

A dramatic photograph of a stormy sky at night, featuring dark, heavy clouds and several bright, jagged lightning bolts striking down. The scene is illuminated by the light of the lightning, creating a stark contrast against the dark background. In the lower portion of the image, some faint lights and silhouettes of trees or structures are visible, suggesting an outdoor setting.

ERIE COUNTY, OHIO NATURAL HAZARDS MITIGATION PLAN

DECEMBER 2020

PREPARED FOR:

Erie County Emergency Management Agency
2800 Columbus Avenue
Sandusky, Ohio 44870



1 Executive Summary

This plan is the successor to hazard mitigation planning efforts begun in Erie County in 2004 when the County received a grant to develop a Natural Hazards Mitigation Plan for the County and the participating jurisdictions and culminating in the adoption of that plan in 2005.

Erie County assets are at risk of damage due to flooding, severe storms, and other natural hazards. This plan provides a long-term approach to reducing the likelihood that a natural hazard will result in severe damage. This plan updates the data upon which the assessment of risk and identification of vulnerabilities is based and presents updated strategies for making Erie County a safer and more sustainable community.

The Erie County Natural Hazards Mitigation Plan represents the work of residents, business leaders, and elected and appointed government officials to develop a blueprint for protecting community assets, preserving the economic viability of the community, and saving lives. Endorsed by FEMA as following regulations based on the Disaster Mitigation Act of 2000, the plan will help the County to implement mitigation projects so that a natural hazard does not result in a natural disaster.

The hazard mitigation planning update consisted of gathering and analyzing data available from various sources within the county. The data show that the hazards most likely to result in costly damages are flooding, severe storms, and tornadoes. Erie County officials and representatives from local jurisdictions proposed and evaluated strategies that may be effective in mitigating the negative effects of natural hazards and the plan presents a conceptual-level approach for implementing these strategies. The plan recommends several public education efforts, structural efforts such as the development of safe rooms in public areas to provide shelter during tornadoes, and regulatory and planning efforts including monitoring and analyzing risks for future mitigation efforts.

Most mitigation activities require funding. Under the Disaster Mitigation Act of 2000 (DMA2K, 42 USC 5165), a mitigation plan is a requirement for eligibility for Federal mitigation funds. Therefore, a mitigation plan will both guide the best use of mitigation funding and meet the prerequisite for obtaining such funds from the Department of Homeland Security's Federal Emergency Management Agency (FEMA). This Mitigation Plan meets the criteria as set forth by FEMA in the DMA2K and provides a community with a comprehensive guide for future mitigation efforts as they relate to the natural hazards that affect Erie community.

This Mitigation Plan was developed in coordination with a Core Group of individuals from communities and agencies throughout Erie County. The Core Group met four separate times during the planning process to reevaluate the hazards that affect the County, the problems associated with these hazards, potential mitigation alternatives to minimize the effect of these hazards and goals that they would like to see achieved within the county.

Erie County has experienced many natural disasters in the past one hundred years. Through a strategic effort led by the Erie County Emergency Management Agency (EMA)

offices, the Core Group evaluated these hazards and chose to address the following hazards based on their impact on human health and property damage: damaging winds, droughts, earthquakes, flooding, lake/stream bank erosion, natural biohazards, severe summer weather, severe winter weather, and tornadoes/waterspouts.

The culmination of Erie County's Mitigation Plan was an Updated Action Plan for the communities to use to track progress on the implementation of their mitigation alternatives. By adopting this plan, county, township and incorporated jurisdictions of Erie County commit to working with citizens and business owners to make their communities safer.

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3 Introduction

This plan is an update of the Erie County Natural Hazards Mitigation Plan that was originally adopted in 2005 by the Erie County Commissioners and all incorporated jurisdictions within the County.

Erie County is at risk of damage from a variety of natural hazards: damaging winds, droughts, earthquakes, flooding, lake/stream bank erosion, natural biohazards, severe summer weather, severe winter weather, and tornadoes/waterspouts. This plan explains the analysis of the potential effects of these natural hazards on the structures and infrastructure within Erie County and proposes measures to reduce the risk of a natural hazard leading to a disaster with property loss, business disruption, or even loss of life.

In the past, natural hazards have led to costly disasters in Erie County resulting in Presidential Declarations of Major Disaster or Emergency Disaster Declarations. These declarations are listed in Table 1. There have been no Disaster Declarations for natural hazards since 2012 in Erie County. The COVID-19 Pandemic major disaster declaration in 2020 is not considered a natural hazard.

Table 1: Past Presidential Disaster and Emergency Declarations in Erie County¹

Date	Disaster Declaration Number	Hazard	Public Assistance
July 15, 1969	DR-266-OH	Heavy Storms and Flooding	\$43,478.26
November 24, 1972	DR-362-OH	Storms and Flooding	\$123,172.60
April 27, 1973	DR-377-OH	Storms and Flooding	\$177,246.88
January 26, 1978	EM-3055-OH	Severe Blizzard Conditions	\$40,303.06
August 4, 1992	DR-951-OH	Severe Storms, Tornadoes, and Flooding	\$8,308,334
August 25, 1995	DR-1065-OH	Severe Storms and Flooding	None
August 23, 2003	EM-3187-OH	Power Outage	\$20,353.54
January 11, 2005	EM-3198-OH	Snow Removal and Response	\$174,178.85
September 13, 2005	EM-3250-OH	Hurricane Katrina Emergency Shelter Operations	\$2,499,103
July 2, 2006	DR-1651-OH	Severe Storms and Flooding	None
June 30, 2012	EM – 3346-OH	Severe Storms	None

¹ (Federal Emergency Management Agency, 2020)

Flooding is a major hazard in terms of total damage costs. Out of the ten presidential disaster declarations, six of them are related to flooding.

3.1 Purpose of the Plan

The emergency management community, citizens, elected officials and others in Erie County recognize the potential impacts of natural hazards on their community and have developed this plan to mitigate potential damages and reduce future losses. Hazard mitigation actions reduce the potential for loss of life and destruction of property. Mitigation actions are taken in advance of the occurrence of a potential hazard and are essential for breaking the disaster cycle of damage, reconstruction, and repeated damage.

This plan presents an evaluation of the potential negative consequences of the natural hazards that may affect Erie County and proposes strategies that will reduce or mitigate losses.

Adoption and implementation of this plan ensures that Erie County and participating jurisdictions continue to be eligible to apply for and receive certain Federal grant funds that are administered by the Ohio Emergency Management Agency (Ohio EMA) for the Federal Emergency Management Agency (FEMA). This plan complies with the requirements of the Disaster Mitigation Act of 2000 and its implementing regulations published in Title 44 of the Code of Federal Regulations (CFR) Section 201.6.

3.2 Organization of the Plan

To make the plan easier to follow, this plan is organized by hazards identified by the Core Group. This plan explains all steps of the mitigation planning process for each hazard. By organizing the plan by hazard, the relationships among a hazard, the potential effect of the hazard, and the actions proposed for mitigating negative effects of that hazard are obvious.

The sections of this plan are as follows:

- **Introduction:** Identifies the purposes of this plan and the jurisdictions that have participated in plan development.
- **Planning Process:** Summarizes the earlier planning process as well as the process of updating this plan.
- **Community Profile:** Discusses existing conditions, including development trends and current local government capabilities.
- **Hazard Identification:** Identifies the natural hazards that may affect Erie County.

- **Hazard Risk Assessment:** Includes a profile of each hazard, updated occurrence data since the last plan update, and an assessment of the potential impact of each hazard.
- **Summary of Risk Assessment Findings:** Highlights the conclusions of the previous Risk Assessment Sections.
- **Mitigation Goals:** Presents planning principles, mitigation goals, and objectives.
- **Mitigation Actions:** Explains process by which new mitigation actions were developed and the cost benefit analysis and prioritization methods used for the newly developed mitigation actions. Provides the status of actions proposed in the previous plan, presents a comprehensive array of possible actions, and explains how actions were evaluated.
- **Plan Maintenance:** Explains how mitigation actions will be monitored and how the plan will be evaluated and updated.
- **Sources of Information:** Lists web sites and publications used to develop this plan.
- **Appendices:** Include sample plan adoption resolutions, public notices about the planning process, and the survey instruments used by participating jurisdictions.

3.3 Jurisdictions Represented in the Plan

This is a multi-jurisdictional hazard mitigation plan. The jurisdictions that participated in the development of this plan are the same jurisdictions that participated in the development of the initial version of this plan and passed legislation adopting the plan.

Along with the County government officials involved, the participating jurisdictions included:

- Village of Bay View
- City of Bellevue
- Village of Berlin Heights
- Village of Castalia
- City of Huron
- Kelley's Island
- Village of Milan
- City of Sandusky
- City of Vermilion

The following townships were also included in the planning process, but are not required to formally adopt the plan:

- Berlin Township
- Florence Township
- Groton Township
- Huron Township
- Margaretta Township
- Milan Township
- Oxford Township
- Perkins Township
- Vermilion Township

The adjacent Counties of Lorain, Huron, Ottawa, and Sandusky were invited to participate in the planning process and provide input on planning efforts. Evidence of invitations to participate is found in Appendix A.

3.4 Adoption Resolutions

Appendix A provides sample adoption resolutions that participating jurisdictions can use to officially adopt the plan after FEMA Region V determines that this plan is Approved Pending Adoption (APA). An approvable plan meets planning requirements specified in 44 CFR Section 201.6. A plan is fully approved after it is adopted. Signed adoption resolutions will be included in Appendix A when the plan is submitted for final approval by FEMA Region V.

4 Planning Process

The Erie County Natural Hazards Mitigation Plan represent the work of citizens, elected and appointed government officials, business leaders, and volunteers of non-profit organizations in developing a blueprint for protecting community assets, preserving the economic viability of the community, and saving lives.

4.1 Mitigation Core Group

During the Planning Process, the plan was led by a Mitigation Core Group. Representatives of the previous Mitigation Core Group as well as other community leaders were invited in November of 2019 by the County EMA Office to actively participate in updating the plan; those who accepted the invitation comprise the current Mitigation Core Group members.

Table 2: 2020 Mitigation Core Group Members

Jurisdiction	Organization	Name
City of Sandusky	Sandusky Police Department	Scott Dahlgren
City of Sandusky	Sandusky Fire Department	Steve Rucker
City of Sandusky	City of Sandusky	Josh Snyder
City of Vermilion	Vermilion	Jim Forthofer
City of Vermilion	Vermilion Fire Department	Rodney Johnston
City of Vermilion	Vermilion Fire Department	Chris Stempowski
Erie County	Erie County Soil and Water	Eric Dodrill
Erie County	Erie County Health Department	Ashley Franks
Erie County	Erie County Soil and Water	Breann Hohman
Erie County	Erie County EMA	Kim Johnson
Erie County	Erie County EMA	Tim Jonovich
Erie County	Erie County DOES	Dave Moyer
Erie County	Erie County Commissioner	Matt Old
Erie County	Erie County Sheriff's Office	Jared Oliver
Erie County	Erie County Commissioner	Pat Shenigo
Erie County	Erie County Commissioner	Stephen Shoffner
Erie County	Erie County Sheriff's Office	Paul Sigsworth
Erie County	Erie Regional Planning	Carrie Whitaker
Erie County	Erie County EMA	Gary Wobser
Erie County	Erie County Auditor's Office	Mark Worblewski
Groton Township	Fire Department	Kerry Jett
Margaretta Township	Margaretta Township Fire Department	Tom Johnson
Oxford Township	Township Trustee	Jim Stewart
Perkins Township	Perkins Township	Gary Boyle
Perkins Township	Perkins Police Department	Vince Donald
State of Ohio	ODNR	Douglas Johnson

Jurisdiction	Organization	Name
State of Ohio	Department of Natural Resources	Jancie Kerns
State of Ohio	Department of Natural Resources	Emily Kuzmick
State of Ohio	ODOT	Brendan Schlachter
Vermillion Township	Vermillion Township	Bob Kurtz
Village of Milan	Red Cross & Milan Village	Suzanne Boegli
Village of Milan	Village of Milan	Brian Rospert
State of Ohio	OVH Police	A.J. Alt
State of Ohio	OVH Police	Rick Ramos
N/A	Red Cross	Lora Taylor
Village of Kelleys Island	Councilman	John Longbrake

To aid in the development of the plan, the county contracted the services of All Clear Emergency Management Group (All Clear), a consulting firm with expertise in hazard mitigation planning.

4.2 Jurisdictional Participation

During the process of updating the plan, each meeting of the Mitigation Core Group was open to representatives of participating jurisdictions and the public. Representatives were invited to attend the first meeting in person or to take advantage of a conference call option to participate in the discussion. During the COVID-19 pandemic, all meetings were held virtually.

The first meeting of the Mitigation Core Group was held on December 17, 2019 at the Erie County Office Building. Representatives from each participating jurisdiction were invited by the Contractor via email to participate in the meeting, a copy of the e-mail invitation and notes from the meeting are included in Appendix B. During this meeting, Core Group members discussed the importance of mitigation, the planning process, an outreach strategy, and next steps needed by participating jurisdictions.

At the second Core Group meeting on March 6, 2020, the Core Group reviewed work previous completed, gaps in the data, and ways to incorporate mitigation planning into other avenues. The Core Group also had an in-depth discussion facilitated by the Contractor regarding the hazards to be addressed in the plan, and the impacts of those hazards. The Core Group approved the Contractor's recommendation of separating Severe Weather into Severe Winter Weather and Severe Summer Weather to better address the specific vulnerabilities of each. Additionally, it was agreed upon that Lake Level Rise, Karst, and Harmful Algae Blooms needed to be incorporated into the mitigation plan, either as their own hazards or as part of existing ones. Based upon the Contractor's recommendation, Lake Level Rise was to be incorporated into the Flooding hazard and the Lake/ Stream Bank Erosion hazard as mitigation against the cause of Lake Level Rise is not as feasible as mitigating the impacts of it. Harmful Algae Blooms was incorporated into the invasive species hazard and renamed "Natural Biohazards" to fully encompass the two related hazards.

The Contractor also reviewed the risk assessment process, in which each member of the Core Group was invited to submit an online form that asked that they rate the consequence, vulnerability, and frequency of each hazard, on a high, medium, low basis.

A third virtual planning meeting was held on September 4, 2020 with the Core Group. During this meeting, the Contractor reviewed the results of the risk analysis, the outreach strategy and information about the specific hazards. In addition, at this meeting, the Contractor recommended adding Damaging Winds as a separate hazard. Research showed that Erie County was subject to damaging wind events that were not associated with thunderstorms throughout the year, so incorporating into Severe Summer or Severe Winter Weather was not appropriate. Additionally, damaging winds have occurred in Erie County every year, and has resulted in costly damage.

At the third planning meeting, the Contractor reviewed the mitigation goals, and worked with the Core Group to develop a new goal to address damaging winds. The Contractor also explained the steps required to develop mitigation actions and reviewed the cost benefit analysis that was used in the previous plan. The Core Group made the decision to continue that cost benefit approach for the newly developed mitigation actions. The Contractor distributed a template that each of the Core Group's participating jurisdictions could use when developing their mitigation actions and evaluate them using the cost benefit analysis method.

A final meeting was held October 7, 2020, in which the draft plan was presented to the Core Group and any members of the public who chose to attend. As everyone participating in the meeting had been participating throughout the process, a review of the mitigation planning process was not included during the presentation. The Contractor pointed out key updates that occurred during this plan, including changes to the hazards addressed and the mitigation goals. To wrap up the meeting, the Contractor explained the final steps in the process, including the public comment period for the plan, which would be finalized October 21, 2020, for submission of the Plan to Ohio Emergency Management Agency. The Contractor also described the review and approval process, as well as the adoption process each participating jurisdiction must undergo to be a full participant in the plan.

Additional correspondence occurred throughout the planning process update through the Erie County Emergency Management Agency. When there were defined gaps in data, the Erie County EMA Director helped the Consultant either locate the source of the needed data or directly supplied the data to the consultant for inclusion in the Mitigation Plan. When representatives of a jurisdiction were unable to participate in one of the Core Group meetings, the contractor met with those representatives, virtually, to go over material covered during the larger planning meetings and to obtain any needed information.

Table 3 summarizes the participation by the various jurisdictions in the 2020 Natural Hazards Mitigation Plan Update Process. An X in a column indicates that at least one representative from that jurisdiction was present at a meeting or submitted requested information, or a member of the public completed the community survey.

Table 3: Participation by Jurisdiction in Natural Hazards Mitigation Plan Update Process

Jurisdiction	Meeting 12/17/19	Meeting 3/6/20	Meeting 9/4/20	Meeting 10/7/20	Capability Matrix	Risk Assessment	Comm. Profile	Comm. Survey	Add'l. Phone Meetings
Erie County	X	X	X	X	X	X	X	X	X
Village of Bay View					X	X	X	X	
City of Bellevue					X		X		
Village of Berlin Heights					X	X	X	X	X
Village of Castalia					X	X			X
City of Huron					X	X		X	X
Village of Kelleys Island			X		X	X	X	X	
Village of Milan	X				X	X	X	X	X
City of Sandusky	X	X	X	X	X	X	X	X	X
City of Vermilion	X		X		X	X	X	X	
Berlin Township					X	X	X	X	X
Florence Township					X	X	X	X	
Groton Township						X	X		
Huron Township			X		X	X	X		
Margaretta Township		X	X	X	X	X	X		
Milan Township								X	
Oxford Township	X				X	X	X		
Perkins Township	X	X	X	X	X	X	X	X	
Vermilion Township			X		X	X	X	X	

4.3 Public Involvement

Each Core Group meeting was open to the public, and private citizens other stakeholders in the County were encouraged to participate. Prior to each meeting, notices were posted on the Erie County website and social media. Local jurisdictions also shared the announcement on their social media or website, too. Evidence of these posting are included in Appendix D.

During the previous mitigation plan update, public involvement was limited. In order to provide another avenue for public participation, the Contractor developed a Mitigation Factsheet and an electronic survey that the County and Jurisdictions distributed. Copies of the Factsheet and the survey and survey results are included in Appendix D. Forty-three members of the public participated in the survey and represented unincorporated Erie County and most of the jurisdictions. The results provided meaningful information to the Core Group and each of the jurisdictions, as they reviewed and developed their new mitigation actions.

The public was provided an opportunity to review and provide comment on the draft Erie County Natural Hazards Mitigation Plan throughout the entire planning process. An electronic copy of the Plan was made available for download by the public to provide an opportunity for them to review the Plan following the October 7, 2020 Draft Plan meeting. Social media and website posts were created by the Contractor asking members of the public to review the plan and submit any comments people might have. The posts included the link to the Plan and contact information for the public to use to submit any comments. No comments were received by the public during the comment period. Minor editorial corrections were submitted by the Core Group and the Contractor included those edits in the plan that was submitted.

4.4 Other Planning Mechanisms

During the process of updating the plan, All Clear and the Mitigation Core Group reviewed existing planning mechanisms to ascertain community capabilities and identify opportunities for implementing mitigation actions. These plans are further referenced in the Capability Assessment section of this plan. The Erie County EMA office staff also worked directly with incorporated communities not present at any of the planning meetings so they have input into the planning process.

During the planning process the following existing plans were reviewed:

- Erie County Flood Damage Prevention and Floodplain Regulations
- Erie County Comprehensive Plan
- Erie County Stormwater Management Rules and Regulations
- Erie County Subdivision Regulations
- City of Sandusky Flood Damage Reduction
- Berlin Township Zoning Ordinances
- City of Bellevue Zoning Ordinances
- City of Huron Zoning Ordinance
- City of Sandusky Planning and Zoning Code
- City of Vermilion Zoning

- Florence Township Zoning Book
- Huron Township Zoning Resolution
- Margaretta Township Zoning Ordinances
- Milan Township Zoning Resolution
- Perkins Township Zoning Resolution
- Vermilion Township Zoning Resolution
- Village of Bay View Zoning Resolution
- Village of Berlin Heights Zoning Ordinance
- Village of Kelleys Island Ordinances
- Village of Milan Planning and Zoning Code
- City of Huron: Vision 2020 City-Wide Master Plan
- Sandusky 2018 Bicentennial Vision Comprehensive Plan

4.5 Gathering New Data

Gathering and analyzing new data about natural hazards and the community was critical to the process of updating the plan as well as verifying data that existed in previous plans. In instances where data from the previous plan could not be corroborated from existing sources, the data was replaced with what is currently available. Data that could be verified was included, with newer information added, as appropriate. Because data from the 2020 census is not yet available, population and housing figures came from the latest available data from the census bureau. However, Hazus-MH software, which was used in the analysis for Flood and Earthquake hazards, only has data available from the 2010 census. As the population of Erie County has decreased since the 2010 census, the Hazus results represent a conservative analysis in regard to impacts to people and structures.

5 Community Profiles

This section provides a large amount of information on the county for community leaders to make better informed decisions when dealing with mitigating natural disasters.

5.1 County Information

On March 15, 1838, the Ohio government authorized the creation of Erie County. The county was originally parts of Huron and Sandusky Counties. Residents named the county after the Erie natives. The county was originally a portion of the Connecticut Western Reserve and was part of the Fire Lands. Located on Lake Erie, the county and its residents played an important role in the Underground Railroad during the first part of the nineteenth century. Sandusky and Huron were once busy ports, allowing Ohio farmers and businesses to ship their products all over the world.

Erie County is heavily rural, with urban areas comprising six percent of the county's land mass. Most residents find employment in service industries, with manufacturing establishments and sales positions coming in second and third respectively. The county is a major tourist destination, with Cedar Point Amusement Park residing within its borders. Lake Erie also attracts a large number of visitors, who participate in boating and fishing.²

Erie County is located in north central Ohio, along the shore of Lake Erie. According to the U.S. Census Bureau, the County has a total area of 626 square miles, with 255 square miles of land and 371 square miles of water. Erie County is bordered on the east by Lorain County, on the south by Huron County, on the west by Sandusky and Ottawa Counties and on the north by Lake Erie. The northern boundary of Erie County consists of 35 miles of shoreline along Lake Erie and Sandusky Bay. Erie County extends 28 miles in an east-west direction and 11 miles in a north-south direction.

The City of Sandusky, which is the County Seat, forms the largest incorporated area, with 24,564 residents, according to estimated population data in 2019³. Sandusky is 55 miles east of Toledo, 60 miles west of Cleveland and 106 miles north of Columbus. Other cities in the County, in the order of descending population, include Huron, Vermilion and Bellevue. Villages in the County, in the order of descending population, include Milan, Castalia, Bay View, Berlin Heights and Kelleys Island.

Erie County is highly suitable for agriculture because of its relatively mild temperatures. The County has annual mean temperature of 49°F, an average low of 20°F in February and an average high of 86°F in July. The average annual rainfall of Erie County is 34 inches. Over 50% of the County's land is used for farming various fruits and vegetables, as well as raising cattle and hogs.⁴

² (Ohio History Connection, n.d.)

³ (United States Census Bureau, 2020)

⁴ (United States Department of Agriculture, 2017)

Erie County is accessible by land, water, or air. U.S. Highway 6 runs east-west along the coast of the County. The Ohio Turnpike (Interstates 80 and 90) also runs east-west through the County and provides access to the cities of Cleveland and Toledo. Six additional Federal and State Highways provide transportation access in the County. Two major railroads pass through Erie County. Shipping access to Lake Erie is available in Huron, Sandusky, or Vermilion. The primary airport utilized by Erie County residents is the Erie-Ottawa Regional Airport is located close to the city of Port Clinton and is within Ottawa County, as the Griffing Sandusky Airport has permanently closed. There are seven other airports within the County and four heliports. However, only three of the airports are accessible to the public.

The entire county population is 74,266 according to 2019 population estimates. Shown in Table 4 is the growth of the county since the 1800s.

Table 4: Erie County's Overall Growth 1810-2019

Year	Total Population	Year	Total Population
1800	N/A	1920	39,789
1810	N/A	1930	42,133
1820	N/A	1940	43,201
1830	N/A	1950	52,565
1840	12,559	1960	68,000
1850	18,568	1970	75,909
1860	24,474	1980	79,655
1870	28,188	1990	76,779
1880	32,640	2000	79,551
1890	35,462	2010	77,079
1900	37,650	2019	74,266
1910	38,327		

There are nine (9) townships in Erie County. Table 5, below, illustrates the change in population over the past decade.

Table 5: Changes in Population from 1990 to 2019^{5,6}

Name	1990 Total	% Change 1990-2000	2000 Total	% Change 2000-2010	2010 Total	% Change 2010-2019	2019 Total
Erie County	76,781	3.6%	79,551	-3.1%	77,079	-3.6%	74,266

⁵ (United States Census Bureau, 2005)

⁶ (United States Census Bureau, 2020)

Name	1990 Total	% Change 1990-2000	2000 Total	% Change 2000-2010	2010 Total	% Change 2010-2019	2019 Total
Bay View Village	739	-6.4%	692	-8.7%	632	-4.7%	602
Bellevue City*	0	0%	0	NA	2	0	2
Berlin Heights Village	688	-0.4%	685	4.2%	714	-0.1%	713
Berlin Township	3,280	12.9%	3,702	0.6%	3,723	-2.1%	3,646
Castalia Village	945	-1.1%	935	-8.9%	852	-4.3%	815
Florence Township	2,024	23.5%	2,500	-2.1%	2,448	-3.4%	2,364
Groton Township	1,247	11.0%	1,384	3.1%	1,427	-4.2%	1,367
Huron City	7,158	11.2%	7,958	-10.2%	7,149	-3.9%	6,869
Huron Township	9,352	12.6%	10,530	1.6%	10,697	-2.0%	10,478
Kelleys Island Village	172	113.4%	367	-15.0%	312	-0.3%	311
Margaretta Township	6,334	-0.7%	6,289	-4.9%	5,981	-2.9%	5,806
Milan Township	3,153	16.9%	3,686	-2.2%	3,606	-2.4%	3,519
Milan Village*	1,061	-3.4%	1,025	-2.0%	1,004	-2.0%	984
Oxford Township	1,123	-2.4%	1,096	9.6%	1,201	-1.6%	1,182
Perkins Township	11,039	13.9%	12,578	-3.0%	12,202	-4.3%	11,678
Sandusky City	29,519	-5.7%	27,844	-7.4%	25,793	-4.8%	24,564
Vermilion City*	5,478	-9.9	4,937	-3.9	4,742	-3.3%	4,586
Vermilion Township	9,538	0.4	9,575	-48.4	4,945	-3.7%	4,763

*Erie County Portion Only

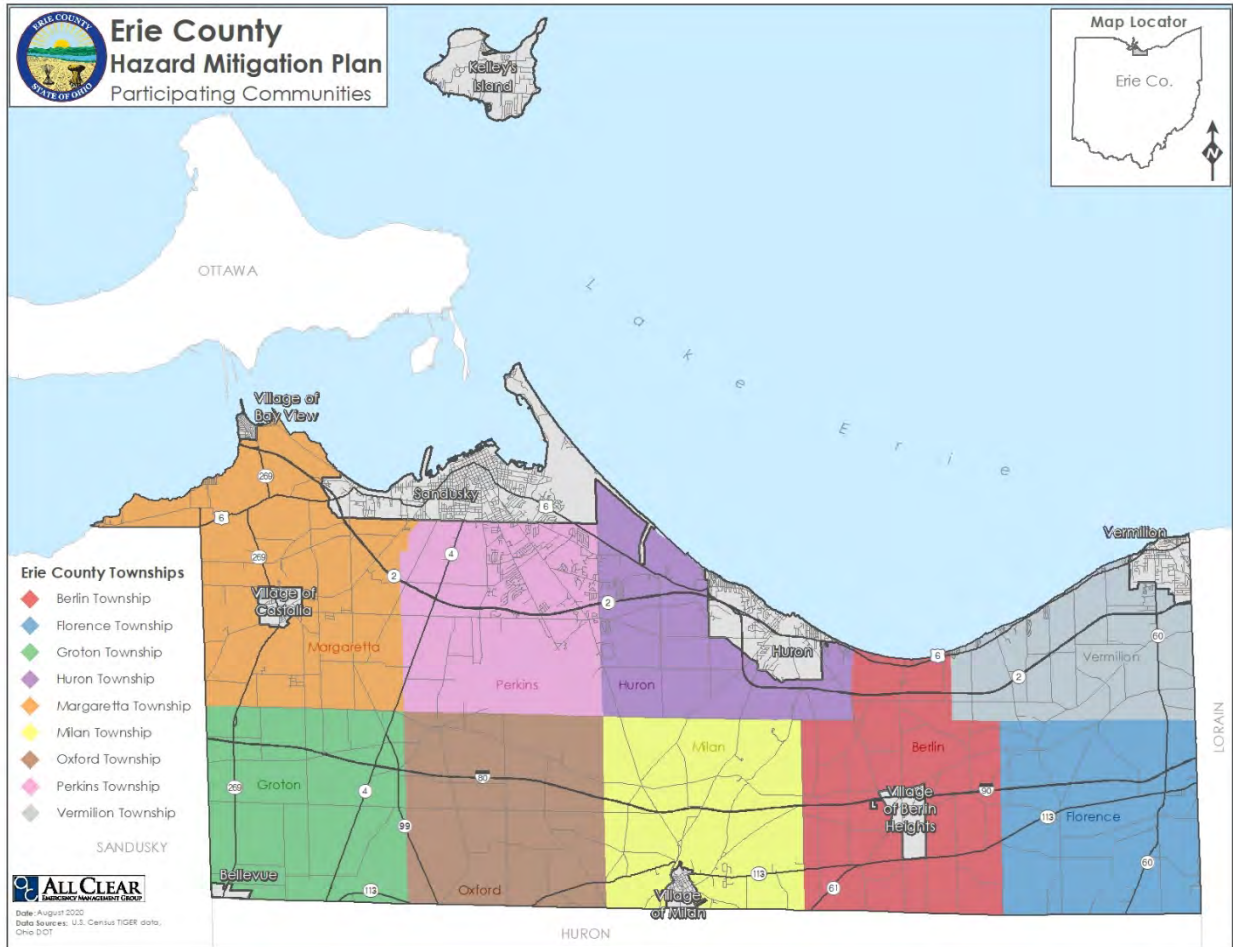


Figure 1: Erie County Map

5.2 Jurisdictions

The nine incorporated jurisdictions that participated in the development of the Erie County hazard mitigation plan are the Village of Bay View, City of Bellevue, Village of Berlin Heights, Village of Castalia, City of Huron, Kelleys Island, Village of Milan, City of Sandusky, and the City of Vermilion. According to 2019 population estimates, the largest areas of population are in City of Sandusky (24,564), City of Huron (6,869), and City of Vermilion (4,586). Information regarding the nine townships in Erie County is provided in this plan for informational and organizational purposes. The townships are not considered as separate participating jurisdictions. A map of Erie County is shown in Figure 1.

5.2.1 Bay View

The Village of Bay View is a small community located next to the Sandusky Bay. It is a tight knit community with a very low crime rate and is protected by police and fire department. The Village recently upgraded to sanitary sewers.

Bay View is in the northern part of Margaretta Township, 8 miles west of Sandusky, and comprises 0.3 square miles of land area. As of 2019 population estimates, there were 602 people residing in the Village. As of the 2018 American Community Survey 5 year estimate for 2013-2017, there were 270 households in Bay View with an average of 2.6 people per

household. The population density was 2,007 people per square mile. There were 323 housing units at an average density of 1,077 units per square mile.⁷

5.2.2 Bellevue

Bellevue was home to Henry Morrison Flagler who was a partner with John D. Rockefeller in the formation of the Standard Oil Company. Flagler later built the Florida Overseas Railroad, to Key West Florida.

The city derives its name from James H. Bell a former railroad official.⁸

The City of Bellevue is in Huron, Sandusky, and Erie Counties. It is in the southwest corner of Erie County in Groton Township, 15 miles southwest of Sandusky, and comprises a total land area of 5.2 square miles. According to 2019 population estimates, there are 7,891 residents, but only two people who reside within the Erie County portion of Bellevue. As of the 2018 American Community Survey 5 year estimate for 2013-2017, there were 2,233 households in Bellevue with an average of 2.4 people per household. The population density was 1,518 people per square mile. There were 3,531 housing units at an average density of 679 units per square mile. The City of Bellevue is participating in Sandusky County's Hazard Mitigation Plan.

5.2.3 Berlin Heights

The Village of Berlin Heights is in the south-central portion of Berlin Township, 18 miles southeast of Sandusky, and comprises a total land area of 1.6 square miles. As of 2019 population estimates, there were 713 people residing in the Village. As of the 2018 American Community Survey 5 year estimate for 2013-2017, there were 287 households in Berlin Heights with an average of 2.3 people per household. The population density was 446 people per square mile. There were 318 housing units at an average density of 199 units per square mile.

5.2.4 Castalia

The Village of Castalia is in central Margaretta Township, 7.5 miles southwest of Sandusky, and comprised of 1.0 square mile of total land area. As of 2019 population estimates, there were 815 people residing in the Village. As of the 2018 American Community Survey 5 year estimate for 2013-2017, there were 321 households in Castalia with an average of 2.8 people per household. The population density was 815 people per square mile. There were 363 housing units at an average density of 363 units per square mile.

5.2.5 Huron

The City of Huron is in the north central portion of the County in Huron Township, 10 miles southeast of Sandusky, bordering Lake Erie. The city has a total land area of 7.7 square miles. As of 2019 population estimates, there were 6,869 people residing in the City. As of the 2018 American Community Survey 5 year estimate for 2013-2017, there were 3,078

⁷ (United States Census Bureau, 2018)

⁸ (Lantz, 2020)

households in Huron, with an average of 2.2 people per household. The population density was 892 people per square mile. There were 3,690 housing units at an average density of 479 units per square mile.

5.2.6 Kelleys Island

Kelleys Island, located in the Southwest basin of Lake Erie, was originally occupied by the Erie or Cat Indian nation. Around the year, 1655, the Mohawk Indians took over the island. During the colonial days the island passed from the French to the English. The island was eventually given to the Connecticut Land Company in 1794. The island eventually transferred to Huron County, then Erie County, then Ottawa County, then back to Erie County on January 1, 1805. An 1817 map, shows the island name changed to Cunningham Island by a French fur trader named Cunningham who settled there in 1803.

In 1833 two brothers, Datus and Irad Kelley, purchased all 3,000 acres from individual landowners. The main businesses on the island were limestone, cedar wood which was used primarily for fence posts and fuel. Eventually, a number of wheat fields and grapes were brought to the island by Datus, and also commercial fishing industry blossomed.

Eventually, many acres of the island were sold to individuals, who eventually became principle property landowners. The island blossomed and became a great tourist destination and remains so.⁹

Kelleys Island is in Lake Erie, 11 miles northwest of Sandusky, and has a land area comprising 4.6 square miles. As of 2019 population estimates, there were 311 people residing in the Village. As of the 2018 American Community Survey 5 year estimate for 2013-2017, there were 103 households in Kelleys Island with an average of 2.0 people per household. The population density was 68 people per square mile. There were 927 housing units at an average density of 202 units per square mile.

5.2.7 Milan

Milan village was platted by Ebenezer Merry in 1817 on the site of a previously abandoned Moravian Indian mission village, named "Petquoting", (1805-1809). Merry dammed the Huron River below the village and established "Merry Mills", a gristmill and sawmill in the river valley. Milan Village, originally named 'Beatty', was incorporated as 'Milan' in 1833. The village is known for being the birthplace the world's greatest inventor, Thomas A. Edison, who was born in Milan village on February 11, 1847, and lived there until the age of 7. His birthplace is now a museum where the public is welcome to view and is located at 9 N. Edison Drive. The Milan Museum is just south from the birthplace is a seven-building campus that offers a family-centered day exploring the past through engaging exhibits and hands-on activities.

Still today Milan honors its historical past with a beautiful village square with many of its buildings from the early to late 1800's. The town hall is a majestic building that was

⁹ (Ehrbar, 2020)

dedicated on July 4, 1876. The village hosts several events throughout the summer months in the Village Square including a car show each Tuesday night May through October, an Antique's Festival in July and the annual Milan Melon Festival each year on Labor Day.¹⁰

The Village of Milan is in southern Milan Township. It has a land area of 1.2 square miles. Milan is 13 miles south of Sandusky. As of 2019 population estimates, there were 984 people residing in the Village. As of the 2018 American Community Survey 5 year estimate for 2013-2017, there were 493 households in Milan with an average of 2.5 people per household. The population density was 820 people per square mile. There were 533 housing units at an average density of 444 units per square mile.

5.2.8 Sandusky

The City of Sandusky, a "Welcoming City", was incorporated in 1824, and sits at the mouth of Sandusky Bay, claiming over 26 miles of Lake Erie's shoreline, not including the Chausee & Cedar Point Peninsula which extends over five miles into the lake and creates a protected bay. Sandusky's unique street grid is one of only two Masonic grids in the country (the other being Washington D.C.). It is known as the Kilbourne Plat after its designer, Hector Kilbourne, who surveyed and laid out the symbol of the Freemason over a typical block grid.

Sandusky, being rich in cultural and historic identity as well as centrally located, is the county seat and most densely populated city in Erie County. The city is home to robust tourism, manufacturing, and healthcare economies anchored primarily by lake recreation and Cedar Point. While best known as the home of the amusement park, Sandusky developed as an industrial Lake Erie port town.

Much of that history remains evident in the bones of the region and echoes through the present in every corner of the city. Days past of bustling ports and manufacturing combine with unique stories of the underground railroad and the ongoing successes of Sandusky natives to give this small city its vibrant soul.

Historic downtown Sandusky is a central business district that continues to experience a resurgence of investment and business attraction. Sandusky draws on its diverse historical identity to guide the way forward to grow as an inclusive and open-minded city.¹¹

The city is comprised of 10.0 square miles of land area. As of 2019 population estimates, there were 24,564 people residing in the City. As of the 2018 American Community Survey 5 year estimate for 2013-2017, there were 10,913 households in Sandusky with an average of 2.3 people per household. The population density was 2,456 people per square mile. There were 13,416 housing units at an average density of 1,342 units per square mile.

¹⁰ (Rospert, 2020)

¹¹ (Orzech, 2020)

5.2.9 Vermilion

The City of Vermilion is in both Lorain County and Erie County. It is located on the western border of Lorain County and the eastern border of Erie County. The City has a total land area of 10.8 square miles. As of 2019 population estimates, there were 10,394 people residing in the City, with 4,586 within the Erie County portion of the City. As of the 2018 American Community Survey 5 year estimate for 2013-2017, there were 4,336 households in Vermilion with an average of 2.3 people per household. The population density was 962 people per square mile. There were 5,319 housing units at an average density of 493 units per square mile.

5.3 Land Use and Development Trends

Erie County lies in the Central Lowland Province. Lying in an area of lake plain and till plain physiography, the County has a relatively uniform, level topography. Berlin Township is the highest point in Erie County and is 320 feet above the approximate mean level of Lake Erie. Most of the County has a slope of six percent or less. The steeper areas are mainly a result of deep stream dissection. Beach ridges and bedrock ridges account for a small percentage of the steeper areas. Figure 2 below illustrates the existing general land use in the County.

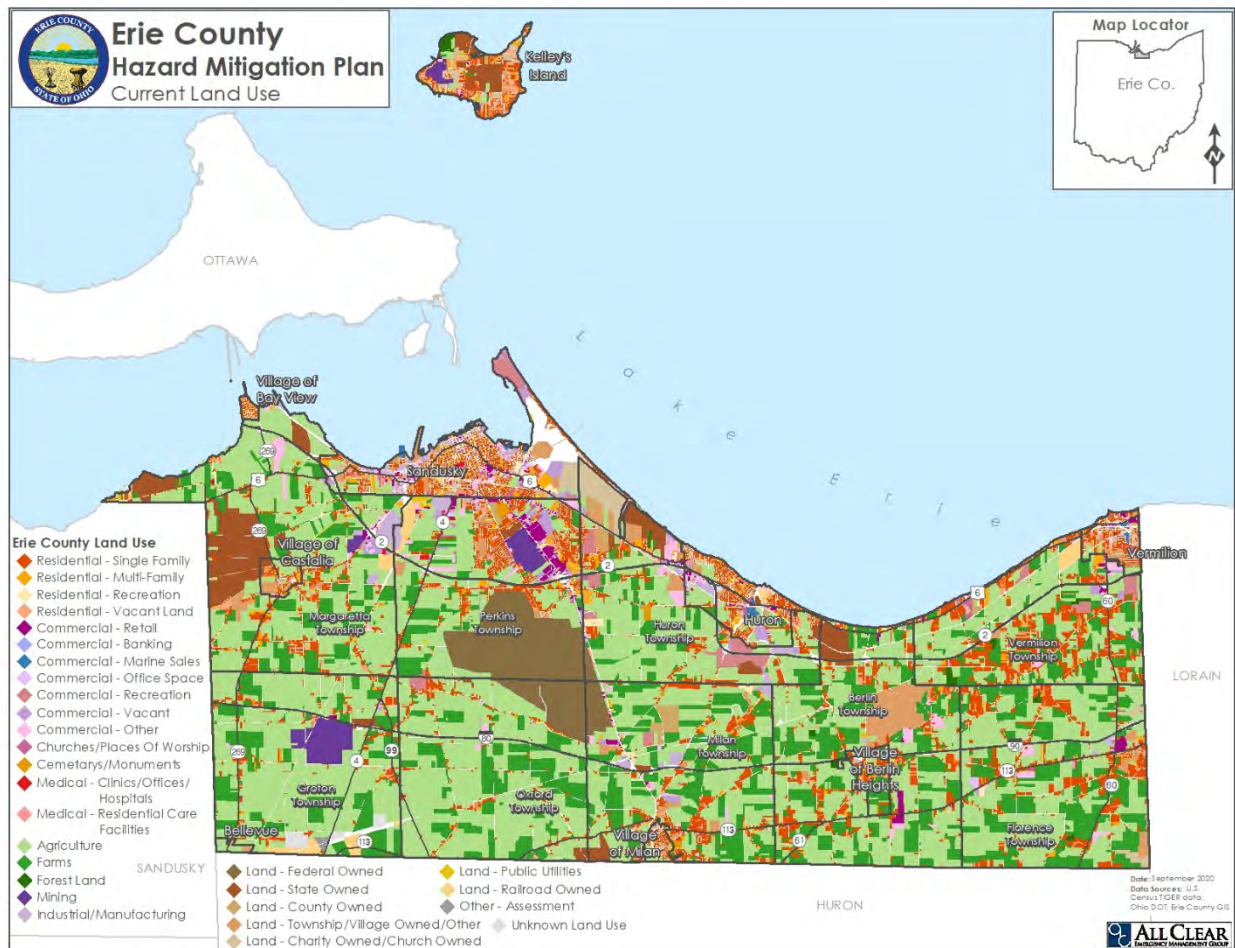


Figure 2: Erie County Land Use

Erie County drains northward into Lake Erie. There are 17 distinct watersheds in the County. Primary watersheds include Mills Creek and Pipe Creek to the west, the Huron River in the central part of the County, Old Woman Creek in the east-central part of the County and the Vermilion River on the eastern edge of the County. Small creeks drain the other watersheds.

Soil surveys contain information that affects the land use planning of a county. The United States Department of Agriculture Natural Resources Conservation Service provides the Web Soil Survey (WSS), replacing older Soil Survey reports. This database is considered the single authoritative source of soil survey information. The WSS can be used by community planners and the public to predict of soil behavior for selected land uses, as well as emphasize soil limitations, improvements needed to overcome the limitations and the impact of selected land uses on the environment¹². Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high-water table makes a soil poorly suited to basements or underground installations.

The soils map of Erie County has 110 different map units, which are groups of soil components or miscellaneous areas (e.g. beaches) with unique characteristics. This alone shows the great advantage to the WSS over the older soil surveys and soil maps, as finer definition of the soil is possible. The 2020 Erie County Interim Soil Survey only had 38 different soil types, which were grouped into 11 broad classifications. Please see Appendix H for the Soil Survey Map Unit Legend with a listing of the different map units and the number of acres that are represented in Erie County. According to the Ohio State University Extension Water Resources, 27% of these soils are very poorly drained and 38% somewhat poorly drained.

¹² (United States Department of Agriculture, 2019)

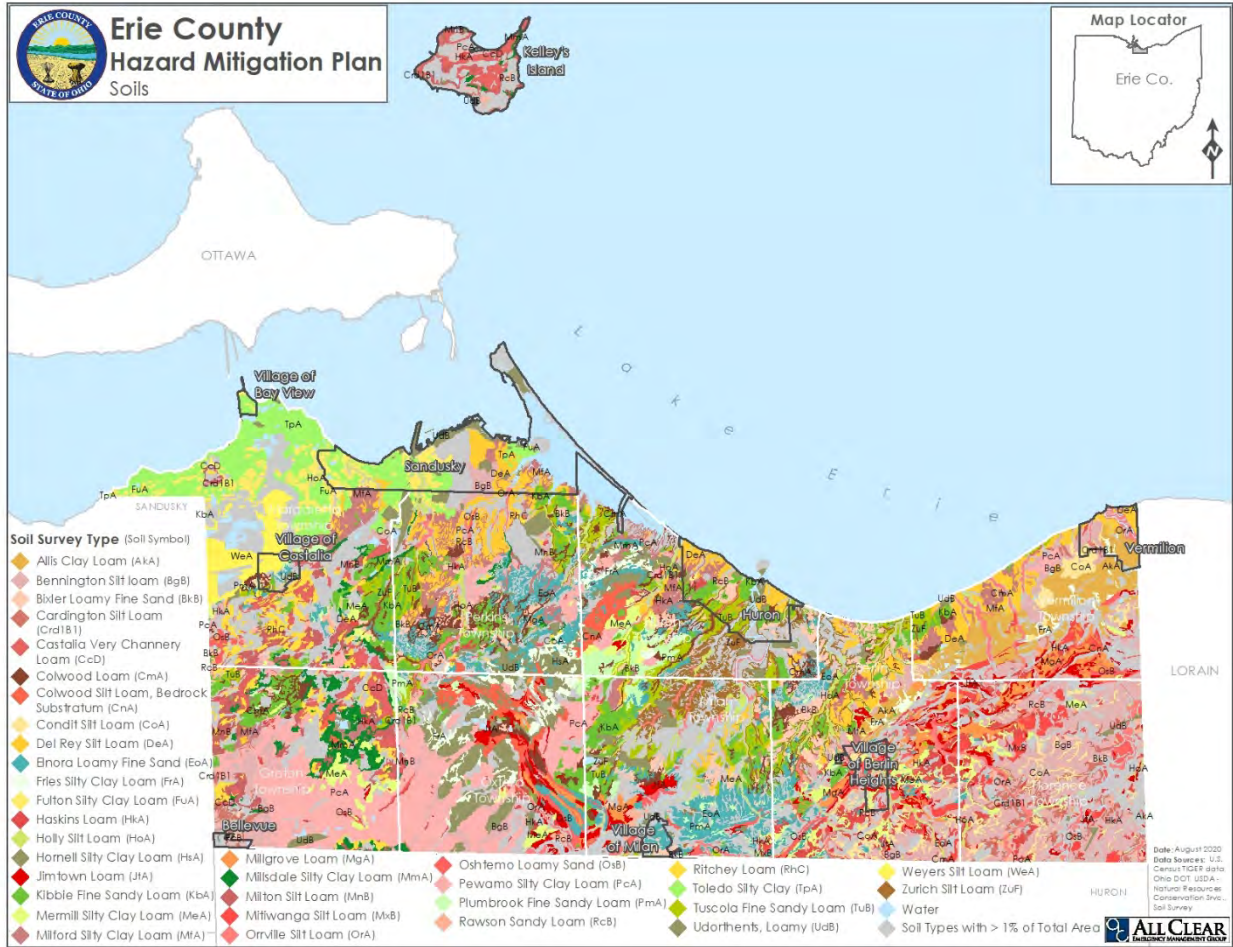


Figure 3: Soil Map of Erie County

The natural resources of Erie County include water, sand and gravel and some layers of bedrock. The groundwater in Erie County varies considerably in quality and quantity. Water is obtained from glacial material or bedrock, depending on the location of the well site. Surface runoff, infiltration rates and geologic material affect the water supply. Typically, good sources of water can be found in glacial deposits with lenses and stratified layers of sand and gravel and yield from 20 to 250 gallons per minute (gpm). However, most wells in glacial deposits have low yields on less than 10 gpm. Bedrock wells also vary considerably in suitability according to the area and type of geologic material. For instance, up to 500 gpm can be obtained from the wells drilled in the cavernous limestone bedrock found in the western portion of the County. A large quantity of ground water obtained from similar formations in the western portion of Erie County has potential for contamination resulting from underground disposal of wastewater or may have high concentrations of hydrogen sulfide. Aside from glacial or bedrock wells, water may also be obtained from Lake Erie, dug wells, cisterns, and ponds, as long as surface water and groundwater pollution are controlled to ensure a quality water supply.

The U.S. Department of Agriculture defines prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Prime farmland includes cultivated

land, pastureland, forest land or other land that is not urban or built-up land or water areas. It has a, adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from zero to six percent¹³.

Approximately 123,000 acres of Erie County, or nearly 76% of the total acreage, meets the soil requirements for prime farmland or prime farmland if drained; and are located primarily in the western part of the County¹⁴. Most agricultural land is used for cash grain crops, particularly soybeans and corn, and to lesser extents, wheat, popcorn, and hay. Specialty crops, such as sugar beets, cabbage, tomatoes, and melons, are also grown. Dairy and livestock are also important sources of revenue. In 2017, approximately 86,440 acres were used as farmland. This acreage consisted of 382 farms, averaging 226 acres per farm. In 2017, soybeans generated the largest amount of crop cash receipts while cattle produced the largest amount of livestock cash receipts. The farmland in Erie County is divided into 89% cropland, 1% pasture, 6% woodland and 3% other.¹⁵

A small percentage of land is devoted to woodlands, usually on steep slopes along major streams and in undrained areas. According to the Ohio Development Services Agency as of 2018, about 18.6% of the county land is forested¹⁶. Most woodlands have been harvested repeatedly, and many have been pastured. Although farm products provide a larger income for the County residents, in effectively managed and harvested woodlands, most Erie County soils may potentially provide income per acre that is similar to other agricultural products through the sale of timber products. Woodlands are also beneficial because they provide wildlife habitat, serve as windbreaks from erosion, produce nuts, lumber, and fuel wood, and have aesthetic value. Pastures are common in areas where soils present severe limitations affecting row crops. The common pasture and hay plants include alfalfa, red clover, alsike clover, bluegrass, orchard grass, tall fescue, timothy, and brome grass.

With good management practices, most soils are highly productive for crops and pasture. The major soil management concerns are seasonal wetness (including ponded areas), erosion, soil structure damage (compaction, crusting, clod formation), droughtiness, and soil fertility. Seasonal wetness and ponding are major concerns on approximately 117,026 acres of land in Erie County. The very poorly drained Colwood, Condit, Holy, Mermill, Milford, Millgrove, Miner, and Pewamo soils are naturally so wet that crop production is typically not possible unless surface or subsurface drainage is installed. The somewhat poorly drained Bennington, Elliot, Haskins, Jimtown, Mahoning and Orrville soils are naturally so wet that crops are damaged during most years and planting and

¹³ (United States Department of Agriculture, 2019)

¹⁴ (United States Department of Agriculture, 2020)

¹⁵ (United States Department of Agriculture, 2017)

¹⁶ (Ohio Development Services Agency, 2018)

harvesting is delayed unless artificial drainage is installed. Existing County and private drainage systems should be maintained as adequate outlets for present and future land uses. Urban construction activities can damage and disrupt these existing systems. As a result, renewed wetness and ponding of these previously drained cropland areas now impact homeowners' use of this land. In order to maintain or improve these drainage systems, cooperation is necessary between the urban and agricultural communities.

Agriculture is the primary land use in Erie County with about 53% of the land occupied by farms. Since 1982, when farms comprised 100,000 acres of the County, or 55% of Erie County's land, the number of acres farmed, and the number of farms has decreased. In 1982 there were 535 farms, with an average size of 185. Thirty-five years later, the number of farms had decreased by 153. Thus, although there was less farmland and a smaller number of farms, the average farm size increased. The difference in number of acres of farmland is most likely due to the conversion of farmland to urban or nonfarm uses.¹⁷

In addition to land acres, the County is bordered by Lake Erie across the northern boundary of the County. The County also contains approximately 800 acres of lakes within its borders. According to an Environmental Protection Agency (EPA) estimate, Erie County also contains approximately 340 linear miles of streams and rivers. In addition, 55.9 miles of County-maintained open ditches, 17.3 of tile ditches and approximately 200 miles of privately maintained ditches are used for land drainage. Approximately 8,600 acres of Erie County are considered wetlands.

The community of Erie County has expressed several ideas and concerns about future land use in their 1995 Erie County Comprehensive Development Plan. Erie County is faced with development pressures due to expanding residential areas in and near villages. Below are some guidelines Erie County has established:

- Promote community development through redevelopment, economic development, and constructing infrastructure to meet the demands for development.
- Provide all residents in the County adequate, affordable housing.
- Preserve the County heritage and those structures significant to its salvation for future generations.
- Maintain harmony between the man-made and natural environment by sustaining the County's dedication to protecting the environment through its support of legislation and programs intended to preserve open spaces and natural habitat.
- Provide high quality recreation facilities to meet the increasing demands of all residents who reside within the planning area.
- Ensure growth in employment will not be obtained through excessive costs to the environment or jeopardize the livability of the community.
- Become efficient and accessible through improvements to street systems, developing along roadways, and through transportation planning.

¹⁷ (United States Department of Agriculture, 2017)

- Encourage growth in areas physically suited and already serviced by infrastructure.

When the State Route 6 overpass was built, it opened up emergency access to the western portions of Sandusky. Other improvements to transportation networks can also affect the future development of Erie County. As US 250 continues to expand southward past Bogart Road, there could be an increase in development. NASA's Plumbrook Station is a space testing facility, is situated off of US 250 in an area that is undeveloped. Further expansion of the highway or the Plumbrook Station could drive development in that area.

The continued resurgence of downtowns is apparent in local cities. Younger and older demographic groups tend to cluster in urban areas reducing sprawl and vehicle usage, but further concentrating the population. And small residential units will most likely increase within the urban areas of the county including the Cities of Sandusky, Huron, Vermilion and Perkins Township to house the increasing elderly population. Conversion of former brownfield and/or industrial spaces to residential areas is also common as land re-use is preferred over sprawl and manufacturing continues to decline in the area.

Commercially, oil and gas extraction is expected to continue to increase in the southeastern portion of Erie County. And as tourism increases, AirBnBs are also anticipated to grow, especially in the Cities of Sandusky and Huron and along the lake front.¹⁸

The following sections detail specific development potential for the local jurisdictions of Erie County.

5.3.1 Bay View

Due to constraints of the Village of Bay View's limits, additional development is not expected. Figure 4 shows the current land use within the Village's limits.

¹⁸ (King & Grohe, 2020)

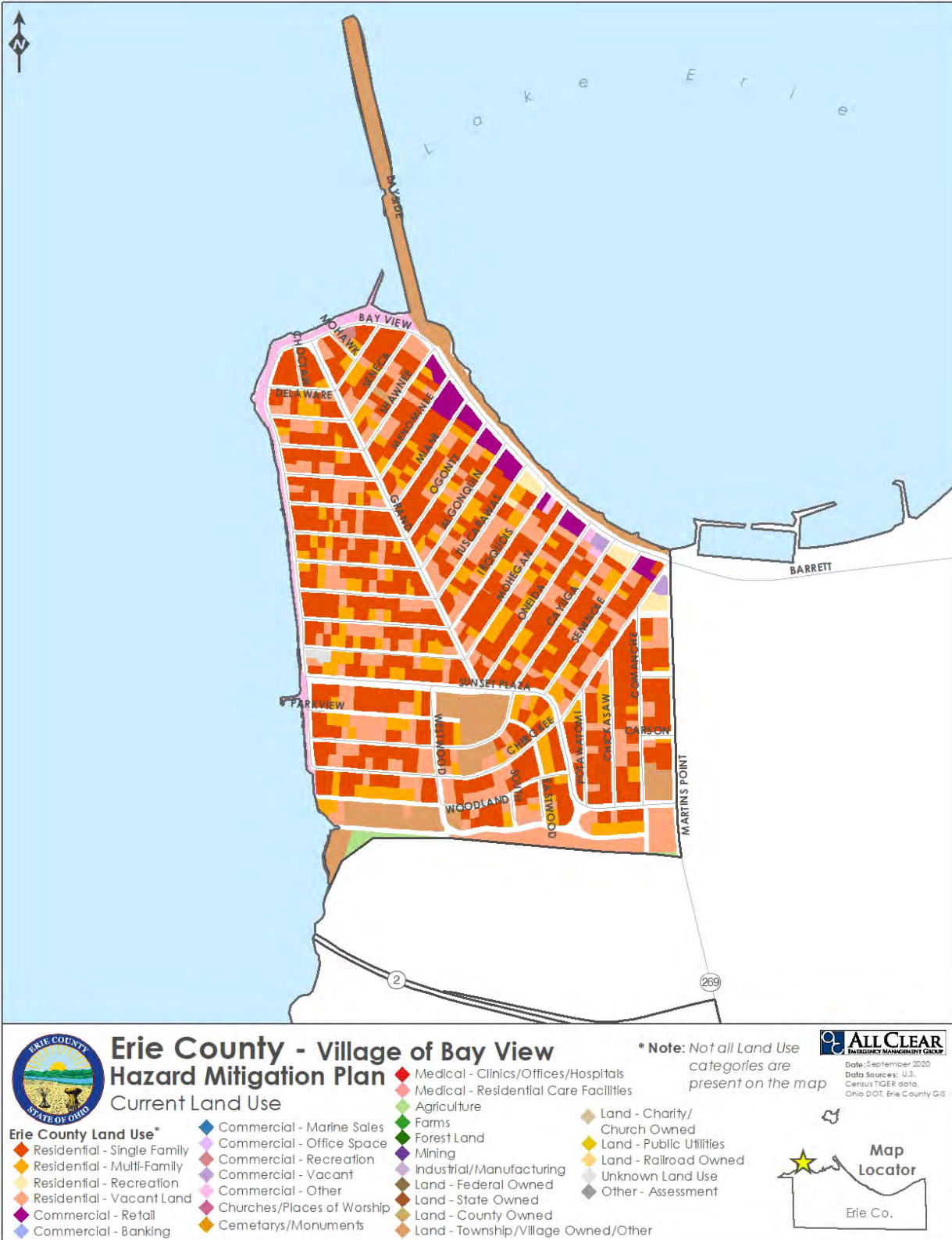


Figure 4: Land Use Map for the Village of Bay View

5.3.2 Bellevue

Bellevue has seen a lot of growth since 2014. In 2015, retail development occurred in or near the downtown area, including a new gas station for Bassett's Market, Advanced Auto Parts opening, Gilbert's Coffee and Old Time Soda Shop, Forget Me Not Flowers, and First Choice of Ohio.

In 2016, one new retail store opened in the downtown area, Bone Boys BBQ. Other development that year occurred in the manufacturing industry. Amcor on the west end added a new addition costing around \$37 million. Amcor makes food grade bottles for many brands. Magretech, a company focused on recycled magnesium processing was purchased by a Chinese company, and jobs were added as part of the purchase. Mitsubishi Chemical Performance Polymers (MCP) made a large investment with rail upgrades near their plant for access to do more bulk processing. This plant is northeast of downtown Bellevue (in Huron County). Four new homes were built around the city, taking advantage of the city-wide CRA enacted on March 10, 2016, which allows for a 15-year real estate tax exemption.

Retail openings in 2017 included Rayz 20 (Restaurant/Bar) and Arby's along with State Farm Insurance office being purchased by a new owner. Two large projects were the 200,000 square foot warehouse built by Ohio Logistics taking advantage of the rail upgrades provided by their close neighbor MCP in a shared endeavor. Bellevue Hospital (TBH) invested \$9 million with the addition of two operating rooms and a redesigned emergency entrance for the facility. Five new homes were built in various areas of the city.

2018 saw an extension of Moore Avenue by the City, which benefitted increased truck traffic anticipated by the newly operating Ohio Logistics building. Tower International invested \$31 million for a new E-coat building and Eco paint line for the Ford F-150 truck line frames. Thomas Steel Incorporated, a long-time local fabricator added a new office complex, tooling and production area upgrades. Magretech added a new melt building, warehouse, office, and finished goods building with a total investment of \$4.8 million. Bellevue Hospital finished renovations on the recently acquired building across from their Main Campus on S R 20 West with a total investment of \$5.5 million adding several doctor offices, a rehab facility and an Anytime Fitness gym. Nine new residential homes were built around the city.

The Prairie Ridge Subdivision, a residential condo and housing development funded by the Bellevue Hospital Foundation was started in 2019, just west of the Bellevue Hospital with the potential of 150 building lots. Infrastructure installed and one model condo was constructed. Phase one allows nine condo lots as well as 10 residential. Goodwill added a 48,000 square foot warehouse/production facility. Mad River/NKP Railroad Museum constructed a new engine building on the site of the museum. Fireland Federal Credit Union (FFCU) kicked off construction of the Corporate Headquarters located on North St. with an estimated cost of \$4 million, the headquarters began operations in May of 2020.¹⁹

¹⁹ (Lantz, 2020)

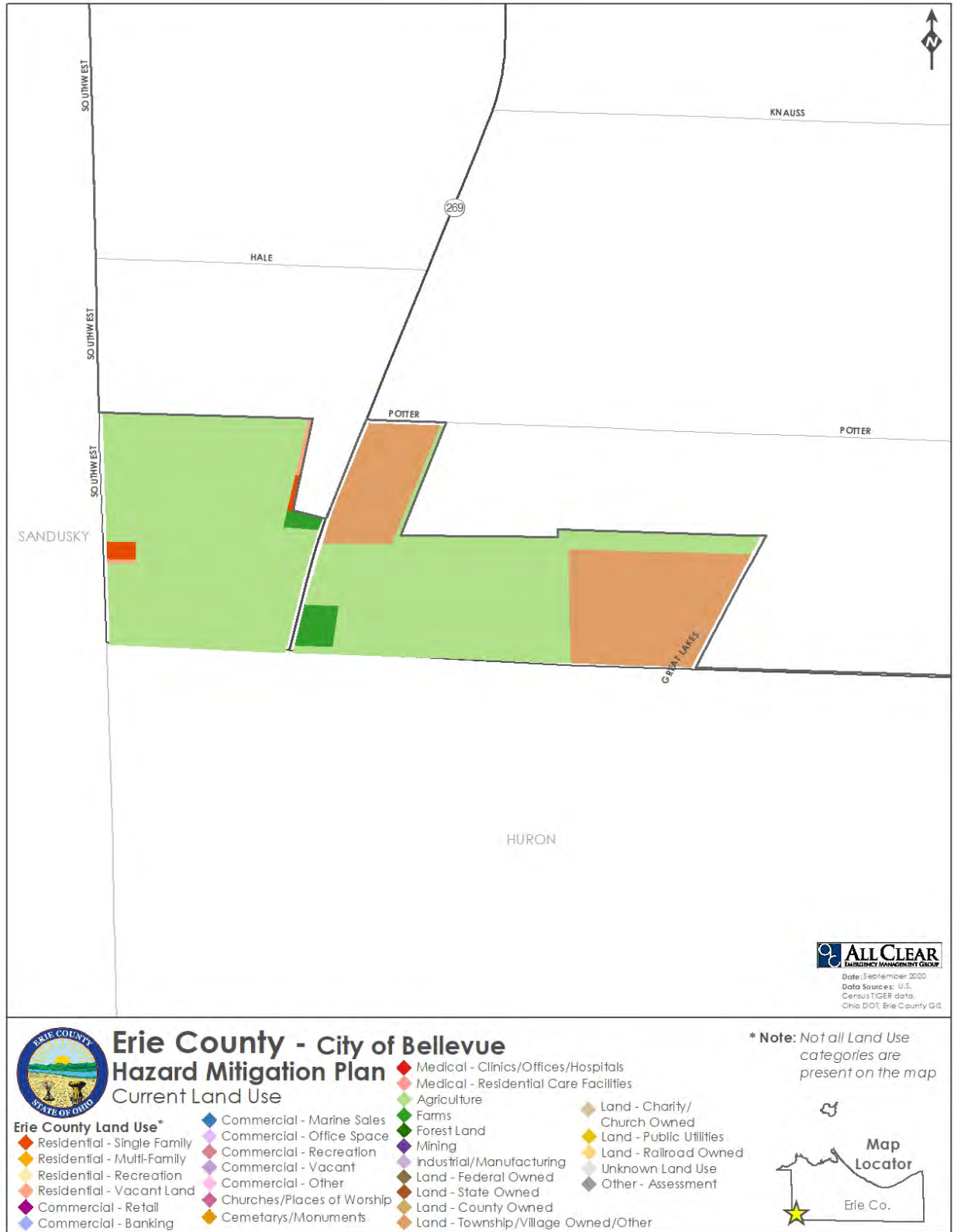


Figure 5: Land Use Map for City of Bellevue (Erie County Portion Only)

First National Bank (FNB) added to their Corporate Headquarters with a \$2 million addition and interior renovations. Two new retail shops opened in the downtown area with Linen & Birch and Shoppe 19. Buckeye One Eleven opened as a new rental hall on Buckeye St. McDonalds on East Main St. went through a complete renovation of the interior and exterior in late 2019. Three new homes were built around the city.

In 2020, Dollar Tree started a complete renovation of a building in the Village Square Plaza on Castalia St. The site will offer three additional retail spaces available for lease later in 2020. Bellevue Family Dentistry broke ground for their 16,000 square foot office and retail building across from Bellevue Hospital and anticipate a late 2020 opening. Three new homes have been completed in the city with an additional five homes under construction throughout the city.²⁰

5.3.3 Berlin Heights

Figure 6 below shows the current land use map for the Village of Berlin Heights. No additional development is expected in the near future.²¹

5.3.4 Castalia

Figure 7 below shows the current land use map for the Village of Castalia. No additional development is expected in the near future.

5.3.5 Huron

In the City of Huron, there are two areas identified for potential expansion. The Huron Business Park, located south of the S R 2 and Rye Beach Road intersection, is one possibility. The other area of potential new development/expansion in Huron is the former ConAgra site.²² Figure 8 below shows the current land use map for the City of Huron.

5.3.6 Kelleys Island

No new development of Kelleys Island is planned.²³ Figure 9 below shows the current land use map for the Village of Kelleys Island.

5.3.7 Milan

Since 2014 the Village of Milan has not experienced much development due to its “landlocked” nature. Growth has been limited to several houses erected in the Landsdown subdivision. The Village is in the infant stages of developing several areas, including biking and walking paths and other downtown revitalization plans.²⁴ Figure 10 below shows the current land use map for the Village of Milan.

²⁰ (Lantz, 2020)

²¹ (Schafer, 2020)

²² (King & Grohe, 2020)

²³ (Ehrbar, 2020)

²⁴ (Rospert, 2020)

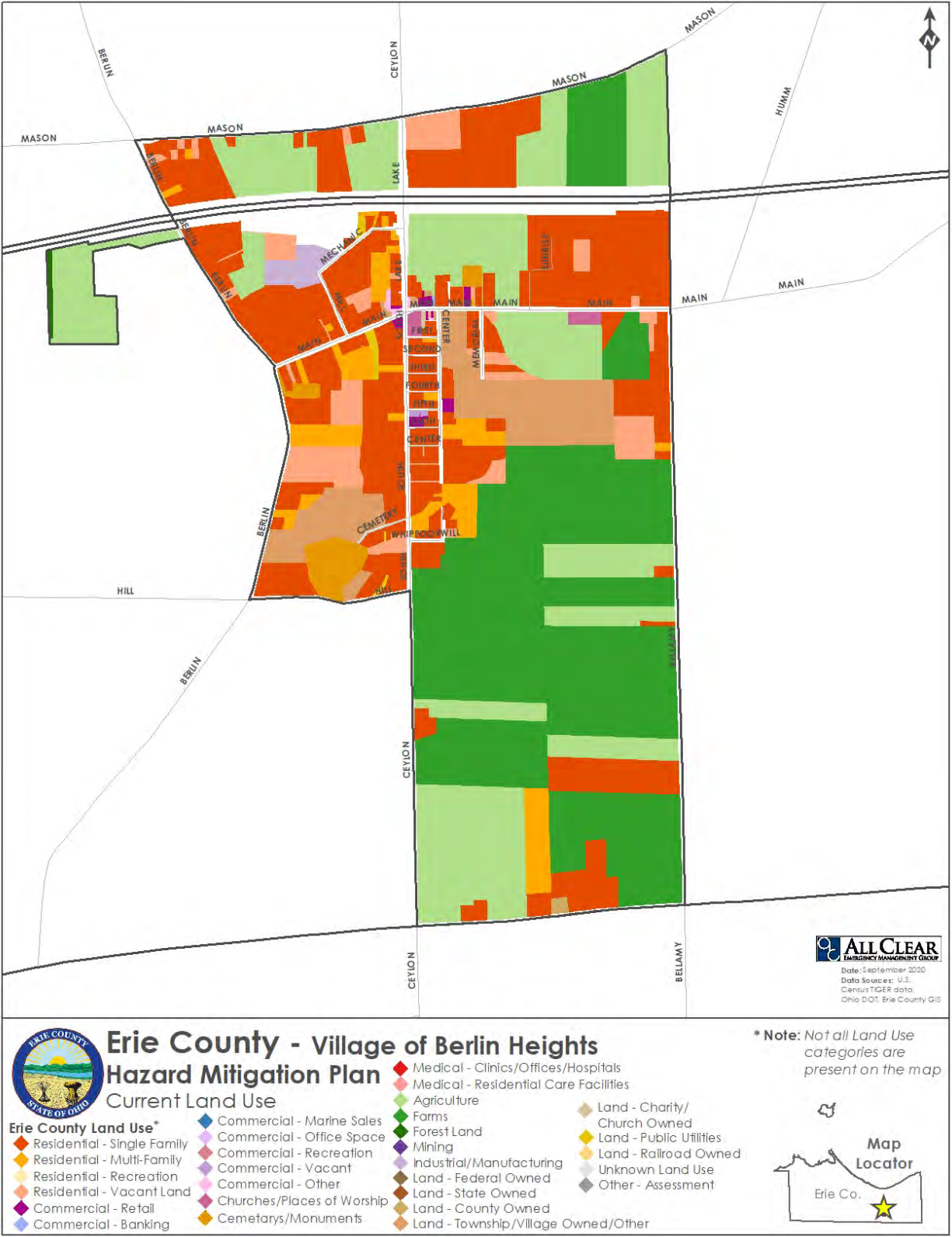


Figure 6: Land Use Map for the Village of Berlin Heights

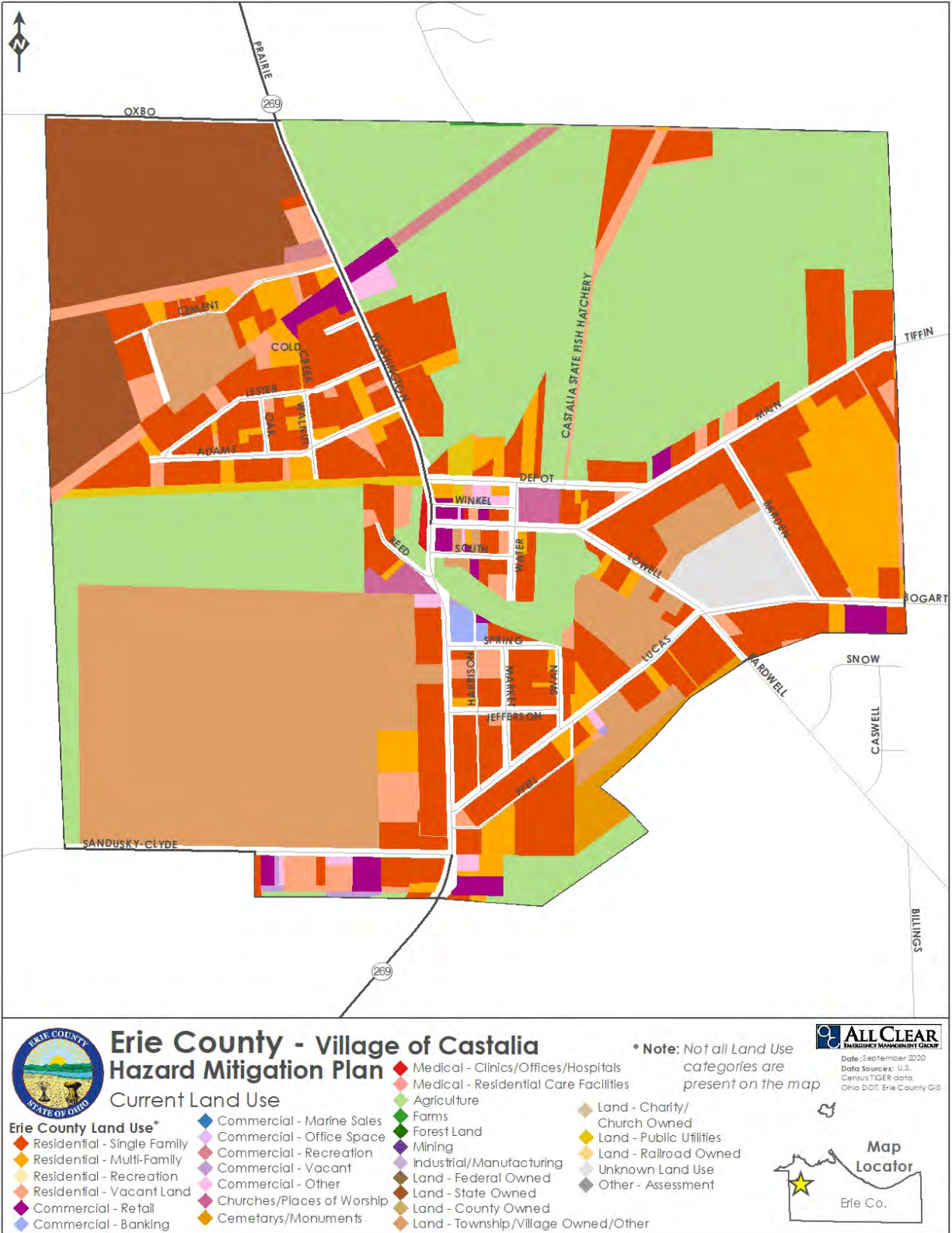


Figure 7: Land Use Map for the Village of Castalia

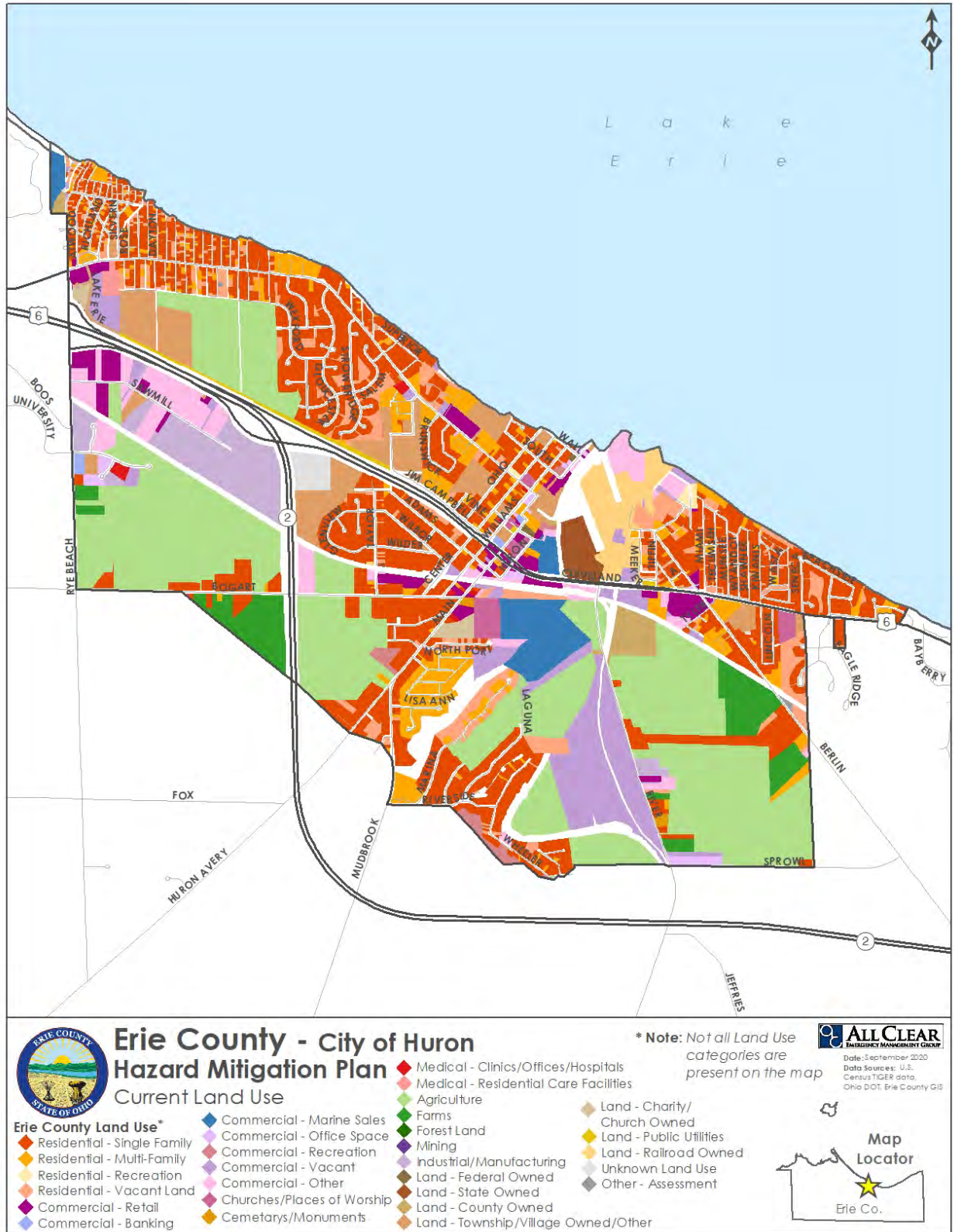


Figure 8: Land Use Map for the City of Huron

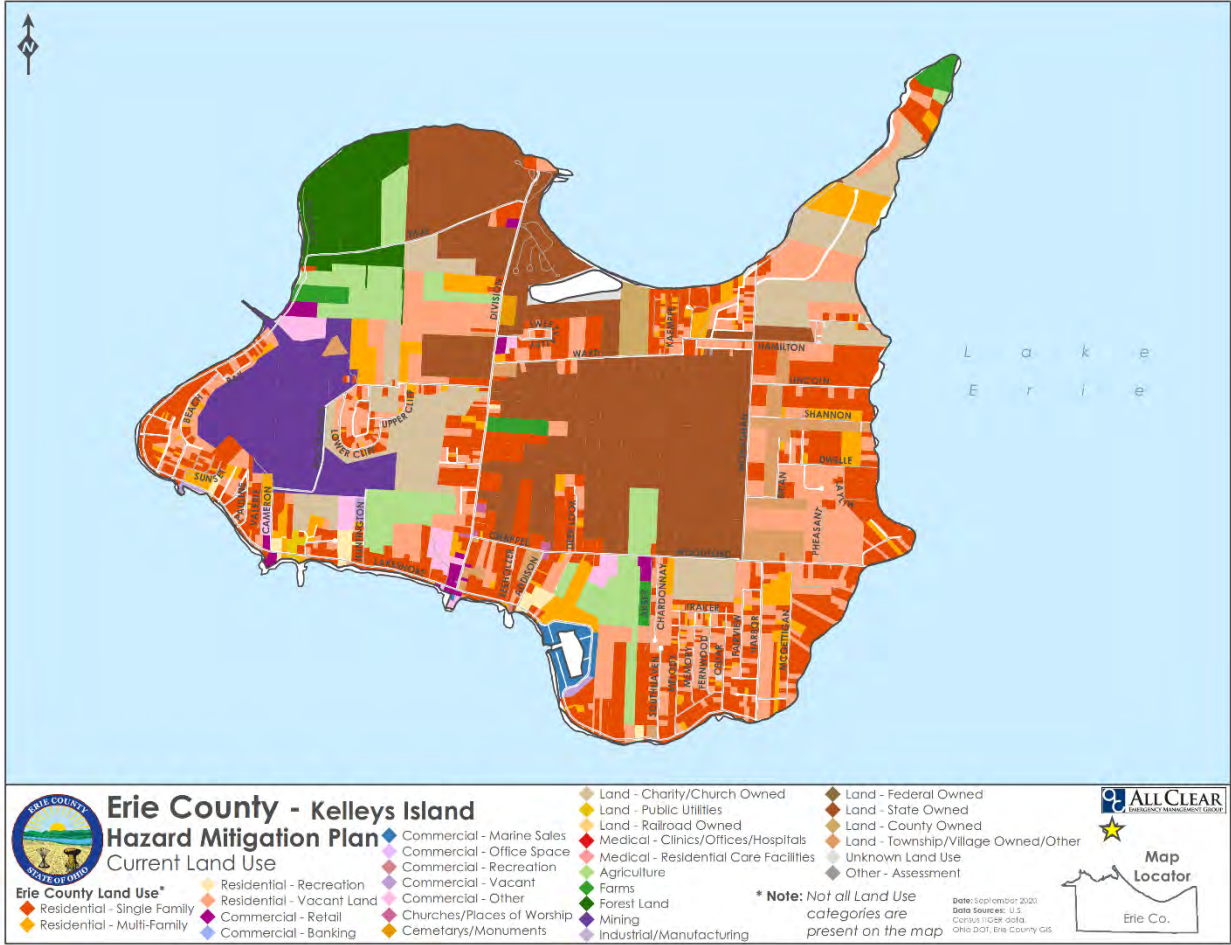


Figure 9: Land Use Map for the Village of Kelleys Island

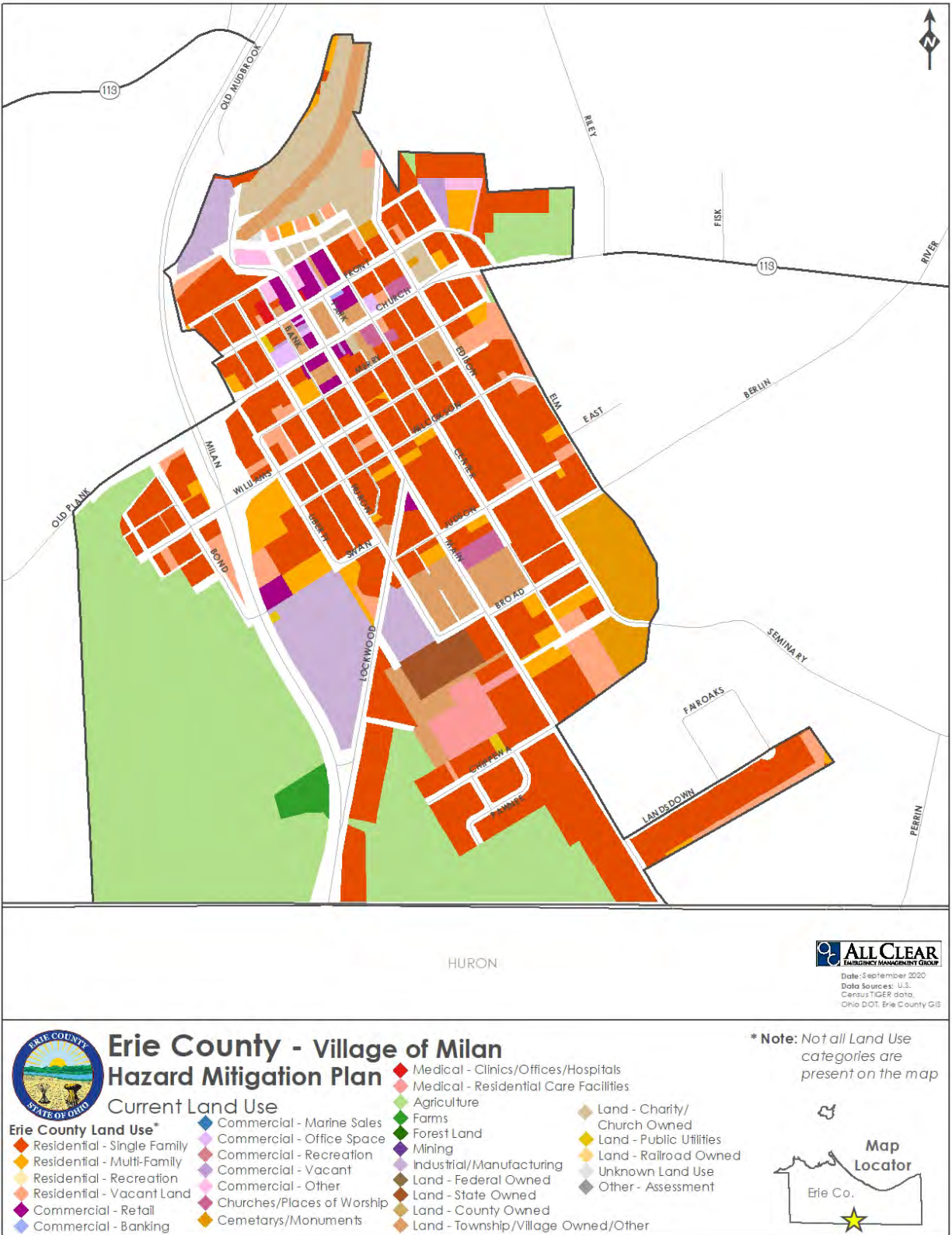


Figure 10: Land Use Map for the Village of Milan

5.3.8 Sandusky

In terms of current development areas, based on noticeable activity and extent of monetary investment and additional square footage – the two main areas include “downtown” Sandusky and also the far east end. With regards to downtown, this is defined as the area between Washington Street to the south, Shoreline Drive to the north, Decatur Street to the west and Franklin Street to the east. Between 2018 and 2020, there has been or is ongoing over \$100 million in both public and private investment. This includes public infrastructure projects but is mainly private investment into rehabilitation of once vacant buildings and new construction. Examples of recent investments include the \$15 million Columbus Avenue revitalization project which now houses the new Sandusky City Hall and a mix of retail and residential uses, the \$15 million BGSU School of Resort and Attraction Management which will house post-secondary education space and residential units, and the \$4 million Water Street lofts which will bring new for-sale housing units to downtown. All told, the new projects will add an approximate 150 new housing units (225 new residents), but also well over 100,000 square feet of new or rehabilitated commercial space. The downtown renaissance currently underway is truly mixed-use in nature combining both residential (rental and for sale), commercial and retail/restaurant.

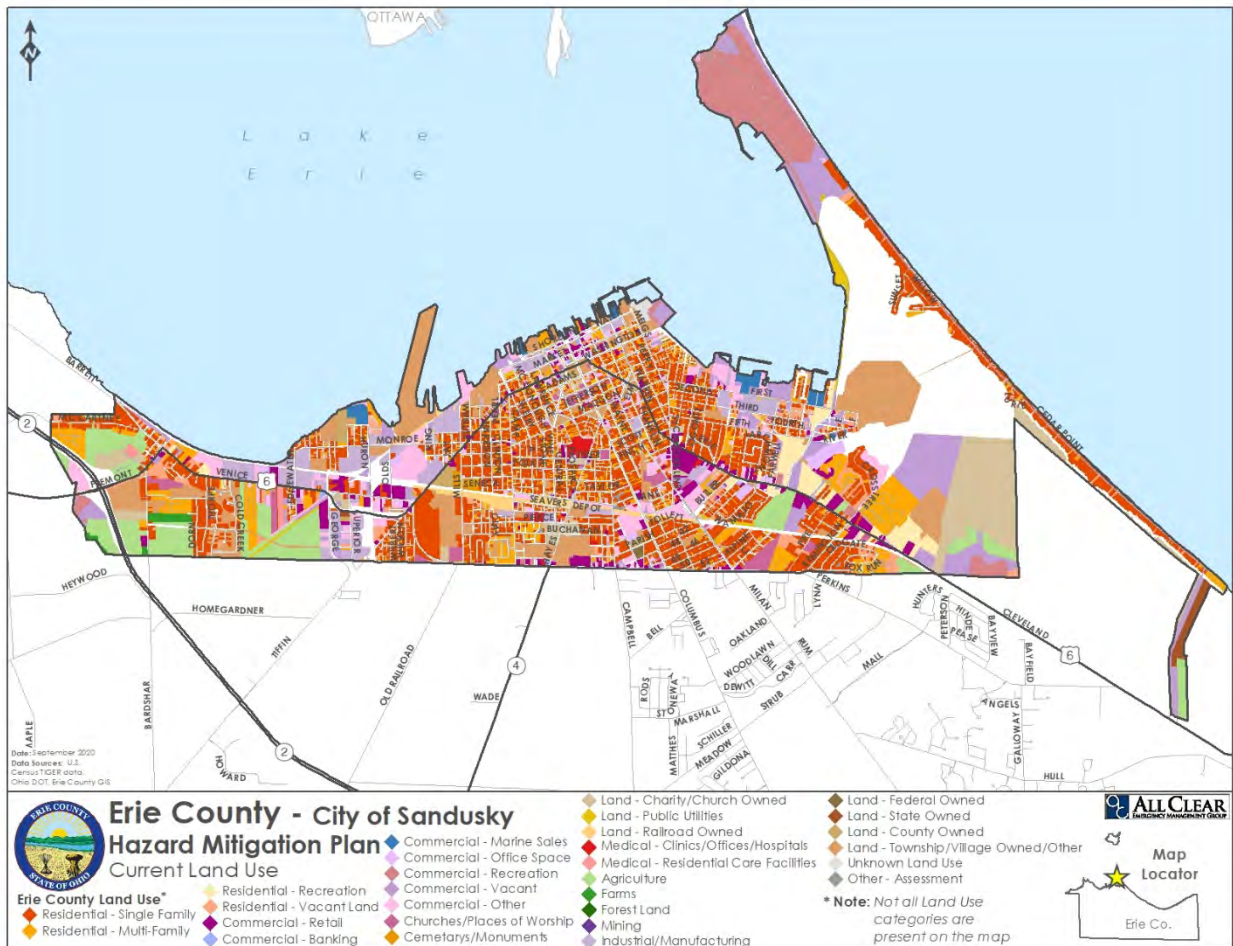


Figure 11: Land Use Map for the City of Sandusky

The second notable area of current development includes the eastern terminus of the city limits along Cleveland Road. This is where the current Cedar Point Sport Center indoor and outdoor facilities have been built. The two facilities combined total an over \$75 million investment. The outdoor facility includes a mix of baseball, softball, soccer and lacrosse fields as well as recreation and food amenities. The 180,000 square foot indoor facility include a mix of basketball and volleyball courts. The indoor facility also includes a new sports medicine tenant – which is operated by Fireland Regional Medical Center.

As with any urban development in a downtown core or the construction of large entertainment venues, there is a major increase in vehicular traffic and related concerns such as vehicular crashes or conflicts between vehicles and pedestrians. Secondly, the large level of construction has results in a major increase in heavy equipment and vehicles entering the downtown core and several street closures which also have the ability to elevate the number of conflicts.

In terms of areas of future development, there are three main areas, in addition to the above two that will continue to develop:

- First Street Corridor between Cedar Point Drive and Meigs Street. This long dormant area is mainly known as one of the main traffic avenues into Cedar Point and also houses the overwhelming majority of dormitories for employees of Cedar Point. This street also houses several commercial and industrial operations that relay on a substantial amount of shipping and receiving to bring and ship products. From a development standpoint, it has traditionally been a mix of marinas and boat/vacation houses and industrial. However, in the upcoming years, some of which is already beginning to occur, there is major mixed-use development planned. The city anticipates upwards of 30-50 new residential units to be constructed in the townhome or condo variety that will house both primary residents and those seeking second homes, namely on the north side of the street. Additionally, there is between 50,000-100,000 square feet of new boat storage and maintenance space to be developed. Finally, many of the existing commercial and industrial entities are exploring expansions to their footprint to add both square footage to their facilities and also employees.
- East end of downtown towards Battery Park. Currently, this area is mainly a combination of vacant land (totaling 10 acres) and the site of the former Sandusky City Hall/current City Justice Center and Battery Park Marina (30 acres). This area is drawing significant development interest through a combination of most of the land being undeveloped and the amazing waterfront access and views provided by its location. The area, per the city's masterplan calls for mixed-use development mainly focused on residential and retail/restaurant. From a residential standpoint, it is envisioned as a mix of single-family houses/townhomes and high-rise apartments/condo with ground floor retail and restaurant uses. It is also possible that there may be a hospitality use that would include upward of 150 new hotel rooms and modest conference space. In total, these two areas could see (in the next decade), 300+ newly constructed housing units, 150 hotel rooms and over 50,000 square feet of commercial and retail space along with beautifully redeveloped public spaces and waterfront access point.

