VINTON COUNTY, OHIO

NATURAL HAZARDS MITIGATION PLAN

MAY 2016

LEAD AGENCY

VINTON COUNTY EMERGENCY MANAGEMENT AGENCY

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Executive Summary

The Vinton County Mitigation Plan lays the road map to a safer community by identifying the natural hazards that may affect the county, assessing the impacts of these hazards on community assets – those things that are important to the residents of the county – and developing mitigation actions to lessen or eliminate the impacts on community assets.

Having a current mitigation plan allows the county to apply for mitigation funding – as it may become available. It also provides a mitigation action list for other sources of funding. Further, it provides information that may be used in other planning efforts and future development.

Through a quantitative process of analyzing hazards and impacts on our community, the Mitigation Planning Team identified five mitigation goals and developed fifteen mitigation actions achieve the goals. Of these fifteen actions, eleven actions were carried over from the previous plan, three actions were added, one action was completed and one action was deleted. The preponderance of the actions deal with roads; the others address communication, infrastructure, education and future development.

The following summarizes these efforts:

- Hazards in Rank Order
  - Severe Thunderstorms (Flash Flooding)
  - Severe Wind Storms
  - Landslides
  - Wildfires
  - Drought
  - Major Flooding
  - Severe Winter Storms
  - Earthquakes
  - Dam Failure
- Impacts in Rank Order
  - Isolation
  - Road Damage
  - Structural Damage
  - Utility Outage/Shortage
  - Economic Impact
  - Critical Facility Damage
  - Causalities
- Goals and Mitigation Actions
  - Engineer Roads to be Safe and Passable During Hazard Events
    - Raise Roadbeds – 19 sites
    - Install Larger Culverts – 8 sites
    - Lengthen Bridges – 4 sites
    - Build up Creek Banks – 14 sites
    - Remove or Reinforce Slipping Soil – 5 sites
    - Remove Debris from Waterways – countywide
    - Cut Open Old Railroad Bed – 1 site

- Inform the Public of Impacts and Actions to Take During Hazard Events
  - Install Depth Sticks & High Water Signs – 55 sites
  - Install/Upgrade Alerting Sirens (Completed) – countywide
  - Establish County-Wide Weather Monitoring Network (Deleted) – countywide
  - Establish County-Wide Alerting/Notification System – countywide
- Educate the Public on Mitigation, Preparedness and Response Actions
  - Develop and Conduct Public Education Program – countywide
- Create Self Sufficiency – Individual, Community, County
  - Install Generator at Community Centers
  - Drill Community Well in Area Affected by Drought – 1 site
- Plan for Safe Development
  - Mitigate Chronically-Flooded/Damaged Dwellings – 2 sites
  - Map Flooding, Water Sources, Causes and Impacts – countywide
  - Build Safe Rooms – countywide
  - Review and Update Planning Regulations – countywide by jurisdiction

As this plan is an update to the 2003 plan, progress can be measured. One existing mitigation action was completed and one new mitigation action is well on its way to be completed. One was deleted due to evolving factors that made it irrelevant. The bulk of the costly mitigation actions are road-related and have been continued (with sites and costs updated); lack of funding has resulted in little progress.

This plan will be reviewed and updated annually and undergo a complete review and rewrite within five years of adoption. Please address any questions, comments, mitigation action status or additional mitigation actions to the Vinton County Emergency Management Agency.

Section I – Introduction

Background & Purpose

There are two basic truths about hazards and community assets:

- *Hazards* will occur – there is little, if anything, we can do to prevent natural hazards from occurring.
- *Community assets* will be *impact*ed by the occurrence of hazards to the extent of the assets' *vulnerabilities* to the hazards' *effects.*

Mitigation seeks to lessen or eliminate:

- The impact of hazards
- The vulnerability of assets to hazard impacts

As there are many impacts on community assets, impacts are ranked and mitigation actions cost-estimated using a quantitate analysis approach. Mitigation Actions may then be implemented in a cost-effective manner that resolves the greatest impact.

The purpose of this plan is document the mitigation planning process conducted in Vinton County, Ohio, and provide that road map to a safer community.

Scope

This plan covers Vinton County, Ohio, and all of its political subdivisions and municipalities.

The Mitigation Planning Process

Mitigation planning is a deliberate process. It starts with profiling the community and identifying its assets – those things that are important to it. Next, hazards that potentially may affect these community assets are profiled – past and projected future occurrences and impacts. Then, mitigation actions that can either lessen or eliminate the impact of a hazard or the vulnerability of a community asset to the impact of a hazard are developed. These mitigation actions form the basis for making the community a safer place to live, work and recreate.

Throughout the process, those who have a stake – elected and appointed government officials, agencies providing services to people, the public – as well as those with pertinent information are advised, consulted and their input incorporated into the plan.

Integration of Results into Other Mechanisms

The county's process to integrate the data, information, and hazard mitigation goals and actions in other planning mechanisms is accomplished through specifically including select positions in the planning process and are members of the Mitigation Planning Team. These include, but are not limited to:

- Vinton County Commissioners
- Vinton County Sheriff's Office
- Floodplain Administrators (County and jurisdictions)
- Vinton County Engineer's Office
- County Education Service Center

These individuals take information to their respective organizations that are charged with the development, maintenance, and on occasion, enforcement of rules, regulations, codes, ordinances, policies, plans, procedures and other administrative instruments. Information from the mitigation planning effort is presented to the leadership of these organizations, who then authorize the information to be added, to revise or update current administrative instruments. This allows for oversight, commitment of time, energy, and resources to change actions into projects.

Although the jurisdictions do not have as many representatives to serve on the Planning Team, their representatives follow the same processes as those at County level.

Other Uses for This Plan

While this plan focuses on mitigation actions, the results of the information gathered and analysis performed can be used for other purposes including:

- Already-identified mitigation actions for funding through other sources
- Assessing risk for other purposes

Sources Consulted

Many sources were consulted in the planning process. The major sources are shown in the following table.

Source	Used to Provide Information on
Federal Emergency Management Agency (FEMA)	National Flood Insurance Program Previous Disasters
National Oceanic and Atmospheric Administration (NOAA)	Hazards U.S. Multi-Hazard Climate, Weather & Drought History and Trends
US & Ohio Departments of Transportation (USDOT & ODOT)	
Ohio Department of Natural Resources (ODNR)	Dams, Waterways & Drought History and Conditions Landslide Characteristics
United States Geological Survey (USGS) & Vinton County Soil & Water Conservation District	Slopes & Soils Affecting Public Safety and County Assets
Ohio Emergency Management Agency (Ohio EMA)	Mitigation Plan State-Wide Hazards History and Trends
Vinton County Emergency Management Agency (EMA)	Emergency Operations Plan Previous Disasters, Emergencies & Other Incidents
Vinton County Auditor	Property Values & Types; Property Ownership
Vinton County Health Department	Well Depths and Quality
Vinton County Engineer's Office	Impacted Roadways and Cost Estimates
Vinton County Sheriff's Office	Public Safety Impacts: Location, Severity, Frequency
Vinton County Planning Commission	Planning Regulations and Development Trends

Plan Organization

This plan is organized into sections and appendices:

Section I – Introduction.
Section II – Community Profile and Assets.
Section III – Planning Process. This section details the planning process; it provides the summary information and conclusions as a result of hazard analysis and details mitigation goals developed.

Appendix A – Hazard Analysis. This appendix lists the hazards likely to affect Vinton County and details the analysis conducted on each. It also summarizes the rankings of hazards and impacts.

Appendix B – Mitigation Actions. This appendix lists and details the mitigation actions and sites developed.

Section IV – Supplemental Information. This section includes information meaningful to the overall plan development but not used directly in development.

Acronyms, Terms and Definitions
Meetings Held
Vinton County Quick Facts
Mitigation Action Sites

Mitigation Action Changes as a Result of This Update

The following table indicates those actions that changed and what was changed.

Mitigation Action	Changed	Priority 2003	Priority 2015	Updated Status
1: Raise Roadbeds	No	1	15	Deferred
2: Install Larger Culverts	No	2	5	Deferred
3: Lengthen Bridges	No	3	14	Deferred
4: Build up Creek Banks	No	4	12	Deferred
5: Remove or Reinforce Slipping Soil	No	5	11	Deferred
6: Remove Debris from Waterways	No	6	10	Deferred
7: Cut Open Old Railroad Bed	Yes	7	13	Deleted
8: Install Depth Sticks & High Water Signs	No	8	2	Deferred
9: Install/Upgrade Alerting Sirens	Yes	9		Completed
10: Establish County-Wide Weather Monitoring Network	Yes	10		Deleted
11: Establish County-Wide Alerting/Notification System	Yes	11		Completed
12: Develop and Conduct Public Education Program	No	12	1	Deferred
13: Install Generator at Community Centers			3	New
14: Drill Community Well in Area Affected by Drought			8	New
15: Mitigate Chronically-Flooded/Damaged Dwellings	No	13	9	Deferred
16: Map Flooding, Water Sources, Causes and Impacts	No	14	6	Deferred
17: Build Safe Rooms			7	New
18: Review and Update Planning Regulations			4	New

The prioritization methodology in the 2003 plan was based on prioritizing goals and then actions to achieve those goals. This update disregarded this approach in favor of a FEMA-recognized methodology (detailed in Section III – The Planning Process) that evaluates and ranks actions without regard to the mitigation goals they support.

Project Management

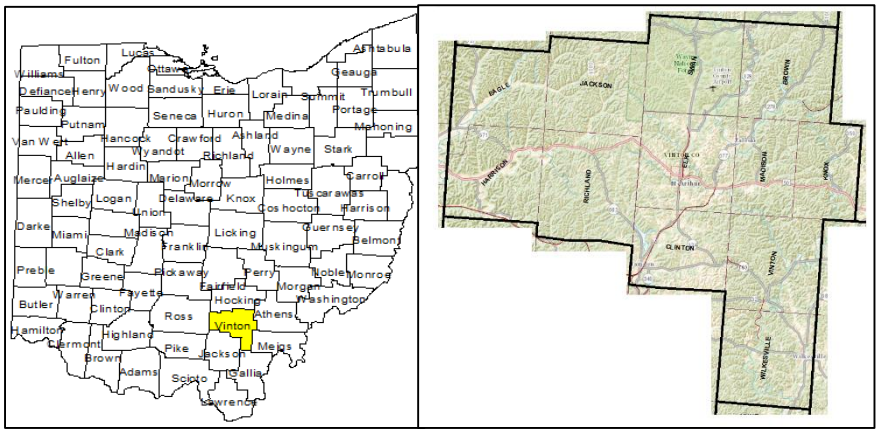
The Vinton County Emergency Management Agency is the lead agency for this plan.

RDI Solutions, LLC, a Service-Disabled Veteran-Owned Small Business (SDVOSB), of McArthur, Ohio, is the contracted consultant to assist in the development of this plan update.

Section II – Community Profile and Assets

Location and Description

Vinton County is located in the southeast quadrant of the State of Ohio. It covers approximately 414 square miles. It is bounded by Hocking County to the north, Athens and Meigs Counties to the east, Jackson and Gallia Counties to the south and Ross County to the west. It is considered part of Appalachia.



Demographics

Vinton County is one of Ohio's six Economically Distressed Appalachian counties. The following information is a summary from US Census Bureau information. Refer to *Section IV – Reference Documents*.

Population Trend. While the nation is growing at a 3.3% rate and Ohio at a .5% rate, Vinton County is losing population at a 1.2% rate.

Diversity. With the exception of ethnicity and primary language (Vinton County is 98% European American), Vinton County's diversity closely matches that of Ohio and the United States. This includes gender, age and family size.

Stability. Vinton County residents tend to stay in the same home much longer than the rest of the state and nation.

Home Ownership. Vinton County's home ownership rate is 18% higher than the national average.

Home Values. The average value of homes in Vinton County is $75,700, almost one half of the state average and almost 60% less than the national average.

Education. Nine percent fewer students graduate high school than the national average. There are 66% fewer residents with post-high school degrees than the state average and 70% fewer than the national average.

Employment. While the state employment rate is growing by 2.6%, Vinton County is losing jobs at a 3.6% rate.

Income. The per capita income is $18,101, 31% lower than the state average and 36% lower than the national average. Twenty percent of Vinton County's population live below the poverty line, 33% higher than the state and national levels.

Manufacturing. The per capita manufacturing sales is 69% lower than the state average and 54% lower than the national average.

Retail Sales. The per capita retail sales in Vinton County is about 75% less than the rest of the state and nation.

Jurisdictions: Unique Features & Vulnerabilities

Vinton County is subdivided into twelve townships and four incorporated villages.

Eagle Township is located in the north west corner of the county. Salt Creek parallels SR 327; the roads and bridges feeding onto SR 327 are generally lower than the highway and are susceptible to flooding. Also, there are many steep hillsides that are prone to slides.

Harrison Township is located in the south western corner of the county. It has the longest straight stretches of US 50, portions of which are susceptible to flooding. Middle Fork Salt Creek feeds through the county into the low-lying unincorporated Ray.

Jackson Township is located in the mid north part of the county. It is very hilly and sparsely populated. Well in Jackson Twp are the first to go bad or dry during dry spells.

Richland Township is located in the mid-western part of the county. The population center is the unincorporated Allensville where there are one of the three county elementary schools and several small businesses. Middle Fork Salt Creek follows US 50 – right through Allensville.

Swan Township is in the north central part of the county. The Vinton County Airport is located here.

Elk Township is located in the center of the county. It is the second largest township and contains the largest village, McArthur. It is largely rural residential and light industrial with several lumber mills. One mill treats lumber and maintains a significant quantity of hazardous materials. A complex housing the Vinton County Community Building, Senior Citizens, Soil and Water District, Elections Office, Health Department and Vinton County Emergency Medical Services. The county's major east-west (US 50) and north-south (SR 93) go through Elk Twp. There is an explosives plant in eastern Elk Twp.

Clinton Township is located in the south central part of the county. It has the second largest village and has a large water-supply reservoir in its jurisdiction that threatens township populations as well as the village of Hamden.

Brown Township is located in the extreme northeast corner of the county. Approximately two-thirds of its area is federal and state owned land. While it has the least residential population, it has the greatest non-residential population. It's fire protection is split between McArthur Volunteer Fire Department and Starr Twp Volunteer Fire Department, based in Hocking County.

Madison Township is located in the east central of the county. More than one half of its area is federal and state owned. There are no industrial or commercial properties in the township.

Knox Township is located in the far eastern part of the county, bordering Athens County. About one fourth of its area is federal and state owned. The major east west highway – US 50 – traverses the township through many treacherous curves. Straddling the Athens County line is a petroleum pipeline pump station.

Vinton Township is located in the south east portion of the county. Almost one half of its area is state and federally owned land. In this is the Vinton Furnace Wildlife Area that has the most rugged terrain in the county. This is a popular hunting area and wireless communications are sparse at best. SR 32, the Appalachian Highway, is the major east west corridor in southern Ohio; it bisects this township.

Wilkesville Township is located in the extreme southern part of the county. Emergency medical and Sheriff's Office response to the extreme southern areas of Wilkesville Twp can be up to 45 minutes – with clear roads. It is mostly rural residential with only a few commercial businesses. With steep slopes and unstable soil, landslides are likely.

The Village of McArthur is in the center of Elk Twp. It has the greatest population density at 1,700 people per square mile. The county's major east-west (US 50) and north-south (SR 93) intersect in the middle of McArthur with the County Courthouse and Sheriff's Office on its southeast corner. While largely residential, it hosts a large number of consumer-based businesses as well as many of the county government's offices.

The Village of Hamden is located in southern Clinton Twp near the Jackson County line. It is the second largest municipality in the county. It is threatened by Lake Rupert; a catastrophic release of its water would affect residents and travel in and around the village. A railroad line carrying raw materials to an explosives plant passes through Hamden.

The Village of Zaleski is on a hilltop in north west Madison Twp. It is a crossroad for travelers visiting Lake Hope State Park and Zaleski State Forest and Wayne National Forest.

The Village of Wilkesville is located on a gentle hillside in far eastern Wilkesville Twp, close to the Meigs County line. Emergency medical and Sheriff's Office response [coming from McArthur] averages 30 minutes.

Populations

Residential

Refer to the table for a breakout of populations by jurisdiction.

2010 Census		
Townships:	Pop	%
Eagle	704	5.3%
Harrison	1,068	8.0%
Jackson	741	5.5%
Richland	1,748	13.0%
Swan	916	6.8%
Elk	1,605	12.0%
Clinton	1,173	8.8%
Brown	293	2.2%
Madison	327	2.4%
Knox	559	4.2%
Vinton	548	4.1%
Wilkesville	710	5.3%
Total	10,392	77.6%
Villages:		
McArthur	1,701	12.7%
Hamden	879	6.6%
Zaleski	278	2.1%
Wilkesville	149	1.1%
Total	3007	22.4%
County Total	13,399	100.0%

Non-Residential Populations

There are two nursing/rehabilitation facilities in Vinton County: Huston's Nursing Home just east of Hamden on SR 161 in Clinton Twp and Twin Maples Nursing Home just north of McArthur on SR 93 in Elk Twp.

There are activities in Vinton County that attract many people from outside the county.

State Parks

Lake Hope State Park is located north of the village of Zaleski on SR 278 in Brown Township. It has camping and picnicking facilities as well as swimming and picnicking areas and hiking trails.

Lake Alma State Park is located southeast of Hamden on SR 349 in Clinton Township. It has camping and picnicking facilities as well as swimming and picnicking areas and hiking trails.

Chief Logan Boy Scout Camp

This facility houses up to several hundred staff and scouts during the summer months. It is located in the extreme southwest corner of Vinton County and is only accessible from the south through Jackson County.

Hunting

Vinton County is a popular area for deer and wild turkey hunting and attracts many out of county hunters during hunting seasons. State and Federal Forestlands as well as private land are used for hunting.

Climate

The average temperature in Vinton County is 54 degrees. The county has temperature extremes from sub-zero in the winter to the mid 90s in the summer. Average wind is 5-8 miles per hour from the southwest. The average annual rainfall in Vinton County is 38 inches. Of this, the average snowfall is 26 inches.

Geography

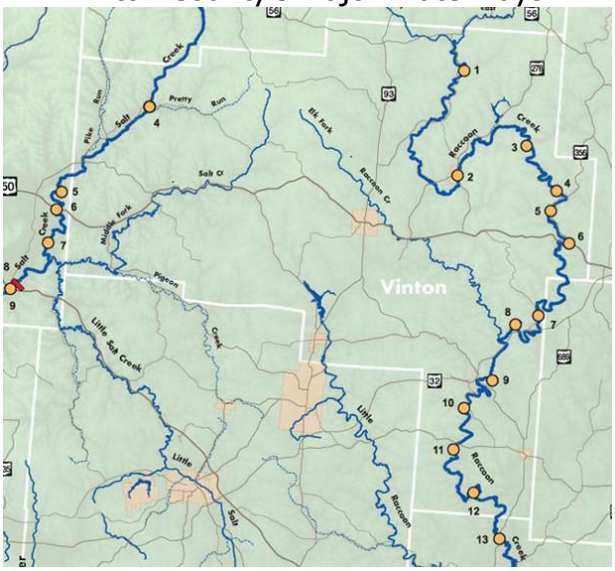
General

The altitude ranges from 580 feet to 1000 feet above sea level. The terrain varies from almost mountainous in east central to a river plain in west central with hilly terrain throughout.

Waterways

Vinton County is geographically divided by two watersheds: the western third of the county is in the Scioto River Watershed and the eastern/southern two thirds is in the Raccoon Creek Watershed. Jackson and Richland Townships are split down the middle north to south. This accounts for the fact that many rain storms only have adverse effects on one half of the county. Flood plains accompany the primary waterways – Salt Creek and Raccoon Creek – as well as many of their tributaries.

Vinton County's Major Waterways

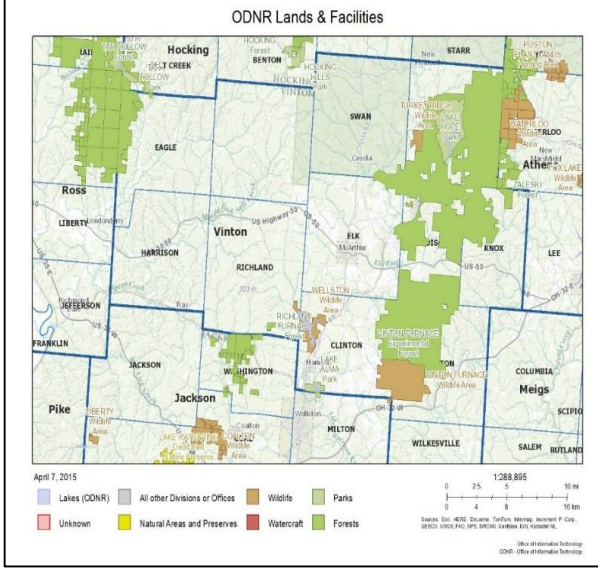


Source: Ohio Department of Natural Resources, Watercraft Division

State Lands

Much of the eastern part of Vinton County, particularly Brown, Madison, Vinton and Knox Townships, is encompassed by state lands. These are:

- *Lake Alma State Park*
- *Lake Hope State Park*
- *Richland Furnace State Forest*
- *Tar Hollow State Forest*
- *Vinton Furnace Experimental Forest*
- *Zaleski State Forest*
- *Vinton Furnace Wildlife Area*
- *Turkey Ridge Wildlife Area*
- *Wellston Wildlife Area*



Source: Ohio Department of Natural Resources

Federal Lands

Wayne National Forest. The portion of Wayne National Forest located in Vinton County is in the southwest portion of Swam Twp.

Development Trends

Land Usage

Vinton County's land use has not significantly changed since 2011. Approximately 82.46% of the county land cover is a combination of the Wayne National Forest, Zaleski State Forest, Lake Hope State Park, Lake Alma State Park and Tar Hollow State Forest. Pasture and cropland make up 15.79% of the county land usage, with the remainder being urban (0.48%), open water (0.58%) and bare/mines (0.69%).

Since 2011, agricultural land decreased in size by 2,600 acres down to 33,400 acres. The number of farms decreased to 226 total farms. However, the average acreage per farm rose to 148. Forestry grew by two facilities and 15,538.97 acres.

Economic Conditions

Vinton County is one of the Ohio counties that is considered part of the Appalachian Mountain region. This region has regularly experienced more economic hardship compared to the rest of the State. Below are unemployment statistics throughout recent years:

Year	Vinton County	Ohio
2005	8.1%	5.9%
2006	7.8%	5.4%
2007	7.8%	5.6%
2008	9.2%	6.6%
2009	13.1%	10.2%
2010	13.5%	10.3%
2011	11.9%	8.8%
2012	10.8%	7.4%
2013	10.6%	7.5%
2014	7.9%	5.7%

Since 2011, establishments in the private sector have grown by only four facilities. Goods-producing facilities have decreased by five, while service-oriented establishments grew by nine facilities. According to the Ohio Development Services Agency, shown there have been job losses in manufacturing, trade, transportation, utilities, education and health, and the leisure and hospitality sectors. Therefore, there has been no increase in construction of manufacturing, warehousing/shipping or other major commercial facilities in the county.

There have been no changes in development that impact the county's overall vulnerability. Where there are no revisions in the plan update, the Mitigation Planning Team reviewed the information and validated the information from the previously FEMA-approved plan to be current and correct.

Major Transportation Routes

Highways

United States Highway (US) 50 passes east/west through the county and State Route (SR) 93 passes north/south through the county. There are numerous other SRs, county roads (CRs), township roads (TRs) and village streets.

Highways, roads, streets, bridges, and culverts are maintained by the jurisdictional engineering agency. Ohio Department of Transportation (ODOT) maintains US Highways and SRs, culverts adjacent to them, and bridges on them. The Vinton County Engineer maintains county roads, culverts adjacent to county roads, bridges on county and township roads and culverts under county roads and those in excess of twenty-four inches on township roads. The jurisdictional township trustees maintain township roads. The jurisdictional village mayor maintains village streets. The Villages of Hamden and McArthur have street departments.

Airways

The Vinton County Airport is situated on CR 22 (Airport Rd) between SRs 93 and 328. The closest commercial airport with regularly scheduled airline arrivals and departures is Port Columbus International Airport in Columbus.

Railways

The CSX Railroad runs from the Austin Powder Company near Zaleski south through Dundas and Hamden into Jackson County. This is a private spur that delivers raw materials to the Austin Powder Company.

Community Events

Community events draw a number of people into a small area. These events also cause congestion on highways and roads in the county. The most attended ones are:

Vinton County Junior Fair

The Vinton County Junior Fair is held each year in July at the Vinton County Fairgrounds, just north of McArthur.

Wild Turkey Festival

The Wild Turkey Festival is held in McArthur starting on the first Thursday in May and continues through Sunday. A portion of US 50 is generally closed off for this street festival.

Vinton County Air Show

The Vinton County Air Show is held each year on the third Sunday in September at the Vinton County Airport, approximately five miles north of McArthur.

Privately-Sponsored Events

Numerous private events, such as motocross, are held at the Vinton County Fairgrounds throughout the year.

Structural Types and Values

The following table summarizes the location and value of structures within Vinton County.

Jurisdiction	Residential	Commercial	Industrial	Exempt	Totals
Brown Twp	$ 4,196,700	$ 146,890		$ 1,907,500	$ 6,251,090
Clinton Twp	$ 15,635,535	$ 923,300	$ 2,644,200	$ 7,280,700	$ 26,483,735
Eagle Twp	$ 6,749,205	$ 29,700		$ 161,900	$ 6,940,805
Elk Twp	$ 20,874,523	$ 2,158,500	$ 5,667,303	$ 26,634,060	$ 55,334,386
Harrison Twp	$ 14,091,329	$ 33,600		$ 1,224,200	$ 15,349,129
Jackson Twp	$ 7,196,905			$ 271,600	$ 7,468,505
Knox Twp	$ 8,091,340	$ 139,310		$ 1,457,500	$ 9,688,150
Madison Twp	$ 4,429,935			$ 291,900	$ 4,721,835
Richland Twp	$ 21,320,630	$ 495,150		$ 1,352,570	$ 23,168,350
Swan Twp	$ 10,907,715	$ 1,023,800		$ 497,400	$ 12,428,915
Vinton Twp	$ 7,625,895	$ 35,800		$ 7,625,895	$ 15,287,590
Wilkesville Twp	$ 9,393,965	$ 245	$ 402,510	$ 202,900	$ 9,999,620
Hamden	$ 12,209,680	$ 562,400		$ 1,380,600	$ 14,152,680
McArthur	$ 33,089,390	$ 9,525,503		$ 6,215,700	$ 48,830,593
Wilkesville	$ 3,196,380	$ 146,600		$ 373,500	$ 3,716,480
Zaleski	$ 4,031,085	$ 142,400	$ 73,700	$ 617,000	$ 4,864,185
Totals	**$183,040,212**	**$15,363,198**	**$ 8,787,713**	**$57,494,925**	**$264,686,048**
Percentages	**69%**	**6%**	**3%**	**22%**	**100%**
Source: Vinton County Auditor					

Critical Facilities

The following table summarizes the critical facilities in Vinton County.

Facility Type / Located in Jurisdiction	Eagle Twp	Harrison Twp	Jackson Twp	Richland Twp	Swan Twp	Elk Twp	McArthur Village	Clinton Twp	Hamden Village	Brown Twp	Madison Twp	Zaleski Village	Know Twp	Vinton Twp	Wilkesville Twp	Wilkesville Village
Public Safety																
Law Enforcement/9-1-1							2									
Emergency Medical		1				1										
Fire and Rescue	1	1		1			1		1			1				1
Emergency Operations Center							1									
Government																
State								1								
County						2	4									
Township	1	1	1	1	1	1		1		1	1		1	1	1	
Village							2		1			1				1
School Facilities				1		2	2	1								
Health Care																
Health Department						1										
Healthcare Center						2										
Nursing Home						1		1								

Facility Type / Located in Jurisdiction	Eagle Twp	Harrison Twp	Jackson Twp	Richland Twp	Swan Twp	Elk Twp	McArthur Village	Clinton Twp	Hamden Village	Brown Twp	Madison Twp	Zaleski Village	Know Twp	Vinton Twp	Wilkesville Twp	Wilkesville Village
Utilities																
Electrical Facility																
Communication Facility																
Water Reservoirs								1								
Water Treatment Facility							1					1				
Wastewater Treatment Facility						1			1							
Source: Vinton County EMA																

Public Warning and Notification Systems

NOAA Weather Radio All Hazards

All county government facilities, local schools, nursing homes and the Chief Logan Boy Scout Camp have weather/all hazard alert radios.

Warning Sirens

Vinton County has a siren alert system used for public warning and notification that cover the villages of Hamden, McArthur, Wilkesville and Zaleski as well as the unincorporated area of Allensville.

Public Safety Location-Based Notification

The Vinton County EMA is currently working on the implementation of a public safety location-based notification system. It will provide the EMA and Sheriff's Office Dispatch Center (9-1-1 Public Safety Answering Point) with the capability to make emergency notifications to residents via phone, texting and email. It is expected to be operational by July 2015.

Authorities Affecting Mitigation Activities

Zoning and Building Regulations

Vinton County and its jurisdictions have limited hazard mitigation capabilities, both in regulation and funding. Only the county has a Planning Commission and Comprehensive Plan which is countywide and includes all townships and jurisdictions. Vinton County (covering unincorporated areas) as well as the Villages of McArthur and Hamden has floodplain regulations formally adopted by resolution or ordinance. As of the Spring of 2005, all entities in Ohio now follow the State Building Code. However, the unincorporated areas of Vinton County do not have zoning ordinances. All health and safety regulations follow State law. Vinton County and its jurisdictions have very limited financial resources. The County ranks as one of the lowest three least populated counties in the state. Vinton County and its jurisdictions have adequate resources to operate and maintain public utilities and public facilities. However, considering the low population

numbers, a per capita income of $18,101 and 20.6% of the population living below poverty level, the county and its jurisdictions do not have much flexibility in financial assets to accomplish mitigation tasks on their own. Below is a summary of their capabilities:

Jurisdiction	Planning Commission	Comprehensive Plans	Floodplain Regulations	Building Codes	Zoning Ordinances	Capital Budget for Mitigation	Public Works Budget for Mitigation
Vinton County (Covers Unincorporated Areas)	Yes	Yes	Yes	Ohio Building Codes	None	None	In-Kind Wages
Village of McArthur	No	None	Yes		Yes	None	In-Kind Wages
Village of Hamden	No	None	Yes		Yes	None	In-Kind Wages
Village of Zaleski	No	None	No		Yes	None	In-Kind Wages
Village of Wilkesville	No	None	No		Yes	None	In-Kind Wages

Floodplain Management

Vinton County floodplain regulations are maintained by the county commissioners and mayors of those villages with such regulations. These regulations are the *Special Purpose Flood Damage Reduction Regulations*. Section 3.1 designates the position of Floodplain Administrator. Section 3.2 outlines the duties and responsibilities of this position. Duties include, but are not limited to enforcement of the regulations, routine monitoring of the flood zones and providing community assistance such as encouragement of owners to maintain flood insurance.

Efforts for the floodplain map modernization project by ODNR Division of Soil & Water and FEMA have been deferred to the Risk MAP discovery process.

National Flood Insurance Program

The following table reflects participation and compliance with the NFIP.

