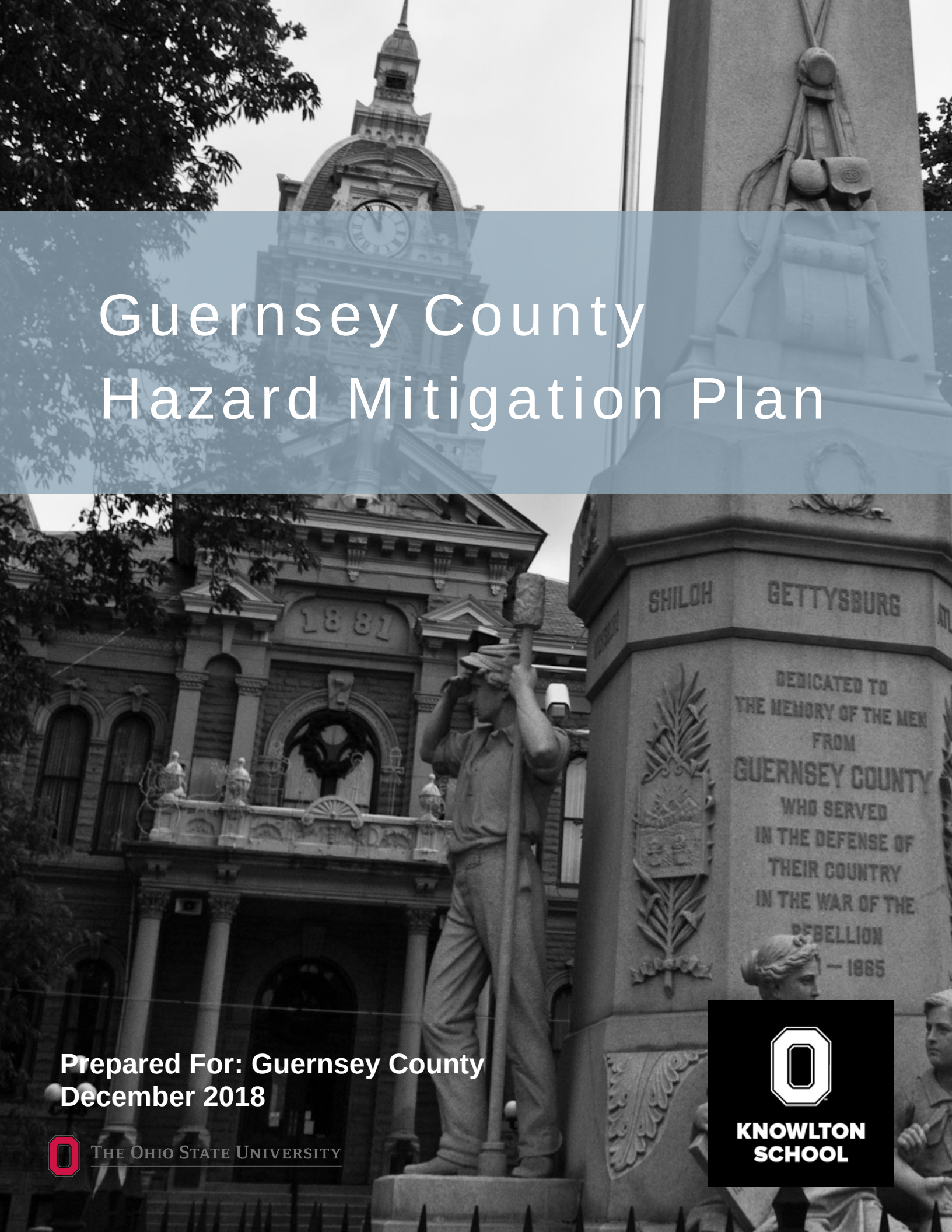

Guernsey County Hazard Mitigation Plan

Prepared For: Guernsey County
December 2018

The Ohio State University

KNOWLTON SCHOOL

Table of Contents

1 Introduction

Overview

Following expiration of its 2011 Multi-Jurisdiction Hazard Mitigation Plan, Guernsey County and its constituents have seen it fit to adopt a new, updated plan. As outlined in the Disaster Mitigation Act of 2000 (DMA2K), any local jurisdiction seeking funding from the Federal Emergency Management Agency (FEMA) must maintain an up-to-date disaster mitigation plan. This Plan meets the criteria as set forth by FEMA in the DMA2K and provides the County and its participating jurisdictions with a comprehensive guide for future mitigation efforts to combat the hazards that affect their communities.

Both natural and man-made hazards pose a variety of risks to the lives, businesses, and properties within Guernsey County. As such, the County recognizes the effectiveness of proper mitigation planning to prepare for and ultimately minimize the social, environmental, and economic costs of such events. Guernsey County officials, local jurisdiction representatives, and other interested stakeholders dedicated their time and efforts to develop this updated Guernsey County Multi-Hazard Mitigation Plan (the Plan) with assistance from the Ohio Emergency Management Agency (OEMA), FEMA, and Professor Kimberly Burton's Hazard Mitigation Planning Studio of City and Regional Planning graduate students at The Ohio State University.

This Plan is comprised of six sections, detailing the methods, analysis, and discussion surrounding the various hazards that threaten Guernsey County and its jurisdictions. These sections are as follows:

- Section 1, **Introduction**, includes a discussion about the general purpose and goals that the county wishes to achieve throughout the development and implementation of the Plan, along with a summary of the Plan's contents.
- Section 2, **History and Demographics**, includes a short description of Guernsey County and each of the participating jurisdictions, including their history, population, and other general information.
- Section 3, **Planning Process**, recounts the process involved in the development of this plan, including a description of who participated, how community involvement was incorporated, what hazards were included in the Plan and why, and how the Plan was composed through public meetings, reviews, and evaluations.
- Section 4 is composed of the **Hazard Identification and Risk Assessment (HIRA)**. The HIRA includes descriptions and analysis of the potential natural and manmade hazards that could affect the County. Section 4 includes a comprehensive list of the natural and manmade hazards that are considered in the mitigation plan and a list of excluded hazards, including the reason for their exclusion. Each hazard is subsequently profiled by discussing its nature, location, extent, historical impact on Guernsey County (if applicable), and likelihood of occurrence. Each hazard profile concludes with an assessment of the County's vulnerability to the hazard, including the number of vulnerable structures and/or crops and their asset values. This includes critical facilities and publicly owned structures.
- Section 5, **Hazard Mitigation**, outlines the goals, strategies, and actions for the County and its jurisdictions. The proposed actions are presented in tables, grouped by which hazard they principally address. They are ranked from highest to lowest priority, according to feedback received from County officials, as well as participating jurisdictions and stakeholders.

- Section 6, **Schedule and Maintenance** provides a synopsis of the proposed Plan adoption, integration, and maintenance schedule.

The updated Guernsey County Hazard Mitigation Plan will be submitted to the OEMA and, subsequently, FEMA for review. Following the agency review, the jurisdictions will then review the Plan for adoption. This hazard mitigation plan serves as a helpful tool for citizens, policymakers, local businesses, and other local stakeholders who all share a public interest in keeping Guernsey County as safe and resilient as possible. As such, this plan aims to:

- Minimize property damage, economic loss, injury, and loss of human life – to achieve the Plan's main goal of reducing the impact of natural and man-made hazards on the County's economy and the well-being of its citizens.
- Enhance public awareness and education – to widen the public's understanding of natural and manmade hazards and how they might affect public health and safety, the environment, the local economy, and basic day-to-day operations.
- Coordinate inter-jurisdictional preparedness measures – to encourage and ensure multi-jurisdictional cooperation in county-wide mitigation actions and programs so that they may be implemented efficiently and effectively.
- Provide decision-making tool for interested stakeholders – to formulate a comprehensive, updated analysis of Guernsey County's vulnerability to hazards so that decision-makers can better prepare for natural and manmade disasters.
- Achieve regulatory compliance – to ensure that the County and its political subdivisions meet state and federal mitigation planning requirements so that they may be eligible to participate in and receive funding from grant programs, policies, and regulations.

Jurisdictions

Guernsey County is situated in the southeastern portion of the State of Ohio, approximately 78 miles east of the City of Columbus, and is bordered by Muskingum, Coshocton, Tuscarawas, Harrison, Belmont, and Noble Counties. As the lone city within Guernsey County, the City of Cambridge serves as the county seat. Other incorporated areas include the Villages of Byesville, Cumberland, Fairview, Lore City, Old Washington, Pleasant City, Quaker City, and Senecaville. These incorporated areas are displayed below (**Figure 1.1**) on a map of Guernsey County's townships.

Located at the crossroads of Interstate-70 (I-70) and Interstate-77 (I-77), Guernsey County contains over 611 total lane miles with 1.8 million vehicle miles travelled annually. The County has over 51 miles of Interstate Routes, 39 miles of US Routes (US), and 153 miles of State Routes (SR). Of these, all 51 miles of Interstate Routes, 25 miles of US Routes, and 7 miles of States Routes are included in the National Highway System (NHS). In addition to I-70 and I-77, other major roadways located in Guernsey County include US-22, US-40, SR-83, SR-146, SR-209, SR-258, SR-265, SR-285, SR-313, SR-340, SR-513, SR-541, SR-574, SR-658, SR-660, SR-662, SR-672, SR-723, SR-761, SR-800, and SR-821 (ODOT).

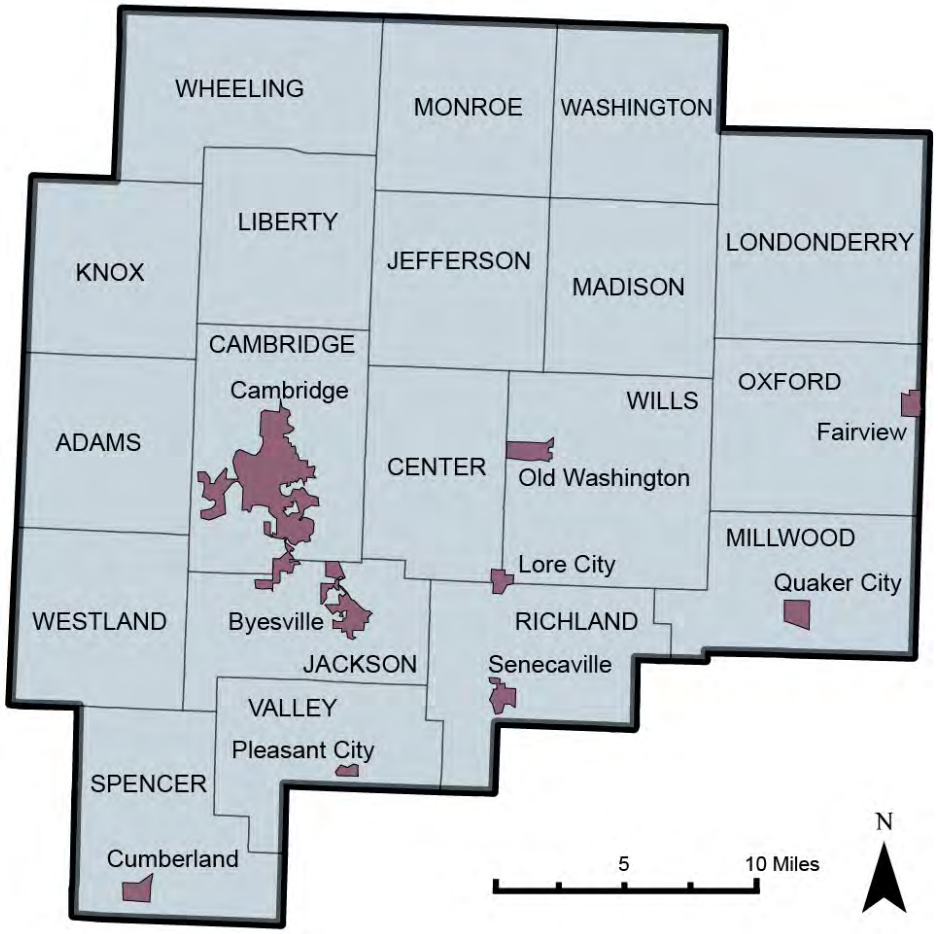

Figure 1.1: Guernsey County Townships and Incorporated Areas

US Bike Route 50 travels in the east-west directions along the northern half of Guernsey County, connecting State Bike Route (SBR) 77 in the northern part of the County with SBR-85 in the northeastern part of the County, as well as SBR-95 in southeastern Guernsey County. Railroads pass through Guernsey County through Cambridge, Byesville, and Cumberland. According to the Ohio Rail Development Commission (ORDC), railroads within the County include the Genesee & Wyoming Railroad, the Cambridge Southern Industrial Railroad, and a portion of the Columbus & Ohio River Railroad. Additionally, the Federal Aviation Administration documents four airports and one heliport in Guernsey County, including the Cambridge Municipal Airport – a General Aviation Level 3 facility (FAA).

Water features within Guernsey County include Salt Fork Lake, Wills Creek, Leatherwood Creek, and Spring Lake. Senecaville Lake borders the County along the southern border of Richland Township. Guernsey County is also home to Salt Fork State Park.

There have been no changes in development that impact the County's overall vulnerability. Therefore, this plan update validates the information in the previously approved plan.

2

History and Demographics

Guernsey County

Guernsey County is a rural Ohio county that is located in the eastern portion of Central Ohio. It contains one city, the City of Cambridge that also serves as the county seat. The County also contains 8 villages that are as follows: Byesville, Cumberland, Fairview (partially), Lore City, Old Washington, Pleasant City, Quaker City, and Senecaville. **Tables 2.1a-c**, below, contain population, income, and housing statistics for Guernsey County.

Tables 2.1a-c: Guernsey County Demographic Information (American Factfinder U.S. Census)

Population Totals	Number
2010 Census	40,087
2011 Estimate	39,902
2012 Estimate	39,871
2013 Estimate	39,705
2014 Estimate	39,689
2015 Estimate	39,385
2016 Estimate	39,200
2017 Estimate	39,093

Housing Statistics 2016 Estimate	Number
Total Housing Units	19,110
Occupied Housing Units	15,863
Vacant Housing Units	3,247
Homeowner Vacancy Rate	1.9
Rental Vacancy Rate	9.4

Family Income Statistics 2016	Number/$
Less than $10,000	1,549
$10,000 to $14,999	1,075
$15,000 to $24,999	2,207
$25,000 to $34,999	1,804
$35,000 to $49,999	2,530
$50,000 to $74,999	3,173
$75,000 to $99,999	1,600
$100,000 to $149,000	1,408
$150,000 to $199,999	314
$200,000 or more	203
Median Family Income	$41,566
Mean Family Income	$53,875

City of Cambridge

The City of Cambridge is located slightly southwest of the center of Guernsey County in Cambridge Township. It is the largest and only city in the County. Major highways and routes accessing the City include Interstate 70, Interstate 77, US Routes 40 and 22, as well as State Route 209. Wills Creek, and Leatherwood Creek flow into or near the city. **Tables 2.2a-c**, below, contain population, income, and housing statistics for the City of Cambridge.

Tables 2.2a-c: City of Cambridge Demographic Information (American Factfinder U.S. Census)

Population Total	Number
2010 Census	10,635
2011 Estimate	10,605
2012 Estimate	10,591
2013 Estimate	10,549
2014 Estimate	10,550
2015 Estimate	10,488
2016 Estimate	10,444
2017 Estimate	10,411

Housing Statistics 2016 Estimate	Number
Total Housing Units	5,132
Occupied Housing Units	4,502
Vacant Housing Units	630
Homeowner Vacancy Rate	0.8
Rental Vacancy Rate	10.7

Family Income Statistics 2016	Number/$
Less than $10,000	627
$10,000 to $14,999	438
$15,000 to $24,999	964
$25,000 to $34,999	509
$35,000 to $49,999	636
$50,000 to $74,999	725
$75,000 to $99,999	224
$100,000 to $149,000	300
$150,000 to $199,999	49
$200,000 or more	30
Median Family Income	$30,795
Mean Family Income	$41,292

The Village of Byesville

The Village of Byesville is located in the southern portion of Guernsey County in Jackson Township, approximately 7 miles south/southeast from the City of Cambridge. Major highways and routes accessing the Village include Interstate 70, Interstate 77, as well as State Routes 209 and 821. Wills Creek flows near the Village. **Tables 2.3a-c**, below, contain population, income, and housing statistics for the Village of Byesville.

Tables 2.3a-c: Demographic Information (American Factfinder U.S. Census)

Population Total	Number
2010 Census	2,438
2011 Estimate	2,434
2012 Estimate	2,432
2013 Estimate	2,418
2014 Estimate	2,418
2015 Estimate	2,395
2016 Estimate	2,382
2017 Estimate	2,371

Housing Statistics 2016 Estimate	Number
Total Housing Units	967
Occupied Housing Units	906
Vacant Housing Units	61
Homeowner Vacancy Rate	0
Rental Vacancy Rate	3.4

Family Income Statistics 2016	Number/$
Less than $10,000	101
$10,000 to $14,999	78
$15,000 to $24,999	147
$25,000 to $34,999	135
$35,000 to $49,999	117
$50,000 to $74,999	110
$75,000 to $99,999	165
$100,000 to $149,000	50
$150,000 to $199,999	0
$200,000 or more	3
Median Family Income	$32,267
Mean Family Income	$44,975

The Village of Cumberland

The Village of Cumberland is located in the southwestern most part of Guernsey County in Spencer Township, approximately 16 miles southwest of the City of Cambridge. Major routes accessing the Village include State Routes 83, 146, and 340. Collins Fork, Buffalo Fork, Rannells Creek, and Millers Creek run near the Village. **Tables 2.4a-c**, below, contain population, income, and housing statistics for the Village of Cumberland.

Tables 2.4a-c: Demographic Information (American Factfinder U.S. Census)

Population Total	Number
2010 Census	367
2011 Estimate	362
2012 Estimate	362
2013 Estimate	360
2014 Estimate	360
2015 Estimate	354
2016 Estimate	351
2017 Estimate	353

Housing Statistics 2016 Estimate	Number
Total Housing Units	164
Occupied Housing Units	138
Vacant Housing Units	26
Homeowner Vacancy Rate	0
Rental Vacancy Rate	23.8

Family Income Statistics 2016	Number/$
Less than $10,000	24
$10,000 to $14,999	5
$15,000 to $24,999	13
$25,000 to $34,999	13
$35,000 to $49,999	20
$50,000 to $74,999	38
$75,000 to $99,999	15
$100,000 to $149,000	8
$150,000 to $199,999	2
$200,000 or more	0
Median Family Income	$42,500
Mean Family Income	$46,881

The Village of Fairview

The Village of Fairview is located in the easternmost portion of Guernsey County in Oxford Township with a portion of the Village located in neighboring Belmont County, approximately 22 miles east of the City of Cambridge. Major highways accessing the Village include Interstate 70. Skull Fork flows near the Village. **Tables 2.5a-c**, below, contain population, income, and housing statistics for the Village of Fairview.

Tables 2.5a-c: Demographic Information (American Factfinder U.S. Census)

Population Total	Number
2010 Census	83
2011 Estimate	83
2012 Estimate	83
2013 Estimate	82
2014 Estimate	82
2015 Estimate	81
2016 Estimate	81
2017 Estimate	80

Housing Statistics 2016 Estimate	Number
Total Housing Units	65
Occupied Housing Units	30
Vacant Housing Units	35
Homeowner Vacancy Rate	0
Rental Vacancy Rate	0

Family Income Statistics 2016	Number/$
Less than $10,000	2
$10,000 to $14,999	8
$15,000 to $24,999	5
$25,000 to $34,999	2
$35,000 to $49,999	8
$50,000 to $74,999	0
$75,000 to $99,999	0
$100,000 to $149,000	5
$150,000 to $199,999	0
$200,000 or more	0
Median Family Income	N/A
Mean Family Income	$43,320

The Village of Lore City

The Village of Lore City is located in the southern portion of Guernsey County in Wills Township, Center Township, and Richland Township, approximately 8 miles from the City of Cambridge. Major routes accessing the Village include state routes 265, and 285. Leatherwood Creek flows near the Village. **Tables 2.6a-c**, below, contain population, income, and housing statistics for the Village of Lore City.

Tables 2.6a-c: Demographic Information (American Factfinder U.S. Census)

Population Total	Number
2010 Census	325
2011 Estimate	322
2012 Estimate	322
2013 Estimate	322
2014 Estimate	321
2015 Estimate	318
2016 Estimate	316
2017 Estimate	315

Housing Statistics 2016 Estimate	Number
Total Housing Units	149
Occupied Housing Units	119
Vacant Housing Units	30
Homeowner Vacancy Rate	2.9
Rental Vacancy Rate	12

Family Income Statistics 2016	Number/$
Less than $10,000	2
$10,000 to $14,999	7
$15,000 to $24,999	12
$25,000 to $34,999	21
$35,000 to $49,999	37
$50,000 to $74,999	18
$75,000 to $99,999	9
$100,000 to $149,000	7
$150,000 to $199,999	0
$200,000 or more	6
Median Family Income	$39,327
Mean Family Income	$58,482

The Village of Old Washington

The Village of Old Washington is located just east of the center of Guernsey County in Wills Township, approximately 8 miles east of the City of Cambridge. Major highways and routes accessing the Village include Interstate 70 and State Route 285. Beeham Run and Hawkins Run flow near the Village. **Tables 2.7a-c**, below, contain population, income, and housing statistics for the Village of Old Washington.

Tables 2.7a-c: Demographic Information (American Factfinder U.S. Census)

Population Total	Number
2010 Census	279
2011 Estimate	276
2012 Estimate	275
2013 Estimate	274
2014 Estimate	274
2015 Estimate	271
2016 Estimate	269
2017 Estimate	268

Housing Statistics 2016 Estimate	Number
Total Housing Units	148
Occupied Housing Units	138
Vacant Housing Units	10
Homeowner Vacancy Rate	0
Rental Vacancy Rate	6

Family Income Statistics 2016	Number/$
Less than $10,000	7
$10,000 to $14,999	7
$15,000 to $24,999	16
$25,000 to $34,999	16
$35,000 to $49,999	14
$50,000 to $74,999	49
$75,000 to $99,999	24
$100,000 to $149,000	4
$150,000 to $199,999	0
$200,000 or more	1
Median Family Income	$51,731
Mean Family Income	$53,147

The Village of Pleasant City

The Village of Pleasant City is located in the southeast portion of the county in Valley Township, approximately 10 miles south of the City of Cambridge. Major highways and routes accessing the Village include Interstate 77, and State Routes 821, 146, and 313. **Tables 2.8a-c**, below, contain population, income, and housing statistics for the Village of Pleasant City.

Tables 2.8a-c: Demographic Information (American Factfinder U.S. Census)

Population Total	Number
2010 Census	447
2011 Estimate	445
2012 Estimate	444
2013 Estimate	442
2014 Estimate	441
2015 Estimate	435
2016 Estimate	434
2017 Estimate	433

Housing Statistics 2016 Estimate	Number
Total Housing Units	197
Occupied Housing Units	163
Vacant Housing Units	34
Homeowner Vacancy Rate	6.6
Rental Vacancy Rate	5.9

Family Income Statistics 2016	Number/$
Less than $10,000	11
$10,000 to $14,999	15
$15,000 to $24,999	21
$25,000 to $34,999	18
$35,000 to $49,999	48
$50,000 to $74,999	16
$75,000 to $99,999	16
$100,000 to $149,000	11
$150,000 to $199,999	5
$200,000 or more	2
Median Family Income	$37,063
Mean Family Income	$51,474

The Village of Quaker City

The Village of Quaker City is located in the southeast portion of the county in Millwood Township, approximately 18 miles southeast of the City of Cambridge. Major routes accessing the Village include County Routes 513 and 265. Leatherwood Creek flows near the Village. **Tables 2.9a-c**, below, contain population, income, and housing statistics for the Village of Quaker City.

Tables 2.9a-c: Demographic Information (American Factfinder U.S. Census)

Population Total	Number
2010 Census	502
2011 Estimate	500
2012 Estimate	499
2013 Estimate	496
2014 Estimate	496
2015 Estimate	491
2016 Estimate	488
2017 Estimate	486

Housing Statistics 2016 Estimate	Number
Total Housing Units	202
Occupied Housing Units	159
Vacant Housing Units	43
Homeowner Vacancy Rate	12.2
Rental Vacancy Rate	14.9

Family Income Statistics 2016	Number/$
Less than $10,000	12
$10,000 to $14,999	20
$15,000 to $24,999	37
$25,000 to $34,999	24
$35,000 to $49,999	19
$50,000 to $74,999	37
$75,000 to $99,999	8
$100,000 to $149,000	2
$150,000 to $199,999	0
$200,000 or more	0
Median Family Income	$29,479
Mean Family Income	$35,472

The Village of Senecaville

The Village of Senecaville is located in the southern portion of Guernsey County in Richland Township, approximately 12 miles southeast of the City of Cambridge. Major routes accessing the Village include County Routes 313 and 285. **Tables 2.10a-c**, below, contain population, income, and housing statistics for the Village of Senecaville.

Tables 2.10a-c: Demographic Information (American Factfinder U.S. Census)

Population Total	Number
2010 Census	457
2011 Estimate	455
2012 Estimate	454
2013 Estimate	450
2014 Estimate	451
2015 Estimate	449
2016 Estimate	444
2017 Estimate	443

Housing Statistics 2016 Estimate	Number
Total Housing Units	206
Occupied Housing Units	166
Vacant Housing Units	40
Homeowner Vacancy Rate	5.3
Rental Vacancy Rate	16.3

Family Income Statistics 2016	Number/$
Less than $10,000	14
$10,000 to $14,999	6
$15,000 to $24,999	28
$25,000 to $34,999	17
$35,000 to $49,999	39
$50,000 to $74,999	29
$75,000 to $99,999	12
$100,000 to $149,000	13
$150,000 to $199,999	5
$200,000 or more	3
Median Family Income	$43,611
Mean Family Income	$63,201

3

The Planning Process

Methodology

The planning effort for the Guernsey County Hazard Mitigation Plan was initiated and coordinated through Ohio EMA and Guernsey County, through direct participation with the planning team at The Ohio State University. This chapter describes the planning process for the 2018 update of the Guernsey County Hazard Mitigation Plan, including the public participation process, risk assessment and research of the hazards, previous plan review, and development.

Local Jurisdiction Participation & Notification Process

Guernsey County notified participating jurisdictions, agencies working within the County, neighboring counties and jurisdictions, and other stakeholders of the planning process. These groups received updates of the plan and were invited to the public involvement meetings to increase regional coordination.

Representatives of the following entities were invited to participate in the planning process:

Guernsey County

- Guernsey County Commissioners
- Guernsey County Health Department
- Guernsey County Engineer's Office
- Guernsey County Emergency Management Agency
- Guernsey County Job & Family Services
- Guernsey County Map Department
- Guernsey County Auditor
- Guernsey County Children Services
- Guernsey County Courthouse
- Guernsey County Visitors & Convention Bureau
- Guernsey County Prosecutor's Office
- Guernsey County Recorder
- Guernsey County Senior Citizens Center
- Guernsey County Sheriff's Office
- Guernsey County Treasurer
- Guernsey Soil & Water Conservation District
- Guernsey-Muskingum Electric Cooperative, Inc.
- Guernsey County Coroner
- Guernsey County Water & Sewer
- East Guernsey Local School District

City of Cambridge

- City of Cambridge Mayor's Office
- City of Cambridge Director of Public Service
- City of Cambridge Director of Public Safety
- City of Cambridge Code Enforcement
- Cassell Station Volunteer Fire Department (VFD)
- Cambridge Police Department
- Cambridge Parks & Recreation
- Cambridge Area Chamber of Commerce
- Cambridge City Engineer
- Cambridge City Schools

- Cambridge Economic and Community Development
- Cambridge FD/Liberty VFD
- Cambridge Fire Department
- Cambridge Law Director
- Cambridge Main Street
- Cambridge Municipal Airport

Villages and Townships

- Village of Byesville
- Village of Cumberland
- Village of Fairview
- Village of Lore City
- Village of Pleasant City
- Village of Quaker City
- Village of Senecaville
- Old Washington VFD
- Old Washington Village Council
- Richland Township
- Rolling Hills Local School District
- Antrim Community VFD
- Cumberland VFD
- Fairview VFD

Non-Profit Organizations

- United Way of Guernsey & Noble Counties
- Salvation Army
- American Red Cross
- First Christian Church
- First Presbyterian Church

Major Employers

- Metallurg Vanadium Corp
- American Electric Power
- LMI Custom Mixing, LLC
- Colgate-Palmolive Company
- Southeastern Ohio Regional Medical Center
- United Ambulance Service
- Federal Mogul

Colleges and Universities

- Mid-East Career & Technology Center - Buffalo Campus
- Zane State College
- Guernsey County OSU Extension

State Agencies

- Ohio Department of Natural Resources (ODNR)
- ODNR Division of Forestry
- Ohio Environmental Protection Agency (EPA)
- Ohio State Patrol

Public Participation

Meetings

The planning process was initiated through a preliminary meeting at The Ohio State University. The meeting detailed the parameters of the project and began the dialogue between Guernsey County, the OSU Knowlton planning team, and representatives from Ohio EMA and FEMA. There were also public involvement meetings in Guernsey County that were attended by stakeholders and local leaders within the jurisdiction that was also open to the public. The final presentation of the plan for the county took place at The Ohio State University.

Public meetings for the plan took place at Guernsey Administration Building in Cambridge, Ohio. The public was notified and invited to attend the meetings through public notices published in the local newspaper, as well as on the Guernsey County EMA website and social media (Facebook and Twitter pages).

Preliminary Meeting - August 22, 2018; Ohio State University

The preliminary meeting was an opportunity for key Guernsey County officials and representatives from Ohio EMA and FEMA to discuss the parameters of the project with the Ohio State project team and identify potential hazards for inclusion in the plan. The project team began with the hazards covered in the 2011 Plan and supplemented those with suggestions from the County. Documentation for this meeting is located in **Appendix A: Kickoff Meeting**.

Public Involvement Meeting #1: 7:00 PM, 10/03/18

The County EMA Director mailed invitations to identified stakeholders in the community, including elected officials and members of key agencies. The meeting was open to the general public, who were notified through a press release and a news article that appeared in the Daily Jeffersonian on September 27, 2018. At the meeting, the Ohio State project team gave a presentation including a quick review of the 2011 plan and outlined the update process. The project team also presented the previously identified hazards, sought feedback on additional hazards, and asked community members and stakeholders to identify the priority level of each hazard. Documentation for this meeting is located in **Appendix E: Public Meeting One Documents**.

Public Involvement Meeting #2: 7:00 PM, 11/07/18

The County EMA Director mailed invitations to identified stakeholders in the community, including elected officials and members of key agencies. The meeting was open to the general public, who were notified through an announcement via the Guernsey County EMA website, the Guernsey County EMA Twitter and Facebook pages, and a notice was posted on the Daily Jeffersonian on October 26, 2018. At the meeting, the Ohio State project team reviewed the results of the first meeting's hazard ranking activity and asked stakeholders to provide comments and rank each mitigation strategy. This provided the priority level for each mitigation strategy listed in the Plan. Documentation for this meeting is located in **Appendix F: Public Meeting Two Documents.**

Table 3.1: Participating Jurisdictions

Community	Representative	Position
City of Cambridge	Jeff McConaughy/Lou Thornton	City Engineer/Utilities Director
Guernsey County Commissioners	Skip Gardner	County Commissioner
Guernsey County Emergency Management Agency	Gerry Beckner	Director
Village of Pleasant City	J. Pat Willis	Mayor
Village of Byesville	Brennan Dudley/ Scott Wilson	Village Administrator/Fire Chief
Village of Cumberland	Shirley Rhinehart	Mayor
Village of Cumberland	Jeff Tucker	Council Member
Village of Fairview	Thomas Bunfil	Mayor
Village of Lore City	Richard Carpenter	Mayor
Village of Old Washington	Ed Wagstaff	Council Member
Village of Quaker City	Sue Thompson/ Randy Thompson/ Brett Geisey	Council Members
Village of Senecaville	Zedrick Clark/ Jacquelin Neuhart	Mayor/Fiscal Officer
Guernsey County Auditor	Amy Swigart	Deputy Auditor

Table 3.2: Communities and Planning Organizations within Guernsey County

Community	Planning Commission	Comprehensive Plan	Floodplain Regulations	Building Codes*	Zoning Ordinance	Capital Budget	Public Works Budget
Guernsey County	Yes	Yes	Yes	Yes	No	(None)	Limited in-kind wages only.
City of Cambridge	No	No	Yes	Yes	Yes	(None)	Limited in-kind wages only.
Village of Lore City	No	No	No	Yes	No	(None)	Limited in-kind wages only.
Village of Pleasant City	No	No	No	Yes	No	(None)	Limited in-kind wages only.
Village of Quaker City	No	No	No	Yes	No	(None)	Limited in-kind wages only.
Village of Cumberland	No	No	No	Yes	No	(None)	Limited in-kind wages only.
Village of Byesville	No	No	No	Yes	Yes	(None)	Limited in-kind wages only.
Village of Senecaville	No	No	No	Yes	No	(None)	Limited in-kind wages only.
Village of Old Washington	No	No	No	Yes	No	(None)	Limited in-kind wages only.
Village of Fairview	No	No	No	Yes	No	(None)	Limited in-kind wages only.

* All jurisdictions within the State of Ohio now follow the State Building Code

Final Meeting
The Final Meeting took place on Wednesday, November 28, 2018 at 6:30 PM. The team provided a synopsis of the Final Plan to Guernsey County and the Ohio EMA at The Ohio State University's Knowlton School of Architecture.

Review of Current Plans

The most recent plans available were the Guernsey County Hazard Mitigation Plans from 2011 and 2003. The plans provided the teams with information regarding past efforts toward hazard mitigation and preparedness, past incidents where hazards presented a risk to Guernsey County, and information regarding the assets of the County that would potentially be at risk. Since the Plan update from 2011, community members have mentioned that many of the identified actions are still in progress; their comments can be found in the filled-out matrices located in **Appendix F: Public Meeting Two Documents.**

Risk Assessment

The list of natural hazards that were selected for this plan is based upon the Guernsey County Hazard Mitigation Plan from 2011. Additional hazards were also considered, selected, and researched by the planning team to provide a more thorough plan that focused on prevention, preparation, and resiliency.

Research for the hazards was based on information from Guernsey County on past incidents, as well as supplementary research to determine the risk each hazard poses for the County and the probability of the hazard occurring in the future. The 2018 update includes climate change considerations for each hazard. The team also identified areas in the County that were potentially vulnerable to the hazards based on their past occurrence and future likelihood. Based on the record of historical hazard events, the Planning Team omitted Levee Failure and Coastal Erosion hazards from this Plan. Coastal Erosion does not affect the study area.

As indicated by the National Levee Database (NLD), there are two levee systems found in Guernsey County, including the East Cambridge Dike and the Southgate Dike. According to the Guernsey County EMA Director, the Southgate Dike protects businesses in a low-lying area along Southgate Parkway (St. Rt. 209); this levy is included on the Class I dam listing with ODNR. The second levy, the East Cambridge Dike is located in East Cambridge and protects homes located in the area. Both levies were built by the City of Cambridge after the flood of 1980 with a Mitigation Grant. Both levies are well maintained by the City of Cambridge and have never been considered a hazard of any concern to local residents or public officials, which is why it was excluded from this Plan. The County will consider adding a risk assessment on Levees in the next plan update.

