Clinton County, Illinois Multi-Hazard Mitigation Plan

A 2017 Update of the 2010 Countywide MHMP

FEMA

IEMA
ILLINOIS EMERGENCY MANAGEMENT AGENCY

SIU
Southern Illinois University
CARBONDALE

Multi-Hazard Mitigation Plan

Clinton County, Illinois

Adoption Date: -- _____ --

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Clinton County Board

Robert Fix, Chairman
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Larry Johnson
Rafael Him
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Section 1. Introduction

Hazard mitigation is any sustained action to reduce or eliminate long-term risk to human life and property from hazards. The Federal Emergency Management Agency (FEMA) makes reducing hazards one of its primary goals; hazard-mitigation planning and the subsequent implementation of mitigation projects, measures, and policies is a primary mechanism in achieving FEMA's goal.

The Multi-Hazard Mitigation Plan (MHMP) is a requirement of the Federal Disaster Mitigation Act of 2000 (DMA 2000). The development of a local government plan is required in order to maintain eligibility for certain federal disaster assistance and hazard mitigation funding programs. In order for the National Flood Insurance Program (NFIP) communities to be eligible for future mitigation funds, they must adopt an MHMP.

In recognition of the importance of planning in mitigation activities, FEMA created Hazus Multi-Hazard (Hazus-MH), a powerful geographic information system (GIS)-based disaster risk assessment tool. This tool enables communities of all sizes to estimate losses from floods, hurricanes, earthquakes, and other natural hazards and to measure the impact of various mitigation practices that might help reduce those losses. The Illinois Emergency Management Agency (IEMA) has determined that Hazus-MH should play a critical role in the risk assessments performed in Illinois.

Clinton County completed their first Multi-Hazard Mitigation Plan in 2010. Throughout the five-year planning cycle, the Clinton County Emergency Management Agency and Mitigation Planning Team reconvened to monitor, evaluate, and update the plan on an annual basis. Southern Illinois University Carbondale (SIU), Southwestern Illinois Planning Commission (SIPC) and Clinton County have joined efforts in updating the county's first mitigation plan. The update process addressed changes in the probability and impact of specific hazards to the county, as well as changes in land-use, population, and demographics. The plan incorporates detailed GIS and Hazus-MH Level 2 analyses to improve the risk assessment, and finally revised and updated mitigation strategies. This document hereby serves as the 2017 Clinton County Multi-Hazard Mitigation Plan update.

Section 2. Planning Process

2.1 Timeline

The MHMP update process is broken into a series of four meetings. These meetings are organized by SIU and hosted by the Clinton County Emergency Management Agency (EMA). At these four meetings, various tasks are completed by SIU, SIPC, and the Clinton County Multi-Hazard Mitigation Planning Team:

Meeting 1: Introduction of the MHMP process and organize resources. SIU gathered local resources that contributed to the detailed county risk assessment and presented the county's historical hazards. Based on this information, the Planning Team identified natural hazards to include in the plan, and ranked hazards by potential damages and occurrences.

Meeting 2: SIU presented the draft risk assessment, derived from the Hazus-MH and GIS modeling of the identified disasters, to the Planning Team. The general public was invited to this meeting through a series of newspaper articles and/or radio spots. At the end of the meeting, SIU encouraged the general public to ask questions and provide input to the planning process, fulfilling one of FEMA's requirements for public input.

Meeting 3: This meeting also consisted of a "brainstorming session." The Planning Team lent local knowledge to identify and prioritize mitigation strategies and projects that can address the threats identified in the risk assessment. FEMA requires the plan to contain mitigation strategies specific to each hazard and for each incorporated area within the county. At this meeting, SIU and SIPC presented options for funding implementation of different mitigation strategies, including a written guide to be distributed to all participants.

Meeting 4: The Planning Team reviewed the draft plan and, proposed revisions, and accepted the plan after SIU incorporated the necessary changes. Subsequently, SIU forwarded the county MHMP to the mitigation staff at the Illinois Emergency Management Agency (IEMA) for review prior to submitting it to FEMA.

2.2 Jurisdiction Participation Information

Approximately fourteen jurisdictions participated in the development of this MHMP with the intent of formally adopting the plan and subsequently fulfill the requirements of the DMA 2000. Various representatives from each jurisdiction were present at the meetings (see Section 2.3 Planning Team

Information). Each jurisdiction falls under the one of the following categories: County, City, Village, Town, School, or Non-Profit Organization.

Participating Jurisdictions

Clinton County	**Breese**	**New Baden**
Albers	**Carlyle**	**Saint Rose**
Aviston	**Damiansville**	**Trenton**
Bartelso	**Germantown**	**Clinton County Animal Control**
Beckemeyer	**Hoffman**	

2.3 Planning Team Information

Timothy Schleper, Clinton County EMA Coordinator, heads the Planning Team. The Planning Team includes representatives from various county departments, municipalities, and public and private utilities. Members of the Planning Team have a common vested interest in the county's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. All members of the Planning Team actively participated in the meetings, reviewed and provided comments on the draft plan, participated in the public input process and the county's formal adoption of the plan.

Clinton County Planning Team Members

Jurisdiction	Name	Title
Clinton County	Timothy Schleper	EMA Coordinator
	Joyce Lucas	Planning & Zoning Administrator
	Dan Behrens	County Engineer
	Charles Simpson	Board Member
	James Rackers	Board Member, District 5
Albers, Village of	Kevin Kenow	Trustee
Aviston, Village of	Michael Buscher	Village Administrator
Bartelso, Village of	John Wilken	Mayor
	Mike Gebke	Village Clerk
Beckemeyer, Village of	Carrie Jurgensmeyer	Deputy Clerk
	Rodney Rakers	ESDA Coordinator
Breese, City of	Charles Hilmes	Mayor
	Bob Wuest	Fire Chief
	Robert Fix	Police Chief
Carlyle, City of	Mark Pingsterhaus	Police Chief
	Andrew Brethorst	Police Sergeant
Damiansville, Village of	Herman Jansen	Village President
Germantown, Village of	Jeff Wuebbles	Police Chief
Hoffman, Village of	William Guile	Village President
New Baden, Village	Michael Hemmer	Village Administrator
	Scott Meinhardt	Police Chief
Saint Rose, Village of	Justin Detmer	Trustee
Trenton, City of	Mike Jones	Police Chief

Jurisdiction	Name	Title
Clinton County Animal Control	Don Deiters	Animal Control Warden

The DMA 2000 planning regulations require that Planning Team members from each jurisdiction actively participate in the MHMP process. The Planning Team was actively involved on the following components:

- Attending the MHMP meetings
- Providing available assessment and parcel data and historical hazard information
- Reviewing and providing comments on the draft plans
- Coordinating and participating in the public input process
- Coordinating the formal adoption of the plan by the county

The first MHMP meeting was held in Carlyle, Illinois on October 18th, 2016. Representatives from SIU explained the rationale behind the MHMP process and answered questions from the participants. SIU representatives also provided an overview of GIS/Hazus-MH, described the timeline and the process of mitigation planning.

The Clinton County Planning Team assembled for four formal meetings. Each meeting was approximately two hours in length. Appendix A includes the minutes for all meetings. During these meetings, the Planning Team successfully identified critical facilities, reviewed hazard data and maps, identified and assessed the effectiveness of existing mitigation measures, established mitigation projects for the future, and assisted with preparation of the public participation information.

Planning Meetings

MEETING 1	Oct 18th, 2016
MEETING 2	Jan 19th, 2017
MEETING 3	March 29th, 2017
MEETING 4	September 13th, 2017

2.4 Public Involvement

The Clinton County EMA solicited public input throughout the planning process a public meeting was held on January 19, 2017 to review the county's risk assessment. The public was encouraged to recommend mitigation strategies. Appendix A contains the minutes from the public meeting. Appendix B contains press releases and/or articles sent to local newspapers throughout the MHMP development process.

2.5 Neighboring Community Involvement

The planning team invited participation from various representatives of county government, local city and town governments, community groups, local businesses, and universities. The planning team also invited participation from neighboring counties to obtain their involvement in the planning process.

Neighboring Community Participation

Person Participating	Neighboring Jurisdiction	Title/Organization
Rick Greten	Washington County	Washington County ESDA and County Zoning
Allan Davis	Bond County	Bond County EMA
Herbert Simmons	St. Clair County	St. Clair County EMA
Frank Miles	Madison County	Madison County Planning & Development
Gary Pondrom	East West Gateway Council of Governments	East-West Gateway Council of Governments

2.6 Review of Technical Documents

The Clinton County Planning Team identified technical documents from key agencies to assist in the planning process. These documents includ land use plans, comprehensive plans, emergency response plans, municipal ordinances, and building codes. The following technical data, reports, and studies were utilized:

- Federal Emergency Management Agency
  - *Developing the Mitigation Plan (April 2003)*
  - *Mitigation Ideas (January 2003)*
  - *Local Mitigation Planning Handbook*
- United State Census Bureau
  - *County Profile Information*
  - *2010 Census Data*
  - *American Community Survey (2009-2013)*
- United States Department of Transportation
  - *PHMSA Hazardous Materials Incident Data*
- United States Geological Survey
  - *Earthquake Data*
- United States Army Corps of Engineers
  - *National Inventory of Dams*
  - *National Levee Database*
- NOAA National Climatic Data Center
  - *Climate Data*
- NOAA / National Water Service Storm Prediction Center
  - *Severe Weather Data*
- Illinois Emergency Management Agency
  - *2013 Illinois Natural Hazard Mitigation Plan*
  - *Hazardous Materials Incident Reports*
- Illinois Environmental Protection Agency
  - *2014 303d Listed Waters and Watershed Maps*
- Illinois State Water Survey
  - *Climate Data*
- Illinois Department of Natural Resources
  - *Repetitive Loss Data*
  - *Dam and Levee Data*
- Illinois State Geological Survey
  - *Geologic Data*
- Clinton County
  - *2013 Assessment Records*
  - *2013 Countywide GIS Parcel Database*

2.7 Adoption by Local Government

Upon IEMA and FEMA approval, the Planning Team presented and recommended the plan to the County Board for formal adoption. The plan was formally adopted by the Clinton County Board on <adoption date>. The Planning Team worked with the county and its jurisdictions to ensure all parties formally adopted the plan. Appendix C contains the Adopting Resolutions for each participating jurisdiction.

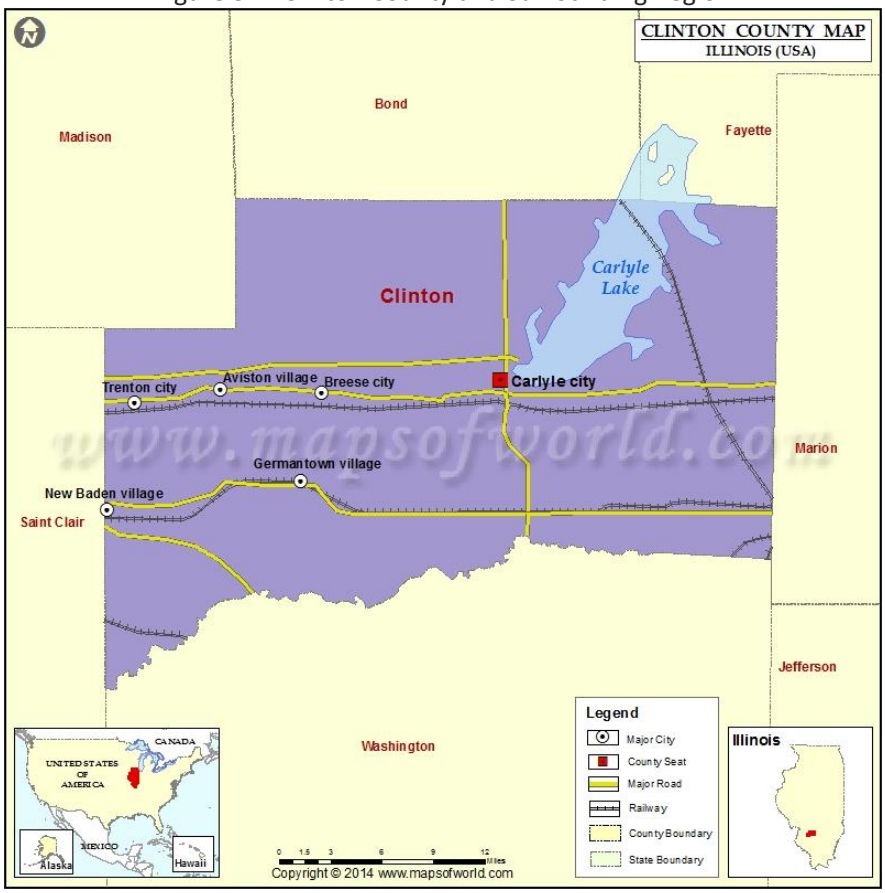
Section 3. County Profile

3.1 County Background

Formally organized in 1824 out of Washington, Fayette and Bond Counties, Clinton County was named in honor of DeWitt Clinton, the seventh Governor of New York, who helped build the Erie Canal. Carlyle, the county seat, was founded in 1818. In approximately 1808 settlers first arrived in what is now Clinton County when a wagon road, the Goshen Road, was laid out across the area from Alton to Shawneetown. The wagon road crossed the Kaskaskia River at a natural ford resulting from the hard river bottom near the point where the City of Carlyle is now situated. Later, a prairie fort was constructed at the Carlyle site which afforded settlers protection from Native American attacks. The historic General Dean Bridge was constructed in 1859, at a cost of $40,000, at the spot where the natural ford in the river is situated. The General Dean Bridge is the only suspension bridge of its kind in the State of Illinois.

Clinton County is located in the southwestern region of Illinois about 30 miles east of St. Louis metropolitan areas. It is bordered on the North by Bond County and Fayette Counties, on the Northwest by Madison County, on the South by the Kaskaskia River and Crooked Creek which separates Clinton County from Washington County, on the West by Saint Clair County, and on the East by Marion County (Figure 3-1).

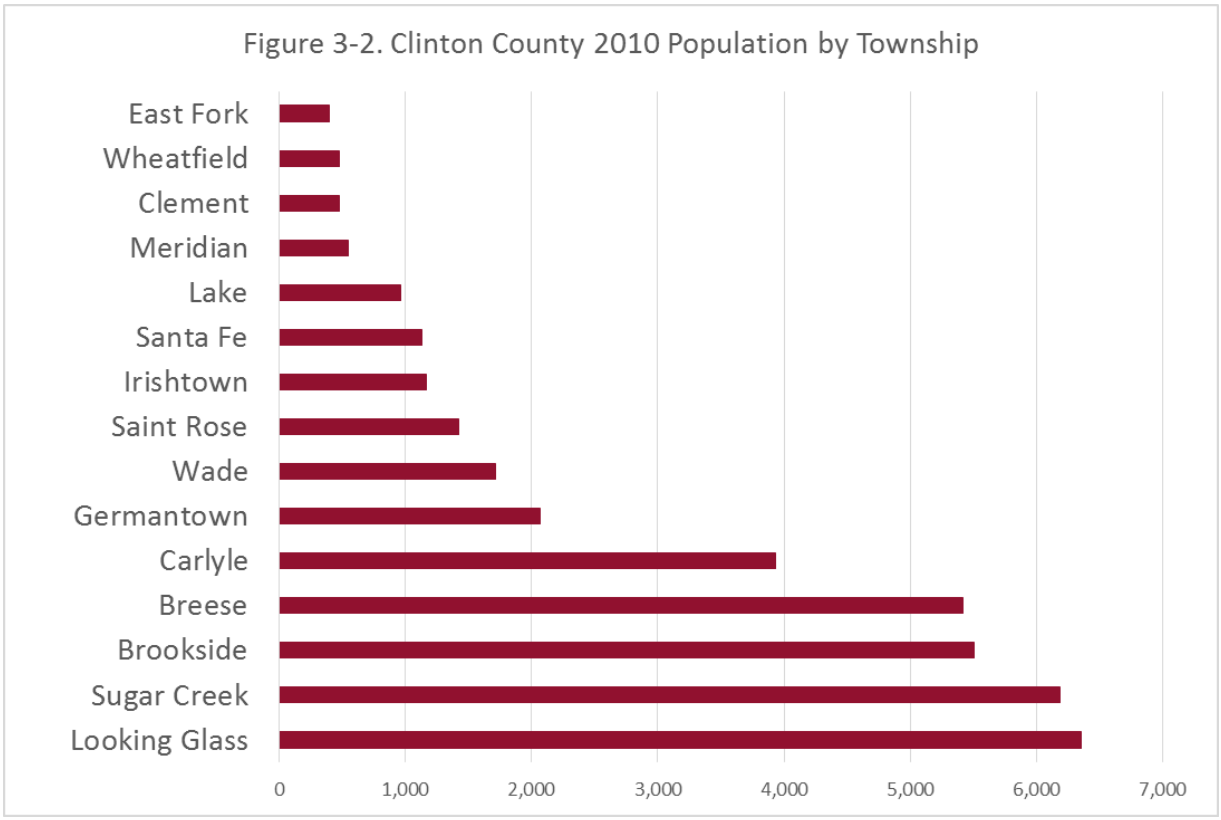
Figure 3-1. Clinton County and Surrounding Region



The Kaskaskia River Valley Project was formed in 1933 as a result of frequent flooding of the Kaskaskia River, which later led to the Kaskaskia Valley Association in 1952, whose efforts resulted in the authorization for the US Army Corps of Engineers authorized by the Federal Flood Control Act of 1958 to construct the dam at Carlyle and the impoundment of a major reservoir. In 1967 work was completed on the dam and lake, resulting in Carlyle Lake, the largest man-made lake in Illinois.

3.2 Demographics

Clinton County has experienced a slight increase in population over the past three decades. According to the U. S Census Bureau, Clinton County's 2014 population estimate is 37,952, an increase of 0.1% from 2010. The population is spread throughout fifteen townships: Breese, Brookside, Carlyle, Clement, East Fork, Germantown, Irishtown, Lake, Looking Glass, Meridian, Saint Rose, Santa Fe, Sugar Creek, Wade and Wheatfield. According to the U.S. Census 2014 population estimates, the largest community within the county is the city of Centralia (12,880) in Brookside township, although much of its populated area lies in the adjoining county of Marion. Figure 3-2 displays the breakdown of population by township from the 2010 Census.



3.3 Economy and Industry

Clinton County's major employers and number of employees are listed in Table 3-1. The largest employers are State of IL Murray Center, Kaskaskia Community College, and State of IL Corrections Center. Manufacturing, Health Care, and Education is the largest industry sector in Clinton County, followed by Government and Retail. The majority of the labor force is in Breese, with citizens also working in Carlyle, Trenton, and Centralia. Clinton County consists of a largely rural population. Traditionally, agriculture has

been the mainstay of the county and continues to play a vital role. Coal mining and petroleum have also been practiced, but have since declined during the last few decades. Breese, Carlyle, Centralia, New Baden, and Trenton are the most populous municipalities the county. Interstate 64 which traverses the southwestern corner, State Highway IL-4, IL-127, IL-160, IL-177, US Highway 50, and four different rail lines provides the major travel route for businesses and the transport of goods and services. The 2014 annual per capita income in the county is $41,527, compared to the Illinois state average of $47,643.

Table 3-1. Clinton County's Major Employers

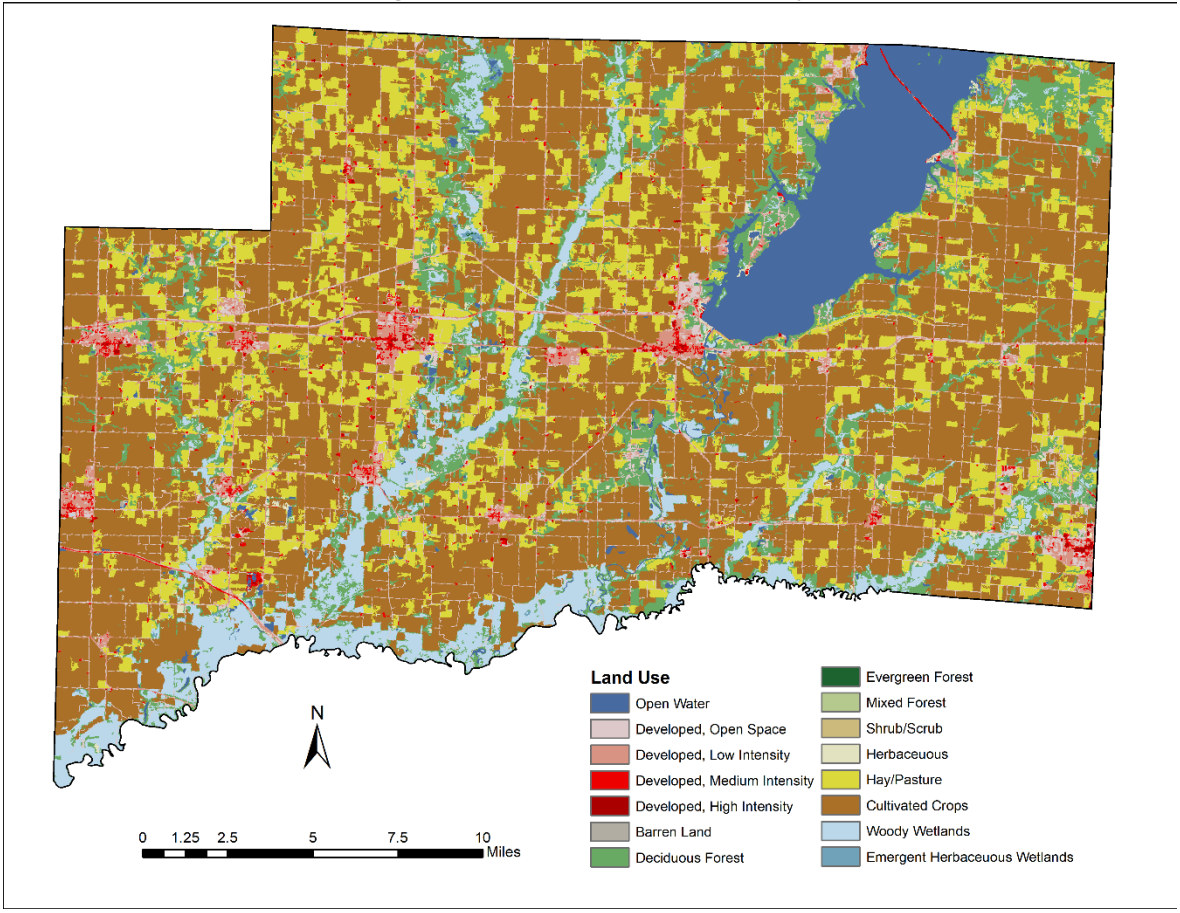
Employer	Industry	Approximate Number of Employees
State of IL Murray Center	Health Care	565
Kaskaskia Community College	Higher Education	450
State of IL Corrections Center	State Agency	375
St. Joseph's Hospital	Health Care	300
Tip VNA	Home Health Care	274
Maschhoffs, LLC	Food Mfg/Processing	250
Arrow Group	Manufacturing	200
Jim's Formal Wear	Clothing Manufacturing & Retail	150
Wesclin School District	Education	145
Fortis Plastics Inc.	Manufacturing	125
B&M Manufacturing	Manufacturing	122
Breese Journal	Media	80
Pactiv	Manufacturing	80
Schuette Super Value Foods	Retail Grocery	50
Clinton County Electric Corp	Utility	35

Source: South Central Illinois Growth Alliance, www.southcentralillinois.com
St. Louis Regional Chamber (formerly Regional Commerce & Growth Association)

3.4 Land Use and Development Trends

Agriculture is the predominant land use in the county with individual farms becoming larger. Figure 3.3 displays the current land use in Clinton County. Corn and soybeans are the primary crops, followed by winter wheat and other small grains and hay. Residential is the second largest land use in the county in terms of impact.

Figure 3-3. Land Use in Clinton County



3.5 Climate

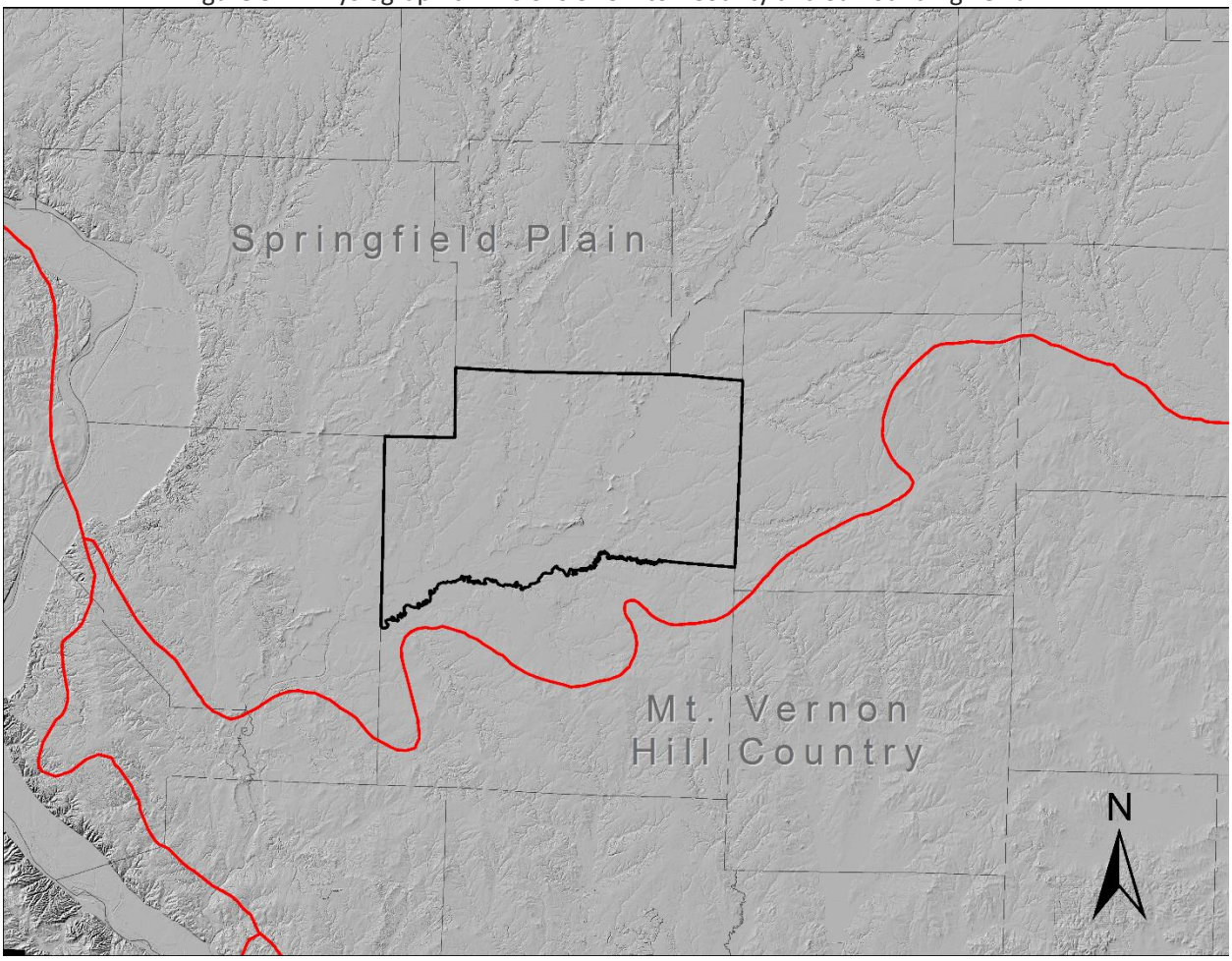
Clinton County's climate is typical of southwestern Illinois. The variables of temperature, precipitation, and snowfall can vary greatly from one year to the next. As early as October and extending as late as April, winter temperatures can fall below freezing. According to the National Climatic Data Center (NCDC), the average lowest winter temperature, occurring in January is 20°F. In the summer, the average high is around 88°F. Average annual precipitation is 40 inches per year.

3.6 Topography

Clinton County is situated in flat to gently rolling topography of the Central Lowland Province, Springfield Plain sub-section of the Till Plains Section physiographic division of Illinois. Figure 3-4 depicts the terrain within Clinton County. During the Illinoian Glaciation, it was covered by sheets of ice. Deposited glacial drift debris and glacial till left the land mostly flat with a pattern of elongated ridges when the glaciers receded. Elevations in the county range from 385 feet above mean sea level in the southwest near the Kaskaskia River to 588 feet above sea level near the City of Carlyle. More than seventy-five percent of the soils form in loess, windblown material that covers much of the glacial till plains. The remainder of the soils formed in alluvial material transported by water and deposited on flood plains during periods of flooding. Near the surface lie thick layers of limestone, with coal seams underlying the same at different

depths. There is a variety of soil, being black and loamy at some points, and at others (under timber) undeniably clayey.

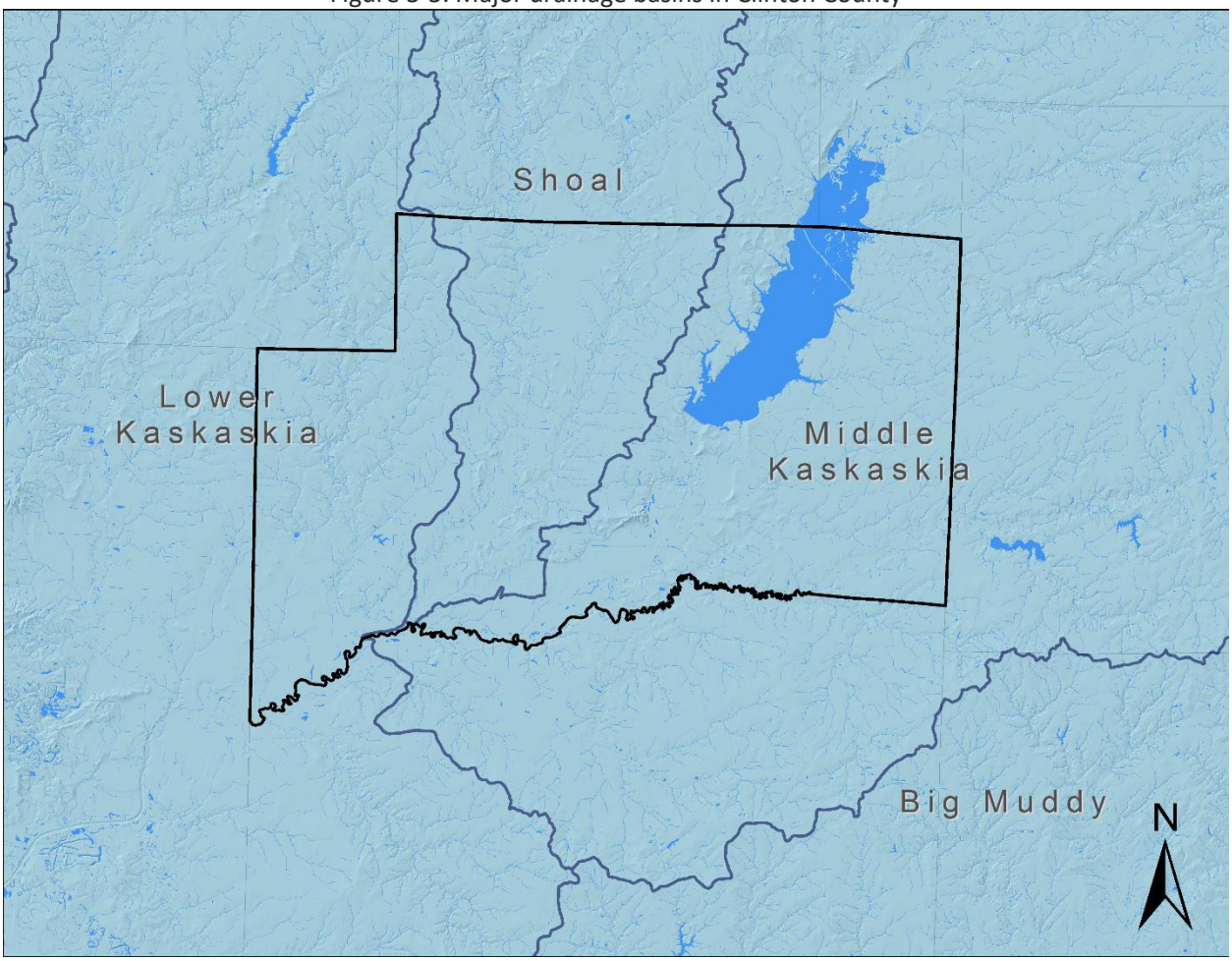
Figure 3-4. Physiographic Divisions of Clinton County and Surrounding Terrain



3.7 Major Lakes, Rivers, and Watersheds

The Kaskaskia River is the largest stream found entirely within Illinois. Its watershed encompasses all or parts of 22 counties and about 10% of the state's total land area. The U.S. Corps of Engineers Carlyle Lake Dam on the Kaskaskia at the City of Carlyle, creates a 26,000 acre reservoir. It is the largest man-made lake in Illinois, being fifteen miles long and three and one-half miles wide. Figure 3-5 depicts the major watersheds of Clinton County. Clinton County lies at the heart of one of Illinois' Priority Watersheds including three-eight digit Hydrologic Unit Code (HUC) Watersheds: Middle Kaskaskia, Shoal and Lower Kaskaskia. Clinton County is drained by the Kaskaskia River and by Shoal, Crooked, Sugar and Beaver Creeks.