CID	Jurisdiction	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Reg-Emer Date	Sanction Date	Does Not Participate
390553	Vinton County	1/3/1975	6/1/1992	6/1/1992 (L)	6/1/1992		
390554	Village of Hamden	2/1/1974	9/29/1989	9/29/1989	9/29/1989		
390718	Village of McArthur	11/26/1976		11/26/1976	11/26/1976	11/26/1977	
	Village of Wilkesville						X
	Village of Zaleski						X

Note that there are no NFIP-designated repetitive-loss structures in Vinton County.

Vinton County Health Department

The Health Department monitors and enforces regulations for septic systems and potable wells as well as deals with public health issues.

Funding Sources

Operating Budgets

Funding for routine maintenance and improvements come from normal operating budgets. Mitigation Actions are considered when performing routine maintenance and improvements. Property values (and therefore taxes collected) suffer due to the lack of industry and commercial businesses and sales tax collected per capita is about one-fourth of the state average – both factors limiting what would be considered to be normal revenues. In-kind labor is generally the only resources that can be committed to mitigation activities.

Grants

Community Development Block Grant Program. The US Department of Housing and Urban Development's (HUD) Community Development Block Grant (CDBG) program is a flexible program that provides communities with resources to address a wide range of unique community development needs.

Appalachian Regional Commission. As an Appalachian county, Vinton County is eligible for grants and contracts from funds appropriated to the Appalachian Regional Commission annually by Congress.

Hazard Mitigation Grant Program. The Hazard Mitigation Grant Program (HMGP) is authorized by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Act, as amended. The key purpose of HMGP is to ensure that the opportunity to take critical mitigation measures to reduce the risk of loss of life and property from future disasters is not lost during the reconstruction process following a disaster. HMGP is available, when authorized under the Presidential major disaster declaration, in areas of the State requested by the Governor.

Pre-Disaster Mitigation Program. The Pre-Disaster Mitigation (PDM) program is authorized by Section 203 of the Stafford Act, 42 USC 5133. The PDM program is designed to assist States and local communities to implement a sustained pre-disaster natural hazard mitigation program to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding from future major disaster declarations.

Flood Mitigation Assistance Program. The Flood Mitigation Assistance (FMA) program is authorized by Section 1366 of the National Flood Insurance Act (NFIA) of 1968, as amended with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). There are no NFIP-designated repetitive-loss structures in Vinton County.

Other Mitigation Grants. Information on other grant programs is available on the Ohio EMA's State Hazard Analysis Resource and Planning Portal (SHARPP)

Declared Presidential Disasters

The following depicts presidential-declared disasters affecting Vinton County and their associated costs:

Date	Title	FEMA	PA Amt	IA Amt
6/29/2012	Severe Storms and Straight-Line Winds	DR 4077	$33,405	N/A
6/29/2012	Severe Storms	EM 3346	$107,527	N/A
4/4/2011	Severe Storms And Flooding	DR 4002	$80,646	N/A
8/29/2005	Hurricane Katrina Evacuation	EM 3250	$0	N/A
8/27/2004	Severe Storms And Flooding	DR 1556	$33,987	$41,570
7/21/2003	Tornadoes, Flooding, Severe Storms, and High Winds	DR 1484	$119,584	$0
2/14/2003	Severe Winter Storm and Record/Near Record Snow	DR 1453	$368,268	$0
2/28/1997	Severe Storms and Flooding	DR 1164	$750,000	Unknown
5/2/1996	Flooding	DR 1122	$37,781	N/A
5/28/1990	Severe Storms, Tornadoes & Flooding	DR 870	$223,689	Unknown
1/26/1978	Blizzards & Snowstorms	EM 3055	Unknown	N/A
6/5/1968	Heavy Rains & Flooding	DR 243	Unknown	Unknown
Note: PA = Public Assistance; IA = Individual Assistance				

Section III - Mitigation Planning Process

The mitigation planning process for Vinton County is designed to include stakeholders in as many steps as practical to ensure an acceptable and viable plan that leads to eliminating or lessening the impacts of hazards on community assets.

Relationship to the 2003 Mitigation Plan

As this is an updated plan, the previously approved plan was the point of departure. All information in it was reviewed and updated as needed. This included the community profile, hazards and analysis and goals and mitigation actions. Status of mitigation actions was assessed and cost estimates updated.

Form the Planning Team

A critical task at the beginning of the planning process was to assemble a planning team of representatives from each jurisdiction and partner organization. These planning partners have the expertise to develop the plan, and their organizations have the authority to implement the mitigation strategy developed through the planning process. This is the core group of people responsible for developing and reviewing drafts of the plan, creating the mitigation strategy, and submitting the final plan for local adoption.

When building the planning team, the Vinton County EMA Director invited representatives to reconvene the team from the previous planning process along with additional individuals or organizations. It was decided that a committee that oversees the comprehensive plan or addresses issues related to land use, transportation, or public facilities would be a good foundation for the mitigation planning team. The team was assembled to consider how threats and hazards impact economic development, housing, health and social services, infrastructure, or natural and cultural resources. Representatives from agencies involved in hazard mitigation activities, agencies with the authority to regulate development, and offices responsible for enforcing local ordinances were important members of the planning team. These agencies are assigned responsibility and have the expertise for implementing mitigation actions.

- Stakeholders were also invited to participate in the plan update process. These stakeholders are individuals or groups that are affected by mitigation actions or policies. Stakeholders include businesses, industry, commercial ventures, private organizations, and citizens. Unlike planning team members, stakeholders may not be involved in all stages of the planning process, but they inform the planning team on a specific topic or provide input from different points of view in the community. As certain stakeholders must be given the opportunity to be on the planning team, some of those invited participated in the planning process, including:
- Local and regional agencies involved in hazard mitigation activities
- Agencies that have the authority to regulate development
- Neighboring jurisdictions
- Businesses, academia, and other private and nonprofit interests

The following accepted the invitation to participate and constituted the Mitigation Planning Team:

- Ashleigh Claar, Director, Vinton County EMA
- Terri Fetherolf, Director, Vinton County Development Department
- Cody Hacker, Conservationist, Vinton County Soil & Water Conservation District
- Peggy Pruit, County Coordinator, American Red Cross
- Mary McCord, Volunteer, American Red Cross
- Suzie Dalton, Volunteer, American Red Cross
- Robert Czechlewski, Director, Jackson County EMA
- Lori Simonton, Planner, Jackson County EMA
- Tim Miller, Deputy Director, Gallia County EMA
- Gerald "LJ" Stewart, Emergency Coordinator, Austin Powder Company – Red Diamond Plant
- David Pollinger, Consultant, RDI Solutions LLC

update The Planning Team conducted their Kick-Off meeting on October 23, 2014 at the Vinton County Development Department Conference Room. At this meeting, the team developed their mission statement, defined key roles and responsibilities, established their meeting dates, times and locations, identified goals and major items that needed to be addressed, established timelines and reviewed the current plan.

Planning Team members were also tasked to gather specific information and data to update the hazard profiles and formulate the vulnerability assessment for each hazard. This included improved definitions of the hazards, determining locations in the county, using correct scales for the extent, updating historical narratives, and re-calculating the probabilities when such hazards may occur in the future. Some team members researched current information of NFIP participation, repetitive loss data, public assistance figures and NFIP compliance facts. By compiling all of this information, the Hazard Identification & Risk Analysis and the vulnerability assessment.

A rough draft was prepared with the updated the Hazard Identification & Risk Analysis and the vulnerability assessment. The Planning Team held their next meeting on May 7, 2015 to review the draft, form the goals and mitigation actions based on the HIRA and vulnerability assessment, and prioritize the actions based on a benefit-cost review. Methods and timelines for plan implementation, monitoring, evaluation and updates were determined and assigned to members of the team. At the conclusion of this meeting, the contractor gathered all remaining information and developed the remainder of the plan.

A draft plan was written and distributed to Planning Team members for their review, comments and changes. After these items were implemented into the plan, a copy was posted on the internet for public review and comment. CD-ROM copies of the plan were made available in public libraries for review by the public who did not have access to the web, computers or needed other assistance. A change/edit sheet was available to provide comments in writing with the assistance of library staff. After a few weeks, no public comments were received and the plan was submitted for State and Federal review. When these reviews are completed and no changes need to be made, Vinton County, and the Villages of Hamden, McArthur, Wilkesville and Zaleski intend to formally adopt the plan by passing a Resolution or Ordinance to obtain final Federal approval.

Participating Agencies

The following agencies and individuals participated in the development of this plan:

Community	Name	Position / Title	Agency / Organization
Vinton County	Jerry Zinn	Commissioner	County Board of Commissioners
Village of Hamden	Mike Woodruff	Councilman	Village Council
Village of McArthur	David Bolender	Councilman	Village Council
Village of Wilkesville	Tracy Barnes	Councilmember	Village Council
Village of Zaleski	Doug Heitman	Mayor	Mayor's Office
Brown Township	Karen Martin	Fiscal Officer	Township Trustees
Clinton Township	Jamie Chesser	Fiscal Officer	Township Trustees
Eagle Township	Craig Albright	Trustee	Township Trustees
Elk Township	Terry Walker	Trustee	Township Trustees
Harrison Township	Jim Lambert	Fiscal Officer	Township Trustees
Jackson Township	Kayle Teeters	Trustee	Township Trustees
Knox Township	Frank Perry	Trustee	Township Trustees
Madison Township	Jim Smallwood	Trustee	Township Trustees
Richland Township	Jerry Hawk	Trustee	Township Trustees
Swan Township	Beverly Goheen	Fiscal Officer	Township Trustees
Vinton Township	Glendon Barnes	Trustee	Township Trustees
Wilkesville Township	Michael Johnson	Trustee	Township Trustees
County EMA	Ashleigh Claar	Director	Vinton County EMA
County Development Dept.	Terri Fetherolf	Director	Vinton County Development Dept.
Soil & Water Conservation	Cody Hacker	Conservationist	Vinton County Soil & Water Conservation District
County Health Dept.	Glen Thompson	Director	Vinton County Health Department
County Engineer	Ron Sharrett	Engineer	Vinton County Engineer
County Auditor	Helen Mitchell	Clerk	Vinton County Auditor's Office
American Red Cross	Peggy Pruit	Co. Coordinator	American Red Cross - Athens Chapter
American Red Cross	Mary McCord	Volunteer	American Red Cross - Athens Chapter
American Red Cross	Suzie Dalton	Volunteer	American Red Cross - Athens Chapter
Jackson County	Robert Czechlewski	Director	Jackson County EMA
Jackson County	Lori Simonton	Planner	Jackson County EMA
Gallia County	Tim Miller	Deputy Director	Gallia County EMA
Business / Industry	Gerald "L.J." Stewart	Emergency Coordinator	Austin Powder Co. - Red Diamond Plant
Business	Dave Pollinger	Consultant	RDI Solutions LLC
Academia	Sarah Davis	Associate Professor	Ohio University - Voinivich School of Leadership & Public Affairs
Non-Profit Organization	Amy Mackey	Coordinator	Raccoon Creek Partnership
Non-Profit Organization	Heike Perko	Coordinator	Waterloo Aquatic Education Center
Non-Profit Organization	Dustin Gross	Volunteer	Americorps

Inform Chief Elected Officials, Stakeholders and the Public

The Vinton County EMA met with the Board of county Commissioners, advising them of the mitigation plan update project and received their full support. The Vinton County EMA then mailed information regarding this project to each board of township trustees and village mayor and council advising them of that the Planning Team would meet with them at one of their regularly scheduled meetings to discuss the project and solicit their input.

Public participation and input to the planning process was first announced through a press release provided to local media. It ran in the Vinton County Courier on October 29, 2016.It stated that Vinton County EMA would be hosting a public meeting on November 17, 2014, to review the current plan and provide feedback. This statement also directed the attention of the public to review the December 2003 mitigation plan on line and provide feedback by e-mail. A copy was also available in the Herbert Wescoat Memorial Library in McArthur. Comment forms were available for the public to complete and to be picked up by Vinton County EMA representatives. However, no comments were received by the public. Also, except for the presenters, there were no attendees at the public meeting.

VINTON COUNTY
EMERGENCY MANAGEMENT AGENCY
106 South Market Street • McArthur, Ohio 45651
Office (24/7): 740-596-3524 • Fax: 740-879-0901 • E-Mail: ema@vintonco.com
Executive Committee Chair – James E. Shiveley • Director – Ashleigh J. Claar

22 October 2014

Memo for: ALL LOCAL MEDIA

Re: FOR IMMEDIATE RELEASE

The general public is invited to participate in the process of updating the Vinton County Mitigation Plan currently facilitated by the Vinton County Emergency Management Agency. Mitigation is described by FEMA as, "Taking action *now*—before the next disaster—to reduce human and financial consequences later (analyzing risk, reducing risk, insuring against risk)." The planning process includes conducting a full risk and vulnerability assessment, as well as creating a list of Mitigation Projects. Copies Vinton County's current Mitigation Plan may be viewed at Herbert Wescoat Memorial Library and in the lobby of the Vinton County Sheriff's Office or electronically at http://vintoncountyema.wix.com/vcema. Individuals, businesses, and other interested parties may provide feedback on the existing plan via the comment form on the website or by attending a public meeting to be held Monday, November 17, 2014 at 7:00 PM in the Vinton County Community Development Department located at 205 S. Market Street, in McArthur. Questions or requests for additional information regarding this project may be directed to The Vinton County Emergency Management Agency – 740.596.3524.

Protecting people, property and the environment from all hazards through Mitigation, Prevention, Protection, Preparedness, Response, and Recovery

EMA Mitigation Meeting

The Vinton County Emergency Management Agency (EMA) is in the process of updating the Vinton County Mitigation Plan; the planning process includes conducting a full risk and vulnerability assessment, as well as creating a list of Mitigation Projects. Copies of the current Mitigation Plan may seen at the Herbert Wescoat Memorial Library and in the lobby of the Vinton County Sheriff's office, or it can be viewed online at http://vintoncountyema.wix.com/vcema.

Mitigation is described by FEMA as "Taking action now – before the next disaster – to reduce human and financial consequences later (analyzing risk, reducing risk, insuring against risk."

The general public is invited to participate as well as businesses and other interested parties and may provide feedback to the existing plan via the comment form on the website or by attending a public meeting which will be held at 7 p.m., Monday, Nov. 17, at the Vinton County Community Development Department, 205 S. Market St., McArthur. Questions or requests for additional information regarding this project may be directed to the VC EMA at 740-596-3524.

Throughout the plan development phase, the public was invited to attend and participate in the Planning Team meetings with each jurisdiction's regularly scheduled open-to-the-public meetings. Locations, dates and times were made to the public and announcements were posted at meeting locations.

After the planning process was finished, the public had the opportunity to review and comment on the revised plan. The plan was made available at the Herbert Wescoat Memorial Library and on the EMA web site. No comments were received.

Gather Information

The Planning Team met with each jurisdiction's governing body at one of their regularly scheduled open-to-the-public meetings. Team members explained what mitigation is and its importance, the planning process and their role in it. They then reviewed the existing mitigation plan and progress made to achieve its goals. They then led a discussion regarding new mitigation actions particularly in light recent events and helped them adjust current and identify new mitigation actions. Rosters of these meetings are located in *Section IV – Supplemental Information*.

The Planning Team also contacted agencies that have a mitigation-related role. This included the Vinton County Health Department, Vinton County Soil & Water Conservation District, Vinton County Engineer's Office, Vinton County Auditor's Office, Vinton County Sheriff's Office and Vinton County EMA. Rosters of these meetings (dates, jurisdictions/locations, attendees) are located in *Section IV – Supplemental Information*.

The Planning Team reviewed existing plans and reports including the county's Emergency Operations Plan, Soil Report, plat maps, and Planning Commission regulations.

The Planning Team performed extensive research from online resources such as Federal Emergency Management Agency (FEMA), National Oceanic and Atmospheric Administration (NOAA), US and Ohio Departments of Transportation (USDOT/ODOT) and Ohio Department of Natural Resources (ODNR). The source is identified where this information is presented in this plan.

Update Community Profile and Assets

The Planning Team updated the community profile and its assets based on data collected and is presented in *Section II – Community Profile and Assets*.

Perform Hazard Analysis, Formulate Goals and Mitigation Actions

Identification of Hazards

Based on a review of the community profile and historical records of hazards affecting southeast Ohio, the following hazards are considered to be credible threats to Vinton County's assets:

Natural Hazards/Events
- Major Flooding (Flood-Causing Events)
- Severe Thunderstorms (Flash Flooding)
- Severe Winter Storms
- Landslides
- Wildfires
- Drought
- Severe Wind Storms
- Earthquakes
- Dam Failure

Hazard Profile, Vulnerability Assessment & Impacts

The Planning Team collected and reviewed hazard information, assessed the impacts and the community's vulnerabilities. Refer to *Appendix A* for details.

Goals & Mitigation Actions

The Planning Team reviewed the vulnerabilities of impacted assets and decided on the following mitigation goals in priority order based on impact resolution.

The following shows the impacts affecting Vinton County assets in order of the estimated probability and cumulated impact. These laid the foundation for establishing and prioritizing mitigation goals.

Impact	Relative Severity	Percent of Severity
Road Damage	3.83	34.14%
Isolation	3.57	31.82%
Structural Damage	1.45	12.92%
Utility Outage/Shortage	1.25	11.14%
Economic Impact	1.08	9.63%
Critical Facility Damage	0.02	.18%
Causalities	0.02	.18%

The Planning Team selected the following goals:

- **Engineer Roads to be Safe and Passable During Hazard Events**
  This goal addresses the most severe impact – road damage.
- **Inform the Public of Impacts and Actions to Take During Hazard Events**
  This goal addresses:
  - Isolation by advising people of developing situations so they can go or stay where isolation would impact them less.
  - Causalities by advising people to stay clear of dangerous areas.
- **Educate The Public On Mitigation, Preparedness and Response Actions**
  This goal addresses isolation, utility outage/shortage and casualties by encouraging people to identify and fix problems, know how to prepare for and respond to these impacts so their severity will be lessened.
- **Create Self Sufficiency – Individual, Community, County**
  This goal addresses impacts on people by building infrastructure that allows communities to care for their residents with minimal outside assistance.
- **Plan for Safe Development**
  This goal addresses:
  - Road damage, structural damage and critical facility damage by providing guidance for planning and engineering more resilient roads and buildings.
  - Isolation, economic impact and causalities by taking the above actions.

The Planning Team then reviewed current mitigation actions, deleted one that was no longer viable and added several new ones. Using Cost Benefit Review procedures, the planning team prioritized the actions. The following table depicts the mitigation actions

developed and selected and the priority assigned. Note that priorities from the 2003 Plan were modified based on the results of this approach.

Goal/Mitigation Action	Priority	Status
1: Engineer Roads to be Safe and Passable During Hazard Events		
1: Raise Roadbeds	15	Deferred
2: Install Larger Culverts	5	Deferred
3: Lengthen Bridges	14	Deferred
4: Build up Creek Banks	12	Deferred
5: Remove or Reinforce Slipping Soil	11	Deferred
6: Remove Debris from Waterways	10	Deferred
7: Cut Open Old Railroad Bed	13	Deleted
2: Inform the Public of Impacts and Actions to Take During Hazard Events		
8: Install Depth Sticks & High Water Signs	2	Deferred
9: Install/Upgrade Alerting Sirens		Completed
10: Establish County-Wide Weather Monitoring Network		Deleted
11: Establish County-Wide Alerting/Notification System		Completed
3: Educate the Public on Mitigation, Preparedness and Response Actions		
12: Develop and Conduct Public Education Program	1	Deferred
4: Create Self Sufficiency – Individual, Community, County		
13: Install Generator at Community Centers	3	New
14: Drill Community Well in Area Affected by Drought	8	New
5: Plan for Safe Development		
15: Mitigate Chronically-Flooded/Damaged Dwellings	9	Deferred
16: Map Flooding, Water Sources, Causes and Impacts	6	Deferred
17: Build Safe Rooms	7	New
18: Review and Update Planning Regulations	4	New

Refer to *Appendix B – Mitigation Actions* for details on these mitigation actions.

Gaps in Pertinent Information

The Planning Team identified the following gaps that with this information, analysis would have been more meaningful:

- Economic impact information
- Future development information

Present Plan to the Public

The plan was placed in the Herbert Wescoat Memorial Library and on the Vinton County EMA's website and a public notice was placed in the Vinton County Courier inviting residents to review and comment on the plan.

Additionally, a copy of the updated plan was sent to the Emergency Management Agencies of adjacent counties.

Submit Plan to Ohio EMA and FEMA

The plan in its final form was submitted to Ohio EMA in February 2016. Upon its review of the plan, Ohio EMA will submit it to FEMA.

Adopt Plan

Upon notification that FEMA has determined this plan meets its requirements, the Vinton County EMA Director will present it to all participating jurisdictions for formal adoption by resolution. These resolutions will be forwarded to Ohio EMA. The plan will become official when FEMA grants federal approval.

Monitor Plan Implementation

The Vinton County EMA Director monitors the implementation of this plan by periodic contact with lead agencies and presents status to the Planning Team and commissioners at each annual review.

Keep Plan Up to Date

Vinton County EMA Director monitors the implementation of this plan by having lead agencies provide updates as the status of their mitigation actions change.

The Vinton County EMA Director convenes the Planning Team annually to review the progress of this plan and propose any needed updates. This meeting is publically-announced and is open to the public. At this meeting, the team:

- Reviews the status of all mitigation actions.
- Assesses the progress toward achieving mitigation goals.
- Considers new related information as it becomes available. This includes recent hazard occurrences as well as changes in related planning documents. If this information would have an impact on goals or actions, the team proposes changes such as adding, changing or eliminating goals or mitigation actions.
- Presents proposed changes to the Board of County Commissioners and chief elected officials of affected jurisdictions for concurrence.
- Formally documents the proceedings, provides it to all stakeholders and makes it available with the current plan.

Once every five years, the Vinton County EMA initiates a formal plan update based on then current FEMA requirements and FEMA and Ohio EMA guidance.

The Vinton County EMA may process out-of-cycle updates by submitting changes to the Board of County Commissioners and the Ohio EMA.

Addendums

Appendix A – Hazard Analysis

Appendix B – Mitigation Actions

Section III – Appendix A – Hazard Analysis

Methodology

The Planning Team used the following methodology in conducting hazard analysis:

For Each Hazard:

Identify & Describe Hazard. This gives an understanding of the hazard.

Determine Extent. This describes how the severity of the hazard is measured.

Describe Historical Occurrences. This gives a history of frequencies and severities of past occurrences.

Estimate Probability of Future Occurrences. Factors that may affect a change in future occurrences are identified and quantified. Probability is expressed in number of occurrences expected in one year, 100% being one occurrence expecting in a given twelve-month period.

Identify Affected Locations. This tells us where impacted assets may be.

Identify Vulnerable Community Assets at Risk & Estimate Impact. This includes:

- People – Casualties and Isolation/Restricted Travel
- Infrastructure – Roads and Utilities
- Structures – Residential, Non-Residential, Critical Facilities
- Economy

Analyze and Rank Hazards, Vulnerabilities and Impacts. The planning team used the criteria specified by Ohio EMA using their SHARPP Website. Additionally, the team analyzed and ranked the impacts on community assets.

Major Flooding (Flood Causing Events)

Description

Flooding is an overflowing of water onto land that is normally dry. Floods can happen during heavy rains, when ocean waves come on shore, when snow melts too fast, or when dams or levees break. Flooding may happen with only a few inches of water, or it may cover a house to the rooftop. They can occur quickly or over a long period and may last days, weeks, or longer. Floods are the most common and widespread of all weather-related natural disasters.

Flash floods are the most dangerous kind of floods, because they combine the destructive power of a flood with incredible speed and unpredictability. Flash floods occur when excessive water fills normally dry creeks or river beds along with currently flowing creeks and rivers, causing rapid rises of water in a short amount of time. They can happen with little or no warning.

Areas near rivers are at risk from flash floods. Embankments, known as levees, are often built along rivers and are used to prevent high water from flooding bordering land. In 1993, many levees failed along the Mississippi River, resulting in devastating flash floods. The city of New Orleans experienced massive devastating flooding days after Hurricane Katrina came onshore in 2005 due to the failure of levees designed to protect the city.

Mountains and steep hills produce rapid runoff, which causes streams to rise quickly. Rocks and clay soils do not allow much water to infiltrate the ground. Saturated soil also can lead rapidly to flash flooding. Vacationing or recreating along streams or rivers can be a risk if there are thunderstorms in the area. A creek only 6 inches deep in mountainous areas can swell to a 10-foot deep raging river in less than an hour if a thunderstorm lingers over an area for an extended period of time.

Additional high-risk locations include low water crossings, recent burn [or logging] areas in mountains, and urban areas from pavement and roofs which concentrate rainfall runoff.

Ice jams and snowmelt can help cause flash floods. A deep snowpack increases runoff produced by melting snow. Heavy spring rains falling on melting snowpack can produce disastrous flash flooding. Melting snowpack may also contribute to flash floods produced by ice jams on creeks and rivers. Thick layers of ice often form on streams and rivers during the winter. Melting snow and/or warm rain running into the streams may lift and break this ice, allowing large chunks of ice to jam against bridges or other structures. This causes the water to rapidly rise behind the ice jam. If the water is suddenly released, serious flash flooding could occur downstream. Huge chunks of ice can be pushed onto the shore and through houses and buildings. (Source: NOAA)

Note that this specific Flash-Flooding hazard is addressed under Severe Thunderstorms.

Extent of Hazard

The magnitude of this hazard is the 25-Year and 100-Year flood scenarios as modeled by the *Hazards U.S. Multi-Hazard* (HAZUS-MH) simulation preformed and provided by Ohio EMA. HAZUS-MH reports used in this analysis are included in *Section IV – Supplemental Information.*

Historical Occurrence

In reviewing the *Summary of Historical Flood Events 1860-1990* found at page 88 of the *State of Ohio Enhanced Hazard Mitigation Plan (May 2014)*, Vinton County was found to be largely spared by geographical elimination. NOAA's Storm Events Database provides information back to 1975.

Event	Dates	Property Damage
Countywide Flooding	April 21-22, 2002	$ 15,000

Warm frontal rains of 1.5 to 2.5 inches were common in about an 18 hour period on the 21st. McArthur measured 2.27 inches, Gallipolis had 2 inches. Isolated amounts over 3 inches were likely. Roads were closed in the usual low spots by overflowing small streams. Jackson County Sheriff's department reported a mobile home flooded along Route 279.

A 44-year-old Lawrence County man drowned in Johns Creek along County Road 4 in Aid Township around 11:00 pm on the 21st. He was driving to a job in Gallipolis. County officials believed he drove into some water on the road, stopped, put his vehicle in reverse to turn around, and then drove into the swollen stream. His body was discovered on Monday morning the 22nd, by a local resident, who was checking the level of the stream. A few reports of large hail also occurred with this episode.

Event	Dates	Property Damage
Countywide Flash Flooding (DR-1507)	January 4-5, 2004	$ 150,000

A strong frontal boundary pushed across southeast Ohio late on the 3rd. By dawn on the 4th, the frontal zone stalled just to the south. Late on the 4th and into the 5th, a low pressure wave lifted northeast, along this boundary, and through the Ohio River Valley.

Rains of 1.5 to 3.3 inches fell on saturated ground, during about a 36 hour time span. One rain maximum extended northeast from the Scioto River Valley, across the northern half of Perry County, then continued northeast into the Muskingum River Valley. Another maximum of rain extended out of central Vinton County, across central Athens County, and into central and northern Washington County. McArthur measured 3.3 inches of rain for the event. Other rain measurements from cooperative observers included 2.6 inches at Athens, 2.3 inches at McConnelsville, 2.2 inches from Nelsonville, 2 inches at Marietta, 1.9 inches at Beverly, 1.6 inches from both New Lexington and Jackson.

Widespread small stream flooding occurred on Sunday the 4th and Monday the 5th. In Jackson County, the stream flooding was limited to townships near the Vinton County border. Water was 2 to 3 feet deep in the streets of Glenford of northern Perry County. Water and debris forced numerous road closures. As the water receded, cleanup was complicated by some ice formation.

River flooding followed on the Muskingum, the Hocking, and on the Ohio. The swollen rivers also caused feeder streams to have backwater flooding. During the morning of the 5th, the Muskingum River crested at McConnelsville of Morgan County around 12.7

feet. Flood stage is 11 feet. This was the highest water level at McConnelsville since the 12.8 feet back in August, 1980. About 27 homes and 1 business along the river in Morgan County sustained at least major damage. All total, about 77 homes in Morgan County, were affected to some degree.

At Athens, the Hocking River crested around 21.3 feet about midday on the 6th. Flood stage is 20 feet. The floods of 1997 and 1998 were higher at Athens. The county engineer reported about a dozen road slippages and a dozen road washouts on roads in Athens County. Near dawn on the 6th, York Township firemen rescued a woman whose vehicle was washed into the Hocking River from County Route 4. She called 911 on her cell phone, while the water was rushing into her vehicle. She got outside and on to the roof, but was swept off the vehicle by the rushing water. She was in the water for nearly 45 minutes, with air temperatures in the 20s. When rescued by boat, her head was poking out of the water and one arm was hanging on to a brush pile. The fire chief commented, about how lucky she was. He said the spot where she drove into the water is usually a dead zone for cell phone service, but somehow she got a signal.

The Ohio River crested at Marietta at 36.8 feet during the afternoon of the 6th. Flood stage is 34 feet. The flood of January 1996 crested at 39.3 feet. Further down the Ohio River, the crest at Racine was 44.7 feet, plus near 47.3 feet at Pomeroy, both on the 7th.

In Washington County, the heaviest flood damage was along the Muskingum River, plus the usual low lying sections in the City of Marietta. Three occupied dwellings were destroyed in Washington County. Over 200 dwellings were affected to some degree. Local fire departments in Washington County performed several rescues, most of which were along County Route 32, known as the Muskingum River Road.

Event	Dates	Property Damage
Countywide Flash Flooding (DR-1556)	September 16-17, 2004	$ 500,000

Light rain spread north into southeast Ohio during the afternoon and evening hours of the 16th. The heavier rain from the remnants of Hurricane Ivan developed over Lawrence County before dawn on Friday the 17th, reaching the Athens and Marietta vicinity by 9:00 pm on the 17th. By 5:00 pm the heavy rain was pulling east and northeast, out of southeast Ohio. A rain event of 24 to 30 hours dumped 4 to 6.5 inches of rain. Some specific preliminary totals included Beverly 6.4 inches, McArthur 6 inches, McConnelsville 5.5 inches, Athens and Waterloo 5.1 inches, Marietta and Newport 4.8 inches, Gallipolis 4.3 inches, and Nelsonville 4 inches. Rains were not as heavy over central and northern portions of Perry County. New Lexington measured 2.4 inches. Spotters reported 6.2 inches from Guysville, 6.1 inches at Tuppers Plains, and 5.5 inches in Pageville.

Since the ground was still recovering from the effects of Hurricane Frances 8 days earlier, streams crested higher in many instances. The small stream flooding developed during the late morning and early afternoon period of the 17th. Serious small stream flooding occurred on such streams as Sunday Creek, Duck Creek, Racoon Creek, Little

Racoon Creek, and Symmes Creek. On the 2 year old gauge at Bolins Mills on Racoon Creek, the crest was 17 feet, its highest. At Millfield on Sunday Creek, a crest of 24.5 feet established a new record. However, the upper reaches of Sunday Creek in Perry and northern Athens County were higher in May of 2004, than this event. For example, the gauge at Glouster crested at 17.6 feet compared to 19 feet in May. Symmes Creek near Aid crested at 23.3 feet.