- MacArthur Park. This park is a post-WWII workforce housing development located at the northwest intersection of Camp Street and Perkins Avenue. The development, comprised of a mix of 1/2/3/4 unit properties centered around a public park – was developed with inadequate construction that was not meant to stand the test of time. Today, many of these units still remain, however many of them are in haphazard condition. As such, the city has identified MacArthur Park as a major target of redevelopment and has been aggressively acquiring and demolishing housing. The ultimate goal is to acquire and clear as much land as possible and completely masterplan the entire area to include new sustainable and affordable housing, a completely revamped and safer street grid and major park redevelopment and amenity creation. The developments location on two major thoroughfares and adjacency to Sandusky School property, makes it both a major eyesore – but more importantly and amazing opportunity for redevelopment and re-visioning.^{25,26}

5.3.9 Vermilion

Figure 12 shows the Land Use for the Erie County portion of the City of Vermilion.

²⁵ (Orzech, 2020)

²⁶ (Snyder, 2020)

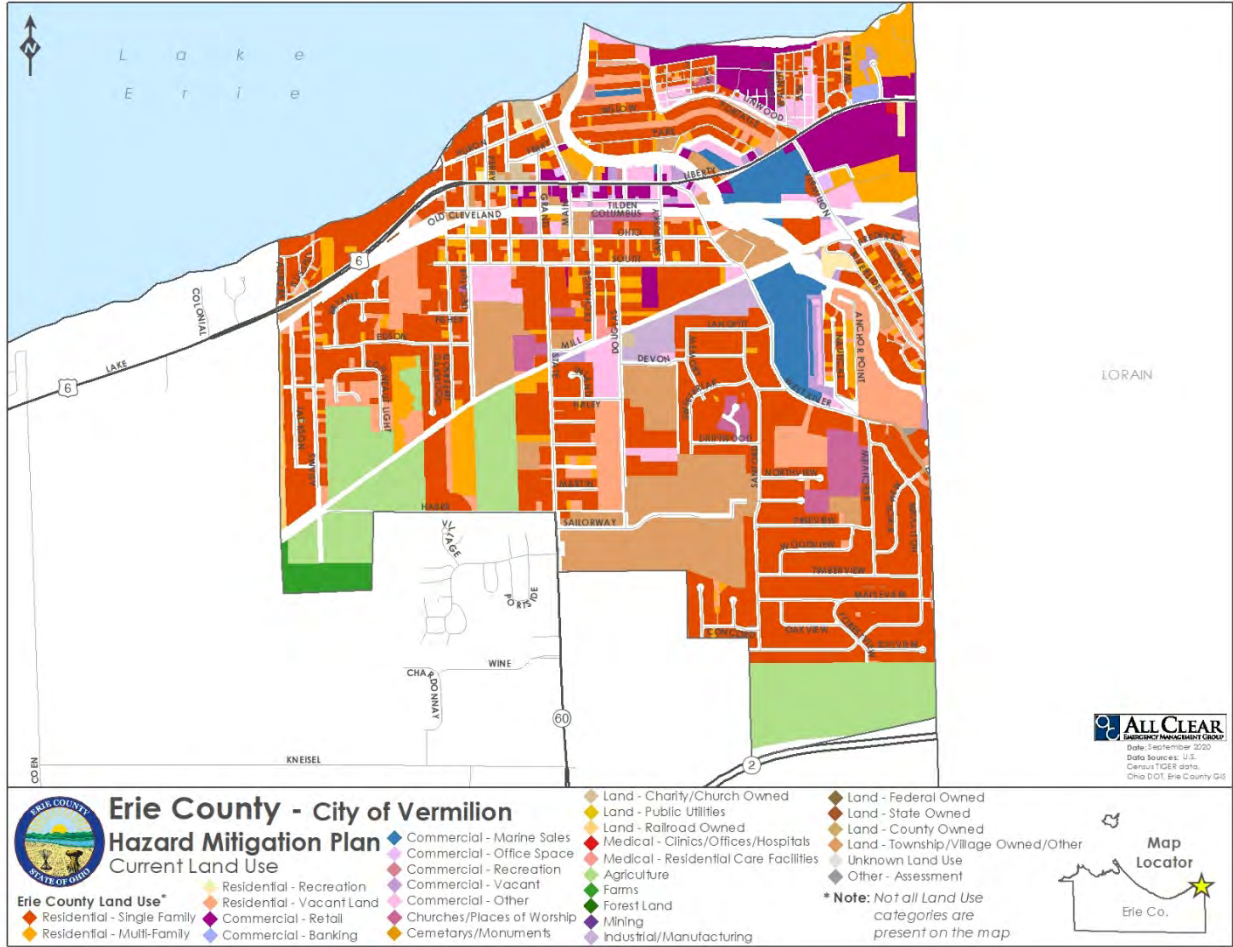


Figure 12: Land Use Map for the City of Vermilion (Erie County Portion Only)

Land Use Maps for the Townships of Erie County are Included in Appendix E for reference.

5.4 Community Capability Assessment

The purpose of the Community Capability Assessment is to identify strengths and weaknesses that will affect the ability of the county and participating jurisdictions to implement mitigation actions. Capabilities include a variety of regulations, existing planning mechanisms, and administrative capabilities provided through established agencies or authorities.

5.5 Capability Matrix

Table 6 summarizes the regulatory tools and resources used in Erie County and participating jurisdictions. These regulations and resources can be used to provide opportunities for further improve and mitigate the potentially negative effects of natural hazards through regulation.

Table 6: Community Capability Matrix for Erie County, and its Municipalities and Selected Townships

	Erie County	Village of Bay View	City of Bellevue	Village of Berlin Heights	Village of Castalia	City of Huron	Kelley's Island	Village of Milan	City of Sandusky	City of Vermilion
Comprehensive Plan	Yes	Yes	No Data	No Data	No Data	Yes	No Data	No	Yes	Yes
Planning Commission	Yes	No	No Data	No	Yes	Yes	Yes	Yes	Yes	Yes
Land Use Plan	Yes	No	No Data	No Data	No Data	Zoning Map	No Data	No	Yes, Zoning Department	Yes Building Department
Subdivision Ordinances	Yes	No	No Data	Yes	Yes	Yes	No Data	No	Yes, Zoning	No
Development Regulations	Yes	Yes	No Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zoning Ordinance	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hazard Mitigation Plan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Floodplain Regulations	Yes	Yes	No Data	Yes	No	Yes	No	Yes	Yes	Yes
Floodplain Management Regulations	Yes (2008)	No	No Data	No	No	Yes	No	No	Yes	Yes
- Floodplain Administrator	Yes	Yes	No Data	Yes	No Data	Yes – Eng. Dept.	No Data	Yes	Yes - Eng. Dept.	Yes - Engineer
- # Structures in Floodplain	No Data	No Data	No Data	No Data	No Data	No Data	No Data	4	No Data	No Data
- # NFIP policies	195	28	1	No Data	1	64	No Data	3	383	165
- # Repetitive loss structures	24	0	3	0	0	12	0	0	25	34
Community Rating System Rating	No	No	No Data	No Data	No Data	No Data	No Data	No Data	Class 3	Yes
Storm Water Management Program	Yes	Yes	No Data	No	Yes	Yes – Erie County Soil and Water	Yes	No	Yes	Yes
Building Codes	No	Yes	No Data	No	Yes	Yes	Yes	Yes - Huron Township	Yes	Yes

	Erie County	Village of Bay View	City of Bellevue	Village of Berlin Heights	Village of Castalia	City of Huron	Kelley's Island	Village of Milan	City of Sandusky	City of Vermilion
- Building Official	No	Yes	No Data	Yes	Yes	Yes	No Data	Yes - Huron Township	Yes - Bldg. Dept.	Yes Building Dept.
- Building Inspections	No	Yes	No Data	Yes	Yes	Yes – through Township	No Data	Class 3 Residential, Class 4 Commercial / Industrial	Yes	Yes
- Building Code Effectiveness Grading Schedule (BCEGS) Rating	No	No	No Data	No	No Data	No Data	No Data	Yes	Yes	No Data
Warning Systems	Yes	Yes	No Data	Yes	No Data	Yes	No Data	Yes	Yes	Yes
- Outdoor Warning Sirens	Yes	Yes	No Data	Yes	Yes	Yes – through County	Yes	Yes	Yes	Yes
- NOAA Weather Radio	No Data	No Data	No Data	No Data	Yes	Yes	No Data	Yes	Yes	No
- Reverse 911	Yes	No Data	No Data	No	No Data	No Data	No Data	No	Yes (Through County)	No
- Other	No Data	No Data	No Data	No Data	No Data	Social Media, Direct Text, Email, Apps	No Data	OneCall Now	No Data	Text Marketing
Capital Improvement Budget	No Data	No	No Data	No Data	Yes	Yes	Yes	\$250K	Yes	Yes
Public Works Budget	No Data	No	No Data	No	No Data	Yes	No Data	\$3.2M	Yes	Yes
Structural Protection Projects	No Data	Yes	No Data	No	No Data	Yes	No Data	\$100K Wastewater Treatment Plant Upgrades	No	No Data
Property Protection Projects	No	Yes	No Data	No	No Data	No	No Data	None	Yes - Annually	No Data
Critical Facility Protection	No	No	No Data	No	No Data	Yes	No Data	\$500K Electrical Substation Upgrade	No	No

	Erie County	Village of Bay View	City of Bellevue	Village of Berlin Heights	Village of Castalia	City of Huron	Kelley's Island	Village of Milan	City of Sandusky	City of Vermilion
Cultural or Natural Resource Inventory	No	No	No Data	No	No Data	No	No Data	No	Tree Inventory - GIS	Tree Inventory GIS
Erosion/Sediment Control	Yes	No	No Data	No	No Data	Yes	No Data	Erie County Soil and Water	Yes - form and permit	No
Public Information/Educational Program	No	No	No Data	No	No Data	Yes – Social Media, Quarterly Newsletter, Direct Mail, Direct Texting	No Data	Working on Disaster Plan	No	Working on a Disaster Plan

	Berlin Township	Florence Township	Groton Township	Huron Township	Margaretta Township	Milan Township	Oxford Township	Perkins Township	Vermilion Township
Comprehensive Plan	Yes	Yes	No Data	Yes	No Data	No Data	Yes	Yes - under revision	Yes
Planning Commission	Yes – through County	Yes – through County	No Data	Yes	No Data	Yes	Yes - through County	Yes	Yes
Land Use Plan	Yes	Yes	No Data	Yes	No Data	Yes	Yes	Yes	Yes
Subdivision Ordinances	Yes	No Data	No Data	Yes – through County	No Data	Yes	No Data	Yes, through Erie Regional Planning Commission	Yes-through County Regional Planning
Development Regulations	Yes	Yes	No Data	Yes – through County	No Data	Yes	Yes	Yes	Yes
Zoning Ordinance	Yes	Yes	No Data	Yes	No Data	Yes	Yes	Yes	Yes
Hazard Mitigation Plan	Yes - through County	Yes - through County	Yes - through County	Yes	Yes - through County	Yes - through County	Yes - through County	Yes, through County	Yes-through County
Floodplain Regulations	Yes - through County	Yes - through County	Yes - through County	Yes	Yes - through County	Yes - through County	Yes - through County	Yes, through County	Yes-through County
Floodplain Management Regulations	Yes - through County	Yes - through County	Yes - through County	Yes	Yes - through County	Yes - through County	Yes - through County	Yes, through County	Yes-through County
- Floodplain Administrator	Yes - through County	Yes - through County	Yes - through County	Yes - through County	Yes - through County	Yes - through County	Yes - through County	Yes, through Erie Regional Planning Commission	Yes-through County
- # Structures in Floodplain	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
- # NFIP policies	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
- # Repetitive loss structures	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	Unknown
Community Rating System Rating	No	No	No Data	No Data	No Data	No Data	No	Unsure	Unknown

	Berlin Township	Florence Township	Groton Township	Huron Township	Margaretta Township	Milan Township	Oxford Township	Perkins Township	Vermilion Township
Storm Water Management Program	Yes – through County	Yes – through County	No Data	Yes – through County	No Data	Yes	Yes - through County	Yes, contract with County Soil and Water	Through County
Building Codes	Yes	Zoning	No Data	Yes	No Data	Yes	Yes	Yes, Ohio Building Code (Commercial), Residential Code of Ohio. Perkins is state-certified Building Dept.	Yes State Certified Building Dept.- Residential and Commercial/Industrial
- Building Official	Yes	Zoning	No Data	Yes	No Data	Yes	Zoning	Yes	Yes
- Building Inspections	Yes	No Data	No Data	Yes	No Data	Yes	Yes	Yes	Yes
- Building Code Effectiveness Grading Schedule (BCEGS) Rating	No Data	No Data	No Data	3	No Data	No Data	No Data	No Data	No Data
Warning Systems	Yes	Yes	No Data	Yes	No Data	No Data	Yes	Yes	Yes
- Outdoor Warning Sirens	Yes	Yes	No Data	Yes	No Data	Yes	Yes	Yes	Yes
- NOAA Weather Radio	Yes	Yes	No Data	No Data	No Data	No Data	No Data	Yes	No Data
- Reverse 911	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No	No
- Other	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Capital Improvement Budget	No Data	No Data	No Data	Yes	No Data	Yes	No Data	Yes	Yes
Public Works Budget	No Data	No Data	No Data	Yes	No Data	No Data	No Data	Yes	No Data
Structural Protection Projects	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No data	No Data
Property Protection Projects	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No data	No Data
Critical Facility Protection	No Data	No Data	No Data	Yes	No Data	No Data	No Data	No data	No Data

	Berlin Township	Florence Township	Groton Township	Huron Township	Margaretta Township	Milan Township	Oxford Township	Perkins Township	Vermilion Township
Cultural or Natural Resource Inventory	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No data	No Data
Erosion/Sediment Control	No Data	No Data	Yes – through County	No Data	No Data	No Data	No Data	Yes, contract through County Soil & Water	No Data
Public Information/Educational Program	No Data	No Data	Yes	No Data	No Data	No Data	No Data	Yes	No Data

Zoning Ordinances: Regulates development by dividing the community into zones or districts and establishing the type of development allowed within each district. The floodplain can be designated as one or more separate zoning districts in which development is prohibited or allowed only if it is not susceptible to flood damage. Some districts that are appropriate for floodplains are those designated for public use, conservation, or agriculture. Zoning works best in conjunction with a comprehensive plan or "road map" for future development and building codes.

While Erie County does not have a countywide zoning ordinance, each of the townships has zoning ordinances and many of the jurisdictions either have their own zoning regulations or they use their township's. In Erie County, zoning regulations are the primary mechanism used to address hazard mitigation by many of the jurisdictions and townships.

- Berlin Township Zoning Ordinances – includes Article 12 addressing conservation/recreation district and acts to protect the public health, safety, comfort and welfare and reducing financial burdens imposed by flooding by restricting use in the designated areas and Article 27 addressing the floodplain, floodway and wetland overlay district, designed to protect lands that are subject to predictable, frequent flooding. Also includes some directives towards stormwater management plans and erosion control for certain land uses. Potential improvements could be included in the mobile home park section, requiring storm shelters for the residents.
- City of Bellevue Zoning Ordinances do not address floods, erosion or stormwater management. However, their Building code includes Flood Damage Reduction Regulations that restrict development on the floodplain and require that facilities that are at risk of flood damage be protected during initial construction.
- City of Huron Zoning Ordinance – Includes a Flood Hazard Zoning/Flood Damage Reduction chapter that restricts development on the floodplain, encourages appropriate uses for land that falls under special flood hazard areas, and regulates how the land may be developed in order to ensure flooding is not worsened in that location or other locations.
- City of Sandusky Planning and Zoning Code – Includes a Flood Damage Reduction chapter that pertains to any special flood hazard area annexed by the City of Sandusky. The regulations restrict or prohibit development in the flood hazard areas and require uses vulnerable to flooding be constructed in ways to protect them.
- City of Vermilion Zoning – Includes a Flood Plain District and requires that a Flood Plain Evaluation Study must be submitted for any exterior project in the flood plain.
- Florence Township Zoning Book – does not have a specific section restricting development in a floodplain or floodway. Instead all new zoning permit applications must identify any areas within a floodplain on the property. Plan must

be written to prevent soil erosion, excessive runoff, excessive raising or lowering of the water table, and flooding of other properties.

- Huron Township Zoning Resolution – Includes a Flood Hazard Area section that specifically permits crop farming and gardening, open recreational uses, public rights-of-way, private drives and porous parking lots, and public utilities and accessory surface structures. Other uses may be permitted as well but are subject to special conditions aimed at reducing flood damage risk, such as having a minimum elevation of three or more feet above the floodplain level.
- Margaretta Township Zoning Ordinances – Does not have a specific section restricting development on floodplains and floodways, but states that new site plan applications must identify areas that are within a floodplain and include plans to prevent erosion, excessive run-off, excessive raising or lowering of the water table. It is further stated that all storm-water drainage plans must be developed in accordance with the Erie County Storm-water and Sediment Control regulations. Elevations plans may also be required by the Zoning Board.
- Milan Township Zoning Resolution – Contains Article 24 Floodplain, Floodway & Wetland Overlay District, which is designed to protect lands that are subject to predictable flooding. Allowable uses in the floodplain include general farming, pasture, outdoor plant nurseries, horticulture, forestry, wildlife sanctuary, game far, or other similar agricultural or wildlife related uses; unpaved parking lots or heliports; lawns, gardens, play areas; and outdoor recreation areas that do not require paved surfaces. The Resolution specifies strict requirements for any structure on the floodplain and requires that landscaping plans be reviewed and approved.
- Perkins Township Zoning Resolution – As does Milan Township's Zoning Resolution, Perkins Township Zoning Resolution contains Article 24 Floodplain, Floodway & Wetland Overlay District which is designed to protect lands that are subject to predictable flooding. Allowable uses in the floodplain include general farming, pasture, outdoor plant nurseries, horticulture, forestry, wildlife sanctuary, game far, or other similar agricultural or wildlife related uses; unpaved parking lots or heliports; lawns, gardens, play areas; and outdoor recreation areas that do not require paved surfaces. The Resolution specifies strict requirements for any structure on the floodplain and requires that landscaping plans be reviewed and approved.
- Vermilion Township Zoning Resolution – Contains Article 21 Floodplain, Floodway and Wetland Overlay District which is designed to protect lands that are subject to predictable flooding. Allowable uses in the floodplain include general farming, pasture, outdoor plant nurseries, horticulture, forestry, wildlife sanctuary, game far, or other similar agricultural or wildlife related uses; unpaved parking lots or heliports; lawns, gardens, play areas; and outdoor recreation areas that do not require paved surfaces. The Resolution specifies strict requirements for any structure on the floodplain and requires that landscaping plans be reviewed and approved.

- Village of Bay View Zoning Resolution – Does not have specific references to development on the floodplain nor erosion control regulations. Culverts to drain stormwater are to be sized to meet engineering standards.
- Village of Berlin Heights Zoning Ordinance – Mandates that a pre-development plan must identify any areas that are located within a floodplain and that plans must be in place to prevent pollution of surface or groundwater, erosion of soil during and after construction, excessive run-off, and excessive raising or lowering of the water table. Landscape plans must also indicate all existing water sources, including wetlands, floodplains and drainage retention areas, and indicate what changes will be made.
- Village of Kelleys Island Ordinances – Includes floodplain regulations as a step to become a participant in the National Flood Insurance Program. The ordinance is applicable to new development and restricts or prohibits development on the floodplain if it would endanger the health, safety or property during a flood. Also has subdivision regulations and zoning ordinances which also address limiting damage caused by flood by restricting development.
- Village of Milan Planning and Zoning Code – Do not include specific flood, stormwater or erosion control measures. However, the Village of Milan's Building Code specifies that the Building Inspector shall determine whether the proposed building site is safe from flooding, or if it is located in a flood hazard area, specific actions are taken to minimize flood damage. Additional regulations are included in the Flood Damage Reduction section of the Building Code, which restrict or prohibit land uses which are dangerous to health, safety and property due to flooding, and requires buildings with potential for flood damage to be constructed in ways to minimize damage.

Development Regulations: Further specify how development can occur. Subdivision Regulations govern how land will be broken up into individual lots. These regulations set construction and location standards for the infrastructure built by the developer, including roads, sidewalks, utility lines, storm sewers, stormwater retention or detention basins, and drainage ways.

The National Flood Insurance Program (NFIP): A voluntary program which requires the development of a floodplain ordinance. Erie County has an approved floodplain management ordinance that protects human life and health, preserves property, and minimizes damage to public facilities and utilities. Erie County Regional Planning Commission plans to update these regulations as soon as the new coastal flood maps from FEMA are finalized.

Stormwater Management Regulations: Provide for the conveyance of stormwater to decrease flooding. In Erie County, the Stormwater Management Rules and Regulations and Erosion Control have been adopted by the Board of County Commissioners and are included in the Subdivision Regulations of Erie County. These rules and regulations inform the public about the stormwater policy and design practices and assist professionals in

the review and development of proposals. It includes regulations with the intended purpose of allowing development without increasing downstream flooding, erosion or sedimentation; maintain water quality goals; and reduce damage to streams that may inhibit their capacity. Erie County's Stormwater Management Rules and Regulations address the hazards of flooding, lake/stream bank erosion, and natural biohazards.

Adoption and enforcement of building codes ensure that both residential and non-residential structures are safe. Building codes provide some of the best methods of addressing all the hazards in this plan. They are the prime measure to protect new property from damage by high winds, tornadoes, earthquakes, hail, and winter storms. When properly designed and constructed according to code, the average building can withstand the impact of most of these forces. The Core Group indicated that it is unlikely that they would pass more stringent building codes than the State of Ohio has adopted.

A local historic district ordinance enables a community to regulate development in a specific, designated area of historic significance. A historic district ordinance is included in Erie County's comprehensive plan.

5.6 Planning Capabilities

Comprehensive Planning: Is a type of long-range planning for a particular community that determines goals and a vision for the future. Erie County last developed a Comprehensive Plan in 1995 and the Cities of Huron, Sandusky, and Vermilion all have their own, more recent Comprehensive Plans. Oxford, Perkins and Vermilion Townships also have their own comprehensive plans; however, Perkins Township is in the process of revising their plan. Comprehensive plans and land use plans can specify how a community should be or should not be developed. Through these plans, uses of land can be tailored to match the hazards present. When mitigation ideas are incorporated into comprehensive plans, they become a powerful tool for a community to address the hazards they face. Upon review of the existing comprehensive plans for the County and jurisdictions within Erie County, there is room for improvement where integrating mitigation concepts are concerned.

Comprehensive planning reflects what a community wants to see happen to their land in the future. A comprehensive plan can look 5, 10, or even 20 years into the future to help a community plan and shape how they envision their community.

Emergency Operations Planning: The Erie County Emergency Operations Plan (EOP) is a requirement of the Ohio Revised Code, Section 5502.271. The purpose of this EOP is to predetermine, to the extent possible, actions to be taken by the governmental jurisdictions of Erie County to prevent avoidable disasters and respond quickly and adequately to emergencies in order to protect the lives and property of the residents of Erie County.

The EOP is designed to work for all types of natural and man-made disasters. The document has a Base Plan which defines and identifies areas of potential risk, lists people and organizations involved in response, and discusses plan development and maintenance. The Base Plan is augmented with annexes that describe the details of

various aspects of emergency response. Some examples of these annexes include Direction and Control, Notification and Warning, Law Enforcement, Medical, Anti-Terrorism, and Resource Management.

The plan also contains guidelines with respect to roles and responsibilities. The Emergency Operations Center (EOC) is responsible for directing and controlling the conduct of emergency operations from that center, or from an alternate facility during emergencies. The EOC, in coordination with the Incident Commander at the site, will be the point of contact for all operating/responding departments and agencies, other counties and the State.

Watershed Planning: Four river basins influence drainage in Erie County: The Black River and Rocky River in Lorain County drain the northeastern corner of Erie County, the eastern portion of the county drains to the Huron River and Vermilion River, the western portion of the county is drained by the Sandusky River and Green Creek, and the islands of Erie County drain into Lake Erie. All four river basins flow into Lake Erie.

Currently the only state endorsed watershed action plan in Erie County is for Old Woman Creek²⁷. In addition, the Firelands Coastal Tributaries Watershed Program covers Erie County's small watersheds.²⁸

Emergency Action Planning for Dams: In Ohio, most dams are constructed of earthen materials. Dams must have spillway systems to safely convey normal stream and flood flows over, around, or through the dam. Spillways are commonly constructed of non-erosive materials such as concrete. Dams also have a drain or other water-withdrawal facility to control the pool or lake level and to lower or drain the lake for normal maintenance and emergency purposes.

There are no Class I dams in Erie County and no Emergency Action Plans (EAPs) for existing dams. Typically, an EAP addresses ways to safeguard lives and reduce property damage within the inundation area; procedures for effective dam surveillance; procedures for prompt notification of emergency management officials; warning and evacuation procedures; and emergency response actions that will be taken in the event of potential or imminent failure of the dam.

Ohio Administrative Code Rule 1501:21-13-01, dams are classified as follows:

²⁷ (Ohio Environmental Protection Agency, 2020)

²⁸ (Ohio State University Extension, 2020)

Table 7: Ohio Dam Classification Systems^{29,30}

Ohio Dam Classification	Description	Corresponding Federal Classification
Class I	Probable loss of life, serious hazard to health, structural damage to high value property (i.e., homes, industries, major public utilities)	High
Class II	Flood water damage to homes, businesses, industrial structures (no loss of life envisioned), damage to state and interstate highways, railroads, only access to residential areas	Significant
Class III	Damage to low value non- residential structures, local roads, agricultural crops and livestock	Significant
Class IV	Losses restricted mainly to the dam	Low

Erie County has two dams that are classified as Class III, and 16 dams that are classified as “Other” according to the GIS data available from the Ohio Department of Natural Resources. The “Other” category includes Class IV dams as well as dams not requiring classification. There are no Class I or Class II dams in Erie County.

There is one dam, Work Lake Dam No. 2, in Erie County recorded in the National Inventory of Dams (NID). According to the National Performance of Dams Program (NPDP) the dam is a low hazard without any previous incidents.

5.7 Additional Capabilities

A variety of additional capabilities are established in Erie County. These capabilities can support the implementation of mitigation actions that are proposed in this plan. One of these capabilities is the State of Ohio Rain Snow Monitoring System, also known as STORMS. The State of Ohio Rain/Snow Monitoring System (STORMS) is an automated rain gauge system that monitors an area's snow and rainfall for potential flooding while transmitting current, real-time precipitation data to the State of Ohio Emergency Operations Center, the ODNR, the NWS and county emergency management agencies. The rain gauges are usually positioned near watersheds and report data 24 hours a day to computers in Columbus and are used by NWS as a prediction tool for flood and flash flood watches and warnings. Local governments are also able to access the data through special computer systems connected to the gauges.

5.8 Other Resources

Support for mitigation planning also is provided by the State of Ohio and the Federal Government. Programs that complement Erie County mitigation planning initiatives are:

- Ohio administered programs include the following:
 - Ohio Department of Development: Provide grants for job ready sites and community development block for economic development.

²⁹ (Ohio Department of Natural Resources, 2020)

³⁰ (Ohio Emergency Management Agency, 2019)

- Ohio Department of Natural Resources: Provide support for land and water conservation efforts.
- Ohio Environmental Protection Agency: Provide grants and loans for capital improvements within a community.
- Federal Government programs include the following:
 - Unified Hazard Mitigation Assistance Grant Programs: Provide grants for cost-effective mitigation projects either in the absence of a disaster or after a disaster declaration has occurred.
 - Pre-Disaster Mitigation Assistance Program (PDM)
 - Flood Mitigation Assistance Program (FMA)
 - Repetitive Flood Claims Program (RFC)
 - Severe Repetitive Loss Program (SRL)
 - Hazard Mitigation Grant Program (HMGP)
 - Community Development Block Grants: Provides funds to address a wide range of community development needs.
 - Small Communities Program Fund: Supports water quality infrastructure projects.
 - Weatherization Assistance Program: Enables low-income households to make their homes more energy efficient.
 - Firewise Communities Program: Involves homeowners and community leaders in protecting structures from fire damage.

5.9 Structure Assessment

The purpose of this section is to identify type, quantity, and value associated with each structure within Erie County. This information is utilized when determining the vulnerability of the built environment for each hazard as well as helping to quantify the potential damages when a disaster occurs. Table 8 was created from information provided in the Hazus-MH software and shows the type and approximate value associated with each structure within Erie County.

Table 8: Structure Inventory

	Residential		Non-Residential	
	Number of Structures	Average Building Value	Number of Structures	Average Building Value
Erie County	31,940	\$249,280	3,164	\$875,158

6 Hazard Identification

To reduce the potential for damage due to hazards, it is necessary to identify hazards that may affect the county. This process is completed using published information and online sources that address hazards globally, nationally, within Ohio, or specifically within Erie County as well as subject matter expertise provided by members of the Mitigation Core Group and the public.

Hazards which were identified and examined in this plan update as required by the Disaster Mitigation Act of 2000 are as follows:

- Damaging Winds
- Drought
- Earthquakes
- Flooding
- Lake/Stream Bank Erosion
- Natural Biohazards (including Invasive Species and Harmful Algae Blooms)
- Severe Summer Weather
- Severe Winter Weather
- Tornadoes/Waterspouts

6.1 Description of Hazards

The descriptions of hazards included in the 2020 Plan are based on publicly available data provided by the National Oceanographic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) and the Ohio Department of Natural Resources. The hazard data was evaluated by the Mitigation Core Group during the first planning meeting and during an online survey following the meeting. The Mitigation Core Group modified the prioritization used in the last plan update to include considerations of vulnerability, consequence, and frequency of each hazard type rather than solely on previous occurrences. Table 9 summarizes each hazard that may affect Erie County, in alphabetical order.

Table 9: Descriptions of Natural Hazards Addressed in This Plan

Hazard	General Description of Hazard
Damaging Winds	Damaging winds are sometimes called straight-line winds to differentiate them from tornadoes. There are many different types of damaging winds: downdrafts, macrobursts, microbursts, gust fronts, derechos, and haboobs (these do not occur in Ohio other than the impacts from dust). Damaging winds are usually associated with thunderstorms but can also be caused by a strong weather system or can flow down a mountain. Isolated damage is possible when winds have a sustained speed of 40-50 miles per hour. Higher wind speeds can cause substantial damage, and cause injuries or death to people through blown debris or destroyed structures.
Droughts	A drought is a period of prolonged dryness that contributes to depletion of ground water and surface water. Adverse consequences of drought include insufficient supplies of water for

Hazard	General Description of Hazard
	<p>human consumption as well as agricultural and industrial uses and deterioration of water quality. High temperatures, prolonged winds, and low relative humidity can exacerbate the severity of drought. The probability of wildfires increases as the severity and duration of a drought increases.</p>
Earthquakes	<p>Earthquakes are the sudden motion or trembling of the ground caused by the breaking and shifting of rock beneath the surface of the earth. Ground shaking from earthquakes can collapse buildings and bridges and disrupt gas, electric, and phone service.</p>
Flooding	<p>A flood is a natural event for rivers and streams. In Erie County excess water from snowmelt or rainfall accumulates and overflows the stream banks into adjacent floodplains.</p> <p>Floods are considered hazards when people and property are affected. Nationwide, hundreds of floods occur each year, making it one of the most common hazards in all 50 states and U.S. territories. In Ohio, flooding can occur during any season of the year. Serious flooding occurs regularly along Ohio's major rivers and streams.</p> <p>Additionally, ice jams can cause flooding during winter months. Ice jams occur when water builds up behind a blockage of ice. Typically, these are due to a heavy rain that causes a frozen river to swell, which breaks the ice on the surface of the river. Ice is carried by the current and accumulates at narrow passages or obstructions.</p> <p>Karst geology can also lead to unique flooding problems. During periods of heavy precipitation, rain water or snow melt can quickly infiltrate the groundwater through sinkholes, causing the groundwater level to rise. This can cause other areas that typically act as a basin to collect runoff to turn into springs and flood the surrounding area.</p>
Lake/Stream Bank Erosion	<p>Lake erosion is the gradual wearing and carrying away of land or beach materials by wave action, water, wind, general weather conditions and tidal currents. Stream bank erosion is the direct removal of banks and beds by flowing water. These types of erosion are typically caused by a rise in sea level and high stream flow.</p>
Natural Biohazards	<p>Natural biohazards are natural elements that can pose a threat to human health or the ecosystem under certain conditions. In this plan, two separate natural biohazards are considered: Invasive Species and Harmful Algae Blooms (HABs).</p> <p>The National Invasive Species Council defines an invasive species as one that "is both non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause</p>

Hazard	General Description of Hazard
	<p>economic or environmental harm, or harm to human health." Invasive species include plants, aquatic life, and insects.</p> <p>The Ohio Sea Grant Program states Harmful Algal Blooms (HAB) are caused by a combination of warm water temperatures (above 60 degrees Fahrenheit) and high concentrations of phosphorus in the water. Typically, a high concentration of phosphorus and nitrogen in cold weather will produce a bloom of diatoms, in cool weather this causes a bloom of green algae, and in warm weather often blue-green algae is found.</p>
Severe Summer Weather	<p>Severe Summer Weather includes thunderstorms, hail, and lightning. Thunderstorms may occur at any time of the year and just about anywhere in the world. A thunderstorm forms when moist, unstable air is lifted vertically into the atmosphere.</p> <p>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. Hail forms only in thunderstorms, in cumulonimbus clouds that contain vast amounts of energy in the form of updrafts and downdrafts.</p> <p>Lightning occurs in all thunderstorms. It is one of the major causes of storm related deaths in the United States. In addition to deaths and injuries, lightning can cause significant damage to communication networks and electrical networks, leading to power and communication outages. Lightning can also cause wildfires.</p>
Severe Winter Weather	<p>Heavy snow and ice are caused by winter storms bringing frozen precipitation and cold temperatures to an area. Heavy accumulations of ice can cause extensive damage by bringing down trees and toppling utility poles and communication towers, which disrupts power and communications. Winter storms may also lead to the collapse of roofs in deteriorated structures.</p>
Tornadoes/Waterspouts	<p>A tornado is an extraordinary feature generally associated with severe thunderstorms or hurricanes. A tornado is characterized by a funnel of violently rotating winds. While the extent of tornado damage is usually localized, the extreme winds of a tornado are among the most destructive and can cause millions of dollars of damage and loss of life when they move through populated, developed areas.</p> <p>Tornadoes can occur at any time but most frequently occur during the late afternoon or early evening, the warmest hours of the day. Peak months for tornado activity are April, May, and June.</p>

Hazard	General Description of Hazard
	There are two types of waterspouts, tornadic waterspouts and fair weather waterspouts. Tornadic waterspouts are tornadoes that are either formed over water or move from land to water. They can be as dangerous as a tornado, and can be accompanied by severe thunderstorms, lightning, dangerous hail, and high winds and seas. Fair weather waterspouts are not typically associated with thunderstorms and typically move very little. They form at the surface of the water, and rise, so by the time they are noticed, they are nearly fully developed.

Lake Level Rise was under consideration for inclusion as its own hazard for this plan update. However, after additional research was done, the committee decided that lake level rise was determined to be more appropriately included as an exacerbating factor in flooding and lake/stream bank erosion hazards and was included in those sections.

7 Hazard Risk Assessment

7.1 Damaging Winds

7.1.1 Hazard Profile

Damaging winds can also be called wind storms or straight-line winds to differentiate them from tornadoes. Like tornadoes, they are frequently associated with severe thunderstorms, however, they can occur without an obvious thunderstorm, which is why they are considered a separate hazard in this mitigation plan. Wind can cause isolated damage at sustained wind speeds of just 40-50 miles per hour but is considered severe if it exceeds 58 miles per hour. Damaging winds can occur any time of year, so they are not considered just summer weather or winter weather.

Damaging winds that are not associated with thunderstorms can be caused by strong weather systems, daytime heating of the ground surface, or can flow down a mountain. Damaging winds associated with thunderstorms can take on many types: downdraft, macroburst, microburst, downburst, gust front, derecho or a haboob.

Downdrafts occur when a column of cold, dense, moist air, originating at high altitudes, sinks down towards the surface of the earth, and spreads out along the ground. Intense downdrafts can be classified as macrobursts or microbursts.

Macrobursts occur when a downdraft causes the strong winds at the ground surface to extend more than 2.4 miles. Macrobursts usually form with a thunderstorm but can also form during storms too weak to produce thunder.

Microbursts are smaller in scale than macrobursts, not exceeding 2.5 miles, and shorter in duration, lasting only 5-10 minutes. Microbursts can be accompanied by heavy precipitation or they can have little or no precipitation. The dry microbursts are more common in the high plains or intermountain regions of the western United States.

A gust front happens when the leading edge of a thunderstorm is cooled by rain, and clashes with the warmer air of the thunderstorm. It is characterized by temperature drops, gusty winds, and changing wind directions.

Derechos are very long lasting and widespread windstorms that is typically composed of several microbursts or macrobursts. If the damage path exceeds 250 miles and includes wind gusts of at least 58 miles per hour, meteorologists may classify the storm a derecho.

Haboobs are dust storms caused by downdrafts and are characterized by a wall of dust.³¹ Ohio often is exposed to the dust caused by haboobs in other parts of the world carried by strong wind currents.

³¹ (National Oceanic & Atmospheric Administration, n.d.)

7.1.2 Location

In the United States, anywhere that a thunderstorm can occur is at risk for damaging winds. However, as previously stated, certain types of damaging winds, such as dry microbursts are more common in other parts of the US and are not likely in Erie County. Damaging winds are equally likely to occur anywhere in Erie County and its jurisdictions. Individual damaging wind storms may affect the entire County or a localized portion.

7.1.3 Extent

Wind can produce damage with gusts as low as 40-50 miles per hour but are not considered severe until wind speeds reach 58 miles per hour. In Erie County, the highest wind speed for a damaging wind event, not associated with a thunderstorm was 68 miles per hour. However, Erie County has had wind storm events with recorded property damage with wind speeds of just 35 miles per hour.

7.1.4 Previous Occurrences

Between 1996 and 2019, there have been 46 reported occurrences of damaging winds not associated with thunderstorms. Table 10, below, is a list of these storms.

High Winds September 2008. High winds associated with the remnants of Hurricane Ike began during the early evening hours of September 14th and continued through late evening. Peak wind gusts were estimated to be around 60 mph with the strongest winds occurring between 6 pm and 8 pm. Damage in the county was extensive with hundreds of trees and many utility poles downed. Widespread power outages occurred as well with some customers without power for a few days. Many homes and buildings were damaged across the county. The damage ranged from a few shingles torn off to significant structural damage caused by fallen trees landing on roofs. Numerous vehicles were damaged by fallen trees and limbs and also from flying debris. This storm hampered travel as downed trees and power lines forced the closure of many roads. Substantial cleanup costs were incurred by local governments. Some of the schools in the county were forced to close on Monday the 15th because of the power outages. Significant crop losses occurred as well. Corn yields were reduced between 3 and 5 percent in many areas with lesser losses to the soybean crop.

Hurricane Sandy October 2012. Winds in Erie County gusted to over 60 mph for a sustained period of time. A peak gust of 62 mph was measured by an automated sensor at the Huron Lighthouse. Hundreds of trees were downed in the county with most of the damage near the Lake Erie shoreline. Up to 4,000 electric customers lost power. There were reports of trees on houses and vehicles. Many homes also lost sections of roofing and siding. A lot of streets had to be closed because of downed trees and power lines. The following table details the occurrence of damaging winds in Erie County between 1996 and 2019.

Table 10: Previous Occurrences of Damaging Winds in Erie County 1996-2019

Location	Date	Type	Magnitude (MPH)	Deaths	Injuries	Property Damage	Crop Damage
Erie (Zone)	1/27/1996	High Wind	68	0	0	\$-	\$-
Erie (Zone)	1/29/1996	High Wind	50	0	0	\$-	\$-
Erie (Zone)	2/10/1996	High Wind	50	0	0	\$3,000	\$-
Erie (Zone)	3/25/1996	High Wind	50	0	0	\$10,000	\$-
Erie (Zone)	4/25/1996	High Wind	50	0	0	\$-	\$-
Erie (Zone)	9/7/1996	High Wind	50	0	0	\$3,000	\$20,000
Erie (Zone)	10/30/1996	High Wind	52	0	0	\$50,000	\$50,000
Erie (Zone)	2/21/1997	High Wind	50	0	0	\$1,000	\$-
Erie (Zone)	2/27/1997	High Wind	50	0	0	\$5,000	\$-
Erie (Zone)	9/29/1997	High Wind	-	0	0	\$2,000	\$-
Erie (Zone)	3/28/1998	High Wind	-	0	0	\$10,000	\$-
Erie (Zone)	11/10/1998	High Wind	-	0	0	\$20,000	\$-
Erie (Zone)	11/11/1998	High Wind	52	0	0	\$500,000	\$-
Erie (Zone)	5/6/1999	High Wind	-	0	0	\$15,000	\$-
Erie (Zone)	12/11/2000	High Wind	-	0	0	\$150,000	\$-
Erie (Zone)	2/9/2001	High Wind	-	0	0	\$10,000	\$-
Erie (Zone)	2/25/2001	High Wind	-	0	0	\$10,000	\$-
Erie (Zone)	4/12/2001	High Wind	-	0	0	\$15,000	\$-
Erie (Zone)	10/25/2001	High Wind	-	0	0	\$15,000	\$-
Erie (Zone)	2/1/2002	High Wind	-	0	0	\$500,000	\$-
Erie (Zone)	3/9/2002	High Wind	-	0	0	\$400,000	\$-
Erie (Zone)	2/12/2003	High Wind	50	0	0	\$125,000	\$-
Erie (Zone)	5/11/2003	Strong Wind	35	0	0	\$50,000	\$-
Erie (Zone)	10/14/2003	Strong Wind	35	0	0	\$10,000	\$-
Erie (Zone)	11/12/2003	High Wind	50	0	0	\$60,000	\$-
Erie (Zone)	3/5/2004	High Wind	50	0	0	\$75,000	\$-
Erie (Zone)	11/27/2004	Strong Wind	35	0	0	\$5,000	\$-
Erie (Zone)	12/1/2004	High Wind	50	0	0	\$25,000	\$-
Erie (Zone)	12/7/2004	Strong Wind	43	0	0	\$10,000	\$-
Erie (Zone)	11/6/2005	High Wind	50	0	0	\$20,000	\$-
Erie (Zone)	2/17/2006	High Wind	50	0	0	\$50,000	\$-
Erie (Zone)	3/10/2006	Strong Wind	44	0	0	\$10,000	\$-
Erie (Zone)	12/1/2006	High Wind	50	0	0	\$15,000	\$-
Erie (Zone)	12/23/2007	High Wind	50	0	0	\$8,000	\$-
Erie (Zone)	1/30/2008	High Wind	55	0	0	\$30,000	\$-
Erie (Zone)	1/30/2008	High Wind	60	0	0	\$250,000	\$-
Erie (Zone)	9/14/2008	High Wind	52	0	0	\$2,500,000	\$750,000
Erie (Zone)	2/11/2009	High Wind	53	0	0	\$350,000	\$-
Erie (Zone)	12/9/2009	High Wind	53	0	0	\$200,000	\$-
Erie (Zone)	4/28/2011	High Wind	52	0	0	\$10,000	\$-
Erie (Zone)	3/2/2012	High Wind	50	0	0	\$-	\$-
Erie (Zone)	10/29/2012	High Wind	54	0	0	\$750,000	\$-
Erie (Zone)	11/24/2014	High Wind	52	0	0	\$150,000	\$-
Erie (Zone)	12/31/2018	Strong Wind	44	0	0	\$2,000	\$-
Erie (Zone)	2/24/2019	High Wind	50	0	0	\$150,000	\$-
Erie (Zone)	11/27/2019	High Wind	50	0	0	\$100,000	\$-
Totals				0	0	\$6,674,000	\$820,000

7.1.5 Probability of Future Events

The recurrence interval is the average time between hazard events and is calculated by dividing the years on record by the number of events that occurred during that time period. For damaging winds in Erie County, the recurrence interval is 0.52 years. This

means Erie County is likely to experience at least two damaging wind events every year. This equates to a probability of damaging winds to occur in Erie County 192%. As probabilities cannot realistically be over 100%, any hazards with a calculated probability greater than 100% will be limited to 100% probability in any given year.

7.1.6 Vulnerability

Winds are capable of damaging property, including buildings and automobiles, infrastructure, such as electrical power grids, and crops. In Erie County, property is much more vulnerable than crops, based on the historical record. The most severe wind storm on record affecting Erie County, based on losses, occurred in September 2008, when wind storms associated with Hurricane Ike, caused \$2.5 million in property damage and \$750 thousand in crop damage, in Erie County alone. It is possible that another wind storm in Erie County could cause as much in losses as those that occurred in 2008.

While it is possible that well-designed and well-constructed buildings might sustain damage during a damaging wind event, it is much more likely that a building with inadequate design, poor maintenance or poor construction will sustain the damage. Buildings constructed prior to current regulations and mobile homes are particularly vulnerable to damaging winds.

Table 11: Summary of Past Losses Due to Damaging Winds

	Estimated Property Damages
Total Losses Due to Damaging Winds (1996–2019)	\$6,674,000
Average Annual Losses for 24years	\$278,083

According to NCDC and reflected above in Table 11, estimated significant property damage in Erie County attributable to damaging winds during the years 1996 through 2019 is \$6,674,000. The average annual loss for these 24 years is $\$6,674,000/24 = \$278,083$.

7.2 Droughts

7.2.1 Hazard Profile

Drought is typically defined as a period of time with abnormally low precipitation, leading to a shortage of water. Droughts are natural occurrences, but human behavior can exacerbate existing problems if water sources are not managed well. There is no strict definition of what constitutes a drought due to widely varying precipitation amounts based upon location. In the United States, drought is the second most expensive natural hazard, with an average cost of \$9.6 billion per event. Droughts can not only impact people, crops, and farmland, but they can impact more of the ecosystem if waterways such as lakes and rivers experience low water levels that can threaten the plants and animals dependent on the water.

Drought can be divided into four categories that measure the impact of the drought. These categories are not mutually exclusive and often overlap. Meteorological Drought is when the precipitation over an area is much lower than normal. Agricultural Drought occurs when the available water supply is not enough to meet the needs of the farms and ranches in a region. The inadequate water supply may be due to a meteorological drought. A Hydrological Drought occurs when a Meteorological Drought is prolonged enough, that water levels in lakes, rivers, creeks, and groundwater are low. A Hydrological Drought can also impact an Agricultural Drought if the farmers and ranchers in an area depend on surface or groundwater.³²

7.2.2 Location

History has shown that in the event of a drought, entire counties, regions, states and areas of the country may be affected. They are usually widespread events, so drought conditions are typically monitored by areas rather than jurisdictions. Erie County is in Ohio Climate Division 2. During an average year in Ohio, an estimated 15,000 wildfires and natural fuel fires occur. Although droughts can persist for several years, even a short drought with intense heat can cause significant damage and harm to the local economy. With Erie County's proximity to the Lake Erie, most droughts will have smaller effect on water supplies, however, drought can negatively impact agricultural and recreational areas.

7.2.3 Extent

The Palmer Drought Severity Index (PDSI) is used to describe abnormally wet to abnormally dry conditions. Zero represents normal rainfall and temperature conditions; drought condition indices are described in Table 12.

Table 12: Palmer Drought Severity Index

Index	Description of Conditions
4.0 or more	Extremely wet
3.0 to 3.99	Very wet

³² (National Resources Defense Council, 2018)

Index	Description of Conditions
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
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

Data provided by NCDC show that drought conditions in Ohio Climate Division 2 have resulted in Palmer Drought Severity Index level as low as -5.85 for a four-month period in 1934. Figure 13, below, shows the PDSI between 1895 and 2020. Ohio has a generally temperate climate and infrequently has severe droughts over an extended period. Ohio Climate Division has only experienced 25 moderate droughts and 13 severe drought conditions (4 of which were categorized as extreme drought) during the typical summer timeframe when droughts are most likely to impact water supply and crops.

Ohio Climate Division 2 Palmer Drought Severity Index (PDSI)

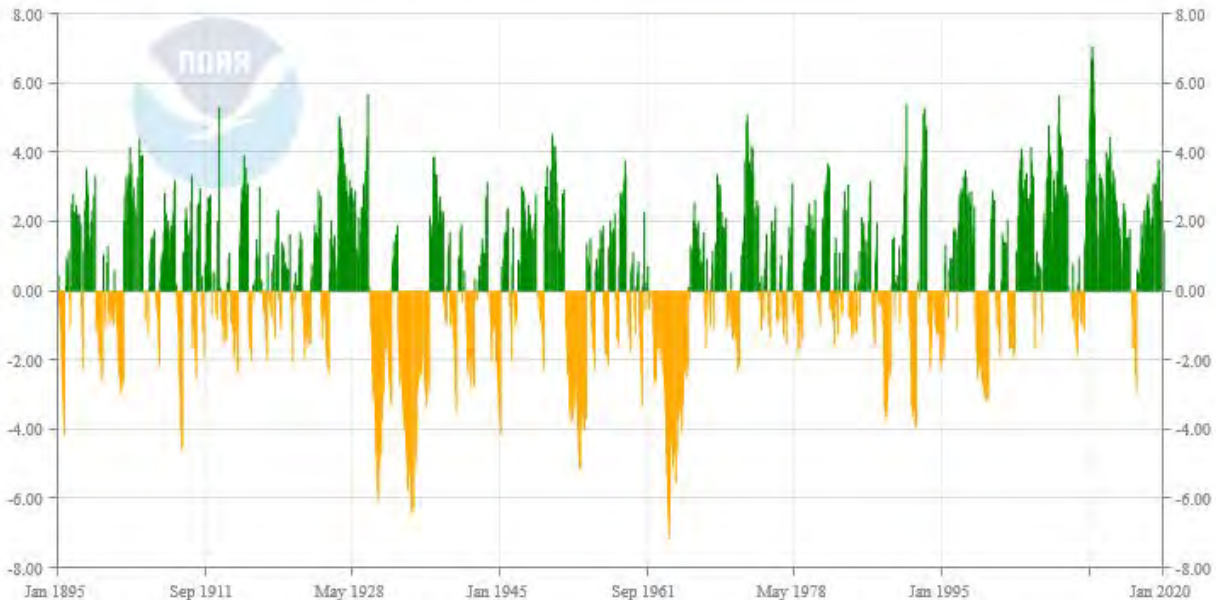


Figure 13: PDSI in Climate Division 2 for the past 125 years

7.2.4 Previous Occurrences

According to the NCDC, Erie County has experienced one drought of significance in the past 118 years, in September of 1999. This drought registers as a -2.58 on the PDSI, which classifies the event as moderate drought. This drought caused \$7,000,000 in crop losses. Since the NCDC data conflicts with the PDSI data available, below is an examination of

a time series of the PDSI for Sandusky (as a representative of the County as a whole). This graph shows that there have been 55 mild or worse periods of drought between 1908 and 2018. The average duration of a drought was 8 months, with the longest lasting 68 months. Overall, Erie County has spent 36.8% of the time between 1908 and 2018 in at least a mild drought.³³

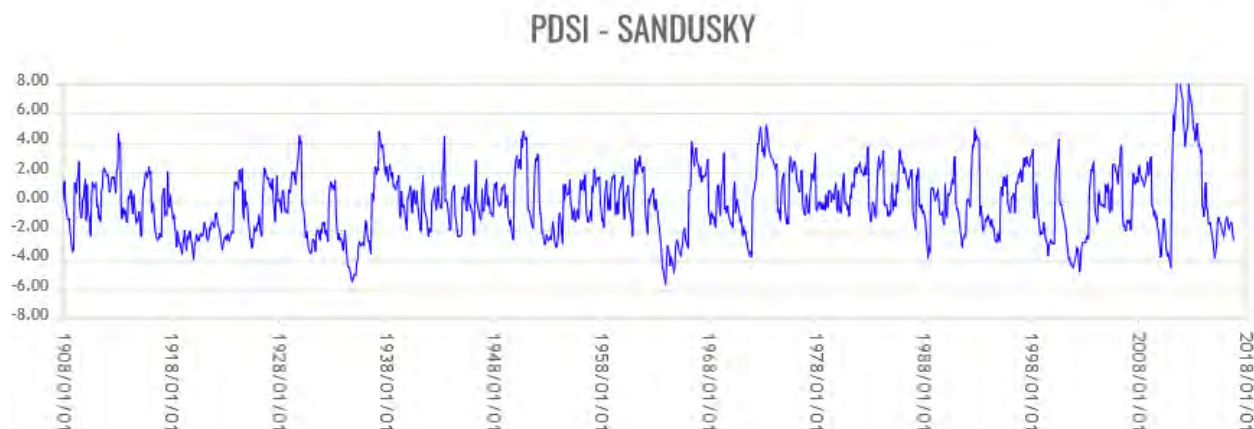


Figure 14: PDSI for Station in Sandusky, Ohio 1908 - 2018

Although not recorded by NCDC, the 2012-2013 North American Drought included most of the US, including Ohio. The drought was an expansion of the 2010-2012 United States drought which began in the spring of 2012, when the lack of snow in the United States caused very little melt water to absorb into the soil. Among many counties, Erie County was designated with moderate drought condition by mid-June. It has been equated to similar droughts occurring in the 1930s and 1950s. In most measures, the drought has exceeded the 1988-1989 North American Drought, which is 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 Reports and determined that there were sufficient production losses in 85 counties to warrant a Secretarial disaster designation. On September 5, 2012, Erie County was one of those designated counties.

Historic drought conditions in most of the corn-growing states caused corn crop conditions to decline rapidly. As of July 29, 2012, only 24 percent of the corn acreage was rated good to excellent, compared to 62 percent rated at the same time in 2011. In Erie County, hay (alfalfa) growers produced 5,900 tons in 2012, compared to the 7,300 tons in the 2011 crop. Winter wheat productions for 2012 totaled 378,000 bushels, down from 574,000 bushels in the 2011 crop. Commodity loss statistics from the 2012 drought are shown below for Erie County in Figure 15. Production of other crops declined as well. As an example, U.S. production of all dry hay is estimated at 120 million tons, this is the lowest level since 1964.

³³ (The National Drought Mitigation Center, 2020)

COMMODITY LOSS STATISTICS
2012 DROUGHT

COUNTY:		Erie			
COMMODITY	2011	2012	UNITS	CHANGE	AMOUNT
Corn - planted	27,500	32,100 acres		up	4,600
Corn, grain - harvested	26,400	30,700 acres		up	4,300
	Yield	96.00%	95.64%	down	0.36%
Corn, grain - production	3,837,000	4,452,000 bushels		up	615,000
Corn, grain - yield	145.3	145.0 bushels/acre		down	0.30
Hay, alfafa - yield	1,700	1,600 acres		down	100
Hay, alfafa - production	7,300	5,900 tons		down	1,400
Hay, alfafa - yield	4.30	3.70 tons/acre		down	0.60
Soybeans - planted	35,200	34,500 acres		down	700
Soybeans - harvested	35,100	34,500 acres		down	600
	Yield	99.72%	100.00%	up	0.28%
Soybeans - production	1,540,000	1,635,000 bushels		up	95,000
Soybeans - yield	43.9	47.4 bushels/acre		up	3.5
Winter wheat - planted	8,900	6,100 acres		down	2,800
Winter wheat - harvested	8,600	5,910 acres		down	2,690
	Yield	96.63%	96.89%	up	0.26%
Winter wheat - production	574,000	378,000 bushels		down	196,000
Winter wheat - yield	66.7	63.9 bushels/acre		down	2.8

Source: U.S. Dept. of Agriculture, National Agricultural Statistics Service

Figure 15: Commodity Loss Statistics for Erie County, 2012 Drought

7.2.5 Probability of Future Events

According to the National Drought Mitigation Center, Erie County has spent 36.8% of the time between 1908 and 2018 in at least mild drought conditions. It is likely that this trend will continue. For other severities, Erie County has been in at least a moderate drought 26% of the time, at least a severe drought 18% of the time, and at least an extreme drought 6% of the time.

7.2.6 Vulnerability

A drought in Erie County can have significant detrimental effect on the domestic water supply, especially for well-water, agriculture, and water-dependent recreational activities. Economic effects in Erie County would likely include crop loss and an impact to the agricultural industry. No structural damage due to drought is anticipated in Erie County or its jurisdictions. The community may also need to conserve water and water-dependent businesses may be forced to alter operations in an extreme drought.

Since no structures would experience damage due to drought, this updated plan, like the previous plan, does not identify existing or future buildings at risk of loss due to drought. No future buildings will be exposed to damage due to drought.

According to the NCDC, the 1999 drought in Erie County cost \$7,000,000 in crop losses. While there may not be any losses to property, a drought can affect crops, and cause losses similar to the 1999 drought in the future.

7.3 Earthquakes

7.3.1 Hazard Profile

The crust of the earth is made up of giant sections called tectonic plates. These plates float on top of the earth's mantle and are in constant slow movement. This movement causes energy to build up when there is friction between two plates. If the energy built up overcomes the force of friction, the two plates will suddenly slip past each other, causing the energy to be released. When this happens, the earth shakes and moves while the energy is dissipated, causing an earthquake. The earthquake's energy is transmitted through the ground as a series of waves. Earthquakes are not limited to the tectonic plate movements. There are many smaller sections of the earth's crust that can slowly move against other sections of the earth's crust, building up energy that is released as an earthquake. Often earthquakes are accompanied by other, smaller earthquakes called foreshocks or aftershocks, depending on whether they occur before or after the big quake.

Scientists use seismograms to record how much movement an earthquake caused, which is then used to calculate how much energy was released. This allows earthquakes to be classified based on their magnitude, which is a measurement of the amount of energy released. In the past, the Richter magnitude scale was used. The Richter magnitude was calculated from the logarithm of the amplitude of the earthquake waves, as measured by the seismograph. The logarithm means that for each whole number increase of the Richter magnitude scale, the earthquake has an amplitude ten times greater, corresponding to 31.6 times more energy released. The Richter magnitude scale was replaced with other scales, in part, because for earthquakes with a magnitude greater than 8, the Richter scale is not accurate.

Scientists now use the Moment magnitude scale to describe the strength of an earthquake and is based on the amount of mechanical work the earthquake accomplished. Like other earthquake magnitude scales, the Moment magnitude is also a logarithm. At lower magnitudes, the Moment magnitude scale and the Richter magnitude scale are nearly identical. The Moment magnitude scale is the preferred magnitude scale as it is the most accurate and more objective than other scales.³⁴

Another way to describe an earthquake is by its intensity, which describes how much the ground shakes at a particular location. The Modified Mercalli Intensity (MMI) scale is calculated solely based on damage assessments and personal accounts of those who experienced the shaking. The MMI scale ranks earthquake on a scale from I-XII. This scale is not typically used by scientists, as rural areas have fewer buildings in which to sustain damage, and fewer people to provide eyewitness accounts. While the Moment magnitude scale and the MMI cannot be compared directly as they measure different things, at the epicenter, they can be roughly correlated, as is shown in Figure 16.

³⁴ (United States Geological Survey, n.d.)

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

Figure 16: Modified Mercalli Intensity Scale compared to the Moment Magnitude Scale³⁵

³⁵ (Kansas Geological Survey, 2020)

7.3.2 Location

The State of Ohio has experienced more than 200 earthquakes since 1776, and 15 of these events have caused minor to moderate damage. The largest historic earthquake in Ohio was centered in Shelby County in 1937. This event, estimated to have had a magnitude of 5.4 on the Richter scale, caused considerable damage in Anna and several other western Ohio communities, where at least 40 earthquakes have been felt since 1875. Northeastern Ohio, east of Cleveland, is the second most active area of the state. At least 20 earthquakes are recorded in the area since 1836, including a 5.0 magnitude event in 1986 that caused moderate damage. A broad area of southern Ohio has experienced more than 30 earthquakes.

Figure 17 shows the epicenter of all the earthquakes that have occurred in or near Erie County. The largest earthquake near Erie was 3.7M in 1961, which was centered in Seneca County. All of Erie County and its jurisdictions are equally likely to experience the effects of an earthquake.

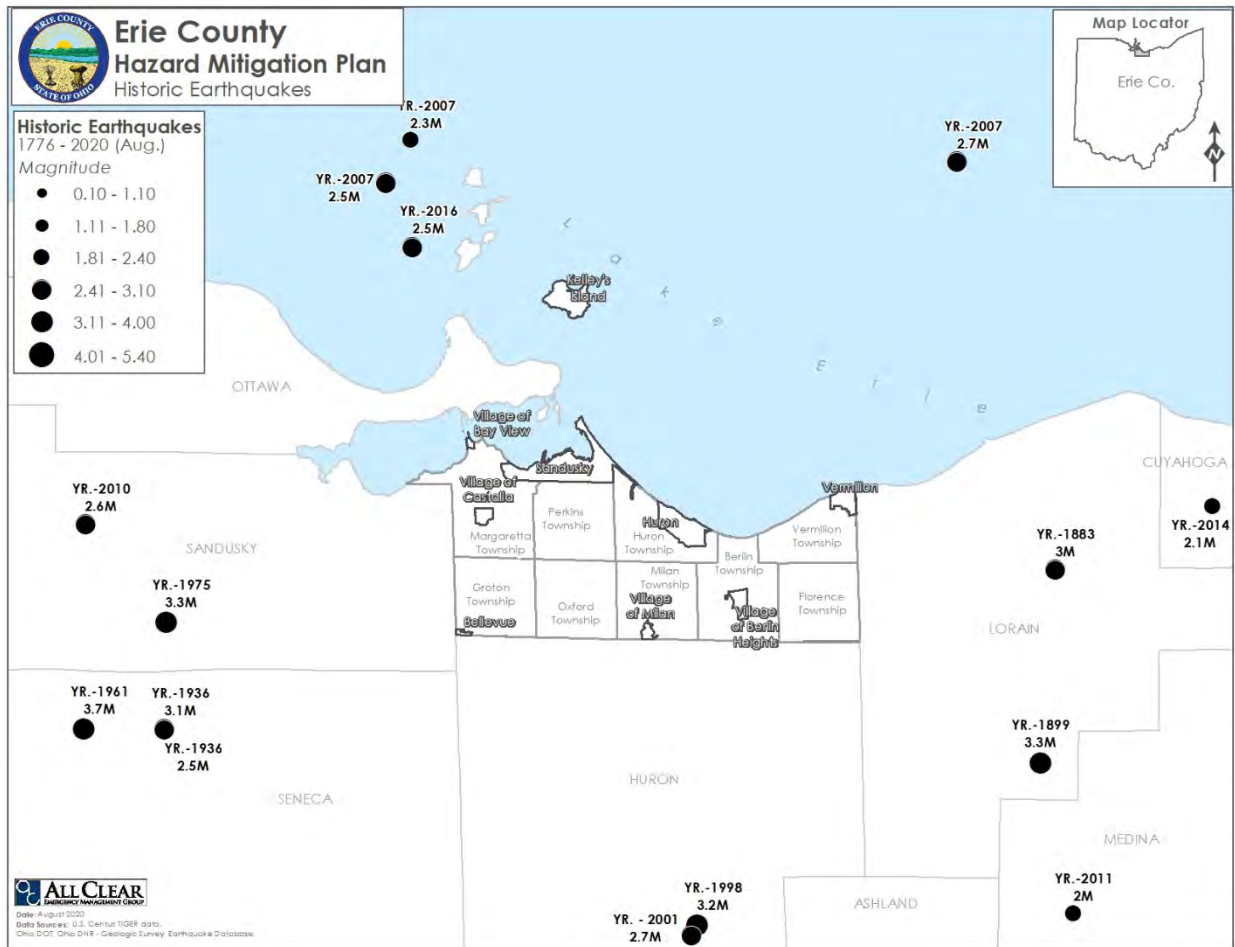


Figure 17: Earthquake Epicenters near Erie County

7.3.3 Extent

Most of the earthquakes in Ohio have been felt only locally, if at all, and have caused no damage or injuries. Ohio is on the periphery of the New Madrid Seismic Zone, an area

in Missouri and adjacent states that was the site of the largest earthquake sequence to occur on record in the continental United States. In 1980, an earthquake with a magnitude of 5.3 on the Richter Scale and centered in Sharpsburg, Kentucky, was strongly felt throughout Ohio and caused minor damage in communities along the Ohio River in southwestern Ohio. In 1998, a Magnitude 5.2 earthquake occurred in western Pennsylvania and caused some damage at the epicentral area. Two regions of Ohio have been identified as susceptible to seismic activity; however, neither Erie County nor its contiguous counties are included in these regions.

7.3.4 Previous Occurrences

No earthquakes have previously been documented with an epicenter in Erie County. Due to the infrequency of earthquakes occurring in Erie County, the impact on the county's infrastructure is very low.

7.3.5 Probability of Future Events

Given that USGS lists zero damaging earthquakes occurring between 1776 and 2019 in Erie County, one might conclude that the probability of a damaging earthquake is less than one percent in any given year. However, Figure 18 shows long term probability of an area to experience peak ground accelerations having a 2 percent probability of being exceeded in 50 years. Peak ground acceleration is the maximum horizontal ground acceleration measured in centimeters per second per second (cm/sec^2). Peak ground acceleration can range from zero for an earthquake that is noticed by very few people to 350, which would be a catastrophic event. A peak ground acceleration of 10 cm/sec^2 means that the shaking is equivalent to about 1 percent of the acceleration due to gravity. Generally, ground acceleration must exceed 15 cm/sec^2 for significant damage to occur. All of Erie County is at a low risk of experiencing an earthquake of that size.

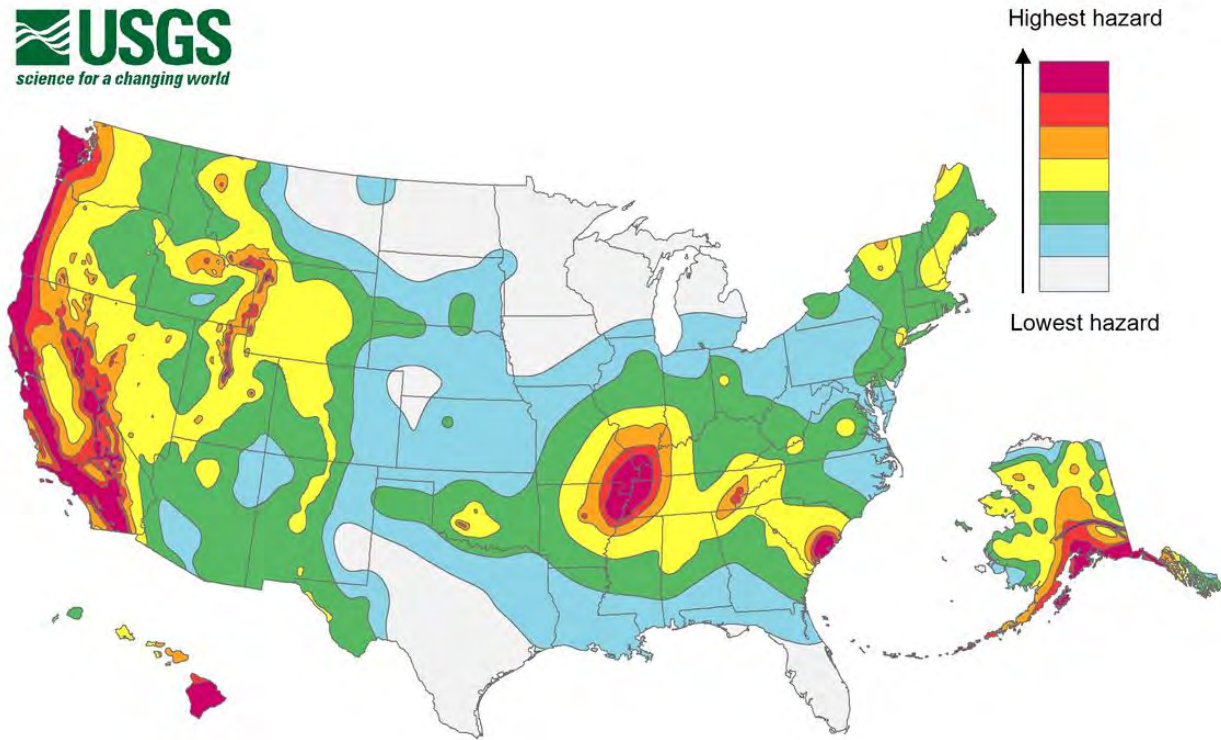


Figure 18: 2018 Long-term National Seismic Hazard Map³⁶

For this purposes of this plan, the estimated probability of a damaging earthquake affecting Erie County in any given year is estimated at less than 1% (0.01). Within the past 243 years, there has not been an epicenter recorded in Erie County.

As with the previous Erie County Natural Hazards Mitigation Plan, it was decided that utilizing Hazus-MH would benefit Erie County and the other jurisdictions involved to determine loss estimates for this regional hazard. These loss estimates are utilized primarily to plan and stimulate efforts to reduce risks from natural hazards and to prepare for emergency response and recovery. Since an earthquake is a widespread hazard, HAZUS-MH was utilized in order to generate more accurate loss estimations for the planning effort. Because no historic earthquakes have severely impacted Erie County, five scenarios were run, in order to have a better understanding of the various risks different earthquakes in varying areas would have. Table 13 summarizes the Hazus-MH scenarios that were modeled. For ease of simplicity, the scenario number will be referred to for the rest of the plan.

³⁶ (United States Geological Survey, 2018)

Table 13: Hazus-MH Earthquake Scenarios

Scenario	Type	Magnitude	Location
1	Historic	5.4	Shelby County, OH
2	Historic	5.2	Astabula County, PA
3	Historic	5.4	Astabula County, PA
4	100 year Probabilistic	5.0	Erie County, OH
5	500 year Probabilistic	5.0	Erie County, OH

7.3.6 Vulnerability

All structures and infrastructure in Erie County are equally at risk of experiencing an earthquake. It would be expected to be on the order of a Magnitude 3.0-3.9 earthquake, or lower. Very minimal structural damage is anticipated. In most cases, damages are expected to be limited and examples of anticipated damages are broken dishes and windows and cracked plaster. The level of damage expected from an earthquake in Erie County is very low.

A very large earthquake affecting Erie County might cause structural damage in dilapidated structures or structures that do not meet current building codes. Roads and bridges might be damaged, and trees and power lines might fall. Communication, power, gas, water and sewer infrastructure also have the potential to crack, rupture, or otherwise fail.

Thus, the impact of an earthquake might range from negligible to minor damage. Based on over 200 years of experience in Erie County, there will most likely be no damage or very slight damage. Hazus-MH estimates that there are 35,000 buildings in the region which have an aggregate total replacement value of \$10,731,000,000.

For each of the scenarios modeled, only Scenario 5 resulted in any building damage; therefore this scenario represents the worst-case scenario. For this simulated earthquake 165 buildings would be at least moderately damaged, and 514 buildings would have slight damage. Most damage will be to residential buildings. Only one building is expected to be completely destroyed.

Table 14 details the impacts from Scenario 5 with an estimated total damage for each occupancy type within Erie County if a 500-year earthquake were to be centered within the County.

Table 14: Expected Building Damage by Occupancy for Scenario 5

Occupancy	Expected Buildings Damaged				
	None	Slight	Moderate	Extensive	Complete
Single Family	28,327	356	99	12	1
Other Residential	3,038	81	24	1	0
Commercial	1,978	49	15	2	0
Industrial	560	14	5	1	0
Agricultural	178	5	2	0	0
Religion	187	5	1	0	0

Occupancy	Expected Buildings Damaged				
	None	Slight	Moderate	Extensive	Complete
Government	90	2	1	0	0
Education	67	2	1	0	0
Total:	34,425	514	148	16	1

The total economic losses for Scenario 5, which includes buildings and lifeline related losses are \$12,650,000. For capital stock losses only, losses are \$7,053,700; 64.9% of which was residential and 35.1% are non-residential. No critical facilities are expected to sustain moderate or greater damage in this scenario. However, functionality of these buildings may be marginally limited. Before the earthquake, the region had 424 hospital beds available for use. On the day of the earthquake, Hazus-MH estimates 401 hospital beds are available for use by patients already in the hospital and those injured by the earthquake. Within one week of the earthquake, 98% of the beds will be available, and all beds will be available within 30 days. Of the 16 police stations, 16 fire stations, 1 Emergency Operations Center, and 36 schools, none will have at least minimum damage, and all will have greater than 50% functionality on the day of the earthquake.

In Scenario 5, no transportation systems, including highways, railways, buses, ferries, ports and airports are expected to incur at least moderate damage, and all will have greater than 50% functionality the day of the earthquake. Of the utility system pipelines in Erie County, there are nine leaks and two breaks expected within the potable water system, and five leaks and one break in the waste water system. However, no utility system facilities are not expected to sustain at least moderate damage. All houses are expected to have electricity and drinking water service on the day of the earthquake.

The Hazus-MH Global Summary Reports for Scenarios 1-5 are found in Appendix G.

7.4 Flooding

7.4.1 Hazard Profile

Flooding is an important issue for the residents and local business owners of Erie County. Riverine flooding and flash flooding events have occurred with regularity in the past with significant impacts on the community.

Erie County has special flood hazard zones identified within the county. The best way to combat disaster losses within these special flood hazard zone areas is through public awareness. Except for Kelleys Island, all of Erie County follows state floodplain management standards and participates in the National Flood Insurance Program (NFIP). Unincorporated Erie County has been involved since September 1981, with most incorporated municipalities joining in the 1970s. Since the last Erie County Hazard Mitigation Plan, the Village of Berlin Heights now fully participates in the National Flood Insurance Program. Table 15 shows the details about each jurisdiction within Erie County and their participation in the National Flood Insurance Program and the effective date of the current Flood Insurance Rate Maps (FIRM), and Table 16 shows the jurisdictions that were formerly a participant in the National Flood Insurance Program but have since withdrawn. Since the last Hazard Mitigation Plan update, Berlin Heights, portions of unincorporated Erie County, Huron, Milan, and Sandusky have received updated FIRMs.

Table 15: Jurisdictions Participating in the National Flood Insurance Program

CID	Community	Initial FHBM Identified	Initial FIRM Identified	Current Effective FIRM	Reg-Emer Date
390595#	Bay View	03/22/1974	09/15/1977	08/28/2008	09/15/1977
390487#	Bellevue	03/15/1974	10/17/1978	01/19/2011	10/17/1978
390650#	Berlin Heights	04/05/1974	08/28/2008	11/19/2014(M)	01/17/2013
390653#	Castalia	03/29/1974	No data	(NSFHA)	05/25/1978
390153#	Erie County (unincorporated)	01/31/1975	01/16/1981	11/19/2014	01/16/1981
390154#	Huron	02/01/1974	04/03/1978	11/19/2014	04/03/1978
390155#	Milan	04/12/1974	09/01/1978	11/19/2014(M)	09/01/1978
390156#	Sandusky	06/21/1974	07/05/1977	11/19/2014	07/05/1977
395374#	Vermilion	05/05/1970	12/31/1970	08/19/2008	12/31/1970
390738#	Kelleys Island	04/18/1975	08/17/1981	08/28/2008	01/29/1986 (W)

FHBM - Flood Hazard Boundary Map

Reg-Emer Date - Date a community joins the National Flood Insurance Program

NSFHA - No Special Flood Hazard Areas - All Zone C

(M) - No Base Flood Elevation Established - All Zone A, C and X

Table 16: Jurisdictions Withdrawn from the National Flood Insurance Program

CID	Community	Initial FHBM Identified	Initial FIRM Identified	Current Effective FIRM	Reg-Emer Date
390738#	Kelleys Island	04/18/1975	08/17/1981	08/28/2008	01/29/1986 (W)

(W) - Withdrawn from program

Lake level rise is also a significant area of concern in the Great Lakes region, but even more so in Lake Erie, due to its shallow depth. The average depth of Lake Erie is 62 feet, with a maximum depth of 210 feet. In the shallower areas, the water depth is 25-30 feet, which allows strong winds to produce significant wave activity. Since the start of recordkeeping, the water levels in Lake Erie have showed natural cycles of higher or lower water levels, usually changing slowly over the course of a few decades. Lake levels also show with seasonal variability, with lake levels increasing in the spring when rain combines with snow melt, with the peak occurring in the summer. Between 1999-2014, the Great Lakes experienced an extended duration of historically low water levels. However, since 2014, water levels have exceeded the average level, reaching historically high monthly values in 2018, 2019 and 2020. In June 2019, Lake Erie experienced the highest average monthly water level at 574.61 feet. June 2020 fell just short of that mark at 574.47 feet. This increasingly rapid cycling between low and high-water levels is driven by climate change. Figure 19 below, shows the historical time series of the monthly average water level for Lake Erie since 1918, as well as the long-term average as indicated by the red line.

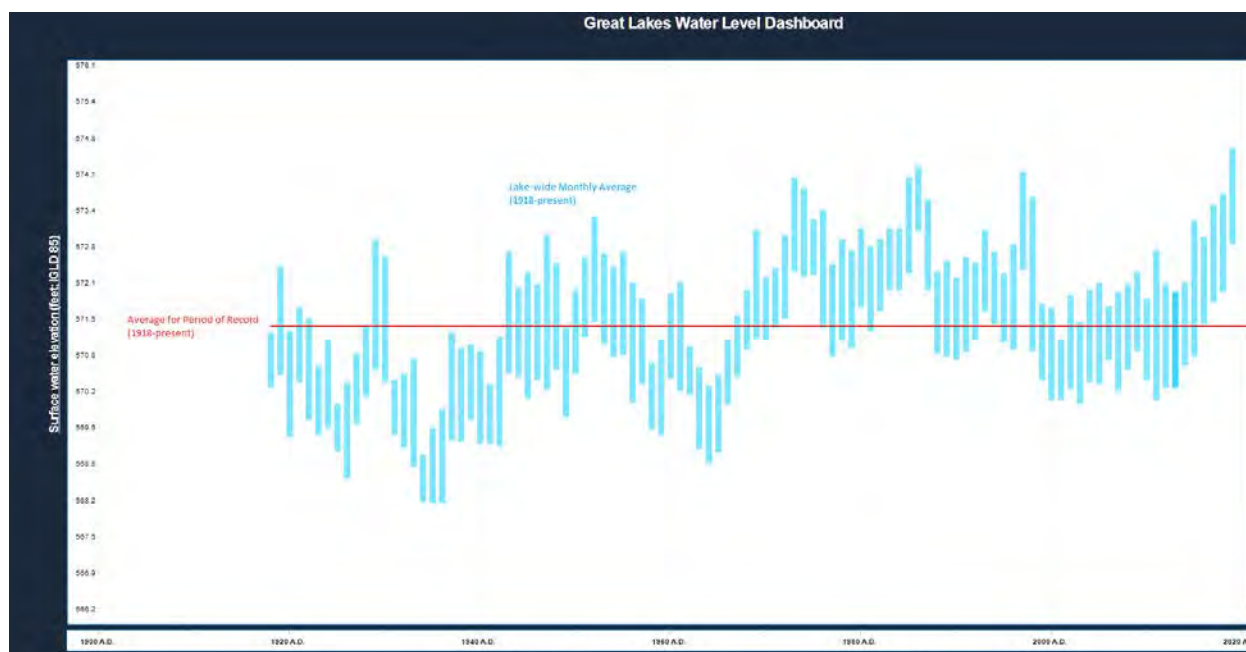


Figure 19: Monthly Average Water Levels in Lake Erie 1918-present³⁷

Lake Erie is used for a variety of purposes, including supplying drinking water, recreation, commercial fishery, commercial shipping, and hydropower. For many of these industries, higher lake levels have been welcome after the most recent low water level period. However, the historically high lake levels have had many severe, negative impacts as well. High lake levels in Lake Erie have cause significant flooding issues along the shoreline, in the estuaries near the shore, and even further up the rivers and creeks that drain into Lake Erie. This flooding in turn can cause road closures, damage to

³⁷ (Gronewold, Clites, Smith, & Hunter, 2013)

infrastructure including roadways and utility systems, damage to private property, critical facilities and more. The effects are also seen inland from the shoreline due to flooding along the river and creeks. The City of Sandusky Engineering Department had not been able to inspect roads for damage sustained from flooding during the spring and summer of 2020, by late fall of that year because the water levels remained too high.

Climate change notwithstanding, addressing high lake levels directly is difficult due to the complexity of the problem. The catchment areas for Lake Superior, Lake Michigan, Lake Huron and Lake Erie is a combined 176,792 square miles, which means any precipitation that falls within that area will drain out through Lake Erie unless it evaporates or is otherwise diverted. Rates of precipitation and evaporation can also play a role in how much water is in Lake Erie or the other Great Lakes at any given time. As all of these causes are much greater than any single community can address individually, mitigation needs to focus on the impacts of the high lake levels, such as flooding. Mitigation for lake shore flooding due to lake level rise can involve regulations prohibiting development on the shoreline, buyout programs for private property that is threatened by the flooding, structural projects such as retaining walls and levees and more.

In Erie County, flooding can also be exacerbated by karst landscape. Karstic landscape are areas that are underlain by dolomite, limestone or gypsum that has eroded by dissolution by groundwater. As a result, subsurface drainage systems can develop. Also, unlike typical flooding associated with flooding, it is very challenging to try and predict when or how severe future karst related flooding will be. According to ODNR, "the engineering



means to prevent or mitigate the effects of karst related flooding is technically very difficult and cost-prohibitive. Wise land-use planning is encouraged for areas that are most likely to be flooded upon the return of this pattern of climatic and hydrologic conditions." Figure 19 shows the different features that can be present in karst landscape. Figure 20 shows the bedrock geology of Erie County. In the eastern portion of the County, is primarily underlain by clastic sedimentary rocks such as sandstones and shales. The western part of the County is primarily underlain by limestones and dolomites, that form karstic landscapes.

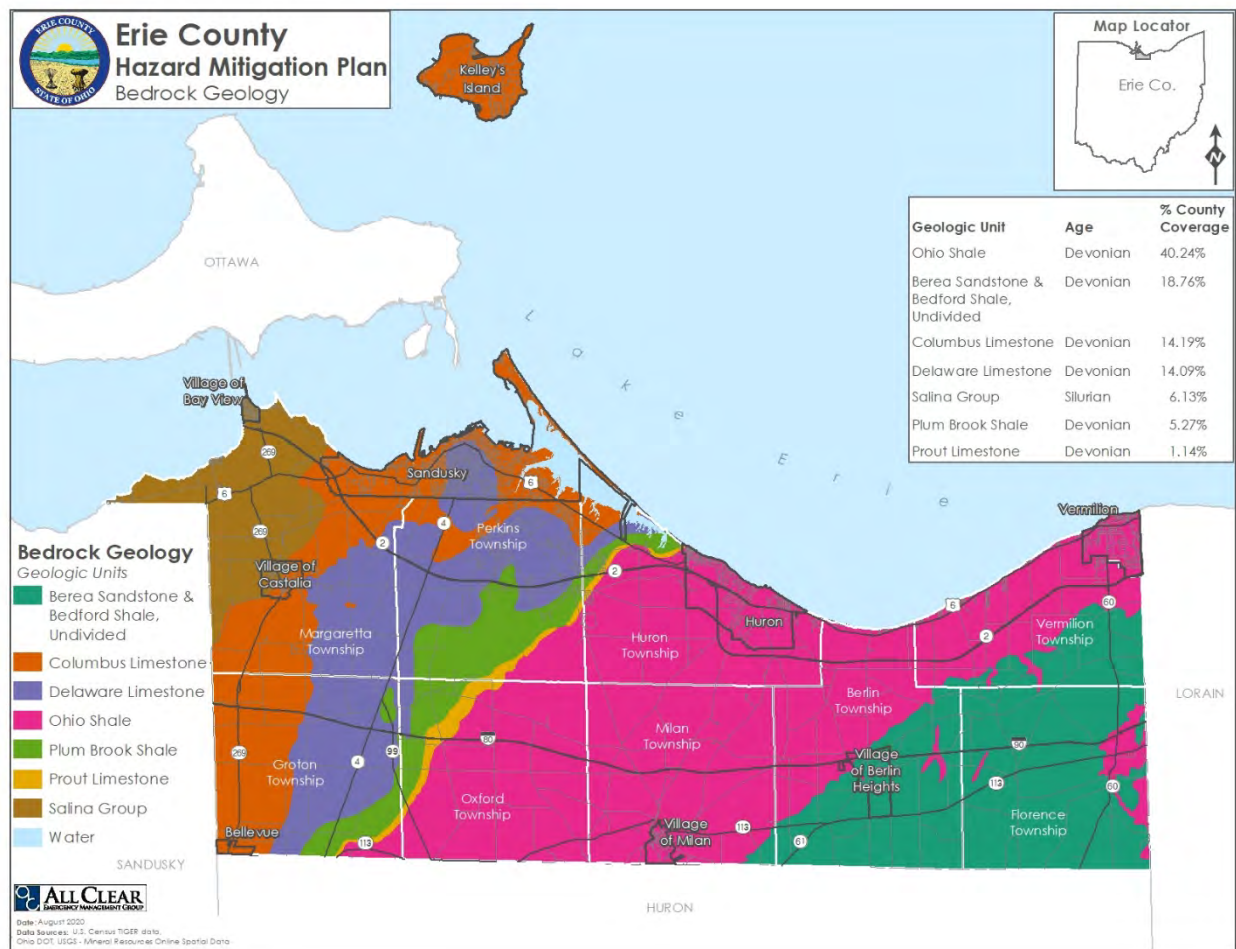


Figure 20: Bedrock Geology Map for Erie County

7.4.2 Location

Erie County lies in the Central Lowland Province. Lying in an area of lake plain and till plain physiography, the County has a relatively uniform, level topography. Erie County drains northward into Lake Erie. There are 17 distinct watersheds in the County. Primary watersheds include Mills Creek and Pipe Creek to the west, the Huron River in the central part of the County, Old Woman Creek in the east-central part of the County and the Vermilion River on the eastern edge of the County. Small creeks drain the other watersheds.

In addition, a portion of the western part of the county is considered to be karstic. The Bellevue-Castalia Karst Plain includes parts of western Erie County and contains more sinkholes than any other karst region in Ohio. Surface drainage in this region often flows into sinkholes and continues underground. Figures 21 - 31 show the karst hazard maps and the point locations of karstic features for Erie County and the jurisdictions that face this hazard. As it can be seen, karst is a flooding hazard for the western portion of Erie County including the Village of Bay View, the City of Bellevue, the Village of Castalia, the Village of Kelleys Island, and the City of Sandusky. Karst hazard maps and karst point locations for affected townships can be found in Appendix F for reference only.

