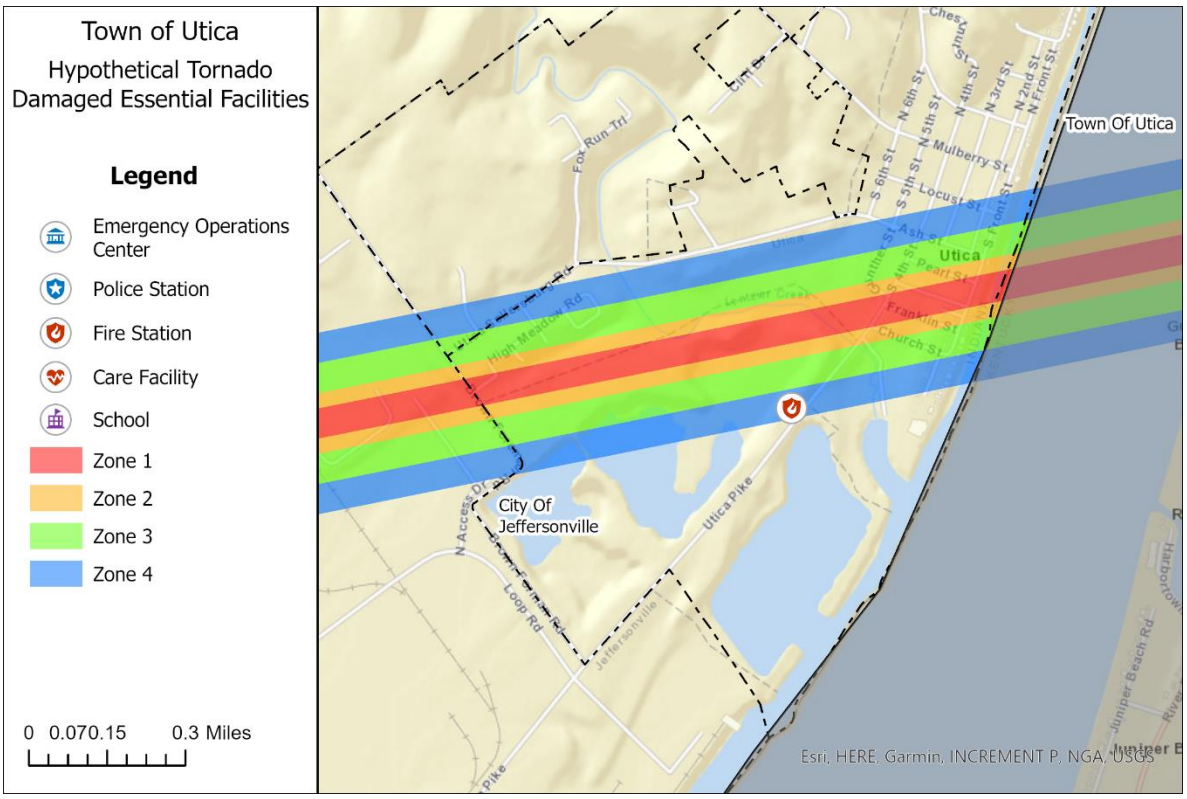

Figure 56. Hypothetical Damages to Essential Facilities, Town of Utica

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 Clark County is included in Table 13. 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 Clark 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. A representative from Town of Sellersburg suggested that more tornado sirens are needed in the town as siren infrastructures have not maintained growth with added population and expansion of the town. A team member from Town of Clarksville suggested maintaining early warning devices, weather radio giveaways, public education on safe places in a home, and public campaign to increase the number of

residents signed up for Clark County's warning system are necessary to reduce damage and loss of life from tornado events. A representative from Tri Township Fire Protection District suggested identifying central shelters where people can evacuate to during 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 30. 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 droughts impacts in the past decade ranging from water shortage warnings to reduced crop yields and wildfires.

4.3.5.2 Drought History in Clark County

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

Clark County has experienced multiple periods of drought since 2011. In November 2011, 100% of the county was at a category of D3 for 4 weeks. Like the rest of Indiana, Clark County was affected by the 2012 Central US drought, although not as badly as other counties. At the peak of the drought, part of the county was at category D2 for 4 weeks. In 2016, Clark County experienced a severe drought. For about 4 weeks, a portion to most of the county was at a category D2. In 2019, the county experienced another severe drought when almost the entire county was at a category D2 for a week.

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 likely 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 2.5.

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 Clark County

The NCEI database identified 17 winter storm, heavy snow, ice storm, winter weather, or blizzard events for Clark County during 2011-2020. In February 2014 a winter weather event was reported with no recorded injuries, deaths, or associated damage costs. However, the heavy, wet nature of the snow and ice led to sporadic power outages. In November 2018, an ice storm hit Clark County. Duke Energy reported that about 9,600 households were without power due to this event. Additional details for NCEI 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 NCEI 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 limited consequences. The warning time for a winter storm is 12-24 hours with a duration of less than 1 week. The calculated CPRI for a winter storm is 3.

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 11. 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 57, includes a frostbite indicator, showing points where temperature, wind speed, and exposure time will produce frostbite in humans.

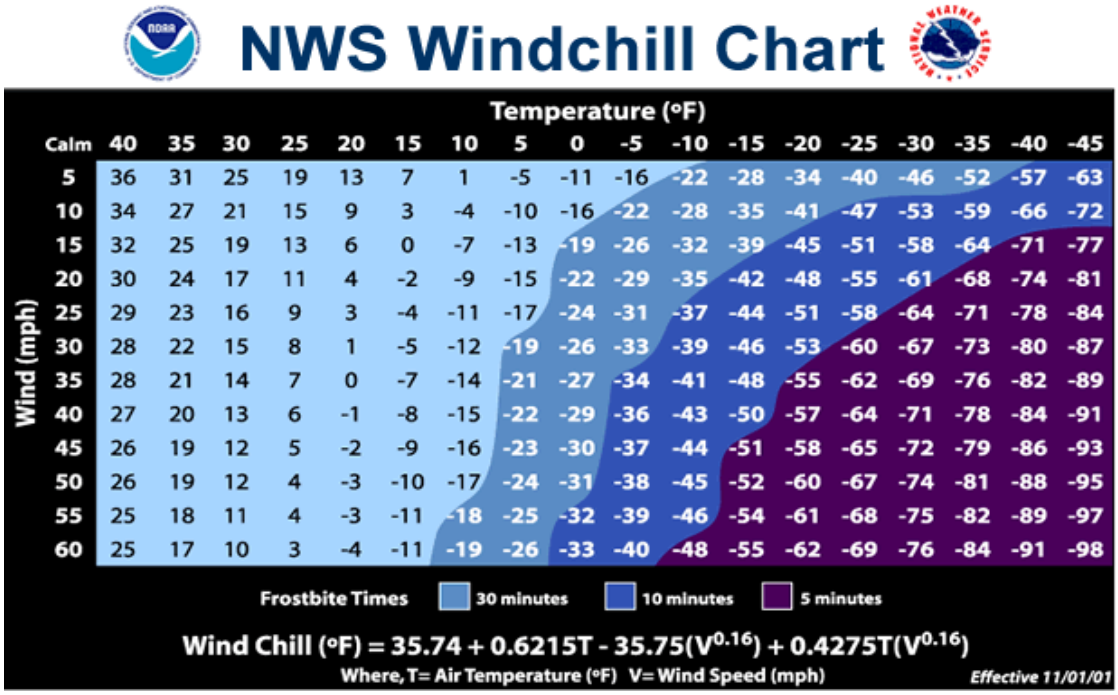

Figure 57. NWS Wind Chill Temperature Index

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 58.

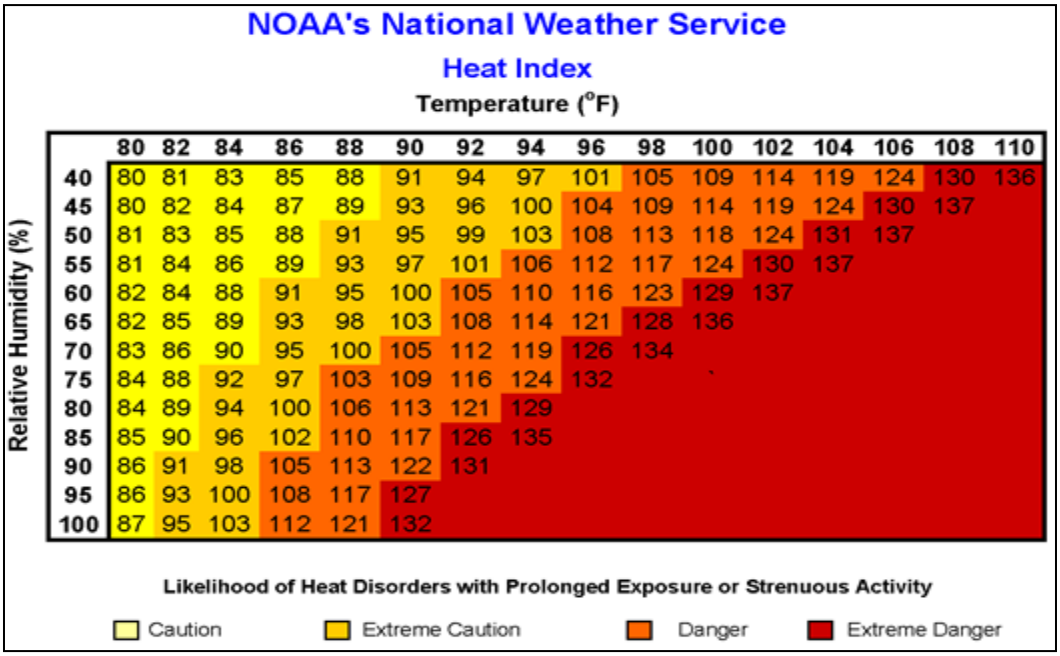

Figure 58. National Weather Service Heat Index

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 Clark County

According to the NCEI database, there were no extreme temperature events in the county in recent history.

4.3.7.3 Geographic Location for Extreme Temperature

Extreme temperatures are regional in nature. All areas of the Clark 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 highly likely with limited consequences. Extreme temperatures were determined to have a warning time greater than 24 hours with a duration more than one week. The calculated CPRI for extreme temperatures in Clark County is 2.95.

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 Clark County

Clark 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 Clark 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 highly likely with catastrophic 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 hazardous material release in Clark County is 4.

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 on the north side of Sellersburg just south of the intersection of US 31 and Old Indiana 403.

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 59 is an illustration of the toxic threat plume footprint as determined by ALOHA.

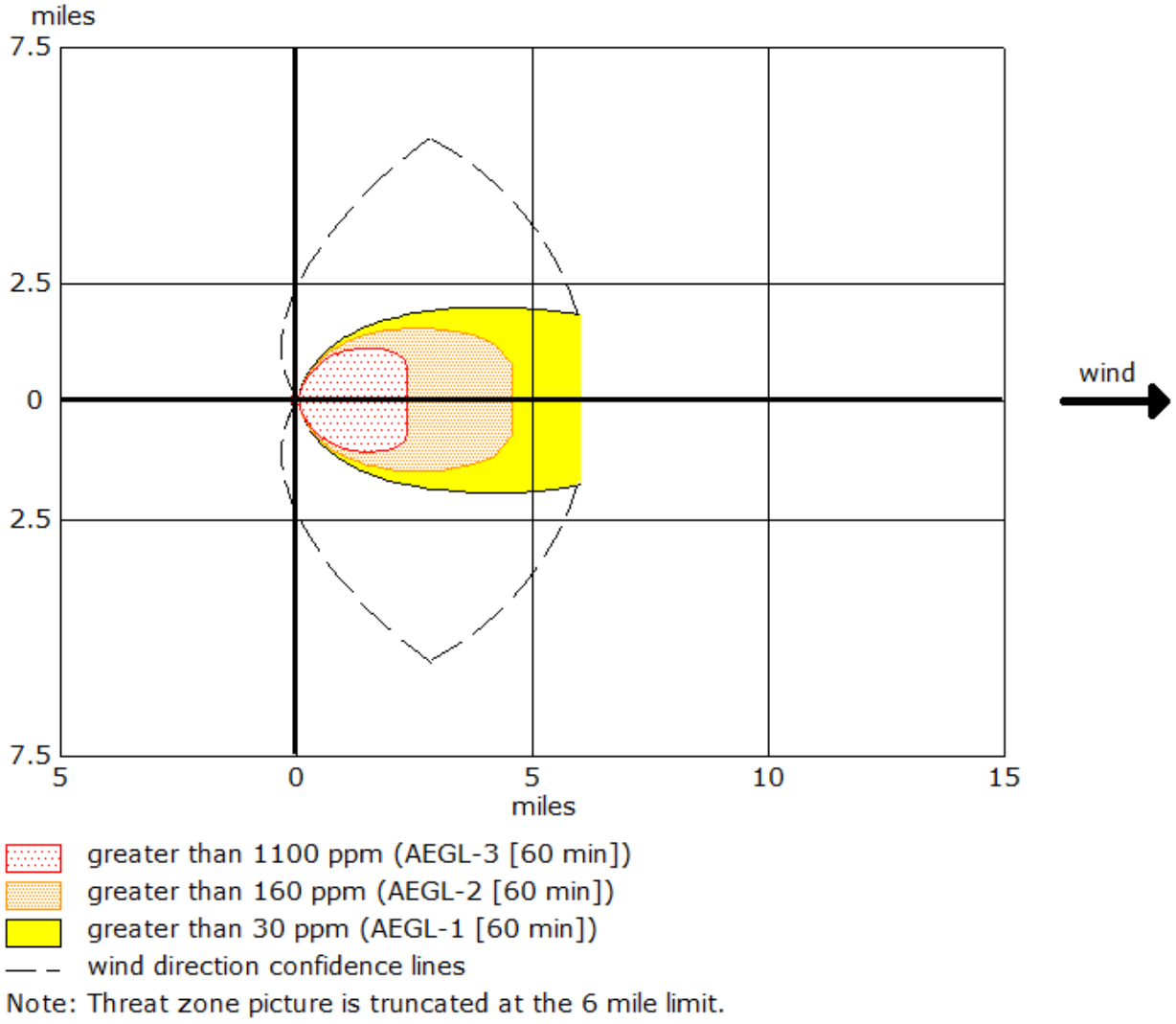

Figure 59. Toxic Threat Plume Footprint Generated by ALOHA

For this scenario, moderate atmospheric and climatic conditions with a slight breeze from the north-northwest 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 4 mph. The temperature was 35°F with 57% humidity and partially 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 65,600 pounds of material would be released per minute. Figure 60 shows the location of the release.

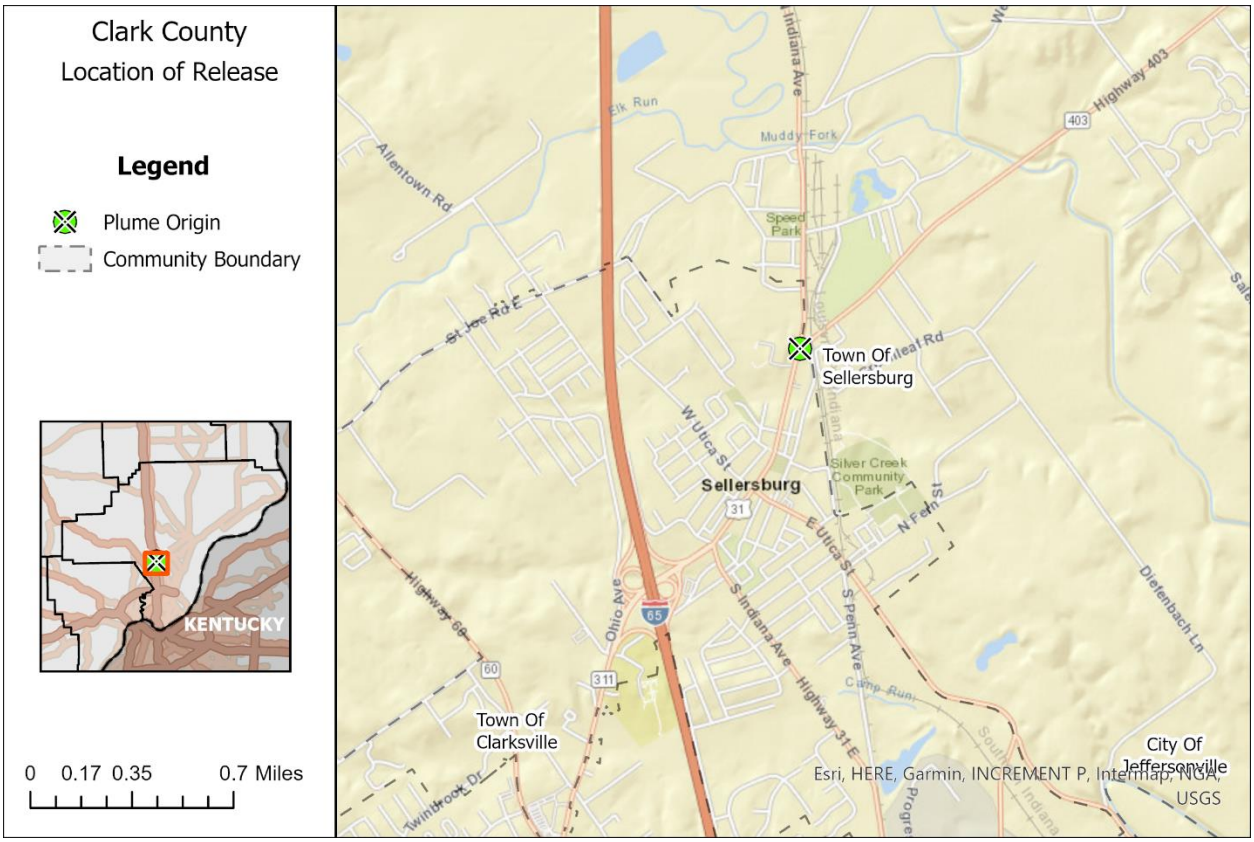

Figure 60. Location of Release

The Clark 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 61 depicts the Clark County Building Inventory after the intersect process.

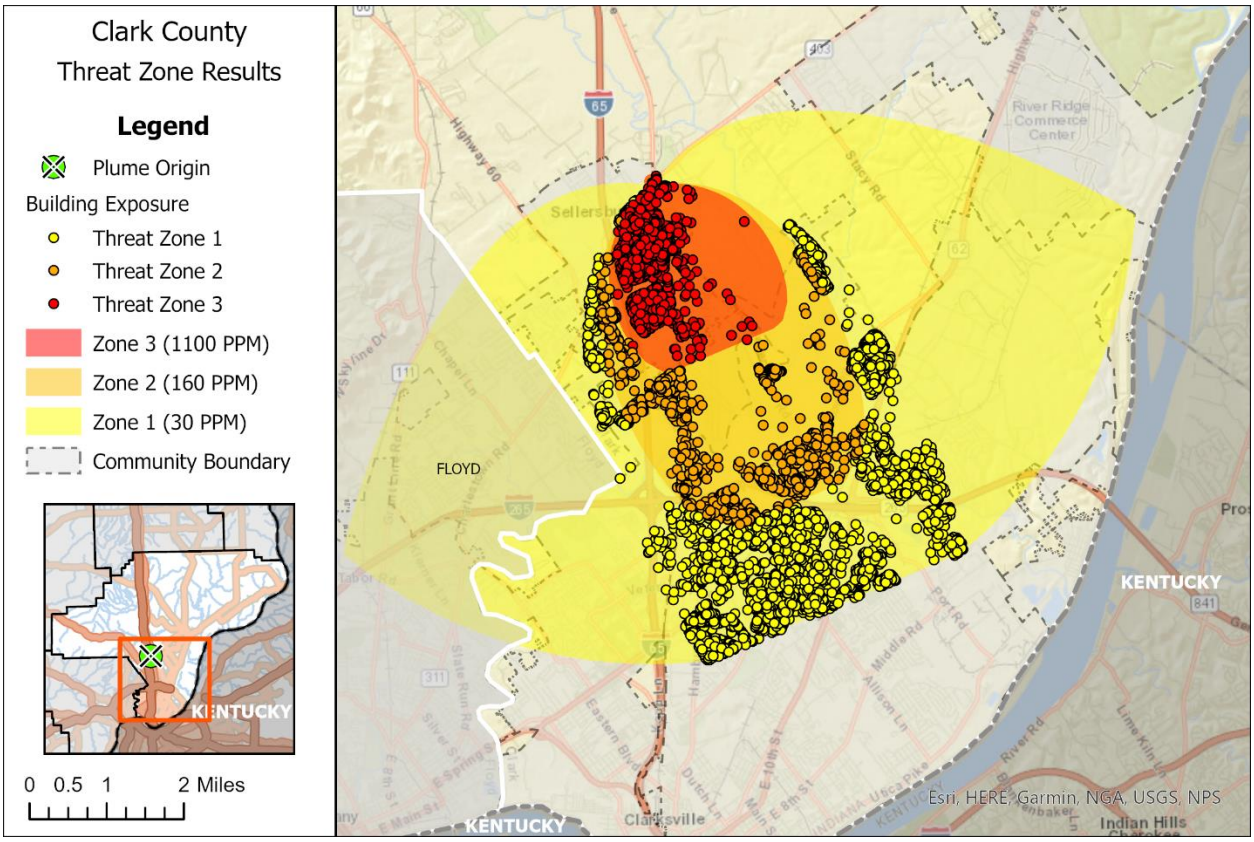

Figure 61. Location of Release and Building Inventory by Threat Zone

The results of the analysis against the Building Inventory counts are depicted in Table 31.

Table 31. 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	6	33	21
Commercial	135	57	198
Education	-	1	-
Government	33	11	8
Industrial	18	21	11
Religious	23	10	30
Residential	1,136	1,079	4,445
Total	**1,351**	**1,212**	**4,713**

Table 31 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 32. Estimated Replacement Cost for all Threat Zones

Occupancy	Replacement Cost of Buildings within the Hazmat Plume		
	AEGL 3 (most severe)	AEGL 2	AEGL 1 (least severe)
Agriculture	$1,894,104	$8,803,477	$5,146,288
Commercial	$287,477,353	$213,768,895	$1,232,802,874
Education	-	$548,471	-
Government	$110,768,684	$383,195,373	$25,901,205
Industrial	$89,985,255	$203,856,294	$153,921,275
Religious	$101,640,563	$50,619,775	$198,441,089
Residential	$201,224,261	$221,787,189	$1,070,245,642
Total	**$792,990,222**	**$1,082,579,473**	**$2,686,458,373**

Essential Facilities

All facilities affected by the plume have been mapped and labeled in Figure 62. Table 32 lists all affected essential facilities. Appendix E contains a map and list of critical facilities that fall in the plume.

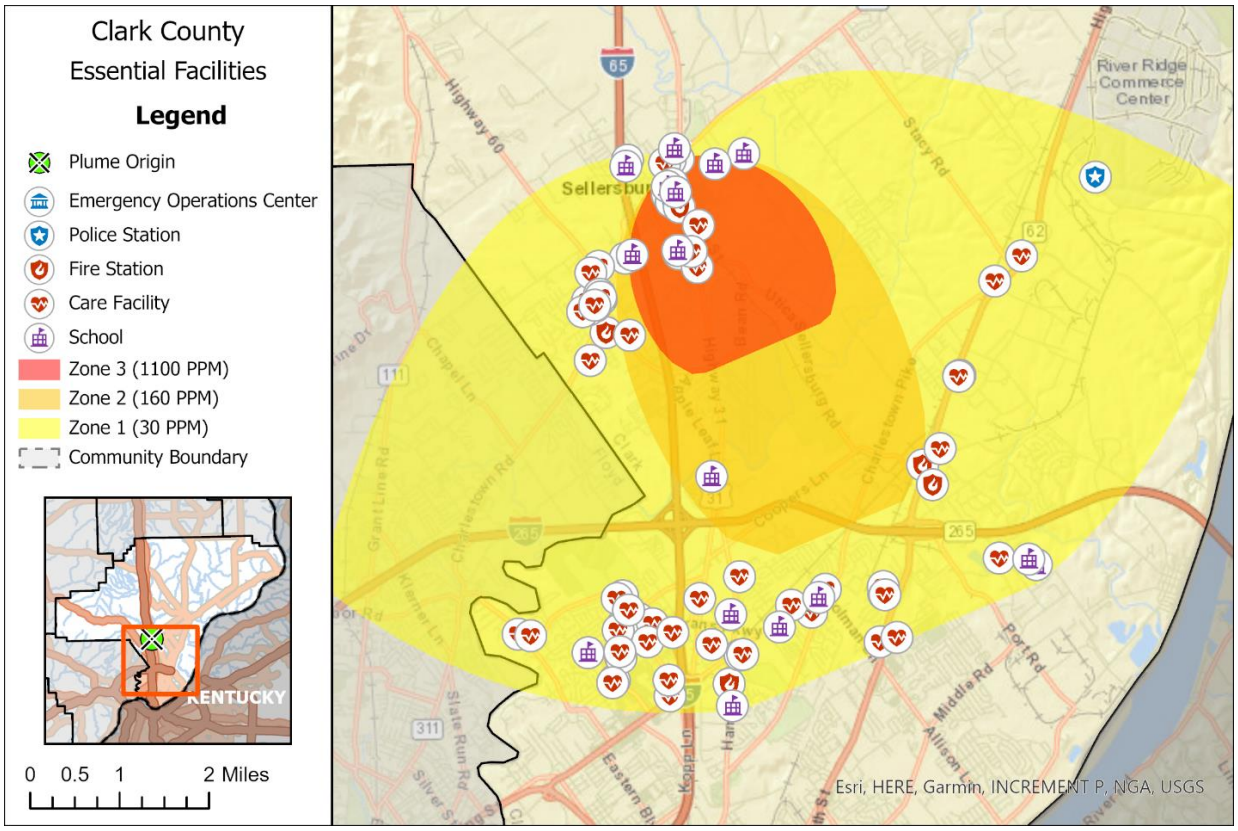

Figure 62. Essential Facilities Located in Threat Zone

Table 33. Essential Facilities

Facility Type	Facility Name
Emergency Center	Central Alarm
Police Station	Clark County Training Center
Police Station	Clarksville Police Department
Police Station	Indiana State Police Post
Police Station	Sellersburg Police Department
Fire Station	Clarksville Fire Department Station 2
Fire Station	Jeffersonville Fire Department Station 3
Fire Station	Jeffersonville Fire Department Station 4
Fire Station	Sellersburg Fire Department Station 1
Fire Station	Tri-Township Fire Department Station 1/HQ
Fire Station	Utica Fire Department Station 2
Care Facility	Advantage Chiropractic
Care Facility	Allen Family Dental
Care Facility	Armstrong Chiropractic
Care Facility	Associates In Dermatology
Care Facility	Baptist Health Medical Group/Physical Therapy
Care Facility	Baptist Health Primary Care
Care Facility	Blackiston Mill Animal Clinic
Care Facility	Brightwell Behavioral Health
Care Facility	Business Health Plus
Care Facility	Care Pets Animal Hospital
Care Facility	Clark Memorial Urgent Care/Hamburg
Care Facility	Cobalt Rehabilitation Center
Care Facility	Community Action Headstart (Sburg)
Care Facility	Community Home Medical
Care Facility	Community Medical Associates
Care Facility	Complete Care Chiropractic
Care Facility	D'Sol Optical
Care Facility	DMD Reynolds
Care Facility	Dr Chris Chiropractic
Care Facility	Dr Fleck, DDS
Care Facility	Dunn Orthodontics
Care Facility	Frazier Rehab
Care Facility	Fresenius Dialysis (Jeffersonville)
Care Facility	Integrity Healthcare
Care Facility	Jay C (Sellersburg)
Care Facility	Jeffersonville Commons Dental
Care Facility	Kentuckiana Radiology
Care Facility	Kindred Healthcare

Facility Type	Facility Name
Care Facility	Kirchner Dental
Care Facility	Kort Physical Therapy
Care Facility	Kort Physical Therapy (Williamsburg)
Care Facility	Kroger (Jeffersonville Commons)
Care Facility	Lifespan Resources
Care Facility	Maple Manor Retirement Home
Care Facility	Medical Imaging
Care Facility	Methadone Clinic (Utica)
Care Facility	Mortenson Family Dental
Care Facility	Norton Community Medical Associates
Care Facility	Norton Immediate Care Center (Clarksville)
Care Facility	Petsmart
Care Facility	Pro Rehab
Care Facility	Riverbend Alzheimer'S Unit
Care Facility	Riverbend Senior Community
Care Facility	Scotts Funeral Home
Care Facility	Sellersburg Health & Rehab
Care Facility	Sellersburg Pediatrics
Care Facility	Silver Creek Veterinary Clinic
Care Facility	Skees Family Dentistry
Care Facility	Skees Family Dentistry (Town Center)
Care Facility	Southern Indiana Clinic (Methadone)
Care Facility	Southern Indiana Dental
Care Facility	Southern Indiana Rehab Hospital
Care Facility	Sunrise Recovery
Care Facility	Traditions At Hunter Station
Care Facility	Vision Works
Care Facility	Wedgewood Healthcare
Care Facility	Wellstone Regional Hospital
Care Facility	Westminister Healthcare (Back Building)
Care Facility	Westminister Village
Care Facility	Westmoreland Pharmacy Sellersburg
Care Facility	Windsor Ridge Assisted Living
Care Facility	Yellowwood Terrace
Care Facility	YMCA
School	Crossroad Baptist Church and Schools
School	Greater Clark Schools Admin
School	Ivy Tech (Main Campus)
School	Jeffersonville Tech Center
School	Kids Care Academy
School	Kids Connection

Facility Type	Facility Name
School	Maple Manor Childrens Home
School	Parkwood Elementary School
School	River Valley Middle School
School	Rock Creek School
School	Silver Creek Elementary
School	Silver Creek Primary School
School	St Pauls Catholic School
School	Utica Elementary
School	West Clark Education Center
School	Wilson Elementary

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 Clark 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 Clark County

According to the Clark 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 20 state regulated dams located in Clark County. Table 32 summarizes the dam information and Figure 63 maps the dams on a county level. High hazard and in channel dams are individually mapped in the vulnerability section. The United States Army Corp of Engineers (USACE) shows the Jeffersonville-Clarksville Levee System protecting the communities of Clarksville and Jeffersonville. It consists of 5.06 miles of earth levee, 1.75 miles of concrete wall, and 10 pumping plants. The protected area consists of 4,190 acres. There are 81 non-levee embankments in the county that could be of concern to the planning team. They are mapped in Figure 64.