The smaller rivers, such as the Little Muskingum and Shade, saw serious flooding. The Little Muskingum River at Bloomfield crested at 31.1 feet, surpassing the 30.7 feet crest in 1998. The Rinard covered bridge, originally built in 1874, was shoved into the river. During a restoration project in the early 1990s, gaps between the wooden boards were taken out. Local residents think, without those gaps, the water pressure was greater, knocking the bridge off its supports. In this vicinity, general stores in Bloomfield and Wingett Run were flooded with 5 feet of water. The Shade River crested at 30 feet near Chester. The 1997 crest was at 31.4 feet.

The Hocking River at Athens crested slightly over its 20-foot flood stage at 20.8 feet. The crest occurred before dawn on the 18th at Athens.

The axis of heaviest rain ran up the main stem of the Ohio River toward Wheeling and Pittsburgh. Storm totals of 6 to 8 inches were seen there. This rain was almost direct local runoff into the upper Ohio River. As a result, a strong rise of 1 to 2 feet per hour was observed on the Ohio River during the Friday evening, the 17th. For example, between 1600E and 2100E, the Ohio River rose 9 feet at Willow Island Lock and Dam, and around 10 feet on the Marietta 2SW gauge. The 24 hour rise at Marietta was 22 feet in 24 hours, the greatest 24 hour rise there on record.

Event	Dates	Property Damage
Countywide Flash Flooding (DR-1507)	January 5, 2005	$ 20,000

Separate waves of rain moved along a strong west to east frontal zone in the Ohio Valley, from late on the 3rd into the early morning hours of the 8th. To the south of the boundary, dew points were in the 50 to 55 degree range. The heaviest rain amounts were from Perry County on north and east into eastern Ohio and western Pennsylvania. Preliminary 5 day totals were 5.2 inches for New Lexington, 4.6 inches at McConnelsville, 4.5 inches at Nelsonville, 4.2 inches at McArthur and Beverly, 3.4 inches at Athens, and 2.9 inches at Marietta.

Small stream flooding started during the morning hours on the 5th, across Perry, Athens, Morgan, Vinton, and Washington Counties. Some of the flooded streams included Jonathan Creek in northern Perry County, plus Monday and Sunday Creeks in southern Perry County and northern Athens County. Sunday Creek crested at 15.8 feet on the 6th at Glouster, and near 23 feet at Millfield. On Monday Creek, the gauge at Doanville crested at 19.1 feet on the 6th. In Perry County, 9 families were evacuated. The small stream flooding across Vinton County was limited to flooded roads.

Significant river flooding occurred on the Muskingum, the Hocking, and the Ohio River. The crest on the Hocking River at Athens was 23.7 feet around 11:00 am on the 7th. This was the highest level since the 24.65 feet observed on the 25th of May in 1968.

It was the highest stage since the river was rechanneled in 1972. The crest level was also the 5th highest on record for Athens. Communities such as Nelsonville and Chauncey were flooded. The lowest and most vulnerable sections of Chauncey had water inside dwellings and other buildings. In Athens, the storm drainage system backup into the business area along East State Street. Some homes on Blick Avenue were flooded. West Union Street was also flooded and closed. Elsewhere in Athens County, the high water along the Ohio River affected Hockingport. All total, about 73 homes in Athens County had minor damage, 56 homes had major damage, and 11 homes were destroyed. About a dozen businesses applied for disaster loans.

In McConnelsville of Morgan County, the Muskingum River crested at 13.45 feet around 2:00 am, E on the 6th. This was the highest level since the 13.8 feet seen back in March 1964. Water rescues were performed by the Ohio Department of Natural Resources and the county sheriff department. An 85 year old woman was rescued from her flooded mobile home along the Muskingum River on the 6th. She did not want to evacuate earlier and had her pets inside. When finally rescued, she was sitting on a chair, with water almost up to her knees. Her feet were swollen. She never recovered from the hypothermia, and died several days later. A second crest would occur less than a week later, from additional rain and dam releases. One furniture store in McConnelsville had flood waters inside.

Further down the Ohio River, Racine Lock and Dam crested at 48.9 feet. The crest at Pomeroy was 50.5 feet around .2 feet. Water still got into businesses. All total, Meigs County had 17 homes with minor damage, 2 homes with major damage, and 3 homes destroyed. Five businesses had major damage and 1 business was destroyed.

The crest near Gallipolis, at the RC Byrd Lock and Dam was 50.3 feet around 2:00 am on the 9th. This was just over the 50 foot flood stage. For the Chesapeake to South Point reach of the river, the Huntington gauge crested at 51.8 feet during the evening hours of the 9th. This was about 6 inches higher than in September 2004. Flood stage at Huntington is 50 feet.

Around 8:45 am on the 6th, just north of the Belleville Lock and Dam, the tugboat Jon Strong was heading up the Ohio River. After passing through the lock chamber, 9 of the 12 barges came loose in the strong currents. Three of barges sank under the gates of the dam, while 3 others were forced up against the dam pier houses. Three other barges went through the structure and were recovered downstream. Salvage crews did not remove all the damaged barges until the last day of the month. Since the gates could not be closed, the pool above Belleville Lock and Dam dropped 10 to 15 feet below normal. River traffic was suspended on the 19th. River bank slippage occurred around Hockingport during the unusually low levels late in the month. This caused damage to roads and a few homes. Water levels returned toward normal in early February.

Event	Dates	Property Damage
Eagle Mills, Ohio Flooding	March 18-19, 2008	$ 10,000

Rain spread into southeast Ohio near dawn on Tuesday, the 18th. A strong east to west warm front had set up across northern Kentucky. By late afternoon, rain amounts

of 0.5 to 1.35 had already fallen, with the heaviest being over northern Jackson, Vinton, and Athens Counties. A lull occurred Tuesday evening, as the warm front and its rain shifted north. However, as the low pressure lifted northeast through the Ohio Valley, another 1 to 2 inches of rain fell on the 19th. Some preliminary rain totals over about a 36 hour period included, 3.5 inches at McArthur, 3.0 inches at New Lexington, 2.7 inches at Jackson, 2.6 inches at Salem Center, 2.3 inches at McConnelsville, 2.2 inches at Beverly, 2.1 inches at Athens, and 1.7 inches at Nelsonville. Storm totals were even higher further southwest, down the Ohio River Valley, where the moisture inflow was greater.

Luckily, southeast Ohio avoided a major flood event. Small stream flooding was widespread across Perry, Athens, Morgan, Vinton, Jackson, and Meigs Counties. A few streams, such as Duck Creek, also flooded in Washington County. Numerous roads were closed by high water, but no dwellings were damaged by flood waters. Several school districts closed schools on the 19th. County maintenance departments were kept busy clearing debris off of culverts and roads.

Later, the larger streams and rivers also saw minor flooding on the 19th into the 20th. The Muskingum River crested just over 12 feet at McConnelsville during the predawn hours of the 20th. Flood stage there is 11 feet. The Hocking River at Athens crested at 21.4 feet during the late evening of the 20th. Flood stage at Athens is 20 feet. The Shade River near Chester crested at 20 feet during the evening of the 20th. Bank full is 17 feet near Chester.

Event	Dates	Property Damage
Ray, Ohio Flooding	May 2-3, 2010	$ 175,000

A strong southerly flow, ahead of a cold front, transported very moist air through Tennessee, Kentucky and into southeast Ohio. Surface dew points were in the mid and upper 60s. Wave after wave in the mid and upper levels helped trigger widespread showers, with embedded thunderstorms. These training rains first affected Jackson and Vinton Counties between 5:00 am and 6:00 am on Sunday May 2nd. The heaviest rains arched into Athens County and eventually sank slowly south, to affect Lawrence, Gallia, and Meigs Counties later in the day. The rains continued into the evening hours on the 2nd, then diminished during the late evening. However, some light rain lingered until after midnight on the 3rd.

The rain amounts over about an 18 to 20 hour period were mostly 3.5 to 4.5 inches across Lawrence, Jackson, Viinton, Gallia, Meigs, and Athens Counties. Waterloo in northern Lawrence County reported 4.8 inches for the maximum. McArthur in Vinton County and Jackson in Jackson County both measured around 4.3 inches. The town of Athens had 4.1 inches, while Gallipolis had 3.9 inches, and South Point measured 3.8 inches. An automatic gauge in Gallia County, between Gallipolis and Rio Grande measured 3.7 inches.

Small stream flooding was common. Roads were flooded. Some small bridges and culverts were washed out. Two men drowned near the Athens County line in Morgan County.

The first report of flooding was around midday as the headwaters of Raccoon Creek, including Wiselabout Creek, flooded Route 278. Numerous other creeks overflowed and blocked roads.

Event	Dates	Property Damage
Orland, Ohio Flooding	March 9-10, 2011	$ 2,000

Another major rain event occurred from late on the 9th into the evening hours of the 10th. Rain amounts of 1 to 2 inches were common. Including this episode, the accumulative effects of 5 significant rain events since February 21st, caused the Ohio River to flood. The crest along the Ohio River was mostly 2 to 6 feet above the assigned flood stages. The crest occurred late on the 12th into the morning hours of the 13th. Along many reaches, it was the highest stage on the Ohio River since 2005. Some of the flood gates were installed in the Ironton floodwall, forcing a school to be canceled for a few days.

The crest of 49 feet at Pomeroy did allow water to reach the businesses along Main Street. Water was about 6 inches to a foot inside the structures. However, damage was minimal. Inventory and personal property was moved to higher levels well in advance of the flood. The Pomeroy police chief said, the community knew what they needed to do, they knew what was expected, and they stuck together, and that's what separates us from other people.

In Lawrence County, about 20 properties along the river had minor water problems. This was either water reaching around their homes, or into their garages and outbuildings.

The other most significant impact was road closures along the entire reach of the river in southeast Ohio. This caused motorists to take alternate routes for a few days. In the wake of the high water, a few roads suffered slips from the saturated ground. Many of the flood prone parks and recreational areas along the river were also flooded, including some of their outbuildings.

The unique feature about this flood, was the fact that there was very little headwater river or small flooding in southeast Ohio. Leading into the Ohio River flood, only some minor stream flooding occurred along portions of some of the larger creeks, such as Raccoon Creek and the Little Muskingum River.

The headwaters of Raccoon Creek overflowed across roads. Sections of Route 356 were closed near Bolins Mills. Route 328 was also closed northwest of Zaleski.

Event	Dates	Property Damage
Allensville, Ohio Flooding	April 11-12, 2011	$ 10,000

Rain began Monday evening the 11th, around the north side of a strong mid-level disturbance. The rain increased during the predawn hours on the 12th. Rain amounts of 1 to 1.5 inches were measured by dawn on the 12th. Another half inch of rain fell during the morning to midday time frame, before tapering off. Most maximum rain totals were in the 1.5 to 2 inch range. Minor stream flooding occurred, blocking and closing roads, but not flooding homes. Several roads were flooded and closed.

Event	Dates	Property Damage
Hamden, Ohio Flooding	April 19, 2011	$ 5,000

On Tuesday the 19th, a strong east to west front stretched from north central West Virginia on across extreme southern Ohio near the Ohio River.

Rounds of showers and thunderstorms moved into southeast Ohio around 2:00 am and continued into the late afternoon. By late afternoon, rain amounts of 1.75 to 2.25 were common, generally from the Route 50 corridor on north through Perry County. One automatic gauge near New Lexington had 2.31 inches. Small stream flooding was common in Athens and Perry Counties. Numerous roads were flooded and closed, but homes were not flooded. The rain diminished by evening, as the front lifted north.

However, another round of convection followed, well ahead of the cold front. Severe convection moved up the Ohio River Valley overnight on the 19th into the 20th. The convection began to weaken as it approached southeast Ohio during the predawn hours on the 20th. However, due to the fast wind flow aloft, wind damage still occurred in Perry County. The additional rain was not as heavy, mostly less than a third of an inch.

The total rain event brought a strong rise on the Hocking River through the day on the 20th, reaching flood stage at Athens by late afternoon on the 20th. The Hocking River crested at Athens during the morning hours of the 21st at 21.17 feet. Flood stage is 20 feet. The river fell below flood stage by that evening. This level kept vulnerable roads near the river flooded. Yet, no homes were flooded. Streams overflowed and blocked roads.

Event	Dates	Property Damage
Radcliff, Ohio Flooding	April 30, 2014	$ 5,000

Rounds of convection began on Monday the 28th. A nearly stationary front was located across the Tri State area near extreme southeast Ohio on Tuesday the 29th with more unstable air upstream over Kentucky. Additional rounds of convection fell on Tuesday. More discrete thunderstorm cells formed during the late afternoon and early evening of the 29th. This produced some large hail and damage to vehicles. One of those downpours caused a flash flood in western Lawrence County.

Additional showers fell on the 30th, but amounts were not as heavy. The storm totals for the rain reached into the 3 to 3.6 inch range. This was over a 3 day period. Spotters in Albany and Athens both measured around 3.6 inches of rain. A spotter in Guysville measured around 3.3 inches. An automatic gauge near Pomeroy had around 3.2 inches of rain. Dean State Forest in Lawrence County and Rio Grande in Gallia County both had around 3 inches. The cooperative observer in Jackson measured just over 3 inches.

Many streams eventually overflowed, causing minor flooding on the 30th. A strong rise occurred on the Hocking River, but eventually the crest remained below flood stage.

Many small streams overflowed and closed low spots in roads. For example, Route 328 was closed in 3 spots and Route 278 in 1 location in the Lake Hope State Park vicinity. No structures were flooded.

Probability of Future Occurrences

According to NCDC, there have been 16 events in 19 years. There is an 84.21% chance of an occurrence in any given year.

Affected Locations

While major flooding affects the entire county, those areas in identified floodplains are the most susceptible. The following table depicts those areas and affected jurisdictions.

Affected Jurisdiction / Watershed and Tributaries	Eagle Twp	Harrison Twp	Jackson Twp	Richland Twp	Swan Twp	Elk Twp	McArthur Village	Clinton Twp	Hamden Village	Brown Twp	Madison Twp	Zaleski Village	Know Twp	Vinton Twp	Wilkesville Twp	Wilkesville Village
Scioto River																
Salt Creek	X															
Pike Run	X															
East Fork Pike Run	X															
Pretty Run	X		X													
Middle Fork Salt Creek		X		X												
Pigeon Creek		X														
Raccoon Creek					X	X				X	X		X	X	X	
Brushy Creek					X											
Dunkle Creek (Lower)					X											
Siverly Creek (Lower)					X											
Brushy Fork					X											
Elk Fork						X					X			X		
Puncheon Fork						X	X									
Wolf Run						X		X			X					
Flat Run														X		
Little Raccoon Creek				X				X	X	X						
Sand Run								X								
Lake Alma								X								
Sugar Run								X								
Unnamed								X	X							
Tripp Run								X	X							
Johnson Run								X								
Lake Rupert								X								
McConnell Run (Lower)								X								
Two Mile Run										X						
Lake Hope										X						
Sandy Run										X						
Hewett Fork										X						
Laurel Run													X			
Pierce Run														X	X	

Watershed and Tributaries / Affected Jurisdiction	Eagle Twp	Harrison Twp	Jackson Twp	Richland Twp	Swan Twp	Elk Twp	McArthur Village	Clinton Twp	Hamden Village	Brown Twp	Madison Twp	Zaleski Village	Know Twp	Vinton Twp	Wilkesville Twp	Wilkesville Village
North Fork														X		
Brush Fork														X		
Zinns Run														X		
Hog Run (Lower)															X	
Rockcamp Run (Lower)															X	
Indiancamp Run (Lower)															X	
Flatlick Run															X	
Strong's Run															X	
Source: FEMA Hazard Boundary Maps for Vinton County, Ohio, January 8, 1981																

Vulnerable Community Assets at Risk & Estimated Damages

People. HAZUS-MH estimates no deaths directly related to flooding. It does estimate that 171 households will be displaced due to the 100-year flood and 161 people due to the 25-year flood.

Infrastructure. The primary vulnerable infrastructure assets are roads, culverts and bridges, damaged by erosion. HAZUS-MH doesn't simulate these damages; the infrastructure damages in the 1997 event was $750,000.

Structures.

Structure Type	Number Affected	Damage Loss Estimate
Residential	2,010	$197,449,000
Non-Residential	399	$ 39,023,000
Critical Facilities	98	$ 9,661,000

Note that HAZUS-MH estimates one critical facility – a school – would be damaged in both scenarios. Since the snapshot of seven schools was taken, five have been demolished and replaced; the site of the one at risk was not rebuilt on.

Economy. HAZUS-MH estimates a total economic loss due to the 100-year flood to be $13.77 million and $11.63 million due to the 25-year flood.

Severe Thunderstorms (Flash Flooding)

Description

A thunderstorm is a rain shower during which you hear thunder. Since thunder comes from lightning, all thunderstorms have lightning. A thunderstorm is the result of convection. Usually created by surface heating, convection is upward atmospheric motion that transports whatever is in the air along with it—especially any moisture available in the air.

Worldwide, there are an estimated 16 million thunderstorms each year, and at any given moment, there are roughly 2,000 thunderstorms in progress. There are about 100,000 thunderstorms each year in the U.S. alone. About 10% of these reach severe levels.

Thunderstorms are most likely in the spring and summer months and during the afternoon and evening hours, but they can occur year-round and at all hours. Thunderstorms are most likely along the Gulf Coast and across the southeastern and western states; most thunderstorms occur during the afternoon. Thunderstorms frequently occur in the late afternoon and at night in the Plains states.

Many hazardous weather events are associated with thunderstorms. Under the right conditions, rainfall from thunderstorms causes flash flooding, killing more people each year than hurricanes, tornadoes or lightning. Lightning is responsible for many fires around the world each year, and causes fatalities. Hail up to the size of softballs damages cars and windows, and kills livestock caught out in the open. Strong (up to more than 120 mph) straight-line winds associated with thunderstorms knock down trees, power lines and mobile homes. Tornadoes (with winds up to about 300 mph) can destroy all but the best-built man-made structures. (Source: NOAA)

Severe thunderstorms are much more common than Persistent, Sustained Rain Storms. Severe thunderstorm events are differentiated by a shorter life span and a shorter "under-water" time but with more land – mostly roads – affected.

Note: these storms are often associated with severe wind storms; they are handled separately in this plan to better isolate and properly address impacts.

Extent of Hazard

A thunderstorm is classified as "severe" when it contains one or more of the following: hail one inch or greater, winds gusting in excess of 50 knots (57.5 mph), or a tornado (Source: NOAA). Additionally, rainfall rates greater than 2 inches per hour indicate a severe thunderstorm.

Historical Occurrence

NOAA's Storm Events Database provides the best comprehensive source of information back to 1996. Presidential disaster declarations for this type of hazard were received in 2003, 2004, 2005 and 2011. The following summarizes significant damage-causing events.

Event	Dates	Property Damage
Prattsville, Ohio	June 9, 1996	$ 75,000

Stream flooding was widespread across eastern areas of the county. Propane tanks, camping trailers, and a few cars were damaged. Raccoon Creek was the main stream that flooded. Route 50 east of Prattsville was closed due to the flooding.

Event	Dates	Property Damage
Countywide Flash Flooding	March 1-2, 1997	$ 750,000

According to the US Geological Survey, thunderstorms and heavy rain in Southern Ohio resulted in flooding that caused widespread damage to public and private property. Areas of Athens and Vinton Counties received about 6 inches of rainfall during the storm. Eighteen Ohio counties were declared Federal and State disaster areas, which qualified them for Federal and State disaster assistance. Vinton was one of those counties. The damage assessment concluded that 41 structures were destroyed or had major damage, 26 structures had minor damage and six structures were affected. The Lake Alma Dam overtopped and experienced downstream slope erosion.

Event	Dates	Property Damage
Countywide Flash Flooding	February 18-19, 2000	$ 75,000

Rains of 2 to 4 inches fell in about an 18 hour period. A strong frontal zone was in the vicinity, as low pressure moved up the Ohio Valley. Southerly winds pulled low level moisture north from Tennessee and Kentucky. Surface dew points were in the 55 to 60 degree range south of the frontal boundary. Carpenter of western Meigs County had 4.1 inches, Gallipolis measured 3.7 inches, Jackson 3.45 inches, Patriot, Salem Center, and Willow wood all had around 3.3 inches, while McArthur had 3.2 inches. A spotter network in Meigs County revealed 3.9 inches at Racine and 3.6 inches at Syracuse.

Event	Dates	Property Damage
Jimtown, OH	May 10, 2011	$ 75,000

Repetitive showers and thunderstorms, moved southeast through western Vinton County, Jackson County, and western and central portions of Lawrence County between 3:00 pm and 6:30 pm on Tuesday, the 10th. This convection was just northeast of the surface warm front. A sharp dew point gradient existed along the front. Surface dew points were around 70 degrees just southwest of the boundary. Luckily, later that same evening, repetitive convection occurred in the Scioto River Valley, missing this area just to the west. Initially, the main impact was large hail. As back building caused repetitive showers and thunderstorms, flooding became the primary issue. Maximum rain amounts of 3 to 4 inches were observed. Jackson measured 3.35 inches. Waterloo observed 3.76 inches. South Point had 3.25 inches of rain. Luckily, no injuries or fatalities occurred. State assistance money was committed to aid uninsured homeowners and renters. Small streams in the western portion of the county flooded. Streams such as Pike Run, and the Middle Fork of Salt

Creek damaged roads, homes and campers. One home was destroyed, 11 homes had major damage, and 42 others had minor damage.

Event	Dates	Property Damage
Jimtown, OH	May 5, 2012	$ 150,000

Convection dropped from northwestern Ohio during the late afternoon and reached into southeast Ohio during the evening hours of the 4th. This was south of an east to west cold front in northern Ohio. That front was sinking slowly south. Surface dew points were in the mid-60s. The convection consolidated into large cold clusters, first in eastern Ohio. As these weakened, the clusters of showers and thunderstorms to their southwest got stronger. These moved through southeast Ohio. Rain amounts of 1.5 to 2 inches fell in less than 2 hours. A few localized amounts around 2.25 inches were likely. The Jackson cooperative observer measured 2.03 inches. One fatality occurred in Athens County. Most of the flooding was confined to roads. Damage occurred to vehicles that stalled when motorists drove through flooded roads. Streams such as Pretty Run, Salt Creek, Middle Fork of Salt Creek, Raccoon Creek, and Puncheon Fork, flooded and damaged roads. Culverts under some roads were damaged. Private bridges were damaged. Near MacArthur, some residents in a trailer park were evacuated. The American Red Cross gave assistance to 14 families in Vinton County.

Event	Dates	Property Damage
Jimtown, OH	July 14, 2015	$ 50,000

Showers and thunderstorms formed during the evening hours on the 12th. A weak low pressure was over southern Ohio. Minor flash flooding occurred in Jackson County. After a lull in the rain during the morning into the early afternoon on the 13th, a mesoscale convective complex moved southeast through southern Ohio during the mid and late afternoon. After another lull during the evening, more thunderstorms formed by late evening on the 13th in southeast Ohio. These moved southeast and caused repetitive showers. The heaviest rains were from Jackson County through Gallia County. The 24 hour rain maximum was from an automatic gauge near Rio Grande with 3.98 inches. Another gauge in Gallia County at Northup measured 3.23 inches. Significant flash flooding occurred. Finally, more thunderstorms formed in northern Ohio ahead of a cold front and mid-level disturbance during the midday and early afternoon on the 14th. These storms formed into a squall line and moved southeast, through southern Ohio during the late afternoon. Rain amounts of a half inch to an inch in an hour were enough to cause minor flash flooding, since streams were running well above normal and soils were saturated. In less than 8 days, the rain total at both Waterloo and Gallipolis was around 6.1 inches. The last event from this multiple day episode was from the slow responding Symmes Creek in Lawrence County. Many roads flooded and became impassable, including areas around McArthur and Zaleski.

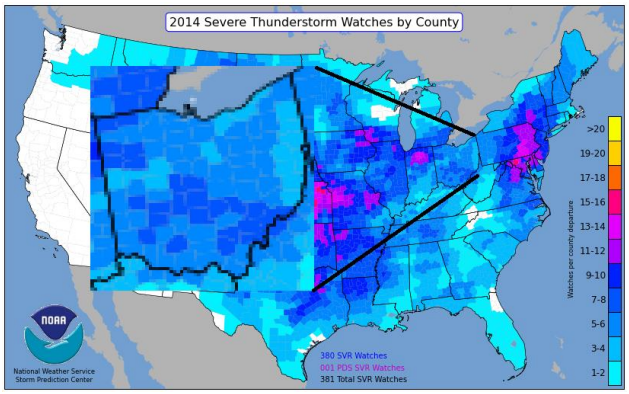
NOAA reported an additional 20 other flash flooding events, many with upwards of three inches in a 24 hour period, were reported with no or minimal damage; all reported water over roadways and road closures.

Taking these events into consideration, the planning team estimates the following to be representative of past occurrences:

Severity	Frequency	Annualized
Affecting People – public safety and travel	4 times per year	4
Affecting Structures	every 3-4 years	.29
Affecting Infrastructure	every 2 years	.5

Probability of Future Occurrences

As there are no known factors, such as development, that would indicate that past trends would not extend into the future, the planning team accepts the historical occurrences to be indicative of the future. In reviewing NOAA's historical data, Vinton County is under seven to eight thunderstorm watches per year with an estimated one half of these manifesting in an actual severe thunderstorm. This is in line with observed historical occurrences. According to NCDC, there have been 23 events in 19 years. There is an excellent chance of 1-2 occurrences in any given year.



Source: NOAA Storm Prediction Center

Affected Locations

The entire county would be affected by this hazard.

Vulnerable Community Assets at Risk & Estimated Damages

People. The primary impact on people would be isolation and not being able to travel at least on primary routes for several hours – perhaps more on township roads that may be washed out. In some cases county roads, state routes and US highways may also be rendered impassible due to erosion damage.

Infrastructure. The primary vulnerable infrastructure assets are roads, culverts and bridges, damaged by erosion. The average loss in previously noted events was $80,000.

Structures.

Structure Type	Number	Damage in Dollars
Residential	11	$ 1,076,526.92
Non- Residential	4	$ 392,788.31
Critical Facilities	2	$ 210,694.00
Totals	17	$ 1,680,009.22

Economy. The planning team lacks sufficient information for an objective conclusion; it estimates there would be little or no impact on the economy.

Severe Wind Storms

Description

Damaging winds are often called "straight-line" winds to differentiate the damage they cause from tornado damage. Strong thunderstorm winds can come from a number of different processes. Most thunderstorm winds that cause damage at the ground are a result of outflow generated by a thunderstorm downdraft. Damaging winds are classified as those exceeding 50-60 mph.

Damage from severe thunderstorm winds account for half of all severe reports in the lower 48 states and is more common than damage from tornadoes. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles.

Since most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft, anyone living in thunderstorm-prone areas of the world is at risk for experiencing this hazard. People living in mobile homes are especially at risk for injury and death. Even anchored mobile homes can be seriously damaged when winds gust over 80 mph. (Source: NOAA)

Severe wind storms can have a devastating effect on a community. Winds can cause trees to fall and structures to fail. These can cascade into other impacts such as downed power lines, interrupting travel and power, and trees blocking roads and causing damage to close-by structures.

Note: these storms are often associated with severe rain storms and severe winter storms; they are handled separately in this plan to better isolate and properly address impacts.

Extent of Hazard

The severity of winds storms is measured in wind speed. Severe wind storms are those whose sustained winds are at least 40 mph and gusts exceed 57 mph.

Historical Occurrence

NOAA's Storm Events Database provides the best comprehensive source of information back to 1974. A presidential disaster declaration for this type of hazard was received in 2012. NOAA reports 81 severe wind events during this period with two causing $500,000 in damages, two causing $50,000, three causing $20,000, three causing $10,000, forty-one causing less damage and thirty causing no damage. The following summarizes significant damage-causing events.

Event	Dates	Property Damage
Countywide High Winds	December 11, 2000	None reported

Wind gusts of 40 to 50 mph were common in the wake of a strong cold frontal passage. However, a few stronger gusts were seen in Washington County, with some speeds reaching near 60 mph. One house in Belpre and one in Reno sustained severe roof damage. A spokesman for the electric company reported scattered power outages throughout southeast Ohio, including Vinton County due to downed trees.

Temperatures went from the mid-50s ahead of the front, to the mid-20s by dawn, a time span of about 6 hours.

Event	Dates	Property Damage
Countywide High Winds	December 14, 2001	None reported

A strengthening low pressure storm lifted northeast from Kentucky into northeastern Ohio during the daylight hours. South of the storm center, brief wind gusts of 40 to 55 mph occurred as the associated cold front swept across southeast Ohio during the early afternoon. Ohio University at Athens measured a gust to 45 mph. Around 1:30 pm, a concrete block wall, about 20 feet high and aligned perpendicular to the wind, was blown over. It was at a Walmart construction site. Luckily, nobody was hurt. Scattered power outages occurred as large branches or trees came down.

Event	Dates	Property Damage
Countywide High Winds	March 9, 2002	$ 5,000

A strong cold front blew through southeast Ohio. A narrow and brief line of showers was associated with the front. Winds gusted into the 45 to 70 mph range. Numerous trees and power lines were blown down. In Somerset of Perry County, 40 foot trees were snapped in half. Law enforcement in Meigs County reported damage to barns, also a few windows were blown out of buildings.

Event	Dates	Property Damage
Countywide High Winds	December 1, 2006	None reported

In the wake of a strong cold front, associated with a strengthening low pressure system, wind gusts of 45 to 60 mph were widespread. A gust to 58 mph was measured at Ohio University in Athens. In Jackson, a gust to 54 mph was measured. A gust to 54 mph was also recorded in Thornville of Perry County. Damage was mostly from fallen tree branches, such as power outages, and houses struck. Also, roads were temporarily blocked. A small plane flipped over at the Vinton County Airport, after 2 of its tie-downs snapped.

Event	Dates	Property Damage
Countywide High Winds	January 9, 2008	$ 3,000

Showers, ahead of a strong cold front, produced brief wind gusts of 50 to 65 mph during the late night hours. An unofficial wind sensor in Thornville of northern Perry County measured a wind gust to 58 mph. Law enforcement reported 4 to 6 inch diameter trees were blown down in scattered locations along County Roads 19, 6 and 25.

Event	Dates	Property Damage
McArthur and Ray, Ohio	July 22, 2008	$ 10,000

A large upper air trough over eastern Canada helped maintain an east to west front across the lower Great Lakes. South of this boundary, the air was warm, moist and unstable. Dew points were near 70 degrees. A mesoscale convective system raced out of Indiana and across Ohio during the late night and predawn hours. Cloud top temperatures on satellite imagery reached their coldest just west of Perry County,

then began to warm as the complex crossed southeast Ohio. Bow echoes were noted on the leading edge of the complex, causing wind damage. In the aftermath, Perry County Sheriff Barker declared a Level 2 road emergency. Perry County commissioners and the mayors of Junction City and New Lexington declared a state of emergency. Many residents were without electricity. Later Governor Ted Stickland issued an emergency declaration for Perry County in order to gain the support of the Ohio Department of Transportation in tree removal from roadways.

