

3.3 Vulnerability Assessment

Requirement §201.6(c)(2)(ii) :[The risk assessment shall include a] description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Requirement §201.6(c)(2)(ii)(A) :The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Requirement §201.6(c)(2)(ii)(B) :[The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

Requirement §201.6(c)(2)(ii)(C) : [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Requirement §201.6(c)(2)(ii) : (As of October 1, 2008) [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.

3.3.1 Methodology

The vulnerability assessment further defines and quantifies populations, buildings, critical facilities, and other community assets at risk to natural hazards. The vulnerability assessment for this plan followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses* (2002).

The vulnerability assessment was conducted based on the best available data and the overall planning significance of the hazard. Data to support the vulnerability assessment was collected from the same sources identified in Section 3.1 Hazard Identification and Section 3.2 Hazard Profiles and from FEMA’s HAZUS-MH MR5 loss estimation software.

The Vulnerability Assessment is divided into four parts:

- **Section 3.3.2 Community Assets** first describes the assets at risk in Vanderburgh County, including the total exposure of people and property; critical facilities and infrastructure; natural, cultural, and historic resources; and economic assets. Note, HAZUS-MH MR5 currently uses 2000 Census Bureau Data.
- **Section 3.3.3 Vulnerability by Hazard** describes the vulnerability to each hazard identified in section 3.1 and profiled in section 3.2. This vulnerability analysis includes a vulnerability overview for each hazard. For hazards of high and moderate significance, the vulnerability analysis includes evaluation of vulnerable buildings, infrastructure, and critical facilities; estimated losses and a description of the methodology used to estimate losses; discussion of future development in relation to hazard-prone areas.

- **Section 3.3.4 Future Land Use and Development** discusses development trends, including population growth, housing demand, and future projects.
- **Section 3.3.5 Summary of Key Issues** summarizes the key issues and conclusions identified in the risk assessment process.

3.3.2 Community Assets

This section assesses the population, structures, critical facilities and infrastructure, and other important assets in Vanderburgh County that may be at risk to natural hazards.

Total Exposure of Population and Structures

Table 3.16 shows the total population, number of structures, and assessed value of improvements to parcels by jurisdiction. Land values have been purposely excluded because land remains following disasters, and subsequent market devaluations are frequently short term and difficult to quantify. Additionally, state and federal disaster assistance programs generally do not address loss of land or its associated value. The greatest exposure of people and property is concentrated in the City of Evansville, though significant population and structures are spread out in the unincorporated areas of the County.

Table 3.32 Maximum Population and Building Exposure by Jurisdiction

Community	Population	Number of Structures	Total Structure Value (\$1000)
Evansville	121,582	55,731	11,725,221
Darmstadt	1,313	657	135,032
Unincorporated Vanderburgh County	49,027	23,663	4,934,524
Total	171,922	80,051	16,794,777

Source: HAZUS-MH (MR 5) (structures), Population - 2000 US Census Bureau; Structures and Value – 2000 US Census Bureau and Vanderburgh County Assessor’s Office; *Value represents “improved structure value” does not include land value.

Critical Facilities and Infrastructure

A critical facility may be defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Table 3.33 is an inventory of critical facilities in Vanderburgh County. Figure 3.31 provides locations of the critical facilities in the entire planning area.

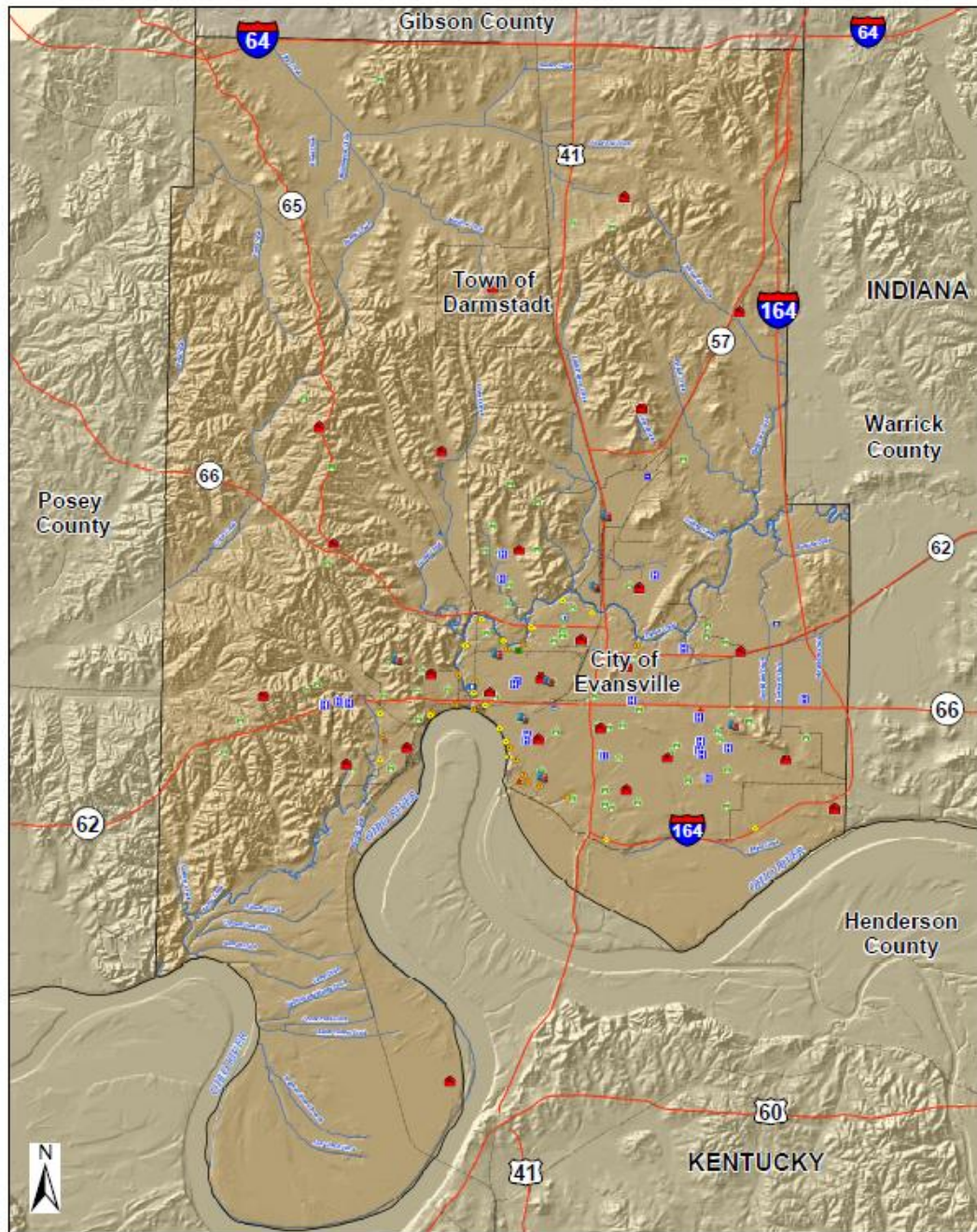
Table 3.33 Inventory of Critical Facilities and Infrastructure