Table 34. Indiana Department of Natural Resources Dam Inventory

Dam Name	Hazard Rank	EAP?
Borden Lake Dam	High	No
Deam Lake Dam	High	Yes
Hideaway Lake Dam	High	No
Muddy Fork Structure No. 2	High	Yes
Muddy Fork Structure No. 3	High	No
Muddy Fork Structure No. 5	High	No
Muddy Fork Structure No. 6	High	Yes
Southern Hills Lake Dam	High	Yes
Greene Lake Dam	Low	No
Harry Hughes Lake Dam	Low	No
James Haas Lake Dam	Low	No
Shady Hollow Lake	Low	No
Ski Starlite Dam No. 1	Low	No
Stumler Dam	Low	No
Tunnel Mill Res. Dam (In-Channel)	Low	No
Country Lake Dam	Significant	No

Dam Name	Hazard Rank	EAP?
Franke Lake	Significant	No
Huber Brothers Lake Dam	Significant	No
Schlamm Lake Dam	Significant	No
Ski Starlite Dam No. 2	Significant	No

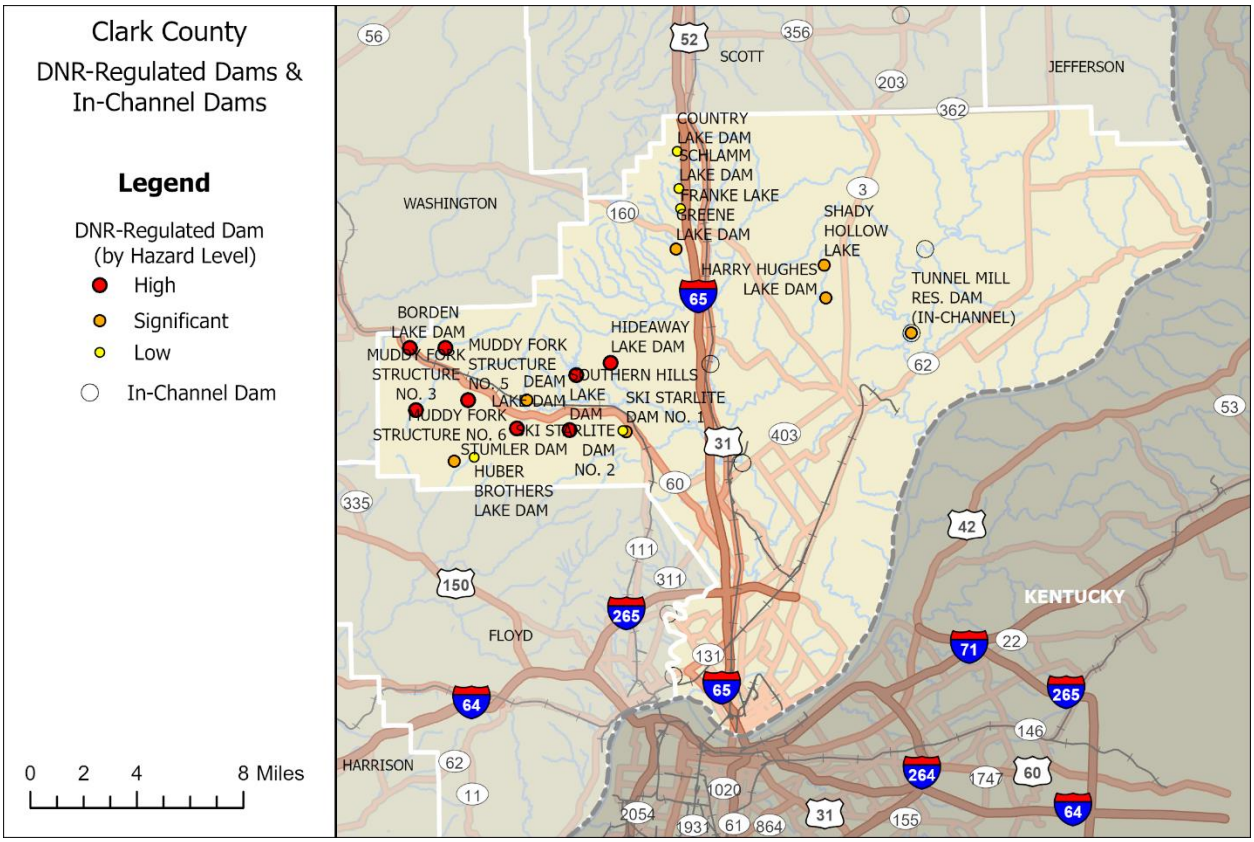

Figure 63. Clark County DNR Regulated Dams with Hazard Classification

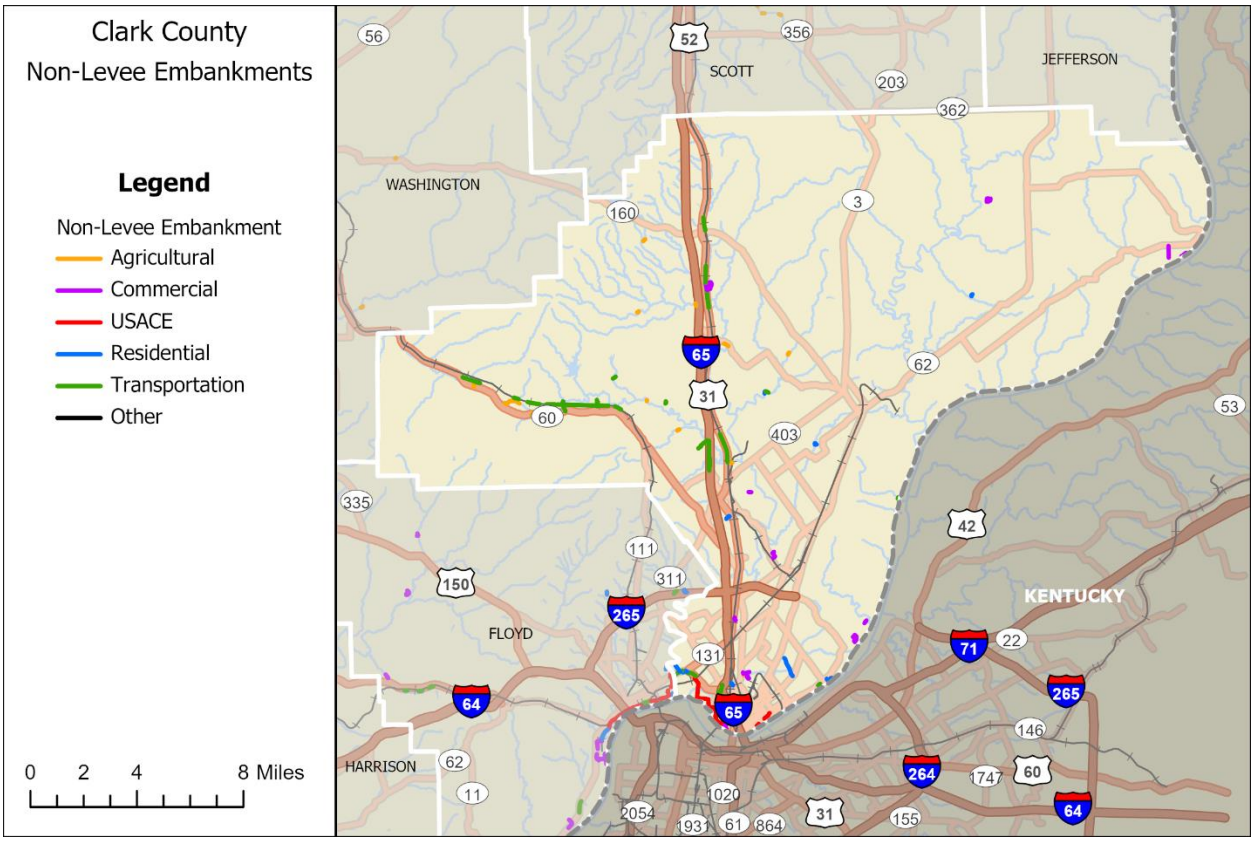

Figure 64. Clark County Non-Levee Embankments

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 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, eight dams were classified as high hazard, and four of them were recorded as having an Emergency Action Plan (EAP). An EAP is not required by the State of Indiana but is strongly recommended in the 2007 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 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 or levee failure is possible 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 or levee failure is 2.9.

4.3.9.6 Vulnerability Analysis for Dam and Levee Failure

There are 8 high-hazard dams located in Clark County, four of which have an EAP. All high-hazard dams are shown in Figure 65. Their inundation areas and affected building are described below.

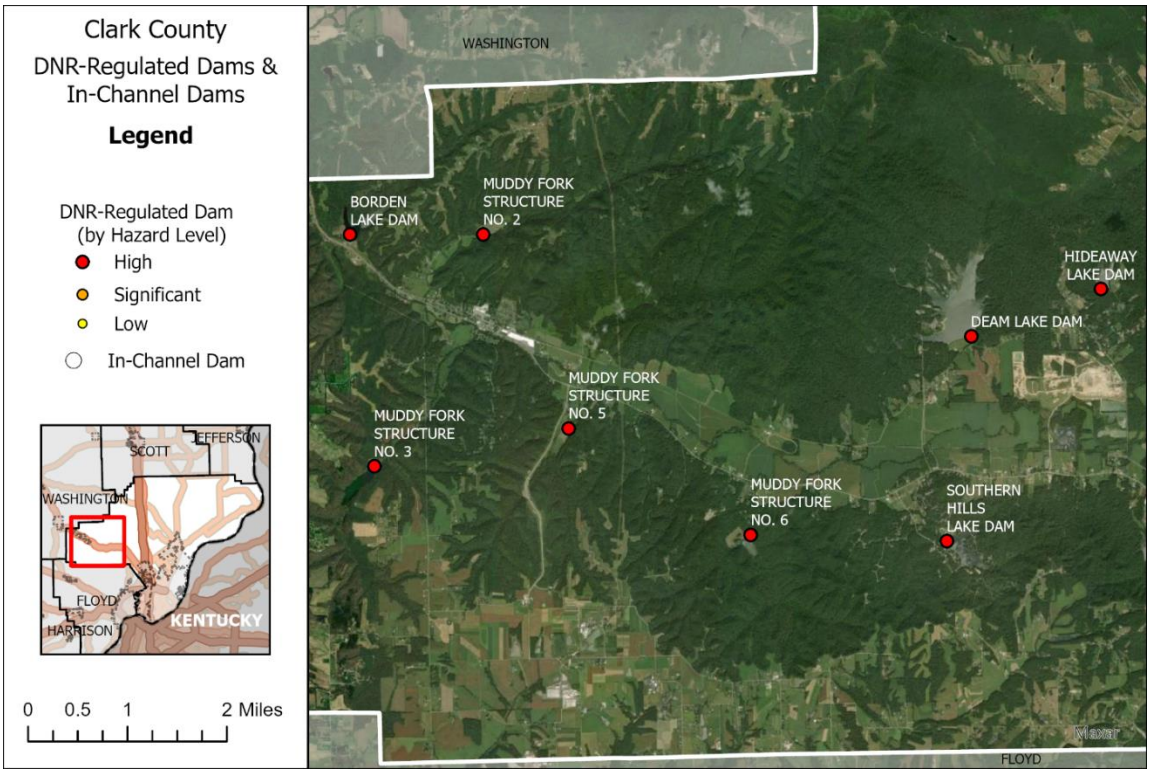

Figure 65. Clark County High Hazard Dams

Deam Lake Dam is a state-owned dam constructed in 1964. It has a height of 59 feet and a surface area of 183 acres. Its inundation area is shown in Figure 66. A handful of residential and agricultural buildings are within the inundation zone, but no essential facilities.

Muddy Fork Structure No. 2 is a local government owned dam constructed in 1971. It has a height of 52 feet and a surface area of 11 acres. Its inundation area is shown in Figure 67. Ver 300 structures are located within the dam's inundation area, most of them residential. Additionally, a care facility (Hughes-Taylor Funeral Home), a fire station (Borden Fire Department Station 1), and a police station (Borden Town Hall – Police Station) are within the inundation area.

Muddy Fork Structure No. 6 is a local government owned dam south of Carwood township. It was built in 2004 and has a height of 52 feet and a surface area of 13 acres. Its inundation area is shown in Figure 68. There are a few residential and agricultural buildings within the inundation zone and no essential facilities.

Southern Hills Lake Dam is a privately owned dam located in western Clark County. It was built in 1971 and has a structural height of 51 feet and a surface area of 51 acres. Its inundation area is shown in Figure 69. There are 39 structures located within the inundation zone, most of them residential. No essential facilities are located within the inundation zone.

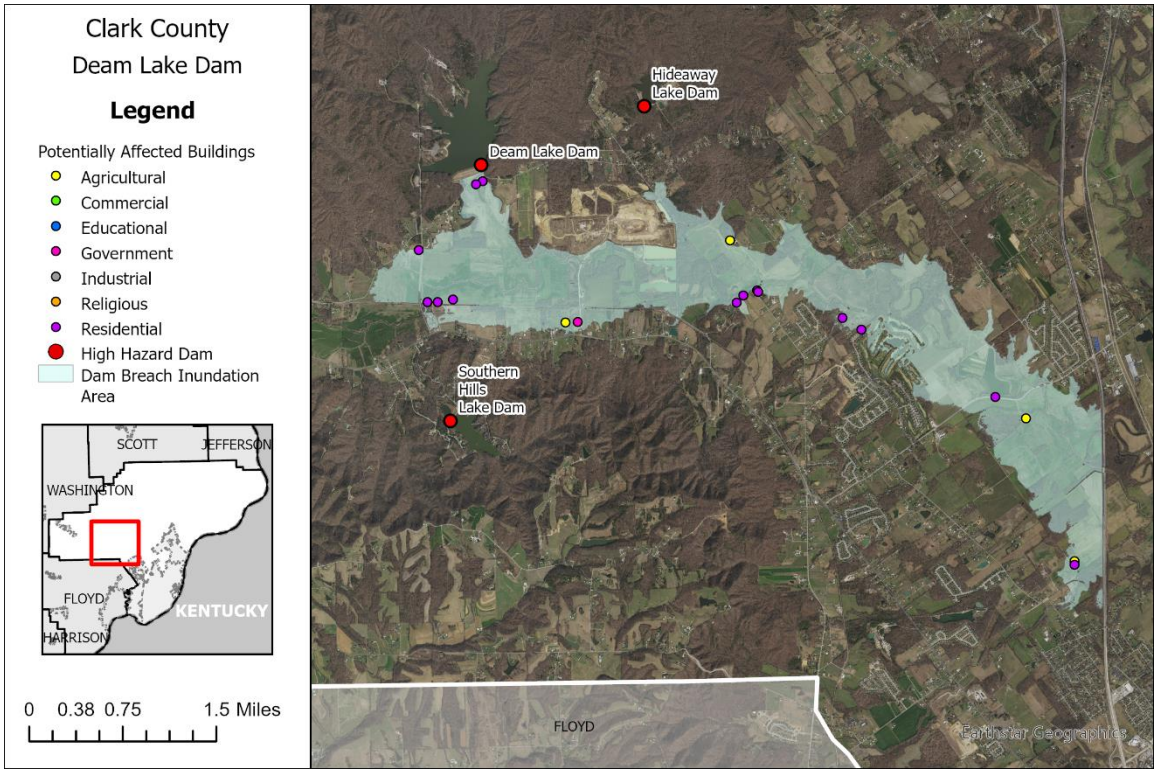

Figure 66. Deam Lake Dam Inundation Area

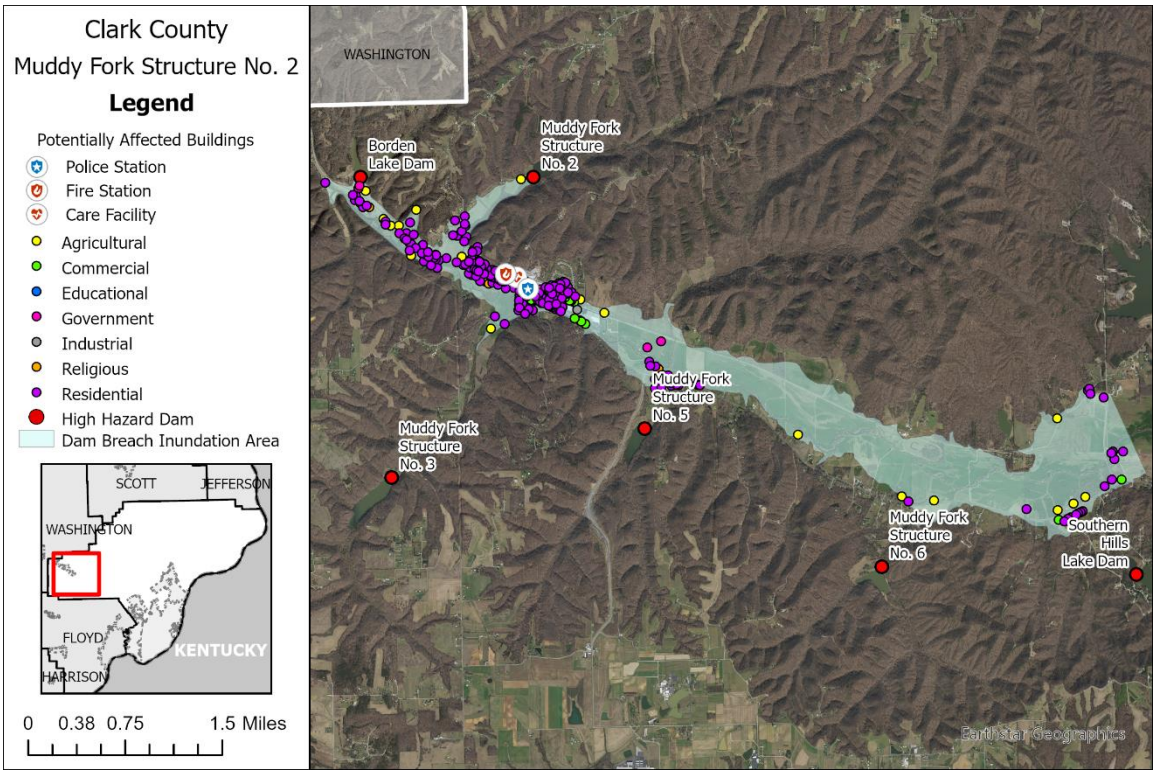

Figure 67. Muddy Fork Structure No. 2 Inundation Area

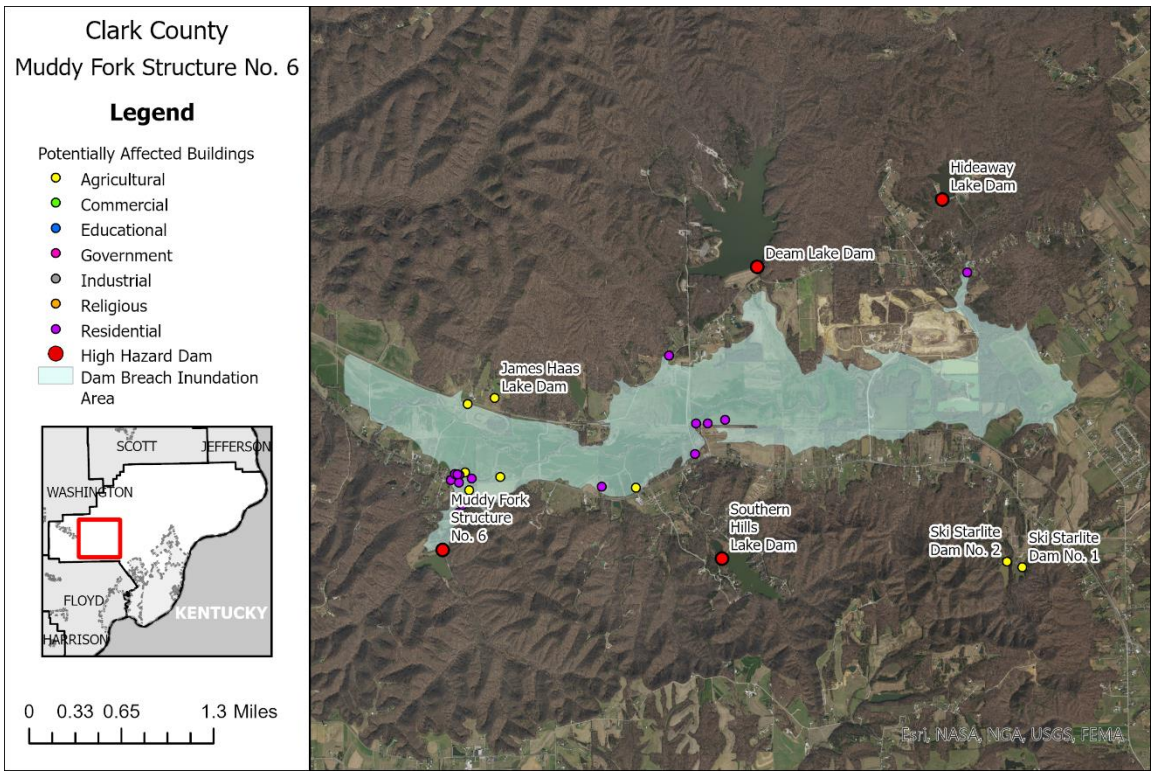

Figure 68. Muddy Fork Structure No. 6 Inundation Area

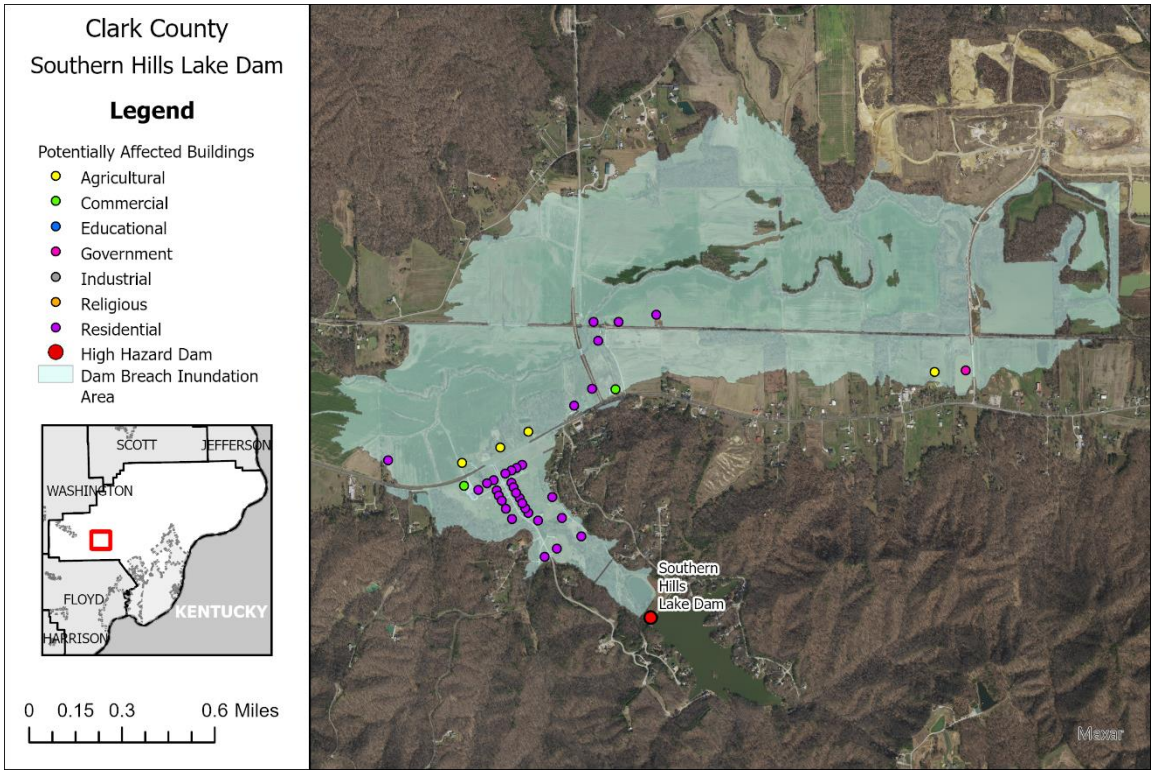

Figure 69. Southern Hills Lake Dam Inundation Area

In addition to the high hazard dam, there are several in channel dams listed in the IDNR dam database. They pose a different type of threat to the county as they can easily trap incautious river goers in their strong currents. Clark County has 5 state-regulated in channel dams.

The extent of potential levee failure varies across the county. 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. Figure 27 shows the area within the county that is protected by levee. As mentioned previously, Clark County has several Non-Levee Embankments that were mapped as part of a statewide project. While these NLEs cannot be regulated, they nonetheless can affect the flow of flood waters.

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 Clark 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 Clark County

There have been no recently recorded wildfires or damages from wildfires reported in Clark 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 likely 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 2.75.

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 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 (RMSF), and Erlichiosis as tick-borne diseases particularly prevalent in Indiana. Over the past few years, Indiana has experienced a rise in tick-borne infections. There were 36 cases of RMSF in 2014 but 80 in 2018. There were approximately 26 cases of Lyme disease in 2006, 112 cases in 2014, and 155 cases in 2018. 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 Clark County

Emerald Ash Borer

EAB has been detected in Clark County, Indiana. As of 2017, the entire state of Indiana lies within the Federal quarantine boundaries, which limits moving firewood and other ash wood materials in infested areas. However, The US Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) has proposed remove the federal domestic EAB quarantine regulations as they have proved ineffective. Indiana lifted its EAB quarantine in October 2016.

Vector-Borne Illness

Mosquitoes carrying West Nile virus have been found in Clark County. 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 Clark County are identified in Figure 70 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 to confirm the presence of EAB at the marked location. There may be more locations with EAB that have not been identified.

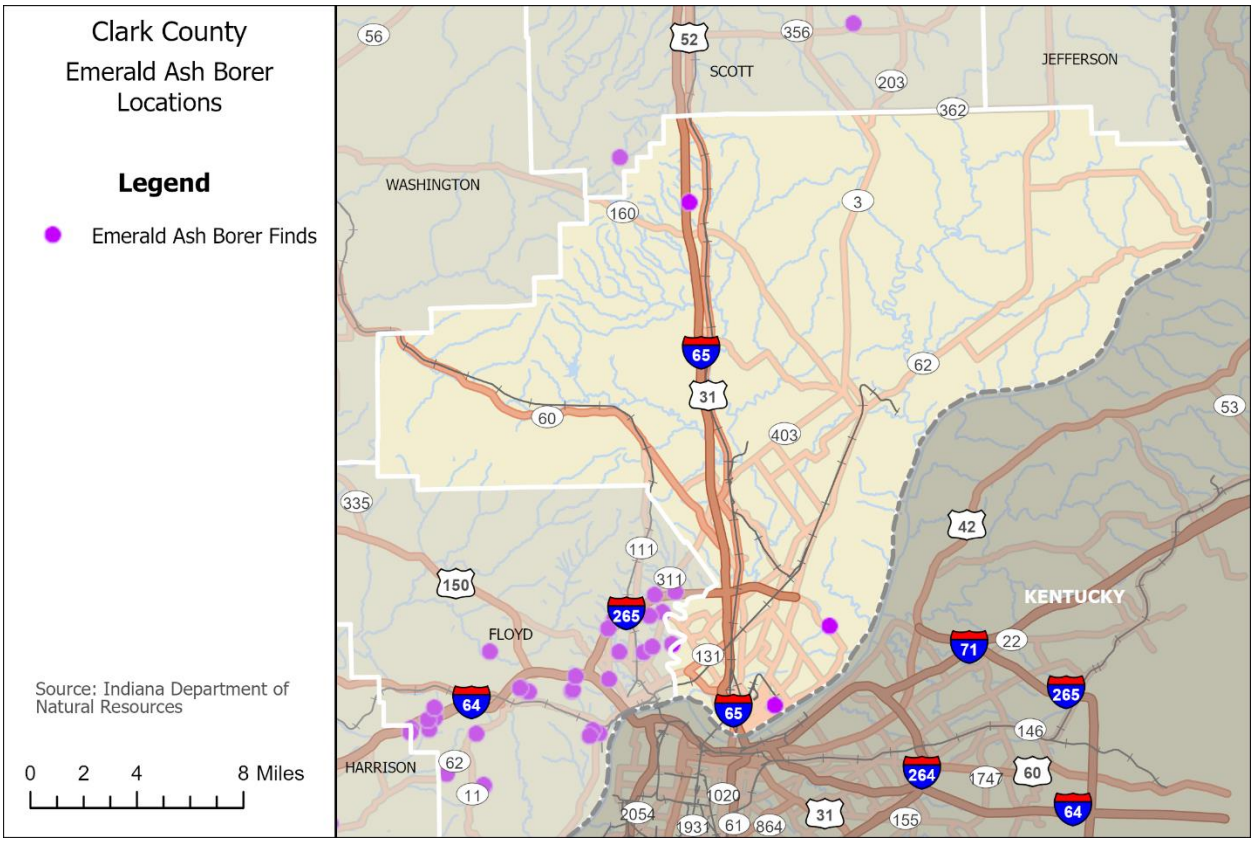

Figure 70. Emerald Ash Borer in Clark County

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 more 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 reduce the impact of future hazards more effectively. The following sections highlight the existing plans and mitigation capabilities within all 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. 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.

Clark County, the Towns of Borden, Clarksville, Sellersburg, Utica, and Cities of Charlestown, and Jeffersonville participate in the NFIP. The total number of policies and coverage of insurance in-force are identified in

Table 15.

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. Town of Clarksville and City of Jeffersonville participate in the CRS program.

5.1.1.2 Plans and Ordinances

Clark County and its incorporated communities have several plans and ordinances in place to ensure the safety of residents and the effective operation of communities. These include the Soil Survey of Clark County, Clark County Comprehensive Plan, and the Clark County Land Use & Development Code- Zoning Ordinance. 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 this plan update.

Table 35. Jurisdictions Planning Mechanisms

Capabilities	County	Borden	Charlestown	Clarksville	Jeffersonville	Sellersburg	Utica
	Planning						
Comprehensive Plan	2019	Yes	2016	Yes	Yes	Yes	Yes
Emergency Operations Plan	2016	Yes	2020	Yes	Yes	Yes	Yes
Watershed Plan	Fourteen Mile/Goose Creek Watershed Management Plan (2018), South Fork Blue River Watershed Management Plan (2017), Indian Creek (Harrison Co.) Watershed Management Plan (2008), Silver Creek Watershed Management Plan (2009)						
	Ordinances						
Zoning Ordinance	2021	No	Yes	Yes	Yes	Yes	Yes
Building Codes/ Ordinance	Yes	No	2000	Yes	Yes	Yes	Yes
Floodplain Ordinance*	Yes	No	Yes	Yes	Yes	Yes	Yes
Storm Water Ordinance	Yes	No	Yes	Yes	-	Yes	No
Erosion Ordinance	State Erosion Control Rule 5 (327 IAC 15-5)						
Burning Ordinance	State						

Capabilities	Borden Henryville SC	Clarksville Community SC	Greater Clark County Schools	Rock Creek Community Academy	Silver Creek Corporation	Jeff-Clarksville Flood Control district
	Planning					
Comprehensive Plan	No	No	Yes	Yes	No	Yes
Emergency Operations Plan	Yes	Yes	Yes	Yes	Yes	Yes
Watershed Plan	Fourteen Mile/Goose Creek Watershed Management Plan (2018), South Fork Blue River Watershed Management Plan (2017), Indian Creek (Harrison Co.) Watershed Management Plan (2008), Silver Creek Watershed Management Plan (2009)					
	Ordinances					
Zoning Ordinance	-	-	-	-	No	Yes
Building Codes/ Ordinance	-	-	-	-	No	Yes
Floodplain Ordinance*	-	-	-	-	No	Yes
Storm Water Ordinance	-	-	-	-	No	Yes
Erosion Ordinance	State Erosion Control Rule 5 (327 IAC 15-5)					
Burning Ordinance	State					

** 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.)*

Many of these plans or policies can help implement the goals, objectives, and strategies in Clark County's MHMP. The Clark 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 to ensure the health, safety, and welfare of Clark 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. The Clark County Comprehensive Plan directly refers to the Multi Hazard Mitigation Plan, highlighting how it outlines risk-based approaches to various hazards the county could face. The Comprehensive Plan also includes guidance that any new development within a floodplain must follow the Clark County Flood Hazard Ordinance, and if developers are seeking to use wetlands, they are required to integrate mitigation strategies into their plans. This plan suggests the best mitigation option for Clark County regarding developing wetlands is to lank bank for off-site mitigation in assisting development. Furthermore, the plan states that "Clark County is vulnerable to a variety of natural and manmade hazards. The responsibility of preparing, mobilizing, and coordinating response activities falls upon the Clark County Emergency Management Department. Centralized direction and control is required to facilitate coordinated responses by elected officials, emergency response personnel, private sector organizations, and individuals who have assigned emergency responsibilities."

5.2 General Mitigation Goals

In Section 4.0 of this plan, the risk assessment identified several natural hazards that Clark County experiences. The MHMP planning team members understand that although hazards cannot be eliminated altogether, Clark County can work toward building disaster-resistant communities. Following are a list of goals, objectives, and actions identified in the previous Clark 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 weatherproofing.
- 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. 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 36 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 36. 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 leads to the project's success. Developing questions evolving around the evaluation criteria, like those outlined below, helps 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

Clark 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 Clark County Emergency Management Director to ensure 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:

- Clark County
- Borden
- Charlestown
- Clarksville
- Jeffersonville
- Sellersburg
- Utica
- Borden Henryville School Corporation
- Clarksville Community School Corporation
- Greater Clark County Schools
- Rock Creek Community Academy
- Silver Creek School Corporation
- Jefferson-Clarksville Flood Control District

Table 37 lists all mitigation actions for Clark 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 Clark 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 the mitigation actions identified in the 2016 Clark County Hazard Mitigation Plan have been carried over into the 2022 plan based on the advisement of the Clark County Emergency Management Director and the consensus of the steering committee. Not all the 2016 mitigation actions have been fully completed, and they are identified in this 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 Clark County, its school districts, and the communities of Borden, Charlestown, Clarksville, Jeffersonville, Sellersburg, and Utica. The Clark County risk and mitigation activities identified in this plan also incorporate the concerns and needs of townships and other entities participating in this plan.