Two microbursts hit the Chief Logan Reservation, a summer camp for Boy Scouts. It occurred during the predawn hours. Luckily, only one scout received a minor injury, despite the large number of occupied tents in the damage paths. One large tree fell right onto a tent cot, but the boys had left earlier to seek safer shelter. There was extensive softwood tree damage found in two distinct paths in the campground. Numerous pine trees were snapped and uprooted in a diverging pattern. Three tents were destroyed by fallen trees. The damage paths of both microbursts were approximately 500 yards in length with a width of 25 to 40 yards.

Event	Dates	Property Damage
Countywide High Winds	February 11, 2009	$ 3,000

A strong low pressure center tracked from Missouri to Michigan. Meanwhile, its associated upper level trough pushed a cold front through southeast Ohio just before sunset. A fast moving band of rain, along and immediately ahead of the front, featured a narrow line of embedded showers. These convective showers helped mix down the winds that were located at 4 to 6 thousand feet above the ground. Surface wind gusts of 55 to 65 mph were common.

Later that night, wind gusts near 60 mph occurred, as the colder air poured in. Power outages were common throughout southeast Ohio, as tree branches fell onto power lines. One major utility company reported the electricity remained out until late on the 13th or early on the 14th for some of its customers in southeast Ohio.

Event	Dates	Property Damage
Creola and Zaleski, Ohio	June 2, 2009	$ 2,000

Thunderstorms fired across southeast Ohio during the heat and instability of the afternoon. The area was well south of an east to west front. The storms became multicellular and formed short lines. Numerous outflow boundaries were produced. Large hail was noted quickly, with strong surface wind gusts developing as the episode unfolded. The heaviest downpours were noted in southern Washington County, causing street flooding in the City of Marietta. In Vinton County, trees were blown down along State Route 677.

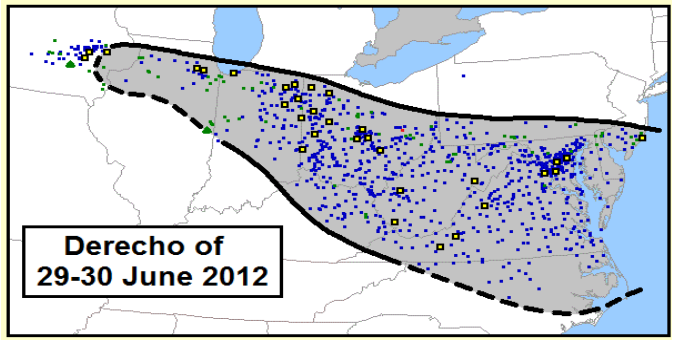
Event	Dates	Property Damage
McArthur, Ohio	August 4, 2010	$ 6,000

In a hot and humid air, thunderstorms moved through southeast Ohio during the afternoon. Low level convergence was aided by a leftover boundary from convection during the early morning hours. The thunderstorms moved southeast around 30 mph with wind gusts the main hazard. The tall thunderstorms also produced considerable

cloud to ground lightning. Brief repetitive showers increased concerns for flash flooding across Vinton and Meigs Counties, but no flooding occurred. Another prefrontal cluster of showers and thunderstorms moved into southeast Ohio during the late evening hours. However, several trees were reported to be down across the County.

Event	Dates	Property Damage
Eagle Mills, Ohio (DR-4077)	June 29, 2012	$ 500,000

On the second day of a developing heat wave, under a sunny sky, afternoon temperatures reached the upper 90s to above 100 degrees across most of southeast Ohio. Meanwhile, an area of multi-cellular convection had moved out of northern Illinois that morning. It continued to organize and strengthen, as it propagated east and southeast across northern Indiana into western Ohio during the afternoon. As it moved toward southeast Ohio, it had already formed into a large arch of storms, or bow, with a developing cool pool in its wake. The temperature contrast between the air ahead of the developing derecho, compared to that in its wake was reaching 30 to 35 degrees. The resultant wind shift in the cool pool resulted in strong moisture convergence on the leading edge of the complex. This in turn, helped drive the storms further southeast, away from the mid and upper level wind support. However, the complex was diving right into that hot air that had obtained large convective available potential energy (CAPE), on the order of 4000 to 5000 joules/kg.



Source: NOAA

The derecho reached southeast Ohio near the hottest time of the day, after 4 pm. It was racing southeast around 65 mph. The outflow or gust front began to outrace the rain as it moved into southeast Ohio. As the system matured, the strong gusts were longer in duration, in some cases around 10 minutes. That gust front crossed the Ohio River into northeast Kentucky and western West Virginia about 5:30 pm. The storms and showers only provided about a quarter to a half inch of rain. Widespread wind gusts of 60 to 85 mph were likely with the leading gust front across southeast Ohio. A department of highways garage in Perry County measured 62 mph. Ohio University at Athens measured 64 mph and the airport near Albany of Athens County had a gust to 59 mph. The department of highways garage in Gallia County near Kerr had 62 mph winds.

The wind caused trees and large branches to fall in scattered locations throughout the nine counties in southeast Ohio. There was some structural damage. Corrugated metal and siding were ripped off a few buildings. Trees fell onto houses and vehicles. Out of the nine counties only four counties reported individual damage to the state. The fallen trees and power lines also caused roads to be temporarily blocked.

However, the largest impact was on the electric power grid. Prolonged power outages occurred and some areas were without electricity for 4 to 7 days.

Luckily there were no direct deaths or injuries, however one indirect death can be attributed to the storm. The lack of electricity in the midst of the heat wave, disrupted the daily routines of most citizens for several days. Water and ice were in high demand. An emergency declaration by President Obama allowed federal supplies to be quickly delivered. Family and retail refrigerated food lost was substantial. Rural citizens with private wells may have been hit harder than those living in towns on public water systems. Citizens that relied on well water had no power to pump the water from their wells. Water had to be hauled just to flush the toilet. Some people slept outside on porches where it was cooler. With limited gas stations available to pump gas, long lines developed for a few days in the wake of the storm. Workers trying to restore the electricity had to take frequent breaks due to the heat and the safety equipment they had to wear. Due to the public damage, a federal major disaster was eventually declared for this episode. A few others episodes during the first few days of July were also included.

Scattered locations throughout Vinton County had trees or large branches blown down. Around 4,000 customers lost electricity. The county middle school was set up as a cooling center and a place to charge cellular phones. Along with residences and businesses, the storm knocked out power and phone lines to the Vinton County Sheriff's Office, the McArthur Police Department, and emergency medical services.

Event	Dates	Property Damage
Hamden, Bolins Mills, and Elk Fork Ohio	July 26, 2012	$ 5,000

Well in advance of an approaching cold front, thunderstorms formed during the afternoon. The first cells reached into southeast Ohio after 1400E, with the main cluster of storms after 1600E. Out ahead of the storms, temperatures were in the 90s. A steep low level lapse rate and strong unidirectional flow aloft helped produce some damaging wind gusts.

In Hamden, a business window was broken when a trash can was picked up by the wind and thrown against it. In Bolins Mills, trees were blown down at the intersection of Routes 356 and 50. Four miles east of Elk Run, trees were blown down along Curry Road.

Event	Dates	Property Damage
Hamden, Ohio	November 1, 2013	$ 20,000

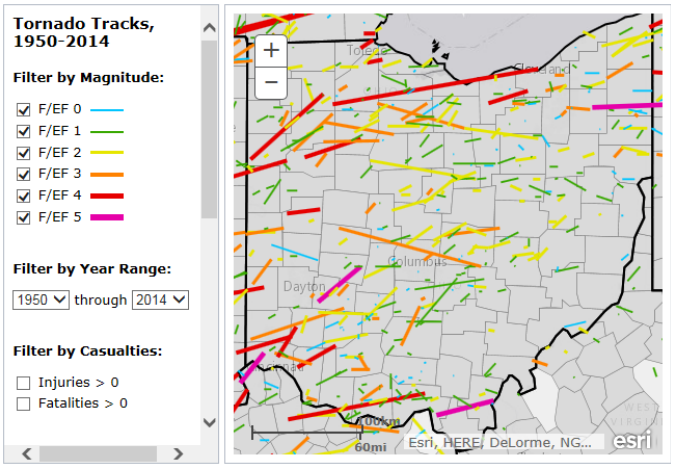
A strong autumn cold front swept across southeast Ohio between midnight and 3:00 am. Strong winds existed just above the surface. There were fast moving showers near the front, with just a few embedded thunderstorms. The convection was able to mix some of the strong wind gusts down to the surface. Wind gusts of 35 to 50 mph were common in southeast Ohio. A few locations had stronger wind gusts, but no injuries occurred. The largest concentration of tree damage was around the village of Hamden.

Event	Dates	Property Damage
Wilkesville, Ohio	July 14, 2015	$ 5,000

Showers and thunderstorms formed during the evening hours on the 12th. A weak low pressure system was over southern Ohio. Minor flash flooding occurred in Jackson County. After a lull in the rain during the morning into the early afternoon on the 13th, a mesoscale convective complex moved southeast through southern Ohio during the mid and late afternoon. After another lull during the evening, more thunderstorms formed by late evening on the 13th in southeast Ohio. These moved southeast and caused repetitive showers. The heaviest rains moved from Jackson County through Gallia County. The 24 hour rain maximum was from an automatic gauge near Rio Grande with 3.98 inches. Another gauge in Gallia County at Northup measured 3.23 inches. Two gauges around Jackson measured 2.68 and 2.03 inches of rain. The cooperative observer in Gallipolis measured 2.25 inches. Significant flash flooding occurred. Finally, more thunderstorms formed in northern Ohio ahead of a cold front and mid-level disturbance during the midday and early afternoon on the 14th. These storms formed into a squall line and moved southeast, through southern Ohio during the late afternoon. Rain amounts of a half inch to an inch in an hour were enough to cause minor flash flooding, since streams were running well above normal and soils were saturated. In less than 8 days, the rain total at both Waterloo and Gallipolis was around 6.1 inches. The last event from this multiple day episode was from the slow responding Symmes Creek in Lawrence County. In Vinton County, trees were blown down. One tree fell onto a barn.

As indicated in the chart, Vinton County hasn't experienced a tornado in recorded history; the planning team feels the severe winds and energy of tornadic activity is not an additional concern.

On average, Vinton County experiences one major, damage-causing severe wind storm every two to three years.



Source: Midwestern Regional Climate Center

Probability of Future Occurrences

As there are no known factors that would indicate that past trends would not extend into the future, the planning team accepts the historical occurrences to be indicative of the future. In reviewing NOAA's historical data, Vinton County is under seven to eight thunderstorm watches per year with an estimated one half of these manifesting in an actual severe thunderstorm. This is in line with observed historical occurrences.

According to NCDC, there have been 13 events in 15 years. There is an 86.67% chance of an occurrence in any given year.

Affected Locations

The entire county would be affected by this hazard.

Vulnerable Community Assets at Risk & Estimated Damages

People. The primary impact on people would be isolation and not being able to travel at least on primary routes for about 12 hours after the storm subsided. Power outages would also be widespread.

Structures. Buildings with construction and condition susceptible to high winds could be damaged or destroyed. Additionally, buildings adjacent to large trees may be damaged by falling trees.

Structure Type	Number	Damage in Dollars
Residential	5	$ 489,330.42
Non- Residential	2	$ 196,394.15
Critical Facilities	1	$ 105,347.00
Totals	8	$ 791,071.57

Infrastructure. Power is likely to be out for a period of time. As this time increases, other utilities dependent on power will also likely fail.

Economy. The planning team lacks sufficient information for an objective conclusion; it feels there would be little or no impact on the economy.

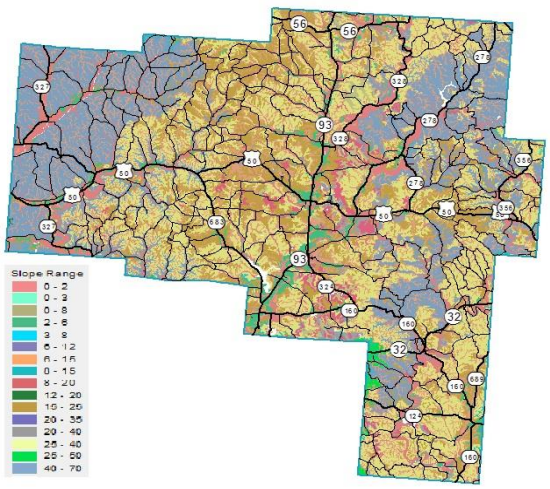
Landslides

Description

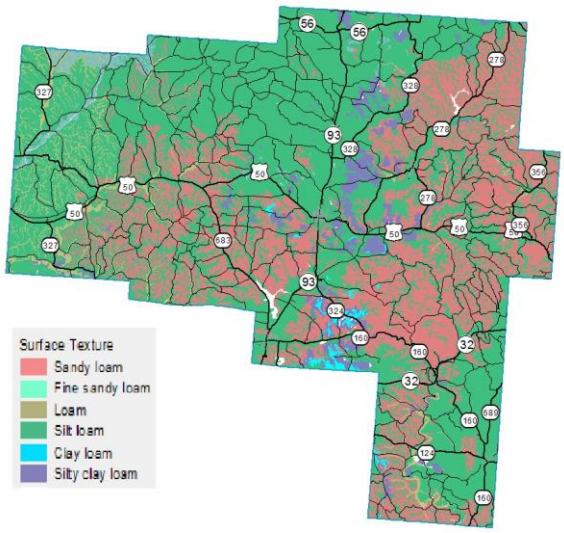
Landslides – or slips – are a downslope movement of earth. They may be quick, moving in seconds, or take a varying amount of time to move.

According to the Ohio Department of Natural Resources, the causes of landslides are steep slopes; jointed rocks; fine-grained, permeable rock or sediment; and clay or shale units subject to lubrication (ground water). The Slopes diagram shows the purple areas to have the greatest slopes while the Soils diagram shows silt loam (green) and sandy loam (pink) in these high slope areas. These loams fall into the last two causes of landslides. This is where one would expect to encounter most of the potential landslides. Heavy rain may also exacerbate the slipping soil, encouraging quicker movement.

Slopes



Soils



Source: Vinton County SSURGO Soil Survey

Extent of Hazard

Landslides are measured by a count of occurrences that cause damage or restrict travel.

Historical Occurrence

While no landslides have occurred that caused damage or significantly restricted travel, slips with the potential to block roads are present. These are slow-moving and are dealt with on a continuing basis.

Probability of Future Occurrences

As there are no known factors that would indicate that past trends would not extend into the future, the planning team accepts the historical occurrences to be indicative of the future. In reviewing NOAA's historical data (see reference under Severe Rain Storms), Vinton County is under seven to eight thunderstorm watches per year with an estimated one half of these manifesting in an actual severe thunderstorm. This is in line with observed historical occurrences. With this potential, there is less than a 1% chance of an occurrence in any given year.

Affected Locations

Interviews with the county engineer, township trustees and village officials indicate there is no landslide concerns in built-up areas. Refer to the *Locations of Mitigation Actions 1 – 5 & 8* table in Appendix B, referring to the Action 4 column, for locations of slips that have been identified by officials.

Vulnerable Community Assets at Risk & Estimated Damages

People. The primary impact on people would be isolation and not being able to travel on roads affected by a slip. These roads may be affected for several days to a week.

Structures. Simulations do show a number of structures at risk for damage from landslides. The following table depicts the simulation summary:

Structure Type	Number Affected	Damage Loss Estimate
Residential	5	$ 347,410
Non-Residential	5	$ 915,644
Critical Facilities	2	$ 1,159,614

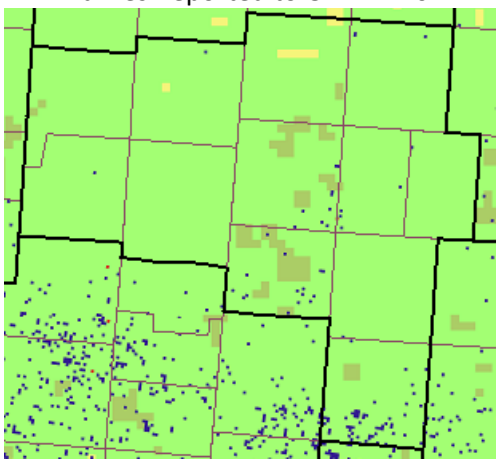
Infrastructure. Roads adjacent to (below) a slip would be covered and possibly damaged; roads above a slip would lose its roadbed. Additionally, pole-mounted power, telephone and cable lines may be affected by the moving soil knocking poles down.

Wildfires

Description

A wildfire is any uncontrolled fire with extensive size and speed in a combustible vegetative area. The danger of wildfires is that they are unpredictable, especially when weather conditions are warm, dry, and windy and the topography of the area is uneven.

Wildfires Reported to ODNR - 2014



Source: ODNR

Extent of Hazard

Wildfires considered a threat are those the pose a threat to people or property, generally 100 acres or more.

Historical Occurrence

In the ten-year period 1997 – 2007, 126 wildfires were reported with 638.62 acres burned. (Source: Ohio EMA) No other details are available to determine the number of damage-causing incidents.

Probability of Future Occurrences

As there are no known developmental or other factors that would indicate that past trends would not extend into the future, the planning team accepts the historical occurrences to be indicative of the future. According to NCDC, there has been 1 event in 10 years. There is a 10% chance of an occurrence in any given year.

Affected Locations

Most of the county is at risk of wild fires, primarily in the eastern and southern areas. When they do occur, these are typically limited to a single site and cause little or no damage. There are several mitigating factors:

- The areas within and around the villages are clear of substantial numbers of trees and brush.
- Many structures have been built on reclaimed strip mines.
- Quick response by federal, state and local firefighters.

Vulnerable Community Assets at Risk & Estimated Damages

Structures. In the ten year period 1997 – 2007, $60,000 in losses have occurred. This equates to an average of $6,000 per year. These were residential structures.

Structure Type	Number Affected	Damage Loss Estimate
Residential	1	$ 6,000
Non-Residential	0	$ 0
Critical Facilities	0	$ 0

Drought

Description

Drought is characterized by a period of extreme dry weather usually complicated by warm temperatures. It is a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people. It is a normal, recurrent feature of climate that occurs in virtually all climate zones, from very wet to very dry. Drought is a temporary aberration from normal climatic conditions, thus it can vary significantly from one region to another. Drought is different than aridity, which is a permanent feature of climate in regions where low precipitation is the norm, as in a desert. Human factors, such as water demand and water management, can exacerbate the impact that drought has on a region. Because of the interplay between a natural drought event and various human factors, drought means different things to different people. In practice, drought is defined in a number of ways that reflect various perspectives and interests. Below are three commonly used definitions:

Meteorological Drought is usually defined based on the degree of dryness (in comparison to some "normal" or average) and the duration of the dry period. Drought onset generally occurs with a meteorological drought.

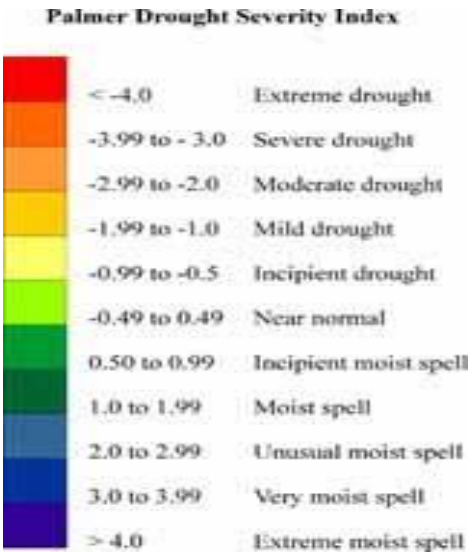
Agricultural Drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, soil water deficits, reduced ground water or reservoir levels needed for irrigation, and so forth.

Hydrological Drought usually occurs following periods of extended precipitation shortfalls that impact water supply (i.e., streamflow, reservoir and lake levels, ground water), potentially resulting in significant societal impacts. Because regions are interconnected by hydrologic systems, the impact of meteorological drought may extend well beyond the borders of the precipitation-deficient area.

Source: NOAA

Extent of Hazard

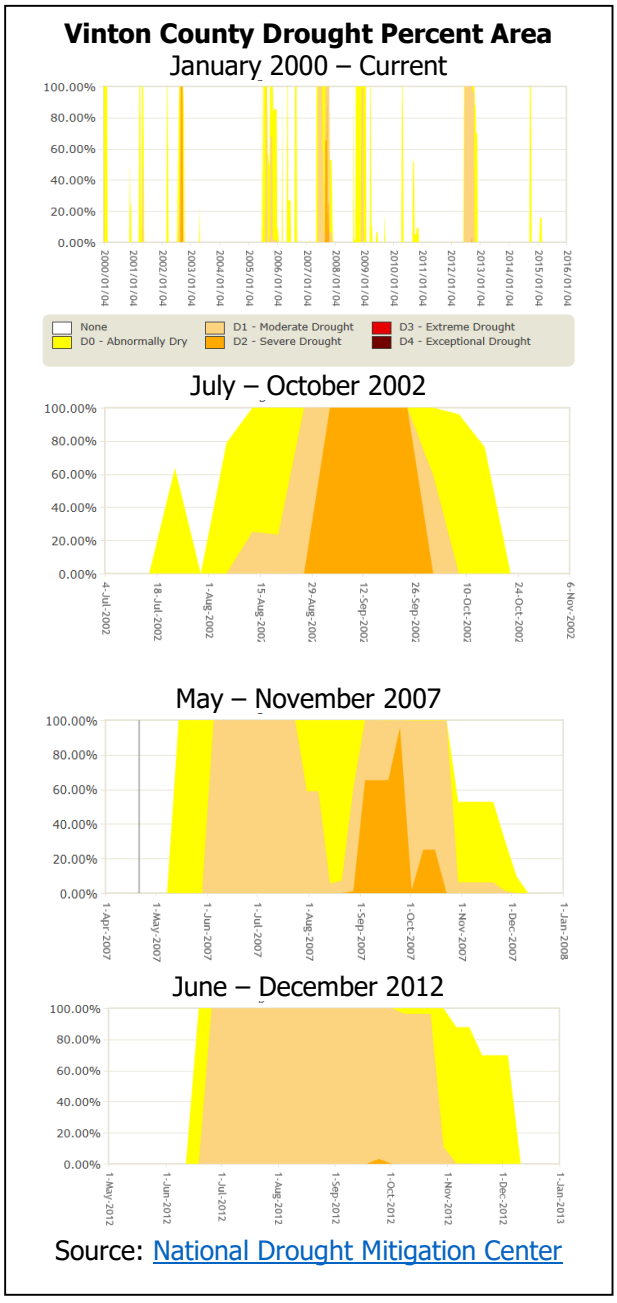
Drought severity is measured using the Palmer Drought Severity Index (PDSI). The PDSI uses readily available temperature and precipitation data to estimate relative dryness. It is a standardized index that spans -10 (dry) to +10 (wet). It has been reasonably successful at quantifying long-term drought. This table translates PDSI indices to plain language.



Historical Occurrence

1988-1989 North American Drought. The Western United States experienced a lengthy drought in the late 1980s. Much of California endured one of its longest droughts ever observed from late 1986 through early 1991. Drought worsened in 1988 as much of the United States also suffered from severe drought. In California, the five-year drought ended in late 1991 as a significant El Niño event in the Pacific Ocean (and the eruption of Mount Pinatubo in June 1991) most likely caused unusual persistent heavy rains.

Following a milder drought in the Southeastern United States and California in 1987, this drought overspread the Mid-Atlantic states, Southeastern United States, Midwestern United States, northern Great Plains, and Western United States. Heat waves accompanied this widespread, unusually intense drought and killed around 4,800 to 17,000 Americans. The heat also killed livestock across the United States. Farmers perhaps cultivated marginally arable land, contributing to the damage from this drought. Pumping groundwater near depletion also contributed to damage. The drought destroyed crops almost nationwide; lawns of residents went brown, and many cities declared water restrictions. Wildfires in Yellowstone National Park burned many trees and created exceptional destruction in the area. This very catastrophic drought for multiple reasons continued across the Upper Midwest and northern Great Plains states during 1989, not officially ending until 1990. The conditions continued into 1989 and 1990, although the drought ended in some states, thanks to normal rainfalls returning to some portions of the United States. Dry conditions, however, increased again during 1989, affecting Iowa, Missouri, eastern Nebraska, Kansas and certain portions of Colorado. The drought also affected Canada in certain divisions.



The drought of 1988 ranks as the worst drought since the Dust Bowl a half-century earlier in the United States; estimates in 2008 put damages from the drought between $80 billion and almost $120 billion in damage (2008 USD). The state of

Minnesota alone saw $1.2 billion in crop losses. The drought of 1988 caused more devastation comparable to that which Hurricane Andrew in 1992 and Hurricane Katrina wrought. In Canada, drought-related losses added to $1.8 billion (1988 Canadian dollars).

Source: Project Gutenberg Self-Publishing Press

Summer 1999. NOAA's Storm Events Database reports drought conditions in Vinton County for a five month period during the summer of 1999.

May 1999. After a dry April, drought conditions resurfaced again during May, after being alleviated during the winter months. Total rains during May were only 1.25 to 2.5 inches. The community of Jackson had only 1.3 inches for the entire month, McArthur had 1.5 inches, while South Point measured 1.9 inches.

June 1999. The drought continued to spread and strengthen in southeast Ohio. A deterioration in stream flow and soil moisture was noted. Some showers at the end of the month temporarily helped the top soil and the crops. Only 1 to 2 inches of rain fell in most areas during the entire month of June. Nelsonville observed the minimum, with just a half inch of rain. Temperatures peaked in the mid and upper 90s during the second week of the month. Beverly registered 98 degrees, while South Point had 97 degrees on the 10th.

August 1999. The drought eased during the month of August across southeast Ohio. Monthly rains were 3 to 6 inches. Temperatures were not as hot, as those felt during July. However, the drought still lingered at month's end.

September 1999. Drought severity either increased, or remain about constant during the month. The rainfall during September was mostly between 1 to 2 inches. Yet, South Point of Lawrence County had even less rain, with just three quarters of an inch.

October 1999. The drought severity eased as monthly rainfall was near normal. Amounts of 2.5 to 3.0 inches were common. Ground water shortages were still a concern at the end of the month.

Summer 2002. Two months moderate; two months severe. The emerging drought from August peaked during the first 2 weeks of September, as hot and dry conditions lingered. Rains of 1.5 to 2 inches, plus cooler temperatures, dampened the drought by the fourth week of the month.

Fall 2007. Three months moderate; one month severe. In September, drought conditions crept north, as the month averaged warmer and drier than normal. The monthly rainfall was mostly between 1 and 2 inches.

A rare October heat wave, during the 1st and 2nd weeks of the month, helped peak the severity of the drought. On the 11th, Gallia County declared an emergency due to a water shortage. With the lowering of the water table, wells were becoming less productive. Morgan County officials reported that their wildlife was being stressed from

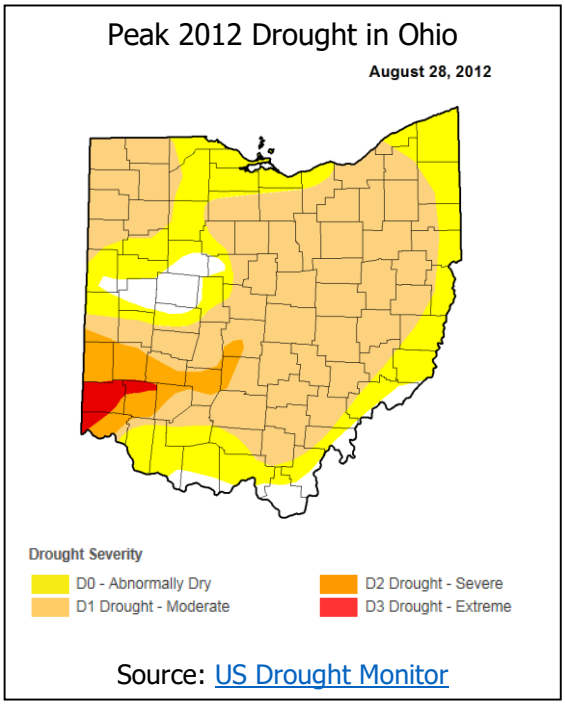
the lack of available water. Deer were dying from the effects of the drought and a dry weather disease.

Much needed and widespread rain finally arrived on the 23rd and the 24th. Rain amounts of 2 to 3 inches were common. As the growing season ended and the autumn foliage peaked, drought conditions began to abate or ease.

After peaking in early October, drought conditions continued to ease during the month of November. Monthly rainfall of 3 to 4 inches was common. By the end of November, the drought of 2007 was also coming to an end across southeast Ohio.

2012 North American Drought. The 2012-2013 North American Drought was an expansion of the 2010-2012 United States drought which began in the spring of 2012, when the lack of snow in the United States caused very little melt water to absorb into the soil. The drought includes most of the United States and included Ohio. Among many counties, Vinton County was designated with moderate drought conditions by mid-June. It has been equaled to similar effects as droughts in the 1930s and 1950s but it has not been in place as long. However, the drought has inflected, and is expected to continue to inflict, catastrophic economic ramifications. In most measures, the drought has exceeded the 1988-1989 North American Drought, which is the most recent comparable drought.

Peak 2012 Drought in Ohio



Source: US Drought Monitor

On July 30, 2012, the Governor of Ohio sent a memorandum to the United States Department of Agriculture's (USDA) Ohio State Executive Director requesting primary county natural disaster designations for eligible counties due to agricultural losses caused by drought and additional disasters during the 2012 crop year. The USDA reviewed and Loss Assessment Reports and determined that there were sufficient production losses in 85 counties to warrant a Secretarial disaster designation. On September 5, 2012, Vinton County was one of those designated counties. Source: Ohio EMA

The 2012 North American Drought is the largest drought since the 1950's as reported by NOAA's National Climatic Data Center National Drought Report of 15 August 2012. At its peak in Ohio, Vinton County experienced "Moderate Drought Severity" for four months. The University of Illinois at Urbana-Champaign reported a slightly elevated crop insurance loss ratio of 1.02 for 2012, indicating little insurance-reported crop loss during this period.

Probability of Future Occurrences

According to NOAA drought information, Vinton County is in a low risk of drought area. According to NCDC, there have been 3 events in 18 years. There is a 16.67% chance of an occurrence in any given year.

Affected Locations

While a drought would affect the entire county, small areas would be impacted, primarily in Jackson and eastern Eagle Twps – those dependent on well water. According to the Vinton County Health Department, less than half of the county's population uses private wells for water and this number is constantly growing smaller with the expansion of public water lines. Public water supplies have always been adequate during past periods of drought and those in other areas of the county who are on well systems haven't reported loss of potable well water due to drought conditions.

Vulnerable Community Assets at Risk & Estimated Damages

People. The impact of a drought would be primarily inconvenience. Related casualties are not anticipated.

Structures. None.

Economy. There is a potential for crop damage and livestock. In 2012, the southern part of Ohio experienced drought conditions. The following table depicts the commodity loss for the 2012 Drought:

Commodity	Non-Drought Year 2011	Drought Year-2012	Units	Change	%
Hay – harvested	7,100	6,600	Acres	-500	-7%
Hay – production	11,500	9,300	Tons	-2,200	-24%
Hay – yield	1.60	1.40	Tons/acres	-.20	-13%
Source: US Dept of Agriculture, National Agriculture Statistics Service					

It is expected that similar losses would be experienced in similar drought.

Severe Winter Storms

Description

A winter storm is an event in which the main types of precipitation are snow, sleet or freezing rain. Winter Storm hazards include wind chill, ice storms, heavy snow, and blizzard conditions.

Most deaths from winter storms are not directly related to the storm itself.

- People die in traffic accidents on icy roads.
- People die of heart attacks while shoveling snow.
- People die of hypothermia from prolonged exposure to cold.