Figure 3-5. Major drainage basins in Clinton County



Section 4. Risk Assessment

The goal of mitigation is to reduce future hazard impacts including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation requires a rigorous risk assessment. A risk assessment involves quantifying the potential loss resulting from a hazard by assessing the vulnerability of buildings, infrastructure, and people. This assessment identifies the characteristics and potential consequences of a hazard, how much the hazard could affect the community, and the impact on community assets. This risk assessment consists of three components—hazard identification, vulnerability assessment, and risk analysis.

4.1 Hazard Identification

4.1.1 Existing Plans

The Planning Team identified technical documents from key agencies to assist in the identification of potential hazards. Several other documents were used to profile historical hazards and guide the Planning Team during the hazard ranking exercise. Section 2-6 contains a complete list of the technical documents utilized to develop this plan.

4.1.2 National Hazard Records

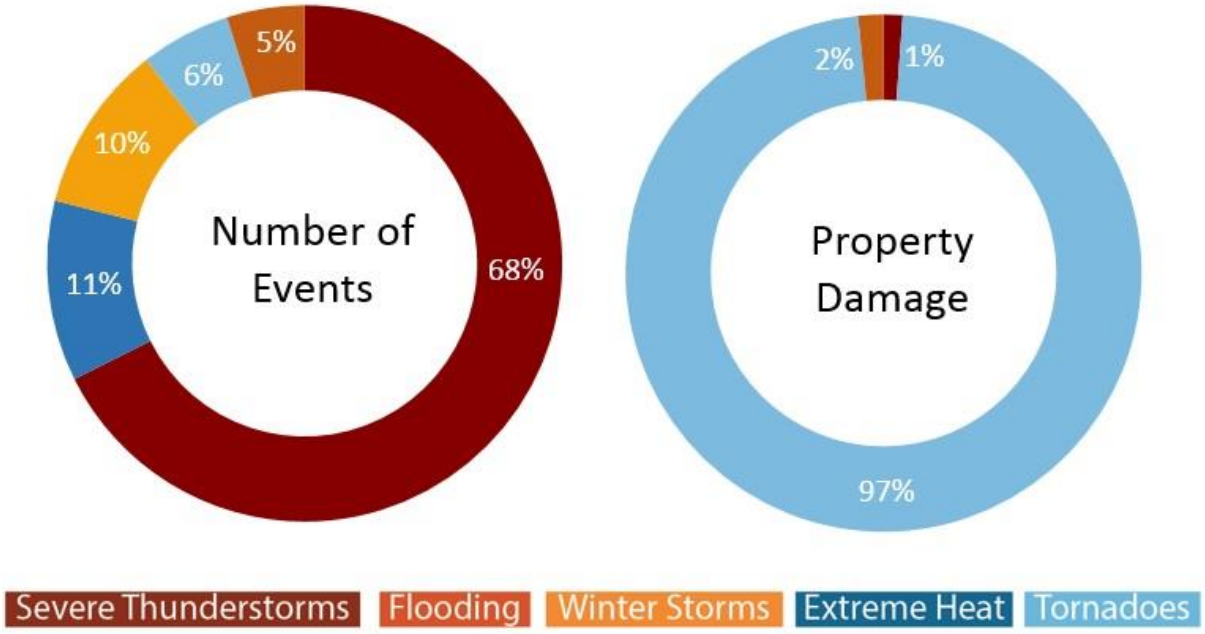
To assist the Planning Team, historical storm event data from the National Climatic Data Center (NCDC) was complied. NCDC records are estimates of damages reported to the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses.

The NCDC database included 347 reported meteorological events in Clinton County from 1950-2017 (the most updated information as of the date of this plan). The following hazard-profile sections each include a summary table of events related to each hazard type. Table 4-1 summarizes the meteorological hazards reported for Clinton County. Figure 4-1 summarize the relative frequency of NCDC reported meteorological hazards and the percent of total damage associated with each hazard for Clinton County. Full details of individual hazard events are on the NCDC website. In addition to NCDC data, Storm Prediction Center (SPC) data associated with tornadoes, strong winds, and hail was mapped using SPC-recorded latitudes and longitudes. Appendix D includes a map of these events.

Table 4-1. Summary of Meteorological Hazards Reported by the NCDC for Clinton County

Hazards	Time Period		Number of Events	Property Damage	Deaths	Injuries
	Start	End				
Flooding	1950	Feb 2017	19	$501,000	1	0
Severe Thunderstorms	1950	Feb 2017	217	$310,000	0	0
Tornadoes	1950	Feb 2017	20	$30,825,000	2	0
Winter Storms	1950	Feb 2017	43	$0	0	0
Extreme Heat	1950	Feb 2017	48	$0	0	4

Figure 4-1. Distribution of NCDC Meteorological Hazards for Clinton County



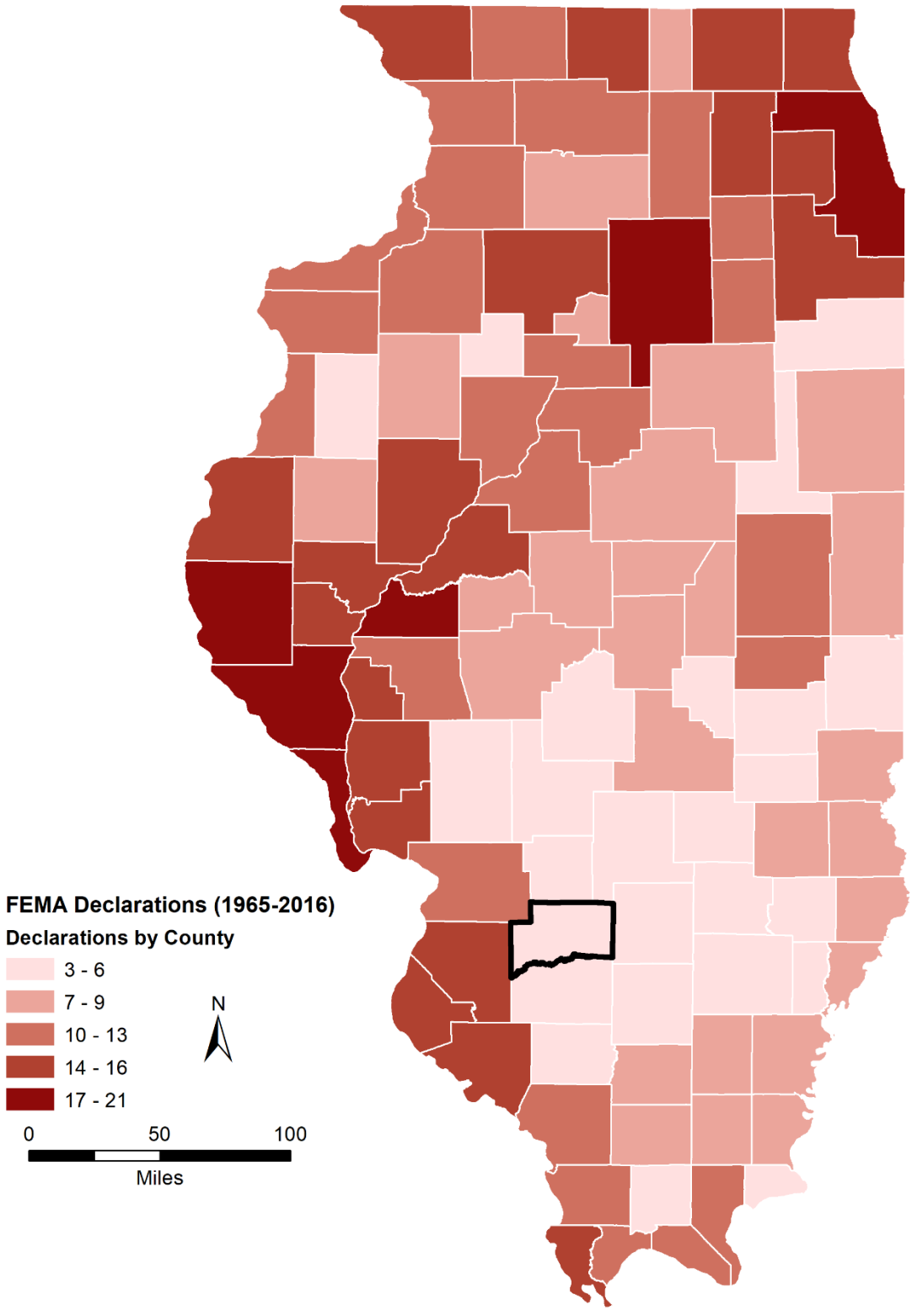
4.1.3 FEMA Disaster Information

Since 1957, FEMA has declared 53 major disasters and 7 emergencies for the State of Illinois. Emergency declarations allow states to access FEMA funds for Public Assistance (PA); disaster declarations allow for even more PA funding, including Individual Assistance (IA) and the Hazard Mitigation Grant Program (HMGP). Clinton County has received federal aid for 4 declared disasters and 1 emergency since 1965. Table 4-2 lists specific information for each disaster declaration in Clinton County. Figure 4-2 depicts the number of disasters and emergencies that have been declared for the State of Illinois and Clinton County since 1965.

Table 4-2. Details of FEMA-declared Emergencies and Disasters in Clinton County

Declaration Number	Date of Declaration	Description
3230	9/7/2005	Hurricane Katrina Evacuation (Emergency)
1416	5/21/2002	Severe Storms, Tornadoes & Flooding
674	12/13/1982	Severe Storms, Tornadoes & Flooding
373	4/26/1973	Severe Storms & Flooding
276	8/30/1969	Heavy Rains & Flooding

Figure 4-2. FEMA-declared Emergencies and Disasters in Illinois



4.1.4 Hazard Ranking Methodology

Based on Planning Team input, national datasets, and existing plans, the Clinton County Planning Team re-ranked the list of hazards from the 2010 MHMP. Other hazards were considered, but these hazards ranked the highest based on the Risk Priority Index discussed in Section 4.1.5. The county identified

Clinton County Hazard List

FLOODING

TORNADOES

LEVEE/DAM FAILURE

EXTREME HEAT/DROUGHT

EARTHQUAKES

WINTER STORMS

SEVERE THUNDERSTORMS

SINKHOLES & COLLAPSE

HAZARDOUS MATERIALS RELEASE

Extreme Heat/Drought and Ground Failure (Sinkholes & Collapse) as new hazards not identified in the initial plan. It should be noted that Wildfire has been omitted from the plan and was not a natural hazard identified by Clinton County or participating jurisdictions during the risk assessment process.

4.1.5 Risk Priority Index

The Risk Priority Index (RPI) quantifies risk as the product of hazard probability and magnitude so Planning Team members can prioritize mitigation strategies for high-risk-priority hazards. Planning Team members use historical hazard data to determine the probability, combined with knowledge of local conditions to determine the possible severity of a hazard. Tables 4-3 and 4-4 display the criteria the Planning Team used to quantify hazard probability and magnitude.

Table 4-3. Hazard Probability Ranking

Probability	Characteristics
4 – Highly Likely	Event is probable within the next calendar year This event has occurred, on average, once every 1-2 years in the past
3 – Likely	Event is probable within the next 10 years Event has a 10-50% chance of occurring in any given year This event has occurred, on average, once every 3-10 years in the past
2 – Possible	Event is probable within the next 50 years Event has a 2-10% chance of occurring in any given year This event has occurred, on average, once every 10-50 years in the past
1 – Unlikely	Event is probable within the next 200 years Event has a 0.5-2% chance of occurring in any given year This event has occurred, on average, once every 50-200 years in the past

Table 4-4. Hazard Severity Ranking

Magnitude/Severity	Characteristics
8 – Catastrophic	Multiple deaths Complete shutdown of facilities for 30 or more days More than 50% of property is severely damaged
4 – Critical	Injuries and/or illnesses result in permanent disability Complete shutdown of critical facilities for at least 14 days More than 25% of property is severely damaged
2 – Limited	Injuries and/or illnesses do not result in permanent disability Complete shutdown of critical facilities for more than seven days More than 10% of property is severely damaged
1 – Negligible	Injuries and/or illnesses are treatable with first aid Minor quality of life lost Shutdown of critical facilities and services for 24 hours or less Less than 10% of property is severely damaged

The product of hazard probability and magnitude is the RPI. The Planning Team members ranked specified hazards based on the RPI, with larger numbers corresponding to greater risk. After evaluating the calculated RPI, the Planning Team adjusted the ranking to better suit the county. Table 4-5 identifies the RPI and adjusted ranking for each hazard specified by the Planning Team.

Table 4-5. Clinton County Hazard Priority Index and Ranking

Hazard	Probability	Magnitude/Severity	Risk Priority Index	Rank
Flooding	4	7	28	1
Tornadoes	3	6	18	2
Levee/Dam Failure	2	8	16	3
Extreme Heat/Drought	3	5	15	4
Earthquakes	2	6	12	5
Winter Storms	3	3	9	6
Severe Thunderstorms	4	2	8	7
Sinkholes & Collapse	3	2	6	8
Hazardous Materials Release	4	1	4	9

4.1.6 Jurisdictional Hazard Ranking

Each jurisdiction created its own RPI because hazard susceptibility may differ by jurisdiction. During the five-year review of the plan, the Planning Team will update this table to ensure these jurisdictional rankings accurately reflect each community's assessment of these hazards. Table 4-6 lists the jurisdictions and their respective hazard rankings (Ranking 1 being the highest concern). The individual jurisdictions made these rankings at Meeting 1.

Table 4-6. Hazard Ranking by Jurisdiction

Jurisdiction	Flooding	Tornado	Levee / Dam Failure	Heat / Drought	Earthquakes	Winter Storms	Severe Storms	Sinkholes & Collapse	HAZMAT	Subsidence
Albers	6	2	-	5	-	3	1	-	-	4
Aviston	2	1	9	3	6	5	4	7	-	8
Bartelso	2	3	-	-	5	4	1	-	-	6
Beckemeyer	6	1	10	5	2	4	3	8	7	9
Breese	8	1	9	4	6	3	2	7	5	-
Carlyle	6	1	8	-	5	3	2	-	4	-
Damiansville	2	1	7	6	3	5	4	8	10	9
Germantown	5	2	9	6	4	3	1	8	7	-
Hoffman	4	1	7	6	9	3	2	8	5	9
New Baden	1	2	3	4	5	6	7	8	9	-
Saint Rose	8	1	-	4	6	3	2	7	5	-
Trenton	1	2	3	4	5	6	7	8	9	-
Clinton County Animal Control	1	2	3	4	5	6	7	8	9	-

4.2 Vulnerability Assessment

4.2.1 Asset Inventory

Processes and Sources for Identifying Assets

Before meeting one, the Planning Team used their resources to update a list of critical facilities from state resources. Local GIS data was used to verify the locations of all critical facilities. SIU GIS analysts incorporated these updates and corrections to the Hazus-MH data tables prior to performing the risk assessment. The updated Hazus-MH inventory contributed to a Level 2 analysis, which improved the accuracy of the risk assessment. Clinton County also provided local assessment and parcel data to estimate the actual number of buildings susceptible to damage for the risk assessment.

Essential Facilities List

Table 4-7 identifies the number of essential facilities identified in Clinton County. Essential facilities are a subset of critical facilities. Appendix E include a comprehensive list of the essential facilities in Clinton County and Appendix F displays a large format map of the locations of the critical facilities within the county.

Table 4-7. Clinton County's Essential Facilities

Facility	Number of Facilities
EOC	1
Fire Stations	13
Police Stations	6
Medical Care	13
Schools	23

Facility Replacement Costs

Table 4-8 identifies facility replacement costs and total building exposure. Clinton County provided local assessment data for updates to replacement costs. Tax-exempt properties such as government buildings, schools, religious and non-profit structures were excluded from this study because they do not have an assessed value. Table 4-8 also includes the estimated number of buildings within each occupancy class.

Table 4-8. Clinton County's Building Exposure

General Occupancy	Estimated Total Buildings	Total Building Exposure
Residential	17631	$2,517,233,424
Commercial	1036	$3,336,688,707
Industrial	141	$317,092,320
Total:	**18808**	**$6,171,014,451**

Future Development

Clinton County is expected to see a modest increase in population due to the expansion of existing distribution centers, light industry, and the creation of new opportunities in the service industry such as retail stores, restaurants, and hotels. Clinton County has a growing manufacturing base that leaves the county vulnerable to major hazardous materials events and other technological threats. Most of this expansion is expected to take place within the incorporated limits of Carlyle, Breese and Centralia within close proximity to transportation corridors such as Interstate 64 and Routes 127 and 50 (see section 3.4 Land Use and Development Trends). No changes in development have occurred that may have increased vulnerability since the initial plan.

4.3 Risk Analysis

4.3.1 GIS and Hazus-MH

The third step in the risk assessment is the risk analysis, which quantifies the risk to the population, infrastructure, and economy of the community. The hazards were quantified using GIS analyses and Hazus-MH where possible. This process reflects a Level 2 Hazus-MH analysis. A level 2 Hazus-MH analysis involves substituting selected Hazus-MH default data with local data and improving the accuracy of model predictions.

Updates to the default Hazus-MH data include:

- Updating the Hazus-MH defaults, critical facilities, and essential facilities based on the most recent available data sources.
- Reviewing, revising, and verifying locations of critical and essential point facilities with local input.
- Applying the essential facility updates (schools, medical care facilities, fire stations, police stations, and EOCs) to the Hazus-MH model data.
- Updating Hazus-MH reports of essential facility losses.

The following assumptions were made during analysis:

- Hazus-MH aggregate data was used to model the building exposure for all earthquake analyses. It is assumed that the aggregate data is an accurate representation of Clinton County.
- The analyses were restricted to the county boundaries. Events that occur near the county boundaries do not contain damage assessments from adjacent counties.

- For each tax-assessment parcel, it is assumed there is only one building that bares all the associated values (both structure and content).
- For each parcel, it is assumed that all structures are wood-framed, one-story, slab-on-grade structures, unless otherwise stated in assessment records. These assumptions are based on sensitivity analyses of Hazus and regional knowledge.

Depending upon the analysis options and the quality of data the user inputs, Hazus-MH generates a combination of site-specific and aggregated loss estimates. Hazus-MH is not intended as a substitute for detailed engineering studies; it is intended to serve as a planning aid for communities interested in assessing their risk to flood-, earthquake-, and hurricane-related hazards. This plan does not fully document the processes and procedures completed in its development, but this documentation is available upon request. Table 4-9 indicates the analysis type (i.e. GIS, Hazus-MH, or historical records) used for each hazard assessment.

Table 4-9. Risk Assessment Tool Used for Each Hazard

Hazard	Risk Assessment Tool(s)
Tornadoes	GIS-based
Severe Thunderstorm	Historical Records
Flooding	Hazus-MH
Winter Storms	Historical Records
Drought / Extreme Heat	Historical Records
Earthquakes	Hazus-MH
Hazmat Release	GIS-based
Fire	GIS-based
Dam / Levee Failure	Historical Records

4.3.2 Flooding Hazard

Hazard Definition for Flooding

Flooding is a significant natural hazard throughout the United States. The type, magnitude, and severity of flooding are functions of the magnitude and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry and hydrology of the catchment, and flow dynamics and conditions in and along the river channel. Floods are classified as one of two types in this plan: upstream floods or downstream floods. Both types of floods are common in Illinois.

Upstream floods, also called flash floods, 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; 18 inches might carry off a car. Generally, upstream floods cause severe damage over relatively localized areas. Urban flooding is a type of upstream flood. Urban flooding involves the overflow of storm drain systems and can result from inadequate drainage combined with heavy rainfall or rapid snowmelt. Upstream or flash floods can occur at any time of the year in Illinois, but they are most common in the spring and summer months.

Downstream floods, sometimes called riverine floods, refer to floods on large rivers at locations with large upstream catchments. Downstream 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 downstream floods than for upstream floods, generally providing ample warning for people to move to safe locations and, to some extent, secure some property against damage. Riverine flooding on the large rivers of Illinois generally occurs during either the spring or summer.

Previous Occurrences of Flooding

The NCDC database reported 19 flooding events in Clinton County. The most significant flood event occurred in June 1996. Up to five inches of rain fell on Clinton County from a nearby stationary thunderstorm, causing widespread flash flooding. Most of the damage occurred in Germantown, where residents had to be evacuated from flooded neighborhoods. At least 40 homes suffered water damage. The county was declared a state disaster area. Table 4-10 identifies NCDC-recorded flooding events that caused damage, death, or injury in Clinton County.

Table 4-10. NCDC-recorded Flooding Events that caused Death, Damage or Injury in Clinton County

Location or County*	Date	Deaths	Injuries	Property Damage
Clinton County	6/10/1996	0	0	$500,000
Trenton	6/6/2008	0	0	$1,000
Damiansville	5/11/2015	1	0	$0
	Total:	**1**	**0**	**$501,000**

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

There is one structure in Clinton County that has experienced repetitive losses due to flooding. FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the NFIP that has suffered flood loss damage on two or more 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 Illinois Emergency Management Agency and Illinois Department of Natural Resources was contacted to determine the location of repetitive loss structures in Clinton County. Records indicate that there is one repetitive loss structure within the county. The total amount paid for building replacement and building contents for damage to this repetitive loss structures is $7597.30. Table 4-11 describes the repetitive loss structures for each jurisdiction.

Table 4-11. Repetitive Loss Structures for each Jurisdiction in Clinton County

Jurisdiction	Number of Properties	Number of Losses	Total Paid
Breese	1	2	$7597.30
Total:	**1**	**2**	**$7597.30**

Geographic Location of Flooding

Most riverine flooding in Illinois occurs during either the spring or summer and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Flash flooding of low-lying areas in Illinois can occur during any time of the year, but tends to be less frequent and more localized between mid-summer and early winter.

The primary sources of river flooding in Clinton County is the Kaskaskia River and its tributaries. On April 28, 2002, Clinton County was one of the six counties (Washington, St. Clair, Fayette, Monroe, and Randolph) in southwestern Illinois impacted by flooding. The NCDC reported heavy rains during the last week in April pushed the Kaskaskia River out of its banks. The flooding was initially relatively minor, but continued and worsened in May.

Hazard Extent for Flooding

All floodplains are susceptible to flooding in Clinton County. The floodplain of concern is for the 100-year flood event which is defined as areas that have a 1% chance of flooding in any given year. However, flooding is dependent on various local factors including, but not limited to, impervious surfaces, amount of precipitation, river-training structures, etc. The 100-year flood plain covers approximately 32% of Clinton County

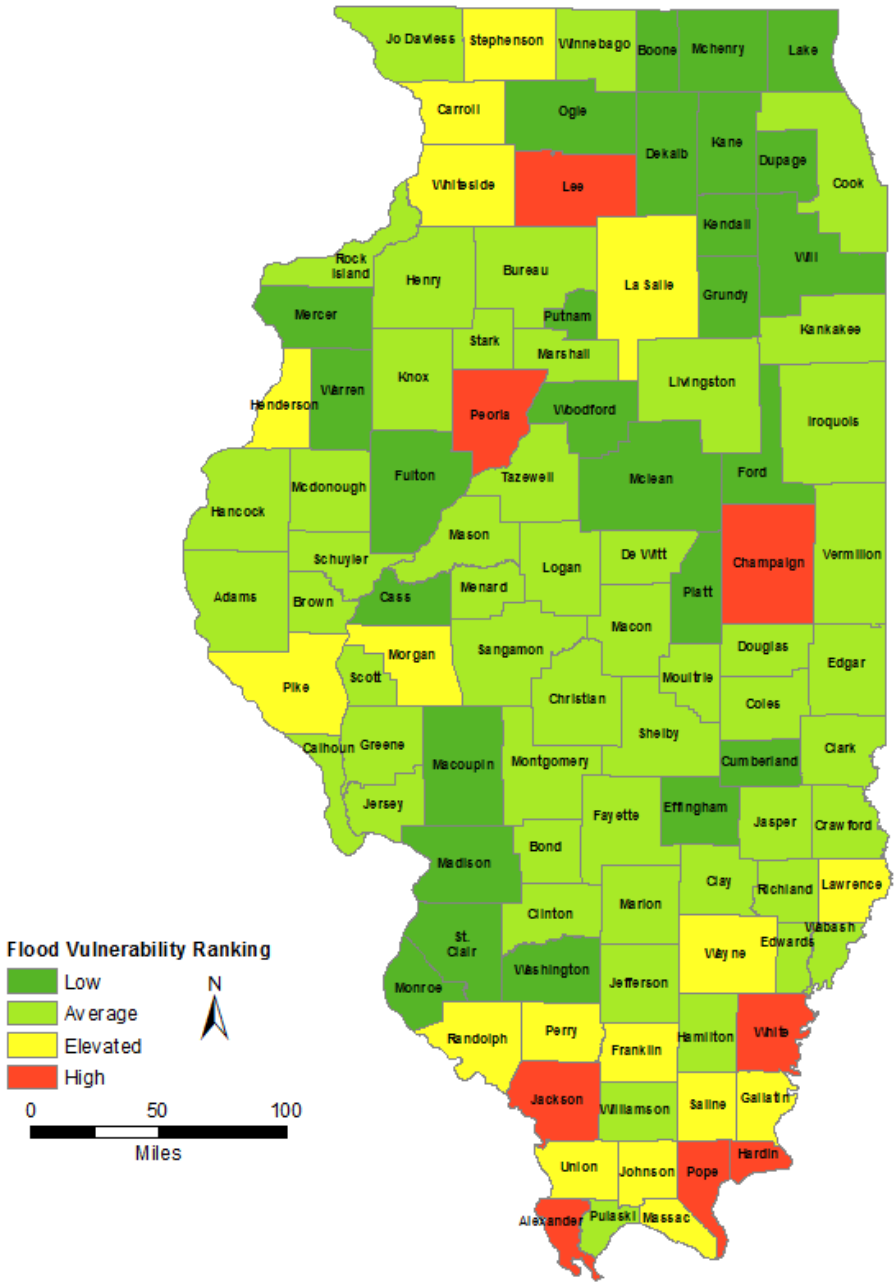
Vulnerability Analysis for Flooding

The 2013 Illinois Hazard Mitigation Plan analyzed a variety potential natural hazards including vulnerability to flooding. A Flood Vulnerability Index (FVI) was calculated for all counties and jurisdictions in Illinois. FVI combines Hazus-based estimates of flood exposure and loss with the widely utilized Social Vulnerability Index (SoVI). The highest vulnerability scores and vulnerability ratings were generally in rural counties and communities located along Illinois's large rivers (i.e., Mississippi, Green, Illinois, Kaskaskia, Rock and Ohio Rivers). Figure 4-3 displays the Flood Vulnerability Ratings for the 102 counties in Illinois. The vulnerability ratings are categorically representations (low, average, elevated, or high) of the flood vulnerability index. Clinton County has an Average Flood Vulnerability Rating and ranks 46 out of the 102 counties in Illinois in terms of loss estimation according to Hazus-MH for floods. Table 4-12 lists the jurisdictional Flood Vulnerability Ratings for Clinton County.

Table 4-12. Jurisdictional Flood Vulnerability Ranking for Clinton County

Jurisdiction	State Ranking	Flood Vulnerability Rating
Albers	453	Average
Aviston	626	Average
Bartelso	581	Average
Beckemeyer	632	Average
Breese	614	Average
Carlyle	533	Average
Centralia	355	Average
Damiansville	609	Average
Germantown	613	Average
Hoffman	710	Low
Keyesport	285	Average
New Baden	304	Average
Trenton	610	Average

Figure 4-3. County Flood Vulnerability Rating for Illinois



Because all floodplains are susceptible to flooding in Clinton County; therefore, the population and all buildings located within the floodplain are vulnerable to flooding. To accommodate this risk, this plan considers all buildings located within 100-year flood plain as vulnerable.

Risk Identification for Flood Hazard

Based on historical information and the Flood Vulnerability Rating, future occurrence of flooding in Clinton County is likely. Although historical information equates a lesser chance of occurrence in any given year for this event in Clinton County, input from the Planning Team suggests flooding in this area of great magnitude and severity of damage and loss is a highly likely event. According to the Risk Priority Index (RPI) and county input, flooding is ranked as the number one hazard.

Risk Priority Index

Probability	X	Magnitude	=	RPI
4	x	7	=	28

Critical Facilities

All critical facilities within the floodplain are vulnerable to floods. An essential facility will encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the fac ility, and loss of facility functionality (e.g., a damaged police station cannot serve the community). Appendix E includes a list of the essential facilities in Clinton County and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

All buildings within the floodplain are vulnerable to floods. These impacts can include structural failure, extensive water damage to the facility, and loss of facility functionality (e.g., damaged home will no longer be habitable, causing residents to seek shelter). This plan considers all buildings located within 100-year flood plain as vulnerable.

Infrastructure

The types of infrastructure potentially impacted by a flood include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure is not available for this plan, it is important to emphasize that a flood could damage any number of these items. 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); or railway failure from broken or impassable railways. Bridges could also fail or become impassable, causing risk to motorists.

Hazus-MH Flood Analysis

Hazus-MH was utilized to generate the flood depth grid for a 100-year return period and made calculations by clipping the USGS one-third-arc-second DEM (~10 m) to the flood boundary. Next, Hazus-MH was used to estimate the damages for Clinton County by utilizing a detailed building inventory database created from assessor and parcel data.

According to this analysis, there are 1,571 buildings located in the Clinton County 100-year floodplain. The estimated damage to these structures is $418 million. It should be noted that the results should be interpreted as degrees of loss rather than exact number of buildings exposed to flooding. Figure 4-4 depicts the building inventory within the 100-year floodplain and Table 4-13 shows the loss estimates by occupancy class.

