MULTI-HAZARD MITIGATION PLAN

BOND COUNTY, ILLINOIS

DRAFT : December, 2009

Southern Illinois University Carbondale
Department of Geology

ILLINOIS EMERGENCY MANAGEMENT AGENCY
IEMA

BOND COUNTY EMERGENCY TELEPHONE SYSTEM BOARD

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Southwestern Illinois Planning Commission

Hazard Mitigation Plan

Bond County, Illinois

Adoption Date: -- _____ --

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Section 1 - Public Planning Process

1.1 Narrative Description

Hazard Mitigation is defined as any sustained action to reduce or eliminate long-term risk to human life and property from hazards. The Federal Emergency Management Agency (FEMA) has made reducing hazards one of its primary goals. Hazard Mitigation Planning and the subsequent implementation of the projects, measures, and policies developed as part of these plans, 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 a requirement 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.

The Bond County Multi-Hazard Mitigation (MHMP)Planning Committee was established in April of 2008 to define and prioritize the risks in the county and to develop this mitigation plan to minimize both the risks and the consequences of the defined hazards. This team has worked closely on previous mitigation projects such as siren identification and location, area zoning considerations, identification and inventory of hazardous materials, and area training of response personnel. The team will continue to work together to develop and implement mitigation initiatives developed as part of the plan.

In recognition of the importance of planning in mitigation activities, the Federal Emergency Management Agency (FEMA) has created HAZUS-MH (**Haz**ards **US**A **M**ulti-**H**azard) a powerful geographic information system (GIS)-based disaster risk assessment tool. This tool enables communities of all sizes to predict the estimated losses from floods, hurricanes, earthquakes, and other related phenomena 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 in Illinois. Southern Illinois University at Carbondale (SIU) and The Polis Center at Indiana University Purdue University Indianapolis (Polis) are assisting Bond County planning staff with performing the hazard risk assessment.

1.2 Planning Team Information

The Bond County Multi-Hazard Mitigation Planning Team is headed by Kevin Terveer, and Allan L. Davis of Bond County ESDA is the primary point of contact. Members of the planning team include representatives from Bond County elected officials and various county departments, the Regional Planning Commission, cities and villages, and public/private utilities. Table 1-1 identifies the planning team individuals and the organizations they represent.

Table 1-1: Multi Hazard Mitigation Planning Team Members

Name	Title	Organization	Jurisdiction
Allan L. Davis	*Coordinator*	*Emergency Services & Disaster Agency*	*Bond County*
Kevin Terveer	*Executive Director*	*Southwestern Illinois Metropolitan and Regional Planning Commission*	*Southwestern Illinois Region*
Linda Tragesser	*Community Planner*	*Southwestern Illinois Metropolitan and Regional Planning Commission*	*Southwestern Illinois Region*
Jill Franks	*Chair*	*County Board*	*Bond County*
Allan Davis	*Coordinator*	*County 911 Board*	*Bond County*
Allan Davis	*Coordinator*	*City ESDA*	*City of Greenville*
Matt Wilman	*Code Enforcement*	*City Administration*	*City of Greenville*
Gerald McCray	*Board Member*	*Bond County Board*	*City of Greenville*
Hiram Renfro	*Village President*	*Village Board*	*Village of Donnellson*
Tom Hoffman	*Coordinator*	*Greenville Regional Hospital EMS, Village of Keyesport FPD*	*Village of Keyesport*
Duane Wiegmann	*Chief*	*Keyesport Fire Protection District*	*Village of Keyesport*
Doug Enloe	*Village President*	*Village Board*	*Village of Mulberry Grove*
Michael G. Knebel	*Trustee*	*Village Board*	*Village of Panama*
Dolly M. Knebel	*Citizen*	*Village Board*	*Village of Panama*
Steve Plocher	*Chief*	*Highland-Pierron Fire Protection District*	*Village of Pierron*
James Moore	*Trustee*	*Village Board*	*Village of Pocahontas*
Joe Rakers	*Trustee*	*Village Board Pocahontas-Old Ripley Fire & EMS*	*Village of Pocahontas Village of Old Ripley*
Lora Kennedy	*Village President*	*Village Board*	*Village of Smithboro*
Dale R. Deverick	*Chief*	*Smithboro Fire Protection District*	*Village of Smithboro*
Edward Wallace	*Village President*	*Village Board*	*Village of Sorento*
Linda Hansen	*Trustee*	*Village Board*	*Village of Sorento*

The Disaster Mitigation Act (DMA) planning regulations and guidance stress that planning team members must be active participants. The Bond County MHMP committee members were actively involved on the following components:

- Attending the MHMP meetings
- Providing available Geographic Information System (GIS) 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

An MHMP kickoff meeting was held at the Bond County Annex in the Board Room on April 29, 2008. Representatives of Clinton County, Bond County, and SIMAPC attended the meeting. Nicholas Pinter of SIU-C explained the rationale behind the MHMP program and answered questions from the participants.

Jonathan Remo from SIU provided an introduction to hazards, and Dan Coats and John Buechler from The Polis Center provided an overview of HAZUS-MH. Professor Pinter described the timeline and the process of the mitigation planning project and presented Clinton County and Bond County with a Memorandum of Understanding (MOU) for sharing data and information.

The Bond County ESDA Coordinator and County Board Chairman, working with Southwestern Illinois Metropolitan and Regional Planning Commission (SIMAPC), organized the committee between April and October in 2008, and began gathering the data that would be needed for risk assessment. Six meetings (including the kick-off meeting) would be needed for the project. The four phases of the planning process were planned as follows:

PHASE 1: Organization of Resources

PHASE 2: Risk Assessment

PHASE 3: Development of a Mitigation Plan

PHASE 4: Implementation of the Plan and the Monitoring of Programs

The representative of SIMAPC and the Bond County ESDA assigned tasks to committee members. The committee determined from the information provided by the Polis Center and SIU-C that five additional meetings would be held for the following tasks and purposes:

Meeting #2 – Discuss Public Participation and review initial critical facilities data

Meeting #3 – Prioritize identified Hazards and profile the Hazards for modeling

Meeting #4 – Present the draft Risk assessment document and the SIU-C Hazard presentation

Meeting #5 – Develop Mitigation Strategies

Meeting #6 – Presentation of Draft Plan and discussion of any changes recommended

The date set for completion of the draft plan was June 30, 2009. By November, 2008 the Bond County ESDA Coordinator and County Board Chairman had appointed additional members to the committee including a representatives from key County departments as well as representatives from each of the nine incorporated municipalities within the County. Committee members had accumulated data concerning many of the county critical facilities, and had forwarded this data to the SIU-C staff for inclusion in their risk assessment process.

The Bond County Multi-Hazard Mitigation Planning Committee met on the following dates:

- December 2, 2008 at 2:00 p.m.
- May 5, 2009
- June 24 , 2009
- September 2, 2009

- December 2, 2009

These meetings were held in Greenville, Illinois at the Bond County Courthouse in the Board Room. Each meeting was approximately two hours in length. The meeting agendas, minutes, and attendance sheets are included in Appendix A. 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, and assisted with preparation of the public participation information.

1.3 Public Involvement in Planning Process

An effort was made to solicit public input during the planning process and a public meeting was held during the formation of the plan on June 24, 2009. Appendix A contains the agendas and minutes from each of the public meetings. Appendix B contains articles published by the local newspaper throughout the public input process.

1.4 Neighboring Community Involvement

The Bond County planning team invited participation from various representatives of county government, local city and town governments, community groups, local businesses, and colleges. The team also held two meetings with adjacent counties to obtain their involvement in the planning process. Details of neighboring stakeholders' involvement are summarized in Table 1-2.

Table 1-2: Neighboring Community Participation

Person Participating	Neighboring Jurisdiction	Organization	Participation Description
Richard Crocker	Clinton County	Clinton County ESDA Coordinator	Neighboring County Reviewed and commented on the plan.
Frank Miles	Madison County	Madison County Planning and Development Department	Neighboring county – reviewed plan and provided comments.
Matt Stroud	Fayette County	Fayette County LEPC	Neighboring county – reviewed plan and provided comments.
Diana Holmes	Montgomery County	Montgomery County LEPC	Neighboring county – reviewed plan and provided comments.
Steve Nagle	East West Gateway Council of Governments	Director of Community Planning	Metropolitan Planning Agency—Reviewed Plan

1.5 Review of Technical and Fiscal Resources

The MHMP planning team has identified representatives from key agencies to assist in the planning process. Technical data, reports, and studies were obtained from these agencies. The organizations and their contributions are summarized in Table 1-3.

Table 1-3: Key Agency Resources Provided

Agency Name	Resources Provided
Illinois Emergency Management Agency	Provided list of repetitive properties
U.S. Army Corps of Engineers	Provided reports about dams, levees, flooding
Illinois Department of Natural Resources, Division of Water	Hydrologic Data
Bond County Supervisor of Assessments and GIS Department	Tax System Data Base, Parcel Map, Ortho Map
Illinois Emergency Management Agency	Illinois 2007 Natural Hazard Mitigation Plan
U.S. Army Corps of Engineers	Provided reports about existing land subsidence issue
Illinois Department of Natural Resources, Div. of Water	Watershed and stream data
Illinois Department of Employment Security	Economic and Demographic Data
East-West Gateway Council of Governments	Regional Demographic and Economic Data
US Department of Commerce, Bureau of the Census	Demographics and Physical Characteristics, 2007 Census of Agriculture, County Business Patterns
United States Geological Survey	Land Cover, Topography
Illinois Department of Commerce and Economic Opportunity	Economic Data and Community Profiles
US Department of Agriculture, National Resources Conservation Services	Soils and Geological data, Physical Characteristics
US Bureau of Economic Analysis	2007 Personal Income By County
Illinois State Geographical Survey	Topography, Physiography, Coal Mining
Illinois State Climatologist	Climate Data
National Climatic Data Center	Climate Data
Illinois Environmental Protection Agency	Illinois 2008 Section 303(d) Listed Waters and watershed maps.
Southwestern Illinois Resource Conservation and Development	Conservation Data
Federal Emergency Management Agency (FEMA)	Flood Hazard Information
Southwestern Illinois Metropolitan and Regional Planning Commission	Future Land Use Plan 2012 of Clinton County, Future Land Use and Transportation of Bond County,
Regional Commerce and Growth Association (St. Louis Chamber)	Business Data, Demographics

1.6 Review of Existing Plans

Bond County has a solid tradition of community development planning tradition. The County and its associated local communities utilized a variety of planning documents to direct community development. These documents include land use plans, master plans, emergency response plans, municipal ordinances, and building codes. The MHMP planning process incorporated the existing natural hazard mitigation elements from previous planning efforts. Table 1-4 lists the plans, studies, reports, and ordinances used in the development of the plan.

Table 1-4: Planning Documents Used for MHMP Planning Process

Author(s)	Year	Title	Description	Where Used
Southwestern Illinois Metro & Regional Planning Commission	2003 – 2008	Comprehensive Economic Development Strategy (CEDS)	Lists economic and community projects for local governments. Includes mitigation to prevent developing in floodplain and building safer structures to withstand a potential earthquake.	Mitigation strategies from this plan were incorporated
Southwestern Illinois Metro & Regional Planning Commission	1990	Bond County Future Land Use Plan	Comprehensive plan for land use, transportation, and public facilities.	Sections related to hazards incorporated into MHMP.
Bond County		Revised Code of Ordinances of Bond County Illinois	This codebook includes ordinances for floodplain, and planning / zoning.	These ordinances were considered for MHMP because they are designed to mitigate hazards.
City of Greenville	2004	Comprehensive Plan	Comprehensive plan for land use, transportation, and public facilities.	Sections related to hazards incorporated into MHMP.
City of Greenville	1974	Greenville Zoning Ordinance	Land Use Regulations	Sections related to hazards incorporated into MHMP.
City of Greenville	1974	Subdivision Ordinance	Land Use and Subdividing Regulations	Sections related to hazards incorporated into MHMP.
City of Greenville	1974	Minimum Housing Standards Ordinance	Housing Code for the City	Sections related to hazards incorporated into MHMP.
City of Greenville	1974	Lake and Reservoirs Ordinance	Management and Regulation of Development of the City Lake	Sections related to hazards incorporated into MHMP.

Section 2 - Jurisdiction Participation Information

The jurisdictions included in this multi-jurisdictional plan are listed in Table 2-1.

Table 2-1: Participating Jurisdictions

Jurisdiction Name	
Bond County	Honorable Jill Franks, County Board Chairman
City of Greenville	Honorable Alan Gaffner, Mayor
Village of Donnellson	Honorable Hiram Renfro, Village President
Village of Keyesport	Honorable Kenneth Carver, Village President
Village of Mulberry Grove	Honorable Doug Enloe, Village President
Village of Old Ripley	Honorable James Carpenter, Village President
Village of Panama	Honorable Edgar Reed, Village President
Village of Pierron	Honorable Ron Hartnagle, Village President
Village of Pocahontas	Honorable David Clark, Village President
Village of Smithboro	Honorable Lora Kennedy, Village President
Village of Sorento	Honorable Edward Wallace, Village President

In addition, there are thirteen unincorporated communities in Bond County: Ayers, Beaver Creek, Bunje, Dudleyville, Durley, Gilmore, Hamburg, Hookdale, Pleasant Mound, Reno, Stubblefield, Tamalco, and Woburn.

2.1 Adoption by local governing body

The draft plan was made available on December 2, 2009 to the planning team and other agencies *including Fayette County LEPC, Montgomery County LEPC, Madison County Planning and Development, and East West Gateway Council of Governments* for review. Comments were then accepted. The Bond County Hazard Mitigation Planning team presented and recommended the plan to Bond County Board, and the Bond County Multi-Hazard Mitigation Plan was subsequently adopted on _____. Resolution adoptions are included in Appendix C of this plan.

2.2 Jurisdiction Participation

It is required that each jurisdiction participates in the planning process. Table 2-2 on the following page lists each jurisdiction and describes its participation in the construction of this plan.

Table 2-2: Jurisdiction Participation

Jurisdiction Name	Participating Member	Participation Description
Bond County	Jill Franks, County Board Chairman	Member, MHMP planning committee
Bond County, City of Greenville	Allan Davis, County 911 Board, ESDA Coordinator	Member, MHMP planning committee
Bond County, City of Greenville	Gerald McCrary	Member, MHMP planning committee
City of Greenville	Matt Willman	Member, MHMP planning committee
Village of Donnellson	Hiram Renfro	Member, MHMP planning committee
Village of Keyesport	Tom Hoffman, Keyesport FPD	Member, MHMP planning committee
Village of Keyesport	Duane Wiegmann, Keyesport FPD	Member, MHMP planning committee
Village of Mulberry Grove	Doug Enloe	Member, MHMP planning committee
Pocahontas & Old Ripley	Joe Rakers	Member, MHMP planning committee
Village of Panama	Michael G. Knebel	Member, MHMP planning committee
Village of Panama	Dolly M. Knebel	Member, MHMP planning committee
Village of Pierron	Steve Plocher, Pierron Fire Protection Dist.	Member, MHMP planning committee
Village of Pocahontas	James Moore	Member, MHMP planning committee
Village of Smithboro	Lora Kennedy	Member, MHMP planning committee
Village of Smithboro	Dale Deverick, Smithboro FPD	Member, MHMP planning committee
Village of Sorento	Edgar Wallace	Member, MHMP planning committee
Village of Sorento	Linda Hansen	Member, MHMP planning committee
Southwestern Illinois Region	Kevin Terveer, SIMAPC Exec. Dir.	Member, MHMP planning committee
Southwestern Illinois Region	Linda Tragesser, SIMAPC Community Planner	Member, MHMP planning committee

Section 3 - Jurisdiction Information

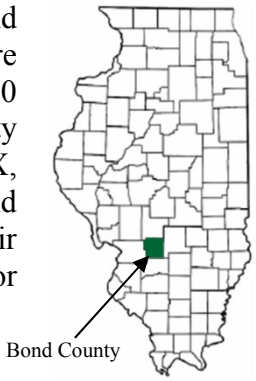
Historical Information

Settlers first arrived in what is now Bond County in approximately 1806. Between 1806 and 1808 a prairie fort, Hill's Fort, was established at a location about 5 miles west of the present City of Greenville, and provided settlers protection from Native American attacks. The fort consisted of a blockhouse and stockade enclosing two cabins. Bond County was formally organized in 1817 out of Madison County and was named in honor of Shadrack Bond, an Army Colonel in the War of 1812 who would later become the first Governor of Illinois. According to the Bond County Historical Society's website:

> "The original boundary of Bond County was a 26 mile wide strip that started just a few miles south of its current border and stretched all the way to Lake Superior in the present state of Wisconsin. Bond was one of 11 original counties when Illinois applied for statehood in 1818."

In 1821 Fayette and Montgomery Counties were formed out of Bond County, and Greenville, one of Illinois' oldest towns having been founded in 1815, became the County Seat. In 1824 Clinton County was formed partially from Bond County, and the State Legislature later gave Bond County a portion of Madison County to recompense for some of the earlier reductions in the Bond County's size. The County has historically consisted of a largely rural population and agriculture is the chief occupation with corn, wheat, and soybeans being the staple products and livestock being on raised on many of the farms. Small villages and towns sprang up to provide the services needed by the agrarian lifestyle. In 1836 the National Road reached all the way to Vandalia, and by 1868 an east-west railroad was completed with Mulberry Grove, Smithboro, Greenville, and Pocahontas being situated along this important transportation asset. Development within the County was encouraged by the enhancements in transportation.

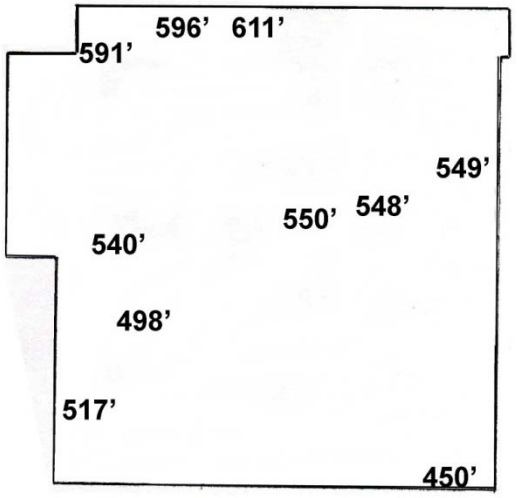
Today, location and transportation continue to be major assets for Bond County. The major metropolitan area of St. Louis, Missouri lies slightly more than forty miles to the southwest of the western county line. Over 22,000 vehicles per day travel along Interstate Highway 70 that traverses the County from east to west, and Interstates 64, 57, and 55 are all nearby. The CSX, Burlington Northern, and Illinois Western Railroads all service the County, and MidAmerica Airport and St. Louis Lambert International Airport provide air service to the region. Port facilities are available within 40 miles, and motor freight carriers in the area are abundant.



3.1 Topography

Bond County is located at coordinates 38°53'N, 89°26'W (38.88,-89.44) in the southwestern region of Illinois about 41 miles east of the St. Louis Metropolitan area. It has an area of approximately 383 square miles of which 380 square miles are land and roughly 3 square miles are covered by water. It is bordered on the north by Montgomery County; on the east by Fayette

County; on the west by Madison County and, and on the south by Clinton County. Elevations in Bond County range from about 430 feet above sea level in the southeast corner in the bottom lands known as "Dutch Flats" near Carlyle Lake and the Kaskaskia River. The upper elevations range from 500 feet on the uplands in the southern section of the county, and ultimately to 650 feet above sea level in the far northeastern part of the County.



Bond County Elevations at Municipal Sites

Municipality	Elevation
Donnellson	611 feet
Panama	596 feet
Sorento	591 feet
Greenville	550 feet
Mulberry Grove	549 feet
Smithboro	548 feet
Old Ripley	540 feet
Pierron	517 feet
Pocahontas	498 feet
Keyesport	450 feet

The area now known as Bond County was covered by sheets of ice during the Illinoian Glaciation. When the glaciers receded they deposited glacial drift debris and glacial till, and left the land basically flat with a pattern of elongated ridges. In addition, the meltwaters from the glaciation formed streams which cut valleys and deposited additional glacial and alluvial material. The county has a general slope from north to south which is attributable to the Kaskaskia River Watershed. For the most part the terrain is nearly level to gently rolling with steep slopes greater than 15% occurring in substantial areas adjacent to the major branches of Shoal Creek and near the Fayette County line.

Bond County is drained by Carlyle Lake, the Kaskaskia River, and Shoal, East Shoal, and Beaver Creeks, which are responsible for much of the alluvial deposits found in the valleys and the stream terraces. The branches of Shoal Creek dissect the central areas of the County forming a distinct "Y" shape. Carlyle Lake and Governor Bond are significant ground water reservoirs which provide flat water recreation and water supply.

Soils in Bond County have developed from glacial or alluvial deposits. Much of the soils formed in loess, the 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 flooding. The General Soils Associations in the county are Piasa-Cowden, Oconee-Darmstadt, Hickory-Marine-Hosmer, Wakeland-Lawson, Ava-Hickory-Parke, Hoyleton-Cisne-Huey, and Bluford-Hickory-Atlas. Its geological formation is similar to that of other counties in the same section. Thick layers of limestone lie near the surface, with coal

seams underlying the same at varying depths. The soil is varied, being at some points black and loamy and at others (under timber) decidedly clayey.

3.2 Climate

Bond County's climate is typical of Southwestern Illinois and is classified as humid continental. The variables of temperature, precipitation, and snowfall can vary greatly from one year to the next. Winter temperatures can fall below freezing starting as early as October and extending as late as April. Based on National Climatic Data Center (NCDC), normals from 1971 to 2000, in winter, on average the lowest normal winter temperature, occuring in January, is 18.8° F, and the average normal high, occurring in March, is 53.7° F. In summer, the average normal low, occurring in June, is 62.1° F and average normal high, occurring in July is 87.7° F. Average annual precipitation is 40.64 inches throughout the year.

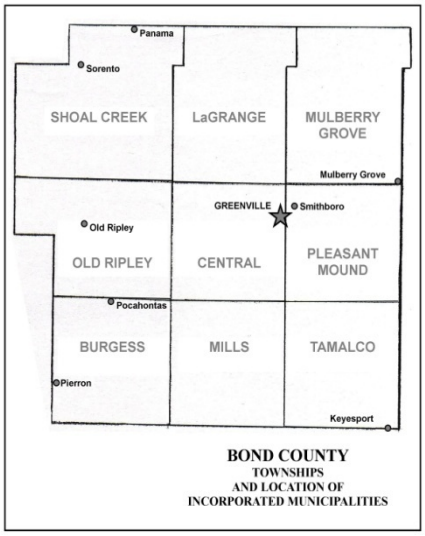
3.3 Demographics

The United States Census Bureau has estimated the 2007 population of Bond County at 18,103. At the 2000 Census the county had a population of 17,633 with a density of 46 persons per square mile and 18 housing units per square mile. Between the 1990 Census and the 2000 Census the County's population increased by 17.6%, which may be somewhat attributable to the population at the Federal Correctional Institution. The average household size is 2.60 persons compared to an average state family size of 3.10 persons. The County's largest municipality is Greenville, the county seat.

The County population is spread out through nine townships including:

Township	2007 Est. Population	2000 Population
Burgess	2,424	2,391
Central	8,014	7,941
Lagrange	984	942
Mills	595	554
Mulberry Grove	1,399	1,360
Old Ripley	834	796
Pleasant Mound	1,306	1,178
Shoal Creek	1,945	1,896
Tamalco	602	575

Source: US Department of Commerce, Bureau of the Census, American Factfinder



Southwestern Illinois Planning Commission

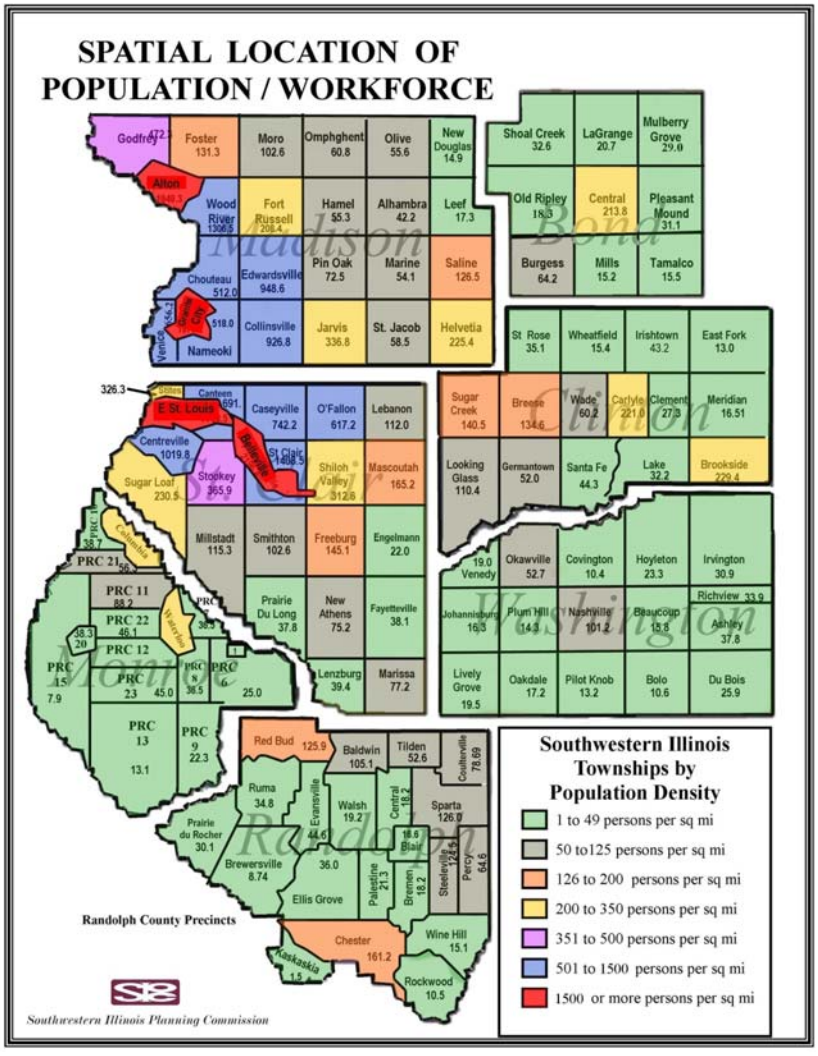
The 2000 Census also shows the County's population is also spread out by age with 21.9% being under the age of eighteen, and 14.7% were 65 or older. The median age was 37 years. There were 12,754 households, 6,690 housing units, and the housing density was 18 units per square miles. The breakdown of 2007 Estimated population by incorporated areas is included in Table 3-1.

Table 3-1: Population by Community

Community	2008 Population Estimate	% of County
Bond County	**18,253**	**100%**
Village of Donnellson	256	1.4%*
City of Greenville	7,396	40.5%
Village of Keyesport	466	2.6%*
Village of Mulberry Grove	658	3.6%
Village of Old Ripley	124	0.6%
Village of Panama	316	1.7%*
Village of Pierron	646	3.5%
Village of Pocahontas	717	3.9%
Village of Smithboro	232	1.3%
Village of Sorento	602	3.3%

Source: American FactFinder , ***2008 Population Estimates***

*The communities of Keyesport, Donnellson, and Panama lie in more than one county, and their Bond County portion of the population is not discernible from the American Fact Finder 2007 population estimate. Figures shown for those municipalities include persons living in adjoining counties.



3.4 Economy

Illinois MapStats reported a civilian work force of 8,816 for 2006, and that 6,077 (68.9%) of the workforce in Clinton County were employed in the private sector. The breakdown is included in Table 3-2. Educational and Health Services represents the largest sector, employing approximately 13.2% of the workforce.. The 2000 Census shows the annual per capita income (PCI) in Bond County is $17,947compared to an Illinois average of $23,104. Bond County's PCI is 83.1% of the U.S. National PCI of $21,587.

Table 3-2: Industrial Employment by Sector

Industrial Sector	% of County Workforce (2006 Base year)	
Agriculture, forestry, fishing, hunting, and mining	880	(9.98%)
Self-employed	390	(4.4%)
Construction	183	(2.1%)
Manufacturing	725	(8.2%)
Wholesale trade	376	(4.3%
Retail trade	484	(5.5%)
Transportation, warehousing and utilities	236	(2.7%)
Professional and Business Services	148	(1.7%)
Information	96	(1.1%)
Finance, insurance, real estate, and rental/leasing	133	(1.6%)
Administrative & Waste management services	89	(1.0%)
Educational, health, and social services	1,161	(13.2%)
Arts, entertainment, recreation, accommodation and food services	324	(3.7%)
Personal and other services(except public administration)	418	(3.1%)
Public administration (Government excluding Post Office, Educ., & Hospital)	612	(6.9%)
Total all industries: 6,077		

Source: http://lmi.ides.state.il.us/projections/countyfiles/lt/industry/Clinton.xls, accessed 12/15/08
http://fedstates.gov/qf/states/17/17005.html, accessed 4/22/09
http://censtats.census.gov/cgi-bin/cbpnaic/cpspsect.pl, accessed 4/22/09

3.5 Industry

Bond County's major employers and approximate number of employees are listed in Table 3-3. The largest employer is Carlisle-SynTec which is located in Greenville and has nearly 250 employees, but does have seasonal force reductions. They have a large manufacturing plant and a separate 294,000 square ft. warehouse completed in 2007 at a cost of $10,000,000. DeMoulin Brothers & Company is the second largest, with approximately 200 full-time employees.

New Carlisle-SynTec $10 million Warehouse in Greenville

Table 3-3: Major Employers

Company Name	Location	NAICS CODE	Employees	Type of Business
Manufacturing				
DeMoulin Bros. & Co.	Greenville	315	100-249	Uniforms – Manufacturers
Carlyle SynTec	Greenville	444	250	Building Materials
Nevco Scoreboard Manuf.	Greenville	339 & 423	50-99	Manufacturer
Peterson Spring	Greenville	332	20-49	Fabricated Metals Manufacturing
Coviden	Greenville	446	50-99	Health Care Products
Enertech	Greenville		50-99	Geo-Thermal Units
Refuse Systems				
Allied Waste Service	Greenville	562	50-99	Garbage Collection – Landfill
Information Technology				
Bass-Mollet Publishers Inc	Greenville	511	20-49	Publishing Industries
Construction and Specialty Trades				
Eagle Panel Systems	Mulberry Grove	423	20-49	Manufacturers Agents & Reps
Joiner Sheet Metal & Roofing	Greenville	238	20-49	Roofing Contractors

Table 3-3: Major Employers (Cont'd)

Company Name	Location	NAICS CODE	Employees	Type of Business
Agriculture				
Greenville Livestock , Inc	Greenville	424	20-49	Livestock Dealers (wholesale)
Wholesale and Retail				
United Stationers Supply Co.	Greenville	424	250+	Stationery – Wholesale
Capri IGA Foodliner	Greenville	445	50-99	Grocers – Retail
Buchheit Country SuperStore	Greenville	452	20-49	Department Store
Transportation Services				
Loves Travel Center	Greenville			Petroleum-retail
Donnewald Distributing	Greenville			Beverage Distributors
Education and Health, Government				
Greenville Regional Hospital	Greenville	622	250-499	Hospitals
Greenville College	Greenville	611	20-49	Schools
Federal Correction Institution	Greenville		311	Penitentiary

Source: Illinois Workforce Information Center, http://wic.ilworkinfo.com/analyzer/empseldata.asp, accessed 12/15/2008

3.6 Land Uses and Development Trends

Agriculture is the predominant land use in Bond County. Corn is the primary crop, followed by soybeans, winter wheat, hay, and oats. Other significant land uses are industrial and residential within the incorporated areas. A Federal Corrections Center is located in Greenville with a significant inmate population. The Land Use Plan maps for Bond County and the City of Greenville are included on the following pages.