Plan Development and Finalization

Using the prioritization information gathered by the first Public Meeting, the Planning Team was able to determine the prioritization of hazards, as provided by Guernsey County Stakeholders. The Planning Team then reviewed previous mitigation strategies and their status in the County and developed new strategies that would help the County achieve their mitigation goals. The Planning Team then prepared the implementation strategy that identified the action, priority, timeline, lead organization, and resources needed, as well as status.

These strategies were then taken back to the community stakeholders for review and comment. Stakeholders provided valuable feedback that allowed the Planning Team to determine the priorities of each mitigation strategy. These strategies were then ranked based on Stakeholder feedback. Collectively, these mitigation strategies provide the County with a list of actionable items they can carry forth and put into action.

4

Hazard Identification and Risk Management

Dam Failure

Description

FEMA defines dams as “man-made structures built across a stream or river that impound water and reduce the flow downstream”. Dam failure occurs when that impounded water is suddenly released in an uncontrollable manner. There are varying degrees of dam failure, however FEMA describes any malfunction or abnormality which adversely affects a dam’s primary function of impounding water as a degree of failure. Water released from the dam during failure will always flow downhill, so any property located below the dam failure site is at risk of serious property damage, and even loss of life.

Dams can fail for one or a combination of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam
- Structural failure of materials used in dam construction
- Movement and/or failure of the foundation supporting the dam
- Settle and cracking of concrete or embankment dams
- Inadequate maintenance and upkeep
- Deliberate acts of sabotage

Location

The National Inventory of Dams (NID), maintained and published by the U.S. Army Corps of Engineers, is a congressionally authorized database documenting dams in the United States and its territories.

The NID consists of dams meeting at least one of the following criteria:

- High hazard classification – loss of one human life is likely if the dam fails
- Significant hazard classification – possible loss of human life and likely significant property or environmental destruction
- Low hazard or undetermined potential classification dams which
    - Equal or exceed 25 feet in height and exceed 15 acre-feet in storage
    - Equal or exceed 50 acre-feet storage and exceed six feet in height

Additionally, according to Ohio Administrative Code Rule 1501:21-13-01 (2010), dams are classified as such:

- Class I – Dams having a total storage volume greater than 5,000 acre-feet or a height of greater than 60 feet shall be placed in Class I.
- Class II – Dams having a total storage volume greater than 500 acre-feet or a height of greater than 40 feet shall be placed in Class II.
- Class III – Dams having a total storage volume greater than 50 acre-feet or a height of greater than 25 feet shall be placed in Class III.

- Class IV – Dams which are 25 feet or less in height and have a total storage volume of 50 acre-feet or less may be placed in Class IV.
- See succeeding **Table 4.1 & Figure 4.1** for a breakdown of dams in Guernsey County by class and location.

Table 4.1: Guernsey County Dam Inventory

Guernsey County Dam Inventory					
Class	**Name**	**Stream**	**Owner Type**	**Year Completed**	**Drainage Area (sq. mi.)**
I	Indian Lakes Rec. Area Lower Lake	Tributary to Wills Creek	Private	1962	0.73
I	Luburgh Lake Dam	Tributary to Crooked Creek	Private	1963	1.19
I	Salt Fork Lake Dam	Salt Fork Creek	Public, State	1968	160
I	Senecaville Lake Dam	Seneca Fork Wills Creek	Public, Federal	1937	118
II	Bilinovich Lake Dam	Tributary to Skull Fork	Private	1992	0.05
II	Cambridge City Reservoir Dam	Board of Trade Run	Public, Local	1916	0.63
II	City of Cambridge Park Dam	Tributary to Leatherwood Creek	Public, Local	N/A	0.38
II	Hidden Haven Lake Dam	Tributary to Millers Fork	Private	N/A	0.35
II	Indian Lakes Rec. Area Upper Lake Dam	Tributary to Wills Creek	Private	N/A	0.37
II	Leatherwood Lake Dam	Tributary to Seneca Fork Willis Creek	Private	1972	0.14

Guernsey County Dam Inventory					
Class	**Name**	**Stream**	**Owner Type**	**Year Completed**	**Drainage Area (sq. mi.)**
II	Ramage Lake Dam	Tributary to Leatherwood Creek	Private	N/A	0.09
II	Redhill Farm Dam No. 1	Tributary to Brushy Fork	Private	1994	0.13
II	Redhill Farm Dam No. 3	Tributary to Brushy Fork	Private	1994	0.14
II	Tennessee Gas Co Lake Dam Station 209	Flat Run	Private.	1951	0.35
II	Wong Lake Dam	Tributary to Salt Fork	Private	N/A	0.07
III	Darrow Lake No. 1 Dam (Upper)	Tributary to Birds Run	Private	1960	0.13
III	Darrow Lake No. 2 Dam (Lower)	Tributary to Birds Run	Private	0	0.17
III	Eldon Reservoir Dam	Tributary to Leatherwood Creek	Private	1933	0.28
III	Heil Lake Dam	Tributary to Leatherwood Creek	Private	1991	1.15
III	Hickory Hollow Lake Dam	Tributary to Sugartree Fork	Private	1969	0.4
III	Jack Towne Dam	Tributary to Wills Creek	Private	1948	0.45

Guernsey County Dam Inventory					
Class	**Name**	**Stream**	**Owner Type**	**Year Completed**	**Drainage Area (sq. mi.)**
III	Johnson Lake Dam	Tributary to Leatherwood Creek	Private	1976	0.03
III	Larrick Lake Dam	Tributary to Clear Fork Creek	Private	1981	0.05
III	Ohio River Collieries Sediment Pond Dam	Tributary to Skull Fork	Private	1979	0.64
III	Redhill Farm Dam No. 2	Tributary to Brushy Fork	Private	1994	0.26
III	Redhill Farm Dam No. 4	Tributary to Brushy Fork	Private	1994	0.03
III	Ritz Lake Dam	Tributary to Wills Creek	Private	1973	0.33
III	Robins Ridge Golf Club Lake No. 1 Dam	Tributary to Seneca Fork Wills Creek	Private	1970	0.04
III	Robins Ridge Golf Club Lake No. 2 Dam	Tributary to Seneca Fork Wills Creek	Private	N/A	0.05
III	Topola Lake Dam	Tributary to Johnson Fork	Private	N/A	0.13
IV	Hebb Lake Dam	Tributary to Leatherwood Creek	Private	1976	0.36
IV	Lake Schotaqua Dam	Tributary to Clear Fork	Private	N/A	0.26
IV	Raush's Lake Dam	Tributary to Wills Creek	Private	N/A	0.04

Guernsey County Dam Inventory					
Class	**Name**	**Stream**	**Owner Type**	**Year Completed**	**Drainage Area (sq. mi.)**
IV	Sparks Lake Dam	Tributary to Salt Fork	Private	N/A	0.05
IV	Unknown	Tributary to Salt Fork	N/A	N/A	0.05
IV	Unknown	Sugartree Fork	N/A	N/A	0.48
IV	Unknown	Tributary to Leatherwood Creek	N/A	N/A	0.19
IV	Unknown	Tributary to Mud Run	N/A	N/A	0.01
IV	Unknown	Soggy Run	N/A	N/A	0.16
IV	Valentine Lake Dam	Tributary to Wills Creek	Private	1974	0.04
IV	Wildlife Pond No. 2 Dam	Tributary to Salt Fork	Public, State	N/A	0.09
IV	Yk Rod and Gun Lake Dam	Tributary to Millers Fork	Private	1959	0.21
Other	Baker Lake Dam	Tributary to Leatherwood Creek	Private	N/A	0.09
Other	Bichard Pond Dam	Tributary to Wills Creek	Private	N/A	0.58
Other	Buckey Lake Dam	Tributary to Wills Creek	Private	1977	0.03
Other	Burns Lake Dam	Tributary to Seneca Fork Wills Creek	Private	1980	0.05

Guernsey County Dam Inventory					
Class	**Name**	**Stream**	**Owner Type**	**Year Completed**	**Drainage Area (sq. mi.)**
Other	Carrizo Hall Impoundment	N/A	N/A	N/A	N/A
Other	Dodd Lake Dam	N/A	Private	N/A	N/A
Other	Hartley Lake Dam	Tributary to Shannon Run	Private	1945	0
Other	Heil Lake Dam	Tributary to Crooked Creek	Private	N/A	0.21
Other	Hoop Well Pad Dam	Offstream	Private	N/A	N/A
Other	Killiany Lake Dam	Tributary to Wills Creek	Public, Local	1966	0.98
Other	Lasko Fresh Water Impoundment Dam	Tributary to Seneca Fork Wills Creek	Private	N/A	N/A
Other	Lermar Lake Dam	Tributary to Leatherwood Creek	Private	1966	0.04
Other	Litt Lake Dam	Tributary to Crooked Creek	Private	N/A	0.02
Other	Morris Pond Dam	Unnamed Tributary of Crooked Creek	Private	2003	0.01
Other	NWDEC Dam	Tributary to Beeham Run	Private	2004	0.04
Other	Oxbow Lake Dam	Rocky Fork Creek	Private	2005	0
Other	Platell Lake Dam	Clear Fork	Private	N/A	0

Guernsey County Dam Inventory					
Class	**Name**	**Stream**	**Owner Type**	**Year Completed**	**Drainage Area (sq. mi.)**
Other	Range Lake Dam	Yellow Dog Creek	Private	2005	0
Other	RVG Pond No. 2 Dam	Tributary	Private	N/A	0
Other	Shegog Lake Dam	Tributary to Crooked Creek	Private	N/A	0.05
Other	Shugert Lane Dam	Unnamed Tributary to Leatherwood Creek	Private	N/A	1.3
Other	Spring Lake Dam	Tributary to Crooked Creek	Private	N/A	0.25
Other	Standing Rock Road Dam	Tributary to Wills Creek	Private	N/A	N/A
Other	Trubisky Pond Dam	Trail Run	Private	1930	0
Other	Unknown	Tributary to Wills Creek	N/A	N/A	0
Other	Unknown	Tributary to Crooked Creek	N/A	N/A	0
Other	Unknown	Tributary to Crooked Creek	N/A	N/A	0
Other	Wall Lake Dam	Tributary to Yellow Water Creek	Private	N/A	0
Other	Winterset Lake Dam	Coon Run	Private	1963	0.23

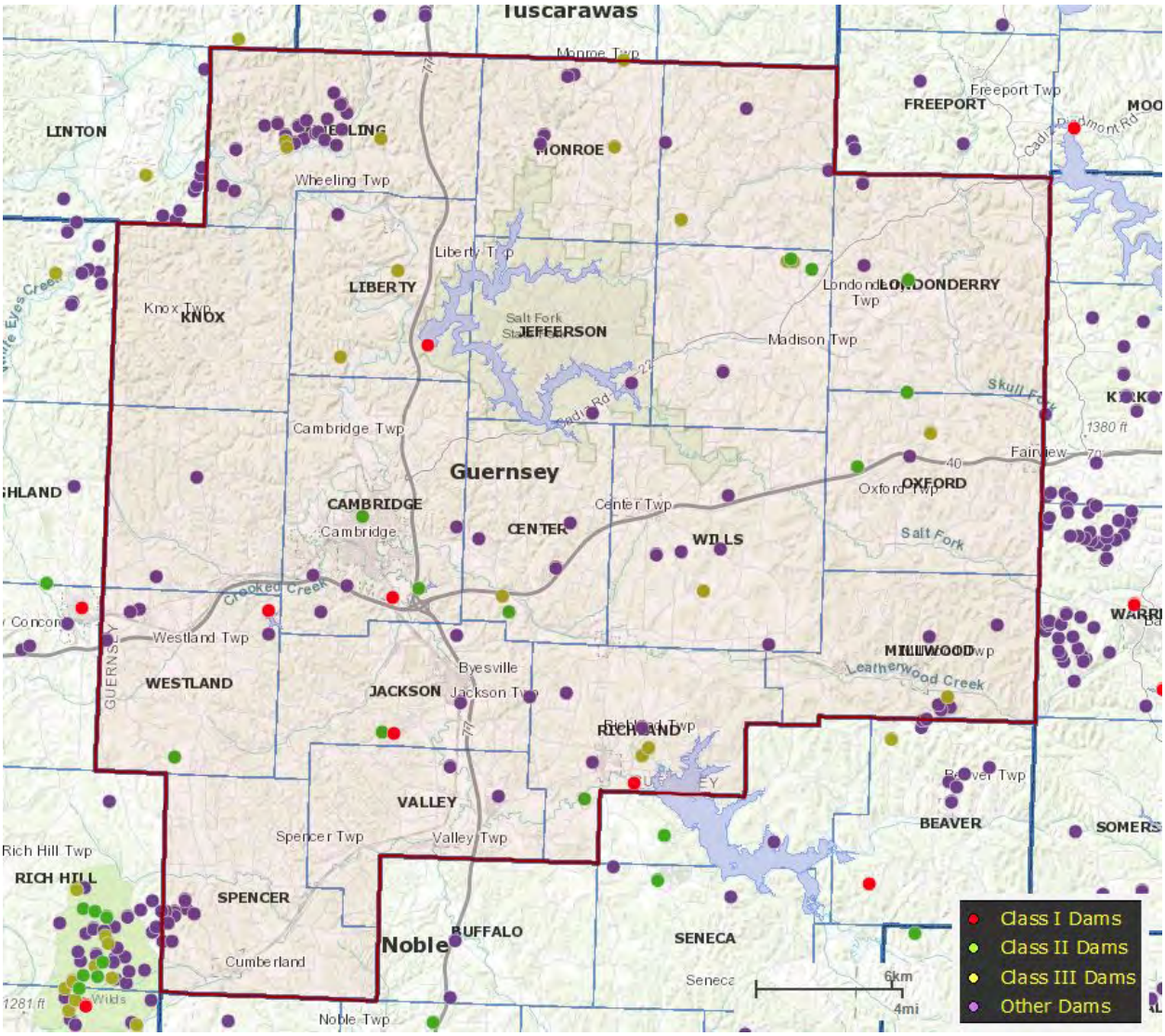

Figure 4.1: Location of Dams in Guernsey County

Extent

A dam shall be placed in Class I when sudden failure of the dam would result in one of the following scenarios:

- Class I: A dam shall be placed in Class I when sudden failure of the dam would result in one of the following situations:
    - Probable loss of human life
    - Structural collapse of at least one residence or one commercial or industrial business
- 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 situations, 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
  - Flooding of high-value 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
  - Damage or disruption to railroads or public utilities
  - Damage to downstream Class I, II, or II 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.

- 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 situations, but loss of human life is not probable:
  - Property losses including, but not limited to, rural buildings not otherwise described in paragraph (A) of the Ohio Administrative Code Rule 1501:21-13-01, 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, dams may be exempted 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: Class IV dams are exempt from the permit requirements of § 1521.06 of the Revised Code pursuant to paragraph (C) of rule 1501:21-19-01 of the Administrative Code.

History
There have been no dam failures recorded for Guernsey County at this time.

Probability
The likelihood of dam failure in Guernsey County is <1 percent per year. This calculation is based upon the average occurrence of previous dam failures (zero) in Guernsey County's history.

Vulnerability Assessment
The level of analysis used to complete this vulnerability assessment is based on the resources available to the planning team. An inundation study was not conducted as part of this update.

Population Impact
According to the 2010 census the population of City of Cambridge is approximately 10,635. To minimize impact to population, residents should be prepared with a safety plan in the event of severe weather. Populations residing in mobile home parks are particularly vulnerable and should determine the closest shelters.

Economic Losses
HAZUS is a regional loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). A loss estimate for Guernsey County was completed for the area downstream from the Salt Fork Lake Dam, which poses the greatest threat in the event of failure (**Table 4.2 and Figure 4.2**). Using 2010 Census data, HAZUS estimated a replacement value of $5.015 million (2010 dollars).

Table 4.2: Estimated Losses

Occupancy	Exposure ($1,000's)	Percent of Total
Residential	3,075,687	61.3%
Commercial	1,288,461	25.7%
Industrial	338,306	6.7%
Agricultural	28,432	0.6%
Religion	98,747	2%
Government	69,189	1.4%
Education	116,195	2.3%
Total	**5,015,017**	**100%**

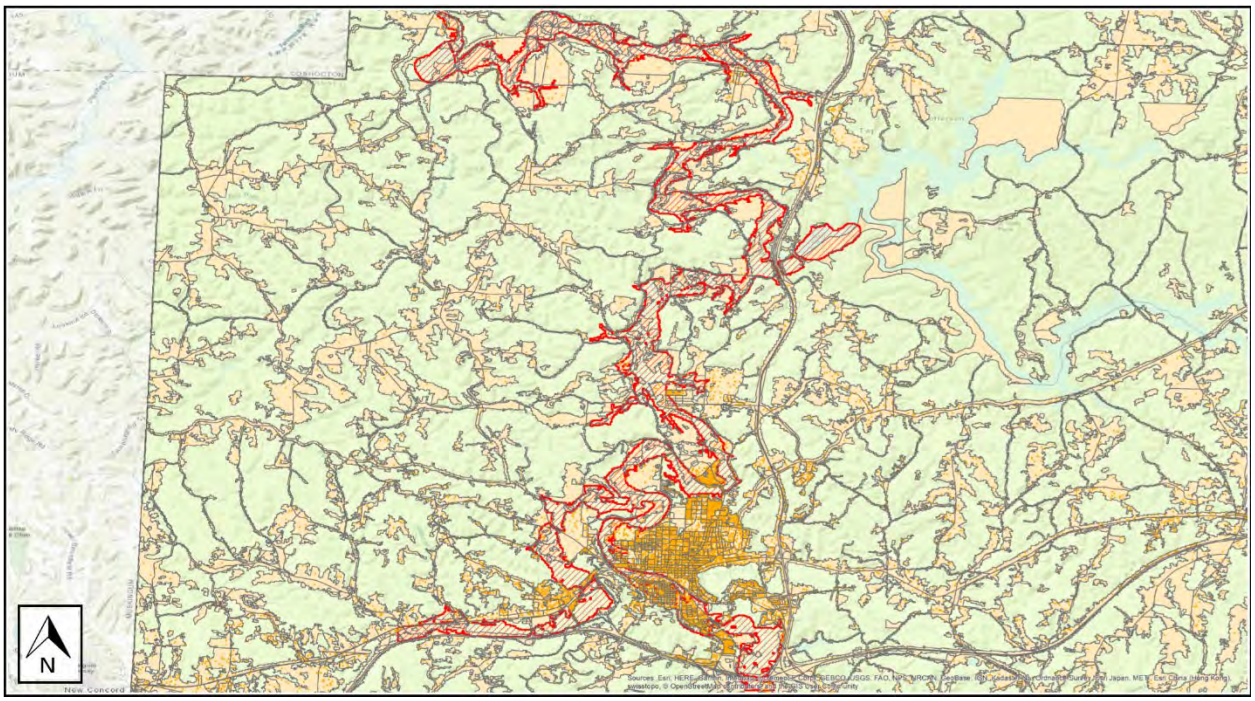

Figure 4.2: Exposure Region

Please note: Emergency Action Plans (EAPs) have been completed for all of the Class I dams (Salt Fork Lake Dam, Senecaville Lake Dam, Luburgh Lake Dam), with the exception of the dam at Indian Lakes Rec. Area Lower Lake. This data, however, is subjected to agreements where it cannot be published publicly. The County EMA holds record of these EAP's.

Damaging Winds

Description

Wind is horizontal motion of the air past a given point. Winds begin with differences in air pressures; pressure that is higher at one place than another sets up a force pushing from the high toward the low pressure. The greater the difference in pressures, the stronger the force. The distance between the area of high pressure and the area of low pressure also determines how fast the moving air is accelerated. Meteorologists refer to the force that starts the wind flowing as the "pressure gradient force". High and low pressures are relative. There is no set number that divides high and low pressure. Wind is used to describe the prevailing direction from which the wind is blowing with the speed given usually in miles per hour or knots. The following list are common weather items categorized as “Damaging Winds”.

- Straight-line wind is a term used to define any thunderstorm wind that is not associated with rotation and is used mainly to differentiate from tornadic winds. 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.
- A downdraft is a small-scale column of air that rapidly sinks toward the ground.
- A downburst is a result of a strong downdraft. A downburst is a strong downdraft with horizontal dimensions larger than 4 km (2.5 mi) resulting in an outward burst of damaging winds on or near the ground. (Imagine the way water comes out of a faucet and hits the bottom of the sink.) Downburst winds may begin as a microburst and spread out over a wider area, sometimes producing damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.
- A microburst is a small concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally small (less than 4km across) and short-lived, lasting only 5-10 minutes, with maximum wind speeds up to 168 MPH. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
- A gust front is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.
- A derecho is a widespread, long-lived wind storm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous microbursts, downbursts, and downburst clusters. By definition, if the wind damage swath extends more than 240 miles (about 400 kilometers) and includes wind gusts of at least 58 MPH (93 km/h) or greater along most of its length, then the event may be classified as a derecho.

Location

Severe Winds are a county-wide hazard in Guernsey County, potentially affecting all areas and jurisdictions.

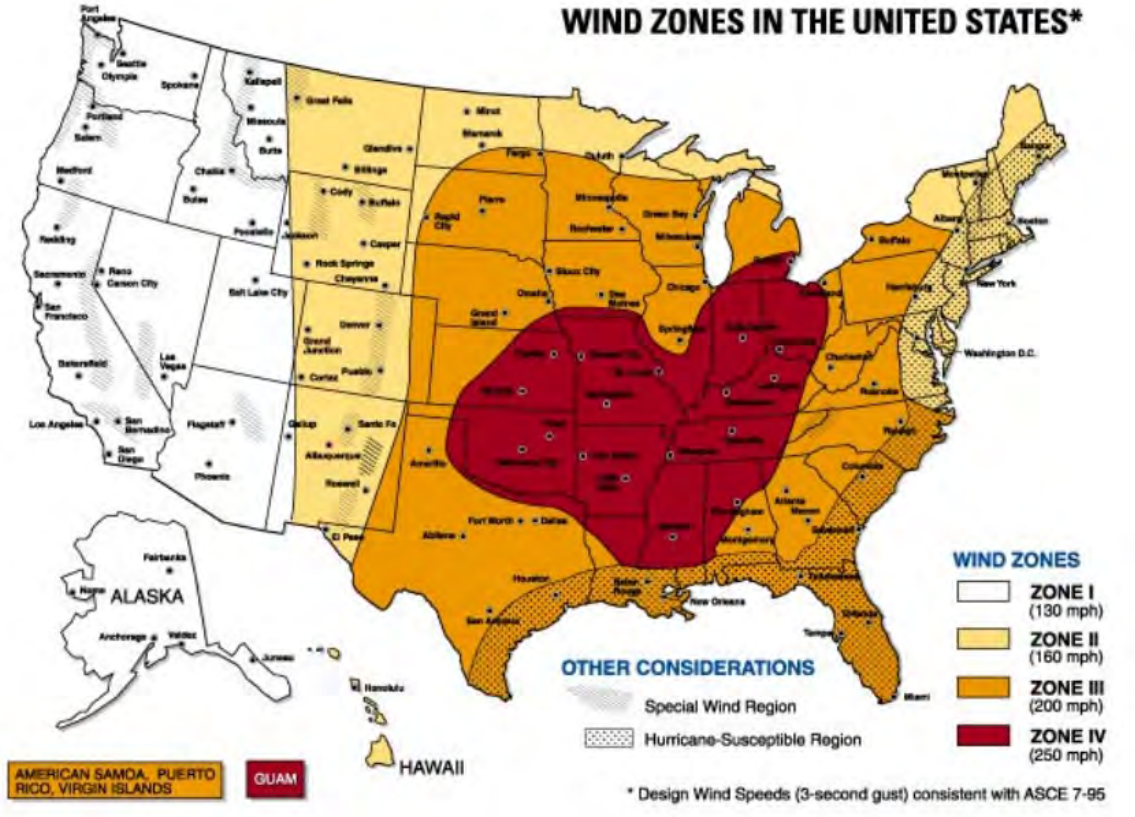

Figure 4.3: Wind Zones in the United States

Extent

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.

The Beaufort Wind Chart rates the severity of wind (based on speed) on a 0-12 scale. As a wind event gains force, the likelihood of damage increases as shown in **Table 4.4**.

Table 4.4: Beaufort Wind Chart

Beaufort Wind Chart – Estimating Winds Speeds

Beaufort Number	MPH Range	MPH Average	Terminology	Description
0	0	0	Calm	Calm. Smoke rises vertically.
1	1-3	2	Light air	Wind motion visible in smoke.
2	4-7	6	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	11	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13-18	15	Moderate breeze	Dust and loose paper is raised. Small branches begin to move.
5	19-24	22	Fresh breeze	Smaller trees sway.
6	25-31	27	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	32-38	35	Near gale	Whole trees in motion. Some difficulty when walking into the wind.
8	39-46	42	Gale	Twigs broken from trees. Cars veer on road.
9	47-54	50	**Severe gale**	**Light structure damage.**
10	55-63	60	**Storm**	**Trees uprooted. Considerable structural damage.**
11	64-73	70	**Violent storm**	**Widespread structural damage.**
12	74-95	90	**Hurricane**	**Considerable and widespread damage to structures.**

History

Table 4.5: Summary of High Wind Events

Event Types: High Wind

Guernsey county contains the following zones:
'Guernsey'

11 events were reported between 05/01/1950 and 09/01/2018 (24961 days)

Summary Info:

Number of County/Zone areas affected:	1
Number of Days with Event:	11
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	0
Number of Days with Event and Property Damage:	9
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	1

Table 4.6: Location Chart of High Wind Events

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	744.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	02/25/2001	09:00	EST	High Wind		0	0	5.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	03/09/2002	18:00	EST	High Wind		0	0	10.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	02/23/2003	06:30	EST	High Wind	55 kts. EG	0	0	3.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	07/21/2003	13:45	EST	High Wind	52 kts. EG	0	0	1.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	12/01/2006	15:00	EST-5	High Wind	55 kts. EG	0	0	25.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	01/09/2008	01:30	EST-5	High Wind	50 kts. EG	0	0	50.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	01/30/2008	01:00	EST-5	High Wind	50 kts. EG	0	0	50.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	09/14/2008	16:45	EST-5	High Wind	50 kts. EG	0	0	500.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	02/12/2009	02:00	EST-5	High Wind	50 kts. EG	0	0	100.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	12/09/2009	13:00	EST-5	High Wind	50 kts. EG	0	0	0.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	02/24/2012	15:00	EST-5	High Wind	54 kts. MG	0	0	0.00K	0.00K
Totals:								0	0	744.00K	0.00K

Table 4.5 summarizes “High Wind” events in Guernsey County and **Table 4.6** details location and impacts of the “High Wind” events that impacted the County. The next page further describes each event in detail.

February 25, 2001

- A high wind event occurred in Guernsey County at 9:00 am. An intense area of low pressure passing over the region brought a prolonged period of high winds to east central Ohio. Wind gusts estimated to around 60 MPH continued from late morning into the early evening hours, downing numerous trees, large limbs and power lines across the entire area. It caused $5,000 in total property damages, 0 injuries, and 0 deaths.

March 9, 2002

- A high wind event occurred in Guernsey County at 6:00 pm. A strong cold front across east central Ohio during the late afternoon hours of the 9th. Winds between 70-80 MPH were present along with severe thunderstorms. This produced widespread damage across the area, mostly in the form of downed trees and power lines. These high winds continued until the early morning hours of March 10th. It is estimated that around 15,000 people were left without electricity in east central Ohio in this wind event. It caused Guernsey County $10,000 in total property damages, 0 injuries, and 0 deaths.

February 23, 2003

- A high wind event occurred in Guernsey County at 6:30 am. Straight-line winds were estimated at 60-65 MPH by the National Weather Service. This caused multiple downed trees and power lines in the Byesville area. It caused $3,000 in total property damages, 0 injuries, and 0 deaths.

July 21, 2003

- A high wind event occurred in Guernsey County at 1:45 pm. Straight-line winds were estimated at 55-60 MPH by the National Weather Service. Several trees were downed in Monroe Township near the Birmingham unincorporated community. It caused $1,000 in total property damages, 0 injuries, and 0 deaths.

December 1, 2006

- A high wind event occurred in Guernsey County at 3:00 pm. A powerful storm system and associated cold front produced severe thunderstorms and high winds. Straight-line winds were estimated at 60- 65 MPH by the National Weather Service. Multiple trees were reported down countywide. It caused $25,000 in total property damages, 0 injuries, and 0 deaths.

January 9, 2008

- A high wind event occurred in Guernsey County at 1:30 am. A strong cold front produced widespread wind damage and power outages from downed wires across southeast Ohio. Straight lined winds were estimated at 55-60 MPH by the National Weather Service. It caused $50,000 in total property damages, 0 injuries, and 0 deaths.

January 30, 2008

- A high wind event occurred in Guernsey County at 1:00 am. Straight-line winds were estimated at 50-55 MPH by the National Weather Service. A strong cold front crossed the region during the morning of January 30th. The strong pressure gradient along and behind the front produced wind gusts near 50-55 MPH in many locations across eastern Ohio. This produced numerous reports of trees and power lines down across the region. It caused $50,000 in total property damages, 0 injuries, and 0 deaths.

September 14, 2008

- A high wind event occurred in Guernsey County at 4:45 pm. Low pressure from the remains of Hurricane Ike moved across Central Ohio to Lake Erie on the evening of September 14th and produced very strong winds into the early morning of September 15th across eastern Ohio, northern West Virginia, and western Pennsylvania. Widespread damage to trees and power lines was reported across the region with power outages and damage to some structures from falling trees. Power was not restored to some rural areas for one week after the storm. At the peak of the storm more than 2 million homes were without power. For a

period of about 8 hours, sustained winds during the storm were from 30-50 MPH, with gusts well over 60 MPH. The highest reported wind gust was 81 MPH at the Beaver County, Pennsylvania Airport, near the Ohio/Pennsylvania state line. In Guernsey County it caused $500,000 in total property damages, 0 injuries, and 0 deaths.

February 12, 2009

- A high wind event occurred in Guernsey County at 2:00 am. A powerful cold front moved across the Ohio Valley on the evening of the 11th as strong low pressure moved north across the Great Lakes. A convective line along the cold front produced widespread damage across eastern Ohio, with thunderstorm wind gusts of 60 to 70 MPH. High winds gusting over 60 MPH behind the front in a strong pressure gradient produced wind damage across the entire region into midday on the 12th. In all across eastern Ohio, western Pennsylvania, northern West Virginia and Garrett County, Maryland over one half million homes and businesses were without power at some point during the storm. In Guernsey County it caused $100,000 in total property damages, 0 injuries, and 0 deaths.

December 9, 2009

- A high wind event occurred in Guernsey County at 1:00 pm. A strong pressure gradient behind a cold front produced damaging winds across all of western Pennsylvania, northern West Virginia, eastern Ohio, and Garrett County, Maryland. Sustained winds were from 30-40 MPH with gusts over 60 MPH. Trees and power lines were reported down across the region, and although no property damage was recorded, more than 50,000 homes were without power late afternoon on the 9th at the peak of the winds. In Guernsey County it caused 0 injuries, and 0 deaths.

February 24, 2012

- A high wind event occurred in Guernsey County at 3:00 pm. A strengthening low pressure system crossed the upper Ohio Valley and Great Lakes on the 24th. Strong cold air advection and a tightening pressure gradient brought strong winds and snow showers and squalls to much of northwestern Pennsylvania, eastern Ohio, northern West Virginia and Garrett County, Maryland. Wind gusts over 58 MPH were realized in multiple counties with damage in the way of downed trees, power lines. Though no property damage was recorded there were numerous power outages. In Guernsey County it caused, 0 injuries, and 0 deaths.

In total, “High Wind” events in Guernsey County were responsible for $744,000 in property damage, 0 injures, and 0 deaths based on National Weather Service records between 05/01/1950 and 09/25/2018.

Table 4.7: Summary of Thunderstorm Wind Events

Event Types: Thunderstorm Wind

158 events were reported between 05/01/1950 and 09/01/2018 (24961 days)

Summary Info:

Number of County/Zone areas affected:	1
Number of Days with Event:	115
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	1
Number of Days with Event and Property Damage:	82
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	1

Table 4.8: Location Chart of Thunderstorm Wind Event

Location	Date	Time	Time Zone	Wind Speed	Death	Injury	Property Damage
Cambridge	6/29/2012	5:00 PM	EST	85-90 MPH	0	0	$500,000
Cambridge	8/25/1998	3:50 PM	EST	80-90 MPH	0	3	$400,000
Kimbolton	6/23/2010	4:30 PM	EST	55-60 MPH	0	0	$75,000
Middlebourne	6/10/2011	9:30 PM	EST	55-60 MPH	0	0	$75,000
Cumberland	7/19/2012	3:45 PM	EST	55-60 MPH	0	0	$75,000
Cambridge	4/21/2006	7:40 PM	EST	70-75 MPH	0	0	$55,000

Between 1950 and 2018 Guernsey County has endured 115 days with thunderstorm wind events (**Table 4.7**) that have totaled to $2,431,000 in total property damages, 3 injuries and 0 deaths. Due to the high volume of events, a threshold was implemented to highlight the most damaging and fatal occurrences (**Table 4.8**). Events that caused $55,000 or more in total property damages (note the collective damages statements) or involved injuries or fatalities are highlighted above. In regard to the total property damages of all 79 events, the 6 events described above account for $1,180,000 of the $2,431,000 (48 percent) in total property damages.

Probability

According to the National Oceanic and Atmospheric Administration (NOAA), between 1950 and 2018, there were 126 strong wind events in Guernsey County. Over the 68-year duration, there was an average of 1.85 strong wind events annually in the County. Countywide, there is approximately a .005 percent chance of having a strong wind events of any size on any given day (1.85 strong wind events divided by 365 days = 0.005 occurrences per day). The most prevalent type of strong wind event to hit Guernsey County has been severe thunderstorm winds. According to the NOAA, between 1950 and 2018, there were 115 severe thunderstorm wind events in Guernsey County. Over the 68-year duration, there was an average of 1.69 thunderstorm wind events annually in the County. Countywide, there is approximately a .004 percent chance of having a thunderstorm wind event of any size on any given day (1.69 thunderstorm events divided by 365 days = 0.004 occurrences per day).

Vulnerability Assessment

Infrastructure Impact
Above ground infrastructure is at risk for storm damage by wind and falling debris. For infrastructure the most damaging part of a storm are the high winds and hail. High winds can strip a tree of bark and detach limbs. If large branches fall they can damage buildings and supporting above ground infrastructure. Large trees, upwards of 200 feet tall, can be uprooted and can fall on buildings or through houses which can cause serious harm or death.

Utilities that are out in the open are at risk for damage by severe storms. Electrical lines are spread throughout the County connecting homes, businesses, and other facilities to one another. Large branches from trees or other debris can strike above ground electrical lines, causing power outages. Further, downed lines that are still live and active are extremely hazardous and can cause death by electrocution.

Roads are spread throughout Guernsey County and can be affected by downed trees, branches, or other debris. Larger debris or trees will take more time and effort to remove and can adversely affect the flow of traffic until safely removed. Wastewater facilities can experience backup and blockages if debris falls into the tanks. There are 3 wastewater treatment plants throughout Guernsey County.