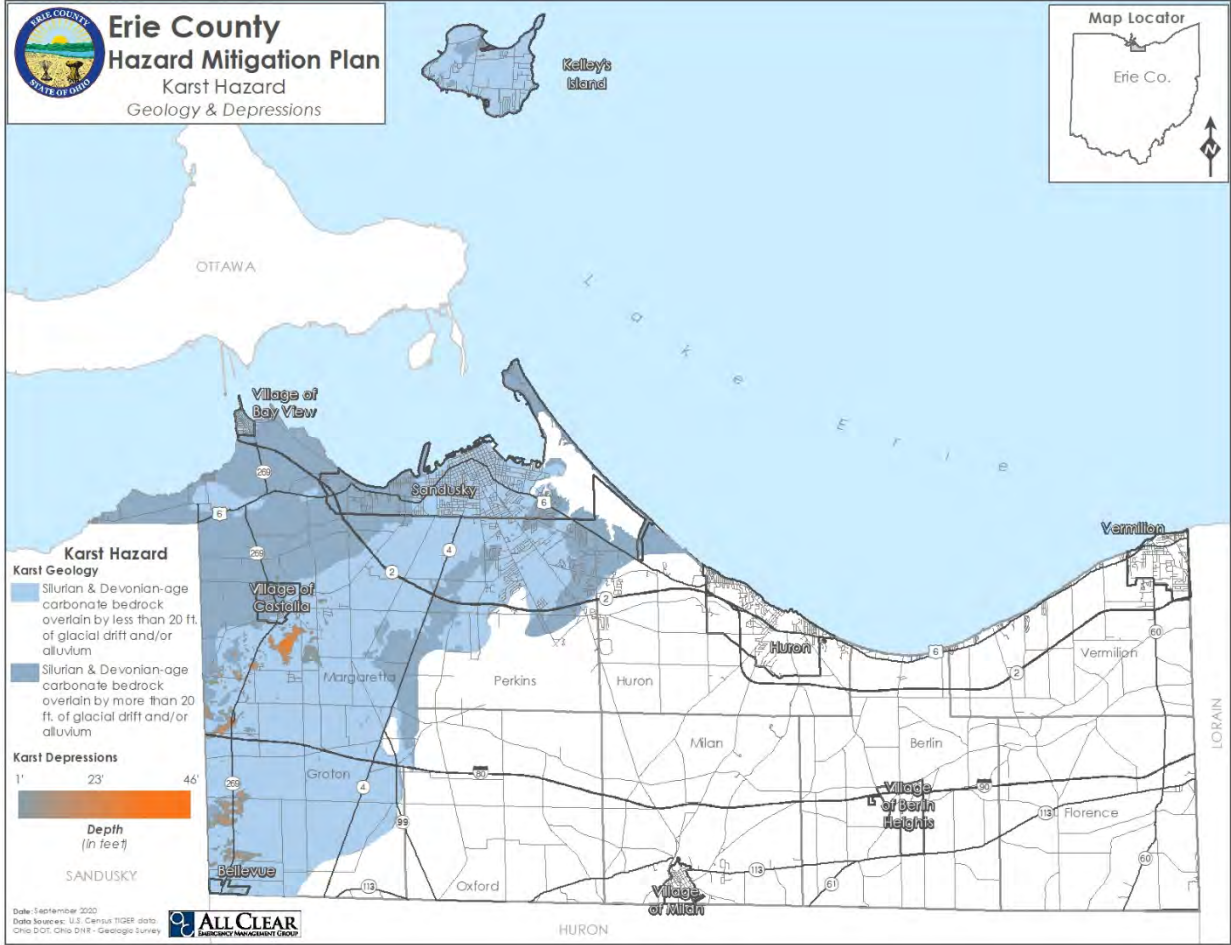


Figure 21: Karst Hazard Map for Erie County

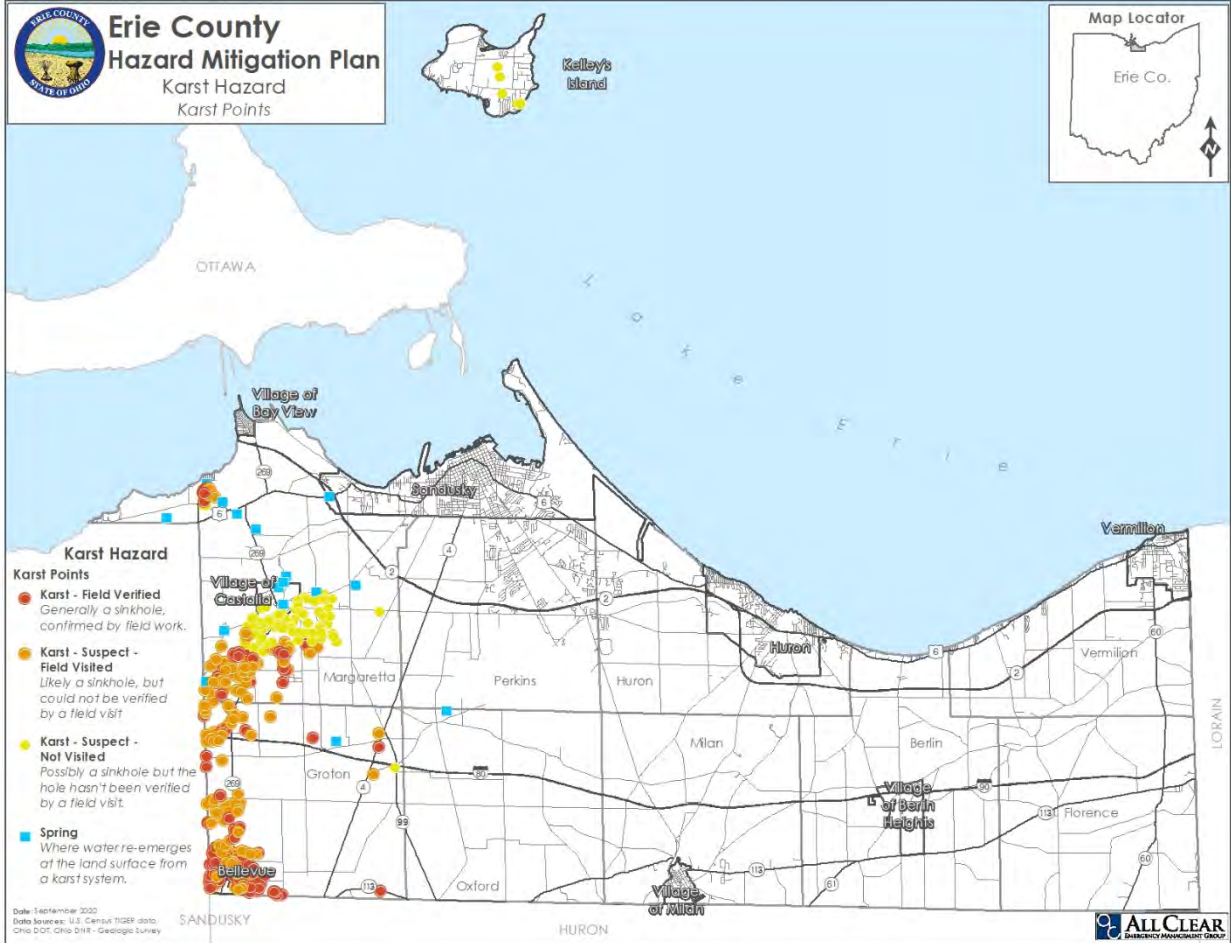


Figure 22: Karst Point Locations for Erie County

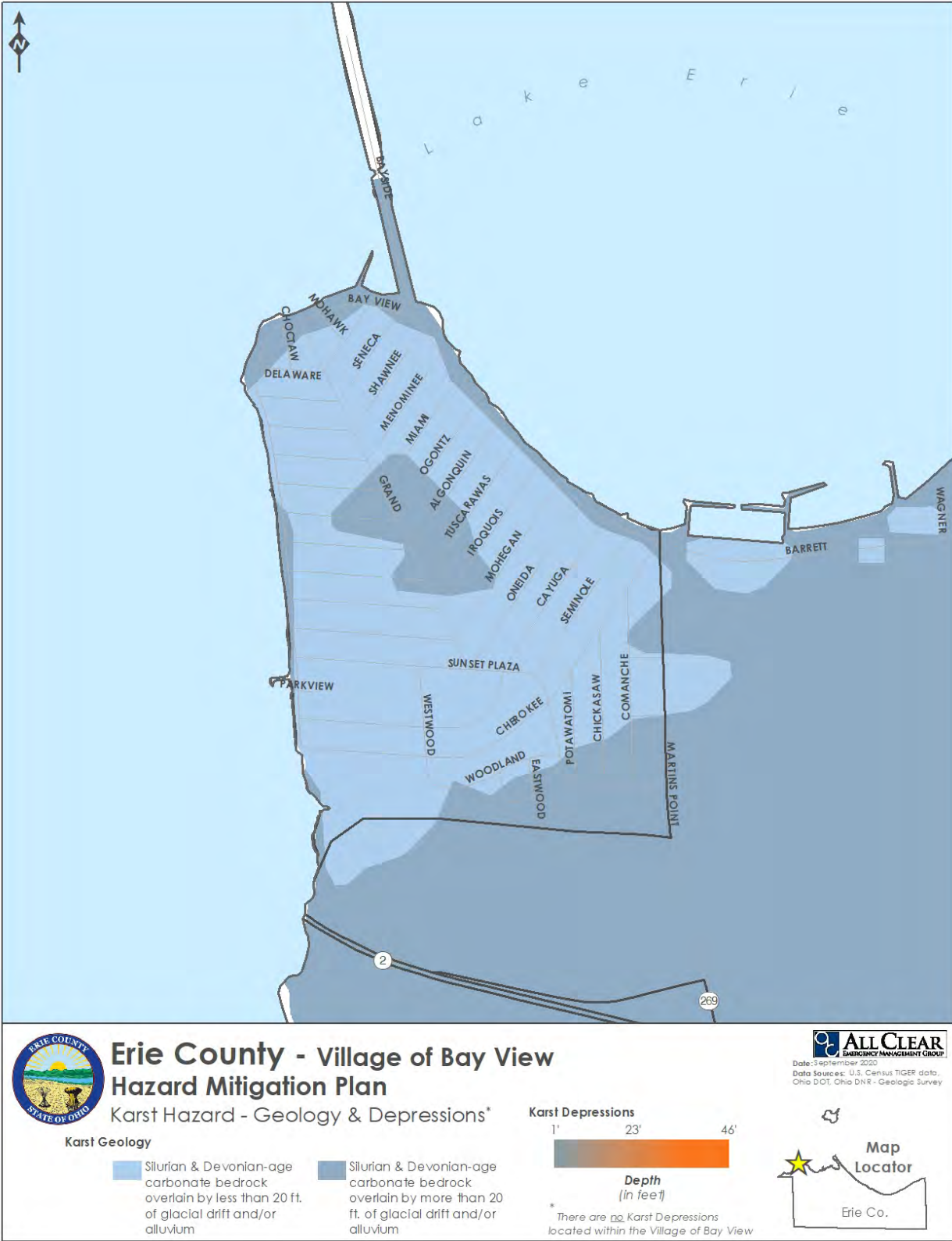


Figure 23: Karst Hazard Map for the Village of Bay View

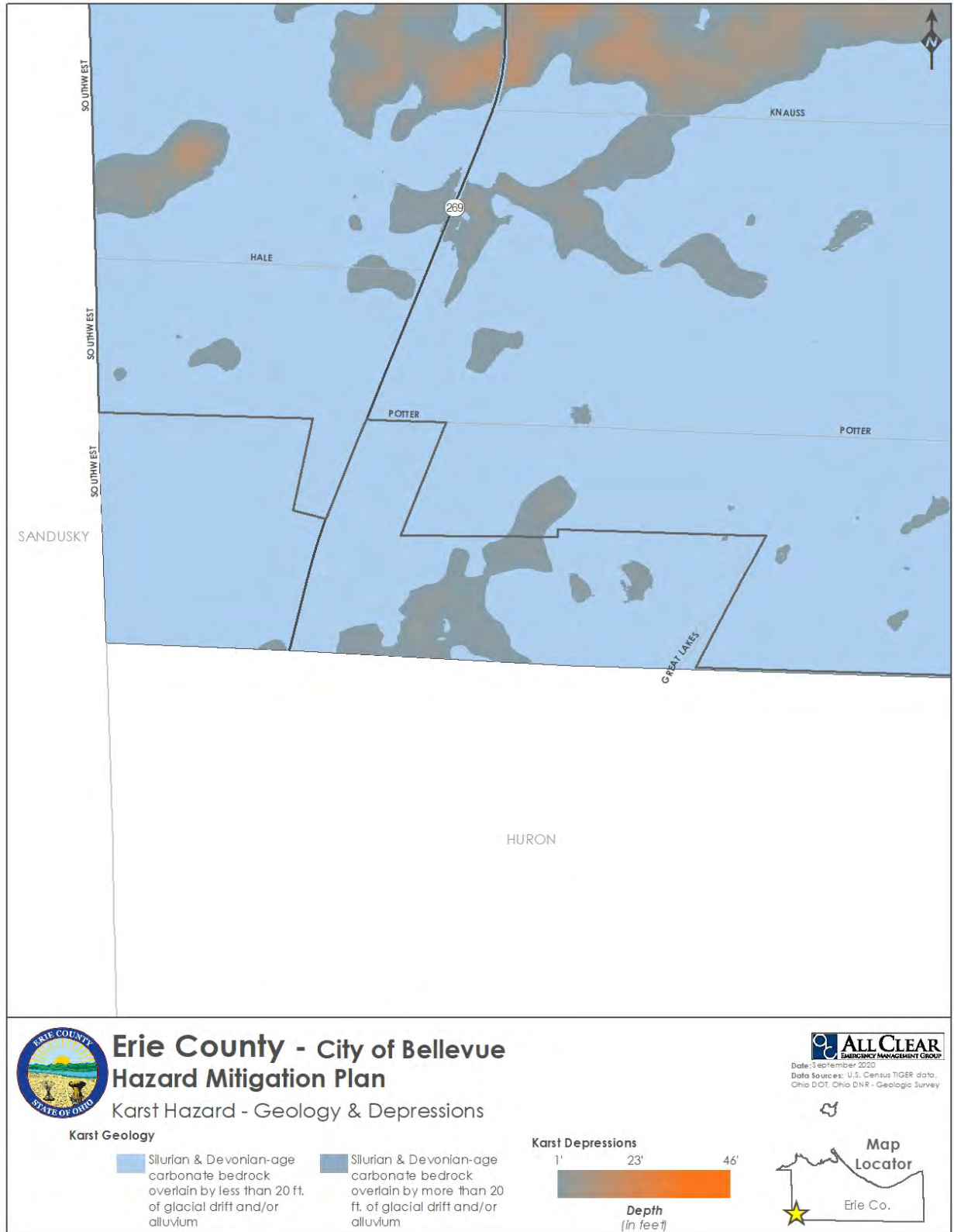


Figure 24: Karst Hazard Map for the City of Bellevue (Erie County Portion Only)

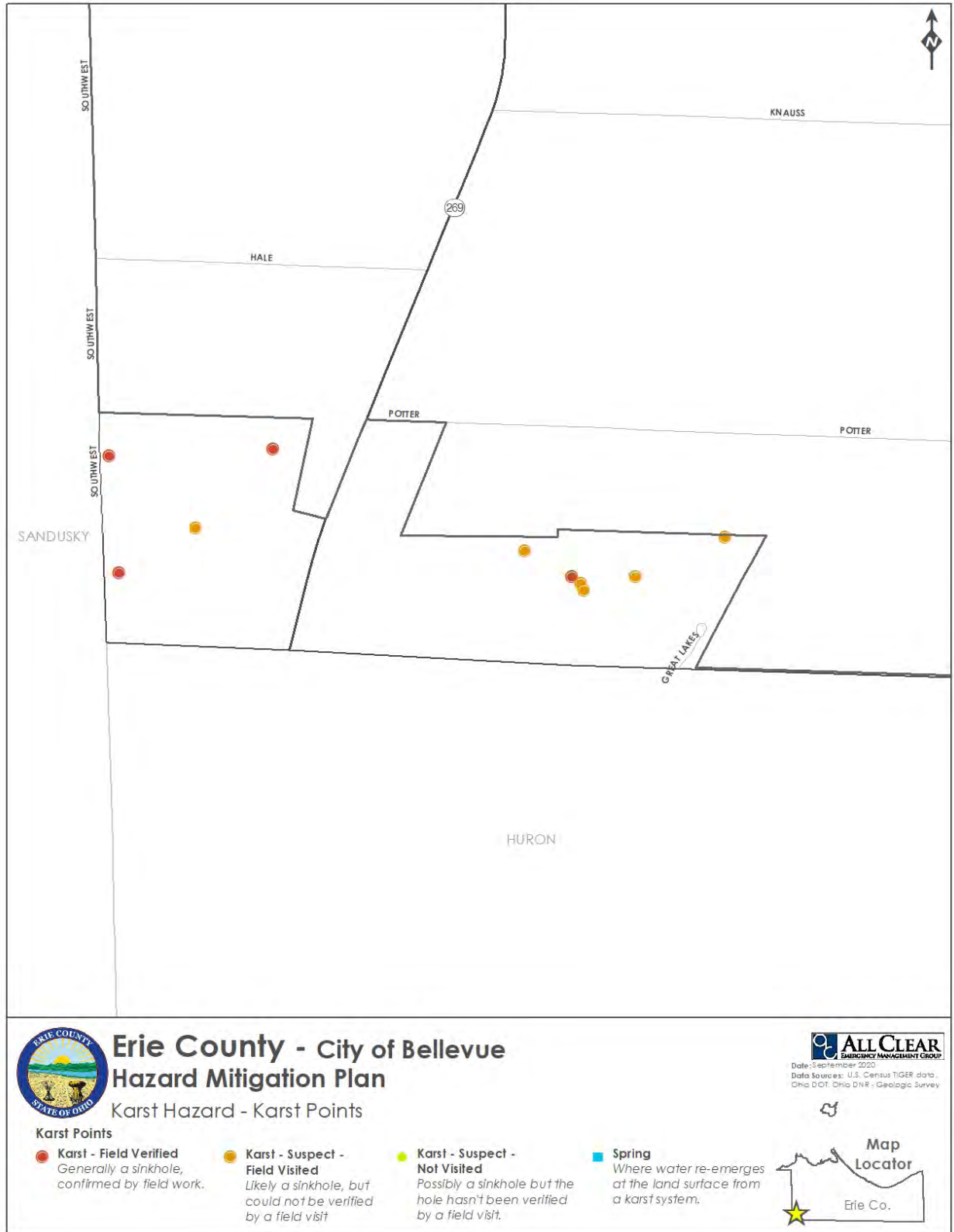


Figure 25: Karst Point Locations for the City of Bellevue

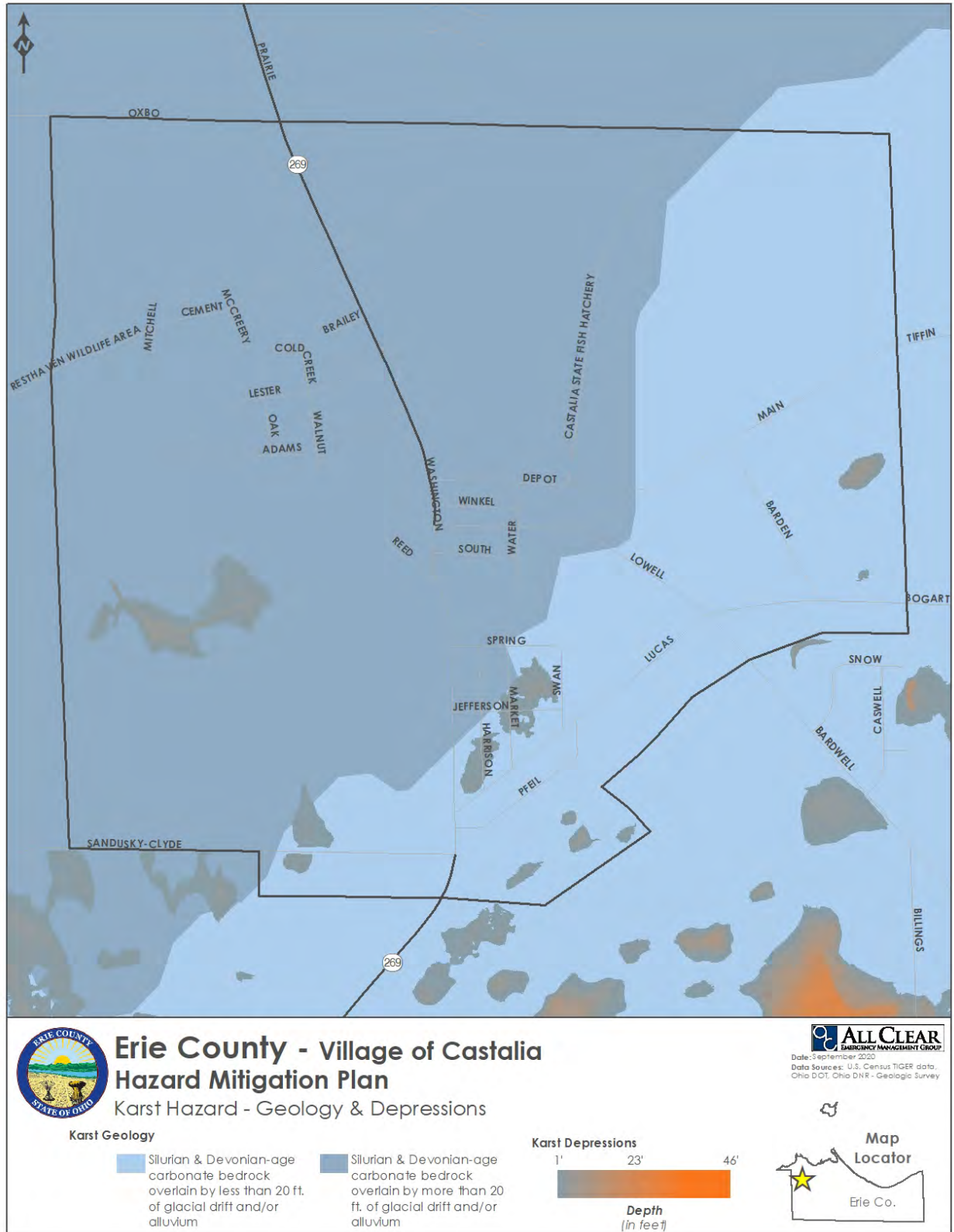


Figure 26: Karst Hazard Map for the Village of Castalia

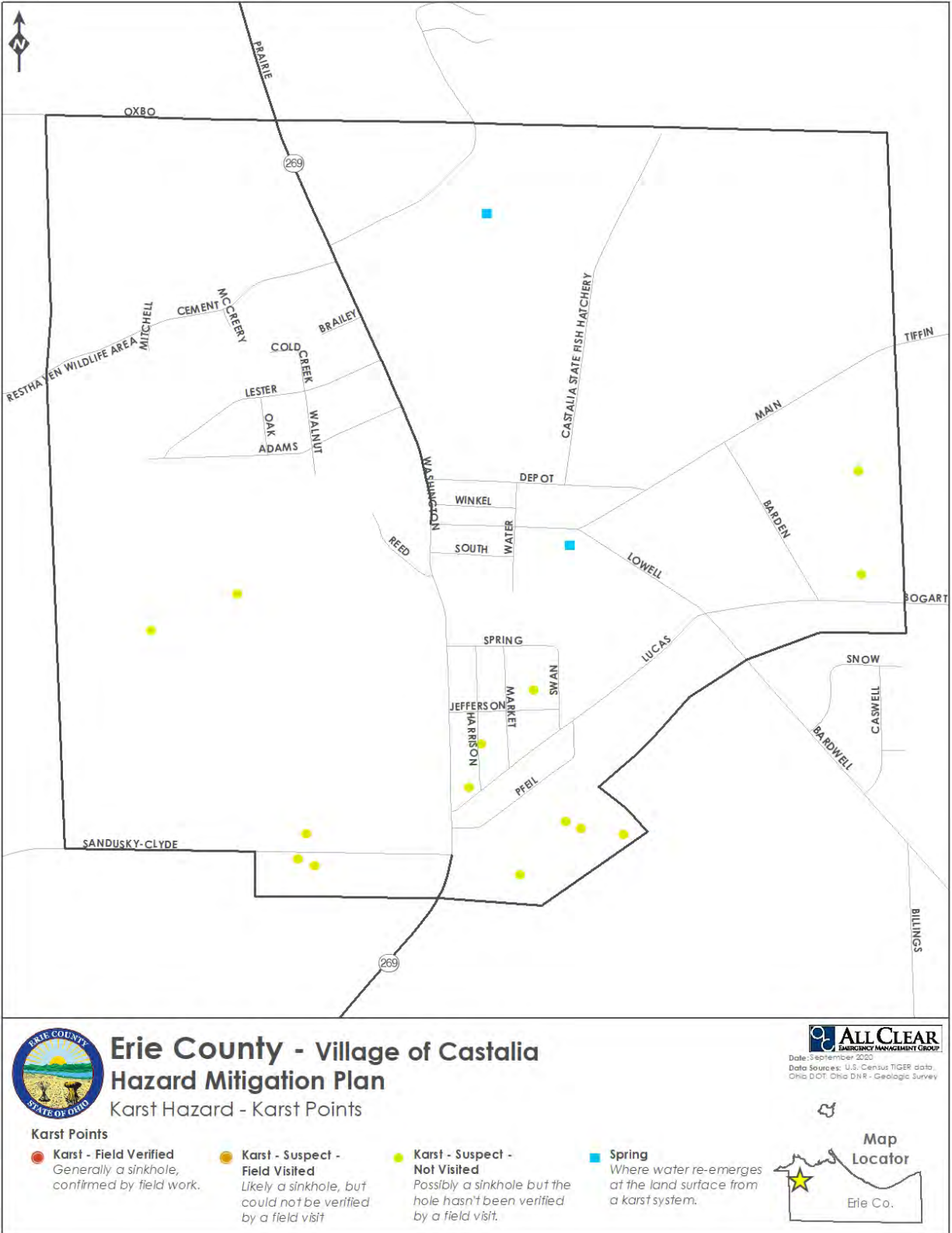


Figure 27: Karst Point Locations for the Village of Castalia

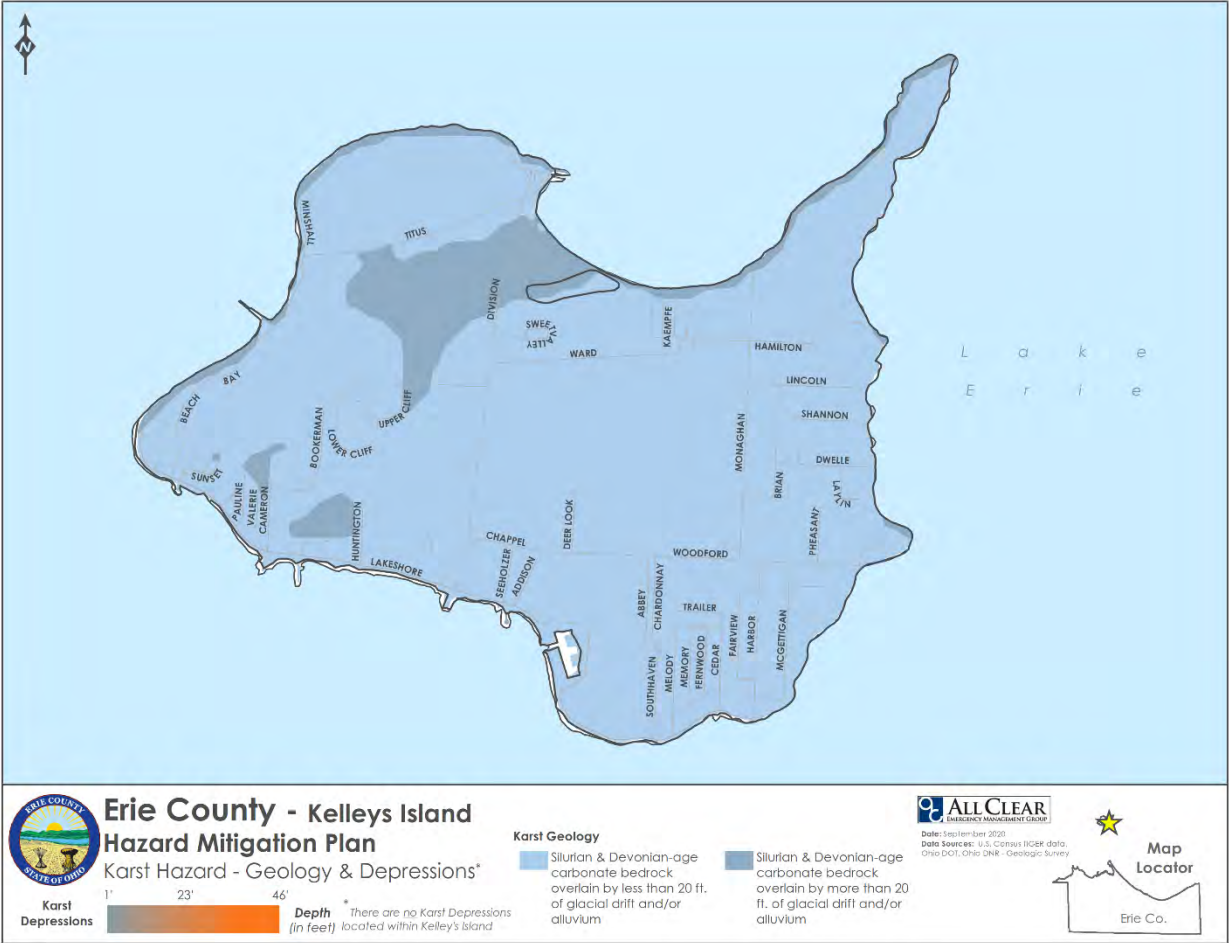


Figure 28: Karst Hazard Map for the Village of Kelleys Island

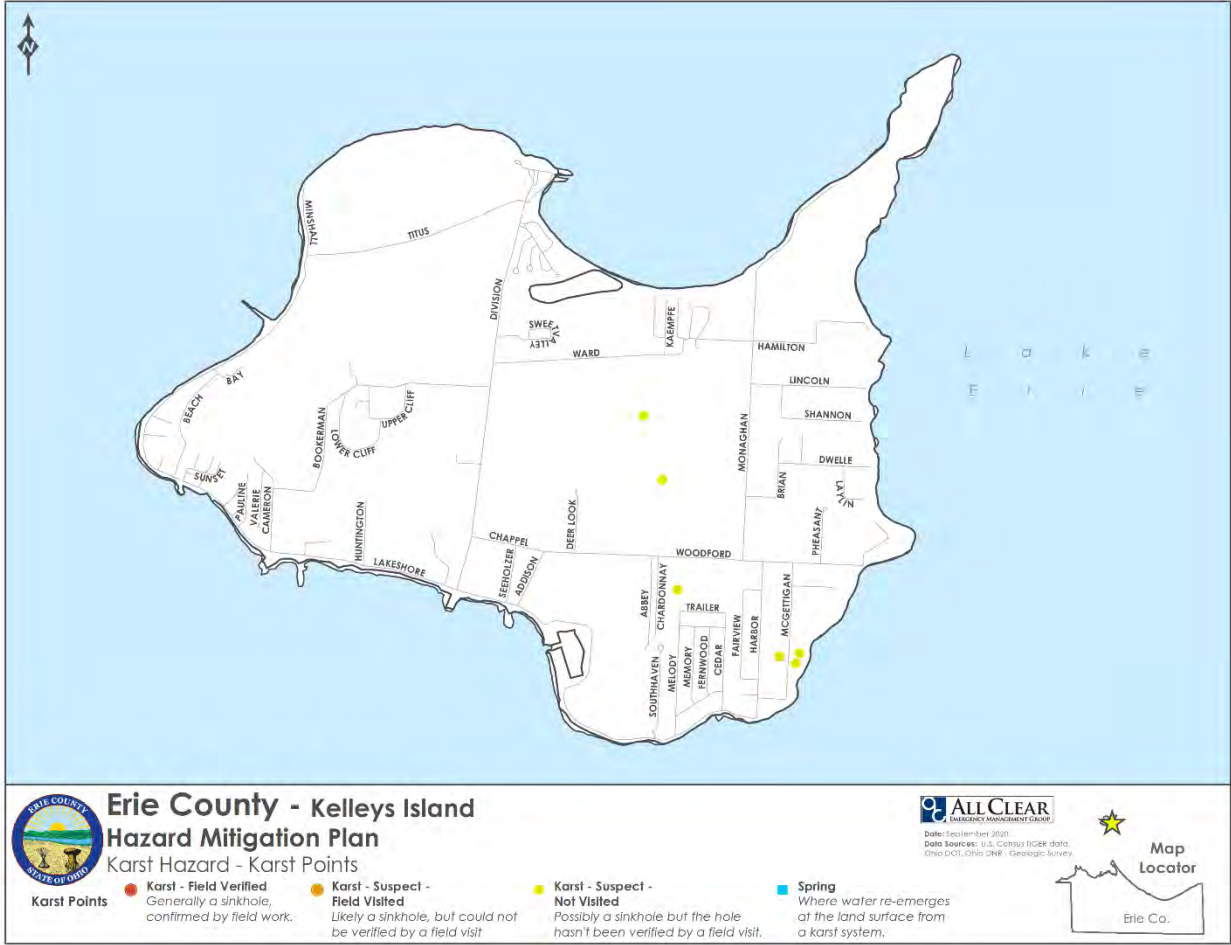


Figure 29: Karst Point Locations for the Village of Kelleys Island

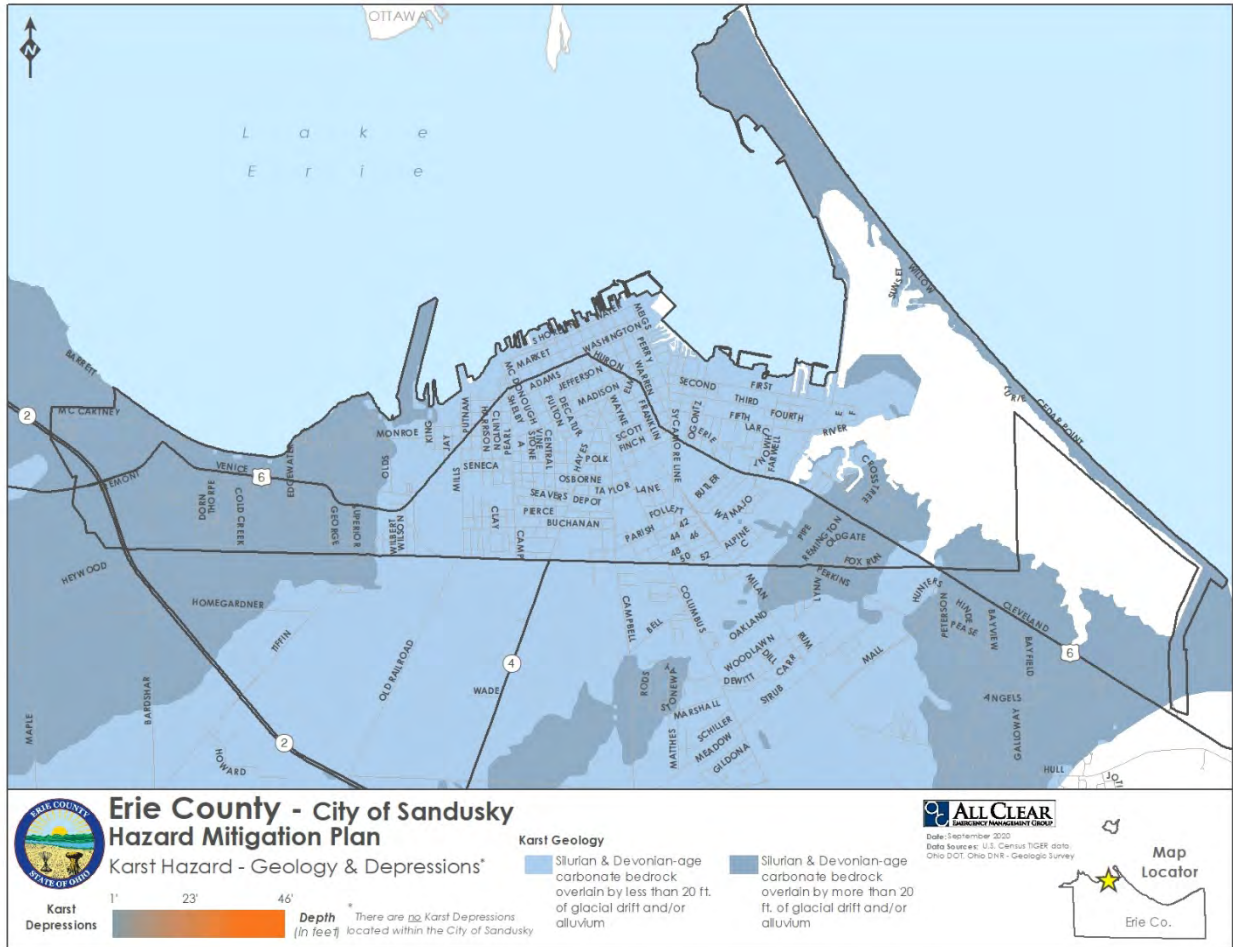


Figure 30: Karst Hazard Map for the City of Sandusky

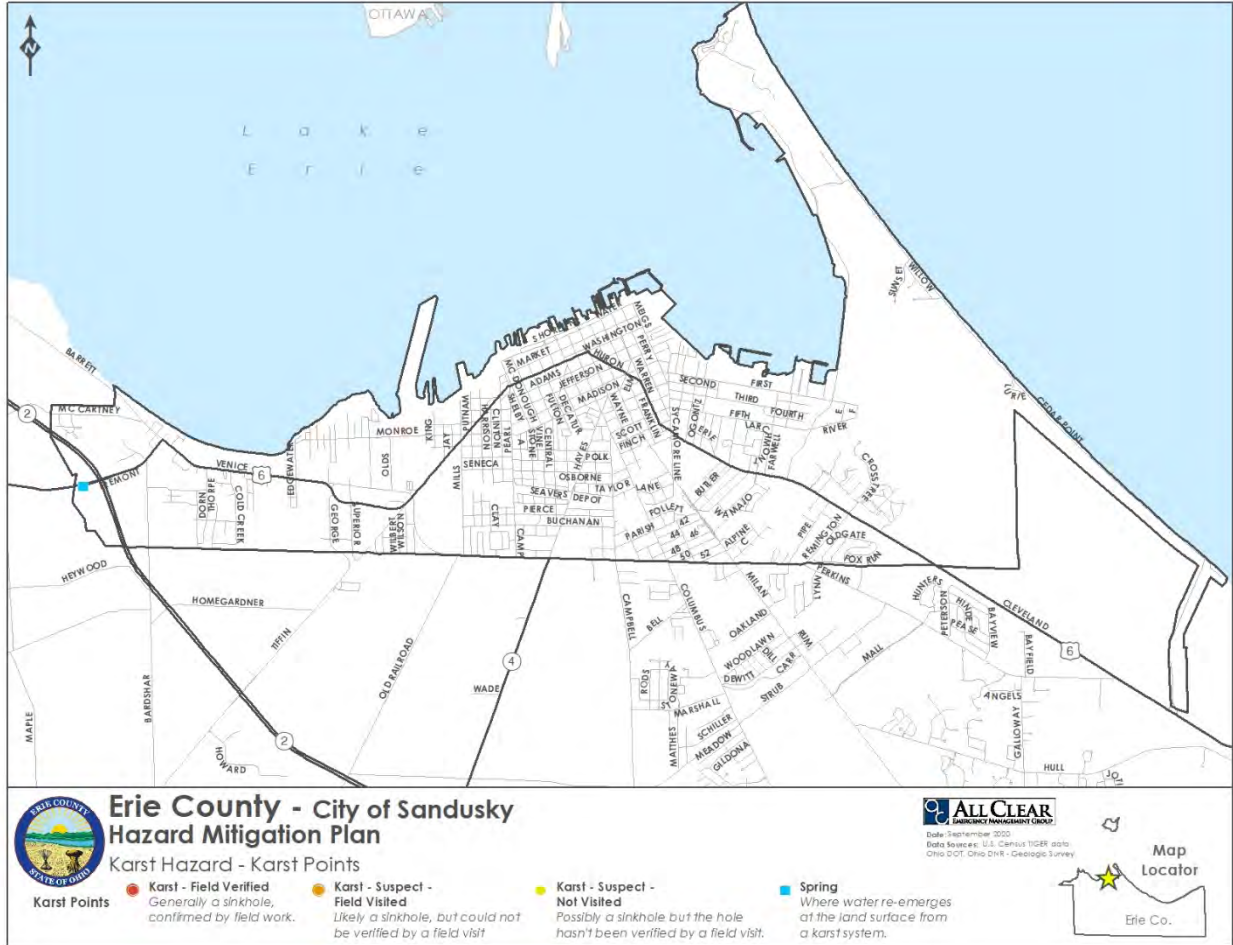


Figure 31: Karst Point Locations for the City of Sandusky

7.4.3 Extent

Flooding is a site-specific hazard. Therefore, floodplains are an important planning consideration. A floodplain is any land area susceptible to inundation by floodwaters from any source. Floodplains are measured in terms of the amount of stormwater that it takes to cover a given area of land. These storm events are measured in frequency of occurrence, such as 5-year, 100-year and 500-year, with the standard measurement being the 100-year storm or floodplain. In Erie County flooding can happen almost anytime however this number one hazard can be exacerbated when heavy rains occur in late winter and accelerate the melting of snow. Flooding in Erie County can also be intensified if the flow of water is obstructed in some way such as by ice jams. Ice jams occur when large chunks of ice flow downstream and become trapped at a point in a creek or stream. This creates a sort of natural dam. Ice jams can cause infrastructure damage to bridges and culverts, but typically their main concern is flooding upstream from the jam. Ice Jams can typically be easily controlled and broken up, so flooding is not always an issue.

Flooding can also be exacerbated locally by the presence of impermeable surfaces due to buildings and pavement or lack of appropriately sized flood water detention basins.

Any development within floodplains can impact the direction, flow and level of the watercourse during periods of high water or flooding. In other words, if fill material is placed or a house constructed in a floodplain, it will alter the boundaries of the floodplain upstream and downstream of that area. This alteration happens because structures or fill utilize valuable space that would otherwise act as a natural retaining area for floodwaters to spread and slow. Not only does development in the floodplain increase dangers downstream, developments within the floodplain are at higher risk of damage due to flooding. This damage includes fill material and debris from destroyed structures upstream colliding with structures in the floodplain downstream of an affected area. Many bridges are washed out in floods because debris clogs their free-flow area.

According to the National Weather Service (NWS), there are three stream gages in Erie County. One is located in Bellevue and records the height of groundwater. This stream gage does not have information regarding historical height of the groundwater at Bellevue. Measures of concern for this gage are at seven feet of depth basements of homes in and around Bellevue would be threatened and some roads could be flooded. At ten feet, the groundwater would flood basements and agricultural fields. Another stream gage in Erie County is on Old Woman Creek at Berlin Road. There are no historic records associated with this stream gage, no flood stages established, and no impacts given.

The last stream gage is located on the Huron River at Milan. The deepest historical flood at this location occurred on July 5, 1969 when the river crested at 31.1 feet. This is the deepest flood recorded by a stream gage in Erie County. At this location, the flood action stage is 14 feet, the flood stage is 18 feet, the moderate flood stage is 19.5 feet and the major flood stage is 22.5 feet. This 1969 flood was 8.6 feet higher than the major flood stage. According to the NWS, at 18 feet, flooding occurs in low lying areas along the Huron River from Milan to Franklin Flats. At 19.5 (moderate flood stage) feet, flood waters are over a foot deep in Franklin Flats. At 21 feet, businesses along the river in Milan, near US Route 50 are affected, and water in Franklin Flats is over two feet deep. Low lying secondary roads may be impassible. At 22.5 (major flood stage) feet, homes are flooded in Franklin Flats, and evacuation may be necessary; many local roads are impassible. The 100-year flood at this location is 23 feet deep. At 24 feet, major flooding occurs in Franklin Flats, and water begins to impact Mud Brook Road. The 500-year flood at this location is 25 feet deep. At 26 feet, the river gage is flooded, and there is major flooding along the Huron River. At 31 feet, record flooding occurs throughout the valley, and considerable backwater flooding occurs along the tributaries of the Huron River. ³⁸

The following figures show the flood hazard maps for Erie County and the jurisdictions. These flood hazard maps delineate the specific zones areas of the County lie in. Flood hazard maps for the Townships are provided for reference in Appendix F.

³⁸ (National Oceanic & Atmospheric Administration, 2020)

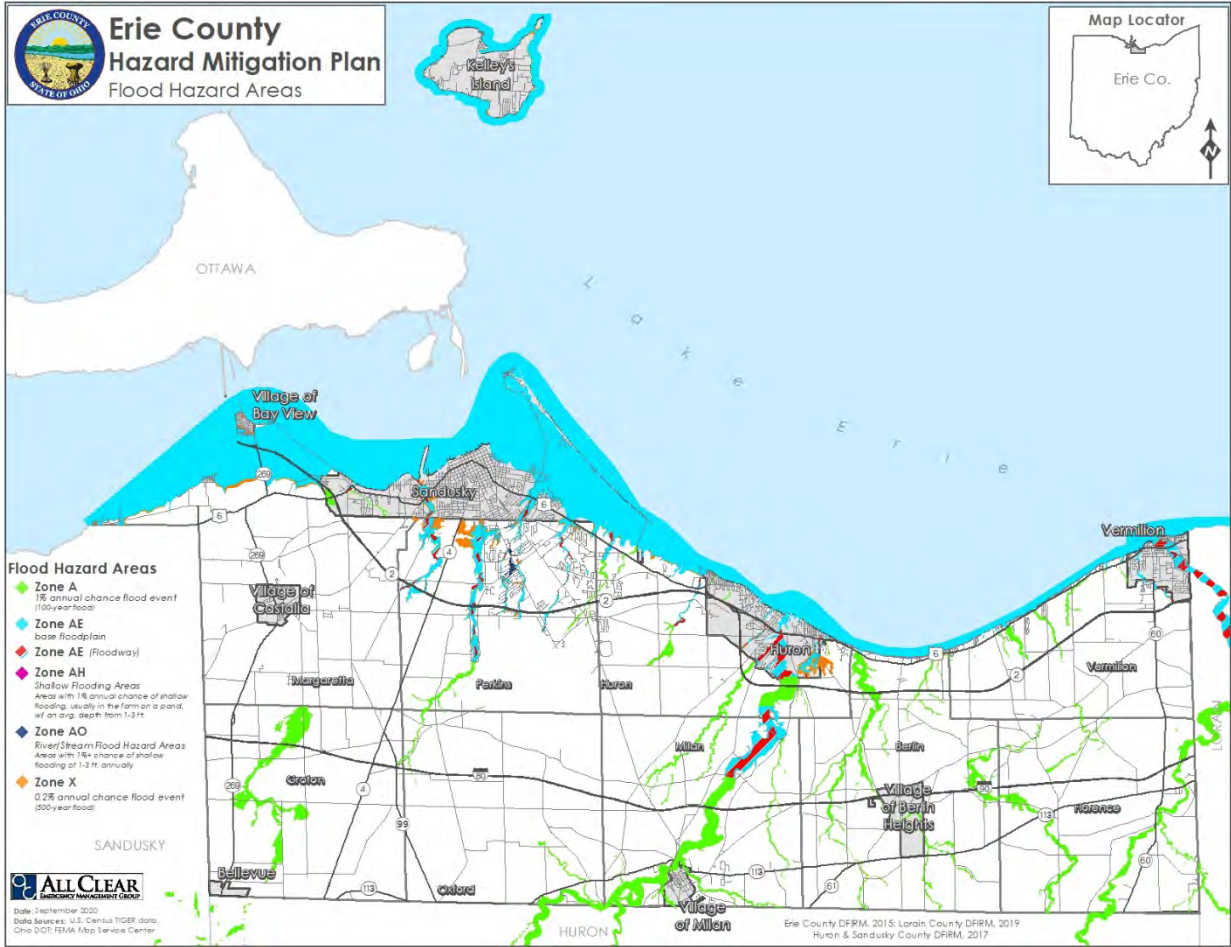


Figure 32: Flood Hazard Map for Erie County

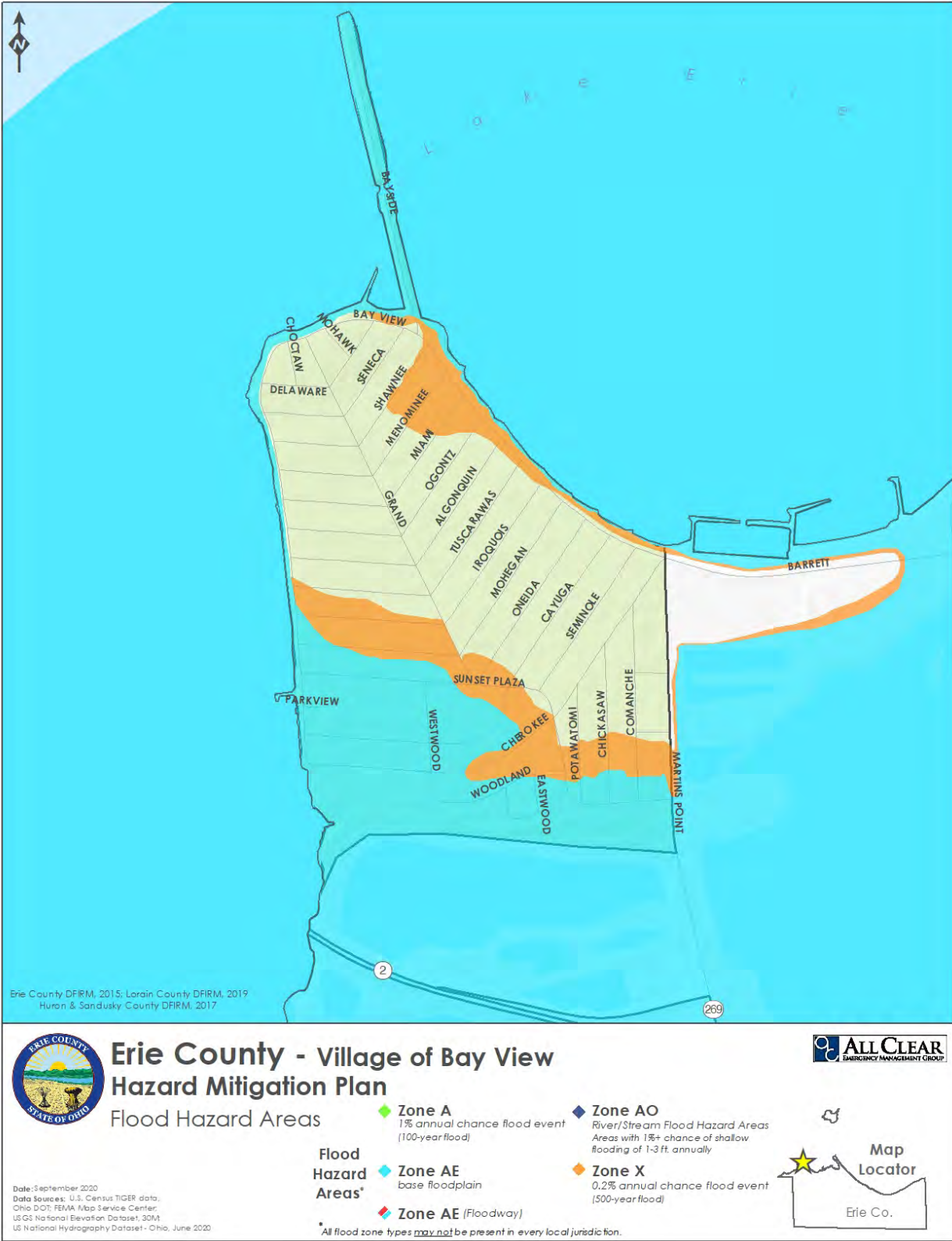


Figure 33: Flood Hazard Map for the Village of Bay View

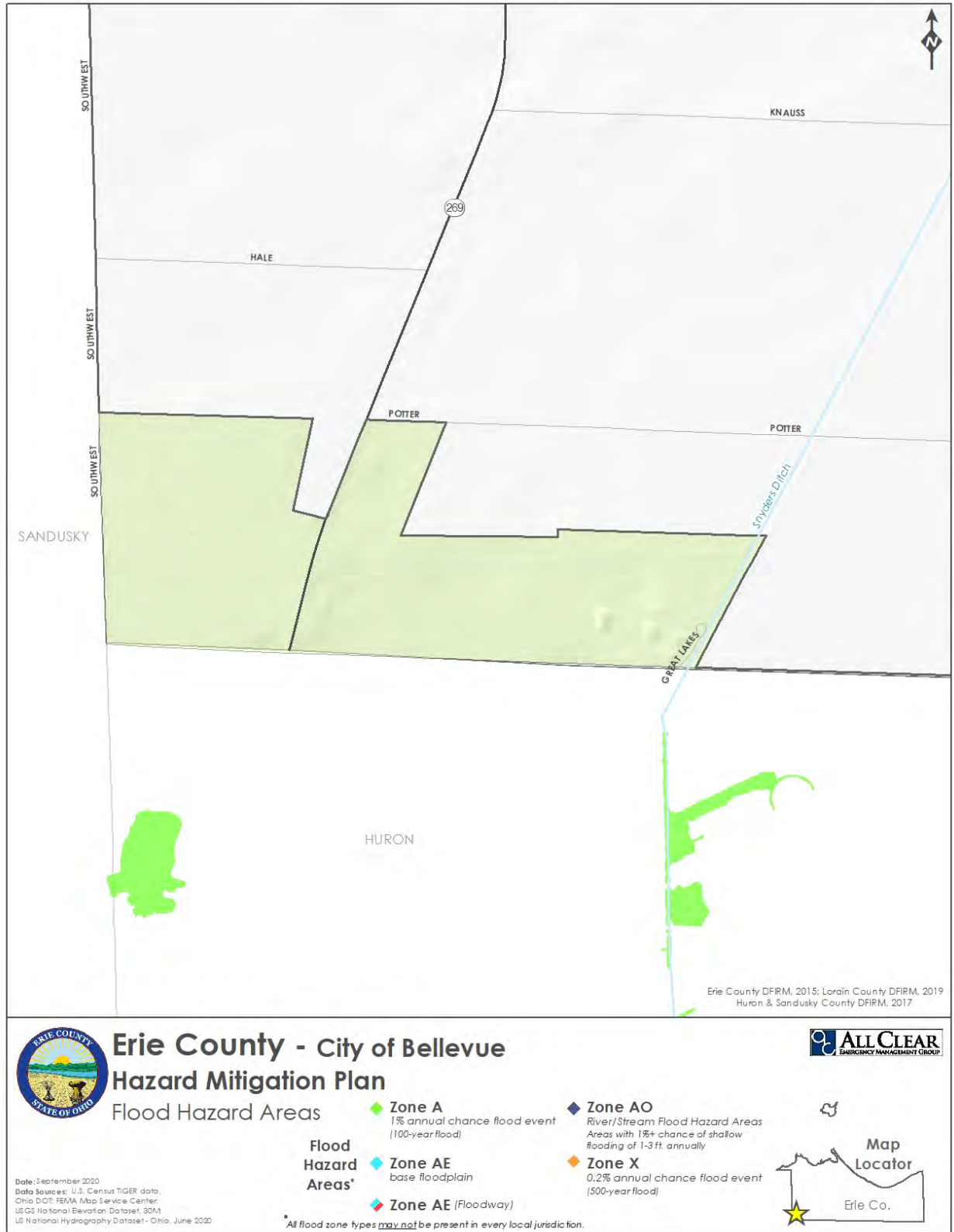


Figure 34: Flood Hazard Map for the City of Bellevue

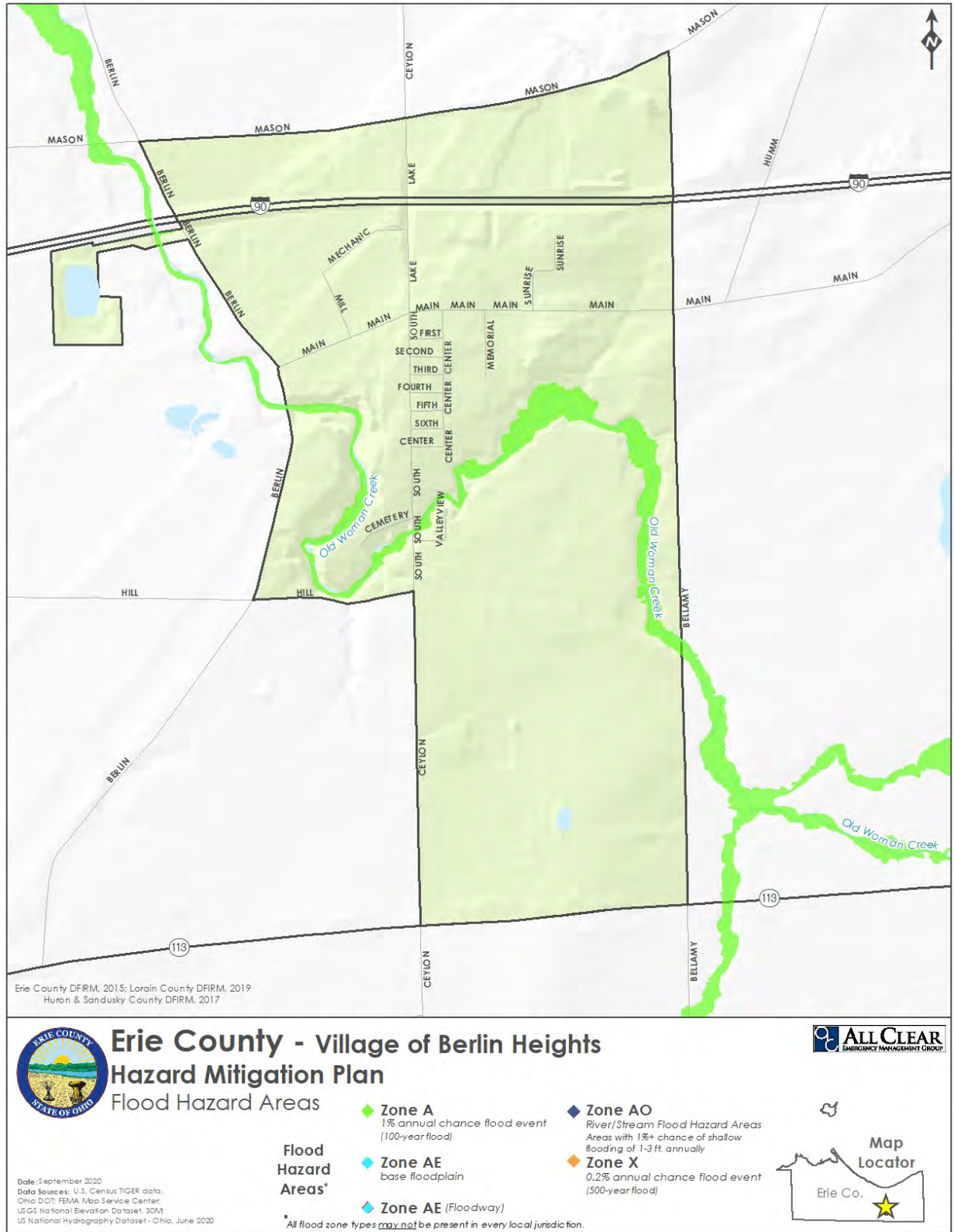


Figure 35: Flood Hazard Map for the Village of Berlin Heights

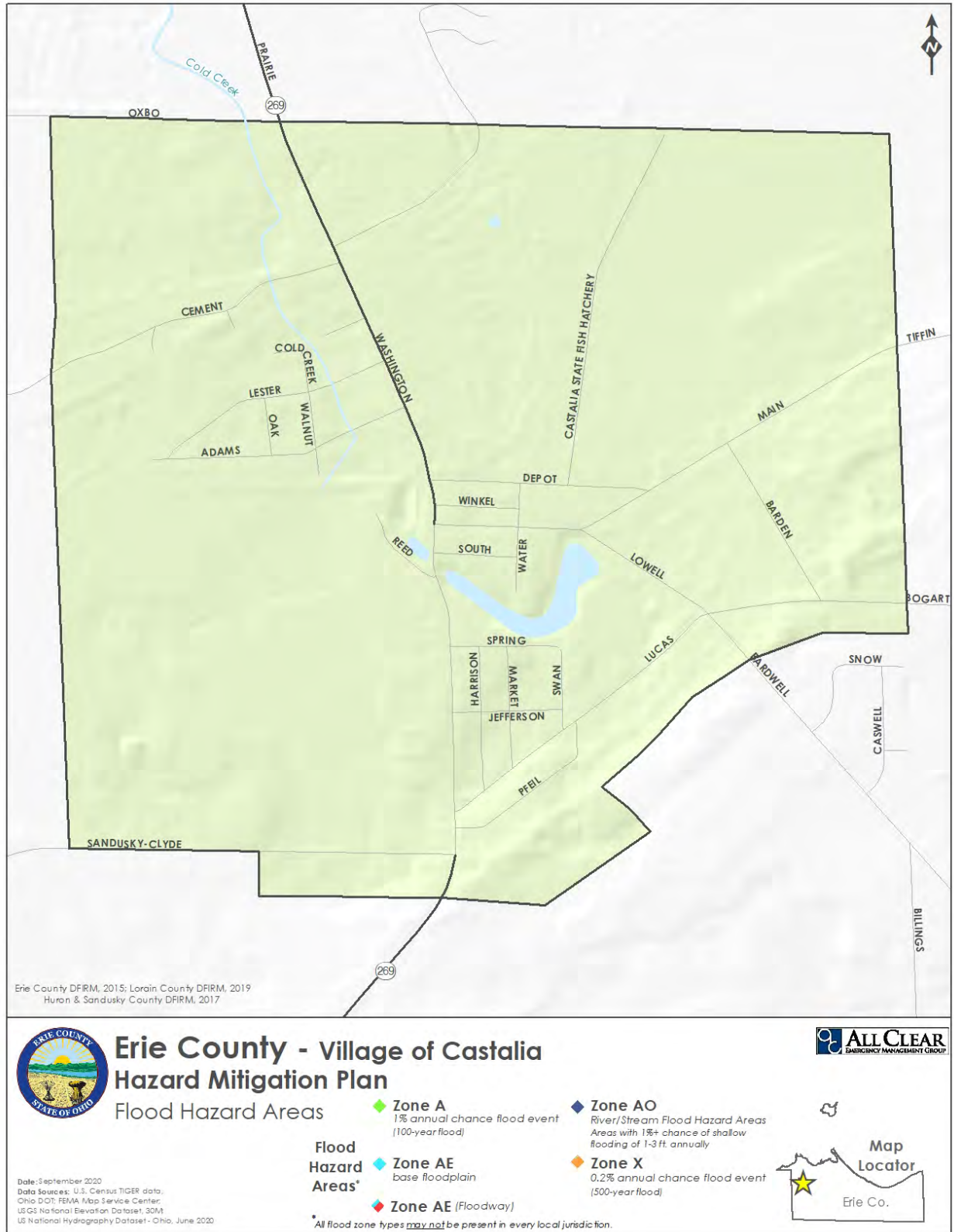


Figure 36: Flood Hazard Map for the Village of Castalia

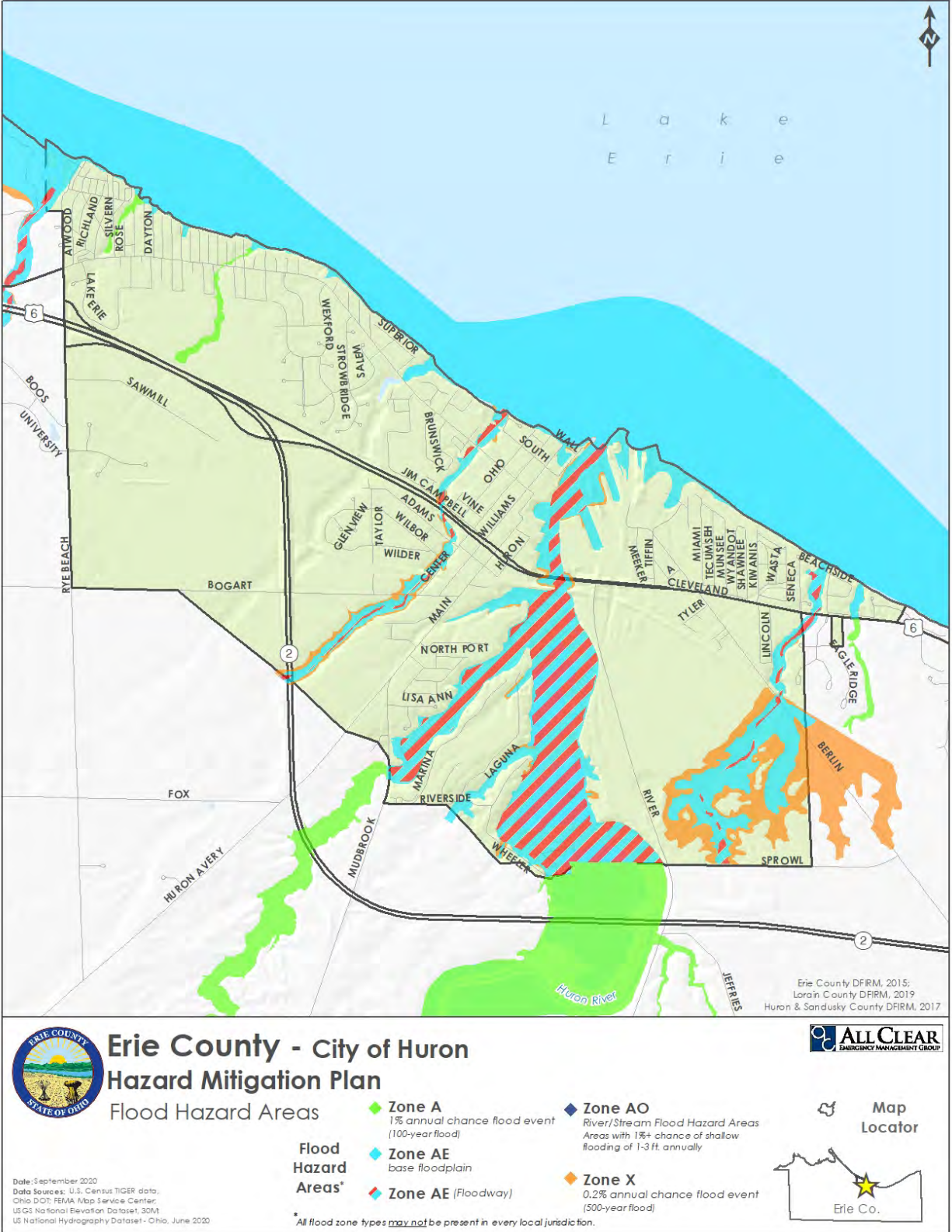


Figure 37: Flood Hazard Map for the City of Huron

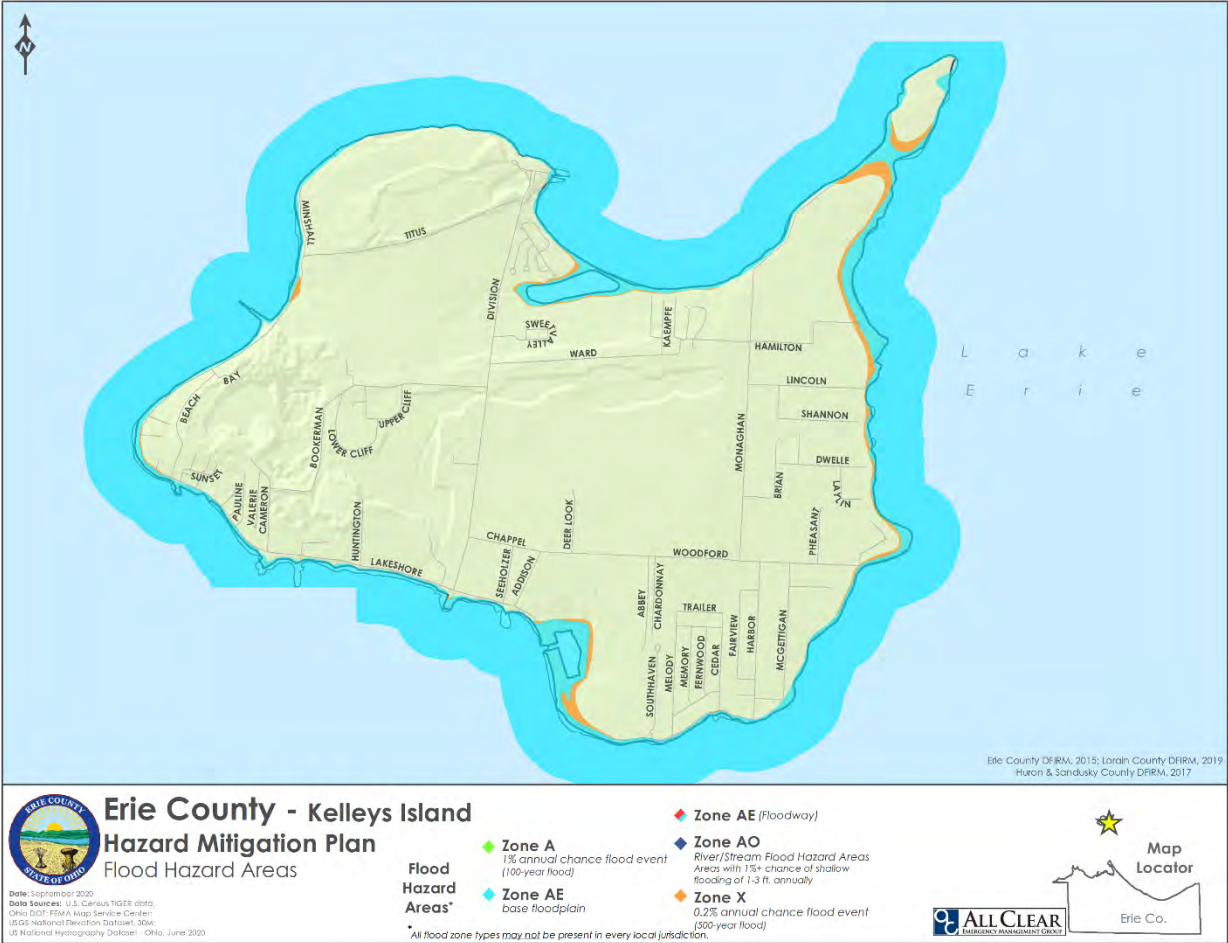


Figure 38: Flood Hazard Map for the Village of Kelleys Island

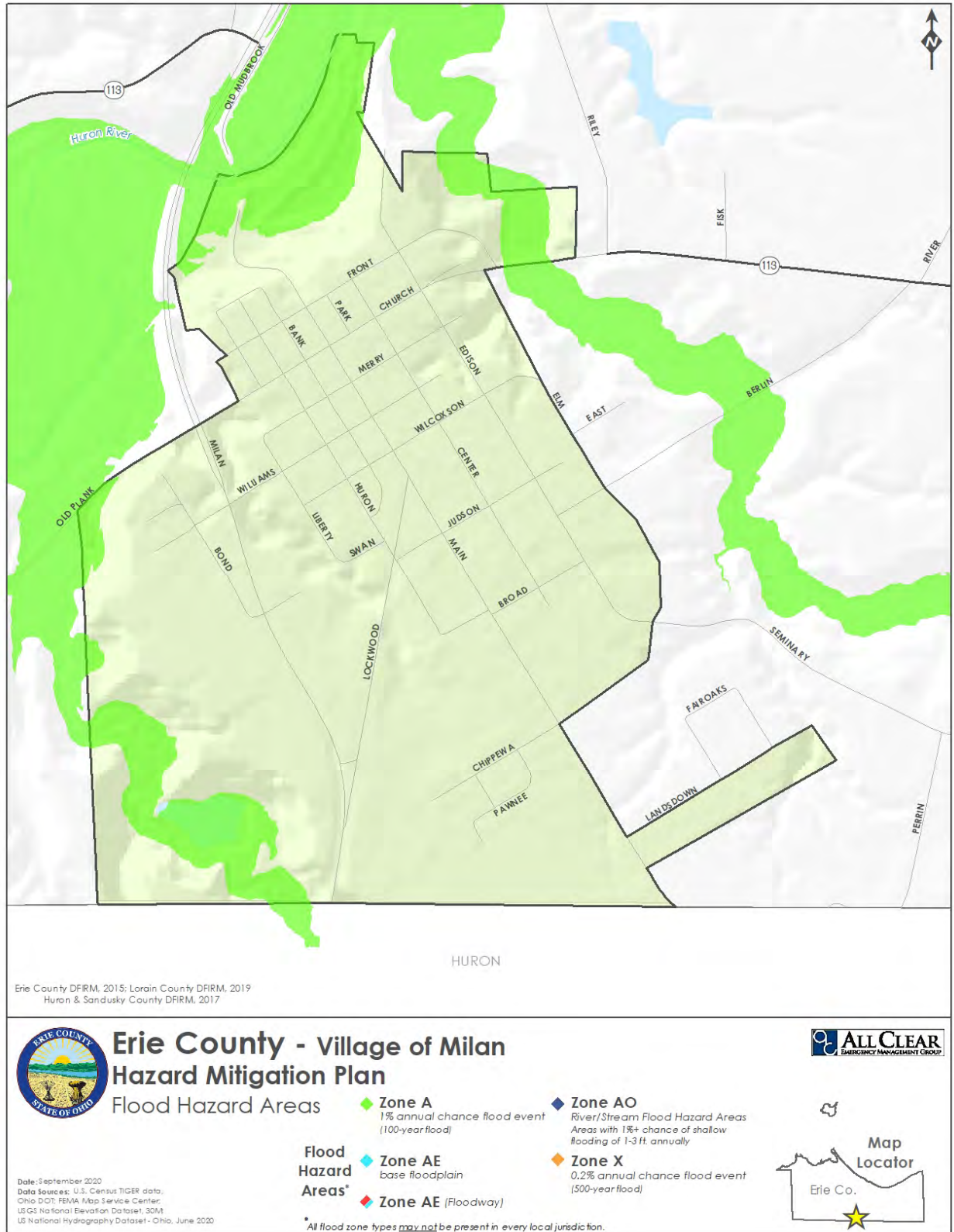


Figure 39: Flood Hazard Map for the Village of Milan

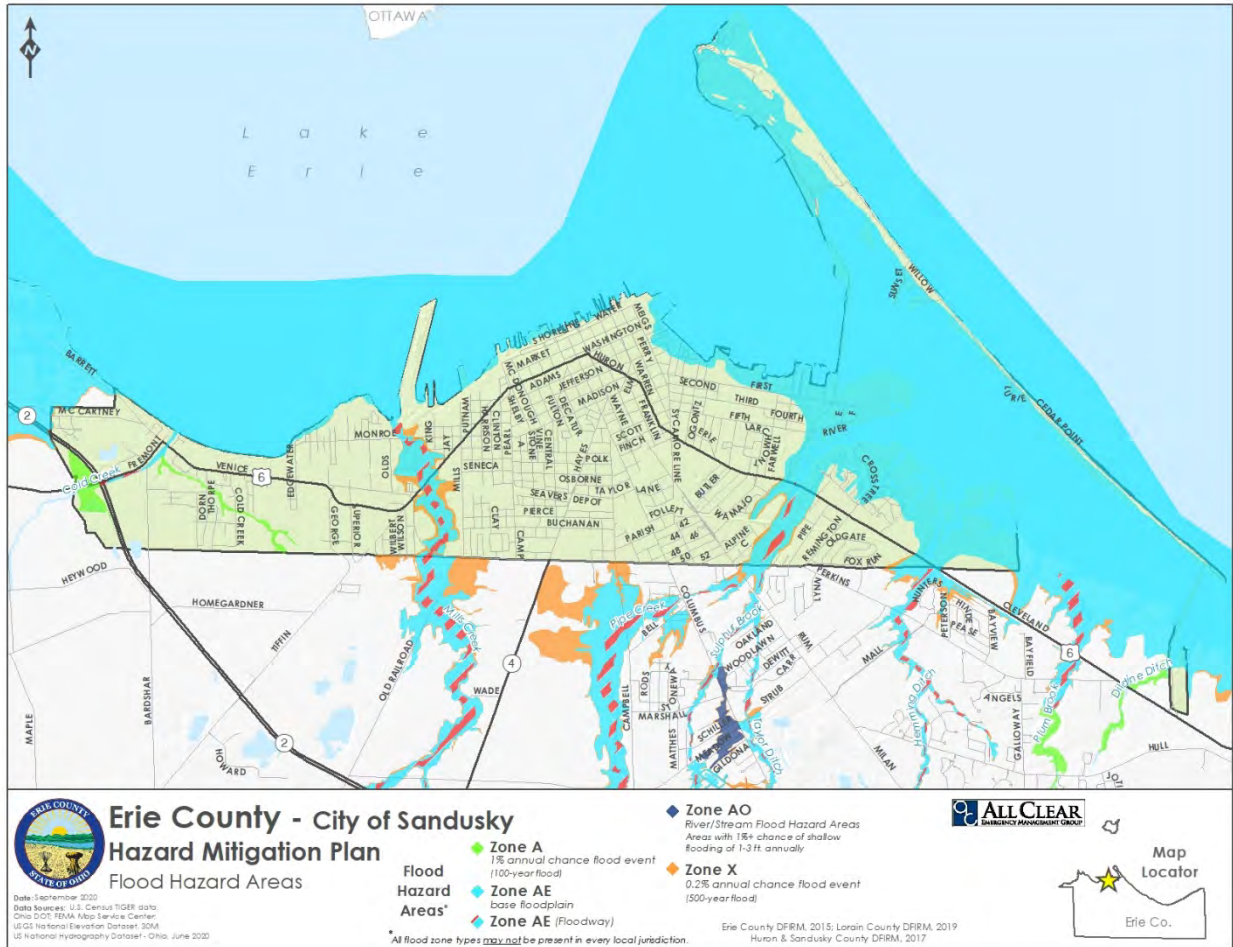


Figure 40: Flood Hazard Map for the City of Sandusky

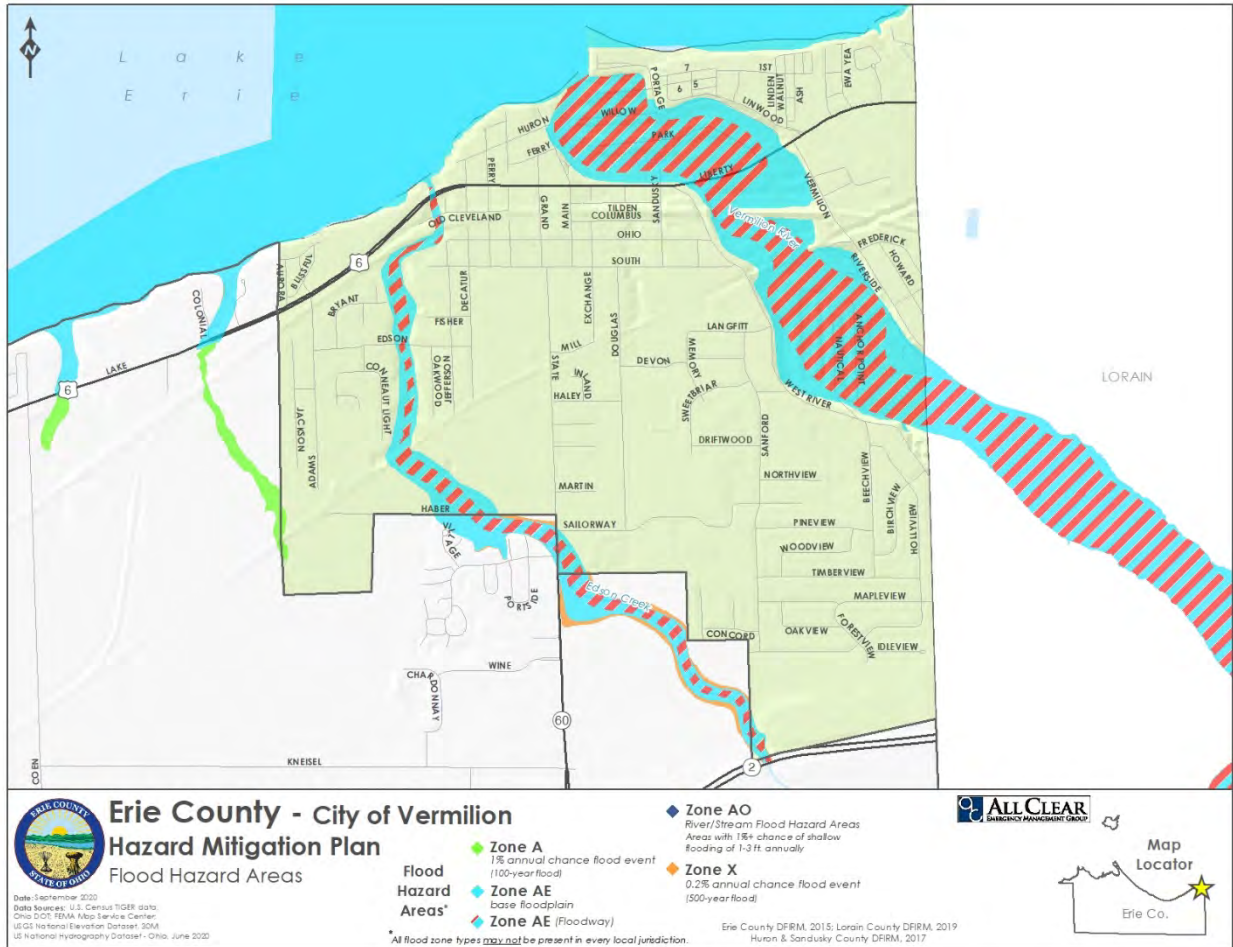


Figure 41: Flood Hazard Map for the City of Vermilion (Erie County Portion Only)

7.4.4 Previous Occurrences

The National Climatic Data Center (NCDC) has comprehensive information available on flood events back to 1996, as shown in Table 17. Additional historical flood information is provided in a narrative format. The county has suffered damage from numerous major floods and localized flash flooding. Flooding is the second most frequent disaster event: severe summer storms being the most common.

Flood of July 1969. The rain began at approximately 8:00 p.m., July 4, 1969 and ended between 1:00 and 3:00 p.m. July 5, 1969. Rain occurred about 20 miles on either side of a line running between Toledo, Ohio and Wheeling, West Virginia with centers of greater than 10 inches located around Wooster, Ohio and Norwalk, Ohio. Preliminary bucket surveys and reports from other unofficial rain gages indicated that up to 14 inches of rain occurred in certain localities.

This precipitation caused flooding which resulted in loss of life and considerable crop and property damages in a dozen Ohio counties. The hardest hit communities were Wooster, Ashland, Norwalk, Vermilion, Millersburg, Loudonville and Killbuck, Ohio. As of July 21, 1969, 46 fatalities were reported and five persons missing as a result of the 4th of July storm.

Total flood damages were estimated to be between 70 and 140 million dollars. Of these flood damages, agricultural damages were estimated between 40 and 80 million while property damage was between 30 to 60 million dollars.

Flood of August 1998. The Huron River at Milan exceeded its flood stage of 14 feet and crested at 23.4 feet at 0700 EST on 08/26/98. Flooding occurred in the lagoon communities from Milan to near Huron and small businesses near US Route 250. Basements and streets were also flooded. Seventy-five homes were evacuated in Franklin Flats, 10 to 12 homes on Mudbrook Road were evacuated as were 70 campers at Huron Valley Campground. This crest level was more than nine feet above flood stage and the second highest in 30 years.

Flood of January 2005. Heavy rain and runoff from snowmelt caused widespread lowland flooding in Erie County during the first half of January 2005. Some of the worst flooding occurred along the Huron River. At Milan, the river was already above the 14-foot flood stage at midnight on the 1st. The river continued in flood through the 14th with crests of 19.74 feet on the 1st and 19.66 feet on the 12th. The flooding on the 1st was caused by ice jamming on the river. Damage was reported to buildings in Franklin Flats on both the 1st and 12th. Businesses along U.S. Route 250 in Milan also sustained some damage from flooding. January 2005 was one of the wettest Januarys on record with 5.48 inches of rain measured by cooperative observers in Florence. In addition to this rain, extensive snowpack existed over Erie County at the beginning of the month. Temperatures in the 40s and 50s the first three days of the month caused a rapid snowmelt and brought area streams and creeks to full just in time for a significant winter storm on the 5th and 6th. Then, just as things began to return to normal, heavy rains fell on the area on the 11th, 12th and 13th causing conditions to once again worsen. Hundreds of homes in the county sustained damage from river, basement, or nuisance flooding. Many secondary roads had to be closed because of flooding.

Flood of June 2006. Thunderstorms caused torrential rains on Erie County during the evening of June 21st 2006. Rainfall rates with the stronger storms exceeded three inches per hour. As much as 7 to 9 inches of rain fell on Perkins Township with 4 to 6 inches over the remainder of the county. Most of this rainfall fell between 8 and 11 p.m. Devastating flash flooding occurred across the county as result of this rainfall. Perkins, Milan, Huron and Margaretta Townships were the hardest hit by the flooding. Rapid rises in water levels occurred in the county forcing the closure of dozens of roads and streets. Hundreds of people had to be evacuated from flood prone areas. The flooding was especially bad along Pike Creek in Perkins Township which quickly left its bank. Flooding also occurred along Mills Creek near Sandusky with several roads in the city flooded by two to three feet of water. The flooding worsened after daybreak on the 22nd as runoff from the heavy rains on the 21st made its way into the larger creeks and rivers. Local officials stated that this flood event was the worst in the county since the July 4th, 1969.

Three piers and several boats in this area were washed out into Lake Erie. A total of 20 homes were destroyed by flooding in Erie County with 25 homes suffering major damage and 79 more with minor damage. Several motorists had to be rescued from stranded vehicles. In addition, 64 mobile homes in Terrace Court and Franklin Flats were heavily damaged. Several hundred additional homes and businesses sustained damage from

either basement or nuisance flooding. A total of 573 people were evacuated in the county by emergency personnel. Damage to roads, culverts and bridges was significant. Crop losses in the county was substantial as standing water was reported over most of the county. Local officials stated that this flooding was the worst in the county since the storms of July 4th, 1969.

Flood of August 2007. A stationary boundary stretched from west to east through northern Ohio during the morning hours of the 20th and remained nearly stationary for the next several days. Heavy rain along this boundary moved across far northern Ohio during the day causing flooding and flash flooding across the region.

Heavy rain fell across the area during the morning hours of the 20th. Rainfall reports indicate that between 2.0 and 3.0 inches of rain fell that morning across the area. The heavy rain was able to quickly make its way to local streams and rivers, but those eventually filled up through the morning hours, and excess runoff began ponding in low lying locations and roads throughout the county. By midday of the 20th, roads northeast of Bellevue to Huron gradually flooded. Flooding continued through the overnight hours into the 21st. By the morning, water eventually flooded out the Franklin Flats area. Floodwaters receded throughout the county during the midday and afternoon hours of the 21st.

Flood of May 2010. A warm front lifted north across northern Ohio during the afternoon hours of May 31st. A cold front followed during the evening. Showers and thunderstorms developed in association with both fronts. Slow moving thunderstorms produced heavy rainfall which caused flash flooding in a few areas. Rainfall rates at times were between two and three inches per hour. A few locations received more than four inches of rainfall. The flooding was the worst in western Geauga County where the damage was extensive. A few storms also became severe with minor damage reported.

Slow moving thunderstorms dumped locally heavy rainfall on portions of Erie and Sandusky Counties. Rainfall rates at times were between two and three inches per hour. A storm total of 3.98 inches of rainfall was measured in Bellevue with 3.48 inches reported a mile north of Bellevue. A spotter in Bloomingville measured a total of 3.90 inches of rain. Widespread flooding occurred across southwestern Erie County, northwestern Huron County and eastern Sandusky County. The worst flooding was in the Bellevue area. To the north of Bellevue, State Route 269 along with Hale, Potter and Portland Roads had to be closed because of flooding. Over two feet of water was also reported on U.S Route 20 in Bellevue. Several cars became stranded in the flood waters. Many other secondary roads in the area also experienced flooding. Several dozen homes sustained damage, mainly from basement flooding.

Flood of March 2015. From mid-January through early March of 2015, frigid and much below normal temperatures set the stage for ice jam development along rivers and creeks in the Lake Erie drainage basin. Nearly every climate station in the Cleveland WFO region saw their coldest February on record in 2015. As a result, Lake Erie was 98% frozen by early March. The lake is the mouth for almost all northern Ohio and Pennsylvania rivers and creeks. When the lake is ice covered, it becomes a barrier to the natural outflow of the rivers. Going into March the area had a widespread and significant snowpack based

on regional climatology. The snowpack was heaviest across the snowbelt where the average depth was two to three feet. Elsewhere the snowpack had compacted to eight inches or less. A survey conducted by NWS Cleveland employees shortly before the thaw revealed the snow water equivalent in the snowpack to be one to two inches west and south of Cleveland, and three to five inches in the snowbelt to the east. By the middle of March temperatures began to warm. A result of the warming was that by the end of the second week of March the snowpack was mostly gone except in the snowbelt. The runoff from this snowmelt began to raise river levels and break up the ice sheets that had accumulated along most northern Ohio and Pennsylvania Rivers. Numerous ice jams formed during this time; however, no flooding impacts were reported. A rain event moved along the Ohio River on the 13th resulting in rapid runoff in the region. The rainfall was not substantial in the Lake Erie basins, with amounts near a trace in the Maumee River near Toledo, to three quarters of an inch in the Cuyahoga Basin near Cleveland. Though not significant, the rainfall was enough to raise river levels. For those rivers experiencing ice jams, the increased flow was forced to back-up and out of the riverbanks. The ice jams shifted and moved between the 13th through the 18th until the rivers were able to empty into Lake Erie. During that time numerous communities were impacted by the ice jams. Below is a summary of some of those communities.

On March 11th an ice jam developed on the Vermilion River in the Mill Hollow metro park located just south and upstream of the town of Vermilion. The ice jam was stationary for days as water continued to build behind it, flooding the metro park but no other properties or roads. Around 3:30 am on the morning of the 14th the combination of snowmelt and rainfall caused the ice jam to break. The water levels in the Riverside Drive community of Vermilion saw a rapid water rise. One person had to be rescued from waist deep water around 6 am that morning. Several people in the community had already evacuated due to the heightened awareness from the ice jam flood watch leading up to the ice jam break. A second ice jam developed around Riverside Drive which broke around 9:30 am. It went in cycles all day long, jamming up and then breaking loose because of all the bends in the river. About 20 homes sustained minor flooding damage mainly to garages and outer buildings.

In 2020, there were a series of Lakeshore flooding events in Erie County due to lake level rise, seiche events, and other severe weather. These flood events occurred on February 5, March 22, April 23, May 5, May 12, May 16, June 6 and June 14. In some areas of the county, the water had not yet receded enough to assess damaged by October 2020.

Table 17: Flooding in Erie County 1996-2019

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Erie (Zone)	3/20/1996	Flood	0	0	\$-	\$-
Erie (Zone)	3/25/1996	Flood	0	0	\$-	\$-
Countywide	4/23/1996	Flash Flood	0	0	\$-	\$-
Erie (Zone)	4/23/1996	Flood	0	0	\$-	\$-
Erie (Zone)	4/30/1996	Flood	0	0	\$-	\$-
Huron	6/19/1996	Flash Flood	0	0	\$10,000	\$-
Sandusky	9/9/1996	Flash Flood	0	0	\$-	\$-
Sandusky	9/9/1996	Flash Flood	0	0	\$50,000	\$-
Erie (Zone)	12/11/1996	Flood	0	0	\$-	\$-

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Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Erie (Zone)	12/17/1996	Flood	0	0	\$-	\$
Erie (Zone)	12/24/1996	Flood	0	0	\$-	\$
Erie (Zone)	1/22/1997	Flood	0	0	\$-	\$
Erie (Zone)	2/4/1997	Flood	0	0	\$75,000	\$-
Erie Lakeshore	3/13/1997	Storm Surge/Tide	0	0	\$-	\$-
Erie (Zone)	5/25/1997	Flood	0	0	\$50,000	\$-
Countywide	6/1/1997	Flash Flood	0	0	\$50,000	\$15,000
Lake Erie Lakeshore	6/1/1997	Storm Surge/ Tide	0	0	\$200,000	\$-
Erie (Zone)	6/1/1997	Flood	0	0	\$-	\$
Erie (Zone)	6/1/1997	Flood	0	0	\$100,000	\$
Erie (Zone)	1/7/1998	Flood	0	0	\$100,000	\$
Countywide	1/7/1998	Flash Flood	0	0	\$-	\$
Countywide	1/9/1998	Flash Flood	0	0	\$-	\$
Sandusky	2/4/1998	Storm Surge/ Tide	0	0	\$75,000	\$
Sandusky	2/17/1998	Storm Surge/Tide	0	0	\$500,000	\$
Erie (Zone)	2/17/1998	Flood	0	0	\$-	\$
Sandusky	3/20/1998	Storm Surge/ Tide	0	0	\$100,000	\$-
Erie (Zone)	3/21/1998	Flood	0	0	\$-	\$
Bay View	4/9/1998	Storm Surge/ Tide	0	0	\$1,000,000	\$-
Erie (Zone)	4/17/1998	Flood	0	0	\$-	\$
South Portion	6/28/1998	Flash Flood	0	0	\$5,000	\$
Erie (Zone)	6/30/1998	Flood	0	0	\$-	\$
Countywide	6/30/1998	Flash Flood	0	0	\$20,000	\$
Countywide	6/30/1998	Flash Flood	0	0	\$-	\$
Countywide	6/30/1998	Flash Flood	0	0	\$10,000	\$
Erie (Zone)	7/22/1998	Flood	0	0	\$-	\$
Erie (Zone)	8/25/1998	Flood	0	0	\$500,000	\$
Lakeshore	11/10/1998	Seiche	0	0	\$-	\$
Erie (Zone)	1/22/1999	Flood	0	0	\$100,000	\$
Erie (Zone)	1/23/1999	Flood	0	0	\$100,000	\$
Erie (Zone)	4/9/1999	Flood	0	0	\$-	\$
Milan	6/12/1999	Flash Flood	0	0	\$-	\$
Erie (Zone)	4/8/2000	Flood	0	0	\$-	\$
Erie (Zone)	6/18/2000	Flood	0	0	\$-	\$
Castalia	7/29/2000	Flash Flood	0	0	\$-	\$
Erie (Zone)	2/1/2001	Flood	0	0	\$-	\$
Erie (Zone)	4/6/2001	Flood	0	0	\$20,000	\$
Erie (Zone)	6/14/2004	Flood	0	0	\$-	\$
Erie (Zone)	1/1/2005	Flood	0	0	\$425,000	\$
Vermilion	8/20/2005	Flash Flood	0	0	\$30,000	\$
Countywide	6/21/2006	Flash Flood	0	0	\$2,000,000	\$
Countywide	6/22/2006	Flood	0	0	\$24,500,000	\$5,000,000
Vermilion	3/2/2007	Flash Flood	0	0	\$100,000	\$
Kimball	8/20/2007	Flood	0	0	\$150,000	\$
Milan	8/20/2007	Flood	0	0	\$-	\$
Castalia	5/31/2010	Flash Flood	0	0	\$200,000	\$
Berlin Heights	4/25/2011	Flash Flood	0	0	\$50,000	\$
Florence	4/25/2011	Flash Flood	0	0	\$80,000	\$
Sandusky	9/7/2011	Flood	0	0	\$3,000	\$
Vermilion	10/30/2012	Flood	0	0	\$40,000	\$
Milan	10/30/2012	Flood	0	0	\$15,000	\$
Milan	7/10/2013	Flash Flood	0	0	\$100,000	\$
Vermilion	3/14/2015	Flash Flood	0	0	\$150,000	\$
Milan	1/12/2018	Flood	0	0	\$-	\$

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Vermilion	1/23/2019	Flash Flood	0	0	\$50,000	\$-
Erie (Zone)	5/12/2019	Coastal Flood	0	0	\$5,000	\$-
Erie (Zone))	6/5/2019	Lakeshore Flood	0	0	\$300,000	
Total			0	0	\$31,263,000	\$5,015,000

7.4.5 Probability of Future Events

In this plan, special flood hazard area is used in conjunction with floodplain to clarify that the area under consideration is identified on the Flood Insurance Rate Maps (FIRM) as having at least a 1% chance of flooding in any given year. Historically, the area with a 1-percent chance of flooding in any given year has been called the “100-year floodplain” and the area with a .2% chance of flooding in any given year has been called the “500-year floodplain.” As these terms can be misleading by suggesting that there will be a flood only every 100 or 500 years respectively. However, 100 year or 500 year floodplains do not predict the frequency or probability of a future flood. Therefore, the probability will be calculated using the historical number of events over the years on record.

The NCDC data indicates that there have been 66 events in the past 24 years. Therefore, the recurrence interval is $24/66 = 0.36$ years, which means the probability is 100 percent chance annually.

Due to climate change, flooding can expect to get worse as the intensity of storms increases and lake levels continue to reach historically high levels.

7.4.6 Vulnerability

Flood vulnerability is described in terms of what community assets, structures, and infrastructure are found in locations where flooding is anticipated.

Table 18: Summary of Past Losses Due to Flooding

	Estimated Property Damages
Total Losses Due to Flooding (1996–2019)	\$31,263,000
Average Annual Losses for 24 years	\$1,302,625

According to NCDC and reflected above in Table 18, estimated significant property damage in Erie County attributable to flooding during the years 1996 through 2019 is \$31,263,000. The average annual loss for these 24 years is $\$31,263,000/25 = \$1,302,625$.

Flooding can lead to property loss as well as loss of life. Flooding damages structures, including homes and businesses, vehicles, and infrastructure, including roadways. People who are surrounded by flood waters can require evacuation placing their lives as well as the lives of rescuers in danger. Flooding can disrupt the operation of businesses and schools and recovery from flood damages can be time consuming and costly.

Hazus-MH modeling was conducted for 100- and 500- year flood scenarios. Table 19 below summarizes the expected building damage by occupancy type for the 100-year flood scenario. Hazus-MH reports damage in damage levels. Level 1-10 represents minor

damage, Level 11-20 is moderate damage, etc. Level >50 is considered completely destroyed. It is predicted that in this scenario, about 155 buildings will sustain at least moderate damage and 5 buildings will be completely destroyed. These structures are all predicted to be residential structures.

Table 19: Expected Building Damage by Occupancy for 100 Year Flood Scenario

Occupancy	1-10	11-20	21-30	31-40	41-50	>50
Agriculture	0	0	0	0	0	0
Commercial	3	0	0	0	0	0
Education	0	0	0	0	0	0
Government	0	0	0	0	0	0
Industrial	1	0	0	0	0	0
Religion	0	0	0	0	0	0
Residential	136	118	24	6	2	5

The Hazus-MH flood model report for Erie County identified 72 critical facilities within the County. No critical facilities are expected to sustain moderate or more damage in either flood event. All hospital beds in the County are expected to be available for use.