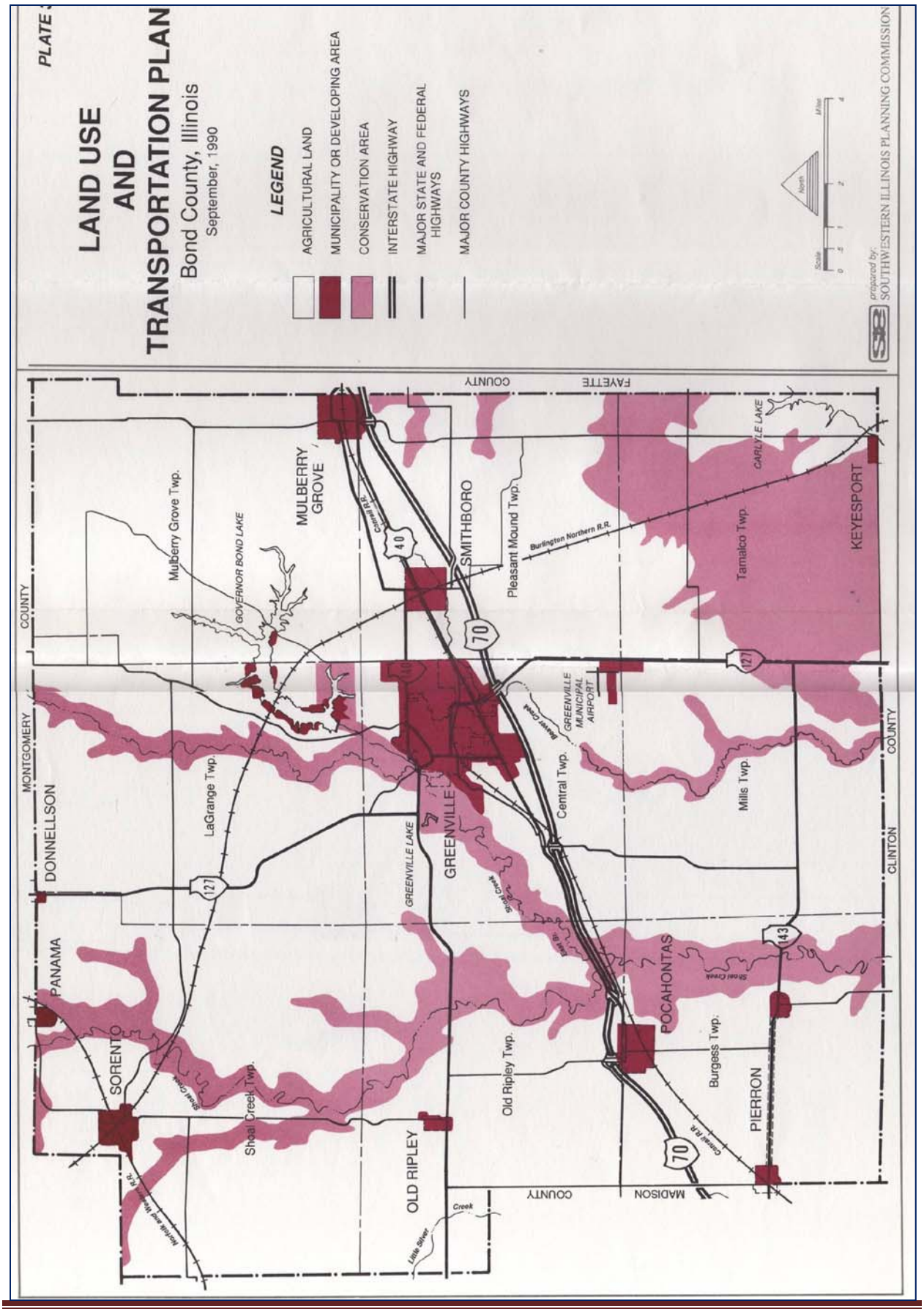
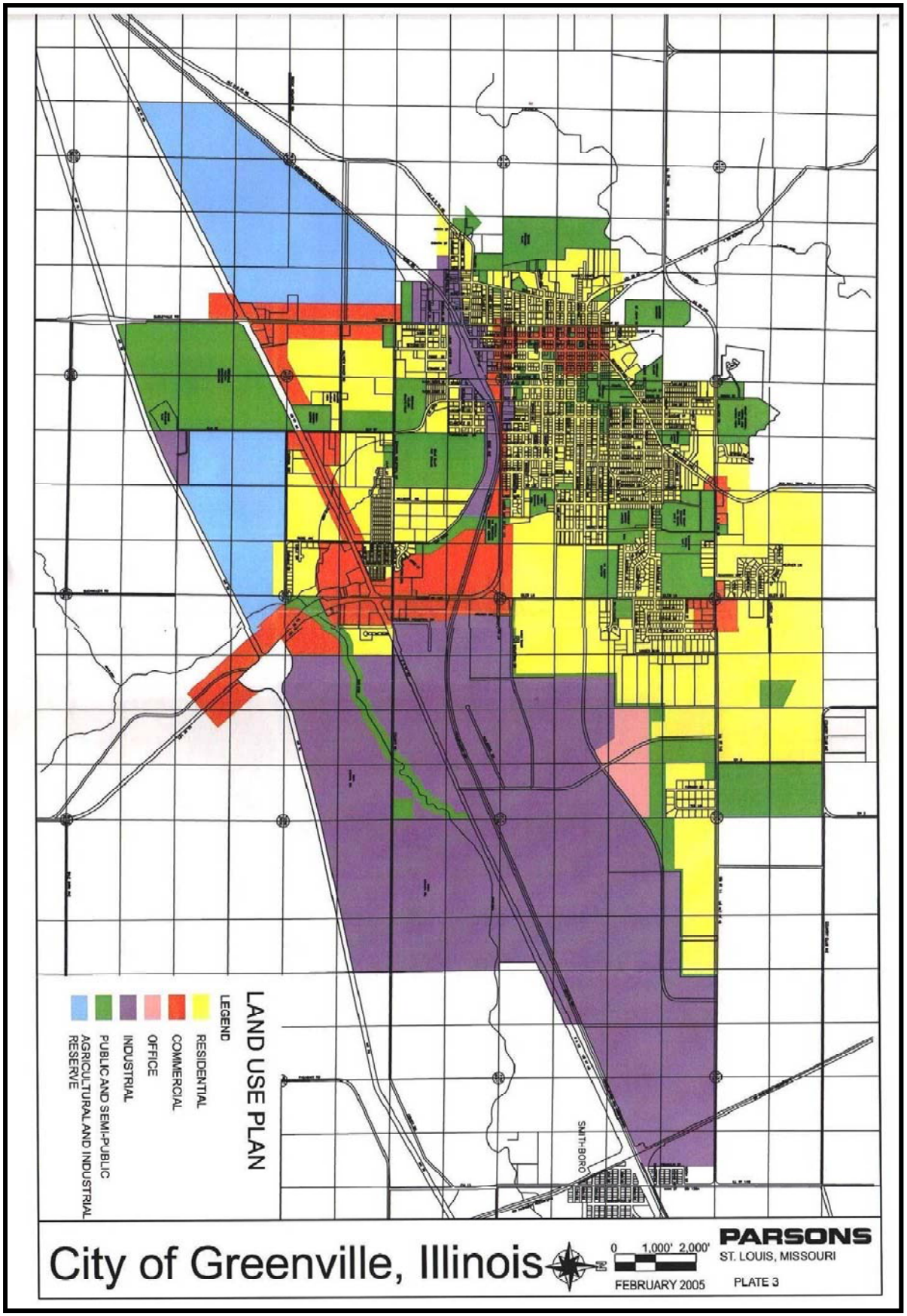
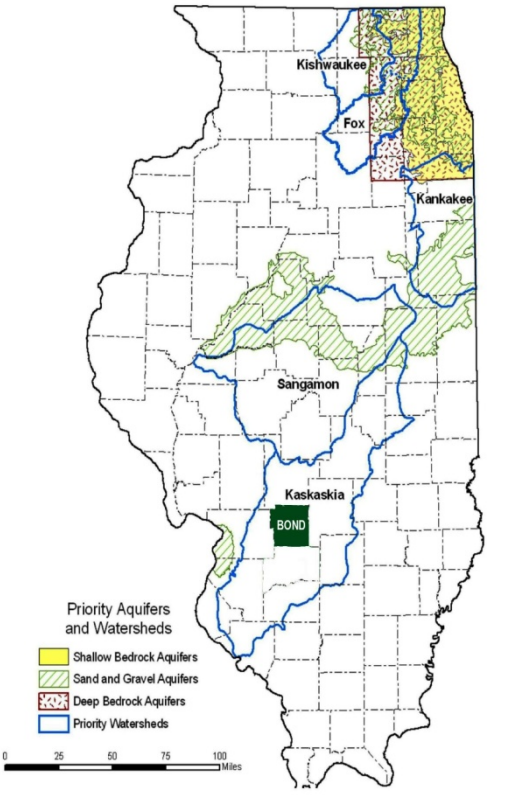


PLATE
LAND USE AND TRANSPORTATION PLAN
Bond County, Illinois
September, 1990
LEGEND
AGRICULTURAL LAND
MUNICIPALITY OR DEVELOPING AREA
CONSERVATION AREA
INTERSTATE HIGHWAY
MAJOR STATE AND FEDERAL HIGHWAYS
MAJOR COUNTY HIGHWAYS
prepared by:
SOUTHWESTERN ILLINOIS PLANNING COMMISSION
MONTGOMERY COUNTY
FAYETTE COUNTY
CLINTON COUNTY
MADISON COUNTY
DONNELLSON
PANAMA
SORENTO
MULBERRY GROVE
SMITHBORO
GREENVILLE
OLD RIPLEY
POCAHONTAS
PIERRON
KEYESPORT
Mulberry Grove Twp.
LaGrange Twp.
Shoal Creek Twp.
Old Ripley Twp.
Central Twp.
Pleasant Mound Twp.
Tamalco Twp.
Mills Twp.
Burgess Twp.
GOVERNOR BOND LAKE
GREENVILLE LAKE
CARLYLE LAKE
GREENVILLE MUNICIPAL AIRPORT
Burlington Northern R.R.
Central R.R.
Shoal Creek
Beaver Creek
Little Silver Creek
40
70
127
143

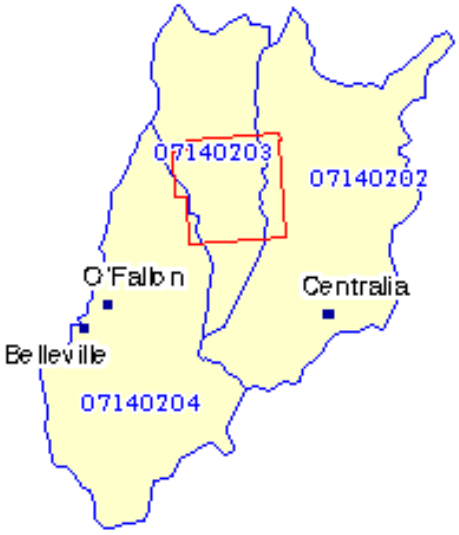

LAND USE PLAN
LEGEND
RESIDENTIAL
COMMERCIAL
OFFICE
INDUSTRIAL
PUBLIC AND SEMI-PUBLIC
AGRICULTURAL AND INDUSTRIAL RESERVE
SMITHBORO
City of Greenville, Illinois
0 1,000' 2,000'
FEBRUARY 2005
PARSONS
ST. LOUIS, MISSOURI
PLATE 3

3.7 Major Lakes, Rivers and Watersheds

Bond County lies within of one of Illinois' Priority Watersheds. The Kaskaskia River is the most managed river in Illinois for water supply use according to the Illinois State Water Survey of the Department of Natural Resources in its "Prioritizing Illinois Aquifers and Watersheds for Water Supply Planning", July, 2006. The U.S. Corps of Engineers' Carlyle Lake Dam on the Kaskaskia at the City of Carlyle in neighboring Clinton County, 107 miles above its confluence with the Mississippi, creates a 26,000-acre reservoir 15 miles long by 3.5 miles wide – the largest man-made lake in Illinois.



Source: Illinois State Water Survey2006



Source: US EPA, http://cfpub.epa.gov/surf/county.cfm?fips=17005, accessed 5/1/09

Table 3-4: Watersheds

Watershed Name	Hydrologic Unit Code
Middle Kaskaskia, Illinois	07140202
Shoal, Illinois	07140203
Lower Kaskaskia, Illinois	01740204

Source: U.S. Geological Survey HUC14 Watersheds,

Watersheds in Southwestern Illinois

Watersheds	Rivers, Streams, Creeks (Miles)	Lakes, Ponds, Reservoir (Acres)	Bays, Estuaries (Square Miles)	Coastal Shorelines (Miles)	Wetlands (Acres)	Inland Lake Shoreline (Miles)	Great Lakes Connecting Channel (Miles)
UPPER KASKASKIA	364.59	11,219.50	0	0	0	0	0
MIDDLE KASKASKIA	445.60	26,925.80	0	0	0	0	0
SHOAL	216.16	4,529.40	0	0	0	0	0
CAHOKIA-JOACHIM	268.48	3,085.10	0	0	0	0	0
LOWER KASKASKIA	482.60	613.60	0	0	0	0	0

Source: US Environmental Protection Agency, *National Assessment Database 2006*.
http://iaspub.epa.gov/waters10/w305b_report_control.get_report?p_state=IL&p_cycle=#assessed_waters, accessed 4/29/2009

Section 4 - Risk Assessment

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

4.1 Hazard Identification/Profile

4.1.1 Existing Plans

The previous Bond County Comprehensive Emergency Management Plan (CEMP) did not contain a risk analysis. Additional local planning documents were reviewed to identify historical hazards and help identify risk. To facilitate the planning process, FIRM maps were used for the flood analysis.

4.1.2 Planning Team

During Meeting #2, which occurred on May 5, 2009, the planning team developed and ranked a list of hazards that affect the county. The team identified 1) severe thunderstorms with tornadoes, 2) winter storms, 3) earthquakes, and 4) flooding which occurs on an annual basis during the spring. The plan also identified Bond County's principal technological hazards (in order of likelihood): 1) land transportation accidents with hazardous material release, 2) mine subsidence, and 3) dam failure.

4.1.3 National Hazard Records

In addition to these identified hazards, the MHMP planning committee reviewed the list of natural hazards prepared by FEMA. To assist the planning team, historical storm event data was compiled from the National Climatic Data Center (NCDC; http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll). This NCDC data included 192 reported events in Bond County between December 2, 1950 and April 2, 2008. A summary table of events related to each hazard type is included in the hazard profile sections that follow. List of the events, including additional sources that identify specific occurrences, are included as Appendix D. In addition to NCDC data, Storm Prediction Center (SPC) data associated with tornadoes, strong winds, and hail were plotted using SPC recorded latitude and longitude. These events are plotted and included as Appendix E. The list of NCDC hazards is included in Table 4-1.

Table 4-1: Climatic Data Center Historical Hazards

Hazard
Tornadoes
Severe Thunderstorms
Drought/Extreme Heat
Winter Storms
Flood/Flash flood

4.1.4 Hazard Ranking Methodology

Based on planning team input, national datasets, and existing plans, Table 4-2 lists the hazards Bond County will address in this multi-hazard mitigation plan. In addition, these hazards ranked the highest based on the Risk Priority Index discussed in section 4.1.5.

Table 4-2: Planning Team Hazard List

Hazard
Winter Storms
Tornados
Hazardous Material Release
Severe Thunderstorms
Earthquakes
Flooding
Mine Subsidence
Dam Failure

4.1.5 Calculating the Risk Priority Index

The first step in determining the Risk Priority Index (RPI) was to have the planning team members generate a list of hazards which have befallen or could potentially befall their community. Next, the planning team members were asked to assign a likelihood rating based on the criteria and methods described in the following table. Table 4-3 displays the probability of the future occurrence ranking. This ranking was based upon previous history and the definition of hazard. Using the definitions given, the likelihood of future events is "Quantified" which results in the classification within one of the four "Ranges" of likelihood.

Table 4-3: Future Occurrence Ranking

Probability	Characteristics
4 - *Highly Likely*	Event is probable within the calendar year. Event has up to 1 in 1 year chance of occurring. (1/1=100%) History of events is greater than 33% likely per year.
3 - *Likely*	Event is probable within the next three years. Event has up to 1 in 3 years chance of occurring. (1/3=33%) History of events is greater than 20% but less than or equal to 33% likely per year.
2 - *Possible*	Event is probable within the next five years. Event has up to 1 in 5 years chance of occurring. (1/5=20%) History of events is greater than 10% but less than or equal to 20% likely per year.
1 - *Unlikely*	Event is possible within the next ten years. Event has up to 1 in 10 years chance of occurring. (1/10=10%) History of events is less than or equal to 10% likely per year.

Next, planning team members were asked to consider the potential magnitude/severity of the hazard according to the severity associated with past events of the hazard. Table 4-4 gives four classifications of magnitude/severity.

Table 4-4: Hazard Magnitude

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.

Finally, the RPI was calculated by multiplying the probability by the magnitude/severity of the hazard. Using these values, the planning team member where then asked to rank the hazards. Table 4-5 identifies the RPI and ranking for each hazard facing Bond County.

Table 4-5: Bond County Hazards (RPI)

Hazard	Probability	Magnitude/Severity	Risk Priority Index	Rank
Winter Storms	3 - Likely	4 -Critical	12	1
Tornado	3 - Likely	4 - Critical	12	2
Hazardous Material Release	3 - Likely	4 - Critical	12	3
Severe Thunderstorms	4- Highly Likely	2 - Limited	8	4
Earthquakes	2 - Possible	4 - Critical	8	5
Flooding	2 - Possible	1 - Negligible	2	6
Mine Subsidence	1 -Unlikely	1 - Negligible	1	7
Dam Failure	1 -Unlikely	1 - Negligible	1	8

4.1.6 Jurisdictional Hazard Ranking

Because the jurisdictions in Bond County differ in their susceptibilities to certain hazards—for example, the City of Greenville located along Interstate 70 and a major rail line is more likely to experience a significant Hazardous Material Release related to a transportation accident than the village of Sorento which is located a substantial distance away from any major transportation route—the hazards identified by the planning team were ranked by SIUC using the methodology outlined in Section 4.1.5. The SIUC rankings were based on input from the other planning team members, available historical data, and the hazard modeling results described within this hazard mitigation plan. During the five-year review of the plan, this table will be updated by representatives from the planning team 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).

Table 4-6: Hazard Rankings by Jurisdiction

Jurisdiction	Hazard							
	Tornado	HAZMAT	Earthquake	Thunderstorms	Flooding	Winter Storms	Subsidence	Dam Failure
Greenville	2	3	5	4	6	1	NA	7
Donnellson	2	3	5	4	6	1	NA	NA
Keyesport	2	3	5	4	6	1	NA	NA
Mulberry Grove	2	3	5	4	6	1	NA	NA
Old Ripley	2	3	5	4	6	1	NA	NA
Panama	2	3	5	4	6	1	7	NA
Pierron	2	3	5	4	6	1	NA	NA
Pocahontas	2	3	5	4	6	1	7	NA
Smithboro	2	3	5	4	6	1	NA	NA
Sorento	2	3	5	4	6	1	7	NA

NA = Not applicable

4.1.7 GIS and HAZUS-MH

The third step in this assessment is the risk analysis, which quantifies the risk to the population, infrastructure, and economy of the community. Where possible, the hazards were quantified using GIS analyses and HAZUS-MH. This process reflects a level two approach to analyzing hazards as defined for HAZUS-MH. The approach includes substitution of selected default data with local data. Level two analysis significantly improves the accuracy of the model predictions.

HAZUS-MH generates a combination of site-specific and aggregated loss estimates depending upon the analysis options that are selected and upon the input that is provided by the user. Aggregate inventory loss estimates, which include building stock analysis, are based upon the assumption that building stock is evenly distributed across census blocks/tracts. Therefore, it is possible that overestimates of damage will occur in some areas while underestimates will occur in other areas. With this in mind, total losses tend to be more reliable over larger geographic areas than for individual census blocks/tracts. It is important to note that HAZUS-MH is not intended to be a substitute for detailed engineering studies. Rather, it is intended to serve as a planning aid for communities interested in assessing their risk to flood-, earthquake-, and hurricane-related hazards. This documentation does not provide full details on the processes and procedures completed in the development of this project. It is only intended to highlight the major steps that were followed during the project.

Site-specific analysis is based upon loss estimations for individual structures. For flooding, analysis of site-specific structures takes into account the depth of water in relation to the structure. HAZUS-MH also takes into account the actual dollar exposure to the structure for the costs of building reconstruction, content, and inventory. However, damages are based upon the assumption that each structure falls into a structural class, and that structures in each class will respond in similar fashion to a specific depth of flooding. Site-specific analysis is also based upon a point location rather than a polygon; therefore the model does not account for the percentage of a building that is inundated. These assumptions suggest that the loss estimates for site-specific structures as well as for aggregate structural losses need to be viewed as approximations of losses that are subject to considerable variability rather than as exact engineering estimates of losses to individual structures.

The following events were analyzed. The parameters for these scenarios were created using GIS, HAZUS-MH, and historical information to predict which communities would be at risk.

Using HAZUS-MH

1. 100-year overbank flooding
2. Earthquake

Using GIS

1. Tornado
2. Hazardous Material Release

4.2 Vulnerability Assessment

4.2.1 Asset Inventory

4.2.1.1 Processes and Sources for Identifying Assets

The HAZUS-MH data is based on best available national data sources. The initial step involved updating the default HAZUS-MH data using State of Illinois data sources. At Meeting #1, the planning team members were provided with a plot and report of all HAZUS-MH critical facilities. The planning team took GIS data provided by SIU-Polis, verified the datasets using local knowledge, and allowed SIU-Polis to use their local GIS data for additional verification. SIU-Polis GIS analysts made these updates and corrections to the HAZUS-MH data tables prior to performing the risk assessment. These changes to the HAZUS-MH inventory allow a level two analysis. This update process improved the accuracy of the model predictions.

The default HAZUS-MH data has been updated as follows:

- The HAZUS-MH defaults, critical facilities, and essential facilities have been updated based on most recent available data sources. Critical and essential point facilities have been reviewed, revised, and approved by local subject matter experts at each county.
- The essential facility updates (schools, medical care facilities, fire stations, police stations, and EOCs) have been applied to the HAZUS-MH model data. HAZUS-MH reports of essential facility losses reflect updated data.
- The analysis is restricted to the county boundaries. Events that occur near the county boundary do not contain damage assessments from the adjacent county.

4.2.1.2 Essential Facilities List

Table 4-7 identifies the critical facilities that were added or updated for the analysis. A complete list of the critical facilities is included as Appendix F. A map of all the critical facilities is included as Appendix G.

Table 4-7: Critical Facilities List

Facility	Number of Facilities
Care Facilities	4
Emergency Operation Centers	1
Fire Stations	8
Police Stations	3
Schools	9

4.2.1.3 Facility Replacement Costs

Default HAZUS-MH building stock data were used for the HAZUS-MH analyses. Facility replacement costs and total building exposure are identified in Table 4-8. Table 4-8 also includes the estimated numbers of buildings within each occupancy class.

Table 4-8: Building Exposure (default HAZUS-MH) for Bond County

General Occupancy	Estimated Total Buildings	Total Building Exposure (X 1000)
Agricultural	125	$18,418
Commercial	346	$138,841
Education	9	$13,926
Government	19	$7,619
Industrial	81	$35,444
Religious/Non-Profit	31	$23,618
Residential	9,073	$828,263
Total	**9,684**	**$1,066,129**

4.3 Future Development

Bond County is subject to a variety of natural disasters. County government, in partnership with State government, must make a commitment to prepare for those types of disasters. Likewise, the Bond County manufacturing base leaves the county vulnerable to major hazardous materials events and other technological threats. However, as the county-elected and appointed officials become better informed on the subject of community hazards, they will be better able to set and direct policies that will enable emergency management and county response agencies to effectively plan, train, and exercise. The end result will be a stronger community and a better place in which to work, live, and grow.

4.4 Hazard Profiles

4.4.1 Tornado Hazard

Hazard Definition for Tornado Hazard

Tornadoes pose a great risk to the State of Illinois and its citizens. Tornadoes historically have occurred during any month of the year. The unpredictability of tornadoes makes them one of Illinois' most dangerous hazards. Their extreme winds are violently destructive when they touch down in the region's developed and populated areas. Current estimates place the maximum velocity at about 300 mph, but higher and lower values can occur. A wind velocity of 200 mph will result in a wind pressure of 102.4 pounds per square foot of surface area, a load that exceeds the tolerance limits of most buildings. Considering these factors, it is easy to understand why tornadoes can be so devastating for the communities they hit.

Tornadoes are defined as 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 very quickly and become a tornado. If the funnel cloud picks up and blows around debris, it has reached the ground and is a tornado.

Tornadoes are classified according to the Fujita tornado intensity scale. The tornado scale ranges from low intensity F0, with effective wind speeds of 40 to 70 mph, to F5 tornadoes with effective wind speeds of over 260 mph. The Fujita intensity scale is included in Table 4-9.

Table 4-9: Fujita Tornado Rating

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, sign boards 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.
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 for Tornado Hazard

There have been several occurrences of tornadoes within Bond County during recent decades. The NCDC database reported 16 tornadoes/funnel clouds in Bond County since 1950. These tornados have been attributed with two deaths, thirty injuries and $5.5 million dollars in property damage within Bond and adjacent counties. As of April 2008, the most recent tornado touchdown occurred on May 24, 2006. Two tornados formed over Bond County. The first tornado touched down 5 miles north of Greenville, southwest of the intersection of Red Ball Trail and Hastings Cemetery Avenue just north of Peach Avenue. It blew down several large trees. Three of the trees fell onto a home causing extensive damage. As it traveled to the east it destroyed a machine shed before lifting and dissipating. The second tornado touched down 1.4 miles northwest of Woburn along Hastings Cemetery Avenue. The tornado caused minor roof damage to one home. Otherwise, most of the damage was to trees before it lifted and dissipated. No injuries were reported in either tornado. Bond County tornadoes recorded in the NCDC database are identified in Table 4-10. Additional details for NCDC events are included in Appendix D.

Table 4-10: Bond County Tornadoes*

Location	Date	Type	Magnitude	Deaths	Injuries	Property Damage
Bond	12/2/1950	Tornado	F3	2	25	2.5M
Bond	11/9/1984	Tornado	F2	0	0	2.5M
Bond	5/12/1990	Tornado	F1	0	0	250K
Pocahontas	6/12/1998	Tornado	F1	0	0	0
Sorento	6/14/1998	Tornado	F1	0	4	0
Greenville	5/12/2000	Tornado	F2	0	0	0
Old Ripley	5/12/2000	Tornado	F1	0	0	200K
Greenville	5/1/2002	Tornado	F1	0	0	0
Greenville	5/1/2002	Tornado	F1	0	0	0
Greenville	5/1/2002	Tornado	F1	0	1	0
Greenville	5/1/2002	Tornado	F1	0	0	0
Greenville	5/1/2002	Tornado	F1	0	0	0
Greenville	5/1/2002	Tornado	F0	0	0	0
Greenville	5/24/2006	Tornado	F0	0	0	0
Greenville	5/24/2006	Tornado	F0	0	0	0
Woburn	5/24/2006	Tornado	F0	0	0	0

Source: NCDC

* 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 for occurrence of tornadoes. They can occur at any location within the county.

Hazard Extent for Tornado Hazard

The historical tornadoes listed previously generally move from west to east across the county—although many other tracks are possible—from more southerly to northerly. The extent of the hazard varies both in terms of the extent of the path and the wind speed.

Calculated Risk Priority Index for Tornado Hazard

Based on historical information, the probability of future tornadoes in Bond County is likely. Tornadoes with varying magnitudes are expected to happen. According to the Bond County planning team's assessment the risk priority index (RPI) assessment, tornadoes ranked as the number two hazard.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
3	x	4	=	**12**

Vulnerability Analysis for Tornado Hazard

Tornadoes can occur within any area of the county; therefore, the entire county population and all buildings are vulnerable to tornadoes. To accommodate this risk, this plan will consider all buildings located within the county as vulnerable. The existing buildings and infrastructure in Bond County are discussed in types and numbers in Table 4-9.

Critical Facilities

All critical facilities are vulnerable to tornadoes. A critical facility will encounter many of the same impacts as any other building within the jurisdiction. These impacts will vary based on the magnitude of the tornado, but can include structural failure, debris (trees or limbs) causing damage, 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 numbers of all of the essential facilities in the area. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Building Inventory

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

Infrastructure

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

An example scenario is described as follows to illustrate the anticipated impacts of tornadoes in the county in terms of numbers and types of buildings and infrastructure.

Bond County Tornado Analysis

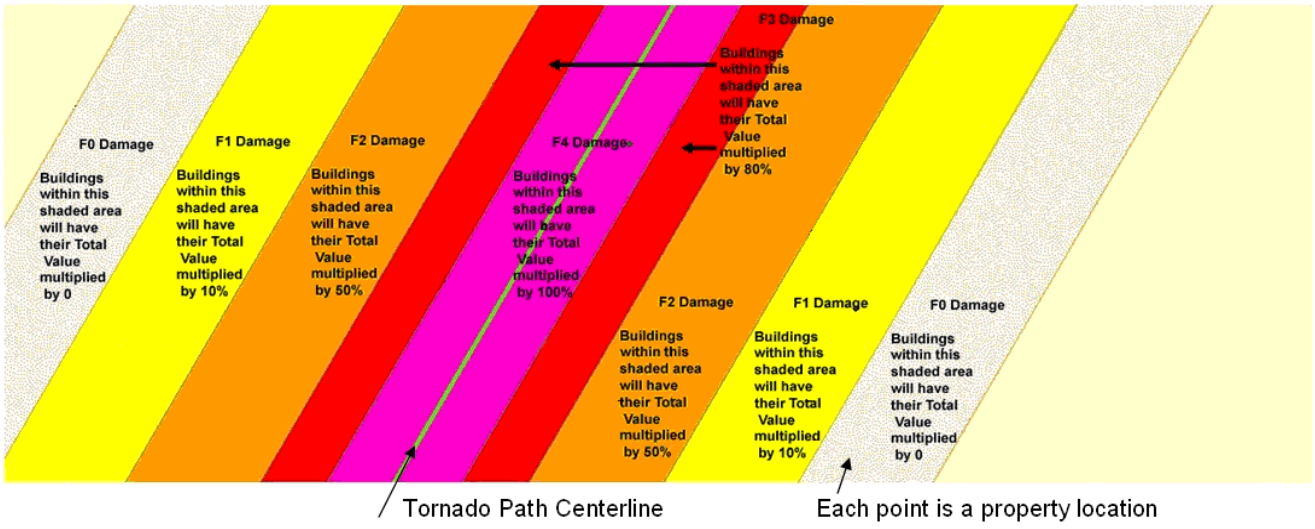
GIS overlay modeling was used to determine the potential impacts of an F4 tornado. The analysis used a hypothetical path for an F4 tornado event that ran approximate 20 miles southwest to northeast across the county paralleling Interstate 70 and US 40. The selected widths were based on a recreation of the Fujita-Scale guidelines based on conceptual wind speeds, path widths, and path lengths. There is no guarantee that every tornado will fit exactly into one of these six categories. The Fujita Scale guidelines are described in Table 4-11.

Table 4-11: Tornado Path Widths and Damage Curves

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

Within any given tornado path there are degrees of damage. The most intense damage occurs within the center of the damage path with a decreasing amount of damage away from the center of the damage path. This natural process was modeled in GIS by adding damage zones around the tornado path. Figures 4-1 and Table 4-12 describe the zone analysis.

Figure 4-1: GIS Analysis Using Tornado Buffers



Once the hypothetical route is digitized on the map, several buffers are created to model the damage functions within each zone.

An F4 tornado has four damage zones. Total devastation is estimated within 150 feet of the tornado path (the darker colored zone 1). The outer buffer is 900 feet from the tornado path (the lightest colored zone 4), within which 10% of the buildings will be damaged.

Table 4-12: Tornado Zones and Damage Curves

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

The selected hypothetical tornado path is depicted in Figure 4-2, and the damage curve buffers with damaged buildings are shown in Figure 4-3.

Figure 4-2: Hypothetical F-4 Tornado Path in Bond County

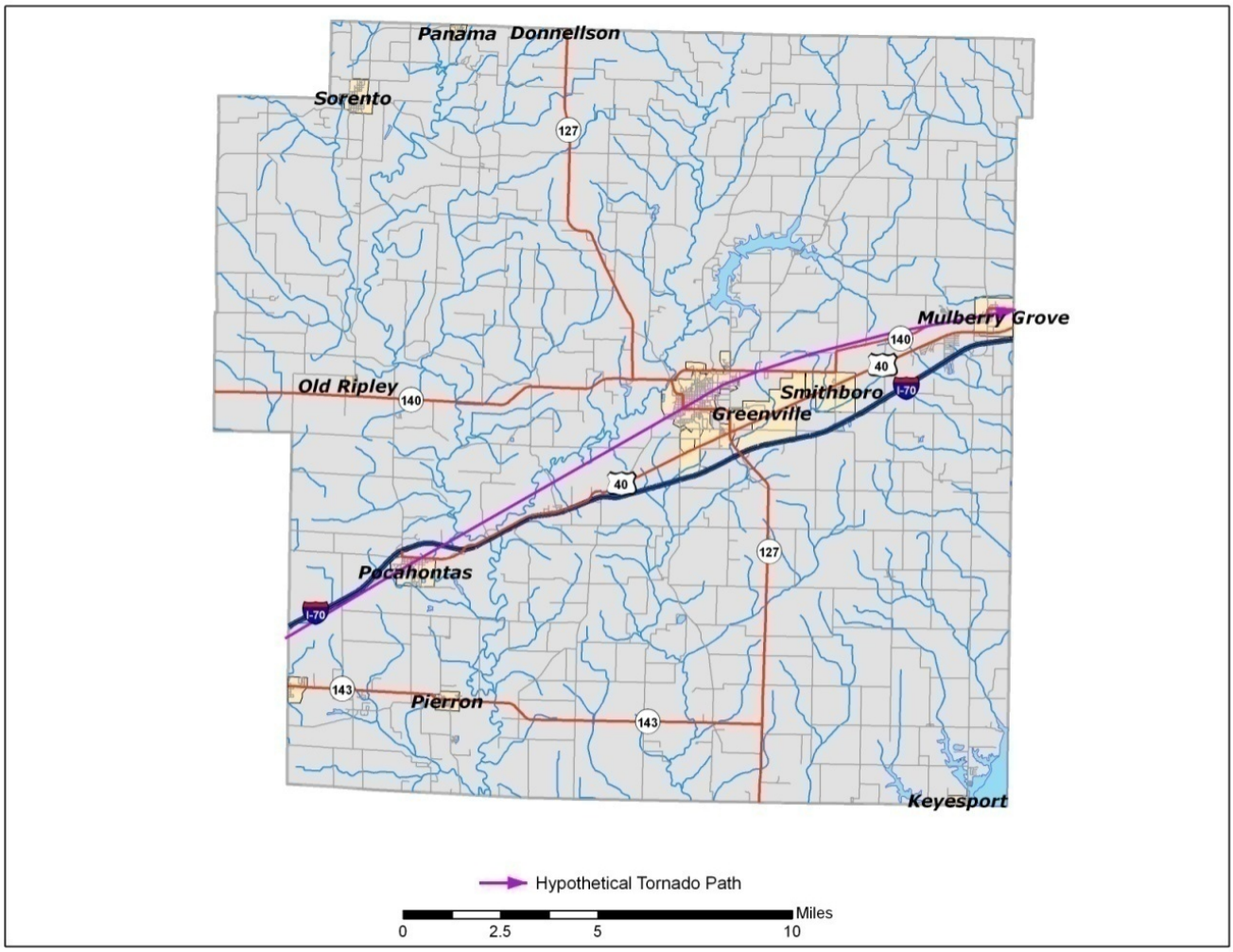
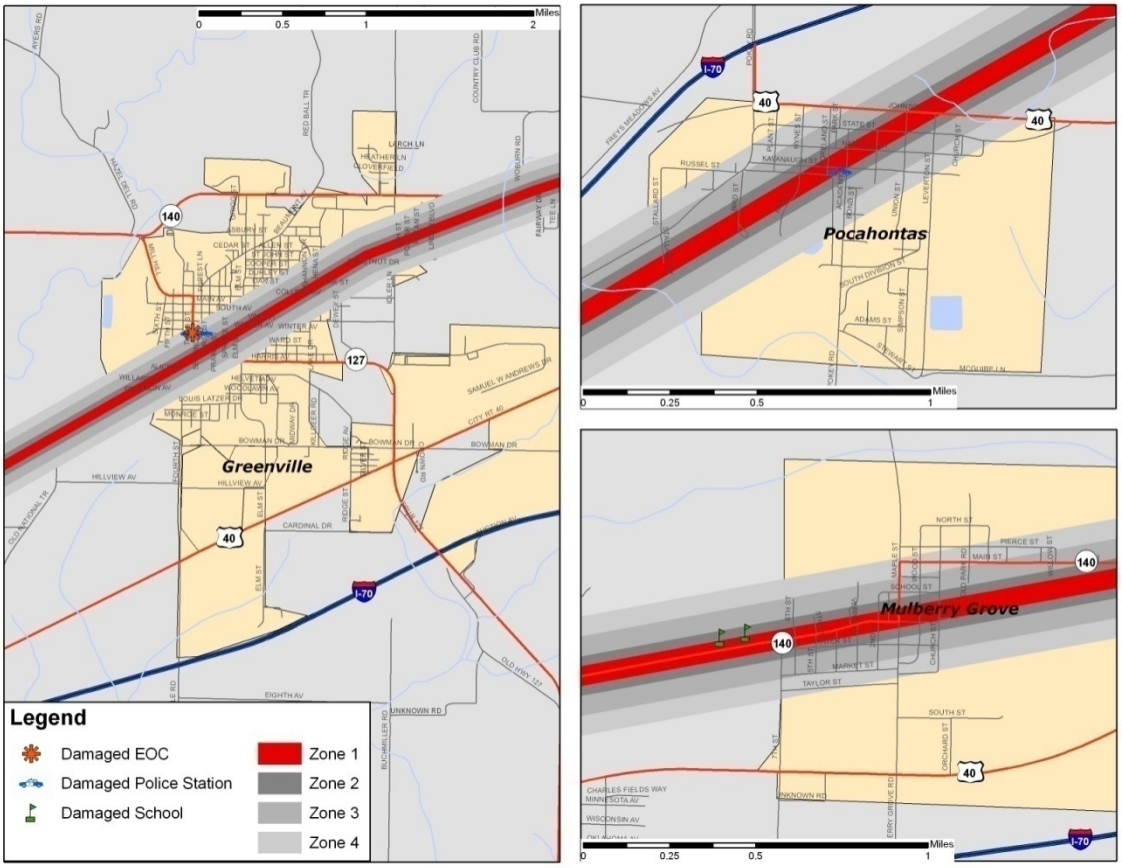


Figure 4-3: Modeled F-4 Tornado Damage Buffers in Greenville, Mulberry Grove, and Pocahontas



The results of the analysis are depicted in Table 4-13. The estimated building losses were $135.1 million. The building losses are an estimate of building replacement costs multiplied by the percentages of damage. HAZUS-MH default data was used to determine the estimated loss amounts.