Population Impact
According to the Census Bureau's 2017 population estimates, the population of Guernsey County is approximately 39,093. The population is expected to shrink to 36,390 through the year 2040, so the number of individuals affected by storm events will stay about the same. Summer storms are random in nature and affect the entire area of a county. Everyone within the County should be prepared during a storm event. Populations residing in mobile home parks are particularly vulnerable and should seek out shelters.

Property Damage
According to the United States Census Bureau, the median home value within Guernsey County was $98,600. There are 19,110 residential housing units within Guernsey County.

Since 1950, according to the NOAA, there have been 126 high wind events with most causing property damage. Of the 126 strong wind events, there have been 115 thunderstorm wind events, with 82 causing property damage. High wind events caused $744,000 in property damages while thunderstorm wind events caused $2.431 million in property damages. Between the two event types, damages total $3.175 million dollars. Annualizing these losses over the data period (1950 to 2018) results in an annual damage estimate of approximately $46,691 for the County.

Loss of Life
According to the NOAA, high wind and thunderstorm wind events have been responsible for 0 deaths and 3 injuries (both attributed to thunderstorm winds) during events that passed through Guernsey County since 1950.

Economic Losses

Severe wind storms usually cause minor damage to structures, like blowing shingles off roofs. Large branches may break windows or fall onto buildings and above ground infrastructure. However, 35 of the 115 reported thunderstorm wind and 5 of the 11 reported high wind events recorded in Guernsey County have each caused more than $20,000 worth of property damage countywide. The costliest damage sustained by a wind event in Guernsey County occurred in June 2012 and September 2008, when wind events caused $500,000 worth of property damage respectively.

Drought

Description

Droughts are a protracted period of deficient precipitation resulting in extensive damage to crops, resulting in loss of yield. According to the National Oceanic and Atmospheric Administration (NOAA), there are four types of droughts: (1) meteorological drought, (2) hydrological drought, (3) agricultural drought, and (4) socioeconomic drought. Each kind of drought has different indicators and occur at different times after a prolonged absence of water. Meteorological drought, for instance, occurs after dry weather patterns have dominated an area. This type of drought can be derived from extended periods of high temperatures with little to no precipitation, leading to deficiencies in soil moisture. Hydrological drought then arises once a low supply of water is observed, especially in streams, reservoirs, and groundwater levels. Typically, hydrological drought occurs after several months of meteorological drought. Once crops have been affected, agricultural drought has occurred. Additionally, socioeconomic drought relates to the supply and demand of various commodities to drought. While meteorological drought tends to be short in length, hydrological drought requires more time to develop and recover.

Location

Droughts are regional events that have the potential to affect all areas and jurisdictions within Guernsey County. They may occur any time from spring through fall. **Figure 4.9** depicts the Drought Monitor for the State of Ohio which indicates the drought conditions over the last year throughout the State, including Guernsey County.

Extent

Usually drought is region specific and the whole of the state experiences the dry spell for which heat is the precursor. Drought is generally a prolonged event involving drier than normal conditions and is a countywide hazard.

Drought affects all jurisdictions and all areas of the County, creating the possibility of excessive heat or periods of extreme cold that result in water-related problems. The amount of precipitation at a particular location varies from year to year but, over a period of years, the average amount is fairly constant. Even if rainfall for a year is above average, rainfall shortages can occur during a period of excessive heat or when rainfall is crucial for plant and crop growth.

When there is little to no rainfall for short periods of time, soils can dry out and plants can die, but when there is limited rainfall for prolonged periods of time (several weeks, months, or years), water levels in wells, lakes, reservoirs, streams, and rivers are reduced and flow declines. If dry conditions persist, water supply problems develop, and the dry period can become a drought.

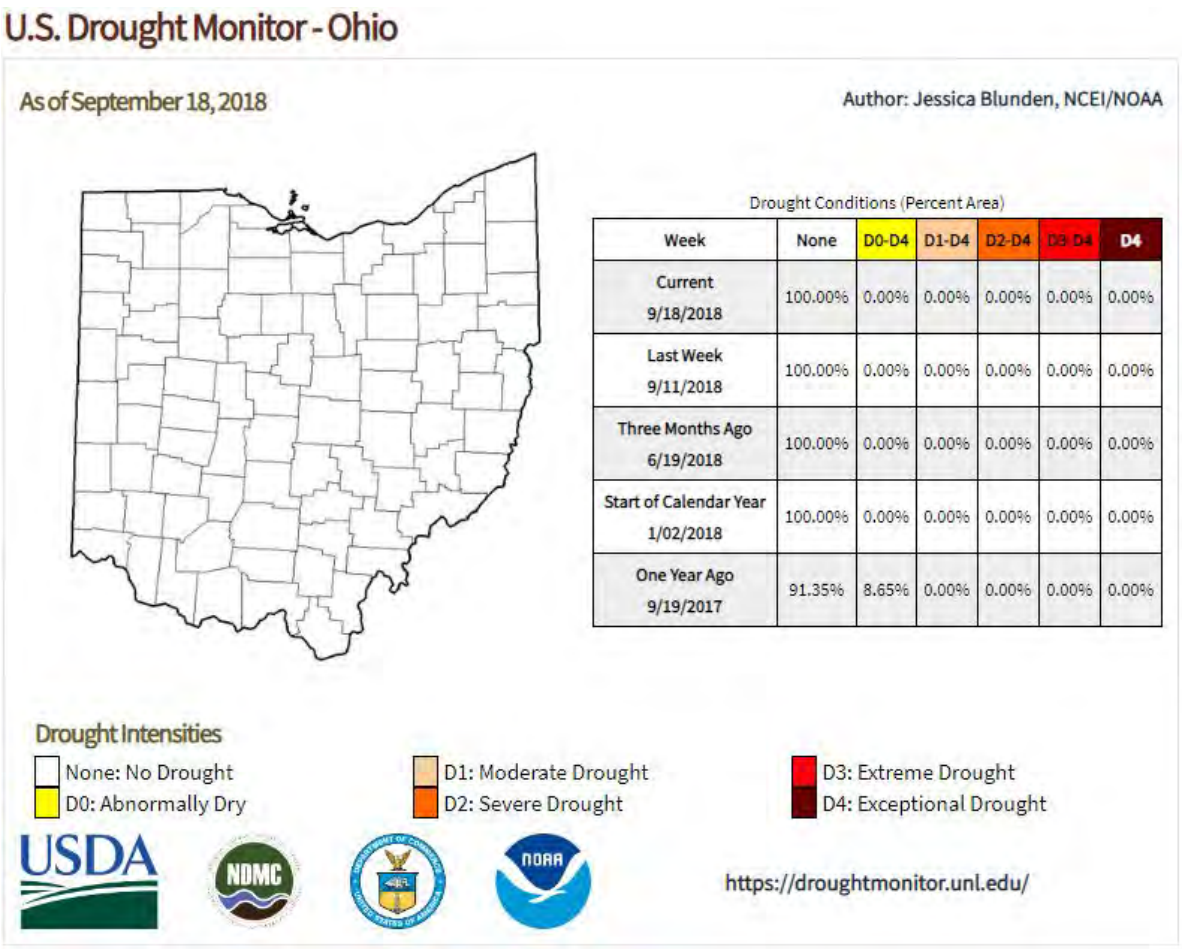

Figure 4.9: Drought Monitor for the State of Ohio

The extent of the drought is determined by the Palmer Drought Severity Index (PDSI). In this way, the Index can be utilized as a tool to help define disaster areas and indicate the availability of irrigation water supplies, reservoir levels, range conditions, amount of stock water, and potential for forest fires. The PDSI depicts prolonged (in months or years) abnormal dryness or wetness and is slow to respond, changing little from week to week. It also reflects long-term moisture runoff, recharge, and deep percolation, as well as evapotranspiration.

The PDSI is a standardized index with values typically falling between -4.00 and +4.00, although extreme conditions can be greater in value (**Table 4.3**). Negative values indicate drought conditions while positive values represent wet spell conditions. Values around zero represent near normal conditions. **Figure 4.10**, visualizes the PDI for the 48 contiguous U.S. states.

Table 4.3: Palmer Drought Severity Index Classifications

4.0 or greater	Extremely Wet
3.0 to 3.99	Very Wet
2.0 to 2.99	Moderately Wet
1.0 to 1.99	Slightly Wet
0.5 to 0.99	Incipient Wet Spell
0.49 to -0.49	Near Normal
-0.5 to -0.99	Incipient Dry Spell
-1.0 to -1.99	Mild Drought
-2 to -2.99	Moderate Drought
-3.0 to -3.99	Severe Drought
-4.0 or less	Extreme Drought

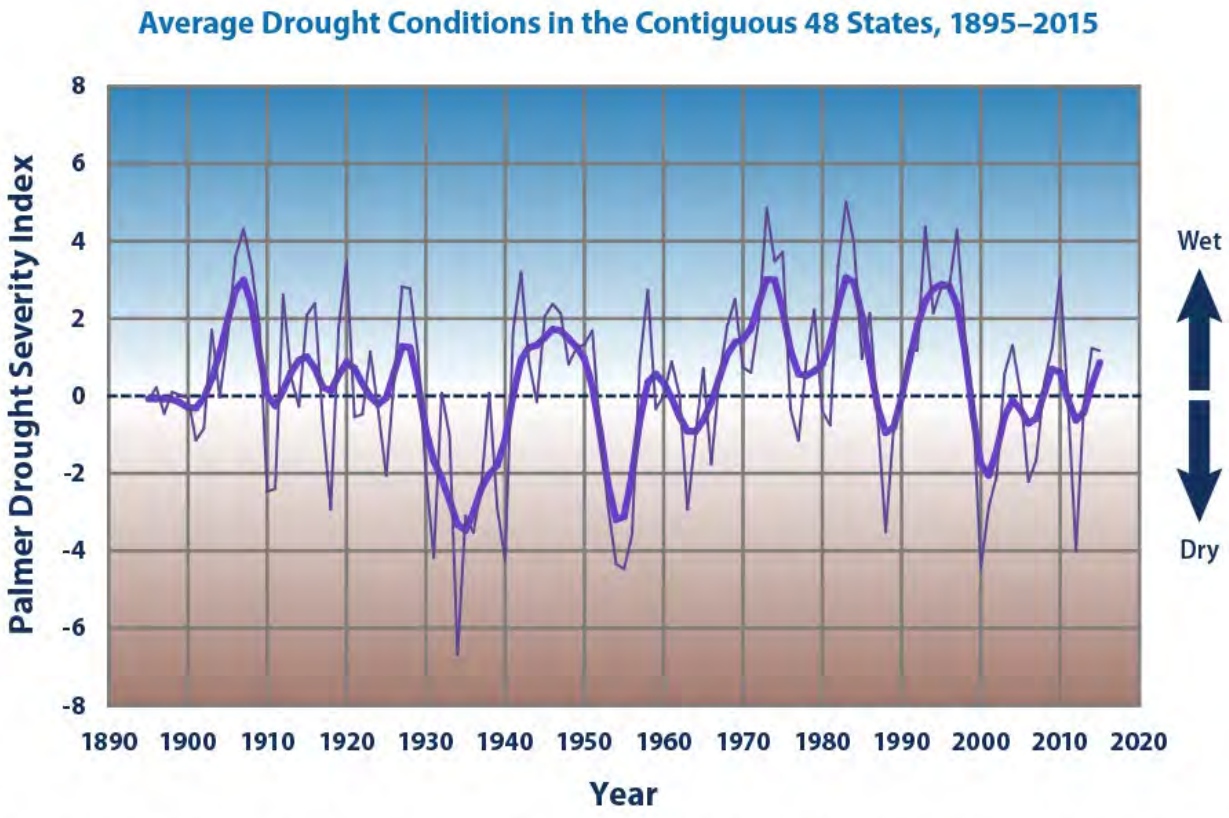

Figure 4.10: Palmer Drought Severity Index Chart

History

Figures 4.11 and 4.12, below, summarize the histoic drought events in Guernsey County and their location. While the National Climatic Data Center has two drought events on record from 1999, the County has supplemental information regarding the 2012 drought.

Sort By: Date/Time (Oldest)

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	0.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	08/01/1999	00:00	EST	Drought		0	0	0.00K	0.00K
GUERNSEY (ZONE)	GUERNSEY (ZONE)	OH	09/01/1999	00:00	EST	Drought		0	0	0.00K	0.00K
Totals:								0	0	0.00K	0.00K

Figure 4.11: Summary of Historic Drought Events in Guernsey County

Storm Events Database

Search Results for Guernsey County, Ohio

Event Types: Drought

Guernsey county contains the following zones:
'Guernsey'

2 events were reported between 01/01/1950 and 09/30/2018 (25110 days)

Summary Info:

Number of County/Zone areas affected:	1
Number of Days with Event:	2
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	0
Number of Days with Event and Property Damage:	0
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	1

Column Definitions:
'Mag': Magnitude, 'Dth': Deaths, 'Inj': Injuries, 'PrD': Property Damage, 'CrD': Crop Damage

*Click on **Location** below to display details.*
Available Event Types have changed over time. Please refer to the Database Details for more information.

Figure 4.12: Location of Historic Drought Events in Guernsey County

August 1999

- With dry conditions beginning in July 1999 and continuing through the month of August, the U.S. Department of Agriculture declared an agricultural disaster area in Eastern Ohio on August 10, 1999. Between May and August of 1999, precipitation deficits were estimated between 2 and 8 inches below normal. Preliminary estimates predicted $600 million in agricultural losses statewide from the drought. No deaths or injuries, either direct or indirect, were reported.

September 1999

- The dry conditions from July and August continued through to the month of September. Rainfall in September still averaged below normal, with the Palmer Drought Index

measuring the entirety of Eastern Ohio as a moderate to severe drought. No deaths or injuries, either direct or indirect, were reported.

August 2002

- Dry conditions began in May of 2002 and by the end of August, actual rainfall had dropped below 60 percent of normal. Major streams were dry and many stream developments had stopped producing water. Livestock sales increased by nearly 20 percent as a result of the shortage of water and pasture land.

2012 North American Drought

- The 2012-2013 North American Drought is an expansion of the 2010-2012 United States Drought, which began in the spring of 2012 when the lack of snow in the U.S. caused very little melt water to absorb into the soil. The drought included most of the U.S. and included Ohio. Among many counties, Guernsey County was designated with moderate drought conditions by mid-June. The drought inflicted catastrophic economic ramifications. In most measures, the drought exceeded the 1988-1989 North American Drought, which was the most recent comparable drought.

- On July 30, 2012, the Governor of Ohio sent a memorandum to the 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 the Loss Assessment Report and determined that there were sufficient production losses in 85 counties to warrant a Secretarial disaster designation. By December 2012, all 88 counties in Ohio – including Guernsey County – received such a designation.

Figure 4.13, below, compares the PDSI for August of 2018 (on the right) with the PDSI for June of 2012 (on the left). The images show how the drought affected much of the United States, extending through Ohio and Guernsey County.

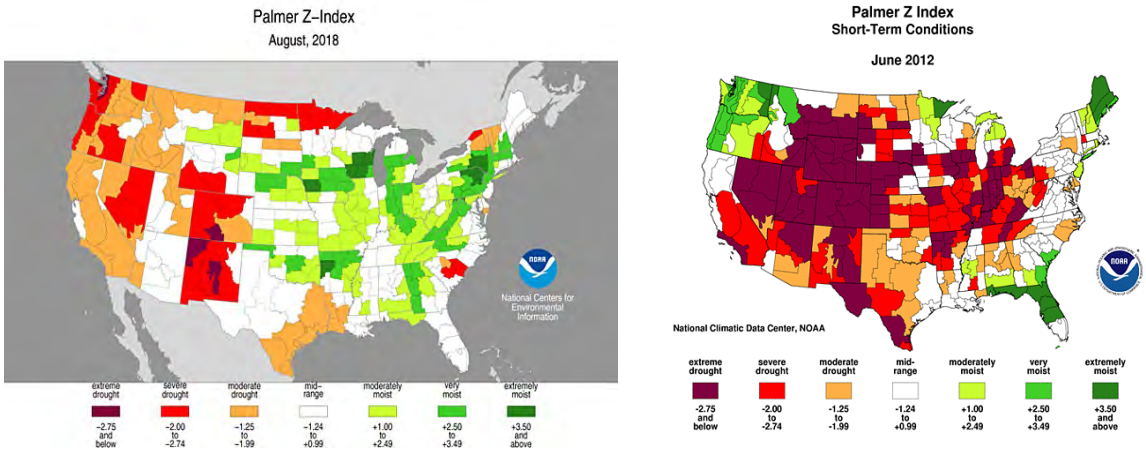

Figure 4.13: Visual Representation of the Palmer Drought Severity Index in August 2018 compared to June 2012

A study completed by OSU Assistant Professor, Extension Agent Clif Little, estimates agricultural losses for Guernsey County resulting from the droughts listed above at $1,984,020.

Table 4.4: Estimated Losses due to 1999, 2002 Droughts

Agricultural Product	Estimated Losses
Dairy	$414,000
Cattle & Calves	$899,820
Sheep & Goats	$15,000
Corn	$128,000
Soybeans	$24,000
Hay & Forages	$503,000
Total	**$1,984,020**

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Agricultural Loss from Drought in Guernsey County

In the last ten years, two major droughts have occurred in Guernsey County. Attached are the USDA synopsis of these events. It should be noted that drought conditions impact agriculture production on a county wide basis. The figures attached in the USDA document in some cases represent a cost share. The federal government does not provide total reimbursement of farm losses in the event of a drought, flood or any other occurrence. In addition, the figures presented in the USDA documents do not represent all farmers. In other words, only a percentage of eligible farmers apply for government assistance. However, these figures do provide us with an indication of the seriousness of the individual event.

Individual Drought Events, "1999" and "2002"

To calculate a loss we will use a production loss percentage based on the county. United States Department of Agriculture Emergency Board figures for each community and multiply times percentage loss. Major commodities, number of acres and cash receipt information will be gleaned from the Ohio Agricultural statistics.

For each of the two drought years we can conservatively estimate agricultural losses at:

Dairy	$414,000
Cattle & Calves	$899,820
Sheep & Goats	$ 15,000
Corn	$128,000
Soybeans	$ 24,000
Hay & Forages	$503,000
Total	$1,984,020

Agricultural losses due to Flood:

The most serious flood in recent time was 1998. A description of the event and the impact on agriculture in described in the USDA report attached. In this event, property, fence, livestock, hay fields, pastures, stored machinery, stored hay and other items were destroyed in flood prone areas. In an event such as the 1998 flood agricultural losses can be estimated at: $180,000 forage and crop losses cost share 65 percent = $276,932.07. The debris removal, structure repair and re-seeding damage estimated cost is $200,000, ($130,000 divided by .65).

Report submitted by:
Clif Little,
OSU Assistant Professor, Extension Agent
Agriculture and Natural Resources

The Ohio State University, The United States Department of Agriculture, and Guernsey County Commissioners Cooperating

USDA

United States Department of Agriculture

Farm Service Agency

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9711 East Pike Rd Room 103
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1999 DROUGHT – SUMMARY OF CONDITIONS

Below normal rainfall began in May 1999 and well above normal temperatures evaporated what little rainfall was received. Rainfall data from May to August was calculated at 38% below normal and temperatures ranging from 81 to 100 degrees were documented for 45 consecutive days during June, July and August. Nighttime temperatures remained above normal and no precipitation in the form of dew was received.

Water levels for the 4-month period were well below normal and most streams and spring developments were running low or completely dry. Crops were suffering from 40-60 percent loss and pastures losses were calculated at nearly 75% loss.

The County Emergency Board recommended requests be submitted for Emergency Conservation Program for water development practices and Non-insured Assistance Program for hay and pasture losses. Approximately 150 Guernsey County livestock producers installed spring developments, wells, or pond clean out practices for cost-share totaling more than $155,000. In addition, the Pasture Recovery Program was implemented and 71 producers received $40,000 in cost-share to re-seed damaged pasture land.

Since the drought was wide spread across the county, the Non-insured Assistance Program was approved and 149 producers received over $335,000 for grain crop, hay and pasture losses.

Submitted by,
Rita A Tucker
County Executive Director

USDA
United States Department of Agriculture
Farm Service Agency
Guernsey-Noble FSA Office
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2002 DROUGHT – SUMMARY OF CONDITIONS

Calendar year 2002 started out well below normal rainfall data. Spring rains during March and April helped to ease the earlier dry conditions. However, high temperatures and below normal rainfall began in May 2002. By the end of August, actual rainfall had fallen below 60% of normal. Major streams were dry and many spring developments had stopped producing water. Approximately 20% increase in livestock sales occurred due to the shortage of water and pasture land. Winter supplies of hay were being used by the end of July.

Since early cuttings of hay were normal to above normal, hay production did not suffer the 50% loss needed to request disaster assistance on a county basis. Estimates indicate 50-60 percent loss of pasture, production for grain crops and vegetable crops.

The County Emergency Board submitted USDA Flash Report indicating a need for Emergency Conservation Program, Livestock Feed Assistance Program, Non-insured Assistance Program, Crop Loss Disaster Program and Emergency Loans.

To date the Emergency Conservation Program has been approved and implemented with 244 requests for water development practices. Funds totaling more than $240,000 have been received to reimburse Guernsey County livestock producers for water development practices needed due to drought conditions. Construction of spring developments, well construction, pipeline and tank installations and pond clean outs is currently underway.

To help livestock producers due to weather and price related disasters, USDA also implemented the Livestock Compensation Program. The LCP made payments to producers based on their livestock numbers as of June 1, 2002. The program was designed to get much-needed dollars into the hands of livestock producers quickly. Guernsey County received 289 applications and paid more than $311,000 for the Livestock Compensation Program to beef cattle, dairy cattle, sheep and goat producers. An LCP II program signup began April 1, 2003 for producers and counties who were unable to sign during the original signup period. The program payments will be based on the same criteria as LCP. In addition, the new signup includes catfish producers.

Congress has recently announced that a Crop Disaster Program and Livestock Assistance Program will be available after June 1, 2003. However, regulations and payment information have not been received for these programs. Producers will have the opportunity to select either 2001 or 2002 as their disaster year under these programs.

Submitted by,
Rita A Tucker
County Executive Director

Probability

Guernsey County has experienced droughts and dry seasons in the past and the potential exists for the County to experience droughts in the future. Increases in water usages and leakage may result in a deficiency in coming years. Water deficiencies and the threat of drought are expected to increase statewide, mainly due to the demand for water by residential, industrial and agricultural use. These situations can be closely monitored and predicted by the use of five parameters: stream-flows, precipitation, reservoir storage levels, groundwater elevations, and soil moisture. With an 8 percent chance of a drought occurring in any given year, the future occurrence of drought is possible, as defined by the Risk Factor Methodology probability criteria.

Vulnerability Assessment

Number of Structures

While drought hardly damages physical properties or structures, it can heavily affect crops. Recently released information on droughts establishes a comprehensive baseline of available data that land managers can use to test how well their efforts to improve drought resilience and adaptation practices are working nationwide. Major findings from the report include:

- Drought projections suggest that some regions of the U.S. will become drier and that most will have more extreme variations in precipitation.
- Even if current drought patterns remained unchanged, warmer temperatures will amplify drought effects.
- Drought and warmer temperatures may increase risks of large-scale insect outbreaks and larger wildfires, especially in the western U.S.
- Drought and warmer temperature may accelerate tree and shrub death, changing habitats and ecosystems in favor of drought-tolerant species.
- Forest-based products and values – such as timber, water, habitat and recreation opportunities – may be negatively impacted.
- Forest and rangeland managers can mitigate some of these impacts and build resiliency in forests through appropriate management actions.

Economic Losses

According to the U.S. Department of Agriculture, Guernsey County contains 1,228 farms totaling over 143,763 acres in land. In 2012, the market value of products sold totaled $21,493,000, with $7,873,000 (37 percent) coming from crop sales and $13,620,000 (63 percent) coming from livestock sales. This averages to approximately $17,503 per farm. As described, drought has the potential to impact the amount of crops that can be harvested, as well as influence livestock sales. **Table 4.5** displays loss statistics, comparing a non-drought year (2011) with the year of the 2012 Drought.

Table 4.5: Loss Statistics between 2011 and 2012 for Guernsey County's Corn Production

Commodity	Units	Non-Drought Year 2011 (acres)	Drought Year 2012 (acres)	Change	Amount
Corn-planted	acres	3400	4200	up	800
Corn, grain-harvested	acres	2970	3310	up	340
Yield	**%**	**87.35%**	**78.81%**	**down**	**8.54%**
Corn, grain-production	bushels	387,000	404,000	up	17,000
Yield	**bushels/acre**	**130.30**	**122.05**	**down**	**8.25**

Earthquakes

Description

According to the U.S. Geological Survey, earthquakes are caused by a sudden slip on a fault. The tectonic plates that make up Earth's surface are always moving but can get stuck due to friction. When the plates overcome the friction, there is an earthquake that releases energy in seismic waves that travel through Earth's crust. These waves produce the shaking feeling that is experienced during an earthquake.

The Ohio Department of Natural Resources Division of Geological Survey has 29 stations throughout the state that cooperate to monitor and record seismic activity. This system of stations is called OhioSeis. Generally, these stations are located at colleges, universities, and other institutions. The nearest stations to Guernsey County are O53A, located in Freeport in Harrison County, O52A, located in Adamsville in Muskingum County, and BSPO, located in Barkcamp State Park in Belmont County.

Location

Earthquakes are county-wide hazards and can affect all areas and jurisdictions.

Extent

Earthquakes are documented by the seismographic network of stations and are measured by magnitude, intensity, and depth. In past Guernsey County incidents, many of the earthquakes occur at relatively shallow depths. While this generally equates to stronger earthquakes, the earthquakes recorded have been regarded as "microquakes," some of which occurred without notice or report of their occurrence.

The Modified Mercalli Intensity (MMI) Scale (**Table 4.6**) assigns roman numerals to increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, based on observed effects.

Table 4.6: Modified Mercalli Intensity Scale

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

Intensity	Shaking	Description/Damage
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

History

Historically, earthquakes in Guernsey County have been rare in the past and have caused very little damage. According to the Ohio Department of Natural Resources Division of Geological Survey, there have been several earthquakes within the past few years in the region (**Figure 4.14**). However, only two of these earthquakes were notable based on location and impact.

August 3, 2016- Barnesville, Guernsey County

- Magnitude: 2.3 ML, MMI Scale: Not Rated, Not Felt
- A small earthquake took place at 04:50 a.m. The epicenter of the earthquake was located approximately 4.5 miles northwest of the Village of Barnesville. While the epicenter has been the only one recorded within the county, there were no reports submitted to the U.S. Geological Survey's Web site.

June 3, 2017- Batesville, Noble County

- Magnitude: 3.7 ML (Preliminary), 3.4 mbLg (USGS), MMI Scale: Not Rated but Felt
- An earthquake was experienced at 11:08 p.m. The epicenter was estimated approximately 1 mile south of the Village of Batesville. Over 90 reports were submitted to the U.S. Geological Survey's Web site, ranging from all over Southeastern Ohio. No physical damages or injuries were reported.

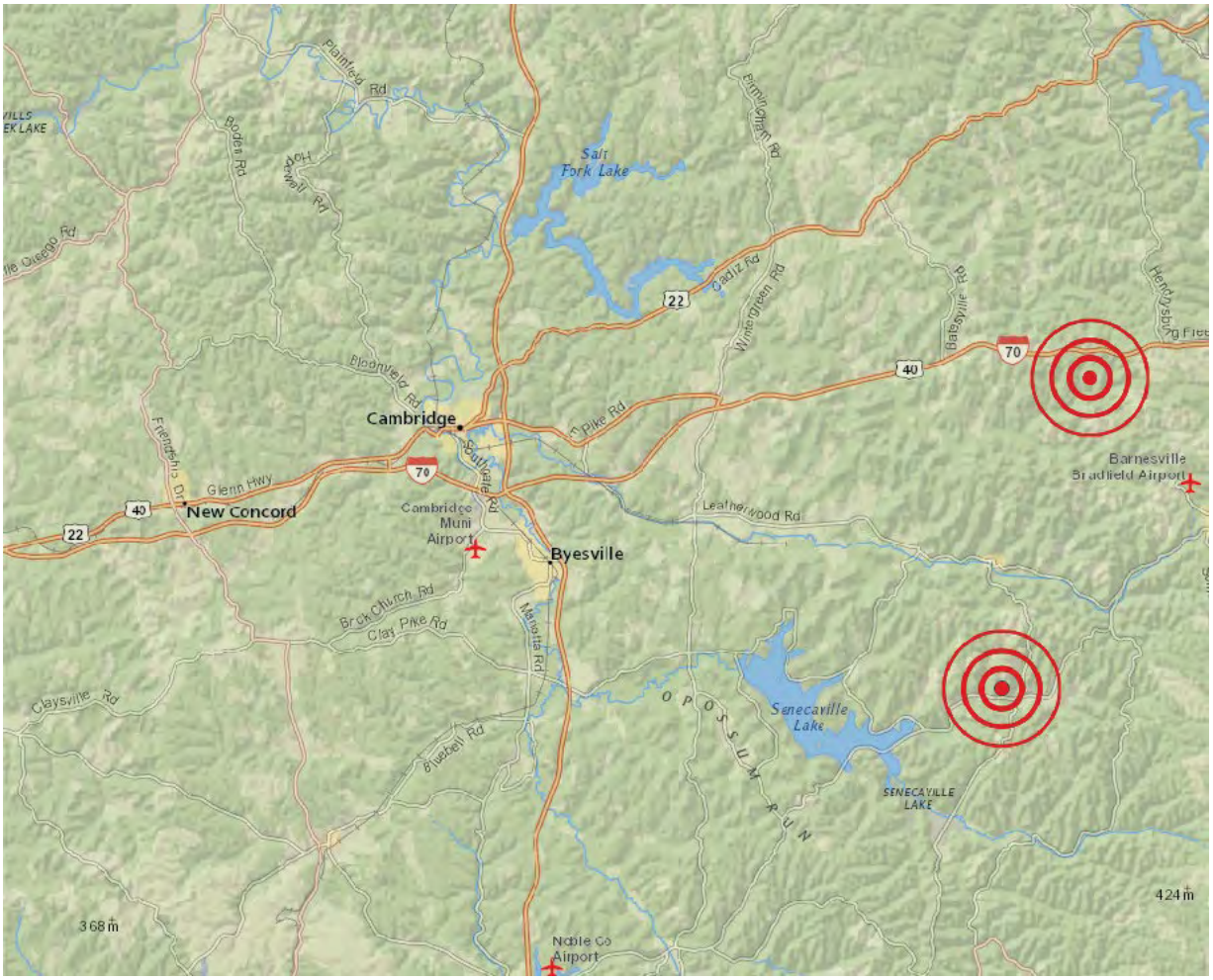

Figure 4.14: Locations of the last two prominent earthquakes in or near Guernsey County (USGS)

Probability

The U.S. Geological Survey provides National Hazard maps which show the probability of distribution of earthquake shaking levels occurring in the United States. The maps are often used by engineers and builders to obtain information regarding design and safety standards of roads, bridges, buildings, and utilities. Based on the results from the 2014 National Seismic Hazard Model, the entire State of Ohio has a less than 1 percent chance of damage from an earthquake as of 2016.

Climate Change

More recently, many scientists have begun to study human-caused earthquakes caused by mining. The University of Utah conducted a study on mining-induced seismicity (MIS) throughout their state. They detected that 17,000 events occurred between 1978 and August 2007 in the central-eastern coalfields of the state. While no fatalities resulted from these occurrences, they discovered that the vast majority of these events were caused by the redistribution of subsurface related to mining activity. Furthermore, they found that less than 2 percent of the tremors and earthquakes that occurred in the state were caused by naturally-occurring tectonic movement. While these have

not caused significant structural damage or injury, it is important to note that the prevalence of mining activity in Guernsey County may increase the probability of tremors and earthquakes.

Vulnerability Assessment

Past incidents have not resulted in any infrastructure impacts, population impacts, economic losses, or loss of life. Earthquakes stronger than those experienced by Guernsey County have the potential to create small amounts of property damage by shaking homes and knocking items off shelves and walls.

Due to the limited history of earthquakes in Guernsey County and the inconsequential nature of past incidents, this plan will not include more detail or mitigation action for this hazard in order to focus on hazards that are more likely to affect the area. However, it is important to be conscious of the potential risk that earthquakes may pose, and how earthquakes, natural and human-influenced, can affect the County.

Extreme Cold and Wind Chill

Definition

The National Weather Service offers the following definitions for wind chill and can issue the following related warnings:

- **Wind Chill:** Wind Chill refers to the Wind Chill Factor. Increased wind speeds accelerate heat loss from exposed skin, and the wind chill is a measure of this effect. No specific rules exist for determining when wind chill becomes dangerous. As a general rule, the threshold for potentially dangerous wind chill conditions is about -20°F.
- **Wind Chill Advisory:** A Wind Chill Advisory is issued when the wind chill temperatures with the combination of the wind and cold air will be between -10° F to -24° F.
- **Wind Chill Factor:** Increased wind speeds accelerate heat loss from exposed skin. No specific rules exist for determining when wind chill becomes dangerous. As a general rule, the threshold for potentially dangerous wind chill conditions is about -20°F.
- **Wind Chill Warning:** A Wind Chill Warning is issued when the wind chill or feel like temperature with the combination of the wind and cold air will be -25° F or colder.

Location

Extreme cold events are countywide and can affect all areas and jurisdictions. The cold season typically lasts from November to March, with average temperatures ranging from approximately 25 degrees to 30 degrees Fahrenheit. Typically, these events will occur at a regional or even national scale.

Extent

According to the National Weather Service, frostbite is an injury to the body caused by freezing body tissue. Fingers, toes, ears, and tip of the nose are most vulnerable. Symptoms include white or pale appearance. The area affected should be slowly re-warmed. Immediate medical attention is needed. **Figure 4.15** shows the onset time for frostbite at certain temperatures and wind chills.

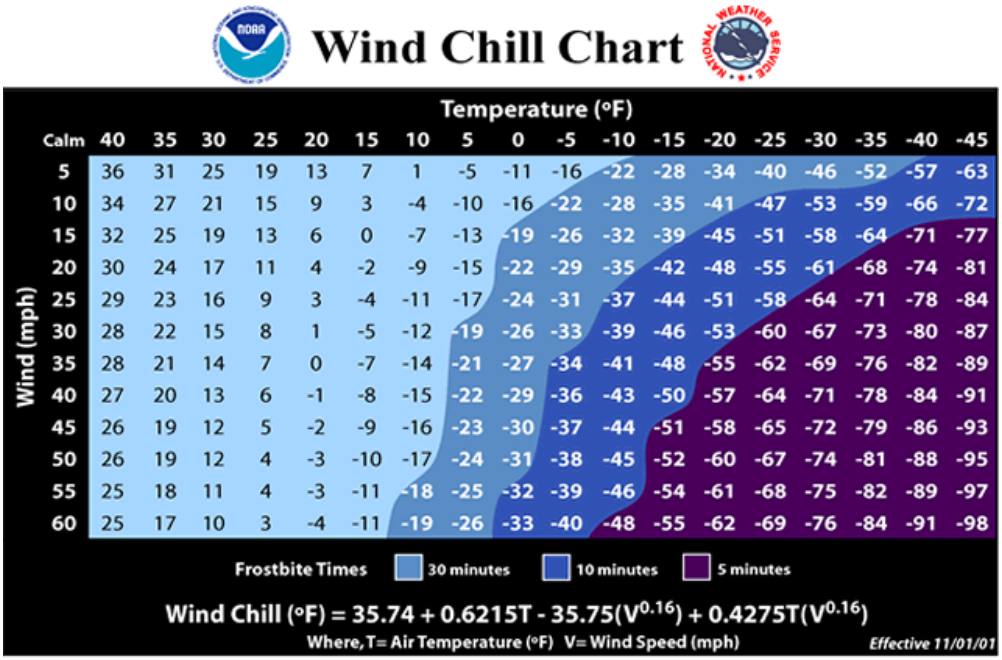

Figure 4.15: National Weather Service Wind Chill Chart

Hypothermia is abnormally low body temperature (below 95ºF). Warning signs include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion. If these symptoms are being experienced, immediate medical attention is needed and the body should be re-warmed slowly.