Table 37. Mitigation Actions

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
1	Flood, Hazmat	Emergency Services	Goal 3 / Objective a	Identify and publicize evacuation routes	County	Complete		MHMP Team, Regional Planning Commission, Clark County Commissioners, Clark County Planning Department	KIPTA	Originally developed as a high priority action item in 2008 MHMP	The emergency evacuation routes have been identified and have been included in the recent Kentuckiana Regional Planning & Development Agency (transportation plan). Although this is completed the county is committed to updating these routes.
2	Flood, Thunderstorm, Winter Storm	Prevention	Goal 1 / Objective c	Plum Run - possible acquisitions	Clarksville	Complete		Clark County Storm Water Department	FEMA, local funding	Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	
3	Winter Storm, Drought	Emergency Services	Goal 1 / Objective d	Provide a plan for emergency	County, Borden, Charlestown,	Complete		MHMP Team, Regional Planning	Red Cross, Clark County	Originally developed as a medium	This has been completed with the

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
				distribution of food/water; identify at risk citizens	Clarksville, Jeffersonville			Commission, Clark County Commissioners, Clark County Planning Department	Commissioners	priority action item in 2008 MHMP	cooperation of Emergency Support Services and Community Organizations Active in a Disaster (COADs).
4	Tornado, Hazmat	Emergency Services	Goal 1 / Objective d	Mass notification	County	Complete	High	MHMP Team, Regional Planning Commission, Clark County Commissioners, Clark County Planning Department	Clark County, Individual Jurisdictions	Originally developed as a high priority action item in 2008 MHMP	The mass communication system used by Clark County is insufficient to ensure public safety. Code Red is being implemented in the county and all jurisdictions. Centralized dispatch has been activated in Clark County.
5	Flood, Thunderstorm, Winter Storm	Property Protection	Goal 2 / Objective c	Oak Park Revised Hydraulic Study (need new flood study for the	Jeffersonville	Complete	High	Oak Park Conservancy District	Oak Park Conservancy District	Originally developed as an action item in the 2012 Risk MAP Resilience	Consultants have been contacted and this study is in progress.

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
				Oak Park area)						Report, Clark County	
6	Flood, Thunderstorm, Winter Storm, Dam/Levee	Emergency Services	Goal 1 / Objective d	Build an Ohio River ramp that would ensure access to the water in the event of local flooding	Clarksville	Deleted	Low	Clarksville Planning Department		This is a new action item developed with the 2015 MHMP	
7	Flood	Prevention	Goal 1 / Objective c	Acquisitions - Terry Lane Gilola Subdivision	Sellersburg	Identified	Medium	Clark County Building Code Department	FEMA	Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	Acquisitions are pending. This remains a high priority.
8	Flood, Thunderstorm, Winter Storm	Property Protection	Goal 1 / Objective a	Upgrade Flood Control Pump Station at Mill Creek	Jeffersonville, Sellersburg	Identified	High	Clarksville, Jeffersonville, Jeffersonville-Clarksville Flood Control	FEMA, State Revolving Loan	Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	
9	Flood	Prevention	Goal 2 / Objective c	Pleasant Run drainage analysis project	Charlestown	Identified	High	City of Charlestown	Local funds, FEMA	Added in 2022 MHMP	
10	Flood	Property Protection	Goal 1 / Objective c	Positive closure in penetrations through the	Clarksville & Jeffersonville Flood Control District	Identified	High	Clarksville & Jeffersonville Flood Control District	FEMA grant	Added in 2022 MHMP	

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
				floodwall and levee							
11	Tornado	Structural Improvement	Goal 1 / Objective a	Build safe rooms in schools	All School Corporations	Identified	High	School corporations	FEMA grant	Added in 2022 MHMP	Rock Creek Community Academy is particularly interested in one
12	Flood	Natural Resource Protection	Goal 1 / Objective c	Create wetlands to minimize flooding	All communities	Identified	Medium	Clark County EMA, local jurisdiction	Indiana DNR	Added in 2022 MHMP	
13	All	Public Education	Goal 3 / Objective a	Identify languages spoken by non-native English speakers	All communities	Identified	Medium	First responders, EMA, local jurisdiction, 911, school corporations	Grants, local municipalities	Added in 2022 MHMP	Recommend working with schools to reach out to families and identify languages spoken
14	All	Public Education	Goal 3 / Objective a	Develop materials for non-native English speakers	All communities	Identified	Medium	First responders, EMA, local jurisdiction, 911, school corporations	Grants, local municipalities	Added in 2022 MHMP	Recommend working with schools to reach out to families and identify languages spoken
15	Tornado, Earthquake, Thunderstorm, Winter Storm	Property Protection	Goal 1 / Objective b	Harden existing critical facilities (Emergency Operations	County, Borden, Charlestown, Clarksville, Jeffersonville, Sellersburg,	In Progress	High	MHMP Team, Regional Planning Commission, Clark County Commissioners,	Clark County Planning, Jurisdictional Funding, FEMA/IDHS	Originally developed as a high priority action item in 2008 MHMP	Only a few critical facilities in the county have been hardened.

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
				Center, fire houses, schools and churches)	Utica, all school corporations			Clark County Planning Department			Clark County acknowledges the need to see this as an ongoing process.
16	Flood	Natural Resource Protection	Goal 1 / Objective a	Sanitary sewer construction and separation	County, Borden, Charlestown, Clarksville, Jeffersonville, Sellersburg, Utica	In Progress	High	MHMP Team, Regional Planning Commission, Clark County Planning Department, Jeffersonville Stormwater Dept, Clarksville Stormwater Dept	Jurisdictional Funding, EPA	Originally developed as a high priority action item in 2008 MHMP	Since 2008 many sanitary water/sewer separation projects have successfully been completed. The planning team recognizes this as an ongoing process that will remain a high priority
17	Flood	Prevention	Goal 1 / Objective c	Buyout of flood-prone private property	County, Charlestown, Clarksville, Jeffersonville, Sellersburg, Utica	In Progress	High	MHMP Team, Regional Planning Commission, Clark County Commissioners, Clark County Planning Department	IDHS/FEMA	Originally developed as a high priority action item in 2008 MHMP	Waverly Court buyouts have been completed in Jeffersonville. Buyouts are planned for Sellersburg. This is an ongoing

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
											process. The City Drainage Board buyouts are in progress in Jeffersonville. Some properties have been bought out but more remain (2022 MHMP).
18	Flood, Thunderstorm	Property Protection	Goal 1 / Objective c	Mill Creek and Cane Run Interior drainage project (need to map area to determine additional flow from creek)	Clarksville, Jeffersonville	In Progress	High	Clarksville, Jeffersonville, Jefferson-Clarksville Flood Control	FEMA Grant	Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	A partial study/analysis has been completed; however action requires additional efforts and funding
19	Flood, Hazmat	Prevention	Goal 2 / Objective c	Initiate a traffic flow study once the Ohio bridges are complete.	County	In Progress	Medium	MHMP Team, Regional Planning Commission, Clark County Commissioners, Clark County Planning Department	INDOT, Clark County	This is a new action item developed for the 2015 MHMP	Local traffic, bus routes, evacuation routes…have been disrupted since construction of the I65 bridge began. This will be a

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
											MEDIUM priority. Funding identified, study to start in 2022.
20	Flood, Thunderstorm, Winter Storm	Prevention	Goal 1 / Objective c	Hamburg Pike Flooding (need to elevate road at Belmar Dr., Bishop Rd, and Crums Ln)	Jeffersonville	In Progress	Medium	Clark County Building Code Department	FEMA Grant	Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	Work on mitigation of this flooding has not been started.
21	Flood, Thunderstorm, Winter Storm	Property Protection	Goal 1 / Objective c	Camp Run Commons Basin Levee and Gate Backwater Prevention System	Sellersburg	In Progress	High	Public Works	FEMA Grant	Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	Work on mitigation of this flooding has not been started.
22	Flood, Thunderstorm, Winter Storm	Property Protection	Goal 1 / Objective a	Upgrade Flood Control Pump Station at Cane Run Creek	Jeffersonville, Sellersburg	In Progress	High	Clarksville, Jeffersonville, Jeffersonville-Clarksville Flood Control	FEMA, State Revolving Loan	Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	This project has been designed and funding has been obtained.
23	Flood, Dam/Levee	Prevention	Goal 1 / Objective c	Install Double Arm Railroad Crossings	Sellersburg	In Progress	Low	Sellersburg Planning Department	IDHS/FEMA, Jurisdictional Funding, L&I	This is a new action item developed	

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
										with the 2015 MHMP	
24	Tornado, Flood, Earthquake, Thunderstorm, Winter Storm, Hazmat, Drought, Subsidence, Dam/Levee	Public Education	Goal 3 / Objective a	Community outreach and education	County, Borden, Charlestown, Clarksville, Jeffersonville, Sellersburg, Utica, all schools	Ongoing	High	MHMP Team, Regional Planning Commission, Clark County Commissioners, Clark County Planning Department	Jurisdictional Funding, Volunteers	Originally developed as a high priority action item in 2008 MHMP.	Since 2008 Clark County has provided public education through fire department visits, distribution of FEMA documents, and Code Red information. Also, the county participates in Great Shake Out drills, and maintains public communication via Facebook and Twitter. Clark County sees this as an ongoing process.
25	Tornado, Thunderstorm	Emergency Services	Goal 1 / Objective d	Siren/warning signal installations +	County, Borden, Charlestown,	Ongoing	High	MHMP Team, Regional Planning	Clark County Planning Department,	Originally developed as a high priority	Since 2008 Clark County has

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
				maintenance countywide, in particular along the riverfront.	Clarksville, Jeffersonville, Sellersburg, Utica			Commission, Clark County Commissioners, Clark County Planning Department	Jurisdictional Funding	action item in 2008 MHMP. The county recognizes the need for additional sirens along the riverfront.	continued to install sirens and warning signals. Many such projects are in progress (Daisy Hill and Bethlehem) and more are planned. Jeffersonville is a NWS StormReady® Community. This is an ongoing process.
26	Tornado, Thunderstorm	Emergency Services	Goal 1 / Objective d	Install and maitain an additional warning siren in the Town of Borden	Borden	Ongoing	High	MHMP Team	IDHS/FEMA, Jurisdictional Funding	This is a new action item developed with the 2015 MHMP	The town has only one siren (located on the Town Hall, adjacent to a school) and not all residents are in range of the warning. Borden residents have previously been

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
											compromised by insufficient warning of pending disaster.
27	Tornado, Flood, Earthquake, Thunderstorm, Winter Storm, Hazmat, Drought, Subsidence, Dam/Levee	Emergency Services	Goal 3 / Objective b	Training and support of storm watcher teams and emergency personnel	County	Ongoing	High	MHMP Team, Regional Planning Commission, Clark County Commissioners, Clark County Planning Department, Local Police and Fire Departments	Local Police and Fire Departments	Originally developed as a high priority action item in 2008 MHMP	FEMA required incident management training has been administered to fire and police departments county- wide. Clark County EMA sponsors two Storm Spotter classes per year. Clark County acknowledges the need to see this as an ongoing process.
28	Flood	Structural Improvement	Goal 1 / Objective a	Storm drainage improvements; including	County, Borden, Charlestown, Clarksville,	Ongoing	High	MHMP Team, Regional Planning Commission,	Local stormwater management fees	Originally developed as a high priority	Storm Water Master Plans have been prepared for

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
				debris removal, channel widening, and monitoring	Jeffersonville, Sellersburg, Utica			Clark County Commissioners, Clark County Planning , Clarksville Stormwater		action item in 2008 MHMP	Jeffersonville, Sellersburg and Clarksville. Implementation projects are in progress.
29	Flood, Earthquake	Property Protection	Goal 1 / Objective a	Anchors for large propane tanks in flood-prone areas	County, Borden, Charlestown, Clarksville, Jeffersonville, Sellersburg, Utica	Ongoing	Medium	MHMP Team, Regional Planning Commission, Clark County Commissioners, Clark County Planning Department	IDHS/FEMA, Private Owners	Originally developed as a high priority action item in 2008 MHMP	The county has implemented an ordinance to require anchors for all propane tanks in the floodplain. Many propane tanks throughout the county have been anchored since the 2008 plan. There are concerns that large tanks could float away in a flood so the planning team intends

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
											to make this an ongoing process.
30	Tornado, Flood, Earthquake, Thunderstorm, Winter Storm	Emergency Services	Goal 1 / Objective b	Provide emergency generators for essential facilities (fire houses, schools, shelters)	County, School Corporations	Ongoing	High	MHMP Team, Regional Planning Commission, Clark County Commissioners, Clark County Planning Department	IDHS/FEMA	Originally developed as a medium priority action item in 2008 MHMP	Emergency generators are available for critical facilities in all incorporated jurisdictions. Clark County considers this an ongoing process to ensure continued safety of residents. Some of the facilities have generators and some communities have portable generators, but more are needed.
31	Flood	Prevention	Goal 1 / Objective c	Rolling flood gates at flood-prone roads	County	Ongoing	Medium	MHMP Team, Regional Planning Commission, Clark County Commissioners, Clark County	IDHS/FEMA	Originally developed as a medium priority action item in 2008 MHMP	Flood gates have been installed at locations of prone to flash flooding and numerous

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
								Planning Department			other areas have warning signs installed. The planning team recognizes that swing gates are more effective than signs and would like to increase the use of gates. This is an ongoing process.
32	Winter Storm	Prevention	Goal 2 / Objective c	Re-evaluate existing snow removal plan annually	All	Ongoing	Medium	Clark County Highway Department, Clark County Commissioners	Clark County	Originally developed as a medium priority action item in 2008 MHMP	The planning team reports improved snow removal over the past several years with fewer customer complaints. Sellersburg has recently quadrupled the snow removal fleet.

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
33	Flood, Thunderstorm, Winter Storm	Structural Improvement	Goal 1 / Objective c	Address erosion on Ohio River near McAlpine Loch	Clarksville	Ongoing	High	US Army Corp of Engineers	US Army Corp of Engineers	Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	Although a local issue, erosion has caused serious road closures in this area. Road and portion of the park have been lost to erosion. Situation is worsening.
34	Flood, Thunderstorm, Winter Storm	Prevention	Goal 1 / Objective c	Forest Estate Retention Pond	Sellersburg	Ongoing	Medium	Public Works	Sellersburg General Fund	Originally developed as an action item in the 2012 Risk MAP Resilience Report, Clark County	Upgrades are needed to eliminate highway flooding. This project has begun and should be considered in progress.
35	Tornado, Flood, Earthquake, Thunderstorm, Winter Storm, Hazmat, Drought, Subsidence, Dam/Levee	Emergency Services	Goal 1 / Objective d	Create a county-wide Incident Management Team including all fire chiefs.	County, Borden, Charlestown, Clarksville, Jeffersonville, Sellersburg, Utica	Ongoing	Medium	Clark County EMA, Jurisdictional Emergency Management, Local Fire and Police Departments	IDHS	This is a new action item developed with the 2015 MHMP	

#	Hazards	Mitigation Action Type	Goals & Objectives	Action	Community	Status	Priority	Coordinating Agency	Potential Funder	Source	Comments
36	Tornado, Earthquake, Thunderstorm	Emergency Services	Goal 1 / Objective d	Acquire mobile command center to respond to events in the event a municipalities offices, workspaces or communication systems were destroyed during a thunderstorm, earthquake, or tornado	All	Identified	High	Clark County EMA	Local funding, State Homeland Security Program and the Port Security Grant	Added in 2022 MHMP	

6 Chapter 6 – Plan Maintenance and Implementation

6.1 Implementation and Maintenance

The Clark 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 Clark 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 Clark 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 Clark 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 Clark County Emergency Management Director's office and the offices of the participating incorporated communities in addition to placing the plan on the Clark 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 several strategies, some of which will require outside funding to implement. If outside funding is not available, the strategy will be set aside until sources of funding can be identified. In these situations, Clark County and its incorporated communities 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 serve 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. Clark 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 county planner to ensure this plan will be used when updating the 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 in Appendix G.

6.3.2 City and Town Adoption

The Multi-Hazard Mitigation Plan for Clark County is a multijurisdictional plan. All communities in the county – towns and cities – were involved in the various stages of the planning process and mitigation strategies have been identified for each jurisdiction. Each of Clark 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 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 Clark 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.

The plan is updated every five years and are led by the County Emergency Management Agency Director in coordination with incorporated communities. A task force, like 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. There was no attendance from the public during this plan update process.

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. Clark 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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County Specific Resources

The Polis Center at IUPUI. “Multi-Hazard Mitigation Plan – Clark County.” 2016.

Federal Emergency Management Agency. “Flood Insurance Study for Clark County, Indiana and Incorporated Areas.” 2012.

The Polis Center at IUPUI. “State of Indiana Multi-Hazard Mitigation Plan.” 2019.

United States Department of Agriculture Natural Resources Conservation Service. “Soil Survey of Clark County, Indiana.” 2007.

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

Initial Invitation

Cardwell, Marianne

Subject: Clark County Multi Hazard Mitigation Plan Meeting 1
Location: Clark County Health Department (1201 Wall Street Jeffersonville)

Start: Tue 9/7/2021 10:00 AM
End: Tue 9/7/2021 11:00 AM

Recurrence: (none)

Meeting Status: Accepted

Organizer: Emergency Management

Good Afternoon,

Clark County is starting the process of updating the Multi Hazard Mitigation Plan. This plan is required by the Federal Emergency Management Agency (FEMA) to be updated every 5 years. Clark County is working with the Polis Center at Indiana University-Purdue University Indianapolis (IUPUI) to update the county information on critical facilities, community capabilities as well as addressing the progress of any ongoing mitigation projects in the county.

Your presence is requested at a series of 3 meetings to satisfy the participation requirement of the mitigation plan. All incorporated communities and the county are required to participate in order to be eligible for mitigation funds. We would like the participation of as many different departments as possible in order to make this mitigation plan a well thought out document that reflects the true needs and desires of Clark County. Part of the grant requirement is that each county is required to meet an "in-kind" match of 25% which is "earned" through time spent participating in this update process both at meetings and outside. These meetings will be an opportunity for you to gain more knowledge about the mitigation plan update process as well as to provide input on specific hazards in your communities.

Again, it is vital for each incorporated community to participate if you wish to apply for mitigation funds in the next 5 years. The Polis Center will also work to provide a list of potential grants and funders for mitigation projects that could help to improve the disaster resiliency of our communities.

Our first meeting will be held on September 7th 2021 at 10AM at the Clark County Health Department. Please complete the attached documents and bring them to this first meeting. The "Community Capability" document is meant to identify the plans, ordinances, and governmental departments for which you have authority to implement mitigation actions. The second document, "Strategy Worksheet," is a way to gather your input on the problems areas in your community. Please note, any time spent on these worksheets will count towards the match, so PLEASE track that time! The first meeting is scheduled for one hour.

If you have any questions or concerns about this process, please call, email, or bring them to the first meeting. Thank you in advance for your participation in this update process. A virtual meeting option is also attached below.

Respectfully,

Gavan Hebner
Director

1

Clark County Emergency Management Agency
812-246-5538 Office
812-406-9815 Cell
EMA@co.clark.in.us

Marianne Cardwell is inviting you to a scheduled Zoom meeting.

Join from computer or mobile:
https://iu.zoom.us/j/81208993036?pwd=bUw2Y3NBRnJyUXpidnlJZW5YYldHZz09

Meeting ID: 812 0899 3036

Join by Telephone

One tap mobile (US): +16465588656,81208993036# or +13017158592,81208993036#

Dial by your location:
+1 646 558 8656
+1 301 715 8592
+1 312 626 6799
+1 669 900 6833
+1 253 215 8782
+1 346 248 7799

Meeting ID: 812 0899 3036

IU videoconferencing equipment:
26 812 0899 3036

Videoconferencing equipment outside of IU:

H.323:
162.255.37.11 (US West)
162.255.36.11 (US East)
221.122.88.195 (China)
115.114.131.7 (India Mumbai)
115.114.115.7 (India Hyderabad)
213.19.144.110 (Amsterdam Netherlands)
213.244.140.110 (Germany)
103.122.166.55 (Australia Sydney)
103.122.167.55 (Australia Melbourne)
209.9.211.110 (Hong Kong SAR)
64.211.144.160 (Brazil)
149.137.68.253 (Mexico)
69.174.57.160 (Canada Toronto)
65.39.152.160 (Canada Vancouver)

2

Meeting #1

In-person attendees:

Hazard Mitigation Plan Update Meeting Number: Date: 9-7-2021

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Gavan Hebner	Director Emergency Mgmt.	Clark Co.	EMA@co.clark.in.us		
Tom Clevidence	Flood Plain Admin	Clarksville	tclevidence@townofclarksville.com		
Josh Thompson	Jeff Fire	Jeff.	jthompson@cityofjeff.net		
David Schickel Jr	Deputy Chief / Fire Township	Sellersburg Cap. Union, Silver Creek	dschickel@HFPD.org		
Brian Smith	Jeffersonville Risk Manager	Jeffersonville	bsmith@cityofjeff.net		
Bruce DeArk	JFD	Jeff	bdeark@cityofJeff.net		
Brad Maxwell	Clark 911	Clark Co.	Brad@ClarkCounty911.com		
Albert Purcell	Asst. Street Director	Charlestown	Streets director@cityofcharlestown.com		
Dean Benefield	Admin/ Clark Health	Clark County	DBenefield@co.clark.in.us		
Brian Jones	CCEMA	Clark Co	bjones@co.clark.in.us		
Gary Green	GCCS	GCCS	ggreen@gccschools.com		
Chad Schenck	GCCS	GCCS	cschenck@gccschools.com		
Rebecca Ashack	Ops. Supervisor	Indiana American Water	rebecca.ashack@amwater.com	7 miles	
Leslie Riley	Assistant Principal	Clark/Sellersburg Academy Rock Creek Comm.	lriley@rccasi.org	20 miles	
Charlie Smith	Town Manager	Sellersburg	CSmith@Sellersburg.org	20 mi.	1hr.

Zoom attendees:

	A	B	C	D	E	F
1	Name	Title/Role	Community Representing (County, Town, City)	Email Address	Mileage (Round Trip)	Time Spent on Surveys
2	Lisa Huber	Govt. & Community Relts Mgr	Duke Energy	lisa.huber@duke-energy.com		
3	Chelsea Crump	Charitable Financial Specialist	River Hills EDD & RPC	ccrump@riverhills.cc	0	0
4	Mindi Holmes	Clerk-Treasurer	Town of Borden			
5	Budd		Borden Henryville School Corp			
6	Dave Barton		Clark County REMC			
7	Troy Morgan	Director	Jefferson County EMA			

Minutes:

- Clark County EMA Director Gavan Hebner introduced the Polis Center team
- Marianne Cardwell from Polis, with the support of Shaikh Abdullah Al Rifat, also from Polis, went through a presentation explaining what a Multi-Hazard Mitigation Plan is, why it is needed, what we need from the participating communities, and presented a high-level timeline of the process.
- Marianne, Rifat, and Gavan answered participants' questions.

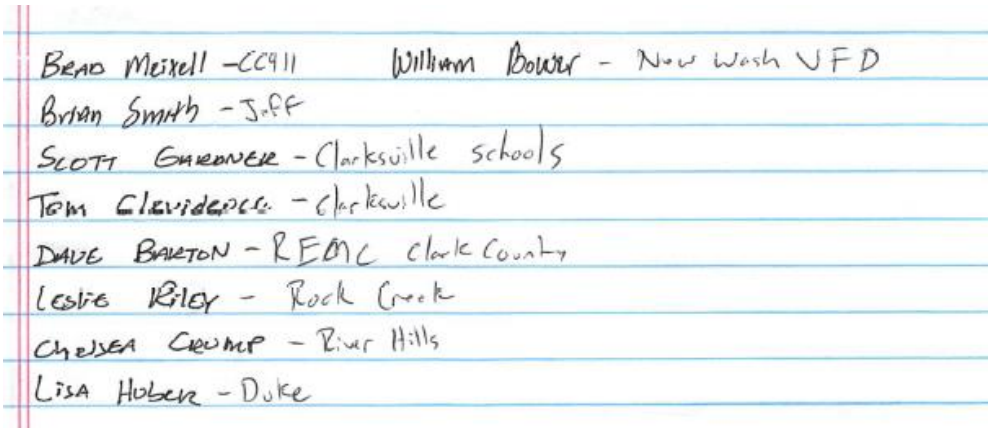
Meeting #2

In-person attendees:

Hazard Mitigation Plan Update Meeting Number: 2 Date: 10/28/2021

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
GARY Greew	Safety Specialist	Greater Clark Co. School	ggreew@gccschools.com	—	—
Dave Schickel	DC of TAI - Township	Perry Univ + Silver Creek Twp. - Township	dschickel@tfpd.org		
Brandon Skaggs	Fire Chief	Clarksville	BSkaggs@CFD fire.com	—	—
Doug Bentfield	Health / Admin	County	dbentfield@co.clark.in.us		1hr
Brian Jones	CEMA	County	bjones@co.clark.in.us		
Albert Purcell	Director	Charlestown	streetsdirector@charlestown.com		
Charlie Smith	Town Manager	Sellersburg	CSmith@Sellersburg.org.us		1hr
Shannon Strutson	Water Superintendent	Sellersburg	SSTRUTSON@SELLERSBURG.ORG	-	—
Stacia Franklin	Planning / Floodplain	Sellersburg	sfranklin@sellersburg.org		
Drew Roudenbush	Health	County	droudenbush@co.clark.in.us		
Gavan Hebner	CEMA	County	EMA@co.clark.in.us		

Zoom attendees:



Minutes:

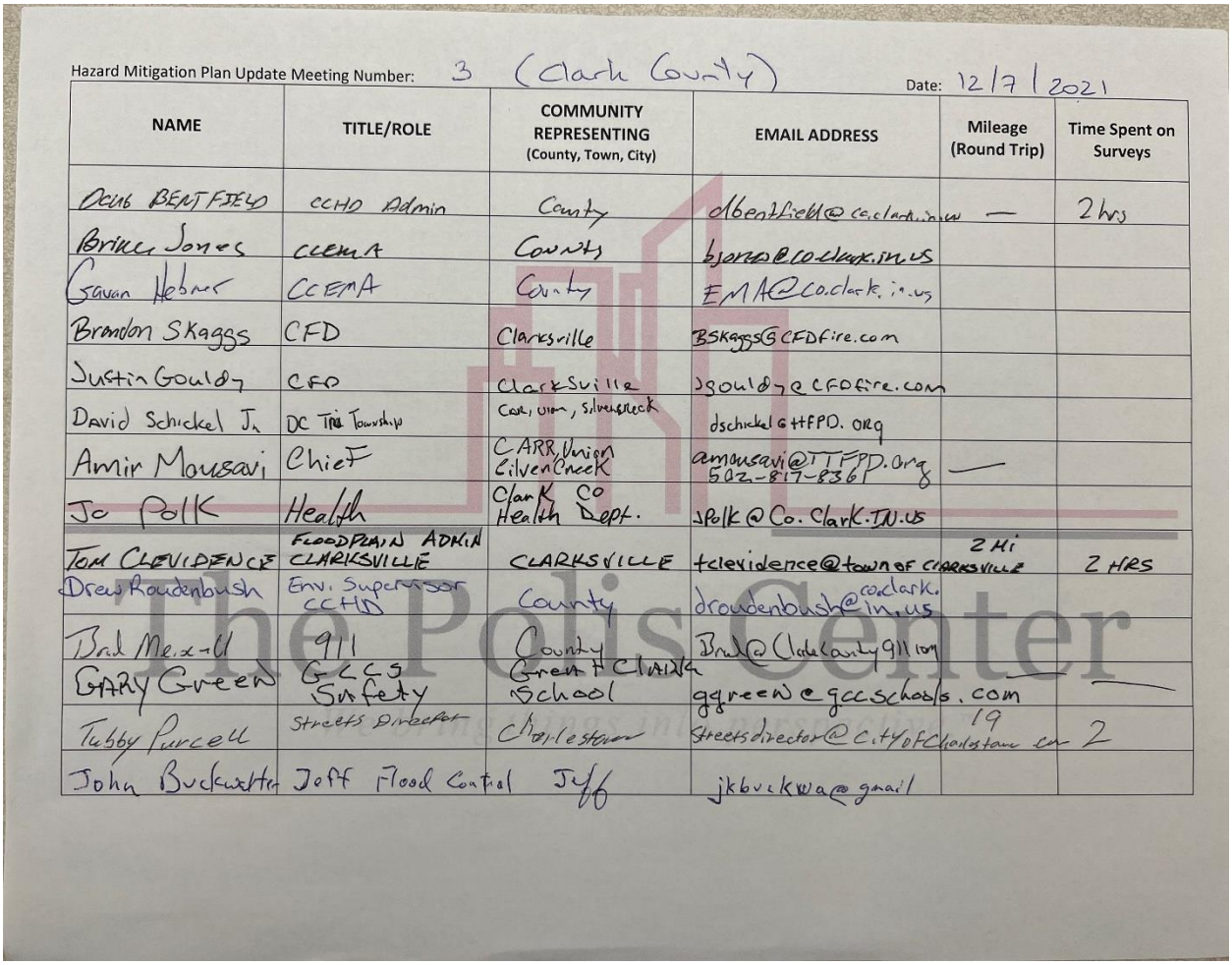
- The Multi-Hazard Mitigation Plan Meeting # 2 was held on October 28th, 2021, at 10:00am. Meeting was conducted by Gavan Hebner with Clark County Emergency Management Agency.