Figure 4-4. Building Inventory Located within the 100-year Floodplain in Clinton County

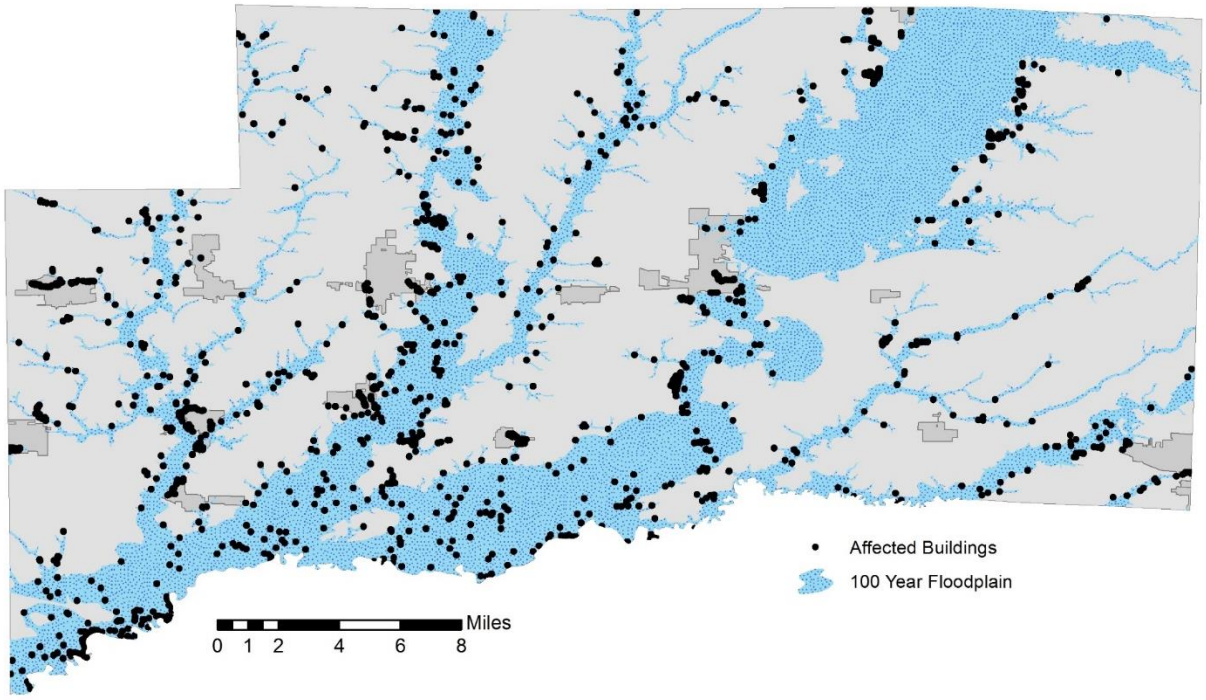


Table 4-13. Estimated Flood Losses within the 100-year Floodplain

Occupancy Class	Number of Structures	Estimated Building Related Losses
Residential	1,516	$259,985,469
Commercial	51	$144,656,481
Industrial	4	$13,693,014
Total:	**1,571**	**$418,334,964**

Essential Facilities Damage

The analysis identified one essential facilities that are subject to flooding. Table 4-14 identified the essential facilities within the 100-year floodplain.

Table 4-14. Essential Facilities within the 100-year Floodplain

Essential Facility	Facility Name
Fire Department	Breese Fire Protection District

Vulnerability Analysis to Future Assets/Infrastructure

Flooding may affect nearly any location within the county; therefore all buildings and infrastructure are vulnerable. Table 4-8 includes the building exposure for Clinton County. All essential facilities in the county are at risk. Appendix E include a list of the essential facilities in Clinton County and Appendix F displays a large format map of the locations of all critical facilities within the county. Currently, the municipal planning commission reviews new developments for compliance with the local flood zoning ordinance. At this time, no new construction is planned within the 100-year floodplain.

Suggestions for Community Development Trends

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

4.3.3 Tornado Hazard

Hazard Definition

Tornadoes are violently rotating columns of air extending from thunderstorms to the ground. Funnel clouds are rotating columns of air not in contact with the ground; however, the violently rotating column of air can reach the ground quickly and become a tornado. If the funnel cloud picks up and blows debris, it has reached the ground and is a tornado.

Tornadoes are a significant risk to Illinois and its citizens. Tornadoes can occur at any time on any day. The unpredictability of tornadoes makes them one of Illinois' most dangerous hazards. Tornado winds are violently destructive in developed and populated areas. Current estimates place maximum wind velocity greater than 300 miles per hour. A wind velocity of 200 miles per hour results in a pressure of 102.4 pounds per square foot—a load that exceeds the tolerance limits of most buildings. Thus, it is easy to understand why tornadoes can devastate the communities they hit.

Tornadoes are classified according to the Enhanced Fujita tornado intensity scale. The Enhanced Fujita scale ranges from intensity EF0, with effective wind speeds of 40 to 70 miles per hour, to EF5 tornadoes, with effective wind speeds of over 260 miles per hour. Table 4-15 outlines the Enhanced Fujita intensity scale.

Table 4-15. Enhanced Fujita Tornado Rating

Enhanced Fujita Number	Estimated Wind Speed	Path Width	Path Length	Description of Destruction
0 Gale	40-72 mph	6-17 yards	0.3-0.9 miles	Light damage, some damage to chimneys, branches broken, signboards damaged, shallow-rooted trees blown over.
1 Moderate	73-112 mph	18-55 yards	1.0-3.1 miles	Moderate damage, roof surfaces peeled off, mobile homes pushed off foundations, attached garages damaged.
2 Significant	113-157 mph	56-175 yards	3.2-9.9 miles	Considerable damage, entire roofs torn from frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted.
3 Severe	158-206 mph	176-566 yards	10-31 miles	Severe damage, walls torn from well-constructed houses, trains overturned, most trees in forests uprooted, heavy cars thrown about.
4 Devastating	207-260 mph	0.3-0.9 miles	32-99 miles	Complete damage, well-constructed houses leveled, structures with weak foundations blown off for some distance, large missiles generated.

Enhanced Fujita Number	Estimated Wind Speed	Path Width	Path Length	Description of Destruction
5 Incredible	261-318 mph	1.0-3.1 miles	100-315 miles	Foundations swept clean, automobiles become missiles and thrown for 100 yards or more, steel-reinforced concrete structures badly damaged.

Previous Occurrences of Tornadoes

There have been several occurrences of tornadoes in Clinton County during recent decades. The National Climatic Data Center (NCDC) database reported 22 tornadoes/funnel clouds in Clinton County since 1950. Table 4-16 identifies NCDC-recorded tornadoes that caused damage, death, or injury in Clinton County. Additional details of individual hazard events are on the NCDC website.

The most damaging tornado event occurred in December 2, 1982 when an EF3 tornado running 10.5 miles touched down in Clinton County killing two people and causing $25 million in property damages.

Table 4-16. NCDC-Recorded Tornadoes That Caused Damage, Death, or Injury in Clinton County

Location or County*	Date	Scale	Deaths	Injuries	Property Damage
Clinton Co	2/25/1956	F4	0	0	2,500,000
Clinton Co	4/5/1958	F3	0	0	250,000
Clinton Co	3/8/1964	F2	0	0	25,000
Clinton Co	12/21/1967	F2	0	0	2,500,000
Clinton Co	4/3/1968	F1	0	0	250,000
Clinton Co	4/18/1975	F1	0	0	250,000
Clinton Co	10/22/1979	F1	0	0	25,000
Clinton Co	12/2/1982	F3	2	0	25,000,000
Clinton Co	11/26/1990	F0	0	0	25,000
		Total:	**2**	**0**	**30,825,000**

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

Geographic Location for Tornado Hazard

The entire county has the same risk of tornado occurrence. Tornadoes can occur at any location within the county.

Hazard Extent for Tornado Hazard

Historical tornadoes generally moved from southwest to northeast across the county, although other tracks are possible, from more southerly to northerly directions. The extent of the hazard varies in terms of the size of the tornado, its path, and its wind speed.

Risk Identification for Tornado Hazard

Based on historical information, the probability of future tornadoes in Clinton County is likely. The County should expect tornadoes with varying magnitudes to occur in the future. Tornadoes ranked as the number two hazard according to the Clinton County Planning Team's risk assessment.

Risk Priority Index

Probability	x	Magnitude	=	RPI
3	x	6	=	18

Vulnerability Analysis for Tornado Hazard

Tornadoes can occur within any area in the county; therefore, the entire county population and all buildings are vulnerable to tornadoes. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Clinton County.

Critical Facilities

All critical facilities are vulnerable to tornadoes. Critical facilities are susceptible to many of the same impacts as any other building within the jurisdiction. These impacts vary based on the magnitude of the tornado but can include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, and loss of facility functionality (e.g., a damaged police station will no longer be able to serve the community). Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can all expect the same impacts, similar to those discussed for critical facilities. These impacts include structural failure, damaging debris (trees or limbs), roofs blown off or windows broken by hail or high winds, and loss of building function (e.g., damaged home will no longer be habitable, causing residents to seek shelter).

Infrastructure

The types of infrastructure that could be impacted during a tornado include roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is vulnerable, it is important to emphasize that any number of these structures could become damaged during a tornado. The impacts to these structures 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 rail lines. Bridges could fail or become impassable, causing risk to motorists.

GIS-based Tornado Analysis

Two tornado scenarios were conducted for Clinton County through Trenton, Aviston, Breese, Beckemeyer, Carlyle, and Huey as well as New Baden, Albers, Germantown, Hoffman, and Centralia. The following analysis quantifies the anticipated impacts of tornadoes in the county in terms of numbers and types of buildings and infrastructure damaged.

GIS-overlay modeling was used to determine the potential impacts of an EF4 tornado. The analysis used a hypothetical path based upon the F4 tornado event that runs for 31 miles for both paths. Table 4-17 depicts tornado damage curves and path widths utilized for the modeled scenarios. The damage curve is based on conceptual wind speeds, path winds, and path lengths from the Enhanced-Fujita Scale guidelines.

Table 4-17. Tornado Path Widths and Damage Curves

Fujita Scale	Path Width (feet)	Maximum Expected Damage
5	2,400	100%
4	1,800	100%
3	1,200	80%
2	600	50%
1	300	10%
0	150	0%

Degrees of damage depend on proximity to the path centerline within a given tornado path. The most intense damage occurs within the center of the damage path, with decreasing amounts of damage away from the center. To model the EF4 tornado, a tornado path were created in GIS with buffers added (damage zones) around the tornado paths. Table 4-18 and Figure 4-5 illustrate the zone analysis. Figure 4-6 depicts the selected hypothetical tornado paths.

Table 4-18. EF4 Tornado Zones and Damage Curves

Zone	Buffer (feet)	EF4 Damage Curve
1	0-150	100%
2	150-300	80%
3	300-600	50%
4	600-900	10%

Figure 4-5. EF4 Tornado Analysis (Damage Curves) Using GIS Buffers

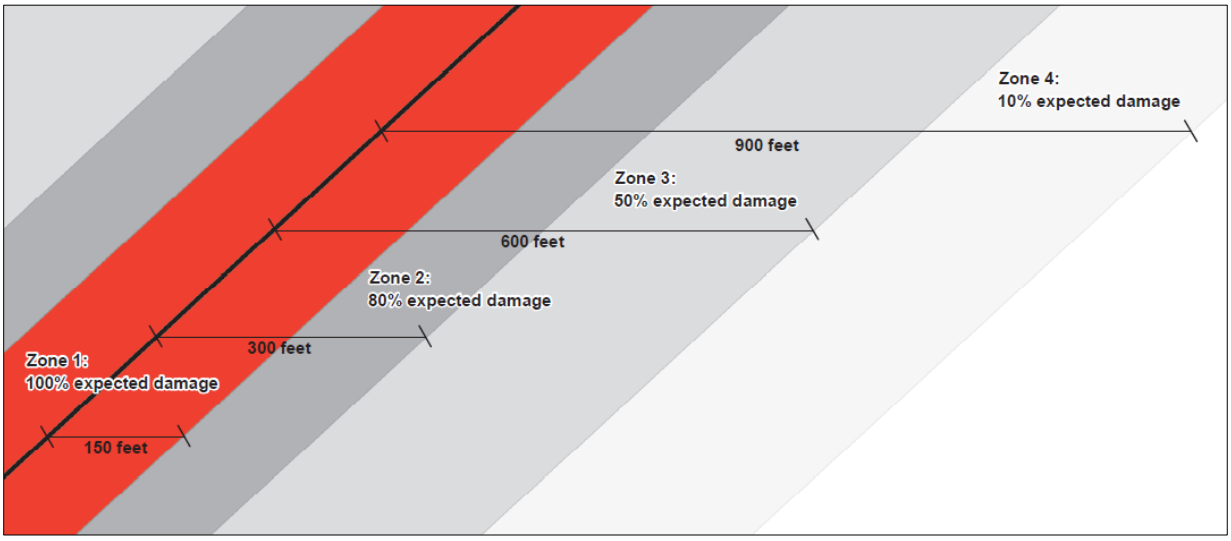
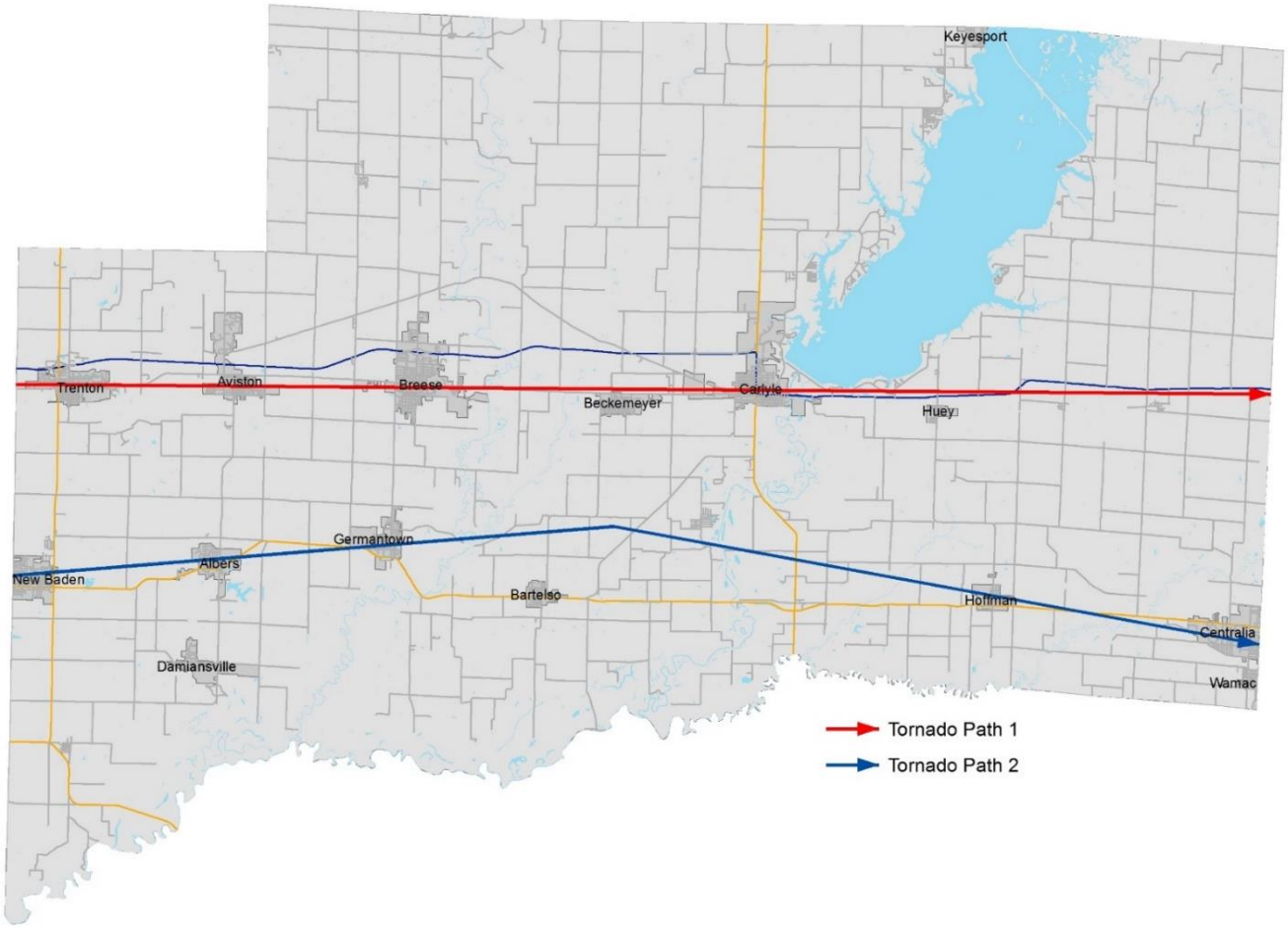


Figure 4-6. Modeled Tornado Tracks for Clinton County



Modeled Impacts of the EF4 Tornado

The GIS analysis estimates that the modeled EF4 tornado would damage 5,583 buildings in Path 1 and 3,784 buildings in Path 2. The estimated building losses are approximately $ 2.4 billion for Path 1 and approximately $ 1.5 billion for Path 2. The building losses are an estimate of building replacement costs multiplied by the damage percent combined with estimated content costs. Table 4-19 and 4-20 and Figures 4-7a, b, c show the results of the EF4 tornado analysis.

Table 4-19. Estimated Building Loss by Occupancy Type of Path 1

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$221,765,693	$170,652,866	$185,220,533	$19,566,298
Commercial	$888,613,320	$378,346,997	$341,538,834	$102,362,378
Industrial	$5,834,753	$0	$53,750,966	$5,681,940
Total:	**$1,116,213,766**	**$548,999,863**	**$580,510,333**	**$127,610,616**

Table 4-20. Estimated Building Loss by Occupancy Type of Path 2

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$145,898,937	$118,206,479	$109,009,330	$11,289,449
Commercial	$453,405,948	$190,926,730	$341,131,950	$51,094,395
Industrial	$5,325	$27,768,720	$35,155,459	$7,140,944
Total:	**$599,310,210**	**$336,901,929**	**$485,296,739**	**$69,524,788**

Figure 4-7a. Building Inventory Affected by the EF4 Tornado

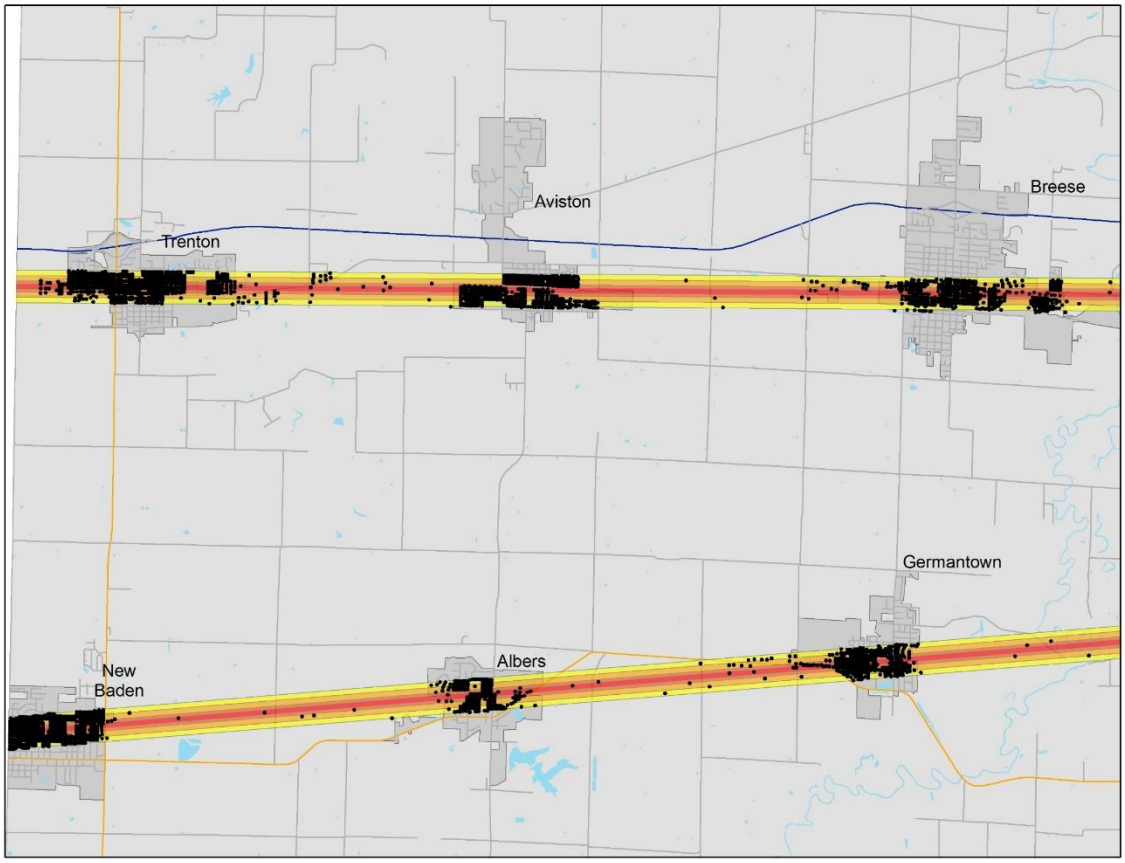


Figure 4-7b. Building Inventory Affected by the EF4 Tornado

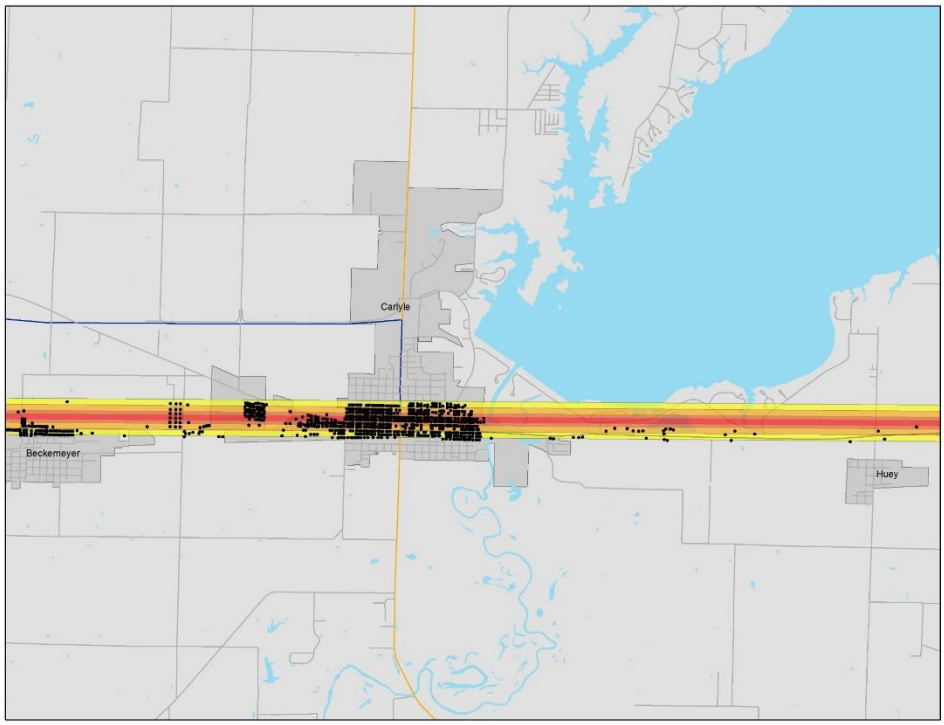


Figure 4-7c. Building Inventory Affected by the EF4 Tornado

Essential Facilities Damage

There are 30 essential facilities located within 900 feet of the EF4 tornado path. The affected facilities are identified in Table 4-21, and their geographic locations are shown in Figure 4-7a, b, c.

Table 4-21. Essential Facilities Affected by the EF4 Tornado

Essential Facility	Facility Name
Schools	Albers Elementary School
	All Saints Academy
	Aviston Elementary School
	Breese Elementary School
	Carlyle Elementary School
	Carlyle Junior High School
	Carlyle High School
	Central Community High School
	Germantown Elementary School
	Kaskaskia Education Center
	Mater Dei High School
	New Baden Elementary School
	Schiller Elementary School
	St. George Elementary School
	St. Mary's Elementary School
	Trenton Elementary School
	Willow Grove Elementary School
Police Stations	Breese Police Department
	Carlyle Police Department
	Clinton County Sheriff Department
	Germantown Police Department
	New Baden Police Department
	Trenton Police Department
Medical Care	St. Joseph's Hospital
Fire Departments	Breese Fire Protection District
	Carlyle Fire Protection District
	Clin-Clair Fire Protection District
	Germantown Rural Fire Department
	New Baden Volunteer Fire Department
	Sugar Creek Fire Protection District

Vulnerability to Future Assets/Infrastructure for Tornado Hazard

The entire population and all buildings are at risk because tornadoes can occur anywhere within the state, at any time. Furthermore, any future development in terms of new construction within the county is at risk. Table 4-8 includes the building exposure for Clinton County. All essential facilities in the county are at risk. Appendix E include a list of the essential facilities in Clinton County and Appendix F displays a large format map of the locations of all critical facilities within the county.

Suggestions for Community Development Trends

Preparing for severe storms will be enhanced if local officials sponsor a wide range of programs and initiative to address severe storm preparedness. It is suggested that the county should build new structures with more sturdy construction, and harden existing structures to lessen the potential impacts of severe weather. This is particularly important where the future economic expansion is expected to take place in Carlyle, Breese, and Centralia. Additional warning sirens can warn the community of approaching storms to ensure the safety of Clinton County residents and minimize property damage.

4.3.4 Dam and Levee Failure

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 create 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 very 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, then 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.

Previous Occurrences of Dam and Levee Failure

While there have been some levee breeches and controlled releases on levees in other counties and along the Mississippi River there are no reported breaches within Clinton County. There are many dams along Carlyle Lake but there have not been any uncontrolled releases in them.

Geographic Location of Dams and Levees in Clinton County

The U.S. Army Corps of Engineers maintains the National Inventory of Dams (NID) which identified 13 dams in Clinton County. According to NID records, four dams in Clinton County are classified as high hazard and four dams have Emergency Action Plans (EAP). Table 4-22 lists the dams located in Clinton County and their respective classification level.

Table 4-22. Clinton County Dam Inventory

Dam Name	Stream/River	Hazard Rating	EAP
Carlyle Lake Dam	Kaskaskia River	High	Yes
Carlyle Lake Dam-Keyesport Levee	Kaskaskia River	High	Yes
Carlyle Lake Dam- Saddle Dam 2	Kaskaskia River	Significant	Yes
Carlyle Lake Dam- Saddle Dam 3	Kaskaskia River	Significant	Yes
CB & Q Railroad Reservoir Dam	Crooked Creek Stream	Low	No
Sportsman Lake Dam	Trib. Sugar Creek	Low	No
Lake Joy Dam	Trib. Little York Branch	Low	No
Dieberthortsman Dam	Trib. Sugar Creek	Low	No
Rocky Ford Pond Dam	Trib. Sugar Creek	Low	No
Sunset Hills Lake Dam	Trib. Sugar Creek	Low	No
Breese Perched Reservoir Dam	None	Unknown	No
Exxon Mobile Mine Recirculation Lake Dam	Trib. Grassy Branch	Unknown	No
Exxon Mobile Freshwater Lake Dam	Trib. Grassy Branch	Low	No

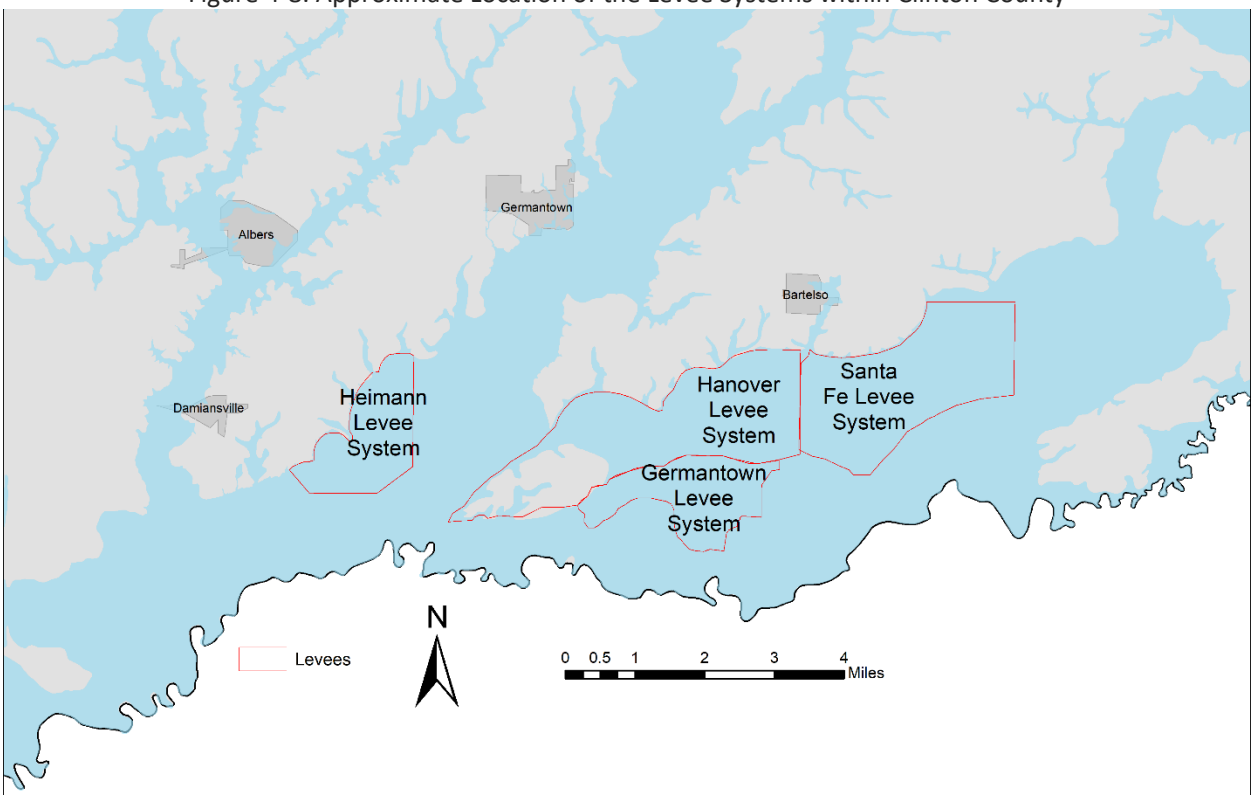
A review of the US Army Corps of Engineers National Levee Database and IDNR records revealed four levee systems within Clinton County. Table 4-23 lists the levees located in Clinton County and their respective U.S. Army Corps of Engineers (USACE) levee system inspection rating. The approximate location of the levee system is shown in Figure 4-8.

Table 4-23. Clinton County Levee Inventory

Levee System	Levees District	Length (miles)	Protection Levee	USACE Levee System Inspection Rating*
Santa Fe Levee System	Santa Fe Drainage and Levee District	6.35	50-year	Unacceptable
Heimann Levee System	Heimann Drainage and Levee District	2.13		Minimally Acceptable
Hanover Levee System	Hanover Drainage and Levee District	1.87		Minimally Acceptable
Germantown Levee System	Germantown Drainage and Levee District	1.95		Minimally Acceptable

*Each levee segment receives an overall segment inspection rating of Acceptable, Minimally Acceptable, or Unacceptable. If a levee system comprises one or more levee segments (if there are different levee sponsors for different parts of the levee) then the overall levee system rating is the lowest of the segment ratings.

Figure 4-8. Approximate Location of the Levee Systems within Clinton County



Hazard Extent for Dam and Levee Failure

Dams are assigned a low hazard potential classification which 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. A significant hazard classification means that failure or incorrect operation results in no probable loss of human life; however, dam or levee failure can cause economic loss, environmental damage, and disruption of lifeline facilities. Significant hazard potential dams are often located in predominantly rural or agricultural areas, but could be located in populated areas with a significant amount of infrastructure. A high hazard potential classification means that failure or incorrect operation has the highest risk to cause loss of human life and to significantly damage buildings and infrastructure.

According to NID records, two dams in Clinton County are classified as high hazard and four dams have Emergency Action Plans (EAP). An EAP is not required by the State of Illinois but is recommended in the 2003 Illinois Dam Safety & Inspection Manual. Review of the EAP indicates that Kaskaskia River can flood portions of the City of Carlyle and a significant area along the south boundary of the county causing potential impacts to the planning area. Flooding along the Kaskaskia River and its major tributaries can impact major transportation routes such as US 50, State Routes 160 and 161.

The U.S. Army Corps of Engineers conducts two types of levee inspections: routine and periodic. Both Routine and Periodic Inspections result in a final inspection rating for operation and maintenance. The rating is based on the levee inspection checklist, which includes 125 specific items dealing with operation and maintenance of levee embankments, floodwalls, interior drainage, pump stations, and channels. Each levee segment receives an overall segment inspection rating of Acceptable, Minimally Acceptable, or

Unacceptable. If a levee system comprises one or more levee segments (if there are different levee sponsors for different parts of the levee) then the overall levee system rating is the lowest of the segment ratings.