Critical Facility	Address
Emergency Operations Center	
Evansville-Vanderburgh County Emergency Management Agency	708 Stanley Avenue
Police Stations	
Evansville Police East Sector Office	4900 Shamrock Dr Suite 105
Evansville Police West Sector Office	401 E. Columbia
Vanderburgh Sheriff Headquarters	3500 N. Harlan Ave
Vanderburgh Sheriff Command Post	5607 North Highway 41
Evansville Police South Sector Office	315 Taylor Av
Evansville Police Central Office	15 NW Martin Luther King Jr. Blvd
Vanderburgh Sheriff Community Correction	1505 North Third Ave.
Central Dispatch and Second Repeaters	1331 Harmony Way
Jail	3500 N. Harlan Ave
Heritage Petroleum – 1	6205 Old Boonville Hwy 47715
Heritage Petroleum – 2	516 N. Seventh Ave. 47710
Heritage Petroleum – 3	1250 E. Morgan Ave. 47711
Fire Stations	
German Twp – Company 8	5220 Kasson Dr
German Twp – Company 9	8400 Saint Wendel Rd
Hose House #1	750 SE Eight St
Hose House #10	120 E Columbia
Hose House #14	545 S Willow Rd
Hose House #15	1711 S. Weinbach Ave
Hose House #16	2801 Washington Ave
Hose House #17	425 W Mill Rd
Hose House #2	3601 Maxx Rd
Hose House #3	310 N 4 th Ave
Hose House #4	1200 Oak Hill Rd
Hose House #5	2413 W Maryland St
Hose House #6	6521 Washington Ave
Hose House #7	1050 S Barker Ave
Hose House #8	2003 N Kentucky Ave
Hose House #9	2020 Keystone Dr
(Former Knight Twp) – Company 7	8026 Pollack Ave
McCutchanville Fire Dept	9219 Petersburg Rd
McCutchanville – Station 5	7707 N Saint Joseph Rd
Perry Twp – Station 1	1510 Johnson Ln
Perry Twp – Station 2	11 Williams Rd
Perry Twp – Station 3	Old Henderson Rd
Scott Twp – Station 1	1540 E Baseline Rd
Scott Twp – Station 2	12425 N Green River Rd
Scott Twp – Station 3	12949 Darmstadt Rd
Utilities	
Water and Sewer Maintenance Bldgs	1931/1933 Allens Lane
Levee Pump Stations	Multiple locations
Water Filtration and Pump Stations	Multiple locations
Eastside Wastewater Treatment Plant	Waterworks Road, near the Ohio River