Everyone is potentially at risk during winter storms. The actual threat to you depends on your specific situation. Recent observations show that:

Of injuries related to ice and snow:

- About 70% occur in automobiles.
- About 25% are people caught out in the storm.
- Majority are males over 40 years old.

Of injuries related to exposure to cold:

- 50% are people over 60 years old.
- Over 75% are males.
- About 20% occur in the home.

Three basic ingredients are necessary to make a winter storm:

- Cold air. Below freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice.
- Lift. Something to raise the moist air to form the clouds and cause precipitation. An example of lift is warm air colliding with cold air and being forced to rise over the cold dome. The boundary between the warm and cold air masses is called a front. Another example of lift is air flowing up a mountainside.
- Moisture. To form clouds and precipitation. Air blowing across a body of water, such as a large lake or the ocean, is an excellent source of moisture.

Source: NOAA

The severity may be measured in inches of snow or ice, but it's more the combination of freezing precipitation with the ambient and precipitation conditions just before the storm as well as the duration of freezing temperatures with temperatures hovering around freezing being an enhancer to the severity.

- *Wet Snow and Freezing Rain can weigh down power lines, tree limbs and roofs* of structures. Wet snow compacts and can be difficult to dispose of.
- *Ice* results for rain freezing or snow compacting. In addition to the effects of wet snow and freezing rain, ice can build up over time. As the temperature drops, it becomes harder and difficult to remove with snow plows; heavy equipment is usually needed. As the temperature rises above freezing, ice left on gravel roads,

as are most township roads, will melt and seep into the roadbed causing the "bottom to drop out."

- *Dry Snow* is usually not a significant problem as it can be plowed away.

There may also be flooding if the snow/ice accumulation is significant and the temperatures warm quickly.

Severe winter storms are those winter storms that have a significant impact.

Note: These storms are often associated with severe wind storms; they are handled separately in this plan to better isolate and properly address impacts.

Extent of Hazard

Winter storms are measured in terms of snowfall, wind and temperature. Generally, a severe winter storm adds at least 6 new inches of snow and winds of 40 mph or greater.

Historical Occurrence

NOAA's Storm Events Database provides the best comprehensive source of information back to 1996. Presidential disaster declarations for this type of hazard were received in 2003 and 1978. The following summarizes events that caused significant damage.

Other than a single entry in FEMA's records, the planning team found no further information on the 1978 event.

Event	Dates	Property Damage
Countywide Winter Storm	February 3-6, 1998	None reported

A slow moving coastal storm and a prolong period of easterly wind aloft, resulted in several periods of snow, sleet, and freezing rain. The deepest snow cover over southeast Ohio was in Lawrence, Gallia, Jackson, and Vinton Counties. On the 6th, Ironton had 9 inches on the ground, South Point and Waterloo had 7 inches, Patriot of Gallia County had 8 inches, the City of Jackson had 5 inches, while McArthur had 4 to 5 inches. No old snow was on the ground prior to the storm. A roof to a South Point home caved in, due to the weight of the snow.

Event	Dates	Property Damage
Countywide Winter Storm	December 13-14, 1998	None reported

A storm lifted northeast out of the Tennessee Valley and into Ohio by midnight. Freezing rain fell with temperatures in the 25 to 30 degree range during a Wednesday evening. Liquid amounts were between 0.25 and 0.40 inches. Ice accumulated to around a quarter of an inch, causing numerous accidents. The most widespread ice was in Jackson, Vinton, and Perry Counties. Temperatures moderated to near freezing after midnight, improving the road conditions.

Event	Dates	Property Damage
Countywide Winter Storm (DR 1453)	February 14, 2003	None reported

On Valentine's Day 2003, Vinton County received 8 to 18 inches of snow, followed by sleet and freezing mixed with snow. This essentially covered the entire county with

a sheet of ice. Unpaved roads fared the worst as the ice could not be treated with chemicals and had to be bulldozed off or left to melt. The damages exceeded $160,000 for emergency actions and road damage.

Event	Dates	Property Damage
Countywide Winter Storm	January 25-26, 2004	None reported

Snow and sleet spread north through southeast Ohio during Sunday afternoon, the 25th. The snow and sleet accumulations ranged from 1 to 2 inches in Lawrence and Gallia Counties, to as much as 3 to 5 inches across Washington, Morgan, Athens, Vinton, and Perry Counties. The snow and sleet changed to freezing rain during the late afternoon and evening. Ice accumulated a quarter to a half inch from the freezing rain. No major power outages occurred.

Event	Dates	Property Damage
Countywide Winter Storm	December 3-4, 2005	None reported

A fast moving, but strong, warm air advection event started as sleet and freezing rain during the 6:00 pm to 8:00 pm time frame on the 3rd. Temperatures were in the mid and upper 20s at the onset of the precipitation. The wintry mixture became mainly freezing rain. The ice, from the freezing rain, accumulated a quarter of an inch on untreated surfaces by 1:00 am on the 4th.

Event	Dates	Property Damage
Countywide Winter Storm	January 27-28, 2009	None reported

Snow moved up the Ohio River Valley and overspread southeast Ohio shortly after midnight on Tuesday the 27th. The snow quickly accumulated 4 to 6 inches across Jackson, Lawrence, Gallia, and Meigs by mid-morning, with 2 to 4 inches common further north.

The snow became lighter by early afternoon. The snow transitioned to freezing rain from south to north, reaching Perry County by 7:00 pm on the 27th. The intensity of the freezing rain increased for the evening hours, with temperatures still in the upper 20s. Ice accumulations of a quarter to a half inch were widespread. The intensity of the freezing rain decreased during the predawn hours of the 28th. Once the low pressure center lifted northeast through West Virginia, the storm ended as a quick burst of snow, during the daylight hours. This added a coating of snow on top of the ice.

Damage to structures was minimal. The main problem was the loss of electricity due to tree limbs falling across power lines. Over 25,000 customers had no power. Some rural areas were without electricity for 4 days. One electric company official said it was the worst ice storm in his area in over 15 years. A few shelters were open for people without heat, but only a handful of residents stayed. Law enforcement and fire departments conducted wellness checks and assisted where needed.

Event	Dates	Property Damage
Countywide Winter Storm	February 5-6, 2010	None reported

A continuous rain, mixed with sleet at times, fell during the daylight hours of Friday the 5th. The exception was further north across Morgan and Perry Counties, where mostly wet snow occurred. The rain changed to snow from north to south during that evening. Six to 12 inches of snow fell across Morgan and Perry Counties with the higher range mostly across northern portions of Perry County. Glenford and Thornville reported 12 inches or more. Meanwhile, the snow accumulation at New Lexington was 8 inches, and 6 inches at McConnelsville. Further south, snow accumulations of 4 to 7 inches were more common across Jackson, Vinton, Athens, Meigs, and Washington Counties.

Event	Dates	Property Damage
Countywide Winter Storm	January 20-21, 2012	$ 20,000

Prior to this episode, arctic air was in place near the ground. Moisture increased rapidly during the late afternoon on Friday the 20th. Strong warm air advection caused a mixture of snow, sleet, and freezing rain to reach the ground during the evening hours. Except for Perry County, the mixture became mostly freezing rain during the late evening hours. Temperatures were in the mid and upper 20s. After a brief lull, the bulk of the freezing rain accumulation occurred after midnight, early on the 21st. The freezing rain diminished by dawn.
A quarter inch of ice accumulated from the freezing rain in Vinton, Athens, Washington and Morgan Counties. A quarter to a half inch of ice was seen in portions of Perry County. Power outages were most common in Athens County, where over 2500 customers lost electricity. A few hundred customers lost electricity in Vinton County.

Event	Dates	Property Damage
Countywide Winter Storm	February 4-5, 2014	None reported

A strong temperature gradient existed from southeast to northeast across the mid-Ohio Valley on the 4th. An old snow cover over Ohio and extreme northern Kentucky helped to maintain surface temperatures below freezing throughout southeast Ohio.

A low pressure storm system moved out of the Tennessee Valley late on the 4th. A wintry mix of sleet, snow and freezing rain developed across southeast Ohio between 6:00 and 7:00 pm on the 4th.

The precipitation was mainly snow across Perry County for the brunt of the storm, before ending as sleet and freezing rain. Snow accumulations ranged from 6 inches across northern Perry County to 2 inches in southern areas of the county. A storm watch observer in New Lexington measured a 4 inch accumulation. Morgan County had 1 to 3 inches of snow before becoming sleet and freezing rain. Further south in Ohio, including Vinton County, the precipitation may have started briefly as snow and sleet, but was mainly freezing rain and rain before ending during the morning of the 5th.

Ice accumulation from freezing rain was a quarter of an inch across Washington, Athens, Vinton, Jackson, and Meigs Counties.

Event	Dates	Property Damage
Countywide Winter Storm	March 2-4, 2014	None reported

A strong north to south temperature gradient existed in the Ohio Valley as a cold front gradually sank south. The front reached into Perry County just after midnight on the 2nd with freezing temperatures by 5:00 am. Strong dynamics associated with a strengthening wind speed maximum in the flow well above the ground, lead to 3 waves along the front. Each wave enhanced the precipitation and helped push the surface front further south.

The first wave caused some mixed snow and freezing rain to reach into Perry County before 6:00 am on the 2nd. This precipitation changed to mostly snow across Perry and Morgan Counties during the morning before diminishing during the afternoon. Accumulations of 2 to 3 inches of snow were noted across Perry County toward Washington County with freezing rain amounts mostly a tenth of an inch.

The second wave created freezing rain late on the afternoon of the 2nd across the rest of southeast Ohio before changing to sleet then snow. Again, ice deposit from the freezing rain was limited to mostly a tenth of an inch. The third wave clipped extreme southern counties of southeast Ohio overnight into the morning of the 3rd.

The end result was a widespread snow accumulation of 3 to 6 inches in 12 hours. Some counties even declared their highest snow emergency level. The quick drop in temperature after the initial freezing rain, made it difficult to remove the accumulating snow from roadways. Readings dropped from the 30s into the 10 to 15 degree range during this storm. In the wake of the storm, a clear sky allowed temperatures to drop into the single digits for dawn on the 4th.

NOAA reported an additional winter 60 events, none of which caused quantified damages.

Probability of Future Occurrences

As there are no known factors, such as development, that would indicate that past trends would not extend into the future, the planning team accepts the historical occurrences to be indicative of the future. The Storm Events Database did record 42 incidents over the past 18 years that would potentially cause dangerous travel conditions for up to 6 hours from the onset until roads are treated. According to NCDC, there have been 10 events in 17 years. There is a 58.82% chance of an occurrence in any given year.

Affected Locations

The entire county would be affected by this hazard.

Vulnerable Community Assets at Risk & Estimated Damages

People. The primary impact on people would be isolation and not being able to travel at least on primary routes for about 12 hours after the storm subsided. People living on township roads may be affected for several days to a week.

Structures. Older structures may be affected by the weight on their roofs. In the 2003 declaration, there were no such damages. The planning team couldn't find sufficient information to estimate damages.

Infrastructure. The primary vulnerable infrastructure assets are roads – covered to the point of not being passable and the roadbed being damaged by thawing. In the 2003 declaration, there was almost $500,000 in damages to roads.

Economy. The planning team lacks sufficient information for an objective conclusion; it feels there would be little or no impact on the economy.

Earthquakes

Description

An earthquake is caused by a sudden slip on a fault. The tectonic plates are always slowly moving, but they get stuck at their edges due to friction. When the stress on the edge overcomes the friction, there is an earthquake that releases energy in waves that travel through the earth's crust and cause the shaking that we feel. Source: USGS

Ohio is located near the New Madrid fault. Vinton County is in the part of Ohio that is designated with a Modified Mercalli Intensity (MMI) of VIII, which anticipates moderate damage. In spite of this, there has been little seismic activity near Vinton County.

Extent of Hazard

Earthquakes are typically measured on the Richter scale. The analyzed profile is a magnitude 5.4 earthquake with the epicenter in McArthur scenario as modeled by the *Hazards U.S. Multi-Hazard* (HAZUS-MH) simulation preformed and provided by Ohio EMA. The HAZUS-MH report used in this analysis is included in *Section IV – Supplemental Information.*

The impact of earthquakes is measured on the Modified Mercalli Scale. The table at the right depicts the sale and its relationship to the Richter Scale.

Modified Mercalli Scale		Richter Magnitude Scale
I	Detected only by sensitive instruments	1.5
II	Felt by few persons at rest, especially on upper floors; delicately suspended objects may swing	2
III	Felt noticeably indoors, but not always recognized as earthquake; standing autos rock slightly, vibration like passing truck	2.5
IV	Felt indoors by many, outdoors by few, at night some may awaken; dishes, windows, doors disturbed; autos rock noticeably	3
V	Felt by most people; some breakage of dishes, windows, and plaster; disturbance of tall objects	3.5
VI	Felt by all, many frightened and run outdoors; falling plaster and chimneys, damage small	4
VII	Everybody runs outdoors; damage to buildings varies depending on quality of construction; noticed by drivers of autos	4.5
VIII	Panel walls thrown out of frames; fall of walls, monuments, chimneys; sand and mud ejected; drivers of autos disturbed	5
IX	Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken	5.5
X	Most masonry and frame structures destroyed; ground cracked, rails bent, landslides	6
XI	Few structures remain standing; bridges destroyed, fissures in ground, pipes broken, landslides, rails bent	6.5
XII	Damage total; waves seen on ground surface, lines of sight and level distorted, objects thrown up in air	7
		7.5
		8

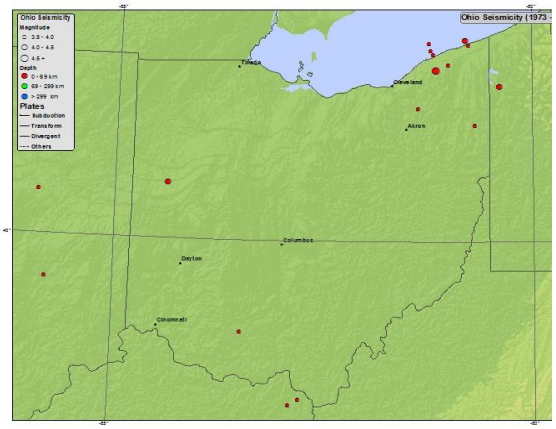
Historical Occurrence

The USGS chart indicates 40 years of no seismic activity over a magnitude of 3.5 centered in southeast Ohio.

The second chart from the Ohio Dept of Natural Resources extends back into the 1800s, showing no seismic activity in Vinton County.

Ohio

Seismicity Map - 1973 to March 2012

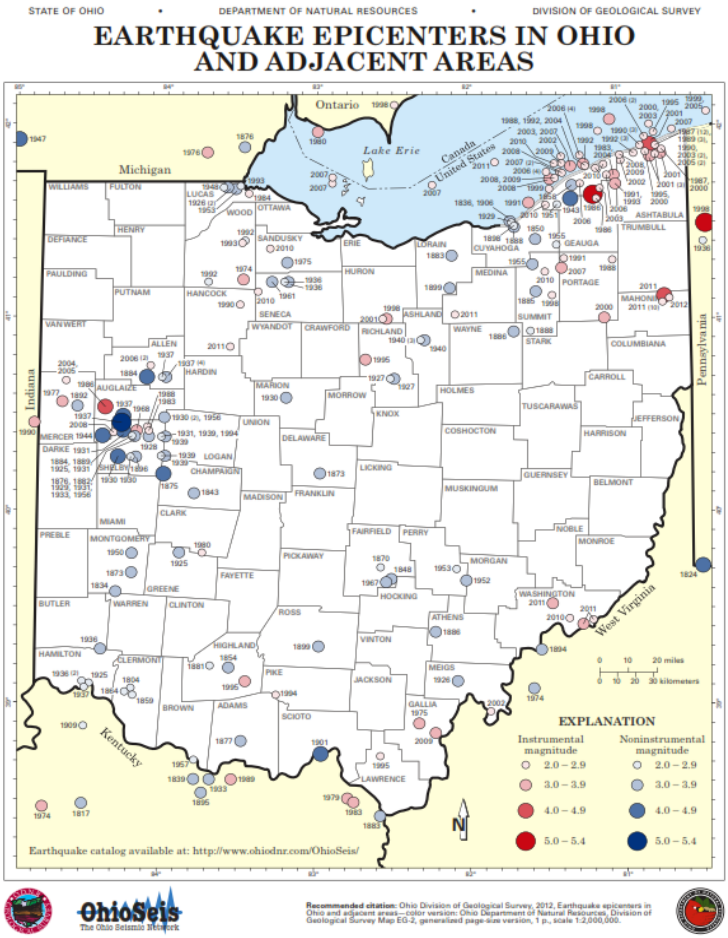


Source: USGS

Probability of Future Occurrences

The USGS reports a 2% probability that Vinton County will be faced with a peak ground acceleration (PGA) of .06 within 50 years. While the USGS hasn't drawn a direct correlation between PGA and magnitude, the Laboratorio de Ingeniería Sísmica, Instituto de Investigaciones en Ingeniería, Universidad de Costa Rica, published research estimating this relationship. A PGA of 2 to 3 relates to a Modified Mercalli Intensity of II and magnitude of 2, characterized as "Felt only by a few persons at rest, especially on upper floors of buildings." Source: USGS.

There is less than a 1% chance of an occurrence in any given year.



Affected Locations

The entire county would be affected with the villages and other built-up areas

Vulnerable Community Assets at Risk & Estimated Damages

People. HAZUS-MH estimates one death, three requiring hospitalization for nonlife-threatening injuries and fifteen requiring medical attention but not hospitalization. It does estimate that 171 households will be displaced.

Infrastructure. HAZUS-MH estimates a total of $56.11 million.

Structures. HAZUS-MH estimates a total of $52.41 million in losses.

Structure Type	Number Affected	Damage Loss Estimate
Residential	560	$ 78,005,159
Non-Residential	844	$ 43,650,498
Critical Facilities	20	$ 1,034,372

Economy. HAZUS-MH estimates a total economic loss of $10.64 million.

Dam Failure

Description

A dam is a barrier that impounds water or underground streams. The reservoirs created by dams not only suppress floods but provide water for various needs to include irrigation, human consumption, industrial use, aquaculture and navigability. Hydropower is often used in conjunction with dams to generate electricity. A dam can also be used to collect water or for storage of water which can be evenly distributed between locations. Dams generally serve the primary purpose of retaining water, while other structures such as floodgates or levees (also known as dikes) are used to manage or prevent water flow into specific land regions. (Source: Wikipedia)

A dam failure is partial, complete or catastrophic release of water held behind a dam that results in down-stream flash flooding. Common causes of dam failure include:

- Sub-standard construction materials/techniques
- Spillway design error
- Geological instability caused by changes to water levels during filling or poor surveying
- Sliding of a mountain into the reservoir
- Poor maintenance, especially of outlet pipes
- Human, computer or design error
- Internal erosion, especially in earthen dams
- Earthquakes
- Intentional acts

In Ohio, dams are classified by size and potential impact of failure:

- Class I. Dams having a total storage volume greater than five thousand acre-feet or a height of greater than sixty feet shall be placed in class I. A dam shall be placed in class I when sudden failure of the dam would result in one of the following conditions:
  - Probable loss of human life.
  - Structural collapse of at least one residence or one commercial or industrial business.
- Class II. Dams having a total storage volume greater than five hundred acre-feet or a height of greater than forty feet shall be placed in class II. A dam shall be placed in class II when sudden failure of the dam would result in at least one of the following conditions, but loss of human life is not probable.
  - Disruption of a public water supply or wastewater treatment facility, release of health hazardous industrial or commercial waste, or other health hazards.
  - Flooding of residential, commercial, industrial, or publicly owned structures. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property.
  - Flooding of high-value property. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property.

  - Damage or disruption to major roads including but not limited to interstate and state highways, and the only access to residential or other critical areas such as hospitals, nursing homes, or correctional facilities as determined by the chief.
  - Damage or disruption to railroads or public utilities.
  - Damage to downstream class I, II or III dams or levees, or other dams or levees of high value. Damage to dams or levees can include, but is not limited to, overtopping of the structure. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property.
- Class III. Dams having a total storage volume greater than fifty acre-feet or a height of greater than twenty-five feet shall be placed in class III. A dam shall be placed in class III when sudden failure of the dam would result in at least one of the following conditions, but loss of human life is not probable.
  - Property losses including but not limited to rural buildings not otherwise described in paragraph (A) of this rule, and class IV dams and levees not otherwise listed as high-value property in paragraph (A) of this rule. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property.
  - Damage or disruption to local roads including but not limited to roads not otherwise listed as major roads in paragraph (A) of this rule.
- Class IV. Dams which are twenty-five feet or less in height and have a total storage volume of fifty acre-feet or less may be placed in class IV. When sudden failure of the dam would result in property losses restricted mainly to the dam and rural lands, and loss of human life is not probable, the dam may be placed in class IV. Class IV dams are exempt from the permit requirements of section 1521.06 of the Revised Code pursuant to paragraph (C) of rule 1501:21-19-01 of the Administrative Code.

Reference: OAC 1501:21-13-01(A)

Extent of Hazard

Failure of a Class I or II dam.

Historical Occurrence

There have been no Class I or II dam failures in Vinton County. According to the Stanford University's National Performance of Dam Program (NPDP) Dam Incident database, the following two incidents have occurred:

ID	Dam Name	Date	Incident Type	Dam Failure
OH00074	Lake Alma Dam	2/28/1997	Inflow Flood - Hydrologic Event	No
OH02548	Tennessee Gas Lake Dam	12/29/1999	Uneven Crest	No

No other information is available on these incidents.

Probability of Future Occurrences

In the American Society of Civil Engineers *2009 Ohio Infrastructure Report Card – Dams Fact Sheet*, Ohio dams received a grade of C. One third of Ohio's dams were rated Poor

or worse and 60% were rated Fair or worse. Based on these high-level ratings, no direct conclusions could be drawn about Vinton County dams. Because of this report, the planning team couldn't assign a value of zero; it decided on a value of .02, a 2% probability of a failure in a given year.

Locations

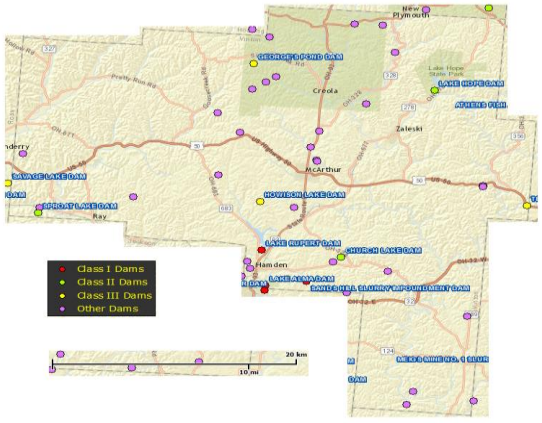
The following dams are listed in the US Army Corps of Engineers' National Inventory of Dams:

Dam Name	ID	Inspection Date	Height (Ft)	Storage (Ac Ft)	Purpose	Dam Type	River
Howison Lake Dam	OH00940	11/4/2011	32.1	64	Recreation	Earth	Tributary To McConnel Run
Tennessee Gas Station 204 Lake Dam	OH02548	12/6/2011	30.3	56.7	Recreation	Earth	Tributary To Flat Run
George's Pond Dam	OH02544	10/4/2011	29.69	22.8	Recreation	Earth	Tributary To Siverly Creek
Church Lake Dam	OH02542	11/14/2011	22	48.5	Recreation	Earth	Tributary To Pierce Run
Sands Hill Slurry Impoundment Dam	OH02839	-	131	1200	Other	Rockfill	Tributary To Sugar Run
Refuse Imp. (Sands Hill Reservoir)	OH83471	10/27/2010	100	1161	Water Supply	Earth	-
Lake Hope Dam	OH00072	12/6/2011	33.79	2461	Recreation	Earth	Sandy Run
Lake Alma Dam	OH00074	11/14/2011	16	490.39	Recreation	Earth	Tributary To Little Raccoon Creek
Sproat Lake Dam	OH00071	5/23/2012	37	117	Recreation	Earth	Tributary To Middle Fork Salt Creek
Lake Rupert Dam	OH00073	10/4/2011	40	7459	Water Supply	Earth	Little Raccoon Creek

Vinton County has three Class I and three Class II dams. Class III and IV dams were deemed inconsequential to mitigation planning.

Class I

Vinton County Dams



Source: Ohio Department of Natural Resources

Lake Alma (OH00074;9124-001). Located just southeast of Hamden near the Jackson County line and with a southerly outward flow, catastrophic failure of its dam would not impact Vinton County. Managed by Ohio Department of Natural Resources.

Lake Rupert (OH00073;9124-002). Located just north of Hamden on the Wellston Wildlife Area, Lake Rupert is the head of the Little Raccoon Creek. Catastrophic failure would have potential impact on Hamden and the surrounding area (Clinton Twp). Managed by Ohio Department of Natural Resources.

Sands Hill Slurry Impoundment (OH02839;9123-008). Located east of Hamden in an uninhabited area, the impact of a catastrophic failure of its dam would be minimal

to Vinton County as it would flow into Jackson County. Owned by Sands Hill Coal Company.

Class II

Lake Hope (OH00072;9222-001). Located north of Zaleski in the Zaleski State Forest, it is fed by Sandy Run and feeds into Raccoon Creek. A catastrophic failure of its dam would release water in Raccoon Creek, impacting travel on SR 278 and side roads as well as a small number of structures including a private campground. Managed by Ohio Department of Natural Resources.

Church Lake (OH02542;9123-002). Located northwest of the intersection of SRs 160 and 324, it feeds into Pierce Run and Raccoon Creek. A catastrophic failure of its dam would impact travel on SR 160 temporarily. Privately owned.

Sproat Lake (OH00071;9125-001). Located in the extreme southwest corner of Vinton County, it is located on the Chief Logan Boy Scout Reservation. A catastrophic failure of its dam would impact activities on the reservation to include camping areas as well as feed into Middle Fork Salt Creek with minimal impact. Its only access is through Jackson County from the south. Managed by Simon Kenton Council, Boy Scouts of America.

Conclusion

The failure of three dams poses a threat to the county's assets:

Lake Rupert. The Village of Hamden and surrounding Clinton Township would be affected. Based on the shallow depth of the lake, the planning team estimates the area flooded would be similar to flash flooding event.

Church Lake. There would be a short-term flow of water across SR 160.

Sproat Lake. The area flooded would a significant part of the Chief Logan Boy Scout Camp. Personal contact with camp managers revealed a comprehensive dam failure plan with a constant watch during camping times as well as a system to rapidly relocate those in the threat area to the main buildings well above the threat area.

Vulnerable Community Assets at Risk & Estimated Damages

People. There are several residences and transient campers in the inundation areas.

Structures.

Structure Type	Number Affected	Damage Loss Estimate
Residential	132	$ 12,918,323
Non-Residential	26	$ 2,553,124
Critical Facilities	6	$ 632,082

Analyze and Rank Hazards, Vulnerabilities and Impacts

Hazard Analysis

Hazard	Adj Freq	Res-ponse	Onset	Adj Magnitude	Busi-ness	Human	Property
Severe Thunderstorms	4.50	3	4	2.50	2	2	1
Severe Wind Storms	4.50	1	4	2.50	2	2	1
Landslides	3.00	2	2	1.25	1	1	1
Wildfires	4.50	1	4	1.25	1	1	1
Drought	3.00	3	1	1.25	1	1	1
Major Flooding	6.00	1	3	2.50	2	2	1
Severe Winter Storms	1.50	3	3	5.00	2	2	1
Earthquakes	1.50	5	1	5.00	4	3	3
Dam Failure	1.50	1	1	1.25	1	1	1

The following table depicts Ohio EMA's SHARPP range codes:

ASPECT	1	2	3	4	5
Frequency	None	Low	Medium	High	Excessive
Avg Response Duration	<1/2 day	<1 day	<1 week	<1 month	1 month
Avg Speed of Onset	>24 hours	12-24 hours	6-12 hours	<6 hours	Not Used
Avg Magnitude	Localized <10% Land Area	Limited 10-25% Land Area	Critical 25-50% Land Area	Catastrophic >50% Land Area	Not Used
Impact on Business	<24 hours	1 week	At least 2 weeks	> 30 days	Not Used
Impact on Humans	Minimum Minor Injuries	Low Some Injuries	Medium Multiple Severe Injuries	High Multiple Deaths	Not Used
Impact on Property	< 10% Damaged	10-25% Damaged	25-50% Damaged	> 50% Damaged	Not Used

Vulnerability Analysis

	Structures at Risk				Damage in Millions of Dollars			
Hazard	Residential (Res)	Non-Res	Crit	Total	Res	Non-Res	Crit	Total
Severe Thunderstorms	11	4	2	17	1.077	.393	.211	1.681
Severe Wind Storms	5	2	1	8	.489	.196	.105	.791
Landslides	5	5	2	12	.347	.916	1.160	2.423
Wildfires	1			1	.006			.006
Drought				0				0
Major Flooding	2,010	399	98	2,507	197.449	39.023	9.661	246.133
Severe Winter Storms				0				0
Earthquakes	560	844	20	1,424	78.005	43.650	1.034	122.690
Dam Failure	132	26	6	164	12.918	2.553	.632	16.103

Hazard Impact Analysis

In addition to ranking hazards by categories required by Ohio EMA, the planning team ranked impacts specific to the communities of Vinton County. Using a quantitative approach, the planning team assigned values to the impact on community assets based on the following table.

Values	1	2	3	4
Affected Area	Single Site	Multiple Sites	Small Area	Large Area
Causalities	1-5	6-10	11-25	26+
Isolation/Restriction	< 1 hr	1-12 hrs	13-168 hrs	169+ hrs
Time & Numbers	1-5	6-10	11-50	51+
Structural Damage	<$10K	$10K-$50K	$50K-$100K	$100K+
Road Damage	<$20K	$20K-$100K	$100K-$500K	$500K+
Utility Outage/Shortage	1 day	2-5 days	6-10 days	10+ days
Critical Facilities Affected	1	2	3	4
Economic Impact	<$.1M	$.1M-$1M	$1M-$10M	$10M+

The ranking of each item is then multiplied by the probability of the hazard occurring in one year to come up with a weighed impact value. The values for impact are summed and sorted to obtain a relative ranking for each impact. The values for the two isolation effects are averaged and computed as a single value so as not to skew the impact of isolation. This information is then used for developing and ranking mitigation goals and mitigation actions.

	Affected Area	Causalities	Isolation Hours	Isolation Numbers	Structural Damage	Road Damage	Utility Outage/Shortage	Critical Facilities	Economic Impact	Total	Probability	Annualized Value
Severe Thunderstorms	3	0	2	3	0	2	0	0	0	7.5	67%	5.00
Severe Wind Storms	4	0	2	2	2	0	3	0	1	12	33%	3.96
Landslides	2	0	2	1	0	4	0	0	0	7.5	50%	3.75
Wildfires	1	0	0	0	1	0	0	0	0	2	50%	1.00
Drought	2	0	0	0	0	0	0	0	2	4	25%	1.00
Major Flooding	4	0	3	4	4	4	2	0	4	22	4%	0.92
Severe Winter Storms	4	0	3	4	0	4	2	0	0	14	7%	0.90
Earthquakes	4	1	2	4	3	3	2	0	4	20	2%	0.40
Dam Failure	1	0	1	4	3	0	0	1	0	7.5	2%	0.15
Total		1	15	22	13	17	9	1	11	96	27%	
Annualized Value		0.02	3.38	3.76	1.45	3.83	1.25	0.02	1.08			
			3.57									

Ranking of Hazard Impact

The annualized hazard values, sorted in descending order, indicated the hazards with the greatest impact on Vinton County. For example, Severe Thunderstorms are far more likely to impact Vinton County Severe Winter Storms.