- Members present reviewed the 2022 Multi-Hazard Mitigation Plan Chapters 1 -3 that was provided by the Polis Center. Members present reviewed, discussed, and provided input to the following:

  Part 1: Confirming Hazard Rank & Impact

  Part 2: Reviewing Mitigation Strategies & Mitigation Strategy Worksheets

Meeting #3



Hazard Mitigation Plan Update Meeting Number: 3 (Clark County) Date: 12/7/2021

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Doug Bentfield	CCHD Admin	County	dbentfield@co.clark.in.us	—	2 hrs
Brian Jones	CCEMA	County	bjones@co.clark.in.us		
Shawn Hebner	CCEMA	County	EMA@co.clark.in.us		
Brandon Skaggs	CFD	Clarksville	BSkaggs@CFDfire.com		
Justin Gouldy	CFD	Clarksville	Jgouldy@CFDfire.com		
David Schickel Jr.	DC Twp Township	Carr, Union, Silvercreek	dschickel@tfpd.org		
Amir Mousavi	Chief	CARR, Union Silver Creek	amousavi@TFPD.org 502-817-8361	—	
Jo Polk	Health	Clark Co Health Dept.	JPolk@Co.Clark.IN.us		
TOM CLEVIDENCE	FLOODPLAIN ADMIN CLARKSVILLE	CLARKSVILLE	tclevidence@townofclarksville	2 Mi	2 HRS
Drew Roudenbush	Env. Supervisor CCHD	County	droudenbush@co.clark.in.us		
Brad Mexell	911	County	Brad@ClarkCounty911.org		
GARY Green	GCCS Safety	Green Clark School	ggreen@gccschools.com		
Tubby Purcell	Streets Director	Charlestown	streetsdirector@cityofcharlestown.com	19	2
John Buckwalter	Jeff Flood Control	Jeff	jkbuckwa@gmail		

Zoom attendees:

Name	Title/Role	Community Representing (County, Town, City)	Email Address	Mileage (Round Trip)	Time Spent on Surveys
Scott Gardner	Director	Clarksville Community School Corportation	sgardner@clarksvilleschools.org	joined online	1 hour
Brian Smith	safety Director	City of Jeffersonville	bsmith@cityofjeff.net		1hour
Sandy Myers	Principal	Silver Creek School Corporation	smyers@scsc.school	Online	
Chelsea Crump	Grant Admin	River Hills EDD & RPC	ccrump@riverhills.cc		
Apoorva Wright	Grant Admin	River Hills EDD & RPC	awright@riverhills.cc		
Bill Paro	SRO	Rock Creek Community Academy	bparo@rccasi.org		

Meeting with Utica

Hazard Mitigation Plan Update Meeting Number: 1-1 with Town of Utica — Date: 3/3/2022

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Gavan Hebner	Director of EM	Clark County	EMA@co.clark.in.us		1
Richard Clark	Police Chief	Town of Utica	Clark55@twc.com	10	1
Brian Jones	Deputy Director of EM	Clark County	bjones@co.clark.in.us		1

Outdoor Warning Siren Discussion Meeting

Hazard Mitigation Plan Update Meeting Number: Outdoor Warning Siren Discussion Meeting — Date: 2/24/2022

NAME	TITLE/ROLE	COMMUNITY REPRESENTING (County, Town, City)	EMAIL ADDRESS	Mileage (Round Trip)	Time Spent on Surveys
Kevin Morlan	Street Superintendent	Jeffersonville	kmorlan@cityofjeff.net		
Matt Owen	EMS Chief	New Chapel (County)	mowen@newchapelems.com		
Donna Ennis	Senior Operations Superintendent	Indiana American Water	Donna.ennis@amwater.com		
Jack Coffman	Commissioner	County	jcoffman@co.clark.in.us		
Daniel Smith	Admin Support	Clark County 911	dsmith@clarkcounty911.org		
Andre Heal	Deputy Chief	Charlestown Fire	Aheal985@outlook.com		
Brad Amos	Council President	Sellersburg	bamos@sellersburg.org		
Charlie Smith	Town Manager	Sellersburg	smith@sellersburg.org		
Chelsea Crump	Charitable Financial Specialist	River Hills	ccrump@riverhills.cc		
Brian Jones	Deputy EM Director	County	bjones@co.clark.in.us		
Gavan Hebner	EM Director	County	ema@co.clark.in.us		
Chuck Ledbetter	IT Admin	Charlestown	cledbetter@ctownpd.com		
Brian Neudorff	Meteorologist	NWS	Brian.neudorff@noaa.gov		
M. Douglas	CF Sothern Indiana	CF Southern Indiana	mdouglas@cfsouthernindiana.com		

Appendix B: Public Notices in the Local Media

Meeting #1

Clark County Multi Hazard Mitigation Plan Update

The Multi-Hazard Mitigation Planning Committee of Clark County will host a public information session on September 7th 2021 at 10am at the Clark County Health Department. Clark County, with the Polis Center at Indiana University-Purdue University Indianapolis (IUPUI), has started the process of updating its Multi-Hazard Mitigation Plan. Once the plan is updated, the committee will submit it to the Federal Emergency Management Agency (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 Clark County Emergency Management Director, Gavan Hebner at 812-246-5538 or by email at EMA@co.clark.in.us.

Meeting #3

"The Multi-Hazard Mitigation Planning Committee of Clark County will host a public information session on December 7th 2021 at 10:30am at the Clark County Health Department. Clark County, with the Polis Center at Indiana University-Purdue University Indianapolis (IUPUI), has started the process of updating its Multi-Hazard Mitigation Plan. Once the plan is updated, the committee will submit it to the Federal Emergency Management Agency (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 Clark County Emergency Management Director, Gavan Hebner at 812-246-5538 or by email at EMA@co.clark.in.us."

hspnxlp

Appendix C: Historical Hazards from NCEI since 2010

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Clark County	1/7/2010	Winter Storm	0	0	0	0	0	0.00K	0.00K	Widespread snow of three to four inches fell across southern Indiana. An upper level trough and weak surface low pressure moved across central Indiana during the day on January 7th. Despite the northerly path of the surface low and southerly winds, antecedent temperatures were cold enough that precipitation remained all snow. Snow began around dawn and continued intermittently through late afternoon. A cold front brought brisk winds and some blowing snow during the late afternoon and evening hours. This storm brought the first significant snow of the season and caused numerous traffic accidents and inconvenience for travelers.
Clark County	2/15/2010	Heavy Snow	0	0	0	0	0	0.00K	0.00K	A compact upper low moving southeast from the upper Midwest brought heavy snow across all of southern Indiana. This storm traveled along a track typical of Alberta Clippers, which originate in Canada. While most clippers bring only light snow, this storm brought widespread 6 to 12 inch snows across southern Indiana. This region was located just north of the track of the surface low, and fell within an extensive deformation zone that developed just north of the upper low. Snow began around midnight and brought 4 to 6 inches by dawn. An additional 4 to 6 inches fell later that morning within an extensive area of snow northwest of the upper low's track. Heavy snow and blowing snow lead to several counties declaring snow emergencies, restricting local roads to official traffic only.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Clark County	2/9/2010	Heavy Snow	0	0	0	0	0	0.00K	0.00K	A combination of an inverted trough moving across Tennessee and a strong closed low diving southward across the upper Midwest brought widespread snow ranging from 4 to 7 inches across southern Indiana. Snow began during the early morning hours on Tuesday Feb 9th. Light snow fell intermittently through the pre-dawn hours with a couple of inches of accumulation. Snowfall rates increased around dawn as banded precipitation associated with a deformation zone moved across the region. Occasionally heavy snow produced an additional 2 to 4 inches before ending during the mid morning hours. The axis of heaviest snow fell generally along the Ohio River from Jeffersonville through Scott and Jefferson Counties Indiana.
Solon	4/5/2010	Hail	0	0	0	0	0	0.00K	0.00K	Afternoon instability combined with a shortwave crossing Indiana and Kentucky to set off thunderstorms. These storms dropped hail of up to golf ball size across Indiana and Kentucky.
Memphis	5/1/2010	Thunderstorm Wind	0	0	0	0	0	NULL	NULL	A couple of isolated severe thunderstorms in southern Indiana produced hail and damaging winds.
Speed	6/15/2010	Thunderstorm Wind	0	0	0	0	0	NULL	NULL	During the afternoon hours destabilization with daytime heating led to scattered thunderstorms across southern Indiana and central Kentucky. During the late afternoon and evening hours an MCS moving southward into the region led to more widespread strong to severe convection. These storms produced numerous reports of damaging winds across much of southern Indiana.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Bennettsville	6/15/2010	Thunderstorm Wind	0	0	0	0	0	NULL	NULL	During the afternoon hours destabilization with daytime heating led to scattered thunderstorms across southern Indiana and central Kentucky. During the late afternoon and evening hours an MCS moving southward into the region led to more widespread strong to severe convection. These storms produced numerous reports of damaging winds across much of southern Indiana.
St Joseph Hill	6/15/2010	Thunderstorm Wind	0	0	0	0	0	NULL	NULL	During the afternoon hours destabilization with daytime heating led to scattered thunderstorms across southern Indiana and central Kentucky. During the late afternoon and evening hours an MCS moving southward into the region led to more widespread strong to severe convection. These storms produced numerous reports of damaging winds across much of southern Indiana.
Memphis	8/15/2010	Thunderstorm Wind	0	0	0	0	0	NULL	NULL	A shortwave moving combined with the hot moist air across the region led to afternoon thunderstorms across southern Indiana. One of these storms became strong enough to produce isolated damaging wind gusts.
Watson	12/20/2010	Winter Weather	0	3	0	1	0	20.00K	0.00K	A light snow and sleet mix fell during the day across southern Indiana. Slick roads later that evening contributed to a fatal automobile accident on Indiana State Highway 62 near Stacy Springs Court.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Underwood	12/15/2010	Heavy Snow	0	0	0	0	0	0.00K	0.00K	Low pressure moved across the Tennessee Valley on Thursday the 16th of December. Ahead of this system, strong warm air advection ahead of an inverted trough spread light snow late Wednesday across southern Indiana. Shortly after midnight, snow quickly changed over to sleet and then freezing rain southwest of a line from Scottsburg to eastern Clark County. Snow accumulations of around one half inch or less were widespread before precipitation changed to freezing rain. Ice accumulations ranged from one quarter to one third of an inch through dawn on Thursday. Farther northeast however, snow accumulated from 3 to 5 inches across Jefferson, Scott, and northern Clark Counties.
Underwood	12/15/2010	Heavy Snow	0	0	0	0	0	0.00K	0.00K	Low pressure moved across the Tennessee Valley on Thursday the 16th of December. Ahead of this system, strong warm air advection ahead of an inverted trough spread light snow late Wednesday across southern Indiana. Shortly after midnight, snow quickly changed over to sleet and then freezing rain southwest of a line from Scottsburg to eastern Clark County. Snow accumulations of around one half inch or less were widespread before precipitation changed to freezing rain. Ice accumulations ranged from one quarter to one third of an inch through dawn on Thursday. Farther northeast however, snow accumulated from 3 to 5 inches across Jefferson, Scott, and northern Clark Counties.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Jeffersonville Arpt	1/20/2011	Heavy Snow	0	0	0	0	0	0.00K	0.00K	Lift associated with warm air advection and the approach of a quick moving upper air trough brought heavy snow across southern Indiana on January 20th. Snow developed during the morning hours and spread southeast toward the Ohio River by mid afternoon. Visibilities were reduced to one half mile at times during the early afternoon in periods of heavy snow. Despite the relatively quick movement of this system, 4 to 6 inches of snow fell across all of southern Indiana before ending by late afternoon.
Charlestown	2/28/2011	Tornado	0	0	0	0	0	5.00K	NULL	A cold front moved through southern Indiana and central Kentucky on the morning of February 28. A strong low low level jet developed ahead of this front with winds of 60-80 knots at 2-3 thousand feet, resulting in very high speed shear and storm relative helicity values. A squall line with bowing segments developed to the west of the Louisville forecast area and crossed the region during the early to mid morning hours. This line produced multiple tornadoes across the region as well as straight line wind damage.
Oak Park	3/23/2011	Hail	0	0	0	0	0	NULL	NULL	A surface low tracked across IL/IN/OH through the day on March 23. Southern Indiana and central Kentucky were in the warm sector of this system through the day with southwesterly winds advecting mid-50s dewpoints into the area. Steep mid level lapse rates and surface instability led to the development of severe thunderstorms along and ahead of the cold front. These storms produced hail and damaging winds across Southern Indiana and central Kentucky.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Jeffersonville Arpt	3/23/2011	Hail	0	0	0	0	0	NULL	NULL	A surface low tracked across IL/IN/OH through the day on March 23. Southern Indiana and central Kentucky were in the warm sector of this system through the day with southwesterly winds advecting mid-50s dewpoints into the area. Steep mid level lapse rates and surface instability led to the development of severe thunderstorms along and ahead of the cold front. These storms produced hail and damaging winds across Southern Indiana and central Kentucky.
Sellersburg	4/19/2011	Tornado	0	0	0	0	0	NULL	NULL	Over the space of about four hours from late on April 19 into the early morning hours of April 20, 2011, a squall line brought a historic number of tornadoes to southern Indiana and central Kentucky. Storm surveys over the subsequent few days uncovered 25 tornadoes -the most ever recorded here in one outbreak. On the 19th, low pressure had organized over southeast Kansas with a stationary front reaching east into the central Appalachians. Plentiful moisture streamed northward from the Gulf of Mexico ahead of the system. The Kansas low moved along the front and swung a cold front eastward. Instability, strong upper level winds, and significant changes in wind speed and direction with height helped cause a large squall line to develop ahead of the low and its cold front. The squall line caused severe weather from the eastern Great Lakes to the Red River Valley. Over two dozen tornadoes spun up along the line as it crossed southern Indiana and central Kentucky. Despite the numerous twisters and the fact that they struck during the overnight hours, there were no fatalities or injuries.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Jeffersonville	4/23/2011	Hail	0	0	0	0	0	NULL	NULL	Multiple waves of showers and thunderstorms tracked along a boundary that was stalled out approximately along the Ohio River on April 23. These thunderstorms brought a mix of severe weather and heavy rain to the region. Hail and damaging winds were reported across southern Indiana and central Kentucky. In addition, many roads were closed due to flooding as up to 5-6 inches of rain fell in places over a two day period.
Borden	4/23/2011	Flash Flood	0	0	0	0	0	0.00K	0.00K	Multiple waves of showers and thunderstorms tracked along a boundary that was stalled out approximately along the Ohio River on April 23. These thunderstorms brought a mix of severe weather and heavy rain to the region. Hail and damaging winds were reported across southern Indiana and central Kentucky. In addition, many roads were closed due to flooding as up to 5-6 inches of rain fell in places over a two day period.
Jeffersonville	4/19/2011	Tornado	0	0	0	0	0	NULL	NULL	Over the space of about four hours from late on April 19 into the early morning hours of April 20, 2011, a squall line brought a historic number of tornadoes to southern Indiana and central Kentucky. Storm surveys over the subsequent few days uncovered 25 tornadoes -the most ever recorded here in one outbreak. On the 19th, low pressure had organized over southeast Kansas with a stationary front reaching east into the central Appalachians. Plentiful moisture streamed northward from the Gulf of Mexico ahead of the system. The Kansas low moved along the front and swung a cold front eastward. Instability, strong upper level winds, and significant changes in wind speed and direction with height helped cause a large squall line to develop ahead of the low and its cold front. The squall line caused severe weather from the eastern Great Lakes to

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										the Red River Valley. Over two dozen tornadoes spun up along the line as it crossed southern Indiana and central Kentucky. Despite the numerous twisters and the fact that they struck during the overnight hours, there were no fatalities or injuries.
Cementville	4/9/2011	Hail	0	0	0	0	0	NULL	NULL	A quasi-stationary boundary stretched from southwest Indiana, across the Ohio River to just south of Lexington, KY the morning of April 9. A weakening MCS associated with a shortwave traveled across the area during the daytime. Redevelopment of severe weather occurred during the late morning and early afternoon with this system as destabilization occurred.
Henryville	5/25/2011	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	Warm humid air in place across the Lower Ohio Valley ahead of deep closed low over Missouri led to widespread severe weather across the lower Missouri Valley and Indiana. A squall line developed across southern Illinois and western Kentucky during the afternoon hours on May 25th and raced across southern Indiana at around 45 mph during the evening and early morning hours on the 26th. Widespread wind damage was reported with frequent reports of 60 to 70 mph winds. A bow echo brought several embedded

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										tornadoes across Dubois, Orange, and Washington counties in southern Indiana.
Clarksville	5/2/2011	Flash Flood	0	0	0	0	0	0.00K	0.00K	Storms developed across southern Indiana just to the north of a frontal boundary stalled along the Ohio River. A LLJ impinging on the boundary and a shortwave over southern Illinois helped to enhance shower and thunderstorm activity. Two to three inches of rain fell over portions of southern Indiana during the overnight hours leading to road closures and flash flooding.
Jeffersonville Arpt	5/23/2011	Thunderstorm Wind	0	0	0	0	0	NULL	NULL	During the predawn hours of May 23 an MCS moved in from the west and pushed across the region. Additionally, convection fired ahead of the MCS in the moist atmosphere with the storms being fueled by a 50 kt. LLJ. After a break in storms during the late morning and early afternoon, the atmosphere was able to recover to become unstable once again. Scattered storms were able to redevelop. These storms produced damaging winds, hail, and some isolated flooding.
Blue Lick	8/13/2011	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	Convection developed during the late afternoon hours in extreme southwestern Indiana. One storm moved east right along Interstate 64, developing into a compact, fast moving bow echo that brought widespread damaging winds of 55 to 70 mph along a corridor stretching from Crawford through Harrison, Floyd, and Clark counties.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										Widespread power outages were reported across Floyd and Clark Counties.
Sellersburg	9/2/2011	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	Scattered thunderstorms developed during the afternoon and early evening of September 2nd. At least one storm produced damaging winds in southern Indiana.
Henryville	9/26/2011	Flash Flood	0	0	0	0	0	0.00K	0.00K	A strong disturbance rotating around a deep cutoff low located over Chicago brought widespread heavy rains and isolated flash flooding to southern Indiana. A very slow moving line of thunderstorms brought 2 to 3 inches of rain within several hours to a large portion of southwestern Indiana west of interstate 65. Across Clark County, located just north of Louisville, 4 inches of rain fell over a 4 hour period.
Otisco	1/17/2012	Tornado	0	0	0	0	0	20.00K	0.00K	Deep low pressure moved across the southern Great Lakes the morning of January 17. A cold front associated with this storm swept southeast of the Ohio River during the early afternoon hours. Fueled by unseasonably warm and moist air, a squall line developed across southeastern Missouri and southern Illinois during the early morning and moved across all of southern Indiana during the late morning hours. Embedded within this line were several bowing segments and mesovorticies. Scattered wind damage and several brief tornadoes were reported. The nine tornadoes surveyed across both southern Indiana and central Kentucky made this date the most prolific regional January outbreak recorded.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Blue Lick	3/2/2012	Tornado	0	0	1	0	1	55.00M	0.00K	A surface Low over Missouri early in the afternoon of March 2nd strengthened to below 990mb as it moved north into Michigan by the evening hours. Around dawn, a warm front moved north of the Ohio River, accompanied by scattered elevated thunderstorms that produced small hail. During the early afternoon, temperatures rose into the lower 70s across southern Indiana. the combination of extreme wind shear and CAPE near 2000 Joules/kg brought several long lived supercells to the state near the Ohio River. These storms produced baseball-sized hail and several tornadoes, including a violent long-tracker, to southern Indiana. The tornadoes across the area were a part of a well forecast regional outbreak that affected the entire Lower Ohio and Tennessee Valleys. Overall, more than 80 tornadoes caused millions of dollars of damage and took several dozen lives. ||For southern Indiana, March 2nd became the worst tornado outbreak since June 2nd, 1990.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Sellersburg	3/2/2012	Hail	0	0	0	0	0	NULL	0.00K	A surface Low over Missouri early in the afternoon of March 2nd strengthened to below 990mb as it moved north into Michigan by the evening hours. Around dawn, a warm front moved north of the Ohio River, accompanied by scattered elevated thunderstorms that produced small hail. During the early afternoon, temperatures rose into the lower 70s across southern Indiana. the combination of extreme wind shear and CAPE near 2000 Joules/kg brought several long lived supercells to the state near the Ohio River. These storms produced baseball-sized hail and several tornadoes, including a violent long-tracker, to southern Indiana. The tornadoes across the area were a part of a well forecast regional outbreak that affected the entire Lower Ohio and Tennessee Valleys. Overall, more than 80 tornadoes caused millions of dollars of damage and took several dozen lives. ||For southern Indiana, March 2nd became the worst tornado outbreak since June 2nd, 1990.
Charlestown	3/15/2012	Hail	0	0	0	0	0	0.00K	0.00K	A weak disturbance moved across the Lower Ohio Valley during the afternoon of March 15th. Near record high temperatures, combined with dewpoints near 60, lead to very strong instability during the afternoon. Despite weak wind shear in this early summer-like environment, numerous strong to severe storms developed during the late afternoon and early evening. Some of the stronger storms produced marginally severe hail and isolated damaging wind gusts.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Clarksville	3/2/2012	Hail	0	0	0	0	0	NULL	0.00K	A surface Low over Missouri early in the afternoon of March 2nd strengthened to below 990mb as it moved north into Michigan by the evening hours. Around dawn, a warm front moved north of the Ohio River, accompanied by scattered elevated thunderstorms that produced small hail. During the early afternoon, temperatures rose into the lower 70s across southern Indiana. the combination of extreme wind shear and CAPE near 2000 Joules/kg brought several long lived supercells to the state near the Ohio River. These storms produced baseball-sized hail and several tornadoes, including a violent long-tracker, to southern Indiana. The tornadoes across the area were a part of a well forecast regional outbreak that affected the entire Lower Ohio and Tennessee Valleys. Overall, more than 80 tornadoes caused millions of dollars of damage and took several dozen lives. ||For southern Indiana, March 2nd became the worst tornado outbreak since June 2nd, 1990.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Henryville	3/2/2012	Tornado	0	0	0	0	0	300.00K	0.00K	A surface Low over Missouri early in the afternoon of March 2nd strengthened to below 990mb as it moved north into Michigan by the evening hours. Around dawn, a warm front moved north of the Ohio River, accompanied by scattered elevated thunderstorms that produced small hail. During the early afternoon, temperatures rose into the lower 70s across southern Indiana. the combination of extreme wind shear and CAPE near 2000 Joules/kg brought several long lived supercells to the state near the Ohio River. These storms produced baseball-sized hail and several tornadoes, including a violent long-tracker, to southern Indiana. The tornadoes across the area were a part of a well forecast regional outbreak that affected the entire Lower Ohio and Tennessee Valleys. Overall, more than 80 tornadoes caused millions of dollars of damage and took several dozen lives. ||For southern Indiana, March 2nd became the worst tornado outbreak since June 2nd, 1990.
Henryville	3/4/2012	Heavy Snow	0	0	0	0	0	0.00K	0.00K	A potent Alberta Clipper brought a quick burst of moderate to occasionally heavy snow along a thin swath less than 50 miles wide across southern Indiana. While this system was moisture starved, lift associated with the nose of a strong jet overcame the limited moisture supply and led to a 3 to 5 hour period of snow. This resulted in 2 to locally over 5 inches of snowfall in extreme southern Indiana. The heaviest snow fell along and just north of Interstate 64. Due to surface temperatures just above freezing, much more snow accumulated on elevated surfaces as compared to the roadways.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Henryville	3/14/2012	Hail	0	0	0	0	0	0.00K	0.00K	Record temperatures with dewpoints in the 50s lead to the development of strong instability during the late afternoon and evening. Isolated pulse storms developed across western Kentucky and southern Indiana during the evening hours. Some of the stronger storms produced marginally severe hail.
Blue Lick	3/2/2012	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A surface Low over Missouri early in the afternoon of March 2nd strengthened to below 990mb as it moved north into Michigan by the evening hours. Around dawn, a warm front moved north of the Ohio River, accompanied by scattered elevated thunderstorms that produced small hail. During the early afternoon, temperatures rose into the lower 70s across southern Indiana. the combination of extreme wind shear and CAPE near 2000 Joules/kg brought several long lived supercells to the state near the Ohio River. These storms produced baseball-sized hail and several tornadoes, including a violent long-tracker, to southern Indiana. The tornadoes across the area were a part of a well forecast regional outbreak that affected the entire Lower Ohio and Tennessee Valleys. Overall, more than 80 tornadoes caused millions of dollars of damage and took several dozen lives. ||For southern Indiana, March 2nd became the worst tornado outbreak since June 2nd, 1990.
Otisco	5/29/2012	Flash Flood	0	0	0	0	0	0.00K	0.00K	A weak low level jet and the approach of a surface trough led to the development of numerous thunderstorms during the early morning hours on May 29th. A few storms produced isolated instances of large hail and damaging winds. One slow moving cluster of storms produced excessive rainfall across Floyd and southern Clark Counties, located just across the river from Louisville.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										Despite antecedent dry conditions, an estimated 3 inches of rain falling within 3 hours produced scattered street flooding.
New Washington	6/16/2012	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	Isolated slow moving thunderstorms developed across southern Indiana during the evening of June 16th. The strongest storm brought several reports of wind damage and heavy rain near Henryville in Clark County, Indiana.
Utica	6/16/2012	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	Isolated slow moving thunderstorms developed across southern Indiana during the evening of June 16th. The strongest storm brought several reports of wind damage and heavy rain near Henryville in Clark County, Indiana.
Oak Park	6/16/2012	Heavy Rain	0	0	0	0	0	0.00K	0.00K	Isolated slow moving thunderstorms developed across southern Indiana during the evening of June 16th. The strongest storm brought several reports of wind damage and heavy rain near Henryville in Clark County, Indiana.
Sellersburg	7/1/2012	Heat	0	0	0	0	0	0.00K	NULL	A heat wave that began June 28 brought excessive temperatures to southern Indiana for a 10 day period through July 7th. As a result of extreme drought across southwestern Indiana, locations such as Tell City and Huntingburg experienced the hottest temperatures. Daily high temperatures varied from the upper 90s to the low 100s each day.
Clarksville	7/26/2012	Hail	0	0	0	0	0	0.00K	0.00K	Severe thunderstorms developed within a highly unstable airmass during the afternoon of July 26th. These storms later developed into several broken lines, one of which produced damaging wind gusts

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										in Clark County as they moved southeast across the Ohio River.
Borden	7/26/2012	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	Severe thunderstorms developed within a highly unstable airmass during the afternoon of July 26th. These storms later developed into several broken lines, one of which produced damaging wind gusts in Clark County as they moved southeast across the Ohio River.
Otisco	7/27/2012	Thunderstorm Wind	0	0	0	0	0	5.00K	0.00K	Intense heating, combined with a pre-frontal trough moving south across Indiana, led to the development of several line segments of thunderstorms that brought widespread wind damage to southeastern Indiana and the Kentucky Bluegrass during the evening hours on July 27th.
Haps Arpt	7/19/2012	Hail	0	0	0	0	0	NULL	0.00K	Temperatures in the mid 90s combined with dewpoints above 70 led to the development of very unstable conditions during the afternoon of July 19th. Scattered severe storms developed across southern Indiana by late afternoon, aided by the approach of an upper level trough sliding southeast from the Upper Midwest. The stronger storms produced wet microbursts and scattered wind damage.
Parkwood	9/5/2012	Thunderstorm Wind	0	0	0	0	0	NULL	0.00K	Very unstable conditions developed along the Ohio River during the early afternoon of September 5th. Temperatures near 90 degrees with dewpoints in the lower 70s provided sufficient instability to sustain a squall line that developed during the morning hours across southern Illinois. By early afternoon, a robust squall line moved across all of southern Indiana. Widespread winds of 50 to 60 mph were reported just north of the Louisville KY metropolitan area,

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										along with very heavy rain that caused minor flooding.
Jeffersonville	9/7/2012	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A line of strong to severe thunderstorms developed across Missouri and Illinois during the afternoon of Sept 7th ahead of the first strong 500mb trough of the fall season. This line, which grew upscale and eventually stretched from Michigan to Arkansas, moved into southwestern Indiana and western Kentucky during the late evening hours. Before weakening across central Kentucky during the early morning hours, this squall line brought scattered wind damage reports across southern Indiana.
Borden	9/5/2012	Flood	0	0	0	0	0	0.00K	0.00K	Very unstable conditions developed along the Ohio River during the early afternoon of September 5th. Temperatures near 90 degrees with dewpoints in the lower 70s provided sufficient instability to sustain a squall line that developed during the morning hours across southern Illinois. By early afternoon, a robust squall line moved across all of southern Indiana. Widespread winds of 50 to 60 mph were reported just north of the Louisville KY metropolitan area, along with very heavy rain that caused minor flooding.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Sellersburg	12/28/2012	Heavy Snow	0	0	0	0	0	0.00K	0.00K	An upper level disturbance moved across the Lower Ohio Valley during the morning hours on December 29th. Ahead of this feature, a weak surface trough moved across Tennessee late on the 28th. Lift associated with the left entrance region of an approaching jet aided in producing a band of heavy snow across southern Illinois into southern Indiana. Snow began during the evening hours, ending during the pre-dawn hours on the 29th. In general, 4 to 7 inches of snow fell across southern Indiana, with the heaviest snow falling along an arc extending from Dubois County through Scott County, Indiana.
Sellersburg	1/30/2013	Thunderstorm Wind	0	0	0	0	0	10.00K	0.00K	During the evening hours on the 29th of January, low pressure across the southern plains began to intensify and move towards the western Great Lakes. A squall line developed during the evening hours and strengthened after midnight as it moved into western Kentucky and southern Illinois. This line, fueled by unseasonably mild temperatures, dewpoints around 60, and an intense low level jet of 80kt at 850mb, spawned one of the largest January tornado outbreaks on record across the Lower Ohio Valley. Two tornadoes were surveyed across southern Indiana. In addition, strong synoptic southerly winds right ahead and along this line produced localized wind damage.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Sellersburg	1/30/2013	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	During the evening hours on the 29th of January, low pressure across the southern plains began to intensify and move towards the western Great Lakes. A squall line developed during the evening hours and strengthened after midnight as it moved into western Kentucky and southern Illinois. This line, fueled by unseasonably mild temperatures, dewpoints around 60, and an intense low level jet of 80kt at 850mb, spawned one of the largest January tornado outbreaks on record across the Lower Ohio Valley. Two tornadoes were surveyed across southern Indiana. In addition, strong synoptic southerly winds right ahead and along this line produced localized wind damage.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Cementville	6/26/2013	Flash Flood	0	0	0	0	0	1.00K	0.00K	Multiple rounds of convection developed on June 26th across southern Indiana. In all, three episodes of heavy thunderstorms contributed to localized flash flooding. The last two episodes, arriving during the mid-afternoon and mid-evening hours, brought wind damage and one tornado that damaged Tell City, Indiana. ||At the beginning of the day, southern Indiana lay in a very humid airmass, with dewpoints in the lower 70s. During the pre-dawn hours, the remains of a decaying nocturnal mesoscale convective system brought widespread substantial rains to southern Indiana. Portions of Washington and Orange Counties received from one to two inches of rain. This convective system didn't penetrate very far into Kentucky before dissipating, leaving a relatively undisturbed airmass for later in the afternoon. A second wave of storms moved southeast across the same area during the mid-afternoon hours. These were surface-based and brought localized flash flooding and wind damage. The final round of storms moved through around mid-evening, supported by a strong digging shortwave moving southeast across Illinois. This final round of storms brought additional flash flooding, damaging winds, and a tornado. A CoCoRahs spotter in Fredricksburg, Indiana, measure 7.22 inches for the entire day. This rain led to minor flooding on the Blue River at Fredricksburg on June 27th.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Clarksville	6/26/2013	Flash Flood	0	0	0	0	0	1.00K	0.00K	Multiple rounds of convection developed on June 26th across southern Indiana. In all, three episodes of heavy thunderstorms contributed to localized flash flooding. The last two episodes, arriving during the mid-afternoon and mid-evening hours, brought wind damage and one tornado that damaged Tell City, Indiana. ||At the beginning of the day, southern Indiana lay in a very humid airmass, with dewpoints in the lower 70s. During the pre-dawn hours, the remains of a decaying nocturnal mesoscale convective system brought widespread substantial rains to southern Indiana. Portions of Washington and Orange Counties received from one to two inches of rain. This convective system didn't penetrate very far into Kentucky before dissipating, leaving a relatively undisturbed airmass for later in the afternoon. A second wave of storms moved southeast across the same area during the mid-afternoon hours. These were surface-based and brought localized flash flooding and wind damage. The final round of storms moved through around mid-evening, supported by a strong digging shortwave moving southeast across Illinois. This final round of storms brought additional flash flooding, damaging winds, and a tornado. A CoCoRahs spotter in Fredricksburg, Indiana, measure 7.22 inches for the entire day. This rain led to minor flooding on the Blue River at Fredricksburg on June 27th.
Jeffersonville	6/17/2013	Hail	0	0	0	0	0	NULL	0.00K	Strong afternoon instability and weak winds aloft lead the the development of scattered slow moving thunderstorms across central Kentucky and southern Indiana during the afternoon of June 17th. Although isolated severe weather and localized flooding were mostly confined to