Repetitive Loss Properties

Some structures in Erie County have been flooded repeatedly and have received more than one payment through the National Flood Insurance Program (NFIP) for flood damages. A repetitive loss structure is defined as an NFIP-insured structure that has had at least two paid NFIP claims of more than \$1,000 each in any 10-year period since 1978. There are 99 structures in Erie County that have been classified as repetitive loss structures and 331 total losses.

Severe repetitive loss properties are properties that have at least four NFIP payments over \$5,000 each and the cumulative amount of such claims exceeds \$20,000, or at least two separate claims payments with the cumulative amount exceeding the market value of the building. There are 15 structures in Erie County that have been classified as severe repetitive loss structures and 80 total losses.

Table 20 lists the repetitive and severe repetitive loss properties by jurisdiction. There are no repetitive loss properties specified for Bay View, Berlin Heights, Castalia, Kelleys Island or Milan. Data from 2018 was used as more recent data had discrepancies that were unable to be verified. The blue highlights indicate that the property is a severe repetitive loss property.

Table 20: Repetitive Loss and Severe Repetitive Loss Structures (2018)

Location	Type	Zone	Total Building Payments	Total Contents Payments	Losses	Total Payments	Average Payment	SRL
Bellevue	Other-Nonres	C	\$197,581.42	\$4,090.71	2	\$201,672.13	\$100,836.07	
Bellevue	Single Family	X	\$15,267.83	\$335.48	2	\$15,603.31	\$7,801.66	

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Bellevue	Single Family	A	\$16,836.71	\$-	3	\$16,836.71	\$5,612.24	
Bellevue	Single Family	A	\$23,611.91	\$-	2	\$23,611.91	\$11,805.96	
Erie Co.	Other-Nonres	AE	\$98,402.72	\$16,372.41	3	\$114,775.13	\$38,258.38	
Erie Co.	Other-Nonres	C	\$-	\$12,025.00	3	\$12,025.00	\$4,008.33	
Erie Co.	Single Family	A02	\$58,595.11	\$15,487.16	4	\$74,082.27	\$18,520.57	MVU
Erie Co.	Single Family	A07	\$21,471.00	\$1,945.00	2	\$23,416.00	\$11,708.00	VU
Erie Co.	Single Family	A02	\$4,353.23	\$6,930.00	2	\$11,283.23	\$5,641.62	
Erie Co.	Single Family	A	\$8,117.53	\$4,076.68	2	\$12,194.21	\$6,097.11	
Erie Co.	Single Family	A	\$9,796.31	\$1,418.00	3	\$11,214.31	\$3,738.10	
Erie Co.	Single Family	X	\$13,404.55	\$1,368.75	2	\$14,773.30	\$7,386.65	
Erie Co.	Single Family	A02	\$34,062.28	\$1,000.00	3	\$35,062.28	\$11,687.43	
Erie Co.	Single Family	C	\$16,140.00	\$2,875.15	2	\$19,015.15	\$9,507.58	
Erie Co.	Single Family	A	\$10,568.39	\$-	3	\$10,568.39	\$3,522.80	
Erie Co.	Single Family	A	\$3,586.00	\$-	2	\$3,586.00	\$1,793.00	
Erie Co.	Single Family	AE	\$10,843.27	\$3,319.36	2	\$14,162.63	\$7,081.32	
Erie Co.	Single Family	AE	\$17,968.48	\$-	2	\$17,968.48	\$8,984.24	
Erie Co.	Single Family	AE	\$38,444.21	\$1,060.70	3	\$39,504.91	\$13,168.30	
Erie Co.	Single Family	A07	\$12,531.24	\$16,640.89	3	\$29,172.13	\$9,724.04	
Erie Co.	Single Family	AE	\$7,360.44	\$-	2	\$7,360.44	\$3,680.22	
Erie Co.	Single Family	A07	\$7,048.51	\$457.48	2	\$7,505.99	\$3,753.00	
Erie Co.	Single Family	A07	\$81,131.14	\$10,971.18	2	\$92,102.32	\$46,051.16	
Erie Co.	Single Family	A03	\$14,627.71	\$9,374.69	3	\$24,002.40	\$8,000.80	
Erie Co.	Single Family	AE	\$49,050.77	\$6,800.00	2	\$55,850.77	\$27,925.39	
Erie Co.	Single Family	A02	\$45,610.45	\$8,000.00	2	\$53,610.45	\$26,805.23	
Erie Co.	Single Family	C	\$9,309.74	\$8,617.00	5	\$17,926.74	\$3,585.35	
Erie Co.	Single Family	A	\$12,494.07	\$-	2	\$12,494.07	\$6,247.04	
Huron	2-4 Family	A06	\$15,554.96	\$7,362.06	3	\$22,917.02	\$7,639.01	
Huron	2-4 Family	A03	\$3,801.60	\$-	2	\$3,801.60	\$1,900.80	
Huron	Single Family	AE	\$61,786.07	\$33,844.73	6	\$95,630.80	\$15,938.47	V
Huron	Single Family	AE	\$45,491.79	\$3,765.65	5	\$49,257.44	\$9,851.49	V
Huron	Single Family	AE	\$149,100.28	\$19,576.32	10	\$168,676.60	\$16,867.66	V
Huron	Single Family	AE	\$27,135.53	\$19,724.31	3	\$46,859.84	\$15,619.95	
Huron	Single Family	A03	\$63,399.01	\$9,699.00	6	\$73,098.01	\$12,183.00	
Huron	Single Family	A	\$16,572.18	\$-	3	\$16,572.18	\$5,524.06	
Huron	Single Family	A	\$3,759.26	\$-	2	\$3,759.26	\$1,879.63	
Huron	Single Family	A	\$37,638.33	\$-	3	\$37,638.33	\$12,546.11	
Huron	Single Family	C	\$2,282.00	\$22.00	2	\$2,304.00	\$1,152.00	
Huron	Other-Nonres	A	\$6,343.15	\$4,799.24	3	\$11,142.39	\$3,714.13	
Sandusky	Assmd. Condo	C	\$8,493.44	\$16,212.69	4	\$24,706.13	\$6,176.53	

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Location	Type	Zone	Total Building Payments	Total Contents Payments	Losses	Total Payments	Average Payment	SRL
Sandusky	Single Family	AE	\$48,203.52	\$997.00	5	\$49,200.52	\$9,840.10	V
Sandusky	Single Family	C	\$6,110.12	\$-	2	\$6,110.12	\$3,055.06	
Sandusky	Single Family	A03	\$9,536.45	\$11.00	3	\$9,547.45	\$3,182.48	
Sandusky	Single Family	A03	\$9,757.92	\$-	3	\$9,757.92	\$3,252.64	
Sandusky	Single Family	C	\$3,193.26	\$466.43	2	\$3,659.69	\$1,829.85	
Sandusky	Single Family	C	\$16,572.39	\$7,953.46	2	\$24,525.85	\$12,262.93	
Sandusky	Single Family	A03	\$11,728.56	\$2,041.39	4	\$13,769.95	\$3,442.49	
Sandusky	Single Family	A03	\$7,133.39	\$1,676.66	2	\$8,810.05	\$4,405.03	
Sandusky	Single Family	A03	\$15,303.44	\$-	2	\$15,303.44	\$7,651.72	
Sandusky	Single Family	A03	\$7,213.65	\$2,965.50	2	\$10,179.15	\$5,089.58	
Sandusky	Single Family	AE	\$17,918.46	\$2,457.50	4	\$20,375.96	\$5,093.99	
Sandusky	Single Family	A03	\$9,553.07	\$2,129.67	3	\$11,682.74	\$3,894.25	
Sandusky	Single Family	A03	\$5,891.26	\$6,169.86	2	\$12,061.12	\$6,030.56	
Sandusky	Single Family	A03	\$15,540.96	\$5,425.00	2	\$20,965.96	\$10,482.98	
Sandusky	Single Family	AE	\$38,799.23	\$7,705.00	4	\$46,504.23	\$11,626.06	
Sandusky	Single Family	A03	\$-	\$2,458.00	2	\$2,458.00	\$1,229.00	
Sandusky	Single Family	A03	\$5,603.38	\$1,081.15	3	\$6,684.53	\$2,228.18	
Sandusky	Single Family	A03	\$11,868.79	\$6,479.90	3	\$18,348.69	\$6,116.23	
Sandusky	Single Family	A03	\$4,388.98	\$2,980.00	2	\$7,368.98	\$3,684.49	
Sandusky	Single Family	A03	\$8,100.00	\$395.00	4	\$8,495.00	\$2,123.75	
Sandusky	Single Family	A03	\$3,142.61	\$4,163.10	2	\$7,305.71	\$3,652.86	
Sandusky	Single Family	C	\$8,835.18	\$984.16	2	\$9,819.34	\$4,909.67	
Sandusky	Single Family	A03	\$26,552.21	\$9,996.24	2	\$36,548.45	\$18,274.23	
Sandusky	Other-Res	A03	\$12,635.79	\$1,782.37	2	\$14,418.16	\$7,209.08	
Vermilion	Assmd. Condo	A10	\$62,869.14	\$52,651.71	5	\$115,520.85	\$23,104.17	
Vermilion	Assmd. Condo	A14	\$28,409.39	\$15,881.16	4	\$44,290.55	\$11,072.64	
Vermilion	Assmd. Condo	AE	\$12,195.75	\$17,785.22	4	\$29,980.97	\$7,495.24	
Vermilion	Single Family	AE	\$35,357.08	\$7,248.18	3	\$42,605.26	\$14,201.75	PU
Vermilion	Single Family	AE	\$39,083.71	\$8,719.85	6	\$47,803.56	\$7,967.26	PU
Vermilion	Single Family	A14	\$42,206.83	\$22,194.00	5	\$64,400.83	\$12,880.17	V
Vermilion	Single Family	A08	\$28,059.80	\$11,538.85	6	\$39,598.65	\$6,599.78	V
Vermilion	Single Family	A08	\$47,934.92	\$19,754.67	10	\$67,689.59	\$6,768.96	VU
Vermilion	Single Family	A08	\$11,742.27	\$5,418.29	3	\$17,160.56	\$5,720.19	
Vermilion	Single Family	AE	\$32,705.29	\$2,908.07	7	\$35,613.36	\$5,087.62	
Vermilion	Single Family	A11	\$58,788.58	\$9,310.87	4	\$68,099.45	\$17,024.86	
Vermilion	Single Family	AE	\$35,826.22	\$11,434.10	10	\$47,260.32	\$4,726.03	
Vermilion	Single Family	A10	\$11,610.57	\$924.28	3	\$12,534.85	\$4,178.28	
Vermilion	Single Family	A	\$43,054.30	\$10,100.97	3	\$53,155.27	\$17,718.42	
Vermilion	Single Family	A10	\$6,884.72	\$6,564.53	3	\$13,449.25	\$4,483.08	

Location	Type	Zone	Total Building Payments	Total Contents Payments	Losses	Total Payments	Average Payment	SRL
Vermilion	Single Family	A10	\$16,496.94	\$3,884.78	6	\$20,381.72	\$3,396.95	
Vermilion	Single Family	A10	\$7,654.10	\$6,746.84	2	\$14,400.94	\$7,200.47	
Vermilion	Single Family	A10	\$6,663.88	\$4,258.72	4	\$10,922.60	\$2,730.65	
Vermilion	Single Family	A	\$5,238.49	\$646.56	3	\$5,885.05	\$1,961.68	
Vermilion	Single Family	A10	\$26,946.65	\$7,968.87	7	\$34,915.52	\$4,987.93	
Vermilion	Single Family	A14	\$2,931.01	\$-	2	\$2,931.01	\$1,465.51	
Vermilion	Single Family	AE	\$25,544.31	\$4,068.33	5	\$29,612.64	\$5,922.53	
Vermilion	Single Family	A14	\$2,729.64	\$1,903.46	2	\$4,633.10	\$2,316.55	
Vermilion	Single Family	A14	\$18,478.73	\$8,278.06	3	\$26,756.79	\$8,918.93	
Vermilion	Single Family	AE	\$12,974.95	\$3,739.75	3	\$16,714.70	\$5,571.57	
Vermilion	Single Family	A10	\$21,248.15	\$2,004.08	4	\$23,252.23	\$5,813.06	
Vermilion	Single Family	B	\$5,468.12	\$-	2	\$5,468.12	\$2,734.06	
Vermilion	Other-Nonres	A	\$48,370.17	\$13,902.51	5	\$62,272.68	\$12,454.54	PNU
Vermilion	Other-Nonres	A14	\$75,203.96	\$11,397.52	3	\$86,601.48	\$28,867.16	PNU
Vermilion	Other-Nonres		\$186,543.90	\$110,536.28	6	\$297,080.18	\$49,513.36	VN
Vermilion	Other-Nonres	A14	\$62,954.79	\$37,039.23	4	\$99,994.02	\$24,998.51	VN
Vermilion	Other-Nonres	X	\$142,316.36	\$12,513.33	2	\$154,829.69	\$77,414.85	
Vermilion	Other-Nonres	A14	\$10,380.00	\$10,109.74	3	\$20,489.74	\$6,829.91	
Vermilion	Other-Nonres	B	\$3,663.43	\$11,731.09	3	\$15,394.52	\$5,131.51	

- MVU – Mitigated Validated Uninsured
- PNU – Pending Non Residential Uninsured
- PU – Pending Uninsured
- V - Validated
- VN – Validated Non Residential
- VU – Validated Uninsured

The current development within Erie County has been primarily concentrated in the western part of the county. This development is centered in Huron Township, which is a metropolitan area to the city of Sandusky. Huron Township has floodplain ordinances that should serve as a guide in keeping new development from being constructed in high hazard areas with respect to flooding.

In 2008, the Erie County Flood Damage Prevention and Floodplain Regulations were adopted. This resolution applies to any areas of special flood hazard, which are defined in the resolution as “the land in the floodplain subject to a one percent or greater chance of flooding in any given year. Areas of special flood hazard are designated by the Federal Emergency Management Agency as Zone A, AE, AH, AO, A1-30, and A-99.” The areas of special flood hazard have been identified by FEMA.

Under this resolution, any proposed development must be reviewed, and a permit must be obtained from the Floodplain Administrator before construction or development can occur within any area of special flood hazard.

The 2005 plan had a method for estimating potential losses due to flooding using historical data from the NCDC. The method utilized in this update is based upon the same historical data updated through 2019, provided by NCDC.

7.5 Lake/Stream Bank Erosion

7.5.1 Hazard Profile

Erosion is defined as the removal and transport of earth materials by natural agents. Some of these agents include glaciers, wind, water, earthquakes, volcanoes, tornadoes, hurricanes, mud flows, and avalanches.

Stream bank erosion is the direct removal of banks and beds by flowing water. Typically, it occurs during periods of high stream flow. It is sometimes confused with gully erosion because it has similarities with seasonal or ephemeral streams.

Erosion of stream or riverbanks through lateral (side) erosion and collapse often causes high sediment loads in creeks and rivers. The problem is often initiated by heavy rainfalls in catchments with poor vegetation cover, causing excess runoff. The resultant high volume and velocity runoff concentrates in the lower drainage lines or streams within catchments. When the stress applied by these stream flows exceeds the resistance of the local soil material, stream bank erosion occurs. As the sediment load increases, fast-flowing streams grind and excavate their banks lower in the landscape. Later, the stream becomes overloaded or velocity is reduced, and deposition of sediment takes place further downstream or finally in dams and reservoirs. Stream bank erosion is exacerbated by the lack of riparian zone vegetation.

Lake erosion, also known as coastal erosion, is the gradual wearing and carrying away of land or beach materials by wave action, water, wind, general weather conditions and tidal currents. It is a process which affects the landmass of an area as a consequence of the sea or lake acting upon it. It is usually caused by a relative rise in water level and the fact that the amount of sediment removed by wave energy exceeds that supplied to the beach by longshore currents. Lake erosion is of particular concern in Erie County due to Lake Erie's water levels rising to record high levels. The higher the lake's water levels, the greater chance for erosion of the lake shore, resulting in property losses. High lake levels can also cause additional erosion further inland, as waterways are flooded from the lake. The combination of high lake level rise, seiche events or other wave action can cause devastating erosion along Lake Erie.

7.5.2 Location

In Erie County lake shore erosion is primarily a concern for jurisdictions that border Lake Erie. These include Bay View, Sandusky, Huron, Vermilion, Kelleys Island and portions of unincorporated Erie County. In Ohio, a Coastal Erosion Area (CEA) is a designated land area along Lake Erie's shore that is anticipated to be lost due to Lake Erie related erosion if preventative measures are not taken. More specifically, a CEA begins at the top of a bluff, bank or beach ridge and includes all land predicted to erode within a 30-year period if that distance totals 14 or more feet. In June 1998, the ODNR finalized its first official designation of CEAs, including those portions of property along Ohio's 262-mile Lake Erie coast which appear most threatened by erosion. They totaled 2,234 parcels, which represents about 37% of Ohio's Lake Erie coastline. In 2018, ODNR published updated CEAs, including five in Erie County. Vermilion has two CEAs, but they are

located within the Lorain County portion of the City. The following chart describes the CEAs located in Erie County, by jurisdiction.

Table 21: Costal Erosion Areas in Erie County and Its Jurisdictions

Jurisdiction	Location	Predicted Erosion
Huron	Behind Huron Filtration Plant	14.5-20.3 feet
Margaretta Township	West of Willow Point Wildlife Area	22.6-138.5 feet
Sandusky	North of Lions Park	18.5-37.8 feet
Sandusky	Tip of small peninsula southeast of Cedar Point parking lot in Sandusky Bay	17.5-29.3 feet
Sandusky	East of Crosstree Lane, in the Back Bay area	22.5-25.8 feet
Vermilion (Lorain County)	Behind Menlo Park Lane at Cinema Court	17.7-21 feet
Vermilion (Lorain County)	Near Edison Estates Park	14.3-14.8 feet

Additionally, much of the areas along Erie County's waterways are at risk for stream bank erosion. Figures 42-51 shows these areas of Erie County and the participating jurisdictions. Water erosion hazard maps are provided for the townships for reference in Appendix F.

Many areas within Erie County and the Jurisdictions are at risk for water erosion. Erosion becomes a hazard when the slope of the soil is greater than two percent and increases as the slope increases. Erosion is a concern because it reduces the natural soil fertility and productivity as the original topsoil is removed and the more acid subsoil is incorporated into the surface layer through tillage. If the amount of annual soil loss exceeds the rate at which new soil is formed, long-term productivity and natural fertility are affected. Erosion is also a problem because it increases the cost of crop production, results in poor soil structure in the surface layer, increases the need for tillage to incorporate organic matter into the surface layer and reduces the available water capacity of the surface layer. Sediment removal is the costliest item in ditch maintenance. Controlling erosion protects the soil resource base, maintains long-term productivity, reduces drainage maintenance costs and improves water quality. Wind erosion is primarily a concern on sandy soils. Sod strips and windbreaks can reduce the effects of wind velocity. Windbreaks protect livestock, buildings, and yards from wind and snow. Erosion can be controlled through crop rotations, cover crops, crop residue management, water-and sediment-control basins, grassed waterways and conservation tillage, as well as plowing in the spring rather than in the fall.

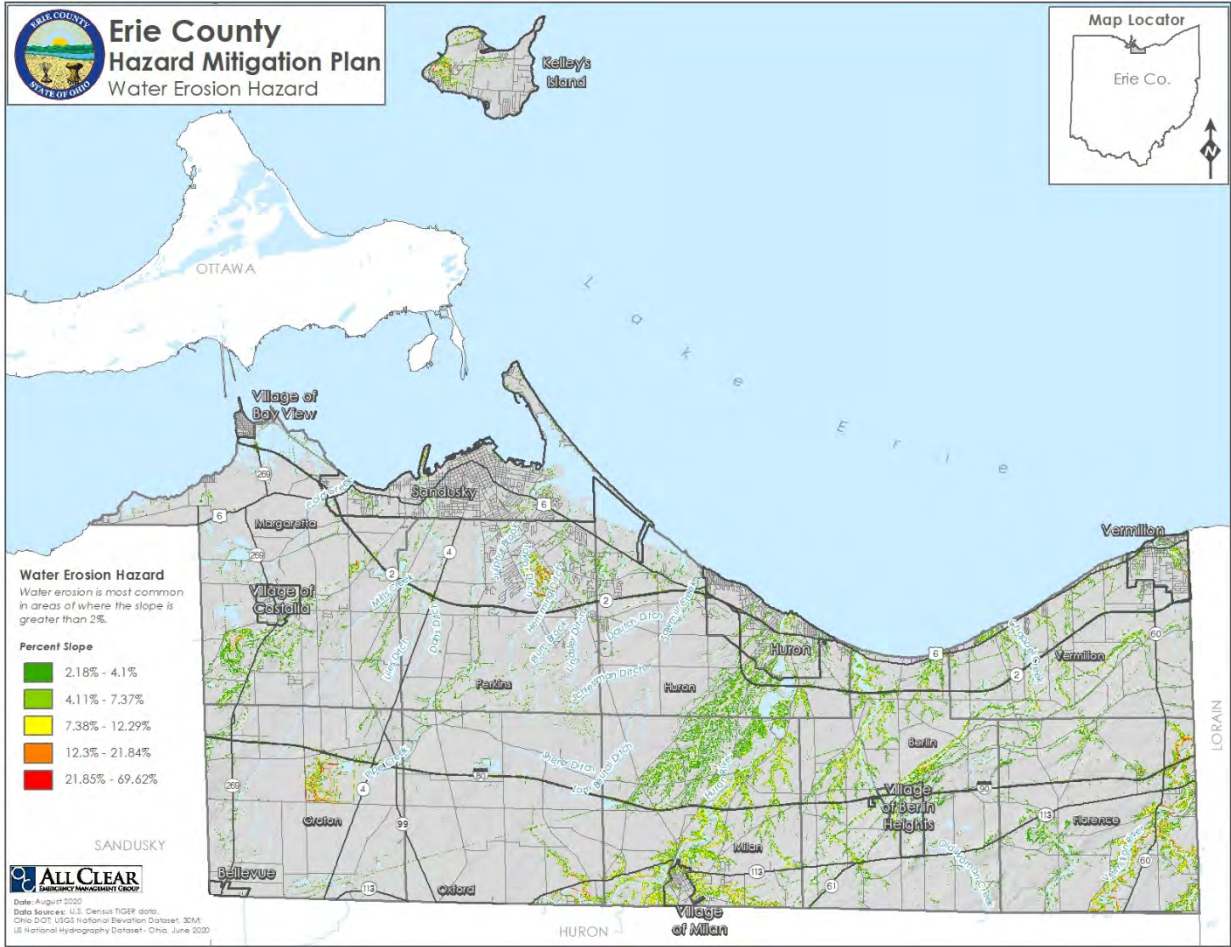


Figure 42: Water Erosion Hazard Map for Erie County



Figure 43: Water Erosion Hazard Map for the Village of Bay View

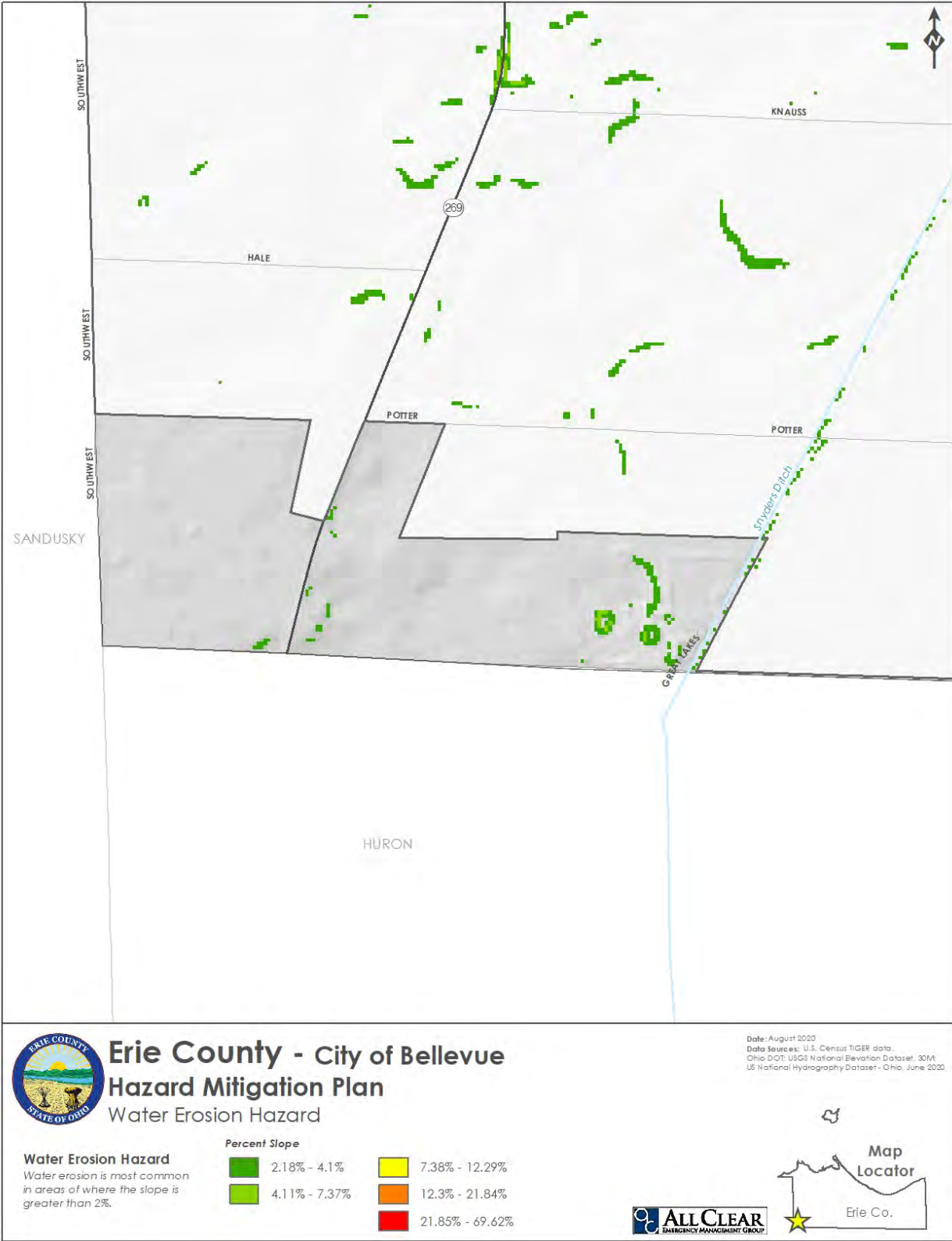


Figure 44: Water Erosion Hazard Map for the City of Bellevue (Erie County Portion Only)

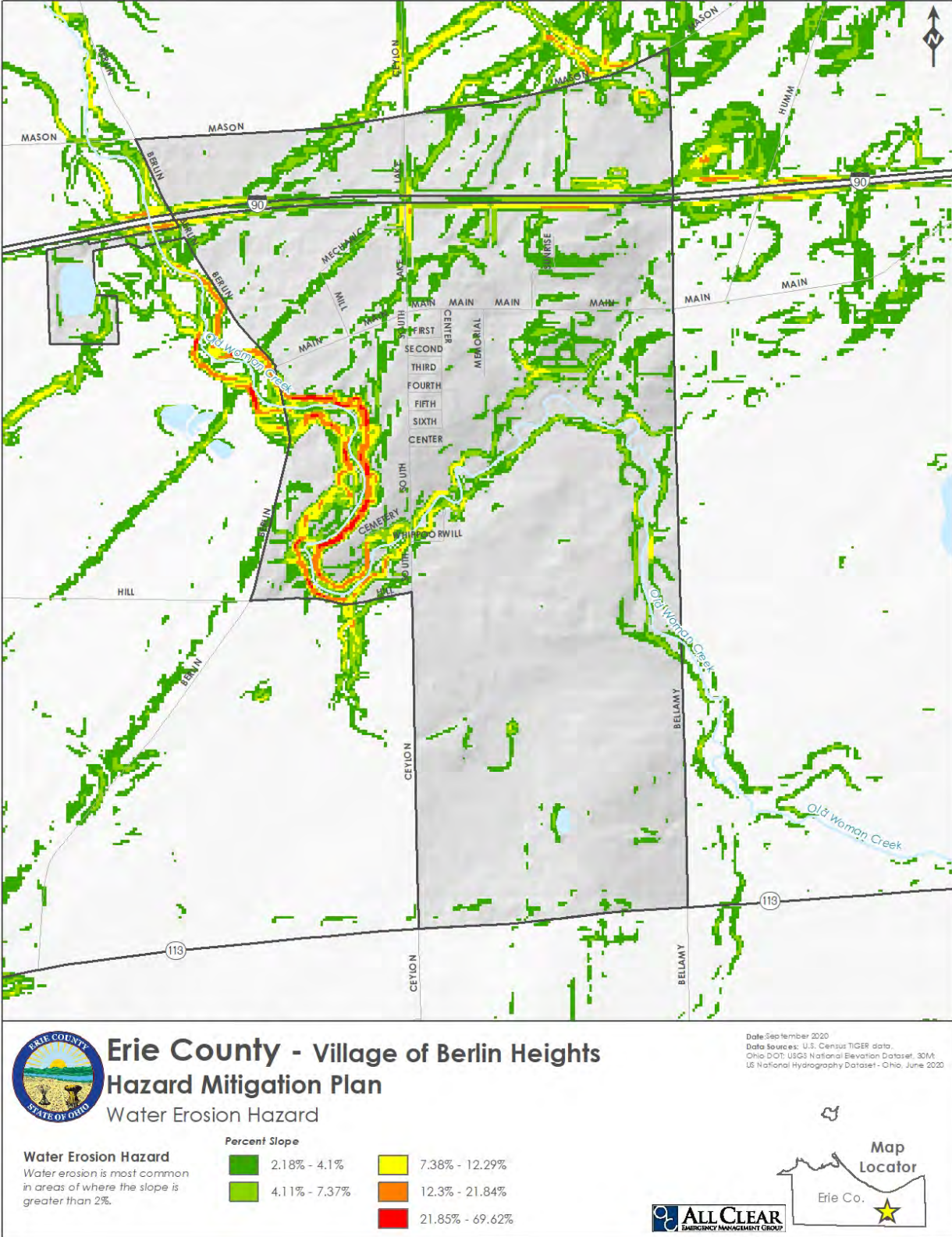


Figure 45: Water Erosion Hazard Map for the Village of Berlin Heights

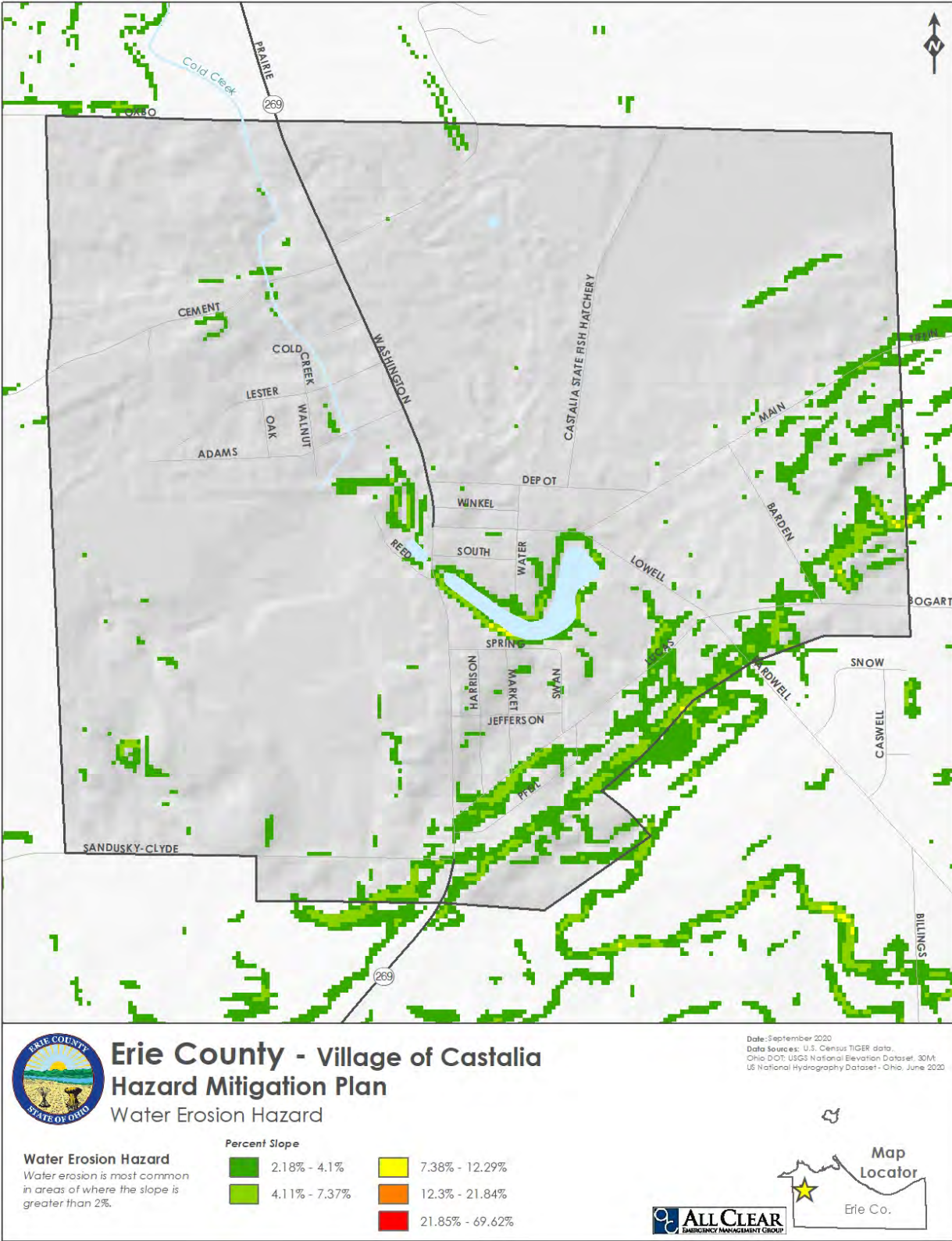


Figure 46: Water Erosion Hazard Map for the Village of Castalia

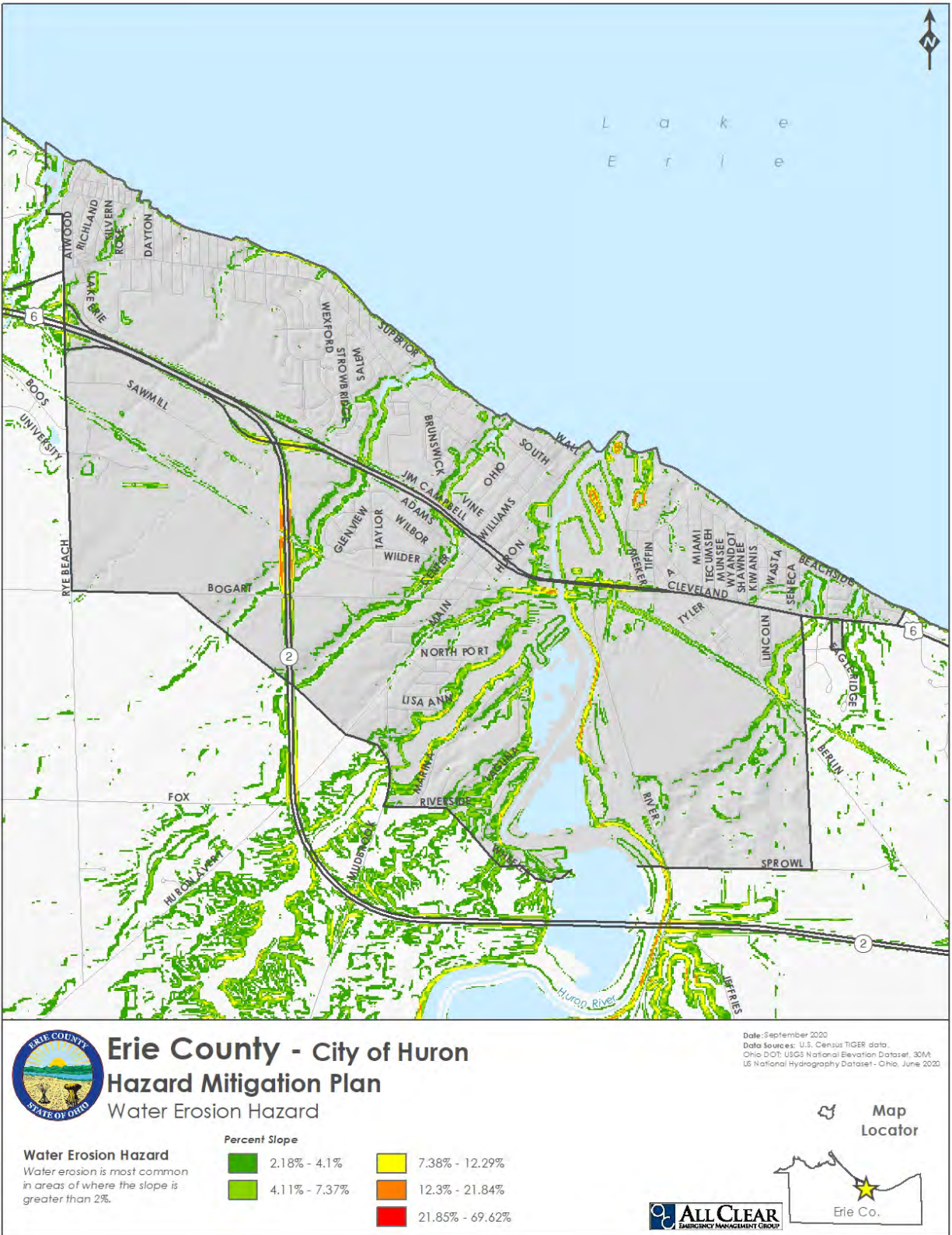


Figure 47: Water Erosion Hazard Map for the City of Huron

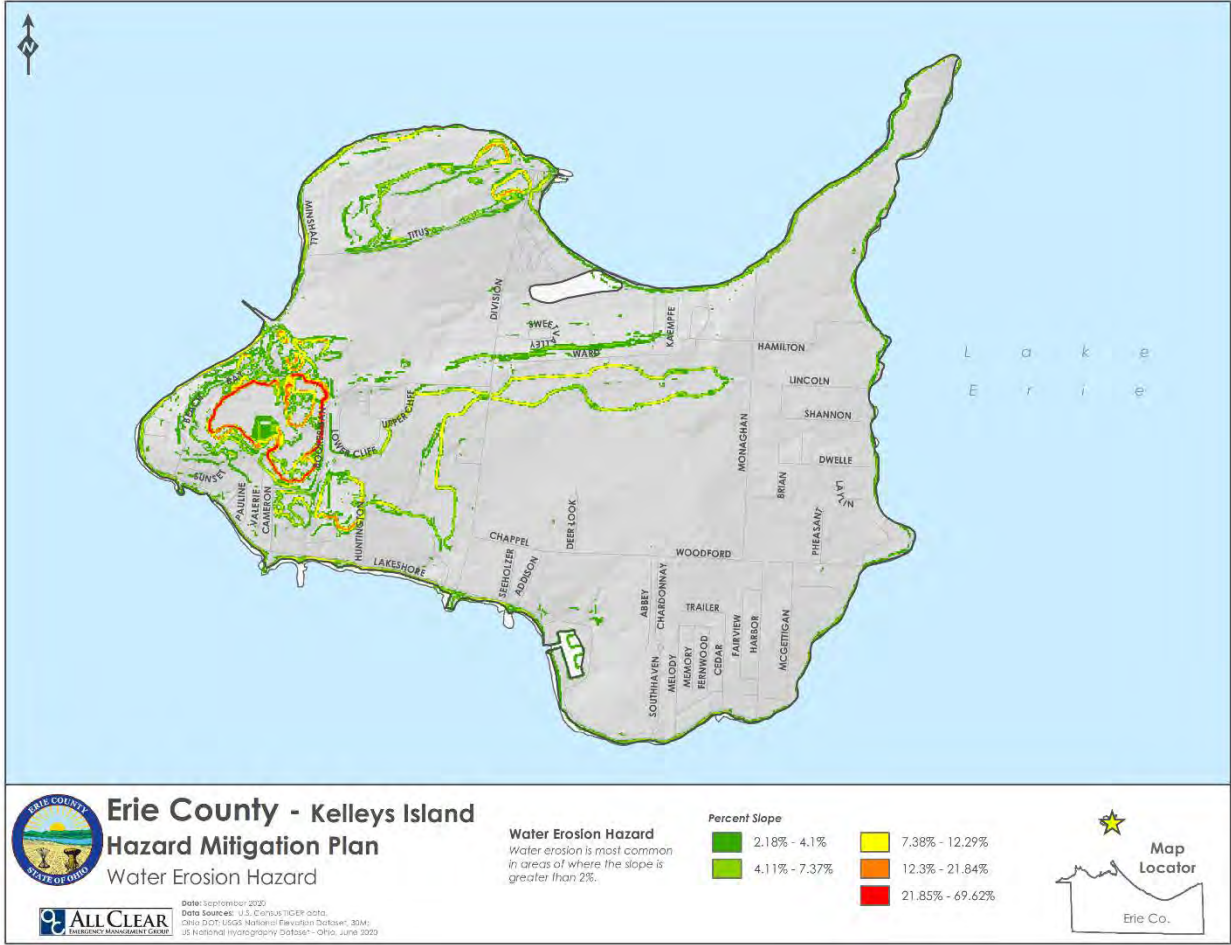


Figure 48: Water Erosion Hazard Map for the Village of Kelleys Island

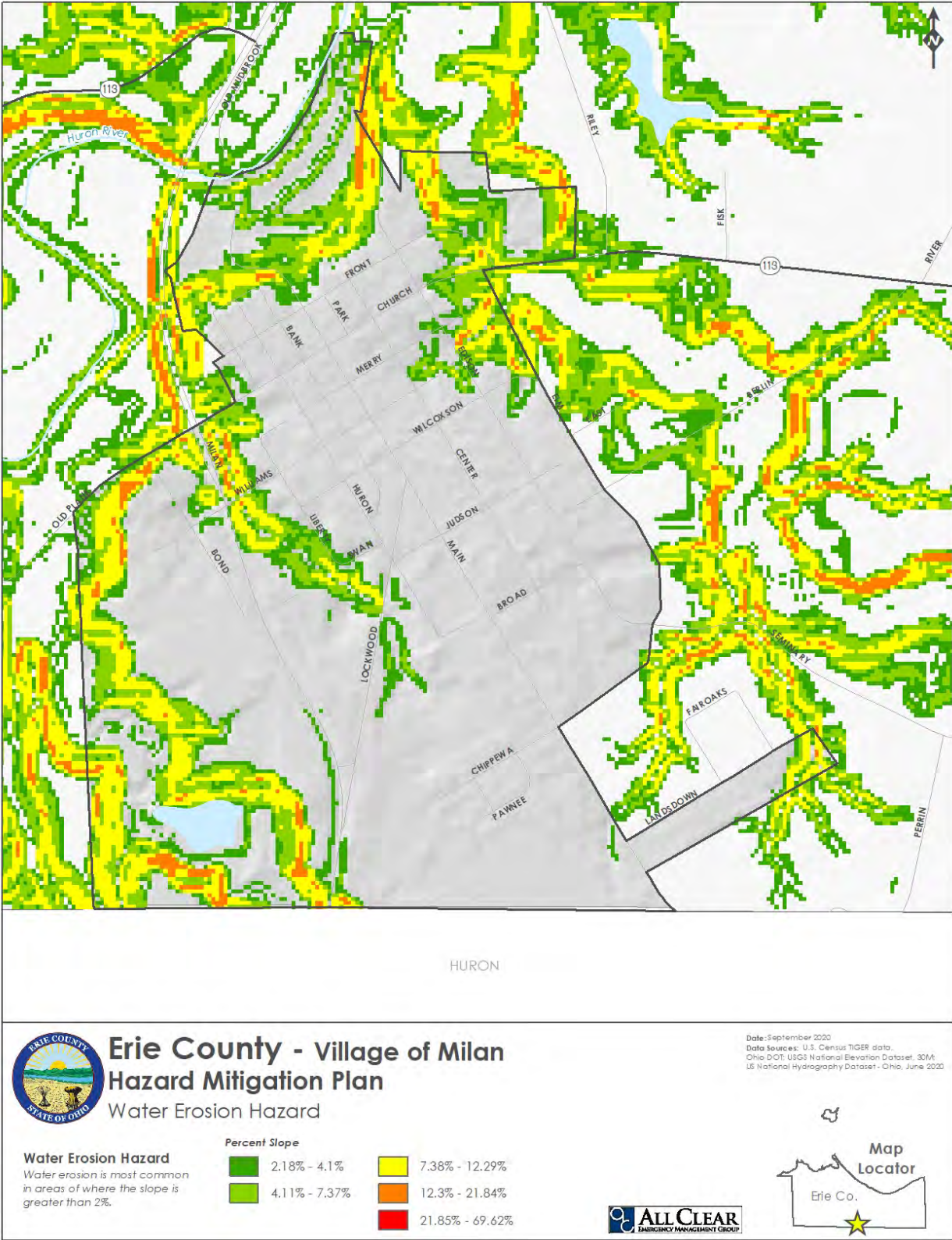


Figure 49: Water Erosion Hazard Map for the Village of Milan (Erie County Portion Only)

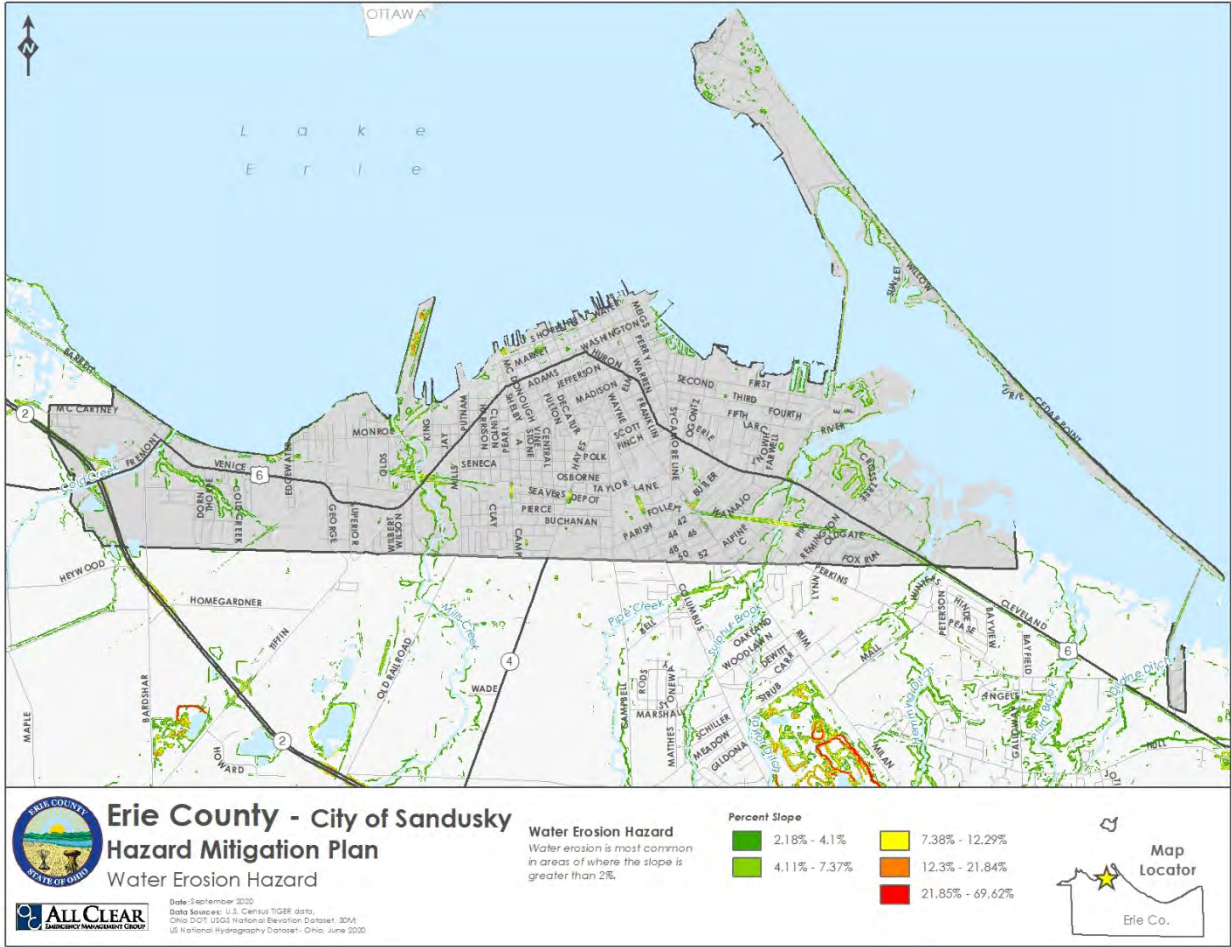


Figure 50: Water Erosion Hazard Map for the City of Sandusky

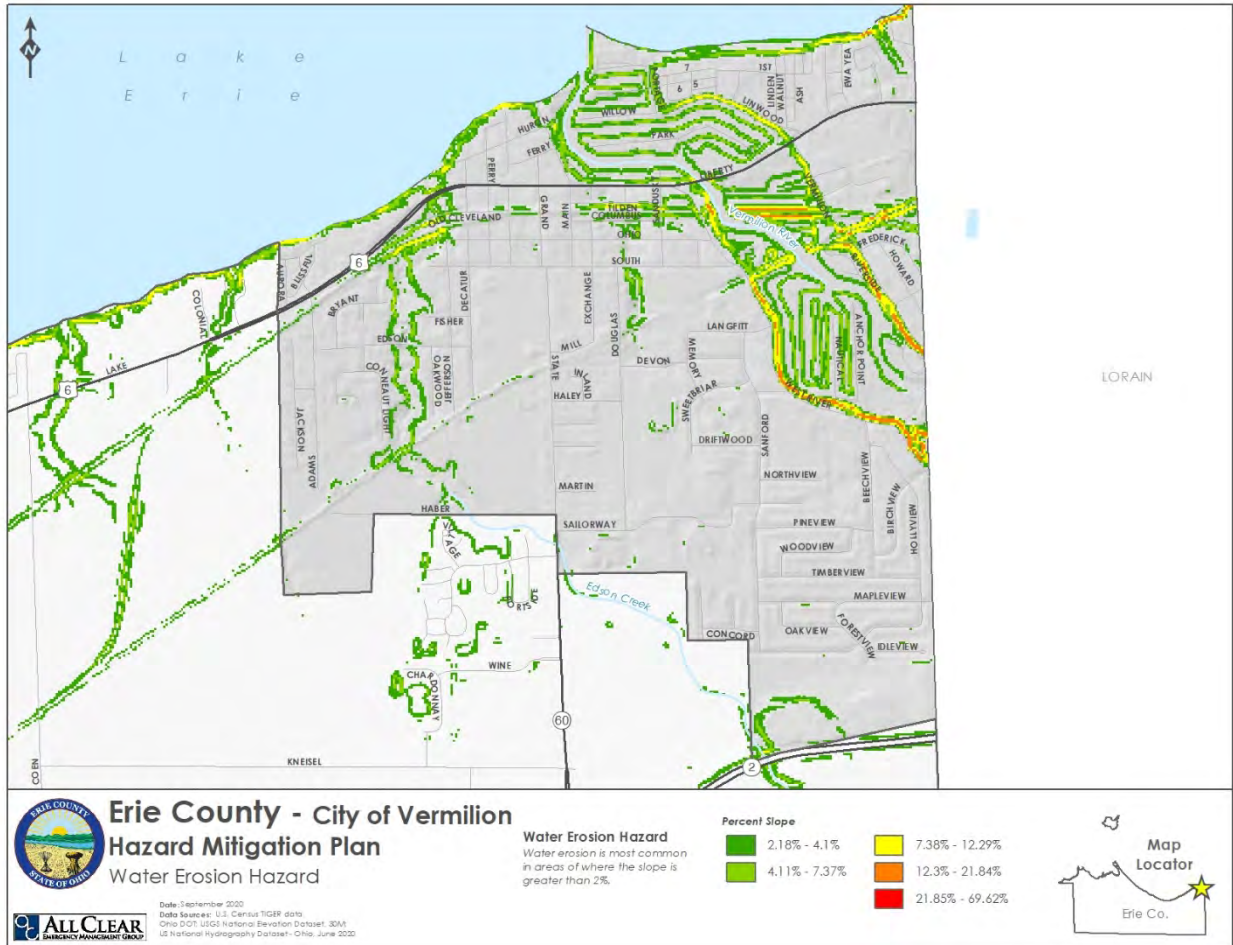


Figure 51: Water Erosion Hazard Map for the City of Vermilion

7.5.3 Extent

In addition to loss of productive land due to bank erosion, dramatic changes in the course of a river or creek often restrict access to property along the waterway. Subsequent deposition of soil causes problems on productive land downstream and sedimentation in reservoirs. Other problems include reduction in water quality due to high sediment loads, loss of native aquatic habitats, damage to public utilities (roads, bridges and dams) and maintenance costs associated with trying to prevent or control erosion sites.

Soil that has eroded and washed into the water is the chief cause of pollution in the waters of Ohio, according to the ODNR. This soil is carried along with the water. When the water's velocity decreases, the soil settles out of the water. The sediment reduces the capacity of creeks, rivers, ponds, and streams, which leads to loss of habitat for insects and fish in that waterway.

Property erosion results in accumulation of sediment and debris within and along the channel of streams and along the shores of Lake Erie. In streams, this accumulation occurs as sediment and debris settles in the channel simultaneously lowering the elevation of the stream banks and raising the elevation of the streambed. The

subsequent result is a reduction in the carrying capacity of the streams, which causes higher water elevations during future floods.

Factors that cause shoreline erosion include bluff recession, high lake levels, high winds and human activities. These cause many problems to the coastal communities of Bay View, Sandusky, Huron, Vermilion and Kelleys Island. Manmade shoreline structures that lie within a designated CEA along Lake Erie's coastline are susceptible to property damage over a 30-year period. Because of the large number of residential properties located within a CEA along the shoreline, property damages are expected to be high. There is no record of stream bank or lakeshore erosion directly causing injuries or death in Erie County, however, indirect injuries or deaths may be caused by motorists being unaware of damaged pavement and possibly driving off the road. However, damaged roads that may cause traffic accidents are typically closed for repairs to minimize the number of motorists traveling through that area.

Based on the property damage expected from stream bank and lake erosion, the impact on the local economy and local government is high. Manmade shoreline structures built along the Lake Erie shoreline are costly. They also trap sand supply, causing a beachless shoreline. Lack of beaches may have an adverse effect upon tourism in Erie County. County roadways have been impacted by rising lake levels and associated roadway erosion. These repairs have been delayed due to access issues as the roadways have been underwater for an extended period of time. These repairs are also quite costly.

7.5.4 Previous Occurrences

Various studies conducted by ODNR have measured lake shore erosion along Lake Erie. The largest measured rate of erosion was in Margaretta Township, and the shoreline eroded 90.4 feet between 2004 and 2015, for a rate of 8.2 feet per year. Erosion has also consistently occurred along stream banks, but no quantifiable data is available.³⁹

7.5.5 Probability of Future Events

Since erosion is a gradual process that occurs over time, there is not an easy way to calculate the number of erosion events each year. However, according to Table 22 erosion is occurring in Erie County somewhere between one and three feet per year.

³⁹ (Ohio Department of Natural Resources, n.d.)

Table 22: Lake Erie Erosion Rates by Ohio County

County	Long-term Distance in Feet	Long-term Rate in Feet per Year (1877-1973)	Short-term Distance in Feet	Short-term Rate in Feet per Year (1973-1990)
Ashtabula	82	0.9	28	1.6
Lake	160	1.7	32	1.9
Cuyahoga	60	0.6	8	0.4
Lorain	80	0.8	12	0.7
Erie (Lake)	103	1.6	42	2.5
Ottawa (Lake)	208	2.0	27	1.6
Lucas	520	5.4	46	2.7
Erie (Bay)	241	2.8	32	1.9
Ottawa (Bay)	61	2.0	21	1.2

7.5.6 Vulnerability

As seen in the hazard profiles and as determined by the Core Group, Erie County has a countywide risk of incurring damage from lake erosion and stream bank erosion. The coastal area of Erie County extends inland on average from 1/8 mile to 1/4 mile on average, but continues to incorporate lake-influenced tributaries, embayments, wetlands and estuarine areas. In urban areas, the coastal boundary is generally less than 1/2 mile from the shore. Stream bank erosion occurs along the Vermilion River, Huron River, Mills Creek and their tributaries and is accelerated during flooding due to higher than normal water velocities within the streams. If property protection measures are not taken to avoid lake erosion along Lake Erie, the risk of damage to or loss of property, possessions, infrastructure and life are greatly increased.

In 1994, according to a study conducted by the H. John Henz III Center for Science, Economics and the Environment, it is estimated that coastal erosion will destroy 87,000 buildings within 500 feet of the U.S. shoreline over the next 60 years, including the Great Lakes. Factors contributing to this erosion include rising sea levels, large storms, flooding, and powerful ocean waves. Other study findings indicate that those who live along the coast face as large a risk of damage from erosion as they do from flooding. Roughly 1,500 homes and the land on which they were built will be lost to erosion each year, with losses averaging \$530 million per year.

As floodwaters overflow their banks, they carry sediment and debris from residential lawns, agricultural land and other sources further downstream and eventually into the channels of the creeks and their tributaries. This sediment and debris deposition has an adverse effect on aquatic and riparian habitats in Erie County and its watersheds. The bridges in Erie County act as collection sites for this debris, causing blockages of the floodway that raise flood elevations further downstream and also threaten evacuation routes during extreme flood emergencies. In addition, erosion left untreated may cause damage to roadways along stream banks, public piers, and marinas along Lake Erie. Undermining of pavement may cause roadways to crumble and slip down the bank, creating hazards for motorists. Public piers and marinas that are affected by erosion could be potentially dangerous, especially near recreational areas or public parks.

The areas within the County that are experiencing a higher rate of development will be more at risk for the occurrence of a landslide. Future structures on or near steep slopes may be a risk of damage due to landslide. If development on steep slopes were to disturb the land and vegetation to an unprecedented degree, the potential for damage due to landslide may increase.

Attempts were made to obtain more detailed information on the history of lake and stream bank erosion occurrences within Erie County in order to better predict both future occurrences and dollars lost associated with those occurrences. However, these events are not recorded by the NCDC so an estimate cannot be calculated.

Due to the lack of information regarding dollars lost associated with lake and stream bank erosion occurrences, the value for the maximum potential dollar losses is not able to be accurately calculated.

7.6 Natural Biohazards

7.6.1 Hazard Profile

Natural biohazards is a term to refer to any hazard that is caused by an organism. For the Erie County Natural Hazard Mitigation Plan, two types of natural biohazards are considered: Invasive Species and Harmful Algae Blooms.

Invasive species are any organism that are not native to an ecosystem that cause harm to that ecosystem. They are not just limited to plants and animals, but can include insects, fish, fungus, and even bacteria. In Ohio, more than 3,000 different species of plants are known to grow. Approximately 25% of these plants are non-native, and were not present before about 1750 when European settlers began expanding into the region in significant numbers. Sometimes, non-native species are introduced on purpose, for agriculture, medicinal use, erosion control or more, but other times, the species are introduced by accident. The Great Lakes, and Lake Erie especially, are extremely vulnerable to aquatic invasive species. To date, more than 185 different non-native species have been identified in the Great Lakes, and due to Lake Erie's characteristics (shallower, warmer, more biologically active), Lake Erie is very susceptible. Invasive species threaten water quality, native fish, wildlife, plants, fisheries, recreation and tourism, all of which are important to Erie County.

Harmful Algae Blooms (HAB) also have effects on the plant and aquatic life in Lake Erie. Algae blooms form in waters that are rich in nutrients, such as iron, nitrogen and phosphorus. Warmer waters also help algae blooms to grow more quickly. In freshwater, HABs most commonly form from cyanobacteria. Algae blooms can block sunlight at the surface of the water and not allow native plants to get a necessary amount to live. In addition, as algae die and sink to the bottom of the lake, bacteria decompose the dead algae and consume oxygen in the water in the process. As a result, there is a dead zone in central Lake Erie that has covered up to a third of the lake bottom in recent years, according to the New York Times. HABs can also produce toxins that can poison humans and animals that come into contact with them. This poisoning can carry up the food chain and sicken an animal or human that consumes fish that was contaminated by the toxins.

7.6.2 Location

All parts of Erie County and its jurisdictions are at risk of invasive species; however, the habitat of the invasive species dictates the precise locations that is affected. For example, the emerald ash borer only affects ash trees and aquatic invasive species affect Lake Erie as well as inland waterways and bodies of water.

Harmful Algae Blooms can occur in fresh water, marine water and brackish water. In Erie County, while HABs can occur in smaller bodies of water, those that occur in Lake Erie are of primary concern. In Lake Erie, HABs typically form first in Maumee Bay at the mouth of the Maumee River and in Sandusky Bay at the mouth of the Sandusky River because blue-green algae prefer warm water and high concentrations of phosphorus. Both bays are very warm and shallow, and the watersheds of both rivers have very high percentages of farmland (the Maumee is the largest tributary to the Great Lakes and

drains 4.2 million acres of agricultural land). As a result, both streams contain very high concentrations of phosphorus that eventually feeds into Lake Erie.⁴⁰

7.6.3 Extent

Without natural predators or controls, invasive, non-native plants can 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.

There are more than 185 non-native species in the Great Lakes, and by some estimates, cause \$5.4 billion in damages. In Lake Erie particularly, invasive species threaten drinking water supplies and commercial fisheries. According to a report by the Ohio Department of Natural Resources, the top aquatic invasive species are:

1. Asian Carp
2. Curlyleaf Pondweed
3. Hydrilla
4. Round Goby
5. Ruffe
6. Red Swamp Crayfish
7. Sea Lamprey
8. White Perch
9. Zebra Mussel

According to the ODNR, Division of Forestry one of the most invasive insect species in Ohio is the Emerald Ash Borer. This Asian pest 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. This ash tree-killing insect from Asia was unintentionally introduced to southeastern Michigan several years ago. 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.

Another concern for Erie County is the eutrophication occurring in Lake Erie, especially due to the growing presence of blue/green algae. Algae blooms are caused by excess nitrogen and phosphorous in Lake Erie due incoming sources of polluted runoff, especially the Maumee and Detroit Rivers. The New York Times reported about the algae bloom issue in Lake Erie "It is perhaps the greatest peril the lake has faced since the 1960s, when relentless and unregulated dumping of sewage and industrial pollutants spawned similar algae blooms and earned it the nickname "North America's Dead Sea." The

⁴⁰ (Ohio Emergency Management Agency, 2019)

recovery during the 1970's and 1980's was an \$8 billion project to clean up Lake Erie. Recently the cause of the blooms is not unregulated dumping, but the phosphorus pollution mainly due to farming techniques. Nutrients that fuel cyanobacteria blooms usually come from the nitrogen in agricultural runoff; the runoff makes its way into streams and rivers, eventually flowing into large waterbodies such as lakes.

The zebra mussel, a dominant invasive species, are assisting the growth of toxic algae blooms. Zebra mussels consume nontoxic green algae and also produce phosphorus, therefore eliminating the toxic algae's competitor while also providing food for the toxic green/blue algae. They also can cause considerable damage to boats, water intake equipment, beaches, and even other aquatic animals.

7.6.4 Previous Occurrences

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. Several examples of species introduction pathways follow:

The Round Goby species was introduced from Eurasia into the St. Clair River and vicinity on the Michigan-Ontario border where several collections were made in 1990 on both the U.S. and the Canadian side. Speculation exists the Goby was transported from its native Caspian Sea by way of ballast tanks on ocean going vessels. Today the Goby is found in all the Great Lakes and is making inroads in all contiguous state watersheds.

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.

The Emerald Ash Borer was introduced into North America sometime in the 1990's. The insect is believed to have been introduced into the U.S. 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, Pennsylvania, West Virginia, and parts of New England.

In August 2014, for example, high microcystin concentrations caused by blue-green algae blooms were detected in drinking water from Lake Erie. As a result, the water supply to 400,000 people in Toledo, Ohio, was shut down.⁴¹

7.6.5 Probability of Future Events

Since the beginning of European colonization non-native species have been arriving in Ohio. With the increase in global trade and travel the probability of new and unexpected species arriving in Ohio will continue to grow. Legislation is in place around the world in an attempt to control the migration of unwanted species between ecosystems. The ODNR is 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 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.

Climate change will bring more rain and snow, higher average temperatures, and flooding to the Great Lakes region. More rain and snowfall increase runoff of the nutrients that fuel harmful algal blooms into the lake. The cyanobacteria that cause HABs also prefer the warmer water that comes with the higher air temperature caused by climate change. When combined, these changing conditions can increase the severity of harmful algal blooms. Global climate change may have an impact on the probability of future events; however, it is unclear the extent of this impact.

In Lake Erie, more than 65% of the phosphorus that causes HABs comes from agricultural fertilizer and manure runoff. Some phosphorus also comes from sewage treatment plants, combined sewer overflows, water treatment plants, cleaning products, faulty septic tanks and residential lawn fertilizers. The largest phosphorus load, about 80-90%, happens during heavy rain storms when fertilizer and other phosphorus sources are quickly washed into rivers and streams that flow into Lake Erie.⁴²

NOAA and its research partners predicted that western Lake Erie will experience a harmful algal bloom (HAB) of cyanobacteria in 2020 that was larger than the mild bloom in 2018. Scientists expect the 2020 bloom to measure greater than a 7 on the severity index. The severity index is based on a bloom's biomass – the amount of its harmful algae – over a sustained period. The largest blooms, 2011 and 2015, were 10 and 10.5, on that index, respectively. The bloom in 2018 had a severity of 3.6 considered a mild bloom. However, the size of a bloom is not necessarily an indication of its toxicity.⁴³

⁴¹ (National Science Foundation, 2019)

⁴² (Ohio Emergency Management Agency, 2019)

⁴³ (National Oceanic and Atmospheric Administration, 2020)

7.6.6 Vulnerability Assessment

Because Erie county is located on Lake Erie, there is a high risk of introducing aquatic invasive species from Welland and Erie barge canals as well as ballast water from incoming ships.

Invasive species can cause infiltration into crop lands, damage to drinking water processing facilities and utilities, impacts to in-water structures, and financial impacts to loggers and marinas and boaters.

Invasive Species and HABs can have a wide range of impacts on structures and critical facilities, ranging from negligible to devastating. The most prominent impact to facilities relates to the maintenance of marinas in Zebra Mussel impacted areas as well as protecting drinking water sources in areas where HABs and other natural biohazards occur.

Invasive species and HABs are not expected to have a significant impact on future buildings.

The effect of invasive species is hard to estimate for Erie County because of the lack of information isolating Erie County. Every invasive species is unique and therefore mitigation costs vary widely. Impacts of invasive species tend to have a greater impact on the operations of organizations than the structural impacts most of the other hazards have. 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. These costs are for the State of Ohio and not specifically for Erie County but they give an idea of how costly invasive species can be.

From the perspective of invasive plant species, the Multiflora Rose is one of most expensive to combat in Ohio. Each individual plant's ability to produce 500,000 seeds a year allows this invasive species to spread over large area with incredible speed. Agricultural groups are facing the highest exposure and expense in the form of infiltration of crop lands and eradication programs. According to agricultural experts associated with The Ohio State University, Ohioans are estimated to spend millions of dollars combating the Multiflora Rose. Precise dollar figures are not available due to most response activities largely privately funded.

Four known methods of responding to invasive plant species exist. First, the removal of the plant, including the roots, can be cost effective in small applications. Second, repeated defoliation or mowing down the plants will eventually kill almost any plant. Third, the use of herbicides can be effective if applied at specific stages of the plant's growth. All of the above management techniques can be expensive and labor intensive. The last method is the use of Rose Rosette Disease, a mite-vectored virus, which is giving rise to a hope for a lower cost control agent.

The Zebra Mussel is one of the most expensive to control and can be very damaging. The mussels naturally collect on any solid surface and create significant problems for drinking water processing facilities and utilities. All in-water structures are impacted including, but

not limited to, piers, breakwalls, vessel hulls, and vessel engines cooled with external water. Estimates for controlling infestations cost between \$2 and \$10 million per year depending on how many sources are aggregated. If the Zebra Mussel effectively invade the river systems of Ohio, it is suggested the annual control costs could rise 10-fold.

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 through 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 has risen 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 5 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 must 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.

HABs can produce toxins that are capable of causing illness and sometimes even death. Microcystin is the most concerning toxin as it causes skin rashes, GI problems and varying degrees of nervous system, liver and kidney damage. While most healthy adults recover from contact with the toxin, it can be more problematic to children, the elderly and people with pre-existing conditions that weaken their systems. Exposure has also killed people in other parts of the world. The toxin can also be fatal to pets that drink or come in contact with contaminated water.⁴⁴

The effect of HABs is difficult to estimate for Erie County because of the lack of information isolating Erie County. Every Harmful Algae Bloom is unique and therefore mitigation costs vary widely. Due to the lack of information regarding dollars lost associated with Harmful Algae Bloom (HABs) occurrences, the value for the maximum potential dollar losses is not able to be accurately calculated.

Of the Great Lakes, Lake Erie has particularly high vulnerability to HABs. As the southernmost, shallowest and warmest of the Great Lakes. Its watershed has the least forest, the most agricultural land and the second-most urban/suburban land. Therefore, Lake Erie gets more sediment and nutrients (fertilizer runoff, sewage, etc.) than the other lakes, while also having environmental conditions that favor algal blooms.

⁴⁴ (Ohio Emergency Management Agency, 2019)

7.7 Severe Summer Weather

7.7.1 Hazard Profile

In order to better address specific risks and vulnerabilities, severe summer weather and severe winter weather were separated into two separate hazards for this plan update. Severe summer weather includes hail, lightning, thunderstorms and extreme heat. Often thunderstorms can also cause damaging winds. For this Natural Hazards Mitigation Plan, damaging winds not associated with thunderstorms are included as a separate hazard due to their frequency of occurrence and their impact.

Hail is frozen precipitation that is formed when columns of air within a thunderstorm carry rain drops to high altitudes and very cold temperatures. Hail can cause damage to buildings and crops, and cause injuries to people.

Lightning is an electrical current between the ground and a cloud. A single bolt of lightning can reach over 5 miles in length, contain 100 million volts, and reach temperatures of about 50,000 degrees. Every year, about 54 people in the US die from being struck by lightning. Lightning can also cause fires or damage power lines.

Thunderstorms are storms that produce lightning, and occasionally damaging winds, or hail. They can even spawn tornadoes under the right circumstances. Most tornadoes are caused by a supercell thunderstorm, which can last several hours. Tornadoes are discussed as a separate hazard.

Extreme heat is defined as an extended period of time with high temperatures and humidity. Typically, it will be considered an extreme heat event if the temperatures reach 90 degrees for at least 2-3 days in a row. However, this definition can vary by location. For an area where heat at or above 90 degrees is not unusual, it is likely not going to be classified as a hazard event unless the temperatures and humidity exceed what is normal for that area. Extreme heat can occur without warning and young children and the elderly are most vulnerable, as well as individuals who work outdoors. Extreme heat can lead to dehydration, heat exhaustion, heat stroke, or even death.

7.7.2 Location

Erie County is in the north central portion of the state and is susceptible to severe summer weather, which may be experienced at any location in Erie County. Because severe summer weather is random in nature, the entire county population is susceptible and should be prepared. Populations located in mobile home parks and campgrounds are particularly at risk due to the lack of appropriate shelter.

7.7.3 Extent

Severe summer storms occur regularly throughout the State of Ohio. All of Erie County is exposed to the hazards associated with severe summer weather. Hail, lightning, and thunderstorms can occur throughout the year, but are most common during warmer months, which is why they are classified as summer weather. Extreme heat is most likely to occur during the summer. The largest diameter of hail recorded in Erie County since

1955 was two inches, which occurred three times, May 7, 2010, May 25, 2011, and August 8, 2012. The highest wind, associated with a thunderstorm, was 98 miles per hour, which occurred on November 10, 1998 along the shore of Lake Erie.

7.7.4 Previous Occurrences

Erie County is highly susceptible to severe summer weather, which encompasses thunderstorms, lightning, and hail. According to the NCDC, there have been 103 hail events since 1955, seven lightning events since 1996, and 197 thunderstorm-wind events since 1955 and two heat events since 1996. Together, these four types of severe summer weather phenomena have caused over \$9 million in property damage in Erie County over the time periods specified. A complete list of these storms is provided below in Tables 23-26.

Table 23: Hail Events in Erie County 1955-2019

Location	Date	Type	Magnitude (Inch Hail)	Deaths	Injuries	Property Damage	Crop Damage
Erie Co.	4/14/1974	Hail	0.75	0	0	\$-	\$-
Erie Co.	6/15/1974	Hail	1	0	0	\$-	\$-
Erie Co.	7/10/1975	Hail	0.75	0	0	\$-	\$-
Erie Co.	8/21/1980	Hail	1.75	0	0	\$-	\$-
Erie Co.	5/22/1982	Hail	1.75	0	0	\$-	\$-
Erie Co.	6/22/1982	Hail	1	0	0	\$-	\$-
Erie Co.	6/22/1982	Hail	1	0	0	\$-	\$-
Erie Co.	6/22/1982	Hail	1.75	0	0	\$-	\$-
Erie Co.	7/21/1983	Hail	1	0	0	\$-	\$-
Erie Co.	3/28/1985	Hail	1	0	0	\$-	\$-
Erie Co.	3/28/1985	Hail	1.75	0	0	\$-	\$-
Erie Co.	3/28/1985	Hail	1	0	0	\$-	\$-
Erie Co.	3/27/1991	Hail	1.75	0	0	\$-	\$-
Erie Co.	8/19/1991	Hail	1	0	0	\$-	\$-
Erie Co.	8/30/1992	Hail	0.75	0	0	\$-	\$-
Erie Co.	9/9/1992	Hail	1.75	0	0	\$-	\$-
Sandusky	5/25/1994	Hail	0.75	0	0	\$-	\$-
Erie Co.	7/6/1994	Hail	0.75	0	0	\$-	\$-
Castalia	6/29/1997	Hail	0.88	0	0	\$-	\$-
Sandusky	4/8/1998	Hail	1	0	0	\$-	\$-
Sandusky	4/8/1998	Hail	0.75	0	0	\$-	\$-
Sandusky	5/31/1998	Hail	1	0	0	\$-	\$-
Castalia	5/31/1998	Hail	0.75	0	0	\$-	\$-
Countywide	6/12/1998	Hail	0.75	0	0	\$-	\$-
Crystal Rock	6/24/1998	Hail	0.75	0	0	\$-	\$-
Castalia	6/28/1998	Hail	1	0	0	\$-	\$-
Sandusky	7/21/1998	Hail	0.75	0	0	\$-	\$-
Countywide	10/13/1999	Hail	0.75	0	0	\$-	\$-
Kelleys Island	8/2/2000	Hail	0.88	0	0	\$-	\$-
Milan	7/1/2001	Hail	0.75	0	0	\$-	\$-
Milan	7/1/2001	Hail	0.75	0	0	\$-	\$-
Berlin Heights	5/30/2002	Hail	0.88	0	0	\$10,000	\$-
Vermilion	6/14/2002	Hail	0.75	0	0	\$5,000	\$-
Sandusky	6/21/2002	Hail	0.75	0	0	\$-	\$-
Sandusky	9/26/2003	Hail	0.75	0	0	\$-	\$-
Milan	4/17/2004	Hail	0.75	0	0	\$-	\$-
Castalia	4/17/2004	Hail	1	0	0	\$2,000	\$-

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Location	Date	Type	Magnitude (Inch Hail)	Deaths	Injuries	Property Damage	Crop Damage
Castalia	5/17/2004	Hail	0.75	0	0	\$-	\$-
Sandusky	4/20/2005	Hail	0.75	0	0	\$-	\$-
Castalia	4/20/2005	Hail	0.75	0	0	\$-	\$-
Huron	4/20/2005	Hail	0.75	0	0	\$-	\$-
Huron	5/13/2005	Hail	0.75	0	0	\$-	\$-
Kimball	4/7/2006	Hail	0.88	0	0	\$-	\$-
Milan	4/7/2006	Hail	0.75	0	0	\$-	\$-
Florence	4/7/2006	Hail	0.75	0	0	\$-	\$-
Milan	4/21/2006	Hail	0.75	0	0	\$-	\$-
Birmingham	4/23/2006	Hail	0.75	0	0	\$-	\$-
Sandusky	6/19/2006	Hail	0.75	0	0	\$-	\$-
Sandusky	6/19/2006	Hail	0.88	0	0	\$-	\$-
Sandusky	6/19/2006	Hail	0.75	0	0	\$-	\$-
Kimball	6/19/2006	Hail	0.75	0	0	\$-	\$-
Sandusky	6/22/2006	Hail	0.88	0	0	\$-	\$-
Sandusky	6/22/2006	Hail	0.75	0	0	\$-	\$-
Weyers	5/30/2007	Hail	0.75	0	0	\$-	\$-
Berlin Heights	5/3/2008	Hail	0.88	0	0	\$-	\$-
Berlin Heights	6/22/2008	Hail	0.75	0	0	\$-	\$-
Berlin Heights	6/22/2008	Hail	1	0	0	\$-	\$-
Vermilion	6/22/2008	Hail	0.75	0	0	\$-	\$-
Kelleys Is	6/22/2008	Hail	0.75	0	0	\$-	\$-
Columbus Park	7/23/2008	Hail	0.88	0	0	\$-	\$-
Sandusky	7/23/2008	Hail	0.75	0	0	\$-	\$-
Sandusky	6/19/2009	Hail	0.75	0	0	\$-	\$-
Sandusky	6/25/2009	Hail	1	0	0	\$20,000	\$-
Sandusky	8/11/2009	Hail	0.75	0	0	\$-	\$-
Huron	4/25/2010	Hail	0.75	0	0	\$-	\$-
Sandusky	5/7/2010	Hail	2	0	0	\$250,000	\$-
Huron	5/7/2010	Hail	1.25	0	0	\$15,000	\$-
Sandusky	5/7/2010	Hail	1	0	0	\$-	\$-
Vermilion	5/7/2010	Hail	1	0	0	\$-	\$-
Milan	5/14/2010	Hail	0.88	0	0	\$-	\$-
Sandusky	6/23/2010	Hail	1	0	0	\$-	\$-
Sandusky	6/23/2010	Hail	1	0	0	\$-	\$-
Sandusky	6/27/2010	Hail	0.75	0	0	\$-	\$-
Huron	5/12/2011	Hail	0.75	0	0	\$-	\$-
Avery	5/12/2011	Hail	1	0	0	\$5,000	\$-
Vermilion	5/23/2011	Hail	0.88	0	0	\$-	\$-
Castalia	5/25/2011	Hail	1.5	0	0	\$20,000	\$-
Sandusky	5/25/2011	Hail	2	0	0	\$400,000	\$-
Sandusky	5/25/2011	Hail	1.75	0	0	\$300,000	\$-
Huron	5/25/2011	Hail	1	0	0	\$10,000	\$-
Milan	5/25/2011	Hail	1.75	0	0	\$125,000	\$-
Huron	5/29/2011	Hail	1	0	0	\$-	\$-
Vermilion	8/1/2011	Hail	1	0	0	\$-	\$-
Sandusky	7/1/2012	Hail	0.75	0	0	\$-	\$-
Venice	7/1/2012	Hail	1.25	0	0	\$-	\$-
Sandusky	7/1/2012	Hail	1	0	0	\$-	\$-
Columbus Park	8/9/2012	Hail	2	0	0	\$15,000	\$-
Sandusky	9/7/2012	Hail	0.75	0	0	\$-	\$-
Milan	9/7/2012	Hail	0.75	0	0	\$-	\$-
Milan	4/8/2013	Hail	1	0	0	\$1,000	\$-
Sand Hill	7/10/2013	Hail	1.25	0	0	\$25,000	\$-

Location	Date	Type	Magnitude (Inch Hail)	Deaths	Injuries	Property Damage	Crop Damage
Avery	7/10/2013	Hail	0.75	0	0	\$-	\$-
Milan	7/10/2013	Hail	1	0	0	\$-	\$-
Vermillion	4/29/2014	Hail	0.75	0	0	\$-	\$-
Pakertown	5/21/2014	Hail	1.5	0	0	\$10,000	\$-
Weyers	5/21/2014	Hail	1	0	0	\$2,000	\$-
Sandusky	7/30/2014	Hail	1	0	0	\$-	\$-
Huron Airport	6/22/2015	Hail	1	0	0	\$2,000	\$-
Huron	7/7/2017	Hail	0.75	0	0	\$-	\$-
Bay View	7/16/2017	Hail	1	0	0	\$-	\$-
Sandusky	7/16/2017	Hail	0.75	0	0	\$-	\$-
Sandusky	7/16/2017	Hail	1	0	0	\$-	\$-
Huron	8/21/2017	Hail	1	0	0	\$-	\$-
Totals				0	0	\$1,217,000	\$ -

Table 24: Lightning Events in Erie County 1996-2019

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Huron	4/22/1996	Lightning	0	0	\$-	\$-
Huron	4/22/1996	Lightning	0	0	\$-	\$-
Huron	6/11/1996	Lightning	0	0	\$350,000	\$-
Groton Township	7/30/1996	Lightning	0	0	\$75,000	\$-
Berlin Heights	4/9/1998	Lightning	0	1	\$-	\$-
Milan	6/26/1998	Lightning	0	0	\$10,000	\$-
Sandusky	8/9/1998	Lightning	0	0	\$12,000	\$-
Total			0	1	\$447,000	\$-

Table 25: Thunderstorm Wind Events in Erie County 1955 - 2019

Location	Date	Type	Magnitude (MPH)	Deaths	Injuries	Property Damage	Crop Damage
Erie Co.	5/15/1968	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	8/8/1968	Thunderstorm Wind	60	0	0	\$-	\$-
Erie Co.	8/7/1972	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	7/3/1973	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	4/14/1974	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	7/16/1976	Thunderstorm Wind	70	0	0	\$-	\$-
Erie Co.	7/16/1976	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	6/30/1977	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	10/5/1978	Thunderstorm Wind	52	0	0	\$-	\$-
Erie Co.	5/13/1980	Thunderstorm Wind	52	0	0	\$-	\$-
Erie Co.	6/7/1980	Thunderstorm Wind	52	0	0	\$-	\$-
Erie Co.	8/2/1980	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	9/13/1980	Thunderstorm Wind	52	0	0	\$-	\$-
Erie Co.	1/4/1982	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	6/15/1982	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	6/15/1982	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	6/15/1982	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	5/2/1983	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	7/4/1983	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	7/4/1983	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	9/6/1983	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	9/6/1983	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	9/6/1983	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	8/8/1984	Thunderstorm Wind	0	0	0	\$-	\$-

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Location	Date	Type	Magnitude (MPH)	Deaths	Injuries	Property Damage	Crop Damage
Erie Co.	5/6/1986	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	6/16/1986	Thunderstorm Wind	52	0	0	\$-	\$-
Erie Co.	8/26/1986	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	9/26/1986	Thunderstorm Wind	52	0	0	\$-	\$-
Erie Co.	9/26/1986	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	6/8/1987	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	6/29/1987	Thunderstorm Wind	52	0	0	\$-	\$-
Erie Co.	8/2/1987	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	8/2/1987	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	8/2/1987	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	5/9/1988	Thunderstorm Wind	50	0	0	\$-	\$-
Erie Co.	8/5/1988	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	5/31/1989	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	11/27/1989	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	6/2/1990	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	6/3/1990	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	3/27/1991	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	5/31/1991	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	6/15/1991	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	5/17/1992	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	6/17/1992	Thunderstorm Wind	51	0	0	\$-	\$-
Erie Co.	6/17/1992	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	8/10/1992	Thunderstorm Wind	0	0	0	\$-	\$-
Berlin Heights	6/20/1994	Thunderstorm Wind	0	0	0	\$5,000	\$-
Milan	4/11/1995	Thunderstorm Wind	0	0	0	\$-	\$-
Erie Co.	5/28/1995	Thunderstorm Wind	0	0	0	\$5,000	\$-
Sandusky	6/28/1995	Thunderstorm Wind	0	0	0	\$10,000	\$-
Countywide	7/13/1995	Thunderstorm Wind	0	0	0	\$100,000	\$-
Castalia	7/15/1995	Thunderstorm Wind	0	0	0	\$3	\$-
Countywide	8/11/1995	Thunderstorm Wind	0	0	0	\$2,000	\$-
Kimball	8/15/1995	Thunderstorm Wind	0	0	0	\$2	\$-
Countywide	4/12/1996	Thunderstorm Wind	52	0	0	\$50,000	\$-
Huron	6/19/1996	Thunderstorm Wind	60	0	0	\$2,000	\$-
Sandusky	7/7/1996	Thunderstorm Wind	50	0	0	\$-	\$-
Sandusky	7/14/1996	Thunderstorm Wind		0	0	\$20,000	\$-
Countywide	10/30/1996	Thunderstorm Wind	50	0	0	\$-	\$-
Huron	12/1/1996	Thunderstorm Wind	50	0	0	\$2,000	\$-
Countywide	5/18/1997	Thunderstorm Wind	56	0	0	\$2,000	\$-
Berlin Heights	5/19/1997	Thunderstorm Wind	50	0	0	\$-	\$-
Castalia	5/19/1997	Thunderstorm Wind		0	0	\$2,000	\$-
Sandusky	7/26/1997	Thunderstorm Wind		0	0	\$5,000	\$-
Milan	7/26/1997	Thunderstorm Wind		0	0	\$3,000	\$-
Countywide	8/16/1997	Thunderstorm Wind		0	0	\$5,000	\$-
Countywide	8/16/1997	Thunderstorm Wind		0	0	\$10,000	\$-
Castalia	3/28/1998	Thunderstorm Wind		0	0	\$20,000	\$-
Sandusky	6/30/1998	Thunderstorm Wind	55	0	0	\$-	\$-
Vermillion	7/21/1998	Thunderstorm Wind		0	0	\$15,000	\$-
Castalia	7/21/1998	Thunderstorm Wind	52	0	0	\$20,000	\$-
Milan	7/21/1998	Thunderstorm Wind	61	0	0	\$750,000	\$-
Sandusky	7/21/1998	Thunderstorm Wind		0	0	\$10,000	\$-
Countywide	7/21/1998	Thunderstorm Wind		0	0	\$10,000	\$-
Countywide	8/25/1998	Thunderstorm Wind		0	0	\$10,000	\$-
Countywide	11/10/1998	Thunderstorm Wind		0	0	\$10,000	\$-
Lakeshore	11/10/1998	Thunderstorm Wind	98	0	0	\$-	\$-

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Location	Date	Type	Magnitude (MPH)	Deaths	Injuries	Property Damage	Crop Damage
Vermillion	7/6/1999	Thunderstorm Wind	51	0	0	\$15,000	\$-
Countywide	7/9/1999	Thunderstorm Wind		0	0	\$20,000	\$-
Berlin Heights	7/30/1999	Thunderstorm Wind		0	0	\$5,000	\$-
Countywide	7/31/1999	Thunderstorm Wind		0	0	\$300,000	\$-
Crystal Rock	7/31/1999	Thunderstorm Wind		0	0	\$25,000	\$-
Countywide	10/13/1999	Thunderstorm Wind	62	0	0	\$30,000	\$-
Sandusky	7/14/2000	Thunderstorm Wind	59	0	0	\$35,000	\$-
Sandusky	8/2/2000	Thunderstorm Wind		0	0	\$35,000	\$-
Sandusky	8/2/2000	Thunderstorm Wind		0	0	\$50,000	\$-
Sandusky	8/6/2000	Thunderstorm Wind		0	0	\$15,000	\$-
Milan	8/9/2000	Thunderstorm Wind		0	0	\$40,000	\$-
Castalia	10/4/2000	Thunderstorm Wind		0	0	\$5,000	\$-
Milan	4/28/2002	Thunderstorm Wind		0	0	\$35,000	\$-
Berlin Heights	5/30/2002	Thunderstorm Wind		0	0	\$10,000	\$-
Sandusky	6/21/2002	Thunderstorm Wind		0	0	\$10,000	\$-
Vermillion	6/21/2002	Thunderstorm Wind	53	0	0	\$-	\$-
Milan	7/22/2002	Thunderstorm Wind		0	0	\$10,000	\$-
Sandusky	7/27/2002	Thunderstorm Wind		0	0	\$2,000	\$-
Sandusky	7/28/2002	Thunderstorm Wind		0	0	\$10,000	\$-
Countywide	7/29/2002	Thunderstorm Wind		0	0	\$15,000	\$-
Castalia	8/4/2002	Thunderstorm Wind		0	0	\$10,000	\$-
Vermillion	9/20/2002	Thunderstorm Wind		0	0	\$5,000	\$-
Milan	11/10/2002	Thunderstorm Wind		0	0	\$25,000	\$-
Vermillion	11/10/2002	Thunderstorm Wind		0	0	\$600,000	\$-
Castalia	4/4/2003	Thunderstorm Wind	50	0	0	\$3,000	\$-
Huron	4/4/2003	Thunderstorm Wind	50	0	0	\$2,000	\$-
Castalia	4/20/2003	Thunderstorm Wind	50	0	0	\$75,000	\$-
Milan	6/26/2003	Thunderstorm Wind	50	0	0	\$5,000	\$-
Sandusky	7/4/2003	Thunderstorm Wind	50	0	0	\$50,000	\$-
Countywide	7/7/2003	Thunderstorm Wind	50	0	0	\$20,000	\$-
Countywide	7/7/2003	Thunderstorm Wind	50	0	0	\$15,000	\$-
Countywide	7/8/2003	Thunderstorm Wind	56	0	0	\$400,000	\$-
Vermillion	9/26/2003	Thunderstorm Wind	50	0	0	\$5,000	\$-
Milan	11/12/2003	Thunderstorm Wind	50	0	0	\$5,000	\$-
Countywide	5/21/2004	Thunderstorm Wind	52	0	0	\$50,000	\$-
Sandusky	6/9/2004	Thunderstorm Wind	50	0	0	\$15,000	\$-
Vermillion	6/13/2004	Thunderstorm Wind	50	0	0	\$8,000	\$-
Castalia	6/14/2004	Thunderstorm Wind	50	0	0	\$3,000	\$-
Bay View	6/5/2005	Thunderstorm Wind	50	0	0	\$2,000	\$-
Avery	6/30/2005	Thunderstorm Wind	54	0	0	\$10,000	\$-
Kelleys Island	7/18/2005	Thunderstorm Wind	50	0	0	\$5,000	\$-
Kelleys Island	7/26/2005	Thunderstorm Wind	50	0	0	\$4,000	\$-
Kelleys Island	7/26/2005	Thunderstorm Wind	50	0	0	\$2,000	\$-
Sandusky	9/22/2005	Thunderstorm Wind	61	0	0	\$750,000	\$-
Castalia	11/6/2005	Thunderstorm Wind	50	0	0	\$1,000	\$-
Castalia	5/25/2006	Thunderstorm Wind	50	0	0	\$6,000	\$-
Sandusky	6/19/2006	Thunderstorm Wind	50	0	0	\$5,000	\$-
Sandusky	6/21/2006	Thunderstorm Wind	50	0	0	\$1,000	\$-
Sandusky	7/4/2006	Thunderstorm Wind	50	0	0	\$10,000	\$-
Vermillion	7/30/2006	Thunderstorm Wind	50	0	0	\$6,000	\$-
Sandusky	6/2/2007	Thunderstorm Wind	50	0	0	\$5,000	\$-
Kelleys Is	6/8/2007	Thunderstorm Wind	50	0	0	\$1,000	\$-
Sandusky	6/8/2007	Thunderstorm Wind	50	0	0	\$30,000	\$-
Castalia	6/21/2007	Thunderstorm Wind	50	0	0	\$3,000	\$-

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Location	Date	Type	Magnitude (MPH)	Deaths	Injuries	Property Damage	Crop Damage
Sandusky	9/8/2007	Thunderstorm Wind	50	0	0	\$25,000	\$-
Berlin Heights	1/9/2008	Thunderstorm Wind	70	0	0	\$30,000	\$-
Bay View	1/29/2008	Thunderstorm Wind	60	0	0	\$25,000	\$-
Bogart	6/9/2008	Thunderstorm Wind	50	0	0	\$2,000	\$-
Milan	6/10/2008	Thunderstorm Wind	50	0	0	\$2,000	\$-
Castalia	6/15/2008	Thunderstorm Wind	50	0	0	\$2,000	\$-
Sandusky	6/15/2008	Thunderstorm Wind	50	0	0	\$1,000	\$-
Sandusky	7/8/2008	Thunderstorm Wind	50	0	0	\$7,000	\$-
Sandusky	8/1/2008	Thunderstorm Wind	50	0	0	\$1,000	\$-
Sandusky	6/25/2009	Thunderstorm Wind	59	0	0	\$-	\$-
Sandusky	6/25/2009	Thunderstorm Wind	50	0	0	\$2,000	\$-
Vermilion	8/28/2009	Thunderstorm Wind	50	0	0	\$3,000	\$-
Huron	4/25/2010	Thunderstorm Wind	50	0	0	\$5,000	\$-
Venice	5/7/2010	Thunderstorm Wind	70	0	0	\$500,000	\$-
Huron	5/7/2010	Thunderstorm Wind	50	0	0	\$50,000	\$-
Sandusky	6/6/2010	Thunderstorm Wind	50	0	0	\$5,000	\$-
Sandusky	6/6/2010	Thunderstorm Wind	50	0	0	\$12,000	\$-
Soldiers Home	6/27/2010	Thunderstorm Wind	50	0	0	\$25,000	\$-
Bogart	6/27/2010	Thunderstorm Wind	50	0	0	\$10,000	\$-
Sand Hill	6/27/2010	Thunderstorm Wind	50	0	0	\$1,000	\$-
Vermilion	7/2/2011	Thunderstorm Wind	50	0	0	\$10,000	\$-
Sandusky	7/22/2011	Thunderstorm Wind	50	0	0	\$15,000	\$-
Pakertown	7/22/2011	Thunderstorm Wind	50	0	0	\$10,000	\$-
Castalia	6/18/2012	Thunderstorm Wind	50	0	0	\$1,000	\$-
Sandusky	6/18/2012	Thunderstorm Wind	50	0	0	\$50,000	\$-
Huron	6/18/2012	Thunderstorm Wind	50	0	0	\$1,000	\$-
Berlin Heights	6/18/2012	Thunderstorm Wind	52	0	0	\$15,000	\$-
Vermilion	6/18/2012	Thunderstorm Wind	50	0	0	\$2,000	\$-
Berlin Heights	7/1/2012	Thunderstorm Wind	70	0	0	\$10,000	\$-
Sandusky	7/1/2012	Thunderstorm Wind	50	0	1	\$15,000	\$-
Sandusky	7/1/2012	Thunderstorm Wind	50	0	0	\$2,000	\$-
Vermilion	7/5/2012	Thunderstorm Wind	55	0	0	\$-	\$-
Berlin Heights	5/31/2013	Thunderstorm Wind	50	0	0	\$2,000	\$-
Castalia	6/13/2013	Thunderstorm Wind	50	0	0	\$15,000	\$-
Milan	6/13/2013	Thunderstorm Wind	50	0	0	\$25,000	\$-
Huron	6/13/2013	Thunderstorm Wind	50	0	0	\$20,000	\$-
North Monroeville	7/10/2013	Thunderstorm Wind	50	0	0	\$50,000	\$-
Florence	11/17/2013	Thunderstorm Wind	50	0	0	\$15,000	\$-
Milan	6/18/2014	Thunderstorm Wind	50	0	0	\$1,000	\$-
Castalia	11/24/2014	Thunderstorm Wind	50	0	0	\$2,000	\$-
Sandusky	5/27/2015	Thunderstorm Wind	50	0	0	\$25,000	\$-
Vermilion	5/27/2015	Thunderstorm Wind	50	0	0	\$-	\$-
Castalia	6/18/2015	Thunderstorm Wind	50	0	0	\$12,000	\$-
Sandusky	6/5/2016	Thunderstorm Wind	74	0	0	2,000,000	\$-
Vermilion	7/18/2016	Thunderstorm Wind	50	0	0	\$1,000	\$-
Berlin Heights	8/28/2016	Thunderstorm Wind	50	0	0	\$100,000	\$-
Huron	8/28/2016	Thunderstorm Wind	51	0	0	\$-	\$-
Vermilion	8/28/2016	Thunderstorm Wind	50	0	0	\$1,000	\$-
Bay View	7/16/2017	Thunderstorm Wind	50	0	0	\$1,000	\$-
Lakeshore	11/5/2017	Thunderstorm Wind	50	0	0	\$35,000	\$-
Sandusky	7/26/2018	Thunderstorm Wind	60	0	0	\$150,000	\$-
Castalia	8/6/2018	Thunderstorm Wind	50	0	0	\$125,000	\$-
Crystal Rock	5/23/2019	Thunderstorm Wind	56	0	0	\$20,000	\$-

Location	Date	Type	Magnitude (MPH)	Deaths	Injuries	Property Damage	Crop Damage
Sandusky	5/23/2019	Thunderstorm Wind	52	0	0	\$-	\$-
Avery	5/23/2019	Thunderstorm Wind	52	0	0	\$-	\$-
Milan	7/2/2019	Thunderstorm Wind	65	0	0	\$100,000	\$-
Milan	7/2/2019	Thunderstorm Wind	65	0	0	\$10,000	\$-
Milan	7/2/2019	Thunderstorm Wind	52	0	0	\$-	\$-
Ogontz	7/2/2019	Thunderstorm Wind	61	0	0	\$-	\$-
Bogart	8/6/2019	Thunderstorm Wind	52	0	0	\$-	\$-
Sandusky	8/6/2019	Thunderstorm Wind	52	0	0	\$2,000	\$-
Venice	8/18/2019	Thunderstorm Wind	52	0	0	\$-	\$-
Vermilion	9/13/2019	Thunderstorm Wind	52	0	0	\$2,000	\$-
Vermilion	9/13/2019	Thunderstorm Wind	52	0	0	\$10,000	\$-
Vermilion	9/13/2019	Thunderstorm Wind	52	0	0	\$10,000	\$-
				0	1	\$7,445,005	\$-

Table 26: Heat Events in Erie County 1996 - 2019

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Erie County	6/6/1999	Heat	0	0	\$-	\$-
Erie County	7/1/1999	Heat	0	0	\$-	\$-
Total			0	0	\$ -	\$ -

7.7.5 Probability of Future Events

Severe summer weather typically occurs every year in Erie County. The NCDC data supports this showing that there was a total of 103 hail events, 7 lightning events, 197 thunderstorm wind events, and 2 heat events in the years included in the NCDC.