Hazard	Relative Impact
Severe Thunderstorms	5.00
Severe Wind Storms	3.96
Landslides	3.75
Wildfires	1.00
Drought	1.00
Major Flooding	0.92
Severe Winter Storms	0.90
Earthquakes	0.40
Dam Failure	0.15

Ranking of Impacts

The annualized impact values, sorted in descending order, indicated the impacts with the greatest impact on Vinton County. For example, Road Damage and Isolation are far more likely to occur – and have impact – than structural damage.

Impact	Relative Severity	Percent of Severity
Road Damage	3.83	34.14%
Isolation	3.57	31.82%
Structural Damage	1.45	12.92%
Utility Outage/Shortage	1.25	11.14%
Economic Impact	1.08	9.63%
Critical Facility Damage	0.02	.18%
Causalities	0.02	.18%

Section III – Appendix B – Mitigation Action Details & Analysis

The Mitigation Planning Team used the Hazard Analysis, Vulnerability Analysis and Impact Analysis to set goals as well as develop mitigation actions.

Goal 1: Keep Roads Safe and Passable During Hazard Events

Mitigation Action 1: Raise Roadbeds

Priority: 15

Description: This mitigation action seeks to prevent flood waters from covering roads, making them impassable and causing structural damage by raising the roadbed.

Locations:

Jurisdiction & Location	Length	Site Nbr
Clinton Township		
SR 349 off SR 160	500'	5
Carr Ridge Rd (TR 1) at Sugar Run	100'	7
Hartwell Rd (TR 3) just off SR 160	100'	8
Eagle Township		
Eagle Mills Rd (CR 17) [?]	100'	12
Narrows Rd (CR 45) [?]	100'	13
Elk Township		
Infirmary Rd (TR 14) from SR 93 almost to Morgan Rd	100′	24
Harrison Township		
Clary Rd (TR 16) from Salt Creek east	100'	30
Fout Rd (TR 19) just north of Nichols Rd (TR 18)	100'	32
Jackson Township		
Claypool Hollow (TR 4) near end	100′	35
Ratcliff Hollow Rd (TR 7) within Jackson Twp	100′	39
Sowers Rd (TR 20) – mid point	100'	40
Knox Township		
SR 356 1 mile north of US 50	500'	42
Stanley Rd (TR 19) at Laurel Run	100'	45
Madison Township		
SR 278 at Raccoon Creek and Atkinson Ridge Rd (TR 5)	100'	47
Webb Rd (TR 24) at Raccoon Creek	100'	50
Corbin Hollow Rd ½ mi south of Zaleski off SR 278	100′	51
Richland Township		
SR 683 south from US 50 to Mt Zion Rd (CR 37)	10000'	52
US 50 west from West Elementary School to Kelly Rd (CR 12)	8000'	54
Swan Township		
Mitchell Hollow Rd (TR 12A) just off SR 328	100′	62
Vinton Township		
Barnes Rd (TR 8) just off Arbaugh Rd N (CR 43B) by Elk Fork	500'	67
Wilkesville Township		
Thompsonville Rd (CR 10) at Raccoon Creek near CR 9	100'	70

Project Leads:

Jurisdiction	Project Lead
Clinton Township Roads	Clinton Township Trustees
Elk Township Roads	Elk Township Trustees

Jurisdiction	Project Lead
Harrison Township Roads	Harrison Township Trustees
Jackson Township Roads	Jackson Township Trustees
Knox Township Roads	Knox Township Trustees
Madison Township Roads	Madison Township Trustees
Swan Township Roads	Swan Township Trustees
Vinton Township Roads	Vinton Township Trustees
County Roads	Vinton County Engineer's Office
State and US Routes	Ohio Department of Transportation

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost:

Paved: $14,000 per 100' to raise 1'

Gravel: $8,500 per 100' to raise 1'

Current Status: Deferred

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Elevation, Minor Localized Flood Reduction, Stormwater

Vulnerability	Before Implementation	After Implementation	Difference
Number of Isolated/Year	500 x 8 = 4,000 people	None	4,000 people
Duration of Isolation/Year	4 x 8 = 32 hours	None	32 hours
Road Damage/Year	$5000	Minimal	$5000
Economy	Minimal	Minimal	None

Benefits
Decreased isolation of people
Decreased road damage

Costs
Paved: $14,000 x 19400' = $ 27,160,0000
Gravel: $8,500 x 1700' = $ 14,450,000

Mitigation Action 2: Install Larger Culverts

Priority: 5

Description: This mitigation action seeks to prevent flood waters from covering roads, making them impassable and causing structural damage by raising installing larger culverts.

Locations:

Jurisdiction & Location	Site Nbr
Clinton Township	
Rowland Rd (TR 5) ¼ mile north of SR 160	9
Eagle Township	
Albright Rd (TR 11) north of Eagle Mills	15
McGee Rd (TR 13A) just off Beechgrove Rd (CR 16)	16
Stevens Branch Rd (TR 9) at beginning of Stevens Branch	18
Elk Township	
Infirmary Rd (TR 14) from SR 93 almost to Morgan Rd	24
Harrison Township	
Clark Rd (TR 14) between US 50 & Benson Rd (TR 15) at Salt Creek)	29
Jackson Township	
Sowers Rd (TR 20) – mid point	40
Madison Township	
Corbin Hollow Rd ½ mi south of Zaleski off SR 278	51
Scott Ave between Elm St and Young Ave	77

Project Leads:

Jurisdiction	Project Lead
Clinton Township Roads	Clinton Township Trustees
Eagle Township Roads	Eagle Township Trustees
Elk Township Roads	Elk Township Trustees
Harrison Township Roads	Harrison Township Trustees
Jackson Township Roads	Jackson Township Trustees
Madison Township Roads	Madison Township Trustees
Village of Hamden	Village of Hamden Mayor

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost: Install 48" culvert: $7,500

Current Status: Deferred

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Minor Localized Flood Reduction, Stormwater

Vulnerability	Before Implementation	After Implementation	Difference
Number of Isolated/Year	250 x 8 = 2,000 people	None	2000 people
Duration of Isolation/Year	4 x 8 = 32 hours	None	32 hours
Road Damage/Year	$10,000	Minimal	$10,000
Economy	Minimal	Minimal	None

Benefits
Decreased isolation of people
Decreased washed out culverts

Costs
$7,500 x 8 = $60,000

Mitigation Action 3: Lengthen Bridges

Priority: 14

Description: This mitigation action seeks to prevent flood waters from covering roads, making them impassable and causing structural damage by lengthening bridges.

Locations:

Jurisdiction & Location	Site Nbr
Harrison Township	
Woodruff Rd (TR 11) at Pigeon Creek	28
Clary Rd (TR 16) from Salt Creek east	30
Thompson Rd (TR 5) just off US 50 at Salt Creek	33
Village of Hamden	
Woolweaver Ave at Sugar Run	78

Project Lead: Vinton County Engineer

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost: $150,000 per site

Current Status: Deferred

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Elevation, Minor Localized Flood Reduction, Stormwater

Vulnerability	Before Implementation	After Implementation	Difference
Number of Isolated/Year	400 x 8 = 3,200 people	None	3,200 people
Duration of Isolation/Year	4 x 8 = 32 hours	None	32 hours
Bridge Damage/Year	$15,000	Minimal	$15,000
Economy	Minimal	Minimal	None

Benefits
Decreased isolation of people
Decreased washed out bridges

Costs
$150,000 x 4 = $600,000

Mitigation Action 4: Remove or Reinforce Slipping Soil

Priority: 12

Description: This mitigation action seeks to prevent landside from covering roads, making them impassable and causing structural damage by removing soil that may likely block the road.

Locations:

Jurisdiction & Location	Site Nbr
Brown Township	
Buck Lane (TR 1) [Near Raccoon Creek]	1
Mace Rd (TR 5)	3
Eagle Township	
Narrows Rd (CR 45)	13
Harrison Township	
Fout Rd (TR 19) just north of Nichols Rd (TR 18)	32
Jackson Township	
Old Sowers Rd (TR 33) at Sowers Rd (TR 20)	38
Knox Township	
Staneart Hollow Rd (TR 4) along Raccoon Creek	43
Bunker Hill Rd (TR 13) at Raccoon Creek	44
Vinton Township	
Knox Rd (TR 11) .25 mi south of Fred Erikson Rd (TR 22)	66
Barnes Rd (TR 8) just off Arbaugh Rd N (CR 43B) by Elk Fork	67
Runyon Rd (TR 9) just off Barnes Rd (TR 8)	68
Wilkesville Township	
Clarion Rd (TR 25) near Clarion	72
McMillin Rd (TR 1) near Meigs County line	73
Rocky Steep Rd (TR 21)	74
Minerton Rd (CD 28) just off SR 124	75

Project Leads:

Jurisdiction	Project Lead
Clinton Township	Clinton Township Trustees
Eagle Township	Eagle Township Trustees
Harrison Township	Harrison Township Trustees
Jackson Township	Jackson Township Trustees
Knox Township	Knox Township Trustees
Vinton Township	Vinton Township Trustees
Wilkesville Township	Wilkesville Township Trustees

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost: $150,000 per site

Current Status: Deferred

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Soil Stabilization

Vulnerability	Before Implementation	After Implementation	Difference
Number of Isolated/Year	50 x .5 = 25 people	None	25 people
Duration of Isolation/Year	24 x .5 = 12 hours	None	12 hours
Repair Cost/Year	$25,000 x .5 = $12,500	None	$12,500
Economy	None	None	None

Benefits
Decreased isolation of people
Decreased damage

Costs
$150,000 x 5 = $750,000

Mitigation Action 5: Build up Creek Banks

Priority: 11

Description: This mitigation action seeks to prevent flood waters from washing out roads, making them impassable and causing structural damage by reinforcing creek banks to prevent erosion into the roadbed.

Locations:

Jurisdiction & Location	Site Nbr
Eagle Township	
Albright Rd (TR 11) north of Eagle Mills	15
Dixon Mill Rd (TR 16) along Salt Creek	17
Harrison Township	
Nichols Rd (TR 18) just off Fout Rd (TR 19)	31
Thompson Rd (TR 5) just off US 50 at Salt Creek	**33**
Wilkesville Township	
Minerton Chapel Rd (TR 8) at Raccoon Creek	76

Project Leads:

Jurisdiction	Project Lead
Clinton Township	Clinton Township Trustees
Harrison Township	Harrison Township Trustees
Wilkesville Township	Wilkesville Township Trustees

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost. $60,000 per site

Current Status: Deferred

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Soil Stabilization

Vulnerability	Before Implementation	After Implementation	Difference
Number of Isolated/Year	20 x 4 = 80 people	None	80 people
Duration of Isolation/Year	24 x 4 = 96 hours	None	96 hours
Repair Cost/Year	$25,000 x 4 = $100,000	50% Maintenance	$50,000
Economy	None	None	None

Benefits
Decreased isolation of people
Decreased road damage
Decreased bank erosion

Costs
$60,000 x 14 = $840,000

Mitigation Action 6: Remove Debris from Waterways

Priority: 10

Description: Debris in the waterways and tributaries tends to collect and cause damming and blockages. This flow restriction where a road not far above the creek can cause flooding on the road even in moderate rain. This mitigation action needs to present a concerted effort to minimize simply transferring the water to a choke point farther downstream.

Locations: Countywide. Footprint closely follows the waterways and floodplains identified in *Section II – Hazard Analysis* with the exception of Salt Creek proper as its width and depth doesn't make it susceptible to debris collecting.

Project Lead: Vinton County Commissioners

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost. Cost estimates for this mitigation action have not been completed. Mitigation Actions need to be surveyed in detail and will have to be assessed for their impact on adjacent jurisdictions. Also, significant research will be necessary to assess environmental impacts as well as address debris disposition.

Current Status: Deferred

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Minor Localized Flood Reduction, Stormwater

Vulnerability	Before Implementation	After Implementation	Difference
Number of Isolated/Year	50 x 8 = 160 people	None	160 people
Duration of Isolation/Year	4 x 8 = 96 hours	None	96 hours
Repair Cost/Year		50% Maintenance	$50,000
Economy	None	None	None

Benefits
Decreased isolation of people

Costs
Possible collateral adverse environmental impact
Debris removal
Property owner buy-in

Mitigation Action 7: Cut Open Old Railroad Bed

Priority: 13

Description: An abandoned railroad bed in Clinton Twp near Carr Ridge Rd (TR 1) and Sugar Run is causing water to back up and flood adjacent road.

Location. Near Carr Ridge Rd (Clinton Twp TR 1) and Sugar Run. Site #11

Project Lead: Clinton Twp Board of Trustees

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost. $5,000

Current Status: Deleted. The township trustees reported this situation was resolved without this action taking place.

Mitigation Action Type: Minor Localized Flood Reduction, Stormwater

Goal 2: Inform the Public of Impacts and Actions to Take During Hazard Events

Mitigation Action 8: Install Depth Sticks & High Water Signs

Priority: 2

Description: Install depth sticks or high water signs at locations that tend to have water over the road as the result of heavy rains. This will alert drivers to the upcoming hazard.

Locations:

Jurisdiction & Location	Site Nbr
Brown Township	
Shea Rd (TR 3) ½ mi off Wheelabout Rd (CR 3) by beaver dam	2
Clinton Township	
SR 349 off SR 160	5
SR 93 at Little Raccoon Creek	6
Carr Ridge Rd (TR 1) at Sugar Run	7
Hartwell Rd (TR 3) just off SR 160	8
Rowland Rd (TR 5) ¼ mile north of SR 160	9
Sam Russell Rd (TR 6)	10
Eagle Township	
Eagle Mills Rd (CR 17) [?]	12
Narrows Rd (CR 45) [?]	13
SR 327 north of Eagle Mills Rd (CR 17) over Pike Run	14
Albright Rd (TR 11) north of Eagle Mills	15
McGee Rd (TR 13A) just off Beechgrove Rd (CR 16)	16
Dixon Mill Rd (TR 16) along Salt Creek	17
Stevens Branch Rd (TR 9) at beginning of Stevens Branch	18
Elk Township	
Meeksville Rd (TR 7) at SR 93	20
SR 93 at Elk Fork	21
SR 93 at Krazy Katie's	22
SR 93 at Puncheon Fork	23
Infirmary Rd (TR 14) from SR 93 almost to Morgan Rd	24
US 50 east of Old McArthur Rd (CR 7)	25
Harrison Township	
Ponetown Rd (CR 13) at Middle Fork Salt Creek	27
Woodruff Rd (TR 11) at Pigeon Creek	28
Clark Rd (TR 14) between US 50 & Benson Rd (TR 15) at Salt Creek)	29
Clary Rd (TR 16) from Salt Creek east	30
Fout Rd (TR 19) just north of Nichols Rd (TR 18)	32
Thompson Rd (TR 5) just off US 50 at Salt Creek	33
Jackson Township	
Claypool Hollow (TR 4) near end	35
Goosecreek Rd (CR 18) at Middle Fork Salt Creek	36
Macedonia Rd (CR 47) at North Branch	37
Ratcliff Hollow Rd (TR 7) within Jackson Twp	39
Sowers Rd (TR 20) – mid point	40
Knox Township	
SR 356 1 mile north of US 50	42
Stanley Rd (TR 19) at Laurel Run	45
Madison Township	

Jurisdiction & Location	Site Nbr
SR 278 at Raccoon Creek and Atkinson Ridge Rd (TR 5)	47
SR 278 at south side of Zaleski	48
SR 278 north of Zaleski (2 sites)	49
Webb Rd (TR 24) at Raccoon Creek	50
Corbin Hollow Rd ½ mi south of Zaleski off SR 278	51
Richland Township	
SR 683 south from US 50 to Mt Zion Rd (CR 37)	52
US 50 east of Allensville	53
US 50 west from West Elementary School to Kelly Rd (CR 12)	54
Swan Township	
Siverly Creek Rd (CR 19) just off SR 93	56
SR 93 at Brushy Fork near Shurtz Rd (CR 21)	57
SR 93 at Brushy Fork near Airport Rd (CR 22)	58
SR 93 at Brushy Fork near Dunkle Creek Rd (CR 34)	59
Old Shurtz Rd (TR 16) just off Shurtz Rd (CR 21)	61
Mitchell Hollow Rd (TR 12A) just off SR 328	62
Vinton Township	
SR 160 at and south of Cottrill Rd (CR 28) at Raccoon Creek	64
SR 32 just west of Thompsonville Rd (CR 10) at Raccoon Creek	65
Barnes Rd (TR 8) just off Arbaugh Rd N (CR 43B) by Elk Fork	67
Wilkesville Township	
Thompsonville Rd (CR 10) at Raccoon Creek near CR 9	70
Hawk Station Rd (CR 9) at Raccoon Creek near CR 10	71
Minerton Chapel Rd (TR 8) at Raccoon Creek	76
Village of Hamden	
Scott Ave between Elm St and Young Ave	77
Woolweaver Ave at Sugar Run	78
Village of McArthur	
Spring St at Puncheon Fork	80

Project Leads:

Jurisdiction	Project Lead
Brown Township Roads	Brown Township Trustees
Clinton Township Roads	Clinton Township Trustees
Eagle Township Roads	Eagle Township Trustees
Elk Township Roads	Elk Township Trustees
Harrison Township Roads	Harrison Township Trustees
Jackson Township Roads	Jackson Township Trustees
Madison Township Roads	Madison Township Trustees
Richland Township Roads	Richland Township Trustees
Swan Township Roads	Swan Township Trustees
Vinton Township Roads	Vinton Township Trustees
Wilkesville Township Roads	Wilkesville Township Trustees
Village of Hamden	Village of Hamden Mayor
Village of McArthur	Village of McArthur Mayor
County Roads	Vinton County Engineer
State and US Routes	Ohio Department of Transportation

Start Date: 6/1/2015

End Date: 5/31/2020

Lead Agency. Jurisdictional Chief Elected Officials on township roads; Vinton County Engineer for county roads; Ohio Department of Transportation for state routes and US highways.

Estimated Cost: $300 per site

Current Status: Deferred

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Public Warning

Vulnerability	Before Implementation	After Implementation	Difference
Number of Stranded/Year	5 x 8 = 40 people	10	30 people
Number of Injuries/Year	5	2	3
Economy	None	None	None

Benefits
Increased public safety

Costs
$300 x 55 = $16,500

Mitigation Action 9: Install/Upgrade Alerting Sirens

Description: Install new or upgrade existing alerting sirens and integrate into a countywide system.

Locations: Allensville, Hamden, McArthur, Wilkesville, Zaleski

Project Lead: Vinton County EMA

Start Date: 3/1/2005

End Date: 12/1/2005

Current Status: Completed

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Public Warning

Mitigation Action 10: Establish County-Wide Weather Monitoring Network

Description: Install weather monitoring stations in key locations around the county and link them to a central monitoring and reporting location as well as the county web site.

Location: Countywide.

Project Lead: Vinton County EMA

Start Date: 6/1/2005

End Date: 5/31/2015

Current Status. Deleted. It was determined that other, existing methods of monitoring were more feasible and even more reliable. These include the National Weather Service and social media.

Funding Resource: None – not funded

Mitigation Action Type: Public Warning

Mitigation Action 11: Establish County-Wide Alerting/Notification System

Description. It is essential for emergency management and public safety officials to be able rapidly and accurately and reliably disseminate information to the public. While there are five outdoor warning sirens in the county, more sirens would not be effective as the terrain and rural setting limits the range and population coverage.

Location: Countywide

Project Lead: Vinton County EMA

Start Date: 6/1/2005

End Date: 3/15/2015

Estimated Cost. $9,000 per year

Current Status. Completed

Funding Resource: Community Development Block Grant

Mitigation Action Type: Public Warning

Goal 3: Educate the Public on Mitigation, Preparedness and Response Actions

Mitigation Action 12: Develop and conduct public education program

Priority: 1

Description: Educate the public on actions to take before, during and after hazard occurrences.

Location. Countywide

Project Lead: Vinton County EMA

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost:

Marketing Consultant: $25.00/hour x 5 hours/week x 52 weeks = $6,500

Supplies: $2,000

Total Annual Cost: $8,500

Timeline. Four months from receipt of funding

Current Status: Deferred

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Public Education

Vulnerability	Before Implementation	After Implementation	Difference
Unprepared people	7,000 (50%)	3,500 (25%)	3,500 people
Economy	Unknown	Unknown	Unknown

Benefits
Increased public safety
Increased self-sufficiency
Decreased response and recovery costs

Costs
$8,500

Goal 4: Create Self Sufficiency – Individual, Community, County

Mitigation Action 13: Install generator at community centers

Priority: 3

Description: Each community – defined by township – needs to have a gathering place that is suitable as a warming/cooling station and potentially as a full-up shelter. Each community already has a facility suitable in size for its population. What most lack is backup power – a real necessity for a facility to function in any of these capacities.

Locations, Details and Estimated Costs:

Location	Size	Details	Est Cost	Site
Vinton County Community Building 31935 SR 93	20 KW	Building requires three phase power; building has electric heat	$20,000	81
Brown Twp Grange Hall Cherry Ridge Rd	10 KW		$10,000	82
Eagle Twp Hall 53302 Eagle Mills Rd	10 KW	Building also needs air conditioning	$15,000	83
Harrison Twp Hall 54625 US 50	10 KW		$10,000	84
Jackson Twp Hall 29725 Goosecreek Rd	10 KW		$10,000	85
Knox Twp Hall SR 356 & CR 35	10 KW		$10,000	86
Zaleski/Madison Twp Hall N Broadway St, Zaleski	10 KW		$10,000	87
Richland Twp Hall 58253 US 50	10 KW		$10,000	88
Swan Twp Hall 26601 SR 93	10 KW		$10,000	89
Vinton Twp Hall 38000 Arbaugh Rd	10 KW		$10,000	90
Hamden Community Building 138 E Railroad St, Hamden	10 KW		$10,000	91
Wilkesville Community Center 164 Main St, Wilkesville	15 KW	Building has complete kitchen	$15,000	92

Project Leads:

Jurisdiction	Project Lead
Brown Township	Brown Township Trustees
Clinton Township	Clinton Township Trustees
Harrison Township	Harrison Township Trustees
Jackson Township	Jackson Township Trustees
Knox Township	Knox Township Trustees
Richland Township	Richland Township Trustees
Swan Township	Swan Township Trustees
Vinton Township	Vinton Township Trustees
Village of Hamden	Village of Hamden Mayor
Village of Wilkesville	Village of Wilkesville Mayor

Jurisdiction	Project Lead
Village of Zaleski	Village of Zaleski Mayor
Vinton County Community Building	Vinton County Commissioners

Start Date: 6/1/2015

End Date: 5/31/2020

Current Status: New

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Storm Shelter

Vulnerability	Before Implementation	After Implementation	Difference
People at risk	4,500 (30%)	700 (5%)	3,800 people
Economy	Unknown	Unknown	Unknown

Benefits
Increased public safety
Increased self-sufficiency
Decreased response and recovery costs

Costs
$140,000

Mitigation Action 14: Drill community well in area affected by drought

Priority: 8

Description: Most residents in Jackson Twp and eastern Eagle Twp use private wells for their potable water, many of which tend to dry up or go sour in extended dry periods. This was particularly an issue during the 2012 drought. This mitigation action would provide a reliable potable water source within the community.

Location: Jackson Twp Hall, 29725 Goosecreek Rd; location may need to be adjusted based on further research by driller. Site #41.

Project Lead: Jackson Twp Trustees

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost: $10,000

Current Status: New

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Drought Effect Minimalization

Vulnerability	Before	After	Difference

	Implementation	Implementation	
People at risk	400	0	400 people
Economy	Unknown	Unknown	Unknown

Benefits
Increased public safety
Increased self-sufficiency
Decreased response and recovery costs

Costs
$10,000

Goal 5: Plan for Safe Development

Mitigation Action 15: Mitigate chronically-flooded/damaged dwellings

Priority: 9

Description: Mitigate chronically-flooded/damaged dwellings of willing residents to break the damage-repair-damage-repair cycle.

Note: there are no NFIP-designated repetitive-loss structures in Vinton County.

Locations:

59499 Curry Rd, McArthur (Jackson Twp) – Appraised value: $39,400 (Site 82)

275 Wilcox St, Hamden – Appraised value: $28,100 (Site 83)

Project Leads:

Jackson Twp Board of Trustees

Village of Hamden Mayor

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost: $67,500

Current Status: Deferred

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Acquisition

Vulnerability	Before Implementation	After Implementation	Difference
Structures	2	0	2 structures
Economy	Unknown	Unknown	Unknown

Benefits
Increased public safety
Decreased response and recovery costs
Community-owned green space

Costs
$67,000

Mitigation Action 16: Map flooding, water sources, causes and impacts

Priority: 6

Description: When it rains, the county residents know where flooding is likely to occur; what is largely unknown is why certain "expected" areas flood when others don't and why this isn't consistent. This study would give insight into the mechanics of flooding in Vinton County and help drive development decisions as well as help determine the most cost-effective mitigation actions.

Location: Countywide

Project Lead: Vinton County EMA

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost: Contractor: $15,000

Current Status: Deferred

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Planning

Vulnerability	Before Implementation	After Implementation	Difference
All community assets	Intangible	Intangible	Intangible
Economy	Unknown	Unknown	Unknown

Benefits
Increased public safety
Decreased response and recovery costs

Costs
$15,000

Mitigation Action 17: Build Safe Rooms

Priority: 7

Description: A safe room is an extreme-wind shelter or space that provides protection to people during a tornado. It can be constructed/installed in one of several places in the home: in the basement, beneath a concrete slab-on-grade foundation or garage floor, or in an interior room on the first floor. A safe room may also be buried in the yard or be a stand-alone structure near your home.

The Ohio EMA manages the Ohio Safe Room Rebate Program. Those interested in this program must file an application through the Ohio EMA.

Location: Countywide

Project Lead: Ohio EMA

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost: Owner receives a 75% cost rebate, up to a maximum rebate of $5,250.

Current Status: New

Funding Resource: Pre-Disaster Mitigation (PDM) Grant

Mitigation Action Type: Storm Shelter

Vulnerability	Before Implementation	After Implementation	Difference
People in vulnerable structures	Unknown	Unknown	Unknown
Economy	Unknown	Unknown	Unknown

Benefits
Increased public safety
Decreased response and recovery costs

Costs
Community education
Community buy-in

Mitigation Action 18: Review and Update Planning Regulations

Priority: 4

Description: Planning regulations (e.g.: Planning Commission regulations, building codes, zoning codes and regulations, subdivision regulations) are key to ensuring current and future development is done in a way that leads the community to be safer and more resilient. This action serves to implement the information and conclusions of this plan update effort into current and new planning regulations.

Location: Countywide

Project Leads:

Vinton County Commissioners

Vinton County Planning Commission

Vinton County Floodplain Manager

Vinton County Health Department

Village of Hamden Mayor and Floodplain Manager

Village of McArthur Mayor and Floodplain Manager

Start Date: 6/1/2015

End Date: 5/31/2020

Estimated Cost: Cost would be absorbed in the day-to-day operation of these entities.

Current Status: New

Funding Resource: Local funds

Mitigation Action Type: Planning

Vulnerability	Before Implementation	After Implementation	Difference
All community assets			
Economy	Unknown	Unknown	Unknown

Benefits
Increased public safety
Decreased response and recovery costs
Increased attractiveness to new businesses, visitors and residents

Costs
Elected official buy-in
Voter buy-in
Increased economic development costs

Relationship of Goals and Mitigation Actions to Hazards

Goal/Mitigation Action	Severe Thunderstorms	Severe Wind Storms	Landslides	Wildfires	Drought	Major Flooding	Severe Winter Storms	Earthquakes	Dam Failure
1: Engineer Roads To Be Safe and Passable During Hazard Events									
1: Raise Roadbeds	X					X			X
2: Install Larger Culverts	X					X			X
3: Lengthen Bridges	X					X			X
4: Build up Creek Banks	X		X			X			X
5: Remove or Reinforce Slipping Soil	X					X			
6: Remove Debris from Waterways	X					X			X
2: Inform the Public of Impacts and Actions to Take During Hazard Events									
8: Install Depth Sticks & High Water Signs	X					X			X
11: Establish County-Wide Alerting/Notification System	X	X	X	X	X	X	X	X	X
3: Educate the Public on Mitigation, Preparedness and Response Actions									
12: Develop and Conduct Public Education Program	X	X	X	X	X	X	X	X	X
4: Create Self Sufficiency – Individual, Community, County									
13: Install Generator at Community Centers	X	X		X	X	X	X	X	
14: Drill Community Well in Area Affected by Drought					X				
5: Plan for Safe Development									
15: Mitigate Chronically-Flooded/Damaged Dwellings	X					X			
16: Map Flooding, Water Sources, Causes and Impacts	X		X			X			X
17: Build Safe Rooms	X	X				X		X	
18: Review and Update Planning Regulations	X	X	X	X		X	X	X	X

Relationship of Goals and Mitigation Actions to Impacts

Goal/Mitigation Action	Isolation	Road Damage	Structural Damage	Utility Outage/Shortage	Economic Impact	Critical Facility Damage	Causalities
1: Engineer Roads To Be Safe and Passable During Hazard Events							
1: Raise Roadbeds	X	X					
2: Install Larger Culverts	X	X					
3: Lengthen Bridges	X	X					
4: Build up Creek Banks	X	X					
5: Remove or Reinforce Slipping Soil	X	X		X			
6: Remove Debris from Waterways	X	X					
2: Inform the Public of Impacts and Actions to Take During Hazard Events							
8: Install Depth Sticks & High Water Signs							X

Goal/Mitigation Action	Isolation	Road Damage	Structural Damage	Utility Outage/Shortage	Economic Impact	Critical Facility Damage	Causalities
11: Establish County-Wide Alerting/Notification System	X						X
3: Educate the Public on Mitigation, Preparedness and Response Actions							
12: Develop and Conduct Public Education Program	X						X
4: Create Self Sufficiency – Individual, Community, County							
13: Install Generator at Community Centers	X			X			
14: Drill Community Well in Area Affected by Drought							
5: Plan for Safe Development							
15: Mitigate Chronically-Flooded/Damaged Dwellings	X		X				
16: Map Flooding, Water Sources, Causes and Impacts	X	X					X
17: Build Safe Rooms							X
18: Review and Update Planning Regulations	X	X	X		X		X

Cost-Benefit Review

Cost-Benefit Review is used to determine the relative feasibility of mitigation actions, thus establishing a prioritized list. The Planning Team used *Using Benefit-Cost Review in Mitigation Planning – State and Local Mitigation Planning How-To Guide Number Five – FEMA 386-5, May 2007*, to conduct this review. Using qualitative methods (Method A), this Cost-Benefit Review methodology was emphasized in the prioritization process.

Review Benefits and Costs

This step is documented with each selected mitigation action above.