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										Kentucky, marginally severe hail fell across southern Clark County, just north of Louisville.
Sellersburg	7/10/2013	Thunderstorm Wind	0	0	0	0	0	NULL	0.00K	A very humid airmass with dewpoints well into the lower 70s was in place over the Lower Ohio Valley during the late morning and early afternoon on July 10th. A sharpening trough over the western Great Lakes brought moderate mid-level northwest flow over the region during the afternoon hours. Strong instability and the absence of a cap allowed individual strong storms to develop by early afternoon across southern Indiana and northern Kentucky along Interstate 64. Some of these storms brought localized damaging wind gusts. A cold pool driven short bowing segment entered southwestern Indiana during the early afternoon hours, eventually moving across Harrison and Floyd counties and into Louisville. This bowing segment brought widespread damaging winds along its path.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
St Joseph Hill	11/17/2013	Flood	0	0	0	0	0	5.00K	0.00K	An intense cyclone that began to form over Kansas during the early morning hours on November 17th deepened rapidly to near 980mb as it raced north northeast over the eastern tip of Michigan's upper peninsula by late evening. An unseasonal combination of temperatures in the lower 70s with lower 60s dewpoints overspread all of Illinois and Indiana during the early afternoon. A strong jet aloft and very high helicities lead to one of the worst November tornado outbreaks ever, with several dozen tornadoes noted over Illinois and Indiana. However, across southern Indiana, widespread cloudiness held temperatures in the mid 60s and severely limited surface-based instability during the afternoon. Despite this, one short line of storms brought isolated wind damage to Orange and Washington Counties. ||Across southern Indiana, widespread soaking rains developed during the pre-dawn hours and continued through mid-morning. Heavy tropical showers trained over a strip of counties right along the Ohio River, including Harrison, Floyd, and Clark Counties. Some locations received locally over 3 inches of rain in a 5 hour period. Some minor urban flooding inconvenienced several motorists.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Sellersburg	12/6/2013	Heavy Snow	0	0	0	0	0	0.00K	0.00K	A massive intrusion of arctic air brought near record cold to the Rockies and the northern Plains by December 5th. Late on the 5th, strong southwesterly flow aloft brought ample moisture along the leading edge of this arctic airmass, which, by now extended from central Texas through Indiana. Widespread mixed wintry precipitation developed all along the boundary, aided by upper level support from the right entrance region of a strong jet. Across southern Indiana, freezing rain early on the 6th quickly turned into sleet and heavy snow by late morning. Heavy snow continued through the late afternoon hours, depositing from 4 to 8 inches on top of a thin icy mix from earlier in the day.
Bonnenburger	1/21/2014	Heavy Snow	0	0	0	0	0	0.00K	0.00K	January 18th featured 500mb troughing across the eastern portion of the United States, with ridging anchored along the west coast, a pattern in place since the first of the year. A potent Alberta Clipper moved southeast across northern Kentucky during the early morning hours on January 18th. Snow developed after midnight across southern Indiana and along the Ohio River and continued through the mid-morning hours. Accumulations of 4 to locally as high as 7 inches developed across southern Indiana along and east of Interstate 65. Along with heavy snow, a strong arctic front moved southeast towards the Ohio River around 6 am. This front brought wind gusts in excess of 35 mph and a quick temperature drop from near freezing to the upper teens. Snow and blowing snow brought dangerous driving conditions and near whiteout conditions during the morning rush hour. A sharp snowfall gradient developed to the west of the main band of snow. Only an inch or so

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										fell across southwestern Indiana across Dubois and Perry Counties.
Sellersburg	2/2/2014	Heavy Snow	0	0	0	0	0	0.00K	0.00K	Broad southwesterly mid-level flow brought a disturbance that crossed the Tennessee Valley during the evening of the 2nd of February. Earlier that morning, a cold front had moved south of the Ohio River. By afternoon, temperatures had fallen into the lower 30s over southern Indiana. By late afternoon, a widespread rain snow mix began to move northeast along the Ohio River across western Kentucky as a result of moisture overrunning a surface boundary. This mixed precipitation changed to snow along the Ohio River by late afternoon. Overnight into early Monday, a thin swath of heavy snow developed right along the Ohio River, especially southwest of Louisville, spreading from 3 to 5 inches. A very tight snowfall gradient developed across southern Indiana, where some locations 40 miles north of the Ohio River received no snow at all.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Memphis	2/4/2014	Winter Storm	0	0	0	0	0	0.00K	0.00K	A cyclone that developed across the southern plains early on the 4th of February spawned weak low pressure that moved into western Tennessee by early afternoon, crossing eastern Kentucky during the evening hours. A strong southwesterly low level jet developed during the morning hours, bringing ample moisture northeast across the Commonwealth and southern Indiana. With the track of the surface low, southern Indiana experienced northeasterly winds. With antecedent cold air, aided in part by a fresh snowpack, surface temperatures stayed around 30 through the afternoon and evening hours. Brief heavy snow quickly changed to sleet and then freezing rain during the mid-afternoon hours, continuing until just after midnight. Icing, with accumulations of over one quarter of an inch developed across all of southern Indiana. Prior to this one to locally 3 inches of snow fell across southwestern Indiana away from the Ohio River. Ice accumulations brought scattered tree damage and power outages.
Sellersburg	2/14/2014	Heavy Snow	0	0	0	0	0	0.00K	0.00K	An amplifying trough dug southeast towards the Lower Ohio Valley during the afternoon of February 14th. Widespread precipitation developed by mid afternoon as a coupled upper jet aided isentropic ascent ahead of the sharpening upper trough. Mixed precipitation changed to rain by late afternoon along and south of Interstate 64 as temperatures stayed just a bit too warm for snow. Farther north across southern Indiana, several hours of steady snow brought 3 to locally over 5 inches of wet snow.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Charlestown	2/14/2014	Heavy Snow	0	0	0	0	0	0.00K	0.00K	An amplifying trough dug southeast towards the Lower Ohio Valley during the afternoon of February 14th. Widespread precipitation developed by mid afternoon as a coupled upper jet aided isentropic ascent ahead of the sharpening upper trough. Mixed precipitation changed to rain by late afternoon along and south of Interstate 64 as temperatures stayed just a bit too warm for snow. Farther north across southern Indiana, several hours of steady snow brought 3 to locally over 5 inches of wet snow.
Sellersburg	3/2/2014	Winter Storm	0	0	0	0	0	0.00K	0.00K	Arctic air, coupled with a slowly sagging cold front, helped produce a winter storm over southern Indiana. Precipitation with this event came in two batches. Freezing rain developed during the early morning hours on the 2nd as a sharp boundary moved south of the Ohio River. Ice accumulated to around one quarter of an inch along an arc stretching from Dubois County through Jefferson County. Slightly lessor amounts of glaze developed near the Ohio River. Freezing rain ended during the early afternoon hours. A second round of mixed wintry precipitation developed later that evening within a deformation zone on the northern edge of a broad area of precipitation associated with low pressure moving across Tennessee. Snow, initially mixed with sleet, brought additional accumulations of 1 to locally 3 inches near the Ohio River.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
St Joseph Hill	4/4/2014	Heavy Rain	0	0	0	0	0	0.00K	0.00K	A series of convective episodes along a stationary boundary brought repeated heavy rains to southern Indiana from late evening on the 2nd of April through the morning hours on April 4th. Overall, widespread 36 hour rainfall totals exceeded 5 inches across a substantial portion of southern Indiana and northern Kentucky along the Ohio River northeast of Louisville. Flash flooding developed during the evening and early morning hours spanning April 3rd and 4th, as repeated bouts of heavy thunderstorms trained from west to east north of a surface boundary stuck over central Kentucky. Overall, from 2 to locally in excess of 3 inches fell within a 6 hour period on already saturated ground. These heavy rains led to flooding on the Blue River at Fredricksburg.
Clarksville	4/4/2014	Flash Flood	0	0	0	0	0	0.00K	0.00K	A series of convective episodes along a stationary boundary brought repeated heavy rains to southern Indiana from late evening on the 2nd of April through the morning hours on April 4th. Overall, widespread 36 hour rainfall totals exceeded 5 inches across a substantial portion of southern Indiana and northern Kentucky along the Ohio River northeast of Louisville. Flash flooding developed during the evening and early morning hours spanning April 3rd and 4th, as repeated bouts of heavy thunderstorms trained from west to east north of a surface boundary stuck over central Kentucky. Overall, from 2 to locally in excess of 3 inches fell within a 6 hour period on already saturated ground. These heavy rains led to flooding on the Blue River at Fredricksburg.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Henryville	5/10/2014	Hail	0	0	0	0	0	NULL	0.00K	A broken line of thunderstorms developed along a stationary front that lay west to east across southern Indiana. Aided by moderate instability and moisture convergence along the front, some of these storms became strong and produced marginally severe hail as they tracked eastward just north of Interstate 64 west of Louisville.
Henryville	5/10/2014	Hail	0	0	0	0	0	0.00K	0.00K	A broken line of thunderstorms developed along a stationary front that lay west to east across southern Indiana. Aided by moderate instability and moisture convergence along the front, some of these storms became strong and produced marginally severe hail as they tracked eastward just north of Interstate 64 west of Louisville.
Borden	5/10/2014	Hail	0	0	0	0	0	0.00K	0.00K	A broken line of thunderstorms developed along a stationary front that lay west to east across southern Indiana. Aided by moderate instability and moisture convergence along the front, some of these storms became strong and produced marginally severe hail as they tracked eastward just north of Interstate 64 west of Louisville.
Bonnenburger	5/21/2014	Hail	0	0	0	0	0	0.00K	0.00K	Strong instability developed during the afternoon of the 21st to the south of a weak boundary sliding south across central Indiana. A shortwave moving across the western Great Lakes contributed to steep low level lapse rates and strong mid-level winds that supported several rounds of strong convection. During the late afternoon, a southeastward-moving bow echo brought wind damage and minor flooding to southeastern Indiana. Throughout the rest of the evening and the early morning hours on the 22nd, several additional rounds of convection, each one just west of the previous round, would bring additional severe weather. Overnight convection was aided

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										by a strong low level southwesterly jet and the presence of pre-existing boundaries.
Charlestown	5/21/2014	Hail	0	0	0	0	0	0.00K	0.00K	Strong instability developed during the afternoon of the 21st to the south of a weak boundary sliding south across central Indiana. A shortwave moving across the western Great Lakes contributed to steep low level lapse rates and strong mid-level winds that supported several rounds of strong convection. During the late afternoon, a southeastward-moving bow echo brought wind damage and minor flooding to southeastern Indiana. Throughout the rest of the evening and the early morning hours on the 22nd, several additional rounds of convection, each one just west of the previous round, would bring additional severe weather. Overnight convection was aided by a strong low level southwesterly jet and the presence of pre-existing boundaries.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Memphis	7/27/2014	Hail	0	0	0	0	0	0.00K	0.00K	A strong jet began to carve out an unseasonably deep trough across the upper midwest early on the 27th of July. Low pressure deepened as it moved across the eastern Great Lakes late on the 27th. Ahead of this surface feature, very warm temperatures and high humidities developed across the Lower Ohio Valley during the afternoon of the 26th. Strong northwesterly flow aloft and a southwesterly low level jet supported the development of a line of storms that brought scattered large hail and wind damage to southern Indiana during the evening hours of the 26th. Additional strong storms developed during the early morning hours northeast of Louisville and brought isolated damage.
Henryville	9/11/2014	Flood	0	0	0	0	0	0.00K	0.00K	On September 11th, moisture pooled along a pre-frontal trough during the early morning hours across southern Indiana and northern Kentucky. A modest low level jet brought a continuous source of moisture to an area of convection that moved southwards across southern Indiana after midnight. This line of storms slowly sagged south and briefly stalled roughly along Interstate 64. Over a three hour period, training convection brought two to locally over 3 inches to several southern Indiana counties along the Ohio River.
Henryville	9/11/2014	Heavy Rain	0	0	0	0	0	0.00K	0.00K	On September 11th, moisture pooled along a pre-frontal trough during the early morning hours across southern Indiana and northern Kentucky. A modest low level jet brought a continuous source of moisture to an area of convection that moved southwards across southern Indiana after midnight. This line of storms slowly sagged south and briefly stalled roughly along Interstate 64. Over a three hour period, training convection

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										brought two to locally over 3 inches to several southern Indiana counties along the Ohio River.
Henryville	10/7/2014	Hail	0	0	0	0	0	0.00K	0.00K	A deep closed low near Hudson's Bay on October 7th brought cyclonic flow to the Lower Ohio Valley. Disturbances rotating around this feature brought several rounds of convection from late morning through afternoon. Low freezing levels and veering and strengthening winds with height provided the potential for rotating storms and very large hail. During the late morning hours, a severe convective line segment exhibiting rotation moved southeast across southern Indiana, crossing the Ohio River just north of Louisville. This fast moving line of storms brought widespread wind damage and large hail to Clark County, Indiana. This initial round of storms left behind a stationary boundary across southern Indiana. Around mid-afternoon, two additional supercells developed about an hour apart very near central Clark County. These individual storms each produced large hail and occasional funnel clouds as they moved southeast towards Oldham County, Kentucky.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Charlestown	10/6/2014	Hail	0	0	0	0	0	0.00K	0.00K	An unseasonably deep closed low at 500mb near Hudson's Bay brought cyclonic flow to much of the entire eastern United States, including the Lower Ohio Valley. A disturbance rotating around this large feature touched off thunderstorms during the morning and afternoon hours on the 6th of October. Freezing levels were quite low during the afternoon of the 6th, well less than 10 thousand feet. Strong mid-level winds and winds veering with height brought conditions supporting splitting storms and large hail.
Memphis	10/7/2014	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A deep closed low near Hudson's Bay on October 7th brought cyclonic flow to the Lower Ohio Valley. Disturbances rotating around this feature brought several rounds of convection from late morning through afternoon. Low freezing levels and veering and strengthening winds with height provided the potential for rotating storms and very large hail. During the late morning hours, a severe convective line segment exhibiting rotation moved southeast across southern Indiana, crossing the Ohio River just north of Louisville. This fast moving line of storms brought widespread wind damage and large hail to Clark County, Indiana. This initial round of storms left behind a stationary boundary across southern Indiana. Around mid-afternoon, two additional supercells developed about an hour apart very near central Clark County. These individual storms each produced large hail and occasional funnel clouds as they moved southeast towards Oldham County, Kentucky.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Haps Arpt	11/16/2014	Heavy Snow	0	0	0	0	0	0.00K	0.00K	An unseasonably early arctic airmass invaded the Lower Ohio Valley November 12th, setting the stage for an unusually early winter storm across southern Indiana along and north of the Ohio River. Rain changed to snow during the evening of the 16th of November as colder air filtered south as weak low pressure traversed Tennessee. Occasional snow, moderate at times, fell across southern Indiana through around dawn. In general, a thin swath of 3 to locally over 5 inches of snow fell along a track just north of the Ohio River.
New Washington	2/16/2015	Heavy Snow	0	0	0	0	0	0.00K	0.00K	Arctic air invaded the Lower Ohio Valley on the 14th of February, setting the stage for heavy snow that developed during the early morning hours on the 16th. Low pressure moved across Arkansas and Tennessee from the 15th to the 16th of February. A large swath of heavy snow spread from southern Missouri into central Kentucky and southern Indiana during the early morning hours on the 16th, ending by late afternoon. During the late morning hours, snow fell at a rate of over one inch per hour, reducing visibility to less than one quarter of a mile for several consecutive hours. Southern Indiana received from 5 to 9 inches of snow, with a strip of heavy snow of near one foot extending right across central Kentucky from Ohio through Madison Counties.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Henryville	3/4/2015	Heavy Snow	0	0	0	0	0	0.00K	0.00K	An intense storm system brought flooding rains to southern Indiana, followed quickly by very heavy snow. The upper level pattern featured a positively tilted upper low across the desert southwest on the 3nd of March. A tight baroclinic zone stretched northeastward through southern Indiana. Strong southwesterly flow at lower levels brought rich moisture along this nearly stationary boundary. Initially, during the evening hours on the 3nd, rain developed along this boundary and gradually overspread all of southern Indiana and central Kentucky. Steady rain continued through the late afternoon on the 4th. One to two inches of rain fell across southern Indiana before precipitation changed into snow during the mid afternoon hours. Minor areal flooding developed across southern Indiana with several roads and low water crossings closed. ||Rain quickly changed to snow as a cold front moved south into Kentucky. Heavy snow fell from mid afternoon on the 4th through the early morning hours of the next day. Snowfall amounts ranged from around 5 inches in northern sections of Dubois, Orange, and Jefferson Counties to just under one foot along the Ohio River southwest of Louisville. This snow fell at a very fast rate, with very low visibilities.
Charlestown	4/7/2015	Flash Flood	0	0	0	0	0	0.00K	0.00K	A compact storm system interacted with a warm and unstable airmass in the late afternoon and evening of April 7th to produce severe weather over portions of southern Indiana. In addition to a tornado in Perry County, wind damage and large hail occurred with the stronger storms.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Otisco	4/7/2015	Flash Flood	0	0	0	0	0	0.00K	0.00K	A compact storm system interacted with a warm and unstable airmass in the late afternoon and evening of April 7th to produce severe weather over portions of southern Indiana. In addition to a tornado in Perry County, wind damage and large hail occurred with the stronger storms.
Charlestown	4/2/2015	Hail	0	0	0	0	0	NULL	NULL	A stalled frontal boundary across the area brought several rounds of showers and thunderstorms to the lower Ohio Valley April 2nd and 3rd. Training thunderstorms during the early morning hours of April 3rd resulted in flash flooding across portions of southern Indiana.
Bonnenburger	4/9/2015	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A strong spring storm system approached the lower Ohio Valley on April 9th into the early morning hours April 10th. Isolated severe storms that produced damaging winds and hail developed during the afternoon hours before a long-lived line of severe storms approached late in the day into the early morning hours of April 10th.
Clarksville	4/9/2015	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A strong spring storm system approached the lower Ohio Valley on April 9th into the early morning hours April 10th. Isolated severe storms that produced damaging winds and hail developed during the afternoon hours before a long-lived line of severe storms approached late in the day into the early morning hours of April 10th.
Jeffersonville	4/3/2015	Flood	0	0	0	0	0	0.00K	0.00K	A stalled frontal boundary across the area brought several rounds of showers and thunderstorms to the lower Ohio Valley April 2nd and 3rd. Training thunderstorms during the early morning hours of April 3rd resulted in flash flooding across portions of southern Indiana.

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Sellersburg	4/2/2015	Hail	0	0	0	0	0	NULL	NULL	A stalled frontal boundary across the area brought several rounds of showers and thunderstorms to the lower Ohio Valley April 2nd and 3rd. Training thunderstorms during the early morning hours of April 3rd resulted in flash flooding across portions of southern Indiana.
New Washington	4/7/2015	Flash Flood	0	0	0	0	0	40.00K	0.00K	A compact storm system interacted with a warm and unstable airmass in the late afternoon and evening of April 7th to produce severe weather over portions of southern Indiana. In addition to a tornado in Perry County, wind damage and large hail occurred with the stronger storms.
New Washington	6/30/2015	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	An approaching weather system from the Upper Midwest and lower Great Lakes combined with the moderately moist and unstable air mass during the early evening hours. This produced localized severe thunderstorms across southern Indiana.
Watson	6/30/2015	Hail	0	0	0	0	0	0.00K	0.00K	An approaching weather system from the Upper Midwest and lower Great Lakes combined with the moderately moist and unstable air mass during the early evening hours. This produced localized severe thunderstorms across southern Indiana.
Utica	6/30/2015	Hail	0	0	0	0	0	0.00K	0.00K	An approaching weather system from the Upper Midwest and lower Great Lakes combined with the moderately moist and unstable air mass during the early evening hours. This produced localized severe thunderstorms across southern Indiana.
Charlestown	6/30/2015	Hail	0	0	0	0	0	15.00K	0.00K	An approaching weather system from the Upper Midwest and lower Great Lakes combined with the moderately moist and unstable air mass during the early evening hours. This produced localized severe thunderstorms across southern Indiana.
Clarksville	6/30/2015	Hail	0	0	0	0	0	0.00K	0.00K	An approaching weather system from the Upper Midwest and lower Great Lakes combined with the moderately moist and unstable air mass during the

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										early evening hours. This produced localized severe thunderstorms across southern Indiana.
Utica	6/30/2015	Hail	0	0	0	0	0	0.00K	0.00K	An approaching weather system from the Upper Midwest and lower Great Lakes combined with the moderately moist and unstable air mass during the early evening hours. This produced localized severe thunderstorms across southern Indiana.
New Washington	6/26/2015	Flash Flood	0	0	0	0	0	0.00K	0.00K	A very warm and unstable air mass brought a few rounds of severe thunderstorms to southern Indiana, starting during the evening hours Thursday June 25th. Isolated storms developed first, producing some sporadic wind damage. Then later that night, a complex of organized storms brought damaging winds, large hail and flash flooding during the early morning hours June 26th. Later that same afternoon, a strong surface low pressure moved across central Kentucky and brought another round of severe storms with damaging winds, large hail and flash flooding.
Sellersburg	7/13/2015	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A series of upper level disturbances moved from the Upper Midwest into the lower Ohio Valley and interacted with a moist, warm and unstable atmosphere. Strong to severe thunderstorms developed and then organized into bowing segments across the area. The result was damaging wind gusts that toppled trees and power lines. In addition, due to the very wet antecedent conditions, flash flooding occurred on occasion, resulting in closed and impassable roads, water rescues and significant property damage. The hardest hit areas included Jefferson County and the Madison, Indiana areas southwest toward Clark and Floyd counties. Rainfall totals over the period were in excess of 5 to 7 inches.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Bonnenburger	7/14/2015	Flash Flood	0	0	0	0	0	0.00K	0.00K	A series of upper level disturbances moved from the Upper Midwest into the lower Ohio Valley and interacted with a moist, warm and unstable atmosphere. Strong to severe thunderstorms developed and then organized into bowing segments across the area. The result was damaging wind gusts that toppled trees and power lines. In addition, due to the very wet antecedent conditions, flash flooding occurred on occasion, resulting in closed and impassable roads, water rescues and significant property damage. The hardest hit areas included Jefferson County and the Madison, Indiana areas southwest toward Clark and Floyd counties. Rainfall totals over the period were in excess of 5 to 7 inches.
Jeffersonville	7/14/2015	Flash Flood	0	0	0	0	0	0.00K	0.00K	A series of upper level disturbances moved from the Upper Midwest into the lower Ohio Valley and interacted with a moist, warm and unstable atmosphere. Strong to severe thunderstorms developed and then organized into bowing segments across the area. The result was damaging wind gusts that toppled trees and power lines. In addition, due to the very wet antecedent conditions, flash flooding occurred on occasion, resulting in closed and impassable roads, water rescues and significant property damage. The hardest hit areas included Jefferson County and the Madison, Indiana areas southwest toward Clark and Floyd counties. Rainfall totals over the period were in excess of 5 to 7 inches.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Borden	7/14/2015	Flash Flood	0	0	0	0	0	5.00K	0.00K	A series of upper level disturbances moved from the Upper Midwest into the lower Ohio Valley and interacted with a moist, warm and unstable atmosphere. Strong to severe thunderstorms developed and then organized into bowing segments across the area. The result was damaging wind gusts that toppled trees and power lines. In addition, due to the very wet antecedent conditions, flash flooding occurred on occasion, resulting in closed and impassable roads, water rescues and significant property damage. The hardest hit areas included Jefferson County and the Madison, Indiana areas southwest toward Clark and Floyd counties. Rainfall totals over the period were in excess of 5 to 7 inches.
Starlight	7/14/2015	Flood	0	0	1	0	1	20.00K	0.00K	A series of upper level disturbances moved from the Upper Midwest into the lower Ohio Valley and interacted with a moist, warm and unstable atmosphere. Strong to severe thunderstorms developed and then organized into bowing segments across the area. The result was damaging wind gusts that toppled trees and power lines. In addition, due to the very wet antecedent conditions, flash flooding occurred on occasion, resulting in closed and impassable roads, water rescues and significant property damage. The hardest hit areas included Jefferson County and the Madison, Indiana areas southwest toward Clark and Floyd counties. Rainfall totals over the period were in excess of 5 to 7 inches.
Solon	7/12/2015	Flash Flood	0	0	0	0	0	0.00K	0.00K	A complex of slow moving thunderstorms moved across Indiana during the early morning hours July 12th and slowly tracked into southern Indiana shortly before dawn. Between 2 and 5 inches of rain fell in a 1 to 2 hour time frame, resulting in flash flooding across parts of the area. The system

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										was also accompanied by an intense amount of lightning.
Vesta	7/12/2015	Flash Flood	0	0	0	0	0	0.00K	0.00K	A complex of slow moving thunderstorms moved across Indiana during the early morning hours July 12th and slowly tracked into southern Indiana shortly before dawn. Between 2 and 5 inches of rain fell in a 1 to 2 hour time frame, resulting in flash flooding across parts of the area. The system was also accompanied by an intense amount of lightning.
Jeffersonville Arpt	7/12/2015	Flash Flood	0	0	0	0	0	0.00K	0.00K	A complex of slow moving thunderstorms moved across Indiana during the early morning hours July 12th and slowly tracked into southern Indiana shortly before dawn. Between 2 and 5 inches of rain fell in a 1 to 2 hour time frame, resulting in flash flooding across parts of the area. The system was also accompanied by an intense amount of lightning.
Utica	7/12/2015	Flash Flood	0	0	0	0	0	0.00K	0.00K	A complex of slow moving thunderstorms moved across Indiana during the early morning hours July 12th and slowly tracked into southern Indiana shortly before dawn. Between 2 and 5 inches of rain fell in a 1 to 2 hour time frame, resulting in flash flooding across parts of the area. The system was also accompanied by an intense amount of lightning.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Jeffersonville	7/13/2015	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A series of upper level disturbances moved from the Upper Midwest into the lower Ohio Valley and interacted with a moist, warm and unstable atmosphere. Strong to severe thunderstorms developed and then organized into bowing segments across the area. The result was damaging wind gusts that toppled trees and power lines. In addition, due to the very wet antecedent conditions, flash flooding occurred on occasion, resulting in closed and impassable roads, water rescues and significant property damage. The hardest hit areas included Jefferson County and the Madison, Indiana areas southwest toward Clark and Floyd counties. Rainfall totals over the period were in excess of 5 to 7 inches.
Charlestown	7/13/2015	Thunderstorm Wind	0	0	0	0	0	15.00K	0.00K	A series of upper level disturbances moved from the Upper Midwest into the lower Ohio Valley and interacted with a moist, warm and unstable atmosphere. Strong to severe thunderstorms developed and then organized into bowing segments across the area. The result was damaging wind gusts that toppled trees and power lines. In addition, due to the very wet antecedent conditions, flash flooding occurred on occasion, resulting in closed and impassable roads, water rescues and significant property damage. The hardest hit areas included Jefferson County and the Madison, Indiana areas southwest toward Clark and Floyd counties. Rainfall totals over the period were in excess of 5 to 7 inches.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Haps Arpt	7/13/2015	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A series of upper level disturbances moved from the Upper Midwest into the lower Ohio Valley and interacted with a moist, warm and unstable atmosphere. Strong to severe thunderstorms developed and then organized into bowing segments across the area. The result was damaging wind gusts that toppled trees and power lines. In addition, due to the very wet antecedent conditions, flash flooding occurred on occasion, resulting in closed and impassable roads, water rescues and significant property damage. The hardest hit areas included Jefferson County and the Madison, Indiana areas southwest toward Clark and Floyd counties. Rainfall totals over the period were in excess of 5 to 7 inches.
Sellersburg	7/13/2015	Thunderstorm Wind	0	0	0	0	0	5.00K	0.00K	A series of upper level disturbances moved from the Upper Midwest into the lower Ohio Valley and interacted with a moist, warm and unstable atmosphere. Strong to severe thunderstorms developed and then organized into bowing segments across the area. The result was damaging wind gusts that toppled trees and power lines. In addition, due to the very wet antecedent conditions, flash flooding occurred on occasion, resulting in closed and impassable roads, water rescues and significant property damage. The hardest hit areas included Jefferson County and the Madison, Indiana areas southwest toward Clark and Floyd counties. Rainfall totals over the period were in excess of 5 to 7 inches.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Memphis	7/13/2015	Flash Flood	0	0	0	0	0	0.00K	0.00K	A series of upper level disturbances moved from the Upper Midwest into the lower Ohio Valley and interacted with a moist, warm and unstable atmosphere. Strong to severe thunderstorms developed and then organized into bowing segments across the area. The result was damaging wind gusts that toppled trees and power lines. In addition, due to the very wet antecedent conditions, flash flooding occurred on occasion, resulting in closed and impassable roads, water rescues and significant property damage. The hardest hit areas included Jefferson County and the Madison, Indiana areas southwest toward Clark and Floyd counties. Rainfall totals over the period were in excess of 5 to 7 inches.
Charlestown	7/17/2015	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A small but intense complex of severe thunderstorms developed north of the area but quickly moved into southern Indiana during the evening hours of July 17th. Widespread damaging wind gusts estimated between 55 and 60 mph occurred, resulting in toppled trees and power lines. The Madison, Indiana area was particularly hit hard with damaging winds as well as flash flooding given the very wet conditions in place.
Charlestown	7/17/2015	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A small but intense complex of severe thunderstorms developed north of the area but quickly moved into southern Indiana during the evening hours of July 17th. Widespread damaging wind gusts estimated between 55 and 60 mph occurred, resulting in toppled trees and power lines. The Madison, Indiana area was particularly hit hard with damaging winds as well as flash flooding given the very wet conditions in place.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Charlestown	7/17/2015	Flash Flood	0	0	0	0	0	0.00K	0.00K	A small but intense complex of severe thunderstorms developed north of the area but quickly moved into southern Indiana during the evening hours of July 17th. Widespread damaging wind gusts estimated between 55 and 60 mph occurred, resulting in toppled trees and power lines. The Madison, Indiana area was particularly hit hard with damaging winds as well as flash flooding given the very wet conditions in place.
Sellersburg	12/23/2015	Hail	0	0	0	0	0	0.00K	0.00K	Unseasonable warmth and rich Gulf moisture collided with an approaching surface low pressure system and cold front to produce several lines of strong to severe thunderstorms across southern Indiana. Damaging winds were the main threat, but hail was also reported. Intense torrential rainfall also fell which produced localized flash flooding issues.
Sellersburg	12/23/2015	Hail	0	0	0	0	0	0.00K	0.00K	Unseasonable warmth and rich Gulf moisture collided with an approaching surface low pressure system and cold front to produce several lines of strong to severe thunderstorms across southern Indiana. Damaging winds were the main threat, but hail was also reported. Intense torrential rainfall also fell which produced localized flash flooding issues.
Henryville	12/23/2015	Thunderstorm Wind	0	0	0	0	0	10.00K	0.00K	Unseasonable warmth and rich Gulf moisture collided with an approaching surface low pressure system and cold front to produce several lines of strong to severe thunderstorms across southern Indiana. Damaging winds were the main threat, but hail was also reported. Intense torrential rainfall also fell which produced localized flash flooding issues.
Solon	1/1/2016	Flood	0	0	0	0	0	0.00K	0.00K	Heavy rainfall that fell during late December pushed the Ohio River at Tell City into flood. The