The recurrence interval for hail events is 65 years/103 events = 0.63, so the probability of Erie County experiencing a hail event is 100% in any given year.

The recurrence interval for lightning events is 24 years/7 events = 3.43, which indicates a lightning event can be expected about every 3.4 years. The probability of a lightning event in any given year is 29%.

The recurrence interval for a thunderstorm wind event is 65 years/197 events = 0.33, so the probability of Erie County experiencing a thunderstorm wind event in any given year is 100%.

The recurrence interval for heat events is 24 years/2 events = 12, which indicates a heat event would occur every 12 years. However, this may be misleading due to how well records have been kept and added to the NCDC database. Only two heat events were reported, and these occurred within a month of each other. It is possible other heat events have occurred but have not been recorded.

7.7.6 Vulnerability

The most vulnerable structures are those that were poorly built or are dilapidated. The wind loads from thunderstorms may lead to structural collapse or to minor damage. Some shed roofs that protect township and borough road maintenance or firefighting equipment have large span roofs that may collapse during especially severe summer

storms although none have collapsed due to recent severe summer storms. Thunderstorms can rip roofs off of any dilapidated structures and overturn mobile homes.

Vulnerability to the effects of severe summer weather on buildings is somewhat dependent on the age of a building because as building codes become more stringent, buildings are capable of enduring greater wind forces due to thunderstorms. As buildings age, various factors may deteriorate their structural integrity. Vulnerability also depends upon the type of construction and the degree to which a structure has been maintained.

The most common detrimental effects of severe storms are not collapsed structures but traffic accidents, interruptions in power supply and communications services, and roadway blockages due to downed trees. In addition, lightning strikes can interrupt communication networks and cause structure or wild land fires. Hail also has the potential to cause significant damage to building roofs, glass windows and skylights, and vehicles. Extreme heat events can cause heat exhaustion, heat stroke or even death.

Because severe summer weather impacts the entire county, all structures within the county are at some risk. The total number and value of structures can be found in Table 8.

For this mitigation plan, structures identified as potentially vulnerable to damage from severe summer weather are structures older than 50 years that may have deteriorated over time. Data on the age of structures was not available when the previous version of this plan was prepared, so an analysis of vulnerability was not completed. Data is only available for housing units. Therefore, only housing unit structures will be evaluated.

There are 9,188 housing units standing in Erie County that were built before 1939 and approximately 58 percent of the structures in the county are more than 50 years old, according to the 2019 American Community Survey. Nevertheless, for this review, because the National Trust for Historic Preservation identifies structures greater than 50 years old as being eligible for designation as historic, the assumption is made that structures built before 1970 are at some risk of at least minor damage due to severe storms. There are 21,648 structures in the county that were built before 1970, thus the percent of structures considered to be particularly vulnerable to damage due to severe storms is 57 percent. Figure 52 shows the number of structures built in Erie County and illustrates the fact that many structures in the county are older than 50 years.

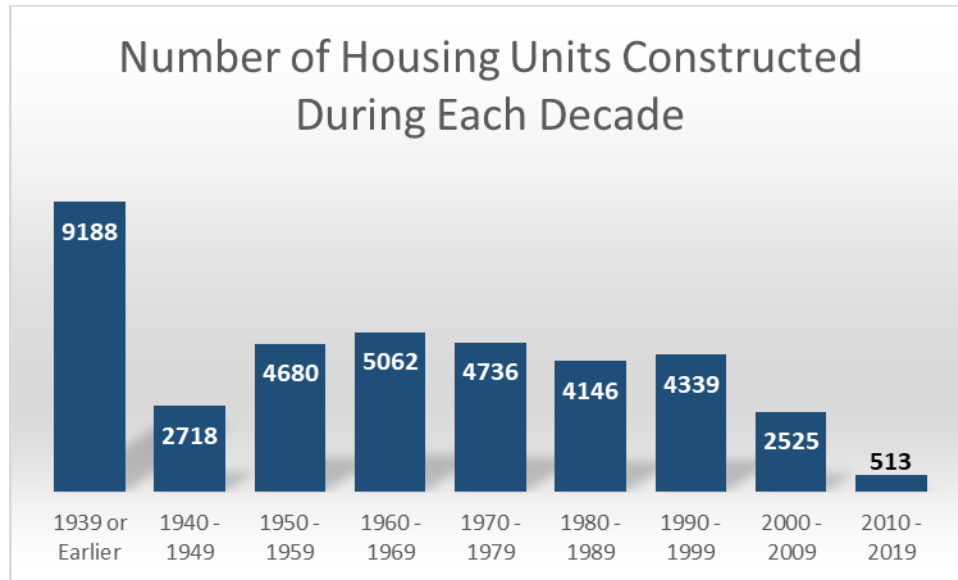


Figure 52: Number of Housing Units Constructed During Each Decade in Erie County

All structures and infrastructure in Erie County will be exposed to severe summer weather. Currently Erie County has not adopted any building codes; however, the cities, villages and townships within Erie County have adopted and enforced the Ohio building codes.

Due to the non-site-specific nature of this hazard, current development trends have no effect. Current development within Erie County has been primarily concentrated in the western part of the county largely in Huron Township.

Table 27: Summary of Past Losses Due to Different Components of Severe Summer Weather

	Estimated Property Damages
Total Losses Due to Hail (1955–2019)	\$1,217,000
Average Annual Losses for 65 years	\$18,723
Total Losses Due to Lightning (1996–2019)	\$447,000
Average Annual Losses for 24 years	\$18,625
Total Losses Due to Thunderstorm Wind (1955–2019)	\$7,445,005
Average Annual Losses for 65 years	\$114,539
Total Losses Due to Heat (1996-2019)	\$0
Average Annual Losses for 24 years	\$0

Because severe summer weather is random in nature, the Core Group has chosen to look at historic events to determine Erie County's susceptibility. According to the National Climatic Data Center (NCDC), there have been 103 hail events (since 1955), 7 lightning events (since 1996), 197 thunderstorm-wind events (since 1955), and 2 heat events (since 1996) in Erie County resulting in over \$9 million in damages, and 2 injuries. Wind events not associated with thunderstorms are in the damaging winds section.

Since the total loss due to hail over the previous 65 years is \$1,217,000, the average annual loss is $\$1,217,000 / 66 = \$18,723$. The total loss due to lightning over the previous 24 years is \$447,000, so the average annual loss is \$18,625. For thunderstorm wind events, the total loss was \$7,445,005 and the average annual loss is \$114,539. The cost due to thunderstorm

wind events is clearly much higher than due to hail or lightning events. There are no annualized losses due to high heat.

Climate change may also impact how severe summer weather affects Erie County and its jurisdictions. Climate changes tends to cause storms to be more severe, which would increase the vulnerability of Erie County to the impacts of severe summer weather.

7.8 Severe Winter Weather

7.8.1 Hazard Profile

Severe winter weather includes freezing temperatures, blizzards, ice storms, and snowstorms. These hazards have the potential to disrupt traffic, cause outages to power and communication networks, and even cause damage to structures. The health impacts from extreme cold (frostbite and hypothermia) as well motor vehicle accidents present a risk to the health of the community and can even cause loss of life. Heavy snow may cause buildings to collapse or suffer damage. Ice storms can cause dangerous build-up of ice on utility wires or trees causing them to fall. Ice and snow can also cause traffic to become extremely hazardous and roads can become impassible. Depending on when the severe winter weather occurs, crops can even be destroyed if there is an early or late freeze.

7.8.2 Location

Erie County is in the north central portion of the state and is susceptible to severe winter weather, which may be experienced at any location in Erie County. Because severe winter weather is random in nature, the entire county population is susceptible. Severe winter weather tends to be even more widespread than severe summer weather, and large portions of the county are likely to be impacted during any storm, if not the entire county and all of the municipalities.

7.8.3 Extent

Severe winter weather occurs throughout the State of Ohio. All of Erie County is exposed to the hazards associated with severe winter weather. Severe winter weather typically occurs between the months of September through May but may be experienced outside of that timeframe. Severe winter weather events may contain extreme cold, heavy snow, blizzards or ice storms. Because the area receives a moderate amount of snowfall and can be stricken by ice storms, all the structures erected in the county and the municipalities are susceptible to damage if not designed to the proper snow loading parameters. The most significant winter weather event in Erie County, in terms of losses, occurred on December 22, 2004, and cost \$3,800,000 in property losses alone. In terms of injuries, the most severe winter weather event occurred on January 13, 1998, when 8 injuries occurred. There have been no reported deaths due to severe winter weather in Erie County since 1996.

7.8.4 Previous Occurrences

Erie County is highly susceptible to severe winter weather, which encompasses freezing temperatures, blizzards, ice storms and snowstorms.

According to the NCDRC, there have been 43 severe winter weather events in Erie County reported since 1996, with total property losses of \$8,197,000 and no reported crop losses. Since 1996 the average annual losses reported for the county have been approximately \$341,512.

Erie County has experienced several severe storms causing significant damage. Some of the most notable and costly are described below. Table 28 list each of the winter

weather events in Erie County and information regarding the number of injuries and damage caused by each.

Table 28: Winter Weather Events in Erie County 1996 - 2019

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Erie (Zone)	2/2/1996	Cold/Wind Chill	0	0	\$50,000	\$-
Erie (Zone)	3/19/1996	Heavy Snow	0	0	\$15,000	\$-
Erie (Zone)	1/10/1997	Cold/Wind Chill	0	0	\$5,000	\$-
Erie (Zone)	1/16/1997	Winter Weather	0	0	\$15,000	\$-
Erie Co.	1/13/1998	Winter Weather	0	8	\$-	\$-
Erie (Zone)	1/2/1999	Winter Storm	0	2	\$15,000	\$-
Erie (Zone)	1/8/1999	Winter Storm	0	0	\$2,000	\$-
Erie (Zone)	3/5/1999	Heavy Snow	0	0	\$10,000	\$-
Erie (Zone)	3/11/2000	Winter Storm	0	0	\$15,000	\$-
Erie (Zone)	12/13/2000	Winter Storm	0	0	\$75,000	\$-
Erie (Zone)	3/24/2002	Winter Storm	0	0	\$50,000	\$-
Erie (Zone)	3/26/2002	Winter Storm	0	0	\$100,000	\$-
Erie (Zone)	12/24/2002	Heavy Snow	0	0	\$75,000	\$-
Erie (Zone)	2/22/2003	Heavy Snow	0	0	\$500,000	\$-
Erie (Zone)	1/4/2004	Winter Storm	0	0	\$100,000	\$-
Erie (Zone)	12/22/2004	Winter Storm	0	0	\$3,800,000	\$-
Erie (Zone)	1/5/2005	Ice Storm	0	0	\$600,000	\$-
Erie (Zone)	1/22/2005	Winter Storm	0	0	\$200,000	\$-
Erie (Zone)	2/4/2006	Winter Storm	0	0	\$50,000	\$-
Erie (Zone)	2/13/2007	Winter Storm	0	0	\$25,000	\$-
Erie (Zone)	12/15/2007	Winter Storm	0	0	\$120,000	\$-
Erie (Zone)	2/25/2008	Winter Storm	0	0	\$75,000	\$-
Erie (Zone)	3/4/2008	Winter Storm	0	0	\$200,000	\$-
Erie (Zone)	3/7/2008	Winter Storm	0	0	\$400,000	\$-
Erie (Zone)	3/21/2008	Heavy Snow	0	0	\$50,000	\$-
Erie (Zone)	12/19/2008	Winter Storm	0	0	\$30,000	\$-
Erie (Zone)	1/9/2009	Winter Storm	0	0	\$120,000	\$-
Erie (Zone)	1/15/2009	Extreme Cold/Wind Chill	0	0	\$-	\$-
Erie (Zone)	1/27/2009	Winter Storm	0	0	\$150,000	\$-
Erie (Zone)	2/1/2011	Winter Storm	0	0	\$250,000	\$-
Erie (Zone)	3/27/2012	Extreme Cold/Wind Chill	0	0	\$-	\$-
Erie (Zone)	4/29/2012	Extreme Cold/Wind Chill	0	0	\$200,000	\$-
Erie (Zone)	1/6/2014	Extreme Cold/Wind Chill	0	0	\$-	\$-
Erie (Zone)	1/28/2014	Extreme Cold/Wind Chill	0	0	\$-	\$-
Erie (Zone)	2/4/2014	Winter Storm	0	0	\$125,000	\$-
Erie (Zone)	3/12/2014	Winter Storm	0	0	\$200,000	\$-
Erie (Zone)	2/1/2015	Winter Storm	0	0	\$250,000	\$-
Erie (Zone)	2/15/2015	Extreme Cold/Wind Chill	0	0	\$-	\$-
Erie (Zone)	2/20/2015	Extreme Cold/Wind Chill	0	0	\$-	\$-
Erie (Zone)	4/8/2016	Winter Storm	0	0	\$150,000	\$-
Erie (Zone)	12/17/2016	Winter Storm	0	0	\$100,000	\$-
Erie (Zone)	1/19/2019	Winter Storm	0	0	\$75,000	\$-
Erie (Zone)	1/30/2019	Extreme Cold/Wind Chill	0	0	\$-	\$-
Total			0	10	\$8,197,000	\$-

7.8.5 Probability of Future Events

Severe winter weather typically occurs every year in Erie County. The NCDC data supports this showing that there was a total of 43 winter weather events over the period

between 1996 and 2019. Thus, the recurrence interval for severe winter weather in Erie County is 24 years/ 43 events = 0.56. The probability of the occurrence of a winter weather event in Erie County in any given year is 100 percent.

7.8.6 Vulnerability

The most vulnerable structures to severe winter weather are those that were poorly built or are dilapidated. The weight of snow and ice on structures can lead to structural collapse or to minor damage. Some shed roofs that protect township and borough road maintenance or firefighting equipment have large span roofs that may collapse under the weight of especially heavy snows, although none have collapsed due to recent winter storms.

Vulnerability to the effects of severe storms on buildings is somewhat dependent on the age of a building because as building codes become more stringent, buildings can support heavier loads. As buildings age, various factors may deteriorate their structural integrity. Vulnerability also depends upon the type of construction and the degree to which a structure has been maintained.

The most common detrimental effects of winter weather events are not collapsed structures but traffic accidents, interruptions in power supply and communications services, and roadway blockages due to downed trees and impassible roads. Because severe storms affect the entire county, all structures within the county are at some risk. The total number and value of structures can be found in Table 8.

Due to the non-site-specific nature of this hazard, current development trends have no effect, other than to increase the number of buildings exposed. Current development within Erie County has been primarily concentrated in the western part of the county. This development is centered in Huron Township. Developers in these areas should consider the importance of road design to maximize accessibility during a severe storm event. In this township especially, more effort should be placed on maintenance of trees in utility areas to reduce the number of power outages due to fallen trees and/or branches due to the accumulation of ice or snow.

Because severe storms are random in nature, the Core Group has chosen to look at historic events to determine Erie County's susceptibility. According to the National Climatic Data Center (NCDC), there have been 43 winter storm events in Erie County since 1996, totaling \$8,197,000 in property losses. Past losses provided in NCDC are used to estimate the potential for annual losses due to severe storms. Since the total loss over 24 years is \$8,197,000 the average annual loss is $\$8,197,000 / 24 = \$341,542$.

Table 29: Summary of Past Losses Due to Severe Winter Weather 1996 - 2019

	Estimated Property Damages
Total Losses Due to Winter Weather (1996–2019)	\$8,197,000
Average Annual Losses for 66 years	\$341,542

Climate change has the potential to cause more severe and more costly storms, therefore, the likelihood that winter weather events negatively impact Erie County and its jurisdictions will increase, potentially with more damage and more losses.

7.9 Tornado and Waterspouts

7.9.1 Hazard Profile

Tornadoes are violently rotating columns of air extending from the base of thunderstorms to the ground. Most often tornadoes are funnel shaped, but it is possible to have a tornado without seeing a visible funnel, and the powerful winds can extend beyond the visible funnel as well. Most tornadoes that occur in the US are classified as weak, but some can have wind speeds of 200-300 miles per hour and last for more than an hour.⁴⁵

Since 2007, tornadoes have been measured by the Enhanced Fujita scale, which is based on estimated three second gust wind speeds and observed damage based on a 28-item damage indicator scale⁴⁶. Figure 54 shows the older Fujita scale as compared to the Enhanced Fujita scale. In Erie County, there has only been one tornado on record since the Enhanced Fujita scale was enacted, so most are still listed using the older Fujita scale.

Fujita Scale		Enhanced Fujita Scale* <small>* In use since 2007</small>	
F-0	40–72 mph winds	EF-0	65–85 mph winds
F-1	73–112 mph	EF-1	86–110 mph
F-2	113–157 mph	EF-2	111–135 mph
F-3	158–206 mph	EF-3	136–165 mph
F-4	207–260 mph	EF-4	166–200 mph
F-5	261–318 mph	EF-5	>200 mph

Figure 53: Fujita Scale and Enhanced Fujita Scale⁴⁷

Tornadoes cause damage from the high winds they contain and from flying debris the strong winds carry as they traverse the ground. In the most violent tornadoes, automobiles can become airborne, homes and buildings can be completely destroyed. Mobile homes are especially vulnerable to tornadoes, even weak ones due to sitting on top of the ground without being anchored to it. Tornadoes can also cause widespread utility and communication failures and often result in injuries and loss of life to humans and animals.⁴⁸

Waterspouts are spouts of rotating air and water mist. There are two types of waterspouts: fair weather and tornadic. Tornadic waterspouts are tornadoes that form over water or move from land to water. They have the same features as regular tornadoes and are

⁴⁵ (National Oceanic & Atmospheric Administration, 2016)

⁴⁶ (National Oceanic & Atmospheric Administration, n.d.)

⁴⁷ (Young, 2020)

⁴⁸ (National Oceanic & Atmospheric Administration, n.d.)

formed from thunderstorms. Fair weather waterspouts are not usually associated with thunderstorms, and typically form from the surface of the water, and move upwards. Tornadic waterspouts form at the cloud and move to the ground surface. Fair weather waterspouts rarely move much from where they form, but if they do move over land, they can cause the same types of damage as a tornado.⁴⁹

7.9.2 Location

Tornadoes can pose a threat to life and property in all parts of Erie County with the potential to destroy property and cause injury or death. Tornadoes are a risk for people anywhere in the path, however those outdoors without adequate shelter are particularly vulnerable. Erie County has many outdoor recreation venues which when populated would be high risk if a tornado were to hit the area. Also those in mobile home parks and campgrounds are also at greater risk.

Tornadoes are finite in their reach. The paths of tornadoes range widely with the largest tornado paths exceeding one mile, while the smallest widths can be less than 10 yards. Widths can even vary considerably during a single tornado, since its size can change during its lifetime. Path lengths can range from a few yards to more than 100 miles. A key point to remember is that the size of a tornado is not necessarily an indication of its intensity. Due to the nature of these paths, it is unlikely an entire community would sustain significant damage, especially for the size of tornadoes that typically form in Erie County.

Waterspouts can be tornadoes that move over water from land, or can form over water in fair weather. While this can happen on smaller, inland waters, in Erie County, it is most likely to occur over or near Lake Erie.

7.9.3 Extent

Tornadoes are considered the most violent atmospheric phenomenon on the face of the earth, having winds estimated at 300 mph in large tornadoes. Although the number of tornadoes in Ohio does not rank high compared to other states in the United States, the State does average around 19 tornadoes a year as shown in Figure 55. Ohio's peak tornado season runs from April through July, with most tornadoes occurring between 2-

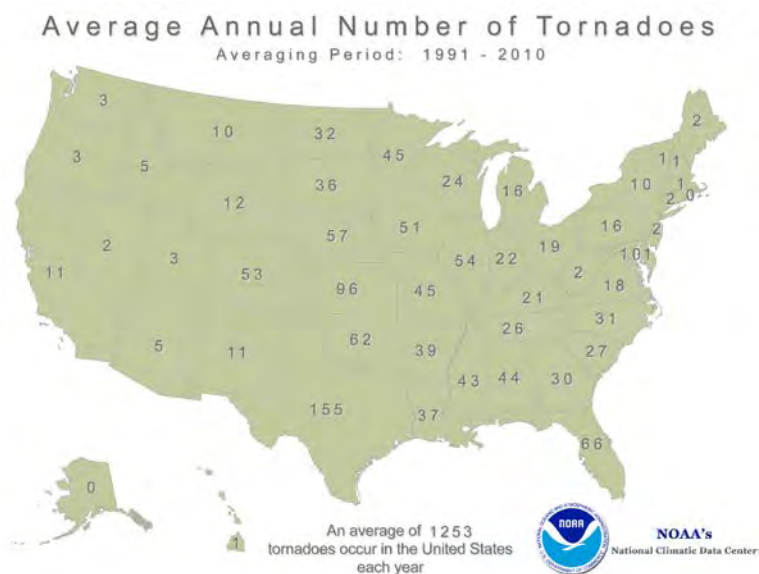
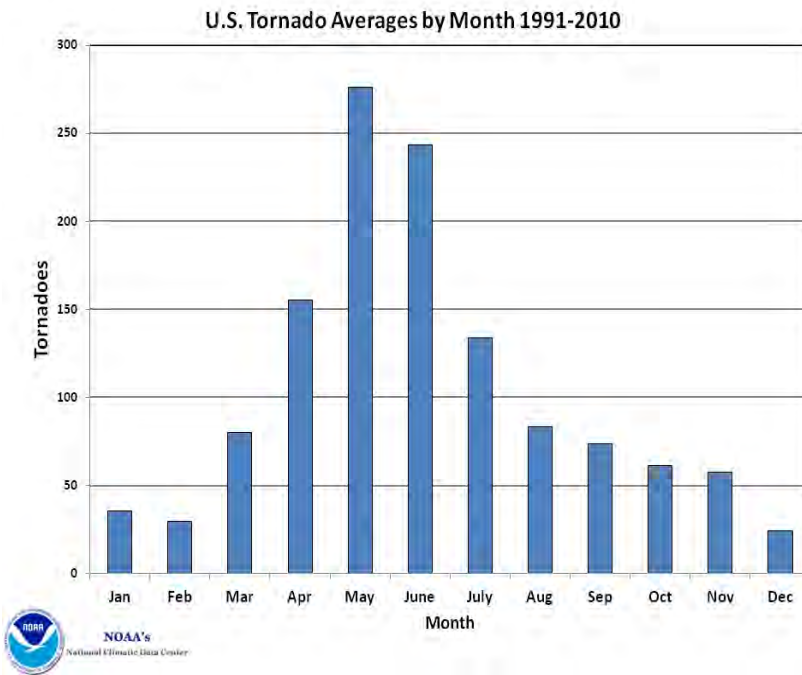


Figure 54: Average Annual Number of Tornadoes

⁴⁹ (National Oceanic & Atmospheric Administration, 2018)

10 p.m. Even though June has been the month with the most tornado occurrences, many of the State's major tornado outbreaks have taken place in April and May. However, history has shown that tornadoes can occur during any month of the year and



at any time of the day or night. Many of these tornadoes are weak (EF0 or EF1 on the Enhanced Fujita Scale), but Ohio has been struck by some of the most destructive (F5) tornadoes ever, including the April 3, 1974 tornado which devastated Xenia, killing over 30 people and destroying 2,000 buildings. The deadliest tornado to occur in Ohio affected Lorain and Sandusky on June 28, 1924 when 85 people were killed. The Lorain-Sandusky tornado remains the 24th most deadly tornado in US history.

Figure 55: U.S. Tornado Average by Month 1991-2010

Ohio. All of Erie County is exposed to the hazards associated with tornadoes. Tornadoes can theoretically occur any time of the year, however the greatest chances of an occurrence are in the spring and summer months.

Tornadoes can occur anywhere in the State of

In Erie County, the highest magnitude tornado recorded occurred on June 8, 1953 and was an F4 tornado. It caused 2 deaths and 23 injuries. Crop and property losses were not recorded. Most recently, there was an EF1 tornado in the Prout are of Sandusky on November 5, 2017 that caused \$125,000 in property losses. Of the recorded waterspouts, none have caused any deaths, injuries or losses.

7.9.4 Previous Occurrences

According to the NCDC, there have been 14 damaging tornado events in Erie County reported since 1950, with total property and crop losses of \$3,620,000, 2 deaths, and 26 injuries. The paths of these tornadoes can be found in Figure 57 below with a list of all tornadoes since 1950 in Table 30. There have been seven waterspouts reported since 1996, but no deaths, injuries or property losses were recorded. Table 31 lists the waterspouts since 1996.

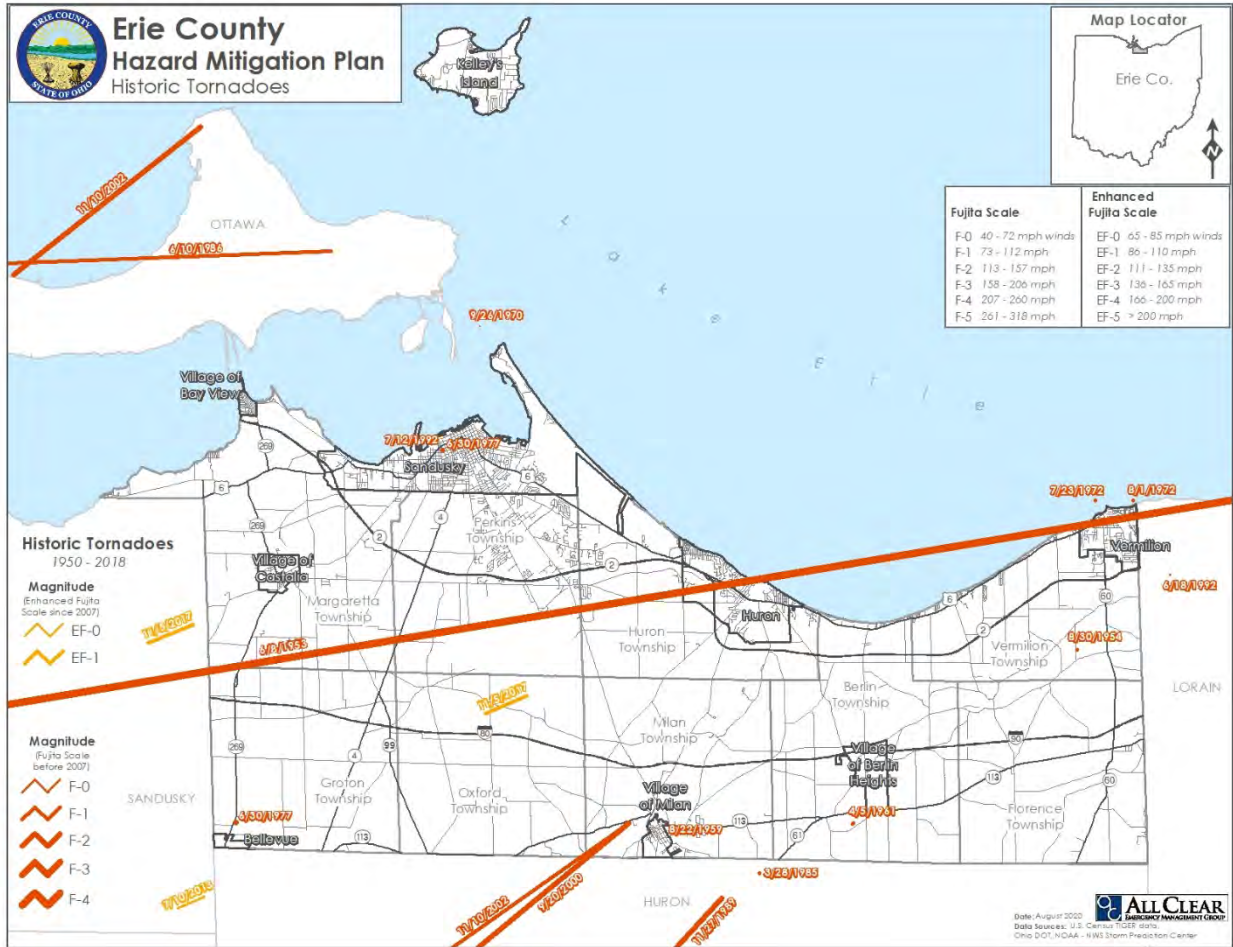


Figure 56: Historic Tornado Tracks 1950-2018 in Erie County

Tornado on June 25, 1924. The deadliest tornado in Ohio history formed over Sandusky Bay during the late afternoon of June 28, 1924 and first touched down in Sandusky. It heavily damaged a nine-block area of Sandusky, destroying over 100 homes and 25 businesses, and killing eight people in Erie County. The tornado continued eastward, over Lake Erie, and came ashore near the Lorain Municipal Bath House in Lakeview Park. Damage in Lorain was significantly worse than in Sandusky. The tornado left a 35-block path of damage along Broadway, and more than 200 automobiles were buried under rubble from collapsed buildings. More than 1,000 homes were damaged and 500 were completely destroyed. A total of 72 people were killed in Lorain County, with 15 deaths occurring in the State Theater alone. Three additional tornadoes formed in the area of Sandusky, Erie, and Lorain Counties that day, but none were as destructive or as deadly.⁵⁰

⁵⁰ (Ohio Historical Society, 2008)



Figure 57: Destruction Along the Waterfront in Sandusky caused by the 1924 Tornado⁵¹

Tornado on September 20, 2000. A tornado touched down north of Monroeville in Huron County and traveled east along State Route 113 into southern Erie County. The tornado dissipated near the corner of Higbee and Livengood Roads after destroying a farm house. The home was ripped from its foundation, moved 40 feet and knocked over. A second house and a small barn were also slightly damaged. The tornado traveled approximately one mile in Erie County and had a damage path about 100 yards wide. Debris was thrown well outside the damage path and was clearly visible through corn fields outside the tornado's path. Ears of corn were shucked, apparently by the tornado and some ears had many kernels removed. Several dozen trees were downed along the damage path. Although there were no deaths or injuries, the tornado caused \$175,000 in property damage and \$10,000 in crop damage.

Tornado on November 10, 2002. A tornado moved into Erie County from Huron County to the southeast of Kimball near the intersection of Section Line Road and State Route 113. The tornado continued east northeast in the county for around five miles and dissipated north of Milan near the intersection of U.S. Highway 250 and State Route 13. Several high voltage transmission poles were toppled by the tornado in Milan Township. A few homes sustained minor damage and several barns were destroyed. Many trees were downed along the damage path which was generally 25 to 50 yards in width. Although there were no deaths or injuries, the tornado caused \$500,000 in property damage.

⁵¹ (Museum, 1924)

Tornado on November 5, 2017. A cold front moved across the Ohio Valley and southern Great Lakes on the afternoon of Sunday, November 5th, 2017. Unseasonably warm and humid air was in place across the region ahead of the front. The cold front gradually progressed across the Ohio Valley and thunderstorms initiated and swept east ahead of the front. The storms formed in a very strong wind field and allowed the storms to move very rapidly east at speeds of 60 to 80 mph. A large macroburst formed and swept east just south of Cleveland and produced winds in excess of 100 mph. The most concentrated damage stretched from southern Lorain County across Cuyahoga County and into northern Summit, northern Portage and southern Geauga Counties. A 105-mph thunderstorm wind gust was measured at Aurora in Portage County. In addition to the damaging winds, at least 13 tornadoes were reported. Three of the tornadoes reached EF2 intensity with eight EF1 tornadoes and two EF0 tornadoes. Tens of thousands of trees were downed by these storms and widespread power outages occurred. In the Cleveland area alone, over 100,000 electric customers lost power. It took several days for power to be completely restored. Dozens of homes, buildings and barns were damaged or destroyed by the tornadoes.

An EF1 tornado touched down in open farmland in rural Oxford Township just west of Ransom Road and about halfway between Mason Road and the Ohio Turnpike. The tornado continued northeast on the ground for about a mile and a quarter before weakening to EF0 intensity and lifting just as it entered NASA's Plum Brook Station. A home near the initial touchdown was damaged by several trees blown over by the tornado. A small barn was leveled, and a trailer flipped at a second property nearby. The tornado ripped a large section of roof including trusses off a house on Mason Road. The roof was found on the NASA facility nearby. Trees were downed along the entire damage path including on the southwestern end of the NASA property. The damage path was up to 50 yards in width. No injuries were reported.

Table 30: Tornado Events in Erie County 1950-2019

Location	Date	Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Erie Co.	6/8/1953	Tornado	F4	2	23	\$-	\$-
Erie Co.	8/12/1954	Tornado	F0	0	0	\$2,500	\$-
Erie Co.	8/30/1954	Tornado	F1	0	0	\$25,000	\$-
Erie Co.	8/22/1959	Tornado	F0	0	0	\$2,500	\$-
Erie Co.	4/5/1961	Tornado	N/A	0	0	\$2,500	\$-
Erie Co.	9/26/1970	Tornado	F0	0	0	\$2,500	\$-
Erie Co.	6/30/1977	Tornado	F1	0	3	\$25,000	\$-
Erie Co.	3/28/1985	Tornado	F1	0	0	\$250,000	\$-
Erie Co.	7/12/1992	Tornado	F2	0	0	\$2,500,000	\$-
Bellevue	4/12/1996	Tornado	F0	0	0	\$-	\$-
Sandusky	6/30/1998	Tornado	F0	0	0	\$-	\$-
Milan	9/20/2000	Tornado	F2	0	0	\$175,000	\$10,000
Kimball	11/10/2002	Tornado	F1	0	0	\$500,000	\$-
Prout (Sandusky)	11/5/2017	Tornado	EF1	0	0	\$125,000	\$-
Totals				2	26	\$3,610,000	\$10,000

Table 31: Waterspout Events in Erie County 1996-2019

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Lake Erie	9/17/1996	Waterspout	0	0	\$-	\$-
Vermillion	8/4/1997	Waterspout	0	0	\$-	\$-
Vermillion	8/21/1997	Waterspout	0	0	\$-	\$-
Sandusky	6/30/1998	Waterspout	0	0	\$-	\$-
Huron	6/30/1998	Waterspout	0	0	\$-	\$-
Huron	7/21/2000	Waterspout	0	0	\$-	\$-
Vermilion	8/13/2001	Waterspout	0	0	\$-	\$-
Totals			0	0	\$ -	\$ -

7.9.5 Probability of Future Events

The NCDC data lists 14 damaging tornadoes for Erie County between 1950 and 2019. The recurrence interval for tornadoes is 70 years / 14 events = 5 years. This means, Erie County can expect a tornado every five years. Thus, the probability of a tornado occurring anywhere within the County in any given year is 20%.

The NCDC data lists seven waterspouts between 1996 and 2019. The recurrence interval for waterspouts is 24 years / 7 events = 3.4 years. This means that Erie County can expect a waterspout about every 3.4 years. The probability of a waterspout occurring anywhere within the County in any given year is 29%. From these calculations, it is clear that a waterspout is slightly more likely to occur than a tornado. However, tornadoes have caused more deaths, injuries, property losses, and crop losses than waterspouts.

7.9.6 Vulnerability Assessment

For tornadoes, any structure is vulnerable to the strong winds associated with these events. Aged and dilapidated structures or structures not built to modern building codes are more susceptible to damage, even from weaker tornadoes. Mobile homes and campgrounds are especially susceptible to damage due to tornadoes. Strong winds can rip roofs off of any dilapidated structures and overturn mobile homes. Past experience with tornadoes in Erie County and adjacent counties shows that death and injury are indeed a possibility. Depending on the magnitude of the tornado, a variety of damage can be expected. Table 32 summarizes different types of expected damage for tornadoes of varying strength.

Table 32: Expected Tornado Damage(s)

F or EF Scale	Examples of Possible Damage(s)
0	Light damage. Some damage to chimneys; broken tree branches; shallow-rooted trees pushed over; damage to sign boards.
1	Moderate damage. Surface peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
2	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
3	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.

F or EF Scale	Examples of Possible Damage(s)
4	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
5	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100 yards; trees debarked.

Tornadoes are also usually accompanied by other hazards when they affect a community. In fact, when tornadoes hit a community, they are typically coupled with other natural events such as high winds, thunderstorms, lighting and possibly flash floods. Vulnerability to the effects of tornadoes is somewhat dependent upon the age of a structure because as building codes become more stringent, buildings are capable of enduring greater wind forces. However, all parts of the County have the same probability of tornado touching down in the area. Unlike waterspouts, which are most likely to affect areas near the shoreline of Lake Erie.

In a worst-case scenario, Erie County could be hit with an EF5 tornado that would travel through the largest city in the county. To predict the structural cost associated with a worst-case scenario for a tornado; an analysis was run with an EF5 tornado traveling on a straight path through the most densely populated and developed area within the county. This analysis assumes that the tornado was to completely encompass the city of Sandusky, destroying nearly all structures in its path. Even with the current building codes, most buildings cannot withstand the force of an EF5. To perform this analysis the average property values for the county were used as a generalization where data for Sandusky specifically was not available. The number of structures in Sandusky were estimated using a ratio of the population of the city from the 2019 American Community Survey Five Year Estimate to the population of the County from the Survey. Since 33.1% of Erie County's population lives in Sandusky, it was assumed that 33.1% of each type of structure is also located in Sandusky.

In Table 33, an assessment shows the total value loss that is expected per type of structure. It also shows the value of damage that is expected for this worst-case scenario. Apart from the devastation within the path of the tornado, large regions of the county can also be expected to be without power and potentially have lesser degrees of damage.

Table 33: Damage Assessment by Land Use and Appraised Value

Type	Count	Average Value	Total
Residential	10,572	\$249,280	\$2,635,388,160
Non-Residential	1,047	\$875,158	\$916,290,426
Total	11,619		\$3,551,678,586

Any future structures might be exposed to tornadoes as this hazard does not occur in specific locations. However, future buildings will be somewhat better protected from the effects of tornadoes as they will meet the most current state building code requirements for bracing and roof design.

As in the previous plan update, NCDC data is used to estimate potential loss. According to NCDC the estimated property damage in Erie County attributable to tornadoes accounts for \$3,610,000 in damage. This amount is attributed to 14 occurrences and was observed from 1950 to 2019. There was no estimated property damage due to waterspouts between 1996 and 2019.

The total costs due to tornadoes over 70 years is \$3,610,000 therefore the average annual losses due to tornadoes is $\$3,610,000 / 70 = \$51,571$. There are no estimated average annual losses due to waterspouts in Erie County.

8 Summary of Risk Assessment Findings

The purpose of completing a rigorous assessment of risk is to inform decision-making about mitigation actions which are most appropriate for the county. Table 34 details the probabilities of occurrence and estimated annual dollar losses discussed in each hazard section found in this plan. The results of this analysis show that Erie County can expect the greatest losses from flooding. Annualized anticipated losses due to flooding are more than three times the losses anticipated due to all hazards combined. Thus, the highest priority actions proposed in this mitigation plan address potential damage due to flooding.

Table 34: Risk Assessment Findings

Hazard	Vulnerable Locations	Annual Probability of Occurrence	Estimated Annual Dollar Loss
Flood	Special Flood Hazard Areas, Karst Areas, Lakeshore, Localized	100%	\$1,290,125
Severe Winter Weather	Entire County	100%	\$341,542
Damaging Winds	Entire County	100%	\$278,083
Severe Summer Weather	Entire County	100%	\$151,887
Tornado	Entire County	20%	\$51,571
Waterspout	Lake Erie	29%	\$0
Earthquake	Localized	<1%	\$0
Drought	Entire County	25%	\$7,000,000*
Lake and Stream Bank Erosion	Localized	100%	Not Available
Natural Biohazards	Entire County	100%	Not Available

*One drought instance

The conclusion of the risk assessment is that the greatest damages attributable to a single hazard occurring in Erie County can be expected to be caused by flooding.

For each hazard, aside from flooding, tornadoes and earthquakes, all critical facilities are assumed to withstand normal forces and events based on the hazards affecting Erie County. This is assumed because these facilities are typically designed to meet building code and they are usually maintained by the personnel occupying the building. Therefore, no damages are assumed for these types of facilities

9 Mitigation Goals

9.1 Mitigation Goals Update

Goals express aspirations about long-term conditions rather than specific measures. The goals expressed in this plan regarding natural hazards have evolved from the goals that were established when the plan was initially developed for adoption in 2005, with some of the original goals being rewritten in 2014. In 2020, the Core Group reviewed the existing goals and determined that some of the goals needed to be reworded for additional clarity. In addition, as the goals in the previous versions of Erie County's Natural Hazard Mitigation Plan were hazard specific, a new goal needed to be developed for the new hazard of Damaging Winds. Existing goals were also modified in order to correspond to the hazards identified and updated as part of the 2020 plan update. Severe Storms was divided into Severe Summer Weather and Severe Winter Weather, so the goals addressing Severe Storms were revised to accommodate that division. Also, the Invasive Species hazard in the 2014 plan was renamed Natural Biohazards, so the goals developed for that hazard were also appropriately renamed.

During the September 4, 2020 planning meeting, the Mitigation Core Group agreed to revised goals. These goals are listed in section 9.3 and are ranked according to the 2020 Risk Assessment.

9.2 Goals

Table 35: Mitigation Goals for Erie County

#	Hazard	Goal
1.	Flooding	Increase awareness of and preparedness for flooding and lake level rise to save lives and reduce property damage and their impacts on the community.
2.	Flooding	Identify, monitor, and evaluate high risk areas of ice jam concern.
3.	Severe Summer Weather	Increase awareness of and preparedness for severe summer weather to reduce loss of life and property damage, examining current means of response to identify gaps in planning and response.
4.	Severe Summer Weather	Evaluate and implement measures to prepare the community for severe summer weather.
5.	Lake and Stream Bank Erosion	Evaluate and implement measures to protect lives, property and the environment impacted by lake and stream bank erosion.
6.	Damaging Winds	Educate residents and businesses on the dangers of damaging winds as well as techniques to mitigate their impacts.
7.	Natural Biohazards	Proactively evaluate and enact measures to reduce the effects of Harmful Algae Blooms.
8.	Natural Biohazards	Increase awareness of invasive species to reduce harm to infrastructure, crops and the native ecology.

#	Hazard	Goal
9.	Severe Winter Weather	Increase awareness of and preparedness for severe winter weather to reduce loss of life and property damage, examining current means of response to identify gaps in planning and response.
10.	Severe Winter Weather	Evaluate and implement measures to prepare the community for severe winter weather.
11.	Tornado/ Waterspouts	Evaluate and implement measures designed to warn residents and provide safe shelter during tornadoes and waterspouts.
12.	Drought	Identify, monitor, and evaluate high risk areas of concern.
13.	Drought	Increase awareness and fire prevention strategies.
14.	Earthquake	Increase awareness of and implement measures to decrease loss of life and property damage from earthquake events.

10 Mitigation Actions

10.1 Mitigation Action Updates

Actions that were included in the previous mitigation plan were reviewed by Erie County staff, members of the Mitigation Core Group and representatives of the participating jurisdictions and townships to determine the status of the actions. These actions are recorded in this updated plan as having been completed, deleted, deferred, in progress or ongoing. These actions were part of the review of a range of actions suggested for inclusion in this updated plan. Representatives from the County and the participating jurisdictions were also encouraged to review these mitigation actions, and modify them if necessary, to better serve the needs of their communities. Actions that existed in the previous mitigation plan, but have been modified, are included as existing mitigation actions. Mitigation actions that were completed prior to the 2014 Erie County Natural Hazard Mitigation Plan were removed from that plan, and thus, are unable to be included in this update.

10.2 Cost Benefit Review of Mitigation Alternatives

During the third Core Group meeting, the Cost-Benefit analysis method used during the previous Natural Hazard Mitigation Plan update process was discussed, and the Core Group agreed that it was appropriate to use for the 2020 Plan with slight modifications based on the results of the updated risk analysis.

This cost benefit analysis was conducted for each new mitigation action that was developed during this planning process. In the same way as in the previous version, the Core Group used a modified version of the FEMA recommended process called STAPLEE. STAPLEE is an acronym that stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental. The modified version used in the previous Plan update process, and continued with this update considered Administrative, Legal, Economic, and Environmental factors for each mitigation action developed.

The template given to Core Group members to develop new mitigation actions included the following explanations for each of the ALEE categories.

A – Administrative: Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.

L – Legal: It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.

E – Economic: Budget constraints can significantly deter the implementation of mitigations actions. Hence, it is important to evaluate whether an action is cost-effective, as determined by a cost-benefit review, and possible to fund.

E – Environmental: Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, and that are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

For each criterion, the prioritization methodology assigned a 1 if there would be a benefit, a -1 if there would be a cost, and a 0 if no cost or benefit could be associated with the suggested action. For example, if an action might have a positive effect on the natural environment, the score for environmental impact would be 1; and if a proposed action would require significant staff time, the score for administrative burden would be -1.

As was done in the previous update of the plan, because the risk assessment showed that estimated annual dollar losses due to flooding, severe winter weather, damaging winds, and severe summer weather would be substantial, the economic benefits of suggested actions for mitigating the effects of these hazards was assigned a weight. A weight of three (3) was given to economic impacts for flood mitigation actions because annualized flood damages are substantially higher than all hazards; a weight of two (2) was given to economic impacts of severe winter weather, severe summer weather and damaging winds because annualized repair costs due to this hazard is the second most costly; a weight of one (1) was given to economic impacts of the remaining hazards mitigation actions because repairs due to these hazards have low to no annualized losses associated with them, or annualized losses could not be calculated from available data.

10.3 Prioritization Methodology

In a change from the previous mitigation plan update processes, mitigation actions were prioritized based on the hazard identification and risk assessment that the Core Group did via electronic survey following the March 6, 2020 planning meeting. During this meeting, the Consultant presented information regarding the hazards of Erie County and asked that each Core Group member assess the hazards based on their Vulnerability, Consequence and Frequency using a high, medium, and low ranking. These rankings were then totaled for each hazard, using a scoring system that equated high with 3, medium with 2 and low with 1. The sums of the Vulnerability, Consequence, and Frequency scores for each hazard were then ranked from highest to lowest. Once the hazards were ranked by the sum of their scores, hazards with a score above 200 were classified as high priority, hazards with a score between 175 and 200 were classified as medium priority and hazards with a score below 175 were classified as low priority. Mitigation goals that addressed high priority hazards, were given high priority, and so on.

Table 36: Hazard Identification and Risk Assessment Results

Hazard	Vulnerability Score	Consequence Score	Frequency Score	Total	Priority
Flooding	83	64	77	224	High
Severe Summer Weather	87	64	62	213	High
Lake/Stream Bank Erosion	79	60	73	212	High
Damaging Winds	81	57	59	197	Medium
Natural Biohazards	73	52	58	183	Medium
Severe Winter Weather	75	54	51	180	Medium
Tornadoes/Waterspouts	67	65	44	176	Medium
Drought	65	42	46	153	Low
Earthquakes	42	38	32	112	Low

10.4 Selected Actions

10.4.1 Mitigation Actions for Erie County

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Provide maintenance for ditches and waterways to avoid overflow due to sediment and debris build up.	EMA/ Incorporated Jurisdictions	Erie Soil and Water Conservation District	Engineers Office	Erie County	4	1	Long Term	Ongoing	
High	Flooding/ Lake & Stream Bank Erosion	Update flood insurance rate maps (FIRMs).	EMA/ Planning Commission	FEMA	State or Federal Sources	Erie County	4	1, 5	Medium Term	Ongoing	Riverine FIRMS updated; Great Lakes Coastal Study will establish new coastal Zone V. Preliminary maps are complete, expected updated regulations Spring 2021
High	Flooding/ Severe Summer Weather/ Severe Winter Weather/ Tornadoes	Provide back-up generators (both temporary and permanent) for pumping and lift stations in sanitary sewer systems.	EMA/ Engineers Office		State or Federal Sources	Erie County	3	1, 4, 10, 11	Medium Term	Ongoing	Not FEMA fundable

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Eliminate cross contamination of storm and sanitary sewers by eliminating CSO and SSO systems.	EMA/ Engineers Office		State or Federal Sources	Erie County	4	1	Long Term	Deferred	Not FEMA fundable
High	Flooding	Increase capacity of sanitary sewer lift stations to avoid overflow.	EMA/ Water and Sewer Department		State or Federal Sources	Erie County	4	1	Long Term	Deferred	Not FEMA fundable
High	Flooding	Assess and inventory problems with undersized culverts within Erie County	EMA/Engineers Office	Erie Soil and Water Conservation District	Existing Budget	Erie County	4	1	Long Term	Ongoing	
High	Flooding/ Lake & Stream Bank Erosion	Assess and inventory problems with roadways susceptible to flooding within Erie County	EMA/Engineers Office		Existing Budget	Erie County	4	1, 5	Long Term	Not Started	
High	Flooding	Identify and assess Pipe Creek Watershed to identify actual hazard	EMA/ Engineers Office	Erie Soil and Water Conservation District	State or Federal Sources	Erie County	4	1	Long Term	Not Started	Seek funding by 2025
High	Flooding	Identify and assess culverts and undersized drainage pipe property and drainage affected on Kelley's Island	EMA/ Engineers Office	Erie Soil and Water Conservation District/ Kelleys Island, ERPC	State or Federal Sources	Kelleys Island	4	1	Long Term	Not Started	Seek additional funding
High	Flooding	Identify and asses Chapel Creek	EMA/ Engineers Office	Erie Soil and Water	State or Federal Sources	Erie County	4	1	Long Term	Not Started	Seek funding by 2025

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
		watershed to benefit Berlin Heights-Florence Twp.		Conservation District, ERPC							
High	Flooding	Re-evaluate Franklin Flats neighborhood for a buyout program.	EMA	Planning Commission	State or Federal Sources	Erie County	4	1	Long Term	In Progress	Seek funding by 2025, ERPC and EMA have had discussions regarding buyout program
High	Flooding	Identify and assess other localized flooding areas and direct tributaries to the Bay and Lake	EMA	Planning Commission	State or Federal Sources	Erie County	4	1	Long Term	In Progress	FEMA map update for coastal zone flooding occurring now
High	Flooding	Identify a flood notification system and a river gauge system	EMA		State or Federal Sources	Erie County	4	1	Long Term	Not Started	Seek funding by 2025
High	Flooding	Foster inter-agency coordination of floodplain management (Round Table)	Planning Commission	EMA/Erie Soil and Water Conservation District	Existing Budget	Erie County	4	1	Long Term	Ongoing	Meet on a case by case basis
High	Flooding	Provide public education of floodplain regulations for new construction through brochures distributed county-wide.	Planning Commission	EMA/Erie Soil and Water Conservation District	Existing Budget	Erie County	4	1	Long Term	Completed	Regulations will be updated once new coastal maps approved (2021)

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding (Ice Jams)	Evaluate the need to consider Ice Jams as concern for those communities that are affected directly from these winter flooding hazard	EMA	Planning Commission	State and Federal Sources	Erie County	5	2	Long Term	Ongoing	ERPC staff has attended US Army Corp ice jam awareness seminar; worked with USGS to find grant to pay for camera to capture real time footage (Vermilion River), USGS was interested in installing a real time camera on top of their river gauge in the Vermilion River. Forwarded grant information
High	Karst Flooding	Identify high risk areas and evaluate land-use planning techniques to mitigate future events	EMA	Erie Soil and Water Conservation District/ Regional Planning	State and Federal Sources	Erie County	5	1	Long Term	Ongoing	2025 Estimated Time of Completion; ERPC will lend assistance if requested
High	Severe Summer Weather/ Severe Winter Weather/ Tornadoes	Provide more NOAA radios in critical facilities to move toward achieving a	EMA/ Incorporated Jurisdictions		State or Federal Sources	Erie County	2	3, 4, 6, 9, 10, 11	Long Term	Ongoing	Several hundred provided

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
	and Waterspouts/ Damaging Winds	"Storm Ready" community status. Provide additional NOAA radios for other facilities such as private businesses									
High	Severe Summer Weather/ Severe Winter Weather/ Tornadoes and Waterspouts/ Damaging Winds	Evaluate the potential to develop a Countywide Program for pre-wiring structures to accept generators	EMA/ Incorporated Jurisdictions		State or Federal Sources	Erie County	2	3, 4, 6, 9, 10, 11	Long Term	Not Started	Seek funding by 2025
High	Severe Summer Weather/ Severe Winter Weather / Tornadoes and Waterspouts/ Damaging Winds	Provide additional interoperable sirens to provide early warnings to citizens of approaching severe weather.	EMA/ Incorporated Jurisdictions		State or Federal Sources	Erie County	2	3, 4, 6, 9, 10, 11	Long Term	Not Started	Seek funding by 2025
High	Severe Summer Weather/ Severe Winter Weather / Tornadoes and Waterspouts/ Damaging Winds	Develop and provide outreach program for County residents and those in the sensitive / special needs population covering the dangers associated with severe storms.	EMA/ County Commissioners		Existing budget	Erie County	3	3, 6, 9, 11	Long Term	Ongoing	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Severe Summer Weather/ Severe Winter Weather/ Tornadoes and Waterspouts/ Damaging Winds	Construct designated safe shelters that would provide protection from severe weather throughout the County.	EMA/ County Commissioners/ Incorporated Jurisdictions		State or Federal Sources	Erie County	2	4, 6, 9, 11	Long Term	Deferred	Seek funding by 2025
High	Severe Summer Weather/ Severe Winter Weather / Tornadoes and Waterspouts/ Damaging Winds	Develop a tree maintenance program to prune or remove those trees recognized to be hazards.	EMA/ City of Sandusky	Erie Soil and Water Conservation District	Existing budget	Erie County	2	3, 4, 6, 9, 10, 11	Long Term	Ongoing	Seek additional funding by 2025
High	Severe Summer Weather/ Severe Winter Weather/ Tornadoes and Waterspouts/ Damaging Winds	Evaluate the need for shelters for marinas and for tourist areas within the County	EMA/ City of Sandusky		State or Federal Sources	Erie County	3	3, 4, 6, 9, 10, 11	Long Term	Ongoing	Seek additional funding by 2025
High	Severe Summer Weather/ Severe Winter Weather/ Tornadoes and Waterspouts/ Damaging Winds	Develop and provide outreach on the unique weather patterns in Erie County	EMA/ City of Sandusky		Existing budget	Erie County	3	3, 6, 9, 11	Long Term	Ongoing	
Medium	Tornadoes and Waterspouts/ Damaging Winds	Evaluate the need for multi-use shelters for marinas and for high tourist	EMA/ Incorporated Jurisdictions		State or Federal Sources	Erie County	2	6, 11	Long Term	Ongoing	Seek additional funding by 2025

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
		areas within the County									
High	Lake & Stream Bank Erosion	Provide additional monitoring of water levels in streams and rivers with stream gauges	EMA/ USGS	Erie Soil and Water Conservation District	State or Federal Sources	Erie County	2	5	Long Term	Ongoing	Assisted with providing grant information to USGS regarding installation of camera on top of stream gauges to capture real time video (see ice jams above)
High	Lake & Stream Bank Erosion	Identify and evaluate areas and tributaries impacted by stormwater	EMA/ Engineers Office	Planning Commission/ Erie Soil and Water Conservation District	State or Federal Sources	Erie County	2	5	Short Term	Ongoing	ERPC will lend assistance if requested, seek additional funding by 2020
High	Lake & Stream Bank Erosion	Identify and evaluate Best Management Practices for stormwater and localized stream and lake bank erosion	EMA/ Engineers Office	Erie Soil and Water Conservation District	State or Federal Sources	Erie County	2	5	Long Term	Ongoing	ERPC will lend assistance if requested, seek additional funding
High	Lake & Stream Bank Erosion	Develop and provide educational information and promotion of urban and agricultural	EMA/ Engineers Office	Erie Soil and Water Conservation District	State or Federal Sources	Erie County	3	5	Medium Term	Ongoing	ERPC will lend assistance if requested, seek additional funding

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
		impacts of stormwater									
Low	Drought	Develop a public education program for restrictions on water usage during drought conditions.	EMA		Existing Budget	Erie County	2	12	Long Term	Ongoing	
Low	Drought/ Severe Summer Weather	Develop a public education program on the hazards associated with droughts and extreme heat.	EMA		Existing Budget	Erie County	2	3, 12	Long Term	Ongoing	
Low	Drought	Develop educational program for restrictions on water usage during fire events	EMA		Existing Budget	Erie County	2	13	Long Term	Ongoing	
Low	Earthquakes	Develop a public education program on the dangers of earthquakes	EMA		Existing Budget	Erie County	2	14	Long Term	Ongoing	
Low	Earthquakes	Develop and enforce appropriate building codes for structures to be constructed in seismic areas.	EMA		Existing Budget	Erie County	2	14	Long Term	Ongoing	
Low	Earthquakes	Evaluate the potential association of injection wells	EMA		State or Federal Sources	Erie County	2	14	Long Term	Ongoing	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
		and how that is affected by earthquakes									
Medium	Natural Biohazards	Evaluate the types and effects of Invasive Species on Erie County and its residents	EMA	Erie Soil and Water Conservation District/ OSU Extension	State or Federal Sources	Erie County	2	8	Long Term	Ongoing	Expected Completion 2025
High	Flooding/ Severe Summer Weather/ Lake and Stream Bank Erosion/ Damaging Winds/ Natural Biohazards/ Severe Winter Weather/ Tornadoes and Waterspouts/ Drought/ Earthquake	Utilize Erie County's Facebook Page and Twitter Account to conduct a social media campaign to increase education and awareness of hazards	Erie County Regional Planning Commission	EMA	Existing Budget	Erie County	1	1, 3, 6, 8, 9, 11, 13, 14	Short Term	New	
High	Flooding/ Severe Summer Weather/ Lake and Stream Bank Erosion/ Damaging Winds/ Natural	Increase awareness and education on hazards by sharing information at established public meetings	EMA/ Erie County Regional Planning Commission	Jurisdictions	Existing Budget	Erie County	1	1, 3, 6, 8, 9, 11, 13, 14	Short Term	New	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
	Biohazards/ Severe Winter Weather/ Tornadoes and Waterspouts/ Drought/ Earthquake										
High	Flooding	Revise County Regulations after the FEMA Coastal Maps become official	Erie County Regional Planning Commission	Impacted jurisdictions	Existing Budget	Erie County	5	1	Long Term	New	
Medium	Natural Biohazards	Create a public education campaign targeted at landowners to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie	EMA	Erie Soil and Water Conservation District, OSU Extension	Existing Budget	Erie County	4	7	Long Term	New	
Medium	Tornadoes and Waterspouts/ Damaging Winds	Create a public education campaign encouraging home owners and private businesses to install safe rooms, and provide information about Ohio's Safe Room Rebate Program	EMA	Erie County Regional Planning Commission	Existing Budget	Erie Count	2	6, 7	Medium Term	New	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Establish program to acquire and demolish or retrofit existing flood prone properties within the County and Incorporated Jurisdictions	Erie County EMA/ Incorporated Jurisdictions	Jurisdictions	State or Federal Sources	Erie County and Incorporated Jurisdictions	-1	1	Long-Term	New	

10.4.2 Mitigation Actions for the Village of Bay View

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Evaluate the need to consider Ice Jams as concern for those communities that are affected directly from these winter flooding hazard	EMA/ Village of Bay View	Erie County Engineering Department, Erie County Planning Commission	State and Federal Sources	Village of Bay View	5	2	Long Term	Deferred	Seeking Funding
High	All Hazards	Identify high risk areas and evaluate land- use planning techniques to mitigate future events	EMA/ Village of Bay View	Erie Soil and Water Conservation District/ Regional Planning	State and Federal Sources	Village of Bay View	5	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	Long Term	50% Completed	2025 Estimated time of completion
High	Flooding	Assess and inventory problems with undersized culverts within Erie County	EMA/ Village of Bay View		Existing Budget	Village of Bay View	N/A	N/A	N/A	Deleted	Not an area of concern for Village
High	Severe Summer Weather/ Severe Winter Weather / Tornadoes and Waterspouts/ Damaging Winds	Develop and provide outreach program for County residents and those in the sensitive/ special needs population covering the dangers associated with severe storms.	EMA/ County Commissioners	Village of Bay View	Existing Budget	Village of Bay View	3	3, 6, 9, 11	Long Term	Ongoing	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Severe Summer Weather/ Severe Winter Weather/ Tornadoes and Waterspouts/ Damaging Winds	Construct designated safe shelters that would provide protection from severe weather throughout the County.	EMA/ County Commissioners/ Incorporated Jurisdictions		State or Federal Sources	Village of Bay View	2	4, 6, 9, 11	Long Term	Deferred	Seeking funding by 2025
High	Flooding/, Lake & Stream Bank Erosion	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater	EMA/ Engineers Office	Village of Bay View/ Erie Soil and Water Conservation District	State or Federal Sources	Village of Bay View	3	5	Medium Term	Ongoing	Seeking additional funding by 2021
Medium	Tornadoes and Waterspouts/ Damaging Winds	Create a public education campaign encouraging home owners and private businesses to install safe rooms, and provide information about Ohio's Safe Room Rebate Program	EMA/ Village of Bay View	Erie County Regional Planning Commission	Existing Budget	Village of Bay View	2	6, 7	Medium Term	New	
Medium	Natural Biohazards	Create a public education campaign targeted at landowners	EMA/ Village of Bay View	Erie Soil and Water Conservation District, OSU Extension	Existing Budget	Village of Bay View	4	7	Long Term	New	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
		to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie									
Medium	Damaging Winds/ Tornadoes and Waterspouts	Cut down and remove dead/rotted trees that have the potential to cause property damage, injury, and power outages	Village of Bay View Council		Potentially a tax levy	Village of Bay View	1	6, 11	Short Term	New	
High	Flooding	Construct a lift station or pumping station on the Bayfront to prevent lake water from entering the storm water system, which causes flooding	Erie County Engineering Department	Village of Bay View Council		Village of Bay View	-2	1	Long Term	New	

10.4.3 Mitigation Actions for the City of Bellevue

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Evaluate the need to consider Ice Jams as concern for those communities that are affected directly from these winter flooding hazard	EMA	Erie County Engineering Department, Erie County Planning Commission	State and Federal Sources	City of Bellevue	5	2	Long Term	Ongoing	2025 Estimated Time of Completion
High	All hazards	Identify high risk areas and evaluate land use planning techniques to mitigate future events	EMA	Erie Soil and Water Conservation District/ Regional Planning	State and Federal Sources	City of Bellevue	5	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	Long Term	Ongoing	2025 Estimated Time of Completion
High	Flooding	Assess and inventory problems with undersized culverts within Erie County	EMA		Existing Budget	City of Bellevue	4	1	N/A	Completed	Erie County portion only
High	Severe Summer Weather	Develop and provide outreach program for County residents and those in the sensitive/special needs population covering the dangers associated with severe storms.	EMA/ County Commissioners		Existing Budget	City of Bellevue	3	3, 6, 9, 11	Long Term	Ongoing	
High	Severe Summer Weather, Tornadoes	Construct designated safe shelters that would	EMA/ County Commissioners/ Incorporated Jurisdictions		State or Federal Sources	City of Bellevue	2	4, 6, 9, 11	Long Term	Deferred	Seek Funding

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
		provide protection from severe weather throughout the County.									
High	Flooding	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater	EMA/ Engineers Office		State or Federal Sources	City of Bellevue	3	5	Medium Term	Ongoing	Seek Funding

10.4.4 Mitigation Actions for the Village of Berlin Heights

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Evaluate the need to consider Ice Jams as concern for those communities that are affected directly from these winter flooding hazard	EMA/ Village of Berlin Heights	Erie County Engineering Department/ Erie County Planning Commission	State and Federal Sources	Village of Berlin Heights	5	2		Deleted	
High	All Hazards	Identify high risk areas and evaluate land-use planning techniques to mitigate future events	EMA/ Village of Berlin Heights	Erie Soil and Water Conservation District/ Regional Planning	State and Federal Sources	Village of Berlin Heights	5	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	Long Term	In Progress	2025 Estimated Time of Completion
High	Flooding	Assess and inventory problems with undersized culverts within Erie County	EMA/ Village of Berlin Heights		Existing Budget	Village of Berlin Heights	4	1	Medium Term	In Progress	
High	Severe Summer Weather/ Severe Winter Weather / Tornadoes and Waterspouts/ Damaging Winds	Develop and provide outreach program for County residents and those in the sensitive/special needs population covering the dangers associated with severe storms.	EMA/ County Commissioners	Village of Berlin Heights	Existing Budget	Village of Berlin Heights	3	3, 6, 9, 11	Medium Term	In Progress	
High	Severe Summer Weather/ Severe	Construct designated safe shelters that would	EMA/ County Commissioners/ Incorporated Jurisdictions		State or Federal Sources	Village of Berlin Heights	2	4, 6, 9, 11	Long Term	In Progress	Seek funding by 2025

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/ Cost	Goal Addressed	Time Frame	Current Status	Other Information
	Winter Weather/ Tornadoes and Waterspouts/ Damaging Winds	provide protection from severe weather throughout the County.									
High	Flooding/ Lake & Stream Bank Erosion	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater	EMA/ Engineers Office	Village of Berlin Heights/ Erie Soil and Water Conservation District	State or Federal Sources	Village of Berlin Heights	3	5	Medium Term	In Progress	Seek additional funding
Medium	Tornadoes and Waterspouts/ Damaging Winds	Create a public education campaign encouraging home owners and private businesses to install safe rooms, and provide information about Ohio's Safe Room Rebate Program	EMA/ Village of Berlin Heights	Erie County Regional Planning Commission	Existing Budget	Village of Berlin Heights	2	6, 7	Medium Term	New	
Medium	Natural Biohazards	Create a public education campaign targeted at landowners to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie	EMA/ Village of Berlin Heights	Erie Soil and Water Conservation District, OSU Extension	Existing Budget	Village of Berlin Heights	4	7	Long Term	New	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
Medium	Damaging Winds/ Tornadoes and Waterspouts	Inspect trees in road ROW and remove as necessary	Village of Berlin Heights Road Department		Existing Budget	Village of Berlin Heights	-3	6, 11	Short Term	New	

10.4.6 Mitigation Actions for the Village of Castalia

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Evaluate the need to consider Ice Jams as concern for those communities that are affected directly from these winter flooding hazard	EMA/ Village of Castalia	Erie County Engineering Department, Erie County Planning Commission	State and Federal Sources	Village of Castalia	5	2	Long Term	Deleted	
High	All Hazards	Identify high risk areas and evaluate land-use planning techniques to mitigate future events	EMA/ Village of Castalia	Erie Soil and Water Conservation District/ Regional Planning	State and Federal Sources	Village of Castalia	5	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	Long Term	Ongoing	
High	Flooding	Assess and inventory problems with undersized culverts within Erie County	EMA/Village of Castalia		Existing Budget	Village of Castalia	4	1	Medium Term	Ongoing	
High	Severe Summer Weather/ Severe Winter Weather / Tornadoes and Waterspouts/ Damaging Winds	Develop and provide outreach program for County residents and those in the sensitive/special needs population covering the dangers associated with severe storms.	EMA/ County Commissioners	Village of Castalia	Existing Budget	Village of Castalia	3	3, 6, 9, 11	Long Term	Ongoing	
High	Severe Summer Weather/ Severe	Construct designated safe shelters that would	EMA/ County Commissioners/ Incorporated Jurisdictions	Village of Castalia	State or Federal Sources	Village of Castalia	2	4, 6, 9, 11	Long Term	Ongoing	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/ Cost	Goal Addressed	Time Frame	Current Status	Other Information
	Winter Weather/ Tornadoes and Waterspouts/ Damaging Winds	provide protection from severe weather throughout the County.									
High	Flooding/, Lake & Stream Bank Erosion	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater	EMA/ Engineers Office	Village of Castalia/ Erie Soil and Water Conservation District	State or Federal Sources	Village of Castalia	3	5	Medium Term	Ongoing	
Medium	Tornadoes and Waterspouts/ Damaging Winds	Create a public education campaign encouraging home owners and private businesses to install safe rooms, and provide information about Ohio's Safe Room Rebate Program	EMA/ Village of Castalia	Erie County Regional Planning Commission	Existing Budget	Village of Castalia	2	6, 7	Medium Term	New	
Medium	Natural Biohazards	Create a public education campaign targeted at landowners to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie	EMA/ Village of Castalia	Erie Soil and Water Conservation District, OSU Extension	Existing Budget	Village of Castalia	4	7	Long Term	New	

10.4.7 Mitigation Actions for the City of Huron

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Evaluate the need to consider Ice Jams as concern for those communities that are affected directly from these winter flooding hazard	EMA/ City of Huron	Erie County Engineering Department, Erie County Planning Commission	State and Federal Sources	City of Huron	5	2	Long Term	Deleted	Ice jams are not a concern; river is wide.
High	All Hazards	Identify high risk areas and evaluate land-use planning techniques to mitigate future events	EMA/ City of Huron	Erie Soil and Water Conservation District/ Regional Planning	State and Federal Sources	City of Huron	5	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	Long Term	Ongoing	Expected completion 2025
High	Flooding	Assess and inventory problems with undersized culverts within Erie County	City of Huron Street Department/City of Huron Engineering Department		Existing Budget	City of Huron	4	1	Long Term	Ongoing	Maintain and improve as necessary existing culverts
High	Severe Summer Weather/ Severe Winter Weather / Tornadoes and Waterspouts/ Damaging Winds	Develop and provide outreach program for County residents and those in the sensitive/special needs population covering the dangers associated with severe storms.	City of Huron Parks Department	Police Department	Existing Budget	City of Huron	3	3, 6, 9, 11	N/A	Completed	Automatic monitoring system
High	Severe Summer Weather/ Severe	Construct designated safe shelters that would	City of Huron Parks Department		State or Federal Sources	City of Huron	2	4, 6, 9, 11	Long Term	Ongoing	All parks have shelter buildings

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
	Winter Weather/ Tornadoes and Waterspouts/ Damaging Winds	provide protection from severe weather throughout the County.									for storms, but not tornadoes
High	Flooding/, Lake & Stream Bank Erosion	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater	EMA/ Engineers Office	City of Huron/ Erie Soil and Water Conservation District	State or Federal Sources	City of Huron	3	5	Medium Term	Ongoing	Rain barrel programs, etc.
Medium	Tornadoes and Waterspouts/ Damaging Winds	Create a public education campaign encouraging home owners and private businesses to install safe rooms, and provide information about Ohio's Safe Room Rebate Program	EMA/ City of Huron	Erie County Regional Planning Commission	Existing Budget	City of Huron	2	6, 7	Medium Term	New	
Medium	Natural Biohazards	Create a public education campaign targeted at landowners to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie	EMA/ City of Huron	Erie Soil and Water Conservation District	Existing Budget	City of Huron	4	7	Long Term	New	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Create educational materials for presentation and distribution at existing public meetings regarding flood zone development	City of Huron Engineering Department	ODNR, Huron Public Library	Existing Budget	City of Huron	-1	1	Medium-Term	New	
High	Lake and Stream Bank Erosion	Develop and maintain a list of funding sources for private property owners to undertake erosion control projects along Lake Erie	City of Huron Engineering Department		Existing Budget	City of Huron	-1	5	Long-Term	New	

10.4.8 Mitigation Actions for the Village of Kelleys Island

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Evaluate the need for multi-use shelters for marinas and for high tourist areas within the County	EMA/ Kelleys Island	Erie County Engineering Department, Erie County Planning Commission	State or Federal Sources	Kelleys Island		2	Long Term	Deferred	Seek Funding
High	All Hazards	Develop and provide outreach program for County residents and those in the sensitive/special needs population covering the dangers	EMA/ Kelleys Island	Erie Soil and Water Conservation District/ Regional Planning	Existing budget	Kelleys Island		1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	Long Term	Ongoing	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
		associated with severe storms.									
High	Flooding	Identify and assess culverts and undersized drainage pipe property and drainage affected on Kelley's Island	EMA/ Kelleys Island		State or Federal Sources	Kelleys Island		1	N/A	Deleted	
High	Severe Summer Weather/ Severe Winter Weather / Tornadoes and Waterspouts/ Damaging Winds	Assess and inventory problems with roadways susceptible to flooding within Erie County	EMA/ County Commissioners	Kelleys Island	Existing budget	Kelleys Island		3, 6, 9, 11	Long Term	Ongoing	
High	Severe Summer Weather/ Severe Winter Weather/ Tornadoes and Waterspouts/ Damaging Winds	Provide NOAA radios in critical facilities to move forward on the "Storm Ready" Community status.	EMA/ County Commissioners/ Incorporated Jurisdictions		State or Federal Sources	Kelleys Island		4, 6, 9, 11	Long Term	Ongoing	
High	Flooding/, Lake & Stream Bank Erosion	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater	EMA/ Engineers Office	Kelleys Island/ Erie Soil and Water Conservation District	State or Federal Sources	Kelleys Island		5	Medium Term	Ongoing	
Medium	Tornadoes and Waterspouts/	Create a public education campaign encouraging	EMA/ Kelleys Island	Erie County Regional Planning Commission	Existing Budget	Kelleys Island	2	6, 7	Medium Term	New	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
	Damaging Winds	home owners and private businesses to install safe rooms, and provide information about Ohio's Safe Room Rebate Program									
Medium	Natural Biohazards	Create a public education campaign targeted at landowners to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie	EMA/ Kelleys Island	Erie Soil and Water Conservation District, OSU Extension	Existing Budget	Kelleys Island	4	7	Long Term	New	
High	Flooding, Lake/Stream Bank Erosion	Repair shoreline and Lakeshore Drive sustainably, to resist future damage from erosion and flooding associated with high lake levels	Village of Kelleys Island	United States Army Corps of Engineers, Ohio EMA, FEMA	BRIC or other funding sources	Kelleys Island	-1	1, 5	Long Term	New	
High	Flooding	Encourage the Village of Kelleys Island to participate in the National Flood Insurance Program	Village of Kelleys Island	Erie County EMA, Erie County Regional Planning Commission	Existing Budget	Kelleys Island	1	1	Medium Term	New	

10.4.9 Mitigation Actions for the Village of Milan

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Evaluate the need to consider Ice Jams as concern for those communities that are affected directly from these winter flooding hazard	EMA/ Milan Township Fire Department	Erie County Engineering Department, Erie County Planning Commission	State and Federal Sources	Village of Milan	5	2	Long Term	Ongoing	
High	All Hazards	Identify high risk areas and evaluate land-use planning techniques to mitigate future events	EMA/ Village of Milan	Erie Soil and Water Conservation District/ Regional Planning	State and Federal Sources	Village of Milan	5	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	Long Term	Ongoing	
High	Flooding	Assess and inventory problems with undersized culverts within Erie County	EMA/ Village of Milan		Existing Budget	Village of Milan	4	1	Long Term	Ongoing	
High	Severe Summer Weather/ Severe Winter Weather / Tornadoes and Waterspouts/ Damaging Winds	Develop and provide outreach program for County residents and those in the sensitive/ special needs population covering the dangers associated with severe storms.	EMA/ County Commissioners	Village of Milan Utilities/Street Department Milan Township Fire Department	Existing Budget	Village of Milan	3	3, 6, 9, 11	Long Term	Ongoing	
High	Severe Summer Weather/ Severe	Construct designated safe shelters that would	EMA/ County Commissioners/ Incorporated Jurisdictions	Village of Milan Utilities/Street Department	State or Federal Sources	Village of Milan	2	4, 6, 9, 11	Long Term	Deferred	Need Funding

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
	Winter Weather/ Tornadoes and Waterspouts/ Damaging Winds	provide protection from severe weather throughout the County.		Milan Township Fire Department							
High	Flooding/, Lake & Stream Bank Erosion	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater	EMA/ Engineers Office	Village of Milan/ Erie Soil and Water Conservation District	State or Federal Sources	Village of Milan	3	5	Medium Term	Deferred	Need Funding
Medium	Tornadoes and Waterspouts/ Damaging Winds	Create a public education campaign utilizing the Village's social media accounts, to notify home owners and private businesses to install safe rooms, and provide information about Ohio's Safe Room Rebate Program and encourage the removal of diseased and damaged trees	Village of Milan	Erie County Regional Planning Commission	Existing Budget	Village of Milan	3	6, 7	Short Term	New	
Medium	Natural Biohazards	Create a public education campaign targeted at	EMA/ Village of Milan	Erie Soil and Water Conservation District, OSU Extension	Existing Budget	Village of Milan	4	7	Long Term	New	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
		landowners to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie									

10.4.10 Mitigation Actions for the City of Sandusky

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Evaluate the need to consider Ice Jams as concern for those communities that are affected directly from these winter flooding hazard	EMA/ County/ Commissioners		State and Federal Sources	City of Sandusky	5	2	Long Term	Deleted	Action item is deleted because ice jams are not a hazard in the City of Sandusky.
High	All Hazards	Identify high risk areas and evaluate land-use planning techniques to mitigate future events	EMA/ County Commissioners		State and Federal Sources	City of Sandusky	5	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	Long Term	Ongoing	
High	Flooding	Assess and inventory problems with existing culverts within Erie County	EMA/ Engineering Office	Sandusky Engineering Department	Existing Budget	City of Sandusky	4	1	Medium Term	Ongoing	
High	Severe Summer Weather	Develop and provide outreach program for County residents and those in the sensitive/special needs population covering the dangers associated with severe storms.	EMA/ County Commissioners		Existing Budget	City of Sandusky	3	3, 6, 9, 11	Long Term	Ongoing	Annual Weather Spotter Training
High	Severe Summer Weather, Tornadoes	Create a public education campaign encouraging	EMA/ City of Sandusky	Erie County Regional Planning Commission	State or Federal Sources	City of Sandusky	2	4, 6, 9, 11	Long Term	Ongoing	Areas of large crowds such as Cedar Point

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
	and Waterspouts/ Damaging Winds	home owners and private businesses to install safe rooms, and provide information about Ohio's Safe Room Rebate Program									and Sports Force.
High	Flooding	Develop and conduct a social media educational campaign informing residents and businesses of the impacts of stormwater	EMA/ Planning Commission/ Engineers Office		State or Federal Sources	City of Sandusky	3	5	Long Term	Ongoing	See Stormwater Management Plan
Medium	Severe Winter Weather	Provide education for vulnerable populations regarding city operated warming centers during events of extreme cold	City of Sandusky Commissioners, New Jerusalem, Sandusky Planning Department		Existing Budget/ Volunteer	City of Sandusky	4	9, 10	Immediate	New	
High	Lake and Stream Bank Erosion	Develop erosion control plans	City of Sandusky Engineering Department		Existing Budget	City of Sandusky	4	5	Short Term	New	
Medium	Natural Biohazards	Create a public education campaign targeted at landowners to encourage ECO-Farming techniques aimed at reducing	EMA/ City of Sandusky	Erie Soil and Water Conservation District, OSU Extension	Existing Budget	City of Sandusky	4	7	Long Term	New	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
		nutrient loads in Lake Erie									

10.4.11 Mitigation Actions for the City of Vermilion

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
High	Flooding	Evaluate the need to consider Ice Jams as concern for those communities that are affected directly from these winter flooding hazard	EMA/ City of Vermilion	Erie County Engineering Department, Erie County Planning Commission	State and Federal Sources	City of Vermilion	5	2	Long Term	Ongoing	
High	All Hazards	Identify high risk areas and evaluate land-use planning techniques to mitigate future events	EMA/ City of Vermilion	Erie Soil and Water Conservation District/ Regional Planning	State and Federal Sources	City of Vermilion	5	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	Long Term	Ongoing	
High	Flooding	Assess and inventory problems with undersized culverts within Erie County	EMA/ City of Vermilion		Existing Budget	City of Vermilion	N/A	N/A	N/A	Deleted	
High	Severe Summer Weather/ Severe Winter Weather / Tornadoes and Waterspouts/ Damaging Winds	Develop and provide outreach program for County residents and those in the sensitive/ special needs population covering the dangers associated with severe storms.	EMA/ County Commissioners	City of Vermilion	Existing Budget	City of Vermilion	3	3, 6, 9, 11	Long Term	Ongoing	
High	Severe Summer Weather/ Severe	Construct designated safe shelters that would	EMA/ County Commissioners/ Incorporated Jurisdictions		State or Federal Sources	City of Vermilion	2	4, 6, 9, 11	Long Term	Ongoing	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/ Cost	Goal Addressed	Time Frame	Current Status	Other Information
	Winter Weather/ Tornadoes and Waterspouts/ Damaging Winds	provide protection from severe weather throughout the County.									
High	Flooding/, Lake & Stream Bank Erosion	Develop and provide educational information and promotion of urban and agricultural impacts of stormwater	EMA/ Engineers Office	City of Vermilion/ Erie Soil and Water Conservation District	State or Federal Sources	City of Vermilion	3	5	Medium Term	Ongoing	
High	Flooding	Communicate with current and new residents the possibility of water rising and entering their basement, or lower level limiting or eliminating access to their home.	Vermilion Police and Fire		Existing Budget	City of Vermilion	0	1	Short Term	New	
Medium	Tornadoes and Waterspouts/ Damaging Winds	Create a public education campaign utilizing the Village's social media accounts, to notify home owners and private businesses to install safe rooms, and provide information about Ohio's	City of Vermilion	Erie County Regional Planning Commission	Existing Budget	City of Vermilion	3	6, 7	Short Term	New	

Priority	Hazard Type	Mitigation Action	Lead Agency	Supporting Agencies	Funding Source	Benefiting Community	Benefit/Cost	Goal Addressed	Time Frame	Current Status	Other Information
		Safe Room Rebate Program and encourage the removal of diseased and damaged trees									
Medium	Natural Biohazards	Create a public education campaign targeted at landowners to encourage ECO-Farming techniques aimed at reducing nutrient loads in Lake Erie	EMA/ City of Vermilion	Erie Soil and Water Conservation District, OSU Extension	Existing Budget	City of Vermilion	4	7	Long Term	New	

10.5 Implementation Strategies

For each proposed alternative, the associated strategy identifies the agency that will be responsible for initiating the work and potential sources of funding for the work. Each action also indicates when the action will happen and identifies all of the parties responsible for implementation of each action.

The county intends to use the Erie County Natural Hazards Mitigation Plan to help in updating and developing other plans in the county as well as for applying for grants. These other plans would include:

- The Erie County Emergency Operations Plan (EOP)
- Various Emergency Action Plans (EAP) for festivals and community functions
- Various grants as they become available
- Emergency Action Plans for other potential emergency situations within individual jurisdictions
- Comprehensive plans
- Capital Improvement Plans
- Watershed Management Plans
- Other

Erie County Emergency Management will encourage the 2020 Natural Hazard Mitigation Plan update be incorporated into other planning opportunities by actively participating in the development of those plans and grant applications and educating other planning participants about the importance and goals of the Natural Hazard Mitigation Plan update. Each jurisdiction will also help to ensure the goals of the 2020 Erie County Natural Hazard Mitigation Plan are incorporated into any of the planning processes they are a part of as well.

To implement mitigation strategies into local government plans, the Core Group will be responsible for identifying how and when to include the mitigation plan into other efforts. With a wide range of government representatives within the Core Group, the Core Group members are best suited to identify local plans that align with the mitigation action items, such as comprehensive or capital improvement plans. It will be the Core Group member's responsibility to align these efforts to maximize the potential for action item completion.

11 Plan Maintenance

11.1 Plan Maintenance Update

An annual review of mitigation actions will be conducted. The process for evaluating the plan has been modified slightly from that presented in the previous version of the plan. The protocols for updating the plan and continued public involvement have been elaborated upon in this version of the plan.

Currently, the Erie County EMA office has ownership of the plan and will govern the document for the foreseeable future. With sole proprietorship of the plan, the EMA office will be able to organize the proper meeting and document any changes for proper plan maintenance.

11.2 Monitoring Mitigation Actions

The Erie County EMA Director will monitor the progress made on the implementation of the identified action items annually at about the anniversary date of plan adoption. Monitoring will be accomplished by calling or e-mailing each county or municipal agency that, through adoption of the plan, has assumed the responsibility of implementing one or more mitigation actions.

By monitoring mitigation actions, when the plan is next updated, information about the status of proposed mitigation actions will be readily available. The updated plan will include a section explaining if previously proposed mitigation actions have been implemented, completed, deleted, or deferred. The updated plan will identify actions that are no longer appropriate for the community and should be deleted. The updated plan will identify obstacles to implementation that caused proposed actions to be deferred and will recommend strategies for overcoming those obstacles.

The Mitigation Core Group will not only monitor the implementation of mitigation actions proposed in this plan, but will also monitor actions of participating jurisdictions and surrounding communities that may affect the ability of Erie County to withstand the effects of natural hazards or to recover from a disaster in the future. The method for gathering information about actions beyond those proposed in this plan will be informal; as active members of the Erie County community, Mitigation Core Group members will bring their own knowledge of the area to monitoring meetings to provide information about actions of participating jurisdictions as well as of nearby communities.

11.3 Evaluating the Plan

One month after conducting the annual monitoring of mitigation actions, the Erie County EMA Director will schedule an annual meeting of the Mitigation Core Group to evaluate the mitigation planning process, implementation of the plan, and conditions in Erie County that suggest the need to modify either planning data or planning actions.

Participating incorporated jurisdictions' and townships will be invited to attend the evaluation meetings. The evaluation meeting will include a presentation of the results of the monitoring of mitigation actions and will answer the following questions:

- Do mitigation goals and objectives reflect current community concerns as well as the finding of the risk assessment?
- Have conditions in the county changed so that findings of the risk assessment should be updated?
- What hazards have caused damage in the county since the plan was written? Were these anticipated and evaluated in the plan or should these hazards be added to the plan?
- Have conditions in the county changed so that the magnitude of risk as expressed in this plan has changed?
- Are new sources of data available that will improve the risk assessment?
- Are current resources sufficient for implementing mitigation actions?
- For each mitigation action that has not been completed, what are the obstacles to implementation? What are potential solutions for overcoming these obstacles?
- Is each completed mitigation action effective in reducing risk? What action is required to further reduce the risk addressed by the completed action?
- What mitigation actions should be added to the plan and proposed for implementation?
- Should any proposed mitigation actions be deleted from the plan? What is the rationale for deleting previously proposed actions from the plan?
- Based upon the evaluation, should the plan be updated as soon as possible, or should the plan be updated as scheduled 5 years after it was adopted?

The Erie County EMA Director will document the results of the annual evaluation meeting and submit the findings to each incorporated jurisdiction and townships in the county for review within 2 weeks. If the Mitigation Core Group determined that the plan should be updated as soon as possible, the Erie County EMA Director will take action to initiate the plan update.

11.4 Updating the Plan

This plan must be updated within 5 years and again adopted by the county and participating jurisdictions in order to maintain compliance with the regulations stated in 44 CFR Part 201.6 and ensure eligibility for applying for and receiving certain Federal mitigation grant funds.

Monitoring and evaluation will identify necessary modifications to the plan including changes in mitigation strategies and actions that should be incorporated in the next update. The update will have more current information about previous occurrences of hazards and improved information about wind speed for high wind events will be sought.

The Erie County EMA Director will initiate the process of updating the plan no more than 3 years after the plan was adopted, or immediately upon a determination by the Mitigation Core Group that the plan should be updated sooner. This will allow approximately 1 year for securing funding and/or staff for updating the plan and 1 year for conducting research and writing the updated plan.