History

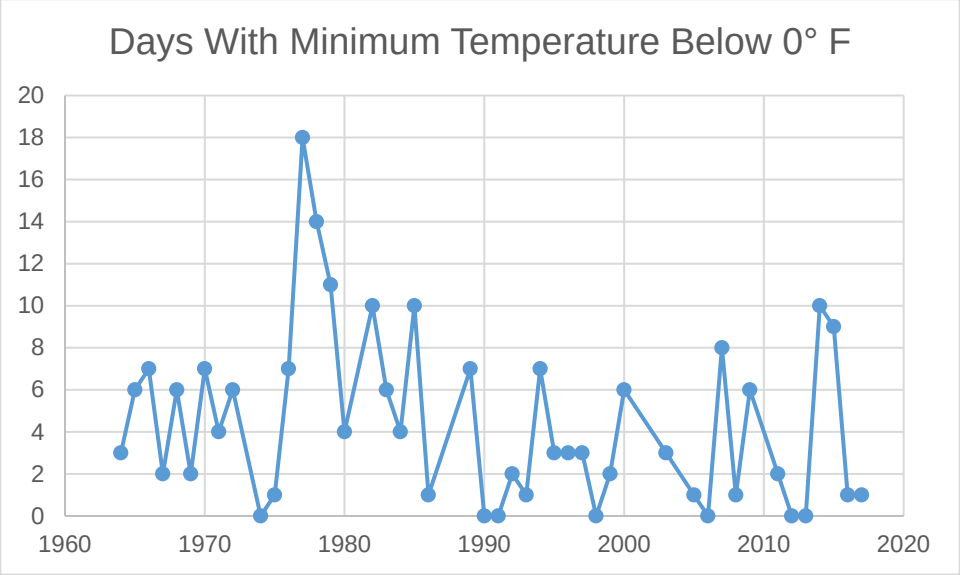

Figure 4.16: Days with Minimum Temperature Below 0°F in Guernsey County

The National Oceanic and Atmospheric Administration's Storm Events Database only lists one wind chill warning in their database for Guernsey County, occurring on December 15, 2016, when the weather station at Cambridge reported a wind chill of –10 degrees.

Probability

Even when official wind chill advisories are not issued, temperatures can still drop below safe levels. According to the NOAA, as shown in **Figure 4.16,** there have been 205 days on which the temperature has dropped below 0°F since 1964, making for an average of 4.45 days per year in which data was recorded.

Vulnerability Assessment

Structures Affected

There is no reported history of structures being affected by extreme cold in Guernsey County. Property can be at risk, however, due to the freezing and thawing action of pipes.

Infrastructure Impact

Extreme cold can have secondary impacts on infrastructure due to the accumulation of snow and ice, for example. The primary impact of extreme cold on infrastructure is typically the freezing of exposed water pipes and systems.

Population Impact

The greatest vulnerability from extreme cold is humans and livestock. People should stay indoors during extreme cold events. If someone is outside during an extreme cold event, they should wear loose-fitting and warm clothing and cover all exposed skin. Efforts should be made to protect livestock, pets, and other animals during extreme cold events.

Economic Loss

While there are no recorded economic losses in Guernsey County due to extreme cold, the potential certainly exists. In addition to the infrastructure vulnerability of pipes freezing, agricultural crops can also be put at risk by extreme cold, particularly if an extreme cold event occurs at a time outside the traditionally coldest months of the year.

Extreme Heat

Description

According to the Centers for Disease Control (CDC), extreme heat is defined as weather that is much hotter and/or humid than average. The definition of extreme heat varies based on many factors, such as location, weather conditions (such as temperature, humidity, and cloud cover), and the time of year.

Each National Weather Service Forecast Office issues some or all of the following heat-related products as conditions warrant.

- **An Excessive Heat Warning** is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Warning is when the maximum heat index temperature is expected to be 105° or higher for at least 2 days and night time air temperatures will not drop below 75°; however, these criteria vary across the country, especially for areas not used to extreme heat conditions.
- **Excessive Heat Watches** are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain.
- **A Heat Advisory** is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Advisory is when the maximum heat index temperature is expected to be 100° or higher for at least 2 days, and night time air temperatures will not drop below 75°; however, these criteria vary across the country, especially for areas that are not used to dangerous heat conditions.
- **Excessive Heat Outlooks** are issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to those who need considerable lead-time to prepare for the event.

Location

Extreme heat events are countywide and affect all locations and jurisdictions in Guernsey County. Often, these events will occur at a regional or even national scale. The hot season typically occurs from June to August.

Extent

The most common health effects (or symptoms) caused by extreme heat, according to the CDC, are listed below. As shown in **Figure 4.17**, the likelihood of each health effect increases as the temperature and relative humidity increase.

Heat cramps are muscle spasms, often in the abdomen, arms, or calves, caused by a large loss of salt and water in the body. Heat cramps can occur from prolonged exposure to extreme heat combined with dehydration, and they commonly happen while participating in strenuous outdoor activities such as physical labor or sports.

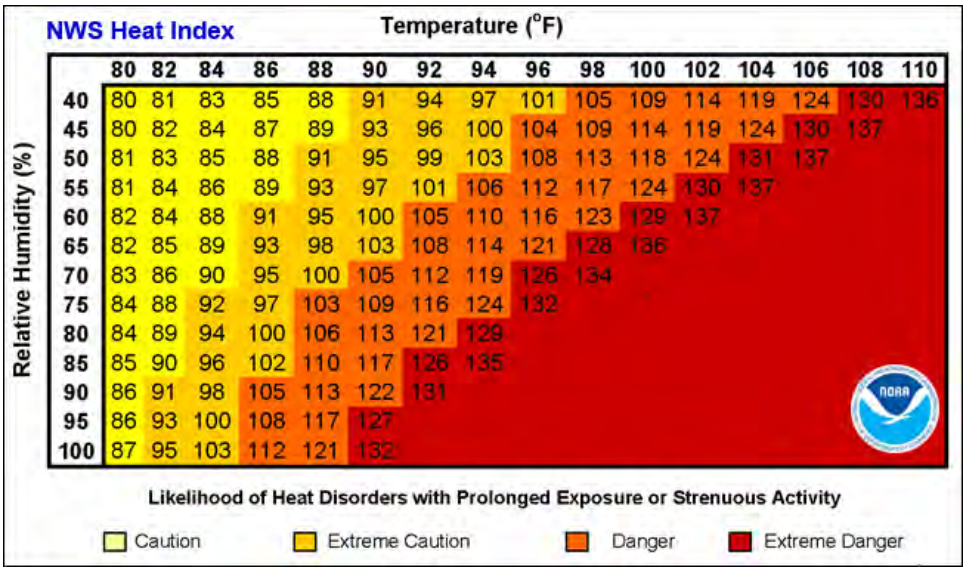

Figure 4.17: NOAA'S National Weather Service Heat Index

Heat exhaustion is a severe illness requiring emergency medical treatment. It can occur from exposure to extreme heat over an extended period of time (usually several days), especially when combined with dehydration. Heat stroke is the most serious medical condition caused by extreme heat, requiring emergency treatment. Heat stroke (or hyperthermia) occurs when the body can no longer regulate its temperature, and its temperature rises rapidly—up to 106°F or higher.

Heat stroke usually occurs as a progression from other heat-related illnesses, such as heat cramps or heat exhaustion. It can also strike suddenly without prior symptoms, however, and it can result in death without immediate medical attention. Extreme heat is especially dangerous because people might not recognize their symptoms as signs of a more serious condition. For example, symptoms like sweating or fatigue may just appear to be normal reactions to a hot day. People may be in more danger if they experience symptoms that alter their decision-making, limit their ability to care for themselves, or make them more prone to accidents. If untreated, heat-related illnesses can worsen and eventually lead to death. Heat can also contribute to premature death from health impacts other than those listed above. This is because extreme heat can worsen chronic conditions such as cardiovascular disease, respiratory disease, and diabetes.

History

No heat events have previously been reported in Guernsey County.

Probability

Although Guernsey County has not had any recorded heat events, **Figure 4.18** shows that the number of consecutive days in Guernsey County with temperatures in the 90th percentile has increased dramatically in the past eight years. This means that it is becoming increasingly likely that the County will experience some type of heat event in the future.

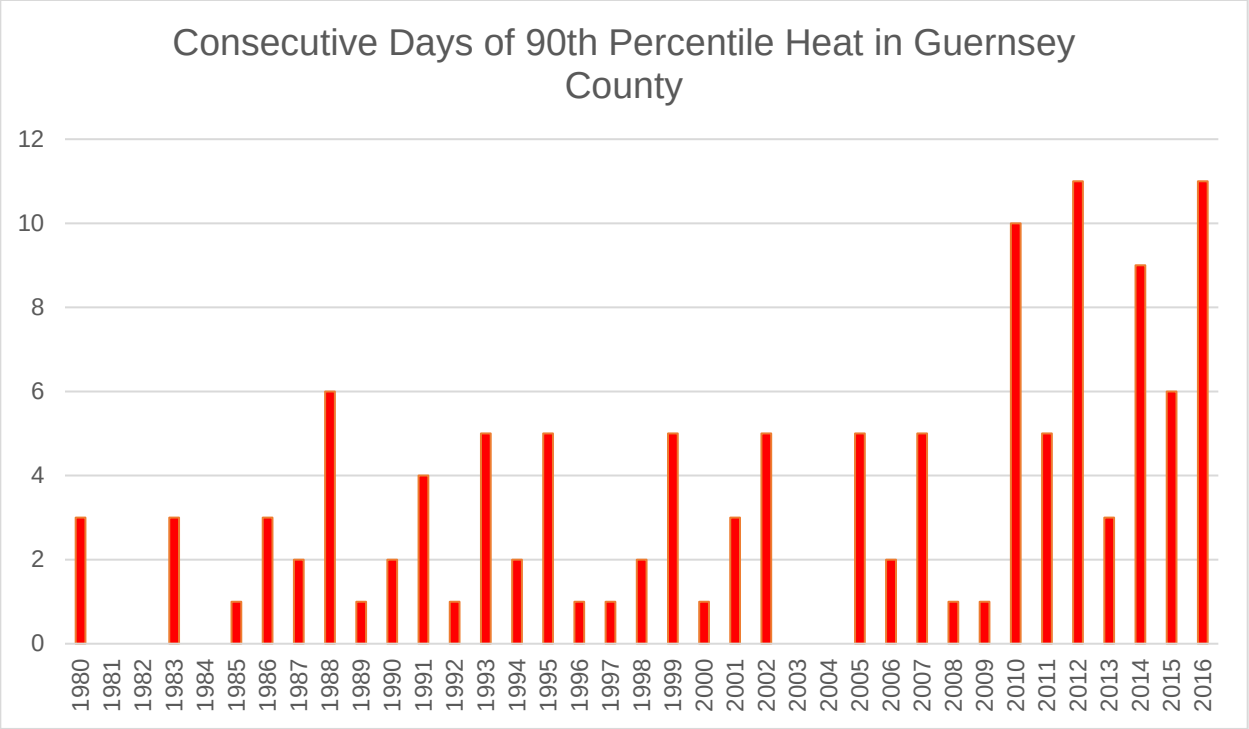

Figure 4.18: Consecutive Days of 90th Percentile Heat in Guernsey County

Vulnerability Assessment

Number of Structures Affected
There have not been any structures affected by extreme heat in Guernsey County.

Infrastructure Impact
Extreme heat does not typically affect infrastructure; however, there can be a power outage if the electric grid is overtaxed due to heavy use of air conditioning.

Population Impact
Although there is no history of population impact, extreme heat can have an impact on the population of the entire County. Groups that are particularly vulnerable to extreme heat include young children, older adults, and people with chronic health conditions, such as obesity, hypertension, cardiopulmonary or vascular disease. Residents should be aware of the dangers of extreme heat and how to recognize the symptoms of such conditions as heat cramps, heat exhaustion, and heat stroke.

Economic Loss
Extreme heat can have an economic impact by compromising crops and livestock, which are both vulnerable to extended extreme heat events. Human productivity can also be adversely affected when working conditions become too hot.

Flooding

Description

A flood is an event in which a large amount of precipitation cannot be contained or absorbed over a period of time, resulting in rising water. Floods vary in magnitude, cause, and resulting damage.

There are three main types of floods: riverine floods, flash floods, and urban floods, each have distinctive features. A riverine flooding event, also referred to as overland flooding, occurs when a river or stream is no longer able to contain the entirety of the water flowing into it from within its watershed. When this occurs, water rises above the banks and flows onto adjacent land located in the floodplain. In places without a large change in elevation, resulting water from a riverine flood may not recede for many days, or even weeks.

While flash floods and riverine floods have been commonplace throughout history, another type of flood, known as an urban flood, is a newly evolving concept.

Urban floods are a product of increasing development: rainfall that might have been naturally absorbed by previously existing soils, vegetation or streams is no longer absorbed, due to the presence of buildings and other impermeable surfaces now blanketing the terrain. In other words, the level of development is connected to the severity of the flood itself. Such floods are often characterized by overflowing drainage systems, inundated streets, and flooded underpasses.

Location

Flooding is a county-wide hazard that can affect all locations and jurisdictions. This makes addressing the issue of flooding important for Guernsey County. While riverine flooding events typically only affect floodplains, urban floods and flash floods can strike virtually anywhere at any time, necessitating countywide strategies to mitigate flooding.

Floodplain and Floodway

The terms floodplain and floodway convey different sets of information within FEMA's Flood Insurance Rate Maps (FIRMs). The term floodway is typically the normal stream or river bed and the immediately adjacent land that contains flowing water during a Base Flood, also known as a "100-year flood." The floodplain includes both the floodway and additional land that can be affected by the Base Flood. The part of the floodplain that is not in the floodway is still inundated by water during a Base Flood, but only by rising water. Conversely, the floodway is inundated by flowing water during such an event. Thus, the risk of damage is not as severe in the area outside of the floodway, but there is still a risk.

Watersheds and Drainage Basins

A watershed, also known as a drainage basin, is a land area in which all surface and ground water converge and drain to a specific point of lower elevation, where the waters join with the water body for which the watershed is named. Watersheds can cover small areas of a few acres around a small stream to millions of square miles that drain into an ocean. Watersheds will drain into other, larger watersheds in a hierarchical pattern, until eventually draining into the ocean; except in a special condition called an endorheic drainage basin, which is also known as a closed drainage basin, or a "sink." All land is located within a watershed, and they cross county, state, and international borders. In the U.S. there are 2,267 watersheds.

There are three distinct hydrological types of watersheds:

- Exoreic watersheds, which eventually empty to the ocean and represent the major part of the drainage of all the continents except Australia;
- Endorheic watersheds, which discharge inland, into closed lake basins. They are mainly, but not exclusively, restricted to arid and semi-arid regions; and
- Arheic regions, which are regions within which no rivers arise. The lower part of the Nile, Oranje and Niger Rivers, all in Africa, are good examples of this category of basin.

According to ODNR's Watershed and Basin Map, Guernsey County is features two predominant watersheds: one near Cambridge and another that forms the southern border of the County. Moreover, there are two large bodies of water: Salt Fork Reservoir and Senecaville Lake. Finally, there are numerous creeks throughout the County. These bodies of waters, as well as other notable bodies of water, may be seen in **Figure 4.19**.

Table 4.7, below, lists the communities in Guernsey County that participate in the National Flood Insurance Program (NFIP), as well as any rationale for not participating.

Table 4.7: NFIP Status for each Jurisdiction within Guernsey County

Jurisdiction	In NFIP?	If no, why not?
Guernsey County	Yes	
City of Cambridge	Yes	
Village of Byesville	Yes	
Village of Cumberland	Yes	
Village of Fairview	No	Not within floodplain, according to FEMA map
Village of Lore City	Yes	
Village of Old Washington	No	Not within floodplain, according to FEMA map
Village of Pleasant City	Yes	
Village of Quaker City	Yes	
Village of Senecaville	Yes	

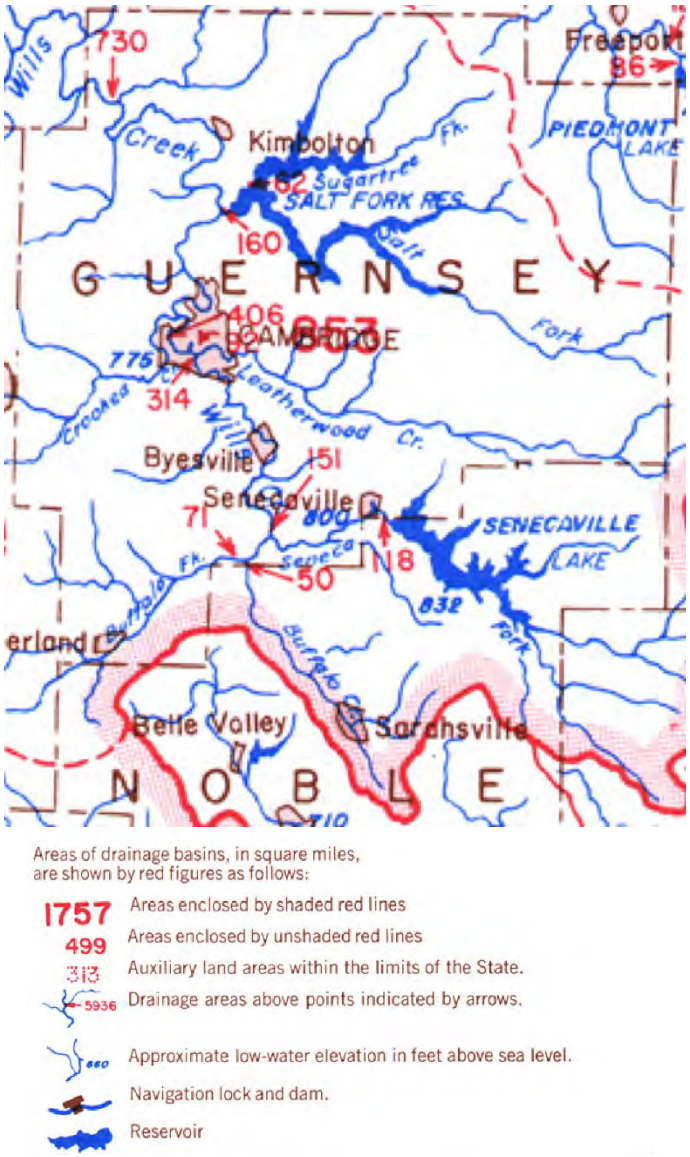

Figure 4.19: Drainage Basins in Guernsey County

History

Table 4.8, below, provides a summary of all historic flood events in Guernsey County, as well as how that historic event was documented.

Table 4.8: Historical Flood Events in Guernsey County

Date	Description	Sources of Information
6/29/2012	Derecho swept through and caused major power outages across the state.	Individual Citizens
7/23/2017	Member of the public reported water over several roads between Quaker City and Barnesville. Small streams out of their banks.	NOAA

Date	Description	Sources of Information
6/23/2017	Social media reported water over Route 265 in Kipling. In addition, both Interstate 70 eastbound and Interstate 77 northbound were closed due to 2 inches of water covering the interstates.	NOAA
3/1/2017	Department of highways reported that state route 146 was closed in both directions between Iowa Road and Crane Run Road due to high water.	NOAA
3/1/2017	Department of highways reported that state route 285 was closed in both directions between Old Glory Road and state route 265.	NOAA
4/9/2015	Law enforcement reported SR 285 closed due to flash flooding.	NOAA
4/9/2015	Law enforcement reported the intersection of SR 265 and SR 285 closed due to flash flooding.	NOAA
5/1/2014	This is a continuation of flooding that began on April 30th. Heavy rainfall caused rises on Wills Creek downstream from Seneca Lake Dam. Minor flooding of roads was reported.	NOAA
4/30/2014	Heavy rainfall caused rises on Wills Creek downstream from Seneca Lake Dam. Minor flooding of roads was reported.	NOAA
2/21/2014	Wills Creek was in minor flood due ice jams and rainfall, causing flooding of low lying areas near Derwent.	NOAA
11/22/2011	Emergency manager reported several roads closed due to flooding in and around Cambridge.	NOAA
11/22/2011	A trained spotter reported flooding on Route 83 near Claysville.	NOAA
7/13/2011	A federal disaster declaration for severe storms and flooding during the period of April and May was declared by the President for several counties in Ohio that included Guernsey County. Preliminary damage assessment for Guernsey County is over $3 million.	FEMA, Ohio EMA

Date	Description	Sources of Information
3/17/2008	Higher than normal rainfall during the week of March 17, 2008, complicated by saturated soil from heavy rains and excessive snow during previous weeks, has caused creek flooding throughout Guernsey County. The heavy rains and flooding has resulted in major damage to local roads and infrastructure. Total damages estimates totaled $4,900,946.30.	Guernsey County EMA
1/7/2005	Higher than normal rainfall during the first week of January, complicated by saturated soil from heavy rains the last week of December caused creek flooding that caused major damage to local roads and infrastructure. Total slip damage to county roads alone was over $1.7 million.	Guernsey County EMA
9/8/2004	The remnants of tropical depression Frances dumped 2.95 inches of rain in a 24-hour period causing local flooding causing damage to local roads, culverts, bridges and residences. President George W. Bush declared a federal emergency declaration that included Guernsey County. The flood waters accounted for 3 deaths in Guernsey County. Damage was assessed at over $1.3 million.	Guernsey County EMA
6/14/2004	On June 14 and 15, 2004 heavy storms, complicated by already saturated soil caused flash flooding in several areas of the county that resulted in damage to private residences, county, township, and incorporated streets, culverts, and bridges.	Guernsey County EMA
5/17/2004	Torrential rainfall beginning May 17, 2004 causing complete soil saturation, heavy runoff, and creek and stream flooding resulting in considerable damage to county, township and incorporated roads, culverts, and bridges.	Guernsey County EMA
1/4/2004	Flooding caused by more than 3 ½ inches of rain in a 48 hour period caused damage in excess of $2 million.	Guernsey County EMA
6/28/1998	Riverine/Flash Flooding caused by torrential rainfall. 506 structures with various degree of damage – 725 people in shelters throughout the county - $2,887,000 in public damage assistance - $8,183,615 in private damage assistance. – Presidential Declaration	Guernsey County EMA
1/28/1994	Flooding – Newspaper Accounts indicate that there were roads closed due to flood water - Gubernatorial Declaration	Guernsey County EMA

Date	Description	Sources of Information
8/14/1980	Flood – 6.69 inches of rain in a 30-hour period-of-time. 1 death reported – body found in Buffalo after water receded. Flood level at Campbell Ave. 24.49 crested. 40 businesses and 300 homes damaged in Cambridge – Presidential Declaration	Individual Citizens, Newspaper Accounts, Public Officials
6/5/1968	Flood – Presidential Declaration	Ohio EMA
8/7/1935	Flood – Almost every State Highway in three-county area is inundated; the City of Cambridge is almost shut off. Many villages within the county completely isolated; telephone service unavailable; most bridges in the county sustained some damage.	Newspaper Accounts

Probability

Based on known flood history, there were 23 flood events between August 1935 and August 2017, a period of 83 years. Therefore, there is approximately a 28 percent chance of a flood in any given year, or almost once every four years.

Vulnerability Assessment

Repetitive Loss Properties

The National Flood Insurance Program (NFIP) defines a repetitive loss property as an NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978. A list of repetitive loss properties, including severe repetitive loss properties, is available in **Table 4.9**.

Potential Losses

HAZUS is a regional loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). A loss estimate for Guernsey County was completed for a 100-year flood. Using 2010 Census data, HAZUS estimated the potential financial losses in the event of a catastrophic flooding event. The results of that estimation are listed in **Table 4.10**. Additionally, it was determined that six (6) critical structures are affected, listed below.

1. R.H.S.D. Administration Offices
2. Byesville Village Waste Water Plant
3. Cambridge Waste Water Plant
4. Cumberland Waste Water Plant
5. Quaker City Waste Water Plant
6. Reservoir Intake

Table 4.9: Repetitive Loss Properties

Jurisdiction	Total Number of Properties	Single-Family Residential	Multi-Family Residential	Non-Residential	Total Payments
Repetitive Loss Properties					
Byesville, Village of	14	9	2	3	$883,987.26
Cambridge, City of	22	11	3	8	$2,519,216.53
Guernsey County	13	5	0	8	$1,245,806.08
Lore City, Village of	2	2	0	0	$34,511.43
Pleasant City, Village of	1	1	0	0	$9,098.43
Quaker City, Village of	3	2	0	1	$37,281.85
Severe Repetitive Loss Properties					
Byesville, Village of	1	1	0	0	$58,970.20
Quaker City, Village of	1	0	0	1	$86,101.97

Table 4.10: Estimated Losses ($ in Millions)

Area	Residential	Commercial	Industrial	Others	Total
Building Loss					
Building	$55.46	$25.66	$14.91	$7.09	$103.12
Content	$26.84	$75.11	$40.10	$36.82	$178.87
Inventory	-	$6.32	$6.32	$0.17	$8.98
Subtotal	$82.30	$107.09	$61.33	$44.08	$290.97
Business Interruption					
Income	$1.13	$43.94	$1.10	$9.21	$55.38
Relocation	$13.66	$13.22	$1.28	$7.47	$35.62
Rental Income	$5.82	$9.79	$0.30	$1.75	$17.66
Wage	$2.67	$52.73	$1.67	$162.33	$219.39
Subtotal	$23.28	$119.68	$4.35	$180.76	$328.05
Total	**$105.58**	**$226.77**	**$65.68**	**$224.84**	**$619.02**

Appendix D provides the FEMA Flood Maps for Guernsey County's Jurisdictions, with each map showing what part of each community lies in the floodplain.

Frozen Precipitation: Hail

Definition

Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. To be considered hail, the frozen precipitation pieces must have a diameter greater than 0.20. There are three different types of hail that depend on size and texture (**Figure 4.20**). Graupel (soft hail or snow pellets) are soft small pellets of ice created when super cooled water droplets coat a snowflake. Sleet (ice pellets) are small, translucent balls of ice, and smaller than hail. They often bounce when they hit the ground. Generally, only hail can directly damage aircraft, homes and cars, and can be deadly to livestock and people.

Figure 4.20: Forms of Frozen Precipitation. Hail, Graupel, and Sleet

Location

Frozen precipitation is a county-wide hazard in Guernsey County, potentially affecting all areas and jurisdictions of the County.

Extent

Hail sizes can range from pea sized to as big as a softball. However, hail quarter size of one inch or larger is considered severe. Hailstone can cause damage to cars and vehicles, aircrafts, buildings, crops, livestock and people. More often, roofs take most of the hail damage including cracks and leaks in buildings. On the ground, hail can severely damage vehicles by breaking windshields, hoods and denting surfaces. In rural areas, hail is hazardous to most crop species. Wheat, corn, soybean, and tobacco are the most sensitive crop to hail damage. Hail can also directly harm people without proper shelters. It can cause concussions or, though rarely, fatal head trauma. It is also possible that hail damages power wires and results in blackout.

Other types of frozen precipitation including graupel and sleet could also be hazardous, especially for travelers. With either type, the ice can create slick spots on roadways, causing motorists to lose control of their automobiles with little to no warning. Bridges, overpasses and elevated roadways are especially susceptible to icing as they are surrounded on all sides by the cold air and freeze more quickly. In addition, ice can rapidly add weight to tree branches and power lines,

causing them to snap or break causing damage to whatever they land on, power outages may also occur.

Table 4.11: Hail Size Conversion Table

Pea	0.25 - 0.375 inch	**Lime**	2.00 inches
Small marble	0.50 inch	**Tennis ball**	2.50 inches
Penny	0.75 inch	**Baseball**	2.75 inches
Nickel	0.88 inch	**Large apple**	3.00 inches
Quarter	1.00 inch (15/16")	**Softball**	4.00 inches
Half dollar	1.25 inch	**Grapefruit**	4.50 inches
Walnut/ping pong	1.50 inch	**Computer CD/DVD**	4.75 - 5.00 inches
Golf ball	1.75 inch		

History

According to hail event records from NOAA, between May 1950 and May 2018 (24,867 days), 48 days are noted as being affected by hail, and zero of the 48 days have damage reports (**Figure 4.21**). No injuries or deaths are recorded.

Due to minor direct damage caused by graupel and sleet, no independent records of events are found in the database of NOAA. However, sleet or graupel would appear during freezing rain and ice storm.

Number of County/Zone areas affected:	1
Number of Days with Event:	48
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	0
Number of Days with Event and Property Damage:	0
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	1

Figure 4.21: Chart of Frozen Precipitation Events

Probability

In total, 80 hail events are found in NOAA's database between 05/01/1950 and 05/31/2018 (**Figure 4.22**). Hail occurrence in Guernsey County is not frequent (48 days out of 24,867 days). Zero damage reports were recorded. Hail in Guernsey County tends to happen between April and June (**Figure 4.23**). Hail magnitudes that reach 0.75 inches and above are not often witnessed. The largest hail recorded is 2.00 inches. **Figure 4.24** displays hail size in inches of recorded hail events.

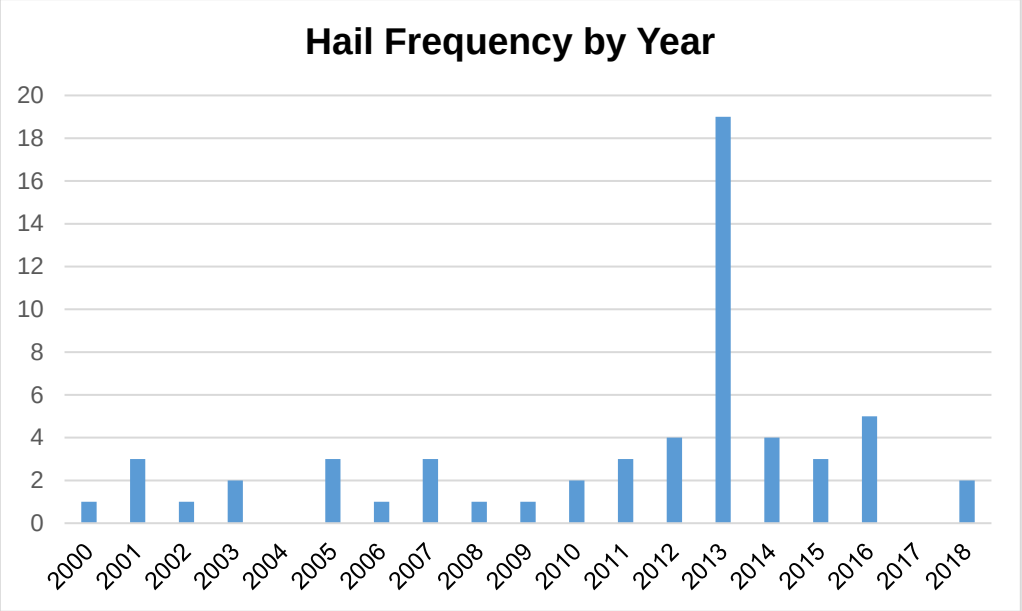

Figure 4.22: Hail Frequency by Year

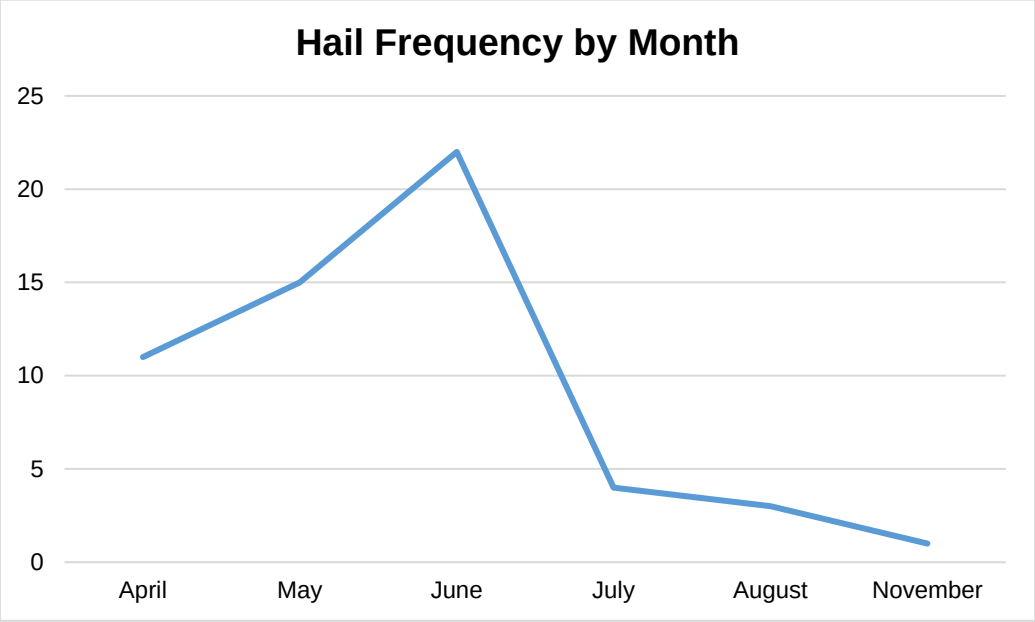

Figure 4.23: Hail Frequency by Month

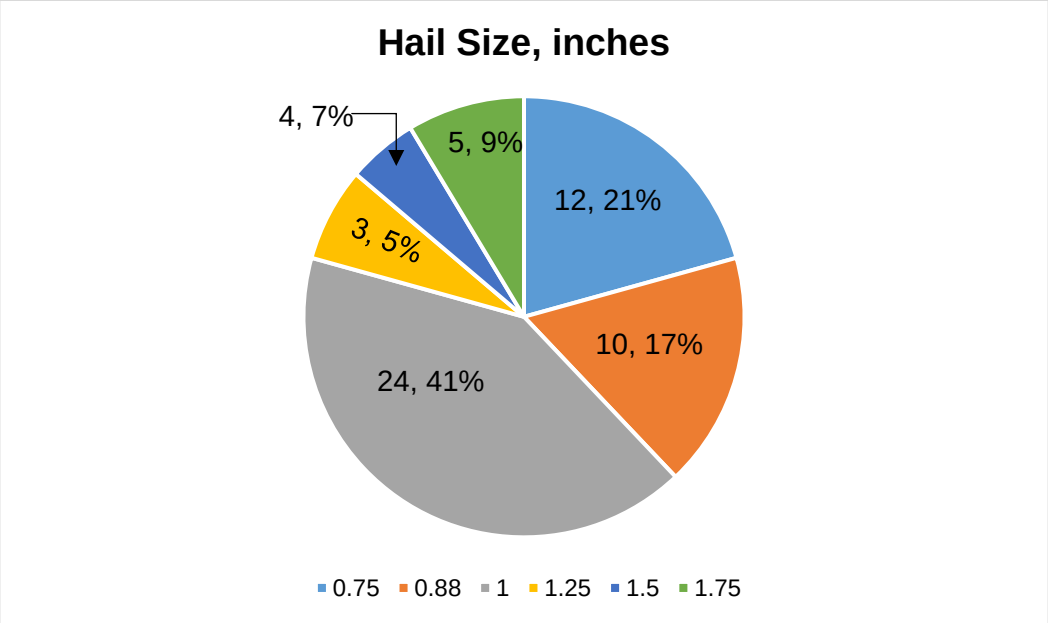

Figure 4.24: Hail Size in Inches

Vulnerability Assessment

Infrastructure impact

Above ground infrastructure is at risk from direct hits and falling debris. If the hail is big enough, it can damage roofs and houses especially those houses which have less resistant roof tiles such as plastic sheeting, glass, corrugated fibers, terracotta, slate, and concrete tiles.