Table 4-13: Estimated Building Losses x $1,000 by Occupancy Type

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$ 35,458	$ 26,771	$ 30,033	$ 4,313
Commercial	$ 3,056	$2,416	$ 3,871	$ 1,230
Industrial	$ 1,844	$ 1,827	$ 1,177	$ 391
Agriculture	$ 71	$ 85	$ 135	$ 28
Exempt	$ 3,853	$ 2,183	$ 4,383	$ 769
Total	**$ 48,135**	**$ 35,466**	**$ 43,980**	**$7,500**

Essential Facilities Damage

There are five essential facilities located within 900 feet of the hypothetical tornado path. The model predicts the county emergency operations center, two police stations, and two schools would experience damage. The affected facilities are identified in Table 4-14, and their geographic locations are shown in Figure 4-3.

Table 4-14: Estimated Essential Facilities Affected

Name
Greenville Civil Defense Center
Bond County Sheriff
Greenville Police Department
Mulberry Grove Elementary School
Mulberry Grove Jr. and Sr. High School

Vulnerability to Future Assets/Infrastructure for Tornado Hazard

The entire population and buildings have been identified as at risk because tornadoes can occur anywhere within the State of Illinois, at any time of the day, and during any month of the year. Furthermore, any future development in terms of new construction within the county will be at risk. The building exposure for Bond County is included in Table 4-8.

All critical facilities in the county and its communities are at risk. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Analysis of Community Development Trends

Preparing for severe storms will be enhanced if officials sponsor a wide range of programs and initiatives to address the overall safety of county residents. New structures should be built with sturdier construction, and existing structures should be hardened to lessen the potential impacts of severe weather. Community sirens to warn of approaching storms are also vital to ensuring the safety of Bond County residents.

4.4.2 Flood 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 amount and distribution of precipitation over a given area, the rate at which precipitation infiltrates into the ground, the geometry and hydrology of the catchment, and flow dynamics and conditions in and along the river channel. Floods can be classified as one of two types: 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; another eighteen inches might carry off a car. Generally, upstream floods cause damage over relatively localized areas, but they can be quite severe in the local areas where they occur. Urban flooding is a type of upstream flood. Urban flooding involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Upstream or flash floods can occur at anytime 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.

Hazard Definition for Dam and Levee Failure

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

Many communities view both dams and levees as permanent and infinitely safe structures. This sense of security may well be false, leading to significantly increased risks. Both downstream of dams and on floodplains protected by levees, security leads to new construction, added infrastructure, and increased population over time. Levees in particular are built to hold back

flood waters only up to some maximum level, often the 100-year (1% annual probability) flood event. When that maximum is exceeded by more than the design safety margin, 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 for Riverine and Flash Flooding

The NCDC database reported six flood events in Bond County since 1995. These flood events have been attributed with $6,000 in property damage. A recent example of flooding in Bond County occurred in May of 2004 when two consecutive days of 2 to 3 inches of rain caused flooding across much of the County. Flooding was reported on roads in and around Livingston, along routes 16 and 127 near Litchfield and Hillsboro, and on roads near Vandalia, Greenville, and Gillespie.

Significant Bond County floods recorded by the NCDC are shown in Table 4-15. A complete list of flood events and additional information about the significant flood events are included in Appendix D. Historical flood crests and discharges at hydrologic monitoring stations are summarized in Appendix H.

Table 4-15: Bond County Previous Occurrences of Flooding*

Location	Date	Type	Deaths	Injuries	Property Damage
Greenville	11/14/1993	Flooding	0	0	5K
Bond	5/17/1995	Flooding	0	0	1K
Greenville	7/6/1999	Flooding	0	0	0
Bond	5/12/2002	Flooding	0	0	0
Bond	6/10/2002	Flooding	0	0	0
Bond	5/27/2004	Flooding	0	0	0
Greenville	5/24/2006	Flooding	0	0	0

Source: NCDC

* 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.

Previous Occurrences for Dam and Levee Dam Failure

There are no records or local knowledge of any dam or any other certified levee failure in the county.

Repetitive Loss Properties

FEMA defines a repetitive loss structure as a structure covered by a contract of flood insurance issued under the National Flood Insurance Program (NFIP), which has suffered flood loss damage on two 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.

Illinois Emergency Management was contacted to determine the location of repetitive loss structures in Clinton County. Records show that there are no repetitive loss structures within the county.

Geographic Location for Flooding

Most riverine floods in Illinois occur during either the spring or summer and are the result of excessive rainfall and/or the combination of rainfall and snowmelt. Flash flooding in Illinois can occur during anytime 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 Bond County are Shoal Creek, the East Fork of Shoal Creek, Beaver Creek and Owl Creek. Shoal Creek can inundate portions of Panama and a significant portion of the unincorporated County. Portions of the city of Greenville can be inundated by Beaver Creek and the East Fork of Shoal Creek. Owl creek can inundate portions of Mulberry Grove. Major transportation routes which can be impacted by these creeks include US 40 and State Routes 127, 140, and 143.

Flash flooding in Bond County typically occurs or is best documented in urban/developed areas. For example on June 10, 2002 three inches of rain fell in about one hour causing flash flooding in the city of Greenville. Numerous roads in Greenville were impassable.

A digitized FIRM was used to identify specific stream reaches for analysis. The areas of riverine flooding are depicted on the map in Appendix E.

Geographic Location for Dam and Levee Failure

The National Inventory of Dams identified ten dams in Bond County. The map in Appendix G illustrates the location of Bond County dams. Table 4-16 summarizes the National Inventory of Dams information.

Table 4-16: National Inventory of Dams

Name	River	Hazard	EAP
Sorento Reservoir Dam	Tributary to Shoal Creek	S	N
Greenville New City Dam	Kingsbury Branch Shoal Creek	S	N
Bond Christian Camp Lake Dam	Tributary to Hurricane Creek	S	N
Greenville Road and Gun Club Lake Dam	Tributary to Eat Branch of Shoal Creek	L	N
Greenville Old City Lake	East Fork Shoal Creek	L	N
Stone Pond Dam	Tributary to Hurricane Creek	L	N
Armstrong Pond Dam	Tributary to Avery Branch	L	N
Rinderer Pond Dam #1	W. Tributary to Little Shoal Creek	L	N
Potthast Pond Dam #1	West Tributary to Shoal Creek	L	N
Brown Pond Dam #1	West Tributary to Shoal Creek	L	N
Coleman-Panama Pond	Tributary to Bear Creek	L	N

Hazard Extent for Flooding

The HAZUS-MH flood model is designed to use a flood depth grid and flood boundary polygon from the digitize FIRM. HAZUS-MH was used to model the Base Flood Elevation (BFE). The BFE is defined as the area that has a 1% chance of flooding in any given year. Planning team input and a review of historical information provided additional information on specific flood events.

Hazard Extent for Dam and Levee Failure

Dams assigned the low (L) hazard potential classification are those where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property. Dams assigned the significant (S) hazard classification are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Dams classified as significant hazard potential dams are often located in predominantly rural or agricultural areas, but could be located in populated areas with a significant amount of infrastructure. Dams assigned the high (H) hazard potential classification are those dams where failure or mis-operation has the highest risk to cause loss of human life and significant damage to buildings and infrastructure.

According to the IDNR and the National Inventory of Dams, none of dams in Bond County are classified as a high hazard dams. Nor do any of these dams have an Emergency Action Plan (EAP; Table 4-18). An EAP is not required by the State of Illinois but is recommended by the Illinois Department of Natural Resources.

Accurate mapping of the risks of flooding behind levees depends on knowing the condition and level of protection the levees actually provide. FEMA and the U.S. Army Corps of Engineers are working together to make sure that flood hazard maps better reflect the flood protection capabilities of levees and that the maps accurately represent the flood risks posed to areas situated behind them. Levee owners—usually states, communities, or private individuals or

organizations such as local levee districts—are responsible for ensuring that the levees they own are maintained to their original design level and condition. In order to be considered creditable flood protection structures on FEMA's flood maps, levee owners must provide documentation to prove that the levee meets design, operation, and maintenance standards for protection against the 1% annual probability (100-year) flood.

Calculated Risk Priority Index for Flooding

Based on historical information and the HAZUS-MH flooding analysis results, the probability of flooding in Bond County is possible. According to the Bond County planning team's RPI, flooding ranked as the number six hazard.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
2	x	1	=	2

Calculated Risk Priority Index for Dam and Levee Failure

Based on operation and maintenance requirements and local knowledge of the dams in Bond County, the probability of failure is unlikely. However, if a high hazard dam were to fail, the magnitude and severity of the damage could be great. The warning time and duration of the dam failure event would be very short. According to the Bond County planning team's RPI, dam and levee failure ranked as the number eight hazard.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
1	x	1	=	1

Vulnerability Analysis for Flooding (HAZUS-MH Analysis Using 100-Year Flood Boundary and Default General Building Stock)

HAZUS-MH generated the flood depth grid for a 100-year return period and made calculations by clipping the USGS one-arc-second DEM (~30 m) to the flood boundary. Next, HAZUS-MH estimated the damages for Bond County by utilizing default aggregate General Building Stock data.

General Building Stock

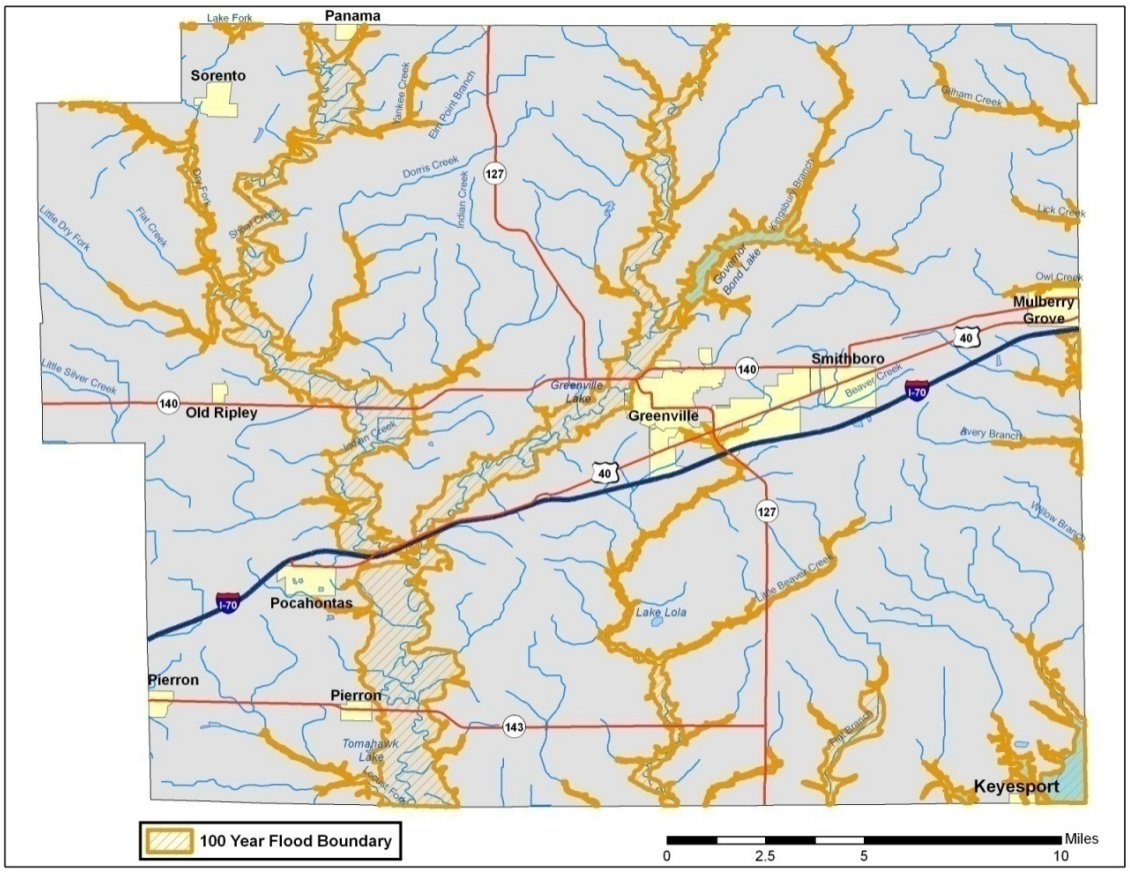
Table 4-17 lists the building replacement costs for the facilities identified in the flood areas. These buildings can expect impacts similar to those discussed for the critical facilities. These include structural failure, extensive water damage to the facility, and loss of facility functionality (i.e. residential buildings may no longer be able to provide shelter to their inhabitants).

Table 4-17: Bond County HAZUS-MH Analysis Total Economic Loss (100-Year Flood)

General Occupancy	Building Loss (X 1000)	Total Economic Loss (X 1000)
Agricultural	$450	$1,620
Commercial	$1,000	$3,530
Education	0	0
Government	0	0
Industrial	$230	$790
Religious/Non-	0	0
Residential	$9,960	$15,000
Total	**$11,640**	**$20,940**

Figure 4-4 depicts the flood boundary from the HAZUS-MH analysis. HAZUS-MH estimates the 100-year flood would cause $11.6 million in building losses and $21.0 million in economic losses.

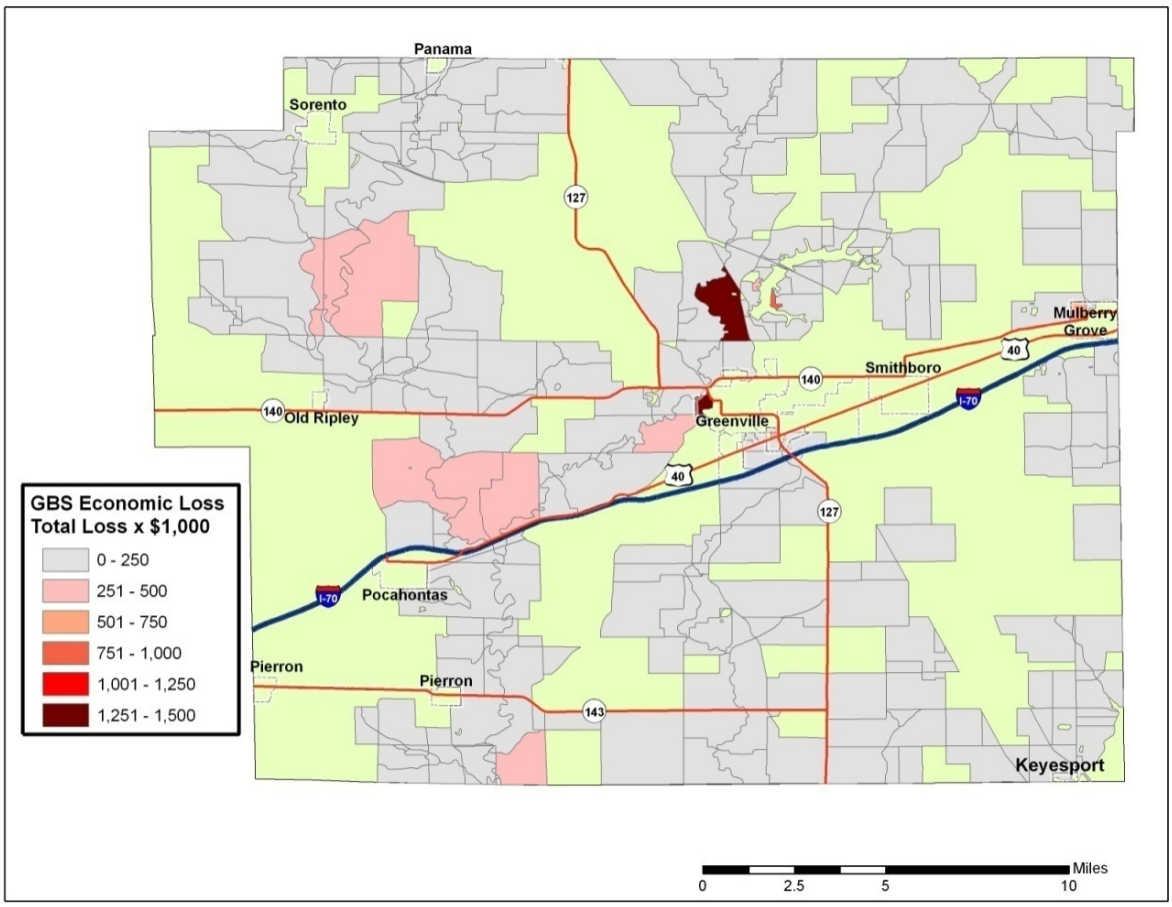
Figure 4-4: Bond County HAZUS-MH Analysis (100-Year Flood)



HAZUS-MH estimates 3 census blocks affected by the modeled flood event, with losses exceeding $1 million. The distribution of losses is shown in Figure 4-5.

HAZUS-MH aggregate loss analysis is evenly distributed across a census block. Census blocks of concern should be reviewed in more detail to determine the actual percentage of facilities that fall within the flood hazard areas. The aggregate losses reported in this study may be overstated.

Figure 4-5: Bond County Total Economic Loss (100-Year Flood)



Essential Facilities

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 will no longer be able to serve the community). However, flood analysis revealed no critical facilities are located within the 100-year floodplain.

Infrastructure

The types of infrastructure that could be 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 any number of these items could become damaged in the event of a flood. 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 fail or become impassable, causing a traffic risk.

Vulnerability Analysis for Flash Flooding

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

Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Vulnerability Analysis for Dam and Levee Failure

An 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.

Vulnerability to Future Assets/Infrastructure for Flooding

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

Currently, the municipality zoning boards review new development for compliance with local zoning ordinances. The Bond County Flood Manager administers the floodplain for the county. At this time no construction is planned within the area of the 100-year floodplain. Therefore, there is no new construction, which will be vulnerable to a 100-year flood.

Vulnerability to Future Assets/Infrastructure for Dam and Levee Failure

Municipal Planning Departments/Commissions review new developments for compliance with local zoning ordinances.

Analysis of Community Development Trends

Areas with recent development within the county may be more vulnerable to drainage issues. Storm drains and sewer systems are usually most susceptible, which can cause the 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. Controlling floodplain development is the key to reducing flood-related damages.

4.4.3 Earthquake Hazard

Hazard Definition for Earthquake Hazard

An earthquake is a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. For hundreds of millions of years, plate tectonics has shaped the Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. At their boundaries, the plates typically are locked together and unable to release the accumulating energy. When this energy grows strong enough, the plate boundary breaks free and causes the ground to shake. Most earthquakes occur at the boundaries where the plates meet; however, some earthquakes occur in the middle of plates, as is the case for seismic zones in the Midwestern United States. The most seismically active area in the Midwest U.S. is the New Madrid Seismic Zone. Scientists have learned that the New Madrid fault system may not be the only fault system in the Central U.S. capable of producing damaging earthquakes. The Wabash Valley fault system in Illinois and Indiana manifests evidence of large earthquakes in its geologic history, and there may be other, as yet unidentified, faults that could produce strong earthquakes.

Ground shaking from strong earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and destructive ocean waves (tsunamis). Buildings with foundations resting on unconsolidated materials and other unstable soil, and trailers and homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths, injuries, and extensive property damage. Magnitude measures the energy released at the source of the earthquake. Magnitude is determined from measurements on seismographs, and a single earthquake will have a single magnitude to quantify its strength. Earthquake intensity measures the strength of shaking produced by the earthquake at a certain location. Intensity is determined from effects on people, human structures, and the natural environment, and a single earthquake will have a wide range of intensity values at different locations around the epicenter. Table 4-18 is a description of earthquake intensity using an abbreviated Modified Mercalli Intensity scale, and Table 4-19 lists earthquake magnitudes and their corresponding intensities.
(Source: *http://earthquake.usgs.gov/learning/topics/mag_vs_int.php*)

Table 4-18: Abbreviated Modified Mercalli Intensity Scale

Mercalli Intensity	Description
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.

Mercalli Intensity	Description
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Table 4-19: Earthquake Magnitude vs. Modified Mercalli Intensity Scale

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

Historical Earthquakes that have Affected Bond County

Numerous instrumentally measured earthquakes have occurred in Illinois. In the past few decades, with many precise seismographs positioned across Illinois, measured earthquakes have varied in magnitude from very low microseismic events of M=1-3 to larger events up to M=5.4. Microseismic events are usually only detectable by seismographs and rarely felt by anyone. The most recent earthquake in Illinois—as of the date of this report—occurred on August 30, 2008 at 0:46:00 local time about 2.4 km (1.5 miles) southeast of Gale, IL and measured 2.6 in magnitude.

The consensus of opinion among seismologists working in the Midwest is that a magnitude 5.0 to 5.5 event could occur virtually anywhere at any time throughout the region. Earthquakes occur in Illinois all the time, although damaging quakes are very infrequent. Illinois earthquakes causing minor damage occur on average every 20 years, although the actual timing is extremely variable. Most recently, a magnitude 5.2 earthquake shook southeastern Illinois on April 18, 2008, causing minor damage in the Mt Carmel, IL area. Earthquakes resulting in more serious damage have occurred about every 70 to 90 years.

First on the list of historical earthquakes that have affected Illinois and first on the list on continuing earthquake threats at present and into the future is seismic activity on the New Madrid Seismic Zone of southeastern Missouri. On December 16, 1811 and January 23 and February 7 of 1812, three earthquakes struck the central U.S. with magnitudes estimated to be 7.5-8.0. These earthquakes caused violent ground cracking and volcano-like eruptions of

sediment *(sand blows)* over an area of >10,500 km^2, and uplift of a 50 km by 23 km zone (the Lake County uplift). The shaking rang church bells in Boston, collapsed scaffolding on the Capitol in Washington, D.C., and was felt over a total area of over 10 million km^2 (the largest felt area of any historical earthquake). Of all the historical earthquakes that have struck the U.S., an 1811-style event would do the most damage if it recurred today.

The New Madrid earthquakes are especially noteworthy because the seismic zone is in the center of the North American Plate. Such intraplate earthquakes are felt, and do damage, over much broader areas than comparable earthquakes at plate boundaries. The precise driving force responsible for activity on the New Madrid seismic zone is not known, but most scientists infer that it is compression transmitted across the North American Plate. That compression is focused on New Madrid because it is the site of a Paleozoic structure—the Reelfoot Rift—which is a zone of weakness in the crust.

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 (magnitude 7.5–8.0) is 7%–10% over the next 50 years (*USGS Fact Sheet 2006-3125*.) Frequent large earthquakes on the New Madrid seismic zone are geologically puzzling because the region shows relatively little deformation. Three explanations have been proposed: 1) recent seismological and geodetic activity is still a short-term response to the 1811–12 earthquakes; 2) activity is irregular or cyclic; or 3) activity began only in the recent geologic past. There is some dispute over how often earthquakes like the 1811–12 sequence occur. Many researchers estimate a recurrence interval of between 550 and 1100 years; other researchers suggest that either the magnitude of the 1811–12 earthquakes have been over-stated, or else the actual frequency of these events is less. It is fair to say, however, that even if the 1811–12 shocks were just magnitude ~7 events, they nonetheless caused widespread damage and would do the same if another such earthquake or earthquake sequence were to strike today.

[Above: New Madrid earthquakes and seismic zone modified from N. Pinter, 1993, Exercises in Active Tectonic history adapted from *Earthquake Information Bulletin*, 4(3), May-June 1972. *http://earthquake.usgs.gov/regional/states/illinois/history.php*]

The earliest reported earthquake in Illinois was in **1795**. This event was felt at Kaskaskia, IL for a minute and a half and was also felt in Kentucky. At Kaskaskia, subterranean noises were heard. Due to the sparse frontier population, an accurate location is not possible, and the shock may have actually originated outside the state.

An intensity VI-VII earthquake occurred on **April 12, 1883**, awakening several people in Cairo, IL. One old frame house was significantly damaged, resulting in minor injuries to the inhabitants. This is the only record of injury in the state due to earthquakes.

On **October 31, 1895** a large M6.8 occurred at Charleston, Missouri, just south of Cairo. Strong shaking caused eruptions of sand and water at many places along a line roughly 30 km (20 mi) long. Damage occurred in six states, but most severely at Charleston, with cracked walls, windows shattered, broken plaster, and chimneys fallen. Shaking was felt in 23 states from Washington, D.C. to Kansas and from southernmost Canada to New Orleans, LA.

A Missouri earthquake on **November 4, 1905**, cracked walls in Cairo. Aftershocks were felt over an area of 100,000 square miles in nine states. In Illinois, it cracked the wall of the new education building in Cairo and a wall at Carbondale, IL.

Among the largest earthquakes occurring in Illinois was the **May 26, 1909** shock, which knocked over many chimneys at Aurora. It was felt over 500,000 square miles and strongly felt in Iowa and Wisconsin. Buildings swayed in Chicago where there was fear that the walls would collapse. Just under two months later, a second Intensity VII earthquake occurred on **July 18, 1909**, damaged chimneys in Petersburg, IL, Hannibal, MO, and Davenport, IA. Over twenty windows were broken, bricks loosened and plaster cracked in the Petersburg area. This event was felt over 40,000 square miles.

On **November 7, 1958**, a shock along the Indiana border resulted in damage at Bartelso, Dale and Maunie, IL. Plaster cracked and fell, and a basement wall and floor were cracked.

On **August 14, 1965**, a sharp but local shock occurred at Tamms, IL, a town of about 600 people. The magnitude 5 quake damaged chimneys, cracked walls, knocked groceries from the shelves, and muddied the water supply. Thunderous earth noises were heard. This earthquake was only felt within a 10 mile radius of Tamms, in communities such as Elco, Unity, Olive Branch, and Olmstead, IL. Six aftershocks were felt.

An earthquake of Intensity VII occurred on **November 9, 1968**. This magnitude 5.3 shock was felt over an area of 580,000 square miles in 23 states. There were reports of people in tall buildings in Ontario and Boston feeling the shock. Damage consisted of bricks being knocked from chimneys, broken windows, toppled television antenna, and cracked plaster. There were scattered reports of cracked foundations, fallen parapets, and overturned tombstones. Chimney damage was limited to buildings 30 to 50 years old. Many people were frightened. Church bells rang at Broughton and several other towns. Loud rumbling earthquake noise was reported in many communities.

Dozens of other shocks originating in Missouri, Arkansas, Kansas, Nebraska, Tennessee, Indiana, Ohio, Michigan, Kentucky, and Canada have been felt in Illinois without causing damage. There have been three earthquakes slightly greater than magnitude 5.0 and Intensity level VII which occurred in 1968, 1987 and 2008 and that were widely felt throughout southern Illinois and the midcontinent.

Above text adapted from *http://earthquake.usgs.gov/regional/states/illinois/history.php* and from *Seismicity of the United States, 1568-1989 (Revised), C.W. Stover and J.L. Coffman, U.S. Geological Survey Professional Paper 1527, United States Government Printing Office, Washington: 1993.*

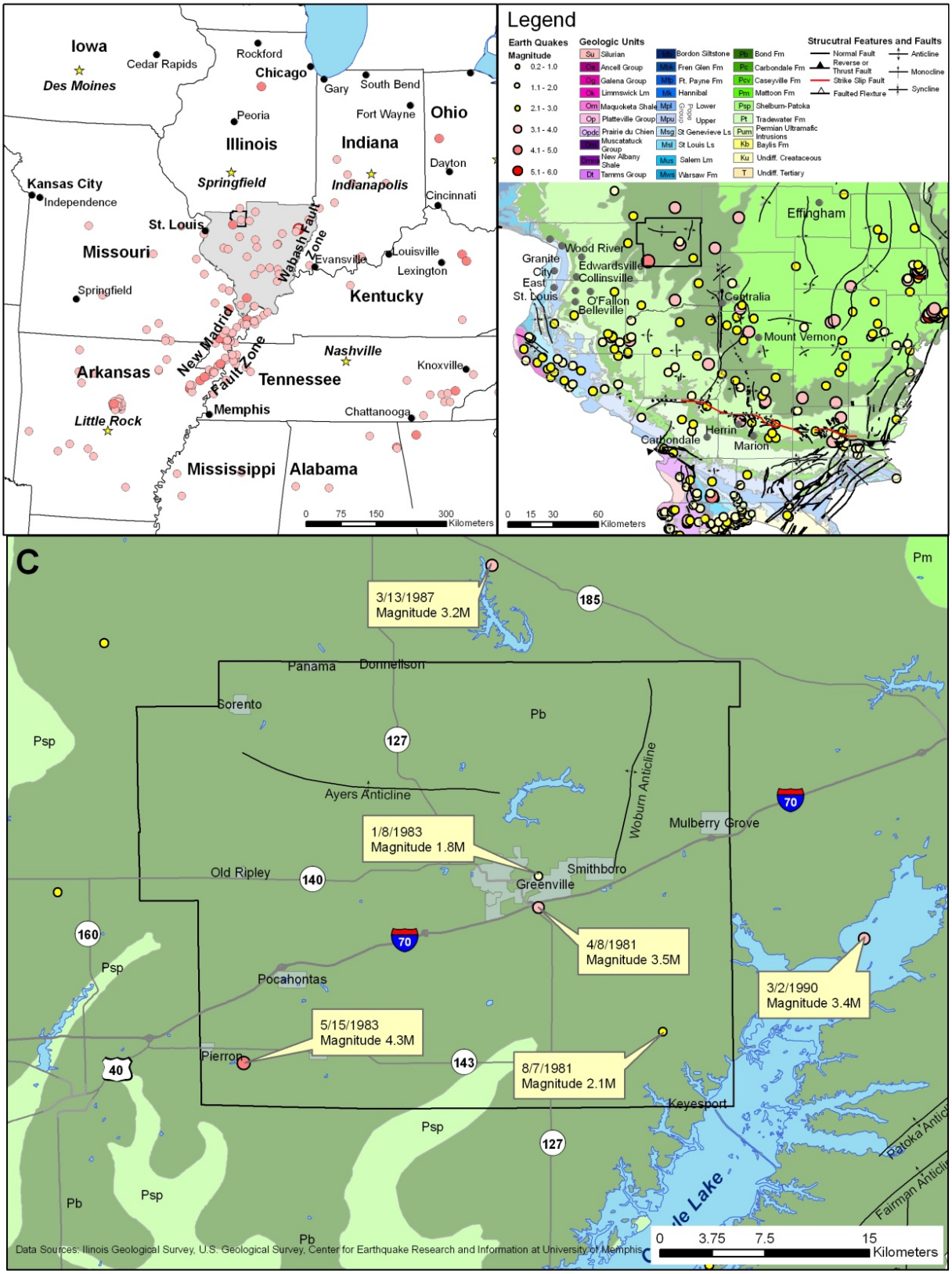
Geographic Location for Earthquake Hazard

Bond County occupies a region susceptible to earthquakes. Regionally, the two most significant zones of seismic activity are the New Madrid Seismic Zone and the Wabash Valley Fault System. The epicenters of three small earthquakes (M1.8–4.3) have been recorded in Bond County (Figure 4-12). The geologic mechanism related to the minor earthquakes is poorly understood. 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 and has the potential to generate an earthquake of sufficient strength to cause damage between St. Louis, MO and Indianapolis, IN. The USGS and the Center for Earthquake Research and Information estimate the probability of a repeat of the 1811–1812 type earthquakes (magnitude 7.5–8.0) at 7%–10% and the probability of a magnitude 6.0 or larger at 25%–40% within the next 50 years.

Figure 4-6 depicts the following: a) Location of notable earthquakes in the Illinois region with inset of Bond County; b) Generalized geologic bedrock map with earthquake epicenters, geologic structures, and inset of Bond County; c) Geologic and earthquake epicenter map of Bond County.

Figure 4-6 a, b, c: Bond County Earthquakes



Hazard Extent for Earthquake Hazard

The extent of the earthquake is countywide.

Calculated Risk Priority Index for Earthquake Hazard

Based on historical information as well as current USGS and SIU research and studies, future earthquakes in Bond County are possible. According to the Bond County planning team's RPI assessment, earthquake is ranked as the number five hazard.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
2	x	4	=	8

Vulnerability Analysis for Earthquake Hazard

This hazard could impact the entire jurisdiction equally; therefore, the entire county's population and all buildings are vulnerable to an earthquake and can expect the same impacts within the affected area. To accommodate this risk this plan will consider all buildings located within the county as vulnerable.

Critical Facilities

All critical facilities are vulnerable to earthquakes. A critical facility would encounter many of the same impacts as any other building within the county. These impacts include structural failure and loss of facility functionality (e.g. damaged police station will no longer be able to serve the community). A complete list of all of the critical facilities, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Building Inventory

Table 4-8 shows building exposure 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 and loss of building function, which could result in indirect impacts (e.g. damaged homes will no longer be habitable, causing residence to seek shelter).

Infrastructure

During an earthquake, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. Since a full inventory of infrastructure is not available for this plan, 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 fail or become impassable causing

risk to traffic. Typical scenarios are described to gauge the anticipated impacts of earthquakes in the county in terms of number and types of buildings and infrastructure.