Risk Identification for Dam and Levee Failure

Based on operation and maintenance requirements and local knowledge of the dams and levees in Clinton County, the probability of failure is possible. If a high-hazard dam failed, the magnitude and severity of the damage could be great. The warning time and duration of the dam failure event would be very short. Based on input from the Planning Team, future occurrence of dam or levee failure in Clinton County is possible. According to the Risk Priority Index (RPI) and County input, flooding by dam or levee breach is ranked as the number three hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
2	x	8	=	16

Vulnerability Analysis for Dam and Levee Failure

An Emergency Action Plan (EAP) is required to assess the effect of dam failure on these communities. In order to be considered creditable flood protection structures on FEMA's flood maps, levee owners must provide documentation to prove the levee meets design, operation, and maintenance standards for protection against the 1% annual probability flood.

All floodplains are susceptible to flooding in Clinton County; therefore, the population and all buildings located downstream of the floodplain are vulnerable to dam and levee failure. To accommodate this risk, this plan considers all buildings located within 100-year flood plain as vulnerable. Failure of dams and levees in the planning area would result in those floodplains adjacent to or downstream to have the greatest impact. For example, if there was a dam failure at the Carlyle Lake Dam in Carlyle then it would impact the Village of Huey which is east of the Carlyle Lake Dam.

To help clarify the potential impacts from dam and levee failure, the gap in lack of inundation maps must be closed and perhaps identified as a mitigation action for this hazard by communities.

Critical Facilities

All critical facilities downstream of the floodplain are vulnerable to dam and levee failure. An essential facility will encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the facility, and loss of facility functionality (e.g., a damaged police station cannot serve the community). Table 4-7 lists the types and number of critical facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

All buildings downstream of the floodplain are vulnerable to floods as a result of dam and/or levee failure. These impacts can include structural failure, extensive water damage to the facility, and loss of facility functionality (e.g., damaged home will no longer be habitable, causing residents to seek shelter). This plan considers all buildings located within 100-year flood plain as vulnerable.

Infrastructure

The types of infrastructure potentially impacted by a flood include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure is not available for this plan, it is important to emphasize that a flood could damage any number of these items. 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); or railway failure from broken or impassable railways. Bridges could also fail or become impassable, causing risk to motorists.

Hazus-MH Flood Analysis

See section 4.3.2 Flooding Hazard for the results of the Hazus-MH Flood Analysis.

Vulnerability to Future Assets/Infrastructure for Dam and Levee Failure

Flooding as a result of dam or levee failure may affect nearly any location within the county; therefore, all buildings and infrastructure downstream of dam or levee are vulnerable. Table 4-8 includes the building exposure for Clinton County. All essential facilities in the county are at risk. Appendix E include a list of the essential facilities in Clinton County and Appendix F displays a large format map of the locations of all critical facilities within the county. Currently, the municipal planning commission reviews new developments for compliance with the local flood zoning ordinance. At this time, no new construction is planned with the 100-year floodplain.

Suggestions for Community Development Trends

Reducing floodplain development is crucial to reducing flood-related damages. Areas with recent development may be more vulnerable to drainage issues. Storm drains and sewer systems are usually most susceptible to drainage issues. Damage to these can cause back-up of water, sewage, and debris into homes and basements, causing structural and mechanical damage as well as creating public health hazards and unsanitary conditions. To help lower the risks of dam and levee failure, mitigation actions can be identified in order to map the levee failure or dam breach zones in a community.

4.3.5 Drought/Extreme Heat Hazard

Hazard Definition for Drought Hazard

Drought is a normal climatic phenomenon that can occur across the state of Illinois and within Clinton County. The meteorological condition that creates a drought is below-normal rainfall over a sustained period of time. Excessive heat can lead to increased evaporation, which enhances 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 longer).

The severity of a drought depends on location, duration, and geographical extent. Additionally, drought severity depends on the water supply, usage demands by human activities, vegetation, and agricultural operations. Droughts will affect the quality and quantity of crops, livestock, and other agricultural assets. Droughts can adversely impact forested areas leading to an increased potential for extremely destructive forest and woodland fires that could threaten residential, commercial, and recreational structures.

Drought conditions are often accompanied by extreme heat, which is defined as temperatures that exceed the average high for the area by 10°F or more and lasts for several weeks. Such extreme heat can have severe implications for humans. Below are common terms associated with extreme heat:

Heat Wave
Prolonged period of excessive heat often combined with excessive humidity.

Heat Index
A number, in degrees Fahrenheit, which estimates how hot it feels when relative humidity is added to air temperature. Exposure to full sunshine can increase the heat index by 15°F.

Heat Cramps
Muscular pains and spasms due to heavy exertion. Although heat cramps are the least severe, they are often the first signal that the body is having trouble with heat.

Heat Exhaustion
Typically occurs when people exercise heavily or work in a hot, humid place where body fluids are lost through heavy sweating. Blood flow to the skin increases, causing blood flow to decrease to the vital organs, resulting in a form of mild shock. If left untreated, the victim's condition will worsen. Body temperature will continue to rise, and the victim may suffer heat stroke.

Heat and Sun Stroke
A life-threatening condition. The victim's temperature control system, which produces sweat to cool the body, stops working. The body's temperature can rise so high that brain damage and death may result if the body is not cooled quickly.

Previous Occurrences for Drought and Extreme Heat

The NCDC database reported 48 drought/heat wave events in Clinton County since 1950. The most recent extreme heat recorded event occurred in July 2016 from the 18th through the 24th. High temperatures rose into the mid to upper 90s with Heat Index up to 110 degrees. The most recent drought recorded event occurred in August 2012 when extreme drought (D3) conditions continued across Illinois throughout the month. As a result, no damage to crops were reported in Clinton County. Table 4-24 identifies NCDC-recorded extreme heat wave events that caused damage, death, or injury in Clinton County.

Table 4-24. NCDC-recorded Extreme Heat Events that caused Death, Damage or Injury in Clinton County

Location or County*	Date	Deaths	Injuries	Property Damage
Clinton County	7/18/1999	0	2	$0
Clinton County	8/5/2007	0	2	$0
	Total:	**0**	**4**	**$0**

Geographic Location for Drought and Extreme Heat

Droughts are regional in nature. Most areas of the United States are vulnerable to the risk of drought and extreme heat.

Hazard Extent for Drought and Extreme Heat

The extent of droughts or extreme heat varies both depending on the magnitude and duration of the heat and the range of precipitation.

Risk Identification for Drought and/or Extreme Heat

Based on historical information, the occurrence of future droughts and/or prolonged extreme heat is highly likely. Although historical information equates a greater chance of occurrence in any given year for this even in Clinton County, input from the Planning Team suggests drought and/or extreme heat in this

Risk Priority Index				
Probability	x	Magnitude	=	RPI
3	x	5	=	15

area of great magnitude and severity of damage and loss are a likely event. The County should expect extreme heat and prolonged periods of less than average rainfall in the future. According to the Clinton County Planning Team's assessment, drought and/or extreme heat are ranked as the number four hazard.

Vulnerability Analysis for Drought and Extreme Heat

Drought and extreme heat are a potential threat across the entire county; therefore, the county is vulnerable to this hazard and can expect impacts within the affected area. According to FEMA, approximately 175 Americans die each year from extreme heat. Young children, elderly, and hospitalized populations have the greatest risk. The entire population and all buildings are at risk. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Clinton County. Even though the exact areas affected are not known, a discussion of the potential impacts are detailed below.

Critical Facilities

All critical facilities are vulnerable to drought. A critical facility will encounter many of the same impacts as any other building within the jurisdiction, which should involve little or no damage. Potential impacts include water shortages, fires as a result of drought conditions, and residents in need of medical care from the heat and dry weather. Table 4-7 lists the types and number of critical facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect similar impacts to those discussed for critical facilities. These impacts include water shortages, fires as a result of drought conditions, and residents in need of medical care from the heat and dry weather.

Infrastructure

During a drought, the risk to infrastructures is primarily associated with fire, which could result from hot, dry conditions.

Potential Dollar Losses from Drought and Extreme Heat

According to the NCDC, Clinton County has not incurred damages relating to drought and extreme heat events storms since 1950. NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event. As a result, the potential dollar losses for a future event cannot be reliably constrained.

Vulnerability to Future Assets/Infrastructure from Drought/Extreme Heat Hazard

Future development will remain vulnerable to droughts. Typically, some urban and rural areas are more susceptible than others. For example, urban areas are subject to water shortages during periods of

drought. Excessive demands of densely populated areas put a limit on water resources. In rural areas, crops and livestock may suffer from extended periods of heat and drought. Dry conditions can lead to the ignition of wildfires that could threaten residential, commercial, and recreational areas.

Suggestion of Community Development Trends

Because droughts and extreme heat are regional in nature, future development is susceptible to drought. 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 drought and extreme heat hazards by educating the public on steps to take before and during the event—for example, temporary window reflectors to direct heat back outside, staying indoors as much as possible, and avoiding strenuous work during the warmest part of the day.

4.3.6 Earthquake Hazard

Hazard Definition

An earthquake is the shaking of the earth caused by the energy released when large blocks of rock slip past each other in the earth's crust. Most earthquakes occur at tectonic plate boundaries; however, some earthquakes occur in the middle of plates, for example the New Madrid Seismic Zone or the Wabash Valley Fault System. Both of these seismic areas have a geologic history of strong quakes, and an earthquake from either seismic area could possibly affect Illinois counties. There may be other, currently unidentified faults in the Midwest also capable of producing strong earthquakes.

Strong earthquakes can collapse buildings and infrastructure, disrupt utilities, and trigger landslides, avalanches, flash floods, fires, and tsunamis. When an earthquake occurs in a populated area, it may cause death, injury, and extensive property damage. An earthquake might damage essential facilities, such as fire departments, police departments, and hospitals, disrupting emergency response services in the affected area. Strong earthquakes may also require mass relocation; however, relocation may be impossible in the short-term aftermath of a significant event due to damaged transportation infrastructure and public communication systems.

Earthquakes are usually measured by two criteria: intensity and magnitude (M). Earthquake intensity qualitatively measures the strength of shaking produced by an earthquake at a certain location and is determined from effects on people, structures, and the natural environment. Earthquake magnitude quantitatively measures the energy released at the earthquake's subsurface source in the crust, or epicenter. Table 4-25 provides a comparison of magnitude and maximum intensity, and Table 4-26 provides qualitative descriptions of intensity, for a sense of what a given magnitude might feel like.

Table 4-25. Comparison of Earthquake Magnitude and Maximum Intensity

Magnitude (M)	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

Table 4-26. Abbreviated Modified Mercalli Intensity Scale

Mercalli Intensity	Description
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motorcars 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 motorcars 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, and 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.

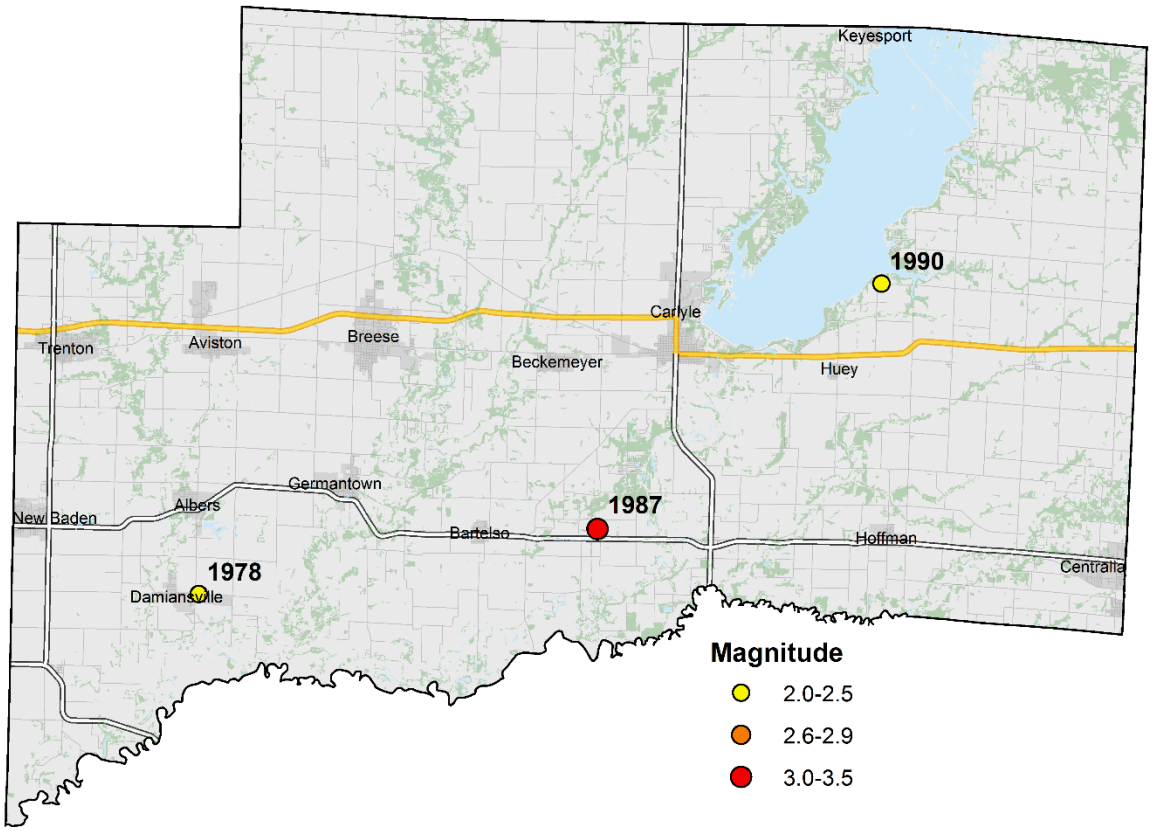
Previous Occurrences for Earthquakes

Historically, the most significant seismic activity in Illinois is associated with New Madrid Seismic Zone. The New Madrid Seismic Zone produced three large earthquakes in the central U.S. with magnitudes estimated between 7.0 and 7.7 on December 16, 1811, January 23, 1812, and February 7, 1812. These earthquakes caused violent ground cracking and volcano-like eruptions of sediment (sand blows) over an area >10,500 km^2, and uplifted a 50 km by 23 km zone (the Lake County uplift). The shaking was felt over a total area of over 10 million km^2 (the largest felt area of any historic earthquake). The United States Geological Survey (USGS) and the Center for Earthquake Research and Information (CERI) at the University of Memphis estimate the probability of a repeat of the 1811-1812 type earthquakes (M7.5-8.0) is 7%-10% over the next 50 years (USGS Fact Sheet 2006-3125).

Earthquakes measured in Illinois typically vary in magnitude from microseismic events of M=1-3 to larger events up to M=5.4. Figure 4-9 depicts the following: (A) location of notable earthquakes in Illinois region; (B) generalized geologic bedrock map with earthquake epicenters and geologic structures; (C) geologic and earthquake epicenter map of Clinton County. The most recent earthquake in Illinois—as of the date of this report—was a M3.0 event in July 2017, approximately 10.80 miles from Vandalia, Illinois in Fayette County.

The last earthquake in Illinois to cause minor damage occurred on April 18, 2008 near Mt. Carmel, IL and measured 5.2 in magnitude. Earthquakes resulting in more serious damage have occurred about every 70 to 90 years and are historically concentrated in southern Illinois.

Figure 4-9. Notable Earthquakes in Illinois with Geologic and Earthquake Epicenters in Clinton County



Geographic Location for Earthquake Hazard

Clinton County is situated in a region susceptible to earthquakes. Since 1974, the epicenters of 3 small earthquakes (M2.1-M3.2) have been recorded in Clinton County (see Figure 4-15(C)). This local seismic activity may be associated with the Du Quoin Monocline.

The two most significant zones of seismic activity in Illinois are the New Madrid Seismic Zone and the Wabash Valley Fault System. Return periods for large earthquakes within the New Madrid System are estimated to be ~500–1000 years; moderate quakes between magnitude 5.5 and 6.0 can recur within approximately 150 years or less. The Wabash Valley Fault System extends nearly the entire length of

southern Illinois along the Indiana border and has the potential to generate an earthquake of sufficient strength to cause damage between St. Louis, MO and Indianapolis, IN. While large earthquakes (>M7.0) are unlikely in Clinton County, moderate earthquakes (≤ M5.5) in or in the vicinity of Clinton County are probable.

Hazard Extent for Earthquake Hazard

Earthquake effects are possible anywhere in Clinton County. One of the most critical sources of information that is required for accurate assessment of earthquake risk is soils data. The National Earthquake Hazards Reduction Program (NEHRP) compliant soils map was provided by FEMA for the analysis. This map identifies the soils most susceptible to failure.

Risk Identification for Earthquake Hazard

Based on historical information and current USGS and SIU research and studies, future earthquakes in Clinton County are possible, but large (>M7.0) earthquakes that cause catastrophic damage are unlikely. According to the Clinton County Planning Team's assessment, earthquakes are ranked as the number five hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
2	x	6	=	12

Vulnerability Analysis for Earthquake Hazard

Earthquakes could impact the entire county equally; therefore, the entire county's population and all buildings are vulnerable to an earthquake. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Clinton County.

Critical Facilities

All critical facilities are vulnerable to earthquakes. Critical facilities are susceptible to many of the same impacts as any other building within the jurisdiction. These impacts include structural failure and loss of facility functionality (e.g., a damaged police station will no longer be able to serve the community). Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect similar impacts to those discussed for critical facilities. These impacts include structural failure and loss of building function which could result in indirect impacts (e.g., damaged homes will no longer be habitable causing residents to seek shelter).

Infrastructure

During an earthquake, the types of infrastructure that shaking could impact include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure was not available for use in the earthquake models, it is important to emphasize that any number of these items could become damaged in the event of an earthquake. 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 also fail or become impassable, causing risk to motorists.

Hazus-MH Earthquake Analyses

Existing geological information was reviewed prior to the Planning Team selection of earthquake scenarios. A Magnitude 5.5 probabilistic earthquake scenario was performed to provide a reasonable basis for earthquake planning in Clinton County. The other two scenarios included a Magnitude of 7.7 with the epicenter located on the New Madrid Fault Zone and a Magnitude 7.1 with the epicenter located on the Wabash Fault Zone.

The earthquake-loss analysis for the probabilistic scenario was based on ground-shaking parameters derived from U.S. Geological Survey probabilistic seismic hazard curves for the earthquake with the 500-year return period. This scenario evaluates the average impacts of a multitude of possible earthquake epicenters with a magnitude typical of that expected for a 500-year return period. The New Madrid Fault Zone runs along the Mississippi River through Arkansas, Tennessee, Missouri, Kentucky and Southern Illinois. The Wabash Valley Fault Zone runs through southeastern Illinois, western Kentucky and southwest Indiana. This represents a realistic scenario for planning purposes.

The earthquake hazard modeling scenarios performed:

- Magnitude 5.5 probabilistic earthquake epicenter in Clinton County
- Magnitude 7.7 event along the New Madrid Fault Zone
- Magnitude 7.1 event along the Wabash Valley Fault Zone

This report presents two types of building losses: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

Results for M5.5 Earthquake Scenario

The results of the M5.5 probabilistic earthquake scenario are depicted in Tables 4-27, 4-28, and Figure 4-17. Hazus-MH estimates that approximately 95 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the Clinton County. It is estimated that 0 building would be damaged beyond repair.

The total building related losses are approximately $4.95 million dollars. It is estimated that 27% of the losses are related to the business interruption of the region. The largest loss is sustained by the residential occupancies which make up over 58% of the total loss.

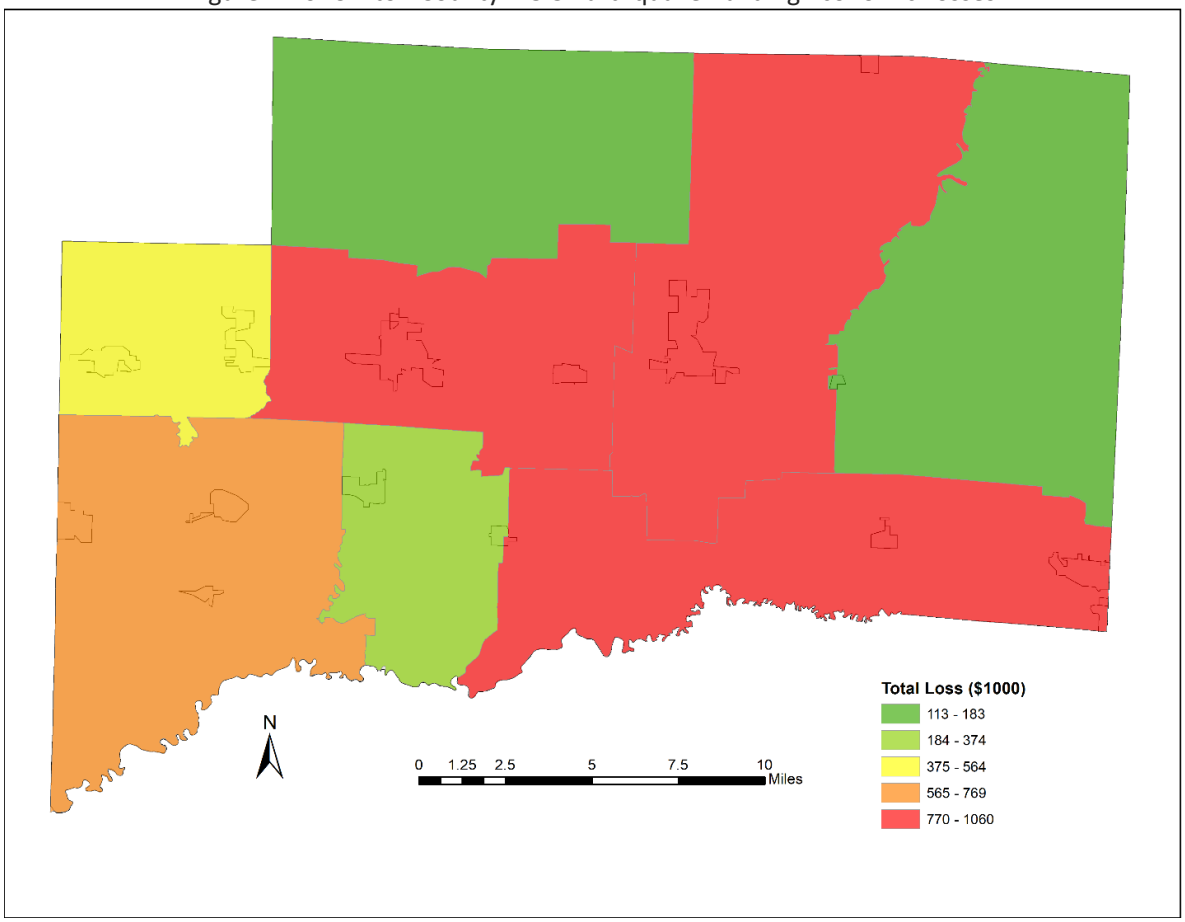
Table 4-27. M5.5 Earthquake Damage Estimates by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	236	1.52	7	2.41	3	2.99	0	4.16	0	2.38
Commercial	780	5.01	22	7.56	7	8.41	1	11.51	0	8.04
Educational	41	0.27	1	0.41	0	0.48	0	0.65	0	0.72
Government	38	0.24	1	0.31	0	0.34	0	0.43	0	0.44
Industrial	246	1.58	7	2.36	2	2.71	0	3.67	0	2.05
Other Residential	1,839	11.81	83	27.97	26	30.47	1	8.13	0	2.38
Religion	65	0.42	2	0.62	1	0.75	0	1.06	0	0.98
Single Family	12,320	79.15	173	58.36	47	53.86	6	70.38	1	83.01
Total:	**15,566**		**296**		**87**		**8**		**1**	

Table 4-28. M5.5 Earthquake Estimates of Building Economic Losses (in Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Other	Total
Income Losses	Wage	0.00	0.01	0.18	0.01	0.03	0.23
	Capital-Related	0.00	0.00	0.16	0.01	0.01	0.17
	Rental	0.10	0.04	0.11	0.00	0.01	0.26
	Relocation	0.34	0.05	0.15	0.02	0.09	0.66
	Subtotal:	**0.43**	**0.11**	**0.60**	**0.04**	**0.14**	**1.33**
Capital Stock Losses	Structural	0.61	0.12	0.29	0.06	0.14	1.23
	Non-Structural	1.13	0.22	0.31	0.08	0.16	1.91
	Content	0.22	0.03	0.11	0.05	0.07	0.47
	Inventory	0.00	0.00	0.00	0.01	0.00	0.01
	Subtotal:	**1.96**	**0.38**	**0.72**	**0.20**	**0.37**	**3.63**
	Total:	**2.39**	**0.49**	**1.32**	**0.25**	**0.51**	**4.95**

Figure 4-10. Clinton County M5.5 Earthquake Building Economic Losses



Results for M7.7 New Madrid Earthquake

The results of the M7.7 New Madrid earthquake scenario are depicted in Tables 4-29, 4-30, and Figure 4-11. Hazus-MH estimates that approximately 363 buildings will be at least moderately damaged. This is over 2% of the buildings in the county. It is estimated that 17 buildings would be damaged beyond repair.

The total building related losses are approximately $42.02 million dollars. It is estimated that 12% of the losses are related to the business interruption of the region. The largest loss is sustained by the residential occupancies which make up over 60% of the total loss.

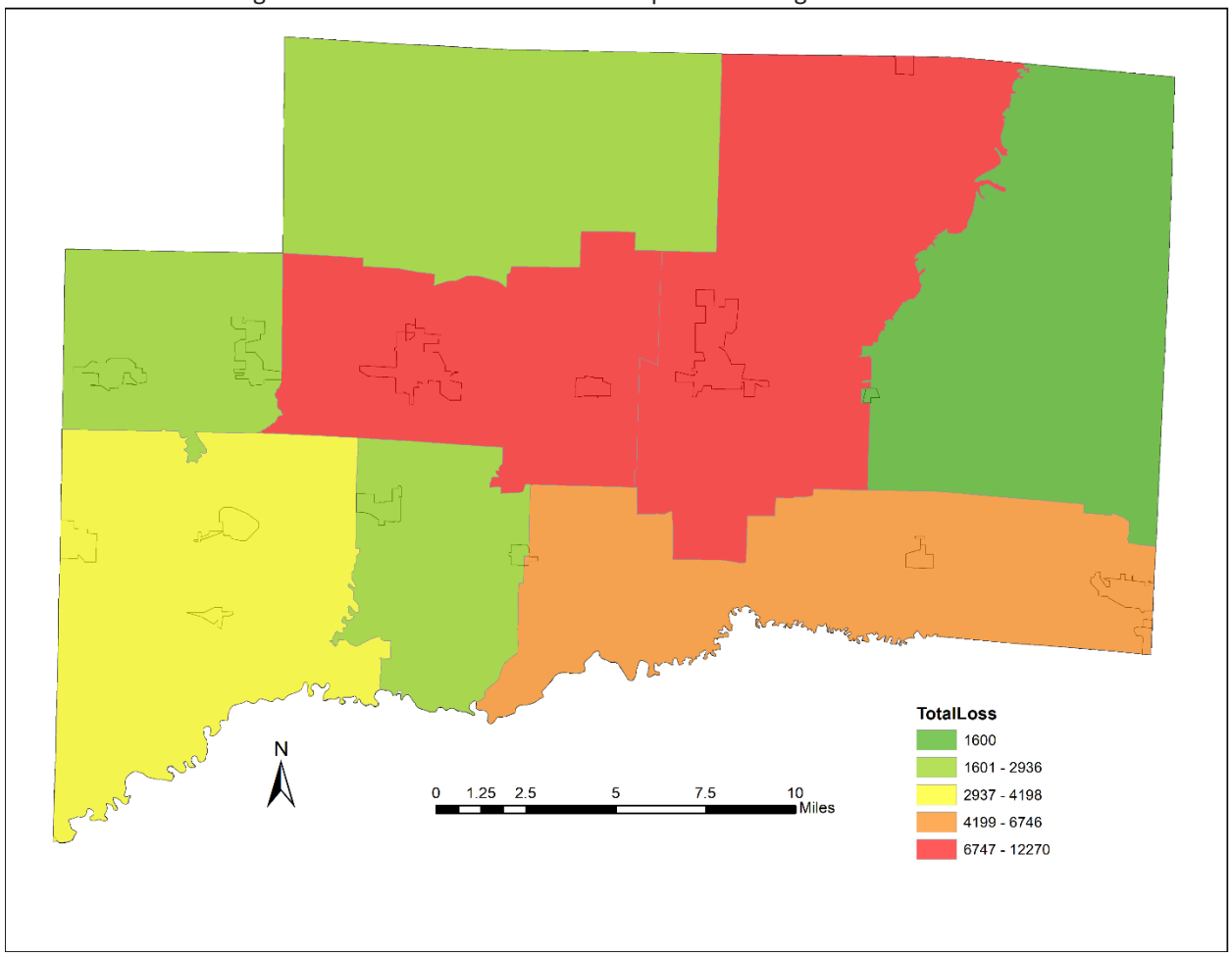
Table 4-29. New Madrid M7.7 Earthquake Damage Estimates by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	223	1.50	16	2.30	5	2.00	2	1.88	0	1.69
Commercial	739	4.95	50	7.36	17	6.27	5	6.29	1	55.54
Educational	40	0.27	2	0.32	0	0.18	0	0.25	0	0.26
Government	34	0.23	4	0.52	1	0.39	0	0.28	0	0.28
Industrial	234	1.57	15	2.18	5	2.00	2	2.04	0	1.81
Other Residential	1,396	9.36	337	49.90	197	73.96	16	19.94	3	14.73
Religion	62	0.42	4	0.60	1	0.43	0	0.44	0	0.42
Single Family	12,190	81.71	249	36.82	39	14.77	55	68.88	13	75.27
Total:	**14,918**		**676**		**266**		**80**		**17**	

Table 4-30. New Madrid M7.7 Earthquake Estimates of Building Economic Losses (in Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Other	Total
Income Losses	Wage	0.00	0.10	0.65	0.04	0.10	0.89
	Capital-Related	0.00	0.04	0.59	0.02	0.02	0.67
	Rental	0.38	0.15	0.34	0.01	0.03	0.92
	Relocation	1.25	0.38	0.48	0.07	0.25	2.43
	Subtotal:	**1.63**	**0.67**	**2.06**	**0.15**	**0.40**	**4.91**
Capital Stock Losses	Structural	2.51	0.58	1.00	0.23	0.43	4.75
	Non-Structural	11.40	2.40	3.99	1.50	1.66	20.95
	Content	5.13	0.72	2.75	1.13	1.33	11.06
	Inventory	0.00	0.00	0.11	0.20	0.04	0.35
	Subtotal:	**19.04**	**3.70**	**7.85**	**3.06**	**3.47**	**37.11**
	Total:	**20.67**	**4.37**	**9.91**	**3.20**	**3.87**	**42.02**

Figure 4-11. New Madrid M7.7 Earthquake Building Economic Losses



Results M7.1 Magnitude Wabash Valley Earthquake – General Building Stock

The results of the Wabash Valley M7.1 earthquake scenario are depicted in Tables 4-31, 4-32, and Figure 4-12. Hazus-MH estimates that approximately 122 buildings will be at least moderately damaged. This is over 1% of the buildings in the county. It is estimated that 14 buildings would be damaged beyond repair.

The building related losses are approximately $30.10 million dollars. It is estimated that 9% of the losses are related to the business interruption of the region. The largest loss is sustained by the residential occupancies which make up over 61% of the total loss.