Westside Wastewater Treatment Plant	Tekoppel Avenue, near the Ohio River
Main Government Buildings	
Civic Center	1 NW M L King Blvd
City Garage	1401 Waterworks Road
County Highway Garage	5105 N. Saint Joseph Avenue
Medical Facilities	
Convenient Care Center West	4912 W University Dr
Deaconess Cross Point	7200 E. Indiana
DEACONESS HOSPITAL	600 MARY STREET
Deaconess Primary Care; SRs North Park	4498 N First Ave
Deaconess Primary Care; SRs Weinbach CTR	2010 Center Dr
Deaconess Urgent Care CTR Northbrook	3844 First Ave
Deaconess Urgent Cart CTR Lawndale	827 S. Green River Rd
EVANSVILLE PSYCH CHILDREN CTR	3300 EAST MORGAN AVENUE
EVANSVILLE STATE HOSPITAL	3400 LINCOLN AVENUE
Evansville Surgery Center	520 Mary Street
HEALTHSOUTH TRI-STATE REHAB	4100 COVERT AVENUE
MEC Urgent Care Center University Center	4550 W Lloyd Expressway
MED First Medical Center	1401 Washington Ave
North Pointe Medical Plaza	2330 Lynch Road
Southwestern Indiana Mental Health CTR	415 Mulberry
ST ELIZABETH ANN SETON HOSP	3700 WASHINGTON AVENUE
ST MARY'S MEDICAL CENTER	3700 WASHINGTON AVENUE
St. Mary's Cancer Center	3801 Bellemeade Ave
St. Mary's Convenient Care West	5320 Weston Rd.
Select Specialty Hospital Campus	401 S. E. Sixth Street
Vanderburgh Health Department	420 Mulberry Street
VA Clinic	500 E Walnut St
Ambulance Dispatch	950 E. Virginia
American Red Cross Facility	29 S. Stockwell Road
Other	
Airport	7801 Bussing Dr
Public Bus Service Transportation Garage	601 John Street
County Coroner's Office / Morgue	201 South Morton Avenue
Humane Society	400 Millner Industrial Drive
Animal Control	815 Uhlhorn Street
Schools	
BENJAMIN BOSSE HIGH SCHOOL	1300 WASHINGTON AVE
CAZE ELEMENTARY SCHOOL	2013 S GREEN RIVER RD
CEDAR HALL ELEMENTARY SCHOOL	2100 N FULTON AVE
CENTRAL HIGH SCHOOL	5400 1 ST AVE
CHRIST THE KING ELEM SCHOOL	3109 BAYARD PARK DRIVE
CORPUS CHRISTI	5530 HOGUE ROAD
CYNTHIA HEIGHTS ELEM SCH	7225 CYNTHIANA RD
DANIEL WERTZ ELEMENTARY SCH	1701 S RED BANK RD
DELAWARE ELEMENTARY SCHOOL	700 N GARVIN ST
DEXTER ELEMENTARY SCHOOL	917 S DEXTER AVE
EVANS MIDDLE SCHOOL	837 TULIP AVE
EVANSVILLE CHRISTIAN SCHOOL	4400 LINCOLN AVE.
EVANSVILLE LUTHERAN SCHOOL	1000 W ILLINOIS ST
FAIRLAWN ELEMENTARY SCHOOL	2021 S ALVORD BLVD

Schools	
FAITH HERITAGE CHRISTIAN SCH	1613 POLLACK AVE
FRANCIS JOSEPH REITZ HIGH SCH	350 DREIER BLVD
GLENWOOD MIDDLE SCHOOL	901 SWEETSER AVE
GOOD SHEPHERD ELEMENTARY SCHOO	2301 N STOCKWELL ROAD
HARPER ELEMENTARY SCHOOL	21 S ALVORD BLVD
HARWOOD MIDDLE SCHOOL	3013 1 ST AVE
HEBRON ELEMENTARY SCHOOL	4400 BELLEMEADE AVE
HELFRICH PARK MIDDLE SCHOOL	2603 W MARYLAND ST
HENRY REIS EDUC CNTR-ALT HIGH SCH	1900 STRINGTOWN RD
HIGHLAND ELEMENTARY SCHOOL	6701 DARMSTADT RD
HOLY REDEEMER ELEM SCHOOL	924 WEST MILL ROAD
HOLY ROSARY SCHOOL	1303 S GREEN RIVER RD
HOLY SPIRIT ELEMENTARY SCHOOL	1760 LODGE AVE
HOWARD ROOSA ELEMENTARY SCH	1230 E ILLINOIS ST
Indiana Business College	4601 Theatre Dr
Ivy Tech State College	3501 First Ave
JOHN M CULVER ELEM SCH	1301 JUDSON ST
LINCOLN ELEMENTARY SCHOOL	635 LINCOLN AVE
LODGE ELEMENTARY SCHOOL	2000 LODGE AVE
Marian Day School	700 Herndon Drive
MATER DEI HIGH SCHOOL	1300 HARMONY WAY
MCGARY MIDDLE SCHOOL	1535 S JOYCE AVE
NORTH HIGH SCHOOL	2319 STRINGTOWN RD
OAK HILL MIDDLE SCHOOL	7700 OAK HILL RD
Oakland City Univ Evansville Campus	110 S Green River Rd
PERRY HEIGHTS MIDDLE SCHOOL	5800 HOGUE RD
PLAZA PARK MIDDLE SCHOOL	7301 OUTER LINCOLN AVE
REITZ MEMORIAL HIGH SCHOOL	1500 LINCOLN AVENUE
RESURRECTION ELEMENTARY SCHOOL	5301 NEW HARMONY ROAD
Sacred Heart Catholic Church: School	2735 West Franklin St.
School of Academic & Career Development	1901 Lynch Road
SCOTT ELEMENTARY SCHOOL	14940 OLD STATE RD
Seventh-Day-Adventist SW Jr Academy	41 West Campground Rd
SIGNATURE HIGH SCHOOL	610 MAIN ST
ST BENEDICT ELEMENTARY SCHOOL	530 SOUTH HARLAN AVE
ST JAMES ELEMENTARY SCHOOL	Old Princeton Road
ST JOSEPH ELEMENTARY SCHOOL	6130 W ST JOSEPH RD
ST THERESA ELEMENTARY SCHOOL/M	700 HERNDON DRIVE
St. Agnes Intermediate School	1620 Glendale Ave.
St. Boniface Catholic Church	2031 W. Michigan
STOCKWELL ELEMENTARY SCHOOL	2501 N STOCKWELL RD
STRINGTOWN ELEMENTARY SCHOOL	4720 STRINGTOWN RD
TEKOPPEL ELEMENTARY SCHOOL	111 N TEKOPPEL AVE
THOMPSON MIDDLE SCHOOL	1300 W MILL RD
TRINITY LUTHERAN SCHOOL	1403 W BOONVLE NEW HRMY
University of Evansville	1800 Lincoln Ave
University of Southern Indiana	8600 University Blvd
VOGEL ELEMENTARY SCHOOL	1500 OAK HILL RD
WASHINGTON MIDDLE SCHOOL	1801 WASHINGTON AVE
WEST TERRACE ELEMENTARY SCH	8000 W TERRACE DR
WILLIAM HENRY HARRISON HIGH SCH	211 FIELDING RD
North High School/Middle School	Base Line Road at US 41 North