Prioritize Actions

The following summarizes the benefits and costs of each mitigation action and reflects the priority assigned by the Planning Team. Guiding criteria was:

- Impact on public safety (isolation and injuries)
- Impact on property damage
- Impact on other mitigation actions
- Acceptability of implementation by elected officials and voters
- Monetary costs

Action	Benefits (Pros)	Costs (Cons)	Priority
1: Raise Roadbeds	Decreased isolation of people Decreased road damage	$41,610,000	15

Action	Benefits (Pros)	Costs (Cons)	Priority
2: Install Larger Culverts	Decreased isolation of people Decreased washed out culverts	$60,000	5
3: Lengthen Bridges	Decreased isolation of people Decreased washed out bridges	$600,000	14
4: Remove or Reinforce Slipping Soil	Decreased isolation of people Decreased damage	$750,000	12
5: Build up Creek Banks	Decreased isolation of people Decreased road damage Decreased bank erosion	$840,000	11
6: Remove Debris from Waterways	Decreased isolation of people	Possible collateral adverse environmental impact Debris removal Property owner buy-in	10
8: Install Depth Sticks & High Water Signs	Increased public safety	$16,500	2
12: Develop and conduct public education program	Increased public safety Increased self-sufficiency Decreased response and recovery costs	$8,500	1
13: Install generator at community centers	Increased public safety Increased self-sufficiency Decreased response and recovery costs	$140,000	3
14: Drill community well in area affected by drought	Increased public safety Increased self-sufficiency Decreased response and recovery costs	$10,000	8
15: Mitigate chronically-flooded/damaged dwellings	Increased public safety Decreased response and recovery costs Community-owned green space	$67,000	9
16: Map flooding, water sources, causes and impacts	Increased public safety Decreased response and recovery costs	$15,000	6
17: Build Safe Rooms	Increased public safety Decreased response and recovery costs	Community education Community buy-in	7

Action	Benefits (Pros)	Costs (Cons)	Priority
18: Review and Update Planning Regulations	Increased public safety Decreased response and recovery costs Increased attractiveness to new businesses, visitors and residents	Elected official buy-in Voter buy-in Increased economic development costs	4

Section IV – Supplemental Information

Acronyms, Terms and Definitions

Term	Acronym	Description
Community Development Block Grant Program	CDBC	The Community Development Block Grant program is a flexible program that provides communities with resources to address a wide range of unique community development needs.
Community Asset		The people, structures, facilities, and systems that have value to the community
Dam - Class I		Dams having a total storage volume greater than five thousand acre-feet or a height of greater than sixty feet shall be placed in class I. A dam shall be placed in class I when sudden failure of the dam would result in one of the following conditions: (a) Probable loss of human life. (b) Structural collapse of at least one residence or one commercial or industrial business. Reference: OAC 1501:21-13-01(A)(1)
Dam - Class II		Dams having a total storage volume greater than five hundred acre-feet or a height of greater than forty feet shall be placed in class II. A dam shall be placed in class II when sudden failure of the dam would result in at least one of the following conditions, but loss of human life is not probable. (a) Disruption of a public water supply or wastewater treatment facility, release of health hazardous industrial or commercial waste, or other health hazards. (b) Flooding of residential, commercial, industrial, or publicly owned structures. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property. (c) Flooding of high-value property. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property. (d) Damage or disruption to major roads including but not limited to interstate and state highways, and the only access to residential or other critical areas such as hospitals, nursing homes, or correctional facilities as determined by the chief. (e) Damage or disruption to railroads or public utilities. (f) Damage to downstream class I, II or III dams or levees, or other dams or levees of high value. Damage to dams or levees can include, but is not limited to, overtopping of the structure. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property. Reference: OAC 1501:21-13-01(A)(2)
Dam - Class III		Dams having a total storage volume greater than fifty acre-feet or a height of greater than twenty-five feet shall be placed in class III. A dam shall be placed in class III when sudden failure of the dam would result in at least one of the following conditions, but loss of human life is not probable.

		(a) Property losses including but not limited to rural buildings not otherwise described in paragraph (A) of this rule, and class IV dams and levees not otherwise listed as high-value property in paragraph (A) of this rule. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property. (b) Damage or disruption to local roads including but not limited to roads not otherwise listed as major roads in paragraph (A) of this rule. Reference: OAC 1501:21-13-01(A)(3)
Dam - Class IV		Dams which are twenty-five feet or less in height and have a total storage volume of fifty acre-feet or less may be placed in class IV. When sudden failure of the dam would result in property losses restricted mainly to the dam and rural lands, and loss of human life is not probable, the dam may be placed in class IV. Class IV dams are exempt from the permit requirements of section 1521.06 of the Revised Code pursuant to paragraph (C) of rule 1501:21-19-01 of the Administrative Code. Reference: OAC 1501:21-13-01(A)(4)
Emergency Management Agency	EMA	
Federal Emergency Management Agency	FEMA	FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain and improve our capability to prepare for, protect against, respond to, recover from and mitigate all hazards.
Hazards U.S. Multi-Hazard	HAZUS-MH	The Hazards U.S. Multi-Hazard is a nationally applicable standardized method that estimates potential losses from earthquakes, hurricane winds, and floods. HAZUS-MH uses state-of-the-art geographic information system (GIS) software to map and display hazard data and estimates of damage and economic loss to buildings and infrastructure.
Impact		The consequences or effects of a hazard on the community and its assets
Mitigation		Activities providing a critical foundation in the effort to reduce the loss of life and property from natural and/or manmade disasters by avoiding or lessening the impact of a disaster and providing value to the public by creating safer communities. Mitigation seeks to fix the cycle of disaster damage, reconstruction, and repeated damage. These activities or actions, in most cases, will have a long-term sustained effect. Mitigation measures may be implemented prior to, during, or after an incident. Mitigation measures are often informed by lessons learned from prior incidents. Mitigation involves ongoing actions to reduce exposure to, probability of, or potential loss from hazards. Measures may include zoning and building codes, floodplain buyouts, and analysis of hazard related data to determine where it is safe to build or locate temporary facilities. Mitigation can include efforts to educate governments, businesses, and the public on measures they can take to reduce loss and injury.
Modified Mercalli Intensity Scale		The Modified Mercalli Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the

		nonscientist than the magnitude because intensity refers to the effects actually experienced at that place. The lower numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage.
Natural Hazard		Source of harm or difficulty created by a meteorological, environmental, or geological event
National Flood Insurance Program	NFIP	The National Flood Insurance Program is aimed at reducing the impact of flooding on private and public structures. This is achieved by providing affordable insurance for property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of Risk Insurance in general, and National Flood Insurance in particular.
National Oceanic and Atmospheric Administration	NOAA	Science, Service, and Stewardship. Mission: To understand and predict changes in climate, weather, oceans, and coasts, To share that knowledge and information with others, and To conserve and manage coastal and marine ecosystems and resources.
National Weather Service	NWS	The National Weather Service provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community.
Ohio Department of Natural Resources	ODNR	
Per Capita		Per unit of population.
Risk		The potential for damage, loss, or other impacts created by the interaction of natural hazards with community assets.
Risk Assessment		Product or process that collects information and assigns values to risks for the purpose of informing priorities, developing or comparing courses of action, and informing decision making.
Threat or Human-Caused Incident		Intentional actions of an adversary, such as a threatened or actual chemical or biological attack or cyber event
United States Geological Survey	USGS	The USGS serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.
United States Department of Housing and Urban Development	USHUD	HUD's mission is to create strong, sustainable, inclusive communities and quality affordable homes for all. HUD is working to strengthen the housing market to bolster the economy and protect consumers; meet the need for quality affordable rental homes; utilize housing as a platform for improving quality of life; build inclusive and sustainable

		communities free from discrimination, and transform the way HUD does business.
Vulnerability		Characteristics of community assets that make them susceptible to damage from a given hazard

Meeting Rosters

The Planning Team held jurisdictional public meetings to officially brief chief elected officials and gather data for inclusion in the updated plan.

Date	Jurisdiction	Attendees
10/20/2014	Village of Zaleski	Sheryl Goble, Fiscal Officer Cathy Dixon, Council Member Patricia Bartoe, Council Member James Shiveley, Council Member Annice Ercikson, Council Member Douglas Heitman, Mayor Ashleigh Claar, Vinton Co EMA Director David Pollinger, RDI Solutions
10/29/2014	Knox Twp	Faith Harkins, Fiscal Officer Thomas Wheatcraft, Trustee Frank Perry, Trustee Rick Brown, Trustee Darrell Perry, Trustee David Pollinger, RDI Solutions
10/30/2014	Swan Twp	Randall Trainer, Trustee Richard Faulkner, Trustee Roger Bentley, Trustee Beverly Goheen, Fiscal Officer David Pollinger, RDI Solutions
11/3/2014	Jackson Twp	Ashleigh Claar, Vinton Co EMA Director Charlie Harper, Trustee Rocky Stevens, Trustee Kayle Teeters, Trustee Bonnie Betts, Fiscal Officer David Pollinger, RDI Solutions
11/13/2014	Madison Twp	Tim Smallwood, Trustee Duane Molihan, Trustee William Bartoe, Trustee Judy Bartoe, Fiscal Officer David Pollinger, RDI Solutions
12/2/2014	Richland Twp	Danny Minton, Fiscal Officer Jerry Hawk, Trustee Paul Mullins, Trustee Curtis Rinehart, Trustee David Pollinger, RDI Solutions
1/8/2015	Harrison Twp	Mark Font, Trustee Ronald Hayes, Trustee Jim Lambert, Fiscal Officer David Pollinger, RDI Solutions

Date	Jurisdiction	Attendees
1/13/2015	Brown Twp	Floyd Largent, Trustee Heath Thompson, Trustee Karen Martin, Fiscal Officer Dan Sheets, Trustee Dexter Toney, Employee Trecia Kimes-Brown, Vinton Co Prosecuting Attorney Joshua Nickels, Vinton Co Deputy Sheriff One township resident David Pollinger, RDI Solutions
1/14/2015	Elk Twp	Marsha Collins, Fiscal Officer Terry Walker, Trustee Jerry Scarberry, Trustee Roy Robinette, Trustee Keith Hagerty, Employee Alan Stapleton, Employee David Pollinger, RDI Solutions
1/29/2015	Vinton Twp	Mike Malone, Trustee Glendon Barnes, Trustee Charles Malone, Trustee David Pollinger, RDI Solutions
1/30/2015	Wilkesville Twp	Mike Johnson, Trustee John Adams, Trustee Jim Shiffet, Trustee John Wood, Fire Chief Phyllis Mulholand, Fiscal Officer John Collins, Operator David Pollinger, RDI Solutions
2/11/2015	Village of Wilkesville	Tracie Barnes, Council Member Bonnie White, Council Member Jerry Mahon, Council Member Joseph White, Fiscal Officer Catherine Bowles, Mayor Ashleigh Claar, Vinton Co EMA Director David Pollinger, RDI Solutions
3/18/2015	Village of McArthur	Misty Napier, Council Member Juanita McNickle, Council Member Jeffery Griffith, Legal Counsel Dana Peters, Council Member Kim Wortman, Council Member David Bolender, Council Member David Gill, Council Member Jim Wooddell, Mayor Six county residents David Pollinger, RDI Solutions
3/26/2015	Eagle Twp	Craig Albright, Trustee Jack Vanover, Trustee Tina Richendollar, Fiscal Officer Rodney Emerine, Employee David Pollinger, RDI Solutions

Date	Jurisdiction	Attendees
4/11/2015	Clinton Twp	Jamie Chesser, Fiscal Officer Lawrence McWhorter, Trustee Matthew Chesser, Trustee William Wellman, Trustee John Womeldorf, Road Supervisor Gerald Martin, Twp Worker David Pollinger, RDI Solutions
4/13/2015	Village of Hamden	Jeffery Griffith, Legal Counsel Charles Wiseman, Mayor Susan Neri, Fiscal Officer Dale McManus, Council Member Kevin Repel, Council Member Marion Seymour, Council Member Mike Woodruff, Council Member Charles Boyer, Police Chief Michael Claar, Village Administrator Angela Browning, Utility Clerk David Pollinger, RDI Solutions

Note: Sign-in sheets for these meetings are on file in the Vinton County EMA Office.

Vinton County Quick Facts

People QuickFacts	Vinton County	Ohio	USA
Population, 2014 estimate	NA	11,594,163	318,857,056
Population, 2013 estimate	13,276	11,572,005	316,497,531
Population, 2010 (April 1) estimates base	13,435	11,536,725	308,758,105
Population, percent change - April 1, 2010 to July 1, 2014	NA	0.5%	3.3%
Population, percent change - April 1, 2010 to July 1, 2013	-1.2%	0.3%	2.5%
Population, 2010	13,435	11,536,504	308,745,538
Persons under 5 years, percent, 2013	5.3%	6.0%	6.3%
Persons under 18 years, percent, 2013	23.0%	22.9%	23.3%
Persons 65 years and over, percent, 2013	15.1%	15.1%	14.1%
Female persons, percent, 2013	50.0%	51.1%	50.8%
White alone, percent, 2013 (a)	97.6%	83.2%	77.7%
Black or African American alone, percent, 2013 (a)	0.5%	12.5%	13.2%
American Indian and Alaska Native alone, percent, 2013 (a)	0.4%	0.3%	1.2%
Asian alone, percent, 2013 (a)	0.2%	1.9%	5.3%
Native Hawaiian and Other Pacific Islander alone, percent, 2013 (a)	Z	Z	0.2%
Two or More Races, percent, 2013	1.2%	2.0%	2.4%
Hispanic or Latino, percent, 2013 (b)	0.8%	3.4%	17.1%
White alone, not Hispanic or Latino, percent, 2013	97.0%	80.5%	62.6%
Living in same house 1 year & over, percent, 2009-2013	91.0%	85.5%	84.9%
Foreign born persons, percent, 2009-2013	0.2%	4.0%	12.9%
Language other than English spoken at home, pct age 5+, 2009-2013	1.8%	6.6%	20.7%
High school graduate or higher, percent of persons age 25+, 2009-2013	80.4%	88.5%	86.0%
Bachelor's degree or higher, percent of persons age 25+, 2009-2013	8.5%	25.2%	28.8%
Veterans, 2009-2013	879	864,923	21,263,779
Mean travel time to work (minutes), workers age 16+, 2009-2013	29.3	23	25.5
Housing units, 2013	6,172	5,123,997	132,802,859
Homeownership rate, 2009-2013	76.4%	67.5%	64.9%
Housing units in multi-unit structures, percent, 2009-2013	3.7%	22.9%	26.0%
Median value of owner-occupied housing units, 2009-2013	$75,700	$130,800	$176,700
Households, 2009-2013	5,191	4,557,655	115,610,216
Persons per household, 2009-2013	2.56	2.47	2.63
Per capita money income in past 12 months (2013 dollars), 2009-2013	$18,101	$26,046	$28,155
Median household income, 2009-2013	$36,705	$48,308	$53,046
Persons below poverty level, percent, 2009-2013	20.6%	15.8%	15.4%
Business QuickFacts	**Vinton County**	**Ohio**	**USA**
Private nonfarm establishments, 2012	149	250,842	7,431,808
Private nonfarm employment, 2012	1,532	4,548,143	115,938,468
Private nonfarm employment, percent change, 2011-2012	-3.6%	2.6%	2.2%
Nonemployer establishments, 2012	699	743,915	22,735,915

Total number of firms, 2007	853	897,939	27,092,908
Black-owned firms, percent, 2007	F	5.8%	7.1%
American Indian- and Alaska Native-owned firms, percent, 2007	F	0.3%	0.9%
Asian-owned firms, percent, 2007	F	2.0%	5.7%
Native Hawaiian and Other Pacific Islander-owned firms, percent, 2007	F	S	0.1%
Hispanic-owned firms, percent, 2007	F	1.1%	8.3%
Women-owned firms, percent, 2007	23.6%	27.7%	28.8%
Manufacturers' shipments, 2007 ($1000)	106,494	295,890,890	5,319,456,312
Merchant wholesaler sales, 2007 ($1000)	D	135,575,279	4,174,286,516
Retail sales, 2007 ($1000)	43,303	138,816,008	3,917,663,456
Retail sales per capita, 2007	$3,241	$12,049	$12,990
Accommodation and food services sales, 2007 ($1000)	2,836	17,779,905	613,795,732
Building permits, 2013	0	19,903	990,822
Geography QuickFacts	**Vinton County**	**Ohio**	**USA**
Land area in square miles, 2010	412.36	40,860.69	3,531,905.43
Persons per square mile, 2010	32.6	282.3	87.4
Notes:			
(a) Includes persons reporting only one race.			
(b) Hispanics may be of any race, so also are included in applicable race categories.			
FN: Footnote on this item for this area in place of data			
NA: Not available			
D: Suppressed to avoid disclosure of confidential information			
X: Not applicable			
S: Suppressed; does not meet publication standards			
Z: Value greater than zero but less than half unit of measure shown			
F: Fewer than 100 firms			

Source: US Census Bureau State & County QuickFacts

Mitigation Action Sites

Those mitigation actions with specific sites were numbered, arrayed by jurisdiction and tagged by mitigation action in the table below:

Jurisdiction / Site Number & Location		Mitigation Actions: 1 - Raise Roadbed	2 - Culvert Size	3 - Lengthen Bridge	4 – Slipping Soil	5 – Creek Banks	8 – Depth Sticks	13 - Generators	14 - Community Well	15 – Mitigate Dwellings
Brown Township										
1	Buck Lane (TR 1) [Near Raccoon Creek]				X					
2	Shea Rd (TR 3) ½ mi off Wheelabout Rd (CR 3) by beaver dam						X			
3	Mace Rd (TR 5)				X					
4	Brown Twp Grange Hall, Cherry Ridge Rd							X		
Clinton Township										
5	SR 349 off SR 160	X					X			
6	SR 93 at Little Raccoon Creek						X			
7	Carr Ridge Rd (TR 1) at Sugar Run	X					X			
8	Hartwell Rd (TR 3) just off SR 160	X					X			
9	Rowland Rd (TR 5) ¼ mile north of SR 160		X				X			
10	Sam Russell Rd (TR 6)						X			
Eagle Township										
12	Eagle Mills Rd (CR 17)	X					X			
13	Narrows Rd (CR 45)	X			X		X			
14	SR 327 north of Eagle Mills Rd (CR 17) over Pike Run						X			
15	Albright Rd (TR 11) north of Eagle Mills		X			X	X			
16	McGee Rd (TR 13A) just off Beechgrove Rd (CR 16)		X				X			
17	Dixon Mill Rd (TR 16) along Salt Creek					X	X			
18	Stevens Branch Rd (TR 9) at beginning of Stevens Branch		X				X			
19	Eagle Twp Hall, 53302 Eagle Mills Rd							X		
Elk Township										
20	Meeksville Rd (TR 7) at SR 93						X			
21	SR 93 at Elk Fork						X			
22	SR 93 at Krazy Katie's						X			
23	SR 93 at Puncheon Fork						X			
24	Infirmary Rd (TR 14) from SR 93 almost to Morgan Rd	X	X				X			
25	US 50 east of Old McArthur Rd (CR 7)						X			
26	Vinton County Community Building, 31935 SR 93							X		
Harrison Township										
27	Ponetown Rd (CR 13) at Middle Fork Salt Creek						X			
28	Woodruff Rd (TR 11) at Pigeon Creek			X			X			

Jurisdiction / Site Number & Location		Mitigation Actions: 1 - Raise Roadbed	2 - Culvert Size	3 - Lengthen Bridge	4 – Slipping Soil	5 – Creek Banks	8 – Depth Sticks	13 - Generators	14 - Community Well	15 – Mitigate Dwellings
29	Clark Rd (TR 14) between US 50 & Benson Rd (TR 15) at Salt Creek)		X				X			
30	Clary Rd (TR 16) from Salt Creek east	X		X			X			
31	Nichols Rd (TR 18) just off Fout Rd (TR 19)					X				
32	Fout Rd (TR 19) just north of Nichols Rd (TR 18)	X			X		X			
33	Thompson Rd (TR 5) just off US 50 at Salt Creek			X		X	X			
34	Harrison Twp Hall, 54625 US 50							X		
Jackson Township										
35	Claypool Hollow (TR 4) near end	X					X			
36	Goosecreek Rd (CR 18) at Middle Fork Salt Creek						X			
37	Macedonia Rd (CR 47) at North Branch						X			
38	Old Sowers Rd (TR 33) at Sowers Rd (TR 20)				X					
39	Ratcliff Hollow Rd (TR 7) within Jackson Twp	X					X			
40	Sowers Rd (TR 20) – mid point	X	X				X			
41	Jackson Twp Hall, 29725 Goosecreek Rd							X	X	
82	59499 Curry Rd									X
Knox Township										
42	SR 356 1 mile north of US 50	X					X			
43	Staneart Hollow Rd (TR 4) along Raccoon Creek				X					
44	Bunker Hill Rd (TR 13) at Raccoon Creek				X					
45	Stanley Rd (TR 19) at Laurel Run	X					X			
46	Harrison Twp Hall, 54625 US 50							X		
Madison Township										
47	SR 278 at Raccoon Creek and Atkinson Ridge Rd (TR 5)	X					X			
48	SR 278 at south side of Zaleski						X			
49	SR 278 north of Zaleski (2 sites)						X			
50	Webb Rd (TR 24) at Raccoon Creek	X					X			
51	Corbin Hollow Rd ½ mi south of Zaleski off SR 278	X	X				X			
Richland Township										
52	SR 683 south from US 50 to Mt Zion Rd (CR 37)	X					X			
53	US 50 east of Allensville						X			
54	US 50 west from West Elementary School to Kelly Rd (CR 12)	X					X			
55	Richland Twp Hall, 58253 US 50							X		
Swan Township										
56	Siverly Creek Rd (CR 19) just off SR 93						X			
57	SR 93 at Brushy Fork near Shurtz Rd (CR 21)						X			
58	SR 93 at Brushy Fork near Airport Rd (CR 22)						X			

Jurisdiction / Site Number & Location		Mitigation Actions: 1 - Raise Roadbed	2 - Culvert Size	3 - Lengthen Bridge	4 – Slipping Soil	5 – Creek Banks	8 – Depth Sticks	13 - Generators	14 - Community Well	15 – Mitigate Dwellings
59	SR 93 at Brushy Fork near Dunkle Creek Rd (CR 34)						X			
60	Orland Flat Rd (TR 19A) at Honey Fork									
61	Old Shurtz Rd (TR 16) just off Shurtz Rd (CR 21)						X			
62	Mitchell Hollow Rd (TR 12A) just off SR 328	X					X			
63	Swan Twp Hall, 26601 SR 93							X		
Vinton Township										
64	SR 160 at and south of Cottrill Rd (CR 28) at Raccoon Creek						X			
65	SR 32 just west of Thompsonville Rd (CR 10) at Raccoon Creek						X			
66	Knox Rd (TR 11) .25 mi south of Fred Erikson Rd (TR 22)				X					
67	Barnes Rd (TR 8) just off Arbaugh Rd N (CR 43B) by Elk Fork	X			X		X			
68	Runyon Rd (TR 9) just off Barnes Rd (TR 8)				X					
69	Vinton Twp Hall, 38000 Arbaugh Rd							X		
Wilkesville Township										
70	Thompsonville Rd (CR 10) at Raccoon Creek near CR 9	X					X			
71	Hawk Station Rd (CR 9) at Raccoon Creek near CR 10						X			
72	Clarion Rd (TR 25) near Clarion				X					
73	McMillin Rd (TR 1) near Meigs County line				X					
74	Rocky Steep Rd (TR 21)				X					
75	Minerton Rd (CD 28) just off SR 124				X					
76	Minerton Chapel Rd (TR 8) at Raccoon Creek					X	X			
Village of Hamden										
77	Scott Ave between Elm St and Young Ave		X				X			
78	Woolweaver Ave at Sugar Run			X			X			
79	Hamden Community Building, 138 E Railroad St, Hamden							X		
83	275 Wilcox St, Hamden									X
Village of McArthur										
80	Spring St at Puncheon Fork						X			
Village of Wilkesville										
81	Wilkesville Community Center, 164 Main St, Wilkesville							X		
Village of Zaleski										
82	Zaleski/Madison Twp Hall, N Broadway St, Zaleski							X		

Brown Township

1 Buck Lane (TR 1) [Near Raccoon Creek]

2 Shea Rd (TR 3) ½ mi off Wheelabout Rd (CR 3) by beaver dam

3 Mace Rd (TR 5)

4 Brown Twp Grange Hall, Cherry Ridge Rd

Clinton Township

5 SR 349 off SR 160

6 SR 93 at Little Raccoon Creek

7 Carr Ridge Rd (TR 1) at Sugar Run

8 Hartwell Rd (TR 3) just off SR 160

9 Rowland Rd (TR 5) ¼ mile north of SR 160

10 Sam Russell Rd (TR 6)

Eagle Township

12 Eagle Mills Rd (CR 17)

13 Narrows Rd (CR 45)

14 SR 327 north of Eagle Mills Rd (CR 17) over Pike Run

15 Albright Rd (TR 11) north of Eagle Mills

16 McGee Rd (TR 13A) just off Beechgrove Rd (CR 16)

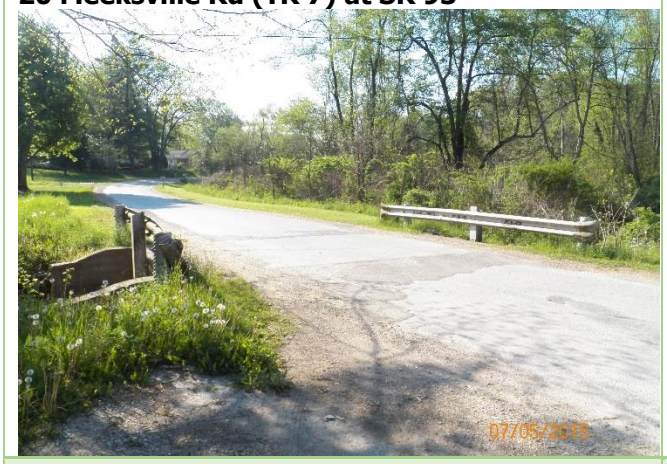
17 Dixon Mill Rd (TR 16) along Salt Creek

18 Stevens Branch Rd (TR 9) at beginning of Stevens Branch

19 Eagle Twp Hall, 53302 Eagle Mills Rd

Elk Township

20 Meeksville Rd (TR 7) at SR 93



21 SR 93 at Elk Fork

22 SR 93 at Krazy Katie's

23 SR 93 at Puncheon Fork

24 Infirmary Rd (TR 14) from SR 93 almost to Morgan Rd

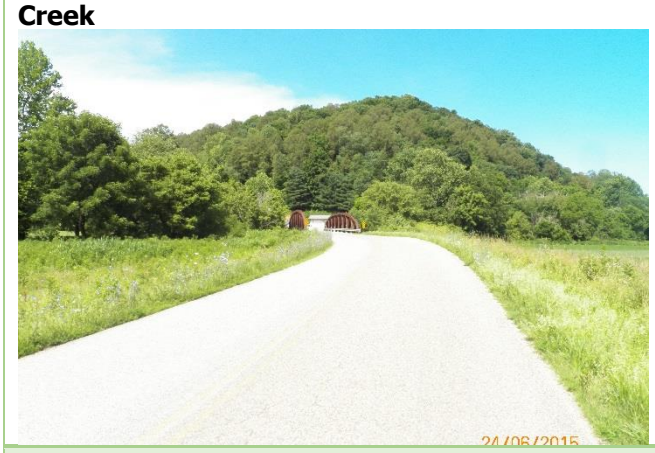
25 US 50 east of Old McArthur Rd (CR 7)

26 Vinton County Community Building, 31935 SR 93

Vinton Station Rd (CR) at US 50

Harrison Township

27 Ponetown Rd (CR 13) at Middle Fork Salt Creek

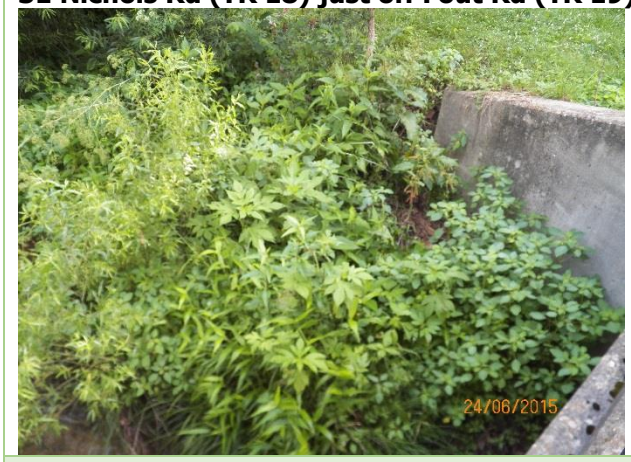


28 Woodruff Rd (TR 11) at Pigeon Creek

29 Clark Rd (TR 14) between US 50 & Benson Rd (TR 15) at Salt Creek)

30 Clary Rd (TR 16) from Salt Creek east

31 Nichols Rd (TR 18) just off Fout Rd (TR 19)



32 Fout Rd (TR 19) just north of Nichols Rd (TR 18)

33 Thompson Rd (TR 5) just off US 50 at Salt Creek

34 Harrison Twp Hall, 54625 US 50

Jackson Township

35 Claypool Hollow (TR 4) near end

36 Goosecreek Rd (CR 18) at Middle Fork Salt Creek

37 Macedonia Rd (CR 47) at North Branch

38 Old Sowers Rd (TR 33) at Sowers Rd (TR 20)

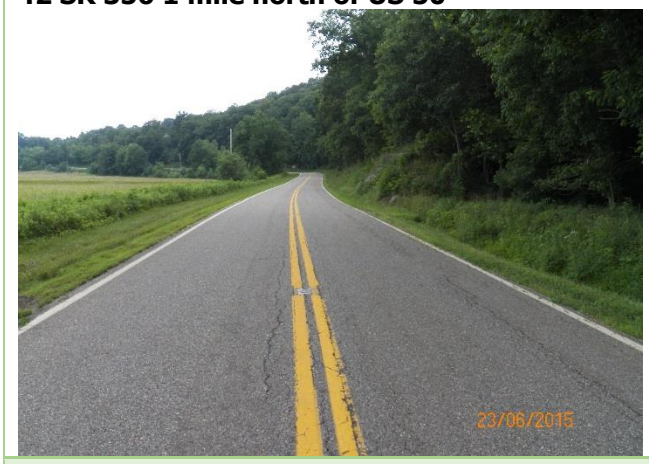
39 Ratcliff Hollow Rd (TR 7) within Jackson Twp