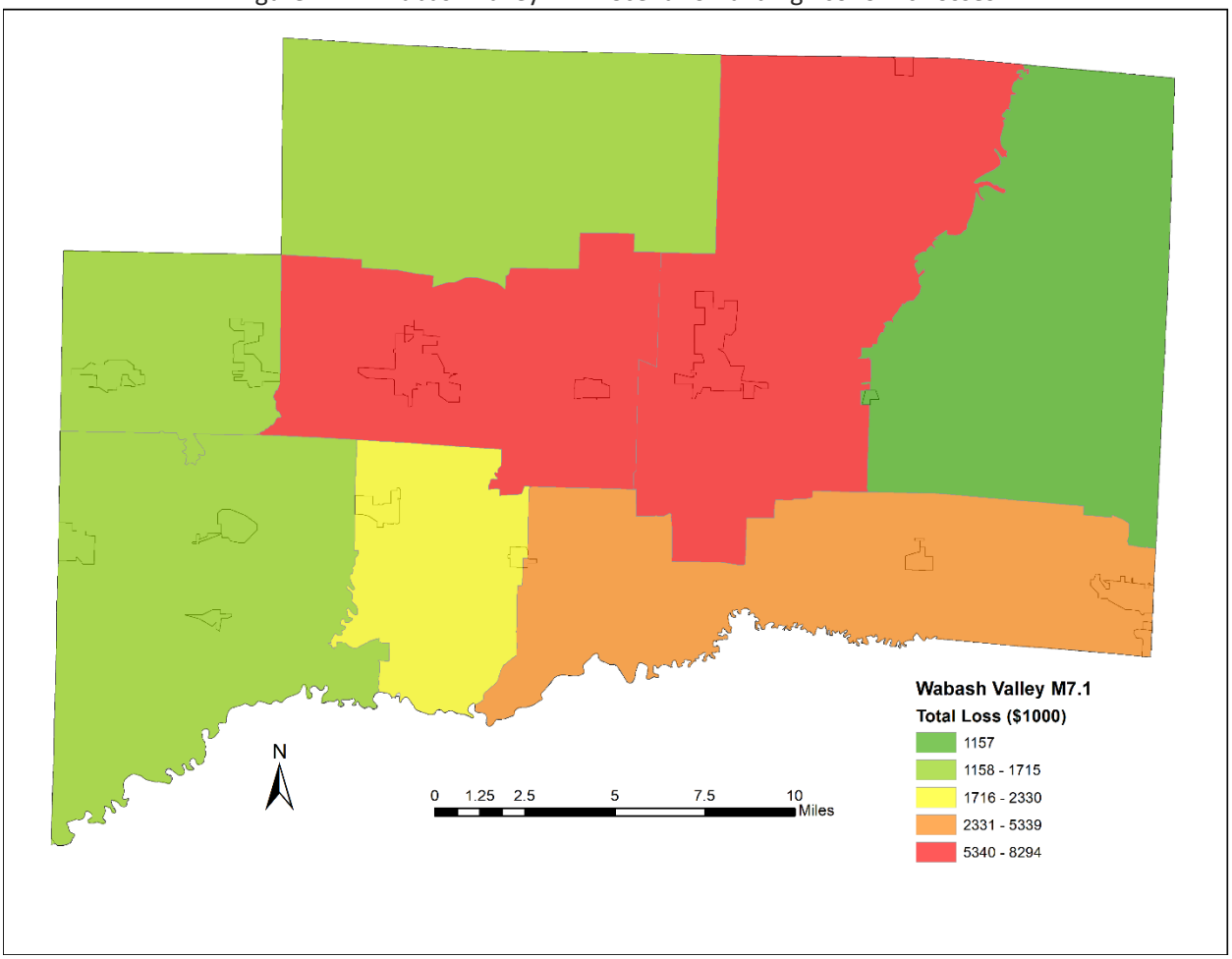
Table 4-31. Wabash Valley 7.1 Magnitude Earthquake Damage Estimates by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	238	1.53	6	1.91	1	2.17	1	1.70	0	1.68
Commercial	784	5.05	19	6.46	4	7.13	3	5.59	1	5.53
Educational	42	0.27	1	0.28	0	0.24	0	0.26	0	0.26
Government	37	0.24	1	0.41	0	0.39	0	0.28	0	0.28
Industrial	248	1.60	6	1.87	1	2.20	1	1.82	0	1.81
Other Residential	1,772	11.40	143	48.22	24	45.61	8	14.7	2	14.74
Religion	66	0.42	2	0.61	0	0.60	0	0.42	0	0.42
Single Family	12,352	79.49	119	40.23	22	41.66	42	75.16	11	75.29
Total:	**15,539**		**297**		**52**		**56**		**14**	

Table 4-32. Wabash Valley 7.1 Magnitude Earthquake Estimates of Building Economic Losses (in Millions of Dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Other	Total
Income Losses	Wage	0.00	0.08	0.31	0.02	0.05	0.46
	Capital-Related	0.00	0.03	0.27	0.01	0.01	0.33
	Rental	0.28	0.09	0.16	0.01	0.02	0.56
	Relocation	0.93	0.10	0.22	0.03	0.14	1.42
	Subtotal:	**1.21**	**0.31**	**0.97**	**0.07**	**0.22**	**2.78**
Capital Stock Losses	Structural	1.83	0.25	0.55	0.12	0.24	2.99
	Non-Structural	8.65	1.60	2.93	1.16	1.20	15.53
	Content	3.94	0.55	2.14	0.89	1.01	8.53
	Inventory	0.00	0.00	0.09	0.15	0.03	0.28
	Subtotal:	**14.41**	**2.40**	**5.71**	**2.32**	**2.48**	**27.33**
	Total:	**15.62**	**2.70**	**6.68**	**2.39**	**2.70**	**30.10**

Figure 4-12. Wabash Valley M7.1 Scenario Building Economic Losses



Vulnerability to Future Assets/Infrastructure for Earthquake Hazard

New construction, especially critical facilities, should accommodate earthquake mitigation design standards.

Suggestions for Community Development Trends

Community development should occur outside of the low-lying areas in floodplains with a water table within five feet of grade that is susceptible to liquefaction. It is important to harden and protect future and existing structures against the possible termination of public services and systems including power lines, water and sanitary lines, and public communication.

4.3.7 Winter Storm Hazard

Hazard Definition of Winter Storm Hazard

Severe winter weather consists of various forms of precipitation and 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, or death and cause property damage and disrupt economic activity.

Ice or sleet, even in small quantities, can result in hazardous driving conditions and can cause property damage. Sleet involves raindrops that freeze completely before reaching the ground. Sleet does not stick to trees and wires. Ice storms, on the other hand, involve liquid rain that falls through subfreezing air and/or onto sub-freezing surfaces, freezing on contact with those surfaces. The ice coats trees, buildings, overhead wires, and roadways, sometimes causing extensive damage.

Ice storms are some of the most damaging winter storms in Illinois. Ice storms occur when moisture-laden Gulf air converges with the northern jet stream causing freezing rain that coats power and communication lines and trees with heavy ice. Strong winds can cause the overburdened limbs and cables to snap; leaving large sectors of the population without power, heat, or communication.

Rapid accumulation of snow, often accompanied by high winds, cold temperatures, and low visibility, characterize significant snowstorms. A blizzard is categorized as a snow storm with winds of 35 miles per hour or greater and/or visibility of less than one-quarter mile for three or more hours. Strong winds during a blizzard blow falling and fallen snow, creating poor visibility and impassable roadways. Blizzards potentially result in property damage.

Blizzards repeatedly affect Illinois. Blizzard conditions cause power outages, loss of communication, and transportation difficulties. Blizzards can reduce visibility to less than one-quarter mile, and the resulting disorientation makes even travel by foot dangerous if not deadly.

Severe cold involves ambient air temperatures that drop to 0°F or below. These extreme temperatures can increase the likelihood of frostbite and hypothermia. High winds during severe cold events can enhance the air temperature's effects. Fast winds during cold weather events can lower the wind chill factor (how cold the air feels on your skin). As a result, the time it takes for frostbite and hypothermia to affect a person's body will decrease.

Previous Occurrences of Winter Storm Hazard

The NCDC database reported 39 winter storm and extreme cold events for Clinton County since 1950. The most recent reported event occurred in March of 2015. The county received six to eight inches of snow over the course of the afternoon of February 28 to the afternoon of March 1. NCDC-recorded no winter storm events that caused damage, death, or injury in Clinton County.

Geographic Location of Winter Storm Hazard

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

Hazard Extent of Winter Storm Hazard

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 county.

Risk Identification of Winter Storm Hazard

Based on historical information, the probability of future winter storms in Clinton County is highly likely. Although historical information equates a greater chance of occurrence in any given year for this event in Clinton County, input from the Planning Team suggests winter storms are a likely event in this area. The county should expect winter storms with varying magnitudes to occur in the future. Winter storms ranked as the number six hazard according to the Clinton County Planning Team's risk assessment.

Risk Priority Index

Probability	x	Magnitude	=	RPI
3	x	3	=	9

Vulnerability Analysis of Winter Storm Hazard

Winter storm impacts are equally likely across the entire county; therefore, the entire county is vulnerable to a winter storm and can expect impacts within the affected area. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Clinton County.

Critical Facilities

All critical facilities are vulnerable to winter storms. A critical facility will encounter many of the same impacts as other buildings within the county. These impacts 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. Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. 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.

Infrastructure

During a winter storm, the types of potentially impacted infrastructure include roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is vulnerable, it is important to emphasize that a winter storm could impact any structure. Potential impacts include broken gas and/or electricity lines or damaged utility lines, damaged or impassable roads and railways, and broken water pipes.

Potential Dollar Losses from Winter Storm Hazard

According to the NCDC, Clinton County has not incurred direct financial damages relating to winter storms since 1950. NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event. As a result, the potential dollar losses for a future event cannot be reliably constrained for Clinton County.

Vulnerability to Future Assets/Infrastructure for Winter Storm Hazard

Any new development within the county will remain vulnerable to these events.

Suggestions for Community Development Trends

Because winter storm events are regional in nature, future development across the county will also face winter storms.

4.3.8 Severe Thunderstorms Hazard

Hazard Definition

Severe thunderstorms are weather events with one or more of the following characteristics: strong winds, large and damaging hail, and frequent lightning. Severe thunderstorms most frequently occur in Illinois during the spring and summer months, but can occur at any time. A severe thunderstorm's impacts can be localized or can be widespread in nature. A thunderstorm is classified as severe when it meets one or more of the following criteria:

Hail 0.75 inches or greater in diameter

Hail is a possible product of a strong thunderstorm. Hail usually falls near the center of a storm, but strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, resulting in damage in other areas near the storm. Hailstones range from pea-sized to baseball-sized, and some reports note hailstones larger than softballs.

Frequent and dangerous lightning

Lightning is a discharge of electricity from a thunderstorm. Lightning is often perceived as a minor hazard, but lightning damages many structures and kills or severely injures numerous people in the United States each year.

Wind speeds greater than or equal to 58 miles per hour

Straight-line winds from thunderstorms are fairly common in Illinois. Straight-line winds can cause damage to homes, businesses, power lines, and agricultural areas, and may require temporary sheltering of individuals who are without power for extended periods of time.

Previous Occurrences of Thunderstorm Hazards

The National Climatic Data Center (NCDC) database reported 87 hailstorms, 1 lightning events, and 129 thunderstorm and wind storms in Clinton County since 1950. Table 4-33 identifies selected NCDC-recorded storms that caused major damage, death, or injury in Clinton County. Additional details of individual hazard events are on the NCDC website.

Table 4-33. Selected NCDC-Recorded Severe Thunderstorms that Caused Major Property Damage, Death, or Injury in Clinton County

Location or County*	Date	Deaths	Injuries	Property Damage
Stolletown	10/4/2000	0	0	$10,000
Beckemeyer	5/25/1996	0	0	$5,000
Carlyle	5/25/1996	0	0	$5,000
Hoffman	5/17/1999	0	0	$75,000
Stolletown	10/4/2000	0	0	$210,000
New Baden	5/30/2008	0	0	$5,000
Total:		**0**	**0**	**$310,000**

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

Geographic Location of Thunderstorm Hazard

The entire county has the same risk for occurrence of thunderstorms. They can occur at any location within the county.

Hazard Extent for Thunderstorm Hazard

The extent of the hypothetical thunderstorms depends upon the extent of the storm, the wind speed, and the size of hail stones. Thunderstorms can occur at any location within the county.

Risk Identification for Thunderstorm Hazard

Based on historical information, the occurrence of future high winds, hail, and lightning is highly likely. The county should expect high winds, hail, and lightning of widely varying magnitudes in the future.

Risk Priority Index

Probability	x	Magnitude	=	RPI
4	x	2	=	8

According to the Clinton County Planning Team's assessment, severe thunderstorms are ranked as the number seven hazard.

Vulnerability Analysis for Thunderstorm Hazard

The entire county's population and all buildings are vulnerable to a severe thunderstorm and can expect the same impacts within the affected area. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Clinton County.

Critical Facilities

All critical facilities are vulnerable to severe thunderstorms. A critical facility will encounter many of the same impacts as any other building within the jurisdiction. These impacts include 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 (e.g., a damaged police station cannot serve the community). Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect impacts similar to those discussed for critical facilities. These impacts include 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 (e.g., a person cannot inhabit a damaged home, causing residents to seek shelter).

Infrastructure

A severe thunderstorm could impact roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is vulnerable, it is important to emphasize that a severe thunderstorm could damage any number of these structures. The impacts to these structures include impassable roadways, broken or failed utility lines (e.g., loss of power or gas to community), or impassable railways. Bridges could become impassable causing risk to motorists.

Potential Dollar Losses from Thunderstorm Hazard

According to the NCDC, Clinton County has incurred approximately $310,000 in damages relating to thunderstorms, including hail, lightning, and high winds since 1950. NCDC records are estimates of damage compiled by the National Weather Service from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to a given weather event. As a result, the potential dollar losses for a future event cannot be fully constrained; however, based on average property damage in the past two decades, SIU estimates that Clinton County incurs property damages of approximately $10,000 per year related to severe thunderstorms.

Vulnerability to Future Assets/Infrastructure for Thunderstorm Hazard

All future development within the county and all communities will remain vulnerable to severe thunderstorm events.

Suggestions for Community Development Trends

Local officials could enhance severe storm preparedness if they sponsor a wide range of programs and initiatives to address the overall safety of county residents. It is suggested that the county should build new structures with more sturdy construction, and harden existing structures to lessen the potential impacts of severe weather. This is particularly import where the future economic expansion is expected to take place near cites of Centralia, Breese, Trenton and Carlyle. Additional warning sirens can warn the community of approaching storms to ensure the safety of Clinton County residents and minimizing property damage.

4.3.9 Ground Failure

Hazard Definition

According to the USGS, the term ground failure is generally referred to landslides, liquefaction, lateral spreads, and any other process that affects the stability of the ground. In Illinois, ground failure is typically associated with subsidence of the land surface related to soluble rock (karst), sink holes, or underground mining.

Subsidence Related to Karst Features

Subsidence can occur on land located over soluble bedrock. The land over such bedrock often has topography characteristic of past subsidence events. This topography is termed "karst." Karst terrain has unique landforms and hydrology found only in these areas. Bedrock in karst areas are typically limestone, dolomite, or gypsum. In Illinois, limestone and dolomite (carbonate rocks) are the principle karst rock types. 9% of Illinois has carbonate rock types close enough to the ground surface to have a well-developed karst terrain. The area in Illinois in which the karst terrain is most developed is the southern and southwestern part of the state (Panno, et al., 1997). The karst feature most associated with subsidence is the sinkhole.

Sinkhole Formation and Collapse

A sinkhole is an area of ground that has no natural external surface drainage—when it rains, all of the water stays inside the sinkhole and typically drains into the subsurface. Sinkholes can vary from a few feet to hundreds of acres and from less than one to more than 100 feet deep. Typically, sinkholes form slowly, so that little change is seen during a lifetime, but they also can form suddenly when a collapse occurs. Such a collapse can have a dramatic effect if it occurs in a populated setting.

Sinkholes form where rainwater moves through the soil and encounters soluble bedrock. The bedrock begins to dissolve along horizontal and vertical cracks and joints in the rock. Eventually, these cracks become large enough to start transporting small soil particles. As these small particles of soil are carried off, the surface of the soil above the conduit slumps down gradually, and a small depression forms on the ground surface. This depression acts like a funnel and gathers more water, which makes the conduit still larger and washes more soil into the conduit.

Sudden collapse of a sinkhole occurs where the soil close to the ground surface does not initially slump down, but instead forms a bridge. Beneath that surface cover, a void forms where the soil keeps washing into the conduit. These voids are essentially shallow caves. Over time, the void enlarges enough that the weight of the overlying bridge can no longer be supported. The surface layer then suddenly collapses into the void, forming a sinkhole.

The process of forming a conduit and a soil bridge usually takes years to decades. However, this natural process can be aggravated and expedited by human activities. Since the process of forming a sinkhole depends on water to carry soil particle down into the karst bedrock, anything that increases the amount of water flowing into the subsurface can accelerate sinkhole formation process. Parking lots, streets, altered drainage from construction, and roof drainage are a few of the things that can increase runoff.

Collapses are more frequent after intense rainstorms. However, drought and altering of the water table can also contribute to sinkhole collapse. Areas where the water table fluctuates or has suddenly been lowered are more susceptible to sinkhole collapse. (White, 1988)

Underground Mining and Subsidence

Underground mines have been used extensively in Illinois to extract coal, lead, zinc, fluorites, shale, clay stones, limestone, and dolomite. When mining first began in Illinois, land over mined areas was sparsely populated. If the ground subsided, homes or other structures were seldom damaged. As towns and cities expanded over mined-out areas, subsidence damage to structures became increasingly more common. The most common underground mines in Illinois are coal mines. A recent study in Illinois has found that about 333,100 housing units were located over or adjacent to 839,000 acres mined for coal (Bauer, 2008).

Illinois has abundant coal resources. All or parts of 86 of 102 counties in the state have coal-bearing strata. As of 2007, about 1,050,400 acres (2.8% of the state) have been mined. Of that total, 836,655 acres are underground mines (Bauer, 2008). Illinois ranks first among all U.S. states for reserves of bituminous coal (Illinois Coal Association, 1992).

There are two fundamental underground mining methods used in Illinois: high-extraction methods such as long-wall and low-extraction room-and pillar mining. High-extraction methods remove almost all of the coal in localized areas. For modern mining practices, subsidence associated with high-extraction methods is planned and regulated by state and federal authorities. The subsurface subsides above the mine within several days or weeks after the coal has been removed. Subsidence of the over-burden above the mined-out area can continue up to seven years after subsurface removal, depending on the local geologic conditions (Bauer, 2008). The initial ground movements associated with this mining, which tend to be the largest, diminish rapidly after a few months. After subsidence has decreased to a level that no longer causes damage to structures, the land may be suitable for development. The maximum amount of subsidence is proportional to the amount of material extracted and the depth between the mining and the surface. In general, over the centerline of the mine panel, subsidence can be 60 to 70% of the extracted material (e.g., 10ft of material extracted would cause a maximum subsidence of six to seven feet; Bauer, 2006).

For low-extraction techniques such as room-and-pillar mining, miners create openings (rooms) as they work. Enough of the coal layer is left behind in the pillars to support the ground surface. In Illinois this system of mining extracts 40% to 55% of the coal resources in modern mines and up to 75% in some older mines. Based on current state regulations, room-and-pillar mines in operation after 1983 that do not include planned subsidence must show that they have a stable design. Although these permitting requirements have improved overall mine stability, there are no guarantees that subsidence will not occur above a room-and-pillar mine in the future. In general, if coal or other mined resources have been removed from an area, subsidence of the overlying material is always a possibility (Bauer, 2006).

In Illinois, subsidence of the land surface related to underground mining undertakes two forms: pit subsidence or trough (sag) subsidence. Pit subsidence structures are generally six to eight feet deep and range from two to 40 feet in diameter. Pit subsidence mostly occurs over shallow mines that are <100 feet deep and where the overlying bedrock is <50 feet thick and composed of weak rock materials such as shale. The pit is produced when the mine roof

collapses and the roof fall void works its way to the surface. These structures form rapidly. If the bedrock is only a few feet thick and the surface material are unconsolidated (loose), these material may fall into adjacent mine voids, producing a surface hole deeper than the height of the collapse mine void. Pit subsidence can cause damage to a structure if it develops under the corner a building or support post of a foundation or other critical location. Subsidence pits should be filled to ensure that people or animals don't fall into these structures (Bauer, 2006).

Trough (or "sag") subsidence forms a gentle depression over a broad area. Some trough subsidence may be as large as a whole mine panel (i.e. several hundred feet long and a few hundred feet wide). Several acres of land may be affected by a single trough event or feature. As discussed above, the maximum vertical settlement is 60% to 70% of the height of material removed (e.g., two to six feet). Significant troughs may develop suddenly (in a few hours or days) or gradually over a period of years. Troughs originate over places in mines where pillar has collapsed, producing downward movement at the ground surface. These failures can develop over mines of any depth. Trough subsidence produces an orderly pattern of tensile features (tension cracks) surrounding a central area of possible compression features. The type and extent of damage to surface structures relate to their orientation and position within a trough. In the tension zone, the downward-bending movements that develop in the ground may damage buildings, roads, sewer and water pipes, and other utilities. The downward bending of the ground surface causes the soil to crack, forming the tension cracks that pull structures apart. In the relatively smaller compression zone, roads my buckle and foundation walls may be pushed inward. Buildings damaged by compressional forces typically need their foundations rebuilt and leveled (Bauer, 2006).

Previous Occurrences of Ground Failure

In Clinton County, there have been no reported occurrences of ground failure.

Geographic Location for Ground Failure

Illinois is usually associated with either underground mining or collapse of soil into crevice in underlying soluble bedrock. Areas at risk for subsidence can be determined from detailed mapping of geologic conditions or detailed mine maps.

Hazard Extent for Ground Failure

The extent of ground failure hazard in Clinton County is a function of where current development is located relative to (1) areas of past and present underground mining, and (2) areas of soluble bedrock.

Risk Identification for Ground Failure

Based on historical information and the underlying geology of Clinton County, the occurrence of future ground failure is likely. According to the Clinton County Planning Team's assessment, ground failure is ranked as the number eight hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
3	x	2	=	6

Vulnerability Analysis for Ground Failure

The county is primarily susceptible to underground mining. A large portion of the county is undermined and there are many buildings on top of the undermined areas. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Clinton County.

Critical Facilities

Any critical facility built above highly soluble bedrock could be vulnerable to ground failure. A critical facility will encounter the same impacts as any other building within the affected area. These impacts include damages ranging from cosmetic to structural. Buildings may sustain minor cracks in walls due to a small amount of settling, while in more severe cases, the failure of building foundations can cause cracking of critical structural elements. Table 4-7 lists the types and number of critical facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect similar impacts to those discussed for critical facilities, ranging from cosmetic to structural. Buildings may sustain minor cracks in walls due to a small amount of settling, while in more severe cases, the failure of building foundations causes cracking of critical structural elements.

Infrastructure

In the area of Clinton County potentially affected by ground failure, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. The risk to these structures is primarily associated with land collapsing directly beneath them in a way that undermines their structural integrity. The impacts to these items include broken, failed, or impassable roadways; broken or failed utility lines (i.e. loss of power or gas to community); and railway failure from broken or impassable railways. In addition bridges could fail or become impassable causing risk to traffic.

GIS-based Analysis of Ground Failure

This section provides an overview of the ground failure hazards in Illinois in general and a discussion of the potential subsidence risk for Clinton County. Ground failure in Illinois is usually associated with either underground mining or collapse of soil into crevice in underling soluble bedrock. Areas at risk for ground failure can be determined from detailed mapping of geologic conditions or detailed mine maps. Figure 4-13 displays data sources compiled from the Illinois State Geologic Survey (ISGS) and Illinois Department of Natural Resources (IDNR) to assess the risk of ground failure in Clinton County.

Figure 4-13. Distribution of Bedrock with Potential Coal Bearing Strata, Karst, Sinkholes and Mining Efforts

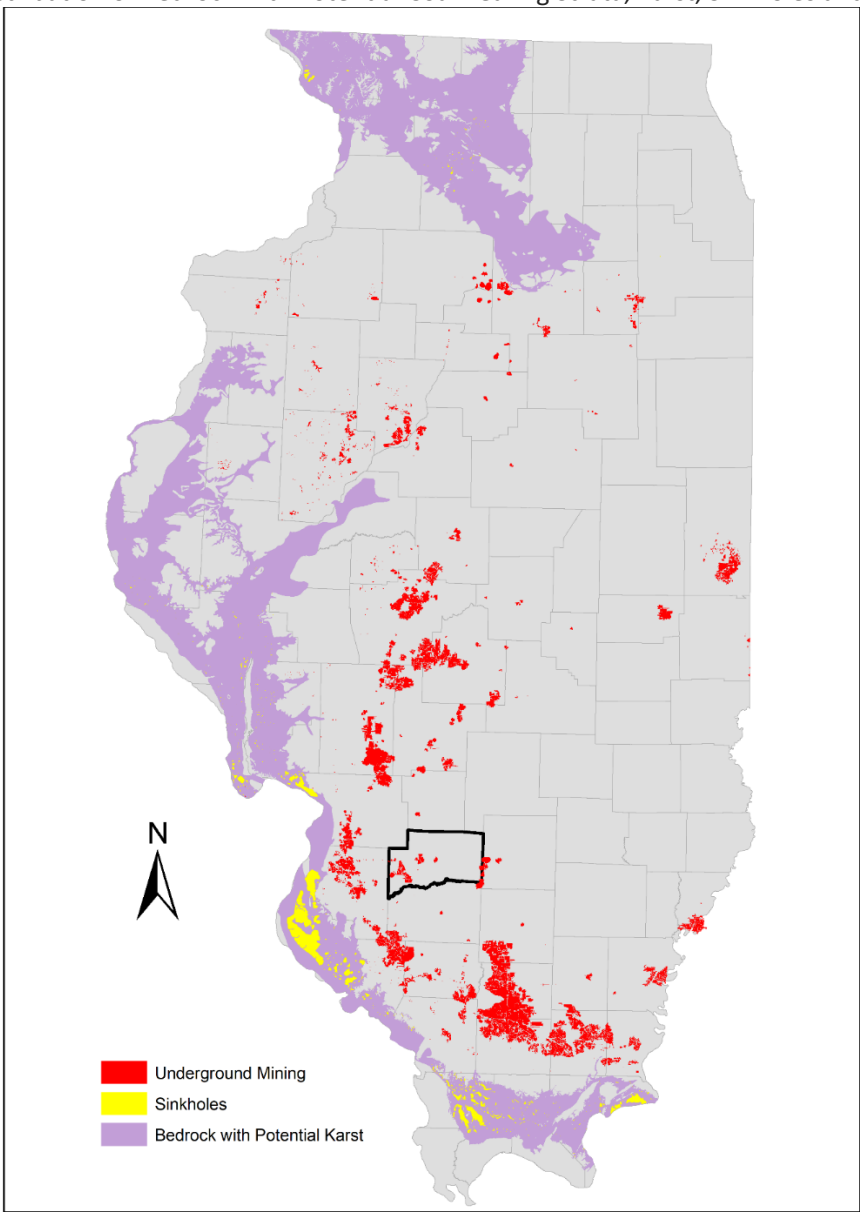
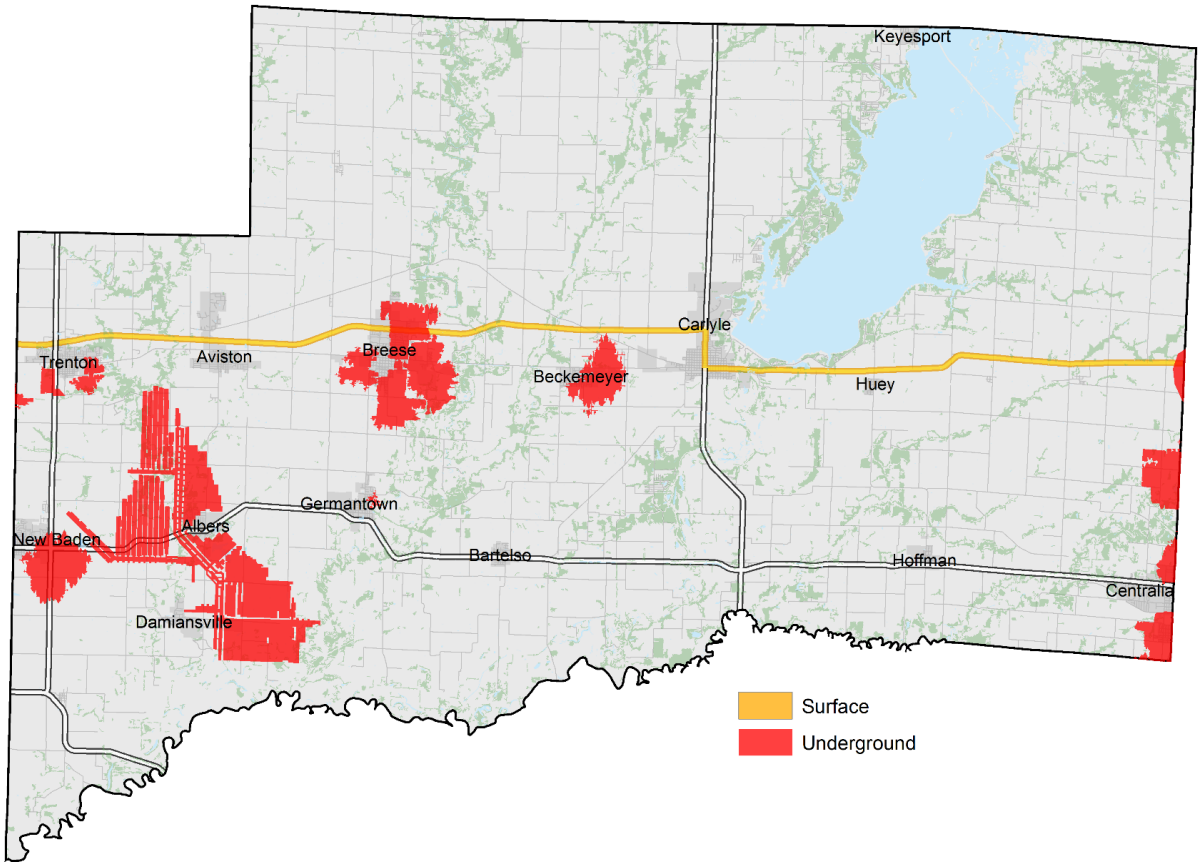


Figure 4-13 shows statewide distribution of bedrock with karst potential, coal bearing strata, sink holes. Nearly all of Clinton County is underlain by rock units which contain coal and is >1% undermined. The Mine Subsidence Insurance Act of 1979 created subsidence insurance as part of an Illinois homeowner's policy. Homeowners in any of the Illinois counties undermined by approximately 1% or more automatically have mine subsidence insurance as a part of their policy, unless coverage is waived in writing. Mine subsidence insurance is especially important for homes located near or over mines that operated before the 1977 Surface Mine Control and Reclamation Act. The companies that operated these mines may no longer be in business (Bauer, 2006).

Figure 4-14 shows the distribution of bedrock with karst potential, coal bearing strata, sink holes, and underground mines in Clinton County. Analysis of the GIS data layer of active and abandoned coal mines in Illinois obtained from the IDNR revealed that 24 mi^2 out of Clinton County's total 503 mi^2 (~5%) have been undermined. The undermined areas are generally found around the city of Albers, Breese, Beckemenyer and New Maden. There are some around Centralia as well. Comparison of Clinton County local assessment and parcel data with IDNR GIS layer of active and abandoned underground-coal mines was performed. This analysis revealed that 2,723 out of the 18,808 or ~14% of the buildings in the county were above undermined areas.

Figure 4-14. Distribution of potential karst bedrock, sinkholes, and underground mines in Clinton County



Vulnerability to Future Assets/Infrastructure for Ground Failure

New buildings and infrastructure placed on undermined land or on highly soluble bedrock will be vulnerable to ground failure.

Suggestions of Community Development Trends

Abandoned underground mine subsidence may affect several locations within the county; therefore buildings and infrastructure are vulnerable to subsidence. Continued development will occur in many of these areas. Newly planned construction should be reviewed with the historical mining maps to minimize potential subsidence structural damage.

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Illinois Coal Association. 1992. Illinois coal facts: Springfield, Illinois, 64p.

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4.3.10 Hazardous Materials Storage and Transportation Hazard

Hazard Definition

Illinois has numerous active transportation lines that run through many of its counties. Active railways transport harmful and volatile substances across county and state lines every day. Transporting chemicals and substances along interstate routes is commonplace in Illinois. The rural areas of Illinois have considerable agricultural commerce, meaning transportation of fertilizers, herbicides, and pesticides is common on rural roads. These factors increase the chance of hazardous material releases and spills throughout the state of Illinois.

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 can potentially 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/law enforcement, search and rescue, and hazardous materials units.