Figure 3.31 Critical Facilities



Evansville/Vanderburgh County, IN
Multi-Hazard Mitigation Plan
June 2011

Base Map Features	
EMA	Schools
City Garage	Waste Water Facility
County Garage	Potable Water Facility
Civic Center	Levee Pump Stations
Police Departments	Combined Sewer Overflows
Critical Fuel Locations	Airport
Fire Stations	Humane Society
Medical Facilities	Animal Control
	American Red Cross
	Public Bus Garage
	Railroads
	Major Roads
	Streams
	Cities
	Vanderburgh Co.
	Other Counties

Scale: 0 1 2 3 4 Miles amec

Natural, Historic, and Cultural Assets

Assessing the vulnerability of Vanderburgh County to disaster also involves inventorying the natural, historic, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing so ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts are higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.

Natural Resources

Additional vulnerability to the catastrophic event would include the current listing of natural resources within Evansville and Vanderburgh County. Those species listed below are identified as endangered, threatened, and rare species documented within Vanderburgh County by the Indiana Department of Natural Resources:

- Bobcat;
- Swamp Rabbit;
- American Badger;
- Great Egret;
- Upland Sandpiper;
- Peregrine Falcon;
- Loggerhead Shrike;
- Copperbelly Water Snake;
- Hellbender;
- Spottail Darter;
- Marbled Underwing Moth;
- American Burying Beetle; and
- Indiana Crayfish.

Historic and Cultural Resources

Vanderburgh County has a history rich in Indian lore, mining, railroads, and agriculture. Preservation of the cultural heritage of this area has been identified as an important value and is ensured by a variety of initiatives. Several national and state historic inventories were reviewed to identify historic and cultural assets in Vanderburgh County:

- The **National Register of Historic Places** is the Nation’s official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.
- The **Indiana Register of Historic Sites and Structures** is a listing of the state’s significant cultural resources worthy of preservation for the future education and enjoyment of Indiana’s residents and visitors. Properties listed in the State Register include individual buildings, structures, objects, districts, and historic and archaeological sites.

Table 3.34 lists the properties in Vanderburgh County that are on both the National Register of Historic Places and the Indiana State Register of Historic Sites and Structures.

Table 3.34 Vanderburgh County Historic Properties in State and National Registers

Historic Place And Location	Date of Construction	Date listed on the State or National Register
Alhambra Theatorium, 50 Adams Avenue	1913	National (10-1-79)
Angel Mounds State Memorial 8 miles southeast of Evansville	Not Available	National (10-15-66)
Bayard Park Historic District; Roughly bounded by Gum, Kentucky, Blackford and Garvin Streets	1893-1935	National (6-27-85)
William Bedford, Sr. House, 838 Washington Avenue	1874	National (11-28-78)
Bernardin-Johnson House, 17 Johnson Place	1916	National (6-29-89)
Bitterman Building, 202-204 Main Street	1923	National (9-22-80)
John W. Boehne House, 1119 Lincoln Avenue	1913	National (2-17-83)
Willard Carpenter House, 405 Carpenter Street	1849	National (2-20-78)
Culver Historic District, Roughly bounded by Madison Ave., Riverside Dr., Emmett and Venice Streets	1890-1929	National (6-1-84)
Downtown Evansville Multiple Resource Area – Multiple Buildings	1817-1943	State (3-2-82) National (7-1-82)
Evansville College, 1800 Lincoln Avenue	1916-1940	National (2-3-83)
Evansville Municipal Market, 813 Pennsylvania Street	1918	National (12-22-83)
Evansville Post Office, 100 block of NW 2nd Street	1879	National (7-2-71)
Former Vanderburgh County Sheriff’s Residence 4th Street between Vine and Court Streets	1891	National (10-6-70)
Garvin Park North Main Street and Morgan Avenue	1915	National (8-29-80)

Historic Place And Location	Date of Construction	Date listed on the State or National Register
General Cigar Company 223 NW 2 nd Street	1902, 1923, 1929	National (2000)
Greyhound Bus Terminal 102 Northwest 3rd Street	1939	National (10-1-79)
Michael D. Helfrich House 700 Helfrich Lane	1920	National (5-24-84)
Hooker-Ensle-Pierce House 6531 Oak Hill Road	1839	National (4-28-77)
Hose House #10 119 East Columbia Street	1888	National (2-11-82)
Hose House #12 1409 1st Avenue	1908	National (6-17-82)
Edgar Iglehart House 5500 Lincoln Avenue	1932	National (12-18-90)
Independence Historic District Roughly bounded by Iowa and Illinois Streets, Wabash and St. Joseph Streets	1857-1920	National (2-1-82)
Koester-Patberg House 504 Herndon Drive	1974	National (3-3-83)
Liberty Baptist Church 701 Oak Street	1886	National (12-8-78)
Lincolnshire Historic District Roughly bounded by Lincoln, Bennighof, Bellmeade, Lodge, Washington, Harlan, East Chandler and College Streets	1913-1940	National (10-2-89)
Peter Augustus Maier House 707 South 6th Street	1873	National (10-29-82)
McCurdy Building, (Sears, Roebuck and Company Building) 101 Northwest 4th Street	1920, 1937, 1943	National (10-1-79)
McJohnston Chapel and Cemetery Kansas Rd. and Erskine Lane	1880	National (1-18-79)
Mead Johnson River-Rail-Truck Terminal and Warehouse 1830 West Ohio Street	1931	National (12-27-84)
Oak Hill Cemetery 1400 E. Virginia Street	1853-1953	National (2004)
Ohio Street Bridge Ohio Street over Pigeon Creek	1891	National (1998)
Old Bitterman Building 200 Main Street	c.1885	National (9-22-80)
Old Vanderburgh County Courthouse Block bounded by Vine, 4th, Court and 5th Streets	1891	National (9-4-70)
John Augustus Reitz House 224 Southeast 1st Street	1872	National (10-15-73)
Ridgeway Building 313-315 Main Street	1895	National (1-3-80)
Riverside Historic District Roughly bounded by Southlane Dr., Walnut, 3rd, and Parrett Streets	1818-1920	National (11-14-78)
Michael Schaeffer House 118 East Chandler Avenue	1894	National (2-11-82)
Robert Smith Mortuary 118-120 Walnut Street	1930	National (9-22-80)