40 Sowers Rd (TR 20) – mid point

47 Jackson Twp Hall, 29725 Goosecreek Rd

Knox Township

42 SR 356 1 mile north of US 50



43 Staneart Hollow Rd (TR 4) along Raccoon Creek

44 Bunker Hill Rd (TR 13) at Raccoon Creek

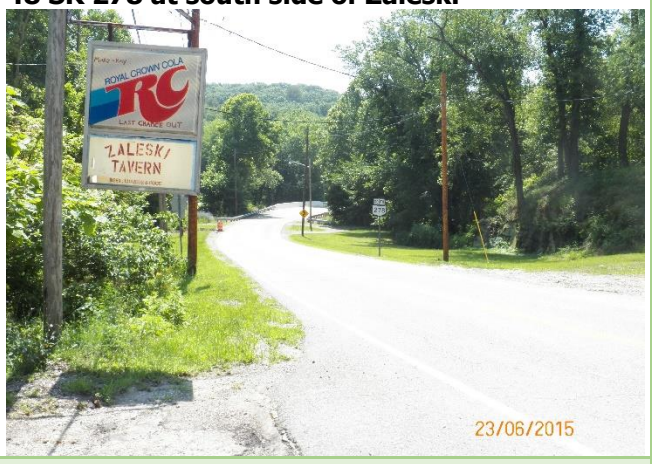
45 Stanley Rd (TR 19) at Laurel Run

46 Knox Twp Hall, SR 356 & CR 35

Madison Township

47 SR 278 at Raccoon Creek and Atkinson Ridge Rd (TR 5)

48 SR 278 at south side of Zaleski



49 SR 278 north of Zaleski (2 sites)

50 Webb Rd (TR 24) at Raccoon Creek

51 Corbin Hollow Rd ½ mi south of Zaleski off SR 278

Richland Township

52 SR 683 south from US 50 to Mt Zion Rd (CR 37)

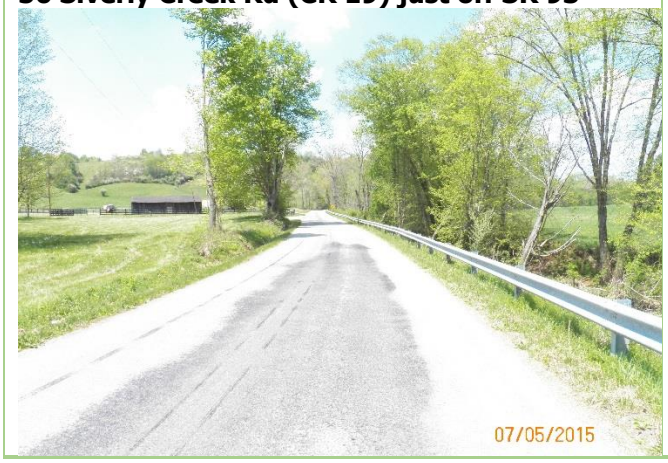
53 US 50 east of Allensville

54 US 50 west from West Elementary School to Kelly Rd (CR 12)

55 Richland Twp Hall, 58253 US 50

Swan Township

56 Siverly Creek Rd (CR 19) just off SR 93

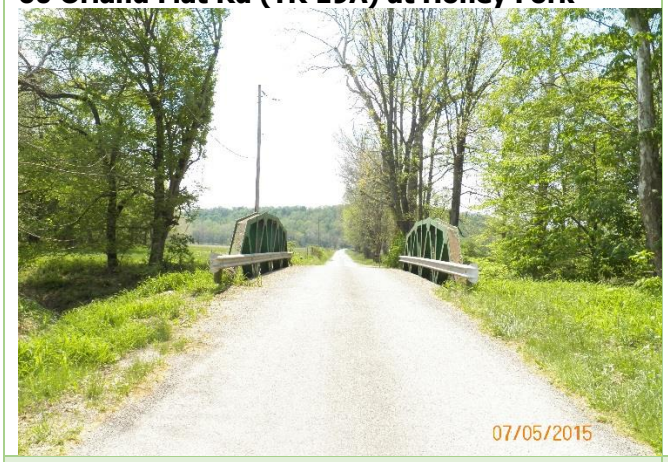


57 SR 93 at Brushy Fork near Shurtz Rd (CR 21)

58 SR 93 at Brushy Fork near Airport Rd (CR 22)

59 SR 93 at Brushy Fork near Dunkle Creek Rd (CR 34)

60 Orland Flat Rd (TR 19A) at Honey Fork



61 Old Shurtz Rd (TR 16) just off Shurtz Rd (CR 21)

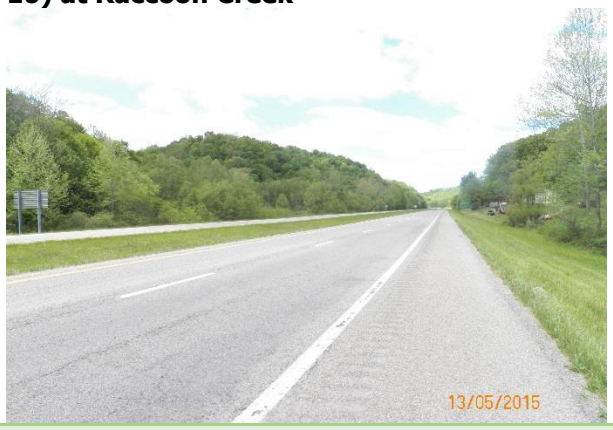
62 Mitchell Hollow Rd (TR 12A) just off SR 328

63 Swan Twp Hall, 26601 SR 93

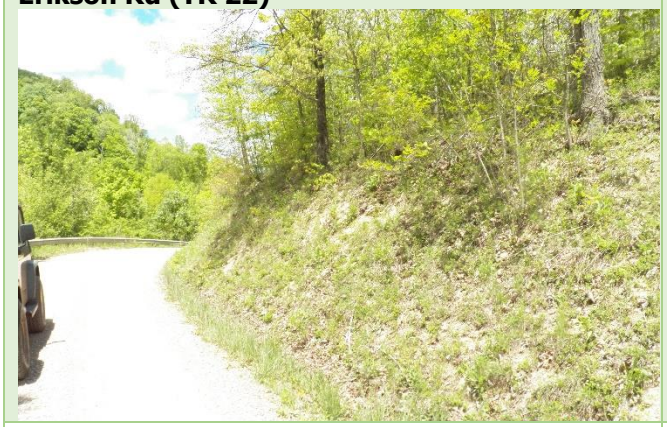
Vinton Township

64 SR 160 at and south of Cottrill Rd (CR 28) at Raccoon Creek

65 SR 32 just west of Thompsonville Rd (CR 10) at Raccoon Creek



66 Knox Rd (TR 11) .25 mi south of Fred Erikson Rd (TR 22)



67 Barnes Rd (TR 8) just off Arbaugh Rd N (CR 43B) by Elk Fork

68 Runyon Rd (TR 9) just off Barnes Rd (TR 8)

69 Vinton Twp Hall, 38000 Arbaugh Rd

Wilkesville Township

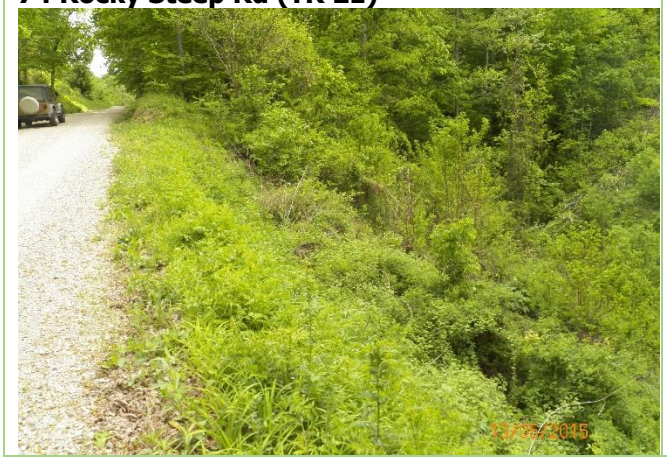
70 Thompsonville Rd (CR 10) at Raccoon Creek near CR 9

71 Hawk Station Rd (CR 9) at Raccoon Creek near CR 10

72 Clarion Rd (TR 25) near Clarion

73 McMillin Rd (TR 1) near Meigs County line

74 Rocky Steep Rd (TR 21)

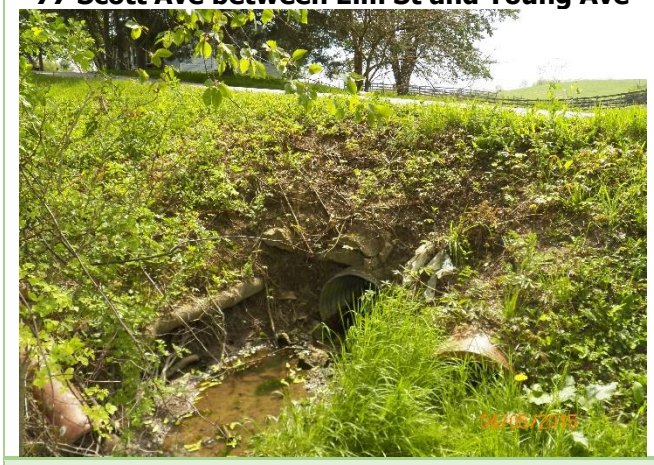


75 Minerton Rd (CD 28) just off SR 124

76 Minerton Chapel Rd (TR 8) at Raccoon Creek

Village of Hamden

77 Scott Ave between Elm St and Young Ave



78 Woolweaver Ave at Sugar Run

79 Hamden Community Building, 138 E Railroad St

Village of McArthur

80 Spring St at Puncheon Fork

Village of Wilkesville

81 Wilkesville Community Center, 164 Main St

Village of Zaleski

82 Zaleski/Madison Twp Hall, N Broadway St, Zaleski

HAZUS-MH Reports Used in Hazard Analysis

HAZUS-MH: Flood Event Report

Region Name: Vinton Co OH

Flood Scenario: 25-Year Flood Scenario

Print Date: Tuesday, July 08, 2014

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Ohio

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 414 square miles and contains 1,005 census blocks. The region contains over 5 thousand households and has a total population of 12,806 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 6,600 buildings in the region with a total building replacement value (excluding contents) of 648 million dollars (2006 dollars). Approximately 93.83% of the buildings (and 75.04% of the building value) are associated with residential housing.

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Vinton Co OH
Scenario Name:	25-Year Flood Scenario
Return Period Analyzed:	25
Analysis Options Analyzed:	No What-Ifs

Before the flood analyzed in this scenario, the region had hospital beds available for use. On the day of the scenario flood event, the model estimates that hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	4	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	7	1	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

The total economic loss estimated for the flood is 23.26 million dollars, which represents 5.00 % of the total replacement value of the scenario buildings.

Building-Related Losses

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

The total building-related losses were 11.57 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 70.95% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

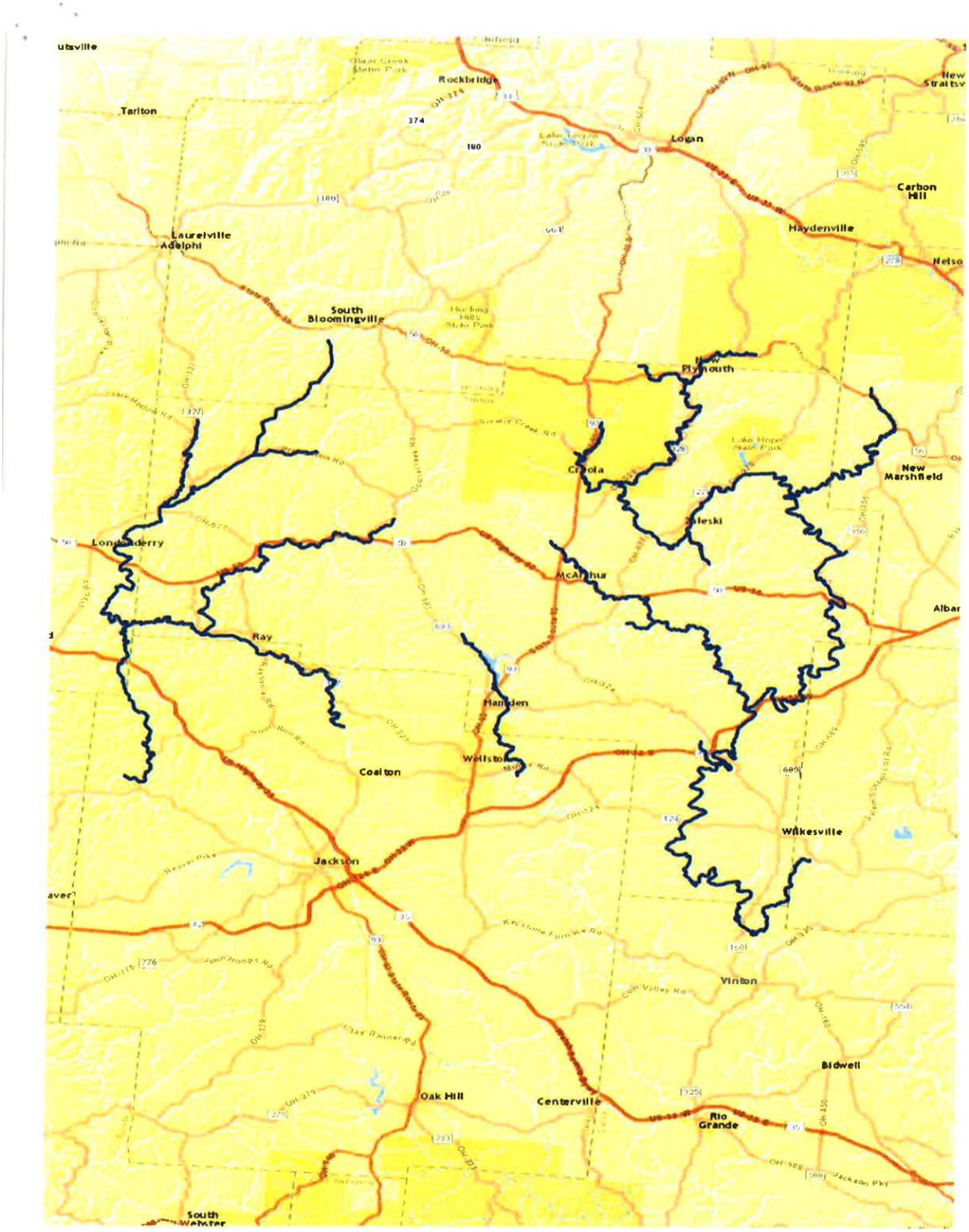
Table 6: Building-Related Economic Loss Estimates

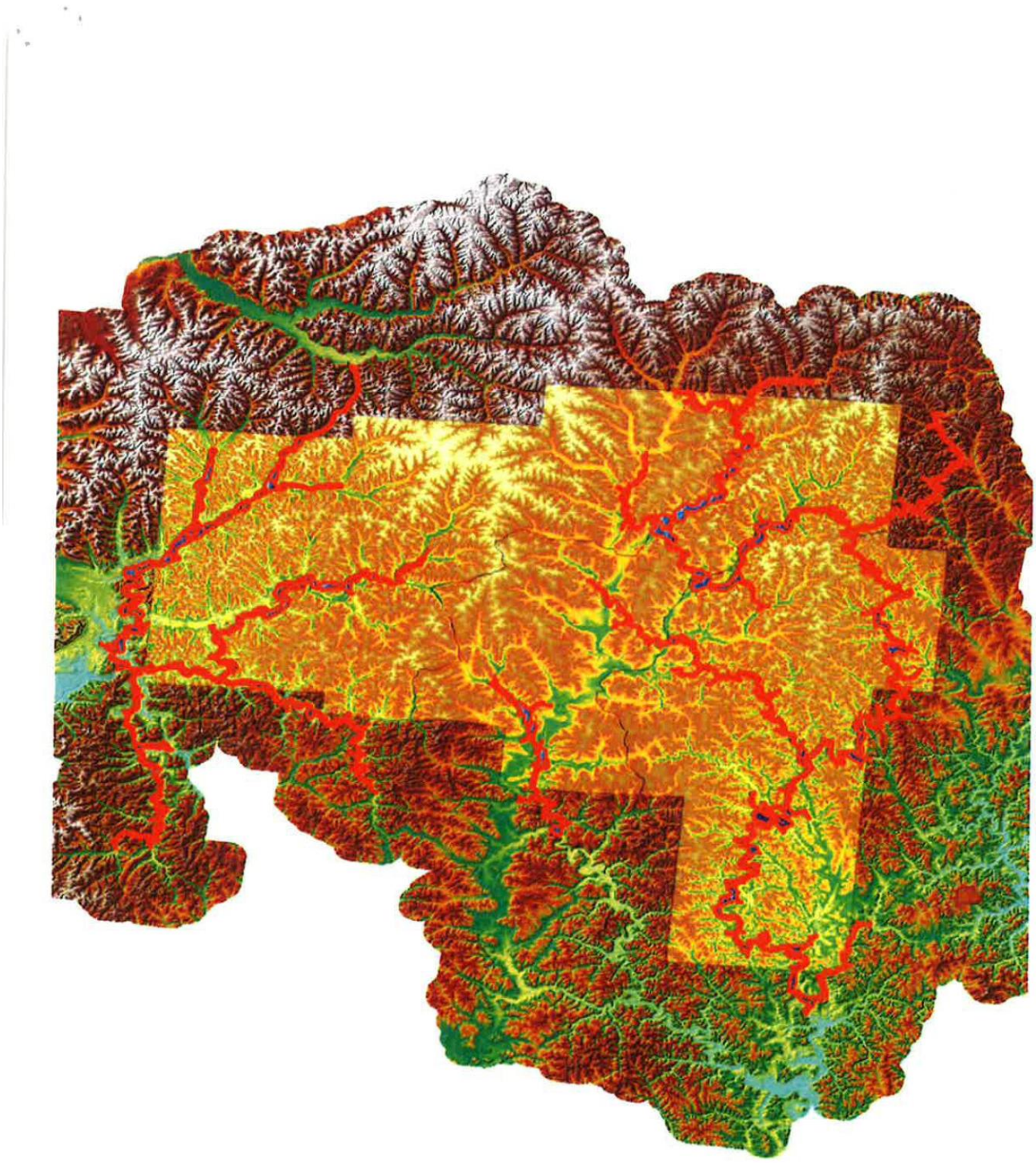
(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	5.30	0.32	0.19	0.28	6.08
	Content	2.95	0.89	0.32	1.16	5.32
	Inventory	0.00	0.06	0.08	0.04	0.18
	Subtotal	**8.24**	**1.27**	**0.58**	**1.48**	**11.57**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.04	0.05
	Subtotal	**0.01**	**0.00**	**0.00**	**0.04**	**0.06**
ALL	**Total**	**8.25**	**1.27**	**0.58**	**1.52**	**11.63**

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Ohio				
Vinton	12,806	486,223	161,697	647,920
Total	**12,806**	**486,223**	**161,697**	**647,920**
Total Study Region	**12,806**	**486,223**	**161,697**	**647,920**


Rockbridge
Tarlton
Logan
Carbon Hill
Haydenville
Laurelville
Adelphi
South Bloomingville
New Plymouth
Crola
New Marshfield
Londonderry
McArthur
Albar
Ray
Hamden
Wellston
Coalton
Jackson
Wilkesville
Vinton
Bidwell
Oak Hill
Centerville
Rio Grande
South Webster



HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	McArthur OH (Epicenterf)
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-82.48
Latitude of Epicenter	39.25
Earthquake Magnitude	5.40
Depth (Km)	0.50
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	CEUS Event

HAZUS-MH: Flood Event Report

Region Name: Vinton Co OH

Flood Scenario: 100 Year Flood Scenario

Print Date: Tuesday, July 08, 2014

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Ohio

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 414.48 square miles and contains 3 census tracts. There are over 4 thousand households in the region and has a total population of 12,806 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 6 thousand buildings in the region with a total building replacement value (excluding contents) of 647 (millions of dollars). Approximately 94.00 % of the buildings (and 75.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 477 and 209 (millions of dollars) , respectively.

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Vinton Co OH
Scenario Name:	100 Year Flood Scenario
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Before the flood analyzed in this scenario, the region had hospital beds available for use. On the day of the scenario flood event, the model estimates that hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	4	0	0	0
Hospitals	0	0	0	0
Police Stations	2	0	0	0
Schools	7	1	0	1

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

The total economic loss estimated for the flood is 13.77 million dollars, which represents 5.59 % of the total replacement value of the scenario buildings.

Building-Related Losses

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

The total building-related losses were 13.71 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 72.01% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

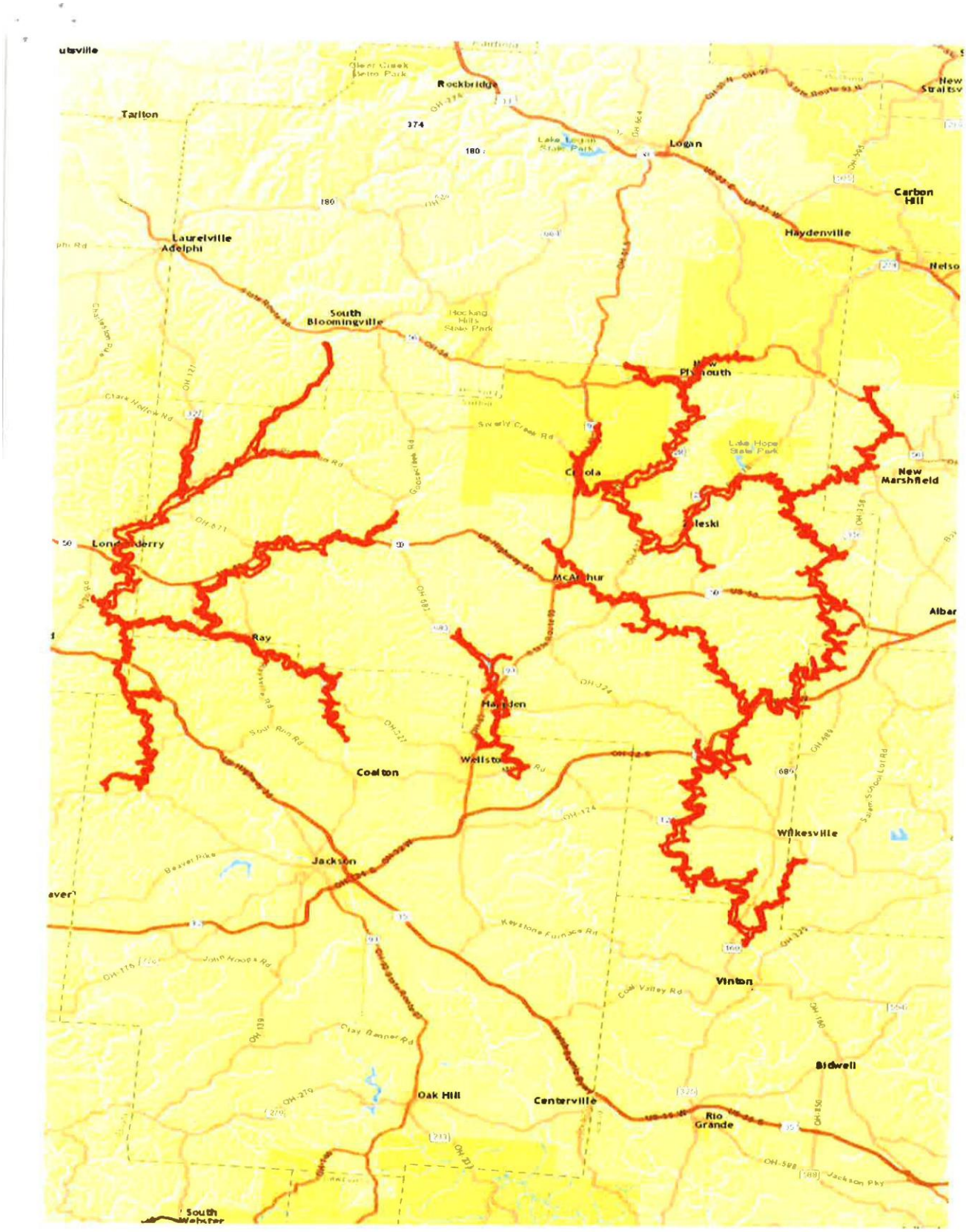
Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	6.38	0.39	0.22	0.30	7.29
	Content	3.53	1.05	0.39	1.25	6.21
	Inventory	0.00	0.07	0.09	0.04	0.21
	Subtotal	**9.91**	**1.51**	**0.70**	**1.59**	**13.71**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.05	0.05
	Subtotal	**0.01**	**0.01**	**0.00**	**0.05**	**0.06**
ALL	**Total**	**9.92**	**1.51**	**0.70**	**1.64**	**13.77**

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Ohio				
Vinton	12,806	486,223	161,697	647,920
Total	**12,806**	**486,223**	**161,697**	**647,920**
Total Study Region	**12,806**	**486,223**	**161,697**	**647,920**


Rockbridge
Tarlton
Logan
Carbon Hill
Haydenville
Laurelville
Adelphi
South Bloomingville
Hocking Hills State Park
Lake Hope State Park
New Marshfield
Londonderry
McArthur
Ray
Coalton
Jackson
Wilkesville
Vinton
Bidwell
Oak Hill
Centerville
Rio Grande

HAZUS-Multi-Hazard
to SHARPP Conversion

Jurisdiction: Vinton County

100-Year Flood Scenario X
25-Year Flood Scenario

From the Building Inventory, General Building Stock, Page 4,
enter # of Buildings in the region: 6,600

Table 1
Building Exposure by Occupancy Type for the Study Region (County)

Occupancy		Enter Exposure from Table 1 (Exposure x $1000)	Enter Percent of Total (i.e. 70.7% enter .707)	Number of Buildings
Residential	$	486,223	0.75	4,950
Commercial	$	64,784	0.1	660
Industrial	$	44,410	0.069	455
Agriculture	$	3,848	0.006	40
Religion	$	27,511	0.042	277
Government	$	12,901	0.02	132
Education	$	8,243	0.013	86
Total	$	647,920		100

Building Type	Number of Buildings		Exposure in Study Region
Residential	4,950	$	486,223,000
Non-Residential	1,155	$	113,042,000
Critical Facilities	495	$	48,655,000

Table 2
Building Exposure by Occupancy Type for this Scenario (Flood)

Occupancy		Enter Exposure from Table 2 (Exposure x $1000)	Ratio (Do not enter any numbers)	Number of Buildings
Residential	$	197,449	0.41	2010
Commercial	$	19,538	0.30	199
Industrial	$	17,513	0.39	180
Agriculture	$	1,972	0.51	20
Religion	$	6,925	0.25	70
Government	$	2,509	0.19	26
Education	$	227	0.03	2
Total	$	246,133		

Here is the Vulnerability Analysis for SHARPP:

Building Type	Number of Buildings		Exposure for this Scenario
Residential	2,010	$	197,449,000
Non-Residential	399	$	39,023,000
Critical Facilities	98	$	9,661,000
Totals:	2,507	$	246,133,000

HAZUS-MH: Earthquake Event Report

Region Name Vinton Co (McArthur Epicenter)

Earthquake Scenario: McArthur OH (Epicenterf)

Print Date: July 15, 2014

Totals only reflect data for those census tracts/blocks included in the user's study region.

Disclaimer:
The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Ohio

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 414.48 square miles and contains 3 census tracts. There are over 4 thousand households in the region and has a total population of 12,806 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 6 thousand buildings in the region with a total building replacement value (excluding contents) of 647 (millions of dollars). Approximately 94.00 % of the buildings (and 75.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 477 and 209 (millions of dollars) , respectively.

Table 1: Transportation System Lifeline Inventory

System	Component		# locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges		172	57.10
	Segments		5	343.70
	Tunnels		0	0.00
		Subtotal		**400.90**
Railways	Bridges		1	0.00
	Facilities		0	0.00
	Segments		22	28.10
	Tunnels		0	0.00
		Subtotal		**28.10**
Light Rail	Bridges		0	0.00
	Facilities		0	0.00
	Segments		0	0.00
	Tunnels		0	0.00
		Subtotal		**0.00**
Bus	Facilities		0	0.00
		Subtotal		**0.00**
Ferry	Facilities		0	0.00
		Subtotal		**0.00**
Port	Facilities		0	0.00
		Subtotal		**0.00**
Airport	Facilities		1	10.70
	Runways		1	38.00
		Subtotal		**48.60**
		Total		**477.60**

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	McArthur OH (Epicenterf)
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-82.48
Latitude of Epicenter	39.25
Earthquake Magnitude	5.40
Depth (Km)	0.50
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	CEUS Event

Essential Facility Damage

Before the earthquake, the region had 0 hospital beds available for use. On the day of the earthquake, the model estimates that only 0 hospital beds (0.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 0.00% of the beds will be back in service. By 30 days, 0.00% will be operational.

Table 5: Expected Damage to Essential Facilities

	# Facilities			
Classification	Total	At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	7	0	0	1
EOCs	0	0	0	0
PoliceStations	2	0	0	0
FireStations	4	0	0	2

Table 7 : Expected Utility System Facility Damage

System	Total #	# of Locations With at Least Moderate Damage	# of Locations With Complete Damage	with Functionality > 50 % After Day 1	with Functionality > 50 % After Day 7
Potable Water	0	0	0	0	0
Waste Water	3	3	0	0	3
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	1,382	53	13
Waste Water	829	42	10
Natural Gas	553	44	11
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	4,892	0	0	0	0	0
Electric Power		3,892	2,373	871	140	5

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 41 households to be displaced due to the earthquake. Of these, 31 people (out of a total population of 12,806) will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

The total economic loss estimated for the earthquake is 119.12 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

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

The total building-related losses were 63.05 (millions of dollars); 17 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 63 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.43	0.94	0.16	0.33	1.86
	Capital-Related	0.00	0.18	0.87	0.09	0.05	1.20
	Rental	0.73	0.56	0.52	0.04	0.12	1.98
	Relocation	2.71	1.08	0.78	0.17	0.87	5.61
	Subtotal	**3.45**	**2.25**	**3.11**	**0.46**	**1.37**	**10.64**
Capital Stock Loses							
	Structural	3.36	1.35	0.96	0.50	0.83	7.00
	Non_Structural	15.04	5.66	3.37	2.44	3.05	29.56
	Content	6.92	1.78	2.37	1.90	2.19	15.16
	Inventory	0.00	0.00	0.09	0.58	0.03	0.70
	Subtotal	**25.32**	**8.78**	**6.78**	**5.43**	**6.09**	**52.41**
	Total	**28.77**	**11.04**	**9.90**	**5.89**	**7.46**	**63.05**

Table 13: Utility System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Line	27.60	$0.24	0.86
	Subtotal	**27.65**	**$0.24**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	209.80	$51.39	24.50
	Distribution Line	16.60	$0.19	1.13
	Subtotal	**226.38**	**$51.58**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Line	11.10	$0.20	1.81
	Subtotal	**11.06**	**$0.20**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Communication	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
	Total	**265.08**	**$52.01**	

Appendix A: County Listing for the Region

Vinton,OH

HAZUS-MH Earthquake
to SHARPP Conversion

1. Enter the Building Counts from Table 3:

	None	Slight	Moderate	Extensive	Complete	General Building Stock	Total Affected
Agriculture	17	7	6	2	0	32	**8**
Commercial	109	48	40	14	3	214	**57**
Education	4	2	2	1	0	9	**3**
Government	14	5	4	1	0	24	**5**
Industrial	46	18	16	6	1	87	**23**
Other Residential	1,264	686	612	129	15	2,706	**756**
Religion	20	9	8	3	1	41	**12**
Single Family	2,029	900	430	105	25	3,489	**560**
Totals by Damage:	3,503	1,675	1,118	261	45	6,602	**1,424**

2. Enter the Building Values, as is, from Appendix B:

		Value	Value per Structure
Enter the Residential Building Value	486	$ 486,000,000	$ 139,294.93
Enter Non-Residential Building Value	161	$ 161,000,000	$ 51,718.60

3. The computer calculates the "non-residential" structures and percentages as:

	# of Bldgs.	Percentage
Number of Non-Residential Buildings	3,039	97.62%
Number of Critical Facilities	74	2.38%
Total of Non-Residential Structures	3,113	

4. Here is the Vulnerability Analysis for SHARPP:

Building Type	Number of Buildings	Exposure in Study Region
Residential	560	$78,005,159.07
Non-Residential	844	$43,650,497.91
Critical Facilities	20	$1,034,371.99
Totals:	1,424	$122,690,028.97

County: **Vinton**