Previous Occurrences of Hazardous Materials Storage and Transportation Hazard

Clinton County has not experienced a significantly large-scale hazardous material incident at a fixed site or during transport resulting in deaths or serious injuries.

The Illinois Emergency Management Agency maintains a comprehensive Hazardous Materials Incident Report Database for the State of Illinois. The database contains information on all Hazardous Materials Reports since 1987 but does not include an assessment of economic and property losses in terms of dollars of damage. The database reported 279 incidents in Clinton County as of September 2017. The most recent event occurred in February 2017 where 750 gallons of liquid hog manure was released in Breese.

Industries regulated by The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) are required to report incidents which meet or exceed established reporting criteria. The data for reported incidents are available on the PHMSA website via the U.S. Department of Transportation Hazmat Intelligence Portal. The database reported 41,330 incidents for the State of Illinois.

Geographic Location of Hazardous Materials Storage and Transportation Hazard

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

Hazard Extent of Hazardous Materials Storage and Transportation Hazard

The extent of the hazardous material hazard varies both in terms of the quantity of material being transported as well as the specific content of the container.

Risk Identification of Hazardous Materials Storage and Transportation Hazard

Based on input from the Planning Team, future occurrence of hazardous materials accident in Clinton County is highly likely. According to the Risk Priority Index (RPI) and County input, hazardous materials storage and transportation hazard is ranked as the number nine hazard.

Risk Priority Index

Probability	x	Magnitude	=	RPI
4	x	1	=	4

Vulnerability Analysis for Hazardous Materials Storage and Transportation Hazard

The entire county is vulnerable to a hazardous material release and can expect impacts within the affected area. The main concern during a release or spill is the affected population. This plan will therefore consider all buildings located within the county as vulnerable. To accommodate this risk, this plan considers all buildings located within the county as vulnerable. Tables 4-7 and 4-8 display the existing buildings and critical infrastructure in Clinton County.

Critical Facilities

All critical facilities and communities within the county are at risk. A critical facility will encounter many of the same impacts as any other building within the jurisdiction. These impacts include structural failure due to fire or explosion and loss of function of the facility (e.g., a damaged police station can no longer serve the community). Table 4-7 lists the types and number of essential facilities for the entire county and Appendix F displays a large format map of the locations of all critical facilities within the county.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within the county can expect similar impacts to those discussed for critical facilities. These impacts include structural failure due to fire or explosion or debris, and loss of function of the building (e.g., a person cannot inhabit a damaged home, causing residents to seek shelter).

Infrastructure

During a hazardous material release, the types of potentially impacted infrastructure include roadways, utility lines/pipes, railroads, and bridges. Since an extensive inventory of the infrastructure is not available to this plan, it is important to emphasize that a hazardous materials release could damage any number of these items. 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 become impassable causing risk to motorists.

ALOHA Hazardous Chemical Release Analysis

The U.S. Environmental Protection Agency's ALOHA (Areal Locations of Hazardous Atmospheres) model was used to assess an ammonia release at the Railroad intersection of Rt. 7 in Breese. ALOHA is a computer program designed for response to chemical accidents, as well as emergency planning and training. The Clinton County planning team selected the Crop Production Plant scenario because bulk chemicals are stored at these facilities within a relatively densely populated area.

Ammonia is a clear colorless gas with a strong odor. Ammonia is shipped as a liquid under its own vapor pressure. The density of liquid ammonia is 6 lb/gal. Contact with the unconfined liquid can cause frostbite. The gas is generally regarded as nonflammable but does burn within certain vapor concentration limits and with strong ignition. Fire hazard increases in the presence of oil or other combustible materials. Although the gas is lighter than air, vapors from a leak initially hug the ground. Prolonged exposure of containers to fire or heat may cause violent rupturing and rocketing. Long-term

inhalation of low concentrations of the vapors or short-term inhalation of high concentrations have adverse health effects. Used as a fertilizer, as a refrigerant, and in the manufacture of other chemicals (NOAA Reactivity, 2007).

For the Railroad Ammonia scenario SIU assumed average atmospheric and climatic conditions for the winter season with a breeze from the southwest. Figures 4-15 depicts the plume origins of the modeled hazardous chemical releases in Clinton County.

Figure 4-15. ALOHA Modeled Ammonia Plume Origin in Clinton County

ALOHA displays the estimated threat zones as Acute Exposure Guideline Levels (AEGL). The AEGLs are intended to describe the risk to humans resulting from once-in-a-lifetime, or rare exposure to airborne chemical (U.S. EPA AEGL Program). The National Advisory Committee for the Development of Acute Exposure Guideline Levels for Hazardous Substances (AEGL Committee) is involved in developing these guidelines to help both national and local authorities, as well as private companies, deal with emergencies involving spills, or other catastrophic exposures. AEGLs represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. The three AEGLs have been defined as follows:

AEGL-1: the airborne concentration, expressed as parts per million or milligrams per cubic meter (ppm or mg/m^3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2: the airborne concentration (expressed as ppm or mg/m^3) of a substance above which 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.

AEGL-3: the airborne concentration (expressed as ppm or mg/m^3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Airborne concentrations below the AEGL-1 represent exposure levels that can produce mild and progressively increasing but transient and non-disabling odor, taste, and sensory irritation or certain asymptomatic, non-sensory effects. With increasing airborne concentrations above each AEGL, there is a progressive increase in the likelihood of occurrence and the severity of effects described for each corresponding AEGL. Although the AEGL values represent threshold levels for the general public, including susceptible subpopulations, such as infants, children, the elderly, persons with asthma, and those with other illnesses, it is recognized that individuals, subject to unique or idiosyncratic responses, could experience the effects described at concentrations below the corresponding AEGL.

Analysis Parameters of the Breese Ammonia Scenario

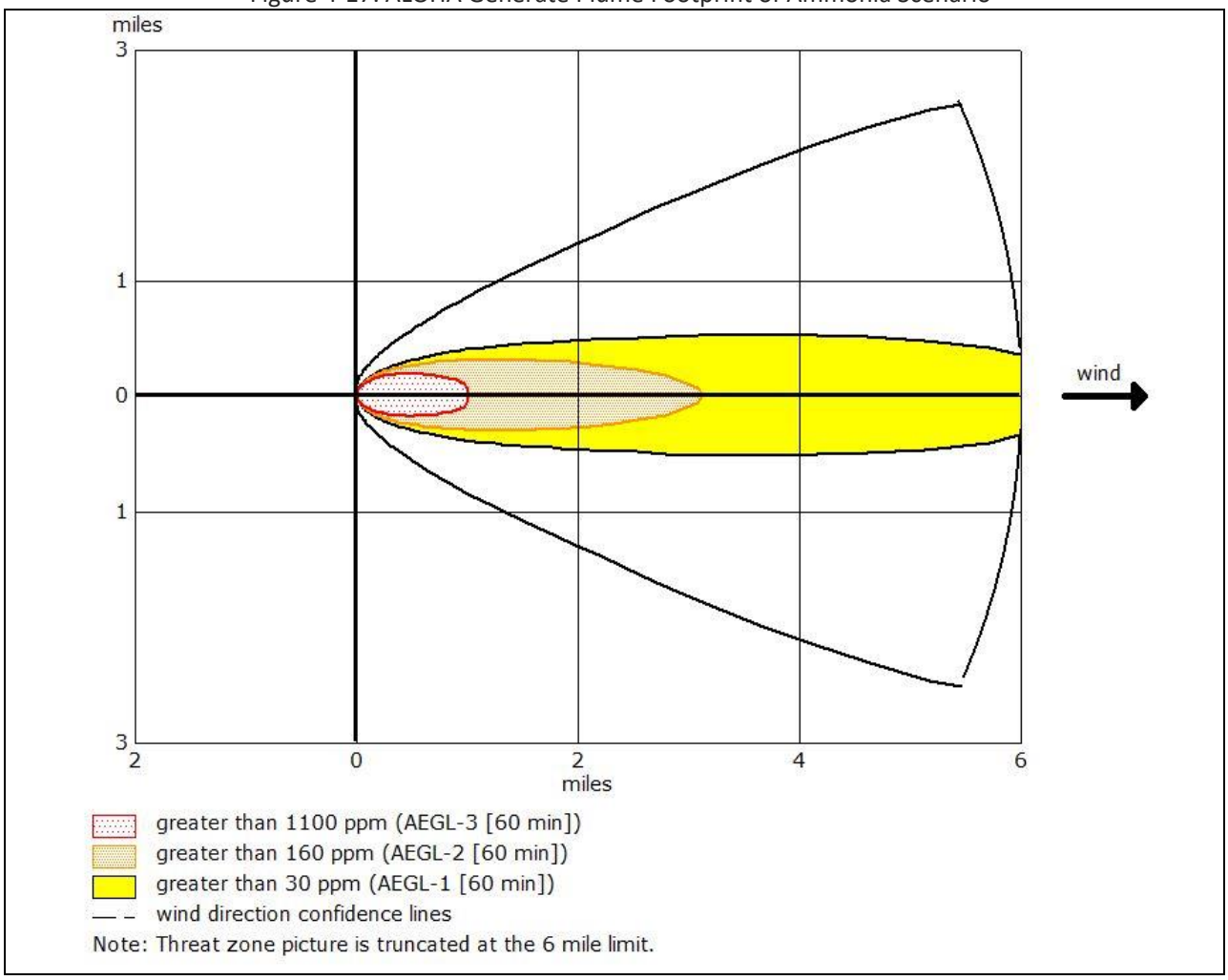
The ALOHA atmospheric modeling parameters for the ammonia release, depicted in Figure 4-15, were based upon a northeasterly speed of 7 miles per hour. The temperature was 55°F with 75% humidity and a cloud cover of five-tenths skies. SIU used average weather conditions reported by NOAA for wind direction, wind speed, and temperature to simulate fall conditions. The source of the chemical spill is a horizontal, cylindrical-shaped tank. The diameter of the tank was set to 8 feet and the length set to 33 feet (12,408 gallons). At the time of its release, it was estimated that the tank was 75% full. The ammonia in this tank is in its liquid state. This release was based on a leak from a 2.5-inch-diameter hole, 12 inches above the bottom of the tank. Figure 4-16 shows the plume modeling parameters in greater detail.

Figure 4-16. ALOHA Modeling Parameters Ammonia Release

```
SITE DATA:
  Location: BREESE, ILLINOIS
  Building Air Exchanges Per Hour: 0.62 (unsheltered single storied)
  Time: January 19, 2017  0848 hours CST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: AMMONIA                  Molecular Weight: 17.03 g/mol
  AEGL-1 (60 min): 30 ppm   AEGL-2 (60 min): 160 ppm   AEGL-3 (60 min): 1100 ppm
  IDLH: 300 ppm      LEL: 150000 ppm      UEL: 280000 ppm
  Ambient Boiling Point: -28.7° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 6 miles/hour from WSW at 10 feet
  Ground Roughness: open country          Cloud Cover: 7 tenths
  Air Temperature: 56° F                  Stability Class: C
  No Inversion Height                     Relative Humidity: 75%

SOURCE STRENGTH:
  Leak from hole in horizontal cylindrical tank
  Flammable chemical escaping from tank (not burning)
  Tank Diameter: 8 feet                   Tank Length: 33 feet
  Tank Volume: 12,408 gallons
  Tank contains liquid                    Internal Temperature: 56° F
  Chemical Mass in Tank: 24.1 tons        Tank is 75% full
  Circular Opening Diameter: 2.5 inches
  Opening is 12 inches from tank bottom
  Release Duration: 11 minutes
  Max Average Sustained Release Rate: 6,880 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 44,665 pounds
  Note: The chemical escaped as a mixture of gas and aerosol (two phase flow).

THREAT ZONE:
  Model Run: Heavy Gas
  Red   : 1.0 miles --- (1100 ppm = AEGL-3 [60 min])
  Orange: 3.1 miles --- (160 ppm = AEGL-2 [60 min])
  Yellow: greater than 6 miles --- (30 ppm = AEGL-1 [60 min])
```

Using the parameters in Figure 4-16, approximately 44,665 pounds of material would be released. The image in Figure 4-17 depicts the plume footprint generated by ALOHA. 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.

Figure 4-17. ALOHA Generate Plume Footprint of Ammonia Scenario



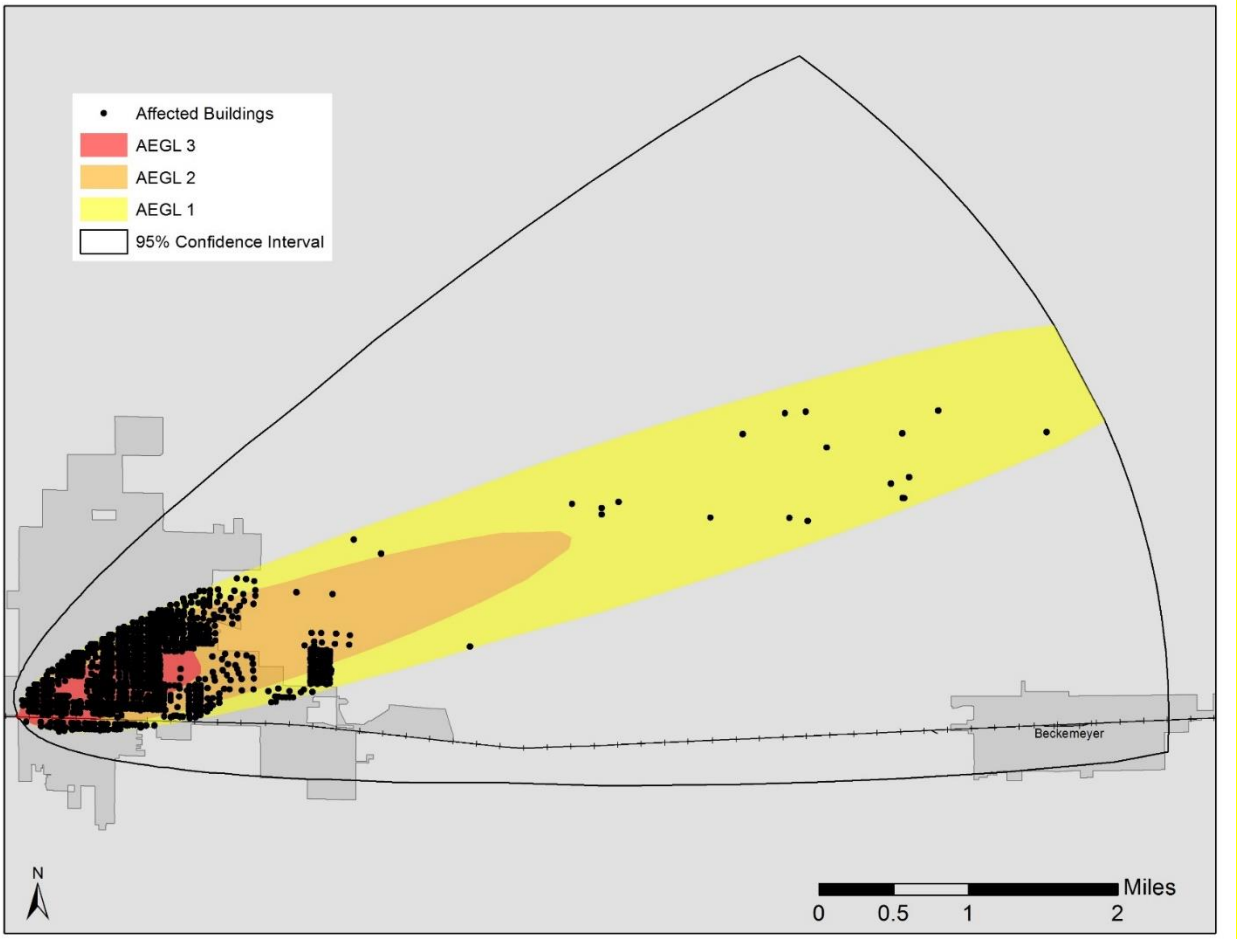
Results for the Breese Ammonia Scenario

An estimate of property exposed to the ammonia spill was calculated by using the building inventory and intersecting these data with each of the AEGL levels. The Clinton County assessment and parcel data was utilized for this analysis. There are 984 buildings within the ammonia plume. It should be noted that the results should be interpreted as potential degrees of impact rather than exact number of buildings affected by the ammonia release. Table 4-34 lists the total amount of building exposure to each AEGL zone. Figure 4-18 depicts the ammonia spill footprint and location of the buildings exposed.

Table 4-34. Estimated Building Exposure as a Result of Ammonia Release

Occupancy	Number of Buildings		
	AEGL 1	AEGL 2	AEGL3
Residential	210	327	295
Commercial	12	29	102
Industrial	3	0	6
Total:	**225**	**356**	**403**

Figure 4-18. ALOHA Plume Footprint and Buildings Exposed to Ammonia Release



There are three essential facilities within the limits of the Ammonia scenario. Table 4-35 identifies the affected facilities.

Table 4-35. Essential Facilities within the Ammonia Plume Footprint

Essential Facility	Facility Name
Police	Breese Police Department
Schools	All Saints Academy
	Breese Elementary School

Vulnerability to Future Assets/Infrastructure for Hazardous Materials Storage and Transportation Hazard

Clinton County is expected to see future economic expansion within the limits of Centralia, Breese, Trenton, and Carlyle. These areas are particularly vulnerable to chemical releases because of transportation of hazardous materials along railways, U.S Route 50, Illinois Route 127, and Interstate 64.

Suggestion for Community Development Trends

Because the hazardous material hazard events may occur anywhere within the county, future development is susceptible to the hazard. The major transportation routes and the industries located in Clinton County pose a threat of dangerous chemicals and hazardous materials release.

Section 5. Mitigation Strategies

The goal of mitigation is to reduce the future impacts of a hazard, including property damage, disruption to local and regional economies, and the amount of public and private funds spent to assist with recovery. Throughout the planning process, the Clinton County Planning Team worked to identify existing hazard mitigation policies, develop mitigation goals, and a create a comprehensive range of mitigation strategies specific to each jurisdiction. This work provides a blueprint for reducing the potential loses identified in the risk assessment (section 4).

5.1 Existing Hazard Mitigation Policies, Programs and Resources

This section documents each jurisdictions existing authorities, policies, programs and resources related to hazard mitigation and the ability to improve these existing policies and programs. It is important to highlight the work that has been completed in Clinton County that pertains to hazard mitigation. In addition, the following information also provides an evaluation of these abilities to determine whether they can be improved in order to more effectively reduce the impact of future hazards.

5.1.1 Successful Mitigation Projects

To be successful, mitigation must be a recurrent process that is continually striving to lessen the impact of natural hazards within the county. Clinton County has made great strides to improve its ability to mitigation against future hazards. The following are projects that have been successfully completed prior to the development of the Clinton County 2017 Multi-Hazard Mitigation Plan.

Maintaining Siren System

The Village of Hoffman currently has and operates a village-wide siren system with four points of activation. The four points are village hall, fire station, and two hand-held radios. The village works with local radio and has a PA mode on the siren system by which they can make announcements.

5.1.2 National Flood Insurance Program

In 1968, Congress created the National Flood Insurance Program (NFIP) to help provide a means for property owners to financially protect themselves. The NFIP offers flood insurance to homeowners, renters, and business owners if their community participates in the NFIP. Participating communities agree to adopt and enforce ordinances that meet or exceed FEMA requirements to reduce the risk of flooding. This section covers the county's NIFP status, flood insurance policy and claim statistics, repetitive loss structures, and Community Rating System status.

NFIP Status

In Clinton County, 11 incorporated communities participate in the NFIP. Table 5-1 includes a summary of information for Clinton County participation in the NFIP. The communities of Aviston and Damiansville were both mapped with a flood risk but were sanctioned on May 20, 1978 and December 4, 1985, respectively. Sanctioned communities do not qualify for flood-related Federal disaster assistance for acquisition, construction, or reconstruction purposes in Special Flood Hazard Areas. This may have serious consequences for the community's real estate market and economic viability, as each federally regulated lender must notify the purchaser or lessee that federal disaster assistance is not available for that property in the event of a flood. The Village of Huey and St. Rose have no identified flood hazard boundaries;

therefore, the communities do not participate in the NFIP. The communities of Aviston and Damiansville do have identified flood zones, but do not participate in the NFIP. Clinton County will continue to provide information to its non-participating jurisdictions regarding the benefits of the National Flood Insurance Program. Participating jurisdictions will continue to comply with the NFIP through the implementation of mitigation strategies that enforce a flood damage prevention ordinance to reduce future flood risks to new construction within the SFHA. At this time, no new construction is planned within the 100-year floodplain.

Two communities are mapped as Non-Special Flood Hazard Areas (NSFHA). NSFHA areas have a moderate-to-low risk flood zone and is not in any immediate danger from flooding caused by overflowing rivers or hard rains. However, it's important to note that structures within a NSFHA are still at risk. In fact, nearly 1 in 4 NFIP flood claims occur in these moderate- to low-risk areas.

Table 5-1: Information on Clinton County's Participation in the NFIP

Community	Participate in the NFIP	Initial Flood Hazard Boundary Map Identified	Initial FIRM Identified	Current Effective Map Date
Clinton County	Yes	12/07/73	09/04/85	08/02/07
Albers	Yes	12/20/74	05/01/87	08/02/07
Aviston	No	05/20/77	06/02/04	08/02/07
Bartelso	Yes	03/28/75	06/02/04	08/02/07
Beckmeyer	Yes		06/02/04	NSFHA
Breese	Yes	06/07/74	02/06/84	08/02/07
Carlyle	Yes	12/07/73	09/04/85	08/02/07
Centralia	Yes	05/03/74	12/18/84	11/16/11
Damiansville	No	12/04/84	06/02/04	08/02/07
Germantown	Yes	03/29/74	07/20/84	08/02/07
Hoffman	Yes		06/02/04	NSFHA
Huey	No			
New Baden	Yes	05/24/74	09/04/86	08/02/07
St. Rose	No			
Trenton	Yes		06/02/04	08/02/07(M)

NFIP status and information are documented in the Community Status Book Report updated on 8/30/2016.
NSFHA – No Special Flood Hazard Area
(M) – No Elevation Determined – All Zone A, C and X

Flood Insurance Policy and Claim Statistics

As of June 30, 2016, 28 households paid flood insurance, insuring $2,499,000 in property value. The total premiums collected for the policies amounted to $22,188. Since the establishment of the NFIP in 1978, nine flood insurance claims were filed in Clinton County, totaling in $66,456.96 in payments. Table 5-2 summarizes the claims since 1978.

Table 5-2: Policy and Claim Statistics for Flood Insurance in Clinton County

Community	Total Losses	Closed Losses	Open Losses	CWOP Losses	Payments
Carlyle	3	2	0	1	$5,273.93
Centralia	6	6	0	0	$35,416.58
Clinton County	16	13	0	3	$494,752.03
New Baden	5	4	0	1	$16,573.11

*NFIP policy and claim statistics since 1978 until the most recently updated date of 03/31/2017. Closed Losses refer to losses that are paid; open losses are losses that are not paid in full; CWOP losses are losses that are closed without payment; and total losses refers to all losses submitted regardless of status. Lastly, total payments refer to the total amount paid on losses.

Repetitive Loss Structures

There is 1 structure in Clinton County that has experienced repetitive losses due to flooding. FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the NFIP that has suffered flood loss damage on two or more 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. Currently there are over 122,000 Repetitive Loss properties nationwide.

The Illinois Emergency Management Agency and Illinois Department of Natural Resources was contacted to determine the location of repetitive loss structures in Clinton County. Records indicate that there is 1 repetitive loss structures within the county. The total amount paid for building replacement and building contents for damage to these repetitive loss structures is $7597.30. Table 5-3 describes the repetitive loss structures for each jurisdiction.

Table 5-3. Repetitive Loss Structures for each Jurisdiction in Clinton County

Jurisdiction	Number of Properties	Number of Losses	Total Paid
Breese	1	2	$7597.30
Total:	**1**	**2**	**$7597.30**

Community Rating System Status

Clinton County and its incorporated areas do not participate in the NFIP'S Community Rating System (CRS). The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance. More than 1,200 communities from all 50 states participate in the CRS. Although joining the CRS is free, completing CRS activities and maintain a CRS rating requires a degree of commitment from the community, including dedicated staff. Joining the CRS could be one way Clinton County or its incorporated communities improve their existing floodplain management policies and further reduce the flood hazard risk.

5.1.3 Jurisdiction Ordinances

Hazard Mitigation related ordinances, such as zoning, burning, or building codes, have the potential to reduce the risk from known hazards. These types of regulations provide many effective ways to address resiliency to known hazards. Table 5-4 list Clinton County's current ordinances that directly pertain, or can pertain, to hazard mitigation. It is important to evaluate the local building codes and ordinances to determine if they have the ability to reduce potential damages caused by future hazards. The Clinton County Planning Team worked to identify gaps in the current list of ordinances and suggested changes/additions in Section 5.3.

Table 5-4: Clinton County's Jurisdiction Ordinances

Community	Zoning	Storm water Mgmt	Flood	Subdivision Control	Burning	Seismic	Erosion Mgmt	Land Use Plan	Building Codes
Clinton County	Y	Y	Y	Y			Y	Y	Y
Albers	Y	Y	Y	Y	Y		Y		Y
Aviston	Y	Y	Y	Y			Y		Y
Beckemeyer	Y	Y	Y	Y			Y		Y
Breese	Y	Y	Y	Y	Y		Y	Y	Y
Carlyle	Y	Y	Y	Y	Y		Y		Y
Centralia	Y	Y	Y	Y	Y		Y		Y
Damiansville	Y			Y	Y		Y		Y
Germantown	Y	Y	Y	Y	Y		Y		Y
Hoffman	Y	Y	Y	Y	Y		Y		Y
Huey	Y								
New Baden	Y	Y	Y	Y	Y		Y	Y	Y
Trenton	Y	Y	Y	Y	Y		Y		Y

*Only those jurisdictions that have ordinances are included in the table.

The adoption of new ordinances, including the adoption of new development standards or the creation of hazard-specific overlay zones tied to existing zoning regulations, present opportunities to discourage hazardous construction and manage the type and density of land uses in areas of known natural hazards. Adopting and enforcing higher regulatory standards for floodplain management (i.e., those that go beyond the minimum standards of the NFIP) is another effective method for minimizing future flood losses, particularly if a community is experiencing growth and development patterns that influence flood hazards in ways that are not accounted for on existing regulatory floodplain maps. Revisions to existing building codes also present the opportunity to address safe growth. Many state and local codes are based off national or industry standard codes which undergo routine evaluations and updates. The adoption of revised code requirements and optional hazard-specific standards may help increase community resilience. At this time, there is no indication that Clinton County or participating jurisdictions will be adopting, reviewing or strengthening current building codes and ordinances.

5.1.4 Fire Insurance Ratings

By classifying communities' ability to suppress fires, the Insurance Service Office (ISO) Public Protection Classification Program helps communities evaluate their public fire-protection services. The program provides a countrywide standard that helps fire departments in planning and budgeting for facilities, equipment, and training. Information is collected on municipal fire-protection efforts in communities

throughout the United States. In each of those communities, ISO analyzes the relevant data using a Fire Suppression Rating Schedule. Rating are assigned from 1 to 10 where Class 1 generally represents superior property fire protection, and Class 10 indicates that the area's fire-suppression program doesn't meet ISO's minimum criteria. Table 5-5 displays each Fire Departments' insurance rating and total number of employees.

Table 5-5: Clinton County Fire Departments, Insurance Ratings, and Number of Employees/Volunteers

Fire Department	Fire Insurance Rating	Number of Employees
Aviston Fire Protection District		30
Beckemeyer –Wade FPD		20
Breese Volunteer FPD	05/5Y	33
Carlyle Fire Protection District		25
Clin-Clair Volunteer FPD		31
Germantown FPD		25
Hoffman Fire Protection District	07/7X	26
Huey-Ferrin-Boulder FPD	06/6X	21
New Baden FPD		25
Santa Fe Township FPD	05/5Y	25
St. Rose Fire Protection District		36
Sugar Creek Township FPD		26
Wheatfield Township FPD		20

5.2 Mitigation Goals

In Section 4 of this plan, the risk assessment identified Clinton County as prone to several hazards. The Planning Team members understand that although they cannot eliminate hazards altogether, Clinton County can work towards building disaster-resistant communities. Below is a generalized list of goals, objectives, and actions. The goals 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: Retrofit critical facilities and structures with structural design practices and equipment that will withstand natural disasters and offer weather-proofing.

Objective: Equip public facilities and communities to guard against damage caused by secondary effects of hazards.

Objective: Minimize the amount of infrastructure exposed to hazards.

Objective: Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county.

Objective: Improve emergency sheltering in Clinton County.

Goal 2: Create new or revise existing plans/maps for Clinton County

Objective: Support compliance with the NFIP for each jurisdiction in Clinton County.

Objective: Review and update existing, or create new, community plans and ordinances to support hazard mitigation.

Objective: Conduct new studies/research to profile hazards and follow up with mitigation strategies.

Goal 3: Develop long-term strategies to educate Clinton County residents on the hazards

Objective: Raise public awareness on hazard mitigation.

Objective: Improve education and training of emergency personnel and public officials.

5.3 Multi-Jurisdictional Mitigation Strategies

After reviewing the Risk Assessment, the Mitigation Planning Team was presented with the task of individually listing potential mitigation activities using the FEMA STAPLEE evaluation criteria (see table 5-6). FEMA uses their evaluation criteria STAPLEE (stands for social, technical, administrative, political, legal, economic and environmental) to assess the developed mitigation strategies. Evaluating possible natural hazard mitigation activities provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. The Planning Team brought their mitigation ideas to Meeting 3.

Table 5-6. FEMA's STAPLEE Evaluation Criteria

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.
Technical	Mitigation actions are technically most effective if they provide a long-term reduction of losses and have minimal secondary adverse impacts.
Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
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.
Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
Economic	Budget constraints can significantly deter the implementation of mitigation actions. Hence, it is important to evaluate whether an action is cost-effective, as determined by a cost benefit review, and possible to fund.
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.

Table 5-7 contains a comprehensive range of specific mitigation actions and projects for each jurisdiction, with an emphasis on new and existing buildings and infrastructure. At least two identifiable mitigation action items have been addressed for each hazard listed in the risk assessment. Each of the incorporated communities within and including Clinton County was invited to participate in brainstorming sessions in which goals, objectives, and strategies were discussed and prioritized. Each participant in these sessions was armed with possible mitigation goals and strategies provided by FEMA, as well as information about mitigation projects discussed in neighboring communities and counties.

All potential strategies and goals that arose through this process are included in Table 5-7. The mitigation strategies are arranged by hazard they directly address. In some cases, certain mitigation strategies can address all hazards. If provided by the jurisdiction, each mitigation strategy contains specific details pertaining to the implementation, responsible and/or organizing agency, and potential funding source. Potential funding sources are identified by Federal, State, Local, or Private. A code is assigned to each mitigations strategy for ease of reference when reviewing the prioritization of each mitigations strategies in Section 5.4.