Historic Place And Location	Date of Construction	Date listed on the State or National Register
Soldiers and Sailors Memorial Coliseum 350 Court Street	1917	National (5-10-79)
Sunset Park Pavilion 411 Southeast Riverside Drive Sunset Park	1912	National (6-17-92)
Charles Sweeton House 8700 Old State Road	1926-1935	National (2005)
Washington Avenue Historic District Roughly bounded by Madison and Grand avenues, East Gum and Parrett Streets	1880-1920	National (11-28-80)
Willard Library 21 1st Avenue	1888	National (9-28-72)

Source: Indiana Department of Natural Resources; <http://www.in.gov/dnr/historic/2823.htm>

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3.3.3 Vulnerability by Hazard

This section describes overall vulnerability and identifies structures and estimates potential losses to buildings, infrastructure, and critical facilities located in identified hazard areas. This assessment was limited to the hazards that were considered moderate or high in planning significance, based on HMPC input and the hazard profiles. Hazards ranked of low significance due to a lack of notable past damage or very low probabilities are not included in the vulnerability assessment. These include the following:

- Mine Subsidence

Vulnerability for this hazard is discussed in qualitative terms in Section 3.2 Hazard Profiles.

The vulnerability assessment is also limited by the data available for the high or moderate ranked hazards. The methods of analysis vary by hazard type and data available. Many of the identified hazards, particularly infestations and weather related hazards, affect the entire planning area, and specific hazard areas cannot be mapped geographically. For these hazards, which include drought, infestations, and severe weather, vulnerability is mainly discussed in qualitative terms because data on potential losses to structures is not available. Geographic hazard areas can be mapped for the following identified hazards: flood; dam failure; levee failure; earthquake; and wildfire.

Drought

Existing Development

Drought affects the water supply of communities in the County, as well as agricultural irrigation on a more widespread scale, affecting the economy. It normally does not impact structures and can be difficult to identify specific hazard areas. Data is not available to estimate potential losses to structures in identified hazard areas.

The most significant impacts are to water intensive activities such as agriculture, municipal usage, commerce, and tourism and recreation. Water quality deterioration can also occur during droughts. According to the 2007 Census of Agriculture, 71,927 acres in Vanderburgh County dedicated to agriculture with total sales of \$32,591,000. A future drought that causes a 20 percent loss of the total value in the County would result in potential losses of about \$6,518,200.

Future Development

As population grows, so do the water needs for household, commercial, industrial, recreation, and agricultural uses. Vulnerability to drought will increase with these growing demands on existing water supplies. Future water use planning in Indiana is addressed the State's Water Shortage Plan, July 23, 2009. The purpose of the plan is to provide the State of Indiana with an effective and systematic plan to assess and manage the State's water resources during a water shortage or potential water shortage to respond, to the maximum extent practicable, to the needs of its water users while protecting its environment. It is intended to serve as a tool for the State to

guide the use and management of the State's water resource as the availability of that resource diminishes during events such as drought.

Infestations

West Nile Virus

Existing Development

Both the risk and vulnerability to Indiana from West Nile Virus (WNV) is considered low, based on the percentage of total population that actually contracts the disease. The first appearance of WNV in North America occurred in 1999. Since 2003, there have been 5 human disease cases identified in Vanderburgh County.

Future Development

To reduce the risk transmission of West Nile Virus by mosquitoes, the Vanderburgh County Health Department recommends residents:

- Take special precautions when outdoors between dusk and dawn, when mosquitoes are most active;
- Use insect repellent containing DEET, Picaridin, or Oil of Lemon Eucalyptus; and
- Make sure your property is free of any standing water, which could be breeding grounds for the mosquitoes that carry disease such as West Nile Virus. Empty flowerpots, buckets, old tires, and clogged gutters.

The Vanderburgh County Health Department's Mosquito Control Division is currently focusing efforts on treating standing water to prevent adult mosquitoes from developing. .

Emerald Ash Borer

Existing Development

The Urban Forestry Department and City Arborist of Evansville have inventoried the ash trees located within the City of Evansville. A row of ash trees located on Division Street between Martin Luther King Junior Boulevard and First Avenue was noted as staghorning. This area has been identified as a good project for Master Gardeners to prune out dead in as a volunteer project.