Electrical lines are spread throughout the County connecting homes, businesses, and other facilities to one another. Hail can strike above ground electrical lines, causing power outages. Further, downed lines that are still live and active are extremely hazardous and can cause death by electrocution.

Roads are spread throughout Guernsey County and can be affected by the icy surfaces caused by graupel and sleet. When the frozen precipitation hits the ground, it freezes on contact, creating a smooth, solid glaze of ice that covers everything on the ground. This type of ice layer is extremely slick - creating nearly zero friction conditions with vehicle tires. Correcting a skid on black ice can be nearly impossible, as the vehicle tires will have close to zero traction.

Population impact

According to the U.S. Census Bureau's annual estimates of the resident population, the population of Guernsey County is 40,087 as of 2010 and is estimated to be 39,258 as of 2015. The population is not expected to significantly change in the following years, so the number of people affected by frozen precipitation will remain approximately the same. Summer storms are random in nature and affect the entire area of a county. Everyone within the County should be prepared. Populations residing in mobile home parks and travelling in vehicles are particularly vulnerable and should have a safety plan in place for severe weather.

Property impact

According to the United States Census (2012-2016), the median home value within Guernsey County is $98,600. There are 19,110 residential housing units within Guernsey County. Since 1950, according to the NCDC, there have been 80 hail events and 48 days with storm. No property damage occurred from hail anywhere within the County.

Frozen Precipitation: Heavy Snow/Winter Storm

Description

A winter storm is defined as now accumulation meeting or exceeding locally/regionally defined 12 and/or 24-hour warning criteria, on a widespread or localized basis (NOAA). This could mean such values as four to eight or more inches in 12 hours or less; or six to 10 inches in 24 hours or less. In some heavy snow events, structural damage, due to the excessive weight of snow accumulations, may occur in the few days following the meteorological end of the event.

Location

Heavy snow and winter storms are a county-wide hazard in Guernsey County, potentially affecting all areas and jurisdictions.

Extent

Heavy snow can immobilize a region and paralyze a city, stranding commuters, closing airports, stopping the flow of supplies, and disrupting emergency and medical services. The weight of snow can cause roofs to collapse and knock down trees and power lines. Homes and farms may be isolated for days and unprotected livestock may be lost. In the mountains, heavy snow can lead to avalanches. The cost of snow removal, repairing damages, and the loss of business can have severe economic impacts on cities and towns.

- Blizzard: Sustained winds or frequent gusts of 35 MPH or more with snow and blowing snow frequently reducing visibility to less than a quarter mile for 3 hours or more.
- Blowing Snow: Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- Snow Squalls: Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.
- Snow Showers: Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- Flurries: Light snow falling for short durations with little or no accumulation.

History

Winter storms are not commonly seen in Guernsey County. According to NOAA's records, from 2000 to 2018, at least one winter storm occurred in the each of the years of 2000 – 2001, 2003, 2008 – 2010, 2014, and 2018. The majority of these heavy snow and winter storm events took place in January or February (**Figure 4.25**) No injuries or direct deaths are found.

February 2018

- Low pressure moved up the western side of the Appalachians Tuesday night, February 6th into the morning hours of Wednesday, February 7th. Initially the precipitation started as snow across the upper Ohio Valley. As the warm air surged north, precipitation type changed to a wintry mix of sleet and freezing rain. Locations in northern West Virginia and southwestern Pennsylvania changed over to rain with temperatures climbing into the upper 30s to lower 40s. Eastern Ohio, the northern West Virginia Panhandle, and locations from central Beaver County, northeast into southern Jefferson County, Pennsylvania switched over to freezing rain. Ice accumulation was around a quarter of an inch for these places.

Farther north along the I-80 corridor and parts of interior southeastern Ohio, cold air remained socked in, keeping the precipitation all snow. Several inches of snow fell with the highest amounts located across parts of northern Butler County northeast into Clarion, Jefferson, and Forest counties. For eastern Ohio, Columbiana, Carroll, southwest into Coshocton county around six inches of snow fell.

January 2018

- Low pressure tracking up the Appalachians combined with a strong arctic cold front to produce a significant rain and snow producing storm for the region. Ahead of the front, a strong southwesterly moisture feed and mid-level short wave brought heavy rainfall to the area, with two to three-inch storm total rainfall reports common. This rain created strong rises on area rivers and streams, with several gauging points reaching flood stage. Also, the strong river rises broke up ice on these waterways, creating significant ice jam concerns.
- The strong arctic cold front passed through during the afternoon and evening of the 12th, bringing a flash freeze to area roads that were wet and water-covered from the rain. A mix of sleet and freezing rain developed during the evening with minor ice accretion reported. Precipitation then changed to all snow and continued into the morning of the 13th before tapering to snow showers. A swath of six to eight inches of snow fell from southeast Ohio, across the northern WV panhandle into portions of southwest Pennsylvania, with lesser totals in the Laurel Highlands and southeastern ridges.

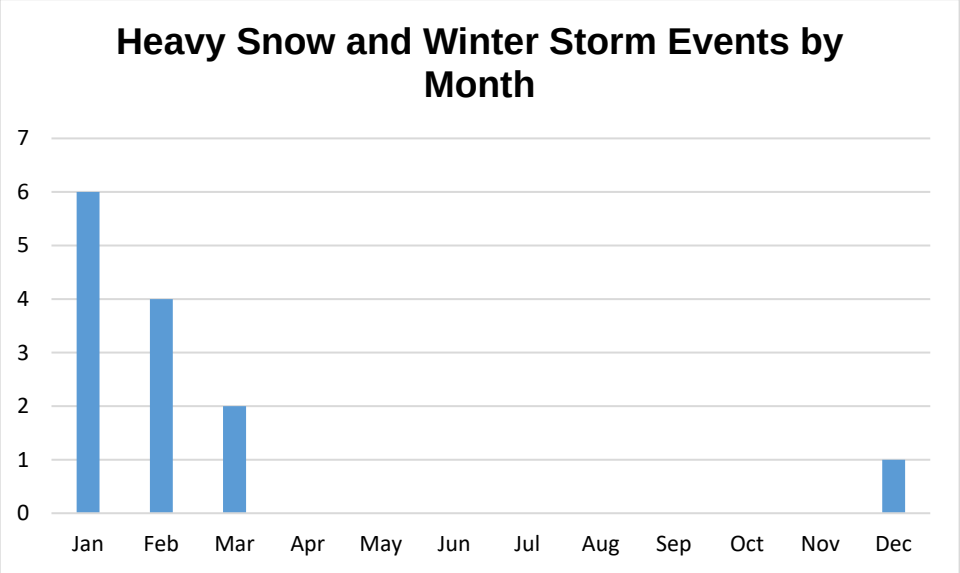

Figure 4.25: Heavy Snow and Winter Storm Events by Month

Probability

There have been 13 Heavy Snow/Winter Storm events in the past 20 years. Therefore, there is a 65 percent chance of occurrence of a Heavy Snow or Winter Storm event each year.

Vulnerability Assessment

Infrastructure Impact
All of the structures erected in Guernsey County are susceptible to damage if not designed to the proper snow loading parameters. Heavy snow and ice accumulations can rip down power lines and trees. Loss of electricity for an extended period of time can also cause death from extreme cold and hypothermia. Excessive amount of snow accumulation could become the source of flooding.

Population Impact
According to U.S. Census Bureau's annual estimates of the resident population, the population of Guernsey County was 40,087 as of 2010 and is estimated to be 39,258 as of 2015. The population is not expected to significantly change in the following years, so the number of people affected by heavy snow will remain approximately the same. Motorists should be aware of declared snow emergencies and seek safety before becoming stranded. The risk of vehicle accidents becomes high during such events, due to slippery, ice-covered roads, poor visibility, or deep snow accumulation on the road. Sensitive populations will be the most susceptible to snow and ice and should prepare for such events prior to the winter months.

Property Damage
13 heavy snow and winter storm events were found from the storm events database of NOAA, with a total of $5,000 worth of property damage. Only one event has resulted in a significant cost in property damage over the past 65 years.

Loss of life
Since 1950, no deaths or injuries associated with heavy snow are recorded in Guernsey County.

Economic Losses
Heavy snow and winter storms can cause a variety of losses for a community such as fallen trees, power outages, roof collapses, other property damage, and hazardous driving conditions. Considering previous events and costs, there were 13 snow and storm events totaling $5,000 in property damage, which equates to an estimated $384 per event. With an estimated 65 percent chance of a snow or storm event each year, that equates to an estimated $250 per year in economic losses from snow and winter storm events.

Frozen Precipitation: Ice Storm

Description

An ice storm is a type of winter storm characterized by freezing rain, also known as a glaze event or, in some parts of the United States, as a silver thaw. The U.S. National Weather Service defines an ice storm as a storm which results in the accumulation of at least 0.25-inch of ice on exposed surfaces. From 1982 to 1994, ice storms were more common than blizzards and averaged 16 per year. They are not violent storms but are commonly perceived as gentle rains occurring at temperatures just below freezing.

Location

Ice storms are a county-wide hazard in Guernsey County, potentially affecting all areas and jurisdictions.

Extent

Heavy accumulations of ice can bring down trees and topple utility poles and communication towers. Ice can disrupt communications and power for days while utility companies repair extensive damage. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces.

- Black Ice: Black ice is a deadly driving hazard defined as patchy ice on roadways or other transportation surfaces that cannot easily be seen. It is often clear (not white) with the black road surface visible underneath. It is most prevalent during the early morning hours, especially after snow melt on the roadways has a chance to refreeze over night when the temperature drops below freezing. Black ice can also form when roadways are slick from rain and temperatures drop below freezing overnight.
- Ice Jams: Long cold spells can cause rivers and lakes to freeze. A rise in the water level or a thaw breaks the ice into large chunks which become jammed at man-made and natural obstructions. Ice jams can act as a dam, resulting in severe flooding.

History

Ice storms are not commonly seen in Guernsey County. According to NOAA's records, at least one winter storm occurred in each of the following years: 1996, 2004, 2005, 2007, and 2012. No injuries or direct deaths are found.

January 2012

- A low-pressure system moved across the Appalachians southeast of the Upper Ohio Valley and produce a mixed bag of heavy freezing rain, sleet and heavy snow across parts of the region. Freezing rain accumulations from one quarter to over one-half inch occurred across eastern Ohio along Interstate 70 to southwest Pennsylvania, and extended south to the Mason-Dixon line, and into Garrett County, Maryland. North of this band heavy snow of six to seven inches fell from New Philadelphia, OH to Pittsburgh. Lighter snows of three to six inches fell from north of Pittsburgh to Interstate 80, and a small amount of freezing rain fell across portions of northern West Virginia.

January 2005

- Snow began about 4 AM, changed to freezing rain and sleet around 10 or 11 AM. By 3 PM, the ice was one quarter inch thick.

Probability

NOAA Storm Events Database archives six ice storm events in Guernsey County since 01/01/1950 and a total of 307 ice storm events in the State of Ohio. Since there have been six ice storm events in Guernsey County over the past 22 years (1996-2018), there is a 27 percent chance of occurrence in any given year.

Vulnerability Assessment

Because ice storms occur countywide, the entire County population is susceptible and should be prepared.

Infrastructure Impact

All of the structures erected in Guernsey County are susceptible to damage if not designed to the proper snow loading parameters. Heavy snow and ice accumulations can rip down power lines and trees. Loss of electricity for an extended period of time can also cause death from extreme cold and hypothermia. Excessive amount of ice accumulation and ice jams could become the source of flooding.

Population Impact

According to U.S. Census Bureau's annual estimates of the resident population, the population of Guernsey County was 40,087 as of 2010 and is estimated to be 39,258 as of 2015. The population is not expected to significantly change in the following years, so the number of people affected by ice storms will remain approximately the same. Motorists should be aware of declared winter emergencies and seek safety before becoming stranded. The risk of vehicle accidents becomes high during such events, due to slippery, ice-covered roads. Sensitive populations will be the most susceptible to snow and ice and should prepare for such events prior to the winter months.

Property Damage

Six ice storm events were found from the storm events database of NOAA, with a total of $2,000 worth of property damage. Only one event has resulted in a significant cost in property damage over the past 65 years.

Loss of life

Since 1950, no deaths or injuries associated with ice storms are recorded in Guernsey County.

Economic Losses

Heavy accumulations of ice can bring down trees and topple utility poles and communication towers. In addition, ice on roadways and bridges can be extremely dangerous to motorists and pedestrians, causing property damage to vehicles, injuries, and fatalities. Considering previous events and costs, there were six ice storm events totaling $2,000 in property damage, which equates to an estimated $333 per event. With an estimated 27 percent chance of an ice storm event each year, that equates to an estimated $90 per year in economic losses from snow and winter storm events.

Hazardous Materials

This section includes information regarding the transportation of hazardous materials, hazardous materials sites, pipelines, and landfills.

Description

Between the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the Department of Transportation (DOT), and the U.S. Nuclear Regulatory Commission (NRC), the definition of hazardous materials varies. The Ohio EPA used five categories to define "hazardous," which are acute, chronic, fire, reactive, or sudden release of pressure. This category, however, is expanded through a greater definition of assessing all sites that have been designated for containing hazardous materials, as well as the transportation of hazardous materials. Above assessing hazardous material spills, this section will also assess the hazards and risks associated with pipelines and landfills.

Pipelines are used to transport natural gas; thus, they can pose a significant risk in the case of a leak. During extreme cold, pipelines can freeze and cause property damage. In the case of a natural gas leak, natural gas is lighter than air and thus, diffuses quickly and does not produce a toxic threat. However, it can have greater health impacts if the gas is concentrated and the leak is significant. Additionally, natural gas can be flammable only under specific conditions where the amount of oxygen produces a ratio that is not too concentrated or not concentrated enough for ignition. Properly maintained pipelines, however, do not pose this threat. There are over 110 miles of pipelines which cross Guernsey County.

Landfills will be assessed based on the possibility of groundwater contamination and landfill gas. Both sites and routes that contain or transport hazardous materials pose risks due to the potential dangers involved in their accidental release. For example, an incident that involves hazardous materials being transported by vehicle can have serious impacts on human and environmental health. This can include death or illness, irreparable pollution, damage to existing infrastructure, and in extreme cases, evacuation of the area.

For hazardous material spills, Guernsey County has adopted the Guernsey County Hazardous Materials and Response Preparedness Plan in 2014, which will be referenced throughout the section.

Location

Depending on if the type of hazardous material spill or contamination is site-based or during transit, the location may vary throughout the county. The Guernsey County Hazardous Materials and Response Preparedness Plan has identified eleven Extremely Hazardous Substances (EHS) facilities within the county (four public and seven private) as well as thirty other facilities having hazardous substances. EHS facilities are categorized by the amount of hazardous substances on site, or the types of hazardous materials. The specific categorizations for designated EHS facilities are:

- Extremely Hazardous Substances (EHSs) of either 500 pounds or the Threshold Planning Quantity (TPQ), whichever is lower.
- All combined grades for gasoline at a retail gas station with a threshold level of 75,000 gallons if the tank(s) was stored entirely underground and was in compliance at all times during the preceding calendar year with all applicable Underground Storage Tank (UST) requirements.

- All combined grades for diesel fuel at a retail gas station with a threshold level of 100,000 gallons if the tank(s) was stored entirely underground and the tank(s) was in compliance at all times during the preceding calendar year with all applicable UST requirements at 40 CFR part 280 or requirements of the State UST program approved by the Agency under 40 CFR part 281.
- All other hazardous chemicals of 10,000 pounds.

Any future facility matching these criteria should be added to the list of known EHS facilities. **Figure 4.26** displays a map of the EHS facilities in Guernsey County, as provided by the Guernsey County Hazardous Materials and Response Preparedness Plan. The EHS facilities within Guernsey County are:

- Byesville Water Treatment Plant: 59870 Vocational Road Byesville, Ohio 43723
- Cambridge Water Pollution Control: 1000 Water St. Cambridge, Ohio 43725
- Cambridge Water Treatment Plant: 1700 Burgess Ave. Cambridge, Ohio 43725
- Cambridge Iron & Metal: 4524 Glenn Hwy. Cambridge, Ohio 43725
- Cambridge MTSO: 63930 Larrick Ridge Rd. Cambridge, Ohio 43725
- Centria: 530 North Second Street Cambridge, Ohio 43725
- Colgate-Palmolive Company: 8800 Guernsey Industrial Blvd. Cambridge, Ohio 43725
- Guernsey County Water Treatment: 11272 East Pike Cambridge, Ohio 43725
- Shieldalloy Metallurgical Corp.: State Route 209 South Cambridge, Ohio 43725
- Verizon-Byesville Central Office: 59343 Marietta Road Byesville, Ohio 43723
- Verizon-Cambridge Customer Ops: 921 Steubenville Ave. Cambridge, Ohio 43725

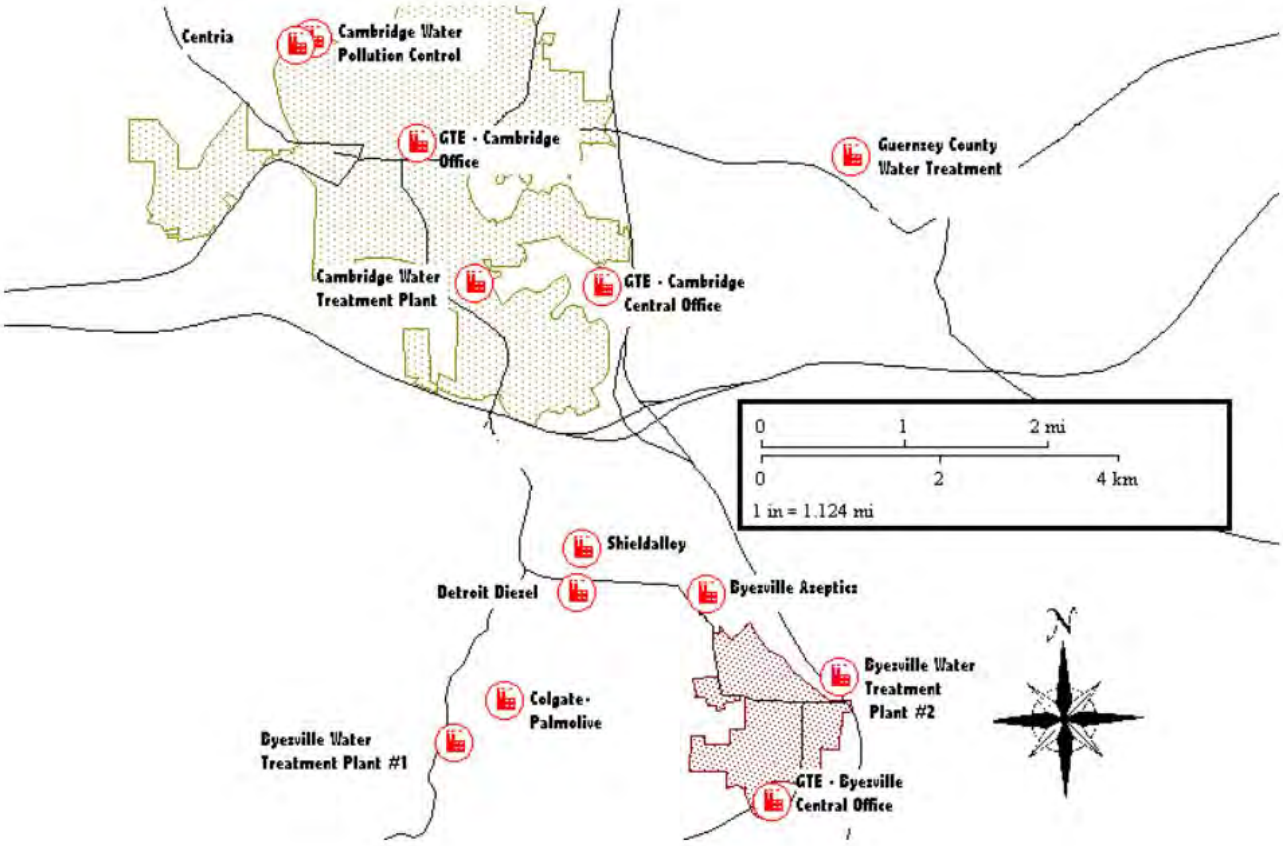

Figure 4.26: Map depicting EHS facilities in Guernsey County (Guernsey County Hazardous Materials and Response Preparedness Plan, 2014)

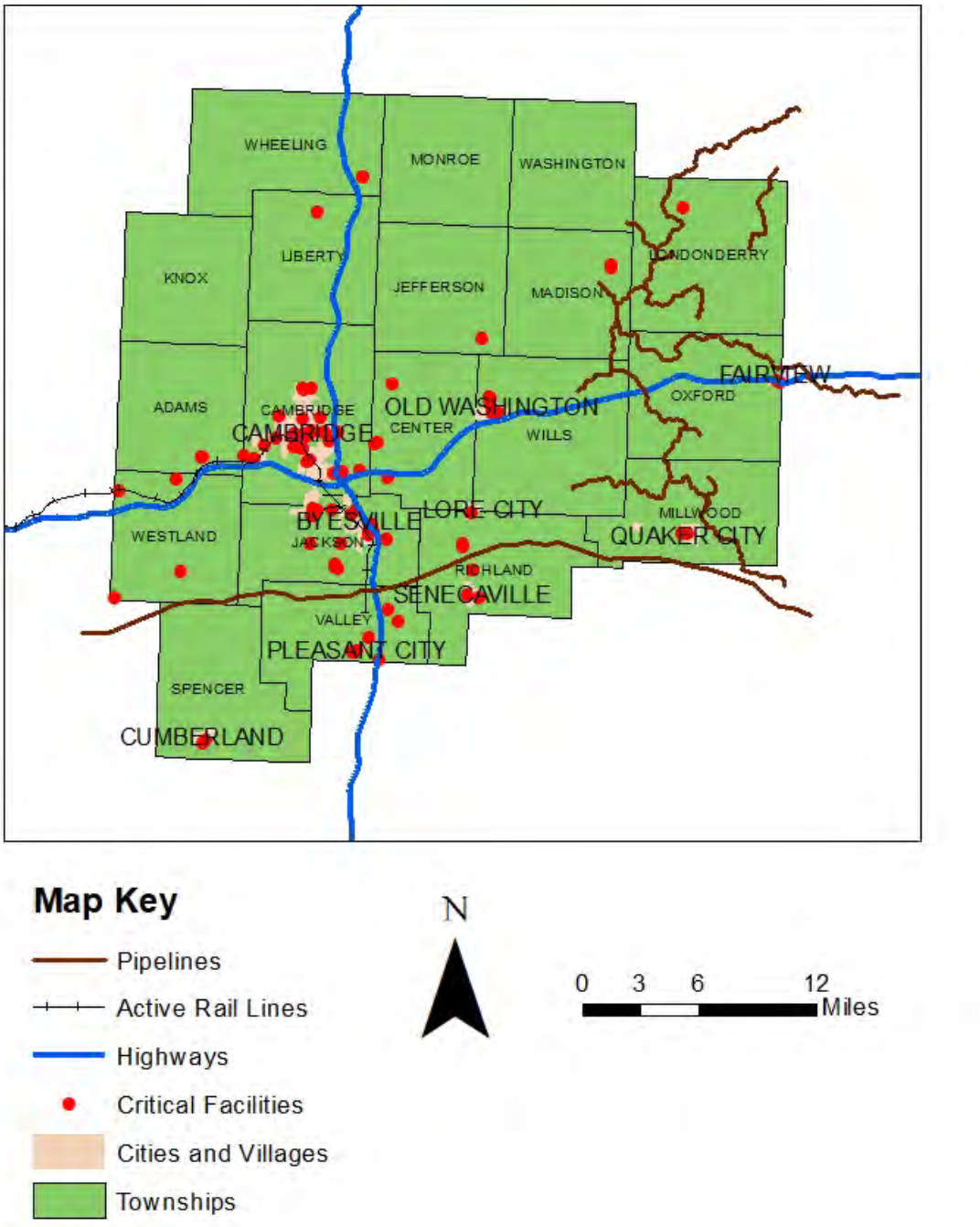

Figure 4.27: Map depicting hazardous material transportation routes in relation to identified critical facilities in Guernsey County

The Village of Fairview, the Village of Quaker City, the Village of Salesville, the Village of Lore City, the Village of Senecaville, and part of the urban area surrounding Cambridge and Byesville all fall within the 1-mile radius of pipelines (**Figure 4.27**).

The urban area that includes the City of Cambridge and the Village of Byesville is intersected by the rail line that is operated by Genesee & Wyoming Railroad. The area is also intersected by Interstate 70 and is adjacent to U.S. Route 77. Interstate 70 also runs directly adjacent to the Village of Old Washington and the Village of Fairview. The Village of Pleasant City, among other

smaller unincorporated communities is also within a 1-mile radius of U.S. Route 77 at the southern edge of the County.

There are several recycling and waste collection sites located throughout the County. Primarily, several are in or near the Cambridge and Byesville urban area. Kimble Transfer and Recycling is located on Glenn Highway, nearly 4 miles west of Downtown Cambridge. Guernsey Scrap Recycling is located in the Village of Byesville near Interstate 70 and in the Village of Caldwell.

Extent

The EPA keeps account for EHS facilities because they have a higher probability of spills due to the higher amounts of hazardous materials at their sites. Many chemicals are safe at low amounts and low concentrations but can become dangerous and even toxic at high amounts and concentrations. Additionally, some chemicals can be flammable and can become more volatile when exposed to oxygen. In ground spills, untreated chemical and waste spills can contaminate the soil and drinking water, creating toxic environmental conditions. Corrosive, flammable, or explosive chemicals can create infrastructure damage depending on the location, amount spilled, and the circumstances of the incident. In worst case scenarios, large spills can trigger evacuations of residents and close transportation routes used for hazardous materials transportation, which can also affect local residents.

History

Overall, over 3 billion tons of hazardous materials is moved through the United States each year. According to an analysis of data collected by the United States Department of Transportation's Pipeline and Hazardous Materials Safety Administration by the Dayton Daily News, there were 5,320 hazardous materials releases across the United States between 2005 and 2014. From those releases, 117 people were killed, 1,524 people were injured, 112,000 people were evacuated, and $612.3 million constituted damages. In the United States, the release of chlorine gas has resulted in more injury than any other hazardous material, while gasoline leaks have killed 61 people since 2005, more than any other transported hazardous material.

The State of Ohio ranks third highest in the country for these serious hazardous materials incidents, behind Texas and California. In Ohio, 602 incidents took place between 1987 and May 2017. Of those incidents, 528 were highway accidents. Ohio has not experienced major incidents through transportation of crude oil by rail and Guernsey County has not experienced incidents regarding the transportation of ethanol; there have been three notable occurrences in other counties of Ohio.

Small hazardous materials incidents occur in the county regularly. However, there have not been a significant number of recent major incidents.

Probability

While no major incidents involving hazardous material spills or contamination have occurred, the risk exists due to the major highways that transect the County, the railway, the pipelines, and the various sites located throughout the area. Ohio abides by federal hazardous materials regulations as they apply to transportation throughout the state. The Guernsey County Hazardous Materials and Response Preparedness Plan highlights areas that are particularly vulnerable to hazardous material spills based on EHS facilities, hazardous material sites, landfill locations, pipeline location, and the location of railroad and major roads where large amounts of hazardous material is transported. Law, policy, and protocol are outlined through this plan in case of an incident or an emergency involving hazardous materials. Thus, organizations, businesses, and all jurisdictions need to adhere to these guidelines to reduce the probability of major incident from occurring.

Vulnerability Assessment

The identified critical facilities have been assessed based on their proximity to pipelines and various hazardous material transportation routes. They have been mapped and listed below; critical facilities near highways have been listed in **Table 4.12**, critical facilities near active rail lines have been listed in **Table 4.13**, and critical facilities located near pipelines have been listed in **Table 4.15** and **Table 4.16**. These locations are based upon a one-mile radius of active rail lines, a one-mile radius of highways, and both a half-mile evacuation radius of pipelines and a one-mile shelter-in-place radius of pipelines.

Each critical facilities list is also mapped alongside their respective hazardous material transport route. **Figure 4.28** depicts critical facilities near highways, **Figure 4.29** depicts critical facilities near active rail lines, and **Figure 4.30** depicts critical facilities near pipelines. The maps do not display proximity to other structures and infrastructure that has not been already identified in the list of Critical Facilities.

Each list and map has a table that displays the calculated total for potential economic losses. This number is a sum total of all critical facilities and parcels within the buffer of the hazardous material transport routes. The monetary values that were calculated were based off parcel values received from the County Auditor. **Table 4.13** shows potential economic losses for parcels and facilities near highways, **Table 4.14** shows potential economic losses for parcels and facilities near active rail lines, and **Table 4.18** shows potential economic losses for parcels and facilities near pipelines.

Please note that **Figure 4.30** only depicts pipelines mapped by the Transportation Information Mapping System (TIMS) through the Ohio Department of Transportation. The National Pipeline Mapping System (NPMS) includes a greater number of gas transmission pipelines, particularly on the eastern half of the County. Since these pipelines are not included on the map, the actual number of critical facilities located near pipelines would conceivably be a greater number than the total number of critical facilities listed in **Table 4.16** and **Table 4.17**. Furthermore, the potential economic impacts shown in **Table 4.18** were calculated based on information from TIMS, and thus present a smaller figure than the total potential impacts from all pipelines located within the County.