Table 5-7: Clinton County's Multi-Jurisdictional Mitigation Strategies

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
	ALL HAZARDS				
AH1	**Establish an Incident Management Team** *The County EMA will oversee the implementation of this project. If funding is available, is forecasted to be completed within the next year.*	Bartelso, Breese	Ongoing	L	Clinton County EMA
AH2	**Purchase/ Distribute NOAA Weather Radios** *The Village of New Baden would like to distribute radios to its schools, daycare centers, etc. County EMA will look into purchasing and distributing radios to the Village and all jurisdictions. If funding is available, implementation is forecasted within the next three years.*	All jurisdictions	Proposed	S, F	Clinton County EMA
AH3	**Develop Social Media Techniques to Provide Critical Weather Updates and Disseminate Critical Information** *Breese will develop social media outlets to release updates on weather and possible disasters to get people to safety with warning. If funding is available, implementation is forecasted to be initiated within one year.*	Breese, Hoffman	Proposed	L	Clinton County EMA
AH4	**Devote section of website to hazard mitigation** *Breese and the County will seek to devote a section of their website to mitigating for all hazards. If funding is available, implementation is forecasted to be initiated within the next year.*	Breese, County	Ongoing	L	Breese, County EMA
AH5	**Establish local emergency planning committee** *Breese will oversee this strategy. If funding is available, implementation is forecasted within the next year.*	Breese	Ongoing	L	Breese
AH6	**Compile and publicize location of safe rooms and/or shelters** *Breese will oversee this strategy. If funding is available, implementation is forecasted within the next year.*	Breese	Ongoing	L	Breese
AH7	**Develop vulnerable population list** *Breese will oversee this strategy. If funding is available, implementation is forecasted within the next year.*	Breese	Ongoing	L	Breese
AH8	**Develop mutual aid agreements** *County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next year.*	Breese, St. Rose, Hoffman	Ongoing	L	Clinton County EMA, Breese
AH9	**Create alternative emergency operations center** *Jurisdictions will oversee this strategy. If funding is available, implementation is forecasted within the next year.*	County Animal Control, Breese, St. Rose	Proposed/Ongoing	L, S	County Animal Control, Breese, St. Rose
AH10	**Equip critical facilities with back-up generators** *Jurisdictions throughout the county will research and purchase back-up generators at their facilities. County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next year.* *Clinton County Animal Control will research and purchase back-up generators at their facilities. County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three to five years.*	All jurisdictions	Proposed/Ongoing	L, S, F, P	Clinton County EMA
AH11	**Identify and procure backup water supply** *The County EMA will oversee the implementation of this project. If funding is available, is forecasted to be initiated within the next one to three years.*	Bartelso	Ongoing	L	Clinton County EMA
AH12	**Supply County Animal Control with Vet Supplies** *Clinton County Animal Control is in need of basic vet supplies including, food and water. If funding is available, implementation is forecasted within the next three years.*	County Animal Control	Proposed	S, F, P	County Animal Control
AH13	**Create additional Heating/Cooling Shelters** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the year.*	St. Rose, Hoffman	Ongoing	L, F	County EMA, St. Rose

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
AH14	**Develop Alternative Traffic Routes** *The Villages of St. Rose and Hoffman will oversee the implementation of this project. If funding is available, implementation is forecasted to be initiated within the next three to five years.*	St. Rose, Hoffman	Proposed	L	St. Rose, Hoffman
AH15	**Acquire Portable Lighting for Mass Casualty Preparation** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next five years.*	Hoffman	Ongoing	L	County EMA
AH16	**Incentivize Hazard Mitigation** *Clinton County zoning code addresses several aspects of hazard mitigation through land use ordinances. The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	County EMA	Ongoing	L	County EMA
AH17	**Devote Section of Library to Maintain Reference on Flood Insurance and General Hazard Information** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	County EMA	Ongoing	L	County EMA
	TORNADO / SEVERE THUNDERSTROMS				
ST1	**Provide jurisdiction-wide siren warning coverage** *County EMA will oversee the implementation of this project. Beckemeyer will seek to upgrade the manual siren at the FD to an automatic siren. If funding is available, is forecasted to be complete within the next one to three years.*	All jurisdictions	Ongoing	L, F	Clinton County EMA
ST2	**Require the construction of safe rooms within new public buildings** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next one to three years.*	Breese, Bartelso, Carlyle	Proposed	L, S, F	Clinton County EMA
ST3	**Construct New Safe Room(s)** *County EMA will oversee the implementation of this project and incentivize local governments to construct and/or retrofit safe rooms. If funding is available, is forecasted to be complete within the next one to three years.*	Breese, New Baden	Proposed	L, S, F	Clinton County EMA
ST4	**Equip critical facilities with lightning protection devices** *The County EMA will oversee the implementation of this project. If funding is available, is forecasted to be complete within the next five years.*	Beckemeyer	Proposed	L	Clinton County EMA
ST5	**Retrofit structures to withstand high winds** *County EMA will oversee the implementation of this project. If funding is available, is forecasted to be completed within the next one to three years.*	Breese, New Baden, St. Rose	Proposed	L	Clinton County EMA
ST6	**Anchor manufactured homes and exterior attachments** *County EMA will oversee this project. If funding is available, implementation is forecasted within the next one to three years.*	Breese	Proposed	L	Clinton County EMA
ST7	**Enhance ordinances to exceed minimum construction standards / techniques in regards to high winds** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next year.*	Breese, St. Rose, Hoffman	Proposed	L	Clinton County EMA
ST8	**Develop ordinance to require new development to place all new utility lines underground** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	Carlyle	Proposed	L	County EMA
	FLOODING / DAM & LEVEE FAILURE				
F1	**Work towards participating in the NFIP's Community Rating System (CRS) to acquire discounted flood insurance rate** *Bartelso will work towards participating in the NFIP's Community Rating System. If funding is available, implementation is forecasted within the next year.*	Bartelso	Proposed	F	Bartelso
F2	**Train local floodplain managers through FEMA/IEMA programs** *Better training in storm water management and floodplains will help to lessen the effects of flooding on the communities. If funding is available, implementation is forecasted within the next year.*	Breese	Proposed	L, F	Clinton County EMA

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
F3	**Develop subdivision ordinance to require proper stormwater infrastructure design and construction** *Bartelso and Breese will oversee this strategy. If funding is available, implementation is forecasted within the next one to three years.*	Bartelso, Breese	Proposed	L, S,	Bartelso, Breese
F4	**Conduct watershed analysis of runoff and drainage systems** *Jurisdictions will oversee this strategy. If funding is available, implementation is forecasted within the next year.*	Bartelso, Breese, New Baden	Proposed	L, S, F	Bartelso, Breese, New Baden
F5	**Install backflow valves and sump pumps in critical facilities** *Public Utilities will oversee this strategy. If funding is available, implementation is forecasted within the next three to five years.*	Breese	Proposed		Public Utilities
F6	**Regularly inspect drainage system maintenance** *County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next year.*	Breese	Proposed	L	Clinton County EMA
F7	**Culvert Replacement** *Clinton County EMA will oversee the implementation of this project. If funding is available, is forecasted to be completed within the next one to three years.*	All Jurisdictions	Ongoing/Proposed	L, S, F	Clinton County EMA
F8	**Institute a Relocation or Buyout Plan for Flood Prone Properties** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	Breese	Proposed	F	Clinton County EMA
F9	**Regularly Inspect Dam/Levees** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	Breese, Carlyle	Proposed	L, F	Clinton County EMA
F10	**Adopt the International Building Code (IBC) and International Residential Code (IRC)** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	Carlyle	Ongoing	L	County EMA
F11	**Encourage Developers to Contribute to Preserve Open Space** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	Carlyle	Ongoing	L	County EMA
F12	**Maintain Participation in NFIP** *The County EMA will oversee this strategy by enforcing the Flood Damage Prevention Ordinance. If funding is available, implementation is forecasted within the next three years.*	County EMA	Ongoing	L, F	County EMA
F13	**Improve Public Awareness of NFIP, Buyout Programs, and Flood Mitigation** *The County EMA will oversee this strategy and use the county website and social media to disperse information. If funding is available, implementation is forecasted within the next year.*	County EMA	Ongoing	L, F	County EMA
F14	**Institute Buy-out Plan for Repetitive Loss Properties** *The County EMA will oversee this strategy. County GIS will create maps and lists of repetitive loss properties with the goal of initiating buy-out plans for high-risk areas. If funding is available, implementation is forecasted within the next three years.*	County EMA	Ongoing	L	County EMA
	WINTER STORMS				
WS1	**Install signs that direct traffic toward shelters and safe travel routes** *Jurisdictions will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	New Baden	Proposed	L, S	New Baden, County EMA
WS2	**Purchase deicing chemicals** *County EMA will oversee this strategy. Various jurisdictions need to have chemical on hand to treat roads before ice storms. If funding is available, implementation is forecasted within three to five years.*	Beckemeyer, Bartelso, Breese	Ongoing/Proposed	L, S, F	Clinton County EMA

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
WS3	**Establish a network of 4WD/Off-road vehicles to access stranded people** *Better equipment is needed throughout the county for snow removal and outside funding is needed. County EMA will oversee this strategy and seek to develop a list of volunteers. If funding is available, implementation is forecasted within three to five years.*	Bartelso, Carlyle	Ongoing	L	Clinton County EMA
WS4	**Develop ordinance to require new development to place all new utility lines underground** *Jurisdictions will oversee this strategy. If funding is available, implementation is forecasted within the next three to five years.*	Bartelso, Carlyle	Ongoing	L	Bartelso, Carlyle
WS5	**Establish warming stations** *New Baden will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	New Baden	Proposed	S, F, P	New Baden
WS6	**Purchase Snow Fences** *The County EMA will oversee this strategy in seeking to purchase and set up snow fences on roads that are highly likely to have snow-drifts and close down. If funding is available, implementation is forecasted within the next five years.*	County EMA	Ongoing	L, S, F	County EMA
	HAZARDOUS MATERIALS RELEASE				
HAZ1	**Develop/Update Hazmat Emergency Response Plan** *The County EMA will continually update the hazmat section of the County EOP. If funding is available, implementation is forecasted within the next three to five years.*	Beckemeyer, Breese, Bartelso, St. Rose, Hoffman	Ongoing/Proposed	L , S, F, P	Clinton County EMA
HAZ2	**Acquire Protective Gear** *The County EMA will oversee the implementation of this project. Jurisdictions will pursue local, state, federal, and private funding to acquire protective gear. If funding is available, implementation is forecasted to be initiated within the next three to five years.*	Beckemeyer, Breese, New Baden, Bartelso, St. Rose, Carlyle, Hoffman	Ongoing/Proposed	L, S, F, P	Clinton County EMA
HAZ3	**Equip Critical Facilities with Centralized Positive Pressure HVAC Systems** *The County EMA will oversee the implementation of this project. Jurisdiction will pursue local, state, federal, and private funding to acquire protective gear. If funding is available, implementation is forecasted to be initiated within the next three to five years.*	St. Rose	Proposed	L, S, F	Clinton County EMA
HAZ4	**Update hazardous material facilities to current regulations** *The City of Carlyle will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	Carlyle	Proposed	S	Carlyle
	DROUGHT / EXTREME HEAT				
H1	**Develop cooling stations** *The Village of New Baden seeks to develop cooling stations during extreme heat events. New Baden will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	New Baden	Proposed	L, S, F, P	New Baden
H2	**Audit Water Loss and Incentivize Water Reuse** *Bartelso and Carlyle will oversee the implementation of this project. If funding is available, implementation is forecasted to be initiated within the next three years.*	Bartelso, Carlyle	Ongoing	L	Bartelso, Carlyle
H3	**Retrofit Water Supply Systems** *The County EMA will work with the local fire stations to update water supply systems. If funding is available, implementation is forecasted within the next three years.*	Bartelso, Breese, St. Rose	Ongoing/Proposed	L, S, F	Clinton County EMA
H4	**Develop/Enforce Water Use Restrictions during periods of drought to conserve water supplies** *County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next five years.*	Breese, St. Rose, Hoffman	Proposed	L	County EMA

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
H5	**Develop/Enforce Strict Burn Ordinances** *Beckemeyer and Hoffman will continue to enforce strict burn ordinance. Breese, Carlyle, and St. Rose will develop a strict burn ordinance to be enforced during periods of extreme heat and drought. If funding is available, implementation is forecasted within the next three years.*	Breese, Beckemeyer, St. Rose, Carlyle, Hoffman	Ongoing/Proposed	L, S, F	County EMA
H6	**Establish fire/landslide/erosion preventive vegetation management techniques** *Breese will oversee the implementation of this project. If funding is available, is forecasted within the next three years.*	Breese	Proposed	L	Breese
H7	**Educate Farmers on Soil and Water Conservation Practices** *The County EMA will oversee this strategy and seek to coordinate closer with Clinton County Soil and Water Conservation District regarding water conservation during droughts. If funding is available, implementation is forecasted within the next three years.*	County EMA	Ongoing	L	County EMA
H8	**Develop a Wildland-Urban Interface Code** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next three years.*	County EMA	Ongoing	L	County EMA
	EARTHQUAKES				
EQ1	**Develop Earthquake Emergency Action Plan** *County EMA developed an emergency action plan and coordinated with local municipalities as well as State and federal agencies. The County EMA will oversee this project. If funding is available, implementation is forecasted within the next three to five years.*	Beckemeyer, Bartelso, Breese, St. Rose	Ongoing/Proposed	L, S, F	Clinton County EMA
EQ2	**Adopt the 2009 International Existing Building Code or the latest applicable standard for the design of building retrofits for seismically vulnerable buildings** *Bartelso seeks assistance to adopt the 2009 International Existing Building Codes. If funding is available, implementation is forecasted within the next five years.*	Bartelso	Proposed	L	Bartelso
EQ3	**Map and Access Community Vulnerability to Seismic Hazards** *The Village of New Baden seeks to assess community buildings and facilities for weaknesses. County EMA will work with jurisdictions. If funding is available, implementation is forecasted within the next three to five years.*	New Baden, Breese, St. Rose, Carlyle	Proposed	L, S, F, P	Clinton County EMA
EQ4	**Retrofit/Harden Critical Facilities** *The County EMA will oversee this project. Many critical facilities in the county need to be retrofitted or hardened to better withstand earthquakes. If funding is available, implementation is forecasted within the next one to three years.*	New Baden	Proposed	L, S, F, P	Clinton County EMA
EQ5	**Retrofit Unreinforced Masonry Structures** *The County EMA will oversee this project. Some masonry structures in the county need to be reinforced to better withstand earthquakes. If funding is available, implementation is forecasted within the next one to three years.*	New Baden	Proposed	L, S, F, P	Clinton County EMA
EQ6	**Perform detailed engineering studies of bridges and buildings** *Breese will oversee this project. If funding is available, implementation is forecasted within the next five years.*	Breese	Proposed	L, S, F, P	Breese
EQ7	**Provide Information to Residents on Structural and Non-Structural Retrofitting** *The Village of St. Rose will oversee the implementation of this project. If funding is available, implementation is forecasted to be initiated within the next three to five years.*	St. Rose	Proposed	L	St. Rose
EQ8	**Install Automatic Shutoff Valves** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next five years.*	Carlyle	Ongoing	S	County EMA
	SINKHOLES & COLLAPSE				

Code	Mitigation Strategy	Jurisdictions Involved	Status	Funding Source*	Responsible Organization or Agency
GF1	**Map and assess vulnerable areas** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted to be initiated within the next three to five years.*	Beckemeyer, Bartelso, Breese, St. Rose	Proposed	L	Clinton County EMA
GF2	**Maintain a list of buildings constructed over underground mines** *Jurisdictions will oversee the implementation of this project. If funding is available, is forecasted within the next three years.*	Beckemeyer, Breese	Proposed	L , F	Beckemeyer, Breese
GF3	**Manage Development in Vulnerable Areas** *Breese will oversee this project. County GIS will create hazard maps for use by local government, primarily municipalities. If funding is available, implementation is forecasted within the next five years.*	Bartelso, Clinton County	Proposed	L	Bartelso, Clinton County
GF4	**Develop specially-engineered pipelines in areas subject to faulting, liquefaction, earthquakes, or other ground failure** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next one to three years.*	Breese	Proposed	L	Clinton County EMA
GF5	**Stabilize Vulnerable Areas** *The County EMA will oversee this strategy. If funding is available, implementation is forecasted within the next one to three years.*	Breese	Proposed	L	Clinton County EMA
GF6	**Develop Building Codes to Minimize Damage** *The Village of St. Rose will oversee the implementation of this project. If funding is available, implementation is forecasted to be initiated within the next three to five years.*	St. Rose	Proposed	L	St. Rose

* F – Federal, S – State, L – Local, P – Private

5.4 Prioritization of Multi-Jurisdictional Mitigation Strategies

Implementation of the mitigation strategies is critical to the overall success of the mitigation plan. It is important to decide, based upon many factors, which action will be undertaken first. In order to pursue the top priority first, an analysis and prioritization of the actions is vital. It is important to note that 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. It is also critical to take into account the amount of time it will take the community to complete the mitigation project.

Table 5-8 displays the priority ranking for each mitigation strategy. Each code refers to a specific mitigations strategy listed in Table 5-7. For each participating jurisdiction a rating (high, medium, or low) was assessed for each mitigation item. The ranking is the result of the STAPLEE evaluation and the timeframe the community is interested in completing the strategy: H - High 1-3 years; M - Medium 3-5 years; and L - Low 5+years.

Table 5-8. Prioritization of the Clinton County Mitigation Strategies

Code	Priority Ranking													
	Clinton County	Albers	Aviston	Bartelso	Beckemeyer	Breese	Carlyle	Damiansville	Germantown	Hoffman	New Baden	Saint Rose	Trenton	Clinton County Animal Control
AH1	H	-	-	H	-	H	-	-	-	-	-	-	-	-
AH2	M	M	M	M	M	M	M	M	M	M	M	M	M	M
AH3	H	-	-	-	-	H	-	-	-	H	-	-	-	-
AH4	M	-	-	-	-	H	-	-	-	-	-	-	-	-
AH5	-	-	-	-	-	H	-	-	-	-	-	-	-	-
AH6	-	-	-	-	-	H	-	-	-	-	-	-	-	-
AH7	-	-	-	-	-	H	-	-	-	-	-	-	-	-
AH8	H	-	-	-	-	H	-	-	-	H	-	H	-	-
AH9	-	-	-	-	-	H	-	-	-	-	-	M	-	M
AH10	M	H	H	H	H	H	H	H	H	H	H	H	H	M
AH11	H	-	-	H	-	-	-	-	-	-	-	-	-	-
AH12	-	-	-	-	-	-	-	-	-	-	-	-	-	M
AH13	H	-	-	-	-	-	-	-	-	H	-	H	-	-
AH14	-	-	-	-	-	-	-	-	-	H	-	M	-	-
AH15	L	-	-	-	-	-	-	-	-	L	-	-	-	-
AH16	L	-	-	-	-	-	-	-	-	-	-	-	-	-
AH17	M	-	-	-	-	-	-	-	-	-	-	-	-	-
ST1	L	L	L	M	H	H	M	L	L	H	L	H	L	L
ST2	M	-	-	M	-	H	M	-	-	-	-	-	-	-
ST3	L	-	-	-	-	H	-	-	-	-	M	-	-	-
ST4	L	-	-	-	L	-	-	-	-	-		-	-	-
ST5	H	-	-	-	-	H	-	-	-	-	M	M	-	-
ST6	H	-	-	-	-	H	-	-	-	-	-	-	-	-
ST7	H	-	-	-	-	H	-	-	-	H	-	M	-	-
ST8	L	-	-	-	-	-	L	-	-	-	-	-	-	-
F1	H	-	-	H	-	-	-	-	-	-	-	-	-	-
F2	H	-	-	-	-	H	-	-	-	-	-	-	-	-
F3	-	-	-	H	-	M	-	-	-	-	-	-	-	-
F4	-	-	-	H	-	H	-	-	-	-	H	-	-	-
F5	-	-	-	-	-	M	-	-	-	-	-	-	-	-
F6	H	-	-	-	-	H	-	-	-	-	-	-	-	-
F7	H	M	M	H	H	H	M	M	M	M	M	M	M	M
F8	M	-	-	-	-	M	-	-	-	-	-	-	-	-
F9	M	-	-	-	-	M	M	-	-	-	-	-	-	-
F10	M	-	-	-	-	-	M	-	-	-	-	-	-	-
F11	M	-	-	-	-	-	M	-	-	-	-	-	-	-
F12	H	-	-	-	-	-	-	-	-	-	-	-	-	-
F13	H	-	-	-	-	-	-	-	-	-	-	-	-	-

Code	Priority Ranking													
	Clinton County	Albers	Aviston	Bartelso	Beckemeyer	Breese	Carlyle	Damiansville	Germantown	Hoffman	New Baden	Saint Rose	Trenton	Clinton County Animal Control
F14	M	-	-	-	-	-	-	-	-	-	-	-	-	-
WS1	L	-	-	-	-	-	-	-	-	-	M	-	-	-
WS2	L	-	-	M	L	M	-	-	-	-	-	-	-	-
WS3	L	-	-	M	-	-	L	-	-	-	-	-	-	-
WS4	-	-	-	M	-	-	L	-	-	-	-	-	-	-
WS5	-	-	-	-	-	-	-	-	-	-	M	-	-	-
WS6	L	-	-	-	-	-	-	-	-	-	-	-	-	-
HAZ1	M	-	-	M	M	H	-	-	-	M	-	H	-	-
HAZ2	M	-	-	M	M	H	L	-	-	M	H	H	-	-
HAZ3	H	-	-	-	-	-	-	-	-	-	-	H	-	-
HAZ4	-	-	-	-	-	-	L	-	-	H	-	-	-	-
HAZ5	H	-	-	-	-	-	-	-	-	H	-	-	-	-
H1	-	-	-	-	-	-	-	-	-	-	M	-	-	-
H2	-	-	-	M	-	-	L	-	-	-	-	-	-	-
H3	L	-	-	M	-	M	-	-	-	-	-	L	-	-
H4	H	-	-	-	-	L	-	-	-	-	-	H	-	-
H5	L	-	-	-	H	M	L	-	-	-	-	H	-	-
H6	-	-	-	-	-	M	-	-	-	-	-	-	-	-
H7	L	-	-	-	-	-	-	-	-	-	-	-	-	-
H8	L	-	-	-	-	-	-	-	-	-	-	-	-	-
EQ1	M	-	-	L	M	L	-	-	-	-	-	H	-	-
EQ2	-	-	-	L	-	-	-	-	-	-	-	-	-	-
EQ3	L	-	-	-	-	L	L	-	-	-	M	H	-	-
EQ4	H	-	-	-	-	-	-	-	-	-	H	-	-	-
EQ5	H	-	-	-	-	-	-	-	-	-	H	-	-	-
EQ6	-	-	-	-	-	L	-	-	-	-	-	-	-	-
EQ7	-	-	-	-	-	-	-	-	-	-	-	M	-	-
EQ8	L	-	-	-	-	-	L	-	-	-	-	-	-	-
GF1	L	-	-	L	M	H	-	-	-	-	M	L	-	-
GF2	-	-	-	-	M	-	-	-	-	-	M	-	-	-
GF3	M	-	-	L	-	-	-	-	-	-	-	-	-	-
GF4	H	-	-	-	-	H	-	-	-	-	-	-	-	-
GF5	H	-	-	-	-	H	-	-	-	-	-	-	-	-
GF6	-	-	-	-	-	-	-	-	-	-	-	M	-	-

Section 6. Plan Implementation and Maintenance

6.1 Implementation through Existing Programs

Throughout the planning process, the Clinton County Planning Team worked to identify existing hazard mitigation policies, develop mitigation goals, and a create a comprehensive range of mitigation strategies specific to each jurisdiction. This work provides a blueprint for reducing the potential loses identified in the Risk Assessment (Section 4). The ultimate goal of this plan is to incorporate the mitigation strategies proposed into ongoing planning efforts within the County. The Clinton County Emergency Management Agency will be the local champion for the mitigation actions. The Clinton County Board and the city and village councils will be an integral part of the implementation process. Federal and state assistance will be necessary for a number of the identified action.

Continued public involvement is also critical to the successful implementation of the MHMP. Comments from the public on the MHMP will be received by the Clinton County Emergency Management Agency and forwarded to the Planning Team for discussion. Education efforts for hazard mitigation will be an ongoing effort of Clinton County. The public will be notified of periodic planning meetings through notices in the local newspaper. Once adopted, a copy of the MHMP will be maintained in each jurisdiction and in the Clinton County Emergency Management Agency.

6.2 Monitoring, Evaluation, and Updating the MHMP

Throughout the five-year planning cycle, the Clinton County Emergency Management Agency will reconvene the Planning Team to monitor, evaluate, and update the plan on an annual basis. Additionally, a meeting will be held in 2022 to address the five-year update of this plan. Members of the planning committee are readily available to engage in email correspondence between annual meetings. If the need for a special meeting, due to new developments or the occurrence of a declared disaster in the county, the team will meet to update mitigation strategies. Depending on grant opportunities and fiscal resources, mitigation projects may be implemented independently by individual communities or through local partnerships.

As part of the update process, the Planning Team will review the county goals and objectives to determine their relevance to changing situations in the county. In addition, state and federal policies will be reviewed to ensure they are addressing current and expected conditions. The team will also review the risk assessment portion of the plan to determine if this information should be updated or modified. The plan revision will also reflect changes in local development and its relation to each hazard. The parties responsible for the various implementation actions will report on the status of their projects, and will include which implementation processes worked well, any difficulties encountered, how coordination efforts are proceeding, and which strategies should be revised.

Updates or modifications to the MHMP during the five-year planning process will require a public notice and a meeting prior to submitting revisions to the individual jurisdictions for approval. The plan will be updated via written changes, submissions as the committee deems appropriate and necessary, and as approved by the Clinton County Board.

The GIS data used to prepare the plan was obtained from existing county GIS data as well as data collected as part of the planning process. This updated Hazus-MH GIS data has been returned to the county for use and maintenance in the county's system. As newer data becomes available, these updated data will be used for future risk assessments and vulnerability analyses.

Definitions

100-year Floodplain	Areas subject to inundation by the 1-percent-annual-chance flood event.
Critical Facility	A structure, because of its function, size, service area, or uniqueness, that has the potential to cause serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if it is destroyed or damaged or if its functionality is impaired. This includes, but are not limited to, water and wastewater treatment facilities, municipal buildings, educations facilities, and non-emergency healthcare facilities.
Community Rating System (CRS)	A voluntary program for National Flood Insurance Program (NFIP) participating communities. The goals of the CRS are to reduce flood damages to insurable property, strengthen and support the insurance aspects of the NFIP, and encourage a comprehensive approach to floodplain management.
Comprehensive Plan	A document, also known as a "general plan," covering the entire geographic area of a community and expressing community goals and objectives. The plan lays out the vision, policies, and strategies for the future of the community, including all the physical elements that will determine the community's future developments.
Disaster Mitigation Act of 2000 (DMA 2000)	The largest legislation to improve the planning process. It was signed into law on October 30, 2000. This new legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur.
Essential Facility	A subset of critical facilities that represent a substantial hazard to human life in the event of failure. This includes (but not limited to) hospital and fire, rescue, ambulance, emergency operations centers, and police stations.
Federal Emergency Management Agency	An independent agency created in 1979 to provide a single point of accountability for all federal activities related to disaster mitigation and emergency preparedness, response, and recovery.
Hazard	A source of potential danger or adverse condition.
Hazard Mitigation	Any sustained action to reduce or eliminate long-term risk to human life and property from hazards.

Hazard Mitigation Grant Program (HMPG)	Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration.
Hazus-MH	A geographic information system (GIS)-based disaster risk assessment tool.
Multi-Hazard Mitigation Planning	Identify policies and actions that can be implemented over the long term to reduce risk and future losses from various hazardous events.
National Flood Insurance Program	Administered by the Federal Emergency Management Agency, which works closely with nearly 90 private insurance companies to offer flood insurance to property owners and renters. In order to qualify for flood insurance, a community must join the NFIP and agree to enforce sound floodplain management standards.
Planning Team	A group composed of government, private sector, and individuals with a variety of skills and areas of expertise, usually appointed by a city or town manager, or chief elected official. The group finds solutions to community mitigation needs and seeks community acceptance of those solutions.
Risk Priority Index	Quantifies risk as the product of hazard probability and magnitude so Planning Team members can prioritize mitigation strategies for high-risk-priority hazards.
Risk Assessment	Quantifies the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people.
Strategy	A collection of actions to achieve goals and objectives.
Vulnerability	Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions.