The SIU-Polis team reviewed existing geological information and recommendations for earthquake scenarios. Three earthquake scenarios—two based on USGS modeled scenarios and one based on deterministic scenarios were developed to provide a reasonable basis for earthquake planning in Bond County. The two USGS analyses were a M7.7 event on the New Madrid fault zone and M7.1 earthquake on the Wabash Valley Seismic Zone. Shake maps provided by FEMA were used in HAZUS-MH to estimate losses for Bond County based on these events. The final scenario was a Moment Magnitude of 5.5 with the epicenter located in Bond County. Note that a deterministic scenario, in this context, refers to hazard or risk models based on specific scenarios without explicit consideration of the probability of their occurrences. This scenario was selected based upon a rupture of a local unnamed fault located just south of Greenville near the intersection of Interstate 70 and State Route 127 that presents a realistic earthquake scenario for planning purposes.

Modeling a deterministic scenario requires user input for a variety of parameters. One of the most critical sources of information that is required for accurate assessment of earthquake risk is soils data. Illinois Geologic Survey provided a NEHRP (National Earthquake Hazards Reduction Program) soil classification map for southern Illinois (Bauer and Su, 2007). NEHRP soil classifications portray the degree of shear-wave amplification that can occur during ground shaking.

Earthquake hypocenter depths in southern Illinois range from less than 1.0 to ~25.0 km. The average hypocenter depth, ~10.0 km, was used for the deterministic earthquake scenario. For this scenario type HAZUS-MH also requires the user to define an attenuation function. To maintain consistency with the USGS's (2006) modeling of strong ground motion in the central United States, the Toro et al. (1997) attenuation function was used for the deterministic earthquake scenario.

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

Results for 7.7 Magnitude New Madrid Earthquake Scenario

The results of the 7.7 New Madrid Earthquake loss modeling are depicted in Table 4-20, Table 4-21, and Figure 4-7. HAZUS-MH estimates that approximately 330 buildings will be at least moderately damaged.
The total building related losses totaled $16.31 million; 12% of the estimated losses were related to the business interruption of the region. Large losses were sustained by the residential occupancies, which comprised more than 58% of the total loss.

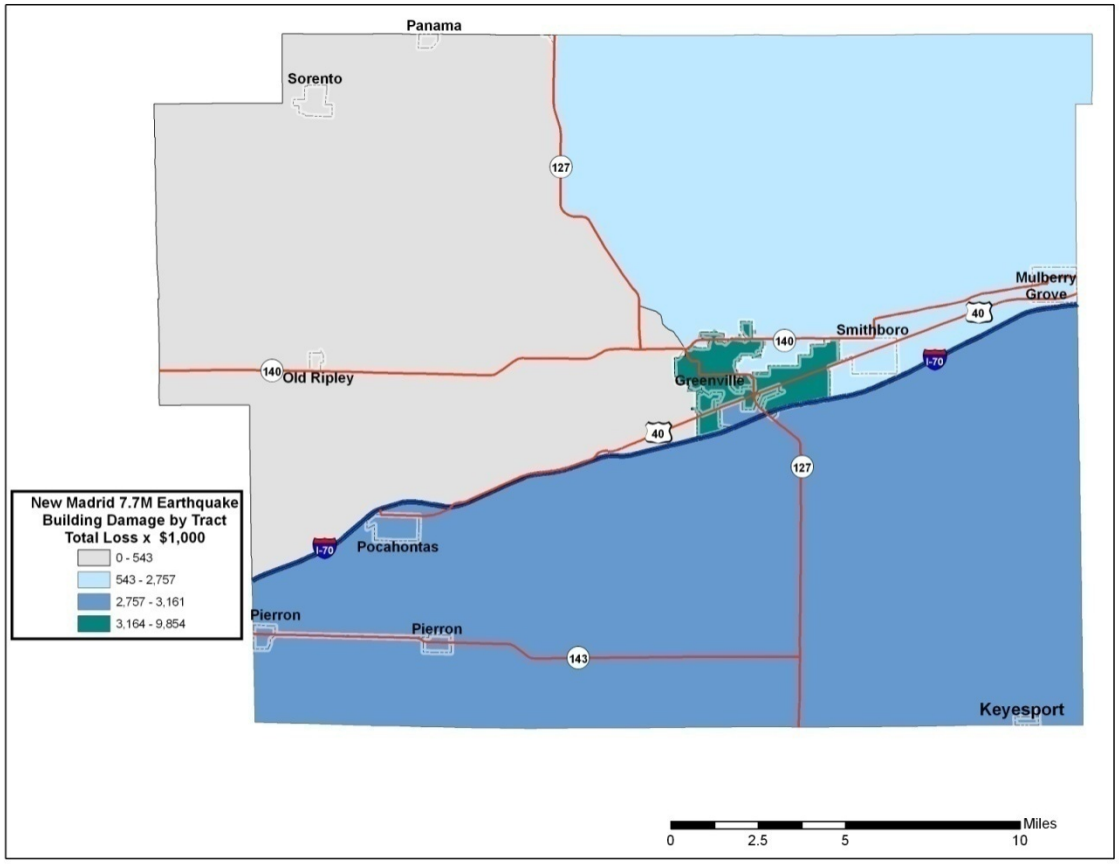
Table 4-20: New Madrid Scenario-Damage Counts by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	5	0.11	2	0.17	1	0.25	0	0.53	0	0.33
Commercial	48	0.92	18	1.81	7	2.26	1	4.68	0	3.32
Education	4	0.07	1	0.11	0	0.12	0	0.15	0	0.23
Government	7	0.13	2	0.19	1	0.20	0	0.24	0	0.30
Industrial	12	0.24	4	0.45	2	0.68	0	1.45	0	0.81
Other Residential	728	14.11	379	38.96	204	63.89	5	45.42	0	4.28
Religion	8	0.15	2	0.24	1	0.28	0	0.52	0	0.56
Single Family	4,351	84.28	564	58.07	103	32.32	5	47.00	0	90.17
Total	**5,163**		**972**		**319**		**11**		**0**	

Table 4-21: New Madrid Scenario-Building Economic losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.03	0.68	0.02	0.06	0.78
	Capital-Related	0.00	0.01	0.51	0.01	0.01	0.55
	Rental	0.12	0.18	0.31	0.02	0.02	0.64
	Relocation	0.01	0.01	0.02	0.00	0.01	0.05
	Subtotal	**0.13**	**0.23**	**1.52**	**0.05**	**0.10**	**2.02**
Capital Stock Loses							
	Structural	0.74	0.62	0.53	0.13	0.27	2.30
	Non_Structural	3.55	1.89	1.46	0.43	0.58	7.90
	Content	1.82	0.54	0.93	0.30	0.41	4.00
	Inventory	0.00	0.00	0.03	0.04	0.02	0.09
	Subtotal	**6.11**	**3.04**	**2.95**	**0.90**	**1.29**	**14.29**
	Total	**6.24**	**3.27**	**4.47**	**0.95**	**1.39**	**16.31**

Figure 4-7: New Madrid Valley Scenario-Building Economic Losses in Thousands of Dollars



New Madrid Earthquake Scenario—Essential Facility Losses

Before the earthquake, the region had 402 care beds available for use. On the day of the earthquake, the model estimates that only 23 care beds (6%) are available for use by patients already in medical care facilities and those injured by the earthquake. After one week, 65% of the beds will be back in service. By day 30, 89% will be operational.

Results for 7.1 Magnitude Wabash Valley Earthquake Scenario

The results of the 7.1M Wabash Valley Earthquake loss modeling are depicted in Table 4-22, Table 4-23, and Figure 4-8. HAZUS-MH estimates that 176 building will be at least moderately damaged.

The total building related losses totaled $13.23 million; 9% of the estimated losses were related to the business interruption of the region. Large losses were sustained by the residential occupancies, which comprised more than 63% of the total loss.

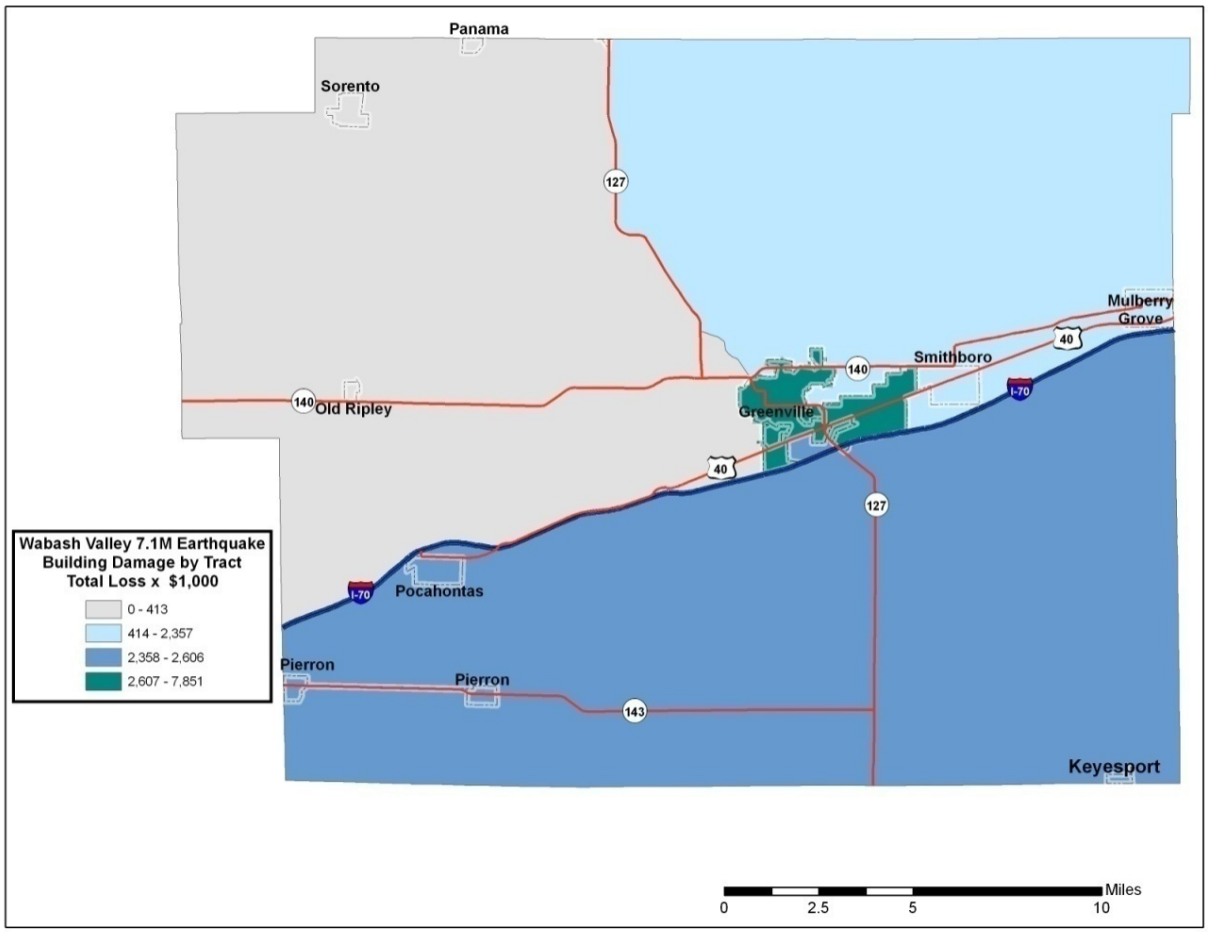
Table 4-22: Wabash Valley Scenario-Damage Counts by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	6	0.12	1	0.15	0	0.25	0	0.41	0	0.21
Commercial	56	1.03	13	1.50	4	2.24	0	3.78	0	2.26
Education	4	0.07	1	0.10	0	0.13	0	0.21	0	0.23
Government	7	0.14	1	0.15	0	0.19	0	0.29	0	0.29
Industrial	15	0.27	3	0.37	1	0.62	0	1.04	0	0.45
Other Residential	952	17.47	284	33.83	79	46.54	1	13.96	0	4.08
Religion	8	0.16	2	0.23	1	0.33	0	0.57	0	0.50
Single Family	4,401	80.75	534	63.68	85	49.69	4	79.74	0	91.98
Total	**5,450**		**839**		**171**		**5**		**0**	

Table 4-23: Wabash Valley Scenario-Building Economic losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.02	0.34	0.01	0.04	0.41
	Capital-Related	0.00	0.01	0.26	0.01	0.01	0.29
	Rental	0.10	0.12	0.17	0.01	0.01	0.41
	Relocation	0.01	0.00	0.01	0.00	0.00	0.03
	Subtotal	**0.11**	**0.16**	**0.78**	**0.02**	**0.06**	**1.13**
Capital Stock Loses							
	Structural	0.65	0.35	0.28	0.07	0.16	1.51
	Non_Structural	3.37	1.48	1.12	0.36	0.48	6.81
	Content	1.76	0.50	0.82	0.26	0.37	3.71
	Inventory	0.00	0.00	0.02	0.03	0.02	0.08
	Subtotal	**5.78**	**2.32**	**2.25**	**0.73**	**1.02**	**12.10**
	Total	**5.88**	**2.48**	**3.03**	**0.75**	**1.08**	**13.23**

Figure 4-8: Wabash Valley Scenario-Building Economic Losses in Thousands of Dollars



Wabash Valley Scenario—Essential Facility Losses

Before the earthquake, the region had 402 care beds available for use. On the day of the earthquake, the model estimates that only 23 care beds (6.0%) are available for use by patients already in medical care facilities and those injured by the earthquake. After one week, 65% of the beds will be back in service. By day 30, 89% will be operational.

Results for 5.5 Magnitude Earthquake in Bond County

The results of the arbitrary 5.5 magnitude earthquake within Bond County are depicted in Tables 4-24 and 4-25 and Figure 4-9. HAZUS-MH estimates that 1,224 buildings will be at least moderately damaged. This is more than 19% of the total number of buildings in the region. It is estimated that 53 buildings will be damaged beyond repair.

The total building related losses totaled $99.9 million; 11% of the estimated losses were related to the business interruption of the region. Large losses were sustained by the residential occupancies, which comprised more than 63% of the total loss.

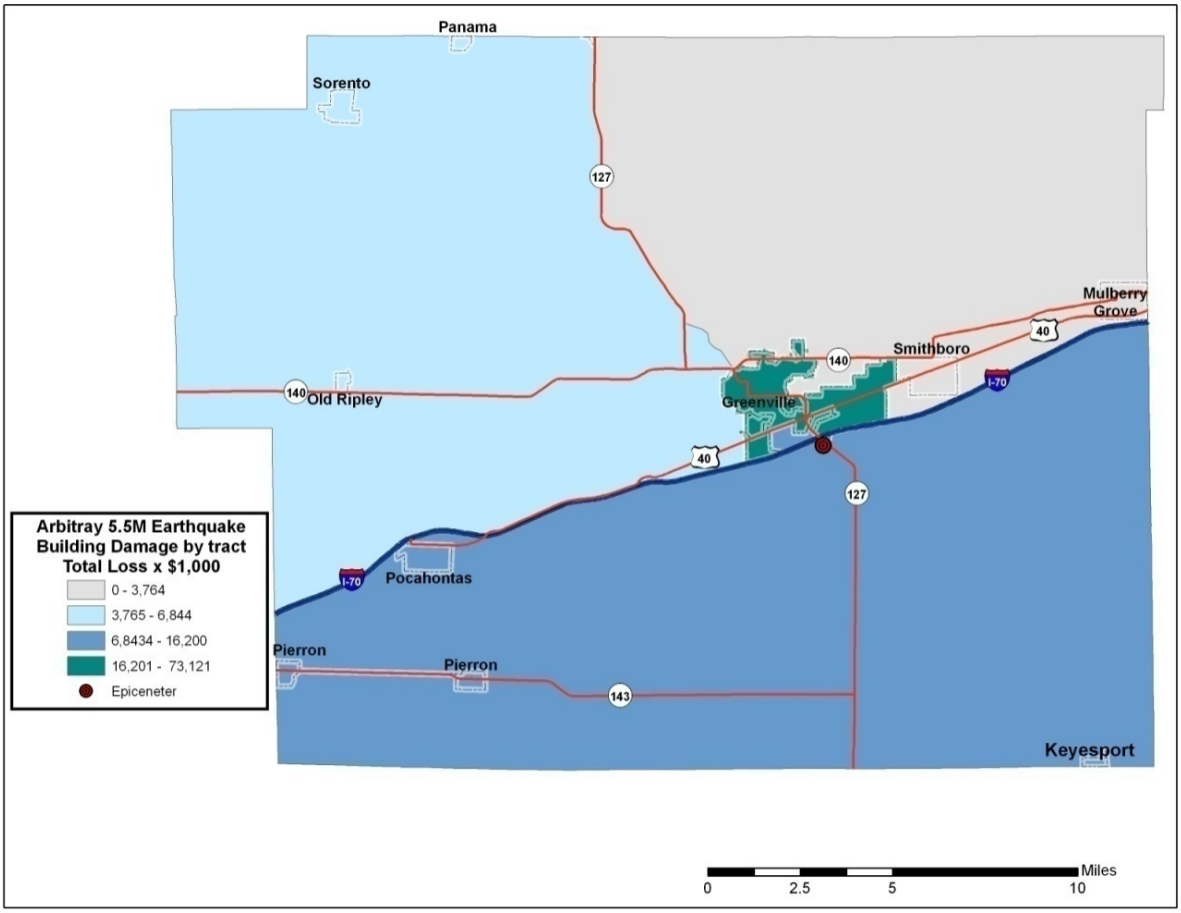
Table 4-24: Bond County 5.5M Scenario-Damage Counts by Building Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	5	0.12	1	0.10	1	0.15	1	0.23	0	0.19
Commercial	34	0.91	16	1.04	15	1.65	6	2.70	2	2.95
Education	3	0.07	1	0.07	1	0.10	0	0.15	0	0.20
Government	5	0.13	2	0.11	2	0.17	1	0.23	0	0.31
Industrial	9	0.24	4	0.24	4	0.43	2	0.77	0	0.71
Other Residential	641	17.11	304	20.35	299	32.03	65	27.24	7	13.13
Religion	5	0.12	3	0.17	2	0.26	1	0.45	0	0.59
Single Family	3,047	81.29	1,162	77.91	609	65.21	163	68.24	43	81.92
Total	**3,749**		**1,492**		**934**		**238**		**53**	

Table 4-25: Bond County 5.5M Scenario-Building Economic Losses in Millions of Dollars

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.45	3.37	0.08	0.28	4.18
	Capital-Related	0.00	0.19	2.48	0.05	0.08	2.80
	Rental	1.14	1.27	1.22	0.06	0.13	3.82
	Relocation	0.13	0.03	0.11	0.01	0.04	0.32
	Subtotal	**1.27**	**1.93**	**7.19**	**0.20**	**0.53**	**11.12**
Capital Stock Loses							
	Structural	6.23	3.08	2.86	0.58	1.35	14.10
	Non_Structural	25.05	11.96	8.59	2.23	3.46	51.29
	Content	9.85	3.45	5.61	1.72	2.31	22.94
	Inventory	0.00	0.00	0.17	0.23	0.08	0.48
	Subtotal	**41.12**	**18.48**	**17.24**	**4.76**	**7.20**	**88.81**
	Total	**42.40**	**20.42**	**24.43**	**4.96**	**7.73**	**99.93**

Figure 4-9: Bond County 5.5M Scenario-Building Economic Losses in Thousands of Dollars



Arbitrary Earthquake Scenario—Essential Facility Losses

Before the earthquake, the region had 402 care beds available for use. On the day of the earthquake, the model estimates that only 2 care beds (1.0%) are available for use by patients already in medical care facilities and those injured by the earthquake. After one week, 30% of the beds will be back in service. By day 30, 62.0% will be operational.

Vulnerability to Future Assets/Infrastructure for Earthquake Hazard

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

Analysis of Community Development Trends

Community development will occur outside of the low-lying areas in floodplains with a water table within five feet of grade which are susceptible to liquefaction. Furthermore, Bond County will continue to provide training to county officials, implement public education, and institute leaders who are proactive in mapping and studying the risks of earthquakes in the county.

4.4.4 Thunderstorm Hazard

Hazard Definition for Thunderstorm Hazard

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

- Hail of diameter 0.75 inches or higher
- Frequent and dangerous lightning
- Wind speeds equal to or greater than 58 mph

Hail

Hail can be a product of a strong thunderstorm. Hail usually falls near the center of a storm; however strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, resulting in a broader distribution. Hailstones range from pea-sized to baseball-sized, but hailstones larger than softballs have been reported on rare occasions.

Lightning

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

Severe Winds (Straight-Line Winds)

Straight-line winds from thunderstorms are a fairly common occurrence across 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 for Thunderstorm Hazard

The NCDC database reported 34 hailstorms in Bond County since 1974 which cause $51,000 in property damage. Hailstorms occur nearly every year in the late spring and early summer months. The most recent significant occurrence of hail occurred in October 2007 when severe thunderstorms produced a swath hail ranging from pea up to golf-ball in size crossed Bond County impacting large portion of the unincorporated County and the City of Greenville.

Bond County hailstorms are listed in Table 4-26; additional details for NCDC events are included in Appendix D.

Table 4-26: Bond County Hailstorms*

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage
Bond	4/3/1974	Hail	0.75 in.	0	0	0
Bond	8/18/1974	Hail	2.00 in.	0	0	0
Bond	8/20/1979	Hail	0.75 in.	0	0	0
Greenville	4/26/1994	Hail	1.00 in.	0	0	0
Mulberry Grove	4/26/1994	Hail	1.75 in.	0	0	1K
Old Ripley	5/3/1996	Hail	0.75 in.	0	0	0
Pocahontas	5/3/1996	Hail	1.75 in.	0	0	0
Greenville	5/22/1998	Hail	0.75 in.	0	0	0
Mulberry Grove	6/12/1998	Hail	1.75 in.	0	0	0
Smithboro	6/12/1998	Hail	1.00 in.	0	0	0
Old Ripley	6/14/1998	Hail	1.75 in.	0	0	0
Beaver Creek	2/27/1999	Hail	1.00 in.	0	0	0
Pocahontas	2/27/1999	Hail	1.75 in.	0	0	50K
Mulberry Grove	6/4/1999	Hail	1.00 in.	0	0	0
Greenville	10/24/2001	Hail	0.75 in.	0	0	0
Greenville	4/24/2002	Hail	1.75 in.	0	0	0
Greenville	5/1/2002	Hail	1.75 in.	0	0	0
Woburn	5/1/2002	Hail	1.00 in.	0	0	0
Greenville	5/8/2003	Hail	0.88 in.	0	0	0
Mulberry Grove	3/31/2005	Hail	0.75 in.	0	0	0
Sorento	3/31/2005	Hail	0.88 in.	0	0	0
Greenville	5/11/2005	Hail	0.75 in.	0	0	0
Pierron	5/19/2005	Hail	0.88 in.	0	0	0
Pocahontas	5/19/2005	Hail	0.75 in.	0	0	0
Greenville	2/16/2006	Hail	1.00 in.	0	0	0
Pocahontas	2/16/2006	Hail	1.00 in.	0	0	0
Pocahontas	4/2/2006	Hail	3.00 in.	0	0	0
Mulberry Grove	4/16/2006	Hail	0.75 in.	0	0	0
Greenville	4/30/2006	Hail	0.75 in.	0	0	0
Baden Baden	5/24/2006	Hail	1.75 in.	0	0	0
Smithboro	3/1/2007	Hail	1.50 in.	0	0	0
Pocahontas	4/3/2007	Hail	0.75 in.	0	0	0
Baden Baden	8/24/2007	Hail	0.88 in.	0	0	0
Greenville	10/18/2007	Hail	1.75 in.	0	0	0

Source: NCDC

* 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.

The NCDC database identified 85 wind storms reported since 1971. On multiple occasions in the past 35 years trees have been uprooted by severe winds in Bond County. These storms have been attributed with $435,000 in property damage in Bond and adjacent counties.

As shown in Table 4-27, wind storms have historically occurred year-round with the greatest frequency and damage in April through August.

Table 4-27: Bond County Wind Storms*

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage
Bond	2/26/1971	Thunderstorm Wind	N/A	0	0	0
Bond	4/3/1974	Thunderstorm Wind	N/A	0	0	0
Bond	6/9/1974	Thunderstorm Wind	N/A	0	0	0
Bond	8/18/1974	Thunderstorm Wind	N/A	0	0	0
Bond	8/18/1974	Thunderstorm Wind	N/A	0	0	0
Bond	9/28/1974	Thunderstorm Wind	N/A	0	0	0
Bond	9/28/1974	Thunderstorm Wind	N/A	0	0	0
Bond	2/23/1977	Thunderstorm Wind	N/A	0	0	0
Bond	2/23/1977	Thunderstorm Wind	N/A	0	0	0
Bond	4/7/1980	Thunderstorm Wind	N/A	0	0	0
Bond	4/7/1980	Thunderstorm Wind	N/A	0	0	0
Bond	4/2/1982	Thunderstorm Wind	N/A	0	0	0
Bond	4/2/1982	Thunderstorm Wind	N/A	0	0	0
Bond	5/28/1982	Thunderstorm Wind	N/A	0	0	0
Bond	4/27/1983	Thunderstorm Wind	N/A	0	0	0
Bond	3/15/1984	Thunderstorm Wind	N/A	0	0	0
Bond	7/9/1986	Thunderstorm Wind	N/A	0	0	0
Bond	7/28/1986	Thunderstorm Wind	N/A	0	0	0
Bond	9/29/1986	Thunderstorm Wind	57 kts.	0	0	0
Bond	5/25/1989	Thunderstorm Wind	N/A	0	0	0
Bond	8/20/1989	Thunderstorm Wind	N/A	0	0	0
Bond	11/15/1989	Thunderstorm Wind	N/A	0	0	0
Bond	5/9/1990	Thunderstorm Wind	N/A	0	0	0
Bond	6/15/1991	Thunderstorm Wind	N/A	0	0	0
Bond	4/9/1992	Thunderstorm Wind	N/A	0	0	0
Bond	7/19/1992	Thunderstorm Wind	N/A	0	0	0
Pocahontas	9/2/1993	Thunderstorm Wind	N/A	0	0	1K

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage
Pocahontas	4/15/1994	Thunderstorm Wind	N/A	0	0	1K
Reno	6/23/1994	Thunderstorm Wind	N/A	0	0	1K
Sorento	6/23/1994	Thunderstorm Wind	N/A	0	0	5K
Bond	4/18/1995	Wind	N/A	0	0	400K
Keyesport	6/8/1995	Thunderstorm Wind	N/A	0	0	0K
Greenville	5/25/1996	Thunderstorm Wind	50 kts.	0	0	0
Bond	9/26/1996	Wind	45 kts.	0	0	140K
Pierron	10/17/1996	Thunderstorm Wind	55 kts.	0	0	0
Pocahontas	10/17/1996	Thunderstorm Wind	55 kts.	0	0	0
Greenville	10/22/1996	Thunderstorm Wind	50 kts.	0	0	0
Bond	4/30/1997	Wind	45 kts.	0	0	0
Smithboro	6/14/1998	Thunderstorm Wind	60 kts.	0	0	0
Greenville	6/29/1998	Thunderstorm Wind	55 kts.	0	0	0
Greenville	7/22/1998	Thunderstorm Wind	56 kts.	0	0	0
Greenville	11/10/1998	Thunderstorm Wind	56 kts.	0	0	0
Sorento	11/10/1998	Thunderstorm Wind	56 kts.	0	0	0
Greenville	4/8/1999	Thunderstorm Wind	50 kts.	0	0	0
Sorento	4/8/1999	Thunderstorm Wind	60 kts.	0	0	0
Greenville	6/4/1999	Thunderstorm Wind	55 kts.	0	0	0
Greenville	6/14/2000	Thunderstorm Wind	52 kts.	0	0	0
Greenville	6/14/2000	Thunderstorm Wind	52 kts.	0	0	0
Dudleyville	7/18/2000	Thunderstorm Wind	55 kts.	0	0	0
Old Ripley	7/18/2000	Thunderstorm Wind	55 kts.	0	0	0
Greenville	7/18/2000	Thunderstorm Wind	52 kts.	0	0	0
Old Ripley	7/18/2000	Thunderstorm Wind	55 kts.	0	0	0
Bond	3/13/2001	Wind	45 kts.	0	0	0
Greenville	4/10/2001	Thunderstorm Wind	52 kts.	0	0	0
Smithboro	4/10/2001	Thunderstorm Wind	55 kts.	0	0	5K
Greenville	7/17/2001	Thunderstorm Wind	55 kts.	0	0	5K
Greenville	10/24/2001	Thunderstorm Wind	51 kts.	0	0	2K
Bond	3/9/2002	Wind	43 kts.	0	0	0
Pocahontas	5/9/2002	Thunderstorm Wind	61 kts.	0	0	0
Greenville	6/11/2002	Thunderstorm Wind	55 kts.	0	0	0
Greenville	5/24/2004	Thunderstorm Wind	52 kts.	0	0	0

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage
Sorento	5/24/2004	Thunderstorm Wind	55 kts.	0	0	0
Bond	1/5/2005	Thunderstorm Wind	N/A	0	0	0
Greenville	5/11/2005	Thunderstorm Wind	51 kts.	0	0	0
Mulberry Grove	5/11/2005	Thunderstorm Wind	51 kts.	0	0	0
Greenville	6/13/2005	Thunderstorm Wind	55 kts.	0	0	0
Greenville	8/13/2005	Thunderstorm Wind	57 kts.	0	0	0
Greenville	11/5/2005	Thunderstorm Wind	55 kts.	0	0	0
Greenville	2/16/2006	Thunderstorm Wind	55 kts.	0	0	0
Pocahontas	4/2/2006	Thunderstorm Wind	55 kts.	0	0	0
Greenville	4/2/2006	Thunderstorm Wind	55 kts.	0	0	0
Greenville	4/2/2006	Thunderstorm Wind	60 kts.	0	0	0
Greenville	4/2/2006	Thunderstorm Wind	60 kts.	0	0	0
Mulberry Grove	4/2/2006	Thunderstorm Wind	60 kts.	0	0	0
Tamalco	4/2/2006	Thunderstorm Wind	60 kts.	0	0	0
Greenville	5/24/2006	Thunderstorm Wind	N/A	0	0	0
Woburn	5/24/2006	Thunderstorm Wind	N/A	0	0	0
Greenville	6/17/2006	Thunderstorm Wind	55 kts.	0	0	0
Mulberry Grove	6/17/2006	Thunderstorm Wind	55 kts.	0	0	0
Greenville	6/22/2006	Thunderstorm Wind	52 kts.	0	0	0
Mulberry Grove	6/22/2006	Thunderstorm Wind	55 kts.	0	0	0
Pocahontas	7/18/2006	Thunderstorm Wind	50 kts.	0	0	0
Greenville	6/23/2007	Thunderstorm Wind	N/A	0	0	10K
Mulberry Grove	8/24/2007	Thunderstorm Wind	N/A	0	0	0
Greenville	10/18/2007	Thunderstorm Wind	N/A	0	0	0

Source: NCDC

* 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 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 historical thunderstorms listed previously varies in terms of the extent of the storm, the wind speed, and the size of hailstones. Thunderstorms can occur at any location within the county.

Calculated Risk Priority Index for Thunderstorm Hazard

Based on historical information, the probability of future high wind damage is likely. High winds with widely varying magnitudes are expected to happen. According to the Bond County planning team's RPI assessment, thunderstorms and high wind damage ranked as the number four hazard.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
4	x	2	=	8

Vulnerability Analysis for Thunderstorm Hazard

Severe thunderstorms are an evenly distributed threat across the entire jurisdiction; therefore, the entire county's population and all buildings are susceptible to severe thunderstorms and can expect the same impacts. This plan will therefore consider all buildings located within the county as vulnerable. The existing buildings and infrastructure in Bond County are discussed in types and numbers in Table 4-8.

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, debris (trees or limbs) causing damage, roofs blown off or windows broken by hail or high winds, fires caused by lightning, and loss of function of the facility (e.g. a damaged police station will no longer be able to serve the community). Table 4-7 lists the types and numbers of all essential facilities in the area. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Building Inventory

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

Infrastructure

During a severe thunderstorm, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. Since the county's entire infrastructure is equally vulnerable, it is important to emphasize that any number of these items could become damaged during a severe thunderstorm. 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 fail or become impassable causing risk to traffic.

Vulnerability to Future Assets/Infrastructure for Thunderstorm Hazard

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

Analysis of Community Development Trends

Preparing for severe storms will be enhanced if officials sponsor a wide range of programs and initiatives to address the overall safety of county residents. New structures need to be built with more sturdy construction, and those structures already in place need to be hardened to lessen the potential impacts of severe weather. Community warning sirens to provide warning of approaching storms are also vital to preventing the loss of property and ensuring the safety of Bond County residents.

4.4.5 Winter Storm Hazard

Hazard Definition for Winter Storm Hazard

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

Ice (glazing) and Sleet Storms

Ice or sleet, even in small quantities, can result in hazardous driving conditions and can cause property damage. Sleet involves frozen raindrops that bounce when they hit the ground or other objects. 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.

The most damaging winter storms in southern Illinois have been ice storms. Ice storms occur when moisture-laden gulf air converges with the northern jet stream causing strong winds and heavy precipitation. This precipitation takes the form of freezing rain coating power and communication lines and trees with heavy ice. The winds will then cause the overburdened limbs and cables to snap; leaving large sectors of the population without power, heat, or

communication. In the past few decades, including the winter of 2007–08, numerous ice storm events have occurred in southern Illinois.

Snow Storms

Significant snow storms are characterized by the rapid accumulation of snow, often accompanied by high winds, cold temperatures, and low visibility. A blizzard is categorized as a snow storm with winds of 35 miles per hour or greater and/or visibility of less than ¼ mile for three or more hours. Blizzards are the most dramatic and perilous of all winter storm events. Most snow within a blizzard is in the form of fine, powdery particles, which are wind-blown in such great quantities that visibility is reduced to only a few feet. Blizzards have the potential to result in property damage.

Illinois has repeatedly been struck by blizzards, although they are less common in the southern part of the state. Blizzard conditions can cause power outages, loss of communication, and make transportation impossible. The blowing of snow can reduce visibility to less than ¼ mile, resulting in disorientation that can make even travel by foot dangerous.

Severe Cold

Severe cold is characterized by the ambient air temperature that may drop to 0°F or below. These extreme temperatures can increase the likelihood of frostbite and hyperthermia. 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), which can lower the time it takes for frostbite and hypothermia to affect a person's body.