Table 4.12: List of Critical Facilities located within one-mile of highways

Educational Facilities
Byesville Elementary
Cambridge City Schools Admin Office
East Guernsey School Administration
Mid East Ed. Center
North Elementary
Pike Elementary School
Communications
North Repeater
Unknown Cell Phone Tower
Fire Stations
Byesville VFD
Cassell Station VFD

Fairview VFD
Old Washington VFD
Government Buildings
Fairview Village Hall
Ohio Division of Watercraft
ODOT Garage
Government Offices
70/77 Office Complex
Byesville Village Offices
Guernsey County Public Library
Industrial Commission/ Ohio
O.W. Village Hall
ODNR Offices
Law Enforcement
Cambridge PD Training Site
Guernsey County Shooting Range
OSHP
Wastewater Treatment
Byesville Water Treatment Plant
Byesville Village Waste Water Plant
Byesville Bulk Water Plant
Byesville Water Treatment Plant
Cambridge Water Reservoir
Old Waste Water/ Byesville
Pleasant City Waste Water Facility
Reservoir Dam
Reservoir Intake
Western Guernsey Services/ Water
Water Tanks
Byesville Water Tank
County Water Tank
GC Water Tank
Byesville Water Tank #3
Cambridge Water Tank Highland Ave.
GC Water Tank Buffalo
GC Water Tank Old Washington

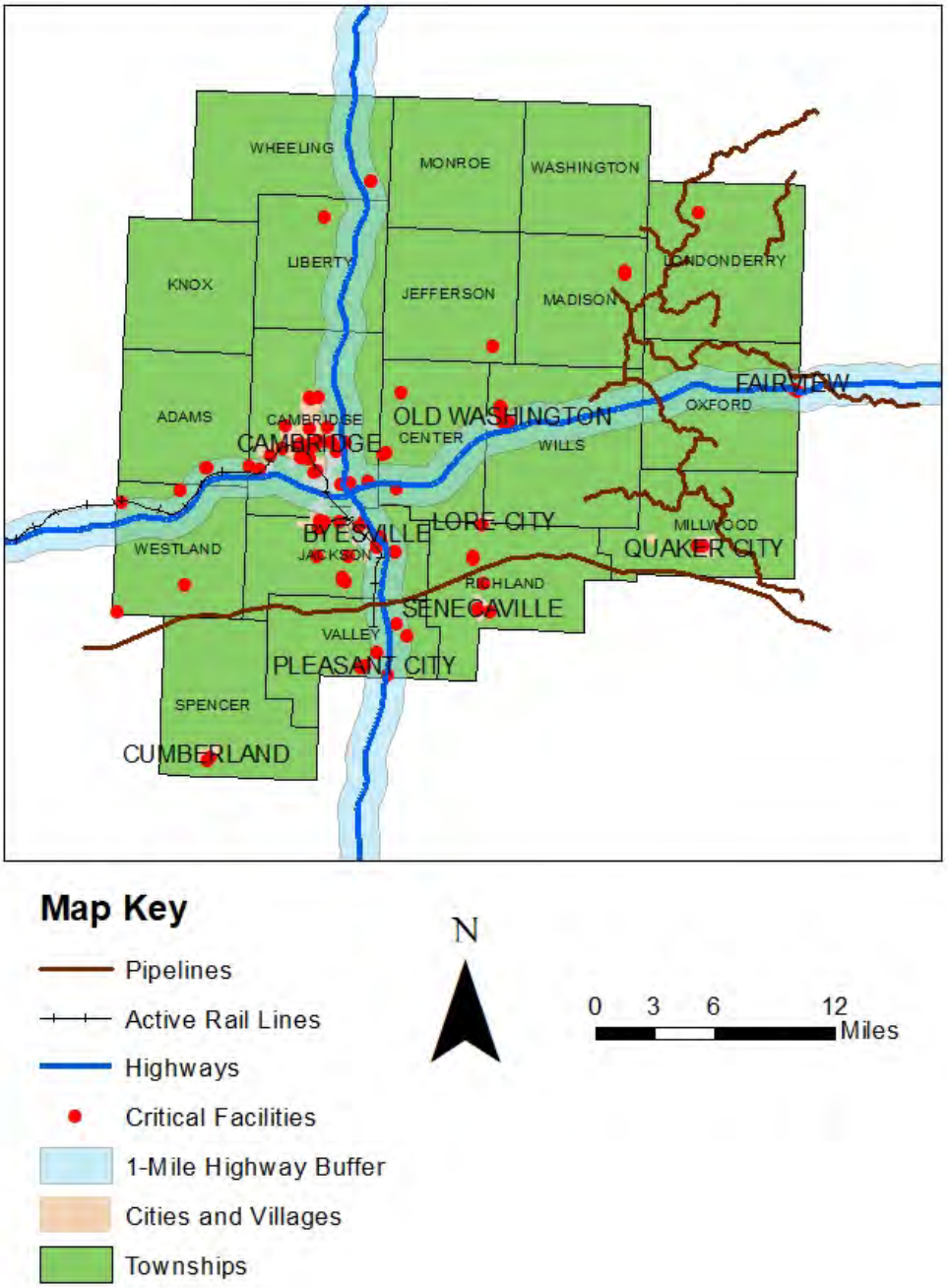

Figure 4.28: Map depicting a one-mile highway buffer in Guernsey County (ArcGIS)

Table 4.13: Potential economic impacts within a one-mile radius of highways

Number of Critical Facilities Impacted	41
Total Property Value of Critical Facilities Impacted	$20,242,625
Number of Property Parcels Impacted	11,683
Total Property Value of Parcels Impacted	$720,966,140

Table 4.14: List of Critical Facilities located within one-mile of active rail lines

Educational Facilities
Beech Grove Family Center/ Day Care
Byesville Elementary
Cambridge City Schools Admin Office
Cambridge South Elementary School
Guernsey Industries
Pike Elementary School
R.H.S.D. Admin Offices
St. Benedict School
Zane State College WPTC
Zane State Epic Center
Fire Stations
Byesville VFD
Cambridge Fire Department
Cassell Station VFD
Government Buildings
Cambridge-Guernsey County Health Department
Ohio Division of Watercraft
ODOT Garage
Government Offices
Byesville Village Offices
Cambridge City Admin Building
County Court House
Guernsey County Administrative Building
Guernsey County Children Services
Guernsey County Job & Family services
Guernsey County Prosecutor Office
Law Enforcement
Cambridge PD
Cambridge Muni Court
Guernsey SO
Jail
OSHP
Wastewater Treatment
Byesville Water Treatment Plant
Byesville Village Waste Water Plant
Byesville Bulk Water Plant
Byesville Water Treatment Plant
Cambridge Water Treatment plant
Cambridge City waste water Plant
Old Waste Water/ Byesville
Reservoir Intake

Western Guernsey Services / Water
Water Tanks
Byesville Water Tank
New Concord Treatment plant
Byesville Water Tank #3
Cambridge Water Tank West 40

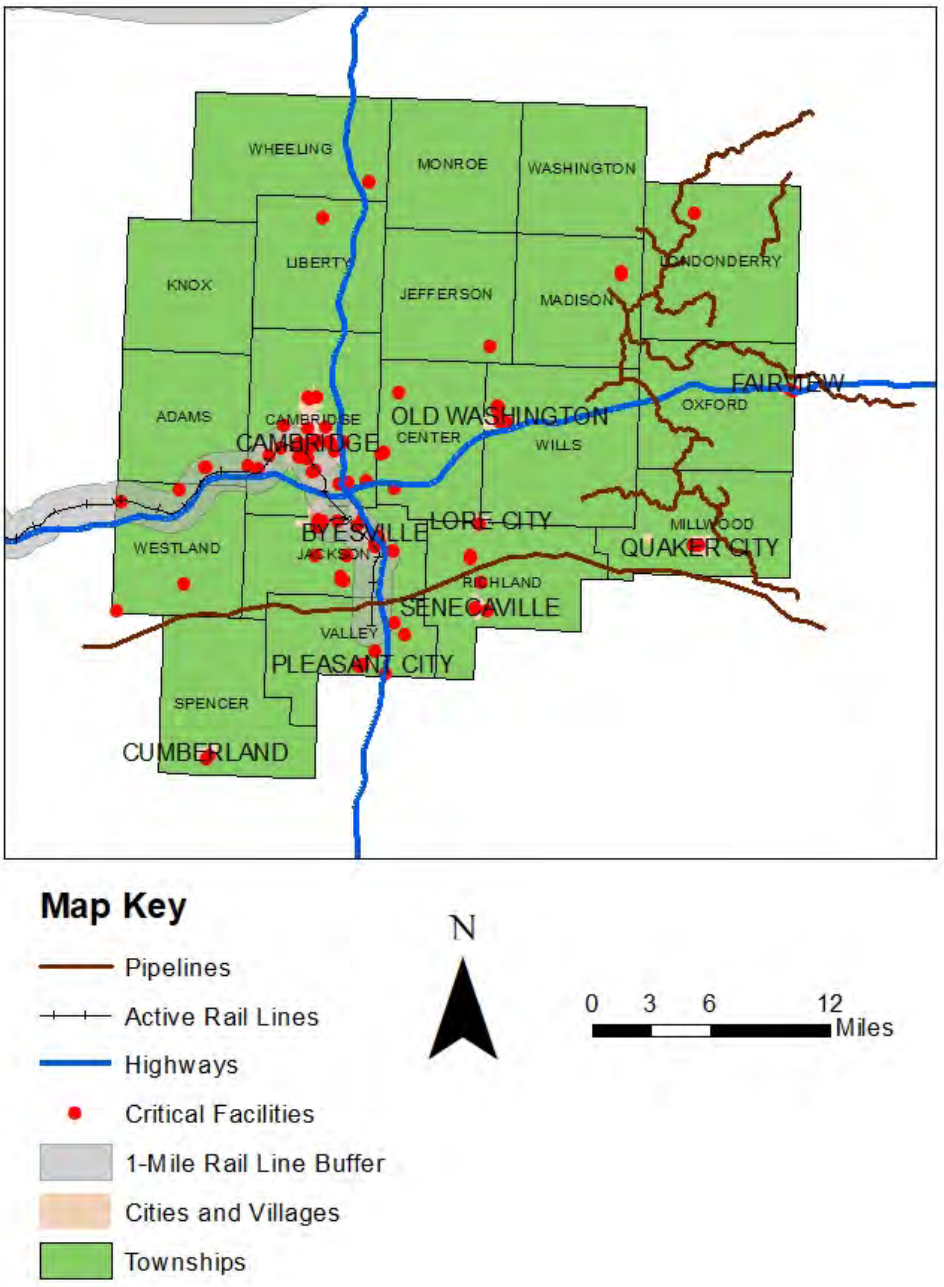

Figure 4.29: Map depicting a one-mile active rail line buffer in Guernsey County (ArcGIS)

Table 4.15: Potential economic impacts within a one-mile radius of active rail lines

Number of Critical Facilities Impacted	41
Total Property Value of Critical Facilities Impacted	$58,516,288
Number of Property Parcels Impacted	11,705
Total Property Value of Parcels Impacted	$648,313,917

Table 4.16: List of Critical Facilities located within a half-mile of pipelines

Communications
South East Repeater - Fire Service/SO
Government Buildings
Fairview Village Hall

Table 4.17: List of Critical Facilities located between a half-mile and one-mile of pipelines

Educational Facilities
Mid East Ed. Center
Secrest Elementary
Communications
East Repeater
Fire Stations
Antrim VFD
Fairview VFD
Quaker City VFD
Government Buildings
Londonderry Township
Wastewater Treatment
Quaker City Waste Water Facility
Water Tanks
GC Water Tank Beros Farm

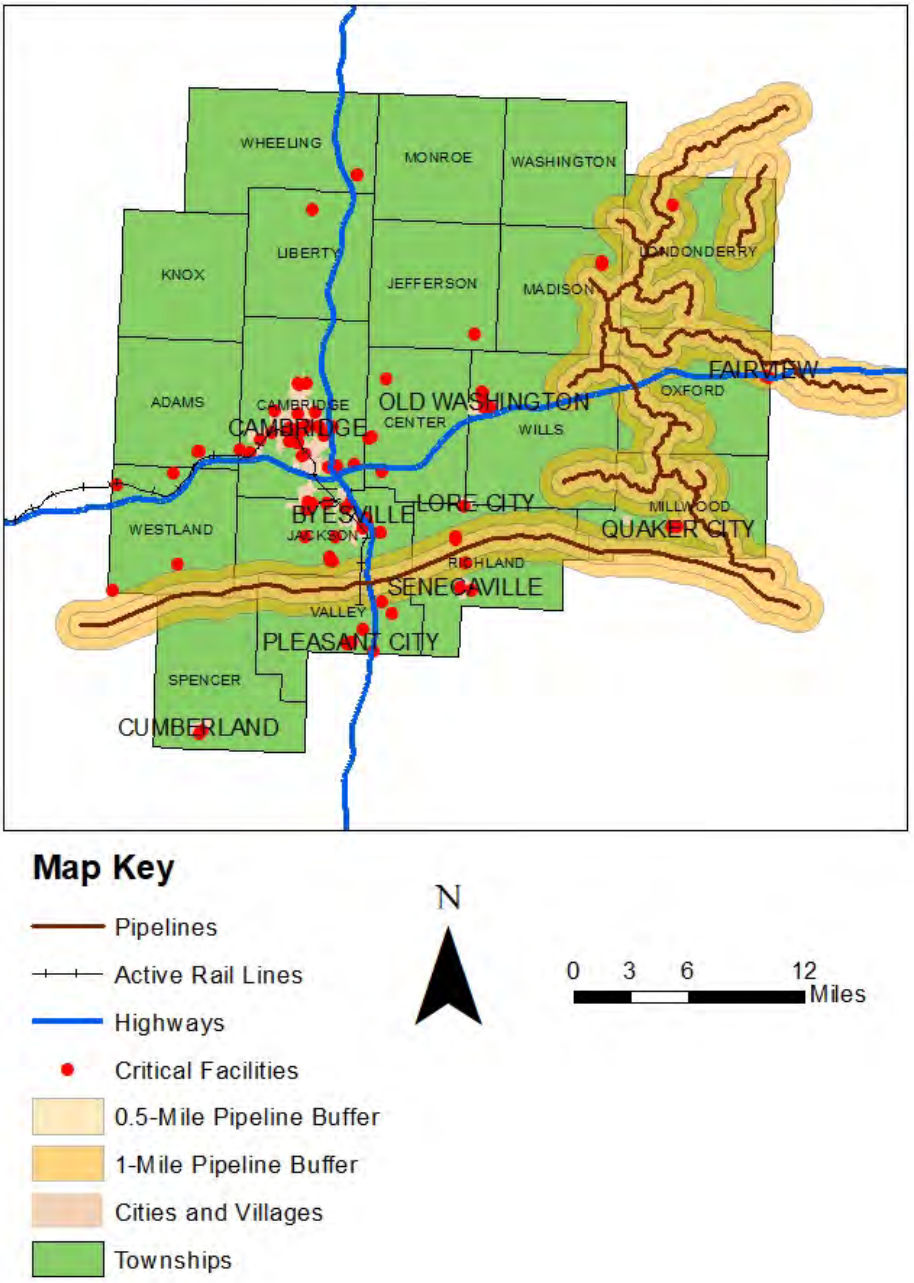

Figure 4.30: Map depicting a half-mile and one-mile pipeline buffer in Guernsey County (ArcGIS)

Table 4.18: Potential economic impacts within a one-mile radius of pipelines

Number of Critical Facilities Impacted	11
Total Property Value of Critical Facilities Impacted	$11,042,257
Number of Property Parcels Impacted	5,200
Total Property Value of Parcels Impacted	$274,329,589

Number of Structures Affected

The urban area that includes the City of Cambridge and the Village of Byesville are intersected by the rail line operated by Genesee & Wyoming Railroad and both major highway routes. The structures in the area located near these major transit routes would be vulnerable to incidents regarding the transportation of hazardous material. The buildings and structures in the Village of Old Washington and the Village of Fairview would also be at risk by highway transport. Other smaller incidents like pipe leaks can affect smaller individual properties.

Infrastructure Impact

Major hazardous material spills can be extremely harmful to infrastructure. Through transit over highway and rail line, the chemicals can be corrosive in nature and can also have severe environmental impacts that can contaminate the soil and groundwater. Furthermore, flammable and volatile substances can expand the original location of the spill and have larger impacts on the infrastructure. A hazardous material spill, natural gas leak, or other incident can have very damaging impacts to where they interrupt major transportation routes or daily operation over a period of time.

Population Impact

Hazardous material spills generally impact populations of people that are nearest to the incident or are using the same infrastructure in some capacity. Depending on the type of contamination, some substances can cause serious human health issues and injury. In severe cases, they can cause death and evacuation of areas. The contamination of soil and groundwater can also impact human health through environmental

Economic Losses

During hazardous materials incident, the Guernsey County Hazardous Materials and Response Preparedness Plan requires the area be properly managed and the spill or leak be remediated. In the case of major incident, transportation routes can be blocked, which can prevent normal operation of transport or commute. During extreme cases that involve evacuation, businesses within the area would have to temporarily seize operations for the purpose of human safety and effective hazardous material mitigation.

Invasive Species

Description

According to the Ohio Department of Natural Resources (ODNR) Division of Wildlife, of the approximately 3,000 species of plants known to occur in Ohio, about 75 percent are native or have occurred in Ohio before the time of substantial European settlement in about 1750. The other 25 percent is not native to Ohio, having been introduced from other states or countries. Most of these species never stray far from where they are introduced (gardens, urban areas, agricultural fields), yet some become very invasive and displace native plants in woodlands, wetlands, prairies, and other natural areas. Non-native plants have been introduced for erosion control, horticulture, forage crops, medicinal use, and wildlife foods as well as by accident. The top 8 species invading Ohio are shown in **Table 4.19**.

Table 4.19: Top 8 plant species invading Ohio

Bush Honeysuckle	Japanese Honeysuckle
Autumn Olive	Garlic Mustard
Buckthorn	Multiflora Rose
Common Reed	Purple Loosestrife

Without natural predators or controls, invasive, non-native plants are able to spread quickly and force out native plants. In Ohio, several non-native plants are invading woodlands and displacing native spring wildflowers. Other non-native plants are impacting our wetlands by creating monocultures. Native plant diversity is important for wildlife habitat, as many animals depend on a variety of native plants for food and cover.

Lastly, according to the ODNR Division of Forestry one of the most invasive insect species in Ohio is the Emerald Ash Borer. This insect is part of a group of insects known as metallic wood-boring beetles. Emerald Ash Borer affects all species of native ash found in Ohio. Because North American ash trees did not coexist in association with this pest, they have little or no resistance to its attack. In February of 2003, it was first found feeding on ash trees in northwest Ohio. Emerald Ash Borer larvae feed on the living portion of the tree, directly beneath the bark. This eating habit restricts the tree's ability to move essential water and nutrients throughout the plant. In three to five years, even the healthiest tree is unable to survive an attack.

Location

The area invaded by each plant species varies based on its preferred environment. Those with the fewest limitations have spread to nearly every county in Ohio. Following is a description of each plant (**Table 4.20**) from the ODNR Division of Natural Areas and Preserves along with a map of known impacted counties from the Nature Conservancy.

Table 4.20: Description of top 8 plant species invading Ohio

Map	Name/Description	Habitat
Bush Honeysuckle ***Lonicera Morrowii Displayed*** Found in 47 out of Ohio's 88 counties. Its range is shown here in yellow. 	**Bush Honeysuckles** consist of a number of upright shrubs which can grow 6-15 feet in height. Each has dark green, egg-shaped leaves. The tubular flowers are white on the Amur and the Morrow (changing to yellow with age), and pink on the Tatarian. Berries range from red to orange, occasionally yellow, and are eaten and dispersed by birds.	The bush honeysuckles inhabit abandoned fields, roadsides, woodlands, and edges of marshes.
Autumn Olive Found in 34 out of Ohio's 88 counties. Its range is shown here in yellow. 	**Autumn-Olive** is a fast-growing shrub or small tree reaching up to 20 feet tall. Its leaves are small and oval, dark green on the upper surface and silvery below. Small coppery dots occur on stems and leaves. This shrub has light yellow, aromatic flowers and produces large quantities of small, round red fruits that are readily eaten and spread by birds.	Autumn-Olive can survive in very poor soils because of its nitrogen-fixing root nodules. It grows in disturbed areas, roadsides, pastures, and fields throughout Ohio.

Map	Name/Description	Habitat
Buckthorn ***Rhamnus Frangula Displayed*** Found in 30 out of Ohio's 88 counties. Its range is shown here in yellow. 	**Buckthorns** are tall shrubs or small trees that grow up to 20 feet tall. The smooth, gray to brown bark is distinctively spotted. Glossy buckthorn has shiny leaves with smooth edges. It has solitary red to purple berry-like fruits. Common buckthorn has black fruits and dull green smooth leaves. Both species are abundant seed producers.	Glossy buckthorn usually occurs in wetlands, such as fens or bogs but it is also found in forests, fencerows, edges, prairies, and old fields. Common buckthorn occurs in a range of upland habitats, such as forests, woodland edges, fencerows, prairies, and old fields. Both species are most prevalent in central and northern Ohio.
Common Reed Found in 43 out of Ohio's 88 counties. Its range is shown here in yellow. 	**The Common Reed** is a grass that reaches up to 15 feet in height. The leaves are smooth, stiff and wide with coarse hollow stems. The big, plume-like flower head is grayish-purple when in fruit. Common reed spreads mostly vegetatively forming huge colonies by sprouting new shoots through underground stems (rhizomes).	Common reed grows in open wetland habitats and ditches primarily in northern Ohio. It occurs in still water areas of marshes, lake shores, riverbanks, and disturbed or polluted soils, often creating pure stands.
Garlic Mustard Found in 69 out of Ohio's 88 counties. Its range is shown here in yellow. 	**Garlic Mustard** is a biennial herb. It begins as a rosette of leaves in the first year, overwinters as a green rosette of leaves, flowers and fruits in the second year, and then dies. The small, four-petaled flowers are white and grow in clusters at the top of the stem. Garlic mustard produces large quantities of seeds which can remain viable for seven years or more.	This woodland plant prefers some shade but is occasionally found in full sun. It invades upland and floodplain forests, savannas, yards, streams, trails, and roadsides throughout Ohio.

Map	Name/Description	Habitat
Japanese Honeysuckle Found in 66 out of Ohio's 88 counties. Its range is shown here in yellow. 	**Japanese Honeysuckle is** a woody semi-evergreen vine with opposite, oval leaves. The flowers grow in pairs, are white to yellow, and very fragrant. Fruits, also in pairs, are purple to black berries. This vine climbs and drapes over native vegetation, forming dense patches.	Japanese Honeysuckle thrives in disturbed habitats, such as roadsides, trails, fencerows, abandoned fields, and forest edges primarily in southern Ohio. Disturbances such as logging, road building, floods, and windstorms create an opportunity for this vine to invade native plant communities.
Multiflora Rose Found in 78 out of Ohio's 88 counties. Its range is shown here in yellow. 	**Multiflora Rose** is a dense spreading shrub with widely arching canes and stiff, curved thorns. This shrub grows up to 15 feet tall with alternate, compound leaves of seven to nine oval leaflets. Multiflora Rose has numerous white flowers that produce clusters of small, red fruits. The fruits (called hips) are eaten by birds and mammals which help disperse the seeds. An individual plant can produce up to 500,000 seeds per year.	Multiflora rose was formerly planted as a "living fence" to control livestock, stabilize soil and create barriers for roadways. It has also been planted as a wildlife cover and food source. This rose occurs in a wide range of habitats throughout Ohio but prefers sunny areas with well-drained soils.
Purple Loosestrife Found in 51 out of Ohio's 88 counties. Its range is shown here in yellow. 	**Purple Loostrife** grows 3-7 feet tall and has a dense bushy growth of 1-50 stems. Long spikes of flowers are purple to magenta; linear-shaped leaves grow opposite along the square stems. Purple Loosestrife spreads aggressively by underground stems (rhizomes) and can produce as many as a million seeds per plant.	Purple Loosestrife grows in a variety of wetland habitats including marshes, river banks, ditches, wet meadows, and edges of water bodies, primarily in northern Ohio. Loosestrife can invade both natural and disturbed wetlands, replacing native vegetation with nearly pure stands of Loosestrife.

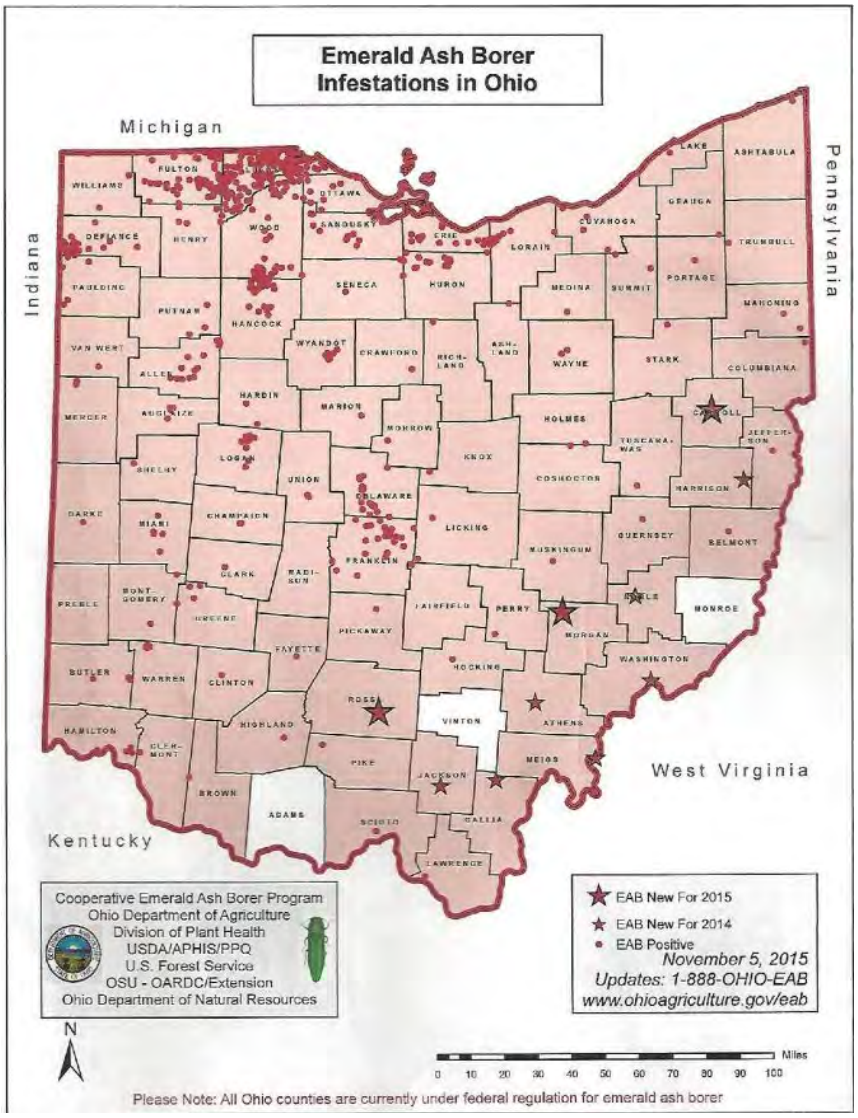

Figure 4.31: Emerald Ash Borer Infestations in Ohio 2015

The Emerald Ash Borer is currently found in 50 of Ohio's 88 counties (**Figure 4.31**), six neighboring states and the province of Ontario. From its initial detecting in Northwest Ohio the insect has spread south to the Ohio River in the south and Pennsylvania in the East. One of the greatest problems increasing the spread of the insects is the transport of infected firewood. Quarantine areas have been established making the transport of firewood across county lines illegal. As of 2015, 85 counties in the state comprise Ohio's quarantine area.

Extent

Impacts of invasive species tend to have commercial operational impacts, as opposed to many built environments impacts of the other hazards covered. Due to this unique situation, rather than a matrix of counties and losses the loss estimates will be presented using historical response costs to predict future losses in unadjusted dollars.

History

Invasive species of plants, fish and insects have been arriving in Ohio since the establishment of European settlers in the 1750s. With each improvement in the scale and speed of human transportation, the potential for unintended introduction of invasive species has increased. Organisms which could not survive the month-long journey from Europe or Africa to America can make the journey in a matter of hours today. Two examples of species introduction pathways are listed below.

Multiflora Rose

- The Multiflora Rose was introduced to the U.S. from Japan in 1886 as an under-stock for ornamental roses. Birds are responsible for spreading the seeds, which remain viable for a number of years. In the 1930s, the Soil Conservation Services advocated the use of Multiflora Rose for erosion projects and as a way to confine livestock. Hedges of Multiflora Rose have also been used as a crash barrier and to reduce headlight glare in highway medians.

Emerald Ash Borer

- The Emerald Ash Borer was introduced into North America sometime in the 1990's. The insect is believed to have been introduced into the United States in wood packing material from China. It was first reported killing ash trees in the Detroit and Windsor areas in 2002. Only species of ash are hosts for the beetle, which usually kill infested trees within a couple of years. Since then, infestations have been found throughout Lower Michigan, Ohio, northern Indiana, the Chicago area, Maryland and recently in Pennsylvania.

Considering the thousands of plants, dozens of aquatic and unknown number of insect species introduced into Ohio over the past 250 years, samples of the most often cited transfer media are provided here. Exotic species can arrive by a nearly endless number of vectors making a complete listing impossible.

Probability

Legislation is in place around the country to control the migration of unwanted species between ecosystems. The Edris currently battling the entrance of wild boars from Kentucky and West Virginia. In addition, there are several species of carp currently migrating up the Mississippi watershed from the Gulf Coast. Although not currently reported in any Ohio waterways, the probability of future infestations is near certain. It is certain that new wanted and unwanted species will arrive in Ohio. The importance of controlling the integrity of existing ecosystems will require ongoing state, national and international efforts to avoid unwanted infestations.

Vulnerability Assessment

Invasive insect species are both the direct source of damage to trees and a vector for other parasites. In the last century the North American population of Elm trees was decimated by a fungus which arrived on infected trees shipped to an Ohio furniture company. One of the primary transport methods is though beetles which the fungus uses as a host to move from tree to tree. The beetle's ability to fly exponentially increased the number of trees impacted. Trees located in non-urban areas posed financial impact only to loggers; however, the Elm was a popular urban tree and the cost to remove them ran into the millions over the years.

The Emerald Ash Borer, which is currently impacting the North American Ash tree, has already cost millions of dollars in attempts to identify and isolate infected trees. In Ohio alone, there are an estimated five billion Ash trees at risk. Although many research centers are searching for

an effective means of combating the insect, the only method currently available is the use of insecticides which have to be applied annually. The un-captured cost to treat Ash trees in Ohio will likely reach into the millions, as urban areas combat the insect.

Landslides

Description

The Ohio Department of Natural Resources (ODNR) Division of Geological Survey defines landslides as the downward and outward movement of soil along a hillside or slope. Fundamentally, a landslide is a slope failure that occurs when the slope soil strength is exceeded by the pressure from human and natural caused activities. Land subsidence is the downward motion of the soil relative to the surrounding terrain. Unlike landslides, land subsidence is the downward movement of soil with no visible outlet. This is often described as a sinkhole. ODNR Division of Geological Survey states that there are three main types of landslides in Ohio:

- Rotational slump is the movement of a mass of weak rock or sediment as a unit along a curved slip plane. Rotational slumps may develop comparatively slowly and require several months or even years to reach stability; however, on occasion, they may move rapidly, achieving stability in only a few hours. In Ohio, this type of landslide is the largest in that it can involve hundreds of thousands of cubic yards of materials.
- Earthflow is the movement of rock, sediment, or weathered surface materials moving downslope in a mass. The rate of movement of an earthflow is generally quite slow. In Ohio, this is type of landslide is the most common and involves a smaller area compared to the rotational slump landslides.
- Rockfall is the rapid downslope movement of bedrock material. Most rockfalls in Ohio involve massive beds of sandstone or limestone.

Additionally, ODNR Division of Geological Survey states that landslides generally include geological conditions that contribute to the occurrence of landslide events:

- Steep slope
- Jointed rocks
- Fine-grained, permeable rock or sediment
- Clay or shale units subject to lubrication
- Large amounts of water

Although an area might possess one or more of the above conditions, landslides require a trigger that will initiate the downslope movement of the soil. The list of triggers includes both human and natural caused events such as vibrations, over steepened slopes, increased weight on slopes, and removal of vegetation and trees.

Location

The State of Ohio Enhanced Hazard Mitigation Plan 2011 provided a State of Ohio Landslide Incidence and Susceptibility Map, shown in **Figure 4.32**. The eastern half of Guernsey County shows a high susceptibility and moderate incidence of landslides, while the western half of the County shows a high susceptibility and low incidence.

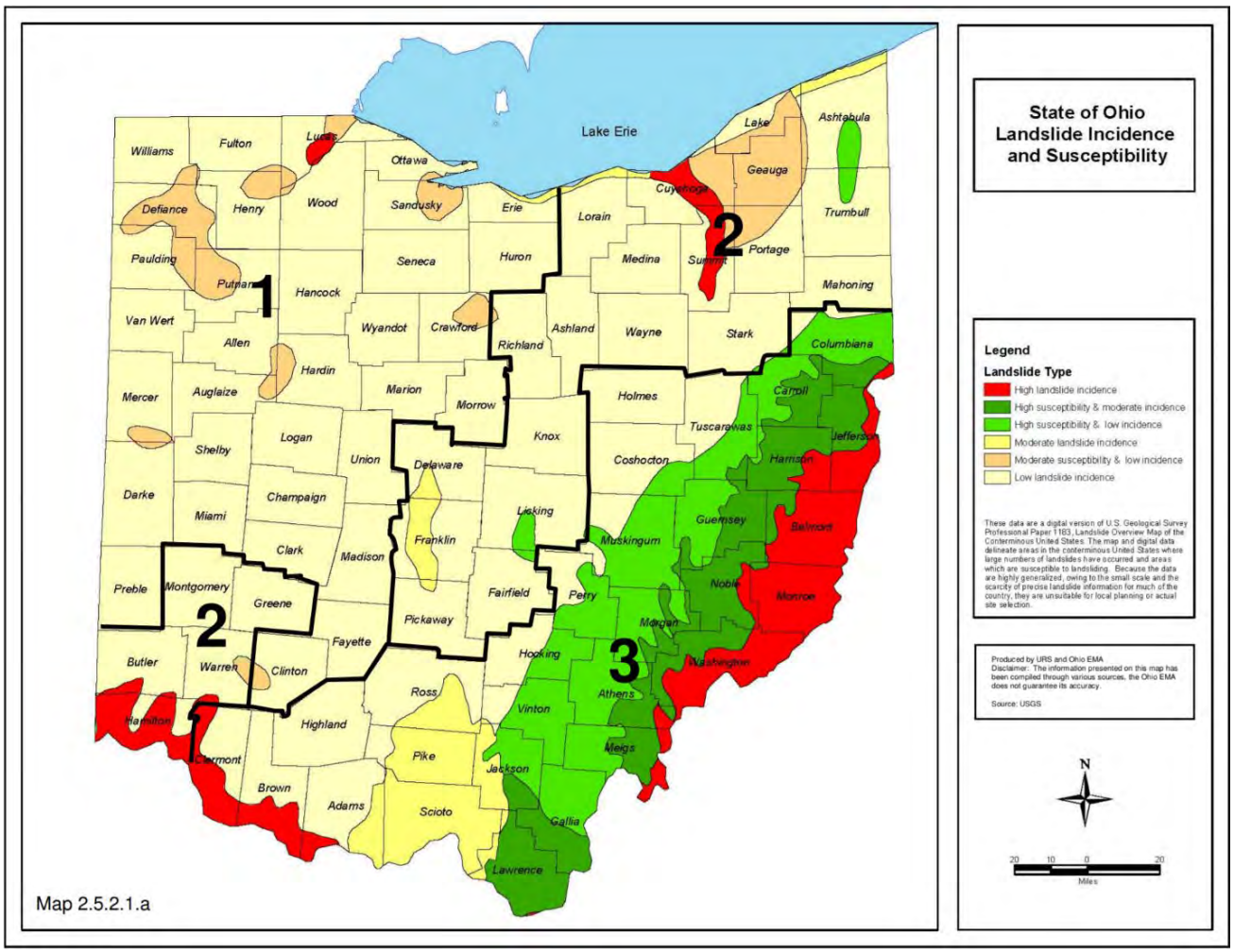

Figure 4.32: State of Ohio Landslide Incidence and Susceptibility Map

Extent

Severity of landslides is measured by a combination of loss of life, property and other infrastructure damage. A separate impact landslides can have in a rural area like Guernsey County is the potential to damage county and state roads that connect throughout the County. Additionally, landslides have the potential to cause a chain reaction of greater impacts.

History

The incidences described below give the most recent accounts of landslides in Guernsey County with the most recent occurring in January of 2014.

April 1993

- A mobile home was destroyed in Jackson Township when a hillside on Indian Lake Road gave way after heavy rains.

January 1995

- A large crack developed on part of Slaughter Hill Road in Cambridge Township causing part of the roadway to slide down Slaughter Hill.

January 2014

- The I-77 southbound travel lane was closed near the Tuscarawas/Guernsey County line due to a landslide. One lane of traffic will be maintained in the southbound passing lane. Northbound lanes were not affected.

Probability

Figure 4.32, above, shows that the eastern half of Guernsey County is highly susceptible with moderate incidence of landslides, while the western half of the County shows a high susceptibility and low incidence of landslides.

Vulnerability

Infrastructure Impact

Landslides could significantly impact infrastructure in Guernsey County. Specifically, landslides can have a major impact to the county roadways. These impacts can cause minor injuries and potentially close roadways for emergency repair.The total estimated loss for state-owned facilities is $984,006 (**Table 4.21**).

Table 4.21: Potential for Loss to Critical Facilities due to Landslide in Guernsey County

Potential For Loss	Medium
Average Critical Facility Value	$272,291
Average Non-Critical Facility Value	$711,715
Total Estimated Loss	$984,006

Population Impact

Since the most common type of landslide in Ohio is the slow-moving Earthflow landslide, the immediate impact to the population is low. However, due to the destructive potential of a landslide, site specific evacuations might be required if the landslides are near structures. The greatest potential impact to the population is the sudden transportation facility impacts. These impacts can either cut off evacuation routes or cause accidents on the roadway.

Economic Losses

According to the State of Ohio Hazard Mitigation Plan 2011, Guernsey County has a medium potential for loss due to landslides, relative to the other counties in Ohio. The total estimated loss for the County is $67,546.

Lightning

Description

According to The National Severe Storms Laboratory, lightning is a giant spark of electricity in the atmosphere between clouds, the air, or the ground. In the early stages of development, air acts as an insulator between the positive and negative charges in the cloud and between the cloud and the ground. When the opposite charges build up, this insulating capacity of the air breaks down and there is a rapid discharge of electricity that call lightning. The flash of lightning temporarily equalizes the charged regions in the atmosphere until the opposite charges build up again.

Lightning can occur between opposite charges within the thunderstorm cloud (intra-cloud lightning) or between opposite charges in the cloud and on the ground (cloud-to-ground lightning).

Location

Lightning is a county-wide hazard, potentially affecting all areas and jurisdictions.

Extent

Lightning can cause both direct and indirect damage. Direct lightning strikes can kill or injure people and animals and can cause direct damage to buildings or other objects. Lightning can also cause indirect damage by starting fires, or by overloading electrical systems. Increasing reliance on electricity and digital systems means that electrical equipment is becoming more vulnerable to transient overvoltage caused by lightning.

History

Lightning is a commonly occurring natural phenomenon that is generally only recorded when it strikes people, structures, or objects, or causes secondary effects like wildfires or blackouts. Although this list is not exhaustive, there are newspaper records of lightning strikes in Guernsey County.

June 27, 1850 – Washington Township

- According to the Pittsburgh Daily Post, two women were killed in Washington Township in Guernsey County, when lightning struck their house.

July 28, 1969 – Senecaville

- A lightning strike in Senecaville caused two deaths and injured one.

July 10, 2017 – Byesville

- According to The Daily Jeffersonian, a lightning strike sparked a fire in a garage at a residence. The garage sustained extensive damage, but no injuries were reported.

Probability

According to the National Lightning Safety Institute, one out of every 200 structures will be struck by lightning each year, and one out of every 280,000 people will be struck by lightning each year.