Future Development

On a national level, research is being conducted at universities to understand the beetle's life cycle and find ways to detect new infestations, control emerald ash borer adults and larvae, and contain the infestation. Additionally, quarantines are in place to prevent infested ash firewood, logs or nursery trees from being transported and starting new infestations.

Within Vanderburgh County, the Urban Forestry Department and City Arborist of Evansville are developing a plan to remove ash trees in order to receive grant funding for tree replacement

within the same year. Additionally, the Urban Forestry Department and City Arborist of Evansville will monitor the ash tree population for indications of the Emerald Ash Borer, and initiate plan when the infestation has been found in Evansville.

Severe Weather

Existing Development

The severe weather evaluated as part of this risk assessment included: extreme temperatures, thunderstorms/high winds/lightning, tornadoes, and winter storms. During severe weather events, the threat to public safety is typically the greatest concern. However, these storms also impact the local economy by disrupting transportation and commercial activities.

Impacts to existing development within the community, as a result of severe weather, includes damage to infrastructure, particularly overhead power lines, road closures, and interruption in business and school activities. Utility outages impact anything relying on electricity without a redundant power supply (e.g., a generator), and include secondary impacts such as interruption to water and sewage services, heat and refrigeration, fuel supplies, computers and cell phones. If interruption to business occurs for an extended period, economic impacts can be severe. Also of concern is the impact to populations with special needs such as the elderly and those requiring the use of medical equipment. Although typically short-lived, delays in emergencies response services are of concern. Depending on the nature of a given storm, all areas within Evansville and Vanderburgh County are potentially at risk; however, those areas relying on above ground utilities would potentially suffer the greatest damage.

Future Development

Future residential or commercial buildings built to code should be able to withstand wind and snow loads from severe weather. Population growth in the County will increase problems with road, business, and school closures and increase need for snow removal and emergency services related to severe winter weather events.

Flood

Existing Development

FEMA's software program, HAZUS-MH MR5, was utilized for estimating the potential losses due to flooding. HAZUS was used to generate a one percent annual flood, or base flood, event for major rivers and creeks in the county. The software produces a flood polygon and flood-depth grid that represents the base flood. The current Flood Insurance Study and associated Digital Flood Insurance Rate Maps (DFIRMs), dated March 2011, did not include flood-depth grids and were therefore, not utilized in this analysis.

Based on the flood polygon and flood-depth grid, HAZUS provides reports on the number of buildings impacted, building repair costs, and the associated loss of building contents and business inventory. Community parcel and tax assessor information were entered into the software program to refine the building inventory.

Additionally, building damage can cause losses to a community as a whole by restricting the building's ability to function properly. Income loss data accounts for business interruption and rental income losses as well as the resources associated with damage repair and job and housing losses. These losses are calculated by HAZUS using a methodology based on the building damage estimates. Flood damage is directly related to the depth of flooding. For example, a two-foot flood generally results in about 20 percent damage to the structure (which translates to 20 percent of the structure's replacement value).

The HAZUS analysis for a 100-year flood event produced the following loss estimates:

Table 3.35 Estimated Displaced Persons and Impacted Buildings by Jurisdiction

Jurisdiction	Displaced Persons	Impacted Buildings
Evansville	13,303	1901
Darmstadt	0	0
Unincorporated Area	3,683	793
Total County	16,986	2,694

Source: HAZUS-MH MR5

Table 3.36 Estimated Building Losses by Jurisdiction (Millions of dollars)

Jurisdiction	Building Damage (\$)	Content Damage (\$)	Inventory Damage (\$)	Income Loss (\$)	Relocation Cost (\$)	Rental Income Loss(\$)	Wage Loss (\$)	Total Loss (\$)	% of Total
Evansville	281	319.10	216.91	12.59	11.46	4.76	32.44	878.42	28.0
Darmstadt	0.27	0.37	0.43	0.41	0.18	0.03	0.97	2.65	0.1
Unincorporated Area	112.08	106.95	1,884.89	33.10	26.65	6.81	81.32	2,251.78	71.9
Total County	393.35	426.42	2,102.23	46.1	38.29	11.6	114.73	3,132.85	100

Source: HAZUS-MH MR5

Critical Facilities in 100-Year Floodplain

Table 3.21 shows critical facilities located in Vanderburgh County's 100- and 500-year flood hazard areas. Critical facilities data was obtained from the HMPC and Evansville-Vanderburgh County Emergency Management Agency.

Table 3.37 Critical Facilities in the 100- and 500-Year Floodplains

Facility	Address	Floodplain
McCutchanville – Station 5	7707 N Saint Joseph Rd	100-Year
Perry Twp – Station 1	1510 Johnson Ln	100-Year
Perry Twp – Station 3	Old Henderson Rd	100-Year
Animal Control	815 Uhlhorn Street	500-Year
Deaconess Cross Point	7200 E. Indiana	500-Year
Heritage Petroleum – 1	6205 Old Boonville Hwy	500-Year
North High School	2319 Stringtown Road	500-Year
Oak Hill Middle School	7700 Oak Hill Road	500-Year
Scott Twp – Station 2	12425 N Green River Rd	500-Year

Source: HAZUS-MH MR5; HMPC; and City of Evansville-Vanderburgh County EMA

Future Development

The risk of flooding to future development should be minimized by the floodplain management programs of the County and its municipalities, if properly enforced. Risk could be further reduced by strengthening floodplain ordinances and floodplain management programs beyond minimum NFIP requirements.