Previous Occurrences for Winter Storm Hazard

The NCDC database identified 27 winter storm and extreme cold events for Bond County since 1996. These storms have been attributed with one death. A recent example a severe winter storm occurred in January 2007 an arctic boundary settled south of the area on the 12th and 13th of January bringing subfreezing temperatures to the northwestern half of the county warning area. Three rounds of precipitation occurred during this period, with the first being the most destructive of all. Significant tree and limb damage was reported as a result of this storm, together with widespread power outages. More than 100,000 homes and businesses lost power during this storm. Ice accumulations across Southwest Illinois were from 1/4 to 1/2 inch.

The NCDC winter storms for Bond County are listed in Table 4-28. Additional details for NCDC events are included in Appendix D.

Table 4-28: Winter Storm Events*

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage
Bond	11/25/1996	Winter	N/A	0	0	0
Bond	1/8/1997	Winter	N/A	0	0	0
Bond	1/15/1997	Winter	N/A	0	0	0
Bond	4/10/1997	Winter	N/A	0	0	0
Bond	1/12/1998	Winter	N/A	0	0	0
Bond	12/21/1998	Winter	N/A	0	0	0
Bond	1/1/1999	Winter	N/A	0	0	0
Bond	1/13/1999	Winter	N/A	0	0	0
Bond	1/17/2000	Winter	N/A	0	0	0
Bond	1/28/2000	Winter	N/A	0	0	0
Bond	3/11/2000	Winter	N/A	0	0	0
Bond	12/13/2000	Winter	N/A	0	0	0
Bond	12/16/2000	Cold	N/A	1	0	0
Bond	1/26/2001	Winter	N/A	0	0	0
Bond	2/25/2002	Winter	N/A	0	0	0
Bond	12/4/2002	Winter	N/A	0	0	0
Bond	12/24/2002	Winter	N/A	0	0	0
Bond	1/1/2003	Winter	N/A	0	0	0
Bond	2/15/2003	Winter	N/A	0	0	0
Bond	2/23/2003	Winter	N/A	0	0	0
Bond	12/13/2003	Winter	N/A	0	0	0
Bond	1/25/2004	Winter	N/A	0	0	0
Bond	11/29/2006	Winter	N/A	0	0	0K
Bond	12/1/2006	Winter	N/A	0	0	0K
Bond	1/12/2007	Winter	N/A	0	0	0K
Bond	4/4/2007	Cold	N/A	0	0	0K
Bond	12/8/2007	Winter	N/A	0	0	0K
Bond	11/25/1996	Winter	N/A	0	0	0
Bond	1/8/1997	Winter	N/A	0	0	0
Bond	1/15/1997	Winter	N/A	0	0	0
Bond	4/10/1997	Winter	N/A	0	0	0
Bond	1/12/1998	Winter	N/A	0	0	0

Location or County	Date	Type	Magnitude	Deaths	Injuries	Property Damage
Bond	12/21/1998	Winter	N/A	0	0	0
Bond	1/1/1999	Winter	N/A	0	0	0
Bond	1/13/1999	Winter	N/A	0	0	0
Bond	1/17/2000	Winter	N/A	0	0	0
Bond	1/28/2000	Winter	N/A	0	0	0
Bond	3/11/2000	Winter	N/A	0	0	0
Bond	12/13/2000	Winter	N/A	0	0	0
Bond	12/16/2000	Cold	N/A	1	0	0
Bond	1/26/2001	Winter	N/A	0	0	0
Bond	2/25/2002	Winter	N/A	0	0	0
Bond	12/4/2002	Winter	N/A	0	0	0
Bond	12/24/2002	Winter	N/A	0	0	0
Bond	1/1/2003	Winter	N/A	0	0	0
Bond	2/15/2003	Winter	N/A	0	0	0
Bond	2/23/2003	Winter	N/A	0	0	0
Bond	12/13/2003	Winter	N/A	0	0	0
Bond	1/25/2004	Winter	N/A	0	0	0
Bond	11/29/2006	Winter	N/A	0	0	0K
Bond	12/1/2006	Winter	N/A	0	0	0K
Bond	1/12/2007	Winter	N/A	0	0	0K

Source: NCDC

* 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 Winter Storm Hazard

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

Hazard Extent for Winter Storm Hazard

The extent of the historical winter storms listed previously varies in terms of storm extent, temperature, and ice or snowfall. Severe winter storms affect the entire jurisdiction equally.

Calculated Risk Priority Index for Winter Storm Hazard

Based on historical information, the probability of future winter storms are probable. Winter storms of varying magnitudes are expected to happen. According to the Bond County planning team's RPI assessment, winter storms ranked as the number one hazard.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
3	x	4	=	12

Vulnerability Analysis for Winter Storm Hazard

Winter storm impacts are evenly distributed across the jurisdiction; therefore the entire county is vulnerable to winter storms and can expect the same impacts within the affected area. The building exposure for Bond County, as determined from the building inventory, is included in Table 4-8.

Critical Facilities

All critical facilities are vulnerable to a winter storm. A critical facility will encounter many of the same impacts as any other buildings within the jurisdiction. These impacts include loss of gas or electricity from broken or damaged utility lines, roads and railways damaged or impassable, broken water pipes, and roof collapse from heavy snow. Table 4-7 lists the types and numbers of the essential facilities in the area. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

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 building stock within the county are similar to the damages expected to the critical facilities, including loss of gas of electricity from broken or damaged utility lines, roads and railways damaged or impassable, broken water pipes, and roof collapse from heavy snow.

Infrastructure

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

Vulnerability to Future Assets/Infrastructure for Winter Storm Hazard

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

Analysis of Community Development Trends

Because the winter storm events are regional in nature, future development will be impacted across the county. Rural areas in Bond County are particularly vulnerable due to the likely hood of long term power outages. Human service agencies, volunteer organizations, the Bond County Health Department, medical and health care facilities, and schools have definite roles to play in public education, planning, and response to extreme winter conditions.

4.4.6 Hazardous Materials Storage and Transport Hazard

Hazard Definition for Hazardous Materials Storage and Transport Hazard

Explosions result from the ignition of volatile materials such as petroleum products, natural gas and other flammable gases, hazardous materials/chemicals and dust, and explosive devices. 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 for Hazardous Materials Storage and Transport Hazard

Bond County has not experienced a significant or large-scale hazardous material incident at a fixed site or transportation route that has resulted in multiple deaths or serious injuries.

Geographic Location for Hazardous Materials Storage and Transport Hazard

The hazardous material hazards are countywide and are primarily associated with the transport of materials via highway or rail.

Hazard Extent for Hazardous Materials Storage and Transport 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.

Calculated Risk Priority Index for Hazardous Materials Storage and Transport Hazard

The possibility of a hazardous materials accident is likely, based on input from the planning team. According to the RPI, Hazardous Materials Storage and Transport ranked as the third highest hazard.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
3	x	4	=	12

Vulnerability Analysis for Hazardous Materials Storage and Transport Hazard

Hazardous material impacts are evenly distributed across the jurisdiction; therefore the entire county is vulnerable to a release associated with hazardous materials storage or transport and can expect the same impacts within the affected area. The building exposure for Bond County, as determined from building inventory, is included in Table 4-8. This plan will therefore consider all buildings located within the county as vulnerable.

Critical Facilities

All critical facilities and communities within the county are at risk. A critical facility, if vulnerable, will encounter many of the same impacts as other buildings 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 will no longer be able to serve the community). Table 4-7 lists the types and numbers of all essential facilities in the area. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Building Inventory

Table 4-8 lists the building exposure in terms of type and number 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 due to fire or explosion or debris and loss of function of the building (e.g. a damaged home will no longer be habitable causing residence to seek shelter).

Infrastructure

During a hazardous materials release, the types of infrastructure that could be impacted include roadways, utility lines/pipes, railroads, and bridges. Since a full inventory of infrastructure is not available for this plan, it is important to emphasize that any number of these items could become damaged in the event of a hazardous material release. The impacts to these items include broken, failed, or impassable roadways; broken or failed utility lines (e.g. loss of power or gas to community); and railway failure from broken or impassable railways. Bridges could fail or become impassable causing risk to traffic.

The U.S. EPA's ALOHA (Areal Locations of Hazardous Atmospheres) is a computer program designed especially for use by people responding to chemical accidents, as well as for emergency planning and training. ALOHA was utilized to assess the area of impact for an ammonia release at the intersection of Fourth Street and the CSX Railroad Line in Greenville, IL. Rail tankers commonly transport ammonia and other hazardous materials through the Greenville and other municipalities in Bond County.

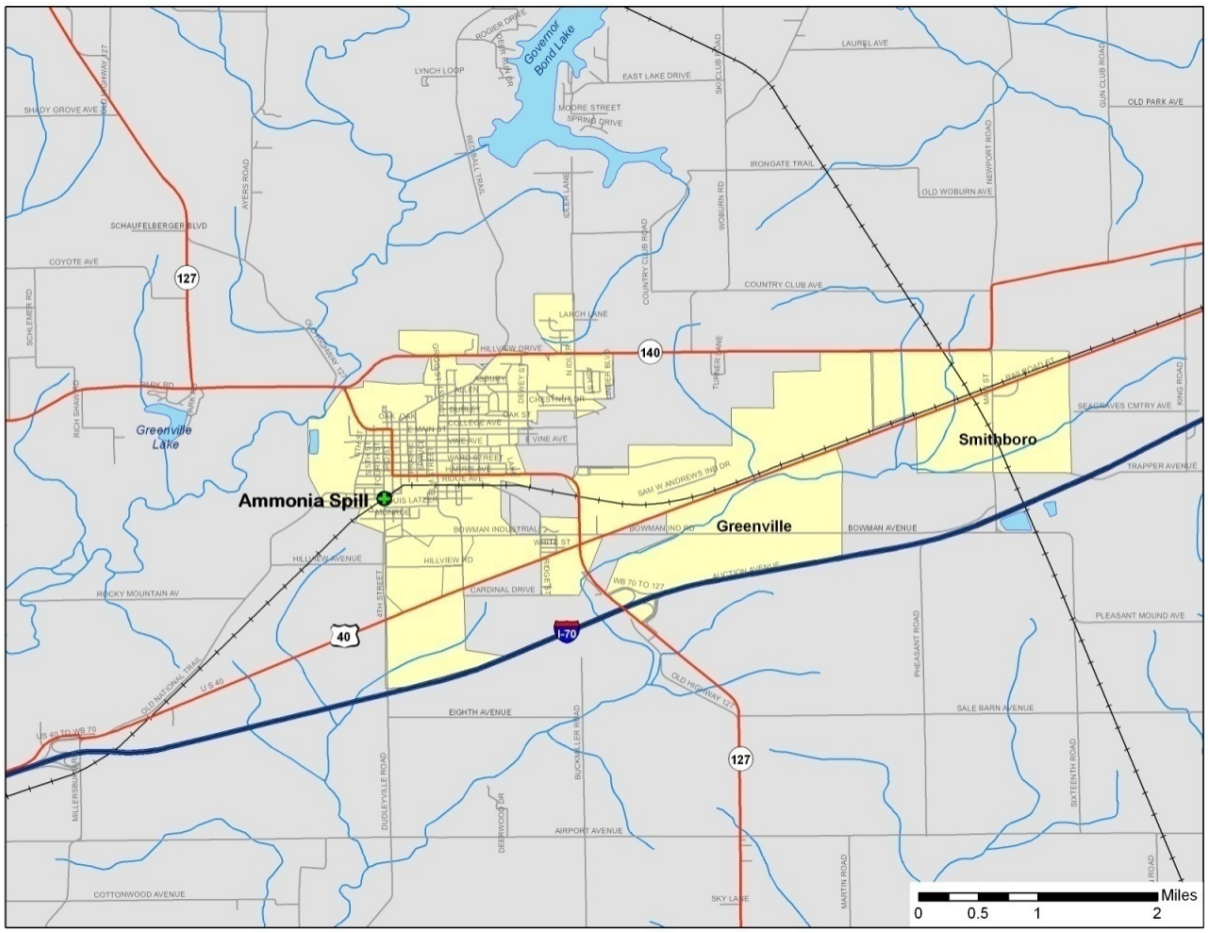
Ammonia is clear colorless liquid consisting of ammonia dissolved in water. It is corrosive to tissue and metals. Although ammonia is lighter than air, the vapors from a leak will initially hug

the ground. Long term exposure to low concentrations or short term exposure to high concentrations may result in adverse health conditions from inhalation. Prolonged exposure of containers to fire or heat may result in their violent rupturing and rocketing. Ammonia is generally used as a fertilizer, a refrigerant, and in the manufacture of other chemicals.

Source: http://cameochemicals.noaa.gov/chemical/24008

For this scenario, moderate atmospheric and climatic conditions with a slight breeze from the southwest was assumed. The target area was selected for three primary reasons: 1) the high volume of train and vehicle traffic, 2) the area is highly populated, and 3) proximity to several critical facilities. The geographic area covered in this analysis is depicted in Figure 4-10.

Figure 4-10: Location of Chemical Release



Analysis

The ALOHA atmospheric modeling parameters, depicted in Figure 4-11, were based upon a north-northwesterly wind speed of five miles per hour The temperature was 68°F with 75% humidity and partly cloudy skies.

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 with 12,408 gallons of ammonia. At the time of its release, it was estimated that the tank was 100% full. The ammonia in this tank is in a liquid state.

This release was based on a leak from a 2.5 inch-diameter hole, at the bottom of the tank.

Figure 4-11: ALOHA Plume Modeling Parameters

SITE DATA:
Location: GREENVILLE, ILLINOIS
Building Air Exchanges Per Hour: 0.34 (sheltered single storied)
Time: June 8, 2009 1635 hours CDT (user specified)

CHEMICAL DATA:
Chemical Name: AMMONIA Molecular Weight: 17.03 g/mol
ERPG-1: 25 ppm ERPG-2: 150 ppm ERPG-3: 750 ppm
IDLH: 300 ppm LEL: 160000 ppm UEL: 250000 ppm
Ambient Boiling Point: -28.9° 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: 5 knots from ssw at 10 meters
Ground Roughness: open country Cloud Cover: 5 tenths
Air Temperature: 68° F Stability Class: C
No Inversion Height Relative Humidity: 75%

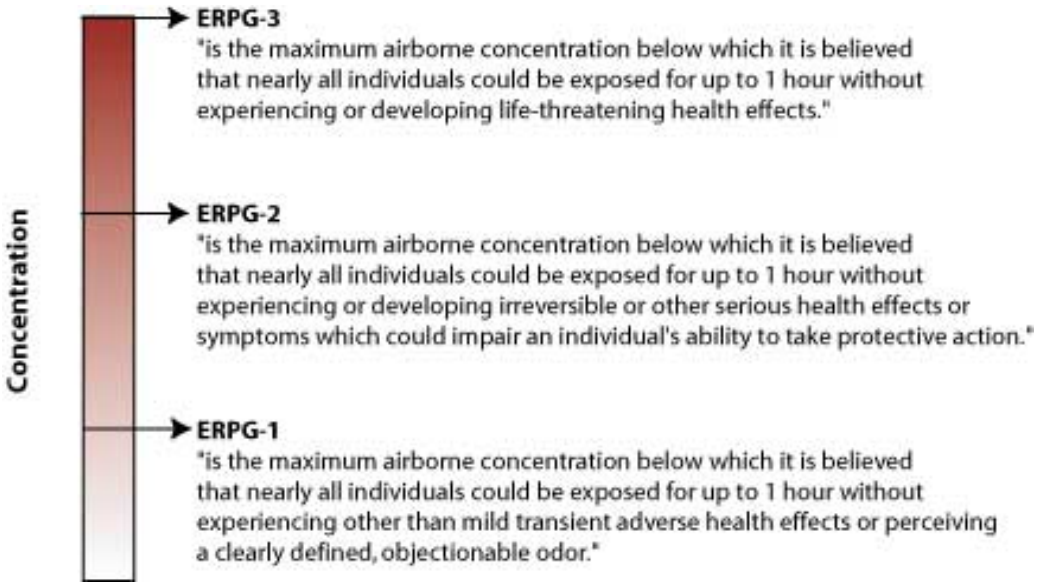
SOURCE STRENGTH:
Leak from hole in horizontal cylindrical tank
Flammable chemical escaping from tank (not burning)
Tank Diameter: 8 feet Tank Length: 33 feet
Tank Volume: 12,408 gallons
Tank contains liquid Internal Temperature: 68° F
Chemical Mass in Tank: 31.6 tons Tank is 100% full
Circular Opening Diameter: 2.5 inches
Opening is 12 inches from tank bottom
Release Duration: 15 minutes
Max Average Sustained Release Rate: 7,740 pounds/min
(averaged over a minute or more)
Total Amount Released: 60,251 pounds
Note: The chemical escaped as a mixture of gas and aerosol (two phase flow).

THREAT ZONE:
Model Run: Heavy Gas
Red : 1.4 miles --- (750 ppm = ERPG-3)
Orange: 3.5 miles --- (150 ppm = ERPG-2)
Yellow: greater than 6 miles --- (25 ppm = ERPG-1)

The Emergency Response Planning Guidelines (ERPGs) were developed by the ERPG committee of the American Industrial Hygiene Association. The ERPGs were developed as planning guidelines, to anticipate human adverse health effects caused by exposure to toxic

chemicals. The ERPGs are three-tiered guidelines with one common denominator—a one-hour contact duration. Each guideline identifies the substance, its chemical and structural properties, animal toxicology data, human experience, existing exposure guidelines, the rationale behind the selected value, and a list of references. Figure 4-12 illustrates the ERPG three-tiered guidelines.

Figure 4-12: Three-Tiered ERPG Public Exposure Guidelines



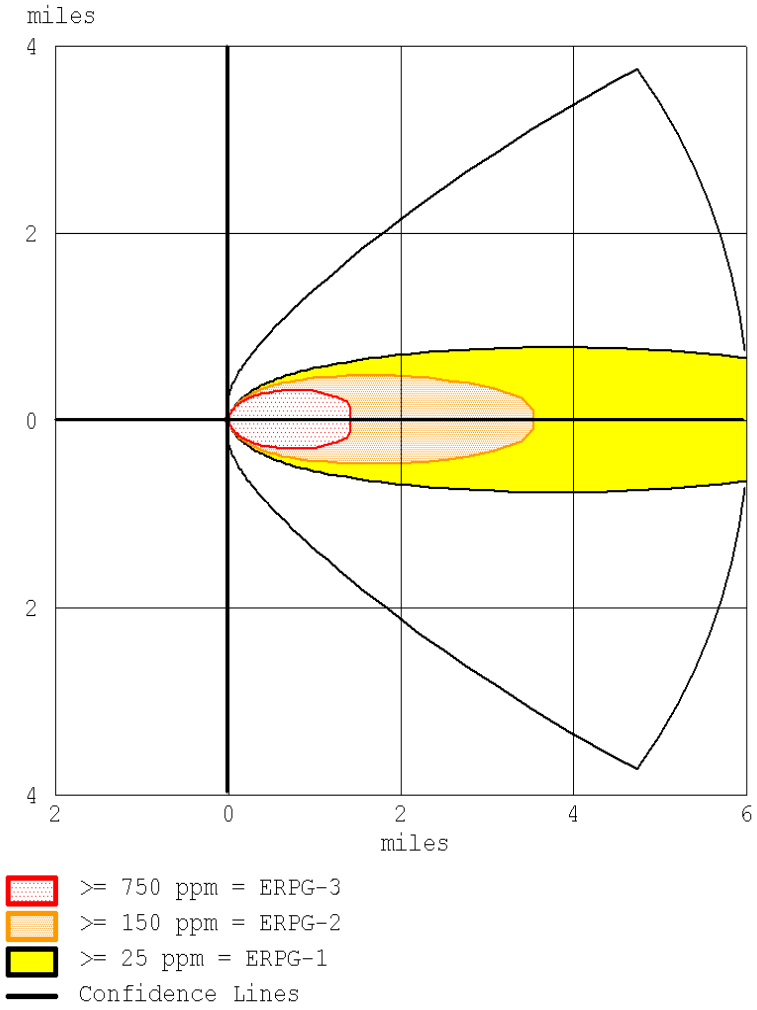
The definitions and format are from the ERPG publication.

The ERPG guidelines do not protect everyone. Hypersensitive individuals would suffer adverse reactions to concentrations far below those suggested in the guidelines. In addition, ERPGs, like other exposure guidelines, are based mostly on animal studies, thus raising the question of applicability to humans. The guidelines are focused on one period of time—one hour. Exposure in the field may be longer or shorter. However, the ERPG committee strongly advises against trying to extrapolate ERPG values to longer periods of time.

The most important point to remember about the ERPGs is that they do not contain safety factors usually incorporated into exposure guidelines such as the TLV. Rather, they estimate how the general public would react to chemical exposure. Just below the ERPG-1, for example, most people would detect the chemical and may experience temporary, mild effects. Just below the ERPG-3, on the other hand, it is estimated that the effects would be severe, although not life-threatening. The TLV differs in that it incorporates a safety factor into its guidelines, to prevent ill effects. The ERPG should serve as a planning tool, not a standard to protect the public.
Source: http://archive.orr.noaa.gov/cameo/locs/expguide.html

According to the ALOHA parameters, approximately 7,740 pounds per minute of material would be released per minute. The image in Figure 4-13 depicts the plume footprint generated by ALOHA.

Figure 4-13: Plume Footprint Generated by ALOHA

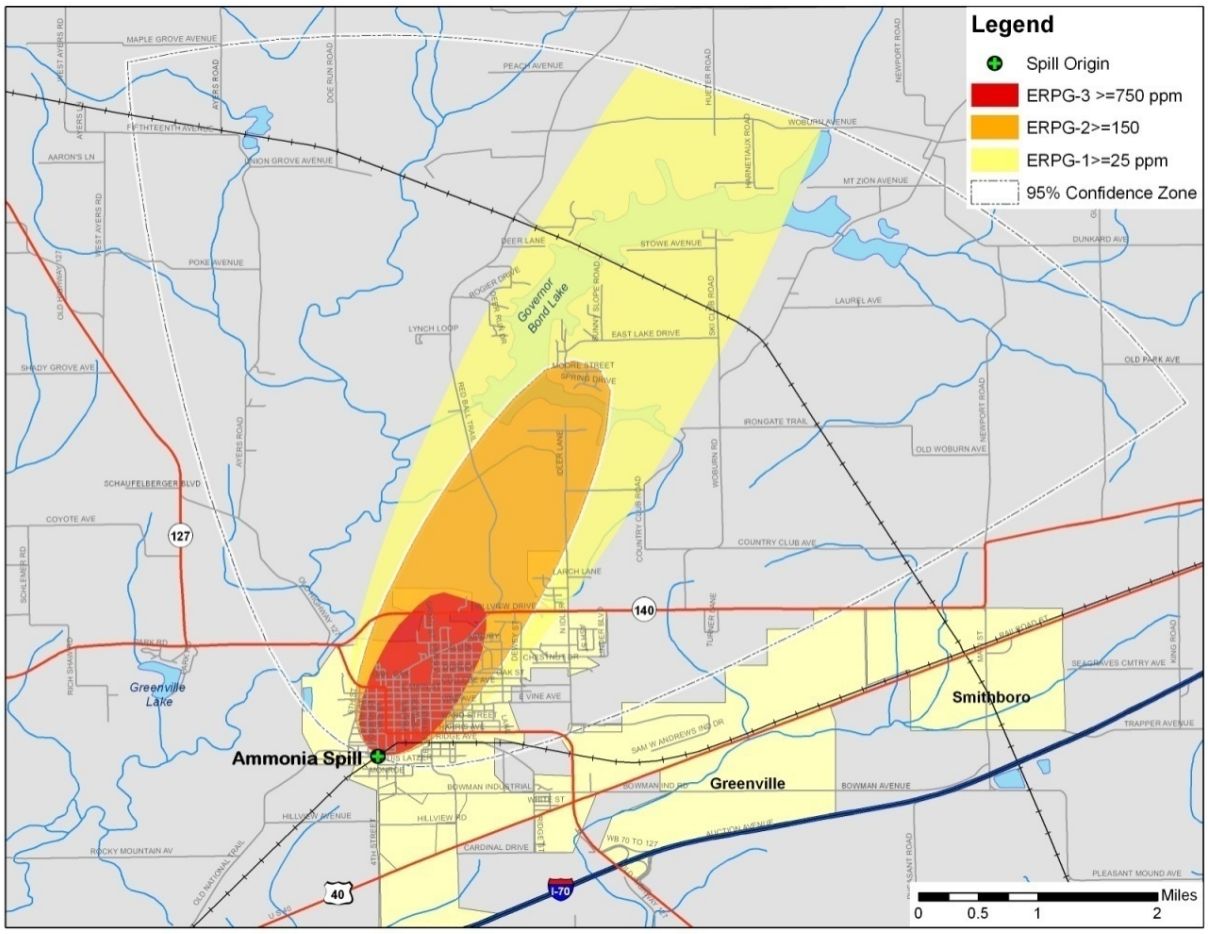


As the substance moves away from the source, the level of substance concentration decreases. Each color-coded area depicts a level of concentration measured in parts per million (ppm). For the purpose of clarification, this report will designate each level of concentration as a specific zone. The zones are as follows:

- **Zone 1** (ERPG-3): The red buffer (≥750 ppm) extends no more than 1.4miles from the point of release after one hour.
- **Zone 2** (ERPG-2): The orange buffer (≥150 ppm) extends no more than 3.2 miles from the point of release after one hour.
- **Zone 3** (ERPG-1): The yellow buffer (≥25 ppm) extends more than six miles from the point of release after one hour.
- **Zone 4** (Confidence Lines): The dashed lines depict the level of confidence in which the exposure zones will be contained. The ALOHA model is 95% confident that the release will stay within this boundary.

The image in Figure 4-14 depicts the plume footprint generated by ALOHA.

Figure 4-14: ALOHA Plume Footprint Overlaid in ArcGIS



Building Inventory Damage (HAZUS-MH Default Data)

HAZUS-MH estimates the exposure for the ammonia spill will be $385 million. The result of the analysis against the HAZUS-MH building inventory is depicted in Table 4-29.

Table 4-29: Estimated Exposure for all Zones (x1000)

Occupancy	Zone 1	Zone 2	Zone 3
Residential	$39,917	$48,377	$192,012
Commercial	$3,303	$18,428	$51,174
Industrial	$245	$64	$4,099
Agriculture	$221	$544	$ 786
Religious	$2,472	$1,798	$8,353
Government	$29	$371	$3,946
Education	$1,868	$47	$7,216
Total	**$48,055**	**$69,629**	**$267,585**

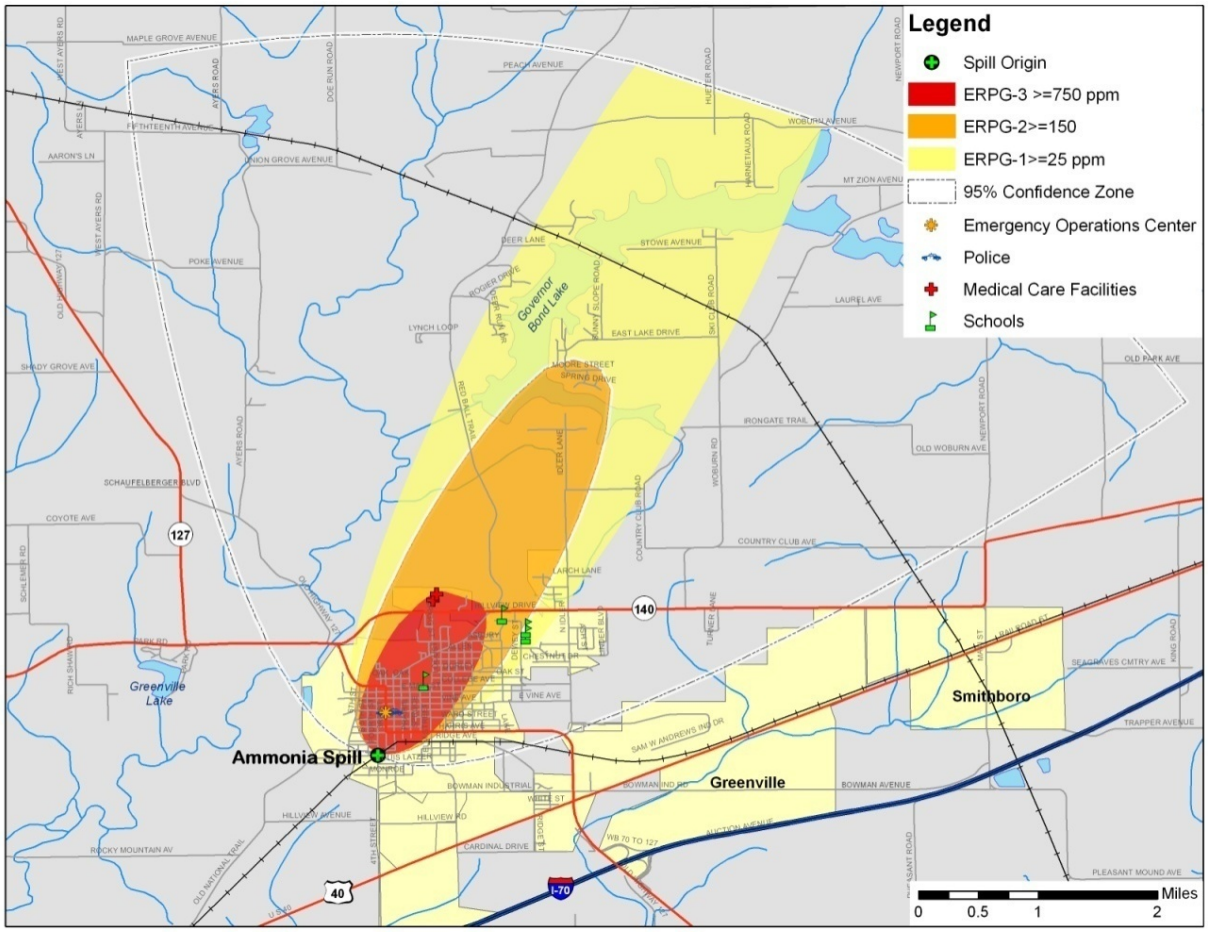
Essential Facilities Damage

There are nine essential facilities within the limits of the chemical spill plume. The affected facilities are identified in Table 4-30. Their geographic locations are depicted in Figure 4-15.

Table 4-30: Essential Facilities within Plume Footprint

Name
Greenville Civil Defense Center
Bond County Sheriff
Greenville Police Department
Fair Oaks
Edward A Utlaut Memorial Hospital
Greenville College
Greenville Elementary School
Greenville Junior High School
Greenville High School

Figure 4-15: Essential Facilities within Plume Footprint



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

A significant portion of the Johnson County's population lives in close proximity to transportation corridors such as CSX Rail Line, Norfolk Southern Rail Line, and Burlington Northern/Santa Fe Rail Lines, Interstate 70, U.S. Route 40 and Illinois State Routes 127, 140 and 143. These areas are particularly vulnerable to chemical releases because of transportation of hazardous materials.

Analysis of Community Development Trends

Because of the concentration of Bond County's Population to the transportation network, future development is likely to be vulnerable. The major transportation routes in Bond County pose a threat of dangerous chemicals and hazardous materials release Bond County will continue to provide a comprehensive means to mitigate, prepare for, respond to, and recover from hazards relating to hazardous materials releases.

4.4.7 Ground Failure Hazard

Subsidence

Subsidence in Illinois is a sinking of the land surface, usually associated with either underground mining or collapse of soil into crevices in underling soluble bedrock. Areas at risk for subsidence can be determined from detailed mapping of geologic conditions or detailed mine maps. Data sources were compiled from the Illinois Geologic Survey and Illinois Department of Natural Resources to assess the risk of subsidence in Bond County. This section provides an overview of the subsidence hazards in Illinois in general and a discussion of the potential subsidence risk for Bond County.

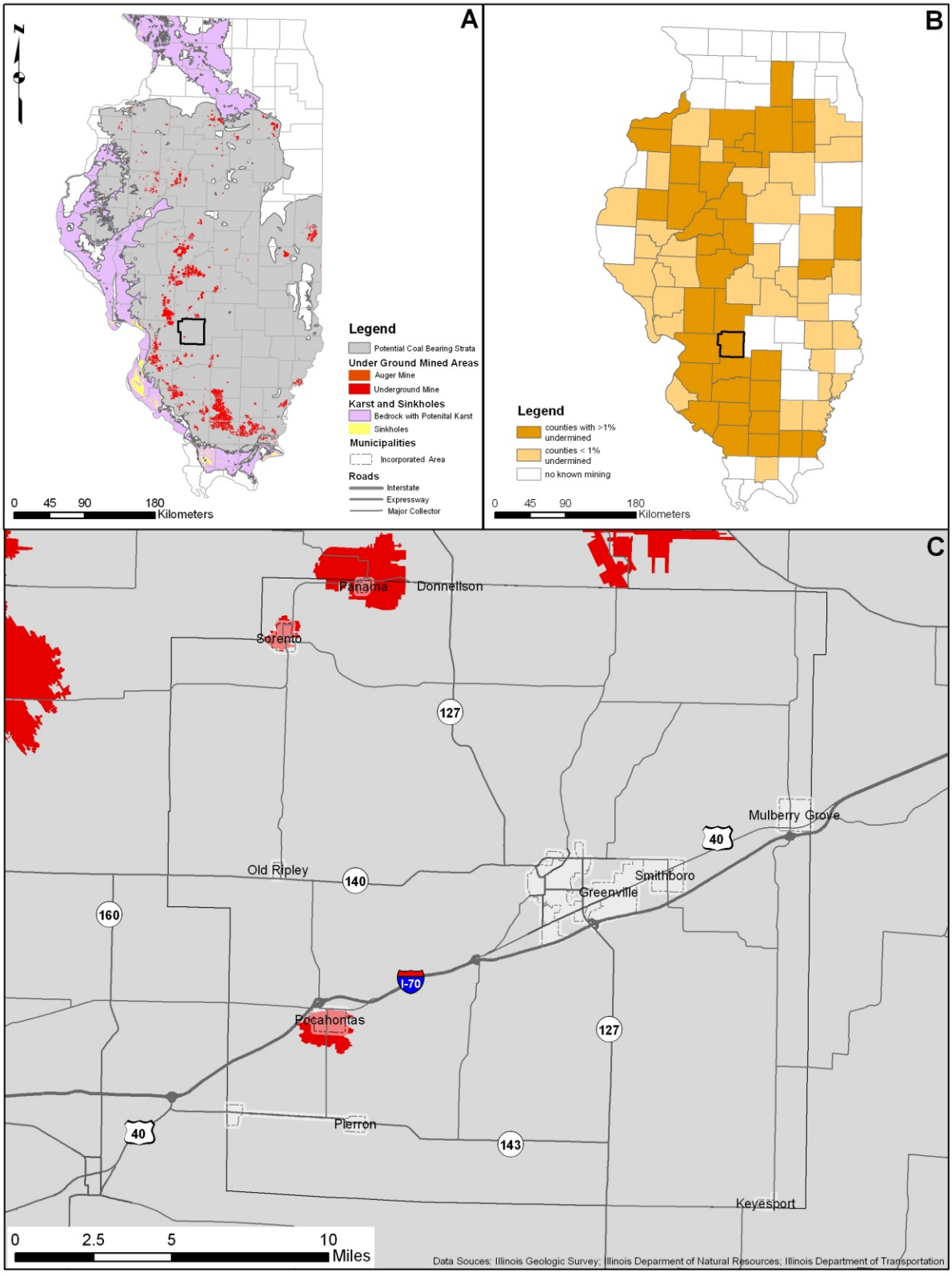
Underground Mining and Subsidence

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 approximately 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, approximately 1,050,400 acres (2.8% of the state) were 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).