Vulnerability Assessment

Infrastructure Impact
There are no records of infrastructure damage due to lightning in Guernsey County, and the random nature of lightning strikes makes the precise risk difficult to assess. However, electrical infrastructure is particularly vulnerable to lightning, including electrical equipment, cables or transmission links, wireless base stations, and power plants.

Population Impact
The 2017 population estimate for Guernsey County according to the U.S. Census Bureau is 39,093. Using the National Lightning Safety Institute's statistic of one out of 280,000 people being struck by lightning in a year, Guernsey County can expect to have one person struck by lightning approximately every 7.16 years.

Property Damage
The 2012-2016 American Community Survey 5-year estimates list the number of housing units in Guernsey County at 19,110. Using the National Lightning Safety Institute's statistic of one out of 200 homes being struck by lightning each year, Guernsey County can expect to have up to 96 homes struck by lightning each year. However, not all lightning strikes will damage homes, so the exact risk to property is difficult to determine.

Loss of Life
According to the University of Illinois at Chicago, approximately 10 percent of lightning strikes are fatal. This means that Guernsey County could expect to have one fatality every 71.6 years. The actual rate is slightly higher, with four deaths reported since 1850, for an average of one death every 42 years.

Economic Losses
There is no specific record of economic losses associated with lightning strikes in Guernsey County. However, in theory economic losses could occur due to property damage, or in lost productivity due to power outages being caused by lightning strikes.

Mine Subsidence

Description

According to the United States Geological Survey, subsidence is the lateral or vertical movement that occurs when an underground mine collapses causes stress to the surface. Mine subsidence is the lowering of ground surface due to collapse of bedrock and unconsolidated materials into underground mined areas. Mine subsidence can occur in the form of a sinkhole or pothole (pit subsidence), or as sag subsidence. Pit subsidence is an abrupt sinking of the surface, leaving a circular, crater-shaped hole. Sag subsidence is a gradual settling of the surface. These may fill with water if the subsidence intersects the water table. Subsidence can occur without any warning, but can cause foundation damage, disrupt underground utilities, as well as damaging infrastructure such as roadways.

Location

There are 170 abandoned coal mines in Guernsey County as of 2017, according to the Ohio Mine Subsidence Insurance Underwriting Association. Active mines in Guernsey County are listed in **Table 4.22**. Please note that records for mines that were created pre-1874 may not be accurately recorded or mapped.

Table 4.22: Active Mines, as listed on ODNR GIS Datamap

Mine Name (National ID)	Mine Type	Location	Area, acres (Reported)	Permit Approval Year
Plainfield (D-2178)	Coal-Surface	SW Wheeling Twp/NW Knox Twp	771.61	2001
(D-2115)	Coal-Surface	SW Wheeling Twp	375.87	2001
Broad Run/Pea3 (D-2295)	Coal-Surface	NW Knox Twp	1317.40	2007
Otsego #1 (D-2373)	Coal-Surface	W Knox Twp	1119.5	2011
(IM-1030)	Limestone-Surface	W Spencer Twp	1580	1989
(D-0907)	Coal-Surface	S Center Twp	94.43	1995

Mine Name (National ID)	Mine Type	Location	Area, acres (Reported)	Permit Approval Year
(IM-2375)	Industrial Materials: Sandstone, Topsoil, Shale	S Richland Twp	20	2011
Vail (D-2355-1)	Coal-Underground-Room & Pillar	W Washington Twp	3209.2	NULL
Ginger Bend (D-2448)	Coal-Underground-Room & Pillar	W Londonderry Twp	5826	2014
Vail South (D-2413)	Coal-Surface-Auger	N Londonderry Twp	96	2013
Ginger Bend (D-2448)	Coal-Surface	Central Londonderry Twp	108	2015
(D-2334)	Coal-Surface	Central Millwood Twp	264.93	2009
King Crum (D-2403)	Coal-Surface	S Millwood Twp	294.8	NULL
(D-0297)	Coal-Surface	SE Millwood Twp	104.12	1985

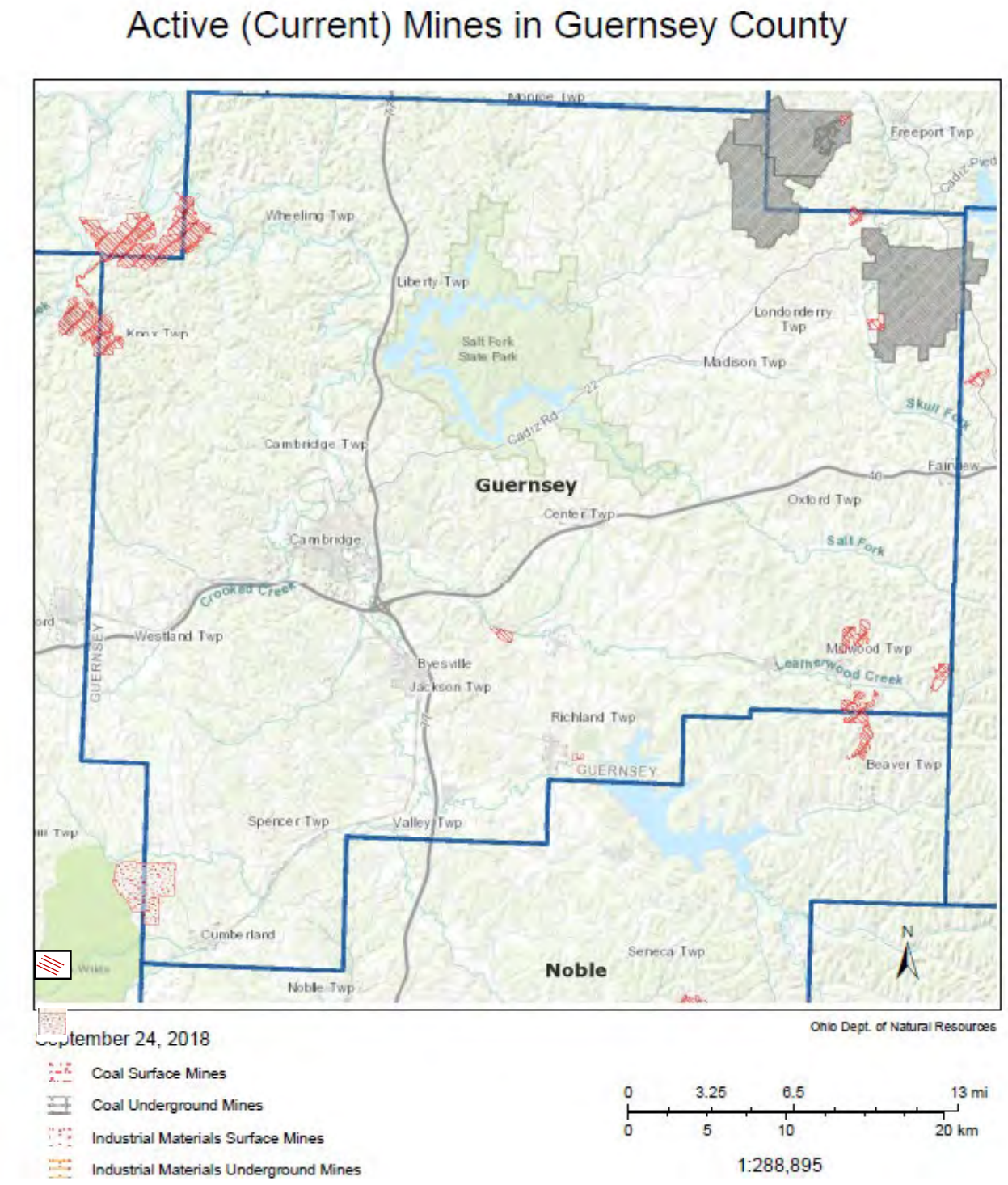

Figure 4.33: Map of Active Mines Within Guernsey County as of 2018

Extent

Figure 4.33 depicts the location of active mines within Guernsey County. There are an estimated 15,181.86 acres of active mines, not including permitted or future proposed mines that are yet to be constructed.

Guernsey County is one of 26 Ohio counties with mandatory coverage by the Ohio Mine Subsidence Insurance Underwriting Association (OMSIUA). To be eligible for mine subsidence insurance, the following eligibility requirements must be met:

1. The primary structure must be an occupied 1-4 family dwelling and at least 50 percent of the total living space must be occupied. Seasonal properties are considered eligible for coverage, as are properties under construction
2. The dwelling structure may have incidental occupancy if the occupancy does not cause the structure to be rated under commercial rating plans and if the structure qualifies for a homeowners, a farm owners, a dwelling fire, or other personal lines policy.
3. The dwelling structure must be located in one of the designated “mandatory” or “optional” counties.
4. The dwelling and detached private garages must be covered by a valid homeowners, farm owners, dwelling fire, or other personal lines insurance contract.

As of 2017, there are 13,971 mine subsidence insurance policies active within Guernsey County.

History

The previous version of the Guernsey County Hazard Mitigation Plan addressed this hazard. According to the 2017 OMSIUA Annual Report, there was one open claim still in review.

In 1995, a mine subsidence event occurred on I-70 Eastbound near Old Washington, with a collapse of a portion of the eastbound lane. The repairs took several months and required the interstate to be closed. The cost of the repair work was estimated at $3.6 million.

Probability

Between 2007 and 2017, there were 22 reported claims filed with the Ohio Mine Subsidence Insurance Underwriting Association, with an average of two per year. Based on this average of 2 subsidence events per year, we can estimate a 0.55% chance of a subsidence event occurring on any given day.

Vulnerability Assessment

Infrastructure Impact

Roads/Highways can require intensive repairs and need to be closed if a subsidence event occurs. **Figure 4.34** shows potential affected areas that are at highest risk of mine subsidence events. One particular area of concern is the east half of Oxford Township along Highway 70. Other townships with areas of concern are Wheeling and Millwood.

Population Impact

Citizens located near the areas of Guernsey County that have been identified as ODNR subsidence problem areas should be aware of the threat posed by potential mine subsidence events.

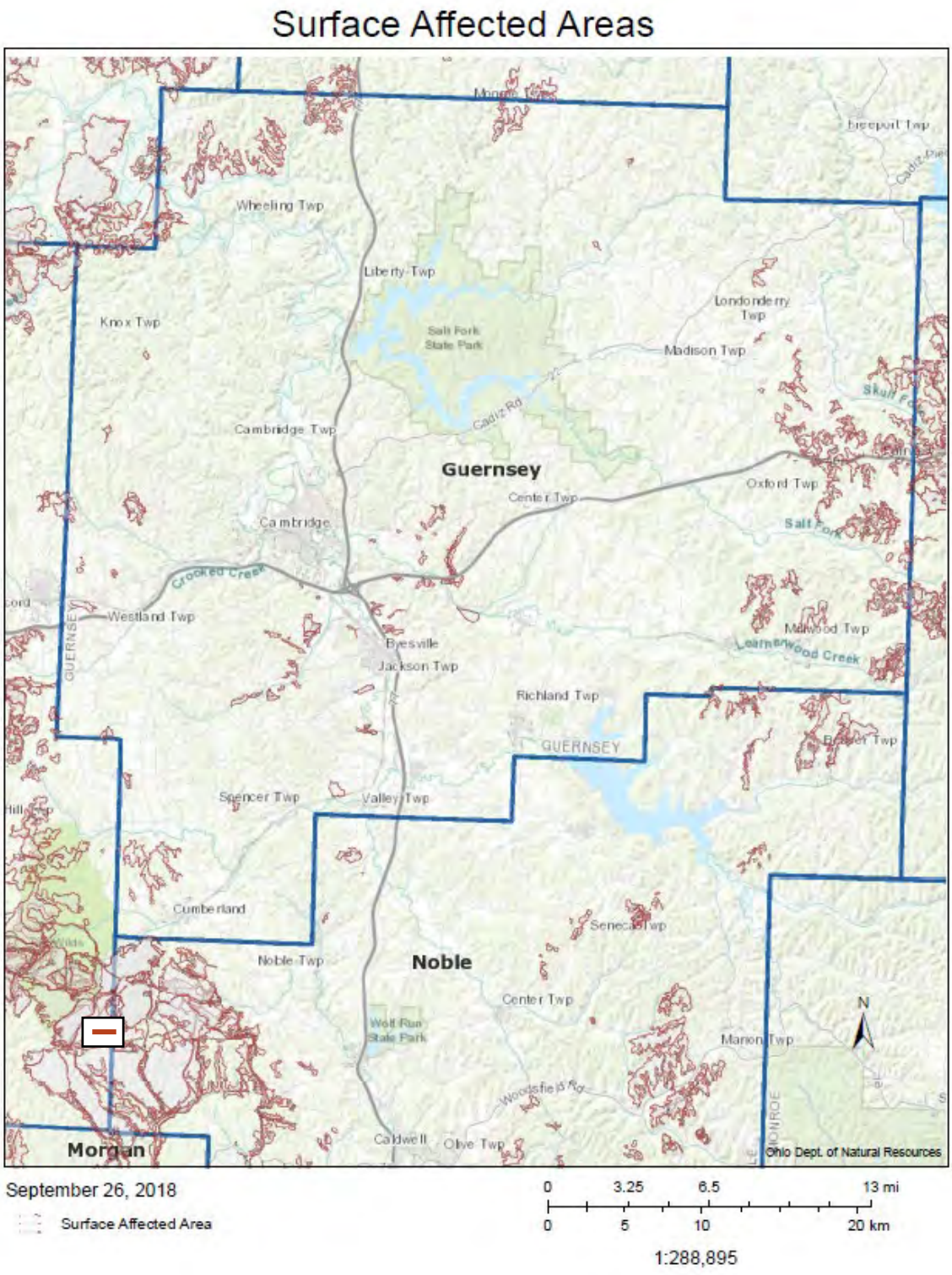

Figure 4.34 Map of Surface Areas Identified as Potentially Affected by Mine Subsidence

Loss of Life
Given the lack of recorded fatalities resulting from mine subsidence incidents, the potential for loss of life from such events is minimal.

Economic Losses and Property Damage
Economic losses are summarized in **Table 4.23**, below. All data came from Guernsey County Auditor site and ODNR map of Surface Affected Areas.

Table 4.23: Critical Facilities and Properties Potentially Impacted by Subsidence Event

Number of Critical Facilities Impacted	4
Total property value of Critical Facilities Impacted	$6,766,200
Number of Property Parcels Impacted	534
Total property value of Property Parcels impacted	$52,733,760

Tornadoes

Description

Tornadoes are rapidly rotating funnels of wind extending from storm clouds to the ground. They form during severe thunderstorms when cold air overrides a layer of warm air, causing the warm air to rise rapidly. The midsection of the United States experiences a higher rate of tornadoes than other parts of the country due to the recurrent collision of moist, warm air moving north from the Gulf of Mexico with colder fronts moving east from the Rocky Mountains.

Tornadoes are most hazardous when they occur in populated areas. Tornadoes can topple mobile homes, lift cars, snap trees, and turn objects into destructive missiles. Among the most unpredictable of weather phenomena, tornadoes can occur at any time of day, in any of the 50 states, and in any season. While the majority of tornadoes cause little or no damage, some are capable of tremendous destruction, reaching wind speeds of 200 MPH or more.

Tornadoes are not spatial hazards, so they can be difficult to profile to determine exact risks. However, this report makes estimates by analyzing historic occurrences and past declarations. While Ohio does not rank among the top states for the number of tornado events, it does rank within the top 20 states in the nation for fatalities, injuries, and monetary losses, indicating that it has a relatively high likelihood of damages resulting from tornadoes.

Location

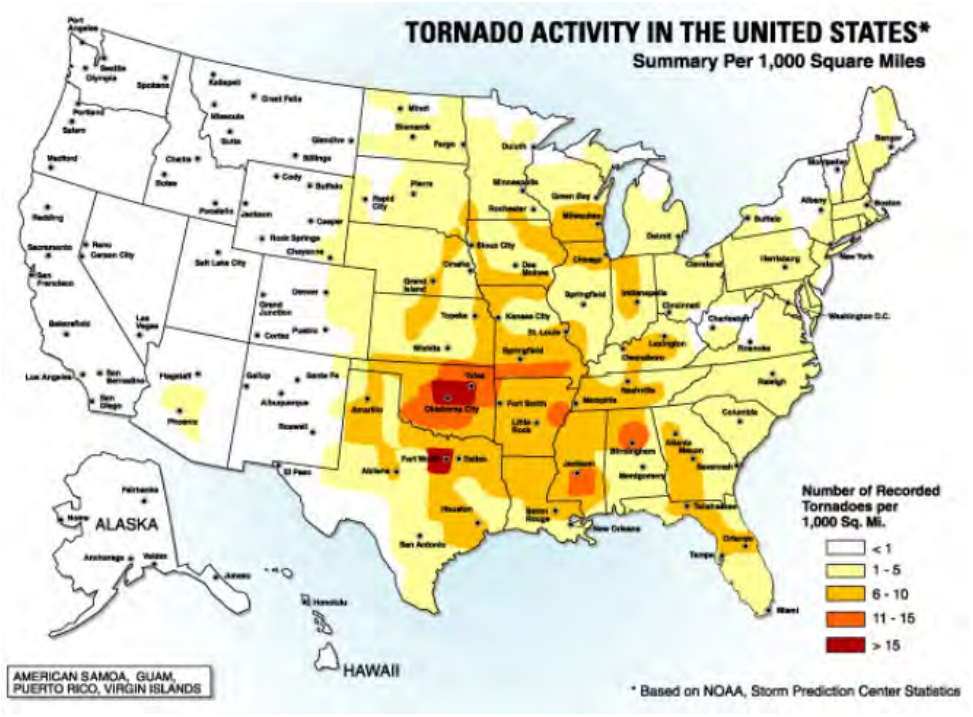

Figure 4.35: Tornado Activity in the United States

Tornadoes are a county-wide hazard in Guernsey County, potentially affecting all areas and jurisdictions. **Figure 4.35** depicts the nationwide tornado activity.

Extent

Table 4.24: Fujita Tornado Damage Scale

Scale	Wind Estimate (MPH)	Typical Damage
F0	<73	**Light damage**: Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign board damaged
F1	73-112	**Moderate damage**: Peels surface off roofs; mobile homes pushed off foundations or overturned; moving automobiles blown off roads
F2	113-157	**Considerable damage**: Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light object missiles generated; cars lifted off ground
F3	158-206	**Severe damage**: Roofs and some walls torn off well-constructed houses; trans overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown
F4	207-260	**Devastating damage**: Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	**Incredible damage**: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters; trees debarked; incredible phenomena may occur.

Tornadoes are measured by damage scale for their winds, greater damage would equate to greater wind speed. The original Fujita-scale (F-Scale) was developed without considering a structure's integrity or condition as it relates to the wind speed necessary to damage it. Different winds may be needed to cause the same damage depending on how well-built a structure is. Also, the process of rating the damage was largely a judgment call, lacking a sufficient number of objective criteria. The Enhanced Fujita-scale (EF-Scale) took effect February 1, 2007.

The Enhanced F-scale starts with the original F-scale's F0-F5 ratings and also classifies tornado damage across 28 different types of damage indicators (**Table 4.24**). These indicators mostly involve building/structure type and are assessed at eight damage levels from 1-8. Therefore, construction types and their relative strengths and weaknesses are incorporated into the EF

classification given to a particular tornado. The most intense damage within the tornado path will generally determine the EF scale given the tornado. **Table 4.25** lists the classifications under each scale. The wind speeds listed are estimates based on damage rather than measurements. Also, there are no plans by National Oceanic Atmospheric Administration or the National Weather Service to re-evaluate the historical tornado data using the enhanced scale.

Therefore, this Plan and subsequent plans will reference both scales until a complete switchover is deemed necessary.

Table 4.25: Updated EF Tornado Scale

Fujita Scale			Derived EF Scale		Operational EF Scale	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	over 200

The EF-scale remains a set of wind estimates based on damage, not measurements. It uses three-second gusts, estimated at the point of damage, based on a judgment of eight levels of damage to the 28 indicators. These estimates vary with height and exposure. The 3-second gust is not the same as wind in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured, “one-minute mile” speed.

The EF Scale’s 28 indicator and eight damage levels can be found on NOAA’s website at http://www.spc.noaa.gov/faq/tornado/ef-scale.

History

Tables 4.26 and 4.27 list the historic tornado events in Guernsey County and their locations, as provided by the National Climatic Data Center. These events are discussed in more detail below.

Table 4.26: History of Tornado Events in Guernsey County

Event Types: Tornado

9 events were reported between 05/01/1950 and 09/01/2018 (24961 days)

Summary Info:

Number of County/Zone areas affected:	1
Number of Days with Event:	8
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	2
Number of Days with Event and Property Damage:	8
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	1

Table 4.27: Location of Tornado Events in Guernsey County

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	11	3.357M	0.00K
GUERNSEY CO.	GUERNSEY CO.	OH	06/25/1968	14:45	CST	Tornado	F2	0	0	250.00K	0.00K
GUERNSEY CO.	GUERNSEY CO.	OH	06/25/1968	15:05	CST	Tornado	F1	0	0	25.00K	0.00K
GUERNSEY CO.	GUERNSEY CO.	OH	07/13/1971	19:45	CST	Tornado	F2	0	5	250.00K	0.00K
GUERNSEY CO.	GUERNSEY CO.	OH	06/15/1975	16:45	CST	Tornado	F0	0	0	25.00K	0.00K
GUERNSEY CO.	GUERNSEY CO.	OH	06/07/1978	19:55	CST	Tornado	F2	0	6	2.500M	0.00K
GUERNSEY CO.	GUERNSEY CO.	OH	06/13/1981	15:36	CST	Tornado	F0	0	0	2.50K	0.00K
GUERNSEY CO.	GUERNSEY CO.	OH	12/23/1990	03:11	CST	Tornado	F1	0	0	250.00K	0.00K
WALHONDING	GUERNSEY CO.	OH	06/27/1998	18:45	EST	Tornado	F0	0	0	50.00K	0.00K
HELENA	GUERNSEY CO.	OH	09/12/2013	18:56	EST-5	Tornado	EF0	0	0	5.00K	0.00K
Totals:								0	11	3.357M	0.00K

June 1968

- On June 25th, an F2 tornado occurred in Guernsey County at 2:45 p.m. It measured 11 miles in length and 150-200 yards in width. It caused $250,000 in total property damage, 5 injuries, and 0 deaths.

June 1968

- On June 25th, an F1 tornado occurred in Guernsey County at 3:05 p.m. It measured 7.3 miles in length and 200 yards in width. It caused $25,000 in total property damage, 0 injuries, and 0 deaths.

July 1971

- On July 13th, an F2 tornado occurred in Guernsey County at 8:45 p.m. It measured 2 miles in length and 100 yards in width. It caused $250,000 in total property damage, 5 injuries, and 0 deaths.

June 1975

- On June 15th, an F0 tornado occurred in Guernsey County at 5:45 p.m. It measured 0 miles (brief touchdown) in length and 33 yards in width. It caused $25,000 in total property damage, 0 injuries, and 0 deaths.

June 1978

- On June 7th, an F2 tornado occurred in Guernsey County at 8:55 p.m. It measured 0.8 miles in length and 100 yards in width. It caused $2.5 million in total property damage, 6 injuries, and 0 deaths.

June 1981

- On June 13th, an F0 tornado occurred in Guernsey County at 4:36 p.m. It measured 0.5 miles in length and 100 yards in width. It caused $2,500 in total property damage, 0 injuries, and 0 deaths.

December 1990

- On December 23rd, an F1 tornado occurred in Guernsey County at 3:11 p.m. It measured 5 miles in length and 50 yards in width. It caused $250,000 in total property damage, 0 injuries, and 0 deaths.

June 1998

- On June 27th, an F0 tornado occurred in Guernsey County at 6:45 p.m. It measured 3.5 miles in length and 100 yards in width. It caused $50,000 in total property damage, 0 injuries, and 0 deaths.

September 2013

- On September 12th, an EF0 tornado occurred in Guernsey County at 6:56 p.m. It measured 0.2 miles in length and 50 yards in width. It caused $5,000 in total property damage, 0 injuries, and 0 deaths.

Probability

According to NOAA, between 1950 and 2018, there were nine tornado events in Guernsey County. Countywide, there is approximately a 13.24 percent chance of having a tornado of any size in any given year and 0.036 percent chance on any given day (0.13 yearly tornadoes divided by 365 days = 0.00036 occurrences per day). The likelihood of a tornado is normally lower during the winter and higher during the summer. Of the nine tornado events, one happened after the F scale was replaced by the EF scale; thus, 33 percent of the total tornadoes were F0 (40-72 MPH), 11 percent were EF0 (65-85 MPH), 22 percent were F1 (73-112 MPH), and 33 percent were F2 (113-157 MPH).The most prevalent type of tornado to hit Guernsey County are F0 and F2 with three occurrences respectively.

Vulnerability Assessment

Between 1990 and 2010, Ohio averaged approximately 18 tornadoes per year. Ohio's peak tornado season runs from April through July, with June experiencing the most storms by month. Most tornadoes occur between 2 p.m. and 10 p.m. Tornadoes are considered the most violent atmospheric phenomenon. There is a high probability that mobile homes and residential units built without wind-resistant construction standards would suffer catastrophic destruction as the result of a strike by an EF2 or stronger tornado. On a statewide basis, Ohio does not have building codes that address wind resistance for most types of residential dwellings. However, since 1995, many local governments around the state have adopted codes that address wind resistance. Therefore,

structures constructed prior to 1995 are potentially more susceptible to catastrophic destruction as the result of a tornado strike than those constructed after 1995.

Infrastructure Impact

Above ground infrastructure is at risk for storm damage by wind and falling debris. For infrastructure the most damaging part of a storm are the high winds and hail. High winds can strip a tree of bark and detach limbs. If large branches fall they can damage buildings and supporting above-ground infrastructure. Large trees, upwards of 200 feet tall, can be uprooted and can fall on buildings or through houses which can cause serious harm or death.

Utilities that are out in the open are at risk for damage by tornadoes. Electrical lines are spread throughout the County connecting homes, businesses, and other facilities to one another. Large branches from trees or other debris can strike above ground electrical lines, causing power outages. Further, downed lines that are still live and active are extremely hazardous and can cause death by electrocution.

Roads are spread throughout Guernsey County and can be affected by downed trees, branches, or other debris. Larger debris or trees will take more time and effort to remove and can adversely affect the flow of traffic until safely removed.

Wastewater facilities can experience backup and blockages if debris falls into the tanks. There are eight wastewater and sewage treatment plants throughout Guernsey County.

Population Impact

According to the Census Bureau's 2017 population estimates, the population of Guernsey County is approximately 39,093. The population is expected to shrink to 36,390 through the year 2040, so the number of individuals affected by storm events will remain about the same as current levels. Summer storms are random in nature and affect the entire area of the County. Everyone within the County should be prepared during a storm event. Populations residing in mobile home parks are particularly vulnerable and should seek out shelters.

Property Damage

According to the United States Census Bureau, the median home value within Guernsey County was $98,600. There are 19,110 residential housing units within Guernsey County.

Since 1950, according to the NOAA, there have been nine tornado events and eight days with events, four of which have caused $250,000 or more in property damage. Damages total $3.357 million from all nine events. There have not been instances of crop damage, according to NOAA.

Loss of Life

According to NOAA, tornado events have been responsible for 0 deaths and 16 injuries during events that passed through Guernsey County from 1950 through 2018.

Economic Losses

Depending on the severity, tornadoes can cause major damage to structures, such as complete destruction. Additionally, large branches may break windows or fall onto buildings and above ground infrastructure. Four of the 9 reported tornado events recorded in Guernsey County have caused $250,000 worth of property damage or more countywide.

The most damage sustained by Guernsey County occurred in June 1978, when a tornado touched down near Cambridge and destroyed a mobile home and inflicted severe damage to a multitude of

buildings in the vicinity, injuring six people in the process. Guernsey County incurred $2.5 million worth of property damage from the event.

Figure 4.38 below simulates an extremely destructive EF5 tornado and its impacts in a worst-case scenario to County assets and infrastructure. **Table 4.28** categorizes the damages that would result from such a tornado.

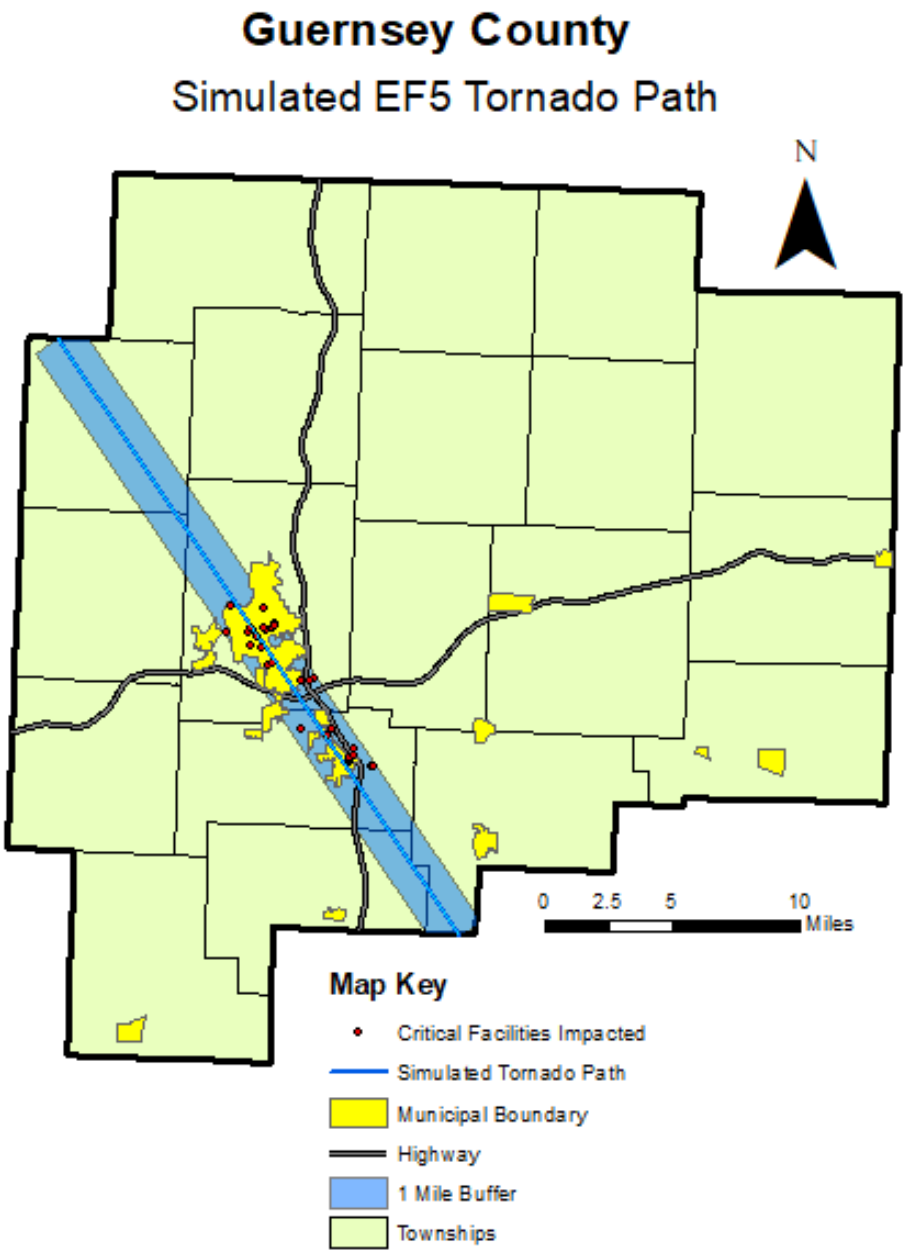

Figure 4.38: Simulated EF5 Tornado Path in Guernsey County

Table 4.28: Potential Economic Impacts of Simulated EF5 Tornado

Number of Critical Facilities Impacted	33
Total Property Value of Critical Facilities Impacted	$53,686,088
Number of Property Parcels Impacted	10,954
Total Property Value of Parcels Impacted	$583,558,387

Wildfires

Description

A wildfire is a fire in an area of combustible vegetation that occurs in the countryside or rural area. The Ohio Department of Natural Resources (ODNR) identifies Ohio's wildfire seasons as occurring primarily in the spring (March, April and May) before vegetation has "greened-up" and the fall (October and November) when leaf drop occurs. During these times and especially when weather conditions are warm, windy and with low humidity, cured vegetation is particularly susceptible to burning. Fuel (vegetation, woody debris), weather (wind, temperature, humidity) and topography (hills and valleys) can combine to present an extreme danger to unwary civilians and firefighters in the path of a wildfire. Each year an average of 1,000 wildfires burn 4,000 to 6,000 acres of forest and grassland within Ohio's forest fire protection district, which corresponds mostly to the state's unglaciated hill country.

Location

In the State of Ohio Enhanced Hazard Mitigation Plan, Guernsey County is identified as a county within the Wildfire Protection Area, as established by the ODNR Division of Forestry. Counties within this area are at highest risk for wildfire in the State of Ohio, with an average of 800 wildfires burning between 4,000 and 5,000 acres of forest and grassland annually. According to the State of Ohio Hazard Mitigation Plan 2011, Guernsey County is at moderate risk for wildfires compared to the rest of the state, due to several natural and industrial hazards. While the majority of Guernsey County is at moderate risk of wildfire, the ODNR Division of Forestry also identified Wills Township as one of 101 communities at risk (CAR) to wildfire. Specifically, Wills Township and the incorporated areas within is a high risk of wildfire.

Extent

According to the State of Ohio Hazard Mitigation Plan 2011, most of the County is under a moderate risk for wildfires, with the exception of Wills Township, which is declared as a highest risk by the Plan. Several factors contribute to the escalation of risk of wildfires specifically in the case of Wills Township: the prevalence of forests and agricultural lands and their close proximity to homes, residences, and structures, as well as the distance between fire and EMS response from volunteer forces increase the probability of wildfires occurring and spreading in the County. In these cases, presence of fire near structures causes fire departments, which are largely volunteer, to shift focus away from fire suppression and towards structure protection. Additionally, mines, often abandoned and largely undocumented, present a significant risk of spreading wildfires in the County. Clean-up and remediation of abandoned mines is becoming increasingly difficult due to financial strain of the energy sector, leading to mine owners becoming unable to fulfill their required obligations for remediation.

History

Between 1/1/1997 and 11/20/2007, Guernsey County experienced 240 wildfire events, as published in the State of Ohio Hazard Mitigation Plan 2011. Collectively, these events affected 663.18 acres of land within the County causing $7,480 worth of damage. The estimated value of loss avoided was $700.00.

Per interviews mentioned in the 2011 Guernsey County Hazard Mitigation Plan, the local fire department and ODNR Division of Forestry have identified that several wildfire events of greater than 150 acres have occurred in the last 20 years (prior to 2011); however, records of these events

were unobtainable. Based on the memory of those consulted, there has not been a wildfire event in Guernsey County that has had an effect on structures or reports of any major injuries.

In general, farmers partake in controlled small-to-medium brush fires intentionally, which complicates recording and reporting of actual occurrence of wildfires in the County.