Acronyms

A B **C** **D** **E** **F** **G** **H** **I** J K L **M** **N** O **P** Q **R** **S** T **U** V W X Y Z

A

AEGL – Acute Exposure Guideline Levels
ALOHA – Areal Locations of Hazardous Atmospheres

C

CERI – Center for Earthquake Research and Information
CRS – Community Rating System

D

DEM – Digital Elevation Model
DFIRM – Digital Flood Insurance Rate Map
DMA – Disaster Mitigation Act of 2000

E

EAP – Emergency Action Plan
EMA – Emergency Management Agency
EPA – Environmental Protection Agency

F

FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map

G

GIS – Geographic Information System

H

Hazus-MH – Hazards USA Multi-Hazard
HMGP – Hazard Mitigation Grant Program
HUC – Hydrologic Unit Code

I

IA – Individual Assistance
IDNR – Illinois Department of Natural Resources
IDOT – Illinois Department of Transportation
IEMA – Illinois Emergency Management Agency
ISO – Insurance Service Office
ISGS – Illinois State Geological Survey
ISWS– Illinois State Water Survey

M

MHMP – Multi-Hazard Mitigation Plan

N

NCDC – National Climatic Data Center
NEHRP – National Earthquake Hazards Reduction Program
NFIP – National Flood Insurance Program
NID – National Inventory of Dams
NOAA – National Oceanic and Atmospheric Administration
NSFHA – Non-Special Flood Hazard Area

P

PA – Public Assistance
PHMSA– Pipeline and Hazardous Materials Safety Administration
PPM – Parts Per Million

R

RPI – Risk Priority Index

S

SIU – Southern Illinois University Carbondale
SPC – Storm Prediction Center
STAPLEE – Social, Technical, Administrative, Political, Legal, Economic, and Environmental

U

USGS – United States Geological Survey

Appendices

Appendix A. Meeting Minutes

Pre-Meeting

Tuesday, April 19, 2016 1:30

CLINTON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE

	Name	E-mail	Title	SIGN_IN
Albers	Stephen Schomaker	Villageofalbers@yahoo.com	Village president	
Albers	Kevin Kenow	Villageofalbers@yahoo.com	Village Trustee	
Aviston	Dale Haukap	villagehall@avistonil.org	Village President	
Aviston	Gary Rakers	garyrakers eatl.net	Public Works Director	
Bartelso	John Wilken		Village President	
Bartelso	Mike Gebke	mgebke4745@hotmail.com	Village Clerk	
Beckemeyer	Mike Rakers	villageofbec@ezeeweb.com	Village President	
Beckemeyer	Rodney Rakers	villageofbec@ezeeweb.com		
Breese/Clinton Co	Timothy Schleper	tschleper@breese.org	City Manager	
Carlyle	Mike Burton	mayor@carlylelake.com	Mayor	
Carlyle	Mike Pingsterhaus	mpingsterhaus@carlylelake.com	Police Chief	
clinton county	Steve Heiligenstein	stevehstein@att.net	County Board	
Centralia	Dan Ramey	dramey@city of centralia.org	City Manager	
Clinton County	Diane Luitjohan	diane.luitjohan@clintoncoillinois.gov	FOIA	
Clinton County	Jim Sullivan	sully94@sbcglobal.net	County Board	
Clinton County	Jay Donnelly	gis@clintonco.illinois.gov	GIS Coordinator	
Clinton County	Joyce Lucas	joyce.lucas@clintonco.illinois.com	County Zoning Admin	
Clinton County	Linda Mensing	assessor@clintonco.illinois.gov	County Assessor	
Clinton County	Robert Fix	rfix2001@yahoo.com	County Board Chair	
Clinton County	Mary Rakers	ccclerk@clintonco.illinois.gov	County Clerk Recorder	
Clinton County	Doug Maue	sheriff@clintonco.illinois.gov	County Sheriff	
Clinton County	Cheryl Lee	health@clintonco.illinois.gov	County Health Dept.	
Clinton County	Ron Daniels	rdaniels@roe13.org	Regional Supt.of Schools	
Clinton County	Don Deiters	ccanimalcontrol@clintonco.illinois.gov	Animal Control Dept.	
Clinton County	Dan Behrens	highway@clintonco.illinois.gov	County Engineer	
Damiansville	Herman "Bud" Jansen	Budjansen@charter.net	Village President	
	Norman Horstmann	Noros4@hotmail.com	Village Board	
Germantown	Duane Ripperda	dawn@gemantownil.net	Village President	

Tuesday, April 19, 2016 1:30

CLINTON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE

Hoffman	William A. Guile	guile@frontiernet.net + VOH @ NETOUTZ.NET	Village President	
Huey	Brian Jones		Village President	
New Baden	Michael Hemmer	mhemmer@newbadenil.com	Village Administrator	
New Baden	Christy Picard	mayor@newbadenil.com	Village President	
New Baden	Mike Mavroeorge	mike.mavrogeorge@newbadenil.com	Village B-Public Safety	
Trenton	Mike Jones	mjones@trenton-il.com	Police Chief	MKJones
Trenton	Kyle Jones	kjones@trenton-il.com	Mayor	
FIRE DISTRICTS				
Aviston FPD	Craig Lampe		Chief	
Beckemeyer-Wade	Thomas Klutho		Chief	
Breese VFPD	Robert Wuest		Chief	
Carlyle FPD	John Mahlandt	dispatch@carlylefiredept.com	Chief	
VFPD	Brian Hubert	bhubert@clinclairfire.org	Chief	
Germantown FPD	Jeff Kampwerth		Chief	
Hoffman FPD	Dennis Haake	~~hoffmanfire@frontiernet.net~~	Chief	
Huey-Ferrin-BoulderFPD	~~Sylvester Reverman~~ Ryan Hughes	hughes.r99@gmail.com	~~Chief~~ LIEUTENANT	
Huey-Ferrin-BoulderFPD	Mike Hohmeyer	hfbfire@tincans.net	Asst. Chief	
New Baden FPD	Matthew Flanagan	ch204@fdmail.sfm.illinois.gov	Chief	
Sante Fe FPD	Marcel Winkeler	sffpd@yahoo.com	Chief	
St. Rose FPD	Dan Trame	strosefire@strosefire.com	Chief	
Sugar Creek FPD	Steve Davis	sugarcreekfire@gmail.com sjdavis1@icloud.com	Chief	
Wheatfield FPD	Donald Beckemeyer	dlbeck7400@gmail.com	Chief	Don Beckemeyer
SIU	Timothy Kropp	timkropp@siu.edu		
SIU	Kurtis Levi Milliron	millironk15@siu.edu		
SIU	James Conder	conder@geo.siu.edu		

Clinton County	Wayne Kruse	kruse.wayne@clintoncounty.illinois.gov	Eng. Tech.
County Hwy.	Neal Richter		
Clinton County Probation	Randy Brandmeyer	randy.brandmeyer@clintonco.illinois.gov	
Centralia ESDA	John Worlds	worldscntrl@aol.com	
Centralia ESDA	Chris Williams	UCANCmehere@yahoo.com	Chris Williams
Clinton County	Charles Simpson	1011 51 at aol.com	
Clinton County	Larry Johnson	LJohnsonfarms@Yahoo.com	
Clinton County	Rafael Him	rhim12@gmail.com	
City of Breese > Clinton County	Robert Fix	nfix2001@yahoo.com	
Clinton County	JAMES G RAIKERS	HOMER_G_HANKS@YAHOO.COM	
CLINTON COUNTY > CITY OF BREESE	Timothy M. Schleper	tschleper@charter.net	T. Schleper
Village of Germantown -	Jeff Wuebbles	chiefwuebbles@yahoo.com	
Village of Beckemeyer	Tom Ellis	TOMLS5906@Yahoo.Com	

Tuesday, April 19, 2016 1:30

CLINTON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE

	Name	E-mail	Title	SIGN_IN
Albers	Stephen Schomaker	Villageofalbers@yahoo.com	Village president	
Albers	Kevin Kenow	Villageofalbers@yahoo.com	Village Trustee	
Aviston	Dale Haukap	villagehall@avistonil.org	Village President	
Aviston	Gary Rakers			
Bartelso	John Wilken		Village President	
Bartelso	Mike Gebke	mgebke4745@hotmail.com	Village Clerk	
Beckemeyer	Mike Rakers	villageofbec@ezeeweb.com	Village President	
Beckemeyer	Rodney Rakers	villageofbec@ezeeweb.com		
Breese/Clinton Co	Timothy Schleper	tschleper@breese.org	City Manager	
Carlyle	Mike Burton	mayor@carlylelake.com	Mayor	
Carlyle	Mike Pingsterhaus	mpingsterhaus@carlylelake.com	Police Chief	Sgt. Andy Buthod
clinton county	Steve Heiligenstein	stevehstein@att.net	County Board	
Centralia	Dan Ramey	dramey@city of centralia.org	City Manager	
Clinton County	Diane Luitjohan	diane.luitjohan@clintoncoillinois.gov	FOIA	
Clinton County	Jim Sullivan	sully94@sbcglobal.net	County Board	
Clinton County	Jay Donnelly	gis@clintonco.illinois.gov	GIS Coordinator	
Clinton County	Joyce Lucas	joyce.lucas@clintonco.illinois.com	County Zoning Admin	
Clinton County	Linda Mensing	assessor@clintonco.illinois.gov	County Assessor	
Clinton County	Robert Fix	rfix2001@yahoo.com	County Board Chair	
Clinton County	Mary Rakers	ccclerk@clintonco.illinois.gov	County Clerk Recorder	
Clinton County	Doug Maue	sheriff@clintonco.illinois.gov	County Sheriff	
Clinton County	Cheryl Lee	health@clintonco.illinois.gov	County Health Dept.	
Clinton County	Ron Daniels	rdaniels@roe13.org	Regional Supt.of Schools	
Clinton County	Don Deiters	ccanimalcontrol@clintonco.illinois.gov	Animal Control Dept.	
Clinton County	Dan Behrens	highway@clintonco.illinois.gov	County Engineer	
Damiansville	Herman "Bud" Jansen	Budjansen@charter.net	Village President	
	Norman Horstmann	Noros4@hotmail.com	Village Board	
Germantown	Duane Ripperda	dawn@gemantownil.net	Village President	

Tuesday, April 19, 2016 1:30

CLINTON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE

Hoffman	William A. Guile	Gguile@frontiernet.net	Village President	
Huey	Brian Jones		Village President	
New Baden	Michael Hemmer	mhemmer@newbadenil.com	Village Administrator	
New Baden	Christy Picard	mayor@newbadenil.com	Village President	
New Baden	Mike Mavroeorge	mike.mavrogeorge@newbadenil.com	Village B-Public Safety	
Trenton	Mike Jones	mjones@trenton-il.com	Police Chief	M C Jones
Trenton	Kyle Jones	kjones@trenton-il.com	Mayor	
FIRE DISTRICTS				
Aviston FPD	Craig Lampe		Chief	
Beckemeyer-Wade	Thomas Klutho		Chief	
Breese VFPD	Robert Wuest		Chief	
Carlyle FPD	John Mahlandt	dispatch@carlylefiredept.com	Chief	
VFPD	Brian Hubert	bhubert@clinclairfire.org	Chief	
Germantown FPD	Jeff Kampwerth		Chief	
Hoffman FPD	Dennis Haake	~~hoffmanfire@frontiernet.net~~	Chief	
Huey-Ferrin-BoulderFPD	~~Sylvester Reverman~~ Ryan Hughes	hughes.r99@gmail.com	~~Chief~~ LIEUTENANT	
Huey-Ferrin-BoulderFPD	Mike Hohmeyer	hfbfire@tincans.net	Asst. Chief	
New Baden FPD	Matthew Flanagan	ch204@fdmail.sfm.illinois.gov	Chief	
Sante Fe FPD	Marcel Winkeler	sffpd@yahoo.com	Chief	
St. Rose FPD	Dan Trame	strosefire@strosefire.com	Chief	
Sugar Creek FPD	Steve Davis	sugarcreekfire@gmail.com	Chief	
Wheatfield FPD	Donald Beckemeyer	dlbeck7400@gmail.com	Chief	
SIU	Timothy Kropp	timkropp@siu.edu		
SIU	Kurtis Levi Milliron	millironk15@siu.edu		
SIU	James Conder	conder@geo.siu.edu		

Meeting 1

MEETING DATE:
Tues., 10/18/2016

CLINTON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE
COMMITTEE MEMBERS

Local Govt Agency	Name	E-mail	Job Title	SIGN_IN
BARTELSO	John D Wilken	JACKCLEO@HOTMAIL.com	MAYOR	
BARTELSO	MIKE GEBKE	MGEBKE4745@HOTMAIL.COM	VILLAGE CLERK	
DAMIANSVILLE	JOE DIESTE		ALTERNATE	
New Baden	Scott Meinhart	PD CHIEF@NewBadenIL.com	Chief of Police	
New Baden	Mike Hemmes	mhemmer@newbadenil.com	Administrator	
Breese Fire Dist.	Bob Wuest	Bob Wuest@BreeseFire.com	Fire Chief	
CARLYLE POLICE DEPT	MARK PINGSTERHAUS	MPINGSTERHAUS@CARLYLELAKE.com	CHIEF OF POLICE	
ALBERS	KEVIN KENOW	KKENOW@gmail.com	board mbr	
Trenton	Mike Jones	mjones@trenton-il.com	Chief of Police/Fire	
Clinton County	Linda Mensing	assessor@clintonco.illinois.gov	Sup. of Assmt	
BREESE	CHARLIE HILMES	MAYORHILMES@BREESE	MAYOR	
Clinton Co.	Jami Staser	jami.staser@clintonco.illinois.gov	Zoning	
Village of Aviston	Mike Bercher	Mbbavston@yahoo.com	Village Adm	
Clinton County Health	September Mcadoo	September.mcadoo@clintonco.illinois.gov	Emergency Prep. & Response Supervisor	
Clinton Co. Sheriff	Doug	sheriff@clintonco.illinois.gov	Sheriff	
Huey Ferrin Boulder F.P.D	MIKE HOHMEYER	mikehohmeyer@sbcglobal.net	ASST. FIRE CHIEF	
CLINTON Co.	TIMOTHY SCHLEPER	tschleper@charter.net	EMA DIRECTOR	
HUEY FERRIN BOULDER	SGT REVERMANN		CHIEF	
CLINTON Co. SHERIFF	MIKE DALL	Mike.dall@clintoNCO.illinois.GOV	CHIEF DEPUTY	

Meeting 2

MEETING DATE:
Thursday 1/19/2017 1:30 p.m.

CLINTON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE
Public Meeting

Name	E-mail	Local Govt Agency/Title (if applicable)	SIGN_IN
Charles Simpson		County Board	
Bob Wiest	Bobwiest@breesefire.com	Breese Fire Dept.	
Timothy M. Schleper	tschleper@charter.net	City of Breese / Clinton Co. EMA	
Bob Fry	nsix2001@yahoo.com	C.C. & Bum	
Vicky Alter	editor@breesepub.com	Breese Journal	
Don Buchan	JACKCLSO@HOTMAIL.COM	BARTELSO MAYOR	
Mike Gilke	MGERBRE4745@HOTMAIL.COM	BARTELSO VILLAGE CLERK	
Rodney Kahrs	Rodney Kahrs1@Gmail.com	Beckemeyer BERT	
September McAdoo	September.mcadoo@il.nacenet.org	Health Dept.	
James B Robins	HOMER-G-JAMES@YAHOO.COM	Clinton County Board	
Jay Donnelly	gis@clintonco.illinois.gov	Clinton County	
Jami Stasek	jami.stasek@clintonco.illinois.gov	Clinton County	
Mark Hodapp	info@apperunionbanner.net	Carlyle Union Banner	
Steve Davis	sjdavis1@icloud.com	Sugar Creek Fire Dept.	
Dan Peters	CCANIMALCONTROL@clintonco.illinois.gov	ANIMAL CONTROL	
MARK PENGSTERHAUS	MPENGSTERHAUS@CARLYSLAKE.COM	CARLYLE POLICE CHIEF	
Scott Meinhardt	PDChief@NewBadenIL.com	New Baden PD	
Mike Hammer	mhammer@newbadenIL.com	New Baden	

Meeting 3

MEETING DATE:
Thursday 3/29/2017 1:30 p.m.

CLINTON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE
Public Meeting

Name	E-mail	Jurisdiction or Place of Residence	SIGN_IN
John B Wilken	clifojack@hotmail.com	Bartelso	[illegible]
[illegible]	[illegible]@hotmail.com	Bartelso	[illegible]
Kevin Kenow	kkenow@gmail.com	[illegible]	[illegible]
Charles Simpson	simp101151 at AOL.com	Centralia	Charles Simpson
Jami Staser	jami.staser@clintonco.illinois.gov	County	[illegible]
Mark Taylor	police@aviston[illegible]	Aviston	[illegible]
Mark Hodapp	mhodapp@unionbanner.net	Carlyle	[illegible]
Robert Fix	rfix2001@yahoo.com	Breese / Clinton County	Robert Fix
Rodney Bakers	Rodney Bakers@gmail.com	Beckemeyer [illegible]	Rodney Baker
[illegible]	[illegible]	[illegible]	[illegible]
Scott Meinhier[illegible]	PDChief@[illegible]	New Baden	[illegible]
Jay Donnelly	gis@clintonco.illinois.gov	Clinton County	[illegible]
Robert Wuest	bobwuest@breese fire.com	Breese	[illegible]
CHARLIE HILMES	MAYORHILMES@BREESE.ORG	BREESE	Charles E Hilmes
[illegible]	animalcontrol@clintonco.illinois.gov	Breese	[illegible]
Timothy M. Schleper	tschleper@charter.net	BREESE / CLINTON COUNTY	[illegible]

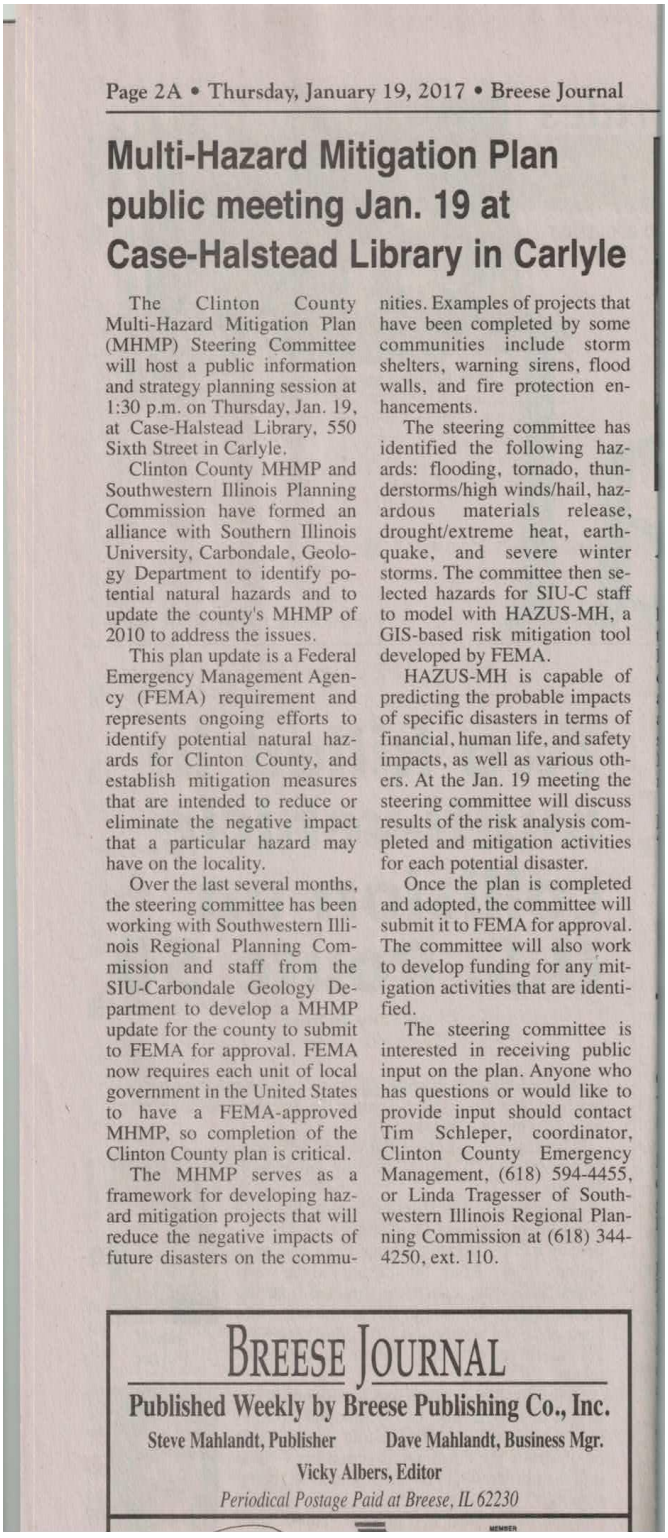
Meeting 4

MEETING DATE:
Thursday 3/29/2017 1:30 p.m.

CLINTON COUNTY
MULTI-HAZARD MITIGATION PLAN UPDATE
Public Meeting

Name	E-mail	Jurisdiction or Place of Residence	SIGN_IN
John B Walker	CLEOJACK@HOTMAIL.COM	BARTELSO	
Mike Zeck	MZEBRE4745@HOTMAIL.COM	BARTELSO	
KEVIN KENOW	KKENOW@GMAIL.COM	BREESE	
Charles Simpson	SIMP1011951@AOL.COM	Centralia	Charles Simpson
Jami Stueck	jami.stueck@clintoncountyillinois.gov	County	
Marla Taylor	police@aviston.com	AVISTON	
Mark Herzog	mherzog@unionbanner.net	CARLYLE	
Robert Fix	Hix2001@yahoo.com	Breese / Clinton County	
Rodney Bakers	Rodney.Bakers@gmail.com	Beckemeyer-Bent	Rodney Baker
[illegible]	[illegible]	[illegible]	
Scott Meinhardt	PDChief@[illegible]	New Bad	
Gary Donnelly	gisec@clinton-co.illinois.gov	Clinton County	
Robert Wuest	bobswuest@breese.com	Breese	
CHARLIE HOLMES	MAYORHOLMES@BREESE.ORG	BREESE	Charles E. Holmes
[illegible]	CAnimalControl@[illegible]	BREESE	
Timothy M. Schleper	tschleper@charter.net	BREESE / CLINTON COUNTY	
Justin Detmer		St. Rose	

Appendix B. Press Release and Newspaper Articles



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Multi-Hazard Mitigation Plan public meeting Jan. 19 at Case-Halstead Library in Carlyle

The Clinton County Multi-Hazard Mitigation Plan (MHMP) Steering Committee will host a public information and strategy planning session at 1:30 p.m. on Thursday, Jan. 19, at Case-Halstead Library, 550 Sixth Street in Carlyle.

Clinton County MHMP and Southwestern Illinois Planning Commission have formed an alliance with Southern Illinois University, Carbondale, Geology Department to identify potential natural hazards and to update the county's MHMP of 2010 to address the issues.

This plan update is a Federal Emergency Management Agency (FEMA) requirement and represents ongoing efforts to identify potential natural hazards for Clinton County, and establish mitigation measures that are intended to reduce or eliminate the negative impact that a particular hazard may have on the locality.

Over the last several months, the steering committee has been working with Southwestern Illinois Regional Planning Commission and staff from the SIU-Carbondale Geology Department to develop a MHMP update for the county to submit to FEMA for approval. FEMA now requires each unit of local government in the United States to have a FEMA-approved MHMP, so completion of the Clinton County plan is critical.

The MHMP serves as a framework for developing hazard mitigation projects that will reduce the negative impacts of future disasters on the communities. Examples of projects that have been completed by some communities include storm shelters, warning sirens, flood walls, and fire protection enhancements.

The steering committee has identified the following hazards: flooding, tornado, thunderstorms/high winds/hail, hazardous materials release, drought/extreme heat, earthquake, and severe winter storms. The committee then selected hazards for SIU-C staff to model with HAZUS-MH, a GIS-based risk mitigation tool developed by FEMA.

HAZUS-MH is capable of predicting the probable impacts of specific disasters in terms of financial, human life, and safety impacts, as well as various others. At the Jan. 19 meeting the steering committee will discuss results of the risk analysis completed and mitigation activities for each potential disaster.

Once the plan is completed and adopted, the committee will submit it to FEMA for approval. The committee will also work to develop funding for any mitigation activities that are identified.

The steering committee is interested in receiving public input on the plan. Anyone who has questions or would like to provide input should contact Tim Schleper, coordinator, Clinton County Emergency Management, (618) 594-4455, or Linda Tragesser of Southwestern Illinois Regional Planning Commission at (618) 344-4250, ext. 110.

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Appendix C. Adopting Resolutions

See Attached Adopting Resolutions

Appendix D. Historical Hazards

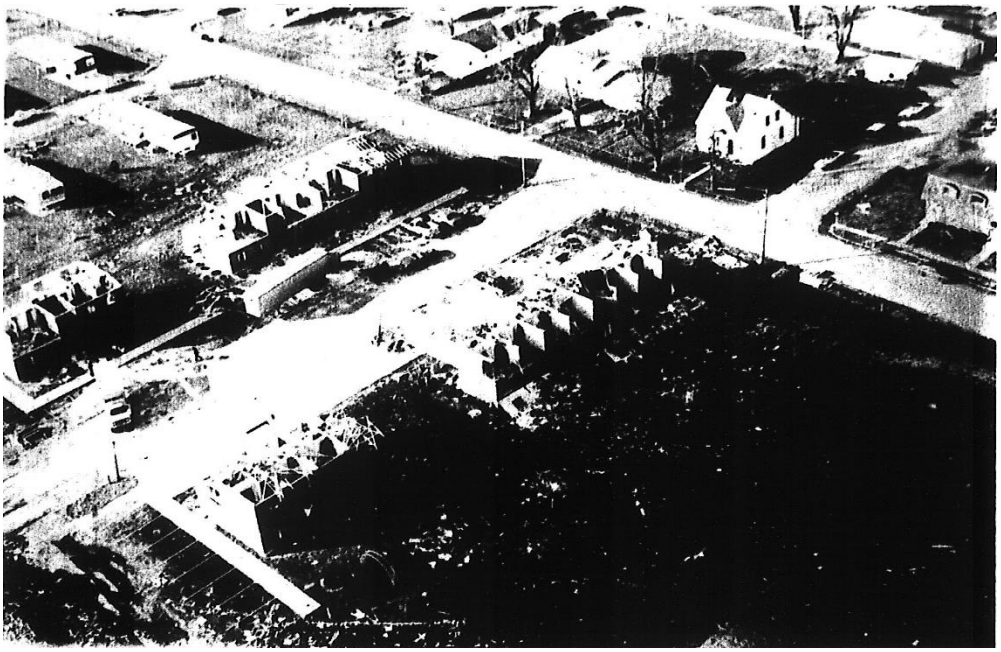
Historical Tornadoes:

On February 25, 1956 an F4 tornado tore through Trenton causing millions in damage. Above is what remains of a building owned by Community Equipment Co. where they had stored vehicles and tractors. Below is a home leveled in Summerfield. Pictures from The Breese Journal.

On December 2, 1982, an F3 tornado tore through New Baden killing two and destroying 134 trailers, homes, and apartments

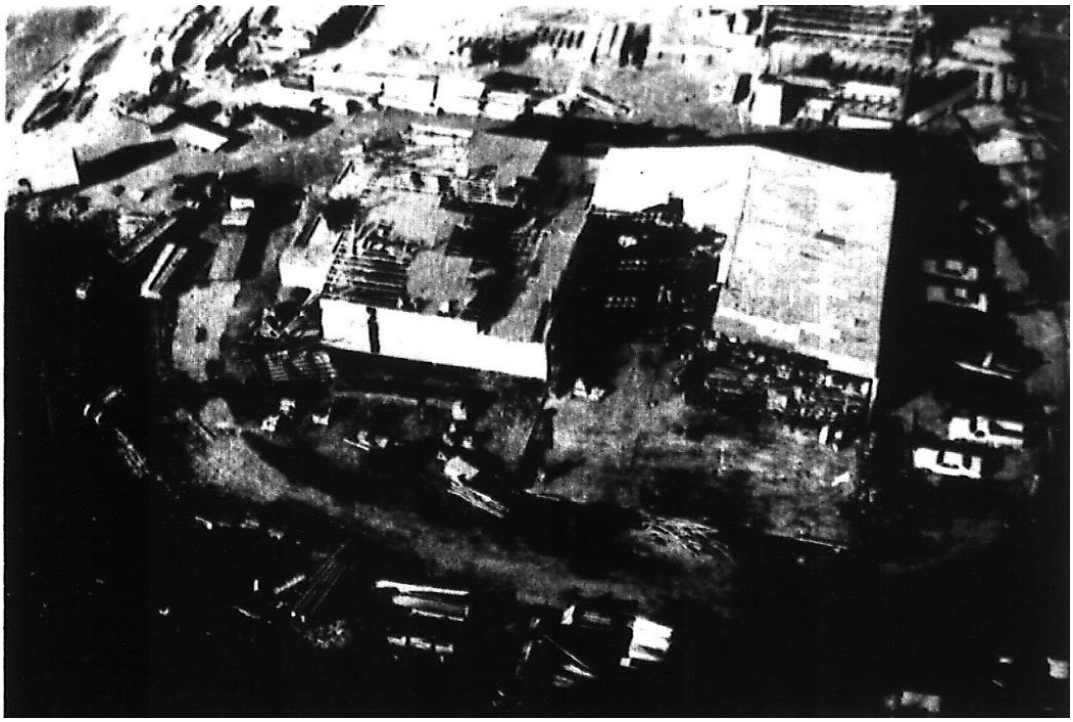
Illinois Governor James Thompson held a press conference the day after the tornado hit to discuss plans to help the community, having declared New Baden a state disaster area. Pictures from The Breese Journal.

74 mobile homes destroyed in New Baden. Pictures from The Breese Journal.



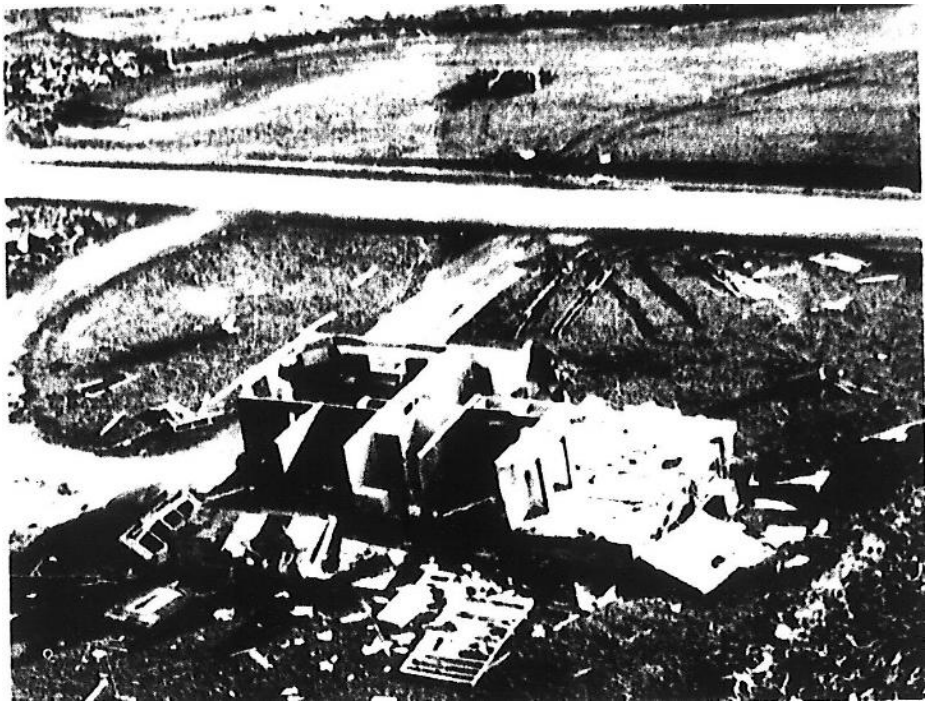
Second floors blown off of two-story apartments. Pictures from The Breese Journal.

A lumber company nearly demolished. Pictures from The Breese Journal.



Total destruction. Pictures from The Breese Journal.

A house two and a half miles north of New Baden. Pictures from The Breese Journal.



Some of twenty four apartments destroyed. Pictures from The Breese Journal.

Appendix E. List of Essential Facilities

Not all data is available for every facility. Other facility specifics may be available upon request.

Emergency Operations Centers

Name	Address	City
Clinton County Emergency Management Agency	431 21st Street	Carlyle

Fire Stations

Name	Address	City
Aviston Fire Protection District	498 Railroad Street	Aviston
Beckemeyer-Wade Fire Protection District	610 Louis Street	Beckemeyer
Breese Volunteer Fire Protection District	50 South Germantown Road	Breese
Carlyle Fire Protection District	431 Franklin Street	Carlyle
Clin-Clair Volunteer Fire Protection District	406 State Route 161 West	Albers
Germantown Fire Protection District	300 Prairie Street	Germantown
Hoffman Fire Protection District	105 Oak Street	Carlyle
Huey-Ferrin-Boulder Fire Protection District	250 North Railroad Street	Carlyle
New Baden Fire Protection District	100 East Hanover Street	New Baden
Santa Fe Township Fire Protection District	801 Carlyle Road	Bartelso
Sugar Creek Township Fire Protection District	1001 West Broadway	Trenton
Wheatfield Township Fire Protection District	19011 Stolletown Road	Carlyle

Police Stations

Name	Address	City
Aviston Police Department	149 S. Page Street	Aviston
Beckemeyer Police Department	191 E. 1st Street	Beckemeyer
Breese Police Department	500 N. 1st Street	Breese
Centrailia Police Department	222 S. Poplar Street	Centralia
Clinton County Sheriff Department	810 Franklin Street	Carlyle
Germantown Police Department	306 Prairie Street	Germantown
New Baden Police Department	100 E. Hanover Street	New Baden
Trenton Police Department	25 W Indiana Street	Trenton

Medical Care Facilities

Name	Address	City	Comments
Aviston Countryside Manor	450 West 1st Street	Aviston	97 Beds
Aviston Terrace	349 West 1st Street	Avision	16 Beds
Breese Nursing Home	1155 North 1st Street	Breese	112 Beds
Brookside Manor	1740 West McCord	Centralia	49 Beds
Carlyle Healthcare Center	501 Clinton Street	Carlyle	119 Beds
Clinton Manor Living Center	111 East Illinois Street	New Baden	140 Beds
Colonial Apartments	920 West 4th	Centralia	16 Beds
Oakview Home	420 East 2nd Street	Trenton	16 Beds
Royal Living Center Inc	200 South 9th Street	New Baden	16 Beds
St. Joseph's Hospital	9515 Holy Cross Lane	Breese	57 Beds
Warren G Murray	1535 West McCord	Centralia	376 Beds
Westlake Home	2090 West Lake Drive	Carlyle	16 Beds

Schools

Name	Address	City	Comments
Albers Elementary School	206 N. Broadway	Albers	Elementary
All Saints Academy	295 N. Clinton Street	Breese	
Aviston Elementary School	350 S Hull Street	Aviston	Elemenatary
Bartelso Elementary School	306 S. Washington Street	Bartelso	Elemenatary
Beckemeyer Elementary School	110 E. 4th Street	Beckemeyer	Elemenatary

Name	Address	City	Comments
Breese Elementary School	777 Memorial Drive	Breese	Elemenatary
Carlyle Elementary School	951 6th Street	Carlyle	Elemenatary
Carlyle Junior High School	1631 12th Street	Carlyle	Junior High School
Carlyle High School	1461 12th Street	Carlyle	High School
Central Community High School	7740 Old US Highway 50	Breese	High School
Christ Our Rock Lutheran High School	9545 Shatuc Road	Centrailia	Private
Damiansville Elementary School	101 E. Main Street	Damiansville	Elementary
Germantown Elementary School	401 Walnut St.	Germantown	Elementary
Lincoln Elementary School	501 N. Elm Street	Centrailia	Elementary
Mater Dei High School	900 Mater Dei Drive	Breese	Private
Trenton Jr Sr High School	10003 State Route 160	Trenton	Junior & Senior High School
Trinity Lutheran School	8701 Huey Rd	Hoffman	Private
New Baden Elementary School	700 Marilyn Drive	New Baden	Elementary
North Wamac Grade School	1500 Case Street	Centrailia	Elementary
St. Mary's Elementary School	313 S. Adams Street	Trenton	Private
St. Rose Elementary School	18004 St. Rose Rd.	Breese	Elementary
Wesclin Senior High School	699 Wesclin Road	Trenton	High
Williow Grove Elementary School	815 W 7th St	Centralia	Elementary

Appendix F. Critical Facilities Map

See Attached Large Format Map of Critical Facilities.