Dam Failure

Existing Development

Although there is no specific evidence to indicate the likelihood of dam failure within the County, there are several high hazard dams located in the County. A dam failure could result in impacts greater than the 100-year flood event and could be catastrophic. Inundation maps were unavailable for this project; therefore, structures and potential loss estimates in these areas could not be calculated. Emergency Action Plans for every high and significant hazard dams are kept on file at the Indiana Department of Natural Resources, Agriculture, Division of Water Resources, and Water Structures Program.

Future Development

Flooding due to a dam failure event is likely to exceed the special flood hazard areas regulated through local floodplain ordinances. Evansville and Vanderburgh County should consider the dam failure hazard when permitting development downstream of the 8 high hazard and 8 significant hazard dams in the County. Low hazard dams could become significant or high hazard dams if development occurs below them.

Earthquake

Existing Development

Common impacts from earthquakes include damages to infrastructure and buildings (e.g., unreinforced masonry [brick] crumbling; architectural facades falling; underground utilities breaking, gas-fed fires; landslides and rock falls; and road closures). Less common, but possible damages would include dam failures and subsequent flash floods.

FEMA’s software program, HAZUS-MH MR5, was utilized for estimating the potential losses due to earthquakes. HAZUS evaluates the geographic distribution of ground shaking resulting from a specified scenario earthquake and expresses ground shaking using quantitative parameters, such as peak ground acceleration and spectral acceleration. For Vanderburgh County, the following specified earthquake scenarios were utilized:

Table 3.37 HAZUS Specified Earthquakes

New Madrid Fault Zone	Wabash Valley Fault Zone
<ul style="list-style-type: none"> • 7.7 Magnitude at 10 KM depth; • 235.53 square mile region with 48 census tracts; • 70,000 households; • Population of 171,922 people; • 72,000 buildings within the region; • Total building replacement cost of 14,412 million dollars; and • Approximately 90% of the buildings (and 66% of the building value) are associated with residential housing. 	<ul style="list-style-type: none"> • 7.1 Magnitude at 10 KM depth; • 235.53 square mile region with 48 census tracts; • 70,000 households; • Population of 171,922 people; • 72,000 buildings within the region; • Total building replacement cost of 14,412 million dollars; and • Approximately 90% of the buildings (and 66% of the building value) are associated with residential housing.

Source: HAZUS-MH MR5; HMPC; and City of Evansville-Vanderburgh County EMA

Based on the specified earthquake, HAZUS provides reports on the number of buildings impacted, building repair costs, and the associated loss of building contents and business inventory. Community parcel and tax assessor information were entered into the software program to refine the building inventory.

Table 3.38. HAZUS Earthquake Results

Impacts / Earthquake	New Madrid Seismic Zone 7.7 @ 10KM	Wabash Valley Seismic Zone 7.1 @ 10KM
Buildings Damaged Single Family Residential	None – 48,508 Slight- 5,979 Moderate- 1,819 Extensive- 331 Complete- 48	None – 10,473 Slight- 16,419 Moderate- 16,718 Extensive- 7,482 Complete- 5,593
Damage to Schools (Based upon 75 buildings)	All with 50% functionality > 1 day	All with at least moderate damage > 50% 23 with complete damage > 50%
Damage to Hospitals	All with 50% functionality > 1 day	All with at least moderate damage > 50% 1 with complete damage > 50%
Damage to Transportation Systems	All with 50% functionality > 1 day	All with 50% functionality > 1 day
Households w/out Power & Water Service	No loss of water No loss of power	No loss of water No loss of power
Debris	4.39 million tons	72.58 million tons
Displaced Households	180	9,618
Injuries	Without requiring hospitalization: 333 Requiring hospitalization: 59 Life Threatening: 6 Fatalities: 11	Without requiring hospitalization: 10,470 Requiring hospitalization: 3,127 Life Threatening: 516 Fatalities: 941
Economic Loss	Income Losses: \$1,699 M Capital Stock: \$343 M Total: \$2,043 M	Income Losses: \$20,879 M Capital Stock: \$7,851 M Total: \$28,731 M

The Wabash Valley Seismic Zone scenario generates thousands of cases of complete damage to residential structures, much greater than the level of complete damage from the New Madrid Seismic Zone scenario. The fault rupture within the Wabash Valley is much closer to Vanderburgh County, and the State of Indiana, and thus the shaking is far more intense.

Future Development

Building codes substantially reduce the costs of damage to future structures from earthquakes. Vanderburgh County and the City of Evansville follow the building rules and regulations of the Indiana Fire Prevention and Building Safety Commission. The State of Indiana Residential Building Code designates Vanderburgh County as Seismic Design Category C₁. An increase in designation to D₀, is currently under consideration and would include the following design changes:

- Increased wall bracing requirements
- Increased stem wall requirements
- Increased height limitations
- Increased steel reinforcement requirements
- Increased concrete compressive strength requirements
- Increased framing and bracing requirements
- Increased requirements for hiring Design Professionals

- Increased wall anchorage requirements
- Increased interior braced wall line requirements
- Increased exterior braced wall line requirements
- Increased veneer anchorage
- Increased veneer limitations

Wildfire

Existing Development

Vulnerability to wildfire is predominantly associated with wildland-urban interface areas. The wildland-urban interface is a general term that applies to development interspersed or adjacent to forests and wildlands.

The August 17, 2001, *Federal Register* included a list of “urban wildland interface communities within the vicinity of federal lands that are at high risk from wildfire.” The communities were identified as required by the National Fire Plan, a cooperative, long-term effort between various government agency partners with the intent of actively responding to severe wildfires and their impacts to communities while ensuring sufficient firefighting capacity for the future. None of the communities within Vanderburgh County were included on this list.