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										river continued above flood stage into the early part of January 2016.
Charlestown	1/22/2016	Heavy Snow	0	0	0	0	0	0.00K	0.00K	A low pressure system lifted snow into southern Indiana on January 22. While most of the heaviest snow remained south in Kentucky, a few snow bands pivoted along the Ohio River, bringing as much as 5 inches of snow to portions of southern Indiana. Road conditions were hazardous to treacherous at times, especially given strong northeasterly winds causing blowing and drifting of snow.
Borden	3/16/2016	Hail	0	0	0	0	0	0.00K	0.00K	A cold front swept through southern Indiana during the early morning hours on March 16. With very warm temperatures and a favorable dynamic setup in place, isolated to scattered thunderstorms developed. One particular storm over northern Clark County produced marginally severe hail with several reports received of 1 inch diameter hail.
Borden	3/16/2016	Hail	0	0	0	0	0	NULL	0.00K	A cold front swept through southern Indiana during the early morning hours on March 16. With very warm temperatures and a favorable dynamic setup in place, isolated to scattered thunderstorms developed. One particular storm over northern Clark County produced marginally severe hail with several reports received of 1 inch diameter hail.
Borden	3/16/2016	Hail	0	0	0	0	0	NULL	0.00K	A cold front swept through southern Indiana during the early morning hours on March 16. With very warm temperatures and a favorable dynamic setup in place, isolated to scattered thunderstorms developed. One particular storm over northern Clark County produced marginally severe hail with several reports received of 1 inch diameter hail.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Bonnenburger	3/27/2016	Thunderstorm Wind	0	0	0	0	0	5.00K	0.00K	A moist and unstable air mass developed ahead of an approaching cold front across the lower Ohio Valley. By late afternoon, isolated to scattered thunderstorms moved into southern Indiana. The primary hazard was large hail but sporadic damaging wind gusts were also reported.
Blue Lick	3/31/2016	Thunderstorm Wind	0	0	0	0	0	20.00K	0.00K	An approaching cold front combined, with ample daytime instability and moisture, led to several lines of strong to severe thunderstorms across portions of southern Indiana during the afternoon and early evening hours March 31st. The primary hazard was damaging wind.
Sellersburg	3/31/2016	Thunderstorm Wind	0	0	0	0	0	NULL	0.00K	An approaching cold front combined, with ample daytime instability and moisture, led to several lines of strong to severe thunderstorms across portions of southern Indiana during the afternoon and early evening hours March 31st. The primary hazard was damaging wind.
Borden	3/16/2016	Hail	0	0	0	0	0	0.00K	0.00K	A cold front swept through southern Indiana during the early morning hours on March 16. With very warm temperatures and a favorable dynamic setup in place, isolated to scattered thunderstorms developed. One particular storm over northern Clark County produced marginally severe hail with several reports received of 1 inch diameter hail.
Charlestown	4/2/2016	High Wind	0	0	0	0	0	50.00K	0.00K	The combination of maximum daytime heating and a strong low pressure system racing across the lower Great Lakes region brought strong to damaging winds to many areas across southern Indiana. Maximum gusts reported ranged from 50 to 60 mph that resulted in downed trees and power lines along with some structural damage to property.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Sellersburg	4/3/2016	Frost/Freeze	0	0	0	0	0	0.00K	0.00K	An unusually warm March led to an early start for the growing season across the lower Ohio Valley. An unseasonably cold air mass settled over the area April 3 and April 5, which brought low temperatures down to the mid 20s to low 30s. This made for a hard freeze across portions of southern Indiana.
Borden	4/5/2016	Frost/Freeze	0	0	0	0	0	0.00K	0.00K	An unusually warm March led to an early start for the growing season across the lower Ohio Valley. An unseasonably cold air mass settled over the area April 3 and April 5, which brought low temperatures down to the mid 20s to low 30s. This made for a hard freeze across portions of southern Indiana.
Otisco	4/9/2016	Frost/Freeze	0	0	0	0	0	0.00K	0.00K	An unusually warm March led to an early start for the growing season across the lower Ohio Valley. An unseasonably cold air mass settled over the area April 8-10, which brought low temperatures down to the mid 20s to low 30s. This made for a hard freeze across portions of southern Indiana.
Underwood	4/26/2016	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	Warm moist air originating in the Gulf of Mexico interacted with a stationary boundary across southern Indiana, resulting in several rounds of strong to severe thunderstorms during the afternoon and evening hours April 26 and April 27. Damaging winds, large hail and flooding were the primary impacts.
Sellersburg	4/26/2016	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	Warm moist air originating in the Gulf of Mexico interacted with a stationary boundary across southern Indiana, resulting in several rounds of strong to severe thunderstorms during the afternoon and evening hours April 26 and April 27. Damaging winds, large hail and flooding were the primary impacts.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Owen	4/10/2016	Frost/Freeze	0	0	0	0	0	0.00K	0.00K	An unusually warm March led to an early start for the growing season across the lower Ohio Valley. An unseasonably cold air mass settled over the area April 8-10, which brought low temperatures down to the mid 20s to low 30s. This made for a hard freeze across portions of southern Indiana.
Henryville	5/1/2016	Hail	0	0	0	0	0	0.00K	0.00K	A passing weather system combined with warm and moist air sparked a line of strong to severe thunderstorms across southern Indiana during the afternoon hours May 1st. These storms were responsible for large hail and damaging winds.
Speed	5/1/2016	Hail	0	0	0	0	0	0.00K	0.00K	A passing weather system combined with warm and moist air sparked a line of strong to severe thunderstorms across southern Indiana during the afternoon hours May 1st. These storms were responsible for large hail and damaging winds.
Henryville	5/1/2016	Hail	0	0	0	0	0	0.00K	0.00K	A passing weather system combined with warm and moist air sparked a line of strong to severe thunderstorms across southern Indiana during the afternoon hours May 1st. These storms were responsible for large hail and damaging winds.
Gibson	5/1/2016	Hail	0	0	0	0	0	0.00K	0.00K	A passing weather system combined with warm and moist air sparked a line of strong to severe thunderstorms across southern Indiana during the afternoon hours May 1st. These storms were responsible for large hail and damaging winds.
Borden	5/11/2016	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A very warm and moist air mass collided with a passing weather system to bring a few rounds of severe thunderstorms to portions of southern Indiana. Damaging winds and large hail were the main impacts from these storms.
Bethlehem	7/8/2016	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A strong cold front swept across southern Indiana during the day on July 8. Damaging winds were the main impact from these storms thanks to very warm temperatures and high amounts of moisture.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Jeffersonville	2/24/2017	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	After a string of record breaking warm February days, a potent cold front marched through southern Indiana during the late afternoon and evening hours February 24. An isolated severe thunderstorms developed which produced damaging winds.
Henryville	3/1/2017	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	The combination of a moist and unseasonably warm air mass and an approaching low pressure system and cold front brought multiple rounds of severe weather to southern Indiana during the early morning hours on March 1. In the end, there were 5 tornadoes across southern Indiana, the strongest being an EF-2 that tracked through portions of Dubois County. In addition to the tornadoes, there were several areas of intense straight-line winds estimated up to 100 mph in places. The impacts included numerous areas of structural damage and downed trees. The widespread heavy rain brought the Muscatatuck River at Deputy into minor flood.
Cementville	3/1/2017	Thunderstorm Wind	0	0	0	0	0	15.00K	0.00K	The combination of a moist and unseasonably warm air mass and an approaching low pressure system and cold front brought multiple rounds of severe weather to southern Indiana during the early morning hours on March 1. In the end, there were 5 tornadoes across southern Indiana, the strongest being an EF-2 that tracked through portions of Dubois County. In addition to the tornadoes, there were several areas of intense straight-line winds estimated up to 100 mph in places. The impacts included numerous areas of structural damage and downed trees. The widespread heavy rain brought the Muscatatuck River at Deputy into minor flood.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Clarksville	3/1/2017	Thunderstorm Wind	0	0	0	0	0	20.00K	0.00K	The combination of a moist and unseasonably warm air mass and an approaching low pressure system and cold front brought multiple rounds of severe weather to southern Indiana during the early morning hours on March 1. In the end, there were 5 tornadoes across southern Indiana, the strongest being an EF-2 that tracked through portions of Dubois County. In addition to the tornadoes, there were several areas of intense straight-line winds estimated up to 100 mph in places. The impacts included numerous areas of structural damage and downed trees. The widespread heavy rain brought the Muscatatuck River at Deputy into minor flood.
Oak Park	3/1/2017	Thunderstorm Wind	0	0	0	0	0	150.00K	0.00K	The combination of a moist and unseasonably warm air mass and an approaching low pressure system and cold front brought multiple rounds of severe weather to southern Indiana during the early morning hours on March 1. In the end, there were 5 tornadoes across southern Indiana, the strongest being an EF-2 that tracked through portions of Dubois County. In addition to the tornadoes, there were several areas of intense straight-line winds estimated up to 100 mph in places. The impacts included numerous areas of structural damage and downed trees. The widespread heavy rain brought the Muscatatuck River at Deputy into minor flood.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Jeffersonville	3/1/2017	Tornado	0	0	0	0	0	200.00K	0.00K	The combination of a moist and unseasonably warm air mass and an approaching low pressure system and cold front brought multiple rounds of severe weather to southern Indiana during the early morning hours on March 1. In the end, there were 5 tornadoes across southern Indiana, the strongest being an EF-2 that tracked through portions of Dubois County. In addition to the tornadoes, there were several areas of intense straight-line winds estimated up to 100 mph in places. The impacts included numerous areas of structural damage and downed trees. The widespread heavy rain brought the Muscatatuck River at Deputy into minor flood.
Otisco	4/29/2017	Flash Flood	0	0	0	0	0	0.00K	0.00K	An unseasonably warm and humid air mass developed across the lower Ohio Valley toward late April 2017. A powerful storm system across the central Plains brought several rounds of strong to severe thunderstorms to the region. Damaging winds and large hail occurred late on April 28 and into the morning hours April 29. Widespread rainfall of 3 to 6 inches fell across southern Indiana, resulting in flash flooding in some places.
Marysville	4/5/2017	Hail	0	0	0	0	0	0.00K	0.00K	A strong area of low pressure tracked across the Ohio Valley on April 5. With an unseasonably warm and humid air mass in place, several lines of strong to severe thunderstorms developed across the area. This resulted in large hail and damaging winds across southern Indiana.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Starlight	4/29/2017	Flood	0	0	0	0	0	0.00K	0.00K	An unseasonably warm and humid air mass developed across the lower Ohio Valley toward late April 2017. A powerful storm system across the central Plains brought several rounds of strong to severe thunderstorms to the region. Damaging winds and large hail occurred late on April 28 and into the morning hours April 29. Widespread rainfall of 3 to 6 inches fell across southern Indiana, resulting in flash flooding in some places.
Charlestown	4/29/2017	Flood	0	0	0	0	0	0.00K	0.00K	An unseasonably warm and humid air mass developed across the lower Ohio Valley toward late April 2017. A powerful storm system across the central Plains brought several rounds of strong to severe thunderstorms to the region. Damaging winds and large hail occurred late on April 28 and into the morning hours April 29. Widespread rainfall of 3 to 6 inches fell across southern Indiana, resulting in flash flooding in some places.
New Market	5/20/2017	Hail	0	0	0	0	0	25.00K	0.00K	An extremely warm, moist, and unstable air mass resided over the lower Ohio Valley during the middle of May. As a series of strong weather systems passed through the region, rounds of strong to severe thunderstorms developed and tracked across southern Indiana. Several inches of rain fell in a very short time resulting in a significant flash flood event for Washington County, Indiana. There were 2 confirmed tornadoes, one in Crawford County and another in Jefferson County, Indiana.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Memphis	5/20/2017	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	An extremely warm, moist, and unstable air mass resided over the lower Ohio Valley during the middle of May. As a series of strong weather systems passed through the region, rounds of strong to severe thunderstorms developed and tracked across southern Indiana. Several inches of rain fell in a very short time resulting in a significant flash flood event for Washington County, Indiana. There were 2 confirmed tornadoes, one in Crawford County and another in Jefferson County, Indiana.
Bonnenburger	7/7/2017	Thunderstorm Wind	0	0	0	0	0	3.00K	0.00K	A powerful cold front pushed through the lower Ohio Valley during the evening hours on July 7. Ahead of this front, unseasonably warm and humid conditions prevailed with high temperatures in the lower 90s and dewpoints in the low to mid 70s. This provided plenty of instability. Several lines of thunderstorms developed across central Indiana and then moved south into southern Indiana. Some large hail up to golf ball size in diameter was reported but the main impact was damaging wind gusts which brought down many trees and power lines, along with some structural damage as well. The storms were also noted for being prolific in-cloud and cloud-to-ground lightning producers.
Henryville	8/2/2017	Hail	0	0	0	0	0	NULL	0.00K	Afternoon to evening thunderstorms developed the first few days of August 2017. The atmosphere was very unstable but a lack of deep wind shear prevented storms from being anything more organized than pulse and marginally severe. A few instances of 1 inch hail was reported along with isolated reports of downed trees and 55 to 60 mph wind gusts.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Bonnenburger	8/1/2017	Hail	0	0	0	0	0	NULL	0.00K	Afternoon to evening thunderstorms developed the first few days of August 2017. The atmosphere was very unstable but a lack of deep wind shear prevented storms from being anything more organized than pulse and marginally severe. A few instances of 1 inch hail was reported along with isolated reports of downed trees and 55 to 60 mph wind gusts.
Nabb	1/12/2018	Winter Storm	0	0	0	0	0	0.00K	0.00K	A sharp cold front and a deep low pressure system brought widespread precipitation to southern Indiana January 12. As temperatures dropped from the 40s and 50s into the 30s and 20s, rain changed over to freezing rain, sleet, and snow. Snow amounts ranged from 1 to 5 inches, which fell on top a glaze to 1/4 inch of ice. Travel was severely impacted with widespread school and business closures.
Hamburg	2/25/2018	Flash Flood	0	0	0	0	0	50.00K	0.00K	Repeated rounds of moderate to heavy rainfall across the entire Ohio River basin totaled between 8 to 9 inches across southern Indiana from February 15 to February 28. These totals were generally 7+ inches, or 200 to 400% of normal values for mid to late February. The large areal extent of the excessive rainfall led to significant rises on area rivers, including the Ohio River. This resulted in numerous flash flood reports across all of the southern Indiana counties including road closures, road washouts and water rescues.
New Washington	2/24/2018	Flood	0	0	0	0	0	0.00K	0.00K	Repeated rounds of moderate to heavy rainfall across the entire Ohio River basin totaled between 8 to 9 inches across southern Indiana from February 15 to February 28. These totals were generally 7+ inches, or 200 to 400% of normal values for mid to late February. The large areal extent of the excessive rainfall led to significant rises on area rivers, including the Ohio River. This

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										resulted in numerous flash flood reports across all of the southern Indiana counties including road closures, road washouts and water rescues.
Otto	2/24/2018	Flash Flood	0	0	0	0	0	0.00K	0.00K	Repeated rounds of moderate to heavy rainfall across the entire Ohio River basin totaled between 8 to 9 inches across southern Indiana from February 15 to February 28. These totals were generally 7+ inches, or 200 to 400% of normal values for mid to late February. The large areal extent of the excessive rainfall led to significant rises on area rivers, including the Ohio River. This resulted in numerous flash flood reports across all of the southern Indiana counties including road closures, road washouts and water rescues.
Broom Hill	2/24/2018	Flood	0	0	0	0	0	0.00K	0.00K	Repeated rounds of moderate to heavy rainfall across the entire Ohio River basin totaled between 8 to 9 inches across southern Indiana from February 15 to February 28. These totals were generally 7+ inches, or 200 to 400% of normal values for mid to late February. The large areal extent of the excessive rainfall led to significant rises on area rivers, including the Ohio River. This resulted in numerous flash flood reports across all of the southern Indiana counties including road closures, road washouts and water rescues.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Underwood	3/20/2018	Winter Storm	0	0	0	0	0	0.00K	0.00K	A potent storm system crossed through the Ohio Valley March 20-21 and led to a band of heavy wet snow over portions of southern Indiana. The highest totals observed were 8-10 inches, with widespread amounts of 4 to 8 inches. The heavy snow led to scattered tree limbs down and power outages. Many schools and businesses were closed, and hazardous travel conditions developed which resulted in traffic accidents.
Owen	5/31/2018	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A shortwave moved east out of Missouri towards southern Indiana and |central Kentucky. As this shortwave met the moisture rich and unstable |environment over the Ohio Valley, a line of heavy storms with high |winds and heavy rainfall strengthened and tracked southeast downing numerous trees which caused power outages and property damage.
Solon	5/31/2018	Thunderstorm Wind	0	0	0	0	0	5.00K	0.00K	A shortwave moved east out of Missouri towards southern Indiana and |central Kentucky. As this shortwave met the moisture rich and unstable |environment over the Ohio Valley, a line of heavy storms with high |winds and heavy rainfall strengthened and tracked southeast downing numerous trees which caused power outages and property damage.
Clark County	5/31/2018	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A shortwave moved east out of Missouri towards southern Indiana and |central Kentucky. As this shortwave met the moisture rich and unstable |environment over the Ohio Valley, a line of heavy storms with high |winds and heavy rainfall strengthened and tracked southeast downing numerous trees which caused power outages and property damage.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Clark County	5/31/2018	Thunderstorm Wind	0	0	0	0	0	50.00K	0.00K	A shortwave moved east out of Missouri towards southern Indiana and |central Kentucky. As this shortwave met the moisture rich and unstable |environment over the Ohio Valley, a line of heavy storms with high |winds and heavy rainfall strengthened and tracked southeast downing numerous trees which caused power outages and property damage.
Clark County	7/20/2018	Thunderstorm Wind	0	0	0	0	0	15.00K	0.00K	Rounds of severe storms hammered southern Indiana and central Kentucky on Friday, July 20, 2018, bringing very large hail, wind damage, heavy rain, and 2 confirmed tornadoes in Indiana. ||The largest hail report the national weather service received was 4 inches in diameter (softball size) in Tompkinsville! The strongest measured wind gust was 70 mph at the Lexington Bluegrass Airport.
Clark County	7/20/2018	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	Rounds of severe storms hammered southern Indiana and central Kentucky on Friday, July 20, 2018, bringing very large hail, wind damage, heavy rain, and 2 confirmed tornadoes in Indiana. ||The largest hail report the national weather service received was 4 inches in diameter (softball size) in Tompkinsville! The strongest measured wind gust was 70 mph at the Lexington Bluegrass Airport.
Clark County	7/20/2018	Flood	0	0	0	0	0	0.00K	0.00K	Rounds of severe storms hammered southern Indiana and central Kentucky on Friday, July 20, 2018, bringing very large hail, wind damage, heavy rain, and 2 confirmed tornadoes in Indiana. ||The largest hail report the national weather service received was 4 inches in diameter (softball size) in Tompkinsville! The strongest measured wind gust was 70 mph at the Lexington Bluegrass Airport.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Clark County	7/20/2018	Hail	0	0	0	0	0	NULL	0.00K	Rounds of severe storms hammered southern Indiana and central Kentucky on Friday, July 20, 2018, bringing very large hail, wind damage, heavy rain, and 2 confirmed tornadoes in Indiana. ||The largest hail report the national weather service received was 4 inches in diameter (softball size) in Tompkinsville! The strongest measured wind gust was 70 mph at the Lexington Bluegrass Airport.
Clark County	7/2/2018	Thunderstorm Wind	0	0	0	0	0	45.00K	0.00K	As an upper level trough moved towards southern Indiana, isolated severe storms developed, causing wind damage and minor street flooding.
Clark County	7/2/2018	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	As an upper level trough moved towards southern Indiana, isolated severe storms developed, causing wind damage and minor street flooding.
Clark County	11/14/2018	Ice Storm	0	0	0	0	0	NULL	0.00K	A cold air mass already in place combined with an anomalous low pressure system to produce an early season freezing rain event across southern Indiana and central Kentucky. Many locations received between a tenth and a quarter of an inch of ice accumulation on trees/shrubs and other elevated surfaces. Warm ground temperatures kept most roads ice free, though some bridges had slick spots. ||The ice on the trees, many of which still had leaves that helped to weigh them down, caused several limbs/branches to snap and some trees to fall. There were many reports of power flashes overnight as branches hit transformers. At the peak of the event, over 100,000 customers were without power in the region. Some lost power for several days. Out of state crews were brought in to help restore power.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Clark County	3/14/2019	Hail	0	0	0	0	0	NULL	0.00K	An upper low over the northern Plains moved northeast toward the Great Lakes throughout the day, with an associated surface cold front draping south from the system. Ahead of the front a strong low level jet caused southern Indiana and central Kentucky to be placed under a Wind Advisory earlier in the day. As the front approached from the west, severe weather become more of an issue. Widespread wind damage was reported across southern Indiana, including a tornado that touched down in Washington County.
Clark County	3/14/2019	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	An upper low over the northern Plains moved northeast toward the Great Lakes throughout the day, with an associated surface cold front draping south from the system. Ahead of the front a strong low level jet caused southern Indiana and central Kentucky to be placed under a Wind Advisory earlier in the day. As the front approached from the west, severe weather become more of an issue. Widespread wind damage was reported across southern Indiana, including a tornado that touched down in Washington County.
Clark County	4/20/2019	Heavy Rain	0	0	0	0	0	0.00K	0.00K	A slow moving surface low, embedded in a cold front, moved north from Tennessee through the Ohio River Valley during the overnight hours between April 19th and 20th. This brought an axis of heavy rain and brief issues to southern Indiana counties, mainly low lying areas. The main issue was water on area roadways.
Clark County	5/16/2019	Hail	0	0	0	0	0	NULL	0.00K	Horizontal flow in the upper levels stayed over the Great Lakes region with an embedded stationary front over northern Indiana. This provided little shear energy south of the front over southern Indiana and central Kentucky. With the heating of the day and outflow boundaries from area convection, isolated pulse thunderstorms caused

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										hail in a few locations near the Ohio River in Indiana and Kentucky.
Clark County	6/5/2019	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	A moist and unstable air mass sat over the Ohio River Valley. CAPE values exceeded 3000 J/kg, but shear was weak. This provided an environment for pulse type thunderstorms. As the heat of the day began to build, it became enough to kickoff area thunderstorms. Thunderstorms across southern Indiana caused several trees to fall, along with severe hail and heavy rainfall.
Clark County	6/5/2019	Thunderstorm Wind	0	0	0	0	0	15.00K	0.00K	A moist and unstable air mass sat over the Ohio River Valley. CAPE values exceeded 3000 J/kg, but shear was weak. This provided an environment for pulse type thunderstorms. As the heat of the day began to build, it became enough to kickoff area thunderstorms. Thunderstorms across southern Indiana caused several trees to fall, along with severe hail and heavy rainfall.
Clark County	6/18/2019	Flash Flood	0	0	0	0	0	0.00K	0.00K	Between June 17-19, the Ohio Valley sat in a warm moist environment with a stationary front draped from northeast to southwest across Indiana and on through Texas. Little wind shear existed above southern Indiana. This provided several days where diurnal heating and shortwave forcing kicked off pulse storms with high rainfall rates. After a few days of this, the ground became more saturated and flooding became easier with each event.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Clark County	6/19/2019	Flash Flood	0	0	0	0	0	0.00K	0.00K	Between June 17-19, the Ohio Valley sat in a warm moist environment with a stationary front draped from northeast to southwest across Indiana and on through Texas. Little wind shear existed above southern Indiana. This provided several days where diurnal heating and shortwave forcing kicked off pulse storms with high rainfall rates. After a few days of this, the ground became more saturated and flooding became easier with each event.
Clark County	6/18/2019	Flash Flood	0	0	0	0	0	0.00K	0.00K	Between June 17-19, the Ohio Valley sat in a warm moist environment with a stationary front draped from northeast to southwest across Indiana and on through Texas. Little wind shear existed above southern Indiana. This provided several days where diurnal heating and shortwave forcing kicked off pulse storms with high rainfall rates. After a few days of this, the ground became more saturated and flooding became easier with each event.
Clark County	6/19/2019	Flash Flood	0	0	0	0	0	0.00K	0.00K	Between June 17-19, the Ohio Valley sat in a warm moist environment with a stationary front draped from northeast to southwest across Indiana and on through Texas. Little wind shear existed above southern Indiana. This provided several days where diurnal heating and shortwave forcing kicked off pulse storms with high rainfall rates. After a few days of this, the ground became more saturated and flooding became easier with each event.
Clark County	6/16/2019	Hail	0	0	0	0	0	NULL	0.00K	The region was in an area with weak surface high pressure. A warm stale air mass was in place that destabilized due to diurnal heating. Shear in the area was weak and freezing levels were high, but a couple of locations in southern Indiana saw severe

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
										weather after area storms took advantage of the instability.
Clark County	6/30/2019	Thunderstorm Wind	0	0	0	0	0	10.00K	0.00K	On June 30th, temperatures reached the low 90s with dewpoints neared 70. The area saw little inhibition. Thunderstorms started forming in areas covered by cumulus. Once these storms got going, outflow boundaries continued to propagate new cell formation and growth. The result was severe thunderstorm damage that affecting southern Indiana by knocking power and trees.
Clark County	8/6/2019	Hail	0	0	0	0	0	NULL	0.00K	Surface high pressure was over the upper Mid-west while a cold front extended through central Indiana to southwest through Missouri. In the mid and upper levels, northwest flow prevailed over southern Indiana and central Kentucky. Ahead of the cold front, a line of storms began with the heating of the day. This line traveled south as it intensified, becoming a Mesoscale Convective System (MCS) which produced large severe hail in southern Indiana and hail and damaging winds in central Kentucky.
Clark County	1/11/2020	Thunderstorm Wind	0	0	0	0	0		0.00K	A cold front stretching from northern Indiana south along the Mississippi River Valley moved east through southern Indiana and central Kentucky. This powerful storm system brought widespread and locally heavy rain to the area, along with damaging gradient and thunderstorm winds throughout the day. High temperatures dropped 20 degrees from January 11 to 12. Widespread 40-60 MPH winds occurred across the region in and out of storms, and through several waves during the day.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Clark County	1/11/2020	Thunderstorm Wind	0	0	0	0	0		0.00K	A cold front stretching from northern Indiana south along the Mississippi River Valley moved east through southern Indiana and central Kentucky. This powerful storm system brought widespread and locally heavy rain to the area, along with damaging gradient and thunderstorm winds throughout the day. High temperatures dropped 20 degrees from January 11 to 12. Widespread 40-60 MPH winds occurred across the region in and out of storms, and through several waves during the day.
Clark County	1/11/2020	Thunderstorm Wind	0	0	0	0	0		0.00K	A cold front stretching from northern Indiana south along the Mississippi River Valley moved east through southern Indiana and central Kentucky. This powerful storm system brought widespread and locally heavy rain to the area, along with damaging gradient and thunderstorm winds throughout the day. High temperatures dropped 20 degrees from January 11 to 12. Widespread 40-60 MPH winds occurred across the region in and out of storms, and through several waves during the day.
Clark County	4/8/2020	Thunderstorm Wind	0	0	0	0	0	50.00K	0.00K	A strong storm system moved from the Midwest into the lower Ohio Valley on April 8, 2020. Isolated storms developed ahead of a sinking cold front during the afternoon across portions of southern Indiana and central Kentucky. These storms dropped large hail and produced damaging winds. Later that evening, a line of severe thunderstorms moved in from the northwest and produced widespread damaging winds and small hail. Storms pushed east of the region during the early morning hours of April 9, 2020.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Clark County	5/24/2020	Flash Flood	0	0	0	0	0	0.00K	0.00K	May 23, warmer temperatures surged into central Kentucky and southern Indiana behind a northward moving warm front. The surge of warm moist air resulted in scattered thunderstorms producing wind damage that occurred for three days from Logan County, Kentucky to southern Indiana before coming to an end in the Bluegrass region of Kentucky. Kentucky resulted in more storm reports from this event over the three day period, but southern Indiana saw reports of wind damage and flooding on the 24th.
Clark County	7/11/2020	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	The Lower Ohio Valley sat under the front of an upper ridge as a surface low advanced towards the state. This low, anchoring a warm front to the east and cold front to the west, caused thunderstorms to breakout across southern Indiana as the system moved through the area. The storms produced wind and hail damage across the region.
Clark County	7/11/2020	Thunderstorm Wind	0	0	0	0	0	0.00K	0.00K	The Lower Ohio Valley sat under the front of an upper ridge as a surface low advanced towards the state. This low, anchoring a warm front to the east and cold front to the west, caused thunderstorms to breakout across southern Indiana as the system moved through the area. The storms produced wind and hail damage across the region.
Clark County	7/9/2020	Flood	0	0	0	0	0	0.00K	0.00K	With zonal flow over the country and high temperatures in the 90s, multiple weak surface fronts help to produce afternoon and evening storms during diurnal heating. These storms produced strong winds, lightning, and heavy rainfall that resulted in wind damage, flooding, and a structure fire from lightning.

Location/ County	Date	Event	Dir. Injuries	Indir. Injuries	Dir. Deaths	Indir. Deaths	Dir. Deaths	Property Damage Cost	Crop Damage Cost	Description
Clark County	7/9/2020	Thunderstorm Wind	0	0	0	0	0		0.00K	With zonal flow over the country and high temperatures in the 90s, multiple weak surface fronts help to produce afternoon and evening storms during diurnal heating. These storms produced strong winds, lightning, and heavy rainfall that resulted in wind damage, flooding, and a structure fire from lightning.
Clark County	7/9/2020	Lightning	0	0	0	0	0	30.00K	0.00K	With zonal flow over the country and high temperatures in the 90s, multiple weak surface fronts help to produce afternoon and evening storms during diurnal heating. These storms produced strong winds, lightning, and heavy rainfall that resulted in wind damage, flooding, and a structure fire from lightning.
Clark County	10/23/2020	Hail	0	0	0	0	0	0.00K	0.00K	A cold front moved from west to east through southern Indiana. Storms associated with the front caused isolated hail and tree damage in multiple counties.
Clark County	10/23/2020	Hail	0	0	0	0	0		0.00K	A cold front moved from west to east through southern Indiana. Storms associated with the front caused isolated hail and tree damage in multiple counties.