11.5 Continued Public Involvement

The Erie County EMA Director will provide printed copies of the plan to key Erie County offices including the public library in the county so that the public has access to printed copies of the plan. A copy of the adopted plan will be posted on the county website for 5 years so that the public has electronic access to the plan. The website will include contact information for anyone to provide comment so that residents, business owners, and others who read the plan will be able to provide a comment about the plan or about the mitigation strategies. The Erie County EMA will maintain these comments and will provide them to the Mitigation Core Group for consideration at the annual plan evaluation meetings.

The Erie County EMA Director will post notices of annual mitigation plan evaluation meetings using the usual methods for posting meeting announcements in the county to invite the public to participate. In addition to posting announcements on the county web site, at least one newspaper press release will be published at the onset of the process of updating the plan inviting public participation.

The Erie County EMA Director will document the number of people who participate in the annual meetings and the results of the meeting for inclusion in the plan when it is next updated. In this way, the public will have an opportunity to become involved in the planning process and to influence mitigation planning decisions.

The Erie County EMA Director will provide a written report and/or make a presentation to the Erie County Commissioners to advise them of the status of the plan and of proposed mitigation actions. In this way, the public will have another opportunity to become aware of local mitigation efforts.

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13 List of Acronyms

CDBG	Community Development Block Grant
CEA	Coastal Erosion Area
CRA	Community Reinvestment Act
CRF	Code of Federal Regulations
CRS	Community Rating System
DMA2K	Disaster Mitigation Act of 2000
EAP	Emergency Action Plan
EMA	Emergency Management Agency
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance Program
GIS	Geographic Information System
HAB	Harmful Algae Bloom
HMGP	Hazard Mitigation Grants Program
HUD	Housing and Urban Development
MCPP	Mitsubishi Chemical Performance Polymers
MORPC	Mid-Ohio Regional Planning Commission
MPH	Miles per Hour
NCDC	National Climate Data Center
NFIP	National Flood Insurance Rate Program
NID	National Inventory of Dams
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
ODNR	Ohio Department of Natural Resources
OEMA	Ohio Emergency Management Agency
OSU	Ohio State University
PDM	Pre-Disaster Mitigation Assistance Program
PDSI	Palmer Drought Severity Index
RFC	Repetitive Flood Claims Program

SLR	Severe Repetitive Loss Program
STORMS	State of Ohio Rain Snow Monitoring System
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WSS	Web Soil Survey

14 Appendix A: Plan Adoption Resolutions

Formal adoptions of the plan will be added to this section as it is approved.

Sample Resolution for Erie County Jurisdictions

The following is a sample resolution in support of the Erie County Natural Hazards Mitigation Plan. A resolution adopting the plan must be passed by Erie County and in each participating city and village County.

RESOLUTION NUMBER [No.]

A RESOLUTION ADOPTING THE ERIE COUNTY NATURAL HAZARDS MITIGATION PLAN

WHEREAS, the citizens and property within the [Jurisdiction] have historically been subjected to the effects of natural hazards and manmade hazard events that pose threats to lives and cause damages to property; and

WHEREAS, the [Jurisdiction] desires to seek ways to mitigate the risks from known natural hazards, reducing the impact on people and property; and

WHEREAS, the Erie County Natural Hazards Mitigation Plan has been updated after twelve months of work by government organizations and participating jurisdictions; and

WHEREAS, Erie County and all jurisdictions within have been charged by the Federal Emergency Management Agency with the responsibility of developing a hazard mitigation plan aimed at reducing the community's vulnerability to natural hazards; and

WHEREAS, Section 322 of the Federal Disaster Mitigation Act of 2000 states that local governments must develop an All-Hazards Mitigation Plan in order to receive future Hazard Mitigation Grant Program Funds; and

WHEREAS, it is the intent of the [Jurisdiction] to fulfill this obligation and show support for the importance of mitigation in Erie County;

NOW, THEREFORE, be it resolved that the [Jurisdiction] hereby adopts the Erie County Natural Hazards Mitigation Plan as the [Jurisdiction]'s Hazard Mitigation Plan and resolves to take official action as may be reasonably necessary to carry out the strategies outlined within the Plan.

PASSED, ADOPTED and APPROVED by the Council of the [Jurisdiction] on [day] day of [Month], 2020.



Erie County Emergency Management Agency

Director: Tim Jonovich
Administrative Assistant: Kim Johnson

Phone: (740) 627-7617

2800 Columbus Ave.
Sandusky, Ohio 44870



It's time to adopt the Mitigation Plan

It is time to adopt the Erie County Mitigation Plan!

The Erie County Natural Hazards Mitigation Plan was completed by the Erie County Emergency Management Agency with a committee of multi-disciplinary subject matter experts from across the county alongside representatives from each participating jurisdiction.

This plan is designed to serve as a guide to local jurisdictions on efforts to mitigate the loss of life and property from natural hazards faced by Erie County.

The plan contains details on hazards and possible strategies

to reduce their impacts.

Each jurisdiction was invited to participate by creating projects individualized for your specific needs to reduce the impact of hazards on your citizens.

The Mitigation Plan has been approved by the Ohio Emergency Management Agency and the Federal Emergency Management Agency and now must be adopted by each participating jurisdiction in Erie County.

This plan must be adopted by formal resolution voted on by the governing body of your jurisdiction in order to meet

applicable legal requirements.

Adoption of this plan ensures your jurisdiction is eligible to receive federal mitigation grant dollars as they become available.

Were it not for your participation in the County plan, each jurisdiction would be required to complete its own mitigation plan to receive funds.

We thank you in advance for your participation with us as we finalize this important plan.

What do you need to do?

The Erie County Board of Commissioners and the administration of each participating jurisdiction need to do the following:

- Adopt the plan by formal resolution (sample resolution wording is provided with this fact sheet).
- Complete the adoption process by 4-1-2021.
- Send the signed adoption resolution to Kim Johnson via U.S. Mail, or email at KJohnson@eriecounty.ohio.gov

Your adoption resolution will become a part of the final version of the plan, showing your commitment to hazard mitigation in Erie County and ensuring you are eligible for federal mitigation grants in the future.

Please contact the Erie County Emergency Management Agency with any questions or concerns.

What does 'adoption' really mean?

Adoption of the Erie County Countywide All Natural Hazards Mitigation Plan is critical and means:

- Your jurisdiction is in compliance with the Disaster Mitigation Act of 2000 (DMA2K). DMA2K requires local jurisdictions adopt the plan in order to be

eligible to receive federal mitigation grant funds.

- Your jurisdiction has the opportunity to advocate for the plan, encourage mitigation, and implement building standards for hazard areas in your jurisdiction.
- Your jurisdiction values

mitigation by supporting the mitigation projects created in your jurisdiction.

Adoption does not mean you agree to take any actions or fund any projects identified in the plan. This plan serves as a guide to mitigation actions and is in no way a mandate to act.



15 Appendix B: Participation Invitations and Meeting Minutes

15.1 December 17, 2019

15.1.1 Advertisement of meeting



JoAnne Huie <joanneh@allclearerng.com>

FW: WEB NEWS - SoundCloud

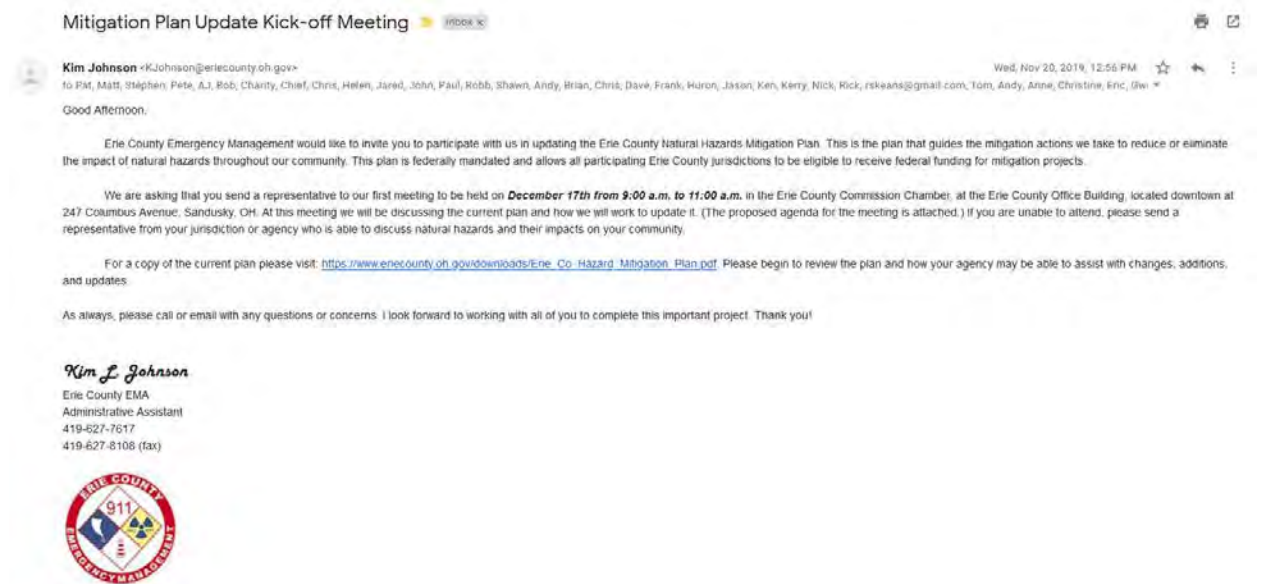
1 message

Kim Johnson <KJohnson@eriecounty.oh.gov> Thu, Nov 21, 2019 at 7:18 AM
To: Jamie Stout <jamies@allclearerng.com>, Jenny Schmitz <jennys@allclearerng.com>, JoAnne Huie <joanneh@allclearerng.com>

This was the sound bite on our local radio station this morning about the kick off meeting. It is the first story up to 47 seconds in.

15.1.2 Invitation Email

Email sent to neighboring counties, representatives for each of the jurisdictions and townships in Erie County, and to other stakeholders in the community.



15.1.3 Press Release For Kickoff Meeting



**Erie County Emergency Management Agency &
Office of Homeland Security**

2900 Columbus Avenue
Sandusky, Ohio 44870

Office: (419) 627-7617

FAX: (419) 627-8108

Timothy G. Jonovich, Director

FOR IMMEDIATE RELEASE

DATE: November 20, 2019
CONTACT: Tim Jonovich, Director

PUBLIC ASKED TO HELP GUIDE REVISIONS TO HAZARD MITIGATION PLAN

(SANDUSKY, OHIO) - The Erie County Natural Hazard Mitigation Plan will be replaced next year by a new, updated version, and Erie County residents are being asked to be a part of the revision process.

Representatives from Erie County Emergency Management Agency are asking the public to help guide future mitigation actions by local governments across Erie County to reduce or eliminate our long-term risk from dangerous natural hazards, as their input can help make the community safer.

The project's kickoff meeting will be held in the Erie County Commission Chamber, on the third floor of the Erie County Office Building, located downtown at 247 Columbus Avenue, Sandusky, OH on **December 17, 2019 from 9:00 a.m. to 11:00 a.m.** Please contact Kim Johnson at 419-627-7617 or via email at kjohnson@eriecounty.oh.gov, with any questions and to RSVP attendance at the meeting. We sincerely appreciate the public's cooperation with this important project.

The countywide mitigation plan was originally created in 2005 to guide work by local government jurisdictions to minimize the area's vulnerability to natural disasters such as tornadoes and flooding. The plan update, required every five years, is a key precondition for future FEMA funding for hazard mitigation projects by participating local jurisdictions.

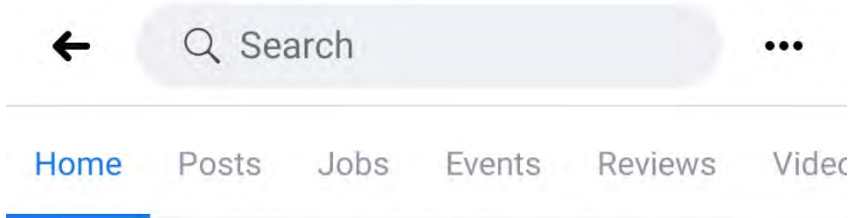
Erie County Emergency Management Agency expects to work with all of Erie County's local government jurisdictions on the project. The agency secured a competitive federal grant to fund the project.

The new plan will include updates to continue efforts to reduce the impact of natural disasters and promote countywide disaster preparedness. It will include an updated risk assessment identifying natural hazards the county is most likely to face, an update of previously identified mitigation projects, and additional mapping.

Erie County Emergency Management Agency is a local government agency responsible for planning, mitigation, response, and recovery for both natural and man-made disasters in Erie County.

15.1.4 Social Media Postings





[Home](#) [Posts](#) [Jobs](#) [Events](#) [Reviews](#) [Videos](#)



Erie County EMA - Ohio

17 mins • 🌐

If you are a community member and would like to help with our Natural Hazard Mitigation Plan Update, please attend our kick off meeting on December 17... [See More](#)



Erie County Emergency Management Agency & Office of Homeland Security

2900 Columbus Avenue
Sandusky, Ohio 44870

Office: (419) 627-7617
FAX: (419) 627-8108

Timothy G. Jonovich, Director

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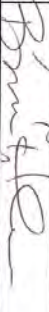



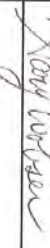



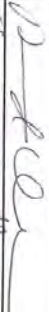

The countywide mitigation plan was originally created in 2005 to guide work by local government jurisdictions to minimize the area's vulnerability to natural disasters such as tornadoes and flooding. The plan update, required every five years, is a key precondition for future FEMA funding for hazard mitigation projects by participating local jurisdictions.

Erie County Emergency Management Agency expects to work with all of Erie County's local


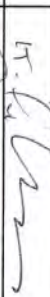

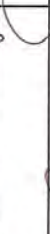

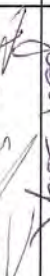
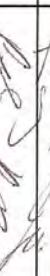






Erie County Hazard Mitigation Plan Update
Kickoff Meeting - December 17, 2019

NAME (Printed)	Signature	Agency/Organization	Email
Ashley Franks		Erie Co. Health Dept.	Afranks@echdoohio.org
A.J. Alt		OvH Police	alan.alt@dvs.ohio.gov
Breann Hohman		Erie, Soil & Water	Bhohman@eriecounty.oh.gov
Brendan Schlachter		ODOT	Brendan.Schlachter@dot.ohio.gov
Carrie Whitaker		Erie Regional Planning	Cwhitaker@eriecounty.oh.gov
Dave Moyer		Erie Co. DOES	Dmoyer@eriecounty.oh.gov
Douglas Johnson	via phone	ODNR	Douglas.Johnson@dnr.state.oh.us
Eric Dodrill		Erie, Soil & Water	Edodrill@eriecounty.oh.gov
Gary Wobser		Erie Co. EMA	gwobser@eriecounty.oh.gov
Jared Oliver		Erie Co. Sheriff's Office	joliver@eriecounty.oh.gov
John Ruf		North Point Ed. Center	Jruf@npesc.org
Kim Johnson		Erie Co. EMA	kjohnson@eriecounty.oh.gov
Mark Wroblewski		Erie Co. Auditor's Office	Mwroblewski@eriecounty.oh.gov
Matt Old		Erie Co. Commissioner	old@eriecounty.oh.gov
Paul Sigsworth		Erie Co. Sheriff	psigsworth@eriecounty.oh.gov
Robb Parthemore		Perkins Police Dept.	Rparthemore@perkinstownship.com
Rick Wilcox		Sandusky Fire Dept.	rwilcox@ci.sandusky.oh.us
Stephen Shoffner		Erie Co. Commissioner	shoffner@eriecounty.oh.gov

Erie County Hazard Mitigation Plan Update
Kickoff Meeting - December 17, 2019

Name	Signature	Agency	Contact Information
Tim Jonovich		Erie Co. EMA	tjonovich@eriecounty.oh.gov
Tom DeChaudens		OVH PD	anthony.dechaudens@ovh.org
Jim Stewart		Oxford Twp	jimstewart987@gmail.com
Josh Snyder		City of Sandusky	jsnyder1@ci.sandusky.oh.us
Rodney Johnston		Vermilion Fire Dept	rodney.johnston@vermilion.net
Rick Kross		OVH Safety & Health	Rick@kross.eoc.erie.oh.us
Lora Taylor		Red Cross	lora.taylor2@redcross.org
Steve Ruelar		SFD	sruelar@ci.sandusky.oh.us
Suzanne Boegli		Red Cross of Milan Village	shoegli@necor.com

15.1.6 Documentation of Bellevue Participation

FW: Required Information Inbox x

Kim Johnson <KJohnson@eriecounty.oh.gov>
to me

Hi Joanne,

Here is the information from the City of Bellevue. If you get a chance, can you confirm who you still need information from so that I can reach out to them again. I would appreciate any help.

Thanks,
Kim

From: Mike Lantz <mike.lantz@cityofbellevue.com>
Sent: Tuesday, April 28, 2020 4:22 PM
To: Kim Johnson <KJohnson@eriecounty.oh.gov>
Subject: Required Information

Please let my office know if there is anything else that you may need.

Mike Lantz
Safety-Service Director
City of Bellevue
mike.lantz@cityofbellevue.com

(419) 484-5511 (Office)

This email has been scanned by SecureGuardian for viruses, phishing, and malware. On request of the sender, ESI(Consulting) may have automatically archived this email. For more information please contact support@esiconsult.net.

15.1.7 Meeting Minutes

Erie County Hazard Mitigation Plan Kickoff Meeting

December 17th, 2019
9:00 am- 11:00 am

Join Zoom Meeting
<https://zoom.us/j/211046083>
1-646-558-8656
Meeting ID: 211 046 083

Minutes

- I. Welcome and Introductions
 - a. Introductions - Tim
 - i. Pulled in some contractors to help meet the requirements
 - b. Will Moorhead - President and Owner of All Clear
 - c. All Clear facilitates Emergency Management programs; assessment, planning, training, and exercises.
 - d. Two of the challenges experienced in previous Hazard mitigation planning projects are engaging the public and municipality participation.
- II. Mitigation Overview
 - a. How many people participated in this previously? One or two in the room; not everyone is familiar with a hazard mitigation plan.
 - b. Emergency Preparedness Cycle
 - i. Mitigate - Example: floods- build dams or levees around an area or build houses on stilts.
 - ii. Prepare - Example: Snow- availability of snowplows.
 - iii. Respond - Example: Snowplow the roads.
 - iv. Recovery - Getting back to normal. Recovery is faster if you mitigate, prepare, and respond appropriately.
 - c. Mitigation Plan Requirement
 - i. There is a federal mandate to have this plan in place and updated every five years.
 - ii. If you want to have access to the federal mitigation grant dollars, you must have a plan approved by FEMA and adopted by your jurisdiction.
 1. Choice is to work on your own plan or work with the County on this plan
 2. Less work and more realistic if everyone plans together.
 - d. Importance
 - i. Partnerships are important.
 - ii. Who is most impacted? Citizens. What groups are further impacted? Elderly, disabled, lower income, businesses. Access and functional needs; one group that is



- disproportionately impacted. Lower income is also impacted. Sometimes it's based on where they live, for example the Lower 9th Ward in New Orleans during Katrina.
- iii. Safer communities.
- iv. Financial impact.
- v. Recover more rapidly; per individual, it takes a lot of money.
- e. What is a Mitigation Plan?
 - i. Guide for mitigation.
 - ii. Determines what will impact us and those impacts may be reduced.
 - iii. Jurisdiction specific projects.
 - 1. Countywide approach.
 - 2. Consider jurisdiction specifics.
 - iv. Outline of Countywide All-Natural Hazard Mitigation Plan
 - 1. Identify and assess risks.
 - 2. Develop policies, strategies and priorities.
 - 3. Provide eligibility to participating jurisdictions.
 - 4. Comprehensive guide for future.
 - 5. Form the foundation for a community's long-term strategy, incorporate into other long-term plans.
 - 6. Create a framework for risk-based decisions, not event-based.

III. Participation

- a. Why should my jurisdiction and/or agency participate?
 - i. Reduces future disaster losses.
 - ii. Eligible for federal funding.
 - 1. Last large payout in Erie County - 2008. Flooding has a high threshold for uninsured. The higher-level lake levels have caused problems, and that's a longer-term problem. Flood money is more common for a single event but it's more challenging now.
 - iii. Reduces individual effort by working on this plan together.
- b. Requirements:
 - i. Identify a person to represent your agency/jurisdiction.
 - ii. Core Group: This is the group which will convene with EMA and All Clear to confirm, update, and validate the plan. Consider committing a person to serve on Core Group, ideally elected officials would participate in this group.
 - iii. Provide data about your jurisdiction.
 - iv. Support and facilitate public outreach.
 - v. Each jurisdiction must adopt the plan in order to be eligible for federal grant funding; this is where elected officials are important.
- c. Why is the plan limited to natural hazards?
 - i. This is the requirement as set forth by FEMA.
 - ii. Manmade hazards may fall under County Emergency Operations Plans (EOP).
- d. Core Group Participation Expectations
 - i. Attend 2-3 additional meetings to guide plan development.
 - ii. Assist with data collection for the jurisdiction represented.
 - iii. Review and provide feedback on the draft.



- 1. Validating the plan and risk assessments requires experts. You must understand your role and your agency - that's the expertise we need.
- iv. Assist with adoption efforts upon completion of the plan
- e. Estimated Timeline
 - i. December 2019 - Kickoff Meeting
 - ii. December-January 2020 - Data Collection
 - iii. February 2020 - Data presented and Risk Assessment
 - iv. May 2020 - Core Group Meeting, Mitigation Action development
 - v. May - August 2020 - Plan development by All Clear
 - vi. August 2020 - Core Group Meeting - Draft Plan Review
 - vii. August 2020 - Draft Plan complete, public comment period open
 - viii. September 2020 - Final Plan to Ohio EMA
 - ix. October -November 2020 - Adoptions by all participating jurisdiction

IV. Outreach Strategy



- a. Need support and help with public outreach. It is vital for the plan to understand concerns for the citizens.
- b. Broad categories of outreach - sector specific, event based, media.
 - i. Need to consider the language, socio-economic, etc.
 - 1. What have been successful outreach campaigns in your community? How were these campaigns conducted?
 - ii. Suggestion: Auditors/treasurers send out tax bills twice a year - January and July schedule. January too late, but July is good.
- c. Mitigation Factsheet and Stakeholder Survey
 - i. Survey can be distributed electronically.
 - ii. Community Health Assessment with LHD is distributed every five years and good response rate. Done through Hospital Council of NW Ohio.
- d. Is outreach for collecting info as well as draft review/public comment? Yes, for all stages.
- e. Public Meetings are a requirement of the process. Want to think about the who, what, where, when, etc. Any thoughts about existing meetings?
 - i. LEPC - great in Ohio.

V. Community Profile

- a. This is where it becomes a multi-jurisdictional plan. We need specifics about what occurs within each jurisdiction. We need to demonstrate the participating jurisdictions have been accounted for. Example of flooding - if we look countywide, we might gravitate towards the east side of the county or the one where it impacts 50,000. But a smaller community might say, there's a flooding problem here, but it impacts only 50 people.
- b. Community Capability Matrix - This document will succinctly show the planning efforts of each jurisdiction and what is in place currently. If a jurisdiction doesn't have something, it's fine. A blank means that there is no data.
- c. Townships should be covered in the county

VI. Hazard Vulnerability and Risk Assessment

- a. Hazards to consider



- b. In Vermilion, there are two rail lines running through down that intersect a river. It's an intersection of manmade and natural hazards. This is a complication as part of this process. FEMA's mandate is for natural hazards, so if you present that as a flooding problem, rather than a train derailment problem, it could be covered. HAZMAT, EOP and Evacuation plans would address the manmade (derailment) problem.

VII. Next Steps

- a. Data Call
 - i. Demographics
 - ii. History
 - iii. Critical facilities
- b. GIS Contacts/Information
- c. Community Capability Assessments
- d. Mitigation Strategy and Action Item Development
- e. Public Outreach
- f. Contact Information - JoAnne Huie JoAnneH@AllClearEMG.com; Will Moorhead WillM@AllClearEMG.com; Lauren Smith LaurenS@AllClearEMG.com



15.1.8 Documentation of Castalia and Margaretta Township participation



JoAnne Huie <joanneh@allclearerng.com>

Capability Matrix

2 messages

Kim Johnson <KJohnson@eriecounty.oh.gov>
To: JoAnne Huie <joanneh@allclearerng.com>

Tue, Jan 7, 2020 at 10:01 AM

Good Afternoon,

I received the attached capability matrix for the Village of Castalia and Margaretta Township today.

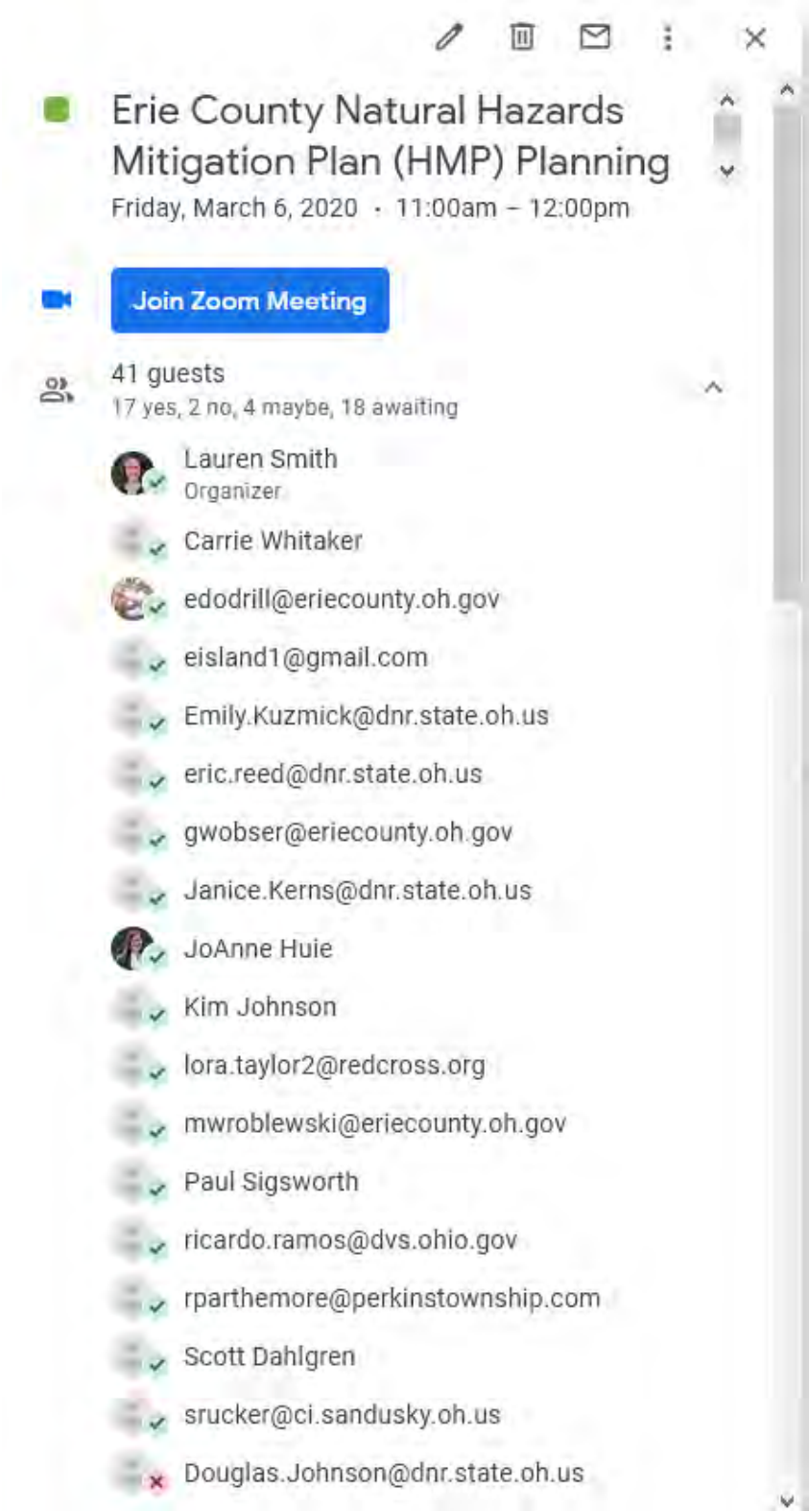
Thanks,


























Kim L. Johnson

Erie County EMA
Assistant Planner
419-627-7617
419-627-8108 (fax)

15.2 March 6, 2020

15.2.1 Meeting calendar appointment for second planning meeting



-  srucker@ci.sandusky.oh.us
-  Douglas.Johnson@dnr.state.oh.us
-  jimstewart987@gmail.com
-  Brian Rospert
-  Josh Snyder
-  Old@eriecounty.oh.gov
-  shboegli@neo.rr.com
-  afranks@echdohio.org
-  alan.alt@dvs.ohio.gov
-  Breann Hohman
-  Brendan.Schlachter@dot.ohio.gov
-  chrisstempowski@vermillion.net
-  DMoyer@eriecounty.oh.gov
-  firechief@margarettatwp.org
-  Gary Boyle
-  Grotontownship@earthlink.net
-  Jamie Stout
-  jimsteward987@gmail.com
-  joliver@eriecounty.oh.gov
-  Mayor@vermillion.net
-  mworblewski@eriecounty.oh.gov
-  PShenigo@eriecounty.oh.gov
-  rodneyjohnston@vermillion.net
-  shoffner@eriecounty.oh.gov
-  Timothy Lonovich

The screenshot shows an email interface. At the top, a list of recipients is visible: Mayor@vermilion.net, mworblewski@eriecounty.oh.gov, PShenigo@eriecounty.oh.gov, rodneyjohnston@vermilion.net, shoffner@eriecounty.oh.gov, and Timothy Jonovich. The email body begins with a greeting: "Hello Erie County HMP Planning Group,". It then states: "Please save March 6th at 3:30pm ET for an upcoming virtual HMP project meeting." This is followed by a list of objectives: "The objectives of this meeting are as follows:" and a bulleted list including "Recap of Data Collected from Jurisdictions", "Information Gaps from Jurisdictions", "Review of demographic, climatologic, topographic and general opening statements for the plan for both the county and local communities", "Review of/update historic hazard information and documentation", "Gather data for critical facilities", and "Hazard Prioritization". A section titled "Zoom Information" provides a link to a Zoom meeting, the meeting ID (224 619 226), and the dial-in number (669 900 6833). The email concludes with "Thank you and we look forward to meeting with all of you soon!". At the bottom, there is a notification for "10 minutes before" and the sender's name, "Lauren Smith". A "Going?" poll is visible at the very bottom with options "Yes", "No", and "Maybe".

Mayor@vermilion.net
mworblewski@eriecounty.oh.gov
PShenigo@eriecounty.oh.gov
rodneyjohnston@vermilion.net
shoffner@eriecounty.oh.gov
Timothy Jonovich

Hello Erie County HMP Planning Group,

Please save March 6th at 3:30pm ET for an upcoming virtual HMP project meeting.

The objectives of this meeting are as follows:

- Recap of Data Collected from Jurisdictions
- Information Gaps from Jurisdictions
- Review of demographic, climatologic, topographic and general opening statements for the plan for both the county and local communities
- Review of/update historic hazard information and documentation
- Gather data for critical facilities
- Hazard Prioritization

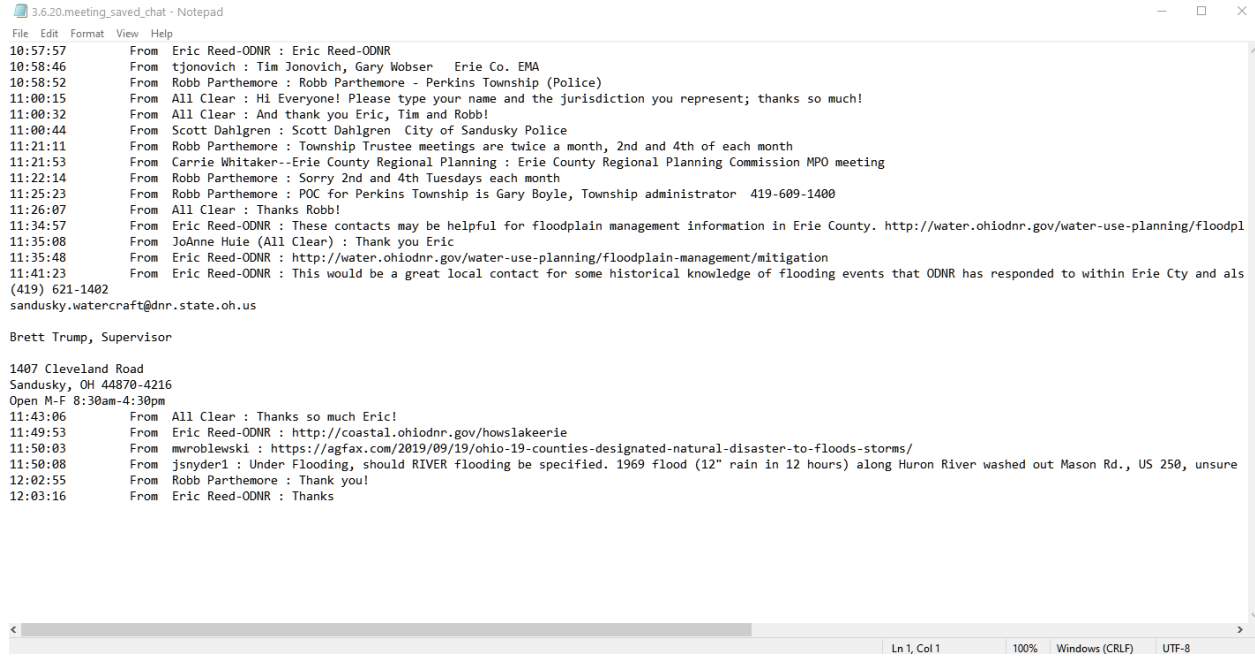
Zoom Information
Link: <https://zoom.us/j/224619226>
Meeting ID: 224 619 226
Dial: 669 900 6833

Thank you and we look forward to meeting with all of you soon!

10 minutes before
Lauren Smith

Going? Yes No Maybe

15.2.2 Meeting Chat Log



15.2.3 Record of Participation from Zoom

Meeting ID	Topic	Start Time	End Time	User Email	Duration (Minutes)	Participants
224619226	Erie County HMP Planning Group Meeting	3/6/2020 12:46	3/6/2020 14:03	joanneh@allclearmg.com	77	25
	Name (Original Name)	User Email	Join Time	Leave Time	Duration (Minutes)	Guest
	JoAnne Huie (All Clear) (JoAnne)		3/6/2020 12:46	3/6/2020 13:52	66	Contractor
	Eric Reed-ODNR		3/6/2020 12:48	3/6/2020 14:03	76	State
	All Clear	joanneh@allclearmg.com	3/6/2020 12:48	3/6/2020 14:03	76	Contractor
	Call-In User_1		3/6/2020 12:48	3/6/2020 14:03	75	Unknown
	Jamie Stout- All Clear		3/6/2020 12:52	3/6/2020 14:03	71	Contractor
	16146795459		3/6/2020 12:52	3/6/2020 14:03	71	Contractor
	Robb Parthemore		3/6/2020 12:53	3/6/2020 14:03	71	Perkins Township
	tjonovich		3/6/2020 12:57	3/6/2020 14:03	67	Erie County
	14196277617		3/6/2020 12:57	3/6/2020 14:03	66	
	Scott Dahlgren		3/6/2020 12:58	3/6/2020 14:03	66	City of Sandusky
	Josh Snyder - Sandusky (14196275875)		3/6/2020 12:59	3/6/2020 14:00	62	City of Sandusky
	14196275897		3/6/2020 12:59	3/6/2020 14:03	65	
	14196275823		3/6/2020 12:59	3/6/2020 14:03	64	
	Steve Rucker Sandusky Fire (SRucker)		3/6/2020 13:01	3/6/2020 14:03	63	City of Sandusky
	Scott - City Of Sandusky Police Department (14196277652)		3/6/2020 13:01	3/6/2020 14:03	62	City of Sandusky
	Carrie Whitaker--Erie County Regional Planning (cwhitaker)		3/6/2020 13:02	3/6/2020 14:03	62	Erie County
	jsnyder1		3/6/2020 13:02	3/6/2020 14:03	61	City of Sandusky
	Emily Kuzmick		3/6/2020 13:03	3/6/2020 14:03	60	State
	Steve Shoffner		3/6/2020 13:04	3/6/2020 14:03	60	Erie County
	15676234868		3/6/2020 13:05	3/6/2020 14:03	59	
	14196277753		3/6/2020 13:05	3/6/2020 14:03	58	
	Eric Dodrill		3/6/2020 13:16	3/6/2020 14:03	47	Erie County
	Mark Wroblewski - Erie County		3/6/2020 13:33	3/6/2020 14:03	30	Erie County
	Tom Johnson - Margaretta Township		3/6/2020 13:48	3/6/2020 14:03	15	Margaretta Township
	14196845686		3/6/2020 13:50	3/6/2020 14:03	14	

15.2.4 Meeting Minutes

**Erie County
 Hazard Mitigation Plan
 Planning Group Meeting Minutes**

March 6, 2020/ 1:00pm ET


Meeting Link: <https://zoom.us/j/224619226>
 Meeting ID: 224 619 226
 Dial: 669 900 6833

I. Introductions and Opening Remarks

- a. Please type your name and organization into the chat feature. We will use that as our sign in sheet for this meeting.
- b. Tim Janovich - Erie County EMA
- c. Carrie Whitaker - Erie County Regional Planning
- d. Steve Rusker - Sandusky Fire Department
- e. Josh Snyder - City of Sandusky Engineering Dept
- f. Scott Dahlgren - City of Sandusky Police Department
- g. Eric Reed - ODNR
- h. Gary Wobser Erie County EMA
- i. Robb Parthemore - Perkins Township
- j. Steve Shoffner
- k. Emily Kuzmick
- l. Eric Dodrill
- m. Lauren Smith - All Clear
- n. Jamie Stout - All Clear
- p. JoAnne Huie - All Clear

II. Project Update

HMP Milestone	Deliverable Due Date:
Milestone 1: Organize planning team and hold Planning Meeting #1 (kickoff meeting) <ol style="list-style-type: none"> 1. Identify team members 2. Address mandate for plan 3. Review local demographic, climatologic, topographic overview information for county and local communities in order to update community profile 4. Gather data for critical facilities—replacement costs, location, numbers of people within, impact 	December 31, 2019- Completed
Milestone 2: Planning Meeting #2 <ol style="list-style-type: none"> 1. Review draft of demographic, climatologic, topographic and general opening statements for the plan 	February 28, 2020 *Moved to March 6, 2020



2. Update historic hazard information and documentation 3. Prioritize hazards	
Milestone 3: Prepare risk information for dissemination 1. Update Hazard Vulnerability Analysis with best available data	February 28, 2020 *Moved to March 6, 2020
Milestone 4: Planning Meeting #3 2. Host public meeting to discuss hazards and challenges facing community 3. Solicit public input into development of goals for plan and community priorities	TBD
Milestone 5: Review of draft and edits 1. Prepare final draft of plan for submission to Ohio EMA for review 2. Prepare Local Hazard Mitigation Plan (LHMP) Review tool 3. Submit plan for State review	September 15, 2020
Milestone 6: Review at Region V 1. Submit plan to FEMA for review 2. Make changes, edits, and additions as required by FEMA review 3. Resubmit for FEMA review and approval pending adoption	October 30, 2020
Milestone 7: Adoption of the plan 1. Create a county resolution for adoption of the federally approved county hazard mitigation plan 2. Submit county resolution of adoption to FEMA for Final Federal Approval 3. Entry of approved plan, HIRA summary, and mitigation actions into the State Hazard Analysis and Resource Planning Portal (SHARPP)	October 31, 2020
Milestone 8: Close out 1. Closeout project with FEMA	November 30, 2020

iii. Meeting Objectives

a. Outreach Strategy

i. Sector-specific

ii. Event based outreach

1. Previously spoke about the LEPC
2. Could be a township or county planning meeting
3. Could be an event that was coming up
4. Looking to get this planning committee to commit to get this information on the agenda for those meetings, and get documented proof of asking people to participate

- iii. Media – Social media, or websites, or press release or radio or newsletters. However we can get this process out there, and get people to complete the community survey and participate in the planning meetings.



- iv. If there's anything your jurisdiction has used well in advance, please let us know what that is, and we can help develop materials. All Clear can help develop the stuff so the planning group can easily do the outreach.
- v. The survey is a surveymonkey designed to collect specific information about hazards and mitigation in Erie County
- vi. All Clear will provide the hazard mitigation factsheet for the core group to commit.
- vii. Put it out at the post office, on social media, at the community centers, on the jurisdictions' websites, etc. Please document these outreach efforts.
- viii. All meetings are open to the public, please send out the meeting invites.
- ix. Reach out to your people, find out what meetings are happening in the community that we can tap into, which will be more important later on in the process.
- x. What meetings and outreach
 - 1. Steve Rucker - Sandusky City Commission Meeting
 - 2. Steve Shoffner - Erie County Commission Meeting
 - 3. Robb Parthemore - Township Trustee meetings 2nd and 4th Tuesdays of each month
 - 4. Tim Jonyich - LEPC - quarterly
 - 5. Carrie Whitaker - Erie County Regional Planning Commission MPO meeting
- b. Recap of Data Collected from Jurisdictions
 - i. Gaps
 - 1. The table shows what information we've received from jurisdictions after our first data call after the December meeting.
 - 2. Primary point of contact
 - 3. Community capability matrix - what resources and capabilities do each of the jurisdictions have currently.
 - a. Copies of plans - Landuse, comprehensive, zoning, etc,
 - b. Need to discuss the relevant portions of those plans in the HMP update
 - c.
 - c. Hazard Mitigation Discussion
 - i. Hazard Risk Assessment
 - 1. Community Assets
 - a. People
 - b. Economy
 - i. Physical Damage
 - ii. Downtime losses



1. Business continuity, how long are people out of work
 - c. Built Environment
 - i. Existing structures
 1. Roads, bridges
 - ii. Infrastructure
 - iii. Critical Facilities
 1. Hospitals, Long-term care
 - iv. Cultural Resources
 1. Historical properties
 - v. Future Development
 1. Industrial
 2. Commercial
 3. Residential
 4. Hospitals
 - d. Natural Environment
2. Risk Assessment Process
 3. State of Ohio Hazards
 - a. Some affect some areas of Ohio, not all
 - b. Need to explain why they are not a hazard in Erie County if they are not included in the plan.
 4. The planning team has identified these hazards
 - a. Droughts
 - b. Earthquakes
 - c. Flooding
 - d. Harmful Algae Blooms - new, we could consider these "Natural Biohazards" and put into the same "bucket" as invasive species. This is what the state of Ohio.
 - i. Thoughts - it's fine.
 - e. Invasive Species
 - f. Lake/Stream Bank Erosion
 - g. Severe Summer Weather - used to be combined with severe storms with severe winter weather too, Need to be separated out
 - h. Severe Winter Weather
 - i. Tornados/Waterspouts - there have been enough waterspouts in the area
 - i. There is the potential, so included just in case
 - j. Lake Level Rise - is this better incorporated into flooding or lake/stream bank erosion. What is the concern with lake level rise in Erie County?



i. Is its own hazard or is it a cause of other hazards (flooding and erosion)

ii. In Sandusky, drainage had problems, and have had erosion problems. Directional winds erosion on the shore, but high lake can cause flooding further upstream.

iii. Vermillion -

k. High Wind -

5.

ii. Prioritization

iii. Mitigation Strategy


iv. Mitigation Goals

v. Mitigation Actions

vi. Action Plan

IV. Action Items

V. Adjourn



15.2.5 Risk Assessment Survey

Erie County Hazard Mitigation Plan (HMP): Risk Assessment Survey

Erie County Emergency Management Agency (EMA) has contracted with All Clear Emergency Management Group (All Clear) to facilitate the review and revision of the current Erie County Natural Hazards Mitigation Plan (HMP).

As a part of this revision process, we will be examining each of the hazards identified by the Erie County Planning Team to determine their severity in comparison to each other. This process is called Hazard Identification and Risk Assessment. Each of the hazards identified by the Planning Team are listed in this survey and will be assessed using criteria related to frequency, vulnerability, and consequences.

Erie County EMA and All Clear are requesting each member of the Planning Team complete and submit this Risk Assessment survey to aid in the revision of the Erie County HMP.

If you have any questions or difficulties with the survey, please contact All Clear at Joanneh@AllClearEMG.com.

* First Name

* Last Name

* Email Address

Phone Number

* Which jurisdiction do you represent?

Erie County Hazard Mitigation Plan (HMP): Risk Assessment Survey

Hazard Information

Please read the information provided and then rank the hazard categories based on your experience and knowledge.

Drought

A drought in Erie County can have significant detrimental effect on the domestic water supply, especially for well-water, agriculture, and water-dependent recreational activities. Economic effects in Erie County would include crop loss. No damage to structures or infrastructure is anticipated due to drought. There have been 10 periods of D1 (Moderate Drought) and two brief periods of D2 (Severe Drought) in Erie County since 2000.

Earthquake

The last earthquake felt in Erie County and throughout Ohio occurred on June 10, 2019 and registered at a 4.2 magnitude. USGS's short term probability of an earthquake causing at least minimal damage in Erie County is than 1%; long term probability of an earthquake strong enough to cause at least minimal damage in Erie County sometime in the next 50 years is 6-8%.

Flooding

In Erie County flooding can happen almost anytime. It can be caused by riverine floods, coastal/ lakeshore flooding, flash floods from heavy rain event, storm surge, and seiches. Flooding in Erie County can be exacerbated by ice jams and karst landforms. There have been 125 flooding events documented since 1964 with a recurrence interval of 0.448 years. Since 1996, \$31.26 million in property damage and \$5.02 million in crop damage has occurred in Erie County as a result of flooding.

Lake Level Rise

The US Army Corps of Engineers predicts lake levels to be high across the Great Lakes for at least the next five years. In June 2019, the all-time record high water level in Lake Erie was set at 574.3 feet above sea level. This year, Lake Erie is expected to set new monthly record high levels through May, with levels forecasted to be 2 to 11 inches above last year's levels. High water levels can cause increased inland flooding, lake shore erosion, and damage to beaches, docks, roads, bike paths and buildings located near the shore.

Lake/Stream Bank Erosion

Lakeshore and streambank erosion in Erie County is primarily concentrated along Lake Erie and Vermillion River, Huron River, Mills Creek and their tributaries. It is estimated that erosion along Lake Erie will continue at approximately 0.3 feet per year. The economic impact of continued lakeshore erosion is expected to be high in Erie County due to the large number of man-made structures and infrastructure located near the shore.

Natural Biohazards

Natural Biohazards in Erie County include invasive species and harmful algae blooms. Invasive species are any non-native species in an ecosystem that are likely to cause environmental or economic damage. They can be plants, wildlife, insects, disease or aquatic organisms. Of the top 10 invasive plants in Ohio, nine are found in Erie County. Of the top 10 invasive aquatic organisms, eight are found in Erie County. The invasive insect, the Emerald Ash Borer is also found in Erie County. Erie County is also impacted by harmful algal blooms, which are increasing in frequency and intensity.

Severe Summer Weather

Severe summer weather includes severe thunderstorms, hail, lightning, high winds, and extreme heat. In Erie County there have been 197 thunderstorm-wind events and 103 hail events since 1955, and 7 lightning events, 46 high wind events, and 2 heat events since 1996. These severe summer weather events have caused over \$15 million of property damage in Erie County.

Severe Winter Weather

Severe winter weather includes heavy snow, ice storms, blizzards, and extreme cold/wind chill. Since 1996 there have been 5 heavy snow events, 1 ice storm, 27 winter weather/winter storm events and 10 extreme cold/wind chill events affecting Erie County. These severe winter weather events have resulted in ten reported injuries and more than \$8 million of property damage.

Tornadoes/Waterspouts

Between 1950 and 2019, 16 tornadoes and funnel clouds have formed over Erie County, and seven waterspouts have been recorded in Lake Erie near Erie County since 1996. The strongest tornado on record in Erie County was an F4 tornado in 1953, injuring 23 people and killing two. The tornado that caused the most property damage occurred in 1992, classified as an F2 tornado, and resulted in 2.5 million dollars of damage. The most recent tornado recorded in Erie County occurred in Prout in 2017 and was categorized as an EF1 tornado. The total amount of damage resulting from tornadoes in Erie County from 1950-2019 is \$3.61 million in property damage and \$10,000 in crop damage. There are no reported injuries, deaths, or economic impact from waterspouts.

Each hazard is to be assessed using the following definitions for these categories:

Vulnerability

- High - 75-100% of county impacted
- Medium - 26-74% of the county impacted
- Low - 25% or less of the county impacted

Consequence

- High - severe injuries, multiple deaths, business and government closures in excess of 3 weeks, major damage and losses
- Medium - severe injuries, minimal loss of life, business and government closures 1-3 weeks, extensive damage and losses,
- Low - minimal injuries, no loss of life, minimal closures less than 1 week, minimal damage to property

Frequency

- High - 60-100% probability in any given year
- Medium - 15-59% probability in any given year
- Low - 15% or less probability in any given year

Using the above categorizations for vulnerability, consequence, and frequency, please rank the following hazards for Erie County as a whole.

	Vulnerability	Consequence	Frequency
Drought	<input type="text"/>	<input type="text"/>	<input type="text"/>
Earthquakes	<input type="text"/>	<input type="text"/>	<input type="text"/>
Flooding	<input type="text"/>	<input type="text"/>	<input type="text"/>
Lake Level Rise	<input type="text"/>	<input type="text"/>	<input type="text"/>
Lake/Stream Bank Erosion	<input type="text"/>	<input type="text"/>	<input type="text"/>
Natural Biohazards	<input type="text"/>	<input type="text"/>	<input type="text"/>
Severe Summer Weather	<input type="text"/>	<input type="text"/>	<input type="text"/>
Severe Winter Weather	<input type="text"/>	<input type="text"/>	<input type="text"/>
Tornados/Waterspouts	<input type="text"/>	<input type="text"/>	<input type="text"/>
Windstorms	<input type="text"/>	<input type="text"/>	<input type="text"/>

15.2.6 Risk Assessment Survey Participants

First Name	Last Name	Email Address	Phone Number	Which jurisdiction do you represent?
Kim	Johnson	kimmers022@yahoo.com		Erie County
Teresa	Jarrett	grotonrecords@earthlink.net	419-271-3259	Groton Township
John	Zimmerman	jaz@hurontwp.org	419-433-2755	Huron Township
MISTY	JOHANNSEN	misty@florencetwp.com	4409654379	Florence Township
James	Stewart	jimstewart987@gmail.com	4196563243	Oxford Township
Larry	Gwinner	bayviewmayor@gmail.com	419-503-1044	Village of Bay View
Thomas	Johnson	Puds107@yahoo.com	419-656-3708	Village of Castalia
Brian	Rospert	brospert@milanohio.gov	41949941613	Village of Milan
Suzanne	Boegli	shboegli@neo.rr.com	4194992836	Village of Milan
Tammy	Boos	Tboos@hurontwp.org	4196563190	Huron Township
Steve	Holland	steve.holland@dnr.ohio.gov		Erie County
Timothy	Riesterer	triesterer@margarettatwp.org	419-684-9500	Margaretta Township
john	farschman	jfarschman@eriecounty.oh.gov	419-627-7710	Erie County
Mike	Dewey	mikedewey@deweyfurniture.com	440-39609297	Berlin Township
Michael	Old	mrld5@aol.com	419-681-2039	Berlin Township
Patti	Nuhn	pattinuhn@yahoo.com	4406531692	Florence Township
Brian	Dunegan	briandunegan@vermilion.net	440-787-4379	City of Vermilion
Frank	Triana	Vtfdchief801@yahoo.com	4196564542	Vermilion Township
Ronald	Nemire	76 South St		Village of Berlin Heights
Robert	Kurtz	bkurtz@vermiliontownship.com	440-967-6841	Vermilion Township
Eric	Dodrill	edodrill@eriecounty.oh.gov	419-626-5211	Erie County
Kurt	Heyman	kurthey@buckeye-express.com	4195410544	Erie County
Rick	Ramos	Ricardo.Ramos@dvs.ohio.gov	567.998.3861	Perkins Township
Steven & Mary	Hill	9418 Angling Rd.		Florence Township
Kirk	Horton	kirkhorton@vermilion.net	4403206159	City of Vermilion
Shawn	Craig	policechief@kellevisland.us	419-504-9101	Kellev's Island
John	Jackson	jejacksonj@aol.com	419626 3209	Perkins Township
Chris	Stempowski	chrisstempowski@vermilion.net		City of Vermilion
Mark	Flock	flock677@yahoo.com		City of Huron
Joe	Bias	jbias@margarettatwp.org	419-341-0842	Margaretta Township
Jeanne	Lawrence	rlawrence1@bex.net	4193662075	City of Sandusky
Dan	Kovatch	w8car@bex.net	4193574504	Margaretta Township
Anne	Maiden	annemaiden@vermilion.net	4402042402	City of Vermilion
Robert	Meister	policechief@milanohio.gov	419-499-2001	Village of Milan
John	Orzech	jorzech@ci.sandusky.oh.us	419-627-5869	City of Sandusky
Kerry	Jett	grotontownship@earthlink.net	4194837840	Groton Township
Charity	Schafer	berlinheightspd@gmail.com	419-588-2055	Village of Berlin Heights
Charles	Trinter	Trinterct@centurytel.net	440-967-3719	Vermilion Township
Eric	Longbrake	eisland1@gmail.com	4195153254	Kelley's Island
Emily	Kuzmick	emily.kuzmick@dnr.state.oh.us		Erie County
Christopher	Hartung	chartung@vermilionpolice.com	4409676116	City of Vermilion
Paul	Sigsworth	psigsworth@eriecounty.oh.gov	4196565404	Erie County

15.3 September 4, 2020

15.3.1 Meeting Invitation

Erie County Mitigation Action Development Meeting - September 4 9:30 - 11:30 Inbox x

JoAnne Huie <joanneh@allclearerng.com> Fri, Aug 21, 11:56 AM

to jamies, Jenny, Kim, bcc: afranks, bcc: alan.alf, bcc: allen.r.turner, bcc: AnneMaiden, bcc: anthony.deshoudens, bcc: bayviewmayor, bcc: bayviewpolice, bcc: berlinheightspd, bcc: bhofman, bcc: bkurtz, bcc: bobday, bcc: Dr

Good Afternoon,

We have scheduled a working meeting for the development of mitigation actions for each of the jurisdictions participating in the Erie County Hazard Mitigation Plan Update. As we will be meeting virtually, through Zoom, we are asking that people register in advance by using this link: <https://bit.ly/2Fo6fmg>. It is important that a representative from each jurisdiction participate in this meeting, as it will be your opportunity to develop mitigation actions that will affect your community. The meeting will also be available to the public. Please share the meeting announcement and registration link with your community. I've attached the meeting announcement as a PDF and as an image file for easy posting on websites and social media. Please send screenshots of the postings for me for documentation purposes.

In preparation of the meeting, I have also attached some homework for each jurisdiction. The word documents attached are the mitigation actions that were listed in the last plan, for each jurisdiction. Please review your jurisdiction's actions and update their status (completed, in progress, etc.). If they were deferred, explain briefly why they were deferred (e.g. lack of funding, re-prioritized, etc.). If they were cancelled, please explain why. Please return the updated mitigation action sheet for your jurisdiction before September 4.

To reiterate, here are the specific actions we are asking each jurisdiction to do:

Action Items:

- Register and attend the virtual meeting on September 4 from 9:30-11:30am: <https://bit.ly/2Fo6fmg>
- Share meeting announcement with your community and send screenshots of the postings to joanneh@allclearerng.com for documentation.
- Update the status of your jurisdiction's mitigation actions from the old plan and return to joanneh@allclearerng.com by September 4.

Please reach out if you have any questions.

Thank you.

JoAnne Huie, MS
Planning Specialist
All Clear Emergency Management Group
303-916-8853
JoAnneH@AllClearEMG.com
www.AllClearEMG.com

12 Attachments

15.3.2 Meeting Reminder

***Reminder* Erie County Hazard Mitigation Meeting - September 4, 2020 9:30 - 11:30 am** Inbox x

JoAnne Huie <joanneh@allclearerng.com> Fri, Aug 28, 2:51 PM

to johnson, jamies, bcc: afranks, bcc: AnneMaiden, bcc: bayviewmayor, bcc: bayviewpolice, bcc: berlinheightspd, bcc: bhofman, bcc: bkurtz, bcc: bobday, bcc: Brendan.Schlaechter, bcc: brospert, bcc: btfidchiel, bcc: bzysebk

Good Afternoon,

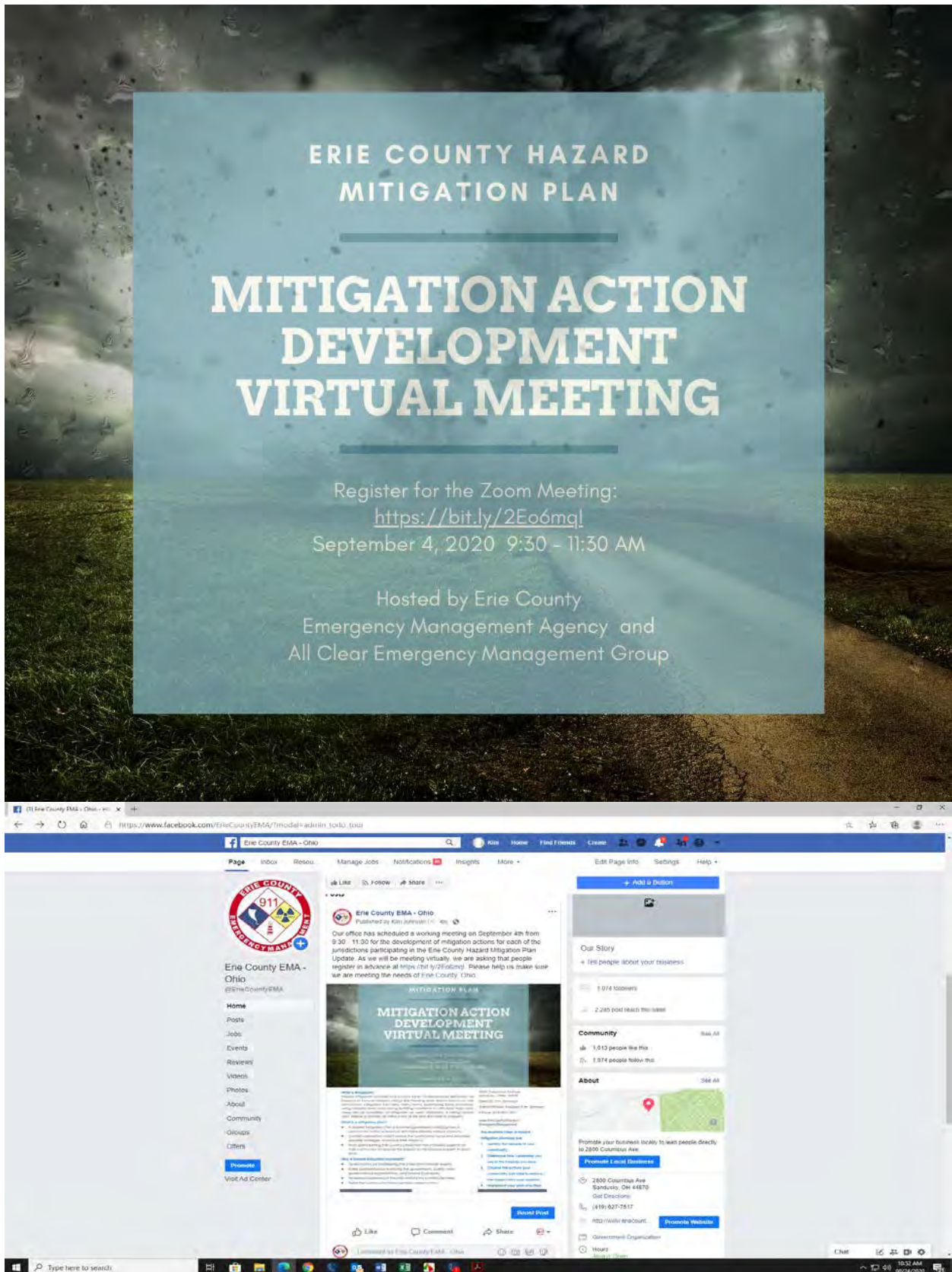
As a reminder we have a virtual meeting next week to discuss mitigation actions for each of the jurisdictions in Erie County. It is important that a representative from each jurisdiction attends as it will provide an opportunity to develop the mitigation actions that will directly affect your community. Please register in advance of the meeting using this link: <https://bit.ly/2Ee6fmg>. FEMA requires documentation of participation by jurisdictions, so registering and attending this meeting is a great way to show your involvement. This meeting is also open to members of the public. If you have not done so already, please post the attached image or PDF files to your website or social media pages to let the public know about this meeting. If you do, please send me screen shots of where you have posted it for documentation purposes.

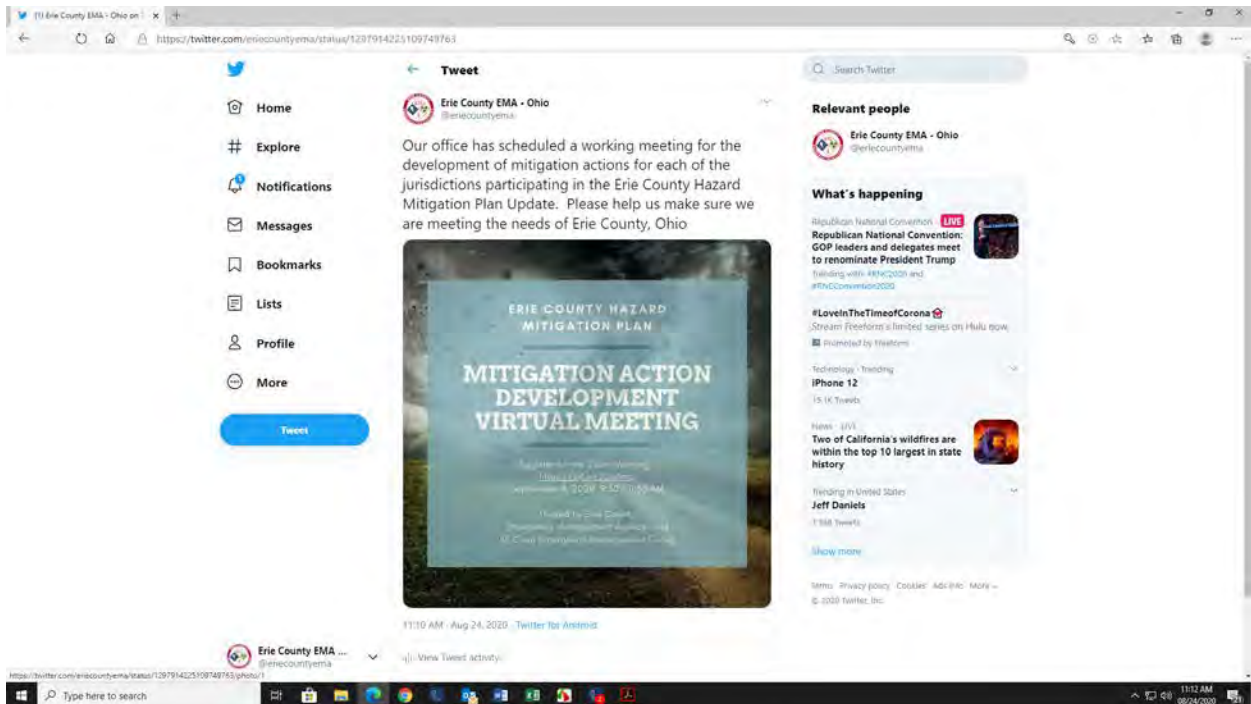
Additionally, we have asked each jurisdiction review the mitigation actions for their communities prior to next week's meeting and update their status. Please return the updated mitigation actions for your jurisdiction before September 4.

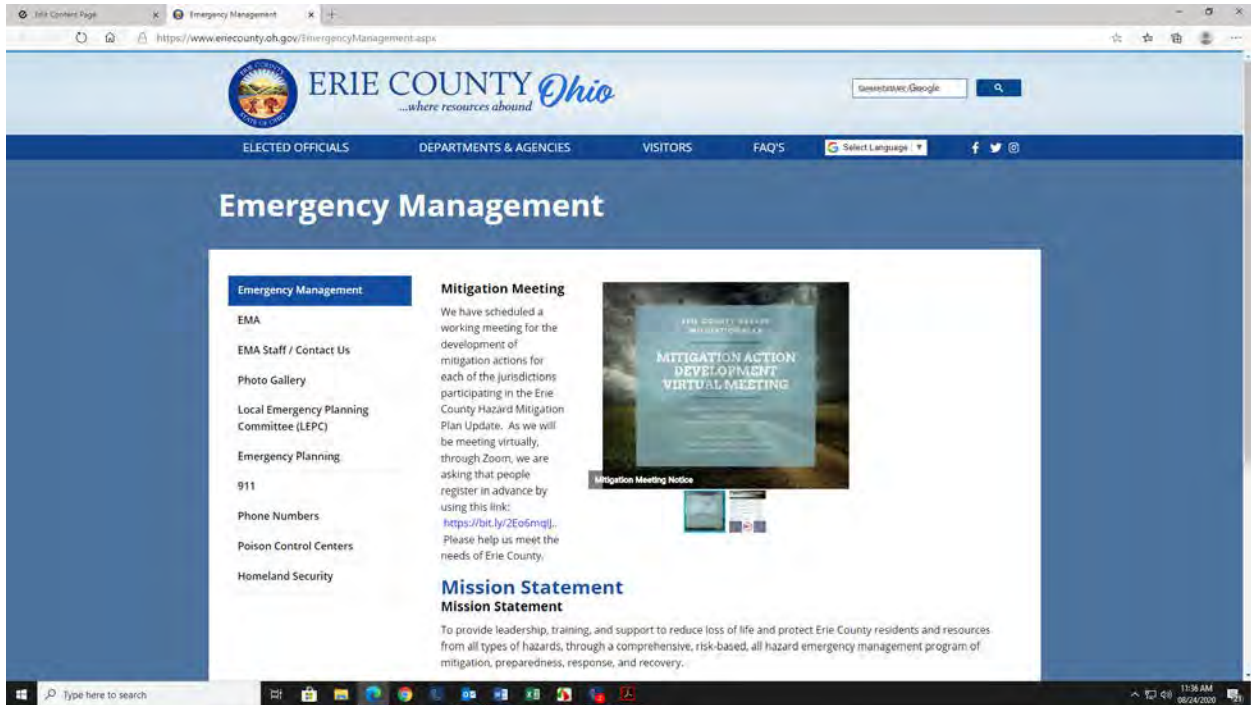
JoAnne Huie, MS
Planning Specialist
All Clear Emergency Management Group
303-916-8853
JoAnneH@AllClearEMG.com
www.AllClearEMG.com

11 Attachments

15.3.3 Social Media Postings







15.3.4 Record of Participation from Zoom

Meeting ID	Topic	Start Time	End Time	User Email	Duration (I	Participants
97053996890	Erie County Hazard Mitigation Plan Mitigation Action Development	9/4/2020 9:02	9/4/2020 10:46	jakep@allclearmg.com	105	23
Name (Original Name)	User Email	Total Duration (Minutes)	Guest	Jurisdiction		
John Flegal	john.w.flegal@gmail.com	105		State		
Jamie Stout - All Clear (All Clear EMG)	jakep@allclearmg.com	185		Contractor		
gwobser	gwobser@eriecounty.oh.gov	1		Erie County		
16146795459		90				
David Murphy	firechief@perkinstownship.com	90		Perkins Township		
14196566630		88				
Aaron Klein	aklein@ci.sandusky.oh.us	85		City of Sandusky		
Robert Kurtz	bkurtz@vermiliontownship.com	85		Vermilion Township		
Carrie Whitaker	cwhitaker@eriecounty.oh.gov	81		Erie County		
Tim Ionovich	tjonovich@eriecounty.oh.gov	81		Erie County		
14196277652		80				
STEVE SHOFFNER	shoffner@eriecounty.oh.gov	80		Erie County		
14196277617		80				
Lora Taylor	lora.taylor2@redcross.org	78		NGO		
Anne Maiden	annemaiden@vermilion.net	77		City of Vermilion		
Matt Rogers	mrogers@eriecounty.oh.gov	76		Erie County		
Tammy Boos	tboos@hurontwp.org	76		Huron Township		
Chief101!	firechief@margarettatwp.org	73		Margaretta Township		
John Longbrake	cisland1@gmail.com	72		Kelleys Island		
Emily Kuzmick	emily.kuzmick@dnr.state.oh.us	69		State		
Jeffrey Berquist	jeffberquist1@gmail.com	38		Citizen		
Breann Hohman	bhohman@eriecounty.oh.gov	45		Erie County		

15.3.5 Meeting Minutes

Erie County Hazard Mitigation Plan

September 4, 2020

9:30 am- 11:30 am

Register for Zoom Meeting

[https://zoom.us/meeting/register/UMtcuqhpz0iE9TcSHi8hjgRhBxPQpVu1wNJ](https://zoom.us/join/zoom/register/UMtcuqhpz0iE9TcSHi8hjgRhBxPQpVu1wNJ)

Agenda

- I. Welcome and Introductions
 - a. Jamie Stout, All Clear
 - b. JoAnne Huie, All Clear
 - c. Tim Jonovich, Erie County EMA - thank you for everyone for participating. If anyone has any questions, feel free to send an email.

- II. Hazard Identification and Risk Assessment

Did this via a survey, and we asked everyone to rank the hazards based on Vulnerability, Consequence and Frequency.

 - a. Of note, the second highest hazard with annualized losses was severe winter weather. It does not fall towards the top of the priority list as scored by the committee. Even if the consequence score for winter weather was the same as that of flooding, it still would not rise to the highest priority, which is a good validation of the methodology.
 - b. Lake Level Rise was a new hazard to be added to this mitigation plan. One of the challenges of this mitigation planning process is to identify and mitigate the impacts of each hazard. Being mindful that stopping some hazards is not possible, but we can mitigate the loss of life and loss of property. The impacts of lake level rise are flooding and erosion, which are separate components of the plan. All Clear is recommending that this hazard be included in the Flooding and Lake/Stream Bank Erosion hazards.
 - c. Tim Jonovich – voiced approval of the course of action to add lake level rise to the plan as a component of flooding and erosion.

- III. Community Capability Matrix
 - a. The completion of the community capability matrix was assigned to each community at the beginning of this planning process. If your jurisdiction has not yet sent it back, please return it to JoAnne Huie at JoAnneH@AllClearEMG.com.
 - b. Townships are not required to complete the [document](#), however we would appreciate your continued participation.



- c. If you have any questions, please contact JoAnne or Jamie, and we are more than happy to help in any way we can.

IV. Survey Results

As a part of the Erie County Public Outreach Strategy, a public survey was conducted regarding how the public feels about certain issues related to mitigation. Many jurisdictions publicized the survey and Erie County had good overall representation for the different communities. Below is a discussion of some of the survey elements.

- a. Respondents were asked to rank how concerned they were about each of the hazards facing Erie County. Many of the hazards were relatively close, a few (earthquakes) were of very little concern.
 - i. The following is a list of additional hazards of concern in Erie County. Respondents listed the following:
 1. Biological hazards/harmful algae blooms
 2. Extreme temperatures/heat days
 3. Climate-induced lake levels
 4. Karst
 5. Pandemics
 6. Stabilizing power/electric due to high winds/falling trees
 7. Nexus pipeline leak/rupture
 8. Solar flares
 - ii. The first four are incorporated into this new version of the plan. They were great additions by the community. The others were not appropriate for inclusion at this time; however this information is useful for other planning efforts.
- b. Respondents were also asked about location specific mitigation needs. All responses were reviewed and will be sent to participants following the meeting. These will be useful as each jurisdiction completes new action items.
- c. The committee also examined a question regarding how the public prefers to receive information from government sources. The results were largely in favor of online mechanisms and social media.
- d. Another question posed to the public was regarding how willing they are to complete mitigation measures at their own homes. Many people in the community have an understanding of the hazards that they face and know that there are things that they need to do to make their homes safer. The majority of them are willing to mitigate their risk at home, especially if there was funding available, or the time and cost was minimal.
- e. When asked which mitigation strategies the community prefers to employ, the results were very well balanced, ranging from 13%-19% across all of the different strategies.

V. Mitigation Strategy

This is the heart of the mitigation plan and serves as the blueprint for the future. There are three components to mitigation strategy.



- a. Goals
 - i. Goals should be general guidelines of what you want to achieve. They should be broad, long-term statements, represent vision for reducing or avoiding loss. Should be representative of what the community wants to achieve.
 - ii. Erie County has all goals listed as hazard specific goals.
 - iii. Committee discussion of current goals.
 - iv. Current Goals
 - 1. Flooding Goal
 - a. Increase awareness of and preparedness for flooding and lake level rise to save lives and reduce property damage and their impacts on the community.
 - b. Identify, monitor, and evaluate high risk areas of ice jam concern.
 - 2. Severe Summer Weather Goals
 - a. Increase awareness of and preparedness for severe summer weather to reduce loss of life and property damage, examining current means of response to identify gaps in planning and response.
 - b. Evaluate and implement measures to prepare the community for severe summer weather.
 - 3. Tornado/Waterspouts Goals
 - a. Evaluate and implement measures designed to warn residents and provide safe shelter during tornadoes and waterspouts.
 - 4. Severe Winter Weather Goals
 - a. Increase awareness of and preparedness for severe winter weather to reduce loss of life and property damage, examining current means of response to identify gaps in planning and response.
 - b. Evaluate and implement measures to prepare the community for severe winter weather.
 - 5. Lake and Stream Bank Erosion Goal
 - a. Evaluate and implement measures to protect lives, property and the environment impacted by lake and stream bank erosion.
 - 6. Natural Biohazards Goal
 - a. Proactively evaluate and enact measures to reduce the effects of Harmful Algae Blooms
 - b. Increase awareness of invasive species to reduce harm to infrastructure, crops and the native ecology by educating residents and businesses about impacts and techniques to minimize the spread.
 - 7. Drought Goals
 - a. Identify, monitor, and evaluate high risk areas of concern
 - b. Increase awareness and fire prevention strategies.
 - 8. Earthquake Goals
 - a. Increase awareness of and implement measures to decrease loss of life and property damage from earthquake events.



9. Damaging Winds

- a. Need to have a goal for damaging winds since the plan has hazard specific goals
- b. FEMA document has some examples for winds:
https://www.fema.gov/media-library-data/20130726-1904-25045-0186/fema_mitigation_ideas_final508.pdf
- c. Goal developed for damaging wind was agreed as the following:
Educate residents and businesses on the dangers of damaging winds as well as techniques to mitigate their impacts.

b. Action Items

Mitigation actions are the specific actions, projects, activities, or processes undertaken to reduce or eliminate risk to populations and property. The primary types of mitigation actions are: plans and regulations, structure and infrastructure projects, natural systems protection, and education and awareness programs. Mitigation actions need to tie back to a specific goal listed in the plan.

- i. For multi jurisdiction plans, there needs to be specific actions relevant to each jurisdiction for each hazard.
 - 1. Townships do not need to create mitigation actions, but it is always helpful for them to do so.
- ii. Previous Actions found in the current plan - Need status update for the old actions that were included in the plan. Each jurisdiction needs to return the form All Clear emailed previously with the status of each action item. Please send the mitigation actions back to JoAnne via email as soon as possible. The following is a guide to updating your action items.
 - 1. Completed – what did you do? How did you do it? Success stories are a great addition to the plan.
 - 2. Deleted – no longer needed for the plan
 - 3. Deferred – action is still valid, however there is no mechanism in place currently to complete it. Indicate why it is deferred: no funding, no staff, etc.
 - 4. In progress - If it is in progress is it 10% done? 90% done? Provide a short synopsis of what has been done.
- iii. Focus on mitigating the impacts of the events rather than mitigating the hazards.
- iv. All jurisdictions need to create projects to mitigate each hazard Erie County faces, including the new hazard of damaging winds.

c. Benefit Cost Review

Consider the benefits of implementing the project in relation to the costs of implementing the project.

- i. Erie County currently uses a modified STAPLEE methodology. The committee will continue with this methodology. Each new mitigation action must include this on the reverse of the handout provided for creating new action items.
 - 1. Previous plan used A-L-E-E (Administrative, Legal, Economic, Environmental)



2. For each criterion, assign +1 if there is a benefit, a -1 if there is a cost, and 0 if there is no cost or benefit associated with the mitigation action.
3. Scoring Summary is the sum of all the ratings for a particular action.

d. Mitigation Actions

- i. Each jurisdiction should consider the need for new action items based upon community feedback and other factors since the last update.
- ii. Each jurisdiction must create action items for Damaging Winds.
- iii. Review Template for Newly Created Action Items handout.
 1. All Clear will send out this template, along with a page with all the Goals listed for reference when creating action items.
 2. Explanation of Template with the example of a project to replace an undersized culvert.
 - a. Mitigation Action Item - What do you want to do. Example - Replace an undersized culvert at Main Street in the City of Sandusky.
 - b. Identify the Problem – When it rains, the road floods and has washed out three times in the past 5 years.
 - c. Goal this Action Item supports - every mitigation action must support a goal listed in the plan. Refer to the document sent listing the goals by number. Each action can support one or more goals. Example - Supports Goal #1 and #2.
 - d. Ideas for Implementation – The City would like to go out to bid for a contractor who will increase the size of the culvert to stop the roadway flooding.
 - e. Responsible Agencies – Sandusky City Engineer's Department.
 - f. Timeline - Immediate, short-term, or long-term.
 - g. Hazards Addressed - can address more than one hazard. Flooding is the hazard for this example.
 - h. Estimated Cost – Do your best to estimate a cost. You do not need to go out and get estimates.
 - i. Completed by: - Whomever is filling out this form.
 - j. Jurisdiction: - The jurisdiction this action item is created by and impacts.
 - k. On the back is the benefit cost review. Make sure to complete this section.

e. Action Plan

The action plan describes how the mitigation actions will be implemented, including how those actions will be prioritized, administered and incorporated into the community's existing planning mechanisms. In a multi-jurisdictional plan, each jurisdiction must have an action plan specific to that jurisdiction and its vulnerabilities.

- i. Prioritization Discussion
 1. Add new hazard to the current ranking of proposed mitigation actions and rank accordingly.
 2. Dual prioritization - Recommended change from previous plan



- a. In the previous plan, the prioritization was done by weighting by a factor of 3, 2, 1, and 0. Weighting with a multiplier of 1 and 0 are counter to the intended purpose.
- b. For this plan, the new methodology will be to utilize the benefit cost review scores for each action item and prioritize them into buckets based upon the already completed risk assessment. All flooding action items will be ranked in order of their benefit cost review score as high priority because flooding is a high priority hazard.
- c. Tim Jonyich and the committee approved the new methodology.
- f. Discussion on the integration of the mitigation plan into existing planning mechanisms. If you have information you want to include it in the plan on how this plan is being included in other mechanisms, please send it to Jamie and JoAnne via email.

VI. Plan Maintenance

- a. This section is largely charged to the EMA Director.
 - i. Tim Jonyich approved the overall plan maintenance section and the following:
 - 1. Annual meeting to monitor progress, prefer to combine with an existing committee like LEPC.
 - 2. Public Involvement to continue through:
 - a. Hard copies of the plan at local library.
 - b. Plan online at county website.
 - c. Continue to make meetings public.
 - d. Correct County Commissioners section to read "adoption presentation".

VII. Next Steps

- a. Complete and return Community Capability Matrix (for those who have not already done so).
- b. Update existing Action Items for each jurisdiction, with completed, deleted, deferred, in-progress status and details about each one.
- c. Create new mitigation actions for hazards including damaging winds by September 21.
 - i. JoAnne and Jamie are available to help.
- d. Draft Plan Public meeting - First full week of October
- e. Plan adoption – All Clear will provide factsheet and sample resolution language.

VIII. Contact information

- a. JoAnne Huie - joanneh@allclearmg.com
- b. Jamie Stout - jamies@allclearmg.com



15.4 Calendar Appointment for Meeting with City of Sandusky Representatives

The screenshot shows a calendar event titled "City of Sandusky Hazard Mitigation Work Session" on Tuesday, September 22, from 9:00 to 10:30am. It includes a "Join Zoom Meeting" button, a list of 11 guests with their names and email addresses, and a message asking attendees to join for a work session to complete requirements for the Erie County Hazard Mitigation Plan. The event details include the topic "City of Sandusky Hazard Mitigation Plan Work Session" and the time "Sep 22, 2020 11:00 AM Eastern Time (US and Canada)". A "Join Zoom Meeting" link is provided at the bottom of the event details. At the bottom of the calendar view, there is a "Going?" section with "Yes", "No", and "Maybe" options.

City of Sandusky Hazard Mitigation Work Session
Tuesday, September 22 - 9:00 - 10:30am

[Join Zoom Meeting](#)

11 guests
6 yes, 1 maybe, 4 awaiting

- JoAnne Huie
Organizer
- Aaron Klein
- gvoltz@ci.sandusky.oh.us
- Jamie Stout
- John Orzech
- mlasko@ci.sandusky.oh.us
- Josh Snyder
- esowecke@ci.sandusky.oh.us
- Jane Cullen
- jgreen@ci.sandusky.oh.us
- sthom@ci.sandusky.oh.us

Please join us for this work session to complete the requirements for the Erie County Hazard Mitigation Plan.

Topic: City of Sandusky Hazard Mitigation Plan Work Session
Time: Sep 22, 2020 11:00 AM Eastern Time (US and Canada)

Join Zoom Meeting
<https://zoom.us>

Going? Yes No Maybe

15.5 Documentation of Berlin Heights Participation



JoAnne Huie <joanneh@allclear.org>

Village of Berlin Heights

1 message

Kathy Deehr <kathydeehr@aol.com>
Reply-To: Kathy Deehr <kathydeehr@aol.com>
To: "joanneh@allclear.org" <joanneh@allclear.org>


Thu, Sep 24, 2020 at 9:48 AM


Attached please find information you needed. Thank you.

2020mitigation plan village.pdf
1947K

15.6 October 7, 2020

15.6.1 Meeting Invitation

Mitigation Draft Plan Review Meeting 

 **Jamies@allclearerng.com**
to me

Thu, Sep 24, 9:18 AM

Good morning! We are nearing the end of our Natural Hazards Mitigation Planning process. We have reached our final public meeting. This step requires us to hold a review of the draft plan with all stakeholders as well as interested members of the public. Due to Covid-19 related restrictions, we will need to hold this meeting virtually over Zoom. **This meeting will be held on October 7th from 9:30 am to 10:30 am.** We have two specific requests of everyone. They are as follows:

1. We are asking all of you to please use the attached documents and post them on your social media sites and your website if possible. One file contains a PDF and the other is an image file more appropriate for use on social media. Also, please post hard copies in areas where the public may have an opportunity to see them. If you have email lists for announcements, feel free to share there as well. Please distribute this information as you are able and then send evidence of your distribution to JoAnne at JoAnneH@AllClearEMG.com. We are required to provide proof that this meeting was open to the public, so please take screenshots or pictures of your distribution and send them for inclusion in the plan.
2. Please register yourself for the meeting at the following link: <https://bit.ly/2lhtq3z7>. We are requiring registration so that we can keep track of any public participation we may receive. Following your registration you will have the opportunity to save the meeting appointment to your calendar with all of the Zoom links.

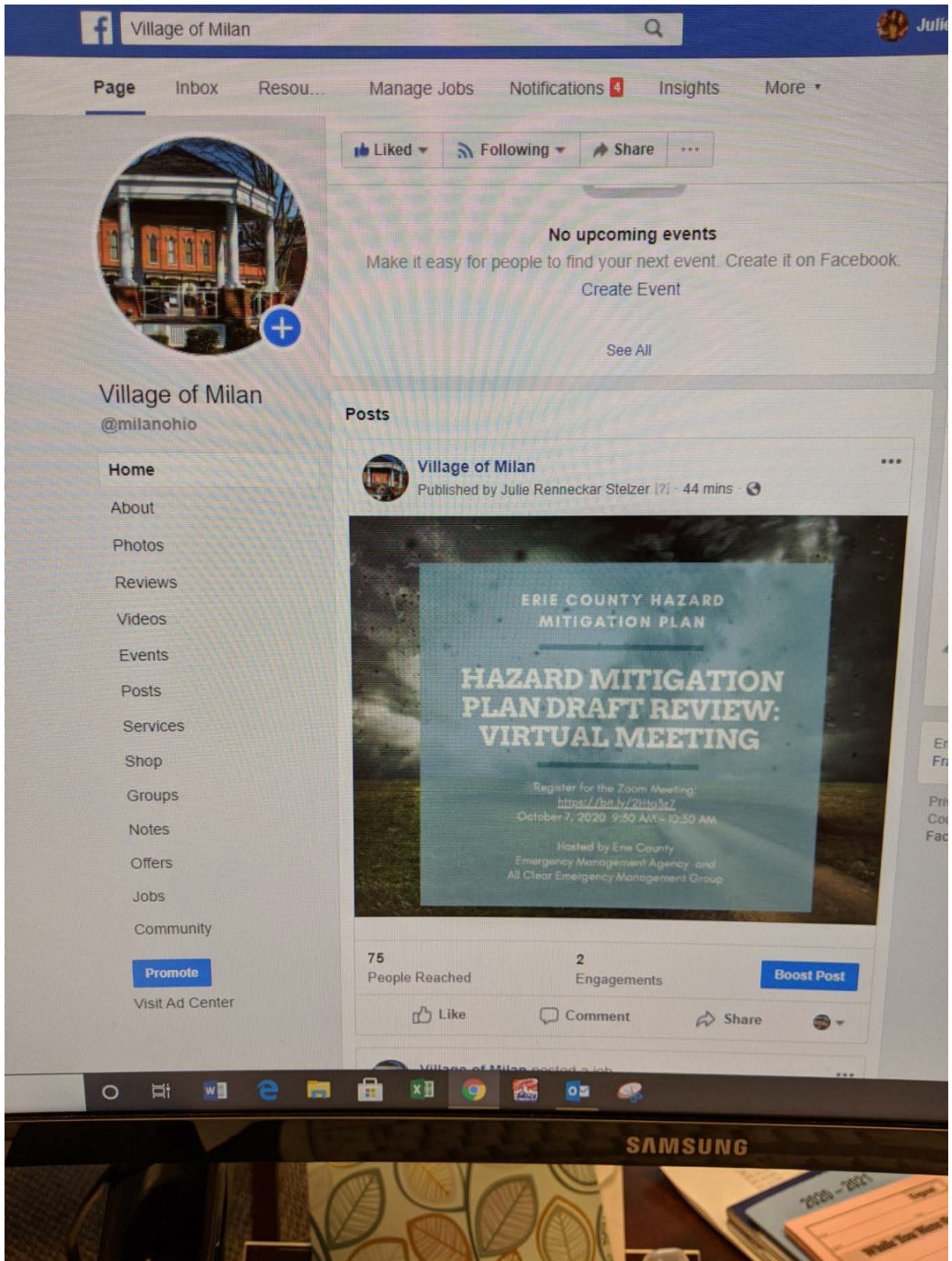
Thank you for your continued participation in this project!

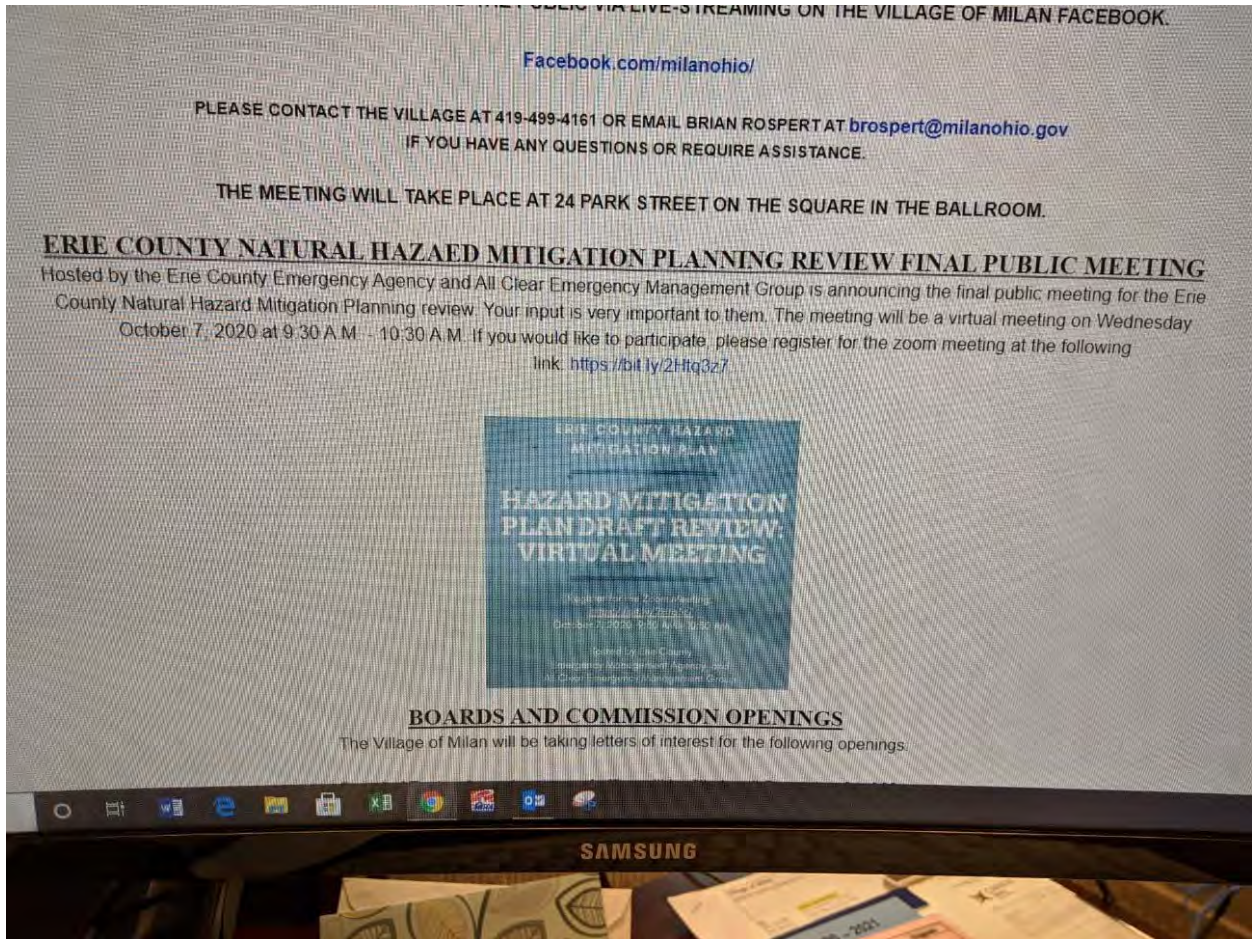
Jamie Stout, OCEM
Senior Planning Specialist
All Clear Emergency Management Group
336-802-1800 Main
614-679-5459 Direct
Jamies@allclearerng.com
www.AllClearEMG.com

2 Attachments

15.6.2 Social Media Posts









AUGUST 24, 2020 | COMMUNITY EVENTS, IMPORTANT NEWS, TOWN NEWS | MELANIE MURRAY

Erie County has scheduled a working meeting for the development of mitigation actions for each of the jurisdictions participating in the Erie County Hazard Mitigation Plan Update. As the meeting will be held virtually, through Zoom, we are asking that people register in advance by using this link: <https://bit.ly/2Eo6mqJ>. It is important that a representative from each jurisdiction participate in this meeting, as it will be your opportunity to develop mitigation actions that will affect your community.



Events

SEPTEMBER, 2020

14 SEP	ZONING COMMISSION MEETING
21 SEP	BOARD OF ZONING APPEALS MEETING

Recent News

ERIE COUNTY HAZARD MITIGATION



HISTORY • INNOVATION • COMMUNITY

HOME ABOUT MILAN DEPARTMENTS GOVERNMENT COMMUNITY

VILLAGE OF MILAN
Liked 1.6K likes

You and 51 other friends like this

HAZARD MITIGATION PLAN DRAFT REVIEW: VIRTUAL MEETING

VILLAGE OF MILAN
Current Events / Announcements

WATER DEPARTMENT DRINKING WATER NOTICE AND 2019 CONSUMER CONFIDENCE REPORT
The Milan Water Department annual 2019 Consumer Confidence report and Drinking Water Notice.
Water Department Notice and 2019 Consumer Confidence Report
For a paper copy call the Water Department at 419-499-4161 ext: 8

CROSS CONNECTION PAMPHLET
To view the Cross Connection can create Health Hazards pamphlet click on the following link below.