Figure 4-16a shows the statewide distribution of bedrock with karst potential, coal bearing strata, sink holes, and underground mines. Figure 4-16b shows the counties which are 0, < 1%, and >1% undermined; Figure 4-16c shows the countywide distribution of bedrock with karst potential, coal bearing strata, sink holes, and underground mines.

Figures 4-16a, 4-16b, and 4-16c: Maps of Statewide and Countywide Areas with Subsidence Hazard Potential



Mining Methods

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 overburden 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 extract 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 extract material (e.g., 10 ft 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% is 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 has been removed from an area, subsidence of the overlying material is always a possibility (Bauer, 2006).

Types of Mine Subsidence

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 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 materials are unconsolidated (loose), these materials 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 of a building, under a support post of a foundation, or in another critical location. Subsidence pits should be filled to ensure that people or animals do not fall into these structures (Bauer, 2006).

Trough 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 previously discussed, 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, within a few hours or days, or gradually over a period of years. Troughs originate over places in mines where pillars have 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 relates 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 may buckle and foundation walls may be pushed inward. Buildings damaged by compressional forces typically need their foundations rebuilt and may also need to be leveled due to differential settling (Bauer, 2006).

Mine Subsidence Insurance

The Mine Subsidence Insurance, as 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).

Mine Subsidence in Bond County

All of Bond County is underlain by rock units which potentially contain coal. Analysis of the GIS data layer of active and abandoned coal mines in Illinois obtained from the Illinois Department of Natural Resources (ILDNR) revealed that 4.0 mi^2 out of Bond County's total 383.0 mi^2 (~ 1%) have been undermined. The undermined areas are located within and adjacent to the towns of Panama, Sorento, and Pocahontas.

Subsidence Related to Karst Features

Subsidence can also occur on land located over soluble bedrock. The land over such bedrock often has topography characteristics 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).

Sinkhole Formation

The karst feature most associated with subsidence is the sinkhole. A sinkhole is an area of ground with 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 slump 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 it.

Sinkhole Collapse

Sudden collapse of a sinkhole occurs when 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 continues to wash 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 to form. However this natural process can be aggravated and expedited by human activates. 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. It is also possible for construction activity to induce the collapse of near-surface voids or caves. In areas of karst bedrock, it is imperative that a proper geotechnical assessment be completed prior to construction of any significant structures. Solutions to foundation problems in karst terrain generally are expensive (White, 1988).

Sinkhole Subsidence or Collapse Potential for Bond County

Bond County is not underlain by any significant expanse of near-surface soluble bedrock (Figure 4-16c). Hence, subsidence related soluble bedrock is unlikely.

Hazard Extent for Subsidence

The extent of subsidence hazard in Bond County is a function of where current development is located relative to areas of past and present underground mining.

Calculated Risk Priority Index for Ground Failure

Based on historical information, future ground failure in the affected regions of Bond County is unlikely. According to the Bond County planning team's RPI assessment, ground failure ranked as the number seven hazard.

RPI = Probability x Magnitude/Severity.

Probability	x	Magnitude /Severity	=	RPI
1	x	1	=	1

Vulnerability Analysis for Ground Failure

The existing buildings and infrastructure of Bond County are discussed in types and numbers in Table 4-8.

Critical Facilities

Any critical facility built above highly soluble bedrock could be vulnerable to land subsidence. 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 essential facilities in the area. Critical facility information, including replacement costs, is included in Appendix F. A map of the critical facilities is included in Appendix G.

Building Inventory

Table 4-8 lists the building exposure in terms of types and numbers of buildings for the entire county. The buildings within this area can anticipate impacts similar 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

Land subsidence areas within Bond County could impact the 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 (e.g. 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.

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.

Analysis 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. Currently, Bond County reviews new development for compliance with the local zoning ordinance. Newly planned construction should be reviewed with the historical mining maps to minimize potential subsidence structural damage.

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Section 5 - Mitigation Strategy

The goal of mitigation is to reduce a hazard's future impacts including property damage, disruption to local and regional economies, and the amount of public and private funds spent to assist with recovery. The goal of mitigation is to build disaster-resistant communities. Mitigation actions and projects should be based on a well-constructed risk assessment; Bond County's is provided in Section 4 of this plan. Mitigation should be an ongoing process that adapts over time to accommodate the community's needs.

5.1 Community Capability Assessment

The capability assessment identifies current activities used to mitigate hazards. The capability assessment identifies the policies, regulations, procedures, programs, and projects that contribute to the lessening of disaster damages. The assessment also provides an evaluation of these capabilities to determine whether the activities can be improved in order to more effectively reduce the impact of future hazards. The following sections identify existing plans and mitigation capabilities within all of the communities listed in Section 2 of this plan.

5.1.1 National Flood Insurance Program (NFIP)

The county and all of its communities are members of the NFIP. As of June 18, 2007, the Federal Emergency Services Disaster Agency NFIP Insurance Report for Illinois stated that 5 households paid flood insurance, insuring $464,400 in property value. The total premiums collect amounted to $3,899 which on average was $134 annually. From 1978 to 2007, one claim was filed, totaling $2,074.

The county and all incorporated areas do not participate in the National Flood Insurance Program's (NFIP) 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 meeting the three goals of the CRS: 1) reduce flood losses; 2) facilitate accurate insurance rating; and 3) promote the awareness of flood insurance. Table 5-1 identifies each community and the date each participant joined the NFIP.

Table 5-1: Additional Information on Communities Participating in the NFIP

Community	Participation Date	FIRM Date	CRS Date	CRS Rating	Flood Plain Zoning Ordinance Adopted Last
Bond County	1/4/1985	1/4/1985	NA	NA	9/16/2003
City of Greenville	6/14/1974	8/5/1985	NA	NA	8/5/1985
Village of Donnellson	NA	NA	NA	NA	NA
Village if Keyesport	NA	NA	NA	NA	NA
Village of Mulberry Grove	NA	NA	NA	NA	NA
Village of Old Ripley	NA	NA	NA	NA	NA
Village of Panama	NA	NA	NA	NA	NA
Village of Pierron	NA	NA	NA	NA	NA
Village of Pocahontas	NA	NA	NA	NA	NA
Village of Smithboro	NA	NA	NA	NA	NA
Village of Sorento	NA	NA	NA	NA	NA

The Villages of Donnellson, Old Ripley, Pierron, Pocahontas, Smithboro, and Sorento have no identified flood hazard boundaries; therefore, the communities do not participate in the NFIP. The Villages of Keyesport, Mulberry Grove, and Panama do have indentified flood zones but, have previously chosen not to participate in the program due lack of interest or perceived need. The County will continue to educate these jurisdictions on the benefits of the program.

5.1.2 Stormwater Management Stream Maintenance Ordinance

Bond County nor its cities or villages have a storm water management plan or ordinance.

The Bond County Subdivision Ordinance (Section 504.0) does require that:

> "An adequate system of storm water drainage shall be constructed and installed, consisting of drainage ponds, pipes, tiles, manholes, inlets and other necessary facilities, that will adequately drain the subdivision and protect roadway pavements, and will prevent excess accumulation of storm water at any place under normal conditions. Open ditches should be avoided if possible. Such drainage system shall be subject to approval by the County Engineer."

The City of Greenville does not address storm water or erosion control in either the Subdivision Ordinance or the Zoning Ordinance, but the City is in the process of forming a Unified Development Ordinance which will incorporate state requirements for storm water and erosion control.

5.1.3 Zoning Management and Subdivision Control Ordinance

Bond County does have a zoning management ordinance and a subdivision control ordinance which defines what a subdivision is within the County and regulation standards on subdivision

roads. This ordinance was passed in July, 1980 and covers all unincorporated areas within the County, and those incorporated areas that are without their own subdivision ordinance.

The City of Greenville has a zoning ordinance, building codes, and a subdivision ordinance. These are currently under review and revision as a Unified Development Ordinance.

5.1.4 Erosion Management Program/ Policy

Bond County utilizes the Illinois Administrative Code Title 35 and the Illinois Environmental Protection Act, administered by the Illinois Environmental Protection Agency. This requires the submission of a storm water pollution prevention plan (SWPPP) for projects involving more than one acre of land disturbance.

5.1.5 Fire Insurance Rating Programs/ Policy

Table 5-2 lists the fire departments in Bond County, as well as the ISO rating and the number of members in each department.

Table 5-2: Listing of Fire Departments, Ratings, and Number of Firefighters

Fire Department	Fire Chief	Fire Insurance Rating	Number of Firefighters
Greenville Fire Department	William Johnston	ISO 5	40 - 45
Highland-Pierron Fire Department	Steve Plocher	ISO City 7 / Rural 9	40
Keyesport Fire Department	Duane Wiegmann	ISO City 6 / Rural 9	
Mulberry Grove Fire Department	Dwight Volkman	ISO City 8 / Rural 9	20
Pocahontas-Old Ripley Fire Department	Kendall Brink	ISO City 7 / Rural 9	26
Shoal Creek Fire Protection District	Gerald Knight	ISO 8	25
Smithboro Fire Department	Dale Deverick	ISO City 9 / Rural 10	20

5.1.6 Land Use Plan

Bond County does have a land use plan that was adopted in 1990, but has not been updated. The City of Greenville has an up-to-date land use plan that was adopted in 2004.

5.1.7 Building Codes

Bond County adopted its Building Code in August, 1976 as a guide for public building standards and it incorporates International Building Code of 2003. The Bond County Zoning Ordinance

adopted December, 1991 and Amended August, 2006, requires manufactured home compliance with Illinois law and requires tie-downs to minimize wind effects to withstand a vertical tension force of four thousand eight hundred (4,800) pounds.

The City of Greenville has adopted the International Building Code of 2003, and has adopted by reference the Environmental Barriers Act (ILCS Chapt. 410, Act 25,§§ 1 et seq.). The Greenville Zoning Code requires compliance with Illinois law (ILCS Chapt. 210, Act 115, §§ 1),for manufactured homes and requires tie-downs to minimize wind effects. There are no building codes specific to seismic control.

Table 5-3: Summary of Development Regulations in Bond County

Jurisdiction	% of County Population	Land Use Plan	Zoning Ordinance	Subdivision ordinance	Building Code	Stormwater/ Erosion control	Seismic Ordinance
Bond County	100%	1990	Revised 8/2006	1980	2008	no	no
Village of Donnellson	1.4%						
City of Greenville	40.5%	2004	1974	1974	2005	no	no
Village of Keyesport	2.6%						
Village of Mulberry Grove	3.6%						
Village of Old Ripley	0.6%						
Village of Panama	1.7%						
Village of Pierron	3.5%						
Village of Pocahontas	3.9%						
Village of Smithboro	1.3%						
Village of Sorento	3.3%						

5.2 Mitigation goals

The Bond County Emergency Services Disaster Agency, Southern Illinois University-Carbondale Geology Department, the Polis Group of IUPUI, and the Southwestern Illinois Metropolitan and Regional Planning Commission assisted the Bond County Multi-Hazard Mitigation Planning Team in the formulation of mitigation strategies and projects for Bond County. The goals and objectives set forth were derived through participation and discussion of the views and concerns of the Bond County Multi-Hazard Mitigation Team members and related public input. The MHMP will focus on these goals, with a great deal of public input, to ensure that the priorities of the communities are represented.

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 which will assist the communities

to attain the listed goals. Table 5-5 lists mitigation actions, which are defined projects that will help to complete the defined goals and objectives.

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

(a) Objective: Retrofit critical facilities with structural design practices and equipment that will withstand natural disasters and offer weather-proofing.

(b) Objective: Equip public facilities and communities to guard against damage caused by hazards.

(c) Objective: Minimize the amount of infrastructure exposed to hazards.

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

(e) Objective: Improve emergency sheltering in Bond County.

Goal 2: Create new or revise existing plans/maps related to hazards affecting Bond County

(a) Objective: Support compliance with the NFIP for each jurisdiction in Bond County.

(b) Objective: Review and update existing community plans and ordinances to support hazard mitigation.

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

Goal 3: Develop long-term strategies to educate the public on the hazards affecting Bond County

(a) Objective: Raise public awareness on hazard mitigation.

(b) Objective: Improve education of emergency personnel and public officials.

5.3 Mitigation Actions/Projects

Upon completion of the risk assessment and development of the goals and objectives, the Planning Committee was provided with a list of the six mitigation measure categories from the *FEMA State and Local Mitigation Planning How to Guides*. The measures are listed as follows.

- **Prevention:** Government, administrative, or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.

- **Property Protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from the hazard area. Examples include acquisition, elevation, structural retrofits, storm shutters, and shatter-resistant glass.

- **Public Education and Awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.

- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

- **Emergency Services:** Actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.

- **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

After Meeting #3, held June 24, 2009 MHMP members were presented with the task of individually listing potential mitigation activities using the FEMA evaluation criteria. The MHMP members brought their mitigation ideas to Meeting #4, which was held September 2, 2009. The evaluation criteria (STAPLE+E) involved the following categories and questions.

Social:

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

Technical:

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

Administrative:

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

Political:

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

Legal:

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

Economic:

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

Environmental:

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

The development of the MHMP is the first step in a multi-step process to implement projects and policies to mitigate hazards in the county and its communities.

5.3.1 Completed or Current Mitigation Actions/Projects

Since this is the first mitigation plan developed for Bond County, there are no deleted or deferred mitigation items. The following tables will refer to completed, ongoing, or future mitigation actions. Table 5-4 presents the completed and ongoing mitigation actions and projects in the county.

Table 5-4: Completed or Current Mitigation Actions

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Comments
Compile a database of community members with special needs	**Goal:** Create new or revise existing plans/maps for Bond County **Objective:** Conduct new studies/research to profile hazards and follow up with mitigation strategies.	Tornado, Flood, Thunderstorm, Winter Storm	Mulberry Grove	This strategy is complete.
Establish warming and cooling centers.	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Improve emergency sheltering in Bond County.	Winter Storm	Greenville	This strategy is complete.
Implement a countywide ordinance requiring mobile homes to have tie-downs	**Goal:** Create new or revise existing plans/maps for Bond County **Objective:** Review and update existing, or create new, community plans and ordinances to support hazard mitigation.	Tornado, Thunderstorm	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	This strategy is complete.
Procure NOAA weather warning radios for schools and hospitals throughout the county	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Equip public facilities and communities to guard against damage caused by secondary effects of hazards.	Tornado, Flood, Thunderstorm, Winter Storm	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	This strategy is complete.

5.4 Implementation Strategy and Analysis of Mitigation Projects

Implementation of the mitigation plan is critical to the overall success of the mitigation planning process. The first step is to decide based upon many factors, which action will be undertaken initially. In order to pursue the top priority first, an analysis and prioritization of the actions is important. Some actions may occur before the top priority due to financial, engineering, environmental, permission, and/or 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.

In Meeting #4, the planning team prioritized mitigation actions based on a number of factors. A rating of High, Medium, or Low was assessed for each mitigation item and is listed next to each item in Table 5-6. The factors were the STAPLE+E (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) criteria listed in Table 5-5.

Table 5-5: STAPLE+E planning factors

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

For each mitigation action related to infrastructure, new and existing infrastructure was considered. Additionally, the mitigation strategies address continued compliance with the NFIP. While an official cost benefit review was not conducted for any of the mitigation actions, the estimated costs were discussed. The overall benefits were considered when prioritizing mitigation items from High to Low. An official cost benefit review will be conducted prior to the implementation of any mitigation actions. Table 5-6 presents mitigation projects developed by the planning team.

Table 5-6: Mitigation Strategies

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Establish a mutual aid response agreement	**Goal:** Develop long-term strategies to educate Bond County residents on the hazards affecting their county **Objective:** Improve education and training of emergency personnel and public officials	Hazmat	Bond County	High	The ESDA Director will work with local resources to establish the agreement. If resources are available, implementation will begin within one year.
Procure generators, transfer switches, and portable heaters for warming centers	**Goal:** Lessen the impacts of hazards to individuals and infrastructure **Objective:** Improve emergency sheltering in Bond County.	Winter Storm	Bond County, Sorento	High	The ESDA Director will oversee implementation of this project. Funding has not been secured as of 2009, but the PDM program and community grants are possible funding sources. If funding is available, implementation will begin within one year.

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Submit application to join the NFIP	**Goal:** Create new or revise existing plans/maps for Bond County **Objective:** Support compliance with the NFIP for each jurisdiction in Bond County.	Flood	Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	High	Only the county and the City of Greenville currently participate in the NFIP. The county Floodplain Manger and ESDA will work with representatives from other communities, as well as IEMA and FEMA, to encourage the remaining communities in the county to participate in the program.
Purchase signage for roads that flood frequently: Shoal Creek Road (Sorento), Old Ripson Road (Sorento), Trestle Road (Panama)	**Goal:** Lessen the impacts of hazards to individuals and infrastructure **Objective:** Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county.	Flood	Sorento, Panama	High	The ESDA Director and County Engineer will oversee this project and will seek funding from resources such as ILDOT or the PDM program. If funding is available, implementation will begin within one year.
Construct safe houses in key locations within the county	**Goal:** Lessen the impacts of hazards to individuals. **Objective:** Improve emergency sheltering in Bond County.	Tornado, Thunderstorm	Sorento, Smithboro, Mulberry Grove	High	The ESDA Director will work with local shelters to complete this project. The PDM program or local resources are funding options. If funding is available, implementation will begin within one year.
Conduct an engineering study to investigate redundancy in public water supply	**Goal:** Create new or revise existing plans/maps for Bond County **Objective:** Conduct new studies/research to profile hazards and follow up with mitigation strategies.	Flood	Bond County	Medium	The ESDA Director or County Engineer will oversee this project and will work with IDNR on the engineering aspects. The county will seek a planning grant from IDNR or community improvement programs. If funding is available, implementation will begin within three years.
Improve drainage in key communities in the county	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Minimize the amount of infrastructure exposed to hazards.	Flood	Bond County, Sorento, Smithboro, Mulberry Grove	Medium	The ESDA Director will work with local drainage districts, IDOT, IDNR, U.S. Army Corps of Engineers to evaluate the current conditions of the county's waterways and drainage and develop a plan. Funding has not been secured as of 2009, but county, state, and federal funding will be sought. Implementation will begin within three years.

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Establish an LEPC and write a CEMP for all hazards	**Goal:** Develop long-term strategies to educate Bond County residents on the hazards affecting their county **Objective:** Improve education and training of emergency personnel and public officials.	Tornado, Flood, Earthquake, Thunderstorm, Winter Storm, Hazmat, Subsidence	Bond County	Medium	The ESDA Director will work with local officials to establish an LEPC. Seeking assistance from IEMA, the LEPC and FEMA will write a CEMP for the county's hazards. If resources are available, implementation will begin within three years.
Implement Nixle for mass media release via e-mail and text messages	**Goal:** Lessen the impacts of hazards to individuals and infrastructure **Objective:** Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county.	Tornado, Flood, Earthquake, Thunderstorm, Winter Storm, Hazmat, Subsidence	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	Medium	The ESDA Director will oversee this project. Local resources will be used to implement the project and notify the public. If resources are available, this project will begin within three years.
Develop a public education program to present at public events, e.g. county fair, and in schools	**Goal:** Develop long-term strategies to educate Bond County residents on the hazards affecting their county **Objective:** Raise public awareness on hazard mitigation.	Tornado, Flood, Earthquake, Thunderstorm, Winter Storm, Hazmat, Subsidence	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	Medium	The ESDA Director will oversee this project. Local resources will be used to develop educational literature and present to each jurisdiction at public events or in schools. If resources are available, the project will be implemented within three years.
Create maps of undermined areas in the county	**Goal:** Create new or revise existing plans/maps for Bond County **Objective:** Review and update existing, or create new, community plans and ordinances to support hazard mitigation.	Subsidence	Bond County	Medium	The ESDA Director with assistance from the county engineer will oversee this project. The county will seek assistance from IDNR. If funding is available, implementation will begin within three years.
Trim trees to minimize the amount/duration of power outages	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Minimize the amount of infrastructure exposed to hazards.	Winter Storm	Bond County	Low	The ESDA Director will work with local power cooperatives or companies for implementation of this project. Funding has not been secured as of 2009, but the PDM program, ILDOT, or IEMA are possibilities. If funding is available, implementation will begin within five years.

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Compile a database of 4x4 vehicles for transportation of people and supplies	**Goal:** Create new or revise existing plans/maps for Bond County **Objective:** Conduct new studies/research to profile hazards and follow up with mitigation strategies.	Winter Storm	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	Low	The ESDA Director will oversee this project and will work with local resources and IDNR. Local resources will be used to create and maintain the database. If resources are available, implementation will begin within five years.
Procure back-up generators for critical facilities	**Goal:** Lessen the impacts of hazards to individuals and infrastructure **Objective:** Equip public facilities and communities to guard against damage caused by secondary effects of hazards.	Flood, Tornado, Earthquake, Thunderstorm, Winter Storm	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	Low	The ESDA Director will oversee the implementation of this project. Funding has not been secured as of 2009, but the pre-disaster mitigation program and community development grants are possible funding sources. If funding is available, this project is forecasted to begin within five years.
Establish backup power for warning sirens	**Goal:** Lessen the impacts of hazards to individuals and infrastructure **Objective:** Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county.	Tornado, Flood, Thunderstorm, Winter Storm	Mulberry Grove, Smithboro, Sorento	Low	The ESDA Director oversees the implementation of the project. Local resources will be used to research options for backup power. Additional funding will be sought from other funding sources, e.g. PDM program. Implementation, if funding is available, is forecasted to begin within five years.
Develop a program to distribute weather radios to all critical facilities	**Goal:** Lessen the impacts of hazards to individuals and infrastructure **Objective:** Equip public facilities and communities to guard against damage caused by secondary effects of hazards.	Flood, Tornado, Thunderstorm, Winter Storm	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento)	Low	The ESDA Director will oversee implementation of this project. Local resources will be used to determine how many radios are needed and when/where to distribute them. Funding has not been secured as of 2009, but the PDM program and community grants are an option. Implementation, if funding is available, will begin within five years.
Begin storm sewer construction	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Minimize the amount of infrastructure exposed to hazards.	Flood	Sorento	Low	The county engineer will work with IDOT and IDNR to evaluate the current conditions of the community's sewer system and develop a plan. Funding has not been secured as of 2009, but county, state, and federal funding will be sought. Implementation will begin within three years.

The Bond County Emergency Services Disaster Agency will be the local champions for the mitigation actions. The county commissioners and the city and town councils will be an integral part of the implementation process. Federal and state assistance will be necessary for a number of the identified actions. Southern Five Regional Planning Commission is qualified to provide technical grant writing services to assist the county in seeking resources to achieve the recommended mitigation action.

5.5 Multi-Jurisdictional Mitigation Strategy

As a part of the multi-hazard mitigation planning requirements, at least two identifiable mitigation action items have been addressed for each hazard listed in the risk assessment and for each jurisdiction covered under this plan.

Each of the 10 jurisdictions, including Bond County, were 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 this plan. The county planning team used FEMA's evaluation criteria to gauge the priority of all items. A final draft of the disaster mitigation plan was presented to all members to allow for final edits and approval of the priorities.

Section 6 - Plan Maintenance

6.1 Monitoring, Evaluating, and Updating the Plan

Throughout the five-year planning cycle, the Bond County Emergency Service and Disaster Director will reconvene the MHMP planning committee to monitor, evaluate, and update the plan on an annual basis. Additionally, a meeting will be held during March 2015 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 arises, due to new developments or a declared disaster, the team will meet as necessary to update mitigation strategies. Depending on grant opportunities and fiscal resources, mitigation projects may be implemented independently by individual communities or through local partnerships.

The committee 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 committee will also review the risk assessment portion of the plan to determine if this information should be updated or modified. 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 county commissioners.

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, this updated data will be used for future risk assessments and vulnerability analyses.

6.2 Implementation through Existing Programs

The results of this plan will be incorporated into ongoing planning efforts. Many of the mitigation projects identified as part of this planning process are ongoing. Where needed, modifications will be made to the county and community planning documents and ordinances as part of regular updates. The mitigation plan will be used to help guide building code changes and land use planning.

6.3 Continued Public Involvement

Continued public involvement is critical to the successful implementation of the MHMP. Comments from the public on the MHMP will be received by Bond County Emergency Management Director and forwarded to the MHMP planning committee for discussion. Education efforts for hazard mitigation will be ongoing through the local television stations, brochures, and yearly public meetings. Once adopted, a copy of this plan will be posted in the library and on the county website.

Glossary of Terms

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

B

BFE – Base Flood Elevation

C

CAMEO – Computer-Aided Management of Emergency Operations
CEMA – County Emergency Services Disaster Agency
CEMP – Comprehensive Emergency Management Plan
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

E

EAP – Emergency Action Plan
ERPG – Emergency Response Planning Guidelines
EMA – Emergency Services Disaster Agency
EPA – Environmental Protection Agency
ESDA - Emergency and Disaster Services

F

FEMA – Federal Emergency Services Disaster Agency
FIRM – Flood Insurance Rate Maps
FIS – Flood Information Study

G

GIS – Geographic Information System

H

HAZUS-MH – **Ha**zards **US**A **M**ulti-**H**azard
HUC – Hydrologic Unit Code

I

IDNR – Illinois Department of Natural Resources
IEMA – Illinois Emergency Services Disaster Agency

L

LEPC - Local Emergency Planning Committee

M

MHMP – Multi-Hazard Mitigation Plan

N

NCDC – National Climatic Data Center
NEHRP – National Earthquake Hazards Reduction Program
NFIP – National Flood Insurance Program
NOAA – National Oceanic and Atmospheric Administration

P

PPM – Parts Per Million

R

RPI – Risk Priority Index

S

SPC – Storm Prediction Center
SWPPP – Stormwater Pollution Prevention Plan
SIUC - Southern Illinois University, Carbondale

–

T

TEEL - Temporary Emergency Exposure Limit

U

USGS – United States Geological Survey

Appendices

Appendix A – Minutes of the Multi-Hazard Mitigation Planning Team Meetings

Pre-Disaster Mitigation Plan Minutes

Planning Program Oversight Meeting:
County Board Chairs, Emergency Services & Disaster Agency Coordinators, Southwestern Illinois Metropolitan and Regional Area Planning Commission, SIUC Geology Department, and IUPUI-Polis

Meeting Date: Tuesday, April 29, 2008

Meeting Time: 1 hour 30 minutes

Place: Clinton County Courthouse Boardroom

Attendance:

Dave Coats, POLIS
John Buechler, POLIS
Nicholas Pinter, SIUC Geology
Andy Flor, SIUC Geology
Harvey Hanson SIUC Geology
Kevin Terveer, Southwestern Ill Metro and Regional Area Planning Commission (SIMAPC)
Linda Tragesser, Southwestern Ill Metro and Regional Area Planning Commission (SIMAPC)
Jill Franks, Bond County Board Chair
Ray Kloeckner, Clinton County Board Chairman
Allan Davis, Bond County ESDA
Richard Crocker, Clinton County ESDA

The meeting was called to order.

Dave Coats (associate director) and John Buechler (project manager) from IUPUI, Polis Center explained the Pre-Disaster Mitigation Planning Project. It was explained that FEMA, based on Federal legislation passed in 2000, required that all incorporated communities must have a Pre-Disaster Mitigation Plan in place to be eligible for FEMA mitigation funding. They also explained that a 25% match was needed to receive funding. John Buechler stated that the value of the GIS data and sweat equity that will be put into developing this plan would satisfy the match. He also expresses the importance of tracking and documenting the time spent on the project by each volunteer working on the project.

Dave Coats and John Buechler explained the process for developing the plan and that it will require a total of six meetings in each of the counties. They went into great detail about each of the meeting and the issues that would be addressed. They also estimated that the complete process of developing the plan would take about one year. Lastly, they introduced

a website that the planning team will use to organize meeting, post documents, and to access minutes throughout the planning process.
Dr. Nicholas Pinter (SIUC Geology) introduced the team and explained the role that SIUC will play in planning process. SIUC will be providing all the technical mapping throughout the planning process.

There was a general discussion about the agreement that will need to be made about the restricted use of the GIS data needed for the project. Andy Flor, Nicholas Pinter, Dave Coats, and John Buechler all confirmed that a Memorandum of Understanding would be created and sent to each county for review and acceptance. All the County Board Chairmen expressed their concerns with the discretion of the use of the GIS data asked how the planning team would be selected. Dave Coats responded and said that a list of affiliations is provided for ideal team member candidacy. He explained that the Emergency Management Agency is typically selected as the chair of the planning team. Lastly, he mentioned that the planning team must be officially recognized by the County Board. Nicholas Pinter added that as soon as a planning team is assembled the first meeting can be scheduled.

After a few questions that clarified the planning process and the presentation of example planning documents of Posey County, Indiana the meeting was adjourned.

Meeting was adjourned.

BOND COUNTY MEMORANDUM OF UNDERSTANDING (MOU)

IEMA
Illinois Emergency Management Agency

Pat Quinn, Governor
Andrew Velasquez III, Director

May 18, 2009

Honorable Jill Franks, County Board Chairperson

Dear Chairperson Franks:

The Southwestern Illinois Metropolitan and Regional Planning Commission, Southern Illinois University Carbondale, and the Polis Center at IUPUI are assisting Bond County with developing a Pre-Disaster Mitigation Plan. This study involves analyzing losses for buildings in the event of an earthquake, flood, or any other disaster. Your county is providing modeling data as a match for federal grant dollars. To analyze property at risk, we require the following information from your tax assessment system.

- Building Improvement value
- Land Improvement value
- Construction type (wood, etc.)
- Property Use
- Total square footage
- Basement square footage
- Property address
- Property City

In addition, Southern Illinois University Carbondale and the Polis Center require existing mapping information to accurately map the losses. This includes roads, parcels, and addresses. As part of the analysis, we will prepare data on the county's essential facilities and provide this back to the county for its future use. The data will be stored on a university server which will only be accessed by university modeling staff. This data will only be used to create the Pre Disaster Mitigation Plans and will not be disseminated or provided to any agency or organization.

Your cooperation in this data sharing and pre-disaster mitigation planning process will reduce loss of life and property damage resulting from a potential disaster. Please provide your written approval to Illinois Emergency Management Agency with a copy to Southern Illinois University Carbondale.

Sincerely

Ron Davis
State Hazard Mitigation Officer

Jill Franks, Bond County
Board Chairperson

EMAP Accredited

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Multi-Hazard Mitigation Plan Minutes

Bond County Planning Team
Assembly of the Bond County Planning Team, Meeting #1:

Chairman & Primary Point of Contact: Allan Davis, Bond County ESDA Coordinator
Plan Directors: Southwestern Illinois Metro & Regional Planning Commission, SIUC Geology
Department, and IUPUI-Polis

Meeting Date: Tuesday, December 2, 2008, at 7:00 p.m.

Meeting Time: 1.5 hours

Place: Bond County Courthouse, County Board Room

Planning Team/Attendance:

Allan Davis, Coordinator Bond County ESDA and 911-Board / City of Greenville
Jill Franks, Bond County Board Chair
Jonathan Remo SIUC Geology
Nicholas Pinter SIUC Geology
Dave Coats Polis Center
John Buechler Polis Center
Kevin Terveer, Southwestern Illinois Metro & Regional Planning Commission
Dale R. Deverick, Smithboro Village Fire Chief
Tom Hoffmann, Greenville Regional Airport / Keyesport Fire Protection District
Steve Plocher, Fire Chief, Highland-Pierron Fire Protection District/ Village of Pierron

The meeting was called to order.

Introduction to the Multi-Hazard Mitigation Planning Process

An outline of the pre-disaster mitigation planning process was presented by John Buechler, Dave Coats, and Nicholas Pinter.

Dave Coats introduced the Planning Team Website. A username and password was given to the
planning team to access the web site. He explained that this website is used to schedule meeting
dates, contact information and to download material pertaining to the planning process.

Dave Coats noted that there are several components to the planning process. The 1st phase is to organize all the resources. The primary resource is the planning team members. Other resources will include GIS Data and Data from the Supervisor of Assessments Office.

This project is funded by a match grant from FEMA. A twenty-five percent local match will be required from each county to fund this project. The match will be met by sweat equity and GIS
data acquired from each county. Sweat equity will be an accumulation of time spent at the meetings, on research assignments, surveys, time spent reviewing a document and time spent
producing the planning document. The value of the match is estimated to be $10,000 to $15,000.

The 2nd phase is to assess the risk of the hazards that are present in the county. A profile of the
county will be provided by Southwestern Illinois Metro & Regional Planning Commission. Phase 3 of this planning process is to develop a strategy and the projects that the county is interested in. Phase four is the implementation of those strategies over a period of time and monitoring their progress.

Nicholas Pinter added that this is not just an intellectual process. There will be work and research that will need to be performed to finish this project and to get funding for potential projects that result from this plan.

Dave Coats stated that FEMA will not provide funding for projects where the county has not
produced a Pre-disaster Mitigation Plan. In the 1st meeting, the planning team will review and will be asked to research the location of all critical facilities within the county. He also discussed a plan for public participation. He explained that all of the meetings are open to the public but there will be a particular effort made to invite the public to the 3rd meeting when the plan is in draft form. At that meeting, SIUC Geology staff will discuss the geology of the area and several facts about this particular county.

In the 2nd meeting, a discussion will focus on disasters that are prone to this area. These hazards will be given a probability rating and ranked in a probability hierarchy. Polis and SIUC Geology
will research these hazards and rank them. A special effort to encourage the public to attend and participate in the 3rd meeting . The Polis and SIUC Geology staff will produce a risk assessment in draft form; each planning team member will get a copy. Strategies and projects will be presented that FEMA and other counties have undertaken.