Appendix D: Essential & Critical Facilities List and Maps

Essential Facilities

Table 38. Medical Care Facilities

Facility Name	Address	City
Adams Family Funeral Home & Crematory	209 Ferguson St	Henryville
Advantage Chiropractic	101 Heritage Sq	Sellersburg
Affordable Dentures And Implants	2760 Jefferson Center Way	Jeffersonville
Ahs Primary Care	255 Quartermaster Ct	Jeffersonville
All Care Chiropractic	221 Court Ave	Jeffersonville
Allen Family Dental	434 Patrol Rd	Jeffersonville
Allison Lane Animal Hospital	1660 Allison Ln	Jeffersonville
Amedisys Home Health Services	303 Quartermaster Ct	Jeffersonville
Amedisys Hospice Services	305 Quartermaster Ct	Jeffersonville
American Health Network	2300 Market St	Charlestown
American Red Cross	1805 8Th St	Jeffersonville
Armstrong Chiropractic	205 Hunter Station Rd	Sellersburg
Associates In Dermatology	1005 Lewis And Clark Pkwy	Clarksville
B&G Mortuary	965 High St	Charlestown
Baptist Health (Qaudrangle)	21 Quartermaster Ct	Jeffersonville
Baptist Health Medical Group/Physical Therapy	7600 Sr 60	Sellersburg
Baptist Health Primary Care	7725 Sr 62	Charlestown
Bechwood Family Dentistry	639 Eastern Blvd	Clarksville
Blackiston Mill Animal Clinic	2601 Blackiston Mill Rd	Clarksville
Bridgepointe Rehab Hospital	1329 Applegate Ln	Clarksville
Brightwell Behavioral Health	1612 Blackiston View Dr	Clarksville
Business Health Plus	4755 Us Route 31	Clarksville
Care Pets Animal Hospital	8800 Old Sr 60	Sellersburg
Catalyst Rescue Mission	1727 Dl Motley Jr Way	Jeffersonville
Center For Lay Ministries	213 Maple St	Jeffersonville
Chapman Funeral Home	431 Harrison Ave	Clarksville
Charlestown Veterinary Clinic	2046 Market St	Charlestown
Childplace - Hub	2404 10Th St	Jeffersonville
Childplace - Office	2420 10Th St	Jeffersonville
Childplace Bales Cottage	2103 Brookshire Dr	Jeffersonville
Childplace Cottage 1	2109 Brookshire Dr	Jeffersonville
Childplace Cottage 2	2108 Childplace Dr	Jeffersonville
Childplace Cottage 3	2104 Childplace Dr	Jeffersonville
Childplace Cottage 4	2100 Childplace Dr	Jeffersonville

Facility Name	Address	City
Childplace Cottage 5	2201 Brookshire Dr	Jeffersonville
Childplace Suspension Alternative	2420 10Th St	Jeffersonville
Clark County Health Dept	1201 Wall St	Jeffersonville
Clark County Youth Shelter	118 Chestnut St	Jeffersonville
Clark Memorial Health	1320 Duncan Ave	Jeffersonville
Clark Memorial Hospital	1220 Missouri Ave	Jeffersonville
Clark Memorial Medical Plaza	301 Gordon Gutmann Blvd	Jeffersonville
Clark Memorial Urgent Care/Hamburg	130 Hunter Station Way	Sellersburg
Clark Rehab And Skilled Nursing	517 Little League Blvd	Clarksville
Clarksville Animal Hospital	1137 Eastern Blvd	Clarksville
Clarksville Chiropractic	815 Eastern Blvd	Clarksville
Clarksville Dental Care	529 Lewis And Clark Pkwy	Clarksville
Clarksville Family Dental	1516 Lynch Ln	Clarksville
Clarksville Veterinary Clinic	1137 Eastern Blvd	Clarksville
Cobalt Rehabilitation Center	2101 Broadway St	Clarksville
Community Action Head Start	214 Mccampbell	Charlestown
Community Action Headstart (Sburg)	490 Indiana Ave	Sellersburg
Community Action Of Southern Indiana	201 15Th St	Jeffersonville
Community Home Medical	7112 Novas Landing	Sellersburg
Community Kitchen	1611 Spring St	Jeffersonville
Community Medical Associates	2051 Clevidence Blvd	Clarksville
Community Medical Associates-Jeff	3118 10Th St	Jeffersonville
Complete Care Chiropractic	1305 Veterans Pkwy	Clarksville
Coots Funeral Home	120 Maple St	Jeffersonville
D'Sol Optical	440 Patrol Rd	Jeffersonville
Davita Jeffersonville Dialysis Center	365 Quartermaster Ct	Jeffersonville
Davita Spring St Dialysis	1601 Spring St	Jeffersonville
Dentistry Plus	1516 Lynch Ln	Clarksville
Dmd Reynolds	809 Indiana Ave	Sellersburg
Dr Black Eye Associates	302 14Th St	Jeffersonville
Dr Blacks Lasik Center	1407 Spring St	Jeffersonville
Dr Blacks Vision Center	1407 Spring St	Jeffersonville
Dr Chris Chiropractic	1442 Horn St	Clarksville
Dr Fleck, Dds	2929 Charlestown Pike	Jeffersonville
Dr Joseph Beaven	9431 Cr 403	Charlestown
Dr Mcgee Office	935 Water St	Charlestown
Dr Sharp Office	2012 Market	Charlestown
Dr Travis Gross	9419 Cr 403	Charlestown
Dunn Orthodontics	493 Indiana Ave	Sellersburg
East Jefferson Medical Center	1806 10Th St	Jeffersonville

Facility Name	Address	City
Eastside Animal Hospital	1623 10Th St	Jeffersonville
Eye Associates Of Southern Indiana	302 14Th St	Jeffersonville
Eye Associates Surgical Center	302 14Th St	Jeffersonville
Family Health Clinic	1319 Duncan Ave	Jeffersonville
First Urology	101 Hospital Blvd	Jeffersonville
Floyd Memorial Cardiovascular Center	9427 Cr 403	Charlestown
Floyd Memorial Group	9423 Cr 403	Charlestown
Floyd Memorial Medical Group	41 Quartermaster Ct	Jeffersonville
Floyd Memorial Physical Therapy	9407 Cr 403	Charlestown
Forefront Dermatology	265 Quartermaster Ct	Jeffersonville
Frazier Rehab	4812 Hamburg Pike	Jeffersonville
Fresenius Dialysis (Clarksville)	810 Eastern Blvd	Clarksville
Fresenius Dialysis (Jeffersonville)	5526 Sr 62	Jeffersonville
Fssa/Drf Service Center	197 Quartermaster Ct	Jeffersonville
Gibson Family Dental	1713 10Th St	Jeffersonville
Grayson Funeral Home (Ctown)	893 High St	Charlestown
Grayson Funeral Home (Nwash)	206 Main St	New Washington
Hanger'S Pharmacy	207 Sparks Ave	Jeffersonville
Hangers Homecare	1712 Spring St	Jeffersonville
Hill Crest	203 Sparks Ave	Jeffersonville
Hillcrest	203 Sparks Ave	Jeffersonville
Hoke Medical	1454 Market St	Charlestown
Hughes-Taylor Funeral Home	225 Main St	Borden
Indiana Department Of Child Services	1421 Youngstown Shopping Center	Jeffersonville
Integrity Healthcare	8755 Sr 60	Sellersburg
Jay C (Charlestown)	9501 Cr 403	Charlestown
Jay C (Sellersburg)	7605 Cr 311	Sellersburg
Jb Ogle Animal Shelter	201 Willinger Ln	Jeffersonville
Jeff Nursing Home	1720 8Th St	Jeffersonville
Jeffersonville Commons Dental	1019 Jeffersonville Commons Dr	Jeffersonville
Jeffersonville Nursing Home	1720 8Th St	Jeffersonville
Joseph Fleck Dds	412 Hale Rd	Clarksville
Ken Ellis Building	1425 Bates Bowyer Ave	Jeffersonville
Kentuckiana Radiology	858 Penn St	Sellersburg
Kindred Healthcare	7823 Old Sr 60	Sellersburg
Kindred Hospice	391 Quartermaster Ct	Jeffersonville
Kirchner Dental	1706 Williamsburg Dr	Jeffersonville
Kort Physical Therapy	3121 10Th St	Jeffersonville
Kort Physical Therapy (Williamsburg)	1730 Williamsburg Dr	Jeffersonville

Facility Name	Address	City
Kort Physical Therapy - Clarksville	325 Lewis And Clark Pkwy	Clarksville
Kroger (Clarksville)	305 Lewis And Clark Pkwy	Clarksville
Kroger (Jeffersonville Commons)	1027 Jeffersonville Commons Dr	Jeffersonville
Kroger - Old (Jeffersonville)	2956 10Th St	Jeffersonville
Legacy Funeral Center	921 Main St	Jeffersonville
Lifespan Resources	835 Utica St	Sellersburg
Lifespring Adult Behavioral Services	404 Spring St	Jeffersonville
Lifespring Community Medical / Treatment Center	1036 Sharon Dr	Jeffersonville
Lifespring Main Center/Admin/Child & Family	460 Spring St	Jeffersonville
Lifespring Turning Point Center	1060 Sharon Dr	Jeffersonville
Louisville Hearing Center	914 Eastern Blvd	Clarksville
Maple Manor Retirement Home	643 Utica St	Sellersburg
Mason Funeral Home	828 Watt St	Jeffersonville
Mater Family Destistry	2948 10Th St	Jeffersonville
Maxim Healthcare	233 Quartermaster Ct	Jeffersonville
Medical Imaging	830 Penn St	Sellersburg
Meijer	2750 Allison Ln	Jeffersonville
Methadone Clinic (Utica)	7509 Charlestown Pike	Charlestown
Mortenson Family Dental	1240 Veterans Pkwy	Clarksville
New Horizons Physical Therapy	2760 Jefferson Center Way	Jeffersonville
New Life Audiology Hearing Care	701 Eastern Blvd	Clarksville
Norton Childrens Medical Associates (E 10Th St)	3118 10Th St	Jeffersonville
Norton Community Medical Associates	2051 Clevidence Blvd	Clarksville
Norton Community Medical Associates (E 10Th St)	3118 10Th St	Jeffersonville
Norton Immediate Care Center (Clarksville)	2051 Clevidence Blvd	Clarksville
Norton Immediate Care Center (Jeffersonville)	3118 10Th St	Jeffersonville
Ohio Valley Ent	301 Gordon Gutmann Blvd	Jeffersonville
Opensided Mri	120 Court Ave	Jeffersonville
Petfirst Healthcare	1 Quartermaster Ct	Jeffersonville
Petsmart	1020 Veterans Pkwy	Clarksville
Physicians Primary Care	1804 10Th St	Jeffersonville
Pro Rehab	1015 Jeffersonville Commons Dr	Jeffersonville
River Crossing Assisted Living	2400 Market St	Charlestown
River View Village Healthcare	586 Eastern Blvd	Clarksville
Riverbend Alzheimer'S Unit	2715 Charlestown Pike	Jeffersonville
Riverbend Senior Community	2715 Charlestown Pike	Jeffersonville
Riverview Village	586 Eastern Blvd	Clarksville
Safe Harbor Daycare	435 Stansifer Ave	Clarksville
Scotts Funeral Home	2515 Veterans Pkwy	Jeffersonville
Sellersburg Health & Rehab	7823 Old Sr 60	Sellersburg

Facility Name	Address	City
Sellersburg Pediatrics	485 Indiana Ave	Sellersburg
Silver Creek Veterinary Clinic	302 Indiana Ave	Sellersburg
Skees Family Dentistry	1370 Veterans Pkwy	Clarksville
Skees Family Dentistry (Town Center)	4123 Town Center Blvd	Jeffersonville
Smith Family Dentistry	1417 Market	Charlestown
Southern Indiana Clinic (Methadone)	7509 Charlestown Pike	Charlestown
Southern Indiana Dental	111 Heritage Sq	Sellersburg
Southern Indiana Pedicatrics	1701 Spring St	Jeffersonville
Southern Indiana Rehab Hospital	430 Patrol Rd	Jeffersonville
Southside Christian Child Care	157 Quartermaster Ct	Jeffersonville
Sunrise Recovery	1610 Blackiston View Dr	Clarksville
Sunshine Chiropractic	1415 Market St	Charlestown
Svs Vision	748 Eastern Blvd	Clarksville
The Salvation Army	528 Little League Blvd	Clarksville
Traditions At Hunter Station	400 Hunter Station Rd	Sellersburg
Vision Works	1030 Veterans Pkwy	Clarksville
Vistacare Hospice	391 Quartermaster Ct	Jeffersonville
Wall Street Internal Medicine	73 Quartermaster Ct	Jeffersonville
Walnut Creek Nursing Home	1720 8Th St	Jeffersonville
Wedgewood Healthcare	101 Potters Ln	Clarksville
Wellstone Regional Hospital	2700 Vissing Park Rd	Jeffersonville
Westminister Healthcare(Back Building)	2210 Greentree Blvd	Clarksville
Westminister Village	2200 Greentree Blvd	Clarksville
Westmoreland Pharmacy (Youngstown)	1495 10Th St	Jeffersonville
Westmoreland Pharmacy Sellersburg	7600 Sr 60	Sellersburg
Windsor Ridge Assisted Living	2700 Waters Edge Pkwy	Jeffersonville
Wooded Glen Recovery Center	2602 Hebron Church Rd	Henryville
Woodlawn Funeral Home	3106 Middle Rd	Jeffersonville
Yellowwood Terrace	2100 Greentree Blvd	Clarksville
Ymca	4812 Hamburg Pike	Jeffersonville

Table 39. School Facilities

Facility Name	Address	City
Borden Elementary School	301 West St	Borden
Borden High School	301 West St	Borden
Borden Jr High School	301 West St	Borden
Bridgepoint Elementary	420 Ewing Ln	Jeffersonville
Charlestown High School	1 Pirate Pl	Charlestown
Charlestown Middle School	8804 High Jackson Rd	Charlestown
Clark County Middle High School	2710 10Th St	Jeffersonville

Facility Name	Address	City
Clarksville Elementary School	700 Randolph Ave	Clarksville
Clarksville High School	800 Dr Dot Lewis Dr	Clarksville
Clarksville Middle School	101 Ettels Ln	Clarksville
Clarksville Schools Admin Bldg	200 Ettels Ln	Clarksville
Corden Porter School	630 Meigs Ave	Jeffersonville
Crossroad Baptist Church And Schools	6109 Appleleaf Ln	Clarksville
Franklin Square Elementary	605 Court Ave	Jeffersonville
George Rogers Clark School	435 Stansifer Ave	Clarksville
Grc Schools	435 Stansifer Ave	Clarksville
Greater Clark County Schools Transportation	1611 10Th St	Jeffersonville
Greater Clark Schools Admin	2112 Utica Sellersburg Rd	Jeffersonville
Greater Clark Schools Auto Shop	101 Industrial Way	Charlestown
Greater Clark Schools Child Place Suspension	2420 10Th St	Jeffersonville
Greater Clark Schools Transportation	301 11Th St	Jeffersonville
Henryville Elementary School	213 Ferguson St	Henryville
Henryville High School	213 Ferguson St	Henryville
Ivy Tech (Jeffersonville Annex)	1638 Production Rd	Jeffersonville
Ivy Tech (Main Campus)	8204 Cr 311	Sellersburg
Jeffersonville High School	2315 Allison Ln	Jeffersonville
Jeffersonville Tech Center	4403 Hamburg Pike	Jeffersonville
Jonathon Jennings	603 Market St	Charlestown
Kids Care Academy	3416 Hamburg Pike	Jeffersonville
Kids Connection	805 Indiana Ave	Sellersburg
Kids Connection (Jeffersonville)	1207 Bridgeport Dr	Jeffersonville
Lil Giggles Childcare & Preschool	8521 Cr 403	Charlestown
Maple Elementary School	429 Division St	Jeffersonville
Maple Manor Childrens Home	637 Utica St	Sellersburg
Mid America College Of Funeral Service	3111 Hamburg Pike	Jeffersonville
Nachand Fieldhouse	601 Court Ave	Jeffersonville
New Washington Elementary School	224 Poplar St	New Washington
New Washington High School	226 Sr 62	New Washington
New Washington Middle School	226 Sr 62	Nabb
Northaven Elementary	1907 Oakridge Dr	Jeffersonville
Our Lady Of Providence High School	707 Providence Way	Clarksville
Parkview Middle School	1600 Brigman Ave	Jeffersonville
Parkwood Elementary School	748 Spicewood Dr	Clarksville
Pj College Of Cosmetology (Clarksville)	1414 Blackiston Mill Rd	Clarksville
Pjs College Of Cosmetology (Jeffersonville)	1710 10Th St	Jeffersonville
Providence High School	707 Providence Way	Clarksville
Restoration Christian School	11515 Us Route 31	Sellersburg

Facility Name	Address	City
River Valley Middle School	2220 Veterans Pkwy	Jeffersonville
Riverside Elementary	17 Laurel Dr	Jeffersonville
Rock Creek School	8000 Diefenbach Rd	Sellersburg
Sacred Heart School	1840 8Th St	Jeffersonville
Saint Anthony Elementary School	320 Sherwood Ave	Clarksville
Saint Michaels School	102 St Michael Dr	Charlestown
School Of The Wee Ones	423 Main St	Jeffersonville
Silver Creek Elementary	503 Indiana Ave	Sellersburg
Silver Creek High School	557 Renz Ave	Sellersburg
Silver Creek Middle School	495 Indiana Ave	Sellersburg
Silver Creek Primary School	8604 Commerce Park Dr	Sellersburg
Silver Creek Senior High School	557 Renz Ave	Sellersburg
St Pauls Catholic School	216 Schellers Ave	Sellersburg
Thomas Jefferson Elementary	2710 Hamburg Pike	Jeffersonville
Utica Elementary	210 Maplehurst Dr	Jeffersonville
West Clark Education Center	206 New Albany St	Sellersburg
West Clark School Administration	601 Renz Ave	Sellersburg
Wilson Education Center	2101 Grace Ave	Charlestown
Wilson Elementary	2915 Charlestown Pike	Jeffersonville

Table 40. Police Stations

Facility Name	Address	City
Charlestown Police Dept	703 Main St	Charlestown
Clark County Sheriff	501 Court Ave	Jeffersonville
Clark County Sheriff Boat Dock		Jeffersonville
Clark County Training Center	400 Lentz Ave	Charlestown
Clarksville Police Department	1970 Broadway St	Clarksville
Clarksville Police Substation	125 Harrison Ave	Clarksville
Borden Town Hall - Police Station	129 West St	Borden
Indiana Dnr Dist 8 Office	1504 Schlamm Lake Rd	Henryville
Indiana State Police Post	8014 Cr 311	Sellersburg
Jeffersonville Police Department	2218 10Th St	Jeffersonville
Sellersburg Police Department	101 New Albany St	Sellersburg
Utica Police Department	107 4Th St	Jeffersonville

Table 41. Fire Stations

Facility Name	Address	City
Borden Fire Department Station 1	327 Main St	Borden
Borden Fire Department Station 2	20022 Star Valley Way	Borden
Charlestown Fire Department Station 1	800 Park St	Charlestown

Facility Name	Address	City
Charlestown Fire Department Station 2	100 Washington St	Otisco
Charlestown Fire Department Station 3	1900 Patrol Rd	Charlestown
Charlestown Fire Department Station 4	16909 Sr 62	Charlestown
Charlestown Fire Department Station 5	5511 Cr 403	Charlestown
Clarksville Fire Department Station 1	106 Stansifer Ave	Clarksville
Clarksville Fire Department Station 2	2249 Sam Gwin Dr	Clarksville
Clarksville Fire Department Station 3	404 Hale Rd	Clarksville
Jeffersonville Fire Department Station 1	735 Wall St	Jeffersonville
Jeffersonville Fire Department Station 2	2204 10Th St	Jeffersonville
Jeffersonville Fire Department Station 3	1603 Truckers Blvd	Jeffersonville
Jeffersonville Fire Department Station 4	5311 Sr 62	Jeffersonville
Jeffersonville Fire Department Station 5	2006 Allison Ln	Jeffersonville
Monroe Fire Station 1	315 Ferguson St	Henryville
Monroe Fire Station 2	22808 Us Route 31	Underwood
Monroe Fire Station 3	805 Henryville Bluelick Rd	Henryville
New Chapel Ems Substation	605 Crestview Ct	Jeffersonville
New Washington Fire Dept Station 1	23511 Sr 62	New Washington
New Washington Fire Dept Station 2	19020 Marysville Nabb Rd	Marysville
Sellersburg Fire Department Station 1	426 Utica St	Sellersburg
Tri-Township Fire Department Station 1/Hq	601 Hamburg Way	Sellersburg
Tri-Township Fire Department Station 2	1000 Main St	Memphis
Tri-Township Fire Department Station 3	8402 Cr 111	Borden
Utica Fire Department Station 2	3718 Utica Sellersburg Rd	Jeffersonville
Utica Fire Headquarters	5820 Utica Pike	Jeffersonville

Table 42. Emergency Operations Center

Facility Name	Address	City
4H Fairgrounds	9608 SR 62	Charlestown
Central Alarm	110 Indiana Ave	Sellersburg

Critical Facilities

Table 43. Airport Facilities

Facility Name	Use	Address	City
Clark County Airport	Airport	7001 Airport Dr	Sellersburg
South Central Regional Airport Authority	Airport	6003 Propeller Ln	Sellersburg

Table 44. Communication Facilities

Facility Name	Use	Address	City
Clark County 911	Communication	110 Indiana Ave	Sellersburg
Csx Railroad (Dispatch)	Communication	499 Willinger Ln	Jeffersonville

Facility Name	Use	Address	City
Marriott Dr	Outdoor Warning Siren		
12Th @ Walnut	Outdoor Warning Siren		
Parkview Ms	Outdoor Warning Siren		
Lincoln @ Adams	Outdoor Warning Siren		
Hamburg Pike @ Woodlawn	Outdoor Warning Siren		
8Th @ Hopkins	Outdoor Warning Siren		
Allison @ Oakpark	Outdoor Warning Siren		
Elks Club	Outdoor Warning Siren		
Blackiston Mill Rd	Outdoor Warning Siren		
Byron Dr	Outdoor Warning Siren		
Ymca	Outdoor Warning Siren		
Holmans Ln	Outdoor Warning Siren		
Port & Middle	Outdoor Warning Siren		
Charlestown Pk @ Patricia	Outdoor Warning Siren		
Somerset Ct @ Sr 60	Outdoor Warning Siren		
Haus & Indiana	Outdoor Warning Siren		
Salem Noble @ Westwood	Outdoor Warning Siren		
Borden	Outdoor Warning Siren		
Monroe Twp Fd	Outdoor Warning Siren		
Otisco On Chestnut	Outdoor Warning Siren		
Sr 62 @ Dave Carr	Outdoor Warning Siren		
New Washington Hs	Outdoor Warning Siren		
Bethelehem	Outdoor Warning Siren		

Table 45. Hazmat Facilities

Facility Name	Address	City
800422-Crown Castle USA Holman & Allison 800422	3117 Holmans Ln,Jeffersonville, IN 47130	Jeffersonville
800777-CROWN CASTLE-Watson	6321 Shungate Rd,Jeffersonville, IN 47130	Jeffersonville
804583-Crown Castle- IN Arsenal BSI	8505 SR HWY 62,Charlestown, IN 47111	Charlestown
A&R Logistics, Inc.	200 Logistics Avenue,Charlestown, IN 40222	Charlestown
AIG	650 Missouri Avenue,Jeffersonville, IN 47130	Jeffersonville
Airgas Specialty Products-Jeffersonville Facility	5133 Maritime Rd,Jeffersonville, IN 47130	Jeffersonville
Altec Extrusions	242 America Place,Jeffersonville, IN 47130	Jeffersonville
Arctic Minerals LLC	5140 Maritime Road,Jeffersonville, IN 47130	Jeffersonville
Asphalt Supply Company Incorporated	4700 Utica Sellersburg Rd,Sellersburg, IN 47172	Sellersburg

Facility Name	Address	City
AT&T - IN1006	16611SIMA GRAY ROAD,Henryville, IN 47126	Henryville
Autoneum North America, Inc	100 River Ridge Parkway,Jeffersonville, IN 47130	Jeffersonville
Bethlehem Substation	4116 Miles Rd,Bethlehem, IN 47104	Bethlehem
Bitumen Supply	14601 Limestone Branch Road,Charlestown, IN 47111	Charlestown
Blue Rhino / Louisville	2000 Coopers Lane,Jeffersonville, IN 47130	Jeffersonville
Booth Veneers	510 Patrol Road,Jeffersonville, IN 47130	Jeffersonville
Boyd Company - Jeffersonville	6109 Hamburg Pike,Jeffersonsville, IN 47130	Jeffersonsville
Bristol Precast-Charlestown	14701 Limestone Branch Rd,Charlestown, IN 47111	Charlestown
Buzzi Unicem USA Jeffersonville Distribution Terminal	1350 Bates Bowyer Ave,Jeffersonville, IN 47130	Jeffersonville
C89	251 Hilton Dr,Jeffersonville, IN 47130	Jeffersonville
CFFE	305 S NEW ALBANY AVE,Sellersburg, IN 47172	Sellersburg
CHARLESTON CDO - N39127	989 Main St,Charlestown, IN 47111	Charlestown
Charlestown	101 Quality Court,Charlestown, IN 47111	Charlestown
Charlestown Substation	501 Pike St,Charlestown, IN 47111	Charlestown
Chemtrusion, Inc.	1403 Port Road,Jeffersonville, IN 47130	Jeffersonville
Chryso Inc.	10600 SR 62 Unit 7,Charlestown, IN 47111	Charlestown
Clark County Rural Electric Membership Cooperative	7810 SR 60,Sellersburg, IN 47172	Sellersburg
Clark Maritime Center Substation	4010 Middle Rd,Jeffersonville, IN 47130	Jeffersonville
Clark Memorial Hospital	2201 Missouri Ave,Jeffersonville, IN 47130	Jeffersonville
Clark-Floyd Landfill	14304 SR 60,Borden, IN 47106	Borden
Clarksville Operations Center	1212 Eastern Blvd,Clarksville, IN 47129	Clarksville
Clarksville Substation	2520 Lincoln Drive,Clarksville, IN 47129	Clarksville
Consolidated Grain & Barge Co.	5130 Port Rd,Jeffersonville, IN 47130	Jeffersonville
Cook Compression	254,Jeffersonville, IN 47130	Jeffersonville
Cylicron, LLC	5171 Maritime Rd,Jeffersonville, IN 47130	Jeffersonville
Dallas Group of America	1402 Fabricon Blvd,Jeffersonville, IN 47130	Jeffersonville
Delaco Kasle Processing LLC	5146 Maritime Rd,Jeffersonville, IN 47130	Jeffersonville
ECOTECH	6108 Sable Mill Court,Jeffersonville, IN 47130	Jeffersonville
Empiregas	10603 HWY 62,Charlestown, IN 47111	Charlestown
Falls City	5701 E US Hwy 31,Clarksville, IN 47192	Clarksville

Facility Name	Address	City
Formwood Industries Inc.	Production Drive,1601 Production DriveJeffersonville, IN 47130	Jeffersonville
Genpak	251 Paul Garrett Ave,Jeffersonville, IN 47130	Jeffersonville
GF Munich Welding	211 Eastern Blvd,Jeffersonville, IN 47130	Jeffersonville
Hughes Group Inc	6200 E. Hwy 62,Bldg 2501 Suite 100Jeffersonville , IN 47130	Jeffersonville
Idemitsu Lubricants America	701 Port Rd,Jeffersonville, IN 47130	Jeffersonville
IMI IN, LLC, Sellersburg Stone	1019 E, Uitca St. ,Sellersburg , IN 46140	Sellersburg
IN-5264_Charter Communications_CKY Sellersburg Hub	5598 Stratford Court,Charlestown, IN 47111	Charlestown
IN-5267_Charter Communications_CKY Jeffersonville Hub	3408 Industrial Boulevard,Jeffersonville, IN 47130	Jeffersonville
Indiana American Water Company Incorporated	2423 Middle Rd,Jeffersonville, IN 47130-5101	Jeffersonville
Irving Materials, Inc.	1221 OLD Hwy 31 E,Clarksville, IN 47129	Clarksville
Irving Materials, Inc.	9608 Hwy. 62,Charlestown , IN 47111	Charlestown
Jeffersonville	240 2nd Avenue,Jeffersonville, IN 47130	Jeffersonville
Jeffersonville	800 Patrol Rd. Ste 100,Jeffersonville, IN 47130	Jeffersonville
Jeffersonville 138 KV Substation	1900 E 8Th St,Jeffersonville, IN 47130	Jeffersonville
Jeffersonville 7621	6101 Hamburg Pike,Jeffersonville, IN 47130	Jeffersonville
JEFFERSONVILLE C.O. - N39130	229 E Maple St,Jeffersonville, IN 47130-3419	Jeffersonville
Jeffersonville DC	800 Patrol Road,STE 200Jeffersonville, IN 47130	Jeffersonville
Jeffersonville Kentucky Ave. Substation	621 Kentucky Ave,Jeffersonville, IN 47130	Jeffersonville
Jeffersonville LP Plant	3101 Holmans Lane,Jeffersonville, IN 47130	Jeffersonville
Jeffersonville Montgomery Substation	500 E Montgomery Ave,Clarksville, IN 47130	Clarksville
Jeffersonville Potter Rd. Substation	2301 Coppers Ln,Sellersburg, IN 47130	Sellersburg
Jeffersonville Sazerac	101 Lewman Way,Jeffersonville, IN 33801	Jeffersonville
Jeffersonville Town Center Substation	850 Town Center Rd,Jeffersonville, IN 47130	Jeffersonville
JVWH	301 Logistics Ave,Jeffersonville, IN 47130	Jeffersonville
K & M Indiana LLC	301 Pike St,Charlestown, IN 47111	Charlestown
KLS MCS IN	201 RIVER RIDGE PARKWAY, JEFFERSONVILLE, IN 47130	JEFFERSONVILLE
Koetter Woodworking Inc.	533 Louis Smith Road,Borden, IN 47106	Borden
Louisville LO (308)	4885 Keystone Boulevard,Jeffersonville, IN 47130	Jeffersonville
Louisville Plant	350 Logistics Avenue,Louisville, IN 47130	Louisville

Facility Name	Address	City
LOWE'S OF CLARKSVILLE 2542, IN	1350 VETERANS PARKWAY,CLARKSVILLE, IN 47129	CLARKSVILLE
MAC Construction Asphalt	1417 Quarry Road,Jeffersonville, IN 47130	Jeffersonville
MAC Construction Shop	215 Applegate Lane,Jeffersonville, IN 47130	Jeffersonville
Main Plant	3230 Industrial Pkwy,Jeffersonville, IN 47130-9632	Jeffersonville
Marketing Logistics Center	700 Patrol Rd,Jeffersonville, IN 47130	Jeffersonville
Medline Industries C89	251 Hilton Dr,Jeffersonville, IN 47130	Jeffersonville
MEIJER STORE #167	2750 Allison Lane,Jeffersonville, IN 47130	Jeffersonville
Mulzer Crushed Stone Incorporated Charlestown Quarry	15602 Bethlehem Rd,Charlestown, IN 47111	Charlestown
Neovia Logistics	600 Patrol Rd Ste 200,Jeffersonville, IN 47130	Jeffersonville
New Washington 34.5 KV Substation	311 Third St,New Washington, IN 47162	New Washington
NEW WASHINGTON CO - N39143	201 E 1st Street,New Washington, IN 47162	New Washington
NIBCO INCORPORATED	105 QUALITY CT,Charlestown, IN 47111	Charlestown
Off-site Warehouse	401 Salem Road,Jeffersonville, IN 47130	Jeffersonville
OmniSource-Jeffersonville	1534 Loop Rd.,Jeffersonville, IN 47130	Jeffersonville
Optum Pharmacy 702, LLC	1050 Patrol Road,Jeffersonville, IN 47130	Jeffersonville
Orica USA Incorporated	15602 Charlestown Bethlehem Rd,Charlestown , IN 47111	Charlestown
Parker HVAC Division	100 River Ridge Cir,Jeffersonville, IN 47130	Jeffersonville
Pilot Travel Centers 152	14013 Blue Lick Rd,Memphis, IN 47143	Memphis
POSCO AAPC	5140 Loop Road,Jeffersonville, IN 47130	Jeffersonville
PQ Corporation	1101 Quartz Rd,Clarksville, IN 47129	Clarksville
Revere Plastics Systems LLC	5171B Maritime Rd,Jeffersonville, IN 47130-8452	Jeffersonville
River Ridge Central Substation	Duke Street,Charlestown, IN 47111	Charlestown
River Ridge South Substation	6200 E Highway 62,Jeffersonville, IN 47130	Jeffersonville
Ryder Truck Rental 114C	3100 Industrial Pkwy,Jeffersonville, IN 47130	Jeffersonville
S-L Snacks IN, LLC	125 Peacely Street,Jeffersonville, IN 47130	Jeffersonville
Sams Club 4851	1301 Veterans Pkwy,Clarksville, IN 47129	Clarksville
Sanders Farm Service	4612 County Road 160,Charlestown, IN 47111	Charlestown
SDF8	900 PATROL RD,JEFFERSONVILLE, IN 47130	JEFFERSONVILLE
SELLERSBURG CO - N39133	121 Hanger St,Sellersburg, IN 47172	Sellersburg

Facility Name	Address	City
Sellersburg Plant	4710 Utica Sellersburg Road,Sellersburg, IN 47172-9325	Sellersburg
Sellersburg Storage Field	W corner of Stacy Rd & High Jackson Rd,Charlestown, IN 47111	Charlestown
Sellersburg Substation	6405 Diefenbach Road,Sellersburg, IN 47172	Sellersburg
Sellersburg Water Department	3221 Holman Lane,Jeffersonville, IN 47130	Jeffersonville
Shelby County Co-op - Underwood	1749 Country Lake Rd,Underwood, IN 47177	Underwood
Sherwin-Williams #1286	4730 New Middle Rd.,Jeffersonville, IN 47130	Jeffersonville
Smyrna Ready Mix 204	2220 Hamburg Pike,Jeffersonville, IN 47130	Jeffersonville
Speed	301 Highway 31,Sellersburg, IN 47172	Sellersburg
Speedway 5018	401 E Lewis and Clark Pkwy,Clarksville, IN 47129	Clarksville
Steel Dynamics Inc. - Jeffersonville	5134 Loop Rd,Jeffersonville, IN 47130	Jeffersonville
Sunbelt Rentals PC 140	1634 Broadway St,Clarksville, IN 47129	Clarksville
Tanco Clark Maritime LLC	5144 Utica Pike Road,Jeffersonville, IN 47130	Jeffersonville
Tenneco Automotive Operating Company Inc	800 Trey Street,Jeffersonville, IN 47130	Jeffersonville
The Home Depot Store #2002	1000 East Hwy 131,Clarksville, IN 47129	Clarksville
Thorntons #47	2980 HWY 62 East,Jeffersonville, IN 47130	Jeffersonville
Trend Offset Printing	100 Quality Ct,Charlestown, IN 47111	Charlestown
U.S. Census Bureau	1201 E. 10th Street,Jeffersonville, IN 47130	Jeffersonville
United Parcel Service Clarksville	2234 Koetter Dr,Clarksville, IN 47129	Clarksville
Verizon Wireless New Albany (ID:203333)	1208 Emery Crossing Road,Clarksville, IN 47129	Clarksville
Verizon Wireless - Sellersburg (ID:51334)	311 Prather Street,Sellersburg, IN 47172	Sellersburg
Watco Terminals and Port Services	5146 Loop Road,Jeffersonville, IN 47130	Jeffersonville