CROSS CONNECTION can create HEALTH HAZARDS

ERIE COUNTY HAZARD
MITIGATION PLAN

**HAZARD MITIGATION
PLAN DRAFT REVIEW:
VIRTUAL MEETING**

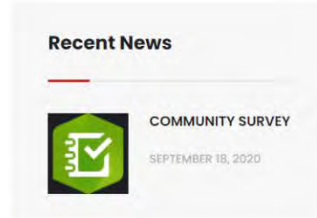
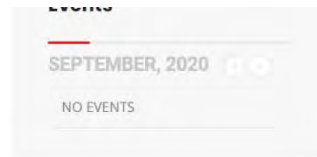
Register for the Zoom Meeting:
<https://bit.ly/2Htg3z7>
October 7, 2020 9:30 AM - 10:30 AM

Village of Bayview Information Page
This virtual meeting is open to the public so feel
free to attend.
Thank You

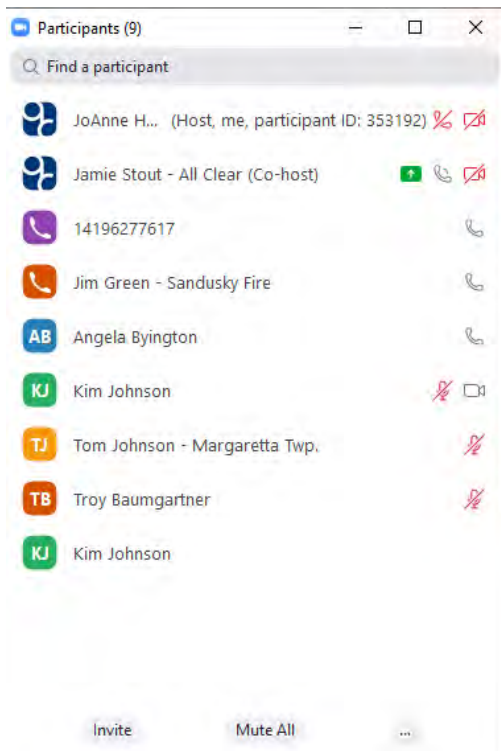
15 MINUTES AGO

Record

Erie County has scheduled a working meeting for the development of mitigation actions for each of the jurisdictions participating in the Erie County Hazard Mitigation Plan Update. As the meeting will be held virtually, through Zoom, we are asking that people register in advance by using this link: <https://bit.ly/2Eo6mqJ>. It is important that a representative from each jurisdiction participate in this meeting, as it will be your opportunity to develop mitigation actions that will affect your community.



15.6.3 List of Participants on Zoom



15.6.4 Record of Participation from Zoom

Meeting ID	Topic	Start Time	End Time	User Email	Duration (I	Participants
96433213788	Erie County Hazard Mitigation Plan Draft Re	10/7/2020 9:06	10/7/2020 9:56	jakep@allk	51	13
Name (Original Name)	User Email	Total Duration (Minutes)	Guest	Jurisdiction		
Troy Baumgartner	troybaumgartner@basbroadcasting.com	50	Yes	Citizen		
Jamie Stout - All Clear (All Clear EMG)	jakep@allclearmg.com	73	No	Contractor		
16146795459		35	Yes	Contractor		
15072695071		35	Yes	Contractor		
Kim Johnson	kjohnson@eriecounty.oh.gov	59	Yes	Erie County		
Jim Green - Sandusky Fire (Call-In User_1)		29	Yes	City of Sandusky		
Tom Johnson - Margaretta Twp. (chief101)	firechief@margarettatwp.org	29	Yes	Margaretta Township		
14196277617		26	Yes			
Angela Byington	angieb@perkinstownship.com	20	Yes	Perkins Township		
14196091400		19	Yes			

15.6.5 Meeting Minutes

Erie County Hazard Mitigation Plan

October 7, 2020
9:30 am- 10:30 am

Register for Zoom Meeting
[https://zoom.us/meeting/register/tJMtcuqhpz0iE9TcSHi8hjqRhBxPQpVu1wNJ](https://zoom.us/join/zoom/register/tJMtcuqhpz0iE9TcSHi8hjqRhBxPQpVu1wNJ)

Minutes

- I. Welcome
 - a. Last official zoom meeting
 - b. Presentation of draft plan. Need to get the plan done as soon as possible. All Clear will still be available by phone, email, etc.
- II. Mitigation process overview
- III. Mitigation plan draft overview
 - a. Draft completed of the plan
 - b. Updated all the sections of the plan
- IV. Sections of plan
- V. Key Updates
 - a. Historical hazards
 - b. County profiles
 - c. Planning description
 - d. Hazard identification
 - i. Hazard changes
 - 1. Added damaging winds
 - 2. Added waterspouts to tornado section
 - 3. Severe storms divided into severe summer and severe winter weather
 - a. Gives a better feel of determining what is causing the problem
 - 4. Renamed invasive species to Natural Biohazards, as it consisted of both invasive species and harmful algae blooms
 - 5. Lake level rise – included in flooding and erosion sections
 - e. Mitigation strategy
- VI. Community Participation



a. Cities, villages, and townships

VII. Risk Assessment

Hazard	Vulnerable Locations	Annual Probability of Occurrence	Estimated Annual Dollar Loss
Flood	Special Flood Hazard Areas, Karst Areas, Lakeshore, Localized	100%	\$1,290,125
Severe Winter Weather	Entire County	100%	\$341,542
Damaging Winds	Entire County	100%	\$278,083
Severe Summer Weather	Entire County	100%	\$151,887
Tornado	Entire County	20%	\$51,571
Waterspout	Lake Erie	29%	\$0
Earthquake	Localized	<1%	\$0
Drought	Entire County	25%	\$7,000,000*
Lake and Stream Bank Erosion	Localized	100%	Not Available
Natural Biohazards	Entire County	100%	Not Available

* One drought instance

VIII. Mitigation Strategy

IX. Next Steps

- a. Public Comment
 - i. Need to have at least two weeks to read draft plan and make comments
 - ii. Love to hear feedback or comments
 - iii. Leave plan open for comment until October 21
 - iv. Send link to online version of the plan, read through, send email to JoAnne
 - v. Social Media/Webposts with links. Love to hear your opinions, send documentation to JoAnne



- b. Usual process is that Ohio EMA send the plan to FEMA. Right now, the state is allowed to review some plans in house, without sending to FEMA. They are saving one spot for Erie County, and Ohio EMA is working with us to quickly push this plan through the approval process.
- c. Kelleys Island needs to be one of the very first adopters of the plan.

X. Plan Adoption

- a. Once the plan receives Approved Pending Adoption status, the All Clear Team will provide each jurisdiction with an Adoption Factsheet.
- b. Adoption needs to be a formal adoption.
- c. Townships do not need to adopt. Erie County Commissioners adopt it, it includes the townships. Townships can adopt if they want to.
- d. Other jurisdictions do need to formally adopt. If you do not, not considered participating, and not eligible for grant funds
- e. Will provided the sample language for the resolution

XI. Contact information

- a. JoAnne Huie - joanneh@allclearme.com
- b. Jamie Stout - jamies@allclearme.com



15.7 Calendar appointment for Meeting with City of Huron

The screenshot shows a calendar event with the following details:

- Title:** Erie Count EMA Mitigation Plan Update Meeting
- Time:** Monday, October 12 - 8:30 - 9:30am
- Location:** Conference Room - Huron City Hall
- Guests:** 3 guests (1 yes, 2 awaiting)
- Organizer:** mike.spafford@huronohio.us
- Attendees:** JoAnne Huie, doug.green@huronohio.us
- Description:** Meeting with JoAnne Huie to update Hazard Mitigation Plan. Call JoAnne at (303) 916-8853
- Reminder:** 10 minutes before
- Created by:** JoAnne Huie

At the bottom, there is a 'Going?' section with buttons for 'Yes', 'No', and 'Maybe', along with an upward arrow icon.

15.8 Other Telephonic Communications

Other telephone communications with Erie County, the Village of Berlin Heights/Berlin Township, the Village of Castalia, and the Village of Milan occurred as impromptu meetings between the jurisdiction representatives and the project contractor. No calendar appointments for these meetings exist.

16 Appendix C: Public Comment on Plan

The draft plan was made available online for the public to view and comment from October 7, 2020 through October 21, 2020. During this time, no public comments were received. However, some members of the planning committee found minor editorial corrections which were made to the draft plan prior to submission.



Emergency Management

EMA

EMA Staff / Contact Us

Photo Gallery

Local Emergency Planning Committee (LEPC)

Emergency Planning

911

Mitigation Draft Plan Review

Announcing the final opportunity for the public and our partners to review the Erie County Natural Hazard Mitigation Plan draft and submit any comments. Your input is very important to us. To view the plan please go to <https://bit.ly/30It5Gf>.

ERIE COUNTY HAZARD MITIGATION PLAN REVIEW

PUBLIC COMMENT PERIOD OPEN THROUGH OCTOBER 21, 2020

Erie County EMA - Ohio - Home

https://www.facebook.com/ErieCountyEMA/?modal=admin_todo_tour

Erie County EMA - Ohio

Page Inbox Resou... Manage Jobs Notifications 20 Insights More

Like Follow Share

Posts

Erie County EMA - Ohio
Published by Kim Johnson [?] · Just now

Announcing the final opportunity for the public and our partners to review the Erie County Natural Hazard Mitigation Plan draft and submit any comments. Your input is very important to us. To view the plan please go to <https://bit.ly/30It5Gf>.

ERIE COUNTY HAZARD MITIGATION PLAN REVIEW


PUBLIC COMMENT PERIOD OPEN THROUGH OCTOBER 21, 2020

ay 2020 - Goc x Erie County EMA - Ohio on Twitt x +

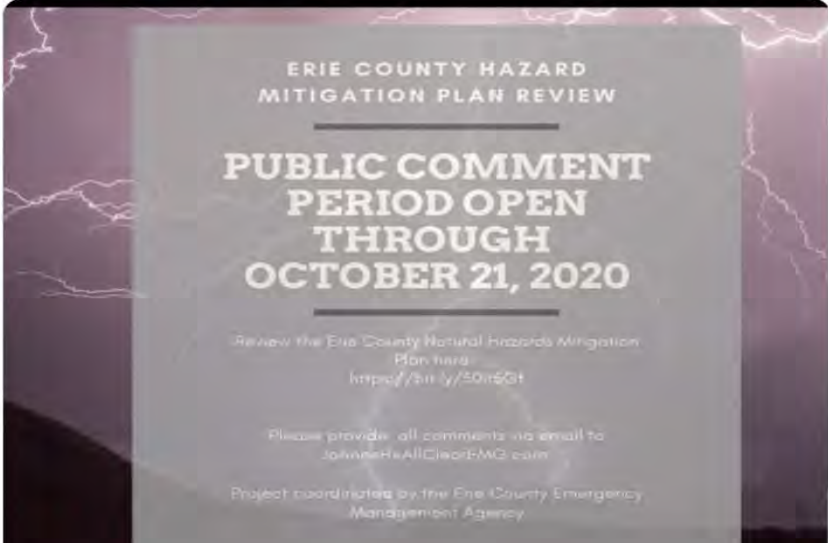
https://twitter.com/eriecountyema/status/1314624942802194432

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Profile
More

Tweet

 **Erie County EMA - Ohio**
@eriecountyema

Announcing the final opportunity for the public and our partners to review the Erie County Natural Hazard Mitigation Plan draft and submit any comments. Your input is very important to us. To view the plan please go to bit.ly/30lt5Gf.




ERIE COUNTY HAZARD MITIGATION PLAN REVIEW

PUBLIC COMMENT PERIOD OPEN THROUGH OCTOBER 21, 2020

Review the Erie County Natural Hazards Mitigation Plan here:
<https://bit.ly/30lt5Gf>

Please provide all comments via email to JoAnneHeAllClearEMG.com

Project coordinated by the Erie County Emergency Management Agency

 **Erie County EMA - ...**
@eriecountyema



ERIE COUNTY HAZARD MITIGATION PLAN REVIEW

PUBLIC COMMENT PERIOD OPEN THROUGH OCTOBER 21, 2020

Review the Erie County Natural Hazards Mitigation Plan here:
<https://bit.ly/30lt5Gf>

Please provide all comments via email to JoAnneHeAllClearEMG.com

Project coordinated by the Erie County Emergency Management Agency

 **eriecountyema_ohio**

 **eriecountyema_ohio** Announcing the final opportunity for the public and our partners to review the Erie County Natural Hazard Mitigation Plan draft and submit any comments. Your input is very important to us. To view the plan please go to <https://bit.ly/30lt5Gf>.

2m

Be the first to like this
2 MINUTES AGO

Add a comment... Post

17 Appendix D: Public Involvement

Each of the public meetings held regarding the Erie County Natural Hazards Mitigation Plan was open to the public and documented in this section. Below is the Erie County Hazard Mitigation Plan Outreach Strategy.

All Erie County jurisdictions are committed to the whole community approach for developing, maintaining, and implementing the Erie County Natural Hazard Mitigation Plan (HMP). The following strategies will be implemented to ensure the success of this HMP.

A. Goals of Outreach:

1. To encourage public involvement and buy-in to the plan and plan process.
2. To solicit and incorporate stakeholder and public input into mitigation objectives, goals and action items.
3. To facilitate stakeholder and public input into the assessment and mitigation of the risks facing Erie County.
4. To allow for public and stakeholder review and comment of draft plan.

B. Outreach Methods

Outreach Method	Implementation
Community Events	Community events, booth at any public events.
Interviews	Targeted discussions with County officials, municipal officials, affected stakeholders, schools, universities, and the general public to identify hazards of concern and potential mitigation measures.
News Media	Local television, radio and print media partners promote widespread public involvement, post to the community's online public events calendar, local news media coverage of public meetings, assist with notifying the public of meetings and the opportunity to comment.
Presentations to Governing Bodies	Presentations about the plan and plan process during County Commissioner General Sessions, City Council meetings. Communications from local jurisdictions/ Erie County to all employees to solicit feedback.
Questionnaires/ Surveys	Distribution of survey online via the Erie County EMA website, and the websites of participating jurisdictions. Copies of the survey distributed by local officials and made available for residents to complete at local county and municipal offices and community events, and an electronic version was posted on local websites.
Public Meetings/ Existing Committees	Distribution of mitigation information at exiting public meetings, LEPC, other.

Outreach Method	Implementation
Social Media	Promoted via any jurisdictional social media accounts in the county.
Area-specific Meetings	Participate in regional meetings and local township trustees meetings and other area specific meetings to distribute mitigation information.
Letter to Adjacent Counties	Invitation letter sent to all adjacent counties in order to invite them to participate.
Faith Based Outreach	Churches distribute survey, present at meetings when possible.
Business/ Private Sector	Distribute survey, solicit feedback on draft planning document.

17.1 Mitigation Factsheet



What is Hazard Mitigation?

What is Mitigation?

Hazard mitigation includes any actions taken to decrease or eliminate the impacts of natural hazards (things like flooding and severe storms) on our community. Mitigation can take many forms, purchasing flood insurance, using tornado sirens, and setting building standards to withstand high wind. These are all examples of mitigation at work. Mitigation is taking action now, before a disaster, to reduce loss of life and damage to property.

What is a mitigation plan?

- A Hazard Mitigation Plan is a written guidebook detailing how a community wants to lessen or eliminate disaster related impacts.
- Contains details on what hazards the community faces and provides possible strategies to reduce their impacts.
- Each participating Erie County jurisdiction has included projects for their community to reduce the impact of the hazards present in each area.

Why is hazard mitigation important?

- Saves money by decreasing the losses from disaster events.
- Builds partnerships by involving the government, public, non-governmental organizations, and private businesses.
- Increases awareness of hazards and risk for a particular area.
- Helps the community make decisions based on risk.

What can you do to help?

Attend public meetings and help shape the plan update!

Read and comment on the plan to inform the changes we will make in this update cycle.

Complete a survey on mitigation at the following link:

<https://www.surveymonkey.com/r/ErieHMP>



Erie County Emergency Management Agency

2800 Columbus Avenue
Sandusky, Ohio 44870

Director: Tim Jonovich

Administrative Assistant: Kim Johnson

Phone: (419) 627-7617

[www.ErieCountyOhio.gov/
EmergencyManagement](http://www.ErieCountyOhio.gov/EmergencyManagement)

The essential steps in hazard mitigation planning are:

1. Identify the hazards in your community.
2. Determine how vulnerable you are to the hazards you face.
3. Choose the actions your community can take to reduce the impact from your hazards.
4. Implement your plan of action.

Is there a financial benefit?

The Federal Emergency Management Agency (FEMA) requires each local government to have a mitigation plan in order to be eligible to receive federal grant funding for local hazard mitigation projects.

FEMA also estimates that mitigation saves six dollars for every dollar spent!

For more information, please contact the planning contractor, All Clear Emergency Management Group at 336-802-1800.



17.2 Survey

ERIE COUNTY HAZARD MITIGATION PLAN
WE NEED YOUR HELP

Grants and Funding Plan and Prepare Mitigate

Take the Community Survey
<https://www.surveymonkey.com/r/ErieHMP>



**ERIE COUNTY
NATURAL HAZARD
MITIGATION PLAN**

**TAKE THE COMMUNITY
SURVEY**

WWW.SURVEYMONKEY.COM/R/ERIEHMP



Erie County Natural Hazard Mitigation Plan Community Survey

The Erie County Emergency Management Agency is currently leading a project to update the Natural Hazard Mitigation Plan. This mitigation plan serves as a roadmap to reducing the impacts of hazards on Erie County. This questionnaire is designed to help the team designated to lead this project understand the concerns that the residents of Erie County have about the hazards which their communities face. Your responses will help guide the development of this important plan.

Please note survey responses are kept confidential. Participation in this survey is voluntary and your completed questionnaire indicates your willingness to participate in the survey. Thank you for taking the time to help your community with the preparation of our mitigation plan.

If you have any questions regarding this survey, please contact JoAnne Huie at JoAnneH@AllClearEMG.com.

Helpful Definitions

Critical Facilities - Any building or structure that provides services to people that are important during an emergency. Examples include fire stations, hospitals and 9-1-1 dispatch centers. Other critical facilities can include buildings that house vulnerable populations, such as nursing homes, or buildings or structures that house hazardous materials that can create additional risks if that building is damaged during a natural disaster.

Hazardous Materials - Any solid, liquid, or gas that has the potential to cause harm to people, animals, property or the environment. Examples include fertilizers, gasoline, or other chemicals involved in manufacturing.

Invasive Species - Any kind of living organism (including plants, insects, animals, etc.) that is not native to where it is found. They can cause damage to the environment or human health. Examples include Emerald Ash Borer, zebra mussels, and Gypsy Moths.

Natural Disaster - A major event caused by natural processes of the Earth. These can cause loss of life and property damage. Some result in economic damage for a long time after the event. Examples include flooding, landslides, tornadoes, and wildfires.

Natural Hazard - Any risk to people and property caused by a natural process of the earth that has the *potential to be* dangerous. Natural disasters are caused by natural hazards, such as tornadoes and floods.

Mitigation - Actions done to reduce or eliminate a risk to people and property. Mitigation helps reduce damage caused by natural hazards. Examples include not building in areas that have been known to flood frequently or putting salt or sand on roadways in the winter to reduce traffic accidents caused by ice.

Resistant - The ability to withstand harmful effects of something, such as natural disasters. One type of resistant building is a tornado shelter that is specifically built to protect people from the effects of tornadoes.

Risk - Risk or threat is the possibility of something bad happening. The risk of a winter storm in Ohio is greater than the risk of a hurricane.

Vulnerable Populations - Groups of people who are at a higher risk than the overall population to experience more severe effects from natural disasters. Examples include residents of a nursing home, young children, and people with limited resources.

1. In which community do you live?

Other (please specify)

2. Do you own or rent your home?

Own

Rent

Other (please specify)

3. Do you have flood insurance?

Yes, purchased voluntarily

Yes, required by insurer or mortgage holder

Yes, unsure why purchased originally

No, too expensive

No, not necessary

No, deductible is too high

No, never considered it

Other (please specify)

4. Would you be willing to make your home more resistant to disasters?

I would be willing to spend a lot of time and/or money

I would be willing to spend a moderate amount of time and/or money

I would be willing to spend a little or no time and/or money

I would be interested in seeking grant funding (example: Safe Room Rebate Program) to make my home more resistant to disasters

Not sure

No

5. What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards?

- Newspaper
- Television
- Radio
- Internet
- Social media
- Mail
- Public workshops/meetings
- School meetings
- Other (please specify)

6. How informed do you feel about the natural hazard risks (earthquake, tornado, winter storm, etc.) facing Erie County?

- Very Informed
- Somewhat informed
- I have little to no knowledge about the hazards in Erie County

7. Please check the box that indicates how concerned you are about the following hazards affecting your community.

	Extremely Concerned	Very Concerned	Concerned	Somewhat Concerned	No Concerned
Drought	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Earthquake	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flooding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Invasive Species (Gypsy Moths, Emerald Ash Borer, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Severe Summer Storm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Severe Winter Storm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tornado	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wildfire	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. Are there natural hazards you are concerned about that are not listed above? If so, please list them below.

9. What types of hazards have you personally experienced in Erie County? (example: flooding at my home, tornado at my place of work, winter storms, etc.)

10. Are there places in your community that are impacted, or could be impacted, by specific hazards? (e.g. Main Street floods after heavy rain.) If so, please describe the hazard and the specific location.

11. In your opinion, what are some actions your local government could take to reduce the risk of future hazard damages to your community?

Questions 12-17 describe different methods that can be used to reduce the risk that hazards pose to lives and property. Please share how important you think each of these methods are in reducing risk in Erie County.

12. Prevention Strategies - These are actions taken to keep a problem from getting worse. An example of a prevention strategy are laws and ordinances that prevent construction of new buildings in floodplains.

- Very important
- Somewhat important
- Not important

13. Property Protection Strategies - These are actions taken to lessen the risk of damage to property. Examples of property protection strategies include removing homes from the floodplain and elevating homes to stay above water levels during flooding.

Very important

Somewhat important

Not important

14. Public Education and Awareness Strategies - These are actions taken to inform the public about hazardous areas and the actions necessary to avoid potential injury or damage. Examples of public education and awareness strategies include outreach programs, notices to residents and property owners, and public service announcements, such as the "Turn Around, Don't Drown" campaign.

Very important

Somewhat important

Not important

15. Natural Resource Protection Strategies - These are actions intended to protect the environment. Examples of natural resource protection strategies include placing limits on hunting and fishing, and requiring boaters to completely clean off the hull of their boats before moving them from one body of water to another.

Very important

Somewhat important

Not important

16. Critical Facility Protection - These are actions taken to protect critical facilities which are important to response efforts. An example of critical facility protection strategy is placing backup generators in hospitals to ensure there is electrical power even in the event of a widespread power outage.

Very important

Somewhat important

Not important

17. Structural Project Strategies - These are actions which directly protect people and property through the construction of manmade structures. Examples of structural project strategies include adding additional storm sewers or elevating roadways to reduce flooding.

Very important

Somewhat important

Not important

18. If you are interested in learning more about emergency preparedness and hazard mitigation, how do you want to receive this information? Check all that may apply.

- Classroom trainings
- Direct mailing
- Information booth (at the County fair, or other public event)
- Newspaper articles
- Online articles
- Online videos
- Social media posts

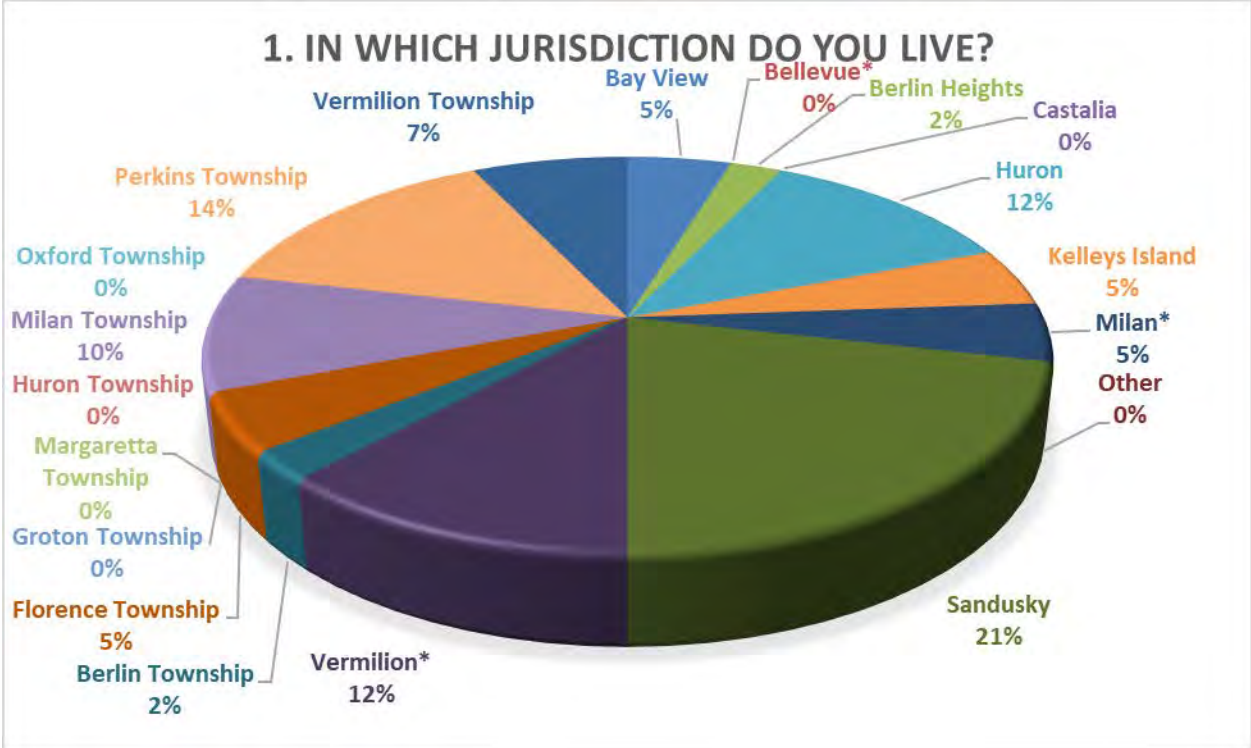
19. How are you currently receiving emergency information in Erie County or your jurisdiction? Check all that may apply.

- Erie County Wireless Emergency Notification System (WENS)
- City of Vermilion Emergency Alerts
- National Weather Service Weather Alert Radio
- I am not receiving any emergency information in Erie County or my jurisdiction.
- Other (please specify)

20. Do you have any other comments, concerns or suggestions about hazard mitigation planning in your community?

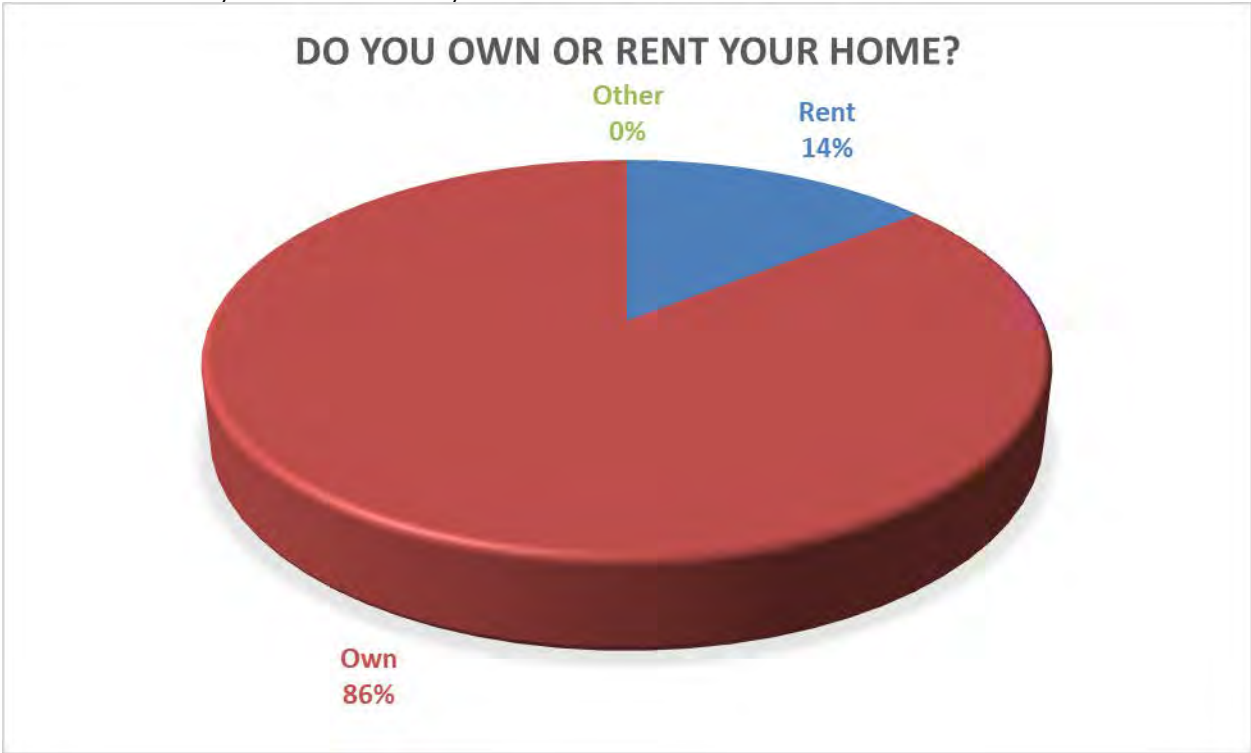
17.3 Survey Results

Question 1: In which jurisdiction do you live?

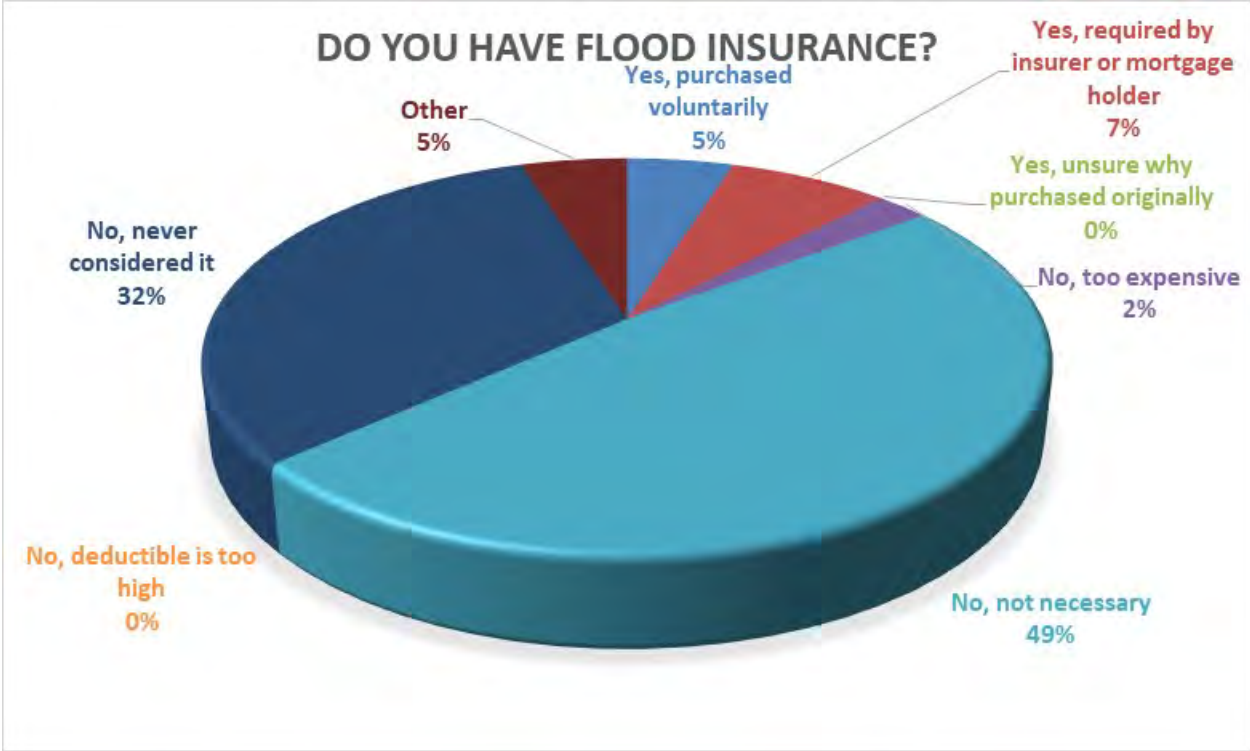


* Erie County portion, only

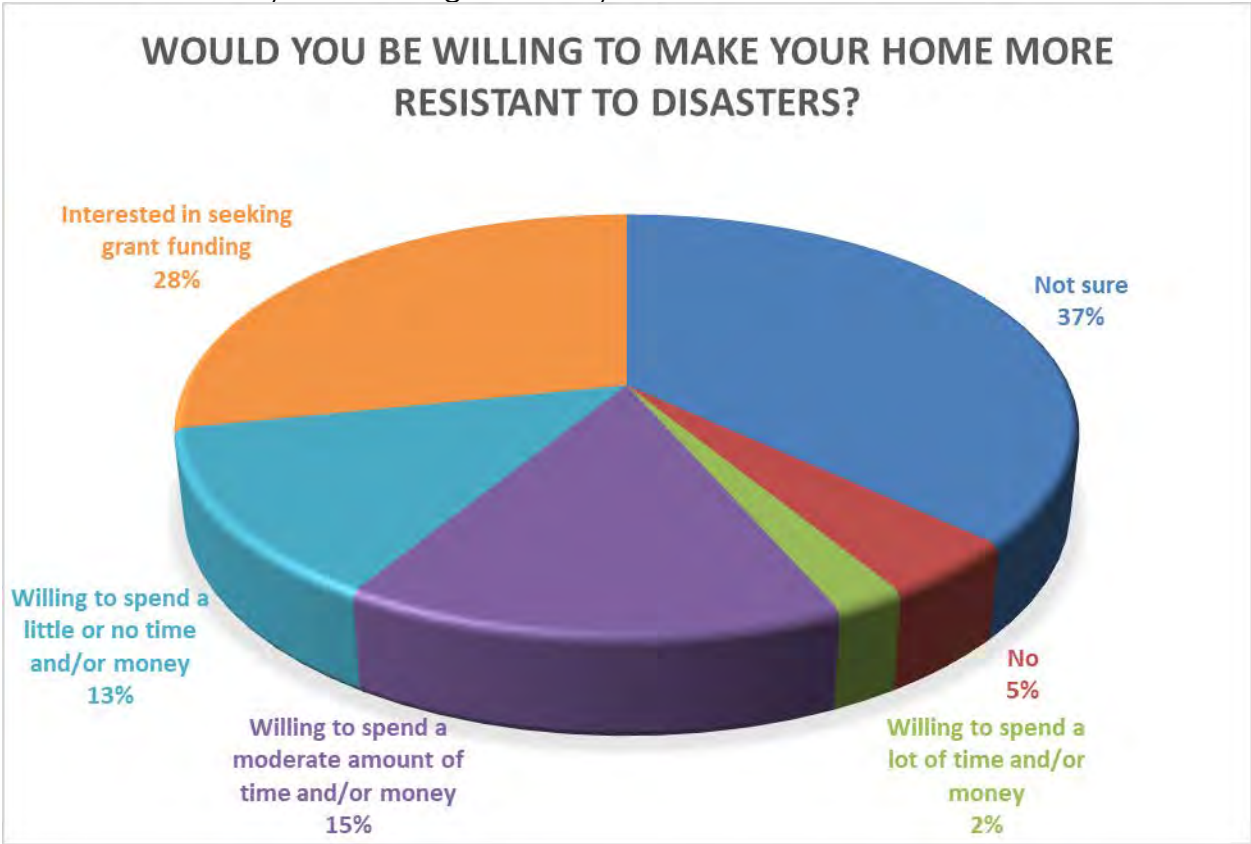
Question 2: Do you own or rent your home?



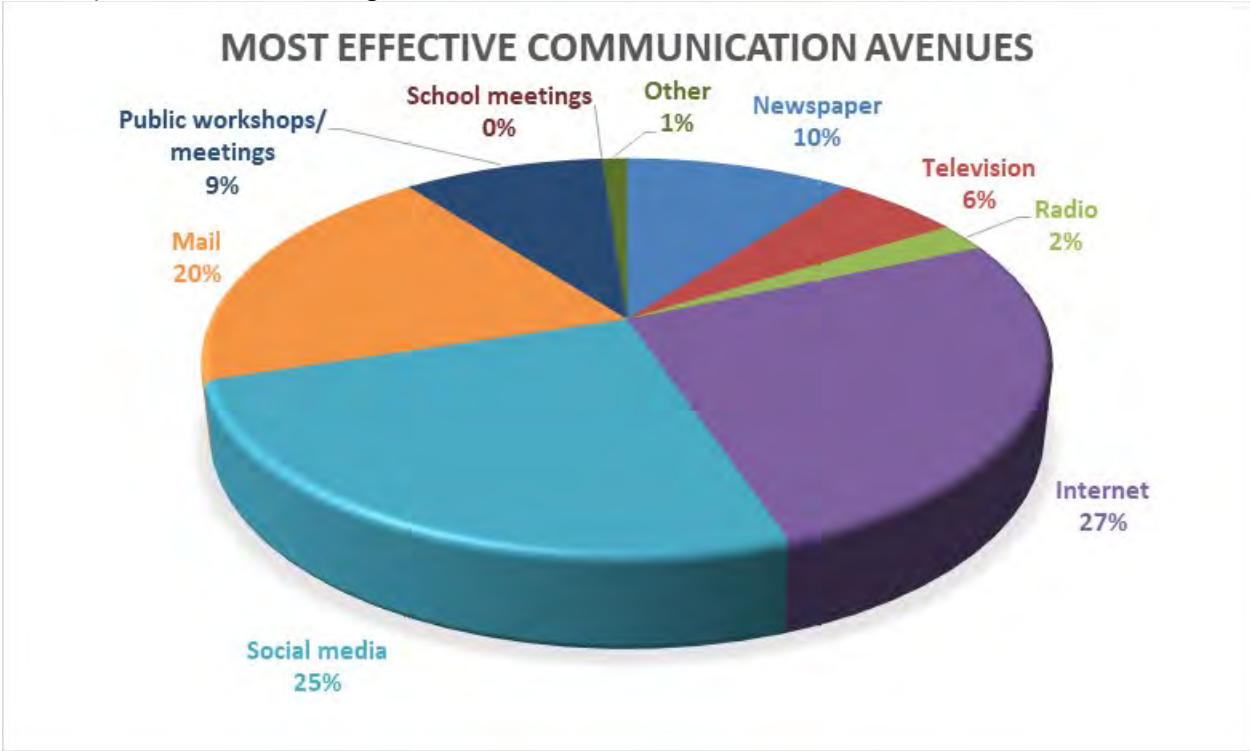
Question 3: Do you have flood insurance?



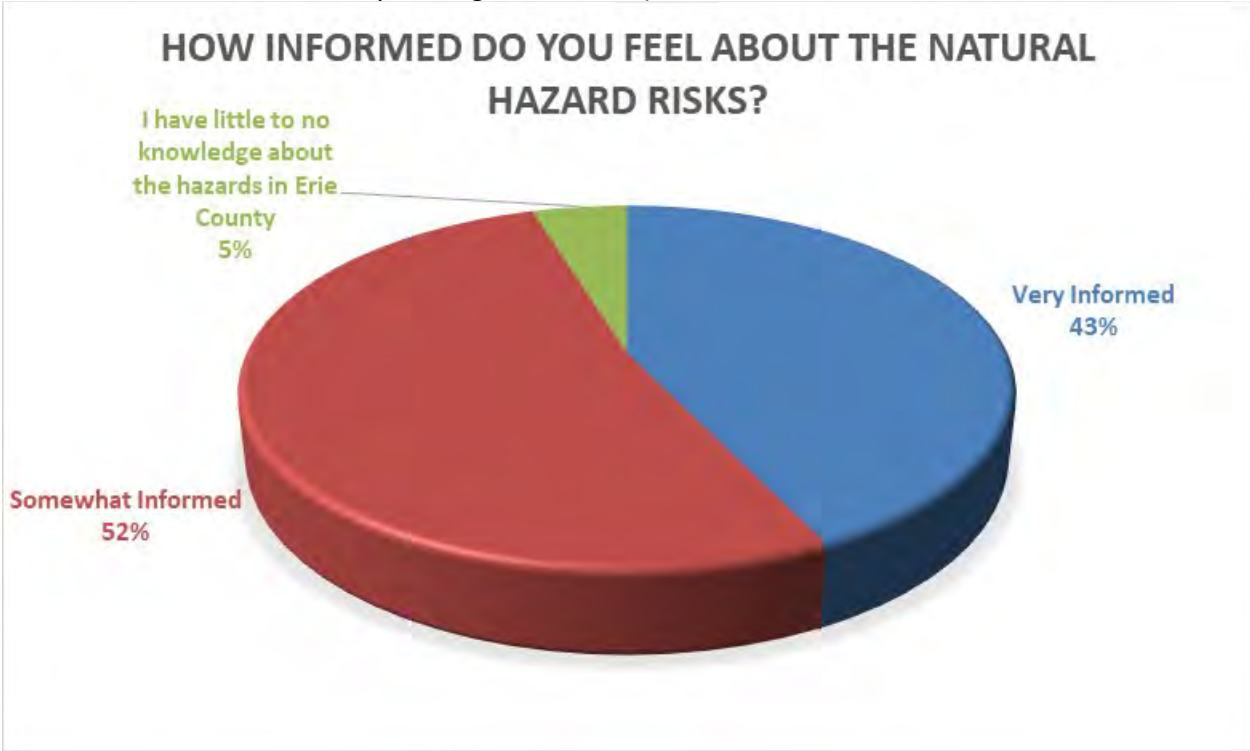
Question 4: Would you be willing to make your home more resistant to disasters?



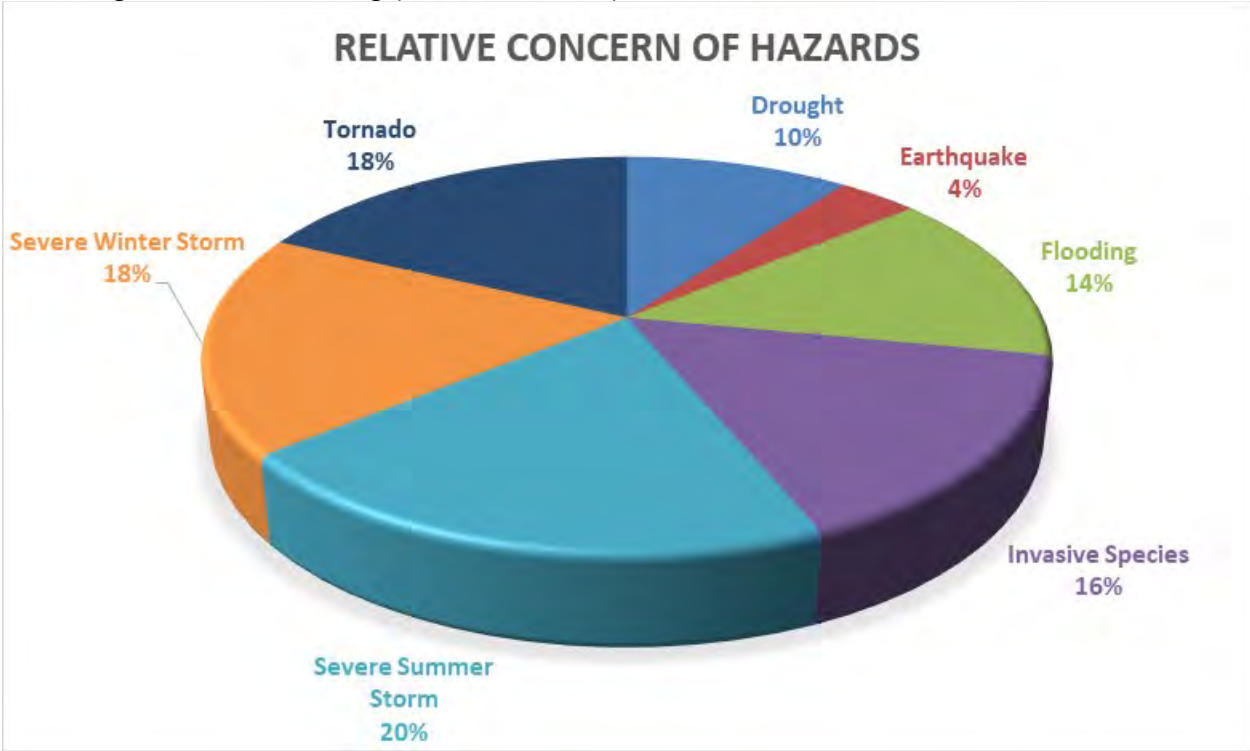
Question 5: What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards?



Question 6: How informed do you feel about the natural hazard risks (earthquake, tornado, winter storm, etc.) facing Erie County?



Question 7: Please check the box that indicates how concerned you are about the following hazards affecting your community.



Question 8: Are there natural hazards you are concerned about that are not listed above? If so, please list them below.

- biological hazards, solar flares (and lots of other types of hazards not considered "natural")
- no
- HAB
- Climate-induced lake levels Karst
- Pandemics
- Most concerned about stabilizing power / electric, due to high winds, falling trees
- HABs
- Extreme Temperatures
- Nexus pipeline leak/rupture
- Heat days

Question 9: What types of hazards have you personally experienced in Erie County? (example: flooding at my home, tornado at my place of work, winter storms, etc.)

- Tornado on Adams St
- Blizzard/ice, damaging straight line winds, summer flooding
- High winds, storms
- High winds and rain
- Winter storms, high wind storms, summer storms
- Summer storms
- Flood, winter storm, tornado
- Severe summer storms
- Shoreline flooding, tornado in DT Sandusky, HAB in Lake Erie
- Flooding Winter storms
- Flooding, winter storms
- Flooding, winter storms, tornadoes, summer storms
- Flooding at work in Berlin Heights, high winds and power outages at home and work.
- Flooding due to water main break, wind damage
- Flooding at the end of my street.
- Winter storms. Heavy thunderstorms
- Winter storms. Summer storms - high winds
- Tornado, Flooding. Winter Storms.
- Winter storms, flooding at my home, severe thunderstorms, high winds
- Winter storms
- Mild flooding in crawlspace. Has not caused damage, I have a sump pump and monitor any dampness in the crawlspace, and turn on sump pump if there's significant standing water. If the flooding makes its way to my furnace, however, my furnace would be ruined. I am retired and on a fixed income and cannot afford to waterproof the crawlspace. Grants may help.
- Flooding, Blizzard
- Polar Vortex
- '78 blizzard, flooding causing damage to road
- Flooding-community, wind damage
- Summer storm. Hail damage
- None
- Flooding, invasive species
- Winter storms
- None
- Flooding, high water, winter storms

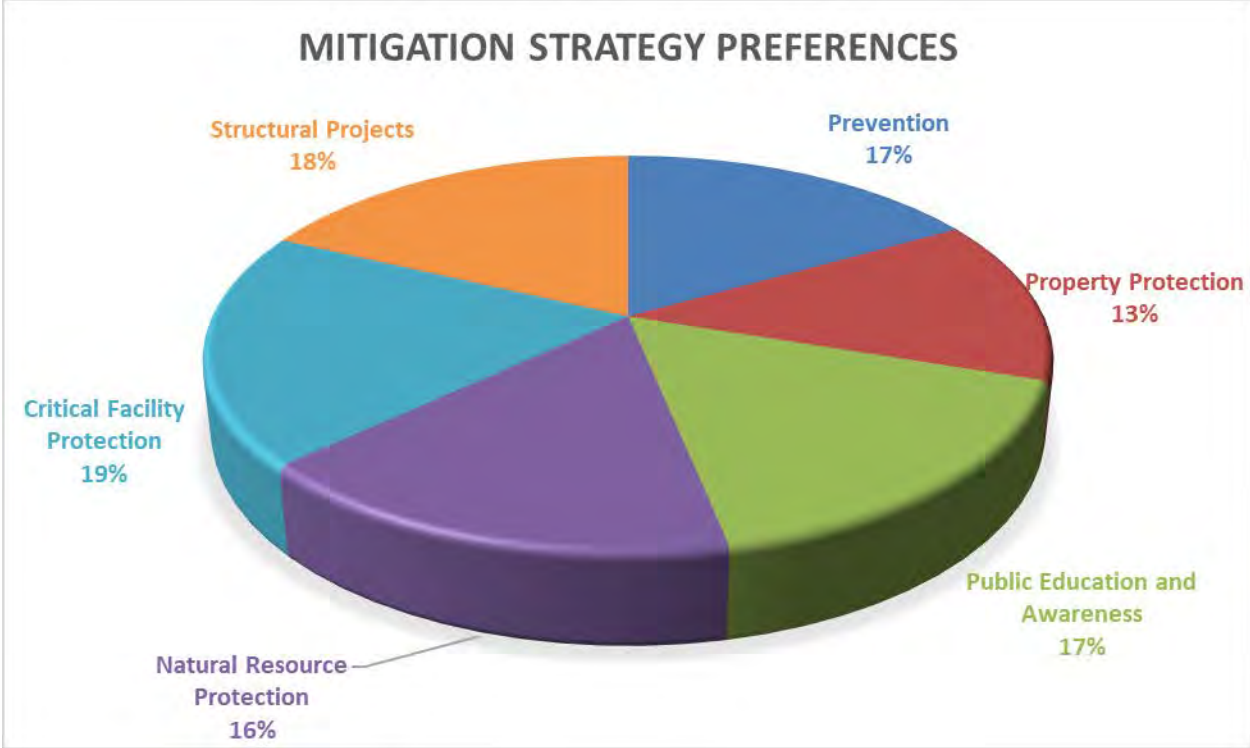
Question 10: Are there places in your community that are impacted, or could be impacted, by specific hazards? (e.g. Main Street floods after heavy rain.) If so, please describe the hazard and the specific location.

- Flood plain has no residents so very low concern, despite tree damage/loss in summer 2019 there are still many that could do property damage throughout village
- NA
- Vermilion river flooding issues
- Our roads with high water
- Downtown power outages. 5th St Sandusky power outages high winds
- Street flooding, extreme high winds and aged infrastructure, flooding and drought impacts local farmers, etc., invasive species impacting trees, 100 year snowstorm?
- Central Ave & Tyler St intersection north west corner floods after Every heavy rainfall
- 1st 2nd Farwell St. flooding.
- Erosion control important. Farmers could always do a better job of preventing erosion and fertilizer runoff.
- Mobile home community tornado or high winds
- Huron River is subject to flooding. The coast of Huron is subject to erosion.
- Pipe Creek flooding
- Long by the river
- Main street flooding
- I live near the bay and streets around me particularly flood from rising bay levels after heavy rain. Not sure what can be done about that.
- Floods, high water levels on the perimeters of the village (Clemens; Deer Park)
- Street I live on always concerned about flooding when we get heavy rain
- Trees and erosion in chapel creek cause flooding to occur sooner than it did 10-20 years ago
- River Ave flooding
- Waterfront damage with lake levels rising
- Unknown
- Coastal flooding from Crystal Rock to Huron. Flooding at Lakeland in Perkins Township. Emerald ash bore killed all our ash trees.
- Huron River area and lake front
- High water, East Lakeshore, just at Seaway Marina

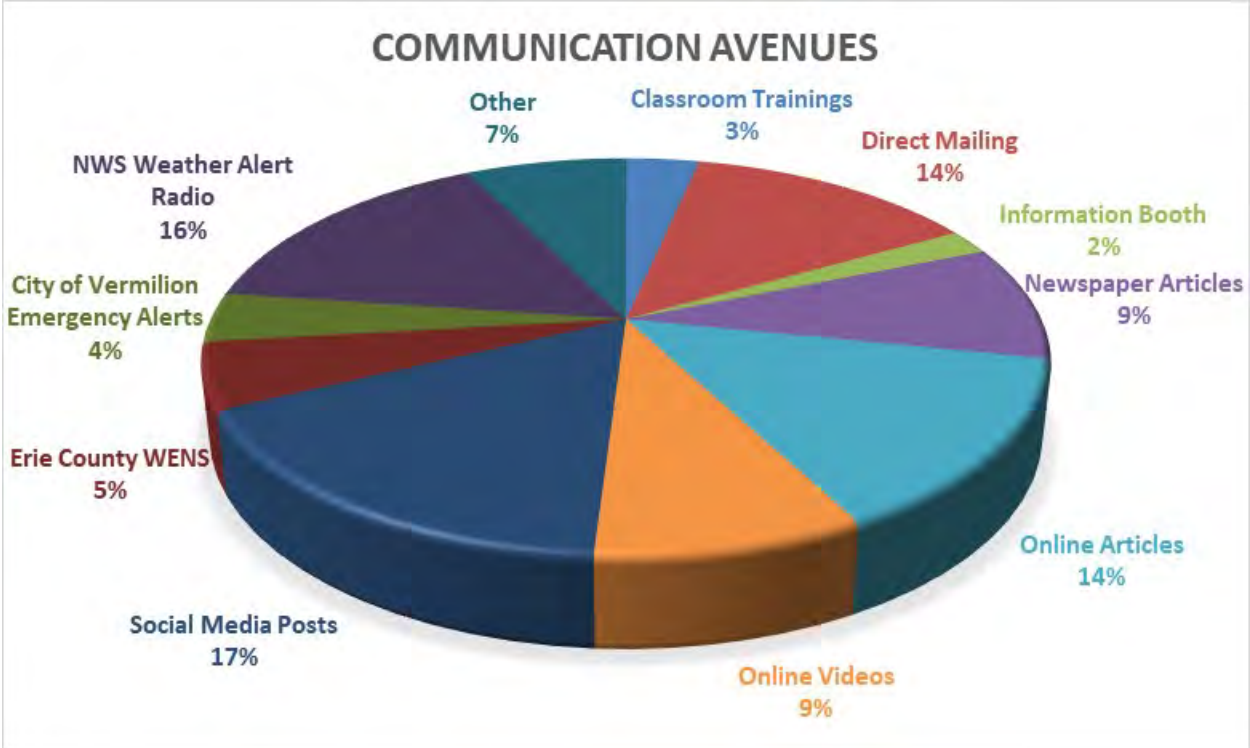
Question 11: In your opinion, what are some actions your local government could take to reduce the risk of future hazard damages to your community?

- Tornado shelter at old Erie Co. Bank
- This survey's a good start for educating people
- Unknown
- Unsure
- Seek funds
- Improve stormwater, infrastructure, target use of harmful chemicals, really basic things too, like trees are good and take your bags to the grocery store
- Storm water management
- Check valves on outflows after any needed separation.
- Stabilize power with underground electric where feasible and prevention of runoff and erosion by farmers and nurseries.
- Early warning
- We as a fire dept. have plans in place for river flooding.
- Improve the tornado sirens as they can be hard to hear inside a building.
- Unsure.
- Restore the shoreline with a living shoreline
- Currently a bridge project is taking place It is replacing a culvert it should help with the flooding problem when it is complete
- Build the waterfront higher
- Remove trees, other blockage from creek. Require farm fields with greatest risk at point of entry utilize grass buffers, cover crops, other tools to slow the rate at which water is leaving farm fields
- Storm sewer upgrades
- Stop letting people build and fill in floodplain. Fix storm sewer issues.
- Some government entity should take responsibility for the inputs/outputs to Lake Erie
- Working with Army Corp of Engineers

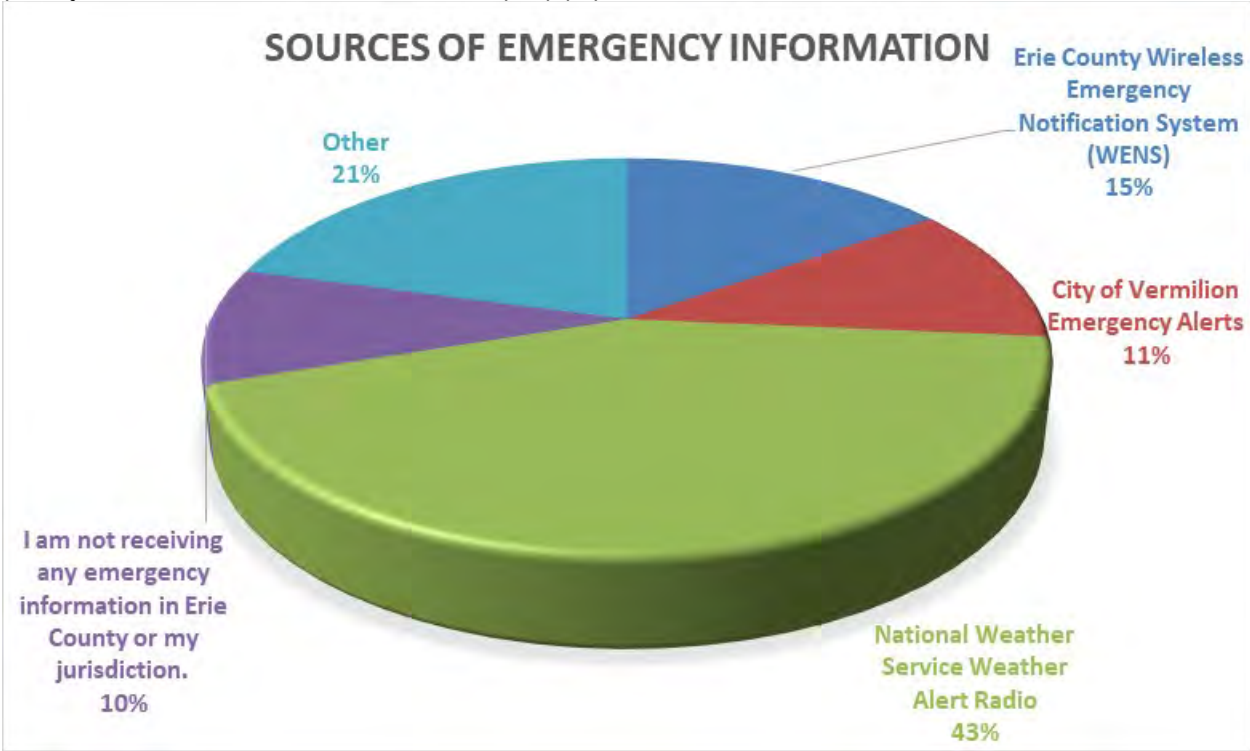
Questions 12-17 describe different methods that can be used to reduce the risk that hazards pose to lives and property. Please share how important you think each of these methods are in reducing risk in Erie County.



Question 18: If you are interested in learning more about emergency preparedness and hazard mitigation, how do you want to receive this information? Check all that may apply.



Question 19: How are you currently receiving emergency information in Erie County or your jurisdiction? Check all that may apply.



Question 20: Do you have any other comments, concerns or suggestions about hazard mitigation planning in your community?

- Poor septic system run off
- Community member involvement and participation is important in hazard mitigation.
- Be more aggressive in communication especially now