The 4th meeting consists of a brain storming session focused on the disasters that were modeled and what was learned about them through the analysis of the Chapter 4. The Planning Team will consider strategies and projects mitigate potential loss and damage. FEMA requires that for every identified potential hazard, a strategy to mitigate the loss and damage must be in place. The strategies may range from educational awareness to

hardening a building or constructing a levee. Following that meeting, the plan will be in final draft form.

At the 5th meeting the planning team will review and adopt the plan prior to forwarding it to IEMA. IEMA will review the plan and will make recommendations to it as they see fit and then
it is submitted to FEMA for review and approval. Once it is approved by FEMA, the plan is sent back to the county.

At the 6th meeting the planning team will present the plan to the Bond County Board to be adopted. Every incorporated community must have one of these plans, or the communities may be included under the umbrella of the county plan. In order for that to happen, communities are encouraged to participate and contribute to plan development. Once the County Board has adopted the plan, each incorporated community will need to adopt the plan as well. Once the plan has been submitted to FEMA, local governments are eligible to apply for grants to mitigate
these established hazards.

With remarks concluded, and no further discussion, the meeting was adjourned.

December 2, 2008

Bond Cty - Hazard Mit Plan

Attendance

Kevin Tesreau	SIMAPC
Jeff Frank	Bond Co. Emer
Dale R. Deverick	Smithboro Fire, Village
Tom Hoffmann	Greenville Regional / Keyesport FPD
Allan Davis	Bond Co 9-1-1 / EMA
Steve Plocher	Highland Pierron FPD / Pierron

Multi-Hazard Mitigation Plan Minutes

Bond County Identification and Prioritization of Disasters: Meeting #2 :

Chairman & Primary Point of Contact: Allan Davis, Bond County ESDA Coordinator
Plan Directors: Southwestern Illinois Metro & Regional Planning Commission, SIUC Geology
Department, and IUPUI-Polis

Meeting Date: Wednesday, May 5, 2009, at 7:00 p.m.

Meeting Time: 1.5 hours

Place: Bond County Board Room

Planning Team/Attendance:

Jill Franks, Bond County Board Chairman
Jonathan Remo, SIUC Geology
Nicholas Pinter, SIUC Geology
Dave Coats, Polis
John Buechler, Polis
Allan Davis, Bond County County ESDA
Hiram Renfro, Village of Donnellson
Lora Kennedy, Village of Smithboro
Linda Tragesser, Southwestern Illinois Metro & Regional Planning Commission

The meeting was called to order.

Hazard Identification and Prioritization

Nicholas Pinter of The SIU-C Geology Department advised the group that the purpose of Meeting #2 is to identify hazards and risks that threaten the citizens, facilities, and infrastructure that have been identified for Bond County in our previous meetings. The previous Bond County Comprehensive Emergency Management Plan (CEMP) did not contain a risk analysis. Additional local planning documents were reviewed to identify historical hazards and help identify risk, FIRM maps were discussed for the flood analysis.

The planning team developed and ranked a list of hazards that affect the county. The team identified

1. severe thunderstorms with tornadoes
2. winter storms
3. earthquakes, and
4. flooding which occurs on an annual basis during the spring.

The team also identified Bond County's principal technological hazards (in order of likelihood):

1) land transportation accidents with hazardous material release,
2) mine subsidence, and
3) dam failure.

In addition to these identified hazards, the MHMP planning committee reviewed the list of natural hazards prepared by FEMA, and historical storm event data was compiled from the National Climatic Data Center. This NCDC data included 192 reported events in Bond County between December 2, 1950 and April 2, 2008.

Dr. Pinter advised that in addition to NCDC data, Storm Prediction Center (SPC) data associated with tornadoes, strong winds, and hail will be plotted in the display maps that will be provided at the Public Meeting.

The Climatic Data Center listed the following hazards for Bond County:

1. Tornadoes
2. Severe Thunderstorms
3. Drought/Extreme Heat
4. Winter Storms
5. Flood/Flash Floods

Based on planning team inputthese hazards ranked the highest based on the Risk Priority Index discussed :

Tornado
Winter Storms
Tornadoes
Hazardous Material Release /Transportation
Severe Thunderstorms
Earthquakes
Flooding
Mine Subsidence
Dam Failure

Calculating the Risk Priority Index

The first step in determining the Risk Priority Index (RPI) was to have the planning team members generate a list of hazards which have befallen or could potentially befall their community. Next, the planning team members were asked to assign a likelihood rating based on the criteria and methods described in the following table. This ranking was based upon previous history and the definition of hazard. Using the definitions given, the likelihood of future events is "Quantified" which results in the classification within one of the four "Ranges" of likelihood.

Probability	Characteristics
4 - *Highly Likely*	Event is probable within the calendar year. Event has up to 1 in 1 year chance of occurring. (1/1=100%) History of events is greater than 33% likely per year.
3 - *Likely*	Event is probable within the next three years. Event has up to 1 in 3 years chance of occurring. (1/3=33%) History of events is greater than 20% but less than or equal to 33% likely per year.
2 - *Possible*	Event is probable within the next five years. Event has up to 1 in 5 years chance of occurring. (1/5=20%) History of events is greater than 10% but less than or equal to 20% likely per year.
1 - *Unlikely*	Event is possible within the next ten years. Event has up to 1 in 10 years chance of occurring. (1/10=10%) History of events is less than or equal to 10% likely per year.

Next, planning team members were asked to consider the potential magnitude/severity of the hazard according to the severity associated with past events of the hazard.

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.
2 - *Limited*	Injuries and/or illnesses do not result in permanent disability. Complete shutdown of critical facilities for more than
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.

Finally, the RPI was calculated by multiplying the probability by the magnitude/severity of the hazard. Using these values, the planning team members where then asked to rank the hazards. The following shows the RPI and ranking for each hazard facing Bond County as determined by the discussion of the planning team members.

Hazard	Probability	Magnitude/Severity	Risk Priority Index	Rank
Winter Storms	3 - Likely	4 -Critical	12	1
Tornado	3 - Likely	4 - Critical	12	2
Hazardous Material Release	3 - Likely	4 - Critical	12	3
Severe Thunderstorms	4- Highly Likely	2 - Limited	8	4
Earthquakes	2 - Possible	4 - Critical	8	5
Flooding	2 - Possible	1 - Negligible	2	6
Mine Subsidence	1 -Unlikely	1 - Negligible	1	7
Dam Failure	1 -Unlikely	1 - Negligible	1	8

The jurisdictions in Bond County differ in their susceptibilities to certain hazards—for example, the City of Greenville located along Interstate 70 and a major rail line is more likely to experience a significant Hazardous Material Release related to a transportation accident than the village of Sorento which is located a substantial distance away from any major transportation route. The hazards identified by the planning team will be ranked by input from the other planning team members, available historical data, and the hazard modeling results.

Jurisdiction	Hazard							
	Tornado	HAZMAT	Earthquake	Thunderstorms	Flooding	Winter Storms	Subsidence	Dam Failure
Greenville	2	3	5	4	6	1	NA	7
Donnellson	2	3	5	4	6	1	NA	NA
Keyesport	2	3	5	4	6	1	NA	NA
Mulberry Grove	2	3	5	4	6	1	NA	NA
Old Ripley	2	3	5	4	6	1	NA	NA
Panama	2	3	5	4	6	1	7	NA
Pierron	2	3	5	4	6	1	NA	NA
Pocahontas	2	3	5	4	6	1	7	NA
Smithboro	2	3	5	4	6	1	NA	NA
Sorento	2	3	5	4	6	1	7	NA

NA = Not applicable

The planning team discussed the continued identification/location of critical facilities so SIU-C can map and model these facilities according to threats identified within two weeks. The next meeting will be a public meeting to report on the hazards modeled and threats identified. That meeting will be held at the end of June and will be held in the evening (7:00) at the Bond County Board Room. The meeting will be publicized by press release and the public will be encouraged to attend and provide input.

Meeting was adjourned.

BOND COUNTY

MULTI-HAZARD MITIGATION PLAN
MEETING #2
May 5, 2009 7:00 P.M
BOND COUNTY BOARDROOM
ATTENDEES

NAME	ORGANIZATION	ADDRESS	PHONE	E-MAIL
Jill Franks	Bond Co. Board	Bond County Courthouse 203 W. College Ave	618 664-3776	franksjill@sbcglobal.net
HIRAM L. RENFRO	VILLAGE OF DONNELLSON	407 JEFFERSON ST P.O. BOX 23, DONNELLSON 62019	217 537-3164	ROSEINWOOD590 HOTMAIL.COM
ALLAN L DAVIS	BOND COUNTY EMA	PO Box 128 Greenville IL 62246	618-664-1911	BOND911@SBCGLOBAL.NET
LORA Kennedy	Smithboro Mayor	P.O. Box 143 Smithboro IL 62284	618-780-4414	farmlandgrade@celeritying.com
John Buechler	the Police Center	1200 Walnut Blvd	317-278-2433	Jobuechl@iupui.edu
Jonathan Remo	SIUC		618-~~737~~ 453-7378	domt@siu.edu
Nicholas Pinter	"	Geology Dept. SIUC Carbondale IL 62901	618 453-7375	npinter@go.siu.edu

SOUTHWESTERN ILLINOIS PLANNING COMMISSION

2511 Vandalia Street
Collinsville, IL 62234-5034
(618) 344-4250
FAX: (618) 344-4253

PRESS RELEASE

June 9, 2009

For Immediate Release

For more information contact: Allan L. Davis
Bond County Emergency Management Agency (618) 664-1911
OR
Linda Tragesser, Southwestern Ill Planning Commission
(618) 344-4250 ext. 110

MULTI-HAZARD MITIGATION PLAN PUBLIC MEETING

The Bond County Hazard Mitigation Steering Committee will host a public information and strategy planning session at 7:00 p.m. on Wednesday, June 24 , 2009 in the Bond County Courthouse Board Room.

Bond County and Southwestern Illinois Planning Commission have formed an alliance with The Polis Center of IUPUI to identify potential natural hazards and to produce a mitigation plan to address the issues. The ongoing efforts of the partnership will result in a Multi-Hazard Mitigation Plan (MHMP), which will seek to identify potential natural hazards for Bond County, and then establish a mitigation measure that is 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 The Polis Center at Indiana University-Purdue University Indianapolis (IUPUI) and staff from the SIU-Carbondale Geology Department to develop a Multi-Hazard Mitigation Plan (MHMP) for the county to submit to the Federal Emergency Management Agency for approval.

The Federal Emergency Management Agency (FEMA) now requires each unit of government in the United States to have a FEMA-approved MHMP, so completion of the **Bond** County plan is critical. The MHMPs will serve as 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 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 The Polis Center 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 June 24th meeting the steering committee will discuss formulated strategies and mitigation activities for each potential disaster.

Once the plan is completed, 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 Allan L. Davis, Bond County Emergency Management Director, (618) 664-1911.

Multi-Hazard Mitigation Plan Minutes

Assembly of the Bond County Planning Team, Public Meeting, Meeting #3:

Chairman & Primary Point of Contact: Allan Davis, Bond County ESDA Coordinator
Plan Directors: Southwestern Illinois Metro & Regional Planning Commission, SIUC Geology
Department, and IUPUI-Polis

Meeting Date: Thursday, June 24, 2009 at 7:00 p.m.

Meeting Time: 1.5 hours

Place: Bond County Board Room

Planning Team/Attendance:

Nicholas Pinter, SIUC Geology
Allan Davis, Bond County ESDA
Lora Kennedy, Village President, Smithboro
Steve Kennedy, Village of Smithboro
Duane Wiegemann, Fire Chief, Village of Keyesport
Matt Willman, City of Greenville
Linda Tragesser, Southwestern Illinois Metro & Regional Planning Commission
Jeff Leidel, ***Greenville Advocate*** Media Representative

The meeting was called to order.

Dr. Nicholas Pinter welcomed everyone to the meeting and introduced the lead agencies and plan directors involved in the formulation of the Bond County Multi-Hazard Mitigation Plan. He provided the audience with background information concerning the County's need for a Multi-Hazard Mitigation Plan and explained that this project is mandated by the Federal Disaster Mitigation Act of 2000. Dr. Pinter pointed out that the plan was being done at no cost to Bond County thanks to a grant received from FEMA and the Illinois Emergency Management Agency, and that the County's twenty-five percent required match to FEMA's grant would be provided by work and data input into to the plan by County staff, and by the "sweat equity" provided by the Planning Team participants.

Dr. Pinter then explained that this was the third in a series of Plan meetings, and is planned as a public meeting to present the Hazard Risk Assessment that had been developed with input received during the first two meetings of the Planning Team, and through computer modeling carried out by the SIU-Carbondale Geography Department and facilitated by the POLIS group from IUPUI. Dr. Pinter then proceeded with the presentation of the Hazard Risk Assessment.

Hazard Risk Assessment

Dr. Pinter began his presentation by providing a list of natural hazards that had occurred historically within the County and provided a rating of their potential risk. He explained that the list had been discussed, expanded, and prioritized during the second meeting of the Planning Team, and that the list is in draft form and subject to reevaluation during the planning process. Dr. Pinter then provided historical references of past natural hazard occurrences in Bond County and discussed the extent to which these hazards had impacted the County. He went on to suggest some solutions the County could act upon to limit or eliminate the effect hazards might have in the future. These solutions primarily involved avoidance of, protection from, and preparation for the hazards. He provided the definition of mitigation and explained how hazard mitigation evolves in the planning process.

Dr. Pinter then present the full risk assessment that is included in Section 4 of the draft plan document after briefly describing all of the different Sections included in the draft plan. He outlined the format of Section 4, and detailed the sources from which the information was accumulated. He explained how the methods and calculation were established, and focused on particular hazards that had been modeled by the HAZUS-MH computer software that simulates the circumstances and resulting cost analysis generated by a given, defined hazard. In particular, he outlined the modeling developed for:

- a hypothetical 100-year overbank flood event,
- a hypothetical F-4 tornado,
- a hypothetical 7.7 earthquake along the New Madrid Fault,
- a 7.1 earthquake along the Wabash Valley Fault,
- a 5.5 earthquake along the Wabash Valley Fault and
- a Hazardous material leak using an ALOHA Plume modeling for an ammonia leak hypothetically occurring along the CSX railroad line at Fourth St. in Greenville.

Estimates of the numbers of buildings and facilities damaged, as well as cost estimates and loss of life estimates were presented for each of the scenarios.

Following the presentation on risk assessment Dr. Pinter explained that at the next meeting of the Planning Team would be for the purpose of identifying mitigation projects and strategies that needed to be planned and implemented in the County and its communities in order to minimize or reduce the risk presented by the potential hazards identified. Each person would receive a copy of the FEMA publication, ***"Mitigation Ideas",*** and Dr. Pinter asked each person to come to the next meeting prepared to provide five ideas they think need to occur in the County, or in their community, to mitigate for the hazards identified.

Dr. Pinter further explained that once all the information and suggestions on mitigation and plan implementation are compiled, a preliminary draft of the plan document will be provided to the Planning Team for discussion and approval. Following local review,

revision, and approval a final draft is forwarded to IEMA for review and approval. The IEMA then submits the draft plan to FEMA for its approval. Following FEMA approval, the document is then presented by the Planning Team to the Bond County Board for Adoption, and would then be submitted to the municipal councils and boards for adoption.

The next meeting of the Bond County MHMP committee will be scheduled for August or early September, 2009 at the Bond County Board Room at 7:00 p.m.

Meeting was adjourned.

BOND COUNTY

MULTI-HAZARD MITIGATION PLAN
MEETING #3 – Public Meeting
June 24, 2009 7:00 P.M
BOND COUNTY BOARDROOM
ATTENDEES

NAME	COMMUNITY / ORGANIZATION	E-MAIL
ALLAN L DAVIS	Bond Co 9-1-1 / ESDA	BOND911CSBCGLOBAL.NET
Nicholas Pinter	SIUC	npinter@geo.siu.edu
Lora Kennedy	Smithboro President	farmlandgande@celerityinc.com
Steve Kennedy		
Duane Wiegmann	Keyesport Fire Chief	wiegmann@frontier.net.net
Jeff Leidel	Greenville Advocate	jleidel@hotmail.com
MATT Williams	City of Greenville	mwilliams@greenville.illinois.edu

Multi-Hazard Mitigation Plan Minutes

Assembly of Bond County Planning Team, Mitigation Strategies: Meeting #4 :

Chairman & Primary Point of Contact: Allan Davis, Bond County ESDA Coordinator
Plan Directors: Southwestern Illinois Metro & Regional Planning Commission, SIUC Geology
Department, and IUPUI-Polis

Meeting Date: Wednesday, September 2, 2009, at 7:00 p.m.

Meeting Time: 1.5 hours

Place: Bond County Board Room

Planning Team/Attendance:

Jill Franks, Bond County Board Chairman
Jonathan Remo, SIUC Geology
Nicholas Pinter, SIUC Geology
Allan Davis, Bond County County ESDA
James Moore, Village of Pocahontas
Doug Enloe, President, Village of Mulberry Grove
Linda Hansen, Village of Sorento Board
Lora Kennedy, Village of Smithboro
Dale Deverick, Village of Smithboro Fire Chief
Linda Tragesser, Southwestern Illinois Metro & Regional Planning Commission

The meeting was called to order

Jonathan Remo of SIU-C Geography Department reviewed the objectives of this planning project, and reviewed progress on the plan to date. Dr. Remo explained the purpose of today's meeting as developing Mitigation Strategies for the hazards that have previously been identified and prioritized.

Each member had a copy of the FEMA publication, ***Mitigation Ideas***. The group then went through the list of hazards discussing each, identifying mitigation activities the County or a community might already have enacted, and addressing each hazard with one or more mitigation idea. After all the strategies were listed Dr. Remo asked the attendees to prioritize them weighing their overall merit against the estimated benefits of each mitigation action.

The following list of Mitigation Activities already implemented was identified:

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Comments
Compile a database of community members with special needs	**Goal:** Create new or revise existing plans/maps for Bond County **Objective:** Conduct new studies/research to profile hazards and follow up with mitigation strategies.	Tornado, Flood, Thunderstorm, Winter Storm	Mulberry Grove	This strategy is complete.
Establish warming and cooling centers.	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Improve emergency sheltering in Bond County.	Winter Storm	Greenville	This strategy is complete.
Implement a countywide ordinance requiring mobile homes to have tie-downs	**Goal:** Create new or revise existing plans/maps for Bond County **Objective:** Review and update existing, or create new, community plans and ordinances to support hazard mitigation.	Tornado, Thunderstorm	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	This strategy is complete.
Procure NOAA weather warning radios for schools and hospitals throughout the county	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Equip public facilities and communities to guard against damage caused by secondary effects of hazards.	Tornado, Flood, Thunderstorm, Winter Storm	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	This strategy is complete.

Itemized list of Hazards along with location information and priority assigned.

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Establish a mutual aid response agreement	**Goal:** Develop long-term strategies to educate Bond County residents on the hazards affecting their county **Objective:** Improve education and training of emergency personnel and public officials	Hazmat	Bond County	High	The ESDA Director will work with local resources to establish the agreement. If resources are available, implementation will begin within one year.

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Procure generators, transfer switches, and portable heaters for warming centers	**Goal:** Lessen the impacts of hazards to individuals and infrastructure **Objective:** Improve emergency sheltering in Bond County.	Winter Storm	Bond County, Sorento	High	The ESDA Director will oversee implementation of this project. Funding has not been secured as of 2009, but the PDM program and community grants are possible funding sources. If funding is available, implementation will begin within one year.
Submit application to join the NFIP	**Goal:** Create new or revise existing plans/maps for Bond County **Objective:** Support compliance with the NFIP for each jurisdiction in Bond County.	Flood	Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	High	Only the county and the City of Greenville currently participate in the NFIP. The county Floodplain Manger and ESDA will work with representatives from other communities, as well as IEMA and FEMA, to encourage the remaining communities in the county to participate in the program.
Purchase signage for roads that flood frequently: Shoal Creek Road (Sorento), Old Ripson Road (Sorento), Trestle Road (Panama)	**Goal:** Lessen the impacts of hazards to individuals and infrastructure **Objective:** Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county.	Flood	Sorento, Panama	High	The ESDA Director and County Engineer will oversee this project and will seek funding from resources such as ILDOT or the PDM program. If funding is available, implementation will begin within one year.
Construct safe houses in key locations within the county	**Goal:** Lessen the impacts of hazards to individuals. **Objective:** Improve emergency sheltering in Bond County.	Tornado, Thunderstorm	Sorento, Smithboro, Mulberry Grove	High	The ESDA Director will work with local shelters to complete this project. The PDM program or local resources are funding options. If funding is available, implementation will begin within one year.
Conduct an engineering study to investigate redundancy in public water supply	**Goal:** Create new or revise existing plans/maps for Bond County **Objective:** Conduct new studies/research to profile hazards and follow up with mitigation strategies.	Flood	Bond County	Medium	The ESDA Director or County Engineer will oversee this project and will work with IDNR on the engineering aspects. The county will seek a planning grant from IDNR or community improvement programs. If funding is available, implementation will begin within three years.

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Improve drainage in key communities in the county	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Minimize the amount of infrastructure exposed to hazards.	Flood	Bond County, Sorento, Smithboro, Mulberry Grove	Medium	The ESDA Director will work with local drainage districts, IDOT, IDNR, U.S. Army Corps of Engineers to evaluate the current conditions of the county's waterways and drainage and develop a plan. Funding has not been secured as of 2009, but county, state, and federal funding will be sought. Implementation will begin within three years.
Establish an LEPC and write a CEMP for all hazards	**Goal:** Develop long-term strategies to educate Bond County residents on the hazards affecting their county **Objective:** Improve education and training of emergency personnel and public officials.	Tornado, Flood, Earthquake, Thunderstorm, Winter Storm, Hazmat, Subsidence	Bond County	Medium	The ESDA Director will work with local officials to establish an LEPC. Seeking assistance from IEMA, the LEPC and FEMA will write a CEMP for the county's hazards. If resources are available, implementation will begin within three years.
Implement Nixle for mass media release via e-mail and text messages	**Goal:** Lessen the impacts of hazards to individuals and infrastructure **Objective:** Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county.	Tornado, Flood, Earthquake, Thunderstorm, Winter Storm, Hazmat, Subsidence	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	Medium	The ESDA Director will oversee this project. Local resources will be used to implement the project and notify the public. If resources are available, this project will begin within three years.
Develop a public education program to present at public events, e.g. county fair, and in schools	**Goal:** Develop long-term strategies to educate Bond County residents on the hazards affecting their county **Objective:** Raise public awareness on hazard mitigation.	Tornado, Flood, Earthquake, Thunderstorm, Winter Storm, Hazmat, Subsidence	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	Medium	The ESDA Director will oversee this project. Local resources will be used to develop educational literature and present to each jurisdiction at public events or in schools. If resources are available, the project will be implemented within three years.

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Create maps of undermined areas in the county	**Goal:** Create new or revise existing plans/maps for Bond County **Objective:** Review and update existing, or create new, community plans and ordinances to support hazard mitigation.	Subsidence	Bond County	Medium	The ESDA Director with assistance from the county engineer will oversee this project. The county will seek assistance from IDNR. If funding is available, implementation will begin within three years.
Trim trees to minimize the amount/duration of power outages	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Minimize the amount of infrastructure exposed to hazards.	Winter Storm	Bond County	Low	The ESDA Director will work with local power cooperatives or companies for implementation of this project. Funding has not been secured as of 2009, but the PDM program, ILDOT, or IEMA are possibilities. If funding is available, implementation will begin within five years.
Compile a database of 4x4 vehicles for transportation of people and supplies	**Goal:** Create new or revise existing plans/maps for Bond County **Objective:** Conduct new studies/research to profile hazards and follow up with mitigation strategies.	Winter Storm	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	Low	The ESDA Director will oversee this project and will work with local resources and IDNR. Local resources will be used to create and maintain the database. If resources are available, implementation will begin within five years.
Procure back-up generators for critical facilities	**Goal:** Lessen the impacts of hazards to individuals and infrastructure **Objective:** Equip public facilities and communities to guard against damage caused by secondary effects of hazards.	Flood, Tornado, Earthquake, Thunderstorm, Winter Storm	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento	Low	The ESDA Director will oversee the implementation of this project. Funding has not been secured as of 2009, but the pre-disaster mitigation program and community development grants are possible funding sources. If funding is available, this project is forecasted to begin within five years.
Establish backup power for warning sirens	**Goal:** Lessen the impacts of hazards to individuals and infrastructure **Objective:** Evaluate and strengthen the communication and transportation abilities of emergency services throughout the county.	Tornado, Flood, Thunderstorm, Winter Storm	Mulberry Grove, Smithboro, Sorento	Low	The ESDA Director oversees the implementation of the project. Local resources will be used to research options for backup power. Additional funding will be sought from other funding sources, e.g. PDM program. Implementation, if funding is available, is forecasted to begin within five years.

Mitigation Item	Goals and Objects Satisfied	Hazards Addressed	Jurisdictions Covered	Priority	Comments
Develop a program to distribute weather radios to all critical facilities	**Goal:** Lessen the impacts of hazards to individuals and infrastructure **Objective:** Equip public facilities and communities to guard against damage caused by secondary effects of hazards.	Flood, Tornado, Thunderstorm, Winter Storm	Bond County, Greenville, Donnellson, Mulberry Grove, Old Ripley, Panama, Pierron, Pocahontas, Smithboro, Sorento)	Low	The ESDA Director will oversee implementation of this project. Local resources will be used to determine how many radios are needed and when/where to distribute them. Funding has not been secured as of 2009, but the PDM program and community grants are an option. Implementation, if funding is available, will begin within five years.
Begin storm sewer construction	**Goal:** Lessen the impacts of hazards to new and existing infrastructure **Objective:** Minimize the amount of infrastructure exposed to hazards.	Flood	Sorento	Low	The county engineer will work with IDOT and IDNR to evaluate the current conditions of the community's sewer system and develop a plan. Funding has not been secured as of 2009, but county, state, and federal funding will be sought. Implementation will begin within three years.

Following the prioritization exercises and recording the results, Dr. Remo advised that at the next meeting we will review and discuss the preliminary draft of the plan and make updates or corrections.

Meeting #5 will be held in late October at the Bond County Board Room.

Meeting was adjourned.

BOND COUNTY
MULTI-HAZARD MITIGATION PLAN COMMITTEE MEETING
SEPTEMBER 2, 2009 7:00 P.M.
BOND COUNTY BOARD ROOM

ATTENDEES

NAME	REPRESENTING	MUNICIPALITY OF RESIDENCE	E-MAIL
Jill Franks	Bond County	Greenville	franksjill@sbcglobal.net
James Moore	Village of Pocahontas	Pocahontas	James@JamesLMoore.net
Denise Enloe	Village of Mulberry	Mulberry	denloe@celerity.inc.com
Linda Hansen	Village of Sorento	Sorento	hansel2@frontiernet.net
ALLAN DAVIS	Bond Co 9-1-1/EMA/Greenville	Greenville	Bond911@SBCGLOBAL.NET
Lora Kennedy	Village of Smithboro	Smithboro	farmlandgardens@celerityinc.com
Dale Deverick	Smithboro Fire Protection	Smithboro	chfdcd73@yahoo.com

Multi-Hazard Mitigation Plan Minutes

Assembly of Bond County Planning Team, Review of Draft Plan: Meeting #5 :

Chairman & Primary Point of Contact: Allan Davis, Bond County ESDA Coordinator
Plan Directors: Southwestern Illinois Metro & Regional Planning Commission, SIUC Geology
Department, and IUPUI-Polis

Meeting Date: Wednesday, December 2, 2009, at 6:30 p.m.

Meeting Time: 1.5 hours

Place: Bond County Board Room

Planning Team/Attendance:

Jill Franks, Bond County Board Chairman
Jonathan Remo, SIUC Geology
Allan Davis, Bond County County ESDA
Joe Rakers, Village of Old Ripley
Linda Hansen, Village of Sorento Board
Edward Wallace, President, Village of Sorento
Matt Willman, City of Greenville
Gerald McCray, Bond County Board, City of Greenville
Steve Plocher, Village of Pierron
Michael Knebel, Trustee, Village of Panama
Dolly Knebel, Village of Panama
Hiram Renfro, President, Village of Donnellson
Lora Kennedy, Village of Smithboro
Linda Tragesser, Southwestern Illinois Metro & Regional Planning Commission

Meeting was Called to order.

Dr. Remo of SIU-C explained the planning process thusfar, and described the method we would use to review the draft copy of the plan. Linda Tragesser of Southwestern Illinois Metropolitan and Regional Planning Commission provided everyone with a PDF copy of the preliminary draft of the Bond County Plan prior to the meeting so that everyone could review it. She acknowledged that the draft had been updated with information provided by Dr. Remo of SIU-C subsequent to the circulation of the draft copies to the committee.

Committee members were asked to voice any opinions or suggest any corrections or changes that need to be made in the plan. The following is a summary of the changes needing to be made:

PLAN SECTION & PAGE	DESCRIPTION	CHANGE NEEDED
Title Page	ESDA Coord data	Correct typo's
Table 1-1, P. 2	Errors in Names & Titles	Corrections & Updates
Table 2-1 P. 7	Errors in Names & Titles	Correction & Updates
Table 2-2 P. 8	Errors in Names, Titles, etc.	Corrections & Updates
Section 3, Page 9	Historical Information	Correct southeast to southwest
Section 3.3 P. 11	Demographics	Correct Center to Institution
Section 3.5 P. 15	Industry	Correct Mallinkrodt to Covidien
Section 3.5 P. 15	Industry	Add Enertech
Section 3.5 P. 15	Industry	Correct to Greenville Livestock Inc
Section 3.5 P. 16	Industry	Buchheit Store
Section 3.5 P. 15	Industry	Add Love's Travel & Donnewald
Section 3.5 P. 15	Industry	Add Federal Correctional Inst.
Section 4.4.2 Table 4-16 P. 38	Dam Inventory	Add Coleman-Panama Pond
Sect. 5.1.7 P. 88	Building Codes	Correct BOCA to Intl Building Code
Sect. 5 P. 95	Table 5-6	Correct Ripson, Trestle, Smithboro
Sect. 5 P. 95	Table 5-6	Add Proposed Senior Center
Appendix A, Page 108	Minutes for 12/2/2008	Correct Wednesday to Tuesday
Repaginate after corrections		

BOND COUNTY
MULTI-HAZARD MITIGATION PLAN COMMITTEE MEETING #5
December 2, 2009 6:30 P.M. BOND COUNTY BOARD ROOM

ATTENDEES

NAME	REPRESENTING	MUNICIPALITY OF RESIDENCE	E-MAIL
WALLACE, EDWARD	SORENTO	SORENTO	edward_wallace1@yahoo.com
Hansen, Linda	Sorento	Sorento	hansel2@frontiernet.net
Gerald McCRAY	Greenville	Greenville	PHONE 618-664-2403
Dolly Monte Knebel	PANAMA	PANAMA	
MICHAEL G. Knebel	PANAMA	Panama	Benhunter@yahoo.com
ALLAN L DAVIS	Bond County 9-1-1 / EMA	Greenville	Bond911@SBCGlobal.net
Steve Focher	Pierron	Pierron	Sfocher@wisperhome.com
Jill Franks	Bond County Board	Greenville	franksjill@sbcglobal.net
[illegible]	City of Greenville	Greenville	[illegible]
Joe Rakers	Village of Pocahontas	Pocahontas	j-Rakers@Hotmail.com
HIRAM L RENFRO	DONNELLSON	DONNELLSON	ROSEINWOOD59@HOTMAIL.COM
Lora Kennedy	Smithboro	Smithboro	
LINDA TRAGESSER	SIUMAPC		

Appendix B – Articles Published by Local Newspapers

Hazardous Mitigation Group Meeting

The Bond County Hazard Mitigation Steering Committee will host a public information and strategy planning session on June 24.

The meeting begins at 7 p.m. in the Bond County Courthouse.

Bond County and the Southwestern Illinois Planning Commission have formed an alliance with the Polis Center of Indiana University-Purdue University Indianapolis (IUPUI) to identify potential natural hazards and produce a mitigation plan to address the issues.

Those efforts will result in the development of a Multi-Hazard Mitigation Plan which will seek to identify potential natural hazards for Bond County, then establish a mitigation measure intended to reduce or eliminate the negative impact a particular hazard might have on the community.

Over the last several months, the steering committee has been working with the Polis Center and staff from the Southern Illinois University Carbondale geology department to develop the plan for the county. It will eventually be submitted to the Federal Emergency Management Agency (FEMA) for approval.

The local steering committee has identified the following hazards in Bond County: flooding, tornadoes, thunderstorms/high winds/hail, hazardous materials release, drought/extreme heat, earthquakes and severe winter storms.

At the June 24 meeting, the steering committee will discuss formulated strategies and mitigation activities for each potential disaster.

FEMA requires each unit of government in the United States to have an approved plan, so completion of one for Bond County is critical.

The committee will also work to develop funding for any mitigation activities that are identified. It is seeking public input on the plan.

Anyone with questions or wishing to provide input can contact Allan Davis, Bond County's emergency management director, at 664-1911.