Table 46. Potable Water

Facility Name	Address	City
Borden Water Co	1791 Water St	Borden
Charlestown Water Pumping Station	215 Charlestown Landing Rd	Charlestown
Indiana American Water	2423 Middle Rd	Jeffersonville
Indiana American Water Charlestown Pumping Station	229 Charlestown Landing Rd	Charlestown
Marysville Otisco Water Company	7703 Sr 3	Otisco
Rural Membership Water Corp	301 Ferguson St	Henryville
Silver Creek Water	8104 County Line Rd	Sellersburg
Stucker Fork Water Utility	2260 Us-31	Scottsburg
Sunflower Valley Water	319 Saint Joe Rd	Sellersburg

Washington Twp Water	108 Pierce St	New Washington
Watson Water Corp	4106 Utica Sellersburg Rd	Jeffersonville

Table 47. Waste Water Treatment Plants

Facility Name	Address	City
Charlestown Wastewater Plant	289 Charlestown Landing Rd	Charlestown
Clarksville Sewer Plant	1 Leuthart Dr	Clarksville
Jeffersonville Waste Water (Bates Bowyer)	1420 Bates Bowyer Ave	Jeffersonville
Jeffersonville Waste Water (Lewman Way)	423 Lewman Way	Jeffersonville
Deam Lake Waste Water Treatment Plan	1217 Deam Lake Rd	Borden
Sellersburg Water Treatment Facility	3201 Holmans Ln	Jeffersonville
Borden Wastewater Treatment Plant	19407 Hayes Rd	Borden
Washington Twp Regional Wastewater	11616 Nabb-New Washington Rd	New Washington
Memphis Wastewater Treatment Plant	15100 Silver Maple Ct	Memphis

Appendix E: Hazard Maps

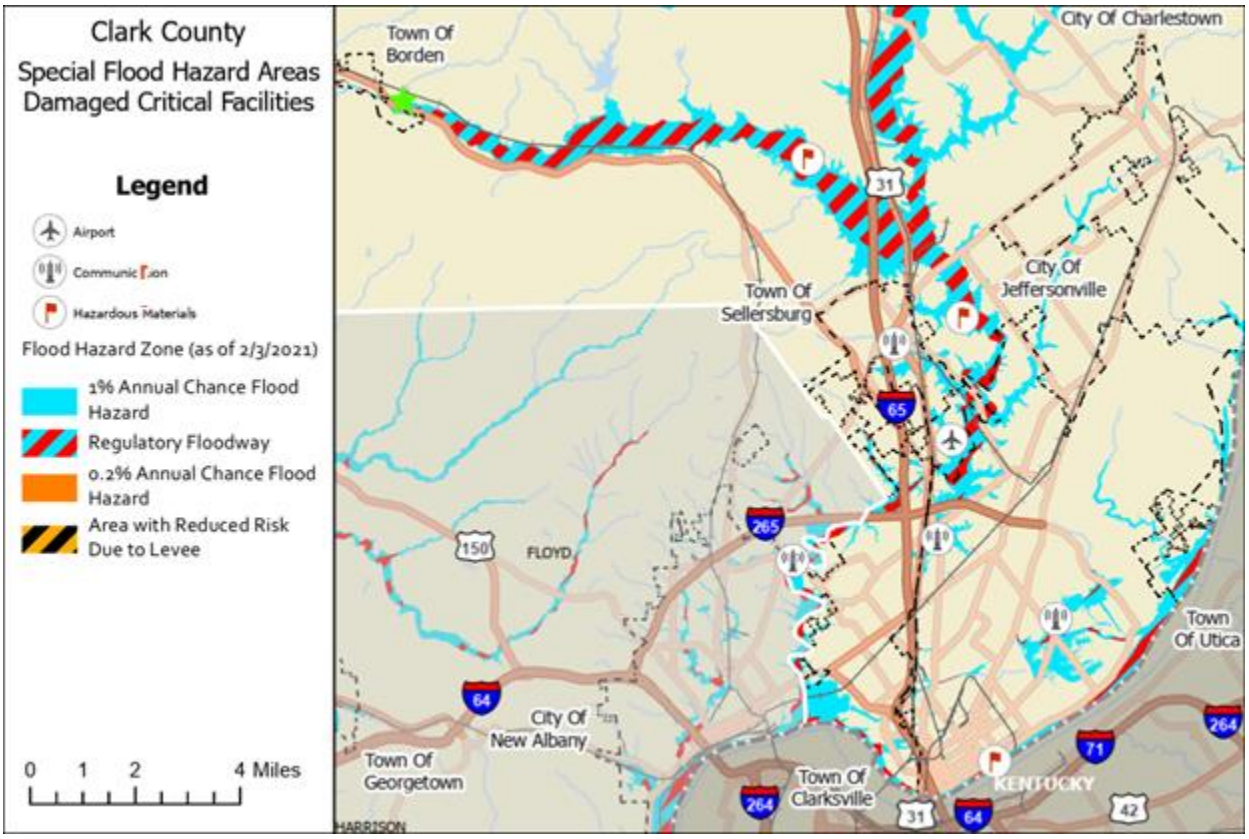

Figure 71. Special Flood Hazard Area: Damaged Critical Facilities

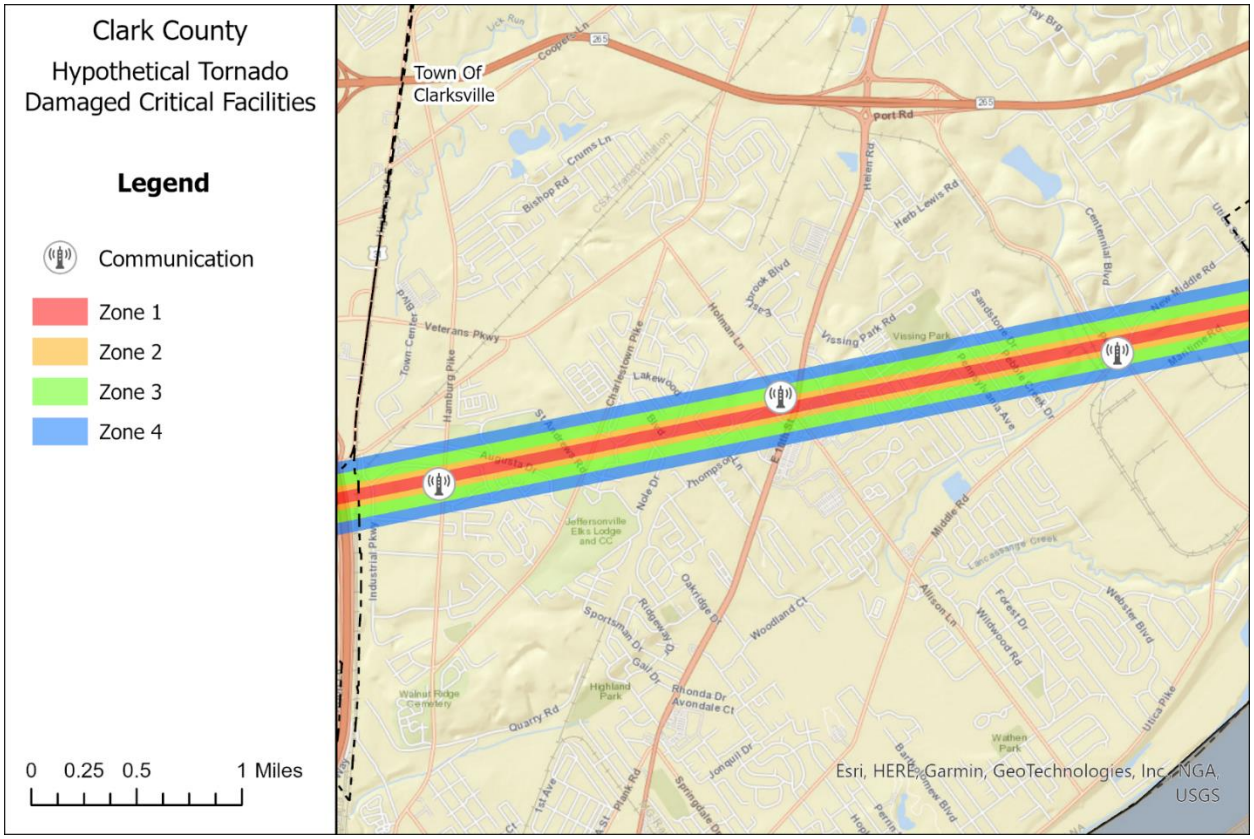

Figure 72. Tornado: Damaged Critical Facilities

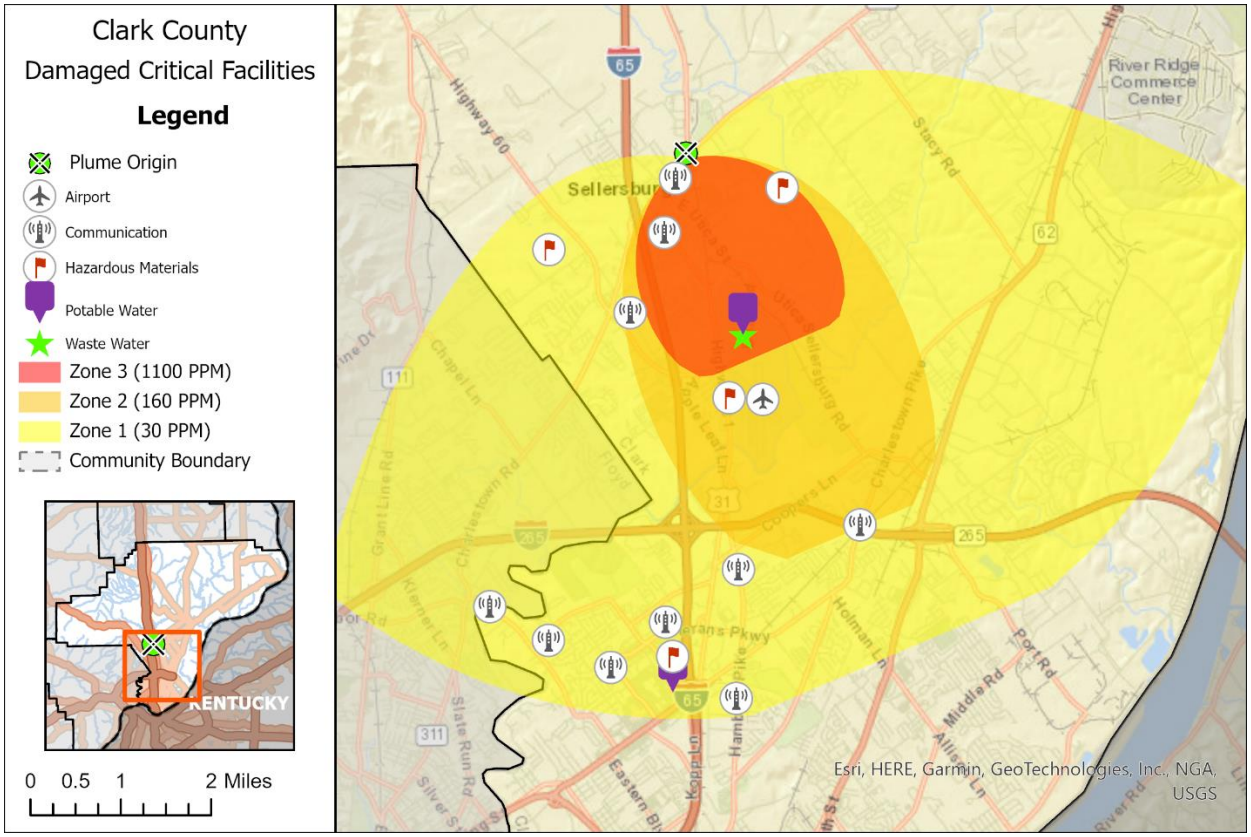

Figure 73. Hazardous Materials Release: Damaged Critical Facilities

Appendix F: Community Capability Assessment Results

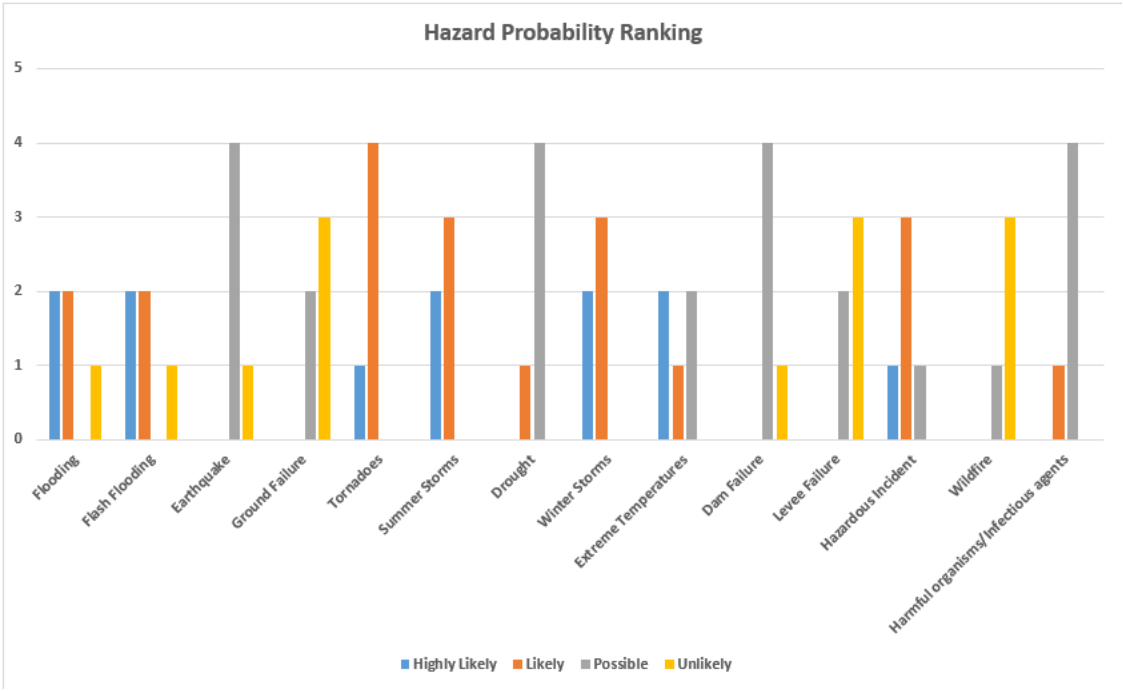

Figure 74. Hazard Priority Survey Results. Total of 5 Reponses.

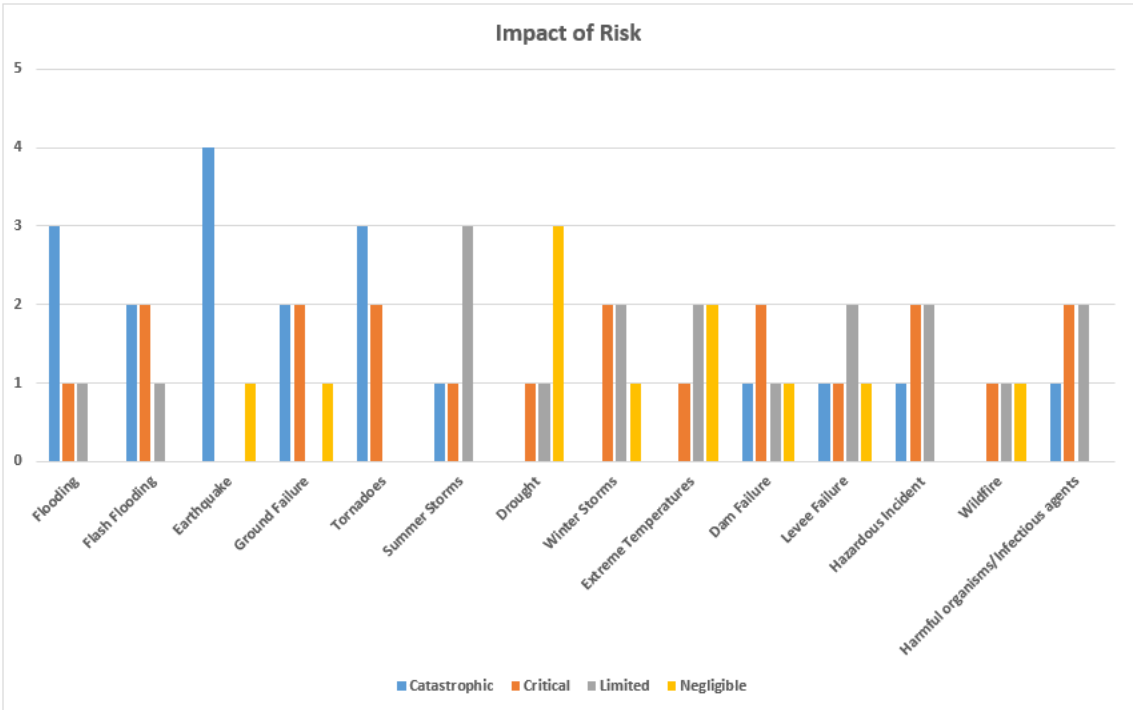

Figure 75. Hazard Priority Rank Survey. Total of 5 Responses.

Multi-Hazard Mitigation Plan Update

Mitigation Strategies

Community Name Town of Clarksville

The purpose of this planning effort is to identify the hazard that most affect your community and then identify projects and strategies that could reduce the potential for loss of life or property in the event of future disasters. This worksheet is meant to help prepare materials for the planning document and meetings. **We want to make sure every community is represented in the plan.**

Flood:

- Is flooding a major problem in your community (YES or NO)
- What is the major reason or source of flooding?
    1. Backwater from the Ohio River flows into the various tributaries.
    2. Failure of flapper gates to completely seal on levee penetrations.

- What could be done to reduce future flooding?
    1. Voluntary Buyouts
    2. Updating and upgrading flood control pumps for Cane Run and Mill Creek ponding areas
    3. Installation of secondary shut-offs at all levee penetrations for positive closure

Dam/Levee Failure:

- Will your community be impacted by any dam/levee failure? (YES or NO)
- If so what could be done to reduce the risk of failure?
    1. Continue regular dam/levee inspections.
    2. Public campaign to increase the number of residents signed up for Clark Counties warning system (Everbridge).

Tornado:

1. What could be done to reduce damage and loss of life?
    1. Maintain early warning devices
    2. Weather radio giveaways
    3. Public education on safe places in a home
    4. Public campaign to increase the number of residents signed up for Clark Counties warning system (Everbridge)

Earthquake:

- What could be done to reduce damage and loss of life?
    1. Additional public education on earthquake safety.
    2. More stringent building codes.

The Polis Center

Severe Summer Storms:

- What could be done to reduce damage and loss of life? EXAMPLE:
    1. Develop family emergency plans during Severe Weather Week in schools.
    2. Maintain early warning devices
    3. Weather radio giveaways
    4. Public campaign to increase the number of residents signed up for Clark Counties warning system (Everbridge)

Winter Storms:

- What could be done to reduce damage and loss of life?
    1. purchase back- up generators for public facilities.
    2. Public campaign to increase the number of residents signed up for Clark Counties warning system (Everbridge)

Hazardous Material Spills:

- What could be done to reduce damage and loss of life?
    1. Continue hazardous spill training and field exercises for emergency personnel.

Which of the hazards listed above is the biggest threat to your community? Explain why in detail.

- Levee Failure: Although levee failure is somewhat unlikely, what has happened twice since 2011 and is more likely to happen again, is the failure of a flapper gate located at the end of a levee penetration to automatically seal it off when the river comes up resulting in the flooding of several homes and businesses.
- Flooding: As with all communities along the Ohio, Clarksville suffers from annual riverine flooding. This affects the residents and businesses in many ways. Even if the water doesn't encroach into their structures it has a negative impact on transportation because of road closures. It is also costly for the Town because of the need for additional manpower to deal with not only the flood waters but also the cleanup afterwards. The Town has also suffered at least one fatality due to flooding in the past.
- Severe Summer Storms: Severe summer storms also cause many issues for the Town of Clarksville. Everything from power outages at some municipal facilities to flash flooding of homes and businesses have occurred in the past along with street flooding causing damage to vehicles and to the drainage system itself.
- Tornado: Tornados are a serious threat to the entire Midwest and Clarksville is no exception. As a community with a large number of homes that were built prior to the adoption of more modern and safer building codes. It is anticipated that these may not fair well in even a less powerful tornado.

Submitted by: Thomas Clevidence, MS4 and Floodplain Administrator

The Polis Center

Multi-Hazard Mitigation Plan Update

Mitigation Strategies

Community Name Electric Utility Clark County REMC

The purpose of this planning effort is to identify the hazard that most affect your community and then identify projects and strategies that could reduce the potential for loss of life or property in the event of future disasters. This worksheet is meant to help prepare materials for the planning document and meetings. **We want to make sure every community is represented in the plan.**

Flood:

- Is flooding a major problem in your ~~community~~ service area. (YES or (NO)) along Ohio River Bushman's Lake area
- What is the major reason or source of flooding? Rising river or flash flood in other areas
- What could be done to reduce future flooding? EXAMPLE: Voluntary Buyouts

Dam/Levee Failure:

- Will your community be impacted by any dam/levee failure? (YES or NO)
- If so what could be done to reduce the risk of failure? EXAMPLE: enforce dam/levee inspections.

Tornado:

- What could be done to reduce damage and loss of life? EXAMPLE: install warning sirens in mobile home communities.

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Earthquake:

- What could be done to reduce damage and loss of life? EXAMPLE: bolt bookshelves to walls in all schools.

Severe Summer Storms:

- What could be done to reduce damage and loss of life? EXAMPLE: develop family emergency plans during Severe Weather Week in schools.

Winter Storms:

- What could be done to reduce damage and loss of life? EXAMPLE: purchase back- up generators for public facilities.

Hazardous Material Spills:

- What could be done to reduce damage and loss of life? EXAMPLE: identify current and establish alternate approved routes for transporting hazardous materials.

Which of the hazards listed above is the biggest threat to your ~~community~~ service area? Explain why in detail.

1. Tornados
2. Summer Storms
3. Winter Storms

> Loss of power

Submitted by: <Name>,<Title> Dave Barton
Manager of Operations & Engineering

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Multi-Hazard Mitigation Plan Update

Mitigation Strategies

Community Name Town of Sellersburg

The purpose of this planning effort is to identify the hazard that most affect your community and then identify projects and strategies that could reduce the potential for loss of life or property in the event of future disasters. This worksheet is meant to help prepare materials for the planning document and meetings. **We want to make sure every community is represented in the plan.**

Flood:

- Is flooding a major problem in your community (YES)
- What is the major reason or source of flooding?

Poor Planning in design of I-65, US31, and railroad through the center of watersheds within Sellersburg. Under capacity storm infrastructure

- What could be done to reduce future flooding? EXAMPLE: Voluntary Buyouts

Buyouts, regional detention basins in the up-stream portions of the watersheds

Dam/Levee Failure:

- Will your community be impacted by any dam/levee failure? (NO)
- If so what could be done to reduce the risk of failure? EXAMPLE: enforce dam/levee inspections.

NA

Tornado:

- What could be done to reduce damage and loss of life? EXAMPLE: install warning sirens in mobile home communities.

Sellersburg is in need of additional warning sirens. Siren infrastructure has not maintained growth with added population and expansion of the Town.

Earthquake:

- What could be done to reduce damage and loss of life? EXAMPLE: bolt bookshelves to walls in all schools.

Unknown

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Severe Summer Storms:

- What could be done to reduce damage and loss of life? EXAMPLE: develop family emergency plans during Severe Weather Week in schools.

See responses under flooding.

Winter Storms:

- What could be done to reduce damage and loss of life? EXAMPLE: purchase back- up generators for public facilities.

Unknown

Hazardous Material Spills:

- What could be done to reduce damage and loss of life? EXAMPLE: identify current and establish alternate approved routes for transporting hazardous materials.

Cross agency training for Town staff with Township fire and County, and state agencies.

Which of the hazards listed above is the biggest threat to your community? Explain why in detail.

Flooding is the number one and most consistent hazard. Flooding on state roads backs up and causes town roads to flood. US31 has been closed 4 times in 2 years. When the closure happens, 2 residential neighborhoods (approx. 500 households) are cut off from ingress and egress of all vehicles including emergency responders.

Submitted by: Charlie Smith; Town Manager of the Town of Sellersburg

The Polis Center

Multi-Hazard Mitigation Plan Update

Mitigation Strategies

Community Name Tri Township fire Protection district (Car , Union and Silver Creek Townships.)

The purpose of this planning effort is to identify the hazard that most affect your community and then identify projects and strategies that could reduce the potential for loss of life or property in the event of future disasters. This worksheet is meant to help prepare materials for the planning document and meetings. **We want to make sure every community is represented in the plan.**

Flood:

- Is flooding a major problem in your community
  - (NO) ***Only during major rain events***
- What is the major reason or source of flooding?
  - ***When Creeks get blocked and there is a several day rain event or multi inches a hour down pour.***
- What could be done to reduce future flooding? EXAMPLE: Voluntary Buyouts

Dam/Levee Failure:

- Will your community be impacted by any dam/levee failure?
  - (NO)
- If so what could be done to reduce the risk of failure? EXAMPLE: enforce dam/levee inspections.

Tornado:

- What could be done to reduce damage and loss of life? EXAMPLE: install warning sirens in mobile home communities.
  - ***Not sure, there is already sirens , maybe some central shelters that people can evacuate too.***

Earthquake:

- What could be done to reduce damage and loss of life? EXAMPLE: bolt bookshelves to walls in all schools.
  - ***Education campaign, Add it to a community life safety inspection program. Start with an evaluation of all public building and Assemblies in area. have go medical bags at multiple locations and 2 multi casualty trailers with a program to maintain all equipment.***

Severe Summer Storms:

- What could be done to reduce damage and loss of life? EXAMPLE: develop family emergency plans during Severe Weather Week in schools.
  - Education in schools
  - Also bring training to civil groups and churches.
  - Public building with back up power and emergency supplies.
  - Civilian volunteer work force that can be called on to clear roads (directory and training and back ground checks)
  - Create list of those on oxygen and are those that might be at risked and should be checked on. The volunteers or fire or police can check on as needed with the data being stored at central alarm.

Winter Storms:

- What could be done to reduce damage and loss of life? EXAMPLE: purchase back- up generators for public facilities.
  - back- up generators for public facilities.
  - On spot chains for some emergency vehicles.
  - The list of at-risk people (see above.)
  - Have a couple 4x4 ambulances (fire based or part of county contract.)
  - Encourage all public agencies to have one designated winter storm vehicle with GPS tracking (central alarm can monitor.)
  - List of civilians with vehicle along with addresses (must clear back ground and a training.)
  - A community gathering place in each community as emergency shelter and a plan to activate it.
  - Equip all fire apparatus with automatic chains

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Capabilities	County	Borden	Charlestown	Clarksville	Jeffersonville	Sellersburg	Utica
	Funding Sources						
Capital Improvements Project Funding	Yes	Yes	Yes	Yes	Yes	Yes	No
Authority to Levy Taxes for Specific Purposes	Yes	No	Yes	-	Yes	Yes	Yes
Fees for water, sewer, gas, or electric services	Yes	Yes	Yes	Yes	Yes	Yes	No
Impact fees for new development	-	No	No	No	No	No	Yes
Storm Water Utility Fee	Yes	No	No	Yes	Yes	No	Yes
Incur Debt through general obligation bonds and/or special tax bonds	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Community Development Block Grant	Yes	No	Yes	Yes	Yes	-	Yes
	Staff						
Chief Building Officer	Yes	No	Yes	Yes	Yes	Yes	Yes
Floodplain Administrator	Yes	No	Yes	Yes	Yes	-	Yes
Emergency Manager	Yes	No	Yes	Yes	Yes	-	Yes
Community Planner	Yes	No	Yes	Yes	Yes	-	Yes
Civil Engineer	Yes	No	Yes	No	Yes	-	Yes
GIS Coordinator	Yes	No	Yes	Yes	Yes	-	No
	Administrative & Planning						
Planning Commission	-	No	Yes	Yes	Yes	Yes	Yes
Mitigation Planning Committee	Yes	No	Yes	No	Yes	-	Yes
Maintenance Programs to Reduce Risk	-	Yes	Yes	Yes	Yes	Yes	Yes
Mutual Aid Agreements	Yes	No	Yes	Yes	Yes	-	Yes
Warning Systems/Services (Ie. Reverse 911, Outdoor Warning Signals)	Yes	Yes	Yes	Yes	Yes	-	No
Hazard Data & Information	Yes	No	Yes	Yes	-	-	Yes
Grant Writing	Yes	Yes	Yes	Yes	Yes	-	Yes
	Education & Outreach						

Capabilities	County	Borden	Charlestown	Clarksville	Jeffersonville	Sellersburg	Utica
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access, and functional needs populations, etc.	Yes	No	Yes	No	-	No	Yes
Ongoing public education o-r information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes	Yes	Yes	Yes	-	Yes	Yes
Natural disaster or safety related school programs	Yes	No	Yes	Yes	-	No	Yes
StormReady certification	Yes	-	No	No	-	No	No
Firewise Communities Certification	No	-	No	No	-	No	No
Public-private partnership initiatives addressing disaster-related issues	Yes	No	No	No	-	No	Yes

Capabilities	Borden Henryville SC	Clarksville Community SC	Greater Clark County Schools	Rock Creek Community Academy	Silver Creek SC	Jefferson-Clarksville Flood Control District
	Funding Sources					
Capital Improvements Project Funding	Yes	No	-	No	No	No
Authority to Levy Taxes for Specific Purposes	Yes	Yes	N/A	No	Yes	No
Fees for water, sewer, gas, or electric services	N/A	N/A	N/A	-	No	No
Impact fees for new development	N/A	N/A	N/A	-	No	No
Storm Water Utility Fee	N/A	N/A	N/A	-	No	No
Incur Debt through general obligation bonds and/or special tax bonds	Yes	Yes	Yes	Yes	Yes	No
Community Development Block Grant	N/A	N/A	N/A	-	No	No
	Staff					
Chief Building Officer	N/A	N/A	Yes	Yes	No	Yes
Floodplain Administrator	N/A	N/A	N/A	-	No	Yes
Emergency Manager	Yes	N/A	Yes	Yes	No	Yes
Community Planner	N/A	N/A	N/A	-	No	Yes

Capabilities	Borden Henryville SC	Clarksville Community SC	Greater Clark County Schools	Rock Creek Community Academy	Silver Creek SC	Jefferson-Clarksville Flood Control District
Civil Engineer	N/A	N/A	N/A	-	No	Yes
GIS Coordinator	N/A	N/A	N/A	-	No	Yes
	Administrative & Planning					
Planning Commission	N/A	N/A	N/A	-	No	Yes
Mitigation Planning Committee	Yes	Yes	N/A	-	No	Yes
Maintenance Programs to Reduce Risk	Yes	N/A	Yes	Yes	No	Yes
Mutual Aid Agreements	N/A	N/A	Yes	-	No	Yes
Warning Systems/Services (Ie. Reverse 911, Outdoor Warning Signals)	Yes	Yes	Yes	Yes	Yes	Yes
Hazard Data & Information	N/A	N/A	N/A	N/A	No	Yes
Grant Writing	Yes	Yes	N/A	Yes	Yes	No
	Education & Outreach					
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access, and functional needs populations, etc.	N/A	N/A	N/A	-	No	Yes
Ongoing public education o-r information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	N/A	Yes	Yes	-	Yes	No
Natural disaster or safety related school programs	Yes	Yes	Yes	No	Yes	Yes
StormReady certification	N/A	No	N/A	No	No	No
Firewise Communities Certification	N/A	No	N/A	No	No	No
Public-private partnership initiatives addressing disaster-related issues	Yes	Yes	N/A	No	Yes	Yes

Appendix G: Adopting Resolutions

RESOLUTION OF THE CITY OF _____

ADOPTION OF THE CLARK 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 Clark 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 Clark County Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects and costs; and

WHEREAS, the Clark County Plan includes a maintenance or implementation process including plan updates, integration of the plan into other planning documents and how Clark 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 Clark County Multi-Hazard Mitigation Plan will make the county and participating jurisdictions eligible to receive FEMA hazard mitigation assistance grants; and

WHEREAS, Clark 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 CLARK COUNTY, INDIANA, that the City of _____ supports the hazard mitigation planning efforts and wishes to adopt the Clark 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 _____, 202_.

_____

Attest:

_____