18 Appendix E: Land Use Maps for the Townships of Erie County

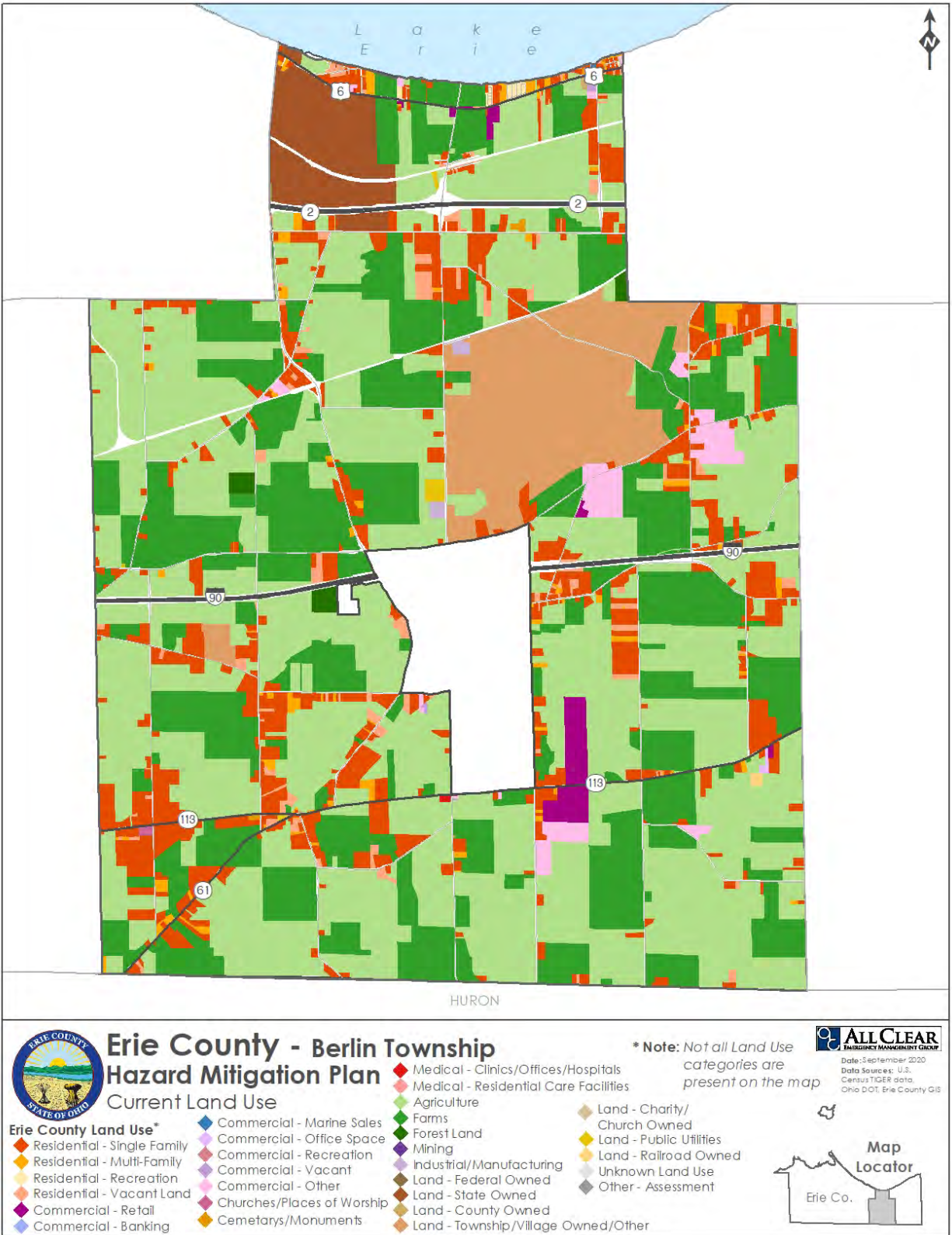


Figure 58: Land Use Map for Berlin Township

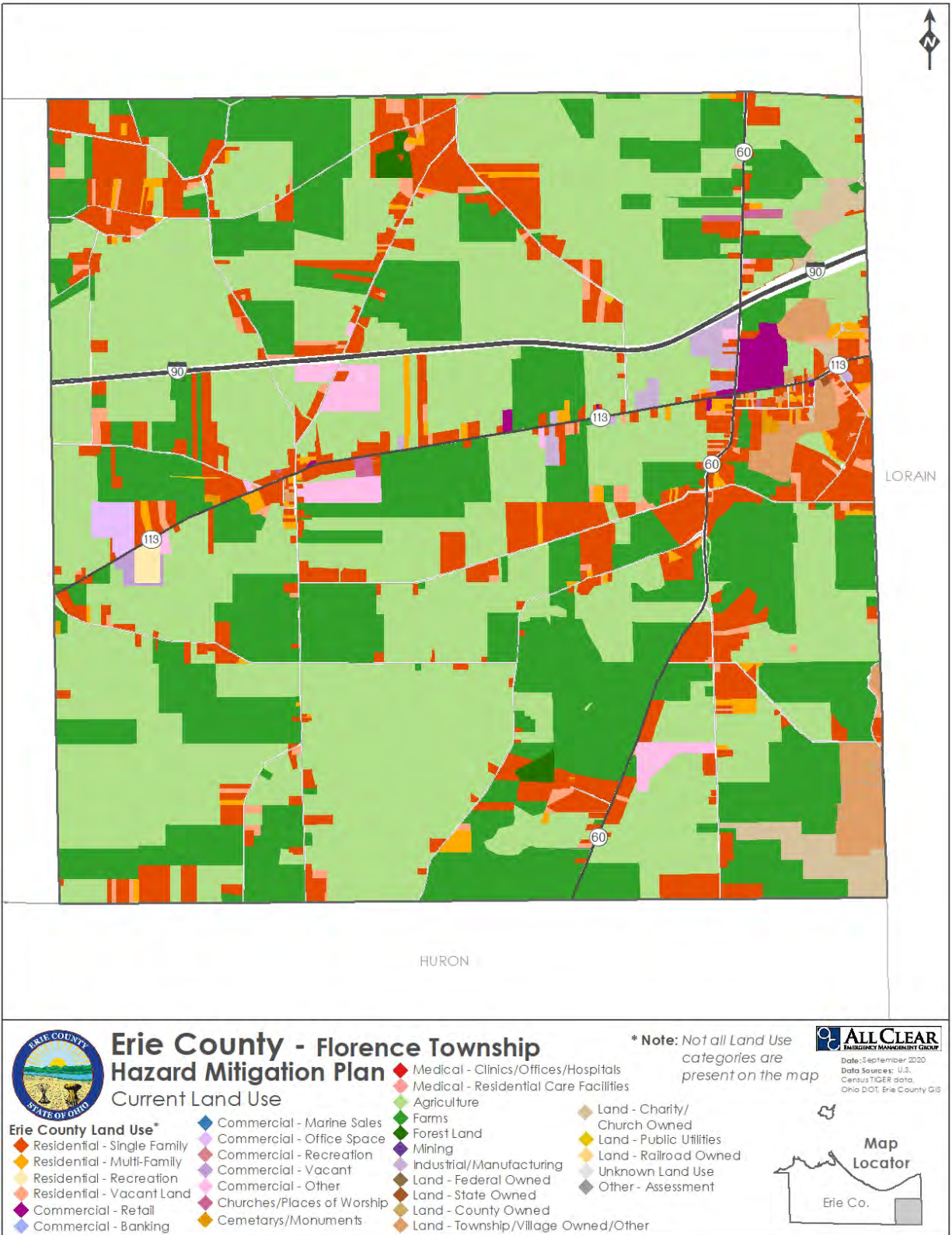


Figure 59: Land Use Map for Florence Township

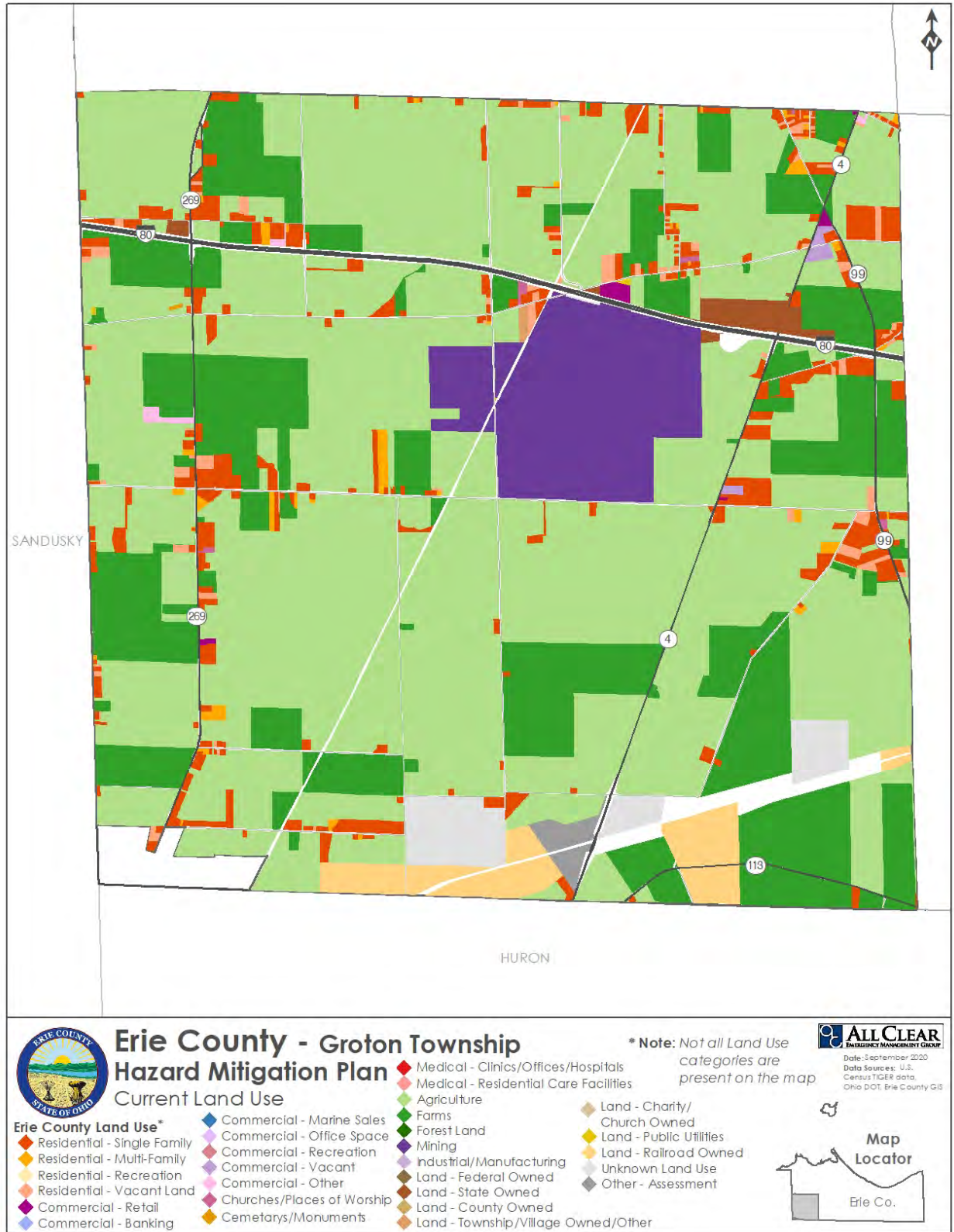


Figure 60: Land Use Map for Groton Township

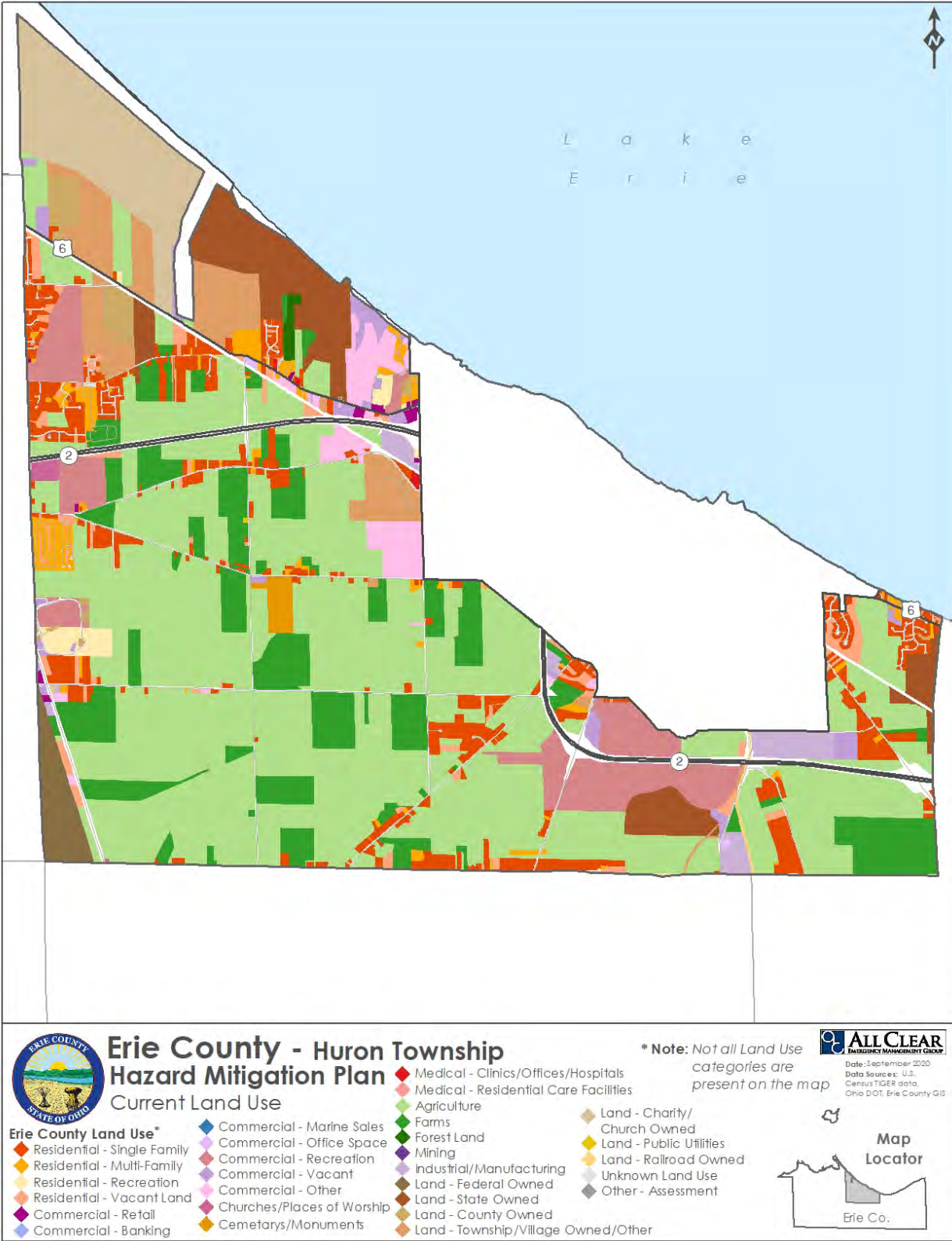


Figure 61: Land Use Map for Huron Township

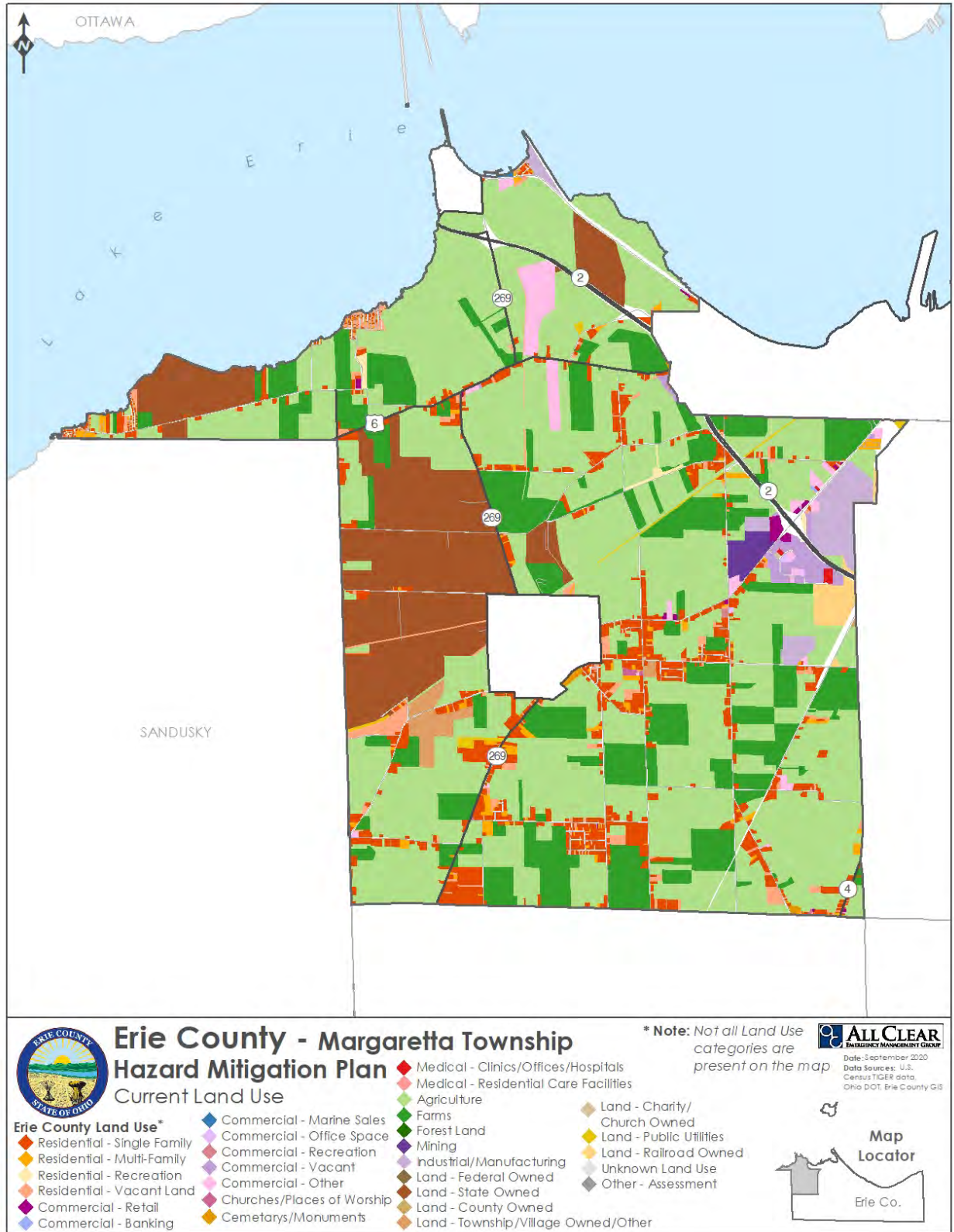


Figure 62: Land Use Map for Margarett Township

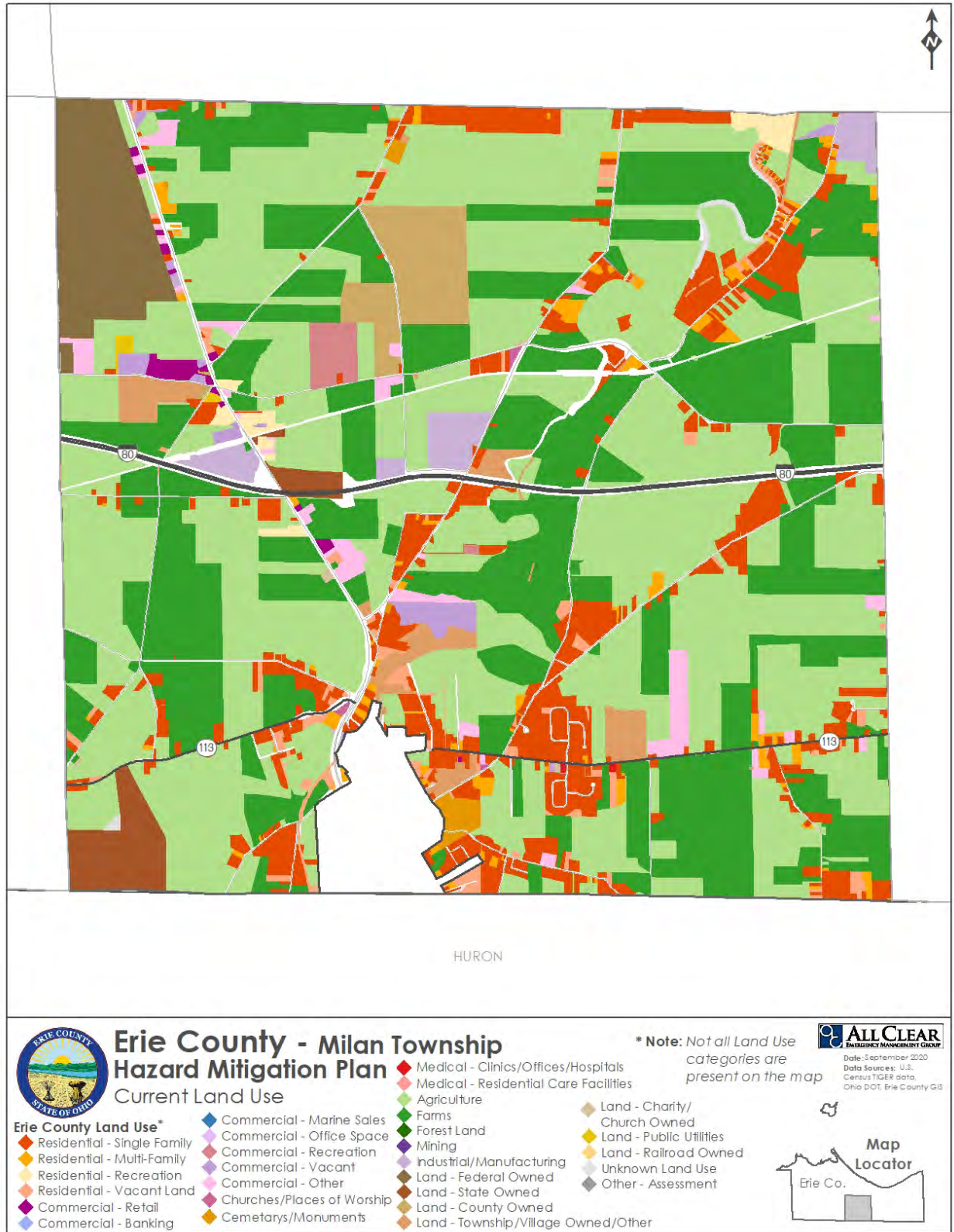


Figure 63: Land Use Map for Milan Township

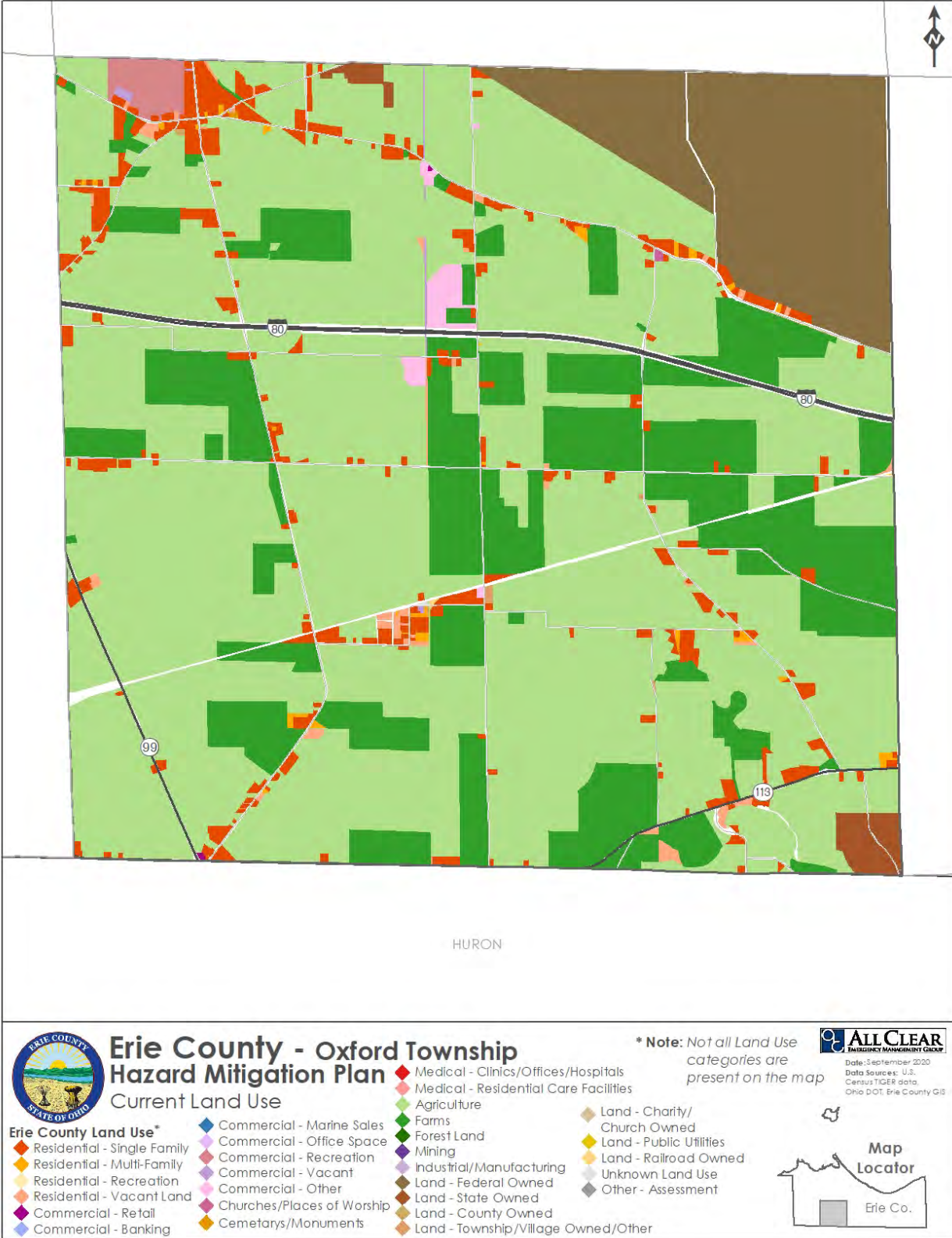


Figure 64: Land Use Map for Oxford Township

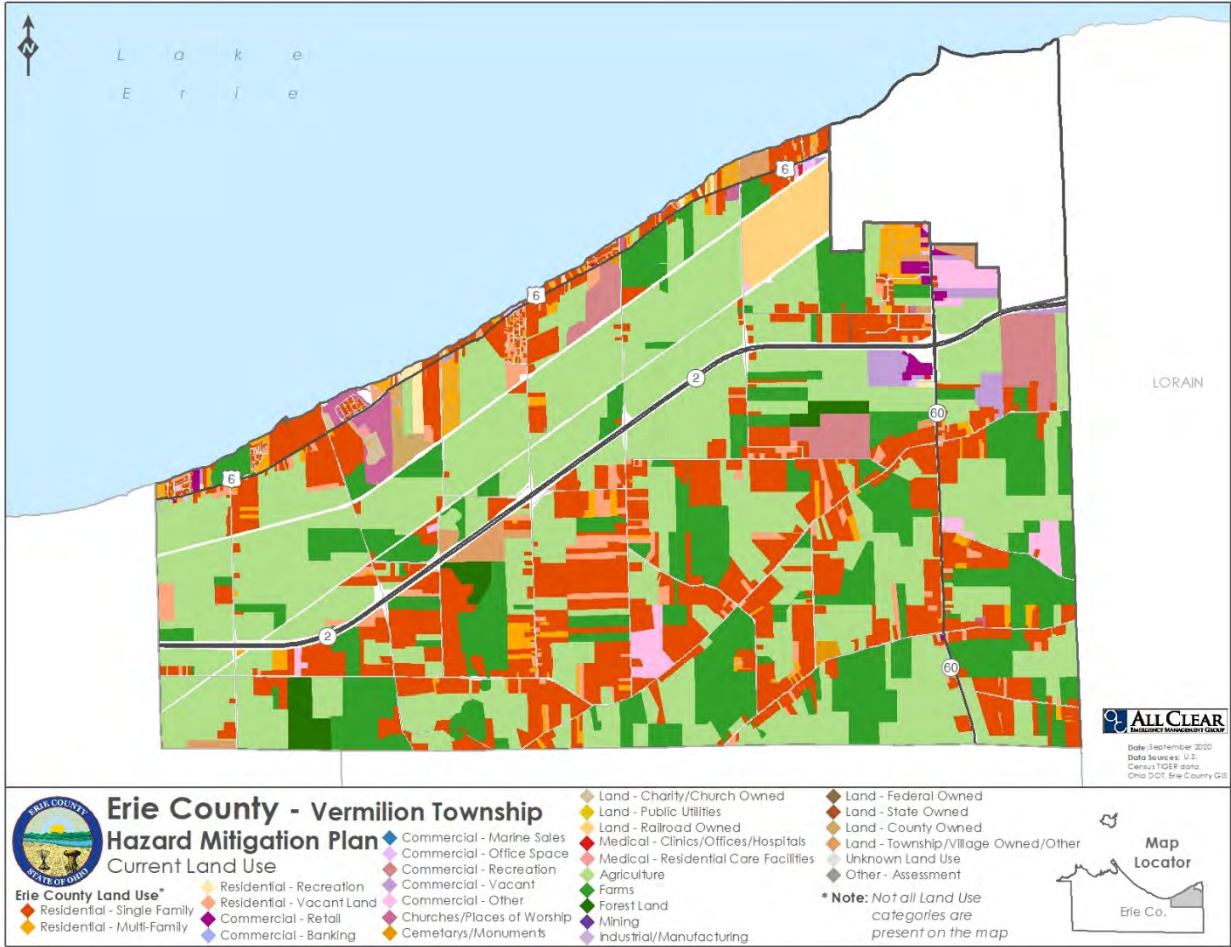


Figure 65: Land Use Map for Vermilion Township

19 Appendix F: Hazard Specific Maps for Townships

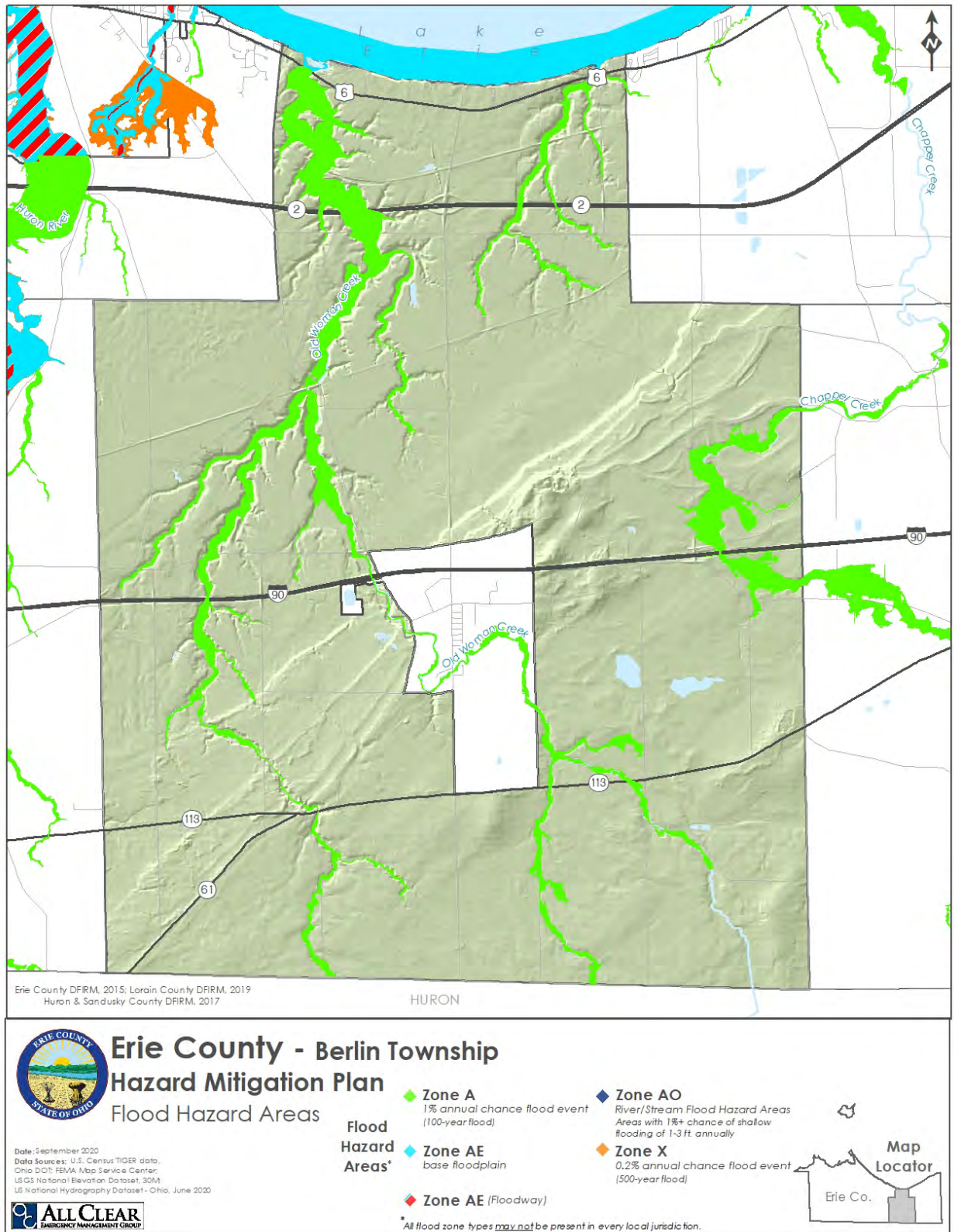


Figure 66: Flood Hazard Map for Berlin Township

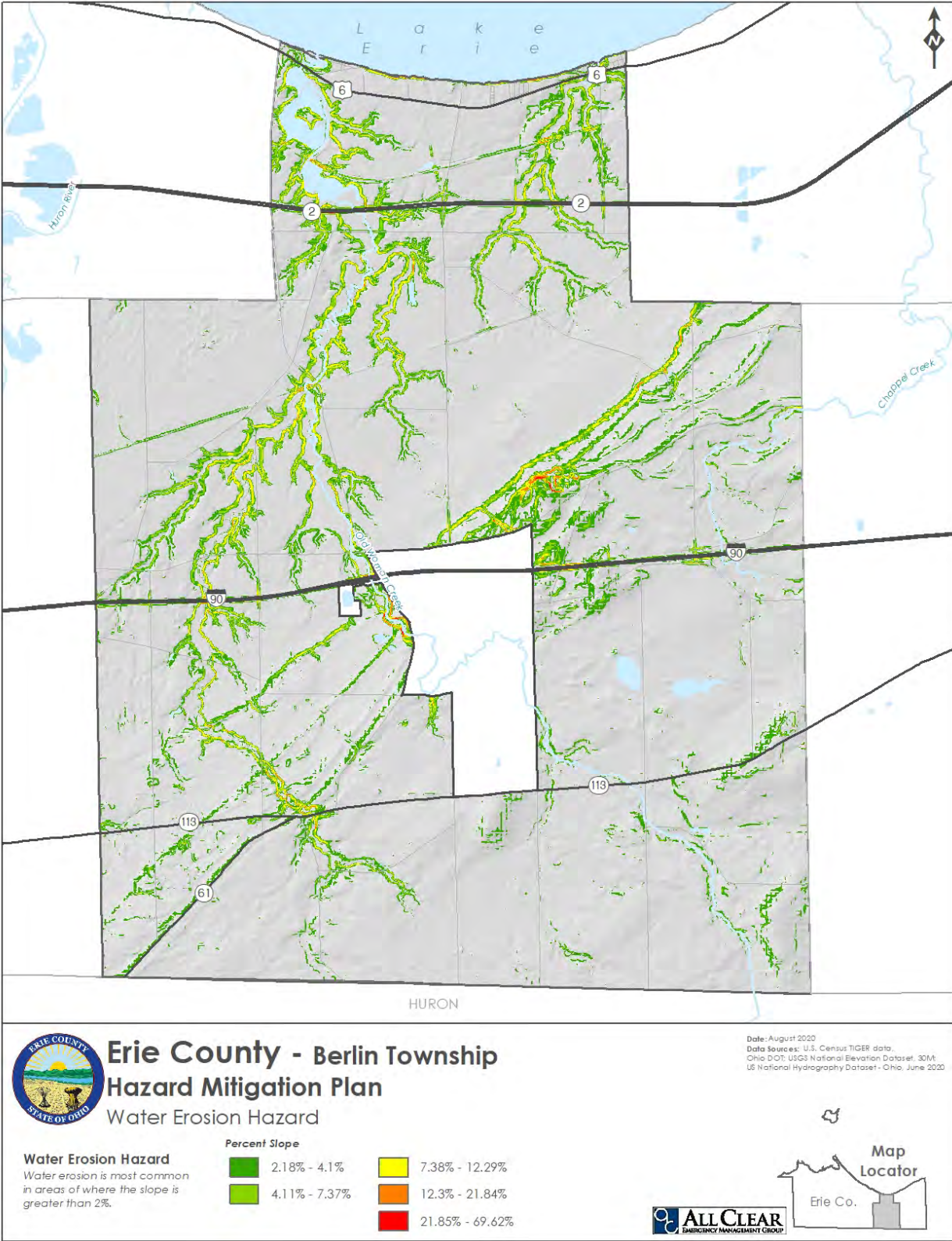


Figure 67: Water Erosion Map for Berlin Township

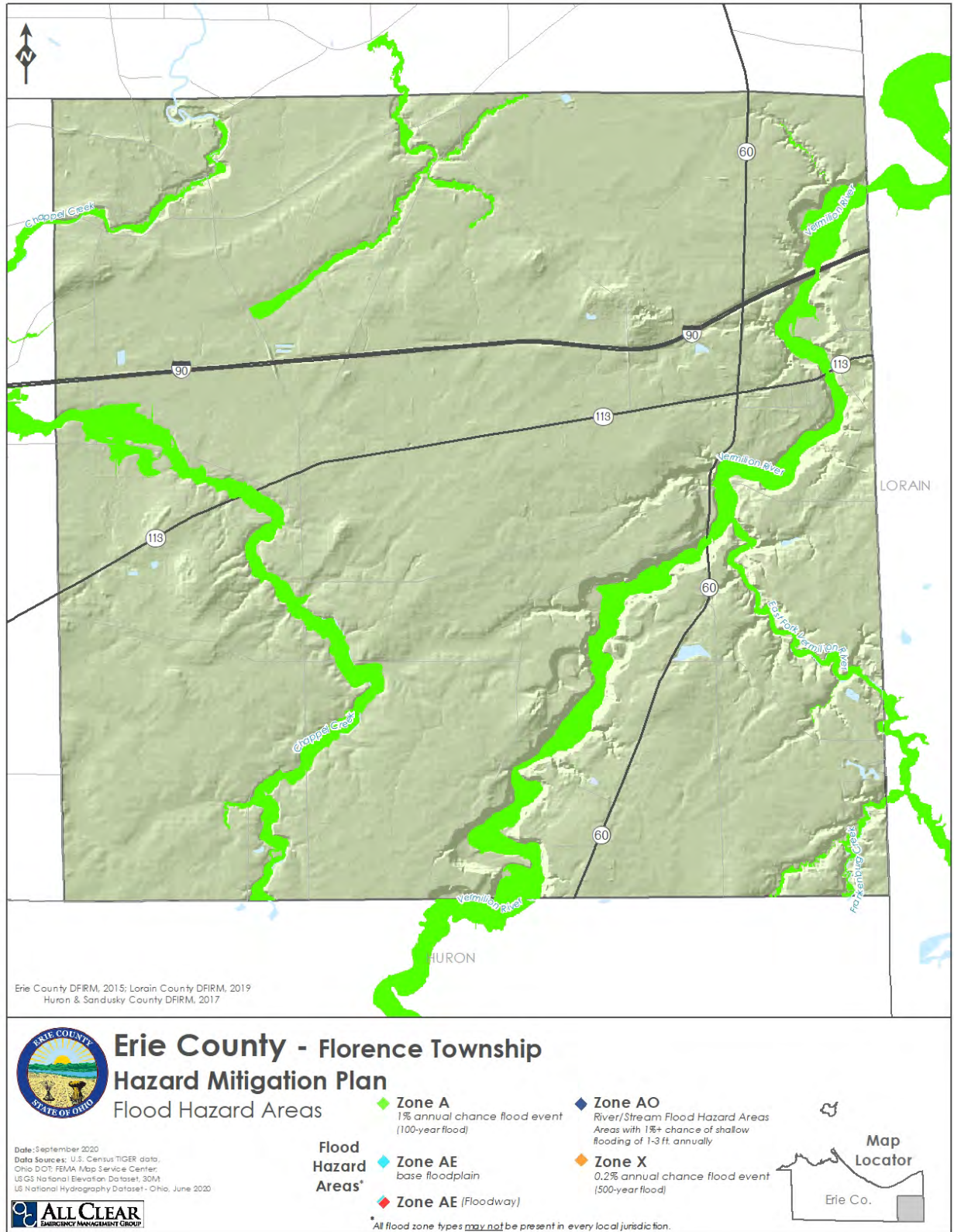


Figure 68: Flood Hazard Map for Florence Township

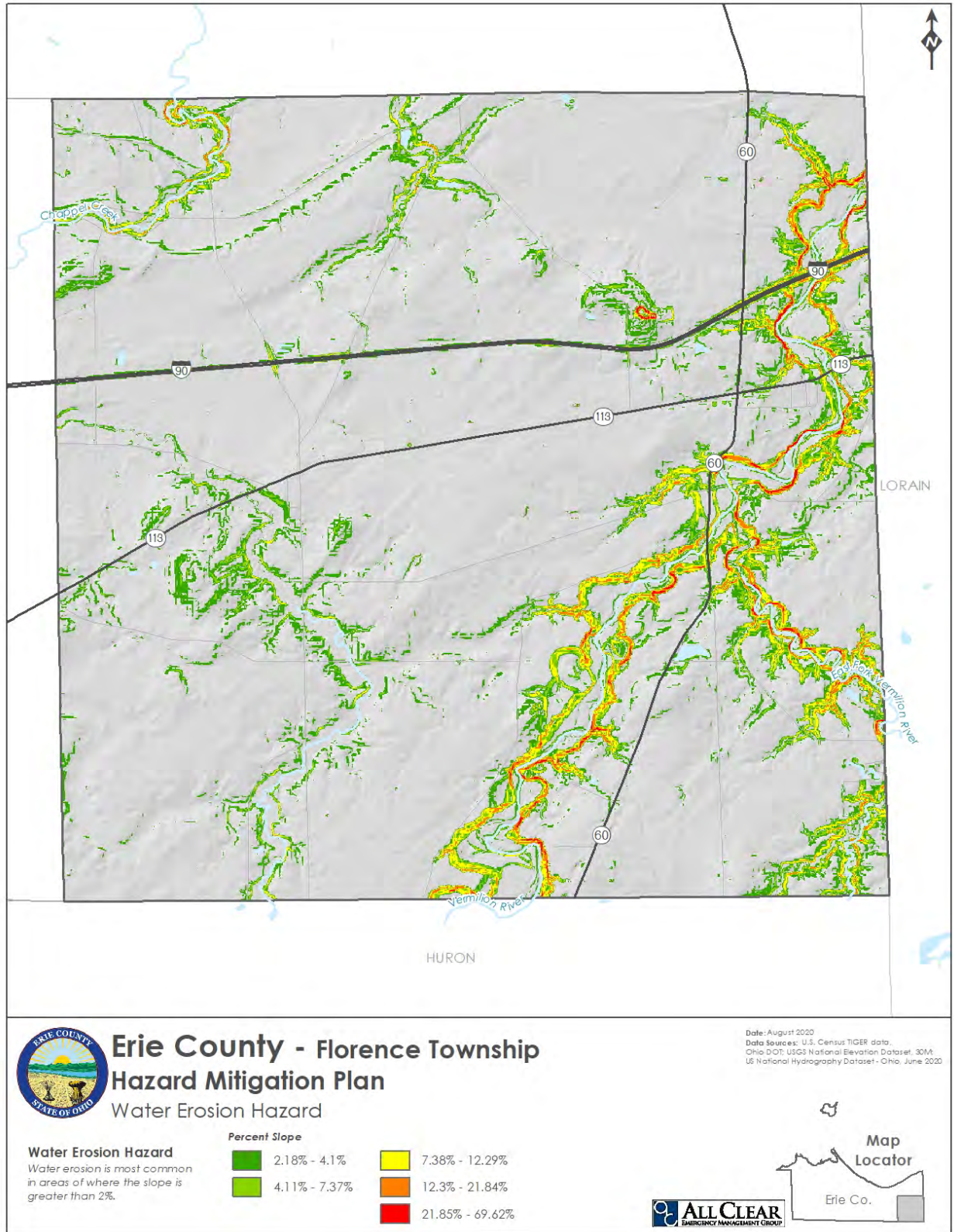


Figure 69: Water Erosion Hazard for Florence Township

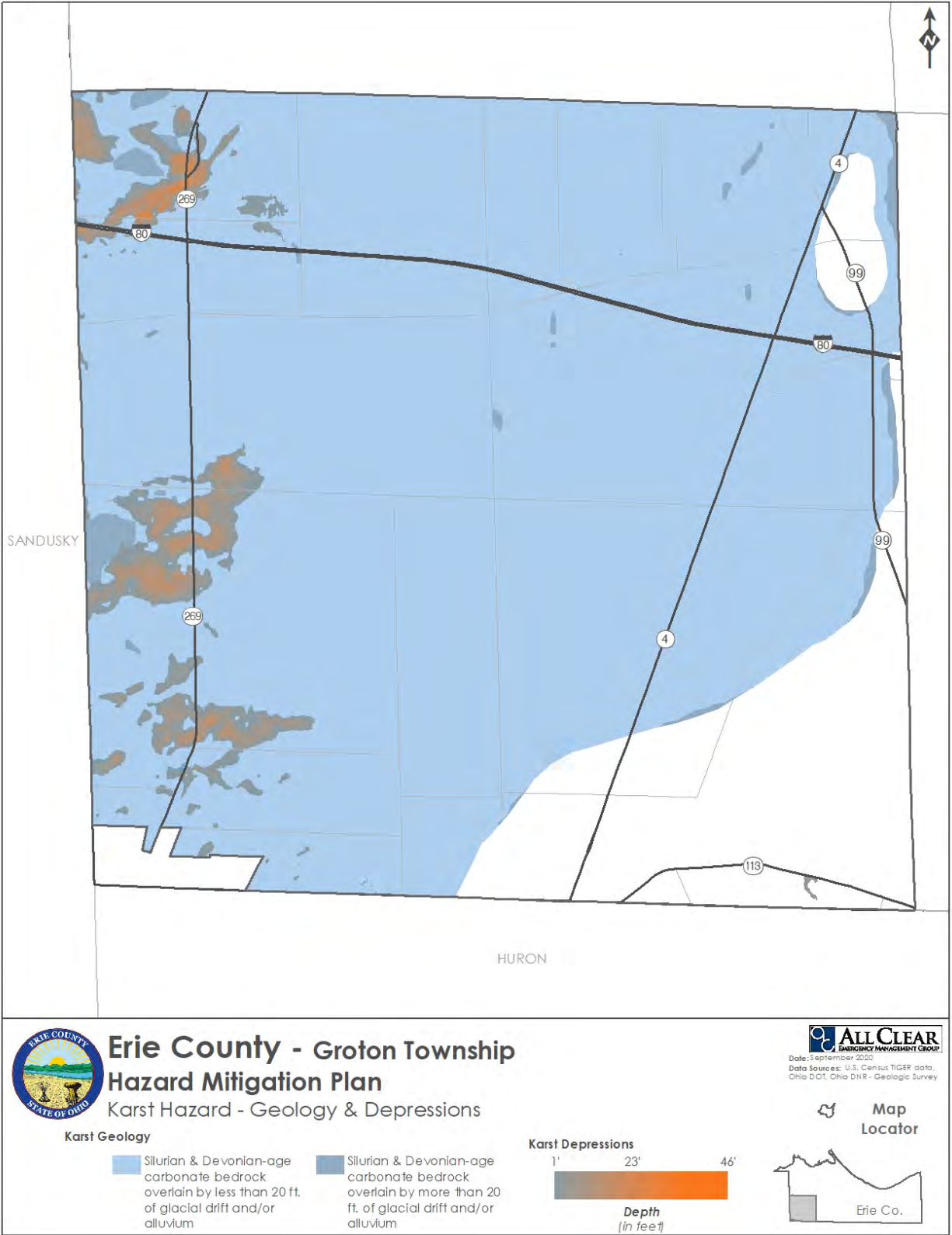


Figure 70: Karst Hazard Map for Groton Township

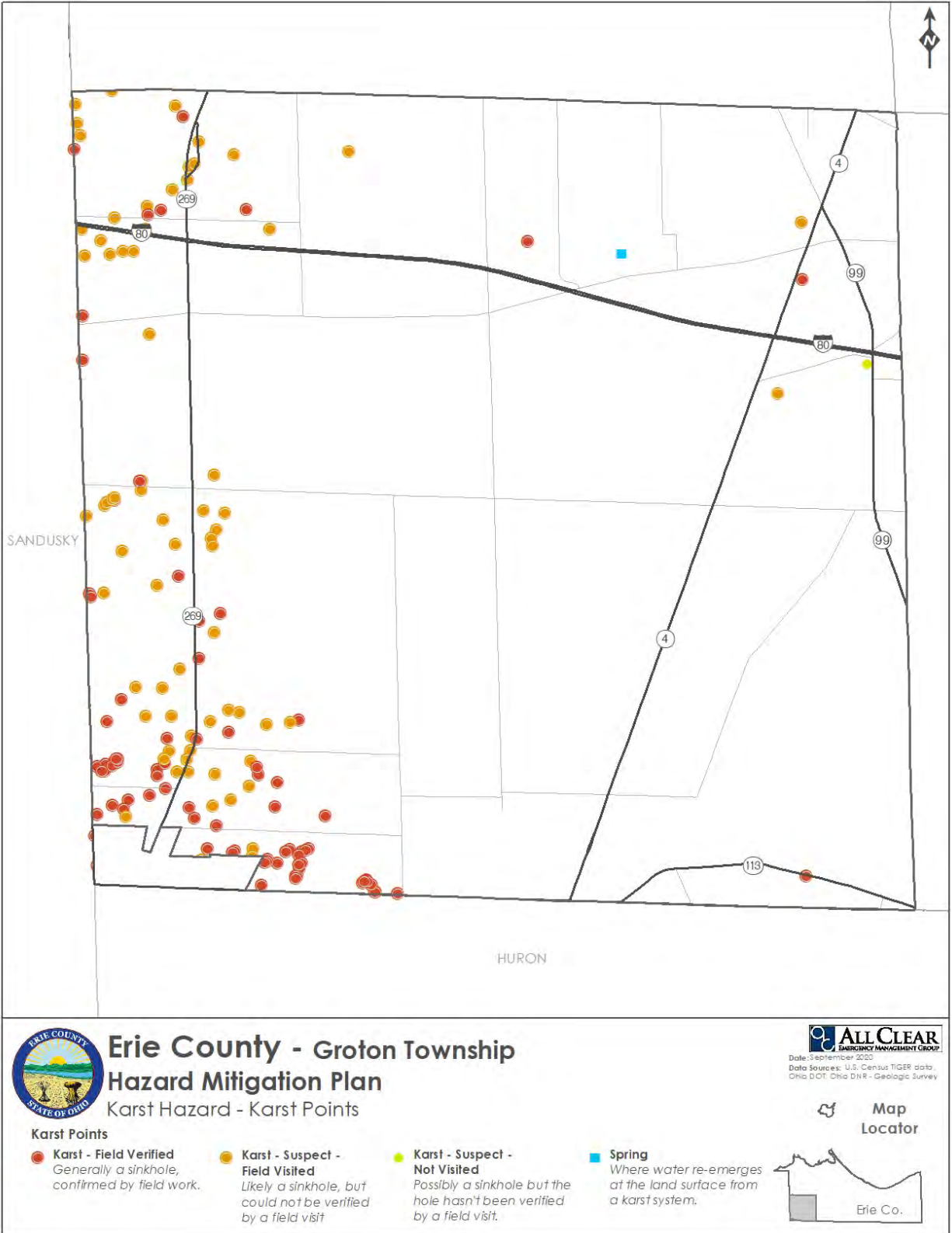


Figure 71: Karst Point Locations for Groton Township

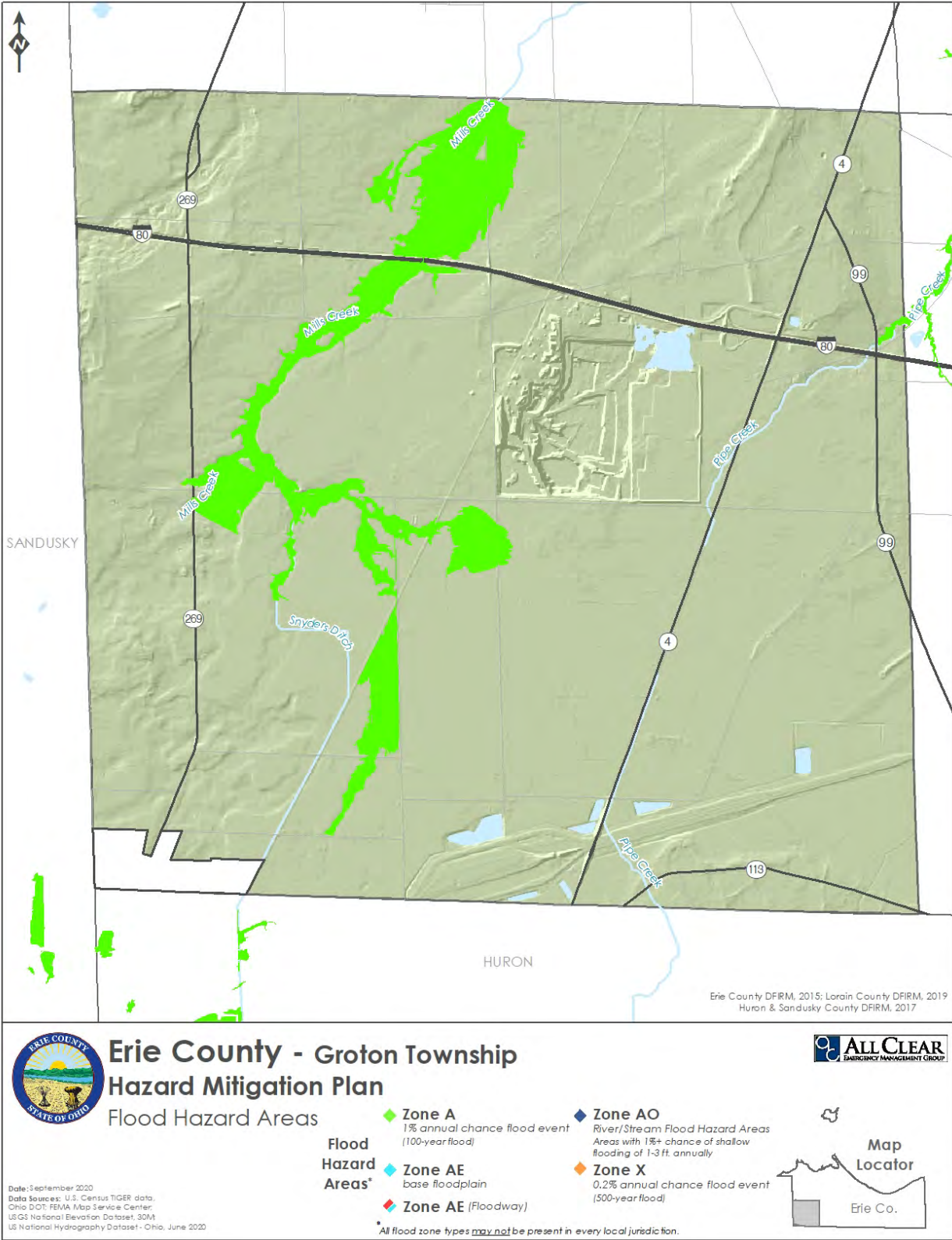


Figure 72: Flood Hazard Map for Groton Township

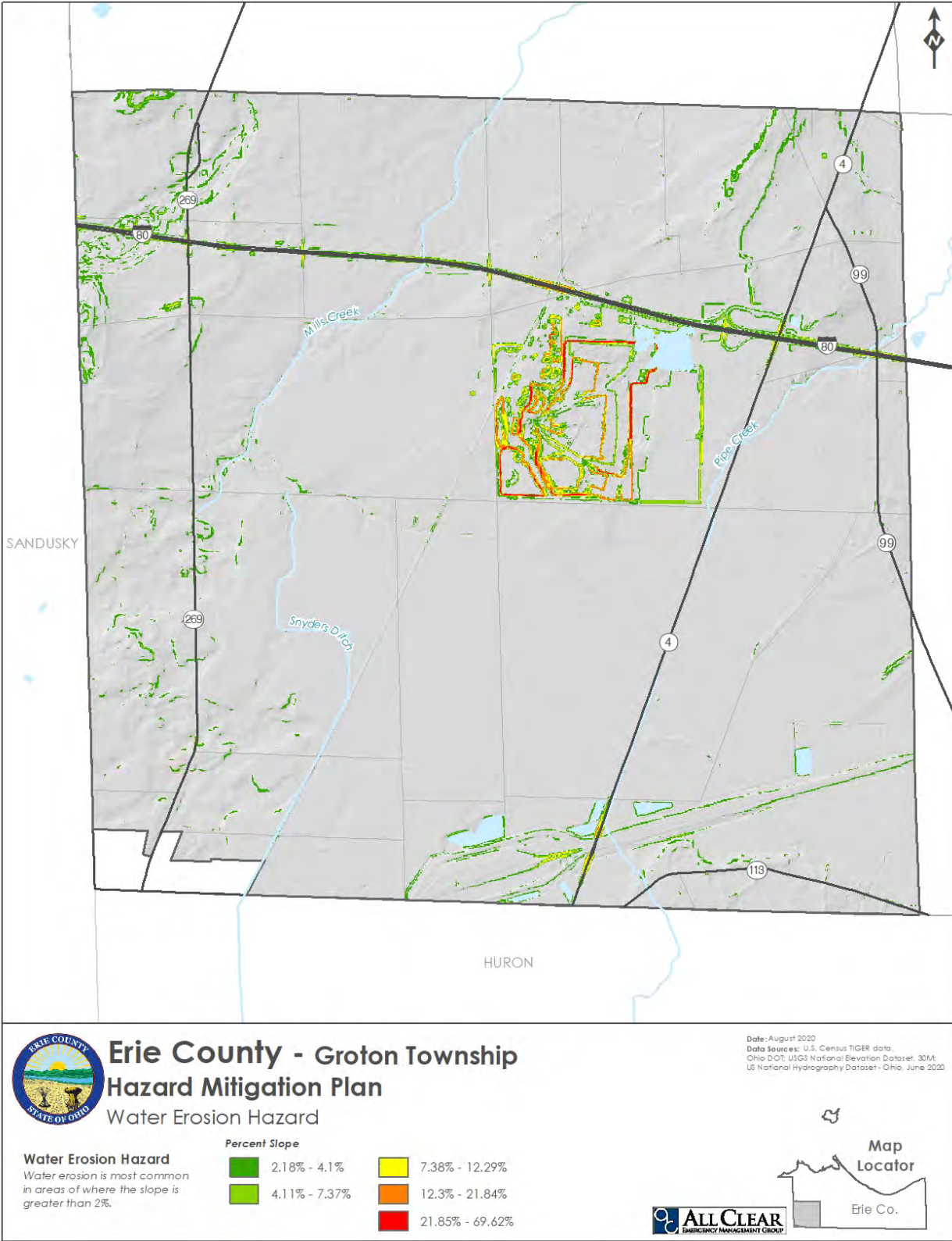


Figure 73: Water Erosion Hazard Map for Groton Township

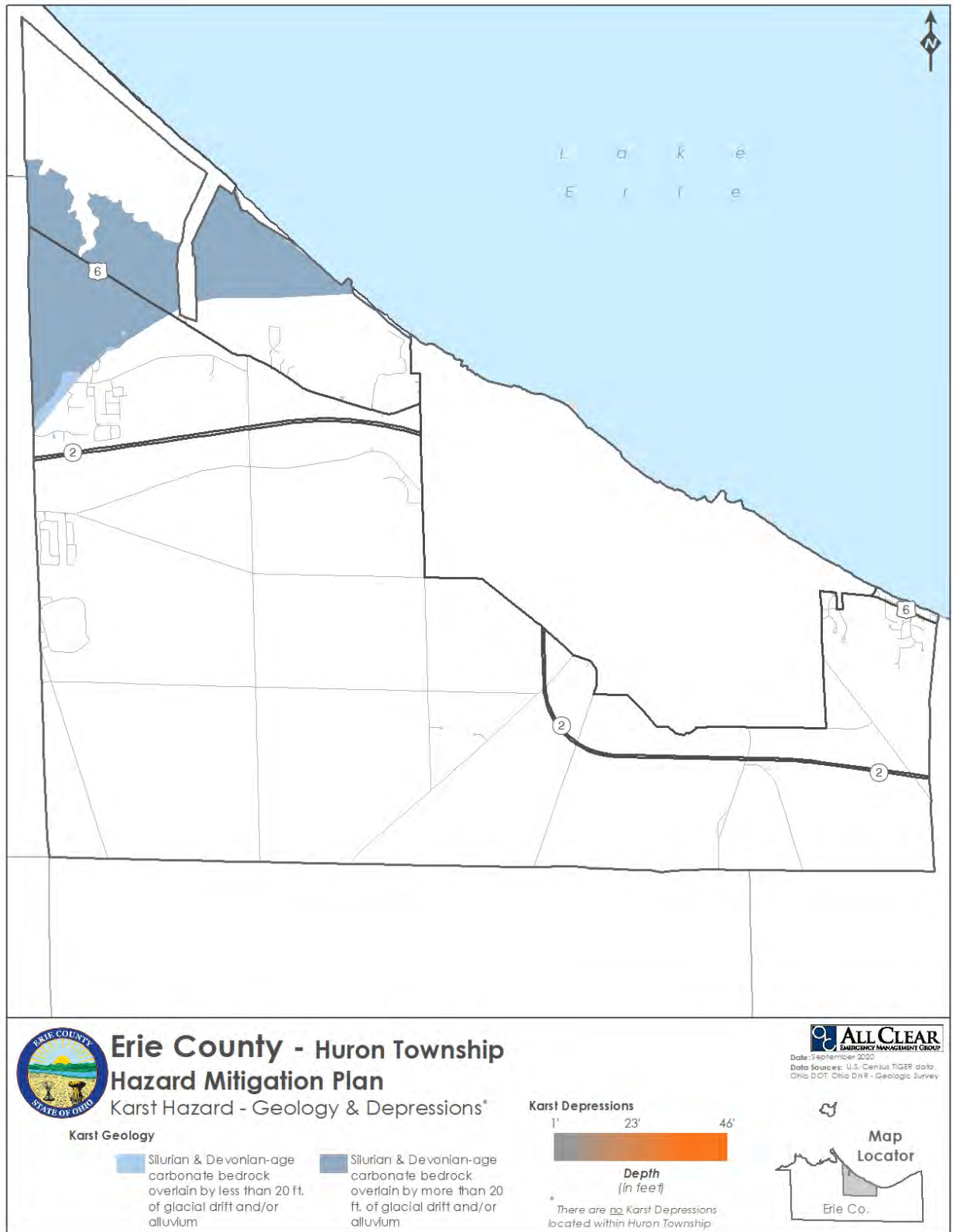


Figure 74: Karst Hazard Map for Huron Township

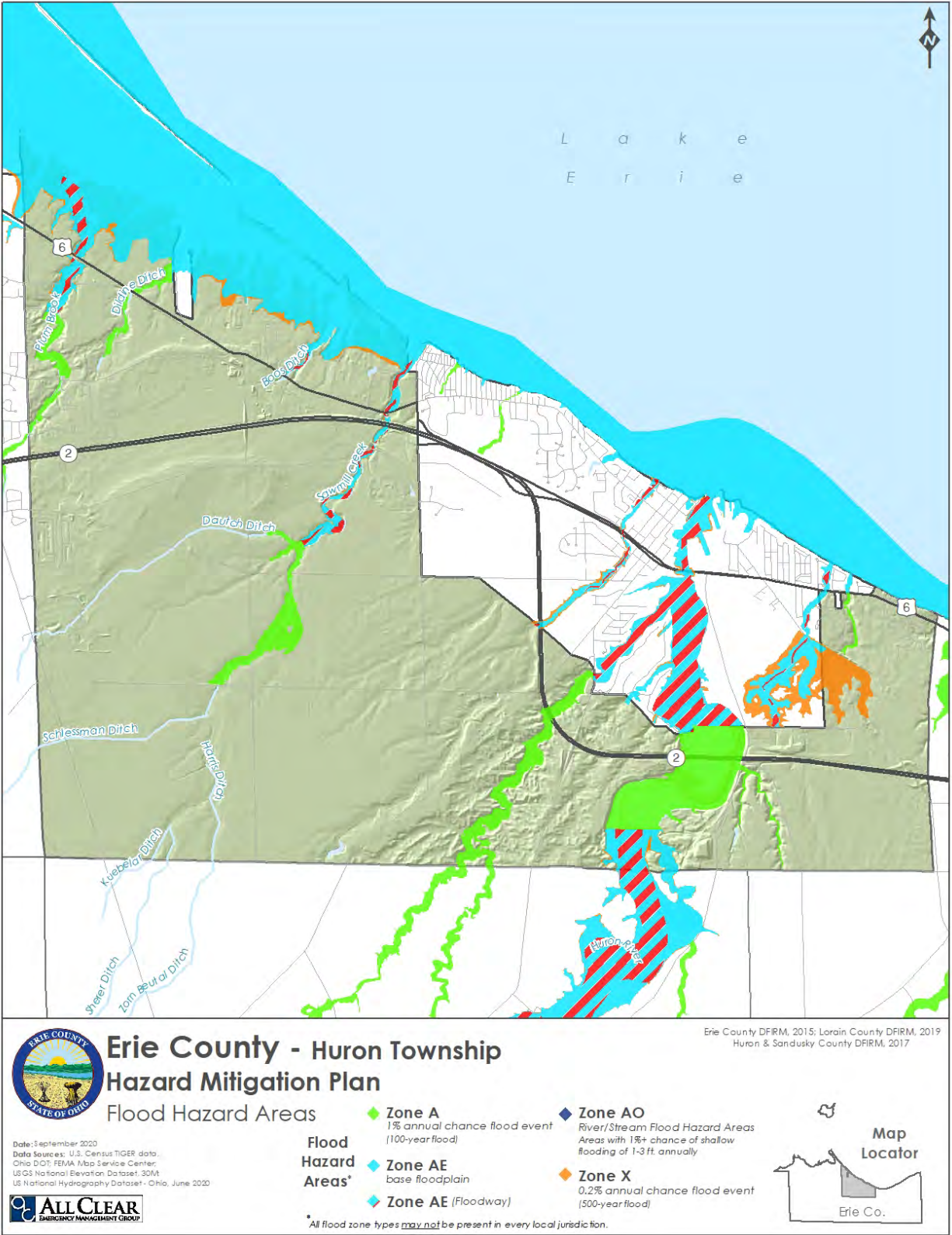


Figure 75: Flood Hazard Map for Huron Township

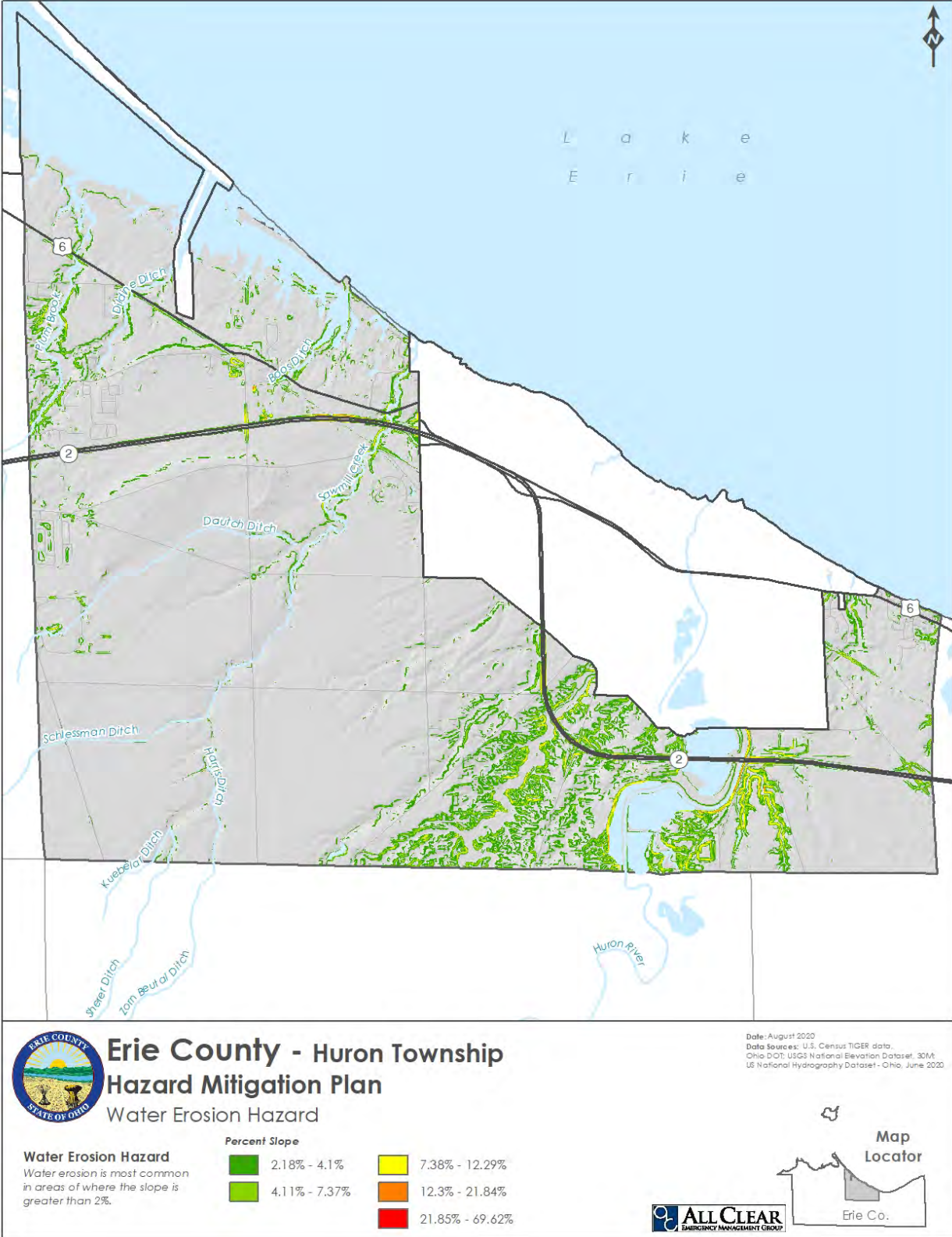


Figure 76: Water Erosion Hazard Map for Huron Township

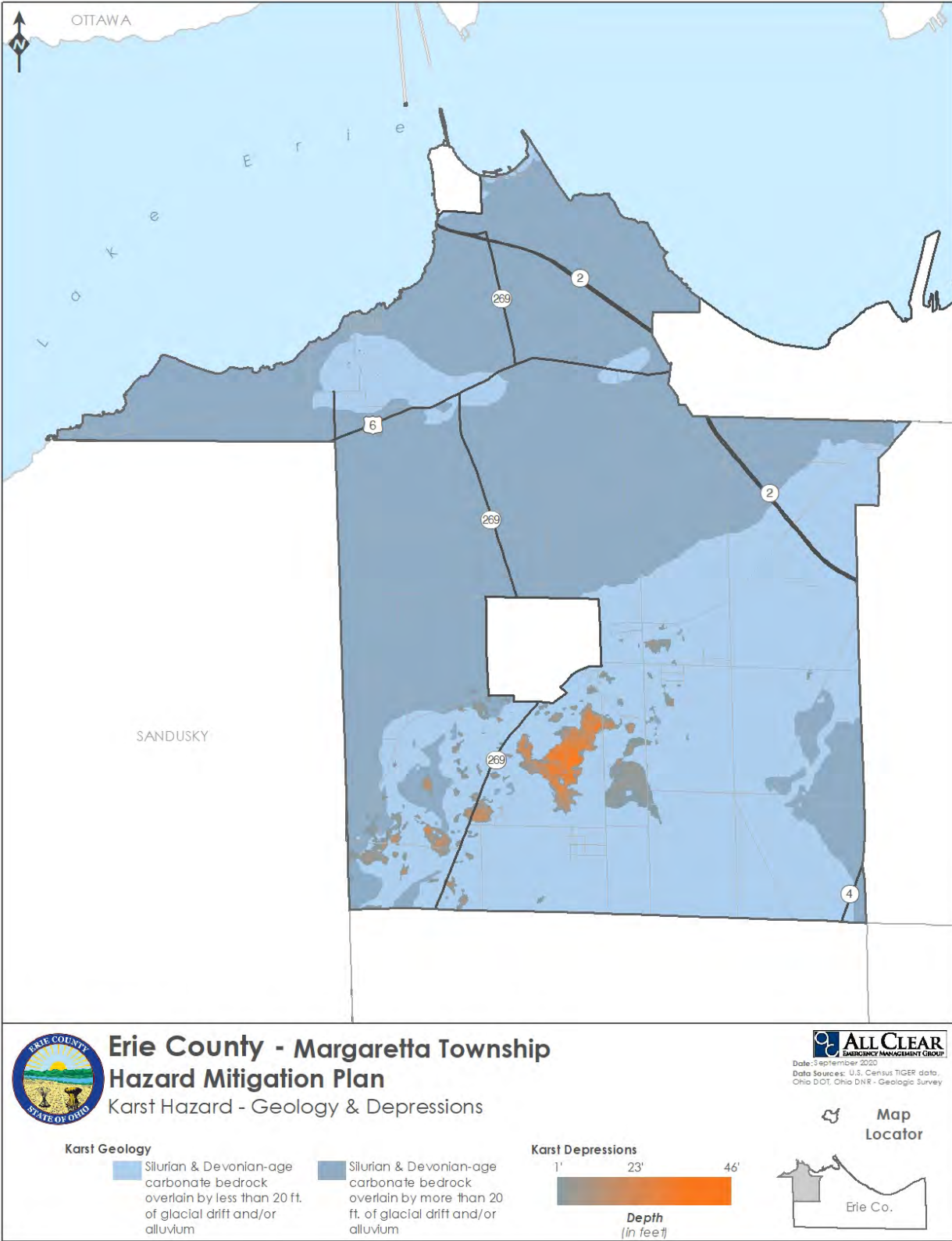


Figure 77: Karst Hazard Map for Margarett Township

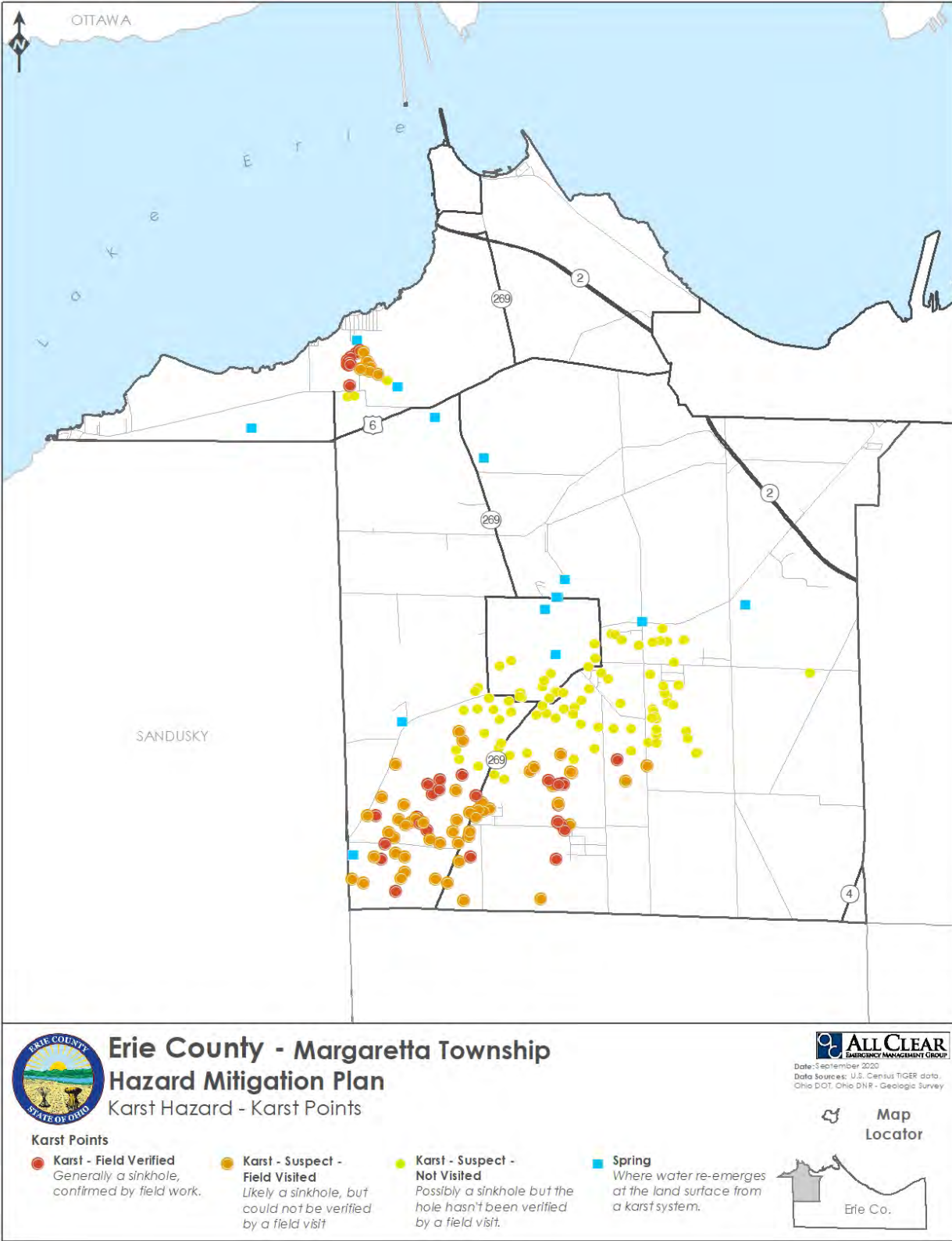


Figure 78: Karst Point Locations for Margaretta Township

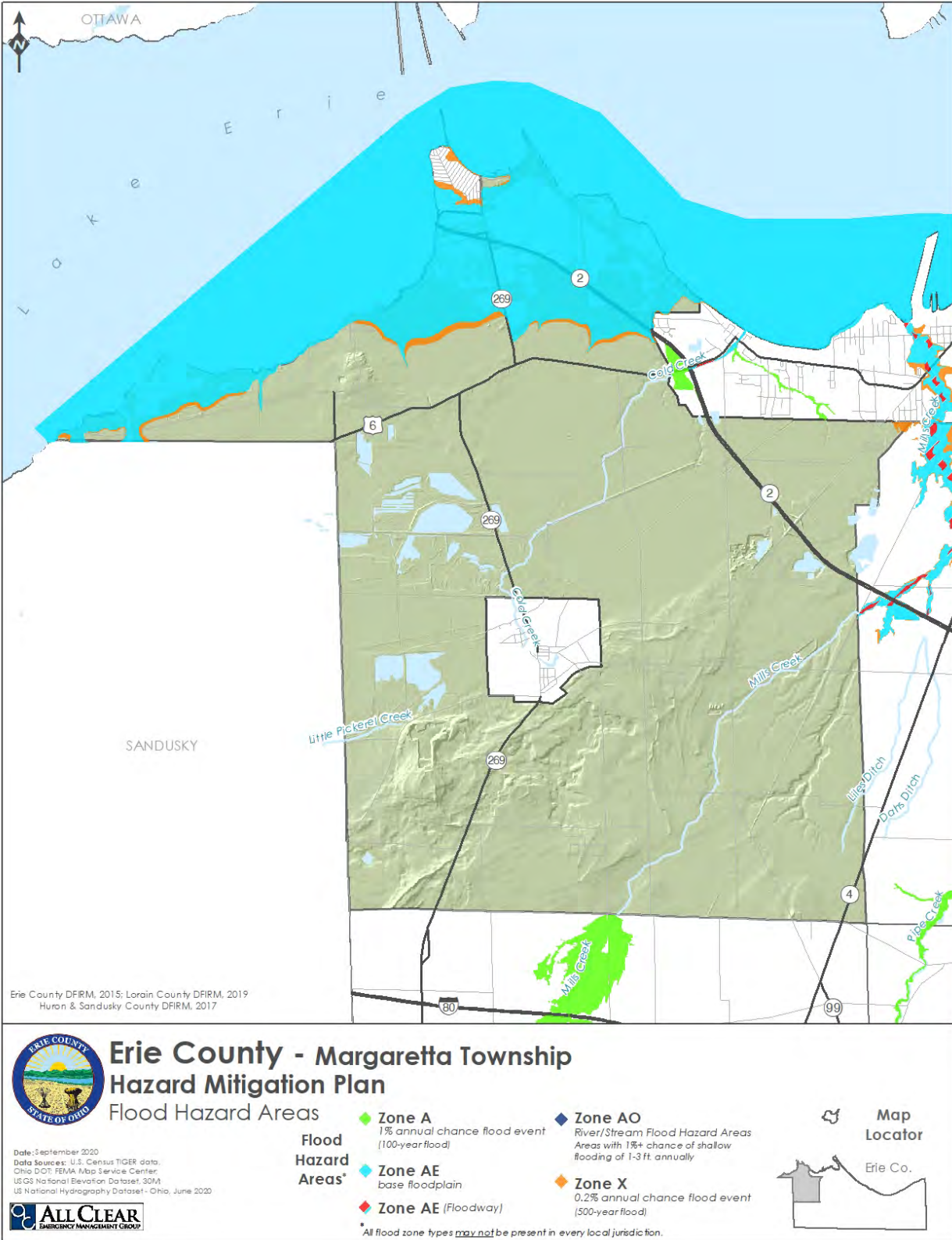


Figure 79: Flood Hazard Map for Margaretta Township

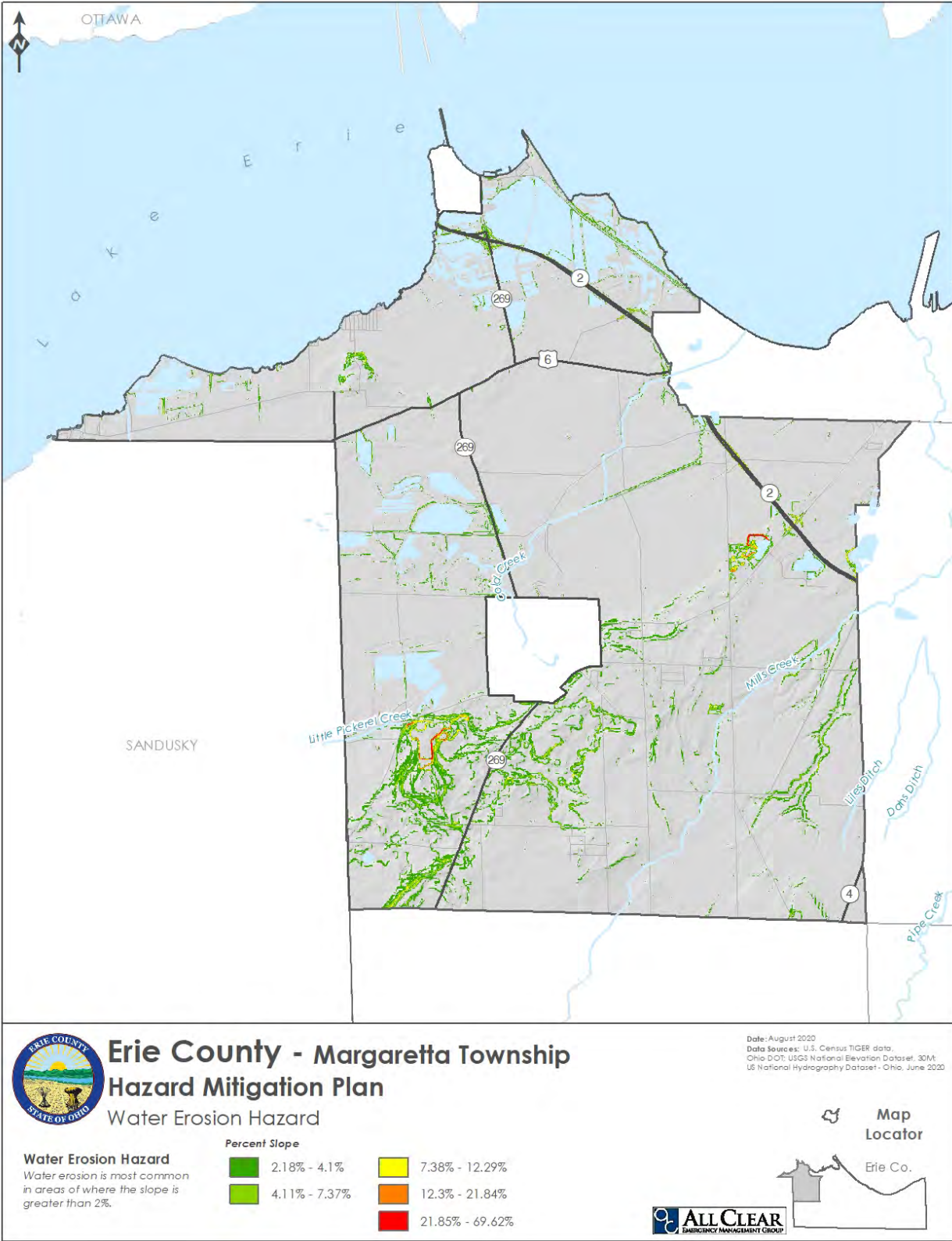


Figure 80: Water Erosion Hazard Map for Margarett Township

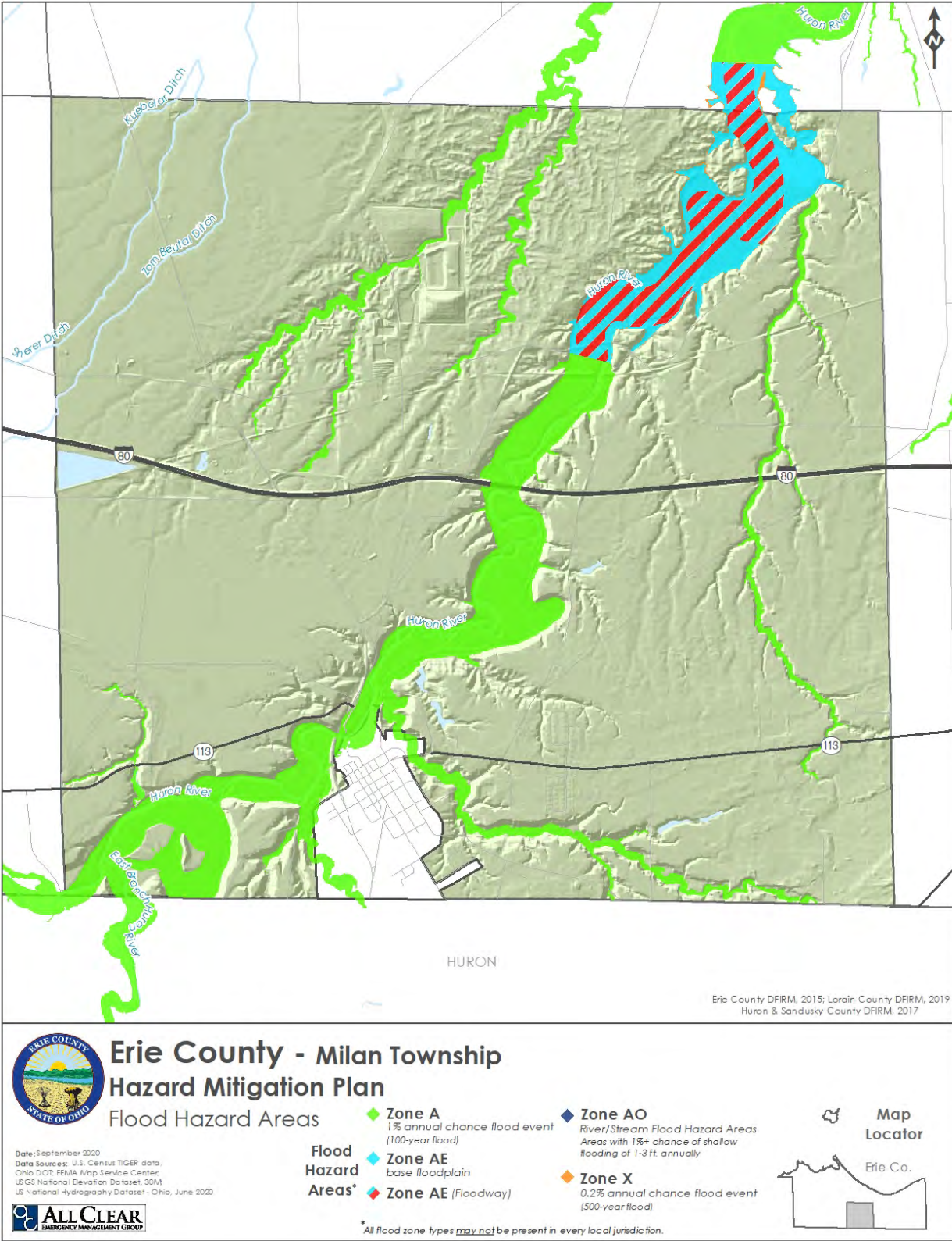


Figure 81: Flood Hazard Map for Milan Township

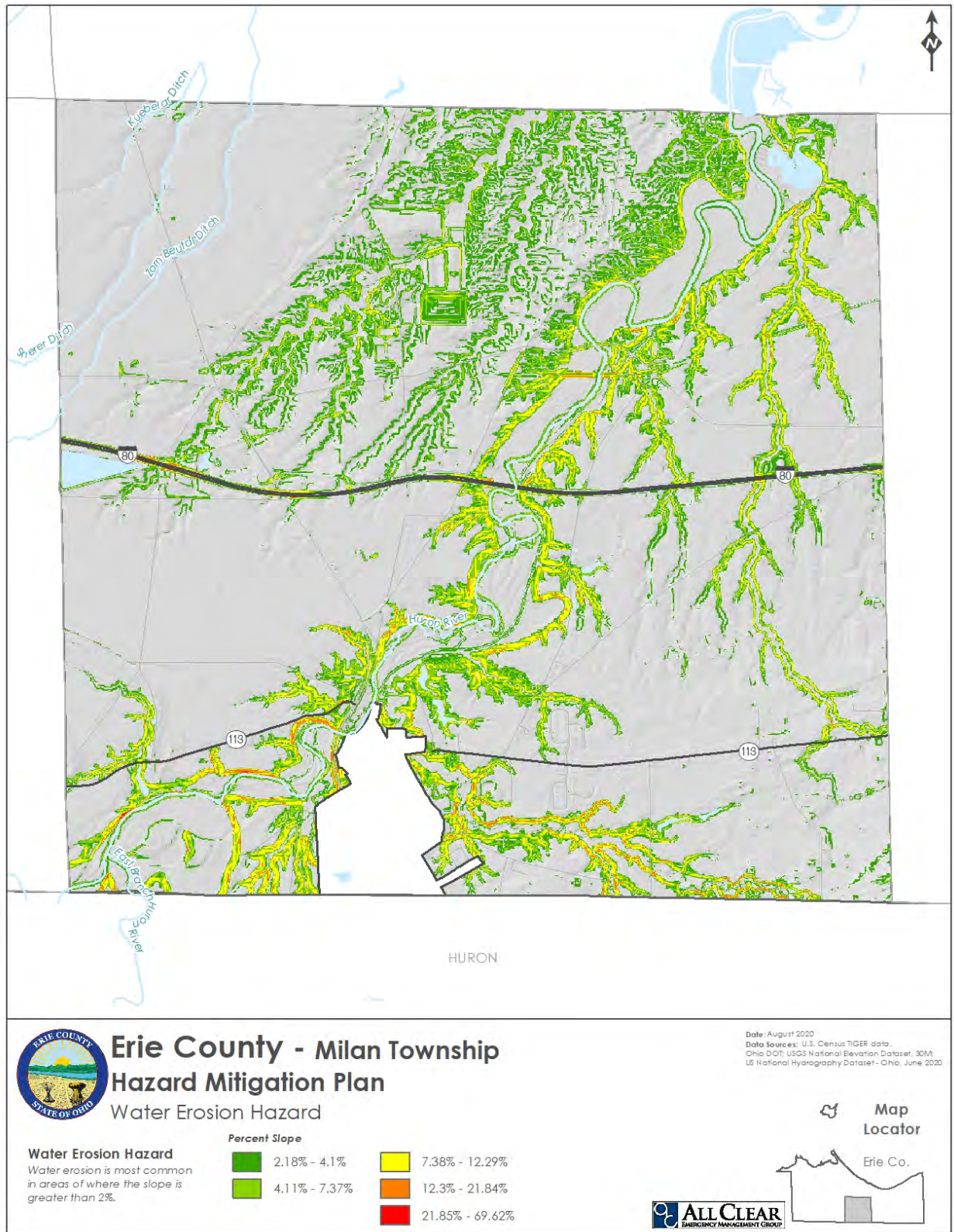


Figure 82: Water Erosion Hazard Map for Milan Township

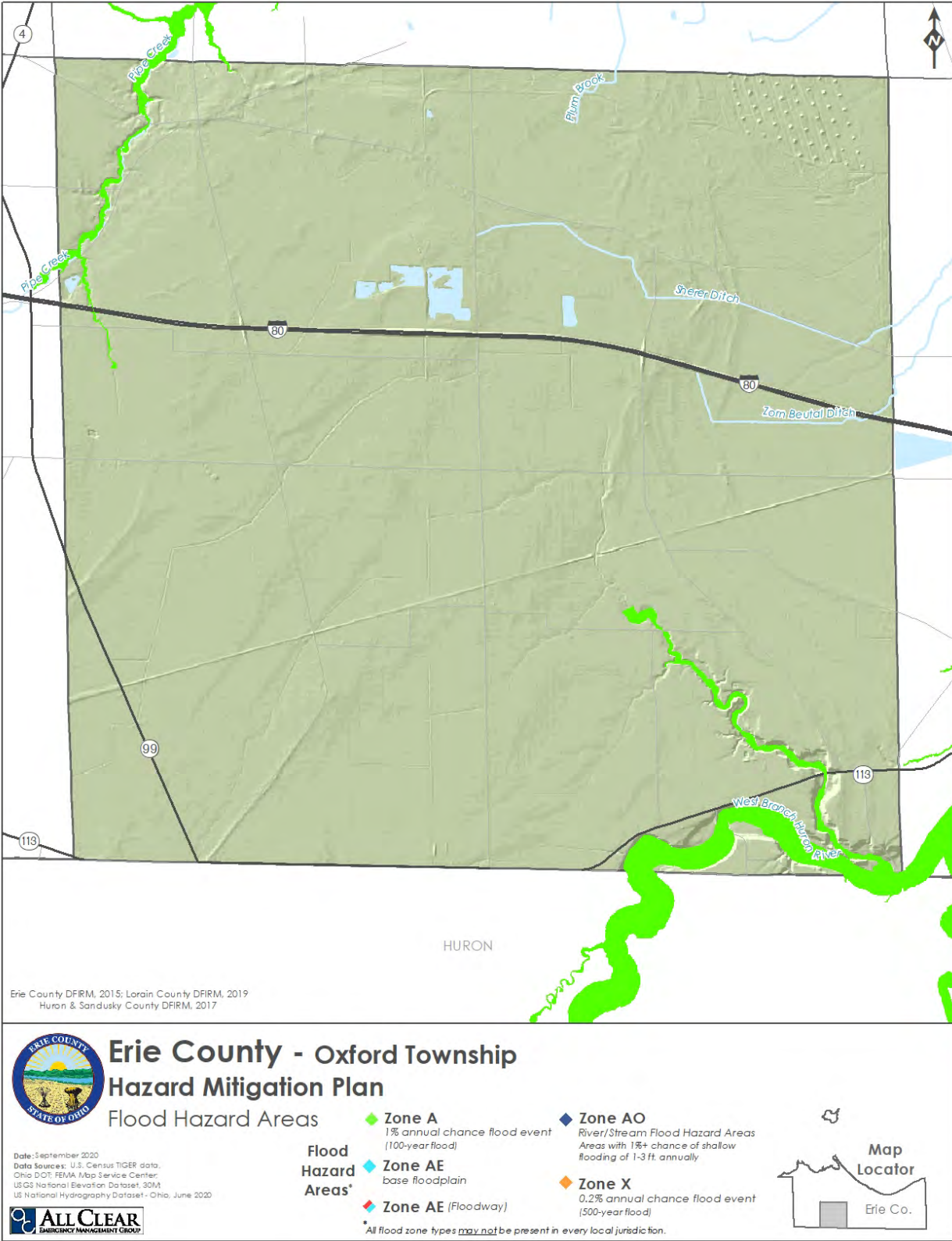


Figure 83: Flood Hazard Map for Oxford Township

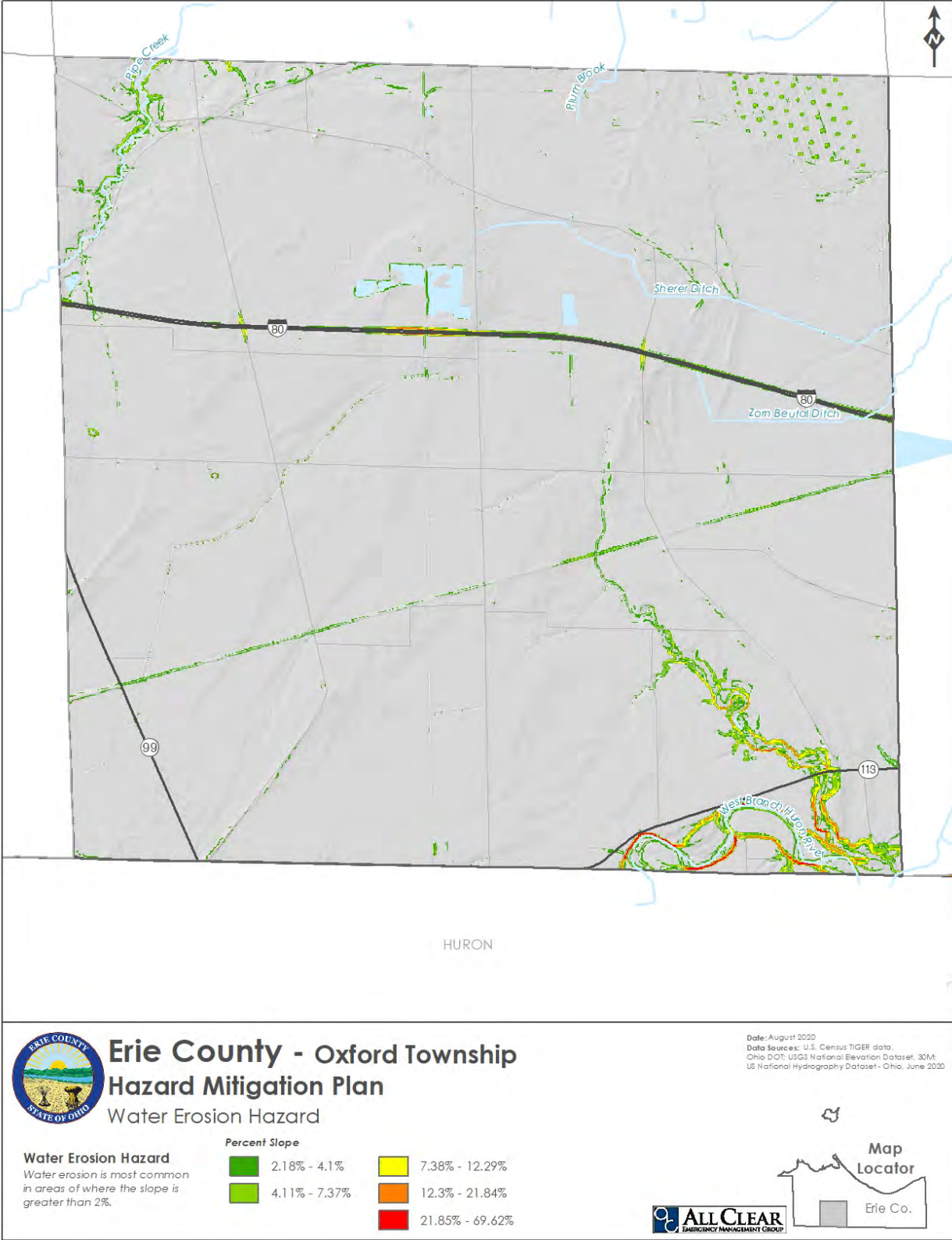


Figure 84: Water Erosion Hazard Map for Oxford Township

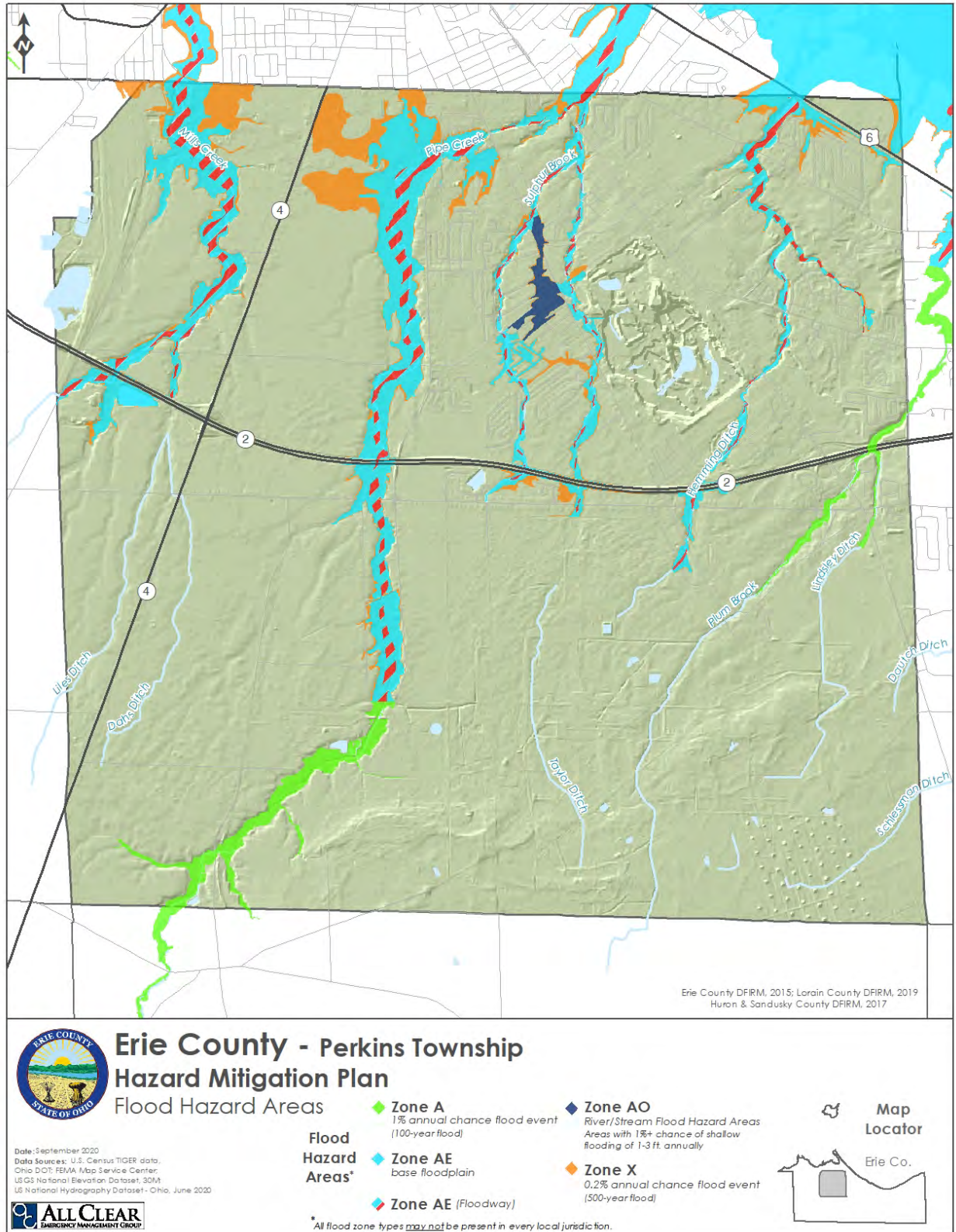


Figure 85: Flood Hazard Map for Perkins Township

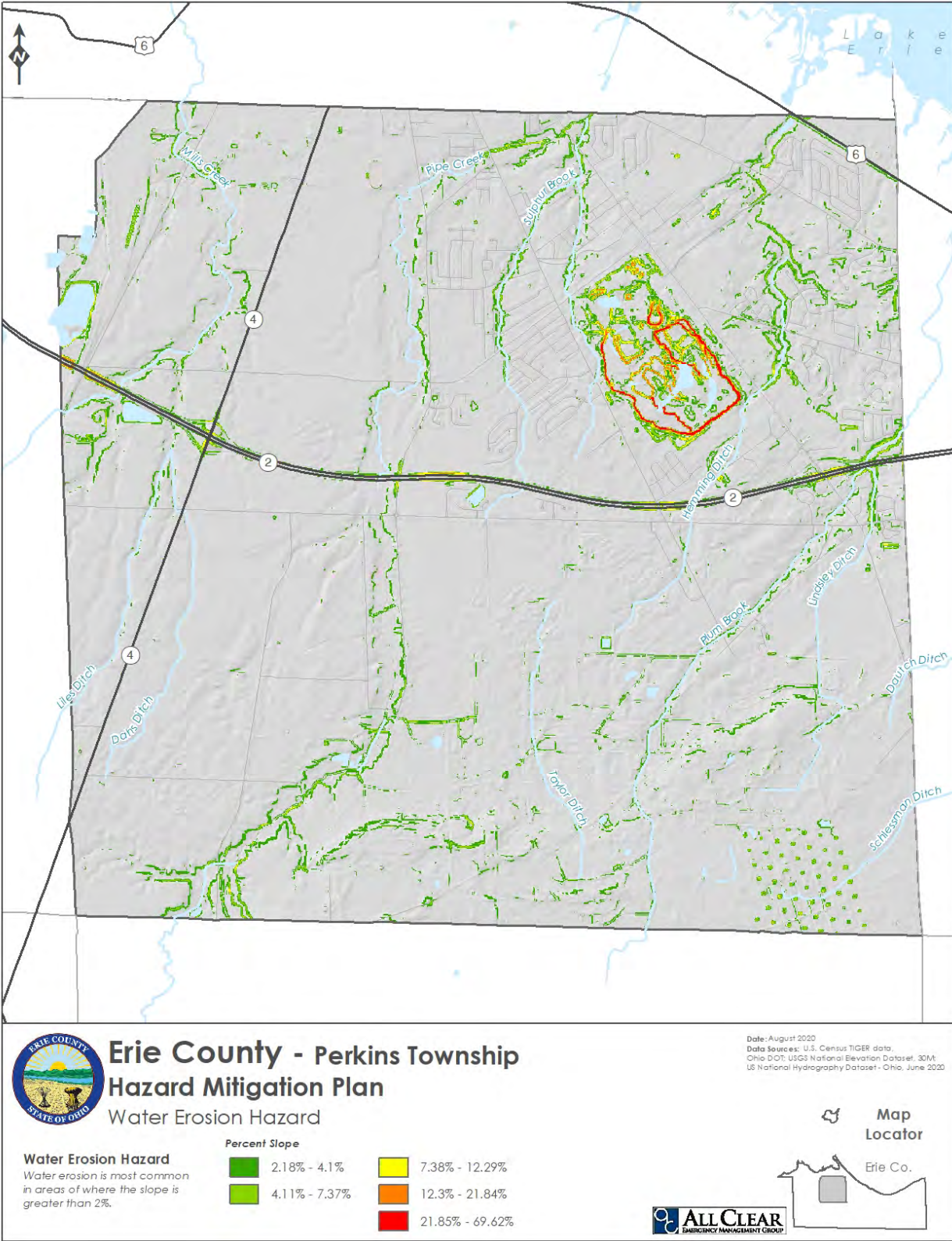


Figure 86: Water Erosion Hazard Map for Perkins Township

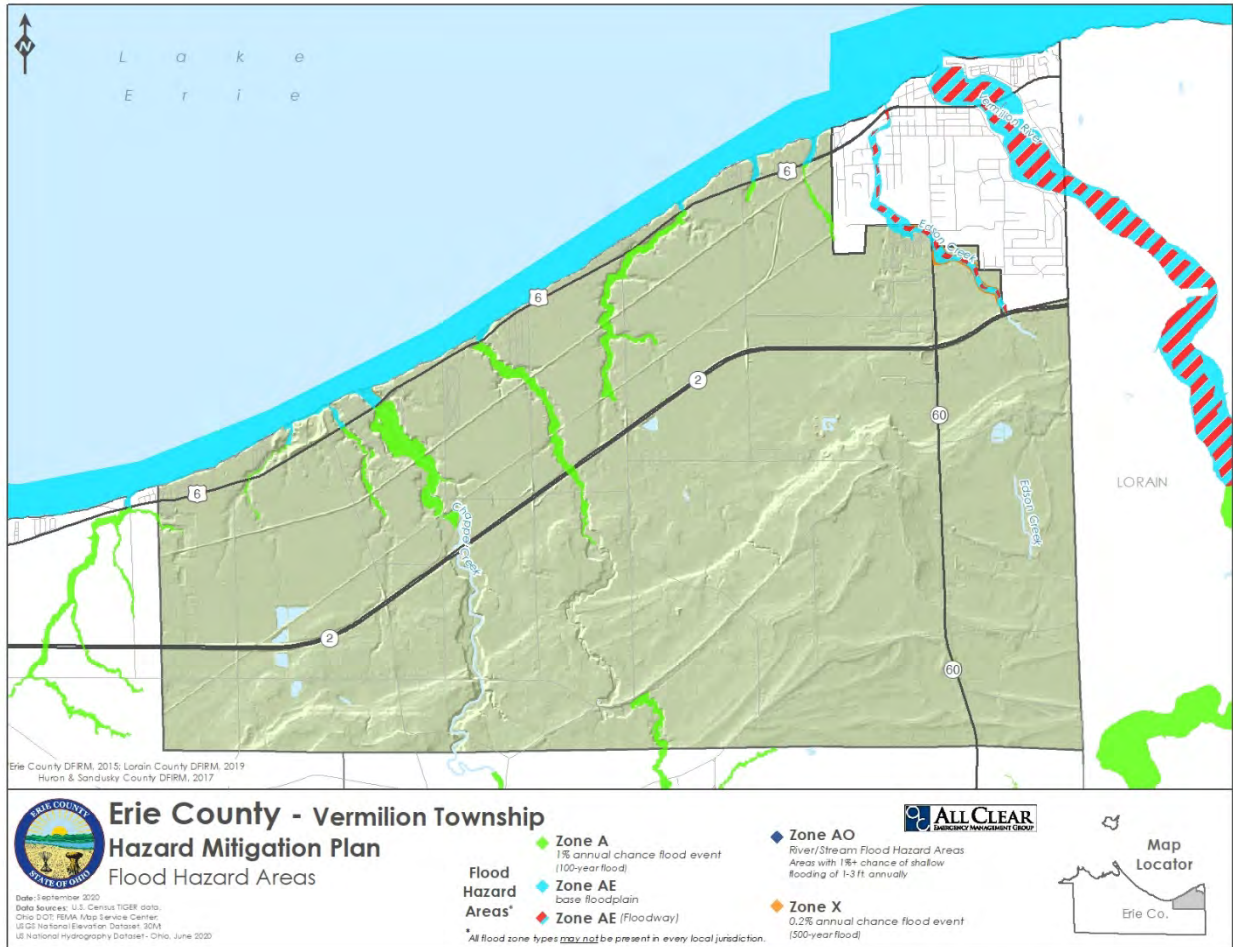


Figure 87: Flood Hazard Map for Vermilion Township

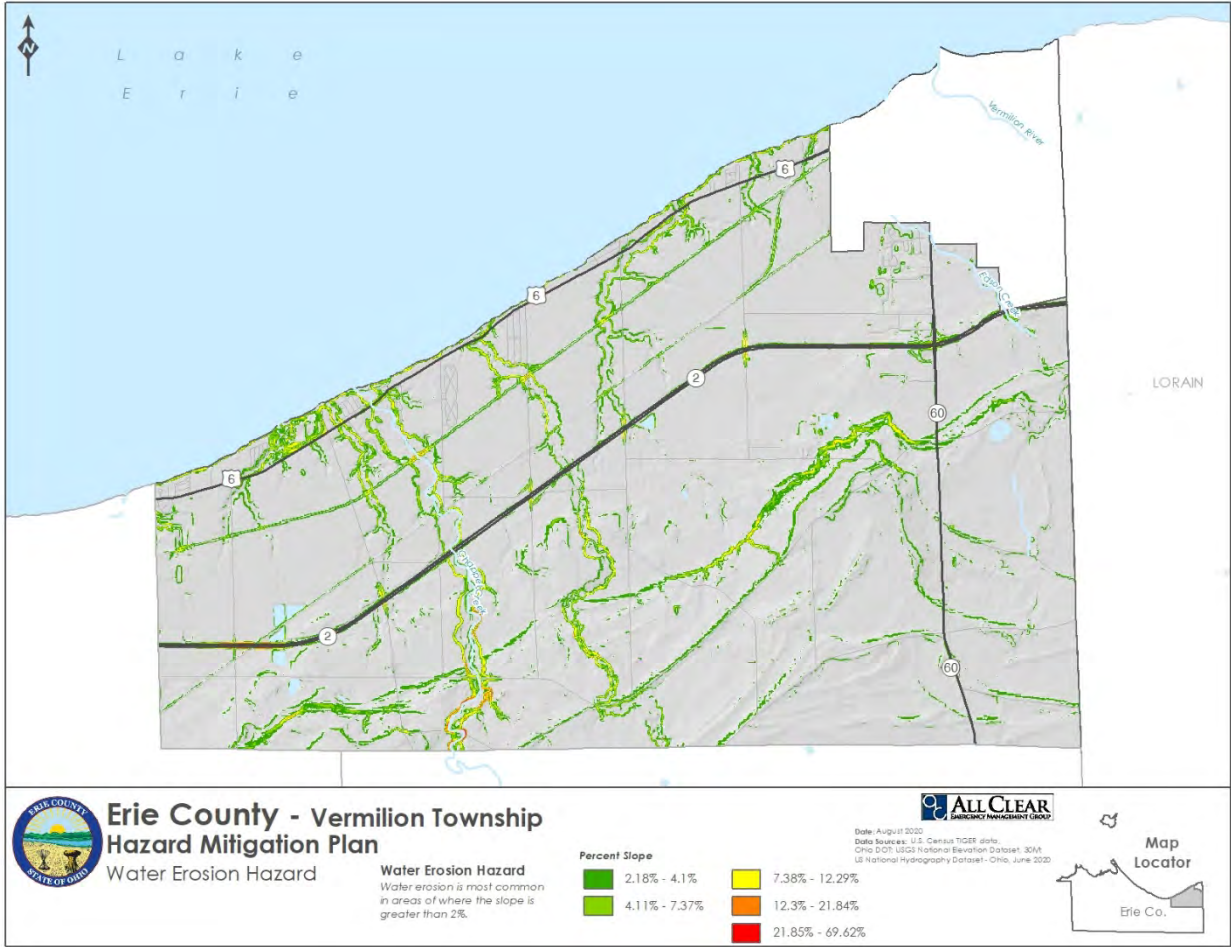


Figure 88: Water Erosion Hazard Map for Vermilion Township

20 Appendix G: Hazus-MH Reports

See Appendix G in separate document.

21 Appendix H: Soil Map Unit Legend⁵²

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AsA	Adrian muck, 0 to 1 percent slopes	27.6	0.0%
AeA	Algiers silt loam, 0 to 2 percent slopes	275.1	0.2%
AgF	Alexandria silt loam, 25 to 50 percent slopes	42.5	0.0%
AkA	Allis clay loam, 0 to 2 percent slopes	3,920.1	2.4%
AmD2	Amanda loam, 12 to 18 percent slopes, eroded	144.7	0.1%
AnG	Amanda-Dekalb-Rock outcrop association, 40 to 70 percent slopes	934.4	0.6%
Bc	Beaches	574.7	0.4%
BdB	Belmore loam, 2 to 6 percent slopes	1.5	0.0%
BeA	Bennington loam, 0 to 2 percent slopes	1,579.5	1.0%
BgA	Bennington silt loam, 0 to 2 percent slopes	10,208.0	6.3%
BgB	Bennington silt loam, 2 to 6 percent slopes	1,287.6	0.8%
BkA	Bixler loamy fine sand, 0 to 2 percent slopes	3,044.9	1.9%
BkB	Bixler loamy fine sand, 2 to 6 percent slopes	721.8	0.4%
BvG	Brecksville silt loam, 40 to 70 percent slopes	256.5	0.2%
CaA	Cardington silt loam, 0 to 2 percent slopes	86.6	0.1%

⁵² (United States Department of Agriculture, 2020)

Custom Soil Resource Report

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CbC2	Cardington silty clay loam, 6 to 12 percent slopes, eroded	523.2	0.3%
CcA	Castalia very channery loam, 0 to 2 percent slopes	1,922.3	1.2%
CcB	Castalia very channery loam, 2 to 6 percent slopes	887.8	0.5%
CcD	Castalia very channery loam, 12 to 18 percent slopes	161.7	0.1%
ChB	Chili loam, loamy substratum, 2 to 6 percent slopes	509.5	0.3%
CmA	Colwood loam, 0 to 1 percent slopes	4,085.9	2.5%
CnA	Colwood silt loam, bedrock substratum, 0 to 1 percent slopes	1,885.3	1.1%
CoA	Condit silt loam, 0 to 1 percent slopes	2,245.7	1.4%
Crd1B1	Cardington silt loam, 2 to 6 percent slopes	2,056.4	1.3%
CtB	Conotton loam, 2 to 6 percent slopes	907.6	0.6%
CuC	Conotton gravelly loam, 6 to 12 percent slopes	135.4	0.1%
DtbB	Dekalb channery loam, 2 to 6 percent slopes	651.7	0.4%
DtbD	Dekalb channery loam, 12 to 18 percent slopes	258.8	0.2%
DeA	Del Rey silt loam, 0 to 2 percent slopes	6,297.0	3.9%
DuA	Dunbridge loamy sand, 0 to 2 percent slopes	893.8	0.5%
DuB	Dunbridge loamy sand, 2 to 6 percent slopes	700.6	0.4%
EcA	Elliott silt loam, bedrock substratum, 0 to 2 percent slopes	1,165.3	0.7%
EdB	Ellsworth silt loam, 2 to 6 percent slopes	122.2	0.1%
EdC2	Ellsworth silt loam, 6 to 12 percent slopes, eroded	37.1	0.0%
EnA	Elnora loamy fine sand, 0 to 4 percent slopes	6,005.4	3.7%
EoA	Elnora loamy fine sand, bedrock substratum, 0 to 4 percent slopes	731.8	0.4%
EsA	Endoaquents, loamy, 0 to 1 percent slopes	998.1	0.6%
FnA	Fluvaquents, silty, 0 to 1 percent slopes, frequently flooded	733.0	0.4%

Custom Soil Resource Report

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FoB	Fox loam, 2 to 6 percent slopes	350.4	0.2%
FrA	Fries silty clay loam, 0 to 1 percent slopes	2,253.5	1.4%
FuA	Fulton silty clay loam, 0 to 2 percent slopes	2,443.6	1.5%
GdA	Gifford fine sandy loam, 0 to 1 percent slopes	1,528.5	0.9%
Gwg1B1	Glynwood silt loam, ground moraine, 2 to 6 percent slopes	0.3	0.0%
HdA	Harrod silt loam, 0 to 1 percent slopes, frequently flooded	53.7	0.0%
HxA	Haskins loam, 0 to 2 percent slopes	3,106.7	1.9%
HoA	Holly silt loam, 0 to 1 percent slopes, occasionally flooded	2,166.6	1.3%
HpB	Hornell loam, 2 to 6 percent slopes	124.4	0.1%
HrB	Hornell silt loam, 2 to 6 percent slopes	243.3	0.1%
HsA	Hornell silty clay loam, 0 to 2 percent slopes	4,222.4	2.6%
JtA	Jimtown loam, 0 to 2 percent slopes	3,065.7	1.9%
JuA	Joliet silt loam, 0 to 1 percent slopes	648.0	0.4%
KbA	Kibbie fine sandy loam, 0 to 2 percent slopes	7,451.1	4.6%
KcA	Kibbie loam, 0 to 2 percent slopes	19.0	0.0%
MaA	Mahoning silt loam, 0 to 2 percent slopes	199.7	0.1%
MaB	Mahoning silt loam, 2 to 6 percent slopes	62.7	0.0%
MbB	Marblehead loam, 0 to 6 percent slopes	693.4	0.4%
MeA	Merrill silty clay loam, 0 to 1 percent slopes	3,297.8	2.0%
MfA	Milford silty clay loam, 0 to 1 percent slopes	4,670.8	2.9%
MgA	Milgrove loam, 0 to 1 percent slopes	2,469.1	1.5%
MmA	Millsdale silty clay loam, 0 to 1 percent slopes	2,214.8	1.4%
MnA	Milton silt loam, 0 to 2 percent slopes	1,811.8	1.1%
MnB	Milton silt loam, 2 to 6 percent slopes	482.2	0.3%

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Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MrA	Miner silty clay loam, 0 to 2 percent slopes	987.1	0.6%
MsA	Miner silt loam, shale substratum, 0 to 2 percent slopes	902.8	0.6%
MxA	Mitwanga silt loam, 0 to 2 percent slopes	1,391.4	0.9%
MxB	Mitwanga silt loam, 2 to 6 percent slopes	252.4	0.2%
NoA	Nolin silt loam, 0 to 2 percent slopes, occasionally flooded	585.3	0.4%
OaB	Oakville loamy fine sand, 0 to 6 percent slopes	588.9	0.3%
OgA	Ogontz fine sandy loam, 0 to 2 percent slopes	864.0	0.5%
OhB	Ogontz silt loam, 2 to 6 percent slopes	1,395.8	0.9%
OmA	Olmsted loam, 0 to 1 percent slopes	81.0	0.0%
On	Orville silt loam, frequently flooded	119.5	0.1%
OpA	Orville silt loam, bedrock substratum, 0 to 2 percent slopes, occasionally flooded	1,963.9	1.2%
OrA	Orville silt loam, bedrock substratum, 0 to 2 percent slopes, frequently flooded	689.7	0.4%
OsB	Osthlema loamy sand, 0 to 6 percent slopes	2,521.0	1.5%
PcA	Pewamo silty clay loam, 0 to 1 percent slopes	10,880.2	6.7%
Pg	Pits, gravel or sand	60.5	0.0%
Pk	Pits, quarry	1,412.9	0.9%
FmA	Plumbrook fine sandy loam, 0 to 2 percent slopes	2,208.7	1.4%
PrA	Prout silt loam, 0 to 2 percent slopes	4.2	0.0%
RaA	Randolph silt loam, 0 to 2 percent slopes	1,800.3	1.0%
RcA	Rawson sandy loam, 0 to 2 percent slopes	671.6	0.4%
RcB	Rawson sandy loam, 2 to 6 percent slopes	1,022.9	0.6%
RgA	Romer loamy fine sand, 0 to 2 percent slopes	952.3	0.6%
RhA	Ritchey loam, 0 to 2 percent slopes	1,031.8	0.6%
RhB	Ritchey loam, 2 to 6 percent slopes	1,046.2	0.6%

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Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
RhC	Ritchey loam, 6 to 12 percent slopes	216.2	0.1%
SaA	Sandusky loam, 0 to 1 percent slopes	439.4	0.3%
SbF	Saylesville silt loam, 25 to 40 percent slopes	1,150.3	0.7%
ShB	Shinrock silt loam, 2 to 6 percent slopes	1,051.2	0.6%
SkC2	Shinrock silty clay loam, 6 to 12 percent slopes, eroded	534.7	0.3%
SkD2	Shinrock silty clay loam, 12 to 18 percent slopes, eroded	581.1	0.4%
SpB	Spinks loamy fine sand, 0 to 6 percent slopes	1,045.5	0.6%
SpD	Spinks loamy fine sand, 12 to 18 percent slopes	275.8	0.2%
SrB	Spinks loamy fine sand, 2 to 6 percent slopes	0.5	0.0%
TgA	Tioga loam, 0 to 2 percent slopes, occasionally flooded	559.4	0.3%
TrA	Toledo silty clay loam, 0 to 1 percent slopes	908.2	0.6%
ToA	Toledo silty clay, 0 to 1 percent slopes	4,391.9	2.7%
TpA	Toledo silty clay, 0 to 1 percent slopes, flooded	1,404.8	0.9%
TuA	Tuscola fine sandy loam, 0 to 2 percent slopes	2,515.6	1.5%
TuB	Tuscola fine sandy loam, 2 to 6 percent slopes	1,692.6	1.0%
UcB	Udipsamments-Spinks complex, 0 to 6 percent slopes	318.9	0.2%
UdB	Udorthents, loamy, 0 to 6 percent slopes	3,919.0	2.4%
W	Water	1,936.1	1.2%
WaB	Wakeman sandy loam, 2 to 6 percent slopes	526.4	0.3%
WaC	Wakeman sandy loam, 6 to 12 percent slopes	115.4	0.1%
WeA	Weyers silt loam, 0 to 1 percent slopes	1,996.1	1.2%
ZuC2	Zurich silt loam, 6 to 12 percent slopes, eroded	1,166.1	0.7%
ZuD2	Zurich silt loam, 12 to 18 percent slopes, eroded	1,457.0	0.9%
ZuE2	Zurich silt loam, 18 to 25 percent slopes, eroded	216.0	0.1%

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Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ZuF	Zurich silt loam, 25 to 40 percent slopes	793.0	0.5%
Totals for Area of Interest		162,946.3	100.0%