Appendix C—Adopting Resolution

Appendix D – Historical Hazards from NCDC

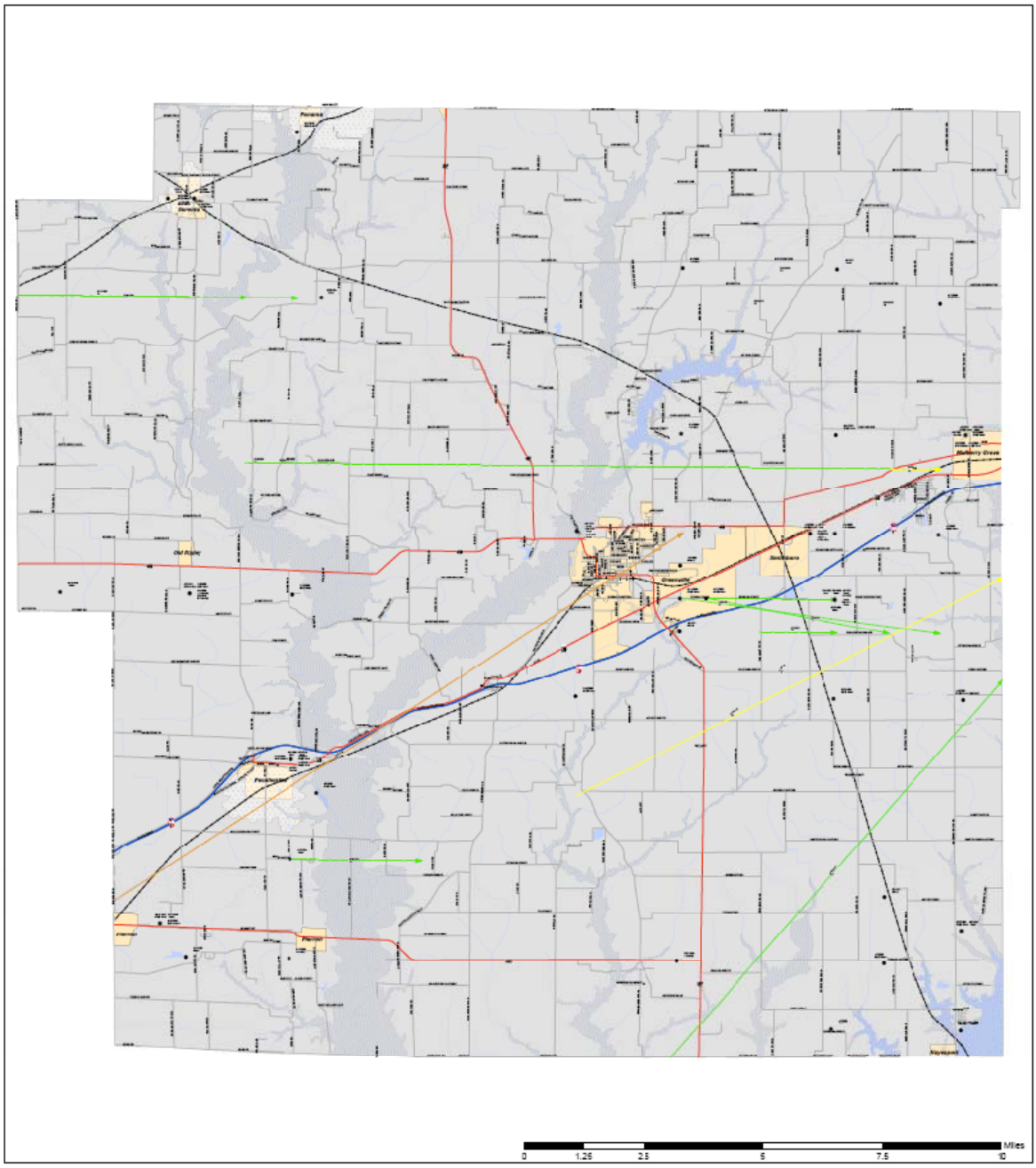
Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD	Description
Bond	12/2/1950	1600	Tornado	F3	2	25	2.5M	0	None Reported
Bond	11/9/1984	1645	Tornado	F2	0	0	2.5M	0	None Reported
Bond	5/12/1990	1649	Tornado	F1	0	0	250K	0	None Reported
Pocahontas	6/12/1998	4:25 PM	Tornado	F1	0	0	0	0	A tornado tracked east across open farmland south of Pocahontas. A storm chaser photographed the tornado which grew to a large wedge shape at its peak. However there was little evidence of damage, except for a few trees down in the area.
Sorento	6/14/1998	5:16 PM	Tornado	F1	0	4	0	0	A damaging tornado occurred in Madison and Bond counties in southwest Illinois, starting about 615 pm in Madison County just east of New Douglas and moving east into Bond County. This tornado has an almost continuous damage path of nearly 6 miles and a maximum width of 150 yards. Four mobile homes in far northwest Bond County near the Gilmore community were destroyed with 4 people suffering minor injuries. Two farm houses sustained roof damage and 4 farm implement buildings were also destroyed. Numerous trees were also downed along the path.
Greenville	5/12/2000	5:47 PM	Tornado	F2	0	0	0	0	A second tornado formed about 100 yards southeast of the initial tornado in Bond County and traveled east for about 1.5 miles. The tornado traveled through a heavily wooded area destroying hundreds of large trees.
Old Ripley	5/12/2000	5:25 PM	Tornado	F1	0	0	200K	0	A tornado left a path of damage for 9 miles across east Bond County. The damage first started 2.5 miles north northeast of Old Ripley where several large trees were damaged. The tornado traveled east alone County Road 1300 destroying one barn and 2 machine sheds. The tornado continued east snapping or uprooting large trees. It then crossed Governor Bond Lake, damaging at least 7 homes in the Springwood Estates subdivision on the east side of the lake. Large pieces from the side of one home and pieces of the roof of another were blown about 1/2 mile east. Several pieces of debris were impaled into the ground at 45 to 60 degree angles.

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD	Description
Greenville	5/1/2002	12:38 PM	Tornado	F1	0	0	0	0	Six tornadoes struck at virtually the same time near Greenville, Illinois. Eye witnesses reported seeing at least 4 tornadoes on the ground at the same time. The tornadoes did not rotate around each other. They each had distinctive paths and moved rapidly east southeast. The bulk of the damage was to barns, grain bins, and other farm outbuildings and to trees and power lines. Over 35 structures were damaged by the tornadoes. The most significant damage caused by tornado 1 was to the Hillview Nursing Home which lost part of its roof. No one was injured as the staff had moved the residents to interior hallways. The residents has to be transferred to neighboring facilities due to the damage.
Greenville	5/1/2002	12:38 PM	Tornado	F1	0	0	0	0	Six tornadoes struck at virtually the same time near Greenville, Illinois. Eye witnesses reported seeing at least 4 tornadoes on the ground at the same time. The tornadoes did not rotate around each other. They each had distinctive paths and moved rapidly east southeast. The bulk of the damage was to barns, grain bins, and other farm outbuildings and to trees and power lines. Over 35 buildings were damaged by the tornadoes. The most significant damage caused by tornado 2 was to a rural electric cooperative radio tower and to the F&S Grain Storage Bins facility which suffered major damage.
Greenville	5/1/2002	12:38 PM	Tornado	F1	0	1	0	0	Six tornadoes struck at virtually the same time near Greenville, Illinois. Eye witnesses reported seeing at least 4 tornadoes on the ground at the same time. The tornadoes did not rotate around each other. They each had distinctive paths and moved rapidly east southeast. The bulk of the damage was to barns, grain bins, and other farm outbuildings and to trees and power lines. Over 35 buildings were damaged by the tornadoes. Tornado number 3 just missed an automobile dealership, however it caused significant damage to a barn, a machine shed, and some damage to a home. This tornado also crossed I-70 and overturned a couple of tractor trailers. One driver suffered minor injuries.

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD	Description
Greenville	5/1/2002	12:41 PM	Tornado	F1	0	0	0	0	Six tornadoes struck at virtually the same time near Greenville, Illinois. Eye witnesses reported seeing at least 4 tornadoes on the ground at the same time. The tornadoes did not rotate around each other. They each had distinctive paths and moved rapidly east southeast. The bulk of the damage was to barns, grain bins, and other farm outbuildings and to trees and power lines. Over 35 buildings were damaged by the tornadoes. Tornado number 5 crossed US 40 just west of Dudlleyville Road and caused tree damage and damage to a home. The tornado also crossed I-70 overturning a couple of tractor trailers. A total of 5 tractor trailers were overturned by tornadoes 3 and 5.
Greenville	5/1/2002	12:42 PM	Tornado	F1	0	0	0	0	A series of 6 tornadoes struck the Greenville, Illinois area at virtually the same time. Eyewitnesses reported seeing at least 4 tornadoes on the ground at the same time. The tornadoes were lined up north to south and moved in distinct paths to the east southeast. They did not rotate around each other. The bulk of the damage was to trees, power lines, and farm outbuildings. Over 35 structures were damaged by the tornadoes. Tornado number 6 destroyed a garage and a machine shed sending pieces of the metal roof one-half mile to the east.
Greenville	5/1/2002	12:40 PM	Tornado	F0	0	0	0	0	Six tornadoes struck at virtually the same time near Greenville, Illinois. Eye witnesses reported seeing at least 4 tornadoes on the ground at the same time. The tornadoes did not rotate around each other. They each had distinctive paths and moved rapidly east southeast. The bulk of the damage was to barns, grain bins, and other farm outbuildings and to trees and power lines. Over 35 structures were damage by the tornadoes. Tornado number 4 was the weakest, reaching only F0 intensity. It damaged trees and power lines and a few farm outbuildings.
Greenville	5/24/2006	4:40 PM	Tornado	50 kts.	0	0	0	0	Several power lines were blown down 4 miles north of Greenville.

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD	Description
Greenville	5/24/2006	4:51 PM	Tornado	F0	0	0	0	0	The first tornado touched down 5 miles north of Greenville, southwest of the intersection of Red Ball Trail and Hastings Cemetery Avenue, just north of Peach Avenue. It blew down several large trees. Three of the trees fell onto a home causing extensive damage. As it traveled to the east it destroyed a machine shed before lifting and dissipating. No injuries were reported.
Woburn	5/24/2006	4:53 PM	Tornado	F0	0	0	0	0	The second tornado touched down 1.4 miles northwest of Woburn along Hastings Cemetery Avenue. The tornado caused minor roof damage to one home. Otherwise, most of the damage was to trees before it lifted and dissipated. No injuries were reported.

Appendix E—Hazard Map



Bond County
Pre-Disaster Mitigation Plan

Historical Natural Hazards Map

2

Legend

- Severe Thunderstorm (Hail Event)
- Severe Thunderstorm (Wind Event)
- Tornado Touchdown
- Earthquake Epicenter

F1
F2
F3
F4
F5

Interstate
State Road
Local Road
Railroad

River
100 Year Flood Area
Underground Mine
Lake
City

Southwestern Illinois Metropolitan
& Regional Planning Commission
2511 Vandalia Street
Collinsville, IL 62234
Phone: (618) 344-4250
Fax: (618) 344-4253

Appendix F—Complete List of Critical Facilities

Communication Facilities Report

ID	Name	Address	City	Class	Owner
1	WPRX645	200 HEALTHCARE DRIVE	GREENVIL	CDFLT	Edward A. Utlaut
2	WPRX646	403 S. SECOND	GREENVIL	CDFLT	Edward A. Utlaut
3	WQIW568	Greenville Airport-1374 sky ln.	GREENVIL	CDFLT	GREENVILLE
4	WQIW568	315 E COLLEGE AVE	GREENVIL	CDFLT	GREENVILLE
5	KB72218		GREENVIL	CDFLT	GREENVILLE FIRE
6	KB72218	404 S THIRD ST	GREENVIL	CDFLT	GREENVILLE FIRE
7	KB72218	1149 RED BUD TRAIL	GREENVIL	CDFLT	GREENVILLE FIRE
8	KD53940			CDFLT	GREENVILLE, CITY
9	WPZZ390	404 SOUTH 3RD STREET	GREENVIL	CDFLT	GREENVILLE, CITY
10	WPZZ390		GREENVIL	CDFLT	GREENVILLE, CITY
11	WQBB433		New	CDFLT	I-WARN, Inc. /
12	WQBB433	83 Mettlerville Lane	New	CDFLT	I-WARN, Inc. /
13	KNKN996		GREENVIL	CDFLT	Illinois RSA 6 and 7
14	WPJV612	R.R. 2, BOX 330		CDFLT	ILLINOIS WESTERN
15	KNCR638	COR MULBERRY GROVE RD & RAILROAD	KEYESPO	CDFLT	KEYESPORT FIRE
16	WHQ995		VANDALI	CDFLT	LB Tower Company
17	WPXV836	RD 1850 THEN N 300	Smithboro	CDFLT	MCC Holdings
18	KYS246	BNSF Radio Bldg.	GREENVIL	CDFLT	Mid- Illinois
19	WNUU673	705 STEPHENS ST	MULBERR	CDFLT	MULBERRY GROVE
20	WNUU673	1/4 MI W ON RT 140	MULBERR	CDFLT	MULBERRY GROVE
21	WPLE447		MULBERR	CDFLT	MULBERRY GROVE
22	WPLE447	211 WOOD ST	MULBERR	CDFLT	MULBERRY GROVE
23	KNKN479	1.5 MILES NORTH OF RT. 140 & 1/2 MI W OF	Mulberry	CDFLT	NEW CINGULAR
24	WPAH735	DONNELLSON AVE, .8KM WEST OF IL. RT	GREENVIL	CDFLT	PETRY, GAY
25	WPAH735	424 N SPRUCE	GREENVIL	CDFLT	PETRY, GAY
26	KNFL998		POCAHO	CDFLT	POCAHONTAS OLD
27	WPME895	OLD HWY 40 AT POCAHONTAS	GREENVIL	CDFLT	READY-VIEW
28	WPME895	1.4 MI S & W OF INTER. STATE RT 127	GREENVIL	CDFLT	READY-VIEW
29	WNZW323			CDFLT	SAINT LOUIS
30	KNEV229		SMITHBO	CDFLT	SCHEWE, MAURICE
31	WPUE322	3/4 MI N OF HOOKSDALE & 3 MI SE OF RT 12	KEYSPORT	CDFLT	SIEBERT, ELVERN
32	WPUE322	1615 3RD AVENUE	KEYSPORT	CDFLT	SIEBERT, ELVERN
33	WPRV622		SMITHBO	CDFLT	SMITHBORO FIRE
34	WPZZ802		SORENTO	CDFLT	SORENTO,
35	KSA325		GREENVIL	CDFLT	SOUTHWESTERN
36	WNTN647	.75 MI W OF RT 127 ON RT 40	GREENVIL	CDFLT	SOUTHWESTERN
37	KSL56	.75 MI W RT 127 ON RT 40	GREENVIL	CDFLT	SOUTHWESTERN
38	KNIV904	HWY 40 S ELM ST	GREENVIL	CDFLT	Southwestern
39	WPIC500		GREENVIL	CDFLT	State of Illinois

40	WPQH263	7.3 MI N & 1.8 MI E	GREENVIL	CDFLT	UNITED
41	WPQH263	2000 WOLF BUSINESS PARK	GREENVIL	CDFLT	UNITED
42	WPBB216		GREENVIL	CDFLT	WHITESIDE, DAVID
43	WPBB216	424 N SPRUCE	GREENVIL	CDFLT	WHITESIDE, DAVID
44	WNGV585		SORENTO	CDFLT	WHITESIDE, RON
45	WPES869		GREENVIL	CDFLT	Whiteside, Ron
46	WPES869	424 N SPRUCE	GREENVIL	CDFLT	Whiteside, Ron
47	WGEL CH 269		GREENVIL	CBR	BOND
48	WGRN CH 208		GREENVIL	CBR	GREENVILLE COL.
49	WNUX332		MULBERR	CDFLT	BLANKENSHIP
50	WNUX332	7 MI N OF MULBERRY GROVE	MULBERR	CDFLT	BLANKENSHIP
51	WNUX332		MULBERR	CDFLT	BLANKENSHIP
52	WQIY357	BNSF LS13 MP87.2 - HBD	Smithboro	CDFLT	BNSF Railway Co
53	WQIY357	BNSF LS13 MP81.7 - HBD	Reno	CDFLT	BNSF Railway Co
54	WNRG515	RAILROAD MILEPOST 87.2 HBD 6 MI N	SMITHBO	CDFLT	BNSF Railway
55	WPWF403	BNSF MP 77.9 WIU	Sorento	CDFLT	BNSF Railway
56	KB63022			CDFLT	BOND CO
57	KXG822	VANDALIA RD AT ADMIN BLDG	GREENVIL	CDFLT	BOND COUNTY
58	WPNY502	WATER TWR @ NE COR OF SR 127 AND	GREENVIL	CDFLT	BOND MADISON
59	KSD589	403 SOUTH SECOND	GREENVIL	CDFLT	BOND, COUNTY OF
60	KSD589		GREENVIL	CDFLT	BOND, COUNTY OF
61	KSD589	.7KM N OF US 140 ON RED BALL TRAIL	Greenville	CDFLT	BOND, COUNTY OF
62	KTG638	1/4 MI N OF US RT 40 ON 3RD ST	GREENVIL	CDFLT	BOND, COUNTY OF
63	WPPC529		GREENVIL	CDFLT	BOND, COUNTY OF
64	WPSY980	404 S THIRD ST	GREENVIL	CDFLT	C - MAL INC
65	WNZZ506	US 40 & 127		CDFLT	CARLISLE SYNTEC
66	KNHV205	404 S THIRD ST	SMITHBO	CDFLT	CSX Transportation
67	KNHV205	W OF FRANKLIN ST & CR XING IN	SMITHBO	CDFLT	CSX Transportation
68	WPHZ699		MULBERR	CDFLT	CSX
69	WPHZ699	100 FT W OF CTY HWY 110 ON CR	POCAHO	CDFLT	CSX
70	WPPS589	50 FT SW OF CR 450 N CROSSING	GREENVIL	CDFLT	D & L DISPOSAL
71	WPPS589	900 WILLARD ST	GREENVIL	CDFLT	D & L DISPOSAL
72	WPLH679	JCT OF I70 & HWY 41	GREENVIL	CDFLT	DATATRONICS INC
73	WPOB855		GREENVIL	CDFLT	EDWARD A
74	WPOB855	.45N OF US140 ON RED BALL TRAIL	GREENVIL	CDFLT	EDWARD A
75	KNAD257		GREENVIL	CDFLT	EDWARD A
76	KNAD257	424 N SPRUCE	GREENVIL	CDFLT	EDWARD A
77	WPRX644		GREENVIL	CDFLT	Edward A. Utlaut
78	WPIC224		SORENTO	CDFLT	Whiteside, Ron
79	WPIC224	4 MI N OF OLD RIPLEY ON CR & 100 FT E	SORENTO	CDFLT	Whiteside, Ron
80	WPIC225		GREENVIL	CDFLT	Whiteside, Ron
81	WPIC225	424 N SPRUCE	GREENVIL	CDFLT	Whiteside, Ron
82	WPKA626		SORENTO	CDFLT	Whiteside, Ron

83	WPWS379		Sorento	CDFLT	Whiteside, Ron
84	WPWS379	1420 Old Ripley Rd	Sorento	CDFLT	Whiteside, Ron
85	WPZZ390		GREENVIL	CDFLT	GREENVILLE, CITY
86	KNCR638		KEYESPO	CDFLT	KEYESPORT FIRE
87	WNUK711	12.0 MILES NW OF	SMITHBO	CDFLT	MARCHELLO, J
88	KNKN479		Greenville	CDFLT	NEW CINGULAR
89	WPSU972	2514 W. OLD NATIONAL TRAIL	GREENVIL	CDFLT	NEXTEL LICENSE
90	WPXK839		Donnelso	CDFLT	PANAMA, VILLAGE
91	WNTP529	.75 MI W RT 127 ON RT 40	GREENVIL	CDFLT	SOUTHWESTERN
92	KNIV904	3/4 MI W RT 127 US 40	GREENVIL	CDFLT	Southwestern
93	WNVN842	SW EDGE OF GREENVILLE ON 4TH ST	NEW	CDFLT	THREE COUNTY
94	KFE380		GREENVIL	CDFLT	Whiteside, Ron
95	KFE380	424 N SPRUCE	GREENVIL	CDFLT	Whiteside, Ron
96	WNGV585	4 MI N OF OLD RIPLEY ON CR AND 100 FT E	SORENTO	CDFLT	WHITESIDE, RON
97	WQIY357	BNSF LS13 MP98.7 - HBD	Hookdale	CDFLT	BNSF Railway Co
98	WPPC529	1149 RED BAL TRAIL	GREENVIL	CDFLT	BOND, COUNTY OF
99	WPLH679		GREENVIL	CDFLT	DATATRONICS INC
100	WPKA615		SORENTO	CDFLT	Whiteside, Ron
101	WPKA615	4 MI N OF OLD RIPLEY ON CR & 100 FEET E	SORENTO	CDFLT	Whiteside, Ron
102	WPKA617	424 N SPRUCE	GREENVIL	CDFLT	Whiteside, Ron
103	WQAF623	424 N. SPRUCE	Greenville	CDFLT	Greenville Airport
104	WPZZ390	INT OF S. ELM AND I-70	GREENVIL	CDFLT	GREENVILLE, CITY
105	WPSU972	804 S. 7th St.	GREENVIL	CDFLT	NEXTEL LICENSE
106	WDID 1510		HIGHLAN	CBR	NEW LIFE
107	KNGK566	R 1 4 1/2 MI S	DONNELL	CDFLT	BAUMBERGER,
108	WQIY357		Smithboro	CDFLT	BNSF Railway Co
109	WYK623	BNSF RADIO BLDG	SMITHBO	CDFLT	BNSF Railway
110	WLD716	309 W MAIN	GREENVIL	CDFLT	BOND
111	KXG822		GREENVIL	CDFLT	BOND COUNTY
112	WPTL203		GREENVIL	CDFLT	CLINTON COUNTY
113	WPOB855	424 NORTH SPRUCE	GREENVIL	CDFLT	EDWARD A
114	WPKA617		GREENVIL	CDFLT	Whiteside, Ron
115	WPKA626	4 MI N OF OLD RIPLEY ON CR & 100 FEET E	SORENTO	CDFLT	Whiteside, Ron

Airport Facilities Report

ID	Name	Address	City	Class	Function
1	GREENVILLE	1374 SKY LANE	GREENVILLE	ADFL	Public
2	NANCE	443 IL RT 140	OLD RIPLEY	ADFL	Private

Dams Report

ID	Name	River	City	Owner	Purpose	Height (ft)
1	SORENTO RESERVOIR DAM	TRIB SHOAL CREEK	POCAHONTAS	Village of Sorento	S	27
2	GREENVILLE NEW CITY DAM	KINGSBURY BRANCH SHOAL	GREENVILLE	City of Greenville	SR	40
3	BOND CHRISTIAN CAMP LAKE DAM	TRIB HURRICANE CREEK	KEYESPORT	Bond County Christian	R	19
4	GREENVILLE ROD AND GUN CLUB	TRIB EAST BRANCH SHOAL	GREENVILLE	Greenville Rod & Gun	R	19
5	GREENVILLE OLD CITY LAKE DAM	EAST FORK SHOAL CREEK-	GREENVILLE	Kingsbury Park District	R	30
6	STONE POND DAM	TRIB HURRICANE CREEK	KEYESPORT	Royal Lake	R	31
7	ARMSTRONG POND DAM	TRIB AVERY BRANCH	PLEASANT	Benjamin Armstrong	R	26
8	RINDERER POND DAM #1	W. TRIB-LITTLE SHOAL CREEK	GREENVILLE	FRANCIS RINDERER	IP	30
9	POTTHAST POND DAM #1	W. TRIB-SHOAL CREEK	JAMESTOWN	CLARENCE POTTHAST	PO	22
10	BROWN POND DAM #1	W. TRIB-SHOAL CREEK	JAMESTOWN	TOM BROWN JR.	RFO	22

EOC Facilities Report

ID	Name	Address	City	Class
1	Greenville Civil Defense Ctr	404 S 3rd St	Greenville	EFEO

FireStation Facilities Report

ID	Name	Address	City	Class	Stories	YearBuilt	ReplaCost
1	Mulberry Grove Fire Dept	1897 US Rt 40	Mulberry Grove	EFFS	1	666	
2	Smithboro Fire Dept	305 S 3rd	Smithboro	EFFS	1	666	
3	Pocahontas Fire House	4 W State St	Pocahontas	EFFS	1	666	
4	Greenville Fire Dept	1110 E Harris	Greenville	EFFS	1	666	
5	Keyesport Fire Dept	901 Mulberry St	Keyesport	EFFS	1	666	
6	Shoal Creek Fire Protection	101 N. Main St	Sorento	EFFS	1	666	
7	Highland-Pierron	223 IL RT 143	Pirron	EFFS	1	1999	650
8	Old Ripley Fire Dept	1003 N Main St	Old Ripley	EFFS	1	666	

Hazardous Materials Report

ID	Name	Address	City	Class	EPAID	ChemicalName
1	MALLINCKRODT INC.	100 LOUIS LATZER DR.	GREENVILLE	HDFLT	ILD006327704	ZINC COMPOUNDS
2	CARLISLE SYNTEC INC.	1825 E. U.S. RTE. 40	GREENVILLE	HDFLT	ILD980503304	THIRAM
3	CARLISLE SYNTEC INC.	1825 E. U.S. RTE. 40	GREENVILLE	HDFLT	ILD980503304	2-
4	CARLISLE SYNTEC INC.	1825 E. U.S. RTE. 40	GREENVILLE	HDFLT	ILD980503304	ZINC COMPOUNDS
5	CARLISLE SYNTEC INC.	1825 E. U.S. RTE. 40	GREENVILLE	HDFLT	ILD980503304	ANTIMONY
6	D&L Dissposal, LLC	900 Willard	GREENVILLE	HDFLT		
7	Federal Correctinal Inst	100 US RT 40	GREENVILLE	HDFLT		
8	Ferrellgas	805 Hillview Ave	GREENVILLE	HDFLT		
9	Greenville Regional Hospital	200 Healthcare Dr	Greenville	HDFLT		
10	Greevnill Service Co	520 Franklin St	Greenville	HDFLT		
11	Kern's Ag Services	612 S Maple St	Mulberry Grove	HDFLT		
12	Southern Central FS Inc	822 S 2nd St	Greenville	HDFLT		
13	Southwest Electric Corps Inc	525 US 40	Greenville	HDFLT		
14	Top Ag, Inc	820 Pacatte St	Pierron	HDFLT		
15	Woolsey Bros Farm Supply	601 Ridge Ave	Greenville	HDFLT		

Medical Care Facilities Report

ID	Name	Address	City	Class	Function	Beds	Stories	Repla Cost
1	EDWARD A UTLAUT MEM	200 HEALTH CARE DRIVE	GREENVILLE	EFHL	Hospital	188		15540
2	Brauns Terrace	1115 East Washington Street	GREENVILLE	EFHS	Nursing	16		
3	Cardinal Hill Healthcare	400 East Hillview Avenue	GREENVILLE	EFHM	Nursing	90		
4	Fair Oaks	200 Health Care Drive	GREENVILLE	EFHL	Nursing	108		

Police Station Facilities Report

ID	Name	Address	City	Class	Stories
1	Bond County Sheriff	403 S 2nd St	Greenville	EFPS	
2	Greenville Police Dept	404 S 3rd St	Greenville	EFPS	
3	Pocahontas	101 Kavanaugh	Pocahontas	PDFLT 1	

Potable Water Facilities Report

ID	Name	Address	City	Class
1	SORENTO WTP	1/4 MILE S. COUNTY HWY 18	SORENTO	36963
2	GREENVILLE WTP, CITY OF	1261 WATER PLANT ROAD	Greenville	

School Facilities Report

ID	Name	Address	City	Class	Students
1	GREENVILLE ELEM SCHOOL	800 N DEWEY	GREENVILLE	EFS1	605
2	Greenville High School	1000 E. State Rte. 140	GREENVILLE	EFS1	581
3	GREENVILLE JR HIGH SCHOOL	1200 Junior High Drive	GREENVILLE	EFS1	302
4	Pochontas Elementary School	4 State Stree	Pocahontas	EFS1	238
5	Sorento Elementary School	510 S. Main Street	Sorento	EFS1	173
6	Greenville College	315 E. College Ave.	Greenville	EFS2	0
7	Mulberry Grove Jr. / Sr. High	801 W Wall	Mulberry Grove	EFS1	197
8	Mulbery Grove Elementary	801 W Wall	Mulberry Grove	EFS1	259
9	Metro Christian Academy	1654 Elevator Road	Sorento	EFS1	30

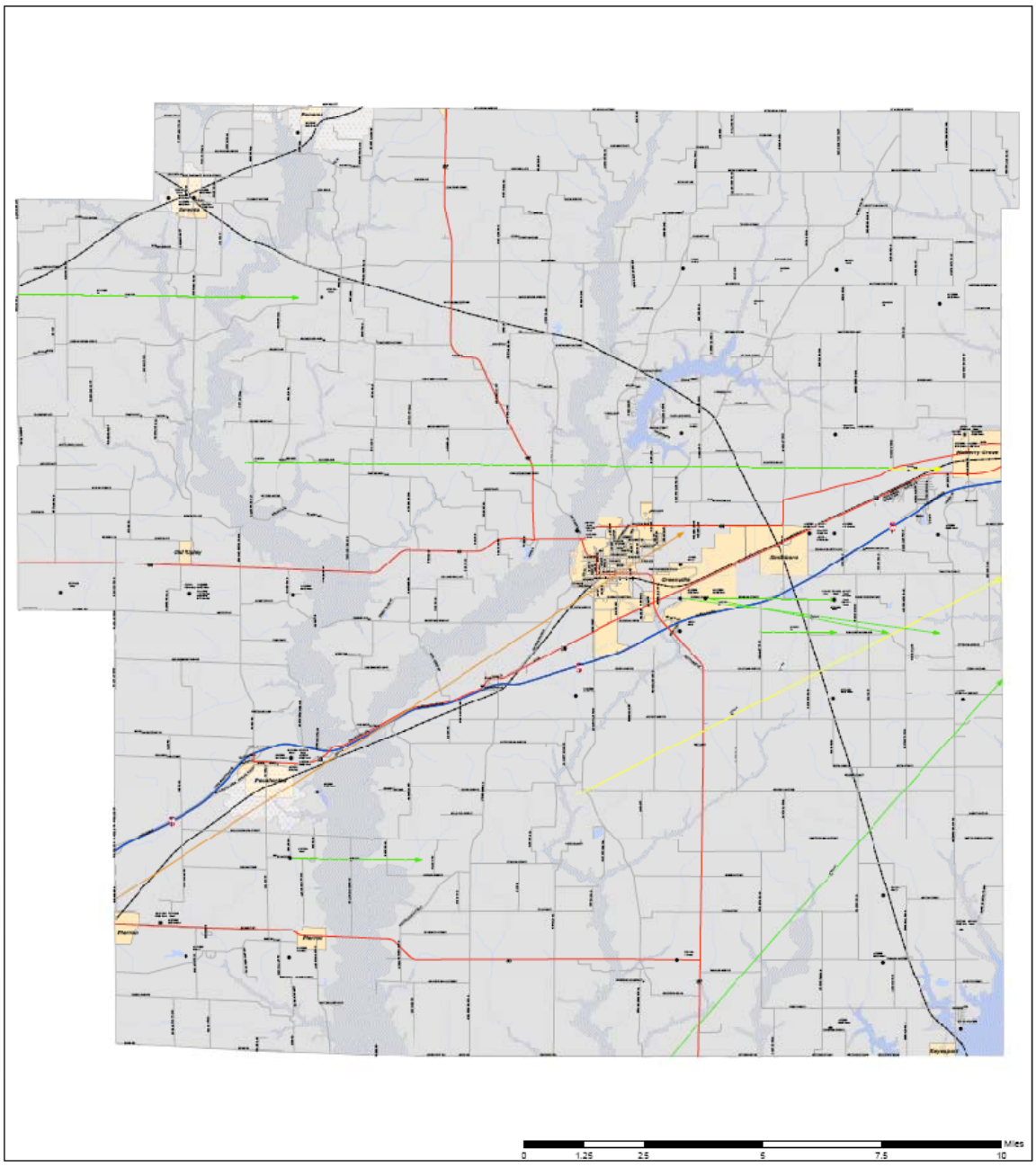
User Defined Facilities Report

ID	Name	Address	City	Class	Function
1	MulberryGrove Municipal Building	205 N Wood St	Mulberry Grove		Village Hall
2	Smithboro Village Hall	202 S Main St	Smithboro		Village Hall
3	Federal Correctional Institution	100 US Hwy40 & 4th	Greenville		

WasteWater Facilities Report

ID	Name	Address	City	Function	Class
1	GATEWAY RETREAT	1391 WOBURN ROAD	GREENVILLE	SPORTING A	CDFLT
2	GREENVILLE SEWAGE	1200 S ELM ST	GREENVILLE	SEWAGE TRE	CDFLT
3	MULBERRY GROVE SD	1993 US RT 140	MULBERRY GROVE	SEWAGE TRE	CDFLT
4	PIERRON EAST STP	EAST OF BARNHARDT STREET	PIERRON	SEWAGE TRE	CDFLT
5	PIERRON WEST STP	830 Main St	PIERRON	SEWAGE TRE	CDFLT
6	POCAHONTAS STP,	801 Leverton St	POCAHONTAS	SEWAGE TRE	CDFLT
7	SORENTO STP, VILLAGE	Sanderson St	SORENTO	SEWAGE TRE	CDFLT
8	Panama STP	9200 Donnellson Ave	Panama	SEWAGE TRE	CDFLT

Appendix G—Map of Critical Facilities



Bond County
Pre-Disaster Mitigation Plan

Historical Natural Hazards Map

2

Legend

- Severe Thunderstorm (Hail Event)
- Severe Thunderstorm (Wind Event)
- Tornado Touchdown
- Earthquake Epicenter

F1
F2
F3
F4
F5

Interstate
State Road
Local Road
Railroad

River
100 Year Flood Area
Underground Mine
Lake
City

Southwestern Illinois Metropolitan
& Regional Planning Commission
2511 Vandalia Street
Collinsville, IL 62234
Phone: (618) 344-4250
Fax: (618) 344-4253

Data Sources: Federal Emergency Management Agency(FEMA); U.S. Geologic Survey; Illinois Geologic Survey; National Oceanic and Atmospheric Administration(NOAA); Center for Earthquake Research and Information, University of Memphis; Illinois Department of Transportation; Bond County 911; Bond County Emergency Telephone System Board

Appendix H—Recorded NOAA Flood Data: USGS Stream Gauge Data

Appendix H – Top ten flood flows from the USGS Stream Gauge Data

County Station River Period of Record Latitude Longitude	Bond County Near Pierron, IL Shoal Creek 1995-2007 38°46'33" 89°29'56"		Montgomery County Near Coffeen, IL Shoal Creek 1964-2007 38°46'33" 89°29'56"		St Clair Near New Athens, IL Kaskaskia River 1908-1971 38°19'11" 89°53'19"	
Rank	**Date**	**Discharge (cfs)**	**Date**	**Discharge (cfs)**	**Year**	**Discharge (cfs)**
1	05/08/2002	24,000	12/07/1966	5,910	05/23/1943	83,000
2	01/06/2005	21,200	05/07/2002	5,680	08/19/1946	71,700
3	05/19/1995	17,700	05/26/1990	5,170	05/13/1961	66,600
4	04/30/1996	12,800	08/05/1998	5,030	08/26/1915	63,100
5	05/29/2004	12,700	10/12/1969	4,630	05/11/1908	62,800
6	02/08/1999	11,100	04/11/1979	4,530	01/10/1950	60,200
7	03/22/1998	9,040	07/20/1982	3,600	03/30/1913	56,600
8	02/28/1997	9,010	12/29/1990	3,410	02/03/1916	54,800
9	08/26/2000	6,690	01/05/2005	3,140	06/20/1957	48,700
10	05/11/2003	6,600	12/11/1985	3,110	04/05/1938	44,000