Future Development

Growth continues to occur in wildland-urban interface areas of unincorporated Vanderburgh County, increasing the vulnerability of people, property, and infrastructure to wildfires. Currently, there are no community wildfire protection plans and no wildfire mitigation review requirements or regulations for development in the wildland-urban interface in the County or towns. However, education and other mitigation initiatives in place in the County,

3.3.4 Development and Land Use Trends

As part of the planning process, the HMPC looked at changes in growth and development and land use trends and examined these changes in the context of hazard-prone areas. Information from the 2004-2025 Comprehensive Plan for Evansville and Vanderburgh County form the basis of this discussion.

Population

The 2004-2025 Comprehensive Plan projected the future population for Vanderburgh County utilize three different methods in order to compare low, medium, and high population alternatives for the County. These methods predicted population within the County to grow by 2.2-, 2/9-, and 7.2-percent, respectively.

Table 3.39 Population Projections for Vanderburgh County, 2025

	2000 Census	2025 Straight-Line Projection	2025 Evansville Urban Transportation Study	2025 Indiana Business Research Center
Population	171,922	175,726	178,588	184,251
Amount of Change		3,804	6,666	12,329
Percent of Change		2.21	3.88	7.17

Source: 2004-2025 Comprehensive Plan of Evansville and Vanderburgh County

The highest growth is projected in the unincorporated Center Township. Moderate growth is projected for the unincorporated Perry, Knight, and Scott Townships. The 2004-2025 Comprehensive Plan also notes that employment and business establishments in the County have steadily increased; construction of housing continues at an unprecedented rate; and a strong local economy is predicted for the future.

Land Use

The 2004-2025 Comprehensive Plan of Evansville and Vanderburgh County establishes the desired land use pattern and development goals, objectives, and policies that provide guidance for land use decisions. The land use categories addressed in the Plan are residential, commercial, industrial, and agricultural land uses. The underlying principal of the land use plan is to assure that Evansville and Vanderburgh County can reasonably accommodate the expected and desired changes in an orderly manner that meets the needs and vision of the community.

The goal of the 2004-2025 Comprehensive Plan for general land use action is to create an overall pattern of orderly development through the arrangement of land uses that are adequately and efficiently served by a system of transportation, community services, and utilities, and sensitive to the natural physical qualities of the area.

Residential

The largest areas for new future residential use designated in the Plan are along the proposed Eickhoff-Koressel road project in western Vanderburgh County and in the northeastern part of the County. Additional residential projections include:

- 2025 County Housing Projections range from: 4,833 to 8,718 units gained
- Estimates of New Residential Land Required: up to 7.4 additional square miles

Commercial

The largest area expected to develop primarily for commercial development is the eastside area bounded by Morgan Avenue, Interstate 164, Lloyd Expressway and the Burkhardt Road corridor. This area could also include some additional multi-family use. The proposed commercial developments along Interstate 164 at the Boonville-New Harmony Road and Green River Road interchanges were expanded and new future commercial was added at the State Route 57 and Millersburg Road interchanges for highway commercial establishments in anticipation of Interstate-69.

Industrial

The 2004-2025 Comprehensive Plan projects the long-planned U.S. 41 North corridor between Interstate 64 and Baseline Road as the primary area for industrial growth. A new secondary corridor for industrial development has been added along/between State Route 57 and Interstate 164 extending south from the northern County Line to nearly Boonville-New Harmony Road. Another smaller area designated for future industrial is the southeast quadrant of the Interstate 164 and Lynch Road interchange.

To prepare for the industrial development anticipated from Interstate 69, the 2004-2025 Comprehensive Plan suggests that Vanderburgh County officials should coordinate with Warrick and Gibson Counties on a regional strategy for economic development and growth, apply for INDOT grant funds for local planning in the proposed Interstate 69 corridor, and prepare new or updated County plans.

Infrastructure

Growth for a community is limited by the availability of infrastructure such as transportation services and water/sewer services. Planning for infrastructure to serve and encourage development should occur in the areas where growth is desired and where noted natural hazards can be avoided. The 2004-2025 Comprehensive Plan presents both short-term and long-term road improvement projects proposed by the Evansville Urban Transportation Study. The most significant infrastructure project to anticipated to occur in the Evansville area over the next 20 years is a proposed Interstate-69 project. This proposed interstate project will be an international trade route linking Canada and Mexico.

3.4 Risk Assessment Summary

The Vanderburgh County Risk Assessment revealed a number of problem areas to be addressed in the mitigation strategy. These key findings are summarized in the following list:

- The majority of past disaster declarations, as well as past damages, have been related to severe storms and flooding.
- Multi-year droughts occur every 10 years on average and impact primarily agriculture and economy.
- Most properties at risk to flooding are located in the City of Evansville, while the majority of inventory damage is located in the unincorporated areas of Vanderburgh County.
- Identified facilities in the 100-year floodplain include the fire stations of McCutchanville and Perry Township; identified facilities in the 500-year floodplain include animal control, Deaconess Cross Point, North High School, Oak Hill Middle School, a fire station in the Scott Township, and the Heritage Petroleum station.
- There are a large number of high and significant hazard dams in Vanderburgh County, although no dam failures have occurred in the past.
- Sensitive natural areas and species primarily occur along streams and drainages.
- There have been 52 recorded earthquakes within a 50-mile radius of Evansville since 1827, most recently along the Wabash Valley Seismic Zone.
- The emerald ash borer is a newly identified hazard to the planning area.
- Winter weather events create problems with water lines, snow loads on roofs, and traveler safety.