Probability

Between January and September of 2018, no wildfires have been detected in Guernsey County by the USDA Forest Service Active Fire Mapping Program. Additionally, the National Centers for Environmental Information has no record of wildfires in Guernsey County from January 1950 through September of 2018. However, wildfires have occurred every spring and fall in the hardwood forests and grasslands of southeastern and eastern Ohio for centuries and will continue to do so. The number of occurrences, size of wildfires, and severity of the fire fluctuate annually in response to several factors, including weather, fuels, ignitions, and the suppression response. More specifically, precipitation, relative humidity, temperature, and wind all play a factor in wildfire occurrence, as does the presence of fuels and their moisture content, arrangement, accumulation level and availability. Human caused ignitions such as debris burning and incendiary (arsonists at large) also lead to wildfires; however, wildfire prevention and awareness efforts can help educate the public on the dangers of their behaviors. Suppression response, particularly the quickness of the response to the incident, local and volunteer fire department capability, and availability of state and local resources, will also impact the severity of the fire.

Vulnerability Assessment

As shown in **Figure 4.39**, the ODNR Division of Forestry assessed the vulnerability and risk level of each township in Ohio. The majority of the County's townships are at a moderate risk of wildfire, with the exception of Adams Township, which is at a low risk for wildfire, and Wills Township, which is at a high risk for wildfire.

High valued personal property, including homes, machinery, agricultural crops, and tree plantations in areas of high wildfire hazard, such as in Wills Township, are more vulnerable to damage by wildfire. Fire engines belonging to local fire departments are also occasionally damaged while suppressing wildfires. Wildfire suppression has resulted in a great amount of personal property being saved by fire departments.

Some of the assets most vulnerable to wildfire within Guernsey County include structures, Salt Fork State Park, and Seneca Lake Park. Loss estimates for a scenario in which a wildfire burns in Salt Fork State Park, uncontrolled, are valued at more than $19,187,770.

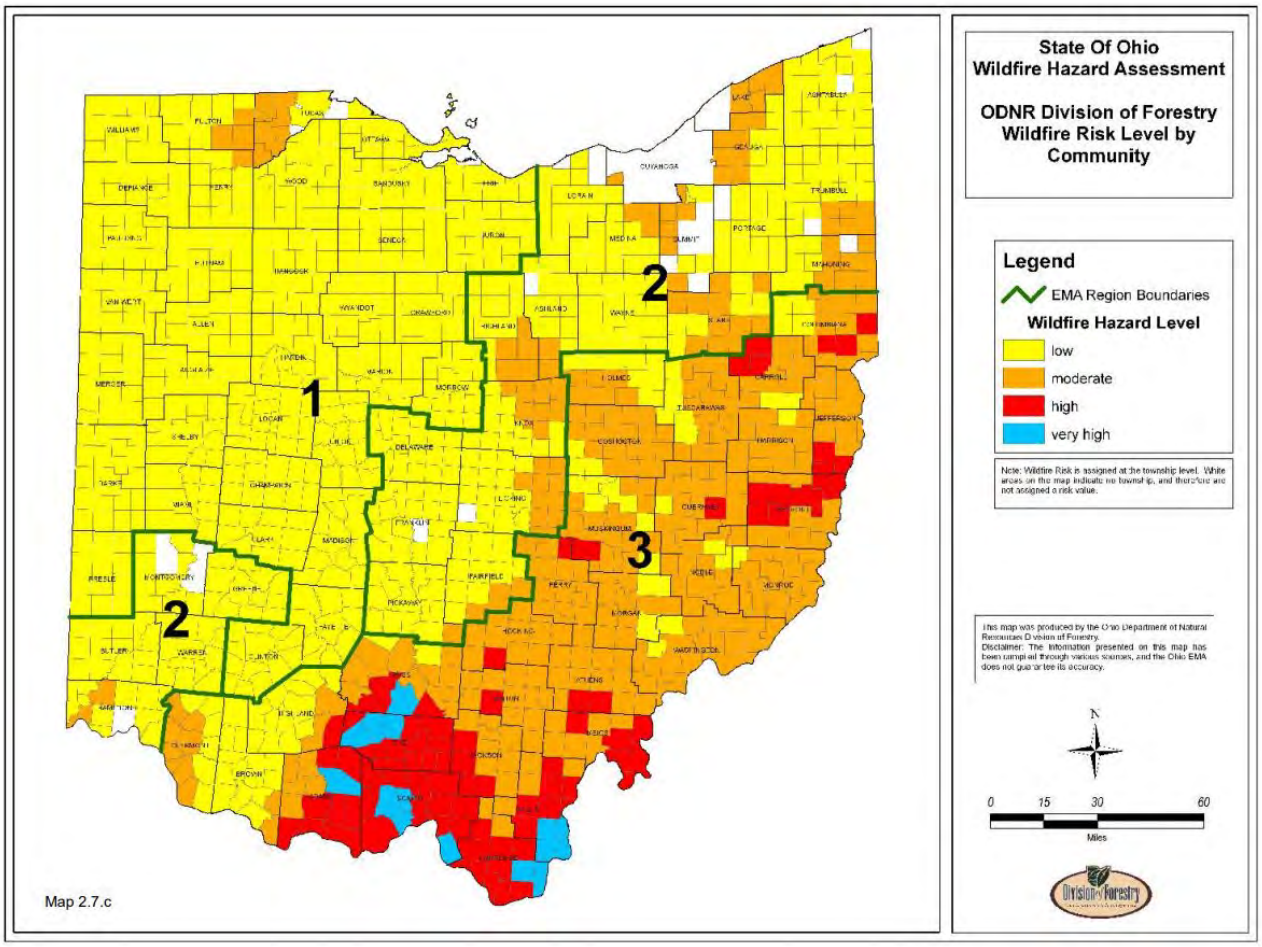

Figure 4.39: The ODNR Wildfire Risk Level by Community (Township)

5

Hazard Mitigation

Hazard Mitigation Strategy

The mitigation goals follow the ranking of hazards as established by the participating jurisdictions of Guernsey County (**Table 5.1**).

Table 5.1: Hazard Priorities

Hazard Rank	Hazard Identification
1	Flooding
2	HAZMAT
3	Hail, Snow, Winter/Ice Storms
4	Damaging Winds
5	Tornadoes
6	Dam Failure
7	Wildfire
8	Mine Subsidence
9	Extreme Cold/Wind Chill
10	Extreme Heat
11	Lightning
12	Drought
13	Landslides
14	Invasive Species
15	Earthquakes

A total of five new hazards have been added since the 2011 Guernsey County Hazard Mitigation Plan. Flooding remains the top Hazard Priority for the County, according to the ranking established by the Guernsey County stakeholders.

Mitigation projects will only be implemented if the benefits outweigh the associated cost of the proposed project. The Mitigation Planning Team performed a general assessment of each action that would require FEMA funding as part of the planning process. A detailed cost-benefit analysis of each mitigation action will be required during the project planning phase in order to determine the economic feasibility for each action. Projects will also be evaluated for feasibility based on social and environmental impact, technical feasibility, and any other criteria that evaluate project effectiveness. This evaluation of each project will be performed during the pre-application phase

of a grant request. Project implementation will be subject to the availability of FEMA grants and other funding sources, as well as local resources.

Projects that are determined to be infeasible during this review process will be re-evaluated by the Mitigation Planning Team for re-scheduling or deletion.

Hazard Mitigation Goals

The Guernsey County Mitigation Planning Team determined several goals and actions to mitigate the hazards identified in the hazard mitigation planning process. These mitigation actions were developed based on best practices and projects thought to be the most feasible and the most beneficial to reducing the impact of the hazards. The mitigation actions were developed in accordance with the following types of mitigation strategies, in no particular order: 1) prevention; 2) protection of property; 3) protection of natural resources; 4) structural projects; 5) emergency services; and 6) public education and awareness.

The mitigation goals identified by the Mitigation Planning Team, in order of priority, are as follows:

1. Identify and update any potential areas of flood risk and work with residents living in flood plains to ensure their safety in the event of a flood.
2. Create greater enforcement measures and outreach programs to understand the risks associated with hazardous material leaks and incidents, reduce the probability of incident, and improve preparedness, communication, and mitigation of future incidents.
3. Identify common hail risk areas, develop efficient strategies to minimize the impact from hail on properties in Guernsey County and prepare an action plan for residents to reach shelter during a storm.
4. Mitigate the impact from ice storms on public infrastructure to prevent damage, loss of life, and injury.
5. Develop and prepare shelters, strategies and educational outreach to alleviate potential impact from snow and winter storms.
6. Develop and promote strategies to prepare against damaging wind events in Guernsey County so that property damage, loss of life, and injuries are prevented.
7. Prepare, mitigate, and educate citizens in order to prevent loss of life, injury, and extensive property damage as a result of tornadoes.
8. Continue efforts to maintain existing dam infrastructure in order to sustain sources of energy and prevent failures leading to flooding.
9. Develop and maintain practices and education programs that prevent wildfire in Guernsey County.
10. Identify and map key areas of risk, educate community members and potential developers on areas of concern, and create strategies for minimizing impact of potential subsidence event.
11. Reduce the impact of extreme cold on the population of Guernsey County through educational outreach, weather-proofing of structures, and assistance during extreme cold events.

12. Identify and assist vulnerable populations to reduce the harm of extreme heat on people in Guernsey County.
13. Minimize the impact of lightning strikes on people and property in Guernsey County through educational outreach and upgrades on buildings and critical infrastructure.
14. Determine risk of drought and prepare the County and its residents for how to reduce negative impacts of drought.
15. Identify key areas of landslide risk, educate potential developers on areas of concern, and create strategies for minimizing impact of a potential landslide event.
16. Educate the citizens of Guernsey County on what qualifies as invasive in order to prevent the spread of invasive species across the county and throughout the state of Ohio.
17. Increase education and awareness of earthquakes, and research inventory and methods to monitor the effects of naturally-occurring and human-caused seismic activity.

Hazard Mitigation Action Priority

The following pages consist of the hazard mitigation actions and priorities tables for all of the identified hazards and associated goals. The information used to develop the priorities can be found in the Matrix Scoring Spreadsheet, which is located in **Appendix B.**

The County as a whole developed three County-wide actions, including:

1. Digitize Maps
2. Public Health Education
3. Outreach programs to educate public on hazard risks and mitigation activities that the public can undertake.

These prioritized actions were incorporated into specific mitigation actions for each of the hazards listed in the table below.

Note: under the “Agency” column, *Mayors of All Participating Local Jurisdictions* include: The City of Cambridge, and the Villages of Byesville, Cumberland, Fairview, Lore City, Old Washington, Pleasant City, Quaker City, and Senecaville.

Hazard Mitigation Action Priorities

	Hazard & Mitigation Action	Score	Priority	Source	Agency	Jurisdiction(s)	Start/ End	Status
	Dam Failure							
1	Coordinate with the Ohio Department of Natural Resources, Division of Water, in accordance with ORC Section 1512.062, to periodically reclassify any dam within Guernsey County in response to any changes, directly to the dam or otherwise, to ensure safety for downstream residents.	1018.18	47	State or Federal Sources	County Commissioners, County EMA, ODNR	Guernsey County	1/1/19-12/31/20; then re-assess	New
2	Coordinate with the US Army Corps of Engineers to update any potentially outdated flood studies encompassing areas affected by the failure or topping of the Salt Fork Lake Dam.	1018.89	45	State or Federal Sources	County Commissioners, County EMA, OEMA, ODNR, USACE	Liberty Twp.	1/1/19-12/31/24	New
3	Coordinate with the Ohio Department of Natural Resources, Dam Safety Engineering Program to conduct periodic safety inspections of existing dams in Guernsey County.	1018.67	46	State or Federal Sources	County Commissioners, County EMA, OEMA, ODNR, USACE	Guernsey County	1/1/19-12/31/24	New
4	Garner community support for the removal or repair of dams in disrepair.	1015.76	50	Existing Budget	County Commissioners, County EMA, OEMA, ODNR, USACE	Guernsey County	1/1/19-12/31/24	New

	Hazard Mitigation Action Priorities							
	Hazard & Mitigation Action	**Score**	**Priority**	**Source**	**Agency**	**Jurisdiction(s)**	**Start/ End**	**Status**
5	Assess the vulnerability of all dams in Guernsey County (31)	1017.18	49	Existing Budget	County Commissioners, County EMA, OEMA, ODNR, USACE	Guernsey County	1/1/19-12/31/21	New
6	Coordinate with officials throughout the County to provide notification and warning of a failure of the Salt Fork Lake Dam.	1017.25	48	Existing Budget	County Commissioners, County EMA, OEMA, ODNR	Guernsey County	1/1/2019-12/31/2020	New
	Damaging Winds / Tornadoes							
7	Protect Power Lines and infrastructure by inspecting utility poles to ensure they meet specifications and are wind resistant, burying power lines to provide uninterrupted power after severe winds, considering both maintenance and repair issues and upgrading overhead utility lines (e.g., adjust utility pole sizes, utility pole span widths, and/or line strength).	1216.32	41	Existing Budget	County Commissioners, County EMA	Guernsey County	1/1/19-12/31/24	New
8	Provide permanent shelters for residents of mobile home parks and campgrounds, where citizens may seek safety.	1213.62	43	State or Federal Sources	County Commissioners, County EMA	Guernsey County	1/1/2019-12/31/2024	New

Hazard Mitigation Action Priorities

	Hazard & Mitigation Action	Score	Priority	Source	Agency	Jurisdiction(s)	Start/ End	Status
9	Upgrade the radio communications system throughout the County for all public safety services.	1217.36	38	Existing Budget	County Commissioners, County EMA	Guernsey County	1/1/19-12/31/24	New
10	Provide back-up generators for critical facilities, including shelters, which need to maintain continuous power to protect human health and life.	1216.35	40	PDM Grant	County Commissioners, County EMA, School Districts	Guernsey County	1/1/19-12/31/24	New
11	Promote or Require Site and Building Design Standards to Minimize Wind Damage	1214.26	42	State or Federal Sources	County Commissioners, County EMA	Guernsey County	1/1/19-12/31/24	New
12	Provide/encourage NOAA weather radios for all critical facilities within the County	1217.97	36	State or Federal Sources	County EMA	Guernsey County	1/1/19-12/31/24	New
13	Seek funding to acquire portable generators to loan out to critical facilities and shelters to loan out to critical facilities and shelters. This is noted as a high priority request by attendee(s).	1217.42	37	Existing Budget	County Commissioners, County EMA	Guernsey County	1/1/19-12/31/24	New
14	Developing and maintaining a database to track community vulnerability to severe wind.	1213.60	44	State or Federal Sources	County EMA, OEMA	Guernsey County	1/1/19-12/31/24	New

	Hazard Mitigation Action Priorities							
	Hazard & Mitigation Action	**Score**	**Priority**	**Source**	**Agency**	**Jurisdiction(s)**	**Start/ End**	**Status**
15	Coordinate with the National Weather Service (NWS) to warn residents of impeding severe winds and possible tornado conditions.	1220.53	34	Existing Budget	County EMA, OEMA, NWS	Guernsey County	1/1/19-12/31/24	New
16	Implementation of Outdoor Warning Sirens for Tornado and severe wind events.	1218.26	35	PDM Grant	OEMA, Township Trustees, Sheriff's Office	Guernsey County	1/1/19-12/31/24	Completed
17	Conduct outreach activities to increase awareness of tornado risk.	1216.95	39	Existing Budget	County EMA, OEMA	Guernsey County	1/1/19-12/31/24	New
	Drought							
18	Develop Water Conservation Plan	415.68	72	To be identified	GC Water Department, Cambridge Engineer	Guernsey County	1/1/19-12/31/24	Not completed, carry forward
19	Install Waterlines in rural areas where none exist	413.64	73	To be identified	GC Water Department	Guernsey County	1/1/19-12/31/24	Not completed, carry forward
20	Pursue Sole Source Aquifer Designation	410.20	78	To be identified	GC Water Department	Village of Byesville	1/1/19-12/31/24	Not completed, carry forward
21	Identify the value of crops and property in Guernsey County	412.36	76	To be identified	GC Water Department	Guernsey County	1/1/19-12/31/24	New
22	Provide alternative potable water source in the event that existing water supplies are disrupted, or wells run dry.	413.34	74	To be identified	GC Water Department	Guernsey County	1/1/19-12/31/24	New

	Hazard Mitigation Action Priorities							
	Hazard & Mitigation Action	**Score**	**Priority**	**Source**	**Agency**	**Jurisdiction(s)**	**Start/ End**	**Status**
23	Construct additional water storage facility for emergency crop management and fire suppression.	411.71	77	To be identified	GC Water Department	Guernsey County	1/1/19-12/31/24	New
24	Develop a public education program concerning the hazards associated with droughts and water restrictions during drought conditions.	412.90	75	To be identified	GC Water Department	Guernsey County	1/1/19-12/31/24	New
	Earthquakes							
25	Collect geologic information on seismic sources, soil conditions, and related potential hazards.	109.13	90	Existing Budget	County Soil & Water Conservation District, ODNR	Guernsey County	1/1/19-12/31/24	New
	Extreme Cold & Wind Chill / Extreme Heat (Extreme Temperatures)							
26	Identify location of vulnerable populations in Guernsey County. Collaborate with hospitals & retirement homes for the elderly to provide services to these vulnerable populations	716.94	62	Existing Budget	County Commissioners, County EMA	Guernsey County	1/1/19-12/31/24	New
27	Set up a program for more regular inspections of endangered facilities during extreme temperature events.	712.70	67	Existing Budget	County Commissioners, City of Cambridge	Guernsey County	1/1/19-12/31/24	New

	Hazard Mitigation Action Priorities							
	Hazard & Mitigation Action	**Score**	**Priority**	**Source**	**Agency**	**Jurisdiction(s)**	**Start/ End**	**Status**
28	Establish cooling centers in centralized locations to serve the largest populations.	713.64	65	Existing Budget	County EMA, City of Cambridge	Guernsey County	1/1/19-12/31/24	New
29	Provide Electric Heaters or Oscillating Fans for the specific-at-risk population especially the elderly.	712.63	68	Existing Budget	County EMA	Guernsey County	1/1/19-12/31/24	New
30	Educate the public about the symptoms associated with dehydration and hypothermia or other illnesses that can result from extreme temperatures.	713.26	66	Existing Budget	County Commissioners, County EMA, OEMA	Guernsey County	1/1/19-12/31/24	New
31	Educate residents how to weather proof and protect their property.	714.32	64	Existing Budget	County EMA	Guernsey County	1/1/19-12/31/24	New
32	Develop a brochure to distribute to local residents.	714.76	63	Existing Budget	County EMA	Guernsey County	1/1/19-12/31/24	New
	Flooding							
33	Acquisitions & demolition of flood-prone properties	1515.21	2	Hazard Mitigation Grant Program	County EMA	All	1/1/19-12/31/24	not completed, carry forward
34	Elevation of flood-prone properties	1513.64	5	Hazard Mitigation Grant Program	County EMA	All	1/1/19-12/31/24	not completed, carry forward

Hazard Mitigation Action Priorities

	Hazard & Mitigation Action	Score	Priority	Source	Agency	Jurisdiction(s)	Start/ End	Status
35	Retrofit of utilities for residents prone to basement flooding	1512.84	8	Hazard Mitigation Grant Program	County EMA	All	1/1/19-12/31/24	Not completed, carry forward
36	Elevate flood-prone roads	1511.82	12	Hazard Mitigation Grant Program	County Engineer Township Trustees	All	1/1/19-12/31/24	Not completed, carry forward
37	Replace undersized culverts	1516.54	1	State or Federal Sources	County Engineer Township Trustees	All	1/1/19-12/31/24	Not completed, carry forward
38	Dike Cambridge Sewer Treatment Plant	1512.19	10	Existing Budget	Cambridge Engineer	City of Cambridge	1/1/19-12/31/24	Not completed, carry forward
39	Dike Cambridge Water Treatment Plant	1512.24	9	Existing Budget	Cambridge Engineer	City of Cambridge	1/1/19-12/31/24	Not completed, carry forward
40	Relocation of Cambridge Sewer Collection and Transmission Infrastructure	1511.89	11	Existing Budget	Cambridge Engineer	City of Cambridge	1/1/19-12/31/24	Not completed, carry forward
41	Connect main sewer line at North Guernsey Sewer Plant to Cambridge City System, bypassing flood hazard plant.	1514.31	4	Existing Budget	Cambridge Engineer	City of Cambridge	1/1/19-12/31/24	Not completed, carry forward
42	Comprehensive Watershed Analysis and Implementation of Recommendations to Reduce the hazards associated with floods.	1513.61	6	Existing Budget	Mayor	Village of Byesville	1/1/19-12/31/21	Not completed, carry forward

	Hazard Mitigation Action Priorities							
	Hazard & Mitigation Action	**Score**	**Priority**	**Source**	**Agency**	**Jurisdiction(s)**	**Start/ End**	**Status**
43	Remove debris from streams	1514.92	3	Existing Budget	Mayor	Village of Byesville	1/1/19-12/31/22	Not completed, carry forward
44	Join the NFIP	1513.42	7	Existing Budget	Mayor	Village of Fairview, Village of Old Washington	1/1/19-12/31/19	Not completed, carry forward
	Extreme Heat - see Extreme Cold & Wind Chill							
	Frozen Precipitation / Heavy Snow / Ice Storms (Winter Storms)							
45	Develop a Resource Manual Database that can be used to inventory emergency resources that can be employed to aid in emergency snow removal.	1315.82	31	Existing Budget	County EMA	Guernsey County	1/1/19-12/31/24	not completed, carry forward
46	Identify existing sites inside or adjacent to homes that could be used as emergency shelters to prevent injuries during severe hail and winter storms in Guernsey County.	1314.04	32	Existing Budget	County EMA	Guernsey County	1/1/19-12/31/24	not completed, carry forward

	Hazard Mitigation Action Priorities							
	Hazard & Mitigation Action	**Score**	**Priority**	**Source**	**Agency**	**Jurisdiction(s)**	**Start/ End**	**Status**
47	Develop techniques and improvements in infrastructure and building practices in new and existing structures to minimize damage from hail, snow, and ice.	1311.84	33	Existing Budget	County Building Department, County EMA, OEMA	Guernsey County	1/1/19-12/31/24	New
48	Encourage the use of NOAA weather radios that continuously broadcast National Weather Service forecasts that provide direct warnings to the public for natural, technological, and man-made hazards.	1316.87	30	Existing Budget	County Commissioners, County EMA	Guernsey County	1/1/19-12/31/24	New
	Hazardous Materials (Sites and Transport)							
49	Conduct a yearly drill to prepare for a disaster involving hazardous materials	1419.80	17	HMEP	County EMA, County Commissioners, County EMS, OEMA	Guernsey County	1/1/19-12/31/24	New
50	Report what hazardous materials are being handled on-site and amounts according to regulation	1419.48	20	Existing Budget, State Funds	County EMA, OSHA, OEPA	Guernsey County	1/1/19-12/31/24	New
51	Report if additional hazardous materials are added or removed to the site	1420.65	13	Existing Budget	County EMA	Guernsey County	1/1/19-12/31/24	New
52	New facilities to report what hazardous materials are being handled on-site	1420.02	15	Existing Budget	County EMA	Guernsey County	1/1/19-12/31/24	New

Hazard Mitigation Action Priorities

	Hazard & Mitigation Action	Score	Priority	Source	Agency	Jurisdiction(s)	Start/ End	Status
53	Schedule for periodic and random load checks of incoming biomass truckloads.	1419.12	23	Existing Budget	County Commissioners	Guernsey County	1/1/19-12/31/24	New
54	Restrict public access to facilities handling hazardous materials and holding waste through various measures (e.g., fencing).	1419.30	21	Existing Budget	County Commissioners, County County Fire & Law Departments	Guernsey County	1/1/19-12/31/24	New
55	Provide fire lanes between piles in landfills to allow fire control equipment access to all operational areas.	1419.82	16	Existing Budget	County Commissioners, County County Fire & Law Departments	Guernsey County	1/1/19-12/31/24	New
56	Perform regular visual inspections and temperature monitoring of storage piles in landfills to observe whether temperature-related effects are occurring (e.g., steam).	1416.68	28	Existing Budget	County Commissioners, County County Fire & Law Departments	Guernsey County	1/1/19-12/31/24	New
57	Notify public in implementing any landfill reclamation.	1417.32	27	Existing Budget	County Commissioners	Guernsey County	1/1/19-12/31/24	New
58	Inform the public about digging near pipelines.	1418.88	24	State	OUPS	Guernsey County	1/1/19-12/31/24	New
59	Ensure proper inspection & maintenance of pipelines.	1419.58	19	Existing Budget	Pipeline Companies	Guernsey County	1/1/19-12/31/24	New

	Hazard Mitigation Action Priorities							
	Hazard & Mitigation Action	**Score**	**Priority**	**Source**	**Agency**	**Jurisdiction(s)**	**Start/ End**	**Status**
60	Conduct annual drills to prepare for hazards involving pipelines.	1418.78	25	HMEP	County EMA	Guernsey County	1/1/19-12/31/24	New
61	Work with villages and townships to create or improve development standards near pipelines.	1419.19	22	Existing Budget	County Commissioners, County Engineers Office	Guernsey County	1/1/19-12/31/24	New
62	Create commodity flow study for chemical transport in Guernsey County	1416.56	29	Existing Budget	County EMA	Guernsey County	1/1/19-12/31/24	New
63	Identify transportation routes that traverse waterways	1419.74	18	Existing Budget	County Engineers Office	Guernsey County	1/1/19-12/31/24	New
64	Create emergency protocol to stop hazardous spills near waterways as quickly as possible	1420.55	14	Existing Budget	County EMA, County Police & Law Departments	Guernsey County	1/1/19-12/31/24	New
65	Identify vulnerability zones for chemicals in accordance with the commodity flow study	1418.46	26	Existing Budget	County EMA	Guernsey County	1/1/19-12/31/24	New
	Invasive Species							
66	Develop a public education program concerning the hazards associated with invasive species.	214.85	88	To be identified	County EMA	Guernsey County	1/1/19-12/31/24	New
67	Educate the public on dangers of West Nile Virus and proper precautions.	216.11	86	To be identified	County EMA	Guernsey County	1/1/19-12/31/24	New

Hazard Mitigation Action Priorities

	Hazard & Mitigation Action	Score	Priority	Source	Agency	Jurisdiction(s)	Start/ End	Status
68	Disseminate information to the public that explains the importance of only planting plants that are native to Ohio.	215.80	87	To be identified	County EMA	Guernsey County	1/1/19-12/31/24	New
69	Disseminate information to the public that explains the importance not importing or exporting firewood.	214.47	89	To be identified	County EMA	Guernsey County	1/1/19-12/31/24	New
	Landslides & Land Subsidence							
70	Completing an inventory of locations where critical facilities, other buildings, and infrastructure are vulnerable to landslides.	313.07	85	Existing Budget	County EMA, County Engineers Office, County SWCD	Guernsey County	1/1/19-12/31/24	New
71	Develop a public education program concerning the hazards associated with landslides and how to report landslides.	314.07	83	USGS Grant	County SWCD	Guernsey County	1/1/19-12/31/24	New
72	Defining Steep slope/high-risk areas in land use and in comprehensive plans and creating guidelines or restricting new development in those areas.	314.18	82	Existing Budget	County EMA, County Engineers Office, County SWCD, ODOT District 5	Guernsey County	1/1/19-12/31/24	New

Hazard Mitigation Action Priorities

	Hazard & Mitigation Action	Score	Priority	Source	Agency	Jurisdiction(s)	Start/ End	Status
73	Develop and use a Guernsey County GIS map that identifies landslide hazardous areas (Steep slopes and soils susceptible to landslides).	315.16	80	Existing Budget	County EMA, County Engineers Office, County SWCD, ODOT District 5	Guernsey County	1/1/19-12/31/24	New
74	Creating or increasing setback limits on parcels near high-risk areas.	313.67	84	Existing Budget	County EMA, County Engineers Office, County SWCD	Guernsey County	1/1/19-12/31/24	New
75	Work with villages and townships to create standards and regulations for development in or adjacent to landslide prone areas.	314.43	81	Existing Budget	County Commissioners, County Engineers Office, Mayors of All Participating Local Jurisdictions	Guernsey County	1/1/19-12/31/24	New
76	Follow proper techniques and protocols to eliminate threats from existing land subsidence and landslides.	316.00	79	Existing Budget	County SWCD, ODNR	Guernsey County	1/1/19-12/31/24	New
	Lightning							
77	Installing lightning protection devices and methods, such as lightning rods and grounding, on communications infrastructure and other critical facilities	514.85	71	Existing Budget	County Commissioners, County EMA, City of Cambridge	Guernsey County	1/1/19-12/31/24	New

Hazard Mitigation Action Priorities

	Hazard & Mitigation Action	Score	Priority	Source	Agency	Jurisdiction(s)	Start/ End	Status
78	Installing and maintaining surge protection on critical electronic equipment.	515.39	70	Existing Budget	County Commissioners, County EMA, Mayors of All Participating Local Jurisdictions	Guernsey County	1/1/19-12/31/24	New
79	Developing a lightning safety brochure for distribution.	515.57	69	Existing Budget	County EMA	Guernsey County	1/1/19-12/31/24	New
	Mine Subsidence							
80	Coordinate with the ODNR's Office of Abandoned Mine Lands & Reclamation to undertake reclamation projects after subsidence incidents.	816.72	59	County EMA	ODNR, County EMA, County Engineer	Guernsey County	1/1/19-12/31/24	New
81	Consider developing a land use plan or modifying an existing plan to guide development away from & reduce population density in subsidence-prone areas.	813.73	61	Planning Office and Commission	County Commissioners, County Engineers Office	Guernsey County	01/01/19-12/31/21	New
82	Consider creating a Guernsey County GIS map to identify subsidence hazard areas.	819.31	57	County EMA, Mapping Department	County Engineers Office, County SWCD, ODNR, ODOT District 5	Guernsey County	01/01/19-12/31/20	not completed, carry forward
83	Permanently & physically close open mine shafts.	814.11	60	SWCD, County Engineer	County Engineers Office, County SWCD, ODNR	Guernsey County	1/1/19-12/31/24	New

	Hazard Mitigation Action Priorities							
	Hazard & Mitigation Action	**Score**	**Priority**	**Source**	**Agency**	**Jurisdiction(s)**	**Start/ End**	**Status**
84	Develop a public notification platform for people to report potential land subsidence or sinkhole development.	818.91	58	County EMA	ODNR, County EMA, Guernsey County SWCD	Guernsey County	1/1/19-12/31/19	New
	Wildfire							
85	Monitor and collect data on wildfires and other fires in the County	915.71	54	Existing budget	GC EMA	Guernsey County	1/1/19-12/31/24	New
86	Establish an enforceable open burning ban to be implemented during droughts.	917.17	53	Existing budget	Commissioners, Sheriff	Guernsey County	1/1/19-12/31/24	New
87	Clear excess brush away from potentially combustible properties and areas.	913.27	55	Existing budget	Fire Departments	Guernsey County	1/1/19-12/31/24	New
88	Develop an education program for County residents on wildfire prevention.	917.55	52	To be identified	GC EMA, Fire Departments	Guernsey County	1/1/19-12/31/24	New
89	Maintain, improve, and expand existing fire hydrant data.	917.75	51	Existing budget	GC EMA, Fire Departments	Guernsey County	1/1/19-12/31/24	New
90	Provide chemical disposal station in County.	912.58	56	Existing budget	GC EMA, Fire Departments	Guernsey County	1/1/19-12/31/19	New

6

Schedule and Maintenance

Schedule and Maintenance

The Guernsey County Hazard Mitigation Plan will be adopted by all jurisdictions that chose to participate: Guernsey County, the City of Cambridge, and the Villages of Byesville, Cumberland, Fairview, Lore City, Old Washington, Pleasant City, Quaker City, and Senecaville. After the jurisdictions have adopted the plan, their signed resolutions or ordinances will be added to the plan as an Appendix.

Continued Public Involvement

The public will continue to be able to provide feedback on the Plan. The Plan will be available through the County EMA website, as well as the Ohio EMA website. The Guernsey County EMA will provide access to the plan to all county, municipality, and township offices, and will make the Plan available in hardcopy and electronic format to the public as appropriate. The Guernsey County EMA Director will post notices of any meetings for updating and evaluating the Plan, using the usual methods for posting meeting announcements in the County to invite the public to participate. All meetings will be open to the general public. The Guernsey County EMA will publicly announce the mitigation action items that are slated for development in the current year, as well as any updates to the Plan as part of the annual review process.

Plan Integration

Local government plays a major role in the execution and implementation of mitigation strategies. This happens in large part during daily operations that guide the development of various communities in the County. Because the municipalities in Guernsey County are small and have limited full-time staff, growth and development is overseen by a variety of organizations at different levels. At the municipal level, officials overseeing development are ultimately responsible to the Mayor of the jurisdiction, while Township officials are responsible to the Township trustees, and County officials report to the Guernsey County Commissioners.

The Guernsey County commissioners have contracted with the Mid-East Ohio Building Department, which issues and inspects the commercial buildings for the incorporated areas. The Southeast Ohio Building Department issues and inspects the commercial building permits for the unincorporated areas of Guernsey County. Residential building permits are issued by the County Auditor's office, while sewage and plumbing permits are issued by the Guernsey County Health Department.

Floodplain administration is overseen countywide by the County Engineer, the Muskingham Watershed Conservancy District, the US Army Corps of Engineers, and the Guernsey County EMA.

The Guernsey County Engineer is responsible for ditch maintenance in the County, and they work alongside the Guernsey Soil and Water Conservation District to manage agricultural drainage issues throughout the County.

All of these agencies across jurisdictions do regular operational work that intersect with hazard mitigation strategies, and many of them are the same officials who have participated in this Hazard Mitigation Plan. They will continue to meet with the County EMA Director on an annual basis to review the plan and update it as needed. They will also work to maintain, revise, and improve local planning efforts to reflect the hazard mitigation strategies in this plan.

Guernsey County will also consider hazard mitigation strategies as a part of all other community planning efforts and will strive to include the concerns and challenges of hazards in all planning areas. The County EMA Director will lead the effort to integrate disaster preparedness and mitigation planning into all plans that are important to the daily operations of the County. Hazard mitigation will be promoted as part of community development, thus being integrated into related community development activities, programs, and projects. Key stakeholders, including the County Commissioners, Village Mayors, Township Trustees, County and City Engineers, zoning officials, and public safety officers, will be important partners in this effort. These individuals, many of whom participated in this Hazard Mitigation Plan, will work through their respective agencies to promote hazard mitigation planning and its inclusion in the plans and priorities of each agency, making hazard mitigation a true multi-jurisdictional effort.

Annual Review Process

The Guernsey County Hazard Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of mitigation actions and to reflect changes in programs or land development that may affect mitigation actions or priorities. The Guernsey County EMA, with consultation and collaboration from the Core Group, maintains overall responsibility for monitoring and evaluating the mitigation strategies and actions outlined in the Hazard Mitigation Plan. All participating jurisdictions will be encouraged to attend a yearly plan update meeting. This will help to track project progress and provide an opportunity to discuss any new projects to be added to the Plan, as well as any current or new problems and prioritization of future funding. The Core Group will review the goals and action items to determine their relevance to the County and to ensure they are addressing current and expected conditions, as well as changes to state or federal policy that may impact Hazard Mitigation in the County.

Updating the Plan

This Plan must be updated within five years and re-adopted by the County and all participating jurisdictions in order to maintain compliance with federal regulations and ensure eligibility for certain federal mitigation grant funds. The Guernsey County EMA will identify any necessary modifications to the Plan, including changes in mitigation goals and actions that should be incorporated into the next update. The Guernsey County EMA Director and the County Commissioners will initiate the process of updating the plan in accordance with federal guidelines in sufficient time to meet state and federal deadlines.